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16. Abstract

This research report represents the latest revisions to the software, PREPIN, POLFAC5A, COADJ, IMPSUM, and SUMALL. The report is presented as a user's guide; operating instructions are provided for each program. The mainframe programs were developed to estimate mobile source emissions and vehicle miles traveled (VMT). The PREPIN program allows the analyst to factor a 24-hour assignment to estimate the VMT and speeds for a subject time period. The POLFAC5A program is used to apply MOBILE5A to obtain emissions factors. COADJ, a special utility program, combines emission factors from three applications of the POLFAC5A program to produce a new set of emission factors. IMPSUM facilitates the computation of emissions by using the emission factors from POLFAC5A and COADJ. Lastly, SUMALL sums the emission results from two or more time periods plus diurnals. IMPSUM and SUMALL have the additional capability of producing gridded emission estimates.

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USER'S GUIDE FOR THE TEXAS MOBILE SOURCE EMISSION ESTIMATION SOFTWARE: PREPIN, POLFAC5A, COADJ, IMPSUM, AND SUMALL

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Develop Air Quality Data for Federal Submission

Research Study Number 0-1279
Research Report Number 1279-2

Sponsored by

Texas Department of Transportation

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College Station, Texas

October 1993

IMPLEMENTATION STATEMENT

This report supports TxDOT's efforts to comply with the Federal Clean Air Act Amendments of 1990 and the associated changes to the Texas Clean Air Act. The improved analysis capabilities will assist TxDOT staff in estimating mobile source emissions and vehicle miles traveled. The analysis tools are designed for immediate implementation by TxDOT.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation. Additionally, this report is not intended for construction, bidding, or permit purposes. George B. Dresser, Ph.D., was the Principal Investigator for the project.

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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	2.54	centimeters	cm
ft	feet	0.3048	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	6.452	centimeters squared	cm^2
ft^2	square feet	0.0929	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
mi^2	square miles	2.59	kilometers squared	km^2
ac	acres	0.395	hectares	ha
		MASS (weight)		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.0328	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3

Note: Volumes greater than 1000 L shall be shown in m^3.

		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

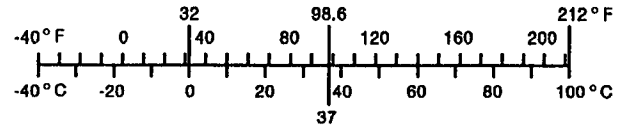
APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
yd	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
yd^2	kilometers squared	0.39	square miles	mi^2
ha	hectares (10,000 m^2)	2.53	acres	ac
		MASS (weight)		
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1000 kg)	1.103	short tons	T
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3

		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

These factors conform to the requirement of FHWA Order 5190.1A

*SI is the symbol for the International System of Measurements



INTRODUCTION

This research report represents the latest revisions to the software, PREPIN, POLFAC5A, COADJ, IMPSUM, and SUMALL. The previous dates of revision are November 1992 and January, April, and July 1993. This report is presented as a user's guide; operating instructions are provided for each program. The mainframe programs were developed to estimate mobile source emissions and vehicle miles traveled (VMT). The PREPIN program allows the analyst to factor a 24-hour assignment to estimate the VMT and speeds for a subject time period. The POLFAC5A program is used to apply MOBILE5A to obtain emissions factors. COADJ, a special utility program, combines emission factors from three applications of the POLFAC5A program to produce a new set of emission factors. IMPSUM facilitates the computation of emissions by using the emission factors from POLFAC5A and COADJ. Lastly, SUMALL sums the emission results from two or more time periods plus diurnals. IMPSUM and SUMALL have the additional capability of producing gridded emission estimates.

PREPIN

PURPOSE

The PREPIN program was developed for use in urban areas which do not have time-of-day assignments available for air quality analyses. The PREPIN program allows the analyst to factor a 24-hour assignment (produced by the Texas Large Network Assignment Package) to estimate the vehicle miles of travel (VMT) and speeds for a subject time period. For example, a 24-hour assignments can be factored to represent time periods: the morning peak hour, the afternoon peak hour, the mid-day travel (i.e., the travel between the morning and afternoon peak hours), and the overnight travel (i.e., the typical portion of the daily travel occurring between the afternoon peak hour and the morning peak hour). This example would require four applications of PREPIN (i.e., an application for each time period).

The factors which may be applied by the analyst using PREPIN are:

- HPMS Factors: The analyst may input HPMS factors (stratified by county and functional classification) which are applied to the link volumes to force the 24-hour assignment VMT to correspond to the HPMS estimate of VMT.

- Seasonal Adjustment Factors: The analyst may input seasonal adjustment factors (stratified by area type and functional classification) which are applied to the link volumes to adjust for seasonal fluctuations in VMT.

- Time-of-day Volume Factors: These analyst-supplied factors (stratified by area type and functional classification) specify the portion of the 24-hour volume expected to occur in the subject time-of-day period.

- Time-of-day Directional Split Factors: These analyst-supplied factors (stratified by area type and functional classification) specify the directional split for the link volumes in the subject time period. For example, if a 60-40 split is expected for a given functional classification within a given area type, the analyst can input a split factor of 60.0; and PREPIN will split the time-of-day volume, setting 60 percent in one direction and 40 percent in the other direction. PREPIN produces two link records for the link, one representing the 60 percent direction and the other representing the 40 percent direction. These directional volumes are used to estimate directional volume to capacity (v/c) ratios for estimating directional speeds.

- Time-of-day Capacity Factors: These analyst-supplied factors (stratified by area type and functional classification) are applied to the 24-hour nondirectional link capacities to estimate the nondirectional capacity for the

subject time period. For the computation of the directional v/c ratio, the capacity is split 50-50.

- Optional VMT Factors: These optional analyst-supplied factors (stratified by county and functional classification) are applied to the link volumes. These factors are generally not used and default to 1.0. These factors can be used in lieu of the time-of-day volume factors if the user prefers to specify the time-of-day volume factors stratified by county and functional classification rather than area type and functional classification.

- Free-flow Speed Factors: These analyst-supplied factors (stratified by area type and functional classification) are applied to the 24-hour nondirectional link speeds to estimate the free-flow speed for the subject time period. The free-flow speed is assumed to be the same in each direction.

Using the directional v/c estimates and free-flow speed estimates, the directional congested speeds are estimated. The Dallas-Fort Worth (D-FW) peak speed model (developed by the North Central Texas Council Of Governments) is used to estimate the directional time-of-day speeds. The PREPIN program produces two link records containing the directional VMT and speed estimates for each link. The link records produced by PREPIN are subsequently used as input to the IMPSUM program.

The PREPIN program produces summaries of the unscaled 24-hour VMT and the final factored VMT. Summaries of the weighted average speeds (weighted by time-of-day VMT) are produced for the input link speeds, the estimated free-flow speeds, and the estimated congested speeds. A summary of the congested vehicle hours of travel is also produced.

PROGRAM STRUCTURE

The PREPIN program prepares link records for the IMPSUM program. The program runs in two load modules. The first load module is Z1OUTA. This load module is also used in the Z1BUILD program for IMPACT. The input to this program is a network data set from LARGENET (not LARGENETII). This load module builds a minimum distance tree in which all zones, simultaneously, are origins of the tree. The paths in this tree determine which zone is closest by distance along the network of each node in the network. The closest zone is called the associated zone. This load module writes a record to Unit 3 containing the paths and another record containing the minimum distances. The Z1OUTA load module has no card input.

The second load module is PREPIN. The inputs to the PREPIN program are a network data set from LARGENET (not LARGENETII) with an assignment and various factor card images, a table of equals of zones to counties, a table of equals of zones to area type, and a data card specifying the assignment number to use for assigned link volume. This load module reads the two records written by Z1BUILD and uses these to find the associated zones for each node. This program also accepts the following input record types:

Parameter, END, EQUAL, AREA, HDR1, HDR2, HPMFAC, SEAFAC, PERFAC, SPLIT, VMTFAC, CAPFAC, SPDFAC, and DELAY. The parameter card specifies the assignment number for the assigned link volumes. The END card marks the beginning of the county EQUAL cards. The table of equals between zones and area types is specified using AREA records. The SPDFAC cards provide for factoring speeds to free-flow speeds. The PERFAC card provides for a single time period factor to adjust VMT for the time period. The CAPFAC provides a factor to adjust link capacities to time period capacities by county and functional classification. The HPMFAC provides a set of factors to adjust link VMT to HPMS values by county and functional classification. The VMTFAC provides a factor to adjust VMT to the time period by county and functional classification. The DELAY cards specify the parameters for the delay equation used for estimating the congested speeds.

THE TIME-OF-DAY VOLUME AND VMT ESTIMATION PROCEDURE

The directional volumes and VMT for each link are calculated as follows:

VOL1(A,B) = VOL24(A,B) * HPMFAC(CNTY,FC) * SEAFAC(AT,CNTY) * PERFAC(AT,FC) * VMTFAC(CNTY,FC) * (SPLIT(AT,FC)/100.0)

VOL2(A,B) = VOL24(A,B) * HPMFAC(CNTY,FC) * SEAFAC(AT,CNTY) * PERFAC(AT,FC) * VMTFAC(CNTY,FC) * ((100-SPLIT(AT,FC))/100.0)

VMT1(A,B) = VOL1(A,B) * DIST(A,B)

VMT2(A,B) = VOL2(A,B) * DIST(A,B)

Where:

A,B	=	The A-node and B-node of the link.
CNTY	=	The county index obtained from the associated zone and the county EQUAL cards. PREPIN allows up to 10 counties.
AT	=	The area type index for the link obtained from the associated zone and the area type EQUAL cards. Prepin allows up to 99 area types.
FC	=	The functional classification index; the functional classification code from the link data plus 1. The functional classification codes in the link data vary from 0 to 15.
DIST(A,B)	=	The link distance for link A,B in miles.

