HP41-TIDES ROM Manual

Overview

This module contains several programs to calculate the water level WL in a port with the harmonic constants given by the NOAA at the
URL: http://tidesandcurrents.noaa.gov/stations.html?type=Harmonic+Constituents

- The Ports Database gives you the harmonic constants of 27 US ports
- The TIME module is required. However, you could also COPY the programs "WL37" or "WL37+" and use "J0" to get the number of days since 2000/01/01.
- For instance COPY "WL37" and replace lines 12-13-14 (1.012 DDAYS -) by XEQ "J0" + Same remarks with "WL37+" , lines 31-32-33. In this case key in the dates in YMD format.

WARNINGS:

These modules were carefully put together, but do not take any risk !

Always check your results at official sites: http://co-ops.nos.noaa.gov/
or http://www.shom.fr/

The water levels are expressed in meters, the phases in degrees and the time scale is UT = GMT

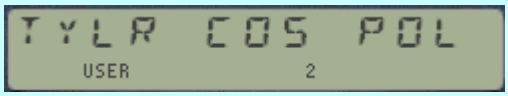
But if you store the amplitudes in feet and if the phases are referred to your local time, WL37 & WL37+ will work as well !

A purely harmonic method is used: WL is computed as a sum of sinusoidal functions.
Two main programs may be used:

- "**WL37**" which is entirely a "focal" program
- "**WL37+**" which calls an M-Code routine depending on the option chosen:

@WL1 if SF 01 / CF 02 / CF 03 which employs the built-in COS function
@WL2 if CF 01 / SF 02 / CF 03 where the cosine function is approximated by a min-max polynomial of degree 4
@WL3 if CF 01 / CF 02 / SF 03 where cos(x) is approximated by a truncated Taylor expansion of degree 8

In fact, your HP-41 presents the choices in alpha so you don't have to worry about the flags setting.



"**WL37+**" with "POL" (i.e. using **@WL2)** is the "fastest" routine, even if not the more accurate

XROM	Function	Desciption
10,00	-TIDES 1B	*Section Header*
10,01	@WL1	MCode1 SF 01 -> buil-in COS function
10,02	@WL2	MCode2 CF 01 SF 02 -> Deg4 Polynomial Approx.
10,03	@WL3	MCode3 CF 01 CF 02 SF 03 -> Taylor Approximation
10,04	"LOADHC"	Loads Harmonic Constants missing in the ports database
10,05	"P3"	Solves a cubic equation (called by "TIDE5")
10,06	"TIDE5"	Find a high (or low) tide from 5 tabular values
10,07	"TIDE5+"	Find a high (or low) tide from a date and an initial time
10,08	"TSUB"	A point in "WL37+" where "TIDE5+" calls "WL37+"
10,09	"VREG"	Visualizes the contents of a block of registers
10,10	"WL="	Displays the water level
10,11	"WL37"	Focal program that computes the water level
10,12	"WL37+"	Focal program that calls M-Code routines to get WL
10,13	"WLM"	Focal program to get the water level in Miami
10,14	AINT	Stores an integer into alpha (M-code)
10,15	LEFT	2 M-Code Routines to make
10,16	GOOSE	the flying goose flying from the right to the left
10,17	"PHASE"	Calculates the date of a phase of the Moon.
10,18	"DT"	Number of days since 2000/01/01 -> Date (YMD)
10,19	"J0"	Date (YMD) -> Nb of days since 2000/01/01 + DOW
11,00	-PORTS 1A	*Section Header: Harmonic Constants*
11,01	ABRDEEN	Aberdeen WA 9441187
11,02	ANCHRPT	Anchor Point, Cook Inlet AK 9455606
11,03	BARHBR	Bar Harbor ME 8413320
11,04	BOSTON	Boston MA 8443970
11,05	CPEMAY	Cape May NJ 8536110
11,06	DELCTY	Delaware City DE 8551762
11,07	HONOLU	Honolulu Hi 1612340
11,08	KETCHKN	Ketchikan AK 9450460
11,09	KODIAK	Kodiak Island AK 9457292
11,10	LACA	Los Angeles CA 9410660
11,11	MIAMI	Miami Beach FL 8723170
11,12	MILBRDG	Milbridge ME 8412581
11,13	MNTREY	Monterey CA 9413450
11,14	NASSAU	Nassauville , Nassau River East , FL 8720098
11,15	NEWHVN	New Haven CT 8465705
11,16	NYLNGB	New-York, Long Beach, NY 8516663
11,17	NYNORPT	New-York, Norton Point, Hook Creek, NY 8516891
11,18	PHILLY	Philadelphia PA 8545240
11,19	PLYMTH	Plymouth Harbor MA 8446493
11,20	PRTLND	Portland ME 8418150
11,21	SANDPT	Sand Point AK 9459450
11,22	SANFRAN	San Francisco CA 9414290
11,23	SEATTLE	Seattle WA 9447130
11,24	SOUTHB	South Beach OR 9435380
11,25	VANCVR	Vancouver WA 9440083
11,26	WSHTDC	Washington D.C. 8594900
11,27	YAKUTAT	Yakutat, Yakutat Bay, AK 9453220

