

Technical Report

Multiple Stringency Version of
MOBILE3 Users Guide

By

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NOTICE

Technical Reports do not necessarily represent final EPA decisions or positions. They are intended to present technical analysis of issues using data which are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments which may form the basis for a final EPA decision, position or regulatory action.

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1.0 BACKGROUND

MOBILE3, as with all of the EPA mobile source models, uses a single stringency to identify the first year failure rate of Tech I (pre-catalyst) and Tech II (oxidation catalyst) vehicles in the Inspection and Maintenance (I/M) program to be modeled. This single number most often covers a wide range of technologies and vehicle classes when applied to an I/M program which inspects many model years and all vehicle types. Unless the cutpoints used are carefully balanced, the actual failure rate may vary greatly from model year to model year and vehicle class to vehicle class. This single stringency input was meant to reduce the amount of input information necessary to model an I/M scenario.

It is possible for MOBILE3 to use a separate stringency for each model year of each vehicle class. The only barrier has been the need to modify the input stream and appropriate subroutines to accept and utilize user supplied information.

Such modifications have now been done and the results are described in this report. No other changes in the MOBILE3 code have been made other than the changes necessary to accept the multiple stringencies. Therefore, this version of MOBILE3 is not different from the original release of MOBILE3 for non-I/M cases and differs only in its flexibility for evaluating I/M cases.

2.0 INPUTS

It is assumed for purposes of this report that the user is familiar with using MOBILE3 and has available the MOBILE3 Users Guide.* This report, therefore, addresses only the new inputs and modifications to the existing inputs.

The only input flag modified is the stringency level described in Section 2.2.3 of the MOBILER3 Users Guide. Usually the second field of the I/M characteristics record indicates the stringency to use for all model years and vehicle classes. In the Multiple Stringency MOBILE3, the use of this flag has been modified to indicate the number of stringencys the user wishes to input. The valid range for of this flag is now therefore 1 to 99.

Immediately following the I/M characteristics record in the input stream should follow the new stringency input data. This information must precede the anti-tampering program (ATP) characteristics record. The user must input stringency description records totaling the number indicated in the second field of the I/M characteristics record. Too many or too few stringency description records will result in an error message. Each stringency description record must contain the following information:

1. Vehicle class (1-3)
2. First model year of stringency group
3. Last model year of stringency group
4. Stringency (10-50)

The format for this record is I1,1X,I2,IX,I2,1X,I2.

The vehicle class indicates the vehicle type for which the stringency will apply. Only passenger cars (LDGV: 1) and light-duty trucks (LDGT1: 2 and LDGT2: 3) are valid vehicle types.

The first and last model years for the stringency group indicate inclusively the model years for which this stringency record will apply. Only the last two digits of the model year are input in each case. If the same model year is used for the first and last model year, then the stringency will only apply to that one model year. If a single stringency is to be used

*"Users Guide to MOBILE3 (Mobile Source Emissions Model)", EPA-460/3-84-002.

for all model years of that vehicle type, the first and last model years must cover all of the model years for which stringency applies. For LDGV, this is 1951 through 1980. For LDGT1 and LDGT2, this is 1951 through 1983. Last model years beyond these ranges will cause an error message.

Model year ranges for a stringency must be chosen with care. Overlapping model year ranges for the same vehicle class will result in an error message.

Since a stringency record cannot apply to more than one vehicle type, there must be at least one stringency record for each vehicle type subject to the I/M program specified in the I/M characteristics record. If a vehicle class or model year is not given a stringency, the model will assume the stringency is zero and put a warning in the output.

The last field of the stringency record is the stringency itself. Stringency is defined as the first year failure rate in percent for the idle hydrocarbon (IHC) and idle carbon monoxide (ICO) concentration cutpoints used in the program. The stringency input in this field must correspond to the stringency for the model year group defined by the first and last model years specified in the second and third fields.

3.0 ERRORS AND WARNINGS

If a stringency record specifies an invalid (greater than 3) vehicle type, an error 84 will occur:

- out of bounds, I/M Stringency for classes 1-3 only

If a stringency record specifies a model year beyond the valid range of model years for that vehicle class, an error 85 or 86 will occur:

- inappropriate first/last MYR for stringency

If a model year is specified in more than one stringency record for a vehicle class, an error 86 will occur:

- inappropriate last MYR for stringency

This error will indicate the stringency record for the model year range whose last model year is duplicated elsewhere.

If the stringency input is not between 10 and 50, an error 33 will occur:

- out of bounds, stringency (10 to 50)

All of the above errors are fatal and will cause the MOBILE3 run to terminate.

If a vehicle class or model year covered by the I/M program which uses stringency has not had a stringency specified using a stringency record, the model will assume that the stringency is zero and will issue a warning in the output:

Warning: I/M stringency for (MYR) class ___ is zero

This warning will not prevent completion of the MOBILE3 computations.

4.0 EXAMPLE

The example input stream shows a case where nine stringencies are specified in the second field of the I/M characteristics record. The I/M characteristics record is then immediately followed by the nine stringency records. In this example three stringency records are used to define stringency levels for each of the three vehicle classes. The third stringency record demonstrates the technique to specify a stringency for a single model year. Note that the model years covered by the stringencies cover all of the model years which must be covered and do so without overlap.

The output echoes the user input stringency information in the I/M program description.

Example Output Using Multiple Stringency MOBILE3

MOBILE3 : MULTIPLE STRINGENCY MOBILE3

I/M program selected:

Start year (January 1): 1983
 Number of input stringencys: 9
 Mechanic training program?: No
 First model year covered: 1951
 Last model year covered: 2020
 Vehicle types covered: LDGV, LDGT1, LDGT2
 1981 & later MYR test type: Idle
 1981 & later MYR test cutpoints: 1.2% ICO / 220 ppm IHC

Vehicle Class 1 - Model Years 1951 through 1974 use 10% Stringency
 Vehicle Class 1 - Model Years 1975 through 1979 use 20% Stringency
 Vehicle Class 1 - Model Years 1980 through 1980 use 10% Stringency
 Vehicle Class 2 - Model Years 1951 through 1974 use 10% Stringency
 Vehicle Class 2 - Model Years 1975 through 1979 use 20% Stringency
 Vehicle Class 2 - Model Years 1980 through 1983 use 10% Stringency
 Vehicle Class 3 - Model Years 1951 through 1978 use 10% Stringency
 Vehicle Class 3 - Model Years 1979 through 1980 use 20% Stringency
 Vehicle Class 3 - Model Years 1981 through 1983 use 10% Stringency

Total HC emission factors include evaporative HC emission factors.

Cal. Year: 1988 Region: Low Altitude: 500. Ft.
 I/M Program: Yes Ambient Temp: 75.0 (F)
 Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Ve
Veh. Spd.:	19.6	19.6	19.6		19.6	19.6	19.6	19.6	19.6	
VMT Mix:	0.643	0.121	0.087		0.041	0.036	0.015	0.050	0.007	

Composite Emission Factors (Gm/Mile)

Total HC:	2.25	4.15	5.14	4.57	8.75	0.40	0.62	3.94	6.02	3.02
*Evap HC:	0.85	1.33	1.74	1.50	4.60	0.0	0.0	0.0	2.26	----
Exhst CO:	14.25	26.49	28.36	27.27	91.06	1.32	1.53	11.63	19.81	19.32
Exhst NOX:	1.56	2.72	3.05	2.86	5.32	1.17	1.45	17.74	0.85	2.78

5.0 COMPUTER CODE CHANGES

The Appendix contains a listing of the subroutines and functions which contain the changes in the MOBILE3 computer code necessary to allow the use of multiple stringency. Any changes in the code are indicated by a vertical bar near the MOBILE3 Users Guide line number. The subroutines and functions with changes are:

1. Subroutine ONESEC
2. Subroutine QUITER
3. Function PCLEFT
4. Subroutine OUTIMP

Subroutine ONESEC contains the input code and input checks for the stringency records. Subroutine QUITER contains the error code output logic. Function PCLEFT chooses the appropriate stringency to use for choosing the I/M program credit for each model year of each vehicle class. This function is where the new input information is actually utilized. Subroutine OUTIMP was modified to write the user input in the MOBILE3 output.

