User's Guide

Canadian Geo*Data

MELISSA DATA®

Canadian
GEO*Data

User's Guide

Melissa Data Corporation

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Document Code: CADUSG
Revision: 131121.018
Last Revision: November 21, 2013

Dear Programmer,

I would like to take this opportunity to introduce you to Melissa Data Corp. Founded in 1985, Melissa Data provides data quality solutions, with emphasis on address and phone verification, postal encoding, and data enhancements.

We are a leading provider of cost-effective solutions for achieving the highest level of data quality for lifetime value. A powerful line of software, databases, components, and services afford our customers the flexibility to cleanse and update contact information using almost any language, platform, and media for point-of-entry or batch processing.

This online manual will guide you through the properties and methods of our easy-to-use programming tools. Your feedback is important to me, so please don't hesitate to email your comments or suggestions to ray@MelissaData.com.

I look forward to hearing from you.

Best Wishes,

Raymond F. Melissa
President

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Chapter 1

Introduction

*Canadian Geo*Data* is a Postal Code database in the fixed length (ASCII), FoxPro (dbf), and Access (mdb) formats. *Canadian Geo*Data* contains all the Postal Codes that are located within Canada. You can use this information to verify the addresses and organizations in your mailing list and to append additional data such as latitude and longitude.

The included databases are:

- *Canadian Geo*Data* Database
- Area Code Overlay Database

*Canadian Geo*Data* comes on a CD ROM.

Updates

*Canadian Geo*Data* is updated quarterly to ensure that the data you receive is as current as possible. Call Melissa Data at 1-800-800-6245 for more information on *Canadian Geo*Data*.

Hardware Requirements

In order to install *Canadian Geo*Data* you must have a PC with Windows XP or newer. Installing dBase or ASCII text databases requires at least 65 MB of available hard drive space. Installing Access databases requires at least 115 MB of available hard drive space.

FILES AND SIZES

1. Postal Database:

Description: Contains Area Code, Overlay Code, Municipality, Province, Postal Code, Latitude, Longitude, Daylight Savings Time (DST), and Time Zone information

File size: Approximately 766,800 records of 82 characters each

2. Overlay Database:

Description: Contains Area Code overlays.

File size: Approximately 3 records of 9 characters each.

INSTALLATION

The *Canadian Geo*Data* files are in a fixed-length (ASCII), FoxPro (dbf), and Access (mdb) format.

Windows Installation

1. Put the *Canadian Geo*Data* CD into your CD-ROM drive.
2. Click the **Start** button on the lower left corner of your screen and select **Run** from the pop-up menu that appears.
3. In the Run screen, click the **Browse** button and navigate to your CD-ROM drive by selecting it from the pull-down menu of the "Look in:" window.
4. Select the "Setup" file in the CD-ROM directory and click Open.
5. Click **OK** in the **Run** screen to launch the installation wizard.
6. When the installation wizard screen appears, click **Next** to begin installing *Canadian Geo*Data* on your computer.
7. Read the License Agreement and choose **Yes** to accept it and continue the installation or **No** to abort the install if you do not agree with the licensing conditions.
8. Click **Next** to choose the default installation location (C:\Program Files\Melissa Data\Canadian GeoData) or use Browse to select another directory for the *Canadian Geo*Data* files . Click Next to proceed.
9. Select your desired file types. The options are:
    - dBase
    - Microsoft Access®.
    - Fixed-Length ASCII (*.DAT files), with or without SQL Headers
10. Click **Next**, then click **Install**.
11. The *Canadian Geo*Data* files will be installed and registered. Click **Finish** to exit the installation wizard.

Installation for Non-Windows Users

If you are using, DOS, Linux, Solaris, another non-Windows operating system, or Windows version before XP, the uncompressed individual data files can be copied from their folders on the *Canadian Geo*Data* installation CD. To do so, create a directory on your hard disk called Canada and copy the files you need from the CD to that directory.

