qfix robot kits

www.qfix.de

crash-bobby

Instructions

Document No. D0305005R3

Contents

Chapter 1

Introduction

Congratulation on your purchase of the Crash Bobby kit!

The qfix kits are specially designed so that you can gain experience in the mechatronic fields of mechanics, electronics and software. They are equally suited for educational purposes in schools, universities or industry, as they are for the advanced hobby modeler who wishes to become involved in the exciting area of robotics.

In order to keep yourself informed about the latest developments or to obtain spare parts and extension sets or to exchange items with other qfix users, be sure to regularly visit the qfix homepage at `www.qfix.de`.

We wish you many hours of enjoyment with Crash Bobby!

The qfix team

1.1 Components supplied

Please check the contents of the pack. If, despite our comprehensive quality control checks, you find that individual parts are missing, please contact us immediately. The missing parts will, of course, be dispatched to you without delay.

The Crash Bobby kit contains the following individual parts:

Mechanics

1x	base plate, blue
3x	sensor mount
3x	distance piece
2x	motor mount
1x	plate1 20x20x5
1x	plate2 25x20x5
2x	wheel bush
4x	controller board support
1x	steel wire (for pennant)
1x	holder for steel wire
2x	wheel, diameter 50mm
1x	caster wheel incl. threaded pin
11x	screw M6x10
3x	screw M6x20
10x	screw M3x6 (for controller board and sensors)
4x	screw M2x6 (for motor)
2x	countersunk screw M4 (for wheel)
2x	setscrew (for wheel)
2x	washer (for caster wheel)

Electronic components

1x	controller board
2x	motor
3x	distance sensor
3x	sensor cable
1x	download cable for parallel port

Software

1x	CD with qfix software

Tools

1x	hexagonal wrench, size 1.5
1x	hexagonal wrench, size 2.0
1x	hexagonal wrench, size 2.5
1x	hexagonal wrench, size 4.0

Miscellaneous

1x	“pennant” sticker

1.2 Additionally required components

For Crash Bobby, a standard model-making rechargeable battery of 7.2, 9.6 or 12 volts can be used. However, the qfix rechargeable battery pack (order No. QAAC000) is especially suited to this use since it already contains the required adapter cable and Velcro strips for simple mounting of the batteries.

For charging the battery, a standard battery charger can be used or, alternatively, the qfix plug-in battery charger (order No. RBAD000) is available.

1.3 Interesting extensions

The following extensions to the Crash-Bobby kit bring even more fun into your robotics adventure:

- Line sensor set (No. QAAAB000) for moving along a line.
- Bumper set (No. QAAB005) to react to contact with obstacles.
- LC-display board (No. QAAF001) for displaying arbitrary information.

For beginners in computer programming the graphical programming environment “Grape” (No. QAAH000) is an interesting tool.

1.4 Reference

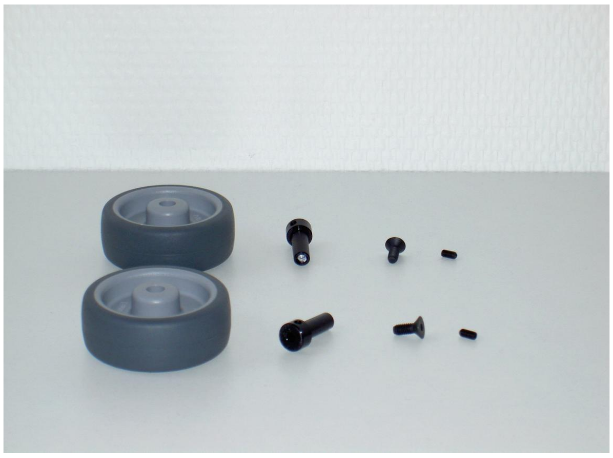
This manual refers to software version 1.2.

Chapter 2

Building the Crash Bobby

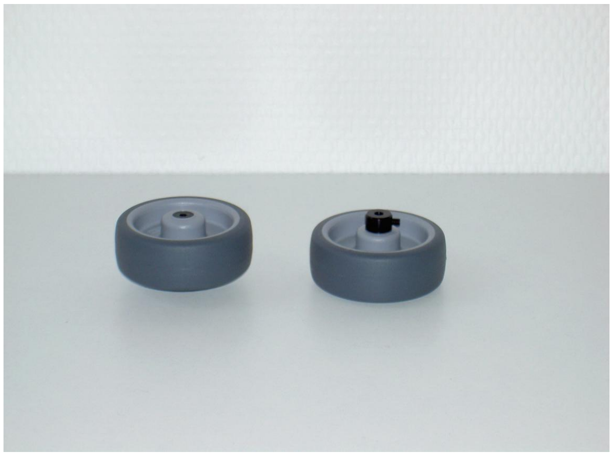
2.1 Step 1 - Assembling the wheels

For assembly of the wheels, the components shown in the following picture are required:



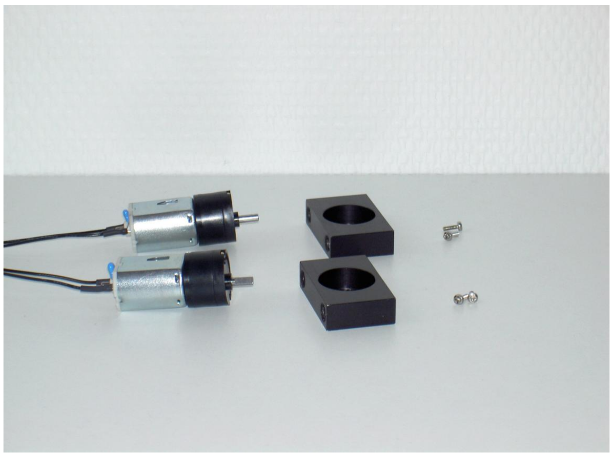
First of all, the small setscrew should be screwed into the side of the wheel bush. Next, the wheel bushes should be pushed as far as possible into the wheels, so that the countersunk screw M4 can be inserted from the other side. This is then tightened with the appropriate hexagonal wrench.

The assembled wheels are shown in the next picture:

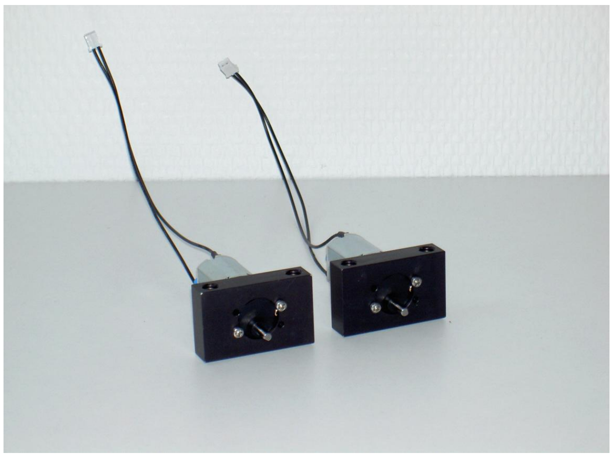


2.2 Step 2 - Assembling the motors

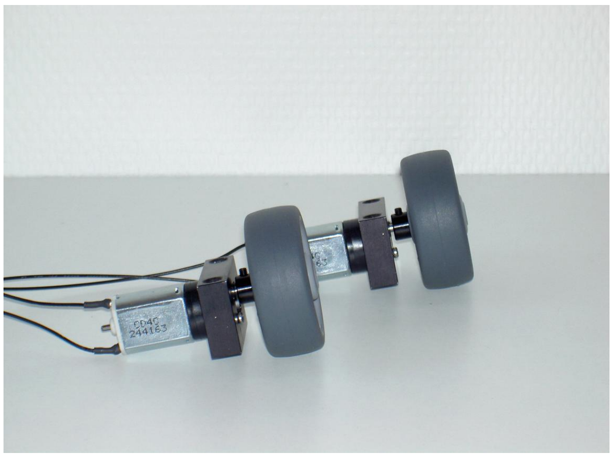
In order that the motors can subsequently be screwed on to the base plate, they must first of all be assembled on the motor mounts. The required components are shown in the next picture:



The motors are located in the large recess of the motor mounts and tightened using the small screws M2x6. Take care with plastic threads – do not overtighten the screws!

