



User Guide

Laird OTA VSP Application

Version 1.0

REVISION HISTORY

Version	Date	Notes	Contributors	Approver
1.0		Initial version	Jamie Mccrae	Jonathan Kaye

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1 OVERVIEW

The Laird OTA VSP application is a cross-platform open-source utility that allows for XCompilation and loading of *smartBASIC* application files to Laird’s range of wireless Bluetooth modules including the BL600, BT900, BL652, BL654, and RM1xx products. This user guide describes how to use the application to program a module and explains the functionality offered by the application.

1.1 Requirements

The requirements for using this application are shown in [Table 1](#).

Table 1: Application requirements

	Android	Linux	Mac	iOS
CPU Architecture	ARM v7a or newer, x86 with ARM v7a compatibility	x86, x86_64 or ARM v7a	x86_64	ARM v8a or newer
OS version	4.4 Kitkat or above	Kernel 4.0 or above with BlueZ 5.0 or newer	10.10 Yosemite or newer	11 or above (source code compiles and runs on 9.0 or newer)
Bluetooth version	4.0 or newer	4.0 or newer	4.0 or newer	4.0 or newer
Minimum RAM	1 GB	512 MB	1 GB	512 MB
System packages	–	BlueZ, glib	–	–

Laird offers a Bluetooth v4.2 USB adapter for Android and Linux devices, the BT851. Further details on the BT851 adapter can be found on the product page: <https://www.lairdtech.com/products/bt850-usb-ble-module>

1.2 Downloading and Installing

The Laird OTA VSP application can be found on the iOS and Android application stores. Search for *Laird OTA VSP* to find and install it.

1.2.1 Linux

To install on Linux, follow these steps:

1. Download the latest version from the Releases page on the Github project page:
https://github.com/LairdCP/Laird_OTV_VSP/releases

2. Open a terminal utility and change directory to the folder in which the file was downloaded to:

```
cd Downloads
```

3. Extract the archive:

```
tar xf OTA_VSP.tar.gz
```

4. Qt-based Bluetooth applications need a special permissions flag set to retrieve the type of address when scanning for device. To set this permission, the executable must not be on a temporary file system or one that prohibits use of `setuid`. You must enable this permission using the system’s root account and the full path to the executable (relative paths do not work):

```
sudo setcap cap_net_admin,cap_net_raw+eip /home/user/Downloads/OTA_VSP
<enter user password>
```

Or

```
su
<enter root password>
setcap cap_net_admin,cap_net_raw+eip /home/user/Downloads/OTA_VSP
exit
```

The application can now be launched:

```
./OTA_VSP
```

If you see a message similar to the following in the terminal when launching the application, the permission flag was not set and connecting to devices will not work:

```
qt.bluetooth.bluez: Missing CAP_NET_ADMIN permission. Cannot determine
whether a found address is of random or public type.
```

Ensure that the executable is located on a drive that supports setuid and that the flag is set. You can verify that the flag is properly set using the following:

```
getcap /home/user/Downloads/OTA_VSP
```

1.2.2 Mac

To install on Mac, follow these steps:

1. Download the latest version from the Releases page on the Github project page:
https://github.com/LairdCP/Laird_OTA_VSP/releases
2. Mount the archive and drag the application file to the Applications folder or any other location (such as the Desktop).

The application can now be launched like any other application.

Upon attempting to launch the application, Gatekeeper might show a warning message saying that application execution was denied, to allow execution...

<TODO>

1.2.3 Android

The Laird OTA VSP application can be installed directly from the google play store by using the following link:

<TODO>

Alternatively, the latest version of the APK can be found on the Github releases page:
https://github.com/LairdCP/Laird_OTA_VSP/releases

1.2.4 iOS

The Laird OTA VSP application can be installed directly from the App Store by using the following link:

<TODO>

2 NEXT

Upon opening the application on Android, a dialogue box requests access to the device's coarse location and external file access. These are required to use Bluetooth functionality. To access files on the device to be transferred to the target modules, accept both options by tapping the **Allow** (Figure 1 and Figure 2).

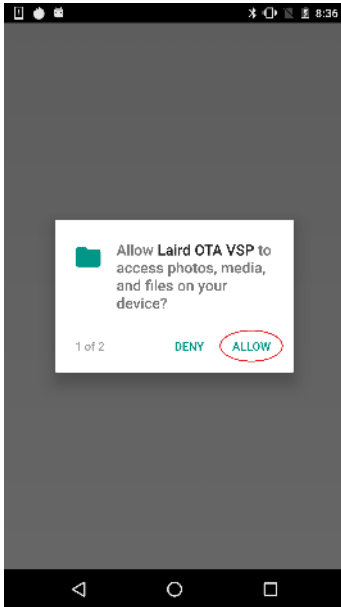


Figure 1: Read file permission

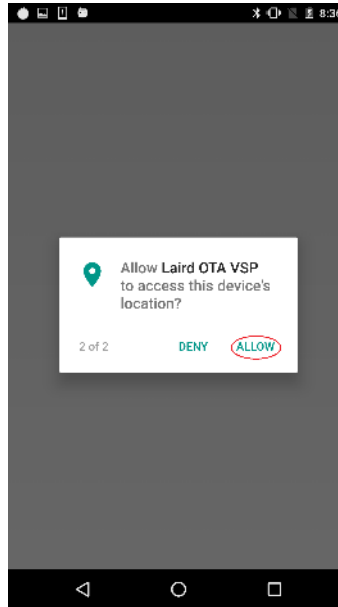


Figure 2: Coarse location permission

If either permission request is denied, then the application is non-functional (Figure 3).

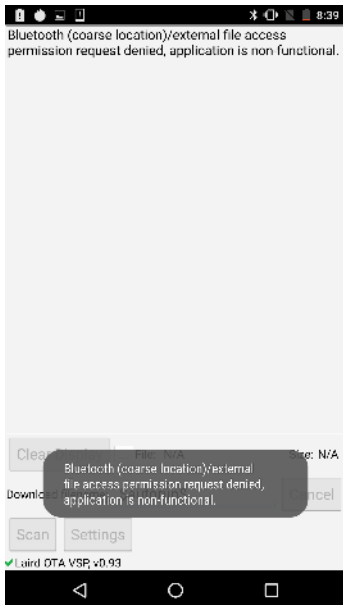


Figure 3: Permission denied, application non-functional

If this occurs, you will need to grant permission by doing the following:

1. From the Settings application, tap **Apps** (Figure 4).

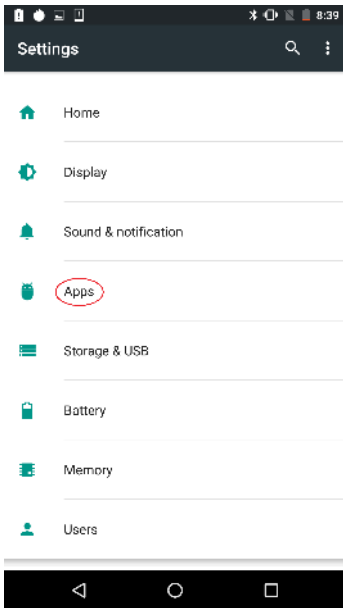


Figure 4: Settings view

2. Scroll down and tap **Laird OTA VSP** (Figure 5).

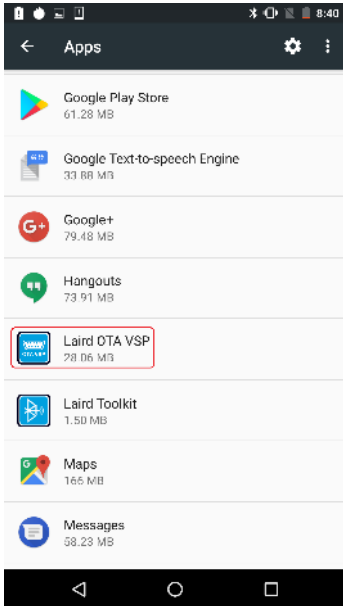


Figure 5: Apps view

- From Laird OTA VSP, tap **Permissions** (Figure 6).