The uncompressed data files are located in the following directories:

- dBase — `\dbf`
- Microsoft Access — `\mdb`
- ASCII files — `\text`

Chapter 2

Record Layouts

*Canadian Geo*Data* contains 5 files and 3 file types. These files are composed of a series of records. Each record is made up of fields. The fields contained in each of these database files are detailed below.

Postal Database (canada.txt)

Field Name	Length	Type
PostalCode	6	Character
Municipality	30	Character (City)
Province	2	Character (State)
Latitude	9	Numeric (xx.xxxxxx)
Longitude	11	Numeric (-xxx.xxxxxx)
TimeZone	2	Character
DST	1	Character (Daylight Savings Time)
AreaCode	3	Character
Overlay	1	Character

Field Name	Length	Type
Filler	15	Character (Future Use)
CR + LF	2	Character
	82	

Postal Code

Postal Codes identify specific geographic delivery areas. The standard format for the Canadian Postal Code is A1A 1A1 (Although the space is removed for storage purposes, it is implied).

Municipality

The municipality (city), community, station or other name by which a Postal Code area is known.

Province

The Canada Post standard 2-letter province abbreviation.

Possible codes are:

AB – Alberta
BC – British Columbia
MB – Manitoba
NB – New Brunswick
NL – Newfoundland and Labrador
NS – Nova Scotia
NT – Northwest Territories
NU – Nunavut
ON – Ontario
PE – Prince Edward Island
QC – Quebec
SK – Saskatchewan
YT – Yukon

Latitude

The geographic coordinate of a point measured in degrees north or south of the equator.

Longitude

The geographic coordinate of a point measured in degrees east or west of the Greenwich meridian.

Area Code

The dominant 3-digit telephone area code associated with the Postal Code. The Overlay Code field will indicate if more than one Area Code is associated with a single Postal Code.

Time Zone

The number representing the hours past UTC Time Standard. All Melissa Data products express time zones in UTC (Coordinated Universal Time). The time zone in which the Postal Code resides.

The values are:

3A – Newfoundland Time (1/2 hour change)
4 – Atlantic
5 – Eastern
6 – Central
7 – Mountain
8 – Pacific

DST - Daylight Savings Time

Indicates if the Postal Code is affected by Daylight Savings Time.

The values are:

Y = uses daylight savings time
N = does not use daylight savings time

Overlay

Indicates if a Postal Code has more than one Area Code. If a letter code indicates there is an overlay, you must refer to the overlay file to locate alternative area codes.

The codes are:

Blank – Indicates that no overlay exists.
A – Vancouver, BC overlay (604/778)
B – Toronto, ON overlay (416/647)
C – Hamilton, ON overlay (905/289)
D to Z – future overlays

Filler

This location is reserved for future use.

CR + LF

The carriage return and line feed code.

OVERLAY DATABASE (OVERLAY.TXT)

Field Name	Length	Type
Parent	3	Character (Original AC)
Overlay	3	Character (Overlay AC)
Group	1	Character
CR + LF	2	Character
	9	

Parent

The original area code (listed in the "canada.txt" file).

Overlay

The alternate area code.

Group

A single letter matching the letter located in the "canada.txt" files overlay field.

The codes are:

A – Vancouver, BC overlay (604/778)
B – Toronto, ON overlay (416/647)
C – Hamilton, ON overlay (905/289)
D-Z future overlays

CR + LF

The carriage return and line feed code.

Appendix A

Distance Calculation

Any point on the earth's surface can be located by its latitude and longitude coordinates. Latitude is the angle above or below the equator in degrees. The equator is zero degrees, the north pole is north 90 degrees latitude, and the south pole is south 90 degrees latitude. The continental United States falls between 25 and 50 degrees north.

Longitude is the angle east or west of the Greenwich meridian. The continental United States is between 70 and 125 degrees west.

Approximate Solutions

One degree of latitude is equal to 69.1 miles. One degree of longitude is equal to 69.1 miles at the equator. North or south of the equator, 1 degree of longitude is a smaller distance. It's reduced by the cosine of the latitude. Dividing the latitude number by 57.3 converts it to radians.

