

CBT/CBT32

Introduction

This page is a placeholder on how to configure and use a R&S CBT/CBT32 Bluetooth Protocol Analyzer with our boards.

References

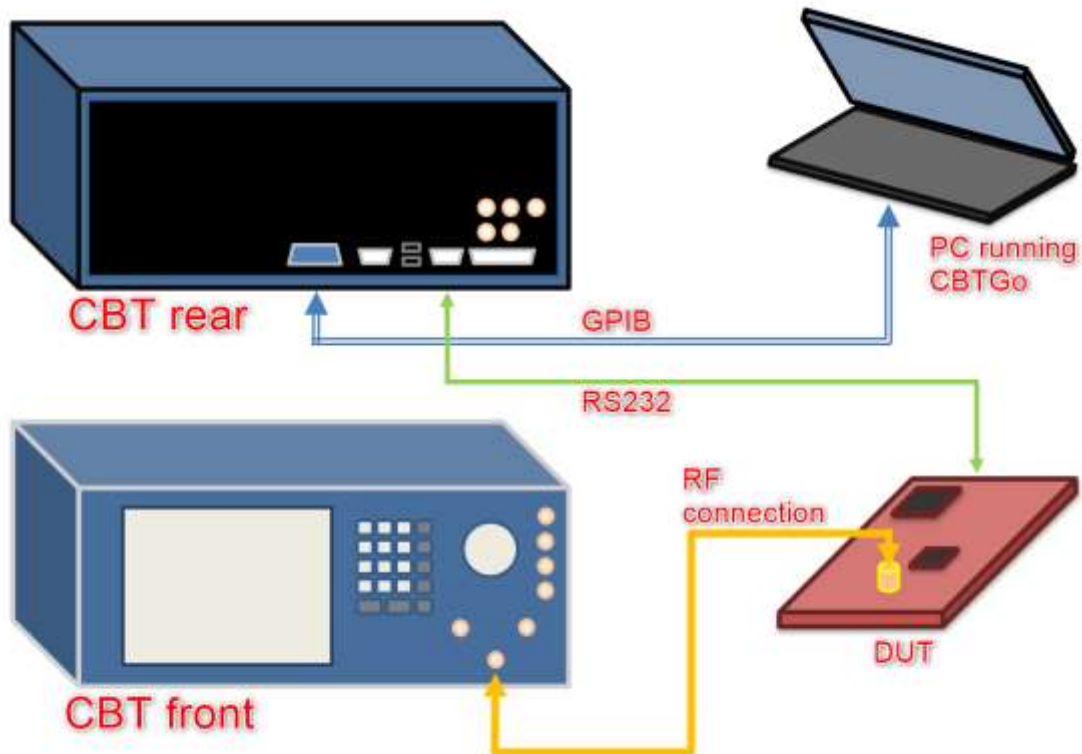
- CBT/CBT32 page at Rhode & Schwarz website: https://www.rohde-schwarz.com/us/product/cbt_cbt32-productstartpage_63493-7927.html
- CBTgo software: https://www.rohde-schwarz.com/us/software/cbt_cbt32/
- App note about testing Bluetooth devices with CBTgo: https://www.rohde-schwarz.com/us/applications/measurements-on-bluetooth-devices-using-r-s-cmu200-and-r-s-cmugo-application-note_56280-15848.html
- Configuring the CC2640 for Bluetooth Direct Test Mode: <https://www.ti.com/lit/an/swra530/swra530.pdf>

Requirements

- A computer running Windows 7 or 10
- CBTgo software
- CBT/CBT32 tester
 - The Analyzer itself is **CBT** and the attenuator is **CBT32**
- The DUT (Device Under Test) furnished with a coaxial connector to be plugged to the test system. Hardware details on section 3.1 of the SWRA530 app note
- A GPIB card or USB accessory and the appropriate GPIB cable to connect to the CBT tester. This procedure used a [National Instruments GPIB-USB-HS](#) interface.
- A RS232 voltage translator accessory. **This is very important!** The voltages on the RS232 port in the back of the CBT tester are high and will damage your DUT.
- A Straight RS232 cable (**not null modem**) - typically female connector (to connect on the back port of the CBT tester) and a male connector (to connect on the RS232 voltage translator)

Initial setup

The overall setup is shown in the diagram below:



1. First step is to install the CBTgo software in your host PC.
 - The CBTgo Help (F1 key) is very helpful to understand the setup and connections required. Check the topics *Quick Start → Connecting the PD to the R&S CBT* and *Quick Start → Connecting Bluetooth Low Energy Device*
2. Connect the GPIB interface of the CBT unit to the GPIB interface of the host PC.
 - This procedure will not get into the details about how to configure the GPIB interface in your host PC
 - The CBT unit can be remotely controlled via RS232 or via GPIB. However, to test Bluetooth Low Energy devices the RS232 port must be used to control the DUT.
3. Connect the RS232 voltage translator to the port on the back of the CBT unit.
 - The CBT RS232 port pinout corresponds to a DTE (Data Terminal Equipment) - i.e., pin 2 is Rx, pin 3 is Tx and pin 5 is GND.
 - Most RS232 voltage translators expect to be connected to a DTE, so use a straight serial cable (not null modem) - check the documentation of your RS232 voltage translator unit.
4. Connect the output of the RS232 voltage translator to the DUT.
 - Be sure to connect the Tx output of the voltage translator to the Rx input of the DUT. Similarly, connect the Rx input of the voltage translator to the Tx output of the DUT.

- Connect the GND pin of the voltage translator to the GND pin of the DUT.
IMPORTANT! Be extremely careful with ground voltage differences that can damage the tester, the host PC or the DUT (for details, check [this video](#) from a famous youtube electronics blogger)

5. Connect the RF connection between the CBT and the DUT

- Most probably an external attenuator will be needed.
- Any RF connections must be thoroughly characterized using a VNA or a calibrated Spectrum Analyzer, as differences in attenuation across the spectrum range may cause tests to fail.

6. Power on the system in this order: host PC, CBT, DUT and RS232 voltage translator

- It was observed that powering the RS232 voltage translator before the DUT can cause it to be in a strange state.

7. The DUT must have a DTM software loaded and running on it, so it can properly receive the HCI commands from the CBT unit.

- If the DUT maps the pins of the UART port the same way as our Launchpads, the host_test project from our SDKs can be used.
- Attention must be taken also if there are no variations w.r.t. the crystal and other hardware aspects that influence the RF configuration.

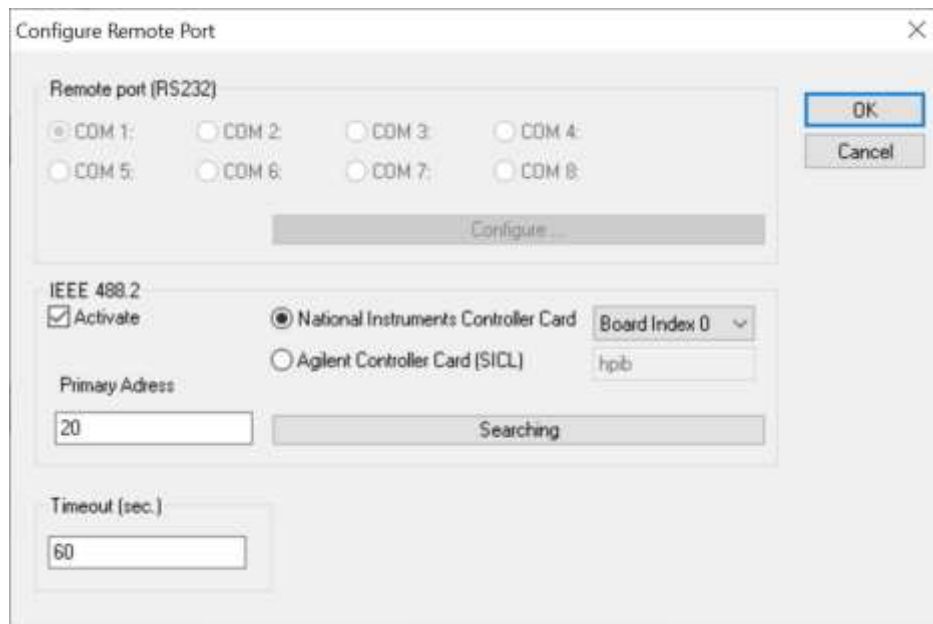
CBTgo setup

The setup of the CBTgo software is only necessary if the intention is to remotely control the tester. This is highly recommended to generate test reports.

