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SECTION 2

GENERAL INFORMATION

Original Release - 02/13/87

1.0 Subject

General Information

2.0 Scope

This general information document provides information not suited to be included in any other section or information which would have to be included in a number of places.

3.0 PFI Hardware

3.1 Inputs

3.1.1 Oxygen Sensor

The oxygen sensor signal is a voltage ranging from low level to high level as the air/fuel ratio ranges from lean to rich.

3.1.2 Coolant Temperature

The coolant temperature is sensed by a thermistor and is determined as a percentage of the A/D reference voltage.

3.1.3 Throttle Position

The throttle position sensor input is a percent of the A/D reference voltage per a percent of full scale throttle travel.

3.1.4 Engine RPM

Reference pulses input from the HEI module or direct fire module (same as CCCI) are used to compute engine RPM.

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3.1.5 Vehicle Speed

A Vehicle Speed Sensor (VSS) provides a signal which changes from low level to high level 2002 times per mile if optical VSS sensor is used or 4004 times per mile if magnetic VSS sensor is used. The time between each of these pulses is used to compute vehicle speed in MPH.

3.1.6 Diagnostic Input

This signal is used to enable the factory test mode of operation.

3.1.7 4th Gear Switch

This signal is used to let the ECM know when the transmission is in high gear. The switch is open when in high gear.

3.1.8 3rd Gear Switch

This signal lets the ECM know when the transmission is in third gear. The switch is open when in third gear.

3.1.9 2nd Gear Switch

This signal lets the ECM know when the transmission is in 2nd gear. The switch is open when in second gear.

3.1.10 Air Conditioner Switch

This signal comes from a normally open switch to ignition which is closed when air conditioning is requested.

3.1.11 Cruise Engaged

This input is compatible with an electronic switch to ground.

3.1.12 Power Steering Pressure Switch

This input comes from a normally closed switch to ignition. The switch is open when a power steering 'cramp' is present.

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3.1.13 Park/Neutral Switch

This input comes from a normally open switch to ground, the switch is closed to ground when in park/neutral.

3.1.14 Frequency Mass Air Flow Sensor

This input is a 2K-10192 Hz frequency based on air flow.

3.1.15 Air Temperature Sensor

The air temperature is sensed by a thermistor and is determined as a percentage of the A/D reference voltage.

3.1.16 ESC Retard

This signal comes into the ECM as an F.M. signal and is filtered for a 6 Khz bandwidth signal by the SNEF.

3.1.17 Cam Input

This input from the computer controlled coiled ignition (CCCI) module is processed inside the ECM to synchronize the sequential operation.

3.2 Outputs

3.2.1 EST/Bypass

These outputs are used in conjunction with the CCCI module or HEI module for the electronic spark timing algorithm.

3.2.2 Check Engine Light

This output is used to flag a malfunction within the system.

3.2.3 Idle Air Control Motor Outputs

Four outputs are provided to control the IAC stepper motor.

3.2.4 Injector Driver Outputs

3.2.5 Solenoid Outputs

Torque Converter Clutch
Fan 1 & Fan 2
Cannister Purge
Exhaust Gas Recirculation (3 Outputs)
A/C Clutch
Engine Hot Light
4 Spare Solenoid Outputs

3.2.6 Fuel Pump Relay Driver

3.2.7 Bidirectional UART Serial Data

3.2.8 Air Conditioner Clutch Interface to Power Module

4.0 PFI Software

4.1 Coolant Temperature (COOLDEG)

Due to the nature of the transducer interface configuration and the characteristics of the temperature sensing thermistor, the A/D conversion is non-linear with coolant temperature. ROM tables *FCLT348* and *FCLT4K* linearize coolant temperature to the equation COOLDEG = (Deg C + 40) * 256/192. This provides a coolant range from -40 to +152 Deg C.

4.1.1 Dual Coolant Temperature Pull-up Logic

Software has the capability to switch between a 348 ohm pull-up and a 3998 ohm pull-up if the system is not operating in back-up fuel. The software controlling this pull-up is described below.

- Initialized to 3998 ohm pull-up on power-up
- Switches to 348 ohm pull-up once temperature exceeds 50 Deg C and COP2 has been toggled for at least 75 msec.
- Switches to 3998 ohm pull-up if temperature drops to or below 39.5 Deg. C. or software has stopped toggling COP2.

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4.1.2 Filtered Coolant Temperature

Coolant temperature is filtered every 100 msec with *KFILTNCT* specifying the filter coefficient.

4.2 Oxygen Sensor Input Voltage

The relationship between the oxygen sensor A/D value and the actual oxygen sensor input voltage is given by the following equation.

O2AD = VIN * 1152/VREF = VIN * 225.88 (nominal)

Where:	O2AD	=	Oxygen sensor voltage in A/D counts
	VIN	=	Oxygen sensor voltage
	VREF	=	A/D reference voltage (5.1 volts nominal)

This provides a usable range of oxygen sensor voltages from 0 to 1.1289V with a resolution of 4.427 mV when the reference voltage is 5.1V.

4.2.1 Filtered Oxygen Sensor

Oxygen sensor voltage is filtered each 12.5 msec with *KADO2AF* specifying the filter coefficient. The filtered value of oxygen sensor is initialized to *KO2FFO* whenever the engine is not running.

4.3 Throttle Position Load (NTPSLD) Calculation

NTPSLD = (*K3*/64) * (ADTHROT - ADTAOFF)

Where:	*K3*	=	Gain Calibration
	ADTHROT	=	Throttle Position in A/D Counts
	ADTAOFF	=	Filtered 'lower' TPS Readings

4.3.1 Lower TPS Filtering for TPS Offset

ADTHROT is filtered at a 12.5 msec rate when the current value of ADTHROT is less than or equal to the current filtered value of TPS. ADTAOFF is initialized to a value of *K4* and *KTAOFF* specifies the filter coefficient.

4.3.2 Standard Throttle Position Filtering

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All throttle position readings are filtered at a 12.5 msec rate with *KTFTPSC* specifying the filter coefficient. Note that this is a different filtered value than the offset filter used for NTPSLD. Throttle position readings for synchronous TPS A.E. use filter coefficient *KTFTPS3C*

4.3.3 Throttle Position Filtering for Decel Enleanment

Throttle position readings are filtered at a 12.5 msec. rate with *KTFTPS2C* specifying the filter coefficient for use in the decel enleanment algorithm.

4.3.4 Throttle Position Filtering for Delta TPS synchronous Acceleration Enrichment

Throttle position readings are filtered at a 12.5 msec rate with *KTFTPS3C* specifying the filter coefficient for use in the delta TPS synchronous acceleration enrichment algorithm.

4.4 Engine Speed (RPM)

Engine RPM is computed from the time between the distributor reference pulses per the following equation:

RPM = 120/(6 * NEWRFPER)

Where: RPM = Engine speed in RPM

NEWRFPER = Time interval between the falling edge of the last two reference pulses

4.4.1 Filtered RPM

RPM is filtered each 12.5 msec with *KRPM125F* specifying the filter coefficient.

4.4.2 Engine Speed Variables

Engine speed functions are usually based on one of the three following engine speed variables.

- ISES = RPM/12.5
- NTRPMX = RPM/25
- NTRPM = 16*(RPM-400)/200, if RPM is less than or equal to 2400

  = 160 + [16(RPM-2400)/400], if RPM is greater than 2400.

When the ignition is turned off, the RPM variables are cleared. The reference period is set to $FFFF (low RPM) if no reference pulses have been received for 300 msec.

4.5 Vehicle Speed (MPH)

The vehicle speed sensor generates 2002 pulses per mile if optical VSS sensor is used. This corresponds to a frequency of 0.556 pulses per second per MPH. The minimum detectable vehicle speed is that which corresponds to a pulse to pulse interval of 1 second or 1.798 MPH. If no pulse is received within a 1 second interval, the speed will be considered as 0 MPH.

The vehicle speed variable most commonly used in the software is NMPH.

NMPH = (FILTMPH/5) * 16

Where: NMPH = Normalized miles per hour

FILTMPH = Filtered miles per hour (see software filtering technique)

NMPH is limited to 192 which corresponds to 60 MPH.

4.5.1 Filtered Vehicle Speed

Vehicle speed is filtered each 100ms with *KFILTMPH* specifying the filter coefficient.

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4.6 Load Variable Based on Mass Air Flow (LV8)

For a description of how LV8 is derived, see the Fuel Control Section.

4.6.1 Filtered LV8

LV8 is filtered each *KTFAVKT* seconds with *KTFLV8C* specifying the filter coefficient. Filtered LV8 is initialized to *KTLV8INT* when the engine is not running.

4.7 Flight Recorder

The flight recorder transmits the following RAM variables on the data bus to be analysis by a grid computer.

- MCU input status word
- Fuel air mode word
- Present minor loop reference pulse
- Grams per second display value
- Load variable (LV8)
- Coolant temperature
- Throttle position
- Oxygen sensor voltage
- Reference pulse counter
- Battery voltage
- Filtered MPH
- Purge duty cycle
- Air/fuel ratio
- Air temperature
- Knock retard
- Spark advance
- Current base pulse width
- Delivered delta TPS AE (asynchronous)
- Block learn memory cell
- Block learn multiplier
- Base pulse closed loop correction
- EGR duty cycle
- Present motor position
- Desired idle speed
- Proportional steps
- Integral steps
- Derivative steps
- Acceleration Enrichment pulse width
- Delta TPS asynchronous base pulse width
- 18X pulse intervals

Note: The above RAM variable are updated every 12.5 msec.

4.7.1 Software Filtering Technique

Various input signals and software variables are conditioned by a software first order lag filter. Some of these signals are oxygen sensor voltage, vehicle speed and RPM. The filter can be expressed as follows:

$$FX1 = FX0 + (I - FX0) * K$$

Where:

- FX1 = New filtered value
- FX0 = Old filtered value
- I = Current unfiltered input value
- K = Filter coefficient (0 to .996)

or

$$FX1 = FX0 + \frac{(I-FX0)*N}{256}$$

$$= FX0 + \frac{(I-FX0)*256*K}{256}$$

$$= FX0 + \frac{(I-FX0)*256*(1-e**(-T/t))}{256}$$

Where:

- N = Filter coefficient value in computer units
  = 256*K
  = 256(1-e**(-T/t))
- T = Software loop time (update rate) in seconds
- t = Filter time constant in seconds
  = -T/ln(1-(N/256))

Note: The filter coefficient should not be set to 0. This will result in the output of the filter being forced to 0.

4.8 Table Lookup

The software has the capability to interpolate between points for purposes of two and three dimensional table lookups. If the value of an X or Y parameter exceeds the range of the tables, the nearest endpoint will be selected.

4.9 Diagnostic Checksum

For purposes of testing the integrity of nonvolatile memory, a double byte checksum is calculated on the malfunction flag words as shown below whenever any of these locations are modified by the software.

SUM (double byte) = MALFFLG1 + MALFFLG2 + MALFFLG3 + MALFFLG4 +
MALFFLG5 + MALFFLG6 + MALFFLG7 + MALFFLG8 +
MALFFLG9 + MALFFLGA + 1

4.9.1 Nonvolatile RAM Failure

The nonvolatile RAM is indicated as failed if any of the following conditions are satisfied.

- Initialization check nonvolatile memory checksum of the 10 malfunction flag words does not agree with the value last calculated.
  - The above condition will result in the block learn memory cells being set to 128, the present IAC motor position being set to *KISPKSP*, A/C learned anticipate being set to *KISACDS*, and the remainder of nonvolatile memory being cleared.
- BLM contents greater than *KBLMMAX* or less than *KBLMMIN* (checked each 50 msec during block learn).
  - This condition will result in the block learn memory cells being set to 128. This condition also has the option to cause the A/C learned anticipate being set to *KISACDS* the next time the engine is not running and a motor reset is not in process.

4.10 High Voltage Disable of ECM Outputs

If ignition voltage is greater than or equal to 17.1 volts, all PWM and discrete outputs will be disabled except for the check engine light and engine hot light.

4.11 Ignition Off Disable of ECM Outputs

All ECM outputs are deenergized when the ignition is off with the exception of the IAC Motor driver outputs.

4.12 Computation Rates

4.12.1 3.125 Msec Logic

- Delta TPS Synchronous AE Reference Pulse Enable Counter
- Add Delta TPS Synchronous AE Pulse Width to Synchronous Run pulse Width
- Airflow Calculation
- Base Pulse Width Calculation
- Crank to Run Pulse Width Ramp Calculation
- Delta Airflow Limiting
- M34 Logic
- IAC Motor Reset/Motor Move Logic

4.12.2 6.25 Msec Logic

- Timing Error Check
- Stack Pointer Error Check
- Reference Pulse Received Check
- Engine Running Timer Update
- FMD Status Register Set up
- PID IAC Open Loop/Motor Move Logic
- RAM Refresh (while waiting for next real time interrupt)
- Simultaneous Asynchronous Double Fire Crank Fuel Delivery (After The REF Pulse Received - see 3.1.1.1 Section 6) or
- Sequential Crank Fuel Delivery

4.12.3 12.5 Msec Logic

- Vehicle Speed Determination and Filtering
- Process Vehicle Speed Input
- Electronic Spark Timing (EST)
- PID IAC 12.5 Msec Logic (Throttle Follower, A/C step Removal, Derivative, Open Loop)
- Read Oxygen Sensor Input and Filter
- Read Throttle Position and Filter
- Ignition On/Off Logic
- Load Variable (LV8) Calculation
- Decel Fuel Cutoff (DFCO)
- Asynchronous Fuel/Air Ratio Calculation
- Block Learn Memory Cell Determination Logic
- Fuel Closed Loop Logic
- Base Pulse Width Background Factor Calculation
- Asynchronous Fuel Output Logic (Except SADF Crank Fuel)
- TCC Shift Release Feature
- Crank Fuel Pulse Width
- Synchronous TPS AE Calculation
- Torque management (Shift Spark, 3-2 Downshift Spark, Torque Spark & Drivetrain Abuse)
- EGR

4.12.4 50 Msec Logic

- IAC Command Speed Calculation
- PID IAC Closed Loop Regulator
- IAC A/C Learning Logic
- Block Learn Memory Updates
- LV8 Filtering Logic

4.12.5 100 Msec Logic

- ESC
- TCC
- A/C Clutch Control
- Purge
- Diagnostics
- Crank to Run Pulse Width Ramp Scaler Calculation

4.12.6 200 Msec Logic

- Closed Loop Determination
- BLM Enable Logic
- Time-out Fuel/Air Logic
- Time-out Spark Logic
- Fan Control

5.0 IAC Motor States

Table *KSTATBL* is supplied in ROM to define motor states necessary for stepping.

6.0 Heads Up Display Configuration

```
******************************************************************
*                                                                *
*  I2U HEADS-UP DISPLAY SELECT SWITCH CONFIGURATION  CAL A - TOP *
*                                                                *
******************************************************************
*
*  SPARK ADVANCE ...............    ............... LEARNED 1-2
*    IN DEGREES                                       SHIFT TIME
*                             .    .
*  ENGINE ................    .    .
*  TORQUE                     .    .    ........... LEARNED 2-3
*                           . 0    1 .                SHIFT TIME
*                          9          2
*  CONSEC. REFS ..........8            3........... PEAK OR SHIFT
*  INCREASING RPM          7          4               SPARK RETARD
*                         . 6      5 .
*  ROAD SPEED ...........    .    .    ........... BASE SHIFT
*                            .    .                  SPARK RETARD
*                            .    .
*  RAM ADDRESS ...............    ................ IAC PRESENT
*                                                    MOTOR POSITION
*
*    BOTTOM ROTARY SWITCH:
*
*  PEAK OR SHIFT ............     .............. ESC RETARD
*  TORQUE                    .    .
*                            .    .
*  CURRENT SHIFT ..........  .    .  ........... BATTERY VOLTAGE
*  TIME                    . 0    1 .
*                         9          2
*  THROTTLE ANGLE.........8           3......... MALF CODES (DECIMAL)
*  IN A/D COUNTS           7         4           CURRENT/HISTORY
*                         . 6      5 .
*
*  THROTTLE ANGLE.........   .    .  ........... A/C STEPS
*  IN PERCENT                .    .              ANTICIPATED
*                            .    .
*  RAM CONTENTS .............     .............. YOU NAME IT-SELECT
*                                                VIA CDS $8FFE
******************************************************************
*                        I2U STATUS LIGHTS                        *
*                                                                 *
*  NVRAM   ALTITUDE  DRIVE   WHO    DRIVE   PURGE   FAN1   FAN2   *
*  FAIL              ABUSE1  KNOWS  ABUSE3  ON      ON     ON     *
*                                                                 *
* -- 7 -- -- 6 -- -- 5 -- -- 4 -- -- 3 -- 2 -- -- 1 -- -- 0 --   *
*                                                                 *
*  2ND GR  3RD GR  4TH GR  TCC     PARK/    A/C     CRUISE  RICH/ *
*  SWITCH  SWITCH  SWITCH  ACTIVE  NEUTRAL  CLUTCH  ACTIVE  LEAN  *
*******************************************************************
```

```
**********************************************************************
*                                                                    *
*  I2U HEADS-UP DISPLAY SELECT SWITCH CONFIGURATION  CAL - B TOP     *
*                                                                    *
**********************************************************************
*
* SPARK ADVANCE  .............     ..............  DIGITAL EGR
* IN DEGREES                  .     .
*                             .     .
* BLM ..................      .     .  ..........  COOLANT TEMP
*                          .  0     1  .           IN DEGREES C
*                            9         2
* AIR/FUEL ............. 8                3.........  O2 SENSOR IN
* SLEW VALUE                 7         4           MILLIVOLTS
*                          .  6     5  .
*
* ROAD SPEED ...........      .     .   ..........  GRAMS PER SEC.
*                             .     .              AIR FLOW
*                             .     .
* PID PROPORTIONAL ...........     ..............  IAC PRESENT
* COUNTS (+ -)                                     MOTOR POSITOIN
*
*    CAL B  BOTTOM ROTARY SWITCH:
*
* SPARK CHANGE ...............     ..............  ESC RETARD
* SLEW VALUE                  .     .
*                             .     .
* COMMAND .................   .     .  ...........  CLOSED LOOP
* IDLE SPEED               .  0     1  .           CORRECTION
*                            9         2
* AIR FUEL  ..............8               3 ........  BLM CELL
* RATIO                      7         4
*                          .  6     5  .
*
* THROTTLE ANGLE ...........  .     .  ..........  IAC DESIRED MOTOR
* IN PERCENT                  .     .              POSITION/EGR SLEW
*                             .     .
*                             .     .
*                             .     .
* PID INTERGRATOR .............     ..............  BASE PULSE WIDTH
* COUNTS (+ -)                                     IN MILLISECONDS
*
**********************************************************************
*                         I2U STATUS LIGHTS                          *
*                                                                    *
*   A/C     A/C    PSPS    T/F     IAC    PROP    INT     DERV       *
* REQUEST  CLUTCH         ACTIVE   O/L    STEP    STEP    STEP       *
*                                                                    *
*    7       6      5       4       3      2       1       0         *
*                                                                    *
*   BLM    DECEL   DFCO   ASYNCH  SYNCH   P.E.    C/L     RICH/      *
*  LEARN   ENLEAN          A.E.    A.E.          ENABLED  LEAN       *
**********************************************************************
```

6.2.3 Alarm Flashing of Status Lights

Status bit number (7, 6, 5, 4) will toggle each second if any of the following alarm conditions have occurred since the last engine shutdown.

S0 Bit 0 - Ram Overwrite error (set when RAM location following program variables contains a value other than 0)

S1 Bit 1 - Stack pointer failure alarm (set if stack pointer is not at its correct value upon entry into the background routine)

S2 Bit 2 - Loop timing error (Set when next minor loop interrupt is received before the present minor loop is finished).

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6.3 Analog Channel Assignments

Block	Default Channel	Parameter	Min. Scale	Max. Scale
0	4	Spark Advance	-20 Deg	80 Deg
1		Coolant Spark Advance (F2)	0 Deg	50 Deg
2	6	Raw Coolant Temperature	-40 Deg C	152 Deg C
3	2	Coolant Temperature with Default	-40 Deg C	152 Deg C
4		CCP Duty Cycle	0%	100%
5		Filtered Oxygen Sensor	0 Volt	1 Volt
6		Ram Address (I2U Slew Valve)	0	255
7		Filtered Vehicle Speed	0 MPH	100 MPH
8		A/F Ratio Change (I2U Slew)	0	25.5
9		BLM Contents	78	178
10		Spark Adv, Change (I2U Slew)	0 Deg	90 Deg
11		ESC Retard	0 Deg	50 Deg
12		Closed Loop Correction	78	178
13		BLM Cell Number	0	20
14		IAC Position Change (I2U Slew)	0	255
15		Base Pulse Width (BPW)	0 msec	10 msec
16		TPS Load (NTPSLD)	0%	100%
17		Battery Voltage	0 Volt	25 volts
18	1	Air/Fuel Ratio	0	25.6
19		Air Flow (DISPFLOW)	0	255 GM/sec
20		Integrator Delay	0 Sec	3.1 sec
21		Integrator Delay	0 Sec	3.1 sec
22		Engine RPM	0	5000
23		Engine RPM	0	5000
24		Main Spark Advance (F1)	0 Deg	50 Deg
25		Delta TPS in 12.5 Msec	0	255
26		Delta LV8 in 12.5 Msec	0	255
27		Air Flow (DISPFLOW)	0	60 GM/sec
28		Load Variable (LV8)	0	255
29		Voltage Correction Term to BPW	0	255
30		Coolant Temperature A/F Ratio	-100%	+100%

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6.3 Analog Channel Assignments (continued)

Block	Default Channel	Parameter	Min. Scale	Max. Scale
31		EGR Duty Cycle	0%	100%
32		IAC Present Motor Position	0 steps	255 steps
33		RAM Contents	0	255
34		Analog Status Word #1	(See Note 1 Below)	
35		Analog Status Word #2	(See Note 2 Below)	
36		IAC Idle Speed	0 RPM	3200 RPM
37		Throttle Follower Delta Steps	0	255
38		IAC Desired Idle Speed	0 RPM	3200 RPM
39		EGR Duty Cycle	0 %	100%
40	4	Spark Advance	-20 Deg	80 Deg
41		Coolant Spark Advance (F2)	0 Deg	50 Deg
42	6	Raw Coolant Temperature	-40 Deg C	152 Deg C
43	2	Coolant Temperature with Default	-40 Deg C	152 Deg C
44		CCP Duty Cycle	0%	100%
45		Filtered Oxygen Sensor	0 Volt	1 Volt
46		Ram Address (I2U Slew Valve)	0	255
47		Filtered Vehicle Speed	0 MPH	100 MPH
48		A/F Ratio Change (I2U Slew)	0	25.5
49		BLM Contents	78	178
50		Spark Adv, Change (I2U Slew)	0 Deg	90 Deg
51		ESC Retard	0 Deg	50 Deg
52		Closed Loop Correction	78	178
53		BLM Cell Number	0	20
54		IAC Position Change (I2U Slew)	0	255
55		Base Pulse Width (BPW)	0 msec	10 msec
56		TPS Load (NTPSLD)	0%	100%
57		Battery Voltage	0 Volt	25 volts
58	1	Air/Fuel Ratio	0	25.6
59		Air Flow (DISPFLOW)	0	255 GM/sec
60		Integrator Delay	0 Sec	3.1 sec
61		Integrator Delay	0 Sec	3.1 sec
62		Engine RPM	0	5000
63		Engine RPM	0	5000
64		Main Spark Advance (F1)	0 Deg	50 Deg
65		Delta TPS in 12.5 Msec	0	255
66		Delta LV8 in 12.5 Msec	0	255
67		Air Flow (DISPFLOW)	0	60 GM/sec
68		Load Variable (LV8)	0	255
69		Voltage Correction Term to BPW	0	255
70		Coolant Temperature A/F Ratio	-100%	+100%

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6.3 Analog Channel Assignments (continued)

Block	Default Channel	Parameter	Min. Scale	Max. Scale
71		EGR Duty Cycle	0%	100%
72		IAC Present Motor Position	0 steps	255 steps
73		RAM Contents	0	255
74		Analog Status Word #1	(See Note 1 Below)	
75		Analog Status Word #2	(See Note 2 Below)	
76		IAC Idle Speed	0 RPM	3200 RPM
77		Throttle Follower Delta Steps	0	255
78		IAC Desired Idle Speed	0 RPM	3200 RPM
79		EGR Duty Cycle	0 %	100%
80		Integrator Delay	0 sec	3.1 sec
81		Analog Status Word #1	(see Note 1 below)	
82		Engine RPM	0 RPM	5000 RPM
83		Engine RPM	0 RPM	5000 RPM
84		Main Spark Advance (F1)	0 Deg	50 Deg
85		Delta TPS for AE Enable	0	255
86		Delta LV8 for AE Enable	0	255
87		Air Flow (DISPFLOW)	0	60 GM/sec
88		Load Variable (LV8)	0	255
89		Voltage Correction Term to BPW	0	255
90		Coolant Temperature A/F Ratio	-100%	+100%
91		EGR Duty Cycle	0%	100%
92		IAC Present Motor Position	0 steps	255 steps
93		RAM Contents	0	255
94		Analog Status Word #1	(see Note 1 below)	
95		Analog Status Word #2	(see Note 2 below)	
96		IAC Idle Speed	0 RPM	3200 RPM
97		Throttle Follower Delta Steps	0	277
98		IAC Desired Idle Speed	0 RPM	3200 RPM
99		EGR Duty Cycle	0%	100%

NOTES:

1. 4th Gear = 5 volts
   3rd Gear = 3.3 volts
   2nd Gear = 1.7 volts

2. TCC Locked = 5 volts

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6.4 Special I2U Features Applicable to this Software

6.4.1 EGR/CCP Duty Cycle Slewing

The EGR or CCP duty cycle can be slewed to a certain value by following the steps below. The slewed duty cycle is only applicable if the EGR/CCP enable criteria are met. When EGR/CCP is disabled, a zero duty cycle is output regardless of slew value.

- Place upper rotary switch to EGR/CCP duty cycle

- Place the lower rotary switch to IAC change

- Place IAC slew switch to MOD position (it should be noted that the IAC motor can only be slewed absolute in this software)

- Slew the duty cycle to the desired value (this is an absolute slew, the duty cycle equals the slew value divided by 256. Ex: 128=50%)

6.4.2 Added Functions

"You name it" function has the capability to display desired RAM variable contents.

- Place the hud in CAL A
- Place the lower rotary switch to position six
- Insert the RAM Variable contents at address $8FFE using CDS

K12ULED function has the capability to display a desired RAM Variable as a status light.

- Place hud in Cal A
- Insert RAM Variable contents at address $8FFC using the CDS

END OF SECTION 2

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SECTION 3A

GM-30/33

HIGH SPEED UART SERIAL DATA LINK

Original Release - 02/13/87

1.0 GENERAL DESCRIPTION

This document describes the operational characteristics, communication protocol, and transmitted data for the GM-30 UART serial data link. The serial data link is to be utilized to transmit and receive data parameters to and from intelligent devices either within or external to the vehicle. The link services the ECM, BCM, Digital Instrument Panel, CRT Service Scanners, Vehicle Assembly Line Testers, etc. Devices external to the vehicle utilize the transmitted information to identify ECM type and for testing during the ECM assembly, in-car installation procedures and service procedures at dealerships. the device internal to the vehicle which acts as master of the link is the Body Computer Module (BCM) and will communicate with other devices in the vehicle. Devices external to the vehicle such as scanners can temporarily assume the role of master.

1.1 Enabling The GM-30 Serial Data

The 88 SFI-4 software for the 3800 Flint program has the ability to communicate in a 'GM-30' or 'C/H' serial data format. To enable proper operation of the GM-30 format, the following calibrations must be complete:

F9FTMSG3	= SDRTBL30	(Link to next message)
KSDGM30	= $FF	(A/C & cruise request from BCM)
KMSGID	= $41	(My 88 GM30 reply to message code $40)

2.0 REFERENCE DOCUMENTS

- XDE-5024, HIGH SPEED Serial Data Communications Between Microcomputer Assemblies, initial publication November 17, 1983.
- DS-1003B, GM-30 Body/Instrument Panel Electronics System Definition and Performance Specification, November 1983 revision.

3.0 SPECIFICATION

3.1 High Speed UART Serial Data Format

The approach used for the high speed transmission is intended to be the same as that used in a UART system. A description follows:

3.1.1 Bit Format

A bit time is 122.07 microseconds $\pm$0.5%. This is equivalent to 8192 Baud. A high voltage state indicates a logic one condition and a low voltage state indicates a logic zero condition.

3.1.2 Word (Byte) Format

A word consists of ten bit times. The first bit is a logic zero and is called the Start Bit. The last (tenth bit) in the word is always a logic one and is called the Stop Bit. The remaining eight center bits are data bits and are transmitted LSB first. A Start Bit must always be preceded by at least one logic one bit time (either the stop bit of the preceding word or an Idle Line).

3.1.3 Message Format

Any and all data transmitted on the serial data bus must be part of a message. All messages must be of the following format:

- Idle Line
- Message Code (Message ID)
- Message Length (85+N)
- N Bytes of Data
- Sum Check
- Idle Line

3.1.3.1 Idle Line

Ten or more consecutive logic one bit times constitute an Idle Line. All receivers on the bus will use the occurrence of an Idle Line followed by a Start Bit to indicate the start of a message.

3.1.3.2 Message Code

When used in a UART system, the first word of each message is a message code. Each message code initiates a unique communications code in a particular electronic module on the UART link; therefore, all message codes must be assigned in the particular Applications Document. The total number of unique message codes is limited to 254. A Message code of $00 and $FF shall not be used in the vehicle. NOTE: GM-30 message codes are not necessarily coordinated with C/H message codes.

3.1.3.3 Message Length Word

The message length word indicates the total number of data words in the remainder of the message plus 85 (decimal). The maximum number of data words within one message which can be transmitted by any transmitter is 64. Thus a valid message length word must lie in the range of 85 to 149. Many messages with no data words are possible; for such messages, the Message Length Word would contain the binary word 0101 0101 (MSB-LSB). This pattern has been selected because, under an abnormally severe noise environment, there is a higher probability that an erroneously received message will be detected as such.

3.1.3.4 Sum Check

The last word to be transmitted in a message is the two's complement of the sum of all the other words in the message, including the Message ID and message length words. Any carryouts of this eight-bit word while it is being formed by both the transmitter and receivers are neglected. The two's complement is used so that the sum of all the words in the message is zero for a valid message.

3.2 GM-30 COMMUNICATIONS FORMAT

With the current GM-30 and GM-33 vehicle configurations, there are seven communications modes, each identified by a predetermined, dedicated message code. They have been defined for GM-30/33 communications as follows:

Communications Mode	Devices	Message Code	Message Code Block
Factory Test (Only if in ECM Factory Test Mode)	ECM only	$01, $02, $03	F9FTMSG1,2,3
Normal/Service Diag	BCM to ECM	$40	SDRM40
Normal/Service Diag	ECM to BCM	$41	Not Used
ALDL (GM-30)	ECM to ALDL Tester	$4F	SDRM4F
ALDL (C/H)	ECM to Scanner	$80	SDRTBL

Each message code to be read by the ECM is assigned a block of at least 10 bytes of calibrations in the following format:

- Next message code block starting address (2 Bytes)
- Message Code ($40, $4F etc, 1 Byte)
- Option Flag Word for UART Data Source (1 Byte)
    - -- Use ROM Table if Bit 7 = 1
    - -- Use RAM Table if Bit 6 = 1
    - -- Use Output Buffer defined if Bit 6 = Bit 7 = 0
- Output Message Length (1 Byte)
- Input Message Length (1 Byte)
- Address of Output Control Block in RAM (2 Bytes)
- Address of Input Control Block in RAM (2 Bytes)
- Start of ROM Table if option selected above

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3.2.1 Software Message Code Validation Determination

When a message code is received by the ECM, it is compared to calibratable blocks, one of which correspond to each message code. If a match occurs, the ECM will continue to monitor the incoming serial data. If a match does not occur, the message code received is compared to the value in the next message control block and so on until a match is achieved or all message control blocks have been checked. Software recognizes the last message control block when it sees a $0000 as the next message code block starting address.

3.2.2 Error Detection/Remedial Action

If any of the following errors are detected the complete message is ignored and the serial data handler is put into the wake-up mode in preparation for the next message.

- Overrun Error, indicates that one or more characters in the Data Stream were lost.
- Framing Error, indicates that the Data Byte received was improperly framed by a start and stop bit.
- Message Code not recognizable by ECM.
- Data Byte Count received does not match Data Byte count expected as defined in input message.
- Checksum Error

3.2.3 Communication Mode Definition

The seven message codes are described in the following Sections.

3.2.3.1 Message Codes $01, $02, $03 - ECM Factory Test Modes

The modes specified by these message codes are related to ECM factory test only; they are not used after being installed in the vehicle. See Section 5 for a functional description.

3.2.3.2 Message Code $40 - Normal or Service Diagnostics Mode (BCM to ECM)

Message code $40 is sent from the BCM to ECM. It is followed by 5 Bytes of data which configure the ECM to perform certain functions. Some functions are for normal mode, others for diagnostic mode. The modes are selected in the first data Byte. When the ECM has detected a valid message code $40, it will respond with message code $41.

If Service Diagnostic Mode is selected in Byte 1 bit 7, the lower bits of Bytes 3, 4 and 5 of message code $40 data will command one of five 'levels'. The levels must always be stepped through sequentially. Each level configures the ECM for a particular diagnostic test. Level four is further broken down into six sub-levels. Each sub-level must also be stepped through sequentially.

3.2.3.2.1 Message $40 Data

Byte	Description			
1	Flags			
	Bit 7	Operating Mode	0=Norm	1=Diag
	Bit 6	Mileage Bit	0=High	1=Low
			(See 3.7.1.7 Section 4)	
	Bit 5	A/C Request	0=OFF	1=ON
	Bit 4	Cruise Control Status	0=OFF	1=ON
	Bit 3	Fan1 Request		1=ON
	Bit 2	A/C Cutout Override	0=NO	1=Yes
	Bit 1	Fan2 Request		1=ON
	Bit 0	Not Used		
2	Not Used			
	Normal Running Mode (Byte 1, Bit 7 = 0)			
3	Not Used			
4	Not Used			
5	Not Used			
	Diagnostic Mode (Byte 1, Bit 7 = 0)			
3	Diagnostic Control Flag			
	Bit 7	System Under Test	0=Other	1=ECM
	Bit 6	Override Mode Active	0=NO	1=YES
	Bit 5	Snapshot Mode Active	0=NO	1=YES
	Bit 4	Not Used		
	Bit 3	Send Next Malf Code		
	Bit 2-0	Current Diagnostics Level		
		000 = Level 0		
		001 = Level 1		
		010 = Level 2		
		011 = Level 3		
		100 = Level 4		
4	Diagnostic Control Flag			
	Bit 7	Slew Up Active		
	Bit 6	Slew Down Active		
	Bit 5	Not Used		
	Bit 4	Not Used		
	Bit 3-0	Diagnostic Level 4 Dash Number		
		0001 = Level 4-1		
		0010 = Level 4-2		
		0011 = Level 4-3		
		0100 = Level 4-4		
		0101 = Level 4-5		
		0110 = Level 4-6		
5	Level 4 Device Number (Tables A-D)			

3.2.3.2.1.1 Byte 1 Default Value

Input Word 1 is interpreted as a default value of *KKSERWD1* upon system initialization or loss of UART communications (Malfunction Code 47).

3.2.3.2.1.2 Diagnostic Level Description

The following is a description of the five different service diagnostic levels (Byte 3). These only apply if in the diagnostics mode (Byte 1, bit 7=1) and the ECM is the system under test (Byte 3, bit 7=1). All results displayed in Bytes 7 & 8 of Message Code $41 data stream.

Level 0 - Not used by ECM

Level 1 - Malf Code Display

While in level 1, the ECM shall send the BCM the malfunction codes that are currently set or were set at some time in history. When level 1 is entered and there are no codes stored in memory, the "No Codes" bits shall be indicated. If there are codes in memory then the "Codes In Progress" bits shall be indicated. The current codes shall be sent first followed by the history codes. The malf code shall be sent as a two digit BCD value in Byte 8 of the Message Code $41 data stream. The ECM shall continue to send the first malf code until the "Send Next Code" bit is set, at which time the ECM shall send the next code. When all malf codes have been sent, the "Codes Complete" bits shall be indicated. If Level 1 is exited and reentered, the Malf Code display shall begin at the lowest Malf Code.

Level 2 - Not Used

Level 3 - Not Used

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Level 4-1 - ECM Data (See Table A)

The software shall calculate a double Byte variable depending on the device number (Byte 5 of message $40) based on the single or double Byte parameters that were captured in the snapshot mode. The software shall also set appropriate bits in Byte 5 of the output message (Message Code $41).

DEVICE NUMBER	VAR1
0	MSB=0 LSB=NTPSLDSD*100/256
1	MSB=0 If COOLDEGA .LT. 53 then Then LSB=(54-COOLDEGA)*192/256 NOTE: 54 is used so that conversion never results in a negative zero. Else LSB=(COOLDEGA-53)*192/256 Set the degree marker bit.
2	BPWDISP*39/256 Set the right decimal point bit.
3	MSB=0 LSB=AD02AF*115/256 Set the left decimal point
4	(199+SAREF)*90/256 Set the degree marker bit
5	MSB=0 LSB=ADBAT Set the right decimal point bit
6	RPM2BYT
7	MSB=0 LSB=FILTMPH
8	MSB=0 LSB=NOCKRTD*45/256 Set the degree marker bit
9	OLDPA3
10	MSB=0 LSB=ACNTDEL
11	MSB=0 LSB=CORRCL
12	MSB=0 LSB=BLM

13	DISPFLOW*10/256 Set the right decimal point bit
14	MSB=0 LSB=ISSPMP
15	ADATSCSD (Scaled like COOLDEGA)
16	MSB=0 LSB=NOMALFCT
17	PROMIDA

The software can convert the double Byte hex number (always positive) into a four digit (2 Byte) BCD number. Leading zero's shall be set to $E to indicate a "Blank". In the case when COOLDEGA or ADATSCSD is less than 53, then se the most significant leading 0 to $A instead of $E to represent a negative number. If any input number is greater than $270F, set the BCD variable to $9999. This double Byte BCD variable shall then be sent to the BCM in Bytes 7 and 8 of the Message Code $41 data stream.

Level 4-2 - Discrete Input Status (See Table B)

While in Level 4-2 the ECM shall supply info on the state of the requested input (device number, Byte 5 of message $40). Bit 7 of Byte 7 shall indicate the current voltage level of the requested input at the ECM connector. A low voltage level shall be indicated by a "0" and a high voltaged level shall be indicated by a "1". A "0" in bit 6 of Byte 7 shall indicate that the current input has not changed state since being selected for display. A "1" shall indicate that at some time since the input was selected for display the state of that input changed.

DEVICE NUMBER	INPUT
0	Brake
1	P/N
2	Power Steering Switch
3	Second Gear Switch
4	Third Gear Switch
5	Fourth Gear Switch

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Level 4-3 - Output Cycling (See Table C)

While in this level and with the engine not running, the ECM shall continuously cycle the device defined by Byte 5. When cycling, the output shall be on for 3 seconds and then off for 3 seconds. The ECM shall also display the status of the device. If the device is on, then bit 6 of Byte 7 shall be set to A 1. Bit 7 of Byte 7 shall be set equal to the engine running flag. The device shall be defined by the following Table.

DEVICE Number	Output Not Used
0	Not Used
1	TCC
2	EGR 1
3	EGR 2
4	EGR 3
5	CCP
6	A/C Clutch Relay
7	FAN 2
8	FAN 1
9	IAC Cycling

The IAC shall cycle from 0 to KISMXSP.

Level 4-4 - Override Mode (See Table D)

The override mode is enabled when Level 4-4 is entered and the override active bit (Byte 3, bit 6) is set. While in the override mode, and ECM output or function will be determined by the incoming serial data. The override mode shall remain enabled until the override active bit is reset. The output or function to be controlled is defined by the following table of device numbers. (Byte 5 of incoming message). Byte 6 of the outgoing message shall display the program control value of the device. The "Ok To Test" bit (Byte 5, bit 4) shall be set as defined.

With the exception of the IAC and the injectors, when a device is forced on due to the "Slew Up", it shall remain on until override is disabled, or another device is selected, or the "Slew Down" bit is a "1". Likewise, when a device is forced off due to the "Slew Down", it shall remain off until override is disabled, or another device is selected, or the "Slew Up" bit is a "1".

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DEVICE NUMBER	OUTPUT OR FUNCTION
0	Not used
1	TCC If in 3rd or 4th gear the "Slew Down" bit shall force TCC off and the "Slew Up" bit shall force TCC on. Byte 6 shall be 0 if TCC is off. Byte 6 shall be $63 if TCC is on. The "Ok To Test" bit shall be set if in3rd or 4th gear.
2-EGR1	The "Slew Up" bit shall force EGR1 on. The "Slew Down" bit shall force EGR1 off. Byte 6 shall be 0 if EGR1 is off. Byte 6 shall be $63 if EGR1 is on. The "Ok To Test" bit shall always be set.
3-EGR2	The "Slew Up" bit shall force EGR2 on. The "Slew Down" bit shall force EGR2 off. Byte 6 shall be 0 if EGR2 is off. Byte 6 shall be $63 if EGR2 is on. The "Ok To Test" bit shall always be set.
4-EGR 3	The "Slew Up" bit shall force EGR3 on. The "Slew Down" bit shall force EGR3 off. Byte 6 shall be 0 if EGR3 is off. Byte 6 shall be $63 if EGR3 is on. The "Ok To Test" bit shall always be set.
5-CCP	The "Slew Up" bit shall force CCP on. The "Slew Down" bit shall force CCP off. Byte 6 shall be set equal to "CCPDC"*99/256. The "Ok To Test" bit shall always be set.
6-A/C	With engine not running, the "Slew Up" bit shall force the A/C on and the "Slew Down" bit shall force the A/C off. Byte 6 shall be 0 if the A/C is off. Byte 6 shall be $63 if A/C is on. The "Ok To Test" bit shall be set if the engine is not running.
7-FAN 2	With engine not running, the "Slew Up" bit shall force Fan 1 off. Byte 6 shall be 0 if the Fan1 is off. Byte 6 shall be $63 if the Fan1 is on. The "Ok To Test" bit shall be set if the engine is not running.
8-FAN 1	With engine not running, the "Slew Up" bit shall force FAN2 on and the "Slew Down" bit shall force the FAN2 off. Byte 6 shall be 0 if FAN2 is off. Byte 6 shall be $63 if FAN2 is on. The "Ok To Test" bit shall be set if the engine is not running.

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9-IAC With the transmission in P/N, the "Slew Down" bit shall force the IAC motor to extend at a rate of 10 steps per second. The "Slew Up" bit shall force the IAC motor to retract at a rate of 10 steps per second. Byte 6 shall display the "Present Motor Position" 899/*KSDIACMX*. The "Ok To Test" bit shall be set if transmission is in P/N.

10-Injectors With the engine running and transmission in P/N, an OFF to ON transition of the "Slew Up" bit increments the injectors. On the first transition, INJA is selected, on the second, INJB is selected and so on. On the seventh toggle no injectors are enabled (selected). When the "Slew Down" bit is toggled, the selected injector is disabled. Toggling this bit again will re-enable that injector. Byte 6 shall display which injector is being disabled. If the selected injector is not being disabled, Byte 6 shall display zero. The "Ok To Test" bit shall be set if engine is running and transmission is in P/N.

Level 4-5 - Clear Malf Codes And Malf Counter

When this level is enabled the ECM shall clear all Malf codes and the Malf counter (NOMALFCT). The ECM shall set bit 7 of Byte 7 to indicate that the codes have been cleared.

Level 4-6 - Snapshot Mode

Each time Level 4-6 is entered, the snapshot mode is enabled and the ECM shall take a "Snapshot" of the data that is usually taken once every 100 msec. No more data shall be taken until the snapshot mode is disabled or Level 4-6 is reentered again. Once enabled, the snapshot mode will not be disabled until Level 4-6 is exited and the snapshot mode active bit (Byte 3, bit 5 of message $40) is zero.

3.2.3.2.1.2.1 Snapshot Mode Data Stream

The following parameters shall be stored into a RAM Buffer in the order shown for the snapshot mode.

ADTHROT*2 - Single Byte
COOLDEGA - Single Byte
BPWDISP - Double Byte
ADO2AF - Save MSB As Single Byte
SAREF - Double Byte
ADBAT - Single Byte
RPM2BYT - Double Byte
FILTMPH - Save MSB As Single Byte
NOCKRTD - Single Byte
OLDPA3 - Double Byte
ACNTDEL - Single Byte
CORRCL - Single Byte
BLM - Single Byte
DISPFLOW - Double Byte
ISSPMP - Single Byte
NOMALFCT - Single Byte
PROMIDA - Double Byte
MCUINST - Single Byte
ADATSCSD - Single Byte

3.2.3.3 Message Code $41 - Normal Or Service Diagnostic Mode (ECM To BCM)

Message Code $41 is sent from the ECM to BCM in response to a valid message Code $40. It consists of 9 Bytes of status data.

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3.2.3.3.1 Message $41 Data

BYTE	DESCRIPTION		
1	Flag Word		
	Bit 7 Operating Mode	0=Normal	1=Diag
	Bit 6 A/C Clutch Status	0=Off	1=On
	Bit 5 VATS Failed		1=Failed
	Bit 4 P/N	0=No	1=Yes
	Bit 3 Fourth Gear Status	0=No	1=Yes
	Bit 2 COOLANT Sensor Malf	0=No	1=Yes
	Bit 1 VATS Disabling Fuel	1=Fuel Disabled	
	Bit 0 S.E.S. Light	0=Off	1=On (Forced to 0 if Engine is Not Running)
2	NTRPMX (25 RPM/Bit)		
3	LITRES2 (0.00005 LITRES/Bit)		
4	COOLDEG (0.75 DEG C/Bit)		
5-9	Not Used In Normal Operating Mode		
5	Diagnostic Flags		
	Bit 7 Left Decimal Point	0=No	1=Yes
	Bit 6 Right Decimal Point	0=No	1=Yes
	Bit 5 Degree Marker	0=No	1=Yes
	Bit 4 Level 4-4 Ok To Test	0=No	1=Yes
	Bit 3 Not Used		
	Bit 2-0 Diag Level Number		
6	Override Mode Device Number (See Table D)		

Bytes 7 and 8 are a function of the Diag Level and Dash Number

Level 1

BYTE	DESCRIPTION		
7	Flag Word		
	Bit 7 History/Current Diag Code	0=CURRENT	1=HIST
	Bit 6-5 Fail Flag Info	00=No Codes 01=Codes In Progress 10=Codes Complete	
	Bit 4 Not Used		
	Bit 3-0 Set To Zero		
8	Bit 7-4 10's Digit Of Malf Code (BCD)		
	Bit 3-0 1's Digit of Malf Code (BCD)		

Level 4-1

BYTE	DESCRIPTION
7	Bit 7-4 1000's Digit of ECM Data (BCD)
	Bit 3-0 100's Digit of ECM Data (BCD)
	Bit 7-4 10's Digit of ECM Data (BCD)
	Bit 3-0 1's Digit of ECM Data (BCD)

Level 4-2		
7	Flags	
	Bit 7 Input State	0=LO 1=HI
	Bit 6 Same/Changed	0=Same 1=Changed
	Bit 5-0 Not Used	
8	Not Used	
Level 4-3		
7	Flags	
	Bit 7 Set to "1"	
	Bit 6 Output State	0=ON 1=OFF
	Bit 5-0 Not Used	
8	Not Used	
Level 4-4		
7	Not Used	
8	Not Used	
Level 4-5		
7	Flags	
	Bit 7 Malf Codes Cleared	0=No 1=Yes
	Bits 6-0 Not Used	
8	Not Used	
Level 4-6		
7	Flags	
	Bit 7 Snapshot Taken	0=No 1=Yes
	Bit 6-0 Not Used	
8	Not Used	
All Diag Levels		
9	Flags	
	Bit 7 A/C On	
	Bit 6 Closed Loop	
	Bit 5 TCC	
	Bit 4 Rich	
	Bit 3 EGR Enabled	
	Bit 2 In 4th Gear	
	Bit 1 In 3rd Gear	
	Bit 0 In 2nd Gear	

3.2.3.3.1.1 Accumulated Fuel for GM-30 (LITRES2)

ACUMFUEL shall be calculated in the 3.125 msec loop. Each time a REF pulse occurs, the BPW delivered shall be added to ACUMFUEL. ACUMFUEL is allowed to roll over. Also, each time the previous injector is updated ACUMFUEL shall be updated. ACUMFUEL shall be updated by asynchronous fuel in the 12.5 msec loop as defined in 3.2.3.3.1.1.1.

Calculate two new parameters called LITRES1 and LITRES2. LITRES1 shall be a double byte parameter and LITRES2 shall be a single byte. Both values are to be initialized to 0. They can be calculated in either the 3.125 msec or 12.5 msec loop, whichever is easier in software.

Each time that the double byte parameter ACUMFUEL rolls over, a calibratable double byte value shall be added to LITRES1. The calibratable value shall be defined by the equation:

N = E * 27.4 * 256

where E is fuel flow of an injector in grams per sec.

LITRES1 is allowed to rollover.

Once each 12.5 msec (immediately after storing ACUMFUEL), LITRES2 shall be calculated as follows:

EQ#1 = (ACUMFUEL * NMSB) / 256

where NMSB is the most significant byte of N described above. The divide by 256 is caused by dropping the least significant byte of the 3 byte result.

EQ#2 = EQ#1 + LITRES1
LITRES2 = Most significant byte of EQ#2

LITRES2 is allowed to rollover.

Resolution of LITRES2 is .00005 litres per bit.

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3.2.3.3.1.1.1 Asynchronous Fuel Term

The simplified Asynchronous fuel term of the accumulated fuel calculation is given by the expression below:

-1.5(ASYNC PW)(1-SYNC FUEL TERM/1229)

The '1.5' represents the fact that there are 6 injectors (Asynchronous Fuel is delivered to all injectors simultaneously) and that one-fourth the actual fuel delivered is accumulated as in the synchronous fuel term (6/4=1.5). The ratio of the synchronous fuel term to the synchronous fuel 'injectors full on' value of 1229 represents the percentage of time the injectors are energized. One minus this value indicates the percentage of the time the injectors are not energized. Since Asynchronous Fuel is actually delivered when an injector is not already on as the result of a synchronous fuel pulse, this number represents the approximate portion of asynchronous fuel that will actually be delivered to any given cylinder.

3.2.3.4 Message Code $4F - GM-30/33 ALDL

When the ECM receives a Message Code $4F, it will automatically respond with a 67 byte long data stream as defined in Table *ALRTBL*.

3.2.3.4.1 Message Lengths

- Number of Input Data Bytes = 2
- Number of Output Data Bytes = 67

3.2.3.4.2 Input Data

DATA BYTE NUMBER	
1	First ALCL Mode Desired
2	Second ALCL Mode Desired

The summary of ALCL modes available is shown in Table E.

3.2.3.4.3 Output Data

The ECM will respond automatically with the output data for the ALCL Mode as given in Table F.

3.2.3.5 ALCL Mode/Normal Mode Transitioning

Once the ALCL Mode is enabled, the system will revert back to the normal mode if the consecutive non-$4F number of message codes is greater than *KALDLNUM*.

3.2.3.6 Message Code $80 - C/H ALDL

When Message Code $80 is received by the ECM and *KSDGM30* = $FF, the ECM shall configure itself to operate as though it was in the C/H mode receiving a message code $F0. (See Section 3B)

3.3 Serial Data Input and Output Buffers

3.3.1 Input Buffers

Input buffers in RAM are reserved for placement of the Data Bytes. This does not include message code, message length and checksum. Currently the input buffers are reserved as shown below:

- Normal Mode - 5 Data Bytes
- ALCL Mode - 2 Data Bytes

3.3.2 Output Buffers

Output buffers in RAM are reserved for placement of the Data Bytes in anticipation of Data Transmission. Currently, the output buffers are reserved as shown below.

- Normal Mode - 9 Data Bytes
- ALCL Mode - 0 Data Bytes in RAM, Output is from ROM Table

3.3.3 Internal Software Buffering

Additional Software Buffering is included to insure that the Data Bytes are not updated while a given transmission is in progress.

4.0 Serial Data Algorithm Modification Priority

Various outputs and functions can be controlled or overridden by serial data. Each of these functions and their associated priority lists are shown below (highest priority first).

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4.1 Fan Control

- ALCL Mode $0E (Fan On)

- ALCL Mode $0D (Fan Off)

- Service Diagnostic Mode Level 4, Test 3, Device 7,8 (Fan On or Off)

- Normal or Service Diagnostic Fan on Override (Message Code $40, Word 1 Bit 3 = 1)

- Normal Fan Control Logic

4.2 A/C Clutch Control

- Service Diagnostic Mode Level 4, Test 3, Device 6 (A/C Clutch On or Off)

- Normal or Service Diagnostic Force A/C Off (Message Code $40, Word 1 Bit 6 = 1)

- Normal A/C Clutch Control Logic

4.3 Canister Purge Control

- Service Diagnostic Mode Level 4, Test 3, Device 5 (On or Off)

- Normal Purge Logic

4.4 Force Backup Fuel (Skip COP2 Toggling)

- ALCL Mode $03
- Normal COP2 Toggling Logic

NOTE: When backup fuel is forced the following outputs are deenergized by hardware;

- EGR1, 2, 3
- FAN2
- CCP
- TCC
- ACCR
- Hot Light

4.5 IAC Command Speed

- ALCL Mode $0A, set command speed to 1500 RPM
- Normal Command Speed Logic

4.6 IAC Motor Set to Minimum Air (0 Steps)

- ALCL Mode $09 (Must be in Park/Neutral)
- Service Diagnostic Mode Level 4, Test 3, Device 3
- Normal IAC Logic

4.7 Clear Malfunction Codes

- ALCL Mode $02
- Service Diagnostic Level 4 Test 5
- Normal Malfunction Detection Logic

4.8 EGR1, 2, 3 Control

- ALCL Mode $07, $12, $14 (EGR1, 2, 3 On)
- ALCL Mode $08, $11, $13 (EGR1, 2, 3 Off)
- Service Diagnostic Mode Level 4, Test 3, Device 2,3 and 4 (On or Off)
- Normal EGR Logic

4.9 TCC Control

- ALCL Mode $0B (Unlock TCC)
- ALCL Mode $0C (Lock TCC)
- Service Diagnostic Mode Level 4, Test 3, Device 1 (Lock or Unlock TCC)

NOTE: When TCC is commanded to lock via serial data, it will do so only after the lock delay timer has expired (see TCC).

5.0 Serial Data Transmitter/Receiver Specifications

The ECM serial data transmitter/receiver is configured as a slave and has the following specifications when driving a test load consisting of an 820 ohm resistor pulled up to 5.0 ± 0.1 volts and a 7500 pf ± 10% capacitor to ground. All boxes communicating with the ECM must use either an SXR integrated circuit or the same discrete interface as provided in the ECM.

CHARACTERISTICS	SYMBOL	MIN.	MAX.	UNITS
X-MIT/Logic "0"	Vol		0.9	Volts
X-MIT/Logic "1"	Voh	3.1		Volts
X-Mit/Fall to Rise Time	tl	106.1	154.1	usec
X-MIT/Transition time (1.3V to 3.0V)	tlht		16.0	usec
Receiver/Threshold Voltage (High to Low and Low to High)	Vth	2.00	2.90	Volts
Transmitter/Receiver Input Current (Vin=0V)	Iir	-60.0	-250.0	uAmp

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TABLE A

LEVEL 4-1 DEVICE SUMMARY

DEVICE NUMBER	DESCRIPTION	NUMBER OF BYTES*
$00	Throttle Position (NTPSLDSD Scaled)	1
$01	Coolant Temperature (COOLDEGA Scaled)	1
$02	Base Pulse Width (BPWDISP Scaled)	2
$03	Oxygen Sensor Voltage (ADO2AF Scaled)	1
$04	Spark Advance (SAREF Scaled)	2
$05	Battery Voltage (ADBAT)	1
$06	RPM (RPM2BYTE)	2
$07	MPH (FILTMPH)	1
$08	Spark Retard (NOCKRTD Scaled)	1
$09	Old PA3	2
$0A	No. of 02 Sensor Transitions/SEC (ACNTDEL)	1
$0B	CORRCL	1
$0C	BLM	1
$0D	Airflow (DISPELOW Scaled)	2
$0E	ISSPMP	1
$0F	Air Temperature (ADATSCSD Scaled)	1
$10	NOMALFCT	1
$11	PROMIDA	2

TABLE B

LEVEL 4-2 DEVICE SUMMARY

DEVICE NUMBER	DESCRIPTION	SWITCH STATE	VALUE TRANSMITTED*
$00	Brake	OPEN	$00
		CLOSED	$01
$01	PARK/NEUTRAL SWITCH	CLOSED	$00
		OPEN	$01
$02	Power Steering Pressure Switch	CLOSED	$01
		OPEN	$00
$03	Second Gear Switch	CLOSED	$00
		OPEN	$01
$04	Third Gear Switch	CLOSED	$00
		OPEN	$01
$05	Fourth Gear Switch	CLOSED	$00
		OPEN	$01

*NOTE: The value transmitted for each parameter can be masked out for each switch state by setting the appropriate member in Table *SDISCRIN* as shown below:

SDISCRIN	BRAKE
SDISCRIN + 1	P/N
SDISCRIN + 2	PSPS
SDISCRIN + 3	2nd Gear
SDISCRIN + 4	3rd Gear
SDISCRIN + 5	4th Gear

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TABLE C

LEVEL 4-3 DEVICE SUMMARY

DEVICE NUMBER	DESCRIPTION
$00	Not Used
$01	TCC Solenoid
$02	EGR 1
$03	EGR2
$04	EGR3
$05	CCP
$06	A/C Clutch Relay
$07	FAN1
$08	FAN2
$09	IAC Cycling

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TABLE D

LEVEL 4-4 DEVICE SUMMARY

DEVICE NUMBER	DESCRIPTION	ACTIVE SLEW BIT
0	Not Used	
1	TCC	UP = ON
2	EGR1	UP = ON
3	EGR2	UP = ON
4	EGR3	UP = ON
5	CCP	UP = ON
6	A/C	UP = ON
7	FAN1	UP = ON
8	FAN2	UP = ON
9	IAC	UP = Retract
10	INJECTORS	UP = Injector Number DOWN = Injector Enable/Disable

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TABLE E

ALCL MODE SUMMARY

MODE NUMBER	DESCRIPTION
$01	No Vehicle Function Modification
$02	Clear All ECM Malfunction Codes
$03	Force ECM Backup Fuel (Inhibit MALF Code 42 When Transitioning In and Out of This Mode)
$07	Force EGR1 Solenoid Full On (Inhibit MALF Code 32 When in This Mode)
$08	Force EGR1 Solenoid Full Off (Inhibit MALF Code 32 When in This Mode)
$09	Move IAC Motor to Minimum Air Position if in Park/Neutral (0 Steps)
$0A	Set IAC Command Speed to 1500 RPM
$0B	Deenergize the TCC Solenoid
$0C	Energize the TCC Solenoid
$0D	Deenergize the FAN1 Relay
$0E	Energize the FAN1 Relay
$0F	Deenergize the FAN2 Relay
$10	Energize the FAN2 Relay
$11	Deenergize the EGR2 Solenoid (Inhibit Associated MALF Code)
$12	Energize the EGR2 Solenoid (Inhibit Associated MALF Code)
$13	Deenergize the EGR3 Solenoid (Inhibit Associated MALF Code)
$14	Energize the EGR3 Solenoid (Inhibit Associated MALF Code)
$15	Deenergize CCP
$16	Energize CCP
$17	Deenergize A/C
$18	Energize A/C

NOTE: During any ALCL modes except Mode 1 the following actions take place:

- BYPASS Closed Loop Timers
- *KSAALDL* added to Spark Advance if vehicle speed = 0
- Inhibit Burst Knock Retard
- Deenergize Canister Purge Solenoid (Except Mode $16)
- Bypass Lean Integrator Clamp
- Send the Defined ALCL Data List

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TABLE F

ALCL MODE SERIAL DATA OUTPUT

BYTE NUMBER	NAME	DESCRIPTION
1	MW1	* Bit 0 = Advance Flag (0 = Advance, 1 = Retard) * Bit 1 = 1 = In Hot Open Loop * Bit 2 = Interrupt Service Execution Exceeded 6.25 msec * Bit 3 = Timing Error Check Bit * Bit 4 = TCC Road Speed First Pulse Flag (1 = Pulse Occured) * Bit 5 = 1 = A/C Clutch Off * Bit 6 = M42A Passed - Go to M42B (1 = Passed) * Bit 7 = EST Engine Running Flag (1 = Running)
2	MW2	* Bit 0 = Fuel Pressure Idle Duty Cycle Temperature Hyst Bit * Bit 1 = ESC Failure * Bit 2 = Reference Pulse Occurred (6.25 msec Check) * Bit 3 = 1 = High Altitude * Bit 4 = 1 = In Serial Data Service Diagnostic Mode * Bit 5 = 1 = High Battery Voltage - 2nd Pass - Disable Output * Bit 6 = 1 = High Battery Voltage - 1st Pass * Bit 7 = 2nd Engine Run Flag for Crank Fuel
3	MCUINST	* Bit 0 = 1 = Park/Neutral Mode * Bit 1 = 1 = 2nd Gear Switch Closed (0 = In 2nd Gear) * Bit 2 = 1 = 3rd Gear Switch Closed (0 = In 3rd Gear) * Bit 3 = 1 = 4th Gear Switch Closed (0 = In 4th Gear) * Bit 4 = 1 = Excessive Power Steering Pressure (S.D or FMD) * Bit 5 = 1 = Cruise Active (From Serial Data or FMDBYTE1) * Bit 6 = Vats Input * Bit 7 = 0 = A/C Request
4	SC1SDIC1	* Bit 0 = Not Allocated * Bit 1 = Brake* * Bit 2 = Vats * Bit 3 = Spare * Bit 4 = QDM Fault 1* * Bit 5 = QDM Fault 2* * Bit 6 = QDM Fault 3* * Bit 7 = QDM Fault 4*
5	PIDMW1	* Bit 0 = A/C Compensation Being Learned (1=Yes) * Bit 1 = Idle Speed Open Loop Speed GT Command, 1=Yes * Bit 2 = Idle Speed Open Loop Flag, 1=No, 0=Yes * Bit 3 = Idle Spd Mot Dir Flg, Open Loop and Throttle Follower - 1=Extend Motor, Decrease Air * Bit 4 = Throttle Follower Flag (1=Decay or Rise) * Bit 5 = 1 = A/C Compensation Steps Being Removed * Bit 6 = 1 = A/C Being Controlled * Bit 7 = 1 = A/C Request is Off

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TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
6	PIDMW2	* Bit 0 = Not Labeled - 1 = Min Motor Learned * Bit 1 = 1 = Motor Reset Completed * Bit 2 = 1 = Motor Reset Progressing * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Hot Start Idle Speed Offset * Bit 6 = 1 = P/N Status Was in Neutral Last Cycle * Bit 7 = 1 = P/N Status in Neutral
7	MWFA	* Bit 0 = 1 = Decel Enleanment Enabled * Bit 1 = 1 = Decel Fuel Cutoff Enabled * Bit 2 = BLM Address Change Flat (1 = Change) * Bit 3 = Delay BLM Update (1 = BL Addr Change) * Bit 4 = In P/N at Specified Engine Run Time * Bit 5 = PE Flag (1 = PE Is Active) * Bit 6 = High Limit Fuel Cutoff Enabled * Bit 7 = Flip/Flop For 3.125 or 6.25 Logic
8	MWFA1	* Bit 0 = 200 msec Old P/N Bit from MCUINST * Bit 1 = Learn Control Enable Flag (1=Enable Store, 0=Disable) * Bit 2 = FATI Filter Active * Bit 3 = Prop Step Taken Flag (1 = Rich Step, 0 = Lean Step) * Bit 4 =FATC Filter Active * Bit 5 = First Time Closed Loop Flag * Bit 6 = Rich-Lean Flag (1=Rich, 0=Lean) * Bit 7 = Closed Flag (1 = Closed Loop, 0 = Open Loop)
9	LCCPMW	* Bit 0 = CCP Purge on Flat (1 = Purge On) * Bit 1 = FAN1 on Flag (1 = FAN1 On) * Bit 2 = Not Used * Bit 3 = 1 = TCC Locked * Bit 4 =Fan2 On Flag (1 = FAN2 On) * Bit 5 = 1 = Engine Hot Light On * Bit 6 = Not Used * Bit 7 = Not Used
10	ALCLMWF	* Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = 1 = No GM30/33 Serial Data * Bit 7 = Serial Data Commands ALDL Mode

TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
11	COOLDEGA	Coolant Temperature, A/D Counts
12	COOLTSU	Start Up Coolant Temperature
13	ADTHROT	Throttle Position, A/D Counts
14	NTRPMX	Engine Speed (RPM) Variable
15	NEWRFPER	Time Between Reference Pulses (MSB)
16	NEWRFPER+1	Time Between Reference Pulses (LSB)
17	FILTMPH	Filtered Miles Per Hour (MSB)
18	FILTMPH+1	Filtered Miles Per Hour (LSB)
19	LV8	Filtered Load Variable
20	ADO2AF	Oxygen Sensor Variable
21	ACNTDEL	O_2 Cross Counts in Last Second
22	CORRCL	Base Pulse (Fuel) C.L. Fine Correction
23	BLM	Base Pulse (Fuel) C.L. Course Correction
24	BLMCELL	Current Block Learn Multiplier (BLM) Cell
25	ISSPMP	Idle Speed, Present IAC Motor Position
26	ISESDD	Desired Idle Speed, RPM/12.5
27	ATSDEG	Air Temperature Sensor Linearized, .75 Deg. C/Bit
28	EGRDC	EGR Duty Cycle
29	PURGEDC	Charcoal Canister Purge Duty Cycle
30	ADBAT	Battery Voltage/A/D Counts
31	DISPFLOW	Mass Air Flow Variable in Grams/Sec (MSB)
32	DISPFLOW+1	Mass Air Flow Variable in Grams/Sec (LSB)
33	SAP	Total Unlimited Spark Adv. Rel. to TDC (MSB)
34	SAP+1	Total Unlimited Spark Adv. Rel. to TDC (LSB)
35	OLDPA3	Elect. Spark Cont. (Knock) Signal Input
36	NOCKRTD	Elect. Spark Cont. (Knock) ECM Output
37	BPW	Injector Base Pulse Width (MSB)
38	BPW+1	Injector Base Pulse Width (LSB)
39	FAVAL	Total Fuel Air Value (MSB)
40	FAVAL+1	Total Fuel Air Value (LSB)
41	ACUMFUEL	Running Total of Fuel Delivered (MSB)
42	ACUMFUEL+1	Running Total of Fuel Delivered (LSB)
43	ACUMDIST	Running Total of Dist. Traveled (.0005MI/Bit)
44	TIME	Engine Running Time in Seconds (MSB)
45	TIME+1	Engine Running Time in Seconds (LSB)

TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
46	MALFFLG1	* Bit 0 = MALF Code 21 Throttle Position High
		* Bit 1 = MALF Code 19 Not Used
		* Bit 2 = MALF Code 18 Not Used
		* Bit 3 = MALF Code 17 Not Used
		* Bit 4 = MALF Code 16 Battery Voltage High
		* Bit 5 = MALF Code 15 Coolant Sensor Low
		* Bit 6 = MALF Code 14 Coolant Sensor High
		* Bit 7 = MALF Code 13 02 Sensor
47	MALFFLG2	* Bit 0 = MALF Code 29 4th Gear Switch Fail
		* Bit 1 = MALF Code 28 3rd Gear Switch Fail
		* Bit 2 = MALF Code 27 2nd Gear Switch Fail
		* Bit 3 = MALF Code 26 QDM Fail
		* Bit 4 = MALF Code 25 ATS High
		* Bit 5 = MALF Code 24 VSS Low
		* Bit 6 = MALF Code 23 ATS Low
		* Bit 7 = MALF Code 22 TPS Low
48	MALFFLG3	* Bit 0 = MALF Code 38 - Brake Switch Failure
		* Bit 1 = MALF Code 37 - Not Used
		* Bit 2 = MALF Code 36 - Not Used
		* Bit 3 = MALF Code 35 - Not Used
		* Bit 4 = MALF Code 34 - Mass Air Flow Sensor High
		* Bit 5 = MALF Code 33 - Mass Air Flow Sensor Low
		* Bit 6 = MALF Code 32 - Not Used
		* Bit 7 = MALF Code 31 - P/N Switch Failure
49	MALFFLG4	* Bit 0 = MALF Code 47 - UART Link Failure
		* Bit 1 = MALF Code 46 - Power Steering Pressure Switch
		* Bit 2 = MALF Code 45 - 02 Sensor Rich
		* Bit 3 = MALF Code 44 - 02 Sensor Lean
		* Bit 4 = MALF Code 43 - ESC Failure
		* Bit 5 = MALF Code 42 - EST Failure
		* Bit 6 = MALF Code 41 - CAM Sensor Failure
		* Bit 7 = MALF Code 39 - TCC Failure

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TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
50	MALFFLG5	* Bit 0 = MALF Code 56 - Not Used
		* Bit 1 = MALF Code 55 - Not Used
		* Bit 2 = MALF Code 54 - Not Used
		* Bit 3 = MALF Code 53 - Not Used
		* Bit 4 = MALF Code 52 - Not Used
		* Bit 5 = MALF Code 51 - PROM Error
		* Bit 6 = MALF Code 49 - Vacuum Leak
		* Bit 7 = MALF Code 48 - Misfire
51	MALFFLG6	* Bit 0 = MALF Code 65 - EGR1 Solenoid Failure
		* Bit 1 = MALF Code 64 - EGR2 Solenoid Failure
		* Bit 2 = MALF Code 63 - EGR3 Solenoid Failure
		* Bit 3 = MALF Code 62 - Not Used
		* Bit 4 = MALF Code 61 - Not Used
		* Bit 5 = MALF Code 59 - Not Used
		* Bit 6 = MALF Code 58 - Vats Failure
		* Bit 7 = MALF Code 57 - Not Used
52	MALFFLG7	* Bit 0 = MALF Code 74 - Not Used
		* Bit 1 = MALF Code 73 - Not Used
		* Bit 2 = MALF Code 72 - Not Used
		* Bit 3 = MALF Code 71 - Not Used
		* Bit 4 = MALF Code 69 - Not Used
		* Bit 5 = MALF Code 68 - Not Used
		* Bit 6 = MALF Code 67 - Not Used
		* Bit 7 = MALF Code 66 - Reset
53	MALFFLG8	* Bit 0 = Not Allocated
		* Bit 1 = Not Allocated
		* Bit 2 = Not Allocated
		* Bit 3 = Not Allocated
		* Bit 4 = Not Allocated
		* Bit 5 = Not Allocated
		* Bit 6 = Not Allocated
		* Bit 7 = Not Allocated

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TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
54	MALFFLG9	* Bit 0 = Not Allocated * Bit 1 = Not Allocated * Bit 2 = Not Allocated * Bit 3 = Not Allocated * Bit 4 = Not Allocated * Bit 5 = Not Allocated * Bit 6 = Not Allocated * Bit 7 = Not Allocated
55	MALFFLGA	* Bit 0 = Not Allocated * Bit 1 = Not Allocated * Bit 2 = Not Allocated * Bit 3 = Not Allocated * Bit 4 = Not Allocated * Bit 5 = Not Allocated * Bit 6 = Not Allocated * Bit 7 = Not Allocated
56	CURMALF1	* Bit 0 = MALF Code 21 - Throttle Position High * Bit 1 = MALF Code 19 - Not Used * Bit 2 = MALF Code 18 - Not Used * Bit 3 = MALF Code 17 - Not Used * Bit 4 =MALF Code 16 - Battery High * Bit 5 = MALF Code 15 - Coolant Sensor Low * Bit 6 = MALF Code 14 - Coolant Sensor High * Bit 7 = MALF Code 14 - 02 Sensor
57	CURMALF2	* Bit 0 = MALF Code 29 - 4th Gear Switch Failure * Bit 1 = MALF Code 28 - 3rd Gear Switch Failure * Bit 2 = MALF Code 27 - 2nd Gear Switch Failure * Bit 3 = MALF Code 26 - QDM Failure * Bit 4 = MALF Code 25 - Air Temp High * Bit 5 = MALF Code 24 - Vehicle Speed Sensor Low * Bit 6 = MALF Code 23 - Air Sensor Temp Low * Bit 7 = MALF Code 22 - Throttle Position Low

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TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
58	CURMALF3	* Bit 0 = MALF Code 38 - Brake Switch Failure
		* Bit 1 = MALF Code 37 - Not Used
		* Bit 2 = MALF Code 36 - Not Used
		* Bit 3 = MALF Code 35 - Not Used
		* Bit 4 = MALF Code 34 - Mass Air Flow Sensor High
		* Bit 5 = MALF Code 33 - Mass Air Flow Sensor Low
		* Bit 6 = MALF Code 32 - Not Used
		* Bit 7 = MALF Code 31 - P/N Switch Failure
59	CURMALF4	* Bit 0 = MALF Code 47 - UART Link Failure
		* Bit 1 = MALF Code 46 - Power Steering Pressure Switch
		* Bit 2 = MALF Code 45 - O2 Sensor Rich
		* Bit 3 = MALF Code 44 - O2 Sensor Lean
		* Bit 4 = MALF Code 43 - ESC Failure
		* Bit 5 = MALF Code 42 - EST Failure
		* Bit 6 = MALF Code 41 - CAM Sensor Failure
		* Bit 7 = MALF Code 39 - TCC Failure
60	CURMALF5	* Bit 0 = MALF Code 56 - Not Used
		* Bit 1 = MALF Code 55 - Not Used
		* Bit 2 = MALF Code 54 - Not Used
		* Bit 3 = MALF Code 53 - Not Used
		* Bit 4 = MALF Code 52 - Not Used
		* Bit 5 = MALF Code 51 - PROM Error
		* Bit 6 = MALF Code 49 - Vacuum Leak
		* Bit 7 = MALF Code 48 - Misfire
61	CURMALF6	* Bit 0 = MALF Code 65 - EGR1 Solenoid Failure
		* Bit 1 = MALF Code 64 - EGR2 Solenoid Failure
		* Bit 2 = MALF Code 63 - EGR3 Solenoid Failure
		* Bit 3 = MALF Code 62 - Not Used
		* Bit 4 = MALF Code 61 - Not Used
		* Bit 5 = MALF Code 59 - Not Used
		* Bit 6 = MALF Code 58 - VATS Failure
		* Bit 7 = MALF Code 57 - Not Used

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TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
62	CURMALF7	* Bit 0 = MALF Code 74 - Not Used * Bit 1 = MALF Code 73 - Not Used * Bit 2 = MALF Code 72 - Not Used * Bit 3 = MALF Code 72 - Not Used * Bit 4 = MALF Code 71 - Not Used * Bit 4 = MALF Code 69 - Not Used * Bit 5 = MALF Code 68 - Not Used * Bit 6 = MALF Code 67 - Not Used * Bit 7 = MALF Code 66 - ECM Software Reset
63	CURMALF8	* Bit 0 = Not Used * Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = Not Used * Bit 7 = Not Used
64	CURMALF9	* Bit 0 = Not Used * Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = Not Used * Bit 7 = Not Used

TABLE F

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
65	CURMALFA	* Bit 0 = Not Used * Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = Not Used * Bit 7 = Not Used
66	PROMIDA	
67	PROMIDA+1	

END OF SECTION 3A

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SECTION 3B

C/H

HIGH SPEED UART SERIAL DATA LINK

Original Release - 02/13/87

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1.0 GENERAL DESCRIPTION

The C/H serial data communications is divided into two operating modes which are mutually exclusive. They are the normal (broadcast remote) mode and ALDL mode.

During the normal mode the ECM transmits to other devices on the link at a rate determined by a scheduler. The ECM may or may not receive a response from a particular controller as defined by the system requirements.

The ALDL mode is intended for use as a diagnostic tool in the assembly plant to verify proper vehicle operation and to aid in the diagnosis of any problems that might exist. The ALDL mode is divided into sub-modes which provide different levels of information or vehicle operation.

1.1 Enabling The C/H Serial Data

The 88 SFI-4 software for the 3800 Flint program has the ability to communicate in a 'C/H' or 'GM-30' serial data format. To enable proper operation of the C/H format, the following calibrations must be complete:

F9FTMSG3 = SDRTBL (link to next message)

KSDGM30 = $00

KALDLNUM = $FF

2.0 Reference Documents

- Serial Communications Protocol Specification (EE-1800-003, Revision A), Delco/Kokomo, dated April 7, 1979.
- ECM Serial Output Specification (EE-1810-004, Revision A), Delco/Kokomo, dated April 17, 1979.
- XDE 5024, system Design Specification for High Speed Serial Data Communication between Microcomputer Assemblies, Latest revision dated January 31, 1985.

3.0 High Speed UART Serial Data Specification

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3.1 High Speed UART Serial Data Format

The approach used for the high speed transmission is intended to be the same as that used in a UART system. A description follows.

3.1.1 Bit Format

A bit time is 122.07 microseconds ±0.5%. This is equivalent to 8192 Baud. A high voltage state indicates a logic one condition and a low voltage state indicates a logic zero condition.

3.1.2 Word (Byte) Format

A word consists of ten bit times. The first bit is a logic zero and is called the Start Bit. The last (tenth bit) in the word is always a logic one and is called the Stop Bit. The remaining eight center bits are data bits and are transmitted LSB first. A Start Bit must always be preceded by at least one logic one bit time (either the stop bit of the preceding word or an Idle Line).

3.1.3 Message Format

Any and all data transmitted on the serial data bus must be part of a message. All messages must be of the following format:

- Idle Line
- Message Code (Message ID)
- Message Length Word (85 + N)
- N Bytes of Message Data
- Sum Check
- Idle Line

3.1.3.1 Idle Line

Ten or more consecutive logic one bit times constitute an Idle Line. All receivers on the bus will use the occurrence of an Idle Line followed by a Start Bit to indicate the start of a message.

3.1.3.2 Message Code

When used in a UART system, the first word of each message is a message code. Each message code initiates a unique communications mode in a particular electronic module on the UART link, therefore, all message codes must be assigned in the particular application specification. The total number of unique message codes is limited to 254. ID's of $00 and $FF shall not be used in the vehicle.

NOTE: C/H message codes are not necessarily coordinated with GM-30 message codes.

3.1.3.3 Message Length Word

The message length word indicates the total number of data words in the remainder of the message plus 85 (decimal). The maximum number of data words within one message which can be transmitted by any transmitter is 170. Thus a valid message length word must lie in the range of 85 to 255. Many messages with no data words are possible; for such messages, the message length word would contain the binary word 01010101 (MSB-LSB). This pattern has been selected because under an abnormally severe noise environment, there is a higher probability that an erroneously received message will be detected as such.

3.1.3.4 Sum Check

The last word to be transmitted in a message is the two's complement of the sum of all the other words in the message, including the message ID and message length words. Any carryouts of this eight-bit word while it is being formed by both the transmitter and receivers are neglected. The two's complement is used so that the sum of all the words in the message is zero for a valid message.

3.2 C/H Communications Format

With the current C/H vehicle configurations, there are six communications modes, each identified by a predetermined, dedicated message code. They have been defined for C/H communications as follows:

Communications Mode	Devices	Message Code	Message Code Block
ECM Factory Test (In Factory Test Mode Only)	ECM Only	$01, $02, $03	F9FTMSG1, 2, 3
Normal (Broadcast Remote)	ECM To Link	$05, $0A	F9MSG1, 2
C/H ALDL Poll	ECM To Link	$F0	F9MSG3
C/H ALDL Reply	Link To ECM	$F0	SDRTBL

Each message code expected to be transmitted or received by the ECM is assigned a block of at least 9 bytes of calibrations of the following format:

- Next message code block starting address (2 bytes)
- Message ID ($05, $0A, $F0 etc., 1 byte)
- Option Flag Word for UART Data Source (1 byte)
  - -- Use ROM Table if Bit 7 = 1
  - -- Use RAM Table if Bit 6 = 1
  - -- Used Output Buffer defined if Bit 6 = Bit 7 = 0
- Output Message Length (1 byte)
- Input Message Length (1 byte)
- Address of Output Control Block in RAM (2 bytes)
- Address of Input Control Block in RAM (2 bytes)

3.2.1 Software Message Code Validation Determination

When a message code is received by the ECM, it is compared to calibratable blocks, one of which corresponds to each message code. If a match occurs, the ECM will continue to monitor the incoming serial data. If a match does not occur, the message code received is compared to the value in the next message control block and so on until a match is achieved or all message control blocks have been checked. Software recognizes the last message control block when it sees a $0000 as the next message code block starting address.

3.2.2 Error Detection/Remedial Action

If any of the following errors are detected while receiving a message, the complete message is ignored and the serial data handler is put into wake-up mode in preparation for the next message.

- Overrun Error, indicates that one or more characters in the data stream were lost.
- Framing Error, indicates that the data byte received was improperly framed by a start and stop bit.
- Device Code not recognizable by ECM.
- Data byte count received does not match data byte count expected.
- Checksum Error
- Noise Error, indicates that one of three samples of the transmitted bit was different from the other two.

3.3 Serial Data Input and Output Buffers

A 29 byte buffer is reserved for the current message being transmitted or received. A second 29 byte buffer is used to store the last valid message that was received.

3.3.1 Internal Software Buffering

Additional software buffering is included to insure that the data bytes are not updated while a given transmission is in progress.

The C/H serial data communications is divided into two operating modes which are mutually exclusive. They are the normal (broadcast remote) mode and ALDL mode.

During the normal mode the ECM transmits to other devices on the link at a rate determined by a scheduler. The ECM may or may not receive a response from a particular controller as defined by the system requirements.

The ALDL mode is intended for use as a diagnostic tool in the assembly plant to verify proper vehicle operation and to aid in the diagnosis of any problems that might exist. The ALDL mode is divided into sub-modes which provide different levels of information or vehicle operation.

3.4 Normal Mode

The normal mode will be enabled if any of the following conditions are satisfied.

- ALDL device not present
- Mode 0 requested by ALDL device
- No ALDL message received for a time of 5 seconds

When the normal mode is enabled, messages will be continuously transmitted by the scheduler unless the ALDL mode is enabled. The scheduler consists of a table of message addresses corresponding to messages that can be transmitted at a given 12.5 msec interval. Only one message can be transmitted in a given 12.5 msec interval.

The scheduler table *F9MST* shown below, shows the expected messages and rates for this application.

Scheduler Interval Code	Message
0	*F9MSG1*
1	No Message
2	No Message
3	No Message
4	*F9MSG1*
5	No Message
6	*F9MSG2*
7	No Message
8	*F9MSG1*
9	No Message
A	No Message
B	No Message
C	*F9MSG1*
D	No Message
E	*F9MSG3*
F	No Message
0	*F9MSG1*
.	.
.	.
.	.

The scheduler shows the messages transmitted at the following rate:

F9MSG1	Every 50 msec
F9MSG2	Every 200 msec
F9MSG3	Every 200 msec (polling message)

3.4.1 Message Code $0A - Table *F9MSG1*

Message code $0A is transmitted from the ECM with the following format. The ECM expects no response to this message.

1. Message Code = $0A
2. Message Length = 85+2+1 = 88 = $58
3. TESTBYTE
4. RPM2BYTE (1 RPM/BIT)
5. RPM2BYTE+1
6. SUMCHECK

3.4.2 Message Code $05 - Table *F9MSG2*

Message Code $05 is transmitted from the ECM with the following format. The ECM expects no response to this message.

1. Message Code = $05
2. Message Length = 85 + 10 = 95 = $5F
3. TESTBYTE
4. TESTBYTE
5. Vehicle Speed (FILTMPH; Upper Byte only)
6. Engine Redline (*KREDLINE*)
7. Battery Voltage (ADBAT)
8. Accumulated Fuel Used Lower Byte (ACUMFUEL)
9. Accumulated Fuel Used Lower Byte (ACUMFUEL+1)
10. Injector Flow Rate Upper Byte (*KSIDFSB*)
11. Injector Flow Rate Lower Byte (*KDISFSB*+1)
12. Engine Coolant (COOLDEG)
13. Sum Check

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3.4.3 Message Code $F0 - Table *F9MSG3*

Message Code $F0 is used to poll for the presence of an ALDL testing device. It is transmitted from the ECM with the following format.

- Message Code = $F0
- Message Length
- Sum Check

If an ALDL device is present, it will respond with the following message.

- Message Code = $F0
- Message Length = 85 + 0 = 85 = $55
- Sum Check

3.5 ALDL Mode

The ALDL mode is enabled when the ALDL device responds to the normal mode ALDL polling message (Transmit Message Code $F0).

Once in the ALDL mode, the ECM will cease transmitting the normal mode messages. All other link devices must recognize the fact that the ALDL polling message was transmitted and a response received and altered their algorithms to maintain near normal operation without ECM data.

If a link device for some reason misses the fact that the ALDL polling message was transmitted and a response received, it should recognize that fact from the ensuing ALDL message codes.

The ALDL mode is divided into the following sub-modes. All ALDL sub-modes use a message code of $F0.

SUB MODE	TRANSMIT TABLE
- 0 (Return to Normal Mode)	*SDRMF0M0*
- 1 (Transmit fixed data stream)	*SDRMF0M1*
- 2 (Transmit Specified Sequential Data)	*SDRMF0M2*
- 3 (Transmit Specified Discrete Data)	*SDRMF0M3*
- 4 (Override Control)	*SDRMF0M4*
- 7 (Command normal mode message)	*SDRMF0M7*

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3.5.1 ALDL Mode 0 (Return to Normal Mode)

When the ALDL device requests Mode 0, the ECM will revert back to the normal mode. The ALDL device requests Mode 0 by sending the following message.

- Message ID = $F0
- Message Length = 85 + 1 = 86 = $56
- Mode = $00
- Sum Check

The ECM will respond with the following message.

- Message ID = $F0
- Message Length = 85 + 1 = 86 = $56
- Mode = $00
- Sum Check

3.5.2 ALDL Mode 1 (Transmit Fixed Data Stream)

When the ALDL device requests Mode 1, the ECM will respond by transmitting a predetermined 67 byte message as defined in table *SDRMFØM1* (see Table 1).

The ALDL device requests Mode 1 by sending the following message.

- Message ID = $F0
- Message Length = 85 + 1 = 86 = $56
- Mode = $01
- Sum Check

The ECM will respond with the following message.

- Message ID = $F0
- Message Length = 85 + 67 + 1 = 153 = $99
- Mode = $01
- Data Byte 1

.

.

.

- Data Byte 67
- Sum Check

3.5.3 ALDL Mode 2 (Transmit Selectable Sequential Data)

When the ALDL device request Mode 2, the ECM will respond by transmitting the contents of the 64 memory locations beginning with the address specified in the request.

The ALDL device request Mode 2 by sending the following message.

- Message ID = $FO
- Message Length = 85 + 2 + 1 = 86 = $58
- Mode = $02
- Address 1 Upper byte
- Address 1 Lower byte
- Sum Check

The ECM will respond with the following message.

- Message ID = $FO
- Message Length = 85 + 64 + 1 = 150 = $96
- Mode = $02
- Contents of Address 1

.

.

.

- Contents of Address (1 + 63)
- Sum Check

3.5.4 ALDL Mode 3 (Transmit Specified Discrete Data)

When the ALDL device requests Mode 3, the ECM will respond by transmitting the contents of the RAM locations specified in the request (from 0 to 16 locations).

The ALDL device requests Mode 3 by sending the following message.

- Message ID = $F0
- Message Length = 85 + 2N + 1 (N = 0 to 16)
- Mode = $03
- Address 1 Upper byte
- Address 1 Lower byte

  .

  .

  .

- Address N Upper byte
- Address N Lower byte
- Sum Check

The ECM will respond with the following message.

- Message ID = $F0
- Message Length = 85 + N + 1 (N = 0 to 16)
- Mode = $03
- Contents of Address 1

  .

  .

  .

- Contents of Address N
- Sum Check

3.5.5 ALDL Mode 4 (Override Control)

When the ALDL device requests Mode 4, the ECM will respond by modifying the operation of the ECM as requested in the 14 control words. Modes 1, 2, 3, & 7 may be entered while mode 4 is controlling the ECM. This allows the results of Mode 4 to be monitored.

The ALDL device requests Mode 4 by sending the following message.

- Message ID = $FO
- Message Length = 85 + 14 + 1 = 64
- Mode = $04
- Control Word #1

  .

  .

  .

- Control Word #14
- Sum Check

The ECM will respond with the following message, with no data.

- Message ID = $FO
- Message Length = 85 + 1 = 86 = $56
- Mode = $01
- Sum Check

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Control words #1 through #14 are described in the table below.

Control Word	Description	
1	Discrete Output Enable Word #1, 1 = Control Enabled	
	Bit 7	Not assigned
	Bit 6	Not assigned
	Bit 5	Not assigned
	Bit 4	Not assigned
	Bit 3	Not assigned
	Bit 2	Not assigned
	Bit 1	Not assigned
	Bit 0	Engine Hot Light
2	Discrete Output Control Word # 1, 1 = On, 0 = Off	
	Bit 7	Not assigned
	Bit 6	Not assigned
	Bit 5	Not assigned
	Bit 4	Not assigned
	Bit 3	Not assigned
	Bit 2	Not assigned
	Bit 1	Not assigned
	Bit 0	Engine Hot Light
3	Discrete Output Enable Word # 2, 1 = Control Enable	
	Bit 7	A/C
	Bit 6	TCC
	Bit 5	EGR1
	Bit 4	EGR2
	Bit 3	EGR3
	Bit 2	Fan1
	Bit 1	Fan2
	Bit 0	Check Engine Light
4	Discrete Output Control Word # 2, 1 = On, 0 = Off	
	Bit 7	A/C
	Bit 6	TCC
	Bit 5	EGR1
	Bit 4	EGR2
	Bit 3	EGR3
	Bit 2	Fan1
	Bit 1	FAN2
	Bit 0	Check Engine Light

5 Mode Control Enable Word 1 = Function enabled

*Bit 7	1 = Backup Fuel and Bypass Spark
Bit 6	1 = Erase Malfunction Codes
Bit 5	1 = Reset IAC Motor
Bit 4	1 = Reset BLM Cells to 128
Bit 3	1 = Bypass Spark
Bit 2	Not assigned
Bit 1	Not assigned
Bit 0	1 = Fuel Closed Loop Control Enabled

6 Mode Control Word

Bit 7	Use *KKAAIR* in Place of MAF Reading
Bit 6	Use *KKATSDEG* in Place of Air Temperature Reading
Bit 5	Use *KKTCDFA* in Place of Coolant Reading
Bit 4	Use *KKHITPS* in Place of TPS Reading
Bit 3	Not assigned
Bit 2	Not assigned
Bit 1	Not Assigned
Bit 0	1 = Fuel Closed Loop Enabled, 0 = Open Loop

* Note: Serial Data Transmission from the ECM is disabled when this function is enabled.

