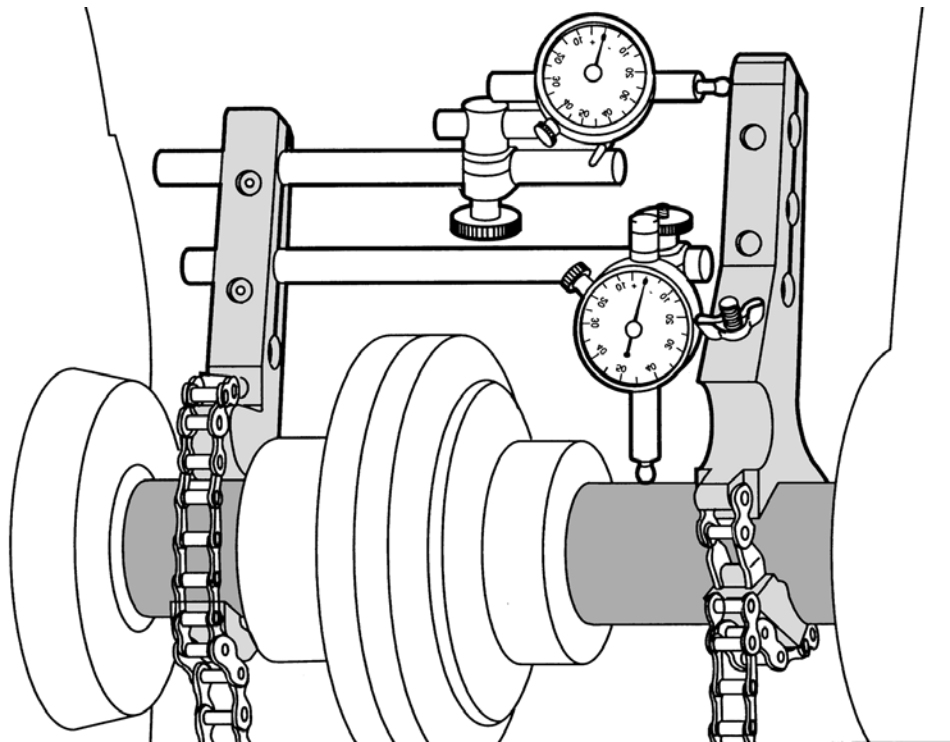


Instruction Manual

Peterson Alignment Tools Company

Alignment Manual and Alignment Calculator Guidebook



#30RA Shaft Alignment Kit shown

Manual for use with the
Alignment Manager™
Calculator v5.0a
(TI-84 Plus Calculator Version)



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IMPORTANT! Read this manual completely and thoroughly before attempting to align your machinery using a Peterson Shaft Alignment System.



Read!

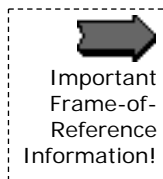
➤ The Importance of Proper Shaft Alignment

Power transmission equipment is usually linked by a coupling system. Proper shaft alignment will dramatically increase the life of the various components that collectively comprise the motor and pump assembly — things like the bearings, the coupling and the gearbox. Conversely, misaligned shafts will inevitably lead to vibration, high bearing loads, seal failure, and, eventually, failure of the coupling, motor or pump, or any combination of those three. The end result: costly down-time and repair and/or replacement expense, along with lots of headaches.

A comprehensive preventive maintenance program will go a long way towards eliminating these problems and keep your machinery — and, therefore, your business — running smoothly. Maintaining proper alignment of your rotating equipment through the periodic use of a Peterson shaft alignment tool will save you money in repairs, replacements and down time — more than paying for itself in a very short period of time.

For purposes of continuity and consistency throughout this instruction manual, the following guidelines will be used:

1. Peterson brand Alignment Tools are designed to operate with the coupling intact, so separation of the coupling assembly should not be performed.



2. Whenever possible, mount the alignment tool frame that will hold the mounting tubes on the stationary equipment side (left side of the coupling) and span the dial indicators across the coupling to the moveable equipment (right side of coupling). This configuration results in measurements being taken on the equipment to be adjusted, and is important in establishing consistency between the measurements and the mathematical formulae they will be used in. Refer to Figure 3 on Page 9.

➤ I. Determining and Correcting “Soft-Foot”

“Soft-Foot” is the term commonly applied to that condition which exists when all four (4) of the machine feet are not supporting the weight of the machine evenly. This condition, when not corrected before starting the alignment procedure, is one of the major causes of inconsistent alignment results, frustration and lost productivity.

Your machinery may display this fault known as soft-foot, which will cause the machine to assume a different height dependent on the following factors:

- The amount of torque on the base fastenings -
- If the mounting base is not true and level -
- If existing shims are rusty, bent or broken -
- Equipment was mounted on an unclean surface -

Consider a chair with one of its legs shorter than the rest. The chair will never be stable unless the other three of its legs are shortened or the short leg is shimmed up. When a machine is in this condition, the dial indicator readings can be different each time the cycle of tightening, loosening and re-tightening is completed. Frustration and lost productivity occurs because attempted corrections do not produce the desired results.

The basis for understanding and correcting soft-foot is the knowledge that a plane is determined by three (3) points. In the case of the chair, the floor is the “plane” that we speak of, and the bottom tips of the legs are the “points.” Three tips will always rest on the floor, even if a person is sitting with his weight positioned above the short leg (the short leg will then be on the floor

and the normal leg which is diagonally opposite the short leg will be off the floor). By using this example, it can easily be seen that when a machine is initially placed on its base it will be resting on three (3) of its support feet unless the base and the bottom of the feet are perfectly machined. Also, because the feet of the machine are actually square pads – not true points – it is possible that the machine will be resting on only two (2) support feet which are diagonally opposite each other. In this case, the machine will have two (2) soft feet.

Soft-foot should always be checked and corrected before beginning the alignment procedure. The following should be done as an initial check for soft-foot:

1. Remove all dirt, rust, and burrs from the bottom of the machine's feet, the shims to be used, and the base (at the areas where the machine's feet will rest).
2. Set the machine in place, but do NOT tighten the hold-down nuts.
3. Attempt to pass a thin feeler gage (or piece of shim stock) underneath each of the four (4) feet. Any foot which is not solidly resting on the base is a "soft-foot." (Bear in mind that a foot may be considered "soft" if the feeler gage passes beneath most of it and only contacts a small point or one edge.) If the feeler gage passes beneath a foot, determine the exact amount of gap beneath the foot with the feeler gages and place this amount of shims beneath that foot. This will be considered as being the "initial" soft-foot correction.

Final correction of soft-foot should be done as follows:

1. Tighten all hold-down nuts on the machine to be aligned ("MTBM" – Motor-To-Be-Moved reference).
2. Secure a dial indicator holder (such as one with a magnetic base) to the base of the MTBM in such a manner that the stem of the dial indicator is placed vertically above the foot which is to be checked for soft-foot. Set the dial indicator to zero (0). Completely loosen the hold-down nut(s) on that foot only. Watch the dial indicator for foot movement during the loosening process.
3. If the foot rises from the base when the hold-down nut(s) is loosened, place beneath the foot an amount of shims stock equal to the amount of deflection shown on the dial indicator.
4. Retighten the hold-down nut(s) and repeat the entire process once more to be certain there is no more movement present at the foot.
5. Move the dial indicator and holder to the next foot and repeat steps (1) through (4) for the remaining three (3) feet.

Remember, while a selected foot is being checked for soft-foot, the remaining (3) must remain securely fastened to the base.

➤ II. Sag Calculation and Measurement



"Sag," within the context of this alignment manual, is the deflection of a dial indicator due to gravity alone. If the distance from the mounting frame to the tip of the perpendicularly mounted dial indicator plunger is less than three inches, SAG will be negligible. For distances greater

than three inches, SAG can have a significant impact on the accuracy of the alignment calculation and must be corrected for. You will be setting up a simulation of the alignment kit on a piece of pipe or tubing. Use the following simple procedure to determine the extent of any SAG:

1. On the equipment to be aligned, measure (or estimate) the distance horizontally from the edge where the mounting frame will be to the point of the perpendicular (also referred to as rim or radial) dial indicator plunger. Write this number down.
2. Mount the alignment kit on a temporary arbor (a scrap piece of pipe or tubing will do) at the horizontal distance you wrote down in #1. IF YOU ARE USING THE MODEL #20RA, BOTH DIAL INDICATORS MOUNTED ON ONE PIECE OF TUBING MUST BE USED FOR THE SAG TEST. READ "PROCEDURE A - MOUNTING AND OPERATING MODEL #20RA", BELOW, FOR MORE INFORMATION ON THIS PROCEDURE.
3. Zero the dial indicator at twelve o'clock (0°) and rotate the arbor to 6 o'clock (180°).
4. Since gravity will pull the indicator away (pulling the plunger away from the surface of the pipe), the resulting reading on the dial indicator will always be a negative number. Write this negative number down for use later on with the FastMath Worksheets or with the Alignment Manager™ calculator. Remember, SAG only applies to the dial indicator mounted perpendicular to the shaft from 0° to 180° .

➤ III. Alignment Procedures - Peterson Alignment Systems

You are now ready to begin the actual alignment process for parallel and angular offset misalignment in both the vertical and horizontal planes. Keep in mind that Peterson Alignment Tools are designed to operate with the coupling intact, so separation of the coupling is not necessary. All alignment data is obtained in one 270° rotation of the equipment with a Peterson Alignment Tool in place.



BEFORE BEGINNING ANY ALIGNMENT JOB, BE SURE ALL POWER IS DISCONNECTED AND/OR SHUT OFF FOR THE MACHINERY YOU WILL BE WORKING ON.

Use one of the two following procedures (IIIA. or IIIB., depending on which model you are using) as a guide in setting up and configuring your Peterson shaft alignment tool. Actual configurations can vary from user to user and/or from job to job. The following is simply a guideline, and you should not be alarmed or deterred if your configuration varies slightly due to the wide variety of machinery limitations, space restrictions, etc., that exist.

➤ IIIA. Mounting and Operating Model #20RA (9 Steps)

1. For proper orientation, mount the first alignment tool frame on the shaft (or coupling) of the stationary (fixed reference) equipment, and have this equipment to your **left**, if possible. Wrap the roller chain around the shaft or coupling and clip it to the footing of the frame (the "hook" that is connected to the frame with a connecting link). Make certain the frame is firm and secure by tightening the wing nut on the frame. It does not matter whether or not the wing nut is towards you or away from you - you can switch it later if setup proves easier.

2. Insert the appropriate length of stainless steel tubing into the ½" diameter hole in the alignment tool frame. Close the frame by tightening the socket-head cap screw with the Allen key. This screw will only close the jaws of the alignment tool. If you need to widen the jaws of the alignment tool to insert the ½" tubing, first make sure the socket-head cap screw is loose, then insert a screwdriver or any appropriate tool in the saw-cut at the top of the alignment tool to gently increase the gap width. You may need to adjust the tubing one or more times before the ideal position is achieved.



