UART boot based flash firmware upgrade on SC58x

Flow Diagram

```
┌─────────────────────────┐          ┌─────────────────────────┐
│  Boot Mode changed to 7 │ ◄─────── │ Current application      │
│  (UART Slave boot).     │          │ executes                 │
│  Reset applied.         │          │                          │
└─────────────────────────┘          └─────────────────────────┘
             │
             ▼
┌───────────────────────────────┬──────────────────┐
│                               │ Host Utility –   │
│ Firmware Upgrade Software is  │ LDR Viewer       │
│ booted                        │                  │
└───────────────────────────────┴──────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Firmware Upgrade        │
│ Software runs from      │
│ internal RAM            │
└─────────────────────────┘
             │
             ▼
┌───────────────────────────────┬──────────────────┐
│ Firmware Upgrade Software     │ Host Utility –   │
│ updates the internal flash    │ Real Term        │
│ with new Application          │                  │
└───────────────────────────────┴──────────────────┘
             │
             ▼
┌─────────────────────────┐          ┌─────────────────────────┐
│ Boot mode changed to 1  │ ───────► │ New application executes │
│ (SPI Master Boot from   │          │                          │
│ Flash)                  │          │                          │
│ Reset applied           │          │                          │
└─────────────────────────┘          └─────────────────────────┘
```

Setup to upgrade the Firmware

1. Install LDRviewer and Realterm.
   http://www.dolomitics.com/downloads/ldrviewer_12.zip
   https://sourceforge.net/projects/realterm/

2. Open the UART Firmware Upgrade loader stream in **LDRviewer**. Then open UART boot window through **Tools >> UART Boot**

3. Configure the Serial port, Bit rate and then press "Test port". Change the boot mode switch (SW1) to UART slave boot (BMODE: 7). Once test port is ready, reset the board before clicking on "autobaud". Please refer the below image.
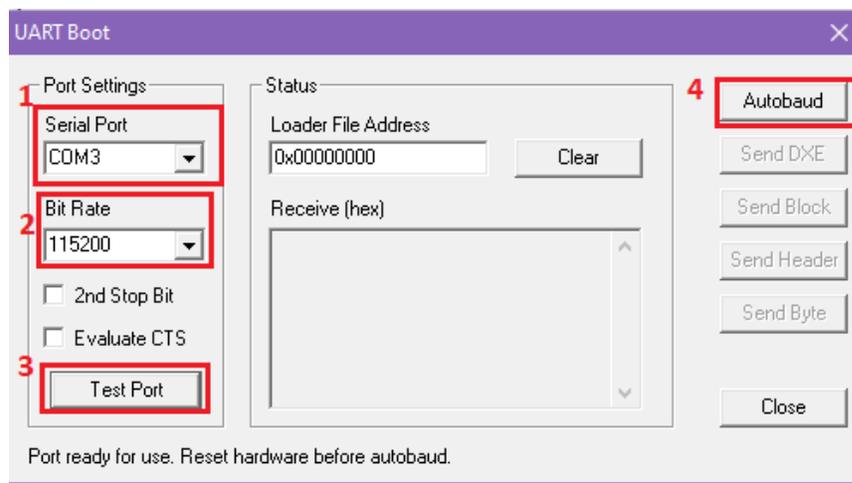
4. The board replies back with below data once the autobaud is completed.
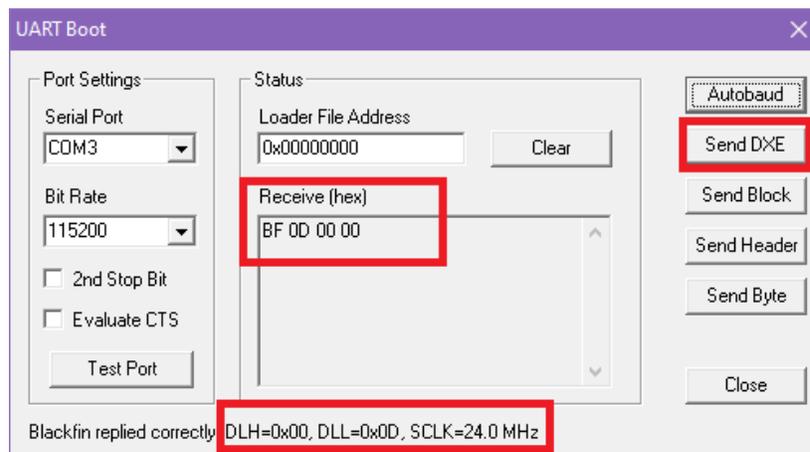
5. Then click on send the DXE.
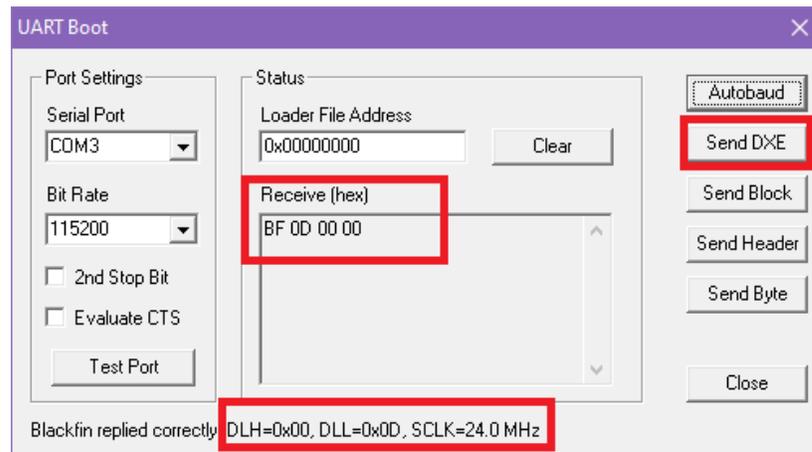
For ADSP-SC584:
..\ADSP_SC584_UART_FirmwareUpgrade\SC584_Loader_Streams\ADSP_SC584_UAR TFirmwareUpgrade_Core0.ldr

