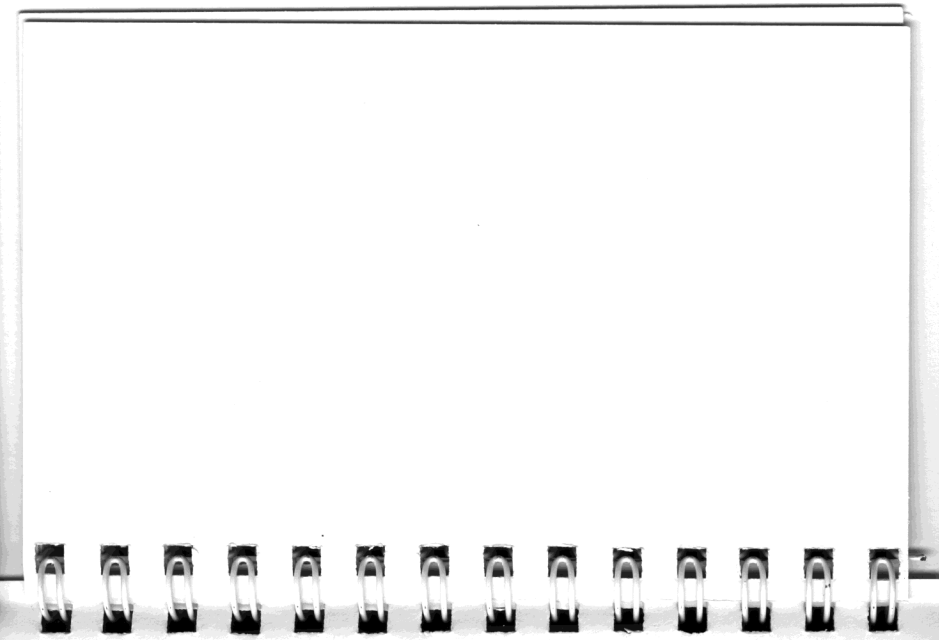

HEWLETT hp PACKARD

HP-01
Owner's Guide

00001-90001, Rev. D 8/77

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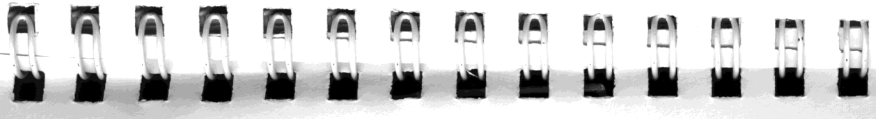
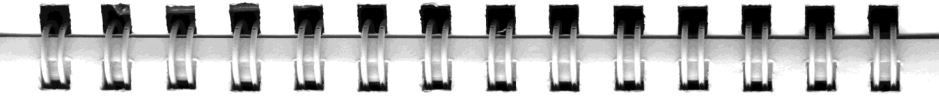
Contents





Introduction

Time: elusive and immediate...limited yet infinite. Because time is important to you, Hewlett-Packard introduces the HP-01, a new dimension in time management and personal computation.

It's a digital electronic wristwatch, a personal calculator, an alarm clock, a stopwatch, a timer, a 200-year calendar...and yet it is more than all of these. The HP-01 is a unique, interactive combination of time and computation functions that offers unmatched capability and versatility. You can do anything from viewing the time to dynamically calculating the cost of a long-distance phone call or, if a pilot, finding the distance to your next checkpoint.

For years, Hewlett-Packard atomic clocks have been used by international observatories and authorities to set time standards with accuracy to within one second in over 3000 years. Currently, millions of HP pocket calculators are in use throughout the world. The same company with this proven and respected clock and calculator expertise stands behind your HP-01.

Hewlett-Packard congratulates you on the acquisition of this fine instrument. We hope you will wear and use it with the same pride that its creators at HP take in this remarkable technical achievement.

HP-01 Highlights

CALCULATOR
Four function,
percentage,
scientific notation.

CALENDAR
200 year,
Day of week,
Day of year.

DATE
Month-day-year,
Day-month-year.

ALARM
Hours, minutes,
and seconds;
12 hour, AM or PM.

STOPWATCH
.01 second resolution.

TIMER
Up to 100 hours,
with alarm.

TIME
Hours, minutes,
and seconds,
12 hour or 24 hour.

MEMORY
8 digit addressable.

HP-01 Keyboard Summary

R Reads display; also resets stopwatch and takes splits **(page 30).**

0 1 2 3 4 5 6 7 8 9 Digit keys for entering numbers **(page 42).**

S Timer/stopwatch function **(page 24).**

· Decimal point; also used to separate seconds from hundredths of seconds **(page 24).**

DW Day of the week **(page 38).**

21 Indicates date in twenty-first century **(page 34).**

−/+ Changes the sign of displayed number **(page 42).**

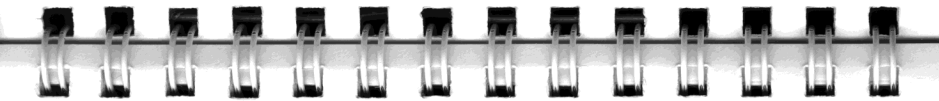
⇄ Exchange function, switches the position of two numbers **(page 47).**

A Alarm function **(page 22).**

▲ Used to store data into D, A, M, T, S. Also, used to access the shift functions **(page 10).**

M Memory; used to store numbers, times, and dates **(page 46).**

% Percent function **(page 50).**



C Clear function **(page 44).**

: Colon, used to separate time fields **(page 12).**

+ − × ÷ Arithmetic operators **(page 42).**

= Equals key, provides answers to arithmetic calculations **(page 42).**

P Indicates PM time **(page 12).**

T▸ Converts hours, minutes, seconds to decimal hours **(page 19).**

▸T Converts decimal hours to hours, minutes, seconds **(page 19).**

a Indicates AM time **(page 13).**

D Date (calendar) function **(page 34).**

/ Separates date fields **(page 34).**

T Time (watch) function **(page 12).**

A Word Or Two About These Instructions...

Your HP-01 is shipped fully assembled, including the batteries.

Six keys— T, D, A, M, R, and S — can be pressed with your finger.

Two keys— R and S — are recessed slightly to prevent accidental continuous stopwatch display.

All keys can be operated with the stylus (fitted in the watchband clasp) or the stylus tip of the pen. **(Do not use the writing tip; it may damage the keys.)** When you press a key, the display blinks momentarily to let you know that the keystroke function has been recognized.

Some keys on your HP-01 perform more than one function. To access the alternate function, press the ▲ key first.

To select the function above the key, first press ▲ then press the function key (+). This appears in the handbook as ▲21.

To select the function printed on the key (addition), press the key (+).

The ▲ key is also used to store values in T, D, A, M, and S.

Two display formats are available for time and dates. Examples throughout this handbook use the 12-hour time display mode although they apply equally to the 24-hour time display mode. Similarly, the month, day, and year format is used for displaying dates in these examples, but you can also select day, month, year format.

When you are working with the clock functions—watch, alarm, stopwatch or timer—your displayed answer may differ slightly from the answer given in this guide. That's because it will take a few seconds to push the keys, during which time the HP-01 clock is incrementing. Your HP-01 displays the correct answer; it may be greater or less, by a few seconds, than the answer printed here.

If the display turns off while you are practicing these examples, simply press R *(read)* to recall the number. If you make a mistake, either press C once to clear the last entry, or press C twice and start the problem over again. Remember to clear the calculator (C C) if you are in doubt as to the calculator status.

After you have mastered the basic functions, try some of the diverse problems in the Applications section—you'll discover the amazing versatility of your HP-01.

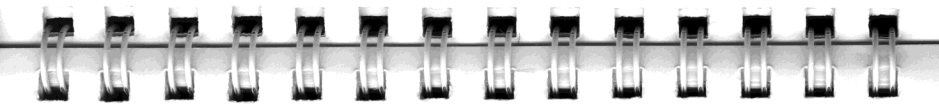
T Time

TO DISPLAY THE TIME. To view the time of day, merely press T. The time is displayed for 2.5 seconds, then the display automatically turns off.

TO SET THE TIME. Key in the time as hours: minutes: seconds (HH:MM:SS), and press ▲ T. Immediately the time is set.

Your HP-01 is set to the 12-hour AM/PM mode, unless you change it. If you wish to enter a PM time, key in HH:MM:SS, and press P ▲ T. A decimal point, displayed on the right, indicates PM time.

Example	Press	Display
6:30 AM	6 : 3 0 ▲ T	6:30 00
6:30 PM	6 : 3 0 P ▲ T	6:30 00.



Midnight is displayed as 12 AM (12:00 00), and noon is displayed as 12 PM (12:00 00.) in the 12-hour display mode. To enter a time during the hour between midnight and 12:59:59 AM, you must use the AM prefix function.

Example	Press	Display
12:45 AM	1 2 : 4 5 ▲ a ▲ T	12:45 00

A blank entry in a time field is interpreted as zero. To key in 6:00:00 PM, you can take a shortcut:

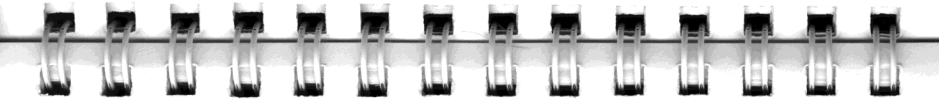
Example	Press	Display
6 PM	6 : P ▲ T	6:00 00.

