

USOLVE v1.8

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Designed by John DeArmond

USOLVE is a Utility program for the HP50 that was designed to complement the built in Multiple Equations Solver (MSOLVR). USOLVE functions will allow the user to create their own unique equation libraries in a directory.

Users can add comments or add units to equation variables. USOLVE Mpar titles browser can display titles for all subdirectories in the parent directory that contains Mpar; the use can then quickly launch MSOLVR menu. Whenever a single or lists of equations are stored; USOLVE creates or updates Mpar automatically, which means less organizing variables for the user and faster execution of MSOLVR menu. USOLVE also maintains order of variables, as well as update variable text as user change, delete or rename equation variables. Those are just some of USOLVE features.

USOLVE is intended for users who have large amounts of equations that are not in the equation library that they need to load on their calculator. According to John DeArmond, he has tons of formulas that he need to store on his calculator. If you're like John, you will benefit from USOLVE tremendously.

INSTALLING AND DELETING USOLVE

In USOLVE package you will find

USOLVE: manual in PDF format

Uexam: Example directories for you calculator. Store Uexam in the HOME directory and press STO you can then store the names of the directories.

USOLVE the library you need to download to your calculator.

Download **USOLVE** to your calculator and store it in a port 2, do a warm start by pressing depressing **ON** then **C**. On the warm start **USOLVE** will store the following key assignments to your calculator.

LSCUSTOM	22.2 USOLVE main menu
MENUONE	11.1 soft menu
MENUTWO	12.1 soft menu
MENUTHREE	13.1 soft menu
MENUFOUR	14.1 soft menu
MENUFIVE	15.1 soft menu
MENUSIX	16.1 soft menu
LSUPDIR	31.21 hold LS press UPDIR pops back to HOME

LSUPDIR

31.2 UPDIR

LS RIGHTARROW 36.2 view any object on stack. Same as **TOOL VIEW** but the advantage is USOLVE main menu won't change. Long equations can be scrolled with Left or Right arrow keys. Also views USOLVE print text very nicely.

To turn on USER mode press LS USER

If you decide that you want to delete **USOLVE** from your calculator, you will also have to get rid of the assigned user keys. Follow the steps below to completely remove the **USOLVE** library and use assign key. I store **USOLVE** in port 2, your port location might be different

:2: 813 **PURGE**

{22.2 11.1 12.1 13.1 14.1 15.1 16.1 31.21 31.2 36.2} **DELKEYS**

The library along with all user assign keys are now deleted

USOLVE AND HOME DIRECTORY

Normally, you can access your directories by pressing the **VAR** key when in HOME.

The user can also create a special menu to access directories of equations by storing a customize menu in the **HOME** directory in variable **CST**. For this reason, **USOLVE** will not build or launch equations in the **HOME** directory and will always default to display the **CST** menu when directory navigation reaches **HOME**.

This is how I have my HOME CST is set up



On a separate note, as you navigate directories, **MSOLVR** menu will be displayed if the current directory contains **Mpar**. Since we are on the subject of **Mpar**, keep in mind that **USOLVE** doesn't use **EQ**. No longer will you have conflicts using **LS MUM.SLV** and **MSOLVR**. Always store your equations the USOLVE way!

Global equation variables and Local equation variables

Now is a good time to download the example directory Uexam.

The screenshot below is typical Global variable setup. The parent directory is FLUIDS. Fluids contain four subdirectories of formulas related to fluids (PAD BE FWL FIFP). Each subdirectory has its own multiple equations stored in Mpar.

```
DEG XYZ HEX R~ 'X'
{HOME FLUIDS}  USR
7:
6:
5:
4:
3:
2:
1:
Gvars PAD BE FWL FIFP
```

Global Equation Variable (Gvars) in the parent directory is a collection of equation variable names for all subdirectories stored in the parent directory. Ghelp is also used the same way if you decide to use it.

