Chapter 6 *Advanced Topics*

In this chapter of the user's guide, the following topics are discussed:

- a description of how data is grouped for use in estimating emissions,
- a description of the required and optional input data file packets,
- a description of all input data files,
- information on how to incorporate local data by editing input tables, and
- steps involved in running multiple model runs in a batch file.

INTRODUCTION

The NONROAD model includes standard data files and tables that allow you to easily estimate the emissions from a wide variety of nonroad equipment and vehicles for any region of the country. As discussed in Chapters 3 and 4, you can quickly set up an option file specifying the parameters that are applicable to your modeling scenario using default data.

The NONROAD model was also designed, however, to provide you with the flexibility to create accurate emissions estimates based on locally specific data that may be available to you. For example, you may have developed more up-to-date information for equipment populations in a particular region than the default data available in the model. Similarly, you might want to estimate the emissions for a particular category of nonroad equipment at a subcounty regional level. The

Note: While editing input files lets you adapt the model to specific local conditions, it also lets you change the model in ways that lead to invalid results. In particular, the interdependency between some inputs means that changes can affect outputs in surprising ways.

The NONROAD model is designed to warn you about the most obvious input errors, but avoiding more subtle, but serious, errors requires understanding how the core model works. The notes in this chapter offer guidance, but EPA's technical support documents provide more detail. If you have questions, e-mail EPA nonroad modeling staff at nonroad@epamail.epa.gov

steps involved in modifying the default data input files and tables are provided in this chapter of the User's Guide. An example is provided for modifying inputs for subcounty runs.

HOW DATA IS GROUPED IN THE NONROAD MODEL

As discussed briefly in Chapter 4, information used by the NONROAD model for estimating emissions, including user-specified options, data files, and data tables, are input into the core model through an option file. The information contained in each option file is separated into "packets" based on common information. For example, all data files related to the population of equipment throughout a state is grouped in a single packet as is information related to the period of time for which you are interested in estimating emissions.

When viewing an option file through a text editor, the keyword that identifies a packet is surrounded by forward slashes ("/") and can appear in upper case, lower case, or mixed case. For example, the packet identifier for all of the data files related to the population of equipment is /POP FILES/; for the period of time that you are interested in modeling, /PERIOD/. To designate the end, or terminator, of a packet, the keyword END is used, also surrounded by forward slashes (i.e., /END/). The /POP FILES/ packet in an option file can be seen in Figure 6-1.

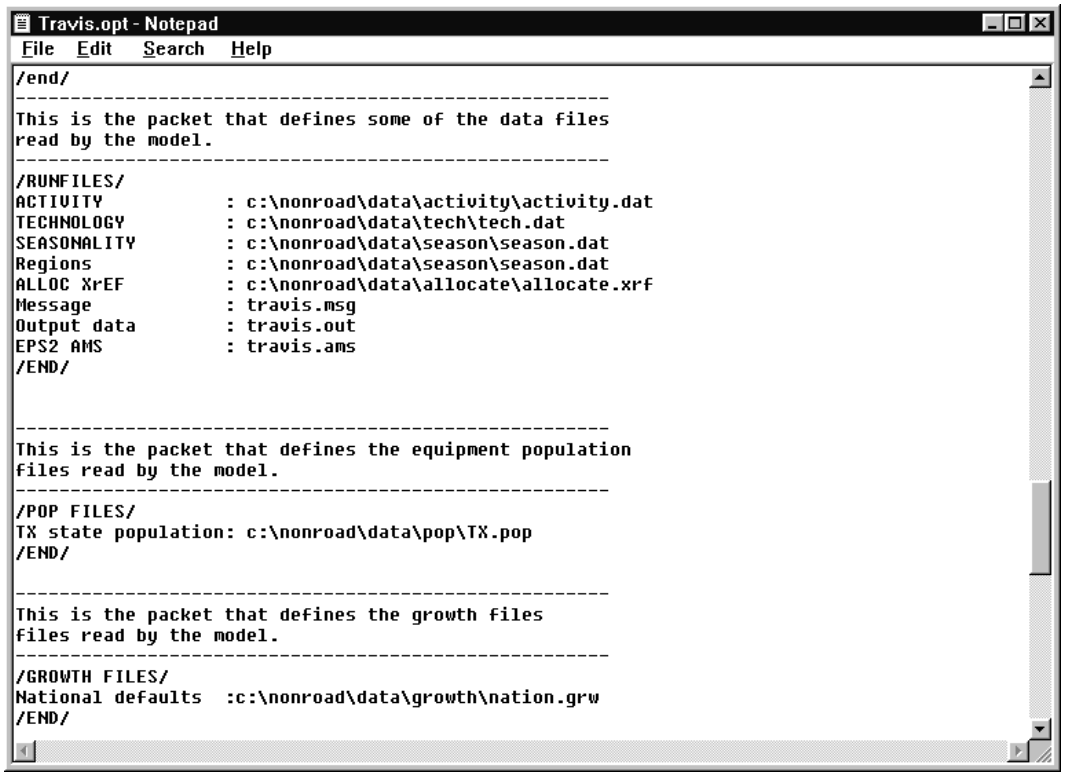


Figure 6-1: /POP FILES/ showing packet identifier and terminator.

Each line within an option file packet begins with a 20 character data label. In most cases, the core model does not read these first 20 characters as they exist simply for the purpose of identifying the file. With the exception of a packet identified as /SOURCE CATEGORY/, all packets are required by the core model to estimate emissions and an error message will appear if a required packet is not found by the model during a run.

One convenient aspect resulting from the use of a packet input structure is that packets can appear in any order in an option file. Furthermore, any type of notes or descriptions that aid in describing the packet can be placed between the individual packets. When executed, the core model searches for packet identifiers and reads the data between the identifier and the packet terminator. All other lines in the file are ignored.

INPUT DATA PACKETS AND DATA FILES

As mentioned above, all data input packets with the exception of that containing source category data are required for the model to accurately estimate emissions from nonroad sources. In many of these packets, default data are supplied in a series of data files. In other packets, information relevant to any scenario you are interested in modeling is supplied through user-specified options. The following information is provided to better explain the packets and data files used in the core model.

Options Packet

As discussed in Chapters 3 and 4, the options file packet, identified as /OPTIONS/, defines several of the user-specified options that make up a modeling scenario (Figure 6-2). Specifically, /OPTIONS/ include fuel specifications that will be in effect during the modeling period and ambient temperatures that are typical during the same period. In addition, you can define the title that describes your modeling scenario which will appear on your modeling reports.

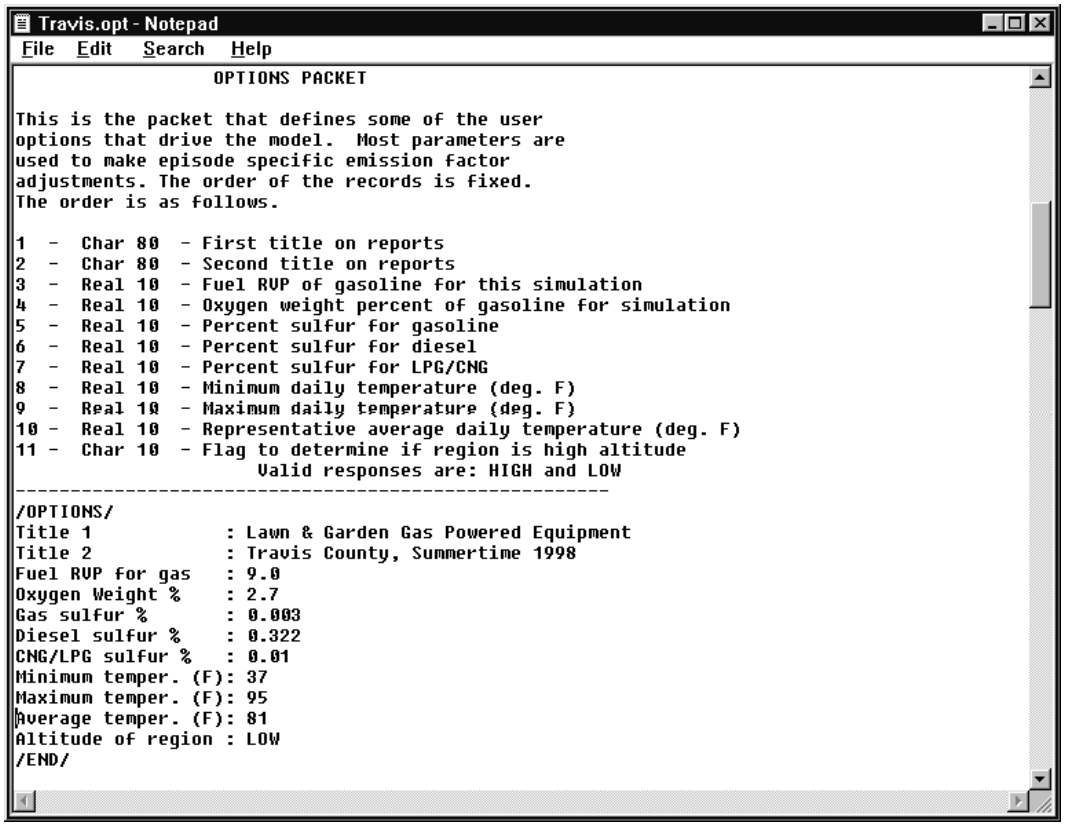


Figure 6-2: /OPTIONS/packet.

