

VRbot with MikroE Boards (rev. 1.1)

VRbot Module

The VRbot module provides voice recognition functions for built-in Speaker Independent (SI) commands and up to 32 user-defined commands (Speaker Dependent (SD) trigger or commands, Voice passwords (SV)).

A simple and robust serial protocol can be used to access these functions from the user's microcontroller boards.

Pinout

- 1 – GND
- 2 – VCC (3.3 to 5VDC)
- 3 – ERX (serial input)
- 4 – ETX (serial output)



Vocal commands should be given from about 60cm from the microphone but you can try at greater distances by using a louder voice

Hardware setup

First of all download the firmware from the "VRbot_Demo" project on the MikroE board, please refer to your board documentation for details on how to do it. In this example we use the EasyPIC5 board, if you have a different board you can modify source code and jumpers/dip switches settings as appropriate for your board.



The VRbot module must be disconnected from the EasyPIC5 when downloading the firmware to the MikroE board

After you have successfully installed the FW on the EasyPIC5 you can connect the VRbot module to the MikroE board.

With the board switched off, connect the VRbot module to the EasyPIC5 board as in the following diagram. Connect the microphone to the white MIC connector.

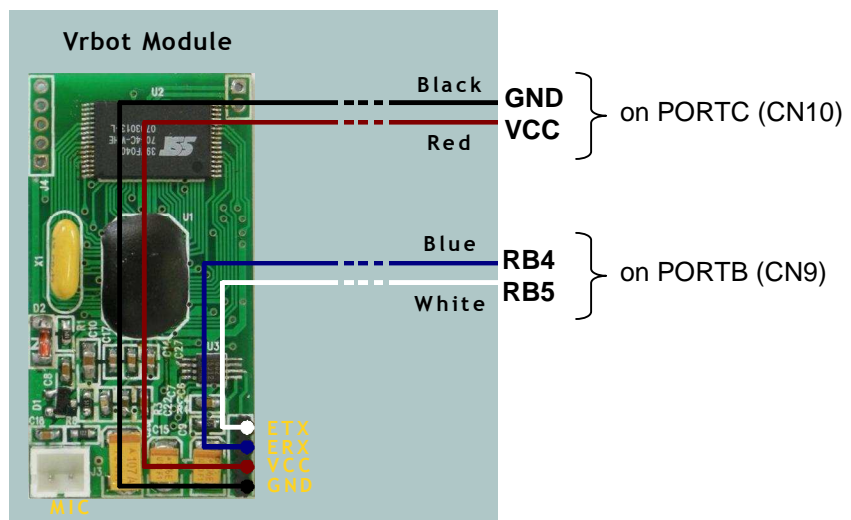


Figure 1: "bridge" configuration needed to run VRbot GUI

For EasyPIC5, be sure to set some dip switches and jumpers as follows:



- ☐ **SW7: position 4 ON, all other OFF**
- ☐ **SW8: position 2 ON, all other OFF**
- ☐ **SW3: position 8 ON, all other OFF**
- ☐ **SW2: all OFF**
- ☐ **J3: jumper on pull-up**
- ☐ **SW6: position 1 to 4 OFF, all other ON**
- ☐ **SW9: position 1 to 2 OFF, all other don't care**

Then connect a serial cable from the DB9 connector to your PC and turn on the EasyPIC5 board: you should see "-PC-" blinking on the 7-segment display.

Now you are ready to run the VRbot GUI software.

VRbotGUI Software

The VRbotGUI software can be used to easily connect the PC to the VRbot module, without the need of additional adapter boards, but simply by using the EasyPIC5 serial port.

To start using the VRbot GUI software, select the serial port to use (the one you connect the EasyPIC5 board to) from the toolbar or the “File” menu, then go with the “Connect” command.