For ADSP-SC589:
..\ADSP_SC589_UART_FirmwareUpgrade\SC589_Loader_Streams\ADSP_SC589_UAR TFirmwareUpgrade_Core0.ldr

6. Once the DXE sent, the above window indicates as "done" and the board starts booting. Please close the LDRviewer once it shows "done".
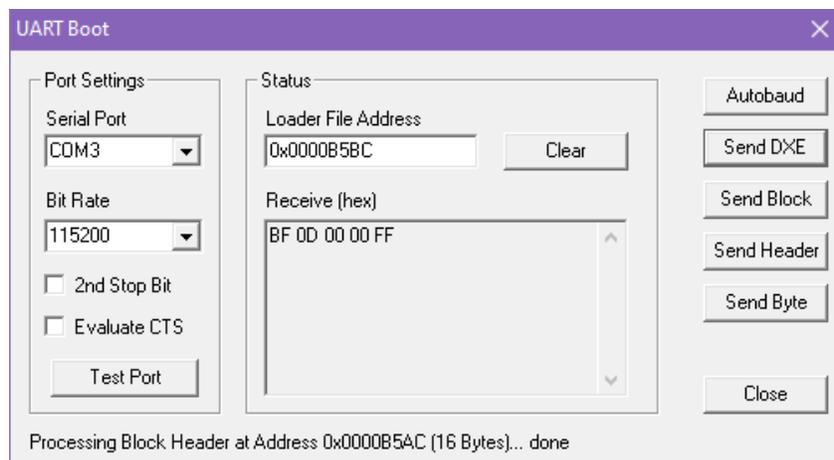

7. Please check whether the "*LED16 and LED17*" (for ADSP-SC584) or "*LED10 and LED11*" (for ADSP-SC589) blinks 5times.
8. Open the Realterm and follow the below steps numbering from 6 to 8 to create a setup for Serial Communication.