In /OPTIONS/, the order of the records are fixed. The order is as follows:

1 - Char 80: First title on reports
2 - Char 80: Second title on reports
3 - Real 10: Fuel RVP of gasoline for this simulation
4 - Real 10: Oxygen weight percent of gasoline for simulation
5 - Real 10: Percent sulfur for gasoline
6 - Real 10: Percent sulfur for diesel
7 - Real 10: Percent sulfur for LPG/CNG
8 - Real 10: Minimum daily temperature (deg. F)
9 - Real 10: Maximum daily temperature (deg. F)
10 - Real 10: Representative average daily temperature (deg. F)
11 - Char 10:Flag to determine if region is high altitude (LOW or HIGH)

Note that the draft version of the NONROAD model does not include a high altitude adjustment; this will be included in future model updates.

Period Packet

The period packet, identified as /PERIOD/, defines the period of time that you are interested in modeling (Figure 6-3). Similar to the /OPTIONS/ packet, the order of the records in this packet are fixed. Furthermore, the selection of certain parameters will cause some of the records in /PERIOD/ to be ignored. For a description of the parameters in the /PERIOD/ packet, see Chapter 4.

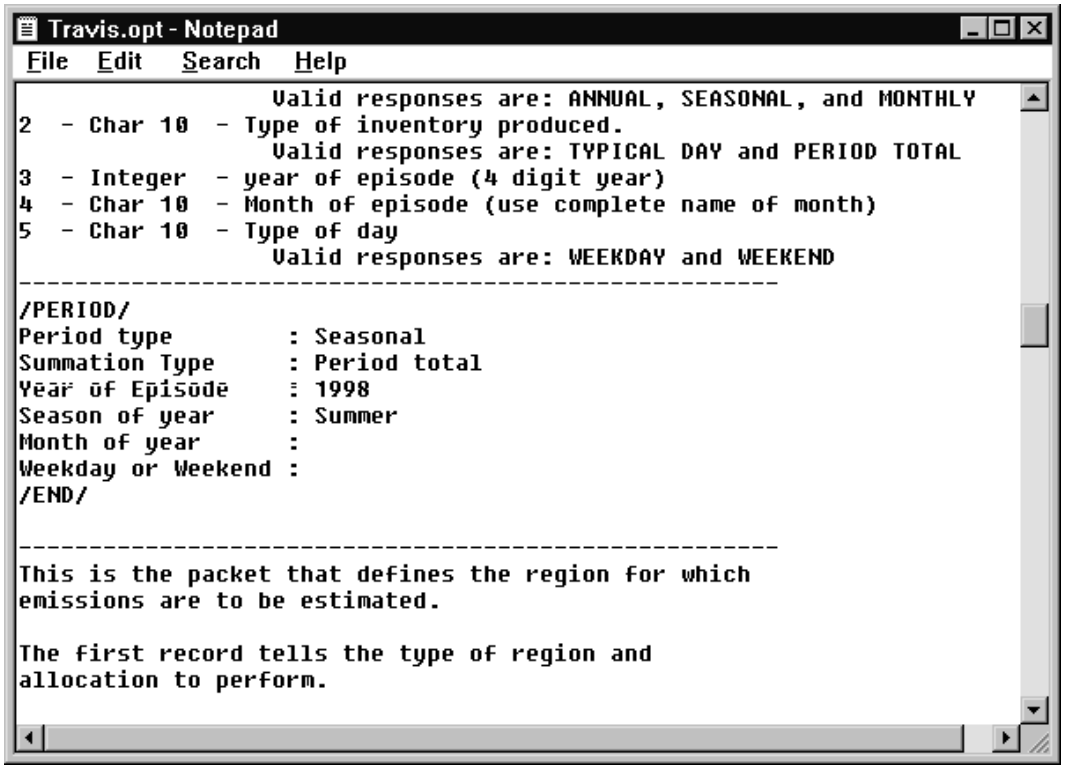


Figure 6-3: /PERIOD/ packet.

Region Packet

In the NONROAD model, you must define the region that you are interested in modeling. This is specified in the region packet, recognized by the model with the packet identifier /REGION/ (Figure 6-4).

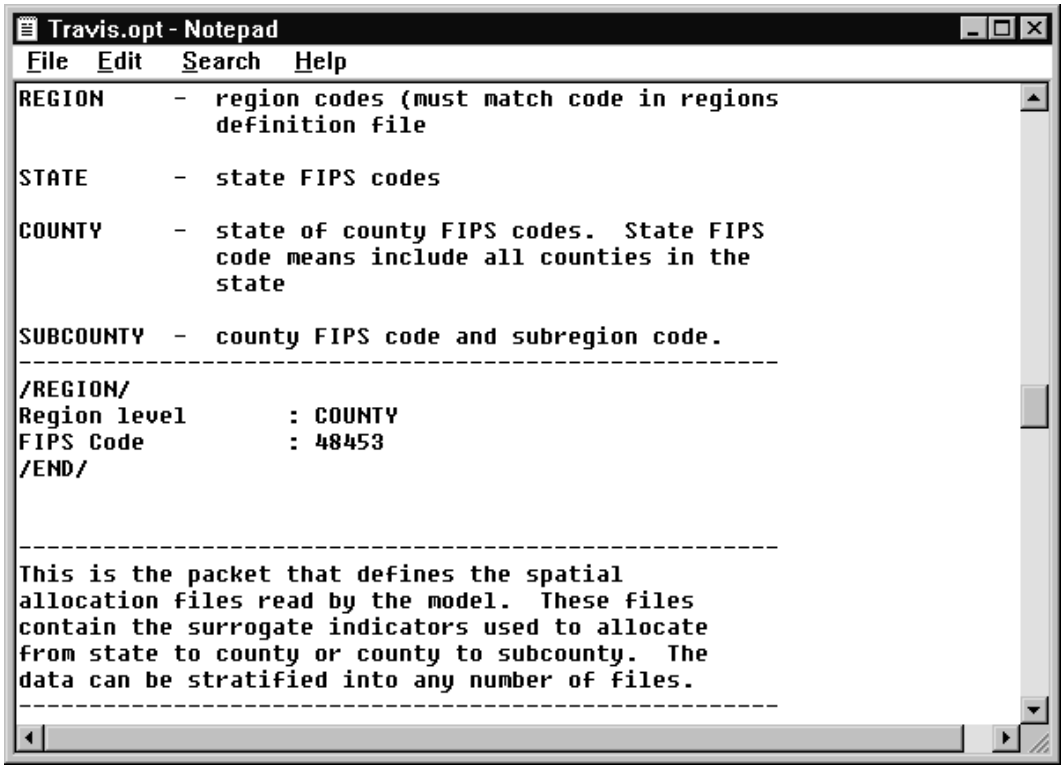


Figure 6-4: /REGION/ packet.

As described more completely in Chapter 4, regions are defined using two types of parameters. The first specifies the type of region and the second the region codes to be included. For example, you might be interested in only estimating emissions from four counties in one state that make up a standard metropolitan statistical area (SMSA). For this example, you would define the type of region as county and identify the four counties of interest (by specifying the FIPS code for each) for inclusion in the model run.

