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ALR-H450/H460 Developer Guide

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ALR-H450
ALR-H460

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ALR-H450/H460 Developer Guide

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1 Introduction

The Alien ALR-H450/H460 Software Developer Kit (SDK) provides libraries and sample code for programmatically controlling Alien ALR-H450/H460 handheld readers, which are running on an Android operating system. Alien provides class libraries and sample applications to help you get up-and-running developing your custom applications to run directly on the device.

1.1 Audience

We assume that the readers of this guide:

- are proficient Android developers,
- have minimal previous knowledge of RFID, and other relevant technologies.

1.2 Type Conventions

- Regular text appears in a plain, sans-serif font.
- External files and documents appear in *italic text*.
- Class names appear in a `fixed-width serif font`.
- Things you type in, and sample code appear:

```
indented, in a fixed-width serif font.
```

- Longer blocks of sample code appear like below:

```
// Obtain RFIDReader instance
RFIDReader reader = RFID.open();
// Release RFIDReader instance
reader.close();
```

1.3 Overview

This document focuses on controlling the ALR-H450/H460 handheld readers using the Alien Android API. The Android Library provided in the SDK, **alienapi.aar**, supports controlling both the RFID Reader and 1D/2D Barcode Scanner.

Library	Hardware Module	ALR-H450/H460 (Android)
alienapi.aar	**RFID Reader**	✓
	1D/2D Barcode Scanner	✓ 1D & 2D

1.4 Documentation and Sample Code

This Guide provides complete documentation of all API elements. Additional usage tips can be gleaned by examining and modifying the source code samples provided by Alien. The sample applications demonstrate most of the major features of each hardware module.

1.5 System Requirements

You will need Android Studio 1.4 (or newer) to develop applications for the Alien handhelds.

2 RFID Reader

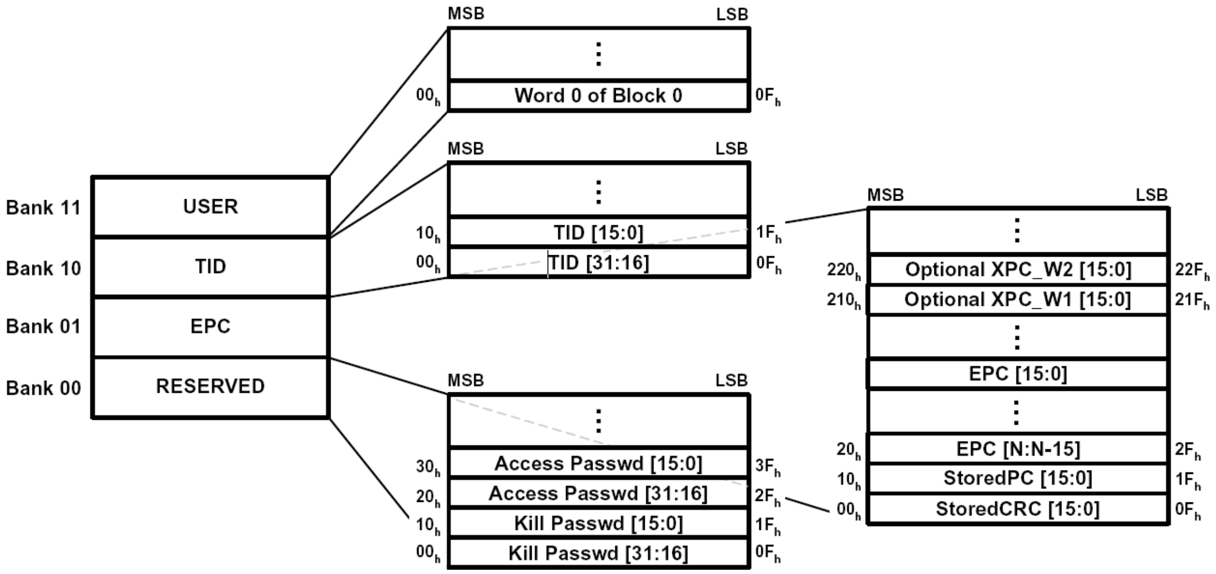
2.1 Introduction

The Alien `alienapi.aar` API library contains classes to provide interface with the RFID module in your Alien handheld reader. After initializing the `RFIDReader` class object, use its methods to communication with the RFID module.

You have control over most aspects of the Gen2 protocol, including access operations like write, lock, and kill, using tag masks, as well as reading tags' EPC IDs and Return Signal Strength Indication (RSSI).

To take full advantage of the RFID module and the Gen2 protocol, you are encouraged to read and understand the relevant portions of the EPCglobal Gen2 specification. One thing you must be aware of when accessing individual portions of memory in the tag is the layout of tag memory. As shown in the diagram below, all Gen 2 tags have four banks of memory (RESERVER, EPC, TID, USER) and each of those banks can be broken down into fields (Kill Password and Access Password within the RESERVED bank).

When reading and writing tag memory, all data operations are performed in one-word (2 bytes, 16 bits) increments, and only on word boundaries within a single bank. Some masking operations allow addressing memory down to the nibble (1/2 byte, 4 bits) or bit level.


MSB
LSB
00h Word 0 of Block 0 0Fh
MSB
LSB
10h TID [15:0] 1Fh
00h TID [31:16] 0Fh
Bank 11 USER
Bank 10 TID
Bank 01 EPC
Bank 00 RESERVED
MSB
LSB
220h Optional XPC_W2 [15:0] 22Fh
210h Optional XPC_W1 [15:0] 21Fh
EPC [15:0]
20h EPC [N:N-15] 2Fh
10h StoredPC [15:0] 1Fh
00h StoredCRC [15:0] 0Fh
MSB
LSB
30h Access Passwd [15:0] 3Fh
20h Access Passwd [31:16] 2Fh
10h Kill Passwd [15:0] 1Fh
00h Kill Passwd [31:16] 0Fh

2.2 Enumerations

2.2.1 Bank

The Bank enumeration is used to specify a particular memory bank, for locking, reading, and writing. See the Gen2 memory diagram at the start of this chapter for details of each bank.

```
public enum Bank{
  RESERVED,
  EPC,
  TID,
  USER
}
```

2.2.2 Target

Controls which Gen2 protocol A/B target is used when performing tag inventories.

```
public enum Target {
  A,
  B
}
```

2.2.3 Session

Controls which Gen2 protocol session is used when performing tag inventories.

```
public enum Session {
  S0,
  S1,
  S2,
  S3
}
```

2.2.4 LockType

Controls the lock type to use for lock/unlock operations.

```
public enum LockType {
  LOCK,
  UNLOCK,
  PERMALOCK,
  PERMAUNLOCK
}
```

2.2.5 RFIDInfo

Defines the available RFID subsystem information.

```
public enum RFIDInfo {
  FIRMWARE_VER,
  HARDWARE_VER,
  MODULE_ID,
  REGION,
}
```

2.3 Connecting to RFID Module

The Alien API's `RFIDReader` class allows controlling the RFID module. Using the `RFIDReader` instance, an application can adjust radio parameters, and execute tag operations (inventory, read, write, kill, lock) according to the ISO 18000 EPC Class 1 Generation 2 (Gen2) tag protocol.

Obtaining `RFIDReader` instance:

```
// Obtain RFIDReader instance
RFIDReader reader = RFID.open();
```

The `RFID.open()` method returns a **global** instance of `RFIDReader` which will be used by all `RFIDReader` methods to control the RFID module.

When finished using the `RFIDReader`, you should call the `close()` method to release the `RFIDReader` resources.

```
// Release RFIDReader instance and resources
reader.close();
```

2.4 Tag Operations

2.4.1 Mask

The Alien API provides the `Mask` class to give an application the ability to filter which tags participate in RFID operations, such as inventory, read, write, kill, and lock.

Constructor:

```
public Mask(Bank bank, int bitOffset, int bitLength, String data)
```

Parameters:

`bank`	which bank for masking
`bitOffset`	the bit offset where mask `data` start
`bitLength`	the bit length of the mask `data`
`pattern`	the data in hex string to filter

Example:
To mask on a tag which has the EPC bank value of “11AA” (16 bits) at the bit offset of 32, set the mask as follows:

```
Mask mask = new Mask(Bank.EPC, 32, 16, “11AA”);
```

No filtering:
The `Mask` class has the static `NONE` instance which disables masking for tag operations.

Example:

```
Mask mask = Mask.NONE;
```

Mask on the EPC starting with a pattern:
For more convenience, the `Mask` class has a static `maskEPC()` method to create masks that would match tags that have EPC start with a certain data string.

