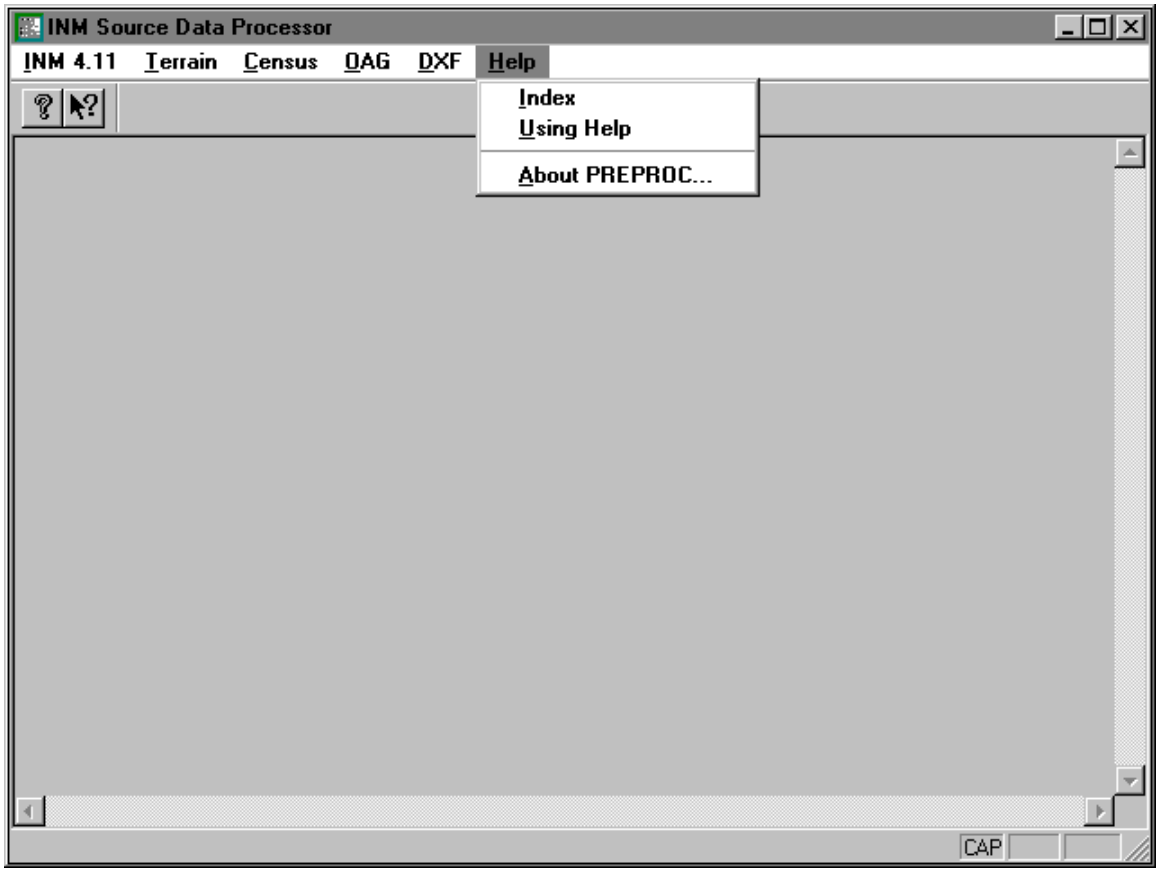


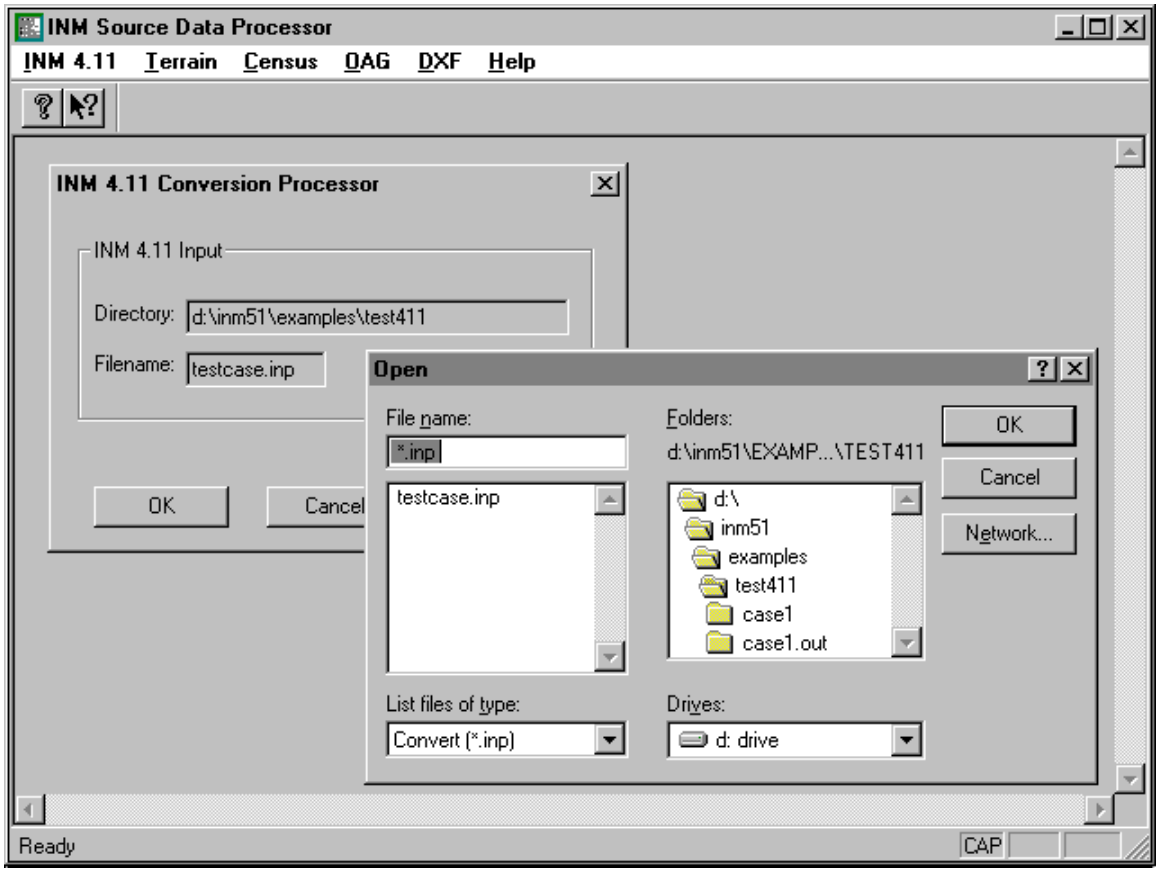
14. SOURCE DATA PROCESSING

The Source Data Processing program is used to process various kinds of source data, such as terrain and census data, so they can be adapted to your particular Study. Sometimes this task is called "preprocessing" because you are preparing data in advance for input into the model.

