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TITAN

by

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Titan Time Study Software
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An Introduction to the System

Titan software is designed to perform a basic but useful task. That task is collecting, compiling, and outputting the data utilized for creation of an engineered work standard. Or, as an abbreviated description, Titan software takes a time study.

Several objectives were outlined during the design phase for the software and then served to craft the overall functionality. The objectives are listed below and were satisfied entirely by the final product.

Easy to operate - the software must remain straightforward
for those using the system

Reasonable cost yet tremendous value - costly software is unnecessary
and the result of poor design, a design that would produce poor
results

Very portable - complicated or elaborate equipment is prohibitive and
more than needed for the task

Faithfully follows the accepted practice of Time Study - software which
creates or requires compromise is faulty while robust design is
accurate and reliable

Using Titan software an analyst can create a thorough description of an operation, collect time data using the accurate, built-in clock of the hardware, summarize the data, and output the results for hard copy, either via a printer or to a PC spreadsheet. Final development of the work standard is expected from the engineer using the data provided from Titan.

Overview of Using Titan Software

Titan time study parallels traditional stopwatch time study. Observation of the job is followed by the engineer creating a list of the elements describing the method, a task accomplished by typing either a brief or extensive description into the calculator. The HP48 screen displays up to four lines of text, a maximum of twenty-two characters per line. Descriptions are entered into the system as a separate feature allowing the flexibility of completing the element listing at the job site or at the analyst desk.

Timing begins by a single key press which zeros the internal hardware clock. As each element is performed by the operator, the system screen displays its description, insuring the time value recorded corresponds to the correct element. A single key press records the time value. Internally, time data is saved as continuous recordings, in the order in which it is completed, permitting a review of the chronology of events. As each element concludes, the software updates the screen, displaying the next element description, element number, and cycle count. Generally, the analyst has only to glance at the screen to verify the element under study and can devote more observation time to the actual performance of the job. Better rating detail and greater methods/motions understanding naturally follow.

To conclude data collection (conclude the time study) a two-key sequence is used to prevent unintended stoppage. Data is immediately compiled and the study is ready for output. The size of the study determines the summary time, either a few seconds to one or two minutes. Since the purpose of collecting data is to examine its contents, a few minute of process time hardly allows the opportunity to return to your desk!

Output is formatted for use by a spreadsheet but contains enough data for work standard construction if directed to a printer for hard copy. Available from the software are:

Spreadsheet format block - identifying the type and size of data to expect

Elemental summary - using the elemental descriptions typed by the analyst, total time recorded for the element, number of observations and the element average

Element elapsed times - as snap back time derived from the continuous data, including identification of selected-out or missed values

Overall time compiled as selected-out (circled-out) and missed

Additional recordings - observations other than those recorded as regular elements

Hardware requirements

Titan software is designed to operate on the Hewlett Packard HP48 G series handheld graphic calculator. These are widely available from numerous sources throughout the country. If you cannot locate a source, please contact our offices. Any of the three models will run the software but the best selection is the GX model which is expandable to 256K of memory.

A calculator to PC/Printer cable is also necessary. This is available as Hewlett Packard part number HP F1207B, HP Graphic Calculator PC Connectivity Kit (F1208B for Mac). This kit includes software for the PC to permit uploads and downloads.

Hardware List

Hewlett Packard “ ”	HP48G (32K) Graphic Calculator		
	HP48G+ (128K) Enhanced Graphic Calculator		
	HP48GX (128K to 256K) Expandable Graphic Calculator		
	HPF1207B PC Interface cable & software HPF1208B Mac Interface cable & software		
Memory	128K Card	HP 82215A	This is an option and not required to use Titan

Note to owners of HP48S or SX machines: The Titan software uses newer features of the G series calculators, mainly the graphic, window style of prompt and input. Titan freeware will not operate on these units. Titan commercial was created around the S versions and will run on either S or G series.

Using Titan Software: Operators Guide

The HP48: Description of Operation and Features

This machine looks imposing. The keyboard is a vast array of keys, each surrounded by cryptic names of complicated math or calculator functions. Fortunately, Titan uses the most basic and straightforward features of the calculator.

Turn on the HP48. The best example of this machine is an actual and practical exercise — setting the correct time and date. The lower portion of the keyboard is used for the numeric keypad. Above the key for the number 4 is the name TIME printed in a light green color that corresponds to the color of a shift key, in this case the right-shift key, named so because its arrow points to the right. Press the right-shift key and at the top of the screen appears an image of the key indicating that the next key pressed corresponds to a right-shift action. Now press the number 4 key to select the TIME function.

The calculator creates a window with three selections for operations utilizing Time. The bottom (third) selection sets the correct time & date. Press the keyboard down cursor key - third row, second most right hand column - to highlight the “Set time, date...” function.

At the base of the screen image are four darkened blocks and two blocks at the right with the names CANCL and OK. The six keys across the top of the calculator are blank (white) on the key face and correspond to function names appearing at the lower portion of the screen. Collectively, these keys are referred to as menu labels. This is a very sensible means for controlling selections and program actions. Choices are presented on the screen, which your viewing, during program execution. Titan uses these menu labels and the window features to guide you through the program.

Continue the “Set time, date...” example by pressing the menu label key OK. This screen identifies the overall function by a title bar at the top of the screen, in this case Set Time and Date. Current settings are displayed for both time and date, with the inverted cursor positioned over the current hour. To change any value, position the inverted cursor over the value and type the new value. Press the ENTER key to change the value. Notice the use of the menu labels. As data is typed the labels change. When no new data is typed the menu labels include additional selections EDIT and CHOOS. Also, as the cursor is positioned to any field, a brief message appears at the bottom left of the screen, above the menu labels. You should select the correct time and date for your location. When entries are complete press the menu label OK.

Directories and Menu Selections

At the top of the screen the name HOME is displayed inside curly braces { HOME }. This is the manner the HP48 indicates the current directory path. The name HOME is equivalent to the root directory of a PC. Changing from any directory to the HOME directory is done by pressing the right-shift key and the HOME key (left most column, third row above tick (') key). This sequence of instructions is used for beginning Titan and is repeated later in this manual where required.

Press the Math key (MTH, left most column, second row). The menu labels display the selections within the overall category Math. A closer look at the menu labels reveals a short bar above the left top corner of each selection. This indicates additional menu label selections are available by pressing the key. Press the menu label REAL. The menu labels change to the real number functions built into the calculator. Percentage is calculated by entering a number, a percentage value and pressing the menu label %. (If you wish to try an example, take 7% of 32 by typing 32 ENTER, 7, %. The result is 2.24. The intention, though, is an example of where and how features are accessed, not their specific use.) Other functions behave in the same manner, in fact the HP48's feature over 2500 separate functions. Why is this important? With so many features, many performed using menu labels, it is easy to navigate the calculator to some display or menu label display that doesn't match what you were trying to do! Try this...

