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TECHSTAR

FLIGHT COMPUTER MANUAL

JEPPESEN

Tech Star

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1. MODE PROMPTS
2. SCROLL UP/DOWN PROMPTS
3. CONVERSION PROMPTS
4. DATA PROMPTS
5. SELECT/COMPUTING PROMPTS
6. SCROLL UP/DOWN KEYS
7. MODE SELECT KEY
8. CONVERSION SELECT KEYS
9. TIME COLON KEY
10. STORE/RECALL KEYS
11. BACKSPACE KEY
12. ARITHMETIC FUNCTION KEYS
13. ON/OFF KEY
14. CLEAR KEY
15. COMPUTE KEY
16. SCRATCH PAD
17. LINE PARAMETER KEYS
18. LINE INPUT/COMPUTE PROMPTS
19. 6-DIGIT/7-LINE DISPLAY

JS315471B 55 Inverness Drive East, Englewood, CO 80112-5498

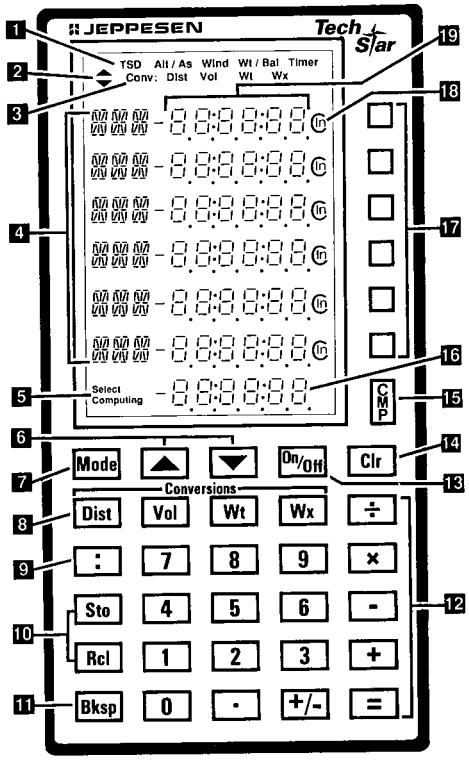


TABLE OF CONTENTS

INTRODUCTION

The TechStar is a powerful navigation computer which reflects the latest in design, technology, and problem-solving capability. Its most significant features include individual data prompts and a seven-line liquid crystal display (LCD). These features make the TechStar simple and convenient to use since the computer program "prompts" you by showing the variables needed for a particular problem's solution. In addition to basic arithmetic functions, your TechStar computer is designed with five operating modes which offer quick, accurate solutions to over 100 air navigation and unit conversion problems.

To solve a particular problem, first access the applicable mode and select the unknown value you wish to determine from the menu screen. The computer then "prompts" the entry of all variables needed to solve the problem. After entry of required variables, pressing the compute CMP key will display the solution. Pressing the compute key a second time will access the extended output screen where additional parameters may be computed from the same variables. In some modes, more than one extended output screen may be accessed to display all parameters of a problem's solution.

This manual provides a brief description of the computer's operating features and illustrates solutions to a variety of typical navigation problems selected from each mode. It is not necessary to review this manual in the order presented but it may be beneficial to first read through the section covering the time-speed-distance mode. Then you can use the table of contents to locate other types of problems you are planning to solve. A list of abbreviations used for the various "prompts" is provided in the back of this manual.

TECHSTAR SAMPLE PROBLEMS

Your TechStar was shipped with a clear vinyl protective cover on the display screen as well as the aluminum bezel (keyboard face). These protective coverings may begin to peel after a period of time and are designed for easy removal.

The following step-by-step sample problems are provided for quick orientation to your TechStar's operating features. If you need additional information, detailed explanations for each mode are available throughout this manual.

Sample Problem — Multipart Fuel Consumption
(Use any order of data entry within a given mode.)

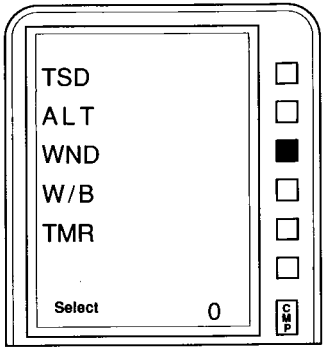
Given:	True airspeed:	130 kts.
	Wind direction:	200°
	Wind speed:	29 kts.
	Course:	320°
	Distance:	375 n.m.
	Fuel consumption rate:	15 g.p.h.

Find: Fuel needed for trip

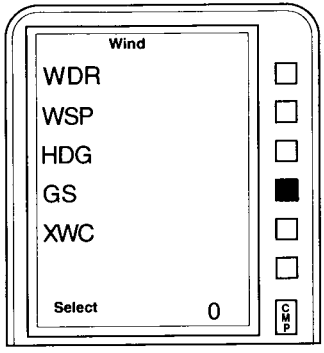
Solution —

First, access the groundspeed prompt screen using the following steps:

Step 1 — Turn computer ON.
Step 2 — Press the Mode key for the Mode Select Screen.

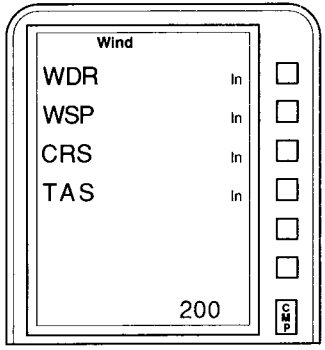


Step 3 — Press the parameter line key to the right of the "WND" prompt for the Wind Mode Menu Select Screen.

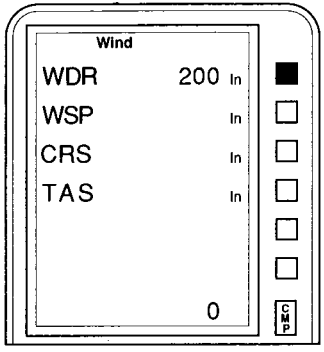


Step 4 — Press the parameter line key to the right of the "GS" prompt for the groundspeed prompt screen.

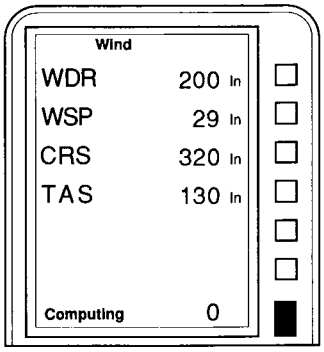
This is the wind mode prompt screen used when solving for groundspeed.



Step 5 — Key 200° into the scratch pad.

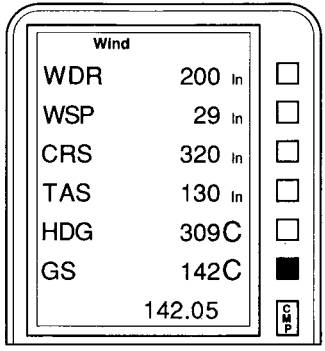


Step 6 — Press the parameter line key to the right of the "WDR" prompt to transfer 200 to the wind direction line. Notice zero appears in the scratch pad after you do this. Use the same method to enter the remaining values. After all values have been entered, you should see the following display.

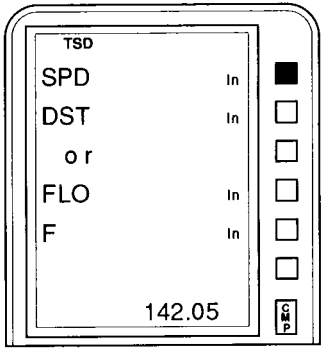


Step 7 — Press the "CMP" key to compute the results. Notice the "Computing" prompt flashes to the left of the scratch pad.

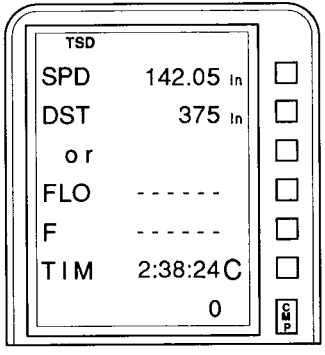
Step 8 — Now you want to be able to save "GS" in the scratch pad while you select the next mode. Then you can reenter it in the TSD Mode "SPD" parameter line. You do this by pressing the "Rcl" key followed by the "GS" parameter line key.



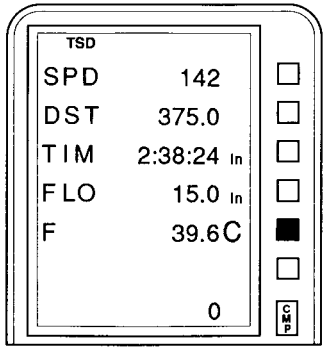
Step 9 — To access the TSD mode, press the Mode key followed by the "TSD" parameter line key. After that, press "TIM" to select the time prompt screen shown below.