Five source data processing functions are contained in a separate Windows program PREPROC.EXE. These functions are documented in this chapter.

Two source data processing functions (Text-to-DBF and Text-to-Radar) have been moved to the File // Import function (see Section 3.5).

Later versions of INM will move the rest of the source data processing functions into the main INM Windows program.



14.1. INM 4.11 Input Data Conversion

Menu Item: INM4.11

Use the INM 4.11 Conversion Processor to create INM 5.1 Study files by processing a valid INM 4.11 input text file (the FOR02.DAT file).

14.1.1. Fix Up the Input File

Usually, valid input files from INM versions earlier than 4.11 will convert also, but you may need to make minor changes (for example, change INM 3.9 "GA3D" approach profiles to "STD3D" or "STD5D").

If you want latitude and longitude values in your INM 5.1 Study, you can put the geographic position of the origin of coordinates into the 4.11 input file before converting to 5.1. Or, you can fix the 5.1 data after conversion.

Use INM 4.11 keywords CODE, LATITUDE, and LONGITUDE, to set the airport identifier and coordinate origin position. For example, Boston-Logan airport would be:

```
SETUP:
TITLE <...>
AIRPORT <...>
CODE BOS
LATITUDE 42 21 20
LONGITUDE 71 00 48
```

If you do not do this, the airport identifier is set to XXX, and the Study lat/long is set to (0.0, 0.0). You can change these data after conversion by using the INM Setup // Study function.

A 3-character or 4-character airport code can be processed.

For south latitude and/or east longitude:

- Use an absolute-value, degree-minute-second format (like the example), which will be converted to positive north latitude and negative west longitude (INM 5.1 lat/long are in decimal degrees)
- After the conversion, use INM to change the sign of the latitude and/or longitude values by using the Setup // Study function.

14.1.2. Run the Converter

1) Create a directory where you want the INM 5.1 Study to reside, and put the INM 4.11 file in it.

2) Use the "Browse" button to select the path and file name of the INM 4.11 input file.

3) Press "OK". INM processes the input file, and writes INM 5.1 files into the same directory as the input file.

14.1.3. Fix Errors Using INPUT.OUT File

If there is a problem converting the input file, it will usually happen in the INPUT50 program. The error message looks like this:

```
INPUT50.EXE failed
Please review errors in file INPUT.OUT in 'C:\inm51\process\conv411'
ERROR, press <Enter>
```

This message means that the 4.11 input file can not be processed by the INM 4.11 INPUT50 program because errors were detected. Therefore, the file cannot be converted to INM 5.1.

To fix the problem, go to the INM51 \ PROCESS \ CONV411 subdirectory, and look in the INPUT.OUT text file. Usually, you will see warning and error messages that will help you find the problem.

Change the 4.11 input text file and try again.

The temporary DAT files that you see in the CONV411 subdirectory will be automatically erased when the 4.11 input file is successfully processed.

14.1.4. Check the CONV411.TXT File

After the 4.11 input file is converted, go to the Study directory (the directory where the input file resides) and look at the CONV411.TXT file. If there are no messages, the conversion went well.

A common warning message is the following example:

```
WARNING: S-76
  Static thrust = 2 is not valid for use in procedure steps
  Please change this parameter to static thrust per engine (pounds)
```

This means that during conversion, INM tried to assign a value to the static thrust parameter for the user-defined Aircraft "S-76", and could not create a reasonable value.

If you do not plan to use Procedure Steps for the named aircraft, you can ignore the warning.

A common error message is the following example:

```
ERROR: DC870  TGO-U1 17 -35C2
  Touch-and-go operations removed from study because
  user-defined profile points cannot be converted
  Operations: Day=0.1000 Eve=0.0000 Night=0.0000
```

This means that the indicated touch-and-go operation was not converted because it employed user-defined takeoff and/or approach profiles points instead of standard profiles.

The operation was removed from the Study. You can use the methods described in Acft // Profile Points to create the required TGO and CIR profiles, and put the operation back in.

INM converts 4.11 touch-and-go operations if:

- the aircraft is a standard 4.11 aircraft (not user-defined)

- the aircraft has performance coefficients for both approach and departure (most 4.11 aircraft do)
- the operation uses a standard takeoff and a standard approach (meaning, no user-defined profile points)

If the above conditions are met, INM converts a 4.11 touch-and-go operation as follows:

- 80% is assigned to a TGO-S1 operation (see Section 8.9.16)
- 20% is assigned to a CIR-S1 operation

This means that for a touch-and-go sequence:

- there is one departure into the pattern (starting from zero speed)
- there are four touch-and-goes
- there is one approach from the pattern (ending at taxi speed).

14.1.5. Check the New Study

Open the new Study and examine it.

1) Use the Setup // Study function to change the airport identifier, latitude, longitude, and/or elevation parameters, if you wish.