Barometric corrections

The computed water levels assume an atmospheric pressure = 1013 millibars. If needed, take also into account the barometric corrections below:

Atmospheric Pressure	963hPa	973hPa	983hPa	993hPa	1003hPa	1013hPa	1023hPa	1033hPa	1043hPa
Corrections	+50cm	+40cm	+30cm	+20cm	+10cm	0	-10cm	-20cm	-30cm

Important Notes:

The M-Code routines in the ports database store the 75 harmonic constants given by the NOAA in registers R00 thru R74.

They can be used directly by "**WL37+**", but if you prefer "**WL37**" (the focal program) you should key in: **0.**008075 REGMOVE to store these constants in R08 thru R82 before executing "WL37"

The names of different ports are sometimes almost identical, be sure to choose the correct one !

-Check at the URL http://tidesandcurrents.noaa.gov/stations.html?type=Harmonic+Constituents

Storing an Integer into Alpha

-The M-code function AINT actually *appends* the integer part of X to the alpha "register"

Visualizing a Block of Registers

-To display the contents of registers Rbbb thru Reee,

key in bbb**.**eeeii XEQ "VREG" (if ii = 01 , you can use ii = 00)

-If you choose "Y": 0.074 XEQ "VREG" will display the 75 constants stored in the paragraph above
or if you chose "N": 8.082 XEQ "VREG" will display the same constants again.

Storing the Harmonic Constants

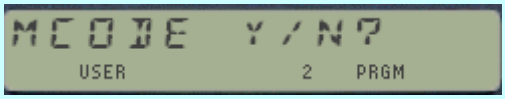
-The ports database contains the harmonic constants of 27 US ports
-There are of course many more ports and you can use "LOADHC" to store your own constants

-For example *Bridgeport CT 8467150*
-You can find the harmonic constants from the NOAA:

1.708 Mean Sea Level
0.604 Mean Lower-Low Water whence Z0 = MSL - MLLW = 1.104 m

#	WAVE	Amplitude	Phase	#	WAVE	Amplitude	Phase
0	Z0	1.104	/	19	J1	0.006	237.0
1	M2	0.991	109.6	20	MM	0	0
2	S2	0.157	135.9	21	SSA	0.022	61.2
3	N2	0.200	87.6	22	SA	0.063	132.0
4	K1	0.097	191.6	23	MSF	0	0
5	M4	0.012	127.4	24	MF	0	0
6	O1	0.064	219.5	25	RHO	0.005	258.1
7	M6	0.013	353.9	26	Q1	0.018	205.7
8	MK3	0.007	198.8	27	T2	0.016	106.4
9	S4	0	0	28	R2	0.001	136.9
10	MN4	0.007	97.2	29	2Q1	0.004	238.8
11	NU2	0.045	89.8	30	P1	0.030	204.1
12	S6	0	0	31	2SM2	0	0
13	MU2	0	0	32	M3	0.004	200.1
14	2N2	0.023	65.6	33	L2	0.049	134.1
15	OO1	0.005	228.7	34	2MK3	0.005	203.7
16	LAM2	0.021	131.1	35	K2	0.046	134.7
17	S1	0.009	175.5	36	M8	0	0
18	M1	0.007	264.4	37	MS4	0	0

Therefore, XEQ "LOADHC"	>>>	Z0 = ?
1.104 , R/S		A1^V1=?
0.991 , ENTER , 109.6 R/S		A2^V2=?
0.157 , ENTER , 135.9 R/S		A3^V3=?
... and so on		A37^V37=?
0 ENTER R/S		MCODE Y/N?