In the parent directory, the user can type Gvar or press **RS LIB USOLVE Gvar** to execute the library program that collects and updates Gvars data.

```
DEG XYZ HEX R~ 'X'
{HOME FLUIDS}
1: "p
   D
   vavg
   ΔP
   Δy
   ε
   μ
ABOUT Gvar
```

Gvar will dump the variable data on the stack. You can edit to add comments then store in the parent directory as Gvars. Below is a screen shot of my edited Gvars ready to be stored. **Use spaces to separate variables and comments**

```

DEG XYZ HEX R~ 'X'
{HOME FLUIDS}
2: "e Roughness
   μ Dynamic viscos...
   ρ density
   ΔP pressure change
   Δy height change
   ΣK Total fitting ""
1: 'Gvars'
Gvars PAD BE FNL FIFP

```

Local Equation Variable (Lvars) on the other hand, is a collection of equation variable names for all equation in a single subdirectory. Local variables are stored in the current subdirectory as **Lvars**. **Lhelp** is also used in the same way if you decide to use it.

```

DEG XYZ HEX R~ 'X'
{HOME FLUIDS BE} USR
7:
6:
5:
4:
3:
2:
1:
Lvars Lhelp Ubak Mpar H Q

```

Global variables (Gvars and Ghelp) in the parent directory will always take precedent over local variables (Lvars and Lhelp) in the subdirectory directory. Equation variable names are always separated by a space!

USOLVE MAIN MENUS

At this point, I will give an explanation of **USOLVE** main menu. Enter BE subdirectory then press **LS CUSTOM** and you will see **USOLVE** main menu. USER mode will have to be on at this point. Explanation of **USOLVE** menu will start from **STOEQ** to **PRINT**

STOEQ

```
DEG XYZ HEX R~ 'X'  
{HOME FLUIDS BE} USR  
7:  
6:  
5:  
4:  
3:  
2:  
1:  
STOEQ|TITLE|MSOLV|VARS|HELP|PRINT
```

STOEQ accepts a single equation on the stack and append it to the equations in Mpar or accepts a list of equations on the stack, **overwriting existing equations in Mpar**.

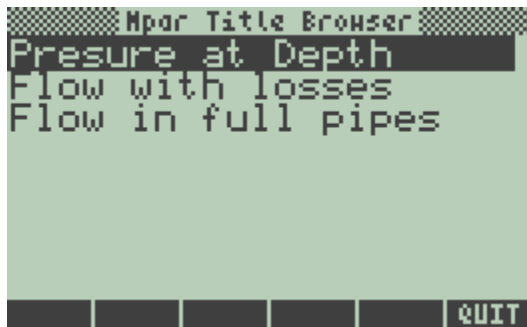
TITLE

Displays Mpar titles from all subdirectories in the current directory

```
DEG XYZ HEX R~ 'X'  
{HOME FLUIDS} USR  
7:  
6:  
5:  
4:  
3:  
2:  
1:  
Gvars|PAD|BE|FWL|FIFP|  
Mpar Title Browser:  
Pressure at Depth  
Bernoulli Equation  
Flow with losses  
Flow in full pipes  
QUIT
```

Displays Mpar title from all sub directories in the parent directory excluding current directory title

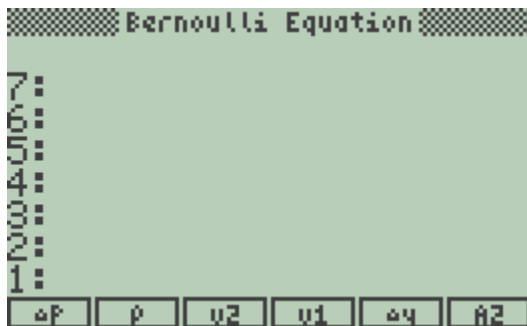
```
DEG XYZ HEX R~ 'X'  
{HOME FLUIDS BE}  
7:  
6:  
5:  
4:  
3:  
2:  
1:  
Lhelp|Ubak|Mpar|M|Q|P
```



Pressing **ENTER** at the highlight bar switches directory to the given title starting up **MSOLVR**. **QUIT** aborts back to menu. If you only have one directory, the title will be displayed in **MSOLVR** format.

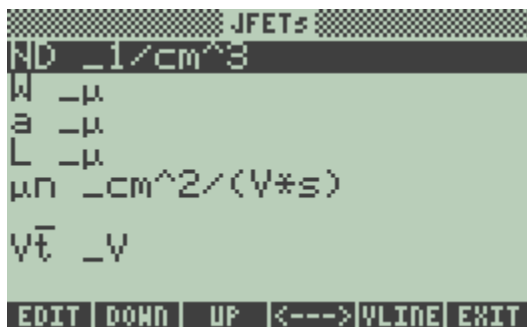
LS TITLE Edits existing title names

MSOLV



MSOLV MSOLV initiates MSOLVR.

VARs



VARs will take MSOLVR menu and display in a browser. The user can press \leftrightarrow to toggle between comments and units. **EDIT** will pull comment or unit to command line. Variables can be moved with **DOWN & UP**.

