User Guide
CASIO FX-603P RS232C Operations

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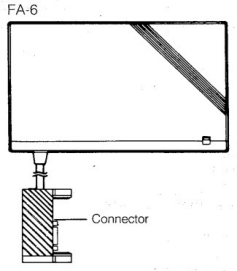
Introduction

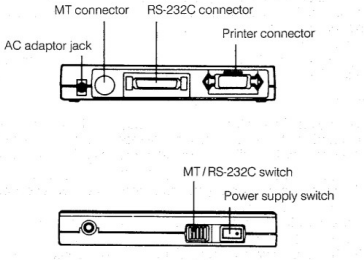
This guide describes save and load operations using the RS232C communication facilities of the CASIO FX-603P Programmable Calculator.

The **Casio FX-603P**[1], released in **1990**, was a pioneering programmable scientific calculator that bridged the gap between traditional pocket calculators and early handheld computers[2].

The Casio FA-6 interface, allows it to connect to cassette tapes for data storage, Centronics-compatible line printers, and RS-232 serial ports for two-way serial communication.







1 https://en.wikipedia.org/wiki/Casio_FX-603P

2 Because of its limited global distribution, the FX-603P remains a highly sought-after landmark piece among vintage computing enthusiasts.

Setting up your environment

Connect the FX-603P to the FA-6 unit.
Switch the FA-6 selector to RS-232C.
Switch the FA-6 power to ON.
Turn on the FX-603P.

When the FA-6 is connected to an active FX-603P, the power light POWER will turn on[3].
As shown in the next picture.



The image demonstrates a DB25-to-DB9 adapter[4] connecting the device to a USB-to-serial cable[5].

Connect your serial over USB cable to your workstation.

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3 After a few minutes of inactivity the FX-603P will turn off, turning off the FA-6. When the FX-603P is turned on, so will the connected FA-6 (assuming that the power switch is ON).

4 https://www.ebay.com/itm/133567885611 AT Modem DB9 9 Pin Male to DB25 25 Pin Male Molded Adapter RS-232 Printer Device

5 https://www.ebay.com/itm/197962207980 USB to RS232 Adapter with FTDI Chipset, 6.6Ft USB 2.0 Male to RS232 Female DB9

If you are running linux in a virtual environment (such as vmware) make sure that the USB port is managed by the virtual machine.

```
$ lsusb
Bus 001 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 001 Device 002: ID 0e0f:0003 VMware, Inc. Virtual Mouse
Bus 001 Device 003: ID 0e0f:0002 VMware, Inc. Virtual USB Hub
Bus 001 Device 006: ID 0403:6001 Future Technology Devices International, Ltd FT232
Serial (UART) IC
```

Setup your terminal emulator. TeraTerm is a popular Windows terminal application. Minicom is very popular for Linux users.

Regardless of the platform, communication parameters between the FX-603P and the terminal application must be the same. For the sake of simplicity we will use the default values defined in the FX-603P.

Parameter	**Value**
Speed	1200 bps
Bits	8
Parity	Even
Stop Bits	2
RTS/CTS	No
XON/OFF	No

We recommend using a 10 ms per character delay and 100 ms per line delay in transfers terminating on the FX-603P[6].

6 If you are using TeraTerm adjust these parameters in the serial connection.

For minicom you need to create an rc file containing these parameters.
On the linux command line copy and paste the following HERE document.

```
cat << 'EOF' > ~/.minirc.fx603p
pu pprog9 ascii-xfr -dsv -c 20 -l 100
pu localecho Yes
pu port /dev/ttyUSB0
pu baudrate 1200
pu bits 8
pu parity E
pu stopbits 2
pu rtscts No
pu xonxoff No
EOF
```

[Enter]

Verify the content of the rc file.

```
cat ~/.minirc.fx603p  [Enter]
pu pprog9 ascii-xfr -dsv -c 20 -l 100
pu localecho Yes
pu port /dev/ttyUSB0
pu baudrate 1200
pu bits 8
pu parity E
pu stopbits 2
pu rtscts No
pu xonxoff No
```

For ASCII file transfers[7], the -c 20 option inserts a 20 ms delay between transmitted characters, while -l 100 adds a 100 ms pause after each line, preventing the FX-603P input buffer from being overrun.