Step 10 — Transfer the computed groundspeed from the scratch pad to the "SPD" line by pressing the "SPD" line parameter key. Then, key in the distance of 375 n.m. and transfer it to the "DST" parameter line and press "CMP".



Step 11 — Now, press "CMP" again to access the extended output screen and enter fuel flow (FLO) of 15 g.p.h. Then compute fuel quantity (F) by pressing the "CMP" key, followed by the "F" line key.



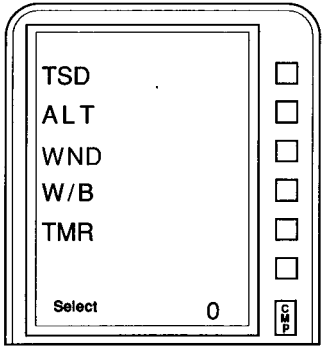
NOTE: The liquid crystal display (LCD) in your TechStar has been carefully engineered to represent appropriate abbreviations for all commonly used aviation parameters. Since the LCD has the capability to display over 80 different parameters using over 50 different screens, some compromises in character symbology were necessary to represent all required abbreviations. Some examples include abbreviations which use the degree sign or percent sign such as "T°C" for true temperature or "%MC" for percent MAC. The letters "K" and "X" are smaller than other letter symbols as shown in kilometers (KM), crosswind component (XWC), or next (NXT). The delta symbol (▲) also has a distinctive appearance for change in center of gravity (▲CG) or change in arm (▲AR). Use the abbreviations list on page 48 of this manual to familiarize yourself with the characters used for the various data prompts.

OPERATING THE AVIATION MODES

Your TechStar computer is programmed for five modes of operation.

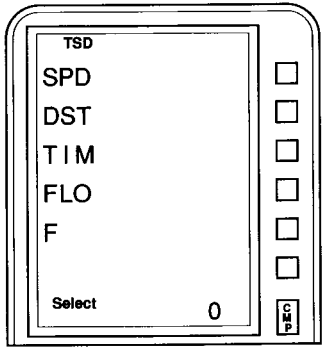
TSD — Time-Speed-Distance
ALT — Altitude/Airspeed
WND — Wind
W/B — Weight and Balance
TMR — Timer

The various modes utilize prompting screens to identify parameters required for a particular problem's solution. To select a particular mode, you simply press the Mode key and the Aviation Mode Select Screen is displayed. Go ahead and press the Mode key now.



TIME-SPEED-DISTANCE MODE

Notice the mode prompts are illuminated on the left side of the display. Also, notice that "select" is shown below the mode prompts on the bottom line. Now, select the TSD mode by pressing the top parameter line key to the right of the display



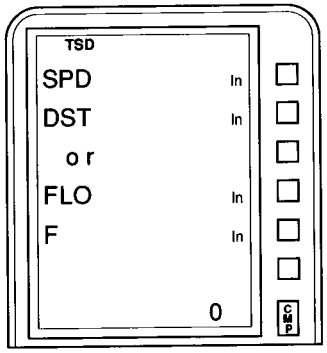
The first screen in the TSD mode is referred to as the Menu Select Screen. Notice TSD is illuminated at the top of the screen and "select" is showing at the bottom. This screen allows you to select the type of problem you wish to solve. In the TSD mode, you have several choices as the screen shows. Your first options are to solve for speed (SPD), distance (DST), or time (TIM). Fuel flow (FLO) and fuel quantity (F) also can be selected. Go ahead and select time (TIM) by pressing the third parameter line key.

SOLVING FOR TIME

This is a TSD mode prompt screen which is used when solving for time. It identifies the input parameters required to solve for time. In this sample problem, speed (SPD) and distance (DST) will be used. You are now ready to input data using the "scratch pad."

SCRATCH PAD

The scratch pad is the bottom line of the display and normally shows a zero. When you press any



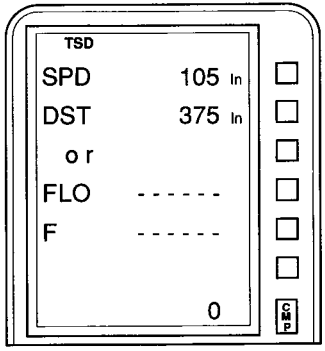
numbered key, that number will appear in the scratch pad. You can "key in" any combination of numbers up to six digits. The scratch pad allows you to verify that the value keyed in is the one you want. Then, you can transfer it to the appropriate line in the display by pressing the parameter key to the right of that line. Once a value has been transferred to a parameter line, zero again appears in the scratch pad.

Sample Problem — Finding Time

(Use any order of data entry.)

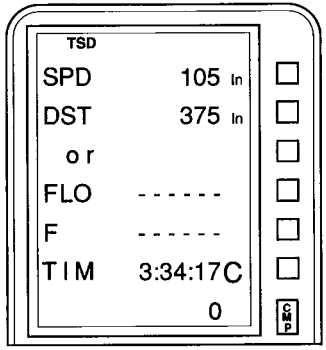
Given: Groundspeed . . . . . 105 knots
Distance . . . . . 375 nautical miles
Find: Time En route

First key 105 into the scratch pad and transfer it to the speed (SPD) line. Then enter 375 and transfer it to the distance (DST) line. Notice the "In" illuminated to the right of the values you have just input. Dashes appear on the lines for fuel flow and fuel quantity and the "Ins" disap-



pear since you are not using these parameters for this computation.

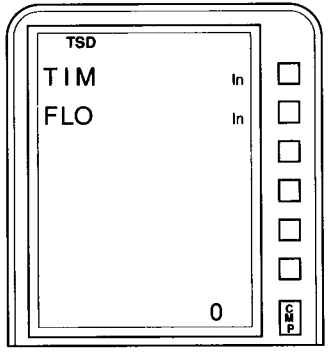
Now, press the CMP key to solve the problem. During the computing sequence, the "Compute" prompt flashes at the bottom of the display. Notice the computed time is now shown in the display followed by a "C."



NOTE: If you want to solve another time problem, it is not necessary to return to the Aviation Mode Select Screen to "reselect" the same mode and type of problem. You can simply key in new values for speed and/or distance. Then transfer the new value(s) to the parameter line(s), and compute a new time while still in the prompt screen. You also could enter values for fuel flow (FLO) and fuel quantity (F) and dashes would appear in the SPD and DST lines.

SOLVING FOR FUEL CONSUMPTION

Fuel consumption problems are solved in the same manner as time and distance problems, except that fuel consumption per hour and fuel quantity are used in lieu of speed and distance. However, you must tell the computer which type of problem you want to solve. Assume you want to solve for fuel quantity. First, you select the TSD mode by accessing the Mode Select Screen. This screen allows you to select the type of TSD problem you wish to solve. In this case, you should select fuel quantity (F). Go ahead and select "F" by pressing the fifth parameter line key and you will see the following screen.



With the fuel quantity prompt screen selected, you can see that time (TIM) and fuel flow (FLO) are the variables needed to solve for fuel (F). Before you do a sample problem, take a moment to study how time formats are entered in the TechStar display.

ENTERING TIME VALUES

Time values are frequently used in navigation problems particularly in the TSD mode. Your TechStar computer is designed so you can quickly enter time values in the scratch pad using any of three time formats:

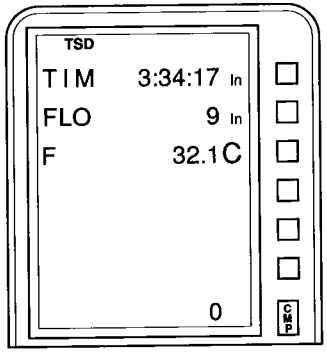
HH:MM:SS — Hours, Minutes, Seconds (3:34:17)
HH:MM.m — Hours, Minutes, Decimals of Minutes (3:34.3)
HH.hh — Hours, Decimals of Hours (3.57139)

It is common to express time values with a time colon separating hours from minutes and minutes from seconds. The TechStar keyboard contains a time colon key [:] on the left side of the keyboard for this purpose. To enter 3 hours, 34 minutes, and 17 seconds, press [3] [:] [3] [4] [:] [1] [7]. Your display should show 3:34:17. Other time formats are entered just like they are expressed using a decimal point in place of one or two colons. Regardless of the time format entered in the scratch pad, HH:MM:SS will be displayed when it is transferred to the TIM parameter line. Now, you can proceed with a sample problem using time.

Sample Problem — Finding Fuel Quantity
(Use any order of data entry.)

