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SX-Key/Blitz Development System Manual

Version 2.0

PARALLAX

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- [SX Tech](#) – Discussion of programming the SX microcontroller with Parallax assembly language tools and 3rd party BASIC and C compilers. Approximately 600 members.
- [BASIC Stamps](#) – With over 2,500 subscribers, this list is widely utilized by engineers, hobbyists and students who share their BASIC Stamp projects and ask questions.
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This manual is valid with the following software and firmware versions:

IDE:

SXKey.exe software version 2.0

Firmware:

SX-Key rev. F and SX-Blitz rev. A

The information herein will usually apply to newer versions but may not apply to older versions. New software can be obtained free on our web site (www.parallax.com). If you have any questions about what you need to upgrade your product, please contact Parallax.

Welcome

Thank you for purchasing the Parallax SX-Key®/Blitz development system. We have done our best to produce a full-featured, yet easy to use development system for the SX microcontrollers. The result is the SX-Key and the SX-Blitz; very tiny, full-featured development tools with a Windows® 95 and higher versions interface. We hope you will find this system as enjoyable to use as we do.

This manual is written for the SX20/28 chips with a date code of AB9921AA or later, and SX48/52 chips with a date code of AB0001A or later.

Older chips are not supported by this manual or the SX-Key development system.

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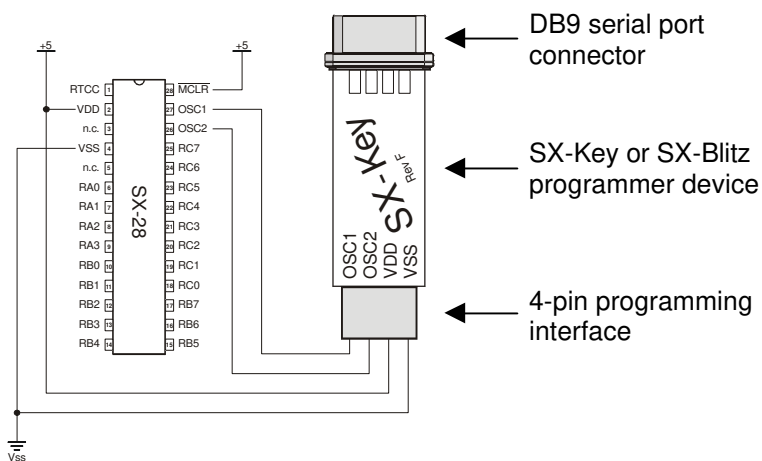
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1 Introduction the SX-Key/Blitz Hardware

1 Introduction to the SX-Key/Blitz Hardware

The SX-Key/Blitz hardware consists of the programmer unit, a four-pin programming interface and a standard, female serial port connector (DB9). The serial port connector should be plugged into an available standard, straight-through serial cable on an IBM-compatible PC. The four-pin connector on the SX-Key/Blitz board should be connected to four pins (VSS, VDD, OSC2 and OSC1) of the SX chip. Take care to connect it in the right orientation because this connector is not indexed.

Figure 1 - Connecting the SX-Key/Blitz



The SX-Key/Blitz is powered by the target circuit's power supply and programming and debugging takes place over the oscillator pins. The power supply to the SX-Key/Blitz must be +5 V DC. If an external crystal, resonator or RC circuit is used, the SX-Key/Blitz can usually remain connected to the SX chip for programming purposes, without affecting the operation of the circuit. When debugging, the SX chip must not have an external clock source since the SX-Key's internal programmable oscillator must be used. *The SX-Blitz can only program SX chips, it cannot debug them.*

Each SX microcontroller contains the necessary debugger hooks required to perform SX in-circuit debugging. No other supporting chips are necessary for the debugging process. During debugging, the SX-Key provides the oscillator signal to drive the SX microcontroller until such time that a breakpoint is hit or a single step or stop mode is initiated.

Figure 1 - Connecting the SX-Key/Blitz shows all the connections necessary to program, debug and run the SX microcontroller. An external resonator or crystal should be connected to the OSC1 and OSC2 pins to run the SX if the SX-Blitz is used, or if the SX-Key's internal clock oscillator is not used.

1 Introduction the SX-Key/Blitz Hardware

The SX-Blitz is designed to be a lower-cost device for programming the SX chips only (no debugging features are available). The SX-Blitz and SX-Key use the same interface software for programming, however, debugging features will not work with the SX-Blitz.