Press "Y" if you want an M-code version or "N" otherwise; the HP-41 displays "READY". Now, the constants are in R00 thru R74 if you have chosen "Y" (execute then "WL37+") or in R08 thru R82 if you have pressed "N" (execute then "WL37")

Cubic Equations

-This routine is called by "TIDE5"
-"P3" finds the 3 roots of $a.x^3+b.x^2+c.x+d$ by the Cardan's (or Tartaglia's) formulae: (with a#0)
-First, the term in x^2 is removed by a change of argument, leading to $x^3+p.x+q = 0$
-Then, $x = u+v$ with $u.v = -p/3$ leads to a quadratic equation in u^3

STACK	INPUTS	OUTPUTS
T	a # 0	/
Z	b	z
Y	c	y
X	d	x

-If CF 04 the 3 solutions are x ; y ; z
-If SF 04 ---------- x ; y+i.z ; y-i.z

Example: Solve $2.x^3 - 5.x^2 - 7.x + 1 = 0$ and $2.x^3 - 5.x^2 + 7.x + 1 = 0$

2 ENTER^
-5 ENTER^
-7 ENTER^
1 XEQ "P3" >>>> 3.467727065 RDN 0.131206041 RDN -1.098933107
which are the 3 real solutions since flag F04 is clear.

2 ENTER^
-5 ENTER^
7 ENTER^
1 R/S >>>> -0.130131632 RDN 1.315065816 RDN 1.453569820

-Flag F04 is set , therefore the 3 solutions are:

-0.130131633 ; 1.315065816 - 1.453569820.i ; 1.315065816 + 1.453569820.i

Water-Level in Miami *(Miami Beach FL 8723170)*

-"WLM" is just one of the focal programs listed in Tides(II)
-Several terms are neglected to increase speed and save bytes

STACK	INPUTS	OUTPUTS
Y	date	/
X	time UT (hh.mnss)	water level (m)

Example: Water level in Miami Beach on 2015/08/08 at 7h41m UT (in DMY format)

8.082015 ENTER^
7.41 XEQ "WLM" >>>> h = 0.772 m ---Execution time = 24s---

Note:

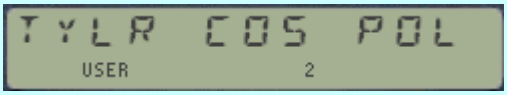
-Other focal programs may be found at Tides(II)
-It's preferable to store the harmonic constants and use a general program for all ports.
-Ángel Martin developed a method to load the constants in the proper registers without using too much room: they are in the ports database !

Water-Level (w/ M-Code routines)

-Find the water level in Ketchikan on 2015/08/21 at 23h41m UT (in DMY format)

1.- First load the harmonic constants from the ports database: XEQ "KETCHKN" they are in the proper registers

2.- XEQ "WL37+" >>>> DATE=?
21.082015 R/S TIME=? or 8.212015 if you are in MDY format
23.41 R/S TYLR COS POL The HP-41 gives you 3 choices:



- Press A in user mode (or XEQ A) if you choose the truncated Taylor series
- Press C in user mode (or XEQ C) if you prefer the built-in COS function
- Press E in user mode (or XEQ E) for the min-max polynomial of degree 4 (accurate enough and faster)

-The 1st choice returns WL=3.482 in 37 seconds
-The 2nd one gives WL=3.482 in 56 seconds (all the WL expressed in meters)
-The 3rd one yields WL=3.484 in 26 seconds

Notes:

-If the constants are stored in R08 thru R82, simply key in 8.000075 REGMOVE before executing "WL37+"

-You can also set flags F01-F02-F03 according to your choice
and key in the date ENTER^ time and XEQ "TSUB" (LBL "TSUB" = line 26 of "WL37+")

-For example CF 01 SF 02

21.082015 ENTER^
23.41 XEQ "TSUB" >>>> WL=3.484

Water-Level (Focal Program)

-"WL37" takes the date & time in registers Y & X and returns the water level in X-register
-The harmonic constants must be stored in R08 thru R82

STACK	INPUTS	OUTPUTS
Y	date	/
X	time UT (hh.mnss)	water level (m)

Example1:

Assuming you stored the harmonic constants of Bridgeport with "LOADHC" and you chose N at the end
-Find tater level in Bridgeport on 2015/07/24 at 7h41m UT (in DMY format)

24.072015 ENTER^
7.41 XEQ "WL37" >>>> h = 1.487 m ---Execution time = 72s---

Note: If the constants are stored in R00 thru R74, simply key in 0.008075 REGMOVE before executing "WL37"

