SC126 Single Board System How-To No. 1
Establishing Serial Communications using Minicom from Linux
25 Jan 2020 – David Reese

0.0) Background: The SC126, while powerful, fast, compact, and energy efficient, is useless without an input/output device. While there are other devices, and other methods of providing I/O, using a serial terminal emulator such as **minicom** from a computer equipped with a Linux operating system is a quick and inexpensive way to get started.

NOTE: there is a concise version of this procedure appended at the end of the document, starting on page 7. It is suggested for those with more experience in serial communications.

0.1) Style Conventions

The following text conventions are applied to help draw the reader's attention to important items in this document:

```
Text displayed by the SC126 to the terminal or a Linux shell
File and folder names in this document
User Input to the SC126 from the terminal keyboard
[key presses], for example, the [ENTER] key, [Ctrl] key, etc.
Text displayed that is emphasized for special interest
```
Text in this document emphasized for special interest

1.0) Getting Minicom Installed

Most modern Linux distributions have a package management system (aka a "Sofware Center") that relies on a repository of packages pre-built specifically for that distribution. If you are using such a distribution, installation is as simple as firing up the software management tool for your distribution, updating your system, clicking "install", then applying your changes.

If your distribution does not have minicom in its repositories, it can be downloaded and compiled from source available at: https://salsa.debian.org/minicom-team/minicom . This operation is beyond the scope of this how-to.

In summary:

1.1) In PCLinuxOS and other Synaptic-managed distributions:
- 1.11) Open Synaptic in the usual manner, providing the required password
- 1.12) Click Reload, Mark All Upgrades, and Apply before installing new software. (this may only be specific to PCLinuxOS)
- 1.13) Once the system is up to date, click the Search button in the top menu.
- 1.14) enter minicom into the Search: field and click the Search button
- 1.15) Right-click the checkbox next to minicom and select "Mark for installation"

1.16) Click the Apply button to install minicom.

{Please proceed to the next page for step (2.0).}

2.0) Finding Which Serial Port to Configure to Communicate with the SC126

2.1) Set Up the SC126: Connect an FTDI to mini-B USB adapter to your SC126, and plug a USB to mini-B cable from the mini-B USB adapter to a USB port on your Linux system. This will power the adapter, and its red LED will light up.

{Insert photo of FTDI to serial adapter and USB to mini-B cable.}

2.2) From a Shell Prompt, Run the Command `dmesg` and scan its output.

```
[wabbit@localhost ~]$ dmesg
```

(Of course, press the **[ENTER]** key to initiate the command. Do this for all shell commands. We will use [] to denote key presses from here onward.)

Scan through the output of this command to find lines describing a new USB device connected to the system. This should look something like:

```
new full-speed USB device number NN using ehci-pci
New USB device found, idVendor=403, idProduct=6001, bcdDevice= 6.00
New USB device strings:  Mfr=1, Product=2, SerialNumber=3
Product FT232R USB UART
Manufacturer:  FTDI
SerialNumber:  XXXXXXXXXXX (varies per device)
FTDI USB Serial Device converter detected
Detected FT232RL
FTDI USB Serial Device Converter now attached to ttyUSB0
```

(This can vary depending on system hardware - ttyUSB0 is what I see.)

3.0) Starting Minicom: Minicom runs inside a shell or shell emulator such as Xterm. The author prefers the XFCE desktop, and so uses the built-in Terminal Emulator for that desktop. From whatever shell you are using, while logged in as a normal (non-root) user, issue the command: **`minicom`** from the shell prompt:

```
[wabbit@localhost ~]$ minicom
```