7 PWM Output Control Enable Word, 1 = Control Enabled

Bit 7	Not assigned
Bit 6	Not assigned
Bit 5	Not assigned
Bit 4	Not assigned
Bit 3	CCP
Bit 2	Not assigned
Bit 1	Not assigned
Bit 0	Not assigned

8 PWM Output Duty Cycle for Outputs Selected in Word 7 (0-100%)

9 Function Modification Control Word

Bit 7	Not assigned
Bit 6	Not assigned
Bit 5	Spark Modify Polarity: 1 = Retard, 0 = Advance
Bit 4	Spark Modify Type: 1 = Delta, 0 = Absolute
Bit 3	Spark Modify Enable: 1 = Enabled, 0 = Disabled
Bit 2	A/F Ratio Modify Enable: 1 = Enabled, 0 = Disab
Bit 1	IAC Control Type: 1 = RPM, 0 = Motor Position
Bit 0	IAC Modify Enable: 1 = Enabled, 0 = Disabled

10 IAC Motor Position (0-255) or RPM (0-3200) N = RPM/12.5

11 A/F Ratio (0-25.5) N = A/F*10

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12 Spark Advance Change (0-90 Degrees) N = ADV*256/90

13 Spark Plug Discrete Word (Not used)

14 Injector Discrete State, 1 = Force Off

Bit 7 = INJ A
Bit 6 = INJ B
Bit 5 = INJ C
Bit 4 = INJ D
Bit 3 = INJ E
Bit 2 = INJ F

The function modifications will have immediate response (next applicable program loop) and will override the normal operation of the outputs if the engine is running and battery voltage is less than 17.1 Volts.

3.5.5.1 ALDL Mode 4 Time Constraints

To limit the amount of time any override function in Mode 4 can remain active, a timer will return C/H serial data to the normal mode if time exceeds *KMD4TIM*. Once Mode 4 is exited due to timer expiration, Mode 4 may not be reentered for a period of time *KMD4LCK*.

3.5.6 ALDL Mode 7 (Command Normal Mode Message)

When the ALDL device requests Mode 7, the ECM will transmit the normal mode scheduler message specified in the request.

The ALDL device requests Mode 7 by sending the following message.

- Message ID = $F0
- Message Length = 85 + 2 = 87 = $57
- Mode = $07
- ECM Scheduler Message Code (0-F)
- Sum Check

The ECM will respond with the appropriate normal mode scheduler message if one exists for that particular scheduler message code.

3.6 Serial Data Transmitter Specifications

Characteristics of the serial data output are as follows when operating into a load not exceeding 10,000 pf.

- VOH greater than or equal to 4.0 V at IOH = -2.5mA, 5.1 V Max
- VOL less than or equal to 1.0 V at IOL = 10.0 mA, ECM Ground Min

3.7 Serial Data Receiver Specifications

The following specifications are required to be met by any device transmitting serial data to the ECM.

- VIH greater than or equal to 3.1 V, 16 V Max
- VIL less than or equal to 1.7 V, -0.5 V Min
- Tristate leakage from -165 uA to -360 uA

All voltages relative to ECM ground and measured at ECM connector. All currents directed into ECM.

Requiring each receiver to meet these specifications insures that the ECMs serial data output will drive at least eight receivers in parallel.

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT

BYTE NUMBER	NAME	DESCRIPTION
1	MW1	* Bit 0 = Advance Flag (0 = Advance, 1 = Retard) * Bit 1 = In Hot Open Loop * Bit 2 = Interrupt Service Execution Exceeded 6.25 msec * Bit 3 = Timing Error Check Bit * Bit 4 = TCC Road Speed First Pulse Flag (1 = Pulse Occured) * Bit 5 = 1 = A/C Clutch Off * Bit 6 = M42A Passed - Go to M42B (1 = Passed) * Bit 7 = EST Engine Running Flag (1 = Running)
2	MW2	* Bit 0 = Fuel Pressure Idle Duty Cycle Temperature Hyst Bit * Bit 1 = ESC Failure * Bit 2 = Reference Pulse Occurred (6.25 msec Check) * Bit 3 = 1 = High Altitude * Bit 4 = 1 = In Serial Data Service Diagnostic Mode * Bit 5 = 1 = High Battery Voltage - 2nd Pass - Disable Outputs * Bit 6 = 1 = High Battery Voltage - 1st Pass * Bit 7 = 2nd Engine Run Flag for Crank Fuel
3	MCUINST	* Bit 0 = 1 = Park/Neutral Mode * Bit 1 = 1 = 2nd Gear Switch Closed (0 = In 2nd Gear) * Bit 2 = 1 = 3rd Gear Switch Closed (0 = In 3rd Gear) * Bit 3 = 1 = 4th Gear Switch Closed (0 = In 4th Gear) * Bit 4 = 1 = Excessive Power Steering Pressure (S.D or FMD) * Bit 5 = 1 = Cruise Active (From Serial Data or FMDBYTE1) * Bit 6 = Vats Input * Bit 7 = 0 = A/C Request
4	SC1SDIC1	* Bit 0 = Not Allocated * Bit 1 = Brake* * Bit 2 = Vats * Bit 3 = Spare * Bit 4 = QDM Fault 1* * Bit 5 = QDM Fault 2* * Bit 6 = QDM Fault 3* * Bit 7 = QDM Fault 4*
5	PIDMW1	* Bit 0 = A/C Compensation Being Learned (1=Yes) * Bit 1 = Idle Speed Open Loop Speed GT Command, 1=Yes * Bit 2 = Idle Speed Open Loop Flag, 1=No, 0=Yes * Bit 3 = Idle Spd Mot Dir Flg, Open Loop and Throttle Follower - 1=Extend Motor, Decrease Air * Bit 4 = Throttle Follower Flag (1=Decay or Rise) * Bit 5 = 1 = A/C Compensation Steps Being Removed * Bit 6 = 1 = A/C Being Controlled * Bit 7 = 1 = A/C Request is Off

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
6	PIDMW2	* Bit 0 = Not Labeled - 1 = Min Motor Learned * Bit 1 = 1 = Motor Reset Completed * Bit 2 = 1 = Motor Reset Progressing * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Hot Start Idle Speed Offset * Bit 6 = 1 = P/N Status Was in Neutral Last Cycle * Bit 7 = 1 = P/N Status in Neutral
7	MWFA	* Bit 0 = 1 = Decel Enleanment Enabled * Bit 1 = 1 = Decel Fuel Cutoff Enabled * Bit 2 = BLM Address Change Flat (1 = Change) * Bit 3 = Delay BLM Update (1 = BL Addr Change) * Bit 4 = In P/N at Specified Engine Run Time * Bit 5 = PE Flag (1 = PE Is Active) * Bit 6 = High Limit Fuel Cutoff Enabled * Bit 7 = Flip/Flop For 3.125 or 6.25 Logic
8	MWFA1	* Bit 0 = 200 msec Old P/N Bit from MCUINST * Bit 1 = Learn Control Enable Flag (1=Enable Store, 0=Disable) * Bit 2 = FATI Filter Active * Bit 3 = Prop Step Taken Flag (1 = Rich Step, 0 = Lean Step) * Bit 4 =FATC Filter Active * Bit 5 = First Time Closed Loop Flag * Bit 6 = Rich-Lean Flag (1=Rich, 0=Lean) * Bit 7 = Closed Flag (1 = Closed Loop, 0 = Open Loop)
9	LCCPMW	* Bit 0 = CCP Purge on Flat (1 = Purge On) * Bit 1 = FAN1 on Flag (1 = FAN1 On) * Bit 2 = Not Used * Bit 3 = 1 = TCC Locked * Bit 4 =Fan2 On Flag (1 = FAN2 On) * Bit 5 = 1 = Engine Hot Light On * Bit 6 = Not Used * Bit 7 = Not Used
10	ALCLMWF	* Bit 0 = Not Used * Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = No GM30/33 Serial Data * Bit 7 = Serial Data Commands ALDL Mode

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
11	COOLDEGA	Coolant Temperature, A/D Counts
12	COOLTSU	Start Up Coolant Temperature
13	ADTHROT	Throttle Position, A/D Counts
14	NTRPMX	Engine Speed (RPM) Variable
15	NEWRFPER	Time Between Reference Pulses (MSB)
16	NEWRFPER+1	Time Between Reference Pulses (LSB)
17	FILTMPH	Filtered Miles Per Hour (MSB)
18	FILTMPH+1	Filtered Miles Per Hour (LSB)
19	LV8	Filtered Load Variable
20	AD02AF	Oxygen Sensor Variable
21	ACNTDEL	O_2 Cross Counts in Last Second
22	CORRCL	Base Pulse (Fuel) C.L. Fine Correction
23	BLM	Base Pulse (Fuel) C.L. Course Correction
24	BLMCELL	Current Block Learn Multiplier (BLM) Cell
25	ISSPMP	Idle Speed, Present IAC Motor Position
26	ISESDD	Desired Idle Speed, RPM/12.5
27	ATSDEG	Air Temperature Sensor Linearized, .75 Deg. C/Bit
28	EGRDC	EGR Duty Cycle
29	PURGEDC	Charcoal Canister Purge Duty Cycle
30	ADBAT	Battery Voltage/A/D Counts
31	DISPFLOW	Mass Air Flow Variable in Grams/Sec (MSB)
32	DISPFLOW+1	Mass Air Flow Variable in Grams/Sec (LSB)
33	SAP	Total Unlimited Spark Adv. Rel. to TDC (MSB)
34	SAP+1	Total Unlimited Spark Adv. Rel. to TDC (LSB)
35	OLDPA3	Elect. Spark Cont. (Knock) Signal Input
36	NOCKRTD	Elect. Spark Cont. (Knock) ECM Output
37	BPW	Injector Base Pulse Width (MSB)
38	BPW+1	Injector Base Pulse Width (LSB)
39	FAVAL	Total Fuel Air Value (MSB)
40	FAVAL+1	Total Fuel Air Value (LSB)
41	ACUMFUEL	Running Total of Fuel Delivered (MSB)
42	ACUMFUEL+1	Running Total of Fuel Delivered (LSB)
43	ACUMDIST	Running Total of Dist. Traveled (.0005MI/Bit)
44	TIME	Engine Running Time in Seconds (MSB)
45	TIME+1	Engine Running Time in Seconds (LSB)

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
46	MALFFLG1	* Bit 0 = MALF Code 21 Throttle Position High
		* Bit 1 = MALF Code 19 Not Used
		* Bit 2 = MALF Code 18 Not Used
		* Bit 3 = MALF Code 17 Not Used
		* Bit 4 = MALF Code 16 Battery Voltage High
		* Bit 5 = MALF Code 15 Coolant Sensor Low
		* Bit 6 = MALF Code 14 Coolant Sensor High
		* Bit 7 = MALF Code 13 02 Sensor
47	MALFFLG2	* Bit 0 = MALF Code 29 4th Gear Switch Fail
		* Bit 1 = MALF Code 28 3rd Gear Switch Fail
		* Bit 2 = MALF Code 27 2nd Gear Switch Fail
		* Bit 3 = MALF Code 26 QDM Fail
		* Bit 4 = MALF Code 25 ATS High
		* Bit 5 = MALF Code 24 VSS Low
		* Bit 6 = MALF Code 23 ATS Low
		* Bit 7 = MALF Code 22 TPS Low
48	MALFFLG3	* Bit 0 = MALF Code 38 - Brake Switch Failure
		* Bit 1 = MALF Code 37 - Not Used
		* Bit 2 = MALF Code 36 - Not Used
		* Bit 3 = MALF Code 35 - Not Used
		* Bit 4 = MALF Code 34 - Mass Air Flow Sensor High
		* Bit 5 = MALF Code 33 - Mass Air Flow Sensor Low
		* Bit 6 = MALF Code 32 - Not Used
		* Bit 7 = MALF Code 31 - P/N Switch Failure
49	MALFFLG4	* Bit 0 = MALF Code 47 - UART Link Failure
		* Bit 1 = MALF Code 46 - Power Steering Pressure Switch
		* Bit 2 = MALF Code 45 - 02 Sensor Rich
		* Bit 3 = MALF Code 44 - 02 Sensor Lean
		* Bit 4 = MALF Code 43 - ESC Failure
		* Bit 5 = MALF Code 42 - EST Failure
		* Bit 6 = MALF Code 41 - CAM Sensor Failure
		* Bit 7 = MALF Code 39 - TCC Failure

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
50	MALFFLG5	* Bit 0 = MALF Code 56 - Not Used
		* Bit 1 = MALF Code 55 - Not Used
		* Bit 2 = MALF Code 54 - Not Used
		* Bit 3 = MALF Code 53 - Not Used
		* Bit 4 = MALF Code 52 - Not Used
		* Bit 5 = MALF Code 51 - PROM Error
		* Bit 6 = MALF Code 49 - Vacuum Leak
		* Bit 7 = MALF Code 48 - Misfire
51	MALFFLG6	* Bit 0 = MALF Code 65 - EGR1 Solenoid Failure
		* Bit 1 = MALF Code 64 - EGR2 Solenoid Failure
		* Bit 2 = MALF Code 63 - EGR3 Solenoid Failure
		* Bit 3 = MALF Code 62 - Not Used
		* Bit 4 = MALF Code 61 - Not Used
		* Bit 5 = MALF Code 59 - Not Used
		* Bit 6 = MALF Code 58 - Vats Failure
		* Bit 7 = MALF Code 57 - Not Used
52	MALFFLG7	* Bit 0 = MALF Code 74 - Not Used
		* Bit 1 = MALF Code 73 - Not Used
		* Bit 2 = MALF Code 72 - Not Used
		* Bit 3 = MALF Code 71 - Not Used
		* Bit 4 = MALF Code 69 - Not Used
		* Bit 5 = MALF Code 68 - Not Used
		* Bit 6 = MALF Code 67 - Not Used
		* Bit 7 = MALF Code 66 - Reset
53	MALFFLG8	* Bit 0 = Not Allocated
		* Bit 1 = Not Allocated
		* Bit 2 = Not Allocated
		* Bit 3 = Not Allocated
		* Bit 4 = Not Allocated
		* Bit 5 = Not Allocated
		* Bit 6 = Not Allocated
		* Bit 7 = Not Allocated

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
54	MALFFLG9	* Bit 0 = Not Allocated * Bit 1 = Not Allocated * Bit 2 = Not Allocated * Bit 3 = Not Allocated * Bit 4 = Not Allocated * Bit 5 = Not Allocated * Bit 6 = Not Allocated * Bit 7 = Not Allocated
55	MALFFLGA	* Bit 0 = Not Allocated * Bit 1 = Not Allocated * Bit 2 = Not Allocated * Bit 3 = Not Allocated * Bit 4 = Not Allocated * Bit 5 = Not Allocated * Bit 6 = Not Allocated * Bit 7 = Not Allocated
56	CURMALF1	* Bit 0 = MALF Code 21 - Throttle Position High * Bit 1 = MALF Code 19 - Not Used * Bit 2 = MALF Code 18 - Not Used * Bit 3 = MALF Code 17 - Not Used * Bit 4 =MALF Code 16 - Battery High * Bit 5 = MALF Code 15 - Coolant Sensor Low * Bit 6 = MALF Code 14 - Coolant Sensor High * Bit 7 = MALF Code 14 - 02 Sensor
57	CURMALF2	* Bit 0 = MALF Code 29 - 4th Gear Switch Failure * Bit 1 = MALF Code 28 - 3rd Gear Switch Failure * Bit 2 = MALF Code 27 - 2nd Gear Switch Failure * Bit 3 = MALF Code 26 - QDM Failure * Bit 4 = MALF Code 25 - Air Temp High * Bit 5 = MALF Code 24 - Vehicle Speed Sensor Low * Bit 6 = MALF Code 23 - Air Sensor Temp Low * Bit 7 = MALF Code 22 - Throttle Position Low

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
58	CURMALF3	* Bit 0 = MALF Code 38 - Brake Switch Failure
		* Bit 1 = MALF Code 37 - Not Used
		* Bit 2 = MALF Code 36 - Not Used
		* Bit 3 = MALF Code 35 - Not Used
		* Bit 4 = MALF Code 34 - Mass Air Flow Sensor High
		* Bit 5 = MALF Code 33 - Mass Air Flow Sensor Low
		* Bit 6 = MALF Code 32 - Not Used
		* Bit 7 = MALF Code 31 - P/N Switch Failure
59	CURMALF4	* Bit 0 = MALF Code 47 - UART Link Failure
		* Bit 1 = MALF Code 46 - Power Steering Pressure Switch
		* Bit 2 = MALF Code 45 - 02 Sensor Rich
		* Bit 3 = MALF Code 44 - 02 Sensor Lean
		* Bit 4 = MALF Code 43 - ESC Failure
		* Bit 5 = MALF Code 42 - EST Failure
		* Bit 6 = MALF Code 41 - CAM Sensor Failure
		* Bit 7 = MALF Code 39 - TCC Failure
60	CURMALF5	* Bit 0 = MALF Code 56 - Not Used
		* Bit 1 = MALF Code 55 - Not Used
		* Bit 2 = MALF Code 54 - Not Used
		* Bit 3 = MALF Code 53 - Not Used
		* Bit 4 = MALF Code 52 - Not Used
		* Bit 5 = MALF Code 51 - PROM Error
		* Bit 6 = MALF Code 49 - Vacuum Leak
		* Bit 7 = MALF Code 48 - Misfire
61	CURMALF6	* Bit 0 = MALF Code 65 - EGR1 Solenoid Failure
		* Bit 1 = MALF Code 64 - EGR2 Solenoid Failure
		* Bit 2 = MALF Code 63 - EGR3 Solenoid Failure
		* Bit 3 = MALF Code 62 - Not Used
		* Bit 4 = MALF Code 61 - Not Used
		* Bit 5 = MALF Code 59 - Not Used
		* Bit 6 = MALF Code 58 - VATS Failure
		* Bit 7 = MALF Code 57 - Not Used

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
62	CURMALF7	* Bit 0 = MALF Code 74 - Not Used
		* Bit 1 = MALF Code 73 - Not Used
		* Bit 2 = MALF Code 72 - Not Used
		* Bit 3 = MALF Code 72 - Not Used
		* Bit 4 = MALF Code 71 - Not Used
		* Bit 4 = MALF Code 69 - Not Used
		* Bit 5 = MALF Code 68 - Not Used
		* Bit 6 = MALF Code 67 - Not Used
		* Bit 7 = MALF Code 66 - ECM Software Reset
63	CURMALF8	* Bit 0 = Not Used
		* Bit 1 = Not Used
		* Bit 2 = Not Used
		* Bit 3 = Not Used
		* Bit 4 = Not Used
		* Bit 5 = Not Used
		* Bit 6 = Not Used
		* Bit 7 = Not Used
64	CURMALF9	* Bit 0 = Not Used
		* Bit 1 = Not Used
		* Bit 2 = Not Used
		* Bit 3 = Not Used
		* Bit 4 = Not Used
		* Bit 5 = Not Used
		* Bit 6 = Not Used
		* Bit 7 = Not Used

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TABLE 1

ALCL MODE SERIAL DATA OUTPUT (CONTINUED)

BYTE NUMBER	NAME	DESCRIPTION
65	CURMALFA	* Bit 0 = Not Used * Bit 1 = Not Used * Bit 2 = Not Used * Bit 3 = Not Used * Bit 4 = Not Used * Bit 5 = Not Used * Bit 6 = Not Used * Bit 7 = Not Used
66	PROMIDA	
67	PROMIDA+1	

END OF SECTION 3B

SECTION 4

IDLE AIR CONTROL (IAC)

Original Release - 02/13/87

1.0 SUBJECT

Idle Air Control (IAC)

2.0 SCOPE

This section describes the proportional integral derivative idle air control (PID IAC) algorithm. The purpose of the idle air control system is to control engine RPM at low idle speeds while preventing stalls due to changes in engine load.

3.0 SPECIFICATION

The Idle Air Control Algorithm is divided into seven general areas.

-IAC Motor Drive Logic (6.25 Msec)

-IAC Motor Reset (12.5 Msec)

-Startup Delay (6.25 Msec)

-Open Loop (12.5 Msec)

-Throttle Follower (12.5 Msec)

-Load Compensations (12.5 Msec, 100 Msec)

-Closed Loop (50 Msec)

3.1 IAC Control Scenario

Following a motor reset the IAC Motor position is at the park position given by *KISPKSP*.

-Startup Delay: When an engine running condition is achieved the IAC motor will move to a warm park position from the *F16B* Table for a period of time of *KISSUDL*. Once this mode has timed out the open loop mode is enabled.

-Open Loop: During the Open Loop Mode the motor position is increased until the current engine RPM is greater than the desired RPM (command speed). Next, the motor position is decreased until the current engine RPM is less than the command speed. Once the RPM has gone above and below the command speed, the open loop mode is disabled until the next startup.

-Closed Loop: After the startup delay and open loop have expired, closed loop operation will begin when its enabling conditions are satisfied. The closed loop logic is intended to maintain a constant RPM for good idle quality and is only active at closed throttle with the vehicle not moving.

-Throttle Follower: The throttle follower (T/F) Logic increases the air intake into the Throttle Body proportionally to the current value of throttle position. This logic is required to provide a smooth transition from idle to off-idle and vice-versa and to reduce the likelihood of a stall during these maneuvers. When the throttle follower is enabled closed loop is disabled.

-Load Compensation: Load compensation is provided to minimize the effects of changes in engine load on idle stability or quality. Load compensation is provided for the air conditioner and power steering. Load compensation, like throttle follower, will disable closed loop when active. Load compensation can occur coincident with throttle follower compensation.

Following is a more detailed description of each of these modes of operation which comprise the IAC control strategy.

3.2 IAC Motor Driver Requirements

The IAC Motor will be energized with a 100% Duty cycle except during the following conditions when the motor cannot be reliably moved.

-Ignition voltage less than or equal to 9.0 volts

-Ignition voltage greater than 17.1 volts

3.3 Motor Position Limits

3.3.1 Minimum Motor Position

A minimum motor position limit is only imposed when throttle follower is active (see Throttle Follower)

3.3.2 Maximum Motor Position

The motor position is limited at all times to a maximum of *KISMXSP*.

3.4 IAC Motor Step Rates

3.4.1 Motor Retraction

The idle air control motor is retracted to increase the air intake into the throttle body to increase idle speed. As the motor is retracted, the present motor position is incremented. The IAC Motor will be allowed to retract at a rate of one step each 3.125 Msec.

3.4.2 Motor Extension

The idle air control motor is extended to decrease the air intake into the throttle body to decrease idle speed. The present motor position is decremented as the motor is extended. When not in closed loop, the IAC motor will be allowed to extend at a rate given by one of the expressions below for the conditions indicated. During closed loop the IAC Motor is controlled as required to sustain a proper idle. The maximum achievable extension rate is one step each 3.125 Msec.

-*KISMPSD*, (Drive, not open loop)

-*KISMPSD* + (*KISCODM*)(1-RPM Error/800), (Drive, Open Loop)

-*KISMPSN*, (Park/Neutral, not open loop)

-*KISMPSN* + (*KISCODM*)(1-RPM Error/800), (Park/Neutral, Open Loop)

The term (1-RPM Error/800) is limited to a minimum of zero which occurs if RPM error is greater than 800 RPM.

3.5 IAC Motor Reset

The IAC motor is reset on ignition off so that the IAC Motor is in a known place for the next startup.

3.5.1 Motor reset Enable Criteria

The IAC Motor Reset is enabled after the following sequence of events are satisfied.

-Engine running for time greater than or equal to *KRUNRST*

-Ignition on to Ignition off transition takes place

-Coolant is greater than *KISCLRST*

-Ignition is off for 3.5 seconds

3.5.2 Motor Reset Maneuver

The IAC Motor reset is accomplished by the following sequence of events.

-Motor extended 255 steps to guarantee minimum air position

-Motor retracted *KISPKSP* steps to cold park position

3.6 Startup Delay

The startup delay is enabled when the engine is first determined as running. It will remain active for a time of *KISSUDL*. During the startup delay, the IAC Motor is moved to a position defined in the *F16B* table as a function of coolant temperature. This movement of the IAC Motor will be bypassed if *KFAOPT2* Bit 6=0 and hot restart spark retard is active (see EST).

3.7 Open Loop Mode

During the Open Loop Mode the motor position is increased until the current engine RPM is greater than the desired RPM (command speed). Next, the motor position is decreased until the current engine RPM is less than the command speed. Once the RPM has gone above and below the command speed, the open loop mode is disabled until the next startup.

The open loop mode will temporarily be bypassed while either of the following conditions are met.

-Throttle position greater than or equal to *KISTATH*

-Vehicle speed greater than *KISMPHOL*

3.7.1 Command Speed Calculation (50 Msec)

3.7.1.1 Base Command Speed

The Base Command Speed (desired RPM) is derived from one of the following tables versus coolant temperature for the conditions indicated.

- *F17A*, in drive

- *F19A*, in Park/Neutral or engine not running

3.7.1.2 Hot Restart Retard Command Speed offset

An RPM offset of *KISESHRO* is added to the command speed if all of the following conditions are satisfied.

- -Hot Restart Spark Retard Active (See EST)
- -Startup coolant temperature greater than or equal to *KHRCTA* (see EST)
- -Engine running for time less than *KISHRTIM*

3.7.1.3 Hot Idle Command Speed Offset

An idle offset of *KISCLTHI* is added to the command speed when all of the following conditions are satisfied.

- -Engine running for time less than *KISCLTTM*
- -Coolant temperature greater than *KISCLTLM*
- -Vehicle speed less than *KISMPHLM*

If any of these conditions are not satisfied, then the hot idle command speed offset is disabled until the next startup.

3.7.1.4 Air Conditioner on Command Speed Offset

An offset of *KISACON* is added to the command speed when the A/C clutch is energized.

3.7.1.5 ALCL Mode $0A Command Speed

When ALCL mode $0A is requested via the UART serial data link, the IAC command speed is fixed at 1500 RPM.

3.7.1.6 Maximum Command Speed Change Rate

The command speed is allowed to increase or decrease a maximum of *KISMAXCH* RPM each 50 Msec.

3.7.1.7 GM 30/33 Low Mileage Offset

In GM 30/33 vehicles, when Bit 6 of byte 1 on message code $40 is set (RPM less than 512 miles) *KSDIACOF* is added to the base command speed.

3.8 Throttle Follower

3.8.1 Throttle Follower Enable Criteria

The Throttle Follower Mode is active when the following conditions are satisfied.

-No MALF 21 or 22

-Startup Delay Expired

-TPS greater than *KISTATH* (Part Throttle)

3.8.1.1 Throttle Follower TPS Load Variable Filtering

This TPS value is only updated (12.5 Msec) if the new value and the old value differ by greater than two counts.

3.8.2 Throttle Follower Function

When the Throttle Follower Mode is enabled steps are added to the IAC Motor position (increasing Air) dependent upon Throttle Position as calculated in the expression below:

-T/F steps = TFTPS (*KISTFGN1*/128)

Where:

TFTPS = Throttle follower TPS load variable

KISTFGN1 = Throttle follower gain in Steps/%TPS

The maximum amount of Throttle Follower steps is not to exceed the current value in the Table *F16TFMAX*.

The IAC motor will return to the position it was at prior to the throttle follower becoming active.

3.8.3 Throttle Follower Minimum Motor Position Limits

The minimum motor position logic is intended to prevent a 'sail-on' or stalls following a decel while Throttle Follower is active. The minimum motor position is initialized to a value from the *F16B* Table as a function of coolant temperature or the last value of min. motor position learned, whichever is larger. NOTE: If a non-volatile memory failure is detected, the learned min motor position is set to *KNVISMNP*. The minimum motor position will learn its way up or down as given by the conditions below:

-Engine Running

-Vehicle Speed=0

-In Drive

-Coolant greater than *KACMINCL*

-Transition Delay not Active (See PID Closed Loop)

-RPM Error in Deadband for time greater than *KMINLRN*

-A/C is off

-Power Steering Pressure Switch not cramped

-Present motor position is greater than or equal to the current minimum motor position

Once all the criteria are met, the minimum motor position will be set to the present motor position and clamped to an absolute minimum of *KMTMINLO*.

3.9 Load Compensation

3.9.1 Air Conditioner Load Compensation

If the air conditioner has been requested for two consecutive 12.5 Msec intervals, the learned value of the A/C anticipate will be added to the motor position. The A/C clutch control algorithm will usually delay energizing the A/C clutch until this anticipate has been delivered.

3.9.1.1 A/C Anticipate Learning

A/C learning is enabled when engine RPM is stable and an A/C off to on transition occurs. The IAC Motor position at this time is saved. When the engine restabilizes, the difference between the current motor position and the motor position saved away at the beginning of learning represents the learned A/C anticipate. This value of anticipate will be used the next time the air conditioner is turned on.

If any conditions are met to disable A/C learning while the learning process is active, learning will be disabled until the enable conditions are again satisfied and the value of the A/C anticipate is not changed.

3.9.1.1.1 A/C Anticipate Learning Enable Criteria

A/C learning will be enabled if all of the following conditions are met.

-RPM Error (command speed - current engine speed) less than or equal to *KISACLD* (RPM in a deadband) for a time greater than *KISACLE* while A/C learn was disabled

-A/C off to A/C on transition occurs.

The Deadband Timer discussed above is reset if any of the following conditions are satisfied.

-RPM Error not in Deadband

-A drive to neutral or vice versa transition delay is issued

-An A/C state transition occurs

-PID closed loop disabled

3.9.1.1.2 A/C Anticipate Learning Disable Criteria

A/C learning will be disabled if any of the following conditions are met.

-Power Steering Pressure Switch indicating a 'cramp'

-A transition delay is active

-A/C is off

-Throttle Position greater than or equal to *KISTATH*

-Vehicle Speed greater than *KISVSTH*

3.9.1.1.3 A/C Anticipate Park/Neutral Multiplier

When in Park/Neutral the A/C anticipate is modified as shown below

-ISACAN = ISACAN (*KISINTP*/128)

3.9.1.1.4 A/C Anticipate Limits

The A/C learn value will be limited to a maximum of *KISACMX* and a minimum of *KISACMN*. The A/C learn value will be initialized to a value of *KISACDS* when A/C comes on each start.

3.9.2 Power Steering Compensation

If *MCUINST* Bit 4 = 1 (PSPS present and a power steering 'cramp' is indicated, the following actions result.

-*KISPSAN* Anticipate added to motor position

-*KISPAAN* additional anticipate steps added if A/C is requested on

-A/C clutch deenergized (Load Swap Feature)

-A/C Learning Disabled

3.10 Park/Neutral State Effect on Throttle Follower and Load Compensations

3.10.1 Park/Neutral Compensation

When a Park/Neutral indication is present, the sum of the throttle follower and load compensation steps is multiplied by *KISTFPN*.

3.10.2 Vehicle Speed Compensation

A number of steps from the *F16TFMPH* as a function of vehicle speed are added to the throttle follower and load compensation steps when all the following conditions are present:

- Vehicle speed is greater than *KISVSTH*
- Throttle position has been greater than *KTPSTFMN* since the last time the brake was applied
- No Malf 38 (brake switch)
- Cruise is active

3.11 PID IAC Closed Loop Engine Speed Regulator

The PID closed loop engine speed regulator is enabled when open loop has expired and the following conditions are met.

- Throttle position less than *KISTATH* and vehicle speed less than or equal to *KISVSTH*
- Throttle follower and load compensation not active
- Transition delay not active

If none of these conditions are satisfied, the PID regulator is not enabled.

If the first condition is not satisfied, only the underspeed mode can enable the PID regulator.

3.11.1 PID Underspeed Mode

The PID underspeed mode is intended to prevent engine RPM from dropping to the point that a stall might occur.

The PID underspeed mode is enabled if the present RPM is lower than the desired RPM by an amount greater than *KISRETH* and any of the following conditions are satisfied.

- -Throttle position less than or equal to *KISTATH* and vehicle speed less than or equal to *KISVSTH*
- -Throttle follower or load compensation active
- -Transition delay active

The PID underspeed mode will not be enabled if vehicle speed is greater than zero and a manual transmission is being used (*KISMAN*=1).

3.11.2 Transition Delay

A transition delay timer exists for purposes of preventing transient conditions from affecting PID closed loop calculations. When any of the following transition delays are active, the PID closed loop regulator is temporarily bypassed unless the underspeed mode is enabled.

Transition Delay	Delay Time
PID Open Loop Disable to Closed Loop Enable Delay	*KISOLDY*
Throttle Follower Enable Delay (TPS was greater than but is now less than or equal to KISTATH*)	*KISTFDY*
Throttle Follower Disable delay (Throttle Follower or load compensation within 2 steps of being completed)	*KISTFDY*
High power steering pressure delay (PID closed loop will be disabled by setting the transition delay to this value, if it is greater than the current transition delay value, while high power steering is present. It will begin to time out when power steering pressure returns to normal).	*KISTPSD*
Delay following drive to neutral transition	*KISDNDY*
Delay following neutral to drive transition	*KISNDDY*

Note that the drive to neutral and neutral to drive delays will not be issued until other transition delays have expired.

3.11.3 PID IAC Closed Loop Regulator Calculations

The PID IAC Closed Loop regulator calculations are divided into three terms; the proportional, integral, and derivative. The proportional term is based on how high or low the engine speed is with respect to the desired engine speed (RPM Error). The derivative term is based on how fast the engine speed is increasing or decreasing. Lastly, the integral term provides minor RPM connections based on RPM error when no steps are commanded by the proportional or derivative terms. Together, these three terms determine how the IAC Motor is stepped to maintain stable idle speed.

Proportional and integral steps are calculated each 50 msec while the derivative (and throttle follower) is calculated each 12.5 msec. When derivative (or throttle follower) steps are commanded, proportional and integral steps are set to 0. Derivative steps will take priority over throttle follower steps. All steps are issued at a 6.25 msec rate.

3.11.4 Proportional Term

The proportional term is set equal to zero if RPM error (difference between present RPM and desired RPM) is less than or equal to one of the following thresholds.

-*KISESDD*, (in drive)

-*KISESDN*, (in Park/Neutral)

If the RPM error is not within the above control deadband, the proportional term is set to one of the following values for the conditions indicated.

-RPM is high, Term=(-*KISERGP*)(RPM Error)/256

-RPM is low, Term=(*KISERGN*)(RPM Error)/256

-RPM is very low, Term=(*KISERGN* + *KISERHN*) (RPM Error)/256

RPM is considered to be very low if RPM Error is greater than *KISERTH*. The proportional term is limited to +127 and -128 steps.

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3.11.5 Derivative Term

The derivative steps are obtained from the *F16DREV* Table as a function of decreasing RPM per 12.5 msec and RPM error. Number of steps of the derivative term will be scaled by *KISPNGN* if the vehicle is in Park/Neutral.

The derivative term will be enabled if the following conditions are met.

-Coolant temperature is greater than or equal to *KISDRCL*

-Vehicle speed is less than or equal to *KISVSTH*

-Throttle position is less than or equal to *KISTATH*

-Not in open loop

The above conditions have been present for a time greater than *KISDREN*.

Once the derivative steps have been issued, the derivative term is disabled until the enable conditions are met again (including the timer).

3.11.6 Integral Term

The integral term is set equal to zero if any of the following conditions are met.

-Proportional or derivative terms require full steps

-RPM changing rapidly (Delta RPM out of integral term deadband)

-RPM in tight control (Delta RPM in integral term deadband) and RPM error in low error deadband)

When a full step is not required by the proportional or derivative terms, an integral term is maintained as shown below for the conditions indicated.

-Overspeed High Gain (RPM Error is greater than *KISINTHD*, in Drive or *KISINTHN*, in Park/Neutral. And RPM Error is less than *KISITLTU, Select Overspeed)

--INT=INT+(*KISITGDO*)(RPM Error)/256 (in Drive)

--INT=INT+(*KISITGNO*)(RPM Error)/256 (in Park/Neutral)

-Overspeed Low Gain (RPM Error is less than or equal to *KISINTHD*, in Drive or *KISINTHN*, in Park/Neutral. And RPM Error is less than *KISITLTU*, Select Overspeed)

--INT=INT+(*KISITLDO*)(RPM Error)/256 (in Drive)

--INT=INT+(*KISITLNO*)(RPM Error)/256 (in Park/Neutral)

-Underspeed High Gain (RPM Error is greater than *KISINTHD*, in Drive or *KISINTHN*, in Park/Neutral. And RPM Error is less than *KISITLUO*, Select Underspeed)

--INT=INT+(*KISITGD*)(RPM Error)/256 (in Drive)

--INT=INT+(*KISITGN*)(RPM Error)/256 (in Park/Neutral)

-Underspeed Low Gain (RPM Error is less than or equal to *KISINTHD*, in Drive or *KISINTHN*, in Park/Neutral. And RPM Error is less than *KISITLUO*, Select Underspeed)

--INT=INT+(*KISITLD*)(RPM Error)/256 (in Drive)

--INT=INT+(*KISITLN*)(RPM Error)/256 (in Park/Neutral)

3.11.6.1 Delta RPM Integral Term Deadband

Delta RPM is considered in the integral term deadband if it is less than or equal to one of the following values for the conditions indicated.

-*KISNDEN1*, (in Park/Neutral)

-*KISNDED2*, (in Drive)

3.11.6.2 Low RPM Error Integral Term Deadband

RPM error is considered in the Low Error Deadband if RPM Error is less than or equal to *KISITLTU* in Underspeed or *KISITLTO* in Overspeed.

3.11.7 IAC Closed Loop Step Calculation

IAC Motor Step(s) will be calculated from the proportional and derivative terms as shown below:

-Steps = (Proportional + Derivative) (*KISQUGN*), in drive

-Steps = (Proportional + Derivative) (*KISPNGN*)(*KISQUGN*), in P/N

If full steps are required (result of the above calculation greater than or equal to one), they will be delivered and the integral term will be cleared. Any fractional steps resulting from the above calculation are ignored.

If no full steps are required by the proportional and derivative terms, the integral term will keep track of its fractional steps and deliver full steps when they are accumulated. The expression below shows how steps are calculated from the integral term.

-Integrator steps=Integral Term (*KISQUGN*)

3.11.7.1 Software Handling of Fractional Steps

In order to properly maintain that portion of the integrator not delivered as full steps, an inverse quantizer gain (*KISINQU*) is utilized. *KISINQU* should be equal to the reciprocal of *KISQUGN* (I.E. *KISINQU*=4, *KISQUGN*=0.25).

3.12 Vehicle Speed Failure Effect on Idle Air Control

When the conditions are met for MALF Code 24, NMPH is set equal to (*KISVSTH* + 1). This has the following effect on the IAC algorithm.

-Open Loop Bypassed

-PID Closed Loop Disabled except for underspeed mode

END OF SECTION 4

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SECTION 5

FACTORY TEST

Original Release - 02/13/87

** GM RESTRICTED **
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1.0 Subject

Factory Test Mode

2.0 Scope

The factory test mode is designed to provide a way to monitor/exercise ECM inputs and outputs for use in manufacturing/production covers on test. It is independent of customer software algorithms and calibration values so that a production ECM test can be implemented prior to production.

3.0 Specification

3.1 Factory Test Mode Enable Criteria

The factory test mode is enabled if the following criteria are satisfied following a system reset.

- In factory test mode (3.9K resistor to ground on diagnostic/ALCL request input)
- Coolant A/D counts less than or equal to 5 counts
- TPS A/D counts greater than or equal to 252 counts
- ATS A/D counts greater than or equal to 252 counts

Once the factory test mode is enabled, it will remain enabled as long as the factory test mode is requested on the diagnostic request input and no system reset occurs.

COP 1 will always be toggled in the factor test mode.

3.2 Factory Test Mode Function

The factory test mode is divided into two basic sections:

- Output cycling routine
- Serial data upload capability

3.2.1 Output Cycling Routine

The output cycling routine has two purposes:

1) to provide an indication that the ECM is capable of executing software such that a serial data upload can be attempted and

2) to provide an output exercise routine satisfactory for burn-in (with production MEM/CAL installed).

The output cycling routine will normally be active when factory test is enabled. If any of the following conditions are satisfied, output cycling is disabled. Output cycling should be disabled prior to attempting serial data communications.

- Last valid message ID is 'execute from RAM'
- Last valid message ID is 'upload into RAM'
- Last valid message ID is 'transmit factory test results'
- Output cycling disabled by modulation switch as described below

3.2.1.1 Output Cycling Routine Function

When output cycling is active, the following actions occur.

- 0 second ECM turn-off delay (when output cycling is not enabled, the ECM will not power down unless a reset is generated or battery voltage is removed from the ECM)

- Discrete outputs energized individually for 100 msec each 100 msec in the following sequence:

  1) EGR1 (P11 ECUE-09)
  2) SMALF (P11 ECUE-10)
  3) FAN1 (P10 ECUE-10)
  4) TCC (OUT4 SC1)
  5) OPT/MAG SPD SENSOR (SC1)
  6) OUT6 (SC1)
  7) OUT7 (SC1)
  8) OUT8 (SC1)
  9) ALL OFF

- PWM outputs energized as follows:

ECUE-10	P3	PWM1 (OF5*)	....10% Duty Cycle at 32 Hz.
	P4	PWM2 (OF1*)	....20% Duty Cycle at 32 Hz.
	P5	PWM3 (OF2*)	....30% Duty Cycle at 32 Hz.
	P6	PWM4 (OF3*)	....40% Duty Cycle at 32 Hz.
	P7	PWM5 (OF4*)	....50% Duty Cycle at 32 Hz.
	P8	PWM6 (ECCC*)	...60% Duty Cycle at 32 Hz.
	P9	PWM7 (FAN*)	....70% Duty Cycle at 32 Hz.
ECUE-09	P4	N.C.	....15% Duty Cycle at 32 Hz.
	P5	N.C.	....25% Duty Cycle at 32 Hz.
	P6	EGR3 (EGR3*)	...35% Duty Cycle at 32 Hz.
	P7	EGR2 (EGR2*)	...45% Duty Cycle at 32 Hz.
	P8	PWMY (OF6*)	....55% Duty Cycle at 32 Hz.
	P9	PWM7 (OF8*)	....65% Duty Cycle at 32 Hz.

- IAC motor stepped towards its seat every 100 msec

- COP2 is toggled (not in backup fuel)

- Fuel pulse width fixed at 3 msec

- EST fixed at 229 us (15 ECU counts) advance and dwell fixed at 1 msec

- Serial data transmits the following 'dummy' message every 100 msec

  -- Message ID = $02
  -- Message Length = 85 + 0 = 85 = $55
  -- Sum Check

3.2.1.2 Output Cycling Disable by Modulation Switch

Output cycling is disabled when (IDSCO) FMD Bit 0 = 0. This provides a method to modify active duty cycle of output by uploading program into the ECM. When output cycling is disabled in this manner, the following actions occur.

When the output cycling is disabled, COP2 will not be toggled until a serial data request is received. (This provides a way to check out the backup fuel function). When a serial data request is received, COP2 will be toggled. (This is done to insure that the SXR transmit enable is not disabled by the SC1 via the BPF* signal). COP2 toggling will be discontinued after responding to a $02 message (execute from RAM). If COP2 toggling is desired when running the uploaded software routine, it must be done in the uploaded routine.

- Discrete outputs deenergized (except Check Engine Light and FPRHI) when COP 2 is not being toggled
- PWM outputs deenergized
- Spark and Digital Fuel disabled
- 0 second ECM turn-off delay when COP2 is not being toggled (the ECM will not power down if COP2 is being toggled)
- IAC motor not moving
- FAN1 will be energized only of COP2 is not being toggled

3.2.2 High Speed UART Serial Data Format (see also Section 3A)

The approach used for the high speed transmission is intended to be the same as that used in a UART system. A description follows.

3.2.2.1 Bit Format

A bit time shall be 122.07 microseconds +- 0.5%. This is equivalent to 8192 Baud. A high voltage state indicates a logic one condition and a low voltage state indicates a logic zero condition.

3.2.2.2 Word Format

A word consists of ten bit times. The first bit is a logic zero and is called the Start Bit. The last (tenth bit) in the word is always a logic one and is called the Stop Bit. The remaining eight center bits are data bits and are transmitted LSB (Least Significant Bit) first. A Start Bit must always e preceded by at least one logic one bit time (either the stop bit of the preceding word or an Idle Line).

3.2.2.3 Message Format

Any and all data transmitted on the serial data bus must be part of a message. All messages must be of the following format.

- Idle Line
- Message Code
- Message Length (85 + N)
- N Bytes of Data
- Sum Check
- Idle Line

3.2.2.3.1 Idle Line

Ten or more consecutive logic one bit times constitute an Idle Line. All receivers on the bus will use the occurrence of an Idle Line followed by a Start Bit to indicate the start of a message.

3.2.2.3.2 Message Code

When used in a UART system, the first word of each message is a message code. Each message code must be unique; therefore, all message codes must be assigned in the particular applications documentation. The total number of unique message codes is limited to 254. ID's of $00 and $FF shall not be used in normal vehicle operation. For factory test the message codes are $01, $02, and $03.

3.2.2.3.3 Message Length Word

The message length word indicates the total number of data words in the remainder of the message plus 85 (decimal). The maximum number of data words within one message which can be transmitted by any transmitter is 170. Thus a valid message length must lie in the range of 85 to 255. Many messages with no data words are possible. For such messages, the message length word would contain the binary word 01010101 (MSB-LSB).

This pattern has been selected because, under an abnormally severe noise environment, there is a higher probability that an erroneously received message will be detected as being erroneous.

3.2.2.3.4 Sum Check

The last word to be transmitted in a message is the two's complement of the sum of all the other words in the message, including the message ID and message length words. Any carryouts of this eight-bit word while it is s being formed by both the transmitter and receivers shall be neglected. The two's complement is used so that if the receivers sum all the words in the message, then the result should be zero for a valid message.

3.2.3 Factory Test Message Codes

Three message codes are reserved for factory test as shown below and are applicable only if factory test is enabled.

Message Codes	Function
$01	Upload Data
$02	Execute uploaded data
$03	Transmit factory test results

This implementation allows the use of variable size test subroutines; the uploading of one factor test program with several executable modules; the uploading of a single factory test program via several serial data frames; and conforms to the standard high speed UART protocol.

3.2.3.1 Message Code \$01 - Upload Data

Message Code \$01 is transmitted to the ECM with the following format.

- Message Code = \$01
- Message Length = 85 + 2 + 32 = 119 = \$77
- Upper byte of address where data is to be loaded
- Lower byte of address where data is to be loaded
- 32 bytes of data to be uploaded
- Sum Check

Upon receiving a valid message with ID \$01, the ECM will respond with the following message.

- Message Code = \$01
- Message Length = 85 + 0 = 85 = 55
- Sum Check

This response is an affirmation that the data was received.

3.2.3.2 Message Code \$02 - Execute Uploaded Data

Message Code \$02 is transmitted to the ECM with the following format.

- Message Code = \$02
- Message Length = 85 + 2 = 87 = \$57
- Upper byte of address where program execution begins
- Lower byte of address where program execution begins
- Sum Check

Upon receiving a valid message with ID $02, the ECM will respond with the following message.

- Message code = $02
- Message Length = 85 + 0 = $55
- Sum Check

This response is an affirmation that the data was received.

3.2.3.3 Message Code $03 - Transmit Factory Test Results

Message Code $03 is transmitted to the ECM with the following format.

- Message Code = $03
- Message Length = 85 + 0 +$55
- Sum Check

Upon receiving a valid message with code $03, the ECM will respond with the following message. The ECM will continue to execute the uploaded program if an execute command has been seen following an upload command.

- Message Code = $03
- Message Length = 85 + 24 = 109 = $6D
- 24 Data bytes
- Sum Check

3.2.4 General Upload Factory Test Requirements

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3.2.4.1 RAM Area Reserved for Upload

The diagram below illustrates the RAM memory map required for upload of factor test software.

```
       ______________________________
$0000 !                              !
      !  Non-volatile RAM            !
      !                              !
      !                              !
      !                              !
$007F !______________________________!
$0080 !                              !
      !  Reserved for upload         !
      !                              !
      !                              !
      !                              !
$00FF !______________________________!
$0100 !                              !
      ! Reserved for upload          !
      !                              !
      !                              !
      !                              !
$017F !______________________________!
      !______________________________!
      ! Serial data buffers          !
      !                              !
      !______________________________!
$02FF ! Stack area                   !
      !                              !
      !______________________________!
```

Addresses $0080 through $017F are reserved for serial data upload in factory test. This means that any RAM locations utilized in factory test but not by factory test must be located from $0000 through $007F or $0180 through $01FF.

The two serial data buffers are each 34 bytes in length (to accommodate the largest factory test message). This buffer area will be utilized by the uploaded software to transmit factory test results. This limits the maximum data transmitted to 68 bytes although only 24 are required for this particular ECM.

3.2.4.2 Interrupt Vector Handling

Interrupts generated within the uploaded routine must be capable of being returned to the uploaded routine.

A NVM bit must be maintained to indicated when each of the respective reset type vectors have been utilized as shown below for GMP4.

Bit	Vector Address	Vector Type
0	FFF0	Software Interrupt
1	FFF2	IRQ1
2	FFF4	Hardware IRQ
3	FFF6	Illegal Opcode
4	FFF8	Illegal Address
5	FFFA	Cop Time Out
6	FFFC	Clock Failure
7	FFFE	External Reset

The RAM location containing this information is placed at address $0016. This location must then be cleared by the uploaded software when in the factory test mode.

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3.2.4.3 S.andard Subroutine and RAM Location Access

A vector table of the following subroutines or RAM locations is placed just before the interrupt and reset vectors as shown below.

Address	Vector Name	Function
$FFD8	VCAMFLAG	Store SFD data from USFDXMIT
$FFDA	VSFDXMIT	Pointer to SFD read subroutine
$FFDC	VNVCKSUM	Pointer to N.V. checksum subroutine
$FFDE	VPLISC1	SC1 subroutine
$FFE0	VCKSUM	Checksum subroutine
$FFE2	VSDVICB	Transmit serial data buffer start address
$FFE4	VFMDSDI*	RAM location transmitted to FMD
$FFE6	VCOP2TOG	COP2 toggle subroutine
$FFE8	VP4FMD1*	Read FMD Byte 1 and Byte 2
$FFEA	VADREAD	Read A/D channels AN0 - AN10
$FFEC	VMUXREAD	Read MUX A/D channels CH0 - CH7 (not used)
$FFEE	VXMITS3	S3 bus communications subroutine

*Note - To read FMD byte 2 use address (VP4FMD1 + 5)

- To read RAM location transmitted to SC1 use address (VFMDSDI minus 2)

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4.0 Simplified Interrupt Handler Flowchart

```
                        *******
                       *       *
Interrupt Logic       *   IRQ   *
Flow                   *       *
                        *******

                           *
                         *   *
                       * Real  *
                     *    time   *    No     *******************
                   *    interrupt?  *---------* Check for other *
                     *             *          *  interrupts     *
                       *         *            *******************
                         *   *
                           *
                              Yes

                 *******************
                 *  Set up for next *
                 *  int., INC MLCNTR*
                 *******************

                           *
                         *   *
                       *  In   *
                     *  Factory  *    No     *******************
                   *     test     *---------* Normal interrupt *
                     *   mode?   *          * logic            *
                       *       *            *******************
                         *   *
                           *
                              Yes

                           *
                         *   *
                       *  In   *
                     *   3.9K    *    No     *******************
                   *     mode?    *---------*   Cause system  *
                     *           *          *   reset         *
                       *       *            *******************
                         *   *
                           *
                              Yes

                          *****
                         *  A  *
                         *     *
                          *****
```

```
              *****
             *  A  *
             *     *
              *****

                *
              *   *
            *       *
          *           *   Yes      *******************
        *  ID = execute  *---------* Point to and JSR *--
          *           *            *  to exec routine *
            *       *              *******************
              *   *
                *
                   No

                *
              *   *
            *       *
          *           *   Yes      *******************
        *  ID = upload   *---------*  Move upload     *-
          *           *            *  block to RAM    *
            *       *              *******************
              *   *
                *
                   No

                *
              *   *
            *       *
          *           *   Yes      *******************
        *  ID = transmit *---------* Execute uploaded *-
          *           *            * routine if there *
            *       *              *******************
              *   *
                *
                   No

                *
              *   *
            *       *
          *   FMD #1  *   Yes      *******************
        *     Bit 0 = 1  *---------*  Cycle outputs   *-
          *  (discrete *           *                  *
            *  open) *             *******************
              *   *
                *
                   No
                 ----------------------------------------

*********************
* Wait for interrupt *
*********************
```

SECTION 6

FUEL CONTROL - PORT FUEL INJECTION

Original Release - 02/13/87

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1.0 Subject

Fuel Control - Port Fuel Injection

2.0 Scope

This section describes the port fuel injection (PFI) fuel control algorithm used to determine the method and amount of fuel to be delivered to the injectors under various engine operating conditions.

3.0 Specification

3.1 Fueling Modes

The ECM has the ability to deliver fuel synchronized to reference pulses (synchronous fuel) or not synchronized to reference pulses (asynchronous fuel). Asynchronous fuel will be delivered based on the ECM's clock frequency.

Asynchronous and synchronous fuel modes can be broken down as follows.

Asynchronous Fuel Functions:

- Simultaneous Asynchronous Double Fire (SADF) Crank

- Asynchronous Update of Previous Injector (AUPI)

- Delta TPS Acceleration Enrichment (TPSAE)

Synchronous Fuel Functions:

- Synchronous Sequential Crank

- Delta TPS Synchronous Acceleration Enrichment

Note: Both synchronous and asynchronous fuel may contain pulse width correction (see 3.2).

In addition to synchronous and asynchronous fuel are the following fuel modes:

- Vehicle Speed Limiting Modes
- Abusive Maneuver Fuel Mode
- V.A.T.S.

Any of these modes can override synchronous or asynchronous fuel modes.

3.1.1 Asynchronous Fuel Functions

3.1.1.1 Simultaneous Asynchronous Double Fire Crank (See also 3.1.2.1 Section 6)

There are no hardware provisions for simultaneous synchronous fueling. Asynchronous fuel must be used to simulate this function. Software monitors reference pulses and issues an asynchronous pulse to all six injectors on every third reference pulse.

3.1.1.1.1 SADF Crank Enable

SADF Crank will be enabled when all of the following conditions are met:

- *KCRKSEQ1* = $FF
- IGN On
- Engine Not Running

3.1.1.1.2 SADF Crank Disable

SADF Crank will be disabled when any of the following conditions are met:

- *KCRKSEQ1* = $80 (Enable Sequential Synchronous CRANK)
- IGN Off or
- Engine Running

3.1.1.1.3 SADF Crank Pulse Width

When the ignition is on and the engine is not running the pulse width is given by the following expression.

Crank PW = (*F66)(*F64SCAL*)(*F64C*)(*F65A*)(*64RCAL*)

F64C = Crank Pulse Width versus Coolant Temperature

F66 = Crank Pulse Width Multiplier (0 to 2) versus throttle position

F64SCAL = SCALER for *F64C* Table

F65A = Crank Pulse Width Multiplier (0 to 1) versus reference pulse counter (See below)

F64RCAL = Crank Pulse Width Multiplier as a function of engine speed.

3.1.1.1.3.1 Reference Pulse Counter Crank Pulse Width Multiplier

The reference pulse counter is incremented for each reference pulse received up to a maximum of 255. It is set to one of the following values for the conditions shown.

- *KCLRFPLS*, in clear flood and a reference pulse is received
- *KNRUNPLS*, Engine running to not running transition occurs
- 0, ignition has been off for 2.5 seconds

Note: If ignition has been off for less than 2.5 seconds, the counter will be set to *KNRUNPLS* since an ignition off transition causes an engine not running transition.

3.1.1.1.3.2. Clear Flood Pulse Width

Setting values of the *F66* Table to zero will allow for a 'clear flood' mode.

3.1.1.1.4 SADF Crank To Run Transition

When engine running criteria have been met, SADF crank fuel is disabled. On the third reference pulse after the last SADF crank injection, the correctly synchronized injector (as synchronized by hardware) shall fire with the run pulse width as calculated in 3.1.2.2 Section 6.

3.1.1.2 Asynchronous Update Of Previous Injector

This function adds fuel asynchronously to a cylinder after the synchronous fuel is delivered if the next injector's pulse width increases, indicating an increase in load. The sequence is as follows.

```
                  ***      ***      ***
                  * *      * *      * *
REF Pulses   ***** ******* ******* ******

                    A            C
INJ X          ***** ***********    ******
                  * *         *   *
                  ***         *****

                             B
INJ Y        ***************    *****
                          *     *
                          *******
```

Where:

A = Synchronous Sequential Fuel

B = Synchronous Sequential Fuel (Next Cylinder In Sequence)

C = AUPI Pulse

3.1.1.2.1 AUPI Fuel Enable

AUPI Fuel will be enabled when all of the following conditions are met:

- Engine Running
- (B-A) is greater than *KASYNC*

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3.1.1.2.2. AUPI Fuel Disable

AUPI Fuel will be disabled when all of the following conditions are met:

- Engine Not Running
- Delta TPS AE Not Enabled

3.1.1.2.3 AUPI Pulse Width

The AUPI Pulse Width shall be calculated as follows:

C(AUPI PW) = B-A + (INJOFFST*2)

Where: INJOFFST is derived from Table *F33B0*

3.1.1.2.3.1 Minimum Limit For AUPI

The AUPI Pulse Width is limited to a minimum of *KASYNC*. If the asynchronous pulse width is less than or equal to *KASYNC* it is set to zero.

3.1.1.3 Delta TPS Asynchronous Acceleration Enrichment

The Delta TPS Asynchronous AE function adds fuel asynchronous based on an increase in throttle position.

3.1.1.3.1 Delta TPS Async AE Enable

The Delta TPS Asynchronous acceleration mode is enabled if both the following conditions are satisfied.

- No malf 21 or 22
- Positive Delta TPS (TPS-FILTTPS) greater than or equal to *KAETPS*

3.1.1.3.2 Delta TPS Asynchronous AE Disable

The Delta TPS Asynchronous AE mode is disabled if any of the enable conditions are not present.

3.1.1.3.3 Delta TPS Asynchronous AE Pulse Width

The Delta TPS Asynchronous AE Pulse Width is defined as follows:

AEPW = AEPWOLD + Delta TPS Term - Decay Term

3.1.1.3.3.1 Delta TPS Term

The Delta TPS term is given by the expression below.

- Delta TPS AE Term = (*F96B)(Delta TPS)

F96B = Delta TPS AE multiplier as a function of coolant temperature

3.1.1.3.3.2 Decay Term

The Decay Term logic is enabled when the following conditions are met:

- No malf 21 or 22
- Negative delta TPS (decrease in TPS) less than or equal to *KNEGLIM*

The Decay Term is exponential in nature and is calculated as shown below.

Decay Term = (AEPW)(*F95B)

Where:

F95B = Delta TPS AE decay rate multiplier as a function of coolant temperature

3.1.1.3.3.3 High Negative Delta TPS Clearing Of TPS Asynchronous AE Pulse Width

If the current value of TPS is less than the filtered value of TPS (negative Delta TPS) by greater than *KNEGLIM*, the TPS asynchronous AE pulse width is set to zero.

3.1.1.3.3.4. Maximum Limit For TPS Asynchronous AE

The TPS Asynchronous AE Pulse Width is limited to a maximum value given by the expression below.

Max Asynchronous Pulse Width = (*F97SCAL*)(*F97A)(*F98*)

Where:

F97SCAL = SCALER for *F97A Table

F97A = Max AEPW versus Coolant Temperature

F98 = Max AEPW multiplier (0-2) versus Delta TPS

3.1.1.3.3.5 Minimum Limit For TPS Asynchronous AE

The TPS Asynchronous AE pulse width is limited to a minimum of *KAPMIN*. If the accumulated asynchronous pulse width is less than or equal to *KAPMIN*, it is reset to zero. The accumulated asynchronous pulse width is also cleared if engine is not running.

3.1.2 Synchronous Fuel

3.1.2.1 Sequential Synchronous Crank (See also 3.1.1.1. Section 6)

When SADF Crank is not enabled (3.1.1.1.1 Section 6), the ECM shall begin to deliver fuel sequentially on the seventh reference pulse. This guarantees that the injectors will be properly synchronized to CAM when fuel is first delivered. A prime pulse is issued to all six injectors simultaneously on the first reference pulse. No fuel shall be delivered on the second through the sixth reference pulse.

For sequential fueling below 240 RPM, software is in place to eliminate extra fuel pulses which occur when the pulse width counters overflow.

3.1.2.1.1 Sequential Synchronous Crank Enable

Sequential Synchronous Crank will be enabled when all the following conditions are met:

- *KCRKSEQ1* = $80
- IGN On
- Engine Not Running

3.1.2.1.2 Sequential Synchronous Crank Disable

Sequential Synchronous Crank will be disabled if any of the following conditions are met.

- *KCRKSEQ1* = $FF (Enables SADF Crank)
- Ignition Off
- Engine Running

3.1.2.1.3 Sequential Synchronous Crank Pulse Width

On the first reference pulse of sequential crank an asynchronous pulse is delivered to all six injectors. The prime pulse is defined as follows:

Prime Pulse = (SADF Crank Pulse)(*F61STPLS*)*2

Where:

SADF Crank Pulse = Crank pulse width as defined in 3.1.1.1.3, section 6
F61STPLS = Scaler vs Coolant (0-2)

On the seventh reference pulse the ECM shall begin to deliver fuel sequentially, with pulse width as defined in 3.1.1.1.3, section 6. This guarantees that the injectors will be properly synchronized to CAM when fuel is first delivered.

3.1.2.2 Sequential Synchronous Run

3.1.2.2.1 Sequential Synchronous Run Enable

Sequential synchronous run fuel is enabled under the following conditions:

- Engine Running

3.1.2.2.2 Sequential Synchronous Run Disable

Sequential synchronous run fuel is disabled under the following conditions:

- Engine Not Running

3.1.2.2.3 Sequential Synchronous Run Pulse Width

The base pulse width calculation for sequential synchronous fuel delivery in the run mode is shown below. Correction terms are not included (see 3.6, Section 6).

BPW = (LV16) (*KNJCHAR2*) (F/A) (BLM) (CORRCL) (DE)
(DFCO)(MPHLMT) + (CRNKRUN)

BPW	=	Base Pulse Width
LV16	=	Load Variable Based on Mass Air Flow (16 Bits)
KNJCHAR2	=	Injector Flow Rate (Seconds/Gram of Fuel)
F/A	=	Fuel/Air Ratio
BLM	=	Block Learn Correction Term
CORRCL	=	Closed Loop Correction Term
DE	=	Decel Enleanment Term
DFCO	=	Decel Fuel Cutoff Term
MPHLMT	=	MPH Fuel Limiting Multiplier
CRNKRUN	=	Crank to Run Pulse Width Ramp Term

The BPW and airflow are calculated each 3.125 msec and are based on airflow data accumulated since the previous reference pulse. When the next ref pulse occurs, the most recent BPW calculation and the averaged airflow reading since the last ref pulse are available.

LV16 is derived from airflow and is also calculated every 3.125 msec. All other terms in the BPW calculation are updated each 12.5 msec.

3.1.2.2.3.1 Load Variable (LV16) Based on Mass Air Flow

LV16 is derived from the amount (mass) of air ingested into the engine as measured by the mass airflow sensor.

3.1.2.2.3.1.1 Conversion of MAF Sensor Frequency to Air Flow

Input frequency from the high speed air meter ranges from 2000 - 10192 Hz and is converted to airflow using 8 tables of 9 values each and defined as follows:

Lookup Frequency (Hz)	Frequency Increments	Table	Table Multiplier
0 - 1024	128	*F1HFTBL*	*K1HFTBL*
1024 - 2048	128	*F2HFTBL*	*K2HFTBL*
2048 - 3072	128	*F3HFTBL*	*K3HFTBL*
3072 - 4096	128	*F4HFTBL*	*K4HFTBL*
4096 - 5120	128	*F5HFTBL*	*K5HFTBL*
5120 - 6144	128	*F6HFTBL*	*K6HFTBL*
6144 - 7168	128	*F7HFTBL*	*K7HFTBL*
7168 - 8192	128	*F8HFTBL*	*K8HFTBL*

The lookup frequency is calculated immediately following a reference pulse being detected (a reference pulse check is done each 3.125 msec).

$$\text{Lookup Freq} = \frac{\text{Delta Pulses}}{\text{Delta Time}} - \text{*KMINHFFR*}$$

Where:

- Delta Pulses = Number of MAF pulses since the last calculation
- Delta Time = Time elapsed from the occurrence of the first to the last pulse to be used on this calculation.
- *KMINHFFR* = Offset (Minimum Frequency)

Once the lookup frequency is calculated, it is used to obtain a value from the Tables and the appropriate table multiplier. Airflow in grams of air/second is calculated as follows:

$$\text{Grams of Air/Second} = \text{Table Value} * \text{Table Multiplier}/256$$

The table multiplier (0-1) is used to increase the useful resolution of the tables.

3.1.2.2.3.1.1.1 Delta Airflow Limiting

Airflow readings are limited in the amount they can increase or decrease from one reference period to the next. This acts as a filter for airflow.

3.1.2.2.3.1.1.1.1 Increase Airflow Limiting

Airflow increase between reference pulses is limited to one of two values, whichever offers the most limiting. The first limit is the product of the *F79D* and *F79MULD* tables. *F79D* is a function of airflow Vs. RPM and *F79MULD* is a correction term as a function of air temp. The second value is *KDELPCTP*. It can be applied only when all the following conditions are present.

- It offers more limiting than the product of (*F79D*)*(F79MULD*)
- Vehicle speed less than *KMPHFDEL*
- Engine runtime greater than 5 seconds
- TPS less than *KTPSFDEL* or TPS greater than or equal to *KTPSFDEH* and transient timer expired

3.1.2.2.3.1.1.1.1.1 Transient Timer

The transient timer is initialized to *KDELWAIT* if the condition below is satisfied.

See Section 2 page 6

- NTPSLD less than *KTPSFDEL* → max TPS for delta flow logic

The transient timer is cleared if the following condition is met.

- NMPH greater than or equal to *KMPHFDEL*

3.1.2.2.3.1.1.1.2 Decrease Airflow Limiting

Airflow decrease between reference pulses is limited to *KDELPCTN* and is applied only when all the following conditions are present:

- Vehicle speed less than *KMPHFDEL*
- Engine runtime greater than 5 seconds
- TPS less than *KTPSFDEL* or TPS greater than or equal to *KTPSFDEH* and transient timer expired. (See 3.1.2.2.3.1.1.1.1)

3.1.2.2.3.1.1.2 Minimum Air Flow

Air flow in grams/second is limited to a minimum of *KMINFLOW*.

3.1.2.2.3.1.1.3 Maximum Air Flow

Maximum airflow is calculated as follows during initialization, engine not running and engine running and is applied to airflow used in torque calculations only.

Max Airflow = (*F79A*)(*F79MUL*)

Where

F79A = Maximum airflow as a function of RPM
F79MUL = 0-2 multiplier as a function of air temperature

NOTE: For max airflow to be calculated during initialization, the *F79A* table must have a calibration other than zero for zero RPM.

3.1.2.2.3.1.2 Grams of Air Per Cylinder Calculation

Since the reference period from the distributor is the same as seconds/cylinder, the following statement can be made.

- Grams of Air/Cylinder = REFPER*Grams of Air/Second

3.1.2.2.3.1.3 Load Variable Calculation

Variable LV16 is a 16-Bit load variable based on mass air flow. It is used in the calculation of the base pulse width and is determined as shown in the last paragraph (grams of air/cylinder).

Variable LV8 is a scaled version of LV16 and is the measurement of engine load used by the fuel algorithm. It has the units of grams of air/cylinder and is determined as shown below.

- LV8 = 256 (grams of air/cylinder) (*KLVMSCAL*)

Load variable Scaling Fact
usually 1.24

3.1.2.2.3.2 Injector Flow Rate

The injector flow rate in seconds per gram of fuel is specified by *KNJCHAR2*.

3.1.2.2.3.3 Fuel/Air Ratio Term (Inverse Air/Fuel Ratio)

The fuel/air (F/A) ratio is adjusted under various conditions to meet engine requirements for emissions and drivability. As the vehicle is first started and engine is running the open loop mode is enabled. After time, coolant, O2 sensor and diagnostic criteria are met (see 3.1.2.2.3.5.1, Section 6), the closed loop mode is entered. The following paragraphs describe the algorithms that control the F/A ratio.

3.1.2.2.3.3.1 Open Loop Fuel Air Ratio

3.1.2.2.3.3.1.1 Open Loop Fuel Air Ratio Enable Criteria

The open loop F/A ratio mode is enabled when the following criteria are met.

- Engine running

- In open loop

3.1.2.2.3.3.1.2 Open Loop Fuel Air Ratio Calculation

The Open Loop F/A ratio is derived as shown below.

- Open Loop F/A ratio = (Coolant Term+TimeOut Term)*(Hot Open Loop Term)* (Open Loop F/A Term)

Each term is capable of multiplying the open loop F/A ratio by 200% (same as cutting A/F ratio in half).

The coolant term and time-out term are different for P/N and drive resulting in a different F/A ratio. To allow changing the F/A ratio on a P/N to drive and drive to P/N transition. The first order lag filter (see 4.7, Section 2) with filter coefficient *KFACOEF* is used to slew between the two sets of tables.

3.1.2.2.3.3.1.2.1 Open Loop F/A Term

Open Loop F/A Ratio = (F50F*)

- *F50F* = Open Loop F/A Ratio versus LV8 and RPM

3.1.2.2.3.3.1.2.2 Coolant Term

The coolant term is a percent change versus coolant temperature to F/A with range -100% to +100%. It is defined as follows:

F56PN if in P/N
F56D if in Drive
F56PN if in P/N at time *KPNTIME*

3.1.2.2.3.3.1.2.3 Time-out Term

The purpose of the time-out function is to simulate the action of the conventional carburetor.

The time-out term is composed of three parts: the initial value, decay delay, and decay rate. In operation the initial value of time-out term is applied for a period of time equal to the decay delay time then decayed to zero at the decay rate. The following paragraphs describe the various aspects of the time-out term in detail.

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3.1.2.2.3.3.1.2.3.1 Time Out Term Initialization

The time-out term is initialized when a legitimate shutdown sequence is detected prior to the last ECM reset and the system makes an engine not running to engine running transition. This initialization consists of calculating new values for the initial value, decay delay, and decay rate.

When the ECM does not detect a legitimate shutdown sequence prior to the last ECM reset, the time-out fuel air logic calculates the value of the decay rate only. The previous values of time-out fuel air ratio and decay delay time remaining that existed at the time of the ECM reset are retained.

The reader should note, that in an engine stall situation the EST logic will force an ECM reset, and a legitimate shutdown sequence will not be detected.

3.1.2.2.3.3.1.2.3.2 Time Out Term Initial Value

The initial value for the time-out term is found in the following tables as a function of coolant temperature.

F51PN if in P/N
F51D if in Drive
F51PN if in P/N at time *KPNTIME*

3.1.2.2.3.3.1.2.3.3 Time-out Term Decay Delay

The value of time-out term decay delay is found in the *F53A* Table as a function of coolant temperature.

3.1.2.2.3.3.1.2.3.4 Time-out Term Decay Calculation

The time-out term decay function is accomplished by performing the calculation shown below.

- New time out term = (Old time out term) (*F52A*)

  F52A = Time out decay multiplier as a function of coolant temperature.

The time-out decay calculation is computed at a rate determined by *KFATICT*.

3.1.2.2.3.3.1.2.4 Hot Open Loop Term

While in the hot open loop mode, the hot open loop term modifies the open loop F/A ratio as a 0-2 multiplier *KHOLFAML* If in the hot open loop mode and *KHOLNOPE* = 0, power enrichment is disabled. Hot open loop mode does not affect CCP.

3.1.2.2.3.3.1.2.4.1 Hot Open Loop Mode Enable

The hot open loop mode is enabled when all the following conditions are met:

- Coolant greater than *KHOLCLTH*
- Vehicle speed greater than *KHOLVSSH*
- Air temperature greater than *KHOLATS*
- LV8 greater than *KHOLLV8*
- The above criteria met continuously for longer than *KHOLTIME*

3.1.2.2.3.3.1.2.4.2 Hot Open Loop Mode Disable

Once enabled, the hot open loop mode is disabled if any of the following criteria are met:

- Coolant is less than or equal to *KHOLCLTL*
- Vehicle speed less than or equal to *KHOLVSS*
- Air temperature is less than or equal to *KHOLATS*
- LV8 is less than or equal to *KHOLLV8*

3.1.2.2.3.3.2 Closed Loop Fuel Air Ratio

The F/A ratio mode is enabled when the following criteria are met.

- Engine running
- Closed loop

The F/A ratio is equal to *KCLRATIO*

3.1.2.2.3.3.3 Power Enrichment (PE) Fuel Air Ratio

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3.1.2.2.3.3.3.1 Power Enrichment Mode Enable Criteria

KPETPS = 45%
KLVWOT = 160

The power enrichment mode is enabled if the following conditions are satisfied.

- NTPSLD greater than or equal to *F62* table versus RPM

- Not in Hot Open Loop

- LV8 greater than or equal to (*KLVWOT*-*KLV8HYST*) or TPS greater than *KPETPS*

min TPS to override LV8 check — LV8 threshold for PE — LV8 hysteresis for PE

3.1.2.2.3.3.3.2 Power Enrichment Mode Disable Criteria

The power enrichment mode is disabled if either of the following conditions are met.

PE TPS hysteresis 3%

- NTPSLD less than (*F62* - *KPEHYS*)

- Hot open Loop is active, and *KHOLNPE* is equal to zero.

- LV8 less than (*KLVWOT* - *KLV8HYST*) and TPS less than or equal to *KPETPS*

3.1.2.2.3.3.3.3 Power Enrichment Mode Fuel Air Ratio Calculation

When the power enrichment mode is enabled the F/A ratio is given by the following expression.

- PE F/A ratio = (*F67B*) (*F67MUL*+Time-Out Term)(*F68B*)

Where:

- *F67B* = PE Base fuel air ratio versus coolant temperature

- *F67MUL*=PE Fuel Air Percent Change (0-200%) versus time in PE

- *F68B* = PE fuel air percent change (0 - 200%) versus RPM

- Time-Out Term = See 3.1.2.2.3.3.1.2.3

The product of the first two terms is limited to a maximum of 255 (minimum A/F ratio of 6.42).

3.1.2.2.3.4 Block Learn Correction

The block learn term provides the means for the system to compensate for engine to engine variation and changes in engine operating characteristics. The value for this term is determined as explained in the paragraphs below.

3.1.2.2.3.4.1 Block Learn Memory (BLM) Cell Selection

The fuel algorithm provides sixteen variables which will be referred to as block learn memory cells. Selection between block learn memory cells is made on the basis of air flow (grams per second) and engine speed (RPM). By setting *KBLMCCP* to 0, an identical set of 16 variables is provided during closed loop fuel. One set is used when CCP is enabled, the other when CCP is disabled. While in open loop fuel mode, the greater of the two is used.

The block learn memory cell selected is determined by the engine operating point on the air flow/engine speed plane in relation to six boundary determining parameters. The block learn memory cell boundary parameters on the air flow axis consist of *KBLPMB1*, *KBLPMB2*, and *KBLPMB3*. The block learn cell boundary parameters on the engine speed (RPM) axis consist of *KBLESB1*, *KBLESB2*, and *KBLESB3*. The six block learn cell boundaries divide the air flow/engine speed plane into sixteen regions which correspond to the sixteen block learn cells. A particular cell is selected when the engine operating point on the air flow/engine speed plane lies within the region corresponding to that cell. All criteria and parameters are common between the CCP cells and non-CCP cells when *KBLMCCP* = 0.

3.1.2.2.3.4.2 Block Learn Memory Cell Hysteresis

The six block learn memory cell boundary parameters are provided with cell hysteresis. When the system is operating in a given cell, the boundaries for that cell are expanded outward from that cell.

When a given block learn memory cell is selected, the engine operating point on the air flow/engine speed plane must cross the cell boundary by a margin of at least *KBLPMHY* in the air flow direction or *KBLESHY* in the engine speed direction, before a new cell is entered.

3.1.2.2.3.4.3 Block Learn Memory Update

The block learn memory cell values are updated by comparing the state of the closed loop correction with the oxygen sensor indication. The active block learn cell is made richer by *KBLMDELT* (BLM = BLM + *KBLMDELT*) if the following conditions are satisfied.

- Closed loop correction greater than (128 + *KLCITHR*)
- Lean Oxygen sensor indication present

The active block learn cell is made leaner by *KBLMDELT* (BLM = BLM - *KBLMDELT*) if the following conditions are satisfied.

- Closed loop correction less than (128 - *KLCITHL*)
- Rich oxygen sensor indication present

3.1.2.2.3.4.3.1 Similar Cell Update

Some block learn cells are seldom accessed and therefore never learn to their optimum value. Table *F28* is a sixteen entree table and each entree slot corresponds to block learn cells 0 through 15. *F28* is used for both CCP and non-CCP block learn cells. The cell number entered into the table slot will be updated with the same value learned for the corresponding BLM cell. Flexibility of this table ranges from keeping all sixteen cells independent to making them all follow a single cell.

This change will allow some cells that are never learned (or very seldom learned) to be learned while operating in a different, but similar, cell that does get learned regularly.

3.1.2.2.3.4.4 Block Learn Update Enable Criteria

Block learn memory update is enabled if all the following conditions are met.

- Closed loop
- Coolant temperature greater than *KLCTCLLA*
- Coolant temperature less than or equal to *KLCTCLHA*
- Fuel/Air ratio equal to *KCLRATIO*
- LV8 load greater than or equal to *KLCLDL*
- Block learn delay time of (*F21*/4) expired

- All above criteria met for time greater than or equal to *KBLMCNT*

- Time since last integrator reset greater than or equal to *KBLMCNT*

- Time since last BLM cell change greater than or equal to *KBLMCNT*

- Time since last BLM update greater than or equal to *KBLMCNT*

3.1.2.2.3.4.5 Block Learn Memory Limits

The block learn memory values are limited to a maximum of *KBLMMAX* and a minimum of *KBLMMIN*.

3.1.2.2.3.4.5.1 Cold BLM Minimum Limit Exception

If coolant temperature during initialization is less than *KCOLDBLM* then the BLM cells are limited to a minimum value given by Table *F9BLMMIN* as a function of BLM cell number. This enrichens the fuel mixture when cold by initializing the block learn memory cells to *F9BLMMIN* if the cells' contents are currently less than *F9BLMMIN*.

F9BLMMIN should be set to a value less than or equal to *KBLMMAX*.

3.1.2.2.3.4.6 Block Learn Memory Initialization

The block learn memory cell values stored in non-volatile memory are initialized to 128 (multiplier of 1) if any of the following conditions are detected.

- Nonvolatile memory failure detected in initialization (See General Information)

- Block learn memory greater than *KBLMMAX*

- Block learn memory less than or equal to *KBLMMIN*

3.1.2.2.3.5 Closed Loop Correction Term

The closed loop correction term (CORRCL) provides the means for the system to maintain a constant air fuel ratio. If the oxygen sensor is indicating a lean mixture, the closed loop correction term is adjusted to cause a richer mixture. Likewise, if the oxygen sensor is indicating a rich mixture, the closed loop correction term is adjusted to cause a leaner mixture.

3.1.2.2.3.5.1 Closed Loop Mode Enable Criteria

The closed loop mode is enabled if the following criteria are met.

- Coolant temperature greater than *KCLTCA*, or a value from the *F9PNCLT* table as a function of startup coolant temp if in P/N at time *KPNTIME*
- Engine run time since last legitimate shutdown greater than or equal to *KT1A* (start-up coolant temperature greater than or equal to *KADSUCTA*) or *KT2A* (Start-up coolant temperature less than *KADSUCTA*)
- Engine RPM must be greater than *KMNRPMCL* continuously for a time equal to or longer than *KRPMCLTM*
- Oxygen Sensor 'ready'
- Malfunction Codes 44 and 45 not present
- I2U not requesting to modify A/F ratio

The engine run time criteria is bypassed if the diagnostic or ALCL mode is selected.

3.1.2.2.3.5.1.1 Oxygen Sensor 'Ready' Test

The oxygen sensor is said to be 'ready' if the following conditions are satisfied.

- Engine running
- Oxygen sensor voltage greater than *KO2AMAX* or less than *KO2AMIN*

The oxygen sensor is said to be 'not ready' if any of the following conditions are satisfied.

- Engine not running
- Oxygen sensor voltage greater than or equal to *KO2AMIN* and less than or equal to *KO2AMAX* continuously for a period of time greater than or equal to *KO2ATIME*.

The oxygen sensor is initialized to the 'not ready' state following a legitimate shutdown reset. If a legitimate shutdown is not detected prior to the last ECM reset, the oxygen sensor status will be that which existed before the reset and the 'not ready' timer will be cleared.

3.1.2.2.3.5.2 Oxygen Sensor Rich/Lean Determination

A rich status is indicated when the oxygen sensor input voltage is greater than *KCLOXTHI*. A lean status is indicated when the oxygen sensor input voltage is less than *KCLOXTLO*.

If the filtered oxygen sensor voltage is between these levels, the rich/lean status is based on whether the oxygen sensor voltage is increasing or decreasing. A rich indication results if the new filtered oxygen sensor voltage is greater than the 12.5 msec old value (increasing). Likewise, a lean indication results if the new voltage is less than or equal to the 12.5 msec old value (decreasing).

An oxygen sensor transition is said to have occurred when the oxygen sensor status changes from rich to lean, or lean to rich.

3.1.2.2.3.5.3 Closed Loop Correction Term Calculation

The closed loop correction term consists of the sum of two parts. The integral and proportional. The sum is limited to a maximum of *KCORCLMX* and a minimum of *KCORCLMN*.

3.1.2.2.3.5.3.1 Integral Term

The operational sequence of the integrator function can be broken into three phases as shown below.

1) When the system detects an oxygen sensor transition, the fuel logic calculates an integrator delay time equal to Table *F21* as a function of air flow.

2) If the above integrator delay time expires without an oxygen sensor transition, the integrator is updated as shown in one of the expressions below and a new value of integrator delay is calculated.

   - If Oxygen sensor indication is rich

     -- Integrator = Integrator - *KCLISNG*

   - If Oxygen sensor indication is lean

     -- Integrator = Integrator + *KCLISPO*

3) Integrator Slow Trim

   The integrator is updated at a rate given by (*F21*)(*KSTLGF*) as a function of the slow trim oxygen sensor voltage as shown below.

   -Integrator = Integrator + 1, if slow trim oxygen sensor voltage is less than *KSO2L*

   -Integrator = Integrator - 1, if slow trim oxygen sensor voltage is greater than *KSO2U*

   -Integrator is unchanged, if slow trim oxygen sensor voltage lies between *KSO2L* and *KSO2U*

4) Phases 2 and 3 are repeated until an oxygen sensor transition is detected.

The above sequence continues as long as the system is operating in closed loop and the integrator reset mode is not enabled.

3.1.2.2.3.5.3.1.1 Slow Trim oxygen Sensor Filter

Every 12.5 msec the 12.5 msec filtered oxygen sensor value is filtered into a slow oxygen sensor filter for use in the closed loop logic. The slow oxygen sensor filtered value is initialized to *KO2FFO*. The filter coefficient is given by Table *F22*.

3.1.2.2.3.5.3.1.2 Integrator Reset Mode Enable Criteria

If any of the following reset mode enable criteria are met, the integrator correction term is set to 128 (1.0) and the proportional correction term is not used to calculate closed loop correction. Following an integrator reset the first integrator delay is equal to the transport delay.

- Base pulse width less than or equal to minimum limit (*KMINCTS*)
- Closed loop mode disabled
- Decel fuel cut off mode enabled
- *KFAOPT3* Bit 5 set and a BLM cell change occurs
- Delta TPS asynchronous A.E. active and *KFAOPT3*, B1 = 1
- Power enrichment mode enabled
- Decel enleanment active with lean oxygen sensor indication
- All of the following conditions met (decel enleanment)
    - -- LV8 load less than or equal to *KCLDETHA*
    - -- RPM greater than *KCLDEES*
    - -- Lean oxygen sensor indication
    - -- ALCL mode not selected
    - -- Integrator greater than or equal to 128 (1.0)

3.1.2.2.3.5.3.2 Proportional Term

The proportional term is derived as shown below.

- If oxygen sensor rich to lean transition just occurred proportional term = Lower 4 bits of value from *F27B* table
- If oxygen sensor lean to rich transition just occurred proportional term = -(Upper 4 Bits of value from *F27B* table)

3.1.2.2.3.5.4 Synchronous TPS AE Inhibit of Closed Loop Correction

While synchronous TPS AE is active, further closed loop correction in the lean direction is not allowed for *KAERFCL* reference pulses.

3.1.2.2.3.6 Decel Fuel Cutoff Term

The decel fuel cutoff (DFCO) function removes fuel from the engine during periods of deceleration to minimize fuel consumption.

3.1.2.2.3.6.1 Decel Fuel Cutoff Enable Criteria

Decel fuel cutoff is enabled when all of the following conditions are met.

- Not in park/neutral
- NTPSLD less than *KDFCOTP* and no malf 21 or 22
- Coolant temperature greater than or equal to *KDFCOOL*
- RPM decreased less than or equal to *KDFCODRM* in last 12.5 msec or RPM increased.
- LV8 decreased and no malf 34.
- LV8 less than *KDFCOLLA* (*KDFCOLHA* if currently in DFCO)
- RPM greater than *KDFCOSPH* (*KDFCOSPL* if currently in DFCO)
- The above conditions met for a time greater than or equal to *KDFCOTO*
- Time since DFCO last enabled greater than or equal to *KSSTIME* (this test bypassed if NTPSLD was greater than or equal to *KDFCOTP* since last DFCO)

3.1.2.2.3.7 Decel Enleanment Term

Decel enleanment is utilized to reduce carbon monoxide and hydrocarbon emissions during periods of deceleration.

3.1.2.2.3.7.1 Decel Enleanment Enable or Criteria

Decel enleanment is enabled if all the following criteria are met.

- Engine running

- Vehicle speed greater than *KDEVSMN*

- Decrease in LV8 (TFLV8-LV8) greater than *KDELV8TH* or an increase in LV8 less than or equal to *KDELV8MN* with *KDELV8TH* set to 0

- Decel fuel cutoff not enabled

- Negative Delta TPS (TFTPS2-NTPSLD) greater than *KDETPS*

Once Decel enleanment is enabled, it will remain enabled if only the following conditions are met.

- LV8 decreased or increased by an amount less than or equal to *KDELV8MN*

- Vehicle speed greater than *KDEVSMN*

- Less than *KDECNT2* reference pulses have occurred while in Decel enleanment

The Decel enleanment reference pulse counter is cleared when Decel enleanment is disabled. If two reference pulses are received within a 6.25 msec interval, (RPM greater than 3200), the reference pulse counter will only increase by one.

3.1.2.2.3.7.2 Decel Enleanment Function

When Decel enleanment is enabled, the base pulse width is reduced as shown in the following expression.

-BPW (NEW)=BPW (OLD)*(FACTOR)

Where factor is one of the following values for the conditions shown

KDEFAC1, TCC unlocked and in Decel enleanment for less than *KDECNT1* reference pulses

KDEFAC2, TCC unlocked and in Decel enleanment for greater than or equal to *KDECNT1* reference pulses

KDEFAC3, TCC locked and in Decel enleanment for less than *KDECNT1* reference pulses

KDEFAC4, TCC locked and in Decel enleanment for greater than or equal to *KDECNT1* reference pulses

3.1.2.2.3.8 Crank to Run Pulse Width Ramp Term

While in crank a ramp scaler is set to 1. As soon as the engine is running the ramp scaler is decremented by *KRAMPDEC* every *KRAMPCTR* reference pulses. Every 3.125 msec the base pulse width is modified by the ramp scaler as follows:

BPW = PBPW+(LASTCRNK-PBPW)*RAMPSCALER

Where:

BPW = New Base Pulse Width

PBPW = Present Base Pulse Width

LASTCRNK = Value of the Last Crank Pulse Width Delivered

3.1.2.2.3.9 MPH Fuel Limiting Multiplier

When vehicle speed exceeds *KVSSLMT*, MPHLMT is applied to the run pulse width

MPHLMT = (MPH - *KVSSLMT*)(*KVSSLMTG*)+128

Note: (MPH - *KVSSLMT*)(*KVSSLMTG*) is limited to $7F.

3.1.2.3 Delta TPS Synchronous Acceleration Enrichment

When enabled, the delta TPS synchronous A.E. pulse width is added to the sequential synchronous run pulse width each 3.125 msec.

3.1.2.3.1 Delta TPS Synchronous A.E. Enable

Delta TPS synchronous A.E. is enabled when both the following conditions are met.

- Engine running
- Increase in throttle position greater than *KDTPSEN*

3.1.2.3.2 Delta TPS Synchronous A.E. Disable

Once enabled, Delta TPS synchronous A.E. is disabled if any of the following conditions are met:

- Engine not running
- Decrease in throttle position greater than *KNEGLIM3*
- Number of reference pulses is greater than *KDTREFHI*
- Number of reference pulses is less than *KDTREFCT*

Once delta TPS synchronous A.E. is disabled, the reference pulse count is set to zero.

3.1.2.3.3 Delta TPS Synchronous A.E. Pulse Width

The Delta TPS synchronous A.E. pulse width is determined as follows:

SAEPW = (*F90DTPS*)(*F91ATS*)(*F91DTPSX*)(*F92DECAY*)(SSRPW-OFFSET)/2

Where:

SAEPW	=	Delta TPS Synchronous A.E. PW
F90DTPS	=	Multiplier Vs. Maximum Delta TPS
F91ATS	=	Multiplier (0-2) Vs. Air Temperature
F91DTPX	=	Multiplier Vs. Coolant Temperature; *F91DTPSP* if in P/N or *F91DTPSD* if in other gears
F92DECAY	=	Multiplier Vs. Number of Reference Pulses
SSRPW	=	Seq. Sync. Run Pulse Width
OFFSET	=	Injector offset; see Section 6, Paragraph 3.2.

Once delta TPS synchronous A.E. is disabled, this pulse width is set to zero.

3.1.2.3.3.1 Maximum Delta TPS

The maximum delta TPS is calculated each 12.5 msec by comparing the present value to the previous value and retaining the larger as the maximum delta TPS. This is done only when delta TPS synchronous A.E. is active. The term is set to zero when delta TPS synchronous A.E. is not active.

3.1.3 Vehicle Speed Limiting Fuel Modes

3.1.3.1 RPM/MPH Fuel Disable Mode

Synchronous and asynchronous fuel will not be delivered if either of the following conditions are met:

- Vehicle speed greater than or equal to *KMPHOFF*
- RPM greater than or equal to *KLDFLOFF*

Once fuel has been disabled it will remain disabled until both the following criteria are met:

- Vehicle speed less than *KMPHOFF*
- RPM less than *KLDFLON*

3.1.3.2 High Vehicle Speed Overfueling Mode

To limit vehicle speed, the fuel/air ratio is multiplied by an overfuel scaler of 1-2. Running a rich A/F mixture (and retarding spark) reduces the engines power output (see 3.1.2.2.3.9).

3.1.4 Abusive Maneuver Fuel Mode

Abusive maneuve controls fuel to limit RPM during transitions from P/N to Drive or Drive to P/N when RPM is considered excessive. Abusive maneuver will be enabled when the following conditions are met:

- Malfunction codes 21, 22, 24, or 31 are not detected
- P/N to Drive or Drive to P/N transition occurs
- Vehicle speed is less than or equal to *KMPHABEN*
- Throttle position is greater than *KABTPSEN* or engine RPM is greater than *KABRPMEN*

Once enabled, a timer is set to *KABTQTME*. Abusive maneuver control of fuel will enable mode 1, 2 or 3 only while this timer is active. The timer will be reset to *KABTQTME* if TPS becomes greater than *KTPSMT* or a P/N to Drive or Drive to P/N transition occurs.

