

Chapter 9. SMOKE Files and File Formats

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Overview

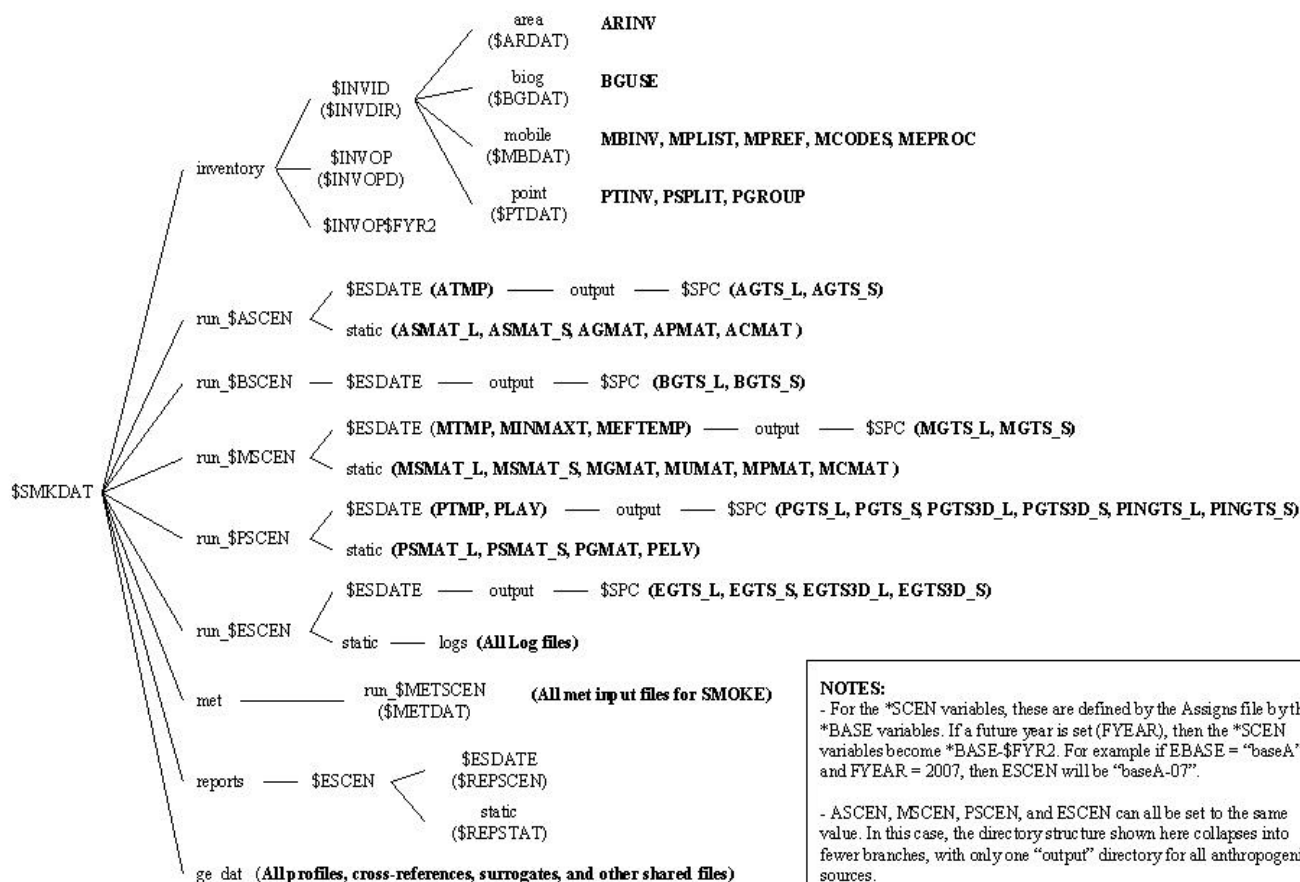
This chapter contains a list of all input files needed by SMOKE, followed by their descriptions. All of the files needed as input by SMOKE are listed in the next section. Future versions of this chapter will contain documentation of all of the intermediate and output files as well.

In the tables used to describe the file formats, column letters indicate that the record(s) should be list-formatted, and therefore need to be delimited (by a space, comma, or semi-colon). If there are text entries that have embedded spaces, commas, or semi-colons in a list-formatted file, these entries must be surrounded by single or double quotation marks to prevent SMOKE from treating those characters as delimiters. Column numbers indicate that the entry must be placed exactly within the columns listed.

For all cross-reference files, all of the source-characteristic fields are optional. For example, it is permissible to provide only the SCC for use in matching a profile to a source. For list-formatted files (i.e., files that do not have column-specific formats), if there are source characteristic fields that will not be used (such as country/state/county code) that come **before** the required fields in the file, these must be filled in with zeros or -9. If there are fields that come **after** the required fields in the file, they can be left blank. For column-specific formats, the optional entries can be left blank when they are not used.

In some cases, a file is listed but not yet supported by SMOKE Version 1.3, although we have tried to note these files where they occur. The default directory structure and file locations used in the Assigns files are shown in the diagram below. The major departure for this structure from previous versions of SMOKE is that users can specify a different scenario name for each of area, biogenics, mobile, and point sources.

SMOKE v1.3 data directory structures



Overview: Input Files

The following table lists all of the input files that SMOKE will need to run in Models-3. Where these files are optional, this is noted in the description column of the table. The files are grouped by type, such as inventory, speciation, gridding, emission factors, etc.

All of the ASCII files could conceivably be prepared manually. However, the last 3 columns indicate other options for the user to prepare the files. Column "CNV" indicates that there is a SMOKE converter (either Fortran program, SAS program, script, or Excel spreadsheet) to create the file. Column "ST" indicates that the SMOKE Tool in Models-3 can prepare the file. Column "Other" indicates if there is another method to create the file, or if the file is resident in the installation and is likely to not need modification for most users.

Environment Variable with (Program)	Category	Description	CNV	ST	Other
Inventory Files					
PTINV (Smkinven)	P	Point source raw inventory in IDA format or SMOKE list format for EMS-95 files (\$PTDAT directory)		X	NEI resident
PTDAY (Smkinven)	P	Point source raw day-specific inventory data (optional, \$PTDAT directory)			User
PTHOUR (Smkinven)	P	Point source raw hour-specific inventory data (optional, \$PTDAT directory)			User or CEM data
ARINV (Smkinven)	A	Area source raw inventory in IDA format or SMOKE list format for EMS-95 files (\$ARDAT directory)		X	NEI resident
MBINV (Smkinven)	M	Mobile source raw inventory in IDA format for nonlink data or SMOKE list format for EMS-95 or EMS-95 list directed nonlink and link data (\$MBDAT directory)			NEI resident
VMTMIX (Smkinven)	M	Mobile source vehicle mix for EMS-95 and EMS-95 list directed files (\$MBDAT directory)			
BCUSE (Rawbio)	B	Biogenic county land use data for use in RAWBIO (\$GE_DAT directory)			Resident
BGUSE (Rawbio)	B	Biogenic gridded land use data for use in RAWBIO (\$BGDAT directory)			U.S. 36 km resident

Temporal Allocation Input Files					
[A/M]PTPRO (Temporal)	A, M, P	Temporal profile file (\$GE_DAT directory)		X	NEI resident
[A/M]PTREF (Temporal)	A, M, P	Temporal cross-reference file (\$GE_DAT directory)	X	X	NEI resident
Spatial Allocation Input Files					
G_GRIDPATH (Grdmat, Elevpoint, Smkmerge)	A, B, M, P	Grid and grid projection information (\$BASDIR directory)			M3 Study Planner
[A/M]GPRO (Grdmat)	A, M	Area and/or mobile source spatial surrogates (\$GE_DAT directory)		X	U.S. 36-km resident
BGPRO (Rawbio, Smkmerge)	B	Biogenic spatial surrogates for county land use (\$GE_DAT directory) in RAWBIO		X	U.S. 36-km resident
BELD3_A BELD3_B BELD3_TOT (Normbeis3)	B	Biogenic gridded landuse for use in SMOKE-BEIS3		X	U.S. 36-km resident
[A/M]GREF (Grdmat)	A, M	Area source or mobile gridding cross-reference (\$GE_DAT directory)		X	NEI resident
MGLNK	M	Link-based gridding file for gridding county VMT onto links by road type (optional, but not yet supported)			
Speciation Input files					
GSPRO (Specmat.Tmobio.	A, B, M, P	Speciation profiles file.CB-IV and RADM2 with PM2.5 speciation for			OR Science

Beis3)		CMAQ model comes with SMOKE (\$GE_DAT directory)			Manager
GSREF (Spcmat)	A, B, M, P	Speciation cross-reference file (a.k.a., mapping table) (\$GE_DAT directory)	X	X	NEI resident
GSCNV (Spcmat)	A, M, P	Pollutant-to-pollutant conversion file (e.g., ROG to TOG) (optional) (\$GE_DAT directory)			ROG to TOG resident
Control Input Files					
GCNTL (Cntlmat)	A, M, P	Control packets or projection packets file (\$STATIC directory)		X	User
Special Merging Input Files					
FILELIST (Mrggrid)	A, B, M, P	Gridded merge 2-d file list (\$SCRIPTS/run directory)			User
Meteorology Input Files					
GRID_CRO_2D (Tmptbio, Beis3)	B	Grid 2D cross-point file (optional) (\$METDAT directory)			MCIP
GRID_CRO_3D (Tmptbio, Beis3, Laypoint)	P	Grid 3D cross-point file (\$METDAT directory)			MCIP
MET_CRO_2D (Tmptbio, Beis3, Temporal, Premobl, Laypoint)	B, M, P	Meteorology 2D cross-point file (\$METDAT directory)			MCIP
MET_CRO_3D (Tmptbio, Beis3, Laypoint)	B, M, P	Meteorology 3D cross-point file (\$METDAT directory) (optional for biogenics)			MCIP

MET_DOT_3D (Laypoint)	P	Meteorology 3D dot-point file (\$METDAT directory)			MCIP
Source-specific Input Files					
B3XRF (Beld3to2)	B	BELD3 to BELD2 cross-reference file			Resident
BFAC (Rawbio)	B	Summer or winter biogenic emission factors (\$GE_DAT directory)			Resident
B3FAC (Normbeis3)	B	BEIS3 emissions factors			Resident
MCODES (Smkinven, Grdmat, Spcmat, Premobl, Emisfac, Temporal)	M	Mobile vehicle type and road codes (\$MBDAT directory)			Resident /User
MEPROC (Premobl, Spcmat, Temporal)	M	Mobile emission processes (e.g., exhaust, running loss, refueling) with associated activities and pollutants (\$MBDAT directory)			Resident /User
MPLIST (Mvsetup, Premobl, Temporal)	M	Mobile source emission factors cross- reference (\$MBDAT directory)	X		Mvsetup
MPREF (Emisfac)	M	Mobile source emission factors settings file (\$MBDAT directory)	X		
MEFUPD (Emisfac)	M	Targeted emission factor update file (optional, \$STATIC directory)			User
IMDATA (Emisfac)	M	Mobile I/M Data for MOBILE5b (part of Mobile5 installation) (\$MBDAT directory – link to IMDATA4.D in \$GE_DAT directory)			Copy in ge_dat directory

TECH12D (Emisfac)	M	Mobile5b input table (part of Mobile5 installation) (\$MBDAT directory – link to TECH12D.D file in \$GE_DAT directory)			Copy in ge_dat directory
PELVCONFIG (Elevpoint)	P	Elevated source and plume-in-grid selection configuration file. Takes the place of PGROUP and PSPLIT from previous versions of SMOKE to permit SMOKE to select sources for elevated and/or plume-in-grid treatment .			User
PSTK (Smkinven)	P	Replacement stack parameters for invalid stacks. This is not really needed when SMOKE is used in Models-3 because the SMOKE Tool will check the stack parameters. (\$GE_DAT directory)			Resident
PTMPLIST (Elevpoint)	P	List of PTMP files for Elevpoint to use to compute maximum daily emissions.			User
QA, Utility, and Other Support Input Files					
ACTVNAMS (Smkinven, Smkmerge)	M	Activity data names and codes (\$INVDIR directory)			Resident /user
SIPOLS (Smkinven, Smkmerge)	A, M, P	Pollutant names and codes in order of output (\$INVDIR directory)			Resident /user

<u>COSTCY</u> (Smkinven, Temporal, Smkmerge, Smkreport)	A, B, M, P	Country, state, and county names and time zones (\$GE_DAT directory)			Resident
<u>SCCDESC</u>	A, M, P	SCC descriptions			Resident
<u>ORISDESC</u>	P	ORIS facility descriptions, needed for getting ORIS facility names for reporting purposes			Resident
<u>VNAMMAP</u> (Smk2emis)	A, B, M, P	Name mapping file for Smk2emis (\$SCRIPTS/run directory)			User
<u>REPCONFIG</u> (Smkmerge)	A, M, P	Reports configuration file, examples are provided (\$SCRIPTS/configure directory)			Resident example files

Overview: Intermediate Files

Documentation on the SMOKE version 1 intermediate files is not yet available.

Overview: Output Files

Most documentation on the SMOKE version 1 output files is not yet available. However, the documentation on the Elevpoint and Smkreport output files is available.

SMOKE Input Files

- [Inventory](#)
- [Temporalization](#)
- [Spatial Allocation](#)
- [Speciation](#)
- [Controls](#)
- [Merging](#)
- [Meteorology](#)
- [Source-specific](#)
 - [Biogenic](#)
 - [Mobile](#)
 - [Point](#)
- [QA and Other Support Files](#)

Inventory Files:

- [PTINV](#)
- [PTDAY](#)
- [PTHOUR](#)
- [ARINV](#)
- [MBINV](#)
- [BCUSE](#)
- [BGUSE](#)

For all inventory files of a particular format. The user can force SMOKE to recognize a file as having a specific format by using the following three header entries:

#IDA indicates that the file is in IDA format

#EPS2 indicates that the file is in EPS2.0 format

#EMS-95 indicates that the file is in EMS-95 format

NOTE: The file formats for EPS2.0 input files have not yet been added to this documentation. The formats supported by SMOKE are consistent with the input file formats described in the User's Guide for the Urban Airshed Model, Volume IV: User's Manual for the Emissions Preprocessor System 2.0. These files are listed in this documentation as the AIRS Facility Subsystem (AFS) data input (Table B-1) and the AIRS Area and Mobile Source (AMS) data input (Table B-2). For the AFS format, the stack and segment fields are treated as integers if they are integers (otherwise, they are treated as character strings). In the cross-reference readers, however, these fields are not (because the format is shared with other formats). So, the cross-reference files need to have these fields specified with leading zeros. Also, SIC is treated as an integer instead of a character as the format specifies.

A NOTE ABOUT EPS2.0 POINT SOURCE FILES: the EPS2.0 point source input file documentation is confusing, because it lists "XLOC" as "latitude" and "YLOC" and "longitude." In truth, the EPS2.0 software reads latitude first, so this is what SMOKE does as well. Make sure that YLOC is in columns 78-87, and XLOC is in columns 89-98.

For all file formats, you may leave fields blank that are not required (labeled as either "recommended," "optional," or "not used by SMOKE"). The required fields are listed as required for the inventory file formats.

PTINV: Point source annual or average day emissions

The PTINV file is the input point source inventory data file. The SMOKE Tool can create this file in IDA format. This file can also have the same format as the SMOKE prototype's PNLST file, which can be used to import EMS-95 data.

IDA Format

This inventory file consists of a set of fixed-format detail records, preceded by a set of header records. The general format of the header records is:

```
command parm1 parm2 ... parm n
```

The *command* field starts in the first position. The remainder of the header is free-format, blank delimited. The specific header formats are:

#TYPE	file type	first nonblank character after the command to the last character of the record
#COUNTRY	country name	first nonblank character after the command to the last character of the record; valid country names are those in the COSTCY file
#YEAR	data year	number from 1900 to 2200

#DESC	description	a description of the data (SMOKE does not use)
#POLID or #DATA	pol1 pol2 ... poln	defines the pollutants that are contained on the detail records. "pol1" is the ID of the first pollutant, "pol2" is the ID of the second pollutant, etc.

Sample header records are shown below:

```
#TYPE      Point Source Inventory
#COUNTRY   US
#YEAR      1995
#DESC      Alabama 1995
#POLID     CO NH3 NOX PM10 PM2_5 SO2 VOC
```

Please note: Starting in version 1.4 of SMOKE, the reader of this file has been changed to workaround a bug in version 6.5 IRIX operating system. This workaround makes the reader more sensitive to missing pollutant data. This can cause problems reading the data if a record has missing emissions data for the last pollutant in the list given by the #POLID header. To prevent this problem, spaces must be used to fill in the missing data columns.

The detail records are fixed-format. The fields in each record are shown in the table below.

Position	Name	Type	Description
1-2	STID	Int	State Code (required)
3-5	CYID	Int	County Code (required)
6-20	PLANTID	Char	Plant Identification Code (required)
21-35	POINTID	Char	Point Identification Code (recommended)
36-47	STACKID	Char	Stack Identification Code (recommended)
48-53	ORISID	Char	DOE Plant ID (generally recommended, and required if matching to hour-specific CEM data)
54-59	BLRID	Char	Boiler Identification Code (recommended)
60-61	SEGMENT	Char	DOE ID (recommended)
62-101	PLANT	Char	Plant Name (recommended)
102-111	SCC	Char	Source Classification Code (required)
112-115	BEGYR	Int	Begin Year of Plant Operation (not used by SMOKE)

116-119	ENDYR	Int	End Year of Plant Operation (not used by SMOKE)
120-123	STKHGT	Real	Stack Height (ft) (required)
124-129	STKDIAM	Real	Stack Diameter (ft) (required)
130-133	STKTEMP	Real	Stack Gas Exit Temperature (deg F) (required)
134-143	STKFLOW	Real	Stack Gas Flow Rate (ft ³ /sec) (required)
144-152	STKVEL	Real	Stack Gas Exit Velocity (ft/sec) (required)
153-160	BOILCAP	Real	Design Capacity (mmBtu/hr) (not used by SMOKE)
161-161	CAPUNITS	Char	Capacity Unit Code (not used by SMOKE)
162-163	WINTHRU	Real	Winter throughput (% of Annual) (not used by SMOKE)
164-165	SPRTHRU	Real	Spring throughput (% of Annual) (not used by SMOKE)
166-167	SUMTHRU	Real	Summer throughput (% of Annual) (not used by SMOKE)
168-169	FALTHRU	Real	Fall throughput (% of Annual) (not used by SMOKE)
170-171	HOURS	Int	Normal Operating Time (hours/day) (not used by SMOKE)
172-173	START	Int	Normal Operation Start Time (not used by SMOKE)
174-174	DAYS	Int	Normal Operating Time (days/week) (not used by SMOKE)
175-176	WEEKS	Int	Normal Operating Time (weeks/year) (not used by SMOKE)
177-187	THRUPUT	Real	Throughput Rate (SCC units/yr) (not used by SMOKE)
188-199	MAXRATE	Real	Max O3 Season Rate (units/day) (not used by SMOKE)
200-207	HEATCON	Real	Heat Content (mmBtu/SCC unit) (not used by SMOKE)

208-212	SULFCON	Real	Sulfur Content (mass percent) (not used by SMOKE)
213-217	ASHCON	Real	Ash Content (mass percent) (not used by SMOKE)
218-226	NETDC	Real	Max Nameplate Capacity (MW) (not used by SMOKE)
227-230	SIC	Int	Standard Industrial Classification Code (required)
231-239	LATC	Real	Latitude (decimal degrees) (required)
240-248	LONC	Real	Longitude (decimal degrees) (required)
249-249	OFFSHORE	Char	Offshore Flag (fill in with “X” if source is offshore), (recommended)
250-262	ANN1	Real	pol1 Annual Emissions (short tons / year) (required)
263-275	OSD1	Real	pol1 Ozone Season Emissions (short tons/average ozone day) (optional)
276-282	CE1	Real	pol1 Control Efficiency (give value of 0-100) (recommended, if left blank, SMOKE default is 0)
283-285	RE1	Real	pol1 Rule Effectiveness (give value of 0-100) (recommended, if left blank, SMOKE default is 100)
286-295	EMF1	Real	pol1 Emission Factors (SCC units) (not used by SMOKE)
296-298	CPRI1	Int	pol1 Primary Control Equipment Code (not used by SMOKE)
299-301	CSEC1	Int	pol1 Secondary Control Equipment Code (not used by SMOKE)
302-314	ANN2	Real	pol2 Annual Emissions (short tons / year), (required)
315-327	OSD2	Real	pol2 Ozone Season Emissions (short tons/average ozone day), (recommended)
328-334	CE2	Real	pol2 Control Efficiency (0-100), see pol1 above
335-337	RE2	Real	pol2 Rule Effectiveness (0-100), see pol1 above
338-347	EMF2	Real	pol2 Emission Factors (SCC units), see pol1 above

348-350	CPRI2	Int	pol2 Primary Control Equipment Code, see pol1 above
351-353	CSEC2	Int	pol2 Secondary Control Equipment Code, see pol1 above
354-366	ANN3	Real	pol3 Annual Emissions (short tons/year) , see pol1 above
367-379	OSD3	Real	pol3 Ozone Season Emissions (short tons/average ozone day) , see pol1 above
380-386	CE3	Real	pol3 Control Efficiency (0-100) , see pol1 above
387-389	RE3	Real	pol3 Rule Effectiveness (0-100) , see pol1 above
390-399	EMF3	Real	pol3 Emission Factors (SCC units) , see pol1 above
400-402	CPRI3	Int	pol3 Primary Control Equipment Code, see pol1 above
403-405	CSEC3	Int	pol3 Secondary Control Equipment Code, see pol1 above

(Repeat for n pollutants)

EMS-95 Format

For EMS-95 inputs, the PTINV file must list the different types of EMS-95 files in a specific order. This is called a SMOKE list format. The order of the EMS-95 files is the same as would be achieved from the UNIX command "ls". The order is: device file, emissions file, facility file, process file, and stack file, and these 5 files must be grouped together for the files that work together. For example, the North Carolina files must be together, not just any 5 of these files. The file can be created by using the UNIX command, which assume the EMS-95 files (and only these files) are all in the \$PTDAT directory.

```
ls $PTDAT/*.pt > $PTINV
```

When using a list format, the PTINV file must also contain one or more **INVYEAR** packets. This packet acts as a switch that sets the inventory year for the files, each of which will get the year designated by the packet until another **INVYEAR** packet appears in the file. Multiple years of inventory data can be combined to the same SMOKE inventory file in this way.