Press the left cursor (third row, fourth column). A mostly blank screen appears, with a cross-hair in the center and the menu labels (X,Y), EDIT, CANCL. This is the graphics screen used to plot mathematic formulas and drawing visual images. If this selection is not wanted, how is it changed? As with many functions, reversing the activity and returning to the normal screen is accomplished by pressing the ON (CANCEL) key at the bottom left corner of the keyboard. Notice the brief appearance of an hourglass icon at the top of the screen. This indicates the HP48 is busy. In a moment, the normal screen (called the stack display) appears and the hourglass disappears.

One other key sequence sets the HP48 to a known state. All Titan actions begin within a directory named TITAN. Returning to this directory from any HP48 activity is accomplished by pressing the key sequence:

ON (bottom left key, which will stop any running application)
Right-shift, HOME (left most column, third row)
Keyboard VAR (second row, fourth column) key

The TITAN directory displays as a menu label. A bar above the name identifies the choice TITAN as a directory. Pressing the menu label changes to the directory similar to changing directories on a computer, except that the HP48 does not require a *cd* command.

Write this down on note paper and attach it to the back of the calculator. This is discussed

completely in the section about operating the software.

Typing Descriptions from the Keyboard

Element descriptions are entered using the alpha-numeric keys of the calculator. These keys are arranged in sequential order beginning with the letter A at the upper left-hand corner. For the top row of keys, the letters are easily visible, printed to the lower right corner of each key. The remaining letters of the alphabet are less visible because of the additional key functions printed on and around each key. However, a little practice leads to acceptable proficiency when typing element descriptions used during a time study.

Normally the HP48 is set to upper-case mode for alphabetic entry. Titan software alters the default, upper-case mode and replaces it with the more common typewriter/keyboard lower-case mode. Upper-case letters are typed by first left-shifting then typing the letter. Since the left-shift key displays an icon it isn't necessary to hold the left-shift key while typing the letter character as is the case with a typewriter. In fact, a second press of the left-shift turns off the shift and the icon.

The condensed keyboard does create one, sometimes confusing problem. Fortunately, this does not cause any harm but still does take some time to remember. Cursor positioning keys - in the upper right area of the keyboard - are shared with the alphabet characters of K, P, Q, and R. When the keyboard is set for typing alpha-numeric characters these keys do not position the cursor. If a cursor key is pressed, the worst that occurs is that one of the four characters - KPQR - is typed to the screen. Pressing the backspace key (opposite end of the ENTER row) will drop the unwanted character.

Cursor keys work when the keyboard is switched from the alpha-numeric entry mode. An icon, the Greek letter alpha, appears at the top of the display indicating alpha-numeric mode. This is the same symbol identifying the key which switches on and off the alpha mode, the key directly below the ENTER key. Upper-case or lower-case mode is not identified however and is only recognized by pressing a key and viewing the character on the screen. Incorrect characters are corrected by backspacing or deleting. (Delete -DEL- key is next to the backspace key)

Chapter 1 and 2 of the HP48G Series Users Guide explains the keyboard and annunciator icons displayed by the calculator. Note that the default design requires two consecutive presses of the alpha key to lock-on the alpha-numeric mode. Typing element descriptions is easier if the alpha-lock is set by one key press, which is how Titan software operates.

Remember, pressing the ON (cancel) key erases all the characters typed onto the screen.

Installing the software

Software for Titan must download to the HP48. The software consists of a directory which runs the program, saves element descriptions, and saves a copy of a completed time study. The directory also saves information about the time units (minutes or hours), connectivity information, and other variables affecting operation. A second component of Titan software is the underling program code. Both of these files must copy into the HP48 from the files downloaded to your PC.

Copying data requires software on the computer for communications between the HP48 and PC. This software is included with the Connectivity Kit. Follow the instructions with the kit and install the software to your computer.

The Connectivity Kit creates the directory Link48 on the computer. Transferring data files to the HP48 requires that the files are accessible by the communication software, so the best choice is copying the Titan files into the Link48 directory. Titan files are available at our web site. The file names you wish to download are:

File Name	Description
TITAN	The TITAN directory for the HP48
TITAN.LIB	The library program code for Titan
Titan98	This manual

Once these files are copied into the Link48 you can download to the HP48.

Step 1: Create the output variables

Press the following keys from the HP48 keyboard

Set the IOPAR:

- 1) Left-shift followed by keyboard number 1
- 2) Press the menu label key IOPAR
- 3) Press the menu label IR key to set IR/wire to : wire
- 4) Press the menu label ASCII key to set ASCII/binary to: binary
- 5) Press the VAR key to verify the name IOPAR is present

Set the PRTPAR

- 1) Left-shift followed by keyboard number 1
- 2) Press the menu label key PRINT
- 3) Press the menu label key PRTPA
- 4) Press the menu label key RESET
- 5) Press the VAR key to verify the name PRTPA is added and present.

Step 2: Copy the TITAN directory to the HP48

Attach the connectivity cable to the proper port of the PC. Attach the other cable end to the HP48. Begin the Windows or DOS program for the Link48. Follow the

instructions on page 2-2 of the Serial Interface Kit Users Guide. Highlight the file name TITAN and transfer to the calculator in binary mode. binary mode is selected on the calculator as described in the text above. Software binary mode is described in the software users guide. This file will transfer and automatically copy as a directory. Note: You can copy the TITAN directory as a sub-directory you created. To copy TITAN into the HOME directory structure, change to the HOME directory prior to transfer.

Step 3: Copy the Titan program code to the HP48

Repeat the download instructions but select the file name TITAN.LIB from Link48. This file copies as a regular object but is not stored directly in its correct form. Follow the steps below to store the program code in its proper format.

- 1) Press the ON key to end server mode if the calculator is still in that mode
- 2) Press the VAR key to display names in the menu label
- 3) Press the left most menu label TITAN (the one without a bar above the name)
The stack display is:
1: Library 1015: MRC... (The full name is MRC Titan Time Study)
- 4) Press the tick (‘) key (left most of third row)
- 5) Press the menu label TITAN as in step 3 and press ENTER
- 6) PURGE the TITAN.LIB by pressing the PURG key (left shift & EEX row 5)
The stack displays as shown before the PURGE
2: Library 1015: MRC...
1: ‘TITAN.LIB’
- 7) Press the right shift & plus (+) key, then the number zero(0), the cursor right key (right most of third row) and the number 1015. Press ENTER for the stack:
2: Library 1015: MRC...
1: 0: 1015
- 8) Press the STO key (second column, third row)
- 9) The stack should empty if successful

Step 4: Attach the software

Turn the HP48 off then back on. The screen will blank for a moment as the HP48 re-boots and attaches the program code. Titan is now ready! Should the memory of the calculator ever clear, repeat the installation steps. Otherwise the program and directory remain available for use.