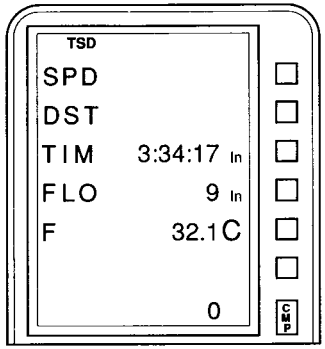
Given: Time en route 3:34:17
Fuel Flow . . . . . 9 g.p.h.
Find: Fuel Quantity

First, enter the time (TIM) and fuel flow (FLO) values in the respective parameter lines using the scratch pad. Next, press the [CMP] key to solve the problem. Notice that 32.1 gallons of fuel are required at a consumption rate of 9 g.p.h.



OPERATIONS IN EXTENDED OUTPUT SCREEN (TSD)

After computing a problem in a prompt screen, you can access the extended output screen by pressing [CMP] a second time. Assume you did this after computing fuel quantity (F) in the previous problem. You should see the following screen.

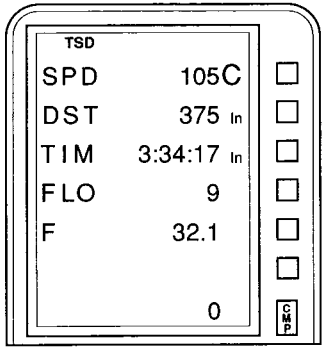


The extended output screen permits you to experiment with different values, and solve all of the same problems presented in the prompt screens. However, you are not prompted through a problem's solution. In the extended output screen, you must determine the variables needed to solve a particular problem.

Sample Problem — Finding Speed
(Use any order of data entry.)

Given: Time 3:34:17
Distance . . . . . 375 nautical miles
Find: Groundspeed

Since the time is already displayed, you need not enter it again. Simply key 375 n.m. into the scratch pad and transfer it to the distance (DST) parameter line. Notice an "In" appears next to 375 but all previous "Ins" and "Cs" are extinguished. Next, press the CMP key followed by the speed (SPD) key. Remember that extended output operations require you to compute a specific parameter by pressing the appropriate line key after pressing the CMP key the first time.

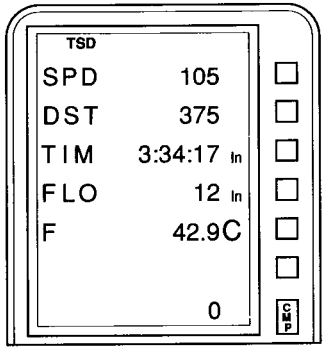


INPUT/COMPUTE PROMPTS

Notice in the previous problem the final "Ins" and "Cs" show that the variables of distance (DST) and time (TIM) were used to compute speed (SPD). Also notice that fuel flow (FLO) and fuel quantity (F) display neither an "In" nor a "C." This is because they were not used in the previous computations. The TechStar is programmed so you can tell which variables were used for a computation in the prompt screens. This also is true for the extended output screens during normal operations.

SECOND COMPUTE

As mentioned previously, the second compute in a prompt screen accesses the extended output screen. Once you change a value in the extended output screen, your first compute must be followed with the desired line parameter key. Assume for this example you decided to increase fuel flow (FLO) to 12 g.p.h. When you transfer 12 to the FLO parameter line all previous "Ins" and "Cs" are extinguished. Now press the CMP key followed by the fuel quantity (F) key.



Notice that fuel quantity (F) was computed using inputs of time (TIM) and fuel flow (FLO). If you press [CMP] again, the computer checks to see if there are any additional parameters that can be computed. In this case, no further computations are possible without changing another parameter value. If you overwrite (change) or clear any value, all "Ins" and "Cs" disappear. Then, you can make further computations. If you wish to clear out all values from the display, press the [Clr] key twice within one second. You will still be in the extended output screen and you can enter new values and solve new problems. However, you cannot solve time, speed, and distance problems simultaneously with time, fuel flow, and fuel quantity problems, but they can be solved with separate steps in the extended output screen. Go ahead and experiment. This concludes the discussion of the TSD Mode.

ERROR MESSAGE

There are a number of operating combinations which will generate an "Error" message to alert you to an improper operation. During arithmetic operations, the "Error" message will appear in the scratch pad only. However, if you are performing an aviation mode operation, an "E" also may be displayed in an affected parameter line when the error message appears in the scratch pad. This means that the affected parameter is required for the problem's solution. You can clear the error in the scratch pad as well as the "E" in the parameter line(s) by pressing the clear key once. In an aviation mode operation you can resume the problem where you left off. However, if you receive an error during an arithmetic operation, you will need to start the problem over again. A list of error messages is shown at the back of this manual.

CORRECTING INPUTS

Occasionally, you may key the wrong number(s) into the scratch pad. To correct the entry, you can use the [Bksp] key to erase the mistake and reenter the correct number(s). The backspace key can be used to clear the entire scratch pad (up to a six-digit whole number), one character at a time. It will also clear decimal numbers back to the decimal point. Go ahead and experiment with it to see how it operates.

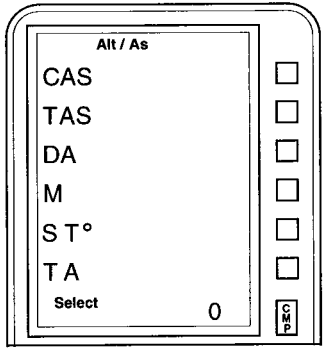
If you have already transferred the value to a parameter line, you can simply key the correct value into the scratch pad and then "overwrite" the value in the parameter line. You also can use the [Clr] key if you make an input mistake and then reenter the entire value. This applies to the scratch pad and any parameter line value. To clear a parameter line, simply press the clear key followed by the parameter line key.

To correct time entries after pressing the time colon [:] key, simply rekey the numbers you should have entered prior to the next press of the time colon key, and the new numbers will overwrite the incorrect entry. If you discover the error after you have pressed the time colon key, you must clear the scratch pad and reenter.

During an aviation mode operation if you lose track of the data you have entered or want to start over again, you can press [Clr] twice within one second. This will clear all registers in the current mode, then you can enter the required data in the appropriate parameter lines and compute the solution. Reselecting the same mode also will allow you to start the same problem over. In this case, you also will need to reselect the type of problem you were trying to solve from the menu select screen.

ALTITUDE/AIRSPEED MODE

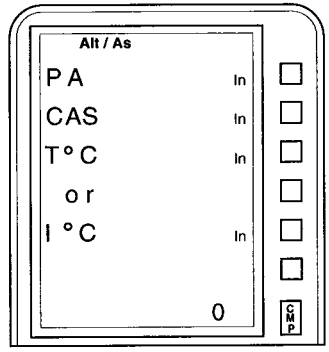
Mode selection for the altitude/airspeed (Alt/As) mode is similar to all other operating modes. Simply press [Mode] to access the Aviation Mode Select Screen. After that, press the line parameter key for "ALT" to select the mode. The first screen you will see is the Alt/As Menu Select Screen.



Notice Alt/As is illuminated at the top of the screen and select is showing at the bottom of the screen. The menu select screen allows you to select the type of problems you wish to solve. In

the Alt/As mode, you have several choices as the screen shows. As an example, assume you want to solve for true airspeed (TAS). Go ahead and select TAS by pressing the second parameter line key.

SOLVING FOR TRUE AIRSPEED

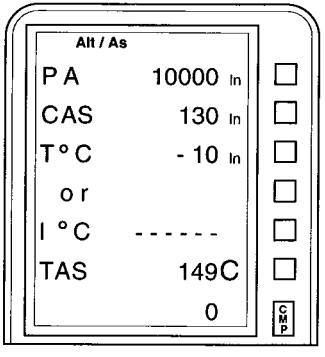


This is the Alt/As mode prompt screen which is used when solving for true airspeed. It identifies the input parameter required to solve for TAS. In this case, pressure altitude (PA), calibrated airspeed (CAS), and either true (T°C) or indicated (I°C) temperature are required. Use the scratch pad to enter the variables in the following sample problem.

Sample Problem — Finding TAS
(Use any order of data entry.)

Given:	Pressure altitude	10,000 feet
	Calibrated airspeed	130 knots
	True temperature	-10°C
Find:	True airspeed	

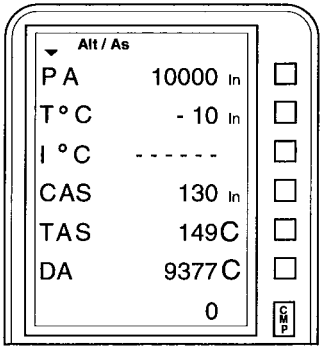
Now, key these values into the scratch pad and transfer them to the appropriate parameter lines. You will need to use the change sign [+/-] key to enter the minus sign for the temperature. The following screen should be displayed after you have entered the variables and pressed the [CMP] key.