Although it would be possible to create a single file of each type (i.e., a single device, emission, facility, process, and stack file with all records), this approach is not recommended because Smkinven will be much slower than if the files are separated by state. This is because SMOKE must match the records among the various files, and it is much faster to do the matching with

subsets of the data than with all of the data at once.

Example: The following is an example of a correct PNLST file when used for EMS-95 inputs.

```
INVYEAR 1995
/epserv/apps/smoke/inventory/smraq95/a15/common/device.pt
/epserv/apps/smoke/inventory/smraq95/a15/common/emission.pt
/epserv/apps/smoke/inventory/smraq95/a15/common/facility.pt
/epserv/apps/smoke/inventory/smraq95/a15/common/process.pt
/epserv/apps/smoke/inventory/smraq95/a15/common/stack.pt
/epserv/apps/smoke/inventory/smraq95/ar5/common/device.pt
/epserv/apps/smoke/inventory/smraq95/ar5/common/emission.pt
/epserv/apps/smoke/inventory/smraq95/ar5/common/facility.pt
/epserv/apps/smoke/inventory/smraq95/ar5/common/process.pt
/epserv/apps/smoke/inventory/smraq95/ar5/common/stack.pt
```

Format for EMS-95- formatted "device.pt" file(s):

The columns listed here are only those that are used by SMOKE. These files cannot have a #COUNTRY entry. The default country code is 0.

Columns	Type	Description
1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Facility ID (alpha-numeric) (required)
21-32	Char	Stack ID (alpha-numeric) (required)
33-44	Char	Device ID (alpha-numeric) (required)
45-48	Char	Standard Industrial Classification (SIC) (required)
121-122	Int	Diurnal profile code (optional, you may use the PTREF file instead)
123-124	Int	Weekly profile code (optional, you may use the PTREF file instead)

Format for EMS-95- formatted "emission.pt" file(s):

The columns listed here are only those that are used by SMOKE. These files cannot have a #COUNTRY entry. The default country code is 0.

Columns	Type	Description
1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Facility ID (alpha-numeric) (required)
21-32	Char	Stack ID (alpha-numeric) (required)
33-44	Char	Device ID (alpha-numeric) (required)
45-56	Char	Process ID (alpha-numeric) (required)
57-61	Char	Pollutant ID (e.g., NOX) (required)
88-100	Real	Actual emissions (short tons/average annual day) (required)
114-115	Char	Temporal basis (required) AA = annual emissions AD = daily emissions with weekday normalizer DS = day-specific emissions
126-132	Real	Control equipment efficiency (percent, give value 0-100) (optional, SMOKE default is 0)

Format for EMS-95- formatted "facility.pt" file(s):

The columns listed here are only those that are used by SMOKE. These files cannot have a #COUNTRY entry. The default country code is 0.

Columns	Type	Description
1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Facility ID (alpha-numeric) (required)
21-24	Int	Standard Industrial Classification (SIC) (not used by SMOKE)
25-33	Real	UTM easting (m) (required)

34-42	Real	UTM northing (m) (required)
43-44	Int	UTM zone (required)
45-84	Char	Facility Name (required)

Format for EMS-95- formatted "process.pt" file(s):

The columns listed here are only those that are used by SMOKE. These files cannot have a #COUNTRY entry. The default country code is 0.

Columns	Type	Description
1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Facility ID (alpha-numeric) (required)
21-32	Char	Stack ID (alpha-numeric) (required)
33-44	Char	Device ID (alpha-numeric) (required)
45-56	Char	Process ID (alpha-numeric) (required)
57 - 64	Char	Source Classification Code (SCC) (required)

Format for EMS-95- formatted "stack.pt" file(s):

The columns listed here are only those that are used by SMOKE. These files cannot have a #COUNTRY entry. The default country code is 0.

Columns	Type	Description
1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Facility ID (alpha-numeric) (required)
21-32	Char	Stack ID (alpha-numeric) (required)

33-40	Real	Stack diameter (ft) (required)
41-47	Real	Stack height above ground surface(ft) (required)
48-54	Real	Stack exit gas temperature (deg K) (required)
55-61	Real	Stack exit gas velocity (ft/s) (required)
62-71	Real	Stack exit flow rate (actual ft ³ /min) (optional)
72-80	Real	UTM easting of stack (m) (default is plant's value) (optional, SMOKE will use facility's value)
81-89	Real	UTM northing of stack (m) (default is plant's value) (optional, SMOKE will use facility's value)

PTDAY: Point source day-specific emissions

The PTDAY file is the input point source inventory file for day-specific data. It must be created by the user without the SMOKE Tool. The file is simply a list of day-specific data files (directory paths included) that are to be read in by SMOKE as day-specific data. The files listed in this file must be in the following format. In addition, these files can have a #COUNTRY entry at the first line of the file to set the country code. The default country code is 0.

SMOKE requires that the sources in the PTDAY file also be in the PTINV file, and that the user has matched the sources between the inventory and the day-specific data. See the documentation for the PTHOUR file (below) for more information on how to use this file with IDA inventories.

Position	Name	Type	Description
1-2	STID	Int	State Code (required)
3-5	CYID	Int	County Code (required)
6-20	FCID	Char	Facility ID (a.k.a. plant ID)
21-32	CHAR1	Char	If PTINV in EMS-95 format: Stack ID (required) If PTINV in IDA format: Point ID
33-44	CHAR2	Char	If PTINV in EMS-95 format: Device ID (required) If PTINV in IDA format: Stack ID

45-56	CHAR3	Char	If PTINV in EMS-95 format: Process ID (required) If PTINV in IDA format: Segment
57-61	POLID	Char	Pollutant name (required)
62-69	DATE	Char	Date in format "MM/DD/YY". Years less than 70 are treated as century 2000. (required)
70-72	TZONNAM	Char	Time zone name. Valid entries GMT, ADT, AST, EDT, EST, CDT, CST, MDT, MST, PDT, PST. Add others to EMCNST3.EXT include file. (required)
73-90	DAYTOT	Real	Daily emissions total (short tons/day) (required)
92-101	SCC	Char	If PTINV in IDA format: source category code is needed to work properly.

PTHOUR: Point source hour-specific emissions

The PTHOUR file is the input point source inventory file for hour-specific data and profiles. The file is simply a list of hour-specific data files (directory paths included) that are to be read in by SMOKE as hour-specific data. The files listed in this file must be in the following format. In addition, these files can have a #COUNTRY entry at the first line of the file to set the country code. The default country code is 0.

The hour-specific data files that are listed in the PTHOUR file can be provided in two ASCII formats: EMS-95 format and Continuous Emissions Monitoring (CEM) format. The EMS-95 format must be created by the user manually. The CEM format can be output from the SMOKE Tool.

Date range setting for extracting hour-specific data from a larger dataset:

The PTHOUR file may optionally contain a packet to control the range of dates that Smkinven will read in the data. The following entry should appear on the first line of the PTHOUR file when this feature is needed.

DATERANGE MMDD(start) MMDD(end)

Where MMDD is two-digit month and day of the month at the start and end of the period of interest. For example, to request July 10th through the 12th, the first line of the file should read:

DATERANGE 0710 0712

The year is implied by the CEM data itself, which can only be provided to SMOKE with a single year in the input file. The year can be broken up into smaller periods in separate files, and

SMOKE can read in only part of the year as well from a file with only specific dates in it. This feature is useful when users want to use the default files and extract a certain period to output to the PTHOUR file from Smkinven. Please note that reading in the whole year of data and extracting just a few days will run much slower than manually editing the CEM file to contain just the days of interest. Also note that the user is responsible for selecting days that fully cover the modeling episode after time zone differences between the facility's time zones and the modeling time zone (set by the OUTZONE option) are accounted for.

EMS-95 Format

For EMS-95 formatted data, SMOKE requires that the sources in the PTHOUR file also be in the PTINV file. The fields that are common to the hour-specific data and the inventory data need to match exactly. These fields are Facility ID, Stack ID, Device ID, and Process ID. These fields are treated as text fields (not numeric) in SMOKE, so leading zeros need to be consistent between the hour-specific and average-day or annual inventory files.

When using hour-specific data in EMS-95 format with the IDA inventory, the fields in the PTHOUR file should line up with the fields in the PTINV file as follows:

- PTHOUR Facility ID maps to PTINV PLANTID
- PTHOUR Stack ID maps to PTINV POINTID
- PTHOUR Device ID maps to PTINV STACKID
- PTHOUR Process ID maps to PTINV SEGMENT
- PTHOUR SCC (implied by Process ID in EMS-95 process file) maps to PTINV SCC

Position	Name	Type	Description
1-2	STID	Int	State Code (required)
3-5	CYID	Int	County Code (required)
6-20	FCID	Char	Facility ID (a.k.a. plant ID) (required)
21-32	SKID	Char	If PTINV in EMS-95 format: Stack ID (required) If PTINV in IDA format: Point ID
33-44	DVID	Char	If PTINV in EMS-95 format: Device ID (required) If PTINV in IDA format: Stack ID
45-56	PRID	Char	If PTINV in EMS-95 format: Process ID (required) If PTINV in IDA format: Segment

57-61	POLID	Char	Pollutant name (required)
62-69	DATE	Char	Date in format "MM/DD/YY". Years less than 70 are treated as century 2000 (required)
70-72	TZONNAM	Char	Time zone name associated with emissions data. Valid entries GMT, ADT, AST, EDT, EST, CDT, CST, MDT, MST, PDT, PST. NOTE: Add others to EMCNST3.EXT include file and recompile. (required)
73-79	HRVAL1	Real	Hourly emissions for hour 1 (short tons/hour) (required for all hours)
80-86	HRVAL2	Real	Hourly emissions for hour 2 (short tons/hour)
87-93	HRVAL3	Real	Hourly emissions for hour 3 (short tons/hour)
...			
234-240	HRVAL24	Real	Hourly emissions for hour 24 (short tons/hour)
241-248	DAYTOT	Real	Daily emissions total (short tons/day)
250-259	SCC	Char	If PTINV in IDA format: source category code is needed to work properly.

CEM hour-specific format

The CEM hour-specific format can be written by the SMOKE Tool in Models-3. This format can *only* be used with IDA-formatted inventory files at this time. With this format, SMOKE uses the CEM ORIS ID field and Boiler ID

Position	Name	Type	Description
A	ORISID	Char	DOE Plant ID (required, should match the same field in the PTINV file in IDA format)
B	BLRID	Char	Boiler Identification Code (required, should match the same field in the PTINV file in IDA format)
C	YYMMDD	Int	Date of data in YY (2-digit year), MM (month), and DD (date) format (required)

D	HOUR	Integer	Hour value from 0 to 23
E	CO2	Real	Carbon dioxide emissions in pounds per hour If PTINV in IDA format: Point ID
F	SO2	Real	Sulfur dioxide emissions in pounds per hour
G	NOXRATE	Real	Rate of Nitrogen Dioxide emissions in pounds per MMBtu
H	OPTIME	Real	Operating time (not used by SMOKE)
I	GLOAD	Real	Not used by SMOKE, but some real needs to be in the field
J	SLOAD	Real	Not used by SMOKE, but some real needs to be in the field
K	HTINPUT	Real	Heat input in MMBtu

ARINV: Area source annual or average day emissions

The ARINV file is the input area source inventory data file. The SMOKE Tool can create this file in IDA format. This file can also have the same format as the SMOKE prototype's ANLST file, which can be used to import EMS-95 data.

IDA Format

This inventory file consists of a set of fixed-format detail records, preceded by a set of header records. The general format of the header records is:

```
command parm1 parm2 ... parm n
```

The *command* field starts in the first position. The remainder of the header is free-format, blank delimited. The specific header formats are:

#TYPE	file type	first nonblank character after the command to the last character of the record
#COUNTRY	country name	first nonblank character after the command to the last character of the record; valid country names are those in the COSTCY file
#YEAR	data year	number from 1900 to 2200

#DESC	description	a description of the data (SMOKE does not use)
#POLID or #DATA	pol1 pol2 ... poln	defines the pollutants that are contained on the detail records. "pol1" is the ID of the first pollutant, "pol2" is the ID of the second pollutant, etc.

Sample header records are shown below:

```
#TYPE      Area Source Inventory
#COUNTRY   US
#YEAR      1995
#DESC      Alabama 1995
#POLID     CO NH3 NOX PM10 PM2_5 SO2 VOC
```

The detail records are fixed-format. The fields in each record are shown below:

Position	Name	Type	Description
1-2	STID	Int	State Code (required)
3-5	CYID	Int	County Code (required)
6-15	SCC	Char	Source Classification Code (required)
16-25	ANN1	Real	pol1 Annual Emissions (short tons) (required)
26-35	OSD1	Real	pol1 Ozone Season Emissions (short tons/average ozone day) (optional)
36-46	EMF1	Real	pol1 Emission Factors (SCC units) (not used by SMOKE)
47-53	CE1	Real	pol1 Control Efficiency (give value of 0-100) (optional, SMOKE default is 0)
54-56	RE1	Real	pol1 Rule Effectiveness (give value of 0-100), (optional, SMOKE default is 100)
57-62	RP1	Real	pol1 Rule Penetration (give value of 0-100) (optional, SMOKE default is 100)
63-72	ANN2	Real	pol2 Annual Emissions (short tons)
73-82	OSD2	Real	pol2 Ozone Season Emissions (short tons/average ozone day)

83-93	EMF2	Real	pol2 Emission Factors (SCC units)
94-100	CE2	Real	pol2 Control Efficiency (give value of 0-100)
101-103	RE2	Real	pol2 Rule Effectiveness (give value of 0-100)
104-109	RP2	Real	pol2 Rule Penetration (give value of 0-100)
110-119	ANN3	Real	pol3 Annual Emissions (short tons/year)
120-129	OSD3	Real	pol3 Ozone Season Emissions (short tons/average ozone day)
130-140	EMF3	Real	pol3 Emission Factors (SCC units)
141-147	CE3	Real	pol3 Control Efficiency (give value of 0-100)
148-150	RE3	Real	pol3 Rule Effectiveness (give value of 0-100)
151-156	RP3	Real	pol3 Rule Penetration (give value of 0-100)

(Repeat for n pollutants)

EMS-95 Format

For EMS-95 inputs, the ARINV file must list the EMS-95 files. This format is called a SMOKE list format. The file can be created by using the UNIX command, which assumes the EMS-95 files (and only these files) are all in the \$ARDAT directory.

```
ls $ARDAT/*.pt > $ARINV
```

When using a list format, the ARINV file must also contain one or more **INVYEAR** packets. This packet acts as a switch that sets the inventory year for the files, each of which will get the year designated by the packet until another **INVYEAR** packet appears in the file. Multiple years of inventory data can be combined to the same SMOKE inventory file in this way.

Format for EMS-95- formatted area source emissions file(s):

The columns listed here are only those that are used by SMOKE. In addition, these files can have a #COUNTRY entry at the first line of the file to set the country code. The default country code is 0.

Columns	Type	Description
---------	------	-------------

1-2	Int	FIPS state code (required)
3-5	Int	FIPS county code (required)
6-20	Char	Source Category Code (SCC) or Area Source Category (ASC) code (required)
21-25	Char	Pollutant ID (name, e.g. VOC) (required)
52-65	Real	Actual emissions of specified pollutant (short tons/average annual day) (required)
88-94	Real	Control equipment efficiency (give value of 0-100) (optional, default SMOKE value is 0)
95-96	Char	Temporal basis: (required) AA = annual emissions AD = daily emissions with weekday normalizer DS = day-specific (will not cause SMOKE to crash, but may not be fully supported to give same behavior as EMS-95 – use with caution)

MBINV: Mobile source activity and emissions

The MBINV file is the input mobile source inventory data file. The SMOKE Tool can create this file in either IDA activities format or IDA emissions format. The IDA activities format is a list-directed file format, but the IDA emissions format is a column-specific format. Although the LINK ID field is now supported by the IDA format, SMOKE cannot yet read the IDA link definitions file, which contains the coordinates for the links. So, in order to use link data with the current version of SMOKE, one must use the EMS-95 format.

The MBINV file can also be in a SMOKE list format, to read in EMS-95 link and non-link data, or a modified EMS-95 format that is list-directed. The following sections have details about these file formats.

Mobile IDA Header

The mobile IDA inventory formats consists of a set of fixed-format header records, preceded by a set of data records. The header records can appear anywhere in the file to change the meaning of the data. For example, the #COUNTRY value could change to allow for multiple countries in a single file, the #YEAR value could change to allow for multiple years, and the #DATA and #UNITS values could change to allow for different data fields in different parts of the inventory file.

The general format of the header records is:

```
command parm1 parm2 ... parm n
```

The *command* field starts in the first position. The remainder of the header is free-format, blank delimited. The specific header formats are:

Command	Purpose	Description and values
#TYPE	file type	first nonblank character after the command to the last character of the record; valid types are: Motor Vehicle Activity Inventory Motor Vehicle Emission Inventory If the word “activity” does not appear in the header, emissions are assumed.
#COUNTRY	country name	first nonblank character after the command to the last character of the record; valid country names are those in the COSTCY file (default “US”, “CANADA”, and “MEXICO”)
#YEAR	data year	number from 1900 to 2200
#DESC	description	a description of the data (SMOKE does not use)
#DATA	data1, data2, dataN	defines the data that are contained after the source identifiers on each records. "data1" is the name of the first data type, "data2" is the name of the second data type, etc.
#UNITS	units1, units2, unitsN	defines the units of the input data. "units1" is the name of the first units, and so forth. These must be included in quotes. This command is valid only for mobile activity data , because emissions data have units built into the file formats.

Sample header records are shown below
For activities:

```
#TYPE      Motor Vehicle Activity Inventory
#COUNTRY   US
#YEAR      1996
#DESC      1996 NET inventory, version 3.1
#DATA      SPEED VMT
#UNITS     "miles/hr" "10E6 miles/yr"
```

For emissions:

```
#TYPE      Motor Vehicle Emission Inventory
#COUNTRY   US
#YEAR      1996
#DESC      1996 NET inventory, version 3.1
#DATA      VOC NOX CO SO2 PM10 PM2_5 NH3
```

Mobile IDA Activity Data Format

The records are list-formatted.

