

User's Guide



PC-MILER[®]

Connect **28**



Technology Beyond Miles



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Welcome to P*MILER|Connect! By purchasing a PC*MILER product, you have made a cost-effective investment in the transportation and logistics industry's leading routing, mileage, and mapping software solution. Accuracy, reliability, and stability have positioned PC*MILER as the technology used by over 22,000 motor carriers, shippers, and logistics companies around the world. The U.S. Department of Defense (DoD), the General Services Administration (GSA), and the Federal Motor Carrier Safety Association (FMCSA) also rely on PC*MILER as their worldwide distance standard. If you're seeking to maximize your revenues while utilizing the safest, most cost-effective routing for your vehicles, PC*MILER will do it for you.

PC*MILER|Connect offers transportation professionals and software developers access to PC*MILER features from other applications. Client applications are able to retrieve PC*MILER distances, driving times, state-by-state mileage breakdowns, and detailed driving instructions. PC*MILER|Connect allows easy integration of PC*MILER distances into popular software, such as Microsoft® Access® and Microsoft Excel®, and custom applications built with various software development environments, such as Visual Basic, Microsoft Visual C++, Delphi, C++ Builder, etc.

PC*MILER|Connect provides a COM Interface to enhance integration with OLE-enabled development environments such as Visual Basic, Visual C++, Delphi, and Active Server Pages (ASP). Also included is a Java Native Interface (JNI) layer to simplify the integration with Java-based software applications. The interface provides the ability to generate reports in HTML format and gives you the ability to build dynamic web sites for use in any browser environments.

PC*MILER|Connect works with all versions of PC*MILER including PC*MILER (highway only), PC*MILER|Streets, PC*MILER|HazMat, PC*MILER|Tolls, PC*MILER|Energy, and PC*MILER|Worldwide.

PC*MILER|Connect calculates distances for an origin-destination pair of locations with intermediate stop-off points. Locations can be city/state abbreviations, ZIP codes, latitude/longitude pairs, SPLC's (available as an add-on data module), Canadian Postal Codes (available as an add-on data module), or custom names created in or imported into PC*MILER. In addition, PC*MILER|Connect can generate hub routes and can optimize a sequence of stops. The PC*MILER|Connect Dynamic Link Library (DLL) is designed to fulfill all the routing and mileage reporting needs of custom truck and shipper application development.

PC*MILER|Connect provides the following major features:

- **PC*MILER Database:** ALK Technologies' proprietary PC*MILER North American database is the industry standard for point-to-point mileage. All 2014 ZIP codes are included. Add-on modules are also available for Canadian Postal Codes and SPLCs. Internationally, the PC*MILER|Worldwide database includes over **1 million named locations** and over **6.6 million kilometers of truck-specific road segments**. PC*MILER|Worldwide generates exact U.S. Department of Defense distances for freight and household goods billing.
- Support for **Practical, Shortest, National Network, Toll Discouraged, Air,** and **53' Trailer** routing. Connect gives users six route types to choose from, plus various route type combinations and options.
- **Standard report formats.** You can insert all PC*MILER|Connect reports as tab delimited text directly into your applications. These reports include the detailed driving instructions, state by state distance breakdown, and summary distance report. These reports are the same ones you use in PC*MILER.
- **Direct accessibility from other applications.** All these features are accessible from any development environment capable of calling a DLL. In addition, most features are accessible from Microsoft Access and Microsoft Excel.

1.1 Requirements

PC*MILER|Connect requires a base installation of PC*MILER, PC*MILER|Streets or PC*MILER|Worldwide. For a complete list of PC*MILER platforms and requirements, see the PC*MILER *User's Guide*. (To access the *User's Guide*, see section 1.4 below.)

Additionally, the Connect application requires:

- **3 MB free** on your hard disk
- **A development system.** Interface definitions for Borland C++, MSVC++, and Visual Basic MS Access are currently supported. Sample Win32 VB .Net and C# that run under .Net 1.1 framework only.
- A copy of **Microsoft Excel 97 or higher** to use PC*MILER|Spreadsheets.

1.2 Installing PC*MILER|Connect

PC*MILER|Connect is a PC*MILER add-on product that can be installed when you install PC*MILER or at a later time. To install Connect along with PC*MILER, you simply make sure that “**PC*MILER|Connect**” is checked on the list of PC*MILER components when you are prompted during the installation process.

If you are adding the Connect module at a later time, see the PDF *User’s Guide* that was included with the PC*MILER installation (refer to *Adding New PC*MILER Products* in Chapter 2). To access the *User’s Guide*, see section 1.4 below.

1.3 Technical Support

ALK Technologies offers one year of free unlimited technical support to all registered users of PC*MILER. If you have any questions about PC*MILER|Connect or problems with the software that cannot be resolved using this *User’s Guide*, contact our staff:

Phone: 609.683.0220, ext 2

Fax: 609.252.8196

Email: pcmsupport@alk.com

Web Site: www.pcmiler.com

Hours: 9:00am – 5:00pm EST, Mon-Fri

When calling, ask for “PC*MILER Technical Support”. Please be sure to have your PC*MILER|Connect Product Key Code, version number, Windows version number, and hardware configuration information (manufacturer, speed, and monitor type) available before your call. Please include this information in your message if you are contacting us by email.

1.4 Accessing User’s Guides and Help Files

To access or print additional copies of the *User’s Guide* for any PC*MILER product, click the Windows **Start** button, then go to **All Programs** (or the equivalent in your version of Windows) > **PCMILER 28** > **User Guides** and select one of the .pdf files from the sub-menu. You must have Adobe Acrobat Reader on your computer to open the *User’s Guide*. If you do not have this program installed already, a free copy can be downloaded from www.adobe.com.

To access online Help files for any PC*MILER product, click the Windows **Start** button, then go to **All Programs** (or the equivalent in your version of Windows) > **PCMILER 28** > **Help** and select a help file from the sub-menu.

1.5 Licensing

The PC*MILER|Connect installation increases your licenses of the PC*MILER database to two concurrent accesses. This means that you can run a copy of PC*MILER or PC*MILER|Worldwide together with one PC*MILER|Connect client application at the same time. Within each client application, the PC*MILER|Connect server engine allows up to eight open routes at a time.

You can connect more client applications by purchasing additional database licenses from ALK. If you plan to connect many users to a network version of the PC*MILER database, ALK has attractive pricing for LAN versions.

1.6 Applications That Use PC*MILER|Connect

Purchasing PC*MILER|Connect does not entitle you to redistribute any portions of this product. You may NOT redistribute ALK's highway database, source code, interface definitions, Excel Add-In, or the PC*MILER|Connect DLL. Please read the PC*MILER licensing agreement for details.

Your clients must purchase additional versions of the PC*MILER database and PC*MILER|Connect directly from ALK. ALK Technologies Sales can be reached by telephone at **1-800-377-MILE**.

1.7 About This Manual

This manual describes the interface to PC*MILER|Connect, via the PCMSRV32.DLL, and how to use it in your own application. It assumes a working knowledge of programming concepts.

NOTE: For a description of the PC*MILER|Spreadsheets Excel interface, see the separate *User's Guide* for that product that came with your purchase of PC*MILER|Connect (go to the Windows Start menu > **All Programs** (or the equivalent in your version of Windows) > **PCMILER 28** > **User Guides**).

1.8 What's New in PC*MILER|Connect?

New in Version 28:

NEW!... PCMSGetFmtMatch3() API. This API returns the time zone in GMT offset format and whether it is in Daylight Savings Time, in addition to the information returned by PCMSGetFmtMatch() and PCMSGetFmtMatch2(). See section 3.7.

NEW!... PCMSGetFmtMatch4() API. This API returns the decimal latitude and longitude in addition to the information returned by PCMSGetFmtMatch() and PCMSGetFmtMatch2(). See section 3.7.

NEW!... PCMSGetNumMilesDecimals() API. This API gets the number of decimals currently returned when distances are calculated. See section 3.17.

NEW!... PCMSSetNumMilesDecimals() API. This API sets the number of decimals that will be returned when distances are calculated. See section 3.17.

NEW!... PCMSSetStopAsWaypoint. This API lets you add waypoints to a trip. See section 3.30.

NEW!... Ability to Use Lat/Longs Combined With Street Addresses. Now stop locations can include latitude/longitude points combined with street addresses for more precise geocoding and directions. See section 2.7. (*PC*MILER|Streets must be installed to use address data.*)

Deprecated Functions in Version 28: PCMSChangeWWDDataSet, PCMSSetDebug, PCMSGetDebug.

New in Version 27:

NEW!... Three APIs Related to Mexican Postal Codes. Three additional APIs related to US and Mexican postal codes have been exposed in Version 27. See section 3.12.

NEW!... PCMSAddStop2() API. This API is the same as PCMSAddStop, except for the inclusion of the integer `easyMatch` that allows the user to modify the way a location is geocoded – see section 3.6. To use `easyMatch`, see the description of the function PCMSLookup in section 3.7, *Validating City Names*.

NEW!... PCMSAddressToLatLong2() API. This API is the same as PCMSAddressToLatLong(), except for the inclusion of the integer `easyMatch` that allows the user to modify the way addresses are geocoded – see section 3.15. To use `easyMatch`, see the description of the function PCMSLookup in section 3.7, *Validating City Names*.

NEW!... Country Code Format Settings in PCMSERVE.INI: The country code format that PC*MILER|Worldwide will accept for locations that are city

name/country abbreviation can now be set in the PCMSERVE.INI file. See section 3.11. (*PC*MILER/Worldwide must be installed*)

NEW!... Enhanced HazMat Routing in Europe: Routing for hazardous materials in Europe has been enhanced with new options to set tunnel restrictions categories. See section 3.36. (*PC*MILER/HazMat must be installed*)

Deprecated in Version 27: PCMSGetExactLevel() and PCMSSetExactLevel() (these two functions can be called, but will always return 100), PCMSSetUseShapePts, PCMSSetOldMode, PCMSSetOldModeForRegion, PCMSConvertLLToPlace, PCMSAirDistToLinks, PCMSGetRouteInfo, PCMSGetNumRouteLinks, PCMSUpdateRouteInfo, PCMSFuelOptimize, PCMSGetManagedRouteMsgBytes.

This chapter explains the concepts needed to use PC*MILER|Connect. The last section describes how to use the PC*MILER|Connect INI file to configure default settings.

2.1 PC*MILER|Connect Server Engine and Trips

PC*MILER|Connect has two basic components: engine and trips.

The **Connect engine** does the license enforcement, trip management, distance calculation, and report generation. The engine is used by opening a connection to it and keeping the connection open for the life of the program. You must close the engine before your application exits or Windows won't free the resources used by PC*MILER|Connect, nor will it unlock the current license. **You won't be able to rerun your application if you don't close down the engine when your application exits.**

Trips are collections of **stops, options and reports**. You must build a trip to access any Connect features other than simple distance calculations (see below). A trip is created by asking the Connect engine for a new trip ID, then setting the trip up with a list of stops and new options. You can then calculate the trip's route and distance, and extract any of the trip's PC*MILER reports.

IMPORTANT NOTE: Running more than about 300 trips (more or less, depending on how much memory each trip uses) simultaneously is not recommended.

2.2 Example: Simple Distance Calculations

(For functions, see section 3.2, *Simple Distance Calculation*.)

The PC*MILER|Connect engine includes a set of simplified functions for distance calculation between an origin and a destination without any stops. These functions do not allow access to any Connect trip options or features (see section 2.3, *Building a Trip* below), but they do make it easy to calculate miles without managing trips from your application. An example of this, the simplest use of the PCMSRV32 DLL, is:

1. Start the engine.

-
2. Calculate the miles from point A to point B.
 3. Repeat with as many origin-destination pairs as you want.
 4. Shut down the engine.

2.3 Example: Building a Trip

(For details, see section 3.3, *Accessing Trip Options and Features* and other function descriptions in Chapter 3.)

To manage multiple trips and use PC*MILER route options and features for each trip, you must build a trip as described below or as described in Chapter 4 on the PC*MILER\RouteMatrix APIs .

You could, for example, execute the following sequence to **calculate mileage** for a trip with six stops, **optimize** the stop sequence to get the most efficient route, and **compare route types**:

1. Open a connection to the engine (PCMSOpenServer).
2. Create a new trip (PCMSNewTrip).
3. Set the route type to use the PRACTICAL routing calculation (PCMSSetCalcType).
4. Set the unit of distance to MILES (PCMSSetMiles).
5. Clear stops from previous trip – use whenever multiple trips are generated (PCMSClearStops).
6. If PC*MILER\Worldwide data is installed, you may change the default region from North America to another region (PCMSSetDefaultRegion).
7. Validate stop names (PCMSCheckPlaceName).
8. Add six stops to the trip's route (PCMSAddStop).
9. Set the resequence mode to keep the final destination of the route the same (PCMSSetResequene).
10. Optimize the stop sequence (PCMSOptimize).
11. Calculate a route and distances (PCMSCalculate).
12. Extract the driving directions report and display it in your own application (PCMSGetRptLine or PCMSGetRpt).
13. Modify the trip's options again to use SHORTEST miles (PCMSSetCalcType).

-
- 14.** Recalculate the trip's route with the new options (PCMSCalculate).
 - 15.** Delete the trip (PCMSDeleteTrip).
 - 16.** Close the engine down (PCMSCloseServer).

2.4 Stops

The **stops** you add to a trip are simply places on the PC*MILER highway network. Place names may be any of the following:

- City/state pairs or 5-digit ZIP/postal codes; for example, ‘Princeton, NJ’ or ‘08540’ (see section 2.6 below on entering non-U.S. postal codes)
- Latitude/longitude points; for example, ‘0401750N,0742131W’
- A street address and city/state (*with PC*MILER/Streets installed*)
- A street address and latitude/longitude point (*with PC*MILER/Streets installed*)
- A SPLC; for example, ‘SPLC202230250’
- Canadian Postal Codes; for example, ‘K7L 4E7’
- Custom names created in PC*MILER

PC*MILER|Connect has functions for validating place names and matching partial names to places on the PC*MILER network. For example, you can use PC*MILER|Connect to return a list of place names that match ‘PRI*, NJ’ or all ZIP codes that start with ‘085*’. When adding a stop to a trip, PC*MILER|Connect chooses the first match if many matching cities exist. For example, adding the stop ‘PRINCE, NJ’ is valid: PC*MILER|Connect will use ‘Princessville, NJ’, the first in its list of valid matches.

Please note that place names **MUST** have commas between city and state. For example, ‘PRINCETON,NJ’ and ‘PRINCETON, NJ’ are valid, while ‘PRINCETON NJ’ is not. PC*MILER|Connect city names have no limit to their number of characters.

2.5 Specifying Street Addresses

You must have PC*MILER|Streets data installed to access street addresses in the U.S. and Canada. To specify a street address, place a semicolon (;) after the state/country abbreviation or postal code, then add the address. Examples: **New York, NY;100 Broadway** or **08540; 20 Nassau Street**. For street address validation, see section 3.8.

If PC*MILER|Worldwide is installed, address data is also available for Brazil, Europe and/or Oceania. In these cases, be sure the correct region and dataset are activated – see sections 3.9 and 3.10.

If the Oceania Streets data set is installed and activated, locations in Australia must be entered using jurisdiction abbreviations rather than the country code – see section 2.6, *Specifying a Non-U.S. Country*, below for a list of valid jurisdiction abbreviations.

Beginning in Version 28, you can also combine street addresses with latitude/longitude points. The lat/long is added after the address, preceded by a semicolon. See section 2.7, *Entering Latitude/Longitude Points as Stops*.

2.6 Specifying a Non-U.S. Country

If PC*MILER|Worldwide data is installed, you may specify a country outside the United States using its FIPS two-letter abbreviation (for example, 'Paris, FR'), ISO2, ISO3, GENC2 or GENC3 code, or a postal code (for example, '46001 sp' – see **important note below** on non-US postal codes).

See section 3.11, *Country Code Format Options* on how to specify a non-FIPS country code; and section 3.14, *State/Country Lists* for information about validating a country abbreviation. See *Appendix D* for postal code formats in various countries.

The correct region must be set (see section 3.9, *Setting the Default Region*). The default region in PC*MILER|Connect is North America unless it is changed.

Canadian and Mexican locations are specified using a province or estado abbreviation after the city name.

For street addresses in Australia: When the Streets Oceania data set is activated, locations in Australia must be entered using jurisdiction abbreviations rather than the country code that is used for highway-only. Valid jurisdiction abbreviations are listed below.

Australian Jurisdiction	PC*MILER Abbreviation
Australian Capital Territory	ACT
New South Wales	NSW
Northern Territory	NT
Queensland	QLD
South Australia	SA
Tasmania	TAS
Victoria	VIC
Western Australia	WA

IMPORTANT NOTE: When you are using European postal codes as stops, you need to enter a country abbreviation to avoid being routed to the wrong country in cases where the same postal code exists in more than one country. Enter the postal code, a comma or space, and the correct two-letter country abbreviation; e.g. “46001 sp” or “46001,sp” for Valencia, Spain.

Outside of the USA and Canada, a postal code is often shared by a group of nearby towns, villages or neighborhoods, each with its own latitude/longitude. In order to route to a particular town, you must include the town name along with the postal code and country. For example "22021 Visgnola, IT" instead of "22021, IT". If you do not include the town name, PC*MILER will route you to the default town for that postal code.

In the United Kingdom (Great Britain), extended postal codes have 6 or 7 alphanumeric characters (with a space before the last 3 characters) and identify a particular block of a particular street, whereas non-extended postal codes have 4 or 5 alphanumeric characters (with a space before the last character) and identify a town, village, or neighborhood. You must include the space in a UK postal code when you pass it to PC*MILER. All versions of PC*MILER|Worldwide accept non-extended postal codes as input, while only versions 24.1 and later accept extended postal codes as input. In order for your interface to be compatible with all versions of PC*MILER, you must strip the last two characters from an extended UK postal code prior to passing it as input to PC*MILER. For example, for the extended postal code "WC1A 2RP", in order to enter this postal code in version 23.1 or earlier you must strip off the last 2 characters, i.e. "Wc1A 2".

In the Republic of Ireland, the Dublin metropolitan area has postal codes of 1 or 2 digits, while the remainder of the country does not have postal codes. In order to pass a single-digit postal code to PC*MILER, you must include the city name. For example, "1 Dublin, EI" (if you are using the default FIPS-2 country codes, or "1 Dublin, IE" if you are using ISO-2 country codes).

In countries that have spaces or dashes in numeric postal codes, you do not have to include the space or dash in your input to PC*MILER, but the result that PC*MILER returns will include the space or dash. For example if you enter either "02879, PL" or "02-879, PL" PC*MILER will return "02-879 Warsaw, PL", and if you enter either "11121, SW" or "11 121, SW" PC*MILER will return "11 121 Stockholm, SW".

In some countries, the place name(s) associated with a postal code in a major city will be the name(s) of the neighborhood(s) and not the name of the city. For example, "104-0061,JA" will return "104-0061 Ginza, JA", not "104-0061 Tokyo, JA" (the Ginza neighborhood is the main shopping district in central Tokyo).

For major cities, PC*MILER's database includes place names in English in addition to the local language(s); for example, "Munich, GM" in addition to "Munchen, GM", and "Brussels, BE" in addition to "Brussel, BE" and "Bruxelles, BE".

In PC*MILER 24.1 and later, place names are coded in UTF-8, and for some countries PC*MILER includes place names in both local, non-Latin characters as well as transliterated into Latin characters. If you pass a postal code to PC*MILER and the place name that PC*MILER returns is unprintable, you probably need to adjust your program to account for UTF-8 coding.

2.7 Entering Latitude/Longitude Points As Stops

PC*MILER|Connect enables you to enter latitude/longitude points as stops on a route. These points can be entered in *degrees minutes seconds direction* format (e.g. **0401750N,0742131W**) or *decimal degrees* (e.g. **40.123N,100.333W**).

Degrees-minutes-seconds format:

In degrees-minutes-seconds format the latitude and longitude are each 8 character strings in the following format:

- Characters **1-3** specify the degrees (be sure to include leading zero if required)
- Characters **4-5** specify the minutes
- Characters **6-7** specify the seconds
- Character **8** is either 'N', 'n', 'W', or 'w' with N's for latitude and W's for longitude

Latitude and longitude must be separated by a comma WITHOUT A SPACE. In general the format for a point is:

dddmmssN,dddmmssW

Decimal degrees format:

In decimal degrees format, latitude and longitude are strings of up to 8 characters representing a decimal number with up to 3 decimal places. No leading zeros are required. The decimal point counts as one of the characters. Latitude and longitude must be separated by a comma WITHOUT A SPACE. In general the format for a point is:

ddd.dddN,ddd.dddW

Converting between formats:

To convert from degrees-minutes-seconds to decimal degrees use the following formula:

dddmmssN → **ddd + mm/60 + ss/3600**

Examples:

Here is an example of an actual lat/long near Kendall Park NJ in both formats:

0402515N,0743340W
40.421N,74.561W

Beginning in Version 28, you can also use latitude/longitude points combined with street addresses for more precise geocoding and directions. The lat/long is added before the address, followed by a semicolon. An example is:

40.211670N,74.703480W;1200 Kuser Road

This new functionality will geocode the lat/long to the nearest point on the particular street in the address, rather than to the nearest street in the direction of

travel, as would be the case for a lat/long by itself. In the example above that uses an address in Trenton, NJ, the route will access its destination via Kuser Road rather than turning off Interstate I-295 as it would if a lat/long were used without an address. If the lat/long is more than .5 miles from the street in the address, an error message will be returned.

NOTE: This functionality will only work if your third party integration software recognizes the street address with lat/long format.

2.8 Reports

There are four different reports generated by the PC*MILER|Connect server engine. For users of PC*MILER the reports will be familiar – they are exactly the same as the on-screen version of the same reports in PC*MILER.

PC*MILER|Connect allows easy, line by line extraction of reports in tab delimited format. Each line can then be added to a spreadsheet or grid control from your application. See section 3.24 for details. The available reports are:

- **Detailed Route Report.** Shows detailed directions from the trip's origin to its destination.
- **Drivers Report.** This report generates detailed driving instructions specifically for drivers.
- **Distance Report.** Shows the distance summary for each leg of the trip (as in the route window in the PC*MILER graphical user interface).
- **State/Country Report.** Appended to the mileage report, it displays the state by state and country breakdown of the trip.
- **Road Type Report.** Breaks down the generated distances by PC*MILER road type.

2.9 Trip Options

Each trip has certain **options** that affect the way the PC*MILER|Connect server engine routes trucks over the highway network and the appearance of the reports. For example, the engine can reorder all your stops in the optimal order (called "resequencing"), or it can treat the first stop as the hub and calculate the miles from the hub to each of the other stops.

You can also report distances in kilometers instead of miles, treat international borders as if they are closed to truck traffic, and change the order of states listed in the state report.

The following options are modifiable via function calls:

-
- **Routing Type.** The engine uses six different algorithms to calculate a route: the most Practical route to travel, the Shortest route, a route that avoids tolls, a route that favors National Network highways, a route that favors 53 Foot Trailer routing, or an “Air” route that travels in a straight line. (See your PC*MILER *User's Guide* or Help for a detailed description of the first five route types; the Air route is unique to PC*MILER|Connect.) Practical or Shortest routing may be combined with Toll-Discouraged and/or National or 53' Trailer routing.

NOTE: When 53' Trailer routing is selected, the National Network is automatically included – but not necessarily vice versa.

NOTE Also: Toll-Discouraged, National and 53' routing is based on Practical miles (rather than Shortest). The CalcTypeEx function (used to calculate route type combinations) uses Shortest miles.

- **Units.** Distances can be reported either in miles or kilometers. By default, distances are returned in tenths of miles/kilometers. To get distances in hundredths or thousandths, either use PCMSSetNumMilesDecimals (see section 3.17), change this setting in the PC*MILER graphical user interface, or add a line to the [Options] section of the PCMSERVE.INI file – see section 2.10. Times are always reported in minutes.
- **Toll Calculations** (*available only if the PC*MILER/Tolls add-on module is installed with PC*MILER*). Accurate, up-to-date U.S. and Canadian tolls for each leg of a trip can be calculated, with or without discount programs applied.
- **Optimized Routes.** The engine can resequence stops in the optimal driving order. When resequencing, the origin of the trip is fixed. You can then choose whether the destination stop is also fixed (resequencing only the stop-offs), or whether to resequence all the stops except the origin. *Warning: Using this option will slow your computer down while PC*MILER/Connect optimizes all your stops.*
- **Borders.** Some trips near international borders may cross over the border and turn back to the U.S. You can force PC*MILER|Connect to keep the route within the U.S. by using closed borders.
- **Vehicle type.** ‘HEAVY’ or ‘LIGHT’. Case is not important and the following will also work: ‘Heavy’ and ‘Light’. The ‘Light’ option is equivalent to ‘Override Restrictions’ in the PC*MILER graphical user interface – see the PC*MILER *User's Guide* for an explanation of this option.
- **Hub mode.** The engine can also treat the trip's origin as a hub and generate distances to all the other stops in the list. This is useful for solving distribution problems with warehouses.

-
- **State order.** Reports list the states/countries traveled through in alphabetical or driving order. See your PC*MILER *User's Guide* or Help for more details.

NOTE for PC*MILER|Streets Users: When stops are city names or ZIP codes, by default “Highway Only” routing is used. See the PC*MILER *User's Guide* for a description of this option. The default can be changed in the PC*MILER graphical user interface or in the PCMSERVE.INI file (see below). The default can also be changed using the `PCMSSetRouteLevel()` function.

2.10 Setting Default Values in the PCMSERVE.INI File

You can modify the PCMSERVE.INI file to set default trip options so that these options are active each time PC*MILER|Connect starts up. The INI file is in your Windows or Windows NT folder, and can be opened using Notepad, Wordpad, or another text editor.

Note that trip options can also be set using the API functions or in the PC*MILER graphical user interface. **An option set with an API function takes precedence over both the INI setting and the setting in the PC*MILER graphical user interface.** The order of precedence is as follows:

1. Options that are set using Connect functions prevail over the default options set in PC*MILER and the INI file.
2. Options set in PCMSERVE.INI prevail over those set in PC*MILER.
3. An option set as the default in PC*MILER takes effect only in the absence of settings 1 and 2, and only when a key for that option exists in the PCMSERVE.INI without an assigned value. For example, the Distance Precision setting in PC*MILER would only take effect when the line **DistancePrecision=** exists in the [OPTIONS] section of the INI.

Note also that the same defaults are used for all clients that connect via PC*MILER|Connect at the same time. You have to shut down all client applications to unload Connect before any changes to the INI file will take effect.

NOTE: Beginning in Version 26, customizations in the PCMSERVE.INI file from the previous version are retained when you install a new version of PC*MILER.

Settings in the INI that can be added or edited are listed below. If you open the INI file, you won't see all of these settings in it. If any key doesn't have a value or is not found in the INI file, it assumes the default value or the value set in the PC*MILER graphical user interface. These defaults are used to initialize each new trip. After creating a trip, you can change the options for that trip through function calls.

<u>KEY</u>	<u>Valid Values</u>	<u>Description</u>
[Logging]		
Enable=	<u>0</u> <u>1</u>	Should log files be generated (1) or not (0). Default = 0
File=		Path/file name of log file.
Append=	<u>0</u> <u>1</u>	Append to old file (1) or write over (0). Default = 0
MaxStrLen=	Any integer up to 254	Assign number of characters to truncate log messages to (optional)
DisplayTime=	<u>0</u> <u>1</u>	When DisplayTime = 1, date and time are shown at the beginning of each line in the specified log file.
[Defaults]		
CalcType=	<u>Practical</u> <u>Shortest</u> <u>National</u> <u>AvoidToll</u> <u>Air</u> <u>FiftyThree</u>	Set the default routing type: most Practical, Shortest by distance, favor National Network highways, avoid tolls, Air (straight line), or 53' Trailer. Default = Practical Note: Toll-Discouraged, National, and 53' routing are all based on Practical miles. Note Also: When 53' Trailer routing is selected, the National Network is automatically included – but not necessarily vice versa.
Units=	<u>Miles</u> <u>Kilometers</u>	What unit of measure should distance be shown in. Default = Miles
ChangeDest=	<u>TRUE</u> <u>FALSE</u>	When optimizing the route, should the trip's destination be optimized also (T). Default = False
Borders=	<u>TRUE</u>	Should the engine try to keep

	FALSE	routes within the United States (F), or can they cross and recross the borders at will (T). Default = True
HubMode=	TRUE <u>FALSE</u>	Calculate the routes from the origin to each stop (T), not through each stop (F). Default = False
AlphaOrder=	<u>TRUE</u> FALSE	List the states in the State Report in alphabetical order (T) or in the order driven (F). Default = True
FerryMiles=	<u>TRUE</u> FALSE	Use ferry distances in mileage and cost calculations (T), or don't use (F). Default = True
LightVehicle=	TRUE <u>FALSE</u>	Should the DLL use Light Vehicle routing (<i>available if Streets data is installed with PC*MILER</i>). Default = False
MAPPING	<u>TRUE</u> FALSE	(AS/400 parameter) Default = False
EXPMAP	TRUE FALSE	(AS/400 parameter) Default = False
[Options]		
CustomRoute=	TRUE <u>FALSE</u>	Should PC*MILER Connect use Custom routing. Default = False
HazRoute= (only with the PC*MILER Hazmat add-on)	<u>None</u> General Explosive Inhalant Radioactive Corrosive Flammable HarmfultoWater	Hazardous material routing types for North America are: none (hazmat routing disabled), general, explosive, inhalant, radioactive, corrosive, or flammable. For Europe or Oceania , hazmat route types are: none, general, explosive, flammable, or harmful to water. Default (all regions) = None

PartialCityMatch=	TRUE <u>FALSE</u>	Enables the return of a city match on a partial match of up to 28 characters. Default = False
HistoricalRoadSpeeds=	TRUE <u>FALSE</u>	Toggles activation of traffic data for use in time-based routing. Equivalent to the “Traffic Enabled” option in PC*MILER. Default = False
TranslateAlias=	TRUE <u>FALSE</u>	This setting pertains to geocoding in PC*MILER FuelTax. It changes “*” and “()” in a custom place name to a “Zip-City-State; Address” format.
UseUSPostCodes=	<u>TRUE</u> FALSE	When set to TRUE, if a 5-digit postal code might be a U.S. or a Mexican code, the U.S. code will be used. Default = True (<i>see note below</i>)
UseMexPostCodes=	TRUE <u>FALSE</u>	When set to TRUE, if a 5-digit postal code might be a U.S. or a Mexican code, the Mexican code will be used. Default = False NOTE: If UseUSPostCodes and UseMexPostCodes are both FALSE, or are not in the INI, the default U.S. code will be used. Also see IMPORTANT NOTE for users of PCMSLookup in section 3.7.
UseStreets= <i>(only if Streets data is installed with PC*MILER)</i>	TRUE <u>FALSE</u>	Should street-level (T) or highway-only (F) routing be used when stops are city names or postal codes. Default = False
UseNLAbbrevInMX	TRUE <u>FALSE</u>	When set to TRUE, the “NL” abbreviation geocodes to Nuevo Leon in Mexico.

LatLonFormatDecimal= TRUE
FALSE

Pertains to the function PCMSAddressToLatLong(), causing the function to return lat/longs in decimal degrees (e.g. 40.348848N,74.662703W).