NOTE: Since the SX-Blitz and SX-Key function almost identically, they will be referred to as the SX-Key/Blitz, except where there are distinct differences.

2 Installing the SX-Key/Blitz Software

2 Installing the SX-Key/Blitz Software

Before following the steps in the next chapter, you should first install the SX-Key/Blitz interface on your computer's hard disk.

The SX-Key/Blitz Interface consists of the integrated editor, programmer, and debugger software. The following system requirements are a minimum for using the SX-Key/Blitz Interface:

- 80486 (or higher) IBM or compatible PC;
- Windows 95 or higher operating system;
- 64 Mb of RAM;
- 3 Mb of available hard drive space;
- CD-ROM drive, or access to the Internet;
- 1 available serial port.

To install the SX-Key/Blitz Interface:

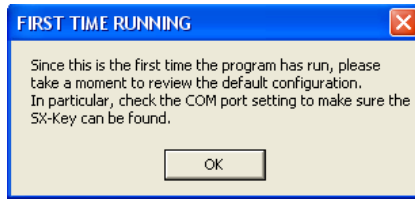
1. Insert the Parallax CD-ROM in an available CD-ROM drive.
2. Use the CD's automatic browser to navigate to the Software section.
3. Expand the SX-Key & SX-Blitz folder.
4. Select the 18/28/48/52-pin SX chips (SXKey.exe) item.
5. Click on the Install button.
6. When prompted for the type of installation, select "Typical" in order to have the software installed in the "Programs\Parallax Inc\SX-Key v2.0" folder. Select "Custom" when you want to change the default installation options, like the installation folder.
7. After the setup has finished, you will find a shortcut on the desktop, and a new "Parallax Inc" program group in the Start menu.

You may also download the software from the Parallax web site. There are two different file versions available. One has a size of about 1.2 MB, and the other one of 4.6 MB. When you use the smaller one, it is necessary to have an Internet connection active while installing the software. Select any folder where the downloaded file shall be stored, and then run "Setup_SX-Key_Editor.exe" from this folder.

After you have successfully installed the SX-Key Editor and start it the first time, the dialog shown below opens:

2 Installing the SX-Key/Blitz Software

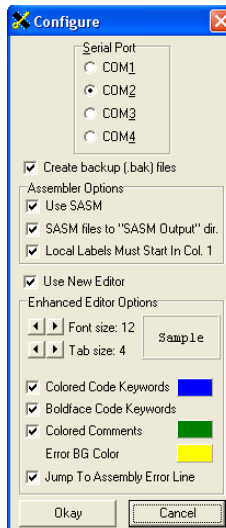
Figure 2 - First Time Running Window



This is to remind you that you should review some basic configuration settings first. Click the OK button, and press Ctrl-U to open the Configuration dialog shown to the right.

The only setting that is important for now is the selection of the serial port to which you have connected the SX-Key/Blitz.

Figure 3 - Configure Window



The configuration dialog allows you to select COM1, COM2, COM3, or COM4.

Click the radio button in the “Serial Port” section that matches your installation.

Make sure that the remaining options are set to the defaults as shown here, and then click “Okay” to close the configuration dialog window.

You may keep the SX-Key Editor active because you will need it to perform the next steps below.

3 Quick Start Introduction

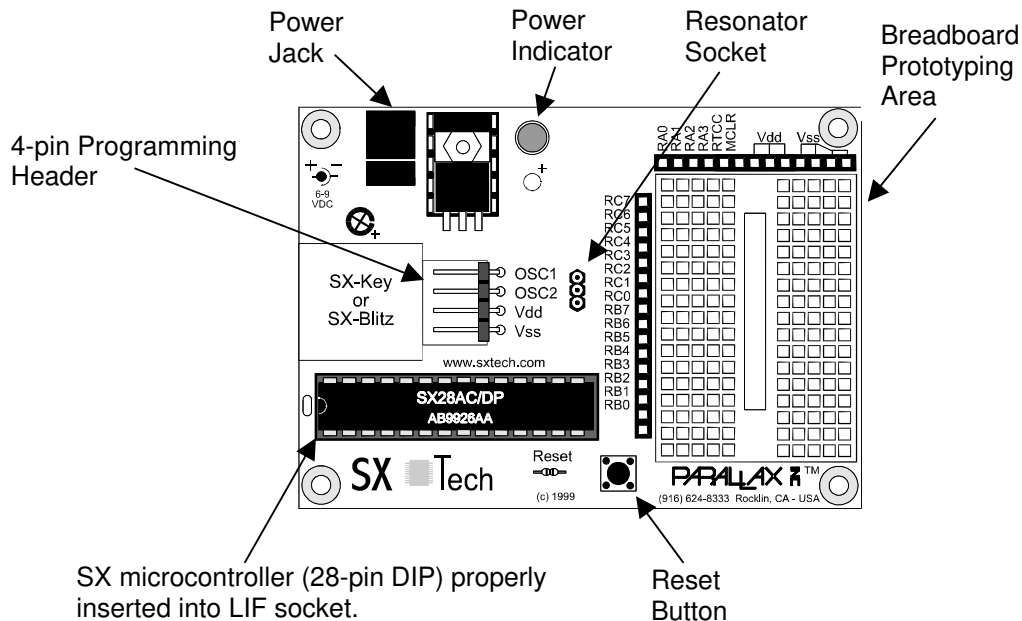
This chapter is a quick start guide to connecting the SX-Key/Blitz and programming the SX microcontroller. Without even knowing how the SX-Key/Blitz and the SX chip work, you should be able to obtain satisfactory results from the steps that follow.