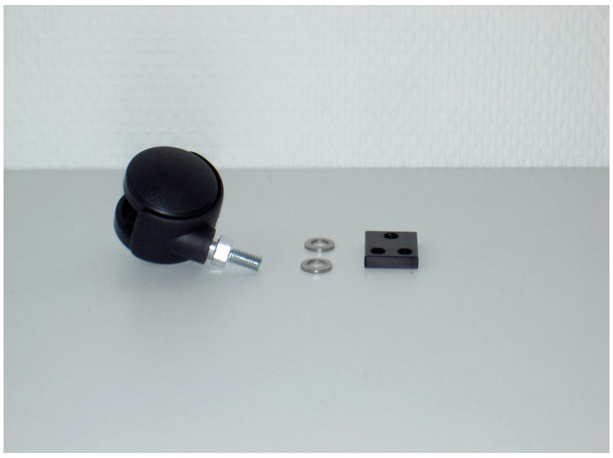


Finally, the pre-assembled wheels are placed on to the motor axles and the setscrew is tightened:

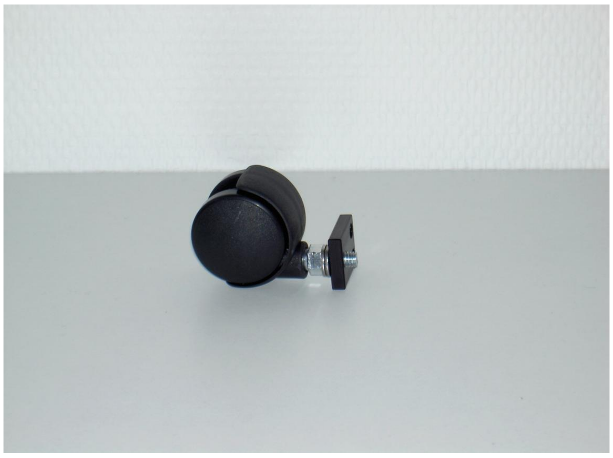


2.3 Step 3 - Assembling the support wheel

For assembly of the support wheel on the rectangular mounting plate, the components shown in the following picture are required:

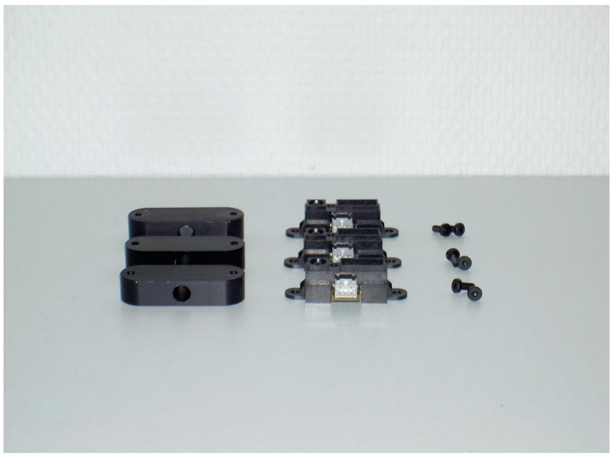


The washers are used as distance spacers and are simply placed on to the threaded pin. Afterwards, the threaded pin is then screwed firmly into the single threaded hole located in the rectangular plate.

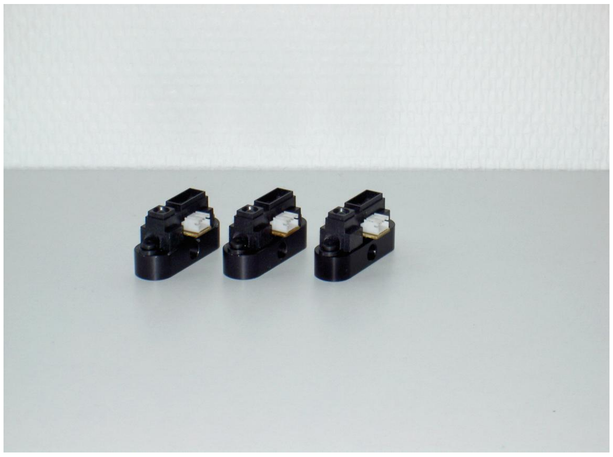


2.4 Step 4 - Assembling the sensors

In order that the sensors can subsequently be screwed on to the base plate, they must first of all be assembled on the sensor mounts. The necessary components are shown in the following picture:

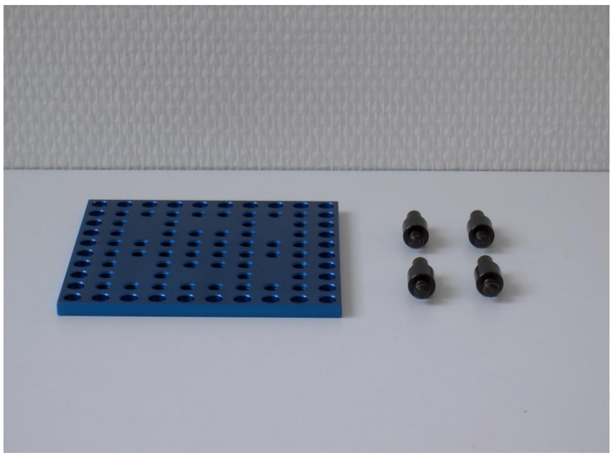


The three sensors are each screwed to the mounts using two screws. The next picture shows the assembled sensors:

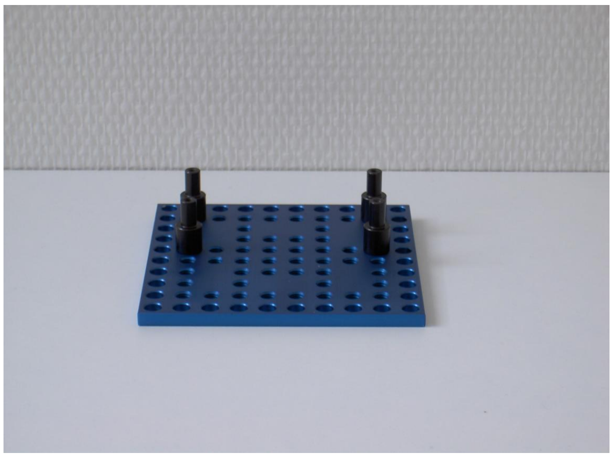


2.5 Step 5 - Fitting the controller board supports

The controller board supports are now screwed into the base plate. The base plate and four controller board supports are required:

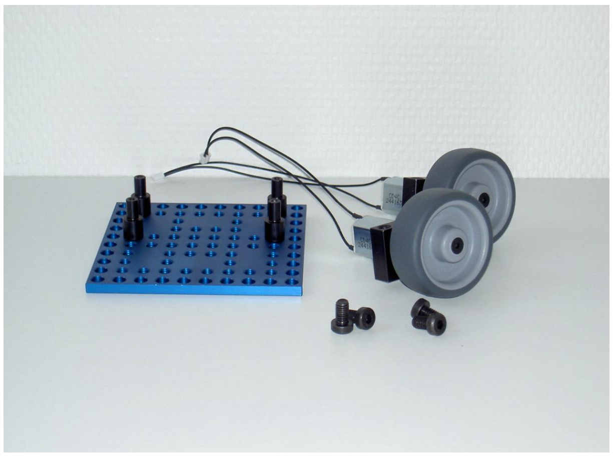


As shown in the following picture, two of the supports are screwed into the corner locations of the outermost row of *threaded* holes. The two further supports are then fixed in an offset position using two threaded holes of the intermediate area.



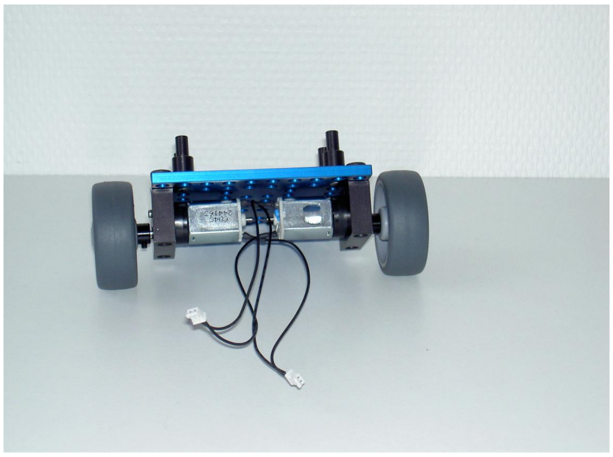
2.6 Step 6 - Mounting the wheels

In this step, the pre-assembled wheels can be mounted on the base plate. The following components are required:



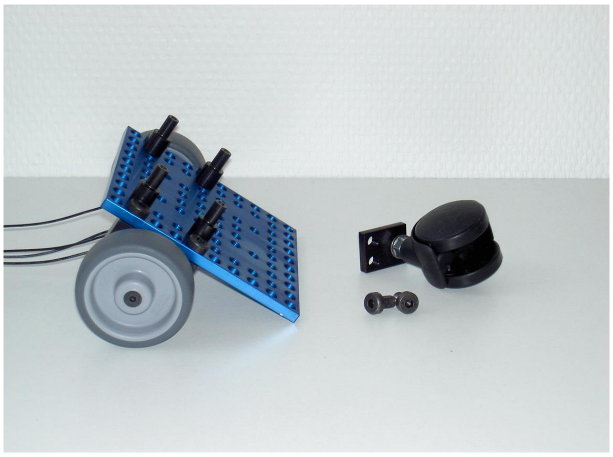
The wheel supports are located directly next to the controller board supports and screwed from above with the screws M6x10.

Caution: The wheels must be mounted in such a way that the wheel axles protrude from the bottom of the support, so that the “ground clearance” is therefore as large as possible.