When this line is not included in the .INI or is included but =FALSE, the function returns degrees, minutes, seconds (e.g. 0402056N,0743946W).
Default = False (Note: when this line is not present, default = false)

CountryAbbrevType= FIPS
ISO2
ISO3
GENC2
GENC3

For PC*MILER|Worldwide, this option sets the country code format that will be accepted when using city name/country abbreviations as locations in regions other than North America.
Default = FIPS

DistancePrecision= Tenths
Hundredths
Thousandths

Sets the number of decimal places that will be returned when distances are calculated.
Default = Tenths

[ConnectOptions]

AvoidFavorAutoSave= TRUE
FALSE

(PC*MILER|Connect) This option can be set to TRUE to autosave avoids/favors on shutdown.
Default = False (Note: when this line is not present, default = false)

GeofenceAutoSave= TRUE
FALSE

(PC*MILER|Connect) This option can be set to TRUE to autosave geofence data on shutdown.
Default = True (Note: when this line is not present, default = false)

[MappingOptions]

AvoidFavorAutoSave= TRUE
FALSE

(PC*MILER|Mapping) This option can be set to TRUE to autosave avoids/favors on shutdown.
Default = False (Note: when this line is not present, default = false)

GeofenceAutoSave	TRUE	(PC*MILER Mapping) This option
=	<u>FALSE</u>	can be set to TRUE to autosave
		geofence data on shutdown.
		Default = True (Note: when this
		line is not present, default = false)

[Defaults]

Region=	<u>NA</u> SA Africa Asia Europe ME Oceania	Default region is NA (North America). Other regions are available worldwide with PC*MILER Worldwide.
---------	--	---

ProductName=	PC*MILER
--------------	----------

ProductVersion=	28.0	Current version of PC*MILER.
-----------------	------	------------------------------

DLLPath=	Usually C:\ALK Technologies\ PCMILER28\app	Path to the current installation of PC*MILER.
----------	---	--

2.11 Query for Version Number and Network Connections

The function `PCMSAbout()` returns the PC*MILER|Connect version number, the current number of active PC*MILER Product users on the network, and the maximum number of simultaneous users that are allowed with the current license.

```
int PCMSFN PCMSAbout (const char FAR *which, char FAR  
    *buffer, int bufSize);
```

The function is described below.

```
char szProdName[BUFLen], szProdVer[BUFLen],  
szMaxUsers[BUFLen], szCurrUsers[BUFLen];
```

When using keyword **ProductName** in the sample below, the `PCMSAbout` function should return the product name, such as “PC*MILER|Connect”, and the length of the buffer stored in the return code `ret`.

```
ret = PCMSAbout("ProductName", szProdName, BUFLen);
```

When using keyword **ProductVersion** in the sample below, the `PCMSAbout` function should return the product version, such as 25, and the length of the buffer stored in the return code `ret`.

```
ret = PCMSAbout("ProductVersion", szProdVer, BUFLen);
```

When using keyword **CurrUsers** in the sample below, the `PCMSAbout` function should return the number of active current users, such as 7, and the length of the buffer stored in the return code `ret`.

```
ret = PCMSAbout("CurrUsers", szCurrUsers, BUFLen);
```

When using keyword **MaxUsers** in the sample below, the `PCMSAbout` function should return the maximum number of PC*MILER Product user licenses purchased, such as 20, and the length of the buffer stored in the return code `ret`.

```
ret = PCMSAbout("MaxUsers", szMaxUsers, BUFLen);
```

The PC*MILER|Connect DLL is named **PCMSRV32.DLL**. This chapter explains how to create applications that use the DLL. It also details how to start up and shut down the server engine, create and configure trips, employ trip options, calculate routes, and extract report data.

The instructions in this chapter should apply to any language that can call DLLs using the Pascal calling convention. Caveats and language-specific instructions for Visual Basic, 'C', and Microsoft Access are in Chapters 6-8. Also please have a look at the sample code included with PC*MILER|Connect. These files can be found in the Connect folder of your PC*MILER installation – usually `C:\ALK Technologies\PCMILER28\Connect`.

Examples for calling `LoadLibrary` at run-time to load PC*MILER|Connect and then calling `GetProcAddress` to retrieve the entry points for the functions exported from PC*MILER|Connect are included with the installation.

3.1 Initialization and Cleanup

Before your application can use any API functions, it must connect to and initialize PC*MILER|Connect. After it finishes, it must shut down the server connection. You must close the server before your application exits or Windows won't free the resources used by the DLL, nor will it unlock the current license. **But do not repeatedly open and close the server. Open the server on startup and close the server on exit.**

The function `PCMSOpenServer()` will initialize PC*MILER|Connect, check your PC*MILER licenses, load the PC*MILER highway database, and ready the engine for routing calculations. `PCMSOpenServer()` must be called before any other functions in PC*MILER|Connect, with the exception of error handling code. See section 3.38, *Error Handling* in this chapter for details. The prototype for the function `PCMSOpenServer()` is as follows:

```
PCMServerID PCMSOpenServer(HINSTANCE hAppInst, HWND  
    hWnd);
```

where `hAppInst` is the instance handle of the calling application. PC*MILER|Connect uses this if it needs to load resources from the calling application. *This argument is currently not used and may be 0.* The argument

hWnd is a handle to the window that will be used as a parent for error messages and other dialogs. *This argument is currently not used and may be 0.*

PCMSOpenServer() returns a valid server ID, of type PCMServerID (integer value 10000).

PCMSCloseServer() must be the last PC*MILER|Connect function called when you're finished using the engine. PCMSCloseServer() will destroy any remaining trips that you haven't deleted with PCMSDeleteTrip(), and unload the PC*MILER highway database. After calling PCMSCloseServer(), you must call PCMSOpenServer() again to reinitialize PC*MILER|Connect before calling any other functions. Here is its prototype:

```
int PCMSCloseServer(PCMServerID server);
```

PCMSCloseServer() takes one argument: the server ID of the PC*MILER|Connect connection from PCMSOpenServer(). It returns 1 if it succeeds and 0 if not.

Here is the way your application should start and stop the Connect server engine:

```
void UsePCMILER()
{
    PCMServerID server;
    /* Pass neither instance handle, nor parent
window*/
    server = PCMSOpenServer(0, 0);

    /* Do other processing here. */
    /* Use the server: calculate trips, etc.... */

    /* Shut down the server */
    PCMSCloseServer(server);
}
```

For efficiency, you should start the server engine when your application initializes and shut down the engine when your application exits, rather than every time you want to compute a route. Also, you should only need to open one connection per application.

Once the engine is initialized, you can then calculate distances, create trips, and generate reports.

3.2 Simple Distance Calculation

REMINDER: These functions do not allow access to trip options and features, you must build a trip to take advantage of trip options.

NOTE: Any route warnings associated with allowable truck configurations cannot be found by using these APIs and must be generated using other calls.

The simplest way to use the Connect server engine once it is initialized is to calculate distances between city pairs. For example, calculating the miles between “Chicago, IL” and “New York, NY”.

There are three functions which calculate the distance between two places:

```
long PCMSCalcDistance (PCMServerID serv,
    const char FAR *orig, const char FAR *dest);

long PCMSCalcDistance2 (PCMServerID serv,
    const char FAR *orig, const char FAR *dest,
    int routeType);

long PCMSCalcDistance3 (PCMServerID serv,
    const char FAR *orig, const char FAR *dest,
    int routeType, long *minutes);
```

`PCMSCalcDistance()` returns the distance between `orig` and `dest` by calculating the route using the default routing type. The distance is returned as tenths of miles, your application should divide the result by 10 to obtain a floating point representation.

`PCMSCalcDistance2()` returns the distance in tenths of miles between `orig` and `dest` by calculating the route using the given `routeType`. See the function reference for the definitions of the routing types: `CALC_PRACTICAL`, `CALC_SHORTEST`, `CALC_NATIONAL`, `CALC_AVOIDTOLL`, `CALC_AIR`, and `CALC_FIFTYTHREE`. **National, AvoidToll, and FiftyThree are based on Practical miles by default.** To use Shortest miles, refer to the `CalcTypeEx` function descriptions in section 3.17, *Route Options*.

`PCMSCalcDistance3()` returns the distance (in tenths of miles) and time between `orig` and `dest` by calculating the route using the given `routeType`. The argument `minutes` must be passed by reference.

Before calculating distances, it is strongly recommended that you validate your city names and ZIP codes using the function `PCMSCheckPlaceName()`. This function checks to see if a place name has an exact match in the PC*MILER database, and returns the number of matching places. If it returns 0 then there are no matching places. If the function returns -1, then either the server ID or the string pointer is invalid. (The precision of this

function extends to street addresses where an exact match is required for a successful return value. If, for example, a street contains only the even numbers of an address range, this function will fail for an input with an odd address number even if it's within the valid range.)

```
int PCMSCheckPlaceName(PCMServerID serv,  
    const char FAR *cityZIP);
```

The following example shows how to calculate the distances between Chicago, IL and New York, NY using three different routing criteria and the functions above.

```
void RunRoutes(PCMServerID server)  
{  
    long minutes;  
    long hours;  
    long miles;  
    int matches;  
  
    /* Note: Server must already be initialized. */  
  
    /* Calculate the distance using default calculation */  
    miles = PCMSCalcDistance(server, "Chicago, IL",  
        "New York, NY");  
    printf("Practical: %f\n", miles / 10.0);  
  
    /* Calculate the distance using shortest algorithm */  
    miles = PCMSCalcDistance2(server, "Chicago, IL",  
        "New York, NY", CALC_SHORTEST);  
    printf("Shortest: %f\n", miles / 10.0);  
  
    /* Calculate the distance avoiding toll roads */  
    miles = PCMSCalcDistance3(server, "Chicago, IL",  
        "New York, NY", CALC_AVOIDTOLL, &minutes);  
    printf("Toll Avoid: %f miles\n", miles / 10.0);  
  
    /* Show the duration in hour:minute notation */  
    hours = minutes / 60;  
    minutes = minutes % 60;  
    printf("Duration: %ld:%ld\n", hours, minutes);  
  
    /* Check the spelling of a city and ZIP */  
    matches = PCMSCheckPlaceName(server, "San Fran,  
        CA");  
    printf("Matching city names: %d\n", matches);  
}
```

3.3 Accessing Trip Options and Features

NOTE: See Chapter 2, *Overview and Basic Concepts*, especially section 2.3, *Building a Trip* and section 2.9, *Trip Options*, for basic information about trips. Users who need to calculate an N X N trip matrix efficiently, taking advantage of parallel processing on multi-core CPUs, should refer to Chapter 4, *PC*MILER/RouteMatrix APIs* for an alternate method of building trips.

IMPORTANT NOTE: Running more than about 300 trips (more or less, depending on how much memory each trip uses) simultaneously is not recommended.

Building a trip enables users to access the many outstanding trip features that PC*MILER|Connect offers. These include various routing options, geocoding, stop optimization, and report generation. The PC*MILER|Connect engine can be used to build many complex trips with multiple stops and various options. For example, you could generate two trips from New York to San Diego via Chicago and Phoenix, using PRACTICAL routing for one and SHORTEST for the other, and then compare them.

To use a complex trip, you must first ask the engine for a new trip. A Trip identifier is defined as a four byte pointer:

```
Trip PCMSNewTrip (PCMServerID serverID);
```

PCMSNewTrip() returns a handle to a new trip. It returns 0 if you pass it an invalid server ID. You can create up to eight simultaneous trips.

```
Trip PCMSResetTrip (PCMServerID serverID);
```

PCMSResetTrip() lets you add default options to a trip (see section 3.17, *Route Options*).

When finished with the trip, you should call PCMSDeleteTrip() to clean up the trip's memory. If you don't, you may not be able to create more trips if you have eight trips open at once.

```
void PCMSDeleteTrip(Trip tripID);
```

HINT: To optimize the performance of your application, you can reuse a single trip created in the beginning of the program throughout its execution.

Once the trip is created, you can do simple calculations with a trip, or more complex ones:

```
long PCMSCalcTrip(Trip tripID, char *orig, char *dest);
```

```
long PCMSCalcTrip2(Trip tripID, char *orig, char *dest,
                  int easyMatch);

long PCMSCalculate(Trip tripID);
```

PCMSCalcTrip() returns the distance between `orig` and `dest` by calculating the route using the trip's current routing type. By default, the distance is returned as tenths of miles and your application should divide the result by 10 to obtain true floating point distance. (To have distances returned in hundredths or thousandths, either use the `PCMSSetNumMilesDecimals` function (section 3.17), edit the precision setting in the PC*MILER graphical user interface, or edit the `PCMSERVE.INI` file – see section 2.10.) Since `PCMSCalcTrip()` actually adds the `orig` and `dest` to the trip as stops, you can use the trip again after modifying some options. The origin and destination locations are geocoded using the default database match at a confidence level of 1 or 2. For a description of PC*MILER confidence levels, see `PCMSLookup` in section 3.6, *Managing Stops*. To modify the way locations are geocoded, use `PCMSCalcTrip2` (see below).

`PCMSCalcTrip2()` is the same as `PCMSCalcTrip` but includes the `easyMatch` integer to allow users to control the way locations are geocoded. For an explanation of `easyMatch`, see the description of the function `PCMSLookup` in section 3.7, *Validating City Names*.

`PCMSCalculate()` computes the distance for the current trip using the trip's current routing type. By default, the distance is returned as tenths of miles and your application should divide the result by 10 to obtain true floating point distance. (To have distances returned in hundredths or thousandths, either use the `PCMSSetNumMilesDecimals` function (section 3.17), edit the precision setting in the PC*MILER graphical user interface, or edit the `PCMSERVE.INI` file – see section 2.10.) If there are not enough stops, or the trip contains invalid stops, `PCMSCalculate()` returns -1.

PC*MILER|Connect can also return the trip's duration in minutes using:

```
long PCMSGetDuration(Trip tripID);
```

A complete example is below.

```
void Test_trip(PCMServerID server)
{
    Trip shortTrip;
    float distance;

    /* Create a new trip */
    shortTrip = PCMSNewTrip(server);

    /* ...Do some error handling... */

    /* Run a route calculation */
```

```

    distance = PCMSCalcTrip(shortTrip, "Princeton, NJ",
"Chicago, IL");
    printf ("Practical route in miles: %f\n", distance);

    /* Calculate in kilometers */
    PCMSSetKilometers(shortTrip);
    distance = PCMSCalcTrip(shortTrip, "Princeton, NJ",
"Chicago, IL");
    printf ("Practical route in kilometers: %f\n",
    distance);

    /* Change to SHORTEST routing, rerun. */
    PCMSSetCalcType(shortTrip, CALC_SHORTEST);
    distance = PCMSCalculate(shortTrip);
    printf ("Shortest route in kilometers: %f\n",
    distance);

    /* Free up the trip before returning!!! */
    PCMSDeleteTrip(shortTrip);
}

```

Each of the functions which modify a trip's options or stop list are described in more detail in the following sections.

3.4 Getting Toll Costs

If the PC*MILER|Tolls add-on module is installed with PC*MILER, there are five PC*MILER|Connect functions that support toll calculations (they are listed and their interfaces in C language are described below). A sixth function, PCMSSetVehicleConfig, enables toll cost calculation with custom vehicle dimensions and number of axles taken into account (see section 3.4.1 below).

Once the toll and vehicle dimensions (if used) information has been passed in, the routing results can be retrieved using the standard PCMSGetRpt and PCMSGetRptLine APIs.

```

void _PCMSFN PCMSSetTollMode (Trip trip, int mode);
int _PCMSFN PCMSGetToll (Trip trip);
int _PCMSFN PCMSNumTollDiscounts (PCMServerID serv);
int _PCMSFN PCMSGetTollDiscountName (PCMServerID serv,
    int idx, char *buffer, int bufSize);
long _PCMSFN PCMSGetTollBreakdown (Trip trip, int
    discProgram, char *state);

```

```

/* Enable/disable toll information mode values as follows:
0 - no toll information,
1 - cash toll amount,
2 - discount toll amount */
void _PCMSFN PCMSSetTollMode(Trip trip, int mode);

/* Return toll amount for the trip in cents */
int _PCMSFN PCMSGetToll(Trip trip);

/* Return the number of toll discount programs (i.e. EZPass, FasTrak, etc.)
recognized by PC*MILER/Tolls. Note that it also includes cash, which
technically is not a discount */
int _PCMSFN PCMSNumTollDiscounts(PCMServerID serv);

/* Retrieve toll discount name by index. Returns actual number of
bytes in buffer, -1 on error */
int _PCMSFN PCMSGetTollDiscountName(PCMServerID serv,
int idx, char *buffer, int bufSize);

```

NOTE: The only way to set membership in a discount program is to run the PC*MILER interactive application (**pcmwin32.exe**), select the Routes tab > General group > *Defaults* and in the **Tolls** tab of the Default Route Options dialog make sure that the desired discount program(s) are checked. (By default, out of the box, all programs are checked.) Click **Save** to save changes. All available discount programs are listed in the Tolls tab, or see the PC*MILER *User's Guide*.

```

/* Specify the toll amounts that apply to each discount program for the discount
programs that are active. */
long _PCMSFN PCMSGetTollBreakdown(Trip trip, int
discProgram, char *state);

```

The above functions are used as follows:

After a trip is created and before requesting a toll amount or report, use PCMSSetTollMode to indicate whether no tolls are calculated (mode=0), tolls are to be calculated on an all-cash basis (mode=1), or discount programs are to be used in toll calculations (mode=2). When discount programs are used, the determination of whether to use a particular program (e.g., EZPass, SunPass, etc.) is based on the discount programs selected in the Default Route Options dialog in the PC*MILER interactive program (see NOTE above).

Use PCMSGetToll to request the total toll charges for the trip.

Use PCMSGetTollBreakdown to get the toll amount attributable to a particular discount program based on the value discProgram passed to the function. The value discProgram=0 always refers to the Cash part. Note that if the Toll Mode is set to 1 (all-cash), then PCMSGetTollBreakdown will report a value of 0 for all programs except "Cash" (discProgram=0). If a

state is specified, the toll amount is in that state only. If state is an empty string, all states are included.

The function `PCMSNumTollDiscounts` will report how many discount programs are available (based on the discount programs selected in the Default Route Options dialog in the PC*MILER GUI); `PCMSGetTollDiscountName` will report the discount program name corresponding to a particular index value.

The following sample code demonstrates the use of most of the toll functions:

```
void Test_tolls(PCMServerID server)
{
    Trip trip1;
    int I, numPrograms;
    float miles;
    float TollsTotal, programTolls;
    char programName[20];

    /* create a new trip */
    trip1 = PCMSNewTrip(server);

    /* run a route */
    miles = PCMSCalcTrip(trip1, "New York, NY",
                        "Washington, DC") / 10.0;

    printf("Total mileage = %.1f miles\n", miles);

    /* get total tolls on all-cash basis */
    PCMSSetTollMode(trip1, TOLL_CASH);
    TollsTotal = PCMSGetToll(trip1) / 100.0;
    printf("All-cash tolls = $%.2f\n", TollsTotal);

    /* get total tolls using discount programs */
    PCMSSetTollMode(trip1, TOLL_DISCOUNT);
    TollsTotal = PCMSGetToll(trip1) / 100.0;
    printf("Discounted tolls = $%.2f\n", TollsTotal);

    /* get breakdown of tolls by cash part (i=0) and
       each discount program */
    PCMSSetTollMode(trip1, TOLL_DISCOUNT);
    numPrograms = PCMSNumTollDiscounts(server);
    for (i=0; i<numPrograms; ++i)
    {
        PCMSGetTollDiscountName(server, i, programName, 20);
        programTolls = PCMSGetTollBreakdown(trip1, I, "") /
            100.0;
        printf("%s Tolls = $%.2f\n", programName,
            programTolls);
    }

    /* delete the trip */
}
```

3.4.1 Toll Calculation With Custom Vehicle Dimensions

*(Installation of PC*MILER/Tolls required)* Jurisdictions in the U.S. and Canada that have toll roads class their toll rates either by vehicle weight or by a vehicle's number of axles. Beginning in PC*MILER Version 22, setting the vehicle's dimensions enables toll cost reporting based on vehicle weight and number of axles. The default values (i.e. if custom vehicle dimensions are not set) are based on a typical Class 8 vehicle with a weight of 80,000 lbs./36,287 kg. and 5 axles.

The available toll rates by axle are from 2 (two axle dual rear wheel vehicles only) up to 14 axles, including multi-trailer rates. For toll rates categorized by weight, each toll road authority publishes its own definition of weight classes, and PC*MILER|Tolls categorizes and reports these toll rates based on the published weight category and range provided.

For those who are new to the arena of toll cost reporting, the jurisdictions that charge toll costs by weight and those that charge by axle are identified below. This information is important to know if you intend to use PC*MILER to generate toll costs that are customized by weight and axle.

- **Jurisdictions Charging Tolls by Vehicle Weight:** MI, NJ, NS, ON, PA
- **Jurisdictions Charging Tolls by Axle:** AL, AK, BC, CA, CO, DE, FL, GA, IN, IL, KS, LA, MA, ME, MD, MI, MN, NB, NH, NJ, NS, NY, OK, OR, PA, PEI, RI, SC, TX, UT, VA, WA, and WV

IMPORTANT NOTE: Twin trailers with 7 or more axles are not allowed on the Massachusetts Turnpike east of Exit 14. If you enter 7 or more axles and indicate that this is a long combination (multiple trailer) vehicle, then PC*MILER will return a \$0 toll rate for that section, without a warning.

Use `PCMSSetVehicleConfig()` (below) to generate a route and receive toll cost information based on a truck's height, width, length, weight and axle configuration. This configuration information is checked against the threshold at which a truck becomes "oversized" and appropriate routing is generated.

Additionally, PC*MILER now supports calculation of routes and toll costs for smaller vehicles (vans, pickup trucks, SUVs, automobiles, etc. that are classed less than 9,000 lbs./4,082 kgs.).

```
int PCMSSetVehicleConfig (Trip tripID, bool units, bool  
overPerm, double height, double width, double length, int  
weight, int axle, bool lcv)
```

Returns 0 on success, -1 indicates that one or all of the length, width, height, or weight values are outside of the acceptable range and none of the vehicle configuration values will be set for this trip. **All arguments are required**, but

only the weight, axle number, and `lcv` (multiple trailer) arguments affect toll cost reporting. The parameters are:

- `trip` – a Trip type parameter with the trip ID
- `units` – FALSE corresponds to English and TRUE to Metric
- `overPerm` – should be set to TRUE if the vehicle weight exceeds 80,000 lbs./36,287 kgs. (indicates that an oversize permit has been obtained, see NOTE below on which U.S. states require a permit); does not affect routing
- `height` – the truck height in inches or meters depending upon units; maximum = 162 inches/4.11 meters, no minimum
- `width` – the truck width in inches or meters depending upon units; maximum = 102 inches/2.59 meters, no minimum
- `length` – the truck length in feet or meters depending upon units; maximum = 80 feet/24.38 meters, no minimum
- `weight` – the truck weight in pounds or kilos depending upon units; maximum = 132,000 lbs./ 59,874 kgs., no minimum
- `axle` – the number of axles on the truck, used only for toll cost calculation (does not affect routing); note that 2 axle includes two axle dual rear wheel vehicles only; any value can be entered, typical values are 2 (indicating an automobile) or 5 (indicating a truck).
- `lcv` – identifies a long combination (multiple trailer) vehicle if set to TRUE

Here is an example of how this API might be used when running routes:

```
Trip trip = PCMSNewTrip(server);
// Drivers starts their trip with a trailer in
// in a specific configuration.
ret = PCMSSetVehicleConfig(trip, 0, 0, 120, 96, 48,
80000, 5, 0);
ret = PCMSCalcTrip(trip, "19104", "51001");

// At their first stop they change trailers so we
//update the vehicle configuration for the next leg
ret = PCMSSetVehicleConfig(trip, 0, 0, 120, 102, 53,
100000, 5, 0);
ret = PCMSCalcTrip(trip, "51001", "91001");
```

NOTE: Trucks weighing more than 80,000 lbs. require a permit in the following states: Arizona, Connecticut, Indiana, Kansas, Louisiana, Michigan, Minnesota, North Carolina, Nevada, New York, Oklahoma, Washington, and Wisconsin. The `overPerm` parameter does not affect routing, it only serves as a reminder that a permit may be required for the vehicle dimensions entered. The default value is FALSE.

NOTE: The New York State Thruway lists separate toll rates for “5-axle 48’ Trailer” and “5-axle 53’ Trailer” vehicle types. When generating a route, PC*MILER|Tolls now reports “5-axle 48’ Trailer” toll costs as the default unless users actively set the trailer length to “53” in the *PCMSSetVehicleConfig* API. (Note that changing the routing option to “53’ Trailer or Twins” will not impact toll cost calculations.) In PC*MILER|Connect, when using the function *PCMSSetVehicleConfig*, identifying vehicle dimensions for length as either “48” or “53” will report the corresponding toll cost.

For those using vehicle profiles, the following function sets the vehicle profile name associated with a trip, which in turn will update all the cost options associated with the profile. For more on vehicle profiles and dimensions, refer to the *PC*MILER User’s Guide*.

```
int PCMSSetProfileName(Trip trip, const char *profileName)
```

Profile names can be seen in the Route Options dialog in PC*MILER. Examples are: “Full-size van”, “26’ straight truck”, “48’ semitrailer”. Returns 0 on success, -1 on failure if the profile name is incorrect or does not exist in PC*MILER.

3.5 Currency Conversion

The function *PCMSSetExchRate* enables accurate toll cost calculation in Canadian dollars. It affects generated toll costs only. Users who are working with PC*MILER|Connect without the PC*MILER user interface can use this function to change the default exchange rate between U.S. and Canadian dollars.

```
void PCMSSetExchRate(Trip trip, long convRate);
```

The first parameter, *trip*, is the standard trip ID declared as long; the second parameter *convRate* is the currency rate FROM U.S. dollars TO Canadian dollars, declared as long. In the example below, the conversion rate from U.S. dollars to Canadian dollars is set at 99.29:

```
PCMSSetExchRate(trip, 9929);
```

3.6 Managing Stops

PC*MILER|Connect can calculate routes with many stops. When the client application adds stops to a trip, PC*MILER|Connect tries to geocode stop names to the PC*MILER highway database.

The following functions are used to manage a trip’s list of stops:

```
int PCMSAddStop(Trip tripID, const char *stop);
```

```

int PCMSAnglicize(char *outBuf, char *inBuf)
int PCMSAddStop2(Trip tripID, const char *stop, int
    easyMatch);
int PCMSDeleteStop(Trip trip, int which);
int PCMSGetStop(Trip tripID, int which, char *buffer,
    int bufSize);
int PCMSGetStopType (Trip trip, int which, int *type);
int PCMSNumStops(Trip tripID);
void PCMSClearStops(Trip tripID);

```

PCMSAddStop() adds a stop to the trip's stop list. This becomes the new destination. PCMSAddStop() returns 1 on success.

This function geocodes the given location by returning the default match in the database at a confidence level of 1 or 2. PC*MILER confidence levels indicate the accuracy of the data matching for each record as follows:

- Level 1: Exact** An exact match was made. Trust is 95% or greater AND if address is outside the range listed in the database, the top match is within 100 address units of input address*; OR for any other match level if there are multiple matches they are all within .1 air miles of each other.
* For example, "100 Main Street" was input and the best match in the database is "150-250 Main Street".
- Level 2: Fair** Fair match: Trust is 85% or greater AND if address is outside the range listed in the database, the top match is within 500 address units of input address*; OR for any other match level if there are multiple matches they are all within .5 air miles of each other.
* For example, "100 Main Street" was input and the best match in the database is "450-550 Main Street".
- Level 3: Uncertain** Uncertain match: Trust is 50% or greater.
- Level 4: Failed** Failed match: Trust is below 50%.

NOTE: If the stop is invalid, it was not added to the trip's list. This means that the trip will recalculate, but the distance and the route will not include the invalid stop! For stop validation, refer to section 3.7, *Validating City Names*. To modify the way locations are geocoded, use PCMSAddStop2 (see below).

PCMSAnglicize() is used if working with diacriticals, it returns the stop name string without special characters. For example, if geocoding the address "Charny, QC; 1021 École" fails, the user needs to consider calling this function first. inBuf is the input string, outBuf is the anglicized output string. Return value is the length of the string.

PCMSAddStop2() is the same as PCMSAddStop, except for the inclusion of the integer easyMatch that allows the user to modify the way a location is geocoded. To use easyMatch, see the description of the function PCMSLookup in section 3.7, *Validating City Names*.

PCMSDeleteStop() deletes a specified stop from this trip. PCMSGetStop() will put a stop name into the supplied buffer. Use which to index into the list of stops. Stop number 0 is the origin. The resulting string will be a NULL terminated string. There is no limit to the length of the place name (**we recommend using at least 128 bytes**). If bufSize is less than the actual stop length, then bufSize - 1 characters will be copied into buffer. PCMSGetStop() returns the number of characters in the actual name so you can check if your buffer is too small.

PCMSGetStopType() is used to determine what type of stop was added to the trip, making it easier to know how to parse the returned results. This function returns the type of each stop in a trip. Pass an index as to which stop you want the stop type for in the trip. PCMSGetStopType() returns 0 when there is no local street address and returns 1 if there is an address. For example:

```
Trip trip = PCMSNewTrip(server);
PCMSAddStop(trip, "12345");
PCMSAddStop(trip, "18974;1174 nassau road");
void DumpStops(Trip trip)
{
    char buf[BUFLen];
    std::cout << " Dumping stops..." << std::endl;
    int nStops = PCMSNumStops(trip);
    for (int iStop = 0; iStop < nStops; ++iStop)
    {
        int type = -1;
        PCMSGetStop(trip, iStop, buf, BUFLen);
        PCMSGetStopType(trip, iStop, &type);
        std::cout << "      " << iStop << " ) " << buf << " ("
        << type << ")" << std::endl;
    }
}
```

This code produces the following report:

```
0) 18974 Warminster, PA; 1174 Nassau Road (1)
1) 12345 General Electric, NY, Schenectady (0)
```

PCMSNumStops () returns the total number of stops currently in the trip's stop list, including origin and destination.

PCMSClearStops () removes all stops from the stop list.

The following example shows how to add some stops and to check a partial match after adding it:

```
void AddStop(Trip tripID)
{
    int matches;
    int bytes;
    char buffer[40];

    /* Clear out all the stops */
    PCMSClearStops();
    /* Add one stop and error check it carefully */
    matches = PCMSAddStop(tripID, "Princeton, NJ");
    if (1 < matches)
        printf("Found %d matching cities!\n", matches);
    else if (1 == matches)
        printf("Found only one\n");
    else if (0 == matches)
        printf("Couldn't find anything\n");
    else
        printf("Oops! Caused an error\n");

    /* Add some more stops simply */
    PCMSAddStop(tripID, "Chicago, IL");
    PCMSAddStop(tripID, "San Diego, CA");

    /* Show the trip's stops as geocoded */
    for (i = 0; i < PCMSNumStops(tripID); i++)
    {
        bytes = PCMSGetRptLine(tripID, RPT_MILEAGE, i,
                               buffer, 40);
        if (0 < bytes)
            printf ("%s\n", buffer);
        else
            printf ("Stop %d is invalid\n", i);
    }
}
```

3.7 Validating City Names

You may want to spell check and validate city names before committing the engine to run the route. There are several functions you can use to look up city/state pairs or 5-digit ZIP codes:

```
int PCMSCheckPlaceName(PCMServerID serv,
    const char FAR *cityZIP);

int PCMSCheckPlaceName2(PCMServerID serv,
    const char FAR *cityZIP, int easyMatch);

int PCMSLookup(Trip tripID, const char *placeName, int
    easyMatch);

int PCMSGetMatch(Trip tripID, int index, char *buffer,
    int bufLen);

int PCMSGetFmtMatch (Trip trip, int which, char FAR
    *buffer, int bufSize, int zipLen, int cityLen,
    int countyLen);

int PCMSGetFmtMatch2 (Trip trip, int which, char FAR
    *addrBuf, int addrLen, char FAR *cityBuf, int
    cityLen, char FAR *stateBuf, int stateLen, char
    FAR *zipBuf, int zipLen, char FAR *countyBuf, int
    countyLen);

int PCMSGetFmtMatch3 (Trip trip, int which, char
    *addrBuf, int addrLen, char *cityBuf, int
    cityLen, char *stateBuf, int stateLen, char
    *zipBuf, int zipLen, char *countyBuf, int
    countyLen, char *timezoneBuf, int timezoneLen,
    bool &isDST);

int PCMSGetFmtMatch4 (Trip trip, int which, char
    *addrBuf, int addrLen, char *cityBuf, int
    cityLen, char *stateBuf, int stateLen, char
    *zipBuf, int zipLen, char *countyBuf, int
    countyLen, double *latitude, double *longitude);

int PCMSNumMatches(Trip tripID);
```

Suggested use of these functions for city validation is as follows:

1. Use **PCMSCheckPlaceName()** or **PCMSLookup()**.

PCMSCheckPlaceName() returns the number of matching places in the PC*MILER database. 0 = no matching places, -1 = the server ID or string pointer is invalid.

