PHYTEC

COMBI-Modul 515

Installation and Getting Started Guide

Edition March 2001

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Introduction

This manual is intended to enable the user to bring the COMBI-Modul 515 into operation and start a preexisting user program on the module. Afterwards there is a brief introduction to use of the monitor as well as the Keil Debugger. Sections are arranged so that the user is given step by step guidance through the initial start up of the module.

Complete function parameters of the COMBI-Modul 515, FlashTools98 and the software driver are not described in this manual. Instead only the most important functions required for initial start up are described. If problems should occur during initial start up, refer to the manuals included with the module. The following manuals are included with the COMBI-Modul 515:

Getting Started Manual

- Intended for initial use of the COMBI-Modul 515, in order to give the user a speedy introduction to the module.

Hardware Manual

- Gives complete descriptions of hardware properties, from technical data to memory models.

Software Module Driver

- Driver functions for access of COMBI-Modul 515 components are described and illustrated for applications with an user program.

- **FlashTools Manual**
- Is a general description of FlashTools98 for use with PHYTEC products.

1 Initial Startup

This section describes preparations for and start up of the COMBI-Modul 515.

1.1 Startup Requirements

The following requirements must be met for successful start up of the COMBI-Modul 515.

The following software is required:

- FlashTools98 for Windows from the TOOL CD-ROM
- User program „*Blinky*“ from the TOOL CD-ROM
- Keil µVision2 for 8051 Controllers
- Monitor program „MON51.hex“ from the TOOL CD-ROM

The following hardware is required:

- COMBI-Modul 515 (phyPS-406)
- An RS-232 extension cable[1]
- At least one 24 V power supply 24 VDC/1..6 A
- an IBM-compatible host-PC (486 or higher running at least Windows95/98/NT)

1.2 Preparations for the COMBI-Modul 515

For start up of the COMBI-Modul 515 it is necessary to take off the removeable cover. This can be accomplished quite simply with a screw driver by carefully prying the cover away from the side engagements. Then the cover can be lifted directly from the module.

A label on the COMBICON-socket connector shows the function and pin assignment of the individual contacts. The following diagram represents the configuration of the function blocks on the COMBICON-socket connectors.

[1] : Not included with the product

Figure 1 gives an overview of the function blocks for the purpose of assisting during the subsequent start up process.

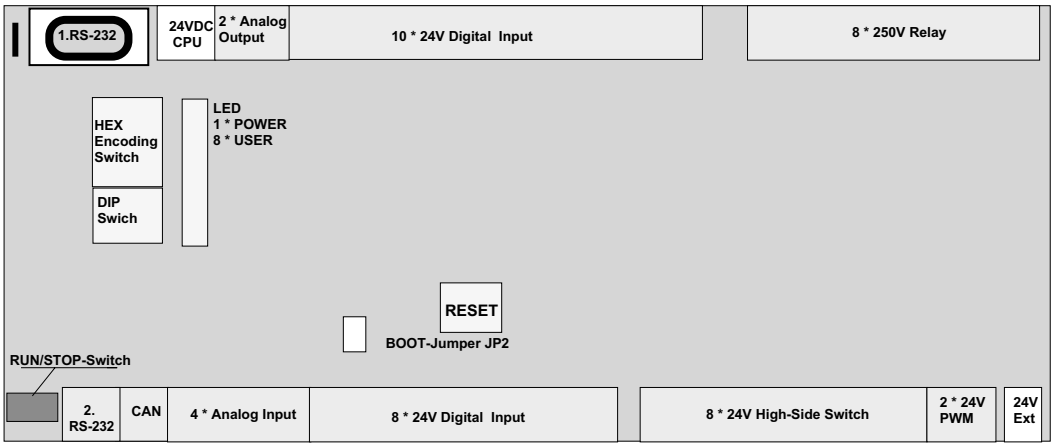

Figure 1: Function Blocks of the COMBI-Modul 515

1.3 Jumper Configuration

Only the BOOT Jumper JP2 is relevant for the user, since it is used to start FlashTools98 firmware on the module. Insert the jumper bridge at Jumper JP2. The BOOT Jumper JP2 is only required for Flash programming purposes and needs to be removed at the end of the download process.

1.4 Connecting the COMBI-Modul 515 to a PC

A PC and the COMBI-Modul 515 can communicate by connecting the COMBI-Modul 515‘s first serial interface and one of the PC’s serial interfaces (preferably COM1 or COM2).

The serial interface on the COMBI-Moduls 515 extends to the DB-9 socket P200. Connect the RS-232 interface of your computer to the DB-9 socket on the COMBI-Modul 515 using the included serial cable. This establishes the physical connection between the COMBI-Modul 515 and the PC.

1.5 Connecting a Power Supply

The COMBI-Modul 515 has two separate power supply inputs.

Input **24 VDC-CPU** supplies the controller circuitry of the COMBI-Modul 515. Typical current draw is 80..100mA.

Transistor outputs **(OUT8..15)**, PWM outputs **(OUT16..17)** and relays **(OUT0..7)** are supplied at input **24 VDC-Ext.** Current draw (max. 4 A) depends on the load connected to the transistor outputs.

For initial start up the power supply inputs can be run parallel to a 24 VDC/1..6 A adapter. For proper connection of the power supply refer to *Figure 2.* Be sure to connect the power supply when it is turned off.

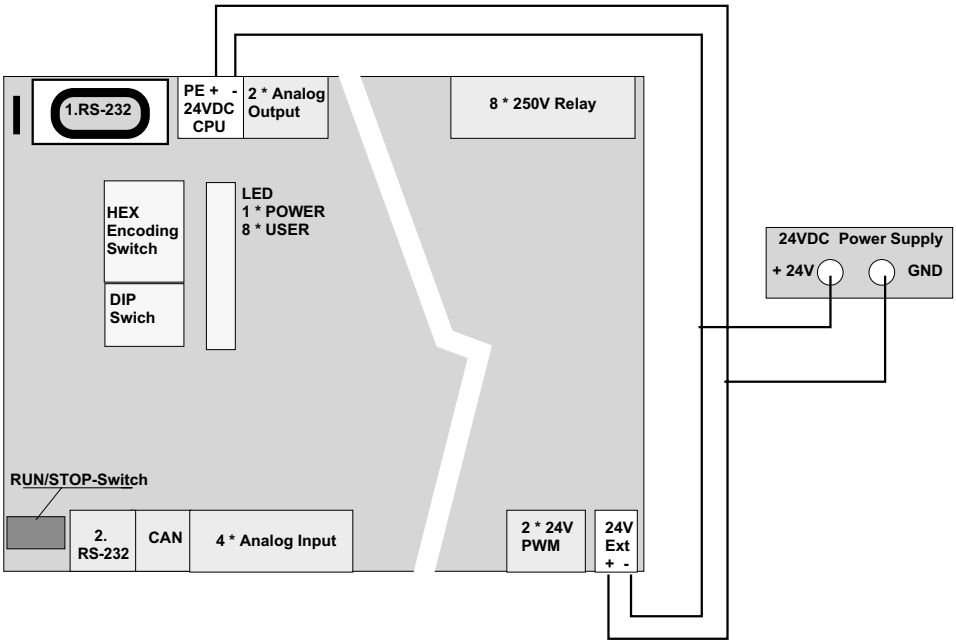

Figure 2: Connecting the Power Supply

1.6 Installing FlashTools98

FlashTools98 is required to download a user program onto the COMBI-Modul 515. The software is located on the TOOL CD-ROM in the ***X:\TOOLS\Flasht98*** folder.