3.1 Connecting and Downloading to the SX Tech Board

In order to get familiar with how the SX-Key/Blitz Development System works, we'll use the SX Tech Board to program and run a 28-pin SX chip.

Keep in mind that the SX Tech Board is not a programmer; rather the SX-Key/Blitz is the programmer/debugger device while the SX Tech board is a type of prototyping board. Follow these steps to connect and download a program:

Figure 4 - SX Tech Board with SX chip inserted



- 1) Plug an SX28AC/DP into the 28-pin LIF socket on the SX Tech board as shown in Figure 4 - SX Tech Board with SX chip inserted. Make sure it is oriented so that the half-moon notch in the chip faces away from the "Reset" button.

3 Quick Start Instruction

- 2) Connect the SX-Key/Blitz to a serial cable, and the serial cable to the serial (COM) port on the PC that you have selected in the “Configure” dialog of the SX-Key/Blitz software.
- 3) Connect the SX-Key/Blitz to the 4-pin programming header with the VSS, VDD, OSC2 and OSC1 indicators lining up with the same indicators on the board. Note that the programming header is not indexed. Therefore, double-check the correct orientation of the SX-Key/Blitz.
- 4) Insert one end of a 470 ohm resistor into the RC7 socket (next to the upper left side of the breadboard). Insert the other end of the resistor into any hole in the breadboard.
- 5) Insert the shorter leg of an LED into the breadboard hole that is closest (horizontally) to the resistor leg. Insert the other leg of the LED into one of the VDD sockets (next to the top side of the breadboard).
- 6) Plug the power supply into the SX Tech board and into an available wall outlet. (The power indicator should light up).
- 7) If it is not still active, start the SX-Key Editor now.
- 8) In the SX-Key Editor window, pull down the File menu and select “Open” (or press Ctrl-O). In the browser window that appears, select and open the led28.src file. (The led28.src source code should appear in the SX-Key code window).
- 9) Pull down the Run menu and select Run (or press Ctrl-R). (The SX-Key software should assemble the code and begin the programming process).

Congratulations! You have just programmed the SX microcontroller with the SX-Key/Blitz Development System. The program in the SX microcontroller should start running. The LED should flash on and off (if wired correctly).

In case you get an error message after you have selected the “Run” option, make sure that you did not modify the source code text in the editor window. If you did, simply re-load the original text by opening it again, and then repeat the steps described above.

Should an error message like “SX-Key not found on COMx” appear, check that you have selected the right serial port for communication with the SX-Key/Blitz, and that the serial cable is correctly connected to the PC, and to the SX-Key/Blitz on the other end. Also make sure that the SX-Key/Blitz is correctly placed on the 4-pin programming header, and that the SX Tech board is powered, i.e. the power indicator LED is active.

4 The SX-Key/Blitz Interface

4 The SX-Key/Blitz Interface

The SX-Key/Blitz interface is an integrated editor, programmer, and debugger. All the functions of the SX-Key and the SX-Blitz are available through this single software interface.

Throughout the rest of this manual, the SX-Key/Blitz interface will be referred to as the SX editor, or more simply, the editor.

4.1 Starting the SX-Key/Blitz Software

Figure 5 - The SX-Key Icon



During installation, a shortcut was automatically placed on the Windows desktop. Double-click on the SX-Key icon to launch the SX-Key/Blitz interface. In case, the Icon has been deleted from the desktop, you can also start the software via the Windows Start button. Navigate to the Parallax Inc. program group and select "SX-Key v2.0" there.