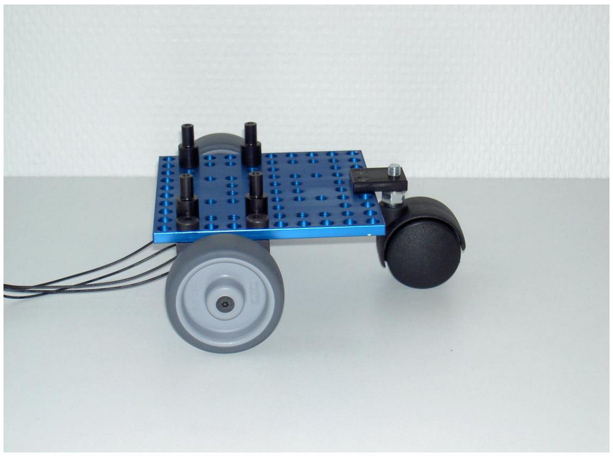


2.7 Step 7 - Mounting the support wheel

Two screws are also required for mounting the pre-assembled support wheel:

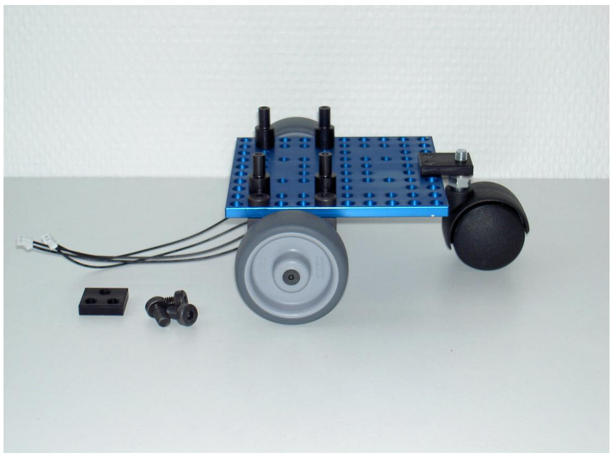


The mounting plate is placed on the base plate from above and then screwed on from below using the screws M6x10.

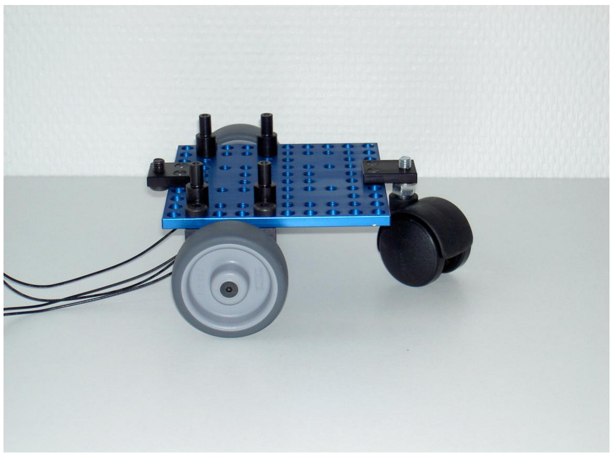


2.8 Step 8 - Mounting the sensors

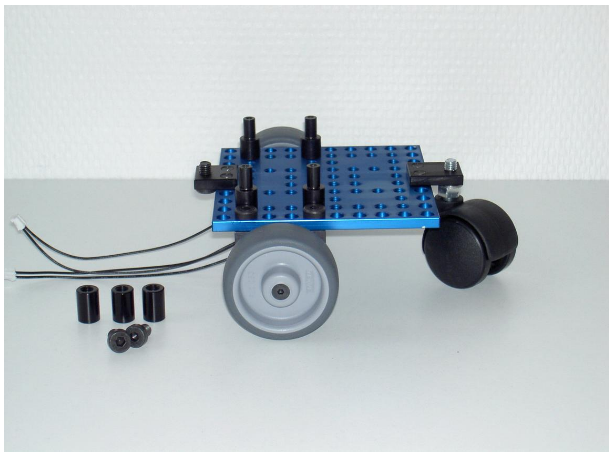
Now, the square mounting plate is required, to which the middle distance sensor will subsequently be screwed.



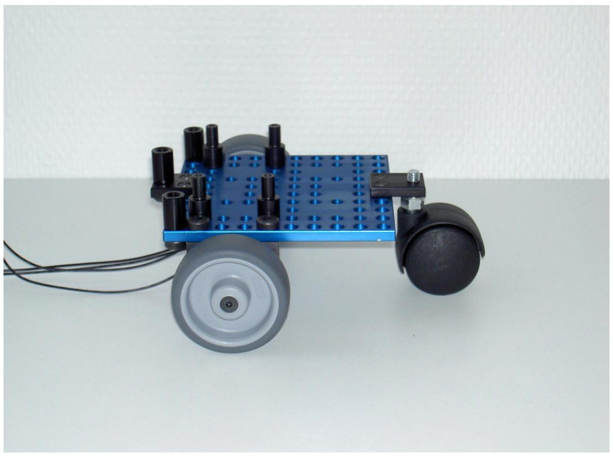
First, one of the three screws M6x10 is screwed firmly into the single threaded hole located in the plate. Then, in the same way as for the support wheel, the plate is placed on top of the base plate and screwed on from below:



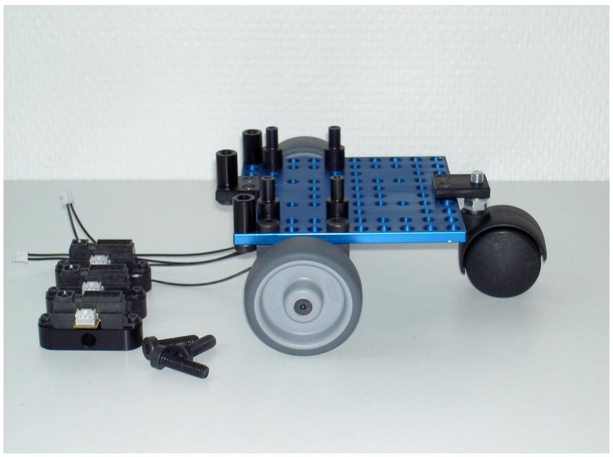
Next, the three distance pieces and two further screws M6x10 are required:



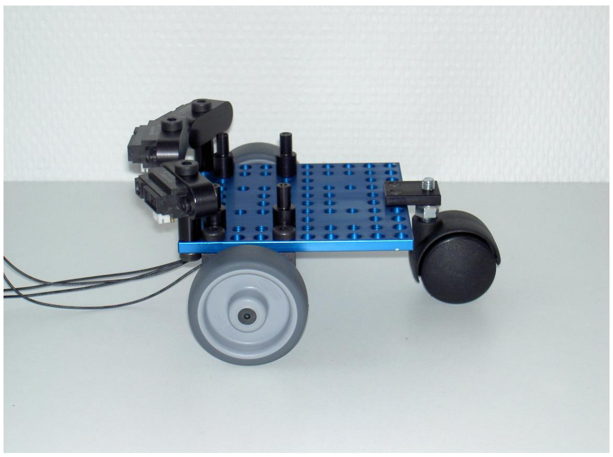
The distance piece for the middle sensor is fitted on the screw which projects upwards in the square plate. The two further distance pieces are placed on the front right and left corner holes of the base plate and screwed on from below:



The longer M6x20 screws are now required in order to screw the pre-assembled sensors on to the distance pieces:

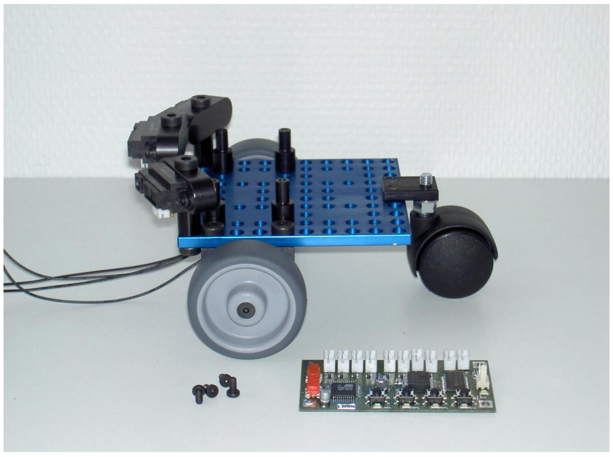


The sensors are screwed firmly on to the mounts with the connection facing downwards. The middle sensor should point exactly straight ahead, while the side sensors should point outwards at a slight angle:

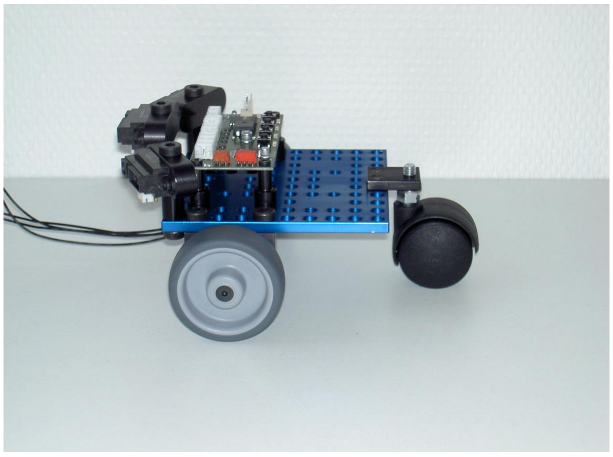


2.9 Step 9 - Attaching the controller board

For the attachment of the controller board, 4 screws M3x6 are required:

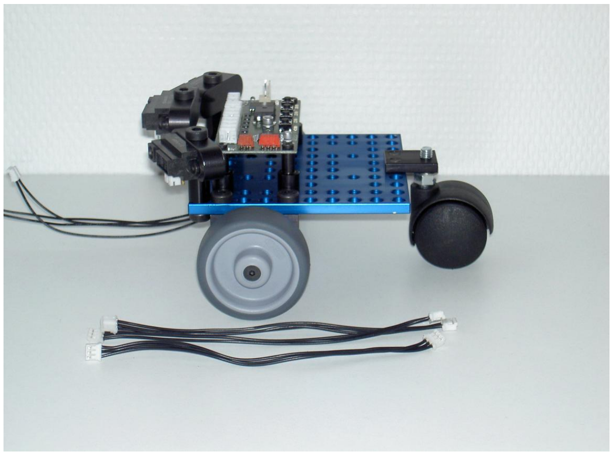


With these, the controller board should be screwed on to the four supports so that the connections for the sensors are located at the front and, therefore, lie close to the sensors.



