ACDC

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I have taken a few of my example circuits from:

Robert L. Boylestad's

Introductory Circuit Analysis 13th Edition.

Before I retired from teaching Electronics, this was my preferred text book, 8th Edition 1997.
The calculator I provided my students with the course, was the HP 32SII. I own several HP calculators starting with my first one HP 33E, Scientific-Programmable calculator right up to HP50g.

I am now 72, and have started learning the hp Prime PPL language back in September, 2015 as a passtime. I hope you will enjoy this program in Basic Electronics and possibly can learn PPL yourself as I have learned through my own efforts and from others who posted their programs on this site.
I plan on expanding this program in the near future if it can be useful to anyone. I also want to mention that if you have an iPhone or iPad, there is a very practical RPN calculator called RPN iX+ by Joshua Brown which makes a wonderful companion to the hp Prime. It has a 4 level Stack, works with Complex Numbers extra-ordinary well, converts easily from Cartesian to Polar, a very clear keypad layout and you can append your own constants to an existing list and now in the process of including Eng. Notation for the next Upgrade and fix a bug or two.

To start the ACDC program, first press the HOME key. This will get rid of the annoying Program List in the background. Then type [Alpha] A, [Alpha] C, [Alpha] D, and [Alpha] C. Press [Enter]
Do not type [Alpha] [Alpha] ACDC, as the Alpha annunciator 'A..Z' at the top of the screen may creep back in and interfere with data entry at the beginning if you don't notice it.

This is the opening screen(next page). I made a more comprehensive document then this one in a PDF format but since I used the Screen capture in the Connectivity Kit, (Right Click on the calculator name) it turned out to be too large to post on this site due to the 3MB limit. If you are interested in this PDF version you can email me at bernmich@bell.net, other wise what I have below will have to do.
There are five sections to the program, 1- Series Circuit, with its sub menu, 2-Parallel Circuit, with its sub menu, 3- Delta Wye Conversion, 4- Wheatstone Bridge and 5-Thevenin Bridge.

AC/DC Series and Parallel Circuits.

1 Quit AC/DC Circuits.
2 Series Circuit.
3 Parallel Circuit.
4 Delta Wye Conversion
5 Wheatstone Bridge
6 Thevenin Bridge
7 About

To begin press 2 for Series Circuit.

1 Quit AC/DC Circuits
2 Series, Solve Zt and Yt.
3 Series Circuit with Esource
4 Series Circuit with Isource
5 Back to Main Menu

Option 2 lets you solve a Series circuit for its Impedance and Admittance for up to 6 Real or Complex components. All the program topics works with DC as well as AC circuits. To solve a DC circuits enter up to 6 Resistors and solve.

Press 2 for Series, Solve Zt and Yt.

Enter Matrix Data

Z1	Z2	Z3
Z4	Z5	Z6
Zt	Yt	0

On the screen above you will see the method of entering Data to solve the circuit.
Its a 3x3 Matrix, and you enter the data in a Row-Column fashion as you would if you pressed [Shift] Matrix from the Keyboard.

The Matrix is very accommodating for data entry. I have tried other methods such as INPUT (a) real part and (b), img. part then forming the Complex number into Z0 to Z9 and so on but found that very limiting. In the Matrix you can enter numbers in any format you like. The program will solve Zt and Yt on the third line if you supply it with at least two Impedances.

R1 = 20 Ω, R2 = 220 Ω, R3 = 1.2 k Ω, R4 = 5.6 k Ω. R_T = 7.04 k Ω. Press [OK] or [Enter]

		1	2	3
Z1 Z2 Z3 in this row.	1	20	220	1200
Z4 in this row	2	5600	0	0
And press [Enter]	3	0	0	0

Lets solve this circuit with ACDC. Press [Enter]
After entering your last component R4, box(2,2) is highlighted, press [OK].

Zt = 7.04E3

Polar = [7.04E3,0.00E0]

Yt = 142E-6

Polar = [142E-6,0.00E0]

Press [Enter] to continue

Your answers are displayed in Cartesian and Cylindrical (Polar) form. After pressing [Enter]

The program returns you to the Series Menu where you can choose to repeat Series Zt and Yt, or Option 2 to solve a Series Circuit with a volage source Es or with a current source Is.

Choose Option below

1 Series Zt and Yt.
2 Series Circuit
3 Back to Main Menu
4 Quit
5

Press 2 for the next screen.

AC/DC Series and Parallel Circuits.

1 Quit AC/DC
2 Series, Solve Zt and Yt.
3 Series Circuit with Esource
4 Series Circuit with Isource
5 Back to Main Menu

Press 3 t o solve a Series Circuit with a voltage source Es.
For this example we will use an AC circuit to see the versatility of using a Matrix.