Source Category Packet

The source category packet, identified as /SOURCE CATEGORY/, is used to identify which source categories are to be processed (Figure 6-5). This is the only packet in the option file that is optional; if you do not specify a list of SCC codes, the model will calculate emissions estimates based on all source categories equipment in the population files.

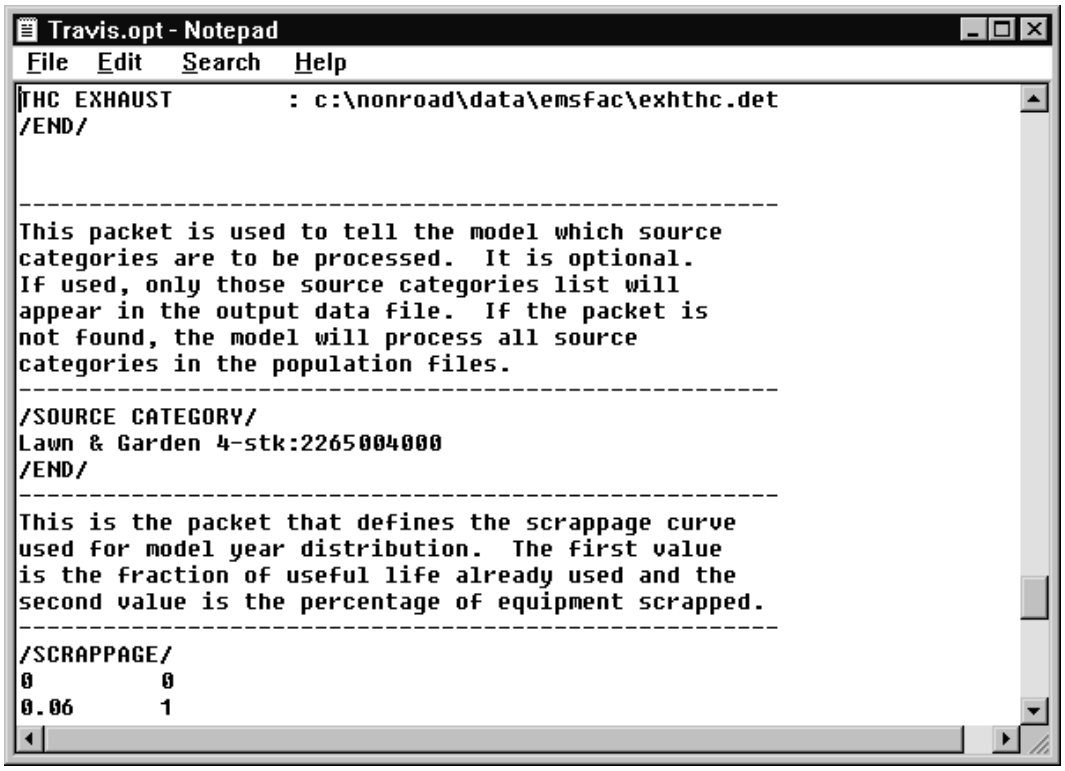


Figure 6-5: /SOURCE CATEGORY/ packet.

Runfiles Packet

The runfiles packet, identified as /RUNFILES/, defines five different data file types used by the model (Figure 6-1). These five data file types contain information that is universal to all regions and emissions species. Each data file type is identified by a keyword which appears in columns 1 to 20 of the /RUNFILES/ packet. The names for these data file types may appear in any order within the packet but each must be preceded by a valid keyword. In addition to data file types, the output file for the model run that can be read by the reporting utility is also contained in /RUNFILES/ as well as a message file created by the core model during a model run. Finally, you can supply a name for an optional output file containing data in EPS2.0 format in /RUNFILES/.

Note: To assist in better understanding the format of information in data files, it is suggested that you open each data file through a text editor as you read the information in this chapter. The data files are in a subdirectory called Data under the Nonroad directory.

Data Files in the /RUNFILES/ Packet

Each of the data files contained in the /RUNFILES/ packet, along with their keyword and format, are described below:

1. "*Allocate.xrf*" - This file, identified by the keyword ALLOC XREF, is the allocation indicator lookup table used by the core model. These data are used to allocate equipment type populations from one regional level to another. Global SCC codes can be used to indicate entire groups of equipment types. To calculate the allocation factors, the model first calculates a linear combination of allocation indicator values. The linear combinations are defined in this file. The indicator codes are arbitrary. The codes in this file are:

> **Note**: If you add additional factors to the *allocate.xrf* file, you must also add corresponding data files. For example, if you add forest land as an allocation factor for recreational vehicles, you must provide the model with data files on forest land per county. (See "ALLOC FILES" for information on these data files.) Furthermore, the option file should list the appropriate data files.

POP	Human population
LSC	Employees in landscape and horticulture services
CON	Dollar value of construction
MFG	Employees in manufacturing industry
COM	Number of wholesale establishments
LOG	Employees in lumber and wood products industry
H2O	Surface water area
FRM	Harvested cropland
HOU	Number of single and double family homes
MTL	Employees in metals mining industry
RVP	Number of recreational vehicle parks
AIR	Employees in air transportation industry
OIL	Employees in oil and gas extraction industry
GC	Number of employees in public golf courses

For each SCC in the file, the code is cross referenced to a list of indicator codes and their associated coefficients. The model will retrieve the indicator data identified by the indicator codes and calculate the linear combination.

The format for the data in this file is as follows:

Column		Description
Line 1:	1 - 10	Equipment code (SCC)
	11 - 20	Coefficient for indicator 1
	21 - 30	Coefficient for indicator 2
	31 - 40	Coefficient for indicator 3
Line 2:	1 - 10	Equipment code (must match the code in Line 1)
	11 - 20	Coefficient for indicator 1
	21 - 30	Coefficient for indicator 2
	31 - 40	Coefficient for indicator 3

2. "*Activity.dat* "- This file, identified by the keyword ACTIVITY, contains the activity data for the core model. The activity is defined as how often a piece of equipment is used in a year. This file also contains some other information about the equipment, such as average load factor and gas tank volume. Global SCC codes can be used to indicate entire groups of equipment types.

Note: The EPA does not recommend changing the activity files. This is because the activity, equipment population, load factor, and average life are all linked and changes can have surprising results. For details, see EPA's technical documents or talk to EPA nonroad modeling staff.

The format for the data in this file is as follows:

Column		Description
Line:	1 - 10	Equipment code (SCC)
	12 - 51	Equipment description (not used)
	52 - 56	Subregion code
	57 - 66	Technology type
	67 - 71	Minimum horsepower
	72 - 76	Maximum horsepower
	77 - 81	Load factor
	82 - 86	Tank volume (gallons)
	87 - 96	Activity level units (Options: Hrs/Yr, Hrs/Day, Gal/Yr, and Gal/Day)
	97 - 106	Activity level
	107 - 116	Starts (not used)

3. "*Tech.dat*" - This file, identified by the keyword TECHNOLOGY, defines the technology type distributions for the core model. The tech types are specified by SCC and horsepower range. Global SCC codes can be used to indicate entire groups of equipment types. The data in this file is separated into two lines. The first line has the identification information and a list of up to 10 technology types which make up the specified equipment population. The second line identifies the year and the fraction of population in each technology type. Multiple second lines may be provided if

Note: The technology type data are generally used with the emission factor data to model changes in control strategies. While users may wish to change the technology type data to experiment with various phase-in strategies, they should use the default values for official submittals to EPA.

Note: Proposed regulations are estimated to reduce the number of 2-stroke engines sold in the future in favor of 4-stroke engines. Therefore, spark ignition engines of less than 25 horsepower are lumped into one SCC category, eliminating the SCC distinction between 2- and 4-stroke gasoline, LPG, and CNG engines.

data is available for different years. The model will use this distribution beginning with the specified year, until a new distribution is provided.

The format for the data in this file is as follows:

Column		Description
Line 1:	6 - 15	SCC code (globals can be used)
	21 - 25	Minimum horsepower range
	26 - 30	Maximum horsepower range
	35 - ?	List of tech type codes (each in field of 10 characters)
Line 2 +:	1 - 5	Year
	35 - ?	Fractions for each tech type (each in field of 10 characters)

4. "*Season.dat*" - This file, identified by the keyword SEASONALITY, contains the seasonality (temporal adjustment data) used by the core model. Two specific types of information are contained in this file, each identified by a different packet keyword.