Start minicom
$ minicom fx603p

```
Welcome to minicom 2.10

OPTIONS: I18n
Port /dev/ttyUSB0, 18:33:53 [U]

Press CTRL-A Z for help on special keys
```

The rc file contains the recommended parameters for serial communications with the FX-603P. There is a rich Help Menu that is displayed by pressing **[Ctrl-A][Z]**

7 This option does not affect copy/paste operations on the terminal.



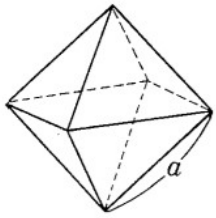
Configuration options can be changed using the O option, which also allows to save the changes in the rc file.

Sample Program

This section illustrates how to transfer a FX-603P sample program stored in the P0 area.

Let's assume that the program described in pages 41 and 42 of the manual has been stored in P0.

Example: Find the surface area and volume of a regular octahedron when the length of one side is given.



Length of one side (a)	Surface area (S)	Volume (V)
10cm	( )cm^2	( )cm^3
7	( )	( )
15	( )	( )

(1) Formulas

For surface area S, volume V, and one side a, the formulas for calculating S and V of a regular octahedron are:

$$S = 2\sqrt{3}\,a^2 \qquad V = \frac{\sqrt{2}}{3}a^3$$

To store the previous program in P0:

P0 **HLT, Min F, 2, ×, 3, SHIFT √‾, ×, MR F, SHIFT x^2, =, HLT, 2, SHIFT √‾, ÷, 3, ×,**

↑ Program number required

↑ To input data

↑ To see the result

MR F, SHIFT x^y, 3, =, HLT, (21 steps)

↑ To see the result

Please transcribe the program using Min01 and MR01 instead of Min F and MR F.

Saving programs and memory with RSSAVE [8]

Run the sample program stored in P0. Supply 10 as the input value.
[MODE][1][P0]
[1][0][EXE]
Result (Surface): 346.41 ...
[EXE]
Result (Volume): 471.40 ...

Transfer the P0 program to your minicom session by entering the following key sequence.

[MODE][X][SHIFT][RSSAVE][P0][EXEC]

Minicom screen:

```
Program List
P0
HLT
Min01 2 * 3 SQR * MR01 X^2 = HLT
2 SQR / 3 * MR01 X^Y 3 = HLT
END
```

8 Page 85 of the CASIO FX-603P INSTRUCTION MANUAL contains additional information about this subject.

Transfer the P0 program and memory content to your minicom session by entering the following key sequence.

[MODE][X][SHIFT][RSSAVE][SHIFT][EXEC]

Minicom screen:

```
All Program List
P0
HLT
Min01 2 * 3 SQR * MR01 X^2 = HLT
2 SQR / 3 * MR01 X^Y 3 = HLT
P2
P3
…
P10
DSZ
P15
EXE
END

Memory List
M00= 0.
M01= 1.E 01
…
M97= 0.
M98= 0.
M99= 0.
M9F= 0.
```

Transfer the memory content to your minicom session by entering the following key sequence.

[MODE][1][SHIFT][RSSAVE][EXEC]

Minicom screen:

```
Memory List
M00= 0.
M01= 1.E 01
M02= 0.
M03= 0.
M04= 0.
M05= 0.
M06= 0.
M07= 0.
…
M96= 0.
M97= 0.
M98= 0.
M99= 0.
M9F= 0.
```

Loading programs and memory with RSLOAD

Imagine that we have edited the source code of program P0 to store the intermediate results in MR02 and MR03. We want to transfer it to P1.

The target area needs to be empty.
Clear program P1 by entering the following key sequence.

[MODE][3][P1][EXE]

```
Program List

P1

HLT
Min01 2 * 3 SQR * MR01 X^2 = Min02 HLT
2 SQR / 3 * MR01 X^Y 3 = Min03 HLT
END
```

Transfer the program to your minicom session by entering the following key sequence.