Example2: Find the water level in Ketchikan on 2015/08/21 at 23h41m UT (in DMY format)

1. First load the harmonic constants from the ports database: XEQ "KETCHKN"
2. Since these constants must be in R08 thru R82 for the focal program "WL37", simply key in 0.008075 REGMOVE
3. Then we are ready:

21.082015 ENTER^
23.41 XEQ "WL37" >>>> h = 3.482 m ---Execution time = 72s---

Water-Level in Miami *(Miami Beach FL 8723170)*

-"WLM" is just one of the focal programs listed in Tides(II)
-Several terms are neglected to increase speed and save bytes

STACK	INPUTS	OUTPUTS
Y	date	/
X	time UT (hh.mnss)	water level (m)

Example: Water level in Miami Beach on 2015/08/08 at 7h41m UT (in DMY format)

8.082015 ENTER^
7.41 XEQ "WLM" >>>> h = 0.772 m ---Execution time = 24s---

Notes:

-Other focal programs may be found at Tides(II)
-It's preferable to store the harmonic constants and use a general program for all ports.
-Ángel Martin developed a method to load the constants in the proper registers without using too much room: they are in the ports database !

High Tide / Low Tide

"TIDE5" takes 5 water-levels in registers R83-R84-R85-R86-R87 at intervals of 1 hour
and returns the instant of a high tide (or low tide) and the corresponding water level (maximum or minimum)

STACK	INPUT	OUTPUT
Y	/	Water Level
X	3rd Time	hh.mnss

Where hh.mnss is the instant of high-tide or low-tide

Example: Ketchikan on 2015/10/24

-Let's compute the water levels at 0h 1h ..... 23h (UT)

-XEQ "KETCHKN" 0.008075 REGMOVE "**WL37**" gives

Time(UT)	0h	1h	2h	3h	4h	5h
WL (m)	0.7971	0.9656	1.5596	2.4228	3.3334	4.0588
Time(UT)	6h	7h	8h	9h	10h	11h
WL (m)	4.4079	4.2760	3.6739	2.7337	1.6832	0.7888
Time(UT)	12h	13h	14h	15h	16h	17h
WL (m)	0.2824	0.2970	0.8332	1.7647	2.8743	3.9064
Time(UT)	18h	19h	20h	21h	22h	23h
WL (m)	4.6201	4.8393	4.4957	3.6560	2.5194	1.3746

3.3334 STO 83
4.0588 STO 84
4.4079 STO 85
4.2760 STO 86
3.6739 STO 87

Then:

6 XEQ "TIDE5" >>>> 6.1407 X<>Y 4.4216
So, there is a High Tide at 6h14m and the water level = 4.422 m at this instant

Likewise, you will find a LowTide at 12h28m , WL = 0.221 m
and another High Tide at 18h54m , WL=4.843 m

ALTERNATIVELY you can also use "**TIDE5+**" , which *will calculate the five water levels* automatically:

```
-XEQ "KETCHKN"
  XEQ "TIDE5+"  >>>> DATE=?
    24.102015     R/S    TIME1=?     asks for the first time  ( 4h in our example )
    4             R/S    WL=4.4227
                  X<>Y   6.1415
```

So, there is a High Tide at 6h14m and the water level = 4.423 m at this instant

Notes:

- There is a small discrepancy according to the version that is used ("WL37" or "WL37+" with the flags F01-F02-F03)
  but the differences are negligible.
- -It is preferable to choose the 5 water-levels near a High Tide or Low Tide, otherwise, "TIDE5" and "TIDE5+" could give meaningless results.

Phases of the Moon

"PHASE" calculates the date of a phase of the Moon near a given date

STACK	INPUTS	OUTPUTS
Z	/	HH.MNSS
Y	/	YYYY.MNDD
X	yyyy.mndd	Phase

where yyyy.mndd is an approximate date

Phase = 0 for a New Moon
Phase = 1 for a First Quarter
Phase = 2 for a Full Moon
Phase = 3 for a Last Quarter

YYYY.MNDD & HH.MNSS are the date & time (in Terrestrial Time) of the Phase

Example:

2015.1016	XEQ "PHASE" >>>>	1.0000
	RDN	2015.1020
	RDN	20.3225

-So, there is a First Quarter on 2015/10/20 at 20h32mn TT

-If you seek a Full Moon, execute PHASE again after adding 7 days to the previous result:

2015.1027	R/S >>>>	2.0000
	RDN	2015.1027
	RDN	12.0758

-So, there is a Full Moon on 2015/10/27 at 12h08mn TT

Notes:

- All results are expressed in Terrestrial Time.
- "PHASE" calls "J0" & "DT" below.
- Dates are expressed in Gregorian Calendar since 1582/10/15 and in Julian Calendar before 1582/10/15
- The precision is about 5 minutes near 2000, perhaps about 15 minutes in 3000 B.C.