TO SET 12- AND 24-HOUR DISPLAY MODES. To switch from 12-hour AM/PM to 24-hour mode, simply press [T][▲][·]. (The time can be *set* in the 24-hour mode as well as the 12-hour mode.) To change back to AM/PM mode, press [T][▲][·] again.

Press	Display
[T]	6:00 00.
[▲][·]	18:00 00
[T][▲][·]	6:00 00.

This time display conversion is particularly helpful if you are involved with both military and civilian time schedules, or if you travel and do business internationally.

Suppose your HP-01 reads 11:54 12 , and you are not sure which display mode is set. Simply add 12 hours, and examine the display.



Press	12-Hour AM/PM Mode	24-Hour Mode
[T]	11:54 12	11:54 12
[+][1][2][=]	11:54 12.	23:54 12
	Decimal point will appear.	Hours will change.

This procedure does not change the time setting inside your HP-01.

CHANGING TIME ZONES. If you are changing time zones, simply add or subtract the appropriate number of hours as follows:

[T] [+ or −] (number of hours) [▲][T]

For example, if you are flying from San Francisco to Geneva, a 9-hour time difference:

San Francisco	Press	Geneva
10:43 AM	T + 9 ▲ T	7:43 56.

Travelling in the opposite direction:

Geneva	Press	San Francisco
4:45:37 PM	T − 9 ▲ T	7:45 37

Typically, you will add or subtract whole hours, but you can also use a fractional number of hours. For example, the time difference between San Francisco and the Cook Islands is 2½ hours. You can adjust the time in either of two ways:

San Francisco	Press	Cook Islands
5:45 PM	T − 2 · 5 ▲ T	3:15 00.
5:45 PM	T − 2 : 3 0 ▲ T	3:15 00.

Adding or subtracting .5 hours is the same as adding or subtracting 30 minutes.

Travellers can cross the International Date Line with minimum confusion and maximum ease. If you adjust the time past midnight, the date in the calendar is automatically adjusted. If you press T + 2 4 ▲ T, the time remains the same, while the calendar contains the date of the following day.

TIME AND TIME INTERVAL CALCULATIONS. You can add or subtract a time interval without affecting the watch setting by using the = key.

T + or − (number of hours) =

Example: You are in Munich, Germany, and wish to telephone Hong Kong. What time is it in Hong Kong?

Press	Display	
T	8:15 47	Munich time.
+ 7 =	3:15 48.	Hong Kong time.
T	8:15 49	Munich time.

You can also use just time intervals or segments of time in arithmetic calculations.

(time interval) + or − (time interval) =

Example: To find the mean (average) of the following times-between-failures:

Hours:Minutes	Press	Display	
210:15	2 1 0 : 1 5 +	210:15	
179:46	1 7 9 : 4 6 +	390:01	
201:23	2 0 1 : 2 3 +	591:24	
191:14	1 9 1 : 1 4 ÷	782:38	
	4 =	195.6583	Mean time (in decimal hours).

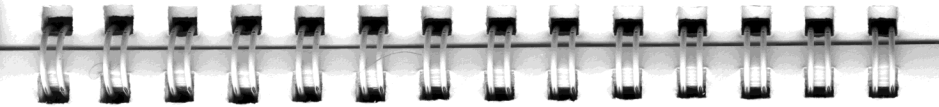
CONVERTING TIME TO DECIMAL HOURS. If you wish to convert the displayed hours, minutes, and seconds to a decimal number of hours, just press ▲ T. To convert decimal hours to hours, minutes, seconds, press ▲ T.

Press	Display	
R	195.6583	(Recall previous answer.)
▲ →T	195:39	Converted to hours and minutes.
▲ T→	195.65	Decimal hours.

Changing the display format like this does not affect the watch setting. Your HP-01 is still keeping accurate time.

CORRECTING TIME ENTRY ERRORS. If you key in 5:42 but really want 6:42, press C *(clear)* and start over again. Once you have entered the colon as a time separator, you cannot go back and change the previous time field without clearing.

Only the last two digits pressed after a colon are recognized. You can correct a mistake after a colon simply by keying in the correct numbers *without clearing*. If you meant to enter 5:26 but pressed 5:36 instead,



Press	Display	
5 : 3 6	5:36	Oops! That's wrong!
2 6	5:26	The correct time.

The sequence :3626 is recognized as :26.

If you key in 60 minutes or more, or 60 seconds or more, the display will flash on and off, indicating an error when you attempt to perform a function.

(A) Alarm

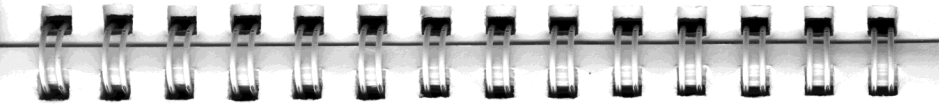
TO DISPLAY THE ALARM SETTING. To view the alarm setting, press (A). The setting is displayed for 6.5 seconds; then the display automatically turns off.

TO SET THE ALARM. The alarm may be set to a fixed time of day, at which time a buzzer "beeps" for 2.5 seconds. To set the alarm, key in the appropriate time of day, then press (▲)(A). This time appears in the display with a dash on the right, indicating that the alarm is set.

Example	Press	Display
4:15 AM	4:15▲A	4:15 00-
4:15 PM	4:15P▲A	4:15 00-

If the actual time is 4:15 AM and the alarm is set for 4:15 PM, it will not trigger for another 12 hours. When the buzzer sounds at 4:15 PM, the dash disappears, indicating that the alarm is no longer set.

To set the alarm to trigger 10 seconds from now, simply press (T)(+)::10▲A. The 10-second count begins the moment you press (A). To sound the alarm in 2 hours, press



(T)(+)2▲A. (Using the time function interactively with the alarm like this does not affect the watch setting.)

TO DISABLE THE ALARM. If the alarm is set, you can disable it (prevent it from sounding) by pressing A▲A.

TO RESET THE ALARM. Once the alarm has sounded, it is automatically disabled and will not sound until you set it again. Recall the setting by pressing (A), then press (▲)(A) to reset it. To leave for the office at 7:15 each day:

Example	Press
Tuesday (Set alarm for next day.)	7:15▲A
Wednesday	A▲A
Thursday (You want to leave an hour earlier.)	A−1▲A
Friday	No alarm.

To summarize: if the alarm is *set,* A▲A disables it. If the alarm is *not* set, A▲A resets it again. (Refer to the Applications section of this handbook for a way to set two alarms.)

S Timer/Stopwatch

The S function operates as a stopwatch if it is counting up or as a timer if it is counting down.

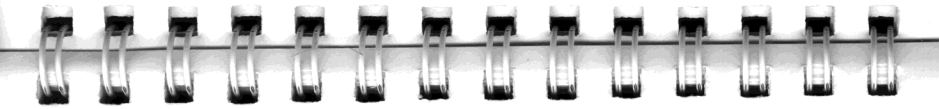
TO DISPLAY THE TIMER/STOPWATCH. Press S and the timer/stopwatch is displayed continuously.

If the timer/stopwatch contains a time interval less than one hour, the display format is MM:SS.CC (minutes, seconds, hundredths of seconds). If an hour or more, the display format is HH:MM:SS (hours, minutes, seconds).

TO SET THE TIMER/STOPWATCH. Press S to access the timer/stopwatch function.

To set the stopped timer/stopwatch to zero, press R.

To key a non-zero time into the timer, key in the desired starting time as HH:MM:SS (hours, minutes, seconds) or MM:SS.CC (minutes, seconds, hundredths of seconds), then press ▲ S. You can use any time interval less than 100 hours.



TO START, STOP, AND RESTART. Having set the timer or stopwatch, press S to start it. If you entered a non-zero time, the timer counts *down,* sounds an alarm when it reaches zero, then immediately starts counting up as the stopwatch function takes over.

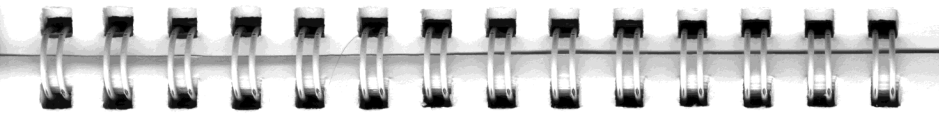
When the stopwatch is started, it counts *up* in hundredths of seconds to a maximum of 24 hours. Then it automatically resets to zero and starts counting up again.

Press S again to stop the timer or stopwatch.

Pressing S again restarts it from the previous stopping point.

Press	Display	
: 2 ▲ S	02:00.00	Timer set to 2 minutes.
S	01:59.99	Start timer.

Press	Display	
	01:59.98	
	⬇	
	00:00.01	
	00:00.00	Alarm sounds.
	00:00.01	Stopwatch starts counting up.
	⬇	
S	00:00.16	Stop it.
S	00:00.17	Restart stopwatch.
	00:00.18	
	⬇	
S	00:03.63	Stop it.



TO RESET TO ZERO. If the timer or stopwatch is displayed and stopped, press R to reset the stopwatch to zero. If running, first stop it with S, then press R.

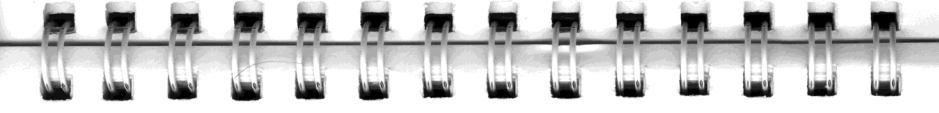
Press	Display	
	00:03.63	Stopwatch stopped.
R	00:00.00	Reset to zero.