9. Choose the appropriate settings from the "Display" option in RealTerm settings window, as show below.
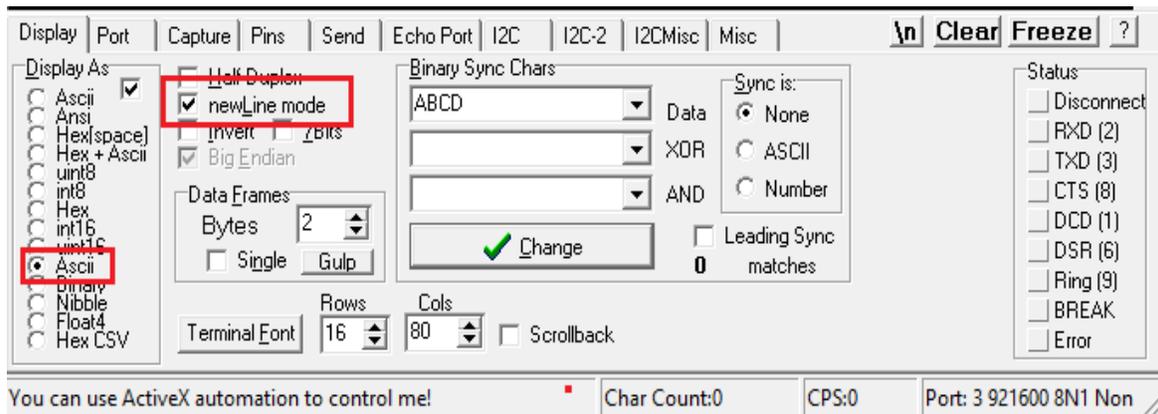

Change the Baud Rate to 921600. Choose the appropriate Port number, for that look under **PC->Device Manager**. Then click open and change. Please note that the setting will change only when the change button click.
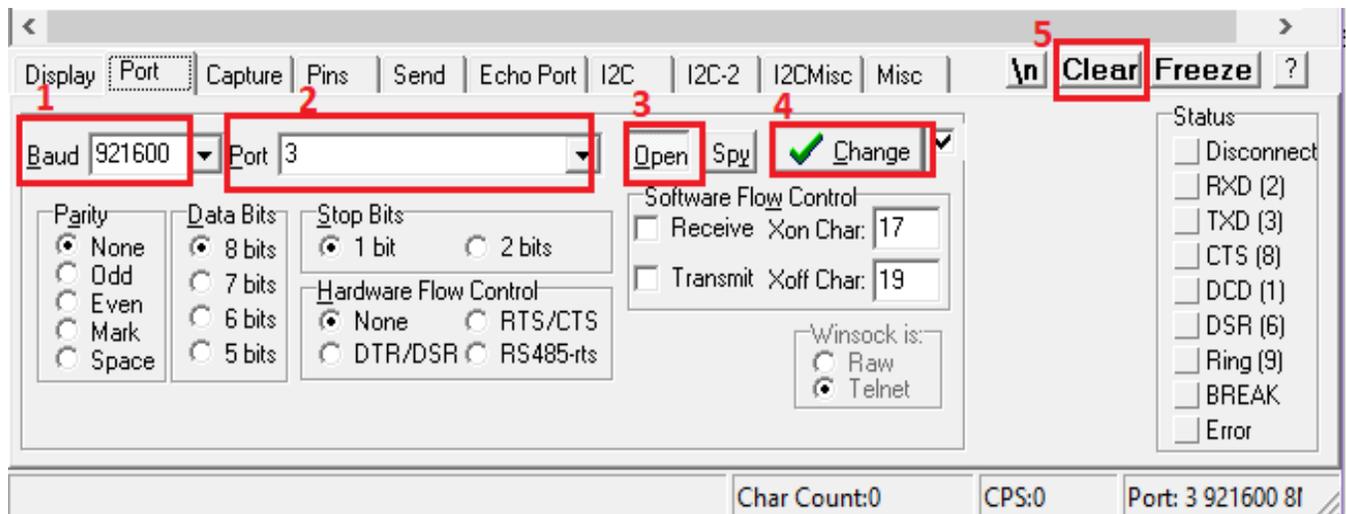