Example:

-3101.0210 XEQ "PHASE" returns:

	0	A New Moon occurred	
RDN	-3101.0217	on -3101/02/17	*Julian Calendar* (-3101 = 3102 B.C.)
RDN	22.5512	at 22h55m TT	

Date -> Number of Days since 2000/01/01

-"J0" computes the number of days between 2000/01/01 0h and a date YYYY.MNDDdd
-It also returns in T-register the day of the week.

STACK	INPUTS	OUTPUTS
T	/	dow
Z	Z	Z
Y	Y	Y
X	YYYY.MNDDdd	N
L	/	YYYY.MNDDdd

(dow = day of week = 0 for Sunday, 1 for Monday, ... , 6 for Saturday)

-N= the number of days between a date YYYY.MMDDdd and 2000/01/01 at 0h = the Julian Day number minus 2451544.5

Examples:

April 4th 2134 at 6h AM 2134.040425 XEQ "J0" >>> N = 49036.25 RDN RDN dow = 0 = Sunday

1234.0428 RTN R/S >>> N = -279651 RDN RDN dow = 5 = Friday
-4123.0707 RTN R/S >>> N = -2236225 RDN RDN dow = 1 = Monday

Notes:

-Registers Y & Z are saved
-The Gregorian calendar reform is taken into account: The day following 1582/10/04 (Julian date) is 1582/10/15 (Gregorian date)
-"J0" (and "DT") are valid at least since 4713 B.C. up to ... the next calendar reform!

Number of days since 2000/01/01 -> Date

"DT" performs the reverse operation.

STACK	INPUTS	OUTPUTS
Z	Z	Z
Y	Y	Y
X	N	YYYY.MNDDdd
L	/	N

Examples:

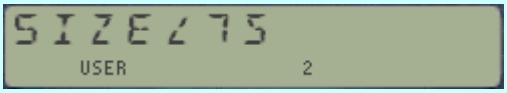
N = 49036.25 XEQ "DT" >>> 2134.040425
N = -279651 XEQ "DT" >>> 1234.0428
N = -2236225 XEQ "DT" >>> -4123.0707

HP41-US PORTS Examples.

Aberdeen WA 9441187

Example: Water level in Aberdeen on 2015/10/24 at 6h41 UT

XEQ "ABRDEEN" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=2.656

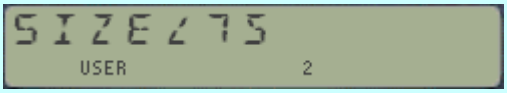
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=2.656

Anchor Point, Cook Inlet AK 9455606

Example: Water level in Anchor Point on 2015/10/24 at 6h41 UT

XEQ "ANCHRPT" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

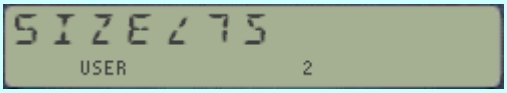
if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL= 4.259

Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL= 4.259

Bar Harbor ME 8413320

Example: Water level in Bar Harbor on 2015/10/24 at 6h41 UT
XEQ "BARHBR" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.011

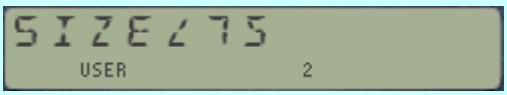
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.011

Boston MA 8443970

Example: Water level in Boston on 2015/10/24 at 6h41 UT

XEQ "BOSTON" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL= -0.086

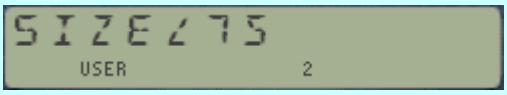
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL= -0.086

Cape May NJ 8536110

Example: Water level in Cape May on 2015/10/24 at 6h41 UT

XEQ "CPEMAY" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.683

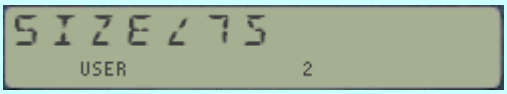
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.683