VOL24(A,B)	=	The link's 24-hour nondirectional assigned volume for link A,B.
VOL1(A,B)	=	The estimated time-of-day volume in one direction.
VOL2(A,B)	=	The estimated time-of-day volume in the other direction.
VMT1(A,B)	=	The estimated time-of-day VMT in one direction.
VMT2(A,B)	=	The estimated time-of-day VMT in the other direction.
HPMFAC(CNTY,FC)	=	The HPMS scaling factor which can be used to force the assigned VMT to correspond with the HPMS VMT. The default value for these factors is 1.0.
SEAFAC(AT,CNTY)	=	The seasonal adjustment factor. The default value for these factors is 1.0.
PERFAC(AT,FC)	=	The time-of-day factor applied to the 24-hour nondirectional volume to estimate the nondirectional volume for the time period.
SPLIT(AT,FC)	=	The directional split parameter specifies the percent of the nondirectional time-of-day volume expected to occur in one direction.
100-SPLIT(AT,FC)	=	The directional split parameter specifies the percent of the nondirectional time-of-day volume expected to occur in the other direction.
VMTFAC(CNTY,FC)	=	The VMTFAC are optional factors stratified by county and functional classification. They will not be used for most applications and have a default value of 1.0. They can, however, be used in place of the PERFAC if the user would prefer to specify the time-of-day factors by county and functional classification rather than area type and functional classification.

THE CONGESTED SPEED ESTIMATION MODELS

The D-FW peak speed model developed by the NCTCOG is used to estimate the

directional time-of-day speeds. Using the D-FW model, the directional v/c ratio on a link is used to compute the average delay per mile (in minutes) due to the level of congestion reflected in the v/c ratio. The congested directional speed is computed using the using the estimated directional delay and the estimated free-flow speed. For links without capacities, the free-flow speed is used. For centroid connectors, the input speed on the centroid connector is used. The following provides a more detailed description of the congested speed estimation process.

The directional volume-to-capacity ratios and free-flow speeds are computed as follows:

VC1(A,B) = VOL1(A,B) / (CAP24(A,B) * CAPFAC(AT,FC) * 0.5)

VC2(A,B) = VOL2(A,B) / (CAP24(A,B) * CAPFAC(AT,FC) * 0.5)

FSPD(A,B) = SPD24 * SPDFAC(AT,FC)

Where:

A,B = The A-node and B-node of the link.

AT = The area type index for the link obtained from the associated zone and the area type EQUAL cards. PREPIN allows up to 99 area types.

FC = The functional classification index; the functional classification code from the link data plus 1. The functional classification codes in the link data vary from 0 to 15.

VC1(A,B) = The estimated time-of-day v/c ratio in one direction.

VC2(A,B) = The estimated time-of-day v/c ratio in the other direction.

VOL1(A,B) = The estimated time-of-day volume in one direction.

VOL2(A,B) = The estimated time-of-day volume in the other direction.

CAP24(A,B) = The link's 24-hour nondirectional capacity from the assignment data set.

CAPFAC(AT,FC) = The user-supplied factor used to estimated time-

of-day nondirectional capacity from the 24-hour nondirectional capacity. Half of the nondirectional time-of-day capacity is used for each direction.

FSPD(A,B) = Estimated free-flow speed on link A,B. The free-flow speed is assumed to be the same in both directions.

SPD24(A,B) = The input speed for the link data (i.e., the 24-hour input link data speed).

SPDFAC(AT,FC) = The user-supplied factor used to estimated time-of-day free-flow speed from the input link data speed.

The directional delay (in minutes per mile) due to congestion is computed using a volume-delay equation. The following is the general form of the volume-delay equation used in the model:

$$Delay = Min\ [A\, e^{B(\frac{V}{C})}\ ,\ M]$$

Where:

Delay = Congestion delay (in minutes/mile).

A & B = Volume-Delay Equation Coefficients (input via DELAY records).

M = Maximum minutes of delay per mile, read from the DELAY cards.

V/C = Time-of-day directional v/c ratio.

Two sets of coefficients and constraints were developed by the NCTCOG for the D-FW model: one for high-capacity facilities and one for low-capacity facilities. High-capacity facilities (usually freeways) are defined as those having a capacity exceeding 3,400 vehicles per hour (one way). The volume-delay equation parameters which were developed by the NCTCOG in late 1992 for use in the D-FW air quality analyses are presented in Table P-1.

Table P-1: Volume-Delay Equation Parameters

Parameters	Parameter Values	
	High-capacity Facilities	Low-capacity Facilities
A	0.015	0.050
B	3.5	3.0
M	5.0	10.0

Since the functional classification codes used in the link data may vary from study area to study area, PREPIN requires that the user specify the desired delay equation parameters by county and functional classification.

Given the estimated directional delay (in minutes/mile) and the estimated free-flow speed, the directional congested speed can be computed as follows:

$$Congested\ speed = \frac{60}{\frac{60}{Freeflow\ speed} + Delay}$$

Tables P-1 and P-2 summarize the estimated hourly capacities used in the D-FW models. Similar hourly capacity estimates should be developed for the urban areas where PREPIN is being applied. One-hour capacity factors for input to PREPIN may be estimated by dividing the hourly capacities per lane by the 24-hour capacities per lane used in the 24-hour network. In the current applications of PREPIN, the capacity factors for multi-hour time periods are computed by simply multiplying the hourly capacity factors times the number of hours in the subject time period.

Table P-2*
D-FW HOURLY SERVICE VOLUMES PER LANE **
(Divided or One-Way Roads)

Area Type	Functional Classification						
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road
CBD	1,800	550	550	450	450	1,100	550
Fringe	1,850	600	600	475	475	1,200	600
Urban Residential	1,875	650	625	500	500	1,250	625
Suburban Residential	1,950	725	700	550	550	1,400	700
Rural	2,000	800	750	575	575	1,500	750

** Source: Multimodal Transportation Analysis Process (MTAP): A Travel Demand Forecasting Model; North Central Texas Council of Governments; January 1990.

* Service Volumes at Level of Service E (The model requires level of service E service volumes or capacities).

Table P-3*
D-FW HOURLY SERVICE VOLUMES PER LANE **
(Undivided Roads)

Area Type	Functional Classification						
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road
CBD	N/A	500	500	400	400	1,100	500
Fringe	N/A	550	550	425	425	1,200	550
Urban Residential	N/A	600	575	450	450	1,250	575
Suburban Residential	N/A	675	625	500	500	1,400	625
Rural	N/A	725	675	525	525	1,500	675

N/A - Not Applicable

** Source: Multimodal Transportation Analysis Process (MTAP): A Travel Demand Forecasting Model; North Central Texas Council of Governments; January 1990.

* Service Volumes at Level of Service E (The model requires level of service E service volumes or capacities).

Table P-2*
D-FW HOURLY SERVICE VOLUMES PER LANE **
(Divided or One-Way Roads)

Area Type	Functional Classification						
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road
CBD	1,800	550	550	450	450	1,100	550
Fringe	1,850	600	600	475	475	1,200	600
Urban Residential	1,875	650	625	500	500	1,250	625
Suburban Residential	1,950	725	700	550	550	1,400	700
Rural	2,000	800	750	575	575	1,500	750

* Source: Multimodal Transportation Analysis Process (MTAP): A Travel Demand Forecasting Model; North Central Texas Council of Governments; January 1990.

** Service Volumes at Level of Service E (The model requires level of service E service volumes or capacities).

Table P-3*
D-FW HOURLY SERVICE VOLUMES PER LANE **
(Undivided Roads)

Area Type	Functional Classification						
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road
CBD	N/A	500	500	400	400	1,100	500
Fringe	N/A	550	550	425	425	1,200	550
Urban Residential	N/A	600	575	450	450	1,250	575
Suburban Residential	N/A	675	625	500	500	1,400	625
Rural	N/A	725	675	525	525	1,500	675

N/A - Not Applicable

* Source: Multimodal Transportation Analysis Process (MTAP): A Travel Demand Forecasting Model; North Central Texas Council of Governments; January 1990.

** Service Volumes at Level of Service E (The model requires level of service E service volumes or capacities).

ESTIMATION OF INTRAZONAL TRAVEL AND SPEEDS

Intrazonal travel cannot be estimated from an assignment, since intrazonal trips are not assigned to the network. The procedure developed for IMPACT for estimating intrazonal travel was also incorporated into PREPIN. Under this approach, the following estimates are used:

INTRA = Number of Intrazonal trips for the subject zone for the subject time-of-day and season. The total number of intrazonal trips for the zone is read from the assignment trip table. The HPMS factor, Seasonal Adjustment factor, and time-of-day factor are applied.

SPD = The average speed for intrazonal trips. The average speed for intrazonal trips is estimated by simply averaging the speeds on the zone's centroid connectors.

ATL1 = Average trip length (in minutes). This average trip length in minutes is assumed to be equal to the zone's radii value used in the trip distribution. The radii values are read from the user-supplied radii cards.

ATL2 = Average trip length (in miles). This average trip length is computed using the speed and average trip length in minutes as follows:

$$ATL2 = (SPD/60) * ATL1$$

VMT = Vehicle miles of travel for the intrazonal trips for the subject zone. The estimate of the intrazonal VMT is computed as follows:

$$VMT = INTRA * ATL2$$

The PREPIN program outputs a link record (for subsequent input to IMPSUM) for the intrazonal trips for each zone. On the records, the zone number is used for both the A-node and B-node. The method to estimate the intrazonal speed and VMT is described above. Since a speed model is not applied to intrazonal travel, it is not necessary to apply directional splits.

In the Speed and VMT summaries produced by PREPIN, the intrazonal travel is summarized as a separate functional classification code (i.e., functional classification code 16 which cannot be used in the link data). This separates these results from the results obtained for travel on centroid connectors. On the link records, the intrazonal records are given a functional classification code of 0 (i.e., the assumed code for centroid connectors).

Z1OUTA JCL REQUIREMENTS

The Z1OUTA program requires 2000K of region size.

DDname	Use
FT01F001	Network data set containing an assignment.
FT03F001	Data set output by Z1OUTA containing the path from the all-zone tree and the times from this tree.
FT06F001	Printed output data set.