3.1.4.1 Abusive Maneuver Control Of RPM

once enabled, RPM will be controlled by alternating etween normal fuel delivery, fuel cutoff, and fuel delivery to only injectors B, D & F when the following RPM limiting conditions are met:

Mode1 - Fuel Shut Off

- RPM is greater than *KDRRPMMX* in Drive, or *KPNRPMMX* if in P/N

Mode2 - Fuel Restored

- RPM is less than or equal to *KDRRPMMX* in Drive, or *KPMRPMMX* if in P/N

- RPM is less than *KDRRPMMN* in Drive, or *KPNRPMMN* if in P/N

Mode 3 - Fuel to Injectors B, D & F only

- RPM is less than or equal to *KDRRPMM* in Drive or *KPNRPMMX* if in P/N

- PPM is greater than or equal to *KDRRPMMN* in Drive or *KPNRPMMN* if in P/N

- RPM is greater than *KDRRPMMD* in drive or *KPNRPMMD* if in P/N

Note: Pulse width while delivering fuel in modes 2 & 3 is calculated normally.

3.2 Pulse Width Correction

The amount of fuel delivered for a given pulse width can vary due to both a drop in fuel pressure, which changes the rate of flow of fuel through the injector, and a change in the opening and closing time of the injector pintle. Both of these conditions are associated with low voltage operation.

The calculated pulse widths are modified with the correction terms from the following table:

	F33B0	*F94B*	*F33B1*
Async SSDF Crank P.W.	X		X
A.U.P.I. P.W.	X		
Delta TPS Async. A.E. P.W.	X		
Seq. Sync. Crank P.W.	X		X
Seq. Sync. Crank Prime P.W.	X		
Seq. Sync. Run P.W. (Including Delta TPS Sync. A.E. P.W.)	X	X	X

The correction terms, where applicable, are applied in the following manner:

P.W. = P.W.*(*F33B1*)+(*F33B0*)+(*F94*)

Where:

F33B0 = Injector Offset as a Function of Battery Voltage

F94B = Positive or Negative Injector Offset as a Function of Base Pulse Width

F33B1 = Voltage Correction as a Function of Battery Voltage

3.3 Engine Running Determination for Fuel

There are two separate engine running determinations made, one for fuel functions and one for all other functions (See 3.1.2.1, Section 9). This allows the transition between crank/run fuel to be at a different time than the transition between bypass/computer spark.

3.3.1 Engine Running Determination For Fuel

The engine is considered 'running' for fuel when all the following criteria are met:

- Ignition on
- Number of reference pulses received is greater than *KERNCTR1*
- Engine speed greater than *KRPMUP1*

3.3.2 Engine Not Running

Once running, the engine will be considered 'running' until a system reset occurs.

END OF SECTION 6

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SECTION 7

CANISTER PURGE

Original Release - 02/13/87

1.0 SUBJECT

Canister Purge Control

2.0 INTRODUCTION

The purpose of the canister purge control system is to control the release of fuel vapors from the vapor collection canister into the engine intake manifold so they are burned in the combustion process. This control is accomplished using an electrically operated (PWM) solenoid valve, energized or deenergized (PWM) by the ECM. With the solenoid deenergized, purge is allowed in accordance with the PWM duty cycle; while purge is not allowed as long as the solenoid is energized.

3.0 SPECIFICATION

3.1 Criteria To Energize The Purge Solenoid (Purge Enabled)

The Purge Solenoid will be energized with a duty cycle from Table *F73B* if all the following conditions are satisfied.

- Engine running for a time greater than or equal to *KCCPTMH* (if startup coolant temperature is greater *KTIMCOOL*) or *KCCPTM* (if startup coolant temperature is less than *KTIMCOOL*).

- Not in ALDL mode

- Coolant temperature greater than or equal to *KCCPTMP*

- Not in Decel Fuel cutoff

- Vehicle Speed greater than or equal to *KCPVST1* (*KCPVST2* if purge is current enabled) where *KCPVST1* is greater than *KCPVST2*

- Throttle position greater than or equal to *KCCPTPSU* (*KCCPTPSL* if purge is currently enabled)

- Throttle position is less than *KHITPSU* (*KHITPSL* if purge is currently enabled)

- Fuel system in close loop

When a transition from purge disabled to purge enabled occurs, the duty cycle filters up to the value specified in *F73B* with a filter coefficient of *KCCPSLEW*.

3.2 Criteria To Deenergize The Purge Solenoid (Purge Disabled)

The Purge Solenoid will be deenergized (Purge Duty Cycle set to zero) if any of the Purge Enable Criteria are not satisfied.

3.3. Purge Solenoid Duty Cycle Calculation

With Purge Solenoid enable, the Purge Solenoid duty cycle shall be calculated as follows:

PURGEDC = F73B + ((NONCCPBLM)-(CCPBLM)-KCCPOFST)*KCCPDC

Where:

- PURGEDC - Purge Duty Cycle
- *F73B* - CCP Duty Cycle Table
- NONCCPBLM - Non Canister Purge Block Learn Memory Cell
- CCPBLM - Canister Purge Block Learn Memory Cell
- KCCPOFST - Offset for CCP/NONCCPBLM difference

END OF SECTION 7

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SECTION 8

DIAGNOSTICS

Original Release - 02/13/87

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1.0 Subject

ECM System - Self Diagnostic Function

2.0 Purpose and Scope

The purpose of the system self diagnostics is to detect malfunctions which may occur and then alert the operator. The self diagnostics also assist service personnel in diagnosing detected system malfunctions.

3.0 Diagnostic Function Specification

3.1 Malfunction Control

3.1.1 Malfunction Control Logic

The Electronic Control Module (ECM) monitors its own performance and certain system input and output signals to determine if a system malfunction has occurred. Each malfunction type (code) has its own set of conditions that must be met for that code to be detected. Once a code is detected, it will cause the malfunction lamp to be illuminated and logged in nonvolatile memory after meeting the general malfunction logging requirements detailed herein.

The purpose of the malfunction logging requirements is three-fold:

1. To prevent false malfunction indications from being logged.

2. To insure that the malfunction light when illuminated, will remain illuminated for a period of time sufficient to be seen by an operator.

3. To prevent an intermittent malfunction from 'flashing' the malfunction light.

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3.1.2 Malfunction Logging Constraints

The malfunction logging requirements are executed via an up/down counter. Each malfunction code has a particular timer in calibration in memory. The timer counts at a rate of 1 count every 100 msec.

3.1.3 Malfunction Lamp Check

The ECM outputs a continuous malfunction light control signal for a period of time specified by *KRUNPLS* if an improper shutdown condition is already detected at the time of engine run condition.

3.2 Storage of Malfunction Codes

The ECM has the capability to store individual malfunction codes in the keep alive area of the ECM memory (RAM) to designate the particular malfunctions, which are detected during system operation. A malfunction code is stored in keep alive memory when the malfunction control logic has logged it.

3.2.1 Erasure of Malfunction Codes

All malfunction codes will be erased from nonvolatile memory if any of the following conditions are satisfied.

- Power removed from ECM unswitched battery terminal
- NVM Checksum Failure exceeds *KKNOMALF*.
- NVM checksum failure detected (See General Information)
- UART request received to clear codes (see Serial Data)

3.2.2 Malfunction Code Disable Criteria

Each of the possible malfunction codes has a corresponding bit in the calibration area of memory. When the bit associated with the particular malfunction code is reset (0), the malfunction code is disabled which will prevent that malfunction code from illuminating the malfunction lamp and being stored in nonvolatile memory.

KKMASK1, *KKMASK2*, *KKMASK3*, *KKMASK4*, *KKMASK5, *KKMASK6, and *KKMASK7* provide means to mask out particular malfunction codes as described below. *KKKMASK1*, *KKKMASK2*, *KKKMASK3*, *KKKMASK4*, *KKKMASK5*, *KKKMASK6*, and *KKKMASK7* provide means to mask out particular malfunction code check engine light as described below. Malfunction code 51 cannot be masked out.

	KKKMASK1 *KKMASK1*	*KKKMASK2* *KKMASK2*	*KKKMASK3* *KKMASK3*	*KKKMASK4* *KKMASK4*
Bit 7	Code 13	22	31	39
6	14	23	32 NA	41
5	15	24	33 NA	42
4	16	25	34	43
3	17 NA	26	35 NA	44
2	18 NA	27	36 NA	45
1	19 NA	28	37 NA	46
0	21	29	38	47

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	KKKMASK5 *KKMASK5*	*KKKMASK6* *KKMASK6*	*KKKMASK7* *KKMASK7*
Bit 7	48	57 NA	66
6	49	[illegible]	NOT USED
5	51	59	NOT USED
4	52 NA	61 NA	NOT USED
3	53 NA	62 NA	NOT USED
2	54 NA	63	NOT USED
1	55 NA	64	NOT USED
0	56 NA	65	NOT USED

The codes followed by 'NA' are not assigned to this program. These are codes not applicable due to system configuration and must be disabled.

3.3 Diagnostic Mode Determination

The ECM hardware provides a diagnostic request input by which users can command the various functions in the diagnostic algorithm. The diagnostic request line is configured such that four (4) separate input states are recognized when various values of resistance are connected from the diagnostic request line to system ground. The various states and their nominal resistance values are listed below:

R Greater than or equal to 20K ohm - Normal Mode

R = 10K ohm - Not Used

R = 3.9K ohm - Factory Test Mode

R = 0 ohm - Field Service Mode (Engine Running)
Field Diagnostic Mode (Engine Not Running)

3.3.1 Normal Mode

When the normal mode is detected the ECM will operate as described in the various sections of this document.

3.3.2 Factory Test Mode

The factory test mode is described in a separate section of this document

3.3.3 Field Service Mode

When the field service mode is enabled, the oxygen sensor state is displayed on the check engine lamp as shown below.

1) If the fuel system is in open loop or engine not running .

   -- Toggle check engine lamp each 200 msec.

2) If the fuel system has just entered closed loop

   -- Turn on check engine lamp for 1 second if oxygen sensor was rich

   -- Turn off check engine lamp for 1 second if oxygen sensor was lean

3) If the fuel system has been in closed loop for more than one second

   -- Toggle check engine lamp if an oxygen sensor transition occurred in the last second.

   -- Turn check engine lamp on if no oxygen sensor transition occurred in the last second and the indication was rich.

   -- Turn check engine lamp off if no oxygen sensor transition occurred in the last second and the indication was lean.

4) Execute step 3 each second while in closed loop.

3.3.4 Field Diagnostic Mode

When the field diagnostic mode is enabled, the following actions occur.

- All QDM outputs except the check engine light are forced on.

- The check engine light will flash out all Malf Codes.

3.4 Malfunction Detection Algorithms

3.4.1 Code 13 - Oxygen Sensor Failure

Malfunction Code 13 is detected when all of the following conditions are satisfied

1. Malfunction Code 21 or 22 are not being detected.
2. Engine running time greater than or equal to *KKO2ENBL*.
3. Oxygen sensor voltage is less than or equal to *KKO2HIGH*.
4. Oxygen sensor voltage is greater than *KKO2LOW*.
5. Coolant temperature greater than *KKDIAWM*.
6. Throttle position sensor is greater than *KKO2LOD*.
7. Conditions 1 through 6 above have been present for a period of time greater than or equal to *KKM13TME*.

Once Malfunction Code 13 has been detected, it will not be reset until conditions 1, 3, or 4 are not met.

3.4.2 Code 14 - High Coolant Temperature

Malfunction Code 14 is detected when the following conditions are met:

1. Coolant Temperature is greater than or equal to *KKETMPH*.
2. Engine run time is greater than *KKETMPTH*.
3. Above conditions have been present for a time greater than *KKM14TME*.

Once Malfunction Code 14 has been detected it will not be reset until one or more of condition 1 is not met.

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3.4.3 Code 15 - Low Coolant Temperature

Code 15 is indicated when all the following conditions are satisfied.

- Engine running time greater than *KKETMPTL*
- Coolant temperature less than or equal to *KKETMPAD*

3.4.3.1 Code 15 Remedial Action

KKTCDFA will be substituted for the current coolant sensor reading if any of the following sets of criteria are satisfied.

1. - Engine running time less than or equal to *KKETMPTL*
   - MALF Code 15 logged.
   - Coolant temperature less than or equal to *KKETMPAD*
2. - MALF Code 15 currently being detected.
3. - Engine started in the clear flood mode (See Fuel Control)
   - Coolant temperature less than *KKETMPAD*

3.4.4 Code 16 High Battery Voltage

Malfunction Code 16 is set under the following conditions:

1. Battery voltage is greater than *KKVOLTHI*.
2. The battery voltage remains high for an amount of time greater than or equal to *KKM16TME*.

Once the code 16 is detected it will not be reset unless condition 1 above no longer exists.

Malfunction Code 16 logic is executed once every 100 msec.

3.4.5 Code 21 - High Throttle Position

Code 21 is indicated when all the following conditions are satisfied.

- Engine running

- Malf Code 34 is Not Active

- Throttle position greater than *KKTA21*

- Air flow in grams/second less than or equal to *KKFLOM21*

- Above conditions continuously met for a time greater than *KK21TME*

Code 21 will also be indicated if the following condition is satisfied:

- Throttle position A/D counts greater than or equal to *KKHITPS*

3.4.5.1 Code 21 Remedial Action

When the conditions are met to store Code 21, *KKTPSDEF* will be substituted in place of the current TPS reading.

3.4.6 Code 22 - Low Throttle Position

Code 22 is indicated when the following conditions are met.

- Engine running

- Throttle position A/D counts less than or equal to than *KKTA22*

- Above conditions continuously met for a time greater than *KKM22TME*

3.4.6.1 Code 22 Remedial Action

When the conditions are met to store Code 22, *KKTPSDEF* will be substituted in place of the current TPS reading. If Code 22 is masked out this remedial action will not occur.

3.4.7 Code 23 - Air Temperature Low

Malfunction Code 23 is detected when the following conditions are met:

1. Air temperature is less than or equal to *KKM23LO*.

2. Above conditions have been present for a time greater than *KKM23TME*.

Once Malfunction Code 23 has been detected it will not be reset until condition 1 is not met.

When the conditions are met to store Code 23, *KKATSDEF* will be substituted in place of the current air temperature reading.

3.4.8 Code 24 - Vehicle Speed Sensor Low

Malfunction Code 24 is detected when the following conditions are present:

1. Engine running.

2. Malfunction 29 or 31 is being detected.

3. Vehicle speed is less than *KKVSDM*.

4. In 4th gear, and 4th gear diagnostic not set.

5. All the above conditions are present for a time greater than *KKM24TME*.

Once Malfunction Code 24 has been detected it will not be reset until one or more of conditions 2 or 3 are not met.

3.4.9 Code 25 - Air Temperature High

Malfunction Code 25 is detected when the following conditions are met:

1. Air Temperature is greater than *KKM25HI*.

2. MPH is greater than *KKM25MPH*.

3. Above conditions have been present for a period of time greater than *KKM25TME*.

Once Malfunction Code 25 has been detected it will not be reset until condition 1 is not met.

When the conditions are met to store Code 25, *KKATSDEF* will be substituted in place of the current Air Temperature reading.

3.4.10 Code 26 - QDM Diagnostic

Malfunction Code 26 is detected when the following conditions are present:

1. Fuel system in close loop.

2. Condition A or B is present

   A. Brake switch is ON and QDM 1, 2 or 4 failure is detected. (Bypass TCC output check when brake is on)

   B. Brake switch is OFF and QDM 1, 2, 3 or 4 failure is detected.

3. The above conditions have been present for a time greater than *KKM26TME*.

Once Malfunction Code 26 has been detected it will not be reset until one or more of conditions 1, 2 or 3 are not met.

Note: When the ECM is put into the diagnostics mode by shorting the diagnostic input line to ground, and the engine is not running, then the ECM shall force all QDM outputs on with the exception of the service engine soon light. This feature shall have priority over all else except the ignition logic and the over-voltage logic.

3.4.11 Code 27 - 2nd Gear Switch Diagnostic

Code 27 consists of two separate detection algorithms, either of these algorithms can set Code 27.

3.4.11.1 Gear Switch Open Circuit

Code 27 is intended to detect an open circuit for 2nd gear switch. Malfunction Code 27 will be detected when the following conditions are met:

1. Engine not running
2. Vehicle speed equal zero
3. The above conditions have been present for a time greater than *KKGEARTM*.

3.4.11.2 Gear Switch Short Circuit

Code 27 is intended to detect a short circuit for 4th gear switch. Malfunction Code 27 will be detected when the following conditions are met:

1. In 4th gear
2. Not in 2nd gear
3. Above condition is present for a period of time greater than *KK27GR2TM*.

Once Malfunction Code 27 is detected it will not be reset until short circuit condition 2 is not met.

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3.4.12 Code 28 - 3rd Gear Switch Diagnostic

Code 28 consists of two separate detection algorithms, either of these algorithms can set Code 28.

Gear Switch Open Circuit

Code 28 is intended to detect an open circuit for 4th gear switch. Malfunction Code 28 will be detected when the following conditions are met:

1. Engine not running

2. Vehicle speed equal zero.

3. The above conditions have been present for a time greater than *KKGEARTM*.

Gear Switch Short Circuit

Code 28 is intended to detect a short circuit for 4th gear switch. Malfunction Code 28 will be detected when the following conditions are met:

1. In 4th gear, and no 4th gear malfunction.

2. Not in 3rd gear.

3. Above conditions are present for a period of time greater than *KKGR3TM*.

Once Malfunction Code 28 is detected it will not be reset until short circuit condition 1 is not met.

3.4.13 Code 29 - 4th Gear Switch Diagnostic

Code 29 consists of two separate detection algorithms, either of these algorithms can set Code 29.

Gear Switch Open Circuit

Code 29 is intended to detect an open circuit for 4th gear switch. Malfunction Code 29 will be detected when the following conditions are met:

1. Engine not running
2. Vehicle speed equal zero.
3. The above conditions have been present for a time greater than *KKGEARTM*.

Gear Switch Short Circuit

Code 29 is intended to detect a short circuit for 4th gear switch. Malfunction Code 29 will be detected when the following conditions are met:

1. Not in 4th gear.
2. Brake is not ON.
3. TCC is locked.
4. RPM/vehicle speed ratio is greater than or equal to *KK4THLOW*.
5. RPM/vehicle speed ratio is less than or equal to *KK4THHI*.
6. Above condition is present for a period of time greater than *KKGR4TM*.

Once Malfunction Code 29 is detected it will not be reset until short circuit condition 1 is not met.

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3.4.14 Code 31 - P/N Gear Switch Diagnostic

Code 31 consists of two separate detection algorithms, either of these algorithms can set Code 31.

Gear Switch Open Circuit

Code 31 is intended to detect an open circuit for P/N gear switch. Malfunction Code 26 will be detected when the following conditions are met:

1. Engine not running
2. Vehicle speed equal zero.
3. Battery voltage is greater than or equal to *KKBATM31*.
4. The above conditions have been present for a time greater than *KKGEARTM* for more than *KKSETM31* consecutive startups.

Gear Switch Short Circuit

Code 31 is intended to detect a short circuit for 4th gear switch. Malfunction Code 26 will be detected when the following conditions are met:

1. IN 4th
2. Not in P/N
3. Above condition is present for a period of time greater than *KKGRPTM*.

Once Malfunction Code 31 is detected it will not be reset until short circuit condition 2 is not met.

3.4.15 Code 34 Mass Air Flow Sensor Failure

Malfunction Code 34 is detected when the following conditions are met:

1. High frequency Mass Air Flow pulse counts are greater than or equal to *KKHFMNCT*.

2. Above conditions have been present for a time greater than *KKM34TME*.

Once Malfunction Code 34 is detected it will not be reset until one or more of condition 1 is not met.

3.4.16 Code 38 - Brake Switch Diagnostic

Malfunction Code 38 is detected when the following conditions are met:

1. VSS malfunction is not detected.

2. Brake switch has not changed status.

3. Test in progress is enabled.

4. Vehicle speed is equal to zero.

5. The above conditions have been present for a time greater than *KKM38TME*.

Once Malfunction Code 38 is detected it will not be reset until one or more of conditions 1 or 2 are met.

3.4.17 Code 39 - TCC Malfunction Code

Code 39 is indicated when the following conditions are satisfied:

1. No other gear malfunction Code detected.

2. Brake switch is OFF.

3. TCC is locked.

4. In 4th gear.

5. RPM/vehicle speed ratio is greater than *KKTCCNVL*.

6. RPM/vehicle speed ratio is less than *KKTCCNVH*.

7. The above conditions have been present for a time greater than or equal to *KKM39TME*.

Once Malfunction Code 39 has been detected it will not be reset until one or more of conditions 5 or 6 are not met.

3.4.18 Code 41 - CAM Sensor Failure

Code 41 is indicated if the following conditions are met:

1. Engine running

2. No cam pulses received in last second interval.

3. Conditions 1 and 2 above have been present for a period greater than or equal to *KKM41TME*.

Once Malfunction Code 41 has been detected it will not be reset until conditions 1 or 2 are not met.

Note: If no cam pulse has been seen by the time the seventh REF pulse occurs, the simultaneous prime pulse (see 3.1.2.1.3 section 6) shall be recalculated and issued again. Simultaneous prime pulses shall continue to occur each 6 REF pulses. Sequential crank pulses shall not occur until a cam pulse has occured.

3.4.19 Code 42 - EST Monitor Error

Code 42 consists of two separate detection algorithms, either, or both, of these algorithms can set Code 42.

3.4.19.1 Open EST Line (Code 42A)

Code 42A is intended to detect an open circuit in the EST line. The criteria for Code 42A are established prior to (spark) engine running, while the actual Code 42A logic is performed once after (spark) engine running. The algorithm is implemented as follows:

Malf 42A will be successfully passed if no EST feedback pulse(s) occur between two adjacent reference pulses. Once passed, the Malf 42A logic is not executed again until another (spark) engine not running to running transition occurs.

If Malf 42A has not already passed, a Malf 42 will be logged if an EST feedback pulse has occurred between two adjacent reference pulses *KK42ALPS* consecutive times.

If the conditions for MALF code 42A are present, the EST mode will not be enabled, thus keeping the spark system in bypass until the ignition is turned off. This remedial action is not taken if Code 42 is masked out.

3.4.19.2 Open Bypass Line (Code 42B)

Code 42B is intended to detect an open or grounded bypass line or an intermittent short to ground on the EST line. Code 42B will be set if the following conditions are satisfied.

1. Malfunction Code 42 is not masked out.

2. EST Mode enabled.

3. No EST pulse seen by EST monitor for 200 msec.

4. Not in ALDL mode.

5. Engine speed is greater than *KK42RM*.

If the conditions for Code 42B are present, even if Code 42 is masked out, the bypass mode will be forced until the ignition is turned off.

3.4.20 Code 43 - ESC Failure

Malfunction Code 43 is detected when the following conditions are met:

1. Engine is running.

2. ESC A/D counts are less than *KKESCLO* or ESC A/D counts are greater than or equal to *KKESCHI*.

3. Above conditions have been present for a time greater than *KKM43TME*.

Once Malfunction Code 43 has been detected it will not be reset until condition 2 is met.

3.4.21 Code 44 - Lean Oxygen Sensor

Malfunction Code 44 is detected when the following conditions are met:

1. Oxygen sensor voltage less than *KKO2MIN*

2. Fuel system in closed loop

3. Closed loop integrator not forced to 128

4. Above conditions continuously present for a time greater than *KKM44TME*

Once Malfunction Code 44 has been detected it will not be reset until condition 1 is not met.

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3.4.22 Code 45 - Rich Oxygen Sensor

Malfunction Code 45 is detected when the following conditions are met.

1. No Malf 21 or 22
2. Oxygen sensor voltage greater than *KKO2MAX*
3. Fuel system in closed loop
4. Closed loop integrator not forced to 128
5. TPS less than *KK45TPSH* or greater than *KK45TPSL*
6. Above conditions present for a time greater than *KKM45TME*

Once Malfunction Code 45 has been detected it will not be reset until one or more of conditions 1 or 2 are not met.

3.4.23 Code 46 - Power Steering Pressure Switch

Malfunction Code 46 is detected when the following conditions are present:

1. Power steering pressure switch is closed.
2. MPH is greater than *KKM46MPH*.
3. One second loop complete.
4. Conditions 1 through 3 above have been present for a period of time greater than *KKM46TME*.

Once Malfunction Code 46 has been detected it will not be reset until condition 1 above has ceased to exist.

3.4.24 Code 47 - UART Link Diagnostic

Malfunction Code 47 is detected when the following conditions are present:

1. Malfunction Code 47 is enabled.
2. Malfunction Code 16 is not detected.
3. ECM has not seen a UART message from the BCM for a time greater than *KK1UART*.

Once Malfunction Code 47 has been detected it will not be reset until one or more of the conditions 1 or 3 above have ceased to exist.

3.4.25 Code 48 - MISFIRE Diagnostic

Code 48 is indicated when the following conditions are satisfied:

1. 1 second loop.
2. Malfunction Codes 21 or 22 are not detected.
3. Vehicle is in closed loop.
4. Throttle position is greater than or equal to *KK48TPSL*.
5. Throttle position is less than or equal to *KK48TPSH*.
6. Delta TPS is less than *KK48TPSD*.
7. RPM is greater than *KK48RPML*.
8. RPM is less than or equal to *KK48RPMH*.
9. MPH is greater than or equal to *KK48MPHL*.
10. MPH is less than or equal to *KK48MPHH*.
11. Enable time is greater than *KK48ENBL*.
12. Cross counts is greater than *KK4802D*.
13. Above conditions have been present for a time greater than *KK48TIM*.

Once Malfunction Code 48 has been detected it will not be reset until one or more of conditions 1 through 12 are not met.

3.4.26 Code 49 - VACUUM Leak Diagnostic

Malfunction Code 49 is detected when the following conditions are met:

1. Select purge or non purged BLM Cell 0.
2. BLM Cell 0 is greater than *KK49CLO*.
3. (BLM Cell 0 - BLM Average) is greater than *KK49CLO*.

Once Malfunction Code 49 has been detected it will not be reset until condition 2 is not met.

3.4.27 Code 51 - EPROM Calibration Error

Code 51 indicates the ECM is not able to read correct data from the calibration EPROM. Code 51 is indicated if any of the following conditions are met.

- Initialization checksum (single byte straight addition, double byte sum) of locations $C008 through $FFFF not equal to *KKSUM*

- Read contents of *KKPRMTW1* at address $8CAA not equal to $55 (running EPROM integrity check)

- Read contents of *KKPRMTW2* at address $8255 not equal to $AA (running EPROM integrity check)

- Read contents of *KPROMROM* not equal to $AA or $33 (EPROM correctness check/checksum disable for development)

During calibration development *KPROMROM* can be set to $AA to bypass the initialization checksum comparison to *KKSUM*. For production it is set to $33 which is a unique identifier for this ROM program.

3.4.27.1 Code 51 Remedial Action

If the checksum or EPROM correctness check fails, the software will stay in a loop until a cop reset occurs thereby recalculating the checksum.

If the running EPROM integrity check fails the following action is taken

- Force engine not running

- Force EST bypass mode

- Force backup fuel by inhibiting COP2 signal

- Activate check engine lamp if not in diagnostic display mode

- Disable logging of other malfunction codes

3.4.27.2 Code 51 Logging Criteria

Code 51 is logged in nonvolatile memory immediately upon a checksum failure or EPROM correctness failure. Code 51 will also be logged if the running EPROM integrity check failure is present for two consecutive 100 msec checks.

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3.4.28 Code 58 - Vehicle Anti-theft System

Malfunction Code 58 is detected when the following conditions are met:

- *KOPTVATS* greater than 0
- Number of VATS pulses in the last 100 msec less than *KK58DGL*.
- Number of VATS pulses in the last 100 msec less than *KK58EDGH*.
- Above criteria met *KK58CTR* times.
- VATS "passed" criteria met since start-up (See Section 17)
- Not in diagnostic mode.
- Malfunction Code 58 is enabled.

Once Malfunction Code 58 is detected it will not be reset until the proper number of VATS pulses are received for 2 consecutive 100 msec loops.

3.4.29 Code 63, 64 and 65 - Digital EGR Failure

Malfunction Codes 63, 64 and 65 are assigned as follows:

Code 63 - EGR1 solenoid failure Code 64 - EGR2 solenoid failure Code 65 - EGR3 solenoid failure

Two tests are done on each of the three digital EGR solenoids (increasing RPM and decreasing RPM). Either test can cause a Malfunction Code failure. Each EGR solenoid is tested for a calibration number of times. Once the solenoid has been tested for the predetermined number of cycles the remaining two solenoids are then the only ones tested and finally just the remaining one. The testing sequence is as follows:

EGR3	EGR2	EGR1 (Until EGR3 solenoids cycles *KKEGRC* times)
	EGR2	EGR1 (Until EGR2 solenoids cycles *KKEGRCM* times)
		EGR1 (Until EGR1 solenoids cycles *KKEGRCS* times)

3.4.29.1 Criteria to Enable EGR Malfunction Tests

The following conditions must be met to enable EGR malfunction tests:

- Coolant temperature is greater than *KKEGRCL*.
- Oxygen voltage is greater than *KKEGRO2*.
- Throttle Follower is not active.
- In closed loop.
- Not in park/neutral
- Not in decel fuel cutoff
- Minimum motor position learned.
- In 3rd or 4th gear.
- Malfunction Code 21 or 22 are not detected.
- Open throttle.
- RPM is greater than *KKEGRMLL* for EGR3,
  KKEGRMLH for EGR2, and
  KKEGRMLS for EGR1.
- RPM is less than or equal to *KKEGRMHL* for EGR3,
  KKEGRMHM for EGR2, and
  KKEGRMHS for EGR1.
- The above conditions have been present for a time greater than *KKEGRTML* for EGR3, *KKEGRTMM* for EGR2, *KKEGRTMS* for EGR1.

If any of the above conditions, except RPM and oxygen sensor voltage, are not met the EGR malfunction test is disabled.

3.4.29.2 Decreasing RPM

Malfunction Codes 63, 64, or 65 are detected when the following conditions are met:

1. EGR malfunction test has been enabled.
2. Delta RPM between starting RPM and current RPM is less than or equal to the following:

   KKDLRPML (Delta RPM required to pass EGR3 solenoid)
   KKDLRPMM (Delta RPM required to pass EGR2 solenoid)
   KKDLRPMS (Delta RPM required to pass EGR1 solenoid)

3. The above conditions have been present for a time greater than the following:

   KKOLTML (Time allowed to pass EGR3 solenoid)
   KKOLTMM (Time allowed to pass EGR2 solenoid)
   KKOLTMS (Time allowed to pass EGR1 solenoid)

4. The number of solenoid failures is greater than the following:

   KKSCTRL (Solenoid failures for EGR3 solenoid)
   KKSCTRM (Solenoid failures for EGR2 solenoid)
   KKSCTRS (Solenoid failures for EGR1 solenoid)

Decreasing RPM test will be disabled if conditions 1, 2 or 3 are not met.

The appropriate Malfunction Code will be cleared if condition 4 is not met.

3.4.29.3 Increasing RPM

Malfunction Codes 63, 64, or 65 are detected when the following conditions are met:

1. EGR malfunction test has been enabled.

2. Decreasing RPM test is disabled.

3. Delta RPM between starting RPM and current RPM is less than or equal to the following:

   KKDLRPML (Delta RPM required to pass EGR3 solenoid)
   KKDLRPMM (Delta RPM required to pass EGR2 solenoid)
   KKDLRPMS (Delta RPM required to pass EGR1 solenoid)

4. The above conditions have been present for a time greater than the following:

   KKOLTML (Time allowed to pass EGR3 solenoid)
   KKOLTMM (Time allowed to pass EGR2 solenoid)
   KKOLTMS (Time allowed to pass EGR1 solenoid)

5. The number of solenoid failures is greater than the following:

   KKSCTRL (Solenoid failures for EGR3 solenoid)
   KKSCTRM (Solenoid failures for EGR2 solenoid)
   KKSCTRS (Solenoid failures for EGR1 solenoid)

Decreasing RPM test will be disabled if conditions 1, 3 or 4 are not met.

The appropriate Malfunction Code will be cleared if condition 5 is not met.

If RPM decreasing test passes and RPM increasing fails then the oxygen sensor is check by the following equations:
1. OLDSTIM - EGRO2TMR is less than 0
2. (OLDSTIM - EGRO2TMR) - *KKEGRO2T* is less than 0

where:

OLDSTIM - RPM drop time
EGRO2TMR - Oxygen sensor timer
KKEGRO2T - Oxygen sensor offset

If condition one is not met then condition 2 is check and if condition 2 is not met a malfunction code will be detected for the appropriate EGR valve.

3.4.32 Code 66 ECM Reset

Malfunction Code 66 is detected when the following conditions are met:

1. Reference pulses are less than *KRPMUP* for *ERUNCTR* number of times.

2. Malfunction Code 66 is enabled.

3. Not in ALDL or Diagnostic Mode.

4. Running Reset (NVMW Bit 4 = 0).

3.5 Major Conditions

All malfunction codes are designed such that once all of the malfunction criteria is met, a malfunction indication will be maintained as long as the major condition for the particular code remains. The major conditions for each code are listed below:

Malfunction Code	Major Condition
13	Oxygen Sensor Voltage
14	Coolant Temperature
15	Coolant Temperature
16	Battery Voltage
21	Throttle Position
22	Throttle Position
23	Air Temperature Low
24	Vehicle Speed
25	Air Temperature High
26	QDM Failure
27	2nd Gear Discrete Input
28	3rd Gear Discrete Input
29	4th Gear Discrete Input
31	P/N Gear Discrete Input
34	Air Flow
38	Brake Switch
39	TCC Failure
41	Entire Routine
42	EST Interface
43	Entire Routine
44	Oxygen Sensor Voltage
45	Oxygen Sensor Voltage
46	Power Steering Pressure Indicator
47	Entire Routine
48	Miss Fire Indication
49	Vacuum Leak
51	Entire Routine
58	Vehicle Anti-Theft System
63	EGR Diagnostic
64	EGR Diagnostic
65	EGR Diagnostic

END OF SECTION 8

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SECTION 9A

ELECTRONIC SPARK TIMING (EST)

Original Release - 02/13/87

** GM RESTRICTED **
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1.0 SUBJECT

Electronic Spark Timing Control

2.0 Introduction

The optimum spark timing output is defined in terms of its relationship to various input parameters, engine load, RPM, coolant temperature, etc. Data tables are provided to allow calibration of the spark timing function in terms of these input parameters. This function controls the spark ignition module which in turn energizes and deenergizes the ignition coil(s).

There are two basic controls which are included in the electronic spark timing function. Dwell control is provided to allow sufficient energy in the ignition coil(s) for a proper ignition system voltage output without over stressing the coil(s). Spark timing is then provided to control the proper time before peak pressure in the cylinder at which the spark plug should be ignited for optimum performance.

3.0 Specification

3.1 Modes of Operation

The spare control system is divided into two exclusive modes: (1) Bypass Mode and (2) EST Mode each of which are described below:

3.1.1 Bypass Mode

The bypass mode is intended to insure an ignition firing signal to the ignition coil(s) when proper ECM execution of the electronic spark timing control function cannot be guaranteed. The bypass mode overrides the EST run mode. The ignition module will be in the bypass mode whenever the bypass terminal is at a low voltage or open circuit. When the bypass mode is enabled by the ECM going open collector on the bypass line, the ignition module will have complete control of on time (dwell) and ignition spark timing.

Ignition secondary voltage is generated by the sudden application of battery voltage to the ignition primary voltage supply line. This means that the ECM bypass control signal must remain below the ignition module threshold during power on initialization. During a crank sequence, ignition secondary voltage is not generated until the first pickup pulse falls from a value above the ignition module "on" threshold to a value below the ignition module "off" threshold. This includes the indeterminate time between key on and starting motor engagement and any noise generated by accessory switching during that time.

3.1.1.1 Bypass Mode Enable Criteria

The Bypass Mode is enabled wherever the EST Mode is disabled.

3.1.2 EST Mode

When the EST Mode is enabled, the ECM will cause the ignition module bypass terminal to be at a high voltage state. The ECM will then have complete control of on time (dwell) and ignition spark timing.

3.1.2.1 EST Mode Enable Criteria

The EST mode will be enabled by the following sequence of events:

- Sufficient system voltage is present for the ECM to operate. (Battery Voltage greater than 6.3V) (Hardware).
- The ignition switch is on (Software and Hardware).
- The engine is running as detected by an RPM exceeding *KRPMUP* for *KERUNCTR* consecutive reference periods (Software)*.
- Malfunction Code 42 is not detected (Software)*.
- RST* must be high (Hardware).
- ESTEN bit of the input data register is set (Software).
- One negative transition of COP2 will be required if EST bypass was entered because of loss of COP2 or if COP2's are terminated during EST bypass (Hardware).
- One negative transition ESTC will be required if EST bypass was entered because of an ESTC error (Hardware).
- Two positive transitions of COP2 must occur (Hardware).
- Next two positive transitions of ESTC must occur (Hardware).
- Then one positive transition of TREF must occur. BYPASS* recovers (goes high) coincident with this transition (Hardware).

*When these two requirements are satisfied software enables the ESTC signal.

3.1.2.2 EST Mode Disable Criteria

The EST mode will be disabled by any of the following:

- -A hardware reset has occurred. Bypass will occur coincident with the fall of the reset signal.
- -The criteria for setting MALF 42B is met. Bypass will occur four reference pulses later.
- -An Engine running to not running transition occurs. This will cause a software generated reset to enable Bypass Spark.
- -Software ceases to execute properly resulting in the loss of COP1 and subsequent reset.
- -Software ceases to execute properly resulting in the loss of COP2 which forces the Bypass Mode.
- -Four reference pulses occur between two consecutive ESTC pulses.
- -The ignition switch is off for 100 milliseconds. This will result in software forcing the engine run flag to zero which will cause a software generated reset.
- -The time since the last reference pulse has exceeded 300 milliseconds. This will result in software forcing the engine run flag to zero which will cause a software generated reset.

3.2 Dwell Control

This feature is designed to provide optimum EST signal on time (dwell) requirements. A minimum on time (dwell) is required in order to build up sufficient coil primary current to generate the required secondary voltage. To prevent excessive module dissipation at low speeds and to provide sufficient burn time at high speeds, maximum on times are also required. To meet these requirements, the software sums static dwell with dynamic dwell, compensates the sum for battery voltage level, and limits the compensated sum to guarantee a minimum burn (EST off) time.

3.2.1 Static Dwell

This portion of the dwell calculation computes the nominal dwell required by the distributor during steady state engine conditions. A three slope straight line function is accomplished in software as determined below.

Condition	Reference Period	Static Dwell Calculation
1	LT 7.0 ms	Static Dwell = 4.7 ms + .5 * (Ref. Period - 7 ms)
2	GT 7.0 ms and LT 25 ms	Static Dwell = 4.7 ms + (Ref. Period - 7 ms)/16
3	GT 25 ms	Static Dwell = 5.825 ms + (Ref. Period - 25 ms)/4

3.2.2 Dynamic Dwell

The dynamic dwell portion of the dwell calculations computes the nominal additional dwell (added to static dwell) required to maintain the desired dwell under conditions of acceleration.

Dynamic dwell is added to static dwell when acceleration is detected via a reduction in reference period or a sudden increase in engine load.

3.2.2.1 Reference Period Detected Acceleration

Every 12.5 msec the software tests for an acceleration by comparing the present reference period to the previous. If the present reference period is shorter than the previous, an acceleration is occurring and dynamic dwell is added to the static dwell output.

The reference period acceleration test performs the following calculation:

N = 2 * [REFPER (NEW) - REFPER (OLD)]

where: REFPER (NEW) is present reference period and

REFPER (OLD) is previously calculated reference period

If the result of this calculation is positive and is greater than the value of dynamic dwell, then it becomes dynamic dwell subject to the maximum restrictions of (reference period)/8. If the result of the calculation is less than dynamic dwell, then dynamic dwell remains unchanged.

3.2.2.2 Increased Engine Load Detected Acceleration

Dynamic Dwell is set to the maximum if LV8 increases by an amount greater than *KDWDLV8* in 25 Msec.

3.2.2.3 Maximum Dynamic Dwell

Dynamic dwell is limited for all operating conditions to a value not to exceed (Reference Period)/8.

3.2.2.4 Dynamic Dwell Recovery

The dynamic dwell parameter is exponentially decayed as shown in the expression below every 12.5 msec interval in which a new reference pulse occurs.

DD1 = DD0 - (DD0/8) -1 Limited to a minimum of 0

Where: DD1 = Present dynamic dwell

DD0 = Dynamic dwell from previous 12.5 msec interval calculation

-1 is to insure no permanent residue

3.2.3 Voltage Compensated Dwell

Dwell is increased as battery voltage decreases below 12V as shown in the following expression:

Dwell = Dwell + (12 - Battery Voltage) * 610 usec/Volt

3.2.4 Desired Dwell Limiting

Dwell is the summation of the battery voltage compensation, static and dynamic dwell terms. To insure sufficient burn time (coil discharge time), desired dwell is limited to a maximum on-time of (Reference Period) - 600 usec.

3.2.5 Increasing Spark Advance Limitation

The ECM software insures that ECU module calculations cannot truncate dwell due to an increase in spark advance. This is accomplished by limiting any increase in spark advance to (Reference Period)/16 at each spark advance calculation interval. Spark is calculated every 12.5 msec. No limiting is done in the increasing retard direction.

3.3 Main Spark Timing Calculation

The main spark timing advance calculation is the sum of the following:

Advance

+ Main Spark Advance
+ Air temperature correction
+ Coolant temperature correction
+ Park/Neutral spark advance
+ ALCL spark advance

Retard

- Air temperature correction bias
- Coolant temperature correction bias
- TCC locked spark retard
- 3/2 Downshift spark retard (see Section 9B)
- Burst knock retard
- Hot restart retard
- Time in power enrichment retard
- High VSS spark retard

If the sum of retard values for torque spark and shift spark (see Section 9B) is greater than the sum of above retard values, use the sum of torque spark and shift spark as the total spark retard to be used in the main spark calculation.

System spark advance is calculated relative to top dead center (TDC) but must be output relative to the EST reference signal. The difference between TDC and the reference signal is accounted for by subtracting the value *KREFANGL* from the spark timing advance calculated as outlined previously, before the spark timing is output.

Output Spark Advance (relative to the reference signal)
= System Spark Advance - (*KREFANGL*).

Lag correction is required to compensate for all mechanical and electronic time lags to which the reference signal and EST signal are subjected.

Lag correction is accomplished by adding *KTIMELAG* to the advance being output after it has been converted to the time domain. Lag correction is performed after all EST calculations including application of the maximum retard limit are complete but before the application of the maximum advance limit.

3.3.1 Main Spark Advance

Main spark advance is determined by the *F1C* Table as a function of LV8 and RPM.

3.3.2 Air Temperature Correction with Bias

A positive or negative air temperature correction is provided by Table *F4A* and its associated bias *KATSBIAS*. The *F4A* Table is a function of air temperature and LV8.

3.3.3 Coolant Temperature Correction with Bias

A positive or negative coolant temperature correction is provided by table *F2C* and its associated bias *KCTBIAS*. The *F2C* table is a function of coolant temperature and LV8.

3.3.4 Park/Neutral Spark Advance

A spark advance of *KPNSPK* is added to the spark computation when the system is in Park/Neutral.

3.3.5 ALCL Spark Advance

A spark advance of *KSAALDL* is added to the spark computation when the ALCL mode is active and vehicle speed equals zero.

3.3.6 TCC Locked Spark Retard

A spark retard of *F8C* will be applied when TCC is locked. The *F8C* table is a function of LV8.

3.3.7 Hot Restart Retard

A spark retard of *KSRHR* will be applied if the following conditions are met.

-Startup Coolant temperature greater than or equal to *KHRCTA*

-Engine running time less than *KISHRTIM*

3.3.8 Burst Knock Retard

A spark retard of *KBKRTD* will be applied for a time of *KBKRTIM* when all of the following conditions are satisfied:

-Positive Delta TPS in 12.5 Msec is greater than *KBKRTPS*

-Coolant Temperature greater than *KBKRCLT*

-Vehicle Speed less than or equal to *KBKRMPH*

-Not in ALCL Mode

3.3.9 Time In Power Enrichment Retard

Spark will be retarded as a function of TIME in power enrichment as defined in Table *F4PE*.

3.3.10 High VSS Spark Retard

To limit top vehicle speed, spark can be retarded as a function of VSS. The retard is calculated as follows:

High VSS Spark Retard = (MPH - *KVSSLMT*)(*KSRVSSHI*)

3.4 EST Advance/Retard Limits

Minimum and maximum advance angles acceptable by the distributor are defined by *KMAXRTD2* and *KMAXADV2*, respectively. These limits are relative to the distributor reference input to the ECM. Advance angles outside these units may result in ignition secondary voltage being applied to the wrong cylinder (crossfire).

These limits shall be defined by Delco Remy, the ignition system design responsible division, on their distributor outline drawing.

KMAXADV2 is applied after all advances and their biases have been summed but before ESC retard is subtracted. *KMAXRTD2* is applied after ESC retard is subtracted.

3.5 Initial Timing

Initial timing is defined as the spark timing in engine degrees referenced to top dead center with the EST system in the bypass mode. *KREFANGL* must be set to this initial timing value.

3.6 Engine Running Determination For Spark

The engine is considered running for spark when all of the following criteria are met:

- Ignition on
- Number of reference pulses received is greater than *KERUNCTR*
- Engine RPM is higher than *KRPMUP*

END OF SECTION 9A

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SECTION 9B

TORQUE MANAGEMENT SPARK

MY '88 SEQUENTIAL PFI FUNCTIONAL SPECIFICATION

Original Release - 2/13/87

** GM RESTRICTED **
Delco Electronics Corporation

1.0 SUBJECT

Torque Management Spark.

2.0 SCOPE

The torque management algorithm controls engine torque during upshifts (Shift Spark), 3-2 downshifts (3-2 Down Shift Spark) and periods of excessive torque (Peak Torque Spark) by subtracting the spark from the main spark calculation. All torque management calculations are done at a 12.5 msec rate.

3.0 SPECIFICATION

3.1 Drivetrain Parameters

The following engine and transmission dynamic operation parameters are used in torque management spark calculations.

3.1.1 Transmission Turbine RPM

Turbine RPM is defined as the RPM of the transmission input shaft and is calculated as follows:

Turbine RPM = PA4Delta * Gear Cal/TIME

Where:

PA4Delta = Number of Road speed pulses in the last 12.5 msec

Gear Cal = *K1STGR* - If in 1st Gear or P/N; *K2NDGR* - If in 2nd Gear; *K3RDGR* - If in 3rd Gear; *K4THGR* - If in 4th Gear

TIME = Time between road speed pulses.

3.1.2 Engine/Transmission Speed Ratio

Engine/Transmission Speed ratio is obtained by dividing Turbine RPM/Engine RPM.

3.1.3 Engine Torque

Engine Torque is calculated as follows:

Engine Torque = (DISPFLOW*REFPER) * (*KLVTQSCL*) * Efficiency - FRICTRQ

Where: DISFLOW = Air Flow in Grams/Sec

REFPER = Time between Reference Periods

KLVTQSCL = Scaler for Torque
EFFICIENCY = Engine Efficiency Scaler
FRICTRQ = Frictional Torque Losses

Note: If friction torque losses exceed engine torque, engine torque is set = 0

3.1.3.1 Engine Efficiency Scaler

The Engine Efficiency Scaler is defined as follows:

Engine Efficiency Scaler = (*F1EFFADJ*)(*F1EFFICB*) * 2

Where: *F1EFFICB* = Engine Efficiency vs A/F Ratio & RPM *F1EFFADJ* = Adjustment vs Air Temperature & Torque Load

Torque load is further defined as raw engine torque or

Torque Load = (DISPFLOW*REFPGR) * (*KLV8TQSCL*)

3.1.3.2 Frictional Torque Loss

Frictional Torque Loss is calculated as follows:

Frictional Torque Loss = (*F1FRCTRQ* + *KACESLD*) * (*KFR1SCAL*)

Where: *F1FRCTRQ* = Torque Loss as a function of Coolant Temperature and Engine RPM

KACESLD = Torque Loss applied when A/C Clutch is engaged

KFR1SCAL = Frictional Torque Loss Scaler

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3.1.5 Engine Performance Calculation

Engine performance is the first order lag filtered value of instantaneous engine torque with *K32COEF* as the filter coefficient and is calculated when the following conditions are met:

- Not in 3-2 downshift
- In 2nd gear
- Throttle position is greater than or equal to *KPRFTMIN*
- Engine RPM is greater than *KPRFEMIN*
- Engine RPM is less than *KPRFEMAX*

When above conditions are met, engine torque is filtered into engine performance as follows:

ENGPERF = OLDPERF + (ENGTRQ-OLDPERF)(*K32COEF*)

Where:

ENGPERF = New Value of Engine Performance

OLDPERF = Old Filtered Value of Engine Performance (Set to *KENGPERF* on Startup)

ENGTRQ = Unfiltered Value of Engine Torque

K32COEF = Filter coefficient

3.1.6 Excess Torque

Excess Torque is calculated as follows:

Excess Torque = (*FXXTMADJ*) + (*FXXCLADJ*)

Where:

FXXTMADF = *F12TMADF* for a 1-2 Upshift or F23TMADJ* for a 2-3 upshift. Excess torque as a function of time since start of shift. (Limited to .8 sec max.).

FXXCLADJ = *F12CLADJ* for a 1-2 upshift or *F23CLADJ* for a 2-3 upshift. Excess torque as a function or coolant.

3.2 Spark Calculations

3.2.1 Peak Torque Spark

Torque spark is the amount of spark reduction due to Excessive Engine Torque, (or retard) from the main spark advance. Torque spark is calculated when the following conditions are met:

- Not in Park/Neutral
- Shift spark or 3-2 downshift spark not active (i.e. No shifts occurring)
- Turbine Torque is greater than or equal to *KMAXTRQ*

Torque spark (retard) is derived from Table *F1TRQSPK* as a function of RPM & excess torque when the above conditions are met.

Torque spark is set to zero if in park/Neutral or transmission turbine torque is less than *KMAXTRQ*.

3.2.2 Shift Spark

Shift spark is performed when a 1-2 or 2-3 upshift occurs. The spark value is calculated as follows:

Shift Spark = (*F1TRQSPK*)(*FXXSHAP*)

Where: *F1TRQSPK* = Base Shift Spark as a function of RPM & Excess Torque

FXXSHAP = *FXXSHAP for a 1-2 Upshift or *F23SHAP for a 2-3 Upshift Shaper as a function of % Shift complete.

% Shift complete is defined as:

Current Shift Time/Appropriate Learned Shift Time.

3.2.2.1 Current Shift Time For Upshifts

current shift time for upshifts indicates the time elapsed since all the following criteria have been met:

- A 1-2 or 2-3 shift is indicated by the gear switches

- Peak Engine RPM experienced during a shift since key on is greater than present engine RPM by at least *KXXDELTA*

- Engine Torque is greater than *KXXSHTRQ* current shift time will then be set to zero under any of the following conditions:

  1. Throttle position is less than or equal to *KXXQUIT*

  2. Current shift time is greater than *KXXTSOON* and present engine RPM + (*KXXBIAS*) is greater than the 12.5 msec old engine RPM for more than *KXXACNT*/80 seconds.

  3. Current shift time is less than or equal to *KXXTSOON* and greater than *KXXTLATE*

  4. Current shift time is greater than *KXXTSOON and *KXXTLATE*. The present engine RPM + (*KXXBIAS*) is greater than the 12.5 msec old engine RPM for less than or equal to *KXXACNT*/80 seconds.

Note: XX = 12 for 1-2 upshift, 23 for 2-3 upshift.

3.2.2.2 Learned Shift Time

Learned Shift Time represents the total time to complete an upshift as 'Learned' in the previous upshift. Learning will be enabled when both the following conditions are met

- A 1-2 or 2-3 upshift has occurred, and

- Criteria 2, 3, 4 from 3.2.2.1 are present

Learned shift time is calculated (before current shifttime is zeroed) as follows:

Learned Shifttime = OLDLEARN + (CURSHFT - OLDLEARN)(*KXXCOEF*)

Where: OLDLEARN = Previous Learned Shift Time

CURSHFT = Current Shift Time

KXXCOAF = *K12COEF* if a 1-2 shift, *K23COEF* if 2-3 shift. Filter coefficient.

There are separate learned shift times for 1-2 and 2-3 upshifts, both residing in nonvolatile memory.

3.2.3 3-2 Downshift Spark

3-2 Downshift Spark is performed when a 3-2 downshift occurs and all the following conditions are present:

- Throttle Position greater than *K23TPSLM*
- Engine RPM increase in the last 12.5 msec is greater than a value from table *F32DELTA* as a function of MPH.

Once enabled, 3-2 downshift spark will be disabled, and 3-2 downshift spark (retard) set to zero if either of the following conditions is present:

- Throttle position less than or equal to *K32TPSLM*
- Current shift time greater than a value from table *F32SHFTM* as a function of MPH.

3.2.3.1 3-2 Downshift spark Calculation

3-2 Downshift Spark is calculated as follows:

3-2 Downshift Spark = [((ENGRPM - OLENGRPM)*GAIN) - (*F32RFSLP*)] * (*F32SHAP*)

Where: ENGRPM = Current Engine RPM

OLENGRPM = 12.5 msec Old Engine RPM

GAIN = *K32GAINH* if MPH is greater than *KGAINSPD* else use *K32GAINL*

F32RFSLP = Target RPM increase in the next 12.5 msec as a function of MPH & TPS

F32SHAP = Spark shaper as a function of percent shift complete

Percent Shift Complete is defined as:

Current Shift Time/*F32SHFTM*

Where: *F32SHFTM* = Expected Shift Time as a function of MPH.

3.2.3.1.1 Current Shift Time For 3-2 Downshifts

Current shift time for 3-2 downshifts indicates the time elapsed since the following criteria are met:

- A 3-2 downshift is indicated by the gear switches
- Throttle position greater than *K32TPSLM*
- Engine RPM increase in the last 12.5 msec is greater than a value from table *F32DELTA* as a function of MPH.

The current shift time will then be set to 0 if either of the following conditions is present.

- Throttle position is less than or equal to *K32TPSLM*
- Current shift time exceeds *F32SHFTM* as a function of MPH

END OF SECTION 9B

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SECTION 10

VEHICLE ANTI-THEFT SYSTEM (V.A.T.S.)

Original Release - 02/13/87

** GM RESTRICTED **
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1.0 Subject

Vehicle Anti-Theft System (V.A.T.S.).

2.0 Scope

The ECM plays an integral part in the Vehicle-Anti-Theft system. A resistor located in the ignition key completes a pulse generator circuit when inserted into the ignition switch. The resultant pulses are fed into the ECM, which will shut off fuel if the frequency of the pulses is outside a calibratable window.

3.0 Specification

3.1 V.A.T.S. Disable Of Fuel Delivery

The V.A.T.S. algorithm will set the asynchronous and synchronous fuel registers to zero when all of the following conditions are met:

- *KOPTVATS* greater than 0 (V.A.T.S. enabled).
- Number of V.A.T.S. pulses in the last 100 msec is less than *KK58EDGH*.
- Number of V.A.T.S. pulses in the last 100 msec is greater than *KK58EDGL*.
- MALF 58 is not set.
- Above criteria met greater than *KK58CTR* times.
- The criteria to enable fuel delivery has not been met since ignition on.

3.2 V.A.T.S. Enable Of Fuel Delivery

The V.A.T.S. algorithm will not effect delivery of fuel if any of the following conditions are met:

- *KOPTVATS* = 0
- For two consecutive times, the number of V.A.T.S. pulses in the last 100 msec falls within the window defined by lower boundary *KK58EDGL* and upper boundary *KK58EDGH*.
- Malf 58 is present.
- The V.A.T.S. counter is less than or equal to *KK58CTR*.

END OF SECTION 10

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SECTION 11

FAN CONTROL

Original Release - 2/13/87

** GM RESTRICTED **
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1.0 SUBJECT

Fan Control

2.0 SCOPE

This specification details the operational characteristics and control algorithm for the Fan Control functions.

3.0 SPECIFICATION

3.1 Criteria To Energize Fan #1 Relay

The fan will be energized with a 100% duty cycle if the engine is running and any of the following criteria are satisfied.

- Malf 14 or 15 indicated this start-up
- Coolant temperature is greater than *KFANTMPH*
- Vehicle speed is less than *KFANMPH* and either coolant temperature is greater than *KFANTMP* or air temperature is greater than *KFANATSH* and A/C is active.

3.2 Criteria To Deenergize Fan #1 Relay

Once the Fan #1 Relay is energized it will not be deenergized until one of the following conditions are met.

- Vehicle Speed is greater than *KKANMPHH* and Fan #2 is off
- Air temperature is less than or equal to *KFANATSL*
- A/C is off

3.3 Criteria To Energize Fan #2 Relay

The fan will be energized with a 100% duty cycle if the engine is running and any of the following conditions are met.

- Malf 14 or 15 is indicated this start-up

- Coolant temperature is greater than *KFN2TMPH*

3.4 Criteria To Deenergize Fan #2 Relay

Once the fan is energized it will not be deenergized until one of the following conditions are met.

- Coolant temperature is less than or equal to *KFN2MPL*

END OF SECTION 11

SECTION 12

TORQUE CONVERTER CLUTCH CONTROL

Original Release - 02/13/87

** GM RESTRICTED **
Delco Electronics Corporation

1.0 Subject

Torque Converter Clutch Control

2.0 Introduction

The purpose of the automatic transmission torque converter clutch feature is to eliminate the power loss of the torque converter stage when the vehicle is in a cruise condition, which allows the convenience of the automatic transmission and the fuel economy of a manual transmission. The heart of the system is a solenoid located inside the automatic transmission which is controlled by the ECM.

This solenoid is configured mechanically such that when the coil is activated (on) the torque converter clutch is applied which results in straight through mechanical coupling from the engine to transmission output. When the transmission solenoid is deactivated, the torque converter clutch is released which allows the torque converter to operate in the conventional manner (fluidic coupling between engine and transmission).

3.0 Specification

The TCC solenoid is actuated (clutch applied) by up to three separate control devices in series. These devices consist of:

1. Vehicle Brake Switch

2. Electronic Driver in ECM

3. Applied Gear Switch (Optional)

The balance of this specification shall deal with the control algorithm relating to the ECM. For purposes of discussion the action of the ECM shall be described. The reader should recognize that the brake switch must be closed (brakes not applied) and the applied gear switch closed for the TCC solenoid to be activated.

Under certain conditions, the TCC solenoid driver is controlled independently of the pertinent control algorithm. These conditions involve high battery voltage, engine not running, diagnostic mode selection, and reset.

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3.1 Criteria to Deenergize the TCC Solenoid

The TCC solenoid will be de-energized if RPM is less than *KRPMXUL* and any of the following unlock criteria are met.

-Coolant Temperature less than *KTCCTMP*

-Coast unlock as described below

-Delta Throttle position unlock as described below

-Cruise unlock as described below

-High Load unlock as described below when not in cruise

-Gear shift unlock as described below

-Vehicle Speed unlock as described below

3.1.1 Coast Release Unlock Criteria

The TCC solenoid will be de-energized by coast release function if one of the following conditions are met:

1. Throttle position is less than or equal to one of the following values:

   - *KCOATSUM* (TCC unlocked and in mid gear)

   - *KCOASTUH* (TCC unlocked and in high gear)

2. Throttle position is less than or equal to one of the following values:

   - *KCOASTLM* (TCC locked and in mid gear)

   - *KCOASTLH* (TCC locked and in high gear)

And time between coast release is greater than *KCTINC*

NOTE: If time between coast release is less than or equal to *KCTINC*, the next TCC lockup will be delayed by *KCSTDLY*.

3.1.2 Delta Throttle Position Unlock

3.1.2.1 Positive Delta Throttle Position Unlock

The TCC solenoid will be de-energized if Delta TPS in 100 msec is positive and the following conditions are met:

1. Delta Throttle Position is greater than one of the following values:

   - *KRELUNMD* (TCC unlocked and in mid gear)
   - *KRELUNHI* (TCC unlocked and in mid gear)
   - *KRELLKMD* (TCC locked and in mid gear)
   - *KRELLKHI* (TCC locked and in high gear)

3.1.2.2 Negative Delta Throttle Position Unlock

The TCC solenoid will be de-energized if Delta TPS in 100 Msec is negative and greater than *KREL1*.

3.1.3 Cruise Unlock Criteria

The TCC solenoid will be de-energized if in cruise and throttle position is greater than one of the following values for the conditions indicated.

-*KTCTPSUM* (TCC unlocked and in mid gear)

-*KTCTPSUH* (TCC unlocked and in high gear)

-*KTCTPSLM* (TCC locked and in mid gear)

-*KTCTPSLH* (TCC locked and in high gear)

3.1.4 High Load Unlock Criteria

The TCC Solenoid will be de-energized if not in cruise and throttle position is greater than a value from one of the following tables for the conditions indicated.

-*F43L1* (TCC unlocked and in mid gear)

-*F44L1* (TCC unlocked and in high gear)

-*F43U1* (TCC locked and in mid gear)

-*F44U1* (TCC locked and in high gear)

3.1.5 Gear Shift Unlock Criteria

The TCC solenoid will be de-energized for a period of time specified by Table *F432GRA* as a function of which gear shift when not in the diagnostic mode.

3.1.6 Vehicle Speed Unlock Criteria

The TCC solenoid will be de-energized if vehicle speed is less than or equal to one of the following:

-*KMNLCKM* (TCC unlocked in mid gear)

-*KMNLCKH* (TCC unlocked in high gear)

-*KMNULCKM* (TCC locked in mid gear)

-*KMNULCKH* (TCC locked in high gear)

3.2 Criteria to Energize the TCC Solenoid

The TCC Solenoid will be energized (TCC locked) if all of the following criteria are satisfied.

-None of the unlock criteria met

-TCC lock delay timer expired

The TCC solenoid will also be energized when not in cruise if throttle position remains in the hysteresis area (throttle position less than *F43U1* - mid gear or less than *F44U1* - high gear) for a time greater than *KTCHTMR*.

3.3 Lock Delay Time

The TCC solenoid will be energized after all enabling criteria have been met for a lock delay time of *KLCKDLYT*. A delay time of *KPDLY* will be used if a positive delta TPS unlock just occurred.

3.4 Engine Speed Release Prevent Criteria

The TCC solenoid will remain energized while RPM is greater than *KRPMXUL*. It will be allowed to deenergize when RPM is less than or equal *KRPMXUL*.

END OF SECTION 12

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SECTION 13

ELECTRONIC SPARK CONTROL (ESC)

Original Release - 02/13/87

1.0 Subject

Electronic Spark Control (ESC)

2.0 Introduction

Electronic Spark control is a system applied to automotive engines where undesirable fuel detonation may occur with advanced spark calculations. The ESC system provides a retard function to spark when fuel detonation conditions are detected by a mechanical vibration sensitive sensor mounted on the engine.

The spark retard magnitude is proportional to a time interval of the detonation conditions. The spark retard is removed in an exponentially decaying manner so that when the detonation condition ceases, the retard is reduced to zero.

2.1 ESC/ECM System Description

The electronic spark control function is added to the electronic spark timing control by means of installing the ESC hybrid into the ECM MEMCAL assembly. The signal derived from the detonation sensor is processed by an analog signal to noise enhancement filter (SNEF). The processed signal is supplied to a detonation counter in the ECM as an indication of the presence of detonation. The output of the SNEF is a logic "low" level when detonation is detected

Retard is applied based on the amount of time knock is detected and is limited to a maximum value.

Retard recovery removes a portion of the retard every 200 msec based on previously calculated ESC retard.

3.0 Specification

3.1 ESC Enable Criteria

ESC is enabled if all the following conditions are met.

-Engine running for time greater than or equal to *KESCTIM*

-Coolant temperature greater than or equal to *KESCOOLA*

-RPM greater than or equal to *KRPMKNOB*

-Battery voltage greater than or equal to 9.3 volts

-ESC fail flag (MALF code 43) not set

-I2U not requesting absolute spark slew

3.2 ESC Retard Function

ESC retard is applied to the EST signal proportional to the number of delta counts accrued by the detonation counter. The detonation counter is examined once every 12.5 msec and a delta count is calculated. The amount of retard is determined in accordance with the following expression:

Retard = Old Retard + (Delta Time * Attack Rate)

The Attack Rate is given by *F6* as a function of RPM.

3.3 Retard Recovery

An EST/ESC system is calibrated in a manner to optimize spark advance for fuel economy and emissions. Retard is applied to these calibrations when detonation is detected due to operation conditions not fully controlled by the calibration tables. Since fuel economy and emissions are not optimized in the ESC retarded condition, retard must be removed as quickly as possible to return to optimum operating conditions.

Every 200 milliseconds, the ECM will perform the "remove retard" computation. The calculation to remove retard is performed as follows:

Retard (NEW)= Retard (Old) (1- Recovery Rate)

The retard recovery rate is given by *F7* as a function of RPM.

3.4 Maximum ESC Retard

ESC retard is limited to one of the following maximum values for the conditions indicated.

-*KRETARDM* (not in power enrichment)

-*KRETMAX* (in power enrichment)

3.5 ESC Default Retard

A default retard of *KKRTDF* is applied if either of the following conditions are met.

-ESC failure currently being detected (MALF code 43)

-Battery voltage less than 9.3 volts

END OF SECTION 13

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SECTION 14

EXHAUST GAS RECIRCULATION (EGR)

Original Release - 02/13/87

** GM RESTRICTED **
Delco Electronics Corporation

1.0 SUBJECT

Exhaust Gas Recirculation (EGR)

2.0 SCOPE

The exhaust gas recirculation system provides means to direct exhaust gases from the exhaust manifold to the intake manifold to improve emissions.

3.0 SPECIFICATION

EGR is regulated either by pulse width modulation or digital EGR. If digital EGR is selected, three digital EGR solenoids shall be energized according to the calculated EGR duty cycle. Digital EGR provides an EGR system which is less sensitive to changes in atmospheric pressure and vacuum levels.

3.1 EGR Disable Criteria

The EGR duty cycle will be set to 0% (EGR disabled) if any of the following criteria are satisfied.

- Start-up coolant temperature less than *KEGRCOOL* and current coolant temperature less than or equal to *KEGRWARM*
- Disable time is greater than or equal to engine run time
- In park/neutral and not in ALCL
- Power enrichment mode enabled and LV8 greater than *KLV8EGRH* if EGR duty cycle is currently not equal to zero.
- Power enrichment mode enabled and LV8 greater than *KLV8EGRL* if EGR duty cycle is currently equal to zero
- TPS less than or equal to *KEGRLTPS* if EGR duty cycle is currently not equal to zero
- TPS less than or equal to *KEGRHTPS* if EGR duty cycle is currently equal to zero

EGR will be enabled if none of the disable criteria are met.

3.2 Altitude Enable Criteria

High altitude will be enabled when the following conditions are satisfied.

1. Malfunction Codes 21, 22, or 34 are not detected
2. In closed loop
3. RPM is greater than or equal to *KALTRPML*
4. RPM is less than or equal to *KALTRPMH*
5. LV8 is greater than or equal to *KALTLV8L*
6. LV8 is less than or equal to *KALTV8H*
7. Throttle position is greater than altitude threshold from the *F74ALT* Table
8. The above conditions have been present for time greater than *KALTTIM*.

The Altitude Bit is clear if Malfunction Codes 21, 22, or 34 are detected or throttle position is less than (F74ALT threshold value minus the hysteresis value *KTPSHYST*).

Altitude is disabled if one or more of conditions 2 thru 6 are not met or throttle position is greater than or equal to (altitude threshold from the *F74ALT* table minus hysteresis value, *KTPSHYST*).

3.3 EGR Duty Cycle Calculation

When EGR is enabled the EGR duty cycle is determined as shown below for the conditions indicated:

3.3.1 Digital EGR

- EGRDC = (*F76A*)(*77B*), - TCC unlocked or TCC locked in first or second gear
- EGRDC = (*76A*)(*77B*)(*78A1*), - TCC locked in 4th gear
- EGRDC = (*76A*)(*77B*)(*78B*), - TCC locked in 3rd gear

3.3.2 Pulse Width Modulation EGR

- EGRDC = (*F76A*)(*F77B*), - TCC unlock
- EGRDC = (*F76A3*)(*F77B*), - TCC locked and in 3rd gear
- EGRDC = (*F76A4*)(*F77B*), - TCC locked and in 4th gear

EGRDC is multiplied by *F74EGR* (high altitude condition is present).

If low mileage is indicated, *KEGRBIAS* will be subtracted from EGRDC.

The intermediate results of this equation are limited to 100% following the *F77B* multiplication and the *F78A* multiplication.

Where:

F76A = EGR Base Duty Cycle versus LV8

F77B = EGR Duty Cycle Multiplier (0-2) versus coolant temperature

F78A = EGR Duty Cycle Multiplier (0-2), if TCC is locked in 4th gear versus LV8

F78B = EGR Duty Cycle Multiplier (0-2), if TCC locked in 3rd gear

F76A3 = EGR Duty Cycle Multiplier (0-2), if TCC locked in 3rd gear

F76A4 = EGR Duty Cycle Multiplier (0-2), if TCC locked in 4th gear

3.4 Digital EGR

If digital EGR is selected (KFAOPT2 Bit 7), the three EGR solenoids shall be energized according to the calculated EGR Duty cycle as shown in the table below.

EGR Duty Cycle	Mode	Large Solenoid	Medium Solenoid	Small Solenoid
0-12.5%	0	OFF	OFF	OFF
12.5-25%	1	OFF	OFF	ON
25-37.5%	2	OFF	ON	OFF
37.5-50%	3	OFF	ON	ON
50-62.5%	4	ON	OFF	OFF
62.5-75%	5	ON	OFF	ON
75-87.5%	6	ON	ON	OFF
87.5-100%	7	ON	ON	ON

If digital EGR is not selected, EGR shall be performed by Pulse Width modulation.

END OF SECTION 14

** GM RESTRICTED **
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SECTION 15

AIR CONDITIONER CLUTCH CONTROL

Original Release - 02/13/87

** GM RESTRICTED **
Delco Electronics Corporation

1.0 SUBJECT

Air Conditioner Clutch Control

2.0 SCOPE

The air conditioner clutch control algorithm inhibits air conditioner operation under certain engine operating conditions to prevent stalls.

3.0 SPECIFICATION

3.1 Criteria to Energize the Air Conditioner Clutch Relay

The air conditioner clutch relay will be energized (A/C enabled) if all the following conditions are met.

- Engine run time is greater than KACENGON*.

- Coolant temperature is less than or equal to *KACOFFHL*

- Initial start-up delay is not active.

- A/C requested.

- Minimum motor position is learned.

- TPS less than or equal to:

  -- *KPIDACDT* (A/C currently on)
  -- *KPIDACDT*-16 (A/C currently off)

- Vehicle speed is less than or equal to *KPIDACTR*.

- All of the above conditions met for a time greater than *KPIDACTR*.

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3.2 Criteria to De-energize the Air Conditioner Clutch Relay

The air conditioner clutch relay will be de-energized (A/C disabled) if any of the energize criteria are not met or any of the following criteria are met.

- IAC Motor reset in progress
- IAC start-up delay active
- IAC transition delay and A/C timer is active
- Engine Run time is less than or equal to *KACENCN*
- Throttle position is greater *KPIDACDT*
- Coolant temperature is greater *KACOFFH* (A/C is active) or *KACOFFL* (A/C is not active)
- Minimum Motor position has not been learned and the following conditions are met:
  - o Vehicle speed is equal to zero
  - o Throttle position is less than *KISTATH*
  - o Coolant temperature is greater than *KACMINCL*
  - o Engine Run time is greater than *KACMINTM*
  - o In Drive
  - o A/C requested
  - o Vehicle speed has been greater than *KACMINVS* since last time A/C forced off
  - o Once the A/C clutch is de-energized due to the above 8 criteria, it will not be re-energized until the minimum motor position is learned or these criteria have disabled A/C for a time *KACMIMLR*

END OF SECTION 15

** GM RESTRICTED **
Delco Electronics Corporation

SECTION 16

ENGINE HOT LIGHT

Original Release - 02/13/87

** GM RESTRICTED **
Delco Electronics Corporation

1.0 SUBJECT

ECM control of engine hot light.

2.0 SCOPE

The ECM is able to control the engine hot light with better accuracy and more cost effective than a mechanical switch. The following section describes the control algorithm.

NOTE: In GM-30/33 vehicles, the BCM controls the engine hot light.

3.0 SPECIFICATION

3.1 Light On

The hot light will be turned on under any the following conditions:

- Ignition on, engine not running (see 3.6, Section 9)
- Engine running and coolant above *KHOTLHI*, or *KHOTLLO* once the light has been turned on

All other conditions result in the light turned off.

NOTE: If ECM is in backup the light is forced off regardless of above criteria.

END OF SECTION 16

Delco Electronics Corporation

SECTION 17

CALIBRATION FORM SUMMARY

Original Release - 02/13/87

```
*+DATA     ++BLOCK ID++ P0588EXZ01:8000:
           NAM ::P0588EXZ01
           OPT GMP4
*::EQUATES
ACNTDEL   EQU       $127
ACUMDIST  EQU       $1E3
ACUMFUEL  EQU       $1E1
ADBAT     EQU       $68
ADO2AF    EQU       $90
ADTHROT   EQU       $95
ALCLMWF   EQU       $7B
ALSOICB   EQU       $1A6
ATSDEG    EQU       $8F
BIT0      EQU       $1
BIT1      EQU       $2
BIT2      EQU       $4
BIT3      EQU       $8
BIT4      EQU       $10
BIT6      EQU       $40
BLM       EQU       $A3
BLMCELL   EQU       $A2
BPW       EQU       $A5
CALDATA   EQU       $8000
COOLDEG   EQU       $88
COOLDEGA  EQU       $8B
COOLTSU   EQU       $8D
CORRCL    EQU       $AA
CURMALFA  EQU       $2A
CURMALF1  EQU       $21
CURMALF2  EQU       $22
CURMALF3  EQU       $23
CURMALF4  EQU       $24
CURMALF5  EQU       $25
CURMALF6  EQU       $26
CURMALF7  EQU       $27
CURMALF8  EQU       $28
CURMALF9  EQU       $29
DISPFLOW  EQU       $D4
EGRDC     EQU       $F0
FAVAL     EQU       $B3
FILTMPH   EQU       $BA
FMDBYTE1  EQU       $6E
FMDBYTE2  EQU       $6F
ISESDD    EQU       $E2
ISSPMP    EQU       $59
LCCPMW    EQU       $78
LV8       EQU       $B7
MALFFLGA  EQU       $1D
MALFFLG1  EQU       $14
MALFFLG2  EQU       $15
MALFFLG3  EQU       $16
MALFFLG4  EQU       $17
MALFFLG5  EQU       $18
MALFFLG6  EQU       $19
MALFFLG7  EQU       $1A
MALFFLG8  EQU       $1B
MALFFLG9  EQU       $1C
MCUINST   EQU       $77
MWFA      EQU       $82
```

```
MWFA1    EQU      $83
MW1      EQU      $74
MW2      EQU      $75
NEWRFPER EQU      $C4
NOCKRTD  EQU      $D0
NTRPMX   EQU      $9C
OLDPA3   EQU      $243
PIDMW1   EQU      $DC
PIDMW2   EQU      $DD
PURGEDC  EQU      $10A
RPLSCNTR EQU      $35
RPM2BYT  EQU      $1F6
SAP      EQU      $239
SC1SDI   EQU      $6C
SDALDLIC EQU      $1D2
SDVICB   EQU      $184
SDVOCB   EQU      $1C8
TESTBYTE EQU      $29D
TIME     EQU      $36
*::END OF EQUATES
*********************
*  CALIBRATION DATA  *
*********************

         ORG      CALDATA  CALDATA

* -------------------------------------------------------------------
PROMIDA  FDB           0 (          ) :0000: '      ' DOUBLE BYTE PROM ID
*-                       :            ::EQU N=E ::
*-                       :            ::PROTECT ::
* -------------------------------------------------------------------
DATECODE FDB       $FFFF (          ) :0002: '      ' DOUBLE BYTE DATE CODE
*-                       :            ::EQU N=E ::
* -------------------------------------------------------------------
SEQNUMB  FDB       $FFFF (          ) :0004: '      ' DOUBLE BYTE SEQUENCE
*-                       :                   NUMBER
*-                       :            ::EQU N=E ::
*-                       :            ::NOPROTECT ::

* -------------------------------------------------------------------
KKSUM    FDB       $0000 (          ) :0006: 'CKSUM ' NOT USED
*-                       :            ::EQU N=E::
*-                       :            ::PROTECT ::
* -------------------------------------------------------------------
KPROMROM FCB         $5B (          ) :0008: '      ' NOT USED
*-                       :            ::EQU N=E ::
*-                       :            ::NOPROTECT ::
*+DATAEST ++BLOCK ID++

*******************************
*  EST PARAMETERS AND TABLES  *
*******************************
         ORG      CALDATA+9

*#############################################
*     F1 TABLE       SAMAIN                  #
*     MAIN SPARK ADVANCE VS. LOAD AND NTRPMP #
*#############################################
```

```
*-                            :          ::TBL3D,17,15,TBL1,1,TBL411,3,1,'DEG'
*-                            :                      ::
*-                            :          ::PROTECT ::
* ------------------------------------------------------------------------
F1C     FCB          0 (              )*:0009: '        ' R MIN;  R = NTRPM
*-                            :          ::EQU N=E ::
* ------------------------------------------------------------------------
        FCB         32 (              ) :000A: '        ' Q MIN;  Q = LOAD (LV8)
*-                            :          ::EQU N=E ::
* ------------------------------------------------------------------------
        FCB         15 (              ) :000B: '        ' R NUM
*-                            :          ::EQU N=E ::
*-                            :          ::NOPROTECT ::
* ------------------------------------------------ SPEED         400 RPM   Yes
        FCB          0 (              ) :000C: 'DEG    '     32       N-LOAD
*-                            :          ::EQU N=E*256/90 ::
        FCB          0 (              ) :000D: 'DEG    '     48
        FCB          0 (              ) :000E: 'DEG    '     64
        FCB          0 (              ) :000F: 'DEG    '     80
        FCB          0 (              ) :0010: 'DEG    '     96
        FCB          0 (              ) :0011: 'DEG    '    112
        FCB          0 (              ) :0012: 'DEG    '    128
        FCB          0 (              ) :0013: 'DEG    '    144
        FCB          0 (              ) :0014: 'DEG    '    160
        FCB          0 (              ) :0015: 'DEG    '    176
        FCB          0 (              ) :0016: 'DEG    '    192
        FCB          0 (              ) :0017: 'DEG    '    208
        FCB          0 (              ) :0018: 'DEG    '    224
        FCB          0 (              ) :0019: 'DEG    '    240
        FCB          0 (              ) :001A: 'DEG    '    256


* ------------------------------------------------ SPEED         600 RPM
        FCB          0 (              ) :001B: 'DEG    '     32       N-LOAD
        FCB          0 (              ) :001C: 'DEG    '     48
        FCB          0 (              ) :001D: 'DEG    '     64
        FCB          0 (              ) :001E: 'DEG    '     80
        FCB          0 (              ) :001F: 'DEG    '     96
        FCB          0 (              ) :0020: 'DEG    '    112
        FCB          0 (              ) :0021: 'DEG    '    128
        FCB          0 (              ) :0022: 'DEG    '    144
        FCB          0 (              ) :0023: 'DEG    '    160
        FCB          0 (              ) :0024: 'DEG    '    176
        FCB          0 (              ) :0025: 'DEG    '    192
        FCB          0 (              ) :0026: 'DEG    '    208
        FCB          0 (              ) :0027: 'DEG    '    224
        FCB          0 (              ) :0028: 'DEG    '    240
        FCB          0 (              ) :0029: 'DEG    '    256


* ------------------------------------------------ SPEED         800 RPM
        FCB          0 (              ) :002A: 'DEG    '     32       N-LOAD
        FCB          0 (              ) :002B: 'DEG    '     48
        FCB          0 (              ) :002C: 'DEG    '     64
        FCB          0 (              ) :002D: 'DEG    '     80
        FCB          0 (              ) :002E: 'DEG    '     96
        FCB          0 (              ) :002F: 'DEG    '    112
```

```
         FCB          0 (           ) :0030: 'DEG   '    128
         FCB          0 (           ) :0031: 'DEG   '    144
         FCB          0 (           ) :0032: 'DEG   '    160
         FCB          0 (           ) :0033: 'DEG   '    176
         FCB          0 (           ) :0034: 'DEG   '    192
         FCB          0 (           ) :0035: 'DEG   '    208
         FCB          0 (           ) :0036: 'DEG   '    224
         FCB          0 (           ) :0037: 'DEG   '    240
         FCB          0 (           ) :0038: 'DEG   '    256

* ---------------------------------------- SPEED           1000 RPM
         FCB          0 (           ) :0039: 'DEG   '     32    N-LOAD
         FCB          0 (           ) :003A: 'DEG   '     48
         FCB          0 (           ) :003B: 'DEG   '     64
         FCB          0 (           ) :003C: 'DEG   '     80
         FCB          0 (           ) :003D: 'DEG   '     96
         FCB          0 (           ) :003E: 'DEG   '    112
         FCB          0 (           ) :003F: 'DEG   '    128
         FCB          0 (           ) :0040: 'DEG   '    144
         FCB          0 (           ) :0041: 'DEG   '    160
         FCB          0 (           ) :0042: 'DEG   '    176
         FCB          0 (           ) :0043: 'DEG   '    192
         FCB          0 (           ) :0044: 'DEG   '    208
         FCB          0 (           ) :0045: 'DEG   '    224
         FCB          0 (           ) :0046: 'DEG   '    240
         FCB          0 (           ) :0047: 'DEG   '    256

* ---------------------------------------- SPEED           1200 RPM
         FCB          0 (           ) :0048: 'DEG   '     32    N-LOAD
         FCB          0 (           ) :0049: 'DEG   '     48
         FCB          0 (           ) :004A: 'DEG   '     64
         FCB          0 (           ) :004B: 'DEG   '     80
         FCB          0 (           ) :004C: 'DEG   '     96
         FCB          0 (           ) :004D: 'DEG   '    112
         FCB          0 (           ) :004E: 'DEG   '    128
         FCB          0 (           ) :004F: 'DEG   '    144
         FCB          0 (           ) :0050: 'DEG   '    160
         FCB          0 (           ) :0051: 'DEG   '    176
         FCB          0 (           ) :0052: 'DEG   '    192
         FCB          0 (           ) :0053: 'DEG   '    208
         FCB          0 (           ) :0054: 'DEG   '    224
         FCB          0 (           ) :0055: 'DEG   '    240
         FCB          0 (           ) :0056: 'DEG   '    256

* ---------------------------------------- SPEED           1400 RPM
         FCB          0 (           ) :0057: 'DEG   '     32    N-LOAD
         FCB          0 (           ) :0058: 'DEG   '     48
         FCB          0 (           ) :0059: 'DEG   '     64
         FCB          0 (           ) :005A: 'DEG   '     80
         FCB          0 (           ) :005B: 'DEG   '     96
         FCB          0 (           ) :005C: 'DEG   '    112
         FCB          0 (           ) :005D: 'DEG   '    128
         FCB          0 (           ) :005E: 'DEG   '    144
         FCB          0 (           ) :005F: 'DEG   '    160
         FCB          0 (           ) :0060: 'DEG   '    176
         FCB          0 (           ) :0061: 'DEG   '    192
```

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          FCB          0 (            ) :0062: 'DEG   '   208
          FCB          0 (            ) :0063: 'DEG   '   224
          FCB          0 (            ) :0064: 'DEG   '   240
          FCB          0 (            ) :0065: 'DEG   '   256

* -------------------------------------------- SPEED         1600 RPM
          FCB          0 (            ) :0066: 'DEG   '    32    N-LOAD
          FCB          0 (            ) :0067: 'DEG   '    48
          FCB          0 (            ) :0068: 'DEG   '    64
          FCB          0 (            ) :0069: 'DEG   '    80
          FCB          0 (            ) :006A: 'DEG   '    96
          FCB          0 (            ) :006B: 'DEG   '   112
          FCB          0 (            ) :006C: 'DEG   '   128
          FCB          0 (            ) :006D: 'DEG   '   144
          FCB          0 (            ) :006E: 'DEG   '   160
          FCB          0 (            ) :006F: 'DEG   '   176
          FCB          0 (            ) :0070: 'DEG   '   192
          FCB          0 (            ) :0071: 'DEG   '   208
          FCB          0 (            ) :0072: 'DEG   '   224
          FCB          0 (            ) :0073: 'DEG   '   240
          FCB          0 (            ) :0074: 'DEG   '   256

* -------------------------------------------- SPEED         1800 RPM
          FCB          0 (            ) :0075: 'DEG   '    32    N-LOAD
          FCB          0 (            ) :0076: 'DEG   '    48
          FCB          0 (            ) :0077: 'DEG   '    64
          FCB          0 (            ) :0078: 'DEG   '    80
          FCB          0 (            ) :0079: 'DEG   '    96
          FCB          0 (            ) :007A: 'DEG   '   112
          FCB          0 (            ) :007B: 'DEG   '   128
          FCB          0 (            ) :007C: 'DEG   '   144
          FCB          0 (            ) :007D: 'DEG   '   160
          FCB          0 (            ) :007E: 'DEG   '   176
          FCB          0 (            ) :007F: 'DEG   '   192
          FCB          0 (            ) :0080: 'DEG   '   208
          FCB          0 (            ) :0081: 'DEG   '   224
          FCB          0 (            ) :0082: 'DEG   '   240
          FCB          0 (            ) :0083: 'DEG   '   256

* -------------------------------------------- SPEED         2000 RPM
          FCB          0 (            ) :0084: 'DEG   '    32    N-LOAD
          FCB          0 (            ) :0085: 'DEG   '    48
          FCB          0 (            ) :0086: 'DEG   '    64
          FCB          0 (            ) :0087: 'DEG   '    80
          FCB          0 (            ) :0088: 'DEG   '    96
          FCB          0 (            ) :0089: 'DEG   '   112
          FCB          0 (            ) :008A: 'DEG   '   128
          FCB          0 (            ) :008B: 'DEG   '   144
          FCB          0 (            ) :008C: 'DEG   '   160
          FCB          0 (            ) :008D: 'DEG   '   176
          FCB          0 (            ) :008E: 'DEG   '   192
          FCB          0 (            ) :008F: 'DEG   '   208
          FCB          0 (            ) :0090: 'DEG   '   224
          FCB          0 (            ) :0091: 'DEG   '   240
          FCB          0 (            ) :0092: 'DEG   '   256
```

```
* ------------------------------------------- SPEED      2200 RPM
       FCB       0 (          ) :0093: 'DEG   '    32     N-LOAD
       FCB       0 (          ) :0094: 'DEG   '    48
       FCB       0 (          ) :0095: 'DEG   '    64
       FCB       0 (          ) :0096: 'DEG   '    80
       FCB       0 (          ) :0097: 'DEG   '    96
       FCB       0 (          ) :0098: 'DEG   '   112
       FCB       0 (          ) :0099: 'DEG   '   128
       FCB       0 (          ) :009A: 'DEG   '   144
       FCB       0 (          ) :009B: 'DEG   '   160
       FCB       0 (          ) :009C: 'DEG   '   176
       FCB       0 (          ) :009D: 'DEG   '   192
       FCB       0 (          ) :009E: 'DEG   '   208
       FCB       0 (          ) :009F: 'DEG   '   224
       FCB       0 (          ) :00A0: 'DEG   '   240
       FCB       0 (          ) :00A1: 'DEG   '   256

* ------------------------------------------- SPEED      2400 RPM
       FCB       0 (          ) :00A2: 'DEG   '    32     N-LOAD
       FCB       0 (          ) :00A3: 'DEG   '    48
       FCB       0 (          ) :00A4: 'DEG   '    64
       FCB       0 (          ) :00A5: 'DEG   '    80
       FCB       0 (          ) :00A6: 'DEG   '    96
       FCB       0 (          ) :00A7: 'DEG   '   112
       FCB       0 (          ) :00A8: 'DEG   '   128
       FCB       0 (          ) :00A9: 'DEG   '   144
       FCB       0 (          ) :00AA: 'DEG   '   160
       FCB       0 (          ) :00AB: 'DEG   '   176
       FCB       0 (          ) :00AC: 'DEG   '   192
       FCB       0 (          ) :00AD: 'DEG   '   208
       FCB       0 (          ) :00AE: 'DEG   '   224
       FCB       0 (          ) :00AF: 'DEG   '   240
       FCB       0 (          ) :00B0: 'DEG   '   256

* ------------------------------------------- SPEED      2800 RPM
       FCB       0 (          ) :00B1: 'DEG   '    32     N-LOAD
       FCB       0 (          ) :00B2: 'DEG   '    48
       FCB       0 (          ) :00B3: 'DEG   '    64
       FCB       0 (          ) :00B4: 'DEG   '    80
       FCB       0 (          ) :00B5: 'DEG   '    96
       FCB       0 (          ) :00B6: 'DEG   '   112
       FCB       0 (          ) :00B7: 'DEG   '   128
       FCB       0 (          ) :00B8: 'DEG   '   144
       FCB       0 (          ) :00B9: 'DEG   '   160
       FCB       0 (          ) :00BA: 'DEG   '   176
       FCB       0 (          ) :00BB: 'DEG   '   192
       FCB       0 (          ) :00BC: 'DEG   '   208
       FCB       0 (          ) :00BD: 'DEG   '   224
       FCB       0 (          ) :00BE: 'DEG   '   240
       FCB       0 (          ) :00BF: 'DEG   '   256

* ------------------------------------------- SPEED      3200 RPM
       FCB       0 (          ) :00C0: 'DEG   '    32     N-LOAD
       FCB       0 (          ) :00C1: 'DEG   '    48
       FCB       0 (          ) :00C2: 'DEG   '    64
       FCB       0 (          ) :00C3: 'DEG   '    80
```

```
        FCB         0 (           ) :00C4: 'DEG    '    96
        FCB         0 (           ) :00C5: 'DEG    '   112
        FCB         0 (           ) :00C6: 'DEG    '   128
        FCB         0 (           ) :00C7: 'DEG    '   144
        FCB         0 (           ) :00C8: 'DEG    '   160
        FCB         0 (           ) :00C9: 'DEG    '   176
        FCB         0 (           ) :00CA: 'DEG    '   192
        FCB         0 (           ) :00CB: 'DEG    '   208
        FCB         0 (           ) :00CC: 'DEG    '   224
        FCB         0 (           ) :00CD: 'DEG    '   240
        FCB         0 (           ) :00CE: 'DEG    '   256

* ---------------------------------------------- SPEED        3600 RPM
        FCB         0 (           ) :00CF: 'DEG    '    32      N-LOAD
        FCB         0 (           ) :00D0: 'DEG    '    48
        FCB         0 (           ) :00D1: 'DEG    '    64
        FCB         0 (           ) :00D2: 'DEG    '    80
        FCB         0 (           ) :00D3: 'DEG    '    96
        FCB         0 (           ) :00D4: 'DEG    '   112
        FCB         0 (           ) :00D5: 'DEG    '   128
        FCB         0 (           ) :00D6: 'DEG    '   144
        FCB         0 (           ) :00D7: 'DEG    '   160
        FCB         0 (           ) :00D8: 'DEG    '   176
        FCB         0 (           ) :00D9: 'DEG    '   192
        FCB         0 (           ) :00DA: 'DEG    '   208
        FCB         0 (           ) :00DB: 'DEG    '   224
        FCB         0 (           ) :00DC: 'DEG    '   240
        FCB         0 (           ) :00DD: 'DEG    '   256