Any software using the same COM port must be closed before selecting “Connect” in VRbot GUI

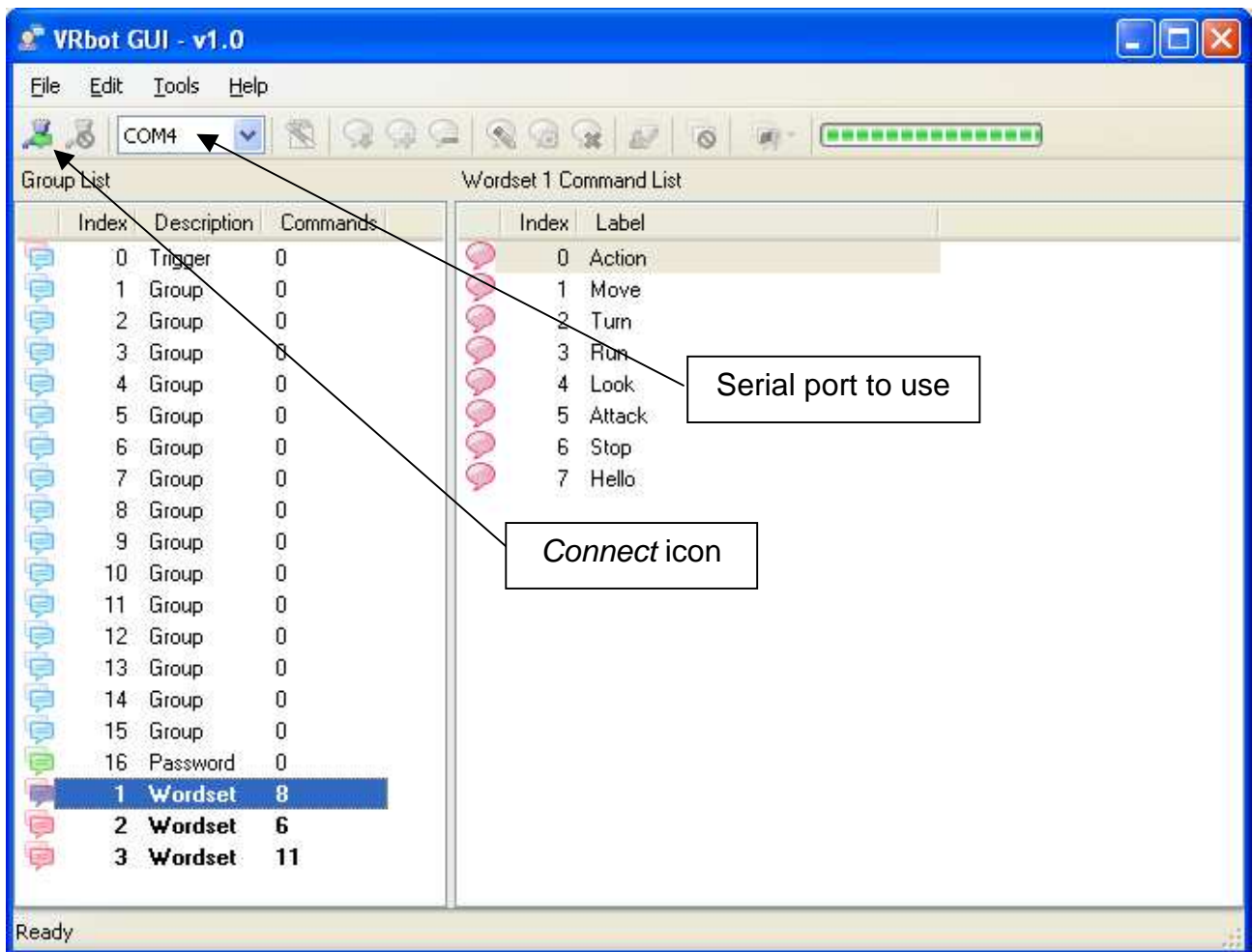


Figure 2

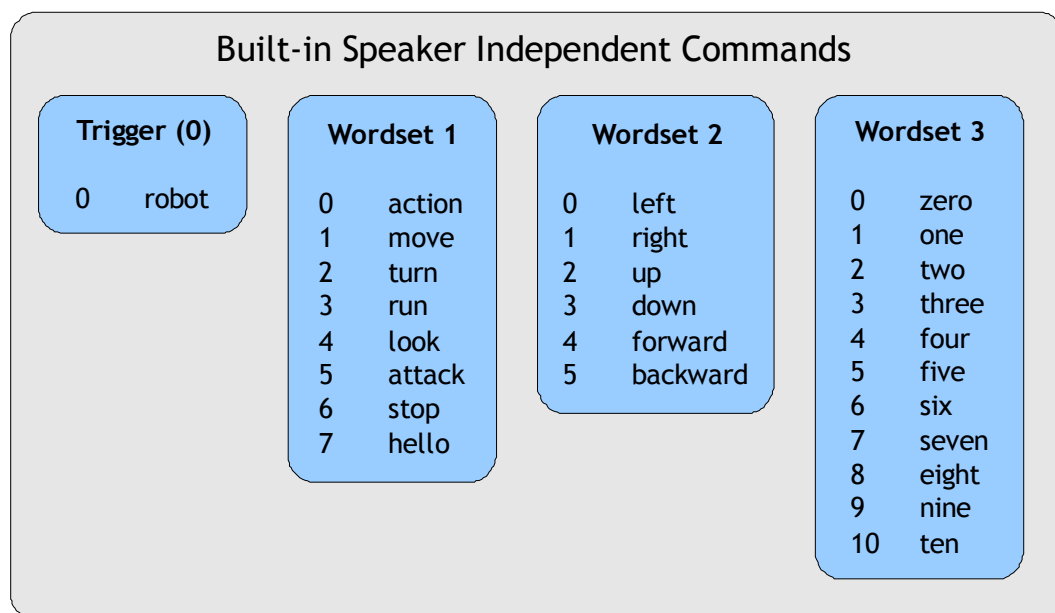


Figure 3

There are four kinds of commands in the GUI (see Figure 2 and Figure 4):

- ☐ Trigger - is a special group where you have the built-in SI trigger word "Robot" and you may add one user-defined SD trigger word. Trigger words are used to start the recognition process
- ☐ Group - where you may add user-defined SD commands

- ☐ Password - a special group for "vocal passwords" (up to five), using Speaker Verification (SV) technology
- ☐ Wordset - built-in set of SI commands (for instance in Figure 2 above, Wordset 1 is selected)

The user can define groups of SD commands or passwords and write a C or basic code to handle them.

The recognition function of VRbot works on a single group at a time, so that users need to group together all the commands that they want to be able to use at the same time.

When VRbotGUI connects to the module, it reads back all the user-defined commands and groups, which are stored into the VRbot module non-volatile memory.