See Sag
Reference
Pg. 4-5

3. Slide one swivel joint (with the dial indicator and mounting rod attached) onto the open end of the tubing and slide it toward the frame. Position it in such a manner that there is sufficient room to accommodate a second swivel joint on the same piece of tubing. Then slide the second swivel joint onto that same piece of tubing.

4. Mount the second alignment tool frame across the coupling on the shaft of the moveable equipment side of the motor/pump assembly (right of coupling). This frame does not have to be directly across from the first, but should be as close as possible. This frame will act as a vertical "target" for your parallel-mounted (also referred to as angular or face) dial indicator.

5. Manipulate and maneuver the first dial indicator assembly (the one you slid on first) so that the indicator plunger is perpendicular to the shaft on the moveable equipment side of the motor/pump assembly. The plunger should be touching the shaft and depressed approximately halfway.

6. Manipulate and maneuver the second dial indicator assembly so that the indicator plunger is parallel to the shaft on the moveable equipment side of the motor/pump assembly and striking the vertical "target" alignment frame anywhere on its flat surface, preferably towards the outer portion of it. The plunger should be depressed approximately halfway (See figure 3).



Don't get -F-,
the face dial
indicator
reading,
confused with
"F", the
distance to
the front feet
on the
stationary
side.

7. The dial indicator positioned perpendicular to the shaft will now be referred to as -R-, for rim indicator, and the dial indicator positioned parallel to the shaft will now be referred to as -F-, for face indicator.

When the alignment tool is setup according to steps 1-6, three constants must be recorded, which are: the diameter of the circle of revolution made by the -F- dial indicator's plunger about the centerline of the shaft ("H"); the horizontal distance from the -F- dial indicator plunger to the front set of motor feet on the Moveable Side ("D" distance to the right); the horizontal distance from the -F- dial indicator plunger to the back set of motor feet on the Moveable Side ("E" distance to the right). See Section IV, Figure 3.

Optionally, you may record the following dimensions: the horizontal distance from the -F- dial indicator plunger to the front feet of the Stationary Machine ("F" distance to the left of the coupling) and the horizontal distance from the -F- dial indicator plunger to the back set of motor feet on the Stationary Side ("G" distance to the left of the coupling). See Figure 3 in Section IV.

Distances "F" and "G" may be entered into the Alignment Manager program if a situation arises where you are unable to add or remove shims to the moveable equipment. By supplying these optional distances, the Alignment Manager software will calculate and display alternate shim and adjustment amounts for each alignment you perform.

8. Zero both indicators at 12 o'clock (0°) and rotate the shaft and coupling assembly, stopping at 90° intervals (90° , 180° , and 270°) to take the dial indicator readings. Each individual dial indicator should stop at each interval. For an example at 90° , if the -R- indicator is 10° behind the -F- indicator, take the -F- reading first, rotate the assembly 10° more, then take your reading off of the -R- indicator.

If you are using the Alignment Manager calculator, you may enter the dial readings directly during this step. Turn to page 11 to use the Alignment Manager calculation method now.

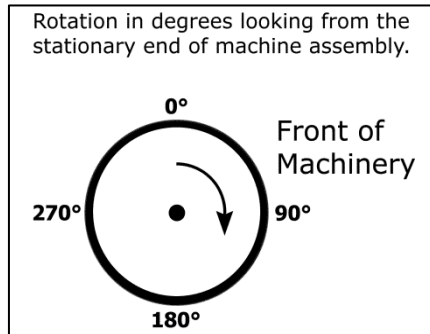


Figure 1: Proper rotation of alignment tool on equipment. Rotation of the shaft-coupling assembly is towards you with the stationary machine to your left and the moveable machine to your right.

9. You now have the data necessary to determine any misalignment present in your equipment. If you haven't already done so in step #IIIA-7 above, use Figure 3 in Section IV to determine constants for use in the alignment calculation.

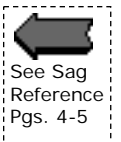
Turn to Page 11 to use the Alignment Manager Calculator

➤ IIIB. Mounting and Operating Model #30RA (9 Steps)

1. For proper orientation, mount the first alignment tool frame on the shaft (or coupling) of the stationary (fixed reference) equipment, and have this equipment to your left, if possible. Wrap the roller chain around the shaft or coupling and clip it to the footing of the frame (the "hook" that is connected to the frame with a connecting link). Make certain the frame is firm and secure by turning the wing nut on the frame. It does not matter whether or not the wing nut is towards you or away from you - you can switch it later if setup proves easier.

2. Insert appropriate lengths of steel tubing into the outermost and center $\frac{1}{2}$ " holes in the frame. Close the frame by turning both of the socket-head cap screws on the alignment frame with the Allen key. These screws will only close the jaws of the alignment tool. If you need to widen the jaws of the alignment tool, insert a screwdriver or any appropriate tool in the saw-cut to gently increase the gap width. You may need to adjust the tubing one or more times before your setup is complete.

3. Slide one swivel joint (with the dial indicator and mounting rod already attached) onto the outer piece of tubing; slide the second swivel joint onto the inner piece of tubing.



4. Mount the second alignment tool frame across the coupling on the shaft of the moveable equipment side of the motor/pump assembly. This frame does not have to be directly across from the first, but should be as close as possible. This frame will act as a vertical "target" for your parallel-mounted (also referred to as *angular* or *face*) dial indicator.

5. Manipulate and maneuver the innermost dial indicator assembly so that the indicator plunger is perpendicular to the shaft on the moveable equipment side of the motor/pump assembly. The plunger should be touching the shaft and pushed in approximately halfway. (See figure 3.)

6. Manipulate and maneuver the outermost dial indicator assembly (farthest from the first mounting frame) so that the indicator plunger is parallel to the shaft on the moveable equipment side of the motor/pump assembly, striking the "target" alignment frame anywhere on its flat surface, preferably towards the outer portion of it. As a starting point, the plunger should be depressed approximately halfway between no compression and full compression (See figure 3).

Don't get -F-, the face dial indicator reading, confused with "F", the distance to the front feet on the stationary side.

7. The dial indicator positioned perpendicular to the shaft will now be referred to as -R-, for rim indicator, and the dial indicator positioned parallel to the shaft will now be referred to as -F-, for face indicator.

When the alignment tool is setup according to steps 1-6, three constants must be recorded, which are: the diameter of the circle of revolution made by the -F- dial indicator's plunger about the centerline of the shaft ("H"); the horizontal distance from the -F- dial indicator plunger to the front set of motor feet on the Moveable Side ("D" distance to the right); the horizontal distance from the -F- dial indicator plunger to the back set of motor feet on the Moveable Side ("E" distance to the right). See Figure 3 in Section IV.

Optionally, you may record the following dimensions: the horizontal distance from the -F- dial indicator plunger to the front feet of the Stationary Machine ("F" distance to the left of the coupling) and the horizontal distance from the -F- dial indicator plunger to the back set of motor feet on the Stationary Side ("G" distance to the left of the coupling). See Figure 3 in Section IV.

Distances "F" and "G" may be entered into the Alignment Manager program if a situation arises where you are unable to add or remove shims to the moveable equipment. By supplying these optional distances, the Alignment Manager software will calculate and display alternate shim and adjustment amounts for each alignment you perform.

8. Zero both indicators at 12 o'clock (0°) and rotate the shaft and coupling assembly, stopping at 90° intervals (90°, 180°, and 270°) to take the dial indicator readings. Each individual dial indicator should stop at each interval. As an example at 90°, if the -R- indicator is 10° behind the -F- indicator, take the -F- reading first, rotate the assembly 10° more, then take your reading off of the -R- indicator.

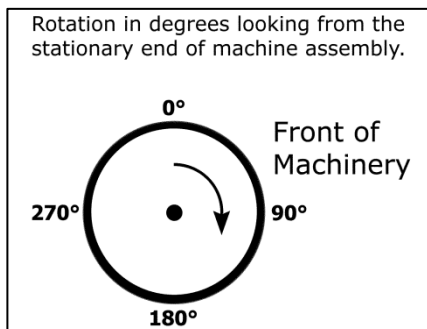


Figure 2: Proper rotation of alignment tool on equipment. Rotation of the shaft-coupling assembly is towards you with the stationary machine to your left and the moveable machine to your right.

If you are using the Alignment Manager calculator, you may enter the dial readings directly during this step. Turn to page 11 to use the Alignment Manager calculator software now.

9. You now have the data necessary to determine any misalignment present in your equipment. If you haven't already done so in step #IIIB-7 above, use Figure 3 in Section IV to determine constants for use in the alignment calculation.

Turn to Page 11 to use the Alignment Manager Calculator

➤ IV. Key to Variables

You should now be finished with mounting either the model #20RA or #30RA alignment system, and you should have your Rim and Face dial indicator readings taken from 90°, 180° and 270°. If you will be using the Alignment Manager calculator for determining alignment correction amounts, you may enter the dial indicator readings directly and follow along as you go.

The following figure shows the variables that are to be used in the alignment procedure, as well as the reference points they should be measured from. Study this diagram carefully.

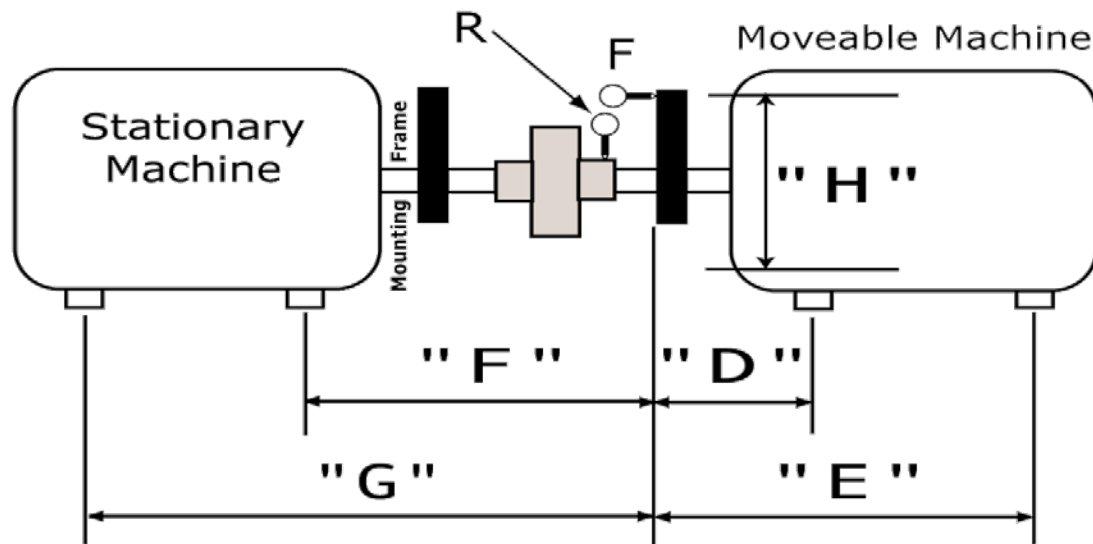


FIGURE 3: Diagram showing orientation and reference-point distances for Rim and Face method of shaft alignment. You will need these measurements for use with the Alignment Manager software and the FastMath Worksheet.