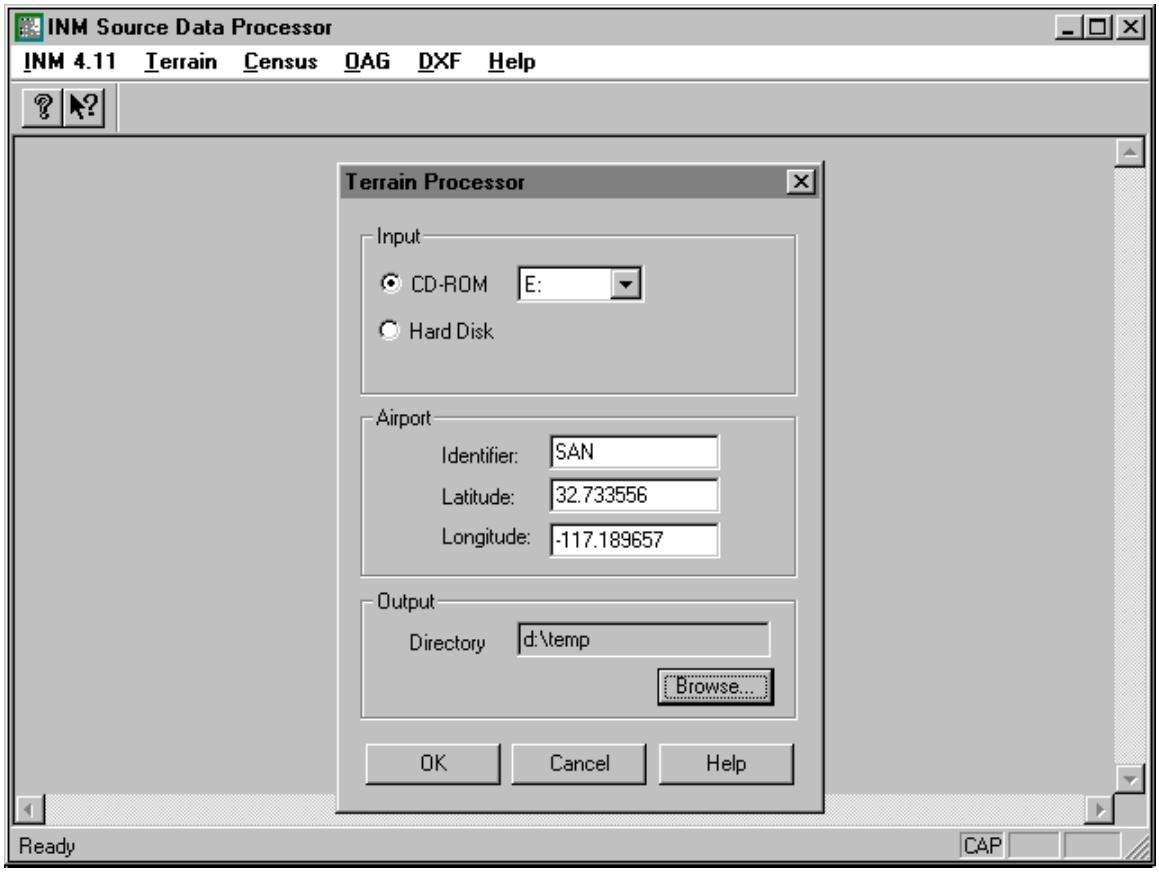
2) Check the list of Aircraft. If any has "User data" showing on the status bar, you need to check, and perhaps provide input data for parameters, such as the static thrust parameter.

3) Check the conversion of touch-and-go operations, and add TGO and CIR profiles and flight operations for those 4.11 touch-and-go operations that did not convert.

4) Check the Cases and their Run Options. INM creates Cases based on the CONTOUR keyword in the 4.11 input file, and it attempts to set run options too. Before you make a run, you should review the options to see if they are set correctly.

5) Check the time-above threshold value. INM 5.1 does not convert multiple time-above thresholds, so you need to create new Cases to study varying time-above thresholds.

Appendix K shows the results of converting the INM 4.11 TESTCASE.INP file.



14.2. Terrain Elevation Data

Menu Item: Terrain

The Terrain Processor:

- Creates a binary file of terrain elevation data used in computing noise.
- Creates a binary file of terrain contours used as an overlay in the output graphics window.

You can purchase a CD-ROM containing 3CD files of U.S. terrain elevations (see Appendix A).

To run the Terrain Processor:

1) Select the input device that you are using: "CD-ROM" or "Hard Disk".

2) If CD-ROM, select the drive letter from the drop-down box. If hard disk, select the full path name using the "Browse" function.

3) Input an airport identifier. This identifier is used as a file name and you may want to make it the same as your Study name.

4) Input the airport lat/long in decimal degrees (north is positive and west is negative). Make sure that the position is the same as used to set up the Study coordinate system, or else the terrain contours will not line up with the other output graphic layers.

5) Use the "Browse" function to select the full path name to the directory where the terrain elevation and terrain contour files are to be written.

When you press "OK", the Terrain Processor reads four 3CD source files and produces two output files, which are written to the output directory:

- The INM-3CD file (for example, SFO.3CD) contains a 1201-by-1201 grid of elevation data, covering a 1-by-1 degree area centered on the airport. The INM-3CD format is the same as the source-data 3CD format, except that some extra information is added to the end of the file (see Appendix N). The INM-3CD file is used by the COMP50 module to calculate noise.

- The _TERRAIN.BIN file contains terrain contour data, which are used for display in an Output Graphics window.