Note: We can install the program into any HP48. Please contact our offices for details. GX owners may wish the download the TITAN.LIB into Ports 1 or higher if they have plug-in memory available. Use of plug-in memory cards, say a older 32K card in a Port, does not use memory in the base calculator.

Titan Operation

Titan software is contained and operates from the TITAN directory. Access to the directory is completed in an absolute order by pressing the following key sequence:

ON key to stop any current applications
Right-shift, HOME keys
VAR key
TITAN menu label key

At the top of the screen is the directory path { HOME TITAN }. Whenever this path is displayed, the calculator is positioned to the proper directory. Pressing the VAR key is necessary if the menu labels are other than the Titan menu labels. The menu labels displayed are:

TITAN - — DESCF DESC MISSE

Pressing the menu label TITAN begins running the program!

The Titan program opens by displaying the Titan logo and Maynard Research Council copyright notice. After about one second the Titan Menu is displayed allowing the selection of software features. All Titan functions are controlled from this menu. The selections are intuitive.

Create Descriptions: This selection permits the creation of a set of element descriptions detailing a job method. Element files are used by the Take Time Study function. Once a file is created it is available for use during time study. Anytime a file is created, Titan prompts for a file name, saving the file into a directory of element descriptions. These files are useful to recall, edit, or reuse, thus saving considerable typing time when same or similar jobs are time studied.

Take Time Study: Using an element description file from above, Titan permits the development of extensive time study data. Study data is compiled and retained through this selection.

Output Results: After a study is finished, data is ready for download to continue the engineering of the work standard. Downloads are usually sent to a PC for both further compilation, - adding a worksheet identifying the operation number, item, department, operator - and completing the calculations to the observed data - rating adjustment, allowance additions, frequency multiplication. A printer download produces a hard copy of the time study data formatted simplistically.

Select Time (min/hr): Set the default unit of time. Note, this is a feature controlling the output of data, not collection. Therefore, a study can hard copy in minutes and then hard copy in hours by changing the time units prior to re-outputting.

Change Delimiter: This is used mainly to match the data field delimiter expected by a PC spreadsheet. If a printer is used select tab (default).

Change Newline: This is normally not visible when the Titan menu displays. Pressing the down cursor key five times highlights this function. Different PC programs and different printers require specific line termination characters when receiving data from other devices. If data is garbled when received, change the newline character selection, possibly even different characters for output to your printer, then another before PC output.

Recover Data: If the timing of a job (Time Study mode) is ended by accidentally pressing the ON key in rapid sequence, Recover Data prepares a time study file from information gathered. Study cannot continue, but no data is lost. While no one would intentionally press the ON key to stop a time study, this could (and has!) occurred if the calculator is dropped, fumbled while shifting grasps, set carelessly aside, or other countless, inadvertent situations. Recover Data is a welcome safety net!

The arrows at the right side corners of the window indicate additional selections are available but not displayed by the window. Pressing the cursor up or cursor down keys scrolls through the choices.

The menu selections perform the function highlighted and return to the normal stack display of the calculator. The exception is Create Description which continues to Take Time Study when a description is created or modified. In fact, creating a description of elements and beginning a time study may represent the normal chain of events during use of the Titan software. If descriptions alone are intended, a cancel feature is built into the software allowing creation of element files without subsequent (immediate) time study.

A menu selection is made by moving the inverted cursor bar to a selection and pressing either the menu label key OK or the ENTER key. Pressing ON or the menu label CANCL returns to the stack display without any further action from the software.

Creating Element Descriptions

Highlight and select the element description function. A new selection menu is visible to either:

Create New Elements: Type a new element description file.

Edit Saved File: Recall a method file for changes before use. Upon completion of edits, either save a unique copy of the modified file or overwrite the old file. The names of available files are provided by you, the system user, after creating or modifying element description files.

Recall File: Recall a method file from the directory of saved files. Begin time study function using the file recalled without changes via Titan Description functions.

A new Titan system is empty, no element files exist. Begin a collection of files by selecting Create New Elements.

Any of the element description screens open in alpha-numeric mode, this mode confirmed by the alpha-on icon annunciator at the top of the screen. Since the Create function begins with an empty file (no element description), the message “Begin Element Desc” appears, reminding you that your starting a fresh list of elements. The screen title bar identifies the function as Create Element Description.

At the lower left corner of the display is a flashing insert cursor. This cursor is shaped as a left pointing, solid arrow. Type element descriptions using the alpha character keys on the keyboard. The bottom row SPC key is the key for a space. The backspace key operates in alpha mode as well.

Type an element description! The best way to learn the software is experience. And, nothing will occur to damage the software or hardware. Anything you type is erasable, so practice files are much like practice time study forms — try-out the process and discard the hard copy! Remember that uppercase letters are made by pressing the left shift key and then the letter. Complete an element description and press the ENTER key. To clear the entire description and start again, press the ON key once before pressing the ENTER key.

Once a single element description is ENTER’ed the system clears the command line - the line where characters appear - and readies for the next line of description. The previous description is abbreviated and displayed in the middle of the screen. Up to three previous entries are displayed, helping keep track of the process. Element numbers are also added as is customary when recording elements on a time study form.

Notes about Element Descriptions

Element description text is adjusted by the software to fit the screen displayed during Time

Study operations. Long lines are broken into segments of twenty-two characters or less, preventing words from chopping-off. A maximum of four lines are displayed during the time study. Extremely long lines are saved but not displayed beyond the four line limit. During entry this formatting does not take place which simplifies the job of typing or editing the text.

During output, the lines print in their entirety within the limits of the device receiving the data. Output formatting of long lines is the responsibility of the receiving software and/or software user.

Only the size of HP48 memory limits the number of elements. Yet, while the system may allow a two hundred element description, many work measurement analyst memory is exceeded well before then. This software is designed to simplify the collection and summary of data. Operations consisting of a considerable number of elements require flexibility while gathering data. Summary of these operations is more a function of organizing the information than crunching numbers. The system will handle many types of study but generally works best where the job method is followed closely and considerable data gathering is required, that is, where calculations consume the greater portion of the summary activities.

Continuing about Element Description Creation

Pressing ENTER without a line of description produces a warning beep without further action. Pressing the ON key when a line of text is present on the command line clears the line. Pressing the ON key when the command line is blank (no characters but the flashing cursor) concludes the entry activity and moves to the function allowing the naming of a file. A default name of UnTitled is always the first selection. This is created to allow you to interrupt the description activity and, sometime later, recall and complete the description file. Pressing ENTER saves the file under the name UnTitled. Note: UnTitled is rewritten whenever the name is selected for the element description file name. A better practice is to name and save your work.