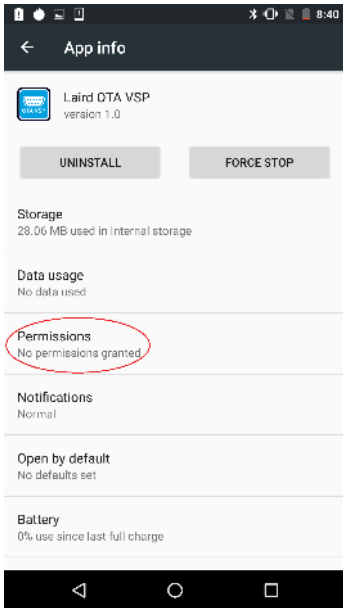


Figure 6: App settings view

- Ensure both permission requests are allowed (Figure 7).

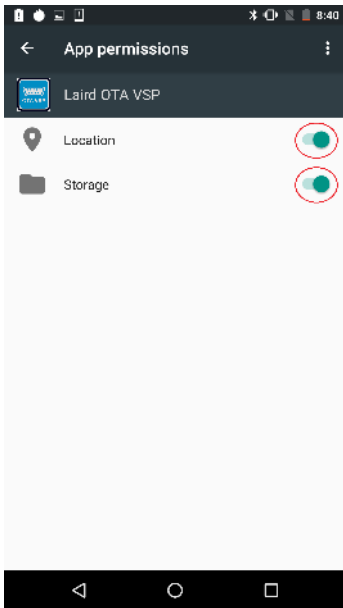


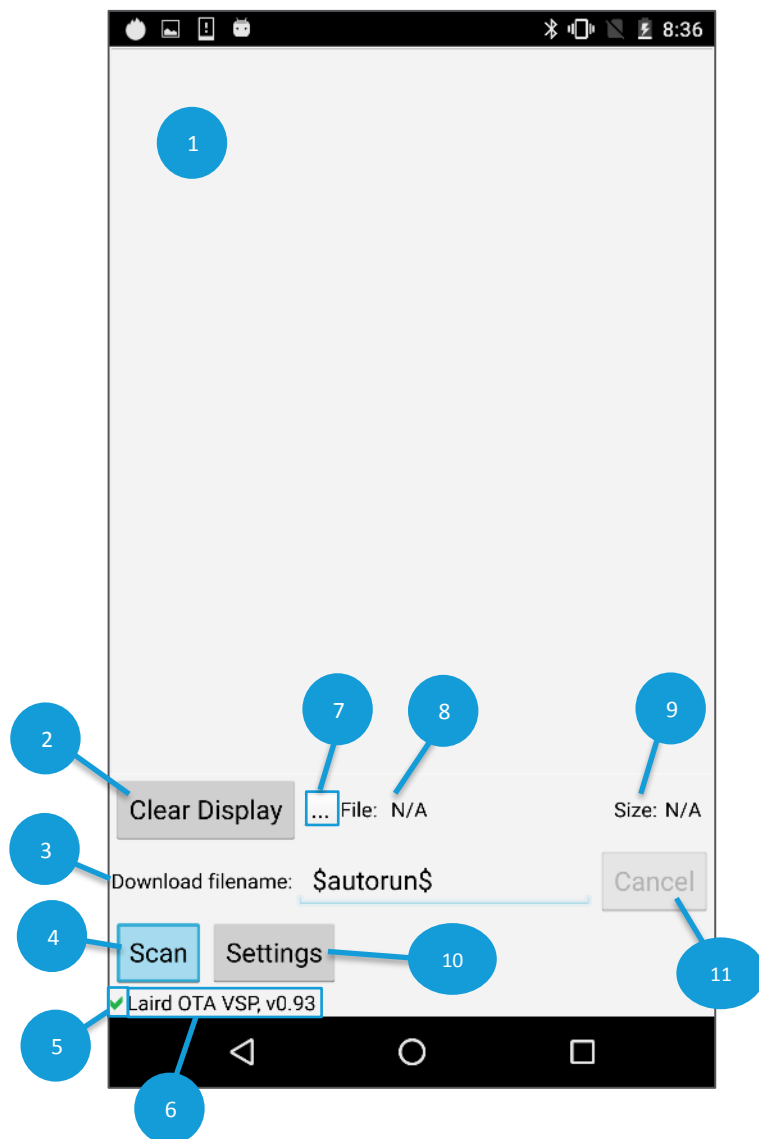
Figure 7: Permissions view

The application should now function properly.

2.1 Application overview

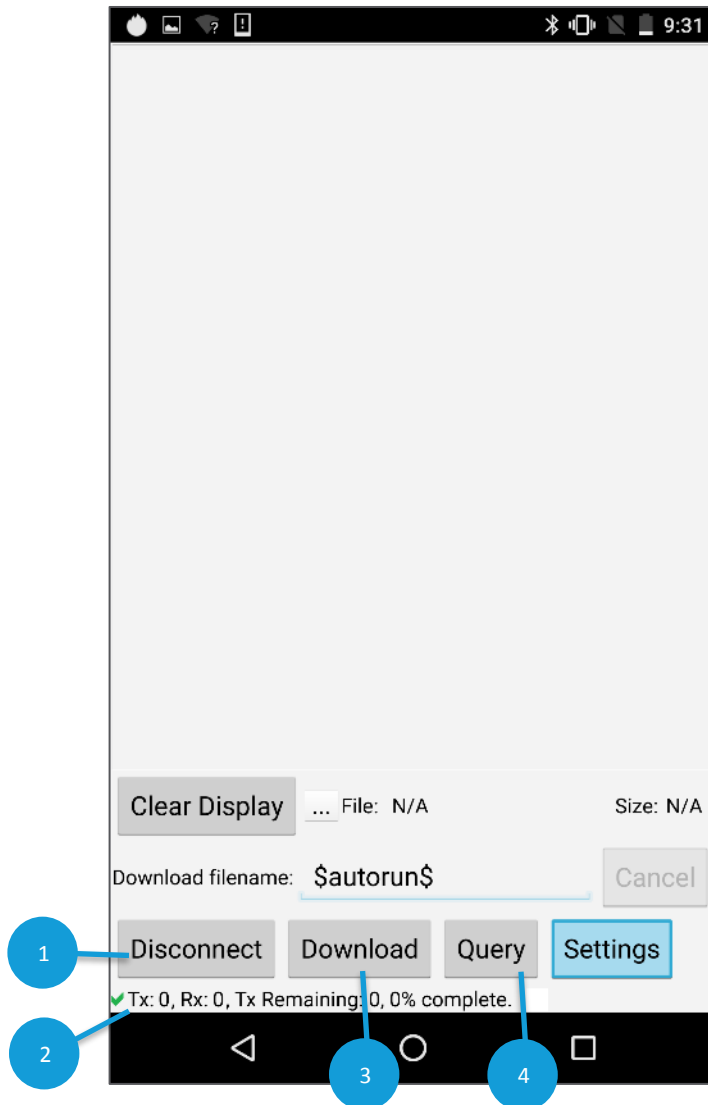
The following images detail the elements of the user interface in each state of the application.

2.1.1 Main Screen – Not Connected



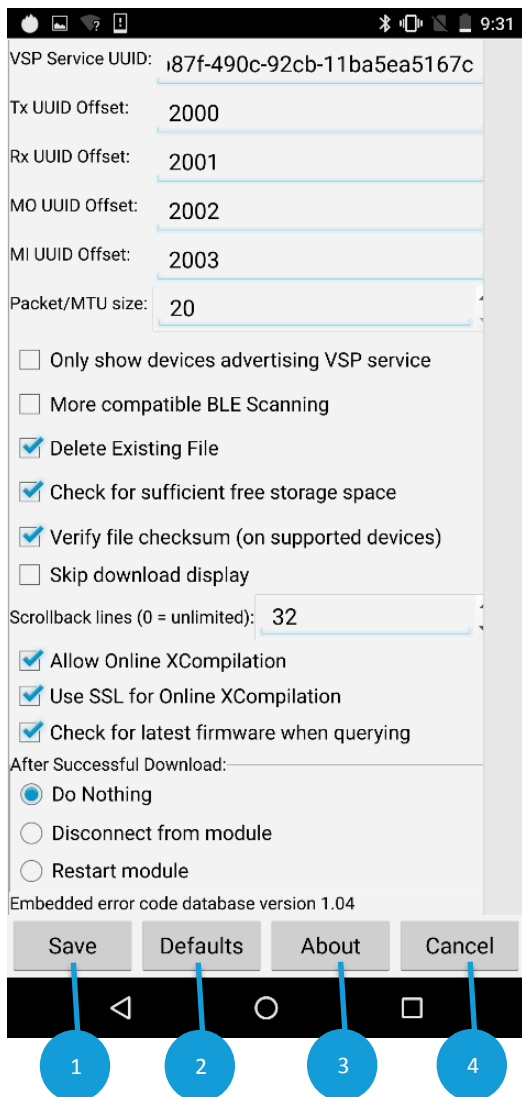
1	Information display for sent/received data
2	Click to clear the display
3	Destination file name on module
4	Click to begin advertising BLE device search
5	Busy icon indicator (spinning icon = busy)
6	Application status bar and version information
7	Click to open the file selection dialogue
8	Selected file source name
9	Selected file (in bytes)
10	Click to open the Settings form
11	Click to cancel pending operation/action