Start the program *setup.exe,* in order to install FlashTools98, and follow the instructions for the installation process.

After installing FlashTools98, go to the ***X:\Products*** folder and copy the entire folder ***phyPS-406*** to the hard drive **C:** on your PC. The folder ***X:\phyPS-406\Software\Demos\Blinky\BlinkyFL*.**** contains a simple user program in Intel hexfile format (*Blinky.hex*) that can be executed on the COMBI-Modul 515.

2 Loading a Program with FlashTools98

Turn on the power supply adapter (24 V) and push the RESET button on the COMBI-Modul 515. Make sure BOOT Jumper JP2 is closed. Start FlashTools98 by selecting it from the *Programs* menu using the Windows *Start* button.

Figure 3: Communication Setup

At the *Communication Setup* window of the FlashTools98 tabsheet, choose the correct serial port for your host-PC and a 38,400 baudrate. Other supported baudrates are 9600, 19200, and 57600. The baudrate to be used depends on the properties of your PC's serial interfaces. However, a baudrate of 38400 baud should always function. Push the *Connect* button in order to connect to the COMBI-Modul 515.

If no connection can be established, check to see if the BOOT jumper is inserted and if the COMBI-Modul 515 is properly connected to the host-PC via the serial cable. Furthermore, ensure that the power supply is connected correctly and that the power adapter (24 VDC) is turned on. If this is the case, push the RESET button on the COMBI-Modul 515.

Select a lower baudrate and try again to make a connection. If the connection to the COMBI-Modul 515 is established, the following window will appear:

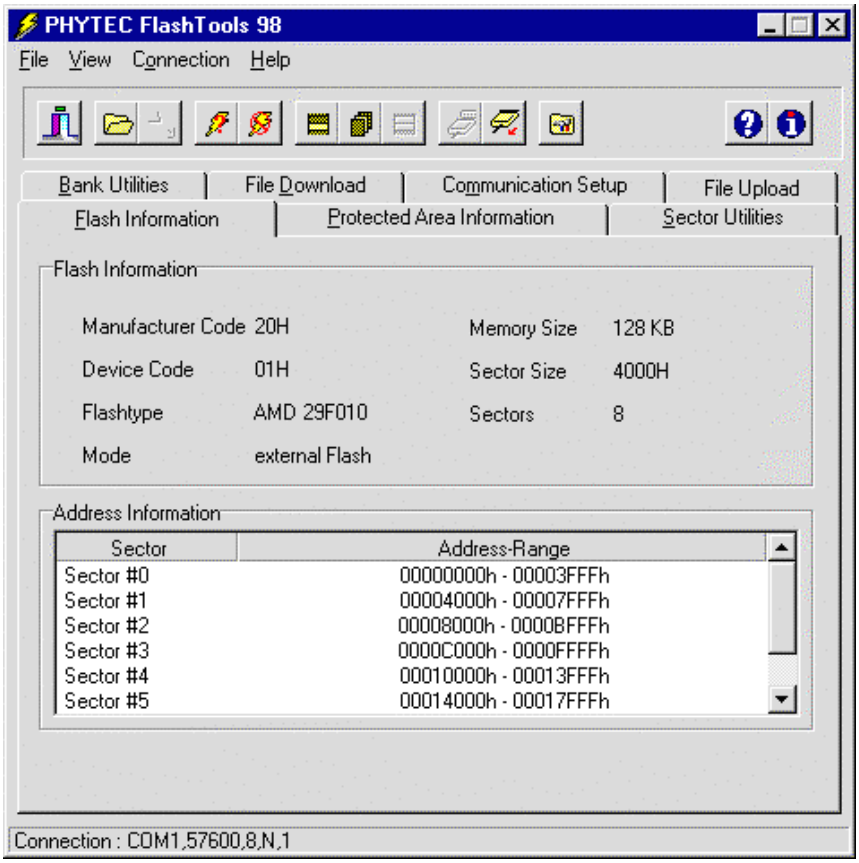

Figure 4: FlashTools98 - Main Window

Choose the *Bank Utilities* tab, highlight *Bank #1* in the *Bank Erase* section of the tab and click on the *Erase Bank(s)* button. This will erase the second 64 kByte Flash bank of the COMBI-Modul 515. The user program will be stored in this bank.

Bank #0 contains the FlashTools firmware for the COMBI-Modul 515 and therefore cannot be used.

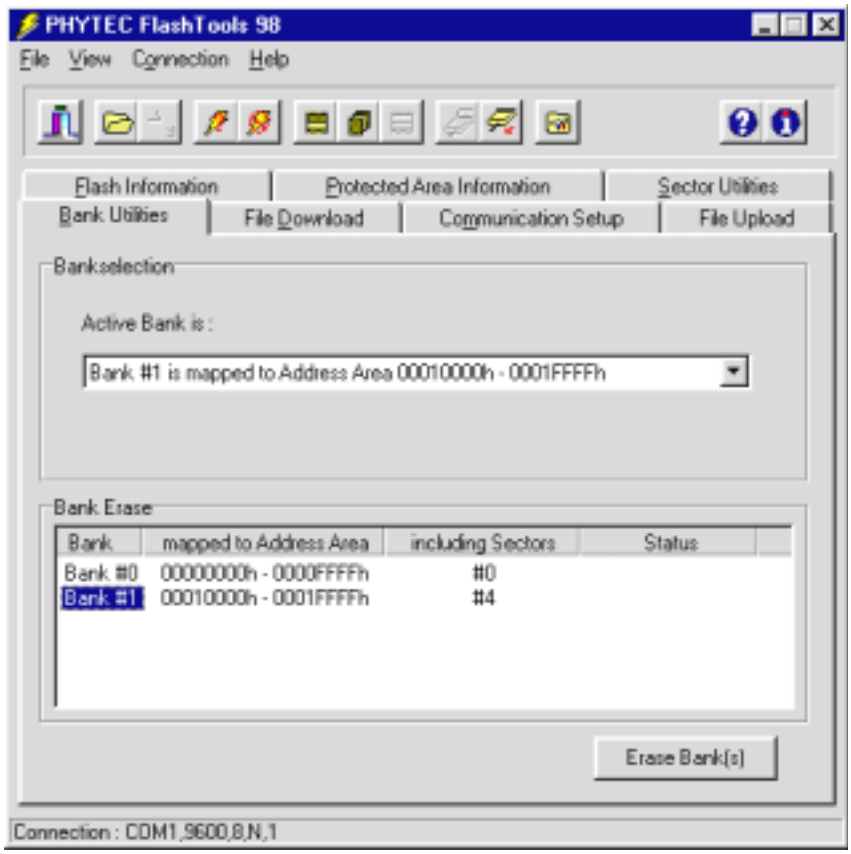

Figure 5: FlashTools98 - Bank Utilities

Next choose the *File Download* tab and click on the *File Open* button.