Position	Name	Type	Description
A	STID	Int	FIPS state code (required)
B	CYID	Int	FIPS county code (required)
C	LINK ID	Char	Link identifier (optional, put 0 for non-link)
D	SCC	Char	AMS Source Classification Code (SCC) (required)
E	DATA(1)	Real	Data for the first field in #DATA header list, given in the units of the first field in the #UNITS header list (required)
F	DATA(2)	Real	Data for the second field in #DATA header list, given in the units of the second field in the #UNITS header list (required if N>1)
G	DATA(3)	Real	Data for third field... (required if N > 2)
	DATA(N)	Real	Data for final field... (required if N > 3)

Mobile IDA Emissions Data Format

The records are fixed-format. The ozone-season data does not have to be truly “ozone-season.” Any day-total value can be used in this field, if some other seasonal average or day-specific data need to be used in SMOKE.

Position	Name	Type	Description
1-2	STID	Int	State Code (required)

3-5	CYID	Int	County Code (required)
6-15	LINK ID	Char	Link identifier (optional, put zero for nonlink data)
16-25	SCC	Char	AMS Source Classification Code (required)
26-35	DATA(1)	Real	Data for the first field in #DATA header list (short tons/year) (required)
36-45	OSD(1)	Real	Ozone season data for the first field in the #DATA header list (short tons/average ozone day) (optional)
46-55	DATA(2)	Real	Data for the second field in #DATA header list (short tons/year)
56-65	OSD(2)	Real	Ozone season data for the second field in the #DATA header list (short tons/average ozone day)
66-75	DATA(3)	Real	Data for third field (short tons/year)
76-85	OSD(3)	Real	Ozone-season data for the third field (short tons/average ozone day)
	DATA(N)	Real	Data for final field (short tons/year)
	OSD(N)	Real	Ozone-season data for the final field (short tons/average ozone day)

EMS-95 Formats

For EMS-95 inputs, the MBINV file must list the nonlink and link EMS-95 files. This format is called a SMOKE list format. The file can be created by using the UNIX command, which assumes the EMS-95 files (and only these files) are all in the \$MBDAT directory.

```
ls $MBDAT/*.mv > $MBINV
```

When using a list format, the MBINV file must also contain one or more **INVYEAR** packets. This packet acts as a switch that sets the inventory year for the files, each of which will get the year designated by the packet until another INVYEAR packet appears in the file. Multiple years of inventory data can be combined to the same SMOKE inventory file in this way.

The data files that are referenced by the SMOKE list formatted MBINV files may also contain

some header fields. They may contain #COUNTRY, #YEAR, and/or #DATA header fields, as described for IDA-formatted area source files. The default country is 0 and the default year is set by the INVYEAR packet. The #DATA header must appear, even if the only data in the file are VMT data. **The #UNITS header must NOT appear.**

EMS-95 nonlink format (column-specific)

Line	Columns	Type	Description
1	A	Int	#NONLINK
2	A+	Int	#DATA VMT
3+	1-2	Int	FIPS state code (required)
	3-5	Int	FIPS county code (required)
	6-6	Int	Area type code (required)
	7-10	Int	Facility type code (required)
	11-18	Real	Vehicle Miles Traveled (VMT) (miles/average annual weekday) (required)

EMS-95 nonlink list-directed format (not column-specific)

Line	Columns	Type	Description
1	A	Char	#NONLINK
2	A+	Char	#DATA VMT PM10 PM2_5 ... Last Data
3+	A	Int	Country, state, and county code (YSSCCC, required)
	B	Int	Road type code (required)
	C	Real	Vehicle Miles Traveled (VMT) (miles/average annual weekday) (required)

	D	Real	PM10 in (short tons/average annual weekday)
	E	Real	PM2_5 (short tons/average annual weekday)

(additional columns for additional data listed on the #DATA line)

EMS-95 link list-directed format (not-column-specific)

Line	Columns	Type	Description
1	A	Char	#LINK
2	A+	Char	#DATA VMT PM10 PM2_5 ... Last Data
2+	A	Int	Country, state, and county code (YSSCCC, required)
	B	Int	Road type code (required)
	C	Char	Link ID (15 Character) (required)
	D	Real	Link start longitude (decimal degrees) or UTM Easting (meters) (required)
	E	Real	Link start latitude (decimal degrees) or UTM Northing (meters) (required)
	F	Real	Link end longitude (decimal degrees) or UTM Easting (meters) (required)
	G	Real	Link end latitude (decimal degrees) or UTM Northing (meters) (required)
	H	Int	UTM Zone or 0 for lat/lon coordinates (required)
	I	Real	Vehicle Miles Traveled (VMT) in (miles/average annual weekday) (required)
	J	Real	PM10 (short tons/average annual weekday)

	K	Real	PM2_5 (short tons/average annual weekday)
--	---	------	---

(additional columns for additional data listed on the #DATA line)

VMTMIX: Mobile vehicle mix data

The VMTMIX file is used for EMS-95 inventory import to disaggregate the data totals by road type. This file can be in EMS-95 column-specific format, or in a list-directed format based on the same. **NOTE: The road type or road class codes used in either VMTMIX file format must match the codes that are used in the mobile VMT inventory file. If roadclass codes are used for the free-formatted files, they must be used in both the inventory and VMTMIX files.**

For both files, a header line is needed to indicate the number and order of vehicle types listed in the file. The standard EMS-95 structure is

```
#VTYPES LDGV LDGT1 LDGT2 HDGV LDDV LDDT HDDV MC
```

EMS-95 format (column specific)

Line	Columns	Type	Description
1	A	Char	#VTYPES header line (see example above)
2+	1-2	Int	State code (required)
	3-5	Int	County code (required)
	6-6	Int	Area type code (required)
	7-10	Int	Facility type code (required)
	11-20	Char	Link ID (optional, zero if nonlink)
	21-25	Real	Fraction of total VMT from gas vehicles (all fractions required)
	26-30	Real	Fraction of total VMT from light duty gas trucks 1
	31-35	Real	Fraction of total VMT from light duty gas trucks 2
	36-40	Real	Fraction of total VMT from heavy duty gas vehicles
	41-45	Real	Fraction of total VMT from light duty diesel vehicles
	46-50	Real	Fraction of total VMT from heavy duty diesel trucks
	51-55	Real	Fraction of total VMT from heavy duty diesel vehicles

56-60 Real Fraction of total VMT from motorcycles

EMS-95 format, list-directed (not column-specific)

Line	Columns	Type	Description
1	A	Char	#VTYPES header line (required)
2+	A	Int	Country, state, and county code (required)
	B	Int	Roadway type code or road class (required)
	C	Char	Link ID (Optional, zero if nonlink)
	D	Real	Fraction of total VMT from first vehicle type (required for all fractions)
	E	Real	Fraction of total VMT from second vehicle type
	F	Real	Fraction of total VMT from third vehicle type
	G	Real	Fraction of total VMT from fourth vehicle type
	H	Real	Fraction of total VMT from fifth vehicle type
	I	Real	Fraction of total VMT from sixth vehicle type
	J	Real	Fraction of total VMT from seventh vehicle type
	K	Real	Fraction of total VMT from eighth vehicle type

BCUSE: Biogenic county land use

BCUSE is the BEIS2-format ASCII biogenic county land use file input to the Rawbio program. BCUSE has the following structure:

Line	Columns	Description
1	A	Country/state/county code (Int)
2	A	Rural forest land area (Real)
	B	Rural forest number of subtypes (Int)
For each rural forest subtype:		

(These subtypes must match the emission factors in BFAC)		
3+	A	Name of land use subtype as per BEIS2 documentation
	B	Area within the county devoted to land use subtype
Repeat lines 2 and 3+ for each of urban forest, agriculture, and other.		

BGUSE: Biogenic gridded land use

BGUSE is the emissions prototype's BEIS2-format ASCII biogenic gridded land use file input to the Rawbio program. BGUSE is an ASCII file. Note that the data records in BGUSE all have list-directed formatting (e.g., quoted strings instead of free-form). given below:

Line	Columns	Description
1	A	#GRID header (see AGPRO and MGPRO)
optional	A	Header with text metadata sections including the following: Introduction; Grid Definition: File Description: A list of "VEGID" names and descriptions, formatted "(1X, A4, 3X, A)" Notes on VEGID: Source of Data Version:
2	A	ENDHEADER (this text is required even if there is no header)
Repeat for each cell		
3+	A	Cell column number (Integer)
	B	Cell row number (Integer)
	C	Cell area in hectares (Real)
Repeat for each land use types (rural forest, urban forest, agriculture, other)		
4+	A	Area of land use type in hectares (Real)

	B	Number of land use subtypes for this land use type in this cell (Integer)
Repeat for each land use subtype		
5+	2-5	4-character name of land use type (in quotes)
	7-80	Area of land use subtype in hectares (Real)

Temporal Allocation

[A|M|P]TPRO: Temporal profile file

The ATPRO, MTPRO, and PTPRO files are used for the Temporal program for area, mobile, and point sources, respectively. These files contain the monthly, weekly, and diurnal temporal profiles used to convert the annual emissions stored in the inventory file to hourly emissions. The SMOKE Tool can create these files, if you are using the Models-3 modeling system. The files can contain four types of records:

- Monthly temporal weighting factors ([/MONTHLY/](#) packet)
- Weekly temporal weighting factors ([/WEEKLY/](#) packet)
- Weekday Diurnal temporal weighting factors ([/DIURNAL WEEKDAY/](#) packet)
- Weekend Diurnal temporal weighting factors ([/DIURNAL WEEKEND/](#) packet)

The weekend diurnal temporal factors are optional. If the monthly factors are not used because all of the inventory emissions are supplied as "per day" emissions, at least one monthly profile is still needed to prevent an error. The file format is column-specific based on the columns listed in the following table. All three source categories use the same file format, and they can share the same file.

Line	Columns	Description
/MONTHLY/ packet		
1	1-20	Packet identifier = /MONTHLY/
2+	1-5	Monthly temporal profile code (Integer)
	7-9	Temporal weight for January (Integer)
	11-13	Temporal weight for February (Integer)

	51-53	Temporal weight for December (Integer)
	54-58	Total of weights for entire year (Integer)
3	1-20	Packet terminator = /END/
/WEEKLY/ packet		

1	1-20	Packet identifier = /WEEKLY/
2+	1-5	Weekly temporal profile code (Integer)
	7-9	Temporal weight for Monday (Integer)
	11-13	Temporal weight for Tuesday (Integer)

	31-33	Temporal weight for Sunday (Integer)
	34-38	Total of weights for entire week (Integer)
3	1-20	Packet terminator = /END/
/DIURNAL/ packet		
1	1-20	Packet identifier = /DIURNAL WEEKDAY/ or /DIURNAL WEEKEND/
2+	1-5	Diurnal temporal profile code (Integer)
	7-9	Temporal weight for hour beginning 0000 (Integer)
	11-13	Temporal weight for hour beginning 0100 (Integer)

	99-101	Temporal weight for hour beginning 2300 (Integer)
	102-106	Total of weights for entire day (Integer)
3	1-20	Packet terminator = /END/

Example:

```

/MONTHLY/
  1  83  83  83  83  83  83  83  83  83  83  83  83  996
/END/
/WEEKLY/
  1  1  1  1  1  1  0  0  5
  2  0  0  0  0  0  1  1  2
  3  1  1  1  1  1  0  0  5
/END/
/DIURNAL WEEKDAY/
  1  0  0  0  0  0  0  0  0  1  1  1  1  1  1  1  1  0  0
0  0  0  0  0  0  8

```

```

      2  0  0  0  0  0  0  0  0  0  1  1  1  1  1  1  1  1  0  0
0  0  0  0  0  0  0  8
      81 417 417 417 417 417 417 417 417 417 417 417 416 414 415 417 417 417 417
417 417 417 417 417 417 41510000
      82 388 351 315 299 299 321 348 402 441 456 457 461 457 461 461 460 464 460
456 456 455 453 450 42910000
/END/

```

[A|M|P]TREF: Temporal cross-reference file

The ATREF, MTREF, and PTREF files contain the area, mobile, and point source cross-reference records for assigning the temporal profiles to the sources. If needed, the same file can be used for area, mobile, or point source categories, but more fields are used for mobile than for area, and more fields are used for point than for mobile. The SMOKE Tool can create these files, if you are using the Models-3 modeling system. The description of the Temporal program in Chapter 7 provides a list of the matching hierarchies that SMOKE uses when applying the file to an inventory. **If a field is blank, it needs to be set to -9.**

Users can fill in whatever fields that they want for the source characteristics after plant ID. It is important to ensure, however, that one is consistent between the PTINV and the PTREF file. For example, if one uses the Process ID in place of the Stack ID field in the PTINV file, the same approach would need to be used in building the PTREF file. Remember that all of the field widths are limited to what is in the original PTINV input format (IDA, EMS-95, or EPS). Also remember that these fields are character strings, and therefore leading zeros are not ignored (this has caused others problems in the past).

The pollutant field allows users to assign a different temporal profile for each pollutant associated with a given source. This is an optional approach; therefore, if users wish not to use pollutant as a characteristic in assigning temporal profiles, users can put a "-9" in the pollutant field. In that case, all pollutants for a given source will be assigned that temporal profile.

Note that the country/state/county code is defined as follows:

```

000000      = applies to all counties, states, and countries
n00000      = applies to all states and counties in country n
mmm000      = applies to all counties in state mm and country n
nmmccc      = applies to county ccc in state mm and country n

```

Area-source temporal cross-reference file

Line	Columns	Description
1+	A	10-digit SCC code, or 7-digit with zeros filling the remaining digits (Character) (optional, put 0 for entry that is not SCC-specific)
	B	Monthly temporal profile code (Integer) (required)
	C	Weekly temporal profile code (Integer) (required)

	D	Weekday or weekend diurnal temporal profile code (Integer) (required)
	E	Pollutant name (Character) (optional, zero if not pollutant-dependent)
	F	Country/state/county code (6-digit Integer YSSCCC) (optional): <ul style="list-style-type: none"> - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent

Mobile-source temporal cross-reference file

Line	Columns	Description
1+	A	10-digit SCC code (Character) (optional, put 0 for entry that is not SCC-specific)
	B	Monthly temporal profile code (Integer) (required)
	C	Weekly temporal profile code (Integer) (required)
	D	Weekday or weekend diurnal temporal profile code (Integer) (required)
	E	Pollutant name (Character) (optional, zero if not pollutant-dependent)
	F	Country/state/county code (6-digit Integer YSSCCC) (optional): <ul style="list-style-type: none"> - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent
	G	Link ID (Character) (optional, leave blank or put zero for entry that is not link-specific)

Point-source temporal cross-reference file

Note, for EMS-95 inventories, Characteristic 1 is the stack ID, Characteristic 2 is the device ID, and Characteristic 3 is the process ID.

Line	Columns	Description
1	A	/POINT DEFN/

	B	Number of point source characteristics in addition to plant ID in point source definition (for IDA, this will always be 4)
	C	Number of point source characteristic in addition to plant ID that is the SCC (if SCC is a part of the source definition), zero otherwise. IDA and EPS2 inventories: 4 EMS-95 inventories: 0
2+	A	10-digit SCC code, or 5-digit with zeros filling the remaining digits (Character) (optional, put 0 for entry that is not SCC-specific)
	B	Monthly temporal profile code (Integer) (required)
	C	Weekly temporal profile code (Integer) (required)
	D	Weekday or weekend diurnal temporal profile code (Integer) (required)
	E	Pollutant name (Character) (optional, zero if not pollutant-dependent)
	F	Country/state/county code (6-digit Integer YSSCCC) (optional): - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent
	G	Plant ID (Character) (optional, leave blank for not plant-specific)
	H	Characteristic 1 (for IDA, this is Point ID or -9) (Character) (optional)
	I	Characteristic 2 (for IDA, this is Stack ID or -9) (Character) (optional)
	J	Characteristic 3 (for IDA, this is segment or -9) (Character) (optional)
	K	Characteristic 4 (blank for IDA because SCC already given in column A) (Character) (optional)
	L	Characteristic 5 (blank for IDA) (Character) (optional)

Spatial Allocation

Preparation of the spatial allocation inputs to SMOKE is one of the major stumbling blocks for most users at this time. All spatial allocation (a.k.a. “gridding”) inputs need to be consistent, and each has a header to indicate the grid projection, location, dimensions, and resolution. SMOKE uses these headers to ensure all inputs are consistent. SMOKE also requires that any meteorology data inputs are consistent with these gridded data. This version of SMOKE cannot extract input data from larger data sets or aggregate data at a finer resolution, although these additions are planned for future SMOKE releases.

SMOKE does not require a Graphical Information System (GIS) to be able to install the software. However, the AGPRO, MGPRO, and BGPRO or BGUSE files require some processing with a GIS to create them. The options that users currently have to prepare these files are the following:

- Use the national 36-km Lambert surrogates provided with SMOKE (only appropriate for 36-km modeling). Users will have to manually copy and edit the 36-km file to create a file for a smaller grid.
- Use the “unified grid” surrogates available on-line at <http://envpro.ncsc.org/emcenter>. These data are hosted, but not supported, by MCNC. These data are at 4-km resolution for the Eastern US, and a program is available with the data to regrid and to aggregate the surrogate data for different grids. The output format from this program is not the SMOKE input format.
- Hire a contractor to prepare the gridding surrogates and/or gridded land use data, or prepare the data yourself using a GIS.

G_GRIDPATH: Grids and grid projection information

The G_GRIDPATH file is a file written by the Models-3 framework when you are using SMOKE through Models-3. Otherwise, users must manually prepare this file with a text editor (based on the sample files provided with the SMOKE installation).

Line	Columns	Description
1	A	Keyword for variable name (Character)
	B	Number of dimensions (Integer)
	C	Number of elements in the first dimension, <i>optional</i> (Integer)
	D	Number of elements in the second dimension, <i>optional</i>

		(Integer)
	E	Number of elements in the third dimension, <i>optional</i> (Integer)
2	A+	Value(s) of record (the number of values depends on entries in columns C, D, and E).

NOTE: The number of dimensions can be set to 0 for a single value, and then the value can appear on the same line as the keyword.

The keywords are:

- GDNAME_GD: Grid name (16 character max)
- GDDESC_GD: Grid description (80 character max)
- GDTYP_GD: Coordinate system type
Valid entries include the following. Users are responsible for ensuring that other settings in the file are consistent with the grid selected using the I/O API documentation (see link below).
 - Latitude-longitude grids: “LAT-LON” or “GEOGRAPHIC” or “LATGRD3”
 - Lambert grids: “LAMBERT” or “LATGRD3”
 - UTM grids: “UTM” or “UTMGRD3”
- GDUNT_GD: Units of coordinate system
- P_ALP_GD: Alpha projection factor
- P_BET_GD: Beta projection factor
- P_GAM_GD: Gamma projection factor
- XCENT_GD: X center of projection
- YCENT_GD: Y center of projection
- XORIG_GD: Column offset (x-origin) in projection units
- YORIG_GD: Row offset (y-origin) in projection units
- XCELL_GD: X direction cell thickness in projection units
- YCELL_GD: Y direction cell thickness in projection units
- NCOLS: Number of grid columns (x-cells)

- NROWS: Number of grid rows (y-cells)
- NTHIK: Number of boundary cells (not used in SMOKE, but needs to be consistent between all of your files)
- NLAYS: Number of vertical layers (not used in SMOKE, see SMK_EMLAYS in [Chapter 5, section on Shared Environment Variables](#)).
- VG_TYP_GD: Type of vertical structure. (Not used in SMOKE). Possible values:
 - VGSGPH3: hydrostatic sigma-P
 - VGSGPN3: non- hydrostatic sigma-P
 - VGSIGZ3: sigma-Z
 - VGPRES3: pressure (mb)
 - VGZVAL3: Z (m) (above sea lvl)
 - VGHVAL3: H (m) (above ground)
- VGTPUN_GD: Units of vertical structure (not used in SMOKE)
- VGTOP_GD: Value of top of domain in units of vertical structure (not used in SMOKE)
- VGLVS_GD: Vertical layer structure values in units of vertical structure (not used in SMOKE)

The I/O API documentation provides more information on the settings for horizontal and vertical grids at <http://envpro.ncsc.org/products/ioapi/H.GRIDS.html>.