PCMSCheckPlaceName2() includes the `easyMatch` integer that allows users to control how locations are geocoded (see the explanation under PCMSLookup below).

PCMSLookup() creates a list of matching cities and returns how many match your input. You can then check each item in the list yourself for a matching name, or pop up the list in your own list box. Input may contain an asterisk (e.g. "PRI*, NJ") or be in the form of latitude/longitude points or any custom place name created in PC*MILER. Matches will also be returned if your input is either a fragment or matches multiple cities with the same name (e.g. a city that has many different ZIP codes).

The input value for `easyMatch` affects the output returned by PCMSLookup() as follows:

0 – Returns the number of matches found (of any confidence level), or 0 if no matches are found. This option is provided for the benefit of users who are implementing pick list functionality, who would then call PCMSGetMatch to get each item for their pick list (see Step 2 below).

1 – Returns one exact match (confidence level 1), or an error if no exact match is found.

2 – Returns one exact match, or one fair match (confidence level 2) if no exact match is found; or an error if no exact or fair matches are found. A fair match is a close match to the user's input address, subject to a minimum trust percentage of 85%, an out-of-range test, and a multiple matches rule. The trust percentage measures how closely the text of the match resembles the text of the user's input. The out-of-range test checks that the match's address range is within 500 address units of the user's input address number. The multiple matches rule checks that alternative exact or fair matches, if any, are within .5 miles of one another.

5 – Returns one exact match (confidence level 1), or extended error code if no exact match is found. See Appendix B, *Constants and Error Codes*, for descriptions of extended error codes.

IMPORTANT NOTE: The INI settings and API that pertain to Mexican postal codes (documented in section 3.12) affect `easyMatch` values of 1 and 5 but **do not** have any effect when an `easyMatch` value of 0 or 2 is passed.

Example inputs are below.

```
int nMatches = PCMSLookup(tripID, "Princeton,NJ;140",
5); //should return 1030
int nMatches = PCMSLookup(tripID, "LA", 5); //should
```

```

return 0
int nMatches = PCMSLookup(tripID, "Princeton,NP", 5);
//should return 0
int nMatches = PCMSLookup(tripID, "19104;4501 HENRY
AVE", 5); //should return 1070
int nMatches = PCMSLookup(tripID, "08540Princeton,NJ;
1000 Herronxtown road", 5); //should return 1040
int nMatches = PCMSLookup(tripID, "08540Princeton,NJ;
1000 Herrontown road", 5); //should return 1

```

When using `easyMatch` with value of 0, it returns the number of matching places, or 0 if no places match the input.

2. Once you've added stops that have at least one match in the database to your trip, use **PCMSGetMatch()** or one of the four **PCMSGetFmtMatch()** functions to retrieve each matching place name.

Using `PCMSGetMatch()`, pass the index of the match wanted and a buffer to store the name in. The name stored in the buffer should be the name passed to `PCMSAddStop()` (see section 3.6, *Managing Stops* above). There is no limit to the length of the place name (we recommend using at least 128 bytes). `PCMSGetMatch()` will return the number of characters in the actual place name so you can check if your buffer is too small.

`PCMSGetFmtMatch()` will format the length of the place name before returning it. `zipLen` is the length of the ZIP field, `cityLen` is the length of the city field, and `countyLen` is the length of the county field. The place name will be returned in the format (zipLen)_(cityLen)_(2-character state abbreviation)_(countyLen), where the underscores represent spaces, for example:

07403 Bloomingdale NJ, Passaic

`PCMSGetFmtMatch2()` will also format the length of the place name before returning it. It contains a different string for each piece of information regarding address, city, state, ZIP code, and county.

`PCMSGetFmtMatch3()` returns the time zone in GMT offset format and whether it is in Daylight Savings Time, in addition to the other information described above.

`PCMSGetFmtMatch4()` returns the decimal latitude and longitude in addition to the other information described above.

NOTE: If the length of a particular input exceeds the parameters of its corresponding field, the return will be truncated; for example, if you pass 4 for `zipLen` and look up Bloomingdale, NJ, you'll get back '0740' rather than '07403'.

-
3. Use `PCMSNumMatches()` to get the number of matches of the last call to `PCMSLookup()`.

To look up a city and print the list of all matching cities, use code like this:

```
char buffer[255];

/* Lookup all cities that match */

matches = PCMSLookup(trip, "PRI*, NJ", 0);
printf ("%d matching cities to 'PRI*, NJ'\n", matches);

/* Show all the matching cities. Note: You could use
variable 'matches' below instead, since PCMSNumMatches()
== matches.*\

for (i = 0; i < PCMSNumMatches(trip); i++)
{
    PCMSGetMatch(trip, i, buffer, 25);
    printf ("%s\n", buffer);
}
```

3.8 Validating Street Addresses

To validate place names with addresses, follow the steps outlined above for validating cities. Addresses must be separated from place names by a semi-colon in your input file.

NOTE: The precision of the `PCMSCheckPlaceName()` function (step 1) extends to street addresses where an exact match is required for a successful return value. If for example, a street contains only the even numbers of an address range, this function will fail for an input with an odd address number even if it's within the valid range. Use `PCMSLookup()` for a looser interpretation.

3.9 Setting the Default Region

The default region in `PC*MILER|Connect` is North America unless it is changed. If `PC*MILER|Worldwide` is installed, you can use the `SetDefaultRegion` and `GetDefaultRegion` functions to change or view the default region.

IMPORTANT NOTE: In a multi-threaded environment we do NOT advise using the `SetDefaultRegion` function, as it sets the region globally and may cause failures if you have threads running routes in other regions. See below for alternate ways to change the default region.

```
int _PCMSFN PCMSSetDefaultRegion (char FAR *regionId);  
int _PCMSFN PCMSGetDefaultRegion (short bufSize, char  
FAR *regionId);
```

The `SetDefaultRegion` function takes precedence over settings in the `.INI` and the `PC*MILER` graphical user interface when it is used. The *regionId* may be NA (North America), SA (South America), Africa, Asia, ME (Middle East), Europe, or Oceania.

Other ways to change the region include editing the `PCMSERVE.INI` file (see section 2.10, *Setting Default Values in the PCMSERVE.INI File*) or changing the region setting in the `PC*MILER` graphical user interface. If using the `PCMSERVE.INI` to change a setting, the change will only take effect after the application is restarted. Changes made in the `INI` file take precedence over settings in the `PC*MILER` GUI.

3.10 Switching the Data Set

Users who wish to switch to a different data set need to make the change in the `PC*MILER` graphical user interface using the *Change Data Set* option (Map tab > Utilities group > *Change Data Set*). The correct region must be set – see section 3.9 above.

3.11 Country Code Format Options

(*PC*MILER/Worldwide only*) By default `PC*MILER|Worldwide` accepts country abbreviations as FIPS codes. To use another country code format you will need to add a line to the `PCMSERVE.INI` file in the Options section (see section 2.10). Supported options are: FIPS, ISO2, ISO3, GENC2, and GENC3. A sample line:

```
[Options]  
CountryAbbrevType=ISO2
```

If this line is not specified, the option can be set in the `PC*MILER` graphical user interface. The setting in the `INI` file overrides whatever is set in `PC*MILER`.

3.12 Using Mexican Postal Codes

Mexican postal codes are now included in the database. Because U.S. ZIP codes and Mexican postal codes share a similar format, new `PCMSERVE.INI` settings and an API are available to ensure that the entered ZIP/postal code matches the desired location. New settings in the `PCMSERVE.INI` (found in the `C:\Windows` folder) are described below. Note that if both are set to `FALSE` or are not in the `INI`, the default US ZIP code will be used.

```
UseUSPostCodes=True/False
UseMexPostCodes=True/False
```

To add or edit these options, open PCMSERVE.INI in Notepad or Wordpad. If they are not already there, add them to the [OPTIONS] section. The possible setting combinations are:

- UseUSPostCodes=False and UseMexPostCodes=False – Defaults to the U.S. ZIP with no routing to Mexican postal codes
- UseUSPostCodes=True and UseMexPostCodes=False – Same as above
- UseUSPostCodes=True and UseMexPostCodes=True – Defaults to the U.S. ZIP, must pass an Estados code to get Mexican location (e.g. “50510,EM”)
- UseUSPostCodes=False and UseMexPostCodes=True – Only Mexican postal codes are available, in the U.S. only city-state pairs will get U.S. location (e.g. “Chico, CA”)

The API’s that control these settings are below. Remember that an API call overrides both the PCMSERVE.INI setting and the setting in the PC*MILER graphical user interface (this is true for all APIs). Each of these functions is a server option and should be made in a single call.

```
PCMSZipCodeOption(server, X)
```

where “X” may be the following: 0 = Use default U.S. ZIP code; 1 = Use default Mexican postal code; or 2 = Use default code, whether U.S. or Mexican.

```
int PCMSZipCodeUSAndMexico(PCMServerID serv)
```

Using this API call, a pick list will contain both US and Mexican postal codes if the same postal codes exist in both the US and Mexico. The sort order of the pick list will put US codes first.

```
int PCMSZipCodeMexicoOnly(PCMServerID serv)
```

Using this API call, only Mexican postal codes will be returned. Therefore, no matches will be returned if an attempt is made to geocode a US postal code.

```
int PCMSZipCodeUSOnly(PCMServerID serv)
```

Using this API call, only US postal codes will be returned. Therefore, no matches will be returned if an attempt is made to geocode a Mexican postal code.

NOTE: The above settings affect `easyMatch` values of 1 and 5 but **do not** have any effect when an `easyMatch` value of 0 or 2 is passed (see section 3.7).

3.13 Setting the ‘NL’ Abbreviation Preference

The function below enables users to choose whether to set the abbreviation ‘NL’ to geocode to Newfoundland and Labrador locations in Canada or to Nuevo Leon locations in Mexico. Use MX for Nuevo Leon, or CN for Newfoundland and Labrador. This can also be set as a default value in the [Options] section of the INI file – see section 2.10.

```
int PCMSFN PCMSSetNLAbbreviation (trip, const char*
    CanorMX);
```

3.14 State/Country Lists

The following functions can be used to build a list of states and countries.

The function `PCMSStateList()` returns the number of U.S. states, Canadian provinces, Mexican estados, and Central American and Caribbean countries included in the North America region.

```
int PCMSFN PCMSStateList (PCMServerID serv)
```

The function `PCMSStateListItem()` prints the name and state code for the given index into the user-supplied buffer, delimited by tabs. The `bAddCountry` Boolean will append the country name and abbreviation to the buffer, defaulted to false. Returns the number of bytes written to the buffer.

```
int PCMSFN PCMSStateListItem (PCMServerID, int index,
    char *buffer, int bufSize, bool bAddCountry =
    false);
```

The function `PCMSCountryList()` returns the number of countries defined by the supplied region. `regionID`) may be one of the following: NA, SA, Africa, Asia, Europe, ME, or Oceania.

```
int PCMSFN PCMSCountryList (PCMServerID serv, const
    char* regionID);
```

The function `PCMSCountryListItem()` below prints the name and FIPS country code for the given index into the user-supplied buffer, delimited by tabs. Returns the number of bytes written to the buffer. `regionID`) may be one of the following: NA, SA, Africa, Asia, ME, Europe, or Oceania.

```
int PCMSFN PCMSCountryListItem (PCMServerID serv,
    const char* regionID, int index, char *buffer,
    int bufSize);
```

3.15 Translating Between Latitude/Longitudes and Places

The function `PCMSCityToLatLong()` takes a PC*MILER place name (city-state, five digit ZIP, SPLC, Canadian Postal Code, or custom name) and returns the latitude/longitude in degrees, minutes, seconds format (dddmmssN, dddmmssW).

```
int PCMSCityToLatLong(PCMServerID serv, const char FAR
    *name, char FAR *buffer, int bufSize)
```

The function `PCMSLatLongToCity()` takes a latitude/longitude (degrees, minutes, seconds or decimal degrees format) and returns by default the miles and direction from the PC*MILER place name at the closest end of the closest road segment. This may be either a city-state or a road intersection. This function connects latitude/longitudes to the highway network as if you were routing to or from the latitude/longitude.

```
int PCMSLatLongToCity(PCMServerID serv, const char FAR
    *latlong, char FAR *buffer, int bufSize)
```

Both of these functions return the number of characters copied into the buffer (-1 in case of error).

IMPORTANT NOTES for PC*MILER|Worldwide Users: Before using these functions, the region must be set to match the lat/longs that will be sent or received (see section 3.9). In North America, city names will include state, province or estado, but not the county. In all other regions, the city format is City, Country, with the country abbreviation being a FIPS 2-character, ISO 2-character, or ISO 3-character code depending on the setting in the PC*MILER graphical user interface. If you are passing a country code, the format must match this setting in PC*MILER (File menu > *Application Settings* > *Country Abbreviation Format* pick list).

The two functions may be, but are not necessarily reversible. That is because not all PC*MILER place names are located at the end points of road segments.

In the example below, Skillman, NJ is located 1.2 miles northwest of Blawenburg, NJ, which is the end point on the nearest link to Skillman (required arguments are left out for clarity).

```
PCMSCityToLatLong(SKILLMAN, NJ)→0402512N,0744253W
```

```
PCMSLatLongToCity(0402512N,0744253W)→1.2 NW
    BLAWENBURG, NJ
```

The following functions are available only if you are using PC*MILER|Streets:

```
int PCMSAddressToLatLong(PCMServerID serv, const char FAR *name, char FAR *buffer, int bufSize);

int PCMSAddressToLatLong2(PCMServerID serv, const char FAR *name, char FAR *buffer, int bufSize, int easyMatch);

int PCMSLatLongToAddress(PCMServerID serv, const char FAR *latlong, char FAR *buffer, int bufSize);
```

The function `PCMSAddressToLatLong()` takes a PC*MILER|Streets address and returns the latitude/longitude in degrees, minutes, seconds format (dddmmssN,dddmmssW), finding a default database match at confidence level 1 or 2. For a description of PC*MILER confidence levels, see `PCMSLookup` in section 3.6, *Managing Stops*. To modify the way addresses are geocoded, use `PCMSAddressToLatLong2` (see below).

`PCMSAddressToLatLong2()` includes the `easyMatch` integer to allow users to control the way addresses are geocoded. For an explanation of `easyMatch`, see the description of the function `PCMSLookup` in section 3.7, *Validating City Names*.

The function `PCMSLatLongToAddress()` takes a latitude/longitude (degrees, minutes, seconds or decimal degrees format) and returns the miles to the address. This function connects latitude/longitudes to the highway network as if you were routing to or from the latitude/longitude.

All of the above functions return the number of characters copied into the buffer (-1 in case of error).

The two address functions may be, but are not necessarily reversible. That is because not all PC*MILER|Streets place names are located at the end points of road segments. For example, Skillman, NJ is located 1.2 miles northwest of Blawenburg, NJ, which is the end point on the nearest link to Skillman (required arguments are left out for clarity).

NOTE: Adding the key `LatLonFormatDecimal=TRUE` to the Options section of the `PCMSERVE.INI` file causes `PCMSAddressToLatLong()` to return lat/longs in decimal degrees (e.g. 40.348848N,74.662703W). When this line is not included in the .INI or is included but `=FALSE`, the function returns degrees, minutes, seconds (e.g. 0402056N,0743946W). See section 2.10, *Setting Default Values in the PCMSERVE.INI File*, for more on this file.

3.16 SPLCs As Stops

PC*MILER|Connect enables you to enter SPLCs as stops. You can use a SPLC in any function that takes city/state or ZIP code as an argument. SPLCs can be six or nine digits in length. SPLC data used in PC*MILER products is owned, maintained and copyrighted by the National Motor Freight Traffic Association, Inc.

In order to differentiate a SPLC from a postal code, SPLCs must be entered with the prefix “splc”. For example, if 111009 is a SPLC, you enter “splc111009” as a stop as shown below:

```
PCMSCalcDistance(serverID, "splc111009", "MADAWASKA, ME");
PCMSCheckPlaceName(server, "splc111009");
PCMSLookup(trip, "splc111009", 1);
```

3.17 Route Options

The following functions affect the trip’s routing calculation and report formats. For more details about route types and route options, refer to the PC*MILER *User's Guide* or Help. Also see section 2.10, *Setting Default Values in the PCMSERVE.INI File* and section 3.18, *Routing With Custom Vehicle Dimensions*.

NOTE: Default options that are set in PC*MILER in the Default Route Options dialog will be active where an option is not specified either directly in Connect or in the INI file. The order of precedence is:

- Options that are set directly in Connect take precedence over the default options set in PC*MILER and the INI file.
- Options set in PCMSERVE.INI take precedence over those set in PC*MILER.
- An option set as the default in PC*MILER takes effect only in the absence of settings 1 and 2, and only when a key for that option exists in the PCMSERVE.INI. For example, the Distance Precision setting in PC*MILER would only take effect when the line **DistancePrecision=** exists in the [OPTIONS] section of the INI, without an assigned value.

```
void PCMSSetCalcType(Trip tripID, int routeType);
int PCMSGetCalcType(Trip tripID);
void PCMSSetCalcTypeEx(Trip trip, int rtType, int
    optFlags, int vehType);
int PCMSGetCalcTypeEx(Trip trip, int* pRtType,
    int* pOptFlags, int* pVehType);
```

```

int PCMSGetNumMilesDecimals();
int PCMSSetNumMilesDecimals(int iNumMilesDecimals);
void PCMSSetBordersOpen(Trip tripID, BOOL open);
void PCMSSetKilometers(Trip tripID);
void PCMSSetShowFerryMiles(Trip trip, BOOL onOff);
void PCMSSetMiles(Trip tripID);
void PCMSSetAlphaOrder(Trip tripID, BOOL alphaOrder);
void PCMSSetVehicleType(Trip trip, BOOL onOff);
(PC*MILER|Streets only)
void PCMSSetRoadNameOnly (Trip trip, BOOL onOff);
(PC*MILER|Streets only)
void PCMSSetRouteLevel (Trip trip, BOOL UseStreets);
(PC*MILER|Streets only)
int PCMSGetExactLevel (PCMServerID serv, int threshold);
(PC*MILER|Streets only) (Deprecated in Version 27)
int PCMSSetExactLevel (PCMServerID serv);
(PC*MILER|Streets only) (Deprecated in Version 27)
void PCMSSetCost(Trip trip, int cost);
int PCMSGetCost(Trip trip);
void PCMSSetCustomMode(Trip trip, BOOL onOff);
void PCMSSetBreakHours(Trip trip, long hours);
long PCMSGetBreakHours(Trip trip);
void PCMSSetBreakWaitHours(Trip trip, long hours);
long PCMSGetBreakWaitHours(Trip trip);
void PCMSSetBorderWaitHours (Trip trip, long minutes);
long PCMSGetBorderWaitHours (Trip trip);

```

PCMSSetCalcType() sets the trip's routing method. Valid values are 0 (Practical), 1 (Shortest), 2 (National), 3 (AvoidToll) 4 (Air), or 6 (FiftyThree). Constants for these values are in *Appendix B*.

PCMSGetCalcType() returns the trip's current routing method.

PCMSSetCalcTypeEx() sets the trip's routing method when route type combinations are desired. The *rtType* (route type) parameter requires one (and only one) of either Practical, Shortest, or Air. *optFlags* (options) with either

Practical or Shortest can be AvoidToll and/or one and only one of either National or FiftyThree. (Note that 53' Trailer includes National Network routing, but not necessarily vice versa). Options are separated by the | symbol. The *vehType* parameter is reserved for future use and must always be 0.

PCMSGetCalcTypeEx() returns the trip's current routing method when SetCalcTypeEx has been used. NULL can be passed for *pRtType*, *pOptFlags*, and/or *pVehType* if value is not needed.

NOTE: CalcTypeEx and CalcType functions cannot be used together. For example, where SetCalcTypeEx has been used to set the routing method, GetCalcType cannot be used to return the current routing method.

PCMSGetNumMilesDecimals() gets the number of decimals currently returned when distances are calculated. Possible return values are: 1 = tenths, 2 = hundredths, 3 = thousandths.

PCMSSetNumMilesDecimals(int iNumMilesDecimals) sets the number of decimals that will be returned when distances are calculated. Possible values are: 1 = tenths, 2 = hundredths, 3 = thousandths.

PCMSSetBordersOpen() will prevent routes from crossing international borders if two stops are in the same country, even if the best route goes through another country. Set open to TRUE to allow border crossings, and FALSE to prevent them.

PCMSSetKilometers() and PCMSSetMiles() set the returned distance values to either kilometers or miles.

PCMSSetShowFerryMiles() sets the trip's ferry mode. TRUE means ferry distances will be included in distance and cost calculations, FALSE means they will not. Actual routing and travel times are not affected.

PCMSSetAlphaOrder() determines the order states are listed in the State Report. If alphaOrder is TRUE, then states are listed alphabetically, otherwise they are listed in driving order.

PCMSSetVehicleType() determines whether Heavy Vehicle truck restrictions on roads are respected when the route is calculated. Restrictions are on by default, set to Off for Light Vehicle routing. See the *PC*MILER User's Guide* for more on these two options. (Available with *PC*MILER/Streets* only.)

PCMSSetRoadNameOnly() gives priority to matching the road name for the street address. If a specific address number does not exist, but the road exists, then it picks the first one in its list. (Available with *PC*MILER/Streets* only.)

`PCMSSetRouteLevel()` allows the setting of routing to be toggled between street level routing and highway only routing. It provides the same effects as the `UseStreets` setting in the `pcmsolve.ini` except it can be changed in between trips. (Available with `PC*MILER/Streets` only.)

(NOTE: These two functions were deprecated in Version 27, they can be called but will always return 100.) `PCMSGetExactLevel()` and `PCMSSetExactLevel()` get and set the confidence level – as a percentage – above which a match is considered exact (the default is 100%). (Available with `PC*MILER/Streets` only.)

`PCMSSetCost()` sets the trip's cost option. `PCMSGetCost()` returns the trip's cost option.

`PCMSSetCustomMode()` sets the trip's `CustomMode` option. Set `onOff` to `TRUE` to allow custom routing and `FALSE` to turn this option off.

`PCMSSetBreakHours()` sets the trip's break hours in minutes.

`PCMSSetBreakWaitHours()` sets the trip's break wait hours in minutes.

`PCMSGetBreakHours()` gets the trip's break hours in minutes.

`PCMSGetBreakWaitHours()` gets the trip's break wait hours in minutes.

`PCMSSetBorderWaitHours()` sets the trip's border waiting hours (minutes).

`PCMSGetBorderWaitHours()` gets the trip's border waiting hours (minutes).

It is possible to set and get all the available options at once (see below). All options are stored internally to the trip as a bit vector. See *Appendix B* for values.

```
long PCMSGetOptions(Trip tripID);  
void PCMSSetOptions(Trip tripID, long opts);  
void PCMSDefaults(Trip tripID);
```

To get all the options at once and save them as a long integer bit vector, use `PCMSGetOptions()`. Then use `PCMSSetOptions()` to put all the values back into the trip. Argument `opts` should be a bitwise OR of the option values or the results of a previous call to `PCMSSetOptions()`. This could be used to transfer options from one trip to another; or to set a trip's options from a global set of defaults.

`PCMSDefaults()` will reset a trip's options to the defaults the engine was started with. You must shut down all client applications using `PC*MILER|Connect` before making any changes to the defaults in the INI file. See the section on modifying the INI file for details.

NOTE: Stop optimization is not an option. It is an action, and therefore not saved as a trip's state. See section 3.26, *Optimizing the Stop Sequence*.

This sample code illustrates how to use the option settings:

```
void ResetTrip(Trip tripID, long defaults)
{
    long oldOptions;
    oldOptions = PCMSGetOptions(tripID);

    /* If not hub mode, reset completely */
    if (!(oldOptions & OPTS_HUBMODE))
        oldOptions = PCMSSetOptions(tripID, defaults);
}
```

3.18 Routing With Custom Vehicle Dimensions

The vehicle dimension options enable you to generate routes based on custom vehicle dimensions. PC*MILER|Connect users can now generate routing that conforms to the requirements of a vehicle's height, length, width and weight using the function `SetVehicleConfig()`.

If a vehicle weight and/or height is entered, PC*MILER route calculations will take into account restrictions on roads and bridges to ensure that the vehicle's weight/height is below the restriction(s). Vehicle weight, length and width information is checked against the threshold at which a truck becomes "oversized" and appropriate routing is generated.

Additionally, PC*MILER now supports calculation of routes and toll costs for smaller vehicles (vans, pickup trucks, SUVs, automobiles, etc. that are classed less than 9,000 lbs./4,082 kgs.).

IMPORTANT: Every time the vehicle width is set to 102 in. or more, or the length to 49 ft. or more, **or** a Vehicle Profile is selected with those dimensions or greater (such as the 53' semitrailer or 28' double trailer profiles), the National Network and 53' Trailer or Twins routing options are set automatically.

However, if you then set the vehicle width to be 96 in. or less, and a length of 48 ft. or less, **or** you select a Vehicle Profile with those dimensions or less (such as the 48' semitrailer or 40' straight truck profiles), the National Network and 53' Trailer or Twins routing options will not be turned off automatically. You must manually undo these settings each time.

This functionality allows you to generate routes that follow National Network and state-designated oversize networks, even if you are not running 53 ft. trailers, double trailers, or 102 in. wide trailers. However, you need to be aware of this

behavior if you want to switch back and forth between routes for different types of equipment.

```
int PCMSSetVehicleConfig (Trip tripID, bool units, bool overPerm, double height, double width, double length, int weight, int axle, bool lcv)
```

Returns 0 on success, -1 indicates that one or all of the length, width, height, or weight values are outside of the acceptable range and none of the vehicle configuration values will be set for this trip. **All arguments are required.** The parameters are:

- `trip` – a Trip type parameter with the trip ID
- `units` – FALSE corresponds to English and TRUE to Metric; default = FALSE
- `overPerm` – should be set to TRUE if the vehicle weight exceeds 80,000 lbs./36,287 kgs. (indicates that an oversize permit has been obtained, see NOTE below on which U.S. states require a permit); does not affect routing, only intended as a reminder that a permit may be required for the vehicle dimensions entered; default = FALSE.
- `height` – the truck height in inches or meters depending upon units; maximum = 162 inches/4.11 meters, no minimum; default = 13 feet 6 inches/4.11 meters
- `width` – the truck width in inches or meters depending upon units; maximum = 102 inches/2.59 meters, no minimum; default = 96 inches or less
- `length` – the truck length in feet or meters depending upon units; maximum = 80 feet/24.38 meters, no minimum; default = 48 feet/14.63 meters
- `weight` – the truck weight in pounds or kilos depending upon units; maximum = 132,000 lbs./ 59,874 kgs., no minimum; default = 80,000 lbs./36,287 kgs.
- `axle` – the number of axles on the truck, used only for toll cost calculation (does not affect routing); note that 2 axle includes two axle dual rear wheel vehicles only; any value can be entered, typical values are 2 (indicating an automobile) or 5 (indicating a truck); default = 5
- `lcv` – identifies a long combination (multiple trailer) vehicle if set to TRUE; default = FALSE

NOTE: Trucks weighing more than 80,000 lbs. require a permit in the following states: Arizona, Connecticut, Indiana, Kansas, Louisiana, Michigan, Minnesota, North Carolina, Nevada, New York, Oklahoma, Washington, and Wisconsin.

3.19 Using Time-Based Routing and Traffic Data

NOTE: A subscription to PC*MILER|Traffic must be purchased to access traffic data using PC*MILER|Connect.

The setting below can be added to the PCMSERVE.INI file that toggles the activation of traffic data for use with time-based routing. See section 2.10 on the INI file. This setting is the equivalent of the “Traffic Enabled” option in the PC*MILER GUI, if set to TRUE traffic will be enabled:

```
HistoricalRoadSpeeds=True/False
```

The functions listed below are related to time-based routing and PC*MILER|Traffic features. PC*MILER time-based routing can be generated with or without using traffic data. Using traffic data will increase the precision of time estimates.

If traffic data is not used, travel times and ETA’s are calculated in the same manner as in all previous versions of PC*MILER, based on average road speeds (either PC*MILER default or user-specified) by class of road in each state/province.

If Traffic is enabled and a departure or arrival time and date are not entered, INRIX default travel times that reflect free-flow conditions – think middle of the night – are used. (This is the “typical” option mentioned below.)

Traffic data is collected by road segment. When a departure or arrival time and date are entered, travel times and ETA’s will be calculated based on **historical**, **typical** and/or **real-time** traffic data, depending on the arrive/depart and day/time settings.

Historical data reflects how average traffic patterns affect road speeds on the road segments used by the generated route. (An “average” historical pattern is created using a historical time slice: 7 days in a week, with each day divided into 15-minute time slices.)

Typical data uses road speeds that would occur if there were no traffic on those road segments.

Real-time data is just that: current traffic patterns that are fed into the system in real-time (see NOTE below on how it is used for travel time calculations).

