

Quick start guide for I/O Block Library

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☰ 1 Overview

The IOLib TTC580 Simulink® blockset facilitates application development for the HY-TTC500 ECUs by supporting Model-Based Design. The HY-TTC 500 family consists of high-end safety control units designed to support a wide range of high-end applications.

The IOLib TTC580 maps the extensive I/O set of all HY-TTC500 variants to an easy-to-use blockset. All configuration options are directly entered in dialog boxes in the Simulink model. Together with MathWorks® Embedded Coder™ the IOLib TTC580 enables the automatic generation of production code. This code contains all function calls for the safety-certified I/O-driver C-library.

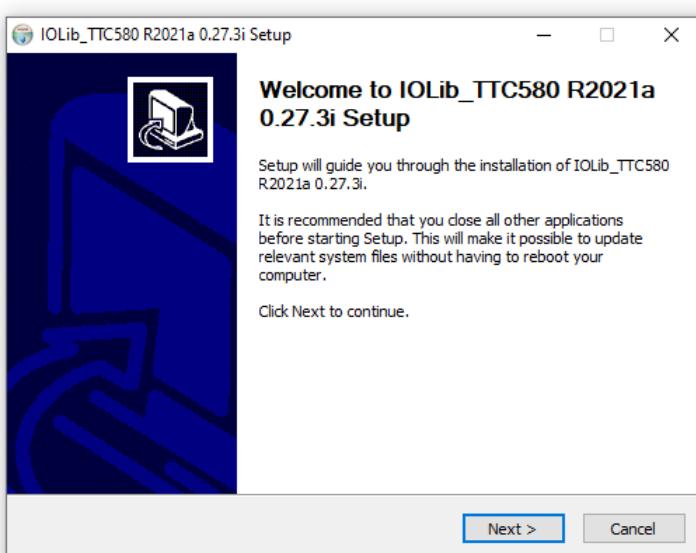
Beside this, a DBC-importer for CAN-communication, an EEPROM-designer, an additional J1939-diagnostic blockset, and integrated CCP functionality for calibration purposes completes the picture and enables users of IOLib TTC580 to build their application completely from the Simulink model.

The purpose of this document is to give a short overview of how to set up and use the IO Library for the TTC580. In case of errors or bugs in documents or workshop examples, please send a feedback to ...

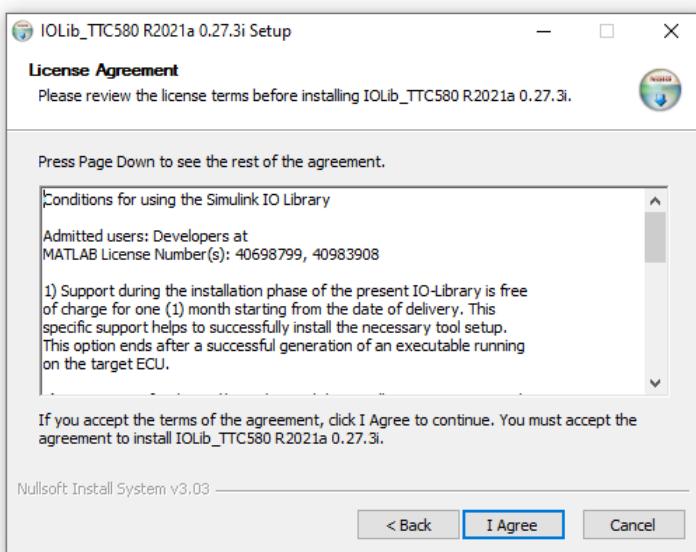
This step-by-step instruction describes the process of installing the I/O Block Library TTC580 onto a windows PC.