DistLat = 69.1 * (Lat2-Lat1)

DistLong = 69.1 * (Lg2-Lg1) * cos(Lat1 / 57.3)

Dist = $(DistLat^2 + DistLong2)^{0.5}$

If you don't want to use the COS function, then a good approximate solution is:

DistLat = 69.1 * (Lat2-Lat1)

DistLg = 53 * (Lg2 - Lg1)

Dist = $(DistLat^2 + DistLong^2)^{0.5}$

EXACT SOLUTION

To calculate the exact distance between points requires spherical geometry.

The basic formula is:

D = 3959arccos[sin(Lat1)sin(Lat2)+
cos(Lat1)cos(Lat2)cos(Lg2-Lg1)]

The above formula has one major problem: most computer languages do not support the arc cosine function. Therefore a different form is necessary, one that uses the arc tangent function that most languages embrace.

D = $3959atn [(1-A^2)^{0.5} / A]$

where A is equal to:

A = sin(Lat1)sin(Lat2)+
cos(Lat1)cos(Lat2)cos(Lg2-Lg1)

Most computer languages compute the sine and cosine function with the angle given in radians. To convert degrees to radians, divide degrees by the constant 57.3 (180/pi).

In BASIC this would be programmed as follows:

C = 57.3

A = sin(Lat1/C)*sin(Lat2/C) + cos(Lat1/C)*
cos(Lat2/C)*cos(Lg2/C - Lg1/C)

D = 3959 * atn(SQR(1-A^2)/A)

Where:

D = distance in statue miles from the first to the second point.

C = degrees to radians constant 57.3.

Lat1 = latitude of the first point in degrees.

Lg1 = longitude of the first point in degrees.

Lat2 = latitude of the second point in degrees.

Lg2 = longitude of the second point in degrees.

NOTE: Dividing the latitude number by 57.3 converts it to radians.

Since all ZIP code points in the United States are north latitude and west longitude, there is no need to check the sines (positive and negative) of the latitudes and longitudes.

Some programming languages, such as dBASE II/III, do not have the functions of the sine, cosine and arc tangent. Also, the formulas given are time-consuming to calculate. A simpler but less accurate method is given here:

D = 69.1 * SQR [(LAT2-LAT1)2 +0.6* $(LG2-LG1)^2$]

Although this formula is not as accurate as the first great circle method, it will give good results for most applications. In Basic, it is written as follows:

D = 69.1 * SQR [(LAT2-LAT1)^2 +
.6*(LONG2-LONG1)^2]

In dBASE III it is written as follows:

```
D = 69.1 * SQRT [(LAT2-LAT1)^2 +
    0.6 *(LONG2-LONG1)^2]
```

To make using the database easier, the latitudes and longitudes are given in the decimal format instead of the degree, minute and second format. The latter would require the additional steps of converting seconds to fractions of a minute and then minutes to a fraction of a degree.

BEARING FORMULA

The bearing is the direction from the first point to the second point. It is expressed as an angle from north in degrees. Due north is a bearing of zero degrees, east is a bearing of 90 degrees, south is 180, and west is 270.

The bearing from the first point to the second is calculated with:

$$B = \text{Arc Tan} \frac{\sin(Lat1) * \sin(Lg2-Lg1)}{\sin(Lat2) * \cos(Lat1) - \cos(Lat2) * \sin(Lat1) * \cos(Lg2-Lg1)}$$

Since the ARCTAN function gives the angle in radians, it is necessary to convert B to degrees by multiplying by 57.3 (180/Pi).

To use this equation requires some special considerations. This example assumes that Lat1, Lat2, Lng1, Lng2 have been converted to radians.

Use the following steps:

```
N = sin(Lat1)*sin(Lng1-Lng2)

D = sin(Lat2)*cos(Lat1) –
    cos(Lat2)*sin(Lat1)*cos(Lng1-Lng2)

B = 57.3 * ARCTAN(N/D)


If (D > 0) then (B = 360+B)

If (D < 0) then (B = 180+B)

If (B < 0) then (B = 360 + B)
```

Where:

N is the Numerator.

D is the Denominator.

B is the Bearing.