NOTE: Specifying “1” (for “now”) for the EntryDateType in the first two functions below will cause **real-time traffic data** to be used for travel time calculations for the first 15 miles of a route.

```
int PCMSSetDepartureTime(Trip tripID);
```

Use this API to set a departure time from the origin. Values for this function are:

```
long trip // Trip ID
int EntryDateType // Entry Date – 0=unknown, 1=now, 2=specific, 3=Day of
Week
int DepartTimeZone // Departure Time Zone
int DepartYear // Departure Year (e.g. 2014)
int DepartMonth // Departure Month (e.g. 10 for October)
int DepartDay // Departure Day (e.g. 23 for 23rd day of October)
int DepartHour // Departure Hour (e.g. 22 for 10:00 PM)
int DepartMinute // Departure Minute (e.g. 10 for tenth minute)
int DepartSecond // Departure Second (e.g. 0 for zero seconds)
int DepartDayOfWeek // Departure Day of Week (1=Monday,... 0=Sunday)
```

```
int PCMSSetArrivalTime(Trip tripID);
```

Use this API to set an arrival time at the destination. Values for this function are:

```
long trip // Trip ID
int EntryDateType // Entry Date – 0=unknown, 1=now, 2=specific, 3=Day of
Week
int ArrivalTimeZone // Arrival Time Zone
int ArrivalYear // Arrival Year (eg. 2014)
int ArrivalMonth // Arrival Month (e.g. 10 for October)
int ArrivalDay // Arrival Day (e.g. 23 for 23rd day of October)
int ArrivalHour // Arrival Hour (e.g. 14 for 2:00 PM military time)
int ArrivalMinute // Arrival Minute (e.g. 10 for tenth minute)
int ArrivalSecond // Arrival Second (e.g. 0 for zeroth second)
int ArrivalDayOfWeek // Arrival Day Of Week (1=Monday,... 0=Sunday)
```

```
int PCMSGetETA(Trip tripID);
```

Use this API to generate the estimated time of arrival based on the provided parameters in PCMSSetDepartureTime. Values for this function are:

```
long trip // Trip ID
int stopNum // Stop number
int ArrivalTimeZone // Arrival Time Zone
int ArrivalYear // Arrival Year (e.g. 2014)
int ArrivalMonth // Arrival Month (e.g. 10 for October)
int ArrivalDay // Arrival Day (e.g. 23 for 23rd day of October)
int ArrivalHour // Arrival Hour (e.g. 14 for 2:00 PM military time)
```

```
int ArrivalMinute // Arrival Minute (e.g. 10 for tenth minute)
int ArrivalSecond // Arrival Second (e.g. 0 for zeroth second)
```

```
int PCMSGetETD(Trip tripID);
```

Use this API to generate the estimated time of departure based on the provided parameters in PCMSSetArrivalTime. Values for this function are:

```
long trip // Trip ID
int stopNum // Stop number
int DepartTimeZone // Departure Time Zone
int DepartYear // Departure Year (e.g. 2014)
int DepartMonth // Departure Month (e.g. 10 for October)
int DepartDay // Departure Day (e.g. 23 for 23rd day of October)
int DepartHour // Departure Hour (e.g. 14 for 2:00 PM military time)
int DepartMinute // Departure Minute (e.g. 10 for tenth minute)
int DepartSecond // Departure Second (e.g. 0 for zeroth second)
```

```
int PCMSSetRoadSpeedType(Trip tripID, roadSpeedOption);
```

Use this API to indicate if time estimate calculations for a route will be based on the traditional PC*MILER average road speeds by road type or historical traffic data. Values for this function are:

```
long trip // Trip ID
int roadSpeedOption // 0=Traditional ALK road speeds, 2=Road speeds
                    based on historical traffic data
```

```
int CALLCONV PCMSTrafficStatus();
```

Queries the Traffic Features subscription status. May return the following: -1 = an unlimited subscription that is not set to expire; -2 = there is no subscription and Traffic Features are not accessible; or if a number greater than or equal to 0 is returned, it is the number of days left until the traffic subscription expires.

Sample code using time-based routing is below, calculating what the required time of departure at four different locations would be so that an arrival time of 8:30 AM on Jan. 28, 2014 can be achieved.

NOTE: Additional sample code and related documentation is now provided to make it easier for users to take advantage of time-based and PC*MILER|Traffic features in PC*MILER|Connect. This resource material can be found in the PC*MILER installation folder, usually C:\ALK Technologies\PCMILER28\Connect\CSharp folder.

SAMPLE CODE:

```
// Declarations
int ArrivalYear;    // Arrival Time Zone
int ArrivalMonth;  // Arrival Month (e.g. 10 for October)
int ArrivalDay;    // Arrival Day (e.g. 23 for 23rd day of October)
int ArrivalHour;   // Arrival Hour (e.g. 10 for ten o'clock)
int ArrivalMinute; // Arrival Minute (e.g. 10 for tenth minute)
int ArrivalSecond; // Arrival Second (e.g. 0 for zeroth second)
int DepartYear;    // Arrival Time Zone
int DepartMonth;   // Arrival Month (e.g. 10 for October)
int DepartDay;     // Arrival Day (e.g. 23 for 23rd day of October)
int DepartHour;    // Arrival Hour (e.g. 10 for ten o'clock)
int DepartMinute;  // Arrival Minute (e.g. 10 for tenth minute)
int DepartSecond;  // Arrival Second (e.g. 0 for zeroth second)

// Create a new trip
trip = PCMSNewTrip(server);

// Add the stops to trip
ret = PCMSAddStop(trip, "Dublin, PA");
ret = PCMSAddStop(trip, "Boston, MA");
ret = PCMSAddStop(trip, "Philadelphia, PA");
ret = PCMSAddStop(trip, "Baltimore, MD");

// Set Road Speed Type
// 0 = default road speeds, 2 = Historical Road Speeds
ret = PCMSSetRoadSpeedType(trip, 2);

/*
** Date Type used below
** Date Type - user wants current system time = 1, user specifying
** date and time = 2, user specifying day of week and time = 3
*/

// Set arrival time to be Jan-28-2014 at 8:30 AM
ret = PCMSSetArrivalTime(trip, // Trip ID
    3, // Date Type
    1, // EasternTimeZone 1;
    2014, // Arrival Year (e.g. 2014)
    1, // Arrival Month (e.g. 10 for October)
    28, // Arrival Day(e.g. 23 for 23rd day of October)
    8, // Arrival Hour (e.g. 23 for 11:00 PM)
    30, // Arrival Minute (e.g. 10 for tenth minute)
    0, // Arrival Second (e.g. 0 for zeroth second)
    0); // Arrival Day Of Week (1 == Monday, ... 0 = Sunday)
```

```

// Run trip
ret = PCMSCalculate(trip);

// Get the number of stops in trip
int numStops = PCMSNumStops(trip);

// Get the Estimated Time Of Departure for each stop
for (int j=0; j< numStops; j++)

{
    ret = PCMSGetETD( trip,          // Trip ID
        j,                          // Stop Number
        &DepartYear,                 // Departure Time Zone
        &DepartMonth,                // Departure Month (eg. 10 for October)
        &DepartDay,                  // Departure Day (e.g. 23 for 23rd day)
        &DepartHour,                 // Departure Hour
        &DepartMinute,               // Departure Minute (e.g tenth minute)
        &DepartSecond);              // Departure Second (e.g zeroth second)
}

// Dump Detail Report
DumpReport(trip, 0, RF_Lines);

// Delete the Trip
PCMSDeleteTrip(trip);

```

3.20 Least Cost Routing Options

Beginning in Version 24, PC*MILER now includes a Least Cost Routing option. In PC*MILER|Connect, the function `PCMSSetCostOptions` allows users to set cost variables related to Least Cost Routing (miles per gallon, cost per gallon, other cost per mile, cost of labor per hour, and CO₂ pounds per gallon).

```
int PCMSSetCostOptions(Trip tripID);
```

Values for this function are as follows:

```

BOOL units // true = METRIC, false = ENGLISH
int fuelInUnit // 1 = gallons 0 = liters
int fuelCost // Fuel Cost Per gallon/liter
int mpgCostLoaded // Miles or KMs Per gallon or liter for loaded truck
int mpgCostEmpty // Miles or KMs Per gallon or liter for empty truck
int otherCostLoaded // Other cost per mile/km for loaded truck
int otherCostEmpty // Other cost per mile/km for empty truck

```

```
int costTimeLoaded // Cost of time "loaded" per mile/km - For Report only,
                  // not for routing
int costTimeEmpty // Cost of time "empty" per mile/km - For Report only,
                  // not for routing
```

```
int greenHouseGas // greenhouse gas amount
```

For PCMSSetCostOptions(), all values passed in by the user should be multiplied by 100 in order to be consistent with the rest of the PCMS calls. These are the actual default options in deftrip.dat:

```
int fuelInUnit=0; // gallons = 0 and liters = 1
int fuelCost=271; // Fuel Cost $2.71
int dpuCostLoaded=600; // Distance Per Unit loaded is 6.00 mpg
int dpuCostEmpty=600; // Distance Per Unit empty is 6.00 mpg
int otherCostLoaded=12; // Other Cost is $.12 cents a mile for loaded truck
int otherCostEmpty=12; // Other Cost is $.12 cents a mile for empty truck
int costTimeLoaded=4011; // Cost of time "loaded" is $40.11 dollars per hour
int costTimeEmpty=4011; // Cost of time "empty" is $40.11 dollars per hour
int greenHouseGas=2220; // green house gas amount 22.2 lbs
```

3.21 Getting Location Information

```
int PCMSGetLocAtMiles(Trip tripID, long miles, char
                      *location, int size);
```

```
int PCMSGetLocAtMinutes(Trip tripID, long minutes,
                        char *location, int size);
```

```
int PCMSLatLongAtMiles(Trip trip, long miles, char
                       *latlong, short useShpPts);
```

```
int PCMSLatLongAtMinutes(Trip trip, long minutes, char
                          *latlong, short useShpPts);
```

PC*MILER|Connect can tell you your location at any time or distance into the trip. Knowing your location a certain number of miles into a trip is critical when planning fuel stops; knowing your location a certain number of hours into the trip is critical to determining drivers' hours of service compliance. Together, these functions allow you to plan trips and manage your fleet more effectively.

PCMSGetLocAtMiles determines the location miles into the trip from the origin. Miles are in tenths.

PCMSGetLocAtMinutes determines the location minutes into the trip from the origin.

In these functions, the location is written into the buffer location as text in the form distance, direction, location. For example, 35 E Princeton

would mean 3.5 miles east of Princeton (with distances in tenths). `Size` indicates the size of the location buffer and therefore the maximum number of characters that will be copied. The function returns 1 on success, 0 on failure.

`PCMSLatLongAtMiles` determines the lat/long miles into the trip from the origin. Miles are in tenths.

`PCMSLatLongAtMinutes` determines the lat/long minutes into the trip from the origin.

In both these functions, the lat/long is written into the buffer location as text in the form `latitude,longitude`. `Size` indicates the size of the lat/long buffer and therefore the maximum number of characters that will be copied. The function returns 1 on success, 0 on failure.

```
long PCMSLatLongsEnRoute(Trip trip, double* latlong,
                          long numPairs, BOOL shpPts);
```

`PCMSLatLongsEnRoute()` retrieves the sequence of latlongs along a trip.

The array of doubles pointed to by `latlong` is filled with pairs of latlong coordinates along the trip. `latlong` must point to a buffer large enough to hold `2*numPairs*sizeof(double)`. If `NULL` is passed as the `latlong` parameter, the function returns the total number of pairs. Otherwise, the function returns 1 on success, 0 on failure.

NOTE: The `numPairs` parameter is only used to limit the number of points returned. The actual number of points depends on the particular route in question. Points along the route are `PC*MILER` node coordinates and shape point coordinates (if `shpPts` is set to `TRUE`). Therefore, it is recommended that the application always calls `PCMSLatLongsEnRoute` function with `latlong` as `NULL` first, in order to determine the number of actual points along the route.

3.22 Location Radius Search Functionality

The following functions are used to search for all cities, postal codes, custom places, and/or POI's (points of interest) within a specified radius of any city/state or ZIP code.

```
int PCMSNumPOICategories(PCMServerID serv);
int PCMSPOICategoryName(PCMServerID serv, int index,
                        char *buffer, int bufSize);
```

If searching for POI's, use `PCMSNumPOICategories` to get the number of available POI categories in the database. `PCMSPOICategoryName` returns the number of bytes written in the buffer. Valid index is from 0 to return value -1.

```
int PCMSLocRadLookup(Trip trip, const char *city, int
    radius, BOOL cities, BOOL postalCodes, BOOL
    customPlaces, BOOL poi, int poiCategoryIndex));

int PCMSGetLocRadItem(Trip trip, int index, char
    *buffer, int bufSize);
```

PCMSLocRadLookup performs a search within the specified radius. Return value is the number of items found. Using this function is currently the only way to perform a location radius lookup in PC*MILER|Connect.

NOTE: Radius must be an **INTEGER** in **WHOLE MILES** (not tenths of miles).

PCMSGetLocRadItem gets an item found in the location radius query. Valid index is from 0 to return value -1 of PCMSLocRadLookup function. Return value is the number of bytes written in the buffer.

3.23 Report Generation and Retrieval

Once a trip's route has been calculated, you can retrieve reports showing the route's information. The reports are returned in *tab delimited* lines which allow easy pasting into spreadsheets, list boxes, and grids. See the PC*MILER *User's Guide* for descriptions of the contents of reports.

Each of the PC*MILER report types, defined by the constants RPT_DETAIL (Detailed), RPT_STATE (State Summary), RPT_MILEAGE (trip mileage), RPT_RDTYPE (Road Type), and RPT_ITINERARY (Drivers Report) can be retrieved line by line using the function PCMSGetRptLine().

```
int PCMSGetRptLine(Trip tripID, int rpt, int line,
    char *buffer, int bufLen);
```

NOTE: To accommodate new features in PC*MILER, the format of the Detailed Route Report has been adjusted to allow for the reporting of new information. When you parse this report (RPT_DETAIL), please take note of the following: a new "Stop Time" column was inserted between the "Toll Plaza" column (if PC*MILER|Tolls is installed) and the "Restriction" column (if PC*MILER|HazMat is also installed). Also, a new route warning related to the new geofencing capability in PC*MILER has been added. See the PC*MILER *User's Guide* for more information on geofencing and warnings in the Detailed Route Report.

PCMSGetRptLine is similar to PCMSGetMatch() described in section 3.7, *Validating City Names*. You must pass in a buffer to fill with the data. The buffer

should be at least 100 characters wide in order to contain any report's entire lines. The function will fill it up to that length.

Use the function `PCMSNumRptLines()` to find out how many lines are contained in each report.

```
int PCMSNumRptLines(Trip tripID, int rpt);
```

You can also retrieve up to 64K bytes of a report (more in 32-bit) at once by using the functions `PCMSGetRpt()` and `PCMSNumRptBytes()`.

```
int PCMSGetRpt(Trip tripID, int rpt, char *buffer, int  
              bufLen);
```

Use the function `PCMSNumRptBytes()` to find out how many bytes are contained in each report.

```
long PCMSNumRptBytes(Trip tripID, int rpt);
```

Below are two different ways to retrieve a report:

```
char buf[20000];  
int lines;  
  
/* Show detailed driving instruction for route */  
/* Index lines from 0. Buffer must be > 100 char */  
lines = PCMSNumRptLines(pracTrip, RPT_DETAIL);  
  
for (i=0; i < lines; i++)  
{  
    PCMSGetRptLine(pracTrip, RPT_DETAIL, i, buf,100);  
    printf ("%s\n", buf);  
}  
  
/* Get state by state mileage breakdown report*/  
length = PCMSNumRptBytes(pracTrip, RPT_STATE);  
PCMSGetRpt(pracTrip, RPT_STATE, buf, 20000);  
printf("The entire state report:\n%s\n", buf);
```

The following function returns a text buffer containing the specified report formatted as HTML.

```
_PCMSFN long _CALLCONV PCMSGetHTMLRpt(Trip trip, int  
rptNum, char FAR *buffer, long bufSize);
```

The following function returns the number of bytes in the HTML-formatted report.

```
_PCMSFN long _CALLCONV PCMSNumHTMLRptBytes(Trip
trip,int rptNum);
```

You can also use the structure and functions below to retrieve information about each report segment in a Detailed report. (A “report segment” is the group of lines within each trip leg on the report that describe the route segments for that leg.)

NOTE: To use these functions, check that the compilers option for data alignment is set to byte alignment.

```
struct segment Struct
{
    char stateAbbrev[2];
    BOOL toll;
    char dir[2];
    char route[32];
    int miles;
    int minutes;
    char interchange[32];
};
```

PCMSGetSegment gets a report segment, line by line, from the Detailed Report in the above structure. If the segNum equals -1, then lines for the next trip leg are returned, else lines for the segNum are returned.

```
int PCMSGetSegment(Trip trip, int segNum, struct
segmentStruct *aSegment);
```

PCMSGetNumSegments gets the number of report segments in the Detailed Report.

```
int PCMSGetNumSegments(Trip trip);
```

To turn off warnings that appear in the Detailed and Drivers reports, use the following function (warnings are turned on by default):

```
int PCMSSetAccessRule(Trip trip, BOOL onOff);
```

3.24 Getting Trip Leg Information

NOTE: To use these functions, check that the compiler's option for data alignment is set to byte alignment.

PCMSNumLegs() returns the number of calculated legs in a trip. That is, if you calculate a trip with 3 stops, then add a fourth without clearing the stop list, the number of legs is still 2, even though the number of stops is 4.

PCMSGetLegInfo gets the leg information for this trip using the following structure and function:

```
struct legInfoType
{
    float legMiles;
    float totMiles;
    float legCost;
    float totCost;
    float legHours;
    float totHours;
};

int PCMSNumLegs(Trip trip)

int PCMSGetLegInfo(Trip trip, int legNum, struct
legInfoType *pLegInfo
```

The sample code that follows illustrates how to use this function:

```
int legNum;
int i;
struct legInfoType plegInfo;
int numLegs = PCMSGetNumLegs();
for(i=0; i < numLegs; i++)
    PCMSGetLegInfo(trip, legNum, &pLegInfo);
```

3.25 Optimizing the Stop Sequence

PC*MILER|Connect can be used to optimize any sequence of stops. Optimizing a trip is a resequencing step which only gets done once for a given sequence of stops.

```
int PCMSOptimize(Trip tripID);

int PCMSCalculate (Trip tripID)
```

```
void PCMSSetResequence(Trip tripID, BOOL changeDest);
```

PCMSOptimize() can take a while to calculate because the optimization has to run routes between every stop in the trip's stop list before resequencing the stops. After the optimization step, you must call PCMSCalculate() to get the new distance for the optimized route. PCMSOptimize() returns 1 on success, 0 if the trip is already optimized and -1 on error.

Use PCMSSetResequence() to change whether optimization should change the destination stop (TRUE), or not (FALSE). PCMSSetResequence() must be called before PCMSOptimize().

NOTE: You cannot optimize a trip with the hub mode option set (see section 3.27). You also cannot optimize a trip with 2 or fewer stops. And, lastly, if you use PCMSSetResequence(FALSE) to set a fixed destination, the trip must have at least 4 stops.

3.26 Hub Routing

Hub routing calculates routing from a central hub to many locations (as spokes). Hub routing is an option that is used on every recalculation of a trip, just like kilometers.

```
void PCMSSetHubMode(Trip tripID, BOOL onOff);
```

PCMSSetHubMode() turns on (TRUE) or off (FALSE) the hub and spoke calculation mode when you call PCMSCalculate() for a given trip.

3.27 Calculating Air Distance

PC*MILER|Connect is able to calculate the straight line or “air” distance between two points. “Air” is a sixth option in all routing functions, in addition to “Shortest”, “Practical”, “National”, “AvoidToll”, and “FiftyThree”. For the air distance, points are specified the same way as in other PC*MILER|Connect distance calculations, as a city/state, five digit ZIP, SPLC, Canadian Postal Code, latitude/longitude, or PC*MILER custom name.

3.28 Designating Stops As Loaded or Empty

```
int PCMSSetLoaded(Trip tripID, int which, BOOL loaded);
```

You can designate each stop as either loaded or empty. If you have entered different costs per mile in PC*MILER for loaded and empty moves, this will

affect the cost of the trip. LOADED or EMPTY reflects the status of a truck as it arrives at the stop. Therefore, setting the origin will have no effect. Which is the stop number you would like to set, loaded is the setting: TRUE for loaded, FALSE for empty. The function returns 1 on success, 0 on failure.

3.29 Designating Stops As Waypoints

```
int PCMSSetStopAsWaypoint(Trip trip, int which, BOOL  
    isWaypoint);
```

This function enables you to add waypoints to a trip. Waypoints are used to customize a route to travel on specific, user-designated roads. A route will travel through a waypoint but the waypoint is not treated as a stop. Waypoints are listed as stops in the Detailed Route and State/Country reports, but they do not appear in driving directions in the Drivers Report. *which* is the stop number. When *isWaypoint* is set to FALSE the stop is a waypoint, TRUE designates it as a stop. Returns 0 on success, -1 on failure. The default value is TRUE.

3.30 Tracking Equipment On Roads

```
int PCMSCalcDistToRoute(Trip tripID, char *location);
```

This function can be used to determine the air distance between a given location and the nearest point on the route. By PC*MILER convention, distances are returned in 10th of a mile or kilometer.

If the current route leg is known, one of the following functions can be used to determine more exactly the air distance between a given point and the route:

```
int PCMSAirDistToRte(Trip tripID, char *location, int  
    leg);
```

```
int PCMSAirDistToRte2(Trip trip, char *location, int  
    leg, char *dir, BOOL recalc);
```

The second function above works just like the first, except that it also returns a compass direction from the given location to the nearest point of the specified leg. The argument *recalc* is for backward compatibility only and is ignored.

3.31 Avoid, Favor, and Override Roads From Within Connect

(See the PC*MILER *User's Guide* or application Help files in the interactive PC*MILER for a description of avoiding, favoring, and overriding roads, and custom sets of road preferences in PC*MILER. An avoided road segment is

effectively treated as if it were a closed road unless no other link can be used for the route. A favored road segment is used unless it is not practical to do so.)

NOTE: Many states and provinces in the north central part of the North American continent have seasonal weight limits that apply either to all commodities or to particular commodities (such as grain) at certain times of year (harvest season, winter, spring thaw, etc.).

In these areas, the carrier typically works with the shipper to adjust how much material is loaded into the truck in order to max out the limit for the season in question, rather than adjust the route traveled. So (for example) more grain would be loaded into the truck during harvest season or winter than during spring thaw. That is the only way to have a legal load when an origin or destination is on a road with a seasonal limit. In addition to legal considerations there are also practical physical considerations since many loading and unloading points in that part of the country are on unpaved surfaces, and to overload a truck during spring thaw risks the truck getting stuck during pickup or delivery.

In PC*MILER, we have coded the weight limit that applies to general commodities during most seasons of the year. For situations where the low-limit road is used as a through route rather than for pickup or delivery, the AFSave function described below can be used to create avoid/favor/restriction override “sets” for each season of the year for each commodity. Custom routing must be turned on (see section 3.33, *Using Custom Routing*, below) to enable road preferences.

NOTE on FAVORED ROADS: PC*MILER’s long-distance “backbone” contains the roads that PC*MILER uses for its default Practical and Shortest routes over long distances. If a favored road is not in PC*MILER’s long-distance backbone, it will not be used for long-distance routes even if it is favored, unless an intermediate stop on that road is inserted into the route.

IMPORTANT NOTE – AUTOSAVE AVOIDS/FAVORS: By default, avoid/favor preferences are loaded at startup as read-only, and not saved when PC*MILER|Connect shuts down. A setting in the PCMSERVE.INI file can be edited so that avoid/favor preferences are automatically saved on shutdown. See section 2.10, *Setting Default Values in the PCMSERVE.INI File* – look under [ConnectOptions] in the INI.

NOTE for FleetPortal USERS: To have avoid/favors automatically saved in a **flattenedAF.dat** file for use with ALK’s FleetPortal fleet tracking and route management system, you’ll need to add the following line to the [User Settings] section of the user.cfg file (the default location of this file is C:\ALK Technologies\PCMILER28\App):

```
[User Settings]
“FlattenAvoidFavors”=1
```

The flattenedAF.dat file will be saved whenever the database is updated, which is typically only on exit.

```
int PCMSAFLinks (Trip tripID, BOOL favor);  
int PCMSAFLinksClear (Trip tripID);
```

PCMSAFLinks allows you to add the links in the trip to the current set of avoided, favored, and overridden links. All subsequent routes which have Custom Routing turned on (see section 3.33, *Using Custom Routing* below) will then either avoid, favor, or override these links. When the engine shuts down, the links will be saved in a file named **avoid** <region abbreviation> .dat in the **Data\Q1\ Save** folder in the PC*MILER installation, or the **World\WW\Save** folder in the PC*MILER|Worldwide installation. The function returns 1 on success, 0 on failure.

PCMSAFLinksClear clears all saved links for the specified trip.

```
int _PCMSFN PCMSAFActivateSet(PCMServerID server,  
const char* pSetName, bool bActivate);
```

The above function activates/deactivates a specific Avoid/Favor set, created in the PC*MILER GUI, for routing and reporting purposes using the name of the set. Multiple sets can be active side by side.

```
int _PCMSFN PCMSAFActivateRegion(PCMServerID server,  
const char* pRegionID, bool bActivate);
```

The above function activates/deactivates a default Avoid/Favor set for a specific region for routing and reporting purposes using the region ID given by the user. Multiple sets can be active side by side.

```
int _PCMSFN PCMSAFExportSet(PCMServerID server, const  
char* pSetName, const char* pFilename, const char  
*pDelimiter);
```

The above function exports detailed information for a specific Avoid/Favor set out to a delimited text file. The name of the set determines which set is exported. All the information fields will be delimited with a symbol of the user's choosing. The set does not need to be active to be exported.

```
int _PCMSFN PCMSAFExportRegion(PCMServerID serv, const  
char* regionID, const char* pFilename, const char  
*pDelimiter);
```

The above function exports detailed information for the default Avoid/Favor set for a specific region to a text file. All of the information fields will be delimited with a symbol of the user's choosing. The set does not have to be active to be exported.

3.32 Using Custom Routing

NOTE: See section 3.32 above for more on setting custom routing preferences.

```
void PCMSSetCustomMode(Trip trip, BOOL onOff);
```

This function can be used to enable/disable custom routing programmatically. Alternatively, this setting can be changed in the PCMSERVE.INI file (see setting that can be added below). When set to TRUE, avoided, favored, and overridden roads set in PC*MILER will be used (see the PC*MILER *User's Guide* or Help for a description of this option). The default is FALSE.

```
CustomRoute=FALSE
```

3.33 Geofence Functions

The following functions are for activating and exporting data related to geofences that have been set up in the PC*MILER graphical user interface.

```
int _PCMSFN PCMSGeofenceActivateSet(PCMServerID serv,  
const char* pSetName, int iActivate);
```

This function activates/deactivates a specific Geofence set for routing and reporting purposes using the name of that set. Multiple geofence sets can be active side by side. See NOTE at the end of this section.

```
int _PCMSFN PCMSGeofenceExportSet(PCMServerID serv,  
const char* pSetName, const char* pFilename, const  
char *pDelimiter);
```

This function exports detailed information for a specific Geofence set out to a delimited text file. The name of the set determines which set is exported. All the information fields will be delimited with a symbol of the user's choosing. The set does not have to be active to be exported.

IMPORTANT NOTE – GEOFENCE AUTOSAVE OPTION: By default, geofence data is loaded at startup as read-only, and not saved when PC*MILER|Connect shuts down. A setting in the PCMSERVE.INI file can be edited so that geofence data is automatically saved on shutdown. See section

2.10, *Setting Default Values in the PCMSERVE.INI File* and look under [ConnectOptions] in the INI.

3.34 Using Custom Places

PC*MILER|Connect recognizes custom places created in PC*MILER (see the PC*MILER *User's Guide* or Help for a description of the Custom Place Manager).

NOTE: Before Connect will recognize a custom place created or changed in PC*MILER, the PC*MILER application must be exited and the Connect engine restarted. This will cause PC*MILER to write the updated custom places to disk and the Connect engine to read the updated file.

The function below can be used to enable/disable translation of custom place names into their original PC*MILER names in reports. When enabled (*translate* = TRUE), the PC*MILER place name or lat/long pair will be displayed along with the custom place name. When disabled, only the custom place name will be displayed.

```
void PCMSTranslateAlias(Trip trip, BOOL translate);
```

3.35 Enabling Hazardous Routing From Your Application

NOTE: See your PC*MILER *User's Guide* or Help files for details about each HazMat routing type. To set a default for the PCMSSetHazOption value, use the HazRoute= setting in the PCMSERVE.INI file, [Options] section.

To generate routing for hazardous materials, you must have the PC*MILER|HazMat data module installed. You can change the setting temporarily by calling the function PCMSSetHazOption. If tunnel restrictions categories are included for hazmat routing in Europe, also use PCMSSetHazTunnelOption (see values below for both functions).

```
void PCMSSetHazOption (Trip trip, int hazType);
```

where **hazType** values in North America can be as follows:

Value	Route Type:
0	Disabled
1	General
2	Explosive
3	Inhalant

4	Radioactive
5	Corrosive
6	Flammable

where **hazType** values in Europe and Oceania can be as follows:

Value	Route Type:
0	Disabled
1	General
2	Explosive
6	Flammable
7	HarmfultoWater

```
void PCMSSetHazTunnelOption (Trip trip, int hazType);
```

where **hazType** values in Europe can be as follows (cannot be set in the PCMSERVE.INI):

Value	Route Type:
0	None
8	HazType_EUTunnelBCDE
9	HazType_EUTunnelCDE
10	HazType_EUTunnelDE
11	HazType_EUTunnelE

3.36 Converting Lat/Longs To Obtain Trip Information

The functions described below process latitude/longitudes to obtain trip information. They were created for PC*MILER|FuelTax users and for use by any external programs that calculate distances between GPS pings (for example, third-party automated driver log programs or fuel tax programs).

It might sometimes happen that a vehicle's GPS signal "drifts" and does not accurately reflect the roadway the vehicle actually traveled on when a parallel road exists nearby.

To ensure the accuracy of trip information that relies on GPS data, it is recommended that you calculate the distance of strings of GPS pings either 1) using the function PCMSReduceTrip(), or 2) using a combination of the functions PCMSAddPing() and PCMSReduceCalculate().

```

_PCMSFN int _CALLCONV PCMSReduceTrip(PCMServerID
    serverID, const char *FilePath, int ColTruckId,
    int ColTruckIdLen, int ColTime, int ColTimeLen,
    int ColDate, int ColDateLen, int ColLatLong, int
    ColLatLongLen, int HourWindow, double
    dMaxMilesOffRoute, bool bHighwayOnly);

int PCMSAddPing(Trip trip, char* tripLatLon);

long PCMSReduceCalculate(Trip tripID, int
    maxMilesOffRoute, bool higwayOnly);

```

PCMSReduceTrip() allows PC*MILER|Connect to receive a large file containing latitude/longitude points and derive trip information from it for use with PC*MILER|FuelTax.

PCMServerID serverID is a valid PC*MILER server ID. *FilePath is the path/file name of the Qualcomm file containing the trip information to be input.

ColTruckID and ColTruckIdLen are the starting column (counting from 1) and the number of characters of the truck ID field. ColTime and ColTimeLen are the starting column and number of characters in the time column – this will be used to calculate “layovers”. ColDate and ColDateLen are the starting column and number of characters in the date column which contains the datestamp associated with the readings – this will be put on the report and is not used in calculations. ColLatLong and ColLatLongLen are the starting column and number of characters in the lat/long column which contains the lat/long readings for the trip.

The HourWindow parameter is given by the user to define the number of hours after the start of a trip that force a break and new trip. The dMaxMilesOffRoute parameter defines the number of miles lat/long tracks can deviate from the calculated route before the route is recalculated – the default is 2.0. The bHighwayOnly parameter corresponds to the trip option: *true* will use highway only routing while *false* will use local streets (defaults to *true*).

Note the following in relation to this function:

1. Any stop over the number of hours input for the same truck ID is considered a new trip.
2. The output file name will be [input File].STA
3. The output file will contain a header of truck ID, start date, and end date – that will be followed by what amounts to the output of the state report (minus its header and footer), i.e. miles and states.

PCMSAddPing() allows a direct programmatic interface to the PCMSReduceTrip functionality that was introduced in PC*MILER Version

20. `PCMSAddPing` is an alternative to `PCMSReduceTrip` that enables you to enter latitude/longitude points directly into `PC*MILER|Connect` without having to read them from a file first.

The `trip` parameter is the identifier associated with the trip, and `tripLatLon` is a lat/long pair separated by a comma.

`PCMSReduceCalculate()` lets you calculate a trip based on the lat/long pings added in `PCMSAddPing`. Once the trip has been calculated, the information can be retrieved using the standard `PCMSGetRpt` and `PCMSGetRptLine` APIs.

The `tripID` parameter is the identifier associated with this trip; `maxMilesOffRoute` defines the “window” around a route within which the pings must exist to be defined as still being on that route (outside this window the route will detour); and `highwayOnly` should be `True` for highway routing or `False` for street level routing.

