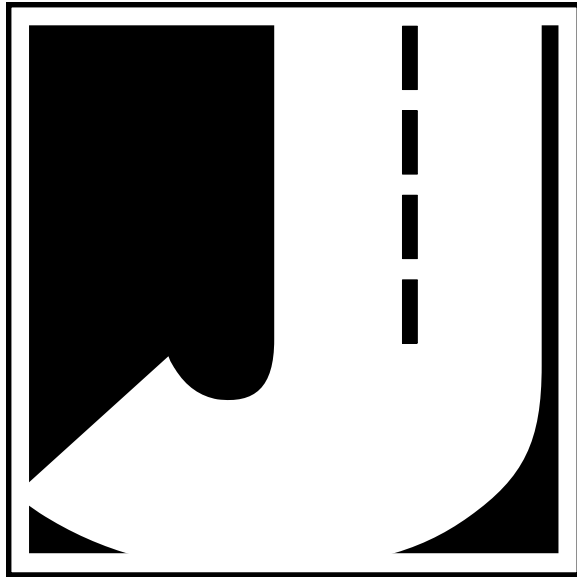


GPS Travel Time

Travel Time and Delay Data Collection Software



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Chapter 1

Introduction and Installation

Introduction to GPS Travel Time

Welcome to GPS Travel Time, a JAMAR Technologies software program designed to collect travel time and delay data using a GPS receiver. Data that has been collected using the GPS Travel Time software is designed to be processed and analyzed using JAMAR's PC-Travel for Windows software.

GPS Travel Time consists of two similar programs, *GPS to Laptop* and *GPS to PDA*. As their names imply, GPS to Laptop is designed to be run on a laptop computer while GPS to PDA is designed to be run on a PDA. You can use whichever program is more suitable to the equipment you have. The data collected will be the same whether it was collected with a laptop or a PDA.

Travel time and delay is a complicated subject and we have not tried to oversimplify it at the expense of the experienced user who wants to get as much from the analysis as possible; yet we have tried to make the software easy to use, even for the occasional user.

Definitions

Before any discussion of travel time data collection can begin, you must have a careful understanding of the terms we use and how we use them. This section defines the words used in the program that mean something more specific than the word itself might imply.

Run

A single collection of travel time data.

For example, when data is collected along an arterial, the user drives to the beginning of the arterial under study, starts data collection, proceeds along the arterial to the end of the study area, and then stops data collection. He has just completed one run. If he turns around and collects data in the other direction, it is another run. All runs are stored as separate entities in the program.

Study

A collection of runs.

When the user collects data, he is making data runs, and when he gets back to the office, he collects those runs into studies. The difference is important because runs can be collected into different studies. For example, a user may make a number of runs at an arterial during one or two days. Back in the office he may create a study with just the morning runs. He may also create a study with all of the runs, which of course use some of the morning runs.

There is one critical rule for studies:

All of the runs in a study must start at the same place, end at the same place, and follow the same route.

Only runs in the same direction can be part of the same study. Since you usually collect runs in two directions (up and back), you typically will create at least two studies for each data collection session.

Fixed-Route

Data collection along a pre-determined route.

GPS Travel Time only supports Fixed-Route studies. Another type of study, called Chase Car studies, may be supported in the future, based on user interest.

When you do Fixed-route studies, you collect run data along the same route several times. One run is rarely sufficient to find the travel time characteristics of a route. You

may be lucky and never hit a red light during your run, or you may be unlucky and hit several. If you collect several runs, the averages of the individual run data will be a better representative of the true traffic characteristics of the route.

Fixed-route studies usually have segments defined at the time the runs are made. The route is divided into geographic segments, using easily determined landmarks to separate the segments. For arterials, the segment boundaries may be signalized intersections. For freeways, the boundaries may be interchanges. You are free to define the segments any way you want.

Node

The boundary between two segments of a run.

Every run has a *starting node*, which is where you start collecting data on a fixed-route study, an *ending node*, which is where you stop collecting data, and several *segment nodes* in between. The user records the location of the nodes by pressing a buttons in the field as the user passes the nodes during a run.

Travel Time

The elapsed time to travel between two points, in seconds.

This is probably the most fundamental of the reported statistics. All run travel times are measured and reported to the nearest second. Study travel times, which are averages of the run travel times, are reported in tenths of second (technically speaking, the tenths of second are not significant in studies with less than about 5 runs, but that is rarely of concern in the vast majority of practical traffic evaluation situations).

Software Updates

Updated versions of JAMAR software are released periodically and are posted on the JAMAR web site. Licensed owners of GPS Travel Time can download updates to the program to make sure they always have the latest version of the software on their computer or PDA. To download the latest version of GPS Travel Time, go to www.jamartech.com and then select Downloads from the list of options.

Installing GPS to Laptop

To install GPS2LT onto your laptop PC, place the JAMAR CD into your CD drive. The Installation Options program will start after a few seconds. If it does not, click on the **Start** button on your Windows desktop. Select **Run** from the list of options and type the command line **X:\setup.exe**, where X is the letter of your CD drive. Press **OK** and you will see the Installation Options for the program. Click Install GPS to Laptop to start the installation.

At the Welcome Screen, click **Next** to start the wizard. You will then be asked whether or not you want to accept the licensing agreement. Click the **Yes** button to accept the agreement and continue with installation.

Fill in the appropriate boxes with your name, and your company's name, and serial number. The serial number will be on the back of your CD case. Be sure to include the hyphens (-). Click **Next** to proceed. The install program checks the serial number you entered and if there is a problem (usually just a mistake typing the number) you will see an error message and get a chance to enter the number again. When the software is happy with the number, you will see the next screen.

The setup program needs a location in which to install your GPS2LT software. The default location will install GPS2LT in the same folder with other Jamar software you might have. Whether or not you have any other Jamar software, the default location will work just fine. If you do have some reason to change you installation location, click the **Browse** button and select any existing directory for installation.

The fifth screen asks you to choose a folder for GPS2LT's icon. Again, the default shown will almost certainly be okay. It may make the most sense to you to pick the folder that matches the directory from the previous screen, but you're free to choose any folder you like. Click the **Next** button to continue.

Now, you are able to review any and all of the information that you've entered into the setup wizard. Click the **Back** button should you want to change anything. If everything looks correct, click **Next** to install all of GPS2LT's files.

Once your GPS2LT software is installed, click the button labeled **Finish** to exit the wizard.

Installing GPS to PDA - Pocket PC Version

It is a simple process to install GPS2PDA on your Pocket-PC PDA. It is required, though, that you have set up an ActiveSync partnership with your desktop computer. If you are unsure of how to do this, consult the instructions that came with your Pocket-PC PDA.

It is recommended that you place your PPC into its cradle and allow ActiveSync to run prior to starting the installation procedure. The installation software will use ActiveSync to copy the files to your PDA.

Place the GPS Travel Time CD into the CD drive of your PC. The computer should recognize the new CD and show you the Installation Options screen, which includes an *Install GPS Travel Time Software* button. Click this button. On the next screen, click the *Install GPS to PDA* button. On the next screen, click *Install GPS to PDA for Pocket PC* and the installer wizard will start.

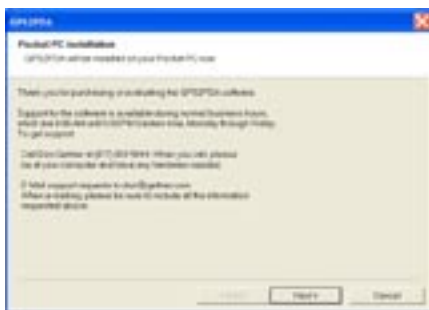


Figure 1.1 - Welcome

At the first screen click the **Next** button.

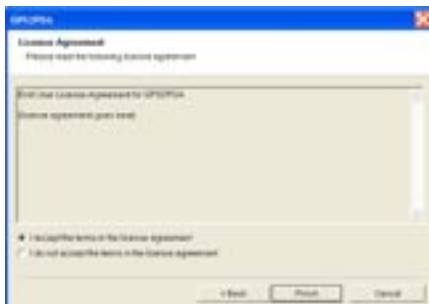


Figure 1.2 - License Agreement

Select the I accept the terms in the licence agreement option and click the Next button.



Figure 1.3 - Installing

Once the wizard opens communications to your PPC, it will ask you if you want to save GPS2PDA in its default directory. Click **Yes** if you would like to have GPS2PDA in the main memory of your PPC in the *Program Files* folder. This option is simplest and would be best for most users. Click the No button if you would like to install GPS2PDA on an expansion card. The wizard will then take you to another screen that allows you to choose the location in which you'd like to install GPS2PDA.

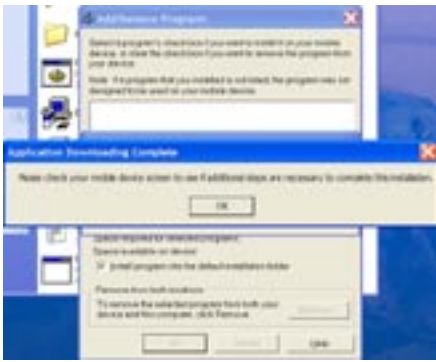


Figure 1.4 - Installation Complete

This is the final screen in the wizard. Click the **OK** button and check your PDA to see if there are any additional steps you need to take to complete the installation of GPS2PDA. There may not be any further steps, but that will vary depending on what type of PPC you are using.

Enter Serial Number For GPS to PDA

Now that the program has been installed on your PDA, you need to enter your serial number for GPS2PDA.

GPS2PDA uses a serial number to help prevent unauthorized use of the software. This number must be entered into the software and stored on your PDA. With most JAMAR software you enter the serial number when you install the program. PDAs are a little different so you need to enter the serial number the first time you run the program.

When you first run GPS2PDA, there will not be a serial number in memory, so you will be brought to this screen.

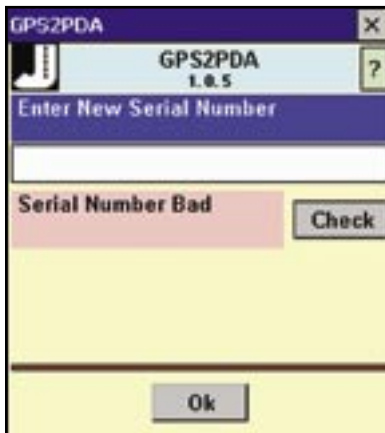


Figure 1.5 - Serial # Bad

Enter the 20 digit serial number that came with the program. If you received a CD from JAMAR, it will be on a label on the back of the CD. When you enter the serial number be sure to include the hyphens (-) between the characters.