Each step to be done is marked with a ">"

After opening the *IOLib_TTC580_<version>.exe* file, the following window appears:

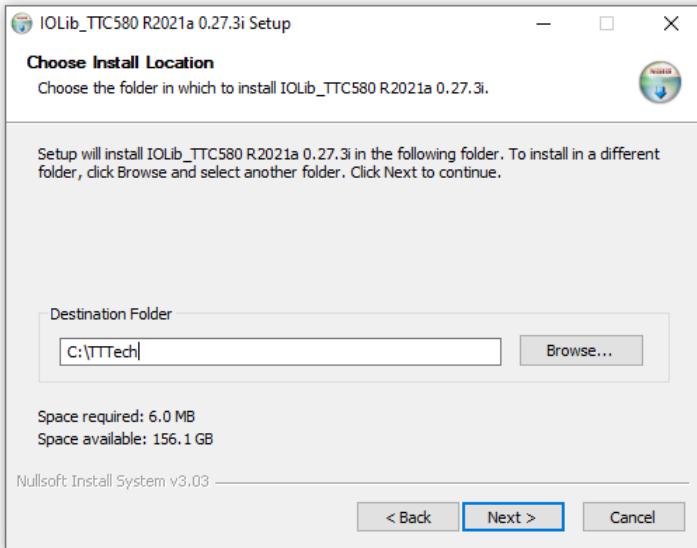


> once you're ready to proceed to the next page, click "Next >"

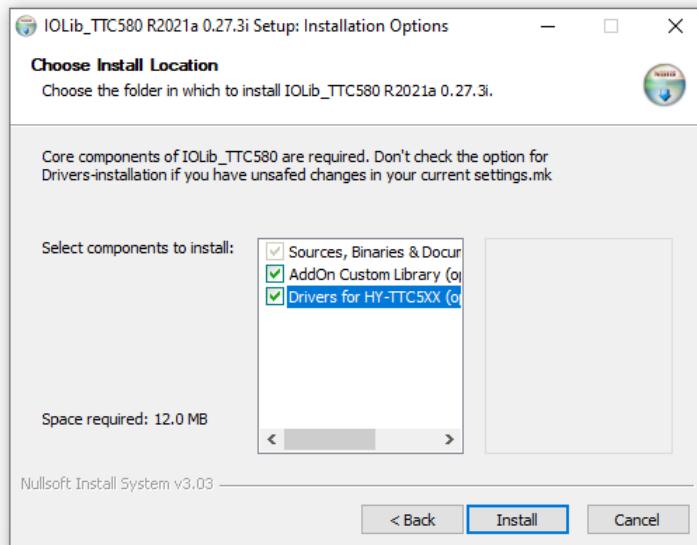


> review the License Agreement

2. INSTALLING THE IOBLOCK LIBRARY



> **select the install location** (recommended: C:\TTTech)

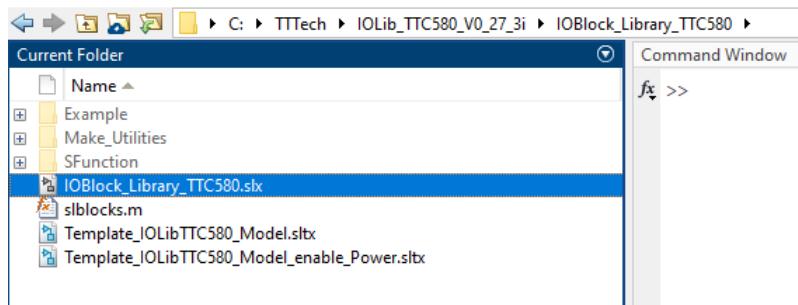


> in case you have purchased any Add On libraries, **select those for installation by ticking the respective checkboxes**

> **Click "Install" to start the Installation**

> Once the Installation is finished, **close the setup procedure by clicking "Finish"**

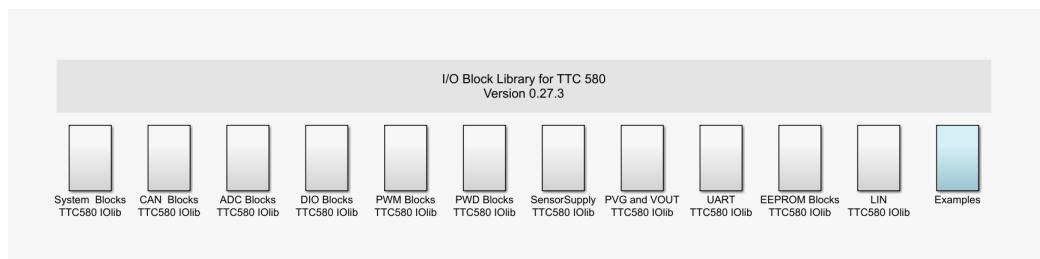
2. INSTALLING THE IOBLOCK LIBRARY



If you selected the recommended location, the I/O Block Library has been installed to the following path:
C:\TTTech\IOLib_TTC580_<version>\IOBlock_Library_TTC580