NOTE: Since `PCMSAddPing` and `PCMSReduceCalculate` are alternative methods to `PCMSReduceTrip`, we recommend calling the APIs in the following order: first call `PCMSAddPing`, then `PCMSReduceCalculate`, then use the standard report APIs to generate the route.

3.37 Error Handling

The only functions callable without a server ID are the error handling routines. They can be used to diagnose why the engine didn’t initialize. These functions relate to the last error encountered by `PC*MILER|Connect`. They can be used to diagnose any runtime problems while using your application’s interface to `PCMSRV32`.

Functions that accept pointer arguments have been updated to check for valid pointers. The error state is set to `PCMS_INVALIDPTR` for invalid pointers. `PC*MILER|Connect` functions return -1 on errors. To find out what went wrong with the function call, use `PCMSGetError()` to determine the cause of the error. See *Appendix B* for all the error codes that `PC*MILER|Connect` generates.

```
int PCMSGetError();

int PCMSGetErrorString(int errCode, char *buffer,
    int bufLen);

int PCMSIsValid(PCMServerID serverID);

int PCMSGetErrorEx(Trip trip, char* buffer, int len);
```

`PCMSGetError()` returns the number of the last error the engine caught. There are constants defined for each of the possible errors in the header `pcms_defs.h`.

`PCMSGetErrorString()` will get the associated error text from `PC*MILER|Connect`'s resources. It returns the number of characters copied into the buffer.

`PCMSIsValid()` checks the server ID to make sure it has a valid license and is initialized. It returns 1 if the engine is OK, 0 if it is not OK.

`PCMSGetErrorEx()` can be called when error code 114 (calculation failed, portions of trip are invalid) has been returned. Generates a string indicating at which stop in the trip the error occurred.

Here is an example of how to sanity check the initialization of the engine and the creation of a new trip:

```
PCMServerID server;
Trip shortTrip;
void Initialize ()
{
    int errorCode;
    char buffer[100];

    /* Open a connection to the server */
    serverID = PCMSOpenServer(NULL, NULL);
    if (!PCMSIsValid(serverID))
    {
        /* Print the error if we couldn't initialize */
        PCMSGetErrorString(PCMSGetError(), buffer, 100);
        printf ("Could not initialize: %s\n", buffer);
        return;
    }

    /* Create a new trip */
    shortTrip = PCMSNewTrip(server);

    /* Error handling */
    if (0 == shortTrip)
    {
        errorCode = PCMSGetError();
        printf ("Could not create a trip:");
        printf ("%s\n", PCMSGetErrorString(errorCode,
            buffer, 100));
        return;
    }
}
```

NOTE: In order to take advantage of the RouteMatrix functionality, both PC*MILER|Connect and PC*MILER|RouteMatrix must be purchased, installed and licensed.

The PC*MILER|RouteMatrix APIs in PC*MILER|Connect efficiently calculate travel time and distance between all possible pairs of points in a set of locations, taking advantage of the functionality of multi-processor CPUs by using multiple cores at the same time. The RouteMatrix feature is a powerful tool for load planning, scheduling and stop optimization that can be used for numerous carrier, shipper and third party logistics applications via their own custom integrations or within third party transportation management systems.

The PC*MILER|RouteMatrix functionality in PC*MILER|Connect provides the ability to calculate an N X N trip matrix efficiently. It enables users to create a stop list with “n” number of stops and have a vector of information returned that includes mileage, travel time, and tolls information (if PC*MILER|Tolls is licensed).

When using the old classic PC*MILER|Connect functions, an integrator would create a matrix by calling our PCMSAddStop or PCMSCalcDistance for every possible origin-destination pair. For example, to create an optimized matrix based on distance for 100 delivery locations, previously the integrator would call our older PCMSAddStop function *10,000 times* and this was an expensive operation.

When using RouteMatrix, the integrator only needs to call PCMSMatrixAddStop *100 times*. RouteMatrix efficiently sorts the possible pairs by distance, calculating 10,000 origin-to-destination distances and travel times on multiple cores and threads. Although they are still useful, the older PC*MILER|Connect functions do not take advantage of multiple cores and threads.

The PC*MILER|RouteMatrix APIs are listed and described below.

Currently all of the RouteMatrix functions return an integer return code. **A value returned as -1 indicates that the product is not licensed for Route Matrix.** We may expand this return code in the future.

```
int _PCMSFN PCMSMatrixAddStop(const char FAR *stop);
```

The above function geocodes the given stop information string. If geocoding is successful, that stop will be added to the stop list for the trip matrix. If a trip

matrix has already been calculated, adding new stops will require a full rerun of the entire trip matrix in order to calculate the new data.

```
int _PCMSFN PCMSMatrixAppendStop(const char FAR *stop);
```

The above function geocodes the given stop information string. If geocoding is successful, that stop will be appended to the stop list for the trip matrix. Appending is different from adding in that it will not require a full rerun of the entire trip matrix. If PCMSCalculateMatrix() is called (see below) on a matrix that has already been run and has new stops appended to it, only the data for the new appended stops will be calculated. All other data will remain unchanged and valid.

```
int _PCMSFN PCMSMatrixSetOptions(Trip trip );
```

The above function sets the routing parameters used when calculating the route for each cell of the matrix. The user will use the standard PC*MILER|Connect functions to create the trip and set all the desired routing parameters in that trip. Then PCMSMatrixSetOptions simply copies the previously set options from the trip ID for RouteMatrix to utilize.

```
int _PCMSFN PCMSMatrixClear();
```

The above function deletes all stops from the trip matrix object. Any data previously calculated for this matrix will also be deleted.

```
int _PCMSFN PCMSMatrixGetStopCount(int *count);
```

The above function returns the number of stops that are currently part of the trip matrix.

```
int _PCMSFN PCMSMatrixCalculate(TripMatrixCallBackProc *cb);
```

The above function initiates the calculation of the trip matrix with all of its current stop information. Depending on the number of stops given, this might be a lengthy process.

```
int _PCMSFN PCMSSetDateOption (Trip trip, int dateOption);
```

The above function sets the date option relates to depart time calculation.

Trip trip: the trip id.

int dateOption: value range is 0 - 3. 0: Unkown, 1: Current, 2: User Specified, 3: Day of Week.

```
int PCMSFN PCMSMatrixSetDepartDayAndTime(int day, unsigned long hour, unsigned long min);
```

```
int PCMSFN PCMSMatrixAddDepartDayAndTime(int day, unsigned long hour,
unsigned long min);
```

The above functions set depart times for the route matrix. PCMSMatrixSetDepartDayAndTime clear existing depart times and set the depart time. PCMSMatrixAddDepartDayAndTime appending the depart time to existing values.

Int day: the day of week

Long hour: the hour of the depart time, value range is 0 – 23

Long min: the minute of the depart time, value range is 0 – 59

Note: For depart time-based calculations, you need to call PCMSSetDateOption and set the date option to 2 and call PCMSSetRoadSpeedType and set the type to 2.

```
int _PCMSFN PCMSMatrixGetDepartTimeCount ();
```

The above function returns the count of depart times for the route matrix.

```
int _PCMSFN PCMSMatrixGetCell(long origIndex, long destIndex, intrptType,
char *pBuffer, intbufSize);
```

```
int _PCMSFN PCMSMatrixGetCell2(long origIndex, long destIndex, intrptType,
char *pBuffer, intbufSize, int hourIndex);
```

The above function allows the user to retrieve certain pieces of information from a specific cell in the trip matrix. The arguments break down as follows:

- *longorigIndex*: The index of the origin stop.
- *longdestIndex*: The index of the destination stop.
- *intrptType*: A value indicating what type of report information should be returned. Value range is 0 – 9. For PCMSMatrixGetCell2 the value range is 0-10. See below for definitions.
- *char* pBuffer*: A pre-allocated memory buffer that will be filled with a delimited string containing the desired information. Types of data returned for each report type are:
 0. Mileage – double
 1. Travel Time – double
 2. Mileage (air mileage) – double
 3. Toll Miles – double
 4. Toll Amount – double
 5. Miles by State – a string starting with ‘<’ and ending with ‘>’.
The contents of the string will be state:mileage.
Example: <NJ:51.2|NY:34.2>
 6. Toll Miles by State – same as above
 7. Computation Time – integer in milliseconds
 8. Initiated Route Computation – true if tried to run route

-
9. Successful Route Computation – true if the route computation is successful
 10. Works for PCMSMatrixGetCell2 only. Travel time for the depart time indicated by the hourIndex
 - *intbufSize*: the size of a memory buffer supplied by the user
 - *int hourIndex*: the index of the depart times set by PCMSMatrixSetDepartDayAndTime/ PCMSMatrixAddDepartDayAndTime, the value range is between 0 – PCMSMatrixGetDepartTimeCount()-1 (the total amount should be the total number of array elements minus 1).

```
int _PCMSFN PCMSMatrixSetThreadCount (long);
```

The above is an optional API that allows the calling application to specify how many threads to use for parallel processing. When not specified, RouteMatrix will use the available cores and threads on the computer.

```
int _PCMSFN PCMSMatrixSetMaxAirMiles (long);
```

The above is an optional API that allows the calling application to specify a maximum airline distance to be used by the PCMSMatrixCalculate () API in order to decide if it needs to run the route. When the airline distance is greater than the value specified, it will store a negative number less than zero in the output matrix. **IMPORTANT:** By default this value is set at 1500 miles when not specified.

```
int _PCMSFN PCMSMatrixSetComputeTollDollars (bool);
```

The above is an optional API that allows the calling application to specify that toll dollars should be generated in the matrix when set to true. Use the Toll Amount option 4 with the PCMSMatrixGetCell API to get the toll amount from the matrix.

```
int _PCMSFN PCMSMatrixSetComputeTollandStateMiles (bool);
```

The above is an optional API that allows the calling application to specify that toll dollars should be generated in the matrix when set to true. Use the Toll Amount option 6 with the PCMSMatrixGetCell API to get the toll amount from the matrix.

```
int _PCMSFN PCMSGetTravelTimes (Trip trip, int day, unsigned long *pDurationArray, unsigned long arrayCount);
```

The above function returns an array of travel times for a trip. Depending the day of the week given, the function returns a trip duration array for 15 minute increments throughout that day using historical road speeds. It returns 24*4=96 trip duration for the given day of week.

- *Trip trip*: The index of trip
- *int day*: The day of week, value range is 0 - 6 where 0 represents Sunday

- *unsigned long* pDurationArray*: A pre-allocated memory buffer that will be filled with trip durations
- *long arrayCount*: The size of the memory buffer *pDurationArray* supplied by the user, must equals 96

The sample Matrix below filled with distances was created by RouteMatrix with 5 lat/long locations. The sample code is written in C++. A C# .Net RouteMatrix sample can be found in the PC*MILER|Connect installation folder – usually ALK Technologies\PCMILER28\Connect\CSharp RouteMatrix\PCMRouteMatrixNET.

0.00	253.40	636.04	1688.83	1184.59
253.10	0.00	383.45	1436.24	881.27
636.30	383.67	0.00	1078.18	654.67
1690.15	1437.53	1079.76	0.00	1359.07
1183.90	881.01	654.71	1359.99	0.00

```
void TestRouteMatrix_UserGuide(PCMServerID server)
{
    //The Lat/Longs for the stops used in each comparison
    const int NUM_STOPS = 5;
    const char* latLongs[] = { "35.173099517822266n,107.89029693603516w",
                              "35.160099029541016n,103.70149993896484w",
                              "35.232200622558594n,97.485397338867188w",
                              "34.064998626708984n,81.024497985839844w",
                              "43.603099822998047n,96.767799377441406w"};

    Trip matTrip = PCMSNewTrip(server);

    // Set up the Matrix Routing options
    PCMSSetCalcType(matTrip, CALC_PRACTICAL);
    PCMSMatrixSetOptions(matTrip);

    // Set the number of threads to be used internally
    PCMSMatrixSetThreadCount(2);

    // Add the stops onto the matrix
    for (int i = 0; i < NUM_STOPS; i++)
    {
        PCMSMatrixAddStop(latLongs[i]);
    }

    // Error check to see if the stops are loaded to the matrix correctly
    long lStopCount = PCMSMatrixGetStopCount();
    if (lStopCount <= 0)
    {
        printf("ERROR: Could not load stops!\n");
    }
    else
    {
        // Calculate the routes
        PCMSMatrixCalculate(NULL);
    }
}
```

```
// Print the distance results
for (long i = 0; i < lStopCount; i++)
{
    for (long j = 0; j < lStopCount; j++)
    {
        char szBuffer[256]= {0};
        PCMSMatrixGetCell(i, j, 0, szBuffer, sizeof(szBuffer));
        printf("%s\t", szBuffer);
    }
    printf("\n");
}

//Clear the matrix of all data so that it can be ran again
PCMSMatrixClear();
}
```

The three functions described in this chapter provide an extension of the functionality of ALK Technologies' RouteSync through PC*MILER|Connect. RouteSync is an add-on to PC*MILER that provides a direct link between two of ALK's existing products: PC*MILER routing, mileage and mapping software in the back office and CoPilot Truck – ALK's truck-specific GPS navigation system – in the vehicle.

PC*MILER|Connect APIs allow you to create RouteSync messages which you will then need to inject into the CoPilot Truck client via the CoPilot SDK. PC*MILER|Connect APIs will not transport the RouteSync messages across the communication channels into the in-cab navigation system; instead, it is up to the user to make sure that the messages are communicated to the in-cab navigation system running CoPilot SDK.

A typical use case would involve creating the trip using PC*MILER and then producing the RouteSync-managed trip message that contains the information about that route. That message can then be communicated to the in-cab system running CoPilot Truck client software. Using the CoPilot SDK, the user can inject that message into CoPilot and the CoPilot application will then generate the route that is identical to the route created by PC*MILER in the back office.

For a description of RouteSync as it is used interactively, see the *PC*MILER User's Guide* or Help file that was shipped with the interactive version of PC*MILER (see section 1.4 in this *PC*MILER/Connect User's Guide* on accessing user's guides and online Help for PC*MILER products).

5.1 RouteSync Function Descriptions

```
long    PCMSGetManagedRouteMsgBytes(Trip  trip,  char
      *pBuffer, long  bufSize, long  lOORCompliance,
      double dOORDist, bool bIsFirstLegManaged);
```

The above function is the recommended RouteSync API – see section 5.2 below for a sample integration that uses it. This function allows you to create a RouteSync message that is used to send a managed route from PC*MILER|Connect to a CoPilot client (see section 5.3.1 for a definition of managed vs. unmanaged route options). The message is created internally and the byte array representing that message is copied into the buffer that you provide.

You are then responsible for transporting this byte array to a CoPilot client and injecting it via the Copilot SDK. The byte array will contain a list of lat/longs that form the route and will also adhere to any avoid/favors created on the desktop installation.

`PCMSGetManagedRouteMsgBytes()` will return a long value indicating the length in bytes of the byte array stored in `pBuffer`. It is recommended to call `PCMSGetManagedRouteMsgBytes()` with a buffer size of 0 first in order to get the size of the buffer necessary to hold the RouteSync message information. Then, the second call to `PCMSGetManagedRouteMsgBytes()` should be made with a buffer size large enough to accommodate the byte array that will be stored in `pBuffer`. If `pBuffer` was allocated but did not contain enough space to hold the entire message, it will return -1 and will not be populated with the RouteSync message. If `pBuffer` was allocated and had enough space to hold the entire message, the return value is the exact number of bytes that were stored into `pBuffer`. `pBuffer` will not be populated with a human-readable string and the calling application should not attempt to print out or analyze this byte array of data. If `pBuffer` was NULL this return value will still indicate the exact number of bytes necessary to contain the entire message.

`Trip trip` – The trip ID of the route that you want to send to CoPilot. This trip should already be filled out with all of the desired stops and trip options. It is not required that the route be run, but it is recommended that you run the trip before calling this API to get the RouteSync message data. If the specified trip has not yet been run, it will automatically be run before the message is created.

`char *pBuffer` – This is a pointer to a predefined, empty byte array that Connect will attempt to put the RouteSync message into.

`long bufSize` – A value indicating the amount of memory allocated for `pBuffer`. If this value is less than the amount of bytes for the entire message, the attempt to fill `pBuffer` with the message contents will be aborted.

`long lOORCompliance` – This value will dictate how the CoPilot client will handle rerouting during an OOR (out-of-route) event. There are three possible values: 0 – Strict Compliance, 1 – Moderate Compliance, 2 – Minimal Compliance. See section 5.3.2 for a description of these options.

`double dOORDist` – This value will determine how far away from the planned route the CoPilot-equipped vehicle must be to generate an out-of-route alert. The default value is 0.2 miles.

`bool bIsFirstLegManaged` – This boolean will dictate whether or not the first leg of the given trip will be considered “managed”. True indicates that the first leg is managed, false means that it will not be managed (see section 5.3.1).

```
long PCMSCreateManagedRouteMsgBytes(Trip trip, char
    *pBuffer, long bufSize, const char *pLatLongs,
    long lOORCompliance, double dOORDist);
```

This function is used in special rare cases. It is very similar to `PCMSGGetManagedRouteMsgBytes()` but with one additional caveat: the `TripID` given by the user is only needed to retrieve the desired routing options that will be applied on the CoPilot side. The actual route generated by that trip, and the stop information it contains, is not put into the message being created. Instead, you must specify the actual route by providing a “bread crumb” trail of lat/long values. It is assumed that this trail of lat/longs will be a fully-run route that was created outside of PC*MILER and that you are providing it to be packaged up into a `RouteSync` message that CoPilot will be able to consume. It is also assumed that this trail of lat/longs has sufficient resolution to map a fully navigable route onto the ALK road network with little to no additional routing calculations needed.

`PCMSCreateManagedRouteMsgBytes()` will return a `long` value indicating the length in bytes of the byte array stored in `pBuffer`. It is recommended to call `PCMSCreateManagedRouteMsgBytes()` with a buffer size of 0 first in order to get the size of the buffer necessary to hold the `RouteSync` message information. Then, the second call to `PCMSCreateManagedRouteMsgBytes()` should be made with a buffer size large enough to accommodate the byte array that will be stored in `pBuffer`. If `pBuffer` was allocated but did not contain enough space to hold the entire message, it will return -1 and will not be populated with the `RouteSync` message. If `pBuffer` was allocated and had enough space to hold the entire message, the return value is the exact number of bytes that were stored into `pBuffer`. `pBuffer` will not be populated with a human-readable string and the calling application should not attempt to print out or analyze this byte array of data. If `pBuffer` was `NULL` this return value will still indicate the exact number of bytes necessary to contain the entire message.

`Trip trip` – The trip ID of the route you want to send to CoPilot. This trip should already be filled out with all of the desired stops and trip options. It is not required that the route be run, but it is recommended that you run the trip before calling this API to get the `RouteSync` message data. If the specified trip has not yet been run, it will automatically be run before the message is created.

`char *pBuffer` – This is a pointer to a predefined, empty byte array that Connect will attempt to put the `RouteSync` message into.

`long bufSize` – A value indicating the amount of memory allocated for `pBuffer`. If this value is less than the amount of bytes for the entire message, the attempt to fill `pBuffer` with the message contents will be aborted.

`const char *pLatLongs` – This is a delimited string of lat/long values dictating the actual route to be traveled. Each pair of lat/long values should be kept in a format that is geocodable by any other PC*MILER API. Each pair of lat/longs should be separated by a “|” character. A sample input string is given below.

“40.389408N,74.656269W|40.389116N,74.655889W|40.388820N,74.655497W”

`long lOORCompliance` – This value will dictate how the CoPilot client will handle rerouting during an OOR (out-of-route) event. There are three possible values: 0 – Strict Compliance, 1 – Moderate Compliance, 2 – Minimal Compliance. See section 5.3.2 below for a description of these options.

`double dOORDist` – This value will determine how far away from the planned route the CoPilot-equipped vehicle must be to generate an out-of-route alert. The default value is 0.2 miles.

```
long PCMSGGetAFMsgBytes(char *pSetName, char* pBuffer,
                        long bufSize);
```

This function is used in special rare cases. It allows you to create a RouteSync message that is used to send avoid/favor data from a PC*MILER client to a CoPilot Truck client. You may want to use this for the special case where you do not want to manage the driver or route but would like the driver to avoid a road. When using the above `PCMSGGetManagedRouteMsgBytes` function, the route will be based on a list of lat/longs that adhere to the avoid/favors on the desktop installation (see section 3.32 on avoid/favor road preferences). The message is created internally and the byte array representing that message is copied into the buffer that you provide. You are then responsible for transporting this byte array to a CoPilot client and injecting it via the CoPilot SDK.

`char *pSetName` – This argument is a string representing the name of the avoid/favor set that you wish to package up into a RouteSync message. You may only specify one name in this string. Optionally you can pass in NULL. In that case all sets contained in the Avoid/Favor Manager are packaged up.

`char *pBuffer` – This is a pointer to a predefined, empty byte array that Connect will attempt to put the RouteSync message into.

`long bufSize` – A value indicating the amount of memory allocated for `pBuffer`. If this value is less than the amount of bytes for the entire message, the attempt to fill `pBuffer` with the message contents will be aborted.

`PCMSGGetAFMsgBytes()` will return a long value indicating the length in bytes of the message stored in `pBuffer`. If `pBuffer` was allocated but did not contain enough space to hold the entire message, it will return -1. If `pBuffer`

was allocated and had enough space to hold the entire message, the return value is the exact number of bytes that were stored into pBuffer. If pBuffer was NULL this return value will still indicate the exact number of bytes necessary to contain the entire message.

5.2 RouteSync Sample Integration

As stated above, the recommended API to use for RouteSync functionality is PCMSGetAFMsgBytes(). By default PC*MILER|Connect is configured to run in highway-only mode for rating purposes, so we suggest that you turn street-level routing on with the PCMSSetRouteLevel API (see section 3.17, PC*MILER|Streets must be installed). The following sample is all you need for an integration.

```
PCMServerID server = PCMSOpenServer(NULL, NULL);
// NOTE: OpenServer and CloseServer should be executed
sparingly due to excess overhead.
Trip trip = PCMSNewTrip(server);
PCMSSetRouteLevel(trip, TRUE); // turn streets on
PCMSAddStop(trip, "Philadelphia, PA");
PCMSAddStop(trip, "Hamilton, NJ");
PCMSAddStop(trip, "Manhattan, NY");
PCMSSetCalcType(trip, CALC_AVOIDTOLL);
PCMSSetCalcType(trip, CALC_FIFTYTHREE);
PCMSCalculate(trip);

long bufRetLength = 0; char * pBuffer = NULL; long
OORCompliance = 0; double OORDist = .5; bool
IsFirstLegManaged = true;

bufRetLength=
PCMSGetManagedRouteMsgBytes(trip, NULL, 0, OORCompliance, OORDi
st, IsFirstLegManaged);

pBuffer = new char[bufRetLength];
bufRetLength = PCMSGetManagedRouteMsgBytes(trip, pBuffer,
bufRetLength, OORCompliance, OORDist, IsFirstLegManaged);

// Send the pBuffer data blob via your communication method
to the CoPilot device.
delete [] pBuffer;
PCMSDeleteTrip(trip);
PCMSCloseServer(server);
```

5.3 RouteSync Definitions

5.3.1 Managed and Unmanaged Route Options

The input from PC*MILER that CoPilot Truck will accept breaks down into two general categories: **Managed Routes** and **Unmanaged Route Options**.

Managed Routes: By sending a route to CoPilot, the sender requires the driver to adhere precisely to that route – in other words, the route is *managed*. This adherence is governed by a small number of options: vehicle dimensions and weight, any avoid/favor road preferences, and a route compliance level that determines how strictly CoPilot should try to return to the original route once the driver is out-of-route (OoR).

Unmanaged Route Options: Route options may be sent via RouteSync to modify all subsequent trips. These options are considered to be “unmanaged” and they may not have the same effect as they would in a managed route. PC*MILER|Connect currently allows you to send avoid/favor road preferences as unmanaged options.

5.3.2 Levels of Route Compliance

The level of route compliance included with a managed route sent to CoPilot indicates how strictly CoPilot should try to return to the original (sent) route in the event that the driver is out-of-route. The three possible compliance levels are as follows:

Strict: CoPilot will try to navigate back to the original route at all costs, even if it means the driver needs to turn around and drive back to rejoin the prescribed route.

Moderate: CoPilot will try to navigate back to the original route but will take into account the driver’s current position in relation to the destination; i.e. CoPilot will try to rejoin the prescribed route as it navigates towards the destination, but along a route that is more reasonable than what the Strict compliance level would follow.

Minimal: At this level, the original prescribed route is not taken into consideration. The route taken may still rejoin the original route, but its first objective is to navigate to the destination from the driver’s current position.

Building an application with PC*MILER|Connect is similar to using other DLLs from your C programs. You'll need to specify in your project the directories that contain header and library files for PC*MILER|Connect. If you installed PC*MILER|Connect in C:\ALK Technologies, then the libraries will be in C:\ALK Technologies\PCMILER28\Connect.

The headers and the sample code will be in C:\ALK Technologies\PCMILER28\Connect\C_CPP. Your application must include PCMSDEFS.H and PCMSTRIP.H in all modules that use subroutines in PCMSRV32. You will need to include PCMSINIT.H only in the files that start and stop the PC*MILER|Connect engine or use the engine's error handling routines.

There is more than one way to call functions in the engine. You can either link the application with the supplied import library, or include the IMPORTS section from the included pcmsrv32.def file in your project's module definition file.

- **To link with the server engine's import library**, add PCMSRV32.LIB to your project. The way you do this depends on the programming environment you use. From the Borland IDE, you insert PCMSRV32.LIB into your project from the project window.
- **To add the imported functions to your module definition file**, open your project's DEF file and the file PCMSRV32.DEF, and copy the IMPORTS section from PCMSRV32.DEF to your project's DEF file. If desired, you can copy only those functions that you use in your project. Your module definition file should now look something like this:

```
EXETYPE WINDOWS
CODE PRELOAD MOVEABLE DISCARDABLE
DATA PRELOAD MOVEABLE MULTIPLE
HEAPSIZE 8192
STACKSIZE 16384

IMPORTS
    PCMSRV32.PCMSOPENSERVER
    PCMSRV32.PCMSCLOSESERVER
    PCMSRV32.PCMSNEWTRIP
    PCMSRV32.PCMSDELETETRIP
    PCMSRV32.PCMSCALCDISTANCE
```

```
PCMSRV32.PCMSCALCULATE  
PCMSRV32.PCMSADDSTOP  
PCMSRV32.PCMSISVALID
```

- **You can also use the `LoadLibrary` call at runtime** to load the `PC*MILER|Connect`, then call `GetProcAddress` to retrieve the entry points for the functions exported from the DLL. Examples of this method using Visual C++ 4.0 are included in `C:\ALK Technologies\PCMILER28\Connect`.

Using PC*MILER|Connect from Visual Basic is very much like calling it from 'C': the declarations are different, but the calling sequences are the same. Please refer to the 'C' section, the sample code, and the Visual Basic declaration file PCMSRV32.TXT as a guide to using PC*MILER|Connect. These files are in your installation folder, usually C:\ALK Technologies\PCMILER28\Connect\VB.

NOTE: The above files do not contain declarations for all PC*MILER|Connect functions and these declarations should not be used for .Net applications. Please refer to pcmsstrip.h and pcmsinit.h in C:\ALK Technologies\PCMILER28\Connect\C_CPP.

The included sample project is not intended to be a complete application. Rather it is a collection of illustrative examples of how to open an engine connection, create a trip, extract a report, look up city names, and create your own user interface on top of PC*MILER|Connect.

7.1 Caveats for Visual Basic

Be sure to use the function prototypes in PCMSRV32.TXT to get the proper argument types.

1. First, server IDs must be declared as Integer (2 bytes), and trip IDs are declared as Long integers.
2. No functions in PC*MILER|Connect use variants, or native Basic strings.
3. All arguments must be declared to be passed with the modifier ByVal. This is especially true for any arguments that accept strings.
4. String arguments that are modified by PC*MILER|Connect must have their space declared beforehand. PC*MILER|Connect does not dynamically resize Basic strings. For example, to get the text of error string #101, do either of the following:

```

Dim bytes As Integer
Dim buffer As String * 50
Dim buff2 As String

bytes = PCMSGetErrorString(101, buffer, 50)
buff2 = String(40, Chr(0))
bytes = PCMSGetErrorString(101, buff2,
Len(buff2))Strings utilities

```

7.2 Strings utilities

These functions are handy for converting 'C' style strings to Basic strings:

```
Function CToBas(str As String) As String
```

```
Function PCMSStrLen (ByVal buffer As String) As
Integer
```

CToBas() truncates a 'C' string declared as

```
Dim buffer As String * 50
```

to the length of the 'C' string (i.e. wherever the NULL terminator is).

PCMSStrLen() returns the length in bytes of a 'C' string. This is simply a cover of the 'C' strlen() routine.

7.3 Using PC*MILER|Connect With Web Applications Running Under Internet Information Services

A working sample code with solution file is in the ...\ALK Technologies\PCMILER28\Connect folder. The solution file is called **pcmdotnet.sln**. You should be able to open in Visual Studio 2003 and build and run this sample application.

Sample VB.Net source code is in the ...\ALK Technologies\PCMILER28\Connect\VB.NET folder. The file is called **testconnect.vb**.

Sample C# (sharp) source code is in the ...\ALK Technologies\PCMILER28\Connect\Csharp folder. The file is called **testconnect.cs**.

Sample C# (sharp) source code with external api function declarations are in the ...\ALK Technologies\PCMILER28\Connect\PCMDLLINT folder. The file is called **PCMDLL.cs**. This file is compiled and builds a wrapper dll called **pcmdllint.dll** which can be used by C# applications or VB.NET applications. A

programmer can add more of the PCM|Connect functions to this wrapper following the data type rules below.

The data type mapping rules follow:

- Use int or integer for longs and shorts. **NOTE:** The TRIPID should be declared as Int or Integer.
- Use StringBuilder for returned strings.
- Use ref or ByRef for long/int/short pointers to returned pointers.

7.4 Configuring/Administrating Internet Information Services

NOTE: If your application is locked into 64 bit mode, only the 64 bit versions of the PC*MILER dlls will work with it. If your application is 32 bit, follow the steps below to get things running with ALK's 32 bit PC*MILER dlls.

1. Under IIS 7, configure the application pools to run in "Classic Mode" win 32, and configure the application pools to run .net 2.0 version.
2. If your .Net application was created using MS Visual Studio, you'll need to build the application using the x86 target output option. (This is under the **Build Properties** tab, the **Platform Target** pull-down option should be **x86** which is another name for 32 bit.)
3. If your application is 64 bit then our interop wrapper dll should be created with the **Platform Target** pull-down option set to **x64** or **Any CPU**. If the platform is 64 bit, your application is 64 bit, and ALK's 64 bit dlls are installed in the correct folders, then having the platform set to **Any CPU** or **x64** should work.

NOTE: The DLL is named PCMSRV32.DLL.

Declare PC*MILER|Connect functions using a 'Declare' statement in the module sheet. Once you have declared the functions, your Microsoft Access applications can call the functions. Please refer to Chapter 6 for more details about this topic. You may also use PCMSRV32.TXT as a guide to using PC*MILER|Connect.

The included sample database file `accdem32.mdb` is not intended to be a complete application. Rather it is a collection of illustrative examples of how to open an engine connection, calculate miles between two cities, find the latitude/longitude for a city name, etc. These sample files are in your installation folder, usually `C:\ALK Technologies\PCMILER28\Connect\Access`.