* ---------------------------------------------- SPEED        4000 RPM
        FCB         0 (           ) :00DE: 'DEG    '    32      N-LOAD
        FCB         0 (           ) :00DF: 'DEG    '    48
        FCB         0 (           ) :00E0: 'DEG    '    64
        FCB         0 (           ) :00E1: 'DEG    '    80
        FCB         0 (           ) :00E2: 'DEG    '    96
        FCB         0 (           ) :00E3: 'DEG    '   112
        FCB         0 (           ) :00E4: 'DEG    '   128
        FCB         0 (           ) :00E5: 'DEG    '   144
        FCB         0 (           ) :00E6: 'DEG    '   160
        FCB         0 (           ) :00E7: 'DEG    '   176
        FCB         0 (           ) :00E8: 'DEG    '   192
        FCB         0 (           ) :00E9: 'DEG    '   208
        FCB         0 (           ) :00EA: 'DEG    '   224
        FCB         0 (           ) :00EB: 'DEG    '   240
        FCB         0 (           ) :00EC: 'DEG    '   256

* ---------------------------------------------- SPEED        4400 RPM
        FCB         0 (           ) :00ED: 'DEG    '    32      N-LOAD
        FCB         0 (           ) :00EE: 'DEG    '    48
        FCB         0 (           ) :00EF: 'DEG    '    64
        FCB         0 (           ) :00F0: 'DEG    '    80
        FCB         0 (           ) :00F1: 'DEG    '    96
        FCB         0 (           ) :00F2: 'DEG    '   112
        FCB         0 (           ) :00F3: 'DEG    '   128
        FCB         0 (           ) :00F4: 'DEG    '   144
        FCB         0 (           ) :00F5: 'DEG    '   160
```

```
        FCB          0 (           ) :00F6: 'DEG    '   176
        FCB          0 (           ) :00F7: 'DEG    '   192
        FCB          0 (           ) :00F8: 'DEG    '   208
        FCB          0 (           ) :00F9: 'DEG    '   224
        FCB          0 (           ) :00FA: 'DEG    '   240
        FCB          0 (           ) :00FB: 'DEG    '   256

* --------------------------------------------- SPEED        4800 RPM
        FCB          0 (           ) :00FC: 'DEG    '    32    N-LOAD
        FCB          0 (           ) :00FD: 'DEG    '    48
        FCB          0 (           ) :00FE: 'DEG    '    64
        FCB          0 (           ) :00FF: 'DEG    '    80
        FCB          0 (           ) :0100: 'DEG    '    96
        FCB          0 (           ) :0101: 'DEG    '   112
        FCB          0 (           ) :0102: 'DEG    '   128
        FCB          0 (           ) :0103: 'DEG    '   144
        FCB          0 (           ) :0104: 'DEG    '   160
        FCB          0 (           ) :0105: 'DEG    '   176
        FCB          0 (           ) :0106: 'DEG    '   192
        FCB          0 (           ) :0107: 'DEG    '   208
        FCB          0 (           ) :0108: 'DEG    '   224
        FCB          0 (           ) :0109: 'DEG    '   240
        FCB          0 (           ) :010A: 'DEG    '   256

*##############################################################
*  F2B TABLE      SATC                CF.KCTBIAS               #
*  BASE COOLANT ADVANCE CORRECTION VS. LOAD / 2 AND COOLDEGF #
*##############################################################

*-                   :           ::TBL3D,12,7,TBL2,3,TBL411,5,2,'DEG'
*-                   :                   ::
*-                   :           ::PROTECT ::
* ------------------------------------------------------------------
F2C     FCB         32 (           ) :010B: '       ' R MIN;  R = COOLDEGF
*-                   :           ::EQU N=E ::
* ------------------------------------------------------------------
        FCB         32 (           ) :010C: '       ' Q MIN;  Q = LOAD (LV8)
*-                   :           ::EQU N=E ::
* ------------------------------------------------------------------
        FCB          7 (           ) :010D: '       ' R NUM  (NUMBER OF
*-                   :                   Q'S)
*-                   :           ::EQU N=E ::
*-                   :           ::NOPROTECT ::

*  -16 DEG C

* --------------------------------------------- TEMP         -16 DEG C
        FCB          0 (           ) :010E: 'DEG    '    64    N-LOAD
*-                   :           ::EQU N=(E+KCTBIAS)*256/90 ::
        FCB          0 (           ) :010F: 'DEG    '    96
        FCB          0 (           ) :0110: 'DEG    '   128
        FCB          0 (           ) :0111: 'DEG    '   160
        FCB          0 (           ) :0112: 'DEG    '   192
        FCB          0 (           ) :0113: 'DEG    '   224
        FCB          0 (           ) :0114: 'DEG    '   256
```

```
* ---------------------------------------- TEMP            -4 DEG C
        FCB         0 (          ) :0115: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :0116: 'DEG    '    96
        FCB         0 (          ) :0117: 'DEG    '   128
        FCB         0 (          ) :0118: 'DEG    '   160
        FCB         0 (          ) :0119: 'DEG    '   192
        FCB         0 (          ) :011A: 'DEG    '   224
        FCB         0 (          ) :011B: 'DEG    '   256

* ---------------------------------------- TEMP             8 DEG C
        FCB         0 (          ) :011C: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :011D: 'DEG    '    96
        FCB         0 (          ) :011E: 'DEG    '   128
        FCB         0 (          ) :011F: 'DEG    '   160
        FCB         0 (          ) :0120: 'DEG    '   192
        FCB         0 (          ) :0121: 'DEG    '   224
        FCB         0 (          ) :0122: 'DEG    '   256

* ---------------------------------------- TEMP            20 DEG C
        FCB         0 (          ) :0123: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :0124: 'DEG    '    96
        FCB         0 (          ) :0125: 'DEG    '   128
        FCB         0 (          ) :0126: 'DEG    '   160
        FCB         0 (          ) :0127: 'DEG    '   192
        FCB         0 (          ) :0128: 'DEG    '   224
        FCB         0 (          ) :0129: 'DEG    '   256

* ---------------------------------------- TEMP            32 DEG C
        FCB         0 (          ) :012A: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :012B: 'DEG    '    96
        FCB         0 (          ) :012C: 'DEG    '   128
        FCB         0 (          ) :012D: 'DEG    '   160
        FCB         0 (          ) :012E: 'DEG    '   192
        FCB         0 (          ) :012F: 'DEG    '   224
        FCB         0 (          ) :0130: 'DEG    '   256

* ---------------------------------------- TEMP            44 DEG C
        FCB         0 (          ) :0131: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :0132: 'DEG    '    96
        FCB         0 (          ) :0133: 'DEG    '   128
        FCB         0 (          ) :0134: 'DEG    '   160
        FCB         0 (          ) :0135: 'DEG    '   192
        FCB         0 (          ) :0136: 'DEG    '   224
        FCB         0 (          ) :0137: 'DEG    '   256

* ---------------------------------------- TEMP            56 DEG C
        FCB         0 (          ) :0138: 'DEG    '    64   N-LOAD
        FCB         0 (          ) :0139: 'DEG    '    96
        FCB         0 (          ) :013A: 'DEG    '   128
        FCB         0 (          ) :013B: 'DEG    '   160
        FCB         0 (          ) :013C: 'DEG    '   192
        FCB         0 (          ) :013D: 'DEG    '   224
        FCB         0 (          ) :013E: 'DEG    '   256
```

```
* ------------------------------------------- TEMP           68 DEG C
        FCB        0 (        ) :013F: 'DEG   '    64        N-LOAD
        FCB        0 (        ) :0140: 'DEG   '    96
        FCB        0 (        ) :0141: 'DEG   '   128
        FCB        0 (        ) :0142: 'DEG   '   160
        FCB        0 (        ) :0143: 'DEG   '   192
        FCB        0 (        ) :0144: 'DEG   '   224
        FCB        0 (        ) :0145: 'DEG   '   256

* ------------------------------------------- TEMP           80 DEG C
        FCB        0 (        ) :0146: 'DEG   '    64        N-LOAD
        FCB        0 (        ) :0147: 'DEG   '    96
        FCB        0 (        ) :0148: 'DEG   '   128
        FCB        0 (        ) :0149: 'DEG   '   160
        FCB        0 (        ) :014A: 'DEG   '   192
        FCB        0 (        ) :014B: 'DEG   '   224
        FCB        0 (        ) :014C: 'DEG   '   256

* ------------------------------------------- TEMP           92 DEG C
        FCB        0 (        ) :014D: 'DEG   '    64        N-LOAD
        FCB        0 (        ) :014E: 'DEG   '    96
        FCB        0 (        ) :014F: 'DEG   '   128
        FCB        0 (        ) :0150: 'DEG   '   160
        FCB        0 (        ) :0151: 'DEG   '   192
        FCB        0 (        ) :0152: 'DEG   '   224
        FCB        0 (        ) :0153: 'DEG   '   256

* ------------------------------------------- TEMP          104 DEG C
        FCB        0 (        ) :0154: 'DEG   '    64        N-LOAD
        FCB        0 (        ) :0155: 'DEG   '    96
        FCB        0 (        ) :0156: 'DEG   '   128
        FCB        0 (        ) :0157: 'DEG   '   160
        FCB        0 (        ) :0158: 'DEG   '   192
        FCB        0 (        ) :0159: 'DEG   '   224
        FCB        0 (        ) :015A: 'DEG   '   256

* ------------------------------------------- TEMP          116 DEG C
        FCB        0 (        ) :015B: 'DEG   '    64        N-LOAD
        FCB        0 (        ) :015C: 'DEG   '    96
        FCB        0 (        ) :015D: 'DEG   '   128
        FCB        0 (        ) :015E: 'DEG   '   160
        FCB        0 (        ) :015F: 'DEG   '   192
        FCB        0 (        ) :0160: 'DEG   '   224
        FCB        0 (        ) :0161: 'DEG   '   256

* ----------------------------------------------------------------------
KREFANGL FCB       0 (        ) :0162: 'DEG   ' SPARK REFERENCE ANGLE
*-                 :            ::EQU N=E*256/90 ::

* ----------------------------------------------------------------------
KCTBIAS  FCB       0 (        ) :0163: 'DEG   ' BIAS FOR BASE COOL
*-                 :                   ADV CORR (TABLE F2)
*-                 :            ::EQU N=E*256/90 ::
* ----------------------------------------------------------------------
```

2383

```
KATSBIAS FCB        0 (          ) :0164: 'DEG   ' BIAS FOR ATS SPARK
*-                    :                   CORR (TABLE F4)
*-                    :            ::EQU N=E*256/90 ::
* -----------------------------------------------------------------
KRPMUP   FDB        0 (          ) :0165: 'RPM   ' NO. OF 65 KHZ COUNTS
*-                    :                   = STARTUP RPM
*-                    :            ::EQU N=65536*120/(E*6) ::
* -----------------------------------------------------------------
KERUNCTR FCB        0 (          ) :0167: 'COUNTS' ENGINE RUN COUNTER
*-                    :                   FOR START-UP.
*-                    :            ::EQU N=E ::
*         NOTE-   ERUN FLAG 1 USED FOR CRANK TO RUN FUEL TRANSITION ONLY
* -----------------------------------------------------------------
KRPMUP1  FDB        0 (          ) :0168: 'RPM   ' NO. OF 65 KHZ COUNTS
*-                    :                   FOR 2ND ENG RUN FLAG
*-                    :            ::EQU N=65536*120/(E*6) ::
* -----------------------------------------------------------------
KERNCTR1 FCB        0 (          ) :016A: 'COUNTS' ENGINE RUN COUNTER
*-                    :                   FOR 2ND ENG. RUN FLAG
*-                    :            ::EQU N=E ::

* -----------------------------------------------------------------
KTIMELAG FCB        0 (          ) :016B: 'USEC  ' TIME DOMAIN
*-                    :                   CORRECTION TO SPARK
*-                    :            ::EQU N=E/15.26 ::
* -----------------------------------------------------------------
KMAXADV2 FDB        0 (          ) :016C: 'DEG   ' MAXIMUM ADVANCE
*-                    :                   RELATIVE TO REFERENCE (2'S COM
*-                    :            ::IF(E.GE.90)N(2)=255 ::
*-                    :            ::IF(E.LT.90)N(2)=E*256/90 ::
*-                    :            ::IF(E.LE.-90)N(2)=-255 ::
* -----------------------------------------------------------------
KMAXRTD2 FDB        0 (          ) :016E: 'DEG   ' MAXIMUM RETARD
*-                    :                   RELATIVE TO REFERENCE (2'S
*-                    :                   COMP)
*-                    :            ::IF(E.GE.90)N(2)=255 ::
*-                    :            ::IF(E.LT.90)N(2)=E*256/90 ::
*-                    :            ::IF(E.LE.-90)N(2)=-255 ::
* -----------------------------------------------------------------
KPNSPK   FDB        0 (          ) :0170: 'DEG   ' PARK/NEUTRAL SPARK
*-                    :                   ADVANCE
*-                    :            ::IF(E.GE.90)N(2)=255 ::
*-                    :            ::IF(E.LT.90)N(2)=E*256/90 ::
*-                    :            ::IF(E.LE.-90)N(2)=-255 ::
* -----------------------------------------------------------------
KSAALDL  FCB        0 (          ) :0172: 'DEG   ' SPARK ADVANCE DELTA
*-                    :                   FOR ALDL
*-                    :            ::EQU N=E*256/90 ::

* -----------------------------------------------------------------
KSRHR    FCB        0 (          ) :0173: 'DEG   ' HOT RESTART SPARK
*-                    :                   RETARD
*-                    :            ::EQU N=E*256/90 ::

* -----------------------------------------------------------------
KHRCTA   FCB        0 (          ) :0174: 'DEG C ' HOT RESTART SPARK
*-                    :                   RETARD COOLANT THRESHHOLD
*-                    :            ::EQU N=(E+40)*256/192 ::
```

```
*****************
* ESC PARAMETERS *
*****************
* ------------------------------------------------------------------------
KESCTIM  FDB          0 (          ) :0175: 'SEC   ' IF ENG RUN TIME <
*-                     :                      THIS SKIP ESC
*-                     :                 ::EQU N=E ::
* ------------------------------------------------------------------------
KRPMKNOB FCB          0 (          ) :0177: 'RPM   ' CUTOFF FOR ESC RETARD
*-                     :                      INCREASE
*-                     :                 ::EQU N=E/12.5 ::
* ------------------------------------------------------------------------
KRETARDM FCB          0 (          ) :0178: 'DEG   ' MAX. ALLOWABLE RETARD
*-                     :                      EGR ON  (256 = 45 DEG)
*-                     :                 ::EQU N=E*256/45 ::
* ------------------------------------------------------------------------
KRETMAX  FCB          0 (          ) :0179: 'DEG   ' MAX. RETARD ALLOWED
*-                     :                      IN POWER ENRICHMENT
*-                     :                 ::EQU N=E*256/45 ::
* ------------------------------------------------------------------------
KESCOOLA FCB          0 (          ) :017A: 'DEG C ' ESC COOLANT CUTOFF
*-                     :                 ::EQU N=(E+40)*256/192 ::

********************************
* BURST KNOCK RETARD PARAMETERS *
********************************
* ------------------------------------------------------------------------
KBKRTIM  FCB          0 (          ) :017B: 'SEC   ' BKR ACTIVE TIME
*-                     :                 ::EQU N=E*80 ::
* ------------------------------------------------------------------------
KBKRTPS  FCB          0 (          ) :017C: '%     ' TPS DELTA THRESHOLD
*-                     :                      TO ACTIVATE BKR
*-                     :                 ::EQU N=E*2.56 ::
* ------------------------------------------------------------------------
KBKRTD   FCB          0 (          ) :017D: 'DEG   ' BKR RETARD FOR ACTIVE
*-                     :                      MODE
*-                     :                 ::EQU N=E*256/90 ::
* ------------------------------------------------------------------------
KBKRCLT  FCB          0 (          ) :017E: 'DEG C ' IF COOLANT < THIS,
*-                     :                      SKIP BKR
*-                     :                 ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------------
KBKRMPH  FCB          0 (          ) :017F: 'MPH   ' IF MPH > THIS, SKIP
*-                     :                      BKR
*-                     :                 ::EQU N=E ::


**********************************************
*    F4A TABLE     SAATS                      *
*  AIR TEMPERATURE SENSOR SPARK CORRECTION    *
*   (USED WITH KATSBIAS)                      *
*     SPARK ADVANCE  VS. AIR TEMP AND LV8     *
**********************************************

*-                     :                 ::TBL3D,9,9,TBL32,2,2,TBL20,9,1,'DEG
*-                     :                         ' ::
*-                     :                 ::PROTECT ::
* ------------------------------------------------------------------------
F4A      FCB          8 (          ) :0180: '      ' R MIN; R = ATPSCNT
```

```
*-                   :          ::EQU N=E ::
* -----------------------------------------------------------------
        FCB       128 (          ) :0181: '      ' Q MIN; Q = LV8
*-                   :          ::EQU N=E ::
* -----------------------------------------------------------------
        FCB         9 (          ) :0182: '      ' R NUM
*-                   :          ::EQU N=E ::
*-                   :          ::NOPROTECT ::
*    -25 DEG
* --------------------------------------------- AIRTMP      -25 DEGC   Yes
        FCB         0 (          ) :0183: 'DEG   '   128    LV8-LOAD
*-                   :          ::EQU N=(E+KATSBIAS)*256/90 ::

        FCB         0 (          ) :0184: 'DEG   '   144
        FCB         0 (          ) :0185: 'DEG   '   160
        FCB         0 (          ) :0186: 'DEG   '   176
        FCB         0 (          ) :0187: 'DEG   '   192
        FCB         0 (          ) :0188: 'DEG   '   208
        FCB         0 (          ) :0189: 'DEG   '   224
        FCB         0 (          ) :018A: 'DEG   '   240
        FCB         0 (          ) :018B: 'DEG   '   256

* --------------------------------------------- AIRTMP       -3 DEGC
        FCB         0 (          ) :018C: 'DEG   '   128    LV8-LOAD
        FCB         0 (          ) :018D: 'DEG   '   144
        FCB         0 (          ) :018E: 'DEG   '   160
        FCB         0 (          ) :018F: 'DEG   '   176
        FCB         0 (          ) :0190: 'DEG   '   192
        FCB         0 (          ) :0191: 'DEG   '   208
        FCB         0 (          ) :0192: 'DEG   '   224
        FCB         0 (          ) :0193: 'DEG   '   240
        FCB         0 (          ) :0194: 'DEG   '   256

* --------------------------------------------- AIRTMP       11 DEGC
        FCB         0 (          ) :0195: 'DEG   '   128    LV8-LOAD
        FCB         0 (          ) :0196: 'DEG   '   144
        FCB         0 (          ) :0197: 'DEG   '   160
        FCB         0 (          ) :0198: 'DEG   '   176
        FCB         0 (          ) :0199: 'DEG   '   192
        FCB         0 (          ) :019A: 'DEG   '   208
        FCB         0 (          ) :019B: 'DEG   '   224
        FCB         0 (          ) :019C: 'DEG   '   240
        FCB         0 (          ) :019D: 'DEG   '   256

* --------------------------------------------- AIRTMP       22 DEGC
        FCB         0 (          ) :019E: 'DEG   '   128    LV8-LOAD
        FCB         0 (          ) :019F: 'DEG   '   144
        FCB         0 (          ) :01A0: 'DEG   '   160
        FCB         0 (          ) :01A1: 'DEG   '   176
        FCB         0 (          ) :01A2: 'DEG   '   192
        FCB         0 (          ) :01A3: 'DEG   '   208
        FCB         0 (          ) :01A4: 'DEG   '   224
        FCB         0 (          ) :01A5: 'DEG   '   240
        FCB         0 (          ) :01A6: 'DEG   '   256

* --------------------------------------------- AIRTMP       33 DEGC
        FCB         0 (          ) :01A7: 'DEG   '   128    LV8-LOAD
        FCB         0 (          ) :01A8: 'DEG   '   144
        FCB         0 (          ) :01A9: 'DEG   '   160
```

```
        FCB       0 (        ) :01AA: 'DEG   '   176
        FCB       0 (        ) :01AB: 'DEG   '   192
        FCB       0 (        ) :01AC: 'DEG   '   208
        FCB       0 (        ) :01AD: 'DEG   '   224
        FCB       0 (        ) :01AE: 'DEG   '   240
        FCB       0 (        ) :01AF: 'DEG   '   256

* ------------------------------------------ AIRTMP      46 DEGC
        FCB       0 (        ) :01B0: 'DEG   '   128    LV8-LOAD
        FCB       0 (        ) :01B1: 'DEG   '   144
        FCB       0 (        ) :01B2: 'DEG   '   160
        FCB       0 (        ) :01B3: 'DEG   '   176
        FCB       0 (        ) :01B4: 'DEG   '   192
        FCB       0 (        ) :01B5: 'DEG   '   208
        FCB       0 (        ) :01B6: 'DEG   '   224
        FCB       0 (        ) :01B7: 'DEG   '   240
        FCB       0 (        ) :01B8: 'DEG   '   256

* ------------------------------------------ AIRTMP      65 DEGC
        FCB       0 (        ) :01B9: 'DEG   '   128    LV8-LOAD
        FCB       0 (        ) :01BA: 'DEG   '   144
        FCB       0 (        ) :01BB: 'DEG   '   160
        FCB       0 (        ) :01BC: 'DEG   '   176
        FCB       0 (        ) :01BD: 'DEG   '   192
        FCB       0 (        ) :01BE: 'DEG   '   208
        FCB       0 (        ) :01BF: 'DEG   '   224
        FCB       0 (        ) :01C0: 'DEG   '   240
        FCB       0 (        ) :01C1: 'DEG   '   256

* ------------------------------------------ AIRTMP     102 DEGC
        FCB       0 (        ) :01C2: 'DEG   '   128    LV8-LOAD
        FCB       0 (        ) :01C3: 'DEG   '   144
        FCB       0 (        ) :01C4: 'DEG   '   160
        FCB       0 (        ) :01C5: 'DEG   '   176
        FCB       0 (        ) :01C6: 'DEG   '   192
        FCB       0 (        ) :01C7: 'DEG   '   208
        FCB       0 (        ) :01C8: 'DEG   '   224
        FCB       0 (        ) :01C9: 'DEG   '   240
        FCB       0 (        ) :01CA: 'DEG   '   256
* ------------------------------------------ AIRTMP     HOT DEGC -
        FCB       0 (        ) :01CB: 'DEG   '   128    LV8-LOAD
        FCB       0 (        ) :01CC: 'DEG   '   144
        FCB       0 (        ) :01CD: 'DEG   '   160
        FCB       0 (        ) :01CE: 'DEG   '   176
        FCB       0 (        ) :01CF: 'DEG   '   192
        FCB       0 (        ) :01D0: 'DEG   '   208
        FCB       0 (        ) :01D1: 'DEG   '   224
        FCB       0 (        ) :01D2: 'DEG   '   240
        FCB       0 (        ) :01D3: 'DEG   '   256


*##################################################
*  F8C TABLE     SATCC              CF.KTCCBIAS   #
*  TCC LOCKED SPARK RETARD VS RPM AND LOAD        #
*##################################################
*-                  :          ::TBL3D,5,11,TBL1,5,1,TBL20,7,1,'DEG'
*-                  :                      ::
*-                  :          ::PROTECT ::
* ------------------------------------------------------------
```

```
F8C      FCB      96 (          ) :01D4: '        ' RMIN; R=NTRPMX (1200
*-                  :                      RPM)
*-                  :             ::EQU N=E ::
* -----------------------------------------------------------------------
         FCB      96 (          ) :01D5: '        ' QMIN; Q = 96
*-                  :             ::EQU N=E ::
* -----------------------------------------------------------------------
         FCB      11 (          ) :01D6: '        ' RNUM
*-                  :             ::EQU N=E ::
*-                  :             ::NOPROTECT ::

* 1200  RPM
* ------------------------------------------------ SPEED       1200 RPM    Yes
         FCB       0 (          ) :01D7: 'DEG    '    96       LV8-LOAD
*-                  :             ::EQU N=E*256/90 ::
         FCB       0 (          ) :01D8: 'DEG    '   112
         FCB       0 (          ) :01D9: 'DEG    '   128
         FCB       0 (          ) :01DA: 'DEG    '   144
         FCB       0 (          ) :01DB: 'DEG    '   160
         FCB       0 (          ) :01DC: 'DEG    '   176
         FCB       0 (          ) :01DD: 'DEG    '   192
         FCB       0 (          ) :01DE: 'DEG    '   208
         FCB       0 (          ) :01DF: 'DEG    '   224
         FCB       0 (          ) :01E0: 'DEG    '   240
         FCB       0 (          ) :01E1: 'DEG    '   256

* ------------------------------------------------ SPEED       1400 RPM
         FCB       0 (          ) :01E2: 'DEG    '    96       LV8-LOAD
*-                  :             ::EQU N=E*256/90 ::
         FCB       0 (          ) :01E3: 'DEG    '   112
         FCB       0 (          ) :01E4: 'DEG    '   128
         FCB       0 (          ) :01E5: 'DEG    '   144
         FCB       0 (          ) :01E6: 'DEG    '   160
         FCB       0 (          ) :01E7: 'DEG    '   176
         FCB       0 (          ) :01E8: 'DEG    '   192
         FCB       0 (          ) :01E9: 'DEG    '   208
         FCB       0 (          ) :01EA: 'DEG    '   224
         FCB       0 (          ) :01EB: 'DEG    '   240
         FCB       0 (          ) :01EC: 'DEG    '   256

* ------------------------------------------------ SPEED       1600 RPM
         FCB       0 (          ) :01ED: 'DEG    '    96       LV8-LOAD
*-                  :             ::EQU N=E*256/90 ::
         FCB       0 (          ) :01EE: 'DEG    '   112
         FCB       0 (          ) :01EF: 'DEG    '   128
         FCB       0 (          ) :01F0: 'DEG    '   144
         FCB       0 (          ) :01F1: 'DEG    '   160
         FCB       0 (          ) :01F2: 'DEG    '   176
         FCB       0 (          ) :01F3: 'DEG    '   192
         FCB       0 (          ) :01F4: 'DEG    '   208
         FCB       0 (          ) :01F5: 'DEG    '   224
         FCB       0 (          ) :01F6: 'DEG    '   240
         FCB       0 (          ) :01F7: 'DEG    '   256

* ------------------------------------------------ SPEED       1800 RPM
         FCB       0 (          ) :01F8: 'DEG    '    96       LV8-LOAD
*-                  :             ::EQU N=E*256/90 ::
         FCB       0 (          ) :01F9: 'DEG    '   112
         FCB       0 (          ) :01FA: 'DEG    '   128
```

```
          FCB            0 (           ) :01FB: 'DEG    '    144
          FCB            0 (           ) :01FC: 'DEG    '    160
          FCB            0 (           ) :01FD: 'DEG    '    176
          FCB            0 (           ) :01FE: 'DEG    '    192
          FCB            0 (           ) :01FF: 'DEG    '    208
          FCB            0 (           ) :0200: 'DEG    '    224
          FCB            0 (           ) :0201: 'DEG    '    240
          FCB            0 (           ) :0202: 'DEG    '    256

 * ------------------------------------------------ SPEED          2000 RPM
          FCB            0 (           ) :0203: 'DEG    '     96    LV8-LOAD
          FCB            0 (           ) :0204: 'DEG    '    112
          FCB            0 (           ) :0205: 'DEG    '    128
          FCB            0 (           ) :0206: 'DEG    '    144
          FCB            0 (           ) :0207: 'DEG    '    160
          FCB            0 (           ) :0208: 'DEG    '    176
          FCB            0 (           ) :0209: 'DEG    '    192
          FCB            0 (           ) :020A: 'DEG    '    208
          FCB            0 (           ) :020B: 'DEG    '    224
          FCB            0 (           ) :020C: 'DEG    '    240
          FCB            0 (           ) :020D: 'DEG    '    256

*************************************************************
*     F4PE TABLE  SPARK RETARD VS. TIME IN POWER ENRICHMENT  *
**********************************#**************************
*-
*                      :            ::TBL2D,9,1,TBL9,1,2,'DEG' ::
* -----------------------------------------------------------------------
F4PE      FCB          0 (           ) :020E: 'DEG    '   0.0     SEC-TIME
*-                     :               ::EQU N=E*256/90 ::
          FCB          0 (           ) :020F: 'DEG    '   3.2
          FCB          0 (           ) :0210: 'DEG    '   6.4
          FCB          0 (           ) :0211: 'DEG    '   9.6
          FCB          0 (           ) :0212: 'DEG    '  12.8
          FCB          0 (           ) :0213: 'DEG    '  16.0
          FCB          0 (           ) :0214: 'DEG    '  19.2
          FCB          0 (           ) :0215: 'DEG    '  22.4
          FCB          0 (           ) :0216: 'DEG    '  25.6
```

```
*****************
* ESC TABLES    *
*****************
******************************
* F6 TABLE                   *
* ESC ATTACK RATE VS. RPM    *
******************************
*
*  TABLE VALUE ATTACK RATE IN DEGREES/MSEC  / .0225
*-                       :            ::TBL2D,5,TBL1,1,4,'DEG/MS' ::
* --------------------------------------------------------------------
F6       FCB         0 (          ) :0217: 'DEG/MS'   400    RPM-SPEED
*-                       :            ::EQU N=E/.0225 ::
         FCB         0 (          ) :0218: 'DEG/MS'  1200
         FCB         0 (          ) :0219: 'DEG/MS'  2000
         FCB         0 (          ) :021A: 'DEG/MS'  3200
         FCB         0 (          ) :021B: 'DEG/MS'  4800

*********************************
* F7 TABLE                      *
* ESC % RECOVERY RATE VS RPM    *
*********************************
*
*  TABLE VALUE:PER CENT RECOVERY PER SECOND * 256/500
*-                       :            ::TBL2D,5,TBL1,1,4,'%/SEC' ::
* --------------------------------------------------------------------
F7       FCB         0 (          ) :021C: '%/SEC '   400    RPM-SPEED
*-                       :            ::EQU N=E*256/500 ::
         FCB         0 (          ) :021D: '%/SEC '  1200
         FCB         0 (          ) :021E: '%/SEC '  2000
         FCB         0 (          ) :021F: '%/SEC '  3200
         FCB         0 (          ) :0220: '%/SEC '  4800

* --------------------------------------------------------------------
KDWDLV8  FCB         0 (          ) :0221: 'LV8   ' IF DELTA LV8 > THIS
*-                       :                   THEN MAX DWELL
*-                       :            ::EQU N=E ::
*+DATADIAG++BLOCK ID++

*******************************
*    DIAGNOSTIC PARAMETERS    *
*******************************


* GENERAL PARAMETERS FOR DIAGNOSTICS
* --------------------------------------------------------------------
KKMASK1  FCB       $00 (          ) :0222: '      ' MASK FOR MALFFLG1;
*-                       :                   BIT=0 DISABLES MALF
*-                       :                   RECOGNITION
*-                       :            ::EQU N=E ::
*      BIT 0 = M21- THROTTLE POSITION SENSOR
*      BIT 1 = M19- NOT USED
*      BIT 2 = M18- NOT USED
*      BIT 3 = M17- NOT USED
*      BIT 4 = M16- BATTERY VOLTAGE HIGH
*      BIT 5 = M15- COOLANT SENSOR LOW
*      BIT 6 = M14- COOLANT SENSOR HIGH
*      BIT 7 = M13- OXYGEN SENSOR
* --------------------------------------------------------------------
```

```
KKMASK2  FCB       $00 (          ) :0223: '        ' MASK FOR MALFFLG2
*_                     :                   "
*_                     :
*                      :               ::EQU N=E ::
*       BIT 0 = M29- 4TH GEAR SWITCH FAILURE
*       BIT 1 = M28- 3RD GEAR SWITCH FAILURE
*       BIT 2 = M27- 2ND GEAR SWITCH FAILURE
*       BIT 3 = M26- QDM FAILURE
*       BIT 4 = M25- AIR TEMP SENSOR HIGH
*       BIT 5 = M24- VEHICLE SPEED SENSOR LOW
*       BIT 6 = M23- AIR TEMP SENSOR LOW
*       BIT 7 = M22- THROTTLE POSITION LOW
* ----------------------------------------------------------------------
KKMASK3  FCB       $00 (          ) :0224: '        ' MASK FOR MALFFLG3
*_                     :                   "
*_                     :
*                      :               ::EQU N=E ::
*       BIT 0 = M38- BRAKE SWITCH FAILURE
*       BIT 1 = M37- NOT USED
*       BIT 2 = M36- NOT USED
*       BIT 3 = M35- NOT USED
*       BIT 4 = M34- MASS AIR FLOW SENSOR FAILURE
*       BIT 5 = M33- NOT USED
*       BIT 6 = M32- NOT USED
*       BIT 7 = M31- P/N SWITCH FAILURE
* ----------------------------------------------------------------------
KKMASK4  FCB       $00 (          ) :0225: '        ' MASK FOR MALFFLG4
*_                     :                   "
*_                     :
*                      :               ::EQU N=E ::
*       BIT 0 = M47- UART LINK FAILURE
*       BIT 1 = M46- POWER STEERING PRESSURE SWITCH
*       BIT 2 = M45- 02 SENSOR RICH
*       BIT 3 = M44- 02 SENSOR LEAN
*       BIT 4 = M43- ESC FAILURE
*       BIT 5 = M42- EST FAILURE
*       BIT 6 = M41- CAM SENSOR FAILURE
*       BIT 7 = M39- TCC FAILURE
*
* ----------------------------------------------------------------------
KKMASK5  FCB       $00 (          ) :0226: '        ' MASK FOR MALFFLG5
*_                     :                   "
*_                     :
*                      :               ::EQU N=E ::
*       BIT 0 = M56- NOT USED
*       BIT 1 = M55- NOT USED
*       BIT 2 = M54- NOT USED
*       BIT 3 = M53- NOT USED
*       BIT 4 = M52- NOT USED
*       BIT 5 = M51- PROM ERROR
*       BIT 6 = M49- VACUUM LEAK
*       BIT 7 = M48- MISFIRE
*
* ----------------------------------------------------------------------
KKMASK6  FCB       $00 (          ) :0227: '        ' MASK FOR MALFFLG6
*_                     :                   "
*_                     :
*                      :               ::EQU N=E ::
*       BIT 0 = M65- EGR1 SOLENOID FAILURE
*       BIT 1 = M64- EGR2 SOLENOID FAILURE
*       BIT 2 = M63- EGR3 SOLENOID FAILURE
*       BIT 3 = M62- NOT USED
*       BIT 4 = M611 NOT USED
*       BIT 5 = M59- NOT USED
```

```
*       BIT 6 = M58- VATS FAILURE
*       BIT 7 = M57- NOT USED
*
* -----------------------------------------------------------------
KKMASK7  FCB       $00 (          ) :0228: '         ' MASK FOR MALFFLG7
*-                     :                  "
*-                     :          ::EQU N=E ::
*       BIT 0 = M74- NOT USED
*       BIT 1 = M73- NOT USED
*       BIT 2 = M72- NOT USED
*       BIT 3 = M71- NOT USED
*       BIT 4 = M69- NOT USED
*       BIT 5 = M68- NOT USED
*       BIT 6 = M67- NOT USED
*       BIT 7 = M66- RESET
*
* -----------------------------------------------------------------
KKMASK8  FCB       $00 (          ) :0229: '         ' MASK FOR MALFFLG8
*-                     :                  "
* -----------------------------------------------------------------
KKMASK9  FCB       $00 (          ) :022A: '         ' MASK FOR MALFFLG9
*-                     :                  "
* -----------------------------------------------------------------
KKMASKA  FCB       $00 (          ) :022B: '         ' MASK FOR MALFFLGA
*-                     :                  "
* -----------------------------------------------------------------
KKKMASK1 FCB       $00 (          ) :022C: '         ' MASK FOR MALFFLG1;
*-                     :               BIT=0 DISABLES CHECK ENG LIGHT
*-                     :          ::EQU N=E ::
*       BIT 0 = M21- THROTTLE POSITION SENSOR
*       BIT 1 = M19- NOT USED
*       BIT 2 = M18- NOT USED
*       BIT 3 = M17- NOT USED
*       BIT 4 = M16- BATTERY VOLTAGE HIGH
*       BIT 5 = M15- COOLANT SENSOR LOW
*       BIT 6 = M14- COOLANT SENSOR HIGH
*       BIT 7 = M13- OXYGEN SENSOR
* -----------------------------------------------------------------
KKKMASK2 FCB       $00 (          ) :022D: '         ' MASK FOR MALFFLG2
*-                     :                  "
*-                     :          ::EQU N=E ::
*       BIT 0 = M29- 4TH GEAR SWITCH FAILURE
*       BIT 1 = M28- 3RD GEAR SWITCH FAILURE
*       BIT 2 = M27- 2ND GEAR SWITCH FAILURE
*       BIT 3 = M26- QDM FAILURE
*       BIT 4 = M25- AIR TEMP SENSOR HIGH
*       BIT 5 = M24- VEHICLE SPEED SENSOR LOW
*       BIT 6 = M23- AIR TEMP SENSOR LOW
*       BIT 7 = M22- THROTTLE POSITION LOW
* -----------------------------------------------------------------
KKKMASK3 FCB       $00 (          ) :022E: '         ' MASK FOR MALFFLG3
*-                     :                  "
*-                     :          ::EQU N=E ::
*       BIT 0 = M38- BRAKE SWITCH FAILURE
*       BIT 1 = M37- NOT USED
*       BIT 2 = M36- NOT USED
*       BIT 3 = M35- NOT USED
*       BIT 4 = M34- MASS AIR FLOW SENSOR FAILURE
*       BIT 5 = M33- NOT USED
```

```
*       BIT 6 = M32- NOT USED
*       BIT 7 = M31- P/N SWITCH FAILURE
* -----------------------------------------------------------------
KKKMASK4 FCB       $00 (          ) :022F: '        ' MASK FOR MALFFLG4
*-                    :                   "
*-                    :            ::EQU N=E ::
*       BIT 0 = M47- UART LINK FAILURE
*       BIT 1 = M46- POWER STEERING PRESSURE SWITCH
*       BIT 2 = M45- O2 SENSOR RICH
*       BIT 3 = M44- O2 SENSOR LEAN
*       BIT 4 = M43- ESC FAILURE
*       BIT 5 = M42- EST FAILURE
*       BIT 6 = M41- CAM SENSOR FAILURE
*       BIT 7 = M39- TCC FAILURE
*
* -----------------------------------------------------------------
KKKMASK5 FCB       $00 (          ) :0230: '        ' MASK FOR MALFFLG5
*-                    :                   "
*-                    :            ::EQU N=E ::
*       BIT 0 = M56- NOT USED
*       BIT 1 = M55- NOT USED
*       BIT 2 = M54- NOT USED
*       BIT 3 = M53- NOT USED
*       BIT 4 = M52- NOT USED
*       BIT 5 = M51- PROM ERROR
*       BIT 6 = M49- VACUUM LEAK
*       BIT 7 = M48- MISFIRE
*
* -----------------------------------------------------------------
KKKMASK6 FCB       $00 (          ) :0231: '        ' MASK FOR MALFFLG6
*-                    :                   "
*-                    :            ::EQU N=E ::
*       BIT 0 = M65- EGR1 SOLENOID FAILURE
*       BIT 1 = M64- EGR2 SOLENOID FAILURE
*       BIT 2 = M63- EGR3 SOLENOID FAILURE
*       BIT 3 = M62- NOT USED
*       BIT 4 = M611 NOT USED
*       BIT 5 = M59- NOT USED
*       BIT 6 = M58- VATS FAILURE
*       BIT 7 = M57- NOT USED
*
* -----------------------------------------------------------------
KKKMASK7 FCB       $00 (          ) :0232: '        ' MASK FOR MALFFLG7
*-                    :                   "
*-                    :            ::EQU N=E ::
*       BIT 0 = M74- NOT USED
*       BIT 1 = M73- NOT USED
*       BIT 2 = M72- NOT USED
*       BIT 3 = M71- NOT USED
*       BIT 4 = M69- NOT USED
*       BIT 5 = M68- NOT USED
*       BIT 6 = M67- NOT USED
*       BIT 7 = M66- RESET
*
* -----------------------------------------------------------------
KKKMASK8 FCB       $00 (          ) :0233: '        ' MASK FOR MALFFLG8-
*-                    :                   "
* -----------------------------------------------------------------
KKKMASK9 FCB       $00 (          ) :0234: '        ' MASK FOR MALFFLG9
```

```
*-                       :                   "
* -----------------------------------------------------------------
KKKMASKA FCB       $00 (        ) :0235: '       ' MASK FOR MALFFLGA
*-                       :                   "
* -----------------------------------------------------------------
KKNOMALF FCB         0 (        ) :0236: '       ' NO. OF SUCCESSIVE
*-                       :                 POWER UPS WITH NO MALFS,N.D.
*-                       :               ::EQU N=E ::

*          MALF 13 PARAMETERS
* -----------------------------------------------------------------
KKO2ENBL FDB         0 (        ) :0237: 'SEC   ' ENG RUN TIME MUST BE
*-                       :                 >CAL TO ENABLE M13
*-                       :               ::EQU N=E ::
* -----------------------------------------------------------------
KKO2LOW  FCB         0 (        ) :0239: 'VOLTS ' O2 SENSOR LOW LIMIT
*-                       :               ::EQU N=E*226 ::
* -----------------------------------------------------------------
KKO2HIGH FCB         0 (        ) :023A: 'VOLTS ' O2 SENSOR HIGH LIMIT
*-                       :               ::EQU N=E*226 ::
* -----------------------------------------------------------------
KKO2LOD  FCB         0 (        ) :023B: '%     ' THROTTLE POSITION
*-                       :                 LIMIT
*-                       :               ::EQU N=E*2.56 ::

* -----------------------------------------------------------------
KKM13TME FCB         0 (        ) :023C: 'SEC   ' IF CONDITIONS MET FOR
*-                       :                 >THIS CAL SET M13
*-                       :               ::EQU N=E ::
* -----------------------------------------------------------------
KKDIAWM  FCB         0 (        ) :023D: 'DEG C ' COOLANT THRESHOLD
*-                       :               ::EQU N=(E+40)*256/192 ::

*          MALF 14 PARAMETERS
* -----------------------------------------------------------------
KKETMPTH FDB         0 (        ) :023E: 'SEC   ' TIME SINCE RUN ENABLE
*-                       :               ::EQU N=E ::
* -----------------------------------------------------------------
KKETMPH  FCB         0 (        ) :0240: 'DEG C ' COOLANT HIGH LIMIT
*-                       :               ::EQU N=(E+40)*256/192::
* -----------------------------------------------------------------
KKM14TME FCB         0 (        ) :0241: 'SEC   ' IF CONDITIONS MET FOR
*-                       :                 >THIS CAL SET M14
*-                       :               ::EQU N=E*10 ::

*          MALF 14/15 PARAMETERS
* -----------------------------------------------------------------
KKTCDFA  FCB         0 (        ) :0242: 'DEG C ' DEFAULT COOLANT
*-                       :                 READING
*-                       :               ::EQU N=(E+40)*256/192::

*          MALF 15 PARAMETERS
* -----------------------------------------------------------------
KKETMPTL FDB         0 (        ) :0243: 'SEC   ' TIME SINCE RUN ENABLE
*-                       :               ::EQU N=E ::
* -----------------------------------------------------------------
KKETMPAD FCB         0 (        ) :0245: 'COUNTS' IF A/D COUNTS > THIS
*-                       :                 SET M15
*-                       :               ::EQU N=E::
```

```
* -------------------------------------------------------------------
KKM15TME FCB          0 (         ) :0246: 'SEC    ' IF CONDITIONS MET FOR
*-                      :                   >THIS CAL SET M15
*-                      :            ::EQU N=E*10 ::

*          MALF 16 PARAMETERS
* -------------------------------------------------------------------
KKVOLTHI FCB          0 (         ) :0247: 'VOLTS ' UPPER VOLTAGE
*-                      :                   THRESHOLD FOR MALF 16
*-                      :            ::EQU  N=E*10 ::
* -------------------------------------------------------------------
KKM16TME FCB          0 (         ) :0248: 'SEC    ' IF CONDITIONS MET FOR
*-                      :                   >THIS CAL SET M16
*-                      :            ::EQU N=E*10 ::

*          MALF 21 PARAMETERS
* -------------------------------------------------------------------
KKTA21   FCB          0 (         ) :0249: 'AD CNTS'THROTTLE POSITION
*-                      :                   LIMIT
*-                      :            ::EQU N=E ::
* -------------------------------------------------------------------
KKM21TME FCB          0 (         ) :024A: 'SEC    ' TIME LIMIT
*-                      :            ::EQU N=E*10 ::
* -------------------------------------------------------------------
KKFLOM21 FCB          0 (         ) :024B: 'GM/SEC' GMPSEC LIMIT
*-                      :            ::EQU N=E ::
* -------------------------------------------------------------------
KKHITPS  FCB          0 (         ) :024C: 'AD CNTS' ADTHROT UPPER BOUND
*-                      :            ::EQU N=E         ::

*          MALF 21/22 PARAMETERS
* -------------------------------------------------------------------
KKTPSDEF FCB          0 (         ) :024D: '%TPS   ' DEFAULT TPS
*-                      :            ::EQU N=E*2.56 ::

*          MALF 22 PARAMETERS
* -------------------------------------------------------------------
KKTA22   FCB          0 (         ) :024E: 'AD CNTS'  THROTTLE POSITION
*-                      :                   LIMIT
*-                      :            ::EQU N=E ::
* -------------------------------------------------------------------
KKM22TME FCB          0 (         ) :024F: 'SEC    ' TIME LIMIT
*-                      :            ::EQU N=E*10 ::

*          MALF 23 PARAMETERS
* -------------------------------------------------------------------
KKM23LO  FCB          0 (         ) :0250: 'AD CNTS' IF RAW COM A/D
*-                      :                   COUNTS >= THIS SKIP M23
*-                      :            ::EQU N=E         ::
* -------------------------------------------------------------------
KKM23TME FCB          0 (         ) :0251: 'SEC    ' IF CONDITION MET >
*-                      :                   THIS TIME SET M23
*-                      :            ::EQU N=E*10      ::

*          MALF 23/25 PARAMETERS
* -------------------------------------------------------------------
KKATSDEF FCB          0 (         ) :0252: 'ADMATINV' DEFAULT VALUE (SEE
*-                      :                   ANNO. TABLE 3)
*-                      :            ::TBL3,ADMATINV  ::
```

```
*           MALF 25 PARAMETERS
* ----------------------------------------------------------------------
KKM25HI  FCB        0 (          ) :0253: 'AD CNTS' IF RAW COM A/D
*-                    :                   COUNTS <= THIS SKIP M25
*-                    :            ::EQU N=E        ::
* ----------------------------------------------------------------------
KKM25MPH FCB        0 (          ) :0254: 'MPH    ' IF MPH < THIS DON'T
*-                    :                   SET M25
*-                    :            ::EQU N= E       ::
         ORG       $8255
*        DIAGNOSTIC PROM TEST WORD 2
*-                    :            ::PROTECT::
* ----------------------------------------------------------------------
KKPRMTW2 FCB      $AA (          ) :0255: '       ' DIAGNOSTIC PROM TEST
*-                    :                   TEST WORD 2
*-                    :            ::EQU N=E ::
*-                    :            ::NOPROTECT ::

* ----------------------------------------------------------------------
KKM25TME FCB        0 (          ) :0256: 'SEC    ' IF CONDITIONS MET >
*-                    :                   THIS TIME SET M25
*-                    :            ::EQU N=E*10     ::

*           MALF 24 PARAMETERS
* ----------------------------------------------------------------------
KKVSDM   FCB        0 (          ) :0257: 'MPH    ' VEHICLE SPEED LIMIT
*-                    :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKM24TME FCB        0 (          ) :0258: 'SEC    ' TIME LIMIT
*-                    :            ::EQU N=E ::

*           MALF 26 PARAMETERS
* ----------------------------------------------------------------------
KK26QMSK FCB      $00 (          ) :0259: 'MASK   ' QDM FAULT BITS = 1,
*-                    :                   OTHERS 0
*-                    :            ::EQU N=E ::
*      BIT 4 = QDM1
*      BIT 5 = QDM2
*      BIT 6 = QDM3
*      BIT 7 = QDM4

* ----------------------------------------------------------------------
KKM26TME FCB        0 (          ) :025A: 'SEC    ' TIME LIMIT
*-                    :            ::EQU N=E*10 ::
* ----------------------------------------------------------------------
KKM26MSK FCB %00000000 (         ) :025B: 'MASK   ' FLAG TO TURN ON
*-                    :                   UNUSED OUTPUTS (QDM)
*-                    :            ::EQU N=E ::
*      BIT 0 = NOT USED
*      BIT 1 = NOT USED
*      BIT 2 = FAN2 PIN 2B5 (PWMB3)
*      BIT 3 = CCP2 PIN 3C4 (PWMB4)
*      BIT 4 = HOTLIGHT PIN 3C9 (PW6)
*      BIT 5 = EGRDC PIN 3C14 (PW1)
*      BIT 6 = FUEL PRES. PIN 3C16 (PW5)
*      BIT 7 = 3/2 DOWNSHIFT PIN 3C1 (PW3)

*  MALF 27,28,29,31  GEAR SWITCH DIAGNOSTIC
*
```

```
* ----------------------------------------------------------------------
KKGEARTM FCB          0 (          ) :025C: 'SEC    ' TIMER FOR GEAR SWITCH
*-                      :                     OPEN TEST
*-                      :            ::EQU  N=E*80    ::
* ----------------------------------------------------------------------
KKGRPTM  FCB          0 (          ) :025D: 'SEC    ' TIMER FOR SETTING P/N
*-                      :                     MALF
*-                      :            ::EQU  N=E*10    ::
* ----------------------------------------------------------------------
KKGR2TM  FCB          0 (          ) :025E: 'SEC    ' TIMER FOR SETTING 2ND
*-                      :                     GEAR MALF
*-                      :            ::EQU  N=E*10    ::
* ----------------------------------------------------------------------
KKGR3TM  FCB          0 (          ) :025F: 'SEC    ' TIMER FOR SETTING 3RD
*-                      :                     GEAR MALF
*-                      :            ::EQU  N=E*10    ::
* ----------------------------------------------------------------------
KKGR4TM  FCB          0 (          ) :0260: 'SEC    ' TIMER FOR SETTING 4TH
*-                      :                     GEAR MALF
*-                      :            ::EQU  N=E*10    ::
* ----------------------------------------------------------------------
KK4THLOW FDB          0 (          ) :0261: 'RATIO ' NOVERV RATIO LOW
*-                      :                     LIMIT FOR 4TH GEAR
*-                      :            ::EQU  N=E       ::
* ----------------------------------------------------------------------
KK4THHI  FDB          0 (          ) :0263: 'RATIO ' NOVERV RATIO HIGH
*-                      :                     LIMIT FOR 4TH GEAR
*-                      :            ::EQU  N=E       ::

*             MALF 34 PARAMETERS FOR HIGH SPEED MASS AIR FLOW SENSOR
*-     MAF DEFAULT = F18DEF * NTPSLD + KKIACGPS * ISSPMP + KMINGPS
* ----------------------------------------------------------------------
KKM34TME FCB          0 (          ) :0265: 'SEC    ' MALF 34B TIMER
*-                      :            ::EQU N=E*10  ::
* ----------------------------------------------------------------------
KKMINGPS FDB          0 (          ) :0266: 'GM/SEC' MINIMUM AIR FLOW FOR
*-                      :                    DEFAULT AIR
*-                      :            ::EQU N=E*256 ::
* ----------------------------------------------------------------------
KKTPSMAX FCB          0 (          ) :0268: '%TPS   ' MAXIMUM TPS FOR
*-                      :                    DEFAULT AIR CALC
*-                      :            ::EQU N=E*2.56 ::
* ----------------------------------------------------------------------
KKIACGPS FCB          0 (          ) :0269: 'MULT   ' GM/SEC PER IAC STEP
*-                      :                    FOR DEF. AIR
*-                      :            ::EQU N=E*256 ::
* ----------------------------------------------------------------------
KKHFMNCT FDB          0 (          ) :026A: 'COUNTS' IF FREQ. DELTA < THIS
*-                      :                    IT'S BROKEN
*-                      :            ::EQU N=E ::
*             MALF 38 PARAMETERS  (BRAKE SWITCH DIAGNOSTIC)
* ----------------------------------------------------------------------
KK38VSSE FCB          0 (          ) :026C: 'MPH    ' ENABLE BRAKE TEST
*-                      :                    WHEN MPH > CAL
*-                      :            ::EQU N=E     ::
* ----------------------------------------------------------------------
KKM38TME FCB          0 (          ) :026D: 'CNTS   ' IF # OF DECELS
*-                      :                    WITHOUT BRAKE > CAL SET M36
*-                      :            ::EQU N=E     ::
```

```
****** MALF 39 TCC FAILURE *******
* ------------------------------------------------------------------
KKTCCNVL FDB        0 (          ) :026E: 'RATIO ' NOVERV LOW LIMIT
*-                    :            ::EQU N=E     ::
* ------------------------------------------------------------------
KKTCCNVH FDB        0 (          ) :0270: 'RATIO ' NOVERV HIGH LIMIT
*-                    :            ::EQU N=E     ::
* ------------------------------------------------------------------
KK39TME  FCB        0 (          ) :0272: 'SEC   ' MALF 39 TIMER
*-                    :            ::EQU N=E  ::

*          MALF 41 PARAMETERS
* ------------------------------------------------------------------
KKM41TME FCB        0 (          ) :0273: 'SEC   ' IF .1 SEC LOOPS W/O
*-                    :                   CAM PULSES > CAL SET M41
*-                    :            ::EQU N=E*10 ::

*          MALF 42 PARAMETERS
* ------------------------------------------------------------------
KK42RM   FCB        0 (          ) :0274: 'RPM   ' ENGINE SPEED LIMIT
*-                    :            ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KK42ALPS FCB        0 (          ) :0275: 'CNTS  ' IF LOOPS W/FEEDBACK >
*-                    :                   THIS SET M42A
*-                    :            ::EQU N=E ::

*          MALF 43 PARAMETERS
* ------------------------------------------------------------------
KKM43TME FCB        0 (          ) :0276: 'SEC   ' IF A/D OUTSIDE WINDOW
*-                    :                   > CAL, FLAG ESC MALF
*-                    :            ::EQU N=E*10 ::
* ------------------------------------------------------------------
KKRTDF   FCB        0 (          ) :0277: 'DEG   ' ESC FAILURE DEFAULT
*-                    :                   RETARD(256 = 45 DEG)
*-                    :            ::EQU N=E*256/45 ::
* ------------------------------------------------------------------
KKESCLO  FCB        0 (          ) :0278: 'COUNTS' IF A/D COUNTS < CAL
*-                    :                   FLAG ESC ERROR
*-                    :            ::EQU N=E ::
* ------------------------------------------------------------------
KKESCHI  FCB        0 (          ) :0279: 'COUNTS' IF A/D COUNTS >= CAL
*-                    :                   FLAG ESC ERROR
*-                    :            ::EQU N=E ::

*          MALF 44 PARAMETERS
* ------------------------------------------------------------------
KKO2MIN  FCB        0 (          ) :027A: 'VOLTS ' O2 SENSOR LOW LIMIT
*-                    :            ::EQU N=E*226 ::
* ------------------------------------------------------------------
KKM44TME FCB        0 (          ) :027B: 'SEC   ' TIME LIMIT
*-                    :            ::EQU N=E ::

*          MALF 45 PARAMETERS
* ------------------------------------------------------------------
KKO2MAX  FCB        0 (          ) :027C: 'VOLTS ' O2 SENSOR HIGH LIMIT
*-                    :            ::EQU N=E*226 ::
* ------------------------------------------------------------------
KKM45TME FCB        0 (          ) :027D: 'SEC   ' TIME LIMIT
*-                    :            ::EQU N=E ::
```

```
* ----------------------------------------------------------------
KK45TPSH FCB          0 (          ) :027E: '%      ' TPS HIGH LIMIT
*-                      :             ::EQU N=E*2.56 ::
* ----------------------------------------------------------------
KK45TPSL FCB          0 (          ) :027F: '%      ' TPS LOW LIMIT
*-                      :             ::EQU N=E*2.56 ::

*   MALF 46   POWER STEERING PRESSURE DISCRETE DIAGNOSTIC
*
*    LOG MALF 46 IF THE POWER STEERING PRESSURE IS TOO HIGH AND
*    NMPH > KKM46MPH  FOR TIME > KK46TIM.
*    KEEP LOGGING UNTIL PRESSURE INPUT DROPS.
*
* ----------------------------------------------------------------
KKM46TME FCB          0 (          ) :0280: 'SEC    ' MALF 46 TIMER
*-                      :             ::EQU N=E*10  ::
* ----------------------------------------------------------------
KKM46MPH FCB          0 (          ) :0281: 'MPH    ' MPH THRESHOLD FOR
*-                      :                   MALF 46.
*-                      :             ::EQU  N=E*3.2  ::

*           MALF 47 PARAMETERS
* ----------------------------------------------------------------
KKSERWD1 FCB %00000000 (          ) :0282: 'FLAG   ' DEFAULT VALUE FOR
*-                      :                   SERIAL DATA WORD 1
*-                      :             ::EQU  N=E ::
* ----------------------------------------------------------------
KK1UART  FCB          0 (          ) :0283: 'SEC    ' IF UART LINK LOST >
*-                      :                   THIS TIME SET M47
*-                      :             ::EQU  N=E*10 ::

*           MALF 48 PARAMETERS
* ----------------------------------------------------------------
KK48TPSL FCB          0 (          ) :0284: '%TPS   ' IF TPS < THIS SKIP
*-                      :                   M48
*-                      :             ::EQU  N=E*2.56 ::
* ----------------------------------------------------------------
KK48TPSH FCB          0 (          ) :0285: '%TPS   ' IF TPS > THIS SKIP
*-                      :                   M48
*-                      :             ::EQU  N=E*2.56 ::
* ----------------------------------------------------------------
KK48TPSD FCB          0 (          ) :0286: 'DTPS   ' IF DELTATPS > THIS
*-                      :                   SKIP M48
*-                      :             ::EQU  N=E*2.56 ::
* ----------------------------------------------------------------
KK48RPML FCB          0 (          ) :0287: '%TPS   ' IF RPM < THIS SKIP
*-                      :                   M48
*-                      :             ::EQU  N=E/25 ::
* ----------------------------------------------------------------
KK48RPMH FCB          0 (          ) :0288: '%TPS   ' IF RPM > THIS SKIP
*-                      :                   M48
*-                      :             ::EQU  N=E/25   ::
* ----------------------------------------------------------------
KK48MPHL FCB          0 (          ) :0289: '%TPS   ' IF MPH < THIS SKIP
*-                      :                   M48
*-                      :             ::EQU  N=E ::
* ----------------------------------------------------------------
KK48MPHH FCB          0 (          ) :028A: '%TPS   ' IF MPH > THIS SKIP
*-                      :                   M48
```

```
*-                       :         ::EQU  N=E   ::
* ------------------------------------------------------------------
KK48ENBL FCB          0 (         ) :028B: 'SEC    ' IF CONDITIONS MET <
*-                       :                  THIS TIME SKIP M48
*-                       :         ::EQU  N=E ::
* ------------------------------------------------------------------
KK48O2D  FCB          0 (         ) :028C: 'SEC    ' IF O2 CROSS CTS  >
*-                       :                  THIS, INC M48 TIMER
*-                       :         ::EQU  N=E ::
* ------------------------------------------------------------------
KK48TIM  FCB          0 (         ) :028D: 'SEC    ' IF M48TMR > THIS, SET
*-                       :                  M48
*-                       :         ::EQU  N=E ::

*           MALF 49 PARAMETERS
* ------------------------------------------------------------------
KK49CL0  FCB          0 (         ) :028E: 'VALUE ' IF BLM CELL 0 > CAL
*-                       :                  CHECK FOR VAC LEAK
*-                       :         ::EQU  N=E ::
* ------------------------------------------------------------------
KK49AVG  FCB          0 (         ) :028F: 'VALUE ' IF AVERAGE BLM CELL <
*-                       :                  CAL SET M49
*-                       :         ::EQU  N=E ::

*           MALF 58 PARAMETERS
* ------------------------------------------------------------------
KK58EDGL FCB          0 (         ) :0290: 'EDGES ' IF VATS EDGES < CAL
*-                       :                  IN 100 MSEC- LOOKOUT
*-                       :         ::EQU  N=E ::
* ------------------------------------------------------------------
KK58EDGH FCB          0 (         ) :0291: 'EDGES ' IF VATS EDGES > CAL
*-                       :                  IN 100 MSEC- LOOKOUT
*-                       :         ::EQU  N=E ::
* ------------------------------------------------------------------
KK58CTR  FCB          0 (         ) :0292: 'EDGES ' IF VATS EDGES BAD CTR
*-                       :                  > CAL  LOOKOUT
* LOOKOU T MEANS  SET MALF IF ENGINE RUNNING, ELSE SHUTOFF FUEL
*-                       :         ::EQU  N=E ::

*           MALF 63, 64, 65  PARAMETERS

*  THE ORDER OF THE FOLLOWING EIGHTEEN (18) PARAMETERS MUST BE PRESERVED
* ------------------------------------------------------------------
KKEGRCL  FCB          0 (         ) :0293: 'DEG C.' SKIP ALL EGR SOL
*-                       :                  TESTS IF COOLDEG <= THIS
*-                       :         ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KKEGRO2X FCB          0 (         ) :0294: 'VOLTS ' SKIP EGR SOL TESTS IF
*-                       :                  O2 VOLTAGE <= THIS
*-                       :         ::EQU N=E*226          ::
* ------------------------------------------------------------------
KKEGRCS  FCB          0 (         ) :0295: 'DEG C.' NOT USED
*-                       :         ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KKEGRMHL FCB          0 (         ) :0296: 'RPM    ' DO NOT TEST LARGE EGR
*-                       :                  SOLENOID IF NTRPM > THIS
*-                       :         ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRMHM FCB          0 (         ) :0297: 'RPM    ' DO NOT TEST MEDIUM
```

```
*-                    :               EGR SOLENOID IF NTRPM > THIS
*-                    :        ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRMHS FCB       0 (         ) :0298: 'RPM   ' DO NOT TEST SMALL EGR
*-                    :               SOLENOID IF NTRPM > THIS
*-                    :        ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRMLL FCB       0 (         ) :0299: 'RPM   ' DO NOT TEST LARGE EGR
*-                    :               SOLENOID IF NTRPM < THIS
*-                    :        ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRMLM FCB       0 (         ) :029A: 'RPM   ' DO NOT TEST MEDIUM
*-                    :               EGR SOLENOID IF NTRPM < THIS
*-                    :        ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRMLS FCB       0 (         ) :029B: 'RPM   ' DO NOT TEST SMALL EGR
*-                    :               SOLENOID IF NTRPM < THIS
*-                    :        ::TBL1,NTRPM ::
* ------------------------------------------------------------------
KKEGRTML FCB       0 (         ) :029C: 'SEC   ' TIME LARGE EGR SOL
*-                    :               TEST CONDITIONS MUST BE VALID
*-                    :        ::EQU N=E*80 ::
* ------------------------------------------------------------------
KKEGRTMM FCB       0 (         ) :029D: 'SEC   ' TIME MEDIUM EGR SOL
*-                    :               TEST CONDITIONS MUST BE VALID
*-                    :        ::EQU N=E*80 ::
* ------------------------------------------------------------------
KKEGRTMS FCB       0 (         ) :029E: 'SEC   ' TIME SMALL EGR SOL
*-                    :               TEST CONDITIONS MUST BE VALID
*-                    :        ::EQU N=E*80 ::
* ------------------------------------------------------------------
KKDLRPML FCB       0 (         ) :029F: 'RPM   ' DELTA RPM REQUIRED TO
*-                    :               PASS LARGE EGR SOL. TEST
*-                    :        ::EQU N=E/12.5   ::
* ------------------------------------------------------------------
KKDLRPMM FCB       0 (         ) :02A0: 'RPM   ' DELTA RPM REQUIRED TO
*-                    :               PASS MEDIUM EGR SOL. TEST
*-                    :        ::EQU N=E/12.5   ::
* ------------------------------------------------------------------
KKDLRPMS FCB       0 (         ) :02A1: 'RPM   ' DELTA RPM REQUIRED TO
*-                    :               PASS SMALL EGR SOL. TEST
*-                    :        ::EQU N=E/12.5   ::
* ------------------------------------------------------------------
KKSOLTML FCB       0 (         ) :02A2: 'SEC   ' TIME ALLOWED TO PASS
*-                    :               THE LARGE EGR SOLENOID TEST
*-                    :        ::EQU N=E*80 ::
* ------------------------------------------------------------------
KKSOLTMM FCB       0 (         ) :02A3: 'SEC   ' TIME ALLOWED TO PASS
*-                    :               THE MEDIUM EGR SOLENOID TEST
*-                    :        ::EQU N=E*80 ::
* ------------------------------------------------------------------
KKSOLTMS FCB       0 (         ) :02A4: 'SEC   ' TIME ALLOWED TO PASS
*-                    :               THE SMALL EGR SOLENOID TEST
*-                    :        ::EQU N=E*80 ::
*  THE ORDER OF THE PREVIOUS EIGHTEEN (18) PARAMETERS MUST BE PRESERVED

* ------------------------------------------------------------------
KKSCTRL  FCB       0 (         ) :02A5: 'COUNTS' FLAG M32 WHEN LARGE
*-                    :               EGR SOL. FAILURES > THIS
```

```
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKSCTRM  FCB          0 (          ) :02A6: 'COUNTS' FLAG M32 WHEN MEDIUM
*-                       :                   EGR SOL. FAILURES > THIS
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKSCTRS  FCB          0 (          ) :02A7: 'COUNTS' FLAG M32 WHEN SMALL
*-                       :                   EGR SOL. FAILURES > THIS
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKTSTNML FCB          0 (          ) :02A8: 'COUNTS' RUN LARGE EGR SOL
*-                       :                   TEST THIS MANY TIMES
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKTSTNMM FCB          0 (          ) :02A9: 'COUNTS' RUN MEDIUM EGR SOL
*-                       :                   TEST THIS MANY TIMES
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKTSTNMS FCB          0 (          ) :02AA: 'COUNTS' RUN SMALL EGR SOL
*-                       :                   TEST THIS MANY TIMES
*-                       :            ::EQU N=E ::
* ----------------------------------------------------------------------
KKEGRO2L FCB          0 (          ) :02AB: 'VOLTS ' IF O2 < CAL, COUNT
*-                       :                   TIME TO PASS TEST
*-                       :            ::EQU N=E*226 ::
* ----------------------------------------------------------------------
KKEGRO2T FCB          0 (          ) :02AC: 'SEC   ' IF O2 SENSOR LOW >
*-                       :                   THIS TIME PASS TEST
*-                       :            ::EQU N=E*80 ::
*;;##########################################################
*;;  F18A TABLE   ENGINE RPM VS. DEFAULT VCO COUNTS        #
*;;  TABLE VALUE = MAX. FLOW (OFFSET)                      #
*##########################################################
*-                       :            ::PROTECT ::
*-                       :            ::TBL2D,17,2,TBL1,1,'OFFSET' ::
* ----------------------------------------------------------------------
F18A     FCB         16 (          ) :02AD: '      ' USE 17 VALUE TABLE
*-                       :            ::EQU N=E ::
*-                       :            ::NOPROTECT ::
* ----------------------------------------------------------------------
         FCB          0 (          ) :02AE: 'OFFSET'  400    RPM-SPEED
*-                       :            ::EQU N=E ::
         FCB          0 (          ) :02AF: 'OFFSET'  600
         FCB          0 (          ) :02B0: 'OFFSET'  800
         FCB          0 (          ) :02B1: 'OFFSET' 1000
         FCB          0 (          ) :02B2: 'OFFSET' 1200
         FCB          0 (          ) :02B3: 'OFFSET' 1400
         FCB          0 (          ) :02B4: 'OFFSET' 1600
         FCB          0 (          ) :02B5: 'OFFSET' 1800
         FCB          0 (          ) :02B6: 'OFFSET' 2000
         FCB          0 (          ) :02B7: 'OFFSET' 2200
         FCB          0 (          ) :02B8: 'OFFSET' 2400
         FCB          0 (          ) :02B9: 'OFFSET' 2800
         FCB          0 (          ) :02BA: 'OFFSET' 3200
         FCB          0 (          ) :02BB: 'OFFSET' 3600
         FCB          0 (          ) :02BC: 'OFFSET' 4000
         FCB          0 (          ) :02BD: 'OFFSET' 4400
         FCB          0 (          ) :02BE: 'OFFSET' 4800
```

```
*;;###########################################################
*;;  F18DEF TABLE   ENGINE RPM VS. AIR FLOW IN GM/SEC       #
*###########################################################
*-                      :           ::TBL2D,17,1,TBL1,1,'GM/SEC' ::
* ------------------------------------------------------------------
F18DEF   FCB         0 (          ) :02BF: 'GM/SEC'   400    RPM-SPEED
*-                      :           ::EQU N=E ::
         FCB         0 (          ) :02C0: 'GM/SEC'   600
         FCB         0 (          ) :02C1: 'GM/SEC'   800
         FCB         0 (          ) :02C2: 'GM/SEC'  1000
         FCB         0 (          ) :02C3: 'GM/SEC'  1200
         FCB         0 (          ) :02C4: 'GM/SEC'  1400
         FCB         0 (          ) :02C5: 'GM/SEC'  1600
         FCB         0 (          ) :02C6: 'GM/SEC'  1800
         FCB         0 (          ) :02C7: 'GM/SEC'  2000
         FCB         0 (          ) :02C8: 'GM/SEC'  2200
         FCB         0 (          ) :02C9: 'GM/SEC'  2400
         FCB         0 (          ) :02CA: 'GM/SEC'  2800
         FCB         0 (          ) :02CB: 'GM/SEC'  3200
         FCB         0 (          ) :02CC: 'GM/SEC'  3600
         FCB         0 (          ) :02CD: 'GM/SEC'  4000
         FCB         0 (          ) :02CE: 'GM/SEC'  4400
         FCB         0 (          ) :02CF: 'GM/SEC'  4800
```

201

```
*####################################################################
* F9MALFN  TABLE : MALF NUMBERS                                     #
*  THIS TABLE IS USED TO ASSIGN NUMBERS TO MALF CODES FOR BLINKOUT. #
*####################################################################
* ------------------------------------------------------------------
F9MALFN  FCB      $00 (          ) :02D0: '      ' TABLE OUTPUT = 2
*-                    :                    DIGIT BCD NUMBERS
*-                            FIRST CODE BLINKED IS A 12
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D1: '      ' OXYGEN SENSOR
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D2: '      ' COOLANT SENSOR HIGH
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D3: '      ' COOLANT SENSOR LOW
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D4: '      ' BATTERY VOLATAGE HIGH
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D5: '      ' NOT USED
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D6: '      ' NOT USED
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D7: '      ' NOT USED
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D8: '      ' THROTTLE POSITION
*-                    :                    HIGH
* ------------------------------------------------------------------
         FCB      $00 (          ) :02D9: '      ' THROTTLE POSIITON LOW
* ------------------------------------------------------------------
         FCB      $00 (          ) :02DA: '      ' AIR TEMP SENSOR LOW
* ------------------------------------------------------------------
         FCB      $00 (          ) :02DB: '      ' VEHICLE SPEED SENSOR
*-                    :                    LOW
* ------------------------------------------------------------------
```

202

```
        FCB     $00 (          ) :02DC: '       ' AIR TEMP SENSOR HIGH
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02DD: '       ' QDM
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02DE: '       ' 2ND GEAR SWITCH
*-                  :                  FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02DF: '       ' 3RD GEAR SWITCH
*-                  :                  FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E0: '       ' 4TH GEAR SWITCH
*-                  :                  FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E1: '       ' P/N SWITCH FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E2: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E3: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E4: '       ' MASS AIR FLOW SENSOR
*-                  :                  FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E5: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E6: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E7: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E8: '       ' BRAKE SWITCH FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02E9: '       ' TCC FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02EA: '       ' CAM SENSOR FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02EB: '       ' EST MONITOR ERROR
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02EC: '       ' ESC FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02ED: '       ' O2 LEAN
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02EE: '       ' O2 RICH
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02EF: '       ' POWER STEERING
*-                  :                  PRESSURE SWITCH
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F0: '       ' UART FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F1: '       ' MISFIRE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F2: '       ' VACUUM FAILURE
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F3: '       ' PROM ERROR
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F4: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F5: '       ' NOT USED
* ---------------------------------------------------------------------
        FCB     $00 (          ) :02F6: '       ' NOT USED
* ---------------------------------------------------------------------
```

```
         FCB       $00 (          ) :02F7: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02F8: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02F9: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FA: '      ' VATS FAILURE
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FB: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FC: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FD: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FE: '      ' EGR1 SOLENIOD FAILURE
* -------------------------------------------------------------------
         FCB       $00 (          ) :02FF: '      ' EGR2 SOLENIOD FAILURE
* -------------------------------------------------------------------
         FCB       $00 (          ) :0300: '      ' EGR3 SOLENIOD FAILURE
* -------------------------------------------------------------------
         FCB       $00 (          ) :0301: '      ' RESET
* -------------------------------------------------------------------
         FCB       $00 (          ) :0302: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0303: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0304: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0305: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0306: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0307: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0308: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0309: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030A: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030B: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030C: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030D: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030E: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :030F: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0310: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0311: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0312: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0313: '      ' NOT USED
* -------------------------------------------------------------------
         FCB       $00 (          ) :0314: '      ' NOT USED
```

```
* -----------------------------------------------------------------
         FCB       $00 (           ) :0315: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :0316: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :0317: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :0318: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :0319: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031A: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031B: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031C: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031D: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031E: '       ' NOT USED
* -----------------------------------------------------------------
         FCB       $00 (           ) :031F: '       ' NOT USED
*+DATAEGR ++BLOCK ID++
******************
*  EGR PARAMETERS *                  321
******************
EGRCAL   EQU     *

* -----------------------------------------------------------------
KDEGRHYT FCB         0 (           ) :0320: '% DC  ' DIGITAL EGR % DUTY
*-                   :                       CYCLE HYSTERESIS
*-                   :                ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KEGRHTPS FCB         0 (           ) :0321: '% TPS ' IF TPS <= CAL KEEP
*-                   :                       EGR OFF
*-                   :                ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KEGRLTPS FCB         0 (           ) :0322: '% TPS ' IF TPS <= CAL TURN
*-                   :                       EGR OFF
*-                   :                ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KLV8EGRL FCB         0 (           ) :0323: '% LV8 ' IF IN PE AND LV8 >=
*-                   :                       CAL KEEP EGR OFF
*-                   :                ::EQU N=E        ::
* -----------------------------------------------------------------
KLV8EGRH FCB         0 (           ) :0324: '% LV8 ' IF IN PE AND LV8 >=
*-                   :                       CAL TURN EGR OFF
*-                   :                ::EQU N=E        ::
* -----------------------------------------------------------------
KEGRCOOL FCB         0 (           ) :0325: 'DEG C.' IF STARTUP COOLANT <
*-                   :                       THIS, CHECK COOLANT
*-                   :                ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------------
KEGRWARM FCB         0 (           ) :0326: 'DEG C.' IF ABOVE TRUE AND -
*-                   :                       COOLANT < THIS, 0 EGR
*-                   :                ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------------
KEGR33D  FCB         0 (           ) :0327: 'FLAG  ' 0 USES 1 3D TABLE, <>
*-                   :                       0 USES 3 3D TABLES
```

```
*-                          :              ::EQU N=E ::
* ----------------------------------------------------------------
KALTRPMH FCB          0 (          ) :0328: 'RPM    ' DO NOT CHANGE
*-                          :                     ALTITUDE BIT (NVMW2,B2) IF
*-                          :                     RPM>THIS
*-                          :              ::TBL1,NTRPM ::
* ----------------------------------------------------------------
KALTRPML FCB          0 (          ) :0329: 'RPM    ' DO NOT CHANGE
*-                          :                     ALTITUDE BIT (NVMW2,B2) IF
*-                          :                     RPM<THIS
*-                          :              ::TBL1,NTRPM ::
* ----------------------------------------------------------------
KALTLV8H FCB          0 (          ) :032A: 'COUNTS' DO NOT CHANGE ALT.
*-                          :                     BIT (NVMW2,B2) IF LV8>THIS
*-                          :              ::EQU N=E ::
* ----------------------------------------------------------------
KALTLV8L FCB          0 (          ) :032B: 'COUNTS' DO NOT CHANGE ALT.
*-                          :                     BIT (NVMW2,B2) IF LV8<THIS
*-                          :              ::EQU N=E ::
* ----------------------------------------------------------------
KTPSHYST FCB          0 (          ) :032C: '% TPS ' HYSTERESIS VALUE FOR
*-                          :                     CLEARING ALT. BIT (NVMW2,B2
*-                          :              ::EQU N=E*2.56 ::
* ----------------------------------------------------------------
KALTTMR  FCB          0 (          ) :032D: 'SEC    ' DON'T CHANGE ALT. BIT
*-                          :                     TIL CONDITIONS MET CAL TIM
*-                          :              ::EQU N=E*80   ::
* ----------------------------------------------------------------
KEGRBIAS FCB          0 (          ) :032E: '% DC   ' IF LOW MILAGE BIT SET
*-                          :                     SUBTRACT FROM EGR DUTY CYCLE
*-                          :              ::EQU N=E*2.56 ::    NOTE: NON-GM3X
*-                          :                     SET TO 0  !!!!*¬%¬%$#&%

*#####################################################
*      F74ALT                                        #
*    % TPS VS. AIR TEMPERATURE                       #
*    TABLE VALUE = % * 2.56       (9 VALUES)         #
*#####################################################
*-                          :              ::PROTECT ::
*-                          :              ::TBL2D,9,2,TBL2,1,2,'% TPS' ::
* ----------------------------------------------------------------
F74ALT   FCB          8 (          ) :032F: '       ' USE 9 VALUE TABLE
*-                          :              ::EQU N=E ::
*-                          :              ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB          0 (          ) :0330: '% TPS '   -40  DEG C-TEMP
*-                          :              ::EQU N=E*2.56 ::
         FCB          0 (          ) :0331: '% TPS '   -16
         FCB          0 (          ) :0332: '% TPS '     8
         FCB          0 (          ) :0333: '% TPS '    32
         FCB          0 (          ) :0334: '% TPS '    56
         FCB          0 (          ) :0335: '% TPS '    80
         FCB          0 (          ) :0336: '% TPS '   104
         FCB          0 (          ) :0337: '% TPS '   128
         FCB          0 (          ) :0338: '% TPS '   152

*#####################################################
*      F74EGR                                        #
*    EGRDC MULTIPLIER VS. LV8                        #
```

```
*    TABLE VALUE = 0 - 2 MULTIPLIER (9 VALUES)       #
*####################################################
*-                       :          ::PROTECT ::
*-                       :          ::TBL2D,9,2,TBL20,1,2,'FACTOR' ::
* ----------------------------------------------------------------
F74EGR   FCB         8 (          ) :0339: '        ' USE 9 VALUE TABLE
*-                       :          ::EQU N=E ::
*-                       :          ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB         0 (          ) :033A: 'FACTOR'    00    LV8-LOAD
*-                       :          ::EQU N=E*128 ::
         FCB         0 (          ) :033B: 'FACTOR'    32
         FCB         0 (          ) :033C: 'FACTOR'    64
         FCB         0 (          ) :033D: 'FACTOR'    96
         FCB         0 (          ) :033E: 'FACTOR'   128
         FCB         0 (          ) :033F: 'FACTOR'   160
         FCB         0 (          ) :0340: 'FACTOR'   192
         FCB         0 (          ) :0341: 'FACTOR'   224
         FCB         0 (          ) :0342: 'FACTOR'   256

*####################################################
*     F75NOEGR TABLE                                 #
*    EGR DISABLE TIME VS. START-UP COOLANT TEMP      #
*    TABLE VALUE = SEC / 2       (9 VALUES)          #
*####################################################
*-                       :          ::TBL2D,9,1,TBL2,1,2,'SEC' ::
* ----------------------------------------------------------------
F75NOEGR FCB         0 (          ) :0343: 'SEC    '   -40   DEG C-TEMP
*-                       :          ::EQU N=E/2 ::
         FCB         0 (          ) :0344: 'SEC    '   -16
         FCB         0 (          ) :0345: 'SEC    '     8
         FCB         0 (          ) :0346: 'SEC    '    32
         FCB         0 (          ) :0347: 'SEC    '    56
         FCB         0 (          ) :0348: 'SEC    '    80
         FCB         0 (          ) :0349: 'SEC    '   104
         FCB         0 (          ) :034A: 'SEC    '   128
         FCB         0 (          ) :034B: 'SEC    '   152


******************************
*     EGR DUTY CYCLE TABLE   *
******************************
*-                       :          ::TBL3D,9,13,TBL19,4,1,TBL20,5,1,'%
*-                       :                DC' ::
*-                       :          ::PROTECT ::
* ----------------------------------------------------------------
F76A     FCB        16 (          ) :034C: '        ' **RMIN; RPM MIN
* ----------------------------------------------------------------
         FCB        64 (          ) :034D: '        ' **QMIN; LOAD MIN
* ----------------------------------------------------------------
         FCB        13 (          ) :034E: '        ' RNUM = 13
*-                       :          ::NOPROTECT ::
*  600 RPM

* ------------------------------------------- SPEED         600 RPM
         FCB         0 (          ) :034F: '% DC '    64    LV8-LOAD
*-                       :          ::EQU N=E*2.55 ::
         FCB         0 (          ) :0350: '% DC '    80
```

33 DC
345
345
335
351

```
        FCB         0 (            ) :0351:  '%  DC '     96
        FCB         0 (            ) :0352:  '%  DC '    112
        FCB         0 (            ) :0353:  '%  DC '    128
        FCB         0 (            ) :0354:  '%  DC '    144
        FCB         0 (            ) :0355:  '%  DC '    160
        FCB         0 (            ) :0356:  '%  DC '    176
        FCB         0 (            ) :0357:  '%  DC '    192
        FCB         0 (            ) :0358:  '%  DC '    208
        FCB         0 (            ) :0359:  '%  DC '    224
        FCB         0 (            ) :035A:  '%  DC '    240
        FCB         0 (            ) :035B:  '%  DC '    256

*  -------------------------------------------- SPEED        800 RPM
        FCB         0 (            ) :035C:  '%  DC '     64     LV8-LOAD
        FCB         0 (            ) :035D:  '%  DC '     80
        FCB         0 (            ) :035E:  '%  DC '     96
        FCB         0 (            ) :035F:  '%  DC '    112
        FCB         0 (            ) :0360:  '%  DC '    128
        FCB         0 (            ) :0361:  '%  DC '    144
        FCB         0 (            ) :0362:  '%  DC '    160
        FCB         0 (            ) :0363:  '%  DC '    176
        FCB         0 (            ) :0364:  '%  DC '    192
        FCB         0 (            ) :0365:  '%  DC '    208
        FCB         0 (            ) :0366:  '%  DC '    224
        FCB         0 (            ) :0367:  '%  DC '    240
        FCB         0 (            ) :0368:  '%  DC '    256

*  -------------------------------------------- SPEED       1000 RPM
        FCB         0 (            ) :0369:  '%  DC '     64     LV8-LOAD
        FCB         0 (            ) :036A:  '%  DC '     80
        FCB         0 (            ) :036B:  '%  DC '     96
        FCB         0 (            ) :036C:  '%  DC '    112
        FCB         0 (            ) :036D:  '%  DC '    128
        FCB         0 (            ) :036E:  '%  DC '    144
        FCB         0 (            ) :036F:  '%  DC '    160
        FCB         0 (            ) :0370:  '%  DC '    176
        FCB         0 (            ) :0371:  '%  DC '    192
        FCB         0 (            ) :0372:  '%  DC '    208
        FCB         0 (            ) :0373:  '%  DC '    224
        FCB         0 (            ) :0374:  '%  DC '    240
        FCB         0 (            ) :0375:  '%  DC '    256

*  -------------------------------------------- SPEED       1200 RPM
        FCB         0 (            ) :0376:  '%  DC '     64     LV8-LOAD
        FCB         0 (            ) :0377:  '%  DC '     80
        FCB         0 (            ) :0378:  '%  DC '     96
        FCB         0 (            ) :0379:  '%  DC '    112
        FCB         0 (            ) :037A:  '%  DC '    128
        FCB         0 (            ) :037B:  '%  DC '    144
        FCB         0 (            ) :037C:  '%  DC '    160
        FCB         0 (            ) :037D:  '%  DC '    176
        FCB         0 (            ) :037E:  '%  DC '    192
        FCB         0 (            ) :037F:  '%  DC '    208
        FCB         0 (            ) :0380:  '%  DC '    224
        FCB         0 (            ) :0381:  '%  DC '    240
        FCB         0 (            ) :0382:  '%  DC '    256
```

```
* ---------------------------------------------- SPEED        1400 RPM
     FCB         0 (          ) :0383: '%  DC '    64       LV8-LOAD
     FCB         0 (          ) :0384: '%  DC '    80
     FCB         0 (          ) :0385: '%  DC '    96
     FCB         0 (          ) :0386: '%  DC '   112
     FCB         0 (          ) :0387: '%  DC '   128
     FCB         0 (          ) :0388: '%  DC '   144
     FCB         0 (          ) :0389: '%  DC '   160
     FCB         0 (          ) :038A: '%  DC '   176
     FCB         0 (          ) :038B: '%  DC '   192
     FCB         0 (          ) :038C: '%  DC '   208
     FCB         0 (          ) :038D: '%  DC '   224
     FCB         0 (          ) :038E: '%  DC '   240
     FCB         0 (          ) :038F: '%  DC '   256

* ---------------------------------------------- SPEED        1600 RPM
     FCB         0 (          ) :0390: '%  DC '    64       LV8-LOAD
     FCB         0 (          ) :0391: '%  DC '    80
     FCB         0 (          ) :0392: '%  DC '    96
     FCB         0 (          ) :0393: '%  DC '   112
     FCB         0 (          ) :0394: '%  DC '   128
     FCB         0 (          ) :0395: '%  DC '   144
     FCB         0 (          ) :0396: '%  DC '   160
     FCB         0 (          ) :0397: '%  DC '   176
     FCB         0 (          ) :0398: '%  DC '   192
     FCB         0 (          ) :0399: '%  DC '   208
     FCB         0 (          ) :039A: '%  DC '   224
     FCB         0 (          ) :039B: '%  DC '   240
     FCB         0 (          ) :039C: '%  DC '   256

* ---------------------------------------------- SPEED        1800 RPM
     FCB         0 (          ) :039D: '%  DC '    64       LV8-LOAD
     FCB         0 (          ) :039E: '%  DC '    80
     FCB         0 (          ) :039F: '%  DC '    96
     FCB         0 (          ) :03A0: '%  DC '   112
     FCB         0 (          ) :03A1: '%  DC '   128
     FCB         0 (          ) :03A2: '%  DC '   144
     FCB         0 (          ) :03A3: '%  DC '   160
     FCB         0 (          ) :03A4: '%  DC '   176
     FCB         0 (          ) :03A5: '%  DC '   192
     FCB         0 (          ) :03A6: '%  DC '   208
     FCB         0 (          ) :03A7: '%  DC '   224
     FCB         0 (          ) :03A8: '%  DC '   240
     FCB         0 (          ) :03A9: '%  DC '   256

* ---------------------------------------------- SPEED        2000 RPM
     FCB         0 (          ) :03AA: '%  DC '    64       LV8-LOAD
     FCB         0 (          ) :03AB: '%  DC '    80
     FCB         0 (          ) :03AC: '%  DC '    96
     FCB         0 (          ) :03AD: '%  DC '   112
     FCB         0 (          ) :03AE: '%  DC '   128
     FCB         0 (          ) :03AF: '%  DC '   144
     FCB         0 (          ) :03B0: '%  DC '   160
     FCB         0 (          ) :03B1: '%  DC '   176
     FCB         0 (          ) :03B2: '%  DC '   192
```

```
        FCB          0 (          ) :03B3: '%  DC '   208
        FCB          0 (          ) :03B4: '%  DC '   224
        FCB          0 (          ) :03B5: '%  DC '   240
        FCB          0 (          ) :03B6: '%  DC '   256

* ---------------------------------------------- SPEED        2200 RPM
        FCB          0 (          ) :03B7: '%  DC '    64    LV8-LOAD
        FCB          0 (          ) :03B8: '%  DC '    80
        FCB          0 (          ) :03B9: '%  DC '    96
        FCB          0 (          ) :03BA: '%  DC '   112
        FCB          0 (          ) :03BB: '%  DC '   128
        FCB          0 (          ) :03BC: '%  DC '   144
        FCB          0 (          ) :03BD: '%  DC '   160
        FCB          0 (          ) :03BE: '%  DC '   176
        FCB          0 (          ) :03BF: '%  DC '   192
        FCB          0 (          ) :03C0: '%  DC '   208
        FCB          0 (          ) :03C1: '%  DC '   224
        FCB          0 (          ) :03C2: '%  DC '   240
        FCB          0 (          ) :03C3: '%  DC '   256

***************************************************
*     EGR DUTY CYCLE TABLE - LOCKED, IN 3RD GEAR  *
***************************************************
*-                    :          ::TBL3D,9,13,TBL19,4,1,TBL20,5,1,'%
*-                    :                 DC' ::
*-                    :          ::PROTECT ::
* ------------------------------------------------------------------
F76A3   FCB         16 (          ) :03C4: '      ' **RMIN; RPM MIN
* ------------------------------------------------------------------
        FCB         64 (          ) :03C5: '      ' **QMIN; LOAD MIN
* ------------------------------------------------------------------
        FCB         13 (          ) :03C6: '      ' RNUM = 13
*-                    :          ::NOPROTECT ::
*  600 RPM

* ---------------------------------------------- SPEED         600 RPM
        FCB          0 (          ) :03C7: '%  DC '    64    LV8-LOAD
*-                    :          ::EQU N=E*2.55 ::
        FCB          0 (          ) :03C8: '%  DC '    80
        FCB          0 (          ) :03C9: '%  DC '    96
        FCB          0 (          ) :03CA: '%  DC '   112
        FCB          0 (          ) :03CB: '%  DC '   128
        FCB          0 (          ) :03CC: '%  DC '   144
        FCB          0 (          ) :03CD: '%  DC '   160
        FCB          0 (          ) :03CE: '%  DC '   176
        FCB          0 (          ) :03CF: '%  DC '   192
        FCB          0 (          ) :03D0: '%  DC '   208
        FCB          0 (          ) :03D1: '%  DC '   224
        FCB          0 (          ) :03D2: '%  DC '   240
        FCB          0 (          ) :03D3: '%  DC '   256

* ---------------------------------------------- SPEED         800 RPM
        FCB          0 (          ) :03D4: '%  DC '    64    LV8-LOAD
        FCB          0 (          ) :03D5: '%  DC '    80
        FCB          0 (          ) :03D6: '%  DC '    96
        FCB          0 (          ) :03D7: '%  DC '   112
        FCB          0 (          ) :03D8: '%  DC '   128
```

```
          FCB       0 (        ) :03D9: '%  DC '    144
          FCB       0 (        ) :03DA: '%  DC '    160
          FCB       0 (        ) :03DB: '%  DC '    176
          FCB       0 (        ) :03DC: '%  DC '    192
          FCB       0 (        ) :03DD: '%  DC '    208
          FCB       0 (        ) :03DE: '%  DC '    224
          FCB       0 (        ) :03DF: '%  DC '    240
          FCB       0 (        ) :03E0: '%  DC '    256