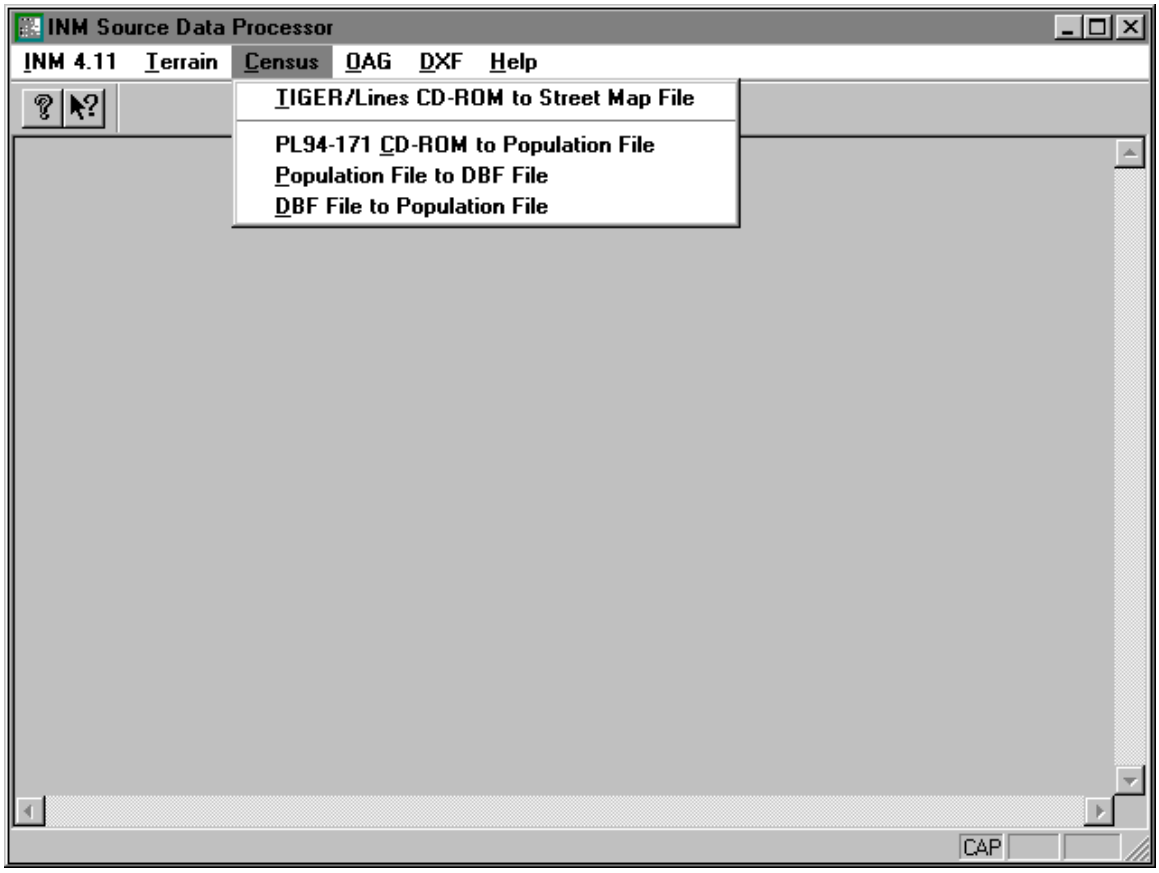
In addition, the Terrain Processor leaves three intermediate files in the INM51 \ PROCESS \ TERRAIN subdirectory. You can delete these files if you don't want to use them.

- BATCH.CFG is a NMPLOT configuration file. If you want to run NMPLOT in interactive mode, use this file to configure the terrain contours.

- TERRAIN.GRD is the input file for NMPLOT. Use it to look at terrain contours inside of NMPLOT. From NMPLOT, you can save the terrain contours to a DXF or HPGL file.

- CONTOURS.DAT is the file produced by NMPLOT. Use it inside of INM to create terrain lat/long data by doing the following: (1) copy this file to an Output subdirectory; (2) use the Output // Contour Points function to create a CONR_PTS file of terrain data. Then, use the CONR_PTS DBF file in a GIS program, or export it to a text file. (Sometimes there are more than 16,000 records, and INM cannot display all of them; however, all the records are in the CONR_PTS.DBF file.)

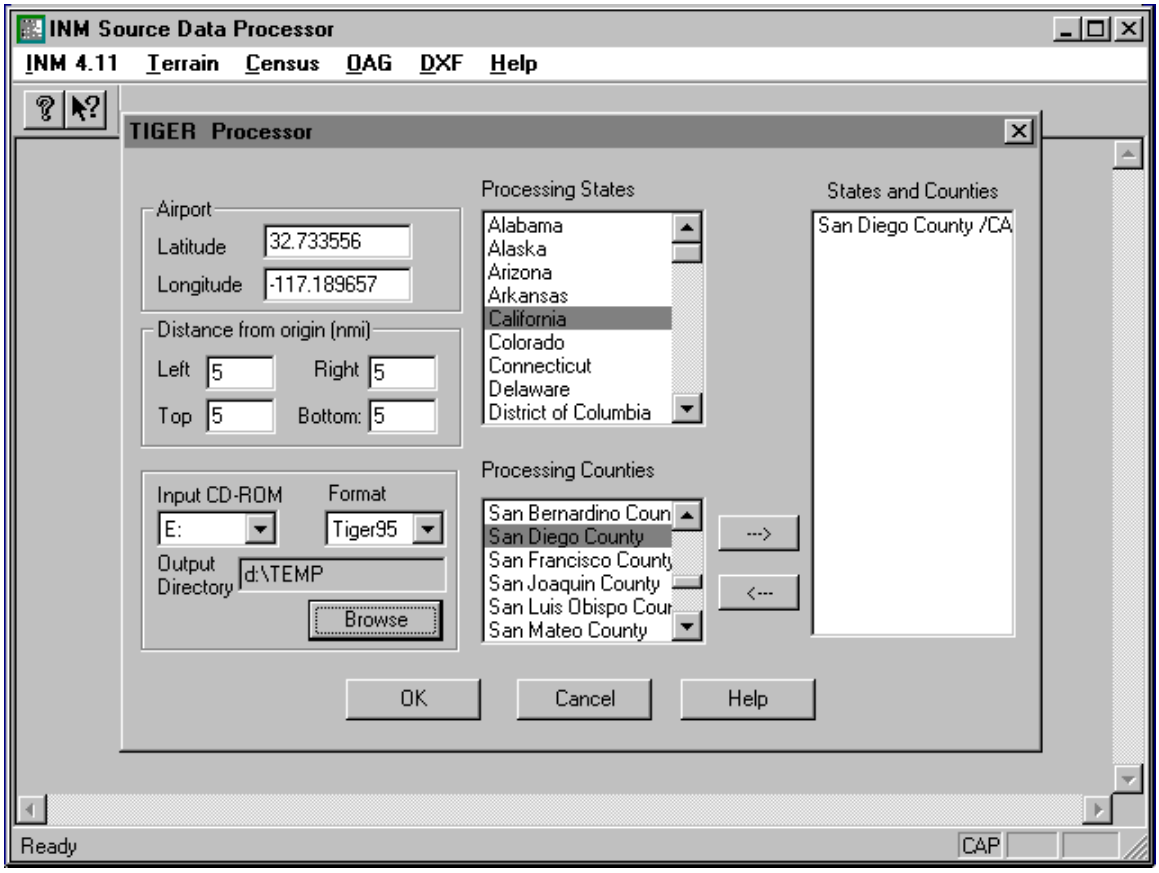
Users outside of the U.S. can directly create an INM-3CD file of elevation data by using the file format described in Appendix N. Select the directory where the file resides, and run the Terrain Processor. If the airport lat/long correlates to the file-encoded SE corner lat/long, the Terrain Processor uses the INM-3CD file to create the _TERRAIN.BIN graphics file.



