ET PREDICTOR II ™ v6.05R - Instructions

Welcome to the world of high-tech drag racing! The ET PREDICTOR II Computer from Family Software will enable you to properly manage air/fuel ratios for the current air density, track vehicle performance or modifications, and accurately predict elapsed time and throttle stop settings according to varying weather conditions. Included are programs to calculate Air Density, Horsepower Correction, Density Altitude, Displacement, Compression Ratios, Corrected Elapsed Time, Run Completion, Corrected HP from MPH, Horsepower Corrected Weight, and our exclusive **Run Segment Analysis™** program for Compulink style race tracks. The next best thing to having an on-board computer. We have even included a program to quickly calculate the total delay when using a single timer delay box to crossover on your opponent's top bulb.

INTRODUCTION

The ET PREDICTOR II Computer uses the most accurate ET Prediction and Weather Station software available. The ET PREDICTOR II provides a Horsepower Correction Factor (HCF) and Air Density Index (ADI) using a standard of 0 elevation, 29.92 In Hg pressure, 60 degrees F temperature, and 0 percent relative humidity. Under these conditions, the HCF equals 1.0000 and the ADI will equal 100.0 percent. The HCF and ADI compensate for pressure, temperature, and relative humidity. Conditions that improve the HCF and ADI are cold air, high air pressure, and low humidity.

The ET PREDICTOR II is based on the PC-1270 Pocket Computer manufactured by SHARP Electronics. The PC-1270 is both a computer and a calculator. Therefore, when not running one of the built-in programs, you can use the calculator mode for numerous other tasks. The computer is equipped with a numeric keyboard, 16-digit display, and Family Software programmed 16K-byte RAM program card. Two (2) built-in lithium batteries power the computer. Under normal use, the batteries should last several years. All programs and data are stored safely in the RAM program card and will remain there even when the power is turned off. The computer also has an Auto-Off function to help conserve battery life.

If the RAM program card is removed, a small lithium cell located inside the card, maintains your data and the program. When the program card is installed in the computer, it is then powered by the computer batteries, not the internal cell.

Note: NEVER press the reset button located inside the back cover. Doing so will erase the program and data from the card, and it will then have to be returned for re-programming.

Located on the left side of the computer are eight (8) Program Start Keys, or PSK's. Each of these keys has a different program or function assigned to it. The PSK's are identified from left to right as 1 to 4 on the top row and 5 to 8 on the bottom row. Whenever you first turn on the computer, it will function in the calculator mode. To run any one of the programs, simply press the proper PSK. To switch to another program, press it's PSK. To exit a program and return to the calculator mode, just press the ON (CA) key. Your new computer will be configured for gasoline fuel and PRO mode. To switch to the methanol calibration, run the SETUP program on PSK # 8.

PRO/NOVICE MODE

There are two different modes your computer can operate in, PRO or NOVICE. The computer runs faster in the PRO mode, however, the user must fully understand how the Horsepower Correction Factor (HCF) is used. Every time you enter the current air conditions, the computer converts this information (the elevation, barometric pressure, temperature, and humidity) into a Horsepower Correction Factor (HCF). Think of the HCF as a *weather factor* representing those particular air conditions. Then, when it becomes necessary for you to enter the air for your base run, you only have to remember the HCF. You then enter only one value instead of the four (4) original values. The program will ask for the BASE HCF and nothing else. The PRO mode is the preferred mode of operation and every user should eventually use it. However, when just starting out, a new user may have difficulty in understanding this process. Therefore, the computer may be set to operate in the novice mode.

In the NOVICE mode, whenever the computer needs the new, or current, air conditions, it will briefly display, 'ENTER *NEW* AIR', and then prompt ELEV.FT?, BARO IN?, TEMP DEGS?, and HUMIDITY?. When the 'INPUT BASE RUN' program needs to know the old, or BASE, air conditions, it will display, 'ENTER *OLD* AIR', and then prompt for BASE ELEV?, BASE BARO?, BASE TEMP?, and BASE RH?. It will then briefly display the computed BASE HCF for your information. To switch between PRO and NOVICE mode, you must run the SETUP program on PSK # 8.

GETTING STARTED

The POWER switch is located at the upper right corner of the computer. Slide the switch to the ON position. If you have the optional printer and wish to make a hard copy of the output, turn on the printer first and then press the red C-CE key on the computer to enable the printer interface. Next, to execute the ET PREDICTION program, press PSK # 1. All the data you will be entering will be saved in the computer's Random Access Memory (RAM). It is then displayed as the current data the next time you run the program. Before requesting new data input for a variable, the program will first display that variable's current value. Then, after pressing the 'ENTER' key to continue, the program will prompt for new input for that variable. Whenever requesting new input for a data variable, a question mark will be displayed after the item. You should only attempt to enter data when a question mark is present. If the current data shown is okay and does not have to be changed, you may just press the ENTER key to accept the current data for that variable and continue on to the next. For example, the program will first display the current elevation as:

ELEV. FT   0.

This shows that the value for the current elevation is 0. Now, press ENTER, to continue. You will see:

ELEV. FT?