2.1.2 Main Screen – Connected



- | | |
|---|--|
| 1 | Click to disconnect from the connected device |
| 2 | Application status bar showing Tx/Rx and download statistics |
| 3 | Click to start XCompiling (if a source file) and downloading the application to the module |
| 4 | Click to query the module to return the type, firmware, and storage information |

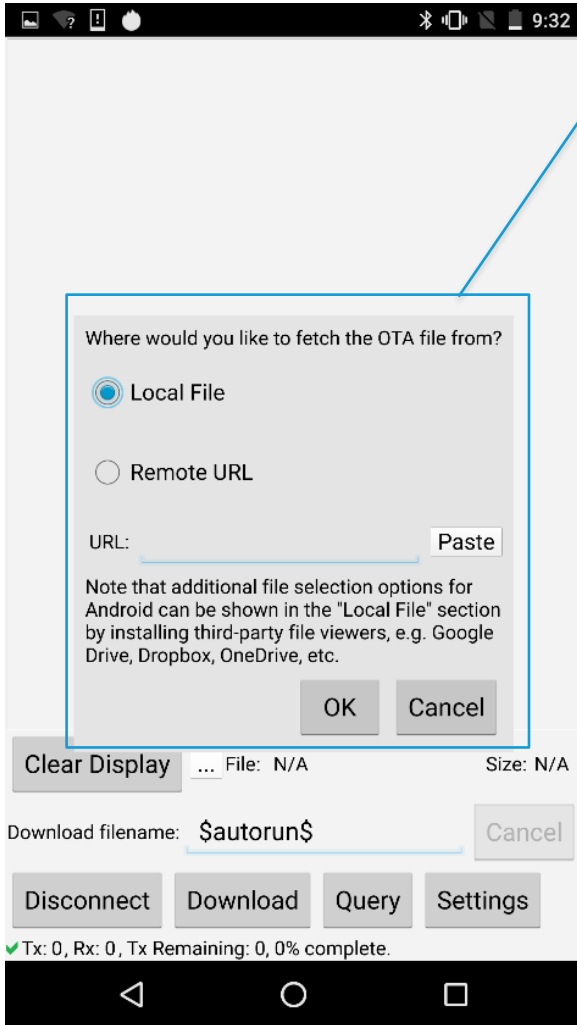
2.1.3 Settings Screen



VSP Service UUID	UUID of VSP service
Tx UUID Offset	VSP Tx characteristic UUID
Rx UUID Offset	VSP Rx characteristic UUID
MO UUID Offset	VSP MO characteristic UUID
MI UUID Offset	VSP MI characteristic UUID
Packet/MTU size	Only adjust when using supported devices
Only show devices advertising VSP service	Filter devices by those advertising VSP service
More compatible BLE Scanning	(Android) May resolve scanning issues on some devices
Delete Existing File	Delete existing application before downloading
Check for sufficient free storage space	Check module has enough space to store application
Verify file checksum (on supported devices)	Verify file was downloaded successfully with a checksum
Skip download display	Do not display writing commands on log window
Scrollbar lines (0=unlimited)	Number of lines to display in log window
Allow Online XCompilation	Allows use of the online XCompilation service
Use SSL for Online Compilation	Enable SSL when using the XCompilation service
Check for latest firmware when querying	Queries the Laird site for the latest firmware when
After Successful Download	Do nothing, disconnect from module, or restart it once an OTA is completed
Embedded error code database version	Version of the embedded error code database

- 1 Click to save the current settings
- 2 Click to restore all settings to their defaults
- 3 Click to view application information
- 4 Click to discard any changes you made

2.1.4 File Selection Screen

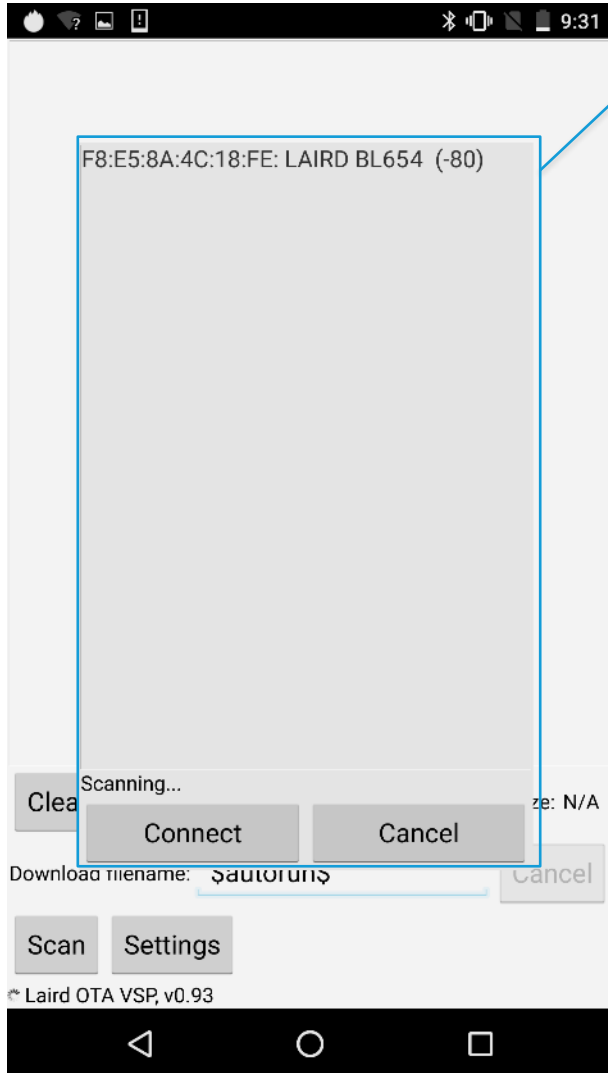


Determine where to retrieve the OTA file from:

- Local file
- Remote URL – (HTTP/HTTPS) Copy the location to your computer clipboard and click **Paste** to enter it as the URL.

Click **OK** to continue or **Cancel** to stop the file-selection process

2.1.5 Scan Selection Screen



List of detected advertising BLE devices – Displays Bluetooth address, device name, and RSSI.

Note: For Mac/iOS, there is no Bluetooth address.

Click **Connect** to connect to the selected device or **Cancel** to stop scanning or connecting to the device.

3 TRANSFERRING FILES TO TARGET PHONE/DEVICE

The OTA VSP application supports *smart*BASIC source files (.txt and .sb file extensions) and XCompiled *smart*BASIC applications (.uwc file extension). On Linux/Mac, a file selection dialogue allows a file to be opened from any directory on the computer or a network drive (if mounted). For mobile devices however, the files must be transferred to the device to use them.

3.1 iOS

Use the application storage function from iTunes to transfer files directly to the application. To do this, follow these steps:

1. Connect your iOS device (with the Laird OTA VSP application pre-installed) to your PC.
2. Open iTunes and select the iOS device button (Figure 8).

