Summary of the RIGOL DS1052E 50MHz → 100MHz (DS1102E-like) RS-232 Softhack for a RIGOL DS1052E with firmware Ver. 2.02 SP2 or Ver. 2.04 (new)

by IPenguin – July 24, 2010 – rev. 1.01, July 26, 2010

Yesterday I received a new (original) Rigol DS1052E DSO from an official Rigol distributor in Europe. It came with firmware Ver. 2.04, the firmware RIGOL released and that was supposed to put an end to the hack after the original hack that works/worked on firmware Ver. 2.02 SP2 and earlier became publicly known via David L. Jones' EEVblog

EEVblog #70 – Turn your Rigol DS1052E Oscilloscope into a 100MHz DS1102E (Hack)

EEVblog #77 – Rigol DS1052E DS1102E Oscilloscope Hack Update

and a number of posts on his EEVblog - The Electronics Engineering Video Blog forum in particular in The Rigol DS1052E thread and on the RCGroups.com forum in the Rigol Digital Storage Oscilloscopes? thread inspired me to buy the scope and to try out the hack.

First a **non-nonsense** and **do-not-hold-anyone-but-yourself-liable warning** before I will describe the hack – don't read on or even try the hack if you are not willing to take the full and sole responsibility for everything you will be doing when following this summary/description and the results and consequences thereof:

- There is absolutely no guarantee the hack will work on your DS1052E (or any other DSO) nor that the DSO will operate properly after the hack has been applied (so, many have reported success)!
- Before the upgrade, please contact RIGOL Technical and Support Department to **confirm whether the current firmware version can be upgraded(/downgraded) to the target version or not.** (RIGOL Upgrade Notice - Publication number UN-080612)
- By performing the hack (or any similar modification) you will void the manufacturers warranty. Even in case of problems that may not be a direct result of the hack, RIGOL may rightfully refuse to provide services/replacements under warranty for hacked/modified units even if the warranty has not expired yet. The hack is a direct infringement of RIGOL's warranty terms.
- Do this at your own rik. Accept that you yourself take full and unrestricted responsibilty for attempting and/or effectively executing any of the steps/actions described hereafter! Don't hold me or anyone but yourself liable if anything goes wrong, including any consequential damage and/or losses.
- **Don't use a hacked/modified DSOs in any project that requires accurate meassurement – in particular not if the function of the circuitry depends on it!**
- **Don't try the hack on a RIGOL DS1052D** (model with 16ch logic analyzer) or on any other RIGOL equipment – I tested the hack on a DS1052E only!

This document describes only the softhack using the RS-232 port on the RIGOL DS1052E (including the downgrade from firmware Ver. 2.04 to Ver. 2.02 SP2 – the hack does not work with firmware Ver. 2.04, so a downgrade to Ver. 2.02 SP will make it possible) and is based on

> MTWs post in The Rigol DS1052E thread

on the EEVblog forum. The hack using the USB port on the RIGOL DS1052E can be found on the EEVblog board (it provides a safer procedure than the RS-232/HyperTerminal hack described in this document):

> changing the rigol DS1052E to DS1102E using USB , the dummy guide by polossati

Prerequisites - what you will need

A	RIGOL DS1052E DSO with firmware Ver. 2.02 SP2 or Ver. 2.04 and a power cord
B1	a Windows (2000, XP) PC with a serial port or
B2	a Windows (2000, XP) PC with a USB ↔ RS-232 adapter cable (with installed virtual COM port drivers)
C	a 1:1 (straight-through) DB9 female ↔ DB9 female cable (2<-->2, 3<-->3, 5<-->5)
D	RIGOL DS1000D/E firmware update package 2.02 SP2 (DS1000_D,E_Upd_v2_02_02.zip)
D(opt)	RIGOL DS1000D/E firmware update package 2.04 (DS1000E(D)(DSP)00.02.04.zip)
E	an empty USB memory stick that's confirmed to work correctly on the RIGOL's USB port (it must be recognized by the DS1052E when plugged into the USB port: "***USB device install success***")