8.1 About `accdem32.mdb`

Following is a description of what is contained in the `accdem32.mdb`.

The module named `PCMiles` contains the declarations section. The macro named `PCMilerStart` opens the engine connection. The macro named `PCMilerEnd` closes the connection. In the Database Window, if you select the Query button, you will see some examples to calculate miles, get latitude/longitudes, etc.

Before selecting any Query, you must run the Macro named `PCMilerStart`. If this is not done, all results will be -1.

If you get an error saying that 'PCMSRV32.DLL is not found', then check to see if you have a copy of the PCMSRV32.DLL and PCMSERVE.INI in your Windows folder. You can also update the module named `PCMiles` with the proper directory of the PCMSRV32.DLL.

Once the engine is connected, you can select any Query and run.

In order to properly shut down the connection to PC*MILER|Connect, run the macro named `PCMilerEnd`.

Example for calculating distances between two places:

1. Open the database named `accdem32.mdb`.

2. Run the macro named PCMilerStart.
3. Run the query named Calculate Miles.
4. Enter Origin as Princeton, NJ
5. Enter Destination as Trenton, NJ.

The query returns the origin, destination and the distance between them in miles.

8.2 Other Ways To Access the PC*MILER|Connect Functions

Using AutoExec Macro

Open the database `accdem32.mdb`.

Now rename the macro named `PCMilerStart` to `AutoExec` in order to have the engine connection open automatically each time you open this sample database. (`AutoExec` is a special macro that runs automatically each time when you start the application, so you won't need to run the `PCMilerStart` macro.)

Using the Library Database to access the PCMSRV32 DLL from any Microsoft Access application

Using this method will allow you to access PC*MILER|Connect from any Microsoft Access application, without recreating the declaration module in each separate application database.

1. Updating MSACC20.INI

For this application of PC*MILER to work, the following bolded lines of code need to be added to the MSACC20.INI file found in the C:\WINDOWS folder.

[Menu Add-Ins]

```
&Add-in Manager==Wm_Entry()  
&Database Documentor==Doc_PrintDataBase()  
A&ttachment Manager==Am_Entry()  
Im&port Database...==Doc_ImportDatabase()  
&Menu Builder==CustomMenuBuilder()  
PC-Miler &Startup==PCMilerStart()  
PC-Miler &Close==PCMilerEnd()
```

[Libraries]

```
O:\APPS\ACCESS\workdir\wzlib.mda=rw  
O:\APPS\ACCESS\workdir\wzTable.mda=rw  
O:\APPS\ACCESS\workdir\wzQuery.mda=rw  
O:\APPS\ACCESS\workdir\wzfrmrpt.mda=rw
```

```
O:\APPS\ACCESS\workdir\wzbldr.mda=rw
;wzlib.mda=rw
;wzTable.mda=rw
;wzQuery.mda=rw
;wzfrmrpt.mda=rw
;wzbldr.mda=rw
C:\WINDOWS\PCMSACC.MDA=ro
```

2. Converting the Database to an Add-In

In order to use the database PCMSACC.MDB as an Add-In, do the following:

- Update the module named PCMiles with the proper directory of the PCMSRV32.DLL.
- The current path is C:\WINDOWS.
- Using either the File Manager or the DOS prompt, change the name of the database to the name PCMSACC.MDA. This needs to be done so that Access recognizes the database as an Add-In.
- The database is now ready to be used to calculate miles. If there ever is a need to update the database, simply rename it back to PCMSACC.MDB and open it in Access. In order to do this the lines entered in MSACC20.INI will have to be commented out.
- Now all the functions are available from any database.

3. Using the function calls from Access

- Open any database that calls PC*MILER|Connect functions, for example calculating distances.
- Under File|Add-Ins choose PC-Miler Startup which opens your connection to PCMSRV32.DLL. If this is not done, all distances will return as -1.
- In order to properly shut down the connection to PC-Miler, run PC-Miler Close found under File|Add-Ins.

The PC*MILER COM Interface is an Automation Server that allows you to access the functionality of the PCMSRV32.DLL in an object-oriented way. The PC*MILER COM Interface can be used to easily integrate PC*MILER with your application written in Visual Basic, Delphi, or any other visual RAD environment. The PC*MILER COM Interface can also easily be used with the Active Server Pages (ASP) environment, which enables integrating PC*MILER functionality into your Web application.

Each PC*MILER|Connect object:

- has characteristics, known as **properties**; for example, you can set a property to change the default region for routing or to create a trip object.
- can perform certain actions, called **methods**; for example, you can use methods to convert place names to lat/long coordinates and vice versa.

The PC*MILER COM Interface consists of various objects. The PC*MILER|Connect object is the only object you can create directly. To access other objects, like a trip, pick list, report, report leg, report segment, trip options or points along the route, you have to call the server object's methods.

The lifetime of trip, report leg, trip options and report segment objects is limited by the life span of the server object, while pick list, points along the route and report objects can be used after the trip object has been deleted.

NOTE: It is the user's responsibility to delete all created objects.

One way to create a COM object in VB is to call the `CreateObject` function with the object's `ProgID`.

```
Dim server as Object
Set server = CreateObject("objectProjgId")
Set server = Nothing
```

Another way is to add a reference to the project. For details see Visual Basic help.

The PC*MILER automation server `ProgID` for the current version can be found in the system registry. The version independent `ProgID` for PC*MILER automation server is:

"PCMServer.PCMServer".

9.1 Working With Objects

When you use properties in your code, you can either **set** (change the value of) the property, or **get** (retrieve the current value of) the property. Most properties are read-write. This means you can set and get them. However, there are properties which are read-only or write-only.

The way you use properties in code varies from one development environment to another. Some environments such as Visual C++ do not support properties, but provide get and set functions to do the work of each property. C++ programmers can find the definition of the interface for the PC*MILER|Connect automation object in the header file *pcmsole.h*. Consult your environment documentation for specific information about using properties. The examples presented below provide guidance to users of development environments like Delphi or VB.

PC*MILER|Connect automation object's errors that occur during program execution are handled like other errors. You must provide your own error handling routines to intercept and manage errors. Note that the return value of all functions is of Windows type HRESULT. There are two error codes specific to PCMSOLE.DLL:

-2147220904 L	Error loading PCMSRV32.DLL
-2147220903L	PCMSRV32.DLL error

For more detailed information on PCMSRV32.DLL errors, use `ErrorCode` or `ErrorMessage` properties.

Note also that there are two success codes: "success true" and "success false".

S_OK	0x00000000L
S_FALSE	0x00000001L

For example, the function `CheckPlaceName` can return either on successful execution.

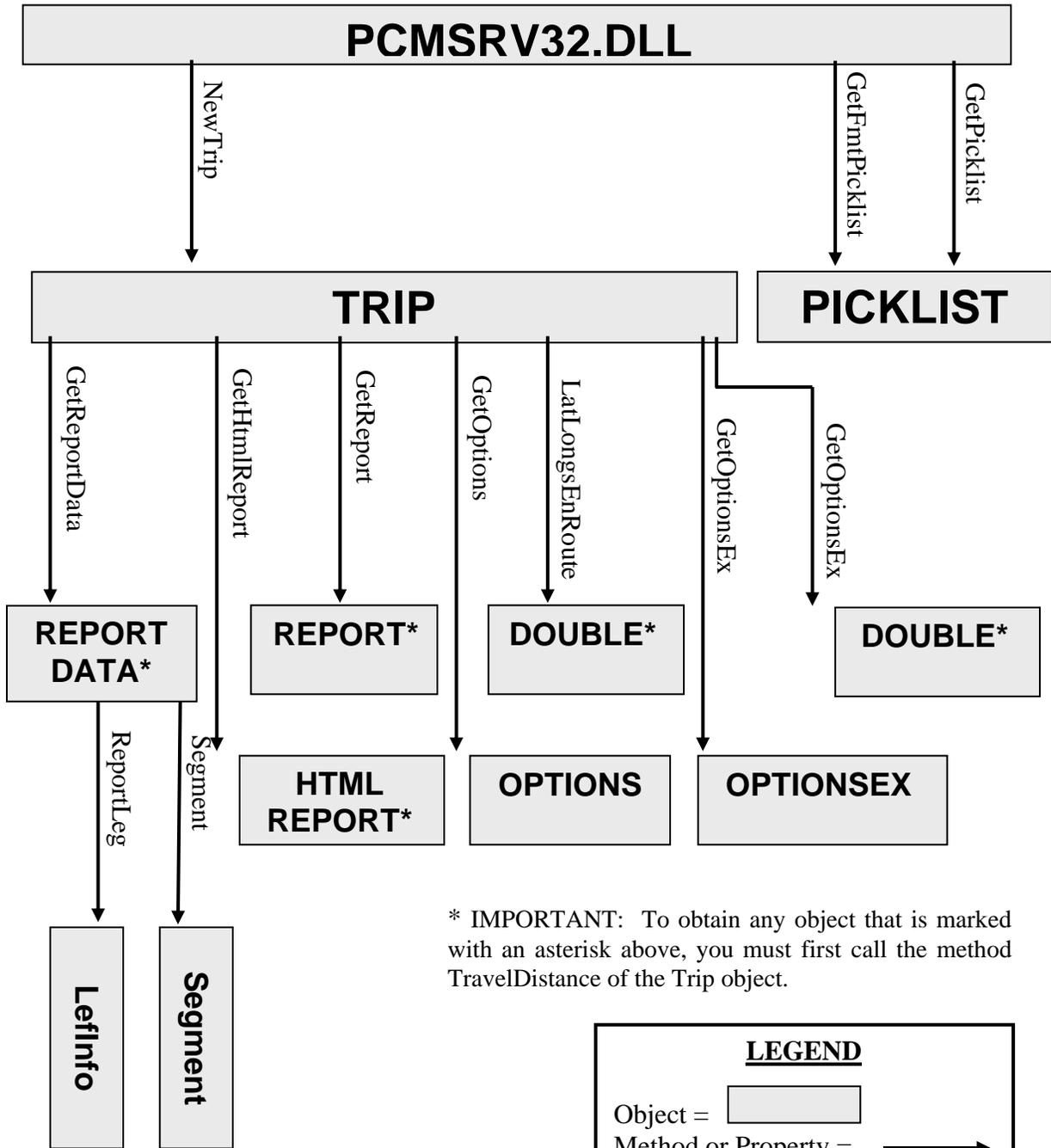
The objects, properties and methods are listed on the following pages. See Figure 1, next page, for an illustration of how to get from one object to another.

9.2 Objects: Descriptions and Relationships

Object	Description
Server	PC*MILER Connect server engine
Trip	Trip
PickList	Picklist of valid locations
Report	Detailed or State or Mileage report of a trip
HTMLReport	Report in HTML format
Double	Object containing route stops as points
Options	Route options
LegInfo	Object containing information about a specific report leg
Segment	Object containing information about a specific report segment (a “report segment” is one line within a trip leg on a Detailed report)
ReportData	Object containing requested report data

The chart on the next page shows how to get from one object to another.

FIGURE 1. RELATIONSHIPS of OBJECTS
 — How to get from one object to another —



9.3 Objects, Properties and Methods Listed

Server OBJECT PROPERTIES AND METHODS

PROPERTIES:

ID	short	(read)
ProductName	String	(read)
ProductVersion	String	(read)
Valid	Boolean	(read)
ErrorCode	long	(read)
ErrorString	String	(read)
NumRegions	short	(read)
DefaultRegion	String	(read/write)

METHODS:

AFLoad (deprecated in version 26)
AFSave (deprecated in version 26)
AFLoadForRegion (deprecated in version 26)
AFSaveForRegion (deprecated in version 26)
CheckPlaceName
CityToLatLong
LatLongToCity
CalcDistance
CalcDistance2
CalcDistance3
GetFmtPickList
GetPickList
NewTrip
RegionName
GetLRPickList
NumPOICategories
POICategoryName
NumTollDiscounts
TollDiscountName

Trip OBJECT PROPERTIES AND METHODS

PROPERTIES:

ID	long	(read)
Region	String	(read)
OnRoad	Boolean	(write)
ErrorStringEx	string	(read)

METHODS:

AFLinks
AFLinksClear

NumStops
 SetDefOptions
 AddStop
 GetStop
 GetStop2
 ClearStops
 Optimize
 DeleteStop
 StopLoaded
 UseShapePts (deprecated in Version 27)
 TravelTime
 TravelDistance
 LLToPlace
 LocationAtMiles
 LocationAtMinutes
 LatLongAtMiles
 LatLongAtMinutes
 LatLongsEnRoute
 DistanceToRoute
 GetReport
 GetReportData
 GetOptions
 GetOptionsEx
 GetHTMLReport
 TollAmount
 TollBreakdown
 SetVehicleConfig
 AddPing
 ReduceCalculate
 FuelOptimize

Options OBJECT PROPERTIES AND METHODS

PROPERTIES:

Miles	Boolean	(read/write)
RouteType	short	(read/write)
BreakHours	long	(read/write)
BreakWaitHours	long	(read/write)
CostPerLoadedMile	long	(read/write)
AlphaOrder	Boolean	(read/write)
BordersOpen	Boolean	(read/write)
Hub	Boolean	(write)
ShowFerryMiles	Boolean	(write)
HazType	short	(write)
CustomMode	Boolean	(write)
RouteLevel	Boolean	(write)
ExchangeRate	long	(write)

METHODS:
Tollmode

OptionsEx OBJECT PROPERTIES AND METHODS

PROPERTIES:
RouteType long (read/write)
OptionFlags long (read/write)
VehicleType long (read/write)

PickList OBJECT PROPERTIES AND METHODS

PROPERTIES:
Count long (read)

METHODS:
Entry

Report OBJECT PROPERTIES AND METHODS

PROPERTIES:
NumLines long (read)
NumBytes long (read)
Type short (read)
Text String (read)

METHODS:
Line

HTMLReport OBJECT PROPERTIES AND METHODS

PROPERTIES:
NumBytes long (read)
Text String (read)

ReportData OBJECT PROPERTIES AND METHODS

PROPERTIES:
NumSegments short (read)
NumLegs short (read)

METHODS:
Segment
ReportLeg

Segment OBJECT PROPERTIES AND METHODS

PROPERTIES:

State	string	(read)
Dir	string	(read)
Interchange	string	(read)
Route	string	(read)
Miles	long	(read)
Minutes	long	(read)
Toll	short	(read)

LegInfo OBJECT PROPERTIES AND METHODS

PROPERTIES:

TotMiles	long	(read)
LegMiles	long	(read)
TotCost	long	(read)
LegCost	long	(read)
TotMinutes	long	(read)
LegMinutes	long	(read)

Double OBJECT PROPERTIES AND METHODS

PROPERTIES:

Count	long	(read)
-------	------	--------

METHODS:

Entry	double	(read)
-------	--------	--------

OLE CONSTANTS

9.4 Detailed Description of Properties and Methods

9.4.1 Server OBJECT PROPERTIES AND METHODS

ID property (read)

Description:

Returns the server id.

Visual Basic Syntax:

serverID = **Server.ID**

<u>Part</u>	<u>Type</u>	<u>Description</u>
serverID	short	server id

Remarks:

0 if errors encountered on creation, check `ErrorCode` or `ErrorString`

ProductName property (read)

Description:

Returns the product name.

Visual Basic Syntax:

productName = **Server.ProductName**

<u>Part</u>	<u>Type</u>	<u>Description</u>
productName	string	product name

ProductVersion property (read)

Description:

Returns the product version.

Visual Basic Syntax:

productVersion = **Server.ProductVersion**

<u>Part</u>	<u>Type</u>	<u>Description</u>
productVersion	string	product version

Valid property (read)

Description:

Returns the status of the server engine.

Visual Basic Syntax:

serverStatus = **Server.Valid**

<u>Part</u>	<u>Type</u>	<u>Description</u>
serverStatus	bool	server engine status

Remarks:

For more details see `PCMSIsValid()` description for PCMSRV32.DLL.

ErrorCode property (read)

Description:

Returns the server error code.

Visual Basic Syntax:

serverErrorCode = **Server.ErrorCode**

<u>Part</u>	<u>Type</u>	<u>Description</u>
serverErrorCode	long	server error code

Remarks:

Returns PCMSRV32.DLL specific error codes.
`PCMSGetError()`

ErrorString property (read)

Description:

Returns the server error string.

Visual Basic Syntax:

serverErrorString = **Server.ErrorString(bufSize)**

<u>Part</u>	<u>Type</u>	<u>Description</u>
bufSize	short	string size
serverErrorString	string	server error string

Remarks: `PCMSGetErrorString()`

***DefaultRegion* property (read/write)**

Description:

Returns/sets the server default region.

Visual Basic Syntax:

```
defRegion = Server.DefaultRegion  
Server.DefaultRegion = defRegion
```

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>defRegion</i>	string	default region name

Remarks:

PCMSSetDefaultRegion(), PCMSGetDefaultRegion()

***NumRegions* property (read/write)**

Description:

Returns the total number of regions available for routing.

Visual Basic Syntax:

```
numRegions = Server.NumRegions()
```

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>numRegions</i>	short	number of regions

Remarks: PCMSNumRegions()

***AFLoad* method**

Description:

Loads a set of avoided or favored links from a file where they were saved previously. (This method was deprecated in version 26.)

Visual Basic Syntax:

```
serverAFLoad = Server.AFLoad (fileName);
```

COM – Interface:

```
HRESULT AFLoad (BSTR fileName, [out, retval] long * pVal);
```

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>fileName</i>	string	file name to load from
<i>pVal</i>	int	result value

Remarks:

PCMSAFLoad, and error codes

***AFSave* method**

Description:

Allows saving a set of avoided or favored links to a file. (This method was deprecated in version 26.)

Visual Basic Syntax:

```
serverAFSave = Server.AFSave ();
```

COM – Interface:

```
HRESULT AFSave ( [out, retval] long * pVal);
```

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>pVal</i>	<i>int</i>	result value

Remarks:

PCMSAFSave, and error codes

***AFLoadForRegion* method**

Description:

See PCMSAFLoadForRegion. (Deprecated in version 26.)

Visual Basic Syntax:

```
serverAFLoadForRegion = Server.AFLoadForRegion (filename,  
regionID);
```

COM – Interface:

```
HRESULT AFLoadForRegion (BSTR fileName, BSTR regionID, [out,  
retval] long * pVal);
```

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>fileName</i>	<i>string</i>	file name to load from
<i>regionID</i>	<i>string</i>	regionID, such as “NA” for North America
<i>pVal</i>	<i>int</i>	result value

Remarks:

PCMSAFLoadForRegion, and error codes

***AFSaveForRegion* method**

Description:

See PCMSSaveForRegion. (Deprecated in version 26.)

Visual Basic Syntax:

```
serverAFSaveForRegion = Server.AFSaveForRegion (regionID);
```

COM – Interface:

*HRESULT AFSaveForRegion (BSTR regionID, [out, retval] long * pVal);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
regionID	string	region ID, such as “NA” for North America
pVal	int	result value

CheckPlaceName *method*

Description:

Checks if a place name exists in the database.

Visual Basic Syntax:

num = Server. CheckPlaceName(placeName)

COM – Interface:

*HRESULT CheckPlacename(BSTR placeName, [out,retval] long *num):*

<u>Part</u>	<u>Type</u>	<u>Description</u>
placeName	string	place name
num	long	number of matching places

Remarks:

Returns the number of matching places in the PC*MILER database. If it returns 0 then there are no matching places. If the function returns -1, then an error has occurred.

CityToLatLong , LatLongToCity *methods*

Description:

Used for converting between place name to lat/long coordinates.

Visual Basic Syntax:

placeLatLong = Server.CityToLatLong(placeName, bufSize)
PlaceName = Server.LatLongToCity(placeLatLong, bufSize)

COM – Interface:

HRESULT CityToLatLong(BSTR placeName, short bufSize, [out, retval] BSTR placeLatLong);*
HRESULT LatLongToCity(BSTR placeLatLong, short bufSize, [out, retval] BSTR placeName);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
placeName	string	place name
placeLatLong	string	place coordinates
bufSize	short	length +1 of the return string

Remarks:

Returns S_OK if converted successfully, S_FALSE if invalid input.
 PCMSCityToLatLong, PCMSLatLongToCity

CalcDistance method

Description:

Calculate distance for a given OD (Origin Destination) pair. Default route type is Practical.

Visual Basic Syntax:

dist = Server. CalcDistance(orig, dest)

COM – Interface:

*HRESULT CalcDistance(BSTR orig, BSTR dest, [out, retval]long *dist);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
orig	string	origin place name
dest	string	destination place name

Remarks:

See PCMSCalcDistance for details.

CalcDistance2 method

Description:

Calculate distance for a given OD pair and route type.

Visual Basic Syntax:

dist = Server. CalcDistance2(orig, dest, routeType)

COM – Interface:

HRESULT CalcDistance2(BSTR orig, BSTR dest, short routeType, [out, retval] long dist);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
orig	string	origin place name
dest	string	destination place name
routeType	short	route type
dist	long	travel distance between orig and dest in tenths of miles

Value	Route Types	Description
0	<u>Practical</u>	The default routing type: most practical
1	Shortest	shortest by distance
2	National	favor national highways
3	AvoidToll	avoid tolls
4	Air	air (straight line)
6	FiftyThree	53' truck routing

Remarks:

PCMSCalcDistance2 , and section 9.4.12, *OLE Constants* at the end of this chapter for CalcEx route type combinations

CalcDistance3 method

Description:

Calculate distance/travel time for an OD pair and route type.

Visual Basic Syntax:

dist = Server. **CalcDistance3**(orig, dest, routeType, time)

COM – Interface:

HRESULT CalcDistance3(*BSTR* orig, *BSTR* dest, *short* routeType, *long* *time, [*out*, *retval*] *long** dist);

<u>Part</u>	<u>Type</u>	<u>Description</u>
orig	string	origin place name
dest	string	destination place name
routeType	short	route type
time	long	travel time, orig to dest (in minutes)

Value	Route Types	Description
<u>0</u>	<u>Practical</u>	The default routing type: most practical
1	Shortest	shortest by distance
2	National	favor national highways
3	AvoidToll	avoid tolls
4	Air	air (straight line)
6	FiftyThree	53' truck routing

Remarks:

PCMSCalcDistance3, and section 9.4.12, *OLE Constants* at the end of this chapter for CalcEx route type combinations.

GetPickList method

Description:

Returns a list of partially or exactly matching place names for supplied name.

Visual Basic Syntax:

pickList = *Server*.**GetPickList**(*placeName*, *regionName*, *matchType*)

COM – Interface:

HRESULT **GetPickList**(*BSTR* *placeName*, *BSTR* *regionName*, *short* *matchType*, [out, retval] *IPCMPickList*** *pickList*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>placeName</i>	string	place name to match
<i>pickList</i>	object	pick list object
<i>regionName</i>	string	region name to match
<i>matchType</i>	short	match Type

Value	Match Types
0	partial
1	exact
2	default

GetFmtPickList method

Description:

Returns a list of partially or exactly matching place names for the name supplied.

Visual Basic Syntax:

pickList = *Server*.**GetFmtPickList**(*placeName*, *regionName*, *matchType*, *zipLen*, *cityLen*, *countyLen*)

COM – Interface:

HRESULT **GetFmtPickList**(*BSTR* *placeName*, *BSTR* *regionName*, *short* *matchType*, *short* *zipLen*, *short* *cityLen*, *short* *countyLen*, [out, retval] *IPCMPickList* * * *pickList*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>placeName</i>	string	place name to match
<i>regionName</i>	string	region name to match
<i>matchType</i>	short	match Type

zipLen	short	number of characters for zip code field
cityLen	short	number of characters for city field
countyLen	short	number of characters for state and county field
pickList	object	pick list object

GetLRPickList method

Description:

Returns a pick list of cities, postal codes, PC*MILER custom places, and/or POI's (points of interest) within a specified radius of a city/state or ZIP.

Visual Basic Syntax:

pickList = *Server*. **GetLRPickList**(*placeName*, *radius*, *regionName*, *cities*, *postalCodes*, *customPlaces*, *poi*, *poiCategory*)

COM – Interface:

HRESULT **GetLRPickList**(*BSTR placeName*, *long radius*, *BSTR RegionName*, *VARIANT_BOOL cities*, *VARIANT_BOOL postalCodes*, *VARIANT_BOOL customPlaces*, *VARIANT_BOOL poi*, *long poiCategory*, [*out, retval*] *IPCMPickList** pickList*;

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>placeName</i>	string	city/state or ZIP around which to search
<i>radius</i>	long	distance of radius (must be an INTEGER in WHOLE MILES)
<i>regionName</i>	string	region of <i>placeName</i>
<i>cities</i>	bool	on/off cities search
<i>postalCodes</i>	bool	on/off postal code search
<i>customPlaces</i>	bool	on/off custom places search
<i>poi</i>	bool	on/off POI search
<i>poiCategory</i>	long	category of POI to search for

Remarks:

PCMSLocRadLookup, PCMSPOICategoryName

NumPOICategories method

Description:

Returns the number of available POI categories for a location radius search.

Visual Basic Syntax:

count = *Server*. **NumPOICategories**

COM – Interface:

HRESULT NumPOICategories([out, retval] long pVal);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
count	long	number of categories

Remarks:

PCMSNumPOICategories

NewTrip method

Description:

Returns a trip object.

Visual Basic Syntax:

trip = Server. NewTrip(regionName)

COM – Interface:

*HRESULT NewTrip(BSTR regionName, [out, retval]
IPCMTrip** trip);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
regionName	string	region in which the trip is created
trip	object	trip object

Remarks:

PCMSNewTripWithRegion

RegionName method

Description:

Returns the name of the region requested by index.

Visual Basic Syntax:

regionName = Server. RegionName(which)

COM – Interface:

HRESULT RegionName(short which, [out, retval] BSTR
regionName);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
regionName	string	region name
which	short	region index

***POICategoryName* method**

Description:

Returns names of available POI categories.

Visual Basic Syntax:

poiName = Server. **POICategoryName**(which)

COM – Interface:

HRESULT POICategoryName(long which, [out, retVal]
BSTR* poiName);

<u>Part</u>	<u>Type</u>	<u>Description</u>
which	long	index of POI category
poiName	string	name of POI category

Remarks:

PCMSPOICategoryName

***NumTollDiscounts* method**

Description:

Available only if the PC*MILER|Tolls add-on module is installed. Returns the number of recognized toll discount programs. Note that “cash” is included in this number.

Visual Basic Syntax:

numTollDiscounts = Server. **NumTollDiscounts**

COM – Interface:

HRESULT NumTollDiscounts([out, retval] long* pVal);

<u>Part</u>	<u>Type</u>	<u>Description</u>
numTollDiscounts	long	number of available toll discount programs

Remarks:

PCMSNumTollDiscounts

***TollDiscountName* method**

Description:

Available only if the PC*MILER|Tolls add-on module is installed. Returns toll discount program names.

Visual Basic Syntax:

discName = *Server*. **TollDiscountName**(*which*)

COM – Interface:

HRESULT **TollDiscountName**(*long* *which*, [*out*, *retval*]
*BSTR** *discName*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>discName</i>	string	discount program name
<i>which</i>	long	program name index

Remarks:

PCMSGGetTollDiscountName

9.4.2 Trip OBJECT PROPERTIES AND METHODS

ID property (read)

Description:

Returns the trip id.

Visual Basic Syntax:

tripID = **Trip.ID**

<u>Part</u>	<u>Type</u>	<u>Description</u>
tripID	long	trip id

Region property (read)

Description:

Returns the name of the region in which the trip was created.

Visual Basic Syntax:

region = **Trip.Region**

<u>Part</u>	<u>Type</u>	<u>Description</u>
region	String	region name

OnRoad property (write)

Description:

Sets the On Road mode.

Visual Basic Syntax:

Trip.OnRoad = mode

<u>Part</u>	<u>Type</u>	<u>Description</u>
mode	bool	on/off road status

Remarks:

PCMSSetOnRoad

ErrorStringEx *property* (*read*)

Description:

Returns the stop at which an error occurred if error code 114 has been generated.

Visual Basic Syntax:

serverErrorStringEx = *Server*.**ErrorStringEx**(bufSize)

<u>Part</u>	<u>Type</u>	<u>Description</u>
serverErrorStringEx	string	server error message
bufSize	short	string size

Remarks:

PCMSErrorStringEx ()

AFLinks *method*

Description:

Adds links in the trip to the current set of avoided or favored links.

Visual Basic Syntax:

tripAFLinks = *trip*.**AFLinks** (*bFavor*);

COM – Interface:

HRESULT AFLinks (*VARIANT_BOOL bFavor*, [*out, retval*] *int* * *pVal*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
bFavor	bool	True for avoid, False for favor
pVal	int	result value

Remarks:

PCMSAFLinks, and error codes

AFLinksClear *method*

Description:

Clears all saved avoided and favored links.

Visual Basic Syntax:

tripAFLinksClear = *Trip*.**AFLinksClear** ();

COM – Interface:

HRESULT AFLinksClear ([*out, retval*] *int* * *pVal*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
pVal	int	result value

Remarks:

PCMSAFLinksClear, and error codes

NumStops ***method***

Description:

Returns the number of stops for the trip.

Visual Basic Syntax:

tripNumStops = *Trip.NumStops*

COM – Interface:

HRESULT NumStops([out, retval] short* *tripNumStops*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
tripNumStops	short	number of stops

TravelTime ***method***

Description:

Returns the travel time in minutes. The method *TravelDistance* of the Trip object **must** be called first before calling this method.

Visual Basic Syntax:

time = *Trip.TravelTime*

COM – Interface:

HRESULT TravelTime([out, retval] long* *time*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
time	long	travel time

Remarks:

PCMSGetDuration

TravelDistance method

Description:

Returns the travel distance in tenths of miles. This method **must** be called first before any of the following methods can be used:

- TravelTime
- LocationAtMiles
- LocationAtMinutes
- LatLongAtMiles
- LatLongAtMinutes
- LatLongEnRoute
- DistanceToRoute
- GetReport
- GetReportData
- GetHTMLReport

Visual Basic Syntax:

dist = *Trip*.**TravelDistance**

COM – Interface:

HRESULT **TravelDistance**(*[out, retval]* long* *dist*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
dist	long	travel distance

Remarks:

PCMSCalcTrip

UseShapePts method

Description:

Sets shapepoints on and off when doing calculations using lat/longs. (Deprecated in Version 27.)

Visual Basic Syntax:

Trip.**UseShapePts**(mode)

COM – Interface:

HRESULT **UseShapePts**(*VARIANT_BOOL* onOff);

<u>Part</u>	<u>Type</u>	<u>Description</u>
Mode	bool	When off, roads are drawn with straight lines; when on, curves in roads are taken into account.

Remarks:

PCMSSetUseShapePts

LLToPlace method

Description:

When this property is set to true, every stop added is converted from latlong to place name.

Visual Basic Syntax:

Trip.LLToPlace (true)

COM – Interface:

HRESULT LLToPlace(VARIANT_BOOL onOff);

Remarks:

PCMSConvertLLToPlace

SetDefOptions method

Description:

Resets trip options to default values.

Visual Basic Syntax:

Trip.SetDefOptions

COM – Interface:

HRESULT SetDefOptions();

Remarks:

PCMSDefaults

AddStop method

Description:

Adds a stop to the trip.

Visual Basic Syntax:

Trip.AddStop(stopName)

COM – Interface:

HRESULT AddStop(BSTR stopName);

<u>Part</u>	<u>Type</u>	<u>Description</u>
stopName	string	stop name

GetStop method

Description:

Returns the place name for the stop requested.