You can also type a file name and press ENTER. The file is then always stored for future use or changes. Only valid characters are active for naming. Invalid characters cause a error beep as a reminder. This function will also overwrite a saved file if a new file name matches. A good practice is to jot down the names of files. (Program code is available to prevent overwriting errors but is deleted to minimize the size of the Titan software for HP48G users, who are limited to 32K total memory)

Review of creating element files:

- 1) Select the Create Descriptions function from the Titan Menu
- 2) Select Create New Elements from the Element Description Menu
- 3) Type descriptions of each individual element, then press ENTER
- 4) Continue typing elements until method is described
- 5) Press the ON key, with a blank command line, when finished
- 6) Type a name for the file or select UnTitled for partially completed files

7) Press ENTER at the Clock screen to begin study or press ON to exit program without timing

Messages during Element Entry

Note: Creating an empty element description file produces the following error warnings.

There is no harm to the software but a good practice is to delete any bad file whenever that file causes either error message.

Window message and warning triangle

Missing or bad elements: the description file is either empty or is not a list of element descriptions. The menu label OK is pressed to continue.

Error beep and top of display message

Make or fix elements and re-try Titan: this is displayed after the program does a precautionary exit because of a bad description file. Press the ON key to clear and return to normal calculator behavior.

So far, the Titan manual has covered the creation of element descriptions. The remainder of this section describes the editing of files or the selection of files used as-is for time study. You can create a description of elements and proceed to the Time Study pages of the manual or continue to read about the text entry features. Whichever manner you decide to learn is alright, as you will find the entire system is well thought-out and for the most part intuitive to operate.

Recalling files as-is for Time Study

Many times, the method employed for producing one product is shared with similar products of the family. Additional work standard study reflect the minute or specific differences among products utilizing this common method of manufacture. Storing unique or generic element description files saves considerable time by eliminating redundant typed entry. Also, the calculator keyboard, while logically arranged, isn't the best for typing long sentences.

Managing the files - naming, controlling content, adding or deleting - is left to the Titan user. Program code is available for these tasks but is not included as part of the basic software in an effort to keep the size of the software to a minimum. A simple solution to managing the file content is to copy the files, either to a printer, for a hard copy reference, or PC, for an electronic one. Selection of the correct file is easier when the available files are hard-copied for review.

Selecting the function Recall File from the Element Description Menu produces a window listing all saved element description files. These files are saved in a sub-directory of Titan named DescFiles (The absolute directory path is { HOME TITAN DescFiles }). A file is selected by using the up or down cursor, moving the inverted cursor to the file name and pressing either the menu label OK or ENTER key. If no files are saved, the software automatically displays a reminder message and substitutes the file UnTitled. However, if UnTitled is also empty, the program will exit after displaying the messages about the bad files. Re-start Titan and select the Create Descriptions function, choosing Create New Elements.

A recalled file is useable without further modifications. Select the correct file name and press the menu label OK or ENTER key. The system advances to the Time Study Clock display. If the file selected is not usable, the warning messages listed above appear and the program exits for file repairs.

Editing Saved Files

Editing a file may involve no more than continuing element entry to a file partially finished, or changing specific descriptions within files, or major revisions to a basic file of elements. Any of these are accomplished through the Edit Saved File function.

Select a file and press ENTER or the menu label OK. The file UnTitled is selected indirectly by pressing the menu label CANCL or the keyboard ON key. A message appears briefly on the screen indicating the UnTitled choice or allows the option to exit the program and re-start. Edits begin by displaying up to three elements from the tail end of the file. The default mode of edit begins as if you plan to add more elements to the current list, similar to process of building the element description file. Editing is easy and intuitive.

The menu label EDIT initiates the function. Edits allow the modification of element descriptions within the file by scrolling through each description to select one for changes, select

one for deletion, or select a point to insert a new description. Since the default mode of the software is for typed entry - indicated by the alpha on annunciator - press the alpha key to turn off text entry and activate the menu label EDIT. If you forget, the letter -f - appears on the screen instead.

The first screen of the Edit function provides the scrolling to position at the correct location within the element description file. Scrolling is controlled using the up or down cursor keys. Edit selections are displayed as menu labels. Position at the intended element description and press one of the selections for the following actions.

Inserting Elements

Inserts are useful to correct the element sequences. The function works by moving the cursor to the desired location within the file, selecting the type of insert - prior to (upward pointing) or following (downward pointing) - pressing the menu label key, and typing the element description. Pressing the ON key with a blank command line cancels the insert action. Two types of insert are needed; insert before (up) to create a new beginning element; insert after (down) to append a new final element, although the latter is also accomplished by simply typing the description from the normal entry screen.

Deleting an Element (Drop)

Deleting an element is a matter of positioning the cursor to highlight the element and pressing the menu label DROP. The screen up-dates the list of elements indicating that the element is deleted. Deletes are un-done by pressing the key combination left-shift & menu label DROP. This restores the deleted element at its original location within the file. Restores cannot occur unless completed immediately. Lost opportunity to restore deletes means retyping the element using the insert feature.

Edit the Element Text

Changing the wording of an element description is accomplished by the EDIT menu label. Select the element and press the menu label. The element description is recalled to the command line and the cursor is placed at the end of the description. Use the cursor keys for moving to the correct place within the description. Remember, typing changes requires that the calculator is changed into alpha-numeric mode. The default mode upon entry into the Edit function is alpha-on. Repositioning along the element description by cursor key is done in regular, alpha-off mode. Press the alpha key (below ENTER) once to switch alpha mode off. (Check top of screen icon)

After positioning to the point within the text, switch to alpha-on mode. Switch modes by pressing the alpha-on key. The annunciator must appear at the top of the screen. Type the changes required. Note, the backspace (opposite end of row with ENTER key) and delete (DEL) work in both modes. After changes are finished, press the ENTER key. Exit without changes to the line of text by pressing the ON key, which clears the command line, and then press ON a second time, returning to the scroll screen. Although the first press of the ON key cleared the description from the edit screen, it is retained within the file. (The copy you saw on screen was intended to replace the file copy!)

Once edits are completed, press the menu label QUIT. This returns to the Element Description mode which permits the addition of further element descriptions to the file.

Naming Edited Files

Before the program initiates further action, it awaits a name for any file created by any activity involving element descriptions. The screen controlling the naming of files behaves in one of two manners, depending upon the preceding activity which created the file. New files are provided the default name of UnTitled. Selecting the name UnTitled creates a temporary copy of the descriptions but not a permanent copy. Use this name for files that are only partially completed when you were interrupted to do other work.

Edit File displays, as its default, the name of the file selected for editing. Pressing the ENTER key while the default name is displayed in the command line overwrites the old file with the file as modified during editing. If a new file is required then type a new, unique name and press ENTER. ENTER pressed when the command line name is blank also saves the new file under the name selected for editing. (Remember, this will overwrite the existing file!)

The Help Screen

The menu label HELP flashes a brief reminder of the Create Element Description function. View the Help screen by pressing the alpha key to turn off the alpha-on icon in the annunciator area, then press the menu label HELP. Help displays briefly; repeat if more time is needed to read the screen. Remember to switch the calculator from alpha-numeric mode to re-display Help. The software automatically switches back to alpha-numeric when Help is completed.