14.3. Census Data

The Census Data menu contain four functions:

1) process street data
2) process population data
3) convert population binary file to a DBF file
4) convert a population DBF file to a binary file.



14.3.1. TIGER/Line CD-ROM to Street Map Files

Menu Item: TIGER CD-ROM to Street Map

This function reads data from a TIGER/Line CD-ROM and creates two related binary files: _TIGER.BIN and _TIGER.IDX. If INM finds these two files in a Study directory, it can display streets, highways, hydrographic features, civil boundaries, etc.

You can purchase a TIGER/Line CD-ROM through the U.S. Bureau of the Census (see Appendix A).

To run the TIGER Processor:

1) Input the airport lat/long in decimal degrees (north is positive and west is negative). Make sure that the position is the same as for the origin of coordinates in your Study. If the two origins are different, the street map layer will not line up with the noise contours

2) Input the size of a rectangular box containing the streets. A large box will contain a large amount of data and the resulting file will take longer to load into INM when displaying streets. The dimensions of the box are left/right and top/bottom from the origin, so that the center of the box does not have to be on the origin. For example, Left = 10 nmi, Right = 20 nmi, Top = 10 nmi, and Bottom = 10 nmi, makes a box that is 30 nmi wide and 20 nmi high, with the origin offset to the left of the center of the box by 5 nmi.

3) Select the drive letter for the CD-ROM drive.

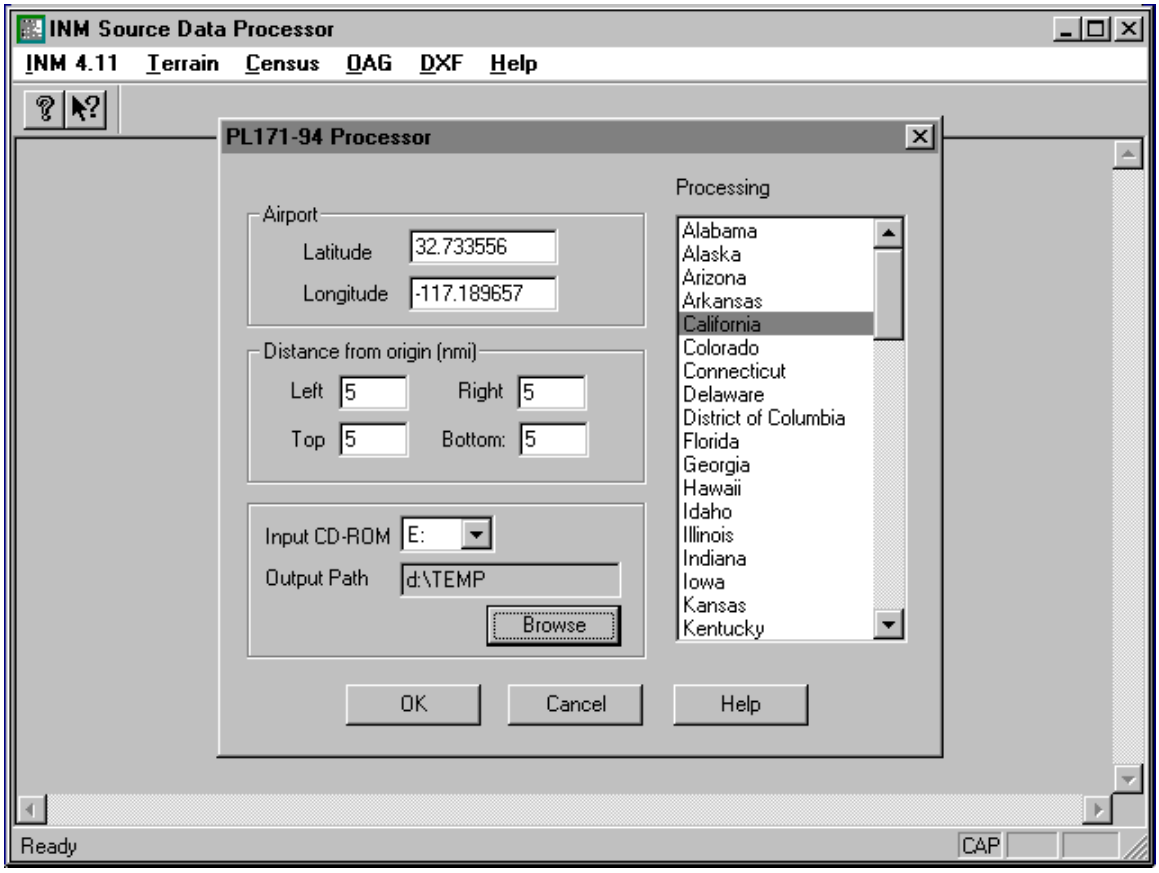
4) Select the TIGER CD-ROM format (1990, 1992, 1994, 1995).

5) Use the "Browse" button to select the name of the directory where you want the output files written.

6) Select the U.S. state in which your airport resides. If your Study is on a border, you can process multiple states. The program will ask you to input the appropriate CD-ROM if the states are not on the same disk.

7) For each state, select one or more counties by highlighting them and using the arrow button.

8) After the county (or counties) is displayed in the right-hand list box, press "OK" to start the TIGER Processor.



14.3.2. PL94-171 CD-ROM to Population File

Menu Item: PL94-171 CD-ROM to Population

This function reads data from a PL94-171 CD-ROM and creates a _CP.BIN file containing binary data. Each population record contains:

1) population point identifier (defined in Appendix O)
2) latitude and longitude of the center of the block
3) number of people living in the block
4) area of the block.

INM uses the _CP.BIN file to display population points and to calculate the population inside noise contours. The _CP.BIN file must be in your Study directory before INM can display and process population-point information.

You can purchase a PL94-171 CD-ROM through the U.S. Bureau of the Census (see Appendix A).

To use the Population Processor:

1) Input the airport lat/long in decimal degrees (north is positive and west is negative). Make sure that the position is the same as for the origin of coordinates in your Study. If the two origins are different, the population points will not line up with the noise contours.