Note: If no data for an equipment type is found in *season.dat*, the default values will be used for temporal allocation. The default values represent an equal distribution of temporal activity throughout each month of the year.

The first, identified by the packet identifier /MONTHLY/, provides the monthly adjustment factors used by the model to calculate the fraction of annual activity occurring in the given month. For periods longer than a single month (e.g. season), the factors from each month spanned by the period are summed. The second, identified as /DAILY/, provides the day-of-the-week adjustments.

Note: If you change the monthly allocations, you should check to make sure the allocations sum to one. Likewise, the weekend and weekday allocations should sum to one for an entire week (i.e. 1 = 5 × weekday fraction + 2 × weekend fraction).

The format for the monthly data is as follows:

Column		Description
Line:	1 - 5	Subregion code (blank = match all)
	7 - 16	SCC code (global codes are acceptable)
	18 - 51	Equipment description (not used)
	52 - 61	Fraction of annual activity in January
	62 - 71	Fraction of annual activity in February
	72 - 81	Fraction of annual activity in March
	82 - 91	Fraction of annual activity in April
	92 - 101	Fraction of annual activity in May
	102 - 111	Fraction of annual activity in June
	112 - 121	Fraction of annual activity in July
	122 - 131	Fraction of annual activity in August
	132 - 141	Fraction of annual activity in September
	142 - 151	Fraction of annual activity in October
	152 - 161	Fraction of annual activity in November
	162 - 171	Fraction of annual activity in December

The format for the day-of-the-week data is as follows:

Column		Description
Line:	1 - 5	Subregion code (blank = match all)
	7 - 16	SCC code (global codes are acceptable)
	18 - 51	Equipment description (not used)
	52 - 61	Fraction of weekly activity in typical weekday day

62 - 71	Fraction of weekly activity in typical weekend day

5. "*Region.dat*" - This file, identified by the keyword REGIONS, defines the states/counties in each geographic region. Identification by the region code is arbitrary but the FIPS code must be a valid state or county FIPS code. If a state code is supplied, all counties in that state are included in the indicated region, unless overridden by a county-specific record.

Note: Changing the region does not change altitude or temperatures, but it does change which activity factor is applied and the allocation of activity throughout the year. In particular, if you define a new region, you must add the new region to the *activity.dat* and the *season.dat* files.

The format for the data in this file that pertains to regional definition is as follows:

Column		Description
Line:	1 - 5	User-defined region code
	6 - 45	Region description (not used)
	46 - 50	State or county FIPS code
	51 - 70	State or county name (not used)

Population Files Packet

The population files packet, identified as /POP FILES/, lists all of the files containing equipment population data. The data in these files ultimately determines which equipment types will be processed in the core model. If population estimates for a given equipment type are included in any of these files, and you do not exclude the equipment from processing by user-specified options (i.e., with the /SOURCE CATEGORY/ packet in the option file), the model will use the population estimates to calculate emissions. The entire equipment population will be processed and written to the output data file unless you specify a specific equipment type.

For convenience and ease of data management, the population data have been disaggregated into separate files by state. The /POP FILES/ packet in an option file was shown earlier in Figure 6-1.

Data Files in the /POP FILES/ Packet

1. "*(state name).pop*" - The **.pop* file for each state contains the equipment population estimates for the core model. These data drive the rest of the model in terms of which equipment types will be processed. The model uses the closest year which comes before the episode year. Population estimates for an entire state may be allocated to county level.

Note: The horsepower range (HP) is lower bound exclusive and upper bound inclusive. For example, a range identified by a minimum HP of 3 and a maximum HP of 6 is the range $3 < HP \leq 6$. The acceptable ranges are:

0 to 1
1 to 3
3 to 6
6 to 11
11 to 16
16 to 25
25 to 40
40 to 50
50 to 100
100 to 175
175 to 300
300 to 600
600 to 750
750 to 1000
1000 to 1500
1500 to 2000
2000 to 3000
Greater than 3000

Note: The EPA does not recommend changing the equipment population files. This is because the activity, equipment population, load factor, and average life are all linked and changes can have surprising results. For details, see EPA's technical documents or talk to EPA nonroad modeling staff.

Note: In order to allow for shifts of equipment from 2-stroke to 4-stroke, spark ignition engines have been grouped into single SCCs with 2-stroke, 4-stroke, CNG and LPG engines in separate technology groups. Therefore, some SCCs are missing from the population file while others have the combined populations for all spark ignition engines.

The format for the data in this file is as follows:

Column	Description
1 - 5	FIPS code
7 - 11	Subregion code (used for subcounty estimates)
13 - 16	Year of population estimates
18 - 27	SCC code (no globals accepted)
29 - 68	Equipment description (ignored)
70 - 74	Minimum horsepower range
76 - 80	Maximum horsepower range (ranges must match those internal to model)
82 - 86	Average life (in hours of use)
87 - 96	Flag for scrappage distribution curve (DEFAULT = standard curve)
100 - 116	Population estimate

Growth Files Packet

The growth files packet, identified as /GROWTH FILES/, lists the names of all of the files containing future year projection data (Figure 6-6). The growth data is contained in a single file called "*nation.grw*" and is separated into four data packets, /INDICATOR/, /GROWTH/, /SCRAPPAGE/, and /ALTERNATE SCRAPPAGE/. The /GROWTH/ data packet specifies indicator data by state/county code (FIPS), an arbitrary indicator code, and year. The model will use the data from the two years which are closest to the base year and the projection year. It then calculates an annual growth factor based on the increase in the indicator values.

Note: Similar to population files, growth data can be placed in separate files, such as by state or county, to simplify data management.

Note: Changing the growth file data will change the model's calculation of equipment populations in past and future years, but the growth will not affect the scrappage function in past years; that is, a high growth factor will lead to rapid turnover of equipment in years after 1996, but will not affect equipment turnover in years prior to 1996.

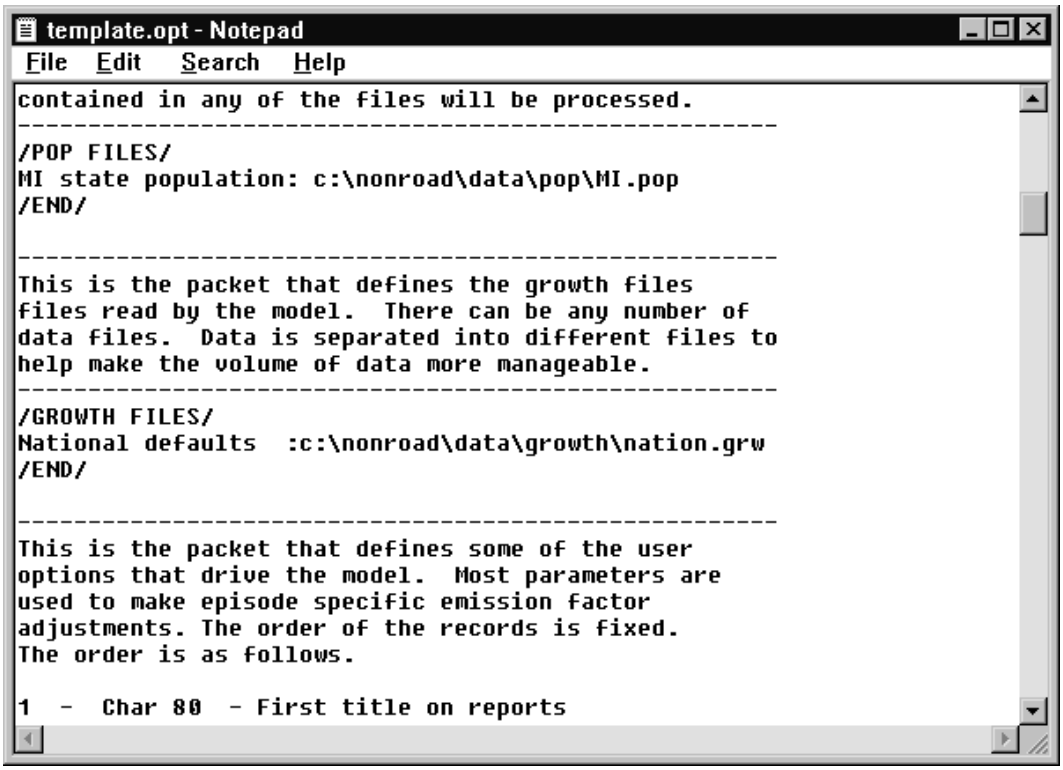


Figure 6-6: /GROWTH FILES/ packet in an option file.