Tap on **Check**. The software will check the number you entered to see if it is OK. If there is a problem (*usually an error entering the characters*) then the status message area will be in red, and the message **Serial Number Bad** displayed.

If the serial number checks out OK, then you will see a screen similar to the second screen shown here. The status message area will now be in green and the message will be the more

encouraging **Serial Number OK**. Tap **OK** to store the serial number and go to the Splash Screen.

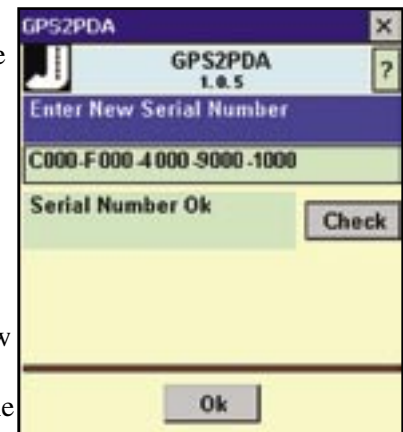


Figure 1.6 - Serial # Good

Demo Mode

If you downloaded GPS2PDA from the Jamar website just to try it out, then you can set the software to run in Demo Mode.

Tap on the **Demo** button on this screen. The serial number will change to DEMO-DEMO-DEMO-DEMO-DEMO.

Tap **OK**. The software will now operate as usual, *except no data will be stored in the database file in the PDA (so you can't actually process any data you collect)*. You can see exactly how the software will operate on your PDA. This is a good way to tell if that old PDA you have will actually work OK with GPS2PDA.

Installing GPS to PDA - Palm Version

Place the GPS Travel Time CD into the CD drive of your PC. The computer should recognize the new CD and show you the Installation Options screen, which includes an *Install GPS Travel Time Software* button. Click this button. On the next screen, click the *Install GPS to PDA* button. On the next screen, click the *Install GPS to PDA for Palm* button that is appropriate for your Palm OS. The installer wizard will then start.

At the *Welcome Screen*, click the **Cancel** button to quit the wizard if you have any programs currently running. Close the other programs and restart the wizard. If you agree with the copyright warning and you've performed at least one synchronization with your PDA, then click the **Next** button to carry on with your installation.

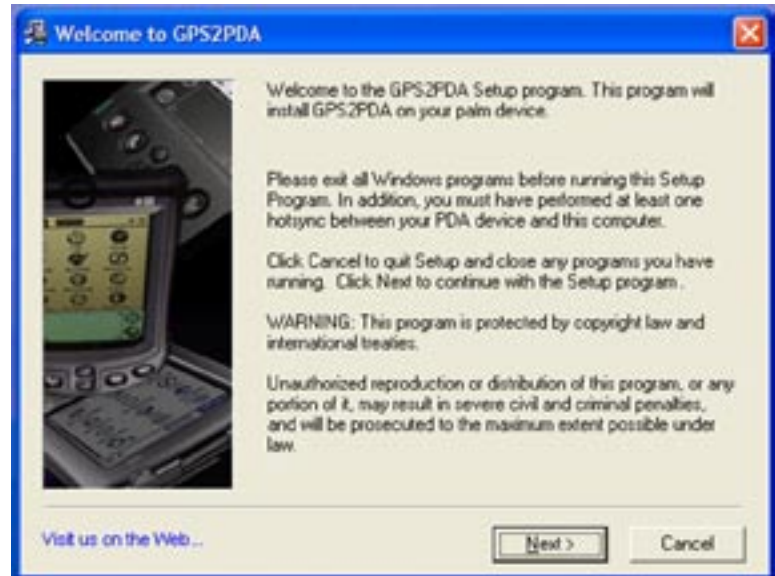


Figure 1.7 - Welcome

The installation wizard will automatically find any PDA synchronization information that you may have on your computer. If you only have one Palm device set up to HotSync with your computer, then that device is selected automatically. If you have connected more than one Palm PDA to your system, click the down arrow in the box to pick the one on which you'd like to install GPS2PDA. Once the proper Palm device has been selected, click the **Next** button to proceed.



Figure 1.8 - Select Device

Finally, GPS2PDA is ready to be installed on your Palm. The program has been added to HotSync Manager's installation list so that it will be loaded onto your Palm the next time you perform a HotSync. Click the button labeled **Finish** to exit the wizard.



Figure 1.9 - Installation Complete

Enter Serial Number For GPS to PDA

Now that the program has been installed on your PDA, you need to enter your serial number for GPS2PDA.

GPS2PDA uses a serial number to help prevent unauthorized use of the software. This number must be entered into the software and stored on your PDA. With most JAMAR software you enter the serial number when you install the program. PDAs are a little different so you need to enter the serial number the first time you run the program.

When you first run GPS2PDA, there will not be a serial number in memory, so you will be brought to this screen.

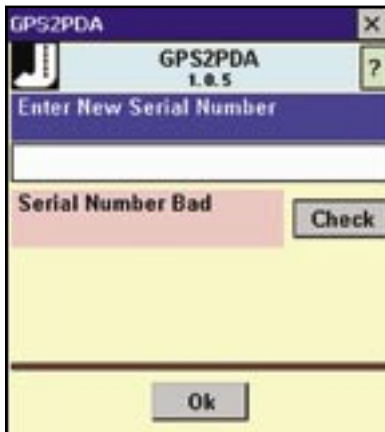


Figure 1.10 - Serial # Bad

Enter the 20 digit serial number that came with the program. If you received a CD from JAMAR, it will be on a label on the back of the CD. When you enter the serial number be sure to include the hyphens (-) between the characters.

Tap on **Check**. The software will check the number you entered to see if it is OK. If there is a problem (*usually an error entering the characters*) then the status message area will be in red, and the message **Serial Number Bad** displayed.

If the serial number checks out OK, then you will see a screen similar to the second screen shown here. The status message area will now be in green and the message will be the more

encouraging **Serial Number OK**. Tap **OK** to store the serial number and go to the Splash Screen.

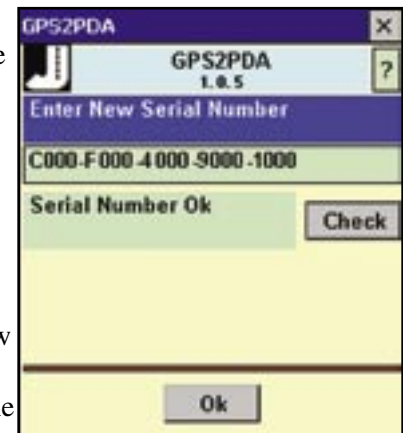


Figure 1.11 - Serial # Good

Installing the GPS to PDA HotSync Conduit

It's time to install what's known as a Conduit. This conduit is what tells HotSync to synchronize and convert your GPS2PDA data. All of the necessary conduit installation files can be found on the GPS Travel Time CD. The CD should already be in your CD drive (*as a result of the installation in the previous section*). This time, click on the Install Palm Data Conduit button and the installation wizard will begin. The screens are shown below.



Figure 1.12 - Welcome

Click the **Next** button.

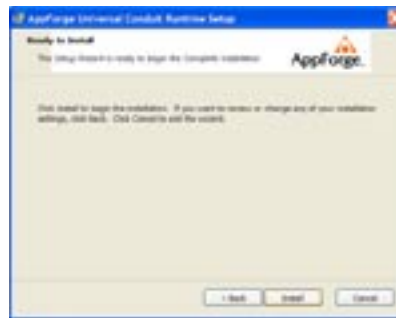


Figure 1.13 - Ready to Install

Click the **Install** button here.



Figure 1.14 - Finished

Click **Finish**.

Now double click on the **GPS2PDA.bat** file. Your screen will blink at you momentarily as this program runs. The last action of the **GPS2PDA.bat** file is to restart your HotSync Manager.

At this point, you should check and make sure that your conduit was properly installed. Here's how:

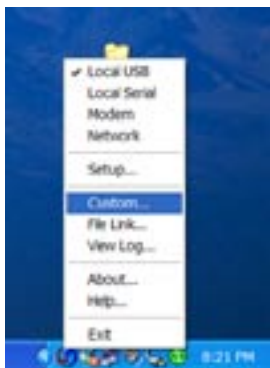


Figure 1.15 - Select Custom

Click on the HotSync Manager's icon in your system tray. A menu will pop up, similar to the image here.

Select **Custom**. This will display a new window that will show a list of conduits that are performed each time you HotSync your Palm PDA.

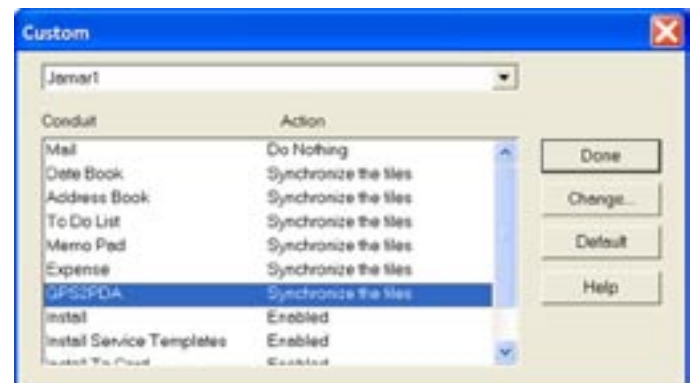


Figure 1.16 - Locate GPS2PDA

Check to make sure that GPS2PDA is listed in this window as shown below. If it is, everything went to plan, click **Done**.

Creating an Open Database Connectivity Data Source Name (ODBC DSN)

Now the acronyms start to get scary. The conduit you just installed in your HotSync Manager wants to synchronize all of the records from the GPS2PDA database on your Palm device with some file on your desktop computer. All that remains is to tell your desktop which file should be used for synchronization.