EXAMPLE Z1OUTA JCL

```
//JOBLIB  DD  DSN=USR.W150.CB.LOADMOD,DISP=OLD
//Z1OUTA   EXEC  PGM=Z1OUTA,REGION=2000K
//FT01F001  DD  DISP=OLD,DSN=USR.W150.CB.JORT.NETWFILE
//FT03F001 DD  UNIT=SYSDA,DISP=(NEW,PASS),DSN=&&ASZ,
//         SPACE=(TRK,(5,5)),DCB=(RECFM=VBS,LRECL=6228,BLKSIZE=6232)
//FT06F001 DD    SYSOUT=A
```

PREPIN JCL REQUIREMENTS

The PREPIN program requires a region size of 3000K.

DDname	Use
FT01F001	Network data set containing an assignment.
FT03F001	Data set output by Z1OUTA containing the path from the all-zone tree and the times from this tree.
FT06F001	Printed output data set.
FT05F001	Input parameter cards, table of equals, etc.
FT08F001	The trip matrix used for the assignment in the format used by the Texas Large Network Assignment Models
FT09F001	Radii cards in the same format as the Texas Trip Distribution Models.
FT19F001	File containing a header record for SIGNON.
FT20F001	Temporary data set used to copy input from Unit 19.

FT21F001 UTPS log file.

FT40F001 Output links containing VMT, link length, and congested speed.

EXAMPLE PREPIN STEP JCL

```
//ZB1    EXEC  PGM=PREPIN4A,REGION=3000K
//STEPLIB  DD  DISP=OLD,DSN=USR.W104.CB.LOADMOD5
//FT06F001 DD    SYSOUT=A
//FT05F001 DD    *
//FT19F001 DD    *
//FT20F001 DD  UNIT=SYSDA,SPACE=(TRK,(1,1)),
//         DCB=(RECFM=FB,LRECL=80,BLKSIZE=6320)
//FT21F001 DD  DISP=OLD,DSN=USR.W104.CB.IMPCTLOG
//FT01F001  DD  DISP=OLD,DSN=USR.W150.CB.JORTS620.NETWFILE.S99931
//FT03F001 DD  UNIT=SYSDA,DISP=(OLD,PASS),DSN=&&ASZ,
//         SPACE=(TRK,(5,5)),
//         DCB=(RECFM=VBS,LRECL=6228,BLKSIZE=6232)
//FT40F001  DD  DISP=(NEW,CATLG),UNIT=DISK,SPACE=(TRK,(20,10)),
//  DSN=USR.W150.CB.JR9993S1,DCB=(RECFM=FB,LRECL=50,BLKSIZE=6300)
//FT09F001  DD  DISP=SHR,DSN=USR.W150.CB.JORTS620.JORRADII
//FT08F001  DD  DISP=OLD,DSN=USR.W150.CB.JORTS620.TOT24HR.F95991
```

PARAMETER RECORD

The PARAMETER record is the first record input to PREPIN on Unit FT05.

Name	Columns	Format	Description
	1-10	2I5	Columns 1-10 should be blank on the PARAMETER Record
Iteration Number	11-15	I5	For weighted iteration, this field left blank. Otherwise, specify the desired iteration volumes to be used.
Assignment Type	16-20	L5	Logical Variable: F = ASSIGN SELF-BALANCING T = PEAK CAPACITY RESTRAINT
Default Time-of-day Factor	21-30	F10.0	Specifies the default value for the PERFAC time-of-day factors. The default value must be in the range of 0.01 to 10.0. If this parameter is not specified, the PERFAC default values are set to 1.0. The PERFAC factors are stratified by area type and functional classification. If a single PERFAC factor is to be used for all area types and functional classifications, the value can be simply entered as the default value and the PERFAC records will not be needed.

COUNTY EQUAL RECORDS

The EQUAL records define a table of equals of associated zones to county numbers. The associated zones are found by the program Z1OUTA.

Name	Columns	Format	Description
County	1-3	I3	County number
Record Type	5-9	A5	Character constant of 'EQUAL'
	11-15	I5	Centroid number[1]
	16-20	I5	Centroid number
	21-25	I5	Centroid number
	26-30	I5	Centroid number
	31-35	I5	Centroid number
	36-40	I5	Centroid number
	41-45	I5	Centroid number
	46-50	I5	Centroid number
	51-55	I5	Centroid number
	56-60	I5	Centroid number
	61-65	I5	Centroid number
	66-70	I5	Centroid number
	71-75	I5	Centroid number
	76-80	I5	Centroid number

[1] Within any EQUAL card a range may be formed by entering the centroid number of the smallest zone number in the range followed by the centroid number (the high end of the range) with a minus sign.

AREA RECORDS

The AREA records define a table of equals of associated zones to area type numbers. The associated zones are found by the program Z1OUTA.

Name	Columns	Format	Description
Area Type	1-3	I3	Area type number
Record Type	5-9	A5	Character constant of 'AREA '
	11-15	I5	Centroid number[2]
	16-20	I5	Centroid number
	21-25	I5	Centroid number
	26-30	I5	Centroid number
	31-35	I5	Centroid number
	36-40	I5	Centroid number
	41-45	I5	Centroid number
	46-50	I5	Centroid number
	51-55	I5	Centroid number
	56-60	I5	Centroid number
	61-65	I5	Centroid number
	66-70	I5	Centroid number
	71-75	I5	Centroid number
	76-80	I5	Centroid number

[2] Within any EQUAL card a range may be formed by entering the centroid number of the smallest zone number in the range followed by the centroid number (the high end of the range) with a minus sign.

HEADER RECORDS

The two header records provide two lines of header information which is printed at the top of pages of the tabular summaries produces by PREPIN.

Name	Columns	Format	Description
Record Type	1-4	A4	Character constant of 'HDR1'
Header	4-80	A76	First line of header information

Name	Columns	Format	Description
Record Type	1-4	A4	Character constant of 'HDR2'
Header	4-80	A76	Second line of header information

HPMS SCALE FACTORS (HPMFAC RECORDS)

The HPMFAC records provide a method of adjusting link volumes and VMT to correspond with the HPMS estimate of VMT by county and functional classification.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'HPMFAC '
County	11-13	I3	County number
Functional Classification	14-16	I3	Functional classification number
Scale Factor	21-30	F10.4	Scale factor applied to link volumes and VMT by county number and functional classification. If not provided by the user, the default value is set to 1.0.

SEASONAL ADJUSTMENT FACTORS (SEAFAC RECORDS)

The SEAFAC records provide a method of adjusting link volumes and VMT for seasonal fluctuations by county and area type.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'SEAFAC '
County	11-13	I3	County number
Area Type	14-16	I3	Area type number
Scale Factor	21-30	F10.4	Scale factor applied to link volumes and VMT by county number and area type. If not provided by the user, the default value is set to 1.0.

VMT SCALE FACTORS (VMTFAC RECORDS)

The VMTFAC records provide an alternative method of adjusting VMT by county and functional classification. The factor is applied to adjust the link volumes and, hence, the VMT on the links.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'VMTFAC '
County	11-13	I3	County number
Functional Classification	14-16	I3	Functional classification number
Scale Factor	21-30	F10.4	Scale factor applied to link volumes and VMT by county number and functional classification. If not provided by the user, the default factors are set to 1.0

TIME PERIOD VOLUME FACTORS (PERFAC RECORDS)

The PERFAC records specify the time period volume factors (stratified by area type and functional classification) which is applied to 24-hour assigned link volumes and VMT. These factors specify the portion of the 24-hour travel expected to occur in the subject time period.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'PERFAC '
Area Type	11-13	I3	Area type number
Functional Classification	14-16	I3	Functional classification number
Scale Factor	21-30	F10.4	Time-of-day scale factor for area type number and functional classification. Default value is 1.0.

TIME PERIOD DIRECTIONAL SPLIT ESTIMATES (SPLIT RECORDS)

The SPLIT records provide for the input of the typical directional splits for two-way traffic by area type and functional classification. The split factor specifies the portion of the two-way traffic on the link expected to be traveling in the peak direction.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'SPLIT '
Area Type	11-13	I3	Area type number
Functional Classification	14-16	I3	Functional classification number
Split Factor	21-30	F10.4	Specifies the portion of the link volume and VMT expected to be traveling in the peak direction. The portion of travel in the off-peak direction is estimated by 1.0-split. The split is input and applied to link volumes and VMT by area type and functional classification. If not provided by the user, the default factors are set to 0.5

TIME PERIOD CAPACITY SCALE FACTORS (CAPFAC RECORDS)

The CAPFAC records provide a method of adjusting 24-hour capacities to time-of-day capacities for each area type and functional classification.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'CAPFAC '
Area Type	11-13	I3	Area type number
Functional Classification	14-16	I3	Functional classification number
Capacity Factor	21-30	F10.4	Capacity scale factor for area type and functional classification number

FREE-FLOW SPEED FACTORS (SPDFAC RECORDS)

The SPDFAC records provide a method of adjusting link data input speeds to estimate the free-flow speed area type and functional classification.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'SPDFAC '
Area Type	11-13	I3	Area type number
Functional Classification	14-16	I3	Functional classification number
Scale Factor	21-30	F10.4	Link speed to free-flow speed scale factor for area type number and functional classification number

DELAY EQUATION PARAMETERS (DELAY RECORDS)

The DELAY records provide constants for a model to calculate congested speed from the v/c ratio.

Name	Columns	Format	Description
Record Type	1-10	A10	Character constant of 'DELAY '
County	11-13	I3	County number
Functional Classification	14-16	I3	Functional classification number
A coefficient	21-30	F10.4	A coefficient
B coefficient	31-40	F10.4	B coefficient
M Factor	41-50	F10.4	Delay upper limit

LINK RECORD OUTPUT RECORDS

The link record output contains Anode, Bnode, county number, functional classification number, link distance in miles, congested speed, and time period for vehicle miles of travel. The format of these records is (I5,1X,I5,1X,I1,1X,I2,1X,F10.2,1X,F6.2, 1X,F15.2).