The program is now asking you to enter in a new value for elevation. If you want to use the current value, in this case 0, simply press ENTER and continue on. The elevation will remain set to 0. Otherwise type in a new value for elevation. If you make a mistake in entering the data, press the C-CE key. The data field will be erased and you can try again. Then press ENTER to display the next item of current data. When you have entered all the necessary input, the output data will be displayed one item at a time. You must press ENTER to display the next data value to be output. When all the data has been displayed, the program will prompt:

HARD COPY?(Y/N)_

If you have the optional printer and wish a hard copy, press the 'YES' key. Otherwise, you may press the ENTER key to continue. In either case, you will then be returned to the start of the program at the ELEV. FT prompt. To exit the program, you may press the ON (CA) key. Its purpose is to halt program execution. Or you may run another program.

INPUT VARIABLES

Below is a listing and explanation of the Input variables and Output data. Be sure to follow the specific directions for the type of weather instruments you are using. In order to help prevent user errors, all values entered are compared to a specific range. If the data entered is smaller or larger than the expected input, the computer will display, 'OUT OF RANGE!', and then re-display the original value, thereby allowing the user to correct his error.

ELEV. FT (Elevation - Range: -3,000 to +26,000 Feet)

If you're using an uncorrected barometer to obtain the absolute pressure, you must always enter 0 for the elevation. If you have an altimeter, set it to 29.92 In Hg and enter the reported altitude as the elevation. If your area requires that you use a corrected barometer, then you should always enter the number of feet that is equal to the amount of correction.

BARO. IN (Barometer - Range: 12 to 35 Inches Hg)

If you're using a barometer to obtain the air pressure, enter the barometric pressure from the gauge. When using an altimeter, you must always enter 29.92 for the barometric pressure. We offer a digital altimeter that has a resolution of just one (1) foot, Part # 1008.

TEMP DEGS. (Temperature - Range: 10 to 130 degrees F)

Enter the temperature from a digital thermometer. Never use the readings reported on your time card. These sensors are not accurate! From round to round, temperature changes effect performance more than any other variable.

HUMIDITY % (Relative Humidity - Range: 0 to 100 Per Cent)

You can use a digital hygrometer to find the relative humidity. At low temperature, relative humidity has the least effect on performance. However, at high temperatures, its effect is much greater. For example, 50% RH at 60 F will result in a .01 loss in power, while at 90 F the addition of 50% RH equals about a .03 loss in power.

BASE HCF (Base HP Correction Factor - Range: 0 to 5.0000)

In PRO mode, enter the HP Correction Factor that corresponds to the ET from the run you are using to predict from. Your predicted ET is computed using the BASE HCF, BASE ET, and the new weather conditions. In NOVICE mode, or if

you enter 0 for the HCF in PRO mode, the program will ask for the BASE ELEV, BASE BARO, BASE TEMP, and BASE RH% and then calculate the BASE HCF for you.

BASE ET (Base Elapsed Time - Range: 0 to 99 Seconds)
    Enter the actual ET that you want to base your predicted performance on. If you are using high quality weather instruments, this can be any previous ET for which you have a corresponding HP Correction Factor (HCF). Due to other variables that can affect your vehicle performance, such as traction factors etc., we recommend that you use the most recent or best ET obtained during time trials or eliminations.

BASE 60 (Base 60' ET - Range: 0 to 99 Seconds)
    Enter the 60 foot ET from your base run in order to predict your new 60 foot ET.

BASE 330/BASE 660/BASE1000 (Base 330', 660', 1000' ET - Range: 0 to 99 Seconds)
    Enter the interval times from your selected base run if you want to predict them. Enter 0 to skip any one interval prediction. It will not appear on the display or on hard copies if you enter 0.

WEIGHT (Vehicle Weight including driver)
    The Vehicle Weight and Ballast is only used in the computation for finding the Horsepower Corrected Weight. These variables are NOT used in predicting Elapsed Times. Therefore, if you are not using ballast and vehicle weight to adjust your ET, then these variables can be set to zero. See HPC LBS.

BALLAST (Weight bars or other ballast not included in Vehicle Weight) *See WEIGHT above and HPC LBS.*

OUTPUT DATA

PRED ET/PRED 60F (Predicted ET/Predicted 60'ET)
    Predicted elapsed times based on your BASE HCF, BASE ET, BASE 60F, and the new weather conditions.

PRED 330/PRED 660/PRED1000 (Predicted 330', 660', and 1000' ET)
    Predicted interval times based on your BASE HCF, BASE 330, BASE 660, BASE1000, and the new weather conditions. Predicted interval times are optional.

CURR HCF (Current HP Correction Factor)
    The CURR HCF is the Horsepower Correction Factor (or weather factor) that is computed using the current weather conditions that you enter. In other words, the CURR HCF is equal to, the current elevation, barometer, temperature, and humidity. When the HCF is higher, less horsepower is produced, and the car will run slower. So, the lower the HCF is, the faster the car will run. You can use the HCF to determine the variance in horsepower or torque that is being produced under different weather conditions. For example, if your engine produces 400 horsepower with an HCF of 1.012, it will produce 404.80 horsepower at sea level conditions (STP) or 1.0000 (400 x 1.012=404.80).

VAPOR PR (Vapor Pressure)
    The vapor pressure is that portion of the barometric pressure (water vapor), expressed in inches of mercury (In Hg), that is present due to moist air (humidity). Vapor pressure displaces oxygen.