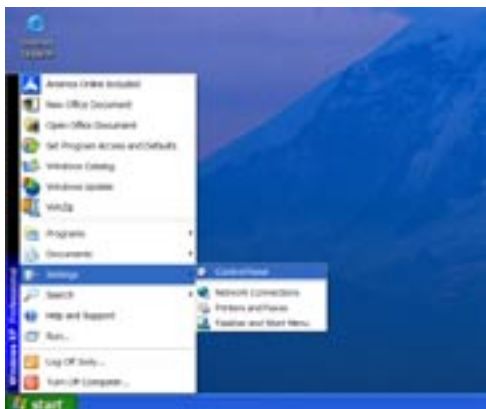


Figure 1.17 - Select Control Panel

These next steps are accessed through your PC's Control Panel. To navigate to the control panel, click on the **Start Menu**, then **Settings**, then **Control Panel**.

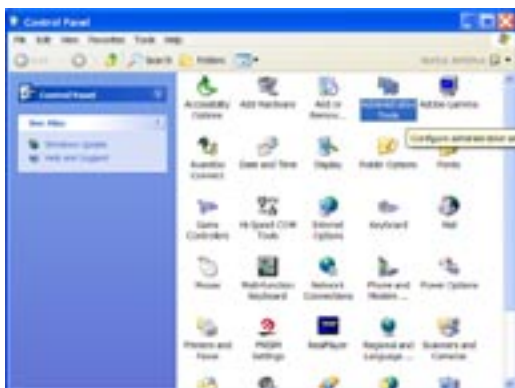


Figure 1.18 - Administrative Tools

This is your PC's Control Panel. It will look slightly different depending on which version of Windows that you are running. In Windows 2000 and Windows XP, you'll now select **Administrative Tools**, otherwise, just click on **Data Sources (ODBC)**.

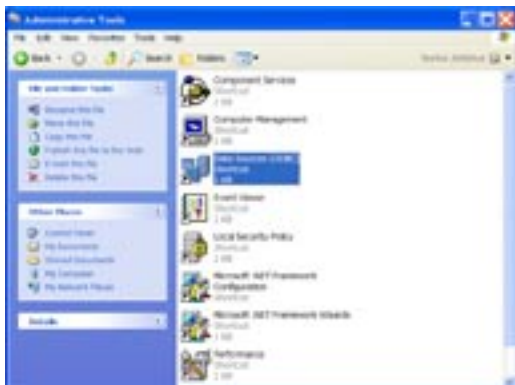


Figure 1.19 - Select Data Sources

This is the Administrative Tools screen for Windows 2000 or Windows XP. Click **Data Sources (ODBC)** to proceed.

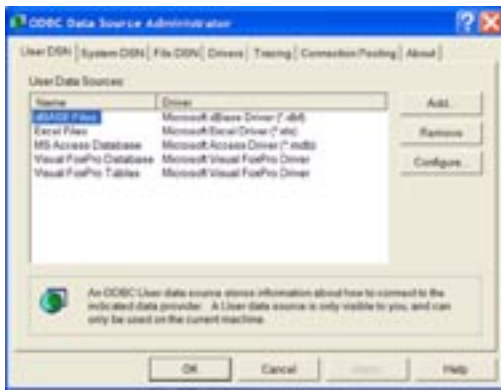


Figure 1.20 - User DSN

You're now faced with a window that has a lot of buttons and a lot of tabs; remain calm. Select the tab entitled **User DSN**. Under the **User DSN** tab, click on the **Add** button.

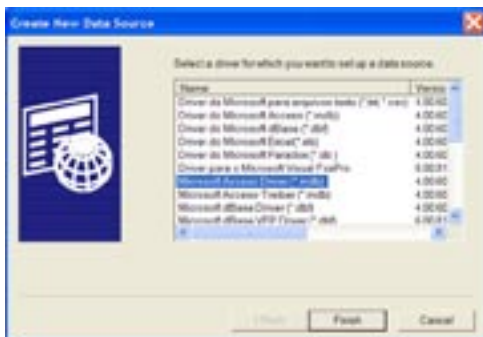


Figure 1.21 - Microsoft Access Driver

The next screen is a list of drivers. Choose the **Microsoft Access Driver (*.mdb)** option. Now click the **Finish** button to continue.



Figure 1.22 - Enter Information

For your next step, enter **GPS2PDA** in both the **Data Source Name** and **Description** text boxes. From this same window, click the **Select Database** button.

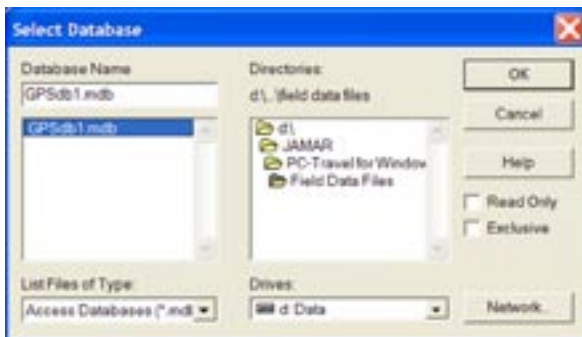
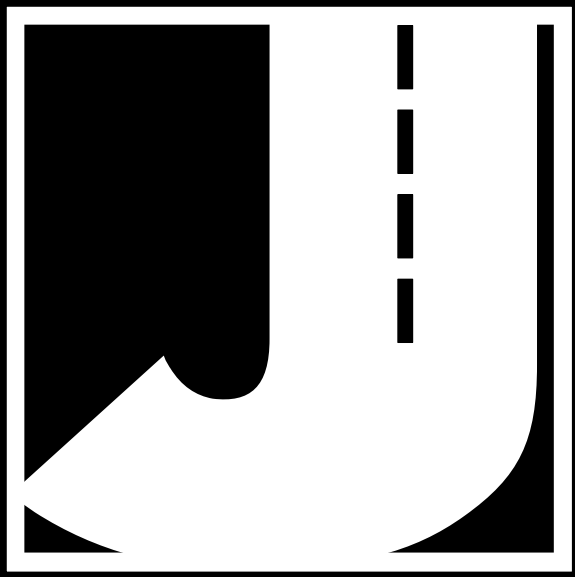


Figure 1.23 - Select Database

At the **Select Database** screen, use the tree window in the center to navigate to the **Field Data Files** folder (*it's in the PC-Travel for Windows folder*). Once you have selected **Field Data Files** from the folder tree, a file called **GPSData.mdb** will appear in the box on the left. Select **GPSData.mdb** from the box on the left. Click the **OK** button on this screen, then click **OK** once again and you're done.

The stage is set for you to take travel time data in the field and synchronize it with your computer once you return to the office.



Chapter 2

Collecting Travel Time Data in the Field

Collecting Data with GPS Travel Time Software

The basic idea is simple. The GPS receiver outputs data every second. Some of this data includes the speed of the vehicle, which is measured to a surprisingly high degree of accuracy (better than 1 MPH). The laptop or PDA reads the data from the GPS receiver and stores the speed information, plus other information that you input. The PC-Travel for Windows software then can read and process these files into travel time studies.

GPS Technology and Receivers

In case you are new to GPS technology, what follows is a brief introduction to the subject. Each GPS receiver is a glorified radio antenna that picks up signals put out by the network of dedicated GPS satellites. Once the receiver gets a signal from three or four satellites, it can compute your position (*latitude and longitude*) anywhere on the planet. Using a little calculus, the receiver can figure out how fast you are moving by monitoring your changes in position.

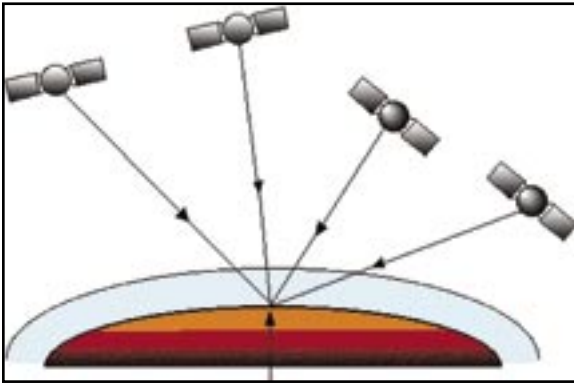


Figure 2.1 - How GPS Works

There are dozens of GPS receivers available, in many different price ranges and with many different features. In general, the best GPS receivers to use with GPS Travel Time do not have dedicated display screens. For our purposes, they just aren't necessary. Since the laptop or PDA you are running GPS Travel Time on acts as your display, you don't need one on your GPS unit. If you've already got a GPS receiver with a display and it's supported by GPS Travel Time, that's fine. However, if you're shopping for a GPS unit for the specific purpose of taking travel time data,

save yourself some coin and opt for something like the simple black receiver shown here. Visit www.gps2traveltime for more information on GPS receivers.



The most important part of the GPS Travel Time set up is the placement of the GPS antenna. In order for the GPS receiver to function properly, it must have a fairly clear view of the sky. This makes GPS reception more difficult in places with numerous tall buildings or dense foliage, and nearly impossible in tunnels.

Since the inside of your car doesn't provide an ideal view of the sky, it is best to have a GPS receiver with an external antenna. This antenna may be the entire receiver, as in the case of the Garmin 35, or it may plug into the GPS device which would then feed the data to your laptop. Either way, you don't want to be driving around holding your GPS receiver out the window so you don't lose your signal. Most of the external antennas are magnetic, which is very handy when popping it on and off of a car's roof, but a suction cup anchor or fixed mounting bracket would also do the job. Route the cable through a window into your car.

To physically connect with GPS Travel Time, your GPS receiver must have some means to send data to your laptop or PDA. Usually the easiest means to achieve this connection is through a serial port. Most GPS receivers are equipped with a female 9-pin serial connector and most laptops have the male equivalent. A fairly standard cable is used to connect the two. *Note: Some new laptops don't have serial ports, they only have USB ports. There are USB to Serial adapters that are available at any computer store that solve this problem. For this tutorial we'll assume you have a GPS receiver and a laptop that each have serial ports.* PDAs require a serial adapter, which can be acquired from the PDA's manufacturer, and the use of a JAMAR GPS cable.