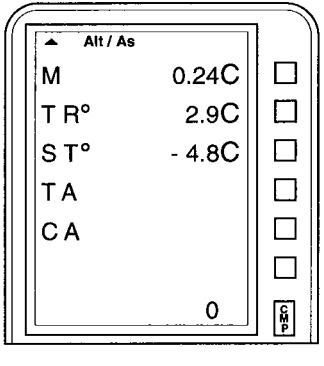
Notice the "In" remains illuminated to the right of the values you have just input. Dashes appear in the indicated temperature line (I°C) since you are using true temperature (T°C) to solve this problem.

OPERATIONS IN EXTENDED OUTPUT SCREENS (ALT/AS)

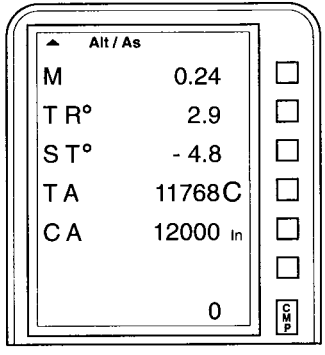
After computing a problem in prompt screen, you can access the extended output screen by pressing the [CMP] key a second time. Essentially this triggers a mass computation of every additional parameter that can be computed using the data now displayed on the screen. Assume you did a second compute after computing TAS in the previous problem. You should see the following screen.



Notice that indicated temperature (I°C) remains lined out because it is an input only value. Also, note the small triangle in the upper left portion of the display. This is a scroll down prompt, which tells you there are more Alt/As parameters on the next screen down. Go ahead and press the "scroll down" [▼] key to view the next screen.



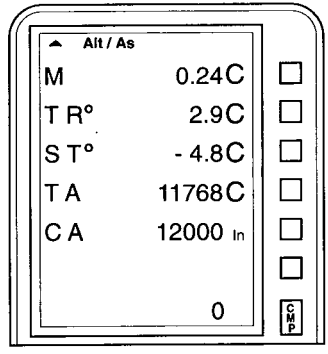
First, notice the scroll up [▲] prompt is now illuminated rather than the scroll down prompt. Also, notice that three values on this screen have been computed but true altitude (TA) and calibrated altitude (CA) are blank. This is because calibrated altitude (CA) is one of the required inputs needed to solve for true altitude (TA). If you input a value such as 12,000 feet in CA, all previous "Ins" and "Cs" disappear and you can line compute TA. After you have done this, you will see the following screen.



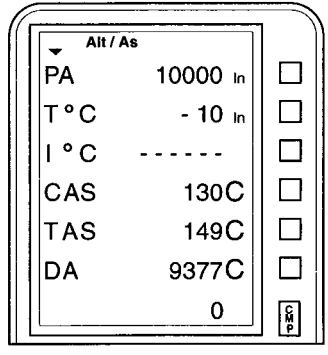
Now press [CMP] a second time and your TechStar will recompute any additional parameters which have required variables.

Notice that Mach (M), temperature rise (TR°), and standard temperature (ST°) were recomputed and now display "Cs." Next, press the [▲] key to see what additional values have been recomputed on the first screen.

Notice that calibrated airspeed (CAS), which originally was an input, has now changed to a "C" meaning it is a computed value. During the second compute in the extended output screens,



the TechStar program is designed to recompute all airspeeds (CAS, TAS, and M) as long as all required variables are available. Now, no further computations are possible without changing a parameter value. If you overwrite (change) or clear any value, all "Ins" and "Cs" disappear. Then, you can make further computations. If you wish to clear out all values from the display, press the [Clr] key twice within one second. You



will still be in the extended output screen and you can enter new values and solve new problems.

The Alt/As extended output screens permit you to experiment with different values, and solve all of the same problems presented in the prompt screens, plus some additional problems. However, you are not prompted through a problem's solution. In the extended output screen, you must determine the variables needed to solve a particular problem. You will know when you do not have required variables during a line compute because "Error" will appear in the scratch pad and an "E" will appear in any affected parameter line(s). An "E" means the affected parameter is required for the problem's solution and must be entered prior to computation.

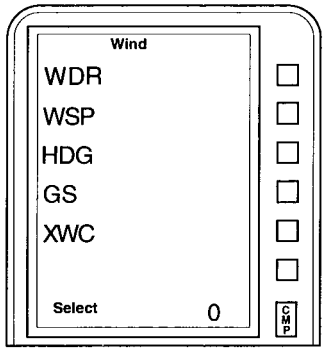
Note: For normal operations in the extended output screens the "Ins" and "Cs" will reflect the variables used to solve for a particular value. However, if you attempt to line compute with insufficient data, an "error" message is triggered. At the same time, other required variables already input will display "Ins." After the error is cleared, if you change your mind and line compute a different value, you will notice values irrelevant to the computation also display "Ins." This problem will be compounded by the second compute. In these situations, it is best to clear the entire screen and reenter the data.

A discussion of TechStar's altitude/airspeed accuracy limitations is included at the back of this manual. This concludes the discussion of the Alt/As Mode.

WIND MODE

Mode selection for the wind mode (WND), as with all modes, requires pressing the [Mode] key

followed by the appropriate line parameter key. In this case, pressing the "WND" parameter line will display the Wind Mode Menu Select Screen.

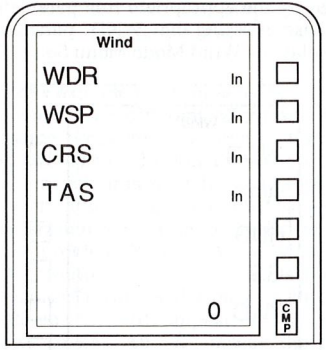


Notice wind is illuminated at the top of the screen and select is showing at the bottom. The menu select screen allows you to select the type of problems you wish to solve. In the wind mode, you have three choices for prompted solutions:

1. Wind direction/wind speed
2. Heading/groundspeed
3. Crosswind component

SOLVING FOR HEADING/GROUNDSPEED

This means selection of either wind direction (WDR) or wind speed (WSP) accesses the same prompt screen so you can solve for unknown wind. Likewise, selection of either heading (HDG) or groundspeed (GS) accesses the same prompt screen. Each pair of values is solved simultaneously in the respective prompt screens. To illustrate this, select either heading (HDG) or groundspeed (GS).



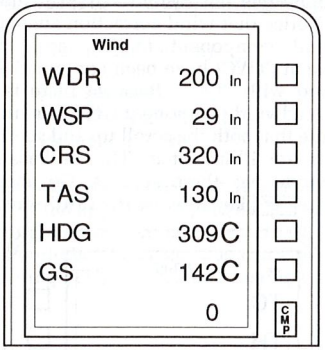
This is the wind mode prompt screen used when solving for heading/groundspeed. In this case, wind direction (WDR) and wind speed (WSP) plus course (CRS) and true airspeed (TAS) are required. Use the scratch pad to enter the variables in the following sample problem. It is a *must* that you state your *entire* wind problem in true *or* magnetic and stay with the same reference throughout each problem.

Sample Problem — Finding Heading/ Groundspeed

(Use any order of data entry.)

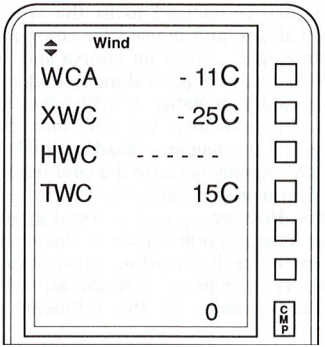
Given:	Wind direction	200°
	Wind speed	29 knots
	Course	320°
	True airspeed	130 knots
Find:	Heading/groundspeed	

Key these values into the scratch pad and transfer them to the appropriate parameter lines. The following screen should be displayed after you have entered the variables and pressed CMP . Notice heading (HDG) and groundspeed (GS) are displayed with "Cs" at the bottom of the screen.

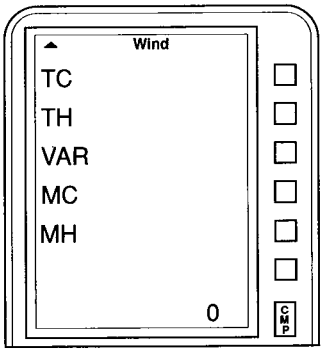


OPERATIONS IN EXTENDED OUTPUT SCREENS (WND)

Now use the second CMP to access the extended output screens and see what additional parameter can be computed. After the second compute, the scroll down prompt will illuminate at the top of the display. Go ahead and scroll down so you can view the following display.



This represents the second screen in the wind mode. Notice that wind correction angle (WCA), crosswind component (XWC), and tailwind component (TWC) have been computed and are displayed with "Cs." Because there is a tailwind, headwind component (HWC) is lined out. Also note that both the scroll up and scroll down prompts are illuminated. This is because the wind mode has three screens. Go ahead and press the ▼ key to view the third screen.