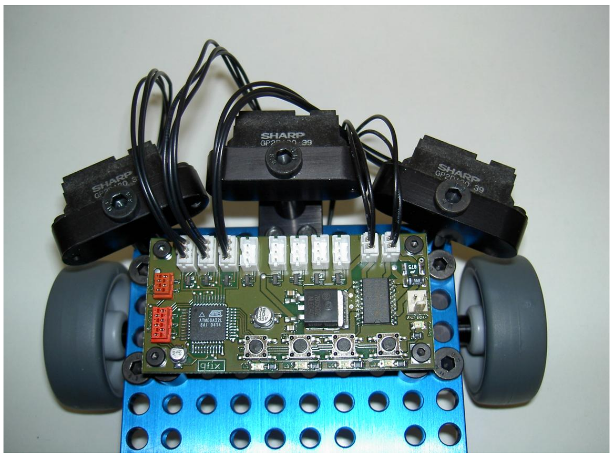
2.10 Step 10 - Connecting motors and sensors

As the last step, it now remains to connect the motors and sensors to the controller board. For this, the three sensor cables are required:

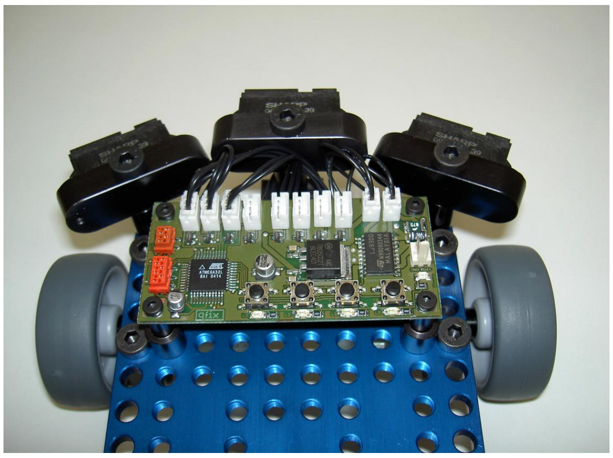


The sensors are connected to the connections `An0` to `An3`; the motors are connected to the connections `Mot0` and `Mot1`. In order that the supplied software will run without any changes being required, the connection configuration should be as follows:

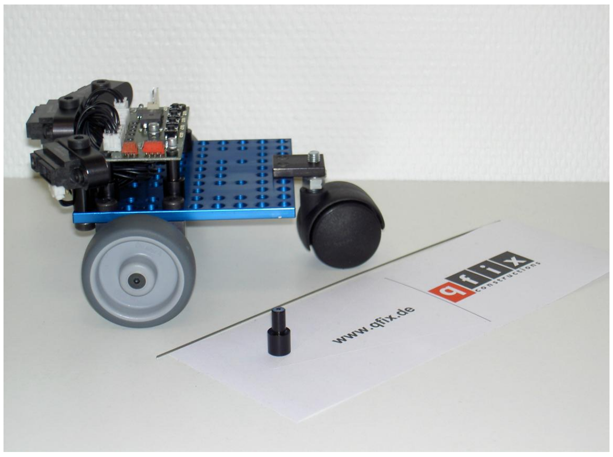
`An0`=left sensor, `An1`=middle sensor, `An2`=right sensor
`Mot0`=left motor, `Mot1`=right motor



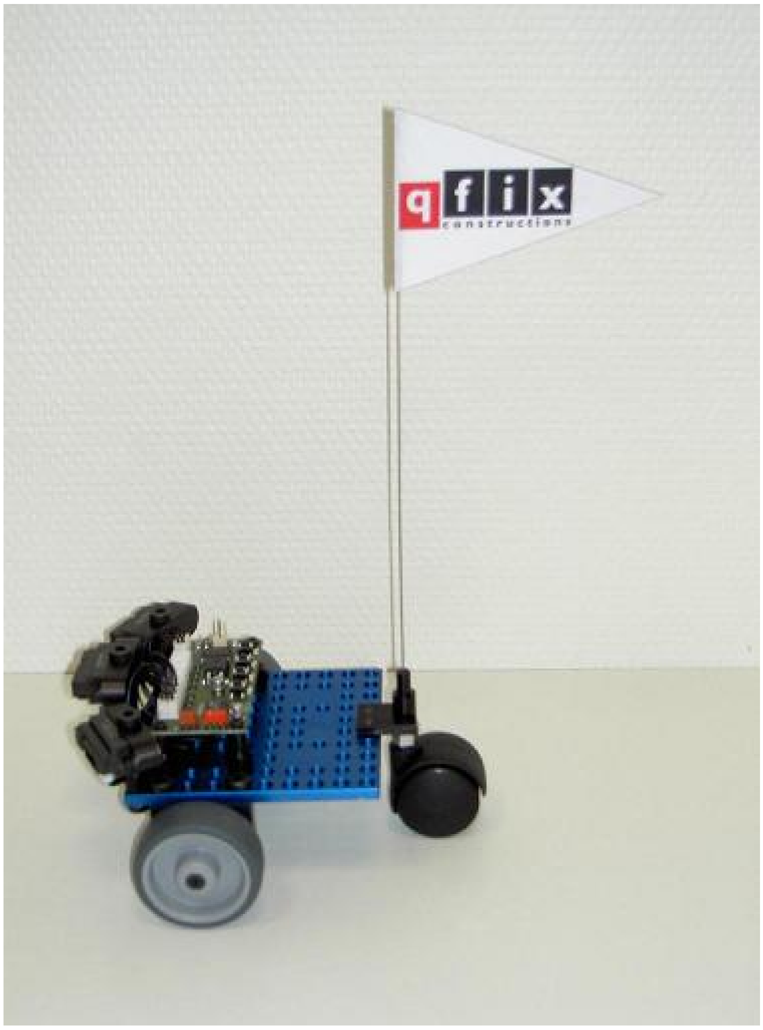
Finally, the cables should now be “concealed” below the controller board:



In order to give Crash Bobby the finishing touch, its pennant must of course be attached. For this, the following parts are required:

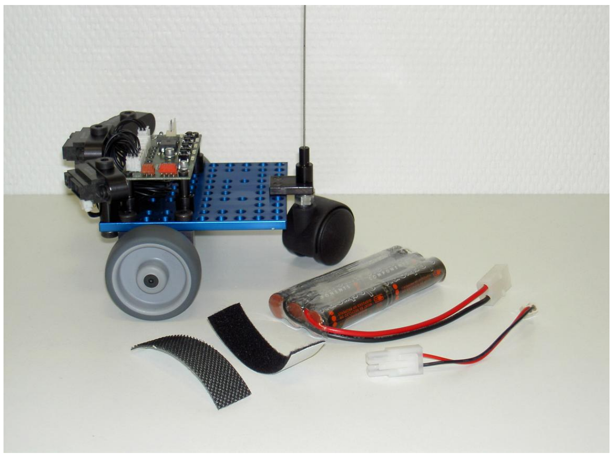


The holder for the steel wire is screwed on to the screw of the support wheel, which projects upwards. Then, the pennant sticker can be detached and the steel wire laid exactly on the center line, so that the two points of the pennant are brought together in precise alignment. Now, the finished pennant is pushed into the holder complete!