Name	Columns	Format	Description
Anode	1-5	I5	Anode of link
Bnode	7-11	I5	Bnode of link
County	13	I1	County number
Link Group	15-16	I2	Link group number
Link Length	18-27	F10.2	Link length in miles
Congested Speed	29-34	F6.2	Congested speed in mph
Link VMT	36-50	F15.2	Link time period VMT

EXAMPLE SETUP FOR PREPIN

```
//JR9993 JOB  ( ,60A,3,30,CB),'BELL  JORTS 99 93'
//JOBLIB  DD  DSN=USR.W104.CB.LOADMOD,DISP=OLD
//*************************************************************
//*         JORTS 99 93 TIME PERIOD 1                         *
//*************************************************************
//ZA1      EXEC  PGM=Z1OUTA,REGION=2000K
//FT01F001  DD  DISP=OLD,DSN=USR.W150.CB.JORTS620.NETWFILE.S99931
//FT03F001 DD  UNIT=SYSDA,DISP=(NEW,PASS),DSN=&&ASZ,
//         SPACE=(TRK,(5,5)),DCB=(RECFM=VBS,LRECL=6228,BLKSIZE=6232)
//FT06F001 DD    SYSOUT=A
//*
//*
//ZB1   EXEC  PGM=PREPIN4A,REGION=3000K
//STEPLIB  DD  DISP=OLD,DSN=USR.W104.CB.LOADMOD5
//FT06F001 DD    SYSOUT=A
//FT19F001 DD    *
HEADER     Z1OUT 1999 JORTS ASSOCIATED ZONE FILE
//FT20F001 DD  UNIT=SYSDA,SPACE=(TRK,(1,1)),
//         DCB=(RECFM=FB,LRECL=80,BLKSIZE=6320)
//FT21F001 DD  DISP=OLD,DSN=USR.W104.CB.IMPCTLOG
//FT01F001  DD  DISP=OLD,DSN=USR.W150.CB.JORTS620.NETWFILE.S99931
//FT03F001 DD  UNIT=SYSDA,DISP=(OLD,PASS),DSN=&&ASZ,
//         SPACE=(TRK,(5,5)),
//         DCB=(RECFM=VBS,LRECL=6228,BLKSIZE=6232)
//FT40F001  DD  DISP=(NEW,CATLG),UNIT=DISK,SPACE=(TRK,(20,10)),
//  DSN=USR.W150.CB.JR9993S1,DCB=(RECFM=FB,LRECL=50,BLKSIZE=6300)
//FT09F001  DD  DISP=SHR,DSN=USR.W150.CB.JORTS620.JORRADII
//FT08F001  DD  DISP=OLD,DSN=USR.W150.CB.JORTS620.TOT24HR.F95991
//FT05F001  DD  *
                T 0.1069          MORNING PK HOUR
END
  1 EQUALS    8 -464  658 -660  663 -672
  2 EQUALS  465 -657  661 -662  677 -681
  3 EQUALS    1   -7  673 -676
  1 AREA    113  114  129
  2 AREA    109  112  127  128
  3 AREA     41  -48   50   51   54   55   73   81  -85   89   93   95   98
    .
    .
    .
  2 AREA    103  106 -108  110  111  115 -120  659
  5 AREA    675  676
  6 AREA    662 -674  677 -681
HDR1      JORTS 1999 NETWORK AND 1993 TRIPS
HDR2  MORNING PEAK HOUR (7:15AM TO 8:15AM)
DELAY       1  0          .050       3.0      10.0  LOW CAP FAC
DELAY       1  1          .015       3.5       5.0  HIGH CAP FAC
DELAY       1  2          .015       3.5       5.0  HIGH CAP FAC
DELAY       1  3          .050       3.0      10.0  LOW CAP FAC
    .
    .
    .
DELAY       3 12          .050       3.0      10.0  LOW CAP FAC
DELAY       3 13          .050       3.0      10.0  LOW CAP FAC
DELAY       3 14          .050       3.0      10.0  LOW CAP FAC
DELAY       3 15          .050       3.0      10.0  LOW CAP FAC
SEAFAC      1  1       1.06500     SUMMER 03 JEFFERSON
SEAFAC      1  2       1.06500     SUMMER 03 JEFFERSON
SEAFAC      1  3       1.06500     SUMMER 03 JEFFERSON
SEAFAC      1  4       1.06500     SUMMER 03 JEFFERSON
SEAFAC      1  5       1.06500     SUMMER 03 JEFFERSON
SEAFAC      1  6       1.06500     SUMMER 03 JEFFERSON
SEAFAC      2  1       1.06500     SUMMER 03 ORANGE
SEAFAC      2  2       1.06500     SUMMER 03 ORANGE
SEAFAC      2  3       1.06500     SUMMER 03 ORANGE
SEAFAC      2  4       1.06500     SUMMER 03 ORANGE
SEAFAC      2  5       1.06500     SUMMER 03 ORANGE
SEAFAC      2  6       1.06500     SUMMER 03 ORANGE
SEAFAC      2  1       1.08400     SUMMER 03 HARDIN
SEAFAC      2  2       1.08400     SUMMER 03 HARDIN
```

```
SEAFAC      2  3       1.08400     SUMMER O3 HARDIN
SEAFAC      2  4       1.08400     SUMMER O3 HARDIN
SEAFAC      2  5       1.08400     SUMMER O3 HARDIN
SEAFAC      2  6       1.08400     SUMMER O3 HARDIN
SPLIT       1  0         54.00 AM_PK  CBD       CENT CONN  CBD      LOCAL
SPLIT       1  1         50.00 AM_PK  CBD       IH & FRWY  CBD      INTERSTATE
SPLIT       1  2         65.00 AM_PK  CBD       MUL LN HWY CBD      OTHER PRIN AR
    .
    .
    .
SPLIT       6 11         50.00 AM_PK  RURAL     NOT USED   RURAL    DEFAULT 50-50
SPLIT       6 12         50.00 AM_PK  RURAL     NOT USED   RURAL    DEFAULT 50-50
SPLIT       6 13         50.00 AM_PK  RURAL     NOT USED   RURAL    DEFAULT 50-50
SPLIT       6 14         50.00 AM_PK  RURAL     NOT USED   RURAL    DEFAULT 50-50
SPLIT       6 15         50.00 AM_PK  RURAL     NOT USED   RURAL    DEFAULT 50-50
CAPFAC      1  0        .10000          PK HOUR           1 HRS
CAPFAC      2  0        .10000          PK HOUR           1 HRS
CAPFAC      3  0        .10000          PK HOUR           1 HRS
CAPFAC      4  0        .10000          PK HOUR           1 HRS
CAPFAC      5  0        .10000          PK HOUR           1 HRS
CAPFAC      6  0        .10000          PK HOUR           1 HRS
CAPFAC      1  1        .09048          PK HOUR           1 HRS
CAPFAC      2  1        .09299          PK HOUR           1 HRS
CAPFAC      3  1        .11896          PK HOUR           1 HRS
CAPFAC      4  1        .11057          PK HOUR           1 HRS
CAPFAC      5  1        .15175          PK HOUR           1 HRS
CAPFAC      6  1        .17524          PK HOUR           1 HRS
    .
    .
    .
CAPFAC      4 15        .10000          PK HOUR           1 HRS
CAPFAC      5 15        .10000          PK HOUR           1 HRS
CAPFAC      6 15        .10000          PK HOUR           1 HRS
SPDFAC      1  0       1.00000             JORTS 6/24/93
SPDFAC      2  0       1.00000             JORTS 6/24/93
SPDFAC      3  0       1.00000             JORTS 6/24/93
SPDFAC      4  0        .99005             JORTS 6/24/93
SPDFAC      5  0        .98760             JORTS 6/24/93
SPDFAC      6  0       1.00345             JORTS 6/24/93
SPDFAC      1  1       1.44737             JORTS 6/24/93
SPDFAC      2  1       1.44737             JORTS 6/24/93
SPDFAC      3  1       1.44670             JORTS 6/24/93
SPDFAC      4  1       1.30137             JORTS 6/24/93
SPDFAC      5  1       1.06542             JORTS 6/24/93
SPDFAC      6  1       1.22744             JORTS 6/24/93
SPDFAC      1  2        .46730             JORTS 6/24/93
    .
    .
    .
SPDFAC      2 15       1.12000             JORTS 6/24/93
SPDFAC      3 15       1.12000             JORTS 6/24/93
SPDFAC      4 15       1.12000             JORTS 6/24/93
SPDFAC      5 15       1.12000             JORTS 6/24/93
SPDFAC      6 15       1.12000             JORTS 6/24/93
```

POLFAC5A

PURPOSE

The POLFAC5A program is one of a series of programs developed by the Texas Transportation Institute to facilitate the computation of emissions. The POLFAC5A program is used to apply MOBILE5A to obtain emissions factors. It provides the user the option of computing emissions factors from two different years and averaging them. The emissions factors are obtained for eight vehicle types and 63 speeds (i.e., 3 mph through 65 mph) for each vehicle type. Hence, there are 504 factors (i.e., 8 x 63 = 504) for each pollution type for each county. There are three pollution types being computed: VOC[3], CO, and NOX. Hence, for each county there are 1,512 emissions factors. These emissions factors are output to an ASCII file for subsequent input to either the IMPSUM program or the COADJ program. The POLFAC5A program can be applied for a 24-hour period or for each time-of-day time period for which VMT and speed estimates are available. The emissions factors from POLFAC5A (or the combined emissions factors from COADJ) are applied using the IMPSUM program to estimate emissions.

To apply MOBILE5A, the POLFAC5A program reads a set of MOBILE5A data cards with either one or two scenarios. If there is one scenario card, then it runs the MOBILE5A subroutine with the scenario card modified for speeds from 3 to 65 mph in 1 mile/hour increments. POLFAC5A then writes a set of emissions factor card images to Unit 25. If there are two scenarios, it runs both scenarios with speeds of 3 to 65 mph and averages the runs of the two scenarios with the same speed. The averaged emissions factors are then written to Unit 25. The output from MOBILE5A is sent to Unit 9; in the example JCL, Unit 9, is set to a dummy unit with a DCB. If the printed output is desired, the dummy option is removed and SYSOUT=A and DCB = (RECFM=FBA, LRECL=133, BLKSIZE=1330) is added. The PRTFLG must be 4 if all emissions factors are desired, since MOBILE5A calculates only the emissions factors that it prints.