Key To Variables:

- H = Swing diameter (circle of revolution)
- F = Face dial indicator orientation (plunger parallel to shaft)
- R = Rim dial indicator orientation (plunger perpendicular to shaft)
- D = Horizontal distance from parallel dial plunger to near feet of Motor-To-Be-Moved
- E = Horizontal distance from parallel dial plunger to far feet of Motor-To-Be-Moved

Optional Measurements for Alignment Manager Software Use Only:

- F = Horizontal distance: parallel dial plunger to near feet of Stationary Machine
- G = Horizontal distance: parallel dial plunger to far feet of Stationary Machine

➤ V. Alignment Manager™ Calculation Procedure

TI-84 Plus keys

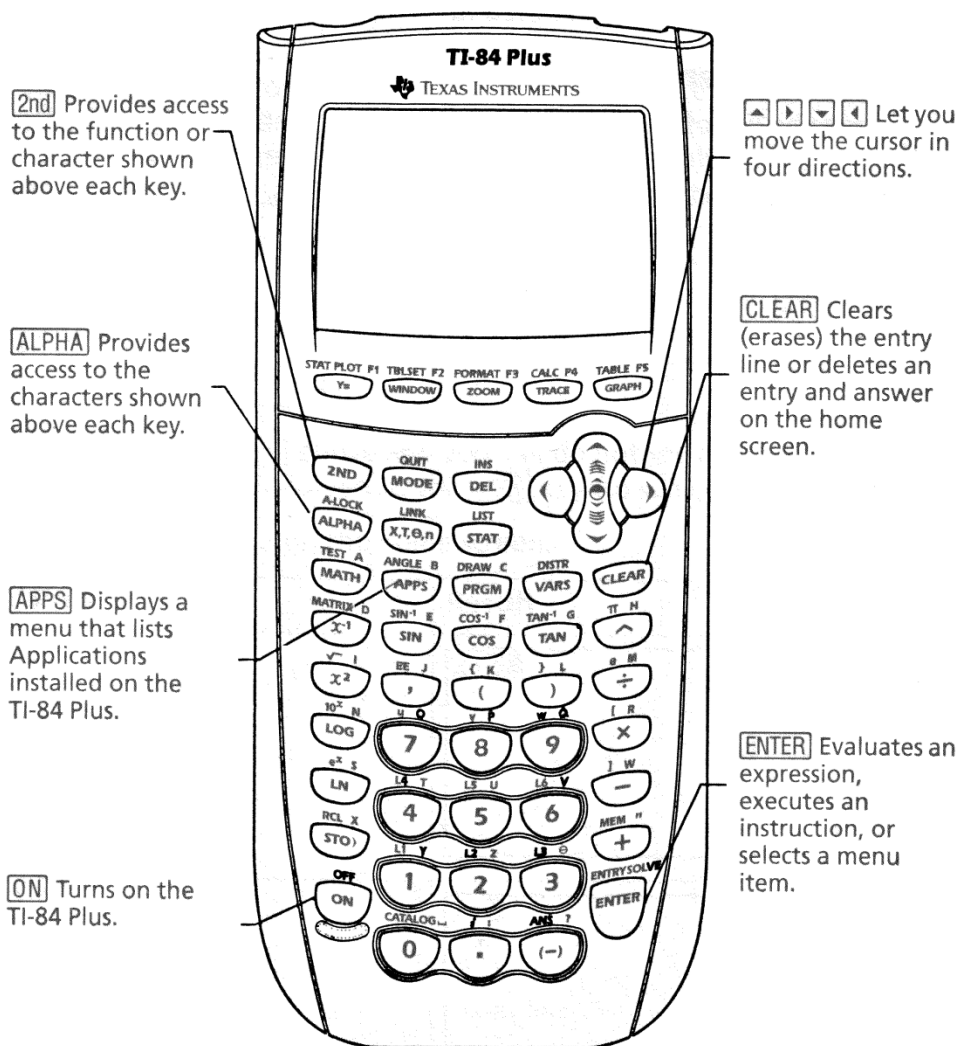


Figure 4: Alignment Manager TI-84 Plus Programmable Calculator key layout.

1. Turn on the calculator by pressing **<ON>** in the lower left of the keypad. To make sure you have a clear screen, press the following sequence: 0 (zero), **<ENTER>**, and then the **<CLEAR>** key just under the arrow keypad along the right edge of the calculator. This gives you a clean screen to start from.
2. Press the **<PRGM>** (Program) key in the center of the keypad.
3. You can select and execute any programs listed by either of these two ways (see screens on next page): (1) by pressing the corresponding number next to the program you wish to execute, and then pressing enter. Or, (2) moving your cursor (**<▲>**) to the program you wish to execute, then press **<ENTER>** twice.



Initial screen after pressing the <PRGM> key (left) showing the programs available for execution (EXEC) on the TI-84 Plus Alignment Manager Calculator (your screen may differ slightly). Press the number "2" or move the selection cursor down to "RIMFACE" and hit <ENTER> to select the program (right). Hit <ENTER> again to run the program.

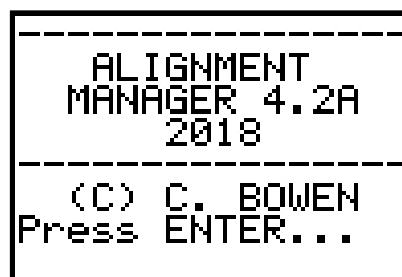
5. Press <ENTER> to launch the program and display copyright information.
6. Press <ENTER> again to begin entering data. Follow the prompts carefully.

➤ Questions the Program Asks / Sample Calculations

The following is a sample and brief description of what the "RIMFACE" program will ask for when you run the program. **Each subsequent screen is arrived at by pressing <ENTER>:**

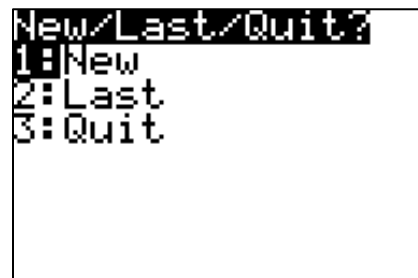
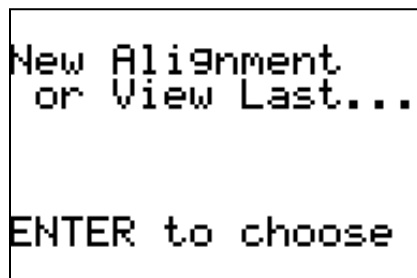
SCREEN 1A, 1B

- COMPANY NAME AND PROGRAM THAT IS CURRENTLY RUNNING. ADDITIONAL INFORMATION MAY BE PRESENT ON YOUR ACTUAL SCREEN. (Screens shown may not reflect current version of product.)



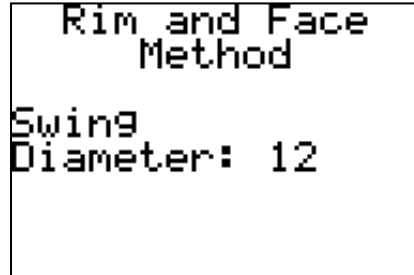
SCREEN 2A, 2B

- AFTER PRESSING <ENTER> AT THE BOTTOM-LEFT SCREEN, PRESS NUMBER [1] ON YOUR KEYPAD TO START A NEW ALIGNMENT, [2] TO VIEW YOUR LAST ALIGNMENT'S DATA OR [3] TO QUIT THE PROGRAM. TO CONTINUE WITH A NEW ALIGNMENT EXAMPLE, SEE THE FOLLOWING SCREEN 2C. TO VIEW YOUR LAST ALIGNMENT, GO TO SCREENS 2N, 2O.



SCREEN 2C

– WE WILL START THE PROCESS WITH A NEW ALIGNMENT. PRESSING [1] CONFIRMS THE RIM-AND-FACE METHOD, AND ASKS YOU FIRST FOR THE “SWING DIAMETER.” ENTER YOUR NUMBER IN WHOLE INCHES AND ANY DECIMAL FRACTIONS. [THE NUMBERS USED IN THESE SAMPLE SCREENS ARE ALSO USED IN THE SAMPLE CALCULATION TOWARDS THE END OF THIS MANUAL].



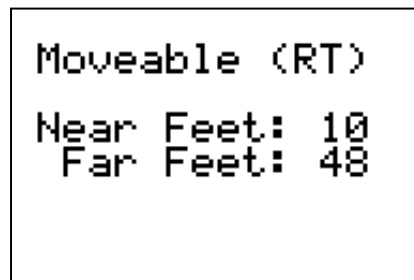
```
Rim and Face
Method

Swing
Diameter: 12
```

Swing Diameter = Key Item “H”

SCREEN 2D

– ENTER NEAR FEET AND FAR FEET DISTANCES FOR MOVEABLE (RIGHT) SIDE OF COUPLING. ENTER IN INCHES AND ANY DECIMAL FRACTIONS.



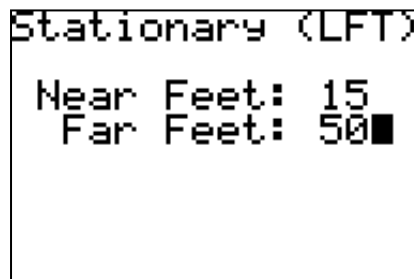
```
Moveable (RT)

Near Feet: 10
Far Feet: 48
```

Near Feet (Right - Moveable) = key item “D”
Far Feet (Right - Moveable) = Key Item “E”

SCREEN 2E

– ENTER NEAR FEET AND FAR FEET DISTANCES FOR STATIONARY (LEFT) SIDE OF COUPLING. ENTER IN INCHES AND ANY DECIMAL FRACTIONS.



```
Stationary (LFT)

Near Feet: 15
Far Feet: 50
```

Near Feet (Left - Stationary) = key item “F”
Far Feet (Left - Stationary) = Key Item “G”

SCREEN 2F, 2G, 2H

- IF YOU WOULD LIKE TO ENTER ACTUAL SAG MEASUREMENTS FOR THIS ALIGNMENT (ALWAYS RECOMMENDED), PRESS [1], OTHERWISE, PRESS [2]. PRESS [3] TO QUIT THE PROGRAM. (SAG WILL NOT BE USED IN THIS EXAMPLE.)

Do you wish to enter SAG? ENTER to choose	Enter SAG? 1:Yes 2:No 3:Quit	SAG will not be Used this time. Press ENTER to continue...
---	---------------------------------------	---

If you are not entering a SAG reading (pressing [2]), you will be shown the screen on the far right. To quit, press [3].

SCREEN 2I, 2J


- WHEN ENTERING SAG, INPUT THE MAGNITUDE ONLY SHOWN ON YOUR DIAL INDICATOR AT 180° (SEE SAG MEASUREMENT PROCEDURE, PAGE 4). THE PROGRAM WILL AUTOMATICALLY CORRECT THE SIGN OF YOUR ENTRY FOR PROPER MATH EXECUTION. ENTER DATA AS A WHOLE NUMBER REPRESENTING THOUSANDTHS (SUCH AS 5 OR 14).