AGPRO and MGPRO: Spatial Surrogates Files

The spatial surrogates files contain the spatial allocation factors for all area sources and non-link mobile sources. One file may be used for both area and mobile sources, although the SMOKE programs use the two logical file names to access it.

Line	Columns	Description
1	A	#GRID
	B	Grid name
	C	X origin in units of the projection
	D	Y origin in units of the projection

	E	X direction cell length in units of the projection
	F	Y direction cell length in units of the projection
	G	Number of columns
	H	Number of rows
	I	Number of boundary cells
	J	Projection types: Latitude-Longitude: "LAT-LON" or "LATGRD3" Lambert Conformal: "LAMBERT" or "LAMGRD3" Universal Transverse Mercator: "UTM" or "UTMGRD3"
	K	Projection units
	L	Projection alpha value
	M	Projection beta value
	N	Projection gamma value
	O	X-dir projection center in units of the projection
	P	Y-dir projection center in units of the projection
2+	A	Spatial Surrogates code (area) or County feature/roadway type (mobile) (Integer) (required)
	B	Country/state/county code (6-digit Integer YSSCCC) (required):
	C	Grid column number (Integer) (required)
	D	Grid row number (Integer) (required)
	E	Spatial surrogate ratio (area) or fraction of county feature in cell (mobile) (Real) (required)

BGPRO: Biogenic spatial surrogate file

The BGPRO file must be provided to SMOKE when using county land use, in order to provide a means of converting county landuse to gridded landuse. The format for the BGPRO file is the same as for the [AGPRO and MGPRO](#) files (above). Typically, the same gridded surrogates file

would be used, and the Rawbio options would be set to assign the county area, agriculture, or forest surrogates to the various biogenic land use groups.

BELD3_A, BELD3_B, BELD3_TOT: BELD3 land use data files

BELD3_A, BELD3_B and BELD3_TOT files are I/OAPI netCDF files that contain gridded Biogenic Emissions Landcover Database version 3 (BELD3) data. The BELD3 consists of 230 land use types. Since the I/OAPI limit on the number of variables in one netCDF file is 120, the gridded BELD3 data is broken up into two files (BELD_A and BELD_B). The BELD_TOT file contains additional information on the BELD3 data for the same grid as the BELD3_A and BELD3_B files. For a list of the BELD3 land use types look in the B3XRF or B3FAC file. The BELD3_TOT file contains the following variables and descriptions:

- FIPCODE: Dominant FIPS code for each grid cell
- URW_FLAG: Urban-Rural-Water flag
- USGS_TYPE: Dominant USGS type for each grid cell
- USGS_TOTAL: total USGS area in each grid cell
- FOREST: total forest (FIA) area in each grid cell
- AGRICULTURE: total agricultural area in each grid cell
- TOTAL_AREA: total area in each grid cell
- LAND: total land area in each grid cell

AGREF and MGREF: Gridding cross-reference files

The gridding cross-reference files are used to match the emissions sources with the spatial surrogates in the surrogates file. Application of the gridding cross-reference files in SMOKE will always be done so that the most-specific matches override the least-specific ones. A description of how the gridding cross-reference is applied to the inventory is provided with the description of the Grdmat program.

Line	Columns	Description
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1+	A	Country/state/county code (6-digit Integer YSSCCC) (optional): <ul style="list-style-type: none"> - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent
	B	10-digit SCC (Character) (optional, set to zero if not SCC-dependent)
	C	Spatial surrogate code (Integer) (required)

Chemical Speciation

GSPPRO: Speciation profile file

The speciation profile file, GSPPRO, contains the factors that are used to separate aggregated inventory pollutant emissions totals into emissions of model species for the AQM. In traditional ozone air quality modeling, this file contained split factors for only VOC. In SMOKE, all inventory pollutants need to be represented in this file, even if it is only to indicate that a pollutant is not split into any model species (e.g., CO emissions would have a "split factor" of 1.0).

Line	Columns (All required)	Description
1 +	A	Speciation profile number (Character)
	B	Pollutant ID (name) (Character)
	C	Species ID (name) (Character)
	D	Split factor (Real)
	E	Divisor (Real)
	F	Mass Fraction (Real)

The columns are used by SMOKE as follows:

- The speciation profile number is matched with the number in the GSREF file. This “number” is treated as a character string, so leading zeros must be the same in both the GSPPRO and GSREF files.
- The pollutant ID must match the pollutant names in the SMOKE inventory file (AREA, MOBL, or PNTS). These names are set by the #POLID or #DATA headers in the Smkinven input files.
- The species IDs are the names of the model species needed by the air quality model for which SMOKE is being used. These depend on the requirement of that model. The default SMOKE inputs will not be correct for all air quality models.

- The split factor is the numerator in the factor computed for the mole-based speciation matrix.
- The Divisor is the denominator in the factor computed for the mole-based speciation matrix.
- The mass fraction is the value put in the mass-based speciation matrix. The ratio of the mass fraction and the split factor is the average molecular weight for the species and profile, if the divisor is 1.
- For BEIS3 modeling, the user must use profile “BV309” in order to properly speciate for CB-IV modeling. There are also BEIS3 speciation profiles for the RADM2 and SAPRC99 chemical mechanisms in the \$GE_DAT directory.

GSREF: Speciation cross-reference file (mapping table)

The speciation cross-reference files (ASREF, MSREF, and PSREF) are used to match the emission sources with the speciation profiles in GSPRO.

Because of the many changes needed for supporting multiple inventory pollutants, flexible point source definitions, 6-digit country/state/county codes, and the use of pollutant-to-pollutant-type conversion factors, the EPS2.0 format is no longer supported by SMOKE and a new format has been defined. A header has been added that is used to define the point-source unique keys. The same file can be used for all source categories. The SMOKE programs use only the applicable entries in the file. Application of the file in SMOKE will always be done so that the most-specific matches override the least-specific ones. A description of how the speciation cross-reference is applied to the inventory is provided with the description of the Spmat program.

Area- and mobile-source speciation cross-reference file entries

When emission processes are used (as with mobile source processing using the Emisfac program), the emission types must be listed instead of the pollutants in column C. For example, if the MEPROC file contained processes EXH (exhaust), EVP(evaporative), and RFL (refueling), then in order to use pollutant-specific entries in this file for mobile sources, records would need to be added to the file that use EXH__VOC, EVP__VOC, and RFL__VOC in column C. The separator for these process-pollutant combinations must be a double underscore.

Line	Columns	Description
1+	A	Area: 10-digit SCC code, or 7-digit with zeros filling the remaining digits (Character) OR Mobile: 10-character SCC code (Character) OR

		set to 0 if cross-reference entry is not SCC-specific
	B	Speciation profile code (Character) (required, must match codes in the GSPRO file)
	C	Pollutant name or emission type (Character) (required, much match pollutants for profile code in GSPRO file, zero for all pollutants)
	D	Country/state/county code (6-digit Integer YSSCCC) (optional): <ul style="list-style-type: none"> - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent

This file can also be in column-specific format, with the fields in the following columns:

A: 1-10

B: 12-16

C: 18-33

D: 35-40

Point-source speciation cross-reference file entries

Note, for EMS-95 inventories, Characteristic 1 is the stack ID, Characteristic 2 is the device ID, and Characteristic 3 is the process ID.

Line	Columns	Description
1	A	/POINT DEFN/
	B	Number of point source characteristics in addition to plant ID in point source definition (for IDA, this will always be 4)
	C	Number of point source characteristic in addition to plant ID that is the SCC (if SCC is a part of the source definition), zero otherwise. IDA and EPS2 inventories: 4 EMS-95 inventories: 0
2+	A	8- or 10-digit SCC code (Character) (optional, set to 0 if cross-reference entry is not SCC-specific)
	B	Speciation profile code (Character) (required, must match codes in the GSPRO file)

	C	Pollutant name or emission type (Character) (required, much match pollutants for profile code in GSPRO file, 0 for all pollutants)
	D	Country/state/county code (6-digit Integer YSSCCC) (optional): <ul style="list-style-type: none"> - leave blank or put zero if not country/state-dependent; - set to YSS000 for country/state-dependent; - set to YSSCCC for county-dependent
	E	Plant ID for point sources (Character) (optional, leave blank if entry is not plant-specific)
	F	Characteristic 1 (for IDA, this is Point ID or -9) (Character) (optional)
	G	Characteristic 2 (for IDA, this is Stack ID or -9) (Character) (optional)
	H	Characteristic 3 (for IDA, this is segment or -9) (Character) (optional)
	I	Characteristic 4 (for IDA, this is 10-digit SCC, or 5-digit with zeroes) (Character) (optional)
	J	Characteristic 5 (blank for IDA) (Character) (optional)

This file can also be in column-specific format, with the fields in the following columns in rows 2 and higher:

A: 1-10
 B: 12-16
 C: 18-33
 D: 35-40
 E: 42-56
 F: 58-72
 G: 74-88
 H: 90-104
 I: 106-120
 J: 122-138

GSCNV: Pollutant-to-pollutant conversion file (optional)

The pollutant-to-pollutant conversion factors files are required when there is a mismatch between

the pollutant in the inventory and the pollutant for which the speciation profiles have been developed. One example is when the inventory has VOC (ROG), but the speciation profiles were developed for TOG. SMOKE permits such a factor to be applied to any pollutant. The same format is used by all source categories. The available combinations and hierarchies for applying the factors are the same as the speciation cross-reference, with the exception of the plant and other more specific source characteristics for point sources. This file is not needed if there is no mismatch between the inventory and the pollutants in the speciation profiles file. The Spmat program will input this file when the POLLUTANT_CONVERSION environment variable is set to Y.

If emission types are being used as with mobile source processing using the Emisfac program, the emission type must be listed instead of the pollutant. For example, if exhaust VOC were being converted to exhaust TOG, then EXH_VOC and EXH_TOG would need to appear in their respective columns on the header line (line 1 in the format below). It would not be correct to put only VOC and TOG. All emission processes must be listed, or the conversion factor that will be applied is 1. This approach permits conversion factors that are specific to each emission process (ie., different conversions for EXH and EVP).

Line	Columns	Description
1	1-16	Name of pollutant or emission type converting <i>from</i> (Character) (required)
	18-33	Name of pollutant or emission type converting <i>to</i> (Character) (required)
2+	1-6	Country/State/County code (Integer) (optional, put zero if entry is not country/state/county-specific)
	8-17	Area: 10-digit SCC (full SCC is needed) (Character) OR Mobile: 10-character SCC (full SCC is needed) (Character) OR Point: 8-digit SCC (full SCC is needed) (Character) OR Zero if entry is not SCC-specific
	19-23	Volatile conversion factor (Real) (required)
Repeat as lines 1 and 2+ needed for multiple pollutants and/or emission types		

Controls and Projection

GCNTL: Files for controls and/or past and future year projection

SMOKE uses the projection and control packets. A packet is a group of inputs used to apply specific types of controls. A single control file can be shared by area and point sources and the packets that do not apply to a given source category will be ignored. The following packets are recognized by the SMOKE control programs:

- [/CTG/](#) contains settings for control technology guideline (CTG) controls, maximum achievable control technology (MACT) controls, and reasonably available control technology (RACT) controls. Contributes to the multiplicative control matrix.
- [/CONTROL/](#) contains settings for control efficiency, rule effectiveness, and rule penetration. Contributes to the multiplicative control matrix. Cannot appear in the same input file with an [/EMS_CONTROL/](#) packet.
- [/EMS_CONTROL/](#) contains settings for control control efficiency, rule effectiveness, and rule penetration for both the base year and a future year. Also contains a point source conversion factor and a control aggregated factor. Cannot appear in the same input file with a [/CONTROL/](#) packet. This packet is for point sources only.
- [/ALLOWABLE/](#) contains county-specific, SIC-specific, SCC-specific controls, caps, and replacement emissions. Contributes to the multiplicative control matrix.
- [/REACTIVITY/](#) contains settings needed for reactivity-based controls. Creates the reactivity control matrix.
- [/PROJECTION/](#) contains settings to permit projection of emission values into the future. Creates the projection matrix for *all* pollutants and activities using the same factor per source.

These packets have the formats as described in the following tables. The projection formats have been designed to handle multiple year-to-year projections. Matching to the SCCs is performed using the 4 levels of SCCs defined by EPA. These levels are defined as follows:

Point sources:

Level 1: X0000000

Level 2: XXX00000

Level 3: XXXXXX00

Level 4: XXXXXXXX (full SCC)

Area and mobile sources:

Level 1: XX00000000

Level 2: XXXX000000

Level 3: XXXXXXXX000

Level 4: XXXXXXXXXXXX (full SCC)

In the above hierarchies, the X's represent numbers in an SCC that could be matched during cross-referencing. The zeros represent defaulting that is implemented in the cross-reference file. For example, if a cross-reference file has a Level 1 point-source entry (e.g. 10000000), this would be a default for any SCC in the point inventory that starts with 1.

Where appropriate, the packets also support the new flexible point source definitions, as noted in the tables below. All packets except for the EMS_CONTROL packet are not column specific formats.

/CTG/ Packet

Line	Columns	Description
1	A	/CTG/
2+	A	Country/State/County code or Country/state code with zero for county or 0 (Integer)
	B	8 or 10-digit SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	C	Pollutant ID (Character)
	D	Control technology control factor or -9 for missing, (<i>not yet supported</i>) (Real)
	E	CTG cutoff for application of control [tons/day] (Real)
	F	Maximum achievable control technology control factor (Real)
	G	Reasonably achievable control technology control factor (Real)
3	A	/END/

The valid key combinations and their order of precedence during assignment to the inventory are:

1. County, [area: 10-digit SCC, point: 8-digit SCC], pollutant
2. County, [area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
3. County, [area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
4. County, [area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
5. Country/state, [area: 10-digit SCC, point: 8-digit SCC], pollutant

6. Country/state, [area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
7. Country/state, [area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
8. Country/state, [area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
9. [Area: 10-digit SCC, point: 8-digit SCC], pollutant
10. [Area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
11. [Area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
12. [Area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
13. County, [area: 10-digit SCC, point: 8-digit SCC]
14. County, [area/mobile: left 7 of SCC, point: left 6 of SCC]
15. County, [area/mobile: left 4 of SCC, point: left 3 of SCC]
16. County, [area/mobile: left 2 of SCC, point: left 1 of SCC]
17. Country/state, [area: 10-digit SCC, point: 8-digit SCC]
18. Country/state, [area/mobile: left 7 of SCC, point: left 6 of SCC]
19. Country/state, [area/mobile: left 4 of SCC, point: left 3 of SCC]
20. Country/state, [area/mobile: left 2 of SCC, point: left 1 of SCC]
21. [Area: 10-digit SCC, point: 8-digit SCC]
22. [Area/mobile: left 7 of SCC, point: left 6 of SCC]
23. [Area/mobile: left 4 of SCC, point: left 3 of SCC]
24. [Area/mobile: left 2 of SCC, point: left 1 of SCC]
25. County, pollutant
26. County
27. Country/state, pollutant
28. Country/state
29. Pollutant (no further defaulting available)

/CONTROL/ Packet

Line	Columns	Description
1	A	/CONTROL/
2+	A	Country/State/County code or Country/state code with zero for county or 0 (Integer)
	B	8 or 10-digit SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	C	Pollutant ID or -9 for all pollutants (Character)
	D	Primary control equipment code (PCEC); -9 or 0 applies to all equipment (<i>not yet supported</i>)
	E	Control efficiency [1-100%] (Real)
	F	Rule effectiveness [0-100%] (Real)
	G	Rule penetration rate [0-100%] (Real)
	H	Standard Industrial Category (SIC), <i>optional (not yet supported)</i> (4-digit Integer)
	I	Plant ID for point sources, <i>optional</i> (Character)
	J	Characteristic 1 (for IDA, this is Point ID), <i>optional</i> (Character)
	K	Characteristic 2 (for IDA, this is Stack ID), <i>optional</i> (Character)
	L	Characteristic 3 (for IDA, this is segment), <i>optional</i> (Character)
	M	Characteristic 4 (blank for IDA), <i>optional</i> (Character)
	N	Characteristic 5 (blank for IDA), <i>optional</i> (Character)
3	A	/END/

The valid key combinations and order for precedence in applying the records to the inventory are:

1. County, plant, Char1, Char2, Char3, Char4, Char 5, SCC, pollutant
2. County, plant, Char1, Char2, Char3, Char4, Char 5, pollutant

3. County, plant, Char1, Char2, Char3, Char4, pollutant
4. County, plant, Char1, Char2, Char3, pollutant
5. County, plant, Char1, Char2, pollutant
6. County, plant, Char1, pollutant
7. County, plant, pollutant
30. County, [area: 10-digit SCC, point: 8-digit SCC], pollutant
31. County, [area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
32. County, [area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
33. County, [area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
34. Country/state, [area: 10-digit SCC, point: 8-digit SCC], pollutant
35. Country/state, [area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
36. Country/state, [area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
37. Country/state, [area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
38. [Area: 10-digit SCC, point: 8-digit SCC], pollutant
39. [Area/mobile: left 7 of SCC, point: left 6 of SCC], pollutant
40. [Area/mobile: left 4 of SCC, point: left 3 of SCC], pollutant
41. [Area/mobile: left 2 of SCC, point: left 1 of SCC], pollutant
42. County, [area: 10-digit SCC, point: 8-digit SCC]
43. County, [area/mobile: left 7 of SCC, point: left 6 of SCC]
44. County, [area/mobile: left 4 of SCC, point: left 3 of SCC]
45. County, [area/mobile: left 2 of SCC, point: left 1 of SCC]
46. Country/state, [area: 10-digit SCC, point: 8-digit SCC]
47. Country/state, [area/mobile: left 7 of SCC, point: left 6 of SCC]
48. Country/state, [area/mobile: left 4 of SCC, point: left 3 of SCC]
49. Country/state, [area/mobile: left 2 of SCC, point: left 1 of SCC]
50. [Area: 10-digit SCC, point: 8-digit SCC]

51. [Area/mobile: left 7 of SCC, point: left 6 of SCC]

52. [Area/mobile: left 4 of SCC, point: left 3 of SCC]

53. [Area/mobile: left 2 of SCC, point: left 1 of SCC]

54. County, pollutant

55. County

56. Country/state, pollutant

57. Country/state

58. Pollutant (no further defaulting available)

/EMS_CONTROL/ Packet (point sources only)

Line	Columns	Description
1	A	/EMS_CONTROL/
2+	1-2	State code (Integer) or zero
	3-5	County code or zero (Integer)
	6-9	Standard Industrial Category (SIC) (Integer) or blank for missing
	10-17	8-character SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	18-22	Pollutant ID, leave blank if not needed (Character)
	23-37	Plant ID (EMS-95 Facility, leave blank if not needed) (Character)
	38-49	Characteristic 2 (EMS-95 Device, blank if not needed) (Character)
	50-61	Characteristic 1 (EMS-95 Stack, blank if not needed) (Character)
	62-73	Characteristic 3 (EMS-95 Process, blank if not needed) (Character)
	74-81	Future year SCC code (<i>not used by SMOKE</i>) (Character)
	82-85	Base year control efficiency percent [1-100] (Real)

	86-89	Base year rule effectiveness percent [0-100] (Real)
	90-93	Base year rule penetration rate percent [0-100] (Real)
	94-97	Future year control efficiency fraction [0.0-1.0] (Real)
	98-101	Future year rule effectiveness fraction [0.0-1.0] (Real)
	102-105	Future year rule penetration rate fraction [0.0-1.0] (Real)
	106-110	Point source conversion factor fraction [0.0-1.0+ (values > 1.0 are okay)] (Real)
	111-126	Control strategy code (not used by SMOKE) (Character)
	127-130	Point source ratio (not used by SMOKE) [0.0-1.0] (Real)
	151-154	Control adjustment factor [0.0-1.0+ (values > 1.0 are okay)] (Real)

The control adjustment factor can be precomputed from other values in each record. The value in this column overrides all other values on the record, and SMOKE uses this value directly as the factor to adjust the emissions.