Taking a Time Study

Using Titan to gather and compile time study data is productive. The software is flexible enough to assure that data is collected accurately and that the various idiosyncrasies which occur during the course of a study are properly addressed. This, combined with the ease of use, make Titan an ideal tool and true innovation to the technique.

The only prerequisite to a time study is a element description file delineating the elements to study. The software uses this information to provide a readable screen, including the element numbers and cycle counts, plus an upper boundary of the number of elements. A method file of nothing more than a series of character spaces (no descriptions) is adequate but a brief description of each element unlocks the real dynamics of the software.

Time studies are initiated either by selecting the functions which create or modify element descriptions - the program will proceed to time study mode - or by directly selecting Take Time Study from the main Titan menu. The description file is authenticated and an image of a stopwatch is displayed. Pressing the ENTER key zeros the internal hardware clock and begins the timing of the operation, therefore, the key is pressed to begin study in the exact same manner a study is started by conventional stopwatch. If no study is planned, for example following the creation of element files, press the ON key and exit the program.

Timing displays a characteristic screen identified by the title Titan Time Study. The next line of screen marks the element number of the element to time and the cycle presently under completion. These data are updated by each timing operation acting on elements of the study. The larger portion of the display is occupied by the description of the elements as entered during the creation of the method file. Four lines of up to twenty-two characters is viewable. The last line is partially clipped to display the flashing cursor. This last line is used for typing element sequences when the sequences vary during study. While variations generally don't occur, they could at any moment, so the system is readily adaptable to the current order, as it happens.

An element is timed by pressing the ENTER key, which is the largest key on the keyboard. Pressing ENTER signals the program to record the elemental time and increment the element to the next one in the definition file. If the last element in the file is performed, then the cycle count is incremented. Because this process is hidden in the software, it sometimes causes confusion. For example, it may seem that while the element description appears in the screen, time is accumulating for that element. In fact, the screen description is only a placeholder. It provides a visual confirmation to the user, so the user can verify that, in fact, this element is taking place at the moment and that when this element ends, record the time as its ending time. Conventional stopwatch study is basically the same. As the clock ticks, the analyst holds a pencil above the element row or column for that element. Time is recorded only when an element ends as if no time accumulated for any element at all! The sequence isn't even important until the moment the time is recorded. Simply move the pencil to the correct position and write the time. This is exactly the behavior of the Titan software because it is modeled after engineered work measurement practice. "Moving the pencil" to the correct column is possible by simple, keyboard entry described later in the text.

Three other keys - also known as timing keys - create the same effect as pressing the ENTER key. These are the two menu labels of MISS and CIR plus SKIP, the keyboard key for cursor-right (rightmost key of the third row). Pressing these keys during a data collection also records and increments through the elements. The actions are:

- MISS: Record the element time, but mark that time as inaccurate. During summary, the software excludes this time from elemental averages, instead accumulating all such recordings as a general category of Missed.
- CIR: Record the element time, but mark that time as outside the bounds of the element definition. Circled-out or selected-out is the common acronym for these times. As with Missed, the time do not appear in the elemental average but in a separate category Circled.
- Skip: This key is used when an element is skipped by the operator. No time is recorded because no work on the element is performed. Skipped elements are indicated during output by printing a -s- mark, wherever occurring. No time category is kept because no times are generated.

Canceling a Recording

In the event of an unintended recording, press the key combination left-shift & backspace key. The name above the key - DROP - is a reminder of its function. This key combination also drops accidental recordings made using the variations in sequence procedure described next. Note, however, that the software limits the dropping to the last recording. Repeatedly pressing the DROP key will not erase several readings, only the most recent.

Variations in Sequence

Most of the time work is performed in an orderly, unwavering sequence. This is especially true of high volume, high production products. It should additionally hold true for highly planned, tightly controlled processes as well. Yet some operations vary, either to a small degree or greatly, from piece to piece. Titan permits easy changes to the sequence of elements within the element description.

Jumps from one element to another in sequence are accomplished by typing the element number - which appears on the screen as you type - and pressing the ENTER key. Note that the element description jumped to doesn't appear on the screen. The software reads the internal clock, saves the time of the element number taken from the screen entry, and increments the element index to the next one following in order. The software behavior may seem awkward because the description of the timed element never appears on screen before timing. The direct

jump and timing are made in one step.

Typing the element number onto the screen and pressing the key combination left-shift & cursor-right advances the display to the element number typed without recording any time value. Timing the element is accomplished by pressing the ENTER key. In general, pressing any timing key - ENTER, MISS, CIR - stores a time value for the element presented in the display screen. Note, should you press the SKIP key after a jump, the software treats the entry as if it had incremented to that element in the normal manner. In other words, no time is recorded by the skip - or the previous elements jumped-over - which is exactly the proper sequence of recording on some studies.

Missed or circled-out elements are recorded in a like manner: type in the number to the screen and press one of the menu labels. Again, this seems awkward. An alternate procedure is to advance to the element using the left-shift & cursor-right jump, then selecting the appropriate menu label

NOTE: The manner in which jumps were designed into the software is a discretionary decision. Since both types of jump - jump-only or jump-and-time - were needed, a style was chosen. If you would prefer the software behave opposite - type a number, press ENTER, jump-to without timing - contact our office for a copy. Its a simple change to program code.

If the element number zero (0) or an element number exceeding the number of elements in the method file is entered, a warning beep sounds and the system awaits a valid element number. The erroneous number remains in the display to visually indicate the error (because you may not hear the error beep in many factory floor, time study settings). Press the backspace to completely erase the value and then enter the correct number. Remember, if the element number selected was intended to produce an immediate jump and time operation, the proper data entry sequence is element number & menu label Miss. In real time, the out-of-range element number error occurred the moment you intended to capture the element break point time. That time has past, therefore the correct entry for that elemental occurrence is Missed.

Additional observations/elements (Foreign entry)

Recording observations beyond those described by the anticipated sequence of elements (methods file) is accomplished by a software branch that builds a separate listing of recorded times. A common name for these recordings doesn't exist but a common thread to the time study data gathering process does exist. These comments are made to avoid confusion among those in the field familiar with varying definitions -foreign, out-of-order, non-cyclic, operator introduced, irregular, etc - which may have different meanings among analysts. Gathering these data is a matter of mechanics, that is, the particular form or practice used.

Maynard Research Council designed a form (Form 109A) which is flexible in any time study situation. Along the right edge is a column to record additional observations: starting time, ending time, description, rating, and classification of activity. The column title on the form is Foreign Element, which, in the limited scope of MRC's recording mechanics, refers to observations other than those defined in the main body of the worksheet. Engineers are expected to determine the exact nature of each observation by its context and either include or exclude them from the work standard. But this decision is made after the collection of data: while the watch is running, you are duty-bound to record every activity that occurs.