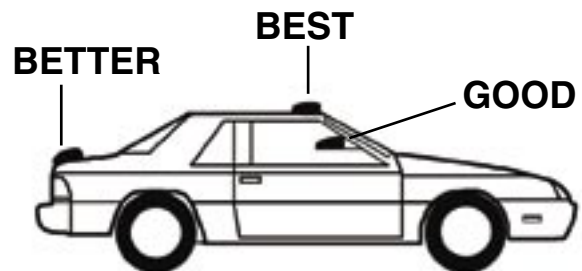


Figure 2.2 - Antenna Placement

The specific information output by GPS receivers will vary from unit to unit. However, there is one standard output format that is supported by nearly every receiver. This format is called NMEA. NMEA outputs are divided into sentences and these sentences are transmitted as ASCII text characters. Often, there are ways to adjust which sentences your receiver transmits. A GPS receiver may default to output its sentences every second, every two seconds, or sometimes every 5 seconds. This time interval may also be changed on most units. GPS2LT requires that your receiver output sentences at one second intervals. *If you aren't sure if your receiver outputs data in the proper format, visit www.gps2traveltime.com or give us a call.* In testing this software, the Garmin 35 and the Garmin 16 were used extensively.

Many GPS receivers are battery powered and any such unit with a reasonable battery life would be fine for use with GPS Travel Time. Since you will be in the car, the best option is to power your GPS unit with a cigarette lighter plug. Some receivers, like the Garmin 35, come with a cigarette lighter plug already included. Otherwise, you can usually find a cigarette lighter adapter to add to your GPS unit through the GPS manufacturer.

Once you have your GPS receiver installed and ready to go, you will have it connected to either a laptop computer or PDA. The following sections detail how to do fixed-route travel time study.

Recommended GPS Receiver Features

- External antenna that mounts on roof of car
- Serial port for standard connection to laptop or PDA
- NMEA format output at 1 second intervals

How to Do a Fixed Route Travel Time Study

This section is a step-by-step guide on how to do a fixed route travel time study on an arterial street using the GPS Travel Time software.

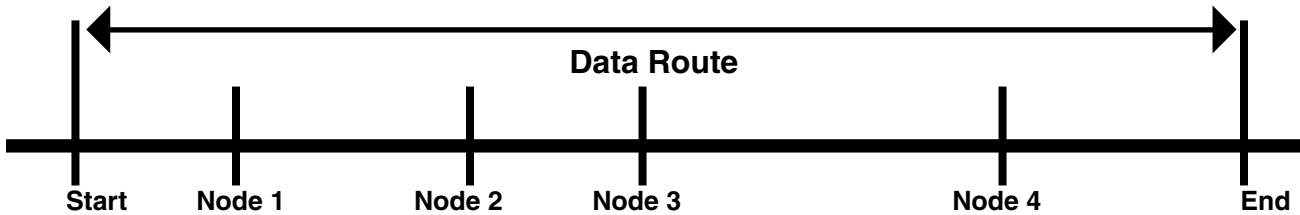


Figure 2.3 — Data Route

Step 1 — Define the Route

This step may seem obvious, but it is easy to forget some important points. You need to define a starting point, an ending point, and the intermediate nodes. Normally the starting, ending, and intermediate nodes are intersections, but they can be other landmarks such as bridge abutments, mile post markers, or other fixed landmarks. Pick points that can be easily identified now and when future *after* runs may be collected. The drawing above shows a simplified diagram of a typical study route. There is a starting node, which could be an intersection, four nodes, which could be signalized intersections, and an ending node.

Make a rough sketch of the route, clearly showing the starting and ending points and list the intermediate nodes you want to use (*see step 2*). You don't have to make every intersection a node. It is important to understand the type of information you want the data to give you before you define the route and nodes. Don't use more nodes than you really need; it just needlessly complicates the analysis.

PC-Travel Field Worksheet							
Location	Bandwidth	Start	5/11/2000				
Site Code	12345678	Del. Contact	SK2				
Notes							
Start/End	Ordeal 95th						
1	4. Mainland	16					
2	3. Griffland	17					
3	2. Broomhaver/Midic	18					
4	1. Broom	19					
5	5. Tigh	20					
6		21					
7		22					
8		23					
9		24					
10		25					
11		26					
12		27					
13		28					
14		29					
15		30					
Runs							
#	Dir	Time	Comments	#	Dir	Time	Comments
1	sb	14:55	ok	2	sb	15:43	ok
3	sb	15:15	redneck truck at brown	4	sb	15:32	ok
5	sb	15:50	ok	6	sb	15:40	ok
7	sb	15:52	slow truck, cannot backup	8	sb	16:12	ok
9	sb	16:20	ok	10	sb	16:29	slow truck at goldfish?
11	sb	16:40	ok	12	sb	16:48	ok
13				14			
15				16			
17				18			
19				20			

Figure 2.4 — Field Worksheet

Step 2 — Prepare the Field Worksheet

You should always keep field notes when you do travel time studies. The field notes help you keep track of the runs when you get back to the office. The Appendix has a master copy of a sample field worksheet to help you store all of the information about the runs you make. You should make copies of this form, or use it as a guide to develop your own field sheet. Also included is a sample of a worksheet that has been filled out (*shown here in reduced form*) to give you an idea of how the form is used.

Before you start the data collection, fill in the general information about the session at the top of the sheet. List the starting point, ending point, and any intermediate nodes.

Step 3 — Collect Your Data

There are two ways to collect your data in the field using the GPS Travel Time software — using the software with a Laptop computer, or using the software with a PDA. The remainder of this chapter details these two options.

Working with GPS to Laptop

This section details the procedures for collecting GPS travel time data using a laptop computer. If you are using a PDA, skip to the next section.

This tutorial will guide you through the basic use of the GPS to Laptop (GPS2LT) software. Read through the tutorial once to get familiar with the basic ideas and to learn how the two primary screens work. The tutorial works best if you actually follow the directions and collect real data in the field with a GPS receiver and laptop, but we tried to write the tutorial to make sense even if you are sitting comfortably in your recliner in your office. (*What? You don't have a recliner?*)

This tutorial assumes you are familiar with the basics of travel time studies. If not, then you should read Chapter 1 of this manual. It will make this tutorial easier to follow. Start the GPS2LT program and the first screen you will see is the **Preferences**.

Setting the Preferences

The purpose of this screen is to allow you to set all of GPS2LT's options before you start recording data. Your interaction with this screen will determine the name of your study, the folder in which your study will be saved, the communication port number that will be active, what type of GPS receiver you'll be using, and whether or not you'll be using the VersaPoint remote control.

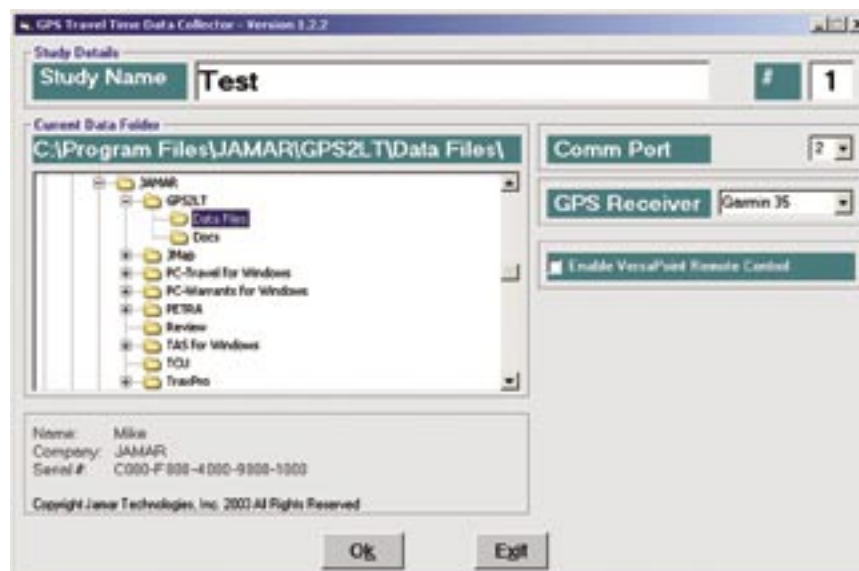


Figure 2.5 - GPS to Laptop Preferences

The lower left corner of the screen shows the **license information**, including your serial number. You may need this number if you are talking to Tech Support at Jamar.

The boxes labeled 'Study' and '#' in the **Study Details** field allow you to enter a unique name for your upcoming study. GPS2LT will save every file with a .gdf file extension. This is not optional, as PC-Travel will be looking for your GPS data in this particular format. For the purposes of this tutorial, leave the study name and number as their default values.

Use the tree viewer in the **Current Data Folder** field to select the folder in which your study will be saved. If your selection is invalid, you will see an error message asking you to pick another folder. For now, you can just have GPS2LT save your data in the default Data Files folder.

To the right of the tree viewer is the **Comm Port** drop-down box that allows you to select the number of the Comm (serial) port with which your GPS receiver will be communicating. If you are unsure of your Comm port number, just leave it set to Comm port number one and GPS2LT will let you know whether or not it was able to open that particular port.

Use the **GPS Receiver** box to select the type of GPS receiver you are using with GPS2LT. This entry will allow the software to better process the information output by your GPS receiver. If the receiver you are using isn't on the list then you may need to experiment to see if any of the listed receivers work the same way as yours. You will be able to tell on the Main screen, before you start collecting any data, if the software can read the data coming from your receiver.



Use the **Enable VersaPoint Remote Control** box to tell the software whether you are using the remote control that is available as an option with GPS2LT. This remote control (shown in the picture) allows you to control the software without looking at the keyboard. One button is used to mark the beginning and end of runs, one button is used to mark nodes, and one button is used to end a study. This low cost remote simplifies the data collection since the person running the software can watch the road instead of glancing back and forth between the road and the keyboard.

When all of your information is correct, click the **OK** button to proceed to the Main Screen.

Figure 2.6 - VersaPoint Remote Control

Data Collection Screen



Figure 2.7 - GPS to Laptop Main Screen

The **Study Details** field at the top portion of the screen is dedicated to displaying important information about your current study. The Study Name and # labels will show whatever you typed into the boxes on the **Preferences** screen. The Run indicator shows the current run number. The Node indicator shows the current node number in the run.

If any information shown under *Study Details* or *GPS Data* is incorrect, go ahead and click the End Study button (or the 'e' key). The program will take you back to the *Preferences* screen where any mistakes can be corrected.

Once your GPS device is properly connected, the GPS information is processed and parsed to fill in the *Time*, *Speed*, *Latitude*, *Longitude*, *Fix*, *Num Sats*, and *HDOP* labels found in the *GPS Data* field.