* ---------------------------------------- SPEED         1000 RPM
          FCB       0 (        ) :03E1: '%  DC '     64   LV8-LOAD
          FCB       0 (        ) :03E2: '%  DC '     80
          FCB       0 (        ) :03E3: '%  DC '     96
          FCB       0 (        ) :03E4: '%  DC '    112
          FCB       0 (        ) :03E5: '%  DC '    128
          FCB       0 (        ) :03E6: '%  DC '    144
          FCB       0 (        ) :03E7: '%  DC '    160
          FCB       0 (        ) :03E8: '%  DC '    176
          FCB       0 (        ) :03E9: '%  DC '    192
          FCB       0 (        ) :03EA: '%  DC '    208
          FCB       0 (        ) :03EB: '%  DC '    224
          FCB       0 (        ) :03EC: '%  DC '    240
          FCB       0 (        ) :03ED: '%  DC '    256

* ---------------------------------------- SPEED         1200 RPM
          FCB       0 (        ) :03EE: '%  DC '     64   LV8-LOAD
          FCB       0 (        ) :03EF: '%  DC '     80
          FCB       0 (        ) :03F0: '%  DC '     96
          FCB       0 (        ) :03F1: '%  DC '    112
          FCB       0 (        ) :03F2: '%  DC '    128
          FCB       0 (        ) :03F3: '%  DC '    144
          FCB       0 (        ) :03F4: '%  DC '    160
          FCB       0 (        ) :03F5: '%  DC '    176
          FCB       0 (        ) :03F6: '%  DC '    192
          FCB       0 (        ) :03F7: '%  DC '    208
          FCB       0 (        ) :03F8: '%  DC '    224
          FCB       0 (        ) :03F9: '%  DC '    240
          FCB       0 (        ) :03FA: '%  DC '    256

* ---------------------------------------- SPEED         1400 RPM
          FCB       0 (        ) :03FB: '%  DC '     64   LV8-LOAD
          FCB       0 (        ) :03FC: '%  DC '     80
          FCB       0 (        ) :03FD: '%  DC '     96
          FCB       0 (        ) :03FE: '%  DC '    112
          FCB       0 (        ) :03FF: '%  DC '    128
          FCB       0 (        ) :0400: '%  DC '    144
          FCB       0 (        ) :0401: '%  DC '    160
          FCB       0 (        ) :0402: '%  DC '    176
          FCB       0 (        ) :0403: '%  DC '    192
          FCB       0 (        ) :0404: '%  DC '    208
          FCB       0 (        ) :0405: '%  DC '    224
          FCB       0 (        ) :0406: '%  DC '    240
          FCB       0 (        ) :0407: '%  DC '    256

* ---------------------------------------- SPEED         1600 RPM
```

```
          FCB        0 (           ) :0408: '%  DC '    64    LV8-LOAD
          FCB        0 (           ) :0409: '%  DC '    80
          FCB        0 (           ) :040A: '%  DC '    96
          FCB        0 (           ) :040B: '%  DC '   112
          FCB        0 (           ) :040C: '%  DC '   128
          FCB        0 (           ) :040D: '%  DC '   144
          FCB        0 (           ) :040E: '%  DC '   160
          FCB        0 (           ) :040F: '%  DC '   176
          FCB        0 (           ) :0410: '%  DC '   192
          FCB        0 (           ) :0411: '%  DC '   208
          FCB        0 (           ) :0412: '%  DC '   224
          FCB        0 (           ) :0413: '%  DC '   240
          FCB        0 (           ) :0414: '%  DC '   256

* ------------------------------------------------ SPEED    1800 RPM
          FCB        0 (           ) :0415: '%  DC '    64    LV8-LOAD
          FCB        0 (           ) :0416: '%  DC '    80
          FCB        0 (           ) :0417: '%  DC '    96
          FCB        0 (           ) :0418: '%  DC '   112
          FCB        0 (           ) :0419: '%  DC '   128
          FCB        0 (           ) :041A: '%  DC '   144
          FCB        0 (           ) :041B: '%  DC '   160
          FCB        0 (           ) :041C: '%  DC '   176
          FCB        0 (           ) :041D: '%  DC '   192
          FCB        0 (           ) :041E: '%  DC '   208
          FCB        0 (           ) :041F: '%  DC '   224
          FCB        0 (           ) :0420: '%  DC '   240
          FCB        0 (           ) :0421: '%  DC '   256

* ------------------------------------------------ SPEED    2000 RPM
          FCB        0 (           ) :0422: '%  DC '    64    LV8-LOAD
          FCB        0 (           ) :0423: '%  DC '    80
          FCB        0 (           ) :0424: '%  DC '    96
          FCB        0 (           ) :0425: '%  DC '   112
          FCB        0 (           ) :0426: '%  DC '   128
          FCB        0 (           ) :0427: '%  DC '   144
          FCB        0 (           ) :0428: '%  DC '   160
          FCB        0 (           ) :0429: '%  DC '   176
          FCB        0 (           ) :042A: '%  DC '   192
          FCB        0 (           ) :042B: '%  DC '   208
          FCB        0 (           ) :042C: '%  DC '   224
          FCB        0 (           ) :042D: '%  DC '   240
          FCB        0 (           ) :042E: '%  DC '   256

* ------------------------------------------------ SPEED    2200 RPM
          FCB        0 (           ) :042F: '%  DC '    64    LV8-LOAD
          FCB        0 (           ) :0430: '%  DC '    80
          FCB        0 (           ) :0431: '%  DC '    96
          FCB        0 (           ) :0432: '%  DC '   112
          FCB        0 (           ) :0433: '%  DC '   128
          FCB        0 (           ) :0434: '%  DC '   144
          FCB        0 (           ) :0435: '%  DC '   160
          FCB        0 (           ) :0436: '%  DC '   176
          FCB        0 (           ) :0437: '%  DC '   192
          FCB        0 (           ) :0438: '%  DC '   208
          FCB        0 (           ) :0439: '%  DC '   224
```

```
        FCB          0 (          ) :043A: '%  DC '    240
        FCB          0 (          ) :043B: '%  DC '    256

*****************************************************
*     EGR DUTY CYCLE TABLE  -  TCC LOCKED, IN 4TH GEAR  *
*****************************************************
*-                    :           ::TBL3D,9,13,TBL19,4,1,TBL20,5,1,'%
*-                    :                   DC' ::
*-                    :           ::PROTECT ::
* ------------------------------------------------------------
F76A4   FCB         16 (          ) :043C: '       ' **RMIN; RPM MIN
* ------------------------------------------------------------
        FCB         64 (          ) :043D: '       ' **QMIN; LOAD MIN
* ------------------------------------------------------------
        FCB         13 (          ) :043E: '       ' RNUM = 13
*-                    :           ::NOPROTECT ::
*  600 RPM

* ---------------------------------------- SPEED        600 RPM
        FCB          0 (          ) :043F: '%  DC '     64    LV8-LOAD
*-                    :           ::EQU N=E*2.55 ::
        FCB          0 (          ) :0440: '%  DC '     80
        FCB          0 (          ) :0441: '%  DC '     96
        FCB          0 (          ) :0442: '%  DC '    112
        FCB          0 (          ) :0443: '%  DC '    128
        FCB          0 (          ) :0444: '%  DC '    144
        FCB          0 (          ) :0445: '%  DC '    160
        FCB          0 (          ) :0446: '%  DC '    176
        FCB          0 (          ) :0447: '%  DC '    192
        FCB          0 (          ) :0448: '%  DC '    208
        FCB          0 (          ) :0449: '%  DC '    224
        FCB          0 (          ) :044A: '%  DC '    240
        FCB          0 (          ) :044B: '%  DC '    256

* ---------------------------------------- SPEED        800 RPM
        FCB          0 (          ) :044C: '%  DC '     64    LV8-LOAD
        FCB          0 (          ) :044D: '%  DC '     80
        FCB          0 (          ) :044E: '%  DC '     96
        FCB          0 (          ) :044F: '%  DC '    112
        FCB          0 (          ) :0450: '%  DC '    128
        FCB          0 (          ) :0451: '%  DC '    144
        FCB          0 (          ) :0452: '%  DC '    160
        FCB          0 (          ) :0453: '%  DC '    176
        FCB          0 (          ) :0454: '%  DC '    192
        FCB          0 (          ) :0455: '%  DC '    208
        FCB          0 (          ) :0456: '%  DC '    224
        FCB          0 (          ) :0457: '%  DC '    240
        FCB          0 (          ) :0458: '%  DC '    256

* ---------------------------------------- SPEED       1000 RPM
        FCB          0 (          ) :0459: '%  DC '     64    LV8-LOAD
        FCB          0 (          ) :045A: '%  DC '     80
        FCB          0 (          ) :045B: '%  DC '     96
        FCB          0 (          ) :045C: '%  DC '    112
        FCB          0 (          ) :045D: '%  DC '    128
        FCB          0 (          ) :045E: '%  DC '    144
        FCB          0 (          ) :045F: '%  DC '    160
```

```
        FCB         0 (            ) :0460: '%  DC '    176
        FCB         0 (            ) :0461: '%  DC '    192
        FCB         0 (            ) :0462: '%  DC '    208
        FCB         0 (            ) :0463: '%  DC '    224
        FCB         0 (            ) :0464: '%  DC '    240
        FCB         0 (            ) :0465: '%  DC '    256

* ---------------------------------------------- SPEED        1200 RPM
        FCB         0 (            ) :0466: '%  DC '     64  LV8-LOAD
        FCB         0 (            ) :0467: '%  DC '     80
        FCB         0 (            ) :0468: '%  DC '     96
        FCB         0 (            ) :0469: '%  DC '    112
        FCB         0 (            ) :046A: '%  DC '    128
        FCB         0 (            ) :046B: '%  DC '    144
        FCB         0 (            ) :046C: '%  DC '    160
        FCB         0 (            ) :046D: '%  DC '    176
        FCB         0 (            ) :046E: '%  DC '    192
        FCB         0 (            ) :046F: '%  DC '    208
        FCB         0 (            ) :0470: '%  DC '    224
        FCB         0 (            ) :0471: '%  DC '    240
        FCB         0 (            ) :0472: '%  DC '    256

* ---------------------------------------------- SPEED        1400 RPM
        FCB         0 (            ) :0473: '%  DC '     64  LV8-LOAD
        FCB         0 (            ) :0474: '%  DC '     80
        FCB         0 (            ) :0475: '%  DC '     96
        FCB         0 (            ) :0476: '%  DC '    112
        FCB         0 (            ) :0477: '%  DC '    128
        FCB         0 (            ) :0478: '%  DC '    144
        FCB         0 (            ) :0479: '%  DC '    160
        FCB         0 (            ) :047A: '%  DC '    176
        FCB         0 (            ) :047B: '%  DC '    192
        FCB         0 (            ) :047C: '%  DC '    208
        FCB         0 (            ) :047D: '%  DC '    224
        FCB         0 (            ) :047E: '%  DC '    240
        FCB         0 (            ) :047F: '%  DC '    256

* ---------------------------------------------- SPEED        1600 RPM
        FCB         0 (            ) :0480: '%  DC '     64  LV8-LOAD
        FCB         0 (            ) :0481: '%  DC '     80
        FCB         0 (            ) :0482: '%  DC '     96
        FCB         0 (            ) :0483: '%  DC '    112
        FCB         0 (            ) :0484: '%  DC '    128
        FCB         0 (            ) :0485: '%  DC '    144
        FCB         0 (            ) :0486: '%  DC '    160
        FCB         0 (            ) :0487: '%  DC '    176
        FCB         0 (            ) :0488: '%  DC '    192
        FCB         0 (            ) :0489: '%  DC '    208
        FCB         0 (            ) :048A: '%  DC '    224
        FCB         0 (            ) :048B: '%  DC '    240
        FCB         0 (            ) :048C: '%  DC '    256

* ---------------------------------------------- SPEED        1800 RPM
        FCB         0 (            ) :048D: '%  DC '     64  LV8-LOAD
        FCB         0 (            ) :048E: '%  DC '     80
```

```
         FCB        0 (          ) :048F: '%  DC '   96
         FCB        0 (          ) :0490: '%  DC '  112
         FCB        0 (          ) :0491: '%  DC '  128
         FCB        0 (          ) :0492: '%  DC '  144
         FCB        0 (          ) :0493: '%  DC '  160
         FCB        0 (          ) :0494: '%  DC '  176
         FCB        0 (          ) :0495: '%  DC '  192
         FCB        0 (          ) :0496: '%  DC '  208
         FCB        0 (          ) :0497: '%  DC '  224
         FCB        0 (          ) :0498: '%  DC '  240
         FCB        0 (          ) :0499: '%  DC '  256

* ---------------------------------------------- SPEED      2000 RPM
         FCB        0 (          ) :049A: '%  DC '   64     LV8-LOAD
         FCB        0 (          ) :049B: '%  DC '   80
         FCB        0 (          ) :049C: '%  DC '   96
         FCB        0 (          ) :049D: '%  DC '  112
         FCB        0 (          ) :049E: '%  DC '  128
         FCB        0 (          ) :049F: '%  DC '  144
         FCB        0 (          ) :04A0: '%  DC '  160
         FCB        0 (          ) :04A1: '%  DC '  176
         FCB        0 (          ) :04A2: '%  DC '  192
         FCB        0 (          ) :04A3: '%  DC '  208
         FCB        0 (          ) :04A4: '%  DC '  224
         FCB        0 (          ) :04A5: '%  DC '  240
         FCB        0 (          ) :04A6: '%  DC '  256

* ---------------------------------------------- SPEED      2200 RPM
         FCB        0 (          ) :04A7: '%  DC '   64     LV8-LOAD
         FCB        0 (          ) :04A8: '%  DC '   80
         FCB        0 (          ) :04A9: '%  DC '   96
         FCB        0 (          ) :04AA: '%  DC '  112
         FCB        0 (          ) :04AB: '%  DC '  128
         FCB        0 (          ) :04AC: '%  DC '  144
         FCB        0 (          ) :04AD: '%  DC '  160
         FCB        0 (          ) :04AE: '%  DC '  176
         FCB        0 (          ) :04AF: '%  DC '  192
         FCB        0 (          ) :04B0: '%  DC '  208
         FCB        0 (          ) :04B1: '%  DC '  224
         FCB        0 (          ) :04B2: '%  DC '  240
         FCB        0 (          ) :04B3: '%  DC '  256

*************************************************
*   EGR DUTY CYCLE MULTIPLIER (0-2) VS. COOLANT   *
*************************************************
*-                     :          ::TBL2D,9,TBL2,5,1,'GAIN' ::
* ----------------------------------------------------------------
F77B     FCB        0 (          ) :04B4: 'GAIN  '    8  DEG C-TEMP
*-                     :          ::EQU N=E*128 ::
         FCB        0 (          ) :04B5: 'GAIN  '   20
         FCB        0 (          ) :04B6: 'GAIN  '   32
         FCB        0 (          ) :04B7: 'GAIN  '   44
         FCB        0 (          ) :04B8: 'GAIN  '   56
         FCB        0 (          ) :04B9: 'GAIN  '   68
         FCB        0 (          ) :04BA: 'GAIN  '   80
         FCB        0 (          ) :04BB: 'GAIN  '   92
         FCB        0 (          ) :04BC: 'GAIN  '  104
```

~~4B7~~
AB6

```
*****************************************************************
*   EGR DUTY CYCLE MULTIPLIER (0-2) VS. LOAD - IN 4TH, TCC LOCKED  *
*****************************************************************
*-                        :           ::TBL2D,13,TBLX,1,'GAIN' ::
* ------------------------------------------------------------------
F78A1     FCB          0 (          ) :04BD: 'GAIN  ' 64 LV8
*-                        :           ::EQU N=E*128 ::
          FCB          0 (          ) :04BE: 'GAIN  ' 80 CTS
          FCB          0 (          ) :04BF: 'GAIN  ' 96
          FCB          0 (          ) :04C0: 'GAIN  ' 112
          FCB          0 (          ) :04C1: 'GAIN  ' 128
          FCB          0 (          ) :04C2: 'GAIN  ' 144
          FCB          0 (          ) :04C3: 'GAIN  ' 160
          FCB          0 (          ) :04C4: 'GAIN  ' 176
          FCB          0 (          ) :04C5: 'GAIN  ' 192
          FCB          0 (          ) :04C6: 'GAIN  ' 208
          FCB          0 (          ) :04C7: 'GAIN  ' 224
          FCB          0 (          ) :04C8: 'GAIN  ' 240
          FCB          0 (          ) :04C9: 'GAIN  ' 256

*****************************************************************
*   EGR DUTY CYCLE MULTIPLIER (0-2) VS. LOAD - IN 3RD, TCC LOCKED  *
*****************************************************************
*-                        :           ::TBL2D,13,TBLX,1,'GAIN' ::
* ------------------------------------------------------------------
F78B      FCB          0 (          ) :04CA: 'GAIN  ' 64 LV8
*-                        :           ::EQU N=E*128 ::
          FCB          0 (          ) :04CB: 'GAIN  ' 80 CTS
          FCB          0 (          ) :04CC: 'GAIN  ' 96
          FCB          0 (          ) :04CD: 'GAIN  ' 112
          FCB          0 (          ) :04CE: 'GAIN  ' 128
          FCB          0 (          ) :04CF: 'GAIN  ' 144
          FCB          0 (          ) :04D0: 'GAIN  ' 160
          FCB          0 (          ) :04D1: 'GAIN  ' 176
          FCB          0 (          ) :04D2: 'GAIN  ' 192
          FCB          0 (          ) :04D3: 'GAIN  ' 208
          FCB          0 (          ) :04D4: 'GAIN  ' 224
          FCB          0 (          ) :04D5: 'GAIN  ' 240
          FCB          0 (          ) :04D6: 'GAIN  ' 256
*+DATACCP ++BLOCK ID++

*****************************************
*   CANISTER PURGE PARAMETERS           *
*****************************************

CCPCAL    EQU       *
* ------------------------------------------------------------------
KCCPTM    FDB          0 (          ) :04D7: 'SEC    ' KEEP PURGE OFF UNTIL
*-                        :                   THIS ERUN TIME(COOL)
*-                        :           ::EQU N=E ::
* ------------------------------------------------------------------
KCCPTMH   FDB          0 (          ) :04D9: 'SEC    ' KEEP PURGE OFF UNTIL
*-                        :                   THIS ERUN TIME(WARM)
*-                        :           ::EQU N=E ::
* ------------------------------------------------------------------
KTIMCOOL  FCB          0 (          ) :04DB: 'DEG C ' COOLANT THRESHOLD
*-                        :                   SELECTS TIME ABOVE
*-                        :           ::EQU N=(E+40)*256/192::
* ------------------------------------------------------------------
```

4BF

4D9

```
KCCPTMP  FCB          0 (          ) :04DC: 'DEG C ' IF COOLANT< THIS TURN
*-                      :                     OFF PURGE
*-                      :              ::EQU N=(E+40)*256/192::
* -----------------------------------------------------------------------
KCCPSLEW FCB          0 (          ) :04DD: '%      ' Q VALUE FOR FILTERING
*-                      :                     CCP DUTY CYCLE
*-                      :              ::EQU N=E*2.56   ::
* -----------------------------------------------------------------------
KCCPOFST FCB          0 (          ) :04DE: 'OFFSET' OFFSET FOR CCP/NONCCP
*-                      :                     BLM DIFFERENCE
*-                      :              ::EQU N=E*256 ::
* -----------------------------------------------------------------------
KCCPDC   FCB          0 (          ) :04DF: 'MULT  ' 0-1 MULTIPLIER OF CCP
*-                      :                     /NONCCP BLM DIFFERENCE
*-                      :              ::EQU N=E*256 ::

*  THE FOLLOWING THREE PAIRS OF PARAMETERS MUST REMAIN IN ORDER  *

* -----------------------------------------------------------------------
KCPVST1  FCB          0 (          ) :04E0: 'MPH   ' IF MPH < CAL, KEEP
*-                      :                     CCP OFF (UPPER    )1        4E2
*-                      :              ::EQU N=E*16/5 ::
* -----------------------------------------------------------------------
KCPVST2  FCB          0 (          ) :04E1: 'MPH   ' IF MPH < CAL, TURN
*-                      :                     CCP OFF (LOWER    )2
*-                      :              ::EQU N=E*16/5 ::
* -----------------------------------------------------------------------
KCCPTPSU FCB          0 (          ) :04E2: '%      ' IF TPS < CAL, KEEP
*-                      :                     CCP OFF
*-                      :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------
KCCPTPSL FCB          0 (          ) :04E3: '%      ' IF TPS < CAL, TURN
*-                      :                     CCP OFF
*-                      :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------
KHITPSU  FCB          0 (          ) :04E4: '%      ' IF TPS >= CAL, KEEP
*-                      :                     CCP OFF
*-                      :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------
KHITPSL  FCB          0 (          ) :04E5: '%      ' IF TPS >= CAL, TURN
*-                      :                     CCP OFF
*-                      :              ::EQU N=E*2.56 ::

*  THE PREVIOUS THREE PAIRS OF PARAMETERS MUST REMAIN IN ORDER  *

*#################################################################
*                                                               #
*    F73  TABLE   -  CCP DUTY CYCLE TABLE                       #
*   TABLE VALUE = % DC * 2.55               (17 VALUES)         #
*                                                               #
*#################################################################
*-                      :              ::TBL2DL,17,2,TBLX,1,'%      ' ::
* -----------------------------------------------------------------------
F73B     FCB          0 (          ) :04E6: '       ' LOAD SELECTOR
*-                      :                     (0=AIRFLOW, 1=LV8)
* -----------------------------------------------------------------------
         FCB          0 (          ) :04E7: '%      ' 0  GM/SEC    0
*-                      :                     COUNTS
*-                      :              ::EQU N=E*2.55 ::
```

```
          FCB          0 (          ) :04E8: '%      ' 4  CCP      16
          FCB          0 (          ) :04E9: '%      ' 8           32
          FCB          0 (          ) :04EA: '%      ' 12          48
          FCB          0 (          ) :04EB: '%      ' 16          64
          FCB          0 (          ) :04EC: '%      ' 20          80
          FCB          0 (          ) :04ED: '%      ' 24          96
          FCB          0 (          ) :04EE: '%      ' 28          112
          FCB          0 (          ) :04EF: '%      ' 32          128
          FCB          0 (          ) :04F0: '%      ' 36          144
          FCB          0 (          ) :04F1: '%      ' 40          160
          FCB          0 (          ) :04F2: '%      ' 44          176
          FCB          0 (          ) :04F3: '%      ' 48          192
          FCB          0 (          ) :04F4: '%      ' 52          208
          FCB          0 (          ) :04F5: '%      ' 56          224
          FCB          0 (          ) :04F6: '%      ' 60          240
          FCB          0 (          ) :04F7: '%      ' 64          256
*+DATATCC ++BLOCK ID++                04F9

*********************************************
*   TRANSMISSION LOCKUP PARAMETERS AND TABLES   *
*********************************************

* -------------------------------------------------------------------
KSPDDIV  FCB %00000000 (          ) :04F8: 'MASK   ' IP PULSE DIVIDER ($10   4FA
*-                     :                    FOR OPTICAL SENSOR)
*-                     :               ::EQU N=DTABLE(E,N,1,$10,6,$80,7,$40,
*-                     :                    8,$C0,9,$20,10,$A0,11,$60) ::  8 - 4FC
* -------------------------------------------------------------------
KMPHCAL  FDB         0 (          ) :04F9: 'PUL/MIL' ROAD SPEED CONSTANT
*-                     :               ::EQU N=921600/E  ::                16 04FD
* -------------------------------------------------------------------
KOPTMAG1 FCB         0 (          ) :04FB: 'FLAG   ' 0 = OLD ALGORITHM =
*-                     :                    OPTICAL SENSOR,<>0 = MAG       8 4FF
*-                     :               ::EQU N=E          ::
* -------------------------------------------------------------------
KMXMPHD  FCB         0 (          ) :04FC: 'MPH    ' LIMIT MPH CHANGE PER
*-                     :                    LOOP TO THIS CAL               8 FE
*-                     :               ::EQU N=E   ::
* -------------------------------------------------------------------
K4THGR   FDB         0 (          ) :04FD: 'PUL/REV' TURBINE SPEED
*-                     :                    CONSTANT, 4TH GEAR             16 FF
*-                     :               ::EQU N=15360/E  ::
* -------------------------------------------------------------------
K3RDGR   FDB         0 (          ) :04FF: 'PUL/REV' TURBINE SPEED
*-                     :                    CONSTANT, 3RD GEAR             16 01
*-                     :               ::EQU N=15360/E  ::
* -------------------------------------------------------------------
K2NDGR   FDB         0 (          ) :0501: 'PUL/REV' TURBINE SPEED
*-                     :                    CONSTANT, 2ND GEAR             16 03
*-                     :               ::EQU N=15360/E  ::
* -------------------------------------------------------------------
K1STGR   FDB         0 (          ) :0503: 'PUL/REV' TURBINE SPEED
*-                     :                    CONSTANT,1ST GEAR              16 05
*-                     :               ::EQU N=15360/E  ::
* -------------------------------------------------------------------
KGRSTAT  FCB %00000000 (          ) :0505: 'MASK   ' SWITCH POLARITY OF    8 07
*-                     :                    THESE INPUTS(GEARS 2-4
*-                     :               ::EQU N=E ::
*******************************************
```

```
*
*  CONTENTS OF STATUS WORD MCUINST              *
*  BIT          MEANING                          *
*   0      PARK/NEUTRAL (1 = IN P/N)             *
*   1      2ND GEAR (0= 2ND IF NOT 3 OR 4)       *
*   2      3RD GEAR (0= 3RD IF NOT IN 4TH)       *
*   3      4TH GEAR (0 = 4TH)                    *
*   4      PWR STRNG PRESS. (1 = CRAMP,SD)       *
*   5      CRUISE (FROM S.D. OR FMD)             *
*   6      ENGINE HOT LIGHT ON                   *
*   7      A/C REQUESTED (0 = REQUESTED)         *
*********************************************
* ---------------------------------------------------------------------
KFILTMPH FCB          0 (          ) :0506: 'COEF  ' LAG FILTER
*-                    :                   COEFFICIENT FOR NMPH, N.D. (0-
*-                    :                   1)
* -----------------   :           ::EQU N=E*256 ::                    0F
---------------------------------------------------------------------
KREL1     FCB         0 (          ) :0507: ' %    ' TCC NEGATIVE DELTA
*-                    :                   THROTTLE POS. UNLOCK LIMIT
* -----------------   :           ::EQU N=E*2.56 ::
---------------------------------------------------------------------
KLCKDLYT FCB          0 (          ) :0508: 'SEC   ' MIN TCC DELAY BEFORE
*-                    :                   LOCK ONCE CONDITIONS MET
* -----------------   :           ::EQU N=E*10 ::                     50A
---------------------------------------------------------------------
KCSTINC   FDB         0 (          ) :0509: 'SEC   ' IF TIME BETWEEN COAST
*-                    :                   RELEASES< CAL ADD KCSTDLY
* -----------------   :           ::EQU N=E ::                        50B
---------------------------------------------------------------------
KCSTDEC   FDB         0 (          ) :050B: 'SEC   ' EACH CAL TIME
*-                    :                   SUBTRACT KSCTSUB FROM LOCK
*-                    :                   DELAY
* -----------------   :           ::EQU N=E*10 ::                     50D
---------------------------------------------------------------------
KCSTDLY   FCB         0 (          ) :050D: 'SEC   ' EXTEND LOCK DELAY
*-                    :                   WHEN ABOVE TIME MET
* -----------------   :           ::EQU N=E*10 ::                     50F
---------------------------------------------------------------------
KCSTSUB   FCB         0 (          ) :050E: 'SEC   ' SUBTRACT FROM LOCK
*-                    :                   DELAY WHEN ABOVE TIME MET
* -----------------   :           ::EQU N=E*10 ::                     510
---------------------------------------------------------------------
KPDLY     FCB         0 (          ) :050F: 'SEC   ' POSITIVE DELTA TPS
*-                    :                   UNLOCK TIME
* -----------------   :           ::EQU N=E*10 ::                     511
---------------------------------------------------------------------
KRPMXUL   FCB         0 (          ) :0510: 'RPM   ' UNLOCK PREVENTION RPM
*-                    :                   THRESHOLD
* -----------------   :           ::EQU N=E/25 ::                     512
---------------------------------------------------------------------
KTCHTMR   FDB         0 (          ) :0511: 'SEC   ' TCC DELAY FOR UNLOCK
*-                    :                   OVERRIDE AFTER                  513
*-                    :           ::EQU N=E*10        ::
                      :                   HYSTERESIS RANGE IN EFFECT

*********************************************
*   TRANSMISSION LOCKUP PARAMETERS AND TABLES   *
*********************************************
```

```
*
* N.B. THE ORDER OF THE FOLLOWING 16 PARAMETERS AND 4 TABLES MUST
*      BE PRESERVED!
*;;-ORDER IS 1)COAST RLSE 2)+ DELTA TPS 3)ROAD SPD 4)LOAD LIM 5)TABLE
* -------------------------------------------------------------------
KCOASTUM FCB          0 (          ) :0513: '% TPS ' IF MID GEAR & TPS <
*-                      :                     THIS REMAIN UNLOCKED        515
*-                      :               ::EQU N=E*2.56::
* -------------------------------------------------------------------
KRELUNMD FCB          0 (          ) :0514: ' %    ' IF POSITIVE DELTA TPS
*-                      :                     IN 100 MSEC > THIS          516
*-                      ;                     REMAIN UNLOCKED FOR KPDLY TIME
*-                      :               ::EQU N=E*2.56 ::
* -------------------------------------------------------------------
KMNLCKM  FCB          0 (          ) :0515: 'MPH   ' ENABLE LOCK IF MPH >
*-                      :                     THIS                        517
*-                      ;                     (IF IN MID GEAR AND UNLOCKED)
*-                      :               ::EQU N=E     ::
* -------------------------------------------------------------------
KTCTPSUM FCB          0 (          ) :0516: '% TPS ' DON'T LOCK IF TPS >  518
*-                      :                     THIS (MIDG,UNL,CRUZ)
*-                      :               ::EQU N=E*2.56 ::
*;;##################################
*;;# F43L1 TABLE  (MID GEAR,LOWER)  #
*;;# LOAD LIMIT VS. FILTMPH         #
*;;# TABLE VALUE = % FULL LOAD*2.56 #
*####################################
*-                      :               ::TBL2D,16,TBLX,1,'%' ::
* -------------------------------------------------------------------
F43L1    FCB          0 (          ) :0517: '%     ' 25   MPH  519
*-                      :               ::EQU N=E*2.56 ::
         FCB          0 (          ) :0518: '%     ' 30
         FCB          0 (          ) :0519: '%     ' 35
         FCB          0 (          ) :051A: '%     ' 40
         FCB          0 (          ) :051B: '%     ' 45
         FCB          0 (          ) :051C: '%     ' 50
         FCB          0 (          ) :051D: '%     ' 55
         FCB          0 (          ) :051E: '%     ' 60
         FCB          0 (          ) :051F: '%     ' 68
         FCB          0 (          ) :0520: '%     ' 76
         FCB          0 (          ) :0521: '%     ' 84
         FCB          0 (          ) :0522: '%     ' 92
         FCB          0 (          ) :0523: '%     ' 100
         FCB          0 (          ) :0524: '%     ' 108
         FCB          0 (          ) :0525: '%     ' 116
         FCB          0 (          ) :0526: '%     ' 124   528
*

* -------------------------------------------------------------------
KCOASTUH FCB          0 (          ) :0527: '% TPS ' IF HIGH GEAR & TPS <
*-                      :                     THIS REMAIN UNLOCKED        529
*-                      :               ::EQU N=E*2.56::
* -------------------------------------------------------------------
KRELUNHI FCB          0 (          ) :0528: ' %    ' IF POSITIVE DELTA TPS  52A
*-                      :                     IN 100 MSEC > THIS
*-                      ;                     REMAIN UNLOCKED FOR KPDLY TIME
*-                      :               ::EQU N=E*2.56 ::
* -------------------------------------------------------------------
KMNLCKH  FCB          0 (          ) :0529: 'MPH   ' ENABLE LOCK IF MPH >   52B
```

```
*_                          :                THIS
*_                               (IF IN HIGH GEAR AND UNLOCKED)
*_                          :          ::EQU N=E      ::
* ------------------------------------------------------------------
KTCTPSUH FCB          0 (          ) :052A: '% TPS ' DON'T LOCK IF TPS >     52C
*_                          :                THIS (HIGHG,UNL,CRUZ)
*_                          :          ::EQU N=E*2.56 ::
*;;##################################
*;;# F44L1 TABLE (HIGH GEAR,LOWER)  #
*;;# LOAD LIMIT VS. FILTMPH         #
*;;# TABLE VALUE = % FULL LOAD*2.56 #
*##################################
*_                          :          ::TBL2D,16,TBLX,1,'%' ::
* ------------------------------------------------------------------
F44L1    FCB          0 (          ) :052B: '%      ' 25   MPH     52D
*_                          :          ::EQU N=E*2.56 ::
         FCB          0 (          ) :052C: '%      ' 30
         FCB          0 (          ) :052D: '%      ' 35
         FCB          0 (          ) :052E: '%      ' 40
         FCB          0 (          ) :052F: '%      ' 45
         FCB          0 (          ) :0530: '%      ' 50
         FCB          0 (          ) :0531: '%      ' 55
         FCB          0 (          ) :0532: '%      ' 60
         FCB          0 (          ) :0533: '%      ' 68
         FCB          0 (          ) :0534: '%      ' 76
         FCB          0 (          ) :0535: '%      ' 84
         FCB          0 (          ) :0536: '%      ' 92
         FCB          0 (          ) :0537: '%      ' 100
         FCB          0 (          ) :0538: '%      ' 108
         FCB          0 (          ) :0539: '%      ' 116
         FCB          0 (          ) :053A: '%      ' 124          53C

* ------------------------------------------------------------------
KCOASTLM FCB          0 (          ) :053B: '% TPS ' UNLOCK TCC IF TPS <     53D
*_                          :                THIS (MID GEAR)
*_                          :          ::EQU N=E*2.56::
* ------------------------------------------------------------------
KRELLKMD FCB          0 (          ) :053C: ' %     ' IF POSITIVE DELTA TPS   53E
*_                          :                IN 100 MSEC > THIS
*_                          :                UNLOCK TCC FOR KPDLY TIME
*_                          :          ::EQU N=E*2.56 ::
* ------------------------------------------------------------------
KMNULCKM FCB          0 (          ) :053D: 'MPH   ' REMAIN LOCKED IF MPH    53F
*_                          :                > THIS, MID GEAR
*_                          :          ::EQU N=E      ::
* ------------------------------------------------------------------
KTCTPSLM FCB          0 (          ) :053E: '% TPS ' UNLOCK IF TPS > THIS    540
*_                          :                (MIDG, LCK,CRUZ)
*_                          :          ::EQU N=E*2.56 ::
*;;##################################
*;;# F43U1 TABLE  (MID GEAR,UPPER)  #
*;;# LOAD LIMIT VS. FILTMPH         #
*;;# TABLE VALUE = % FULL LOAD*2.56 #
*##################################
*_                          :          ::TBL2D,16,TBLX,1,'%' ::
* ------------------------------------------------------------------
F43U1    FCB          0 (          ) :053F: '%      ' 25   MPH     541
*_                          :          ::EQU N=E*2.56 ::                542
         FCB          0 (          ) :0540: '%      ' 30
```

```
          FCB          0 (           ) :0541: '%     ' 35
          FCB          0 (           ) :0542: '%     ' 40
          FCB          0 (           ) :0543: '%     ' 45
          FCB          0 (           ) :0544: '%     ' 50
          FCB          0 (           ) :0545: '%     ' 55
          FCB          0 (           ) :0546: '%     ' 60
          FCB          0 (           ) :0547: '%     ' 68
          FCB          0 (           ) :0548: '%     ' 76
          FCB          0 (           ) :0549: '%     ' 84
          FCB          0 (           ) :054A: '%     ' 92
          FCB          0 (           ) :054B: '%     ' 100
          FCB          0 (           ) :054C: '%     ' 108
          FCB          0 (           ) :054D: '%     ' 116
          FCB          0 (           ) :054E: '%     ' 124   550
* ---------------------------------------------------------------------
KCOASTLH FCB           0 (           ) :054F: '% TPS ' UNLOCK TCC IF TPS <
*_                       :                         THIS (HIGH GEAR)
*_                       :               ::EQU N=E*2.56::                 551
* ---------------------------------------------------------------------
KRELLKHI FCB           0 (           ) :0550: ' %    ' IF POSITIVE DELTA TPS
*_                       :                         IN 100 MSEC > THIS
*_                       ;                         UNLOCK TCC FOR KPDLY TIME   552
*_                       :               ::EQU N=E*2.56 ::
* ---------------------------------------------------------------------
KMNULCKH FCB           0 (           ) :0551: 'MPH   ' REMAIN LOCKED IF MPH
*_                       :                         > THIS, HIGH GEAR
*_                       :               ::EQU N=E      ::                553
* ---------------------------------------------------------------------
KTCTPSLH FCB           0 (           ) :0552: '% TPS ' UNLOCK IF TPS > THIS   554
*_                       :                         (HIGHG,LCK,CRUZ)
*_                       :               ::EQU N=E*2.56 ::
*;;###################################
*;;# F44U1 TABLE (HIGH GEAR,UPPER)  #
*;;# LOAD LIMIT VS. FILTMPH         #
*;;# TABLE VALUE = % FULL LOAD*2.56 #
*####################################
*_
                         :               ::TBL2D,16,TBLX,1,'%' ::
* ---------------------------------------------------------------------
F44U1    FCB           0 (           ) :0553: '%     ' 25   MPH        555
*_                       :               ::EQU N=E*2.56 ::
         FCB           0 (           ) :0554: '%     ' 30
         FCB           0 (           ) :0555: '%     ' 35
         FCB           0 (           ) :0556: '%     ' 40
         FCB           0 (           ) :0557: '%     ' 45
         FCB           0 (           ) :0558: '%     ' 50
         FCB           0 (           ) :0559: '%     ' 55
         FCB           0 (           ) :055A: '%     ' 60
         FCB           0 (           ) :055B: '%     ' 68
         FCB           0 (           ) :055C: '%     ' 76
         FCB           0 (           ) :055D: '%     ' 84
         FCB           0 (           ) :055E: '%     ' 92
         FCB           0 (           ) :055F: '%     ' 100
         FCB           0 (           ) :0560: '%     ' 108
         FCB           0 (           ) :0561: '%     ' 116
         FCB           0 (           ) :0562: '%     ' 124   564

* N.B. THE ORDER OF THE PREVIOUS 16 PARAMETERS AND 4 TABLES MUST
*      BE PRESERVED!
```

```
*
*;;######################################################
*;;# F432GRA TABLE : UNLOCK TIME VS. GEAR CHANGE        #
*;;# TABLE VALUE = SECONDS / 10 (NOTE :  0 = NO UNLOCK) #
*######################################################
*-                     :           ::TBL2D,16,TBLX,1,'SEC' ::
*                                         3RD GEAR     NO 3RD GEAR
*                                           SWTCH         SWITCH
* ----------------------------------------------------------------
F432GRA  FCB        0 (          ) :0563: 'SEC   ' 4 TO 4  GEAR  4 TO 4   565
*-                     :           ::EQU N=E*10 ::
         FCB        0 (          ) :0564: 'SEC   ' 4 TO 4        4 TO 4
         FCB        0 (          ) :0565: 'SEC   ' 3 TO 4        3 TO 4
         FCB        0 (          ) :0566: 'SEC   ' 2 TO 4        3 TO 4
         FCB        0 (          ) :0567: 'SEC   ' 4 TO 4        4 TO 4
         FCB        0 (          ) :0568: 'SEC   ' 4 TO 4        4 TO 4
         FCB        0 (          ) :0569: 'SEC   ' 3 TO 4        3 TO 4
         FCB        0 (          ) :056A: 'SEC   ' 2 TO 4        3 TO 4
         FCB        0 (          ) :056B: 'SEC   ' 4 TO 3        4 TO 3
         FCB        0 (          ) :056C: 'SEC   ' 4 TO 3        4 TO 3
         FCB        0 (          ) :056D: 'SEC   ' 3 TO 3        3 TO 3
         FCB        0 (          ) :056E: 'SEC   ' 2 TO 3        3 TO 3
         FCB        0 (          ) :056F: 'SEC   ' 4 TO 2        4 TO 3
         FCB        0 (          ) :0570: 'SEC   ' 4 TO 2        4 TO 3
         FCB        0 (          ) :0571: 'SEC   ' 3 TO 2        3 TO 3
         FCB        0 (          ) :0572: 'SEC   ' 2 TO 2        3 TO 3   574

* ----------------------------------------------------------------
KTCCTMP  FCB        0 (          ) :0573: 'DEG C ' TCC LOWER TEMPERATURE
*-                     :                        LIMIT                       575
*-                     :           ::EQU N=(E+40)*256/192::
* ----------------------------------------------------------------
KTCCLVH  FCB        0 (          ) :0574: 'LV8   ' IF LV8 > CAL,
*-                     :                        INCREMENT 'LV8 TOO HIGH' TIMER   576
*-                     :           ::EQU N=E ::
* ----------------------------------------------------------------
KTCLVTM  FCB        0 (          ) :0575: 'SEC   ' IF LV8 TOO HIGH             577
*-                     :                        LONGER THAN CAL, UNLOCK TCC
*-                     :           ::EQU N=E*10 ::
* ----------------------------------------------------------------
KTCCOFF  FCB        0 (          ) :0576: 'SEC   ' IF LV8 HIGH TOO LONG        578
*-                     :                        UNLOCK TCC FOR CAL TIME
*-                     :           ::EQU N=E*10 ::
* ----------------------------------------------------------------
KGRUNLTM FCB        0 (          ) :0577: 'SEC   ' BLIP OFF A/C FOR THIS       579
*-                     :                        TIME IF 3/2 SHIFT
*-                     :           ::EQU N=E*80 ::
* ----------------------------------------------------------------
KRPM2GR  FCB        0 (          ) :0578: 'RPM   ' KEEP A/C OFF UNTIL          57A
*-                     :                        RPM < CAL ON 3/2 BLIP OFF
*-                     :           ::EQU N=E/25 ::
* ----------------------------------------------------------------
KTPS32   FCB        0 (          ) :0579: '      ' "% TPS" IF TPS < THIS       57B
*-                     :                        , BYPASS 3/2 A/C BLIP OFF
*-                     :           ::EQU N=E*2.56 ::
*+DATATORQ++BLOCK ID++
********************************************
*   TORQUE MANAGEMENT TABLES AND PARAMETERS  *
********************************************
```

57D

```
* ---------------------------------------------------------------
KFRISCAL FCB          0 (          ) :057A: 'MULT  ' TORQUE SCALER TO
*-                      :                    ACCOUNT FOR FRICTION
*-                      :                :: EQU N=E*256 ::

*################################################
*     F1EFFIC TABLE:                           #
*   ENGINE EFFICIENCY VS. NTRMPX AND FAVAL     #
*################################################

*-                      :                ::TBL3D,13,6,TBL7,3,TBL16,1,1,'EFFIC'
*-                      :                              ::
*-                      :                ::PROTECT ::
* ---------------------------------------------------------------
F1EFFICB FCB         32 (          ) :057B: '      ' R MIN; R = NTRPM, 32
*-                      :                    = 800 RPM
*-                      :                ::EQU N=E ::
* ---------------------------------------------------------------
         FCB         96 (          ) :057C: '      ' Q MIN; Q = FUEL/AIR
*-                      :                    RATIO (FAVAL)
*-                      :                ::EQU N=E ::
* ---------------------------------------------------------------
         FCB          6 (          ) :057D: '      ' R NUM (NUMBER OF Q'S
*-                      :                ::EQU N=E ::
*-                      :                ::NOPROTECT ::
* ---------------------------------------------- SPEED       800 RPM
         FCB          0 (          ) :057E: 'EFFIC '    96  EFFIC-LOAD
*-                      :                ::EQU N=E*128 ::
         FCB          0 (          ) :057F: 'EFFIC '   112
         FCB          0 (          ) :0580: 'EFFIC '   128
         FCB          0 (          ) :0581: 'EFFIC '   144
         FCB          0 (          ) :0582: 'EFFIC '   160
         FCB          0 (          ) :0583: 'EFFIC '   176

* ---------------------------------------------- SPEED      1200 RPM
         FCB          0 (          ) :0584: 'EFFIC '    96  EFFIC-LOAD
         FCB          0 (          ) :0585: 'EFFIC '   112
         FCB          0 (          ) :0586: 'EFFIC '   128
         FCB          0 (          ) :0587: 'EFFIC '   144
         FCB          0 (          ) :0588: 'EFFIC '   160
         FCB          0 (          ) :0589: 'EFFIC '   176

* ---------------------------------------------- SPEED      1600 RPM
         FCB          0 (          ) :058A: 'EFFIC '    96  EFFIC-LOAD
         FCB          0 (          ) :058B: 'EFFIC '   112
         FCB          0 (          ) :058C: 'EFFIC '   128
         FCB          0 (          ) :058D: 'EFFIC '   144
         FCB          0 (          ) :058E: 'EFFIC '   160
         FCB          0 (          ) :058F: 'EFFIC '   176

* ---------------------------------------------- SPEED      2000 RPM
         FCB          0 (          ) :0590: 'EFFIC '    96  EFFIC-LOAD
         FCB          0 (          ) :0591: 'EFFIC '   112
         FCB          0 (          ) :0592: 'EFFIC '   128
         FCB          0 (          ) :0593: 'EFFIC '   144
         FCB          0 (          ) :0594: 'EFFIC '   160
         FCB          0 (          ) :0595: 'EFFIC '   176

* ---------------------------------------------- SPEED      2400 RPM
```

4857F

```
       FCB         0 (          ) :0596: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :0597: 'EFFIC '   112
       FCB         0 (          ) :0598: 'EFFIC '   128
       FCB         0 (          ) :0599: 'EFFIC '   144
       FCB         0 (          ) :059A: 'EFFIC '   160
       FCB         0 (          ) :059B: 'EFFIC '   176

* ---------------------------------------------- SPEED      2800 RPM
       FCB         0 (          ) :059C: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :059D: 'EFFIC '   112
       FCB         0 (          ) :059E: 'EFFIC '   128
       FCB         0 (          ) :059F: 'EFFIC '   144
       FCB         0 (          ) :05A0: 'EFFIC '   160
       FCB         0 (          ) :05A1: 'EFFIC '   176

* ---------------------------------------------- SPEED      3200 RPM
       FCB         0 (          ) :05A2: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05A3: 'EFFIC '   112
       FCB         0 (          ) :05A4: 'EFFIC '   128
       FCB         0 (          ) :05A5: 'EFFIC '   144
       FCB         0 (          ) :05A6: 'EFFIC '   160
       FCB         0 (          ) :05A7: 'EFFIC '   176

* ---------------------------------------------- SPEED      3600 RPM
       FCB         0 (          ) :05A8: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05A9: 'EFFIC '   112
       FCB         0 (          ) :05AA: 'EFFIC '   128
       FCB         0 (          ) :05AB: 'EFFIC '   144
       FCB         0 (          ) :05AC: 'EFFIC '   160
       FCB         0 (          ) :05AD: 'EFFIC '   176

* ---------------------------------------------- SPEED      4000 RPM
       FCB         0 (          ) :05AE: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05AF: 'EFFIC '   112
       FCB         0 (          ) :05B0: 'EFFIC '   128
       FCB         0 (          ) :05B1: 'EFFIC '   144
       FCB         0 (          ) :05B2: 'EFFIC '   160
       FCB         0 (          ) :05B3: 'EFFIC '   176

* ---------------------------------------------- SPEED      4400 RPM
       FCB         0 (          ) :05B4: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05B5: 'EFFIC '   112
       FCB         0 (          ) :05B6: 'EFFIC '   128
       FCB         0 (          ) :05B7: 'EFFIC '   144
       FCB         0 (          ) :05B8: 'EFFIC '   160
       FCB         0 (          ) :05B9: 'EFFIC '   176

* ---------------------------------------------- SPEED      4800 RPM
       FCB         0 (          ) :05BA: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05BB: 'EFFIC '   112
       FCB         0 (          ) :05BC: 'EFFIC '   128
       FCB         0 (          ) :05BD: 'EFFIC '   144
       FCB         0 (          ) :05BE: 'EFFIC '   160
       FCB         0 (          ) :05BF: 'EFFIC '   176

* ---------------------------------------------- SPEED      5200 RPM
       FCB         0 (          ) :05C0: 'EFFIC '    96  EFFIC-LOAD
       FCB         0 (          ) :05C1: 'EFFIC '   112
       FCB         0 (          ) :05C2: 'EFFIC '   128
```

```
        FCB          0 (          ) :05C3: 'EFFIC '   144
        FCB          0 (          ) :05C4: 'EFFIC '   160
        FCB          0 (          ) :05C5: 'EFFIC '   176

* ------------------------------------------ SPEED       5600 RPM
        FCB          0 (          ) :05C6: 'EFFIC '    96  EFFIC-LOAD
        FCB          0 (          ) :05C7: 'EFFIC '   112
        FCB          0 (          ) :05C8: 'EFFIC '   128
        FCB          0 (          ) :05C9: 'EFFIC '   144
        FCB          0 (          ) :05CA: 'EFFIC '   160
        FCB          0 (          ) :05CB: 'EFFIC '   176

*#####################################################
*     F1EFFADJ TABLE:                                 #
*   ENGINE EFFICIENCY ADJUSTMENT VS AIR TEMP AND LOAD #
*#####################################################

*-                  :        ::TBL3D,8,5,TBL2,1,2,TBL16,3,2,'MULT'
*-                  :                  ::
*-                  :        ::PROTECT ::
* ---------------------------------------------------------------
F1EFFADJ FCB         0 (         )*:05CC: '       ' R MIN;  R = ATS
*-                  :        ::EQU N=E ::
* ---------------------------------------------------------------
        FCB         64 (         ) :05CD: '       ' Q MIN;  Q = LOAD
*-                  :                  TORQUE             )
*-                  :        ::EQU N=E ::
* ---------------------------------------------------------------
        FCB          5 (         ) :05CE: '       ' R NUM (NUMBER OF Q'S
*-                  :        ::EQU N=E ::
*-                  :        ::NOPROTECT ::
* -40 DEG C
* ------------------------------------------ TEMP        -40 DEG C
        FCB          0 (         ) :05CF: 'MULT  '   128  EFFIC-LOAD
*-                  :        ::EQU N=E*128 ::
        FCB          0 (         ) :05D0: 'MULT  '   160
        FCB          0 (         ) :05D1: 'MULT  '   192
        FCB          0 (         ) :05D2: 'MULT  '   224
        FCB          0 (         ) :05D3: 'MULT  '   256

* ------------------------------------------ TEMP        -16 DEG C
        FCB          0 (         ) :05D4: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05D5: 'MULT  '   160
        FCB          0 (         ) :05D6: 'MULT  '   192
        FCB          0 (         ) :05D7: 'MULT  '   224
        FCB          0 (         ) :05D8: 'MULT  '   256

* ------------------------------------------ TEMP          8 DEG C
        FCB          0 (         ) :05D9: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05DA: 'MULT  '   160
        FCB          0 (         ) :05DB: 'MULT  '   192
        FCB          0 (         ) :05DC: 'MULT  '   224
        FCB          0 (         ) :05DD: 'MULT  '   256

* ------------------------------------------ TEMP         32 DEG C
        FCB          0 (         ) :05DE: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05DF: 'MULT  '   160
        FCB          0 (         ) :05E0: 'MULT  '   192
        FCB          0 (         ) :05E1: 'MULT  '   224
```

85D0

```
        FCB          0 (         ) :05E2: 'MULT  '   256

 * -------------------------------------------- TEMP           56 DEG C
        FCB          0 (         ) :05E3: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05E4: 'MULT  '   160
        FCB          0 (         ) :05E5: 'MULT  '   192
        FCB          0 (         ) :05E6: 'MULT  '   224
        FCB          0 (         ) :05E7: 'MULT  '   256

 * -------------------------------------------- TEMP           80 DEG C
        FCB          0 (         ) :05E8: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05E9: 'MULT  '   160
        FCB          0 (         ) :05EA: 'MULT  '   192
        FCB          0 (         ) :05EB: 'MULT  '   224
        FCB          0 (         ) :05EC: 'MULT  '   256

 * -------------------------------------------- TEMP          104 DEG C
        FCB          0 (         ) :05ED: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05EE: 'MULT  '   160
        FCB          0 (         ) :05EF: 'MULT  '   192
        FCB          0 (         ) :05F0: 'MULT  '   224
        FCB          0 (         ) :05F1: 'MULT  '   256

 * -------------------------------------------- TEMP          128 DEG C
        FCB          0 (         ) :05F2: 'MULT  '   128  EFFIC-LOAD
        FCB          0 (         ) :05F3: 'MULT  '   160
        FCB          0 (         ) :05F4: 'MULT  '   192
        FCB          0 (         ) :05F5: 'MULT  '   224
        FCB          0 (         ) :05F6: 'MULT  '   256

*################################################
*     F1FRCTRQ TABLE:                            #
* FRICIION TORQUE LOSS VS. NTRMPX AND COOLANT    #
*################################################

                                          7 13
*-                  :          ::TBL3D,13,7,TBL7,3,TBL2,2,2,'EFFIC'
*-                  :                      ::
*-                  :          ::PROTECT ::
* -----------------------------------------------------------------------
F1FRCTRQ FCB       32 (         ) :05F7: '        ' R MIN;  R = NTRPM    5FB
*-                  :          ::EQU N=E ::
* -----------------------------------------------------------------------
        FCB         8 (         ) :05F8: '        ' Q MIN;  Q = COOLANT IN
*-                  :                      DEG. CELCIUS
*-                  :          ::EQU N=E ::
* -----------------------------------------------------------------------
        FCB         7 (         ) :05F9: '        ' R NUM (NUMBER OF Q'S
*-                  :          ::EQU N=E ::
*-                  :          ::NOPROTECT ::
* -------------------------------------------- SPEED          800 RPM
        FCB          0 (         ) :05FA: 'EFFIC '   -28  DEG C-TEMP
*-                   :          ::EQU N=E  ::
        FCB          0 (         ) :05FB: 'EFFIC '    -4
        FCB          0 (         ) :05FC: 'EFFIC '    20
        FCB          0 (         ) :05FD: 'EFFIC '    44
        FCB          0 (         ) :05FE: 'EFFIC '    68
        FCB          0 (         ) :05FF: 'EFFIC '    92
        FCB          0 (         ) :0600: 'EFFIC '   116
```

```
* ------------------------------------------- SPEED        1200 RPM
        FCB        0 (        ) :0601: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :0602: 'EFFIC '    -4
        FCB        0 (        ) :0603: 'EFFIC '    20
        FCB        0 (        ) :0604: 'EFFIC '    44
        FCB        0 (        ) :0605: 'EFFIC '    68
        FCB        0 (        ) :0606: 'EFFIC '    92
        FCB        0 (        ) :0607: 'EFFIC '   116

* ------------------------------------------- SPEED        1600 RPM
        FCB        0 (        ) :0608: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :0609: 'EFFIC '    -4
        FCB        0 (        ) :060A: 'EFFIC '    20
        FCB        0 (        ) :060B: 'EFFIC '    44
        FCB        0 (        ) :060C: 'EFFIC '    68
        FCB        0 (        ) :060D: 'EFFIC '    92
        FCB        0 (        ) :060E: 'EFFIC '   116

* ------------------------------------------- SPEED        2000 RPM
        FCB        0 (        ) :060F: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :0610: 'EFFIC '    -4
        FCB        0 (        ) :0611: 'EFFIC '    20
        FCB        0 (        ) :0612: 'EFFIC '    44
        FCB        0 (        ) :0613: 'EFFIC '    68
        FCB        0 (        ) :0614: 'EFFIC '    92
        FCB        0 (        ) :0615: 'EFFIC '   116

* ------------------------------------------- SPEED        2400 RPM
        FCB        0 (        ) :0616: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :0617: 'EFFIC '    -4
        FCB        0 (        ) :0618: 'EFFIC '    20
        FCB        0 (        ) :0619: 'EFFIC '    44
        FCB        0 (        ) :061A: 'EFFIC '    68
        FCB        0 (        ) :061B: 'EFFIC '    92
        FCB        0 (        ) :061C: 'EFFIC '   116

* ------------------------------------------- SPEED        2800 RPM
        FCB        0 (        ) :061D: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :061E: 'EFFIC '    -4
        FCB        0 (        ) :061F: 'EFFIC '    20
        FCB        0 (        ) :0620: 'EFFIC '    44
        FCB        0 (        ) :0621: 'EFFIC '    68
        FCB        0 (        ) :0622: 'EFFIC '    92
        FCB        0 (        ) :0623: 'EFFIC '   116

* ------------------------------------------- SPEED        3200 RPM
        FCB        0 (        ) :0624: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :0625: 'EFFIC '    -4
        FCB        0 (        ) :0626: 'EFFIC '    20
        FCB        0 (        ) :0627: 'EFFIC '    44
        FCB        0 (        ) :0628: 'EFFIC '    68
        FCB        0 (        ) :0629: 'EFFIC '    92
        FCB        0 (        ) :062A: 'EFFIC '   116

* ------------------------------------------- SPEED        3600 RPM
        FCB        0 (        ) :062B: 'EFFIC '   -28  DEG C-TEMP
        FCB        0 (        ) :062C: 'EFFIC '    -4
        FCB        0 (        ) :062D: 'EFFIC '    20
        FCB        0 (        ) :062E: 'EFFIC '    44
```

```
        FCB          0 (          ) :062F: 'EFFIC '    68
        FCB          0 (          ) :0630: 'EFFIC '    92
        FCB          0 (          ) :0631: 'EFFIC '   116

 * ------------------------------------------ SPEED      4000 RPM
        FCB          0 (          ) :0632: 'EFFIC '   -28  DEG C-TEMP
        FCB          0 (          ) :0633: 'EFFIC '    -4
        FCB          0 (          ) :0634: 'EFFIC '    20
        FCB          0 (          ) :0635: 'EFFIC '    44
        FCB          0 (          ) :0636: 'EFFIC '    68
        FCB          0 (          ) :0637: 'EFFIC '    92
        FCB          0 (          ) :0638: 'EFFIC '   116

 * ------------------------------------------ SPEED      4400 RPM
        FCB          0 (          ) :0639: 'EFFIC '   -28  DEG C-TEMP
        FCB          0 (          ) :063A: 'EFFIC '    -4
        FCB          0 (          ) :063B: 'EFFIC '    20
        FCB          0 (          ) :063C: 'EFFIC '    44
        FCB          0 (          ) :063D: 'EFFIC '    68
        FCB          0 (          ) :063E: 'EFFIC '    92
        FCB          0 (          ) :063F: 'EFFIC '   116

 * ------------------------------------------ SPEED      4800 RPM
        FCB          0 (          ) :0640: 'EFFIC '   -28  DEG C-TEMP
        FCB          0 (          ) :0641: 'EFFIC '    -4
        FCB          0 (          ) :0642: 'EFFIC '    20
        FCB          0 (          ) :0643: 'EFFIC '    44
        FCB          0 (          ) :0644: 'EFFIC '    68
        FCB          0 (          ) :0645: 'EFFIC '    92
        FCB          0 (          ) :0646: 'EFFIC '   116

 * ------------------------------------------ SPEED      5200 RPM
        FCB          0 (          ) :0647: 'EFFIC '   -28  DEG C-TEMP
        FCB          0 (          ) :0648: 'EFFIC '    -4
        FCB          0 (          ) :0649: 'EFFIC '    20
        FCB          0 (          ) :064A: 'EFFIC '    44
        FCB          0 (          ) :064B: 'EFFIC '    68
        FCB          0 (          ) :064C: 'EFFIC '    92
        FCB          0 (          ) :064D: 'EFFIC '   116

 * ------------------------------------------ SPEED      5600 RPM
        FCB          0 (          ) :064E: 'EFFIC '   -28  DEG C-TEMP
        FCB          0 (          ) :064F: 'EFFIC '    -4
        FCB          0 (          ) :0650: 'EFFIC '    20
        FCB          0 (          ) :0651: 'EFFIC '    44
        FCB          0 (          ) :0652: 'EFFIC '    68
        FCB          0 (          ) :0653: 'EFFIC '    92
        FCB          0 (          ) :0654: 'EFFIC '   116

* ---------------------------------------------------------------
K1TRQRTO FCB         0 (          ) :0655: 'MULT  ' TORQUE MULTIPLIER
*-                     :                 WHEN SPEED RATIO >= 1
*-                     :          ::EQU N=E*64 ::
*###########################################################
*      F1TRQMLT                                            #
*      TORQUE MULTIPLIER VS. SPEED RATIO WHEN SPEED RATIO < 1 #
*    TABLE VALUE = MULTIPLIER * 64                          #
*###########################################################
*-                     :          ::TBL2D,17,1,TBL22,1,1,'MULT' ::
```

659

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* ---------------------------------------------------------------------
F1TRQMLB FCB          0 (          ) :0656: 'MULT   ' .0000       %-RATIO
*-                      :            ::EQU N=E*64 ::
         FCB          0 (          ) :0657: 'MULT   '  .625
         FCB          0 (          ) :0658: 'MULT   ' .1250
         FCB          0 (          ) :0659: 'MULT   ' .1875
         FCB          0 (          ) :065A: 'MULT   ' .2500
         FCB          0 (          ) :065B: 'MULT   ' .3125
         FCB          0 (          ) :065C: 'MULT   ' .3750
         FCB          0 (          ) :065D: 'MULT   ' .4375
         FCB          0 (          ) :065E: 'MULT   ' .5000
         FCB          0 (          ) :065F: 'MULT   ' .5625
         FCB          0 (          ) :0660: 'MULT   ' .6250
         FCB          0 (          ) :0661: 'MULT   ' .6875
         FCB          0 (          ) :0662: 'MULT   ' .7500
         FCB          0 (          ) :0663: 'MULT   ' .8125
         FCB          0 (          ) :0664: 'MULT   ' .8750
         FCB          0 (          ) :0665: 'MULT   ' .9375
         FCB          0 (          ) :0666: 'MULT   ' 1.0000

*################################################
*     F1TRQSPK                                  #
*   SPARK RETARD  VS. RPM6000 AND EXCESS TORQUE #
*################################################

*-                      :            ::TBL3D,17,9,TBL6,1,TBL21,9,1,'DEG'
*-                      :                   ::
*-                      :            ::PROTECT ::
* ---------------------------------------------------------------------
F1TRQSPK FCB          0 (          )*:0667: '       ' R MIN; R = 0 (0 =
*-                      :                   1000 RPM)
*-                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
         FCB        128 (          ) :0668: '       ' Q MIN; Q = EXCESS
*-                      :                   TORQUE
*-                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
         FCB          9 (          ) :0669: '       ' R NUM
*-                      :            ::EQU N=E ::
*-                      :            ::NOPROTECT ::
* --------------------------------------------- SPEED        1000 RPM
         FCB          0 (          ) :066A: 'DEG    '   128 EXCTRQ-TORQUE
*-                      :            ::EQU N=E*256/90 ::
         FCB          0 (          ) :066B: 'DEG    '   144
         FCB          0 (          ) :066C: 'DEG    '   160
         FCB          0 (          ) :066D: 'DEG    '   176
         FCB          0 (          ) :066E: 'DEG    '   192
         FCB          0 (          ) :066F: 'DEG    '   208
         FCB          0 (          ) :0670: 'DEG    '   224
         FCB          0 (          ) :0671: 'DEG    '   240
         FCB          0 (          ) :0672: 'DEG    '   256

* --------------------------------------------- SPEED        1200 RPM
         FCB          0 (          ) :0673: 'DEG    '   128 EXCTRQ-TORQUE
         FCB          0 (          ) :0674: 'DEG    '   144
         FCB          0 (          ) :0675: 'DEG    '   160
         FCB          0 (          ) :0676: 'DEG    '   176
         FCB          0 (          ) :0677: 'DEG    '   192
         FCB          0 (          ) :0678: 'DEG    '   208
```

$65A

66A

$66B

```
        FCB          0 (            ) :0679: 'DEG    '   224
        FCB          0 (            ) :067A: 'DEG    '   240
        FCB          0 (            ) :067B: 'DEG    '   256

*  -------------------------------------------- SPEED        1400 RPM
        FCB          0 (            ) :067C: 'DEG    '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :067D: 'DEG    '   144
        FCB          0 (            ) :067E: 'DEG    '   160
        FCB          0 (            ) :067F: 'DEG    '   176
        FCB          0 (            ) :0680: 'DEG    '   192
        FCB          0 (            ) :0681: 'DEG    '   208
        FCB          0 (            ) :0682: 'DEG    '   224
        FCB          0 (            ) :0683: 'DEG    '   240
        FCB          0 (            ) :0684: 'DEG    '   256

*  -------------------------------------------- SPEED        1600 RPM
        FCB          0 (            ) :0685: 'DEG    '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :0686: 'DEG    '   144
        FCB          0 (            ) :0687: 'DEG    '   160
        FCB          0 (            ) :0688: 'DEG    '   176
        FCB          0 (            ) :0689: 'DEG    '   192
        FCB          0 (            ) :068A: 'DEG    '   208
        FCB          0 (            ) :068B: 'DEG    '   224
        FCB          0 (            ) :068C: 'DEG    '   240
        FCB          0 (            ) :068D: 'DEG    '   256

*  -------------------------------------------- SPEED        1800 RPM
        FCB          0 (            ) :068E: 'DEG    '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :068F: 'DEG    '   144
        FCB          0 (            ) :0690: 'DEG    '   160
        FCB          0 (            ) :0691: 'DEG    '   176
        FCB          0 (            ) :0692: 'DEG    '   192
        FCB          0 (            ) :0693: 'DEG    '   208
        FCB          0 (            ) :0694: 'DEG    '   224
        FCB          0 (            ) :0695: 'DEG    '   240
        FCB          0 (            ) :0696: 'DEG    '   256

*  -------------------------------------------- SPEED        2000 RPM
        FCB          0 (            ) :0697: 'DEG    '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :0698: 'DEG    '   144
        FCB          0 (            ) :0699: 'DEG    '   160
        FCB          0 (            ) :069A: 'DEG    '   176
        FCB          0 (            ) :069B: 'DEG    '   192
        FCB          0 (            ) :069C: 'DEG    '   208
        FCB          0 (            ) :069D: 'DEG    '   224
        FCB          0 (            ) :069E: 'DEG    '   240
        FCB          0 (            ) :069F: 'DEG    '   256

*  -------------------------------------------- SPEED        2200 RPM
        FCB          0 (            ) :06A0: 'DEG    '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06A1: 'DEG    '   144
        FCB          0 (            ) :06A2: 'DEG    '   160
        FCB          0 (            ) :06A3: 'DEG    '   176
        FCB          0 (            ) :06A4: 'DEG    '   192
        FCB          0 (            ) :06A5: 'DEG    '   208
        FCB          0 (            ) :06A6: 'DEG    '   224
        FCB          0 (            ) :06A7: 'DEG    '   240
        FCB          0 (            ) :06A8: 'DEG    '   256
```

```
* ------------------------------------------ SPEED        2400 RPM
        FCB          0 (            ) :06A9: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06AA: 'DEG   '   144
        FCB          0 (            ) :06AB: 'DEG   '   160
        FCB          0 (            ) :06AC: 'DEG   '   176
        FCB          0 (            ) :06AD: 'DEG   '   192
        FCB          0 (            ) :06AE: 'DEG   '   208
        FCB          0 (            ) :06AF: 'DEG   '   224
        FCB          0 (            ) :06B0: 'DEG   '   240
        FCB          0 (            ) :06B1: 'DEG   '   256

* ------------------------------------------ SPEED        2800 RPM
        FCB          0 (            ) :06B2: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06B3: 'DEG   '   144
        FCB          0 (            ) :06B4: 'DEG   '   160
        FCB          0 (            ) :06B5: 'DEG   '   176
        FCB          0 (            ) :06B6: 'DEG   '   192
        FCB          0 (            ) :06B7: 'DEG   '   208
        FCB          0 (            ) :06B8: 'DEG   '   224
        FCB          0 (            ) :06B9: 'DEG   '   240
        FCB          0 (            ) :06BA: 'DEG   '   256

* ------------------------------------------ SPEED        3200 RPM
        FCB          0 (            ) :06BB: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06BC: 'DEG   '   144
        FCB          0 (            ) :06BD: 'DEG   '   160
        FCB          0 (            ) :06BE: 'DEG   '   176
        FCB          0 (            ) :06BF: 'DEG   '   192
        FCB          0 (            ) :06C0: 'DEG   '   208
        FCB          0 (            ) :06C1: 'DEG   '   224
        FCB          0 (            ) :06C2: 'DEG   '   240
        FCB          0 (            ) :06C3: 'DEG   '   256

* ------------------------------------------ SPEED        3600 RPM
        FCB          0 (            ) :06C4: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06C5: 'DEG   '   144
        FCB          0 (            ) :06C6: 'DEG   '   160
        FCB          0 (            ) :06C7: 'DEG   '   176
        FCB          0 (            ) :06C8: 'DEG   '   192
        FCB          0 (            ) :06C9: 'DEG   '   208
        FCB          0 (            ) :06CA: 'DEG   '   224
        FCB          0 (            ) :06CB: 'DEG   '   240
        FCB          0 (            ) :06CC: 'DEG   '   256

* ------------------------------------------ SPEED        4000 RPM
        FCB          0 (            ) :06CD: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06CE: 'DEG   '   144
        FCB          0 (            ) :06CF: 'DEG   '   160
        FCB          0 (            ) :06D0: 'DEG   '   176
        FCB          0 (            ) :06D1: 'DEG   '   192
        FCB          0 (            ) :06D2: 'DEG   '   208
        FCB          0 (            ) :06D3: 'DEG   '   224
        FCB          0 (            ) :06D4: 'DEG   '   240
        FCB          0 (            ) :06D5: 'DEG   '   256

* ------------------------------------------ SPEED        4400 RPM
        FCB          0 (            ) :06D6: 'DEG   '   128 EXCTRQ-TORQUE
        FCB          0 (            ) :06D7: 'DEG   '   144
        FCB          0 (            ) :06D8: 'DEG   '   160
```

```
        FCB           0 (           ) :06D9: 'DEG     '    176
        FCB           0 (           ) :06DA: 'DEG     '    192
        FCB           0 (           ) :06DB: 'DEG     '    208
        FCB           0 (           ) :06DC: 'DEG     '    224
        FCB           0 (           ) :06DD: 'DEG     '    240
        FCB           0 (           ) :06DE: 'DEG     '    256

* ------------------------------------------- SPEED        4800 RPM
        FCB           0 (           ) :06DF: 'DEG     '    128 EXCTRQ-TORQUE
        FCB           0 (           ) :06E0: 'DEG     '    144
        FCB           0 (           ) :06E1: 'DEG     '    160
        FCB           0 (           ) :06E2: 'DEG     '    176
        FCB           0 (           ) :06E3: 'DEG     '    192
        FCB           0 (           ) :06E4: 'DEG     '    208
        FCB           0 (           ) :06E5: 'DEG     '    224
        FCB           0 (           ) :06E6: 'DEG     '    240
        FCB           0 (           ) :06E7: 'DEG     '    256

* ------------------------------------------- SPEED        5200 RPM
        FCB           0 (           ) :06E8: 'DEG     '    128 EXCTRQ-TORQUE
        FCB           0 (           ) :06E9: 'DEG     '    144
        FCB           0 (           ) :06EA: 'DEG     '    160
        FCB           0 (           ) :06EB: 'DEG     '    176
        FCB           0 (           ) :06EC: 'DEG     '    192
        FCB           0 (           ) :06ED: 'DEG     '    208
        FCB           0 (           ) :06EE: 'DEG     '    224
        FCB           0 (           ) :06EF: 'DEG     '    240
        FCB           0 (           ) :06F0: 'DEG     '    256

* ------------------------------------------- SPEED        5600 RPM
        FCB           0 (           ) :06F1: 'DEG     '    128 EXCTRQ-TORQUE
        FCB           0 (           ) :06F2: 'DEG     '    144
        FCB           0 (           ) :06F3: 'DEG     '    160
        FCB           0 (           ) :06F4: 'DEG     '    176
        FCB           0 (           ) :06F5: 'DEG     '    192
        FCB           0 (           ) :06F6: 'DEG     '    208
        FCB           0 (           ) :06F7: 'DEG     '    224
        FCB           0 (           ) :06F8: 'DEG     '    240
        FCB           0 (           ) :06F9: 'DEG     '    256

* ------------------------------------------- SPEED        6000 RPM
        FCB           0 (           ) :06FA: 'DEG     '    128 EXCTRQ-TORQUE
        FCB           0 (           ) :06FB: 'DEG     '    144
        FCB           0 (           ) :06FC: 'DEG     '    160
        FCB           0 (           ) :06FD: 'DEG     '    176
        FCB           0 (           ) :06FE: 'DEG     '    192
        FCB           0 (           ) :06FF: 'DEG     '    208
        FCB           0 (           ) :0700: 'DEG     '    224
        FCB           0 (           ) :0701: 'DEG     '    240
        FCB           0 (           ) :0702: 'DEG     '    256

* ----------------------------------------------------------------------
KLVTQSCL FCB          0 (           ) :0703: 'SCALER' SCALER FOR TORQUE   #707
*-                      :             ::EQU N=E ::
* ----------------------------------------------------------------------
KACESLD  FCB          0 (           ) :0704: 'TORQUE' TORQUE LOST DUE TO A/   #708
*-                      :                          C LOAD
*-                      :             ::EQU N=E ::
* ----------------------------------------------------------------------
```

```
KMAXTRQ  FDB          0 (          ) :0705: 'TORQUE' MAXIMUM TORQUE
*_                      :             ::EQU N=E ::

***************************************
*   SHIFT SPARK TABLES AND PARAMETERS  *
***************************************
K12       EQU      *

*################################################
*      F12ETRQ  TABLE:                          #
* EXCESS TORQUE VS. NTRMPX AND ENGINE TORQUE    #
*################################################

*_
*_                      :             ::TBL3D,9,9,TBL7,8,TBL8,9,'EXTRQ%' ::
*                       :             ::PROTECT ::
* ---------------------------------------------------------------------
F12ETRQB FCB        112 (          ) :0707: '        ' R MIN; R = NTRPM, MIN
*_                      :                        = 2800
*_                      :             ::EQU N=E ::                        70B
* ---------------------------------------------------------------------
         FCB        128 (          ) :0708: '        ' Q MIN; Q = ENGINE
*_                      :                        TORQUE IN COUNTS         70C
*_                      :             ::EQU N=E ::
* ---------------------------------------------------------------------
         FCB          9 (          ) :0709: '        ' R NUM (NUMBER OF Q'S)
*_                      :             ::EQU N=E ::
*_                      :             ::NOPROTECT ::                      70D
*  2800 RPM
* --------------------------------------------- SPEED      2800 RPM
         FCB          0 (          ) :070A: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ  70E
*_                      :             ::EQU N=E  ::
         FCB          0 (          ) :070B: 'EXTRQ%' 36864
         FCB          0 (          ) :070C: 'EXTRQ%' 40960
         FCB          0 (          ) :070D: 'EXTRQ%' 45056
         FCB          0 (          ) :070E: 'EXTRQ%' 49152
         FCB          0 (          ) :070F: 'EXTRQ%' 53248
         FCB          0 (          ) :0710: 'EXTRQ%' 57344
         FCB          0 (          ) :0711: 'EXTRQ%' 61440
         FCB          0 (          ) :0712: 'EXTRQ%' 65536                716

* --------------------------------------------- SPEED      3200 RPM
         FCB          0 (          ) :0713: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ  717
         FCB          0 (          ) :0714: 'EXTRQ%' 36864
         FCB          0 (          ) :0715: 'EXTRQ%' 40960
         FCB          0 (          ) :0716: 'EXTRQ%' 45056
         FCB          0 (          ) :0717: 'EXTRQ%' 49152
         FCB          0 (          ) :0718: 'EXTRQ%' 53248
         FCB          0 (          ) :0719: 'EXTRQ%' 57344
         FCB          0 (          ) :071A: 'EXTRQ%' 61440
         FCB          0 (          ) :071B: 'EXTRQ%' 65536                71F

* --------------------------------------------- SPEED      3600 RPM     720
         FCB          0 (          ) :071C: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
         FCB          0 (          ) :071D: 'EXTRQ%' 36864
         FCB          0 (          ) :071E: 'EXTRQ%' 40960
         FCB          0 (          ) :071F: 'EXTRQ%' 45056
         FCB          0 (          ) :0720: 'EXTRQ%' 49152
         FCB          0 (          ) :0721: 'EXTRQ%' 53248
         FCB          0 (          ) :0722: 'EXTRQ%' 57344
```

```
        FCB          0 (            ) :0723: 'EXTRQ%' 61440
        FCB          0 (            ) :0724: 'EXTRQ%' 65536         728

 * ------------------------------------------ SPEED       4000 RPM    729
        FCB          0 (            ) :0725: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
        FCB          0 (            ) :0726: 'EXTRQ%' 36864
        FCB          0 (            ) :0727: 'EXTRQ%' 40960
        FCB          0 (            ) :0728: 'EXTRQ%' 45056
        FCB          0 (            ) :0729: 'EXTRQ%' 49152
        FCB          0 (            ) :072A: 'EXTRQ%' 53248
        FCB          0 (            ) :072B: 'EXTRQ%' 57344
        FCB          0 (            ) :072C: 'EXTRQ%' 61440
        FCB          0 (            ) :072D: 'EXTRQ%' 65536         731

 * ------------------------------------------ SPEED       4400 RPM    732
        FCB          0 (            ) :072E: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
        FCB          0 (            ) :072F: 'EXTRQ%' 36864
        FCB          0 (            ) :0730: 'EXTRQ%' 40960
        FCB          0 (            ) :0731: 'EXTRQ%' 45056
        FCB          0 (            ) :0732: 'EXTRQ%' 49152
        FCB          0 (            ) :0733: 'EXTRQ%' 53248
        FCB          0 (            ) :0734: 'EXTRQ%' 57344
        FCB          0 (            ) :0735: 'EXTRQ%' 61440
        FCB          0 (            ) :0736: 'EXTRQ%' 65536    73A

 * ------------------------------------------ SPEED       4800 RPM    73B
        FCB          0 (            ) :0737: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
        FCB          0 (            ) :0738: 'EXTRQ%' 36864
        FCB          0 (            ) :0739: 'EXTRQ%' 40960
        FCB          0 (            ) :073A: 'EXTRQ%' 45056
        FCB          0 (            ) :073B: 'EXTRQ%' 49152
        FCB          0 (            ) :073C: 'EXTRQ%' 53248
        FCB          0 (            ) :073D: 'EXTRQ%' 57344
        FCB          0 (            ) :073E: 'EXTRQ%' 61440
        FCB          0 (            ) :073F: 'EXTRQ%' 65536  743

 * ------------------------------------------ SPEED       5200 RPM    744
        FCB          0 (            ) :0740: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
        FCB          0 (            ) :0741: 'EXTRQ%' 36864
        FCB          0 (            ) :0742: 'EXTRQ%' 40960
        FCB          0 (            ) :0743: 'EXTRQ%' 45056
        FCB          0 (            ) :0744: 'EXTRQ%' 49152
        FCB          0 (            ) :0745: 'EXTRQ%' 53248
        FCB          0 (            ) :0746: 'EXTRQ%' 57344
        FCB          0 (            ) :0747: 'EXTRQ%' 61440
        FCB          0 (            ) :0748: 'EXTRQ%' 65536    74C

 * ------------------------------------------ SPEED       5600 RPM    74D
        FCB          0 (            ) :0749: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
        FCB          0 (            ) :074A: 'EXTRQ%' 36864
        FCB          0 (            ) :074B: 'EXTRQ%' 40960
        FCB          0 (            ) :074C: 'EXTRQ%' 45056
        FCB          0 (            ) :074D: 'EXTRQ%' 49152
        FCB          0 (            ) :074E: 'EXTRQ%' 53248
        FCB          0 (            ) :074F: 'EXTRQ%' 57344
        FCB          0 (            ) :0750: 'EXTRQ%' 61440
        FCB          0 (            ) :0751: 'EXTRQ%' 65536     755

 * ------------------------------------------ SPEED       6000 RPM
```

```
            FCB          0 (            ) :0752: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ  756
            FCB          0 (            ) :0753: 'EXTRQ%' 36864
            FCB          0 (            ) :0754: 'EXTRQ%' 40960
            FCB          0 (            ) :0755: 'EXTRQ%' 45056
            FCB          0 (            ) :0756: 'EXTRQ%' 49152
            FCB          0 (            ) :0757: 'EXTRQ%' 53248
            FCB          0 (            ) :0758: 'EXTRQ%' 57344
            FCB          0 (            ) :0759: 'EXTRQ%' 61440
            FCB          0 (            ) :075A: 'EXTRQ%' 65536     75E

*###########################################################
*     F12SHAP  SPARK SHAPER VS. % SHIFT COMPLETION         #
*   TABLE VALUE = MULTIPLIER   (0-1)                       #
*###########################################################
*-                     :            ::TBL2D,17,1,TBL24,1,1,'MULT' ::
* -----------------------------------------------------------------
F12SHAP  FCB           0 (            ) :075B: 'MULT  '  0.00     %-SHFTCOMP  75F
*-                     :              ::EQU N=E*256 ::
            FCB        0 (            ) :075C: 'MULT  '  6.25
            FCB        0 (            ) :075D: 'MULT  ' 12.50
            FCB        0 (            ) :075E: 'MULT  ' 18.75
            FCB        0 (            ) :075F: 'MULT  ' 25.00
            FCB        0 (            ) :0760: 'MULT  ' 31.25
            FCB        0 (            ) :0761: 'MULT  ' 37.50
            FCB        0 (            ) :0762: 'MULT  ' 43.75
            FCB        0 (            ) :0763: 'MULT  ' 50.00
            FCB        0 (            ) :0764: 'MULT  ' 56.25
            FCB        0 (            ) :0765: 'MULT  ' 62.50
            FCB        0 (            ) :0766: 'MULT  ' 68.75
            FCB        0 (            ) :0767: 'MULT  ' 75.00
            FCB        0 (            ) :0768: 'MULT  ' 81.25
            FCB        0 (            ) :0769: 'MULT  ' 87.50
            FCB        0 (            ) :076A: 'MULT  ' 93.75
            FCB        0 (            ) :076B: 'MULT  ' 100.00  76F

*###########################################################
*   F12CLADJ TABLE:                                        #
*     COOLANT ADJUSTMNET FOR EXCESS TORQUE FOR 1-2 UPSHIFT #
*     TABLE VALUE = TORQUE ADJUSTMENT + 128                #
*###########################################################
*-                     :            ::TBL2D,7,1,TBL2,2,2,'EXSHTQ' ::
* -----------------------------------------------------------------
F12CLADJ FCB           0 (            ) :076C: 'EXSHTQ'   -28  DEG C-TEMP  770
*-                     :              ::EQU N=E+128    ::
            FCB        0 (            ) :076D: 'EXSHTQ'    -4
            FCB        0 (            ) :076E: 'EXSHTQ'    20
            FCB        0 (            ) :076F: 'EXSHTQ'    44
            FCB        0 (            ) :0770: 'EXSHTQ'    68
            FCB        0 (            ) :0771: 'EXSHTQ'    92
            FCB        0 (            ) :0772: 'EXSHTQ'   116     776

*###########################################################
*  F12TMADJ TABLE:                                         #
*     SHIFT TIME ADJUSTMENT FOR EXCESS TORQUE FOR 1-2 UPSHIFT  #
*     TABLE VALUE = 0 TO 2 MULTIPLIER  (128 = MULTIPLIER OF 1) #
*###########################################################
*-                     :            ::TBL2D,17,1,TBL25,1,1,'MULT' ::
* -----------------------------------------------------------------
F12TMADJ FCB           0 (            ) :0773: 'MULT  '     0    SEC-SHFTME
```

```
*-                        :              ::EQU N=E*128    ::
          FCB            0 (            ) :0774: 'MULT  '  0.05
          FCB            0 (            ) :0775: 'MULT  '  0.1
          FCB            0 (            ) :0776: 'MULT  '  0.15
          FCB            0 (            ) :0777: 'MULT  '  0.2
          FCB            0 (            ) :0778: 'MULT  '  0.25
          FCB            0 (            ) :0779: 'MULT  '  0.3
          FCB            0 (            ) :077A: 'MULT  '  0.35
          FCB            0 (            ) :077B: 'MULT  '  0.4
          FCB            0 (            ) :077C: 'MULT  '  0.45
          FCB            0 (            ) :077D: 'MULT  '  0.5
          FCB            0 (            ) :077E: 'MULT  '  0.55
          FCB            0 (            ) :077F: 'MULT  '  0.6
          FCB            0 (            ) :0780: 'MULT  '  0.65
          FCB            0 (            ) :0781: 'MULT  '  0.7
          FCB            0 (            ) :0782: 'MULT  '  0.75
          FCB            0 (            ) :0783: 'MULT  '  0.8

* ---------------------------------------------------------------------
K12FREZE FCB             0 (            ) :0784: '%TPS  ' IF TPS < CAL BASE
*-                        :                        SPARK = 0
*-                        :              ::EQU N=E*2.56 ::
* ---------------------------------------------------------------------
K12BIAS  FDB             0 (            ) :0785: 'RPMCHG'
*-                        :              ::EQU N=E ::
* ---------------------------------------------------------------------
K12ACNT  FCB             0 (            ) :0787: 'REFS  ' MIN CONSEC. RPM
*-                        :                        INCREASES FOR SHIFT COMPLT
*-                        :              ::EQU N=E ::
* ---------------------------------------------------------------------
K12DELTA FDB             0 (            ) :0788: 'RPMCHG' MIN RPM DELTA TO
*-                        :                        BEGIN SHIFT
*-                        :              ::EQU N=E ::
* ---------------------------------------------------------------------
K12SHTRQ FCB             0 (            ) :078A: 'TORQUE'
*-                        :              ::EQU N=E ::
* ---------------------------------------------------------------------
K12COEF  FCB             0 (            ) :078B: 'COEFF ' FILTER COEFFICIENT
*-                        :                        FOR SHIFT TIME LEARN
*-                        :              ::EQU N=E*256 ::
* ---------------------------------------------------------------------
K12QUIT  FCB             0 (            ) :078C: '%TPS  ' MIN TPS TO INCREMENT
*-                        :                        SHIFT TIME
*-                        :              ::EQU N=E*2.56 ::
* ---------------------------------------------------------------------
K12DFLTM FCB             0 (            ) :078D: 'SEC   ' DEFAULT SHIFT TIME
*-                        :                        FOR 1-2 UPSHIFT
*-                        :              ::EQU N=E*80 ::
* ---------------------------------------------------------------------
K12TSOON FCB             0 (            ) :078E: 'SEC   ' DON'T LEARN IF SHIFT
*-                        :                        TIME < THIS
*-                        :              ::EQU N=E*80 ::
* ---------------------------------------------------------------------
K12TLATE FCB             0 (            ) :078F: 'SEC   ' LIMIT SHIFT TIME TO
*-                        :                        THIS FOR LEARN
*-                        :              ::EQU N=E*80 ::
K23      EQU      *

*##################################################
```

```
*      F23ETRQ  TABLE:                                #
* EXCESS TORQUE VS. NTRMPX AND ENGINE TORQUE          #
*######################################################

*-                          :               ::TBL3D,9,9,TBL7,8,TBL8,9,'EXTRQ%' ::
*-                          :               ::PROTECT ::                          #794
* -----------------------------------------------------------------------------
F23ETRQB FCB          112 (          ) :0790: '       ' R MIN;  R = NTRPM, MIN
*-                          :                      = 2800
*-                          :               ::EQU N=E ::
* -----------------------------------------------------------------------------
         FCB          128 (          ) :0791: '       ' Q MIN;  Q = ENGINE
*-                          :                      TORQUE IN COUNTS
*-                          :               ::EQU N=E ::
* -----------------------------------------------------------------------------
         FCB            9 (          ) :0792: '       ' R NUM (NUMBER OF Q'S)
*-                          :               ::EQU N=E ::                          796
*-                          :               ::NOPROTECT ::
*  2800 RPM
* ---------------------------------------------------- SPEED       2800 RPM       797
         FCB            0 (          ) :0793: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
*-                          :               ::EQU N=E  ::
         FCB            0 (          ) :0794: 'EXTRQ%' 36864
         FCB            0 (          ) :0795: 'EXTRQ%' 40960
         FCB            0 (          ) :0796: 'EXTRQ%' 45056
         FCB            0 (          ) :0797: 'EXTRQ%' 49152
         FCB            0 (          ) :0798: 'EXTRQ%' 53248
         FCB            0 (          ) :0799: 'EXTRQ%' 57344
         FCB            0 (          ) :079A: 'EXTRQ%' 61440
         FCB            0 (          ) :079B: 'EXTRQ%' 65536   79F

* ---------------------------------------------------- SPEED       3200 RPM       7A0
         FCB            0 (          ) :079C: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
         FCB            0 (          ) :079D: 'EXTRQ%' 36864
         FCB            0 (          ) :079E: 'EXTRQ%' 40960
         FCB            0 (          ) :079F: 'EXTRQ%' 45056
         FCB            0 (          ) :07A0: 'EXTRQ%' 49152
         FCB            0 (          ) :07A1: 'EXTRQ%' 53248
         FCB            0 (          ) :07A2: 'EXTRQ%' 57344
         FCB            0 (          ) :07A3: 'EXTRQ%' 61440
         FCB            0 (          ) :07A4: 'EXTRQ%' 65536          7A8

* ---------------------------------------------------- SPEED       3600 RPM       7A9
         FCB            0 (          ) :07A5: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
         FCB            0 (          ) :07A6: 'EXTRQ%' 36864
         FCB            0 (          ) :07A7: 'EXTRQ%' 40960
         FCB            0 (          ) :07A8: 'EXTRQ%' 45056
         FCB            0 (          ) :07A9: 'EXTRQ%' 49152
         FCB            0 (          ) :07AA: 'EXTRQ%' 53248
         FCB            0 (          ) :07AB: 'EXTRQ%' 57344
         FCB            0 (          ) :07AC: 'EXTRQ%' 61440
         FCB            0 (          ) :07AD: 'EXTRQ%' 65536          7B1

* ---------------------------------------------------- SPEED       4000 RPM       7B2
         FCB            0 (          ) :07AE: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
         FCB            0 (          ) :07AF: 'EXTRQ%' 36864
         FCB            0 (          ) :07B0: 'EXTRQ%' 40960
         FCB            0 (          ) :07B1: 'EXTRQ%' 45056
         FCB            0 (          ) :07B2: 'EXTRQ%' 49152
```

```
FCB        0 (          ) :07B3: 'EXTRQ%' 53248
FCB        0 (          ) :07B4: 'EXTRQ%' 57344
FCB        0 (          ) :07B5: 'EXTRQ%' 61440
FCB        0 (          ) :07B6: 'EXTRQ%' 65536     7BA

* ------------------------------------------- SPEED      4400 RPM     7BB
FCB        0 (          ) :07B7: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
FCB        0 (          ) :07B8: 'EXTRQ%' 36864
FCB        0 (          ) :07B9: 'EXTRQ%' 40960
FCB        0 (          ) :07BA: 'EXTRQ%' 45056
FCB        0 (          ) :07BB: 'EXTRQ%' 49152
FCB        0 (          ) :07BC: 'EXTRQ%' 53248
FCB        0 (          ) :07BD: 'EXTRQ%' 57344
FCB        0 (          ) :07BE: 'EXTRQ%' 61440
FCB        0 (          ) :07BF: 'EXTRQ%' 65536     7C3

* ------------------------------------------- SPEED      4800 RPM     7C4
FCB        0 (          ) :07C0: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
FCB        0 (          ) :07C1: 'EXTRQ%' 36864
FCB        0 (          ) :07C2: 'EXTRQ%' 40960
FCB        0 (          ) :07C3: 'EXTRQ%' 45056
FCB        0 (          ) :07C4: 'EXTRQ%' 49152
FCB        0 (          ) :07C5: 'EXTRQ%' 53248
FCB        0 (          ) :07C6: 'EXTRQ%' 57344
FCB        0 (          ) :07C7: 'EXTRQ%' 61440
FCB        0 (          ) :07C8: 'EXTRQ%' 65536     7CC

* ------------------------------------------- SPEED      5200 RPM     7CD
FCB        0 (          ) :07C9: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
FCB        0 (          ) :07CA: 'EXTRQ%' 36864
FCB        0 (          ) :07CB: 'EXTRQ%' 40960
FCB        0 (          ) :07CC: 'EXTRQ%' 45056
FCB        0 (          ) :07CD: 'EXTRQ%' 49152
FCB        0 (          ) :07CE: 'EXTRQ%' 53248
FCB        0 (          ) :07CF: 'EXTRQ%' 57344
FCB        0 (          ) :07D0: 'EXTRQ%' 61440     7D5
FCB        0 (          ) :07D1: 'EXTRQ%' 65536

* ------------------------------------------- SPEED      5600 RPM     7D6
FCB        0 (          ) :07D2: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
FCB        0 (          ) :07D3: 'EXTRQ%' 36864
FCB        0 (          ) :07D4: 'EXTRQ%' 40960
FCB        0 (          ) :07D5: 'EXTRQ%' 45056
FCB        0 (          ) :07D6: 'EXTRQ%' 49152
FCB        0 (          ) :07D7: 'EXTRQ%' 53248
FCB        0 (          ) :07D8: 'EXTRQ%' 57344
FCB        0 (          ) :07D9: 'EXTRQ%' 61440     7DE
FCB        0 (          ) :07DA: 'EXTRQ%' 65536

* ------------------------------------------- SPEED      6000 RPM     7DF
FCB        0 (          ) :07DB: 'EXTRQ%' 32768 EXCSTQ-ENGTRQ
FCB        0 (          ) :07DC: 'EXTRQ%' 36864
FCB        0 (          ) :07DD: 'EXTRQ%' 40960
FCB        0 (          ) :07DE: 'EXTRQ%' 45056
FCB        0 (          ) :07DF: 'EXTRQ%' 49152
FCB        0 (          ) :07E0: 'EXTRQ%' 53248
FCB        0 (          ) :07E1: 'EXTRQ%' 57344
FCB        0 (          ) :07E2: 'EXTRQ%' 61440
FCB        0 (          ) :07E3: 'EXTRQ%' 65536     7E7
```

```
*#############################################################
*      F23SHAP  SPARK SHAPER VS. % SHIFT COMPLETION           #
*   TABLE VALUE = MULTIPLIER   (0-1)                          #
*#############################################################
*-
*                     :               ::TBL2D,17,1,TBL24,1,1,'MULT' ::
* ----------------------------------------------------------------------
F23SHAP  FCB          0 (           ) :07E4: 'MULT  '  0.00    %-SHFTCOMP  7E8
*-                    :               ::EQU N=E*256 ::
         FCB          0 (           ) :07E5: 'MULT  '   6.25
         FCB          0 (           ) :07E6: 'MULT  '  12.50
         FCB          0 (           ) :07E7: 'MULT  '  18.75
         FCB          0 (           ) :07E8: 'MULT  '  25.00
         FCB          0 (           ) :07E9: 'MULT  '  31.25
         FCB          0 (           ) :07EA: 'MULT  '  37.50
         FCB          0 (           ) :07EB: 'MULT  '  43.75
         FCB          0 (           ) :07EC: 'MULT  '  50.00
         FCB          0 (           ) :07ED: 'MULT  '  56.25
         FCB          0 (           ) :07EE: 'MULT  '  62.50
         FCB          0 (           ) :07EF: 'MULT  '  68.75
         FCB          0 (           ) :07F0: 'MULT  '  75.00
         FCB          0 (           ) :07F1: 'MULT  '  81.25
         FCB          0 (           ) :07F2: 'MULT  '  87.50
         FCB          0 (           ) :07F3: 'MULT  '  93.75
         FCB          0 (           ) :07F4: 'MULT  ' 100.00  7F8

*#############################################################
*   F23CLADJ TABLE:                                           #
*      COOLANT ADJUSTMNET FOR EXCESS TORQUE FOR 2-3 UPSHIFT   #
*      TABLE VALUE = TORQUE ADJUSTMENT + 128                  #
*#############################################################
*-
*                     :               ::TBL2D,7,1,TBL2,2,2,'EXSHTQ' ::
* ----------------------------------------------------------------------
F23CLADJ FCB          0 (           ) :07F5: 'EXSHTQ'   -28  DEG C-TEMP  7F9
*-                    :               ::EQU N=E+128    ::
         FCB          0 (           ) :07F6: 'EXSHTQ'    -4
         FCB          0 (           ) :07F7: 'EXSHTQ'    20
         FCB          0 (           ) :07F8: 'EXSHTQ'    44
         FCB          0 (           ) :07F9: 'EXSHTQ'    68
         FCB          0 (           ) :07FA: 'EXSHTQ'    92
         FCB          0 (           ) :07FB: 'EXSHTQ'   116     7FF

*#############################################################
*  F23TMADJ TABLE:                                            #
*     SHIFT TIME ADJUSTMENT FOR EXCESS TORQUE FOR 2-3 UPSHIFT #
*     TABLE VALUE = 0 TO 2 MULTIPLIER                         #
*#############################################################
*-
*                     :               ::TBL2D,17,1,TBL25,1,1,'MULT' ::
* ----------------------------------------------------------------------
F23TMADJ FCB          0 (           ) :07FC: 'MULT  '     0   SEC-SHFTME  800
*-                    :               ::EQU N=E*128     ::
         FCB          0 (           ) :07FD: 'MULT  '  0.05
         FCB          0 (           ) :07FE: 'MULT  '   0.1
         FCB          0 (           ) :07FF: 'MULT  '  0.15
         FCB          0 (           ) :0800: 'MULT  '   0.2
         FCB          0 (           ) :0801: 'MULT  '  0.25
         FCB          0 (           ) :0802: 'MULT  '   0.3
         FCB          0 (           ) :0803: 'MULT  '  0.35
         FCB          0 (           ) :0804: 'MULT  '   0.4
         FCB          0 (           ) :0805: 'MULT  '  0.45
```

```
          FCB            0 (            ) :0806: 'MULT   '   0.5
          FCB            0 (            ) :0807: 'MULT   '  0.55
          FCB            0 (            ) :0808: 'MULT   '   0.6
          FCB            0 (            ) :0809: 'MULT   '  0.65
          FCB            0 (            ) :080A: 'MULT   '   0.7
          FCB            0 (            ) :080B: 'MULT   '  0.75
          FCB            0 (            ) :080C: 'MULT   '   0.8      810

* -----------------------------------------------------------------------
K23FREZE FCB             0 (            ) :080D: '%TPS   ' IF TPS < CAL BASE   811
*-                         :                     SPARK = 0
*-                         :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------
K23BIAS  FDB             0 (            ) :080E: 'RPMCHG'
*-                         :              ::EQU N=E ::                     >812
* -----------------------------------------------------------------------
K23ACNT  FCB             0 (            ) :0810: 'REFS   ' MIN CONSEC. RPM   814
*-                         :                     INCREASES FOR SHIFT COMPLT
*-                         :              ::EQU N=E ::
* -----------------------------------------------------------------------
K23DELTA FDB             0 (            ) :0811: 'RPMCHG' MIN RPM DELTA TO
*-                         :                     BEGIN SHIFT               > 815
*-                         :              ::EQU N=E ::
* -----------------------------------------------------------------------
K23SHTRQ FCB             0 (            ) :0813: 'TORQUE'                 817
*-                         :              ::EQU N=E ::
* -----------------------------------------------------------------------
K23COEF  FCB             0 (            ) :0814: 'COEFF ' FILTER COEFFICIENT
*-                         :                     FOR SHIFT TIME LEARN       818
*-                         :              ::EQU N=E*256 ::
* -----------------------------------------------------------------------
K23QUIT  FCB             0 (            ) :0815: '%TPS   ' MIN TPS TO INCREMENT   819
*-                         :                     SHIFT TIME
*-                         :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------
K23DFLTM FCB             0 (            ) :0816: 'SEC    ' DEFAULT SHIFT TIME   820
*-                         :                     FOR 1-2 UPSHIFT
*-                         :              ::EQU N=E*80 ::
* -----------------------------------------------------------------------
K23TSOON FCB             0 (            ) :0817: 'SEC    ' DON'T LEARN IF SHIFT   821
*-                         :                     TIME < THIS
*-                         :              ::EQU N=E*80 ::
* -----------------------------------------------------------------------
K23TLATE FCB             0 (            ) :0818: 'SEC    ' LIMIT SHIFT TIME TO   822
*-                         :                     THIS FOR LEARN
*-                         :              ::EQU N=E*80 ::

*****************************************
*   3-2 DOWNSHIFT TABLES AND PARAMETERS   *
*****************************************

* -----------------------------------------------------------------------
KGAINSPD FCB             0 (            ) :0819: 'MPH    ' IF MPH > CAL USE HI   823
*-                         :                     GAIN: ELSE LOW GAIN
*-                         :              ::EQU N=E ::
* -----------------------------------------------------------------------
K32GAINH FCB             0 (            ) :081A: 'GAIN   ' MULT. DELTA RPM *   824
*-                         :                     GAIN FOR 32 SPARK RETARD
*-                         :              ::EQU N=E*64 ::
```

```
* -------------------------------------------------------------------
K32GAINL FCB          0 (          ) :081B: 'GAIN  ' MULT. DELTA RPM *   825
*-                      :                  GAIN FOR 32 SPARK RETARD
*-                      :              ::EQU N=E*64 ::
* -------------------------------------------------------------------
K32TPSLM FCB          0 (          ) :081C: '%TPS  ' IF TPS < CAL END 3/2   826
*-                      :                  SHIFT
*-                      :              ::EQU N=E*2.56 ::

*************************************
*  ENGPERF CAL VALUES               *
*************************************

* -------------------------------------------------------------------
KENGPRF  FCB          0 (          ) :081D: 'TORQUE' DEFAULT TORQUE VALUE
*-                      :                  FOR MAX 3/2 SPARK
*-                      :              ::EQU N=E ::
* -------------------------------------------------------------------
KPRFEMIN FCB          0 (          ) :081E: 'RPM   ' DON'T LEARN ENGPERF
*-                      :                  IF RPM <= CAL
*-                      :              ::EQU N=E/25 ::
* -------------------------------------------------------------------
KPRFEMAX FCB          0 (          ) :081F: 'RPM   ' DON'T LEARN ENGPERF
*-                      :                  IF RPM >= CAL
*-                      :              ::EQU N=E/25 ::
* -------------------------------------------------------------------
KPRFTMIN FCB          0 (          ) :0820: '%TPS  ' DON'T LEARN ENGPERF
*-                      :                  IF TPS < CAL
*-                      :              ::EQU N=E*256/100 ::
* -------------------------------------------------------------------
K32COEF  FCB          0 (          ) :0821: 'COEFF ' FILTER COEFFICIENT
*-                      :                  FOR LEARNING ENGPERF
*-                      :              ::EQU N=E*256     ::

***************************************************************
*   REFERENCE ENGINE ACCEL : TARGET RPM INCREASE PER 12.5 MSEC.  *
***************************************************************
                                                                      #826
*-                      :              ::TBL3D,13,9,TBL10,4,TBL38,1,2,
*-                      :                  'RPMSLP'::
*-                      :              ::PROTECT ::
* -------------------------------------------------------------------
F32RFSLP FCB          0 (          )*:0822: '      ' R MIN; R = MPH
*-                      :                  (FILTMPH)
* -------------------------------------------------------------------
         FCB          0 (          )*:0823: '      ' Q MIN; Q = THROTTLE
*-                      :                  (NTPSLD)
* -------------------------------------------------------------------
         FCB          9 (          ) :0824: '      ' R NUM
*-                      :              ::EQU N=E :: 'RATE OF ENGINE
*-                      :                  ACCELERATION IN RPM/12.5MSEC'
*-                      :              ::EQU N=E :: 'NOMINAL ENGINE TORQUE'
*-                      :              ::NOPROTECT ::

*12 MPH
* --------------------------------------------- SPEED          12 MPH
         FCB          0 (          ) :0825: 'RPMSLP'  0.00     %-THROTPOS
*-                      :              ::EQU N=E ::
         FCB          0 (          ) :0826: 'RPMSLP' 12.50
```

```
        FCB          0 (          ) :0827: 'RPMSLP' 25.00
        FCB          0 (          ) :0828: 'RPMSLP' 37.50
        FCB          0 (          ) :0829: 'RPMSLP' 50.00
        FCB          0 (          ) :082A: 'RPMSLP' 62.50
        FCB          0 (          ) :082B: 'RPMSLP' 75.00
        FCB          0 (          ) :082C: 'RPMSLP' 87.50
        FCB          0 (          ) :082D: 'RPMSLP' 100.00

*  ---------------------------------------- SPEED        16 MPH
        FCB          0 (          ) :082E: 'RPMSLP'  0.00    %-THROTPOS
        FCB          0 (          ) :082F: 'RPMSLP' 12.50
        FCB          0 (          ) :0830: 'RPMSLP' 25.00
        FCB          0 (          ) :0831: 'RPMSLP' 37.50
        FCB          0 (          ) :0832: 'RPMSLP' 50.00
        FCB          0 (          ) :0833: 'RPMSLP' 62.50
        FCB          0 (          ) :0834: 'RPMSLP' 75.00
        FCB          0 (          ) :0835: 'RPMSLP' 87.50
        FCB          0 (          ) :0836: 'RPMSLP' 100.00

*  ---------------------------------------- SPEED        20 MPH
        FCB          0 (          ) :0837: 'RPMSLP'  0.00    %-THROTPOS
        FCB          0 (          ) :0838: 'RPMSLP' 12.50
        FCB          0 (          ) :0839: 'RPMSLP' 25.00
        FCB          0 (          ) :083A: 'RPMSLP' 37.50
        FCB          0 (          ) :083B: 'RPMSLP' 50.00
        FCB          0 (          ) :083C: 'RPMSLP' 62.50
        FCB          0 (          ) :083D: 'RPMSLP' 75.00
        FCB          0 (          ) :083E: 'RPMSLP' 87.50
        FCB          0 (          ) :083F: 'RPMSLP' 100.00

*  ---------------------------------------- SPEED        24 MPH
        FCB          0 (          ) :0840: 'RPMSLP'  0.00    %-THROTPOS
        FCB          0 (          ) :0841: 'RPMSLP' 12.50
        FCB          0 (          ) :0842: 'RPMSLP' 25.00
        FCB          0 (          ) :0843: 'RPMSLP' 37.50
        FCB          0 (          ) :0844: 'RPMSLP' 50.00
        FCB          0 (          ) :0845: 'RPMSLP' 62.50
        FCB          0 (          ) :0846: 'RPMSLP' 75.00
        FCB          0 (          ) :0847: 'RPMSLP' 87.50
        FCB          0 (          ) :0848: 'RPMSLP' 100.00

*  ---------------------------------------- SPEED        28 MPH
        FCB          0 (          ) :0849: 'RPMSLP'  0.00    %-THROTPOS
        FCB          0 (          ) :084A: 'RPMSLP' 12.50
        FCB          0 (          ) :084B: 'RPMSLP' 25.00
        FCB          0 (          ) :084C: 'RPMSLP' 37.50
        FCB          0 (          ) :084D: 'RPMSLP' 50.00
        FCB          0 (          ) :084E: 'RPMSLP' 62.50
        FCB          0 (          ) :084F: 'RPMSLP' 75.00
        FCB          0 (          ) :0850: 'RPMSLP' 87.50
        FCB          0 (          ) :0851: 'RPMSLP' 100.00

*  ---------------------------------------- SPEED        32 MPH
        FCB          0 (          ) :0852: 'RPMSLP'  0.00    %-THROTPOS
        FCB          0 (          ) :0853: 'RPMSLP' 12.50
        FCB          0 (          ) :0854: 'RPMSLP' 25.00
        FCB          0 (          ) :0855: 'RPMSLP' 37.50
        FCB          0 (          ) :0856: 'RPMSLP' 50.00
        FCB          0 (          ) :0857: 'RPMSLP' 62.50
```

```
          FCB         0 (          ) :0858: 'RPMSLP' 75.00
          FCB         0 (          ) :0859: 'RPMSLP' 87.50
          FCB         0 (          ) :085A: 'RPMSLP' 100.00

*  ------------------------------------------ SPEED         36 MPH
          FCB         0 (          ) :085B: 'RPMSLP'  0.00    %-THROTPOS
          FCB         0 (          ) :085C: 'RPMSLP' 12.50
          FCB         0 (          ) :085D: 'RPMSLP' 25.00
          FCB         0 (          ) :085E: 'RPMSLP' 37.50
          FCB         0 (          ) :085F: 'RPMSLP' 50.00
          FCB         0 (          ) :0860: 'RPMSLP' 62.50
          FCB         0 (          ) :0861: 'RPMSLP' 75.00
          FCB         0 (          ) :0862: 'RPMSLP' 87.50
          FCB         0 (          ) :0863: 'RPMSLP' 100.00

*  ------------------------------------------ SPEED         40 MPH
          FCB         0 (          ) :0864: 'RPMSLP'  0.00    %-THROTPOS
          FCB         0 (          ) :0865: 'RPMSLP' 12.50
          FCB         0 (          ) :0866: 'RPMSLP' 25.00
          FCB         0 (          ) :0867: 'RPMSLP' 37.50
          FCB         0 (          ) :0868: 'RPMSLP' 50.00
          FCB         0 (          ) :0869: 'RPMSLP' 62.50
          FCB         0 (          ) :086A: 'RPMSLP' 75.00
          FCB         0 (          ) :086B: 'RPMSLP' 87.50
          FCB         0 (          ) :086C: 'RPMSLP' 100.00

*  ------------------------------------------ SPEED         44 MPH
          FCB         0 (          ) :086D: 'RPMSLP'  0.00    %-THROTPOS
          FCB         0 (          ) :086E: 'RPMSLP' 12.50
          FCB         0 (          ) :086F: 'RPMSLP' 25.00
          FCB         0 (          ) :0870: 'RPMSLP' 37.50
          FCB         0 (          ) :0871: 'RPMSLP' 50.00
          FCB         0 (          ) :0872: 'RPMSLP' 62.50
          FCB         0 (          ) :0873: 'RPMSLP' 75.00
          FCB         0 (          ) :0874: 'RPMSLP' 87.50
          FCB         0 (          ) :0875: 'RPMSLP' 100.00

*  ------------------------------------------ SPEED         48 MPH
          FCB         0 (          ) :0876: 'RPMSLP'  0.00    %-THROTPOS
          FCB         0 (          ) :0877: 'RPMSLP' 12.50
          FCB         0 (          ) :0878: 'RPMSLP' 25.00
          FCB         0 (          ) :0879: 'RPMSLP' 37.50
          FCB         0 (          ) :087A: 'RPMSLP' 50.00
          FCB         0 (          ) :087B: 'RPMSLP' 62.50
          FCB         0 (          ) :087C: 'RPMSLP' 75.00
          FCB         0 (          ) :087D: 'RPMSLP' 87.50
          FCB         0 (          ) :087E: 'RPMSLP' 100.00

*  ------------------------------------------ SPEED         52 MPH
          FCB         0 (          ) :087F: 'RPMSLP'  0.00    %-THROTPOS
          FCB         0 (          ) :0880: 'RPMSLP' 12.50
          FCB         0 (          ) :0881: 'RPMSLP' 25.00
          FCB         0 (          ) :0882: 'RPMSLP' 37.50
          FCB         0 (          ) :0883: 'RPMSLP' 50.00
          FCB         0 (          ) :0884: 'RPMSLP' 62.50
          FCB         0 (          ) :0885: 'RPMSLP' 75.00
          FCB         0 (          ) :0886: 'RPMSLP' 87.50
          FCB         0 (          ) :0887: 'RPMSLP' 100.00
```

```
 * -------------------------------------------- SPEED        56 MPH
        FCB           0 (          ) :0888: 'RPMSLP'  0.00   %-THROTPOS
        FCB           0 (          ) :0889: 'RPMSLP' 12.50
        FCB           0 (          ) :088A: 'RPMSLP' 25.00
        FCB           0 (          ) :088B: 'RPMSLP' 37.50
        FCB           0 (          ) :088C: 'RPMSLP' 50.00
        FCB           0 (          ) :088D: 'RPMSLP' 62.50
        FCB           0 (          ) :088E: 'RPMSLP' 75.00
        FCB           0 (          ) :088F: 'RPMSLP' 87.50
        FCB           0 (          ) :0890: 'RPMSLP' 100.00

 * -------------------------------------------- SPEED        60 MPH
        FCB           0 (          ) :0891: 'RPMSLP'  0.00   %-THROTPOS
        FCB           0 (          ) :0892: 'RPMSLP' 12.50
        FCB           0 (          ) :0893: 'RPMSLP' 25.00
        FCB           0 (          ) :0894: 'RPMSLP' 37.50
        FCB           0 (          ) :0895: 'RPMSLP' 50.00
        FCB           0 (          ) :0896: 'RPMSLP' 62.50
        FCB           0 (          ) :0897: 'RPMSLP' 75.00
        FCB           0 (          ) :0898: 'RPMSLP' 87.50
        FCB           0 (          ) :0899: 'RPMSLP' 100.00

**************************************
*  SPARK LIMIT AS FUNCTION OF ENGPERF *
**************************************
*-                    :          ::TBL2D,11,1,TBL18,1,'MAXSPK'::
* ---------------------------------------------------------------
F32PRFMX FCB          0 (          ) :089A: 'MAXSPK'    96 ENGPRF-TORQUE   89E
*-                    :            ::EQU N=E*256/90 ::
        FCB           0 (          ) :089B: 'MAXSPK'   112
        FCB           0 (          ) :089C: 'MAXSPK'   128
        FCB           0 (          ) :089D: 'MAXSPK'   144
        FCB           0 (          ) :089E: 'MAXSPK'   160
        FCB           0 (          ) :089F: 'MAXSPK'   176
        FCB           0 (          ) :08A0: 'MAXSPK'   192
        FCB           0 (          ) :08A1: 'MAXSPK'   208
        FCB           0 (          ) :08A2: 'MAXSPK'   224
        FCB           0 (          ) :08A3: 'MAXSPK'   240
        FCB           0 (          ) :08A4: 'MAXSPK'   256
**************************************
*  RETARD LIMIT AS FUNCTION OF RPM    *
**************************************
*-                    :          ::TBL2D,15,1,TBL1,1,'MXSPK' ::
* ---------------------------------------------------------------
F32MXSPK FCB          0 (          ) :08A5: 'MXSPK '   400    RPM-SPEED
*-                    :            ::EQU N=E*256/90 ::          8A9
        FCB           0 (          ) :08A6: 'MXSPK '   600
        FCB           0 (          ) :08A7: 'MXSPK '   800
        FCB           0 (          ) :08A8: 'MXSPK '  1000
        FCB           0 (          ) :08A9: 'MXSPK '  1200
        FCB           0 (          ) :08AA: 'MXSPK '  1400
        FCB           0 (          ) :08AB: 'MXSPK '  1600
        FCB           0 (          ) :08AC: 'MXSPK '  1800
        FCB           0 (          ) :08AD: 'MXSPK '  2000
        FCB           0 (          ) :08AE: 'MXSPK '  2200
        FCB           0 (          ) :08AF: 'MXSPK '  2400
        FCB           0 (          ) :08B0: 'MXSPK '  2800
        FCB           0 (          ) :08B1: 'MXSPK '  3200
        FCB           0 (          ) :08B2: 'MXSPK '  3600
```

```
          FCB           0 (          ) :08B3: 'MXSPK '  4000
*****************************************
*  DELTA RPM FOR START OF SHIFT          *
*****************************************
*-
                          :              ::TBL2D,13,1,TBL10,4,1,'DRPM' ::
* -------------------------------------------------------------------------
F32DELTA FCB            0 (          ) :08B4: 'DRPM  '    12     MPH-SPEED
*-                      :              ::EQU N=E*80 ::
          FCB           0 (          ) :08B5: 'DRPM  '    16
          FCB           0 (          ) :08B6: 'DRPM  '    20
          FCB           0 (          ) :08B7: 'DRPM  '    24
          FCB           0 (          ) :08B8: 'DRPM  '    28
          FCB           0 (          ) :08B9: 'DRPM  '    32
          FCB           0 (          ) :08BA: 'DRPM  '    36
          FCB           0 (          ) :08BB: 'DRPM  '    40
          FCB           0 (          ) :08BC: 'DRPM  '    44
          FCB           0 (          ) :08BD: 'DRPM  '    48
          FCB           0 (          ) :08BE: 'DRPM  '    52
          FCB           0 (          ) :08BF: 'DRPM  '    56
          FCB           0 (          ) :08C0: 'DRPM  '    60
**************************************************
*  F32SHFTM : EXPECTED SHIFT TIME VS. MPH         *
**************************************************
*-
                          :              ::TBL2D,13,1,TBL10,4,1,'SEC' ::
* -------------------------------------------------------------------------
F32SHFTM FCB            0 (          ) :08C1: 'SEC   '    12     MPH-SPEED
*-                      :              ::EQU N=E*80 ::
          FCB           0 (          ) :08C2: 'SEC   '    16
          FCB           0 (          ) :08C3: 'SEC   '    20
          FCB           0 (          ) :08C4: 'SEC   '    24
          FCB           0 (          ) :08C5: 'SEC   '    28
          FCB           0 (          ) :08C6: 'SEC   '    32
          FCB           0 (          ) :08C7: 'SEC   '    36
          FCB           0 (          ) :08C8: 'SEC   '    40
          FCB           0 (          ) :08C9: 'SEC   '    44
          FCB           0 (          ) :08CA: 'SEC   '    48
          FCB           0 (          ) :08CB: 'SEC   '    52
          FCB           0 (          ) :08CC: 'SEC   '    56
          FCB           0 (          ) :08CD: 'SEC   '    60

*##############################################################
*     F32SHAP  SPARK SHAPER VS. % SHIFT COMPLETION            #
*   TABLE VALUE = MULTIPLIER   (0-1)                          #
*##############################################################
*-
                          :              ::TBL2D,17,1,TBL24,1,1,'MULT' ::
* -------------------------------------------------------------------------
F32SHAP  FCB            0 (          ) :08CE: 'MULT  '  0.00      %-SHFTCOMP
*-                      :              ::EQU N=E*256 ::
          FCB           0 (          ) :08CF: 'MULT  '  6.25
          FCB           0 (          ) :08D0: 'MULT  ' 12.50
          FCB           0 (          ) :08D1: 'MULT  ' 18.75
          FCB           0 (          ) :08D2: 'MULT  ' 25.00
          FCB           0 (          ) :08D3: 'MULT  ' 31.25
          FCB           0 (          ) :08D4: 'MULT  ' 37.50
          FCB           0 (          ) :08D5: 'MULT  ' 43.75
          FCB           0 (          ) :08D6: 'MULT  ' 50.00
          FCB           0 (          ) :08D7: 'MULT  ' 56.25
          FCB           0 (          ) :08D8: 'MULT  ' 62.50
          FCB           0 (          ) :08D9: 'MULT  ' 68.75
```