Enter SAG reading (+) 180°: 14■	Enter SAG reading (+) 180°: 14 Press Enter...
---	--

Enter the SAG reading without entering a negative sign. Press <ENTER> after each step. The SAG reading above is for illustration only. A SAG reading of zero (0) is used in the following steps.

SCREEN 2K

- CONFIRM READINGS AT 90°, FIRST FROM THE FACE AND THEN THE RIM INDICATOR AND ENTER DATA AS WHOLE NUMBERS REPRESENTING THOUSANDTHS. WITH THE STATIONARY EQUIPMENT ON YOUR LEFT AND THE MOVEABLE EQUIPMENT ON YOUR RIGHT, ROTATION TO 90° BEGINS BY ROTATING THE SHAFT-COUPLING ASSEMBLY TOWARDS YOU. (SEE FIGURE 1 OR FIGURE 2.)

Face Indicator 90°: 11 Rim Indicator 90°: 12	 Remember: rotation is towards you starting at 90° as you stand in front of the machinery.
---	---

SCREEN 2L

- CONFIRM READINGS AT 180°, FIRST FROM THE FACE AND THEN THE RIM INDICATOR AND ENTER DATA AS WHOLE NUMBERS REPRESENTING THOUSANDTHS.

```

Face Indicator
180°: -6
Rim Indicator
180°: 9

```

To enter a negative sign, press the <(—)> key below and to the left of the <ENTER> key.

SCREEN 2M

- CONFIRM READINGS AT 270°, FIRST FROM THE FACE AND THEN THE RIM INDICATOR AND ENTER DATA AS WHOLE NUMBERS REPRESENTING THOUSANDTHS.

```

Face Indicator
270°: -17
Rim Indicator
270°: -3

```

To enter a negative sign, press the <(—)> key below and to the left of the <ENTER> key.

SCREEN 2N, 2O

- DECIDE IF YOU WILL BE ALIGNING THE MACHINERY TO THE RIGHT OF THE COUPLING (MOST COMMON), OR THE MACHINERY TO THE LEFT OF THE COUPLING. (ALIGN THE LEFT SIDE ONLY IF THERE IS A RESTRICTION ON THE EQUIPMENT TO THE RIGHT). SELECT [1] FOR THE RIGHT SIDE OR [2] FOR THE LEFT SIDE. THIS WILL DISPLAY ANSWERS FOR THE SELECTED SIDE ONLY. SELECT [3] TO QUIT.

➡
"View
Answers"
Menu Entry
Point after
choosing [1] in
SCREEN 2W,
Page 16.

```

Align which side
of coupling?

ENTER to
choose

```

```

Align side?
1:Right
2:Left
3:Quit

```

SCREEN 2P, 2Q

SCREEN WHEN YOU PRESS [1] (RIGHT) OR [2] (LEFT).

```

< Left Side

Enter to
continue -

```

Result of pressing [2] in
screen 2O, above.

```

Right Side >

Enter to
continue -

```

Result of pressing [1] in
screen 2O, above.

SCREEN 2R, 2S

ANSWER SCREEN(S) #1. SHIM THICKNESS FOR NEAR AND FAR FEET IN THE **VERTICAL DIRECTION** ARE SHOWN FOR BOTH THE STATIONARY MACHINE (LEFT SCREEN) AND THE MTBM (RIGHT SCREEN). NOTICE ARROW INDICATOR ("**<**" AND "**>**") AFTER THE WORD "PLANE" INDICATING WHICH SIDE OF THE COUPLING THE ANSWER IS FOR. **ANSWERS ARE IN THOUSANDTHS AND DO NOT INCLUDE A SAG READING** (EX: -19.50 = -0.0195", OR -19.50 MILS).

```
Vert Plane <
(- sub/+ add)

Near shims =
           -12.00
Far shims =
           -29.50
```

```
Vert Plane >
(- sub/+ add)

Near shims =
           -.50
Far shims =
          -19.50
```

SCREEN 2T, 2U

ANSWER SCREEN(S) #2. ADJUSTMENT AMOUNTS AT NEAR AND FAR FEET IN THE **HORIZONTAL DIRECTION** ARE SHOWN FOR BOTH THE STATIONARY MACHINE (LEFT SCREEN) AND THE MTBM (RIGHT SCREEN). THESE ADJUSTMENTS ARE MADE BY SLIDING THE MACHINERY TOWARDS YOU FOR A POSITIVE ANSWER [**+**] OR AWAY FROM YOU FOR A NEGATIVE ANSWER [**-**].

```
Horiz. Plane <
(- left/+ right)

Near adj =
          -27.50
Far adj =
          -109.17
```

```
Horiz. Plane >
(- left/+ right)

Near adj =
          -30.83
Far adj =
          -119.50
```

Left and Right of coupling answers for this example in the HORIZONTAL DIRECTION (viewed from top; [-] is left, away from you and [+] is right, towards you).

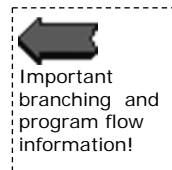
SCREEN 2V, 2W

MENU SCREENS. AFTER VIEWING YOUR ANSWERS AND THEN PRESSING <ENTER>, THE "CHOICES" MENU WILL APPEAR AT THE TOP (RIGHT SCREEN).

```
What do you
want to do
next?

ENTER to choose
```

```
Choices
1:View Answers
2:Re-input Dials
3:Plot Answer
4:New Alignment
5:View OFFSETS
6:Quit
```



Program flow information –

<1> takes you back to SCREENS 2N and 2O so you can VIEW your answers again either to the right or the left of the coupling.

<2> allows you to RE-ENTER your dial indicator readings starting at the SAG entry decision screen 2F. The physical dimensions you entered for your equipment are preserved.

- <3> Plot your alignment data collected for the left or right of the coupling
(See SCREEN 3A, 3B, below).
- <4> takes you back to SCREEN 2A, allowing you to view your answers
for this alignment, or start a new alignment.
- <5> Allows you to view OFFSET dimensions in the RADIAL
(perpendicular) and ANGULAR (parallel) directions. (See start of SCREEN
4A, 4B.)
- <6> Quit the program.

SCREEN 3A, 3B, 3C

PLOT SCREEN. AFTER PRESSING [3] IN THE PREVIOUS SCREEN, THE PROGRAM
WILL ASK YOU WHICH PLANE ([1] FOR VERTICAL OR [2] FOR HORIZONTAL) TO
THE LEFT (LEFT SCREEN) OR RIGHT (RIGHT SCREEN) OF THE COUPLING YOU
WOULD LIKE TO PLOT. THE SIDE OF THE COUPLING TO PLOT IS PRE-
DETERMINED BY YOUR CHOICE FROM SCREEN 2O AND IS DISPLAYED
AUTOMATICALLY FOR YOU. TO PLOT A DIFFERENT COUPLING SIDE, YOU MUST
FIRST CHOOSE TO VIEW THAT SIDE IN SCREEN 2O (SCREEN #2 FOLLOWED BY
THE LETTER "O," PAGE 15).

```
Which PLANE to
the LEFT of the
coupling do you
want to plot?

Hit ENTER...
```

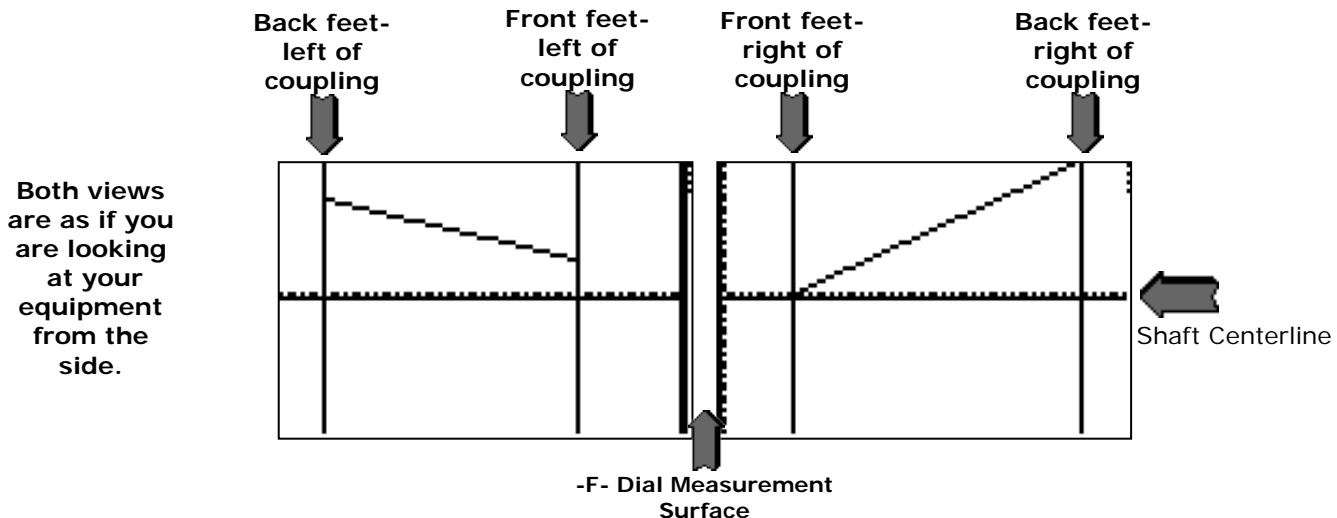
```
Which PLANE to
the RIGHT of the
coupling do you
want to plot?

Hit ENTER...
```

```
Plot Plane?
1:Vertical
2:Horizontal
3:Quit
```

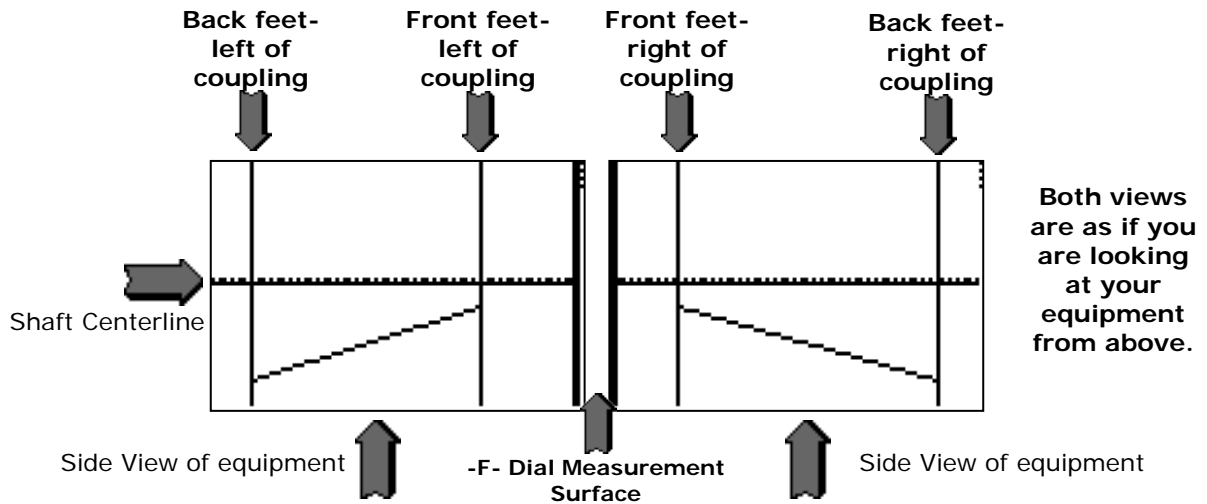
SCREEN 3D, 3E

PLOT SCREEN. **VERTICAL DIRECTION** PLOTS ARE DISPLAYED BY PRESSING
[1] IN THE PREVIOUS SCREEN 3C. PLOTS TO THE LEFT AND RIGHT OF THE
COUPLING ARE SHOWN. NUMBERS FROM SCREEN 2R (PG 19) ARE DEPICTED IN
THE PLOT TO THE LEFT (TAKE OUT 12/1000" FROM THE FRONT FEET AND TAKE
OUT 29.5/1000" FROM THE BACK FEET). NUMBERS FROM SCREEN 2S (PG 19)
ARE DEPICTED IN THE PLOT TO THE RIGHT (TAKE OUT ½ THOUSANDTH FROM
THE FRONT FEET AND TAKE OUT -19.5/1000" FROM THE BACK FEET).