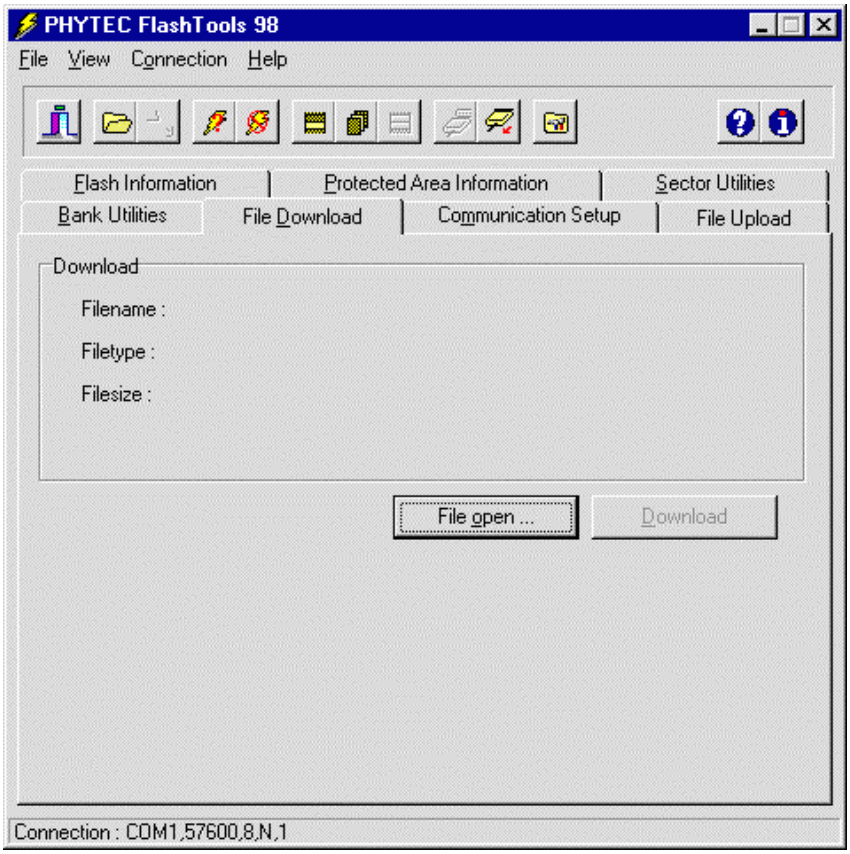

Figure 6: FlashTools98 - File Download

Choose the correct drive and path to the COMBI-Modul 515 demo folder (***C:\phyPS-406\Software\Demos\Blinky\BlinkyFL*.****). Open the file ***blinky.hex***.

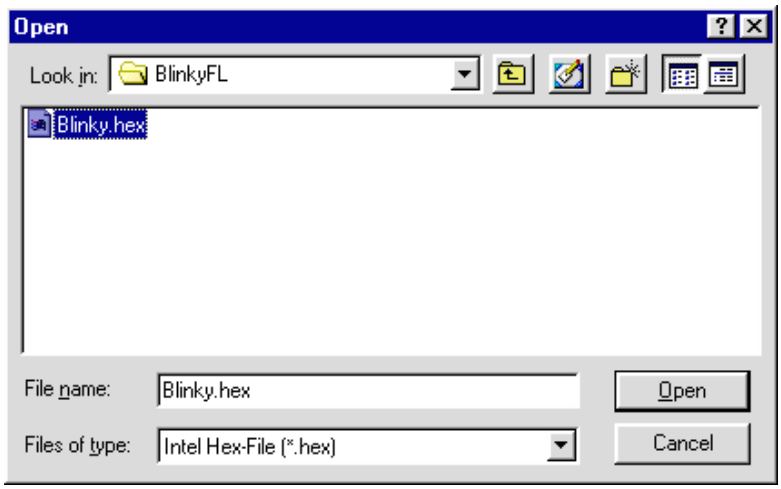

Figure 7: FlashTools98 - File Open

The file is displayed in the *File Download* window. Click on the *Download* button. You can watch the status of the download of the ***blinky.hex*** into external Flash memory on the COMBI-Modul 515 in the *Download* window.

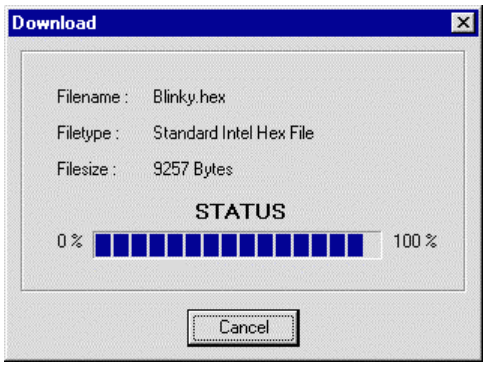

Figure 8: *FlashTools98* - File Download

Returning to the *Communications Setup* tab, click on the *Disconnect* button and exit FlashTools98. This terminates the serial connection between the COMBI-Modul 515 and the host-PC.

2.1 Starting Blinky

Remove the BOOT Jumper JP2 and push the RESET button. The user program should now run on the COMBI-Modul 515.

The user program „Blinky“ has the following functions:

- The green RUN-LED blinks.
- A running light (green LEDs) is generated at outputs OUT8-15. The red status LEDs indicate an OpenLoad, if the output is active. If a load consuming more than 100 mA of current at 24 V is connected to the output, the status LED remains inactive.
- If the RUN/STOP switch is set to position *RUN*, the DIP switch setting is displayed at outputs **OUT0..3**.
- If the RUN/STOP switch is set to position *STOP*, the HEX switch setting is displayed at outputs OUT0..7.
- If the RUN/STOP-Switch is set to *MRES*, the state of inputs **IN0..7** is displayed at outputs **OUT0..7**.

The first section has guided you through the following steps:

- Connecting the COMBI-Modul 515 properly to a power supply and a PC using an RS-232 cable.
- Downloading a user program into the COMBI-Modul 515‘s Flash memory using PHYTEC FlashTools98.
- Getting accostomed to the COMBI-Modul 515 and its peripheral units by start up and operation of a demonstration program.

3 Debugging Blinky with Keil µVision2

3.1 Monitor Program Mon51.hex

Use of a ROM Monitor allows debugging of application programs directly on the COMBI-Modul 515 during runtime.

The Monitor program ***mon51.hex*** is responsible for loading the application program and for communication with the Keil µVision2 debugger.