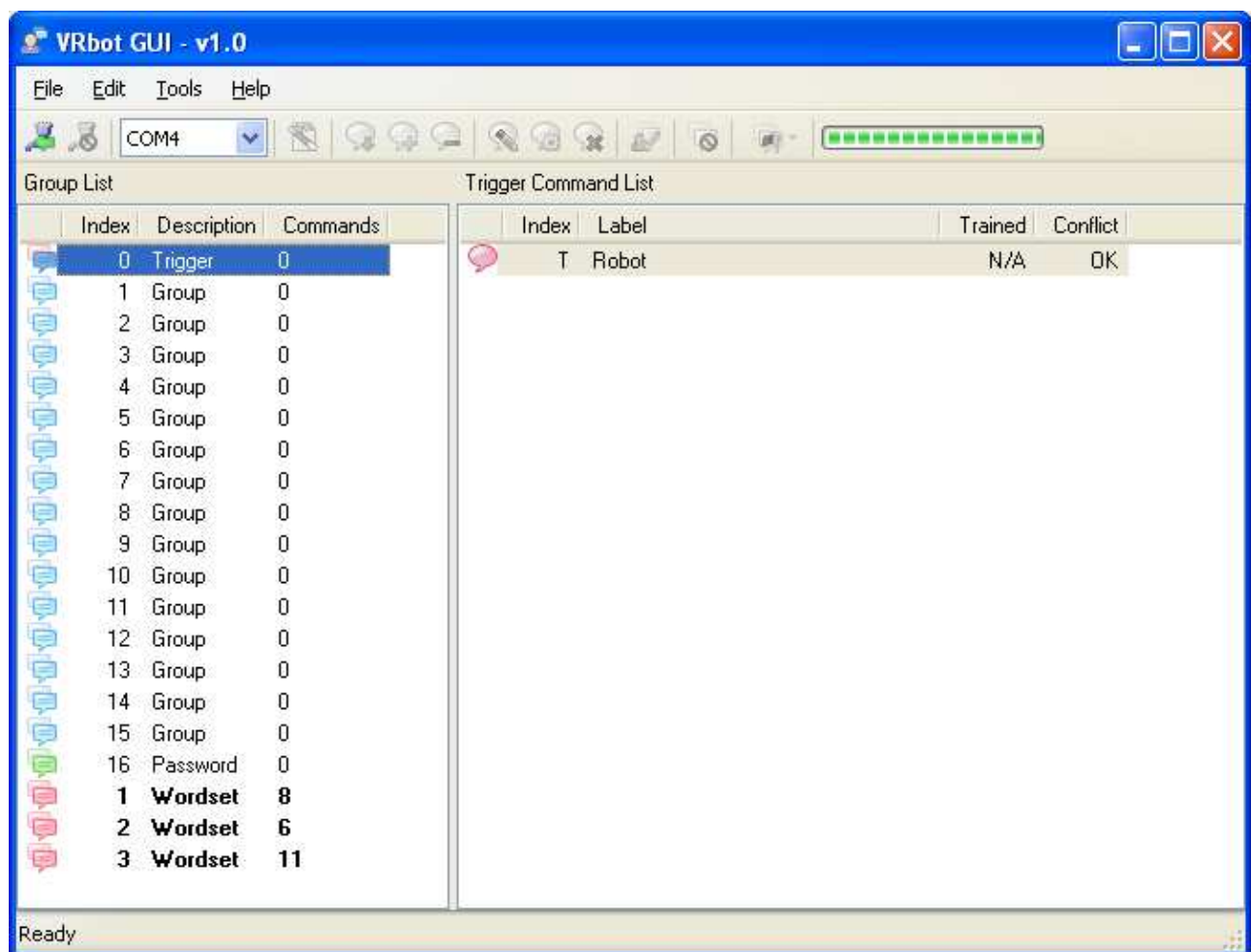


Figure 4

The user can add a new command by first selecting the group in which the command needs to be created and then using the toolbar icons or the "Edit" menu.

A command should be given a label and then it should be trained twice with the user's voice: the user will be guided throughout this process (see Figure 5) when the "train command" icon is clicked or the "train command" is selected from the Edit menu.

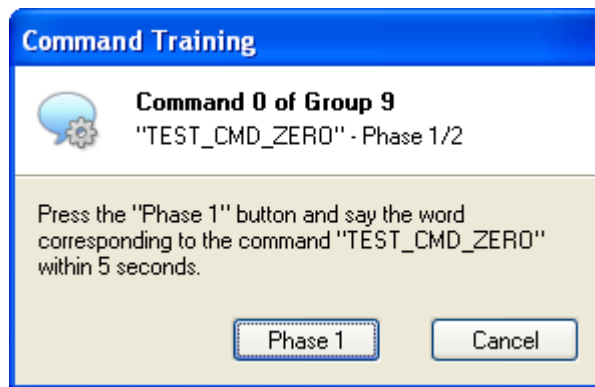
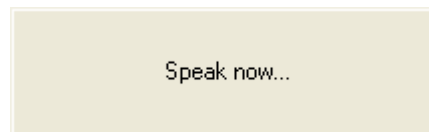


Figure 5

After clicking on Phase 1 or Phase 2 buttons, remember to start speaking only when you see this little window:



If any error happens, command training will be canceled. Errors may happen when the user voice is not heard correctly or when the second word heard is too different from the first. The software will also alert if a command is too similar to another one by specifying the index of the "conflicting command" in the "conflict" column.