SCREEN 3F, 3G

PLOT SCREEN. **HORIZONTAL DIRECTION** PLOTS ARE DISPLAYED BY PRESSING [2] IN SCREEN 3C. PLOTS TO THE LEFT AND RIGHT OF THE COUPLING ARE SHOWN. NUMBERS FROM SCREEN 2T ARE DEPICTED IN THE PLOT TO THE LEFT (MOVE THE EQUIPMENT **AWAY** FROM YOU 27.5/1000" AT THE FRONT FEET AND **AWAY** FROM YOU 109.17/1000" AT THE BACK FEET). NUMBERS FROM SCREEN 2U ARE DEPICTED IN THE PLOT TO THE RIGHT (MOVE THE EQUIPMENT **AWAY** FROM YOU 30.83/1000" AT THE FRONT FEET AND MOVE THE EQUIPMENT **AWAY** FROM YOU 119.5/1000" AT THE BACK FEET).



SCREEN 4A, 4B

"VIEW OFFSETS" SCREEN. PRESSING [5] AT SCREEN 2W DISPLAYS OFFSET DATA. THE FIRST TWO OFFSETS DISPLAYED (SCREEN 4A, BELOW LEFT) ARE THE PERPENDICULAR OFFSET AMOUNTS FOR THE VERTICAL AND HORIZONTAL PLANES (**POV** AND **POH**, RESPECTIVELY). PARALLEL OFFSET IS SIMPLY THE DIFFERENCE BETWEEN YOUR END AND START VALUE TAKEN FROM THE -R- (RIM) INDICATOR DIVIDED BY 2 ($180^\circ - 0^\circ$ FOR THE VERTICAL PLANE, AND $270^\circ - 90^\circ$ FOR THE HORIZONTAL PLANE; REMEMBER, 0° IS ZERO). THESE CALCULATIONS ARE PROVIDED FOR YOU IN THE EVENT THAT DOCUMENTATION OF THIS TYPE IS REQUIRED.

SIMILARLY, ANGULAR OFFSET IS THE DIFFERENCE BETWEEN YOUR END AND START VALUES TAKEN FROM THE -F- (FACE) INDICATOR DIVIDED BY THE SWING RADIUS, "H" ($180^\circ - 0^\circ$ FOR THE VERTICAL PLANE, AND $270^\circ - 90^\circ$ FOR THE HORIZONTAL PLANE; REMEMBER, 0° IS ZERO). THE OFFSETS RELATE THE MOVEABLE MACHINE ON THE RIGHT TO THE STATIONARY MACHINE ON THE LEFT. PARALLEL OFFSET AMOUNTS ARE GIVEN IN THOUSANDTHS, AND ANGULAR OFFSETS ARE GIVEN IN THOUSANDTHS PER INCH OF TRAVEL FROM THE DIAL INDICATOR STARTING REFERENCE POINT.

```
POV =          4.50
POH =         -7.50
Hit ENTER...
```

```
POV =          -.50
POH =         -2.33
Hit ENTER...
```

SCREEN 4A

POV = $9/2 = 4.50$
thousandths

POH = $(-3 - 12)/2 = -15/2 =$
-7.50 thousandths

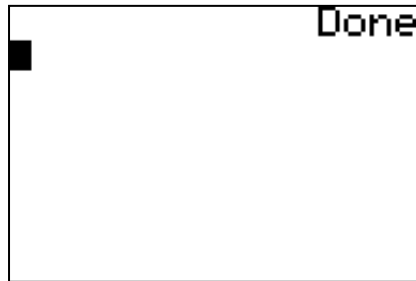
SCREEN 4B

AOV = $-6/12 = -0.50$
thousandths/inch

AOH = $(-17 - 11)/12 = -28/12 =$
-2.33 thousandths/inch

QUIT SCREEN

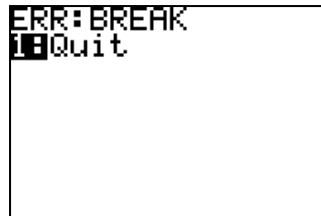
IF YOU WISH TO EXIT THE PROGRAM AT ANY TIME, YOU MAY PRESS [6] ON THE "CHOICES" MENU. WHEN YOU DO THIS, YOU WILL SEE THE FOLLOWING SCREEN.



Blank screen after pressing <F5>
under "Quit" on the menu bar.

BREAK SCREEN

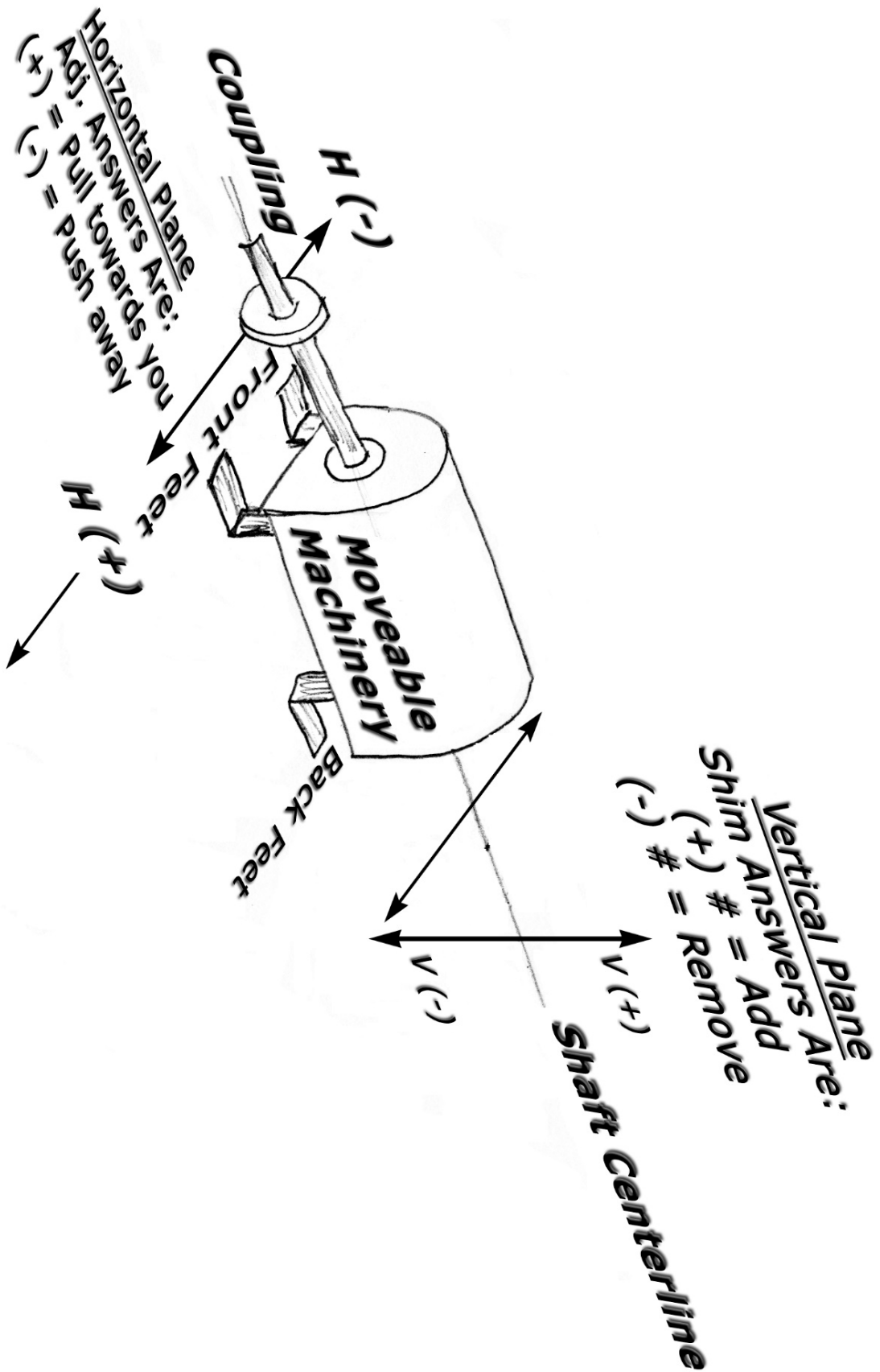
THERE MAY BE INSTANCES WHEN YOU NEED TO EXIT FROM THE PROGRAM WITHOUT USING THE "QUIT" FUNCTION. YOU MAY DO THIS BY PRESSING THE "ON" KEY IN THE LOWER LEFT CORNER OF THE KEYPAD. THIS "BREAKS" EXECUTION OF THE PROGRAM CODE AND DISPLAYS THE FOLLOWING SCREEN:



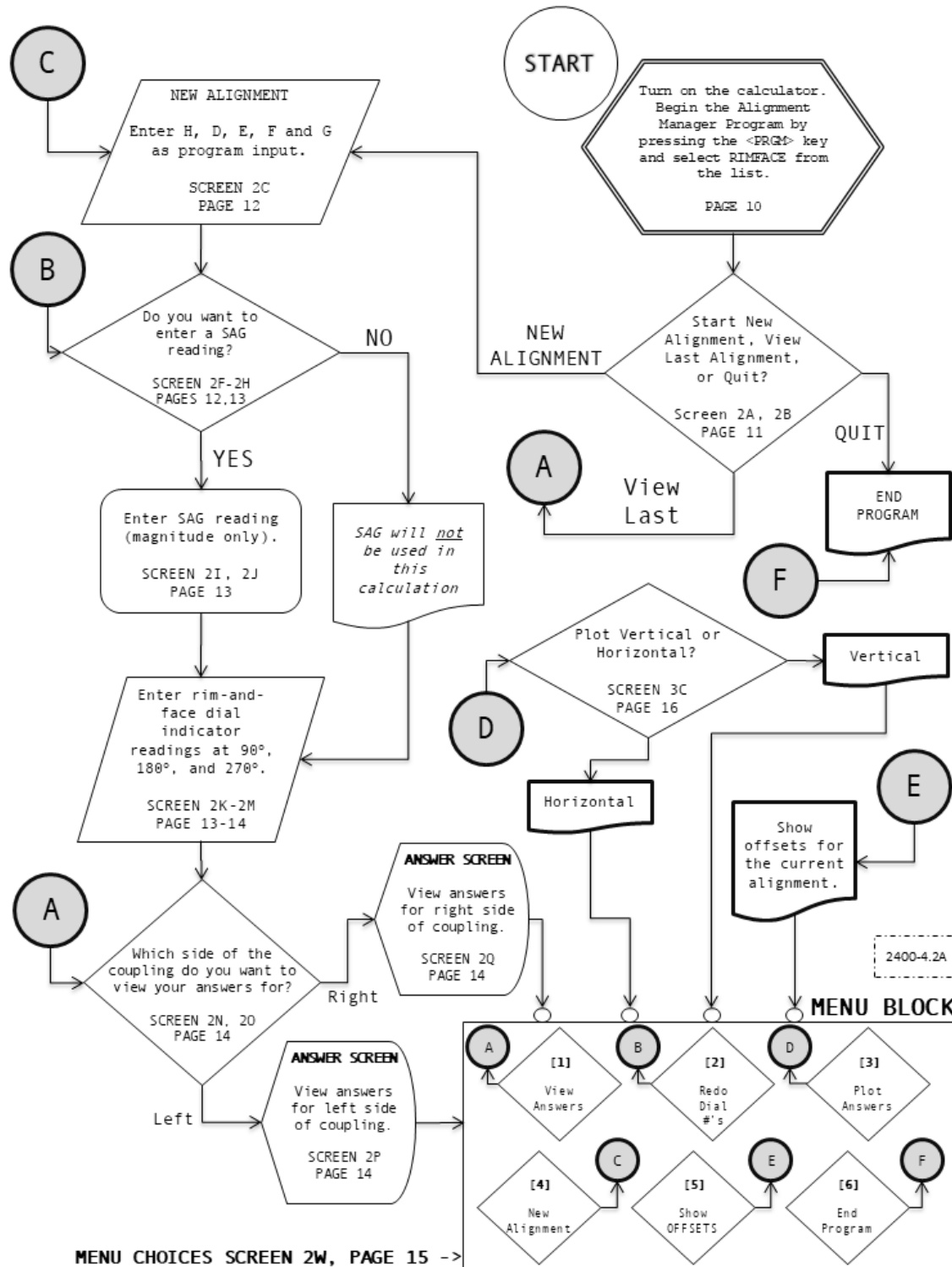
THERE MAY BE REMNANTS OF THE PROGRAM DISPLAYED ON THE SCREEN WHEN HALTING THE PROGRAM IN THIS MANNER. TO CLEAR THE CALCULATOR'S SCREEN PROPERLY, PRESS THE FOLLOWING SEQUENCE:

0 (ZERO), <ENTER>, AND THEN THE <CLEAR> KEY.

THIS GIVES YOU A CLEAR SCREEN TO RESTART ANY OF THE PROGRAMS FOUND ON YOUR ALIGNMENT MANAGER CALCULATOR.



➤ VI. Alignment Manager 5.0a Flowchart – RIMFACE PROGRAM



This concludes the Alignment Manager calculator portion of the instruction manual. You should now have finished the alignment procedure – both the setting up and configuration of the alignment kit, and using the data to establish corrective shim thicknesses. It may take *more* than one or two rotations and adjustments of the equipment if the motor/pump assembly is out of alignment by a considerable amount. Repeat the procedure until required shim amounts are within acceptable tolerances.

➤ VII. Reference Example and Graphic: Rim and Face Method

The following figure may be used as a reference when performing alignments with either of the Peterson brand shaft alignment systems. Follow the directions carefully from the Alignment Manager Calculation procedure.

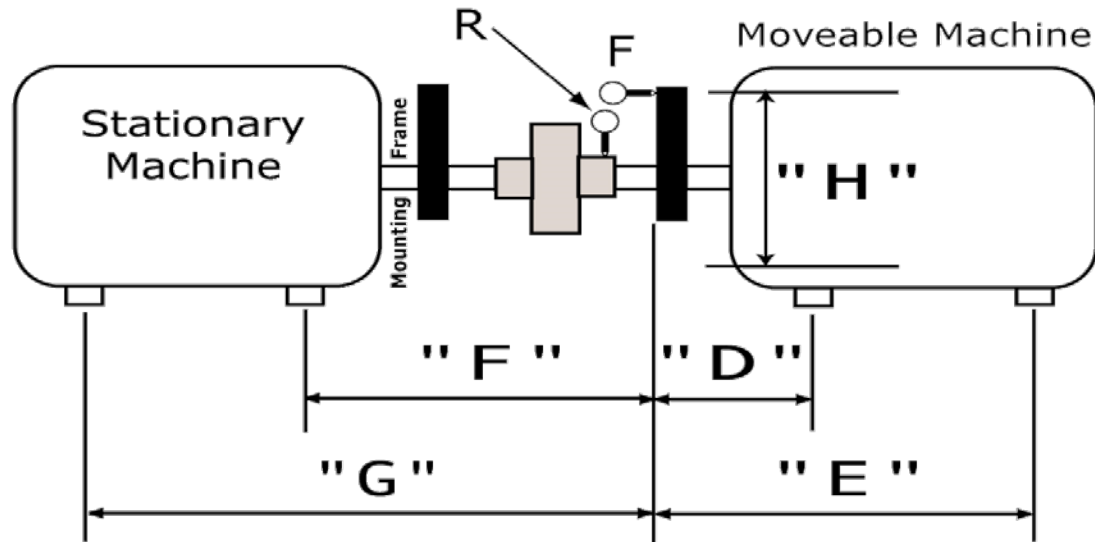


Figure 5: This figure is the same as Figure 3 found on page 9. Use this diagram to follow the sample calculations below. Use the Key To Variables also found with this figure on page 9.

The following example may be used as a check to ensure the program "RIMFACE" is functioning properly. (V = Vertical, H = Horizontal; N and F stand for Near and Far Feet, respectively). Both R0 and F0 are 0 (Zero):

<u>Physical Measurements</u>		<u>Rim Readings</u>	<u>Face Readings</u>
H = 12		R90 = 12	F90 = 11
F = 15	D = 10	R180 = 9	F180 = -6
G = 50	E = 48	R270 = -3	F270 = -17

Answers are as follows using the above sample:

<u>Stationary Machine Alignment</u>		<u>Motor-To-Be-Moved Alignment</u>	
<u>Vertical Direction</u>	<u>Horizontal Direction</u>	<u>Vertical Direction</u>	<u>Horizontal Direction</u>
VN = -12.00	HN = -27.50	VN = - 0.50	HN = - 30.83
VF = -29.50	HF = -109.17	VF = - 19.50	HF = - 119.50

➤ VIII. Reference Example and Graphic: Reverse Indicator Method

The following figure may be used as a reference when taking measurements on equipment set up for the Reverse-Indicator method of shaft alignment.

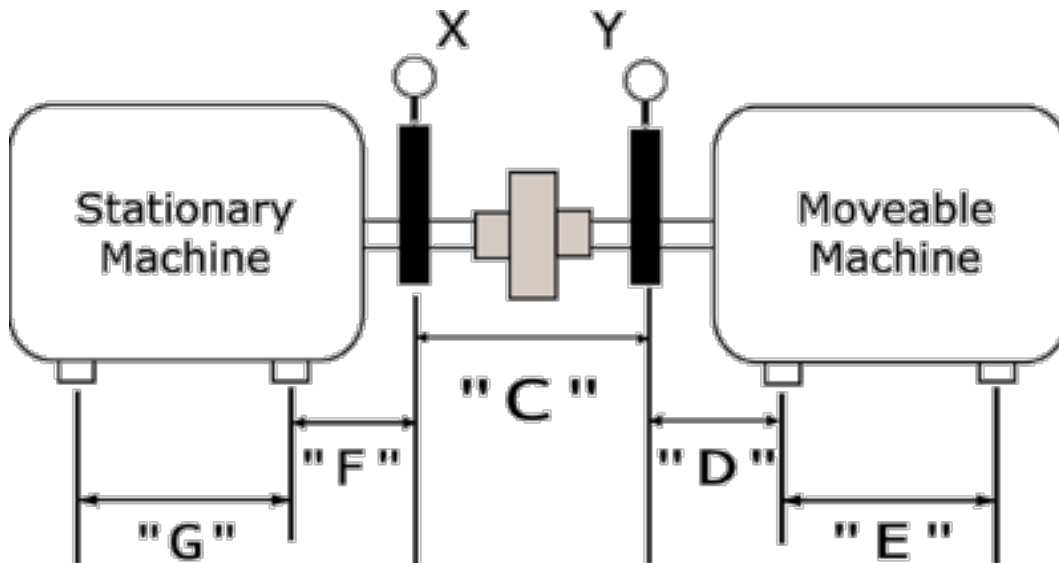


Figure 6: Use this figure for determining reference measurement points when performing the Reverse-Indicator method of shaft alignment. Alignment kit setup instructions are not available for this method of shaft alignment. Peterson brand alignment kits are based on the Rim-and-Face method (figure 5).

The following example may be used as a check to ensure the program "REVDIAL" is functioning properly. (V = Vertical, H = Horizontal; N and F stand for Near and Far Feet, respectively). Both X0 and Y0 are 0 (Zero):

Physical Measurements		Left "X" Indicator	Right "Y" Indicator
C = 10		X90 = 11	Y90 = 12
F = 6	D = 5	X180 = -6	Y180 = 9
G = 11	E = 10	X270 = -17	Y270 = -3

Answers are as follows using the above sample:

Stationary Machine Alignment		Motor-To-Be-Moved Alignment	
Vertical Direction	Horizontal Direction	Vertical Direction	Horizontal Direction
VN = - 2.10	HN = - 26.90	VN = 5.25	HN = - 18.25
VF = - 0.45	HF = - 50.55	VF = 6.75	HF = - 39.75

► XI. Kit Component List for Models #20RA and #30RA

The following is a list of parts and components present in each of the alignment kits. Please report any missing items immediately to customer service at (815) 263-4024.