This annual growth rate is applied to base year populations to obtain future-year predictions of equipment populations. Global FIPS codes can be used to provide growth indicator data for an entire state or even the entire country. The model will use county-specific indicator data where available.

Data Files in the /GROWTH FILES/ Packet

1. "*Nation.grw*" - As described above, the file "*nation.grw*" contains the growth data used in the core model. The data included here is based on national growth estimates for the various source category groups. The data is separated into four packets, /INDICATOR/, /GROWTH/, /SCRAPPAGE/, and /ALTERNATE SCRAPPAGE/. The /INDICATOR/ packet, provides a cross reference of equipment code (SCC) to growth indicator. The indicator code is an arbitrary code that identifies an actual predicted value such as human population or employment. The /GROWTH/ packet contains the actual growth values.

   Note: The indicator codes found in the **.grw* file are:

   001 -- Farm
   002 -- Mining
   003 -- Oil and Gas
   004 -- Construction
   005 -- Manufacturing
   006 -- Lumber and wood
   007 -- Railroad transportation
   008 -- Transportation by air
   009 -- Total population

   The format for the data in the /INDICATOR/ packet is as follows:

Column	Description
1 - 5	State/county code (FIPS)
7 - 10	Indicator code (arbitrary alphanumeric code)
12 - 21	Equipment code (SCC)
23 - 27	Minimum HP range
28 - 32	Maximum HP range
34 - 43	Technology type

The format for the data in the /GROWTH/ packet is as follows:

Column	Description
1 - 5	State/county code (FIPS)
6 - 10	Subregion code (blank = applies to all subregions
11 - 15	Year of estimate (4-digit year)
17 - 20	Indicator code (arbitrary alphanumeric code)
26 - 45	Estimated value

An additional packet that must appear in the growth indicators files is the /SCRAPPAGE/ packet. This packet contains the definition of the default scrappage curve used for the model year distribution calculations. All equipment types in which the scrappage flag in the population file is set to DEFAULT will use this scrappage curve. The scrappage curve is the percentage of equipment scrapped as a function of the fraction of useful life consumed. For example, the default scrappage curve has 10 percent of equipment scrapped when the equipment has reached 45 percent of its useful life.

The format for the data in the /SCRAPPAGE/ packet is as follows:

Column	Description
1 - 10	Fraction of useful life already consumed
11 - 20	Percentage of equipment scrapped

An optional packet of the growth data file is the /ALTERNATE SCRAPPAGE/ packet. This optional packet can be used to define scrappage curves that are used in place of the default scrappage curve for selected equipment types. To apply the /ALTERNATE SCRAPPAGE/ curve to an equipment type, you must first modify the records of the population file for the selected equipment type by changing the scrappage flag from DEFAULT to some user-defined name. The name can be any alpha-numeric

Note: An example of an alternate scrappage curve is provided in *nation.grw*.

string up to 10 characters in length (e.g., "chainsaw" or "motorcycle"). The next step is the creation of the /ALTERNATE SCRAPPAGE/ packet. The packet is similar to the /SCRAPPAGE/ packet in form, but allows for multiple columns for defining up to 10 alternate scrappage curves for various equipment groups. The first field is the fraction of useful life consumed. The remaining columns, one for each alternate scrappage curve, contain the percentage of units scrapped. Another significant difference between this packet and the /SCRAPPAGE/ curve is that the first record is used to identify the name of the scrappage curves. These names must match the name used to replace the DEFAULT value of the scrappage flag in the population files.

The format for the data in the /ALTERNATE SCRAPPAGE/ packet is as follows:

	Column	Description
Line 1:	1 - 10	not used
	11 - 20	Name used to identify scrappage curve 1
	21 - 31	Name used to identify scrappage curve 2
	x1 - x1	up to 10 curves
Line 2+:	1 - 10	Fraction of useful life already consumed
	11 - 20	Percentage of equipment scrapped in scrappage curve 1
	21 - 30	Percentage of equipment scrapped in scrappage curve 2
	x1 - x0	up to 10 curves

Allocation Packet

A list of spatial allocation files used by the core model is contained in the packet identified as /ALLOC FILES/. Specifically, the data in this packet is used to allocate from state-level equipment populations to county-level equipment populations. It could also be used to allocate national-level equipment populations to state-level. Additional data can be added to allocate from county-level to subcounty-level.

As seen in Figure 6-7, the /ALLOC FILES/ packet contains numerous data files (one for each of the indicators found in the *allocate.xrf* file). These files contain surrogate indicators used by the model for allocating equipment populations from a larger region type to a smaller region type (e.g., national-level to state-level or state-level to county-level).

Note: Similar to the population files found in the /POP FILES/ packet, the spatial allocation data files in the /ALLOC FILES/ packet have been desegregated into separate files by state and by indicator type for convenience and ease of data management.

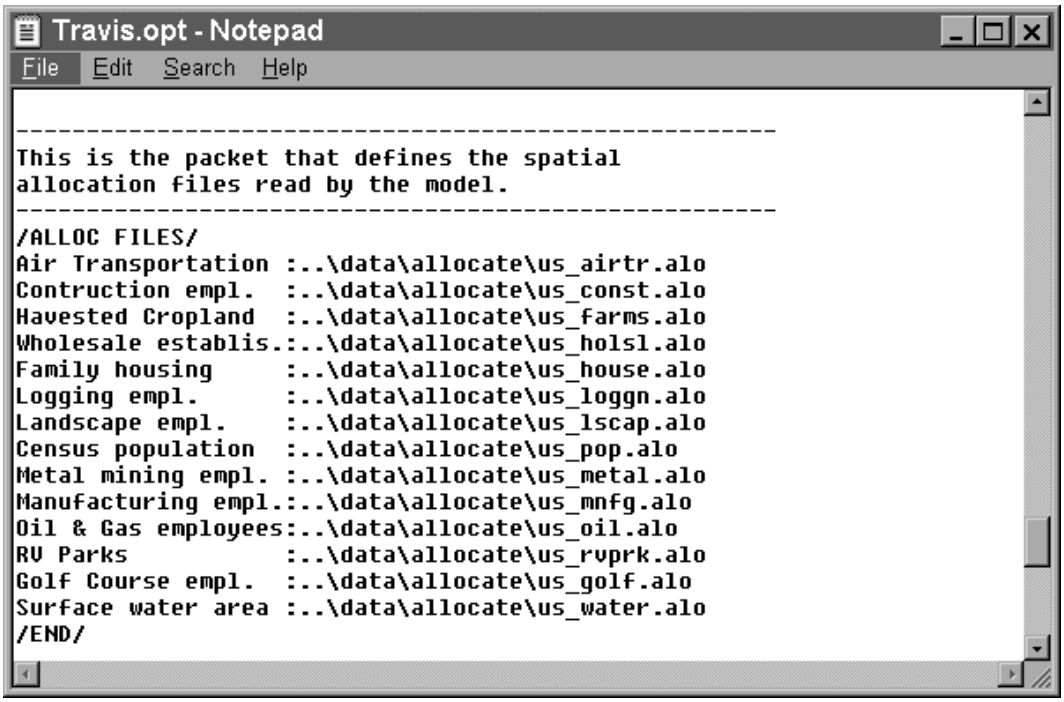


Figure 6-7: /ALLOC FILES/ packet.

To calculate the allocation factors, the model first calculates a linear combination of allocation indicator values. Once the linear combinations are calculated, the model then takes the ratio of smaller region to larger region (e.g., the ratio of county to state). This ratio is used to allocate the portion of equipment population contained in the smaller region.