Enter Matrix Data

Z1	Z2	Z3
Z4	Z5	Z6
Es	0	0

Now we can enter up to 6 individual components or pairs. R, (0, -Xc), (0, XL), (R, -XC), (R, XL).
Note Es in box(3,1). After entering Z1 3, Z2, and Z3,
TAP box[3,1] to SKIP Z4, Z5 and Z6.

	1	2	3
1	3	(0,7)	(0,-3)
2	0	0	0
3	50	0	0
4			

If you made an error entering the data, you can navigate to that box by Taping it or using < ^ >

Enter this data in the Matrix above.
Enter 3 in box[1,1], (0,7) in box[1,2] and (0,-3) in box[1,3].

After entering Z3, TAP box(3,1) and enter 50 in box[3,1]

If you do not enter a value for Es, ACDC will simply calculate Zt and Yt as it did for Solve for Zt and Yt.

If you enter the 50 volts in box(3,1) you will however get the screen below.

Zt = 3.00E0 +4.00E0 Zt = [5.00E0, 53.1E0]
Yt = 120E-3 -160E-3 Yt = [200E-3, -53.1E0]

Is = 6.00E0 -8.00E0 Is = [10.0E0, -53.1E0]

V1 = 18.0E0 -24.0E0 [30.0E0, -53.1E0]
V2 = 56.0E0 +42.0E0 [70.0E0, 36.9E0]
V3 = -24.0E0 -18.0E0 [30.0E0, -143E0]
V4 = 0
V5 = 0
V6 = 0

Press [ENTER to continue]

Now ACDC calculated the Is current source and V1, V2 and V3. Press [Enter].

You can now 1-Redo a Series Circuit with Esource, 2- return to Series Circuit Menu or return to Main Menu.

Choose Option below

1 Series Circuit with Esource
2 Series Circuit
3 Back to Main Menu
4 Quit

Press 2 for Series Circuit.

1 Quit AC/DC Circuits
2 Series, Solve Zt and Yt.
3 Series Circuit with Esource
4 Series Circuit with Isource
5 Back to Main Menu

Press 4 for Series Circuit with Isource.

Enter Matrix Data

Z1	Z2	Z3
Z4	Z5	Z6
Is	0	0

If you enter the same Impedances as in the previous circuit for Z1 to Z3 and the Is (6, -8), the result should be the same as above except the program will solve for Es instead of Is and the 3 voltages.

Notice box(3,1) for Is.

	1	2	3
1	3	(0,7)	(0,-3)
2	0	0	0
3	(6,-8)	0	0

In the screen above, after entering IS (6, -8)in box(3,1)
Press [Enter] for the result screen below.

Zt = 3.00E0 +4.00E0 Zt = [5.00E0, 53.1E0]
Yt = 120E-3 -160E-3 Yt = [200E-3, -53.1E0]

Es = 6.00E0 -8.00E0 Es = [50.0E0, 0.00E0]

V1 = 18.0E0 -24.0E0 [30.0E0, -53.1E0]
V2 = 56.0E0 +42.0E0 [70.0E0, 36.9E0]
V3 = -24.0E0 -18.0E0 [30.0E0, -143E0]
V4 = 0
V5 = 0
V6 = 0

Press [ENTER to continue]

Choose Option below

1 Series Circuit with Isource
2 Series Circuit
3 Back to Main Menu
4 Quit

Press 3 to return to the Main Menu.

AC/DC Series and Parallel Circuits.

1 Quit AC/DC Circuits.
2 Series Circuit.
3 Parallel Circuit.
4 Delta Wye Conversion
5 Wheatstone Bridge
6 Thevenin Bridge
7 About

From the Main Menu above, press 3 for Parallel Circuit.

1 Quit AC/DC Circuits
2 Parallel, Solve Zt and Yt.
3 Parallel Circuit with Esource
4 Parallel Circuit with Isource
5 Back to Main Menu

From the Parallel Menu above , Press 2 for Parallel, Solve Yt and Zt.

Enter Matrix Data

Z1 Z2 Z3
Z4 Z5 Z6
Zt Yt 0

RLB, Pg. 709, Example 16.2, Fig. 16.5

TAP [OK]

	1	2	3
1	5	(0,8)	(0,-20)
2	0	0	0
3	0	0	0

Enter the 3 Impedances 5, (0,8) and (0,-20), **TAP [OK].**

Yt = (200E-3, -75,0E-3)

Polar = [214E-3, -20.6E0]

Zt = (4.38E0, 1.64E0)

Polar = [4.68E0, 20.6E0]

Press [Enter] to continue

Choose Option below

1 Parallel Zt and Yt.
2 Parallel Circuit Menu
3 Back to Main Menu
4 Quit

Press 2 to return to Parallel Circuit Menu.