TAKING SPLITS. If you are timing an event with the stopwatch, it may be desirable to fix or "freeze" a time interval. This is called taking a split.

While the stopwatch is running, press R *(read).* The exact time is fixed in the display. After writing down or recording the split, you can return to the stopwatch by pressing S. If you wish to take a second or third split, press R for each one to "read" the running stopwatch.

Using the memory in your HP-01, you can take two splits without writing them down. For the first split, press ▲ M (stores in memory). Press S to return to the stopwatch display, then press R for the second split.

Press	Display	
	⬇	Stopwatch running.
	00:20.51	
▲ M	00:20.52	First split stored exactly at M.
		Display blanks out.
S	00:43.28	Return to stopwatch (still running).
	⬇	
	00:53.31	
R	00:53.32	Second split.
M	00:20.52	Recalls first split from memory.
S S	01:05.06	Stop stopwatch.



INHIBITING THE CONTINUOUS DISPLAY. The continuous timer/stopwatch display uses considerable battery power, so you may prefer to inhibit the display (and conserve your battery) while the timer/stopwatch keeps on running. Simply switch to another display mode, such as T. The time is displayed, then the display turns off.

To return to the running stopwatch at any time, press S.

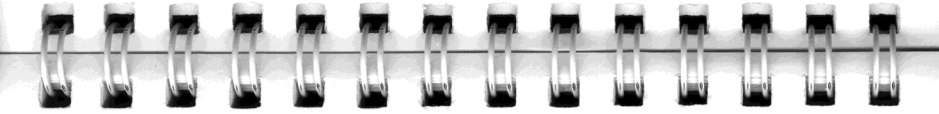
Press	Display	
	01:05.06	Stopwatch stopped at results from previous example.
R	00:00.00	Reset to zero.
S	00:00.01	Start it.
	00:00.02	
	⬇	
T	3:24 16.	Current time displayed.
		Display shuts off.

Press	Display	
S	02:10.36	Return to stopwatch.
	02:10.37	
S	02:10.38	Stop it.

SUMMARY OF R AND S. To avoid confusion, here's a recap of the R and S functions.

Not in timer/ stopwatch mode	If timer/stopwatch is displayed and stopped	If timer/stopwatch is displayed and running
R Read display.	R Reset to zero.	R Read, take a split.
S Display timer/stopwatch.	S Start.	S Stop.

DYNAMIC CALCULATIONS. One important feature of the HP-01 is the ability to use the calculator to perform dynamic (continuously updated) calculations while the timer or stopwatch is running.



S × or ÷ (hourly rate) =

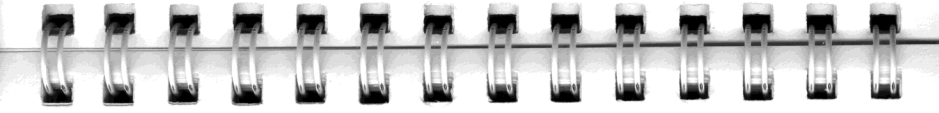
After you press =, the calculation is performed once each second. Generally, dynamic calculations are those involving accumulation or consumption, e.g., distance traveled, fuel consumed, etc. Inhibit a continuous dynamic calculation display by switching to another display mode, such as T, and return by pressing S=. To end a dynamic calculation, press S once to return to the timer/stopwatch (hold the key down firmly for a full second) then press S again to stop the timer/stopwatch. For the calculated result, press =.

Example: A person-to-person telephone call from San Francisco to Germany costs $4.00 per minute ($240 per hour). Klaus Keller decides to call his father in Germany and use his HP-01 to keep track of the charges dynamically.

Press	Display	
S(R or SR)	00:00.00	Display stopwatch (reset, or stop and reset if running).

Press	Display	
(S)	00:00.01	Father answers. Start stopwatch.
	00:00.02	
	⇩	
(×)(2)(4)(0)(=)	.370001	Switch to accumulating charges.
	⇩	
	11.97	Cost for 3 minutes. Father keeps on talking.
	⇩	
(S) (Hold down for one second.)	04:19.36	
(S)	04:19.37	Klaus finally hangs up! Total elapsed time of the call.
(=)	17.29133	Total cost of the call.

The dynamic calculating feature allows you to use decimal hours, minutes, or seconds with



the timer/stopwatch. For example, if you were performing an industrial efficiency study and wanted to time projects or tasks in terms of decimal hours:

Press	Display	
(C)(C)	0.	Clear calculator.
(S)((R) or (S)(R))	00:00.00	Display stopwatch (reset, or stop and reset if running).
(S)	00:00.01	Start stopwatch.
(×)(1)(=)	.003 1667	Decimal hours ((×)(6)(0)(=) for decimal minutes). ((×)(3)(6)(0)(0)(=) for decimal seconds).
	⇩	
(S)(S)	00:26.93	Return to stopwatch and stop.

Because dynamic calculations usually pertain to consumption of time, money, distance, or materials, it is important that you hear the alarm. If a dynamic calculation using the timer is displayed and has counted to zero, the alarm stays on until you consciously turn it off. Simply switch to another mode to disable the alarm.

More dynamic calculations are described in the Applications section of this handbook.

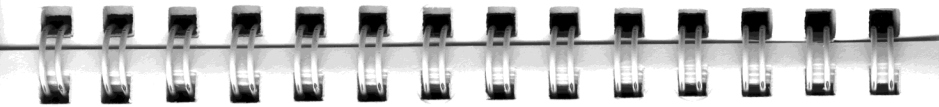
D Date/Calendar

TO DISPLAY THE CURRENT DATE. Press the D key. The month, day and year will be displayed for 6.5 seconds.

TO SET THE DATE. The HP-01 has an automatic 200-year calendar that accounts for leap years and months of different lengths. Once you set the date, you need to reset it only when you change the circuit battery.

Your HP-01 is set to the month, day, year format unless you change it. To set the date, enter one or two digits for the month, then press /. Key in one or two digits for the day, press /, then key in the last two digits of the year, and press ▲ D. The HP-01 will accept dates from January 1, 1900 to December 31, 2099.

For dates in the twenty-first century, follow the MM/DD/YY digits with ▲ 21. A decimal point will appear on the right of the display, indicating a year in the twenty-first century.



Example	Press	Display
April 1, 2044	4 / 1 / 4 4 ▲ 21 ▲ D	4-01-44.
February 14, 1978	2 / 1 4 / 7 8 ▲ D	2-14-78

TO SET THE DATE DISPLAY MODE. The HP-01 displays dates in month, day, year (MM-DD-YY) or day, month, year (DD-MM-YY) mode. In the same manner as you were able to change the time display mode, press D ▲ · to interchange the month and day positions. You already have February 14, 1978 in the display:

Press	Display
	2-14-78
D ▲ ·	14-02-78
D ▲ ·	2-14-78

Suppose you saw 7-05-00 in the display. To determine which date display mode is being used, add one day and see which figure changes.

Press	Display MM-DD-YY	Display DD-MM-YY
D	7-05-00	7-05-00
+ 1 =	7-06-00	8-05-00
	Days increase.	Days increase.

This identifies the date display mode, without altering the stored date.

FUTURE OR PAST DATES. To find a future or past date, press:

D (+ or −) (number of days) =

Example	Press	Display
Date (July 29, 1977) + 8 days	D + 8 =	8-06-77

Adding (or subtracting) dates like this does not affect the calendar setting—the current date is still stored in D.

NUMBER OF DAYS BETWEEN DATES. You can also find the number of days between two dates. A date minus another date results in the number being displayed.

D or (date) − (date) =

For example, it's March 7, 1977, and you are anxiously awaiting a shipment of components that you ordered on January 21, specifying a 30-day delivery. How many days have you waited?

Press	Display
D − 1 / 2 1 / 7 7 =	45.
Or: 3 / 7 / 7 7 − 1 / 2 1 / 7 7 =	45. Days.

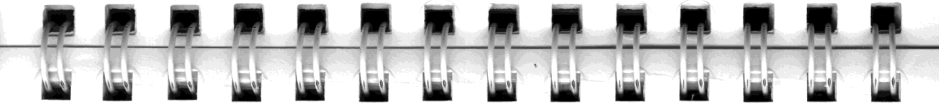
You should have received the shipment 15 days ago.

DAY OF THE WEEK. To find a specific day of the week, enter the desired date and press ▲ DW. A number between 1 and 7 appears in the display, corresponding to Monday through Sunday.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	2	3	4	5	6	7

You can have fun with this feature—key in your birthdate and discover what day of the week you were born.

DAY OF THE YEAR. Key in the desired date and press ▲ /. A number from 1 to 366 is displayed, representing the day of the Julian year. For example, July 27, 1977:



Press	Display	
7 / 2 7 / 7 7 ▲ /	208.	Day of year.

Determining day of the week, day of the year, or the number of days between two dates does not alter the internal calendar. The current date is still stored and can be recalled by pressing D.

CORRECTING DATE ENTRY ERRORS. Like the time function, only the last two digits entered after the separator (/) are recognized.

Example	Press	Display	
January 1, 1978	1 / 1 / 7 7	1-01-77	Wrong year!
	8	1-01-78	The corrected date.

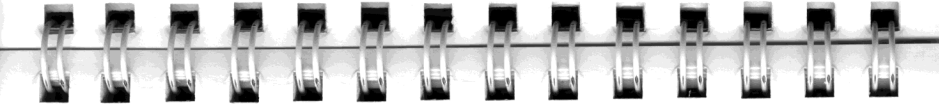
Pressing /778 produces the result /78.