[MODE][X][SHIFT][RSLOAD][P1][EXEC]

Select the program (all the grayed background text), copy it to the clipboard and paste it on minicom.

Execute the program, supply 10 as the input parameter. The results should be identical to the version in P0. However, MR02 and MR03 have the values for the surface and volume of this solid.

For short program listings, pasting text directly into the Minicom terminal is usually sufficient. For longer programs, use Minicom's **ASCII file transfer** to ensure a reliable, properly paced transmission to the FX-603P.

File Transfer with RSLOAD

We will start this section by clearing all program areas by entering the following key sequence.

[MODE][3][2ndF][MAC]

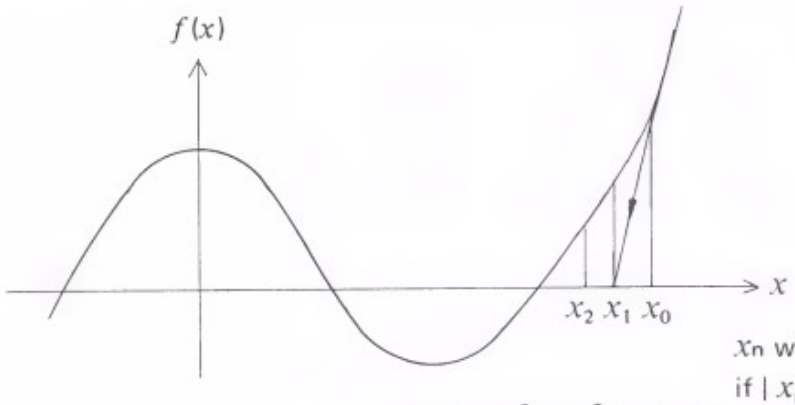
We will use a corrected version of the program Mathematics-8 “Solving a cubic equation by the Newton method” found on page 17 of the “Program Library CASIO FX-603P” handbook.

Program for
Solving a cubic equation by the Newton method

No.
Mathematics-8

Description

• Input the program written in the next page.



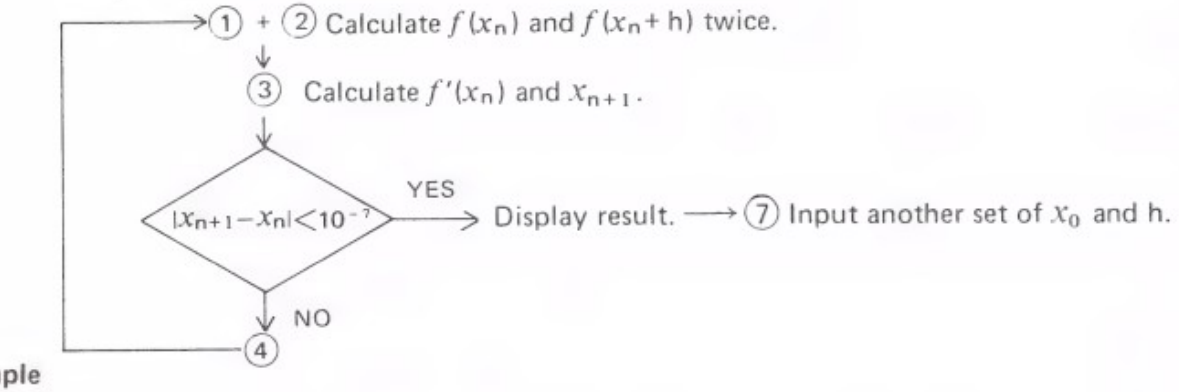
$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

$$f'(x) = \frac{f(x+h) - f(x)}{h}$$

x_n will be taken as an approximate solution if $|x_{n+1} - x_n| < \epsilon_0$.

$f(x) = ax^3 + bx^2 + cx + d$

< Flowchart >



Example

$f(x) = x^3 + x^2 - x - 1$

$x_0 = 0$, $\epsilon_0 = 1 \times 10^{-7}$, $h = 0.01$

Next we will create a linux file containing the text of the program, suitable for RSLOAD.