Delaware City DE 8551762

Example: Water level in Deleware City on 2015/10/24 at 6h41 UT

XEQ "DELCTY" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.199

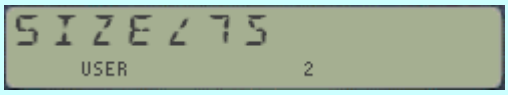
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.199

Honolulu_Hi_1612340

Example: Water level in Honolulu on 2015/10/24 at 6h41 UT

XEQ "HONOLU" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.043

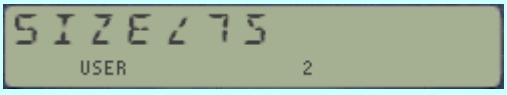
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.043

Ketchikan_AK_9450460

Example: Water level in Ketchikan on 2015/10/24 at 6h41 UT

XEQ "KETCHKN" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=4.373

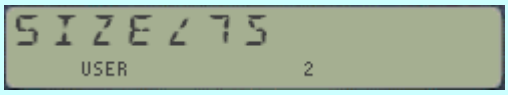
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=4.373

Kodiak Island AK 9457292

Example: Water level in Kodiak Island on 2015/10/24 at 6h41 UT

XEQ "KODIAK" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=2.314

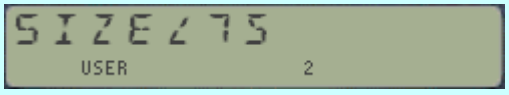
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL= 2.314

Los Angeles CA 9410660

Example: Water level in Los Angeles on 2015/10/24 at 6h41 UT

XEQ "LACA" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.278

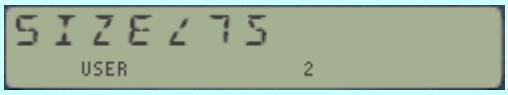
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.278

Miami Beach FL 8723170

Example: Water level in Miami Beach on 2015/10/24 at 6h41 UT

XEQ "MIAMI" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.554

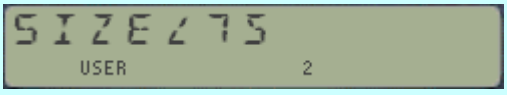
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.554

Milbridge ME 8412581

Example: Water level in Milbridge on 2015/10/24 at 6h41 UT

XEQ "MILBRDG" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.043

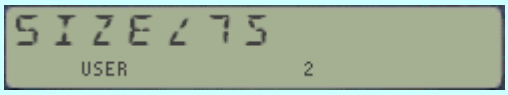
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.043

Monterey CA 9413450

Example: Water level in Monterey on 2015/10/24 at 6h41 UT

XEQ "MNTREY" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.586

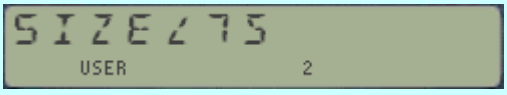
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.586

Nassauville , Nassau River East , FL 8720098

Example: Water level in Nassau on 2015/10/24 at 6h41 UT

XEQ "NASSAU" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.396

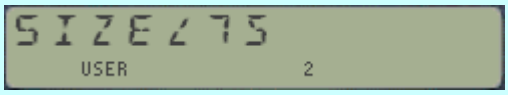
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.396

New Haven CT 8465705

Example: Water level in New Haven on 2015/10/24 at 6h41 UT

XEQ "NEWHVN" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL= -0.047

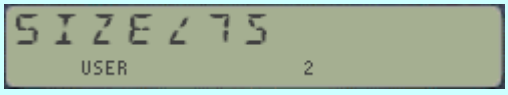
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL= -0.047

New-York, Long Beach, NY 8516663

Example: Water level in New-York Long Beach on 2015/10/24 at 6h41 UT

XEQ "NYLNGB" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.847

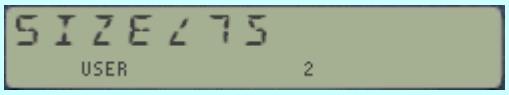
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.847

New-York, Norton Point, Hook Creek, NY 8516891

Example: Water level in New-York Norton Point on 2015/10/24 at 6h41 UT

XEQ "NYNORPT" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.955

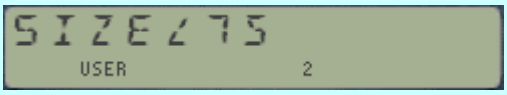
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.955