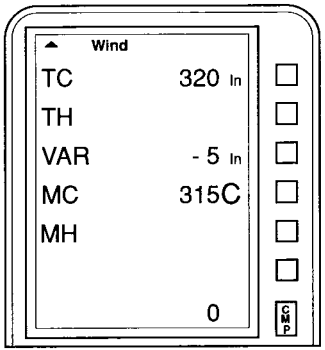
This display is referred to as the wind mode auxiliary screen and is used for computation of true or magnetic values for course and heading. The "AUX" screen stands alone from the primary and secondary screens. A computed heading doesn't automatically transfer into the true heading (TH) or magnetic heading (MH) lines of the "AUX" screen, because the computer doesn't know if you are working in true or magnetic reference. However, you can recall a computed heading from the first screen to the scratch pad and then enter it in either true or magnetic heading, as appropriate. Use the scratch pad to enter the variables in the following sample problem.

Sample Problem — Determining Magnetic Course

(Use any order of data entry.)

Given: True course . . . . . 320°
Magnetic variation . . . . . 5°E
Find: Magnetic course

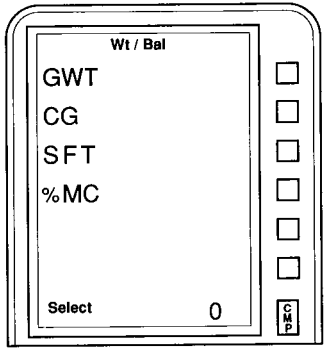
Key these values into the scratch pad and transfer them to the appropriate parameter lines. After computing magnetic course (MC), the following screen should be displayed. You can also convert true heading (TH) to magnetic heading (MH) or vice versa.



Notice that the "AUX" screen really functions as a true/mag conversion display. Go ahead and enter a new value or overwrite a previous value and experiment. Problems involving true and magnetic courses and true and magnetic headings cannot be solved simultaneously. You must line compute these problems separately or in sequence. This concludes the section on the wind mode.

WEIGHT AND BALANCE MODE

Access the weight and balance mode (Wt/Bal) by pressing the [Mode] key followed by the appropriate line parameter key. In this case, pressing the "W/B" parameter line will display the Weight and Balance Mode Menu Select Screen.



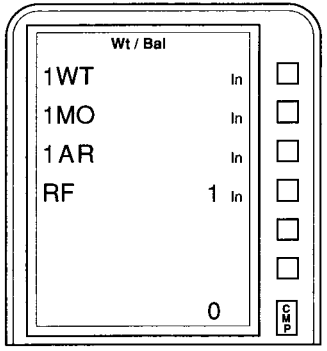
Notice the Wt/Bal mode prompt is illuminated at the top of the screen and select is showing at the bottom. The menu select screen allows you to select the type of problems you wish to solve. In the weight and balance mode, you have three choices for prompted solutions:

1. Gross weight/center of gravity
2. Weight shift
3. Percent mean aerodynamic cord

SOLVING FOR GROSS WEIGHT/CG

Selection of either gross weight (GWT) or center of gravity (CG) accesses the same prompt screen

allowing you to solve basic weight and balance problems. To illustrate this, select either gross weight or CG.



This is the prompt screen used when solving for gross weight and/or center of gravity. Weight and balance computations require the addition of weights, and the computation and addition of moments. To prevent the possibility of error, it is absolutely essential to enter each weight and its associated arm (or moment) consecutively. The computer is programmed to accept mixed formats (weight/arm and weight/moment) in the same problem. Since accuracy is so critical in weight and balance, it is recommended that you work from an official weight and balance form provided by the aircraft manufacturer. That way, you can record data as you proceed through the various entries required to solve the problem. This lessens the possibility of error. The following sample problem illustrates this method.

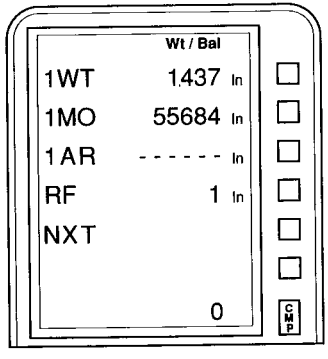
Sample Problem — Gross Weight and CG

Given:

WEIGHT and BALANCE FORM			
ITEM	WEIGHT (lbs.)	ARM (in.)	MOMENT (lb.-in.)
BASIC EMPTY WT.	1,437		55,684
FUEL (38 gal.)	228	48.0	
FRONT OCCUPANTS	340	37.0	
REAR OCCUPANTS	280	73.0	
BAGGAGE	15	95.0	
TOTAL			
CG =_____ INCHES			

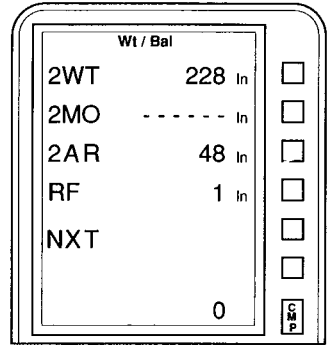
Find: Gross weight/CG

Notice this problem has mixed formats. Begin by entering the basic empty weight in "1WT" parameter line and the moment in the "1MO" parameter line. The display will appear as follows:

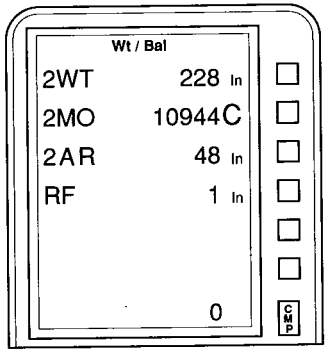


Notice that the "1AR" or arm has been lined out since your first entry was a weight and moment combination. Also, notice the "RF" or reduction factor line displays the number "1." This means no reductions in computed moment will occur. Manufacturers may use reduction factors of 100, 1,000 or 10,000 to simplify weight and balance calculations by reducing the size of the numbers. A reduction factor also is necessary when total moment exceeds the 999,999 display limit of the computer. In this problem, no change in "RF" is needed. However, in problems where a change in RF is needed, the value must be entered at this point. After this point, it becomes a protected value and cannot be changed.

Finally, note the abbreviation "NXT" in the last parameter line. After entry of a weight/moment or weight/arm computation, "NXT" prompts the entry of your *next* set of figures. Go ahead and press "NXT" to go to the next screen and enter your second combination, 228 pounds of fuel with an arm of 48.0 inches.

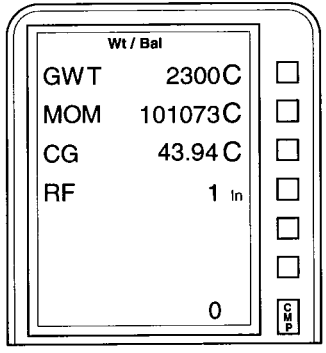


Now press next, and you will see the following display for approximately four seconds.



This brief display shows you the calculated moment for this weight/arm entry. The weight and moment are then combined with previous entries. This interim screen appears only for weight/arm combinations to give you the calculated moment for that particular weight/arm combination. The weight and moment are then combined with previous entries, and the display changes to the next blank screen to prompt the next set of entries. After you have entered all weight/arm or weight/moment combinations, press CMP to solve the problem.

Since the last combination of entries included weight and arm, you will see an interim display of moment prior to the final screen. Notice the final display shows a summation of gross weight and moment and also provides the aircraft's loaded center of gravity.

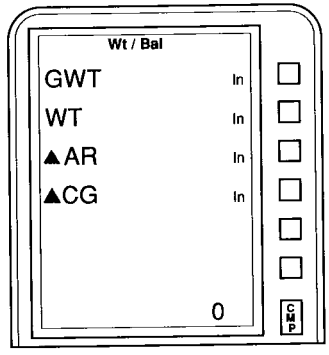


SOLVING WEIGHT SHIFT PROBLEMS

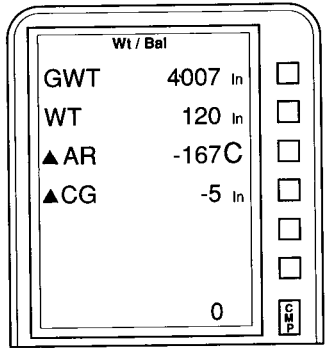
Often during weight and balance computations, you will find that the loaded weight, total moment and/or center of gravity are outside the limits of safe operation specified by the aircraft manufacturer. Reducing or shifting weight to new locations and recomputing the new balance condition can be a complicated and tedious process. TechStar can solve these problems quickly and provide the recomputed balance condition. First, select shift (SFT) from the Weight and Balance Menu Select Screen. The following sample problem shows how you can use this function.

Sample Problem — Weight Shift

Given: Gross weight . . . . . 4,007 pounds
Center of gravity . . . . . 5 inches (aft of limits)
Weight to be shifted . . . . . 120 pounds
Find: Distance weight must be shifted



First enter gross weight (GWT) and weight (WT) in the respective parameter lines. In these problems, the delta sign (▲) means a change in values. In this problem, the required change in center of gravity (▲CG) is -5 inches. In other words, the CG must move forward 5 inches for the aircraft to be within limits. When you enter -5 inches in the ▲CG parameter line, ▲AR is lined out. This means that ▲AR will be the value solved for when you press compute.