Most of these labels are obvious, but the last three may need some explanation:

Fix: This shows the type of data detected by the GPS receiver. If it equals zero, then the receiver is not getting sufficient information to accurately determine the position. If it equals one, then the receiver is getting information only from the satellites. If it equals two, then the receiver is getting data from the satellites and a source of *differential correction*, which gives more accurate position information but doesn't improve the speed measurement significantly. For GPS2LT, the Fix should equal 1 or 2.

Num Sats: This shows the number of satellites used to calculate the current location. In general, the more satellites the receiver can see the better the data will be. This is included primarily to help you determine if the data you are collecting might have problems. The number of satellites can vary from 3 to 8 or more.

HDOP: This stands for Horizontal Dilution of Precision. It is a fancy term for the theoretical quality of the data based on the current location of the satellites in the sky used by the receiver to calculate the position and other statistics. If the satellites, by chance, happen to all be in the same general portion of the sky then the calculations made by the receiver are not as accurate as if the satellites are spread out. The HDOP ranges from less than 1, which is very good, to 5 or more. Data collected with the HDOP consistently over 4 or so may not be as accurate as the data collected on the same route at another time.

To the right of the GPS Data display is the **Data Grid**. This section is filled in when you are doing a run. Each line is one second of data. This is the data that is stored in the data file and used by PC-Travel for Windows to create the run files.

The unprocessed **GPS transmission sentences** are shown on the Status Line, below the GPS Data. This is the data that is displayed in the GPS Data section. Normally you don't pay much attention to this data; it is there as an indication that the communication with the GPS receiver is working.

It is possible that the GPS information displayed will not be correct. If the GPS receiver hasn't been used in a while, it may take some time to get a proper satellite fix. If you've given your GPS unit a few minutes to adequately determine its position and its transmissions are still erroneous, try moving to a new location that has a less obstructed view of the sky.

If you don't want to see these sentences (*they can be distracting*), then click on the **Hide** button to the right of the Status Line. You can turn the display of the sentences back on by clicking the same button (*now labeled Show*) at any time.

Once you start a run, GPS2LT will begin to fill in the Data Grid with the information supplied by the receiver.

At the bottom of the screen are the **Command Buttons** you use to control the software. There are three buttons, (*R*)un, (*N*)ode, and (*E*)nd Study. Only the buttons that are active at a given time are shown. Each command can be entered in two ways, either click on the button with the mouse or enter the letter in parenthesis on the keyboard. For example, to start a new run, press the **r** key. (*If the Remote Control option is used, then you can also control the software using the remote*).

Preparing to Start Run

When you first get to the *Main* screen, the software tries to communicate with the GPS receiver. If there is a problem, the screen will not show any GPS data. (*See below for notes on what to do*). If the software successfully connects to the receiver, the GPS data is shown on the left side of the screen. You should check the **Time** and **Speed** in particular to make sure they seem correct. You should also check the **Fix**, **Num Sats**, and **HDOP** to see the quality of the data. No information is shown in the GPS Grid section yet; that only happens once you start a run. The **Start (R)un** button is now visible, but the run hasn't started yet.

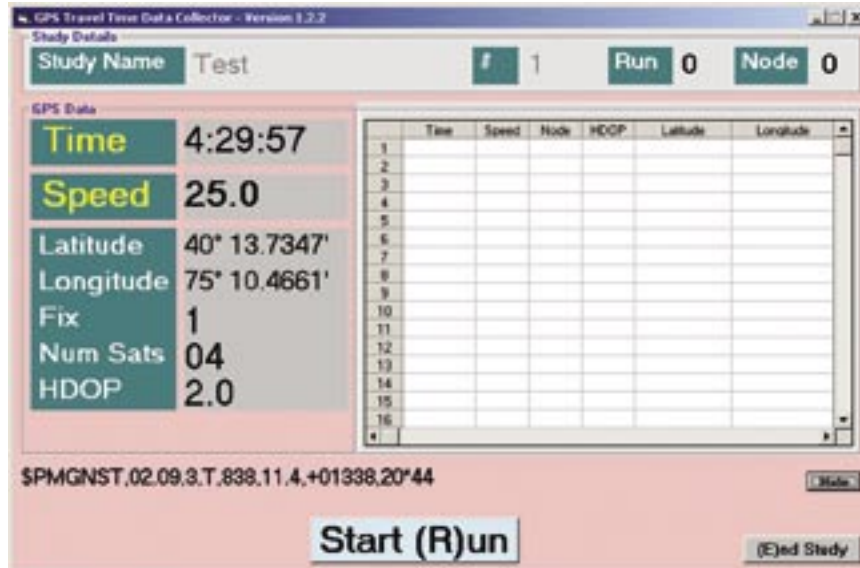


Figure 2.8 - Initial Data Collection Screen

Once all of the information you've entered is satisfactory and the GPS unit is properly connected, you're ready to start collecting data. Drive to the start of the route. Check the **Time** and **Speed** shown on the screen. They should be correct, and the speed should be close to the speed shown on the speedometer.

No GPS Data?

If you have everything set up and you're not getting any data, check the following:

- Make sure the GPS receiver is getting power. Some cigarette lighter adapters only work when the car is moving or a key is in the ignition.
- Make sure the Comm port setting is correct in the *Preferences* screen. Laptops almost always use Com1 for the serial port, but check it anyway. Also check that some other application isn't monitoring the serial port.
- Make sure the antenna has a good view of the sky. Some receivers don't output data until the data is above a certain quality level. If the receiver is new or has been moved more than a few hundred miles since it's last use, it may take up to 10 minutes to figure out where it is and start outputting data.

Collecting Data

To start the first run, click the **Start (R)un** button or press the **R** key. Note that the background changes its color to green once the run has started. At this point, you will notice that the GPS data has begun to fill in the grid and your screen will look similar to the one pictured here. Also, the **(N)ode** button has appeared while the **(E)nd Study** button has disappeared. This ensures that you aren't counting nodes in between runs or mistakenly ending a study while taking data during a run. The **Start (R)un** button now reads **Stop (R)un**.



Figure 2.9 - Data Collection Screen

To record a node during your run, click the **Node** button, press the **Spacebar**, or the **N** key. Any one of these actions will cause the node number in the top right corner of the screen to increment by one. You can have as many, or as few (even zero), nodes as you like marked on a given run; your GPS data is recorded either way.

When you come to the end of your run, click the **Stop (R)un** button or **R** key again to end data collection for that particular run. Once you stop the run, the background becomes red and data entry ceases in the grid. Now you're ready to start another run that will be added to the current study. Drive to the beginning of the second run and click the **(R)un** button or **R** key again. You can have as many runs as you like in any particular study.

When you've collected as many runs as you need, click **(E)nd Study** or the **E** key. Your data is automatically saved, and the program ends.

The data for the study is stored in a file using the names you entered into the *Preferences* screen and shown at the top of the *Main* screen, in this case Test-1. The next step is to process the data you collected in PC-Travel for Windows.

Using GPS to Laptop Data with PC-Travel

After you've collected all of the necessary travel time data, it's time to use PC-Travel for data analysis and report generation. There is a sample data file installed with the GPS2LT software. This tutorial will use that file to show you the basic procedure; then you can duplicate the process with any data you collect.

Run your PC-Travel software. One way to do this is click on the **Start** button, select **Programs**, then the **JAMAR** folder, and click on **PC-Travel** to start the software.



Figure 2.10 - Startup Options

At the *Startup Options* screen, click the **Process GPS2LT Data** button. The program takes you to a screen which allows you to browse for the particular GPS2LT study that you want to process, as shown in Figure 2.11 below.

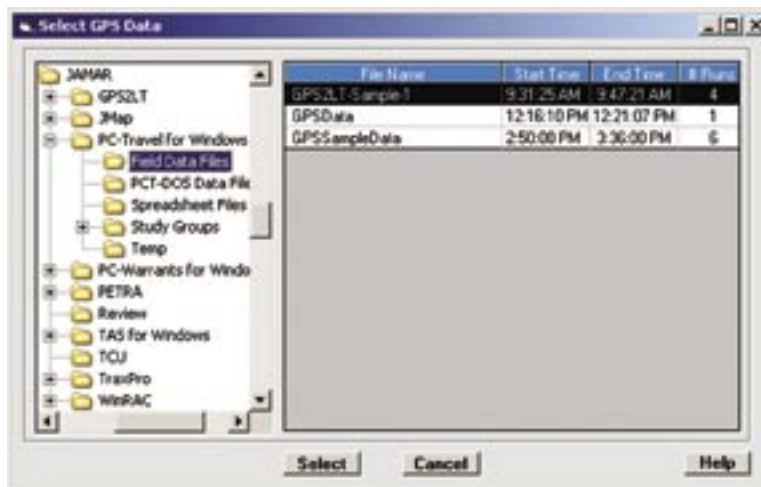


Figure 2.11 - Select GPS Data

The left side of the screen shows the familiar folder tree. The folder highlighted is the folder selected in the *Field Data* folder setting in the *Preferences* screen, which typically is called *Field Data Files*. The software looks in the highlighted folder for files with an extension of .gdf, which are the files produced by GPS2LT. The grid on the right side of the screen shows some information about each GPS2LT data file so that it is easier for you to locate the one you want. The example shown above only has one data file called *GPS2LT-Sample-1*, which is already highlighted. Click the **Select** button.