8B8

8C5

8D2

```
         FCB          0 (          ) :08DA: 'MULT  ' 75.00
         FCB          0 (          ) :08DB: 'MULT  ' 81.25
         FCB          0 (          ) :08DC: 'MULT  ' 87.50
         FCB          0 (          ) :08DD: 'MULT  ' 93.75
         FCB          0 (          ) :08DE: 'MULT  ' 100.00
*+DATAFAN ++BLOCK ID++


*****************************************************
*     FAN PARAMETERS                                *
* *&¬%*|@¬%$ NOTE : THESE PARAMETERS MUST REMAIN IN ORDER! *
*    THEY ARE ACCESSED BY MEANS OF THE X INDEX REGISTER   *
*****************************************************

* -----------------------------------------------------------
KFN2TMPH FCB          0 (          ) :08DF: 'DEGC  ' IF FAN2 OFF AND
*-                      :                   COOLANT > THIS TURN ON
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KFN2TMPL FCB          0 (          ) :08E0: 'DEG C ' IF FAN2 ON AND
*-                      :                   COOLANT <= THIS TURN OFF
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KFANMPHL FCB          0 (          ) :08E1: 'MPH   ' IF FAN2 OFF AND MPH >
*-                      :                   THIS KEEP FAN1 OFF
*-                      :              ::EQU N=E ::
* -----------------------------------------------------------
KFANMPHH FCB          0 (          ) :08E2: 'MPH   ' IF FAN2 OFF AND MPH >
*-                      :                   THIS TURN FAN1 OFF
*-                      :              ::EQU N=E ::
* -----------------------------------------------------------
KFANTMPH FCB          0 (          ) :08E3: 'DEGC  ' IF FAN OFF AND
*-                      :                   COOLANT > THIS TURN ON
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KFANTMPL FCB          0 (          ) :08E4: 'DEG C ' IF FAN ON AND COOLANT
*-                      :                   <= THIS TURN OFF
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KFANATSH FCB          0 (          ) :08E5: 'DEGC  ' IF FAN OFF, ATS> CAL
*-                      :                   CHECK A/C(ELSE FAN1 OFF)
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KFANATSL FCB          0 (          ) :08E6: 'DEGC  ' IF FAN ON, ATS> CAL
*-                      :                   CHECK A/C(ELSE FAN1 OFF)
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KACFANON FDB          0 (          ) :08E7: 'SEC   ' IF A/C ON KEEP FAN1
*-                      :                   ON FOR THIS LONG
*-                      :              ::EQU N=E*5 ::
*    ENGINE HOT LIGHT PARAMETERS                    *

* -----------------------------------------------------------
KHOTLHI  FCB          0 (          ) :08E9: 'DEGC  ' IF HOT LIGHT OFF,
*-                      :                   COOLANT > THIS TURN ON
*-                      :              ::EQU N=(E+40)*256/192 ::
* -----------------------------------------------------------
KHOTLLO  FCB          0 (          ) :08EA: 'DEG C ' IF HOT LIGHT ON,
*-                      :                   COOLANT <= THIS TURN OFF
```

8E3

8ED

```
*-                          :                 ::EQU N=(E+40)*256/192 ::
*+DATAPFI ++BLOCK ID++

***********************************
* AIR FUEL PARAMETERS AND TABLES   *
***********************************

* ----------------------------------------------------------------
K3        FCB          0 (          ) :08EB: 'GAIN  ' THROTTLE HIGH -
*-                       :                    THROTTLE LOW
*-                       NTPSLD =(K3/64)*(ADTHROT-K4); K4 IS INITIAL
*-                       :            ::EQU N=E*64  ::
* ----------------------------------------------------------------
K4        FCB          0 (          ) :08EC: '%     ' MINIMUM THROTTLE
*-                       :                    POSITION IN %
*-                       :            ::EQU N=E*2.56 ::
* ----------------------------------------------------------------
KTAOFF    FCB          0 (          ) :08ED: 'COEF  ' LOW THROTTLE POSITION
*-                       :                    FILTER COEFFICIENT, N.D.
*-                       :            ::EQU N=E*256 ::
* ----------------------------------------------------------------
KADO2AF   FCB          0 (          ) :08EE: 'CONST ' MINOR LOOP O2 SENSOR
*-                       :                    FILTER CONSTANT, (0-1)
*-                       :            ::EQU N=E*256 ::
* ----------------------------------------------------------------
KO2FF0    FCB          0 (          ) :08EF: 'VOLTS ' O2 FILTERS'
*-                       :                    INITIALIZATION VALUE,VOLTS *
*-                       :                    226
*-                       :            ::EQU N=E*226 ::
* ----------------------------------------------------------------
KFILTNCT FCB           0 (          ) :08F0: 'COEF  ' COOLDEG FILTER
*-                       :                    COEFFICIENT, 0-1.
*-                       :            ::EQU N=E*256 ::

* ----------------------------------------------------------------
KFAOPT1   FCB %00000000 (          ) :08F1: 'N     ' $FF IF PSPS SWITCH
*-                       :                    PRESENT, ELSE $EF
*-                       :            ::EQU N=E ::

* ----------------------------------------------------------------
KFAOPT2   FCB %00000000 (          ) :08F2: 'N     ' AIR FUEL OPTION FLAG
*-                       :                    WORD 2
*-                       :            ::EQU N=E ::
*-                    BIT    DESCRIPTION
OPTWMPRK EQU        $40      6   1 = BYPASS HOT SPK WRM PRK DN DISABLE
OPTDEGR  EQU        $80      7   1 = DIGITAL EGR, 0 = PWM EGR

* ----------------------------------------------------------------
KFAOPT3   FCB %00000000 (          ) :08F3: 'N     ' AIR FUEL OPTION FLAG
*-                       :                    WORD 3
*-                       :            ::EQU N=E ::
*                     BIT    DESCRIPTION
OPTCLINT EQU        $02      1   1 = RESET CORRCL/INT ON A.E.
OPTEGRDC EQU        $10      4   1 = DISPLAY PURGE D.C. (0= DISPLAY EGRDC)
OPTBLCC  EQU        $20      5   1 = DO INT RESET WHEN B.L. CELL CHANGES

* ----------------------------------------------------------------
KFAOPT4   FCB        $00 (          ) :08F4: 'N     ' SET TO $FF TO FORCE
*-                       :                    ISACAN TO KISACDS, ELSE 0
```

8F0
8F1
8F3
8F5

```
*-                       :           ::EQU N=E ::

* ------------------------------------------------------------------
 KOPTVATS FCB       $00 (           ) :08F5: 'FLAG  ' VATS = $FF, NO VATS =
*-                       :                   00
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
 KCRKSEQ1 FCB       $00 (           ) :08F6: 'FLAG  ' SEQ. CRANK= $80,
*-                       :                   ASYNCH SIM CRANK = $FF
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
 KNO2RUN  FCB         0 (           ) :08F7: 'RPM   ' IF NO REFS FOR THIS
*-                       :                   TIME CLEAR ERUN 2 FLAG
*-                       :           ::EQU N=3200/E   ::
*-   WATCH OUT!!!!  THIS ALSO SHUTS OFF FUEL AT LOW RPM
* ------------------------------------------------------------------
 KBLMCCP  FCB       $00 (           ) :08F8: 'FLAG  ' OLD BLM = $FF, PURGE/
*-                       :                   NO PURGE BLM = 00
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
 KADSUCTA FCB         0 (           ) :08F9: 'DEG C ' C/L TIMER, WARM
*-                       :                   TEMPERATURE THRESHOLD
*-                       :           ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
 KT1A     FDB         0 (           ) :08FA: 'SEC   ' WARM C/L TIMER VALUE,
*-                       :                   SEC
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
 KT2A     FDB         0 (           ) :08FC: 'SEC   ' COLD C/L TIMER VALUE,
*-                       :                   SEC
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
 KCLTCA   FCB         0 (           ) :08FE: 'DEG C ' TEMPERATURE THRESHOLD
*-                       :                   FOR C/L DETERMINATION
*-                       :           ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
 KO2ATIME FCB         0 (           ) :08FF: 'SEC   ' O2 SENSOR NOT READY
*-                       :                   TIMER LIMIT, SEC*5
*-                       :           ::EQU N=E*5 ::
* ------------------------------------------------------------------
 KPNTIME  FDB         0 (           ) :0900: 'SEC   ' IF IN P/N AT THIS
*-                       :                   ENG. RUN TIME USE F9PNCLT
*-                       :           ::EQU N=E ::

 HOL      EQU      *
* N.B. THE ORDER OF THE FOLLOWING 4 PARAMETERS MUST BE PRESERVED!
* ------------------------------------------------------------------
 KHOLCLTL FCB         0 (           ) :0902: 'DEG C ' IF COOLANT <= CAL
*-                       :                   DISABLE HOT OPEN LOOP
*-                       :           ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
 KHOLCLTH FCB         0 (           ) :0903: 'DEG C ' IF COOLANT > CAL
*-                       :                   DON'T DISABLE HOL
*-                       :           ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
 KHOLVSSL FCB         0 (           ) :0904: 'MPH   ' IF MPH <= CAL DISABLE
*-                       :                   HOT OPEN LOOP
*-                       :           ::EQU N=E ::
* ------------------------------------------------------------------
```

8F9
8FE
890
892

```
KHOLVSSH FCB          0 (          ) :0905: 'MPH   ' IF MPH > CAL DON'T
*_                      :                   DISABLE HOT OPEN LOOP
*_                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
KHOLATS  FCB          0 (          ) :0906: 'DEG C ' IF AIR TEMP <= CAL
*_                      :                   DISABLE HOT OPEN LOOP
*_                      :            ::EQU N=(E+40)*256/192 ::
* ---------------------------------------------------------------------
KHOLLV8  FCB          0 (          ) :0907: 'GM/CYL' IF LV8 <= CAL DISABLE
*_                      :                   HOT OPEN LOOP
*_                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
KHOLTIME FCB          0 (          ) :0908: 'SEC   ' IF ALL CONDITIONS MET
*_                      :                   > CAL ENABLE HOL
*_                      :            ::EQU N=E*5 ::
* ---------------------------------------------------------------------
KHOLNOPE FCB          0 (          ) :0909: 'FLAG  ' IF CAL NOT 0 DISABLE
*_                      :                   P.E. IF IN HOL
*_                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
KHOLFAML FCB          0 (          ) :090A: 'MULT  ' IF HOL ENABLED MULT O
*_                      :                   /L F/A RATIO BY CAL
*_                      :            ::EQU N=E*128 ::
* ---------------------------------------------------------------------
KLCTCLLA FCB          0 (          ) :090B: 'DEG C ' IF COOLANT <= CAL
*_                      :                   SKIP LEARNING (BLM)
*_                      :            ::EQU N=(E+40)*256/192 ::
* ---------------------------------------------------------------------
KLCTCLHA FCB          0 (          ) :090C: 'DEG C ' IF COOLANT > CAL SKIP
*_                      :                   LEARNING (BLM)
*_                      :            ::EQU N=(E+40)*256/192 ::
* ---------------------------------------------------------------------
KLCLDL   FCB          0 (          ) :090D: ' GM/CYL' LV8 BELOW WHICH
*_                      :                   BLOCK LEARNING IS DISABLED
*_                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
KBLMCNT  FCB          0 (          ) :090E: 'SEC   ' FREQUENCY OF BLOCK
*_                      :                   LEARN UPDATE
*_                      :            ::EQU N=E*20+1 ::
*
* N.B. THE ORDER OF THE FOLLOWING 6 PARAMETERS MUST BE PRESERVED!
*
* ---------------------------------------------------------------------
KBLESB1  FCB          0 (          ) :090F: 'RPM   ' BLOCL LEARN
*_                      :                   MULTIPLIER RPM CELL BOUNDARY
*_                      :            ::EQU N=E/25 ::
* ---------------------------------------------------------------------
KBLESB2  FCB          0 (          ) :0910: 'RPM   ' BLOCK LEARN
*_                      :                   MULTIPLIER RPM CELL BOUNDARY
*_                      :            ::EQU N=E/25 ::
* ---------------------------------------------------------------------
KBLESB3  FCB          0 (          ) :0911: 'RPM   ' BLOCK LEARN
*_                      :                   MULTIPLIER RPM CELL BOUNDARY
*_                      :            ::EQU N=E/25 ::
* ---------------------------------------------------------------------
KBLPMB1  FCB          0 (          ) :0912: 'GM/SEC' BLK LEARN MULT. FLOW
*_                      :                   CELL BOUNDARY
*_                      :            ::EQU N=E ::
* ---------------------------------------------------------------------
```

```
KBLPMB2  FCB          0 (          ) :0913: 'GM/SEC' BLK LEARN MULT. FLOW
*-                      :                  CELL BOUNDARY
*-                      :               ::EQU N=E ::
* ----------------------------------------------------------------------
KBLPMB3  FCB          0 (          ) :0914: 'GM/SEC' BLK LEARN MULT. FLOW
*-                      :                  CELL BOUNDARY
*-                      :               ::EQU N=E ::
*
* N.B. THE ORDER OF THE PREVIOUS 6 PARAMETERS MUST BE PRESERVED!
*
* ----------------------------------------------------------------------
KBLESHY  FCB          0 (          ) :0915: 'RPM   ' BLOCK LEARN
*-                      :                  MULTIPLIER RPM HYSTERSIS, RPM
*-                      :                  UNIT
*-                      :               ::EQU N=E/25 ::
* ----------------------------------------------------------------------
KBLPMHY  FCB          0 (          ) :0916: 'GM/SEC' BLOCK LEARN CELL FLOW
*-                      :                  HYST, FLOW UNITS
*-                      :               ::EQU N=E  ::
* ----------------------------------------------------------------------
KLCITHR  FCB          0 (          ) :0917: 'UNITS ' C/L INTEGRATOR RICH
*-                      :                  WINDOW VALUE
*-                      :               ::EQU N=E ::
* ----------------------------------------------------------------------
KLCITHL  FCB          0 (          ) :0918: 'UNITS ' C/L INTEGRATOR LEAN
*-                      :                  WINDOW VALUE
*-                      :               ::EQU N=E ::
* ----------------------------------------------------------------------
KBLMDELT FCB          0 (          ) :0919: 'VALUE ' BLM MODIFIER, VALUE*
*-                      :                  128
*-                      :               ::EQU N=E*128 ::
* ----------------------------------------------------------------------
KBLMMAX  FCB          0 (          ) :091A: 'VALUE ' MAXIMUM ALLOWABLE BLM
*-                      :                  , VALUE*128
*-                      :               ::EQU N=E*128 ::
* ----------------------------------------------------------------------
KBLMMIN  FCB          0 (          ) :091B: 'VALUE ' MINIMUM ALLOWABLE BLM
*-                      :                  , VALUE*128
*-                      :               ::EQU N=E*128 ::
* ----------------------------------------------------------------------
KCOLDBLM FCB          0 (          ) :091C: 'DEG C ' IF COOLANT< CAL,
*-                      :                  LIMIT TO BLM TO F9BLMMIN
*-                      :               ::EQU N=(E+40)*256/192 ::
*
* N.B. THE ORDER OF THE FOLLOWING 2 PARAMETERS MUST BE PRESERVED!
*
* ----------------------------------------------------------------------
KO2AMAX  FCB          0 (          ) :091D: 'VOLTS ' C/L UPPER O2
*-                      :                  THRESHOLD, O2 A/D UNITS
*-                      :               ::EQU N=E*226 ::
* ----------------------------------------------------------------------
KO2AMIN  FCB          0 (          ) :091E: 'VOLTS ' C/L LOWER O2
*-                      :                  THRESHOLD, O2 A/D UNITS
*-                      :               ::EQU N=E*226 ::
*
* N.B. THE ORDER OF THE PREVIOUS 2 PARAMETERS MUST BE PRESERVED!
*
* ----------------------------------------------------------------------
KCLOXTLO FCB          0 (          ) :091F: 'VOLTS ' O2 SENSOR R-L LOW
```

```
*-                    :              THRESHOLD, O2 A/D UNITS
*-                    :          ::EQU N=E*226 ::
* -----------------------------------------------------------------------------
KCLOXTHI FCB        0 (        ) :0920: 'VOLTS ' O2 SENSOR R-L HIGH
*-                    :              THRESHOLD, O2 A/D UNITS
*-                    :          ::EQU N=E*226 ::
* -----------------------------------------------------------------------------
KSO2L    FCB        0 (        ) :0921: 'VOLTS ' O2 R-L LOW THRESHOLD,
*-                    :              SLOW TRIM
*-                    :          ::EQU N=E*226 ::
* -----------------------------------------------------------------------------
KSO2U    FCB        0 (        ) :0922: 'VOLTS ' O2 R-L HIGH THRESHOLD
*-                    :              , SLOW TRIM
*-                    :          ::EQU N=E*226 ::
* -----------------------------------------------------------------------------
KSTLGF   FCB        0 (        ) :0923: 'MULT  ' O2 SLOW TRIM
*-                    :              INTEGRATOR DELAY FACTOR
*-                    :          ::EQU N=E*128 ::
* -----------------------------------------------------------------------------
KCLDETHA FCB        0 (        ) :0924: 'CTS   ' IF LV8 >= CAL SKIP
*-                    :              LEAN DECEL (C/L)
*-                    :          ::TBL411,0 ::
* -----------------------------------------------------------------------------
KCLDEES  FCB        0 (        ) :0925: 'RPM   ' IF RPM > CAL SKIP
*-                    :              LEAN DECEL (C/L)
*-                    :          ::EQU N=E/25 ::
* -----------------------------------------------------------------------------
KDELV8TH FCB        0 (        ) :0926: 'D-LV8 ' IF DELTA LV8 <=CAL,
*-                    :              DON'T ENABLE DE
*-                    :          ::EQU N=E         ::
* -----------------------------------------------------------------------------
KCLISNG  FCB        0 (        ) :0927: 'UNITS ' CLOSED LOOP NEGATIVE
*-                    :              INTEGRATOR STEP
*-                    :          ::EQU N=E ::
* -----------------------------------------------------------------------------
KCLISPO  FCB        0 (        ) :0928: 'UNITS ' CLOSED LOOP POSITIVE
*-                    :              INTEGRATOR STEP
*-                    :          ::EQU N=E ::
* -----------------------------------------------------------------------------
KCORCLMN FCB        0 (        ) :0929: 'UNITS ' CLOSED LOOP
*-                    :              CORRECTION MINIMUM VALUE
*-                    :          ::EQU N=E ::
* -----------------------------------------------------------------------------
KCORCLMX FCB        0 (        ) :092A: 'UNITS ' CLOSED LOOP
*-                    :              CORRECTION MAXIMUM VALUE
*-                    :          ::EQU N=E ::
* -----------------------------------------------------------------------------
KPEHYS   FCB        0 (        ) :092B: '%     ' POWER ENRICHMENT TPS
*-                    :              HYSTERESIS
*-                    :          ::EQU N=E*2.56 ::
* -----------------------------------------------------------------------------
KFATICT  FCB        0 (        ) :092C: 'SEC   ' FUEL AIR TIME OUT
*-                    :              REDUCTION FREQ.
*-                    :          ::EQU N=E*5-1 ::
* -----------------------------------------------------------------------------
KFACOEF  FCB        0 (        ) :092D: 'COEF  ' FUEL AIR TIME OUT
*-                    :              FILTER COEF (P/N-D)
*-                    :          ::EQU N=E*256 ::
* -----------------------------------------------------------------------------
```

```
KCLRATIO FCB         0 (         ) :092E: 'RATIO ' CLOSED LOOP FUEL AIR
*-                     :                  RATIO
*-                     :          ::EQU N=1638.4/E ::

* ----------------------------------------------------------------
KCLRFPLS FCB         0 (         ) :092F: 'COUNTS' RPLSCNTR = THIS WHEN
*-                     :                  IN CLEAR FLOOD
*-                     :          ::EQU N=E ::
* ----------------------------------------------------------------
KNRUNPLS FCB         0 (         ) :0930: 'COUNTS' RPLSCNTR = THIS WHEN
*-                     :                  RUN/NORUN TRANS.
*-                     :          ::EQU N=E ::

*****************************
*  LOAD VARIABLE PARAMETERS  *
*****************************
* ----------------------------------------------------------------
KLVMSCAL FCB         0 (         ) :0931: 'MULT  ' LOAD VARIABLE SCALING
*-                     :                  FACTOR
*-                     :          ::EQU N=E*128  ::

*************************
* FUEL OUTPUT PARAMETERS *
*************************
* ----------------------------------------------------------------
KNJCHAR2 FDB         0 (         ) :0932: 'CONST ' INJECTOR FLOW RATE,
*-                     :                  SECONDS/GRAM OF FUEL
*-                     :          ::EQU N=E*20480 ::
* ----------------------------------------------------------------
KMINCTS  FDB         0 (         ) :0934: 'MSEC  ' MINIMUM BASE PULSE
*-                     :                  WIDTH
*-                     :          ::EQU N=E*65.536  ::
* ----------------------------------------------------------------
KDEFPW   FDB         0 (         ) :0936: 'MSEC  ' DEFAULT PULSE WIDTH
*-                     :                  FOR LOW CALCULATED
*-                     :          ::EQU N=E*65.536 ::
* ----------------------------------------------------------------
KAPMIN   FDB         0 (         ) :0938: 'MSEC  ' MIN ASYNCHRONOUS
*-                     :                  PULSE, MSEC*65.536
*-                     :          ::EQU N=E*65.536 ::
* ----------------------------------------------------------------
KASYNC   FCB         0 (         ) :093A: 'MSEC  ' MIN ASYNCH. PULSE TO
*-                     :                  TOUCH PREV. INJ
*-                     :          ::EQU N=E*65.536 ::
* ----------------------------------------------------------------
KRAMPCTR FCB         0 (         ) :093C: 'COUNTS' STEP CRANK/RUN FUEL
*-                     :                  EVERY KRAMPCTR REFS
*-                     :          ::EQU N=E        ::
* ----------------------------------------------------------------
KRAMPDEC FCB         0 (         ) :093D: 'STEP  ' SUBTRACT THIS FROM
*-                     :                  CRANK/RUN MULT EACH STEP
*-                     :          ::EQU N=E        ::


*******************************
* ABUSIVE MANEUVER PARAMETERS *
*******************************

ABM      EQU      *
```

```
* ------------------------------------------------------------------
 KMPHAB   FCB          0 (          ) :093E: 'MPH    ' IF MPH > CAL, DON'T
*_                       :                     ENABLE ABM MODE
*_                       :               ::EQU N=E        ::
* ------------------------------------------------------------------
 KABRPMEN FDB          0 (          ) :093F: 'RPM    ' IF RPM > CAL, ENABLE
*_                       :                     ABUSIVE MANEUVER MODE
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KABTPSEN FCB          0 (          ) :0941: '%TPS   ' IF TPS > CAL ENABLE
*_                       :                     ABUSIVE MANEUVER LOGIC
*_                       :               ::EQU N=E*2.56::
* ------------------------------------------------------------------
 KTPSMT   FCB          0 (          ) :0942: '%TPS   ' IF TPS > CAL REMAIN
*_                       :                     IN ABM MODE
*_                       :               ::EQU N=E*2.56::
* ------------------------------------------------------------------
 KABTQTME FCB          0 (          ) :0943: 'SEC    ' MINIMUM TIME FOR ABM
*_                       :                     ONCE ENABLED
*_                       :               ::EQU N=E*80  ::
* ------------------------------------------------------------------
 KDRRPMMX FDB          0 (          ) :0944: 'RPM    ' IF RPM > CAL, SHUT
*_                       :                     OFF FUEL (ABM MODE 1) DR
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KPNRPMMX FDB          0 (          ) :0946: 'RPM    ' IF RPM > CAL, SHUT
*_                       :                     OFF FUEL (ABM MODE 1)P/N
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KDRRPMMN FDB          0 (          ) :0948: 'RPM    ' IF RPM < CAL, RESTORE
*_                       :                     FUEL (ABM MODE 2)DRIV
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KPNRPMMN FDB          0 (          ) :094A: 'RPM    ' IF RPM < CAL, RESTORE
*_                       :                     FUEL (ABM MODE 2) P/N
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KDRRPMMD FDB          0 (          ) :094C: 'RPM    ' IF RPM < CAL, FUEL 3
*_                       :                     CYLS (ABM MODE 3)DRIV
*_                       :               ::EQU N=E ::
* ------------------------------------------------------------------
 KPNRPMMD FDB          0 (          ) :094E: 'RPM    ' IF RPM < CAL, FUEL 3
*_                       :                     CYLS (ABM MODE 3) P/N
*_                       :               ::EQU N=E ::


****************************************
* DECELERATION FUEL CONTROL PARAMETERS *
****************************************

DFCAL    EQU     *

*  THE FOLLOWING TWO PAIRS OF PARAMETERS MUST REMAIN IN ORDER  *

* ------------------------------------------------------------------
KDFCOSPH FCB          0 (          ) :0950: 'RPM    ' IF NOT IN DFCO, RPM
*_                       :                     >= CAL, DON'T ENABLE DFCO
*_                       :               ::EQU N=E/25 ::
* ------------------------------------------------------------------
```

```
KDFCOSPL FCB          0 (          ) :0951: 'RPM    ' IF IN DFCO, RPM >=CAL
*-                      :                    , DISABLE DFCO
*-                      :              ::EQU N=E/25 ::
* ----------------------------------------------------------------------
KDFCOLLA FCB          0 (          ) :0952: 'CTS    ' IF NOT IN DFCO, LV8
*-                      :                    >= CAL, DON'T ENABLE
*-                      :              ::EQU N=E ::
* ----------------------------------------------------------------------
KDFCOLHA FCB          0 (          ) :0953: 'CTS    ' IF IN DFCO, LV8 >=
*-                      :                    CAL, DISABLE DFCO
*-                      :              ::EQU N=E ::

*  THE PREVIOUS TWO PAIRS OF PARAMETERS MUST REMAIN IN ORDER  *

* ----------------------------------------------------------------------
KDFCODRM FCB          0 (          ) :0954: '       ' RPM' IF RPM DECREASE
*-                      :                    LAST 50 MSEC. >= CAL NO DFCO
*-                      :              ::EQU N=E/12.5 ::
* ----------------------------------------------------------------------
KDFCOTO  FCB          0 (          ) :0955: 'SEC    ' IF CONDITIONS MET >
*-                      :                    CAL TIME ENABLE DFCO
*-                      :              ::EQU N=E*80 ::
* ----------------------------------------------------------------------
KDFCOTP  FCB          0 (          ) :0956: '% TPS ' IF TPS > CAL DISABLE
*-                      :                    DECEL FUEL CUTOFF
*-                      :              ::EQU N=E*2.56  ::
* ----------------------------------------------------------------------
KDFCOOL  FCB          0 (          ) :0957: 'DEG C ' IF COOLANT TEMP < CAL
*-                      :                    DISABLE DFCO
*-                      :              ::EQU N=(E+40)*256/192::

*******************************************************************
* DECELERATION ENLEANMENT PARAMETERS (SEE ALSO KDELV8TH, KTFTPS2C) *
*******************************************************************

* ----------------------------------------------------------------------
KDETPS   FCB          0 (          ) :0958: '%TPS   ' IF NEG DELTATPS <
*-                      :                    THIS DISABLE DE
*-                      :              ::EQU N=E*2.56 ::
* ----------------------------------------------------------------------
KDELV8MN FCB          0 (          ) :0959: 'CTS    ' IF NEG DELTALV8 <
*-                      :                    THIS DISABLE DE
*-                      :              ::EQU N=E ::
* ----------------------------------------------------------------------
KDEVSMN  FCB          0 (          ) :095A: 'MPH    ' IF MPH < THIS DISABLE
*-                      :                    DE
*-                      :              ::EQU N=E ::
* ----------------------------------------------------------------------
KDECNT1  FCB          0 (          ) :095B: 'CTS    ' USE KDEFAC1 IF REF
*-                      :                    PULSES < THIS (>=,FAC2)
*-                      :              ::EQU N=E ::
* ----------------------------------------------------------------------
KDECNT2  FCB          0 (          ) :095C: 'CTS    ' LIMIT REF PULSES IN
*-                      :                    DE TO THIS
*-                      :              ::EQU N=E ::
* ----------------------------------------------------------------------
KDEFAC1  FCB          0 (          ) :095D: 'MULT   ' 0-1 MULTIPLIER OF BPW
*-                      :                    IN DE (CNTS<KDECNT1)
*-                      :              ::EQU N=E*256 ::
```

```
* ------------------------------------------------------------------
KDEFAC2  FCB          0 (          ) :095E: 'MULT  ' 0-1 MULT OF BPW IN DE
*-                      :                  (DECNTS >= KDECNT1)
*-                      :             ::EQU N=E*256 ::
* ------------------------------------------------------------------
KDEFAC3  FCB          0 (          ) :095F: 'MULT  ' SAME AS KDEFAC1 BUT
*-                      :                  WITH TCC LOCKED
*-                      :             ::EQU N=E*256 ::
* ------------------------------------------------------------------
KDEFAC4  FCB          0 (          ) :0960: 'MULT  ' SAME AS KDEFAC2 BUT
*-                      :                  WITH TCC LOCKED
*-                      :             ::EQU N=E*256 ::


* ------------------------------------------------------------------
KLVWOT   FCB          0 (          ) :0961: 'UNITS ' LV8 THRESHOLD FOR
*-                      :                  POWER ENRICHMENT
*-                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KLV8HYST FCB          0 (          ) :0962: 'UNITS ' LV8 HYSTERSIS FOR
*-                      :                  POWER ENRICHMENT
*-                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KPETPS   FCB          0 (          ) :0963: '%TPS  ' MIN TPS TO OVERRIDE
*-                      :                  PE LV8 CHECK
*-                      :             ::EQU N=E*2.56 ::
*
* N.B. THE ORDER OF THE FOLLOWING 2 PARAMETERS MUST BE PRESERVED!
*
* ------------------------------------------------------------------
KTFAVKT  FCB          0 (          ) :0964: 'SEC   ' LOOPS BETWEEN
*-                      :                  TRANSINT FILTERING OF LV8
* NOTE: A VALUE GREATER THAN $80 FOR KTFAVKT RESULTS IN CONT. FILTERING
*-                      :             ::EQU N=E*20 ::
* ------------------------------------------------------------------
KTFLV8C  FCB          0 (          ) :0965: 'COEFF ' LV8 FILTER CONSTANT
*-                      :                  TRANSIENT
*-                      :             ::EQU N=E*256 ::
*
* N.B. THE ORDER OF THE PREVIOUS  2 PARAMETERS MUST BE PRESERVED!
*
* THE  FOLLOWING 6 PARAMETERS ARE FOR ASYNCHRONOUS DELTA TPS AE
* ------------------------------------------------------------------
KTLV8INT FCB          0 (          ) :0966: 'CTS   ' INITIAL  VALUE FOR
*-                      :                  TRANSIENT LV8 FILTER
*-                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KAETPS   FCB          0 (          ) :0967: '%     ' MIN DELTA THROTTLE
*-                      :                  POSITION FOR A.E.
*-                      :             ::EQU N=E*2.56  ::
* ------------------------------------------------------------------
KTFTPSC  FCB          0 (          ) :0968: 'COEFF ' TPS FILTER CONST FOR
*-                      :                  ASYNCH DELTA TPS AE
*-                      :             ::EQU N=E*256 ::
* ------------------------------------------------------------------
KTFTPS2C FCB          0 (          ) :0969: 'COEFF ' TPS TRANSIENT FILTER
*-                      :                  COEFF FOR DECEL ENL
*-                      :             ::EQU N=E*256 ::
* ------------------------------------------------------------------
```

```
KNEGLIM  FCB         0 (         ) :096A: '% TPS ' NEGATIVE TPS LIMIT
*-                     :                    BEFORE AE DISABLE
*-                     :              ::EQU N=E*2.56 ::
* THE  FOLLOWING 6 PARAMETERS ARE FOR SYNCHRONOUS DELTA TPS AE
* -----------------------------------------------------------------
KNEGLIM3 FCB         0 (         ) :096B: '% TPS ' IF NEG DELTATPS > CAL
*-                     :                    SKIP SYNCH TPS AE
*-                     :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KTFTPS3C FCB         0 (         ) :096C: 'COEFF ' TPS FILTER CONST FOR
*-                     :                    SYNCH DELTA TPS AE
*-                     :              ::EQU N=E*256 ::
* -----------------------------------------------------------------
KDTREFCT FCB         0 (         ) :096D: 'REFPLS' IF REFS IN TPSAE <
*-                     :                    CAL SKIP SYNCH TPS AE
*-                     :              ::EQU N=E ::
* -----------------------------------------------------------------
KDTREFHI FCB         0 (         ) :096E: 'REFPLS' IF REFS IN TPSAE >
*-                     :                    CAL SKIP SYNCH TPS AE
*-                     :              ::EQU N=E ::
* -----------------------------------------------------------------
KDTPSEN  FCB         0 (         ) :096F: '% TPS ' IF DELTATPS > CAL
*-                     :                    ENABLE SYNCH TPS AE
*-                     :              ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KAERFCL  FCB         0 (         ) :0970: 'REFPLS' CORRCL CAN'T DECREASE
*-                     :                    FOR CAL REF PULSES
*-                     :              ::EQU N=E ::
*
* N.B. THE ORDER OF THE FOLLOWING 4 PARAMETERS MUST BE PRESERVED!
*
* -----------------------------------------------------------------
KLDFLOFF FCB         0 (         ) :0971: 'RPM   ' IF RPM >= CAL, SHUT
*-                     :                    OFF FUEL
*-                     :              ::EQU N=E/25 ::
* -----------------------------------------------------------------
KLDFLON  FCB         0 (         ) :0972: 'RPM   ' IF RPM >= CAL, DON'T
*-                     :                    TURN FUEL BACK ON
*-                     :              ::EQU N=E/25 ::
* -----------------------------------------------------------------
KMPHOFF  FCB         0 (         ) :0973: 'MPH   ' IF FILTMPH >= CAL,
*-                     :                    SHUT OFF FUEL
*-                     :              ::EQU N=E ::
* -----------------------------------------------------------------
KMPHON   FCB         0 (         ) :0974: 'MPH   ' IF FILTMPH >= CAL,
*-                     :                    DON'T TURN FUEL BACK ON
*-                     :              ::EQU N=E ::
*
* N.B. THE ORDER OF THE PREVIOUS  4 PARAMETERS MUST BE PRESERVED!
*
* -----------------------------------------------------------------
KVSSLMT  FCB         0 (         ) :0975: 'MPH   ' IF FILTMPH >= CAL,
*-                     :                    FREAK OUT FUEL
*-                     :              ::EQU N=E ::
* -----------------------------------------------------------------
KVSSLMTG FCB         0 (         ) :0976: 'GAIN  ' FUEL FREAK OUT FACTOR
*-                     :                    (* MPHDELTA * FAVAL)
*-                     :              ::EQU N=(E-1)*128 ::
* -----------------------------------------------------------------
```

```
KSRVSSHI FCB         0 (          ) :0977: 'DEG    ' DEGREES RETARD/MPH
*-                     :                        OVER KVSSLMT
*-                     :                 ::EQU N=E*256/90 ::
*+DATAPFIT++BLOCK ID++

*########################################
*      F21  TABLE                        #
*  INTEGRATOR DELAY VS  FLOW (GMPSEC)    #
*    TABLE VALUE = SEC. * 80             #
*########################################
*-
*                      :                ::TBL2D,9,1,TBL35,1,1,'SEC' ::
* ----------------------------------------------------------------------
F21       FCB         0 (          ) :0978: 'SEC    '     0    FLOW-GM/SEC
*-                     :             ::EQU N=E*80 ::
          FCB         0 (          ) :0979: 'SEC    '     8
          FCB         0 (          ) :097A: 'SEC    '    16
          FCB         0 (          ) :097B: 'SEC    '    24
          FCB         0 (          ) :097C: 'SEC    '    32
          FCB         0 (          ) :097D: 'SEC    '    40
          FCB         0 (          ) :097E: 'SEC    '    48
          FCB         0 (          ) :097F: 'SEC    '    56
          FCB         0 (          ) :0980: 'SEC    '    64

*########################################
*      F22  TABLE                        #
* FILTER COEFFICIENT VS FLOW (GMPSEC)    #
*   TABLE VALUE = COEFFICIENT *256       #
*########################################
*-
*                      :                ::TBL2D,9,1,TBL35,1,1,'SEC' ::
* ----------------------------------------------------------------------
F22       FCB         0 (          ) :0981: 'SEC    '     0    FLOW-GM/SEC
*-                     :             ::EQU N=E*256 ::
          FCB         0 (          ) :0982: 'SEC    '     8
          FCB         0 (          ) :0983: 'SEC    '    16
          FCB         0 (          ) :0984: 'SEC    '    24
          FCB         0 (          ) :0985: 'SEC    '    32
          FCB         0 (          ) :0986: 'SEC    '    40
          FCB         0 (          ) :0987: 'SEC    '    48
          FCB         0 (          ) :0988: 'SEC    '    56
          FCB         0 (          ) :0989: 'SEC    '    64

*#############################################################
*      F27 TABLE                                             #
*    INTEGRATOR PROPORTIONAL TERM VS BLOCK LEARN CELL NUMBER #
*    TABLE VALUE = PROPORTIONAL UNITS                        #
*    BITS 0 THROUGH 3 ARE THE RICH TO LEAN PROPORTIONAL GAIN #
*    BITS 4 THROUGH 7 ARE THE LEAN TO RICH PROPORTIONAL GAIN #
*#############################################################
*-
*                      :                ::TBL2D,16,TBL12,1,'UNITS' ::
* ----------------------------------------------------------------------
F27B      FCB       $00 (          ) :098A: 'UNITS '     0     #-BLM CELL
*-                     :             ::EQU N=E ::
          FCB       $00 (          ) :098B: 'UNITS '     1
          FCB       $00 (          ) :098C: 'UNITS '     2
          FCB       $00 (          ) :098D: 'UNITS '     3
          FCB       $00 (          ) :098E: 'UNITS '     4
          FCB       $00 (          ) :098F: 'UNITS '     5
          FCB       $00 (          ) :0990: 'UNITS '     6
          FCB       $00 (          ) :0991: 'UNITS '     7
```

```
         FCB        $00 (          ) :0992: 'UNITS '    8
         FCB        $00 (          ) :0993: 'UNITS '    9
         FCB        $00 (          ) :0994: 'UNITS '   10
         FCB        $00 (          ) :0995: 'UNITS '   11
         FCB        $00 (          ) :0996: 'UNITS '   12
         FCB        $00 (          ) :0997: 'UNITS '   13
         FCB        $00 (          ) :0998: 'UNITS '   14
         FCB        $00 (          ) :0999: 'UNITS '   15

*#################################################################
*     F28 TABLE   NEIGHBOR CELL BLM UPDATE TABLE                 #
*   PUT  CELL TO UPDATE IN 'FROM' CELL'S SLOT - (SAME = NO CHANGE) #
*#################################################################
*-                    :          ::TBL2D,16,TBL12,1,'CELL #' ::
* ----------------------------------------------------------------
F28      FCB          0 (          ) :099A: 'CELL #'    0      #-BLM CELL
*-                    :          ::EQU N=E ::
         FCB          0 (          ) :099B: 'CELL #'    1
         FCB          0 (          ) :099C: 'CELL #'    2
         FCB          0 (          ) :099D: 'CELL #'    3
         FCB          0 (          ) :099E: 'CELL #'    4
         FCB          0 (          ) :099F: 'CELL #'    5
         FCB          0 (          ) :09A0: 'CELL #'    6
         FCB          0 (          ) :09A1: 'CELL #'    7
         FCB          0 (          ) :09A2: 'CELL #'    8
         FCB          0 (          ) :09A3: 'CELL #'    9
         FCB          0 (          ) :09A4: 'CELL #'   10
         FCB          0 (          ) :09A5: 'CELL #'   11
         FCB          0 (          ) :09A6: 'CELL #'   12
         FCB          0 (          ) :09A7: 'CELL #'   13
         FCB          0 (          ) :09A8: 'CELL #'   14
         FCB          0 (          ) :09A9: 'CELL #'   15

*#####################################################
*     F33B  TABLE                                   #
*    INJECTOR OFFSET VS BATTERY VOLTAGE (ADBAT)     #
*   TABLE VALUE = MSEC * 32.768                     #
*#####################################################
*-                    :          ::PROTECT ::
*-                    :          ::TBL2D,17,2,TBL11,1,'MSEC' ::
* ----------------------------------------------------------------
F33B0    FCB         16 (          ) :09AA: '      ' USE 17 VALUE TABLE
*-                    :          ::EQU N=E ::
*-                    :          ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB          0 (          ) :09AB: 'MSEC  '  0.0  VOLTS-BATTERY
*-                    :          ::EQU N=E*32.768 ::
         FCB          0 (          ) :09AC: 'MSEC  '  1.6
         FCB          0 (          ) :09AD: 'MSEC  '  3.2
         FCB          0 (          ) :09AE: 'MSEC  '  4.8
         FCB          0 (          ) :09AF: 'MSEC  '  6.4
         FCB          0 (          ) :09B0: 'MSEC  '  8.0
         FCB          0 (          ) :09B1: 'MSEC  '  9.6
         FCB          0 (          ) :09B2: 'MSEC  ' 11.2
         FCB          0 (          ) :09B3: 'MSEC  ' 12.8
         FCB          0 (          ) :09B4: 'MSEC  ' 14.4
         FCB          0 (          ) :09B5: 'MSEC  ' 16.0
         FCB          0 (          ) :09B6: 'MSEC  ' 17.6
         FCB          0 (          ) :09B7: 'MSEC  ' 19.2
```

```
            FCB           0 (            ) :09B8: 'MSEC  '  20.8
            FCB           0 (            ) :09B9: 'MSEC  '  22.4
            FCB           0 (            ) :09BA: 'MSEC  '  24.0
            FCB           0 (            ) :09BB: 'MSEC  '  25.5

 *##################################################
 *      F33B1 TABLE                                  #
 *    PUMP COMPENSATION VS BATTERY VOLTAGE (ADBAT)   #
 *   TABLE VALUE = MULTIPLIER   * 128                #
 *##################################################
 *_                       :          ::PROTECT ::
 *_                       :          ::TBL2D,17,2,TBL11,1,'MULT' ::
 * -------------------------------------------------------------------
 F33B1    FCB         16 (           ) :09BC: '      ' USE 17 VALUE TABLE
 *_                       :          ::EQU N=E ::
 *_                       :          ::NOPROTECT ::
 * -------------------------------------------------------------------
          FCB          0 (           ) :09BD: 'MULT  '  0.0  VOLTS-BATTERY
 *_                       :          ::EQU N=E*128 ::
          FCB          0 (           ) :09BE: 'MULT  '   1.6
          FCB          0 (           ) :09BF: 'MULT  '   3.2
          FCB          0 (           ) :09C0: 'MULT  '   4.8
          FCB          0 (           ) :09C1: 'MULT  '   6.4
          FCB          0 (           ) :09C2: 'MULT  '   8.0
          FCB          0 (           ) :09C3: 'MULT  '   9.6
          FCB          0 (           ) :09C4: 'MULT  '  11.2
          FCB          0 (           ) :09C5: 'MULT  '  12.8
          FCB          0 (           ) :09C6: 'MULT  '  14.4
          FCB          0 (           ) :09C7: 'MULT  '  16.0
          FCB          0 (           ) :09C8: 'MULT  '  17.6
          FCB          0 (           ) :09C9: 'MULT  '  19.2
          FCB          0 (           ) :09CA: 'MULT  '  20.8
          FCB          0 (           ) :09CB: 'MULT  '  22.4
          FCB          0 (           ) :09CC: 'MULT  '  24.0
          FCB          0 (           ) :09CD: 'MULT  '  25.5

*;;############################################################
*;;#  F50F TABLE-   OPEN LOOP A/F RATIO VS. LV8  AND NTRPMX    #
*##############################################################

*_
*_                      :          ::TBL3D,17,14,TBL1,1,TBL20,4,1,
*_                      :                  'AFRTIO' ::
*_                      :          ::PROTECT ::
* ------------------------------------------------------------------
F50F     FCB          0 (          )*:09CE: '      ' R MIN;  R = NTRPM (400
*_                      :                  RPM)
*_                      :          ::EQU N=E ::
* ------------------------------------------------------------------
         FCB         48 (          ) :09CF: '      ' Q MIN;  Q = LV8
*_                      :          ::EQU N=E ::
* ------------------------------------------------------------------
         FCB         14 (          ) :09D0: '      ' R NUM  (# OF Q'S)
*_                      :          ::EQU N=E ::
*_                      :          ::NOPROTECT ::
* ----------------------------------------------- SPEED       400 RPM
         FCB          0 (          ) :09D1: 'AFRTIO'   48    LV8-LOAD
*_                      :          ::EQU N=1638.4/E ::
         FCB          0 (          ) :09D2: 'AFRTIO'   64
         FCB          0 (          ) :09D3: 'AFRTIO'   80
```

```
         FCB        0 (          ) :09D4: 'AFRTIO'    96
         FCB        0 (          ) :09D5: 'AFRTIO'   112
         FCB        0 (          ) :09D6: 'AFRTIO'   128
         FCB        0 (          ) :09D7: 'AFRTIO'   144
         FCB        0 (          ) :09D8: 'AFRTIO'   160
         FCB        0 (          ) :09D9: 'AFRTIO'   176
         FCB        0 (          ) :09DA: 'AFRTIO'   192
         FCB        0 (          ) :09DB: 'AFRTIO'   208
         FCB        0 (          ) :09DC: 'AFRTIO'   224
         FCB        0 (          ) :09DD: 'AFRTIO'   240
         FCB        0 (          ) :09DE: 'AFRTIO'   256

* ------------------------------------------ SPEED        600 RPM
         FCB        0 (          ) :09DF: 'AFRTIO'    48    LV8-LOAD
         FCB        0 (          ) :09E0: 'AFRTIO'    64
         FCB        0 (          ) :09E1: 'AFRTIO'    80
         FCB        0 (          ) :09E2: 'AFRTIO'    96
         FCB        0 (          ) :09E3: 'AFRTIO'   112
         FCB        0 (          ) :09E4: 'AFRTIO'   128
         FCB        0 (          ) :09E5: 'AFRTIO'   144
         FCB        0 (          ) :09E6: 'AFRTIO'   160
         FCB        0 (          ) :09E7: 'AFRTIO'   176
         FCB        0 (          ) :09E8: 'AFRTIO'   192
         FCB        0 (          ) :09E9: 'AFRTIO'   208
         FCB        0 (          ) :09EA: 'AFRTIO'   224
         FCB        0 (          ) :09EB: 'AFRTIO'   240
         FCB        0 (          ) :09EC: 'AFRTIO'   256

* ------------------------------------------ SPEED        800 RPM
         FCB        0 (          ) :09ED: 'AFRTIO'    48    LV8-LOAD
         FCB        0 (          ) :09EE: 'AFRTIO'    64
         FCB        0 (          ) :09EF: 'AFRTIO'    80
         FCB        0 (          ) :09F0: 'AFRTIO'    96
         FCB        0 (          ) :09F1: 'AFRTIO'   112
         FCB        0 (          ) :09F2: 'AFRTIO'   128
         FCB        0 (          ) :09F3: 'AFRTIO'   144
         FCB        0 (          ) :09F4: 'AFRTIO'   160
         FCB        0 (          ) :09F5: 'AFRTIO'   176
         FCB        0 (          ) :09F6: 'AFRTIO'   192
         FCB        0 (          ) :09F7: 'AFRTIO'   208
         FCB        0 (          ) :09F8: 'AFRTIO'   224
         FCB        0 (          ) :09F9: 'AFRTIO'   240
         FCB        0 (          ) :09FA: 'AFRTIO'   256

* ------------------------------------------ SPEED       1000 RPM
         FCB        0 (          ) :09FB: 'AFRTIO'    48    LV8-LOAD
         FCB        0 (          ) :09FC: 'AFRTIO'    64
         FCB        0 (          ) :09FD: 'AFRTIO'    80
         FCB        0 (          ) :09FE: 'AFRTIO'    96
         FCB        0 (          ) :09FF: 'AFRTIO'   112
         FCB        0 (          ) :0A00: 'AFRTIO'   128
         FCB        0 (          ) :0A01: 'AFRTIO'   144
         FCB        0 (          ) :0A02: 'AFRTIO'   160
         FCB        0 (          ) :0A03: 'AFRTIO'   176
         FCB        0 (          ) :0A04: 'AFRTIO'   192
         FCB        0 (          ) :0A05: 'AFRTIO'   208
         FCB        0 (          ) :0A06: 'AFRTIO'   224
         FCB        0 (          ) :0A07: 'AFRTIO'   240
         FCB        0 (          ) :0A08: 'AFRTIO'   256
```

```
* ------------------------------------------ SPEED      1200 RPM
        FCB        0 (        ) :0A09: 'AFRTIO'    48    LV8-LOAD
        FCB        0 (        ) :0A0A: 'AFRTIO'    64
        FCB        0 (        ) :0A0B: 'AFRTIO'    80
        FCB        0 (        ) :0A0C: 'AFRTIO'    96
        FCB        0 (        ) :0A0D: 'AFRTIO'   112
        FCB        0 (        ) :0A0E: 'AFRTIO'   128
        FCB        0 (        ) :0A0F: 'AFRTIO'   144
        FCB        0 (        ) :0A10: 'AFRTIO'   160
        FCB        0 (        ) :0A11: 'AFRTIO'   176
        FCB        0 (        ) :0A12: 'AFRTIO'   192
        FCB        0 (        ) :0A13: 'AFRTIO'   208
        FCB        0 (        ) :0A14: 'AFRTIO'   224
        FCB        0 (        ) :0A15: 'AFRTIO'   240
        FCB        0 (        ) :0A16: 'AFRTIO'   256
* ------------------------------------------ SPEED      1400 RPM
        FCB        0 (        ) :0A17: 'AFRTIO'    48    LV8-LOAD
        FCB        0 (        ) :0A18: 'AFRTIO'    64
        FCB        0 (        ) :0A19: 'AFRTIO'    80
        FCB        0 (        ) :0A1A: 'AFRTIO'    96
        FCB        0 (        ) :0A1B: 'AFRTIO'   112
        FCB        0 (        ) :0A1C: 'AFRTIO'   128
        FCB        0 (        ) :0A1D: 'AFRTIO'   144
        FCB        0 (        ) :0A1E: 'AFRTIO'   160
        FCB        0 (        ) :0A1F: 'AFRTIO'   176
        FCB        0 (        ) :0A20: 'AFRTIO'   192
        FCB        0 (        ) :0A21: 'AFRTIO'   208
        FCB        0 (        ) :0A22: 'AFRTIO'   224
        FCB        0 (        ) :0A23: 'AFRTIO'   240
        FCB        0 (        ) :0A24: 'AFRTIO'   256
* ------------------------------------------ SPEED      1600 RPM
        FCB        0 (        ) :0A25: 'AFRTIO'    48    LV8-LOAD
        FCB        0 (        ) :0A26: 'AFRTIO'    64
        FCB        0 (        ) :0A27: 'AFRTIO'    80
        FCB        0 (        ) :0A28: 'AFRTIO'    96
        FCB        0 (        ) :0A29: 'AFRTIO'   112
        FCB        0 (        ) :0A2A: 'AFRTIO'   128
        FCB        0 (        ) :0A2B: 'AFRTIO'   144
        FCB        0 (        ) :0A2C: 'AFRTIO'   160
        FCB        0 (        ) :0A2D: 'AFRTIO'   176
        FCB        0 (        ) :0A2E: 'AFRTIO'   192
        FCB        0 (        ) :0A2F: 'AFRTIO'   208
        FCB        0 (        ) :0A30: 'AFRTIO'   224
        FCB        0 (        ) :0A31: 'AFRTIO'   240
        FCB        0 (        ) :0A32: 'AFRTIO'   256
* ------------------------------------------ SPEED      1800 RPM
        FCB        0 (        ) :0A33: 'AFRTIO'    48    LV8-LOAD
        FCB        0 (        ) :0A34: 'AFRTIO'    64
        FCB        0 (        ) :0A35: 'AFRTIO'    80
        FCB        0 (        ) :0A36: 'AFRTIO'    96
        FCB        0 (        ) :0A37: 'AFRTIO'   112
        FCB        0 (        ) :0A38: 'AFRTIO'   128
        FCB        0 (        ) :0A39: 'AFRTIO'   144
        FCB        0 (        ) :0A3A: 'AFRTIO'   160
        FCB        0 (        ) :0A3B: 'AFRTIO'   176
        FCB        0 (        ) :0A3C: 'AFRTIO'   192
```

```
        FCB          0 (            ) :0A3D: 'AFRTIO'   208
        FCB          0 (            ) :0A3E: 'AFRTIO'   224
        FCB          0 (            ) :0A3F: 'AFRTIO'   240
        FCB          0 (            ) :0A40: 'AFRTIO'   256

* -------------------------------------------------- SPEED        2000 RPM
        FCB          0 (            ) :0A41: 'AFRTIO'    48     LV8-LOAD
        FCB          0 (            ) :0A42: 'AFRTIO'    64
        FCB          0 (            ) :0A43: 'AFRTIO'    80
        FCB          0 (            ) :0A44: 'AFRTIO'    96
        FCB          0 (            ) :0A45: 'AFRTIO'   112
        FCB          0 (            ) :0A46: 'AFRTIO'   128
        FCB          0 (            ) :0A47: 'AFRTIO'   144
        FCB          0 (            ) :0A48: 'AFRTIO'   160
        FCB          0 (            ) :0A49: 'AFRTIO'   176
        FCB          0 (            ) :0A4A: 'AFRTIO'   192
        FCB          0 (            ) :0A4B: 'AFRTIO'   208
        FCB          0 (            ) :0A4C: 'AFRTIO'   224
        FCB          0 (            ) :0A4D: 'AFRTIO'   240
        FCB          0 (            ) :0A4E: 'AFRTIO'   256

* -------------------------------------------------- SPEED        2200 RPM
        FCB          0 (            ) :0A4F: 'AFRTIO'    48     LV8-LOAD
        FCB          0 (            ) :0A50: 'AFRTIO'    64
        FCB          0 (            ) :0A51: 'AFRTIO'    80
        FCB          0 (            ) :0A52: 'AFRTIO'    96
        FCB          0 (            ) :0A53: 'AFRTIO'   112
        FCB          0 (            ) :0A54: 'AFRTIO'   128
        FCB          0 (            ) :0A55: 'AFRTIO'   144
        FCB          0 (            ) :0A56: 'AFRTIO'   160
        FCB          0 (            ) :0A57: 'AFRTIO'   176
        FCB          0 (            ) :0A58: 'AFRTIO'   192
        FCB          0 (            ) :0A59: 'AFRTIO'   208
        FCB          0 (            ) :0A5A: 'AFRTIO'   224
        FCB          0 (            ) :0A5B: 'AFRTIO'   240
        FCB          0 (            ) :0A5C: 'AFRTIO'   256

* -------------------------------------------------- SPEED        2400 RPM
        FCB          0 (            ) :0A5D: 'AFRTIO'    48     LV8-LOAD
        FCB          0 (            ) :0A5E: 'AFRTIO'    64
        FCB          0 (            ) :0A5F: 'AFRTIO'    80
        FCB          0 (            ) :0A60: 'AFRTIO'    96
        FCB          0 (            ) :0A61: 'AFRTIO'   112
        FCB          0 (            ) :0A62: 'AFRTIO'   128
        FCB          0 (            ) :0A63: 'AFRTIO'   144
        FCB          0 (            ) :0A64: 'AFRTIO'   160
        FCB          0 (            ) :0A65: 'AFRTIO'   176
        FCB          0 (            ) :0A66: 'AFRTIO'   192
        FCB          0 (            ) :0A67: 'AFRTIO'   208
        FCB          0 (            ) :0A68: 'AFRTIO'   224
        FCB          0 (            ) :0A69: 'AFRTIO'   240
        FCB          0 (            ) :0A6A: 'AFRTIO'   256

* -------------------------------------------------- SPEED        2800 RPM
        FCB          0 (            ) :0A6B: 'AFRTIO'    48     LV8-LOAD
        FCB          0 (            ) :0A6C: 'AFRTIO'    64
        FCB          0 (            ) :0A6D: 'AFRTIO'    80
        FCB          0 (            ) :0A6E: 'AFRTIO'    96
        FCB          0 (            ) :0A6F: 'AFRTIO'   112
```

```
        FCB          0 (          ) :0A70: 'AFRTIO'   128
        FCB          0 (          ) :0A71: 'AFRTIO'   144
        FCB          0 (          ) :0A72: 'AFRTIO'   160
        FCB          0 (          ) :0A73: 'AFRTIO'   176
        FCB          0 (          ) :0A74: 'AFRTIO'   192
        FCB          0 (          ) :0A75: 'AFRTIO'   208
        FCB          0 (          ) :0A76: 'AFRTIO'   224
        FCB          0 (          ) :0A77: 'AFRTIO'   240
        FCB          0 (          ) :0A78: 'AFRTIO'   256

*  ------------------------------------------ SPEED        3200 RPM
        FCB          0 (          ) :0A79: 'AFRTIO'    48   LV8-LOAD
        FCB          0 (          ) :0A7A: 'AFRTIO'    64
        FCB          0 (          ) :0A7B: 'AFRTIO'    80
        FCB          0 (          ) :0A7C: 'AFRTIO'    96
        FCB          0 (          ) :0A7D: 'AFRTIO'   112
        FCB          0 (          ) :0A7E: 'AFRTIO'   128
        FCB          0 (          ) :0A7F: 'AFRTIO'   144
        FCB          0 (          ) :0A80: 'AFRTIO'   160
        FCB          0 (          ) :0A81: 'AFRTIO'   176
        FCB          0 (          ) :0A82: 'AFRTIO'   192
        FCB          0 (          ) :0A83: 'AFRTIO'   208
        FCB          0 (          ) :0A84: 'AFRTIO'   224
        FCB          0 (          ) :0A85: 'AFRTIO'   240
        FCB          0 (          ) :0A86: 'AFRTIO'   256

*  ------------------------------------------ SPEED        3600 RPM
        FCB          0 (          ) :0A87: 'AFRTIO'    48   LV8-LOAD
        FCB          0 (          ) :0A88: 'AFRTIO'    64
        FCB          0 (          ) :0A89: 'AFRTIO'    80
        FCB          0 (          ) :0A8A: 'AFRTIO'    96
        FCB          0 (          ) :0A8B: 'AFRTIO'   112
        FCB          0 (          ) :0A8C: 'AFRTIO'   128
        FCB          0 (          ) :0A8D: 'AFRTIO'   144
        FCB          0 (          ) :0A8E: 'AFRTIO'   160
        FCB          0 (          ) :0A8F: 'AFRTIO'   176
        FCB          0 (          ) :0A90: 'AFRTIO'   192
        FCB          0 (          ) :0A91: 'AFRTIO'   208
        FCB          0 (          ) :0A92: 'AFRTIO'   224
        FCB          0 (          ) :0A93: 'AFRTIO'   240
        FCB          0 (          ) :0A94: 'AFRTIO'   256

*  ------------------------------------------ SPEED        4000 RPM
        FCB          0 (          ) :0A95: 'AFRTIO'    48   LV8-LOAD
        FCB          0 (          ) :0A96: 'AFRTIO'    64
        FCB          0 (          ) :0A97: 'AFRTIO'    80
        FCB          0 (          ) :0A98: 'AFRTIO'    96
        FCB          0 (          ) :0A99: 'AFRTIO'   112
        FCB          0 (          ) :0A9A: 'AFRTIO'   128
        FCB          0 (          ) :0A9B: 'AFRTIO'   144
        FCB          0 (          ) :0A9C: 'AFRTIO'   160
        FCB          0 (          ) :0A9D: 'AFRTIO'   176
        FCB          0 (          ) :0A9E: 'AFRTIO'   192
        FCB          0 (          ) :0A9F: 'AFRTIO'   208
        FCB          0 (          ) :0AA0: 'AFRTIO'   224
        FCB          0 (          ) :0AA1: 'AFRTIO'   240
        FCB          0 (          ) :0AA2: 'AFRTIO'   256

*  ------------------------------------------ SPEED        4400 RPM
```

```
         FCB          0 (          ) :0AA3: 'AFRTIO'    48    LV8-LOAD
         FCB          0 (          ) :0AA4: 'AFRTIO'    64
         FCB          0 (          ) :0AA5: 'AFRTIO'    80
         FCB          0 (          ) :0AA6: 'AFRTIO'    96
         FCB          0 (          ) :0AA7: 'AFRTIO'   112
         FCB          0 (          ) :0AA8: 'AFRTIO'   128
         FCB          0 (          ) :0AA9: 'AFRTIO'   144
         FCB          0 (          ) :0AAA: 'AFRTIO'   160
         FCB          0 (          ) :0AAB: 'AFRTIO'   176
         FCB          0 (          ) :0AAC: 'AFRTIO'   192
         FCB          0 (          ) :0AAD: 'AFRTIO'   208
         FCB          0 (          ) :0AAE: 'AFRTIO'   224
         FCB          0 (          ) :0AAF: 'AFRTIO'   240
         FCB          0 (          ) :0AB0: 'AFRTIO'   256

* ------------------------------------------ SPEED        4800 RPM
         FCB          0 (          ) :0AB1: 'AFRTIO'    48    LV8-LOAD
         FCB          0 (          ) :0AB2: 'AFRTIO'    64
         FCB          0 (          ) :0AB3: 'AFRTIO'    80
         FCB          0 (          ) :0AB4: 'AFRTIO'    96
         FCB          0 (          ) :0AB5: 'AFRTIO'   112
         FCB          0 (          ) :0AB6: 'AFRTIO'   128
         FCB          0 (          ) :0AB7: 'AFRTIO'   144
         FCB          0 (          ) :0AB8: 'AFRTIO'   160
         FCB          0 (          ) :0AB9: 'AFRTIO'   176
         FCB          0 (          ) :0ABA: 'AFRTIO'   192
         FCB          0 (          ) :0ABB: 'AFRTIO'   208
         FCB          0 (          ) :0ABC: 'AFRTIO'   224
         FCB          0 (          ) :0ABD: 'AFRTIO'   240
         FCB          0 (          ) :0ABE: 'AFRTIO'   256

*
* N.B. THE ORDER OF THE FOLLOWING 4 TABLES MUST BE PRESERVED!
*
*##########################################################
*     F51PN TABLE                                         #
*    AIR/FUEL TIME OUT VS COOLANT TEMP.                   #
*   TABLE VALUE = % CHANGE * 1.28        (FATI)           #
*##########################################################
*-                    :          ::TBL2D,17,1,TBL2,1,1,'% CHG' ::
* -----------------------------------------------------------------
F51PN    FCB          0 (          ) :0ABF: '% CHG '   -40  DEG C-TEMP
*-                    :            ::EQU N=E*1.28 ::
         FCB          0 (          ) :0AC0: '% CHG '   -28
         FCB          0 (          ) :0AC1: '% CHG '   -16
         FCB          0 (          ) :0AC2: '% CHG '    -4
         FCB          0 (          ) :0AC3: '% CHG '     8
         FCB          0 (          ) :0AC4: '% CHG '    20
         FCB          0 (          ) :0AC5: '% CHG '    32
         FCB          0 (          ) :0AC6: '% CHG '    44
         FCB          0 (          ) :0AC7: '% CHG '    56
         FCB          0 (          ) :0AC8: '% CHG '    68
         FCB          0 (          ) :0AC9: '% CHG '    80
         FCB          0 (          ) :0ACA: '% CHG '    92
         FCB          0 (          ) :0ACB: '% CHG '   104
         FCB          0 (          ) :0ACC: '% CHG '   116
         FCB          0 (          ) :0ACD: '% CHG '   128
         FCB          0 (          ) :0ACE: '% CHG '   140
         FCB          0 (          ) :0ACF: '% CHG '   152
```

```
*#########################################################
*      F51D  TABLE                                       #
*    AIR/FUEL TIME OUT VS COOLANT TEMP.                  #
*   TABLE VALUE = % CHANGE * 1.28        (FATI)          #
*#########################################################
*-                     :          ::TBL2D,17,1,TBL2,1,1,'% CHG' ::
* -----------------------------------------------------------------
F51D     FCB          0 (          ) :0AD0: '% CHG '   -40  DEG C-TEMP
*-                     :           ::EQU N=E*1.28 ::
         FCB          0 (          ) :0AD1: '% CHG '   -28
         FCB          0 (          ) :0AD2: '% CHG '   -16
         FCB          0 (          ) :0AD3: '% CHG '    -4
         FCB          0 (          ) :0AD4: '% CHG '     8
         FCB          0 (          ) :0AD5: '% CHG '    20
         FCB          0 (          ) :0AD6: '% CHG '    32
         FCB          0 (          ) :0AD7: '% CHG '    44
         FCB          0 (          ) :0AD8: '% CHG '    56
         FCB          0 (          ) :0AD9: '% CHG '    68
         FCB          0 (          ) :0ADA: '% CHG '    80
         FCB          0 (          ) :0ADB: '% CHG '    92
         FCB          0 (          ) :0ADC: '% CHG '   104
         FCB          0 (          ) :0ADD: '% CHG '   116
         FCB          0 (          ) :0ADE: '% CHG '   128
         FCB          0 (          ) :0ADF: '% CHG '   140
         FCB          0 (          ) :0AE0: '% CHG '   152

*#########################################################
*      F56PN TABLE                                       #
*    COLD ENGINE TEMP. DEPENDENT AIR/FUEL RATIO          #
*           VS COOLANT TEMP. (FATC)                      #
*   TABLE VALUE = ( % CHANGE * 1.28 ) + 128              #
*#########################################################
*-                     :          ::TBL2D,17,1,TBL2,1,'% CHG' ::
* -----------------------------------------------------------------
F56PN    FCB          0 (          ) :0AE1: '% CHG '   -40  DEG C-TEMP
*-                     :           ::EQU N=(E*1.28)+128 ::
         FCB          0 (          ) :0AE2: '% CHG '   -28
         FCB          0 (          ) :0AE3: '% CHG '   -16
         FCB          0 (          ) :0AE4: '% CHG '    -4
         FCB          0 (          ) :0AE5: '% CHG '     8
         FCB          0 (          ) :0AE6: '% CHG '    20
         FCB          0 (          ) :0AE7: '% CHG '    32
         FCB          0 (          ) :0AE8: '% CHG '    44
         FCB          0 (          ) :0AE9: '% CHG '    56
         FCB          0 (          ) :0AEA: '% CHG '    68
         FCB          0 (          ) :0AEB: '% CHG '    80
         FCB          0 (          ) :0AEC: '% CHG '    92
         FCB          0 (          ) :0AED: '% CHG '   104
         FCB          0 (          ) :0AEE: '% CHG '   116
         FCB          0 (          ) :0AEF: '% CHG '   128
         FCB          0 (          ) :0AF0: '% CHG '   140
         FCB          0 (          ) :0AF1: '% CHG '   152

*#########################################################
*      F56D TABLE                                        #
*    COLD ENGINE TEMP. DEPENDENT AIR/FUEL RATIO          #
*           VS COOLANT TEMP. (FATC)                      #
*   TABLE VALUE = ( % CHANGE * 1.28 ) + 128              #
*#########################################################
```

```
*-                         :            ::TBL2D,17,1,TBL2,1,'% CHG' ::
* -------------------------------------------------------------------
F56D      FCB          0 (          ) :0AF2: '% CHG '   -40  DEG C-TEMP
*-                         :            ::EQU N=(E*1.28)+128 ::
          FCB          0 (          ) :0AF3: '% CHG '   -28
          FCB          0 (          ) :0AF4: '% CHG '   -16
          FCB          0 (          ) :0AF5: '% CHG '    -4
          FCB          0 (          ) :0AF6: '% CHG '     8
          FCB          0 (          ) :0AF7: '% CHG '    20
          FCB          0 (          ) :0AF8: '% CHG '    32
          FCB          0 (          ) :0AF9: '% CHG '    44
          FCB          0 (          ) :0AFA: '% CHG '    56
          FCB          0 (          ) :0AFB: '% CHG '    68
          FCB          0 (          ) :0AFC: '% CHG '    80
          FCB          0 (          ) :0AFD: '% CHG '    92
          FCB          0 (          ) :0AFE: '% CHG '   104
          FCB          0 (          ) :0AFF: '% CHG '   116
          FCB          0 (          ) :0B00: '% CHG '   128
          FCB          0 (          ) :0B01: '% CHG '   140
          FCB          0 (          ) :0B02: '% CHG '   152
*
* N.B. THE ORDER OF THE PREVIOUS 4 TABLES MUST BE PRESERVED!
*
*################################################################
*     F52A TABLE                                                 #
*    TIME OUT DECAY MULTIPLIER VS COOLANT TEMP. (CLDEG116)       #
*   TABLE VALUE = MULTIPLIER * 256   (FADM) (DECAYS FATI)        #
*################################################################
*-                         :            ::TBL2D,14,1,TBL2,1,1,'MULT' ::
* -------------------------------------------------------------------
F52A      FCB          0 (          ) :0B03: 'MULT   '   -40  DEG C-TEMP
*-                         :            ::EQU N=E*256 ::
          FCB          0 (          ) :0B04: 'MULT   '   -28
          FCB          0 (          ) :0B05: 'MULT   '   -16
          FCB          0 (          ) :0B06: 'MULT   '    -4
          FCB          0 (          ) :0B07: 'MULT   '     8
          FCB          0 (          ) :0B08: 'MULT   '    20
          FCB          0 (          ) :0B09: 'MULT   '    32
          FCB          0 (          ) :0B0A: 'MULT   '    44
          FCB          0 (          ) :0B0B: 'MULT   '    56
          FCB          0 (          ) :0B0C: 'MULT   '    68
          FCB          0 (          ) :0B0D: 'MULT   '    80
          FCB          0 (          ) :0B0E: 'MULT   '    92
          FCB          0 (          ) :0B0F: 'MULT   '   104
          FCB          0 (          ) :0B10: 'MULT   '   116

*###########################################################
*     F53A TABLE                                            #
*    TIME OUT DECAY DELAY VS COOLANT TEMP. (CLDEG116)       #
*       (FADD- INITIAL CHOKE DELAY)  TABLE VALUE = SEC.*5   #
*###########################################################
*-                         :            ::TBL2D,14,1,TBL2,1,1,'SEC' ::
* -------------------------------------------------------------------
F53A      FCB          0 (          ) :0B11: 'SEC    '   -40  DEG C-TEMP
*-                         :            ::EQU N=E*5 ::
          FCB          0 (          ) :0B12: 'SEC    '   -28
          FCB          0 (          ) :0B13: 'SEC    '   -16
          FCB          0 (          ) :0B14: 'SEC    '    -4
          FCB          0 (          ) :0B15: 'SEC    '     8
```

```
          FCB           0 (          ) :0B16: 'SEC    '    20
          FCB           0 (          ) :0B17: 'SEC    '    32
          FCB           0 (          ) :0B18: 'SEC    '    44
          FCB           0 (          ) :0B19: 'SEC    '    56
          FCB           0 (          ) :0B1A: 'SEC    '    68
          FCB           0 (          ) :0B1B: 'SEC    '    80
          FCB           0 (          ) :0B1C: 'SEC    '    92
          FCB           0 (          ) :0B1D: 'SEC    '   104
          FCB           0 (          ) :0B1E: 'SEC    '   116

*********************************
*   F62 TABLE                   *
*   PE TPS THRESHOLD VS RPM     *
*   TABLE VALUE = %TPS * 2.56   *
*********************************
*-
*                       :          ::TBL2D,5,TBL1,1,4,'%' ::
* ---------------------------------------------------------------
F62       FCB           0 (          ) :0B1F: '%      '   400    RPM-SPEED
*-                      :          ::EQU N=E*2.56 ::
          FCB           0 (          ) :0B20: '%      '  1200
          FCB           0 (          ) :0B21: '%      '  2000
          FCB           0 (          ) :0B22: '%      '  3200
          FCB           0 (          ) :0B23: '%      '  4800

*##############################################################
*     F61STPLS TABLE CRANK FUEL PW MULT VS COOLANT TEMPERATURE  #
*   TABLE VALUE =  0-2 MULTIPLIER OF SIMULTANEOUS PULSE WIDTH   #
*     NOTE: THIS SQUIRT DOUBLED FOR SEQUENTIAL CRANK            #
*##############################################################
*-
*                       :          ::TBL2D,9,1,TBL2,1,2,'MULT' ::
* ---------------------------------------------------------------
F61STPLA FCB            0 (          ) :0B24: 'MULT   '   -40   DEG C-TEMP
*-                      :          ::EQU N=E*128 ::
          FCB           0 (          ) :0B25: 'MULT   '   -16
          FCB           0 (          ) :0B26: 'MULT   '     8
          FCB           0 (          ) :0B27: 'MULT   '    32
          FCB           0 (          ) :0B28: 'MULT   '    56
          FCB           0 (          ) :0B29: 'MULT   '    80
          FCB           0 (          ) :0B2A: 'MULT   '   104
          FCB           0 (          ) :0B2B: 'MULT   '   128
          FCB           0 (          ) :0B2C: 'MULT   '   152


* ---------------------------------------------------------------
F64SCAL   FDB           0 (          ) :0B2D: 'MSEC   ' CRANK TBL SCLR FOR
*-                      :                        MAX CRANK PW
*-                      :          ::EQU N=E*65.536  ::
*##############################################################
*     F64C TABLE                                                #
*     CRANK FUEL PW VS COOLANT TEMPERATURE (CLDEG116)           #
*                                                               #
*   TABLE VALUE = (MSEC*65.536*256)/F64SCAL                     #
*   NOTE: THIS IS SQUIRT NOT CYLINDERS WORTH OF FUEL (ASYNC)    #
*     NOTE: THIS SQUIRT DOUBLED FOR SEQUENTIAL CRANK            #
*##############################################################
*-
*                       :          ::TBL2D,14,1,TBL2,1,1,'MSEC' ::
* ---------------------------------------------------------------
F64C      FCB           0 (          ) :0B2F: 'MSEC   '   -40   DEG C-TEMP
*-                      :          ::EQU N=E*KCRKSEQ1/F64SCAL ::
```

```
          FCB          0 (          ) :0B30: 'MSEC  '   -28
          FCB          0 (          ) :0B31: 'MSEC  '   -16
          FCB          0 (          ) :0B32: 'MSEC  '    -4
          FCB          0 (          ) :0B33: 'MSEC  '     8
          FCB          0 (          ) :0B34: 'MSEC  '    20
          FCB          0 (          ) :0B35: 'MSEC  '    32
          FCB          0 (          ) :0B36: 'MSEC  '    44
          FCB          0 (          ) :0B37: 'MSEC  '    56
          FCB          0 (          ) :0B38: 'MSEC  '    68
          FCB          0 (          ) :0B39: 'MSEC  '    80
          FCB          0 (          ) :0B3A: 'MSEC  '    92
          FCB          0 (          ) :0B3B: 'MSEC  '   104
          FCB          0 (          ) :0B3C: 'MSEC  '   116

*;;###############################################################
*;;   F64RCAL TABLE   CRANK ENLEANMENT VS. RPM                   #
*;; TABLE VALUE = SCALAR * 256              (17 VALUES)          #
*################################################################
*-                     :          ::TBL2D,17,2,TBLX,1,'SCALAR'::
* ----------------------------------------------------------------
F64RCAL  FCB           0 (          ) :0B3D: '      ' 0   RPM
*-                     :          ::EQU N=E*256 ::
* ----------------------------------------------------------------
         FCB           0 (          ) :0B3E: 'SCALAR' 50
         FCB           0 (          ) :0B3F: 'SCALAR' 100
         FCB           0 (          ) :0B40: 'SCALAR' 150
         FCB           0 (          ) :0B41: 'SCALAR' 200
         FCB           0 (          ) :0B42: 'SCALAR' 250
         FCB           0 (          ) :0B43: 'SCALAR' 300
         FCB           0 (          ) :0B44: 'SCALAR' 350
         FCB           0 (          ) :0B45: 'SCALAR' 400
         FCB           0 (          ) :0B46: 'SCALAR' 450
         FCB           0 (          ) :0B47: 'SCALAR' 500
         FCB           0 (          ) :0B48: 'SCALAR' 550
         FCB           0 (          ) :0B49: 'SCALAR' 600
         FCB           0 (          ) :0B4A: 'SCALAR' 650
         FCB           0 (          ) :0B4B: 'SCALAR' 700
         FCB           0 (          ) :0B4C: 'SCALAR' 750
         FCB           0 (          ) :0B4D: 'SCALAR' 800

*##########################################################
*     F65A TABLE                                          #
*     CRANK FUEL PW MULTIPLIER VS REFERENCE PULSES        #
*   TABLE VALUE = MULTIPLIER * 256                        #
*##########################################################
*-                     :          ::TBL2D,17,1,TBL23,1,1,'MULT' ::
* ----------------------------------------------------------------
F65A     FCB           0 (          ) :0B4E: 'MULT  '    00    REF-PULSES
*-                     :          ::EQU N=E*256 ::
         FCB           0 (          ) :0B4F: 'MULT  '     8
         FCB           0 (          ) :0B50: 'MULT  '    16
         FCB           0 (          ) :0B51: 'MULT  '    24
         FCB           0 (          ) :0B52: 'MULT  '    32
         FCB           0 (          ) :0B53: 'MULT  '    40
         FCB           0 (          ) :0B54: 'MULT  '    48
         FCB           0 (          ) :0B55: 'MULT  '    56
         FCB           0 (          ) :0B56: 'MULT  '    64
         FCB           0 (          ) :0B57: 'MULT  '    72
         FCB           0 (          ) :0B58: 'MULT  '    80
```

```
          FCB          0 (          ) :0B59: 'MULT  '    88
          FCB          0 (          ) :0B5A: 'MULT  '    96
          FCB          0 (          ) :0B5B: 'MULT  '   104
          FCB          0 (          ) :0B5C: 'MULT  '   112
          FCB          0 (          ) :0B5D: 'MULT  '   120
          FCB          0 (          ) :0B5E: 'MULT  '   128

*###########################################################
*     F66  TABLE                                           #
*     CRANK FUEL PW MULTIPLIER VS TPS (0-2 MULTIPLIER)     #
*   TABLE VALUE =  MULTIPLIER * 128                        #
*###########################################################
*-                     :          ::PROTECT ::
*-                     :          ::TBL2D,9,2,TBL38,1,2,'MULT' ::
* ----------------------------------------------------------------
F66       FCB          8 (          ) :0B5F: '      ' USE 9 VALUE TABLE
*-                     :          ::EQU N=E ::
*-                     :          ::NOPROTECT ::
* ----------------------------------------------------------------
          FCB          0 (          ) :0B60: 'MULT  '  0.00     %-THROTPOS
*-                     :          ::EQU N= E*128  ::
          FCB          0 (          ) :0B61: 'MULT  ' 12.50
          FCB          0 (          ) :0B62: 'MULT  ' 25.00
          FCB          0 (          ) :0B63: 'MULT  ' 37.50
          FCB          0 (          ) :0B64: 'MULT  ' 50.00
          FCB          0 (          ) :0B65: 'MULT  ' 62.50
          FCB          0 (          ) :0B66: 'MULT  ' 75.00
          FCB          0 (          ) :0B67: 'MULT  ' 87.50
          FCB          0 (          ) :0B68: 'MULT  ' 100.00

*################################################################
*     F67B TABLE                                                #
*     POWER ENRICHMENT FUELAIR RATIO VS COOLANT (COOLDEG)       #
*   TABLE VALUE =  1638.4 * (1/AIRFUEL RATIO)                   #
*################################################################
*-                     :          ::PROTECT ::
*-                     :          ::TBL2D,9,2,TBL2,1,2,'RATIO' ::
* ----------------------------------------------------------------
F67B      FCB          8 (          ) :0B69: '      ' USE 9 VALUE TABLE
*-                     :          ::EQU N=E ::
*-                     :          ::NOPROTECT ::
* ----------------------------------------------------------------
          FCB          0 (          ) :0B6A: 'RATIO '   -40  DEG C-TEMP
*-                     :          ::EQU N=1638.4/E ::
          FCB          0 (          ) :0B6B: 'RATIO '   -16
          FCB          0 (          ) :0B6C: 'RATIO '     8
          FCB          0 (          ) :0B6D: 'RATIO '    32
          FCB          0 (          ) :0B6E: 'RATIO '    56
          FCB          0 (          ) :0B6F: 'RATIO '    80
          FCB          0 (          ) :0B70: 'RATIO '   104
          FCB          0 (          ) :0B71: 'RATIO '   128
          FCB          0 (          ) :0B72: 'RATIO '   152

*####################################################################
*     F67MUL TABLE                                                  #
*    FAPE  PERCENT CHANGE (-100 TO +100) VS. TIME IN POWER ENRICHMENT #
*####################################################################
*-                     :          ::TBL2D,9,1,TBL9,1,2,'MULT' ::
* ----------------------------------------------------------------
```

```
F67MUL   FCB        0 (         ) :0B73: 'MULT  '   0.0    SEC-TIME
*-                  :             ::EQU N=(E*1.28)+128 ::
         FCB        0 (         ) :0B74: 'MULT  '   3.2
         FCB        0 (         ) :0B75: 'MULT  '   6.4
         FCB        0 (         ) :0B76: 'MULT  '   9.6
         FCB        0 (         ) :0B77: 'MULT  '  12.8
         FCB        0 (         ) :0B78: 'MULT  '  16.0
         FCB        0 (         ) :0B79: 'MULT  '  19.2
         FCB        0 (         ) :0B7A: 'MULT  '  22.4
         FCB        0 (         ) :0B7B: 'MULT  '  25.6

*###################################################
*      F68 TABLE                                    #
*    POWER ENRICHMENT TRIM VS RPM (NTRPM)           #
*      TABLE VALUE = (PERCENT CHANGE)*1.28+128      #
*###################################################
*-                  :             ::TBL2D,8,TBL7,3,2,'% CHG ' ::
* ------------------------------------------------------------------
F68B     FCB        0 (         ) :0B7C: '% CHG '   800    RPM-SPEED
*-                  :             ::EQU N=(E*1.28)+128 ::
         FCB        0 (         ) :0B7D: '% CHG '  1600
         FCB        0 (         ) :0B7E: '% CHG '  2400
         FCB        0 (         ) :0B7F: '% CHG '  3200
         FCB        0 (         ) :0B80: '% CHG '  4000
         FCB        0 (         ) :0B81: '% CHG '  4800
         FCB        0 (         ) :0B82: '% CHG '  5600
         FCB        0 (         ) :0B83: '% CHG '  6400

*#############################################################
*      F90DTPS                                                #
*      DELTA TPS AE MULTIPLIER OF LAST BPW                    #
*    TABLE VALUE = %ADDITIONAL FUEL * 10.24                   #
*#############################################################
*-                  :             ::TBL2D,9,1,TBL38,1,2,'MULT' ::
* ------------------------------------------------------------------
F90DTPS  FCB        0 (         ) :0B84: 'MULT  '  0.00      %-THROTPOS
*-                  :             ::EQU N=E*10.24  ::
         FCB        0 (         ) :0B85: 'MULT  ' 12.50
         FCB        0 (         ) :0B86: 'MULT  ' 25.00
         FCB        0 (         ) :0B87: 'MULT  ' 37.50
         FCB        0 (         ) :0B88: 'MULT  ' 50.00
         FCB        0 (         ) :0B89: 'MULT  ' 62.50
         FCB        0 (         ) :0B8A: 'MULT  ' 75.00
         FCB        0 (         ) :0B8B: 'MULT  ' 87.50
         FCB        0 (         ) :0B8C: 'MULT  ' 100.00

*##################################################################
* F91DTPSD TABLE  SYNCH DELTA TPS AE MULTIPLIER VS. COOLANT TEMP. #
*##################################################################
*-                  :             ::PROTECT ::
*-                  :             ::TBL2D,9,2,TBL2,1,2,'DMULT' ::
* ------------------------------------------------------------------
F91DTPSD FCB        8 (         ) :0B8D: '      ' USE 9 VALUE TABLE
*-                  :             ::EQU N=E  ::
*-                  :             ::NOPROTECT ::
* ------------------------------------------------------------------
         FCB        0 (         ) :0B8E: 'DMULT '   -40  DEG C-TEMP
*-                  :             ::EQU N=E*128  ::
         FCB        0 (         ) :0B8F: 'DMULT '   -16
```

```
          FCB           0 (           ) :0B90: 'DMULT '     8
          FCB           0 (           ) :0B91: 'DMULT '    32
          FCB           0 (           ) :0B92: 'DMULT '    56
          FCB           0 (           ) :0B93: 'DMULT '    80
          FCB           0 (           ) :0B94: 'DMULT '   104
          FCB           0 (           ) :0B95: 'DMULT '   128
          FCB           0 (           ) :0B96: 'DMULT '   152

*##################################################################
* F91DTPSP TABLE  SYNCH DELTA TPS AE MULTIPLIER VS. COOLANT TEMP. #
*##################################################################
*_                      :             ::PROTECT ::
*_                      :             ::TBL2D,9,2,TBL2,1,2,'PNMULT' ::
* ------------------------------------------------------------------
F91DTPSP FCB           8 (           ) :0B97: '       ' USE 9 VALUE TABLE
*_                      :             ::EQU N=E  ::
*_                      :             ::NOPROTECT ::
* ------------------------------------------------------------------
          FCB           0 (           ) :0B98: 'PNMULT'   -40  DEG C-TEMP
*_                      :             ::EQU N=E*128  ::
          FCB           0 (           ) :0B99: 'PNMULT'   -16
          FCB           0 (           ) :0B9A: 'PNMULT'     8
          FCB           0 (           ) :0B9B: 'PNMULT'    32
          FCB           0 (           ) :0B9C: 'PNMULT'    56
          FCB           0 (           ) :0B9D: 'PNMULT'    80
          FCB           0 (           ) :0B9E: 'PNMULT'   104
          FCB           0 (           ) :0B9F: 'PNMULT'   128
          FCB           0 (           ) :0BA0: 'PNMULT'   152

*##################################################################
* F91ATS   TABLE  0-2 SYNCH DELTA TPS AE MULTIPLIER VS. AIR TEMP. #
*##################################################################
*_                      :             ::TBL2D,9,1,TBL2,1,2,'MULT' ::
* ------------------------------------------------------------------
F91ATS    FCB           0 (           ) :0BA1: 'MULT  '   -40  DEG C-TEMP
*_                      :             ::EQU N=E*128  ::
          FCB           0 (           ) :0BA2: 'MULT  '   -16
          FCB           0 (           ) :0BA3: 'MULT  '     8
          FCB           0 (           ) :0BA4: 'MULT  '    32
          FCB           0 (           ) :0BA5: 'MULT  '    56
          FCB           0 (           ) :0BA6: 'MULT  '    80
          FCB           0 (           ) :0BA7: 'MULT  '   104
          FCB           0 (           ) :0BA8: 'MULT  '   128
          FCB           0 (           ) :0BA9: 'MULT  '   152

*##############################################################
*      F92DECAY
*      DTPSAE MULTIPLIER VS REFERENCE PULSES                   #
*    TABLE VALUE = MULTIPLIER * 256                            #
*##############################################################
*_                      :             ::TBL2D,17,1,TBL23,1,2,'MULT' ::
* ------------------------------------------------------------------
F92DECAY FCB           0 (           ) :0BAA: 'MULT  '    00    REF-PULSES
*_                      :             ::EQU N=E*256 ::
          FCB           0 (           ) :0BAB: 'MULT  '    16
          FCB           0 (           ) :0BAC: 'MULT  '    32
          FCB           0 (           ) :0BAD: 'MULT  '    48
          FCB           0 (           ) :0BAE: 'MULT  '    64
          FCB           0 (           ) :0BAF: 'MULT  '    80
```

```
        FCB         0 (          ) :0BB0: 'MULT  '    96
        FCB         0 (          ) :0BB1: 'MULT  '   112
        FCB         0 (          ) :0BB2: 'MULT  '   128
        FCB         0 (          ) :0BB3: 'MULT  '   144
        FCB         0 (          ) :0BB4: 'MULT  '   160
        FCB         0 (          ) :0BB5: 'MULT  '   176
        FCB         0 (          ) :0BB6: 'MULT  '   192
        FCB         0 (          ) :0BB7: 'MULT  '   208
        FCB         0 (          ) :0BB8: 'MULT  '   224
        FCB         0 (          ) :0BB9: 'MULT  '   240
        FCB         0 (          ) :0BBA: 'MULT  '   256

*******************************************************************
*     F94A TABLE  TABLE VALUE = MSEC * 65536                      *
*   LOW PULSE WIDTH INJECTOR OFFSET VS. BASE PULSE WIDTH          *
*    NOTE: IF PULSE WIDTH < KMINCTS DEFAULT PULSE WIDTH IS USED   *
*     DOUBLE NOTE : VALUES ARE NOW +/-, SO DON'T SUBTRACT A LARGER *
*                   NUMBER THAN THE TABLE ENTRY VALUE!!!!!!!!!!!!!! *
*******************************************************************
*-                    :          ::TBL2D,16,TBL36,1,'MSEC' ::
* ------------------------------------------------------------------
F94B    FDB         0 (          ) :0BBB: 'MSEC  ' 0.000    PW-MSEC
*-                    :          ::EQU N(2)=E*65.536 ::
        FDB         0 (          ) :0BBD: 'MSEC  ' 0.244
        FDB         0 (          ) :0BBF: 'MSEC  ' 0.488
        FDB         0 (          ) :0BC1: 'MSEC  ' 0.732
        FDB         0 (          ) :0BC3: 'MSEC  ' 0.976
        FDB         0 (          ) :0BC5: 'MSEC  ' 1.220
        FDB         0 (          ) :0BC7: 'MSEC  ' 1.460
        FDB         0 (          ) :0BC9: 'MSEC  ' 1.708
        FDB         0 (          ) :0BCB: 'MSEC  ' 1.950
        FDB         0 (          ) :0BCD: 'MSEC  ' 2.197
        FDB         0 (          ) :0BCF: 'MSEC  ' 2.440
        FDB         0 (          ) :0BD1: 'MSEC  ' 2.685
        FDB         0 (          ) :0BD3: 'MSEC  ' 2.929
        FDB         0 (          ) :0BD5: 'MSEC  ' 3.170
        FDB         0 (          ) :0BD7: 'MSEC  ' 3.410
        FDB         0 (          ) :0BD9: 'MSEC  ' 3.660

*##################################################################
*     F95B TABLE                                                  #
*     DELTA TPS AE DECAY RATE MULTIPLIER VS  COOLANT TEMPERATURE  #
*##################################################################
*-                    :          ::PROTECT ::
*-                    :          ::TBL2D,9,2,TBL2,1,2,'MULT ' ::
* ------------------------------------------------------------------
F95B    FCB         8 (          ) :0BDB: '      ' USE 9 VALUE TABLE
*-                    :          ::EQU N=E ::
*-                    :          ::NOPROTECT ::
* ------------------------------------------------------------------
        FCB         0 (          ) :0BDC: 'MULT  '   -40  DEG C-TEMP
*-                    :          ::EQU N=E*256 ::
        FCB         0 (          ) :0BDD: 'MULT  '   -16
        FCB         0 (          ) :0BDE: 'MULT  '     8
        FCB         0 (          ) :0BDF: 'MULT  '    32
        FCB         0 (          ) :0BE0: 'MULT  '    56
        FCB         0 (          ) :0BE1: 'MULT  '    80
        FCB         0 (          ) :0BE2: 'MULT  '   104
        FCB         0 (          ) :0BE3: 'MULT  '   128
```

```
        FCB          0 (          ) :0BE4: 'MULT  '   152

*#####################################################
*      F96B TABLE                                     #
*  DELTA TPS AE PULSE MULTIPLIER VS COOLANT           #
*    TABLE VALUE = MULT                               #
*#####################################################
*-                   :          ::PROTECT ::
*-                   :          ::TBL2D,9,2,TBL2,1,2,'MULT ' ::
* ----------------------------------------------------------------
F96B    FCB          8 (          ) :0BE5: '      ' USE 9 VALUE TABLE
*-                   :          ::EQU N=E ::
*-                   :          ::NOPROTECT ::
* ----------------------------------------------------------------
        FCB          0 (          ) :0BE6: 'MULT  '   -40  DEG C-TEMP
*-                   :          ::EQU N=E*256 ::
        FCB          0 (          ) :0BE7: 'MULT  '   -16
        FCB          0 (          ) :0BE8: 'MULT  '     8
        FCB          0 (          ) :0BE9: 'MULT  '    32
        FCB          0 (          ) :0BEA: 'MULT  '    56
        FCB          0 (          ) :0BEB: 'MULT  '    80
        FCB          0 (          ) :0BEC: 'MULT  '   104
        FCB          0 (          ) :0BED: 'MULT  '   128
        FCB          0 (          ) :0BEE: 'MULT  '   152

* ----------------------------------------------------------------
F97SCAL FCB          0 (          ) :0BEF: 'SCALER' FOR MAX AE PULSE
*-                   :                   WIDTH
*-                   :          ::EQU N=E ::
*#####################################################
*      F97A TABLE                                     #
*    MAXIMUM  AE PULSE WIDTH VS COOLANT               #
*   TABLE VALUE = MSEC*65.536/F97SCAL                 #
*#####################################################
*-                   :          ::TBL2D,17,1,TBL2,1,1,'MSEC ' ::
* ----------------------------------------------------------------
F97A    FCB          0 (          ) :0BF0: 'MSEC  '   -40  DEG C-TEMP
*-                   :          ::EQU N=E*65.536/F97SCAL ::
        FCB          0 (          ) :0BF1: 'MSEC  '   -28
        FCB          0 (          ) :0BF2: 'MSEC  '   -16
        FCB          0 (          ) :0BF3: 'MSEC  '    -4
        FCB          0 (          ) :0BF4: 'MSEC  '     8
        FCB          0 (          ) :0BF5: 'MSEC  '    20
        FCB          0 (          ) :0BF6: 'MSEC  '    32
        FCB          0 (          ) :0BF7: 'MSEC  '    44
        FCB          0 (          ) :0BF8: 'MSEC  '    56
        FCB          0 (          ) :0BF9: 'MSEC  '    68
        FCB          0 (          ) :0BFA: 'MSEC  '    80
        FCB          0 (          ) :0BFB: 'MSEC  '    92
        FCB          0 (          ) :0BFC: 'MSEC  '   104
        FCB          0 (          ) :0BFD: 'MSEC  '   116
        FCB          0 (          ) :0BFE: 'MSEC  '   128
        FCB          0 (          ) :0BFF: 'MSEC  '   140
        FCB          0 (          ) :0C00: 'MSEC  '   152

*############################################################
*      F98  TABLE                                           #
*      DELTA TPS AE SCALER OF MAX AE PULSE WIDTH            #
*   TABLE VALUE = MULTIPLIER * 128                          #
```

```
*###############################################################
*-                        :           ::TBL2D,17,1,TBL38,1,1,'SCALER' ::
* ----------------------------------------------------------------------
F98       FCB           0 (           ) :0C01: 'SCALER'  0.00      %-THROTPOS
*-                        :           ::EQU N=E*128 ::
          FCB           0 (           ) :0C02: 'SCALER'  6.25
          FCB           0 (           ) :0C03: 'SCALER' 12.50
          FCB           0 (           ) :0C04: 'SCALER' 18.75
          FCB           0 (           ) :0C05: 'SCALER' 25.00
          FCB           0 (           ) :0C06: 'SCALER' 31.25
          FCB           0 (           ) :0C07: 'SCALER' 37.50
          FCB           0 (           ) :0C08: 'SCALER' 43.75
          FCB           0 (           ) :0C09: 'SCALER' 50.00
          FCB           0 (           ) :0C0A: 'SCALER' 56.25
          FCB           0 (           ) :0C0B: 'SCALER' 62.50
          FCB           0 (           ) :0C0C: 'SCALER' 68.75
          FCB           0 (           ) :0C0D: 'SCALER' 75.00
          FCB           0 (           ) :0C0E: 'SCALER' 81.25
          FCB           0 (           ) :0C0F: 'SCALER' 87.50
          FCB           0 (           ) :0C10: 'SCALER' 93.75
          FCB           0 (           ) :0C11: 'SCALER' 100.00

*###############################################################
*      F9BLMMIN                                                 #
*      BLOCK LEARN MINIMUMS, CELLS 0-15, WHEN COLD              #
*    TABLE VALUE = MINIMUM                                      #
*###############################################################
*-                        :           ::TBL2D,16,TBLX,1,'MIN ' ::
* ----------------------------------------------------------------------
F9BLMMIN FCB            0 (           ) :0C12: 'MIN   ' 0      BLM MINIMUM
*-                        :           ::EQU N=E ::
          FCB           0 (           ) :0C13: 'MIN   ' 1
          FCB           0 (           ) :0C14: 'MIN   ' 2
          FCB           0 (           ) :0C15: 'MIN   ' 3
          FCB           0 (           ) :0C16: 'MIN   ' 4
          FCB           0 (           ) :0C17: 'MIN   ' 5
          FCB           0 (           ) :0C18: 'MIN   ' 6
          FCB           0 (           ) :0C19: 'MIN   ' 7
          FCB           0 (           ) :0C1A: 'MIN   ' 8
          FCB           0 (           ) :0C1B: 'MIN   ' 9
          FCB           0 (           ) :0C1C: 'MIN   ' 10
          FCB           0 (           ) :0C1D: 'MIN   ' 11
          FCB           0 (           ) :0C1E: 'MIN   ' 12
          FCB           0 (           ) :0C1F: 'MIN   ' 13
          FCB           0 (           ) :0C20: 'MIN   ' 14
          FCB           0 (           ) :0C21: 'MIN   ' 15

*################################################
*       F9PNCLT  TABLE                          #
*      PARK/NEUTRAL CLOSED LOOP COOLANT CRITERIA #
*      VS. START-UP COOLANT TEMP (COOLTSU)      #
*################################################
*-                        :           ::TBL2D,17,1,TBL2,1,1,'DEG C' ::
* ----------------------------------------------------------------------
F9PNCLT  FCB            0 (           ) :0C22: 'DEG C '   -40  DEG C-TEMP
*-                        :           ::EQU N=(E+40)*256/192 ::
          FCB           0 (           ) :0C23: 'DEG C '   -28
          FCB           0 (           ) :0C24: 'DEG C '   -16
          FCB           0 (           ) :0C25: 'DEG C '    -4
```