Preparation

1. Get familiar with the basic procedures!

Get and read following two documents to get acquainted with the firmware update process and using SCPI remote commands with Windows HyperTerminal via RS-232:

- RIGOL Series products Upgrade Steps and Notice - UN-080612 – RIGOL June 2008 (included in `DS1000_D,E_Upd_v2_02_02.zip`)
- RS232 Interface Using Windows Hyper Terminal - AN091220-00 – RIGOL

2. Test your DS1052E for model, serial number, firmware version.

- turn the DSO on
- push the “Utility” button in the Menu group
- select “System Info” (3/3)
- if your DSO came with firmware Ver. 2.04 you will see (S/N will be different)

- if it came with firmware Ver. 2.02 SP2 you will see (S/N will be different)

- write down the 9-digit serial number (S/N), it should be the same S/N as printed on the product sticker on the back of the DSO unit – **in this example we will use 122989898 - you will have to use your actual serial number!**

3. Test and prepare the USB memory stick with firmware Ver. 2.02 SP2
(only needed if firmware Ver. 2.04 is installed)

- ideally you will use an empty USB stick but actually there can be data on the stick – it should have enough free space for the firmware update image, so (at least 4MB, better more)
- plug the USB stick into the USB port on the front side of the DS1052E
- the message “USB device install success” confirms that the USB stick has been recognized by the DS1052E and can be used for the upgrade

- remove the USB stick from the DS1052E
- plug the USB stick into a USB port on your PC
- extract **`DS1000EUpdate.RGL`** (MD5 hash sum 272086b2037231c62446617436544a77) from `DS1000_D,E_Upd_v2_02_02.zip` and **copy it into the root directory of your memory stick**! (Make absolutely sure you copied the DS1000**E**Update.RGL and **not** the DS1000**D**Update.RGL file on the memory stick!)

4. Downgrade the DS1052Es firmware to firmware Ver. 2.02 SP2 (only required if Ver. 2.04 is installed)

- plug the USB memory stick into the USB port on the frontside of the DS1052E
- you should see the message “Detect a lower-version software, upgrade or not?”

- select “OK” (eventhough you are actually downgrading^^)

- while the firmware update/downgrade proceeds make sure the process will not be interrupted!

- until you see the message “Updata successed,please restart”

- unplug the USB memory stick, switch the DS1052E off. This completes the firmware downgrade.

5. Check if the firmware downgrade was successful

- turn the DS1052E back on
- push the “Utility” button in the Menu group
- select “System Info” (3/3) – you should now see:

Hacking the DS1052E for 100MHz operation (DS1102E-like)

1. Connect the DS1052E to your PC (RS-232 connection)

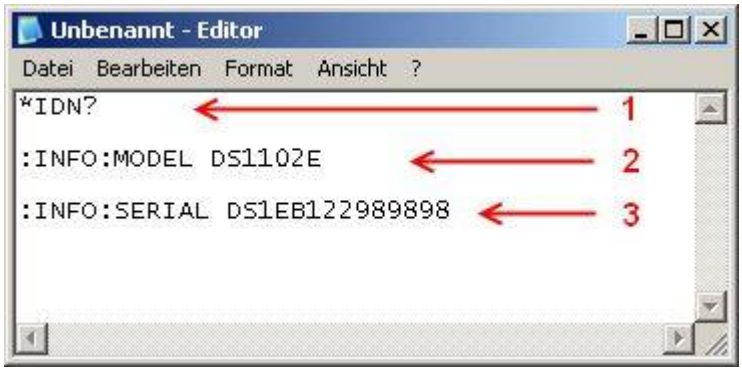
- connect the DS1052E RS-232 port (backside) with the 1:1 (straight-through) DB9 female ↔ DB9 female cable to the/a COM port on your PC

- or use a USB ↔ RS-232 adapter cable – connect the USB side to a USB port on your PC and the RS-232 (DB9 female) connector to the RS-232 port on the backside of the DS1052E

2. Prepare and verify the strings needed for the hack in an editor, e.g. Notepad

- open Notepad (Start → All Programs → Notepad)
- type in the 3 strings that will be needed for the hack as shown below (make sure there are no trailing space characters behind the text!)