Visual Basic Syntax:

placeName = *Trip*.**GetStop**(which, bufSize)

COM – Interface:

HRESULT **GetStop**(short which, short len, [out, retval]
BSTR*placeName);

<u>Part</u>	<u>Type</u>	<u>Description</u>
bufSize	short	stop string size
placeName	string	stop name
which	short	stop index

Remarks:

PCMSGetStop

GetStop2 method

Description:

Returns the place name for the stop requested.

Visual Basic Syntax:

placeName = *Trip*.**GetStop2**(which)

COM – Interface:

HRESULT **GetStop2**(short which, [out, retval] BSTR*placeName);

<u>Part</u>	<u>Type</u>	<u>Description</u>
placeName	string	stop name
which	short	stop index

Remarks:

PCMSGetStop

DeleteStop method

Description:

Deletes the stop from the trip by index.

Visual Basic Syntax:

Trip.**DeleteStop**(which)

COM – Interface:

HRESULT **DeleteStop**(short which);

<u>Part</u>	<u>Type</u>	<u>Description</u>
which	short	stop index

Remarks:
PCMSDeleteStop

ClearStops *method*

Description:
Deletes all stops from the trip.

Visual Basic Syntax:
Trip.**ClearStops**

COM – Interface:
HRESULT ClearStops();

Remarks:
PCMSClearStops

Optimize *method*

Description:
Optimizes the trip by changing the stop order.

Visual Basic Syntax:
Trip.**Optimize**(fixDest)

COM – Interface:
HRESULT Optimize(short fixDest);

<u>Part</u>	<u>Type</u>	<u>Description</u>
fixDest	short	1 if fix destination when resequencing stops, 0 if not

Remarks:
PCMSOptimize

StopLoaded *method*

Description:
Marks each stop as either loaded or empty.

Visual Basic Syntax:
Trip.**StopLoaded**(which, onOff)

COM – Interface:
HRESULT StopLoaded(short which, VARIANT_BOOL onOff);

<u>Part</u>	<u>Type</u>	<u>Description</u>
which	short	stop index
onOff	bool	True if loaded; False if not

Remarks:

PCMSSetLoaded

GetReport *method*

Description:

Returns a report object of the type specified for the trip.
The method `TravelDistance` of the Trip object **must** be called first before calling this method.

Visual Basic Syntax:

report = Trip.GetReport(reportType)

COM – Interface:

HRESULT GetReport(short reportType, [out,retval]
*IPCMReport** report*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
reportType	short	report type
report	object	report object

Value	Report Types	Description
<u>0</u>	<u>Detailed</u>	Detailed Route report. Shows detailed driving instructions from the trip's origin to its destination.
1	State	State/Country report. Appended to the mileage report, it displays the state by state and country breakdown of the trip.
2	Mileage	Mileage report. Shows the mileage summary for each leg of the trip.
5	Road Type	Road Type report. Breaks down trip mileage by PC*MILER road category.

GetHTMLReport *method*

Description:

Returns an HTML report object of the type specified for the trip. The method `TravelDistance` of the Trip object **must** be called first before calling this method. Decimal places in mileage are set in the PC*MILER graphical user interface or in the PCMSERVE.INI file.

Visual Basic Syntax:

HTMLReport = *Trip*.**GetHTMLReport**(reportType)

COM – Interface:

HRESULT **GetHTMLReport**(short reportType, [out, retval]
*IPCMHTMLReport** HTMLReport*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
reportType	short	report type
HTMLReport	object	HTML report object

DistanceToRoute *method*

Description:

Calculates distance to route from a given location. The method `TravelDistance` of the Trip object **must** be called first before calling this method.

Visual Basic Syntax:

dist = *Trip*.**DistanceToRoute** (location)

COM – Interface:

HRESULT **DistanceToRoute**(BSTR location, [out, retval]
long dist*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
dist	long	distance
location	string	location name

Remarks:

PCMSCalcDistToRoute

LocationAtMiles *method*

Description:

Tells you your location at given distance into the trip. The method `TravelDistance` of the `Trip` object **must** be called first before calling this method.

Visual Basic Syntax:

location = *Trip*. **LocationAtMiles**(miles, bufSize)

COM – Interface:

HRESULT *LocationAtMiles*(long miles, short bufSize, [out, retval] *BSTR** location);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>location</i>	string	location name
miles	long	distance
bufSize	short	buffer size for returned string

Remarks:

`PCMSGGetLocAtMiles`

LocationAtMinutes *method*

Description:

Tells you your location at given time into the trip. The method `TravelDistance` of the `Trip` object **must** be called first before calling this method.

Visual Basic Syntax:

location = *Trip*. **LocationAtMinutes**(minutes, bufSize)

COM – Interface:

HRESULT *LocationAtMinutes*(long minutes, short bufSize, [out, retval] *BSTR** location);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>location</i>	string	location name
minutes	long	travel time
bufSize	short	buffer size for returned string

Remarks:

`PCMSGGetLocAtMinutes`

LatLongAtMinutes *method*

Description:

Tells you your location at given time into the trip. The method `TravelDistance` of the Trip object **must** be called first before calling this method.

Visual Basic Syntax:

location = Trip. **LatLongAtMinutes** (minutes, useSPts)

COM – Interface:

HRESULT LatLongAtMinutes(long min, VARIANT_BOOL useSPts, [out, retval] BSTR* location);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>location</i>	string	latlong string
minutes	long	travel time
useShapePts	bool	use or not shape points

Remarks:

PCMSLatLongAtMinutes

LatLongAtMiles *method*

Description:

Tells you your location at given distance into the trip. The method `TravelDistance` of the Trip object **must** be called first before calling this method.

Visual Basic Syntax:

location = Trip. **LatLongAtMiles** (miles, useShapePts)

COM – Interface:

HRESULT LatLongAtMiles(long miles, VARIANT_BOOL useShapePts, [out, retval] BSTR* location);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>location</i>	string	latlong string
miles	long	travel time
useShapePts	bool	use or not use shape points

Remarks:

PCMSLatLongAtMiles

LatLongsEnRoute *method*

Description:

Returns an object containing coordinates of points along the route. The method `TravelDistance` of the `Trip` object **must** be called first before calling this method.

Visual Basic Syntax:

routePoints = *Trip*. **LatLongsEnRoute** (useShapePts)

COM – Interface:

HRESULT LatLongsEnRoute(*VARIANT_BOOL useShapePts*,
[*out, retval*] *IPCMDouble** routePoints*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
useShapePts	bool	use or not shape points
routePoints	object	a Double object (not to be confused with the datatype double)

Remarks:

`PCMSGetLocAtMinutes`

GetReportData *method*

Description:

Gets the report object. The method `TravelDistance` of the `Trip` object **must** be called first before calling this method.

Visual Basic Syntax:

reportData = *Trip*. **GetReportData**

COM – Interface:

HRESULT GetReportData([*out, retval*] *IPCMLReportData** reportData*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
ReportData	ReportData	ReportData object

GetOptions *method*

Description:

Returns the trip options object.

Visual Basic Syntax:

options = *Trip*. **GetOptions**

COM – Interface:

HRESULT GetOptions([*out, retval*] *IPCOptions** options*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
options	Options	Options object

Remarks:

PCMSGetOptions

GetOptionsEx *method*

Description:

Returns the extended trip options object. Options and OptionsEx cannot be used together. For example, where OptionsEx has been used to set the routing method, Options cannot be used to return the current routing method.

Visual Basic Syntax:

options = *Trip*. **GetOptionsEx**

COM – Interface:

HRESULT GetOptionsEx([*out, retval*] *IPCOptionsEx** options*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
options	OptionsEx	OptionsEx object

TollAmount *method*

Description:

Available only if the PC*MILER|Tolls add-on module is installed.
Returns the toll amount for a trip in cents.

Visual Basic Syntax:

toll = *Trip*. **TollAmount**

COM – Interface:

HRESULT TollAmount([*out, retval*] *long* cents*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
toll	long	toll value in cents

Remarks:
 PCMSGGetToll

TollBreakdown method

Description:
 Available only if the PC*MILER|Tolls add-on module is installed.
 Returns toll calculated using the specified discount program.

Visual Basic Syntax:
toll = *Trip*.**TollBreakdown**(discProgram, state)

COM – Interface:
HRESULT TollBreakdown([in] long discProgram, [in] BSTR state, [out], retval] long* cents);

<u>Part</u>	<u>Type</u>	<u>Description</u>
toll	long	discounted toll in cents
discProgram	long	index of toll discount program
state	string	state, or empty string for all states

Remarks:
 PCMSGGetTollBreakdown

SetVehicleConfig method

Description:
 Enables route generation and toll cost calculation based on custom vehicle dimensions.

Visual Basic Syntax:
trip.**SetVehicleConfig** (False, False, 120, 96, 48, 90000, 5, True)

<u>Part</u>	<u>Type</u>	<u>Description</u>
units	bool	False is English (default), True is Metric
overPerm	bool	permit for vehicle over 80,000 lbs. (default=False)
height	long	vehicle height (feet/inches or meters)
width	long	vehicle width
length	long	vehicle length
weight	long	vehicle weight
axle	long	number of axles
lcV	bool	multiple trailer (default=False)

Remarks:
 PCMSSetVehicleConfig

AddPing *method*

Description:

Add a lat/long ping to the trip's list of pings. The pings added with this are used to build a route using the ReduceCalculate method.

Visual Basic Syntax:

trip.**AddPing** ("41.471607N,74.384949W")

COM – Interface:

HRESULT **AddPing**(*BSTR* pingLatLon);

<u>Part</u>	<u>Type</u>	<u>Description</u>
pingLatLon	string	latitude/longitude point

Remarks:

PCMSAddPing

ReduceCalculate *method*

Description:

Calculate trip's distance through all the added pings. Returns the distance in tenths of a mile.

Visual Basic Syntax:

trip.**ReduceCalculate** (0.5, True)

COM – Interface:

HRESULT **Reduce Calculate**(*double* maxMilesOfRoute, *VARIANT_BOOL* highwayOnly, [*out,retval*] *long* *miles);

<u>Part</u>	<u>Type</u>	<u>Description</u>
maxMilesOfRoute	double	maximum miles of route
highwayOnly	bool	if true use highways only

Remarks:

PCMSReduceCalculate

FuelOptimize *method*

Description:

(Deprecated in Version 27.) Provides a COM interface to the PCMSFuelOptimize interface. Requests the fuel stop locations from the IDSC Web Service and updates trip with the fuel stops. Returns a large report of the fuel stops returned from the provider.

Visual Basic Syntax:

trip.**FuelOptimize** ("", "200", "100", "6.25", 8096)

COM – Interface:

*HRESULT FuelOptimize(BSTR capacity, BSTR level, BSTR mpg, [in] int reparse, [out, retval] BSTR * statusreport);*

<u>Part</u>	<u>Type</u>	<u>Description</u>
vehicle	string	vehicle ID
capacity	string	capacity of fuel tank (if vehicle ID is supplied then registered value will be used)
level	string	level in fuel tank – gallons
mpg	string	miles per gallon to two decimal places
reparse	int	report size recommended to use: 8096

Remarks:

PCMSFuelOptimize

9.4.3 Options OBJECT PROPERTIES AND METHODS

RouteType *property* (*read/write*)

Description:

Returns/sets the route type.

Visual Basic Syntax:

rtType = **Options.RouteType**

Options.RouteType = *rtType*

<u>Part</u>	<u>Type</u>	<u>Description</u>
rtType	short	route type

Remarks:

PCMSSetCalcType, PCMSGetCalcType, and
Appendix B: Constants and Error Codes

BordersOpen *property* (*read/write*)

Description:

Returns/sets the status of borders.

Visual Basic Syntax:

borders = **Options.BordersOpen**

Options.BordersOpen = *borders*

<u>Part</u>	<u>Type</u>	<u>Description</u>
borders	bool	border status

Remarks:

PCMSSetBordersOpen

Hub *property* (*write*)

Description:

Sets the hub mode.

Visual Basic Syntax:

Options.Hub = *hub*

<u>Part</u>	<u>Type</u>	<u>Description</u>
hub	bool	hub mode

Remarks:

PCMSSetHubMode

Miles *property* (*read/write*)

Description:

Returns/sets the units to miles (True) or kilometers (False).

Visual Basic Syntax:

ml = *Options.Miles*

Options.Miles = *ml*

<u>Part</u>	<u>Type</u>	<u>Description</u>
ml	bool	miles or km

Remarks:

PCMSSetKilometers, PCMSSetMiles

AlphaOrder *property* (*read/write*)

Description:

Returns/sets the state order in reports.

Visual Basic Syntax:

alphaOrder = *Options.AlphaOrder*

Options.AlphaOrder = *alphaOrder*

<u>Part</u>	<u>Type</u>	<u>Description</u>
alphaOrder	bool	when True, states are listed in alphabetical order; when False states are listed in the order driven

Remarks:

PCMSSetAlphaOrder

BreakHours *property* (*read/write*)

Description:

Returns/sets the trip break hours.

Visual Basic Syntax:

breakHours = *Options.BreakHours*

Options.BreakHours = *breakHours*

<u>Part</u>	<u>Type</u>	<u>Description</u>
breakHours	long	trip break hours

Remarks:

PCMSSetBreakHours, PCMSGetBreakHours

***BreakWaitHours* property (read/write)**

Description:

Returns/sets the trip break wait hours.

Visual Basic Syntax:

breakWaitHours = **Options.BreakWaitHours**

Options.BreakWaitHours = *breakWaitHours*

<u>Part</u>	<u>Type</u>	<u>Description</u>
breakWaitHours	long	the trip break wait hours

Remarks:

PCMSSetBreakWaitHours, PCMSGetBreakWaitHours

***CostPerLoadedMile* property (read/write)**

Description:

Returns/sets the trip cost per loaded mile.

Visual Basic Syntax:

cost = **Options.CostPerLoadedMile**

Options.CostPerLoadedMile = *cost*

<u>Part</u>	<u>Type</u>	<u>Description</u>
Cost	long	cost per loaded mile

Remarks:

PCMSSetCost, PCMSGetCost

***ShowFerryMiles* property (write)**

Description:

If set to true (default value), ferry miles are shown on report.

Visual Basic Syntax:

Options.ShowFerryMiles = mode

<u>Part</u>	<u>Type</u>	<u>Description</u>
mode	bool	on/off show ferry miles

Remarks:

PCMSSetShowFerryMiles

HazType* property** ***(write)

Description:

Sets trip options for hazardous material routing.

Visual Basic Syntax:

Options. **HazType**(type)

<u>Part</u>	<u>Type</u>	<u>Description</u>
type	short	hazard type

Remarks:

PCMSSetHazOption. See the PC*MILER *User's Guide* or Help files for details about each HazMat route type.

hazType values in North America can be as follows:

Value	HazType
0	Disabled
1	General
2	Explosive
3	Inhalant
4	Radioactive
5	Corrosive
6	Flammable
7	Harmful to Water

hazType values in Europe and Oceania can be as follows:

Value	Route Type:
0	Disabled
1	General
2	Explosive
6	Flammable
7	Harmful to Water

***CustomMode* property (write)**

Description:

Sets custom mode to True or False.

Visual Basic Syntax:

Options. **CustomMode** (mode)

<u>Part</u>	<u>Type</u>	<u>Description</u>
mode	bool	custom mode

Remarks:

PCMSSetCustomMode

***ExchangeRate* property (write)**

Description:

Sets the exchange rate from U.S. to Canadian dollars, such as 9900 (99 cents), for toll reports.

Visual Basic Syntax:

Options. **ExchangeRate** = 12500

<u>Part</u>	<u>Type</u>	<u>Description</u>
exchangeRate	long	number for rate, e.g. 12500 which is the default value

Remarks:

PCMSSetExchRate

***RouteLevel* property (write)**

Description:

Sets the route level.

Visual Basic Syntax:

Options. **RouteLevel** = True

<u>Part</u>	<u>Type</u>	<u>Description</u>
routeLevel	bool	when True use Streets routing when False use Highway routing

Remarks:

PCMSRouteLevel

TollMode method

Description:

Available only if the PC*MILER|Tolls add-on module is installed.
Enables/disables toll fee calculation.

Visual Basic Syntax:

Options. **TollMode** (mode)

<u>Part</u>	<u>Type</u>	<u>Description</u>
mode	long	toll mode

Remarks:

PCMSSetTollMode

Value	Toll Mode
0	Disabled, no toll information
1	Cash toll amount
2	Discount toll amount

9.4.4 OptionsEx PROPERTIES AND METHODS

RouteType ***property*** ***(read/write)***

Description:

Returns/sets the route type.

Visual Basic Syntax:

rtType = **Options.RouteType**

Options.RouteType = *rtType*

<u>Part</u>	<u>Type</u>	<u>Description</u>
rtType	long	route type

Remarks:

PCMSSetCalcTypeEx, PCMSGetCalcTypeEx, and
Appendix B: Constants and Error Codes

OptionFlags ***property*** ***(read/write)***

Description:

Returns/sets the route options flags.

Visual Basic Syntax:

rtType = **Options.OptionFlags**

Options.OptionFlags = *rtType*

<u>Part</u>	<u>Type</u>	<u>Description</u>
rtType	long	route type

Remarks:

PCMSSetCalcTypeEx, PCMSGetCalcTypeEx, and
Appendix B: Constants and Error Codes

VehicleType ***property*** ***(read/write)***

Description:

Reserved for future use. Must be set to zero.

Visual Basic Syntax:

rtType = **Options.VehicleType**

Remarks:

PCMSSetCalcTypeEx, PCMSGetCalcTypeEx, and
Appendix B: Constants and Error Codes

9.4.5 PickList PROPERTIES AND METHODS

Count *property* *(read)*

Description:

Returns the number of entries on the list.

Visual Basic Syntax:

num = *PickList.Count*

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	long	number of entries on the list

Remarks:

PCMSNumMatches

Entry *method*

Description:

Returns the requested entry on the list.

Visual Basic Syntax:

match = *Trip.Entry*(*which*)

COM – Interface:

HRESULT Entry(*long which*, [*out, retval*] *BSTR* match*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
<i>which</i>	long	index
<i>match</i>	string	the entry on the list

Remarks:

PCMSGetMatch

9.4.6 Report PROPERTIES AND METHODS

NumLines *property* (*read*)

Description:

Returns the number of lines on the report.

Visual Basic Syntax:

num =Report.**NumLines**

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	long	

Remarks:

PCMSNumRptLines

Type *property* (*read*)

Description:

Returns the report type.

Visual Basic Syntax:

reportType =Report.**Type**

<u>Part</u>	<u>Type</u>	<u>Description</u>
reportType	short	

NumBytes *property* (*read*)

Description:

Returns the number of bytes in the report.

Visual Basic Syntax:

num =Report.**NumBytes**

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	long	num bytes in report

Remarks:

PCMSNumRptBytes

9.4.7 HTMLReport PROPERTIES AND METHODS

NumBytes *property* (*read*)

Description:

Returns the number of bytes in the report.

Visual Basic Syntax:

num = *HTMLReport.NumBytes*

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	long	num bytes in report

Remarks:

PCMSNumHTMLRptBytes

Text *property* (*read*)

Description:

Returns the report text.

Visual Basic Syntax:

text = *HTMLReport.Text*

<u>Part</u>	<u>Type</u>	<u>Description</u>
text	string	report text

Remarks:

PCMSGetHTMLRpt

9.4.8 ReportData PROPERTIES AND METHODS

NumSegments *property* (*read*)

Description:

Returns the number of segments in the report.

Visual Basic Syntax:

num = *Report.NumSegments*

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	short	total number of segments in the report

NumLegs *property* (*read*)

Description:

Returns the number of legs in the trip.

Visual Basic Syntax:

num = *Report.NumLegs*

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	short	total number of legs in the trip

Segment *method*

Description:

Returns the segment requested by index.

Visual Basic Syntax:

segment = *Report.Segment*(*which*)

COM – Interface:

HRESULT Segment(*short which*, [*out,retval*] *IPCMSegment** segment*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
segment	object	object containing segment information
which	short	index

Remarks:

PCMSGetNumSegments

ReportLeg *method*

Description:

Returns the leg requested by index.

Visual Basic Syntax:

leg = *Report*.**ReportLeg**(*which*)

COM – Interface:

HRESULT **ReportLeg**(*short which*, [*out, retval*]
*IPCMLegInfo** leg*);

<u>Part</u>	<u>Type</u>	<u>Description</u>
leg	object	object containing report leg information
which	short	index

9.4.9 Segment PROPERTIES AND METHODS

State *property* (*read*)

Description:

Returns the state abbreviation for the segment.

Visual Basic Syntax:

state = *Segment.State*

<u>Part</u>	<u>Type</u>	<u>Description</u>
state	string	segment state

Dir *property* (*read*)

Description:

Returns the direction of the segment

Visual Basic Syntax:

dir = *Segment.Dir*

<u>Part</u>	<u>Type</u>	<u>Description</u>
dir	string	direction of the segment

Route *property* (*read*)

Description:

Returns the route name for the segment.

Visual Basic Syntax:

route = *Segment.Route*

<u>Part</u>	<u>Type</u>	<u>Description</u>
route	string	route name

***Miles* *property* (*read*)**

Description:
Returns the segment miles.

Visual Basic Syntax:
miles = Segment.Miles

<u>Part</u>	<u>Type</u>	<u>Description</u>
miles	long	segment length

***Minutes* *property* (*read*)**

Description:
Returns the segment minutes

Visual Basic Syntax:
min = Segment.Minutes

<u>Part</u>	<u>Type</u>	<u>Description</u>
min	long	time

***Interchange* *property* (*read*)**

Description:
Returns the segment interchange

Visual Basic Syntax:
interchange = Segment.Interchange

<u>Part</u>	<u>Type</u>	<u>Description</u>
interchange	string	segment interchange

\

Toll *property* *(read)*

Description:

Available only if the PC*MILER|Tolls add-on module is installed. Returns the segment toll status.

Visual Basic Syntax:

toll = *Report.Toll*

<u>Part</u>	<u>Type</u>	<u>Description</u>
toll	short	0 if toll

9.4.10 LegInfo PROPERTIES AND METHODS

TotMiles, LegMiles properties (read)

Description:

Returns leg/cumulative miles in tenths.

Visual Basic Syntax:

lMiles = *LegReport.LegMiles*

tMiles = *LegReport.TotMiles*

<u>Part</u>	<u>Type</u>	<u>Description</u>
tMiles	long	
lMiles	long	

TotCost, LegCost properties (read)

Description:

Returns leg/cumulative cost in cents.

Visual Basic Syntax:

lCost = *LegReport.LegCost*

tCost = *LegReport.TotCost*

<u>Part</u>	<u>Type</u>	<u>Description</u>
tCost	long	
lCost	long	

TotMinutes, LegMinutes properties (read)

Description:

Returns leg/cumulative time in minutes.

Visual Basic Syntax:

legMinutes = *LegReport.LegMinutes*

totMinutes = *LegReport.TotMinutes*

<u>Part</u>	<u>Type</u>	<u>Description</u>
legMinutes	long	
totMinutes	long	

9.4.11 Double PROPERTIES AND METHODS

Count *property* *(read)*

Description:

Returns the number of coordinate entries.

Visual Basic Syntax:

num = *Double*. **Count**

<u>Part</u>	<u>Type</u>	<u>Description</u>
num	long	total number of coordinate entries

Remarks:

PCMSLatLongsEnRoute

Entry *method* *(read)*

Description:

Returns the entry requested by index.

Visual Basic Syntax:

coord = *Double*. **Entry**(which)

COM – Interface:

HRESULT **Entry**(long which, [out, retval] double * coord);

<u>Part</u>	<u>Type</u>	<u>Description</u>
coord	double	a coordinate entry
which	long	index

Remarks:

PCMSLatLongsEnRoute

9.4.12 OLE CONSTANTS

These constants are defined within the PC*MILER|Connect COM object:

```
typedef enum {
    CALC_PRACTICAL = 0,
    CALC_SHORTEST = 1,
    CALC_NATIONAL = 2,
    CALC_AVOIDTOLL = 3,
    CALC_AIR = 4,
    CALC_FIFTYTHREE = 6
} RouteType;

typedef enum {
    RPT_DETAIL = 0,
    RPT_STATE = 1,
    RPT_MILEAGE = 2,
    RPT_ROADTYPE = 5
} ReportType;

typedef enum {
    LOOKUP_PARTIAL = 0,
    LOOKUP_EXACT = 1,
    LOOKUP_DEFAULT = 2
} LookupType;

typedef enum {
    CALCEX_TYPE_PRACTICAL = 1,
    CALCEX_TYPE_SHORTEST = 2,
    CALCEX_TYPE_AIR = 4
} CalcExRouteType;

typedef enum {
    CALCEX_OPT_AVOIDTOLL = 256,
    CALCEX_OPT_NATIONAL = 512,
    CALCEX_OPT_FIFTYTHREE = 1024
} CalcExOptionFlags;

typedef enum {
    CALCEX_VEH_TRUCK = 0,
    CALCEX_VEH_AUTO = 0x01000000
} CalcExVehicleType;
```

Appendix A: Location of Header Files, Additional Documentation & Sample Code

The header files `pcmsinit.h`, `pcmstrip.h`, and `pcmsdefs.h` can be found in the `C_CPP` folder of the PC*MILER|Connect installation (usually `C:\ALK Technologies\PCMILER28\Connect\C_CPP`). Sample code in the `pcmstest.cpp` file is in the same location.

Other folders in the PC*MILER|Connect installation include additional files containing sample code and additional documentation, along with descriptive ReadMe files.

Appendix B: Constants and Error Codes Descriptions

The following constants and error codes are defined in the header file PCMSDEFS.H, found in the PC*MILER installation folder (usually C:\ALK Technologies\PCMILER28\Connect\C_CPP).

Simple Routing Calculations	Value (Decimal)
CALC_INVALID	-1
CALC_PRACTICAL	0
CALC_SHORTEST	1
CALC_NATIONAL	2
CALC_AVOIDTOLL	3
CALC_AIR	4
CALC_FIFTYTHREE	6

Extended Routing Calculations	Value (Decimal)
CALCEX_TYPE_PRACTICAL	1
CALCEX_TYPE_SHORTEST	2
CALCEX_TYPE_AIR	4
CALCEX_OPT_AVOIDTOLL	256
CALCEX_OPT_NATIONAL	512
CALCEX_OPT_FIFTYTHREE	1024
CALCEX_VEH_TRUCK	0
CALCEX_VEH_AUTO	16777216

Report types	Value (Decimal)
RPT_DETAIL	0
RPT_STATE	1
RPT_MILEAGE	2
RPT_ROADTYPE	5

Order of states in reports	Value (Decimal)
STATE_ORDER	1
TRIP_ORDER	2

Time-Based Routing	UTC ref.	Example city	Value (Decimal)
Time Zones			
TIME_ZONE_SYSTEM		n/a	-1
TIME_ZONE_LOCAL		n/a	-2
HAWAII	-11	Honolulu	0
ALASKA	-9	Anchorage	1
PACIFIC	-8	Los Angeles	2
ARIZONA	-7 (no DST)	Phoenix	3

MOUNTAIN	-7	Denver	4
CENTRAL	-6	Chicago	5
EASTERN	-5	New York	6
ATLANTIC	-4	Halifax	7
NEWFOUNDLAND	-3.5	St. John's	8
GMT	0	London	9
CENTRALEUROPE	+1	Paris	10
EASTERNEUROPE	+2	Helsinki	11
WESTERNRUSSIA	+4 (no DST)	Moscow	12

Options	Value (Hex)
OPTS_NONE	0x0000L
OPTS_MILES	0x0001L
OPTS_CHANGEDEST	0x0002L
OPTS_HUBMODE	0x0004L
OPTS_BORDERS	0x0008L
OPTS_ALPHAORDER	0x0010L
OPTS_HEAVY	0x0020L
OPTS_FERRYMILES	0x0040L
OPTS_ERROR	0xFFFFL

Error Codes	Value	Message
PCMS_INVALIDPTR	101	Invalid pointer
PCMS_NOINIFILE	102	The INI file was not found
PCMS_LOADINIFILE	103	Could not load the INI file
PCMS_LOADGEOCODE	104	Could not load location database
PCMS_LOADNETWORK	105	Could not load the network database
PCMS_MAXTRIPS	106	Too many open trips (limit of 8)
PCMS_INVALIDTRIP	107	Invalid trip ID
PCMS_INVALIDSERVER	108	Invalid server ID
PCMS_BADROOTDIR	109	Could not find RootDir setting in INI file
PCMS_BADMETANETDIR	110	Invalid PCMNetDir setting
PCMS_NOLICENSE	111	License infraction: too many users, or licenses not found
PCMS_TRIPNOTREADY	112	The trip is not ready to calculate
PCMS_INVALIDPLACE	113	Invalid place name (city, state not found)
PCMS_ROUTINGERROR	114	Calculation failed: portions of trip are invalid
PCMS_OPTERROR	115	Optimization failed: portions of the trip are invalid
PCMS_OPTHUB	116	Cannot optimize a trip in HUB mode
PCMS_OPT2STOPS	117	Not enough stops to optimize the trip
PCMS_OPT3STOPS	118	Not enough stops to optimize without

		changing destination
PCMS_NOTENOUGHSTOPS	119	Not enough stops to calculate the trip
PCMS_BADNETDIR	120	Bad network directory
PCMS_LOADGRIDNET	121	Error loading gridded network
PCMS_BADOPTIONDIR	122	Bad option directory
PCMS_DISCONNECTEDNET	123	Disconnected network
PCMS_NOTRUCKSTOP	124	Truck inaccessible stop
PCMS_INVALIDREGIONID	125	Invalid region ID
PCMS_CLOSINGERROR	126	Engine did not shut down properly
PCMS_NORTENGINE	127	Engine could not properly initialize internal routing component
PCMS_NODATASERVER	128	Engine could not properly initialize internal routing component
PCMS_SWITCHDIR	129	Connect could not switch the current working directory for the directory specified by 'DLLPath' in the INI file
PCMS_NOACTIVATE	135	Your product or add-on license has not yet been activated
PCMS_EXPIRED	136	Your license has expired
PCMS_BADDLLPATH	137	Could not find the directory specified by 'DLLPath' in the INI file.
PCMS_LOADLICDLL	138	Unable to load alk_license.dll or alk_license64.dll
PCMS_LOADGRIDDLL	139	Unable to load alk_grid.dll or alk_grid64.dll
PCMS_LOADDATADLL	140	Unable to load alk_data.dll or alk_data64.dll
PCMS_NETUSER_EXCEED	157	Too many users connecting to the network license, user count exceeded

PCMSLookup() Extended Error Codes Returned When easyMatch=5

ErrorDesc	Code	Explanation
Error: Postal code given but bad format	400	The data given as a postal code was not properly formatted and could not be parsed; see Appendix D for postal code formats by country.
Error: No city (or zip) tokens	410	Users entered only a state without a city or ZIP to accompany it
Error: This PO Box ZIP is not usable for routing	420	The given ZIP code cannot be used to generate a route
Error: State invalid for region	430	The given state is not a valid state within the current region
Error: No matching zip	440	No zip was found that matches the given

		postal code
Error: No matching city	445	No city was found that matches the given city name
Error: Zip doesn't match ST for given city,ST	450	No entries were found where the given zip resides in the specified state
Error: Zip doesn't match city for given city,ST	455	No entries were found where the given zip resides in the specified city
Error: No exact matches for city name	460	No results were found that exactly match the entered city. Partial or similar matches may have been found instead
Error: No zip code exists for input city,ST	470	The given city, ST entry does not have any valid ZIP codes associated with it
Error: No matching SPLC	475	No SPLC was found that matches the given code
Error: Not enough information provided to locate the requested stop	500	No valid ZIP, city, or state tokens could be parsed from the user's input
Warning: "There is a parity mismatch with the address range"	1000	Returned if address number is within the overall data range, but not in the odd or even range for this link
Warning: "The address provided had no number"	1010	Returned if the supplied address did not contain a number, e.g. "Smith Ave." instead of "10 Smith Ave."
Warning: "The street type does not match"	1030	Returned if the "best match" address has a different street type from the input address, i.e. "Smith St." vs. "Smith Rd."
Warning: "The street name is misspelled"	1040	Returned if the street was matched through soundex, but did not match the name on the data link, e.g. "Main" vs. "Maine"
Warning: "Street has multiple exact matches"	1050	Returned if the geocoder returned a confidence level of 100%, but more than one match
Warning: "No street name"	1060	Returned if there was no street name in the address
Warning: "Address number out of range"	1070	Returned if the street number received exceeds the highest address number contained in the data for that street
Warning: "Street is not within zip code specified"	1080	Returned if the ZIP code contained on the link does not match the street name specified
Warning: "The coordinates returned are for the zip centroid"	1090	Returned if the best match is the ZIP centroid (center point of the zip code area) for the address received

Jurisdictions in the United States, Canada, Mexico & Australia

(For country abbreviations in North America, see “North America” in the Country Codes for All Worldwide Regions section of this appendix)

States/Provinces in the United States & Canada

AL	Alabama
AK	Alaska
AB	Alberta
AZ	Arizona
AR	Arkansas
BC	British Columbia
CA	California
CO	Colorado
CT	Connecticut
DE	Delaware
DC	Dist. of Columbia
FL	Florida
GA	Georgia
ID	Idaho
IL	Illinois
IN	Indiana
IA	Iowa
KS	Kansas
KY	Kentucky
LA	Louisiana
ME	Maine
MB	Manitoba
MD	Maryland
MA	Massachusetts
MI	Michigan
MN	Minnesota
MS	Mississippi
MO	Missouri
MT	Montana

NE	Nebraska
NV	Nevada
NB	New Brunswick
NH	New Hampshire
NJ	New Jersey
NM	New Mexico
NY	New York
NL	Newfoundland & Labrador
NC	North Carolina
ND	North Dakota
NT	Northwest Territory
NS	Nova Scotia
NU*	Nunavut
OH	Ohio
OK	Oklahoma
ON	Ontario
OR	Oregon
PA	Pennsylvania
PE	Prince Edward Island
QC	Quebec
RI	Rhode Island
SK	Saskatchewan
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VT	Vermont
VA	Virginia
WA	Washington
WV	West Virginia
WI	Wisconsin
WY	Wyoming
YT	Yukon Territory

* The same FIPS code, NU, is used for Nicaragua and the province of Nunavut, Canada in the PC*MILER database.