> Open the IOBlock Library

A window pops up (see picture below)



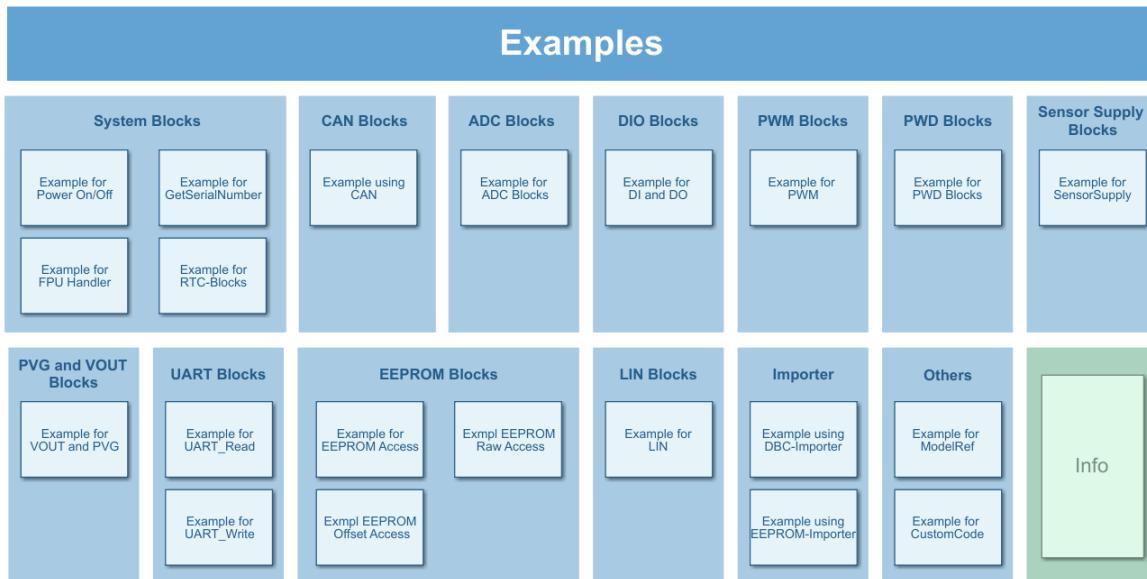
In case you want to try building code from one of the Examples provided by the Library, follow the instructions in chapter [Building the code](#)

3 Building the Code

This step-by-step instruction describes the process of building C Code based on a Simulink model using blocks from the I/O Library. The executive binary image may later be downloaded onto the ECU as instructed in the chapter [Download](#).

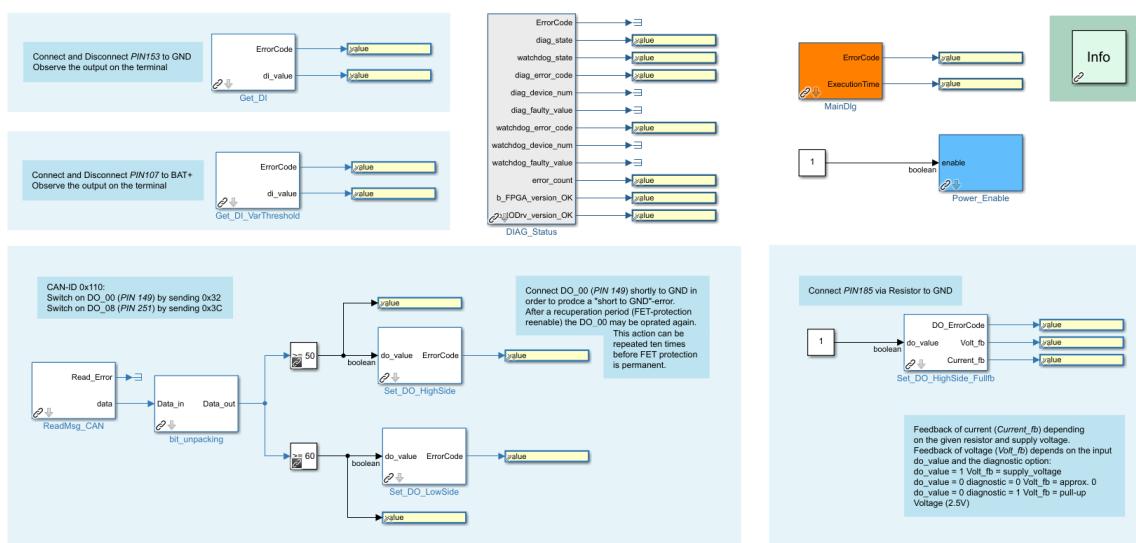
Each step to be done is marked with a ">"

NOTE Further information on the code generation- and building process can be found in "how_to_build.txt" to open this file double-click on the block called "Info" within every example model.