In order to execute an application program within the monitor and enable debugging, the program has to be linked for a von-Neumann memory architecture. That means that the CODE and XDATA memory spaces must not overlay. The memory configuration in the monitor program ***mon51.hex*** for the COMBI-Modul 515 is depicted in the following figure:

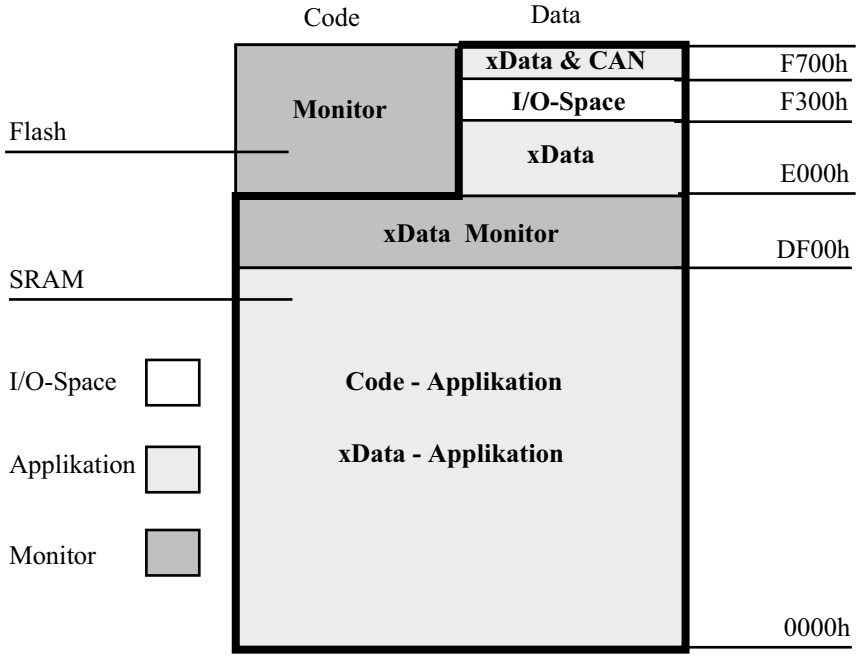

Figure 9: Memory Areas in Monitor Mode

The SRAM address space from 0000h to DEFFh is reserved in the monitor as application memory. CODE, as well as DATA access is possible in this range. In the example program Blinky this space is used as CODE memory.

The area between DF00h and DFFFh is reserved for the monitor‘s XDATA memory. This memory area cannot be used for the application. The space between E000h and FFFFh is configured as Harvard architecture. The code of the monitor program is located in Flash. The DATA area is available for the application program.

The DATA space is divided into three areas. SRAM is located in the area from E000h to F2FFh and can be used by the application as XDATA. The Blinky example uses this memory area as XDATA. The area from F300h to F6FFh is used by the address decoder with its three I/O Chip Select signals. The area from F700h to FFFFh is occupied by XDATA. Either SRAM or the CAN controller of the C515C can be mapped in here.

3.2 Loading the Monitor

The monitor file ***mon51.hex*** has to be loaded onto the COMBI-Modul 515 so that the monitor mode can be used. The file is located in the folder ***C:\phyPS-406\Software\Monitor*.***. Insert Jumper JP2 and push the RESET button. Using FlashTools98, load the file into Flash *Bank #1* of the COMBI-Modul 515. Remove BOOT Jumper JP2 and push the RESET button. The monitor mode should now run on the COMBI-Modul 515.

3.3 Opening the Blinky Project with Keil µVision2

Start the Keil uVision2 development environment on your PC. Choose *Project/ Open Project* to open the project file ***Blinky.uv2*** located in the folder ***C:\phyPS-406\Software\Demos\Blinky\BlinkyMon*.****.

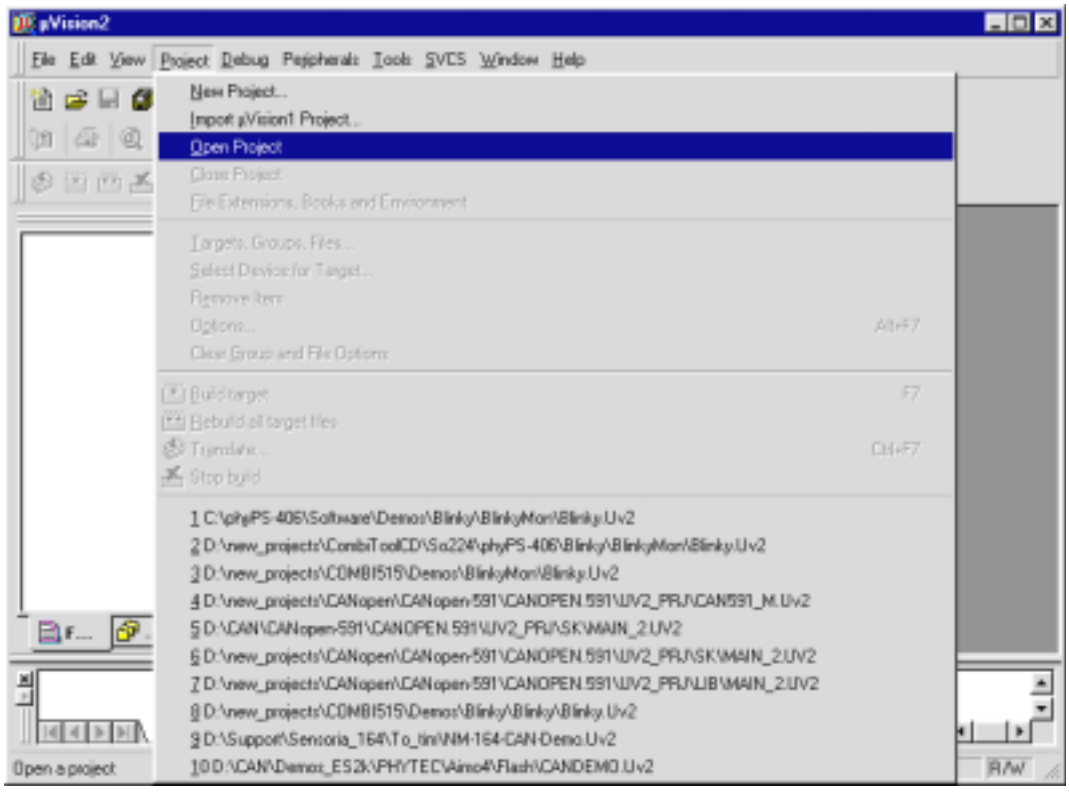

Figure 10: Open Project

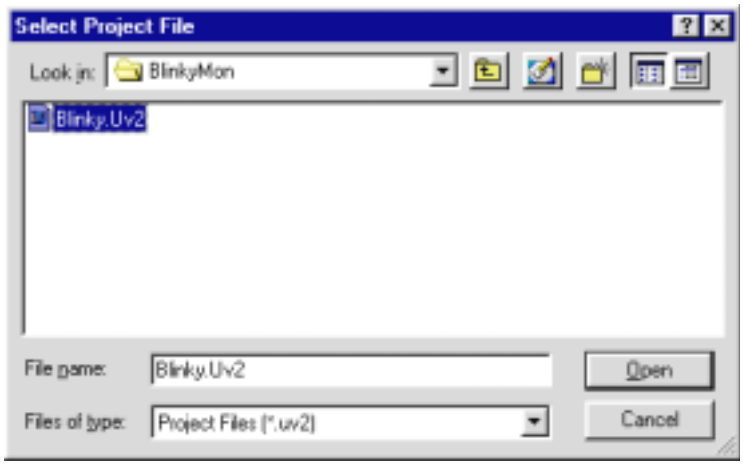

Figure 11: Select Project File

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The following window will appear:

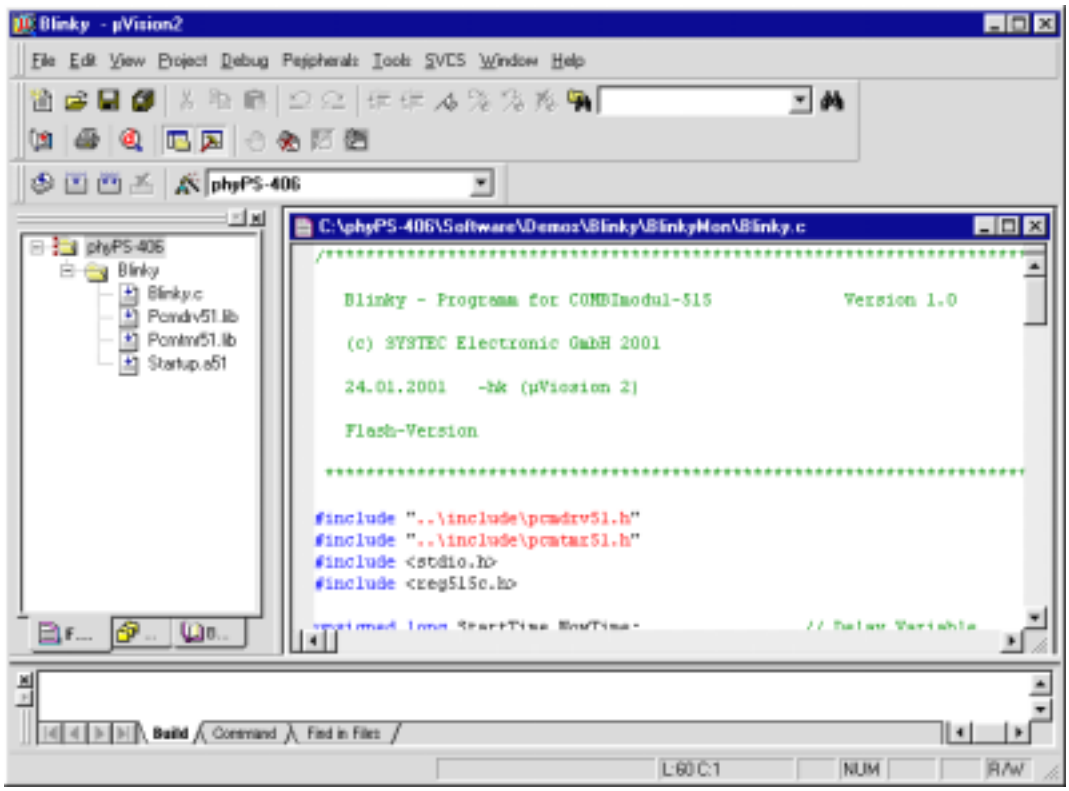

Figure 12: Project Blinky

For communication between the monitor and the debugger, the serial interface of the PC and the baudrate need to be configured. In the tabsheet *Debug* go to the *Projects/ Option for Target* menu and click on the *Settings* button.

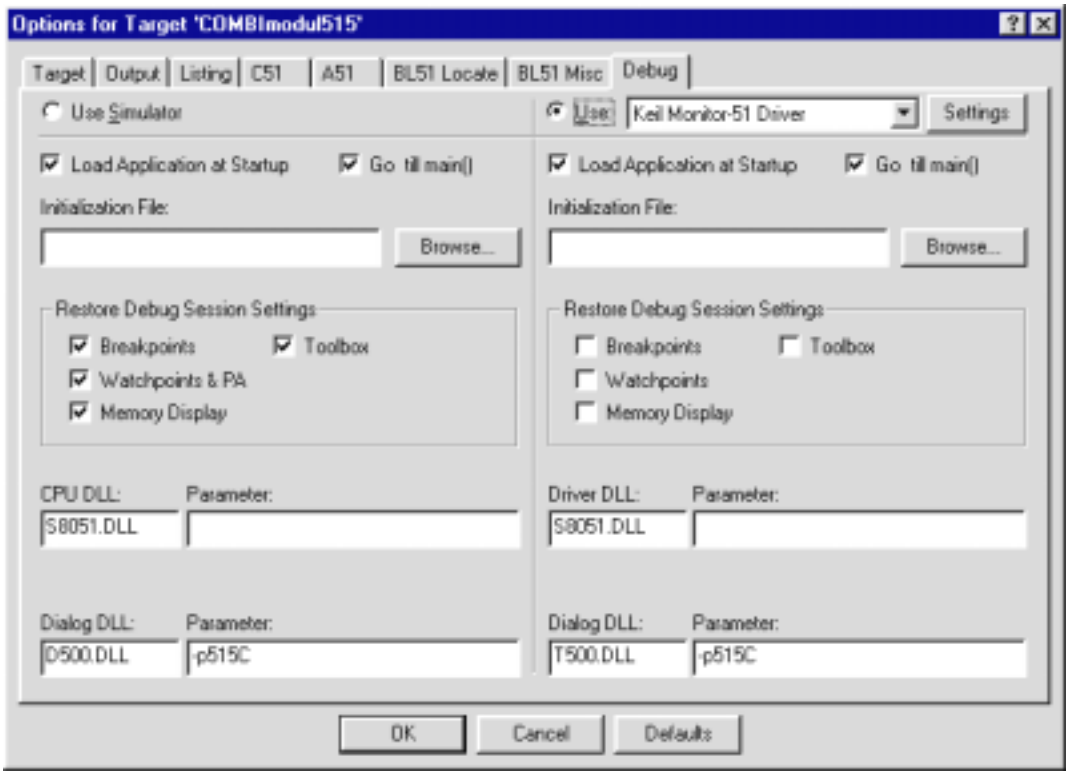

Figure 13: Option > Debug

After pushing the *Setting* button, the following window will appear:

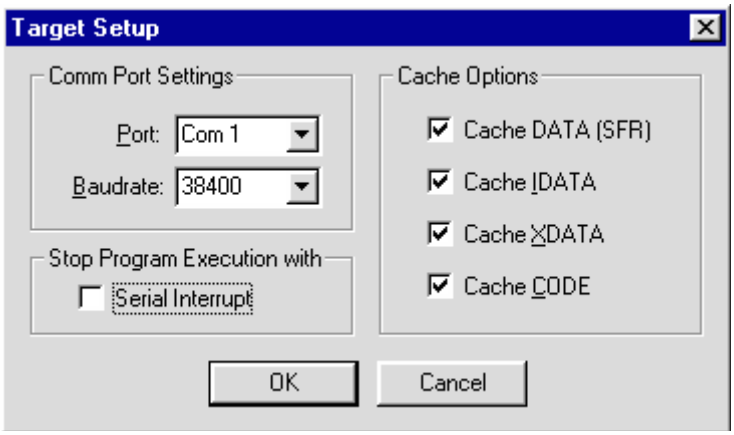

Figure 14: Option > Target Setup

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The serial interface of your PC can be set using the *Port* pulldown menu. Set the baudrate of your PC using the *Baudrate* pulldown menu. The monitor supports the following baudrates: 9600, 19200, 38400, and 56700 baud. Click on *OK* to save these configurations and to exit the window „*Option for Target*“.

Push the RESET button on the COMBI-Modul 515. Start the debugger by engaging the *Start/Stop Debug Session* in the *Debug* menu.

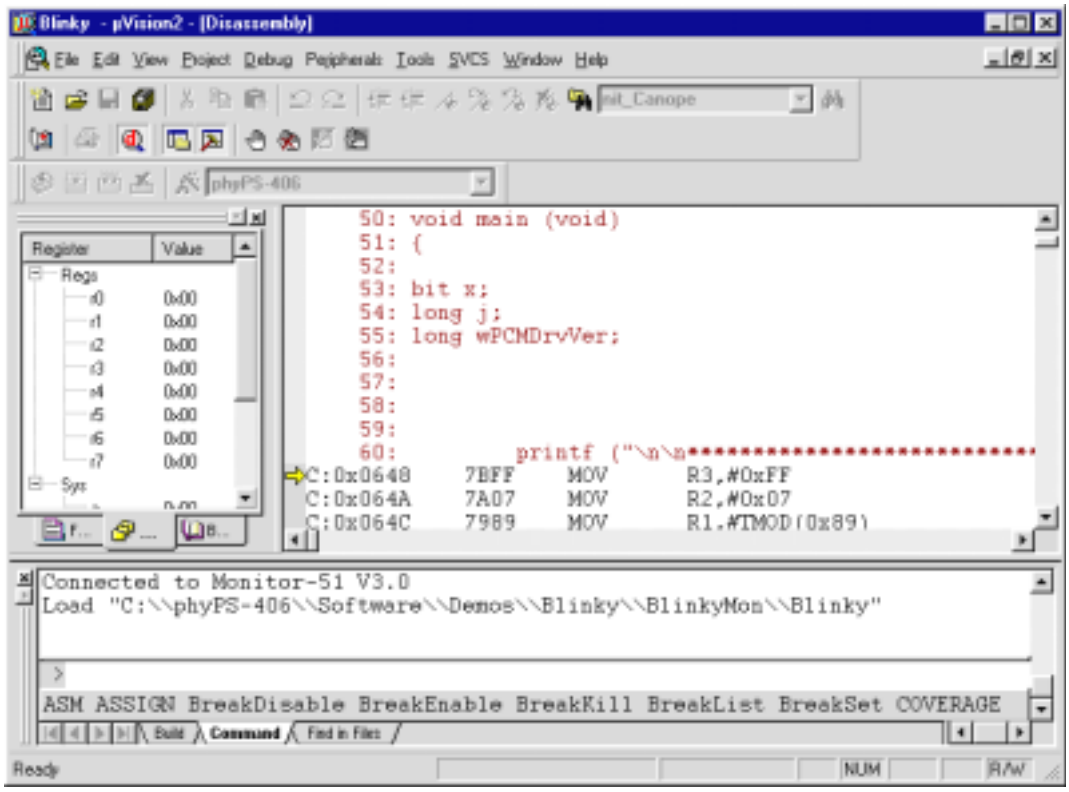

Figure 15: Debug Disassembly

Switch to the window ***phyPSphyPS-406\Blinky\BlinkyMon\Blinky.c***. Now it is possible to debug the program *Blinky* using the key *F10 Step over* or *F11 Step into.*

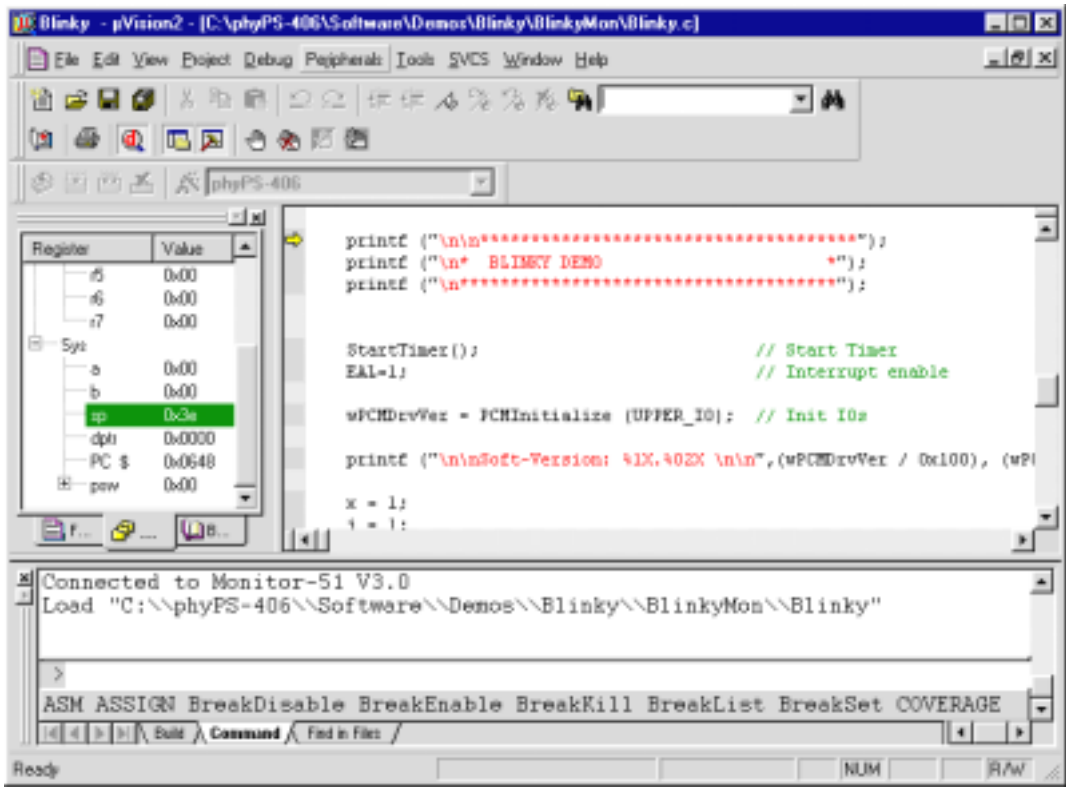

Figure 16: Debug Blinky.c

3.4 Important Project Settings

In order to configure a project for execution in monitor mode, some specific settings are required. In the project *Blinky* these settings are pre-established, and can serve as a reference for subsequent user applications.