---

[3]The user may select any of the five hydrocarbon types with the NMHFLG. The program will label the resulting hydrocarbon emissions rates as either THC, TOG, NMHC, VOC, or NMOG. The IMPSUM program will accept only the VOC hydrocarbon type.

DATA SETS REFERENCES

The data sets used by this program are:

DDNAME	Description of data set
STEPLIB	The load module library. The program name is POLFAC.
FT05F001	MOBILE5 data cards including one or two scenarios
FT06F001	Printed output from POLFAC5A
IMDATA[4]	IMDATA data supplied by EPA. Read if an inspection maintenance program is used.
TECH12[5]	TECH12 data supplied by EPA. Read if an inspection maintenance program is used.
INLEV	LEVIMP data supplied by user if PROMPT flag is 5
FT09F001	Printed output from MOBILE5
FT25F001	Emissions factor card image output
FT10F001	Temporary data set used to pass MOBILE5 a set of data cards

OUTPUT DATA SET

The POLFAC5A program produces 63 emissions factors card images on Unit 25 which provide the emissions factors for speeds from 3 to 65 mph. The format of the emissions factor card images is:

Columns	Format	Contents
1-3	I3	Speed (these speeds will be integer values from 3 to 65)

[4]The user can optionally input a DDname. The DDname must begin with an alphabetic character and can be from 1 to 7 characters long including only alphabetic characters and numbers. The name can not start with FT.

[5]The user can optionally input a DDname. The DDname must begin with an alphabetic character and can be from 1 to 7 characters long including only alphabetic characters and numbers. The name can not start with FT.

5-8	A3	Type of emissions, either THC, NMHC, VOC, TOG, NMOG[6], NOX, or CO
9-80	8F9.5	Eight emissions factors for vehicle types LDGV, LDGT1, LDGT2, HDGV, LDDV, LDDT, HDDV, and MC

These emissions factor data are subsequently input to the program IMPSUM.

EXAMPLE JCL

```
//IM3BLK JOB ( ,60A,S59,5,CB),'BELL POL FACTORS'
//POL EXEC PGM=POLFAC5A,REGION=1400K
//STEPLIB DD DISP=OLD,DSN=USR.W150.CB.JB.IMPSUM
//FT06F001 DD SYSOUT=A
//TECH12 DD DISP=OLD,DSN=USR.W104.CB.TECH12.MOB5A
//IMDATA DD DISP=OLD,DSN=USR.W104.CB.IMDATA.MOB5A
//FT09F001 DD DUMMY,DCB=(RECFM=FB,LRECL=223,BLKSIZE=2230)
//FT25F001    DD    SYSOUT=A,DCB=(RECFM=FB,LRECL=80,BLKSIZE=800)
;RATES
//FT10F001 DD UNIT=SYSDA,SPACE=(TRK,(5,2)),
//  DCB=(RECFM=FB,LRECL=80,BLKSIZE=6320)
//FT05F001 DD DISP=OLD,DSN=USR.W150.CB.IM3BLK.PLF2
```

EXAMPLE MOBILE5A INPUT DATA

The data set JEF90BAS.POL is shown below:

```
1          PROMPT
1 JEFFERSON COUNTY - Base Year Ozone Season 1990
1          TAMFLG  - Default: Tampering Rates
1          SPDFLG  - User input: one speed for all vehicle types
3          VMFLAG  - User input: single VMT mix for all scenario
3          MYMRFG  - User input: Reg. Distributions
1          NEWFLG  - Default: Basic exhaust emission rates
1          IMFLAG  -      no   I/M
1          ALHFLG  - No additional correction factors
1          ATPFLG  -      no   atp
5          RLFLAG  - Zero-out refueling emissions
2          LOCFLG  - User input: one LAP record for all scenarios
1          TEMFLG  - MOBILE5.0 calculates exhaust temperatures
4          OUTFMT  - 80-column descriptive format
4          PRTFLG  - Print all three pollutant emissions factors
1          IDLFLG  - No idle emissions calculated or printed
3          NMHFLG  - Print HC = volatile organic compounds (VOC)
1          HCFLAG  - Print total HC
.584.237.065.036.008.004.063.003 - LDGV,LDGT1,LDGT2,HDGV,LDDV,LDDT,HDDV,MC
 .060 .081 .076 .074 .074 .077 .079 .054 .053 .057  July,1990 .LDGV..MY AGES 1-10
 .051 .058 .051 .042 .026 .015 .012 .011 .008 .007  Vehicle                  11-20
```

[6] Only one type of hydrocarbon is allowed per run. The hydrocarbon type of THC, NMHC, VOC, TOG, or NMOG is specified by the NMHFLG.

```
 .009 .006 .006 .005 .005                                Registrations          21-25
 .070 .097 .077 .064 .071 .071 .077 .048 .060 .055            .LDGT1.MY AGES 1-10
 .038 .048 .044 .039 .027 .014 .016 .014 .012 .010                           11-20
 .014 .009 .009 .007 .007                                                    21-25
 .059 .089 .080 .036 .072 .087 .095 .062 .060 .044            .LDGT2.MY AGES 1-10
 .037 .060 .044 .050 .039 .023 .017 .014 .006 .006                           11-20
 .006 .004 .004 .003 .003                                                    21-25
 .036 .055 .052 .025 .040 .047 .059 .042 .054 .069            .HDGV..MY AGES 1-10
 .058 .078 .071 .044 .030 .046 .043 .031 .023 .012                           11-20
 .026 .017 .016 .014 .014                                                    21-25
 .060 .081 .076 .074 .074 .077 .079 .054 .053 .057            .LDDV..MY AGES 1-10
 .051 .058 .051 .042 .026 .015 .012 .011 .008 .007                           11-20
 .009 .006 .006 .005 .005                                                    21-25
 .070 .097 .077 .064 .071 .071 .077 .048 .060 .055            .LDDT..MY AGES 1-10
 .038 .048 .044 .039 .027 .014 .016 .014 .012 .010                           11-20
 .014 .009 .009 .007 .007                                                    21-25
 .022 .028 .040 .023 .062 .050 .043 .030 .056 .122            .HDDV..MY AGES 1-10
 .118 .097 .067 .045 .028 .047 .028 .028 .013 .013                           11-20
 .011 .007 .007 .006 .007                                                    21-25
 .017 .041 .049 .055 .100 .088 .055 .078 .118 .085            .MC....MY AGES 1-10
 .080 .231 .000 .000 .000 .000 .000 .000 .000 .000                           11-20
 .000 .000 .000 .000 .000                                                    21-25
Jefferson  BY Run   70. 093. 08.0 08.0 90      LAP rec: SCNME,MNTMP,MXTMP,RVP1,RVP2,RVP2SY
1 90 XXXX 85.6 20.6 27.3 20.6  7               SCN rec: RGN,CY,SPD,AMBTMP,PCCN,PCHC,PCCC,JULY
```

MICROCOMPUTER USAGE

The POLFAC5A program must be run on a 386, 486, or Pentium microcomputer with a math coprocessor. The computer should have at least 2 megabytes of memory. The inspection/maintenance files IMDATA.D and TECH12.D must be in the logged drive and directory or in an APPEND statement for the IMDATA.D and TECH12.D directory and in the path for the POLFAC5A.EKE file. Run time will vary by equipment, complexity of the MOBILE5A data, and output options chosen. The above example ran 95 seconds on a 486DX 33 megahertz machine. If two scenarios are used, the time will double. If ATP and I/M programs are included, the time will be longer. If a TECH12 ATP program is included, the time will be still longer.

EXAMPLE POLFAC5A MICROCOMPUTER RUN

```
c:\mob5a>polfac5a

        32-bit Power for Lahey Computer Systems
      Phar Lap's 386|DOS-Extender(tm) Version 4.1L
     Copyright (C) 1986-92 Phar Lap Software, Inc.
              Available Memory = 5484 Kb


POLFAC5A INPUT DATA SET=jef90bas.pol

POLFAC5A RATES FILE=jef90bas.rat

POLFAC5A STARTED AT:  06/30/93  15:56:09
Scenario  1 Speed  3 Started: 15:56:09.5
Scenario  1 Speed  4 Started: 15:56:10.6
Scenario  1 Speed  5 Started: 15:56:11.8
Scenario  1 Speed  6 Started: 15:56:13.0
Scenario  1 Speed  7 Started: 15:56:14.1
                   .
                   .
                   .
Scenario  1 Speed 63 Started: 15:57:30.2
Scenario  1 Speed 64 Started: 15:57:41.2
Scenario  1 Speed 65 Started: 15:57:42.8
POLFAC5A ENDED AT:  06/30/93  15:57:44 RUN TIME =    95 SECONDS
```

EXAMPLE OUTPUT

```
  3 VOC  20.52074 22.31578 30.19042 46.98459  1.54198  2.21365  7.34906 22.64065
  4 VOC  14.76799 16.29338 21.75100 36.37848  1.46396  2.10165  6.97724 19.76731
  5 VOC  11.58599 12.90062 17.01745 30.55119  1.39111  1.99708  6.63005 17.64391
    .
    .
    .
 63 VOC   2.46092  3.27929  3.90254  5.69563  0.32480  0.46629  1.54801  9.54342
 64 VOC   2.53424  3.38639  4.03280  5.70232  0.32509  0.46670  1.54938  9.68090
 65 VOC   2.60769  3.49362  4.16326  5.71272  0.32566  0.46752  1.55211  9.81838
  3 CO  178.61035212.24690288.48853483.49680  5.16276  6.06064 44.96612179.99255
  4 CO  135.92184162.48410220.87981441.75018  4.75807  5.58556 41.44136143.54373
  5 CO  109.54968131.04698177.41107404.49713  4.39308  5.15710 38.26247117.21025
    .
    .
    .
 63 CO   37.67552 55.06861 65.01883105.32437  0.96567  1.13362  8.41074 31.90504
 64 CO   40.56795 59.46175 70.25137109.80925  0.99267  1.16531  8.64585 34.53033
 65 CO   43.46038 63.85488 75.48392114.73725  1.02228  1.20006  8.90372 37.15561
  3 NOX   2.31466  2.57152  2.83812  4.90207  2.81461  3.29356 37.40145  0.82612
  4 NOX   2.15549  2.38542  2.65918  4.95280  2.69607  3.15484 35.82620  0.79017
  5 NOX   2.05603  2.27158  2.55188  5.00352  2.58618  3.02626 34.36606  0.76034
    .
    .
    .
 63 NOX   3.17528  3.85953  4.51484  7.94569  2.62853  3.07581 34.92872  1.58214
 64 NOX   3.26006  3.95826  4.63412  7.99641  2.74174  3.20829 36.43316  1.61675
 65 NOX   3.34484  4.05698  4.75341  8.04714  2.86390  3.35124 38.05640  1.65136
```