AIR DENS (Air Density Index)
    The Air Density Index (ADI) is the computed ratio of the current density to that of STP with STP having an index of 100 percent. This factor is used to determine the correct jetting or pill size required under varying weather conditions. The higher the ADI, the more air there is available for combustion. Therefore, more fuel must be burned to maintain the correct air/fuel ratio. When using gasoline, a four (4) percent change in the ADI will usually necessitate a change in jet area in order to maintain the same level of performance. Holley jet sizes are about 4 percent apart in flow area. If the ADI goes up four (4) percent, for example 100.0 to 104.0, increase all jet sizes by one number. And, if the ADI goes down four (4) percent, for example 100.0 to 96.0, decrease all jet sizes by one number.

DENS ALT (Density Altitude)
    Density altitude is the air density expressed in feet of elevation. Density Altitude is also known as corrected altitude.

HPC LBS (Horsepower Corrected Weight)
    The computer uses the input variables WEIGHT and BALLAST as the total vehicle BASE weight and then corrects this weight to the current air conditions. The reported HPC LBS changes with the weather conditions entered. The HPC LBS should be logged in your logbook for every run that you make. By adding or removing ballast, the car can be made to run the same Elapsed Time in different air conditions without changing the throttle stop. For example, u

conditions, the reported HPC LBS was 1720 and the car ran an 8.900 ET. Later on, the HPC LBS is now 1740 because of worsening air conditions. If you remove 20 pounds of ballast, the car will still run an 8.900 ET.

QUICK START FOR ET PREDICTION

First you must establish a base line for performance. This can be the results of one good run or an average of several runs. You must log a Current Horsepower Correction Factor (CURR HCF) and corrected ET (STP ET) for each pass that you make. The STP ET will enable you to determine which run is the best, regardless of the weather conditions present on the run. The HCF is the correction factor defined by the current weather conditions for the time of that particular run. The HCF is then equal to that elevation, barometer, temperature, and humidity. Therefore, when it becomes time to predict your next ET, it isn't necessary to remember all the previous weather variables. You only have to remember the Current HCF and Actual ET from each run. When you wish to predict a future run, the CURR HCF and Actual ET from your time run will become the BASE HCF and BASE ET that you enter into the computer for your BASE RUN.

Step 1: Establish Base Performance. Immediately after each time trial, run the HCF/Corrected ET program, PSK #3. The HCF/Corrected ET program is for 1/8 mile or 1/4 mile tracks not using the Compulink timing system. If you are running on a Compulink equipped track, always use the STP Run Segment Analysis program, PSK # 2. For the following example we will be using the HCF/Corrected ET program and gasoline fuel calibration with the computer operating in the PRO mode. We'll say that the first run netted an ET of 9.352, a 60' time of 1.348, and the weather conditions were: Barometer=29.82, Temperature=73, and the RH%=56. Turn on your computer and press PSK # 3. The first prompt request is for ELEV. FT?. Using an uncorrected barometer (absolute pressure) the elevation should always be set to 0. Enter 0 and press ENTER. The next prompt requests BARO. IN?. Enter the barometer reading as 29.82. The next prompt requests TEMP DEGS.?. Enter the temperature as 73. Next, the computer asks HUMIDITY % ?. You enter 56. Press ENTER and the computer will report 'CURR HCF 1.0374'. Press ENTER and you should see 'VAPOR PR 0.458'. Press ENTER again and you should see 'AIR DENS 95.737'. Press ENTER again and you should see 'DENS ALT 1476'. This is the 'air' for your first pass. The next prompt is asking for the ACTUAL ET. Enter the 9.352 that the car just ran. Next, the computer will report 'STP ET 9.238'. This is the STP Corrected ET. The STP ET is the time that the car would have run if the weather conditions were perfect. The best run of the day will be the one with the lowest STP ET. If you use this run as your base line, your BASE ET would be 9.352, your BASE 60F would be 1.348, and your BASE HCF would be 1.0374.

Step 2: Input Base Run. For this example, we will say that you made two more time trials and logged an STP ET and CURR HCF for each run. The lowest STP ET of the three runs was the 9.238 from the first pass. When eliminations begin, we'll use that run as our base line. Press PSK # 5 to start the 'INPUT BASE RUN' program. The computer will display the value for the last BASE HCF that you used. Remember that the BASE HCF is a number that you are feeding into the computer as part of your base line. It is the value that was equal to the weather conditions for the run that you wish to predict from. In this case, the HCF from our best run was 1.0374. Press ENTER and the computer will ask BASE HCF?. At this point enter the 1.0374. Next, you must enter the BASE ET which is the ACTUAL ET from that same run, or in this case, 9.352. Next, enter the BASE 60F. In this example, 1.348.

Step 3: Predict ET. Two hours later, you are in the staging lanes awaiting your first round. The new weather conditions are: Barometer=29.88, Temperature=70, Humidity=60. Turn on your computer and press PSK # 1. This is the ET Prediction program. At each prompt, enter the new weather conditions. The computer will then report the PRED ET of 9.332 and the PRED 60F of 1.345. This is the predicted performance and is what your car should run under the current weather conditions, providing that the air/fuel ratio is correct. On gasoline engines the air/fuel ratio must be about 12.5 to 1 for proper results.

It is important to understand that the BASE 60F is not used in predicting the full track ET. Rather it is used to predict the 60 foot time only. The predicted 60 foot time is used to keep track of the traction factor. If your actual 60 foot time is not the same as the predicted 60 foot time, the amount of traction available is changing. You may have to adjust your dial to compensate for varying track conditions. If you enter a BASE 330, BASE 660, or BASE1000 time, then a predicted ET will also be reported for each of these. Enter a 0 for any BASE time that you don't have or do not wish to use. The computer will then skip that prediction.