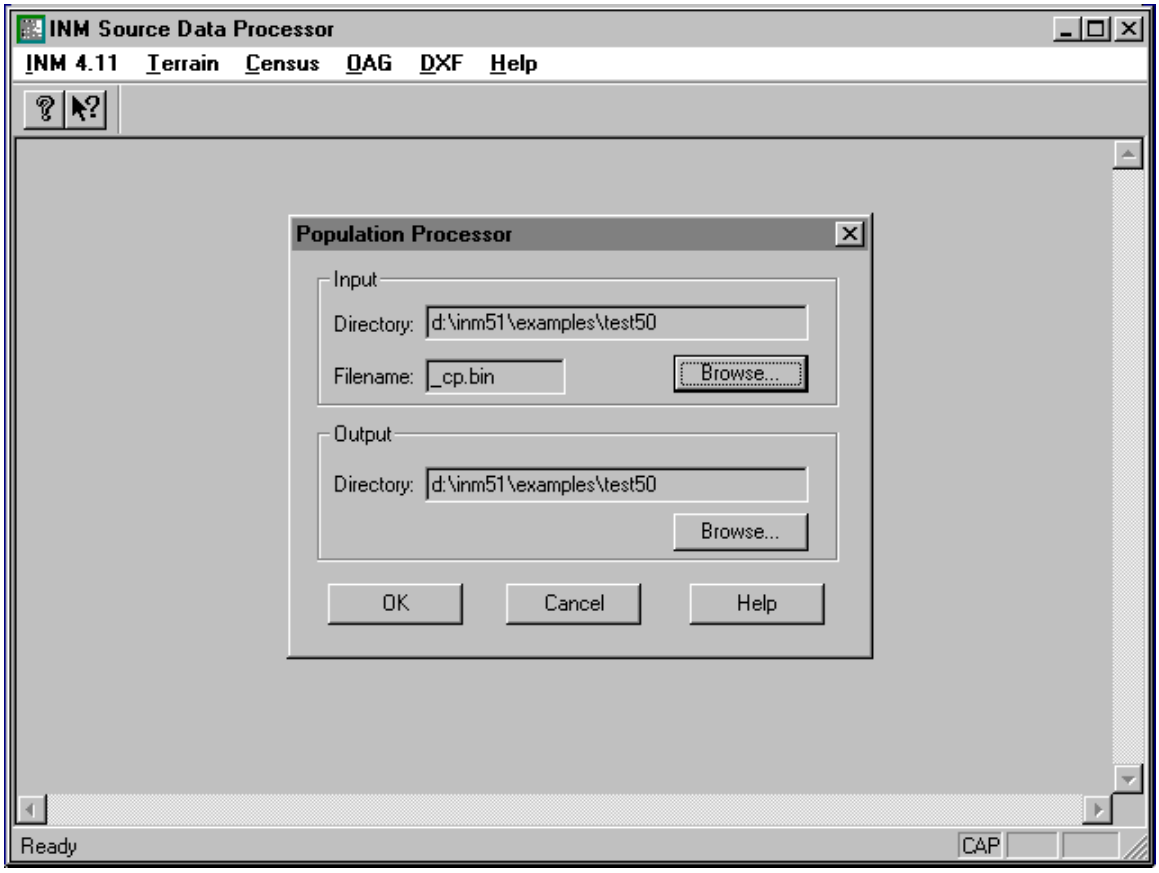
2) Input the size of a rectangular box containing the streets. If you want the population points to match the streets, use the same parameters as used in the TIGER Processor.

3) Select the drive letter for the CD-ROM drive.

4) Use the "Browse" button to select the name of the directory where you want the output file written. If a _CP.BIN file already exists in this directory, the population data will be appended to the file.

5) Select the U.S. state in which your airport resides. If your Study is on a border, you can select multiple states. The program will ask you input the appropriate CD-ROM if the states are not on the same disk.

6) Press "OK" to start the Population Processor.



14.3.3. Convert Population File to DBF File

Menu Item: Population to DBF

This function creates a POP_PTS.DBF file using binary data in a _CP.BIN file.

There are two reasons why you may want to do this:

- You must have a POP_PTS file in your Study directory if you want INM to calculate noise values at population points.
- You may want to edit population records.

If you do edit the POP_PTS file, you must convert it back to the binary format using the "DBF to Population" function (see below). INM will use your new binary file when computing population inside contours.

To make a POP_PTS file:

1) Use the first "Browse" button to select the directory where the _CP.BIN file resides, and then select the file.

2) Use the second "Browse" button to select the directory where you want the POP_PTS file to be written.

3) Press "OK" to start the conversion process.

INM uses the POP_PTS file to compute X,Y coordinates for the noise computation module, so that it can calculate the noise level at each population point.

INM writes noise calculation results into the POP_NOIS DBF file by extracting the POINT_ID field in POP_PTS and reproducing it in POP_NOIS.

Thus, you have two related files:
1) POP_PTS, with lat/long and population counts
2) POP_NOIS, with noise levels.

They are related across the POINT_ID field. You may have many Output POP_NOIS files related to one POP_PTS file. You can use a DBMS to "join" two related files.

It is very important that you do not change the POP_PTS file while INM is computing noise because INM does not actually copy the POINT_IDs to the noise computation module. Instead INM relies on the order of the computed X,Y points being the same as the order of the POP_PTS records from which they were extracted. If the record order is changed, noise levels will be assigned to the wrong POINT_IDs.

14.3.4. Convert DBF File to Population File

Menu Item: DBF to Population

This function creates a _CP.BIN binary file using data in a POP_PTS file. INM uses the _CP.BIN file to display population points and to calculate the population inside of noise contours.