1 Quit AC/DC Circuits
2 Parallel, Solve Zt and Yt.
3 Parallel Circuit with Esource
4 Parallel Circuit with Isource
5 Back to Main Menu

Press 5 to return to Main Menu.

AC/DC Series and Parallel Circuits.

1 Quit AC/DC Circuits.
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Press 4 for Delta Wye Conversion.

To solve ZA ZB ZC

Enter Z1 Z2 Z3

To solve Z1 Z2 Z3

Enter ZA ZB ZC

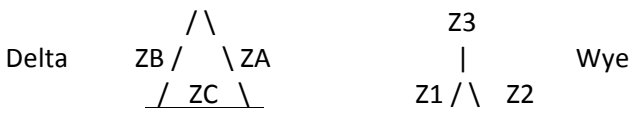
Press [ENTER]

Enter Matrix Data

Enter data in Row 1 to solve for Z1, Z2 and Z3

ZA	ZB	ZC
Z1	Z2	Z3
Zd	0	Zy

Press [Enter]



	1	2	3
1	(0, -4	(0, -4)	(3,4)
2	0	0	0
3	0	0	0

Input ZA (0,-4), ZB (0,-4) ZC (3,4). TAP [OK].

In this case, if you enter ZA, ZB and ZC "First Row" and TAP [OK], ACDC will solve for Z1, Z2 and Z3.

If you enter Z1, Z2 and Z3 "Second Row" and TAP [OK], ACDC will solve for ZA, ZB and ZC.

The screen below re-displays the Delta section ZA, ZB and ZC, with the Wye answers Z1, Z2 and Z3.

ZA = (0.00E0, -4.00E0) [4.00E0, -90.0E0]

ZB = (0.00E0, -4.00E0) [4.00E0, -90.0E0]

ZC = (3.00E0, 4.00E0) [5.00E0, 53.1E0]

Z1 = (3.84E0, 1.12E0) [4.00E0, 16.3E0]

Z2 = (3.84E0, 1.12E0) [4.00E0, 16.3E0]

Z3 = (-1.92E0, -2.56E0) [3.20E0, -127E0]

Press [Enter] to continue

Choose option below

1 Delta Wye Delta.

2 Back to Main Menu

Press 2 to return to the Main Menu.

AC/DC Series and Parallel Circuits.

1 Quit AC/DC Circuits.
2 Series Circuit.
3 Parallel Circuit.
4 Delta Wye Conversion
5 Wheatstone Bridge
6 Thevenin Bridge
7 About

Enter 5 for Wheatstone Bridge

Es 0 0 0

ZA ZB ZC Z4

Z5 Z1 Z2 Z3

0 0 0 0

Press [ENTER]

		1	2	3	4
Enter Es 12 / 53.13 in this row >	1	(7.20, 9.6)	0	0	0
TAP box(2,1) >	2	(6,2)	(3,4)	(2,4)	(3,5)
Z5 goes here	3	(6,8)	0	0	0

Es = 12 / 53.13 TAP box(2,1), ZA = (6,2) ZB = (3,4) ZC = (2,4) Z4 = (3,5) Z5 = (6,8).
or (7.2, 9.6)

After you have entered Z5 TAP [OK].

IS = (1.85E0, 138E-3) [1.85E0, 4.27E0]
IZ4 = (1.15E0, 404E-6) [1.15E0, 20.1E-3]
IZ5 = (694E-3, 137E-3) [708E-3, 11.2E0]
Va = (3.45E0, 5.76E0) [6.71E0, 59.1E0]
Vb = (3.07E0, 6.38E0) [7.08E0, 64.3E0]

Va-Vb = (383E-3, -623E-3) [732E-3, -58.4E0]

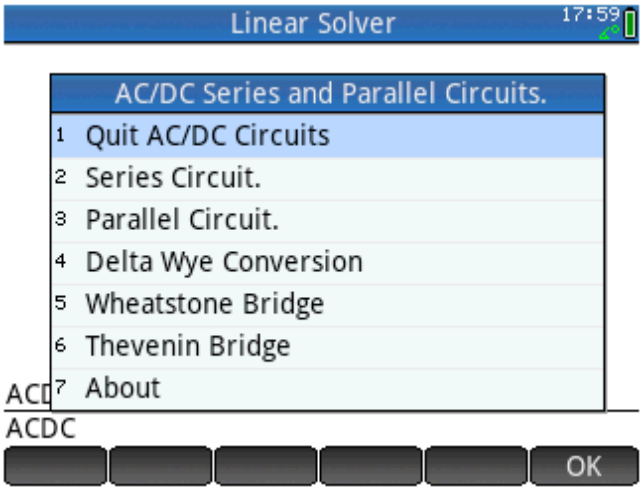
Zt = (4.27E0, 4.88E0) [6.48E0, 48.9E0]

Press [Enter] to continue.