Notice the required change in arm for the 120-pound weight computes as -167 inches. This means moving 120 pounds forward 167 inches will move the entire aircraft's CG 5 inches forward and place it within limits.

Weight/shift problems can be solved with these same variables in three different ways. Item 2 is the same problem illustrated above.

1. Wt can be computed from GWT, ▲AR and ▲CG
2. ▲AR can be computed from GWT, WT, and ▲CG
3. ▲CG can be computed from GWT, ▲AR and WT

If you wish to experiment and compute parameters which were previously inputs in any of these three types of problems, you should first access the extended output screens.

PERCENT MEAN AERODYNAMIC CORD (MAC)

Mean aerodynamic cord (MAC) is the average distance from the leading edge to the trailing edge of the wing. The acceptable weight and balance range of large aircraft usually is expressed in percent of MAC (%MC). In other words, the CG must be located within certain percentages of the mean aerodynamic cord for the aircraft to be safely controllable. Another parameter is LEMAC, which is the leading edge of the mean aerodynamic cord. Determining CG as a percent of MAC involves the following relationships.

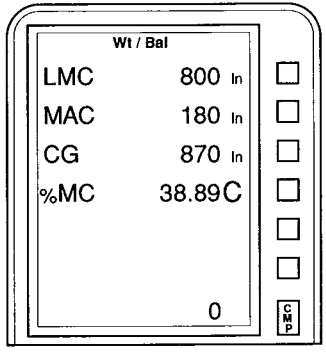
$$\%MAC = \frac{CG - LEMAC}{MAC}$$

The next sample problem illustrates these relationships. First select %MC from the Weight and Balance Menu Select Screen.

Sample Problem — Percent MAC

Given: LEMAC ..... Station 800
MAC 180
CG ..... Station 870
Find: %MAC

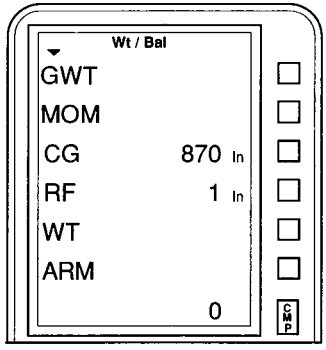
First, enter the prompted values, transfer them to the appropriate parameter lines and then press CMP. The following solution will be displayed.

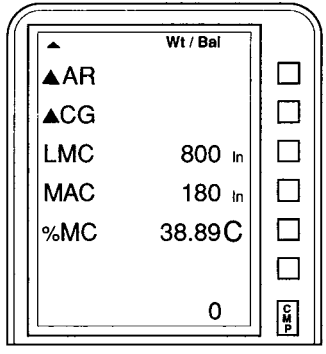


OPERATIONS IN EXTENDED OUTPUT SCREENS (WT/BAL)

Notice that %MC is the only computable value in these problems; all others are input only. Now use the second CMP to access the extended output screens.

The extended output screens in the weight and balance mode are unique in the TechStar program. To use them effectively, you need to be very knowledgeable about the variables used in the three types of problems (gross weight/CG, weight shift, and %MC). Notice in the screens



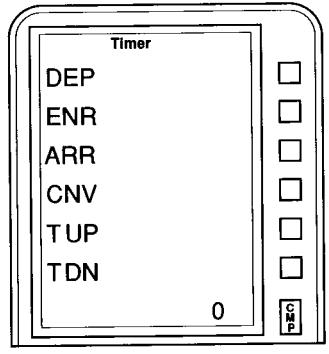


above that the CG parameter line value has been carried through from the previous %MC problem. At this point, if you entered gross weight and moment and computed CG, the 870 value would be overwritten and the "Ins" and "C" would disappear from LMC, MAC, and %MC. Attempting to recompute %MC without verifying correct input would provide an erroneous solution. If you are working different types of problems in

the weight and balance extended output screens, it is best to first press [Clr] twice within one second. This clears all previously entered or computed values so you can enter any one of the three problem types and compute the answer without confusion. Also, remember that in the extended output screens, you may enter GWT and MOM to compute CG. However, you cannot compute MOM from GWT and CG, nor compute GWT from MOM and CG. Also, remember that RF is not a protected value after the [Clr] key has been pressed twice within one second in the extended output screens. This concludes the section on the weight and balance mode.

TIMER MODE

The timer mode has several useful features including a unique method for computing departure, enroute, and arrival times, a time format conversion, and a timeup/timedown timer function. All of these features are contained on one prompt screen which is accessed directly from the Aviation Mode Select Screen. Simply press the timer (TMR) parameter line key and use the following screen to solve a sample problem.

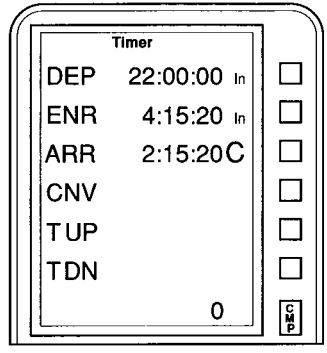


Sample Problem — Solving for Arrival Time

Given: Departure time . . . . . 2200 Zulu
Time en route . . . 2:40:00 (leg one)
1:35:20 (leg two)

Find: Arrival time

First, use the time colon [:] key to enter 22:00:00 in the scratch pad and transfer it to the departure (DEP) parameter line. Next, enter the two enroute times, one after another, in the en route (ENR) parameter line. Notice that values are accumulated automatically after each successive entry. Also, notice that the arrival (ARR) parameter is lined out. This means arrival time will be the value solved for when you press [CMP].



Notice it is not necessary to press the arrival (ARR) parameter line key after [CMP]. The TechStar timer mode is programmed to use any pair

of parameters to compute the third parameter. This means you also can solve for departure time or en route time with the other two appropriate variables. The "Ins" and "Cs" will reflect the type of problem being solved. Keep in mind that 24 hours is the maximum that can be entered for departure (DEP) and arrival (ARR). If you are experimenting with values, you should first "line clear" the value you wish to compute.

TIME CONVERSION

The conversion (CNV) function also is easy to use for changing time expressions from one format to another. When the timer mode is selected, time values can be entered in the scratch pad in any one of three formats:

1. Hours, Minutes, Seconds (HH:MM:SS)
2. Hours, Minutes, and Decimals of Minutes (HH:MM.m)
3. Hours, Decimals of Hours (HH.hh)

After entering a time value, transferring it to the CNV parameter line will automatically change the entered format as follows:

HH:MM:SS — Converts to HH.hh
HH:MM.m — Converts to HH.hh
HH.hh — Converts to HH:MM:SS

Go ahead and experiment with time conversions. After you have made a conversion, you can recall it to the scratch pad and transfer it to another mode for input.

TIME UP/TIME DOWN

The bottom two parameter lines are used to show a running time sequence for either timeup (TUP) or timedown (TDN); they do not operate simultaneously. Regardless of time format entered, the timer displays HH:MM:SS. Pressing the parameter line key for TUP causes the timer to count up from the time value entered in the parameter line. Pressing this key a second time causes the countup timer to stop. Pressing this key a third time restarts the countup timer from the value displayed.

Pressing the parameter line key for TDN causes the timer to count down from the time value entered in the parameter line. Pressing this key a second time causes the countdown timer to stop. Pressing this key a third time restarts the countdown timer from the displayed value. When the timer reaches zero, the counter continues counting down using a minus sign.

It also is possible to clear an active timing sequence. Simply press [Clr] and the line parameter key for either TUP or TDN (whichever is active) to stop the timing sequence. You also can press [Clr] twice within one second to clear an active timing sequence. You cannot "overwrite" an active timing sequence but you can enter a TUP sequence when TDN is active, or vice versa; however, when you do this, you will lose the previous timing sequence. In addition, if you attempt to input a value greater than 24 hours, an "Error" will appear in the scratch pad and the prior timing sequence will be lost.

TIMER OPERATIONS

The TechStar has a number of unique operating parameters in the timer mode.

1. The program is designed to prevent entry of a negative timing sequence. The minus sign will not transfer from the scratch pad, but the time value will be transferred as a positive value.
2. The countdown timer will display a minus sign after it reaches zero and continues counting down. After reaching -24:00:00, it will roll over and continue counting down from -0:00:01.
3. A time of 24 hours is the maximum time that can be activated in the countup or countdown timers. After counting up to 24:00:00, the timer will roll over and continue counting up from 0:00:01.
4. Automatic shutdown of the computer is cancelled for 25 hours once the timer is activated. However, to prolong battery life, it is recommended that the timer be stopped manually or the computer turned OFF when the timer is not in use.
5. Once you have activated the timer, you can access other modes and the timer remains active. This means you will see two mode prompts at the top of the display. To return to the timer mode to check the display, simply press [Mode] and select TMR.