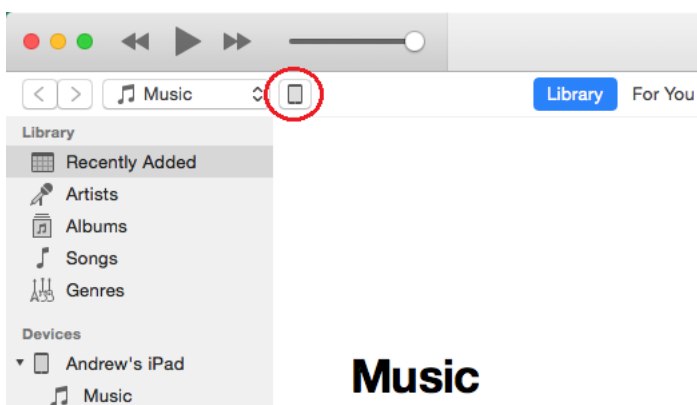


Figure 8: Selecting the iOS device

3. From the iOS device view, select **File Sharing** (Figure 9):

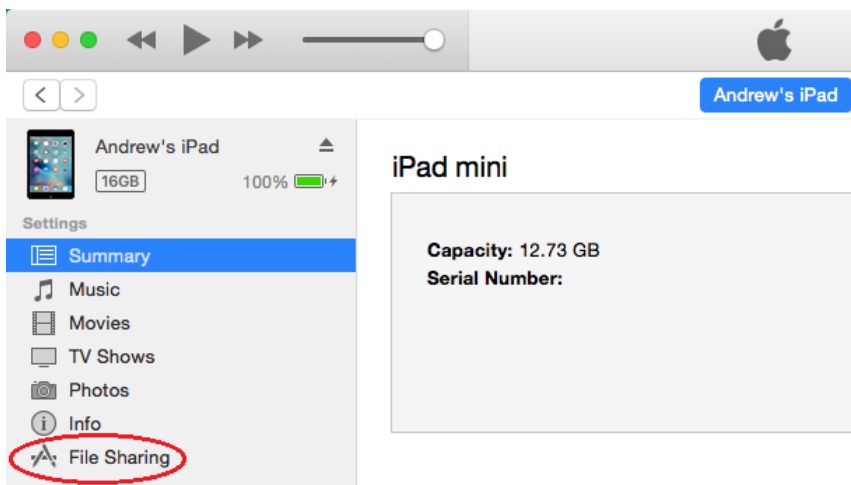


Figure 9: Selecting the file sharing option

4. In the file sharing view, find and select **Laird OTA VSP** from the applications with file sharing abilities (Figure 10). From this view, you can manage files available to the application.

File Sharing

The apps listed below can transfer documents between your iPad and this computer.

Apps

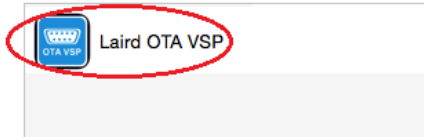


Figure 10: Selecting the Laird OTA VSP application

5. Click **Add** to transfer a file from the PC to the iOS device (Figure 11).

File Sharing

The apps listed below can transfer documents between your iPad and this computer.

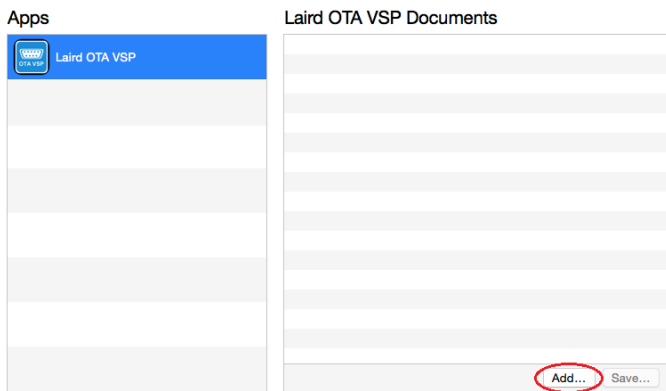


Figure 11: Adding a file to the application

6. Navigate to the file location on the computer and select the file to add it to your iOS device. Both *smartBASIC* source files (.sb/.txt) and applications (.uwc) files can be added.
7. Once finished, click **Done** in the bottom right of the iTunes window (Figure 12).

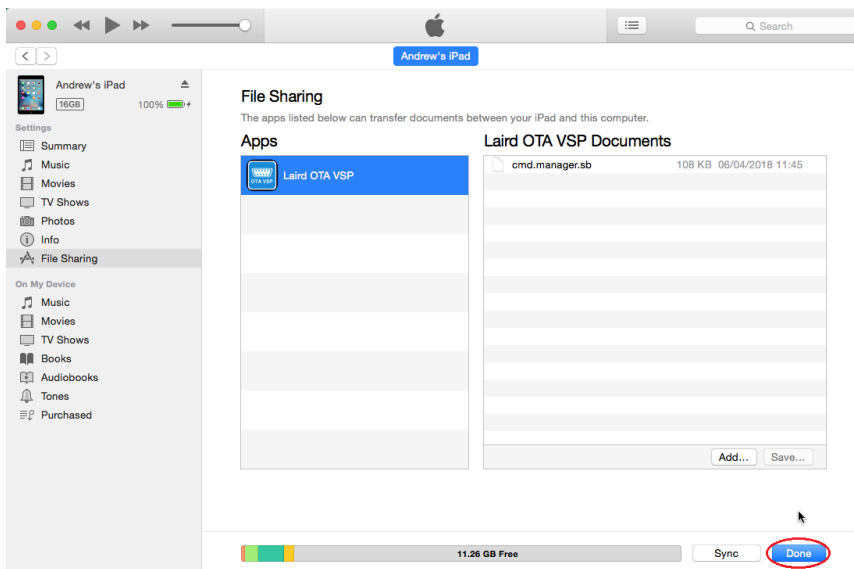


Figure 12: Finished adding files

- Eject the iOS device from the PC as shown in (Figure 13).

You can now open the application and use it with the transferred files, as desired.

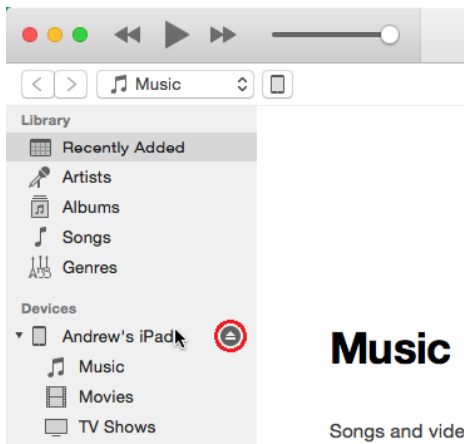


Figure 13: Ejecting the attached iOS device

Alternatively, the OTA VSP client supports selecting files from external applications using the *Open with...* file action. This allows you to select *smartBASIC* source and application files from cloud storage applications, email clients, and many other types of applications.

To use this feature, follow these steps:

- Select the desired file from the application and select **open with Laird OTA VSP**.

If there is only an *Open with...* option, select this and then select **Laird OTA VSP**. (refer to Figure 14 and Figure 15).

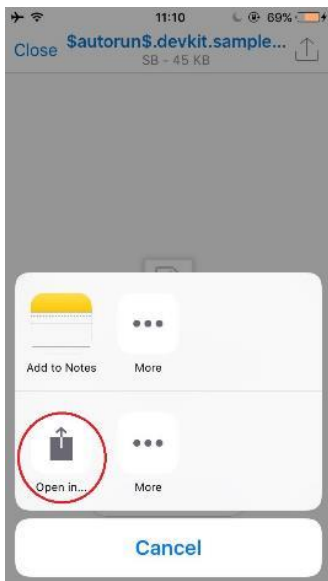


Figure 14: Using "Open In..." Option

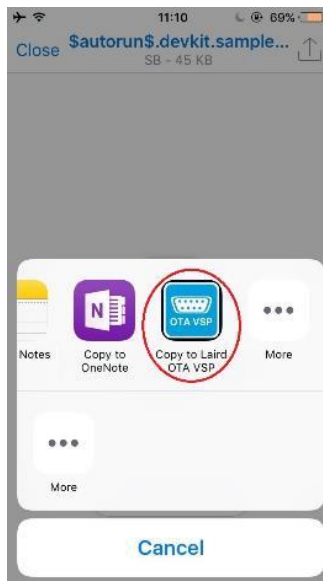


Figure 15: Opening file in OTA VSP application

Once the application opens, you should see that the file is loaded and is ready for XCompilation/download. If an error occurs whilst attempting to open the file, the error message will display.

3.2 Android

Android has a plugin-based file selection system which allows a file on the device to be chosen. Other applications can also add selection locations for selecting files from cloud service providers (such as OneDrive, Dropbox, and Google Drive). To use these providers, you must install the application from the play store and configure it with your user account details – you can then choose it from the file viewer.

Alternatively, files can be stored on the Android device’s filesystem. To transfer files to the device, follow these steps:

1. Plug it into a computer with a USB cable. A notification displays which may indicate that the device is in a charging mode.
2. Select USB for charging ([Figure 16](#)).