4.1.1 Command Line Switches

It is also possible to start the SX-Keys software together with parameters from a command line, e.g. using the Windows "Run..." option, or from the DOS command line. The Syntax is:

```
SxKey /<switch> {/<switch>...} <File name>
```

When you specify a file name with a ".src" extension, the editor window will open, displaying the contents of the source code file. When you specify an ".sxh" extension instead, the hex will be opened into the device window.

The /r switch is used to open a file in read-only mode, i.e. it can be displayed but not modified in the editor or in the device window.

For example

```
SxKey /r test.src
```

opens the source file named "test", and displays it in the editor window and

```
SxKey /r test.sxh
```

opens the hex file named "test", and displays the device window. In both examples, the files are opened read-only, i.e. they cannot be modified.

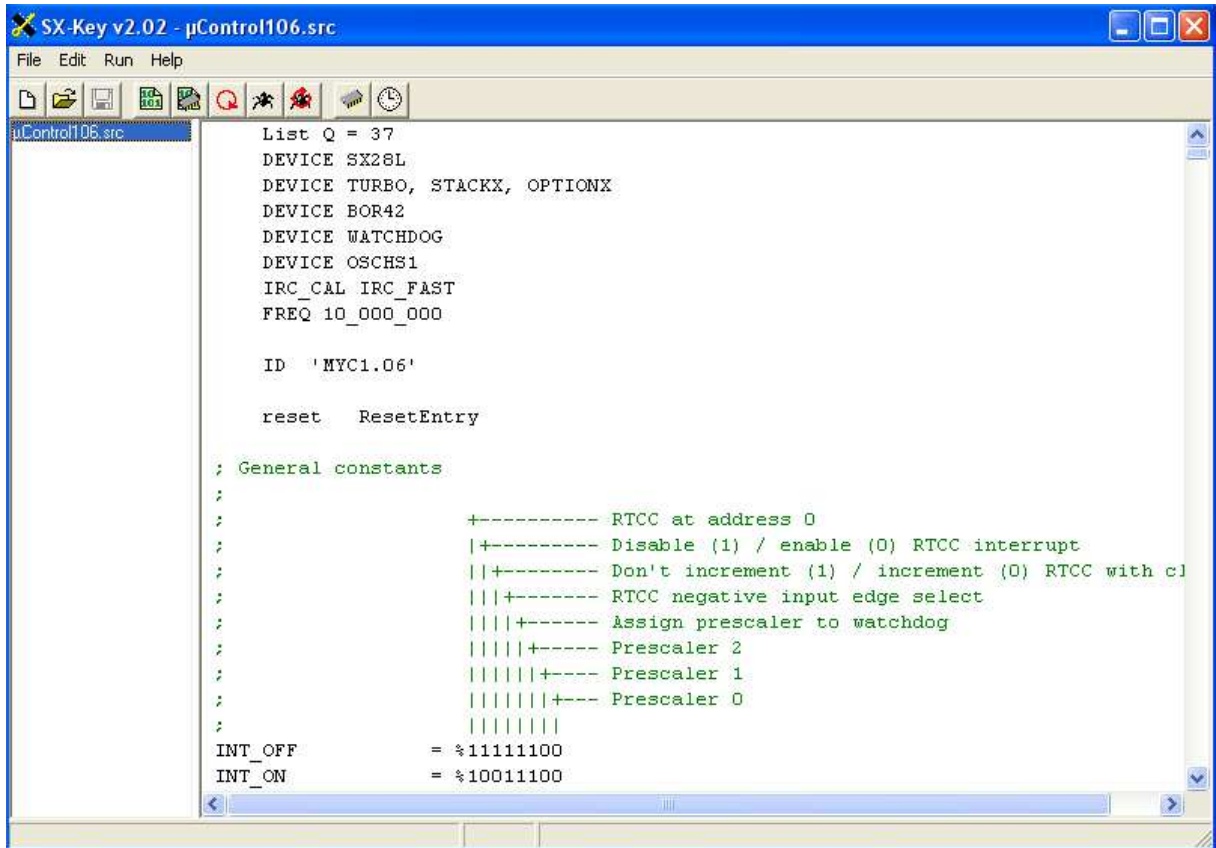
In addition to the /r switch, the switches /1, /2, /3 and /4 are also defined. They are used to select the COM port where the SX-Key/Blitz is attached. This will override the setting that has been recently

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made in the Configure window. It is recommended **not** to use these switches; they have been implemented for compatibility reasons only.