If you wish to change the date field preceding the separator (e.g., you keyed in February instead of January), press **C** to start over again.

If you exceed the largest (12-31-99.) or smallest (1-01-00) internal calendar date, the display will flash on and off, signalling an error.

If you enter a month equal to 0, a month greater than 12, a day equal to 0, or more than 31 days in a month, the display will flash. Just clear it and begin again.

If you try to convert time or a decimal number—rather than a date—to day of the week or day of the year, the display will flash, indicating an error.



Using The Calculator

In addition to all the time and calendar functions, your HP-01 contains an arithmetic calculator with a memory and a percent function.

ARITHMETIC. Key in numbers by pressing the digit keys in sequence. A decimal point must be keyed in if it is part of the number.

Example	Press	Display
148.84	1 4 8 · 8 4	148.84

For a negative number, key in the digits, then press ▲ -/+. This changes the sign.

Press	Display
▲ -/+	-148.84
▲ -/+	148.84

To perform simple arithmetic, key in a number, press one of the four operators (+ − × ÷), key in a second number, and press =.

Example	Press	Display
12 + 3 =	1 2 + 3 =	15.
12 − 3 =	1 2 − 3 =	9.
12 × 3 =	1 2 × 3 =	36.
12 ÷ 3 =	1 2 ÷ 3 =	4.

To save battery power, the answer is displayed for 6.5 seconds then the display blanks out. Don't worry, that number is still in the calculator. To display it again, press R *(read)*.

Clearing Operations. It is not necessary to always clear your HP-01 between problems. After an equals (=) operation, your HP-01 is ready to start a new problem. Just key in the new entry and proceed with the next problem.

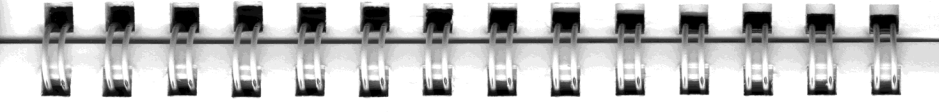
But what if you make a mistake? It depends on where you are in the problem:

If you key in the wrong:	Correct it by pressing:
First operand (number)	C *(clear entry)* and start over again.
Operator (+ − × or ÷)	The correct operator—this will overwrite the previous operator.
Second operand (number)	C *(clear entry)* and key in correct second number.

If you don't know where you are in the calculation or where you made a mistake, press C twice (C C) and start all over again. Basically, pressing C once clears just your last entry, while pressing C twice clears the calculator.

To clear the memory, press 0 ▲ M.

Automatic Doubling. Suppose you want to add 24.17 and 24.17. Instead of entering the number twice, simply press + =.



Example	Press	Display
24.17 + 24.17 =	2 4 • 1 7 + =	48.34
−13 + −13 =	1 3 ▲ +/− + =	-26.

Automatic Squaring. Following the same principle, you can multiply a number times itself without keying in the second entry.

Example	Press	Display
27.63 × 27.63 =	2 7 • 6 3 × =	763.4169

Further you can multiply a number times itself more than once. Raising 3 to the fourth power (3^4) is the same as 3 × 3 × 3 × 3:

Example	Press	Display
3^4	3 × = = =	81.
2^6	2 × = = = = =	64.

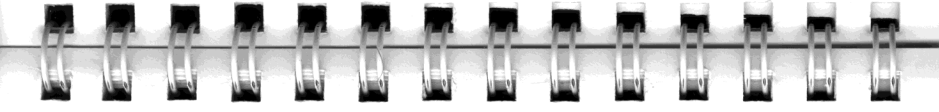
Note that you press ⊗, then press the = key *one less* time than the exponent number. Calculating 2^6 requires pressing the = key 5 times.

Chain Calculations. For chain calculations, follow every numerical entry with an operator. When you press the second, third, or any following operator, the HP-01 automatically calculates the mathematical expression up to that point.

Following the rules of mathematics, solve the expression in parentheses first. Then move through the equation one successive number and operation at a time.

Example	Press	Display
$3(16 - 4) + 1$	16−4×3+1=	37.
$2\left(\frac{50 - 14}{12}\right)$	50−14÷12×2=	6.

Problems that are even more complicated can be solved using the M *(memory)* key. If a problem contains two or more parenthetical expressions, store the intermediate answers in the



memory. When you press ▲M, the first expression is calculated up to that point and retained, while you solve the second expression. ▲M acts as an automatic equals operation.

Example	Press	Display	
$(2 \times 3) + (4 \times 5)$	2×3▲M	6.	First expression calculated and stored in memory.
	4×5+	20.	Second expression.
	M	6.	Recall and add data from memory.
	=	26.	Final answer.

Exchange Function. Another helpful feature is the exchange function ⇄. Sometimes when solving subtraction or division problems, it may be necessary to switch the operands. To do this, press ▲⇄, then complete the problem.

The following example requires the exchange function to switch the numerator and denominator to the correct position for division. The division is performed when you press the = key.

To Solve	Press	Display	
$(17 - 12) \times 4 \div (10 - 5)$	17 − 12 × 4	4.	
	▲ M	20.	Store in memory.
	10 − 5 ÷ M	20.	
	▲ ⇄	5.	Switch numerator and denominator.
	=	4.	The answer.

Both numbers have to be in the calculator before you can switch their positions. Here you must recall the number from memory first, before pressing the exchange function.

AUTOMATIC CONSTANT. If you perform an equals (=) operation with two different numbers (operands), the *second* operand is stored in your HP-01 as a constant. You need not key in the operator or the constant over again. This automatic constant feature is particularly helpful for metric and currency conversions, retail or inventory calculations, factoring, and other repetitive calculations. For example, if 1 mark = .3886 U.S. dollars and 1 mark = 1.8505 French francs, calculate what you are paying (in dollars and in francs) for services in West Germany.

Example	Press	Display	
	C C	0.	
96 marks	96 × .3886 =	37.3056	U.S. $.
346 marks	346 =	134.4556	U.S. $.
43 marks	43 =	16.7098	U.S. $.
96 marks	96 × 1.8505 =	177.648	French francs.
346 marks	346 =	640.273	French francs.
43 marks	43 =	79.5715	French francs.

Remember that the *second* operand is the automatic constant. The first number is the quantity you wish to convert.

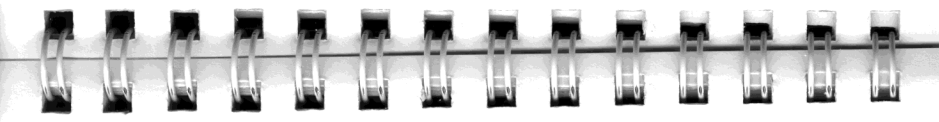
PERCENTAGE PROBLEMS. The % key is used to perform percentage calculations. With your HP-01, you don't have to convert percents to their decimal equivalents; 4% need not be changed to .04.

Calculating Percents. To find the percent of a number, use the following keystrokes:

(base number) × (percent number) % =

To Solve	Press	Display
14% of 675	675×14%=	94.5
30% of −114	114 +/− ×30%=	-34.2

Net Amount and Discounts. Often you must add a sales tax amount to a purchase—or subtract a discount amount—to find the total cost of the item. Calculating this net amount is



effortless with your HP-01 because the calculator retains the base amount while you add or subtract percents. The procedure is:

(base amount) + or − (percent number) % =

For example, if the sales tax on a $8550 car is 5%, what is the amount of the tax and the total cost of the car?

Press	Display	
8550+5%	427.5	Sales tax amount.
=	8977.5	Net amount (total cost).

If the dealer gives you a 10% discount on the car, what will the cost (including sales tax) be?

Press	Display	
8550−10%	855.	Amount of discount.

Press	Display	
+	7695.	Discounted price.
5 %	384.75	Sales tax.
=	8079.75	Net amount.

Finding Proportions. To find what percentage one number is of another (proportion), state the problem as "A is what percentage of B?" The keystroke procedure is:

A ÷ B % =

For example, 64 is what percentage of 340?

Press	Display	
6 4 ÷ 3 4 0 % =	18.82353	%

Percent of Total. First, add all the numbers and store them in memory M. Then, key in the particular number you wish to convert to a percentage, divide by M, and press % =.

Example: You own $1500 worth of stock in the Congruent Computer Company, $5200 worth of Flickering Films, Inc., and $2000 worth of Raucous Records. What percentage of your portfolio does each represent?

Press	Display	
1 5 0 0 + 5 2 0 0 + 2 0 0 0		
▲M	8700.	Total.
1 5 0 0 ÷ M % =	17.24138	% Congruent Computers.
5 2 0 0 ÷ M % =	59.77011	% Flickering Films.
2 0 0 0 ÷ M % =	22.98851	% Raucous Records.

DISPLAY FORMATTING. Your HP-01 handles numbers from 1×10^{-99} to 9.999×10^{99}. The calculator display shows seven digits, a decimal point, and a minus sign (if there is one). You can key in numbers from .0000001 to 9999999. Trailing zeros after the decimal point are blanked out.

If you key in the number 21.3157832, it will be cut off to seven digits: 21.31578 .

If an answer is equal to or greater than 10^7 or less than 10^{-4}, the display automatically shifts to scientific notation. Scientific notation displays a four-digit number (and a decimal point and sign) and a two-digit exponent that is a power of 10. It is particularly useful when working with very large or very small numbers.

For example, raising .05 to the fourth power results in the answer .00000625. Since this is less than 10^{-4}, your HP-01 switches automatically to scientific notation and displays 6.25 -06 .