For instance, in the following Figure 6 the command "TEST_CMD_ONE" sounds too similar to "TEST_CMD_ZERO" (i.e. they have a too similar pronunciation).



TEST CMD ZERO and TEST CMD ONE are just examples of labels, you should use label names that reflects the real command that you are going to train

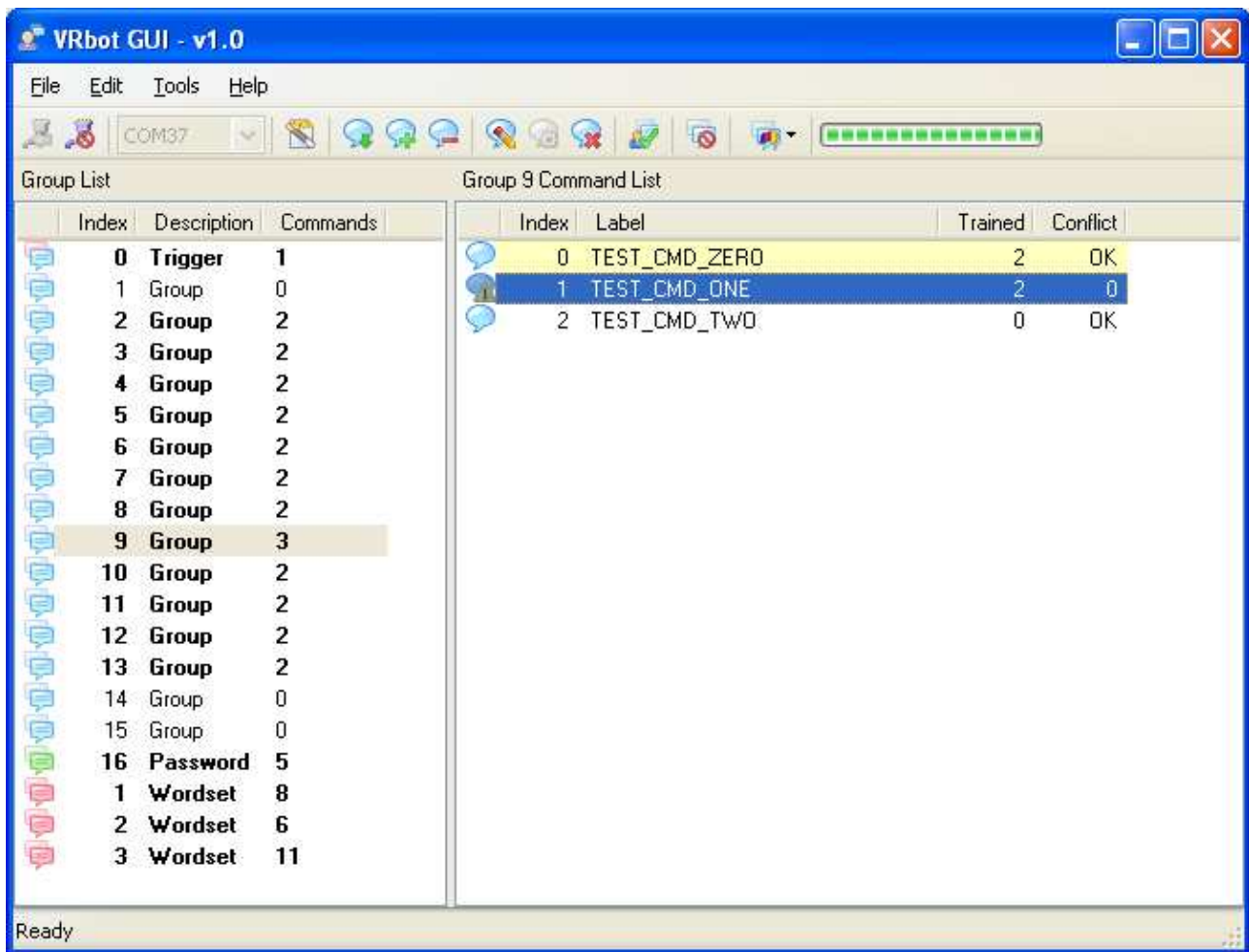


Figure 6

The current status is displayed in the VRbotGUI list view where groups that already contain commands are highlighted in bold.