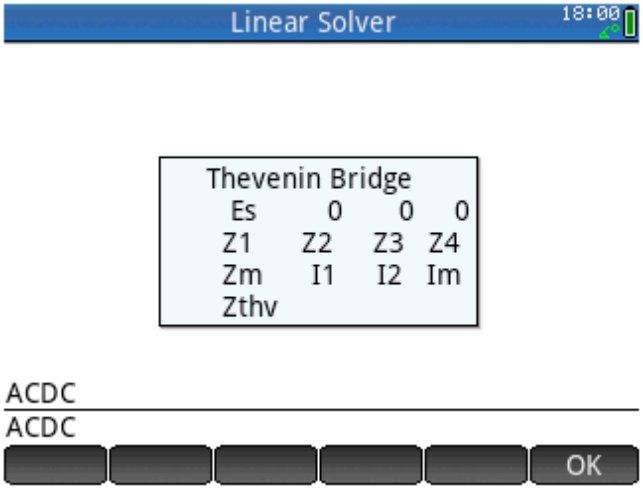
Choose Option below
1 Wheatstone Bridge
2 Back to Main Menu
3 Quit

Press 2 for Main Menu.

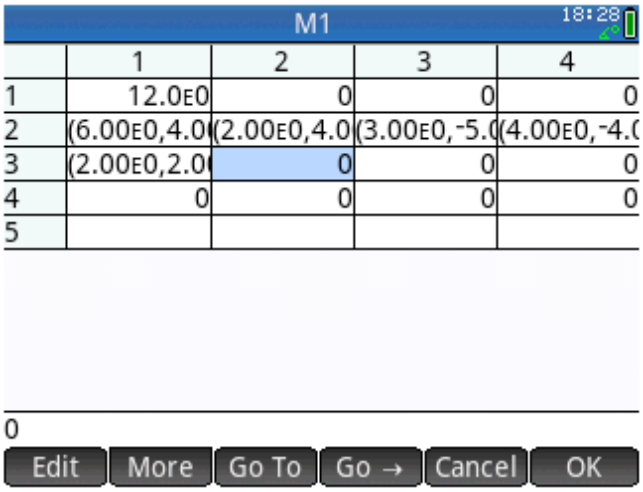
This is what this file would have looked like if I could have used the screen shots all the way through.



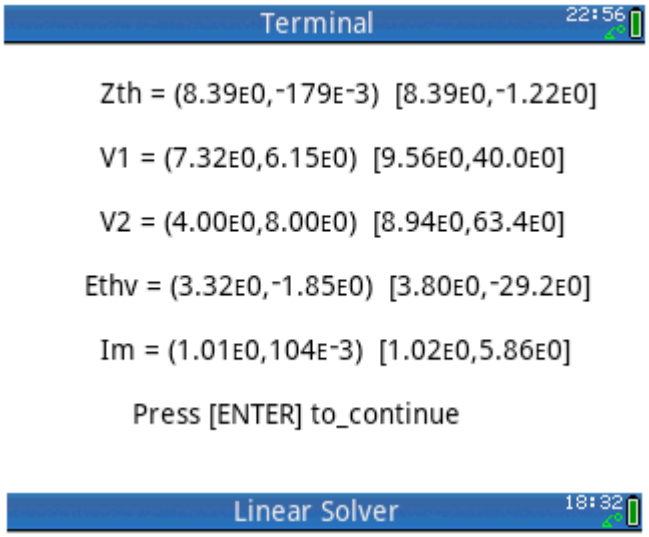
Press 6 for Thevenin Bridge.

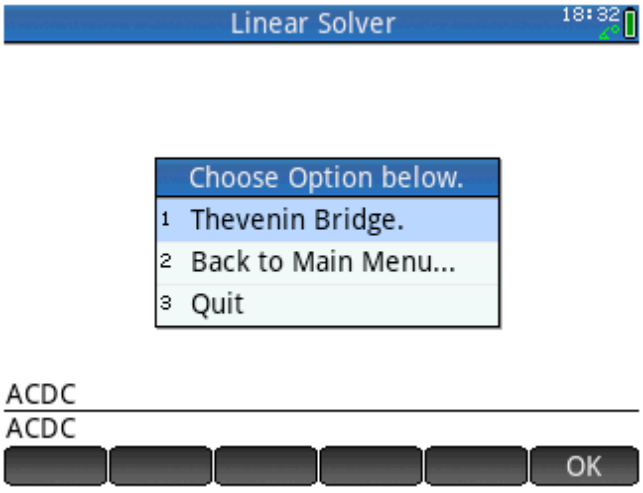


Data entry Model. Press [ENTER]



Es = 12 / 0 Z1 = (6,4) Z2 = (2,4) Z3 = (3,-5) Z4 = (4,-4) Zm = (2,2). Press [ENTER]





Press 3 to Quit.

ENJOY