Note that the expected order of the plant characteristics is reversed in this file from other EMS-95 files. The device is specified before the stack. Also note that the number of characters available for several of the input variables are not at the SMOKE maximum, so this file format must be used cautiously when using for inventories other than EMS-95. Finally, note that the base year factors are expected to be given as percentages (1-100), while the future year factors are expected to be given as fraction (0-1)

The valid key-combinations and order of precedence is the same as for the /CONTROL/ packet, described above.

/ALLOWABLE/ Packet

Note, for EMS-95 inventories, Characteristic 1 is the stack ID, Characteristic 2 is the device ID, and Characteristic 3 is the process ID. The matching hierarchy is the same as for the CONTROL packet, above.

Line	Columns	Description
1	A	/ALLOWABLE/
2+	A	Country/State/County code or Country/state code with zero for

		county or 0 (Integer)
	B	8 or 10-digit SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	C	Pollutant ID, or –9 if not needed (Character)
	D	Control factor, (Real)
	E	Allowable emissions, cap (Real)
	F	Allowable emissions, replace (Real)
	G	4-digit SIC for point sources (Integer) or –9 if not needed
	H	Plant ID for point sources, <i>optional</i> (Character)
	I	Characteristic 1 (for IDA, this is Point ID), <i>optional</i> (Character)
	J	Characteristic 2 (for IDA, this is Stack ID), <i>optional</i> (Character)
	K	Characteristic 3 (for IDA, this is segment), <i>optional</i> (Character)
	L	Characteristic 4 (blank for IDA), <i>optional</i> (Character)
	M	Characteristic 5 (blank for IDA), <i>optional</i> (Character)
3	A	/END/

The valid key-combinations and order of precedence is the same as for the /CONTROL/ packet, described above.

/REACTIVITY/ Packet

Note, for EMS-95 inventories, Characteristic 1 is the stack ID, Characteristic 2 is the device ID, and Characteristic 3 is the process ID.

Line	Columns	Description
1	A	/REACTIVITY <4-digit base year> <4-digit future year>/

2+	A	Country/State/County code or Country/state code with zero for county or 0 (Integer)
	B	8 or 10-digit SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	C	Pollutant ID, required (Character)
	D	Replacement emissions for base year [tons/day] (Real)
	E	Projection factor (or 0. for none) (Real)
	F	Future year 10-digit SCC code (or 0 to set equal to basecase) (Character)
	G	Speciation profile number (or 0 to set equal to basecase) (Real)
	H	Market penetration of new speciation [fraction/year] (0. to 1.0) (Real)
	I	4-digit SIC for point sources (Integer) or -9 if not needed
	J	Plant ID for point sources, <i>optional</i> (Character)
	K	Characteristic 1 (for IDA, this is Point ID), <i>optional</i> (Character)
	L	Characteristic 2 (for IDA, this is Stack ID) , <i>optional</i> (Character)
	M	Characteristic 3 (for IDA, this is segment) , <i>optional</i> (Character)
	N	Characteristic 4 (blank for IDA) , <i>optional</i> (Character)
	O	Characteristic 5 (blank for IDA) , <i>optional</i> (Character)
3	A	/END/

The valid key-combinations and order of precedence is the same as for the /CONTROL/ packet, described above.

/PROJECTION/ Packet

Note that matching using the SIC is not yet supported. If the SCC is supplied, the SIC will not be used. Also note that there is not currently a pollutant/activity field in this file format, which means that all pollutants and/or activities for a source are changed with the same factor.

Line	Columns	Description
1	A	/PROJECTION <4-digit from year> <4-digit to year>/
2+	A	Country/State/County code or Country/state code with zero for county or 0 (Integer)
	B	8 or 10-digit SCC, or pieces of SCC with remaining digits filled in with zeroes or 0 (Character). See hierarchy list above for valid SCC defaulting.
	C	Projection factor (Real)
	D	4-digit SIC, or 2-digit with remaining digits filled in with zeroes or blank for missing, <i>optional</i> (Integer)
3	A	/END/

The valid key combinations and order of precedence in applying to the inventory are:

1. County, [area: 10-digit SCC, point: 8-digit SCC]
2. County, [area/mobile: left 7 of SCC, point: left 6 of SCC]
3. County, [area/mobile: left 4 of SCC, point: left 3 of SCC]
4. County, [area/mobile: left 2 of SCC, point: left 1 of SCC]
5. Country/state, [area: 10-digit SCC, point: 8-digit SCC]
6. Country/state, [area/mobile: left 7 of SCC, point: left 6 of SCC]
7. Country/state, [area/mobile: left 4 of SCC, point: left 3 of SCC]
8. Country/state, [area/mobile: left 2 of SCC, point: left 1 of SCC]
9. [Area: 10-digit SCC, point: 8-digit SCC]
10. [Area/mobile: left 7 of SCC, point: left 6 of SCC]
11. [Area/mobile: left 4 of SCC, point: left 3 of SCC]
12. [Area/mobile: left 2 of SCC, point: left 1 of SCC]

13. County

14. Country/state

15. Ultimate default

Merging

FILELIST: Gridded merge 2-d file list

The FILELIST file provides a list of logical file names to the Mrggrid program. This list should contain the logical file names for all 2-d files to be merged by a given run. It is a very simple file, which has no limit to the number of files listed.

Line	Columns	Description
1+	A	Logical file name

Meteorology input files

The meteorological input files needed by SMOKE need to come from a MM5 post-processor. Either Models-3 MCIP, EDSS MCIP, or MCPL can be used to supply SMOKE meteorology data.

The five meteorology files that SMOKE needs for biogenic calculations, mobile calculations, and plume rise are GRID_CRO_2D, GRID_CRO_3D, MET_CRO_2D, MET_CRO_3D, and MET_DOT_3D. SMOKE computes virtual temperature from information in these files.

Source-specific input files

BIOGENICS

B3XRF: BELD3 to BELD2 cross-reference file

B3XRF is an ASCII file that contains cross-reference information in order to convert Biogenic Emissions Landcover Database version 3 (BELD3) data into the 127 BELD version 2 (BELD2) land use types. This cross-reference file is used in the program Beld3to2. The B3XRF file contains 230 (number of BELD3 land use types) lines of data in the following format:

Line	Columns	Description
1+	1-4	BELD2 land use type ID (Char)
	6-8	BELD2 category (Integer)
	10-25	BELD3 land use type ID (Char)

BFAC: BEIS2 emission factors file

BFAC is the same file as the BEIS2 ASCII emissions factor file. There are two different emission factor files available for use. There is a winter and a summer emissions factor file. BFAC (winter and summer files) have the following structure:

Line	Columns	Description
1+	2-6	Vegetation ID (Char)
	7-15	ISOP emission factor (Real)
	16-24	MONO emission factor (Real)
	25-33	OVOC emission factor (Real)
	34-39	NO emission factor (Real)
	40-41	Leaf area index (Integer)

B3FAC: BEIS3 emissions factors file

This file contains a leaf area index, dry leaf biomass, winter biomass factor, indicator of specific

leaf weight, and normalized emission fluxes for 4 different species/compounds (ISOP, OVOC, MONO, and NO). This ASCII file has the following structure:

Line	Columns	Description
1+	9-24	Abbreviated name for land use type (Character*16)
	A	Leaf area index (m^2/m^2) (Integer)
	B	Dry leaf biomass (g/m^2) (Integer)
	C	Winter biomass factor (Real)
	D	Indicator of specific leaf weight (Integer)
	E	Normalized emissions flux for ISOP (Real)
	F	Normalized emissions flux for MONO (Real)
	G	Normalized emissions flux for OVOC (Real)
	H	Normalized emissions flux for NO (Real)

MOBILE

MCODES: Mobile source codes file

The MCODES file contains the codes for mobile source vehicle types and road classes. It is used to convert from the codes in the inventory to the codes used internally by SMOKE. The vehicle types must be in the order listed below for the current version of the code so that they properly match with emission factors from MOBILE5b.

The SCC section maps the vehicle type and road class combinations to a mobile source SCC.

Line	Columns	Description
1	A	"/VEHICLE TYPES/" header
2+	A	Name of vehicle type from MBINV file (Char)
	B	Number of vehicle type used in SMOKE files (Integer)
	C	Y – use vehicle type in modeling

		N – do not use vehicle type
3	A	"/ROAD CLASSES/" header
4+	A	Road class code from last 3 digits of SCC in MBINV file (Integer)
	B	Road class code used in SMOKE files (Integer)
	C	Y – use road class code in modeling N – do not use road class code
5	A	“/SCC/” header
6+	A	Road class (Integer)
	B	Vehicle type name (Char)
	C	Source Category Code - SCC (10-character)

Example:

/VEHICLE TYPES/

```
LDGV 0100 Y
LDGT1 0102 Y
LDGT2 0104 Y
HDGV 0107 Y
LDDV 3000 Y
LDDT 3006 Y
HDDV 3007 Y
MC 0108 Y
LDGT 0106 N
```

/ROAD CLASSES/

```
110 01 Y
111 01 Y
130 02 Y
150 06 Y
170 07 Y
190 08 Y
210 09 Y
230 11 Y
250 12 Y
270 14 Y
290 16 Y
310 17 Y
330 19 Y
```

/SCC/

```
110 LDGV 2201001110
130 LDGV 2201001130
150 LDGV 2201001150
```

```

170 LDGV      2201001170
190 LDGV      2201001190
210 LDGV      2201001210
230 LDGV      2201001230
250 LDGV      2201001250
270 LDGV      2201001270
290 LDGV      2201001290
310 LDGV      2201001310
330 LDGV      2201001330
110 LDGT1     2201021110
130 LDGT1     2201020130
150 LDGT1     2201020150
170 LDGT1     2201020170
190 LDGT1     2201020190
210 LDGT1     2201020210
230 LDGT1     2201020230
250 LDGT1     2201020250
270 LDGT1     2201020270
290 LDGT1     2201020290
310 LDGT1     2201020310
330 LDGT1     2201020330
...

```

MPLIST: Mobile emission factor cross-reference file

The MPLIST file is a list-formatted file used for a given mobile source data processing control strategy. The file associates spatial and temporal characteristics of the simulation with sets of MOBILE5 input parameters in the MPREF file. In other words, this file is used to assign specific emission factors or combinations of emission factors to each country, state, county, road class, and link ID. In cases where defaults are desired, zeroes should be used in place of the actual codes for fields that will not be used. See the examples below for how to use defaults.

Line	Columns	Description
1+	A	Country/State/County code ¹ (Integer)
	B	AIRS road class code (e.g., 230=Rural Interstate) or -9 or zeroes for default (Integer)
	C	Link ID, or -9, or zero if not link-specific (Integer)
	D	Vehicle type number or -9, or zero if not vehicle-type-specific. Number is taken from order of vehicle types in MCODES file.
	E	Activity variable to apply emission factors (e.g., "VMT")
	F ₁ – F ₂₄	PSI entries for each hour (can use shortcut format, see below)

The PSI references need to be specified for each of 24 hours of the day. In the typical case, the emission factors (and therefore the PSIs) do not vary with time. The most basic way to structure this file is by putting one PSIs per column. A shortcut format, however, can also be used to indicate blocks of hours to use a specific PSI. This format is the number of hours, followed by an asterisk, followed by a PSI. See the examples below.

Example:

Ultimate default This MPLIST entry would be used to apply PSI 001 for all 24 hours, and all sources that do not have a more specific entry in the file.

```
000000 000 000 24*001
```

State default for specific road type This example applies PSI 002 to all Urban Freeways (road type 250) in North Carolina (country/state/county code 37000).

```
037000 250 000 24*002
```

Time variable application This example applies PSI 003 for the first 8 hours, PSI 004 for the second 8 hours, and PSI 001 for the final 8 hours of the day.

```
037000 000 000 8*003 8*004 8*001
```

Example file Normally, this file will contain multiple lines of different type, all in a single file.

```
000000 000 000 0 VMT 24*001
037000 000 000 0 VMT 8*003 8*004 8*001
037000 250 000 0 VMT 24*002
045000 000 000 0 VMT 24*009
```

MPREF: Mobile source emission factor settings file

There are several formats permitted for this file. For Models-3, we are assuming that the Mobile5a or Mobile5b input formats will be used, as well as the combination emission factors.

MOBILE5a input: To read MOBILE5a input files and generate MOBILE5a emission factors.

Structure, SMOKE part: List formatted

Structure, MOBILE5a part: Column specific

Line	Columns	Description
1	A	The entry "MOBILE5A" should appear in this line and column (no quotes in the actual entry - see example, below)
	B	The number of PSIs generated in the record (equivalent to the number of "scenarios" in the MOBILE5a input file . The scenarios in the example below are defined by the lines labeled "URBAN

		INTERSTATE", etc.
	C through C(B)	For each of the number of PSIs listed in column B, these columns should contain the PSI codes for each scenario in the MOBILE5a input file (assign arbitrary numbers)
2+	all	For as many rows are as needed, this part of the record should contain the MOBILE5a inputs

MOBILE5b input: To input MOBILE5a or MOBILE5b input files and generate MOBILE5b emission factors.

Structure, SMOKE part: List formatted

Structure, MOBILE5b part: Column specific

Line	Column s	Description
1	A	The entry "MOBILE5B" should appear in this line and column (no quotes in the actual entry - see example, below)
	B	The number of PSIs generated in the record (equivalent to the number of "scenarios" in the MOBILE5a or MOBILE5b input file. The scenarios in the example below are defined by the lines labeled "URBAN INTERSTATE", etc.
	C through C(B)	For each of the number of PSIs listed in column B, these columns should contain the PSI codes for each scenario in the MOBILE5a or MOBILE5b input file (assign arbitrary numbers)
2+	all	For as many rows are as needed, this part of the record should contain the MOBILE5a or MOBILE5b inputs

Combinations

Combination emission factors allow you to generate emission factors based on combinations of other emission factors. The number of columns in the second line of this record depends on the value in the second column of line 1 of this record. If N is the value in the second column of line 1, the second line contains N*2 entries where the entries PERCENT(I) and PSI(I) are used in the following formula to create a new set of emission factors:

$$EF = \text{SUM}(\text{PERCENT}(I) * \text{PSI}(I), I = 1, N)$$

PERCENT(I) is the percentage of PSI(I) on which to base the new emission factor.

PSI(I) is the PSI index from elsewhere in the MPREF file to use in calculating the new emission factor. SMOKE will not accept the MPREF file if any PSI is designated for use in a

combination emission factor but is not defined elsewhere in the file.

Line	Columns	Description
1	A	PSI number
	B	Should contain a positive integer indicating the number of PSIs on which this PSI depends
2	A	Percentage of first PSI to contribute to this PSI
	B	First PSI to contribute to this PSI
	C, E, G, etc.	Percentage of additional PSIs to contribute to this PSI
	D, F, H, etc.	Additional PSIs to contribute to this PSI

Example:

The following example shows two of the three input types. PSI 013 is a combination emission factor, PSIs 001 through 012 are MOBILE5b based factors. A MOBILE5a example would be similar to the MOBILE5b ones, but the field 'MOBILE5B' would be replaced with 'MOBILE5A'.

```

013 2
0.5 001 0.5 006
MOBILE5B 6 001 002 003 004 005 006
3 0
JULY 10-15, I/M RUN, 1995, OZONE SEASON, MAINTENANCE COUNTIES
1 1 2 3 1 2 1 2 1 1 3 4 1 3 2
.055 .094 .098 .093 .088 .085 081 .058 .047 .046
.043 .046 .039 .031 .021 .011 .010 .010 .009 .005
.005 .003 .003 .002 .017
.087 .131 .138 .107 .101 .088 .067 .035 .034 .021
.017 .029 .032 .023 .016 .009 .013 .008 .007 .004
.006 .004 .004 .003 .016
.060 .112 .117 .098 .097 .074 .066 .044 .031 .030
.027 .039 .033 .029 .021 .013 .018 .018 .015 .009
.010 .009 .006 .006 .018
.063 .093 .085 .092 .084 .087 .065 .035 .031 .025
.040 .055 .044 .026 .019 .023 .029 .025 .021 .009
.008 .005 .005 .005 .026
.055 .094 .098 .093 .088 .085 081 .058 .047 .046
.043 .046 .039 .031 .021 .011 .010 .010 .009 .005
.005 .003 .003 .002 .017
.087 .131 .138 .107 .101 .088 .067 .035 .034 .021

```

```

.017 .029 .032 .023 .016 .009 .013 .008 .007 .004
.006 .004 .004 .003 .016
.074 .109 .109 .103 .080 .084 .077 .039 .043 .032
.045 .046 .034 .030 .015 .012 .013 .012 .007 .004
.002 .003 .002 .001 .024
.079 .095 .070 .076 .099 .088 .058 .058 .067 .053
.044 .213 .000 .000 .000 .000 .000 .000 .000 .000
.000 .000 .000 .000 .000
87 14 75 20 01 01 80 2 1 2222 1111
92 75 20 2222 21 80 22212222
1 95 58.1 81.0 00.0 00.0 00.0 7
URBAN INTERSTATE 70.0091.007.8007.800 92 1 1
.668.112.051.018.002.001.144.004
1 95 57.2 81.0 00.0 00.0 00.0 7
URBAN FREEWAY 70.0091.007.8007.800 92 1 1
.773.093.042.015.002.000.071.004
1 95 24.0 81.0 20.6 27.3 20.6 7
URBAN PRIN ART 70.0091.007.8007.800 92 1 1
.785.085.039.014.003.000.070.004
1 95 21.0 81.0 20.6 27.3 20.6 7
URBAN MIN ART 70.0091.007.8007.800 92 1 1
.819.079.036.013.003.000.046.004
1 95 22.0 81.0 20.6 27.3 20.6 7
URBAN COLLECTOR 70.0091.007.8007.800 92 1 1
.900.046.021.007.003.000.019.004
1 95 13.0 81.0 20.6 27.3 20.6 7
URBAN LOCAL 70.0091.007.8007.800 92 1 1
.900.046.021.007.003.000.019.004
MOBILE5B 6 007 008 009 010 011 012
3 0
JULY 10-15, I/M RUN, 1995, OZONE SEASON, MAINTENANCE COUNTIES
1 1 2 3 1 2 1 2 1 1 1 3 4 1 3 2
.055 .094 .098 .093 .088 .085 081 .058 .047 .046
.043 .046 .039 .031 .021 .011 .010 .010 .009 .005
.005 .003 .003 .002 .017
.087 .131 .138 .107 .101 .088 .067 .035 .034 .021
.017 .029 .032 .023 .016 .009 .013 .008 .007 .004
.006 .004 .004 .003 .016
.060 .112 .117 .098 .097 .074 .066 .044 .031 .030
.027 .039 .033 .029 .021 .013 .018 .018 .015 .009
.010 .009 .006 .006 .018
.063 .093 .085 .092 .084 .087 .065 .035 .031 .025
.040 .055 .044 .026 .019 .023 .029 .025 .021 .009
.008 .005 .005 .005 .026
.055 .094 .098 .093 .088 .085 081 .058 .047 .046
.043 .046 .039 .031 .021 .011 .010 .010 .009 .005
.005 .003 .003 .002 .017
.087 .131 .138 .107 .101 .088 .067 .035 .034 .021
.017 .029 .032 .023 .016 .009 .013 .008 .007 .004
.006 .004 .004 .003 .016
.074 .109 .109 .103 .080 .084 .077 .039 .043 .032
.045 .046 .034 .030 .015 .012 .013 .012 .007 .004
.002 .003 .002 .001 .024
.079 .095 .070 .076 .099 .088 .058 .058 .067 .053
.044 .213 .000 .000 .000 .000 .000 .000 .000 .000

```

```

.000 .000 .000 .000 .000
87 14 75 20 01 01 80 2 1 2222 1111
92 75 20 2222 21 80 22212222
1 95 58.1 81.0 00.0 00.0 00.0 7
RURAL INTERSTATE 70.0091.007.8007.800 92 1 1
.676.078.035.013.002.000.192.004
1 95 56.5 81.0 00.0 00.0 00.0 7
RURAL PRIN ART 70.0091.007.8007.800 92 1 1
.719.104.047.017.002.001.106.004
1 95 37.0 81.0 20.6 27.3 20.6 7
RURAL MINOR ART 70.0091.007.8007.800 92 1 1
.746.105.047.017.002.001.078.004
1 95 24.0 81.0 20.6 27.3 20.6 7
RURAL MAJ COL 70.0091.007.8007.800 92 1 1
.746.107.049.018.002.001.073.004
1 95 24.0 81.0 20.6 27.3 20.6 7
RURAL MIN COL 70.0091.007.8007.800 92 1 1
.802.098.044.016.003.001.032.004
1 95 24.0 81.0 20.6 27.3 20.6 7
RURAL LOCAL 70.0091.007.8007.800 92 1 1
.802.098.044.016.003.001.032.004

```

MEPROC: List of mobile emission processes and associated activities and pollutants

The MPROC file is a list of the emission processes to model for mobile sources.