The selected group of commands can also be tested, by using the icon on the toolbar or the “Tools” menu, to make sure the trained commands can be recognized successfully.



If you want to re-train a command you have to erase the previous training first

Once you have created and trained all your desired commands, you can try them on the EasyPIC5 running the demo firmware. In order to do that just disconnect VRbotGUI, switch off the EasyPIC5 board and change the VRbot connection as in the following diagram:

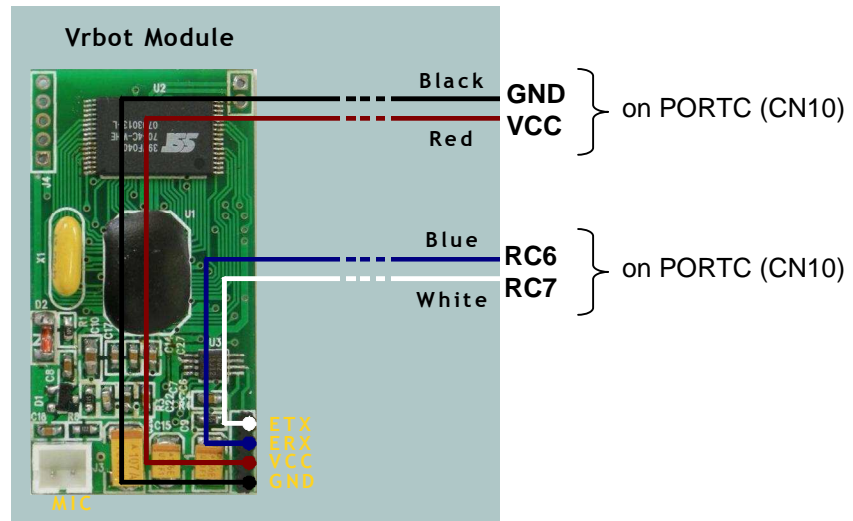


Figure 7: configuration needed to use the VRbot module with the EasyPIC5 firmware

Then turn on the EasyPIC5 and you will see "SI _" and "Sd _" cycling on the 7-segment display. If you want to test SI commands:

- ☐ just press once RE0 button when you see "SI";
- ☐ the available languages will cycle on the display (Eng, Ita, Jap, Ger): just press RE0 when you see the language that you would like to test;
- ☐ once the language is selected, you will see "0._ _" on the display. "0" stands for the selected wordset and the two underscores blinking mean that the system is waiting to hear a command included in wordset zero (i.e. "Robot");
- ☐ if you press once RE0 you will pass to the next wordset (0, 1, 2, 3, 0, 1...) and you will be able to test commands included in the selected wordset;
- ☐ If you say a command the underscores on the right will be replaced with the index of the recognized command in the wordset (for instance if you are in wordset 1 in English and you say "Hello" you should see "1.07" for a couple of seconds);
- ☐ just reset the board to start from the beginning with SI/SD selection.

In order to test SD commands:

- ☐ just press once RE0 button when you see "SD";
- ☐ the first group with existing SD commands will be automatically selected. If no SD commands are present in any group, you will see "no.SD" on the 7-segment display;
- ☐ once a group with SD commands is selected, for instance group 8, you will see "08._ _" on the display. "08" stands for the selected group and the two underscores blinking mean that the system is waiting to hear a command included in that group;
- ☐ if you press once RE0 you will pass to the next group with available commands and you will be able to test commands included in that group;
- ☐ just reset the board to start from the beginning with SI/SD selection.

Starting from this demo C source code and the VRbot protocol, you can create your custom voice recognition application!



"Vocal passwords"(group 16) are much more sensitive to environment noise and distance from the microphone: be sure to train and give the password in similar conditions