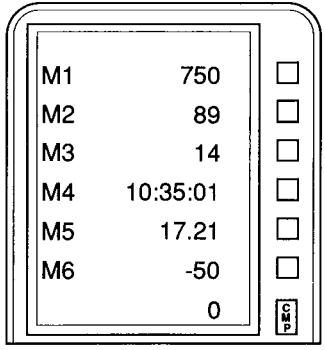
Go ahead and experiment with the various timer functions. This concludes the discussion on timer mode.

MEMORY FUNCTION

Your TechStar has six user memories which can be accessed during any mode or arithmetic operation. Simply press the [Sto] key followed by

an arithmetic key (1 through 6) to store the value shown in the scratch pad. You will not affect any mode or arithmetic operation in progress and the mode screen you have been using will not change. The computer simply transfers the value from the scratch pad to the selected memory location. The value remains in that location until overwritten with a new value or the computer is turned off. To retrieve a value from memory, press [Rcl] followed by the arithmetic key which corresponds to the stored location (1 through 6). The value will appear in the scratch pad. It is not necessary to clear a memory location before entering a new value. You can simply overwrite the previously stored value. However, you can press [Clr] twice within one second when the memory screen is displayed to clear all values and place nulls in the memory registers.

If you have stored a number of values in the user memories and you wish to review them, press [Rcl] twice within one second. This will display the entire memory screen showing the values you have placed in memory registers M1 through M6.



After you have reviewed the memory screen, press [Mode] and you will return to the mode you were previously using. Keep in mind that you can add or subtract a value in the scratch pad to or from a value in memory. For example, to subtract 391 in the scratch pad from Memory 1, press [Sto], [−], [1] and 359 will appear in Memory 1 parameter line (391 will remain in the scratch pad). Go ahead and experiment with the user memories. This concludes the discussion on the memory function.

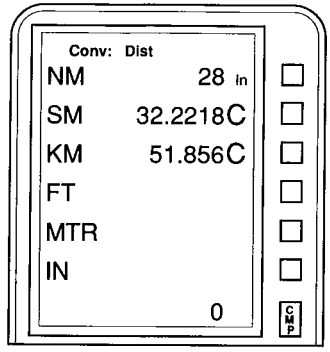
CONVERSION FUNCTION

The TechStar is designed so you can access conversion functions at any point during an arithmetic or aviation mode operation. You can convert most commonly used values for distance, volume, weight, or barometric pressure, and temperature. Simply press the [Dist], [Vol], [Wt], or [Wx] key, as appropriate, for the type of conversion you desire. If you press the [Dist] key, for example, you will notice that the conversion (Conv:) and distance (Dist) prompts are illuminated at the top of the display screen. You can also see the various conversion unit prompts on the left side of the screen. Now, solve the following sample problem.

Sample Problem — Distance Conversions

Given: Nautical miles 28
Find: Statute miles and Kilometers

First, enter 28 n.m. in the scratch pad and transfer it to the nautical mile (NM) parameter line. Then press the [CMP] key followed by the statute mile (SM) parameter line key. Repeat the steps



First, notice there is no rounding of computed values to whole numbers or decimals; only the sixth digit is rounded in conversion operations. This permits you to decide on the accuracy required. Also, notice NM is an "In" while SM and KM are followed by a "C." You can continue to compute all additional parameters if you desire by pressing [CMP] and the appropriate line key. Remember that the display is limited to ±999,999. If the conversion exceeds that figure, an overload prompt (OL) will appear in the affected parameter line. If this happens, it is not necessary to press the [Clr] key. You can continue computing additional units if you desire.

Also, remember that "overwriting" previously entered or computed values on the conversion screen is not permitted after a computation is executed. This prevents mixing of conversion values on the same screen. However, you can still clear all values on the screen by pressing [Clr] twice within one second, or by reselecting the [Dist] key.

You can access the conversion screen the same way when operating in an aviation mode. When you do this, both the mode prompt for the mode you were using and the conversion prompt will be illuminated at the top of the display. After you make a conversion while operating concurrently in an aviation mode, you may want to transfer it back for use in the aviation mode. Simply recall the converted value from the parameter line to the scratch pad and press the [Mode] select key. You will automatically be transferred back to the mode you were working in and the converted value will be in the scratch pad. You can then enter it in the desired parameter line. Go ahead and experiment with conversions.

You will notice that the Wx conversion function includes temperature as well as barometric pressure values. If you make a temperature conversion first, you will need to reselect [Wx] in order to convert pressure values or vice versa. The program is designed to prevent conversion of different types of values on the same screen. This concludes the discussion on conversion functions.

BASIC OPERATING FEATURES

The TechStar arithmetic keyboard is the same as other handheld computers you may have used. You must use the [=] key to obtain the result of your last entered arithmetic operation. Keep in mind that basic arithmetic calculations can be performed in any mode. During arithmetic operations, the calculated results are *not rounded* at the sixth digit.

You also can perform arithmetic operations on time values regardless of time format(s). However, any computed time values are expressed in the last entered time format unless they exceed 99:59:59. In the latter case, the value will appear

in HH.hh format. In addition, entry of any time format in a time (TIM) parameter line will display the HH:MM:SS format. You also can convert from one time format to another in the timer mode which is discussed in the section on Timer.

ROUNDING OF COMPUTED VALUES

Some *computed* values are rounded to one or two decimal places or whole numbers for convenience. The TSD mode displays computed values with one digit to the right of the decimal point (nearest tenth) except for SPD which rounds to the nearest whole number. Whole numbers are displayed for most computed values in the Alt/As and WIND modes. However, Mach is shown with two decimal places while TR° and ST° reflect one decimal point. In the Wt/Bal mode CG, ▲CG, and %MC reflect two decimal places, while ARM and ▲AR use one decimal. Other Wt/Bal values are shown as whole numbers. Any rounded value can be converted to its full decimal display by simply recalling it to the scratch pad.

RECALL

The [Rcl] key allows you to recall data to the scratch pad. This data may have been previously entered, computed, and/or stored in memory. To recall data from any parameter line, press the [Rcl] key followed by the line key. When you do this, you will notice the value displayed in the scratch pad often is the unrounded value. The recall function converts any rounded value from a parameter line to the full 6-digit display (the last digit is *not rounded*). This may be beneficial if you need the additional accuracy. To recall data from the user memories, simply press [Rcl] followed by the number of the memory register, 1 through 6. You can also call up the memory screen by pressing [Rcl] twice within

one second. When this memory screen is displayed, the data in each memory register can be recalled by pressing [Rcl] followed by pressing the appropriate parameter line key.

AUTOMATIC SHUTDOWN

You can turn the computer off at anytime by pressing the [On/Off] key. The computer also will shut off automatically if there is no activity on the keyboard for a period of approximately 15 minutes. In either case, all values previously entered in any registers are erased. This includes the user memories as well. However, operation of the timer will override the automatic shutdown feature for a period of 25 hours. If there has been no activity during that period, the computer will shut itself off. The automatic shutdown feature extends battery life significantly.

BATTERY CONDITION

Clear, readable digits and mode prompts in the display indicate a "good battery" condition. When the display is not bright at normal viewing angles, the batteries are getting weak. TechStar uses four AAA batteries which can be accessed from a cover on the back of the computer. Correct positioning for replacement batteries is indicated in the battery compartment.

ALTITUDE/AIRSPEED ACCURACY LIMITATIONS

The standard temperature lapse rate changes above 36,089 feet (11 km.). This affects calculations for standard temperature, density altitude, true altitude, true airspeed, and Mach. The calculator compensates for these variations and provides accurate results up to 65,616.8 feet (20 km.). In addition, the rate of air compressibility changes for speeds in excess of Mach 1, so true airspeed, calibrated airspeed, and Mach calculations in excess of Mach 1 are not accurate with this computer.

True airspeed and Mach calculations are affected by a temperature recovery coefficient which varies with installation and design of the temperature probe on the individual airplane. Since most modern, high-speed aircraft use a recovery coefficient equal to 1.0, TechStar also uses a recover coefficient of 1.0.

The airspeed indicator is a reliable instrument, but its reading is affected by various items such as temperature, pressure, and compressibility. A fast-flying aircraft passes through the atmosphere so rapidly that the air is compressed in front of the aircraft and is heated by this compression. As a result, an outside air temperature probe "feels" a higher air temperature than really exists in the surrounding noncompressed air. Also, the rush of air over the outside air temperature (OAT) probe creates friction, causing further heating and a still higher (false) reading. The amount of this higher reading of the thermometer is called "temperature rise." It must be considered when computing accurate, true airspeed and Mach. An automatic compensation for compressibility, temperature rise, and air friction is built into TechStar so that correct true airspeed and Mach solutions are provided. The amount of temperature rise (TR°) for a given airspeed also can be computed with TechStar.