In subroutine PCLEFT, the model sorts through all of the input stringency records for each model year of each vehicle class covered by the I/M program once for HC and once for CO. If the model year and vehicle class combination is not covered by a stringency record and that combination is covered by the I/M program as specified in the I/M characteristics record, then the stringency is assumed to be zero and PCLEFT is returned as one.

Appendix

Multiple Stringency MOBILE3 :

Computer Code Changes Necessary
to Allow Multiple Stringency Input

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3000          SUBROUTINE ONESEC(INERR,*)
3000.6 C
3000.7 C   This Subroutine has been modified to use multiple stringencies
3001 C
3002 C   ONESEC checks if control flags indicate One-time Data. It then reads in,
3003 C   validates, and stores the data.
3004 C
3005 C   Called by MAIN.
3006 C
3007 C   Calls CCEVAX, GETATP, GETIMC, GETVMT, NEWERQ, QUITER and YRTEST.
3008 C
3009 C   Input on call:
3010 C
3011 C       parameter list: INERR
3012 C       common blocks:
3013 C       /FLAGS1/ IPROMT,TAMFLG,VMFLAG
3014 C       /FLAGS2/ MYMRFG,NEWFLG,IMFLAG,ATPFLG
3015 C       /FLAGS3/ ICEVFG
3016 C       /IOUCOM/ IOUGEN,IOUASK
3017 C       /SYSCOM/ MAXVEH
3018 C       /YEARS4/ IY1941,IY1960,IY2020
3019 C
3020 C   Output on return:
3021 C
3022 C       parameter list: INERR
3023 C       common blocks:
3024 C       /BASETR/ ZMLTAM,DRTAM
3025 C       /CEVCOM/ USRTPD,USRMPD
3026 C       /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
3027 C       /IMPAR2/ ILDT,ITEST,ICUTS,NUDATA,NLIM,IMNAME
3028 C       /MYRSAV/ AMAR,JULMYR
3029 C       /NEWCOM/ NEWPAR,BERNEW,NEWFIT,NEWCT
3030 C
3031 C   Local array subscripts:
3032 C
3033 C   NAMMMR(2,2,8) - NAMMMR ( ICH, IG, IV )
3034 C
3035 C   Local variable / array dictionary:
3036 C
3037 C   Name      Type      Description
3038 C   -----
3039 C   CHKMYR    R          myr mix check: sum of the myr fractions = 1.0 +/- 1.E-6
3040 C                      (a normalized myr distribution has been entered for each IV)
3041 C   DRNEW     R          new emission rate's deterioration rate (slope)
3042 C   MYF       I          my of first (JDX order) AMAR / JULMYR to be entered on READ
3043 C   MYL       I          my of last (JDX order) AMAR / JULMYR to be entered on READ
3044 C   NAMMMR    R*8       prompts for replacement AMAR & JULMYR, by JDX & IV
3044.2 C   NVEH     I          vehicle class for stringency input
3044.4 C   NMYF     I          first model year of stringency grouping
3044.6 C   NMYL     I          last model year of stringency grouping
3044.8 C   NSTR     I          stringency for MYR/CLASS grouping
3045 C   NEWMYF    I          new emission rate's first my of affected range
3046 C   NEWMYL    I          new emission rate's last my of affected range
3047 C   NEWPOL    I          new emission rate's pollutant code
3048 C   NEWREG    I          new emission rate's region code
3049 C   NEWVEH    I          new emission rate's vehicle type code
3050 C   SUMMYR    R          sum of myr for IV; used to normalize user entered JULMYR
3051 C   ZEROML    R          user entered tampering zml to be checked: ZEROML <= 1.0

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3052 C ZMLNEW R new emission rate's zero mile level (intercept)
3053 C
3054 C
3055 C
3056 INTEGER TAMFLG,SPDFLG,VMFLAG,ALHFLG,ATPFLG,PRTFLG
3057 REAL JULMYR
3058 C
3059 COMMON /BASETR/ BTR(7,2),ZMLTAM(7,2,4),DRTAM(7,2,4)
3060 COMMON /CEVCOM/ USRTPD(8),USRMPD(8)
3061 COMMON /FLAGS1/ IPROMT,TAMFLG,SPDFLG,VMFLAG
3062 COMMON /FLAGS2/ MYMRFG,NEWFLG,IMFLAG,ALHFLG,ATPFLG
3063 COMMON /FLAGS3/ IFORM,PRTFLG,ICEVFG,IDLFLG,NMHFLG
3064 COMMON /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
3065 COMMON /IMPAR2/ ILDT,ITEST,ICUTS,NUDATA,NLIM,IMNAME(20,9)
3066 COMMON /IOUCOM/ IOUAER,IOUIMD,IOUGEN,IOUREP,IOUERR,IOUASK
3067 COMMON /MYRSAV/ AMAR(20,8),JULMYR(20,8),NEWCUM
3068 COMMON /NEWCOM/ NEWPAR(5,100),BERNEW(2,100),NEWFIT(100),NEWCT
3068.5 COMMON /NEWT00/ NEWSTR(4,100)
3069 COMMON /SYSCOM/ MAXVEH,MAXLW,MAXPOL,MAXREG,INITPR
3070 COMMON /YEARS4/ IY1941,IY1960,IY2020
3071 C
3072 REAL*8 NAMMMR(2,2,8)
3073 C
3074 DATA NAMMMR/
3075 * '1-10 for',' LDGV: ',
3076 * '11-20 fo','r LDGV: ',
3077 * '1-10 for',' LDGT1: ',
3078 * '11-20 fo','r LDGT1: ',
3079 * '1-10 for',' LDGT2: ',
3080 * '11-20 fo','r LDGT2: ',
3081 * '1-10 for',' HDGV: ',
3082 * '11-20 fo','r HDGV: ',
3083 * '1-10 for',' LDDV: ',
3084 * '11-20 fo','r LDDV: ',
3085 * '1-10 for',' LDDT: ',
3086 * '11-20 fo','r LDDT: ',
3087 * '1-10 for',' HDDV: ',
3088 * '11-20 fo','r HDDV: ',
3089 * '1-10 for',' MC: ',
3090 * '11-20 fo','r MC: '/
3091 C
3092 C Process flags.
3093 C
3094 IF(TAMFLG.EQ.1) GOTO 20
3095 IF(IMFLAG.EQ.2) GOTO 10
3096 C
3097 IF(IPROMT.EQ.2) WRITE(IOUASK,200)
3098 200 FORMAT(' ','Enter tampering intercepts (zero mile levels)')
3099 IF(IPROMT.EQ.2) WRITE(IOUASK,205)
3100 205 FORMAT(' ','for non-I/M case only:')
3101 READ(IOUGEN,100,END=99)((ZMLTAM(ID,1,IVTAM),ID=1,7),IVTAM=1,4)
3102 100 FORMAT(7F8.4)
3103 IF(IPROMT.EQ.2) WRITE(IOUASK,210)
3104 210 FORMAT(' ','Enter tampering slopes (deterioration rates)')
3105 IF(IPROMT.EQ.2) WRITE(IOUASK,205)
3106 READ(IOUGEN,110,END=99)((DRTAM(ID,1,IVTAM),ID=1,7),IVTAM=1,4)
3107 110 FORMAT(7F9.5)
3108 GOTO 12
3109 C