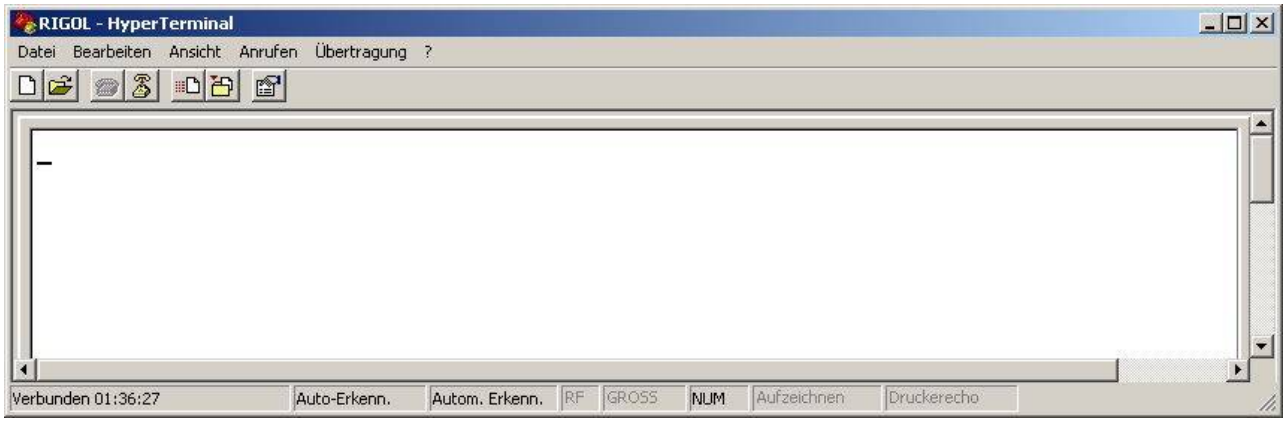
```
1. *IDN?
2. :INFO:MODEL DS1102E
3. :INFO:SERIAL DS1EB122989898
```
(make sure to enter your S/N instead of 122989898)



- keep Notepad open, you will copy&paste the strings from there to HyperTerminal later (Step 4.)

3. Start and configure HyperTerminal on your PC

- Start → All Programs → Accessories → Communications → HyperTerminal
- enter a name for the connection, e.g. “Rigol” → OK
- select the COM port you have connected the DS1052E to (we use COM1 in this example)
- set the communication parameters to
  Bits per second: 9600
  Data bits: 8
  Parity: None
  Stop bits: 1
  Flow-control: None
  → OK
- you should now see a blank HyperTerminal window/screen



- click on the Properties icon or select Properties from the Files menu
- the Properties window will open, select Settings
- the Settings window/screen will open, click on “ASCII Setup”
- the ASCII Setup window/screen will open, check/tag

  Send line ends with line feeds
  Echo typed characters locally
  (Line delay 0 milliseconds)
  (Character delay 0 milliseconds)
  Append line feeds to incoming line
  (do not check “Force incoming data to 7-Bit ASCII”)
  Wrap lines that exceed terminal width

  → OK → OK will get you back to the empty HyperTerminal screen.