C2 ?

```
        FCB          0 (            ) :0C26: 'DEG C '     8
        FCB          0 (            ) :0C27: 'DEG C '    20
        FCB          0 (            ) :0C28: 'DEG C '    32
        FCB          0 (            ) :0C29: 'DEG C '    44
        FCB          0 (            ) :0C2A: 'DEG C '    56
        FCB          0 (            ) :0C2B: 'DEG C '    68
        FCB          0 (            ) :0C2C: 'DEG C '    80
        FCB          0 (            ) :0C2D: 'DEG C '    92
        FCB          0 (            ) :0C2E: 'DEG C '   104
        FCB          0 (            ) :0C2F: 'DEG C '   116
        FCB          0 (            ) :0C30: 'DEG C '   128
        FCB          0 (            ) :0C31: 'DEG C '   140
        FCB          0 (            ) :0C32: 'DEG C '   152
*+DATAPID ++BLOCK ID++
*****************************************************************
*   IDLE  AIR CONTROL CONSTANTS AND TABLES FOR PID FEEDBACK      *
*                A/C ENABLING CONDITIONS AND CALIBRATIONS       *
*****************************************************************
PID       EQU      *         PID LOOK UP TABLE BASE ADDRESS

* ------------------------------------------------------------------
KPIDOPT  FCB          0 (           ) :0C33: 'N      ' $80=DON'T GO BELOW
*-                    :                    MIN MOTOR WHEN A/C REMOVED
*-                    :             ::EQU N=E ::
* ------------------------------------------------------------------
KISCLRST FCB          0 (           ) :0C34: 'DEG C ' IF COOLANT > CAL,
*-                    :                    RPLSCNTR=0, ENABLE RESET
*-                    :             ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KRPM125F FCB          0 (           ) :0C35: 'COEFF ' RPM/12.5 FILTER
*-                    :                    CONSTANT
*-                    :             ::EQU N=E*256 ::
* ------------------------------------------------------------------
KISPKSP  FCB          0 (           ) :0C36: 'STEPS ' IDLE SPEED PARK START
*-                    :                    -UP POSITION
*-                    :             ::EQU N=E ::
* ------------------------------------------------------------------
KMTMINLO FCB          0 (           ) :0C37: 'STEPS ' ABSOLUTE MINIMUM
*-                    :                    MOTOR POSITION
*-                    :             ::EQU N=E ::
* ------------------------------------------------------------------
KMINLRN  FCB          0 (           ) :0C38: 'MSEC  ' IDLE SPEED ENGINE
*-                    :                    SPEED IN DEADBAND
*-                         ( NO. OF PID CYCLES IN THE DEADBAND BEFORE
*-                         ENABLING OR DISABLING MIN MOTOR LEARNING)
*-                    :             ::EQU N=E/50 ::

*****************************************************************
*         C O M M A N D   S P E E D   D E F I N I T I O N   *
*****************************************************************

* ------------------------------------------------------------------
KISSUDL  FCB          0 (           ) :0C39: 'MSEC  ' IDLE SPEED START-UP
*-                    :                    DELAY
*-                    :             ::EQU N=E/6.25 ::
* ------------------------------------------------------------------
KISACON  FCB          0 (           ) :0C3A: 'RPM   ' IAC COMMAND SPEED
*-                    :                    OFFSET WITH A/C ON
*-                    :             ::EQU N=E/12.5 ::
```

```
* ------------------------------------------------------------------------
KSDIACOF FCB           0 (          ) :0C3B: 'RPM    ' ADD THIS TO COMMAND
*_                       :                   RPM WHEN ENGINE GREEN
*_                                 SET TO 0 IF NOT GM30!!!!!
*_                       :                ::EQU N=E/12.5 ::
* ------------------------------------------------------------------------
KISCLTHI FCB           0 (          ) :0C3C: 'RPM    ' RPM OFFSET FROM
*_                       :                   COMMAND FOR HIGH COOLANT
*_                       :                ::EQU N=E/12.5 ::
* ------------------------------------------------------------------------
KISCLTLM FCB           0 (          ) :0C3D: 'DEG C ' IF COOLANT <= THIS
*_                       :                   DISABLE HOT OFFSET
*_                       :                ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------------
KISMPHLM FCB           0 (          ) :0C3E: 'MPH    ' IF MPH >= THIS
*_                       :                   DISABLE HOT OFFSET
*_                       :                ::EQU N=E ::
* ------------------------------------------------------------------------
KISCLTTM FDB           0 (          ) :0C3F: 'SEC    ' IF ERUNTIME >= THIS
*_                       :                   DISABLE HOT OFFSET
*_                       :                ::EQU N=E ::
* ------------------------------------------------------------------------
KISMAXCH FCB           0 (          ) :0C41: 'RPM    ' MAX COMMAND SPEED
*_                       :                   CHANGE PER 50 MSEC
*_                       :                ::EQU N=E/12.5 ::

**************************************
*  F17A : ENGINE SPEED AT IDLE       *
*         VS. TEMPERATURE IN DRIVE   *
**************************************
*_                       :                ::TBL2D,17,TBL2,1,'RPM ' ::
* ------------------------------------------------------------------------
F17A      FCB          0 (          ) :0C42: 'RPM    '   -40  DEG C-TEMP
*_                       :                ::EQU N=E/12.5 ::
          FCB          0 (          ) :0C43: 'RPM    '   -28
          FCB          0 (          ) :0C44: 'RPM    '   -16
          FCB          0 (          ) :0C45: 'RPM    '    -4
          FCB          0 (          ) :0C46: 'RPM    '     8
          FCB          0 (          ) :0C47: 'RPM    '    20
          FCB          0 (          ) :0C48: 'RPM    '    32
          FCB          0 (          ) :0C49: 'RPM    '    44
          FCB          0 (          ) :0C4A: 'RPM    '    56
          FCB          0 (          ) :0C4B: 'RPM    '    68
          FCB          0 (          ) :0C4C: 'RPM    '    80
          FCB          0 (          ) :0C4D: 'RPM    '    92
          FCB          0 (          ) :0C4E: 'RPM    '   104
          FCB          0 (          ) :0C4F: 'RPM    '   116
          FCB          0 (          ) :0C50: 'RPM    '   128
          FCB          0 (          ) :0C51: 'RPM    '   140
          FCB          0 (          ) :0C52: 'RPM    '   152

**************************************
*  F19A : ENGINE SPEED AT IDLE       *
*         VS. TEMPERATURE IN NEUTRAL *
**************************************
*_                       :                ::TBL2D,17,TBL2,1,'RPM ' ::
* ------------------------------------------------------------------------
F19A      FCB          0 (          ) :0C53: 'RPM    '   -40  DEG C-TEMP
*_                       :                ::EQU N=E/12.5 ::
```

```
         FCB        0 (         ) :0C54: 'RPM    '   -28
         FCB        0 (         ) :0C55: 'RPM    '   -16
         FCB        0 (         ) :0C56: 'RPM    '    -4
         FCB        0 (         ) :0C57: 'RPM    '     8
         FCB        0 (         ) :0C58: 'RPM    '    20
         FCB        0 (         ) :0C59: 'RPM    '    32
         FCB        0 (         ) :0C5A: 'RPM    '    44
         FCB        0 (         ) :0C5B: 'RPM    '    56
         FCB        0 (         ) :0C5C: 'RPM    '    68
         FCB        0 (         ) :0C5D: 'RPM    '    80
         FCB        0 (         ) :0C5E: 'RPM    '    92
         FCB        0 (         ) :0C5F: 'RPM    '   104
         FCB        0 (         ) :0C60: 'RPM    '   116
         FCB        0 (         ) :0C61: 'RPM    '   128
         FCB        0 (         ) :0C62: 'RPM    '   140
         FCB        0 (         ) :0C63: 'RPM    '   152

************************************************************************
*     C O M M A N D   S P E E D   C O N T R O L   D E A D B A N D
************************************************************************
* -------------------------------------------------------------------
KISACLD  FCB        0 (         ) :0C64: 'RPM    ' IDLE SPEED DEADBAND
*-                  :                   FOR A/C & MIN MOT. LEARN
*-                  :             ::EQU N=E/12.5 ::

************************************************************************
*        S T E P   M O T O R   P A R A M E T E R S                     *
************************************************************************
* -------------------------------------------------------------------
KISQUGN  FCB        0 (         ) :0C65: '       ' QAUNTIZER GAIN TO
*-                  :                   CONVERT ALGORITHM
*                OUTPUT FROM LINEAR MOTOR GAINS TO STEPPER-UNITLESS
*-                  :             ::EQU N=E*256 ::
* -------------------------------------------------------------------
KISINQU  FCB        0 (         ) :0C66: '       ' IDLE SPEED INVERSE
*-                  :                   QUANTIZER GAIN
*-                          (N = E); UNITLESS -  = (1/KISQUGN)
*-                  :             ::EQU N=E ::

************************************************************************
*             P I D   E N A B L I N G   C O N D I T I O N S            *
************************************************************************
* -------------------------------------------------------------------
KISTATH  FCB        0 (         ) :0C67: '% TPS  ' ISC TPS THRESHOLD
*-                  :                   BELOW WHICH ISC IS ENABLED
*-                  :             ::EQU N=E*2.56 ::
* -------------------------------------------------------------------
KISVSTH  FCB        0 (         ) :0C68: 'MPH    ' VEHICLE SPEED THRESH
*-                  :                   FOR THE PID ENABLE
*-                  :             ::EQU N=E*16/5 ::
* -------------------------------------------------------------------
KISMPHOL FCB        0 (         ) :0C69: 'MPH    ' IF MPH > CAL BYPASS
*-                  :                   OPEN LOOP
*-                  :             ::EQU N=E*16/5 ::
* -------------------------------------------------------------------
KISRETH  FCB        0 (         ) :0C6A: 'RPM    ' RPM ERROR UNDERSPEED
*-                  :                   THRESHOLD NEEDED
*-                           BEFORE ENABLING THE PID REGULATOR,
*-                           DURING A TRANSITION OF CONTROL MODES.
```

```
*-                        :               ::EQU N=E/12.5 ::
*****************************************************
*  PROPORTIONAL CALIBRATIONS
*****************************************************

* ------------------------------------------------------------------
KISESDD  FCB          0 (          ) :0C6B: 'RPM    ' IF RPM ERROR <= THIS
*-                      :                       SKIP PROPORTIONAL(DRIVE)
*-                      :                 ::EQU N=E/12.5 ::
* ------------------------------------------------------------------
KISESDN  FCB          0 (          ) :0C6C: 'RPM    ' IF RPM ERROR <= THIS
*-                      :                       SKIP PROPORTIONAL(P/N)
*-                      :                 ::EQU N=E/12.5 ::
* ------------------------------------------------------------------
KISERGP  FCB          0 (          ) :0C6D: 'STEPS ' ISC OVERSPEED ERROR
*-                      :                       GAIN; STEPS/RPM
*-                      :                 ::EQU N=E*256*12.5*(KISINQU-.5) ::
* ------------------------------------------------------------------
KISERGN  FCB          0 (          ) :0C6E: 'STEPS ' ISC UNDERSPEED ERROR
*-                      :                       LOW GAIN; STEPS/RPM
*-                      :                 ::EQU N=E*256*12.5*(KISINQU-.5) ::
* ------------------------------------------------------------------
KISERTH  FCB          0 (          ) :0C6F: 'RPM    ' IF UNDERSPEED ERROR >
*-                      :                       CAL USE HIGH GAIN
*-                      :                 ::EQU N=E/12.5 ::
* ------------------------------------------------------------------
KISERHN  FCB          0 (          ) :0C70: 'STEPS ' ISC UNDERSPEED ERROR
*-                      :                       HIGH GAIN; STEPS/RPM
*-                      :                 ::EQU N=E*256*12.5*(KISINQU-.5) ::

**************************************************************
*        DERIVATIVE  (RATE)  CALIBRATIONS                    *
**************************************************************
* ------------------------------------------------------------------
KISDRCL  FCB          0 (          ) :0C71: 'DEG    ' IF COOLANT < THIS
*-                      :                       CLEAR DERIVITIVE TERM
*-                      :                 ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KISDREN  FCB          0 (          ) :0C72: 'SEC    ' IF CONDITIONS MET
*-                      :                       THIS LONG ALLOW DERIVITIV
*-                      :                 ::EQU N=E*80      ::
* ------------------------------------------------------------------
KISDRMN  FCB          0 (          ) :0C73: 'DRPM/RF' IF NEG DELTA RPM/REF
*-                      :                       <= CAL, SKIP DERIV
*-                      :                 ::EQU N=E         ::

**************************************************************
*  INTEGRAL GAINS - DO NOT DISTURB ORDER - D-P/N, LO-HI, UNDER/OVERSPEED
**************************************************************
* ------------------------------------------------------------------
KISNDED1 FCB          0 (          ) :0C74: 'DRPM/RF' RPM RATE (NDOT) TO
*-                      :                       DISABLE INT IN DRIVE
*-                      :                 ::EQU N=E         ::
* ------------------------------------------------------------------
KISNDEN1 FCB          0 (          ) :0C75: 'DRPM/RF' RPM RATE (NDOT) TO
*-                      :                       DISABLE INT IN NEUTRAL
*-                      :                 ::EQU N=E         ::
* ------------------------------------------------------------------
KISINTHD FCB          0 (          ) :0C76: 'RPM    ' IF RPM ERROR > THIS
```

```
*-                     :               USE HIGH INT GAIN (DRIVE)
*-                     :            ::EQU N=E/12.5 ::
* ---------------------------------------------------------------
KISINTHN FCB         0 (          ) :0C77: 'RPM    ' IF RPM ERROR > THIS
*-                     :               USE HIGH INT GAIN (P/N)
*-                     :            ::EQU N=E/12.5 ::
* ---------------------------------------------------------------
KISITLTU FCB         0 (          ) :0C78: 'RPM    ' IF RPM ERROR < THIS
*-                     :               SKIP INTEGRAL(UNDERSPEED
*-                     :            ::EQU N=E/12.5 ::
* ---------------------------------------------------------------
KISITLTO FCB         0 (          ) :0C79: 'RPM    ' IF RPM ERROR < THIS
*-                     :               SKIP INTEGRAL(OVERSPEED)
*-                     :            ::EQU N=E/12.5 ::
* ---------------------------------------------------------------
KISITGD  FCB         0 (          ) :0C7A: 'STEPS ' HIGH INT GAIN (DRIVE)
*-                     :               WHEN UNDERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITGN  FCB         0 (          ) :0C7B: 'STEPS ' HIGH INT GAIN (P/N)
*-                     :               WHEN UNDERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITLD  FCB         0 (          ) :0C7C: 'STEPS ' INT GAIN (DRIVE) WHEN
*-                     :               UNDERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITLN  FCB         0 (          ) :0C7D: 'STEPS ' INT GAIN (P/N) WHEN
*-                     :               UNDERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITGDO FCB         0 (          ) :0C7E: 'STEPS ' HIGH INT GAIN (DRIVE)
*-                     :               WHEN OVERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITGNO FCB         0 (          ) :0C7F: 'STEPS ' HIGH INT GAIN (P/N)
*-                     :               WHEN OVERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITLDO FCB         0 (          ) :0C80: 'STEPS ' INT GAIN (DRIVE) WHEN
*-                     :               OVERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::
* ---------------------------------------------------------------
KISITLNO FCB         0 (          ) :0C81: 'STEPS ' INTEGRATOR GAIN (P/N)
*-                     :               WHEN OVERSPEED
*-                     :            ::EQU N=E*128*12.5*.05/KISQUGN ::

*****************************************************************
*         P A R K / N E U T R A L   S C A L I N G   G A I N     *
*****************************************************************
* ---------------------------------------------------------------
KISPNGN  FCB         0 (          ) :0C82: 'STEPS ' ISC PARK/NEUT SCALAR
*-                     :               GAIN
*-                  (N = E * 256); (NETURAL STEPS)/(DRIVE STEP)
*-                     :            ::EQU N=E*256 ::

*****************************************************************
*  T H R O T T L E   F O L L O W E R   C A L I B R A T I O N S  *
*****************************************************************
```

```
* -------------------------------------------------------------------
KISTFDCD FCB          0 (          ) :0C83: 'MSEC  ' DELAY BETWEEN T/F
*-                      :                     STEPS, DRIVE
*-                      :              ::EQU N=E/6.25 ::
* -------------------------------------------------------------------
KISMPSD  FCB          0 (          ) :0C84: 'MSEC  ' MIN. DELAY BETWEEN O/
*-                      :                     L STEPS, DRIVE
*-                      :              ::EQU N=E/12.5 ::
* -------------------------------------------------------------------
KISTFDCN FCB          0 (          ) :0C85: 'MSEC  ' DELAY BETWEEN T/F
*-                      :                     STEPS, P/N
*-                      :              ::EQU N=E/6.25 ::
* -------------------------------------------------------------------
KISMPSN  FCB          0 (          ) :0C86: 'MSEC  ' MIN. DELAY BETWEEN O/
*-                      :                     L STEPS, P/N
*-                      :              ::EQU N=E/12.5 ::
* -------------------------------------------------------------------
KISCODM  FCB          0 (          ) :0C87: 'MSEC  ' THIS+KISMPS? = MAX
*-                      :                     DELAY BETWEEN O/L STEPS
*-                      :              ::EQU N=E/6.25 ::
* -------------------------------------------------------------------
KISTFGN1 FCB          0 (          ) :0C88: 'ST/%TP' IDLE SPEED THROTTLE
*-                      :                     FOLLOWER SLOPE GAIN
*-                                             STEPS/(PERCENT TPS)
*-                      :              ::EQU N=E*25 ::
* -------------------------------------------------------------------
KISTFPN  FCB          0 (          ) :0C89: 'STEPS ' IDLE SPEED THROTTLE
*-                      :                     FOLLOWER P/N SCALER
*-                          (N = E * 256); (NEUTRAL STEPS)/(DRIVE STEPS)
*-                      :              ::EQU N=E*256 ::

*********************************************************************
*          A / C   L E A R N I N G   G A I N S                      *
*********************************************************************
* -------------------------------------------------------------------
KISACDS  FCB          0 (          ) :0C8A: 'STEPS ' IDLE SPEED A/C
*-                      :                     COMPENSATION DEFAULT STEPS
*-                      :              ::EQU N=E ::
* -------------------------------------------------------------------
KISACMX  FCB          0 (          ) :0C8B: 'STEPS ' IDLE SPEED A/C
*-                      :                     COMPENSATION MAX NO OF STEPS
*-                      :              ::EQU N=E ::
* -------------------------------------------------------------------
KISACMN  FCB          0 (          ) :0C8C: 'STEPS ' IDLE SPEED A/C
*-                      :                     COMPENSATION MIN NO OF STEPS
*-                      :              ::EQU N=E ::
* -------------------------------------------------------------------
KISACLE  FCB          0 (          ) :0C8D: 'MSEC  ' IDLE SPEED ENGINE
*-                      :                     SPEED IN DEADBAND
*-                          ( NO. OF PID CYCLES IN THE DEADBAND BEFORE
*-                          ENABLING OR DISABLING A/C LEARNING)
*-                      :              ::EQU N=E/50 ::
* -------------------------------------------------------------------
KISINTP  FCB          0 (          ) :0C8E: 'STEPS ' INVERSE A/C P/N GAIN
*-                        (DRIVE STEPS)/(NEUTRAL STEP)= (1/KISTFPN)
*-                      :              ::EQU N=E*128 ::

*********************************************************************
*       A / C  C L U T C H  E N A B L E  P A R A M E T E R S       *
```

```
*********************************************************************
* ------------------------------------------------------------------
KACENGON FDB         0 (          ) :0C8F: 'SEC    ' IF ENG RUN TIME<=THIS
*-                     :                    KEEP A/C OFF
*-                     :              ::EQU N=E ::
* ------------------------------------------------------------------
KPIDACDT FCB         0 (          ) :0C91: '% TPS ' IF TPS W/HYST >= CAL
*-                     :                    TURN OFF A/C
*-                     :              ::EQU N=E*2.56 ::
* ------------------------------------------------------------------
KPIDACTH FCB         0 (          ) :0C92: 'SEC    ' DELAY A/C CAL TIME IF
*-                     :                    HIGH MPH
*-                     :              ::EQU N=E*10 ::
* ------------------------------------------------------------------
KPIDACTL FCB         0 (          ) :0C93: 'SEC    ' DELAY A/C CAL TIME IF
*-                     :                    LOW MPH
*-                     :              ::EQU N=E*10 ::
* ------------------------------------------------------------------
KACVSSDL FCB         0 (          ) :0C94: 'MPH    ' IF MPH < CAL DELAY
*-                     :                    KPIDACTR, ELSE KPIDACT2
*-                     :              ::EQU N=E*16/5   ::
* ------------------------------------------------------------------
KACOFDLY FCB         0 (          ) :0C95: 'SEC    ' DELAY CAL TIME BEFORE
*-                     :                    TURNING OFF A/C
*-                     :              ::EQU N=E*10 ::
* ------------------------------------------------------------------
KACOFFH  FCB         0 (          ) :0C96: 'DEG C ' IF A/C ON AND COOLANT
*-                     :                    > THIS TURN A/C OFF
*-                     :              ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KACOFFL  FCB         0 (          ) :0C97: 'DEG C ' IF A/C OFF AND
*-                     :                    COOLANT > THIS KEEP A/C OFF
*-                     :              ::EQU N=(E+40)*256/192 ::
*********************************************************************
* THESE CALS FORCE A/C TO CYCLE SO MIN MOTOR AND A/C COMP CAN BE LEARNED
*********************************************************************
* ------------------------------------------------------------------
KACMINCL FCB         0 (          ) :0C98: 'DEG C ' IF COOLANT <= NO MIN
*-                     :                    MOTOR A/C DISABLE
*-                     :              ::EQU N=(E+40)*256/192 ::
* ------------------------------------------------------------------
KACMINVS FCB         0 (          ) :0C99: 'MPH    ' IF MPH BETWEEN MIN
*-                     :                    MOTR A/C OFF < CAL NO OFF
*-                     :              ::EQU N=E ::
* ------------------------------------------------------------------
KACMINTM FDB         0 (          ) :0C9A: 'SEC    ' IF ENG RUN TIME<=THIS
*-                     :                    NO MIN MOTOR A/C DISABLE
*-                     :              ::EQU N=E ::
* ------------------------------------------------------------------
KACMINOF FCB         0 (          ) :0C9C: 'SEC    ' IF A/C OFF TIME> THIS
*-                     :                    THEN NO MORE MIN SHUTOFF
*-                     :              ::EQU N=E*10 ::
* ------------------------------------------------------------------
KACMINLR FCB         0 (          ) :0C9D: 'TIMES ' IF A/C LEARNED < CAL
*-                     :                    TIMES, CYCLE A/C
*-                     :              ::EQU N=E ::

*********************************************************************
*           T R A N S I T I O N A L   D E L A Y S                  *
```

```
***********************************************************************
* ------------------------------------------------------------------
KISOLDY  FCB          0 (         ) :0C9E: 'MSEC  ' OPEN-LOOP TO CLOSED-
*_                      :                   LOOP ENABLE DELAY TIME
*_                      :             ::EQU N=E/50 ::
* ------------------------------------------------------------------
KISTFDY  FCB          0 (         ) :0C9F: 'MSEC  ' THROTTLE-FOLLOWER TO
*_                      :                   PID-ENABLE DELAY TIME
*_                      :             ::EQU N=E/50 ::
* ------------------------------------------------------------------
KISDNDY  FCB          0 (         ) :0CA0: 'MSEC  ' DRIVE-TO-NEUTRAL
*_                      :                   SHIFT TO PID-ENABLE DELAY TIME
*_                      :             ::EQU N=E/50 ::
* ------------------------------------------------------------------
KISNDDY  FCB          0 (         ) :0CA1: 'MSEC  ' NEUTRAL-TO-DRIVE
*_                      :                   SHIFT TO PID-ENABLE DELAY TIME
*_                      :             ::EQU N=E/50 ::

***********************************************************************
*             M O T O R   R E S E T   P A R M E T E R S               *
***********************************************************************
* ------------------------------------------------------------------
KISMXSP  FCB          0 (         ) :0CA2: 'STEPS ' MAXIMUM STEP MOTOR
*_                      :                   POSITION POSSIBLE,
*_                          WORST CASE VALUE:STEPS FROM THE ORIFICE
*_                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KRUNRST  FDB          0 (         ) :0CA3: 'SEC   ' IF ERUNTIME > THIS
*_                      :                   ENABLE MOTOR RESET
*_                      :             ::EQU N=E ::

***********************************************************************
*               P / S   A N T I C I P A T E                          *
***********************************************************************
* ------------------------------------------------------------------
KISPSAN  FCB          0 (         ) :0CA5: 'STEPS ' POWER STEERING
*_                      :                   ANTICIPATE CORRECTION
*_                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KISPAAN  FCB          0 (         ) :0CA6: 'STEPS ' POWER STEERING
*_                      :                   ANTICIPATE STEPS AC ON
*_                      :             ::EQU N=E ::

***********************************************************************
*           M A N U A L   P A R A M E T E R S
***********************************************************************
* ------------------------------------------------------------------
KISMAN   FCB          0 (         ) :0CA7: 'FLAG  ' MANUAL VEHICLE OPTION
*_                      :                   FLAG
*_                      :             ::EQU N=E ::
* ------------------------------------------------------------------
KISMANOF FCB          0 (         ) :0CA8: 'STEPS ' THROTTLE FOLLOWER
*_                      :                   OFFSET FOR A MANUAL
*_                      :             ::EQU N=E ::          VEHICLE,
                        :                   IF THE VEHICLE IS MOVING.

         ORG      $8CAA
*         PROM TEST WORD 1
*_                      :             ::PROTECT ::
```

```
* -----------------------------------------------------------------
KKPRMTW1 FCB       $55 (          ) :0CAA: '        '
*-                     :            ::EQU N=E ::
*-                     :            ::NOPROTECT ::
**********************************************************************
*       P I D  H O T  S P A R K  R E T A R D  P A R A M E T E R S
**********************************************************************
* -----------------------------------------------------------------
KISHRTIM FDB         0 (          ) :0CAB: 'SECS  ' LENGTH OF TIME FOR
*-                     :                   HOT SPARK RETARD , SEC
*-                     :            ::EQU N=E ::
* -----------------------------------------------------------------
KISESHRO FCB         0 (          ) :0CAD: 'RPM   ' RPM OFFSET FROM
*-                     :                   COMMAND FOR HOT SPARK RETARD
*-                     :            ::EQU N=E/12.5 ::
*#########################################################
*     F16B TABLE                                          #
*  MIN MOTOR POSITION (STEPS) VS START-UP COOLANT TEMP.   #
*#########################################################
*-                     :            ::PROTECT ::
*-                     :            ::TBL2D,9,2,TBL2,1,2,'STEPS' ::
* -----------------------------------------------------------------
F16B      FCB        8 (          ) :0CAE: '        ' USE 9 VALUE TABLE
*-                     :            ::EQU N=E  ::
*-                     :            ::NOPROTECT ::
* -----------------------------------------------------------------
          FCB        0 (          ) :0CAF: 'STEPS '   -40  DEG C-TEMP
*-                     :            ::EQU N=E       ::
          FCB        0 (          ) :0CB0: 'STEPS '   -16
          FCB        0 (          ) :0CB1: 'STEPS '     8
          FCB        0 (          ) :0CB2: 'STEPS '    32
          FCB        0 (          ) :0CB3: 'STEPS '    56
          FCB        0 (          ) :0CB4: 'STEPS '    80
          FCB        0 (          ) :0CB5: 'STEPS '   104
          FCB        0 (          ) :0CB6: 'STEPS '   128
          FCB        0 (          ) :0CB7: 'STEPS '   152

*#########################################################
*     F16PARK TABLE                                       #
*  WARM PARK POSITION (STEPS) VS START-UP COOLANT TEMP.   #
*#########################################################
*-                     :            ::PROTECT ::
*-                     :            ::TBL2D,9,2,TBL2,1,2,'STEPS' ::
* -----------------------------------------------------------------
F16PARK   FCB        8 (          ) :0CB8: '        ' USE 9 VALUE TABLE
*-                     :            ::EQU N=E  ::
*-                     :            ::NOPROTECT ::
* -----------------------------------------------------------------
          FCB        0 (          ) :0CB9: 'STEPS '   -40  DEG C-TEMP
*-                     :            ::EQU N=E       ::
          FCB        0 (          ) :0CBA: 'STEPS '   -16
          FCB        0 (          ) :0CBB: 'STEPS '     8
          FCB        0 (          ) :0CBC: 'STEPS '    32
          FCB        0 (          ) :0CBD: 'STEPS '    56
          FCB        0 (          ) :0CBE: 'STEPS '    80
          FCB        0 (          ) :0CBF: 'STEPS '   104
          FCB        0 (          ) :0CC0: 'STEPS '   128
          FCB        0 (          ) :0CC1: 'STEPS '   152
```

```
*#########################################################
*      F16DERV TABLE                                      #
*  DERIVITIVE STEPS VS DELTA RPM (DROP) AND RPM ERROR     #
*#########################################################
*-                       :          ::TBL3D,3,9,TBL27,1,TBL28,1,'STEPS'
*-                       :                   ::
*-                       :          ::PROTECT ::
* ------------------------------------------------------------------
F16DERV  FCB           0 (          )*:0CC2: '       ' RMIN;  R=RPMERR (0 RPM
*-                       :                   ERROR)
*-                       :          ::EQU N=E ::
* ------------------------------------------------------------------
         FCB           0 (          )*:0CC3: '       ' QMIN;  Q = NEGATIVE
*-                       :                   DELTA RPM
*-                       :          ::EQU N=E ::
* ------------------------------------------------------------------
         FCB           9 (          ) :0CC4: '       ' RNUM
*-                       :          ::EQU N=E ::
*-                       :          ::NOPROTECT ::

* 0000  RPMER
* ----------------------------------------------- ERROR          0 RPM
         FCB           0 (          ) :0CC5: 'STEPS '     0 DLTRPM-RATCHG
*-                       :          ::EQU N=E          ::
         FCB           0 (          ) :0CC6: 'STEPS '     8
         FCB           0 (          ) :0CC7: 'STEPS '    16
         FCB           0 (          ) :0CC8: 'STEPS '    24
         FCB           0 (          ) :0CC9: 'STEPS '    32
         FCB           0 (          ) :0CCA: 'STEPS '    40
         FCB           0 (          ) :0CCB: 'STEPS '    48
         FCB           0 (          ) :0CCC: 'STEPS '    56
         FCB           0 (          ) :0CCD: 'STEPS '    64

* ----------------------------------------------- ERROR        100 RPM
         FCB           0 (          ) :0CCE: 'STEPS '     0 DLTRPM-RATCHG
         FCB           0 (          ) :0CCF: 'STEPS '     8
         FCB           0 (          ) :0CD0: 'STEPS '    16
         FCB           0 (          ) :0CD1: 'STEPS '    24
         FCB           0 (          ) :0CD2: 'STEPS '    32
         FCB           0 (          ) :0CD3: 'STEPS '    40
         FCB           0 (          ) :0CD4: 'STEPS '    48
         FCB           0 (          ) :0CD5: 'STEPS '    56
         FCB           0 (          ) :0CD6: 'STEPS '    64
* ----------------------------------------------- ERROR        200 RPM
         FCB           0 (          ) :0CD7: 'STEPS '     0 DLTRPM-RATCHG
         FCB           0 (          ) :0CD8: 'STEPS '     8
         FCB           0 (          ) :0CD9: 'STEPS '    16
         FCB           0 (          ) :0CDA: 'STEPS '    24
         FCB           0 (          ) :0CDB: 'STEPS '    32
         FCB           0 (          ) :0CDC: 'STEPS '    40
         FCB           0 (          ) :0CDD: 'STEPS '    48
         FCB           0 (          ) :0CDE: 'STEPS '    56
         FCB           0 (          ) :0CDF: 'STEPS '    64

*#########################################################
*      F16TFMPH TABLE  T/F STEPS VS MPH                   #
*#########################################################
*-                       :          ::TBL2D,9,1,TBL10,1,2,'STEPS' ::
* ------------------------------------------------------------------
```

```
F16TFMPH FCB          0 (          ) :0CE0: 'STEPS '     0    MPH-SPEED
*-                      :            ::EQU N=E       ::
         FCB          0 (          ) :0CE1: 'STEPS '     8
         FCB          0 (          ) :0CE2: 'STEPS '    16
         FCB          0 (          ) :0CE3: 'STEPS '    24
         FCB          0 (          ) :0CE4: 'STEPS '    32
         FCB          0 (          ) :0CE5: 'STEPS '    40
         FCB          0 (          ) :0CE6: 'STEPS '    48
         FCB          0 (          ) :0CE7: 'STEPS '    56
         FCB          0 (          ) :0CE8: 'STEPS '    64

*#########################################################
*     F16TFMAX TABLE  MAX T/F VS MPH                     #
*#########################################################
*-                      :            ::TBL2D,9,1,TBL10,1,2,'STEPS' ::
* -----------------------------------------------------------------
F16TFMAX FCB          0 (          ) :0CE9: 'STEPS '     0    MPH-SPEED
*-                      :            ::EQU N=E       ::
         FCB          0 (          ) :0CEA: 'STEPS '     8
         FCB          0 (          ) :0CEB: 'STEPS '    16
         FCB          0 (          ) :0CEC: 'STEPS '    24
         FCB          0 (          ) :0CED: 'STEPS '    32
         FCB          0 (          ) :0CEE: 'STEPS '    40
         FCB          0 (          ) :0CEF: 'STEPS '    48
         FCB          0 (          ) :0CF0: 'STEPS '    56
         FCB          0 (          ) :0CF1: 'STEPS '    64

* -----------------------------------------------------------------
KTPSTFMN FCB          0 (          ) :0CF2: '%TPS   ' IF TPS SINCE BRAKE ON
*-                      :                   <= THIS NO MPH STEPS
*-                      :            ::EQU N=E*2.56 ::
*+DATAHFMF++BLOCK ID++
*******************************************************
*   DIGITAL MASS AIR FLOW TABLES                      *
*      FREQ RANGE  2300 - 10400 HZ (BASED ON KMINHFFR) *
*                                                     *
*      TABLE 1    0 - 1024 COUNTS                     *
*      TABLE 2 1024 - 2048                            *
*      TABLE 3 2048 - 3072                            *
*      TABLE 4 3072 - 4096                            *
*      TABLE 5 4096 - 5120                            *
*      TABLE 6 5120 - 6144                            *
*      TABLE 7 6144 - 7168                            *
*      TABLE 8 7168 - 8192                            *
*******************************************************
* -----------------------------------------------------------------
KDELPCTP FCB          0 (          ) :0CF3: '% CHG ' MAXIMUM POSITIVE %
*-                      :                   FLOW CHANGE
*-                      :            ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KDELPCTN FCB          0 (          ) :0CF4: '% CHG ' MAXIMUM NEGATIVE %
*-                      :                   FLOW CHANGE
*-                      :            ::EQU N=E*2.56 ::
* -----------------------------------------------------------------
KTPSFDEL FCB          0 (          ) :0CF5: '%     ' MAXIMUM TPS FOR DELTA
*-                      :                   FLOW LOGIC
*-                      :            ::EQU N=E*2.56::
* -----------------------------------------------------------------
KTPSFDEH FCB          0 (          ) :0CF6: '%     ' MINIMUM TPS FOR DELTA
```

```
*-                          :               FLOW LOGIC
*-                          :          ::EQU N=E*2.56::
* -------------------------------------------------------------------
KMPHFDEL FCB           0 (          ) :0CF7: 'MPH    ' MAX MPH FOR DELTA
*-                          :               FLOW LOGIC IF BELOW TPSLIMIT
*-                          :          ::EQU N=E*3.2 ::
* -------------------------------------------------------------------
KDELWAIT FCB           0 (          ) :0CF8: 'MSEC   ' TIME TO DISABLE DELTA
*-                          :               LOGIC FOR RPM DISABLE
*-                          :          ::EQU N=E/6.25 ::
* -------------------------------------------------------------------
KMINFLOW FDB           0 (          ) :0CF9: 'GM/SEC' MINIMUM ALLOWABLE
*-                          :               FLOW
*-                          :          ::EQU N=E*256    ::
* -------------------------------------------------------------------
KMINHFFR FDB           0 (          ) :0CFB: 'HERTZ ' MINIMUM FREQUENCY OF
*-                          :               HIGH FREQ MAF
*-                          :          ::EQU N=E ::
*
* NOTE WELL: THE ORDER OF THE FOLLOWING 8 TABLES CANNOT CHANGE
*
* -------------------------------------------------------------------
K1HFTBL  FCB           0 (          ) :0CFD: 'SCALER ' DIVIDE VALUE FOR
*-                          :               TABLE 1
*-                          :          ::EQU N=E ::
*#################################################################
*   F1HFTBL :  MASS FLOW TABLE 1  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*#################################################################
*-                          :          ::TBL2D,9,1,TBL41,1,'GM/SEC' ::
* -------------------------------------------------------------------
F1HFTBL  FCB           0 (          ) :0CFE: 'GM/SEC'  0000    FREQ-COUNTS
*-                          :          ::EQU N=E*256/K1HFTBL    ::
         FCB           0 (          ) :0CFF: 'GM/SEC'  0128
         FCB           0 (          ) :0D00: 'GM/SEC'  0256
         FCB           0 (          ) :0D01: 'GM/SEC'  0384
         FCB           0 (          ) :0D02: 'GM/SEC'  0512
         FCB           0 (          ) :0D03: 'GM/SEC'  0640
         FCB           0 (          ) :0D04: 'GM/SEC'  0768
         FCB           0 (          ) :0D05: 'GM/SEC'  0896
         FCB           0 (          ) :0D06: 'GM/SEC'  1024

* -------------------------------------------------------------------
K2HFTBL  FCB           0 (          ) :0D07: 'SCALER ' DIVIDE VALUE FOR
*-                          :               TABLE 2
*-                          :          ::EQU N=E ::
*#################################################################
*   F2HFTBL :  MASS FLOW TABLE 2  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*#################################################################
*-                          :          ::TBL2D,9,1,TBL42,1,'GM/SEC' ::
* -------------------------------------------------------------------
F2HFTBL  FCB           0 (          ) :0D08: 'GM/SEC'  1024    FREQ-COUNTS
*-                          :          ::EQU N=E*256/K2HFTBL    ::
         FCB           0 (          ) :0D09: 'GM/SEC'  1152
         FCB           0 (          ) :0D0A: 'GM/SEC'  1280
         FCB           0 (          ) :0D0B: 'GM/SEC'  1408
         FCB           0 (          ) :0D0C: 'GM/SEC'  1536
         FCB           0 (          ) :0D0D: 'GM/SEC'  1664
```

```
         FCB          0 (          ) :0D0E: 'GM/SEC'  1792
         FCB          0 (          ) :0D0F: 'GM/SEC'  1920
         FCB          0 (          ) :0D10: 'GM/SEC'  2048

* ------------------------------------------------------------------
K3HFTBL  FCB          0 (          ) :0D11: 'SCALER ' DIVIDE VALUE FOR
*-                    :                     TABLE 3
*-                    :            ::EQU N=E ::
*##################################################################
*   F3HFTBL :  MASS FLOW TABLE 3  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*##################################################################
*-                    :            ::TBL2D,9,1,TBL43,1,'GM/SEC' ::
* ------------------------------------------------------------------
F3HFTBL  FCB          0 (          ) :0D12: 'GM/SEC'  2048   FREQ-COUNTS
*-                    :            ::EQU N=E*256/K3HFTBL     ::
         FCB          0 (          ) :0D13: 'GM/SEC'  2176
         FCB          0 (          ) :0D14: 'GM/SEC'  2304
         FCB          0 (          ) :0D15: 'GM/SEC'  2432
         FCB          0 (          ) :0D16: 'GM/SEC'  2560
         FCB          0 (          ) :0D17: 'GM/SEC'  2688
         FCB          0 (          ) :0D18: 'GM/SEC'  2816
         FCB          0 (          ) :0D19: 'GM/SEC'  2944
         FCB          0 (          ) :0D1A: 'GM/SEC'  3072

* ------------------------------------------------------------------
K4HFTBL  FCB          0 (          ) :0D1B: 'SCALER ' DIVIDE VALUE FOR
*-                    :                     TABLE 4
*-                    :            ::EQU N=E ::
*##################################################################
*   F4HFTBL :  MASS FLOW TABLE 4  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*##################################################################
*-                    :            ::TBL2D,9,1,TBL44,1,'GM/SEC' ::
* ------------------------------------------------------------------
F4HFTBL  FCB          0 (          ) :0D1C: 'GM/SEC'  3072   FREQ-COUNTS
*-                    :            ::EQU N=E*256/K4HFTBL     ::
         FCB          0 (          ) :0D1D: 'GM/SEC'  3200
         FCB          0 (          ) :0D1E: 'GM/SEC'  3328
         FCB          0 (          ) :0D1F: 'GM/SEC'  3456
         FCB          0 (          ) :0D20: 'GM/SEC'  3584
         FCB          0 (          ) :0D21: 'GM/SEC'  3712
         FCB          0 (          ) :0D22: 'GM/SEC'  3840
         FCB          0 (          ) :0D23: 'GM/SEC'  3968
         FCB          0 (          ) :0D24: 'GM/SEC'  4096

* ------------------------------------------------------------------
K5HFTBL  FCB          0 (          ) :0D25: 'SCALER ' DIVIDE VALUE FOR
*-                    :                     TABLE 5
*-                    :            ::EQU N=E ::
*##################################################################
*   F5HFTBL :  MASS FLOW TABLE 5  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*##################################################################
*-                    :            ::TBL2D,9,1,TBL45,1,'GM/SEC' ::
* ------------------------------------------------------------------
F5HFTBL  FCB          0 (          ) :0D26: 'GM/SEC'  4096   FREQ-COUNTS
*-                    :            ::EQU N=E*256/K5HFTBL     ::
         FCB          0 (          ) :0D27: 'GM/SEC'  4224
```

```
          FCB           0 (           ) :0D28: 'GM/SEC'  4352
          FCB           0 (           ) :0D29: 'GM/SEC'  4480
          FCB           0 (           ) :0D2A: 'GM/SEC'  4608
          FCB           0 (           ) :0D2B: 'GM/SEC'  4736
          FCB           0 (           ) :0D2C: 'GM/SEC'  4864
          FCB           0 (           ) :0D2D: 'GM/SEC'  4992
          FCB           0 (           ) :0D2E: 'GM/SEC'  5120

* -----------------------------------------------------------------
K6HFTBL   FCB           0 (           ) :0D2F: 'SCALER ' DIVIDE VALUE FOR
*-                      :                      TABLE 6
*-                      :               ::EQU N=E ::
*#################################################################
*   F6HFTBL :  MASS FLOW TABLE 6  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*#################################################################
*-                      :               ::TBL2D,9,1,TBL46,1,'GM/SEC' ::
* -----------------------------------------------------------------
F6HFTBL   FCB           0 (           ) :0D30: 'GM/SEC'  5120   FREQ-COUNTS
*-                      :               ::EQU N=E*256/K6HFTBL    ::
          FCB           0 (           ) :0D31: 'GM/SEC'  5248
          FCB           0 (           ) :0D32: 'GM/SEC'  5376
          FCB           0 (           ) :0D33: 'GM/SEC'  5504
          FCB           0 (           ) :0D34: 'GM/SEC'  5632
          FCB           0 (           ) :0D35: 'GM/SEC'  5760
          FCB           0 (           ) :0D36: 'GM/SEC'  5888
          FCB           0 (           ) :0D37: 'GM/SEC'  5016
          FCB           0 (           ) :0D38: 'GM/SEC'  6144

* -----------------------------------------------------------------
K7HFTBL   FCB           0 (           ) :0D39: 'SCALER ' DIVIDE VALUE FOR
*-                      :                      TABLE 7
*-                      :               ::EQU N=E ::
*#################################################################
*   F7HFTBL :  MASS FLOW TABLE 7  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*#################################################################
*-                      :               ::TBL2D,9,1,TBL47,1,'GM/SEC' ::
* -----------------------------------------------------------------
F7HFTBL   FCB           0 (           ) :0D3A: 'GM/SEC'  6144   FREQ-COUNTS
*-                      :               ::EQU N=E*256/K7HFTBL    ::
          FCB           0 (           ) :0D3B: 'GM/SEC'  6272
          FCB           0 (           ) :0D3C: 'GM/SEC'  6400
          FCB           0 (           ) :0D3D: 'GM/SEC'  6528
          FCB           0 (           ) :0D3E: 'GM/SEC'  6656
          FCB           0 (           ) :0D3F: 'GM/SEC'  6784
          FCB           0 (           ) :0D40: 'GM/SEC'  6912
          FCB           0 (           ) :0D41: 'GM/SEC'  7040
          FCB           0 (           ) :0D42: 'GM/SEC'  7168

* -----------------------------------------------------------------
K8HFTBL   FCB           0 (           ) :0D43: 'SCALER ' DIVIDE VALUE FOR
*-                      :                      TABLE 8
*-                      :               ::EQU N=E ::
*#################################################################
*   F8HFTBL :  MASS FLOW TABLE 8  FOR HIGH FREQUENCY FM AIR METER #
*   TABLE VALUE = GRAMS OF AIR/SECOND       (9 VALUES)            #
*#################################################################
*-                      :               ::TBL2D,9,1,TBL48,1,'GM/SEC' ::
```

```
* ---------------------------------------------------------------------
F8HFTBL  FCB          0 (           ) :0D44: 'GM/SEC'  7168   FREQ-COUNTS
*-                      :             ::EQU N=E*256/K8HFTBL    ::
         FCB          0 (           ) :0D45: 'GM/SEC'  7296
         FCB          0 (           ) :0D46: 'GM/SEC'  7424
         FCB          0 (           ) :0D47: 'GM/SEC'  7552
         FCB          0 (           ) :0D48: 'GM/SEC'  7680
         FCB          0 (           ) :0D49: 'GM/SEC'  7808
         FCB          0 (           ) :0D4A: 'GM/SEC'  7936
         FCB          0 (           ) :0D4B: 'GM/SEC'  8064
         FCB          0 (           ) :0D4C: 'GM/SEC'  8192
* NOTE WELL: THE ORDER OF THE PREVIOUS 8 TABLES CANNOT CHANGE
*
*###########################################################
*   F79A  TABLE  MAXIMUM AIR FLOW VS RPM                    #
*   TABLE VALUE = MAX. FLOW (GM/SEC)                        #
*###########################################################
*-
                        :             ::TBL2D,17,1,TBL7,1,'GM/SEC' ::
* ---------------------------------------------------------------------
F79A     FCB          0 (           ) :0D4D: 'GM/SEC'     0   RPM-SPEED
*-                      :             ::EQU N=E ::
         FCB          0 (           ) :0D4E: 'GM/SEC'   400
         FCB          0 (           ) :0D4F: 'GM/SEC'   800
         FCB          0 (           ) :0D50: 'GM/SEC'  1200
         FCB          0 (           ) :0D51: 'GM/SEC'  1600
         FCB          0 (           ) :0D52: 'GM/SEC'  2000
         FCB          0 (           ) :0D53: 'GM/SEC'  2400
         FCB          0 (           ) :0D54: 'GM/SEC'  2800
         FCB          0 (           ) :0D55: 'GM/SEC'  3200
         FCB          0 (           ) :0D56: 'GM/SEC'  3600
         FCB          0 (           ) :0D57: 'GM/SEC'  4000
         FCB          0 (           ) :0D58: 'GM/SEC'  4400
         FCB          0 (           ) :0D59: 'GM/SEC'  4800
         FCB          0 (           ) :0D5A: 'GM/SEC'  5200
         FCB          0 (           ) :0D5B: 'GM/SEC'  5600
         FCB          0 (           ) :0D5C: 'GM/SEC'  6000
         FCB          0 (           ) :0D5D: 'GM/SEC'  6400

*###########################################################
*     F79MUL  TABLE                                         #
*    MAXIMUM AIR FLOW MODIFIER (0-2) VS ATSDEG              #
*  TABLE VALUE = MULTIPLIER / 128                           #
*###########################################################
*-
                        :             ::TBL2D,5,2,TBL2,1,4,'MULT' ::
* ---------------------------------------------------------------------
F79MUL   FCB          0 (           ) :0D5E: '      ' USE 5  VALUE TABLE
*-                      :             ::EQU N=E ::
*-                      :             ::NOPROTECT ::
* ---------------------------------------------------------------------
         FCB          0 (           ) :0D5F: 'MULT  '   -40  DEG C-TEMP
*-                      :             ::EQU N=E*128 ::
         FCB          0 (           ) :0D60: 'MULT  '     8
         FCB          0 (           ) :0D61: 'MULT  '    56
         FCB          0 (           ) :0D62: 'MULT  '   104
         FCB          0 (           ) :0D63: 'MULT  '   152

*###########################################################
*   F79D  TABLE  MAXIMUM DELTA AIR FLOW VS RPM              #
*   TABLE VALUE = MAX. DELTA FLOW (GM/SEC)                  #
```

```
*############################################################
*-                        :          ::TBL2D,17,1,TBL7,1,'GM/SEC' ::
* ------------------------------------------------------------------
F79D     FCB        0 (          ) :0D64: 'GM/SEC'    0    RPM-SPEED
*-                        :          ::EQU N=E ::
         FCB        0 (          ) :0D65: 'GM/SEC'   400
         FCB        0 (          ) :0D66: 'GM/SEC'   800
         FCB        0 (          ) :0D67: 'GM/SEC'  1200
         FCB        0 (          ) :0D68: 'GM/SEC'  1600
         FCB        0 (          ) :0D69: 'GM/SEC'  2000
         FCB        0 (          ) :0D6A: 'GM/SEC'  2400
         FCB        0 (          ) :0D6B: 'GM/SEC'  2800
         FCB        0 (          ) :0D6C: 'GM/SEC'  3200
         FCB        0 (          ) :0D6D: 'GM/SEC'  3600
         FCB        0 (          ) :0D6E: 'GM/SEC'  4000
         FCB        0 (          ) :0D6F: 'GM/SEC'  4400
         FCB        0 (          ) :0D70: 'GM/SEC'  4800
         FCB        0 (          ) :0D71: 'GM/SEC'  5200
         FCB        0 (          ) :0D72: 'GM/SEC'  5600
         FCB        0 (          ) :0D73: 'GM/SEC'  6000
         FCB        0 (          ) :0D74: 'GM/SEC'  6400

*############################################################
*     F79MULD TABLE
*    MAXIMUM DELTA AIR FLOW MODIFIER (0-2) VS ATSDEG           #
*  TABLE VALUE = MULTIPLIER * 128                              #
*############################################################
*-                        :          ::PROTECT ::
*-                        :          ::TBL2D,5,2,TBL2,1,4,'MULT' ::
* ------------------------------------------------------------------
F79MULD  FCB        4 (          ) :0D75: '      ' USE 5  VALUE TABLE
*-                        :          ::EQU N=E ::
*-                        :          ::NOPROTECT ::
* ------------------------------------------------------------------
         FCB        0 (          ) :0D76: 'MULT  '   -40  DEG C-TEMP
*-                        :          ::EQU N=E*128 ::
         FCB        0 (          ) :0D77: 'MULT  '     8
         FCB        0 (          ) :0D78: 'MULT  '    56
         FCB        0 (          ) :0D79: 'MULT  '   104
         FCB        0 (          ) :0D7A: 'MULT  '   152
LASTCAL  EQU      *
*+DATASD  ++BLOCK ID++
**************************************
*     SERIAL DATA CALIBRATION        *
**************************************
         ORG      $8DE0
* ------------------------------------------------------------------
KALDLNUM FCB        0 (          ) :0DE0: 'NUM   ' IF # OF CONSEC. NON-
*-                        :                $4F CODES > CAL,
*-                               END ALDL MODE (IF C/H ALDL, SET TO $FF)
*-                        :          ::EQU N=E ::
* ------------------------------------------------------------------
KINJCHSD FCB        0 (          ) :0DE1: 'CONST ' INJECTOR FLOW RATE,
*-                        :                SECOND/GRAM OF FUEL
*-                        :          ::EQU N=E*256 ::
* ------------------------------------------------------------------
KFULCAL1 FDB        0 (          ) :0DE2: 'CONST ' INJECTOR FLOW RATE,
*-                        :                GRAMS/SEC OF FUEL
*-                        :          ::EQU N=E*27.4*256  ::
```

```
* ------------------------------------------------------------------
KREDLINE FCB          0 (          ) :0DE4: 'RPM   ' ENGINE RED LINE, RPM/
*-                      :                   100
*-                      :            ::EQU N=E/100 ::
* ------------------------------------------------------------------
KDISFSB  FDB          0 (          ) :0DE5: 'CONST ' INJECTOR FLOW RATE,
*-                      :                   GALLONS/HOUR OF FUEL
*-                      :            ::EQU N=E*32 ::
* ------------------------------------------------------------------
KSDIACMX FCB          0 (          ) :0DE7: 'STEPS ' 99*256/MAX IAC MOTOR
*-                      :                   POSITION FOR SCALING
*-                      :            ::EQU N=99*256/E ::

*;;**********************************
*;;*     SERIAL DATA CALIBRATION    *
*;;**********************************

*-                      :            ::PROTECT ::
* ------------------------------------------------------------------
F9FTMSG1 FDB      $8DF1 (          ) :0DE8: '      ' LINK TO NEXT MESSAGE
*-                      :            ::EQU N=E ::
* ------------------------------------------------------------------
         FCB          1 (          ) :0DEA: '      ' MESSAGE ID
* ------------------------------------------------------------------
         FCB          0 (          )*:0DEB: '      ' FLAG - USE RAM BUFFER
* ------------------------------------------------------------------
         FCB          0 (          )*:0DEC: '      ' NUMBER OF DATA BYTES
*-                      :                   TRANSMITTED
* ------------------------------------------------------------------
         FDB      $01A6 (          ) :0DED: '      ' ADDRESS OF OCB
* ------------------------------------------------------------------
         FDB      $0184 (          ) :0DEF: '      ' ADDRESS OF ICB

* ------------------------------------------------------------------
F9FTMSG2 FDB      $8DFA (          ) :0DF1: '      ' LINK TO NEXT MESSAGE
*-                      :            ::EQU N=E ::
* ------------------------------------------------------------------
         FCB          2 (          ) :0DF3: '      ' MESSAGE ID
* ------------------------------------------------------------------
         FCB          0 (          )*:0DF4: '      ' USE RAM BUFFER
* ------------------------------------------------------------------
         FCB          0 (          )*:0DF5: '      ' NUMBER OF OUTPUT DATA
*-                      :                   BYTES
* ------------------------------------------------------------------
         FDB      $01A6 (          ) :0DF6: '      ' ADDRESS OF OCB
* ------------------------------------------------------------------
         FDB      $0184 (          ) :0DF8: '      ' ADDRESS OF ICB
*-                      :            ::NOPROTECT ::

* ------------------------------------------------------------------
F9FTMSG3 FDB      $0000 (          ) :0DFA: '      ' LINK TO NEXT MESSAGE-
*-                      :                   POINT TO GM-30 OR NON-GM30
*-                      :            ::EQU N=E ::
*;;                       SDRTBL = NON-GM30, SDRTBL30 = GM30
*-                      :            ::PROTECT ::
* ------------------------------------------------------------------
         FCB          3 (          ) :0DFC: '      ' MESSAGE ID
* ------------------------------------------------------------------
         FCB          0 (          )*:0DFD: '      ' USE RAM BUFFER
```

```
* ------------------------------------------------------------------
        FCB          24 (           ) :0DFE: '       ' NUMBER OF OUTPUT
*-                      :                      BYTES
* ------------------------------------------------------------------
        FDB       $0184 (           ) :0DFF: '       ' ADDRESS OF OCB
* ------------------------------------------------------------------
        FDB       $0184 (           ) :0E01: '       ' ADDRESS OF ICB

*;;************************
*;;* F9MST TABLE  (NON-GM30)*
*;;* MESSAGE SCHEDULE TABLE *
*;;* TABLE VALUE = ADDRESS  *
***************************
*-                      :          ::TBL2D,16,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
F9MST   FDB       $8E23 (           ) :0E03: 'ADDRS ' 0
*-                      :          ::EQU N=E ::
        FDB           0 (           )*:0E05: 'ADDRS ' 1
        FDB           0 (           )*:0E07: 'ADDRS ' 2
        FDB           0 (           )*:0E09: 'ADDRS ' 3
        FDB       $8E23 (           ) :0E0B: 'ADDRS ' 4
        FDB           0 (           )*:0E0D: 'ADDRS ' 5
        FDB       $8E32 (           ) :0E0F: 'ADDRS ' 6
        FDB           0 (           )*:0E11: 'ADDRS ' 7
        FDB       $8E23 (           ) :0E13: 'ADDRS ' 8
        FDB           0 (           )*:0E15: 'ADDRS ' 9
        FDB           0 (           )*:0E17: 'ADDRS ' 10
        FDB           0 (           )*:0E19: 'ADDRS ' 11
        FDB       $8E23 (           ) :0E1B: 'ADDRS ' 12
        FDB           0 (           )*:0E1D: 'ADDRS ' 13
        FDB       $8E4F (           ) :0E1F: 'ADDRS ' 14
        FDB           0 (           )*:0E21: 'ADDRS ' 15

*;;**************************************************
*;;* F9MSG1                                         *
*;;* MESSAGE TO BE TRANSMITTED IN BROADCAST REMOTE MODE *
*;;* TABLE VALUE = ADDRESS                          *
***************************************************
*-                      :          ::TBL2D,3,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
F9MSG1  FDB           0 (           )*:0E23: 'ADDRS ' NEXT MESSAGE ENTRY
*-                      :                      ADDRESS
*-                      :          ::EQU N=E ::
* ------------------------------------------------------------------
        FCB         $0A (           ) :0E25: '       ' MESSAGE ID
* ------------------------------------------------------------------
        FCB           0 (           )*:0E26: 'FLAG  ' USE RAM BUFFER
*-                      :                      (BUFFER LOADED IN SDLOGIC)
* ------------------------------------------------------------------
        FCB           3 (           ) :0E27: 'BYTES ' NUMBER OF OUTPUT DATA
*-                      :                      BYTES
* ------------------------------------------------------------------
        FDB       $01C8 (           ) :0E28: 'ADDRS ' ADDRESS OF OUTPUT
*-                      :                      MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB       $0184 (           ) :0E2A: 'ADDRS ' ADDRESS OF INPUT
*-                      :                      MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB       $029D (           ) :0E2C: 'ADDRS ' 1
```

```
        FDB      $01F6 (          ) :0E2E: 'ADDRS ' 2
        FDB      $01F7 (          ) :0E30: 'ADDRS ' 3

*;;*************************************************
*;;* F9MSG2                                         *
*;;* MESSAGE TO BE TRANSMITTED IN BROADCAST REMOTE MODE *
*;;* TABLE VALUE = ADDRESS                          *
*************************************************
*_                    :          ::TBL2D,9,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
F9MSG2  FDB          0 (          )*:0E32: 'ADDRS ' NEXT MESSAGE ENTRY
*_                    :                    ADDRESS
*_                    :          ::EQU N=E ::
* ------------------------------------------------------------------
        FCB        $05 (          ) :0E34: '      ' MESSAGE ID
* ------------------------------------------------------------------
        FCB          0 (          )*:0E35: 'FLAG  ' USE RAM BUFFER
*_                    :                    (BUFFER LOADED IN SDLOGIC)
* ------------------------------------------------------------------
        FCB         10 (          ) :0E36: 'BYTES ' NUMBER OF OUTPUT DATA
*_                    :                    BYTES
* ------------------------------------------------------------------
        FDB      $01C8 (          ) :0E37: 'ADDRS ' ADDRESS OF OUTPUT
*_                    :                    MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB      $0184 (          ) :0E39: 'ADDRS ' ADDRESS OF INPUT
*_                    :                    MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB      $029D (          ) :0E3B: 'ADDRS ' 1
        FDB      $029D (          ) :0E3D: 'ADDRS ' 2
        FDB      $00BA (          ) :0E3F: 'ADDRS ' 3
        FDB      $8DE4 (          ) :0E41: 'ADDRS ' 4
        FDB      $0068 (          ) :0E43: 'ADDRS ' 5
        FDB      $01E1 (          ) :0E45: 'ADDRS ' 6
        FDB      $01E2 (          ) :0E47: 'ADDRS ' 7
        FDB      $8DE5 (          ) :0E49: 'ADDRS ' 8
        FDB      $8DE6 (          ) :0E4B: 'ADDRS ' 9
* ------------------------------------------------------------------
        FDB      $0088 (          ) :0E4D: '      ' 10

*;;*************************************************
*;;* F9MSG3                                         *
*;;* MESSAGE TO BE TRANSMITTED IN BROADCAST REMOTE MODE *
*;;* TABLE VALUE = ADDRESS                          *
*************************************************
*_                    :          ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
F9MSG3  FDB          0 (          )*:0E4F: 'ADDRS ' NEXT MESSAGE ENTRY
*_                    :                    ADDRESS
*_                    :          ::EQU N=E ::
*_                    :          ::NOPROTECT ::
* ------------------------------------------------------------------
KSDALALN FCB       $00 (          ) :0E51: '      ' MESSAGE ID  ALL
*_                    :                    SHOULD BE $F0 OR $80
*_                    :          ::PROTECT ::
* ------------------------------------------------------------------
        FCB          0 (          )*:0E52: 'FLAG  ' USE RAM BUFFER
* ------------------------------------------------------------------
        FCB          0 (          )*:0E53: 'BYTES ' NUMBER OF OUTPUT DATA
```

```
*-                      :                   BYTES
* ------------------------------------------------------------------
        FDB     $01C8 (           ) :0E54: 'ADDRS ' ADDRESS OF OUTPUT
*-                      :                   MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB     $0184 (           ) :0E56: 'ADDRS ' ADDRESS OF INPUT
*-                      :                   MESSAGE BUFFER

*;;*****************************************************
*;;* SDRTBL                                            *
*;;* MESSAGE RECEIVED IN RESPONSE TO ALDL POLLING MESSAGE *
*;;* TABLE VALUE = ADDRESS                             *
*******************************************************
SDRTBL  EQU     *
*
*-                      :           ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
        FDB     $8E61 (           ) :0E58: '       ' NEXT MESSAGE ENTRY
*-                      :                   ADDRESS
*-                      :           ::EQU N=E ::
*-                      :           ::NOPROTECT ::
* ------------------------------------------------------------------
        FCB       $00 (           ) :0E5A: '       ' MESSAGE ID
*-                      :           ::PROTECT ::
* ------------------------------------------------------------------
        FCB         0 (           )*:0E5B: 'FLAG  ' USE RAM BUFFER
* ------------------------------------------------------------------
        FCB       $80 (           ) :0E5C: 'BYTES ' NUMBER OF OUTPUT DATA
*-                      :                   BYTES
* ------------------------------------------------------------------
        FDB     $01C8 (           ) :0E5D: 'ADDRS ' ADDRESS OF OUTPUT
*-                      :                   MESSAGE BUFFER
* ------------------------------------------------------------------
        FDB     $0184 (           ) :0E5F: 'ADDRS ' ADDRESS OF INPUT
*-                      :                   MESSAGE BUFFER

*;;*****************************************************
*;;* SDRFOMO                                           *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 0 *
*;;* TABLE VALUE = ADDRESS                             *
*******************************************************
*-                      :           ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
SDRMFOMO FDB        0 (           )*:0E61: '       ' NEXT MESSAGE ENTRY
*-                      :                   ADDRESS
*-                      :           ::EQU N=E ::
*-                      :           ::NOPROTECT ::
* ------------------------------------------------------------------
        FCB       $00 (           ) :0E63: '       ' MESSAGE ID
*-                      :           ::PROTECT ::
* ------------------------------------------------------------------
        FCB         0 (           )*:0E64: 'FLAG  ' USE RAM BUFFER
* ------------------------------------------------------------------
        FCB         1 (           ) :0E65: 'BYTES ' NUMBER OF OUTPUT DATA
*-                      :                   BYTES
* ------------------------------------------------------------------
        FDB     $01C8 (           ) :0E66: 'ADDRS ' ADDRESS OF OUTPUT
*-                      :                   MESSAGE BUFFER
* ------------------------------------------------------------------
```

```
        FDB     $0184 (          ) :0E68: 'ADDRS ' ADDRESS OF INPUT
*-                    :                   MESSAGE BUFFER
*
* ADDRESSES OF DIFFERENT MODE BLOCKS
*
* ----------------------------------------------------------------
ALDLMSGS FDB    $8E61 (          ) :0E6A: 'ADDRS '
* ----------------------------------------------------------------
        FDB     $8E76 (          ) :0E6C: '      '
* ----------------------------------------------------------------
        FDB     $8F05 (          ) :0E6E: '      '
* ----------------------------------------------------------------
        FDB     $8F0E (          ) :0E70: '      '
* ----------------------------------------------------------------
        FDB     $8F17 (          ) :0E72: '      '
* ----------------------------------------------------------------
        FDB     $8F20 (          ) :0E74: '      '

*;;*****************************************************
*;;* SDRFOM1                                           *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 1 *
*;;* TABLE VALUE = ADDRESS                             *
*******************************************************
*-                    :          ::TBL2D,67,7,TBLX,1,'ADDRS' ::
* ----------------------------------------------------------------
SDRMFOM1 FDB        0 (          )*:0E76: '      ' NEXT MESSAGE ENTRY
*-                    :                   ADDRESS
*-                    :          ::NOPROTECT ::
* ----------------------------------------------------------------
        FCB       $00 (          ) :0E78: '      ' MESSAGE ID
*-                    :          ::PROTECT ::
* ----------------------------------------------------------------
        FCB       $80 (          ) :0E79: 'FLAG  ' USE PROM TABLE
* ----------------------------------------------------------------
        FCB        68 (          ) :0E7A: 'BYTES ' NUMBER OF OUTPUT DATA
*-                    :                   BYTES(1ST IS MODE #)
* ----------------------------------------------------------------
        FDB     $01C8 (          ) :0E7B: 'ADDRS ' ADDRESS OF OUTPUT
*-                    :                   MESSAGE BUFFER
* ----------------------------------------------------------------
        FDB     $0184 (          ) :0E7D: 'ADDRS ' ADDRESS OF INPUT
*-                    :                   MESSAGE BUFFER

* ----------------------------------------------------------------
        FDB     $0074 (          ) :0E7F: 'ADDRS ' 1 ADDRESS OF FIRST
*-                    :                   DATA BYTE TRANSMITTED
        FDB     $0075 (          ) :0E81: 'ADDRS ' 2
        FDB     $0077 (          ) :0E83: 'ADDRS ' 3
        FDB     $006C (          ) :0E85: 'ADDRS ' 4
        FDB     $00DC (          ) :0E87: 'ADDRS ' 5
        FDB     $00DD (          ) :0E89: 'ADDRS ' 6
        FDB     $0082 (          ) :0E8B: 'ADDRS ' 7
        FDB     $0083 (          ) :0E8D: 'ADDRS ' 8
        FDB     $0078 (          ) :0E8F: 'ADDRS ' 9
        FDB     $007B (          ) :0E91: 'ADDRS ' 10
        FDB     $008B (          ) :0E93: 'ADDRS ' 11
        FDB     $008D (          ) :0E95: 'ADDRS ' 12
        FDB     $0095 (          ) :0E97: 'ADDRS ' 13
        FDB     $009C (          ) :0E99: 'ADDRS ' 14
```

```
        FDB     $40C4 (                 ) :0E9B: 'ADDRS ' 15
        FDB     $40C4 (                 ) :0E9D: 'ADDRS ' 16
        FDB     $40BA (                 ) :0E9F: 'ADDRS ' 17
        FDB     $40BA (                 ) :0EA1: 'ADDRS ' 18
        FDB     $00B7 (                 ) :0EA3: 'ADDRS ' 19
        FDB     $0090 (                 ) :0EA5: 'ADDRS ' 20
        FDB     $0127 (                 ) :0EA7: 'ADDRS ' 21
        FDB     $00AA (                 ) :0EA9: 'ADDRS ' 22
        FDB     $00A3 (                 ) :0EAB: 'ADDRS ' 23
        FDB     $00A2 (                 ) :0EAD: 'ADDRS ' 24
        FDB     $0059 (                 ) :0EAF: 'ADDRS ' 25
        FDB     $00E2 (                 ) :0EB1: 'ADDRS ' 26
        FDB     $008F (                 ) :0EB3: 'ADDRS ' 27
        FDB     $00F0 (                 ) :0EB5: 'ADDRS ' 28
        FDB     $010A (                 ) :0EB7: 'ADDRS ' 29
        FDB     $0068 (                 ) :0EB9: 'ADDRS ' 30
        FDB     $40D4 (                 ) :0EBB: 'ADDRS ' 31
        FDB     $40D4 (                 ) :0EBD: 'ADDRS ' 32
        FDB     $4239 (                 ) :0EBF: 'ADDRS ' 33
        FDB     $4239 (                 ) :0EC1: 'ADDRS ' 34
        FDB     $0243 (                 ) :0EC3: 'ADDRS ' 35
        FDB     $00D0 (                 ) :0EC5: 'ADDRS ' 36
        FDB     $40A5 (                 ) :0EC7: 'ADDRS ' 37
        FDB     $40A5 (                 ) :0EC9: 'ADDRS ' 38
        FDB     $40B3 (                 ) :0ECB: 'ADDRS ' 39
        FDB     $40B3 (                 ) :0ECD: 'ADDRS ' 40
        FDB     $41E1 (                 ) :0ECF: 'ADDRS ' 41
        FDB     $41E1 (                 ) :0ED1: 'ADDRS ' 42
        FDB     $01E3 (                 ) :0ED3: 'ADDRS ' 43
        FDB     $4036 (                 ) :0ED5: 'ADDRS ' 44
        FDB     $4036 (                 ) :0ED7: 'ADDRS ' 45
        FDB     $0014 (                 ) :0ED9: 'ADDRS ' 46
        FDB     $0015 (                 ) :0EDB: 'ADDRS ' 47
        FDB     $0016 (                 ) :0EDD: 'ADDRS ' 48
        FDB     $0017 (                 ) :0EDF: 'ADDRS ' 49
        FDB     $0018 (                 ) :0EE1: 'ADDRS ' 50
        FDB     $0019 (                 ) :0EE3: 'ADDRS ' 51
        FDB     $001A (                 ) :0EE5: 'ADDRS ' 52
        FDB     $001B (                 ) :0EE7: 'ADDRS ' 53
        FDB     $001C (                 ) :0EE9: 'ADDRS ' 54
        FDB     $001D (                 ) :0EEB: 'ADDRS ' 55
        FDB     $0021 (                 ) :0EED: 'ADDRS ' 56
        FDB     $0022 (                 ) :0EEF: 'ADDRS ' 57
        FDB     $0023 (                 ) :0EF1: 'ADDRS ' 58
        FDB     $0024 (                 ) :0EF3: 'ADDRS ' 59
        FDB     $0025 (                 ) :0EF5: 'ADDRS ' 60
        FDB     $0026 (                 ) :0EF7: 'ADDRS ' 61
        FDB     $0027 (                 ) :0EF9: 'ADDRS ' 62
        FDB     $0028 (                 ) :0EFB: 'ADDRS ' 63
        FDB     $0029 (                 ) :0EFD: 'ADDRS ' 64
        FDB     $002A (                 ) :0EFF: 'ADDRS ' 65
        FDB     $8000 (                 ) :0F01: 'ADDRS ' 66
        FDB     $8001 (                 ) :0F03: 'ADDRS ' 67

*;;*********************************************************
*;;* SDRFOM2                                               *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 2 *
*;;* TABLE VALUE = ADDRESS  (64 BYTE MEMORY DUMP)          *
***********************************************************
```

```
*-                       :         ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ----------------------------------------------------------------
SDRMFOM2 FDB           0 (         )*:0F05: '      ' NEXT MESSAGE ENTRY
*-                       :                    ADDRESS
*-                       :         ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB         $00 (         ) :0F07: '      ' MESSAGE ID
*-                       :         ::PROTECT ::
* ----------------------------------------------------------------
         FCB         $40 (         ) :0F08: 'FLAG  ' USE RAM BUFFER
* ----------------------------------------------------------------
         FCB          65 (         ) :0F09: 'BYTES ' NUMBER OF OUTPUT DATA
*-                       :                    BYTES
* ----------------------------------------------------------------
         FDB       $0184 (         ) :0F0A: 'ADDRS ' ADDRESS OF OUTPUT
*-                       :                    MESSAGE BUFFER
* ----------------------------------------------------------------
         FDB       $0184 (         ) :0F0C: 'ADDRS ' ADDRESS OF INPUT
*-                       :                    MESSAGE BUFFER

*;;***************************************************************
*;;* SDRFOM3                                                     *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 3       *
*;;* TABLE VALUE = ADDRESS  (SEND BACK DATA FROM RECEIVED ADDRESSES) *
******************************************************************
*-                       :         ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ----------------------------------------------------------------
SDRMFOM3 FDB           0 (         )*:0F0E: '      ' NEXT MESSAGE ENTRY
*-                       :                    ADDRESS
*-                       :         ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB         $00 (         ) :0F10: '      ' MESSAGE ID
*-                       :         ::PROTECT ::
* ----------------------------------------------------------------
         FCB         $40 (         ) :0F11: 'FLAG  ' USE RAM BUFFER
* ----------------------------------------------------------------
         FCB          95 (         ) :0F12: 'BYTES ' NUMBER OF OUTPUT DATA
*-                       :                    BYTES
* ----------------------------------------------------------------
         FDB       $0182 (         ) :0F13: 'ADDRS ' ADDRESS OF OUTPUT
*-                       :                    MESSAGE BUFFER
* ----------------------------------------------------------------
         FDB       $0184 (         ) :0F15: 'ADDRS ' ADDRESS OF INPUT
*-                       :                    MESSAGE BUFFER

*;;***************************************************************
*;;* SDRFOM4 (OVERRIDE CONTROL, TRANSMIT DATA FROM RECEIVED ADRESSES) *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 4       *
*;;* TABLE VALUE = ADDRESS                                       *
******************************************************************
*-                       :         ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ----------------------------------------------------------------
SDRMFOM4 FDB           0 (         )*:0F17: '      ' NEXT MESSAGE ENTRY
*-                       :                    ADDRESS
*-                       :         ::NOPROTECT ::
* ----------------------------------------------------------------
         FCB         $00 (         ) :0F19: '      ' MESSAGE ID
*-                       :         ::PROTECT ::
* ----------------------------------------------------------------
```

```
          FCB        $40 (            ) :0F1A: 'FLAG  ' USE RAM BUFFER
* ----------------------------------------------------------------------
          FCB          1 (            ) :0F1B: 'BYTES ' NUMBER OF OUTPUT DATA
*-                       :                     BYTES
* ----------------------------------------------------------------------
          FDB      $01A6 (            ) :0F1C: 'ADDRS ' NO REPLY IN MODE 4
* ----------------------------------------------------------------------
          FDB      $0184 (            ) :0F1E: 'ADDRS ' ADDRESS OF INPUT
*-                       :                     MESSAGE BUFFER

*;;*****************************************************
*;;* SDRFOM7    (GET OUT OF ALDL MODE)                  *
*;;* SERIAL DATA RECEIVE MESSAGE, MESSAGE ID = $F0, MODE 7 *
*;;* TABLE VALUE = ADDRESS                              *
******************************************************
*-                       :           ::TBL2D,0,7,TBLX,1,'ADDRS' ::
* ----------------------------------------------------------------------
SDRMFOM7 FDB           0 (           )*:0F20: '      ' NEXT MESSAGE ENTRY
*-                       :                     ADDRESS
*-                       :           ::NOPROTECT ::
* ----------------------------------------------------------------------
          FCB        $00 (            ) :0F22: '      ' MESSAGE ID
*-                       :           ::PROTECT ::
* ----------------------------------------------------------------------
          FCB        $80 (            ) :0F23: 'FLAG  ' USE RAM BUFFER
* ----------------------------------------------------------------------
          FCB        120 (            ) :0F24: 'BYTES ' NUMBER OF OUTPUT DATA
*-                       :                     BYTES
* ----------------------------------------------------------------------
          FDB      $01C8 (            ) :0F25: 'ADDRS ' ADDRESS OF OUTPUT
*-                       :                     MESSAGE BUFFER
* ----------------------------------------------------------------------
          FDB      $0184 (            ) :0F27: 'ADDRS ' ADDRESS OF INPUT
*-                       :                     MESSAGE BUFFER

*-                       :           ::NOPROTECT ::
* ----------------------------------------------------------------------
KMD4TIM   FDB          0 (            ) :0F29: 'ADDRS ' ALLOW MODE 4 FOR THIS
*-                       :                     LONG
*-                       :           ::EQU N=E ::
* ----------------------------------------------------------------------
KMD4LCK   FCB          0 (            ) :0F2B: 'SEC   ' PREVENT MODE 4 FOR
*-                       :                     THIS LONG
*-                       :           ::EQU N=E ::
*-                       :           ::PROTECT ::
*
*       MESSAGE CODE $40 ENTRIES
*
SDRTBL30 EQU        *
* ----------------------------------------------------------------------
SDRM40    FDB      $8F48 (            ) :0F2D: '      ' NEXT MESSAGE ENTRY
*-                       :                     ADDRESS
* ----------------------------------------------------------------------
          FCB        $40 (            ) :0F2F: '      ' MESSAGE CODE
* ----------------------------------------------------------------------
          FCB          0 (           )*:0F30: '      ' OPTION FLAG WORD
* ----------------------------------------------------------------------
          FCB          9 (            ) :0F31: '      ' OUTPUT MESSAGE LENGTH
* ----------------------------------------------------------------------
```

```
         FDB      $01C8 (           ) :0F32: '      ' ADDRESS OF OUTPUT
*-                      :                      CONTROL BLOCK
* ---------------------------------------------------------------------
         FDB      $0184 (           ) :0F34: '      ' ADDRESS OF INPUT
*-                      :                      CONTROL BLOCK
* ---------------------------------------------------------------------
         FDB      $01C8 (           ) :0F36: '      ' ADDRESS LIST FOR
*-                      :                      TABLE DRIVEN OUTPUT
* ---------------------------------------------------------------------
         FDB      $0088 (           ) :0F38: '      '
* ---------------------------------------------------------------------
         FDB      $009C (           ) :0F3A: '      '
* ---------------------------------------------------------------------
         FDB      $41E1 (           ) :0F3C: '      '
* ---------------------------------------------------------------------
         FDB      $41E1 (           ) :0F3E: '      '
* ---------------------------------------------------------------------
         FDB      $8DE1 (           ) :0F40: '      '
* ---------------------------------------------------------------------
         FDB      $029D (           ) :0F42: '      '
* ---------------------------------------------------------------------
         FDB      $0088 (           ) :0F44: '      '
* ---------------------------------------------------------------------
         FDB      $0099 (           ) :0F46: '      '
*
*      MESSAGE CODE $41 ENTRIES
*
* ---------------------------------------------------------------------
SDRM41   FDB      $8F51 (           ) :0F48: '      ' NEXT MESSAGE ENTRY
*-                      :                      ADDRESS
* ---------------------------------------------------------------------
         FCB        $41 (           ) :0F4A: '      ' MESSAGE CODE
* ---------------------------------------------------------------------
         FCB          0 (           )*:0F4B: '      ' OPTION FLAG WORD
* ---------------------------------------------------------------------
         FCB          0 (           )*:0F4C: '      ' OUTPUT MESSAGE LENGTH
* ---------------------------------------------------------------------
         FDB      $01C8 (           ) :0F4D: '      ' ADDRESS OF OUTPUT
*-                      :                      CONTROL BLOCK
* ---------------------------------------------------------------------
         FDB      $0184 (           ) :0F4F: '      ' ADDRESS OF INPUT
*-                      :                      CONTROL BLOCK
*
*      MESSAGE CODE $42 ENTRIES
*
* ---------------------------------------------------------------------
SDRM42   FDB      $8F5A (           ) :0F51: '      ' NEXT MESSAGE ENTRY
*-                      :                      ADDRESS
* ---------------------------------------------------------------------
         FCB        $42 (           ) :0F53: '      ' MESSAGE CODE
* ---------------------------------------------------------------------
         FCB        $40 (           ) :0F54: '      ' OPTION FLAG WORD
* ---------------------------------------------------------------------
         FCB          4 (           ) :0F55: '      ' OUTPUT MESSAGE LENGTH
* ---------------------------------------------------------------------
         FDB      $01C8 (           ) :0F56: '      ' ADDRESS OF OUTPUT
*-                      :                      CONTROL BLOCK
* ---------------------------------------------------------------------
         FDB      $0184 (           ) :0F58: '      ' ADDRESS OF INPUT
```

```
*_                     :                 CONTROL BLOCK
*
*      MESSAGE CODE $4F ENTRIES
*
*_                     :            ::TBL2D,67,7,TBLX,1,'ADDRS' ::
* ------------------------------------------------------------------
SDRM4F   FDB         0 (          )*:0F5A: '      ' NEXT MESSAGE ENTRY
*_                     :                 ADDRESS
* ------------------------------------------------------------------
         FCB       $4F (          ) :0F5C: '      ' MESSAGE CODE
* ------------------------------------------------------------------
         FCB       $80 (          ) :0F5D: '      ' OPTION FLAG WORD ($80
*_                     :                 = PROM TABLE)
* ------------------------------------------------------------------
         FCB        67 (          ) :0F5E: '      ' OUTPUT MESSAGE LENGTH
* ------------------------------------------------------------------
         FDB     $01C8 (          ) :0F5F: '      ' ADDRESS OF OUTPUT
*_                     :                 CONTROL BLOCK
* ------------------------------------------------------------------
         FDB     $01D2 (          ) :0F61: '      ' ADDRESS OF INPUT
*_                     :                 CONTROL BLOCK
*
*      ALDL MESSAGE TABLE
*
* ------------------------------------------------------------------
         FDB     $0074 (          ) :0F63: 'ADDRS ' 1 ADDRESS OF FIRST
*_                     :                 DATA BYTE TRANSMITTED
         FDB     $0075 (          ) :0F65: 'ADDRS ' 2
         FDB     $0077 (          ) :0F67: 'ADDRS ' 3
         FDB     $006C (          ) :0F69: 'ADDRS ' 4
         FDB     $00DC (          ) :0F6B: 'ADDRS ' 5
         FDB     $00DD (          ) :0F6D: 'ADDRS ' 6
         FDB     $0082 (          ) :0F6F: 'ADDRS ' 7
         FDB     $0083 (          ) :0F71: 'ADDRS ' 8
         FDB     $0078 (          ) :0F73: 'ADDRS ' 9
         FDB     $007B (          ) :0F75: 'ADDRS ' 10
         FDB     $008B (          ) :0F77: 'ADDRS ' 11
         FDB     $008D (          ) :0F79: 'ADDRS ' 12
         FDB     $0095 (          ) :0F7B: 'ADDRS ' 13
         FDB     $009C (          ) :0F7D: 'ADDRS ' 14
         FDB     $40C4 (          ) :0F7F: 'ADDRS ' 15
         FDB     $40C4 (          ) :0F81: 'ADDRS ' 16
         FDB     $40BA (          ) :0F83: 'ADDRS ' 17
         FDB     $40BA (          ) :0F85: 'ADDRS ' 18
         FDB     $00B7 (          ) :0F87: 'ADDRS ' 19
         FDB     $0090 (          ) :0F89: 'ADDRS ' 20
         FDB     $0127 (          ) :0F8B: 'ADDRS ' 21
         FDB     $00AA (          ) :0F8D: 'ADDRS ' 22
         FDB     $00A3 (          ) :0F8F: 'ADDRS ' 23
         FDB     $00A2 (          ) :0F91: 'ADDRS ' 24
         FDB     $0059 (          ) :0F93: 'ADDRS ' 25
         FDB     $00E2 (          ) :0F95: 'ADDRS ' 26
         FDB     $008F (          ) :0F97: 'ADDRS ' 27
         FDB     $00F0 (          ) :0F99: 'ADDRS ' 28
         FDB     $010A (          ) :0F9B: 'ADDRS ' 29
         FDB     $0068 (          ) :0F9D: 'ADDRS ' 30
         FDB     $40D4 (          ) :0F9F: 'ADDRS ' 31
         FDB     $40D4 (          ) :0FA1: 'ADDRS ' 32
         FDB     $4239 (          ) :0FA3: 'ADDRS ' 33
```

```
        FDB     $4239 (          ) :0FA5: 'ADDRS ' 34
        FDB     $0243 (          ) :0FA7: 'ADDRS ' 35
        FDB     $00D0 (          ) :0FA9: 'ADDRS ' 36
        FDB     $40A5 (          ) :0FAB: 'ADDRS ' 37
        FDB     $40A5 (          ) :0FAD: 'ADDRS ' 38
        FDB     $40B3 (          ) :0FAF: 'ADDRS ' 39
        FDB     $40B3 (          ) :0FB1: 'ADDRS ' 40
        FDB     $41E1 (          ) :0FB3: 'ADDRS ' 41
        FDB     $41E1 (          ) :0FB5: 'ADDRS ' 42
        FDB     $01E3 (          ) :0FB7: 'ADDRS ' 43
        FDB     $4036 (          ) :0FB9: 'ADDRS ' 44
        FDB     $4036 (          ) :0FBB: 'ADDRS ' 45
        FDB     $0014 (          ) :0FBD: 'ADDRS ' 46
        FDB     $0015 (          ) :0FBF: 'ADDRS ' 47
        FDB     $0016 (          ) :0FC1: 'ADDRS ' 48
        FDB     $0017 (          ) :0FC3: 'ADDRS ' 49
        FDB     $0018 (          ) :0FC5: 'ADDRS ' 50
        FDB     $0019 (          ) :0FC7: 'ADDRS ' 51
        FDB     $001A (          ) :0FC9: 'ADDRS ' 52
        FDB     $001B (          ) :0FCB: 'ADDRS ' 53
        FDB     $001C (          ) :0FCD: 'ADDRS ' 54
        FDB     $001D (          ) :0FCF: 'ADDRS ' 55
        FDB     $0021 (          ) :0FD1: 'ADDRS ' 56
        FDB     $0022 (          ) :0FD3: 'ADDRS ' 57
        FDB     $0023 (          ) :0FD5: 'ADDRS ' 58
        FDB     $0024 (          ) :0FD7: 'ADDRS ' 59
        FDB     $0025 (          ) :0FD9: 'ADDRS ' 60
        FDB     $0026 (          ) :0FDB: 'ADDRS ' 61
        FDB     $0027 (          ) :0FDD: 'ADDRS ' 62
        FDB     $0028 (          ) :0FDF: 'ADDRS ' 63
        FDB     $0029 (          ) :0FE1: 'ADDRS ' 64
        FDB     $002A (          ) :0FE3: 'ADDRS ' 65
        FDB     $8000 (          ) :0FE5: 'ADDRS ' 66
        FDB     $8001 (          ) :0FE7: 'ADDRS ' 67

*********************************************************
*  THIS TABLE CONTAINS SIX MASKS FOR THE SIX DISCRETE    *
*  INPUTS TO BE TRANSMITTED IN LEVEL 4-2. RAM VARIABLE   *
*  SDDISCRT CONTAINS THE DATA, WHICH IS ISOLATED AND SENT *
*********************************************************
* ------------------------------------------------------------------
SDISCRIN FCB     $40 (          ) :0FE9: '      ' BRAKE* IN BIT 6 OF
*-                   :                   SDDISCRT (SNAPBUF + 21)
* ------------------------------------------------------------------
         FCB     $01 (          ) :0FEA: '      ' PARK/NEUTRAL IN BIT 0
* ------------------------------------------------------------------
         FCB     $10 (          ) :0FEB: '      ' POWER STEERING SWITCH
*-                   :                   IN BIT 4
* ------------------------------------------------------------------
         FCB     $02 (          ) :0FEC: '      ' SECOND GEAR IN BIT 1
* ------------------------------------------------------------------
         FCB     $04 (          ) :0FED: '      ' THIRD GEAR IN BIT 2
* ------------------------------------------------------------------
         FCB     $08 (          ) :0FEE: '      ' FOURTH GEAR IN BIT 3

*-                   :          ::NOPROTECT ::

*********************************************************
*  THIS CALIBRATION FLAGS GM30 OR NON-GM30 SERIAL DATA   *
```

```
*********************************************************
* ------------------------------------------------------------------
KSDGM30  FCB      $00 (          ) :0FEF: '       ' IF A/C AND CRUISE
*-                    :                     COME FROM GM30 S.D, SET=$FF
*;;                             ALSO F9FTMSG3 MUST BE SET TO SDRTBL30
*-                    :               ::EQU N=E ::
*-                    :               ::PROTECT ::
* ------------------------------------------------------------------
KMSGID   FCB      $41 (          ) :0FF0: '       ' $40 = 86 MESSAGE ID,
*-                    :                     $41 = 88 GM30 MESSAGE ID
*-                    :               ::EQU N=E ::
*-                    :               ::NOPROTECT ::
LASTPROM EQU      *
         ORG      $8FFC
* ------------------------------------------------------------------
KI2ULED  FDB      $0000 (          ) :0FFC: '       ' DISPLAY CONTENTS OF
*-                    :                     THIS LOC. CALA UPPER LED'S
*             *******  NOTE- SET TO 0 FOR NORMAL CAL A UPPER LED DISPLAY
*-                    :               ::EQU N=E ::
* ------------------------------------------------------------------
KDSPLYB6 FDB      $0000 (          ) :0FFE: '       ' DISPLAY CONTENTS OF
*-                    :                     THIS LOCATION CALB POS. #6
*-                    :               ::EQU N=E ::
ADDRX1   EQU      FMDBYTE1 HERE ARE A FEW EQUATES FOR EASE OF USE
ADDRX2   EQU      FMDBYTE2 ... TO PLUG INTO THE CDS IN HEX
ADDRX3   EQU      MCUINST
ADDRX4   EQU      MW1
ADDRX5   EQU      LCCPMW
ADDRX6   EQU      MWFA
ADDRX7   EQU      MWFA1
ADDRX8   EQU      PIDMW1
*+DATATBLS++BLOCK ID++
*******************************************************************
*        THERE IS NO CODE IN THIS MEMBER .                        *
*        THESE TABLES ARE REQUIRED FOR AUTOMATIC UNITS CONVERSION. *
*   CONVERSION  TABLE       AXIS                                   *
*                 1          NTRPM                                 *
*                 2          COOLDEG                               *
*                 3          MAT                                   *
*                 4          LOAD                                  *
*   ANNOTATION  TABLE       AXIS                                   *
*                 5          NMPH                                  *
*                 6          NOT USED                              *
*                 7          RPM                                   *
*                 8          NOT USED                              *
*                 9          NOT USED                              *
*                10          NOT USED                              *
*                11          VOLTS                                 *
*                12          BLOCK LEARN CELL NUMBER               *
*                13          GEAR CHANGE TABLE- OLD.NEW GEAR       *
*                14          NOT USED                              *
*                15          NOT USED                              *
*                16          NOT USED                              *
*                17          NOT USED                              *
*                18          NOT USED                              *
*                19          RPM                                   *
*                20          NOT USED                              *
*                                                                  *
```

```
*********************************************************************
*::TABLES::
*   *****************************************************************
*                           TABLE 1
*                           N VS RPM
*                           (NTRPM)
*   *****************************************************************
*
*::TBL1 (NTRPM)
*                        SPEED        NTRPM
*                         RPM           N
*                         400           0
*                         600          16
*                         800          32
*                        1000          48
*                        1200          64
*                        1400          80
*                        1600          96
*                        1800         112
*                        2000         128
*                        2200         144
*                        2400         160
*                        2800         176
*                        3200         192
*                        3600         208
*                        4000         224
*                        4400         240
*                        4800         256    ::
*
*        FOR HYSTERESIS CALCULATIONS:
*
*        N = RPM*16/200 FOR RPM'S BETWEEN 400 - 2400
*            THIS SAME N WILL EQUAL TWICE THE RPM HYSTERESIS
*            FOR RPM'S BETWEEN 2400 - 4800


*   *****************************************************************
*                           TABLE 2
*                  COOLANT TEMPERATURE VS N
*                          (COOLDEG)
*   *****************************************************************
*
*::TBL2 (COOLDEG)
*                        TEMP         COOLDEG
*                       'DEG C'          N
*                         -40            0
*                         -28           16
*                         -16           32
*                         -4            48
*                          8            64
*                          20           80
*                          32           96
*                          44          112
*                          56          128
*                          68          144
*                          80          160
*                          92          176
*                         104          192
*                         116          208
```