Enter the following commands on your linux command line.

```
cat << 'EOF' > ~/cubic.603
Program List

P0

LBL1
  "A?" HLT Min01
  "B?" HLT Min02
  "C?" HLT Min03
  "D?" HLT Min04
  "E0?" HLT MinF
  "X0?" HLT Min05
  "H?" HLT Min06
LBL2
  MR05 Min07
  2 Min00
LBL3
  MR01 * MR05 X^2 * MR05 + MR02 * MR05 X^2 + MR03 * MR05 + MR04 = Min09
  MR06 M+05
  DSZ GOTO4
  GOTO5
LBL4
  MR09 Min08
  GOTO3
LBL5
  MR07 Min05
  ( MR09 - MR08 ) / MR06 = Min09
  MR07 - MR08 / MR09 = Min08
  MR08 - MR07 =
  ABS X≥F GOTO6 GOTO7
LBL6
  MR08 Min05
  GOTO2
LBL7
  "X=" MR08 HLT
  MR01 * MR08 X^2 * MR08 + MR02 * MR08 X^2 + MR03 * MR08 + MR04 =
  "Y=" HLT

END
EOF

[ENTER]
```

Verify that the file was created successfully in your home directory.

```
$ cat ~/cubic.603
```

Note: The use of the .603 file extension is entirely arbitrary. Unlike Windows, Linux does not assign any special meaning to file extensions; they are simply part of the filename. The .603 extension is used here only as a convenient way to identify FX-603P program files.

In your minicom session type **[CTRL-A][Z]** to display the help menu.

Press **[S]** Send Files

Scroll down the list to ascii and press **[ENTER]**

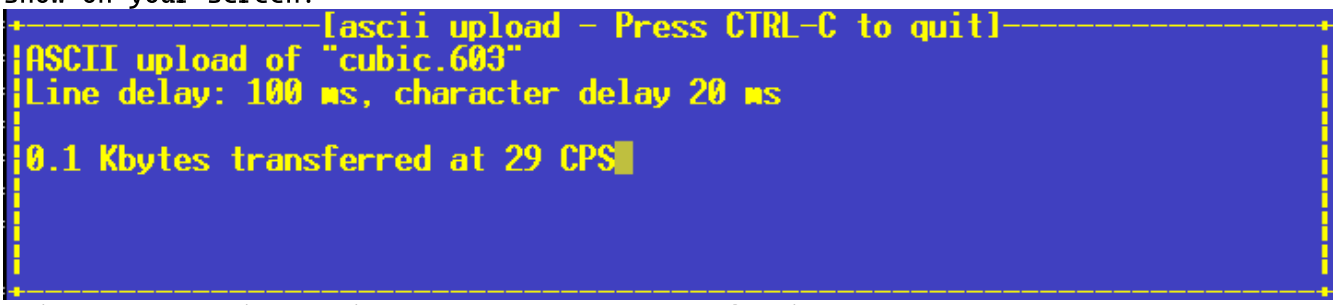


Scroll down the file list, locate cubic.603 and press **[SPACE]** to tag it



On your FX-603P press **[MODE][X][SHIFT][RSLOAD][P0] [EXEC]**
The FX-603P is now waiting for the transfer.

Turn you attention to the minicom session. You have cubic.603 tagged for ascii transfer, press **[ENTER]** to start the file transfer. A pop up progress windows will show on your screen.



This progress window will close when the transfer is complete.

The program is now ready for execution.

[MODE][1][P0]

Let’s use P0 to solve:

$$f(x) = x^3 - 2x - 5 = 0$$

- Inputs: $A = 1, B = 0, C = -2, D = -5$
- Initial Guess: $X_0 = 2$ (`Min05`), $H = 0.001$ (`Min06`), $E_0 = 0.0001$ (`MinF`)

Enter the input parameters.

The result is X=2.09455 and Y=1.2341E-07 (very close to zero).