To Solve	Press	Display	
$.05^3$	●05×==	.000125	
$.05^4$	●05×===	6.25 -06	Scientific notation.

The two-digit exponent of 10, displayed on the right, will be positive if you are dealing with large numbers and will be negative if you are using very small numbers.

$.0000000625 = 6.25 \times 10^{-8}$	6.25 -08	(Move the decimal point 8 places to the left.)
$62500000 = 6.25 \times 10^7$	6.25 07	(Move the decimal point 7 places to the right.)

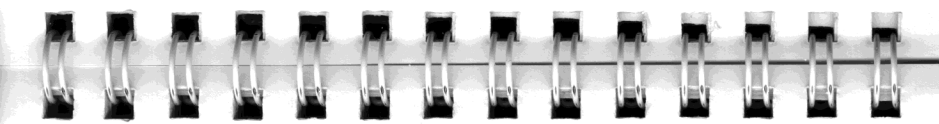
As you can see from these two examples, scientific notation is nothing more than a mathematical "shorthand." Your HP-01 display automatically returns to decimal notation when the number or answer falls within the seven-digit display range again.

OVERFLOW AND UNDERFLOW DISPLAYS. If an answer is greater than 9.999×10^{99}, the display will show 9.999 99 and will flash on and off.

If you calculate an answer smaller than 10^{-99}, zero is displayed. (The display will not flash since 1×10^{-99} is *very* close to zero.)

USING THE TIMER AS A SECOND ALARM *(Timer).* You have a meeting in 2 hours and an important appointment at 3 PM. To be reminded of both events, use the HP-01 timer as a second alarm. Set (A) to 3 PM, then key 2 hours into the timer. The timer alarm will remind you of your meeting; at 3 PM, the alarm will go off.

Press	Display	
3 : P ▲ A	3:00 00	Alarm set for 3 PM.
2 : ▲ S	02:00:00	Timer set for 2 hours.
S	01:59:59	Start timer decrementing.
	⇩	
	00:00.00	Alarm sounds.
S	00:00.01	Stop timer.
	⇩	
T	2:59 59.	
	3:00 00.	Alarm sounds.



BEATING THE RECORD *(Timer/Stopwatch).* If an athlete wants to compare his performance in a race or training session against a certain sports record, simply enter the record time and start the timer. The alarm will sound at the record time. At the end of the race, press (S) to stop the stopwatch. You can quickly compare your time against the record.

Example: A zealous young roller skater decides to challenge Gianni Ferretti's time in the *Guiness Book of World Records.* Ferretti skated a mile on a rink in 2 minutes, 25.1 seconds. The young challenger's trainer clocks his protege with an HP-01.

Press	Display	
2 : 2 5 • 1 ▲ S	02:25.10	Enter record time.
S	02:25.09	Start timer when skater starts.
	⇩	
	00:00.01	
	00:00.00	Alarm sounds. Stopwatch starts incrementing.
	⇩	
S	00:04.36	Challenger finishes, stop stopwatch.

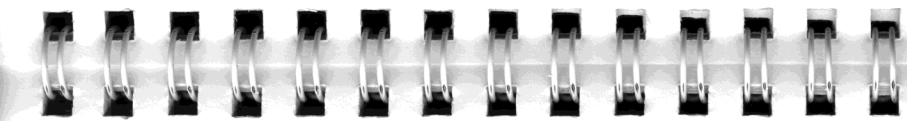
The skater exceeded Ferretti's time by 4.36 seconds.

LAP TIMES *(Stopwatch and Calculator).* Often at sports events, it is desirable to find partial time intervals or to compare portions of the event. For example, in an eight-lap race, you can calculate each lap time or compare one lap with another.

The keystroke procedure is a logical extension of the basic stopwatch keystrokes.

1. To clear the calculator and set up the stopwatch, press [C] [C] [−] [=] [S] ([R] or [S] [R]).
2. Press [S] to start the stopwatch.
3. Take the split or lap time by pressing [R].
4. Press [▲] [⇄] to read the previous time and save the present time.
5. Press [=]. The minus sign denotes the latest lap time. Press [S] to return to the stopwatch.

Continue to repeat steps 3 thru 5 for successive laps or splits.



Press	Display	
[C] [C] [−] [=]	0.	Clear and set up calculator.
[S] ([R] or [S] [R])	00:00.00	Display stopwatch (reset, or stop and reset, if running).
[S]	00:00.01	Race begins, start stopwatch.
	⇓	
[R]	00:27.29	Take first split.
[▲] [⇄] [=]	-00:27.29	Time of first lap.
[S]	00:33.35	Return to running stopwatch.
	⇓	
[R]	00:56.59	Take second split.
[▲] [⇄]	00:27.29	Observe first lap time.
[=]	-00:29.30	Time of second lap.

Press	Display	
(S)	02:37.84	Return to running stopwatch.
(S)	02:37.85	Stop stopwatch.

ROAD RALLY *(Alarm, Dynamic Calculation).* Sports car enthusiasts will particularly appreciate the HP-01. The interactive combination of calculator, alarm, and stopwatch is ideal, for instance, for car rally participation.

Example: Your rally instructions begin: "Travel at 40 KPH (kilometers per hour) for 7 minutes, 15 seconds."

With your HP-01, you can dynamically calculate odometer readings at one-second intervals. Set the alarm for the 7 minute, 15 second mark, then switch to the stopwatch for the dynamic calculation.

Press	Display	
(4)(0)(÷)(1)(.)(6)(0)(9)(3)(4)(4)(▲)(M)	24.85485	Convert kilometers to miles and store in memory.
(T)(+)(:)(7)(:)(1)(5)(▲)(A)		Set alarm.
(S)((R) or (S)(R))	00:00.00	Display stopwatch (and reset).
(S)	00:00.01	Start stopwatch.
(×)(M)(=)	.0372132	Odometer readings (miles).
(T)		Inhibit display (stopwatch still running).
		Alarm sounds.
(S)(S)	07:15.12	Stop stopwatch.

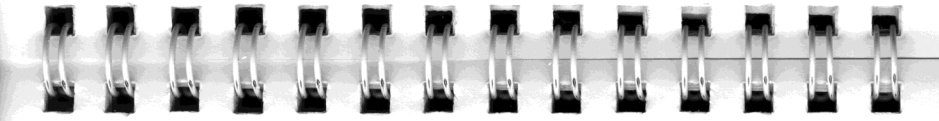
The second instruction on your rally sheet reads: "Turn left, and travel 4.3 kilometers in 6 minutes, 37 seconds." To calculate your speed for the second leg:

Press	Display
(C)(C)	0.

Press	Display	
4 • 3 ÷	4.3	
1 • 6 0 9 3 4 4 ÷	2.671896	Kilometers converted to miles.
: 6 : 3 7 =	24.22877	Average speed (MPH).

TIME AND DISTANCE TO DESTINATION *(Dynamic Calculation).* Suppose you are in your airplane travelling at 140 miles per hour, and at 7:05 you fly over a landmark that is 45 miles from your destination. By using the calculator dynamically with the timer, you can obtain a continuous reading of the time and distance to your destination.

Press	Display	
C C	0.	
4 5 ÷ 1 4 0 =	.3214286	Decimal hours to destination.
▲ T	19:17.14	Converted to MM:SS.CC.
▲ S	19:17.14	Set timer.



S	19:17.13	Start timer.
× 1 4 0 =	44.51586	Miles to destination.

To view remaining time to destination,

Press	Display	
S	18:40.08	
=	43.17134	Return to continuous display of distance.

To determine the time of arrival:

Press	Display	
S + T =	7:24 38	Time of arrival.
S × 1 4 0 =	42.9345	Return to your distance reading.

The alarm will sound when you are over your checkpoint or destination (distance = 0). To stop the alarm, switch to another mode—i.e., press T.

METRIC/U.S. CONVERSIONS *(Calculator).* The following list provides keystrokes for the most common metric/U.S. conversions. The conversion factors given here are exact values or values accurate to seven places. For simplicity, you may choose to round off the conversion factor to three digits.

If you perform a specific conversion repeatedly, it may be convenient to store the constant value in M or to use the automatic constant feature.

Inches	× 2 . 5 4 =	Centimeters
Centimeters	÷ 2 . 5 4 =	Inches
Feet	× . 3 0 4 8 =	Meters
Meters	÷ . 3 0 4 8 =	Feet
Miles (statute)	× 1 . 6 0 9 3 4 4 =	Kilometers
Kilometers	÷ 1 . 6 0 9 3 4 4 =	Miles (statute)
Degrees F	− 3 2 ÷ 1 . 8 =	Degrees C
Degrees C	× 1 . 8 + 3 2 =	Degrees F

Ounces (mass)	× 2 8 . 3 4 9 5 2 =	Grams
Grams	÷ 2 8 . 3 4 9 5 2 =	Ounces (mass)
Pounds	× . 4 5 3 5 9 2 4 =	Kilograms
Kilograms	÷ . 4 5 3 5 9 2 4 =	Pounds
Ounces (fluid)	× 2 9 . 5 7 3 5 3 =	Milliliters or cc
Milliliters or cc	÷ 2 9 . 5 7 3 5 3 =	Ounces (fluid)
Quarts	× . 9 4 6 3 5 2 9 =	Liters
Liters	÷ . 9 4 6 3 5 2 9 =	Quarts
Gallons (U.S.)	× 3 . 7 8 5 4 1 2 =	Liters
Liters	÷ 3 . 7 8 5 4 1 2 =	Gallons (U.S.)

HAVING FUN. The next two applications show how your HP-01 can be entertaining, too.