Figure 16: Switching USB modes

3. Select **File transfers** ([Error! Reference source not found.](#)) to allow file system access from the connected computer.

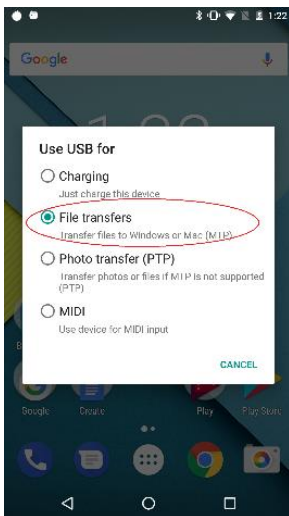


Figure 17: Switching to file transfer mode

A drive displays on the computer under the list of portable devices ([Figure 18](#)). We recommend that you create a unique directory within this drive for the OTA files that you transfer ([Figure 19](#)).

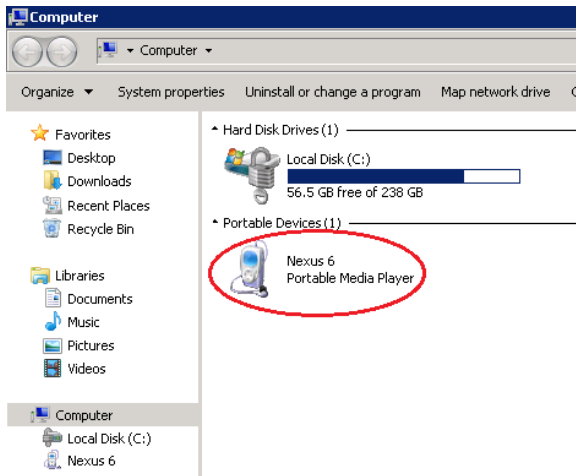


Figure 18: Android filesystem attached to PC

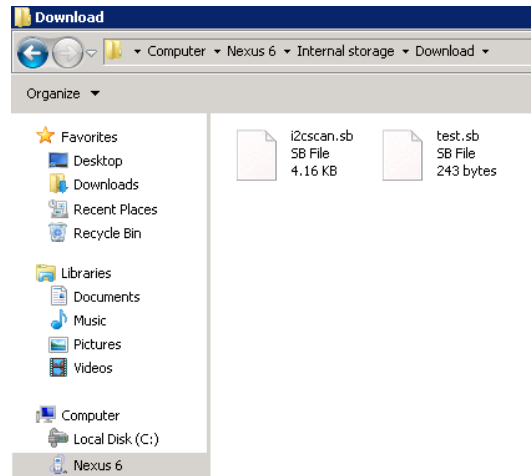


Figure 19: smartBASIC files on Android device

4 ENABLING COMMAND MODE HARDWARE VSP

The first step to communicating with a module using VSP is to enable command mode hardware VSP. Unlike software VSP (which can be used as part of an application), hardware VSP is entered at startup by the firmware.

There are two types of VSP:

- Bridge mode – All data sent/received over VSP is transmitted to the UART without any interpretation by the module.
- Command mode – The VSP interface acts as a second transparent UART interface which allows commands to be issued as if the module’s UART is connected to a PC in interactive mode.

The steps for entering command mode hardware VSP depend upon the module used. VSP can be enabled on Laird’s DVK development boards or on customer designs if the required pins can be set to the required state.

4.1.1 BL600

To enable command mode VSP on the BL600 (Figure 20):

- SIO_7 must be bridged to V_{cc} ,
- The autorun pin (SIO_28) must be set to nAutoRUN (low)
- If using OTA on a DVK, the USB_DTR – Autorun pin on CON12 must be switched off

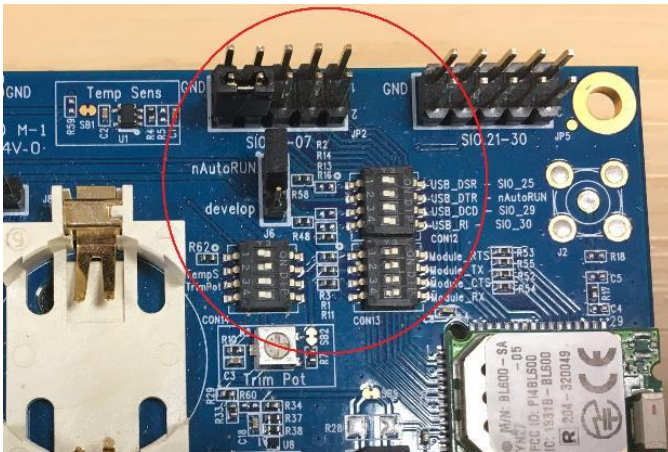


Figure 20: BL600 DIP switch and jumper positions

4.1.2 BL652

To enable command mode VSP on the BL652:

- Autorun (SIO_13) must be set low
- SIO_2 must be set high

This is achieved on the DVK by removing the jumper from J12 and putting a jumper on J5 as shown in [Figure 21](#).

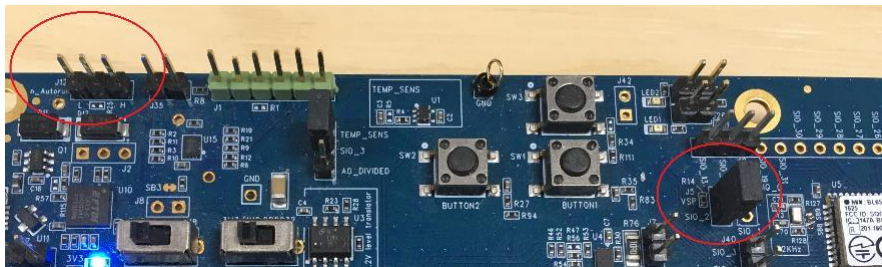


Figure 21: BL652 jumper positions

4.1.3 BL654

To enable command mode VSP on the BL654:

- Autorun (SIO_35) must be set low
- SIO_2 must be set high

This is achieved on the DVK by removing the jumper from J12 and putting a jumper on J5 as shown in [Figure 22](#).



Figure 22: BL654 jumper positions

4.1.4 BT900

To enable command mode VSP on the BT900 ([Figure 23](#)):

- The nAutoRun pin (SIO_22) must be set low (autorun)
- SIO_19 set low (use a jumper wire on the DVK)
- If using OTA on a DVK, the USB_DTR – Autorun pin on CON12 must be switched off

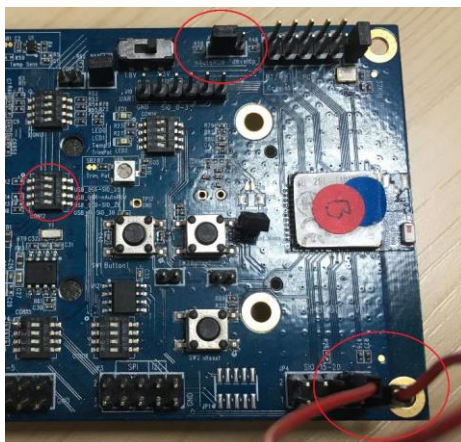


Figure 23: BT900 DIP switch and jumper positions

4.1.5 RM1xx

Although there are two types of firmware on the RM1xx, only the peripheral firmware supports VSP mode. You can convert a module with the central firmware to one with peripheral firmware by using either a Laird QPK or a Segger JLink. See the Programming RM1xx Modules with the QPK-NRF5x-01 application note which is available from the RM1xx product page of the Laird website – <https://www.lairdtech.com/products/rm1xx-lora-modules>

To enable hardware command mode VSP on the RM1xx:

- Set Autorun (SIO_25) low
- Set SIO_28 high
- For the DVK, remove the DTR jumper from J10, place a jumper on J12 pins 1-2 and connect pin 1 of J6 to V_{cc} (3v3) as shown in Figure 24.