Line	Columns	Description
1+	A	Activity name
	B	Mobile emissions process (See "Emission processes and emission types in Chapter 6)
	C+	Associated pollutant name(s) for activity and process combination

Example:

```

VMT EXH CO NOX VOC
VMT EVP VOC
VMT RST VOC
VMT RNL VOC
VMT DNL VOC
VMT RFL VOC

```

MEFUPD: Mobile emission factors forced update file

The MEFUPD file is used to control the EMISFAC program. When the user needs emission

factors for specific PSIs to be updated in a MEFSD or MESFND file that already exists, and the default behavior of EMISFAC will not update those PSIs, this file can be used to instruct EMISFAC to update those PSIs. This updating feature is most useful for correcting PSIs when they were inadvertently created with incorrect MOBILE5 inputs.

Line	Columns	Description
1+	A	Starting and ending PSI separated by a dash, or single PSI value

POINT

PELVCONFIG: Elevated source selection file (optional)

The Elevpoint program optionally uses the PELVCONFIG file. It permits users to provide SMOKE criteria for grouping stacks and for selecting elevated and plume-in-grid (PinG) point sources. Stack groups are groups of stacks from the same facility that are treated by SMOKE and the air quality model as a single stack when computing plume rise and/or processing the stack as a PinG source. They have the effect of reducing the number of elevated and PinG stacks which makes for faster processing, particularly in the case of PinG sources in the air quality models. Users can specify stack groups regardless of whether elevated or PinG sources are also being specified.

All emissions in a stack group are summed for the purposes of comparing against the elevated source criteria and PinG source criteria. In short, the grouped sources are treated as a single source for all SMOKE features regarding elevated source selection and special outputs. The sources still can have different temporal profiles and chemical speciation profiles. For more information on how the emissions are computed for source selection, see the Elevpoint documentation in Chapter 7.

The PELVCONFIG file has four sections: (1) source category selection, (2) source grouping, (3) plume-in-grid source selection, and (4) elevated source selection. Sections 2, 3, and 4 are optional, but Elevpoint will not run if all three sections are missing, since the file would be instructing it to do nothing. The sections need not appear in any particular order, and each section is permitted only once. Comments may also be used in the file. The following subsections explain these major input features.

USING COMMENTS

Comments can be put in the file using a pound sign (#) at the first column of a line or a double pound sign (##) anywhere else on a line. The double pound can appear after packet labels or instructions in the file.

SOURCE CATEGORY SELECTION

This section is used to tell Elevpoint which source category to process, but since Elevpoint is

only designed for point sources, this is very simple. This section needs to appear as follows:

```
SMK_SOURCE      P
```

SOURCE GROUPING

The **/SPECIFY ELEV GROUPS/** packet is used for defining source groups based on source criteria. The packet contains the following entries:

- **/SPECIFY ELEV GROUPS/**
Must appear to start the packet. Only one packet of this type is permitted
- **<Source grouping criteria, explained next>**
- **/END/**
Must appear to end the packet.

The *source grouping criteria* can be as many lines as the user wants, and contain at least three parts: (1) variable, (2) type of criterion, and (3) value for criterion in the following structure:

<variable> <type of criterion> <value for criterion>

For example, the following source grouping criterion groups all inventory records (sources) at the same facility that have stack heights within plus or minus 2 meters:

```
HT   +/-   2.0
```

The fact that sources are grouped by facility is implicit to the Elevpoint program, since we assumed that grouping at a coarser level of detail was not desirable. The packet supports Boolean OR and AND conditions. Each separate line of the packet is an OR condition. The AND conditions must appear on a single line. Any number of records are permitted in this packet and any number of AND conditions or AND/OR combinations.

The following example will help illustrate. To indicate that sources with stack heights within plus or minus 2 meters that also have diameters within plus or minus 1 meter should be grouped, as well as sources with exit velocities below 10 m/s, the packet would be:

```
/SPECIFY ELEV GROUPS/  
HT   +/-   2.0   AND   DIAMETER   +/-   1.0  
VE   <    10.  
/END/
```

The elevated groups packet supports the following variables:

- **HT**: stack height in meters
- **DM**: stack diameter in meters
- **TK**: stack gas exit temperature in Kelvin
- **VE**: stack gas exit velocity in meters/s
- **FL**: stack gas exit flow rate in cubic meters/s
- **<pollutant name>**: whatever pollutant names are in the inventory (e.g., NOX). We do not know why a user might want this type of grouping, but SMOKE does not prevent it.

The elevated groups packet supports the following types of grouping criteria:

- **+/- or -/+**: variables must be within the *<value of criterion>* for the variable given
- **>**: variables must be greater than the *<value of criterion>* for the variable given
- **>= or =>**: variables must be greater than or equal to the *<value of criterion>* for the variable given
- **<**: variables must be less than the *<value of criterion>* for the variable given
- **<= or =<**: variables must be less than or equal to the *<value of criterion>* for the variable given
- **= or ==**: variables must be equal to the *<value of criterion>* for the variable given

PLUME-IN-GRID SOURCE SELECTION

The **/SPECIFY PING/** packet is used for selecting plume-in-grid sources based on source criteria. The packet contains the following entries:

- **/SPECIFY PING/**
Must appear to start the packet. Only one packet of this type is permitted.
- **<Source selection criteria, explained next>**
- **/END/**
Must appear to end the packet.

The *source selection criteria* can be as many lines as the user wants, and contain at least three parts: (1) variable, (2) type of criterion, and (3) value for criterion in the following structure:

<variable> <type of criterion> <value for criterion>

This structure is the same as the /SPECIFIC ELEV GROUPS/ packet, and the description of the source selection criteria is the same as that of the source grouping criteria. The same variables and types of criteria are supported, with two additions, as follows.

The plume-in-grid packet supports the following variables **in addition to those described with the elevated groups packet, above:**

- **RISE:** The plume rise as computed by the Briggs algorithm documented with the Elevpoint program. The *<value for criterion>* must be provided in meters. To select all sources with plume rise greater than or equal to 75 meters, one would input:

RISE >= 75.
- **SOURCE:** Source number from SMOKE's PSRC file output from Smkinven. This variable permits selection of specific SMOKE sources as PinG sources.
- **PLANT:** Plant ID code from SMOKE's PSRC file output from Smkinven. **Please note:** the "PLANT" variable must be used with the "IS" criteria and cannot be used with any other criteria such as "<" or "=". It is recommended that this variable be used in addition to the FIPS variable to allow selection of all records at specific plants. It can also be combine with stack parameter variables.
- **FIPS:** Country/State/County region code can be used with the PLANT variable or other variables to specific PinG sources by region. It is not recommended that this variable be used alone for specifying PinG sources, since it will result in insignificant sources being prepared for the air quality model as PinG sources. It does not make sense to process such sources as PinG sources in air quality models.

The packet also supports the following type of criterion in addition to those described with the source grouping packet:

- **TOP:** This type permits users to select sources with the largest value of the variable given. The *<value for criterion>* is the number of sources that will be selected based on the value given. This type is only permitted when using a pollutant name as the *<variable>*.
- **IS:** This type must be used to assign a value to the PLANT criteria.

The following example illustrates using some of the different variables and criteria. The elevated source selection example further below demonstrates using the rest of the variables and criteria.

```
/SPECIFY PING/  
RISE >= 150.  
HT >= 100.  
NOX TOP 100 AND SO2 TOP 100  
NOX > 500.
```

/END/

ELEVATED SOURCE SELECTION

The **/SPECIFY ELEV/** packet is used for selecting elevated sources based on source criteria. The packet contains the following entries:

- **/SPECIFY ELEV/**
Must appear to start the packet. Only one packet of this type is permitted.
- **<Source selection criteria, explained above>**
- **/END/**
Must appear to end the packet.

All of the source selection criteria are the same as the PinG selection criteria at this time. To use the “cutoff” method for UAM-style processing, only the RISE variable should be used with no other selection criteria. This approach is the traditional approach for elevated source selection for UAM, UAM-V, REMSAD, and CAM_x; users can decide whether they want to use this traditional approach or a more complex set of criteria.

The following example illustrates using all of the different variables and criteria.

```
/SPECIFY ELEV/  
RISE >= 40. AND RISE < 150.  
NOX TOP 500  
NH3 TOP 50  
FIPS >= 37001 AND FIPS <= 37031  
SOURCE > 100 AND SOURCE < 200  
/END/
```

PSTK: Point source stack replacement parameters file

The PSTK file is an ASCII file that contains the replacement stack parameters for use by [Smkinven](#) when stack parameters are missing from the inventory file(s). The format of the file permits stack parameters to be replaced based on the point sources' country/state/county code and SCC.

Line	Columns	Description
1+	A	Country/State/County code (Integer)
	B	Standard Classification Code - SCC (10-Character)
	C	Stack height from ground [m] (Real)

	D	Stack diameter [m] (Real)
	E	Stack exhaust temperature [K] (Real)
	F	Stack exhaust velocity [m/s] (Real)

PTMPLIST: List of hourly point source emissions files

The PTMPLIST file is an ASCII contains the replacement stack parameters that are used when stack parameters are missing from the inventory file(s). The format of the file permits stack parameters to be replaced based on the point sources' country/state/county code and SCC.

Line	Columns	Description
1+	A	Country/State/County code (Integer)
	B	Standard Classification Code - SCC (10-Character)
	C	Stack height from ground [m] (Real)
	D	Stack diameter [m] (Real)
	E	Stack exhaust temperature [K] (Real)
	F	Stack exhaust velocity [m/s] (Real)

QA and other support input files

ACTVNAMS: Activity data names and codes

This file simply lists the names of the activity data and a code number associated with that variable name. SMOKE currently only supports two kinds of activity data (vehicle miles traveled (VMT) and speed).

Line	Columns	Description
1+	A	Activity code number (or dummy code if none available) – Value <i>cannot</i> be 0
	B	Name of activity (e.g., VMT), 16 characters or less only
	C	Units of activity to output to inventory files. Valid units are miles/hr for speed data and miles/year for VMT data.

Smkinven uses this file to confirm that the activity names in any input inventory file are valid. Smkinven only needs this file when it reads activity data such as VMT.

Smkmerge uses this file to double-check the input activities being merged with the gridding matrix and optionally the speciation matrix. The order of the activities in this file will dictate the order of the species output for each of activities. Species from activity data will always follow species from pollutant data in the Smkmerge output files. Smkmerge will sort multiple species for the same activity in alphabetical order.

SIPOLS: Inventory pollutant data names and codes

This file simply lists the names of the pollutant data and a code number associated with that name.

Line	Columns	Description
1+	A	Pollutant code number (or dummy code if none available) – Value <i>cannot</i> be 0
	B	Name of Pollutant (e.g., CO, NOX, SO2), 16 characters or less only
	C	Units of pollutant to output to inventory files. Valid units are tons/year (which represents short tons/year)

Smkinven uses this file to confirm that the pollutant names in any input inventory file are valid. Smkinven only needs this file when emissions data such as CO are read, but does not need the file only activity data are being read.

Smkmerge uses this file to double-check the input pollutants being merged with the gridding matrix and optionally the speciation matrix. The order of the pollutants in this file will dictate the order of the species output for each of pollutants. Species from pollutant data will always precede species from activity data in the Smkmerge output files. Smkmerge will sort multiple species for the same pollutant will be sorted in alphabetical order.

COSTCY: Country, state, and county names and data

A header line can be used in this file to indicate that population data are contained in the file as the last column on each line of the /COUNTY/ packet. This header line and the additional population column are optional. The header needs to be on the first line of the file, if it is present in the file. The syntax of the optional header is:

#POPULATION <year>

where <year> is a 4-digit year.

The country, state, and county codes in each section of this file must be sorted in increasing order. If they are not, the reader for this file will give an error.

Line	Columns	Description
1	A	Start of country section using packet /COUNTRY/
2+	1	Country code
	3-22	Country name
3	A	Start of state section using packet /STATE/
4+	1	Country code (Integer)
	2-3	State code (Integer)
	4-5	State abbreviation (Character, not used by SMOKE)
	7-26	State name (Character)
	27-28	EPA Region (Integer, optional, not used by SMOKE)
	32-34	Standard (non-daylight) state time zone - see below for valid time

		zones (Character, optional)
5	A	Start of county section using packet /COUNTY/
6+	2-3	State abbreviation, should match state section (Character, not used by SMOKE)
	5-24	County name (Character)
	26	Country code, should match country section (Integer)
	27-28	State code, should match state section (Integer)
	29-31	County code (Integer)
	32-34	AEROS State Code (Integer, not used by SMOKE)
	35-38	AEROS County Code (Integer, op not used by SMOKE tional)
	40-42	Standard (non-daylight) county time zone - see below for valid time zones (Character)
	43	Blank indicates daylight savings time is used in the county. Any character in this field will turn off the use of daylight savings time in the county.
	44-52	County center longitude [degrees] (Real, not used by SMOKE)
	53-61	County center latitude [degrees] (Real, not used by SMOKE)
	63-74	County area [square miles] (Real, not used by SMOKE)
	76-84	Westernmost longitude [degrees] (Real, not used by SMOKE)
	86-94	Easternmost longitude [degrees] (Real, not used by SMOKE)
	95-103	Southernmost latitude [degrees] (Real, not used by SMOKE)
	104-112	Northernmost latitude [degrees] (Real, not used by SMOKE)
	114-128	Population for the county [Optional, used only by Smkreport for using the NORMALIZE POPULATION instruction (see REPCONGIG file documentation]

Valid time zones are the following.

GMT	Time zone	Description
+0:00	GMT	Greenwich Mean Time (Also known as Zulu time)
-4:00	AST	Atlantic standard time
-5:00	EST	Eastern standard time
-6:00	CST	Central standard time
-7:00	MST	Mountain standard time
-8:00	PST	Pacific standard time
-9:00	YST	Yukon standard time
-10:00	HST	Hawaiian standard time
-10:00	CAT	Central Alaska time
-11:00	NT	Nome time

SCCDESC

This file provides a textual description of the source category codes (SCC) for:

- Smkinven when reading hourly emissions data (for reporting in the REPINVEN output file)
- Smkreport when user requests the SCC description be included in the report.

It is a 2-column, list-formatted file as follows:

Lines	Columns	Description
1+	A	Source category code (SCC), 10-character string
	B	SCC description, 200-character string

ORISDESC

This file provides descriptive information for the ORIS IDs, which are used when reporting the status of reading and matching CEM data in Smkinven. The information will appear in the REPINVEN output file from Smkinven. The file is a list-formatted, 11-column file with the following column information. Note that only the first 5 columns of data need to appear in the file, and the rest can be blank since SMOKE does not use any information past column 5.

Lines	Columns	Description
1+	A	DOE Plant ID (ORIS ID), 6-character string, must match the same field in the IDA-formatted PTINV file.
	B	Country/State/County code (FIPS code), 6-digit integer
	C	Latitude (optional, <i>not used by SMOKE</i>), use -9 for missing
	D	Longitude (<i>not used by SMOKE</i>), use -9 for missing
	E	Plant name, 80-character string
	F	Operating company (optional, <i>not used by SMOKE</i>)
	G	EPA Region (optional, <i>not used by SMOKE</i>)
	H	State name (optional, <i>not used by SMOKE</i>)
	I	County name (optional, <i>not used by SMOKE</i>)
	J	North American Electric Reliability Council Region (e.g., ASCC, ECAR, ERCOT, MAAC, MAIN, MAPP, NPCC, SERC, SPP, WSCC) (optional, <i>not used by SMOKE</i>)
	K	Acid rain program phase (optional, <i>not used by SMOKE</i>) <ul style="list-style-type: none"> • P1 = Phase I Generator regulation began in 1995-1999 • P1.5 = Phase II Generator in which source opted to begin early regulation prior to the year 2000. • P2 = Phase II Generator - generator regulation began in year 2000. • If blank then plant is likely in a non-generating status (such as retired, deferred, exempt, or future.)

VNAMMAP: Variable name mapping file

This file is used to rename variables output from Smk2emis, the I/O API format to 2-d-UAM “EMISSIONS” file format converter. The VNAMMAP file lists the SMOKE variable names and the variable names to be output from Smk2emis. It is needed for SMOKE support of UAM-AERO, which requires variable names that cannot be supported by the netCDF format. Please see the [Smk2emis](#) documentation in Chapter 8 for more information on how to get Smk2emis to use this optional file.

The format of the VNAMMAP file is the following:

Lines	Columns	Description
1+	A	SMOKE I/O API variable name
	B	Smk2emis output name to be written to the UAM “EMISSIONS” file binary format

REPCONFIG: Reports configuration file

This file is used to control the Smkreport program. Please see the Smkreport documentation for more information. Each run of Smkreport is constrained to a single source category (area, mobile, or point), at most one speciation scenario, at most one grid, and at most one hourly emissions file. All of these component datasets are optional, however, and their use is controlled by the settings in this file. This file also controls the number and types of reports created by Smkreport. Lastly, REPCONFIG cannot specify control matrices to be read by Smkreport.

This file has three sections and a large number of options for each section. The file works on the principles of "packets" and "instructions." Packets are groups of instructions or a single action, and instructions are settings that tell the program what to do. The file also can contain comments and an instruction for creating several files.

The maximum number of characters that can be read on any line in this file is 300.

USING COMMENTS

Comments can be put in the file using a pound sign (#) at the first column of a line or a double pound sign (##) anywhere else on a line. The double pound can appear after packet labels or instructions in the file.

ONE-TIME SECTION

The first section of the file is the One-time section. This section is used for setting the environment variables that control Smkreport for all reports in a given run. The variables are set by listing the environment variable as an instruction, followed by its value. No "setenv" command (used in the C shell) is needed, because SMOKE is interpreting these values directly.

The instructions to control these values are the following:

SMK_SOURCE:

Set as "A", "M", or "P", for area-source reporting, mobile-source reporting, and point-source reporting, respectively.

An example of the way this setting would appear in the REPCONFIG file is the following:

```
SMK_SOURCE    A
```

DEFINE-GROUP SECTION

The second section of the file is the Define-group Section. This optional section is used for defining groups of source characteristics for use later in the create-reports section. This section uses packets for defining these groups. There are currently two types of groupings, and therefore two packet types for this section: regions and subgrids.

The **/DEFINE GROUP REGION/** packet is used for defining groups by the country, state, and county codes in the inventory. The packet contains the following entries.

- **/DEFINE GROUP REGION/ <Label>**
Must appear to start the packet. A label (see below) is required for naming the group.
- **INCLUDE** and/or **EXCLUDE** instruction(s) (see below) - optional.
- Country, state, and county codes in format NSSCCC, where N is the country number, SS is the state code, and CCC is the county code. Zeros can be used in place of CCC to select all counties in a state, or in place of SSCCC to select all counties and states in a country.
- **/END/**
Must appear to end the packet.

The **/DEFINE SUBGRID/** packet is used for defining subdomains based on cell counts from the full grid being applied using the gridding matrices. The packet contains the following entries.

- **/DEFINE SUBGRID/ <Label>**
Must appear to start the packet. A label (see below) is required for naming the subgrid.
- **INCLUDE** and/or **EXCLUDE** instruction(s) (see below) - optional.
- **(X cell, Y cell):**
Cell numbers should appear for all cells in the subgrid. The number of the cells depends on the grid defined by the gridding matrix being used by Smkreport. A range can be given with the following syntax:

(X cell, Y cell) TO (X cell, Ycell)

If only one cell is to be specified, the range must still appear, with both entries indicating the same cell.

Smkreport is not very sensitive to the spacing of this instruction, and additional spaces or no spaces may be placed between the parentheses, the cell numbers, and the commas. Spaces around the “TO” are recommended.