10. Clear the RealTerm display window every time before run the application, use "Clear" option as shown above.

11. Once the LEDs Blinks 5times. Open "Send" tab and send the character "1" to the board to confirm the Realterm setup is ready. Once the character sent, it displays the following on RealTerm console window within few seconds. Please refer the below image to send the character.
    a. *For ADSP-SC584 : LED16 and LED17*
    b. *For ADSP-SC589 : LED10 and LED11*
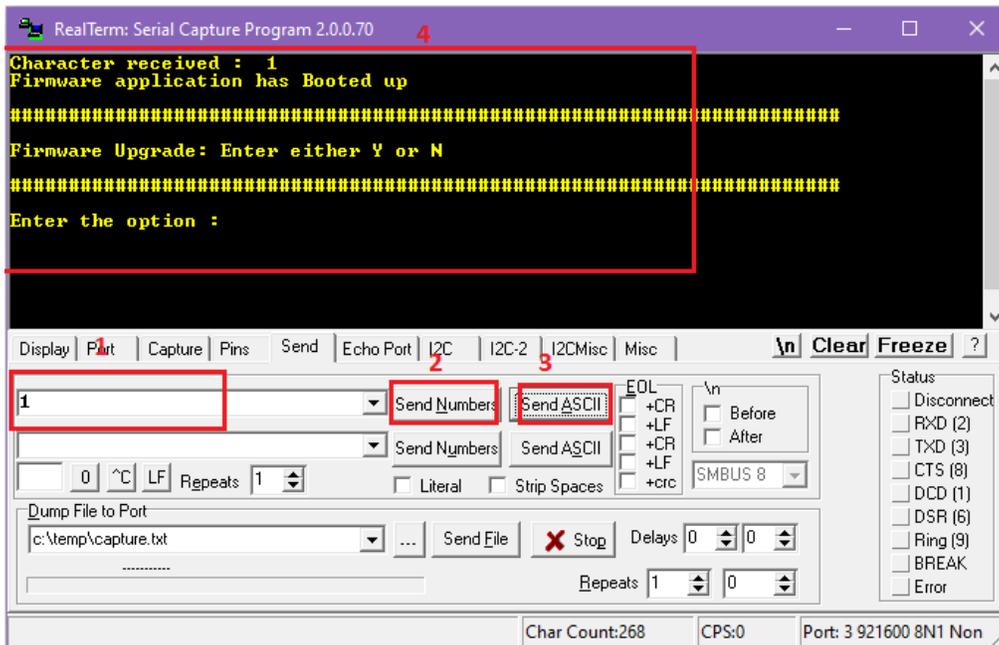
12. For firmware upgrade, type 'y' or 'Y' on Realterm console window and press 'ENTER' on Keyboard. If firmware upgrade is not necessary, type any alphabet (Eg. "N").

13. If either of 'y' or 'Y' is chosen, it displays *"You have Chosen : Y"*. Then press "ENTER" on the Keyboard. The Realterm's console window displays "*Send loader stream generated in ASCII format for Firmware Upgrade*" as given below.
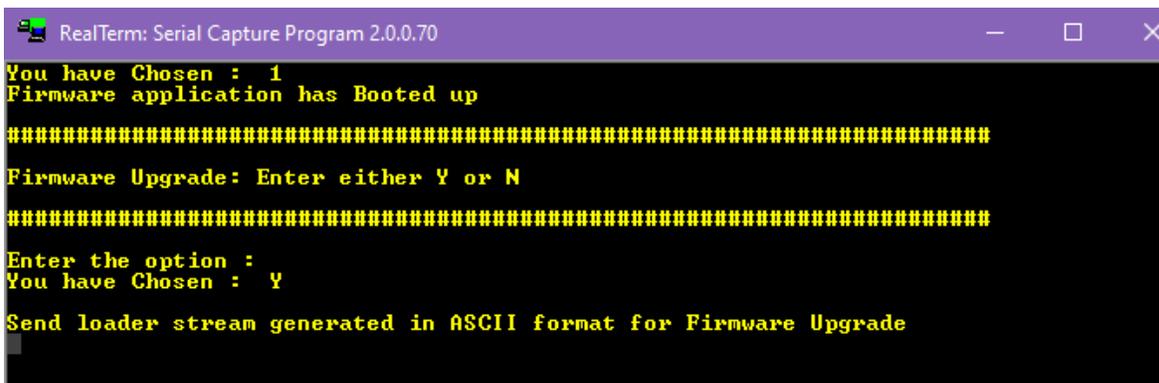