Run	Node	Time	Speed	Latitude	Longitude	HDOP	Quality	Sat Lk	
1	1	0	9:31:25 AM	0.7	2801.5939	8223.5953	1.80	2	5
2	1	0	9:31:26 AM	0.0	2801.5939	8223.5954	1.80	2	5
3	1	0	9:31:27 AM	0.0	2801.594	8223.5956	1.80	2	5
4	1	0	9:31:28 AM	3.0	2801.5943	8223.5975	1.80	2	5
5	1	0	9:31:29 AM	8.3	2801.5957	8223.5912	2.20	2	5
6	1	0	9:31:30 AM	12.3	2801.5981	8223.5937	2.20	2	5
7	1	0	9:31:31 AM	15.4	2801.6017	8223.5995	2.30	2	5
8	1	0	9:31:32 AM	18.5	2801.6074	8223.595	1.70	2	5
9	1	0	9:31:33 AM	21.2	2801.6133	8223.5952	1.80	2	5
10	1	0	9:31:34 AM	25.0	2801.6204	8223.5995	1.80	2	5
11	1	0	9:31:35 AM	28.4	2801.6283	8223.596	1.90	2	5
12	1	0	9:31:36 AM	30.3	2801.6362	8223.5962	2.00	2	5
13	1	0	9:31:37 AM	31.8	2801.6443	8223.5963	2.00	2	6
14	1	0	9:31:38 AM	34.0	2801.6532	8223.5965	1.30	2	6
15	1	0	9:31:39 AM	35.7	2801.6624	8223.5968	1.30	2	6
16	1	0	9:31:40 AM	36.9	2801.6717	8223.5971	1.30	2	6
17	1	0	9:31:41 AM	37.5	2801.6811	8223.5972	1.40	2	6
18	1	0	9:31:42 AM	37.9	2801.6905	8223.5974	1.40	2	6
19	1	0	9:31:43 AM	37.8	2801.6997	8223.5976	1.50	2	6
20	1	0	9:31:44 AM	37.8	2801.7089	8223.5977	1.30	2	6
21	1	0	9:31:45 AM	37.8	2801.7182	8223.5978	1.30	2	6
22	1	0	9:31:46 AM	37.8	2801.7275	8223.598	1.30	2	6
23	1	0	9:31:47 AM	37.9	2801.7367	8223.5982	1.30	2	6

Figure 2.12 - GPS Data Screen

At this point, you see a window entitled **GPS Data**. The purpose of this screen is to check your data for missing speeds. If you lost your GPS fix at any point during your travel time study (*which is not uncommon*), there will be missing data points. The grid on this screen shows all of the GPS data for the study that you've selected (*this includes every run in that study*). If the **OK** button is red then the software has found missing data points and you should go through your data and fix the missing speeds.

Fixing Missing Speeds

Click the **Find Next Missing Speed** button to find the first place where you data needs to be fixed.

The grid will jump to the line with first missing speed. To have the software calculate a reasonable speed for the missing data point, click **Fix Missing Speed** and the software will fill in a speed value based on the recorded speeds before and after the missing point (*it will linearly interpolate between the two, if you like fancy words*). If you don't like the speed calculated by the software you can edit the speed manually. Click on the speed data point and type in the speed.

You may have sections where several seconds of data are missing. The process just described does not need to be repeated for every point. As soon as you click **Fix Missing Speed**, the program will fill in speeds for the entire group of missing data points. When the **OK** button turns green, there are no more missing speeds.

You should not try to fix a large amount of data. The software can only do so much. If there are large blocks of missing data then any attempt to estimate the missing speeds is likely to give bad results. In all likelihood the people collecting the data will have noticed the data was not collected properly during one or more runs. You may need to ignore these runs because the data isn't complete. In this case you should let the software fill in the missing speeds so that the runs will be created, but simply ignore those runs when you create your studies.

Creating Run Files

If the **OK** button is green, you can click it to continue. The software takes the data in the grid and creates individual run files, names the runs, and copies them to the *Temp* folder. At this point, refer to the PC-Travel for Windows manual for more information on how to work with your data in that program.

Summary

If you followed this tutorial then you should have a pretty good idea how to collect travel time data using a GPS receiver and a laptop, and how to process that data in PC-Travel for Windows. Now you can go out and try it yourself.

Make sure you have two people in the car, one to operate the laptop and one to drive and tell the laptop operator when to start runs, mark nodes, and end runs. Even if you use the VersaPoint Remote Control, we recommend you still use two people.

Working with GPS to PDA

This section details the procedures for collecting GPS travel time data using a PDA. If you are using a laptop, refer to the previous section.

This tutorial will guide you through the basic use of the GPS to PDA (GPS2PDA) software. Read through the tutorial once to get familiar with the basic ideas and to learn how the two primary screens work. The tutorial works best if you actually follow the directions and collect real data in the field with a GPS receiver and your PDA, but we tried to write the tutorial to make sense even if you are sitting comfortably in your recliner in your office. (*What? You don't have a recliner?*)

This tutorial assumes you are familiar with the basics of travel time studies. If not, then you should read Chapter 1 of this manual. It will make this tutorial easier to follow.

Navigating GPS to PDA



GPS2PDA has been designed for easy navigation on any PDA. The figures in this tutorial show GPS2PDA running on a Pocket-PC operating system and an iPAQ variety PDA. However, the software will also run on the Palm Operating System and the screens will be much the same.

Once you've installed your GPS2PDA software (refer to Chapter 1 for details), you'll notice a couple of new icons on your *Applications Screen*. The first one you'll see is a program called **Booster**. The **Booster** program is the middle man that allows Jamar software to run on your PDA. Should you delete **Booster**, GPS2PDA will no longer run. The icon for GPS2PDA has also been added to your list of applications, as would be expected.

Tap on the **GPS2PDA** icon to run your new software.

Figure 2.14 is the first screen that you will see. Its main purpose is to look pretty and entertain you while the program is loading. If you're an experienced PDA user, you know that load times can be somewhat lengthy. This screen also has four buttons.



Figure 2.13 - PDA Programs

Click the **Serial #** button to go to the *Enter New Serial Number* screen. You normally only need to do this if you get a new serial number from JAMAR.

Click the **Prefs** button to navigate to the *Preferences Screen* should any of the program defaults need to be changed.

Click the **Exit** button to end the program.

Click the **Start** button to proceed to the data collection screen.

Figure 2.14 - Splash Screen

Preferences

Once you've clicked the **Prefs** button on the Splash Screen, you will arrive at the *Preferences Screen* shown in Figure 2.15. At this point, you'll be able to adjust some of the major parameters of GPS2PDA. You should notice that you have a ? button in the upper right hand corner of the screen. This button will take you to the *Help Screen* should you need any more tips on navigating the *Preferences Screen*.



Figure 2.15 - Preferences

The uppermost box, labeled **GPS Receiver**, allows you to pick out your particular GPS unit from the list of those that GPS2PDA supports. Click the downward pointing arrow to open up the box and show all of the options in the list. Don't worry if you don't see your receiver on the list. It is very likely that its output structure is identical to one of the units already on the list. Contact JAMAR Technologies and we'll find out what is needed to support your GPS receiver. You can also check the support web site at www.gps2traveltime.com to find more information about GPS receivers we have tested.

The **Time Zone** option applies to the time zone in which you reside. The time data from the GPS receiver is in Greenwich Mean Time and needs to be converted to your local time. Select your time zone from the drop-down list. EDT is Eastern Daylight Time, EST is Eastern Standard Time, CDT is Central Daylight Time, etc.

The **Hor Resolution** and **Vert Resolution** refer to the number of pixels that make up the display on your PDA. These settings are currently disabled. The **Timer Delay** is a variable used by the software while reading the GPS data. It normally should not be adjusted by the user unless instructed to by someone from tech support.

The **Enable Sounds** checkbox allows you to choose whether to have the PDA make sounds when you tap on the **Run** or **Node** buttons. If you have an older Palm PDA and you find the software isn't reliably reading the GPS data then you may want to disable this option.

NOTE: The *Preferences Screen* on the Pocket PC will have one additional setting labeled **CommPort**. If you are connecting to your GPS unit through the cradle port of your PPC, then **CommPort** should be set to 1. If you are using another connection method, such as a Compact Flash card, then **CommPort** should be set to whatever value is appropriate for your device.

Data File options

GPS2PDA stores the travel time data in one database file in the PDA. The data in this file is not deleted or erased when you transfer the data to your computer for processing. Typically, when you start a new study, the database file has the data from the last study still in it. This screen gives you the option to delete the data in the file before you start the new study, or to leave the data and add the new data to the end of the existing data.

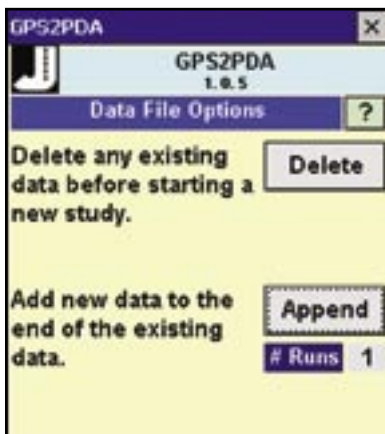


Figure 2.16 - Data Options

There are two common scenarios that make the use of this screen more understandable.

First is the case where you do a travel time study and then bring the PDA back to the office and process the data in PC-Travel for Windows. The data in the PDA is no longer needed. The next time you do a study, you select **Delete** to remove the data from the database file before you start the new study.

The second scenario is where you do a travel time study in the morning and collect data during the AM peak. You go back to the office, but don't process the data. You then return to the site at noon and possibly at the PM peak to col-

lect more travel time data. Since you haven't processed the data in the PDA yet, you don't want to delete it. Instead you select Append. The software checks the existing data, determines the run number of the last run you did, and then starts the data at the next run number. If you did 10 runs in the morning and 10 more in the afternoon then when you processed the data you would see 20 runs, numbered 1 to 20.

In the screen shown in Figure 2.16, there is currently 1 run in memory. The next run stored would be stored as run number 2.

There are certainly other scenarios you can imagine, but these two are probably the most basic.

If you choose to delete the data, the data is permanently removed from the database, so be careful before you tap that button. When you tap either of these buttons, the software brings you to the *Main Screen*.

Main Screen

This screen is where all of the good stuff happens. Your PDA will begin communication with your GPS unit and all of your data will be taken while looking at this screen. The title bar atop the screen includes the Jamar logo on the left, the version number of your GPS2PDA software in the middle and the help button in the right corner. Just below the title bar is the status label. In the illustration, the status label reads "Waiting" which means the software is waiting for you to connect your GPS unit. Otherwise, the status label will give you any error messages that may be associated with any communication errors. Information taken from your GPS unit will be placed into the **Time**, **Speed**, **Latitude**, **Longitude**, etc. labels as it is received.



Figure 2.17 - Main Screen

The **Time**, **Speed**, **Latitude**, and **Longitude** labels are fairly self-explanatory.

HDOP stands for Horizontal Dilution of Precision and it is a number that describes how well your GPS unit is currently able to calculate your position. The lower the value for HDOP, the better your position values (*lower = better*). An HDOP value of 4 or 5 would be high enough to make any travel time data suspect. If you have a reasonably good satellite configuration, your GPS unit will operate with its HDOP around 1 or 2, which is fine for using GPS2PDA.