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3110      10 IF(IPROMT.EQ.2) WRITE(IOUASK,200)
3111      IF(IPROMT.EQ.2) WRITE(IOUASK,215).
3112      215 FORMAT(' ','for non-I/M and I/M cases:')
3113      READ(IOUGEN,100,END=99) ZMLTAM
3114      IF(IPROMT.EQ.2) WRITE(IOUASK,210)
3115      IF(IPROMT.EQ.2) WRITE(IOUASK,215)
3116      READ(IOUGEN,110,END=99) DRTAM
3117      C
3118      C Insure tampering zero mile levels (intercepts) do not exceed unity.
3119      C There is no range check for deterioration rates.
3120      C
3121      12 DO 14 IVTAM=1,4
3122      DO 14 IM=1,IMFLAG
3123      DO 14 ID=1,7
3124      ZEROML=ZMLTAM(ID,IM,IVTAM)
3125      IF(ZEROML.GT.1.0) CALL QUITER(ZEROML,0,50,INERR)
3126      14 CONTINUE
3127      C
3128      C Check for user supplied vmt mix to be used for all scenarios of this run.
3129      C
3130      20 IF(VMFLAG.EQ.3) CALL GETVMT(INERR,&99)
3131      C
3132      C Check for user supplied my mileage accrual rates and / or registration
3133      C distributions.
3134      C
3135      IF(MYMRFG.EQ.1) GOTO 44
3136      IF(MYMRFG.EQ.3) GOTO 26
3137      IF(IPROMT.EQ.2) WRITE(IOUASK,220)
3138      220 FORMAT(/)
3139      C
3140      DO 22 IV=1,MAXVEH
3141      DO 22 IG=1,2
3142      IF(IPROMT.EQ.2) WRITE(IOUASK,230) (NAMMMR(ICH,IG,IV),ICH=1,2)
3143      230 FORMAT(' ','Enter MYM ages ',2A8)
3144      MYF=1
3145      IF(IG.EQ.2) MYF=11
3146      MYL=10
3147      IF(IG.EQ.2) MYL=20
3148      READ(IOUGEN,130,END=99) (AMAR(JDX,IV),JDX=MYF,MYL)
3149      130 FORMAT(10F5.3)
3150      22 CONTINUE
3151      C
3152      DO 24 IV=1,MAXVEH
3153      DO 24 JDX=1,20
3154      IF(AMAR(JDX,IV).LT.0.) CALL QUITER(AMAR(JDX,IV),0,19,INERR)
3155      24 CONTINUE
3156      C
3157      IF(MYMRFG.EQ.2) GOTO 36
3158      26 IF(IPROMT.EQ.2) WRITE(IOUASK,220)
3159      DO 32 IV=1,MAXVEH
3160      DO 28 IG=1,2
3161      IF(IPROMT.EQ.2) WRITE(IOUASK,235) (NAMMMR(ICH,IG,IV),ICH=1,2)
3162      235 FORMAT(' ','Enter MYR ages ',2A8)
3163      MYF=1
3164      IF(IG.EQ.2) MYF=11
3165      MYL=10
3166      IF(IG.EQ.2) MYL=20
3167      READ(IOUGEN,130,END=99) (JULMYR(JDX,IV),JDX=MYF,MYL)
3168      28 CONTINUE

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3169 C
3170     CHKMYR=0.0
3171     DO 30 JDX=1,20
3172     CHKMYR=JULMYR(JDX,IV)+CHKMYR
3173     30 CONTINUE
3174 C
3175     IF(CHKMYR-.00001.GT.1..OR.CHKMYR+.00001.LT.1.)
3176     * CALL QUITER(CHKMYR,0,49,INERR)
3177     32 CONTINUE
3178 C
3179     DO 34 IV=1,MAXVEH
3180     DO 34 JDX=1,20
3181     IF(JULMYR(JDX,IV).LT.0.) CALL QUITER(JULMYR(JDX,IV),0,20,INERR)
3182     34 CONTINUE
3183 C
3184 C
3185     36 DO 38 IV=1,MAXVEH
3186 C
3187 C Skip 0 with non-0 checks if user supplies MYR only and on HDDV pass:
3188 C the BD values are 0.0's for all 20 my's (HDDMYM has not yet been called).
3189 C
3190     IF(MYMRFG.EQ.3.AND.IV.EQ.7) GOTO 38
3191     DO 38 JDX=1,20
3192     IF(AMAR(JDX,IV).LE.0.0.AND.JULMYR(JDX,IV).GT.0.0)
3193     * CALL QUITER(JULMYR(JDX,IV),0,21,INERR)
3194     IF(AMAR(JDX,IV).GT.0.0.AND.JULMYR(JDX,IV).EQ.0.0)
3195     * CALL QUITER(AMAR(JDX,IV),0,22,INERR)
3196     38 CONTINUE
3197 C
3198 C Check vehicle equalities (LDGV,LDDV), (LDGT1,LDDT) mod yr regs.
3199 C
3200     DO 40 JDX=1,20
3201     IF(JULMYR(JDX,1).NE.JULMYR(JDX,5)) CALL QUITER(0.,JDX,65,INERR)
3202     IF(JULMYR(JDX,2).NE.JULMYR(JDX,6)) CALL QUITER(0.,JDX,66,INERR)
3203     40 CONTINUE
3204 C
3205 C Normalize JULMYR.
3206 C
3207     44 DO 50 IV=1,MAXVEH
3208 C
3209     SUMMYR=0.0
3210     DO 46 JDX=1,20
3211     SUMMYR=JULMYR(JDX,IV)+SUMMYR
3212     46 CONTINUE
3213     IF(SUMMYR.EQ.0.) SUMMYR=1.
3214 C
3215     DO 50 JDX=1,20
3216     JULMYR(JDX,IV)=JULMYR(JDX,IV)/SUMMYR
3217     50 CONTINUE
3218 C
3219 C Here read in e.f. modification data.
3220 C
3221     IF(NEWFLG.EQ.1) GOTO 60
3222     IF(IPROMT.EQ.2) WRITE(IOUASK,240)
3223     240 FORMAT('0','Enter no. of new e.f. intercept/slope pairs (I2)')
3224     READ(IOUGEN,140,END=99) NEWCT
3225     140 FORMAT(I2)
3226     IF(NEWCT.LT.1.OR.NEWCT.GT.100) CALL QUITER(0.,NEWCT,23,INERR)
3227 C

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3228      DO 55 IFAC=1,NEWCT
3229      IF(IPROMT.EQ.2) WRITE(IOUASK,250)
3230      250 FORMAT(' ', 'Enter region,veh. type,pollutant,first my, '/
3231      * ' ', 'last my,new intercept (A), and new slope (B)')
3232      READ(IOUGEN,150,END=99) NEWREG,NEWVEH,NEWPOL,
3233      * NEWMYF,NEWMYL,ZMLNEW,DRNEW
3234      150 FORMAT(I1,1X,I1,1X,I1,1X,I2,1X,I2,1X,F6.2,1X,F6.2)
3235      IF(NEWREG.NE.1.AND.NEWREG.NE.2)
3236      * CALL QUITER(0.,NEWREG,62,INERR)
3237      IF(NEWVEH.LT.1.OR.NEWVEH.GT.8) CALL QUITER(0.,NEWVEH,25,INERR)
3238      IF(NEWPOL.LT.1.OR.NEWPOL.GT.3) CALL QUITER(0.,NEWPOL,26,INERR)
3239      CALL YRTEST(NEWMYF,27,IY1941,IY2020,INERR)
3240      CALL YRTEST(NEWMYL,28,IY1941,IY2020,INERR)
3241      IF(NEWMYL.LT.NEWMYF) CALL QUITER(0.,0,29,INERR)
3242      IF(ZMLNEW.LE.0.) CALL QUITER(ZMLNEW,0,30,INERR)
3243      IF(DRNEW.LT.0.) CALL QUITER(DRNEW,0,31,INERR)
3244      C
3245      C Store alternate equation data.
3246      C
3247      NEWPAR(1,IFAC)=NEWREG
3248      NEWPAR(2,IFAC)=NEWVEH
3249      NEWPAR(3,IFAC)=NEWPOL
3250      NEWPAR(4,IFAC)=NEWMYF
3251      NEWPAR(5,IFAC)=NEWMYL
3252      BERNEW(1,IFAC)=ZMLNEW
3253      BERNEW(2,IFAC)=DRNEW
3254      55 CONTINUE
3255      CALL NEWERQ(INERR)
3256      C
3257      C If IMFLAG=2, read in I/M program parameters.
3258      C
3259      60 IF(IMFLAG.EQ.1) GOTO 70
3260      NLIM=0
3261      IF(IPROMT.EQ.2) WRITE(IOUASK,260)
3262      260 FORMAT('0', 'Enter I/M Start Year, # of stringencies, m.t. flag, '/
3263      * ' ', 'first model year and last model year of prog. benefits, '/
3264      * ' ', 'vehicle, test type, cutpoints and newdata flags')
3265      READ(IOUGEN,160,END=99)
3266      * ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2,ILDT,ITEST,ICUTS,NUDATA
3267      160 FORMAT(2(I2,1X),I1,1X,2(I2,1X),3(I1,1X),I1)
3268      C
3269      C Check I/M inputs.
3270      C
3271      CALL YRTEST(ICYIM,32,IY1960,IY2020,INERR)
3272      IF(ISTRIN.LT.1) CALL QUITER(0.,ISTRIN,33,INERR)
3273      IF(IMTFLG.LT.1.OR.IMTFLG.GT.2) CALL QUITER(0.,IMTFLG,34,INERR)
3274      CALL YRTEST(MODYR1,35,IY1941,IY2020,INERR)
3275      CALL YRTEST(MODYR2,36,IY1941,IY2020,INERR)
3276      IF(MODYR1.GT.MODYR2) CALL QUITER(0.,0,37,INERR)
3277      IF(ILDT.LT.1.OR.ILDT.GT.4) CALL QUITER(0.,ILDT,72,INERR)
3278      IF(ITEST.LT.1.OR.ITEST.GT.3) CALL QUITER(0.,ITEST,73,INERR)
3279      IF(ICUTS.LT.1.OR.ICUTS.GT.3) CALL QUITER(0.,ICUTS,82,INERR)
3280      IF(NUDATA.LT.1.OR.NUDATA.GT.4) CALL QUITER(0.,NUDATA,74,INERR)
3281      IF(NUDATA.GT.1) CALL GETIMC(&99)
3281.02 C
3281.04 C This is where the new stringencies are read.
3281.06 C
3281.08      IY1980 = 1980
3281.1      IY1983 = 1983