VLIN quick view of single line of unit or comment

LS VLIN small font comment viewer

So the user knows where the menu starts and ends, the browser will not wrap display and they are no hour glass arrows to the far right of the display. This gives the user the complete screen to display long units and comments.

Active HardKey Assignments

RS DownArrow move highlight bar to bottom of display

RS UpArrow move highlight bar to the top of display

ENTER will always abort browser if command line is empty

ON Clears command line. Pressing **ON** again will return to main menu
.Aborts in main menu.

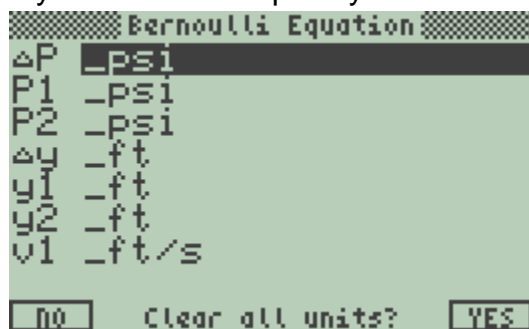
+/- Add or remove NULL from MSOLVR menu

A good example of NULL menu is Mohr's Circle in The HP50 equation Library. First create a directory where you want formulas it then press 14 4 0 **SOLVEQN**. Remember **USOLVE** do not use EQ

RS CHARS for adding special character

RS then **MinusKey** underscore key for removing a unit

If you need to completely remove all units press **RS CLEAR**



You can change your mind and press NO or press YES to completely remove the units.
In my case this is what I see when YES is pressed

```

Bernoulli Equation
P2 -
P1 -
y2 -
y1 -
D2 -
D1 -
P -
EDIT DOWN UP <---> VLINE EXIT

```

I am no longer using units any more. USLOVE saves the units in a variable call **Ubak** in the current directory. Pressing **Ubak** will explode all units on the stack. All you have to do is press STO until the stack is cleared. Re-launch VARS and you should see your units again

```

DEG XYZ HEX R~ 'X'
{HOME FLUIDS BE} USR
6: 0_in^2
5: 'A1'
4: 0_psi
3: 'ΔP'
2: 0_ft
1: 'Δy'
Ubak help vars Mpar EQ H

```

RS EVAL key is activated if you need special characters

Working with Lvars

Go to FULIDS directory put the contents of Gvars on the stack then PURGE Gvars from the menu

```

DEG XYZ HEX R~ 'X'          ALG
{HOME FLUIDS} USR
1: "e Roughness
   μ Dynamic viscos...
   ρ density
   ΔP pressure change
   Δy height change
   ΣK Total fitting ...
'Gvars' PURGE
Gvars PAD BE FNL FIFP

```


Switch to PAD directory and store the old Gavrs variables in Lvars

```
DEG XYZ HEX R~ 'X'      ALG
\HOME FLUIDS PAD\ USR
1: "e Roughness
   μ Dynamic viscos...
   ρ density
   ΔP pressure change
   Δy height change
   ΣK Total fitting ...
'Lvars'STO
Lhelp Mpar ρ h P P0
```

Press **LS CUSTOM VARS** then **EXIT**

```
DEG XYZ HEX R~ 'X'
\HOME FLUIDS PAD\ USR
3:
2:
1: "ρ density
   h Depth relative...
   P Pressure at h
   P0 Reference pres...
   "
Lvars Lhelp Mpar ρ h P
```

The PAD directory is now being used locally and Lvars had been updated for all variables in the PAD directory.

HELP

```
DEG XYZ HEX R~ 'X'
\HOME FLUIDS BE\ USR
7:
6:
5:
4:
3:
2:
1:
STOEQ TITLE MSOLV VARS HELP PRINT
```

HELP will display notes the user enters about equations. **LS HELP** allows you to edit or create help text. **USOLVE** will display help giving Global help variable precedence over Local help variable.

PRINT

```
DEG XYZ HEX R~ 'X'  
{HOME TY}      USR  
7:  
6:  
5:  
4:  
3:  
2:  
1:  
INOUT ALL ☐ PRINT ☐ EXIT
```

Previous versions of **USOLVE** would simply **PRINT** variable name and data assuming all users have a HP infrared 82240B printer. **USOLVE** will now put variable name and data on the stack formatted for the HP infrared printer.