Fix is an integer value that applies to the method that is being used by your GPS unit to find your position. If it equals zero, then the receiver is not getting sufficient information to accurately determine the position. If it equals one, then the receiver is getting information only from the satellites. If it equals two, then the receiver is getting data from the satellites and a source of *differential correction*, which gives more accurate position information but doesn't improve the speed measurement significantly. For GPS2PDA, the Fix should equal 1 or 2.

The **Start Run 1** button will begin GPS2PDA's data collection, however the button is disabled if there is not a GPS unit already connected.

The **Exit** button exits GPS2PDA and returns your PDA to its normal functioning.

Help Screen

Should you need any extra information while running GPS2PDA, just click the button with the question mark caption in the upper right hand corner of the screen. This will open up a help screen that provides extra information about what you're currently doing in GPS2PDA.



Figure 2.18 - Help Screen

Collecting Data with GPS to PDA

Now that you've seen the screens that make up GPS2PDA, and you know how the controls are laid out, it's time to start collecting data out in the field. Plug your GPS receiver into the cigarette lighter (*or just turn it on if it uses batteries*) and connect it to your PDA. Run GPS2PDA and navigate to the *Main Screen*.

Prepare for Start of Run

If everything is connected properly, your screen will look like the one shown in Figure 2.19. It is often a good idea to do a quick visual check to make sure you're getting good GPS data. Make sure that the **Time** is increasing by one second intervals and check to see if the **Speed** value is close to what you read off of your car's speedometer. At this point you can proceed to the starting point of your travel time run. When you reach your desired starting point, tap the **Start Run** button.

Recording Data During a Run

Once you click the **Start Run** button, GPS2PDA begins to record your travel time data. The background changes to green and the status line shows *Storing GPS Data*. At this point, the **Node** button is visible. Tap this button to record a node during you run. You may record as many nodes as you like or none at all. The number on the right side of the **Node** button tells you how many nodes have been recorded. At the end of your run, tap the **Stop Run 1** button (*it formerly read Start Run 1*) to halt data collection. The background will turn red and you will be able to begin another run (*the button will read Start Run 2*) or end your study by tapping the **Exit** button.

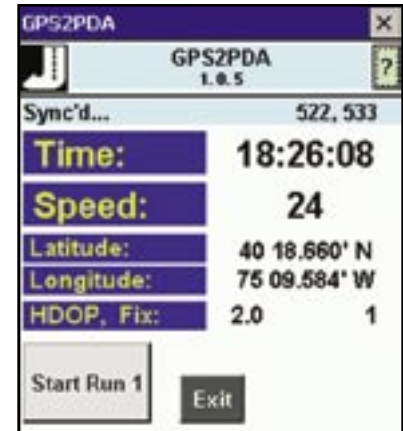


Figure 2.19 - Ready to Start

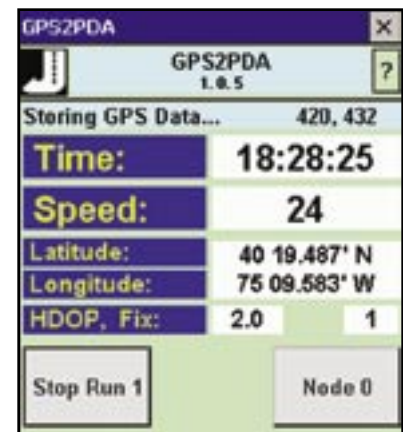


Figure 2.20 - Collecting Data

Transferring Data from GPS to PDA to Your Computer

After you've collected all of the necessary travel time data on your PDA, the next step is to upload the data from your PDA onto your computer.

Pocket PC

If you're a Pocket PC user and confident ActiveSync navigator, go ahead and find the **GPSData.pdb** file on your Mobile Device, and copy it to the **Field Data** folder under PC-Travel. This is usually located at **C:\Program Files\PC-Travel for Windows\Field Data**. PC-Travel will take care of the rest. If that proves difficult, please follow the directions below.



Figure 2.21 - ActiveSync

First, connect your Pocket PC to your computer and let them connect via ActiveSync. If your PPC is already connected, the easiest thing to do is remove it from the cradle then replace it. During the synchronization process, the ActiveSync window will open by itself. Click on the **Explore** icon in the ActiveSync window.

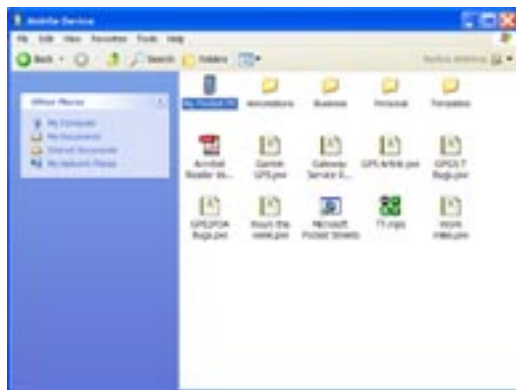


Figure 2.22 - PPC Explorer

You are now looking at the *Explore Window* which displays the files and directories on your PPC. Double click on **My Pocket PC**.

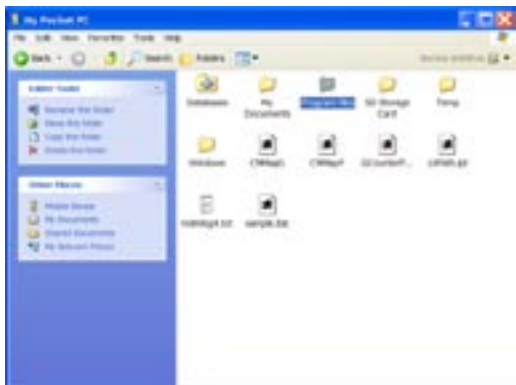


Figure 2.23 - Program Files

Now double click on **Program Files**. If you installed GPS2PDA on a storage card (*or any location other than the default directory*), these steps will be slightly different.

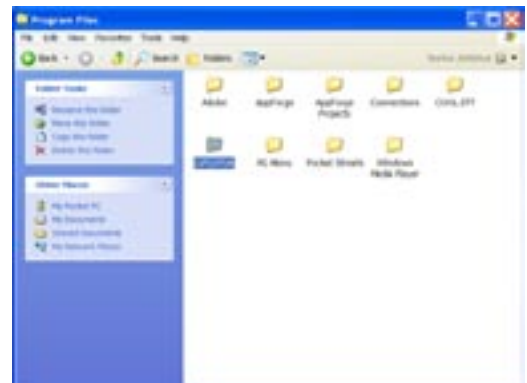


Figure 2.24 - Start GPS2PDA

At the next screen, double click on the **GPS2PDA** folder. This is where the software saves your travel time data.



Figure 2.25 - Select GPSData.pdb

The GPS2PDA folder on your PPC will contain, among other things, a file called **GPSData.pdb**. This is the file that contains all of your travel time field data. The point of this exercise is to copy **GPSData.pdb** into the **Field Data Files** folder on your desktop computer.

Leave the GPS2PDA window that you opened through ActiveSync visible while you open the **Field Data Files** folder that is on your desktop computer. PC-Travel's setup program has installed a **Field Data Files** folder in the **PC Travel for Windows** folder. If you're not sure where to find the **PC Travel for Windows** folder, here are the steps in a nutshell:

First, open **My Computer** from your Desktop.

Double click on your **C: Drive**.

Open the **Program Files** folder, then open the **Jamar** folder.

Open the **PC Travel for Windows** folder. The **Field Data Files** folder is under this folder.

Now click again on the **GPS2PDA** window that applies to your PPC.

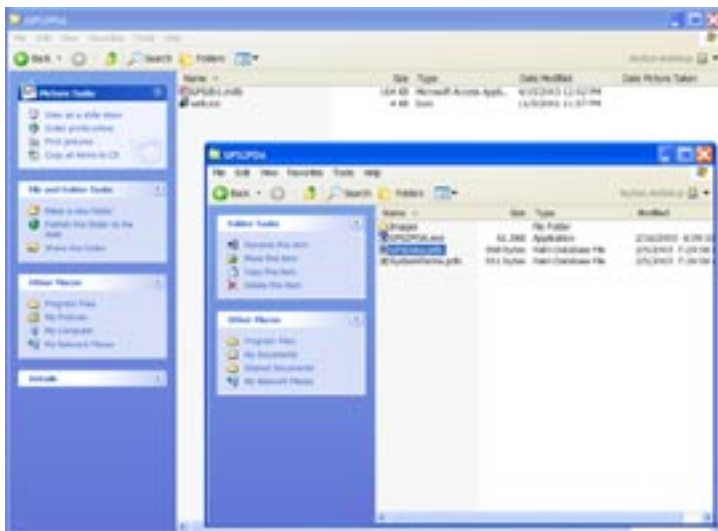


Figure 2.26 - Move GPSData.pdb

Click and hold the **GPSData.pdb** file and drag it into the second **PC Travel** window that you've opened. This copies your travel time data from your PDA to the **Field Data Files** folder on your desktop computer. *(If you aren't comfortable dragging and dropping files on your computer then you may want to get someone to show you how to do it. Once you do it once or twice it becomes very easy.)*

Your field data is now safe and sound on your computer and your PDA is ready to be put back into action in the field. **However, before you try to upload more field data to your computer, you need to run PC-Travel and process your current data.** Keep in mind that you can't rename the **GPSData.pdb** file on your PDA so you must

overwrite it every time you synchronize your field data. For a description of PC-Travel's use in tandem with GPS2PDA, refer back to the main section of this manual.

Palm

If you have installed the custom GPS2PDA HotSync Conduit and created a ODBC DSN as detailed in Chapter 1, transferring your travel time data couldn't be easier. All that you have to do is place your Palm PDA in its cradle and press the HotSync button. If you have not yet installed these features, refer back to Chapter 1.

During the HotSync process, the conduit you installed will write all of your field data to the Microsoft Access Database file called GPSData.mdb that is stored on your desktop in the PC-Travel\Field Data Files folder. What actually happens is the conduit looks for a file called GPSData.pdb that is stored on your PDA. This file has your field data. The .pdb means it is a Palm Database file, a file format used in all Palm PDAs to store data. The data in this file is converted to the GPSData.mdb file that is then copied to your computer.