Slide-type, mechanical computers do not compensate for compressibility; therefore, the answers from TechStar are more accurate than those derived from slide-type computers. The difference in answers between the slide-type and electronic computers is insignificant below 200 knots and 20,000 feet. Above these values, however, the differences in answers increase as speed and altitude increase.

ERROR MESSAGES

An "Error" message will be displayed in the scratch pad when any of the following conditions exist. An "E" will be displayed simultaneously in a parameter line where noted.

1. Dividing a number by zero.
2. Attempting to compute an input only value.
3. Attempting to enter a compute only value.
4. Pressing a line key for a "compute only" parameter without first pressing the compute key.
5. Attempting to compute a value without sufficient data to solve the problem. In these cases, an "E" also will appear on the parameter lines for those values needed to solve the problem.
6. Attempting to compute TIM in TSD mode with a zero in SPD or FLO. An "E" will appear in SPD (or FLO).
7. Attempting to compute SPD or FLO in TSD mode with a TIM of zero. An "E" will appear in TIM.
8. Attempting to compute HDG or GS in WND mode with a TAS of zero. An "E" will appear in TAS.
9. When a computation results in a negative groundspeed value. An "E" will appear in GS.
10. Entering a negative value (other than zero) or a value greater than 360° in the following wind mode bearing registers: (WDR, CRS, HDG, TC, TH, MC or MH).
11. Entering magnetic variation (VAR) in excess of ±180°.
12. In Wt/Bal prompt screen, pressing compute after weight is entered but before moment or arm is entered.
13. Attempting to compute CG with a total weight of zero.

14. Attempting to enter zero in RF.
15. Attempting to enter zero in a basic WT, MO, or AR line. "E" will appear in the WT, MO, or AR line.
16. Attempting to enter weight as a negative value in a SFT problem. An "E" will appear in WT.
17. Attempting to enter a time greater than 24:00:00 in DEP, ARR, TUP, or TDN.
18. Pressing STORE followed by any keys other than numeric keys 1 through 6, or CLEAR.
19. Pressing RECALL followed by any keys other than the line parameter keys numeric keys 1 through 6, or CLEAR.
20. Attempting to RECALL a value from any register that contains no data (null).
21. Attempting to overwrite a value in a conversion screen after any value has been computed. You need to clear the error and reselect the same conversion function, or press the clear key twice within one second.
22. Pressing compute after the second compute has been executed without changing a line parameter value first.

CLEARING ERROR MESSAGES

Pressing the [Clr] key clears the "Error" from the scratch pad and simultaneously clears "E" in any parameter line(s). This also places a null in the parameter line register and a zero in the scratch pad. You also can clear a value from a parameter line by pressing [Clr] followed by the line key. However, the RF register in the weight and balance mode is programmed to default to one following a clearing sequence.

Note: In the extended output screens, clearing a scratch pad error message also removes the "E" from any parameter lines on the display in use.

It does not remove "Es" from any parameter lies on other screens. This allows you to identify missing data on other screens. These remaining "Es" do not have to be cleared; they may simply be overwritten.

ABBREVIATIONS LIST

The following abbreviations list also shows the values with prompt screen solutions in **Bold.** Notations identify input only or compute only values; all others can be inputs or computes.

TSD — Time-Speed-Distance
- **SPD—Groundspeed**
- **DST—Distance**
- **TIM—Time**
- **FLO—Fuel Flow**
- **F—Fuel Quantity**

Alt/As — Altitude Airspeed
- **CAS—Calibrated Airspeed**
- **TAS—True Airspeed**
- **DA—Density Altitude (Compute Only)**
- **M—Mach**
- **ST°—Standard Temperature (Compute Only)**
- **TA—True Altitude (Compute Only)**
- PA—Pressure Altitude (Input Only)
- T°C—True Temperature
- I°C—Indicated Temperature (Input Only)
- TR°—Temperature Rise (Compute Only)
- CA—Calibrated Altitude (Input Only)

WND—Wind
- **WDR—Wind Direction**
- **WSP—Wind Speed**
- **HDG—Heading**
- **GS—Groundspeed**
- **XWC—Crosswind Component (Compute Only)**
- CRS—Course (Input Only)
- TAS—True Airspeed
- WCA—Wind Correction Angle (Compute Only)

- HWC—Headwind Component (Compute Only)
- TWC—Tailwind Component (Compute Only)
- TC—True Course
- TH—True Heading
- VAR—Variation (Input Only)
- MC—Magnetic Course
- MH—Magnetic Heading

Wt/Bal—Weight and Balance
- **GWT—Gross Weight**
- **CG—Center of Gravity**
- **SFT—Shift (Menu Select Prompt Only)**
- **%MC—Percent MAC (Compute Only)**
- 1WT—First Weight (Input Only)
- 1MO—First Moment
- 1AR—First Arm (Input Only)
- (Continues thru 9 and recycles)
- NXT—Next (Prompt Only)
- MOM—Moment
- RF—Reduction Factor (Input Only)
- WT—Weight
- ARM—Arm
- ▲AR—Change in Arm
- ▲CG—Change in CG
- LMC—Leading Edge of MAC (Input Only)
- MAC—Mean Aerodynamic Cord (Input Only)
- TIM—Timer (No prompted solutions)
- DEP—Departure Time
- ENR—Enroute Time
- ARR—Arrival Time
- CNV—Conversion for Time
- TUP—Timeup
- TDN—Timedown

CONVERSIONS (Inputs or Computes)
- Dist—Distance (Conversion Select Key/Prompt)
- NM—Nautical Miles
- SM—Statute Miles
- KM—Kilometer
- FT—Feet
- MTR—Meters
- IN—Inches

VOL—Volume (Conversion Select Key/Prompt)
- GAL—Gallon
- LTR—Liter
- IPG—Imperial Gallons

WT—Weight (Conversion Select Key/Prompt)
- LB—Pounds
- KG—Kilogram

WX—Weather (Conversion Select Key/Prompt)
- °F—Degrees Fahrenheit
- °C—Degrees Celsius
- IHG—Inches of Mercury
- MB—Millibars
- HPA—Hectopascals
- MHG—Millimeters of Mercury

MEMORY—Inputs Only
- M1—Memory One
- M2—Memory Two
- M3—Memory Three
- M4—Memory Four
- M5—Memory Five
- M6—Memory Six

CAUTION
This electronic computer is a training and information verification tool, and it is not an avionics instrument.

NOTE
This computer is designed to operate accurately within a wide range of atmospheric conditions. However, if exposed to extreme temperatures or direct sunlight for an extended period of time, the display may go blank. If this occurs, remove the computer from the heat or sunlight and it will display properly within several minutes.

3-YEAR LIMITED WARRANTY

This electronic computer warranty extends to the original purchaser of the computer.

Warranty Duration

This electronic computer is warranted to the original purchaser for a period of three years from the original purchase date.

Warranty Coverage

This electronic computer is warranted against defective materials or workmanship. THIS WARRANTY DOES NOT COVER BATTERIES AND IS VOID IF:

1. THE COMPUTER HAS BEEN DAMAGED BY ACCIDENT OR UNREASONABLE USE, NEGLECT, IMPROPER SERVICE, OR OTHER CAUSES NOT ARISING OUT OF DEFECTS IN MATERIAL OR WORKMANSHIP.

2. THE SERIAL NUMBER HAS BEEN ALTERED OR DEFACED.

Warranty Performance

During the above three-year warranty period, your computer will either be repaired or replaced with a reconditioned model of an equivalent quality (at Jeppesen Sanderson's option) when the computer is returned, postage prepaid and insured, to Jeppesen Sanderson. In the event of replacement with a reconditioned model, the replacement unit will continue the warranty of the original computer. Other than the postage and insurance requirement, no charge will be made for such repair adjustment and/or replacement. Be sure to provide a written statement or example explaining any difficulty encountered.

Warranty Disclaimers

Any implied warranties arising out of this sale, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above three-year period. Jeppesen Sanderson shall not be liable for loss of use of the computer or other incidental or consequential costs, expenses, or damages incurred by the purchaser.

Some states do not allow the exclusion or limitation of implied warranties or consequential damages; so, the above limitations or exclusions may not apply to you.

Legal Remedies

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Jeppesen Sanderson, Inc.
55 Inverness Drive East
Englewood, CO 80112-5498

IMPORTANT

Record the serial number (from the back of unit) and purchase date in the space below. Always reference this information in any correspondence.

MODEL SERIAL NO.

TECHSTAR _____

PURCHASE DATE _____