Settings can be configured in the *Project* menu under *Option for Target*.

In the tabsheet *Target* the *Memory Model* should be set to *Large: variable XDATA*. The quartz frequency for the COMBI-Modul 515 must be set to 10MHz.

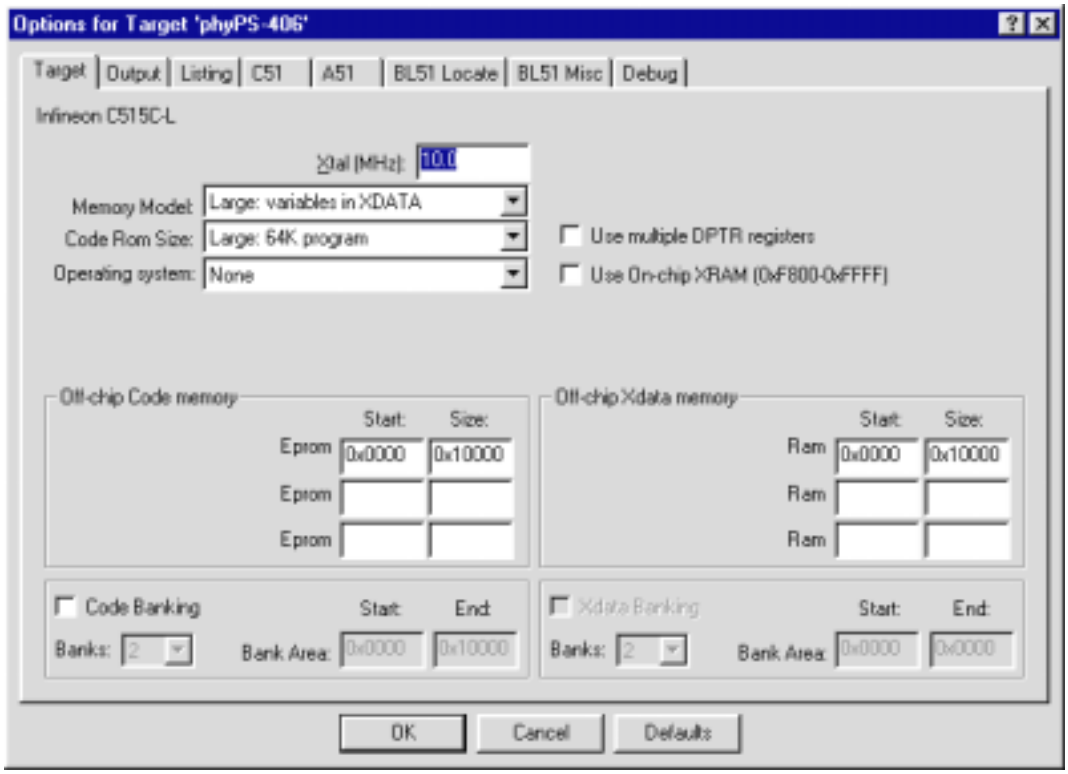

Figure 17: Option > Target

In the tabsheet *Output* the *Debug Information* and *Create HEX File* check boxes should be activated.

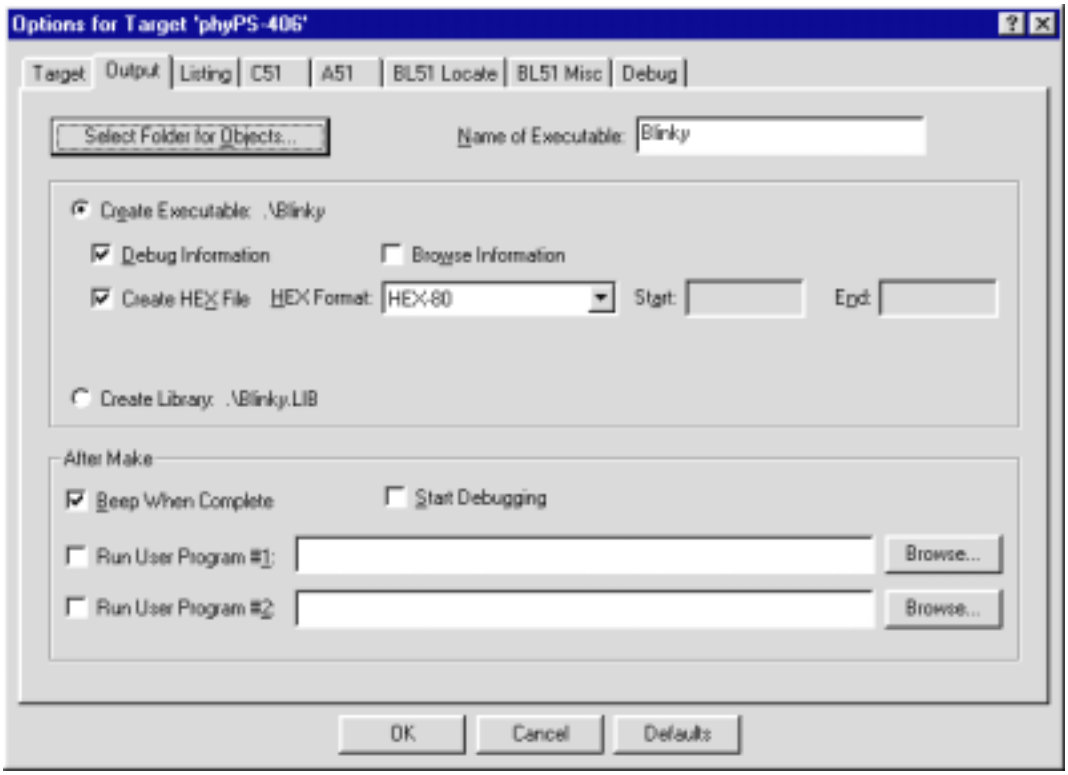

Figure 18: Option > Output

In the **L51 Misc** option (*refer to Figure 19*) it is possible to include an external linker file via the ***„use linker control file“*** check box.. This has the advantage of allowing to include of a specific link file for the monitor and a different link file for Flash. This enables fast software development with flexible choice of either compiling for Flash or for use with the monitor.