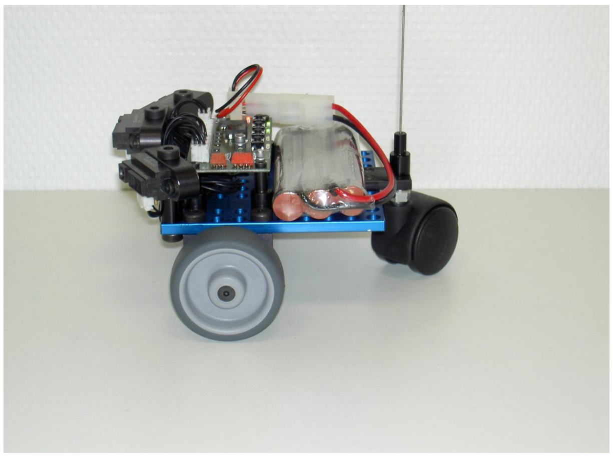


2.11 Preparing the robot for operation

In order to put the robot into operation, a rechargeable battery is required. The following picture shows the qfix rechargeable battery pack with its components:



The Velcro strip is simply fixed to the base plate with adhesive; the velour strip is positioned on the underside of the battery pack. One piece of adhesive tape helps to secure the cable to the battery without being disturbing. After plugging in the adapter cable, the robot is ready for operation.



Chapter 3

Software installation

Note: Instructions and software on this CD are updated regularly. Please check if you have the most recent version or if there is a new CD version on the website `www.qfix.de` (downloads). The version identifier of this CD can be found in the file `README.txt` in the main directory of the CD.

3.1 Requirements

The software can be installed under Windows XP or windows 2000 operating systems. The application has not yet been tested for use with older versions of Windows.

In order to load programs into the qfix controller, it is necessary to use the parallel port (printer connection).

3.2 Content of the CD

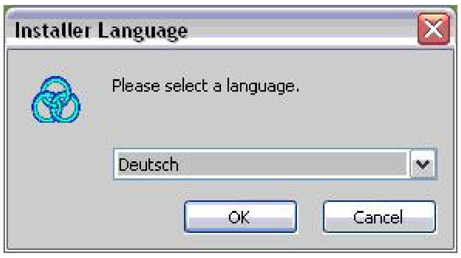
The CD contains the following entries:

- File “README.txt”
- File “LIESMICH.txt”
- File “install.bat”
- Directory “software”
- Directory “doc”
- Directory “WinAVR”

3.3 Installation of the WinAVR software

Concealed behind “WinAVR” is the compiler for the Atmel controller that is used on the qfix boards.

Please start the installation by double clicking on `install.bat`. First of all, you will be requested to select the desired language:

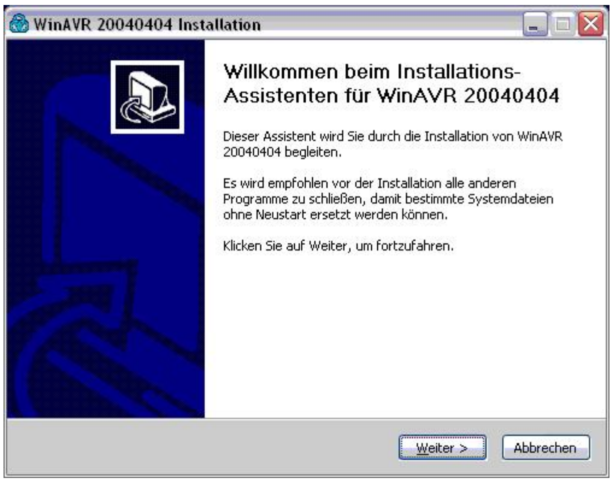


Installer Language

Please select a language.

Deutsch

Select e.g. `English` and then click on OK. In the following description, we assume German was chosen. Now, a welcome screen appears:



WinAVR 20040404 Installation

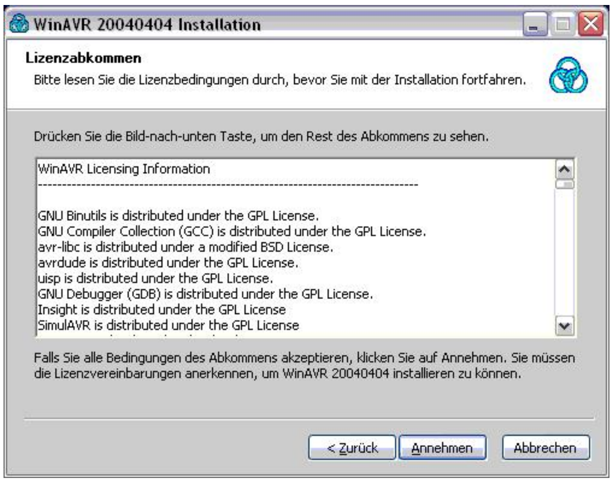
Willkommen beim Installations-Assistenten für WinAVR 20040404

Dieser Assistent wird Sie durch die Installation von WinAVR 20040404 begleiten.

Es wird empfohlen vor der Installation alle anderen Programme zu schließen, damit bestimmte Systemdateien ohne Neustart ersetzt werden können.

Klicken Sie auf Weiter, um fortzufahren.

By clicking on `Continue`, you reach the license agreement:



WinAVR 20040404 Installation

Lizenzabkommen

Bitte lesen Sie die Lizenzbedingungen durch, bevor Sie mit der Installation fortfahren.

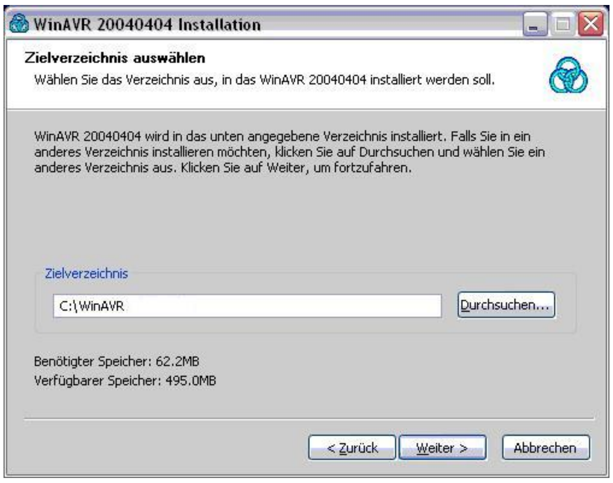
Drücken Sie die Bild-nach-unten Taste, um den Rest des Abkommens zu sehen.

```
WinAVR Licensing Information
--------------------------------------------------------------------------------

GNU Binutils is distributed under the GPL License.
GNU Compiler Collection (GCC) is distributed under the GPL License.
avr-libc is distributed under a modified BSD License.
avrdude is distributed under the GPL License.
uisp is distributed under the GPL License.
GNU Debugger (GDB) is distributed under the GPL License.
Insight is distributed under the GPL License
SimulAVR is distributed under the GPL License
```

Falls Sie alle Bedingungen des Abkommens akzeptieren, klicken Sie auf Annehmen. Sie müssen die Lizenzvereinbarungen anerkennen, um WinAVR 20040404 installieren zu können.

Here, please select `Accept`. Now, a window appears for selection of the target directory:


WinAVR 20040404 Installation

Zielverzeichnis auswählen

Wählen Sie das Verzeichnis aus, in das WinAVR 20040404 installiert werden soll.

WinAVR 20040404 wird in das unten angegebene Verzeichnis installiert. Falls Sie in ein anderes Verzeichnis installieren möchten, klicken Sie auf Durchsuchen und wählen Sie ein anderes Verzeichnis aus. Klicken Sie auf Weiter, um fortzufahren.

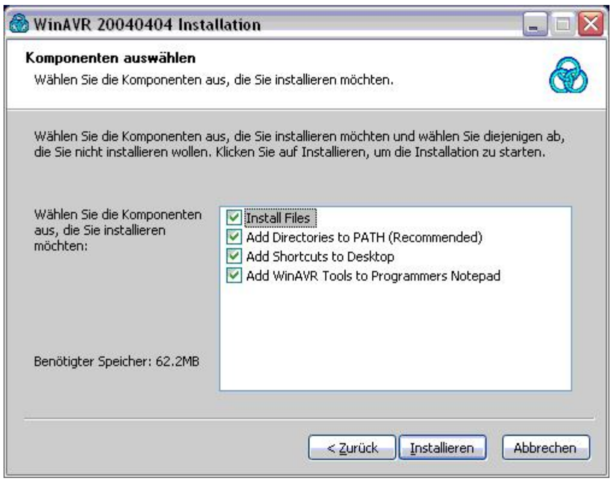
Zielverzeichnis: C:\WinAVR

Benötigter Speicher: 62.2MB
Verfügbarer Speicher: 495.0MB

Please leave the suggested path unchanged (C:\WinAVR).

Caution: If the wrong path is selected, the supplied programs may not compile correctly! (However, WinAVR may be uninstalled again at any time and can then be installed correctly.)

Confirm your selection by clicking on `Continue`. A window opens for the selection of the components to be installed:


WinAVR 20040404 Installation

Komponenten auswählen

Wählen Sie die Komponenten aus, die Sie installieren möchten.