Step 4: Predict Throttle Stop. If you are using a throttle stop, predict the required timer duration. *See throttle stop management.*

DESCRIPTION OF MEMORY RESIDENT PROGRAMS

To execute a program, turn on the computer and press it's PSK key 1 - 8. Each program momentarily displays its title after pressing it's PSK, so it is easy to find the program you want to use. To change to another program, at any time, just press it's assigned PSK. Some programs, upon ending, will reset the computer to the calculator mode. Ot

continue to run, returning to a particular section of the program for new input. This is handy when you need to perform several calculations using similar data. To exit a continuous running program, either select another program, or press the 'ON' (CA) key. This action will return the computer to the calculator mode of operation.

PSK-1	PSK-2	PSK-3	PSK-4
ET Prediction	Run Analysis	HCF/STP ET	Run Completion
PSK-5	**PSK-6**	**PSK-7**	**PSK-8**
Base Run	Cross Over	T-Stop	Setup, etc.

PSK # 1 - ET Prediction Program

Using a base line of performance consisting of a previous ET (BASE ET) and its associated Horsepower Correction Factor (BASE HCF), this program will calculate and predict a new ET under new weather conditions. This is used to determine the proper dial-in or in determining a need to adjust a throttle stop. This program will also predict 60', 330', 660' and 1000' times if base data is entered.

PSK # 2 - Quarter Mile STP Run Segment Analysis™

This program is designed for use on quarter mile tracks using a timing system that reports 60', 330', 660', 1000', and 1320' elapsed times. Other than having an on-board computer, we feel that it is currently the ultimate tool available to help a racer obtain maximum consistency and performance from his race car. After entering the above times from your time slip, the program treats the track as six (6) separate distance segments. Think of it as six individual races of different lengths. These are the 0'-60', 60'-330', 330'-660', 660'-1000', 1000'-1320', and 0'-1320' distances. The actual time and the STP (corrected) time are reported for each of the above distance segments. This allows you to quickly analyze what the car is doing at any point on the track. Because the times are all corrected to STP (standard pressure), you can compare every run you make at a glance and know to the thousandth of a second any variable that exists in your combination or driving style. Once your combination has been optimized, you'll be able to see the variance between lanes or from track to track.

While the actual times from each run will (and should) vary with every pass, ideally the STP times between passes should be the same. By comparing the STP segments between two runs you can see traction variances, throttle stop function, wind, and other variables that affect performance and prediction. Select two runs and subtract the corrected segment times from each other and note the plus (+) and minus (-) variance at each segment. Traction problems will be seen at the 0-60 and 60-330 segments. Wind will affect the 660-1000 and 1000-1320 segments. Second gear shift will usually be seen at the 60-330 segment. Throttle stops will be seen between the segments of activation and de-activation.

PSK # 3 - HCF/Corrected ET

This program is basically used to quickly find the Horsepower Correction Factor (HCF) for the current air conditions. It is also used to correct any ET (60', 330', 660', 1000', 1320') to sea level conditions for the purpose of evaluating engine/chassis and other modifications or to establish your base line performance. The program will prompt you for the weather conditions and the actual ET and then report the STP (standard air) ET. For example, for weather conditions of 0 elevation, 29.65 barometer, 75 temp, and 45% humidity, an ET of 9.337 would be equal to 9.203 after being corrected to sea level conditions. Comparatively, for weather conditions of 0 elevation, 29.80 barometer, 67 temp, and 68% humidity, an ET of 9.298 will also equal 9.203 at STP. Actually, the program calculates and then removes the effect that the current air density had on the run. This creates a basis to directly compare one ET against another regardless of the weather conditions associated with the run. Comparing these two STP ET's shows us that this particular car is responding perfectly to changes in weather conditions and is consistent right down to the thousandth. The corrected ET (STP ET) is how fast the car would have run under perfect (standard pressure) weather conditions.

PSK # 4 - Run Completion

Based on the information entered under your BASE ET, BASE HCF, and the new air conditions, this program will report a projected ET on a run where you had to hit the brakes or lift the throttle. The program will ask for the current air and then the BASE SEG (Base Segment). The program reads the BASE1000 time and enters it for you under BASE SEG, assuming that you are running on a 1/4 mile track and that you ran the car on full throttle past the 1000 foot cone. If you lifted earlier, you can use the 660 foot time for the BASE SEG. Likewise, if you are running on a 1/8th mile track, you may use the 330 foot or 60 foot time for the BASE SEG. When the program asks for the NEW SEG (new segment), enter the corresponding time from your time card. If you used the BASE1000 time for the BASE SEG, then you must enter the new 1000 foot time from your time card for the NEW SEG. The computer will then output a PROJ ET (Projected ET) based on this information. When using the 1000 foot times for 1/4 mile or 330 foot times for 1/8th mile, the projected ET's will be extremely accurate.

PSK # 5 - Input Base Run

This program is for entering the performance from the time run or other run that you wish to use as your base run. You must enter the BASE HCF, the BASE ET, and the BASE 60F. The BASE 330, BASE 660, and BA

optional. In NOVICE mode, instead of entering the BASE HCF, enter the BASE ELEV, BASE BARO, BASE TEMP, and BASE RH%. The BASE HCF will be calculated and entered for you. In the PRO mode, you may enter a 0 for the BASE HCF if you wish to quickly calculate the BASE HCF from the base weather conditions.