4.2 The SX Editor

Figure 6 - The SX Editor



The SX editor (see Figure 6 – **The SX Editor**, above) consists of a window containing a menu at the top, several shortcut buttons in a tool bar, a list of files that are currently open to the left, and a large text area to the right. In the status bar at the bottom, there is the row/column indicator, telling you at which row and column the cursor is currently located. The editor window is where your SX source code will be entered and edited. Standard Windows editing shortcut keys listed in **Table 1 – Editor Shortcut Keys**, below, may be used in addition to the commands in the Edit menu and the tool bar buttons to manipulate the source code.

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Table 1 - Editor Shortcut Keys

Function Name	Shortcut Keys	Function Description
Copy	Ctrl-C	Copies selected text to the clipboard.
Cut	Ctrl-X	Cuts selected text to the clipboard.
Paste	Ctrl-V	Pastes clipboard contents.
Page Up	PgUp	Moves editor window one page up.
Page Down	PgDn	Move editor window one page down.
Begin of Line	Home	Move the cursor to column 1 in the current line
End of Line	End	Move the cursor behind the last character in the line.
Begin of Text	Ctrl-Home	Moves the cursor to row 1, column 1 in the editor window.
End of Text	Ctrl-End	Moves the cursor behind the last character of the text in the editor.
Tab	Tab	Moves cursor to the next tab position. The tab position can be set in the configuration dialog.

4.3 The Menus

The SX editor menu bar contains four menus: *File*, *Edit*, *Run* and *Help*. These menus and their associated menu items are each described below. The most important functions can be also selected with one of the shortcut buttons in the tool bar that are also shown below. You will find details to some of the functions that can be selected via the menus later in this manual.

4.3.1 The File Menu

New



Creates a new, empty edit window. Use this item to start a new source code editing session. You may also click the shortcut button to create a new file. When you start the editor software, a blank session will be opened automatically, called "Blank 1".

When you select "New" while another editing session is already open, it will be moved to the "background" but it will still remain open. The open files list to the left displays the names of all open sessions.

Open...



Opens a browse window to locate and load source code files. As an alternative, click the shortcut button, or type Ctrl-O to open an existing file.

Again, if there is another session already open, it will be moved to the background.

The names of all currently open files are listed in the open files list to the left of the editor window. To switch between the sessions, left-click on the name of the file you want to see in the foreground.

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Close Closes the source code file currently displayed in the editor window. You may also right-click on the file name in the open files list, and then left-click on the prompt that is displayed to close a file.

When the file to be closed has been modified since the last save, a dialog box will open allowing you to select whether or not to save the file or abort the close operation; i.e. keep the file open in the editor.

Save



Saves the source code file currently displayed in the editor window. The shortcut button or Ctrl-S can also be used to save the file.

Save As...

Opens a Save As dialog box to save the source code currently displayed in the editor window with a designated name.

Reopen

Displays a list of the files that were most recently edited. You may then click on one of the list items to open any of these files directly.

Print...

Opens a print dialog box to print the source code currently displayed in the editor window.

Exit

Terminates the SX-Key/Blitz editor.

4.3.2 The Edit Menu

Undo

This menu selection remains inactive until you make a change to the text in the editor window. You can then revert the recent changes you have made to the text. Ctrl-Z also activates the Undo function.

Redo

This is the opposite of the Undo function. It allows you to restore any changes that were reverted by previous Undo actions. This selection remains inactive until you have used the Undo function at least once. Ctrl-Y also does a redo. After you have re-done an operation, you may undo it again.

Cut

Cuts the selected text from the editor window and stores it in the Windows clipboard. Ctrl-X is the equivalent keyboard entry.

To select text, use one of the standard Windows methods, like moving the mouse pointer across the text to be marked with the left mouse button pressed, or move the cursor with the cursor keys while the Shift key is held down.

In order to select complete lines in the text, move the mouse cursor to the left margin of the text area until it turns into an arrow, and then click the left mouse button. To mark two or more lines, mark the first line, and then drag the mouse up or down.