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3281.12 C
3281.14 IF(IPROMT.EQ.2) WRITE(IOUASK,261) ISTRIN
3281.16 261 FORMAT('0','Enter for each of the ',I2,' stringencies :',/,
3281.18 *'0The vehicle type code ( 1:LDGV, 2:LDGT1, 3:LDGT2 ),',/,
3281.2 *' The first model year of the grouping,',/,
3281.22 *' The last model year of the grouping,',/,
3281.24 *' The first year failure rate (stringency).')
3281.26 C
3281.28 DO 61 IM=1,ISTRIN
3281.3 READ(IOUGEN,161,END=99) NVEH,NMYF,NMYL,NSTR
3281.32 161 FORMAT(I1,2(1X,I2),1X,I2)
3281.34 C
3281.36 C Check the stringency input parameters
3281.38 C
3281.4 IF(NVEH.GT.3) CALL QUITER(0.,NVEH,84,INERR)
3281.42 IF(NVEH.EQ.1) CALL YRTEST(NMYF,85,IY1941,IY1980,INERR)
3281.44 IF(NVEH.GT.1) CALL YRTEST(NMYF,85,IY1941,IY1983,INERR)
3281.46 IF(NVEH.EQ.1) CALL YRTEST(NMYL,86,NMYF,IY1980,INERR)
3281.48 IF(NVEH.GT.1) CALL YRTEST(NMYL,86,NMYF,IY1983,INERR)
3281.5 IF(NSTR.LT.10.OR.NSTR.GT.50) CALL QUITER(0.,NSTR,33,INERR)
3281.52 C
3281.54 C Store new stringency information
3281.56 C
3281.58 NEWSTR(1,IM) = NVEH
3281.6 NEWSTR(2,IM) = NMYF
3281.62 NEWSTR(3,IM) = NMYL
3281.64 NEWSTR(4,IM) = NSTR
3281.66 C
3281.68 61 CONTINUE
3281.7 C
3281.72 C Check the MYR group ranges for overlaps
3281.74 C
3281.76 DO 62 IM=1,ISTRIN
3281.78 DO 62 IN=1,ISTRIN
3281.8 IF(NEWSTR(1,IM).NE.NEWSTR(1,IN)) GOTO 62
3281.82 IF(IM.EQ.IN) GOTO 62
3281.84 IF(NEWSTR(3,IM).LT.NEWSTR(2,IN)) GOTO 62
3281.86 IF(NEWSTR(3,IM).LT.NEWSTR(3,IN))
3281.88 * CALL QUITER(0.,NEWSTR(3,IM),86,INERR)
3281.9 62 CONTINUE
3281.92 C
3283 C Anti-tampering program => get parameters and effectiveness rates.
3284 C
3285 70 IF(ATPFLG.EQ.2) CALL GETATP(INERR,&99)
3286 C
3287 IF(ICEVFG.LT.3) GOTO 90
3288 C
3289 C Read trips/day and miles/day.
3290 C
3291 IF(IPROMT.EQ.2) WRITE(IOUASK,270)
3292 270 FORMAT('0','Enter average trips/day')
3293 READ(IOUGEN,170,END=99) USRTPD
3294 170 FORMAT(8F5.1)
3295 C
3296 DO 80 IV=1,MAXVEH
3297 IF(USRTPD(IV).LT.0.) CALL QUITER(USRTPD(IV),0,54,INERR)
3298 80 CONTINUE
3299 C
3300 IF(IPROMT.EQ.2) WRITE(IOUASK,280)

```



```
3301      280 FORMAT('0','Enter average miles/day')
3302      READ(IOUGEN,170,END=99) USRMPD
3303      C
3304      DO 85 IV=1,MAXVEH
3305      IF(USRMPD(IV).LT.0.) CALL QUITER(USRMPD(IV),0,55,INERR)
3306      85 CONTINUE
3307      CALL CCEVAX
3308      90 RETURN
3309      C
3310      C EOF on any attempted read => take alternate return 1 => run aborts.
3311      C
3312      99 RETURN 1
3313      END
```

```

11000          SUBROUTINE QUITER(RVALUE,IVALUE,MESSAG,INERR)
11000.3        C
11000.6        C   This Subroutine has been modified to use multiple stringencies
11001          C
11002          C   QUITER prints error and warning messages on unit IOUERR.
11003          C
11004          C   Called by CONSEC, CRANKC, DIURNL, EFCALX, GETATP, HOTSOK, IERPTR,
11005          C           IEXMPT, IGEPTR, IGLPTR, IGPPTR, IGSFPT, IGTPT, IGUPTR,
11006          C           ISPPTR, ISPPT8, ITCPTR, NEWERQ, ONESEC, PARSEC, TFCALX,
11007          C           TPD, XMPD and YRTEST.
11008          C
11009          C   Input on call:
11010          C
11011          C       parameter list: RVALUE,IVALUE,MESSAG,INERR
11012          C       common blocks:
11013          C       /IOUCOM/ IOUREP,IOUERR,IOUASK
11014          C       /NEWCOM/ NEWPAR
11015          C       /NEWEQU/ MAXEQU
11016          C       /YEARS4/ IY1941,IY1960,IY2020
11017          C
11018          C   Output on return:
11019          C
11020          C       parameter list: INERR
11021          C
11022          C   Warning: there is a conditional branch to STOP at statement number 98.
11023          C
11024          C   Local array subscripts:
11025          C
11026          C   IOBMSG(5) - IOBMSG ( ICH )
11027          C   NAMFLG(15) - NAMFLG ( ICH )
11028          C   NAMFNC(16) - NAMFNC ( ICH )
11029          C   NAMVEH(8) - NAMVEH ( IV )
11030          C
11031          C   Local variable / array dictionary:
11032          C
11033          C   Name      Type      Description
11034          C   -----
11035          C   IOBMSG    I        character string vector: 'out of bounds for'
11036          C   MAXMES    I        maximum message code value ( = 83 in MOBILE3 release version)
11037          C   MCODE     I        = MESSAG = message code, unless < 0 or > MAXMES => = 1
11038          C   NAMFLG    R*8      control flag names + 'Unknown'
11039          C   NAMFNC    R*8      function names (to identify subprogram source of error)
11040          C   NAMVEH    R*8      vehicle type names
11041          C
11042          C   Notes:
11043          C
11044          C   The error message for the new function ITCPTR was installed.
11045          C   Error/warning code related to INFLAG, TRKFLG & UNFFLG removed and replaced
11046          C   with code for TAMFLG & ATPFLG. Error code 73 refers to ITEST, not IOPTN.
11047          C   Error codes 82 (refers to ICUTS) and 83 (refers to interpolated altitude)
11048          C   added. MAXMES accordingly was increased to 83, leaving MESSAG values
11049          C   84-97 available for future additions to QUITER's messages.
11050          C
11051          C
11052          C       COMMON /IOUCOM/ IOUAER,IOUIMD,IOUGEN,IOUREP,IOUERR,IOUASK
11053          C       COMMON /NEWCOM/ NEWPAR(5,100),BERNEW(2,100),NEWFIT(100),NEWCT
11054          C       COMMON /NEWEQU/ MAXEQU
11055          C       COMMON /YEARS4/ IY1941,IY1960,IY2020
11056          C

```