`public static Mask maskEPC(String data)`

Parameters:
`data` the data the tag's EPC starts with

Returns:
`Mask` object that contains mask information

Example:
To mask on tags that have an EPC starting with "11AA".

```
Mask mask = Mask.maskEPC("11AA");
```

2.4.2 Reading a single tag

The `RFIDReader` class has the `read` method to perform an inventory that would read a single tag.

`public RFIDResult read(Mask mask [optional]) throws ReaderException`

Parameters:

`mask`	the mask to use when reading tags

Returns:

`RFIDResult`	object that contains `Tag` object. Calling `RFIDResult.getData()` will return a `Tag` object that contains EPC and RSSI information

Exceptions:
`ReaderException` is raised if the operation fails.

Example:
To read one tag with no filtering

```
RFIDReader reader = RFID.open();
RFIDResult result = reader.read();
if (result.isSuccess()) {
    Tag tag = (Tag)result.getData();
    String epc = tag.getEPC();
    double rssi = tag.getRSSI();
}
```

2.4.3 Continuous Inventory

The `RFIDReader` class provides the `inventory` method to initiate a continuous inventory and `stop` method to stop it.

The `RFIDCallback` **interface** is used to retrieve Tag information from the continuous inventory operation, via the `onTagRead` method callback. The caller needs to implement this method to receive tag information.

The `RFIDReader` class provides the `isRunning` method to check if continuous inventory is running.

```
public void inventory(RFIDCallback callback, Mask mask [optional])
    throws ReaderException
```

Parameters:

`callback`	the callback to receive tag information.
`mask`	the mask object for filtering

Returns:

`Tag`	object that contains EPC and RSSI information. For convenience, the `Tag` object has its own methods to execute operations for that specific tag.

Exceptions:

`ReaderException` is raised if there is an error.

NOTE:

- Continuous inventories run **asynchronously**.
- The reader cannot respond to other commands during continuous inventories. It is necessary to stop the continuous inventory before executing other commands. An `RFIDBusyException` will be raised if you attempt to execute other commands while the continuous inventory is running.

```
public interface RFIDCallback {
  void onTagRead(Tag tag);
}
```

Parameters:

`Tag` – The Tag object that contains tag information.

NOTE: Only EPC and RSSI information can be obtained from the tag object while inside the callback or while continuous inventory is running. To perform other operations on the tag object you must stop the continuous inventory.

```
public void stop() throws ReaderException
```

Exceptions:

`ReaderException` is raised if there is an error.

```
public boolean isRunning()
```

Returns:

`boolean` true if a continuous inventory is running.

Example:

To perform a continuous inventory for tags which EPCs start with “1122”

```
RFIDReader reader = RFID.open();
reader.inventory(new RFIDCallback() {
        @Override
        public void onTagRead(Tag tag) {
            String epc  = tag.getEPC();
            double rssi = tag.getRSSI();
        }
    },
    Mask.maskEPC("1122")
);
```

To stop continuous inventory:

```
reader.stop();
```

To check if continuous inventory is running:

```
boolean isRunning = reader.isRunning();
```

2.4.4 Reading and Writing tag’s memory

The `RFIDReader` class provides `read` and `write` methods to read and write data from and to specific locations of tag’s memory.

```
public RFIDResult read(Bank bank, int wordPointer, int wordCount,
   Mask mask [optional], String accessPassword [optional]) throws ReaderException
```

Parameters:

`bank`	the memory bank to read data from
`wordPointer`	the offset within the bank where to read the data from (in word units)
`wordCount`	the number of words to read
`mask`	the mask for filtering
`accessPassword`	the access password used when accessing protected memory. If not using password, pass this parameter as an empty string (`””`)

Returns:

`RFIDResult`	the results of the operation. Call `isSuccess()` on the `RFIDResult` object to check if the operation succeed. Call `getData()` on the `RFIDResult` object to get data read from the tag.

Exceptions:

`ReaderException` is raised if there is an error.

```
public RFIDResult write(Bank bank, int wordOffset, String data,
   Mask mask [optional], String accessPassword [optional]) throws ReaderException
```

Parameters:

`bank`	the memory bank to write data to
`wordOffset`	the offset within the bank where to write data to (in word units)
`data`	the data as a hex string to write
`mask`	the mask for filtering
`accessPassword`	the access password used when accessing protected memory. If not using password, passing this parameter as empty string (″″).

Returns:

`RFIDResult`	the results of the operation. Call `isSuccess()` on the `RFIDResult` object to check if the operation succeeded.

Exceptions:

`ReaderException` is raised if there is an error.

Example: To write and read a word from the USER bank

```
RFIDReader reader = RFID.open();
// Write "AABB" to the beginning of the USER memory bank of the tag which
// EPC starts with "1122"
RFIDResult writeResult = reader.write(Bank.USER,0,"AABB",Mask.maskEPC("1122"));
if (writeResult.isSuccess()) {
    // Write operation succeeded.
}


// Read 1 word from the beginning of the USER memory bank of the tag which
// EPC starts with "1122"
RFIDResult readResult = reader.read(Bank.USER,0,1,Mask.maskEPC("1122"));
if (readResult.isSuccess()) {
    // Read operation succeeded.
    String data = readResult.getData(); // data returned as a hex string
}
```

2.4.5 Lock Fields

The Alien API provides the `LockFields` class to be used as a parameter for tag lock/unlock operations. A `LockFields` object specifies which tag's memory fields will be affected when executing lock operations.

The `LockFields` class defines the following fields: `ACCESS_PWD, KILL_PWD, EPC` and `USER`

Descriptions:

`ACCESS_PWD`	Access Password is used to protect tag memory from access. The Access Password is stored within the RESERVED memory bank.
`KILL_PWD`	Kill Password is used when kill a tag. The Kill Password is stored within RESERVED memory bank.
`EPC`	EPC field, same as EPC bank.
`USER`	USER field, same as USER bank

Constructor:

`public LockFields(int fields)`

Parameters:

`fields`	a bitmap of fields to be locked

Example:
Create a `LockFields` bitmap specifying EPC and USER lock fields:

```
LockFields fields = new LockFields(

    LockFields.EPC | LockFields.USER

);
```

2.4.6 Locking and Unlocking Tag Memory

The `RFIDReader` class provides `lock` method to lock, unlock, permlock or permaunlock tag memory fields.

```
public RFIDResult lock(LockFields fieldBitmap, LockType lockType,
   Mask mask [optional], String accessPassword [optional]) throws ReaderException
```

Parameters:

`fieldBitmap`	a bitmap of fields to be locked
`lockType`	lock type (lock, unlock, permalock, permaunlock)
`mask`	the mask object for filtering
`accessPassword`	the access password used when accessing protected memory

Returns:

`RFIDResult`	the results of the operation. Call `isSuccess()` on the `RFIDResult` object to check if the operation succeeded.

Exceptions:

`ReaderException` is raised if there is an error.

NOTE:

- If a field is locked, a correct access password must be supplied in order to write to the memory
- If the EPC or USER fields are locked, they are **read-only** without knowing the access password. To write, you are required to pass the correct access password.
- If the ACCESS_PWD or KILL_PWD fields are locked, they are not accessible at all (**cannot read or write**) without knowing the access password.
- To unlock, it is necessary to know the correct access password.
- Use caution when using `lockType PERMALOCK` or `PERMAUNLOCK` – the results are **permanent**! If a field is permanently locked, it cannot be unlocked. If a field is permanently unlocked, it cannot be locked.

```
RFIDReader reader = RFID.open();
// Lock EPC and USER fields for the tags which EPC start with "1122"
LockFields fields = new LockFields(LockFields.EPC | LockFields.USER);
RFIDResult lockResult = reader.lock(fields, LockType.LOCK, Mask.maskEPC("1122"));
if (lockResult.isSuccess()) {
    // Lock operation succeed.
}


// Unlock EPC and USER fields for the tags which EPC start with "1122"
RFIDResult unlockResult = reader.lock(fields, LockType.UNLOCK,
           Mask.maskEPC("1122"), accessPassword);
if (unlockResult.isSuccess()) {
    // Unlock operation succeed.
}
```

2.4.7 Kill tags

The `RFIDReader` class provides the `kill` method to kill RFID tags. This prevents the tags from communicating further with an RFID reader. Once a tag is killed, that tag can't be recovered.

```
public RFIDResult kill(String killPassword, Mask mask [optional])
                throws ReaderException
```

Parameters:

`killPassword`	non-zero kill password
`mask`	mask object for filtering

Returns:

`RFIDResult`	the result of the operation. Call `isSuccess()` on the `RFIDResult` object to check if the operation succeeded.