FILES PRODUCED OR USED BY THE EXAMPLE RUN

```
------     709,587   5-06-93   8:41a  c:polfac5a.eke
--a---      62,551   3-26-93  12:00p  c:tech12.d
--a---     569,424   3-26-93  12:00p  c:imdata.d
--a---       3,328   6-18-93   4:00p  c:jef90bas.pol
```

```
--a---      15,498   6-30-93   3:57p  c:jef90bas.rat
--a---     134,694   6-30-93   3:57p  c:m4out
--a---       3,690   6-30-93   3:57p  c:temp4in
--a---       3,989   6-30-93   3:57p  c:tstout
```

The file "m4out" is the output from MOBILE5A for the 63 different speed runs. The file "tstout" is the POLFAC5A printed output. The file "jef90bas.rat" is the rate output which is partially listed above. The file "tempin" is the last input to MOBILE5A. The user can scratch the files "m4out", "temp4in", and "tstout" after a run. These files will be overwritten by the next POLFAC5A run. The file "jef90bas.pol" is the input file to POLFAC5A in the above example run.

COADJ

PURPOSE

COADJ, a special utility program, produces a new set of emissions factors by combining the emissions factors from three applications of the POLFAC5A program. The program reads the emissions factors from three data sets (i.e., FT01F001, FT02F001, and FT03F001) produced by the three applications of POLFAC5A. The COADJ program processes the VOC type of hydrocarbons only. In the typical application of COADJ, the three data sets would contain the following emissions factors:

FT01F001: Emissions factors from the POLFAC5A application which specified no Anti-Tampering Program and no Inspection and Maintenance Program.

FT02F001: Emissions factors from the POLFAC5A application which specified an Anti-Tampering Program for model years 1968 to 1979 and Inspection and Maintenance Program.

FT03F001: Emissions factors from the POLFAC5A application which specified an Anti-Tampering Program for model years 1980 to present and no Inspection and Maintenance Program.

The corresponding emissions factors from FT02F001 and FT03F001 are summed, and the corresponding emissions factors from FT01F001 are subtracted from the sums. The resulting set of emissions factors are output on the FT04F001 data set.

To apply the program, the three input data sets (i.e., on Units 1, 2 and 3) and the output data set (on Unit 4) are specified. No other data are needed.

MICROCOMPUTER USAGE

The microcomputer version of this program is similar to the mainframe version, except there is no JCL. The program must be in the path or the current directory. The file F77L.EER must be in same directory as the program. The program asks for the names of the input and output data sets. The user can enter up to 80 characters for the drive, path, and name for each data set.

The following is the microcomputer console output from an example run of COADJ. The lower case characters were typed by the user.

```
C:\ELPASO>coadj

COADJ STARTED AT:01/06/93  09:24:16.0
```

```
INPUT POLLUTION FACTORS FILE F1 =el-co1.fac

INPUT POLLUTION FACTORS FILE F2 =el-co2.fac

INPUT POLLUTION FACTORS FILE F3 =el-co3.fac

OUTPUT POLLUTION FACTORS =el-co.f

  COADJ ENDED AT:  01/06/93  09:24:46 RUN TIME =    30 SECONDS

C:\ELPASO>dir

 VOLUME IN DRIVE C IS STACVOL_DSK
 DIRECTORY OF  C:\ELPASO\*.*

.            <DIR>     10-14-92  4:01P
..           <DIR>     10-14-92  4:01P
             .
             .
             .
EL-CO1.FAC      15498  10-20-92 10:56A
EL-CO2.FAC      15498  10-20-92 10:58A
EL-CO3.FAC      15498  10-20-92 11:00A
EL-CO.F         15498   1-06-93  9:24A
   1,441,853 BYTES IN 91 FILE(S)     1,851,392 BYTES ALLOCATED
   5,816,320 BYTES FREE

C:\ELPASO>
```

IMPSUM

PURPOSE

The IMPSUM program is one of a series of programs developed by the Texas Transportation Institute to facilitate the computation of emissions. The IMPSUM program uses emission factors obtained from POLFAC5A or COADJ, the user-estimated VMT mixes, and the VMT/speed estimates to compute the emissions by county. The program uses XY coordinates to compute emissions by grid square.

The basic inputs to IMPSUM are:

1. Data specifying the number of counties in the region and their names.
2. The names of the road types used in the study. These road types are used to summarize the emission results.
3. VMT mix by county and road type.
4. Emission factors from POLFAC5A or COADJ by county.
5. Specification of the units for reporting emissions (grams, pounds or tons).
6. Link records providing the estimated VMT and speeds. For each link record, the following information must be provided: county number, road type number, VMT estimate, operational speed estimate, and center line miles.
7. Coordinates for nodes and zones are an optional input.

The input data are printed.

To calculate the emission estimates, VMT for a link record is disaggregated by vehicle type applying the user-supplied VMT mixes. The software was designed to allow the user to input the VMT mix data by county and by roadway type within a county. The IMPSUM program uses these data to disaggregate the VMT for each link by the eight vehicle types based on the user-supplied estimate of the VMT mix for that link's county and roadway type.

The emission estimates are computed for each link by multiplying the appropriate emission factors corresponding to the link's roadway type and the link's estimated speed. For non-integer speed estimates, the emission factors are computed by interpolating between the emission factors for the integer speeds on either side of the subject speed. The interpolation is performed using the reciprocals of the corresponding speeds rather than the speeds themselves. The emission results are accumulated for each county by vehicle type and roadway type. If the GRID data card is present, emissions are allocated to grid squares and a grid square report is prepared.

The emissions are reported either by gram, by pound, or by ton. The limits of the program are eight counties, 21 roadway types (codes 0 to 20), and eight vehicle types. The program reads data from Units 5 and 1. The Unit 5 input contains emission factors, VMT

mixes, roadway type names, county names, and a 'UNITS' record. The Unit 1 input contains the VMT and speed estimates. All data card name fields are upper case characters.

DATA SET REFERENCES

Input Data Sets

1 = Link Records.

5 = Data card types GRID, REF, UNITS, ROADTYPE, COUNTY, VMTMX, VOC, TOC, NMHC, TOG, NMOG, CO, and NOX.

8 = XY Coordinates.

Output Data Sets

9 = Binary results data set for input to SUMALL. This output data set contains additional data which was not in the July 29, 1993, version.

10 = Grid square report without header lines. If not needed then put the "DUMMY" parameter on the DD statement.

OPERATION

Initialization

The input data arrays for the VMT mix are set to zero. The emission factor cells are set to -1.0 to indicate missing values. Summation arrays for VHR and VMT by county, roadway type, and vehicle type are set to zero. A summation array for emissions by county, roadway type, and emission type is set to zero. A storage array for average speed by county, roadway type, and vehicle type is set to zero. The number of errors is set to zero. The county ID number is set to 1. The grid square summation array is set to zero.

Reading Unit 5 Input Data

A data card is read from Unit 5 as a character variable. A comparison os made between the input data starting in Column 1 and the character strings of GRID, REF, UNITS, ROADTYPE, COUNTY, or VMTMX. If the data card matches one of these, it is read from the character variable with the appropriate format; and it is checked. If the input data did not match a character string starting in Column 1, then a comparison is made between the input data starting in Column 5 and the character strings of VOC, TOC, NMHC, TOG, NMOG, CO, or NOX. If the data card matches one of these, it is read from the character variable with the appropriate format; and it is checked. If the data card type is COUNTY, then a new county ID number is saved. If the data card type os VMTMX, VOC, CO, or NOX, then the last county ID number will be used as an index for saving the data.

Error Checking of Unit 5 Input Data

The county number of the county ID card is checked for a range of 1 to 8. The roadway type of the roadway type name card and the VMT mix data cards are checked for a range of 0 to 20. The speed read from the VOC, TOC, NMHC, TOG, NMOG, CO, and

NOX data cards is checked for a range of 3 to 65. The first occurrence of a VOC, TOC, NMHC, TOG, or NMOG data card will determine the type of hydrocarbon emissions which will be reported. Only data cards of this type will be accepted for hydrocarbon emissions after this, and the other four hydrocarbon emission rate data cards will be printed in error messages if they are input latter. The number of emission constants for each county which are not missing values are summed. The number must be either 1,512 or zero. Each VMT mix is summed. Each VMT mix is then scaled to 1.0, and a warning message is written if the mix sum is less than 0.99 or greater than 1.01 before scaling. If any errors are found in the input data from Unit 5, the program prints these messages and terminates with a Stop Code of 1.

Error Checking of Unit 1 Data and Reports

The links records from Unit 1 are then processed. A check is made for a speed between 1.0 and 99. A check of the roadway type and county number is made to see if they are valid. A sum of links with incomplete VMT mixes is kept. A sum of links missing emission factors is also kept. After all links are processed, reports are printed for VMT mix, VMT, vehicle hours of travel, VOC emissions, CO emissions, and NOX emissions. If data were missing for VMT mixes or emission factors, error reports summing the number of links by county for missing emission factors and by county and roadway type for missing VMT mixes are made. If errors in the links records were found, the program stops with a Stop 9.