```

11057      DIMENSION IOBMSG(5)
11058      C
11059      REAL*8 NAMFLG(15),NAMVEH(8),NAMFNC(16)
11060      C
11061      DATA NAMFLG/
11062      *      ' Unknown' ,
11063      *      ' IPROMT ' ,
11064      *      ' TAMFLG ' ,
11065      *      ' SPDFLG ' ,
11066      *      ' VMFLAG ' ,
11067      *      ' MYMRFG ' ,
11068      *      ' NEWFLG ' ,
11069      *      ' IMFLAG ' ,
11070      *      ' ALHFLG ' ,
11071      *      ' ATPFLG ' ,
11072      *      ' IFORM ' ,
11073      *      ' PRTFLG ' ,
11074      *      ' ICEVFG ' ,
11075      *      ' IDLFLG ' ,
11076      *      ' NHMFLG ' /
11077      C
11078      DATA NAMVEH/
11079      *      ' LDGV ' ,
11080      *      ' LDGT1 ' ,
11081      *      ' LDGT2 ' ,
11082      *      ' HDGV ' ,
11083      *      ' LDDV ' ,
11084      *      ' LDDT ' ,
11085      *      ' HDDV ' ,
11086      *      ' MC ' /
11087      C
11088      DATA NAMFNC/
11089      *      ' HOTSOK ' ,
11090      *      ' TPD ' ,
11091      *      ' DIURNL ' ,
11092      *      ' XMPD ' ,
11093      *      ' CRANKC ' ,
11094      *      ' IGEPTR ' ,
11095      *      ' IGUPTR ' ,
11096      *      ' IGLPTR ' ,
11097      *      ' IGTPTT ' ,
11098      *      ' IGPPTT ' ,
11099      *      ' IERPTR ' ,
11100      *      ' ISPPTR ' ,
11101      *      ' ISPPT8 ' ,
11102      *      ' IEXMPT ' ,
11103      *      ' ITCPTR ' ,
11104      *      ' IGSFPT ' /
11105      C
11106      DATA IOBMSG/
11107      *      ' ou','t of',' bou','nds ','for ' /
11108      C
11109      DATA MAXMES/86/
11110      C
11111      MCODE=MESSAG
11112      C
11113      C Trap unknown errors.
11114      C
11115      IF(MCODE.LT.1.OR.MCODE.GT.MAXMES) MCODE=1

```

```

11116 C
11117 C Test for warnings.
11118 C
11119 IF(MCODE.NE.16.AND.MCODE.NE.21.AND.MCODE.NE.22.AND.MCODE.NE.31
11120 * .AND.MCODE.NE.49.AND.MCODE.NE.52.AND.MCODE.NE.53
11121 * .AND.MCODE.NE.56.AND.MCODE.NE.59.AND.MCODE.NE.71)
11122 * WRITE(IOUSERR,300)
11123 300 FORMAT('-',T2,'*** Error:')
11124 C
11125 C Branch to the appropriate error / warning message.
11126 C
11127 GOTO(
11128 * 10, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11,
11129 * 11, 11, 11, 11, 11, 16, 17, 18, 19, 20,
11130 * 21, 22, 23, 24, 25, 26, 27, 27, 29, 30,
11131 * 31, 32, 33, 34, 35, 36, 37, 38, 39, 40,
11132 * 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
11133 * 51, 52, 53, 54, 55, 56, 57, 58, 59, 60,
11134 * 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
11135 * 71, 72, 73, 74, 75, 76, 77, 78, 79, 80,
11136 * 81, 82, 83, 84, 85, 86
11137 * ) ,MCODE
11138 C
11139 10 WRITE(IOUSERR,310) MESSAG,NAMFLG(MCODE)
11140 310 FORMAT('+',10X,'Message code ',I4,A8)
11141 GOTO 98
11142 11 WRITE(IOUSERR,311) IVALUE,IOBMSG,NAMFLG(MCODE)
11143 311 FORMAT('+',10X,I4,5A4,'flag',A8)
11144 IF(MCODE.EQ.2) WRITE(IOUSERR,312)
11145 312 FORMAT(' ','Prompt/mode type (1 to 4) must be corrected before',
11146 * ' your next run.')
11147 GOTO 98
11148 16 WRITE(IOUSERR,316) RVALUE
11149 316 FORMAT(' ','Warning: ',G10.3,' speed reduced to 55 m.p.h.',
11150 * ' maximum')
11151 GOTO 99
11152 17 WRITE(IOUSERR,317) RVALUE,IOBMSG
11153 317 FORMAT('+',10X,G10.3,5A4,'VMTMIX (0. to 1.)')
11154 GOTO 98
11155 18 WRITE(IOUSERR,318) RVALUE
11156 318 FORMAT('+',10X,G10.3,' sum of VMTMIX is not equal to 1.')
11157 GOTO 98
11158 19 WRITE(IOUSERR,319) RVALUE
11159 319 FORMAT('+',10X,G10.3,' negative model year mileage')
11160 GOTO 98
11161 20 WRITE(IOUSERR,320) RVALUE
11162 320 FORMAT('+',10X,G10.3,' negative model year registration')
11163 GOTO 98
11164 21 WRITE(IOUSERR,321) RVALUE
11165 321 FORMAT(' ','Warning: ',G10.3,' registration with zero mileage')
11166 GOTO 99
11167 22 WRITE(IOUSERR,322) RVALUE
11168 322 FORMAT(' ','Warning: ',G10.3,' mileage with zero registration')
11169 GOTO 99
11170 23 WRITE(IOUSERR,323) IVALUE,IOBMSG
11171 323 FORMAT('+',10X,I4,5A4,'e.f. changes (1 to 100 pairs)')
11172 GOTO 98
11173 24 WRITE(IOUSERR,324) IVALUE,IOBMSG
11174 324 FORMAT('+',10X,I4,5A4,'region (1,2,3 only)')