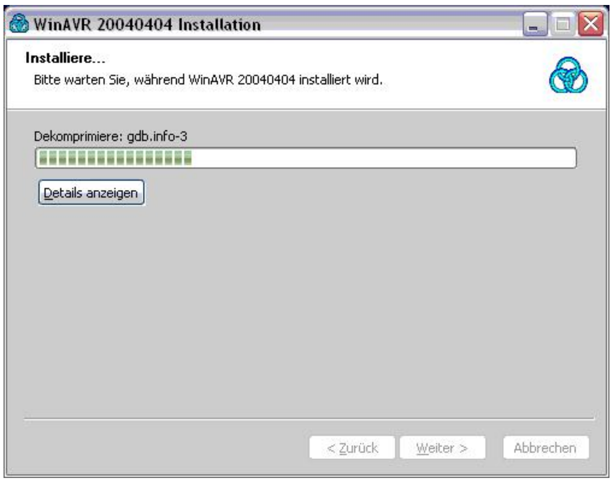
Wählen Sie die Komponenten aus, die Sie installieren möchten und wählen Sie diejenigen ab, die Sie nicht installieren wollen. Klicken Sie auf Installieren, um die Installation zu starten.

Wählen Sie die Komponenten aus, die Sie installieren möchten:

- ✓ Install Files
- ✓ Add Directories to PATH (Recommended)
- ✓ Add Shortcuts to Desktop
- ✓ Add WinAVR Tools to Programmers Notepad

Benötigter Speicher: 62.2MB

Please leave all entries selected (or select all entries) and then click on `Install`. Now, a window opens which shows the installation status by means of a progress bar:

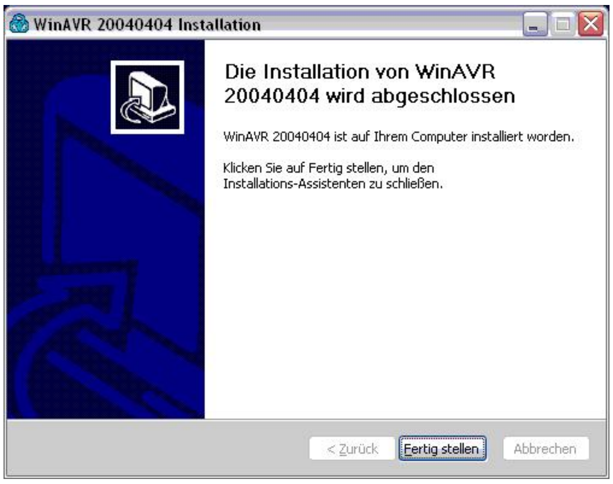

WinAVR 20040404 Installation

Installiere...

Bitte warten Sie, während WinAVR 20040404 installiert wird.

Dekomprimiere: gdb.info-3

Depending on the computer, this may take a few minutes. When the installation is complete, click on `Continue`. Finally, the last window opens which you can acknowledge with `Finish`:

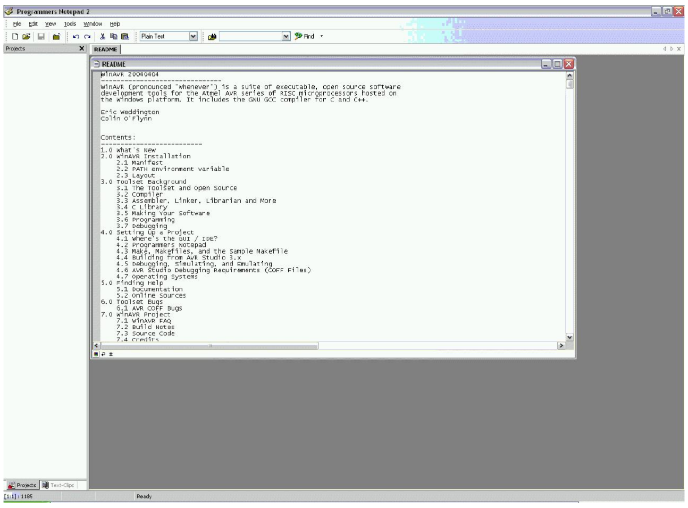


Die Installation von WinAVR 20040404 wird abgeschlossen

WinAVR 20040404 ist auf Ihrem Computer installiert worden.

Klicken Sie auf Fertig stellen, um den Installations-Assistenten zu schließen.

In some cases, the program “Programmers Notepad” also opens, together with the last window, in order to display additional information for you to read, concerning WinAVR:



```
WinAVR 20040404
-------------------------------
WinAVR (pronounced "whenever") is a suite of executable, open source software
development tools for the Atmel AVR series of RISC microprocessors hosted on
the Windows platform. It includes the GNU GCC compiler for C and C++.

Eric Weddington
Colin O'Flynn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```

You may simply close this program before or after reading the contents.

Now, the compiler is installed!

3.4 Installation of the qfix sample software

For installation of the qfix sample software it is sufficient to copy the complete directory named “software” from the CD into any desired directory on the hard disk. You can, for example, drag the software directly onto your desktop or place it in your “My Documents” folder.

Chapter 4

First steps

This chapter will describe how to put the qfix controller into operation, how to edit and to compile a program and how to transfer it from the PC into the controller.

4.1 Putting the controller into operation

In order to put the controller into operation, you simply need to connect the battery. The battery connection socket is protected against polarity reversal. After inserting the plug, the red Power LED must immediately light up. If it does not light up, please immediately remove the plug and check the connection.

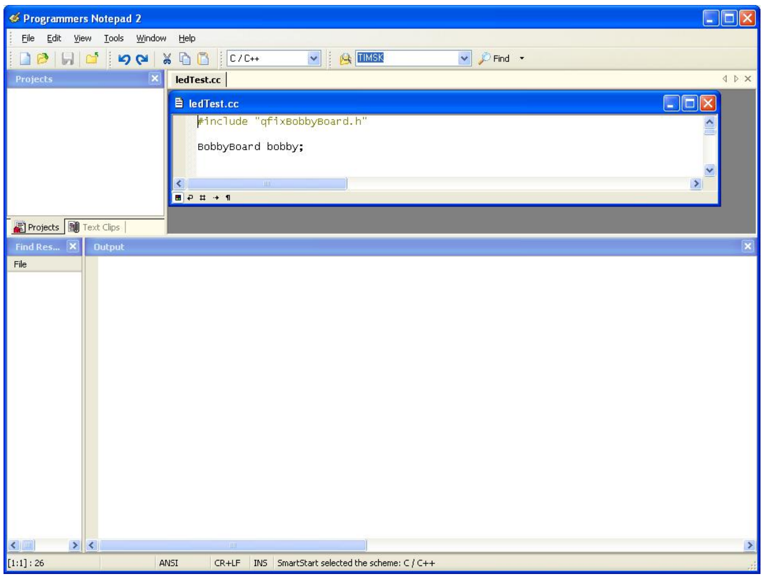
In order to load a program from the PC into the controller, the download cable must be plugged into the parallel port (printer connection, LPT1) of the PC and the red plug must be connected to the larger red socket of the controller board.

4.2 Editing a program

Note: In order to load a demo program into the editor you should have copied the software directory onto your hard disk as described in section 3.4.

Please start the programming environment “Programmers Notepad” (e.g. in Start → WinAVR → Programmers Notepad) and open via the menu File→Open e.g. the qfix demo file `ledTest.cc`.

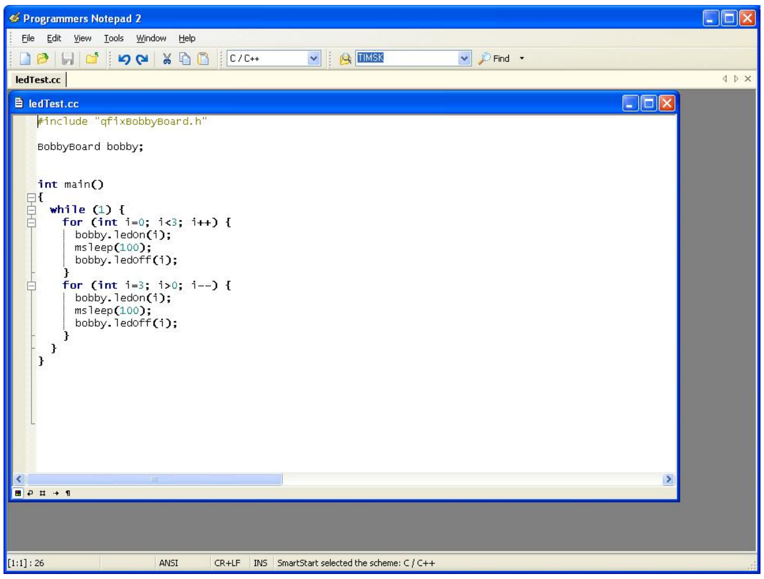
The first time the Programmers Notepad is started, it opens a lot of unnecessary windows:



```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;
```

```
[1:1] : 26    ANSI    CR+LF    INS    SmartStart selected the scheme: C / C++
```

You can close all windows except the one with the desired source code `ledTest.cc`. The editor looks like the following now:

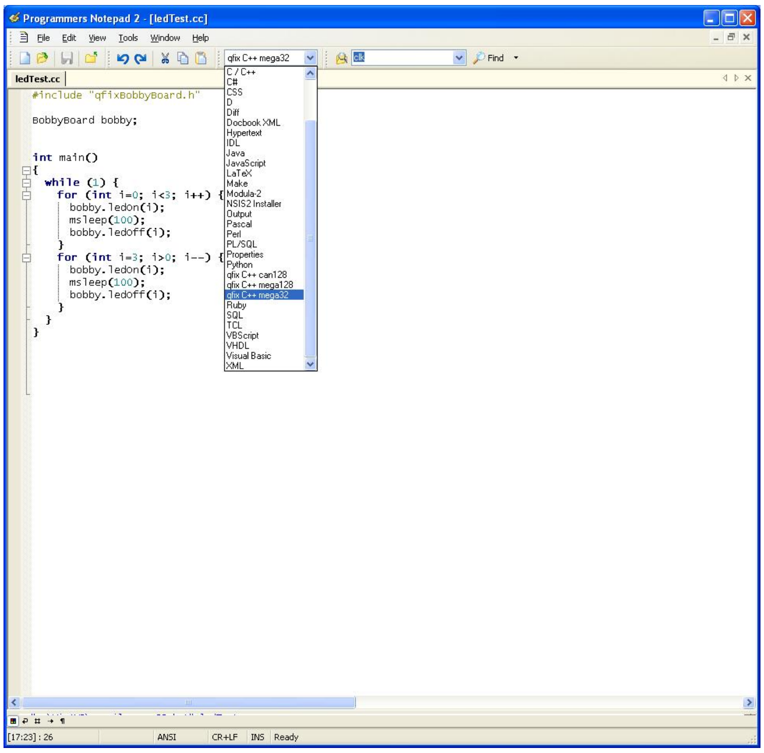


```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;

int main()
{
  while (1) {
    for (int i=0; i<3; i++) {
      bobby.ledon(i);
      msleep(100);
      bobby.ledoff(i);
    }
    for (int i=3; i>0; i--) {
      bobby.ledon(i);
      msleep(100);
      bobby.ledoff(i);
    }
  }
}
```

```
[1:1] : 26    ANSI    CR+LF    INS    SmartStart selected the scheme: C / C++
```

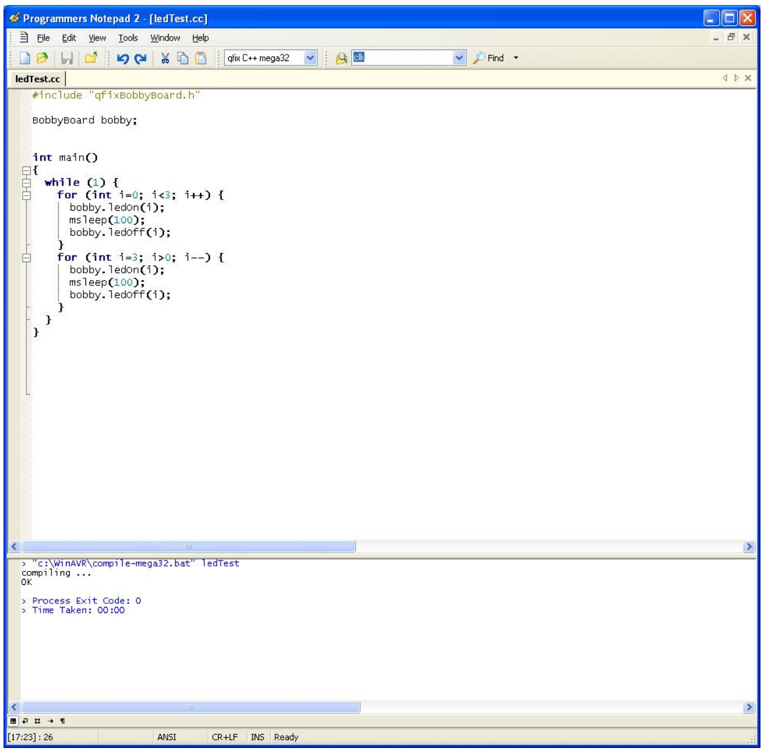
4.3 Compiling a program

In order to compile the program for your board the correct controller must be selected. The qfix kits currently support the Atmel controllers mega32, mega128 and AT90CAN128. Crash-Bobby comes with the mega32 controller board, so please select `qfix C++ mega32` from the selection list on the toolbar of the editor:



```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;


int main()
{
  while (1) {
    for (int i=0; i<3; i++) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
    }
    for (int i=3; i>0; i--) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
    }
  }
}
```

For compiling the program in the editor simply press F5. A new output window opens at the bottom of the editor window displaying the status of the compilation:



```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;


int main()
{
  while (1) {
    for (int i=0; i<3; i++) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
    }
    for (int i=3; i>0; i--) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
    }
  }
}
```

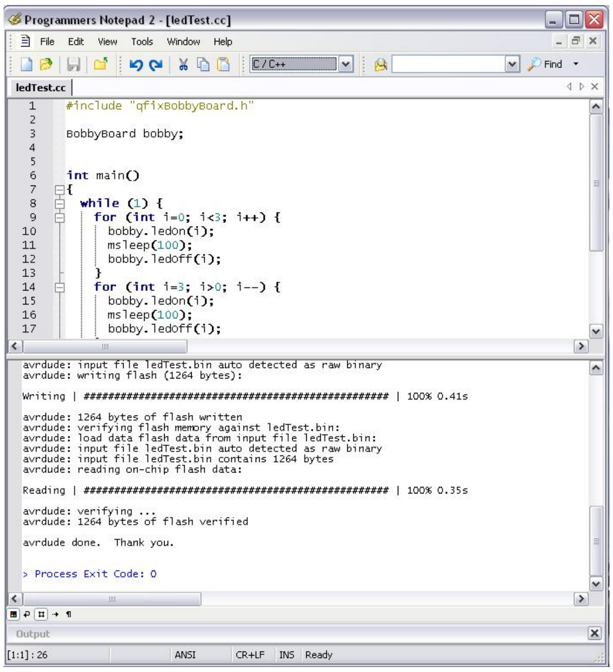
```
> "c:\WinAVR\compile-mega32.bat" ledTest
compiling ...
OK

> Process Exit Code: 0
> Time Taken: 00:00
```

As you can see in the topmost line of the output window the tool `c:`⟶`WinAVR`⟶`compile-mega32.bat` was called for compilation. If the messages `compiling ...` and `OK` occur the compilation was successful and the program can then be transferred into the controller. If the program still contains errors these are also displayed here.

4.4 Downloading the program into the controller

After successful compilation, press F6 to transfer the program to the controller board. Here, you also have to be sure that the correct controller is selected! The transfer takes several seconds. Output messages of the used transfer program `avrdude` are displayed in the output window.

After a successful download, the controller starts immediately running the program. E.g. the `ledTest` sample makes the four LEDs blink.


Programmers Notepad 2 - [ledTest.cc]
File Edit View Tools Window Help
C / C++
Find
ledTest.cc
Output
[1:1] : 26
ANSI
CR+LF
INS
Ready

```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;


int main()
{
  while (1) {
    for (int i=0; i<3; i++) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
    }
    for (int i=3; i>0; i--) {
      bobby.ledOn(i);
      msleep(100);
      bobby.ledOff(i);
```

```
avrdude: input file ledTest.bin auto detected as raw binary
avrdude: writing flash (1264 bytes):

Writing | ################################################## | 100% 0.41s

avrdude: 1264 bytes of flash written
avrdude: verifying flash memory against ledTest.bin:
avrdude: load data flash data from input file ledTest.bin:
avrdude: input file ledTest.bin auto detected as raw binary
avrdude: input file ledTest.bin contains 1264 bytes
avrdude: reading on-chip flash data:

Reading | ################################################## | 100% 0.35s

avrdude: verifying ...
avrdude: 1264 bytes of flash verified

avrdude done.  Thank you.