This theme is transferred to the Titan software. Observations beyond the definitions within the element description file are recorded by branching to the foreign element collection mode. But do not confuse this style of time study mechanics with a widespread definition of foreign element, which is an observation not necessary for the completion of job. A foreign element recording on either Form 109A or within Titan is for subsequent analysis, not immediate exclusion.

A separate summary form (worksheet) is used to record a description of these events because these observations were not defined prior to study. The Titan output lists each observation and a matching index. Worksheets list the index and definition for compilation.

When a new activity occurs press the menu label FOR. A window appears with the standardized prompt Foreign: followed by the index. Index increment from A to S, sub-scripted by a number. The number matches a worksheet, 1 for the first column of A to S, 2 for the second column, etc. Simply record a description on the worksheet using care to match the correct index. Press the ENTER key to record the ending time of the occurrence. The software advances the index to the next in sequence. Pressing the menu label key BACK returns to the regular sequence of elements.

Time values for Foreign branches are recorded in one of two manners, matching the two possible chronologies of actual events. Pressing the menu label FOR indicates that the starting time of the foreign recording is the ending time of the previous element. Pressing the menu label NOW indicates that the starting time is now, the moment the key is pressed. Both branch to the foreign recording mode.

An illustration of the difference is below:

Regular element		Foreign Recording	
...		This is a normal, each piece sequence	
Clamp part in vise	12.58		
Drill part	13.01		
...			
...			
Clamp part in vise	14.22	A1: Oil drill bit	Start: 14.22
			End: 14.66

Drill part	15.09	Oiling occurs in addition to the normal sequence. In fact, oiling may occur every twenty pieces in compliance with process documents, but was not planned for by the time study analyst. It's part of the job and must factor in, making the broad category Foreign incorrect!
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Because the oiling is started immediately after the part is clamped, select FOR which records the start time as the ending of the previous element (14.22)

....
Clamp part in vise 14.22

Oil drill bit	Start: 14.41
	End: 14.85

Drill part	15.09
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This list of events is different yet the times are the same. Drilling began, was interrupted to oil, then resumed until completed. Proper recording is made by pressing the menu label NOW (at 14.41).

An option also exists to record the ending time of a foreign branch. The oiling element of the previous example could occur, but require additional time due to actions beyond the scope of the basic function. In other words, the time is circled or selected-out. Pressing the menu label CIR records the ending time but marks it for exclusion from any summary. Because the Titan output function only lists the recording time values, accurate summary is created from the output hard copy and subsequent work-up, not by the Titan software.

The backspace key engages the Cancel Recording action in a manner similar to regular elemental recording. Press the key to cancel the last foreign entry. From this point, either return BACK to the regular recording or continue to record Foreign occurrences.

An indirect form of cancel works when the menu label key FOR or NOW is pressed, either by mistake or in anticipation of a foreign branch that subsequently doesn't occur. Pressing the menu label BACK returns to the normal time study mode without recording additional data into the foreign list.

Concluding the study

Ending the time study is done by pressing the menu label END. This key does not work directly but is first preceded by the left-shift key. This is a mechanical guard preventing accidental key presses from ending the study. Once a study is ended it cannot resume. Make certain that all data is collected before pressing the End Study keys. (Program code is available to

allow resumption of data gathering but is excluded from this version to keep software size minimal)

A window appears immediately after the conclusion of the study data collection indicating that the software is summarizing the data. This requires a few seconds to a few minutes. Once summarized, the data is organized into a file for output.

Output of data

Select the Output Data function from the Titan Menu. The software first calculates the element data (when the Titan Slide Rule is visible) and then downloads the results to either a printer or PC (while the Titan Download graphic, hourglass, and transmit icon are displayed). Subsequent organization of the information into a work standard is the responsibility of the user and not part of the Titan software. (Program code to generate a completed standard is available ...)

Before initiating the output, connect the interface cable to the correct device and the HP48. Outputs do not alter or purge data. If data is not received by a device repeat the output function.

Make certain to output a file before beginning additional studies. Each study is saved to a generic file named TSfile in the TITAN directory. New time studies overwrite this file. You can create a separate directory and move(copy) completed time study files into the directory, supplying a unique name to each. To produce an output, move(copy) a specific file back to the TITAN directory, copying into the TSfile object. Refer to the HP48 Users Guide for instructions about moving or coping files. Users of the HP48G may wish to delete the contents of the TSfile following output to maximize available memory. This is done by:

From the TITAN directory, program not running

1) Press the left-shift & plus(+) key, and ENTER

Curly braces on stack display

1: {}

2) Press the NXT key (right-most of second row)

3) Press the tick delimiter key (left-most key of third row)

4) Press the menu label TSFIL

5) Press ENTER

The name 'TSfile' displayed below the braces

2: {}

1: `TSfile`

6) Press the STO key (next to the tick delimiter key)

This reduces the size of TSfile to a minimum

Further Safeguards of TSfile

If the Titan program is started, press the ON key to exit when the stopwatch screen appears. The old time study data in TSfile is unaltered. If the Titan program is started and timing of elements initiated, press the ON key quickly and repeatedly. This terminates the program and preserves the old time study data. Incidentally, because of this hardware behavior, avoid pressing the ON key repeatedly or existing data is lost. Single presses of the ON key are protected by the program code. (Note: Recoverable data is collected into the TSfile using the Recover Data menu selection should the ON key cause a halt. However, do not use Recover Data if the timing began accidentally as described above.)

The Other Titan Menu Selections

The main Titan menu includes three other selections. Each of the selections are global, that is, they function as set-up or default settings for all work performed. However, since each setting affects output action only, you can change these at will and not destroy any of your work. In other words, if your output is incorrect or incompatible with the intended results, simply re-set the particular variable and re-output the data!

The time selection is self-explanatory. Time changes affect the output of data, not the collection. For example, select minutes as the time unit and output a time study file. Change the units of time to hour and re-output the same file. The data is identical but expressed in each of the units, minutes and hours.

Data is generally divided into segments which govern something as simple as its visual appearance to matters as complex as the number of discreet fields and datum. Outputs from the Titan software is straightforward yet, if directed to a spreadsheet, must follow a consistent format including a delimiter for each field. Since delimiters could vary among PC software, you have the option of changing the delimiter to match the character for your spreadsheet.

The format of the output is detailed next. In order to distinguish among descriptions in this printed text, data fields are typed in upper case and data descriptions are typed in lower case. The location of the field delimiter is indicated by the notation [DELIM] and the end of line by [CR].