Enhance the program and keep count of the number of iterations, if the count exceeds 50 your initial values are probably divergent and the program should end. Display the number of iterations to show how quickly Newton converges in most cases.

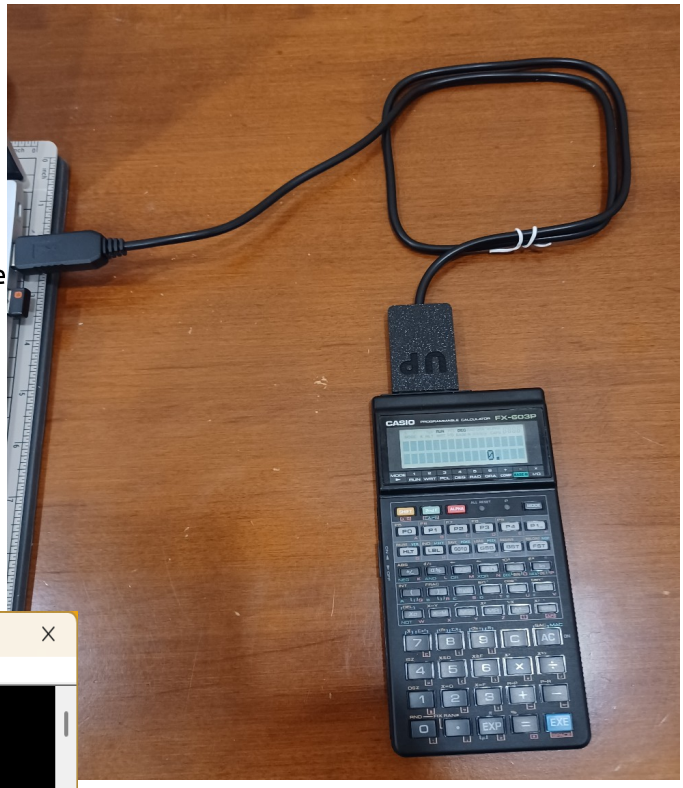
RSSAVE and RSLOAD in a nutshell

In **[MODE][X]**

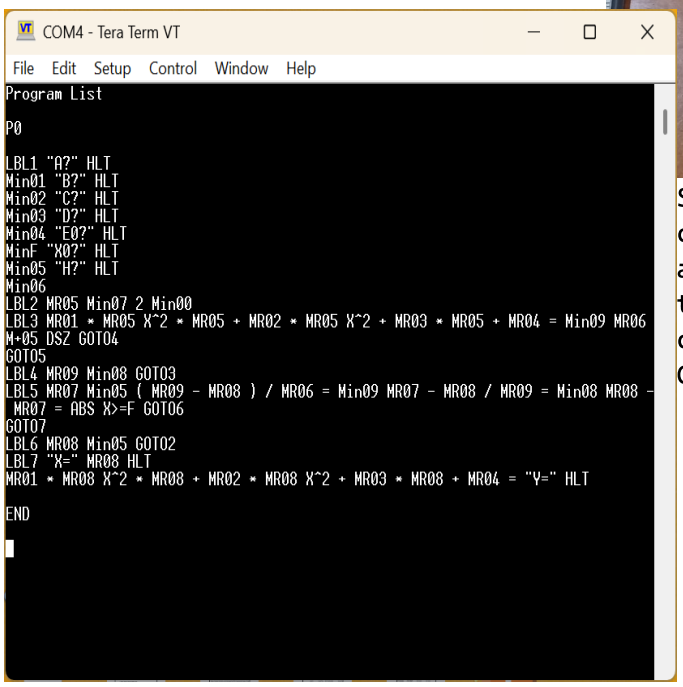
Send a program	**[SHIFT][RSSAVE][Pn][EXEC]**
Send all program and memory	**[SHIFT][RSSAVE][SHIFT][EXEC]**
Send memory contents	**[MODE][1][SHIFT][RSSAVE][EXEC]**
Receive a program	**[SHIFT][RSLOAD][Pn][EXEC]**
Receive all programs and memory	**[SHIFT][RSSAVE][SHIFT][EXEC]**
Receive memory contents	**[MODE][1][SHIFT][RSLOAD][EXEC]**

CASIO USB Interface Cable

The picture demonstrates a CASIO FX-603P connecting to a PC using the CASIO USB Connector[9].