Data Files in the /ALLOC FILES/ Packet

For ease of data management the data has been separated into files by indicator type. The files provided with the NONROAD model are:

"*(state name)_pop.alo*"	Human population
"*(state name)_lscap.alo*"	Employees in landscape and horticulture services
"*(state name)_const.alo*"	Dollar value of construction
"*(state name)_mnfg.alo*"	Employees in the manufacturing industry
"*(state name)_holsl.alo*"	Number of wholesale establishments
"*(state name)_loggn.alo*"	Employees in lumber and wood products industry
"*(state name)_water.alo*"	Surface water area
"*(state name)_farms.alo*"	Harvested cropland
"*(state name)_house.alo*"	Number of single and double family homes
"*(state name)_metal.alo*"	Employees in metals mining industry
"*(state name)_rvprk.alo*"	Number of recreational vehicle parks
"*(state name)_airtr.alo*"	Employees in air transportation industry
"*(state name)_oil.alo*"	Employees in oil and gas extraction industry
"*(state name)_golf.alo*"	Number of employees in public golf courses

The format for the data in these files is as follows:

Column	Description
1 - 3	Indicator code
6 - 10	FIPS code (can be global)
11 - 15	Subregion code (blank means entire nation, state, or county)
16 - 20	Year of estimation or prediction
21 - 40	Indicator value

Modifying Inputs for Subcounty Runs

As described in Chapter 4, the NONROAD model has the capability of estimating emissions at a subcounty level provided that data for the subcounty level is supplied. To demonstrate how you can modify model inputs to estimate emissions at a subcounty level, we will again use the example found in Chapters 3 and 4 with the following revision:

> *You have been given an assignment to estimate the total emissions from 2-stroke residential lawn mowers with a horsepower range of 1 to 6 in the city of Austin, Texas for summertime, 1998.*

In simple terms, the methodology that the model will use to calculate emissions from 2-stroke lawn mowers with a horsepower range of 1 to 6 in Austin will be to first determine the number of 2-stroke lawn mowers (1 to 6 HP range) in Travis County based on an allocation indicator from the state-level to the county-level, and then in the Austin metropolitan area based on an allocation indicator from the county-level to the subregion-level. The allocation indicator that will be used for this example will be housing. Once the number of 2-stroke lawn mowers in Travis County has been supplied (either through a separate model run or locally available data), the model will then estimate the emissions from these sources in Austin (based on the ratio of the allocation indicator value from county-level to subregion-level).

To modify the input files for this scenario, follow these steps:

1. Create a subregion code for the county which, together with the state/county code in which the subcounty is contained, will be used to identify the data applied to the subcounty. Since the Austin metropolitan area is within Travis County, Texas, a subregion code could be identified as '48453 Austn' where

   Note: The subregion identifier can only be up to five characters in length.

   - 48453 is the FIPS code for Travis County, and
   - Austn is the identifier for the Austin metropolitan area.

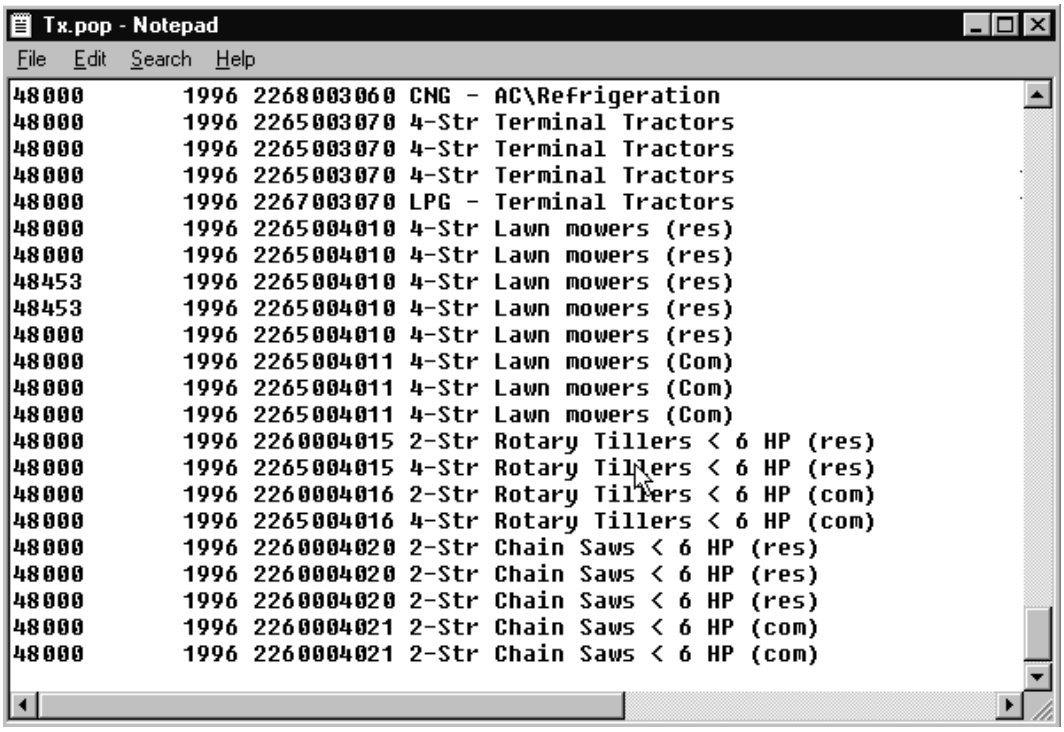
2. After the subregion code is defined, an estimate of the county-level equipment populations for each equipment type of interest must be made. The most straightforward method for determining this estimate is to have the core model produce a county-level estimate using the state-to-county allocation. For our example, the core model would be run with the regional inputs identified in Figure 6-4 and the /SOURCE CATEGORY/ packet modified to include Lawn and Garden 2-stroke lawn mower: 2260004010, where 2260004010 is the SCC for 2-stroke residential lawn mowers.

   Note: The county-level equipment populations can be included in a file other than the *(state name).pop* file provided, however, that you make sure that the name of this new file is listed in the /POP FILES/ packet of the options file.

3. Once the core model run is completed, use the reporting utility to generate a *Population and Fuel Consumption by SCC* report. This will provide an estimate of the population of 2-stroke lawn mowers in Travis County. Next, you must enter the county-level population data into the population files using the FIPS code for the county where your subregion is located. For our example, the population file for the state of Texas (*nonroad\data\pop\TX.pop*) would be modified as shown in Figure 6-8 where:

   - 48000 is the FIPS code for the state of Texas;
   - 48453 is the FIPS code for Travis County;
   - 1996 is the year of population estimates;
   - 2260004010 is the SCC for 2-stroke residential lawn mowers;
   - 1 and 3, and 3 and 6 are the minimum and maximum horsepower ranges, respectively;
   - 47.9 is the expected useful life in number of hours;
   - DEFAULT is the flag for scrappage distribution curve with default representing the standard curve; and
   - 1737 and 86314 representing the population estimate.

   Note: With the exception of the FIPS code and the population value field, the additional population records (county-level) will be identical to the corresponding state-level population records.



Figurre 6-8: Modified *TX.pop* file with population estimates for 2-stroke residential lawn mowers in Travis County (48453).

4. For each of the allocation indicators that are used, you must next estimate the value of the indicator within the subcounty of interest. This value should be added to the appropriate allocation file, using the county FIPS code and the subregion code as the identifier.

   For our example, the allocation indicator that we will use is housing of the Austin metropolitan area which is estimated to be 112,970. To reflect this in the option file for our modeling scenario, the /INDICATOR/ packet of the housing allocation file for the state of Texas (*nonroad\data\allocate\TX_house.alo*) would be modified as shown in Figure 6-9.