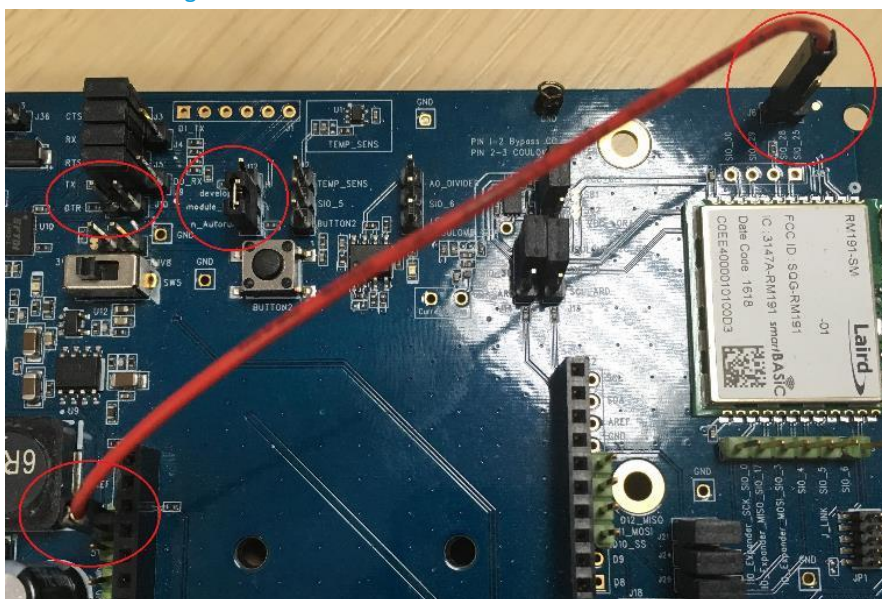


Figure 24: RM1xx jumper positions

5 PERFORMING AN OTA APPLICATION DOWNLOAD

5.1 Enabling Command Mode Hardware VSP

Please follow the section labelled [Enabling Command Mode Hardware VSP](#) to enable command mode hardware VSP on your target module before proceeding with the next step.

5.2 Connecting to the Device

To connect the device, follow these steps:

1. After enabling VSP, open the Laird OTA VSP application.
2. Apply power to the module (or press the reset button on the board if it already has power).
3. Start scanning for devices by clicking **Scan**. Your module name should appear in the list of devices ([Figure 25](#)).

Note: VSP advertises for ten seconds after the module starts. You may need to press the reset button to restart advertising.

4. Select the target device and click **Connect**. The application will attempt to connect to the selected module.

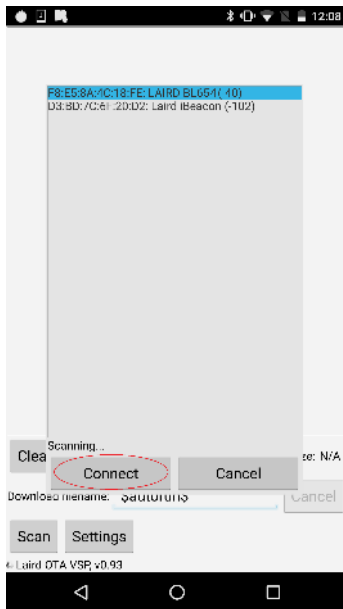


Figure 25: Target module selected

5.3 File Selection

To properly select a file, follow these steps:

1. Once connected to the module, select a file to load by clicking ... (Figure 26).



Figure 26: Connected to module

2. Select between loading a file off the local device or downloading a file from an internet location (Figure 27).

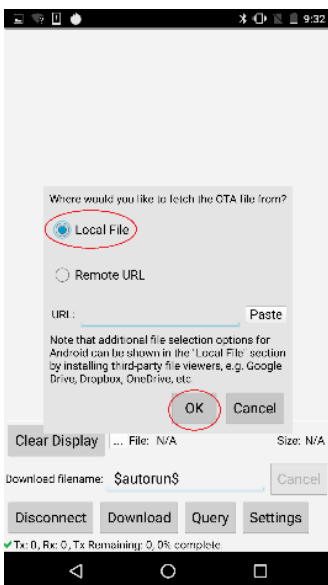


Figure 27: File type selection

3. Select local file and click **OK**.

On Linux/Mac, this opens a generic file selection dialog. On Android, this opens the Android file selection dialog (Figure 28). The top left lines display a list of file providers (local device or cloud service providers).

- 4. Navigate to the desired file and select the application.

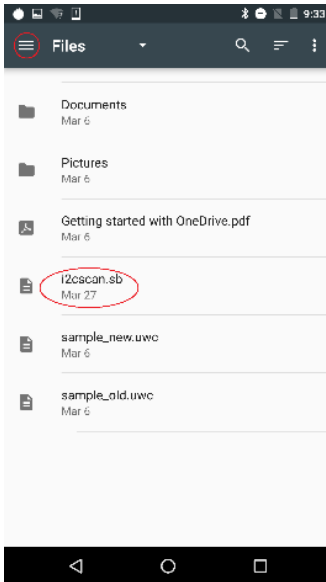


Figure 28: Android file selector

5.4 Downloading

To download the selected file, click **Download**.

Note: Prior to download, the application filename, when saved to the module, can be customized by editing the *Download filename* (Figure 29).

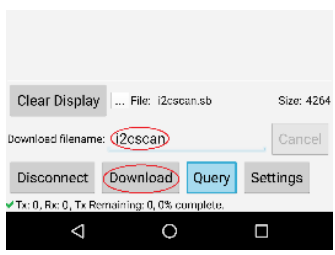


Figure 29: File selected, ready to download

If a *smartBASIC* source file was selected and the online XCompilation option enable in Settings, the download process of the device to the module begins. The length of time of the download varies depending on the device you are using and the size of each data packet.

Once the process has completed, a message displays its completion (Figure 30). The device remains connected or it disconnects and restarts the module (depending on which option you chose in the Settings). The application can now be run on the module as needed.

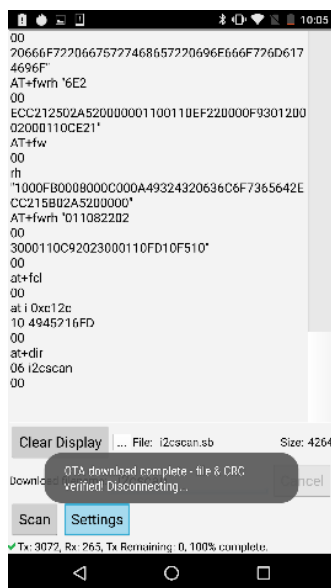


Figure 30: Successful OTA

If an error occurs, the error message and a description display on-screen (Figure 31). The most likely cause of an error is a full filesystem on the module. This can be erased by issuing the *at&f 1* command via a UART connection to the module.

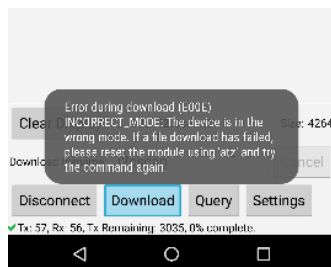


Figure 31: OTA failed

6 RETRIEVING MODULE INFORMATION

6.1 Enabling Command Mode Hardware VSP

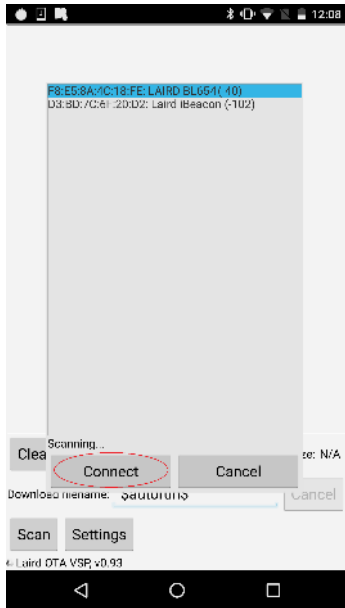
Please follow the section labelled [Enabling Command Mode Hardware VSP](#) to enable command mode hardware VSP on your target module before proceeding with the next step.

6.2 Connecting to the Device

To connect to the device, follow these steps:

1. After enabling VSP, open the Laird OTA VSP application.
2. Apply power to the module (or press the reset button on the board if it already has power).
3. Click Scan to start scanning for devices.

The name of your module should appear in the list of devices (Figure 32).



Note: VSP advertises for ten seconds after the module starts. You may need to press the reset button to restart advertising.

Figure 32: Target module selected

4. Select the target device and click **Connect**. The application attempts to connect to the selected module.

6.3 Retrieving Module Information

To retrieve module information, follow these steps:

1. Once connected to the target module, press **Query** (Figure 33) and wait for the response.

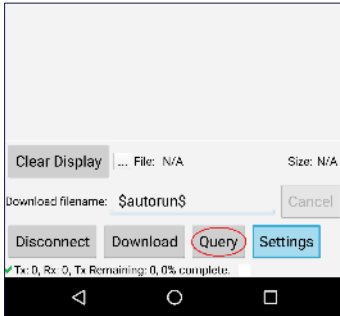


Figure 33: Connected and ready to query

This command queries various information from the module including available storage space, device type, and firmware version. If *Check for latest firmware* is enabled in Settings, the latest firmware supported on the module is also queried.