The CASIO USB interface cable is functionally equivalent to connecting the FA-6's serial port to a computer via a USB-to-serial adapter, providing direct PC-to-calculator RS232C transfer for the FX-603P and other compatible models. All of the FA-6 configuration and transfer examples in this guide apply equally to the Casio USB interface cable.



Showing the results of transferring our cubic program to the PC. Note that another USB COM port was created by this interface cable (COM4). It was configured with the same parameters as COM3 in the FA-6 sections.

9 https://www.casio880.com/en/product/cable-interface-casio-usb-880850en/

CASIO-CASIO Connector Notes



The picture demonstrates a CASIO VX-4 connected to a CASIO FX-603P using a CASIO-CASIO connector[10].

Of academic interest, files can also be transferred directly to the VX-4 or any other FA-6-compatible device. Use the **[F.COM]** menu and load the file using:

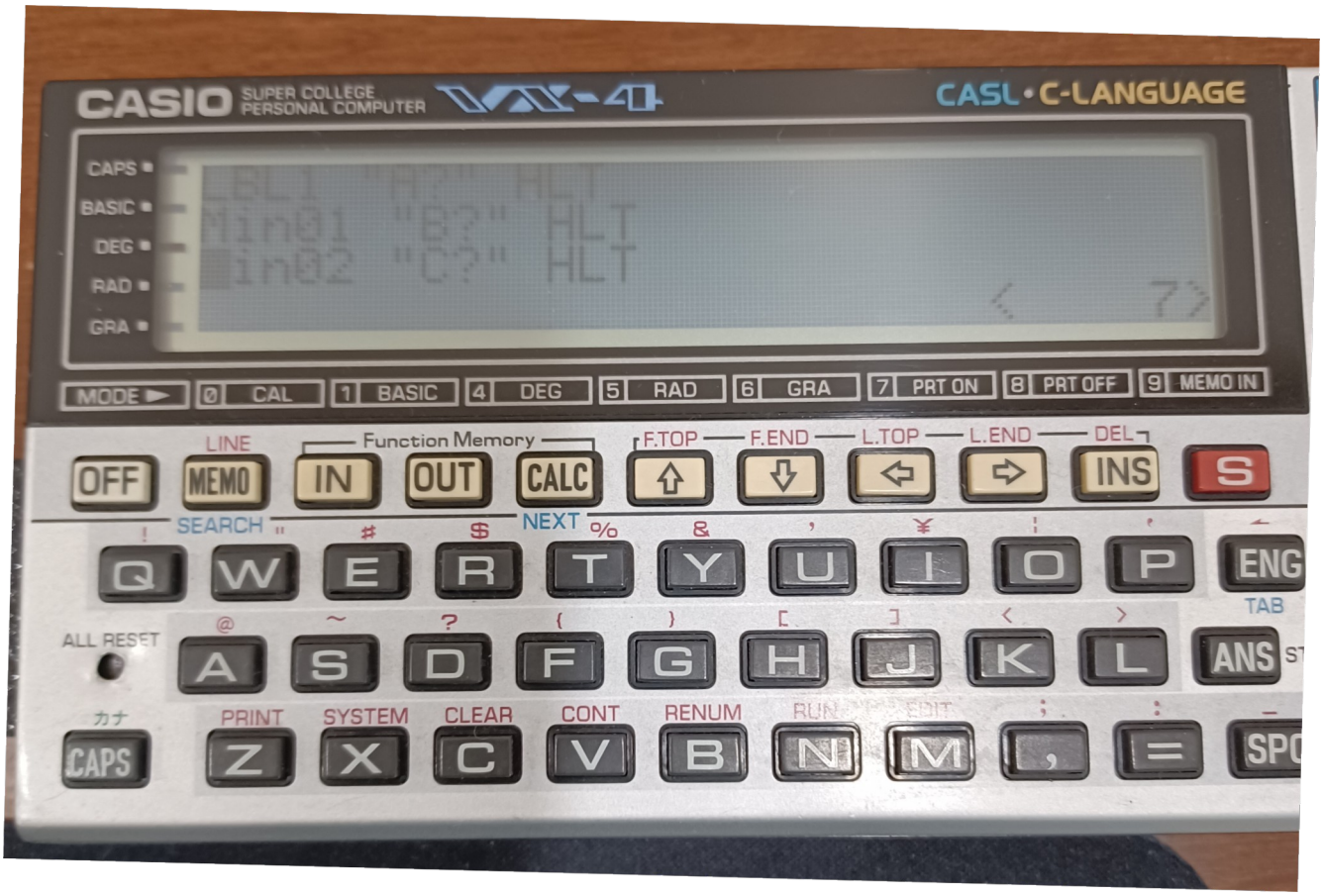
COM0:4,E,8,2,N,N,N,N,N

RSSAVE the program, and it will be transferred directly to the device.

Files can likewise be sent to the FX-603P and **RSSLOAD**ed directly into the calculator.

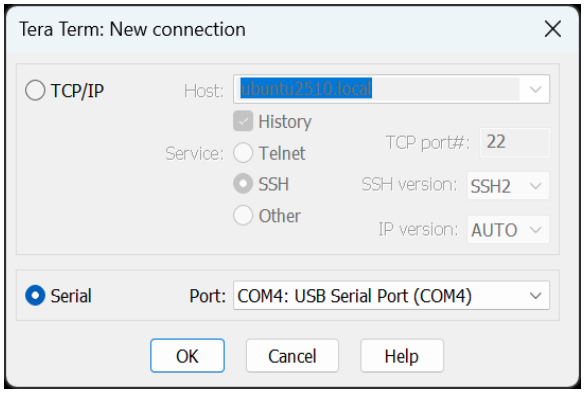
10 https://www.casio880.com/en/product/interface-cable-casio-casio-for-calculators-casio-fx-880p-fx-850p-z-1gr-vx-4-fx-603p-fx-890p/

The unusual sight of a FX-603P program in a VX-4 file.