Thunder and Lightning *(Stopwatch and Calculator).* Remember when you were a child and learned to count the seconds between streaks of lightning and claps of thunder? Since the speed of light is faster than the speed of sound, the count revealed how far away the lightning struck.

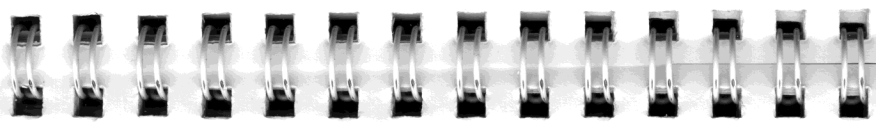
Now that you own an HP-01 with built-in stopwatch, you can pinpoint the distance exactly. Set the stopwatch to zero, and start it when lightning strikes. Stop it when you hear the thunder. Multiply the display reading by 770 (speed of sound in miles per hour), or 1240 (speed of sound in kilometers per hour).

Press	Display	
S(R or SR)	00:00.00	Display stopwatch (reset, or stop and reset if running).
S	00:00.01	Lightning strikes.
	00:00.02	
	⇩	
S	00:06.27	Thunder sounds.

To obtain the answer in miles:

×770= 1.341084 Miles.

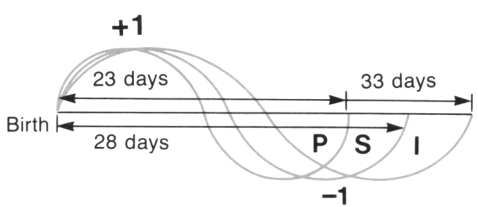
Or to obtain the answer in kilometers, multiply the time (00:06.27) by 1240:



×1240= 2.159667 Kilometers.

BIORHYTHMS *(Calendar and Calculator).* Ever wonder why some days nothing goes right? Check your biorhythms—it might be a critical day!

The biorhythm theory postulates that certain metabolic rhythms have a constant cycle time in the human body, starting from birth. The first is a 23-day cycle that correlates with physical vitality, endurance, and energy. The second cycle is 28 days and corresponds to sensitivity, intuition, and emotion. The third is a 33-day cognitive or intellectual cycle that relates to mental alertness and judgement.



Days when the cycle crosses the median line are called "critical days," especially for the physical and sensitivity cycles. To calculate your critical days:

1. Recall today's date, subtract your birthdate, and store the result in (M).
2. Divide the number of days in (M) by 23 (physical cycle).
3. Divide the number of days in (M) by 28 (sensitivity cycle).
4. Divide the number of days in (M) by 33 (intellectual cycle).

In steps 2, 3, and 4, look at the fractional part of each answer—i.e., disregard the integer digits to the left of the decimal point and use only the digits to the right. A fractional value of zero (not displayed) or between .47 up to and including .50 indicates a critical day for that cycle.

Example: Lucky Pierre, at the age of 21½, decides to seek his fortune. He was born on April 15, 1955, and decides to use his HP-01 to calculate his biorhythm cycles. He recalls the present date (October 15, 1976) and proceeds as follows:

Press	Display	
C C	0.	
D −	10-15-76	
4 / 1 5 / 5 5 ▲ M	7854.	
÷ 2 3 =	341.4783	Critical day (physical).
M ÷ 2 8 =	280.5	Critical day (sensitivity).
M ÷ 3 3 =	238.	Critical day (cognitive).

Lucky Pierre is not so lucky, after all—it's a triple critical day for him! (He decides to stay in bed and to seek his fortune tomorrow.)

Maintenance and Service

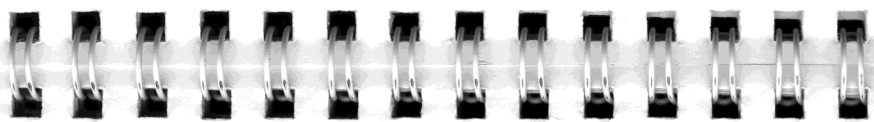
Your HP-01 comes equipped with the following items:

- Three batteries.
- One stylus (fitted in the clasp of the watchband).
- *HP-01 Owner's Guide.*
- *HP-01 Reference Guide.*
- Stylus pen.

Replacement items may be purchased from your nearest authorized dealer.

OPERATING CHARACTERISTICS AND SPECIFICATIONS. Your HP-01 is a durable precision instrument, the result of professional design and quality craftsmanship. Here are a few facts to bear this out:

Latest Technology: Your HP-01 uses six large scale integrated circuits, containing in all, the equivalent of 38,000 transistors.



Power Source: Two 1.5-volt watch cell batteries power the display, and a third 1.5-volt battery powers the internal circuitry.

Weight: Approximately 170 grams (6 ounces).

Time Accuracy: The HP-01 time function was set at the factory to an initial accuracy of within 30 seconds per year. Because of the effects of temperature variations, aging, shocks, and vibrations on its quartz-crystal time standard, the HP-01 time accuracy may vary.

Stopwatch Resolution: ±0.01 second.

Operating Temperature: 0° to 55°C (32° to 131°F). When worn on the wrist, the HP-01 battery operating temperature will remain relatively close to body temperature even though the ambient temperature may be far below freezing.

Storage Temperature: Without batteries: −40° to 75°C (−40° to 167°F).
With batteries: −40° to 55°C (−40° to 131°F).

Anti-magnetic: The HP-01 will operate in a magnetic field up to 60 gauss without adverse effect.

Shock Resistance: The HP-01 has been designed and tested to withstand shocks beyond those encountered in normal use with only minor changes in accuracy. Excessive or cumulative shocks may be cause for recalibration.

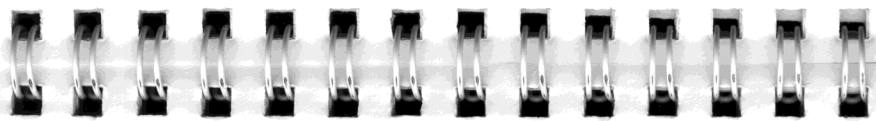
Water Protection: Although the HP-01 is not intended for underwater use, it has been designed and tested to withstand immersion in water at 10 meters (32.8 feet) for 5 minutes at 25°C provided the HP-01 case and window are intact.

BATTERY OPERATION/REPLACEMENT: Inside your HP-01 are three watch batteries. Two power the display, and the third powers the internal circuitry.

Battery life depends on battery capacity and on the extent of display use. Expected life of the circuit battery is 6 to 12 months. Expected life of the display batteries is 3 to 6 months.

As your display batteries wear down, the numbers on the display become dim. If you notice incomplete numbers or decreased intensity of illumination, it is time to change the two display batteries.

Your dealer will replace the batteries for you, or you may purchase an optional battery set with the necessary tool to replace them yourself. Replacement battery sets are available from



your dealer. Do *not* return the unit to an HP Customer Service Facility; if the HP-01 is returned for battery replacement, you will be charged a nominal fee regardless of whether or not your warranty is in effect.

CAUTION

Do not use hearing aid batteries. Use only Eveready or UCAR (Union Carbide) 357 batteries or equivalent. Also, do not attempt to recharge your HP-01 batteries.

Changing the two display batteries does not alter or destroy any information stored in your HP-01. The time setting, date setting, and any number stored in M are all still current and operable.

However, when you replace the circuit battery, *none* of the time, alarm, date, or memory data is retained. Set the functions that you need immediately after the circuit battery is changed.

It's also advisable to keep a written record of battery replacement dates.

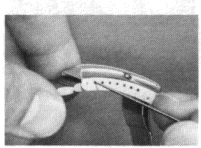
BATTERY REPLACEMENT REMINDER

Display batteries changed		Circuit battery changed	

ADJUSTING THE BAND. If your HP-01 fits too tightly, contact your nearest HP dealer. Links can be added to expand the band.

If your HP-01 fits too loosely, it can usually be corrected with a simple clasp adjustment. Go to your nearest HP dealer or any watch dealer for the adjustment; or you can tighten it yourself by following this procedure:

1. At the end where the band links are hinged to the buckle, unfasten the hinge pin by pressing it with a sharp pointed object (pin, knife point, file tip, etc.).

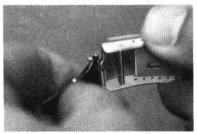


2. Move the pin along the buckle to the appropriate adjustment, and snap it into the pin holes on the side of the buckle.

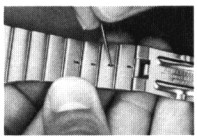
For most people, this simple clasp adjustment will eliminate the slack. However, if your HP-01 still fits loosely, you can remove a few links from the band. We advise letting your dealer fit you if link removal is necessary.

If you are not near a dealer, follow this procedure to remove the links yourself:

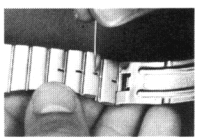
1. Unhook the band at the buckle clasp and lay the watchband flat (face down).

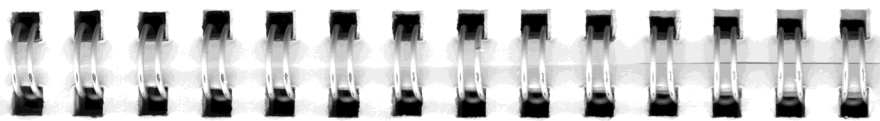


2. The removable links are the slotted links on either side of the clasp. In the center of each slot is a tiny connector pin. Insert a sharp pointed object (like a pin or the tip of a nail file) in the slot and push the pin away from the clasp.