Exceptions:

`ReaderException` is raised if there is an error.

2.4.8 Tag class

The Alien API library provides the `Tag` class to provide more convenience for the developer to run operations for a specific tag.

A `Tag` object is returned by reading a single tag, or via a callback from a continuous inventory. The data returned inside the `RFIDResult` is a `Tag` object.

```
RFIDReader reader = RFID.open();

RFIDResult result = reader.read(Mask.NONE);

Tag tag = (Tag)result.getData();

String epc = tag.getEPC();

double rssi = tag.getRSSI();
```

The `Tag` class provides wrapper methods, below, which allow you to run all operations for the tag directly on the tag itself. You don't need to supply a mask for that tag as it's going to automatically mask on the tag's EPC when calling an RFIDReader method.

- ***Obtaining Data From The Tag Object (without issuing RFID commands):***

```
public String getEPC();  // tag's EPC
public double getRSSI(); // tag's Returned Signal Strength
```

- ***Executing Rfid Operations On The Tag Object*:**

Write EPC:
```
public RFIDResult writeEPC(String epc) throws ReaderException;
```

Read/Write ACCESS_PWD:
```
public RFIDResult readAccessPwd() throws ReaderException
public RFIDResult writeAccessPwd() throws ReaderException
```

Read/Write KILL_PWD:
```
public RFIDResult readKillPwd() throws ReaderException
public RFIDResult writeKillPwd() throws ReaderException
```

Read TID memory bank:
```
public RFIDResult getTID() throws ReaderException
```

Read/Write USER memory bank:
```
public RFIDResult readUser() throws ReaderException
public RFIDResult writeUser() throws ReaderException
```

Read/Write tags's memory:
```
public RFIDResult read(Bank bank, int wordOffset, int wordCount,
        String accessPassword [optional])
public RFIDResult write(Bank bank, int wordOffset, String data,
        String accessPassword [optional]) throws ReaderException
```

Lock/Unlock tag's memory:
```
public RFIDResult lock(LockFields fields, LockType lockType,
        String accessPassword [optional]) throws ReaderException
```

Kill tag:
```
public RFIDResult kill(String killPassword) throws ReaderException
```

2.5 Setting RFID Parameters

The `RFIDReader` class includes methods to configure RFID related parameters, as well as to obtain information about the device.

2.5.1 Transmit Power

The `RFIDReader` class provides `getPower` and `setPower` methods to manage the RFID module's transmit power.

`public int getPower() throws ReaderException`

Parameters:
None

Returns:

`int`	the RFID module's power attenuation in dBm

Exceptions:
`ReaderException` is raised if there is an error.

`public void setPower(int power) throws ReaderException`

Parameters:

`power`	the RFID module's transmit power in dBm (1-30)

Exceptions:
`ReaderException` is raised if there is an error.
`InvalidParamException` is raised if the parameter value is not valid

2.5.2 Q Parameter

The `RFIDReader` class provides `getQ` and `setQ` methods to configure the starting Q parameter value that is used in the Gen2 protocol to read tags. It indicates approximately how many tags to expect (2^Q).

`public int getQ() throws ReaderException`

Parameters:
None

Returns:

`int`	the starting Q parameter value

Exceptions:
`ReaderException` is raised if there is an error.

`public void setQ(int QValue) throws ReaderException`

Parameters:

`QValue`	starting Q parameter value. Valid Q values are from 0 to 15.

Exceptions:
`ReaderException` is raised if there is an error.
`InvalidParamException` is raised if the parameter value is not valid

2.5.3 Session Parameter

The `RFIDReader` class provides `getSession` and `setSession` methods to configure the session parameter of the Gen2 protocol to keep track of inventoried tags. Please refer to the Gen2 protocol specification for information on the Session value.

`public Session getSession() throws ReaderException`

Parameters:
`None`

Returns:
`Session` the Gen2 protocol Session parameter

Exceptions:
`ReaderException` is raised if there is an error.

`public void setSession(Session session) throws ReaderException`

Parameters:
`Session` the Gen2 protocol Session parameter

Exceptions:
`ReaderException` is raised if there is an error.

2.5.4 Inventory Target

The `RFIDReader` class provides `getTarget` and `setTarget` methods to configure the Inventory target parameter used in the Gen2 protocol.

`public Target getTarget() throws ReaderException`

Parameters:
`None`

Returns:
`Target` the Gen2 protocol inventory target parameter

Exceptions:
`ReaderException` is raised if there is an error.

`public void setTarget(Target target) throws ReaderException`

Parameters:
`target` the Gen2 protocol inventory target parameter

Exceptions:
`ReaderException` is raised if there is an error.

2.5.5 RFID Subsystem Information

The `RFIDReader` class provides `getInfo` methods to obtain the device information, such as hardware version, firmware version, and model number.

`public String getInfo(DeviceInfo type)`

Parameters:

`type` the information type to obtain

Return:

`String` device information returned as a string, or null if the information is not available

`public Map<DeviceInfo, String> getInfo()`

Parameters:

None

Return:

`Map` a Map object containing all available device information

Example

```
RFIDReader reader = RFID.open();
String rfidHardwareVersion = reader.getInfo(DeviceInfo.RFID_HARDWARE_VER);
String rfidFirmwareVersion = reader.getInfo(DeviceInfo.RFID_FIRMWARE_VER);
String rfidModuleId = reader.getInfo(DeviceInfo.RFID_ID);
```

2.5.6 Device Information

The `DeviceInfo` class provides several methods to obtain the device information, such as the device model and the device ID.

`public String getDeviceID()`

Return:

`String` device ID returned as a string.

`public String getModel()`

Return:

`String` device model returned as a string.

Example

```
DeviceInfo dev = new DeviceInfo(context);
String id    = dev.getDeviceID();
String model = dev.getModel();
```

3 Barcode Reader

3.1 Introduction

The Alien API library includes classes to control and communicate with the Barcode Scanner module. Use `BarcodeReader` instance's methods to communicate with the Barcode Scanner.

3.2 Controlling Barcode Reader

The `BarcodeReader` allows scanning 1D and 2D barcodes.

`public BarcodeReader(Context context)`

Parameters:
`context` the Android context where the `BarcodeReader` instance is used

Example:

```
// Create BarcodeReader instance
BarcodeReader barcodeReader = new BarcodeReader(androidContext);
```

3.2.1 Scan 1D and 2D barcode

The `start` and `stop` methods control the Barcode Reader module to start and stop barcode scanning.
NOTE: The scanning will automatically stop after a barcode has been successfully scanned.

The `BarcodeCallback` **`interface`** is used to retrieve barcode information from the scanning operation, via the `onBarcodeRead` method callback. The caller needs to implement this method in order to receive barcode information.

The `isRunning` method is used to determine if barcode scanning is currently in progress.

`public void start(BarcodeCallback callback)`

Parameters:
`callback` the callback to receive barcode information

Returns:
None

`public void stop()`

Parameters:
None

Returns:
None

`public boolean isRunning()`

Parameters:
None

Returns:

`true`	if the barcode scanning is currently in progress

Example:

```
// Start barcode scan
barcodeReader.start(new BarcodeCallback() {
        @Override
        public void onBarcodeRead(String barcode) {
            String detectedBarcode = barcode;
            // Scan will automatically stop after successfully scanning a barcode
        }
    }
);
```

Stop barcode scan:

```
// Stop barcode scan
barcodeReader.stop();
```

3.2.2 Controlling Barcode Parameters

The default Barcode Reader settings can be changed using the methods listed below.
NOTE: Refer to the next section for the list of Barcode Reader parameters and descriptions of their values.

`public boolean setParameter(int param, int value)`

Parameters:

`param`	barcode parameter ID. Use -1 to reset all parameters to the default values
`value`	barcode parameter value

Returns:

`boolean`	`true` if success

`public int getParameter(int param)`

Parameters:

`param`	barcode parameter ID

Returns:

`int`	parameter value or -1 if failed

`public void setAllSymbologies(boolean enable)`

Parameters:

`enable`	boolean true/false to enable/disable all supported symbologies **NOTE**: enabling all symbologies initializes their parameters to default values. Use **`setParameter()`** method to set a custom parameter value.