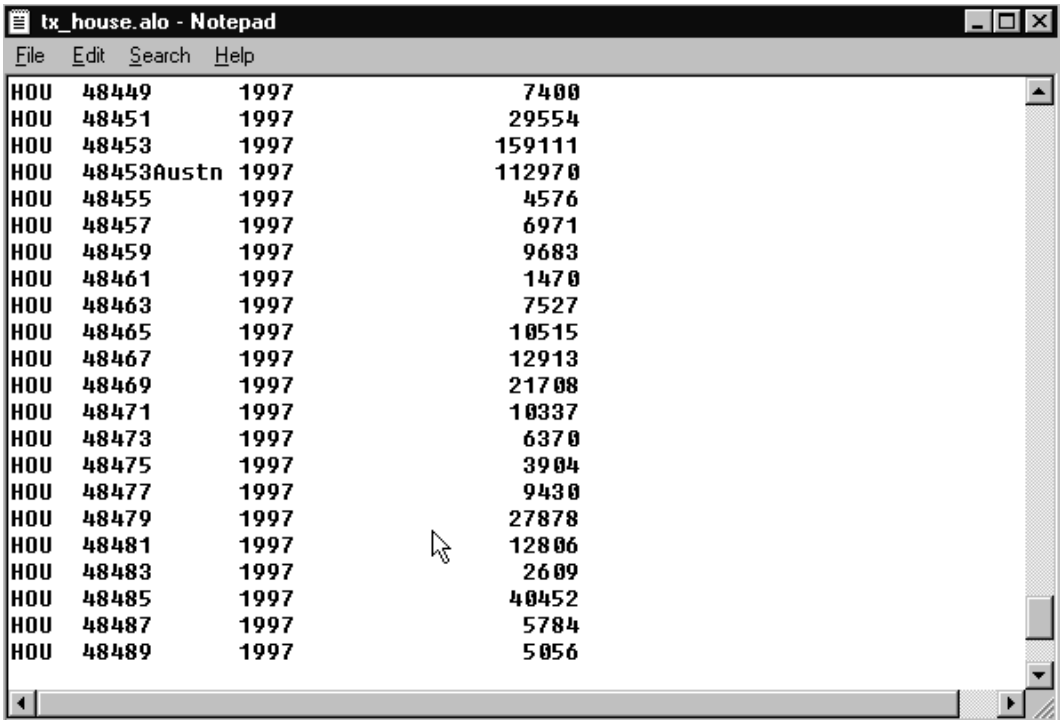


Figure 6-9: Modified *TX_house.alo* file showing housing of Austin.

5. Next, you must modify the /REGION/ packet of the options file to indicate a subcounty run. For this, you should include any whole counties by listing their FIPS code and any partial counties by listing their FIPS code/subregion code pair. Figure 6-10 shows the /REGION/ packet modified for our example.

Note: Before running your subcounty modeling scenario, make sure that the /POP FILES/ and /ALLOC FILES/ packets of the option file lists the file names of the data files containing the newly created subcounty data.

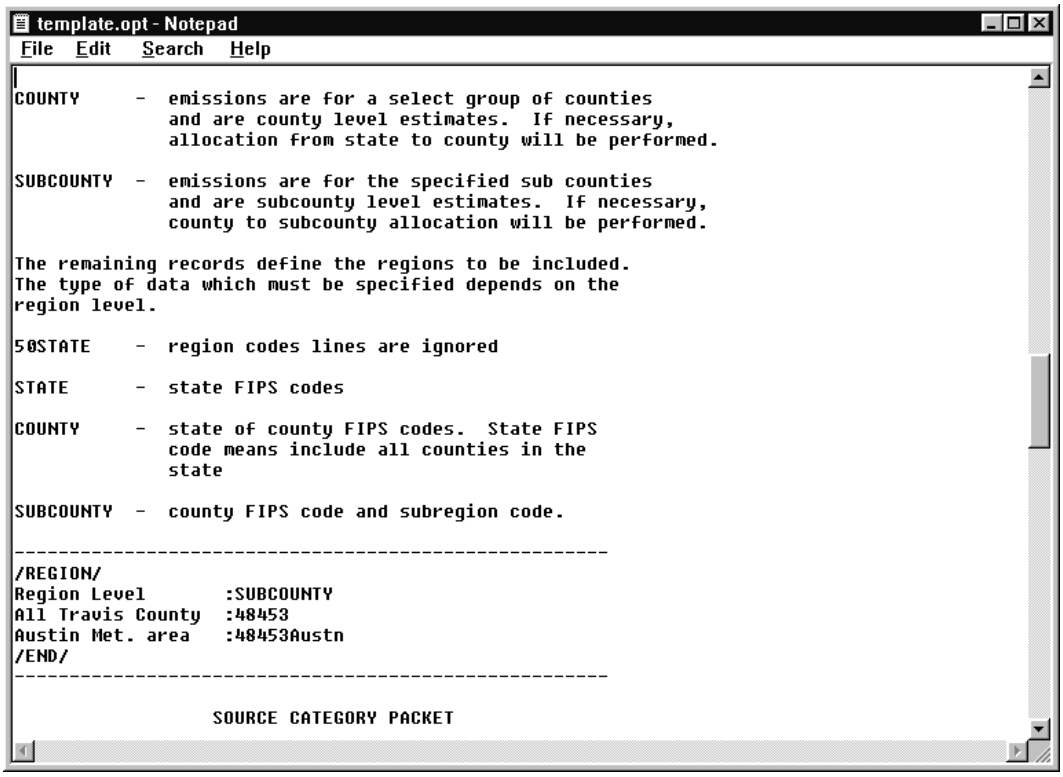


Figure 6-10: Modified /REGION/ packet showing subcounty region.

6. Once you have completed steps 1 through 5 described above, create an options file incorporating the modified packets that reflect the subregion data, save the file under an appropriate name, and run the modeling scenario as explained in Chapters 3 and 4.

Emissions Factors Packet

Simply put, emissions factors are the rate at which emissions are produced for a particular process. In the NONROAD model, emissions factors for a variety of species and engine operating modes are contained in the packet identified as /EMFAC FILES/. Similar to the /RUNFILES/ packet, each filename must be preceded by a keyword. The keyword identifies the species or operating mode that is contained in the associated data file.

Note: The EPA does not expect users to have local data on emission factors. If you know of a study on emission factors that was not incorporated into the model inputs, please
e-mail the nonroad modeling team at nonroad@epamail.epa.gov

The valid species/modes (keywords) are as follows:

THC EXHAUST	REFUELING
CO EXHAUST	SPILLAGE
NOX EXHAUST	DIURNAL
PM EXHAUST	RUNNING LOSS
HOT SOAKS	RESTING LOSS
CRANKCASE	BSFC

Note: SOx emissions are a function of the BSFC factors and adjusted exhaust hydrocarbons.

As seen in Figure 6-11, these species/modes are contained in separate data files. In calculating emissions using these files, the model will use the emission factor for the closest year that is less than or equal to the current model year. The file names can appear in any order in the packet and are identified by a keyword. If a species/mode is not included in an option file, all data for that species/mode will be reported as missing. For example, if there is no data file for PM emission factors, the PM field of the output data file will contain all missing values. The exception is BSFC which is a required file.

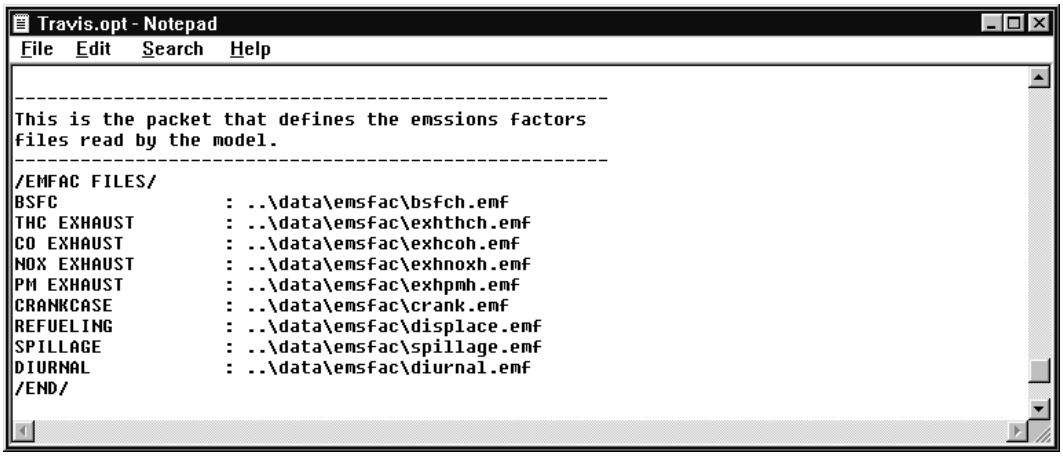


Figure 6-11: /EMFAC FILES/ packet

Data Files in the /EMFAC FILES/ Packet

Data provided with the NONROAD model include:

Note: The units field is ignored in the BSFC file; the units are lbs of fuel/hp-hr. The units field is 'MULT' in the crankcase file. The emission factor is treated as a multiplier.