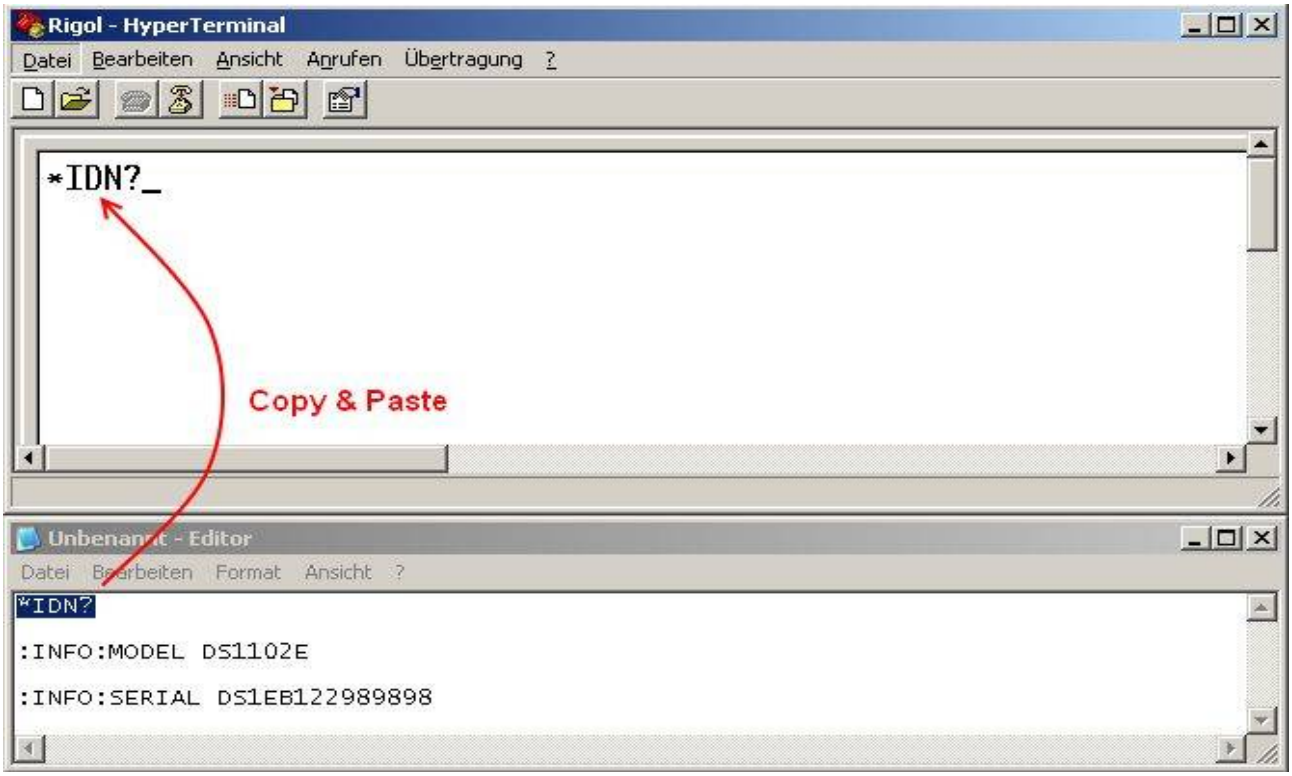
4. Performe the DS1052E 50MHz → 100MHz hack

- **now it gets serious and you should continue with great care, double-checking every single step before executing it!**

- **Whenever terminating/entering each step/command do NOT use the ENTER key!!!! Instead insert ASCII code 10, by holding the “Alt” key, using the numeric key pad of your keyboard type 010!**

- **In case you mistype any character do NOT use the BACKSPACE key or any other way to correct the error in the HyperTerminal session (as this will cause wrong data to be written to memory and may brick the unit)! Power the DSO off, close the HyperTerminal session and restart at Step 3.**

- copy the “*IDN?” string (1) from Notepad and paste it into HyperTerminal (or type in `*IDN?`)



- **press and hold the ALT key down, type 010 on the numeric keypad, then release the ALT key**

- the response will be

  `Rigol Technologies,DS1052E,DS1ED`***`122989898`***`,00.02.02.02.00`

  instead of 122989898 you will see your serial number.