Returns:
`None`

3.3 Symbology Parameters

3.3.1 List of Barcode Symbology Parameters

Parameter	ID	Default
UPC/EAN		
UPC-A	1	Enable
UPC-E	2	Enable
UPC-E1	12	Disable
EAN-8/JAN 8	4	Enable
EAN-13/JAN 13	3	Enable
Bookland EAN	83	Disable
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	16	Ignore
UPC/EAN/JAN Supplemental Redundancy	80	10
Decode UPC/EAN/JAN Supplemental AIM ID	672	Combined
Transmit UPC-A Check Digit	40	Enable
Transmit UPC-E Check Digit	41	Enable
Transmit UPC-E1 Check Digit	42	Enable
UPC-A Preamble	34	System Character
UPC-E Preamble	35	System Character
UPC-E1 Preamble	36	System Character
Convert UPC-E to A	37	Disable
Convert UPC-E1 to A	38	Disable
EAN-8/JAN-8 Extend	39	Disable
Bookland ISBN Format	576	ISBN-10
UCC Coupon Extended Code	85	Disable
Coupon Report	730	New Coupon Symbols
ISSN EAN	617	Disable
Code 128		
Code 128	8	Enable
Set Length(s) for Code 128	209, 210	Any Length
GS1-128 (formerly UCC/EAN-128)	14	Enable
ISBT 128	84	Enable
ISBT Concatenation	577	Disable
Check ISBT Table	578	Enable
ISBT Concatenation Redundancy	223	10
Code 39		
Code 39	0	Enable
Trioptic Code 39	13	Disable
Convert Code 39 to Code 32 (Italian Pharmacy Code)	86	Disable
Code 32 Prefix	231	Disable
Set Length(s) for Code 39	18 19	2 to 55
Code 39 Check Digit Verification	48	Disable
Transmit Code 39 Check Digit	43	Disable
Code 39 Full ASCII Conversion	17	Disable
Code 93		
Code 93	9	Disable
Set Length(s) for Code 93	26, 27	4 to 55
Code 11		
Code 11	10	Disable
Set Lengths for Code 11	28, 29	4 to 55
Code 11 Check Digit Verification	52	Disable
Transmit Code 11 Check Digit(s)	47	Disable
Interleaved 2 of 5 (ITF)		
Interleaved 2 of 5 (ITF)	6	Enable
Set Lengths for I 2 of 5	22, 23	14
I 2 of 5 Check Digit Verification	49	Disable
Transmit I 2 of 5 Check Digit	44	Disable
Convert I 2 of 5 to EAN 13	82	Disable
Discrete 2 of 5 (DTF)		
Discrete 2 of 5	5	Disable
Set Length(s) for D 2 of 5	20, 21	12
Codabar (NW - 7)		
Codabar	7	Disable

Set Lengths for Codabar	24 25	5 to 55
CLSI Editing	54	Disable
NOTIS Editing	55	Disable
MSI		
MSI	11	Disable
Set Length(s) for MSI	30, 31	4 to 55
MSI Check Digits	50	One
Transmit MSI Check Digit	46	Disable
MSI Check Digit Algorithm	51	Mod 10/Mod 10
Chinese 2 of 5	408	Disable
Korean 3 of 5	581	Disable
Matrix 2 of 5		
Matrix 2 of 5	618	Disable
Matrix 2 of 5 Lengths	619 620	14
Matrix 2 of 5 Redundancy	621	Disable
Matrix 2 of 5 Check Digit	622	Disable
Transmit Matrix 2 of 5 Check Digit	623	Disable
Inverse 1D	586	Regular
Postal Codes		
US Postnet	89	Enable
US Planet	90	Enable
Transmit US Postal Check Digit	95	Enable
UK Postal	91	Enable
Transmit UK Postal Check Digit	96	Enable
Japan Postal	290	Enable
Australia Post	291	Enable
Australia Post Format	718	Autodiscriminate
Netherlands KIX Code	326	Enable
USPS 4CB/One Code/Intelligent Mail	592	Disable
UPU FICS Postal	611	Disable
GS1 DataBar (formerly RSS, Reduced Space Symbology)		
GS1 DataBar-14	338	Enable
GS1 DataBar Limited	339	Disable
GS1 DataBar Limited Security Level	728	3
GS1 DataBar Expanded	340	Disable
Convert GS1 DataBar to UPC/EAN	397	Disable
Composite		
Composite CC-C	341	Disable
Composite CC-A/B	342	Disable
Composite TLC-39	371	Disable
UPC Composite Mode	344	Never Linked
GS1-128 Emulation Mode for UCC/EAN Composite Codes	427	Disable
2D Symbologies		
PDF417	15	Enable
MicroPDF417	227	Disable
Code 128 Emulation	123	Disable
Data Matrix	292	Enable
Data Matrix Inverse	588	Regular
Decode Mirror Images (Data Matrix Only)	537	Never
Maxicode	294	Enable
QR Code	293	Enable
QR Inverse	587	Regular
MicroQR	573	Enable
Aztec	574	Enable
Aztec Inverse	589	Regular
Han Xin	1167	Disable
Han Xin Inverse	1168	Regular
Symbology-Specific Security Levels		
Redundancy Level	78	1
Security Level	77	1
Intercharacter Gap Size	381	Normal

3.3.2 Barcode Symbology Parameter Values

NOTE: Asterisk (*) designates the default value

1	UPC-A	• 1*- Enable • 0 - Disable
2	UPC-E	• 1* - Enable • 0 - Disable
12	UPC-E1	• 0* - Disable • 1 - Enable NOTE: UPC-E1 is not UCC (Uniform Code Council) approved symbology
4	EAN-8/JAN-8	• 1* - Enable • 0 - Disable
3	EAN-13/JAN-13	• 1* - Enable • 0 - Disable
83	Bookland EAN	• 0* - Disable • 1 - Enable NOTE: If you enable Bookland EAN, select a Bookland ISBN Format. Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in Decode UPC/EAN/JAN Supplementals
16	Decode UPC/EAN/JAN Supplementals	Supplementals are barcodes appended according to specific format conventions (e.g., UPC A+2, UPC E+2, EAN 13+2). Select one of the following options: • 0* - Ignore UPC/EAN with Supplementals - if the decoder is presented with a UPC/EAN plus supplemental symbol, the decoder decodes UPC/EAN and ignores the supplemental characters. • 1 - Decode UPC/EAN with Supplementals - the decoder only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals. • 2 - Autodiscriminate UPC/EAN Supplementals - decoder decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the decoder must decode the bar code the number of times set via UPC/EAN/JAN Supplemental Redundancy before transmitting its data to confirm that there is no supplemental. If you select one of the following Supplemental Mode options, the decoder immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the decoder must decode the bar code the number of times set via UPC/EAN/JAN Supplemental Redundancy before transmitting its data to confirm that there is no supplemental. The decoder transmits UPC/EAN bar codes that do not have that prefix immediately. • 4 - Enable 378/379 Supplemental Mode • 5 - Enable 978/979 Supplemental Mode NOTE: If you select 978 Supplemental Mode and are scanning Bookland EAN bar codes, see Enable/Disable Bookland EAN to enable Bookland EAN, and select a format using Bookland ISBN Format • 7 - Enable 977 Supplemental Mode • 6 - Enable 414/419/434/439 Supplemental Mode • 8 - Enable 491 Supplemental Mode • 3 - Enable Smart Supplemental Mode - applies to EAN-13 bar codes starting with any prefix listed previously. • 9 - Supplemental User-Programmable Type 1 - applies to EAN-13 barcodes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using User-Programmable Supplementals. • 10 - Supplemental User-Programmable Type 1 and 2 - applies to EAN-13 bar codes starting with either of two 3-digit user-defined prefixes. Set the 3-digit prefixes using User-Programmable Supplementals • 11 - Smart Supplemental Plus User-Programmable 1 - applies to EAN-13 barcodes starting with any prefix listed previously or the user-defined prefix set using User-Programmable Supplementals • 12 - Smart Supplemental Plus User-Programmable 1 and 2 - applies to EAN-13 barcodes starting with any prefix listed previously or one of the two user-defined prefixes set using User-Programmable Supplementals NOTE: To minimize the risk of invalid data transmission, select either to decode or ignore supplemental characters
  579 580	User-Programmable Supplemental 1 Supplemental 2	If you selected a Supplemental User-Programmable option from Decode UPC/EAN/JAN Supplementals, select User-Programmable Supplemental 1 to set the 3-digit prefix select User-Programmable Supplemental 2 to set a second 3-digit prefix
80	UPC/EAN/JAN Supplemental Redundancy	With Autodiscriminate UPC/EAN/JAN Supplementals selected, this option adjusts the number of times a symbol without supplementals is decoded before transmission. The range is from two to 30 times. Five or above is recommended when decoding a mix of UPC/EAN/JAN symbols with and without supplementals, and the autodiscriminate option is selected. The default is set at 10