A very comprehensive reference is the Help menu of the CBTgo software (F1 key). It contains very thorough explanations about the process and each menu option.

1. First step is to set up the GPIB connection on the menu *Configuration* → *Remote Port*. In this setup, the National Instruments Controller USB to GPIB adapter was used.

- The *Searching* button is useful to find out the address of the CBT device. If there is a cable problem, this procedure might cause CBTgo to run for a very long time or lockup (useful troubleshooting).



2. Go to menu *Configuration* → *BT Low Energy device*. This will setup the RS232 port to the DUT.

- Select the CBT (COM1) and click on *Configure* to setup the UART settings (baud rate, flow control, start, stop and parity bits). The host_test uses 115200, 8N1 and no flow control.
- Also, make sure the field *EUT Protocol* is set to HCI.

Configuration Low Energy Device

Configuration

Config 1

Control

Name: Config 1

☐ Popup

☒ CBT (COM 1)

Configure...

☐ CBT (CBT-ZUSB)

☒ Reset EUT

☐ External application

Configure...

☒ Enable

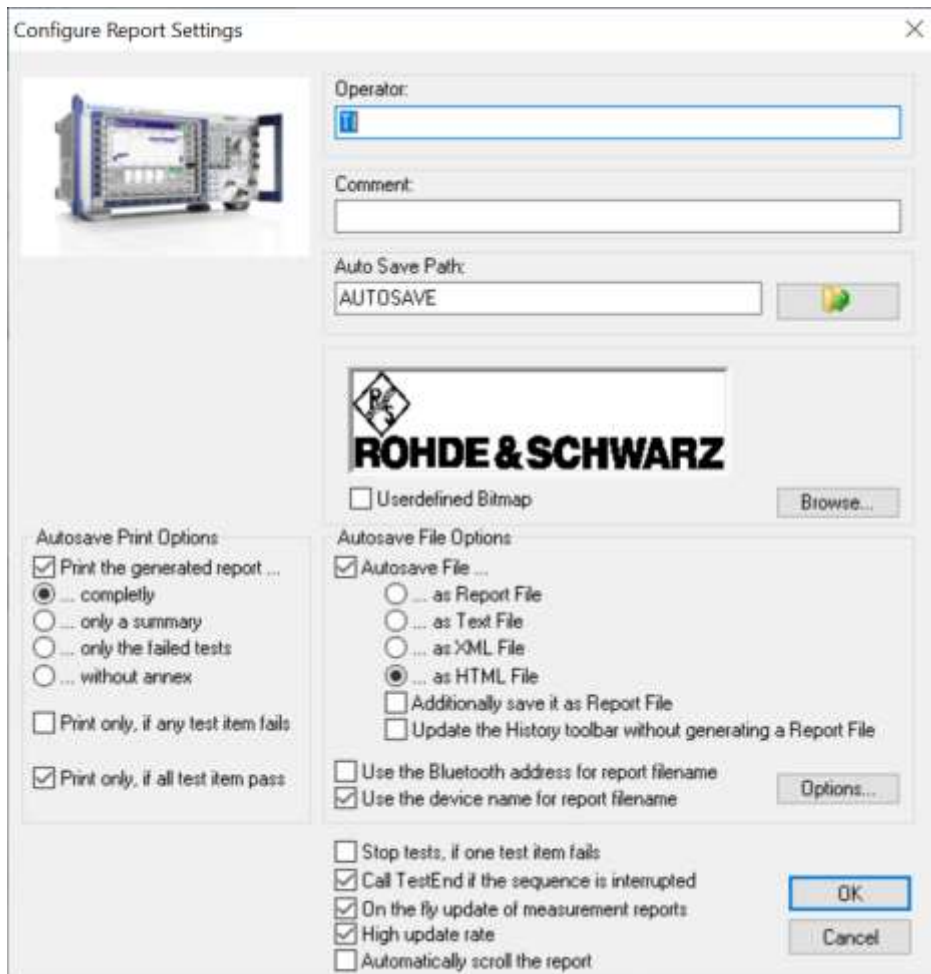
OK

Cancel

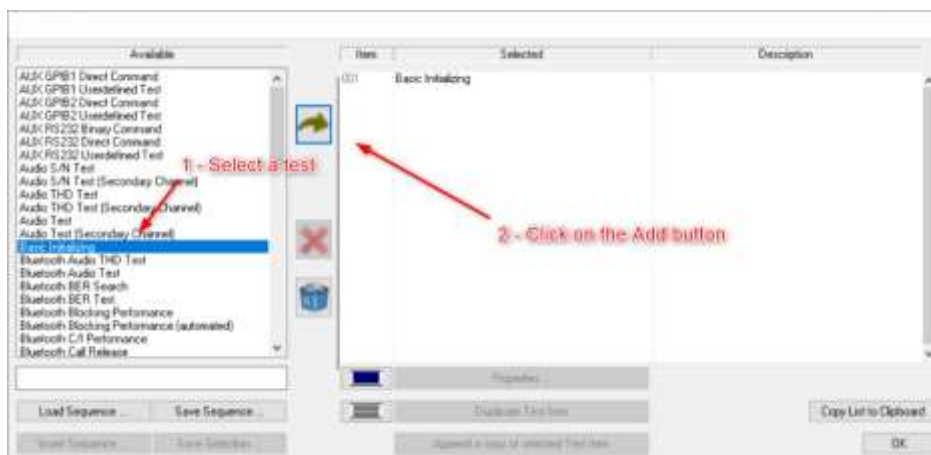


3. Go to menu *Configuration* → *Measurement Report*. This allows configuring the various formats to present the test results.

- Several fields are self explainable (Operator, Comments, etc) and, in case of questions, the help reference (at *User Interface* → *Configuration menu* → *Measurement Report*) is very useful.