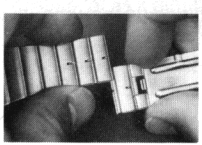


3. Gently slide the link slightly to one side. Remove the pointed tool, and slide the link off completely. Repeat steps 2 and 3 for the desired number of links.

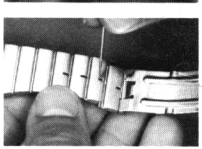




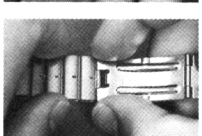
4. To reconnect the band, align the two links, and slide them halfway together.



5. Depress the connector pin carefully, and align the slot in the center position. When you remove the pointed tool, the connector pin will lock the link in place.



6. Make sure the links are connected securely by moving them back and forth. Reconnect the band at the clasp.



CLEANING. To clean the face or case of your HP-01, use either a damp cloth or a cotton tip applicator, lightly moistened with isopropyl alcohol (rubbing alcohol).

ENGRAVING. Engraving is most commonly done on the back of the case. Use quality engraving—either hand or pressure engraving—to personalize your HP-01. Do *NOT* use vibratory machine engraving as you are apt to damage the alarm mechanism.

If you choose to personalize your HP-01 by engraving, be aware that some parts are permanently attached to the back of the case. Repair of those parts may require completely replacing the case back with a new, *unengraved* case back.

SERIAL NUMBER. The serial number of your HP-01 is located on the back of the case. It is advisable to make note of your serial number, just in case you and your HP-01 accidentally become separated.

FULL ONE-YEAR WARRANTY. The HP-01 is warranted against defects in materials and workmanship for one (1) year from the date of delivery. During the warranty period, Hewlett-Packard will repair or, at its option, replace at no charge, components that prove to be defective, provided the HP-01 is returned to an authorized HP-01 dealer or the unit is returned, shipping prepaid, to Hewlett-Packard's Customer Service Facility. (Refer to Shipping Instructions.)

This warranty does not apply to batteries, display window, case, band or pen.

The warranty does not apply if the HP-01 has been damaged by accident or misuse, or as a result of service or modification by other than an authorized Hewlett-Packard Customer Service Facility. No other express warranty is given by Hewlett-Packard. **HEWLETT-PACKARD SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES.**

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

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

Battery Replacement Batteries should be replaced by an authorized HP-01 dealer or by use of the HP-01 Battery Set. If your HP-01 is returned to the Hewlett-Packard Customer Service Facility for battery replacement, you will be charged a fee regardless of whether or not your warranty is in effect.

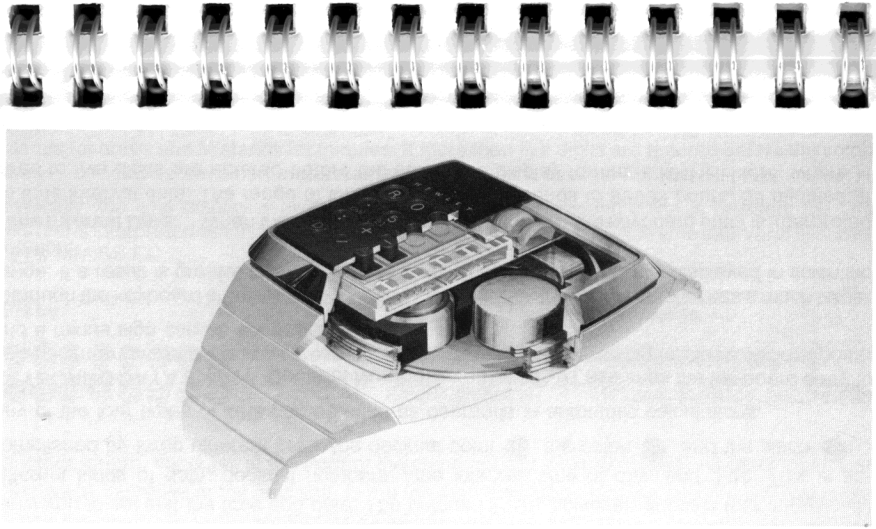
Out of Warranty. After the one-year warranty period, your HP-01 will be repaired for a moderate charge. All repair work performed beyond the warranty period is warranted for a 90-day period.

Warranty Information Toll Free Number
(800) 648-4711 (In Nevada, call collect 702-323-2704.)

Warranty Transfer. If you sell your HP-01 or give it as a gift, the warranty is transferable and remains in effect for the new owner until the original one-year expiration date. It is not necessary for the owner to notify Hewlett-Packard of the transfer.

Shipping Istructions. You should normally return the unit to an authorized HP-01 dealer. If that is not possible it is your responsibility to pay shipping charges to the Hewlett-Packard Customer Service Facility, whether the unit is under warranty or not. After warranty repairs are completed, the Customer Service Facility will return the unit postage prepaid. On non-warranty and out-of-warranty repairs, the unit is returned C.O.D. or charged as indicated on the included Service Card.

In all cases please fill out the Service Card included with your HP-01.



HP-01 Computing Time Instrument
(Cutaway View)

Operational Description

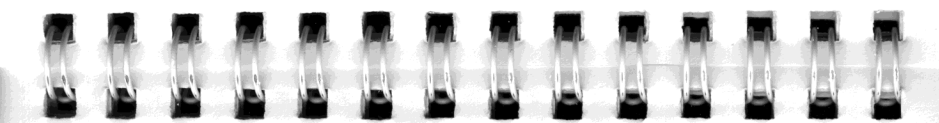
Most calculators with which you are familiar allow you to key in numbers only. Most watches allow you to set just the time and date. The unique HP-01, however, accepts four intrinsically different kinds of data: decimal numbers, time interval, time of day, and date. This is accomplished by three different keys: the decimal point ●, the colon :, and the slash /.

Any of the four types of data can be used as operands in arithmetic calculations.

KEYBOARD DATA ENTRY. Decimal Numbers. The HP-01 assumes the keyboard entry to be a decimal number unless you press a colon or a slash. Up to seven digits, plus a decimal point, and a minus sign can be entered.

Although the keyboard entry range is .0000001 to 9999999, the HP-01 display has a much larger range. If a result is greater than 10^7 or less than 10^{-4}, it is automatically displayed in scientific notation.

Time Interval Data. When the HP-01 encounters a colon :, the keyboard entry is interpreted as time interval data. The range of time entry is 0.01 seconds to 99999 hours, 59 minutes. If three to five digits are entered before the colon, the display format is HHHHH:MM, where H



stands for hours and M stands for minutes. If more than five digits are entered before the colon, the HP-01 ignores the colon and assumes the entry is a decimal number.

Typically, the time display is divided into three parts. If a second *colon* is pressed, the time interval is interpreted as HH:MM:SS. If the *decimal point* is pressed, the time interval is assumed to be MM:SS.CC.

Press	Display	Comments
10:10:10	10:10:10	Hours, minutes, seconds.
10:10●10	10:10.10	Minutes, seconds, hundredths.

In either format, the digits to the *right* of the colon occupy a two-digit field. As other digits take their place, numbers in the field shift to the left then disappear, leaving only the last two digits. Hence, the keystroke sequence :54321 produces a displayed result of 00:21. That's why you can correct time entry errors without clearing and re-entering the entire number again.

Any time field in which no entry is made is assumed to be zero.

Press	Display
7 : : 4 5	07:00:45

Time of Day Data. Time of day data is a special case of time interval data in which the format changes when the AM or PM function is used or the time interval is stored in T or A. All digits shift one position to the left. A blank in the last-digit position indicates AM; a decimal point indicates PM (in 12-hour mode). Also, the second colon blanks out.

Press	Display	Comments
1 2 : 3 0 : 4 5	12:30:45	Time interval.
P ▲ T	12:30 45.	Time of day.

Date Data. A slash informs the HP-01 that the keyboard entry is a date. Dates are entered as MM/DD/YY or DD/MM/YY, where MM stands for month, DD for day, and YY for the last two digits of the year. If you key in more than two digits before the slash, the HP-01 interprets the entry as a decimal number or a time interval and ignores the slash.

You can enter any date from January 1, 1900 to December 31, 2099. When you press ▲ D, the date entry is loaded into a calendar register.

DATA ENTRY AND DISPLAY SUMMARY

	Digit Position								
	1	2	3	4	5	6	7	8	9
Decimal Entry Data									
Minimum Non-Zero		.	0	0	0	0	0	0	1
Maximum	9	9	9	9	9	9	9	.	
Scientific Notation Display Data									
Minimum	1	.					–	9	9
Maximum	9	.	9	9	9			9	9

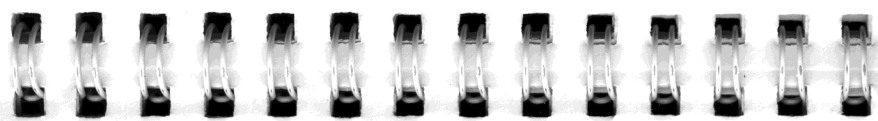
Digit Position								
1	2	3	4	5	6	7	8	9

Time Interval Entry and Display Data

Minimum Entry	0 0 : 0 0 . 0 1	H = hours
Maximum Entry	9 9 9 9 9 : 5 9	M = minutes
Display ⩾ 100 Hours	H H H H H : M M	S = seconds
Display 1 – <100 Hours	H H : M M : S S	C = hundredths of seconds
Display <1 Hour	M M : S S . C C	

Time of Day Entry and Display Data

Minimum Entry	0 0 : 0 0 : 0 0	12- or 24-hour format.
Maximum Entry	2 3 : 5 9 : 5 9	



Display	H H : M M S S	AM time.
	H H : M M S S .	PM time.
	H H : M M S S –	Alarm set, AM time.