672	UPC/EAN/JAN Supplemental AIM ID Format	Select an output format when reporting UPC/EAN/JAN bar codes with Supplementals with Transmit Code ID Character set to AIM Code ID Character: • 0 - Separate - transmit UPC/EAN with supplementals with separate AIM IDs but one transmission, i.e.:]E<0 or 4><data>]E<1 or 2>[supplemental data] • 1*- Combined – transmit UPC/EAN with supplementals with one AIM ID and one transmission, i.e.:]E3<data+supplemental data> • 2 - Separate Transmissions - transmit UPC/EAN with supplementals with separate AIM IDs and separate transmissions, i.e.:]E<0 or 4><data>]E<1 or 2>[supplemental data]
40 41 42	Transmit Check Digit UPC-A UPC-E UPC-E1	The check digit is the last character of the symbol used to verify the integrity of the data. Select whether to transmit the bar code data with or without the check digit. It is always verified to guarantee the integrity of the data. • 1* - Transmit Check Digit • 0 - Do Not Transmit Check Digit
34 35 36	Preamble UPC-A UPC-E UPC-E1	Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a preamble to the host device. Select the appropriate option to match the host system: • 1* - Transmit System Character Only (<SYSTEM CHARACTER> <DATA>) • 2 - Transmit System Character and Country Code (“0” for USA) (< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>) • 0 - Transmit no preamble (<DATA>)
37 38	Convert UPC-E to UPC-A UPC-E1 to UPC-A	Enable this to convert UPC-E /E1 decoded data to UPC-A format before transmission. After conversion, the data follows UPC-A format and is affected by UPC-A programming selections (e.g., Preamble, Check Digit). When disabled, UPC-E/E1 decoded data is transmitted as UPC-E/E1 data, without conversion. • 0* - Do Not Convert to UPC-A (Disable) • 1 - Convert to UPC-A (Enable)
39	EAN-8/JAN-8 Extend	Enable this parameter to add five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols. Disable this to transmit EAN-8 symbols as is. • 0* - Disable EAN/JAN Zero Extend • 1 - Enable EAN/JAN Zero Extend
576	Bookland ISBN Format	If you enabled Bookland EAN using Enable/Disable Bookland EAN, select one of the following formats for Bookland data: • 0*- Bookland ISBN-10 - The decoder reports Bookland data starting with 978 in traditional 10-digit format with the special Bookland check digit for backward-compatibility. Data starting with 979 is not considered Bookland in this mode. • 1 - Bookland ISBN-13 - The decoder reports Bookland data (starting with either 978 or 979) as EAN-13 in 13-digit format to meet the 2007 ISBN-13 protocol. NOTE: For Bookland EAN to function properly, first enable Bookland EAN using Enable/Disable Bookland EAN, then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in Decode UPC/EAN/JAN Supplementals
85	UCC Coupon Extended Code	Enable this parameter to decode UPC-A bar codes starting with digit ‘5’, EAN-13 bar codes starting with digit ‘99’, and UPC-A/EAN-128 Coupon Codes. UPCA, EAN-13, and EAN-128 must be enabled to scan all types of Coupon Codes. • 0*- Disable • 1 - Enable NOTE: Use the Decode UPC/EAN Supplemental Redundancy parameter to control auto discrimination of the EAN128 (right half) of a coupon code
730	Coupon Report	Traditional coupon symbols (old coupon symbols) are composed of two bar codes: UPC/EAN and Code128. A new coupon symbol is composed of a single Databar Expanded bar code. The new coupon format offers more options for purchase values (up to $999.99) and supports complex discount offers such as a second purchase requirement. An interim coupon symbol also exists that contains both types of bar codes: UPC/EAN and Databar Expanded. This format accommodates both retailers that do not recognize or use the additional information included in the new coupon symbol, as well as those who can process new coupon symbols. • 0 - Old Coupon Symbols - Scanning an old coupon symbol reports both UPC and Code 128, scanning an interim coupon symbol reports UPC, and scanning a new coupon symbol reports nothing (no decode). • 1*- New Coupon Symbols - Scanning an old coupon symbol reports either UPC or Code 128, and scanning an interim coupon symbol or a new coupon symbol reports Databar Expanded. • 2 - Both Coupon Formats - Scanning an old coupon symbol reports both UPC and Code 128, and scanning an interim coupon symbol or a new coupon symbol reports Databar Expanded.
617	ISSN EAN	• 0* - Disable • 1 - Enable
8	Code 128	• 1* - Enable • 0 - Disable

209 210	Set Lengths for Code 128 Length1 Length2	Length1 = 0..55, default=0 Length2 = 0..55, default=0 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Code 128 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Code 128 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0. • Two Discrete Lengths - To limit the decoding of Code 128 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode Code 128 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Code 128 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Code 128 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
14	GS1-128 formerly UCC/ EAN-128	• 1* - Enable • 0 - Disable
84	ISBT 128	ISBT 128 is a variant of Code 128 used in the blood bank industry. If necessary, the host must perform concatenation of the ISBT data. • 1* - Enable • 0 - Disable
577	ISBT Concatenation	• 0* - Disable ISBT Concatenation - The device does not concatenate pairs of ISBT codes it encounters. • 1 - Enable ISBT Concatenation - There must be two ISBT codes in order for the device to decode and perform concatenation. The device does not decode single ISBT symbols. • 2 - Auto discriminate ISBT Concatenation - The device decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the device must decode the symbol the number of times set via ISBT Concatenation Redundancy before transmitting its data to confirm that there is no additional ISBT symbol.
578	Check ISBT Table	The ISBT specification includes a table that lists several types of ISBT bar codes that are commonly used in pairs. If you enable ISBT Concatenation, enable Check ISBT Table to concatenate only those pairs found in this table. Other types of ISBT codes are not concatenated. • 1* - Enable Check ISBT Table • 0 - Disable Check ISBT Table
223	ISBT Concatenation Redundancy	With ISBT Concatenation set to Autodiscriminate, this option sets the number of times the device must decode an ISBT symbol before determining that there is no additional symbol. The range is from two to 20 times. The default is 10
0	Code 39	• 1* - Enable • 0 - Disable
13	Trioptic Code 39	Trioptic Code 39 is a variant of Code 39 used in the marking of computer tape cartridges. Trioptic Code 39 symbols always contain six characters. • 0* - Disable • 1 - Enable NOTE: Trioptic Code39 and Code39 Full ASCII cannot be enabled simultaneously
86	Convert Code 39 to Code 32	Code 32 is a variant of Code 39 used by the Italian pharmaceutical industry. • 0* - Disable • 1 - Enable NOTE: Code 39 must be enabled for this parameter to function
231	Code 32 Prefix	Enable or disable adding the prefix character “A” to all Code 32 bar codes. • 0* - Disable • 1 - Enable NOTE: Convert Code 39 to Code 32 must be enabled to use this parameter
18 19	Set Lengths for Code 39 Length1 Length2	Length1 = 0..55, default=2 Length2 = 0..55, default=55 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Code 39 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Code 39 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14 , Length2 = 0 . • Two Discrete Lengths - To limit the decoding of Code 39 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2 . For example, to decode Code 39 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Code 39 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Code 39 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
48	Code 39 Check Digit Verification	Enable this to check the integrity of all Code 39 symbols to verify that the data complies with specified check digit algorithm. Only Code 39 symbols which include a modulo 43 check digit are decoded. Enable this feature if the Code 39 symbols contain a Modulo 43 check digit. • 0* - Disable Code 39 Check Digit Verification • 1 - Enable Code 39 Check Digit Verification
43	Transmit Code 39 Check Digit	• 0* - Do Not Transmit Code 39 Check Digit (Disable) • 1 - Transmit Code 39 Check Digit (Enable) NOTE: Code 39 Check Digit Verification must be enabled