- The *Autosave Print Options* controls the amount of information that will be present in the report. It is useful to select the option *completely* to get the full set of results. Also, if you have a printer driver that "Prints to PDF" (Adobe, Foxit, etc.) it is very useful to share a PDF file directly with customers.
- The *Autosave File Options* controls the file type to save. The HTML format is the nicer one, although the Text or XML might be easier to feed into a script or parser to populate a spreadsheet.

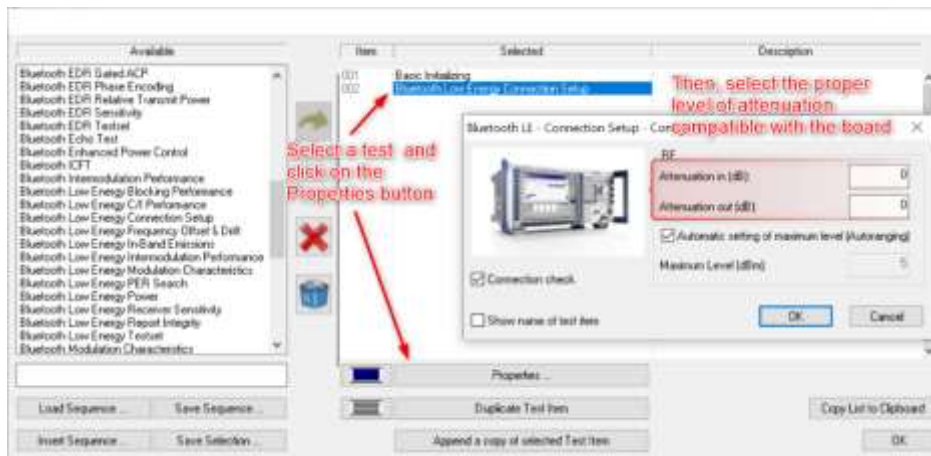


4. Go to menu *Configuration* → *Configure Tests*. That is where all the test steps will take place, including the initialization and termination of the sequence.



- The test sequence always starts with the *Basic Initializing* (which sets up the function groups to be tested)

- For Bluetooth LE, the second step is the *Bluetooth Low Energy Connection Setup*, which sets the RF connection parameters between the DUT and the CBT, including the external attenuator (mentioned in the prior section).



- Keep adding test steps to the sequence and configuring their properties. Comprehensive description of each test is shown in the help reference (at *Test Reference* → *Test Items*)
- Optionally, use one of the existing pre-defined Test Sequences by clicking on the button *Load Sequence*. It will contain a complete set of tests. Comprehensive description of each Test Sequence is shown in the help reference (at *Test Reference* → *Test Sequences*).

5. Once all is ready, simply click on the Play button at the top toolbar to initiate the tests.



The end of the test sequence

Once the tests finish running successfully, CBTgo will prompt to Save the report and/or Print it (if the option is chosen).