Model #20RA Parts List

- ☐ 2Alignment frames, each with 1 x ½" diameter mounting hole
(Reorder item #20FRM)
- ☐ 20"#41 roller chain (attached to each frame)
(Reorder item #20CHN for each frame, above)
- ☐ 2dial indicator assemblies with swivel joints and mounting rods
[Reorder #J1-B500-250 (dials); #S8SJ (swivel joint), #571 IMR (mounting rod)]
- ☐ 2each of ½" diameter tubing in 5", 7", and 9" lengths
(Reorder #TUBE-X where X is the length you need)
- ☐ 13/16" Allen key
(Reorder #H XK316)
- ☐ 1Instruction manual
(Reorder #MAN400 - also available on-line)
- ☐ 1Impact-resistant carrying case
(Reorder #CASE20 – comes with top and bottom foam)

Model #30RA Parts List

- ☐ 2Alignment frames, each with 3 x ½" diameter mounting holes
(Reorder item #30FRM)
- ☐ 18"#40 roller chain, 18" attached to each alignment frame. Expandable
with extra chain (not included). (Reorder item #18CHN)
- ☐ 2Dial indicator assemblies with swivel joints and mounting rods
[Reorder #J1-B500-250 (dials); #S8SJ (swivel joint), #571 IMR (mounting rod)]
- ☐ Assorted ½" diameter tubing, 2 x 5", 1 x 7", 1 x 9", 1 x 12", and 2 x 15" long
(Reorder #TUBE-X or TUBE-XX, where X or XX is the length you need)
- ☐ 1General inspection mirror
(Reorder item #555GIM)
- ☐ 13/16" Allen key
(Reorder #H XK316)
- ☐ 1Instruction manual
(Reorder #MAN400 - also available on-line)
- ☐ 1Impact-resistant carrying case
(Reorder #CASE30 – comes with top and bottom foam)

➤ X. TIConnectCE / Program Restore Procedure

USE THESE INSTRUCTIONS ONLY IF YOU NEED TO RESTORE THE PROGRAM CODE TO YOUR #AMTI-84P ALIGNMENT MANAGER CALCULATOR v4.0 OR LATER.

Thank you for purchasing the Alignment Manager™ software for the Texas Instruments© TI-84 Plus scientific calculator.

You must have a basic working knowledge of Windows File Explorer in order to properly restore program code contained on the backup CD included with your #AMTI-84 Plus Alignment Manager™ calculator. In case of accidental program deletion or corruption on your calculator, you will need the following software and hardware combination to fully restore the Alignment Manager™ software to your TI-84 Plus scientific calculator:

- (1) USB computer cable that came with your #AMTI-84 Plus calculator. One end fits into any available USB port on your computer; the other end connects to the data port located on the top of the calculator.
- (2) CD labeled, "AMTI-84P BACKUP." This CD contains the following software:
 - the TIConnectCE v5.3 software.
 - Alignment Manager™ software code files.

Use the following steps to restore all previously installed Alignment Manager™ programs to your #AMTI-84 Plus.

STEP 1: If your computer has the TIConnectCE 5.3 software installed, skip to STEP 2. If it does not, perform the following procedure to initiate the installation.

[A] Insert the "AMTI-84P BACKUP" CD into your CD drive and browse to the CD's directory labeled, "01. TIConnectCE-5.3.0.384 Install File," shown below, left (Figure A).

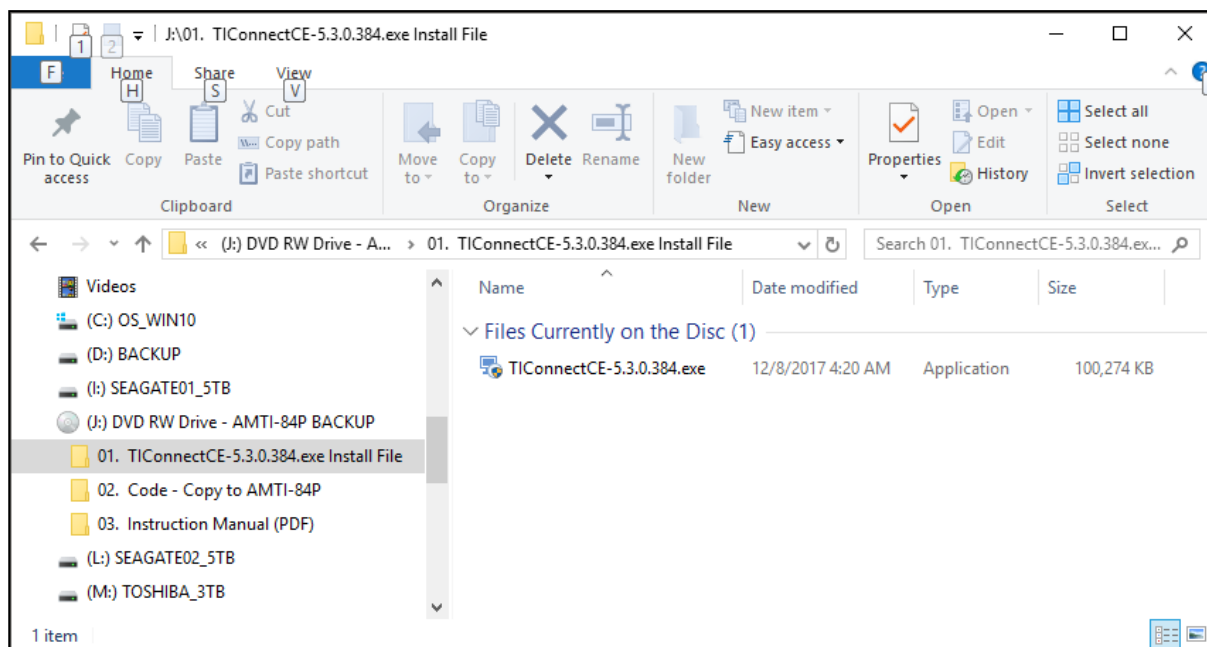


FIGURE A

[B] Double-click the file, “TIConnectCE-5.3.0.384.exe” in the right pane of Windows Explorer, shown above, right. This will start the TIConnectCE v5.3 software installation process, as shown below in Figure B:

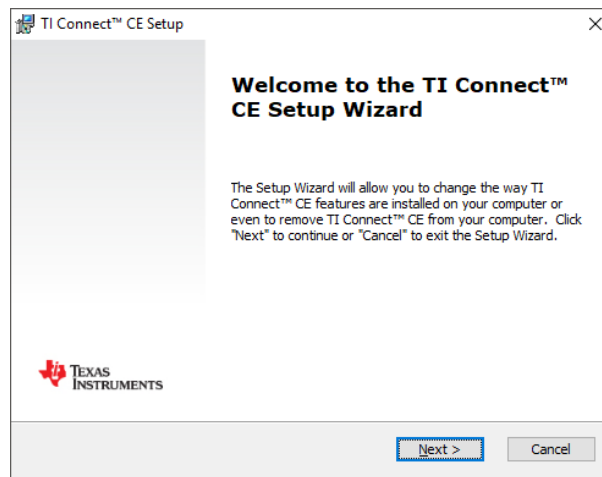



FIGURE B

Follow the prompts until this software is installed successfully. The software may ask you to reboot your computer.

STEP 2: The TIConnectCE software should now be installed. First, plug the supplied USB computer-to-calculator cable into any open USB port on your computer; plug the other end into your #AMTI-84 Plus calculator. You should hear a Windows-audible confirmation tone that a USB peripheral has been plugged in and detected by Windows. This will automatically turn your calculator’s screen on and display what was on it just before the last time you turned it off. In most cases, you will have a blank screen on your calculator with a blinking square cursor in the upper-left corner.

STEP 3: Next, start the TIConnectCE software by double-clicking its program icon  that was installed on your desktop. The TIConnectCE software will start, showing the following program screen (Figure C):

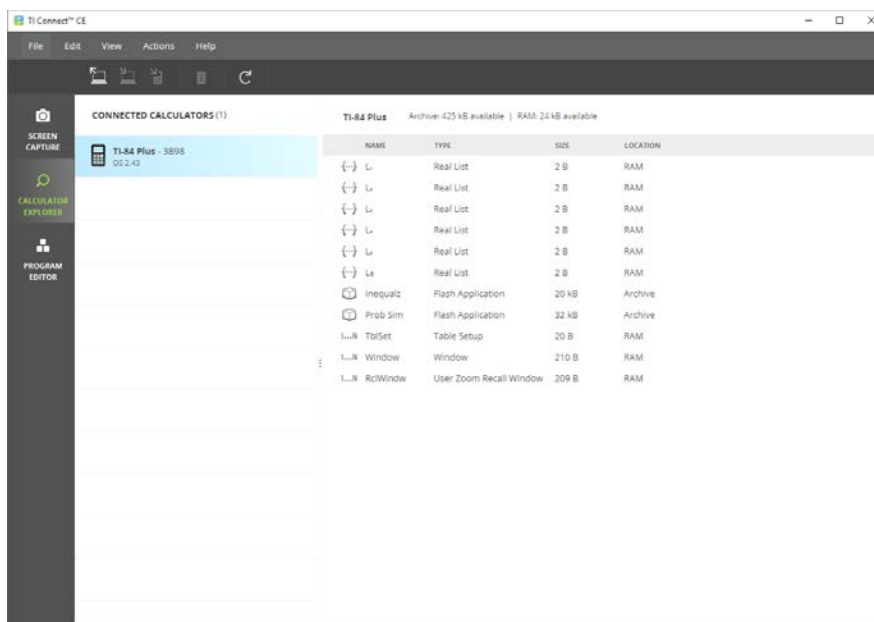


FIGURE C

The goal now is to transfer copies of the calculator program files located on the included CD to the calculator using the TIConnectCE software with the included USB cable.

(1) Click the "Add Files from Computer" icon located at the top-left; (2) Hold down the <Ctrl>-<M> key combinations, or (3) Click on the "Actions" menu, then select "Add Files from Computer."



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because your calculator has turned off. Turn it on now to proceed. If you *are* able to “Add Files from Computer,” the following dialog box will appear (Figure E):

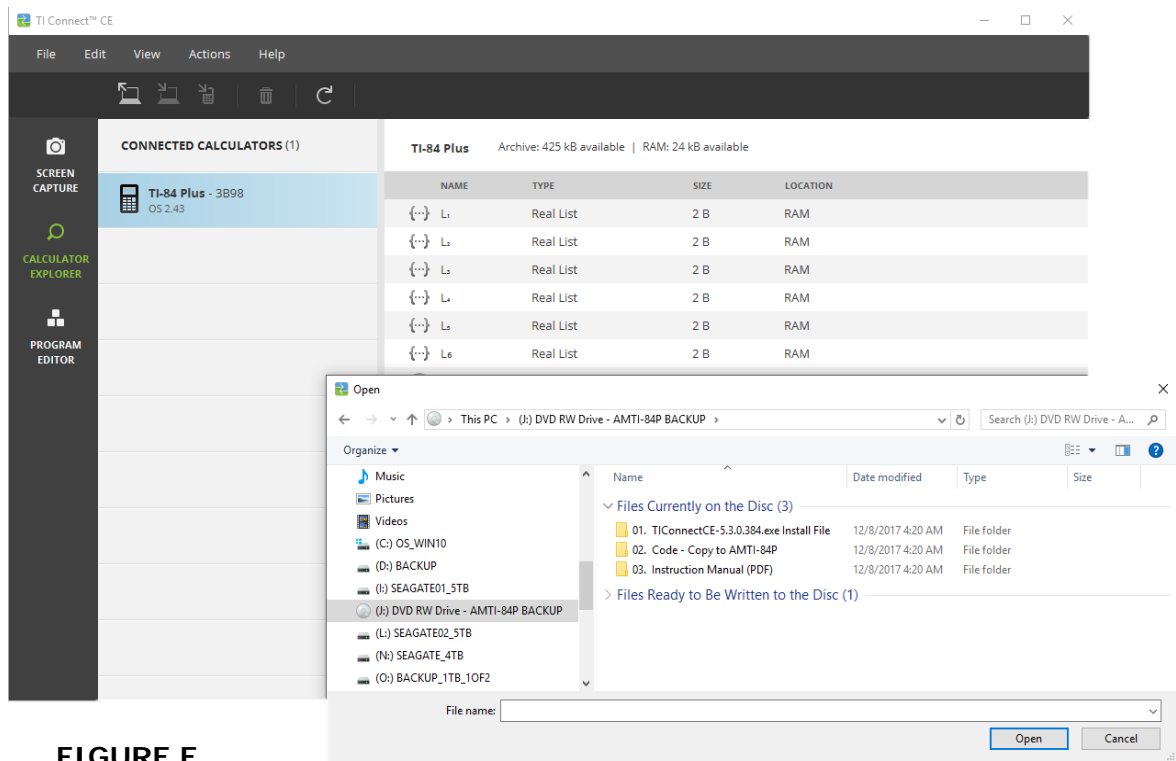


FIGURE E

In the left pane of the “Open” dialog box, click on your CD/DVD/BD drive with the “Alignment Manager Backup” CD in it, labeled, “AMTI-84P BACKUP.” In the right pane, double-click on the “02. Code – Copy to AMTI-84P” file folder. The dialog box changes to the following (Figure F):