17	Code 39 Full ASCII Conversion	Code 39 Full ASCII is a variant of Code 39 which pairs characters to encode the full ASCII character set. • 0* - Disable Code 39 Full ASCII • 1 - Enable Code 39 Full ASCII NOTE1: Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. NOTE2: Code 39 Full ASCII to Full ASCII Correlation is host-dependent.
9	Code 93	• 0* - Disable • 1 - Enable
26 27	Set Lengths for Code 93 Length1 Length2	Length1 = 0..55, default=4 Length2 = 0..55, default=55 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Code 93 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Code 93 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0 . • Two Discrete Lengths - To limit the decoding of Code 93 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode Code 93 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Code 93 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Code 93 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
10	Code 11	• 0* - Disable • 1 - Enable
28 29	Set Lengths for Code 11 Length1 Length2	Length1 = 0..55, default=4 Length2 = 0..55, default=55 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Code 11 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Code 11 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0. • Two Discrete Lengths - To limit the decoding of Code 11 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode Code 11 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Code 11 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Code 11 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
52	Code 11 Check Digit Verification	This feature allows the decoder to check the integrity of all Code 11 symbols to verify that the data complies with the specified check digit algorithm. This selects the check digit mechanism for the decoded Code 11 bar code. To enable this feature, set the number of check digits encoded in the Code 11 symbols: • 0*- Disable Code 11 Check Digit Verification • 1 - 1 Check Digit • 2 - 2 Check Digits
47	Transmit Code 11 Check Digits	• 0*- Do Not Transmit Code 11 Check Digit(s) (Disable) • 1 - Transmit Code 11 Check Digit(s) (Enable) NOTE: Code 11 Check Digit Verification must be enabled
6	Interleaved 2 of 5	• 1*- Enable • 0 - Disable
22 23	Set Lengths for Interleaved 2 of 5 Length1 Length2	Length1 = 0..55, default=14 Length2 = 0..55, default=0 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for I 2 of 5 to decode either one or two discrete lengths, or a length within a specific range. • One Discrete Length - To limit the decoding of I 2 of 5 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0 . • Two Discrete Lengths - To limit the decoding of I 2 of 5 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode I 2 of 5 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only I 2 of 5 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode I 2 of 5 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12 NOTE: Due to the construction of the I 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (one or two discrete lengths) for I 2 of 5 applications
49	Interleaved 2 of 5 Check Digit Verification	Enable this feature to check the integrity of all I 2 of 5 symbols to verify the data complies with either the specified Uniform Symbology Specification (USS), or the Optical Product Code Council (OPCC) check digit algorithm. • 0*- Disable • 1 - USS Check Digit • 2 - OPCC Check Digits

44	Transmit Interleaved 2 of 5 Check Digit	• 0*- Do Not Transmit I 2 of 5 Check Digit (Disable) • 1 - Transmit I 2 of 5 Check Digit (Enable)
82	Convert Interleaved 2 of 5 to EAN-13	Enable this parameter to convert 14-character Interleaved 2 of 5 codes to EAN-13, and transmit to the host as EAN-13. To accomplish this, the Interleaved 2 of 5 code must be enabled, and the code must have a leading zero and a valid EAN-13 check digit. • 0*- Do Not Convert I 2 of 5 to EAN-13 (Disable) • 1 - Convert I 2 of 5 to EAN-13 (Enable)
5	Discrete 2 of 5	• 0*- Disable • 1 - Enable
20 21	Set Lengths for Discrete 2 of 5 Length1 Length2	Length1 = 0..55, default=12 Length2 = 0..55, default=0 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for D 2 of 5 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of D 2 of 5 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0. • Two Discrete Lengths - To limit the decoding of D 2 of 5 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode D 2 of 5 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2 . • Length Within Range - To decode only D 2 of 5 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode D 2 of 5 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12 NOTE: Due to the construction of the D 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (one or two discrete lengths) for D 2 of 5 applications.
7	Codabar	• 0*- Disable • 1 - Enable
24 25	Set Lengths for Codabar Length1 Length2	Length1 = 0..55, default=5 Length2 = 0..55, default=55 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Codabar to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Codabar to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14 , Length2 = 0 . • Two Discrete Lengths - To limit the decoding of Codabar to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2 . For example, to decode Codabar codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Codabar codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Codabar codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
54	CLSI Editing	Enable this parameter to strip the start and stop characters and insert a space after the first, fifth, and tenth characters of a 14-character Codabar symbol. • 0*- Disable • 1 - Enable NOTE: Symbol length does not include start and stop characters
55	NOTIS Editing	Enable this parameter to strip the start and stop characters from a decoded Codabar symbol. • 0*- Disable • 1 - Enable
11	MSI	• 0*- Disable • 1 - Enable
30 31	Set Lengths for MSI Length1 Length2	Length1 = 0..55, default=4 Length2 = 0..55, default=55 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for MSI to decode either one or two discrete lengths, or a length within a specific range. • One Discrete Length - To limit the decoding of MSI to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0 . • Two Discrete Lengths - To limit the decoding of MSI to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode MSI codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only MSI codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode MSI codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12 NOTE: Due to the construction of the MSI symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (one or two discrete lengths) for MSI applications.

50	MSI Check Digits	With MSI symbols, one check digit is mandatory and always verified by the reader. The second check digit is optional. If the MSI codes include two check digits, select Two Check Digits to enable verification of the second check digit: • 0*- One MSI Check Digit • 1 - Two MSI Check Digits See MSI Check Digit Algorithm to select second digit algorithms
46	Transmit MSI Check Digit(s)	• 0*- Do Not Transmit MSI Check Digit(s) (Disable) • 1 - Transmit MSI Check Digit(s) (Enable)
51	MSI Check Digit Algorithm	Select one of two algorithms for the verification of the second MSI check digit: • 1*- MOD 10/MOD 10 • 0 - MOD 10/MOD 11
408	Chinese 2 of 5	• 0*- Disable • 1 - Enable
581	Korean 3 of 5	• 0*- Disable • 1 - Enable NOTE: The length for Korean 3 of 5 is fixed at 6
618	Matrix 2 of 5	• 0*- Disable • 1 - Enable
619 620	Set Lengths for Matrix 2 of 5 Length1 Length2	Length1 = 0..55, default=14 Length2 = 0..55, default=0 The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Assign lengths for Matrix 2 of 5 to decode either one or two discrete lengths, or a range of lengths. • One Discrete Length - To limit the decoding of Matrix 2 of 5 to one specific length, assign this length to the Length1 parameter and 0 to the Length2 parameter. For example, for fixed length 14, set Length1 = 14, Length2 = 0. • Two Discrete Lengths - To limit the decoding of Matrix 2 of 5 to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode Matrix 2 of 5 codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2. • Length Within Range - To decode only Matrix 2 of 5 codes that fall within a specific length range, assign the lesser length to the Length1 parameter and the greater to the Length2 parameter. For example, to decode Matrix 2 of 5 codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12
621	Matrix 2 of 5 Redundancy	• 0*- Disable Matrix 2 of 5 Redundancy • 1 - Enable Matrix 2 of 5 Redundancy
622	Matrix 2 of 5 Check Digit	The check digit is the last character of the symbol used to verify the integrity of the data. • 0*- Disable Matrix 2 of 5 Check Digit • 1 - Enable Matrix 2 of 5 Check Digit
623	Transmit Matrix 2 of 5 Check Digit	• 0*- Do Not Transmit Matrix 2 of 5 Check Digit • 1 - Transmit Matrix 2 of 5 Check Digit
586	Inverse 1D	Set the 1D inverse decoder setting: • 0*- Regular Only - the decoder decodes regular 1D bar codes only. • 1 - Inverse Only - the decoder decodes inverse 1D bar codes only. • 2 - Inverse Autodetect - decode both regular and inverse 1D bar codes.
89	US Postnet	• 1*- Enable • 0 - Disable
90	US Planet	• 1* - Enable • 0 - Disable
95	Transmit US Postal Check Digit	Select whether to transmit US Postal data, which includes both US Postnet and US Planet, with or without the check digit: • 1*- Transmit US Postal Check Digit • 0 - Do Not Transmit US Postal Check Digit
91	UK Postal	• 1*- Enable • 0 - Disable
96	Transmit UK Postal Check Digit	• 1*- Transmit UK Postal Check Digit • 0 - Do Not Transmit UK Postal Check Digit
290	Japan Postal	• 1*- Enable • 0 - Disable
291	Australia Post	• 1*- Enable • 0 - Disable
718	Australia Post Format	• 0*- Autodiscriminate (or Smart mode) - Attempt to decode the Customer Information Field using the N and C Encoding Tables • 1 - Raw Format - Output raw bar patterns as a series of numbers 0 through 3. • 2 - Alphanumeric Encoding - Decode the Customer Information Field using the C Encoding Table • 3 - Numeric Encoding - Decode the Customer Information Field using the N Encoding Table
326	Netherlands KIX Code	• 1*- Enable Netherlands KIX Code • 0 - Disable Netherlands KIX Code
592	USPS 4CB/ One Code/ Intelligent Mail	• 0*- Disable USPS 4CB/One Code/Intelligent Mail • 1 - Enable USPS 4CB/One Code/Intelligent Mail
611	UPU FICS Postal	• 0*- Disable UPU FICS Postal • 1 - Enable UPU FICS Postal
338	GS1 DataBar-14	• 1*- Enable GS1 DataBar-14 • 0 - Disable GS1 DataBar-14
339	GS1 DataBar Limited	• 0*- Disable GS1 DataBar Limited • 1 - Enable GS1 DataBar Limited