Date Display Data

Display	M M – D D – Y Y	M = month
	D D – M M – Y Y	D = day
		Y = year
	M M – D D – Y Y .	Twenty-first century.

THE REGISTERS

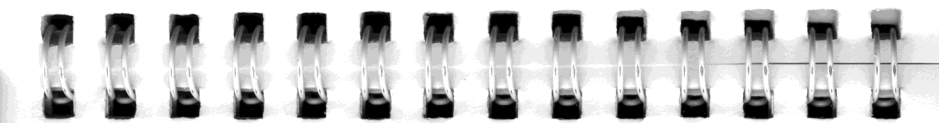
Time Register. The quartz crystal and electronic circuitry inside your HP-01 update the contents of the time register every second in a 24-hour mode. So, if you enter or display the time of day in the 12-hour mode, the HP-01 instantly converts the internal time to or from the 12-hour mode. The largest allowable time of day is 23:59:59.

Date Register. Each day in the 200-year calendar is represented internally by a number:

Date	Day Number
January 1, 1900	0
January 2, 1900	1
⇩	⇩
December 31, 2099	73048

When you press ▲ D, the HP-01 changes the displayed date entry to the appropriate internal day number. Everytime the time register rolls over at midnight, the internal day number increments by one. When you press D to view the current date, the HP-01 converts the day number back to MM-DD-YY or DD-MM-YY format for the display.

Alarm Register. The alarm accepts any time in a 24-hour day. When you press ▲ A, the displayed time is loaded into the alarm register and the alarm is automatically armed. When the alarm register matches the time register, the alarm sounds and is automatically disarmed.



Timer/Stopwatch Register. The timer and stopwatch functions are handled in a register that holds hours, minutes, seconds, and hundredths of seconds (HH:MM:SS.CC). Because there is not room to display all eight digits, you see only three out of the four time fields. If the time is greater than or equal to an hour, HH:MM:SS is displayed. If the time is less than an hour, the last three fields are displayed as MM:SS.CC.

The time interval loaded into the register determines the function. If zero is in the register, your HP-01 is set to count up or increase (stopwatch). A time other than zero sets the register to decrease or count down (timer).

S starts and stops the timer/stopwatch. When the timer/stopwatch is running, the contents of the register are updated every 0.01 seconds. The largest timer time interval allowed is 99:59:59. The stopwatch counts up to 23:59:59.99, then rolls over to zero.

Memory Register. The memory will accept any type of data and retain it until it is replaced with new data.

THE CALCULATOR. Any arithmetic calculation consists of two numbers (called *operands)* and an arithmetic operator (+, −, ×, or ÷). On paper, you would write 2 × 3 as:

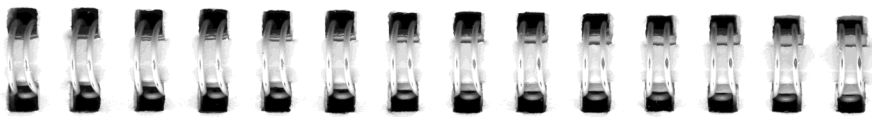
$$2 \times 3 =$$

This calculation is accomplished by using three registers in your HP-01 calculator:

1. A register that holds the first operand (we'll call this the X-register).
2. A register that holds the operator (the F-register).
3. A register that holds the second operand (the Y-register).

Now, let's look at how the HP-01 performs this calculation. Begin by pressing C twice to clear the calculator.

Press	Registers			Display
	X	F	Y	
C C	0		0	0.



The first entry goes into the X-register. This can be a number from the keyboard or any number from T, A, D, M or S. For simplicity, we'll solve the expression 2 × 3:

Press	Registers			Display
	X	F	Y	
2	2		0	2.

When an operator key is pressed, the first entry is terminated, the operator is stored in the F-register, and the number in the X-register is copied into the Y-register.

Press	Registers			Display
	X	F	Y	
×	2	×	2	2.

At this point, if you press C, the calculator would return to its initial state—all three registers would be cleared. Also, at this point, you can press another operator and it will overwrite the × in the F-register.

Press	Registers			Display
	X	F	Y	
+	2	+	2	2.

Thus, if you pressed the wrong operator key, you don't have to clear and start over again. Instead, simply key in the correct operator.

Press	Registers			Display
	X	F	Y	
×	2	x	2	2.

Look at the contents of these registers. This should give you some insight as to how the automatic doubling and automatic squaring features of the HP-01 work. If you press =, the squaring operation would be performed. If the arithmetic operator were +, pressing = would double the operand.

Key in the second operand, 3. This entry goes into the Y-register and overwrites the X-operand placed there.

Press	Registers			Display
	X	F	Y	
3	2	×	3	3.

If you press C at this point, the Y-register would be cleared. Your HP-01 would return to the same state it was immediately after the operator key was pressed; you could change the operator or key in another operand.

Having keyed in 2 × 3, press =. The equals operation computes the result X(F)Y and stores the answer in the X-register. The contents of the F- and Y-registers remain the same.

Press	Registers			Display
	X	F	Y	
=	6	×	3	6.

With the result in the X-register and both the operator and second operand left intact, your HP-01 is set up efficiently for the next operation whether it is a chain calculation, an automatic constant, exponentiation, or a new problem.

Earlier in this handbook, you used the exchange function in a few chain calculations. The ⇄ function switches the operands in the X- and Y-registers. For example, if you meant to subtract 2 from 3 but accidentally keyed in 2-3:

Press	Registers			Display
	X	F	Y	
C C	0		0	0.
	X	F	Y	
2 − 3	2	−	3	3.
	X	F	Y	
▲ ⇄	3	−	2	2.
	X	F	Y	
=	1	−	2	1.

So far, we've used just decimal numbers in calculator examples, but you can also use time interval data, time of day, and dates for operands. The following table summarizes how the four different types of data interact.

ARITHMETIC OPERATION RESULTS

First Operand and Operator	Second Operand			
	d	**t**	**T**	**D**
d +	d	t	T	D
d −	d	t	t	E
d × or ÷	d	d	E	E
t +	t	t	T	E
t −	t	t	t	E
t × or ÷	d	d	E	E
T +	T	T	E	E
T −	T	T	t	E
T × or ÷	E	E	E	E
D +	D	E	E	E
D −	D	E	E	d
D × or ÷	E	E	E	E

d = decimal number
t = time interval
T = time of day
D = date
E = error

There are some special operations not covered here—e.g., dynamic calculations, day of the week, etc.—but they too are only mathematical manipulations of the four types of data.

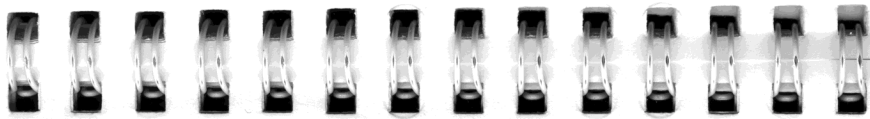
Given an understanding of your HP-01, you can appreciate the thoughtful design and engineering expertise that has produced this interactive, multifunction capability in a compact 6-ounce package.

Appendix C

Shortwave Time Signal Broadcasts

The following shortwave stations regularly broadcast time signal checks. An asterisk (*) denotes authorities that use Hewlett-Packard atomic clocks for their time and frequency standards. Under "TYPE," A denotes an audible tone pulse, and V denotes voice announcements of the time.

STATION	LOCATION	FREQUENCY	TYPE
WWV*	Fort Collins, Colorado, USA	2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz	A, V
WWVH*	Kauai, Hawaii, USA	2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	A, V
BSF*	Taiwan, Republic of China	5 MHz	A, V
CHU*	Ottawa, Canada	3.33 MHz, 7.335 MHz, 14.67 MHz	A, V



DAM*	Elmshorn, West Germany	4.625 MHz, 6.4755 MHz, 8.6385 MHz, 12.7635 MHz, 16.9804 MHz	A
DAN*	Osterloog, West Germany	2.614 MHz	A
DAO*	Kiel, West Germany	2.775 MHz	A
DCF77*	Mainflingen, West Germany	77.5 kHz	A
FFH	Chavannes, France	2.5 MHz	A
FTH42* FTK77* FTN87*	Pontoise, France	7.428 MHz, 10.775 MHz, 13.873 MHz	A
IAM	Rome, Italy	5 MHz	A
IBF*	Torino, Italy	5 MHz	A, V
JJY*	Koganei, Japan	2.5 MHz, 5 MHz, 10 MHz 15 MHz	A

STATION	LOCATION	FREQUENCY	TYPE
L0L1	Buenos Aires, Argentina	5 MHz, 10 MHz, 15 MHz	A, V
MSF*	Rugby, United Kingdom	60 kHz, 2.5 MHz, 5 MHz, 10 MHz	A
OLB5*	Podebrady, Czechoslovakia	3.17 MHz	A
OMA*	Liblice, Czechoslovakia	50 kHz, 2.5 MHz	A
PPE, PPR*	Rio de Janeiro, Brazil	8.72 MHz, 435 kHz, 8.634 MHz, 13.105 MHz, 17.1944 MHz	A
VNG	Lyndhurst, Australia	4.5 MHz, 7.5 MHz, 12 MHz	A, V
YVTO	Caracas, Venezuela	6.1 MHz	A, V
ZUO*	Olifantsfontein, South Africa	2.5 MHz, 5 MHz, 100 MHz	A