Your field data is now safe and sound on your computer and your PDA is ready to be put back into action in the field. *However, before you try to upload more field data to your computer, you need to run PC-Travel and process your current data.* Keep in mind that you can't rename the **GPSData.pdb** file on your PDA so you must overwrite it every time you synchronize your field data. For a description of PC-Travel's use in tandem with GPS2PDA, refer back to the main section of this manual.

For more details on using PC-Travel with GPS2PDA field data, go to the following section.

Processing GPS to PDA Data with PC-Travel

After you've collected all of the necessary travel time data, it's time to use PC-Travel for data analysis and report generation. There is a sample data file installed with the PC-Travel software. This tutorial will use that file to show you the basic procedure; then you can duplicate the process with any data you collect.

Run your PC-Travel software. One way to do this is to click on the **Start** button, select **Programs**, then the **JAMAR** folder, and click on **PC-Travel** to start the software.



Figure 2.27 - Startup Options

At the *Startup Options* screen, click the **Process GPS2PDA Data** button. The program takes you to a screen which allows you to browse for the particular GPS2PDA study that you want to process, as shown in figure 2.28.

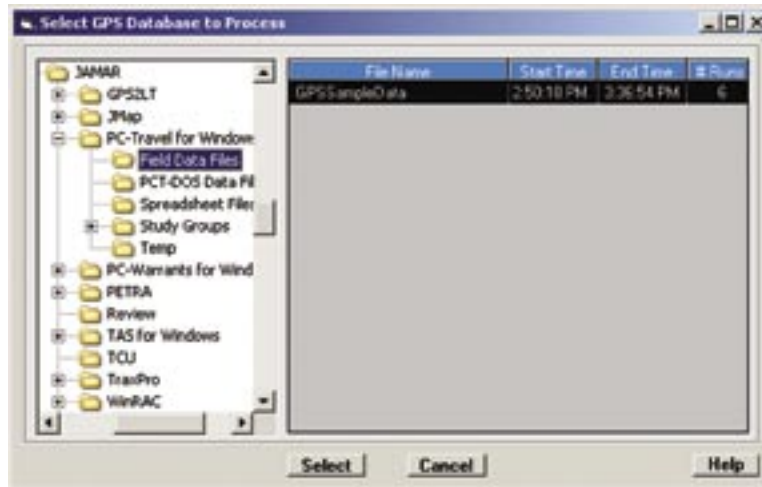


Figure 2.28 - Select GPS Database

The left side of the screen shows the familiar folder tree. The folder highlighted is the folder selected in the **Field Data** folder setting in the **Preferences** screen, which typically is called **Field Data Files**. The software looks in the highlighted folder for files produced by GPS2PDA. The grid on the right side of the screen shows some information about each GPS2PDA data file so that it is easier for you to locate the one you want. The example shown above only has one data file called **GPS2PDA-Sample-1**, which is already highlighted. Click the **Select** button.

Run	Node	Time	Speed	Latitude	Longitude	HDOP	Quality	Sat Us
1	0	9:31:25 AM	0.7	2801.5930	8223.5953	1.80	2	5
2	0	9:31:26 AM	0.0	2801.5939	8223.5954	1.80	2	5
3	0	9:31:27 AM	0.0	2801.594	8223.5956	1.80	2	5
4	0	9:31:28 AM	3.0	2801.5943	8223.5975	1.80	2	5
5	0	9:31:29 AM	8.3	2801.5957	8223.5912	2.20	2	5
6	0	9:31:30 AM	12.3	2801.5981	8223.5937	2.20	2	5
7	0	9:31:31 AM	15.4	2801.6017	8223.5995	2.30	2	5
8	0	9:31:32 AM	18.5	2801.6074	8223.595	1.70	2	5
9	0	9:31:33 AM	21.2	2801.6133	8223.5952	1.80	2	5
10	0	9:31:34 AM	25.8	2801.6204	8223.5955	1.80	2	5
11	0	9:31:35 AM	28.4	2801.6283	8223.596	1.90	2	5
12	0	9:31:36 AM	30.3	2801.6362	8223.5962	2.00	2	5
13	0	9:31:37 AM	31.8	2801.6443	8223.5963	2.00	2	6
14	0	9:31:38 AM	34.8	2801.6532	8223.5965	1.30	2	6
15	0	9:31:39 AM	35.7	2801.6624	8223.5968	1.30	2	6
16	0	9:31:40 AM	36.9	2801.6717	8223.5971	1.30	2	6
17	0	9:31:41 AM	37.5	2801.6811	8223.5972	1.40	2	6
18	0	9:31:42 AM	37.9	2801.6905	8223.5974	1.40	2	6
19	0	9:31:43 AM	37.8	2801.6997	8223.5976	1.50	2	6
20	0	9:31:44 AM	37.8	2801.7089	8223.5977	1.30	2	6
21	0	9:31:45 AM	37.8	2801.7182	8223.5978	1.30	2	6
22	0	9:31:46 AM	37.8	2801.7275	8223.598	1.30	2	6
23	0	9:31:47 AM	37.9	2801.7367	8223.5982	1.30	2	6

Figure 2.29 - GPS Data Screen

At this point, you see a window entitled **GPS Data**. The purpose of this screen is to check your data for missing speeds. If you lost your GPS fix at any point during your travel time study (*which is not uncommon*), there will be missing data points. The grid on this screen shows all of the GPS data for the study that you've selected (*this includes every run in that study*). If the **OK** button is red then the software has found missing data points and you should go through your data and fix the missing speeds.

Fixing Missing Speeds

Click the **Find Next Missing Speed** button to find the first place where your data needs to be fixed.

The grid will jump to the line with first missing speed. To have the software calculate a reasonable speed for the missing data point, click **Fix Missing Speed** and the software will fill in a speed value based on the recorded speeds before and after the missing point (*it will linearly interpolate between the two, if you like fancy words*). If you don't like the speed calculated by the software you can edit the speed manually. Click on the speed data point and type in the speed.

You may have sections where several seconds of data are missing. The process just described does not need to be repeated for every point. As soon as you click **Fix Missing Speed**, the program will fill in speeds for the entire group of missing data points. When the **OK** button turns green, there are no more missing speeds.

You should not try to fix a large amount of data. The software can only do so much. If there are large blocks of missing data then any attempt to estimate the missing speeds is likely to give bad results. In all likelihood the people collecting the data will have noticed the data was not collected properly during one or more runs. You may need to ignore these runs because the data isn't complete. In this case you should let the software fill in the missing speeds so that the runs will be created, but simply ignore those runs when you create your studies.

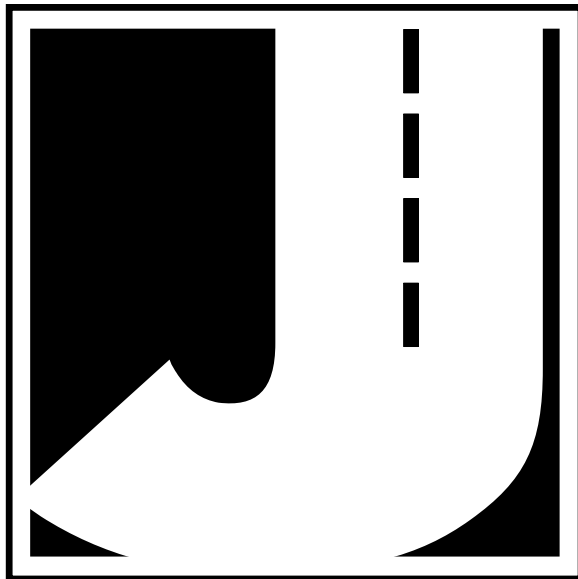
Creating Run Files

If the **OK** button is green, you can click it to continue. The software takes the data in the grid and creates individual run files, names the runs, and copies them to the *Temp* folder. At this point, refer to the PC-Travel for Windows manual for more information on how to work with your data in that program.

Summary

If you followed this tutorial then you should have a pretty good idea how to collect travel time data using a GPS receiver and a laptop, and how to process that data in PC-Travel for Windows. Now you can go out and try it yourself.

Make sure you have two people in the car, one to operate the PDA and one to drive and tell the PDA operator when to start runs, mark nodes, and end runs.



Appendix

Appendix 1 — Field Worksheet

Fill out the top section and the Node info before you start the runs. Use one sheet for each count.

You could put a rough sketch of the route on the back of the worksheet, especially to show temporary things like work zones.

Reverse the numbering to remind you of the order of nodes in the opposite direction. The numbers match the numbers shown in the software during the run.

Mark the End and Start Nodes to remind you to press the DO key at these nodes.

Put the direction and starting time at the beginning of each run.

Add any comments at the end of each run.

PC-Travel Field Worksheet

Location: <u>Bandout</u>	Date: <u>5/11/2000</u>
Site Code: <u>12345678</u>	Cal Constant: <u>882</u>

Nodes:	
Start/End	Druid Hills
1 4	Mainland 16
2 3	Guilbeau 17
3 2	Bresnahan/Mistic 18
4 1	Braun 19
5 S	Tighe 20
6	21
7	22
8	23
9	24
10	25
11	26
12	27
13	28
14	29
15	30

Runs:							
#	Dir	Time	Comments	#	Dir	Time	Comments
1	nb	14:55	ok	2	sb	15:03	ok
3	nb	15:15	missed link at braun	4	sb	15:22	ok
5	nb	15:33	ok	6	sb	15:41	ok
7	nb	15:52	slow truck caused backup	8	sb	16:12	ok
9	nb	16:21	ok	10	sb	16:29	late link at guilbeau?
11	nb	16:40	ok	12	sb	16:48	ok
13				14			
15				16			
17				18			
19				20			

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Remember: The point of the worksheet is to record what happens during the runs so the information can be entered properly and easily into the software back in the office. Also focus on items that might effect the interpretation of the data---odd traffic patterns, weather considerations, accidents, work zones, etc. Ask yourself, "What do I want to remember about these runs 6 months from now?"

PC-Travel Field Worksheet

Location: _____ Date: _____

Site Code: _____ Cal Constant: _____

Nodes:

Start/End	
1	16
2	17
3	18
4	19
5	20
6	21
7	22
8	23
9	24
10	25
11	26
12	27
13	28
14	29
15	30

Runs:

#	Dir	Time	Comments	#	Dir	Time	Comments
1				2			
3				4			
5				6			
7				8			
9				10			
11				12			
13				14			
15				16			
17				18			
19				20			