PSK # 6 - Crossover Math

   This program is used for quickly calculating a delay box setting for crossing over with a single timer delay box. To save time and prevent user errors, no decimals are accepted. Only enter whole numbers. Therefore the elapsed time of 13.20 would be entered as 1320. Enter your BASE DEL (Base Delay). This is the delay you would normally use for leaving off your own top bulb. Then enter the YOU DIAL (Your Dial). The computer will remember these two values which saves time in later rounds. Next, enter HIS DIAL. The computer reports which bulb to use and the total amount of delay required. For example, if you use 1100 for your BASE DEL, you dial 884, and your opponent's dials 1080, the computer will report 'HIS TOP BULB' and 'DELAY: 3060'.

PSK # 7 - Throttle Stop Prediction

   This program has two separate functions. The first is used to predict a future throttle stop setting based on a previous run, previous stop setting, and existing throttle stop factor. The other is to calculate the actual throttle stop factor, if unknown, based on two or more test runs. By entering 0 for the throttle stop factor (TS FACT) the program automatically enters into the CALC TS FACTOR program. When a factor has been accepted, the program returns to the 'PREDICT T-STOP' program. For information on using this program, please read the section on throttle stop management.

PSK # 8 - SETUP Program, Compression Ratio, Estimated HP, Altitude to InHg

   The SETUP program is used to switch between gasoline or methanol calibration and to select between Pro and Novice modes of operation. If you choose to run this program all the current weather data will be lost. After PSK # 8 is pressed, the program will ask 'SETUP? (YES/NO)'. Pressing the 'NO' key will exit the program without losing any data and offer the Compression Ratio Program. If you press the 'YES' key, the program will ask, 'GAS/ALKY? 1/2'. Press the '1' key for gasoline or the '2' key for methanol.   Then press ENTER.   The computer shows the current calibration either as *ALCOHOL FUEL* or *GASOLINE FUEL* on the display and on all hard copies. After calibration, the computer will ask 'PRO MODE? (Y/N)'. Press the 'YES' key for the PRO MODE, or the NOVICE MODE will be selected.

PSK # 8A - Compression Ratio/Displacement

   If you press PSK # 8 and then press the 'NO' key, the program will ask, 'COMP RATIO? .' Press 'YES' to select this program. If you press 'NO' the computer will offer the Estimated HP program. The Compression Ratio program first asks you to enter a value for the following variables - bore, stroke, number of cylinders, cylinder head chamber volume, head gasket thickness, deck height, and piston dome volume. For negative dome volumes, enter a minus (-) sign before the value, as in - 4.4 . Once this has been done, the displacement of the engine will be displayed. Press the ENTER key to continue and the gasket volume will be displayed. The gasket volume is calculated from the cylinder bore size and the thickness of the gasket. It is more accurate to enter the actual gasket volume, if known. Press ENTER to continue and the program will ask for the known gasket volume. If you know this value, then enter it here, otherwise just press ENTER to continue and the calculated gasket volume will be used in the final result. Finally, the actual compression ratio will be displayed. Press ENTER to repeat the program.

PSK # 8B - Estimated Horsepower from 1/4 Mile Speed

   This program will ask, 'Estimated HP?'. Press 'YES" to select the program. If you press 'NO', the computer will go to the Altitude to InHg program. This program will calculate the actual average horsepower that is being produced under the current weather conditions for the vehicle in question. It will also calculate the corrected horsepower that the engine would produce under STP. First enter the vehicle weight in pounds and the observed 1/4 mile speed in MPH. This program will read the current horsepower factor from the ET PREDICTOR program and will display it as HP FACT. This is the correction factor that relates to the current weather conditions. After pressing ENTER to continue, the program asks for a new HP FACT. If you want to use the current horsepower factor, just press ENTER to continue, otherwise enter another value here. The program will next display the current horsepower being produced based on the performance of the vehicle. After pressing ENTER to continue, the corrected horsepower will be displayed, or the amount of power the engine is capable of producing under ideal weather conditions.

PSK # 8C - Feet of Altitude to Pressure (InHg)

   This program converts altitude (in feet) to barometric pressure (inches of mercury) and is useful for calibrating a barometer from an altimeter.

ERROR HANDLING: Running the SETUP program will clear all user entered data and re-initialize the computer's RAM. Since all of our programs make use of sophisticated 'error trapping' routines to help prevent user errors, it is unlikely that

your computer will ever report any errors or lock up. It is important to enter all decimal points in the proper position. If an ERROR continues to occur in the same portion of the program, just run the SETUP program and then re-enter your data.

The calibration on this computer can be finely tuned by the user, if necessary, through the SETUP program. Since, this very rarely needs to be done, you must contact Family Software for further instruction. If the air/fuel ratio is correct, the calibration will be correct. Sometimes, it may become necessary to richen the mixture until the computer generated predictions match actual performance. Again, this will only become necessary if the engine is running too lean of a mixture.