> Open "**Examples**" and then "**Example for DI and DO**"

This DI/DO model is used as an example in this instruction because it is easy to get started with.



This is what the model should look like.

3. BUILDING THE CODE

> build the C Code:

Go to: Apps > Embedded Coder > C CODE > "Build Code" ("Generate Code" but click on the downward-pointing arrow and select "Build")

This action results in code which is generated into a folder called "Example_IOBlock_Library_DIO_ert_rtw". Shortcut for this process: *Ctrl+B*

For the next step you need to install the "Code composer studio" (see HY-TTC 500 Quick start guide chapter "Tool Chain")

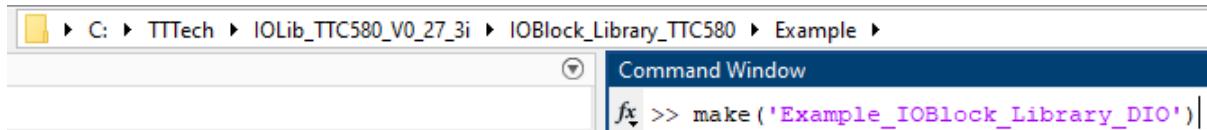
NOTE

You need the version 5.1.6 of the *ARM Compiler Tool* (Further information on how to download the right version: HY-TTC 500 Quick start guide chapter "Tool Chain")

After installing the code composer and checking whether you have the right version, return to the Matlab Command Window

> Use the command "make" in order to build your application

For the given example the call would look like this: *make('Example_IOBlock_Library_DIO')*



NOTE

make has to be launched from the directory where the corresponding model file (*.mdl or *.slx) is located

The binary image which will be downloaded onto the ECU can be found at the following location:
...\\Example\\Example_IOBlock_Library_DIO_ert_rtw\\build**Example_IOBlock_Library_DIO.hex**

NOTE

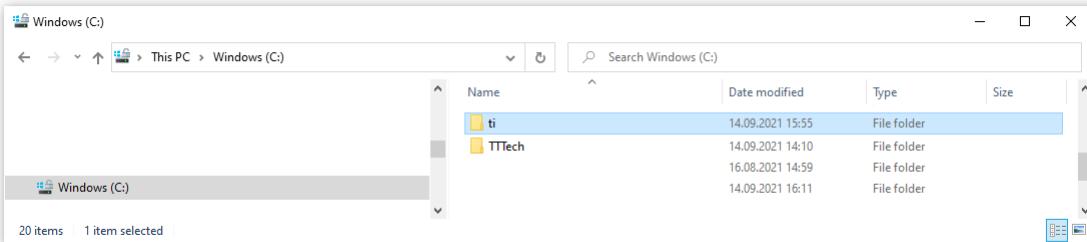
More information on the code generating- and building process can be found in "how_to_build.txt" to open this file double-click on the "Info" Block in the example model

In case the following error occurs during the execution of the *make* command, please do as instructed below:

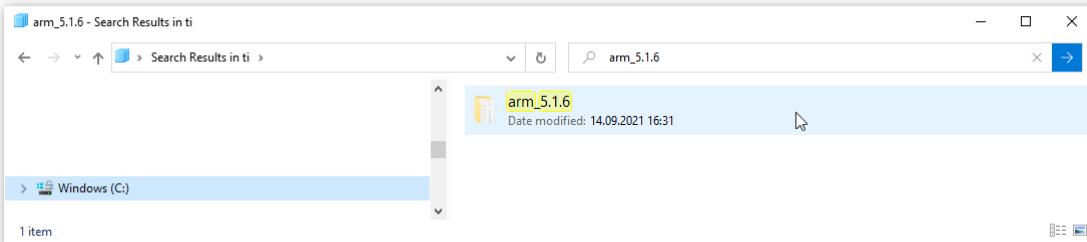
```
!"C:\\TTTech\\IOLib_TTC580_V0_27_3i\\IOBlock_Library_TTC580\\Make_Utils\\make.exe" TARGET=
cleaning up application module files
done.
-----
Checking CGT (compiler) version...
-----
The system cannot find the path specified.
make: *** [prebuild] Error 1
```