Reading Unit 8 Data

The XY coordinate data are read if a GRID card was read. The node or zone number is checked for the range of 1 to 16000; if the node or zone number is outside of this range, the coordinate data are skipped.

UNIT 5 DATA CARDS

The ordering of data on the Unit 5 input is important. The only county number input is from the county ID card. The VMTMX, VOC, NOX, and CO data cards do not contain a county number. The data from these four data cards are stored using the county number from the last county ID card as an index.

GRID CARD

Columns	Format	Contents
1-5	A5	'GRID'
11	F10.0	Width and height of a grid square in coordinate units. If GRID is omitted or is zero, the grid output will not be produced; and the XY coordinates will not be read.

REF CARD

Columns	Format	Contents
1-3	A3	'REF'
11-20	F10.0	X coordinate of southwest corner of grid area.
21-30	F10.0	Y coordinate of southwest corner of grid area.

UNITS CARD

Columns	Format	Contents
1-5	A5	'UNITS'
7	I1	Report units code: 1 = Grams 2 = Pounds 3 = Tons

ROADWAY TYPE NAME CARD

Columns	Format	Contents
1-8	A8	'ROADTYPE'
10-11	I2	Roadway type number (values from 0 to 20 are valid)
13-32	A20	Roadway type name

COUNTY ID CARD

Columns	Format	Contents
1-6	A6	'COUNTY'
8-9	I2	County number (values from 1 to 8 are valid)
11-22	A12	County name

VEHICLE MILES OF TRAVEL MIX CARD[7]

Columns	Format	Contents
1-5	A5	'VMTMX'
7-8	I2	Roadway type number (valid values are from 0 to 20)
9-17	F9.5	LDGV fraction of VMT
18-26	F9.5	LDGT1 fraction of VMT
27-35	F9.5	LDGT2 fraction of VMT
36-44	F9.5	HDGV fraction of VMT
45-53	F9.5	LDDV fraction of VMT
54-62	F9.5	LDDT fraction of VMT
63-71	F9.5	HDDV fraction of VMT
72-80	F9.5	MC fraction of VMT

[7]The county number from the last county ID card is used.

VOC EMISSION FACTOR CARD[8]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'VOC'
8	A1	blank
9-17	F9.5	LDGV VOC emission factor in grams/mile
18-26	F9.5	LDGT1 VOC emission factor in grams/mile
27-35	F9.5	LDGT2 VOC emission factor in grams/mile
36-44	F9.5	HDGV VOC emission factor in grams/mile
45-53	F9.5	LDDV VOC emission factor in grams/mile
54-62	F9.5	LDDT VOC emission factor in grams/mile
63-71	F9.5	HDDV VOC emission factor in grams/mile
72-80	F9.5	MC VOC emission factor in grams/mile

[8]The county number from the last county ID card is used.

TOG EMISSION FACTOR CARD[9]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'TOG'
8	A1	blank
9-17	F9.5	LDGV TOG emission factor in grams/mile
18-26	F9.5	LDGT1 TOG emission factor in grams/mile
27-35	F9.5	LDGT2 TOG emission factor in grams/mile
36-44	F9.5	HDGV TOG emission factor in grams/mile
45-53	F9.5	LDDV TOG emission factor in grams/mile
54-62	F9.5	LDDT TOG emission factor in grams/mile
63-71	F9.5	HDDV TOG emission factor in grams/mile
72-80	F9.5	MC TOG emission factor in grams/mile

[9]The county number from the last county ID card is used.

TOC EMISSION FACTOR CARD[10]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'TOC'
8	A1	blank
9-17	F9.5	LDGV TOC emission factor in grams/mile
18-26	F9.5	LDGT1 TOC emission factor in grams/mile
27-35	F9.5	LDGT2 TOC emission factor in grams/mile
36-44	F9.5	HDGV TOC emission factor in grams/mile
45-53	F9.5	LDDV TOC emission factor in grams/mile
54-62	F9.5	LDDT TOC emission factor in grams/mile
63-71	F9.5	HDDV TOC emission factor in grams/mile
72-80	F9.5	MC TOC emission factor in grams/mile

[10]The county number from the last county ID card is used.

NMHC EMISSION FACTOR CARD[11]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-8	A4	'NMHC'
9-17	F9.5	LDGV NMHC emission factor in grams/mile
18-26	F9.5	LDGT1 NMHC emission factor in grams/mile
27-35	F9.5	LDGT2 NMHC emission factor in grams/mile
36-44	F9.5	HDGV NMHC emission factor in grams/mile
45-53	F9.5	LDDV NMHC emission factor in grams/mile
54-62	F9.5	LDDT NMHC emission factor in grams/mile
63-71	F9.5	HDDV NMHC emission factor in grams/mile
72-80	F9.5	MC NMHC emission factor in grams/mile

[11]The county number from the last county ID card is used.

NMOG EMISSION FACTOR CARD[12]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-8	A4	'NMOG'
9-17	F9.5	LDGV NMOG emission factor in grams/mile
18-26	F9.5	LDGT1 NMOG emission factor in grams/mile
27-35	F9.5	LDGT2 NMOG emission factor in grams/mile
36-44	F9.5	HDGV NMOG emission factor in grams/mile
45-53	F9.5	LDDV NMOG emission factor in grams/mile
54-62	F9.5	LDDT NMOG emission factor in grams/mile
63-71	F9.5	HDDV NMOG emission factor in grams/mile
72-80	F9.5	MC NMOG emission factor in grams/mile

[12]The county number from the last county ID card is used.

CO EMISSION FACTOR CARD[13]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-6	A3	'CO'
7-8	A2	blank
9-17	F9.5	LDGV CO emission factor in grams/mile
18-26	F9.5	LDGT1 CO emission factor in grams/mile
27-35	F9.5	LDGT2 CO emission factor in grams/mile
36-44	F9.5	HDGV CO emission factor in grams/mile
45-53	F9.5	LDDV CO emission factor in grams/mile
54-62	F9.5	LDDT CO emission factor in grams/mile
63-71	F9.5	HDDV CO emission factor in grams/mile
72-80	F9.5	MC CO emission factor in grams/mile

[13]The county number from the last county ID card is used.

NOX EMISSION FACTOR CARD[14]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'NOX'
8	A1	blank
9-17	F9.5	LDGV NOX emission factor in grams/mile
18-26	F9.5	LDGT1 NOX emission factor in grams/mile
27-35	F9.5	LDGT2 NOX emission factor in grams/mile
36-44	F9.5	HDGV NOX emission factor in grams/mile
45-53	F9.5	LDDV NOX emission factor in grams/mile
54-62	F9.5	LDDT NOX emission factor in grams/mile
63-71	F9.5	HDDV NOX emission factor in grams/mile
72-80	F9.5	MC NOX emission factor in grams/mile

[14]The county number from the last county ID card is used.

XY COORDINATE DATA CARD

Columns	Format	Contents
1-5	I5	Node or zone number
6-15	F10.0	X coordinate of node or zone
16-25	F10.0	Y coordinate of node or zone

The suggested order of the Unit 5 data cards is:

```
REF[15]
GRID[15]
UNIT  3  (tons)
ROADTYPE
   .
   .
   .
COUNTY  1 ------
VMTMX
   .
   .
   .
   VOC
   .
   .
   .
   CO
   .
   .
   .
   NOX
   .
   .
   .
COUNTY  2 ------
VMTMX
   .
   .
   .
   VOC
   .
   .
   .
   CO
   .
   .
   .
   NOX
   .
   .
   .
(repeat for additional counties)
```

[15]Optional

UNIT 1 DATA CARDS

Links Cards

Columns	Format	Description
1-5	I5	A-node
7-11	I5	B-node
13	I1	County number (1-10)
15-16	I2	Roadway type (0-20)
18-27	F10.2	Link distance in miles
29-34	F6.2	Congested speed
36-50	F15.2	VMT

The A-node and B-node fields are not used by IMPSUM.

EXAMPLE JCL

```
//IMPSUMT   JOB  (W150,60A,S5,5,JB),'BELL  TEST IMPSUM'
//IMP1  EXEC  PGM=IMPSUM,REGION=1024K
//STEPLIB  DD  DISP=SHR,DSN=USR.W104.CB.JB.IMPSUM
//FT06F001 DD  SYSOUT=A
//FT05F001 DD  *
//FT01F001 DD  DISP=OLD,DSN=USR.W150.CB.JR9090S1
//FT09F001  DD  DISP=(NEW,CATLG),UNIT=DISK,SPACE=(TRK,(3,2)),
//  DSN=USR.W150.CB.JRT90901.SAV,
//  DCB=(RECFM=VBS,LRECL=6316,BLKSIZE=6320)
//FT10F001  DD  DISP=(NEW,CATLG),UNIT=DISK,SPACE=(TRK,(3,2)),
//  DSN=USR.W150.CB.JRT90901.GRID,
//  DCB=(RECFM=FB,LRECL=80,BLKSIZE=6320)
```

MICROCOMPUTER USAGE

The microcomputer version of this program is similar to the mainframe version, except there is no JCL. The program must be in the path or in the current directory. The file F77L.EER must be in same directory as the program. The program asks for the name of the input and output data sets. The user can enter up to 80 characters for the drive, path, and name for each data set.

The following is the microcomputer console output from an example run of IMPSUM. The lower case characters were typed by the user. The "nul" response to "GRID OUTPUT =" causes the grid output without headings to be discarded. The grid output with headings will be written to the data set "jrt96931.out" in the example below;

```
C:\JORTS\TEST>impsum
```

```
32-bit Power for Lahey Computer Systems
Phar Lap's 386|DOS-Extender(tm) Version 4.1L
Copyright (C) 1986-92 Phar Lap Software, Inc.
Available Memory = 5552 Kb
```

```
POLLUTION FACTOR FILE =s1

LINKS FILE =jr9693s1

OUTPUT FILE =jrt96931.out

GRID OUTPUT =nul

SAVE FILE =jrt96931.sav

IMPSUM STARTED AT 08/04/93            11:17:28.8

C:\JORTS\TEST>dir


 Volume in drive C is STACVOL_DSK
 Directory of C:\JORTS\TEST

S1              50903 07-15-93   4:40p
JR9693S1       479284 07-15-93   4:06p
JRT96931 OUT    46061 08-04-93  11:17a
JRT96931 SAV   130485 08-04-93  11:17a


C:\ELPASO>cc < jrt96931.out > prn[16]
```

[16]The CC program reads a FORTRAN output file with carriage control characters and prints the file in landscape mode to an HP LaserJet II-compatible printer or to a character file. This program should not be used with printers that are not HP LaserJet II-compatible. The CC program is written in Turbo C.