> Process Exit Code: 0
```

The same steps (compilation plus download) can be performed for the other sample programs, too. A list of provided samples can be found in the appendix.

If there is a problem transferring the program to the board, please check the status of the battery. The parallel interface LPT1 should be in mode “ECP” (refer to your BIOS manual).

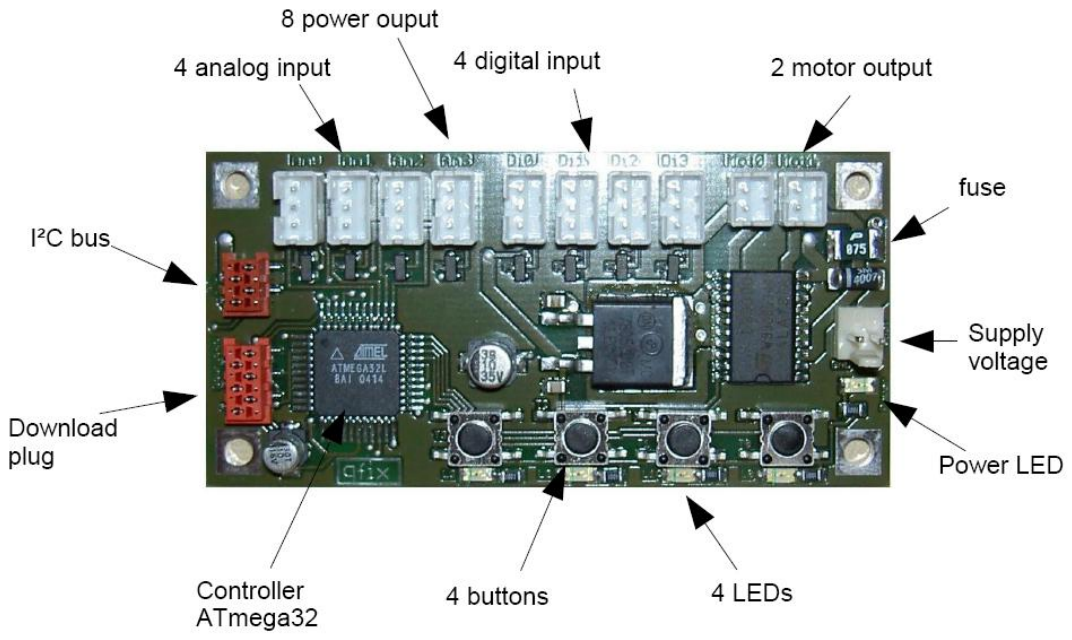
4.5 Creating your own programs

In order to create a program yourself, the simplest way is to copy an already existing program file (e.g. “ledTest.cc” to “myFirstTest.cc”) and open this file in the editor.

For programming the controller, the C++ class `BobbyBoard` can be used. The methods of this class are described in appendix C.1.

Appendix A

Controller circuitry



Clock: 8MHz

Pin assignment of the three-pole input / output plugs:

- The outer pin is the power output. It can be swithed on and off by the commands `powerOn` and `powerOff`.
- The middle pin is ground.
- The inner pin is the input signal pin. For analog input a voltage of between 0 and 5V can be impressed. For digital input a voltage of 0 or 5V can be impressed.

Appendix B

Standard Programm

```
#include "qfixBobbyBoard.h"

BobbyBoard bobby;

int main()
{
  /* Here go the commands */
}
```

The standard program can be used as a starting point for own programs.

First, it includes the required library `qfixBobbyBoard.h` and then creates an object `bobby`. This object can be used to invoke arbitrary commands.

For example, the command **`bobby.`<*command*>`;`** calls the “method” *command* of the object *bobby*.

All methods of class `BobbyBoard` are described in appendix C.

Appendix C

Command Overview

Each of the following tables describes one class with their methods. To call these methods, an object of this class must exist. Please refer to the sample programs on the CD.

The column *RValue* in the class table describes the type of the return value for each method. The following types are used:

Type	*Description*
`void`	No value (used as return type in functions without return value)
`bool`	Boolean value (`true` or `false`)
`int`	Integer value (-32767 – 32768)
`char`	Character (e.g. 'A')
`char*`	Pointer to a character. This is used for character strings as parameters to a function (e.g. `"Hello"`)

C.1 Class BobbyBoard

Class: `BobbyBoard`		File: `qfixBobbyBoard.h`
RValue	*Method*	*Description*
	`BobbyBoard()`	This constructor is called automatically when the object is created. It initializes the object as follows: The motors are set to 0, all LEDs are off, all power outputs are on.
`void`	`ledOn(int i)`	Puts on LED with index `i`. `i` must be in the range 0 to 3.
`void`	`ledOff(int i)`	Puts off LED with index `i`. `i` must be in the range 0 to 3.
`void`	`ledsOff()`	Puts off all LEDs.
`void`	`led(int i, bool state)`	Puts on LED with index `i` if `state=true`, else off. `i` must be in the range 0 to 3.
`bool`	`button(int i)`	Returns `true` if the button with index `i` is pressed, else `false`. `i` must be in the range 0 to 3.
`bool`	`waitForButton(int i)`	Waits until the button with index `i` is pressed and released again. `i` must be in the range 0 to 3.
`void`	`motor(int i, int speed)`	Sets the motor with index `i` to the value `speed` which must be in the range -255 to +255. A value of 0 puts off the motor..
`void`	`motors(int motor0, int motor1)`	Sets both motors to the respective values `motor0` and `motor1`. Both values must be in the range -255 to +255.
`void`	`motorsOff()`	Puts off both motors.
`int`	`analog(int i)`	Returns the value of the analog input with index `i`. The returned value is in the range 0-255. `i` must be in the range 0 to 3.
`bool`	`digital(int i)`	Returns `true` if the digital input with index `i` is high (+5V), else `false`. `i` must be in the range 0 to 3.
`void`	`powerOn(int i)`	Puts on the power output with index `i`. `i` must be in the range 0 to 7.
`void`	`powerOff(int i)`	Puts off the power output with index `i`. `i` must be in the range 0 to 7.
`void`	`power(int i, bool state)`	Puts on the power output with index `i` if `state=true`. `i` must be in the range 0 to 7.
`void`	`ledMeter(int i)`	Displays the given value in the range 0-255 using the four LEDs.
`void`	`sleep(int s)`	Waits for `s` seconds.
`void`	`msleep(int ms)`	Waits for `ms` milliseconds.

C.2 Class LCD

The class LCD supports the qfix LC-displays. The used display must be connecte via the I2C-bus to the controller board.

Class: `LCD`		File: `qfixLCD.h`
RValue	*Method*	*Description*
	`LCD()`	The constructor initializes the connection to the display, clears the display and puts the cursor to (0,0).
`void`	`clear()`	Clears the display.
`void`	`print(int i)`	Prints the number `i` at the current cursor position.
`void`	`print(char* s)`	Prints the string `s` at the current cursor position.
`void`	`print(int row, int col, int i)`	Prints the number `i` at row `row` and column `col`.
`void`	`print(int row, int col, char* s)`	Prints the string `s` at row `row` and column `col`.
`void`	`lightOn()`	Puts on the backlight.
`void`	`lightOff()`	Puts off the backlight.

Appendix D

Demo programs

This chapter describes tre sample programs delivered with the CD.

analogTest

This program outputs a value at the analog port 0 via the LEDs. At a voltage of 0V (internal value 0) no LEDs light up; at a voltage of 5V (internal value 255) all four LEDs light up. In between, the corresponding number of LEDs light up.

bobbyTest

This program allows the Crash Bobby to drive around and to avoid obstacles. For this, the three distance sensors must be connected to the controller as follows:

- Left sensor: An0
- Middle sensor: An1
- Right sensor: An2

Die Motoren müssen folgendermaßen angeschlossen sein:

- Left motor: Mo0
- Right motor: Mo1

Operation:

At the start, the LED 0 lights up. Now, the sensors must be calibrated to the “critical distance”. For this, you must hold your hand approx. 10-20 cm in front of the middle sensor and press button 0. Now, the robot can be placed down.

After pressing button 2, it will drive off.

Pressing button 0 will stop it again; by pressing button 2, it will start up once more. To carry out a recalibration, the battery cable must be briefly unplugged.

buttonTest

With this program, pressing one of the buttons will cause the corresponding LED to light up.

digitalTest

This program tests all four digital inputs and when a voltage is applied it will cause the corresponding LED to light up.

lcdTest

This program demonstrates the usage of the qfix LC-display.

lcdChangeID

With this program it is possible to change the logical ID of a LC-display. This is needed whenever multiple display are connected to the controller board.

ledTest

This program causes the four LEDs to flash in similar fashion to the Knight Rider automobile.

lineFollow

This program uses the qfix line sensor to move along a line.

For this, the line sensor must be connected to analog input 3.

After program start, place the robot next to the line and press button 0. Then, place the robot exactly on the line and press button 1. Now, button 2 starts the robot.

While moving, the robot can be stopped by pressing button 0. Button 1 starts again.

motorTest

This program controls both motors at 4 different speeds in both directions. The 4 possible choices can be selected via the buttons.

myTest

This program has no actual function and merely contains an empty base structure for your own programs. To use it for this purpose, the whole directory should be copied.

powerOutTest

This program corresponds to the program “ledTest”, but with the difference that instead of switching the LEDs, the power outputs are switched.

slaveBoardTest

This program shows how to connect two BobbyBoards via the I2C-bus. One board is the master, the other one the slave. Thus, she sample consists of two programs: `master.cc` and `slaveBoard.cc`.

The slave program is compiled and transferred to the slave board. It simply waits for any command (like “motor on”) by the master and reacts according to the command. The program code must not be known or understood (“black box principle”).

In the master program two objects are instantiated: (`bobby` and `slave`). It always polls the buttons of the master board and sends a command to the slave according to the pressed button:

- Master button 0 switches slave LED 0 on and off.
- Master button 1 switches slave motor 0 on and off.
- Master button 2 checks slave button 0 and returns its value on master LED 2.
- Master button 3 checks slave digital in 0 and returns its value on master LED 3.

vehicle

This program corresponds to the Braitenberg vehicle. It drives around and avoids obstacles. This is similar to the program “bobbyTest”, but is constructed in a much simpler manner and uses only 2 sensors.

For this, the three distance sensors must be connected to the controller as follows:

- Left sensor: An0
- Right sensor: An1

The motors must be connected as follows:

- Left motor: Mo0
- Right motor: Mo1