Philadelphia PA 8545240

Example: Water level in Philadelphia on 2015/10/24 at 6h41 UT

XEQ "PHILLY" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=1.000

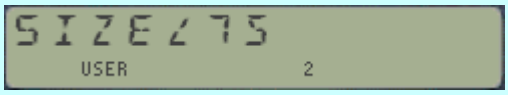
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=1.000

Plymouth Harbor MA 8446493

Example: Water level in Plymouth Harbor on 2015/10/24 at 6h41 UT

XEQ "PLYMTH" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.051

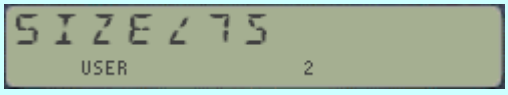
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.051

Portland ME 8418150

Example: Water level in Portland on 2015/10/24 at 6h41 UT

XEQ "PRTLND" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL= -0.030

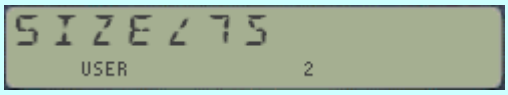
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL= -0.030

Sand Point AK 9459450

Example: Water level in Sand Point on 2015/10/24 at 6h41 UT

XEQ "SANDPT" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=1.856

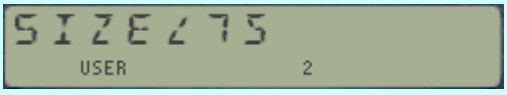
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=1.856

San Francisco CA 9414290

Example: Water level in San Francisco on 2015/10/24 at 6h41 UT

XEQ "SANFRAN" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=1.007

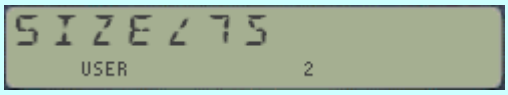
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=1.007

Seattle WA 9447130

Example: Water level in Seattle on 2015/10/24 at 6h41 UT

XEQ "SEATTLE" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=1.966

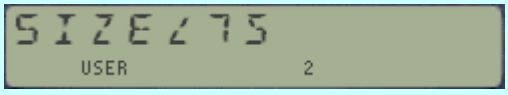
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=1.966

South Beach OR 9435380

Example: Water level in South Beach on 2015/10/24 at 6h41 UT

XEQ "SOUTHB" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=1.798

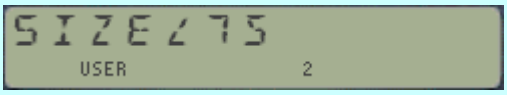
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=1.798

Vancouver WA 9440083

Example: Water level in Vancouver on 2015/10/24 at 6h41 UT

XEQ "VANCVR" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.216

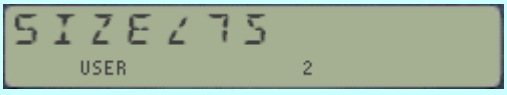
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.216

Washington D.C. 8594900

Example: Water level in Washington D.C. on 2015/10/24 at 6h41 UT

XEQ "WSHTDC" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=0.519

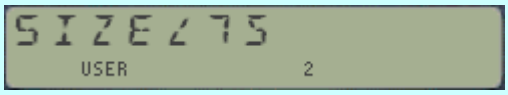
Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=0.519

Yakutat, Yakutat Bay, AK 9453220

Example: Water level in Yakutat on 2015/10/24 at 6h41 UT

XEQ "YAKUTAT" -> If there are less than 75 registers, the HP41 displays



XEQ "WL37+" >>>> DATE=?
24.102015 R/S TIME=?
6.41 R/S TYLR COS POL

if you choose TYLR press [A] in user mode (Flag F03 will be set)
[A] WL=2.808

Notes: You can also key in SF 03 (or another choice)

24.102015 ENTER^
6.41 XEQ "TSUB" >>>> WL=2.808

References:

- A slightly different approach is described in the "Manual of Harmonic Analysis and Prediction of Tides" - Paul Schureman - US Gov Printing Office (with node factors and phase corrections instead of the nodal corrections).
- This quasi-harmonic method is used in an HP-48 program (hptide) which may be downloaded from the website http://www.hpcalc.org/
- The Zip-files contain the 75 constants of many ports (but listed in a different order).
- Please take also a look at my webpage Tides(II) for more details on the harmonic method.