"Bsfc.emf"	Brake specific fuel consumption factors
"*Crank.emf*"	Emission factors data for crankcase emissions
"*Displace.emf*"	Emission factors data for displacement component of refueling emissions
"*Diurnal.emf*"	Emission factors data for diurnal emissions
"*Exhco.emf*"	Emission factors data for exhaust CO emissions
"*Exhnox.emf*"	Emission factors data for exhaust NO_x emissions
"*Exhpm.emf*"	Emission factors data for exhaust PM emissions
"*Exhthc.emf*"	Emission factors data for exhaust THC emissions
"*Spillage.emf*"	Emission factors data for emissions resulting from refueling

The format for the data in the emission factors files is as follows:

Column		Description
Line 1:	6 - 15	SCC code (globals can be used)
	21 - 25	Beginning of horsepower range
	26 - 30	End of horsepower range
	35 - 44	Technology type 1
	x5 - x4	Technology types (repeating field)
	x5 - x4	Units (options: g/hr, g/hp-hr, g/gallon, g/tank, g/day, mult)

	x5 - x4	Pollutant
Line 2:	1 - 5	Year
	35 - 44	Emission factors for technology type 1
	x5 - x4	Emission factors for technology types (repeating)

Deterioration Factors Packet

Generally speaking, as a piece of equipment or vehicle ages over time, the rate at which pollutants are emitted increases. The deterioration factors used by the core model to estimate this increase in emissions are contained in a packet identified as /DETERIORATE FILES/ (Figure 6-12).

Note: As for emission factors, the EPA does not expect users will have data on deterioration factors. If you know of data on deterioration that was not considered in developing the model, please let us know.

Similar to the /EMFAC FILES/ packet, each filename must be preceded by a keyword. The valid species/modes are the same as for the /EMFAC FILES/ (except BSCF is not recognized).

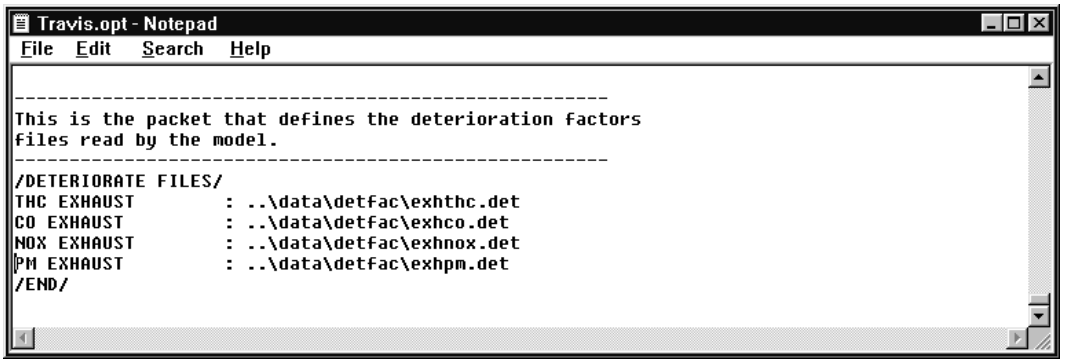


Figure 6-12: /DETERIORATE FILES/ packet.

Data Files in the /DETERIORATE FILES/ Packet

The deterioration factors are specified by technology type. An "ALL" in the technology type field indicates that the deterioration factors apply to all technology types. The values are actually the coefficients of the deterioration equation

$$DF = 1 + A \times \text{engine age}^{b} ,$$

where A and b are provided in the file. The model will use the emission factor for the closest year that is less than or equal to the current model year.

Data provided with the NONROAD model include:

"*Exhco.det*"	Deterioration factors data for exhaust CO emissions
"Exhnox.det"	Deterioration factors data for exhaust NO_x emissions
"*Exhpm.det*"	Deterioration factors data for exhaust PM emissions
"*Exhthc.det*"	Deterioration factors data for exhaust THC emissions

The format for the data in these files is as follows:

Column	Description
1 - 10	Technology type
21 - 30	A coefficient of equation
31 - 40	b coefficient of equation
41 - 50	Emission Cap (in median life units)
51 - 60	Pollutant

EDITING INPUT DATA PACKETS AND FILES

For an advanced user of the NONROAD model, the process of incorporating locally-derived data into the core model is relatively straightforward. To make changes to the data files, simply use a text editor such as

Note: When the NONROAD model is initially installed, all data files are in a subdirectory called Data in the Nonroad directory.

Microsoft's Notepad or WordPad, or the Edit command in DOS, to access the data file. Once you have accessed the data file that you want to change, type the revised data in the appropriate field. Once complete, save the modified file under a new name to prevent the overwriting of default data.

There are two methods for indicating that you want to use new data files in an option file. The first is through the Advanced Options menu in the graphical user interface which is described in Chapter 3. The second is through a text editor which is described in Chapter 4.

MAKING MULTIPLE MODEL RUNS

Through a text editor or DOS, you can create a batch file that allows you to run the core model with as many different scenarios as you desire. This capability provides you with the flexibility of setting up and running these scenarios when you have available computer time, such as in the evening.

To create a batch file, simply open a text editor in Windows 3.1 or Windows 95, or type "*edit*" from a DOS window. On the first line of the screen, type "*nonroad (first file you want).opt*". Press **<Enter>**. On the next line, type "*nonroad (next file you want).opt*". Continue this process until you have identified all of the option files that you want to run.

To save your batch file, use the left button on the mouse to click on **File** or press **<Alt-F>**. Next, click on **Save** or press **<S>**. An open file dialog box appears that requests you save the file. Name the file with a relevant name and the extension .bat. After you have saved the file, click on **Exit**, or press **<X>** to close the text editor. Figure 6-13 shows the batch file *landg.bat* (for lawn and garden run) in a text editor.

To run a batch file in DOS, type "*(name of your batch file).bat*". From Windows 3.1, use the left button on the mouse to click on **File** or press **<Alt-F>**. Next, click on **Run** or press **<R>**. Type the name of your batch file in the dialog box and click on **OK**. From Windows 95, drag the mouse to the menu bar and click on **Start**. Next, click on **Run** or press **<R>**. Type the name of your batch file in the dialog box and click on **OK**.

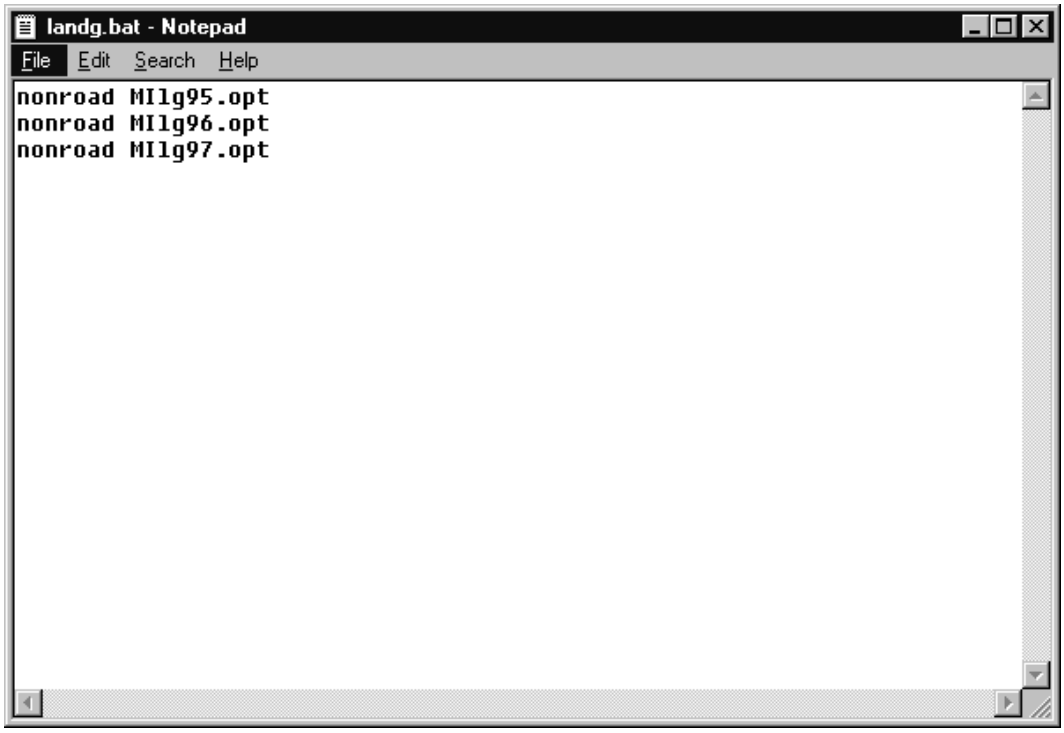


Figure 6-13: *landg.bat* in Notepad.