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```
11175      GOTO 98
11176      25 WRITE(IOUSERR,325) IVALUE,IOBMSG
11177      325 FORMAT('+',10X,I4,5A4,'vehicle type (1 to 8)')
11178      GOTO 98
11179      26 WRITE(IOUSERR,326) IVALUE,IOBMSG
11180      326 FORMAT('+',10X,I4,5A4,'pollutant (1 to 3)')
11181      GOTO 98
11182      27 WRITE(IOUSERR,327) IVALUE,IOBMSG,IY1941,IY2020
11183      327 FORMAT('+',10X,I4,5A4,'year (',I4,' to ',I4,')')
11184      GOTO 98
11185      29 WRITE(IOUSERR,329)
11186      329 FORMAT('+',10X,' last year cannot be less than first year')
11187      GOTO 98
11188      30 WRITE(IOUSERR,330) RVALUE
11189      330 FORMAT('+',10X,G10.3,' intercept must be positive')
11190      GOTO 98
11191      31 WRITE(IOUSERR,331) RVALUE
11192      331 FORMAT(' ','Warning: ',G10.3,' negative slope for ageing vehicle')
11193      GOTO 99
11194      32 WRITE(IOUSERR,327) IVALUE,IOBMSG,IY1960,IY2020
11195      GOTO 98
11196      33 WRITE(IOUSERR,333) IVALUE,IOBMSG
11197      333 FORMAT('+',10X,I4,5A4,'stringency (10 to 50)')
11198      GOTO 98
11199      34 WRITE(IOUSERR,334) IVALUE,IOBMSG
11200      334 FORMAT('+',10X,I4,5A4,'mechanics training (1 to 2)')
11201      GOTO 98
11202      35 WRITE(IOUSERR,335) IVALUE,IOBMSG,IY1941,IY2020
11203      335 FORMAT('+',10X,I4,5A4,'MODYR1 (',I4,' to ',I4,')')
11204      GOTO 98
11205      36 WRITE(IOUSERR,336) IVALUE,IOBMSG,IY1941,IY2020
11206      336 FORMAT('+',10X,I4,5A4,'MODYR2 (',I4,' to ',I4,')')
11207      GOTO 98
11208      37 WRITE(IOUSERR,337)
11209      337 FORMAT('+',10X,' MODYR1 cannot be greater than MODYR2')
11210      GOTO 98
11211      38 WRITE(IOUSERR,327) IVALUE,IOBMSG,IY1960,IY2020
11212      GOTO 98
11213      39 WRITE(IOUSERR,339) RVALUE
11214      339 FORMAT('+',10X,G10.3,' speed must be positive')
11215      GOTO 98
11216      40 WRITE(IOUSERR,340) RVALUE
11217      340 FORMAT('+',10X,G10.3,' valid temperature is 0-110 deg. (F)')
11218      GOTO 98
11219      41 WRITE(IOUSERR,341) RVALUE,IOBMSG
11220      341 FORMAT('+',10X,G10.3,5A4,'PCCN (0. to 100.)')
11221      GOTO 98
11222      42 WRITE(IOUSERR,342) RVALUE,IOBMSG
11223      342 FORMAT('+',10X,G10.3,5A4,'PCHC (0. to 100.)')
11224      GOTO 98
11225      43 WRITE(IOUSERR,343) RVALUE,IOBMSG
11226      343 FORMAT('+',10X,G10.3,5A4,'PCCC (0. to 100.)')
11227      GOTO 98
11228      44 WRITE(IOUSERR,344) RVALUE,IOBMSG
11229      344 FORMAT('+',10X,G10.3,5A4,'AC (0. to 1.)')
11230      GOTO 98
11231      45 WRITE(IOUSERR,345) RVALUE,IOBMSG
11232      345 FORMAT('+',10X,G10.3,5A4,'extra load (0. to 1.)')
11233      GOTO 98
```

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11234      46 WRITE(IOUERR,346) RVALUE,IOBMSG
11235      346 FORMAT('+',10X,G10.3,5A4,'trailers (0. to 1.)')
11236          GOTO 98
11237      47 WRITE(IOUERR,347) RVALUE,IOBMSG
11238      347 FORMAT('+',10X,G10.3,5A4,'humidity (20. to 140.)')
11239          GOTO 98
11240      48 WRITE(IOUERR,348) NAMVEH(IVALUE)
11241      348 FORMAT('+',10X,' there are no sales for vehicle ',A8)
11242          GOTO 98
11243      49 WRITE(IOUERR,349) RVALUE
11244      349 FORMAT(' ',Warning: ',G10.3,' MYR sum not = 1. (will normalize)')
11245          GOTO 99
11246      50 WRITE(IOUERR,350) RVALUE,IOBMSG
11247      350 FORMAT('+',10X,G10.3,5A4,'tampering rate intercept (up to 1.0)')
11248          GOTO 98
11249      51 WRITE(IOUERR,351) IVALUE,MAXEQU
11250      351 FORMAT('+',10X,'equation',I3,' causes more than',I3,
11251          *      ' allowed for any 1 reg/mode/pol.')
11252          GOTO 98
11253      52 WRITE(IOUERR,352) RVALUE
11254      352 FORMAT(' ',Warning: ',G10.3,' speed increased',
11255          *      ' to 5 m.p.h. minimum')
11256          GOTO 99
11257      53 WRITE(IOUERR,353)
11258      353 FORMAT('0','You must correct all flags before you run again.')
11259          GOTO 98
11260      54 WRITE(IOUERR,354) RVALUE
11261      354 FORMAT('+',10X,G10.3,' average trips/day cannot be negative')
11262          GOTO 98
11263      55 WRITE(IOUERR,355) RVALUE
11264      355 FORMAT('+',10X,G10.3,' average miles/day cannot be negative')
11265          GOTO 98
11266      56 WRITE(IOUERR,356)
11267      356 FORMAT(' ',Comment: A/C correction factor will be calculated.'
11268          *      '/' ',T11,'Value of inputted AC usage parameter is ignored.')
11269          GOTO 99
11270      57 WRITE(IOUERR,357)
11271      357 FORMAT('+',10X,'WB temp cannot be greater than DB temp')
11272          GOTO 98
11273      58 WRITE(IOUERR,358) RVALUE,IOBMSG
11274      358 FORMAT('+',10X,G10.3,5A4,'altitude (-200 to 10,000 ft.)')
11275          GOTO 98
11276      59 WRITE(IOUERR,359) IVALUE,(NEWPAR(IPAR,IVALUE),IPAR=1,3)
11277      359 FORMAT(' ',Warning: equation',I3,' zeroes all idle coefficients',
11278          *      '(and total) for IR=',I1,', IV=',I1,', IP=',I1)
11279          GOTO 99
11280      60 WRITE(IOUERR,360) RVALUE,INERR,NAMFNC(IVALUE)
11281      360 FORMAT('+',10X,G10.3,' default used for',I5,' in function',A8)
11282          GOTO 98
11283      61 WRITE(IOUERR,361) INERR,NAMFNC(IVALUE)
11284      361 FORMAT('+',10X,' default used for',I5,' in index function',A8)
11285          GOTO 98
11286      62 WRITE(IOUERR,362) IVALUE,IOBMSG
11287      362 FORMAT('+',10X,I4,5A4,'new e.f. region (1,2,3 only)')
11288          GOTO 98
11289      63 WRITE(IOUERR,363) RVALUE,IOBMSG
11290      363 FORMAT('+',10X,G10.3,5A4,'(0. <= PCHC+PCCC <= 100.)')
11291          GOTO 98
11292      64 WRITE(IOUERR,364) RVALUE,IOBMSG
```

```
11293 364 FORMAT('+',10X,G10.3,5A4,'(0. <= PCHC+PCCC-PCCN <= 100.)')
11294     GOTO 98
11295     65 WRITE(IOUSERR,365) IVALUE
11296 365 FORMAT('+',10X,' MYR of LDDV not equal to LDGV for JDX=',I2)
11297     GOTO 98
11298     66 WRITE(IOUSERR,366) IVALUE
11299 366 FORMAT('+',10X,' MYR of LDDT not equal to LDGT1 for JDX=',I2)
11300     GOTO 98
11301     67 WRITE(IOUSERR,367) NAMVEH(IVALUE)
11302 367 FORMAT('+',10X,' EFFTP>0. and GSF=0. for vehicle ',A8)
11303     GOTO 98
11304     68 WRITE(IOUSERR,368) NAMVEH(IVALUE)
11305 368 FORMAT('+',10X,' EFFTP<=0. and VMTIX>0. for vehicle ',A8)
11306     GOTO 98
11307     69 WRITE(IOUSERR,369) NAMVEH(IVALUE)
11308 369 FORMAT('+',10X,' EFIDLE>0. and GSF=0. for vehicle ',A8)
11309     GOTO 98
11310     70 WRITE(IOUSERR,370) NAMVEH(IVALUE)
11311 370 FORMAT('+',10X,' EFIDLE<=0. and VMTIX>0. for vehicle ',A8)
11312     GOTO 98
11313     71 WRITE(IOUSERR,371) IOUREP,IOUSERR,IOUSASK
11314 371 FORMAT(' ','Comment: Current output unit numbers are',
11315     * ' IOUREP=',I1,' IOUERR=',I1,' IOUASK=',I1)
11316     GOTO 99
11317     72 WRITE(IOUSERR,372) IVALUE,IOBMSG
11318 372 FORMAT('+',10X,I4,5A4,'I/M vehicle type (1 to 4)')
11319     GOTO 98
11320     73 WRITE(IOUSERR,373) IVALUE,IOBMSG