The maximum width of these lines is 100 characters. Multiple entries of this type may appear in the packet, allowing for the grouping of spatially unconnected cells/regions or non-rectangular regions.

- **/END/**
Must appear to end the packet.

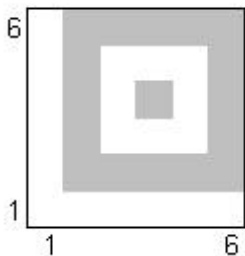
The **INCLUDE** and **EXCLUDE** instructions are used for defining the meaning of the entries in the packet. If the **INCLUDE** instruction appears, then Smkreport interprets the subsequent entries in the packet as identifying records for *including* in the output report(s). On the other hand, if the **EXCLUDE** instruction appears, then Smkreport interprets the subsequent entries in the packet as identifying records to *exclude* from the output report(s). The **INCLUDE** and **EXCLUDE** instructions may appear in both the **/DEFINE GROUP REGION/** and **/DEFINE SUBGRID/** packets. These instructions act as toggle switches, and Smkreport will give a warning if a county previously included is later excluded. All subsequent packet entries after an instruction will be interpreted according to the instruction, until another instruction is given, or until the packet ends. The **INCLUDE** instruction is the default, so if neither are given, SMOKE will assume that the records in the packet are to be only those included in the report.

Whether an **INCLUDE** or **EXCLUDE** instruction is provided first in a group definition can change the meaning of a group definition. If **INCLUDE** is given first, Smkreport will initialize the group to exclude all grid cells and proceed interpreting the instructions. If **EXCLUDE** is given first, Smkreport will initialize the group to include all grid cells. Here is an example for a small 6 cell by 6 cell grid, which shows how the order of the **INCLUDE** and **EXCLUDE**

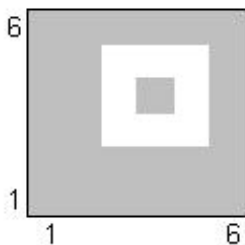
statements will change the meaning of a group definition. If the instructions are

```
/DEFINE GROUP REGION/ Example group
    INCLUDE (2,2) TO (6,6)
    EXCLUDE (3,3) TO (5,5)
    INCLUDE (4,4) TO (4,4)
/END/
```

then the following cells will be selected as shown by the gray cells in the picture below:



If the instructions were rearranged to have the EXCLUDE statement first, then the initialized status for all cells will be INCLUDE. The additional INCLUDE statements are therefore unneeded and the definition of the group has changed to the following:



Group labels, denoted above by <Label>, are used to name a group for identification when creating a report in the create-report section. The text appearing in the placeholder <Label> can be any alpha-numeric combination of characters up to 200 characters, including intervening blanks. The text string (less trailing blanks) after /DEFINE .../ and before a comment (indicated with ##), is treated as the group label. References to the group label in the Create-report Section do not have to be consistent in the case of the text; SMOKE will ignore the case of the text, and treat lower- and upper-case characters as if they were the same.

In the future, other types of groups will be permitted:

- /DEFINE GROUP SCC/: Permits user-defined SCC groups
- /DEFINE GROUP PLANT/ Permits user-defined groups by country/state/county code and plant ID
- /DEFINE GROUP STACK/ Permits user-define groups by country/state/county code, plant ID, and stack ID
- /DEFINE GROUP POINT/ / Permits user-define groups by country/state/county code, plant ID, stack ID, and point ID
- /DEFINE GROUP SOURCE/: Permits user-defined source groups by SMOKE source ID
- /DEFINE GROUP HOURS/: Permits user-defined hour groupings

CREATE-REPORT SECTION

The third section of this file is called the Create-report Section, and it is responsible for providing instructions to Smkreport for generating the reports. The /CREATE REPORT/ packet is used in this section, and this packet uses several types of instructions. The instructions that can be used in the /CREATE REPORT/ packet are the following, listed in alphabetical order:

- BY
- GRIDDING
- LAYFRAC
- NORMALIZE
- NUMBER
- SELECT
- SPECIATION
- TEMPORAL
- TITLE
- UNITS

By using these instructions (and some have a number of different options), a large number of different types of outputs can be achieved by Smkreport. **The order that the instructions appear in the packet is not important**, with one exception. If multiple titles are used, they will

be printed to the report in the order that they appear in the packet. The remainder of this subsection provides descriptions of each of these instructions.

BY: The BY instruction controls what columns in addition to data columns will be printed in the output report. Multiple BY commands may appear in the same /CREATE REPORT/ packet, but not all combinations make sense. The BY instructions tell the program the basis on which to sum the emissions or activity values. The syntax of the BY instruction is:

BY <option>, with the following valid options:

- CELL: Records are printed by cell. This option forces the GRIDDING instruction.
- COUNTRY [NAME]: Records are printed by country total. This option invokes use of the COSTCY file. NAME can be appended to the option to additionally output the country name instead of only the country number.
- COUNTY [NAME]: Records are printed by county total. This option invokes use of the COSTCY file. NAME can be appended to the option to additionally output the county name instead of only the county number.
- DIUCODE: Records are printed by diurnal profile code. **This option will only work correctly when monthly temporal profiles have not been applied by pollutant.**
- ELEVSTAT: Records include the status of sources as elevated (E), plume-in-grid (P), and low-level (L). Applies for point sources only.
- HOUR: Records are printed by hour total for each day. This option forces the TEMPORAL instruction.
- LAYER: For point sources, emissions are printed by vertical layer. This option implies the LAYFRAC option that requires input of the PLAY SMOKE intermediate file. It also implies the BY HOUR instruction, and emissions will be written by hour as well as by layer. In the report, records are written first for 1 layer, then the next, and so on. The JART software can be used to sort the records in a different order. Only records with non-zero emissions in a layer are written. Since the number of records this report can generate is very large, we recommend that a source group be used to subselect the inventory records.
- MONCODE: Records are printed by monthly profile code. **This option will only work correctly when monthly temporal profiles have not been applied by pollutant.**
- ROADCLASS: Records are printed by road class total. This option can only be used for mobile sources.
- SCC10: Records are printed by full 10-digit SCC totals.

- SOURCE [STACKPARM] [NAME]: Records are printed by source totals. Source characteristics are printed as well:

Point: country/state/county code, plant ID, stack ID, point ID, segment ID, and SCC

Area: country/state/county code and SCC

Mobile: country/state/county code, road type code, vehicle type code, link ID, and SCC

For point sources, STACKPARM can be appended to the option to also output the stack parameters (height, diameter, exit velocity, exit temperature). Also for point sources, NAME can be appended to the option to get the facility names in the output file.

- SPCCODE <POLLUTANT>: Records are printed by speciation profile codes assigned to sources by the speciation cross-reference file. **Only one pollutant can appear with this command throughout the entire REPCONFIG file.** The pollutant should be one that is in the inventory file and that was processed as part of the chemical speciation file run. This BY option does not imply the SPECIATION instruction, and it can be used without included speciated emissions in the report.
- SRGCODE [FALLBACK]: Records are printed by surrogate codes assigned to sources by the gridding cross-reference file. If no option is used, both primary and fallback surrogate codes are included in the output report. If the FALLBACK option is used, only the fallback surrogate codes are included in the output report, and a zero is used for all records that did not use a fallback surrogate (i.e., their primary surrogate did not cause emissions to go to zero). This BY option does not imply the GRDMAT instruction, and it can be used without applying the gridding matrix in the report. A value of -9 is used for fallback surrogate IDs in the resulting report.
- STATE [NAME]: Records are printed by state totals. This option invokes the use of the COSTCY file. NAME can be appended to the option to additionally output the state name instead of only the state number.
- WEKCODE: Records are printed by weekly profile code. **This option will only work correctly when monthly temporal profiles have not been applied by pollutant.**

The most detailed BY instruction will determine the resolution of the emissions and activity totals. For example, the COUNTRY, STATE, and COUNTY can be used in the same report to affect the column headers (e.g. to get the state name in the county report), but the data output will not be different because the emissions totals will be at the finest resolution specified. In other words, if the instructs are to report BY COUNTY and BY STATE, the emission totals in that report will be by county, and the BY STATE instruction will merely add the state name to the columns printed. Another example is that the BY SCC10 instruction will override the resolution of BY ROADCLASS.

Future versions of the BY command will support the following options :

- SCC[#] [NAME]: Records are printed by collections of SCCs based on the number selected from 1 to 10. For example, SCC3 would total emissions by and SCC tier with the structure ###*****, where ### is the first three digits of the SCCs, and the asterisks indicate that the rest of the SCC number is ignored for purposes of grouping. The NAME trailer could be used to include the name of the SCC as one of the records in the output report.
- PLANT [NAME]: For point sources only, records are printed as facility totals. NAME can be appended to the option to get the facility names in the output file.
- STACK [NAME]: For point sources only, records are printed as facility and stack totals. NAME can be appended to the option to get the facility names in the output file.
- POINT [NAME]: For point sources only, records are printed as facility, stack, and point totals. NAME can be appended to the option to get the facility names in the output file.
- VTYPE: For mobile sources only, records are printed as vehicle-type totals.
- SIC: For point sources only, records are printed as Standard Industrial Code (SIC) totals.
- GROUP <option>: Records are printed based on the user-defined groups. Where the following options would be supported:
 - REGION: Rows in report are user-defined region groups.
 - SCC: Rows in report are user-defined SCC groups.
 - SOURCE: Rows in report are user-defined source groups, by SMOKE record number.
 - HOURS: Rows in report are user-defined hour groups.

GRIDDING: The GRIDDING instruction controls whether or not the gridding matrix is going to be used by the program. When the instruction is present, the gridding matrix is used in generating the report. The gridding matrix file name is determined by the environment variables set at runtime of the Smkreport program (as described in [Chapter 8](#)). When the GRIDDING instruction is given, the gridding matrix will be applied to the emissions before the totals are made. One use of this option would be the following: a report could be generated without GRIDDING to see emission totals before gridding, and another report could be generated with GRIDDING to see the totals after gridding. The totals could be compared from the two reports to see if any emissions were lost because of the gridding step.

The GRIDDING instruction is assumed when any of the following other instructions appear in the packet:

SELECT SUBGRID,
BY CELL,
NORMALIZE CELLAREA.

LAYFRAC: The LAYFRAC instruction controls whether or not the point source layer fractions file (PLAY) from the Laypoint program will be used in determining elevated and low-level sources. If the PLAY file is not used for determining elevated sources, the PELV file from the Elevpoint program will be required.

NORMALIZE: The NORMALIZE instruction controls whether or not the emission values will be normalized using some other data value. Two normalize options are currently supported; the CELLAREA option and the POPULATION option. When the emissions are normalized by cell area, they are divided by the area of each cell (or just the cells selected if a subgrid is used).

Emissions normalization can provide additional insight to the inventory instead of simply summarizing emissions values. Normalizing by grid-cell area is useful for comparing emission reports from grids at different resolutions, including nested grids, to ensure that a consistent emissions density is maintained across the multiple grid resolutions.

The syntax of the NORMALIZE instruction is:

NORMALIZE <option>, with the following valid options:

- CELLAREA: Normalize emissions based on grid cell area.

For Lambert and UTM grids, the cell area will be computed using the formula:

$$DX * DY$$

where:

DX is the cell x-direction size in meters

DY is the cell y-direction size in meters

For lat-lon grids, the area of the lat-lon cell will be estimated using the formula:

$$(\cos Y) * (\pi * DX * R / 180) * (\pi * DY * R / 180)$$

where:

DX is the cell x-direction size in degrees longitude

DY is the cell y-direction size in degrees latitude

Y is the cell center in degrees latitude

R is the radius of the earth in meters

This instruction forces the GRIDDING instruction to be used, because the gridding information is needed in order to normalize the emissions by grid area. If the GRIDDING instruction is left out of the report instructions, Smkreport will add it to the report and continue.

- **POPULATION:** Normalize emission based on county population. Emissions in the report will be divided by county population, regardless of whether the BY COUNTY instruction has been used in the report instructions.

This option requires that the COSTCY input file to Smkreport include an additional field and a #POPULATION header, as is described in the COSTCY documentation.

Future versions of the NORMALIZE instruction will support the following options:

- **NORMALIZE COUNTYAREA:** Normalize emissions based on county area.

NUMBER: The NUMBER instruction controls the format used to display *data values* in the report. The argument for the number instruction applies to all data values that are written to the report, and the structure of the argument is simply the formats supported by FORTRAN. The data values in the reports are rounded to the nearest value allowed based on the format selected. A value of five is rounded up to the next decimal place, when such rounded is needed.

The syntax of the NUMBER instruction is simply:

NUMBER <format>

where <format> is the FORTRAN format specification. The common formats one might use are the following:

Float format:

F<x>.<y>: where <x> is the number of digits for the number, including the decimal place, and <y> is the number of digits shown after the decimal place.

Exponential format:

E<x>.<y>: where <x> is the complete width of the value, including five characters for "E+00" and the decimal, and <y> is the number of significant figures.

If the NUMBER instruction does not appear in the report instructions, the E8.3 format is used.

SELECT: The SELECT instruction controls which records in the inventory are used in generating the report. It allows the user to extract particular records from the inventory, for inclusion in the report. This instruction also permits references to the groups defined in the Define-Groups section. If no SELECT instruction is used, then the other report instructions will

be applied to all records in the inventory. Only one SELECT statement of each type is permitted in per report; for example, only one SELECT REGION statement and one SELECT SUBGRID statement could be used for a single report. Of course, different SELECT REGION or SELECT SUBGRID instructions could be used for different reports in the same output file.

The syntax of the command is:

```
SELECT <options> <label>,
```

where <label> is an optional field, depending on the <option> selected. The following options are available for the SELECT instruction:

- **DATA <label>:** Selects data values to include in the report. When no SELECT DATA instruction is used, all pollutants, activities, or species found in the input file(s) are reported. When species are being reported, the corresponding pollutants in the inventory or hourly emissions file are reported as well as the speciated emission values. The <label> must be a space-delimited list of pollutant, activity, or species names. Do not include the pollutant names in the list when species are listed, these will be included by default.

To specify a species value when the species name is the same as the pollutant name, a “S” and a hyphen can be inserted before the species name. One can also use this method for specifying the sum of post-speciated emissions. For instance, to specify carbon monoxide after speciation, the SELECT instruction should be:

```
SELECT DATA S-CO
```

To specify the sum of VOC emissions after speciation, the SELECT instruction should be:

```
SELECT DATA S-VOC
```

Note that Smkreport does not determine whether the summation makes sense, and does not correct for species molecular weights. The user has the responsibility of ensuring that data requests make sense.

- **ELEVATED [PING]:** Selects all elevated point sources (recognized for point sources only). If no elevated sources are found (after applying all other selection criteria), the report will contain a warning to this effect. If the PING option appears, only plume-in-grid sources will be selected. When the ELEVATED instruction is used by any report, the PELV file (from Elevpoint) or PLAY file (from Laypoint) will be required to determine which sources are elevated or not. The latter will be used when the LAYFRAC instruction is also included in the report instructions. If the PING option is used, the PELV file will be required in all cases, although the LAYFRAC instruction can still be used to set the elevated source status based on the layer fractions.

- **NOELEVATED:** Selects all low-level point sources (recognized for point sources only). If both the ELEVATED and NOELEVATED commands appear in the same report, a warning will be given, and the latter setting will be used to generate the report. If no low-level sources are found (after applying all other selection criteria), the report will contain a warning to this effect. The same rules apply for use of the PELV or PLAY files as described for the ELEVATED option.
- **REGION <label>:** Selects a region using the country/state/county code or a region group. For this option, <label> must be either a country/state/county code in NSSCCC format, or a region group label from the Define-group section of the file.
- **SUBGRID <label>:** Selects a subgrid using the grid cell numbers or a subgrid group label. For this option, <label> must be either a range of grid cells, or a subgrid label from the Define-group section of the file.

When the <label> defines the cell range, the same syntax as specified as above for the /DEFINE SUBGRID/ packet should be used. However, the INCLUDE setting is assumed, and Smkreport will not understand the INCLUDE and EXCLUDE commands as part of the <label>.

For the REGION and SUBGRID options, the value of <label> must either match a group or subgrid label or match characteristics of the inventory or grid. Also, the <label> for the REGION and SUBGRID options must be 200 characters or less.

Future versions of Smkreport will support the following additional options:

- **SCC <label>:** Select a single SCC or SCC group for reporting.
- **PLANT <label>:** Select a single point source plant, or a plant group for reporting.
- **STACK <label>:** Select a single point source stack, or a stack group for reporting.
- **POINT <label>:** Select a single point source point, or a point group for reporting.
- **HOURS <label>:** Select a single hour or hour group for reporting.
- **SOURCE <label>:** Select a single source or source group for reporting.

SPECIATION: The SPECIATION instruction controls whether or not the speciation matrix is going to be used by the program. This option controls the columns of data that will be printed in the output file. When the SPECIATION instruction is in the report instructions, the columns in the output file will include speciated emissions values as well as inventory emissions from the SMOKE inventory or hourly emissions file (depending on the use of the TEMPORAL instruction or not). When the SPECIATION instruction is not used, the columns in the output file will be inventory emissions and/or activities.

The syntax of the SPECIATION instruction is:

SPECIATION <option>

where the following options are supported

- MOLE: Uses the mole-based speciation matrix.
- MASS: Uses the mass-based speciation matrix.

TEMPORAL: The TEMPORAL instruction controls whether or not emission values are used from the hourly emission files ATMP, MTMP, or PTMP. When this instruction is used, the default behavior of Smkreport is to sum up the emissions by day and report emissions as daily totals. To override this behavior, the BY HOUR instruction must be used.

When dates and times are given in the report, the hours are reported in the time zone from the ATMP, MTMP, or PTMP file. The time zone is listed as the *standard* time zone for the time zone stored in the header of the hourly emissions file; therefore, hours are not ever reported as *daylight* time values.

The TEMPORAL instruction is assumed when either of the following options appear in the report instructions:

SELECT HOURS,
BY HOUR.

In the future, it may be possible to enhance this instruction to permit the reported hour values to be labeled by a different time zone than is in the hourly emissions file.

TITLE: The TITLE instruction allows one or more titles to be added to a report. The titles are printed into the report in the order in which they appear in the packet. Quotes are **not** needed in titles with blank spaces. The title will be ended at the last character on the line, or at a double pound sign (##), whichever appears first on the line. Double pound signs cannot be printed in the title of reports. It is recommended that titles be 80 characters wide. The maximum title is 300 characters wide. The syntax of the TITLE instruction is the following:

TITLE <title text>

UNITS: The UNITS instruction allows control of the units of the output data. The current version of Smkreport does not permit units control by data value, but rather the same units must be used for all data values, or the default units will be used. Future versions of Smkreport will permit control of the units by data variable. All unit conversions that *can* be done, *will* be done. For example, if the inventory is stored in tons/hour, and the output is requested in fathoms/day, the hour-to-day conversion will be made, while the impossible tons-to-fathoms conversion will not be made. The syntax of the UNITS instruction is the following:

```
UNITS ALL <units>
```

Valid values for the <units> option numerator are the following:

```
ton(s)
g, gm(s), gram(s)
kg(s)
mole(s), gm mole(s)
```

Valid values for the <units> option denominator are the following:

```
year(s), yr(s)
day
hour(s), hr(s)
min(s)
day(s)
s, sec(s)
```

No quotes are needed around the unit labels. Unit labels must be 30 characters or less. Some examples of the units instruction are the following:

```
UNITS ALL gm moles/s
UNITS ALL tons/hr
UNITS ALL kg/year
```

The **/DELIMITER/** packet

The **/DELIMITER/** packet can be used to change the column delimiter used in the output reports from Smkreport. The default delimiter is a semi-colon (“;”). Users can change the delimiter to any single-character value to suit their needs. Please note that using a space as a delimiter may result in slightly misformatted reports. Some reasons to change the delimiter from the default are:

- You are reporting “BY SOURCE” and including the source name, and it has semicolons included in one or more of the names. This would prevent those records in the output report from being read into another program using semicolon as the delimiter.
- Software you want to use to read the Smkreport output report does not support semi-colons for delimiters.
- You prefer a different appearance in the reports, and you can select another delimiter that will not conflict with other fields in your report.