- **External Monitor Link File for Blinky**

  NOOL &
  RAMSIZE(256)&
  DA(030h)&
  IDATA(030h)&
  XD(0E000h)&
  CO(00100h, ?STARTUP_START (00000h))

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- **External Flash Link File for Blinky**

  NOOL &
  RAMSIZE(256)&
  DA(030h)&
  IDATA(030h)&
  XD(00000h)&
  CO(00100h, ?STARTUP_START (00000h))

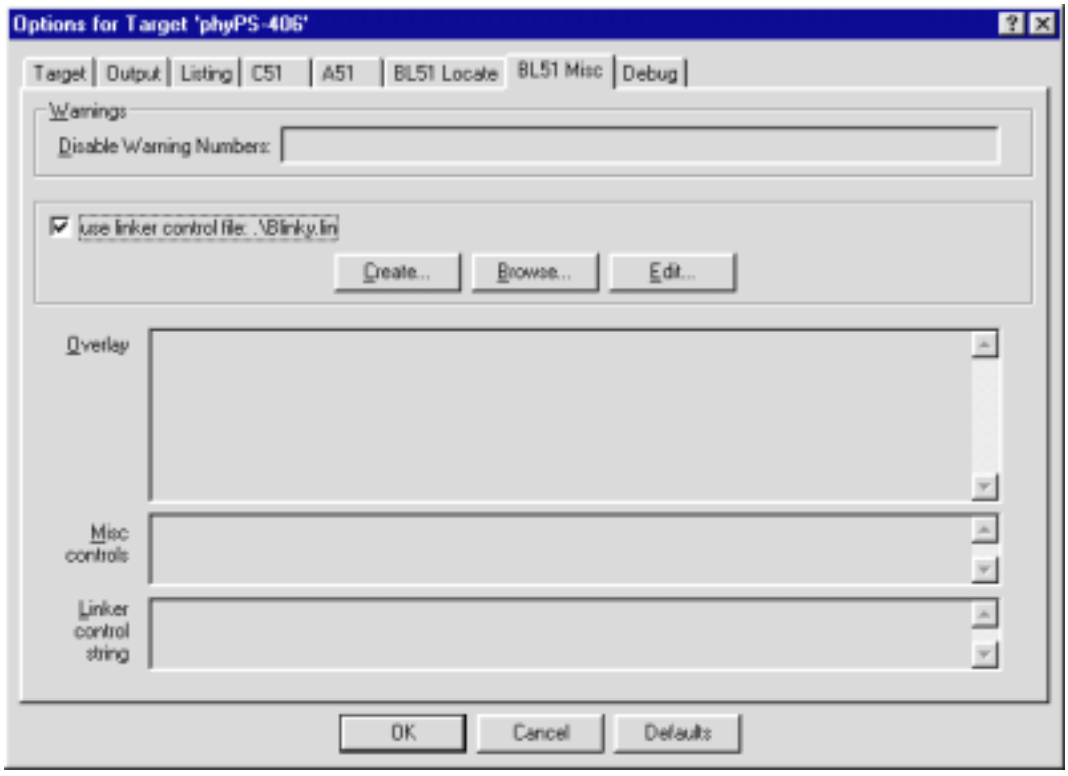

Figure 19: Option > L51 Misc

In the tabsheet *Debug* settings should be entered as shown in *Figure 20*.

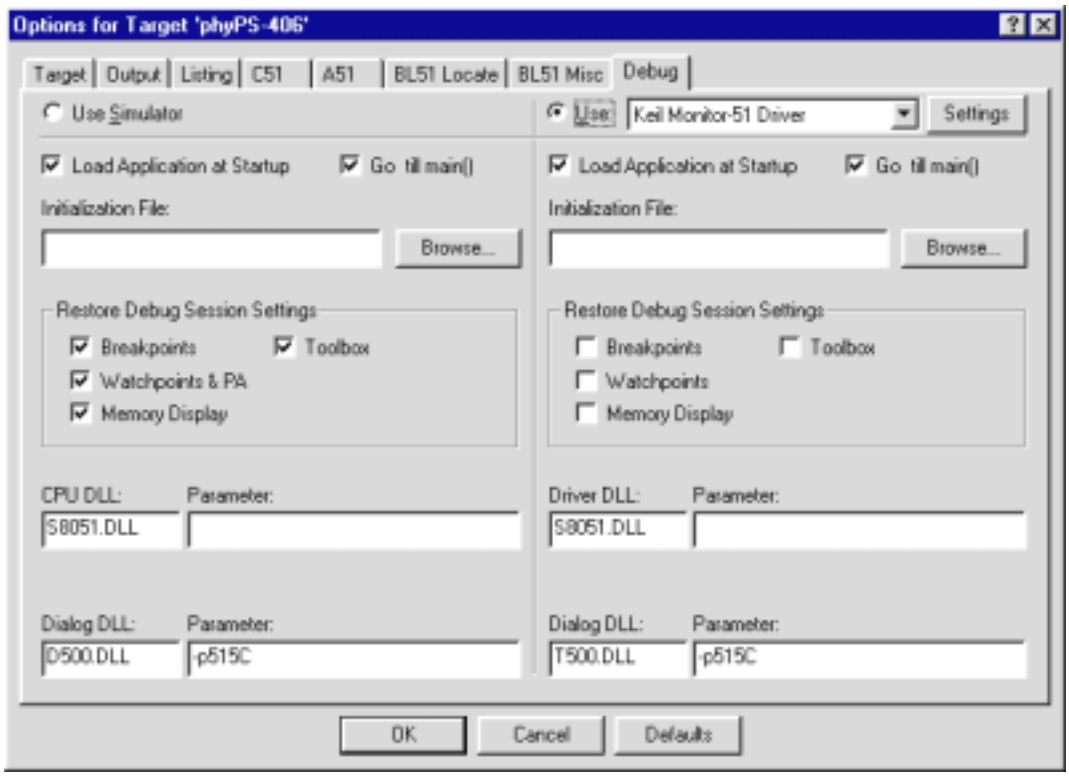

Figure 20: Option > Debug

In the *Settings* window the serial interface of your PC can be set using the *Port* pulldown menu. Set the baudrate of your PC using the *Baudrate* pulldown menu. The monitor supports the following baudrates: 9600, 19200, 38400, and 56700 baud.

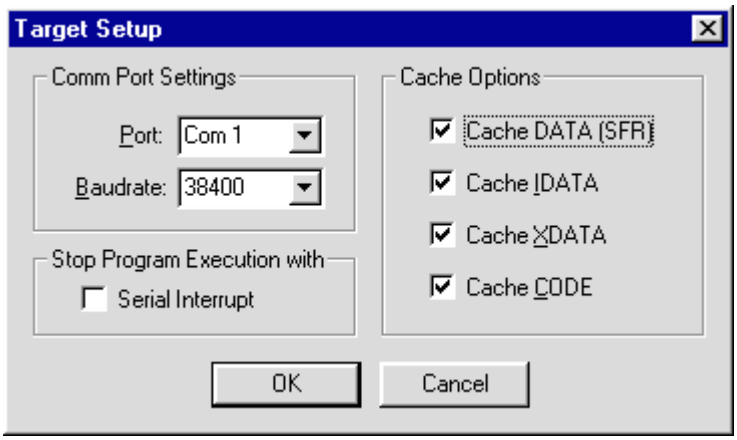

Figure 21: Target Settings for Debugger

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