- Selecting the ldr file from directory:
  Send >>Dump File to Port >>select the ldr file >>Send File.
  - Multiple example application LDRs are provided in the path:
    - For ADSP-SC584:
      ...\ADSP_SC584_UART_FirmwareUpgrade\SC584_Loader_Streams
    - For ADSP-SC589:
      ...\ADSP_SC589_UART_FirmwareUpgrade\SC589_Loader_Streams
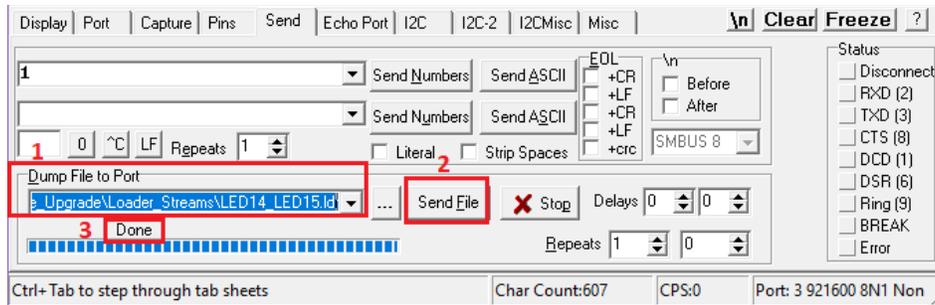
After successful file upload, it displays "Done" on RealTerm settings window.

- We can monitor the Handshake and Communication signals in Status Option as shown below.
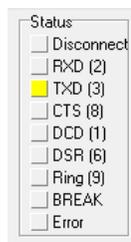
- Once "Done", it displays below message on RealTerm display window.

- Change the boot mode switch (SW1) to SPI master boot (BMODE: 1) and then Reset the Board (using SW2) to run the upgraded Firmware.

14. Below is another method to run the old/upgraded Firmware available in the sector 0 without changing the boot mode to SPI master boot (BMODE: 1).
    - Please follow the steps numbering 2 to 11. If either of 'y' or 'Y' is not chosen (Eg. "N"), it displays as shown below on RealTerm display window.
    - Press the "ENTER" on the keyboard to boot the old/upgraded Firmware available in the sector 0.
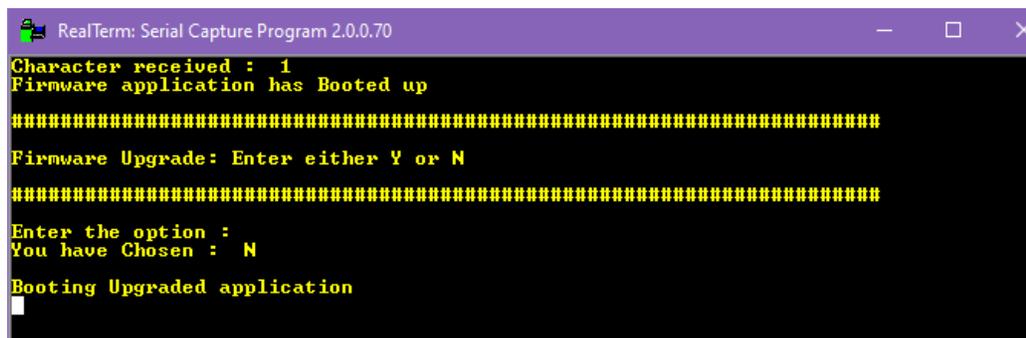
Loader file Generation to use with RealTerm

The Realterm utility has certain restrictions. Below information needs to be used only if using this utility and using the firmware upgrade software developed for it.

1. Please follow the below steps to generate the loader stream for UART Firmware Upgrade.
   - Please configure the boot mode and format as below.

☐ Output verbose loader messages (-v)	
Boot mode (-b)	UART slave
Boot format (-f)	ASCII
Boot code (-bcode)	0x01

   - No need to add the INIT file, since the code and data are mapped to L2 space.
   - Add the executable file(.dxe) and build the project.

2. Please refer the points 2 to 4 to generate loader stream for second application.
   - Please configure the boot mode and format as below.

☐ Output verbose loader messages (-v)	
Boot mode (-b)	SPI master
Boot format (-f)	ASCII
Boot code (-bcode)	0x1

   - Please add the INIT file via **Properties >> Settings >> Tools settings >> CrossCore ARM loader >> Initialization >> Add the path of the INIT file**
   - Add the executable file(.dxe) and build the project.

3. Open the ldr file and add "@@@@@@" as shown below diagram at the end and save it before sending the file.

   ```
   19533   0x00
   19534   0x00
   19535   0x00
   19536   0x00
   19537   0x00
   19538   0x00
   19539   0x00
   19540   0x00
   19541   @@@@@@
   19542
   ```

Miscellaneous

| Firmware Upgrade Software is booted | Host Utility – LDR Viewer |

↓

| Firmware Upgrade Software runs from internal RAM | Host Utility – RealTerm |

Utilities maybe clubbed to a single utility or a single Python script