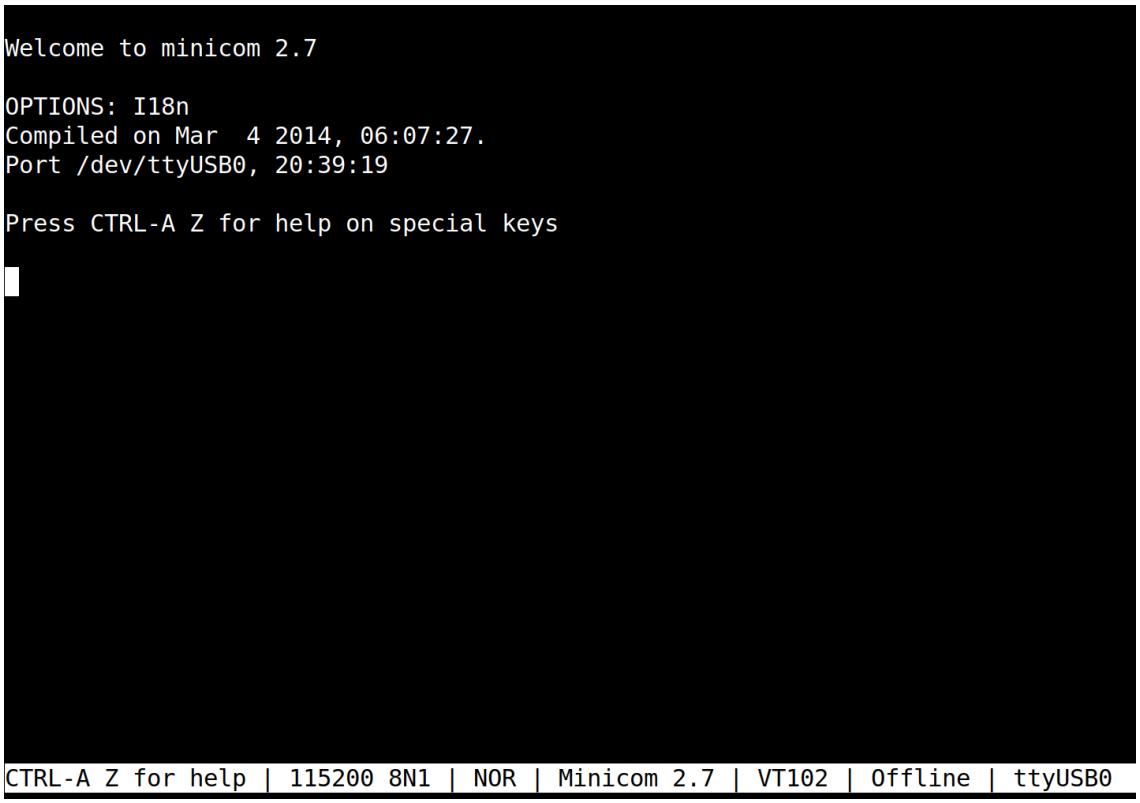
NOTE: **`minicom`** may fail to open if it has previously been configured, and the serial device for which it is configured *is not connected at startup.* If this happens, check the connections on your serial adapter and USB port and try again, or start **`minicom`** with the following argument:

```
[wabbit@localhost ~]$ minicom -s
```

This is minicom's **`setup`** option, which will allow you to select and configure a different port if needed. USB devices are created on demand by a modern Linux system, but once created should remain the same for a given system.

3.0) Starting Minicom (continued)

If minicom starts without the **-s** argument, you should see:

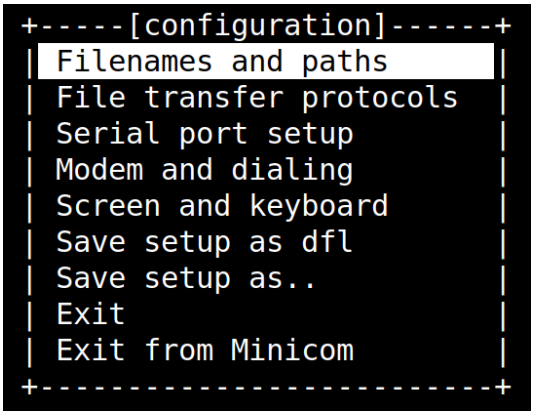


Pressing **[Ctrl]+A** then **Z** will display the command help:

From this menu, press **O** to open the **cOnfigure Minicom** menu. No **[ENTER]** key is needed.