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THROTTLE STOP MANAGEMENT

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Proper throttle stop management is essential to vehicle consistency and predictability. A timer controlled throttle stop has several critical adjustments. These are the throttle position, or stop adjustment, the timer delay setting, and the timer duration setting. The throttle position adjustment limits how far the throttle plates can close on activation. The timer delay setting is a variable, input by the user, in seconds, tenths, and hundredths, that delays the point at which the device will activate. The timer duration setting, also input by the user, determines the length of time the stop is to remain activated. This exact combination of throttle position adjustment and timer delay setting determines how dramatic of an effect the timer duration setting will have on elapsed time. This relationship, in fact, defines the ratio that exists between timer duration and any variance in elapsed time. A ratio of 1 to .1 would be established if one second of duration was equal to one a tenth change in ET. Using a smaller duration setting is one way to achieve better consistency. This is because, the longer the stop is activated, the less predictable it becomes. To compensate, the throttle stop is then activated sooner, when vehicle speed is low. Ideally, the system should perform a sudden, yet brief, hesitation in performance.

Throttle Position Adjustment

The most important step in throttle stop management is to determine a permanent throttle position adjustment. This will depend greatly on the type of throttle stop and how responsive the induction system is. The perfect system would have no variables associated with the activation or deactivation of the throttle stop. Possibly, direct port fuel injection with a throttle linkage actuator would be the best choice. Here, the throttle could be closed almost completely, then reopened, without incurring any hesitation due to poor throttle response.   On carbureted engines, it may be advantageous to limit the closing of the throttle plates to the operating range of the main system. This is mandatory, when using a throttle-body style unit mounted under the carburetor, because the accelerator pumps do not function on deactivation. Otherwise, an unpredictable bog or surge will occur. With the actuator located in the linkage, the accelerator pumps will function. However, if the throttle plates are closed to where the main system stops flowing, then the accelerator pumps are being relied on for good response. Provided that the volume of fuel delivery is adequate, larger total jet area, higher float levels, and increased initial ignition timing all help to improve throttle response. Ultimately, the throttle plates should be closed as far as possible while still maintaining maximum consistency. This can only be achieved through direct experimentation and analysis. Start by adjusting the throttle plate position to where the boosters begin to flow strongly.

Timer Delay Setting

In the beginning, it is usually best to set the timer delay to activate the stop after the car has tripped the 60 foot clocks. Otherwise, the traction factor becomes an unknown. An inconsistency could be due to traction or throttle response. Since the timer delay begins counting before the elapsed time clocks, it is necessary to add the vehicle reaction time to the 60 foot time to compute the proper timer delay setting. The roll out is the elapsed time from when the trans-brake button is released to when the front wheels clear the stage beam and start the timing system. In an example car, the average 60 foot time is 1.250 seconds, and the roll out is .250. The 60 foot time plus the roll out equals a total of 1.500 seconds. So, the timer delay must be set to at least 1.500 seconds or the stop will activate before the 60 foot mark. For a safety margin add one tenth to this computation. For this example then, 1.60 would be entered as the timer delay for each test run.

In order to test for consistency of the desired throttle position adjustment, enter 2.00 for the timer duration and make several runs in the same lane. Correct all the 60' and 1320' times to Standard Pressure (STP). This process removes the effect that weather conditions have on the run. Handily, this allows direct comparison of any run without regard to atmospheric conditions. Next, select all the runs where the STP 60 foot times are almost identical. Compare the STP 1320 foot time of each of these selected runs. Any variance between runs accurately reveals the consistency of the current throttle position adjustment. Continue this process, opening the throttle plates slightly, until the best results are obtained. The throttle position adjustment should never be changed after this point. The Run Segment Analysis program will show exactly how much a throttle stop, or other variable, is effecting performance at each point on the track.

Timer Duration Setting

Once the throttle position adjustment and timer delay setting are established, a ratio exists between the amount of timer duration and reduction in performance. When the value of this ratio is known and throttle stop performance is consistent, we can accurately predict the timer duration.

In order to obtain the existing ratio, it is necessary to compare a minimum of two runs. Of course, the more runs made, the better the analysis will be. To begin, make a full run with the throttle stop turned off. Next, enter

duration and make another run with the throttle stop turned on. If the STP 60 foot times are almost identical, these two runs can be used for comparison, otherwise the process should be repeated. Subtract the STP 1320 ET of the first run from the STP 1320 ET of the second run and divide the result by the timer duration, in this case 2.00. The final result is the existing ratio. For example, the first run netted an STP ET of 8.630 without the stop being on. The second run netted an STP ET of 8.855 with the stop activated. The result of 8.855 minus 8.630 is .225. Dividing .225 by 2.0 gives a result of .1125. This is a ratio of 1 to .1125 seconds. One second of timer duration equals .1125 seconds of reduction in performance. The throttle stop factor then, is .1125. If the throttle stop is consistent, when subsequent runs are analyzed, this factor should be approximately the same. If the system does not perform consistently, it is possible to use an average throttle stop factor, computed from several pairs of test runs.