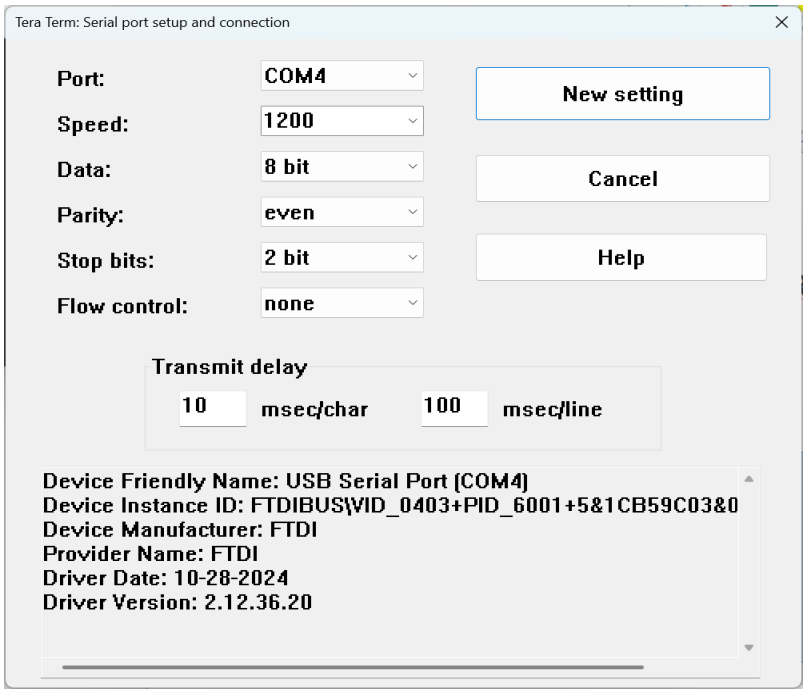
TeraTerm Notes

Configure a New connection, Serial on your USB Serial Port

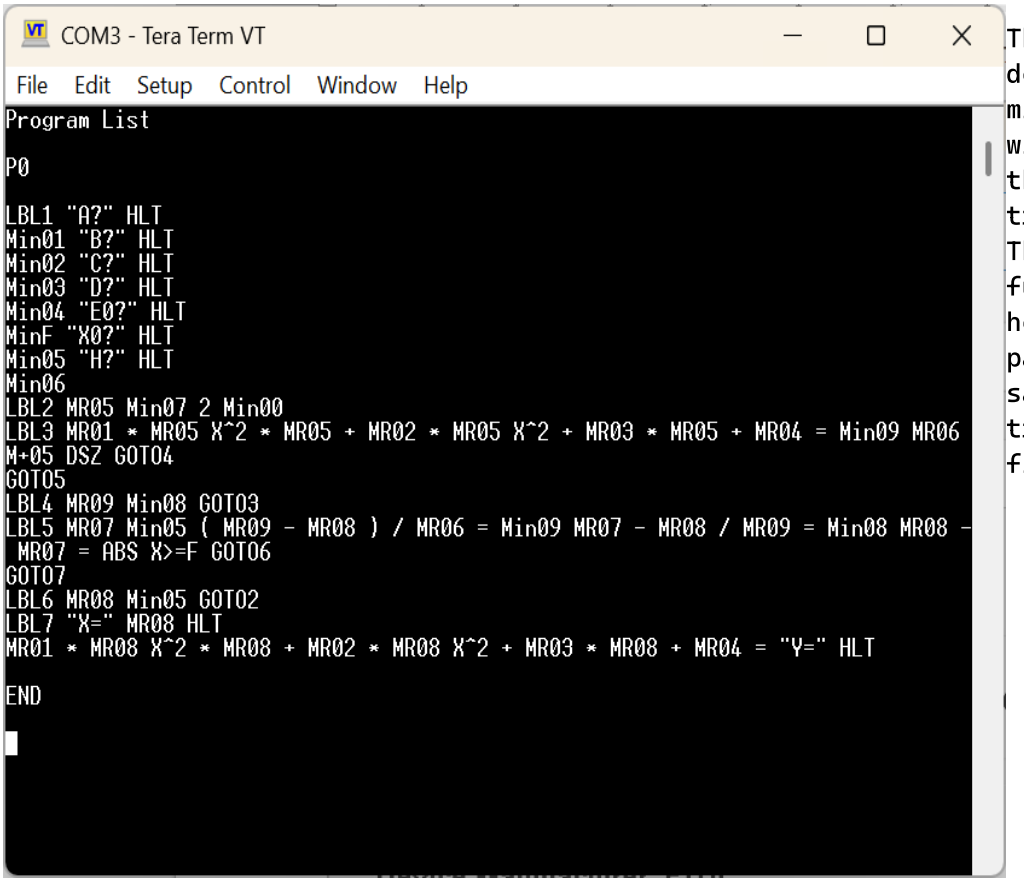


Connection parameters

(Press New setting to confirm)



Listing our cubic program on TeraTerm:



The interactions documented using minicom are similar, with the exception of the lack of an ASCII transfer function. The copy/paste functions in TeraTerm honor the delay parameters so it is safe to use them to transfer larger files.

Suggested Community Enhancements

It would be wonderful to have all FX-603P programs from the CASIO collection transcribed and verified. As the Cubic Solver example has already shown, this historic document almost certainly contains a number of typographical and printing errors waiting to be discovered. Every verified program helps preserve the accuracy of this remarkable collection for future enthusiasts.

Enhance this guide by documenting and testing the communication behavior using XON/OFF.

Acknowledgments

This User Guide was produced by Xandrian Labs. 付喪神.

In accordance with ShareAlike licensing guidelines, this guide incorporates and expands upon community-developed resources. All derivative works must be released under identical license terms to sustain and support the vintage computing community.