4.0) Configure Minicom to Communicate with the USB Port

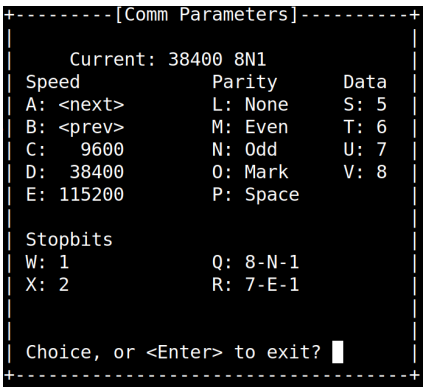
Whether **minicom** starts in setup mode, or you opened it normally and issued the commands on the previous page, what you see should look something like:



From here, scroll through the menu to **Serial port setup** using the arrow keys on your keyboard, then press **[ENTER]**. Set the serial port as shown below:

To open the setup for the Serial Device, press **A**. This will place the cursor to the right of whatever might be listed for your present serial device. Backspace over the stuff that needs to be changed, and ***type in what you found in step (2.2).*** My system uses **/dev/ttyUSB0**, as shown. (Yeah… that's USB-Zero.) Press **[ENTER]** when done, and the cursor will "home" to the **Change which setting?** line at the bottom of the dialog.

The next settings to change are listed together under **E – Bps/Par/Bits.** Press the letter **E** to bring up the **Comm Parameters** dialog:



4.0) Configure Minicom to Communicate with the USB Port (continued)

If you are running RomWBW *with a revision before Version 2.9.2-pre.27,* press **D** to select 38,400 baud. *If running RomWBW 2.9.2-pre.27 or later,* choose **E** to set the baud rate at 115,200 baud. For either case, next press **Q** to set to 8 data bits, No Parity, and 1 stop bit. Once these parameters are set, press **[ENTER]** to exit from the dialog. This will return you to the previous dialog for **Serial port setup**. From there, after verifying that all is set as required for your system, press **[ENTER]** again to exit back to the **configuration** menu.

Arrow down to **Exit** in the configuration menu and press **[ENTER]** to leave that menu.

5.0) Reset the SC126 to Establish Communications:

Press the reset button or power the SC126 OFF and then back ON while still connected via the USB port. You should now see a welcome screen on the Minicom console from the SC126 that looks something like:

```
SC126 Z8S180-N @ 18.432MHz IO=0xC0
0 MEM W/S, 2 I/O W/S, INT MODE 2
512KB ROM, 512KB RAM

ASCI0: IO=0xC0 ASCI W/BRG MODE=38400,8,N,1
ASCI1: IO=0xC1 ASCI W/BRG MODE=38400,8,N,1
DSRTC: MODE=STD IO=0x0C Thu 2018-11-08 02:01:35 CHARGE=OFF
MD: UNITS=2 ROMDISK=384KB RAMDISK=384KB
IDE: IO=0x10 DEVICES=1
IDE0: NO MEDIA
SD: MODE=SC OPR=0x0C CNTR=0xCA TRDR=0xCB DEVICES=1
SD0: SDHC NAME=SDU1  BLOCKS=0x01D7E000 SIZE=15100MB

Unit        Device      Type              Capacity/Mode
----------  ----------  ----------------  --------------------
Char 0      ASCI0:      RS-232            38400,8,N,1
Char 1      ASCI1:      RS-232            38400,8,N,1
Disk 0      MD1:        RAM Disk          384KB,LBA
Disk 1      MD0:        ROM Disk          384KB,LBA
Disk 2      IDE0:       Hard Disk         --
Disk 3      SD0:        SD Card           15100MB,LBA


SC126 Boot Loader

ROM: (M)onitor (C)P/M (Z)-System (F)orth (B)ASIC (T)-BASIC
Disk: (0)MD1 (1)MD0 (2)IDE0 (3)SD0

Boot Selection?
```

If this screen is seen, all is well, and you should choose one of the listed boot options to continue starting up the SC126.

If you see garbled characters, it means the baud rate, data bits, parity, and stop bits may not be set correctly.

5.0) Reset the SC126 to Establish Communications (continued)

If your terminal window is sized for 80 columns by 25 rows, you should see a status line at the bottom that reads:

```
CTRL-A Z for help | 38400 8N1 | NOR | Minicom 2.7 | VT102 | Offline | tyUSB0
```

Note the comms settings between the first and second | (pipe symbols). If these are not as shown above, go back to step 4.) for configuring Minicom and check the settings again, revising them where needed.

{Please continue on to the next page for the concise version of this procedure.}

6.0) TL;DR. For those who prefer concise instructions, we offer the following:

1.) Acquire and install minicom onto a Linux system.