INOUT When equations are solved, variables are organized based on user input and what were solved. **INOUT** only works when small squares are on **MSOLVR** menu.

```
DEG XYZ HEX R~ 'X'  
{HOME TY}      USR  
1: "NMOS Transistors  
   THU 02/05/15 05:2...  
  
   INPUT  
   tox 700.0000_A  
   NA  1.0000E15_1/c...  
    $\mu$ n 600.0000_cm^2...  
INOUT ALL ☐ PRINT ☐ EXIT
```

ALL all variables are displayed in the same order of MSOLVR menu

```
DEG XYZ HEX R~ 'X'  
{HOME TY}      USR  
1: "NMOS Transistors  
   THU 02/05/15 05:3...  
  
   tox 700.0000_A  
   NA  1.0000E15_1...  
    $\mu$ n 600.0000_cm...  
   T 26.8500_°C  
INOUT ALL ☐ PRINT ☐ EXIT
```

PRINT prints a string on the stack. In my research, I found that changing the print reserved variable PRTPAR delay parameter to 1 gives the best results for printing. You can find the reserve variable PRTPAR in the HOME directory. Changing the first number in the list from 0 to 1 will give much better print results.

To follow the example below, create a directory with any name then type
13 2 0 **SOLVEQN** below is an example of my printout.

NMOS Transistors

THU 02/05/15 08:46:38P

User Input:

tox 700.0000_Å
NA 1.0000E15_1/cm^3.
μn 600.0000_cm^2./V*s
T 26.8500_°C
Vt0 0.7500_V
VGS 5.0000_V
VBS 0.0000_V
VDS 5.0000_V
W 25.0000_μ
ΔW 1.0000_μ
L 4.0000_μ
ΔL 0.7500_μ
λ 0.0500_1/V

Solved:

We 23.0000_μ
Le 2.5000_μ
Cox 49,330.4750_pF/cm^2
γ 0.3725_V^0.5000
Øp - 0.2898_V
Vt 0.7500_V
VDsat 4.2500_V
IDS 3.0741_mA

gds 0.0002_S
gm 1.4466_mA/V

Second page of main menu

```
DEG XYZ HEX R~ 'X'  
{HOME FLUIDS BE} USR  
7:  
6:  
5:  
4:  
3:  
2:  
1:  
EQcom|EQlib| | | |
```

EQNLIB can be used to export equations and variables to a directory. Unfortunately, EQNLIB will not allow you to export equation variable comments.

EQcom is a routine that will give the user the ability to extract comment from The built in Equation Library (EQNLIB). It accepts two numbers on the stack

EQcom input:

2: Subject number ex: Gases is subject number 5
1: Title number ex: Real Gas Law title will be number 6

EQcom Output:

2: Title
1: Comments

EQlib same as **EQNLIB**

Before and during the use of USOLVE always backup your calculator.

If you are using USOLVE for critical engineering calculations, neither the programmer nor the Designer is responsible for errors in calculation or crashes. When you download and use USOLVE you are agreeing to those terms.

References for this project was

The book HP Solve Equation Library Application Card Owner Manual
Debug 4x v2.2 build 168
Programming in System RPL by Eduardo M Kalinowski and Carsten Dominik

USOLVE v1.8 March 1, 2015

VARs menu:

Comments are now standard size fonts.

Comments and units can now be toggled.

Changed 1VIEW to VLINE and added LS to VLINE for comments small fonts

Removed LS UNITS; added a smart EDIT menu key

Added EQcom and EQlib on second page of USOLVE main menu

EQcom extracts comments from built in equation Library to use with USOLVE

EQlib launches built in Equation library

USOLVEv1.7 Feb 28, 2015

Fixed Crash in VARs browser when editing Nulls

USOLVEv1.6 Feb25, 2015

Fixed DECOMP\$ problems with VARs and PRINT.

Fixed PRINT removing one too many character if more than 24 characters

USOLVEv1.5 Feb 22, 2015

Fixed a small issue with Ubak,

Update TITLE to check for NULL\$ strings

VARs variable browser made LS UNITS smarter

USOLVEv1.4 Feb 20, 2015

More program optimizing

Rewrite of STOEQ; appending equations preserves null menus

Added LS Right Arrow key for viewing objects on stack (Level1) . Convenient for scrolling large equations or viewing Print Text

USOLVEv1.3 Feb 15, 2015

Moved NULL menu key in VARs to keyboard -/+

Lot of program optimizing

USOLVEv1.2 Feb 10, 2015

Complete re-write of PRINT menu key gives user better choice of exporting data

For vars browser LS DOWN and UP arrow key is now RS DOWN and UP

USOLVE v1.1 Feb 1, 2015

Added display of titles parent directory when in subdirectory

Added Error traps

Updated PRINT menu

USOLVE v1.0 Jan 1, 2015

First Release