11321 373 FORMAT('+',10X,I4,5A4,'short test type flag (1 to 3)')
11322     GOTO 98
11323     74 WRITE(IOUSERR,374) IVALUE,IOBMSG
11324 374 FORMAT('+',10X,I4,5A4,'new I/M data flag (1 to 4)')
11325     GOTO 98
11326     75 WRITE(IOUSERR,375) IVALUE,IOBMSG
11327 375 FORMAT('+',10X,I4,5A4,'anti-tampering program start year')
11328     GOTO 98
11329     76 WRITE(IOUSERR,376) IVALUE,IOBMSG
11330 376 FORMAT('+',10X,I4,5A4,'anti-tampering program 1st model year')
11331     GOTO 98
11332     77 WRITE(IOUSERR,377) IVALUE,IOBMSG
11333 377 FORMAT('+',10X,I4,5A4,'anti-tampering program last model year')
11334     GOTO 98
11335     78 WRITE(IOUSERR,378) IVALUE,IOBMSG
11336 378 FORMAT('+',10X,I4,5A4,'anti-tampering vehicle type (1 to 2)')
11337     GOTO 98
11338     79 WRITE(IOUSERR,379) RVALUE,IOBMSG
11339 379 FORMAT('+',10X,G10.3,5A4,'evap ATP effectiveness rate (0. to 1.)')
11340     GOTO 98
11341     80 WRITE(IOUSERR,380) RVALUE,IOBMSG
11342 380 FORMAT('+',10X,G10.3,5A4,'exh ATP effectiveness rate (0. to 1.)')
11343     GOTO 98
11344     81 WRITE(IOUSERR,381) RVALUE,IOBMSG
11345 381 FORMAT('+',10X,G10.3,5A4,'AER matrix file column sum (0. to 1.)')
11346     GOTO 98
11347     82 WRITE(IOUSERR,382) IVALUE,IOBMSG
11348 382 FORMAT('+',10X,I4,5A4,'1981+ vehicles cutpoints flag (1 to 3)')
11349     GOTO 98
11350     83 WRITE(IOUSERR,383) RVALUE,IOBMSG
11351
```

```
11352 C Use F, not G, format because PARSEC check of entered altitude aborts
11353 C scenario if altitude < -200 or > 10000 feet (see QUITER message 58).
11354 C
11355 383 FORMAT('+',10X,F6.0,5A4,'altitude (region = 3 => alt. < 1500.)')
11355.1 GOTO 98
11355.2 84 WRITE(IOUERR,384) IVALUE,IOBMSG
11355.3 384 FORMAT('+',10X,I4,5A4,'I/M stringency for classes 1-3 only')
11355.4 GOTO 98
11355.5 85 WRITE(IOUERR,385) IVALUE
11355.6 385 FORMAT('+',10X,I4,' is inappropriate first MYR for stringency')
11355.7 GOTO 98
11355.8 86 WRITE(IOUERR,386) IVALUE
11355.9 386 FORMAT('+',10X,I4,' is inappropriate last MYR for stringency')
11356 C
11357 C Messages 60 and 61 produce excessive output if not stopped here.
11358 C
11359 98 IF(MCODE.EQ.1.OR.MCODE.EQ.2.OR.MCODE.EQ.53.OR.MCODE.EQ.60
11360 * .OR.MCODE.EQ.61) STOP
11361 INERR=INERR+1
11362 C
11363 99 RETURN
11364 END
```



```

40000          FUNCTION PCLEFT(MY,ICY,IP,IV)
40000.09 C
40000.18 C   This Subroutine has been modified to use multiple stringencies
40000.27 C
40001 C
40002 C   PCLEFT determines the basic emission factor multiplicative adjustment
40003 C   ( = percentage left of BEF = PCLEFT ) for the effects of an inspection /
40004 C   maintenance (I/M) program, after checking whether or not I/M applies to the
40005 C   factor being computed by the calling function.
40006 C
40007 C   Called by BEF.
40008 C
40009 C   Input on call:
40010 C
40011 C       parameter list: MY,ICY,IP,IV
40012 C       common blocks:
40013 C         /FLAGS2/ IMFLAG
40014 C         /IMCR12/ CRED12
40015 C         /IMCR4P/ CRED4P
40016 C         /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
40017 C         /IMPAR2/ ILDT,ITEST,ICUTS
40018 C
40019 C   Output on return:
40020 C
40021 C       function: PCLEFT
40022 C
40023 C   Local array subscripts:
40024 C
40025 C   MYGIM(10,3) - MYGIM ( ITECH, IVIM )
40026 C
40027 C   Local variable / array dictionary:
40028 C
40029 C   Name      Type      Description
40030 C   -----
40031 C   AGE1ST    I        age of the vehicle at first inspection
40032 C   BY        I        benefit year for technology 1 or 2 vehicle
40033 C   IBY       I        benefit year for technology 4 plus vehicle
40034 C   IREM      I        remainder = stringency - greatest multiple of 10 < stringency
40035 C   ISTRN     I        stringency index into technology 1 or 2 credits array
40036 C   ITECH     I        emissions control technology as f(model year, vehicle type)
40037 C   MYGIM     I        model year groups for I/M pollution control technologies
40037.5 C   NSTR      I        local stringency for MYR/CLASS grouping
40038 C   REM       R        IREM converted to REAL value
40039 C
40040 C   Notes:
40041 C
40042 C   PCLEFT has been completely rewritten. Credits are now read in and stored
40043 C   as type REAL. Technology IV+ modeling is changed. For example, there are
40044 C   7 technology categories covered (4 thru 10) and IOPTN has been replaced by
40045 C   IOPTN and ICUTS.
40046 C
40047 C
40048 C       INTEGER ALHFLG,ATPFLG
40049 C
40050 C       COMMON /FLAGS2/ MYMRFG,NEWFLG,IMFLAG,ALHFLG,ATPFLG
40051 C       COMMON /IMCR12/ CRED12(19,20,5,2,2)
40052 C       COMMON /IMCR4P/ CRED4P(19,2,7,3,3)
40053 C       COMMON /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
40054 C       COMMON /IMPAR2/ ILDT,ITEST,ICUTS,NUDATA,NLIM,IMNAME(20,9)

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40054.2      COMMON /IOUCOM/ IOUAER, IOUIMD, IOUGEN, IOUREP, IOUERR, IOUASK
40054.5      COMMON /NEWTOO/ NEWSTR(4,100)
40055      C
40056      INTEGER BY, IBY, AGE1ST, MYGIM(10,3)
40057      C
40058      C ITECH = 4 does not occur for LDGT1/2 => repeat last year (1983) of previous
40059      C my group => value 4 will never be selected by technology search loop.
40060      C
40061      DATA MYGIM/
40062      C ITECH: 1      2      3      4      5      6      7      8      9      10
40063      C LDGV
40064      * 1974, 1979, 1980, 1981, 1982, 1983, 1984, 1986, 1989, 2020,
40065      C LDGT1
40066      * 1974, 1980, 1983, 1983, 1984, 1985, 1986, 1987, 1989, 2020,
40067      C LDGT2
40068      * 1978, 1980, 1983, 1983, 1984, 1985, 1986, 1987, 1989, 2020/
40069      C
40070      C Initialize PCLEFT to "no reduction" value = 1.0.
40071      C
40072      PCLEFT = 1.0
40073      C
40074      C If factor being calculated by BEF is not covered by I/M, then RETURN.
40075      C
40076      IF(IMFLAG.EQ.1.OR.IP.EQ.3.OR.IV.GT.3.OR.
40077      * (IV.GT.1.AND.ILDT.EQ.1).OR.
40078      * (IV.EQ.3.AND.ILDT.EQ.2).OR.
40079      * (IV.EQ.2.AND.ILDT.EQ.3).OR.
40080      * ICY.EQ.MY.OR.ICY.LE.ICYIM.OR.
40081      * MY.LT.MODYR1.OR.MY.GT.MODYR2) GOTO 99
40082      C
40083      C Find the benefit year:
40084      C
40085      BY=ICY-ICYIM
40086      IF(MY.GT.ICYIM) BY=ICY-MY
40087      IF(BY.GT.19) BY=19
40088      C
40089      C Find the age of the vehicle at first inspection.
40090      C
40091      AGE1ST=1
40092      IF(MY.LT.ICYIM) AGE1ST=ICYIM-MY+1
40093      C
40094      C Determine technology by model year and vehicle type. Note that because
40095      C MYGIM(10,IV) = 2020 for IV=1,2,3 = ICY upper bound (see PARSEC), a match in
40096      C the technology serch loop has to occur. As with all the my index arrays in
40097      C MOBILE3, insure in any my changes that 2020 remains a my group upper bound.
40098      C
40099      DO 10 ITECH=1,10
40100      IF(MY.LE.MYGIM(ITECH,IV)) GOTO 20