   The ET Predictor II has a built-in program to easily calculate the throttle stop factor. Press PSK # 7 to execute the Throttle Stop Prediction program. The current factor will be displayed as 'TS FACT: 0.0000'. After pressing Enter, the program will prompt with 'TS FACT?'. Whenever a 0 is entered here, the computer will execute the CALC TS FACT program. The CALC TS FACT program prompts with 'STP ET#1?'. The STP ET is entered from the first run. The next prompt is 'T DUR.#1?'. Here, the timer duration is entered from the first run, in this case, 0. Next, the program asks for the STP ET#2 and T DUR.#2 from the second run. After entering this data the result is displayed as 'TS FACT: 0.1125'. The next prompt displayed is 'ACCEPT? Y/N'. Pressing the YES key will store this result in memory. Pressing the NO key cancels the operation and returns to the beginning for new input. The STP ET#2 and T DUR.#2 must always be higher in value than STP ET#1 and T DUR.#1.   Otherwise, the program will report, 'USER MADE ERROR! SEE INSTRUCTIONS', and start over.

Predicting Throttle Stop Timer Duration

   Predicting the throttle stop timer duration is easy, once the throttle stop factor is known. Using a throttle stop factor of .1125, a previous stop duration of 2.00, and a predicted elapsed time of 8.855, the new timer duration would be 2.40 seconds, in order to slow this car to an 8.90 index.

   To predict throttle stop timer duration using the ET Predictor computer, the user presses PSK # 7. The program begins by displaying the current throttle stop factor, in this example 'TS FACT: 0.1125'. The user then presses Enter to input a new value for TS FACT. The program prompts with 'TS FACT?'. The question mark shows that the program is awaiting new input. To use the currently stored value, as in this case, just the Enter key is pressed. The next value to be displayed is the predicted ET, and appears as 'PRED ET: 8.855'. The predicted ET is updated every time the ET Prediction program is run. Again, a new value can be entered here, or the current value can be accepted. The same procedure is followed for entering the index (INDEX) and base (or previous) timer duration setting (BASE TD). The base timer duration is needed to predict the new timer duration. It is the duration setting that was used on the Base run, that is being used to predict the ET from. Finally, the predicted timer duration is output as 'PRED TD: 2.400'. The user may elect to print out the results. The program will prompt, 'HARD COPY?(Y/N)'. The 'YES' button is pressed for a hard copy, or 'NO' , to skip this option.

USING YOUR ET PREDICTOR II: Hints and Tips

   In bracket racing, the most important factor is driver and vehicle consistency. Racer's use weather computers for ET Prediction, air/fuel ratio management, and to analyze vehicle performance. When used properly, the computer can help you to achieve the utmost in consistency. By eliminating the variables in your car's performance, it becomes easier to predict the precise dial-in. Being able to consistently 'run the number' will make you a feared competitor and result in more rounds won. Here are a few hints and tips to help in using your weather computer to it's full capability.

Air Fuel Ratio Management

   On gasoline burning engines, the air/fuel ratio must be about 12.5 to 1 for the computer to predict performance accurately. There is no benefit from running a lean mixture. When using a weather computer to predict your dial-in, you want the car to respond to changes in atmospheric conditions.

   Find a day when the air density is average for the racing season in your area. Then richen the mixture until the car slows down. The car may go faster at first, as it is probably too lean. After this, you shouldn't have to re-jet until the air density changes four (4) per cent or more. By adjusting the fuel mixture for an average air density of 96 per cent, for example, the air can range from 92 to 100 per cent, without having to re-jet.

   A quick way to check for proper fuel mixture, is to check the color inside the headers. This should be a very dark gray, or almost black. If they are white to a light gray, the mixture is way too lean. As the air density changes from week to week, you will actually see the color change. The header color will appear lighter as the air density increases and darker as it decreases.   You can also use an Exhaust Gas Temperature (EGT) gauge to evaluate jetting changes. Call us for information on our Digital EGT kits.

Analyzing Performance

   After adjusting the fuel mixture properly, the car should consistently run right on the predicted ET. If it doesn't, there are variables in your particular combination. Your computer will help you to find these variables. Start by correcting every ET to STP and recording it in your racer's log for every run. STP is the abbreviation for Standard Pressure,

level conditions. In correcting the ET, we remove the effect that the current atmospheric conditions have on the run. Therefore, the STP ET is the elapsed time the car would have run under perfect weather conditions. This creates a basis to compare one ET against another regardless of the weather conditions associated with the run. When you have removed all the variables, ideally, the STP ET should be the same for every run. The ET Predictor II has a unique feature for locating these variables. Run Segment Analysis™ is for use with quarter mile tracks with a timing system reporting 60, 330, 660, 1000, and 1320 foot elapsed times. Other than having an on-board computer, it is the best method to get maximum consistency and performance from your race car. After entering the above times, the computer treats the track as six (6) separate distance segments. These are the 0-60, 60-330, 330-660, 660-1000, 1000-1320, and 0-1320 foot distances. Reported are the actual time and the STP time for each of the above distance segments. This allows you to analyze what the car is doing at any point on the track. Correcting the segment ET's allows you to compare every run at a glance. This reveals, to one thousandth of a second, any variable that exists in your combination or driving style. Then, after optimizing your combination, you can see any variance between lanes or from track to track.

Figure 1 and figure 2, are actual runs made within two (2) months of each other. Each run was the second time trial of the day. The first example is from July 20, 1991 at Cecil County Dragway, MD. The second example is from September 22, 1991 at the same track. Because of the difference in weather conditions between July and September, the actual ET's differ by about 2 tenths of a second, even with the car running on methanol. However, the STP ET's vary by only .003. Look closely at the actual times and corrected segment times for each run. These examples show a perfect combination at work. Using the numbers from the previous weekend at Cecil County, the ET Predictor predicted an ET of 8.864 for the first example. The car ran 8.866. Two months later, using the first example as a base line, the computer predicts an 8.737. The car ran 8.740. Very consistent and very predictable.