1) Go into the folder where the ARM Compiler Tool is installed. In the following this folder is called "ti"

3. BUILDING THE CODE



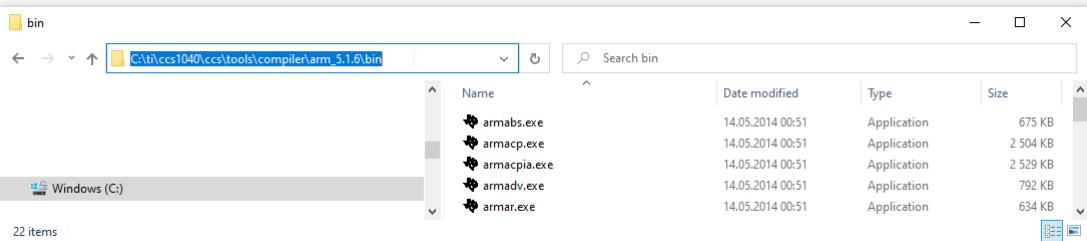
2) Search for "arm_5.1.6"



Once you've opened "arm_5.1.6", go into the folder called "bin"

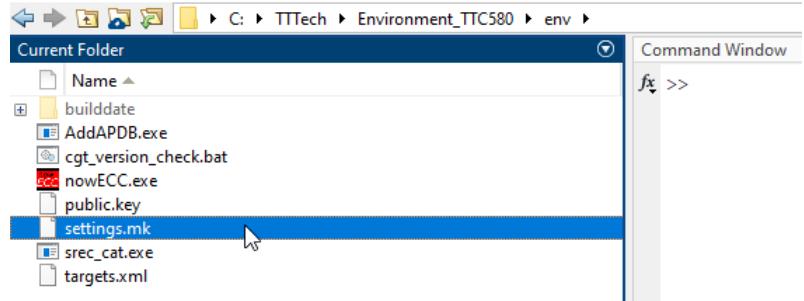
NOTE if you can't find "arm_5.1.6" you might have the wrong version of the ARM Compiler Tool. In this case please follow the instructions in the HY-TTC 500 Quick start guide, chapter "Tool Chain")

3) Copy the path



3. BUILDING THE CODE

4) Go to C:/TTTech/Environment_TTC580/env/settings.mk



5) Search for "C_COMP_PATH" in the "settings.mk" file

6) Replace the path next to "C_COMP_PATH" with the one you've copied previously (...\\arm_5.1.6\\bin)

```

settings.mk  X + 84
85  # path with C compiler
86  ifndef C_COMP_PATH
87      C_COMP_PATH = C:\\ti\\ccs1040\\ccs\\tools\\compiler\\arm_5.1.6\\bin
88
89  endif