- to change the model to DS1102E copy the ":INFO:MODEL DS1102E" string (2) from Notepad and paste it into HyperTerminal (or type in)

  ```
  :INFO:MODEL DS1102E
  ```

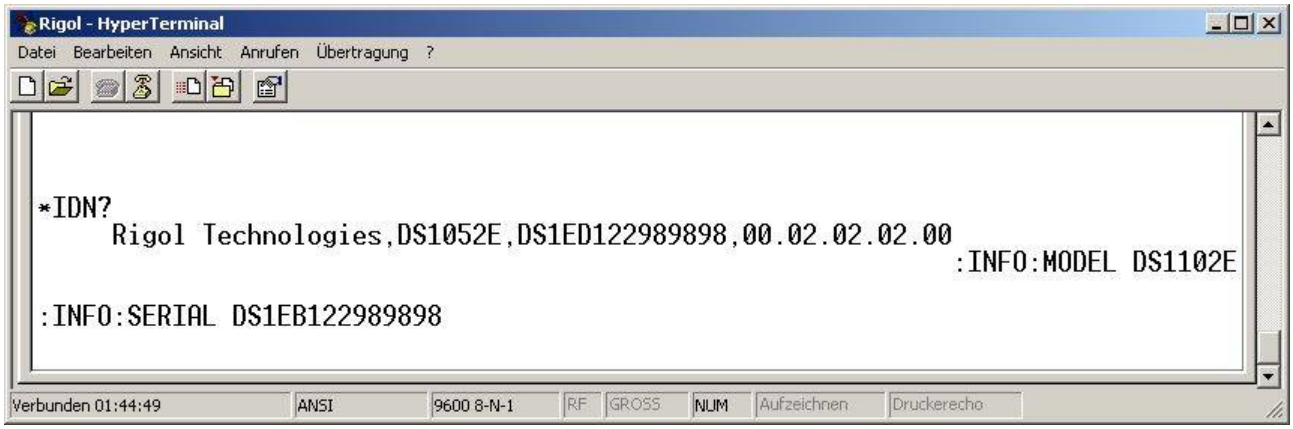
  press and hold the ALT key down, type 010 on the numeric keypad, then release the ALT key

- to change the serial number to a matching DS1102E serial number (**remember to replace 122989898 with your serial number and to change the leading part of the serial number from DS1ED to DS1EB**) copy your "INFO:SERIAL DS1E**B122989898**" string (3) from Notepad and paste it into HyperTerminal (or type in)

  ```
  :INFO:SERIAL DS1EB122989898
  ```

  press and hold the ALT key down, type 010 on the numeric keypad, then release the ALT key

  Here is the full sequence as it should show in HyperTerminal:



- this completes the hack, switch the DS1052E (hopefully it will act like a DS1102E now) off and wait a few seconds

5. Verify the hack and recalibrate the 100MHz DS1052E(DS1102E-like)

- switch the unit back on
- push the "Utility" button in the Menu group and select "System Info" (3/3) – you should now see:

- press “RUN/STOP” and turn the Horizontal Scale knob clockwise (towards ns) until you get the message “Time/Div at limit” – if the time base shows 2ns you have succeeded!

- keep the unit turned on for 30 min and perform the self-calibration procedure as described in the RIGOL DS1000E, DS1000D Series Digital Oscilloscopes User's Guide - UGA07112-1110 (don't forget to disconnect all probes and cables from the input channels before starting the self-calibration!)

Be aware that after having succeeded in applying the hack and even after succesful completion of the self-calibration procedure there is no guarantee that the unit will perform/comply to/with the specifications of a DS1102E (not even to the specifications of a DS1052E anymore) over the full operating range!

Testing if the hacked DS1052E really performs to the specs of the DS1102E is beyond the scope of this summary! If you will depend on the unit to comply with the specifications of the DS1102E, do NOT hack a DS1052E. Instead buy an original DS1102E from an official RIGOL distributor for an extra US$ 180-250!

Special thanks to David L. Jones for publishing this hack on his EEVblog and to all who contributed to making it possible! Beauty! :)

Thanks to rct for suggestions to improve this summary.

Absolutely no credits to me – I haven't contributed anything to the hack! All I have done is watched/read and followed the steps described in the EEVblog video casts and the details/descriptions posted by many others on the EEVblog forum and the RCGroups.com forum and then documented the process how I performed the hack.

July 24, 2010 – IPenguin!