In order to compare these two (2) runs after using the Run Segment Analysis™ program, you simply subtract the corrected segment times from each other and note the difference as a plus (+) or minus (-). For example, on the first run the corrected 0-60' segment was 1.258. On the second run, the corrected 0-60' segment was 1.255. The difference is .003. Since the corrected segment on the second run is smaller than the first, this becomes minus .003 or (-.003). On the second run, the 0-60' segment then was .003 faster than the first. So, traction was better. Doing the same for each pair of corrected segment times will show the variance at each point on the track. You can watch shift points, throttle stop function, head or tail wind, traction, and other variables. If your predicted ET's are not matching your actual performance, this analysis will show you why and where to look for problems. If every segment is off by the same amount in the same direction (plus or minus) then you should look for a jetting problem. Being too rich or too lean will affect every segment time. Traction problems will show up in the 0-60 and 60-330 segments. Variation on second gear shifts usually occurs in the 60-330 segment. Head wind and tail wind will affect the 660-1000 and 1000-1320 segments. For wind to be the culprit, both segments should be off in about the same amount and in the same direction. Fuel delivery problems can be mistaken for a head wind. Your throttle stop factor consistency can even be accurately checked by watching the segments where the stop functions. When the corrected ET's are close to perfect, the predicted ET's generated by the computer will be dead on.

ET Prediction

It's a good idea when predicting your dial-in to also predict the 60 and 1000 foot times. This will give you a good idea between rounds what would have happened. As elimination's progress, comparing the predicted 60-foot time to the actual 60-foot time will show you exactly what is happening to the traction factor. Moreover, if you hit the brakes to avoid breaking out, you can tell exactly what the car would have run. Just compare the predicted 1000-foot time to the actual 1000-foot time, or use the Run Completion program on PSK # 4.

By comparing the STP ET's from every run, you can find out exactly how consistent your car is. If the STP ET's vary by .02 then you may want to dial .01 or more under the predicted ET to avoid breaking out. This is especially true for the car being chased. This driver needs to have the confidence to run it 'out the back door', if necessary.

Methanol fuel is becoming increasingly popular in bracket racing. One of the rumors concerning methanol is that changes in the air will not affect performance. This is not true. Any naturally aspirated engine running methanol at a proper air/fuel mixture will respond to changes in air density. So, when using methanol fuel, it is necessary to use methanol calibrated weather computer. Always use the readings from your own gauges. What someone else is doing will not help you. Keep your gauges outside, in the shade, and shielded from the wind. Even with the doors wide open, a trailer will absorb, and retain, radiant heat from the sun. The readings will never be accurate. This is why you cannot use the weather readings reported on your time slip. Depending on the time of day and location of the sensors, temperature readings will vary by 10 degrees or more from the actual temperature. Use a hood scoop or fresh air system of some sort. When you want to predict an ET based on ambient temperature, the actual inlet air must be at that temperature. Under hood temperatures are much higher than ambient air and result in poor and inconsistent performance if allowed to enter the carb inlet.

Run Segment Analysis™

ACTUAL PERFORMANCE DATA - 7/20/91 Cecil County Dragway, MD

RUN # **2** (TRIAL) ELIM. LANE 1 (LANE 2) (Circle)

WIN LOSE 1ST FOUL BREAKOUT (Circle)

DIAL:

Run Segment Analysis TM		
	Actual Time	**Corrected**
0' - 60' ET:	*1.282*	*1.258*
60' - 330' ET:	*2.340*	*2.296*
330' - 660' ET:	*1.999*	*1.961*
660' - 1000' ET:	*1.749*	*1.716*
1000' - 1320' ET:	*1.496*	*1.468*
STP Corrected ET:	**8.701**	

RT: .522

60': 1.282

330': 3.622

660': 5.621 MPH: **122.46**

1000': 7.370

ET: **8.866** MPH: **149.92**

COMMENTS: Predicted ET was 8.864
Current HCF was 1.0983
Air Density% was 89.507

Figure 1

ACTUAL PERFORMANCE DATA - 9/22/91 Cecil County Dragway, MD

RUN # **2** (TRIAL) ELIM. (LANE 1) LANE 2 (Circle)

WIN LOSE 1ST FOUL BREAKOUT (Circle)

DIAL:

Run Segment Analysis TM			
	Actual Time	**Corrected**	
0' - 60' ET:	*1.261*	*1.255*	-.003
60' - 330' ET:	*2.307*	*2.297*	+.001
330' - 660' ET:	*1.974*	*1.965*	+.004
660' - 1000' ET:	*1.725*	*1.717*	+.001
1000' - 1320' ET:	*1.473*	*1.466*	-.002
STP Corrected ET:	**8.704**		

RT: .480

60': 1.261

330': 3.568

660': 5.542 MPH: **123.81**

1000': 7.267

ET: **8.740** MPH: **152.20**

COMMENTS: Predicted ET was 8.737
Current HCF was 1.0207
Air Density% was 97.522

Figure 2

Example of Run Segment Analysis™ Compare 2 runs by subtracting the corrected segment times. The difference at each point is the variance in performance **that is not due to changes in the air density**, but other variables, like traction, shift points, throttle stop, head wind, or tail wind.