728	GS1 DataBar Limited Security Level	There are four levels of decode security for GS1 DataBar Limited bar codes. There is an inverse relationship between security and scanner aggressiveness. Increasing the level of security may result in reduced aggressiveness in scanning, so only choose the level of security necessary. • 1 - Level 1 – No clear margin required. This complies with the original GS1 standard, yet might result in erroneous decoding of the DataBar Limited bar codes when scanning some UPC symbols that start with the digits “9” and “7”. • 2 - Level 2 – Automatic risk detection. This level of security may result in erroneous decoding of DataBar Limited bar codes when scanning some UPC symbols. If a misdecode is detected, the scanner operates in Level 3 or Level 1. • 3*- Level 3 – Security level reflects newly proposed GS1 standard that requires a 5X trailing clear margin. • 4 - Level 4 – Security level extends beyond the standard required by GS1. This level of security requires a 5X leading and trailing clear margin.
340	GS1 DataBar Expanded	• 0*- Disable GS1 DataBar Expanded • 1 - Enable GS1 DataBar Expanded
397	Convert GS1 DataBar to UPC/EAN	This parameter only applies to GS1 DataBar-14 and GS1 DataBar Limited symbols not decoded as part of a Composite symbol. Enable this to strip the leading 010 from GS1 DataBar-14 and GS1 DataBar Limited symbols encoding a single zero as the first digit, and report the bar code as EAN-13. For bar codes beginning with two or more zeros but not six zeros, this parameter strips the leading'0100 and reports the bar code as UPC-A. The UPC-A Preamble parameter that transmits the system character and country code applies to converted bar codes. Note that neither the system character nor the check digit can be stripped. • 0*- Disable Convert GS1 DataBar to UPC/EAN • 1 - Enable Convert GS1 DataBar to UPC/EAN
341	Composite CC-C	• 0*- Disable • 1 - Enable NOTE: Before enabling a composite code, first enable Multi Decode Mode
342	Composite CC-A/B	• 0*- Disable • 1 - Enable
371	Composite TLC-39	• 0*- Disable • 1 - Enable
344	UPC Composite Mode	Select an option for linking UPC symbols with a 2D symbol during transmission as if they were one symbol: • 0*- UPC Never Linked - transmit UPC bar codes regardless of whether a 2D symbol is detected. • 1 - UPC Always Linked - transmit UPC bar codes and the 2D portion. If 2D is not present, the UPC bar code does not transmit. • 2 - Autodiscriminate UPC Composites - the imager determines if there is a 2D portion, then transmits the UPC, as well as the 2D portion if present.
427	GS1-128 Emulation Mode for UCC/EAN Composite Codes	• 0*- Disable GS1-128 Emulation Mode for UCC/EAN Composite Codes • 1 - Enable GS1-128 Emulation Mode for UCC/EAN Composite Codes
15	PDF417	• 1*- Enable • 0 - Disable
227	MicroPDF417	• 0*- Disable • 1 - Enable
123	Code 128 Emulation	Enable this parameter to transmit data from certain MicroPDF417 symbols as if it was encoded in Code 128 symbols. Transmit AIM Symbology Identifiers must be enabled for this parameter to work. • *0 - Disable Code 128 Emulation - transmits these MicroPDF417 symbols with one of the following prefixes:]L3 if the first codeword is 903-905]L4 if the first codeword is 908 or 909]L5 if the first codeword is 910 or 911 • 1 - Enable Code 128 Emulation - transmits these MicroPDF417 symbols with one of the following prefixes:]C1 if the first codeword is 903-905]C2 if the first codeword is 908 or 909]C0 if the first codeword is 910 or 911 NOTE: Linked MicroPDF codewords 906, 907, 912, 914, and 915 are not supported. Use GS1 Composites instead.
292	Data Matrix	• 1*- Enable • 0 - Disable
588	Data Matrix Inverse	• 0*- Regular Only - the decoder decodes regular Data Matrix bar codes only. • 1 - Inverse Only - the decoder decodes inverse Data Matrix bar codes only. • 2 - Inverse Autodetect - decode both regular and inverse Data Matrix codes
537	Decode Mirror Images (Data Matrix Only)	• 0*- Never - do not decode Data Matrix bar codes that are mirror images • 1 - Always - decode only Data Matrix bar codes that are mirror images • 2 - Auto - decode both mirrored and unmirrored Data Matrix bar codes
294	Maxicode	• 1*- Enable • 0 - Disable
293	QR Code	• 1*- Enable • 0 - Disable
587	QR Inverse	• 0*- Regular Only - the decoder decodes regular QR bar codes only.

		• 1 - Inverse Only - the decoder decodes inverse QR bar codes only. • 2 - Inverse Autodetect - decode both regular and inverse QR bar codes.
573	MicroQR	• 1*- Enable • 0 - Disable
574	Aztec	• 1*- Enable • 0 - Disable
589	Aztec Inverse	• 0*- Regular Only - the decoder decodes regular Aztec bar codes only. • 1 - Inverse Only - the decoder decodes inverse Aztec bar codes only. • 2 - Inverse Autodetect - the decoder decodes both regular and inverse Aztec bar codes.
1167	Han Xin	• 0*- Disable • 1 - Enable
1168	Han Xin Inverse	• *0 - Regular Only - decode Han Xin bar codes with normal reflectance only • 1 - Inverse Only - decode Han Xin bar codes with inverse reflectance only • 2 - Inverse Autodetect - decode both regular and inverse Han Xin bar codes
78	Redundancy Level	The decoder offers four levels of decode redundancy. Select higher redundancy levels for decreasing levels of bar code quality. As redundancy levels increase, the decoder's aggressiveness decreases • 1* - Redundancy Level 1 The following code types must be successfully read TWICE before being decoded (Code Type / Code Length): ○ Codabar 8 characters or less ○ MSI 4 characters or less ○ D 2 of 5 8 characters or less ○ I 2 of 5 8 characters or less 2 - Redundancy Level 2 The following code types must be successfully read TWICE before being decoded (Code Type / Code Length): ○ All All • 3 - Redundancy Level 3 Code types OTHER THAN the following must be successfully read TWICE before being decoded. The following codes must be read THREE times: ○ MSI Plessey 4 characters or less ○ D 2 of 5 8 characters or less ○ I 2 of 5 8 characters or less ○ Codabar 8 characters or less • 4 - Redundancy Level 4 The following code types must be successfully read THREE times before being decoded (Code Type / Code Length): ○ All All
77	Security Level	The decoder offers four levels of decode security for delta bar codes, which include the Code 128 family, UPC/EAN, and Code 93. Select increasing levels of security for decreasing levels of bar code quality. There is an inverse relationship between security and decoder aggressiveness, so choose only that level of security necessary for any given application. • 0 - Security Level 0: This setting allows the decoder to operate in its most aggressive state, while providing sufficient security in decoding most "in-spec" bar codes. • 1*- Security Level 1: Select this option if misdecodes occur. This default setting eliminates most misdecodes. • 2 - Security Level 2: Select if Security level 1 fails to eliminate misdecodes. • 3 - Security Level 3: If misdecodes still occur with Security Level 2, select this security level. Be advised, selecting this option is an extreme measure against mis-decoding severely out of spec bar codes. Selecting this level of security significantly impairs the decoding ability of the decoder. If this level of security is necessary, try to improve the quality of the bar codes.
381	Intercharacter Gap Size	The Code 39 and Codabar symbologies have an intercharacter gap that is typically quite small. Due to various bar code-printing technologies, this gap can grow larger than the maximum size allowed, preventing the decoder from decoding the symbol. If this problem occurs, select Large Intercharacter Gaps to tolerate these out-of-specification bar codes. • 6*- Normal Intercharacter Gaps • A - Large Intercharacter Gaps

4 Key Codes

The physical keys on the handheld each generate a unique Key Code, and when you handle key events in your application you look at the reported key code to determine which button was pressed.

The Alien API library provides the `KeyCode` class that defines codes for special physical keys on the handheld.