40101      10 CONTINUE
40102      C
40103      C Technology 3 does not exist as a separate category in the credits arrays.
40104      C The percent reduction for technology 3 = that for technology 2.
40105      C
40106      20 IF(ITECH.EQ.3) ITECH=2
40107      C
40108      C Select correct I/M credits for TECH 1 & 2.
40109      C Interpolate between 10,20,30,40 & 30% stringency.
40110      C
40111      IF(ITECH.GT.2) GOTO 40

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40111.05 C
40111.1 C Determine which stringency to use for this MYR/CLASS grouping
40111.15 C
40111.2 NSTR = 0
40111.25 DO 21 IM=1,ISTRIN
40111.3 NMYF = NEWSTR(2,IM)
40111.35 NMYL = NEWSTR(3,IM)
40111.4 IF(MY.GE.NMYF.AND.
40111.45 * MY.LE.NMYL.AND.
40111.5 * IV.EQ.NEWSTR(1,IM)) NSTR = NEWSTR(4,IM)
40111.55 21 CONTINUE
40111.6 C
40111.65 C Check for missing stringencies
40111.7 C
40111.75 IF(NSTR.LE.0.AND.IP.EQ.1) WRITE(IOUERR,121) MY,IV,NSTR
40111.8 121 FORMAT(' Warning: I/M stringency for ',I4,' class ',I1,' = ',I2)
40111.85 IF(NSTR.LT.10) GOTO 99
40111.9 C
40113 22 IREM=NSTR-(NSTR/10)*10
40114 REM=IREM*.1
40115 ISTRN=(NSTR-IREM)/10
40116 C
40117 C Without mechanic training
40118 C
40119 IF(IMTFLG.EQ.2) GOTO 30
40120 PCRED=CRED12(BY,AGE1ST,ISTRN,ITECH,IP)
40121 IF(ISTRN.LT.5.AND.IREM.GT.0) PCRED=
40122 * (CRED12(BY,AGE1ST,ISTRN+1,ITECH,IP)-PCRED)*REM+PCRED
40123 GOTO 50
40124 C
40125 C With mechanic training
40126 C
40127 30 PCRED=CRED12(20-BY,21-AGE1ST,ISTRN,ITECH,IP)
40128 IF(ISTRN.LT.5.AND.IREM.GT.0) PCRED=
40129 * (CRED12(20-BY,21-AGE1ST,ISTRN+1,ITECH,IP)-PCRED)*REM+PCRED
40130 GOTO 50
40131 C
40132 C Select I/M credits for TECH 4-10 vehicles.
40133 C
40134 C ITEST = 1 : idle test
40135 C 2 : 2500 rpm idle test
40136 C 3 : loaded test
40137 C
40138 C ICUTS = 1 : 0.5% ICO / 100 ppm IHC
40139 C 2 : 1.2% ICO / 220 ppm IHC
40140 C 3 : 3.0% ICO / 300 ppm IHC
40141 C
40142 C
40143 C IP=1 (HC emissions)
40144 C IP=2 (CO emissions)
40145 C
40146 40 IBY = BY + AGE1ST - 1
40147 C
40148 PCRED=CRED4P(IBY,IP,ITECH-3,ICUTS,ITEST)
40149 C
40150 C Set I/M benefit.
40151 C
40152 50 PCLEFT = 1.0 - PCRED
40153 C
40154 99 RETURN
40155 END

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62000          SUBROUTINE OUTIMP
62000.3        C
62000.6        C   This Subroutine has been modified to use multiple stringencies
62001          C
62002          C   OUTIMP prints the I/M program parameters and the alternate I/M credits
62003          C   set name, if it was entered.
62004          C
62005          C   Called by OUTHD3 and OUTHD4.
62006          C
62007          C   Input on call:
62008          C
62009          C   common blocks:
62010          C   /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
62011          C   /IMPAR2/ ILDT,ITEST,ICUTS,NLIM,IMNAME
62012          C   /IOUCOM/ IOUREP
62013          C   /STRING/ NOYES,COMMA
62014          C
62015          C   Local array subscripts:
62016          C
62017          C   CUTCO(3)   -   CUTCO ( ICUTS )
62018          C   CUTHC(3)   -   CUTHC ( ICUTS )
62019          C   TTYPE(4,3) -   TTYPE ( ICH, ITEST )
62020          C
62021          C   Local variable / array dictionary:
62022          C
62023          C   Name      Type      Description
62024          C   -----
62025          C   CUTCO      R        labels for testing cuts for CO, in percents
62026          C   CUTHC      R        labels for testing cuts for HC, in ppm IHC
62027          C   ICO         I        ICO label
62028          C   LDGT         I        LDGT label
62029          C   LDGV         I        LDGV label
62030          C   ONE         R        number 1 as character
62031          C   PPMIHC     R*8      ppm IHC label
62032          C   SLASH      R        character '/'
62033          C   TTYPE      R        test type description
62034          C   TWO         R        number 2 as character
62035          C
62036          C   Notes:
62037          C
62038          C   Output formats were updated to reflect new I/M methodology, including
62039          C   replacing IOPTN with ITEST and ICUTS.
62040          C
62041          C
62042          C   COMMON /IMPAR1/ ICYIM,ISTRIN,IMTFLG,MODYR1,MODYR2
62043          C   COMMON /IMPAR2/ ILDT,ITEST,ICUTS,NUDATA,NLIM,IMNAME(20,9)
62044          C   COMMON /IOUCOM/ IOUAER,IOUIMD,IOUGEN,IOUREP,IOUERR,IOUASK
62044.5        C   COMMON /NEWT00/ NEWSTR(4,100)
62045          C   COMMON /STRING/ NOYES(2),COMMA,PERIOD
62046          C
62047          C   DIMENSION TTYPE(4,3),CUTCO(3),CUTHC(3)
62048          C   REAL*8 PPMIHC
62049          C
62050          C   DATA LDGV,LDGT,ONE,TWO/'LDGV','LDGT','1','2' /
62051          C   DATA TTYPE/'Idle',' ',' ',' ',' ',' ',' ',' ',' ',' ' /
62052          C   2          '2500',' rpm',' / I','dle ' /
62053          C   3          'Load','ed /',' Idl','e ' /
62054          C   DATA CUTCO/'0.5%','1.2%','3.0%'/,ICO/' ICO'/
62055          C   DATA SLASH/' / ' /

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62056      DATA CUTHC/' 100',' 220',' 300'/,PPMIHC/' ppm IHC'/
62057      C
62058      WRITE(IOUREP,200) ICMYIM,ISTRIN,NOYES(IMTFLG),MODYR1,MODYR2
62059      200 FORMAT('0','I/M program selected: '/
62060      *      '0',' Start year (January 1):           ',I4/
62061      *      ' ',' Number of input stringencies:       ',I2,/
62062      *      ' ',' Mechanic training program?:         ',A4/
62063      *      ' ',' First model year covered:           ',I4/
62064      *      ' ',' Last model year covered:            ',I4)
62065      C
62066      IF(ILDT.EQ.1)WRITE(IOUREP,210) LDGV
62067      IF(ILDT.EQ.2)WRITE(IOUREP,210) LDGV,COMMA,LDGT,ONE
62068      IF(ILDT.EQ.3)WRITE(IOUREP,210) LDGV,COMMA,LDGT,TWO
62069      IF(ILDT.EQ.4)WRITE(IOUREP,210) LDGV,COMMA,LDGT,ONE,COMMA,LDGT,TWO
62070      210 FORMAT(' ',' Vehicle types covered:           ',
62071      *      'A4,A2,A4,A1,A2,A4,A1)
62072      C
62073      WRITE(IOUREP,220) (TTYE(ICH,ITEST),ICH=1,4),
62074      *      CUTCO(ICUTS),ICO,SLASH,CUTHC(ICUTS),PPMIHC
62075      220 FORMAT(' ',' 1981 & later MYR test type:       ',4A4/
62076      *      ' ',' 1981 & later MYR test cutpoints:     ',2A4,A2,A4,A8)
62076.1    C
62076.2    C      Output of stringencies input
62076.3    C
62076.4      WRITE(IOUREP,230)
62076.5      DO 21 IM=1,ISTRIN
62076.6      WRITE(IOUREP,221) (NEWSTR(J,IM),J=1,4)
62076.7      221 FORMAT(' Vehicle Class ',I1,' - Model Years ',I4,' through ',
62076.8      *I4,' use ',I2,'% Stringency')
62076.9      21 CONTINUE
62077      C
62078      IF(NLIM.EQ.0) GOTO 99
62079      WRITE(IOUREP,230).
62080      230 FORMAT(' ')
62081      DO 10 LINES=1,NLIM
62082      WRITE(IOUREP,240) (IMNAME(N,LINES),N=1,20)
62083      240 FORMAT(' ',20A4)
62084      10 CONTINUE
62085      C
62086      99 RETURN
62087      END

```