Use this function if you:

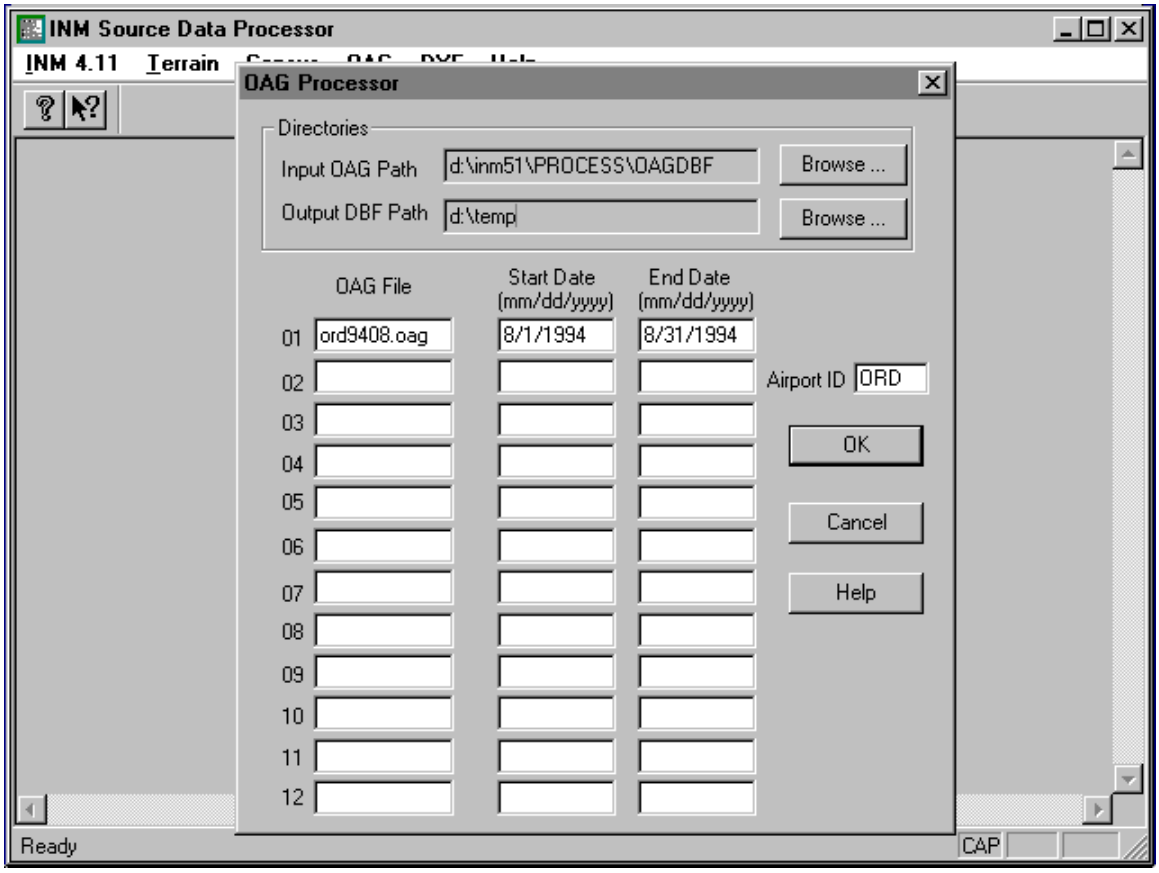
- Change the POP_PTS file produced by the "Population to DBF" function.
- Create your own POP_PTS file by using a DBMS program and the DBF header definition in the SYS_DBF subdirectory.

To make a CP.BIN file:

1) Use the first "Browse" button to select the directory where the POP_PTS.DBF file resides, and then select the file.

2) Use the second "Browse" button to select the directory where you want the _CP.BIN file to be written.

3) Press "OK" to start the conversion process.



14.4. OAG Flight Data

Menu Item: OAG

The OAG Processor is used to convert flight event data from the Official Airline Guides (OAG) format to a DBF format for use in INM.

The OAG data must be in the "Basic Chronological Diskette" format that provides one month's worth of flight data for a single airport. You can purchase data from OAG (see Appendix A). A technical description of the format is provided in Appendix P.

The OAG Processor can process up to twelve months of data for a single airport. The flight operation data are averaged to produce an average day over the specified time interval.

14.4.1. Run the OAG Processor

1) Use the first "Browse" button to select the directory where the OAG files reside.

2) Use the second "Browse" button to select where you want the output data to be written.

3) Input the names of the OAG files.

4) For each file, specify a start date and an end date. For a single day of data, these two dates are the same. For example, to process data in a file covering July 1994, for the days of July 7 through July 31, you type in "7/7/1994" for the start date, and "7/31/1994" for the end date.

5) Input an airport identifier. This must be the same as the three-character code of the airport in the OAG file. For example, you type "ORD" if you have OAG files for Chicago O'Hare.

6) Press "OK" to start the OAG Processor.

Upon successful completion of the program, a message box appears, notifying you that OAG processing is completed. Click on the "OK" button to return to the Source Data Processor main menu.

14.4.2. OAG Processor Details

The OAG Processor reads four DBF files, which are distributed with INM:

- PROCESS \ OAGDBF \ OAG_APRT.DBF file provides latitudes and longitudes for airports. The OAG Processor uses these coordinates to calculate the distances between two airports, obtaining a "stage length" number. If an airport, which is in the OAG, is not in the OAG_APRT file, the flight is discarded, and a warning message is written to the log file.

- PROCESS \ OAGDBF \ OAG_SUB.DBF file describes how OAG aircraft equipment codes are mapped to INM aircraft identifiers. If there is an OAG equipment code that is not provided in the OAG_SUB file, the flight is excluded, and a warning messages is written to the log file. You can add to or change the OAG_SUB file to improve equipment-code mapping for your particular Study.

- SYS_DATA \ PROFILE.DBF file determines the maximum stage length of a standard aircraft. If INM does not support a stage length implied in the OAG, a warning message is written to the log file. You can add

these flights to your Study later, but you cannot change the INM standard profile database.

- SYS_DBF \ OPS_APRT.DBF file is used to obtain the format of the output file, which is also called OPS_APRT. It is written into the output directory that you specified.

In addition to creating the OPS_APRT file, the OAG Processor produces a log file (for example, OAG_LOG.ORD), which contains statistical information on the converted flight data, as well as a list of warnings for OAG flight data that could not be converted.

If the log file currently exists in the output directory, the program appends information to the end of an existing file. You should delete current versions of the log file and OPS_APRT file, if they exist, before running the OAG processor.

14.4.3. Adjusting the Computed Airport Operations

After creating the OPS_APRT file, you need to edit this file by using either INM or a DBMS program.

This editing process includes:

- Adding missing flights that are identified in the OAG log file.
- Deleting known "code-share" flights.
- Adding non-OAG flights.

The OAG LOG file contains:

1) a section listing airports not found in the SYS_APRT.DBF file,

2) a section listing the distance to origin/destination airports and the corresponding INM stage length numbers,

3) a warning section listing missing airports, missing equipment types, and flights with incompatible stage lengths, and

4) a section listing all the types of OAG equipment, the OAG average daily operation frequency (Freq1), the resultant INM frequency (Freq2), the equivalent INM aircraft identifier, and the stage length.