Data descriptor: this is always a six line output at the top of the time study data

BEGINNING OF DATA: [copyright, mrc name& phone enclosed in square brackets][CR]

TIME UNITS OUTPUT: minutes or hours indicated [CR]

NUMBER OF ELEMENTS: number of elements or columns of data [CR]

NUMBER OF CYCLES: number of cycles studies [CR]

TIME CATEGORIES: this is always the number 2 for missed and circles time [CR]

FOREIGN LIST SIZE: this indicates the number of lines of foreign data [CR]

no space in output, included here for readability

FIELD 1 [DELIM] FIELD 2 [DELIM] FIELD 3 [DELIM] FIELD 4 [DELIM] FIELD 5 [CR]

FIELD 1: the element number in sequence

FIELD 2: the full description of the element which you must format if too long for page

FIELD 3: the total of the times collected for the element excluding missed or circled

FIELD 4: the number of element observations after excluding missed or circled

FIELD 5: the average elemental time

these lines of data continue for each element in the description file

FIELD 1 [DELIM] FIELD 2 [DELIM] FIELD 3 [DELIM] FIELD N [CR]

FIELD n: each cycle of the study is output element by element, elapsed (snap) time only

these lines of data continue for each cycle in the study

CIRCLED TIME [DELIM] TIME [CR]: circled title and time on a separate line

MISSED TIME [DELIM] TIME [CR]: missed title and time on a separate line

FOREIGN CODE [DELIM] START TIME [DELIM] END TIME [DELIM] TOTAL TIME [CR]

FOREIGN CODE: the indexes beginning at A1
START TIME: the starting time of the event
END TIME: the ending time of the event
TOTAL TIME: total time for the event
the lines continue for each foreign recorded

Note: in the output, circled-out (selected-out) times are surrounded by opening and closing parentheses, simulating a circle. Elements skipped in the sequence of elements are displayed by the notation -s- in place of the element time. Missed elements are indicated by -m-.

Hard copies to a printer are not formatted beyond the field designations. The output appearance is best when the delimiter selection is TAB.

The example of outputs indicated that each line is terminated by the [CR] character. Both PC software and printer devices use this character to signal the ending of a line of text. The character required by any device, however, is not universal. Fortunately, only three possible characters are used by any computer device: LF, line feed character; CR, carriage return; CR&LF, in combination. If the correct line termination character is known then make the appropriate selection from the menu. (Remember! This is the bottom most menu usually hidden by the opening Titan screen.) If the character is not known the output will let you know. The first row of data will look alright but the remaining rows will appear shifted or broken incorrectly. As with any other Titan outputs, change the parameters and do it again!

Quick Guide to Titan Operation

Selecting the Program

- 1) Press the ON key to stop any running applications
- 2) Press right shift & HOME key to move to HOME directory
- 3) Press the VAR key to display user objects (programs)
- 4) Press the menu label TITAN to open directory
Note: Steps 1 - 4 are not necessary if in TITAN directory
- 5) Press the menu label Titan to begin program

Creating Descriptions

- 1) Press menu label Titan to start program
- 2) Highlight the Create Descriptions selection
- 3) Move highlight to Create New Description
- 4) Type element descriptions until completed
- 5) Press ON key, when command line is empty, to end entry
- 6) Either type new name for file or select UnTitled
- 7) At time study clock display, ENTER to start, ON to exit

Editing Descriptions during element creation

- 1) At any point during entry, turn-off alpha and press menu label EDIT
 - 2) Use cursor up or down key to highlight position in file
 - 3) Use the menu keys to:
 - INSert: element description before or after highlight (ON cancels)
 - EDIT: recalling element text to modify (ON cancels)
 - DROP: element highlighted. Left shift DROP restores
 - QUIT: edits and return to text entry
- Note: exiting the EDIT selection without changes is accomplished by pressing the ON key when the command line is blank

Edit Saved File

- 1) Press menu label Titan to start program
- 2) Highlight the Create Descriptions selections
- 3) Highlight the Edit Saved File selection
- 4) If files are available, highlight file name. CANCL or ON to select UnTitled.
- 5) Follow instructions for Create Elements
- 6) Default file name overwrites existing or create new name

Recall File

- 1) Press menu label Titan to start program
- 2) Highlight the Create Descriptions selections
- 3) Move highlight to Recall File
- 4) If files are available, highlight file name. CANCL or ON to select UnTitled
- 5) ENTER at clock display to time, ON to cancel.

Timing Elements

- 1) Press the menu label Titan to start program
- 2) Highlight the selection Take Time Study
- 3) Press ENTER at clock display to zero watch and begin timing
Note: if method file is faulty, program ends and reports file status.
- 4) Use ENTER key to time element
- 5) Select menu labels as appropriate for Missed, Circled, Foreign
- 6) Conclude study by pressing left shift & menu label END

Output Time Study

- 1) Press the menu label Titan to start program
- 2) Highlight the Output Results selection
- 3) Make cable connection to output device and set device to receive data
- 4) Press ENTER key
- 5) Data is transmitted when normal, stack display is visible

Changing Units of Time

- 1) Press the menu label Titan to start program
- 2) Highlight the Select Time (min/hr) selection
- 3) Highlight Minutes or Hours
- 4) Press ENTER or OK. The selection remains in effect until re-set.
Note: this is an output altering selection. Data is collected in relative units altered.

Changing Delimiter

- 1) Press the menu label Titan to start program
- 2) Highlight the Change Delimiter selection
- 3) Highlight the desired delimiter

- 4) Press ENTER or OK. This is also an output altering selection.

Changing Newline

- 1) Press the menu label Titan to start program
- 2) Highlight the Change Newline selection
- 3) Highlight the desired newline character(s)
- 4) Press ENTER or OK. This is also an output altering selection.

Recovering Data of Unintended Termination of Time Study

- 1) Immediately upon error, press the menu label Titan to start program
- 2) Highlight the Recover Data selection
- 3) Recoverable data produces no warning message. The Summary window displays and the calculator returns to the normal, stack display. Output study after recovery. If data is entirely lost, a warning message is produced. Note: the current cycle of data is not saved if the cycle is not completed to its terminal element.

Common Questions

Q) Can I make a copy of Titan?

A) You may not copy Titan without written permission from Maynard Research Council.

Q) Why can't I find the Titan program?

A) Make sure you are in the correct directory. Press the right-shift HOME key. Next Press the VAR key. Finally, press the menu label TITAN.

Q) I followed the instructions and don't see the Titan program

A) Did you try some of the examples in the Users Guide. If you have, then new objects were created by some of the examples. Each new object gets its own menu label, pushing the right-most object to the next menu page. In other words, the Titan program was pushed into the next electronic file cabinet drawer. Press the keyboard NXT key to step through all the objects, six at a time. If Titan has moved to another drawer, it will appear somewhere within the menus. You can PURGE the unwanted objects following the instructions in the Users Guide.

Q) I tried to take a time study and couldn't.

A) Before a time study can start, you must have a set of elements to time. This is the element definition file. Also, the files must contain strings of characters. The program checks the condition of a file - desc - for these requirements. The message - Missing or bad elements - lets you know that the description file needs fixed up

Q) I can't get the Help or Edit keys to work while typing elements.