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<i>Copy</i>	Copies the selected text from the editor window and stores it in the Windows clipboard. Ctrl-C is the equivalent keyboard entry.
<i>Paste</i>	Pastes the text from the Windows clipboard into the editor window starting at the current cursor location. Alternatively, type Ctrl-V to paste text.
<i>Find</i>	Opens the Find dialog box. Ctrl-F is the shortcut key for this function. Enter the text (or part of it) you are looking for. If necessary, you may select the options to search for whole words only, or to match upper- and lower-case characters. You can also specify the search direction, i.e. if the search shall be performed beginning at the current cursor position towards the beginning or end of the text.
<i>Find Next</i>	Finds the next occurrence of the specified text from the most recent Find operation. F3 also performs this function.
<i>Find/Replace...</i>	Opens the standard Windows replace dialog box. Ctrl-H is the shortcut key for this function. Again, you have the options to search for whole words only, or to match upper- and lower-case characters.
<i>Go to Line Number</i>	Opens a dialog box where you can enter a line number. Ctrl-G is the shortcut key for this function. Click “Ok” to close the dialog, and to position the cursor to column 1 in the specified line.
<i>Clear Errors</i>	When errors are encountered while assembling a source code file with the “new” default SASM assembler, the lines with errors are highlighted, and the errors found are displayed in the status area. Use this menu selection to clear all error information.

4.3.3 The Run Menu

Assemble



Assembles the code. You may also press Ctrl-A, or click the shortcut button to start the assembly. When the code in the editor window could be assembled without errors, the message “Assembly Successful” will show up in the status bar.

When you use the default “new” SASM assembler and if there are any errors encountered in the code, a message box will open, telling you that errors were found. Click “Ok” to close the box. At the bottom of the editor window, you will notice a new area that contains a list of all errors found during assembly. The first error message line is highlighted, and the offending line in the source code is also automatically highlighted.

When there are two or more error lines, double-click on a line in order to jump to the offending line in the source code.

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Make the necessary corrections to the source code, and assemble the code again, until no more errors are reported.

The assembler may also generate warning messages that are shown in the same area, together with any errors. With warnings, the code will be assembled, but it is a good idea to make the necessary corrections to the source code in order to avoid warnings.

NOTE: Before assembly, the current file will be saved automatically. If you have entered code into a new blank editor window, use the Save function to save the window contents under a specific name before starting the assembler.

Program



Assembles the source code and programs the SX microcontroller (when the assembly was successful). Ctrl-P also starts programming.

Run



Assembles the source code, programs the SX and generates a clock signal. Ctrl-R also runs a program.

Debug



Assembles the source code, programs the SX, generates a clock signal and initiates the debug mode. (Not used on the SX-Blitz). Ctrl-D also starts the debugging mode.

Debug (reenter)



Assembles the source code, assumes that the SX device is already programmed with the recent code to be debugged (i.e. does not program the SX again), generates a clock signal and enters the debug mode. (Not used on the SX-Blitz). Ctrl-Alt-D also re-enters the debugger.

This option is handy when you have previously terminated a debug session that you want to continue later without having made changes to the source code in the meantime.

As long as you add, remove or change WATCH or BREAK directives in the source code, you may still use this function to reenter the debugging session without downloading the program to the SX.

Any other changes to the source code require a new download, i.e. you must use the Debug option instead, to start the debugger.

4 The SX-Key/Blitz Interface

View List

Assembles the source code, and then opens another window that shows the contents of the list file generated by the assembler. Ctrl-L also displays the list file. The list file will be described in detail later in this manual (see **Chapter 7.10 – Files Created by SASM**).

Clock...



Opens the clock control dialog box to allow the modification of the clock activity and frequency. (Not used on the SX-Blitz). Ctrl-K also opens the clock dialog. With this function, the SX device's clock is supplied by the SX-Key, and you may test the functionality of an application at various clock rates.

Device...



Opens the device dialog box to allow modification of the SX microcontroller parameters. Ctrl-I also opens the device dialog box.

Configure...

Opens the configuration dialog box to allow modification of the SX-Key/Blitz programming interface. See **Chapter 4.4.5 – Configure Window** for configuration details. Ctrl-U also performs this operation.

4.3.4 The Help Menu

Contents

Displays information on how to use the WATCH and BREAK directives.

About

Displays the SX-Key/Blitz Development System information box.

4.4 The Windows

Many menu items open up a separate window for further configuration or monitoring. These windows are described below.

4.4.1 Print Window

The print window is accessed via the Print... item on the File menu. It is the standard Windows Print dialog box that you know from other applications. It allows you to select which printer shall be used, and depending on the printer type, various options can be selected.