The syntax of this instruction is the following:

```
/DELIMITER/ ,
```

This example would result in a comma (“,”) being used as the delimiter for columns of any results from **/CREATE REPORT/** instructions that followed this instruction in the REPCONFIG file.

The **/REPORT TIME/** packet

The **/REPORT TIME/** packet can be used to change the hour value for which daily total hourly emissions are output. The syntax of this instruction is the following:

```
/REPORT TIME/ <HHMMSS>
```

The setting uses HHMMSS format, for which HH is the hour and MMSS is 0000. The time specified is in the time zone of the input hourly data file. This setting is ignored when hourly data are not input to Smkreport. The default behavior of Smkreport is to report at the last hour of the day, hour 23 (hours are counted from 0 to 23).

The **/O3SEASON/** packet

The **/O3SEASON/** packet can be used to toggle on or off the use of the ozone-season emissions from the SMOKE inventory file. The syntax of the command is the following:

```
/O3SEASON/ <option>
```

Where the <option> field can be set to Y or N. The default behavior of the program (if no such packets appears) is to *not* use the ozone-season emission in the reports. This packet *only* affects the program when the inventory emission are being reported. If the TEMPORAL instruction is

given, the output report will contain whatever emission values were used to create the hourly emissions file.

The /NEWFILE/ packet

The /NEWFILE/ packet can be used before or between any /CREATE REPORT/ packets to cause Smkreport to write out the subsequent reports to a different report file. The syntax of the command is the following:

```
/NEWFILE/ <Filename>
```

Where the placeholder <Filename> is replaced by either:

1. A physical file name, including the path.
2. The keyword LOGICAL, followed by a logical file name.

If no information is given for <Filename> the output files will be named by their automatic logical file names, REPORT[#], where [#] is replaced by the number of the report file in order of its associated /NEWFILE/ packet.

Future versions of Smkreport will be able to parse strings with environment variables if they are used in the file names, but the current version cannot.

SMOKE Intermediate and Output Files

In this section, the intermediate and output files are arranged by SMOKE program.

- [ELEVPOINT](#): Selects elevated and plume-in-grid sources
 - [SMKMERGE](#): Prepares model-ready files
 - [SMKREPORT](#): Creates user-defined reports and summaries for quality assurance
-

ELEVPOINT output files

STACK_GROUPS

I/O API intermediate file and output file for CMAQ. Unavailable at this time

PELV

This ASCII intermediate file contains the SMOKE source numbers of elevated and plume-in-grid sources and their groups. Recall that the source number is also provided in the PSRC file for cross-referencing with this file, if needed. The source number is the same and the SMOKE-sorted position in the inventory arrays. The file does not contain a header. Only SMOKE programs use this file. The three columns in the file are defined as follows:

Column 1: Source number for elevated sources, zero if the source is a PinG source

Column 2: Source number for PinG sources, zero if the source is simply an elevated source

Column 3: Group number for source. All sources in this file will have a group number, even if only one source is in the group. This is needed for creating the STACK_GROUPS file.

REPPELV

This ASCII output file contains the sources and criteria used for selecting elevated and PinG sources in SMOKE. The following is a description of columns/header in the report:

Source ID: SMOKE source ID used by SMOKE only

Region: Country/state/county code (CSSYYY where C=country, SS=state, and YYY=county)

Plant: Inventory facility ID

Char 1: For IDA inventory like this, Point ID

Char 2:	For IDA inventory like this, Stack ID
Char 3:	For IDA inventory like this, Segment ID
Char 4:	For IDA inventory like this, source category code (SCC)
Plt Name:	Plant description from the input inventory
Elevstat:	Elevated status, P = plume-in-grid, E = elevated
Group:	SMOKE-assigned stack group number
Stk Ht:	Stack height in meters
Stk Dm:	Stack diameter in meters
Stk Tmp:	Stack exit gas temperature in K
Stk Vel:	Stack exit gas velocity in m/s
Stk Flw:	Stack exit gas flow rate in m ³ /s
Rise:	Briggs analytical solution plume rise in meters. This column is only output when RISE is specified as a selection criterion in the PELVCONFIG input file.
Group <pol>:	Daily max emissions for source or source group for each pollutant (<pol>) in the PELVCONFIG file. These emissions are source emissions when a single source has its own group number. This column is only output when a pollutant is specified as a selection criterion in the PELVCONFIG input file.
Var 1:	The first variable from the PELVCONFIG input file that was used in establishing the source as a PinG/elevated source
Type 1:	If “TOP” was used in the PELVCONFIG input file, this field says "RANK"
Test 1:	The test used to establish this source as a PinG/elevated source (e.g. >, <, >=, =)
Val 1:	If TOP was used, this value is the RANK. Otherwise, this value is the criteria used with Var 1 and Test 1 (e.g., if Var 1 is HT, Test 1 is “>”, and Val 1 is 50, then the criteria for selection is that the stack height is greater than 50.

Var 2 through Val 2 are the same as Var 1 through Val 1, except these are only defined if an AND condition existed for the OR condition that SMOKE used to establish the source as PinG or elevated. There will be as many variables of these types for maximum number of AND conditions in the PELVCONFIG file.

SMKMERGE output files

SMKREPORT output files

Overview

Description: Quality assurance and summary reports

Type: ASCII

Summary: As described in [Chapter 8](#), the Smkreport program creates reports for quality assurance purposes based on the SMOKE intermediate files (e.g., SMOKE inventory files, hourly emissions, speciation matrix, gridding matrix). Because the program is very flexible, there are a large number of reports that can be generated. The File Format(s) Section below describes the guidelines that Smkreport uses in building the output reports, based on the instructions provided to Smkreport. It also contains a large number of example reports, to help the user understand the possible format options.

File Formats(s)

Multiple reports in one file: Each file output by Smkreport may contain multiple reports. The user has control of whether and how many reports are included in each file (please see the REPCONFIG file documentation for more information on using the /CREATE REPORT/ and /NEWFILE/ packets). The reports in a file are separated by a row of pound signs (#). If having multiple reports in a single file causes problems for importing the data into other software, then the user should create a REPCONFIG file that specifies a new file for each report.

Basic report structure: The reports in an output file use columns and rows to structure the information. The reports are structured to permit the user to import the report into Microsoft Excel, Dbase, or some other data-processing tool for future analysis. The columns in the reports are comma delimited, have labels, and have units. Where possible, we have also tried to make sure that the text versions of the reports can be viewed easily. The width of the widest entry in a column is used to set the width for the column, thereby making fixed-file format transfer to other software possible.

Structure Template: The following is a general template for the Smkreport output files:

```
<REPORT 1>
  <User Title(s), one per line>
  <Automatic Titles, one per line>
  <Column headers>
  <Units, for columns that need them>
  <Data values for all rows>
```

#####

<REPORT2. if any>
 <User Title(s), one per line>
 <Automatic Titles, one per line>
 <Column headers>
 <Units, for columns that need them>
 <Line of minus signs>
 <Data values for all rows>

#####

METADATA

 <Input files>
 <Echoed group definitions from REPCONFIG file>
 <Echoed report instructions from REPCONFIG file>

<End of file>

REPORTS SECTION

User titles: The first section of each report is a title section. The first title entries in the report are any titles specified in the /CREATE REPORT/ packets in the REPCONFIG file, created by the user. They are listed in the same order as those provided in the input packets for the report.

Automatic titles: Automatic titles are inserted by Smkreport to indicate the operations needed to be done by Smkreport to generate the requested report. This helps the report be self-describing. The automatic titles are formatted to be no larger than 80 characters wide, to permit easier viewing as text files. The following automatic titles will be applied, where applicable:

- Source category processed
- The year of the inventory
- Time period processed with dates, hours, and time zones
- Whether a gridding matrix was applied and the grid name, or if no gridding
- Whether a speciation matrix was applied and if it was mole-based or mass-based, or if no speciation
- Whether hourly data were input, or if inventory data
- The name of the group used to select the data, if any (the group definition will be listed in the METADATA section)
- The name of the subgrid used to select the data, if any (the subgrid definition will be listed in the METADATA section)

Data columns: The data that are written to a report are determined by the BY instructions in the /CREATE REPORT/ packet. Typically, one column is created for each BY instruction, which corresponds to the name of the BY instruction. The exceptions to this rule are

1. the BY COUNTRY, BY STATE, and BY COUNTY instructions, which output the country, state, and county codes, and optionally the country, state, and county names, respectively (if NAME is included at the end of the instruction).
2. the BY SOURCE instruction, which outputs columns for all source characteristics (point sources: country/state/county, plant, char1, char2, char3, char4, char5; area sources: country/state/county, SCC; mobile sources: country/state/county, road class, vehicle type, SCC). For point sources, the BY SOURCE instruction can also output 4 additional columns for stack parameters, and another additional column for facility name.

In addition to the columns specified by the BY instructions, the emissions and/or activity data are written out to the report. If no speciation option is used (the SPECIATION instruction is not given), then the other data columns are the emissions and activities from the SMOKE inventory file (e.g., NO_x, VOC, PM10, VMT). If the speciation option is used, then the other data columns are the speciated emissions data (e.g., NO, NO₂, ALD, PAR, ISOP). The SELECT DATA instruction determines which inventory data and speciated emissions data are written to the reports. When speciated data are output, the columns for the corresponding inventory pollutants are written as well (as explained more fully in the input file description of the SELECT DATA instruction).

The order of the columns of data values is taken from the order of the data in the SMOKE intermediate files. The orders of pollutants and activities are controlled by the SIPOLS and ACTVNAMS files when Smkinven is run to create the SMOKE inventory files. Species are

arranged by Spcmat based on the order of the pollutants, and then alphabetically for species coming for the same pollutant, and this order is used to create the speciation matrix.

Each column is labeled by a header name. Where applicable, the columns also are labeled by units, as set by the UNITS instruction or by the default units for the data used by the program. For the emissions and activity data, the header name are simply the names of the pollutants or activity variables input to SMOKE. For columns generated by the BY instructions, the following possible column headers are used by SMOKE. These are listed in the order that they would appear.

- Date (values of MM/DD/YYYY)
- Hour (Integer values 1 to 24)
- Layer number (Integer values > 0)
- X cell (Integer values > 0)
- Y cell (Integer values > 0)
- Source ID (SMOKE record number, Integer values > 0)
- Co/St/Cy (Country, state, and county code; values of NSSCCC, with SS and/or CCC replaced by zeros, as is necessary depending on the BY option used.)
- Country (value is name; optional when country, state, and county code is output)
- State (value is name; optional when country, state, and county code is output)
- County (value is name; optional when country, state, and county code is output)
- SCC (10-character values, with 2 leading zeros for 8-character SCCs)
- Primary Srg (primary surrogate ID code, area or mobile sources)
- Fallbk Srg (fallback surrogate ID code, area or mobile sources)
- Monthly Prf (monthly temporal profile code)
- Weekly Prf (weekly temporal profile code)
- Diurnal Prf (diurnal temporal profile code)
- Spec Prf (speciation profile code)
- Plant ID (point sources) or Road (road class, mobile sources)
- Char 1 (for IDA inventories, the point source stack ID) or Veh Type (vehicle type, mobile sources)

- Char 2 (for IDA inventories, the point source point ID)
- Char 3 (for IDA inventories, the point source segment ID)
- Char 4 (point sources, if defined)
- Char 5 (point sources, if defined)
- Stk Ht (stack height, point sources)
- Stk Dm (stack diameter, point sources)
- Stk Tmp (stack exit temperature, point sources)
- Stk Vel (stack exit velocity, point sources)
- Elevstat (E= elevated, P= Plume-in-grid, L= low-level; point sources)
- Plt Name (facility name with quotes around it, point sources)
- SCC Description (possible future, quotes around it)

Header units: The units used in the header for each column depend on (1) the units in the input files, (2) the units set as output units in the report instructions, and (3) any normalization used. Smkreport starts with the units achieved from the input files and application of any matrices of interest. Then all unit conversions that can be made, are made. The conversions are done separately on the numerator and the denominator, but one or both of the conversion will not be done if Smkreport has not been configured for the conversions. A note will appear to this affect in the log file in this case. Lastly, the units are converted to $[1/m^2]$ when the NORMALIZE CELLAREA instruction is given.

Below the header units, a line created by minus signs will appear in the reports.

Data rows: The rows of data are listed sequentially, without spaces between the rows, in sorted order of the BY instructions, and based on the order listed in the file (just explained above). Emission-value-based sorting is not done by Smkreport, but rather left for a post-processing step of other data manipulation software. With the exception of the title, the length of the rows is not constrained.

The data values in the rows are formatted based on the NUMBER instruction for the report.

Basis of Totals: The summary basis of the emission totals depends on the BY instructions for the report. The inventory records included in the totals depends on the SELECT instructions for the report. More description of these instructions and how they affect the output is provided with the REPCONFIG file format information.

METADATA SECTION *(Not yet implemented)*

This section is denoted by a line with the word METADATA on it.

Input files: In this section, all of the input files used in running the program are provided, one on each line. The full path and file name are provided.

Echoed group definitions: The group definitions from the REPCONFIG file used to generate the file are listed in this section. The definitions are merely echoed out from the input file.

Echoed report instructions: The report instructions from the REPCONFIG file used for creating each report in the file are listed in this section. The instructions are merely echoed out from the input file.

Examples

The following provides examples for various types of reports that can be generated from Smkreport. Each example is labeled by the Title appearing in the report. No actual emission data values are given in the reports (and sometimes the emission values are not even listed). No example is given with two reports in a single file. Imagine that the inventory used to generate these examples has only CO and NO_x available. Also, the entire report is not provided, but rather a sampling of what the reports look like without all states, SCCs, etc.

Example 1

Country total point source inventory emissions, with country names
1996 Inventory
No gridding

Co/St/Cy, Country Name	CO	NOX
	[tons/yr]	[tons/yr]
000000, US	602390.4	302123.1
100000, Canada	312233.3	197158.9
200000, Mexico	809822.1	289321.3

Example 2

State total point source emissions, with state names
1996 Inventory
No gridding

Co/St/Cy, State Name	CO	NOX
	[tons/yr]	[tons/yr]
010000, Alabama	2390.4	2123.1
037000, North Carolina	5233.3	2400.9
045000, South Carolina	3822.1	1321.3

Example 3

County total area source emissions, with state and county names
1996 Inventory
No gridding

Co/St/Cy	State Name	County Name	CO	NOX
			[tons/yr]	[tons/yr]
037001	North Carolina	Alamance Co	0.2344E+03	0.1235E+03
037003	North Carolina	Alexander Co	0.1354E+03	0.9909E+02
037005	North Carolina	Alleghany Co	0.9807E+02	0.7897E+02
037007	North Carolina	Anson Co	0.8734E+03	0.9807E+02
037009	North Carolina	Ashe Co	0.1140E+03	0.9871E+02

Example 4

Hourly area source emissions by county for first 3 counties in NC
1996 Inventory
No gridding
July 1, 1996 at 0 GMT to July 7, 1996 at 23 GMT

Day	Hour	Co/St/Cy	CO	NOX
			[tons/hr]	[tons/hr]
07/01/1996	0	037001	0.1234	0.5678
07/01/1996	0	037003	0.1234	0.5678
07/01/1996	0	037005	0.1234	0.5678
07/01/1996	1	037001	0.2345	0.6789
07/01/1996	1	037003	0.2345	0.6789
07/01/1996	1	037005	0.2345	0.6789
07/01/1996	2	037001	0.2345	0.6789
07/01/1996	2	037003	0.2345	0.6789
07/01/1996	2	037005	0.2345	0.6789

Example 5

In this example, the x-cell will cycle slowest, followed by the y-cell, and then by the county code. The data are sorted by the first the columns (the BY settings) from left to right.

Grid-cell inventory area source emissions by county, daily average
1996 Inventory
Grid name NC36_03X03

X cell	Y cell	Co/St/Cy	CO	NOX
			[kg/day]	[kg/day]
1	1	037001	0.123556	0.0789112
1	1	037003, etc.		
1	2	037001		
2	1	037001		

Example 6

SCC total mobile source emissions by day from hourly data

1996 Inventory

No gridding

July 1, 1996 at 0 GMT to July 7, 1996 at 23 GMT

Date	, SCC	, CO	, NOX
		[tons/day]	[tons/day]
07/01/1996,	2201001110,	123.321,	456.654
07/01/1996,	2201001130,		
07/01/1996,	2201001150,		
07/01/1996,	2201001170,		
07/01/1996,	2201001190,		
07/01/1996,	2201001210,		
07/01/1996,	2201001230,		

Example 7

SCC total mobile source daily total emissions by state (no state names)

North Carolina and South Carolina

1996 Inventory

No gridding

July 1, 1996 at 0 GMT to July 7, 1996 at 23 GMT

Date	, Co/St/Cy,	SCC	, CO	, NOX
			[tons/day]	[tons/day]
07/01/1996,	37000,	2201001110,	123.321,	456.654
07/01/1996,	37000,	2201001130,		
07/01/1996,	37000,	2201001150,		
07/01/1996,	37000,	2201001170,		
07/01/1996,	37000,	2201001190,		
07/01/1996,	37000,	2201001210,		
07/01/1996,	37000,	2201001230,		
07/01/1996,	45000,	2201001110,		
07/01/1996,	45000,	2201001130,		
07/01/1996,	45000,	2201001150,		
07/01/1996,	45000,	2201001170,		
07/01/1996,	45000,	2201001190,		
07/01/1996,	45000,	2201001210,		
07/01/1996,	45000,	2201001230,		

Example 8

Elevated hourly emissions by grid cell and point sources

Only 2 point sources in inventory (wouldn't that be nice?)

1996 Inventory

Grid name NC36_03X03

July 1, 1996 at 0 GMT to July 7, 1996 at 23 GMT

Date	, Hour,	X cell,	Y cell,	Source ID,	CO	, NOX
					[tons/day]	[tons/day]

07/01/1996,	0,	1,	1,	1,	123.321,	456.654
07/01/1996,	0,	1,	1,	2,	12.345,	56.789
07/01/1996,	0,	1,	2,	1,	123.321,	456.654
07/01/1996,	0,	1,	2,	2,	12.345,	56.789
07/01/1996,	0,	1,	3,	1,		
07/01/1996,	0,	1,	3,	2,		
07/01/1996,	0,	2,	1,	1,		
07/01/1996,	0,	2,	1,	2,		
07/01/1996,	0,	2,	2,	1,		
07/01/1996,	0,	2,	2,	2,		
07/01/1996,	0,	2,	3,	1,		
07/01/1996,	0,	2,	3,	2,		
07/01/1996,	0,	3,	1,	1,		
07/01/1996,	0,	3,	1,	2,		
07/01/1996,	0,	3,	2,	1,		
07/01/1996,	0,	3,	2,	2,		
07/01/1996,	0,	3,	3,	1,		
07/01/1996,	0,	3,	3,	2,		
07/01/1996,	1,	1,	1,	1,		
07/01/1996,	1,	1,	1,	2,		
07/01/1996,	1,	1,	2,	1,		
07/01/1996,	1,	1,	2,	2,		
07/01/1996,	1,	1,	3,	1,		
07/01/1996,	1,	1,	3,	2,		

Example 9

Breweries and Wineries SCC total area source emissions for a subgrid

Grid name: NC36_24X24

Subgrid cells selected:

(1,1) TO (4,4)

(6,6) TO (9,9)

X cell,	Y cell,	SCC	, CO	, NOX
,	,		[tons/day],	[tons/day]
1,	1,	2302070001,	0.1234E-03,	0.4567E-04
1,	1,	2302070005,		
1,	2,	2302070001,		
1,	2,	2302070005,		
1,	3,	2302070001,		
1,	3,	2302070005,		
1,	4,	2302070001,		
1,	4,	2302070005,		
2,	1,	2302070001,		
2,	1,	2302070005,		

Example 10

Grid cell-normalized area-source, daily-total speciated emissions for NC

Grid name: NC36_24X24

Cell-area-normalized emissions using cell size 36000m X 36000m

July 1, 1996 at 0 GMT to July 7, 1996 at 23 GMT

Date	, Co/St/Cy,	State	, CO	, NO	, NO2
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			[g/day*m^2]	[g/day*m^2]	[g/day*m^2]
07/01/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/02/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/03/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/04/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/05/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/06/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
07/07/1996,	37000,	North Carolina,	112.3456,	23.3456,	1.1234