*		
*	128	224
*	140	240
*	152	256 ::

```
*   *****************************************************************
*                             TABLE 3
*   *****************************************************************
*
*::TBL3  (ADMATINV)
*              AIRTMP           ADMATINV
*              DEGC                N
*              -99                 0
*              -25                16
*              -12                32
*               -3                48
*                4                64
*               11                80
*               17                96
*               22               112
*               27               128
*               33               144
*               39               160
*               46               176
*               54               192
*               65               208
*               78               224
*              102               240
*              255               255  ::

*
*   *****************************************************************
*                             TABLE 411
*                LV8, LV82X, NTPSLD  VS N
*   *****************************************************************
*
*::TBL411 (0,1,2,3)
*  LOAD       LV8             THROTPOS   '2 MAP'     LV8
*     N       CTS                %          KPA      CTS
*     0         0              0.00          10       00
*    16        16              6.25          20       16
*    32        32             12.50          30       32
*    48        48             18.75          40       48
*    64        64             25.00          50       64
*    80        80             31.25          60       80
*    96        96             37.50          70       96
*   112       112             43.75          80      112
*   128       128             50.00          90      128
*   144       144             56.25         100      144
*   160       160             62.50         110      160
*   176       176             68.75         120      176
*   192       192             75.00         130      192
*   208       208             81.25         140      208
*   224       224             87.50         150      224
*   240       240             93.75         160      240
*   256       256            100.00         170      256  ::
*            (LV8)          (NTPSLD)    (N2MPLD) (  LV8 )
```

```
*****************************************************************
*                  ANNOTATION TABLES                            *
*****************************************************************

*  **************************************************************
*                           TABLE 5
*                       ROAD SPEED VS N
*                            (NMPH)
*  **************************************************************
*
*::TBL5 (NMPH)
*                        SPEED       NMPH
*                         MPH         N
*                           0         0
*                           5        16
*                          10        32
*                          15        48
*                          20        64
*                          25        80
*                          30        96
*                          35       112
*                          40       128
*                          45       144
*                          50       160
*                          55       176
*                          60       192
*                         100       208
*                         101       224
*                         102       240
*                         103       256 ::
*
*    LAST FOUR VALUES IN THE TABLE ABOVE ARE ARTIFICIAL TO
*    ACCOMMODATE COMPUTER UNITS TO ENGINEERING UNITS CONVERSION
*
*       FOR HYSTERESIS CALCULATIONS:
*
*          N=MPH*16/5


**************************
*     TABLE 6            *
**************************
*
*::TBL6
*      SPEED
*      RPM
*      1000
*      1200
*      1400
*      1600
*      1800
*      2000
*      2200
*      2400
*      2800
*      3200
*      3600
*      4000
*      4400
```

```
*       4800
*       5200
*       5600
*       6000 ::


**************************
*      TABLE 7           *
**************************
*::TBL7
*       SPEED
*       RPM
*       0
*       400
*       800
*       1200
*       1600
*       2000
*       2400
*       2800
*       3200
*       3600
*       4000
*       4400
*       4800
*       5200
*       5600
*       6000
*       6400 ::

**************************
*      TABLE 8           *
**************************
*::TBL8
*       ENGTRQ
*       EXCSTQ
*       0
*       4096
*       8192
*       12288
*       16384
*       20480
*       24576
*       28672
*       32768
*       36864
*       40960
*       45056
*       49152
*       53248
*       57344
*       61440
*       65536 ::

**************************
*      TABLE 9           *
```

```
*************************
*::TBL9
*       TIME
*        SEC
*        0.0
*        1.6
*        3.2
*        4.8
*        6.4
*        8.0
*        9.6
*       11.2
*       12.8
*       14.4
*       16.0
*       17.6
*       19.2
*       20.8
*       22.4
*       24.0
*       25.6  ::

*************************
*       TABLE 10        *
*************************
*::TBL10
*       SPEED
*        MPH
*          0
*          4
*          8
*         12
*         16
*         20
*         24
*         28
*         32
*         36
*         40
*         44
*         48
*         52
*         56
*         60
*         64
*         68
*         72
*         76
*         80
*         84
*         88
*         92
*         96
*        100
*        104
*        108
*        112
*        116  ::
```

```
*************************
*      TABLE 11         *
*************************
*::TBL11
*      BATTERY
*       VOLTS
*        0.0
*        1.6
*        3.2
*        4.8
*        6.4
*        8.0
*        9.6
*       11.2
*       12.8
*       14.4
*       16.0
*       17.6
*       19.2
*       20.8
*       22.4
*       24.0
*       25.5  ::

*************************
*      TABLE 12         *
*************************
*::TBL12
*      'BLM CELL'
*          #
*          0
*          1
*          2
*          3
*          4
*          5
*          6
*          7
*          8
*          9
*         10
*         11
*         12
*         13
*         14
*         15  ::

*************************
*      TABLE 13         *
*************************
*::TBL13
*      'GEARCH'
*          #
*         4.4
*         4.0
*         4.3
*         4.2
```

```
*           0.4
*           0.0
*           0.3
*           0.2
*           3.4
*           3.3
*           3.0
*           3.2
*           2.4
*           2.0
*           2.3
*           2.2 ::

**************************
*     TABLE 14           *
*     N VS BARO          *
*      (NBARO)           *
**************************

*::TBL14 (NBARO)
*          BARO                    NBARO
*          KPA                       N
*           15                       0
*           25                      16
*           35                      32
*           45                      48
*           55                      64
*           65                      80
*           75                      96
*           85                     112
*           95                     128
*          105                     144
*          115                     160
*          125                     176
*          135                     192
*          145                     208
*          155                     224
*          165                     240
*          175                     256  ::
**********************************************************************

**************************
*     TABLE 15           *
*     N VS BARO          *
*      (NBARO)           *
**************************

*::TBL15 (NBARO)
*          BARO                    NBARO
*          KPA                       N
*           55                      64
*           60                      72
*           65                      80
*           70                      88
*           75                      96
*           80                     104
*           85                     112
```

```
*          90                    120
*          95                    128
*         100                    136
*         105                    144  ::
**********************************************************************

**************************
*      TABLE 16          *
**************************
*::TBL16
*    LOAD
*    EFFIC
*       96
*      112
*      128
*      144
*      160
*      176
*      192
*      208
*      224
*      240
*      256  ::

**************************
*      TABLE 17          *
**************************
*::TBL17
*       LAG
*       SEC
*         0
*       0.1
*       0.2
*       0.3
*       0.4
*       0.5
*       0.6
*       0.7
*       0.8
*       0.9
*       1.0
*       1.1
*       1.2
*       1.3
*       1.4
*       1.5
*       1.6  ::

**************************
*      TABLE 18          *
**************************
*::TBL18
*    TORQUE
*    ENGPRF
*       96
*      112
*      128
```

```
*       144
*       160
*       176
*       192
*       208
*       224
*       240
*       256  ::

*************************
*       TABLE 19        *
*************************
*::TBL19
*       SPEED
*        RPM
*          0
*        200
*        400
*        600
*        800
*       1000
*       1200
*       1400
*       1600
*       1800
*       2000
*       2200
*       2400
*       2600
*       2800
*       3000
*       3200
*       3400
*       3600
*       3800 ::

**************************
*      TABLE 20          *
**************************
*::TBL20
*     LOAD
*     LV8
*        00
*        16
*        32
*        48
*        64
*        80
*        96
*       112
*       128
*       144
*       160
*       176
*       192
*       208
*       224
*       240
```

```
*       256  ::

*************************
*       TABLE 21        *
*************************

*::TBL21
*     TORQUE
*     EXCTRQ
*        00
*        16
*        32
*        48
*        64
*        80
*        96
*       112
*       128
*       144
*       160
*       176
*       192
*       208
*       224
*       240
*       256  ::

*************************
*       TABLE 22        *
*************************

*::TBL22
*     RATIO
*       %
*     .0000
*     .625
*     .1250
*     .1875
*     .2500
*     .3125
*     .3750
*     .4375
*     .5000
*     .5625
*     .6250
*     .6875
*     .7500
*     .8125
*     .8750
*     .9375
*    1.0000        ::

*************************
*       TABLE 23        *
*************************
*::TBL23
*        PULSES
```

```
*         REF
*         00
*         8
*         16
*         24
*         32
*         40
*         48
*         56
*         64
*         72
*         80
*         88
*         96
*         104
*         112
*         120
*         128
*         136
*         144
*         152
*         160
*         168
*         176
*         184
*         192
*         200
*         208
*         216
*         224
*         232
*         240
*         248
*         256 ::

************************
*       TABLE 24       *
************************

*::TBL24
*     SHFTCOMP
*        %
*       0.00
*      6.25
*      12.50
*      18.75
*      25.00
*      31.25
*      37.50
*      43.75
*      50.00
*      56.25
*      62.50
*      68.75
*      75.00
*      81.25
*      87.50
*      93.75
```

```
*       100.00          ::

**************************
*      TABLE 25          *
**************************
*::TBL25
*       SHFTME
*        SEC
*         0
*        0.05
*        0.1
*        0.15
*        0.2
*        0.25
*        0.3
*        0.35
*        0.4
*        0.45
*        0.5
*        0.55
*        0.6
*        0.65
*        0.7
*        0.75
*        0.8  ::

**************************
*      TABLE 27          *
**************************
*::TBL27
*           ERROR
*            RPM
*             0
*           100
*           200 ::

**************************
*      TABLE 28          *
**************************
*::TBL28
*           RATCHG
*           DLTRPM
*             0
*             8
*            16
*            24
*            32
*            40
*            48
*            56
*            64 ::

**************************
*      TABLE 31          *
**************************
*::TBL31
```

```
*          GM/SEC
*           FLOW
*            0
*            4
*            8
*           12
*           16
*           32
*           48
*           64
*           80 ::

************************
*       TABLE 32       *
************************
*
*::TBL32
*          AIRTMP
*          DEGC
*          COLD
*          -25
*          -12
*          -3
*           4
*          11
*          17
*          22
*          27
*          33
*          39
*          46
*          54
*          65
*          78
*          102
*          HOT
*          HOT ::

************************
*       TABLE 33       *
************************
*::TBL33
*          DELTA
*          GM/SEC
*            0
*           32
*           64
*           96
*          128
*          160
*          192
*          224
*          256  ::

************************
*       TABLE 34       *
```

```
************************
*::TBL34
*         GM/SEC
*          FLOW
*           0
*           4
*           8
*          12
*          16
*          20
*          24
*          28
*          32 ::

************************
*       TABLE 35       *
************************
*::TBL35
*         GM/SEC
*          FLOW
*           0
*           8
*          16
*          24
*          32
*          40
*          48
*          56
*          64 ::

************************
*       TABLE 36       *
************************
*::TBL36
*          MSEC
*           PW
*         0.000
*         0.244
*         0.488
*         0.732
*         0.976
*         1.220
*         1.460
*         1.708
*         1.950
*         2.197
*         2.440
*         2.685
*         2.929
*         3.170
*         3.410
*         3.660
*         3.900  ::

************************
*       TABLE 37       *
```

```
************************
*::TBL37
*           LV8
*          DELTA
*           0
*           64
*           128
*           192
*           256  ::

************************
*      TABLE 38        *
************************
*::TBL38
*    THROTPOS
*       %
*      0.00
*     6.25
*     12.50
*     18.75
*     25.00
*     31.25
*     37.50
*     43.75
*     50.00
*     56.25
*     62.50
*     68.75
*     75.00
*     81.25
*     87.50
*     93.75
*     100.00       ::

************************
*      TABLE 41        *
************************
*::TBL41
*       COUNTS
*        FREQ
*       0000
*       0128
*       0256
*       0384
*       0512
*       0640
*       0768
*       0896
*       1024 ::

************************
*      TABLE 42        *
************************
*::TBL42
*       COUNTS
*        FREQ
*       1024
*       1152
```

```
 *        1280
 *        1408
 *        1536
 *        1664
 *        1792
 *        1920
 *        2048 ::

*************************
*       TABLE 43        *
*************************
*::TBL43
*        COUNTS
*         FREQ
*        2048
*        2176
*        2304
*        2432
*        2560
*        2688
*        2816
*        2944
*        3072 ::

*************************
*       TABLE 44        *
*************************
*::TBL44
*        COUNTS
*         FREQ
*        3072
*        3200
*        3328
*        3456
*        3584
*        3712
*        3840
*        3968
*        4096 ::

*************************
*       TABLE 45        *
*************************
*::TBL45
*        COUNTS
*         FREQ
*        4096
*        4224
*        4352
*        4480
*        4608
*        4736
*        4864
*        4992
*        5120 ::

*************************
*       TABLE 46        *
*************************
```

```
*::TBL46
*        COUNTS
*         FREQ
*        5120
*        5248
*        5376
*        5504
*        5632
*        5760
*        5888
*        5016
*        6144 ::

*************************
*       TABLE 47        *
*************************
*::TBL47
*        COUNTS
*         FREQ
*        6144
*        6272
*        6400
*        6528
*        6656
*        6784
*        6912
*        7040
*        7168 ::

*************************
*       TABLE 48        *
*************************
*::TBL48
*        COUNTS
*         FREQ
*        7168
*        7296
*        7424
*        7552
*        7680
*        7808
*        7936
*        8064
*        3192 ::
*::COMMENTS
```

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES	
ABM	$093E	2411	NONE	
ACNTDEL	$0127	1	NONE	
ACUMDIST	$01E3	2	NONE	
ACUMFUEL	$01E1	3	NONE	
ADBAT	$0068	4	NONE	
ADDRX1	$006E	3772	NONE	
ADDRX2	$006F	3773	NONE	
ADDRX3	$0077	3774	NONE	
ADDRX4	$0074	3775	NONE	
ADDRX5	$0078	3776	NONE	
ADDRX6	$0082	3777	NONE	
ADDRX7	$0083	3778	NONE	
ADDRX8	$00DC	3779	NONE	
AD02AF	$0090	5	NONE	
ADTHROT	$0095	6	NONE	
ALCLMWF	$007B	7	NONE	
ALDLMSGS	$0E6A	3554	NONE	
ALSOICB	$01A6	8	NONE	
ATSDEG	$008F	9	NONE	
BIT0	$0001	10	NONE	
BIT1	$0002	11	NONE	
BIT2	$0004	12	NONE	
BIT3	$0008	13	NONE	
BIT4	$0010	14	NONE	
BIT6	$0040	15	NONE	
BLM	$00A3	16	NONE	
BLMCELL	$00A2	17	NONE	
BPW	$00A5	18	NONE	
CALDATA	$0000	19	75	81
CCPCAL	$04D7	1299	NONE	
COOLDEG	$0088	20	NONE	
COOLDEGA	$008B	21	NONE	
COOLTSU	$008D	22	NONE	
CORRCL	$00AA	23	NONE	
CURMALFA	$002A	24	NONE	
CURMALF1	$0021	25	NONE	
CURMALF2	$0022	26	NONE	
CURMALF3	$0023	27	NONE	
CURMALF4	$0024	28	NONE	
CURMALF5	$0025	29	NONE	
CURMALF6	$0026	30	NONE	
CURMALF7	$0027	31	NONE	
CURMALF8	$0028	32	NONE	
CURMALF9	$0029	33	NONE	
DATECODE	$0002	77	NONE	
DFCAL	$0950	2423	NONE	
DISPFLOW	$00D4	34	NONE	
EGRCAL	$0320	859	NONE	
EGRDC	$00F0	35	NONE	
FAVAL	$00B3	36	NONE	
FILTMPH	$00BA	37	NONE	
FMDBYTE1	$006E	38	3772	
FMDBYTE2	$006F	39	3773	
F1C	$0009	82	NONE	

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
F1EFFADJ	$05CC	1535	NONE
F1EFFICB	$057B	1454	NONE
F1FRCTRQ	$05F7	1578	NONE
F1HFTBL	$0CFE	3343	NONE
F1TRQMLB	$0656	1673	NONE
F1TRQSPK	$0667	1690	NONE
F12CLADJ	$076C	1951	NONE
F12ETRQB	$0707	1850	NONE
F12SHAP	$075B	1934	NONE
F12TMADJ	$0773	1958	NONE
F16B	$0CAE	3265	NONE
F16DERV	$0CC2	3285	NONE
F16PARK	$0CB8	3275	NONE
F16TFMAX	$0CE9	3324	NONE
F16TFMPH	$0CE0	3315	NONE
F17A	$0C42	3161	NONE
F18A	$02AD	744	NONE
F18DEF	$02BF	762	NONE
F19A	$0C53	3178	NONE
F2C	$010B	340	NONE
F2HFTBL	$0D08	3353	NONE
F21	$0978	2464	NONE
F22	$0981	2473	NONE
F23CLADJ	$07F5	2087	NONE
F23ETRQB	$0790	1986	NONE
F23SHAP	$07E4	2070	NONE
F23TMADJ	$07FC	2094	NONE
F27B	$098A	2482	NONE
F28	$099A	2498	NONE
F3HFTBL	$0D12	3363	NONE
F32DELTA	$08B4	2276	NONE
F32MXSPK	$08A5	2261	NONE
F32PRFMX	$089A	2250	NONE
F32RFSLP	$0822	2130	NONE
F32SHAP	$08CE	2302	NONE
F32SHFTM	$08C1	2289	NONE
F33B0	$09AA	2514	NONE
F33B1	$09BC	2532	NONE
F4A	$0180	451	NONE
F4HFTBL	$0D1C	3373	NONE
F4PE	$020E	593	NONE
F43L1	$0517	1354	NONE
F43U1	$053F	1394	NONE
F432GRA	$0563	1430	NONE
F44L1	$052B	1374	NONE
F44U1	$0553	1414	NONE
F5HFTBL	$0D26	3383	NONE
F50F	$09CE	2550	NONE
F51D	$0AD0	2808	NONE
F51PN	$0ABF	2791	NONE
F52A	$0B03	2859	NONE
F53A	$0B11	2873	NONE
F56D	$0AF2	2842	NONE
F56PN	$0AE1	2825	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
F6	$0217	602	NONE
F6HFTBL	$0D30	3393	NONE
F61STPLA	$0B24	2892	NONE
F62	$0B1F	2887	NONE
F64C	$0B2F	2902	NONE
F64RCAL	$0B3D	2916	NONE
F64SCAL	$0B2D	2901	NONE
F65A	$0B4E	2933	NONE
F66	$0B5F	2950	NONE
F67B	$0B69	2960	NONE
F67MUL	$0B73	2970	NONE
F68B	$0B7C	2979	NONE
F7	$021C	607	NONE
F7HFTBL	$0D3A	3403	NONE
F73B	$04E6	1313	NONE
F74ALT	$032F	875	NONE
F74EGR	$0339	885	NONE
F75NOEGR	$0343	895	NONE
F76A	$034C	904	NONE
F76A3	$03C4	1024	NONE
F76A4	$043C	1144	NONE
F77B	$04B4	1264	NONE
F78A1	$04BD	1273	NONE
F78B	$04CA	1286	NONE
F79A	$0D4D	3422	NONE
F79D	$0D64	3445	NONE
F79MUL	$0D5E	3439	NONE
F79MULD	$0D75	3462	NONE
F8C	$01D4	535	NONE
F8HFTBL	$0D44	3413	NONE
F9BLMMIN	$0C12	3113	NONE
F9FTMSG1	$0DE8	3476	NONE
F9FTMSG2	$0DF1	3482	NONE
F9FTMSG3	$0DFA	3488	NONE
F9MALFN	$02D0	779	NONE
F9MSG1	$0E23	3510	NONE
F9MSG2	$0E32	3519	NONE
F9MSG3	$0E4F	3535	NONE
F9MST	$0E03	3494	NONE
F9PNCLT	$0C22	3129	NONE
F90DTPS	$0B84	2987	NONE
F91ATS	$0BA1	3016	NONE
F91DTPSD	$0B8D	2996	NONE
F91DTPSP	$0B97	3006	NONE
F92DECAY	$0BAA	3025	NONE
F94B	$0BBB	3042	NONE
F95B	$0BDB	3058	NONE
F96B	$0BE5	3068	NONE
F97A	$0BF0	3079	NONE
F97SCAL	$0BEF	3078	NONE
F98	$0C01	3096	NONE
HOL	$0902	2355	NONE
ISESDD	$00E2	40	NONE
ISSPMP	$0059	41	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KABRPMEN	$093F	2413	NONE
KABTPSEN	$0941	2414	NONE
KABTQTME	$0943	2416	NONE
KACENGON	$0C8F	3238	NONE
KACESLD	$0704	1847	NONE
KACFANON	$08E7	2327	NONE
KACMINCL	$0C98	3246	NONE
KACMINLR	$0C9D	3250	NONE
KACMINOF	$0C9C	3249	NONE
KACMINTM	$0C9A	3248	NONE
KACMINVS	$0C99	3247	NONE
KACOFDLY	$0C95	3243	NONE
KACOFFH	$0C96	3244	NONE
KACOFFL	$0C97	3245	NONE
KACVSSDL	$0C94	3242	NONE
KADO2AF	$08EE	2333	NONE
KADSUCTA	$08F9	2349	NONE
KAERFCL	$0970	2456	NONE
KAETPS	$0967	2447	NONE
KALDLNUM	$0DE0	3470	NONE
KALTLV8H	$032A	870	NONE
KALTLV8L	$032B	871	NONE
KALTRPMH	$0328	868	NONE
KALTRPML	$0329	869	NONE
KALTTMR	$032D	873	NONE
KAPMIN	$0938	2407	NONE
KASYNC	$093A	2408	NONE
KATSBIAS	$0164	429	NONE
KBKRCLT	$017E	449	NONE
KBKRMPH	$017F	450	NONE
KBKRTD	$017D	448	NONE
KBKRTIM	$017B	446	NONE
KBKRTPS	$017C	447	NONE
KBLESB1	$090F	2369	NONE
KBLESB2	$0910	2370	NONE
KBLESB3	$0911	2371	NONE
KBLESHY	$0915	2375	NONE
KBLMCCP	$08F8	2348	NONE
KBLMCNT	$090E	2368	NONE
KBLMDELT	$0919	2379	NONE
KBLMMAX	$091A	2380	NONE
KBLMMIN	$091B	2381	NONE
KBLPMB1	$0912	2372	NONE
KBLPMB2	$0913	2373	NONE
KBLPMB3	$0914	2374	NONE
KBLPMHY	$0916	2376	NONE
KCCPDC	$04DF	1306	NONE
KCCPOFST	$04DE	1305	NONE
KCCPSLEW	$04DD	1304	NONE
KCCPTM	$04D7	1300	NONE
KCCPTMH	$04D9	1301	NONE
KCCPTMP	$04DC	1303	NONE
KCCPTPSL	$04E3	1310	NONE
KCCPTPSU	$04E2	1309	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KCLDEES	$0925	2391	NONE
KCLDETHA	$0924	2390	NONE
KCLISNG	$0927	2393	NONE
KCLISPO	$0928	2394	NONE
KCLOXTHI	$0920	2386	NONE
KCLOXTLO	$091F	2385	NONE
KCLRATIO	$092E	2400	NONE
KCLRFPLS	$092F	2401	NONE
KCLTCA	$08FE	2352	NONE
KCOASTLH	$054F	1410	NONE
KCOASTLM	$053B	1390	NONE
KCOASTUH	$0527	1370	NONE
KCOASTUM	$0513	1350	NONE
KCOLDBLM	$091C	2382	NONE
KCORCLMN	$0929	2395	NONE
KCORCLMX	$092A	2396	NONE
KCPVST1	$04E0	1307	NONE
KCPVST2	$04E1	1308	NONE
KCRKSEQ1	$08F6	2346	NONE
KCSTDEC	$050B	1344	NONE
KCSTDLY	$050D	1345	NONE
KCSTINC	$0509	1343	NONE
KCSTSUB	$050E	1346	NONE
KCTBIAS	$0163	428	NONE
KDECNT1	$095B	2435	NONE
KDECNT2	$095C	2436	NONE
KDEFAC1	$095D	2437	NONE
KDEFAC2	$095E	2438	NONE
KDEFAC3	$095F	2439	NONE
KDEFAC4	$0960	2440	NONE
KDEFPW	$0936	2406	NONE
KDEGRHYT	$0320	860	NONE
KDELPCTN	$0CF4	3335	NONE
KDELPCTP	$0CF3	3334	NONE
KDELV8MN	$0959	2433	NONE
KDELV8TH	$0926	2392	NONE
KDELWAIT	$0CF8	3339	NONE
KDETPS	$0958	2432	NONE
KDEVSMN	$095A	2434	NONE
KDFCODRM	$0954	2428	NONE
KDFCOLHA	$0953	2427	NONE
KDFCOLLA	$0952	2426	NONE
KDFCOOL	$0957	2431	NONE
KDFCOSPH	$0950	2424	NONE
KDFCOSPL	$0951	2425	NONE
KDFCOTO	$0955	2429	NONE
KDFCOTP	$0956	2430	NONE
KDISFSB	$0DE5	3474	NONE
KDRRPMMD	$094C	2421	NONE
KDRRPMMN	$0948	2419	NONE
KDRRPMMX	$0944	2417	NONE
KDSPLYB6	$0FFE	3771	NONE
KDTPSEN	$096F	2455	NONE
KDTREFCT	$096D	2453	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KDTREFHI	$096E	2454	NONE
KDWDLV8	$0221	612	NONE
KEGRBIAS	$032E	874	NONE
KEGRCOOL	$0325	865	NONE
KEGRHTPS	$0321	861	NONE
KEGRLTPS	$0322	862	NONE
KEGRWARM	$0326	866	NONE
KEGR33D	$0327	867	NONE
KENGPRF	$081D	2125	NONE
KERNCTR1	$016A	433	NONE
KERUNCTR	$0167	431	NONE
KESCOOLA	$017A	445	NONE
KESCTIM	$0175	441	NONE
KFACOEF	$092D	2399	NONE
KFANATSH	$08E5	2325	NONE
KFANATSL	$08E6	2326	NONE
KFANMPHH	$08E2	2322	NONE
KFANMPHL	$08E1	2321	NONE
KFANTMPH	$08E3	2323	NONE
KFANTMPL	$08E4	2324	NONE
KFAOPT1	$08F1	2336	NONE
KFAOPT2	$08F2	2337	NONE
KFAOPT3	$08F3	2340	NONE
KFAOPT4	$08F4	2344	NONE
KFATICT	$092C	2398	NONE
KFILTMPH	$0506	1340	NONE
KFILTNCT	$08F0	2335	NONE
KFN2TMPH	$08DF	2319	NONE
KFN2TMPL	$08E0	2320	NONE
KFRISCAL	$057A	1453	NONE
KFULCAL1	$0DE2	3472	NONE
KGAINSPD	$0819	2121	NONE
KGRSTAT	$0505	1339	NONE
KGRUNLTM	$0577	1450	NONE
KHITPSL	$04E5	1312	NONE
KHITPSU	$04E4	1311	NONE
KHOLATS	$0906	2360	NONE
KHOLCLTH	$0903	2357	NONE
KHOLCLTL	$0902	2356	NONE
KHOLFAML	$090A	2364	NONE
KHOLLV8	$0907	2361	NONE
KHOLNOPE	$0909	2363	NONE
KHOLTIME	$0908	2362	NONE
KHOLVSSH	$0905	2359	NONE
KHOLVSSL	$0904	2358	NONE
KHOTLHI	$08E9	2328	NONE
KHOTLLO	$08EA	2329	NONE
KHRCTA	$0174	440	NONE
KINJCHSD	$0DE1	3471	NONE
KISACDS	$0C8A	3233	NONE
KISACLD	$0C64	3195	NONE
KISACLE	$0C8D	3236	NONE
KISACMN	$0C8C	3235	NONE
KISACMX	$0C8B	3234	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KISACON	$0C3A	3154	NONE
KISCLRST	$0C34	3148	NONE
KISCLTHI	$0C3C	3156	NONE
KISCLTLM	$0C3D	3157	NONE
KISCLTTM	$0C3F	3159	NONE
KISCODM	$0C87	3230	NONE
KISDNDY	$0CA0	3253	NONE
KISDRCL	$0C71	3208	NONE
KISDREN	$0C72	3209	NONE
KISDRMN	$0C73	3210	NONE
KISERGN	$0C6E	3205	NONE
KISERGP	$0C6D	3204	NONE
KISERHN	$0C70	3207	NONE
KISERTH	$0C6F	3206	NONE
KISESDD	$0C6B	3202	NONE
KISESDN	$0C6C	3203	NONE
KISESHRO	$0CAD	3264	NONE
KISHRTIM	$0CAB	3263	NONE
KISINQU	$0C66	3197	NONE
KISINTHD	$0C76	3213	NONE
KISINTHN	$0C77	3214	NONE
KISINTP	$0C8E	3237	NONE
KISITGD	$0C7A	3217	NONE
KISITGDO	$0C7E	3221	NONE
KISITGN	$0C7B	3218	NONE
KISITGNO	$0C7F	3222	NONE
KISITLD	$0C7C	3219	NONE
KISITLDO	$0C80	3223	NONE
KISITLN	$0C7D	3220	NONE
KISITLNO	$0C81	3224	NONE
KISITLTO	$0C79	3216	NONE
KISITLTU	$0C78	3215	NONE
KISMAN	$0CA7	3259	NONE
KISMANOF	$0CA8	3260	NONE
KISMAXCH	$0C41	3160	NONE
KISMPHLM	$0C3E	3158	NONE
KISMPHOL	$0C69	3200	NONE
KISMPSD	$0C84	3227	NONE
KISMPSN	$0C86	3229	NONE
KISMXSP	$0CA2	3255	NONE
KISNDDY	$0CA1	3254	NONE
KISNDED1	$0C74	3211	NONE
KISNDEN1	$0C75	3212	NONE
KISOLDY	$0C9E	3251	NONE
KISPAAN	$0CA6	3258	NONE
KISPKSP	$0C36	3150	NONE
KISPNGN	$0C82	3225	NONE
KISPSAN	$0CA5	3257	NONE
KISQUGN	$0C65	3196	NONE
KISRETH	$0C6A	3201	NONE
KISSUDL	$0C39	3153	NONE
KISTATH	$0C67	3198	NONE
KISTFDCD	$0C83	3226	NONE
KISTFDCN	$0C85	3228	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KISTFDY	$0C9F	3252	NONE
KISTFGN1	$0C88	3231	NONE
KISTFPN	$0C89	3232	NONE
KISVSTH	$0C68	3199	NONE
KI2ULED	$0FFC	3770	NONE
KKATSDEF	$0252	658	NONE
KKDIAWM	$023D	639	NONE
KKDLRPML	$029F	730	NONE
KKDLRPMM	$02A0	731	NONE
KKDLRPMS	$02A1	732	NONE
KKEGRCL	$0293	718	NONE
KKEGRCS	$0295	720	NONE
KKEGRMHL	$0296	721	NONE
KKEGRMHM	$0297	722	NONE
KKEGRMHS	$0298	723	NONE
KKEGRMLL	$0299	724	NONE
KKEGRMLM	$029A	725	NONE
KKEGRMLS	$029B	726	NONE
KKEGRO2L	$02AB	742	NONE
KKEGRO2T	$02AC	743	NONE
KKEGRO2X	$0294	719	NONE
KKEGRTML	$029C	727	NONE
KKEGRTMM	$029D	728	NONE
KKEGRTMS	$029E	729	NONE
KKESCHI	$0279	692	NONE
KKESCLO	$0278	691	NONE
KKETMPAD	$0245	645	NONE
KKETMPH	$0240	641	NONE
KKETMPTH	$023E	640	NONE
KKETMPTL	$0243	644	NONE
KKFLOM21	$024B	651	NONE
KKGEARTM	$025C	669	NONE
KKGRPTM	$025D	670	NONE
KKGR2TM	$025E	671	NONE
KKGR3TM	$025F	672	NONE
KKGR4TM	$0260	673	NONE
KKHFMNCT	$026A	680	NONE
KKHITPS	$024C	652	NONE
KKIACGPS	$0269	679	NONE
KKKMASKA	$0235	632	NONE
KKKMASK1	$022C	623	NONE
KKKMASK2	$022D	624	NONE
KKKMASK3	$022E	625	NONE
KKKMASK4	$022F	626	NONE
KKKMASK5	$0230	627	NONE
KKKMASK6	$0231	628	NONE
KKKMASK7	$0232	629	NONE
KKKMASK8	$0233	630	NONE
KKKMASK9	$0234	631	NONE
KKMASKA	$022B	622	NONE
KKMASK1	$0222	613	NONE
KKMASK2	$0223	614	NONE
KKMASK3	$0224	615	NONE
KKMASK4	$0225	616	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KKMASK5	$0226	617	NONE
KKMASK6	$0227	618	NONE
KKMASK7	$0228	619	NONE
KKMASK8	$0229	620	NONE
KKMASK9	$022A	621	NONE
KKMINGPS	$0266	677	NONE
KKM13TME	$023C	638	NONE
KKM14TME	$0241	642	NONE
KKM15TME	$0246	646	NONE
KKM16TME	$0248	648	NONE
KKM21TME	$024A	650	NONE
KKM22TME	$024F	655	NONE
KKM23LO	$0250	656	NONE
KKM23TME	$0251	657	NONE
KKM24TME	$0258	665	NONE
KKM25HI	$0253	659	NONE
KKM25MPH	$0254	660	NONE
KKM25TME	$0256	663	NONE
KKM26MSK	$025B	668	NONE
KKM26TME	$025A	667	NONE
KKM34TME	$0265	676	NONE
KKM38TME	$026D	682	NONE
KKM41TME	$0273	686	NONE
KKM43TME	$0276	689	NONE
KKM44TME	$027B	694	NONE
KKM45TME	$027D	696	NONE
KKM46MPH	$0281	700	NONE
KKM46TME	$0280	699	NONE
KKNOMALF	$0236	633	NONE
KKO2ENBL	$0237	634	NONE
KKO2HIGH	$023A	636	NONE
KKO2LOD	$023B	637	NONE
KKO2LOW	$0239	635	NONE
KKO2MAX	$027C	695	NONE
KKO2MIN	$027A	693	NONE
KKPRMTW1	$0CAA	3262	NONE
KKPRMTW2	$0255	662	NONE
KKRTDF	$0277	690	NONE
KKSCTRL	$02A5	736	NONE
KKSCTRM	$02A6	737	NONE
KKSCTRS	$02A7	738	NONE
KKSERWD1	$0282	701	NONE
KKSOLTML	$02A2	733	NONE
KKSOLTMM	$02A3	734	NONE
KKSOLTMS	$02A4	735	NONE
KKSUM	$0006	79	NONE
KKTA21	$0249	649	NONE
KKTA22	$024E	654	NONE
KKTCCNVH	$0270	684	NONE
KKTCCNVL	$026E	683	NONE
KKTCDFA	$0242	643	NONE
KKTPSDEF	$024D	653	NONE
KKTPSMAX	$0268	678	NONE
KKTSTNML	$02A8	739	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KKTSTNMM	$02A9	740	NONE
KKTSTNMS	$02AA	741	NONE
KKVOLTHI	$0247	647	NONE
KKVSDM	$0257	664	NONE
KK1UART	$0283	702	NONE
KK26QMSK	$0259	666	NONE
KK38VSSE	$026C	681	NONE
KK39TME	$0272	685	NONE
KK4THHI	$0263	675	NONE
KK4THLOW	$0261	674	NONE
KK42ALPS	$0275	688	NONE
KK42RM	$0274	687	NONE
KK45TPSH	$027E	697	NONE
KK45TPSL	$027F	698	NONE
KK48ENBL	$028B	710	NONE
KK48MPHH	$028A	709	NONE
KK48MPHL	$0289	708	NONE
KK48O2D	$028C	711	NONE
KK48RPMH	$0288	707	NONE
KK48RPML	$0287	706	NONE
KK48TIM	$028D	712	NONE
KK48TPSD	$0286	705	NONE
KK48TPSH	$0285	704	NONE
KK48TPSL	$0284	703	NONE
KK49AVG	$028F	714	NONE
KK49CLO	$028E	713	NONE
KK58CTR	$0292	717	NONE
KK58EDGH	$0291	716	NONE
KK58EDGL	$0290	715	NONE
KLCITHL	$0918	2378	NONE
KLCITHR	$0917	2377	NONE
KLCKDLYT	$0508	1342	NONE
KLCLDL	$090D	2367	NONE
KLCTCLHA	$090C	2366	NONE
KLCTCLLA	$090B	2365	NONE
KLDFLOFF	$0971	2457	NONE
KLDFLON	$0972	2458	NONE
KLVMSCAL	$0931	2403	NONE
KLVTQSCL	$0703	1846	NONE
KLVWOT	$0961	2441	NONE
KLV8EGRH	$0324	864	NONE
KLV8EGRL	$0323	863	NONE
KLV8HYST	$0962	2442	NONE
KMAXADV2	$016C	435	NONE
KMAXRTD2	$016E	436	NONE
KMAXTRQ	$0705	1848	NONE
KMD4LCK	$0F2B	3658	NONE
KMD4TIM	$0F29	3657	NONE
KMINCTS	$0934	2405	NONE
KMINFLOW	$0CF9	3340	NONE
KMINHFFR	$0CFB	3341	NONE
KMINLRN	$0C38	3152	NONE
KMNLCKH	$0529	1372	NONE
KMNLCKM	$0515	1352	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KMNULCKH	$0551	1412	NONE
KMNULCKM	$053D	1392	NONE
KMPHAB	$093E	2412	NONE
KMPHCAL	$04F9	1332	NONE
KMPHFDEL	$0CF7	3338	NONE
KMPHOFF	$0973	2459	NONE
KMPHON	$0974	2460	NONE
KMSGID	$0FF0	3767	NONE
KMTMINLO	$0C37	3151	NONE
KMXMPHD	$04FC	1334	NONE
KNEGLIM	$096A	2450	NONE
KNEGLIM3	$096B	2451	NONE
KNJCHAR2	$0932	2404	NONE
KNO2RUN	$08F7	2347	NONE
KNRUNPLS	$0930	2402	NONE
KOPTMAG1	$04FB	1333	NONE
KOPTVATS	$08F5	2345	NONE
KO2AMAX	$091D	2383	NONE
KO2AMIN	$091E	2384	NONE
KO2ATIME	$08FF	2353	NONE
KO2FFO	$08EF	2334	NONE
KPDLY	$050F	1347	NONE
KPEHYS	$092B	2397	NONE
KPETPS	$0963	2443	NONE
KPIDACDT	$0C91	3239	NONE
KPIDACTH	$0C92	3240	NONE
KPIDACTL	$0C93	3241	NONE
KPIDOPT	$0C33	3147	NONE
KPNRPMMD	$094E	2422	NONE
KPNRPMMN	$094A	2420	NONE
KPNRPMMX	$0946	2418	NONE
KPNSPK	$0170	437	NONE
KPNTIME	$0900	2354	NONE
KPRFEMAX	$081F	2127	NONE
KPRFEMIN	$081E	2126	NONE
KPRFTMIN	$0820	2128	NONE
KPROMROM	$0008	30	NONE
KRAMPCTR	$093C	2409	NONE
KRAMPDEC	$093D	2410	NONE
KREDLINE	$0DE4	1473	NONE
KREFANGL	[illegible]	[illegible]	NONE
KRELLKHI	$0550	1411	NONE
KRELLKMD	$053C	1391	NONE
KRELUNHI	$0528	1371	NONE
KRELUNMD	$0514	1351	NONE
KREL1	$0507	1341	NONE
KRETARDM	$0178	443	NONE
KRETMAX	$0179	444	NONE
KRPMKNOB	$0177	442	NONE
KRPMUP	$0165	430	NONE
KRPMUP1	$0168	432	NONE
KRPMXUL	$0510	1348	NONE
KRPM125F	$0C35	3149	NONE
KRPM2GR	$0578	1451	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
KRUNRST	$0CA3	3256	NONE
KSAALDL	$0172	438	NONE
KSDALALN	$0E51	3536	NONE
KSDGM30	$0FEF	3766	NONE
KSDIACMX	$0DE7	3475	NONE
KSDIACOF	$0C3B	3155	NONE
KSO2L	$0921	2387	NONE
KSO2U	$0922	2388	NONE
KSPDDIV	$04F8	1331	NONE
KSRHR	$0173	439	NONE
KSRVSSHI	$0977	2463	NONE
KSTLGF	$0923	2389	NONE
KTAOFF	$08ED	2332	NONE
KTCCLVH	$0574	1447	NONE
KTCCOFF	$0576	1449	NONE
KTCCTMP	$0573	1446	NONE
KTCHTMR	$0511	1349	NONE
KTCLVTM	$0575	1448	NONE
KTCTPSLH	$0552	1413	NONE
KTCTPSLM	$053E	1393	NONE
KTCTPSUH	$052A	1373	NONE
KTCTPSUM	$0516	1353	NONE
KTFAVKT	$0964	2444	NONE
KTFLV8C	$0965	2445	NONE
KTFTPSC	$0968	2448	NONE
KTFTPS2C	$0969	2449	NONE
KTFTPS3C	$096C	2452	NONE
KTIMCOOL	$04DB	1302	NONE
KTIMELAG	$016B	434	NONE
KTLV8INT	$0966	2446	NONE
KTPSFDEH	$0CF6	3337	NONE
KTPSFDEL	$0CF5	3336	NONE
KTPSHYST	$032C	872	NONE
KTPSMT	$0942	2415	NONE
KTPSTFMN	$0CF2	3333	NONE
KTPS32	$0579	1452	NONE
KT1A	$08FA	2350	NONE
KT2A	$08FC	2351	NONE
KVSSLMT	$0975	2461	NONE
KVSSLMTC	$0976	2462	NONE
[illegible]	[illegible]	[illegible]	NONE
K1STGR	$0503	1338	NONE
K1TRQRTO	$0655	1672	NONE
K12	$0707	1849	NONE
K12ACNT	$0787	1977	NONE
K12BIAS	$0785	1976	NONE
K12COEF	$078B	1980	NONE
K12DELTA	$0788	1978	NONE
K12DFLTM	$078D	1982	NONE
K12FREZE	$0784	1975	NONE
K12QUIT	$078C	1981	NONE
K12SHTRQ	$078A	1979	NONE
K12TLATE	$078F	1984	NONE
K12TSOON	$078E	1983	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
K2HFTBL	$0D07	3352	NONE
K2NDGR	$0501	1337	NONE
K23	$0790	1985	NONE
K23ACNT	$0810	2113	NONE
K23BIAS	$080E	2112	NONE
K23COEF	$0814	2116	NONE
K23DELTA	$0811	2114	NONE
K23DFLTM	$0816	2118	NONE
K23FREZE	$080D	2111	NONE
K23QUIT	$0815	2117	NONE
K23SHTRQ	$0813	2115	NONE
K23TLATE	$0818	2120	NONE
K23TSOON	$0817	2119	NONE
K3	$08EB	2330	NONE
K3HFTBL	$0D11	3362	NONE
K3RDGR	$04FF	1336	NONE
K32COEF	$0821	2129	NONE
K32GAINH	$081A	2122	NONE
K32GAINL	$081B	2123	NONE
K32TPSLM	$081C	2124	NONE
K4	$08EC	2331	NONE
K4HFTBL	$0D1B	3372	NONE
K4THGR	$04FD	1335	NONE
K5HFTBL	$0D25	3382	NONE
K6HFTBL	$0D2F	3392	NONE
K7HFTBL	$0D39	3402	NONE
K8HFTBL	$0D43	3412	NONE
LASTCAL	$0D7B	3468	NONE
LASTPROM	$0FF1	3768	NONE
LCCPMW	$0078	42	3776
LV8	$00B7	43	NONE
MALFFLGA	$001D	44	NONE
MALFFLG1	$0014	45	NONE
MALFFLG2	$0015	46	NONE
MALFFLG3	$0016	47	NONE
MALFFLG4	$0017	48	NONE
MALFFLG5	$0018	49	NONE
MALFFLG6	$0019	50	NONE
MALFFLG7	$001A	51	NONE
MALFFLG8	$001B	52	NONE
[illegible]	[illegible]	[illegible]	[illegible]
MCUINST	$0077	54	3774
MWFA	$0082	55	3777
MWFA1	$0083	56	3778
MW1	$0074	57	3775
MW2	$0075	58	NONE
NEWRFPER	$00C4	59	NONE
NOCKRTD	$00D0	60	NONE
NTRPMX	$009C	61	NONE
OLDPA3	$0243	62	NONE
OPTBLCC	$0020	2343	NONE
OPTCLINT	$0002	2341	NONE
OPTDEGR	$0080	2339	NONE
OPTEGRDC	$0010	2342	NONE

SYMBOL NAME	VALUE	DEFINED AT LINE	REFERENCES
OPTWMPRK	$0040	2338	NONE
PID	$0C33	3146	NONE
PIDMW1	$00DC	63	3779
PIDMW2	$00DD	64	NONE
PROMIDA	$0000	76	NONE
PURGEDC	$010A	65	NONE
RPLSCNTR	$0035	66	NONE
RPM2BYT	$01F6	67	NONE
SAP	$0239	68	NONE
SC1SDI	$006C	69	NONE
SDALDLIC	$01D2	70	NONE
SDISCRIN	$0FE9	3760	NONE
SDRMFOM0	$0E61	3548	NONE
SDRMFOM1	$0E76	3560	NONE
SDRMFOM2	$0F05	3633	NONE
SDRMFOM3	$0F0E	3639	NONE
SDRMFOM4	$0F17	3645	NONE
SDRMFOM7	$0F20	3651	NONE
SDRM4F	$0F5A	3687	NONE
SDRM40	$0F2D	3660	NONE
SDRM41	$0F48	3675	NONE
SDRM42	$0F51	3681	NONE
SDRTBL	$0E58	3541	NONE
SDRTBL30	$0F2D	3659	NONE
SDVICB	$0184	71	NONE
SDVOCB	$01C8	72	NONE
SEQNUMB	$0004	78	NONE
TESTBYTE	$029D	73	NONE
TIME	$0036	74	NONE

FROM AUGUST 90 DPG TRIP
(-10dB CAL)

ATTACK AND RECOVERY SOFTWARE VALUES

1993MY 3300 SFI A AND N PLATFORM
(FRONT SENSOR BOSS)

LOCATION	ATTACK	RPM	LOCATION	RECOVERY
$82CB	$16	0400	$82D0	$04
$82CC	$19	1200	$82D1	$04
$82CD	$19	2000	$82D2	$04
$82CE	$1E	3200	$82D3	$07
$82CF	$1E	4800	$82D4	$07

ATTACK AND RECOVERY SOFTWARE VALUES

1993MY 3800 TPI C AND W PLATFORM
(FRONT SENSOR BOSS)

LOCATION	ATTACK	RPM	LOCATION	RECOVERY
$82CB	$10	0400	$82D0	$0B
$82CC	$12	1200	$82D1	$07
$82CD	$14	2000	$82D2	~~$05~~ $07
$82CE	$14	3200	$82D3	$09
$82CF	$14	4800	$82D4	$09

93GMEDFLINTSFTWR

NUMBER


```
                                  * -----------------------------------------------------------------------------
 624  8235 0028         KMAXADV2 FDB     43
                                  *-                         (        15) :0235: 'DEG     ' MAXIMUM ADVANCE
                                  *-                         :               RELATIVE TO REFERENCE (2'S COM
                                  *-                         :           ::IF(E.GE.90)N(2)=255 ::
                                  * -------------------------:           ::IF(E.LT.90)N(2)=E*256/90 ::
 625  8237 FF39         KMAXRTD2 FDB     65337                             ::IF(E.LE.-90)N(2)=-255 ::
                                  *-                         (       -70) :0237: 'DEG     ' MAXIMUM RETARD
                                  *-                         :               RELATIVE TO REFERENCE (2'S
                                  *-                         :               COMP)
                                  *-                         :           ::IF(E.GE.90)N(2)=255 ::
                                  * -------------------------:           ::IF(E.LT.90)N(2)=E*256/90 ::
 626  8239 FFFF         KPNSPK   FDB     65535                             ::IF(E.LE.-90)N(2)=-255 ::
                                  *-                         (      -0.3) :0239: 'DEG     ' PARK/NEUTRAL SPARK
                                  *-                         :               ADVANCE
                                  *-                         :           ::IF(E.GE.90)N(2)=255 ::
                                                             :           ::IF(E.LT.90)N(2)=E*256/90 ::
                                  * -------------------------:           ::IF(E.LE.-90)N(2)=-255 ::
 627  823B 00           KSRHR    FCB     0
                                  *-                         (         0) :023B: 'DEG     ' HOT RESTART SPARK
                                  *-                         :               RETARD
                                  * -------------------------:           ::EQU N=E*256/90 ::
 628  823C C0           KHRCTA   FCB     192
                                  *-                         (       104) :023C: 'DEG C   ' HOT RESTART SPARK
                                  *-                         :               RETARD COOLANT THRESHHOLD
                                                                         ::EQU N=(E+40)*256/192 ::
                                  ******************
                                  * ESC PARAMETERS *
                                  ******************
                                  * -----------------------------------------------------------------------------
 629  823D 0005         KESCTIM  FDB     5
                                  *-                         (         5) :023D: 'SEC     ' IF ENG RUN TIME <
                                  * -------------------------:               THIS SKIP ESC
 630  823F 48           KRPMKNOB FCB     72                                ::EQU N=E ::
                                  *-                         (       900) :023F: 'RPM     ' CUTOFF FOR ESC RETARD
                                  *-                         :               INCREASE
                                  * -------------------------:           ::EQU N=E/12.5 ::
 631  8240 55           KRETARDM FCB     85
                                  *-                         (        15) :0240: 'DEG     ' MAX. ALLOWABLE RETARD
                                  *-                         :               EGR ON  (256 = 45 DEG)
                                  * -------------------------:           ::EQU N=E*256/45 ::
 632  8241 55           KRETMAX  FCB     85
                                  *-                         (        15) :0241: 'DEG     ' MAX. RETARD ALLOWED
                                  *-                         :               IN POWER ENRICHMENT
                                  * -------------------------:           ::EQU N=E*256/45 ::
 633  8242 35           KESCOOLA FCB     53
                                  *-                         (         0) :0242: 'DEG C   ' ESC COOLANT CUTOFF
                                                             :           ::EQU N=(E+40)*256/192 ::
```



```
                                  ***********************************
                                  * BURST KNOCK RETARD PARAMETERS *
                                  ***********************************
 634  8243 20           KBKRTIM  FCB     32
                                  *-                         (       0.4) :0243: 'SEC     ' BKR ACTIVE TIME
                                  * -------------------------:           ::EQU N=E*80 ::
 635  8244 00           KBKRTPS  FCB     13
                                  *-                         (         5) :0244: '%       ' TPS DELTA THRESHOLD
                                  * -------------------------:               TO ACTIVATE BKR
 636  8245 00           KBKRTD   FCB     0                                  ::EQU N=E*2.56 ::
                                  *-                         (         0) :0245: 'DEG     ' BKR RETARD FOR ACTIVE
                                  * -------------------------:               MODE
 637  8246 BD           KBKRCLT  FCB     189                               ::EQU N=E*256/90 ::
                                  *-                         (       102) :0246: 'DEG C   ' IF COOLANT < THIS,
                                  * -------------------------:               SKIP BKR
 638  8247 14           KBKRMPH  FCB     20                                ::EQU N=(E+40)*256/192 ::
                                  *-                         (        20) :0247: 'MPH     ' IF MPH > THIS, SKIP
                                  *-                         :               BKR
                                                                         ::EQU N=E ::

                                  ***********************************************************
                                  *     F4PE TABLE  SPARK RETARD VS. TIME IN POWER ENRICHMENT   *
                                  ***********************************************************
                                  *-
 639  8248 00                     * -------------------------:           ::TBL2D,9,1,TBL9,1,2,'DEG' ::
                        F4PE     FCB     0
                                  *-                         (         0) :0248: 'DEG     '  0.0    SEC-TIME
 640  8249 00                    FCB     0                   (               ::EQU N=E*256/90 ::
 641  824A 00                    FCB     0                   (         0) :0249: 'DEG     '  3.2
 642  824B 00                    FCB     0                   (         0) :024A: 'DEG     '  6.4
 643  824C 00                    FCB     0                   (         0) :024B: 'DEG     '  9.6
 644  824D 00                    FCB     0                   (         0) :024C: 'DEG     ' 12.8
 645  824E 04                    FCB     4                   (         0) :024D: 'DEG     ' 16.0
 646  824F 08                    FCB     8                   (       1.4) :024E: 'DEG     ' 19.2
 647  8250 08                    FCB     8                   (       2.8) :024F: 'DEG     ' 22.4
                                                             (       2.8) :0250: 'DEG     ' 25.6
 648  8255                       ORG     $8255
                                  *
                                  *-     DIAGNOSTIC PROM TEST WORD 2
 649  8255 AA                     * -------------------------:           ::PROTECT::
                        KKPRMTW2 FCB     $AA
                                  *-                         (       $AA) :0255: '        ' DIAGNOSTIC PROM TEST
                                  *-                         :               TEST WORD 2
                                  *-                         :           ::EQU N=E ::
                                                                         ::NOPROTECT ::
```

DATAEST

```
                          ******************************************************
                          *    F68SPARK TABLE                                  *
                          *  POWER ENRICHMENT SPARK TRIM VS RPM (NTRPM)        *
                          *                                                    *
                          *    TABLE VALUE = 0-1 MULTIPLIER                    *
                          *                                                    *
                          ****************************************************** ::TBL2D,8,TBL7,3,2,'% CHG ' ::
                          *-                                         :
                          * -----------------------------------------------------------------------------
650  8256 80              F68SPARK FCB     128                      (      0.5)  :0256: '% CHG '      800   RPM-SPEED
                          *-                                        :            ::EQU N=E*256 ::
651  8257 80                       FCB     128                      (      0.5)  :0257: '% CHG '     1600
652  8258 FF                       FCB     255                      (    0.996)  :0258: '% CHG '     2400
653  8259 FF                       FCB     255                      (    0.996)  :0259: '% CHG '     3200
654  825A FF                       FCB     255                      (    0.996)  :025A: '% CHG '     4000
655  825B FF                       FCB     255                      (    0.996)  :025B: '% CHG '     4800
656  825C FF                       FCB     255                      (    0.996)  :025C: '% CHG '     5600
657  825D FF                       FCB     255                      (    0.996)  :025D: '% CHG '     6400
```

'3300'

DATAEST

```
                          ******************
                          * ESC TABLES     *
                          ******************
                          ******************************
                          * F6 TABLE                   *
                          * ESC ATTACK RATE VS. RPM    *
                          ******************************
                          *
                          *  TABLE VALUE ATTACK RATE IN DEGREES/MSEC  / .0225   ::TBL2D,5,TBL1,1,4,'DEG/MS' ::
                          *-                                         :
                          * -----------------------------------------------------------------------------
658  825E 14              F6       FCB     20                       (     0.45)  :025E: 'DEG/MS'   400   RPM-SPEED
                          *-                                        :            ::EQU N=E/.0225 ::
659  825F 14 20                    FCB     20                       (     0.45)  :025F: 'DEG/MS'  1200
660  8260 14 20                    FCB     20                       (     0.45)  :0260: 'DEG/MS'  2000
661  8261 18                       FCB     24                       (     0.54)  :0261: 'DEG/MS'  3200
662  8262 1D                       FCB     29                       (     0.65)  :0262: 'DEG/MS'  4800

                          ******************************
                          * F7 TABLE                   *
                          * ESC % RECOVERY RATE VS RPM *
                          ******************************
                          *
                          *  TABLE VALUE:PER CENT RECOVERY PER SECOND * 256/500   ::TBL2D,5,TBL1,1,4,'%/SEC' ::
                          *-                                         :
                          * -----------------------------------------------------------------------------
663  8263 10              F7       FCB     16                       (       31)  :0263: '%/SEC '   400   RPM-SPEED
                          *-                                        :            ::EQU N=E*256/500 ::
664  8264 10                       FCB     16                       (       31)  :0264: '%/SEC '  1200
665  8265 10                       FCB     16                       (       31)  :0265: '%/SEC '  2000
666  8266 0E                       FCB     14                       (       27)  :0266: '%/SEC '  3200
667  8267 0D                       FCB     13                       (       25)  :0267: '%/SEC '  4800

                          * -----------------------------------------------------------------------------
668  8268 20              KDWDLV8  FCB     32    18?                (       32)  :0268: 'LV8     ' IF DELTA LV8 > THIS
                          *-                                        :                 THEN MAX DWELL
                          *-                                        :            ::EQU N=E ::
```

```
     2.5 for 3
1500 3.2 for 5msec
     3.0 for 4
     1.8 for 2
```

```
5E  1D     63  08
F   1D     64  08
60  1D     65  08
61  1D     66  0A
62  1D     67  0B
```