SUMALL

PURPOSE

This program was written to sum the emission results from two or more time periods plus diurnals. The SUMALL program sums the results from one or more IMPSUM runs. SUMALL also calculates diurnal emissions and prints the summed results in the same formats as IMPSUM with the additional diurnal HC output. This program reads all Unit 5 data read by IMPSUM. Additionally, this program reads a parameter card specifying the number of binary result data sets to sum, diurnal rates, and the number of vehicles by vehicle type.

Emission output by grid square will be printed if the IMPSUM runs which produced the binary result data sets had grid square output. A second copy of this output without headings will be written to Unit 10. The Unit 10 output is for input to computer programs.

The diurnal rates will come from either three MOBILE5A runs or one MOBILE5A run for each county. Three runs of MOBILE5A will be made if COADJ is being used with the POLFAC5A runs. If one run is used, specify Run 2 for the DIUW and DIUM data cards. If three runs are used, the actual rates will be calculated by summing Run 2 and 3 data and subtracting Run 1. It is assumed that the IMPSUM runs to be summed have no diurnal emissions. This is accomplished by making the minimum temperature, the maximum temperature, and the ambient temperature the same in the POLFAC5A runs.

The basic inputs to SUMALL are:

1. Data specifying the number of IMPSUM runs to sum (NSAV).
2. Data specifying the number of counties in the region and their names.
3. The names of the road types used in the study. These road types are used to summarize the emission results.
4. VMT mix by county and road type.
5. Emission factors from POLFAC5A or COADJ by county.
6. Specification of the units for reporting emissions (grams, pounds, or tons).
7. Diurnal rates and the number of vehicles by county.
8. Binary data sets which saved the results from one or more IMPSUM runs. The binary data sets produced by the IMPSUM program of the July 29, 1993, version are not compatible with this version of SUMALL because grid square output was added.

UNIT 5 DATA CARDS

The ordering of data on the Unit 5 input is important. The only county number input is from the county ID card. The VMTMX, VOC, NOX, and CO data cards do not

contain a county number. The data from these four data cards are stored using the county number from the last county ID card as an index.

UNITS CARD

Columns	Format	Contents
1-5	A5	'UNITS'
7	I1	Report units code: 1 = Grams 2 = Pounds 3 = Tons

NSAV CARD

Columns	Format	Contents
1-4	A4	'NSAV'
11	I5	Number of binary results data sets to sum. The value can have a value of 1 to 89. The save data sets will be read from Units 11, 12, etc. The number of save data sets may be limited by the number of DD statements that can be used in a job or a jobstep.

WEIGHTED DIURNAL EMISSION RATES CARD

Columns	Format	Contents
1-4	A4	'DIUW'
5-6	I2	Run number
7-8	I2	County number
11-18	F8.2	Weighted diurnal rate for LDGV
19-26	F8.2	Weighted diurnal rate for LDGT1
27-34	F8.2	Weighted diurnal rate for LDGT2
35-42	F8.2	Weighted diurnal rate for HDGV
43-50	F8.2	Weighted diurnal rate for LDDV
51-58	F8.2	Weighted diurnal rate for LDDT
59-66	F8.2	Weighted diurnal rate for HDDV
67-76	F8.2	Weighted diurnal rate for MC

MULTIPLE DIURNAL EMISSION RATES CARD

Columns	Format	Contents
1-4	A4	'DIUM'
5-6	I2	Run number
7-8	I2	County number
11-18	F8.2	Multiple diurnal rate for LDGV
19-26	F8.2	Multiple diurnal rate for LDGT1
27-34	F8.2	Multiple diurnal rate for LDGT2
35-42	F8.2	Multiple diurnal rate for HDGV
43-50	F8.2	Multiple diurnal rate for LDDV
51-58	F8.2	Multiple diurnal rate for LDDT
59-66	F8.2	Multiple diurnal rate for HDDV
67-76	F8.2	Multiple diurnal rate for MC

VEHICLES CARD

Columns	Format	Contents
1-4	A4	'VEH '
7-8	I2	County number
11-18	F8.2	Number of LDGV vehicles
19-26	F8.2	Number of LDGT1 vehicles
27-34	F8.2	Number of LDGT2 vehicles
35-42	F8.2	Number of HDGV vehicles
43-50	F8.2	Number of LDDV vehicles
51-58	F8.2	Number of LDDT vehicles
59-66	F8.2	Number of HDDV vehicles
67-76	F8.2	Number of MC vehicles

ROADWAY TYPE NAME CARD

Columns	Format	Contents
1-8	A8	'ROADTYPE'
10-11	I2	Roadway type number (values from 0 to 20 are valid)
13-32	A20	Roadway type name

COUNTY ID CARD

Columns	Format	Contents
1-6	A6	'COUNTY'
8-9	I2	County number (values from 1 to 8 are valid)
11-22	A12	County name

VEHICLE MILES OF TRAVEL MIX CARD[17]

Columns	Format	Contents
1-5	A5	'VMTMX'
7-8	I2	Roadway type number (valid values are from 0 to 20)
9-17	F9.5	LDGV fraction of VMT
18-26	F9.5	LDGT1 fraction of VMT
27-35	F9.5	LDGT2 fraction of VMT
36-44	F9.5	HDGV fraction of VMT
45-53	F9.5	LDDV fraction of VMT
54-62	F9.5	LDDT fraction of VMT
63-71	F9.5	HDDV fraction of VMT
72-80	F9.5	MC fraction of VMT

[17]The county number from the last county ID card is used.

VOC EMISSION FACTOR CARD[18]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'VOC'
8	A1	blank
9-17	F9.5	LDGV VOC emission factor in grams/mile
18-26	F9.5	LDGT1 VOC emission factor in grams/mile
27-35	F9.5	LDGT2 VOC emission factor in grams/mile
36-44	F9.5	HDGV VOC emission factor in grams/mile
45-53	F9.5	LDDV VOC emission factor in grams/mile
54-62	F9.5	LDDT VOC emission factor in grams/mile
63-71	F9.5	HDDV VOC emission factor in grams/mile
72-80	F9.5	MC VOC emission factor in grams/mile

[18]The county number from the last county ID card is used.

CO EMISSION FACTOR CARD[19]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-6	A3	'CO'
7-8	A2	blank
9-17	F9.5	LDGV CO emission factor in grams/mile
18-26	F9.5	LDGT1 CO emission factor in grams/mile
27-35	F9.5	LDGT2 CO emission factor in grams/mile
36-44	F9.5	HDGV CO emission factor in grams/mile
45-53	F9.5	LDDV CO emission factor in grams/mile
54-62	F9.5	LDDT CO emission factor in grams/mile
63-71	F9.5	HDDV CO emission factor in grams/mile
72-80	F9.5	MC CO emission factor in grams/mile

[19]The county number from the last county ID card is used.

NOX EMISSION FACTOR CARD[20]

Columns	Format	Contents
1-3	I3	Speed (valid values are 3 to 65)
4	A1	blank
5-7	A3	'NOX'
8	A1	blank
9-17	F9.5	LDGV NOX emission factor in grams/mile
18-26	F9.5	LDGT1 NOX emission factor in grams/mile
27-35	F9.5	LDGT2 NOX emission factor in grams/mile
36-44	F9.5	HDGV NOX emission factor in grams/mile
45-53	F9.5	LDDV NOX emission factor in grams/mile
54-62	F9.5	LDDT NOX emission factor in grams/mile
63-71	F9.5	HDDV NOX emission factor in grams/mile
72-80	F9.5	MC NOX emission factor in grams/mile

The suggested order of the Unit 5 data cards is:

```
UNIT  3  (tons)
NSAV       4
DIUW 1 1
DIUW 2 1
DIUW 3 1
DIUM 1 1
DIUM 2 1
DIUM 3 1
VEH    1
ROADTYPE
   .
   .
   .
COUNTY  1 ------
VMTMX
   .
   .
   .
   VOC
```

[20]The county number from the last county ID card is used.

```
   .
   .
   .
   CO
   .
   .
   .
   NOX
   .
   .
   .
COUNTY  2 ------
VMTMX
   .
   .
   .
   VOC
   .
   .
   .
   CO
   .
   .
   .
   NOX
   .
   .
   .
(repeat for additional counties)
```

EXAMPLE JCL

```
//SUMALL93 JOB (W150,60A,2,5,CB),'BELL  JORTS 96 93'
//SUMALL   EXEC  PGM=SUMALL2,REGION=512K
//STEPLIB  DD    DISP=OLD,DSN=USR.W104.CB.JB.IMPSUM
//FT05F001 DD  *
//FT06F001  DD  SYSOUT=A
//FT10F001  DD  DISP=(NEW,CATLG),UNIT=DISK,SPACE=(TRK,(3,2)),
//  DSN=USR.W150.CB.JRT9090T.GRID,
//  DCB=(RECFM=FB,LRECL=80,BLKSIZE=6320)
//FT11F001  DD  DISP=OLD,DSN=USR.W150.CB.JRT96931.SAV
//FT12F001  DD  DISP=OLD,DSN=USR.W150.CB.JRT96932.SAV
//FT13F001  DD  DISP=OLD,DSN=USR.W150.CB.JRT96933.SAV
//FT14F001  DD  DISP=OLD,DSN=USR.W150.CB.JRT96934.SAV
```

EXAMPLE UNIT 5 INPUT

```
HDR1  JORTS 1996 TRIPS ON 1993 NETWORK
NSAV          4
HDR2  24 HOUR
UNITS 3
```