Once the module responds, the following information displays (Figure 34).

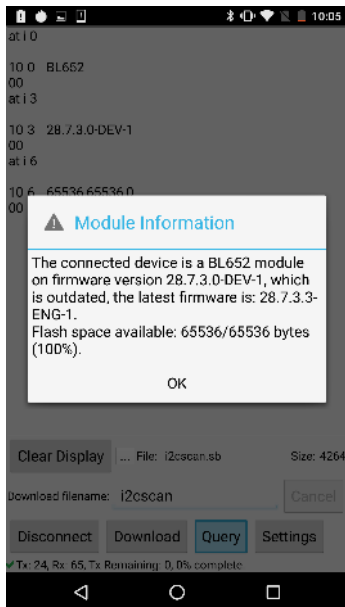


Figure 34: Module information

7 CONFIGURATION OPTIONS

There are many configuration options available in the settings page of the OTA VSP application which can be used to fine tune the OTA process ().

Table 2: OTV VSP application configuration options

Option	Description
VSP Service UUID	The UUID of the VSP service Note: Currently, you cannot change this on any modules. It is reserved for possible future use.
Tx UUID Offset	The characteristic UUIDs of the VSP service Note: Currently, you cannot change these on any modules. They are reserved for possible future use.
Rx UUID Offset	
MO UUID Offset	
MI UUID Offset	
Packet/MTU (Maximum Transmission Unit) Size	The number bytes sent per each characteristic write. Note: Do not change this from the default value of 20 unless your device supports a larger MTU or DLE (data length extensions) and you have configured the target module correctly. Not supported on BL600, BT900, RM1xx, or BL652 firmware earlier than version 28.7.3.0. To configure the BL652/BL654, you must enable larger attributes using the following commands: <pre>at+cfg 211 247 at+cfg 212 244 at+cfg 214 1 at+cfg 216 251 atz</pre> After performing this process and connecting with a supported device, you should be able to increase the value and transfer applications to the module at a faster rate. If you get errors when increasing this value, set it back to the default value of 20.
Only show devices advertising VSP service	If this option is enabled, filtering is performed on discovered Bluetooth Low Energy (BLE) devices. The devices only display if they are advertising the VSP service UUID. This option may cause issues and slow discovery, especially if the service UUID is in the scan response and the Bluetooth adapter is performing a passive scan. In this case, disabling this option may be beneficial.
(Android) More compatible BLE Scanning	Rather than force the device to start scanning for BLE devices, with this option it searches for all Bluetooth devices and only filters them when device information has been retrieved. Enable this option if your device has problems discovering modules.
Delete existing file	If enabled, this overwrites existing files on the module to prevent it from failing if an application already exists with the same filename.

Option	Description
Check for sufficient free storage space	If enabled, this checks that the module has sufficient space to store the application before starting the download process. It prompts a warning to continue if it doesn't have enough space.
Verify file checksum (on supported devices)	<p>If enabled, this confirms a successful download by verifying that the downloaded file checksum matches its expected value.</p> <p>The BL6xx is supported and the BT900 with firmware greater than or equal to 9.1.12.8 is supported.</p> <p>If disabled or unsupported, it only checks that the module has a file with the specified download filename.</p>
Skip download display	If enabled, it skips displaying the file data sent to the module in the log window. This slightly speeds up the file download process.
Scrollbar lines	<p>This option selects the number of display lines to keep in the buffer before discarding them.</p> <p>0 = not discarding any.</p>
Allow online XCompilation	<p>If a <i>smart</i>BASIC source file is selected for download (.sb or .txt file extension), it is XCompiled for the module using the online XCompiler service. This service allows one file to be loaded to multiple different modules or firmware versions without needing to XCompile them on a computer beforehand.</p> <p>Note: <i>Special or engineering firmware versions may not be supported by the online XCompilation system. If this is the case, an error is reported on the device and a pre-compiled .uwc file must be used instead.</i></p> <p>Refer to the Online XCompiler Service Privacy section for privacy information when using this service.</p>
Use SSL (Secure Sockets Layer) for Online XCompilation	<p>This option enables using SSL when communicating with the online XCompilation server. This ensures that the data transmitted and received is encrypted.</p> <p>Note: <i>This option should be disabled in countries where encryption is not legal. Laird takes no responsibility or liability for customers that enable this where its use is prohibited.</i></p> <p>Refer to the Online XCompiler Service Privacy section for privacy information when using this service.</p>
Check for latest firmware when querying	<p>Allows checking that the module is using the latest available firmware when a query command is used. It does this by transmitting the module type and firmware version to the online XCompiler service.</p> <p>Refer to the Online XCompiler Service Privacy section for privacy information when using this service.</p>

Option	Description
<p>After successful download:</p> <ul style="list-style-type: none">▪ Do Nothing▪ Disconnect from module▪ Restart Module	<p>Configures what action should be taken after a successful OTA download. It either does nothing (keep the application connected to the device), disconnects from the module, or restarts the module.</p> <p>If an application is downloaded as \$autorun\$, it begins executing on reboot assuming that the autorun pin is set to the correct logic level.</p> <p>This option only applies to successful OTA downloads, if an OTA fails then the application will remain connected.</p>

8 ENABLING DATA LENGTH EXTENSIONS FOR FASTER DOWNLOADING (v4.2+)

Packet Data Length Extensions is an optional feature of Bluetooth Low Energy version 4.2 and newer. It allows messages exchanged between devices to have a larger transmissions size and therefore a faster throughput.

Note: This is an optional feature. Not all Bluetooth chipsets support it. Ensure that your device supports this feature before attempting to use it.

Laird offers a Bluetooth v4.2 USB adapter for Android and Linux devices with support for DLE – the BT851. Further details on the BT851 adapter can be found on the product page: <https://www.lairdtech.com/products/bt850-usb-ble-module>

Enabling DLE only works with a BL654 module or BL652 module with firmware greater than 28.7.3.0. It must be disabled to communicate with other modules or with devices that do not have DLE enabled.

Note: There is an issue on firmware 28.7.3.0 when using Bluetooth v5 radios #12647. If you are using a v5 radio, please use a newer firmware).

Note: On some devices that do not support DLE, enabling a larger packet size makes use of long characteristic writes – multiple fragments of a packet are sent over the air and reassembled into one write by the other device. This may improve performance of transferring data.

8.1 Enabling DLE on BL654/BL652

The target BL652/BL654 must be connected to a computer to adjust the module's configuration using a utility such as UwTerminalX. Refer to the documentation on the [BL652 product page](#) or [BL654 product page](#) for information on how to communicate with the module.

Send the following commands to the module in interactive command mode to set the module to enable use of DLE and restart the module:

```
at+cfg 211 247
at+cfg 212 244
at+cfg 214 1
at+cfg 216 251
atz
```

Note that this configuration is global and applies DLE configuration to any applications which are loaded to the module. It is possible to disable DLE from inside an application if desired using code like the following:

```
#define ATTRIBUTE_MTU_KEY_ID           211
#define ATTRIBUTE_DATA_LENGTH_KEY_ID  212
#define ENABLE_HIGH_BANDWIDTH_KEY_ID  214
#define BLE_MAX_PACKET_LENGTH_KEY_ID  216

dim rc, nAttributeMTU

rc = NvCfgKeyGet(ATTRIBUTE_MTU_KEY_ID, nAttributeMTU)

IF (nAttributeMTU > 23) THEN
    //Disable DLE configuration
    rc = NvCfgKeySet(ATTRIBUTE_MTU_KEY_ID, 23)
```

```
rc = NvCfgKeySet (ATTRIBUTE_DATA_LENGTH_KEY_ID, 20)
rc = NvCfgKeySet (ENABLE_HIGH_BANDWIDTH_KEY_ID, 0)
rc = NvCfgKeySet (BLE_MAX_PACKET_LENGTH_KEY_ID, 27)
//Reset module for configuration update to apply
Reset(0)
ENDIF
```

If the configuration is applied successfully, success codes display (Figure 35).