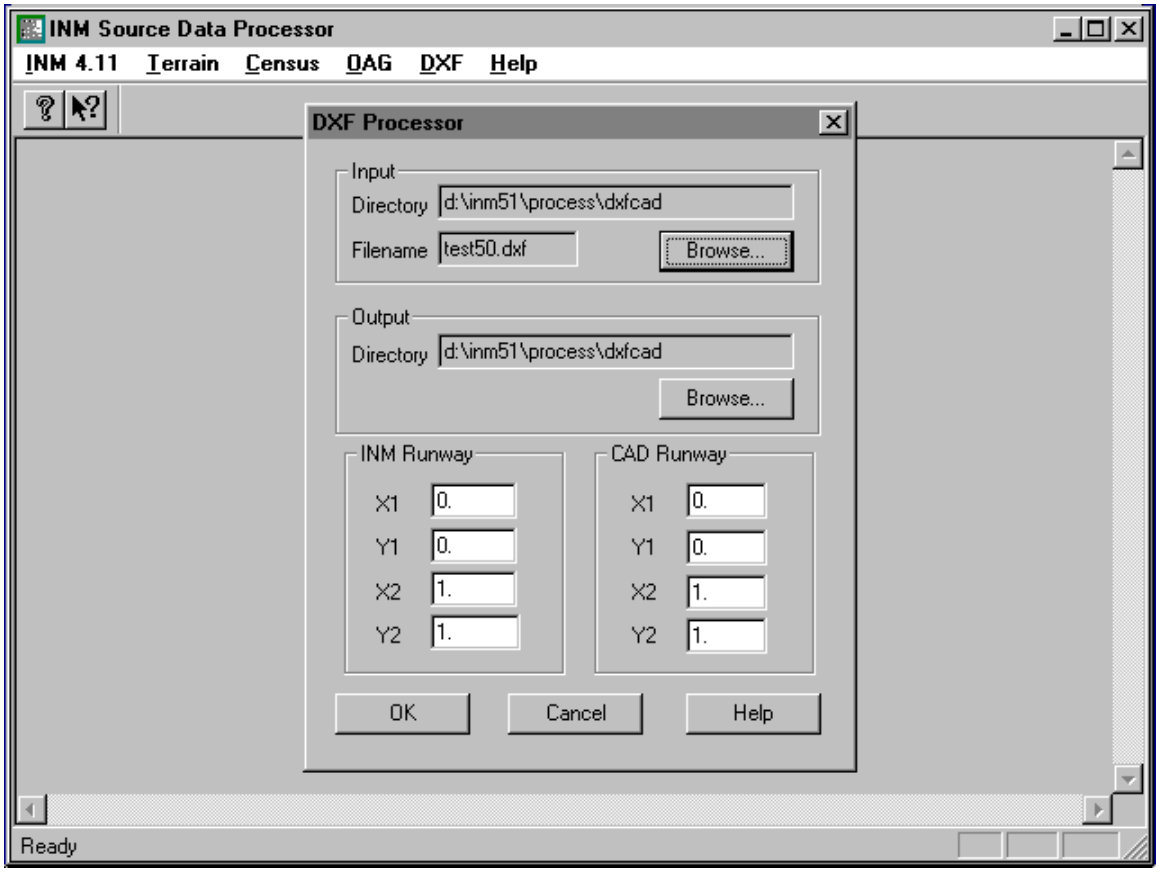
If there are warnings, you need to fix them:

- Add missing airports to the SYS_APRT file, add new OAG types to the OAG_SUB file, and run the OAG Processor again.

- If there are incompatible stage lengths (usually because the computed distance is slightly longer than the INM stage-length definition), you need to manually add these flights back into the OPS_APRT file. Use the next lower stage number.

Some OAG flights are duplicates of others; this situation is caused by the practice of airline "code sharing". Somehow you need to identify duplicate flights and decrease the number of flight operations in the OPS_APRT file.

You need to add unscheduled commercial flights, general aviation flights, and military flights because they are not represented in the OAG.



14.5. Airport Drawing

Menu Item: DXF

Use the DXF Processor to bring an airport drawing into INM:

- The input file must be in the "DXF" format. Most CAD application programs provide a DXF-file export option. AutoCAD R13 format can be converted, except for line-arc-line graphical objects.

- The output file is given the same name as the DXF file, but with a "CAD" extension. INM looks for CAD files in the Study-level directory. If there are any, INM can display the drawings in both Input and Output Graphics windows.

Try to use a simple drawing of the runways, taxiways, and buildings — not a complicated engineering drawing. A simple drawing makes the size of the DXF file small, keeps the converted file small, and allows INM to display the airport overlay quickly. A DXF file that is greater than one megabyte is probably too large.

To make a CAD file:

1) In AutoCAD®, load your drawing, and go to the Data // Drawing Limits function. Write down the X,Y coordinates of two runway ends, in whatever units that are presented. For example, runway end 05L is at (376071, 176139) and 23R is at (377738, 177418).

2) In INM, create runways using the Setup // Study dialog box or the Runway Ends window. Write down the X,Y coordinates in nautical miles. For example, runway end 05L is at (0.0, 0.0) and 23R is at (0.7451, 0.6252).

3) In PREPROC, use the first "Browse" button to select the directory where the DXF file resides, and then select the file.

4) Use the second "Browse" button to select the directory where you want the CAD file to be written. Use the Study directory.

5) Fill out the bottom part of the form with the X,Y data that you collected. For example:

INM Runway		DXF Runway	
X1	0.0	X1	376071
Y1	0.0	Y1	176139
X2	0.7451	X2	377738
Y2	0.6252	Y2	177418

6) Press "OK" to start the conversion process.

When the DXF Processor is finished converting your DXF file, go back to INM and look at the result in either the Input or Output Graphics window. Make sure that the new CAD file is the Study directory.

The CAD drawing should match the INM runway system almost exactly.

If not, you may have made a mistake in the X,Y data, or the DXF file has complex structures that are not being properly converted, or your airport drawing may be distorted. (The TEST50 airport drawing is slightly distorted, and this is the reason that runways 10-28 are off.)