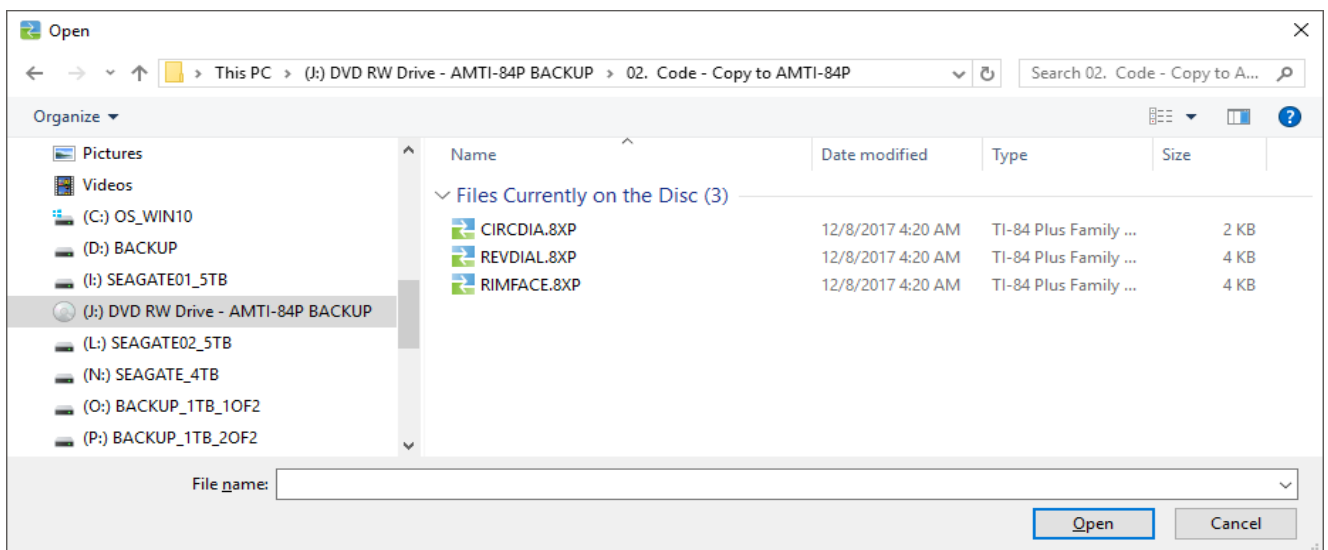


FIGURE F

STEP 5: Click once anywhere within the right pane listing the calculator files, then press the combination keys <Ctrl>-<A> to select all of the files in the right pane, then click “Open” at the bottom. The following final dialog box appears before sending the files to your calculator:

Send to Calculators

FILE NAME:	NAME ON CALCULATOR:	LOCATION:
CIRCDIA.8XP	CIRCDIA	RAM
REVDIAL.8XP	REVDIAL	RAM
RIMFACE.8XP	RIMFACE	RAM

DESTINATION CALCULATORS:

☐ All Connected Calculators
 ☒ Select Calculators

☒ TI-84 Plus-3B98

☒ Replace existing content with the same name on destination calculators

CANCEL SEND

FIGURE G

Press “SEND” in the lower-right corner of the dialog box to begin to send files to the calculator and restore its program contents to its factory default. (Note: The 4-digit code shown after “TI-84 Plus-” on your computer will be different than the one shown above.) Once the transfer is complete, the programs just sent to the calculator will be displayed, as shown below (Figure H):

TI Connect™ CE

File Edit View Actions Help

CONNECTED CALCULATORS (1)

TI-84 Plus - 3B98 OS 2.43

TI-84 Plus Archive: 425 kB available | RAM: 15 kB available

NAME	TYPE	SIZE	LOCATION
{→} L1	Real List	2 B	RAM
{→} L2	Real List	2 B	RAM
{→} L3	Real List	2 B	RAM
{→} L4	Real List	2 B	RAM
{→} L5	Real List	2 B	RAM
{→} L6	Real List	2 B	RAM
CIRCDIA	Protected Program	1 kB	RAM
REVDIAL	Protected Program	3 kB	RAM
RIMFACE	Protected Program	3 kB	RAM
Inequalz	Flash Application	20 kB	Archive
Prob Sim	Flash Application	32 kB	Archive
1...N TblSet	Table Setup	20 B	RAM
1...N Window	Window	210 B	RAM
1...N RclWindw	User Zoom Recall Window	209 B	RAM

FIGURE H

Your calculator is now fully restored to its original state when it was shipped. Please refer to your #AMTI-84 Plus instruction manual for program use and proper function. You may now perform alignment procedures as before.

➤ **XI. Other Files On This CD**

Also included on this CD is this instruction manual in Adobe Acrobat PDF (Portable Document Format).

You can easily view any portion of this manual by browsing to the “03. Instruction Manual (PDF)” directory on the CD (Figure I, below), then double-clicking the single PDF file that’s in the directory.

You will need the Adobe Acrobat Reader which is free at www.adobe.com/acrobat. If this program is not on your computer, you will be prompted to download and install it. Once the installation is complete, return to the proper directory on your CD and repeat the process.

Please visit our website at www.petersontools.com for current pricing.

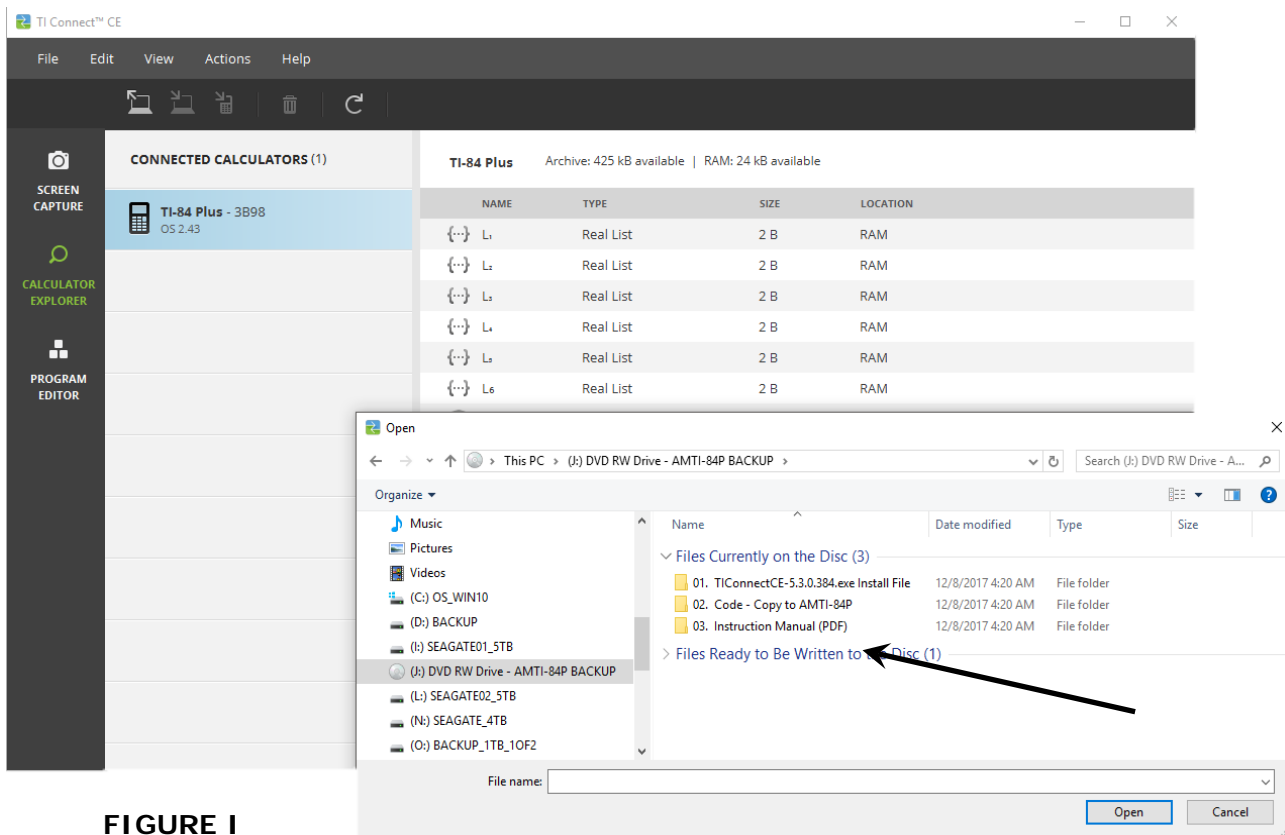


FIGURE I

The following page is for any notes you would need to take, either within your facility, or out in the field. Detailed notes are vital to correcting misalignment, and can be very helpful in tracking down errors regarding input to the Alignment Manager Program for the TI-84 Plus calculator.

NOTES

➤ XII. How To Contact Us

You may contact us at the following addresses and telephone numbers:

Physical Address (Returns, Etc.) —

PETERSON ALIGNMENT TOOLS CO
1316 Oneida St.
JOLIET IL 60435
ATTN: RETURNS DEPARTMENT

Payment / Correspondence Address —

Peterson Alignment Tools Co.
1316 Oneida St.
Joliet, IL 60435
Attn: Chris Bowen

For All Technical Assistance —

Contact: Chris Bowen
Local: (815) 263-4024 (Please leave a message)

E-Mail / Website —

For product questions, direct your e-mails to:

> sales2@petersontools.com

Visit our website for detailed product information:

> <https://petersontools.com>

**The Alignment Manager™ software is a
product of Peterson Alignment Tools
Company and is not endorsed by Texas
Instruments Inc.**

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Rev. #4. Form Name: <ALIGNMENT MANAGER 5.0a MANUAL_2020_G.docx>