Mexican Estados

AG	Aguascalientes
BJ	Baja California
BS	Baja California Sur
CP	Campeche
CH	Chiapas
CI	Chihuahua
CU	Coahuila de Zaragoza
CL	Colima
DF	Distrito Federal
DG	Durango
GJ	Guanajuato
GR	Guerrero
HG	Hidalgo
JA	Jalisco
EM	Mexico (Estado)
MH	Michoacan de Ocampo
MR	Morelos
NA	Nayarit
NX *	Nuevo Leon
OA	Oaxaca
PU	Puebla
QA	Queretaro Arteaga
QR	Quintana Roo
SL	San Luis Potosi
SI	Sinaloa
SO	Sonora
TA	Tabasco
TM	Tamaulipas
TL	Tlaxcala
VZ	Veracruz
YC	Yucatan
ZT	Zacatecas

* Please note that by default, “NX” is used for Nuevo Leon because the province of Newfoundland and Labrador in Canada already utilizes “NL” in the database. However, there is an option that sets “NL” as the abbreviation for Nuevo Leon: in the File application menu, select *Application Settings...* . In the *NL Abbreviation* drop-down, select *Use for Nuevo Leon* and click **Save**.

Australian Jurisdictions

When using the Streets Oceania address data set, use the state or territory abbreviations below instead of a country code to enter stops in Australia.

ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

Country Codes For All Worldwide Regions

Africa

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Algeria	AG	DZ	DZA	DZ	DZA
Angola	AO	AO	AGO	AO	AGO
Benin	BN	BJ	BEN	BJ	BEN
Botswana	BC	BW	BWA	BW	BWA
Burkina Faso	UV	BF	BFA	BF	BFA
Burundi	BY	BI	BDI	BI	BDI
Cameroon	CM	CM	CMR	CM	CMR
Cape Verde	CV	CV	CPV	CV	CPV
Central African Republic	CT	CF	CAF	CF	CAF
Chad	CD	TD	TCD	TD	TCD
Comoros	CN	KM	COM	KM	COM
Congo Democratic Republic (Kinshasa)	CG	CG	COD	CD	COD
Congo, Republic of the (Brazzaville)	CF	CD	COG	CG	COG
Djibouti	DJ	DJ	DJI	DJ	DJI
Egypt	EG	EG	EGY	EG	EGY
Equatorial Guinea	EK	GQ	GNQ	GQ	GNQ
Eritrea	ER	ER	ERI	ER	ERI
Ethiopia	ET	ET	ETH	ET	ETH
Gabon	GB	GA	GAB	GA	GAB
Gambia	GA	GM	GMB	GM	GMB
Ghana	GH	GH	GHA	GH	GHA
Guinea	GV	GN	GIN	GN	GIN
Guinea-Bissau	PU	GW	GNB	GW	GNB
Ivory Coast (Côte d'Ivoire)	IV	CI	CIV	CI	CIV
Kenya	KE	KE	KEN	KE	KEN

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Lesotho	LT	LS	LSO	LS	LSO
Liberia	LI	LR	LBR	LR	LBR
Libya	LY	LY	LBY	LY	LBY
Madagascar	MA	MG	MDG	MG	MDG
Malawi	MI	MW	MWI	MW	MWI
Mali	ML	ML	MLI	ML	MLI
Mauritania	MR	MR	MRT	MR	MRT
Mauritius	MP	MU	MUS	MU	MUS
Mayotte	MF	YT	MYT	YT	MYT
Morocco	MO	MA	MAR	MA	MAR
Mozambique	MZ	MZ	MOZ	MZ	MOZ
Namibia	WA	NA	NAM	NA	NAM
Niger	NG	NE	NER	NE	NER
Nigeria	NI	NG	NGA	NG	NGA
Reunion	RE	RE	REU	RE	REU
Rwanda	RW	RW	RWA	RW	RWA
Saint Helena	SH	SH	SHN	SH	SHN
Sao Tome and Principe	TP	ST	STP	ST	STP
Senegal	SG	SN	SEN	SN	SEN
Seychelles	SE	SC	SYC	SC	SYC
Sierra Leone	SL	SL	SLE	SL	SLE
Somalia	SO	SO	SOM	SO	SOM
South Africa	SF	ZA	ZAF	ZA	ZAF
South Sudan	OD	SD	SDW	SS	SSD
Sudan	SU	SD	SDN	SD	SDN
Swaziland	WZ	SZ	SWZ	SZ	SWZ
Tanzania	TZ	TZ	TZA	TZ	TZA
Togo	TO	TG	TGO	TG	TGO
Tunisia	TS	TN	TUN	TN	TUN
Uganda	UG	UG	UGA	UG	UGA
Western Sahara	WI	EH	ESH	EH	ESH
Zambia	ZA	ZM	ZMB	ZM	ZMB
Zimbabwe	ZI	ZW	ZWE	ZW	ZWE

Asia

Afghanistan	AF	AF	AFG	AF	AFG
Armenia	AM	AM	ARM	AM	ARM
Azerbaijan	AJ	AZ	AZE	AZ	AZE
Bangladesh	BG	BD	BGD	BD	BGD
Bhutan	BT	BT	BTN	BT	BTN
Brunei	BX	BN	BRN	BN	BRN
Burma (Myanmar)	BM	MM	MMR	MM	MMR

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Cambodia	CB	KH	KHM	KH	KHM
China	CH	CN	CHN	CN	CHN
Georgia	GG	GE	GEO	GE	GEO
Hong Kong	HK	HK	HKG	HK	HKG
India	IN	IN	IND	IN	IND
Indonesia	ID	ID	IDN	ID	IDN
Israel	IS	IL	ISR	IL	ISR
Japan	JA	JP	JPN	JP	JPN
Kazakhstan	KZ	KZ	KAZ	KZ	KAZ
Korea, North	KN	KP	PRK	KP	PRK
Korea, South	KS	KR	KOR	KR	KOR
Kuwait	KU	KW	KWT	KW	KWT
Kyrgyzstan	KG	KGZ	KGZ	KG	KGZ
Laos	LA	LA	LAO	LA	LAO
Macao	MC	MO	MAC	MO	MAC
Malaysia	MY	MY	MYS	MY	MYS
Maldives	MV	MV	MDV	MV	MDV
Mongolia	MG	MN	MNG	MN	MNG
Nepal	NP	NP	NPL	NP	NPL
Pakistan	PK	PK	PAK	PK	PAK
Papua New Guinea	PP	PG	PNG	PG	PNG
Philippines	RP	PH	PHL	PH	PHL
Singapore	SN	SG	SGP	SG	SGP
Sri Lanka	CE	LK	LKA	LK	LKA
Syria					
Taiwan	TW	TW	TWN	TW	TWN
Tajikistan	TI	TJ	TJK	TJ	TJK
Thailand	TH	TH	THA	TH	THA
Timor-Leste	TT	--	TMP	TL	TMP
Turkmenistan	TX	TM	TKM	TM	TKM
Uzbekistan	UZ	UZ	UZB	UZ	UZB
Vietnam	VM	VN	VNM	VN	VNM

Europe

Akrotiri	AX	--	--	QZ	XQZ
Albania	AL	AL	ALB	AL	ALB
Andorra	AN	AND	AND	AD	AND
Austria	AU	A	AUT	AT	AUT
Belarus	BO	BY	BLR	BY	BLR
Belgium	BE	B	BEL	BE	BEL
Bosnia and Herzegovina	BK	BIH	BIH	BA	BIH
Bulgaria	BU	BG	BGR	BG	BGR

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Croatia	HR	HR	HRV	HR	HRV
Cyprus	CY	CY	CYP	CY	CYP
Czech Republic	EZ	CZ	CZE	CZ	CZE
Denmark	DA	DK	DNK	DK	DNK
Dhekelia	DX	--	--	XD	XXD
Estonia	EN	EST	EST	EE	EST
Faroe Islands	FO	FO	FRO	FO	FRO
Finland	FI	FIN	FIN	FI	FIN
France	FR	FR	FRA	FR	FRA
Germany	GM	D	DEU	DE	DEU
Gibraltar	GI	GI	GIB	GI	GIB
Greece	GR	GR	GRC	GR	GRC
Guernsey	GK	--	--	GG	GGY
Hungary	HU	H	HUN	HU	HUN
Iceland	IC	IS	ISL	IS	ISL
Ireland	EI	IE	IRL	IE	IRL
Isle of Man	IM	--	IMN	IM	IMN
Italy	IT	I	ITA	IT	ITA
Jersey	JE	--	--	JE	JEY
Kosovo	KV	--	XKS	XK	XKS
Latvia	LG	LV	LVA	LV	LVA
Liechtenstein	LS	FL	LIE	LI	LIE
Lithuania	LH	LT	LTU	LT	LTU
Luxembourg	LU	L	LUX	LU	LUX
Macedonia	MK	MK	MKD	MK	MKD
Malta	MT	M	MLT	MT	MLT
Moldova	MD	MD	MDA	MD	MDA
Monaco	MN	MC	MCO	MC	MCO
Montenegro	MJ	MNE	MNE	ME	MNE
Netherlands	NL	NL	NLD	NL	NLD
Norway	NO	N	NOR	NO	NOR
Poland	PL	PL	POL	PL	POL
Portugal	PO	P	PRT	PT	PRT
Romania	RO	RO	ROU	RO	ROU
Russia	RS	RUS	RUS	RU	RUS
San Marino	SM	RSM	SMR	SM	SMR
Serbia	RI	SRB	SRB	RS	SRB
Slovakia	LO	SK	SVK	SK	SVK
Slovenia	SI	SLO	SVN	SI	SVN
Spain	SP	E	ESP	ES	ESP
Svalbard and Jan Mayen Islands	SV	SJ	SJM	XR	XSV
Sweden	SW	S	SWE	SE	SWE
Switzerland	SZ	CH	CHE	CH	CHE

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Turkey	TU	TR	TUR	TR	TUR
Ukraine	UP	UA	UKR	UA	UKR
United Kingdom	UK	GB	GBR	GB	GBR
Vatican City	VT	V	VAT	VA	VAT

Middle East

Bahrain	BA	BH	BHR	BH	BHR
Gaza Strip	GZ	--	XGZ	XG	XGZ
Iran	IR	IR	IRN	IR	IRN
Iraq	IZ	IQ	IRQ	IQ	IRQ
Israel	IS	IL	ISR	IL	ISR
Jordan	JO	JO	JOR	JO	JOR
Kuwait	KU	KW	KWT	KW	KWT
Lebanon	LE	LB	LBN	LB	LBN
Oman	MU	OM	OMN	OM	OMN
Palestinian Territory	--	PS	PSE	PS	PSE
Qatar	QA	QA	QAT	QA	QAT
Saudi Arabia	SA	SA	SAU	SA	SAU
Syria	SY	SY	SYR	SY	SYR
United Arab Emirates	AE	AE	ARE	AE	ARE
West Bank	WE	--	XWB	XW	XWB
Yemen	YM	YE	YEM	YE	YEM

North America

Bermuda	BD	BM	BMU	BM	BMU
Canada	CA	CA	CAN	CA	CAN
Greenland	GL	GL	GRL	GL	GRL
Guantanamo Bay	--	--	--	A2	AX2
Mexico	MX	MX	MEX	MX	MEX
Puerto Rico*	PR*	PR	PRI	PR	PRI
Saint Pierre and Miquelon	SB	PM	SPM	PM	SPM
United States	US	US	USA	US	USA
Virgin Islands, U.S.	VQ	VI	VIR	VI	VIR

* Note: "PR" for Puerto Rico is a USPS code, not a FIPS code.

Oceania

American Samoa	AQ	AS	ASM	AS	ASM
Australia*	AS	AU	AUS	AU	AUS
Cook Islands	CW	CK	COK	CK	COK
Fiji	FJ	FJ	FJI	FJ	FJI

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
French Polynesia	FP	PF	PYF	PJ	PYF
French Southern and Antarctic Islands	FS	TF	ATF	TF	ATF
Guam	GQ	GU	GUM	GU	GUM
Kiribati	KR	KI	KIR	KI	KIR
Marshall Islands	RM	MH	MHL	MH	MHL
Micronesia, Federated States of	FM	FM	FSM	FM	FSM
Midway Island	MQ	UM	--	QM	XMW
Nauru	NR	NR	NRU	NR	NRU
New Caledonia	NC	NC	NCL	NC	NCL
New Zealand	NZ	NZ	NZL	NZ	NZL
Niue	NE	NU	NIU	NU	NIU
Norfolk Island	NF	NF	NFK	NF	NFK
Northern Mariana Islands	CQ	MP	MNP	MP	MNP
Palau	PS	PW	PLW	PW	PLW
Pitcairn Islands	PC	PN	PCN	PN	PCN
Samoa (Western Samoa)	WS	WS	WSM	WS	WSM
Solomon Islands	BP	SB	SLB	SB	SLB
Tokelau	TL	TK	TKL	TK	TKL
Tonga	TN	TO	TON	TO	TON
Tuvalu	TV	TV	TUV	TV	TUV
Vanuatu	NH	VU	VUT	VU	VUT
Wake Island	WQ	WQ	XWK	QW	XWK
Wallis and Futuna	WF	WF	WLF	WF	WLF

* When using the Streets Oceania data set, use state or territory abbreviations instead of the country abbreviation for locations in Australia – see the Jurisdictions section at the beginning of this appendix.

South America

Anguilla	AV	AI	AIA	AI	AIA
Antigua and Barbuda	AC	AG	ATG	AG	ATG
Argentina	AR	AR	ARG	AR	ARG
Aruba	AA	AW	ABW	AW	ABW
Bahamas	BF	BS	BHS	BS	BHS
Barbados	BB	BB	BRB	BB	BRB
Belize	BH	BZ	BLZ	BZ	BLZ
Bolivia	BL	BO	BOL	BO	BOL
Bonaire, Sint Eustatius, Saba	--	--	--	BQ	BES
Brazil	BR	BR	BRA	BR	BRA
Caribbean Netherlands	NT	AN	BES	BQ	BES
Cayman Islands	CJ	KY	CYM	KY	CYM
Chile	CI	CL	CHL	CL	CHL
Colombia	CO	CO	COL	CO	COL

COUNTRY NAME	FIPS	ISO2	ISO3	GENC2	GENC3
Costa Rica	CS	CR	CRI	CR	CRI
Cuba	CU	CU	CUB	CU	CUB
Curacao	UC	--	--	CUW	CUW
Dominica	DO	DM	DMA	DM	DMA
Dominican Republic	DR	DO	DOM	DO	DOM
Ecuador	EC	EC	ECU	EC	ECU
El Salvador	ES	SV	SLV	SV	SLV
Falkland Islands (Islas Malvinas)	FK	FK	FLK	FK	FLK
French Guiana	FG	GF	GUF	GF	GUF
Grenada	GJ	GD	GRD	GD	GRD
Guadeloupe	GP	GP	GLP	GP	GLP
Guatemala	GT	GT	GTM	GT	GTM
Guyana	GY	GY	GUY	GY	GUY
Haiti	HA	HT	HTI	HT	HTI
Honduras	HO	HN	HND	HN	HND
Jamaica	JM	JM	JAM	JM	JAM
Martinique	MB	MQ	MTQ	MQ	MTQ
Montserrat	MH	MS	MSR	MS	MSR
Nicaragua*	NU*	NI	NIC	NI	NIC
Panama	PM	PA	PAN	PA	PAN
Paraguay	PA	PY	PRY	PY	PRY
Peru	PE	PE	PER	PE	PER
Saint Barthalemy	TB	--	BLM	BL	BLM
Saint Kitts and Nevis Islands	SC	KN	KNA	KN	KNA
Saint Lucia	ST	LC	LCA	LC	LCA
Saint Martin	RN	--	MAF	MF	MAF
Saint Vincent and the Grenadines	VC	VC	VCT	VC	VCT
Sint Maarten	NN	--	SXM	SX	SXM
Suriname	NS	SR	SUR	SR	SUR
Trinidad and Tobago	TD	TT	TTO	TT	TTO
Turks and Caicos Islands	TK	TC	TCA	TC	TCA
Uruguay	UY	UY	URY	UY	URY
Venezuela	VE	VE	VEN	VE	VEN
Virgin Islands, British	VI	VG	VGB	VG	VGB

* The same FIPS code, NU, is used for Nicaragua and the province of Nunavut, Canada in the PC*MILER database.

Official Sources

FIPS Country Codes:

<http://geonames.nga.mil/ggmagaz/geonames4.asp> and

<http://www.state.gov/s/inr/rls/4250.htm>

ISO2 Country Codes:

http://www.iso.org/iso/country_codes/iso_3166_code_lists/english_country_names_and_code_elements.htm and
http://www.iso.org/iso/english_country_names_and_code_elements#s

ISO 3 Country Codes:

<http://unstats.un.org/unsd/methods/m49/m49alpha.htm>

GENC2 and GENC3 Country Codes (Geopolitical Entities, Names and Codes):

Issued by the National Geospatial-Intelligence Agency

<https://www1.nga.mil/Pages/default.aspx>

Legend:

A = alphabetic (A,B,C,...Z)

N = numeric (0,1,2,...9)

North America

Canada

ANA NAN or ANANAN

Mexico, starting in Version 25

NNNNN

Puerto Rico, starting in Version 27.1

NNNNN

United States

NNNNN

South America

Brazil, starting in Version 24.1

NNNNN

Europe

United Kingdom

AANA N or AAN N or AANN N

or, starting in Version 24.1, AANAN or AANN or AANNN

or, starting in Version 25.1, AANA NAA or AANANAA or AAN NAA or

AANNAA or AANN NAA or AANNNAA

France, Germany, Italy, Vatican City, Spain, and Finland

NNNNN

Russian Federation, starting in Version 22.1

NNNNNN

Romania, starting in Version 23.1

NNNNNN

Estonia and Croatia, starting in Version 22.1

NNNNN

Lithuania, starting in Version 23.1

NNNNN

Andorra, starting in Version 26.1
AANNN

Monaco, starting in Version 26.1
NNNNN

Ukraine and Turkey, starting in Version 24.1
NNNNN

Netherlands, Belgium, Luxemburg, Austria, Switzerland, Liechtenstein,
Denmark, Norway and Hungary
NNNN

Latvia and Slovenia, starting in Version 22.1
NNNN

Bulgaria, starting in Version 23.1
NNNN

Iceland
NNN

Ireland (Dublin only)
NN (single digit postcodes N are not supported for input in PC*MILER)

Poland
NN-NNN
or, starting in Version 24.1: NNNNN

Portugal
NNNN
or, starting in Version 24.1: NNNN-NNN or NNNNNNN

San Marino, starting in Version 26.1
NNNNN

Sweden
NNN
or, starting in Version 22.1: NNN NN or NNNNN

Czech Republic and Slovakia
NNN NN or NNNNN

Greece, starting in Version 22.1
NNN NN or NNNNN

Africa

Lesotho, starting in Version 27.1
NNNN

South Africa, starting in Version 24.1
NNNN

Swaziland, starting in Version 27.1
ANNN

Asia

Japan, starting in Version 24.1
NNN-NNNN or NNNNNNN

India, starting in Version 24.1
NNNNNN

Indonesia, starting in Version 27.1
NNNNN

Malaysia, starting in Version 27.1
NNNNN

Taiwan, starting in Version 27.1
NNN

Thailand, starting in Version 27.1
NNNNN

Oceania

Australia, starting in Version 24.1
NNNN

New Zealand, starting in Version 27.1
NNNN

Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, and Palau, starting in Version 27.1
NNNNN

Please consult the following list of frequently asked questions before calling tech support.

To ensure you have installed PC*MILER and PC*MILER|Connect properly, run the Connect Tester which can be found by going to *Start > Programs > PC*MILER 28 > Connect Tester*. It should return a window with a version number, and a whole page of routing information. If an error is returned, review the solutions listed below. If you do not find an answer, contact technical support.

Running your application generates the error ‘Cannot find PCMSRV32.DLL’

This error is caused by an incorrect installation. To run, PC*MILER|Connect must find the dynamic link library PCMSRV32.DLL, DATASERVER.DLL, RTENGINE.DLL, PCMGCODE.DLL, PCMNET.DLL somewhere in your path. By default, it looks in your Windows folder.

⇒ **Solution:** Copy PCMSRV32.DLL to your Windows folder (usually C:\WINDOWS), or reinstall the minimal installation of PC*MILER|Connect. If you choose not to install PC*MILER|Connect in your Windows folder, that folder must be in your PATH.

“Pcmserver object not found”

The Server_Demo.asp that was installed with Connect is not working. This error is caused by an incorrect installation.

⇒ **Solution:** Try the following steps:

1. Check that the PC*MILER graphical user interface application was properly installed.
2. Check that the global.asa file creates the object.
3. Make sure the internet server was restarted after the addition of this demo.
4. Check that IIS properties for this project have proper permissions.
5. It is recommended that this application run in a separate memory space.

PC*MILER|Connect cannot find the INI file

PC*MILER|Connect cannot locate the INI file when your application calls `PCMSOpenServer()`.

- ⇒ **Solution:** The PC*MILER|Connect INI file (`PCMSERVE.INI`) must be installed in your Windows or WINNT folder, or reside in the same folder as the `PCMSRV32.DLL`.

Mileage discrepancies occur with PC*MILER|Streets data installed

PC*MILER|Streets local street data is installed with PC*MILER, and you come across mileage discrepancies using Connect. This can happen if PC*MILER is set to use an air distance from the midpoint of the nearest highway segment to the stop.

- ⇒ **Solution:** Open the `PCMSERVE.INI` file in your Windows or WINNT folder, and make sure the `UseStreets` setting is set to `TRUE` under `[Options]`. This will cause local street mileage to be included in route calculations.

```
UseStreets=TRUE
```

Making changes to the INI file has no effect

Making changes to the INI file has no effect, because the INI file is only re-read when PC*MILER|Connect is initially loaded into memory the first time. INI file settings are shared between all applications using PC*MILER|Connect.

- ⇒ **Solution:** Shut down all applications making use of PC*MILER|Connect, make any changes you want in the INI file, then restart your custom applications. Exit and restart Windows completely if you suspect that PC*MILER|Connect still wasn't unloaded. If your changes still do not take effect:

- * Search your disk for multiple copies of the INI file and DLL. Eliminate any duplicate copies.
- * Make sure that the format of the INI file is correct. See the examples in section 2.10 of this *User's Guide* for the correct format.

You have problems optimizing a list of stops

Optimizing a list of stops is a time consuming computation: the distance between each possible pair of stops is calculated, then the best ordering of stops is determined. However, if PC*MILER|Connect never returns control to your program while optimizing your stops, you may have run into some of the algorithm's limitations.

⇒ **Solution:** The error could be any of the following.

- * Check that you are not running in Hub mode: PC*MILER|Connect will not resequence stops in hub mode.
- * Make sure that there are at least 3 stops in your trip (4 if the destination is fixed – see below). Optimizing only two stops is not valid.
- * If you set the option `ChangeDest` to `FALSE` using `PCMSSetResequence()`, then you must have at least 4 stops in your trip, because if the origin and destination are fixed, then optimizing only one stop between them is invalid.

This software provides a way to interact with the PC*MILER Connectivity (DLL) Products running on Windows personal computers over a TCP/IP network from any other computer platform. All of the applicable functions of the Connectivity Products listed below are supported:

- PC*MILER|Connect
- PC*MILER|Streets-Connect
- PC*MILER|Hazmat-Connect
- DTOD|Connect

Important Changes to the Interface

PC*MILER|Connect is thread-safe. The TCP/IP Interface no longer disconnects automatically (if version 14 or higher software is used) and thus can support true simultaneous connections.

Hardware Requirements

- PC with a 1.5-2 GHz processor and TCP/IP Capability
- UNIX or other host with TCP/IP Capability
- Physical Connection (cable)
- An additional 2 MB hard disk space

Software Requirements

- Microsoft Windows® (XP, 7 or 8)
- PC*MILER or PC*MILER|Streets (Version 28)
- PC*MILER|Connect
- Client software on the UNIX host (sample PERL application provided)

1. Installation

The installation program copies the PC*MILER TCP/IP files into the default directory: **c:\ALK Technologies\PCMILER28\tcpip.**

PC*MILER|Connect must be installed prior to running the TCP/IP interface. The interface program (pcmsoc.exe) or the Windows Service (tcpvc.exe) requires a command-line parameter — a unique port number to which they will be listening. An optional parameter can be used to designate the thread number.

In addition, a **sample client script (simple.pl)** is included. It is intended to run on the client (UNIX, VMS, etc.) system. The examples are PERL scripts utilizing some features of PERL v.5 which must be installed in order to run the examples.

For **PC*MILER|Connect:**

```
pcmsoc PC_MILER 2001  
or  
pcmsoc PC_MILER 2001 NA
```

To set the thread number to 4 (default to 64):

```
pcmsoc PC_MILER 2001 4  
or  
pcmsoc PC_MILER 2001 NA 4
```

The server program comes with a **tester program: tcptest.exe** to connect to PC*MILER|Connect. This test program sends commands to the server engine that is running via TCP/IP. It includes a sample trip (**trip.txt**) to send to the engine.

2. Syntax *(do not include brackets)*

pcmsoc [product code] [port number] [dataset code]

(The parameters below are to be used as the Service's 'start' parameters. Dataset Code is optional. When the parameter is set, the dataset name takes precedence over the default region set in pcmsoc.ini.)

<u>Product Code</u>	<u>Product Name</u>
PC_MILER	= PC*MILER Connect
PC_MILERSTR	= PC*MILER Streets-Connect
PC_DTOD	= DTOD Connect
PC_ETA	= PC*MILER ETAServer
PC_HAZMAT	= PC*MILER Hazmat-Connect

<u>Dataset Code</u>	<u>Dataset Name</u>
NA	= North America
AF	= Africa
AS	= Asia
EU	= Europe
ME	= Middle East
OC	= Oceania
SA	= South America

3. Interface Specifics

The interface is completely text based. One can use a **telnet** application to test the installation and familiarize oneself with the interface. For example (assuming that the host PC has a 127.0.0.1 address):

For PC*MILER|Connect:

- telnet 127.0.0.1 [Port #]

When the connection is made the host PC (server) sends a prompt ending with the word **READY**. All of the routing functions listed in the corresponding Connectivity manuals are available. However, there are a few differences in the syntax. PC*MILER|Connect functions do not require (and will not accept) the ServerID parameter. The strings in the parameters must be quoted if they contain commas and/or parentheses.

Example:

```
# telnet 127.0.0.1 [Port #] <Enter>
ALK PCMILER/SERVER READY
pcmscalcdistance(08540, "boston, ma") <Enter>
2897
ALK PCMILER/SERVER READY
...
```

Functions that return values in the **user-supplied parameters** do not use them in the TCP/IP version. Instead, they return these values on a separate line.

Example:

```
# telnet 127.0.0.1 [Port #] <Enter>
ALK PCMILER SERVER READY
pcmscalcdistance3(08540, "Boston, ma", 1) <Enter>
2897 -- this is distance in tenths of miles
326 -- this is time in minutes
```

Syntax errors (wrong spelling of functions, missing parameters, etc.) will result in textual error messages.

Examples:

```
# telnet 127.0.0.1 2001 <Enter>
ALK PCMILER SERVER READY
pcmscalc3(08540, 1) <Enter>
TOO FEW ARGUMENTS
```

```
# telnet 127.0.0.1 2001 <Enter>
ALK PCMILER SERVER READY
pcmscalc3(08540, "Boston, ma", 1) <Enter>
NO SUCH FUNCTION
```

Errors in parameters (which cannot be caught by the parser) will result in error codes from the underlying PC*MILER|Connect DLL.

*/*COM function*/ AddPing (trip method), 128*
*/*COM function*/ AddStop (trip method), 118*
*/*COM function*/ AFLinks (trip method), 115*
*/*COM function*/ AFLinksClear (trip method), 115*
*/*COM function*/ AFLoad (server method), 104*
*/*COM function*/ AFLoadForRegion (server method), 105*
*/*COM function*/ AFSave (server method), 105*
*/*COM function*/ AFSaveForRegion (server method), 105*
*/*COM function*/ AlphaOrder (options property), 131*
*/*COM function*/ BordersOpen (options property), 130*
*/*COM function*/ BreakHours (options property), 131*
*/*COM function*/ BreakWaitHours (options property), 132*
*/*COM function*/ CalcDistance (server method), 107*
*/*COM function*/ CalcDistance2 (server method), 107*
*/*COM function*/ CalcDistance3 (server method), 108*
*/*COM function*/ CheckPlaceName (server method), 106*
*/*COM function*/ CityToLatLong (server method), 106*
*/*COM function*/ ClearStops (trip method), 120*
*/*COM function*/ CostPerLoadedMile (options property), 132*
*/*COM function*/ Count (double property), 147*
*/*COM function*/ Count (picklist property), 137*
*/*COM function*/ CustomMode (options property), 134*
*/*COM function*/ DefaultRegion (server property), 104*
*/*COM function*/ DeleteStop (trip method), 119*
*/*COM function*/ Dir (segment property), 143*
*/*COM function*/ DistanceToRoute (trip method), 122*
*/*COM function*/ Entry (double method), 147*
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