```

7) Save the file

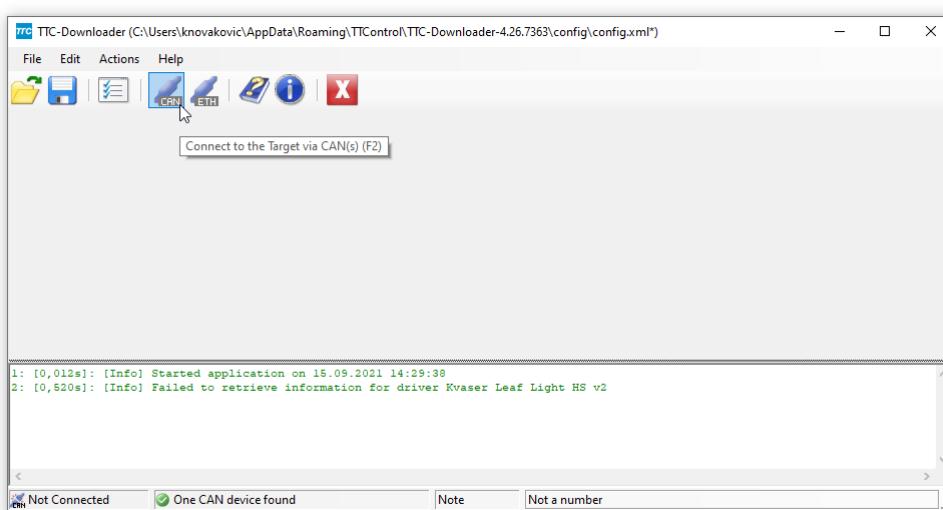
8) Retry the make-process

4. DOWNLOAD

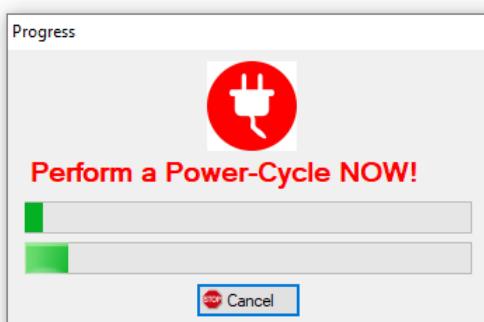
This step-by-step instruction describes the process of downloading a programm onto the ECU (example code, which is based on the "Example_IOPack_Library_DIO" simulink model, is used in this example).

See chapter [Building the Code](#) for further information on how to build code in MATLAB simulink).
Each step to be done is marked with a ">"

> Open the TTC Downloader



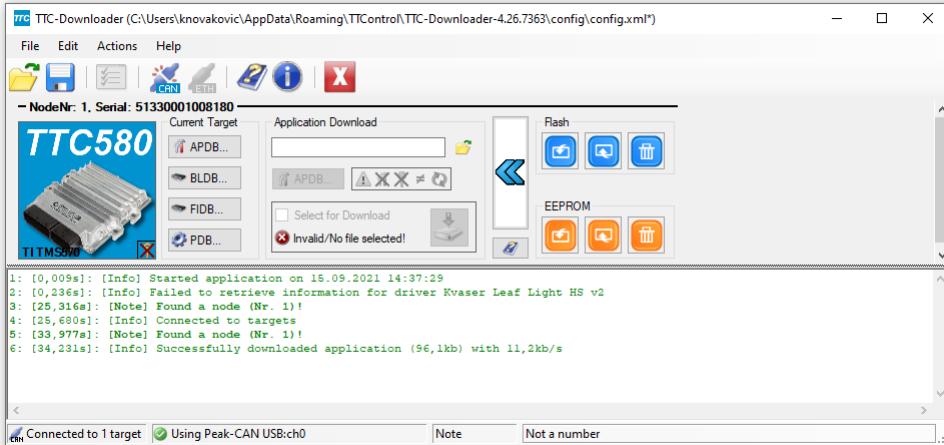
- > Select the CAN channel which is connected to your device via Peak CAN USB
- > Connect to Target via CAN



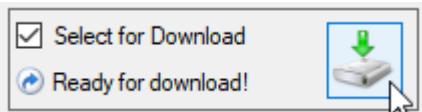
NOTE In case no CAN device is found, please make sure that the devices are properly connected and the driver is correctly installed

4. DOWNLOAD

Once the connection via CAN was successful, new options should appear at the top of the window (see in picture below)



> **Select the file to be downloaded** : "*name_of_your_model.hex*" which can be found in the "build" folder. After selecting the file, the absolute path should appear underneath "Application Download" (see in picture above)
 (...*name_of_your_model\\ert_rtw\\build\\Example_IOBlock_Library_DIO.hex*)



> **check "Select for Download"**
 > **click button to start the downloading process** (see in picture above)