A) Remember, when the alpha icon appears at the top of the screen, the menu label keys make the letters a to f (A to F). This is also the case for any of the first twenty-six keys on the calculator. Press the alpha key to turn off the mode, then the keys will work.

Q) Now I can't type letters.

A) Check the annunciator area for the alpha icon. Press the alpha key to switch modes.

Q) I made a mistake while typing an element description, how do I fix it?

A) It depends. Simple mistakes made while typing are corrected using the backspace key. You could backspace away an entire line to reach a mistake or use the cursor keys to move to the error, but remember the normal and typing mode of the keyboard. If an entire line needs erased, say you skipped typing an element in its sequence, pressing the ON key while text appears on the command line erases the line. Once text is saved into a file by pressing ENTER, you can still make fix-ups by using the Edit function. Need yet another idea. After output to a PC, use your word processor or spreadsheet and make the changes. In fact, one strategy is to

type a brief description into the calculator, output the completed time study, and expand the description on the PC.

Q) What names are OK for descriptions files.

A) You should avoid names that match build-in functions of the calculator, such as SIN, EDIT, SWAP. Also, don't use names that match any in the parent TITAN directory: Titan, DescFiles, desc, Missed, Circled, Tsfile, Summary, ExceptionList, Units, Delimiter, NewLine, UnTitled, ForeignList, Cycle, or Begin.

When typing a name, only valid characters are allowed. The character set is limited by the software, so any name you create is acceptable, respecting the above mentioned restrictions. You can avoid problems altogether by beginning each name in upper case and include the dash character within the name.

Q) I've pressed some keys and don't know what's happening.

A) Press the ON key several times quickly. If this doesn't work, try a calculator warm start, similar to a computer re-boot. Press and hold the ON key, then press the C key on the top row of menu labels. The calculator ends all current operations and switches to a default mode. The menu labels change to the Math (MTH) menu in the HOME directory. Press VAR to switch menus and start Titan.

Q) How long do batteries last?

A) Batteries last a long time but the biggest drain comes from using the hard wire transfer, which you will do when outputting Titan data. Keep replacements on hand but don't panic. Heavy users report batteries last about four to six weeks during constant, heavy use and months otherwise. But, you could always get a weak battery, even a new one. Since the AAA batteries are readily available and are inexpensive, the battery concerns are minor. PS: write the installation date on the battery with a permanent marker.

Q) But won't the data erase when I change batteries.

A) NO! You will get your first indication that batteries are weak during output. A message may appear indicating that I/O cannot continue because the batteries need replacement. Follow the Users Guide and change the batteries. The memory is not erased. But be careful. The cover to the battery case is sometimes stiff and hard to remove. So people have wrapped their fingers around the calculator for a better grip and accidentally pressed the ON key, turning on the calculator. When they take out the batteries ... Oh No!. Always turn over the calculator after removing the cover to make sure you didn't press ON. Change the batteries only when the calculator is OFF! When off, you have a few minutes to install new batteries, even after the old batteries are removed!

Q) I'm still a little uncertain about the timing. How does it gather times?

A) When the ENTER key is pressed at the clock display, the software reads the system time. System time is not hours and minutes, but an accumulation of CPU

clock ticks. You can switch to the HP48 Time Menu and find the menu label TICKS. At the beginning of a study, the software reads the ticks and saves the time into a variable Begin. Next, the description for the first element is formatted for the display, the element number and cycle count prompt made-up, and these are displayed. Then, the HP48 system does a type of power down. In the HP48 literature this is referred to as a light sleep mode. Nothing is happening except that the underlying software is waiting for a keyboard key press. The reason is that this mode saves the batteries from unnecessary drain. Pressing a time key immediately signals the software to get the current TICKS, subtract the ticks stored in Begin, save the time and advance to the next element. So what is happening between element times is, well ... , nothing. Of course, this is similar to what occurs between element recordings using a stopwatch. For all intents and purposes, the stopwatch is running but nothing is “happening” because nothing is written down between readings, only AT readings!

- Q) What happens when elements are jumped over?
- A) Somewhat the same, except the software, after reading the ticks, then decides which element matches the time. Omitting an element number in the command line instructs the software to increment the element number by one. A number in the command line gives an explicit jump value to the software.

- Q) What about jumps without timing?
- A) This jumps elements for display, not timing. Therefore, time is not recorded from the element last recorded up to the “jumped” element.

- Q) Can I jump cycles?
- A) In one way yes, but in reality, no. You are collecting data when you time study. The cycle count is almost always in a one-to-one correspondence to the rows of completed data on a time study form. But, you could create an element or time as additional data, something such as “Complete five pieces.” Is this jumping cycles or not? Titan software can do the same. Obviously, this may cause the cycle displayed to mis-match the actual cycle. The screen display is correct in the majority of cases.

- Q) What happens if the elements are performed in something other than a normal sequence?
- A) This isn’t a problem but an assumption is built-into the manner in which cycles are displayed. The assumption is that the final element in a sequence concludes the cycle. In many cases this is correct, but in a case where you are interested in pieces packaged, but the final element says “Close shipping box of ten parts”, the cycle count is changing only every ten pieces, not each piece. The data from the time study is correctly saved - one row of time for each piece - but cycle count display during study are not exactly correct. Obviously, the software can handle the mechanics of study with a very few limitations.

- Q) Ok, but can I jump cycles?
A) Yes! Whenever you time an element that is a number value less than the previous element number, the system in essence jumps cycles.
- Q) Foreign elements are not part of the job. Why time them?
A) Several reasons. First, the mode is intended to record data OTHER THAN the elements anticipated (or each piece) in the element description file. A planned gauging of completed pieces, made every fifty parts, that you overlooked when creating the element file, needs timing. How will you do the timing? Time the occurrence as a foreign and re-classify it after the study.

The other reason to time ALL occurrences during a time study is that this attention to detail is the very purpose of study. You may discover an important deterrent to the completion of work. Ignoring these “foreign” elements ignores a possibly to eliminate waste!

- Q) Are updates available?
A) Yes. We make updates all the time. If you have a specific suggestion, please let us know. You can e-mail or call us directly.
- Q) Is training available?
A) Yes and for a wide variety of topics. Maynard Research Council started in 1934 to extend the work of Dr. Maynard to those in the business world. The training he began is still the primary business of MRC today. Classes are offered 50 weeks of the year. Topics range from work measurement - time study, MTM, MTM2 - and work methods, to development classes for supervisory personnel, who are increasingly becoming the focal point of all a business wishes to achieve.

We are also available to provide our expertise to companies wishing to stimulate productivity among employees but without the complex schemes which seemly pervade industry today. Our programs share an ingredient common to the successful programs already at your company - our programs are common sense and easily administered by the company alone.

We are always happy to speak with you about upcoming classes. Please contact our offices for further details.