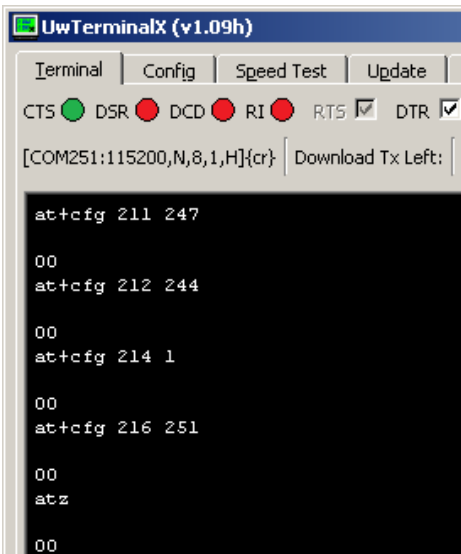


Figure 35: DLE configuration applied

If there is an error, the following displays (Figure 36). If you receive an error, ensure that you are using the latest firmware.

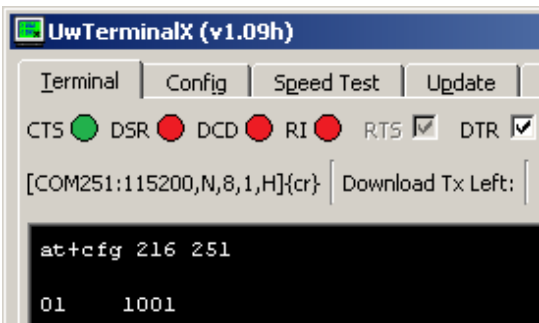


Figure 36: DLE unsupported in firmware

8.2 Enabling DLE on the OTA VSP Application

To enable DLE on the OTA VSP application, follow these steps:

1. Select **Settings** from the main interface.
2. Adjust the packet size option from the default of 20 up to a larger value. We recommend a value no larger than 90 ([Figure 37](#)).

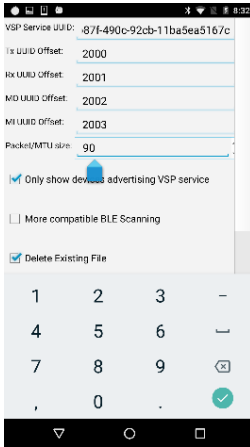


Figure 37: Increasing packet length to 90

3. Click **Save** to save changes and return to the main screen.

8.3 Downloading an application with DLE enabled

Follow the normal instructions in the [Performing an OTA Application Download](#) section to download with DLE enabled.

8.4 Disabling DLE on the OTA VSP Application

To disable DLE on the OTA VSP application, follow these steps:

1. Select **Settings** from the main interface.
2. Adjust the packet size option to the default of 20 ([Figure 38](#)).

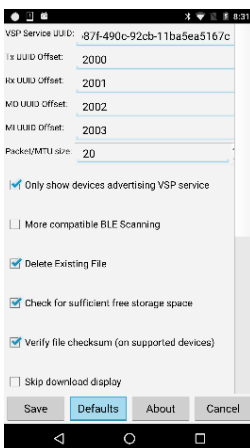


Figure 38: Packet length set back to default

3. Click **Save** to save changes and return to the main screen of the application.

8.5 Performance Analysis

We tested how long it takes to load an application to a BL652 module. We enabled/disabled long characteristic writes as well as DLE. The results gathered are displayed in the following tables.

- Android device testing with a Bluetooth v4.1 radio – Long characteristic write performance comparison with BL652 (28.7.3.0) tested with a Nexus 6 (6.0.1) and packet lengths 20 and 90. TCalculated as Without/With*100 – [Table 3](#)
- Linux device testing – DLE performance comparison with BL652 (28.7.3.0) tested with a Laird BT851 on Arch Linux and packet lengths 20 and 90. TCalculated as Without/With*100 – [Table 4](#)
- Testing on a Linux PC and Laird BT851 Bluetooth v4.2 radio with supports long characteristic writes and DLE – [Table 5](#)

The results show a marked improvement in throughput when larger packet sizes are used.

Table 3: Testing on a Nexus 6 Android device

	AT Interface	CMD Manager	SmartZ	BL652 Sample App
Transfer size (bytes)	117289	81285	50940	28875
Without DLE (seconds)	374	212	132	75
With DLE (seconds)	82	53	34	21
DLE throughput comparison ^T	456%	400%	388%	357%

Table 4: Testing on a Linux device

	AT Interface	CMD Manager	SmartZ	BL652 Sample App
Transfer size (bytes)	117289	81285	50940	28875
Without DLE (seconds)	214	148	93	54
With DLE (seconds)	56	40	25	15
DLE throughput comparison ^T	382%	370%	372%	360%

9 KNOWN ISSUES

- (12647) BL652 OTA fails with devices using a Bluetooth v5 radio which supports 2M PHY on firmware version 28.7.3.0
 - This is an issue caused by the module not responding to the PHY change event, to resolve the issue please update the module’s firmware to a newer version than 28.7.3.0.
- (12772) BL652 OTA fails with Android devices using a Bluetooth v5 radio with DLE configuration keys enabled on firmware 28.7.3.0 and 28.7.3.3
 - This is an issue caused by Android expecting a response to a command that the BL652 is not sending, to work-around the issue, restore the DLE config keys of the BL652 back to default and put the packet size in the OTA VSP application to 20.
- (12742) BL654 OTA fails with Android devices using a Bluetooth v5 radio with DLE configuration keys enabled
 - This is an issue caused by Android expecting a response to a command that the BL654 is not sending, to work-around the issue, restore the DLE config keys of the BL654 back to default and put the packet size in the OTA VSP application to 20.

10 TESTED DEVICES

10.1 Android

Device	Details	Bluetooth Version	Issues?	Issue Details
Nexus 6		4.1	✗	
Nexus 7		4.0	✗	
Nexus 9		4.1	✗	
Hudl 2		4.0	✗	
Pixel 2		5.0	✓	Incompatible with BL652 firmware version 28.7.3.0

10.2 Linux

Device	Details	Bluetooth Version	Issues?	Issue Details
x86_64 laptop	Using BT851 USB dongle	4.2	✗	
Raspberry Pi 3		4.1		

10.3 iOS

Device	Details	Bluetooth Version	Issues?	Issue Details
iPod Touch 5g	iPod Touch 5g	4.0		
iPad X	iPad X			
iPad Mini X	iPad Mini X		✗	
iPhone SE	iPhone SE	4.2	✗	
iPhone 8	iPhone 8	5.0	✓	Incompatible with BL652 firmware version 28.7.3.0

10.4 Mac

Device	Details	Bluetooth Version	Issues?	Issue Details
Late 2012 Macbook		4.0	✗	
Late 2012 iMac		4.0	✗	

11 ONLINE XCOMPILER SERVICE PRIVACY

Laird takes security and privacy of customer's data seriously. When a request is made to the online XCompilation server, some public information is recorded in a log file which consists of the following:

- Time and date of the request
- Originating IP address
- Type of web request and the URL
- Destination TCP port
- Browser user-agent string
- Size of the submitted request
- Result code of the submitted request.

This public information only contains meta-data from the request and does not contain any sensitive private data such as the source code to be XCompiled. Submitted application source code and output XCompiled application files are stored temporarily on the XCompilation server only for the purpose of XCompilation and are purged from the system once the web request has finished being transmitted back to the client.

Remember: There is the option of communicating with the XCompilation server using unencrypted HTTP and encrypted HTTPS using SSL (Secure Sockets Layer) which ensures that data exchanged between the client and XCompilation server cannot be intercepted and decrypted by third parties. We recommend that you keep the SSL option enabled. If you are in a country that has outlawed encryption, you can disable SSL support by unchecking the checkbox in settings.

Information in the log files may be used for data analytical purposes to monitor common modules or firmware versions used on the online XCompilation server – this data only includes anonymised data from the log files where the IP address and browser user-agent have been stripped and does not include any portion of the submitted application source code.

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Version 3, 29 June 2007

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14 ADDITIONAL DOCUMENTATION

Laird offers a variety of documentation and ancillary information to support our customers through, additional documentation can be accessed from the Documentation tab of all product pages which can be found on the [Laird Bluetooth Modules Product Page](#).

For any additional questions or queries, or to receive technical support for this VSP application, please contact Embedded Wireless Solutions Support: <http://ews-support.lairdtech.com>

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