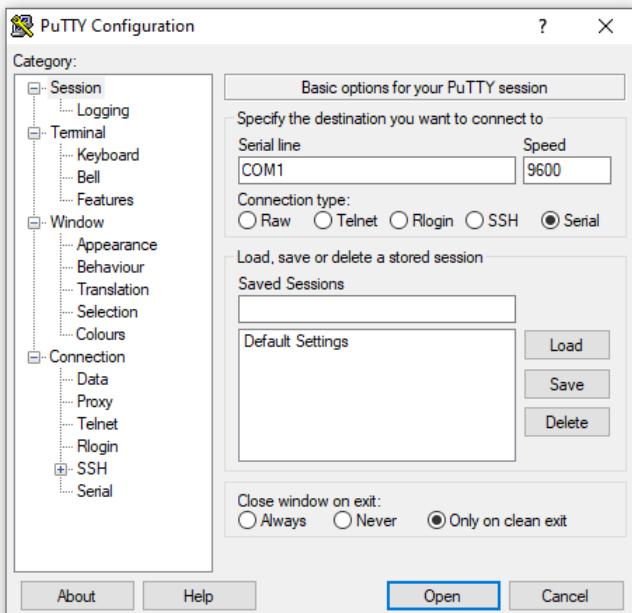
Once the flashing is done a message appears saying "[Info] Successfully downloaded application [...]" . The binary image of your application has been downloaded.

NOTE

Further information on the downloading process can be found in "HY-TTC 500 Quick start guide- C Programming"

5 Check out your first example

In the DIO Example model some IO-blocks are connected to a "Write_RS232" block which writes a value with a comment to an serial interface (see user manual for the IO Library TTC580, chapter "UART") These comments can be displayed on a serial console. In the following steps the application "Putty" is used, skip those in case you're using a different console.



> Select "Serial"

> choose the correct **Serial line** (check in Device Manager)

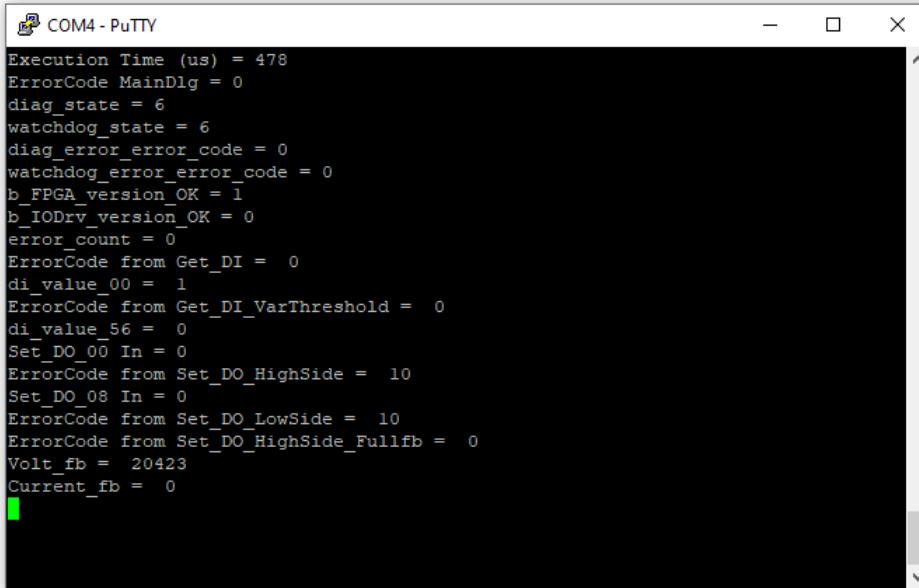
> change the **Speed** (check in mask of Write_RS232 Block or IOLib_TTC580_help.pdf)

> type in a name to save the settings (e.g.: **iolib**) and then > click "**Save**"

When using Putty during future sessions, select the name and click "Load" to apply the previously saved settings.

5. CHECK OUT YOUR FIRST EXAMPLE

Once you've clicked "Open" a window should appear. When all of the steps explained in the previous chapters have been done correctly, the console should display the comments from the "Write_RS232" Blocks and a value next to them.



```
Execution Time (us) = 478
ErrorCode MainDlg = 0
diag_state = 6
watchdog_state = 6
diag_error_error_code = 0
watchdog_error_error_code = 0
b_FPGA_version_OK = 1
b_IODrv_version_OK = 0
error_count = 0
ErrorCode from Get_DI = 0
di_value_00 = 1
ErrorCode from Get_DI_VarThreshold = 0
di_value_56 = 0
Set_DO_00 In = 0
ErrorCode from Set_DO_HighSide = 10
Set_DO_08 In = 0
ErrorCode from Set_DO_LowSide = 10
ErrorCode from Set_DO_HighSide_Fullfb = 0
Volt_fb = 20423
Current_fb = 0
```

> follow the instructions in the simulink model in order to try out the examples

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