1.1) In PCLinuxOS and other Synaptic-fed distributions:

1.11) Open Synaptic in the usual manner, providing the required password (varies depending on sudo use)
1.12) Click Reload, Mark All Upgrades, and Apply before installing new software.
1.13) Once the system is up to date, click the Search button
1.14) enter minicom into the Search: field and click the Search button
1.15) Right-click the checkbox next to minicom and select "Mark for installation"
1.16) Click the Apply button to install minicom.

2.) Determine which port minicom needs to use to communicate with the SC126.

2.1) Connect the SC126 to the USB port on your Linux system which you intend to use and power it up. (You *can* simply hook up the serial adapter by itself...)

2.2) From a shell prompt on the Linux system, issue the command **`dmesg`** and scan its output until you find the line saying:

```
FTDI USB Serial Device Converter now attached to ttyUSB0
```

(This can vary depending on system hardware – ttyUSB0 *is what I see.)*

3.) Start minicom.

3.1) Open a shell or an X Window terminal emulator such as XTerm.
3.2) at the shell prompt, type **`minicom`** followed by the enter key.
3.3) If minicom fails to start, try again with the following argument to the command: **`minicom -s`**
3.4) Minicom should now be started. *Continue to step 4 on the next page.*

4.) Configure Minicom to use the correct settings for communication with the USB Port.

4.1) Minicom's Command Summary is opened by holding the **`[Ctrl]`** key and typing **`A`** then releasing **`[Ctrl]`** and typing **`Z`**
4.2) From the Command Summary, type **`P`** to select **`Comm Parameters`**
4.3) From the **`Comm Parameters`** menu, under Speed, select **`D`** to set the port to 38,400 baud *unless using a more recent RomWBW*, in which case select 115,200 baud.
4.4) NOTE: Parity should default to None, Data Bits (the Data column) to 8, and Stop Bits to 1. *If these are not set to the default values*, select Q to set these all at once.
4.5) Press **`[ENTER]`** twice to return to minicom's **`cOnfiguration`** menu, then arrow down to **`Exit`** in the **`cOnfiguration`** menu and press **`[ENTER]`** again to leave the menu. Continue on the next page with step (5.)

5.) Power off and back on (or press the Reset button on) the SC126.

You should now see a welcome screen from the SC126 that looks like:

```
SC126 Z8S180-N @ 18.432MHz IO=0xC0
0 MEM W/S, 2 I/O W/S, INT MODE 2
512KB ROM, 512KB RAM

ASCI0: IO=0xC0 ASCI W/BRG MODE=38400,8,N,1
ASCI1: IO=0xC1 ASCI W/BRG MODE=38400,8,N,1
DSRTC: MODE=STD IO=0x0C Thu 2018-11-08 02:01:35 CHARGE=OFF
MD: UNITS=2 ROMDISK=384KB RAMDISK=384KB
IDE: IO=0x10 DEVICES=1
IDE0: NO MEDIA
SD: MODE=SC OPR=0x0C CNTR=0xCA TRDR=0xCB DEVICES=1
SD0: SDHC NAME=SDU1  BLOCKS=0x01D7E000 SIZE=15100MB

Unit        Device      Type               Capacity/Mode
----------  ----------  ----------------   --------------------
Char 0      ASCI0:      RS-232             38400,8,N,1
Char 1      ASCI1:      RS-232             38400,8,N,1
Disk 0      MD1:        RAM Disk           384KB,LBA
Disk 1      MD0:        ROM Disk           384KB,LBA
Disk 2      IDE0:       Hard Disk          --
Disk 3      SD0:        SD Card            15100MB,LBA


SC126 Boot Loader

ROM: (M)onitor (C)P/M (Z)-System (F)orth (B)ASIC (T)-BASIC
Disk: (0)MD1 (1)MD0 (2)IDE0 (3)SD0

Boot Selection?
```

6.) SUCCESS?: If you have seen this screen, all is well, and you should make a choice for the boot loader to continue starting up your system.

If you see garbage characters, it means the baud rate, data bits, parity, and stop bits may not be set correctly.

If your terminal window is opened to 80 X 25 lines or greater, you should see a status line from minicom at the bottom:

```
CTRL-A Z for help | 38400 8N1 | NOR | Minicom 2.7 | VT102 | Offline | tyUSB0
```

Note the comms settings between the first and second | (pipe symbols). If these are not correct for your version of RomWBW, go back to step 4.) for configuring Minicom and check the settings again, revising them where needed.