4.1 ALR-H450 (Android 4.4.2)

The `KeyCode.ALR_H450` class defines the following key codes for the ALR-H450 handheld:
`SCAN, SIDE_LEFT, SIDE_RIGHT.`

Descriptions:

`SCAN`	Key code of the Scan button.
`SIDE_LEFT`	Key code of the button on the Left Side of the unit.
`SIDE_RIGHT`	Key code of the button on the Right Side of the unit, below the Power button.

4.2 ALR-H460 (Android 6.0)

The `KeyCode.ALR_H460` class defines the following key codes for the ALR-H460 handheld:
`SCAN, MENU, ENTER, BACK, FUNC, HANDLE_TRIGGER.`

Descriptions:

`SCAN`	Key code of the SCAN button (both Left and Right sides)
`MENU`	Key code of the MENU button (1st button on the Front side)
`ENTER`	Key code of the ENTER button (3rd button on the Front side)
`BACK`	Key code of the BACK button (4th button on the Front side)
`FUNC`	Key code of the FUNC button (gray button on the Left side)
`HANDLE_TRIGGER`	Key code of the HANDLE TRIGGER

5 Developing applications with Android Studio

5.1 Install Android Studio

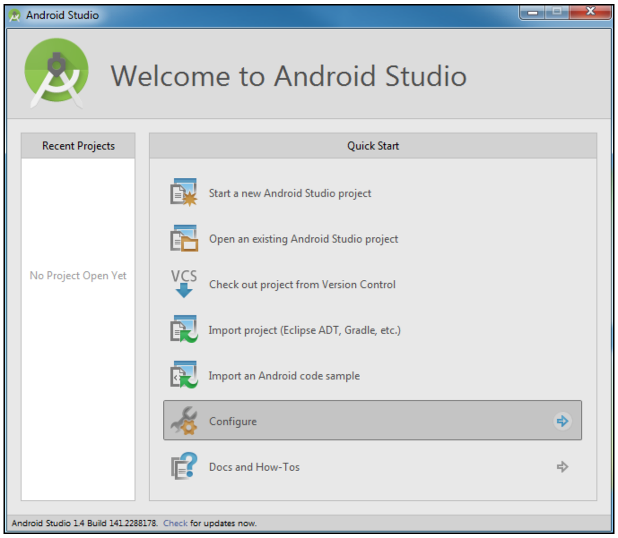
In order to develop RFID applications running on the Alien ALR-H450/H460 handheld, you need to install Android Studio 1.4 (or newer) on your computer.

Download Android Studio from http://developer.android.com/sdk/index.html

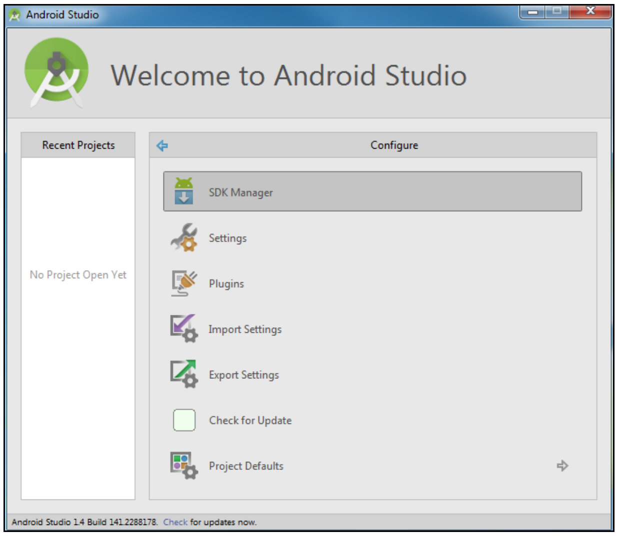
Run the installer and use all the default settings. The installer will automatically download and install the required components, including Android Support Repository and Android SDK Tools.

5.2 Install Google USB Driver

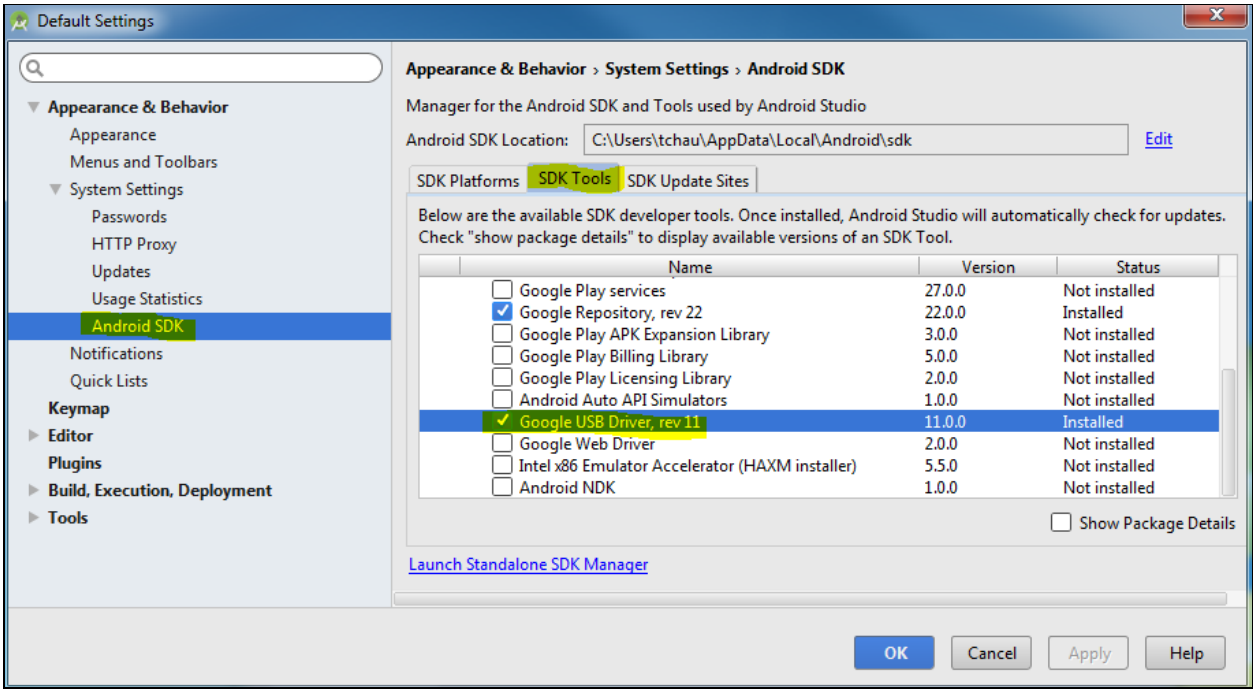
Open Android Studio. On the "Welcome to Android Studio" screen select Configure:


Android Studio
Welcome to Android Studio
Recent Projects
No Project Open Yet
Quick Start
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure
Docs and How-Tos
Android Studio 1.4 Build 141.2288178. Check for updates now.

Select "SDK Manager":



Select “SDK Manager”, then “Android SDK”, then “SDK Tools” tab, and check the “Google USB Driver”. Click OK:



Appearance & Behavior › System Settings › Android SDK

Manager for the Android SDK and Tools used by Android Studio

Android SDK Location: C:\Users\tchau\AppData\Local\Android\sdk

Below are the available SDK developer tools. Once installed, Android Studio will automatically check for updates. Check "show package details" to display available versions of an SDK Tool.

	Name	Version	Status
☐	Google Play services	27.0.0	Not installed
☑	Google Repository, rev 22	22.0.0	Installed
☐	Google Play APK Expansion Library	3.0.0	Not installed
☐	Google Play Billing Library	5.0.0	Not installed
☐	Google Play Licensing Library	2.0.0	Not installed
☐	Android Auto API Simulators	1.0.0	Not installed
✓	Google USB Driver, rev 11	11.0.0	Installed
☐	Google Web Driver	2.0.0	Not installed
☐	Intel x86 Emulator Accelerator (HAXM installer)	5.5.0	Not installed
☐	Android NDK	1.0.0	Not installed

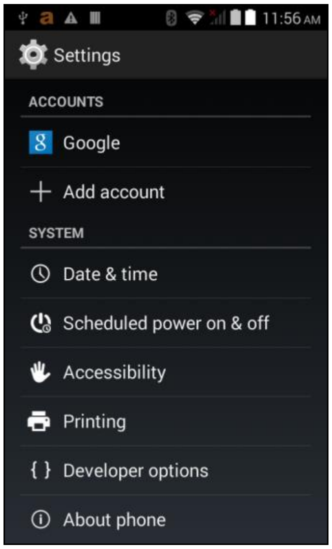
☐ Show Package Details

Make sure your PC is connected to the Internet.
Configure Windows to automatically download device drivers:

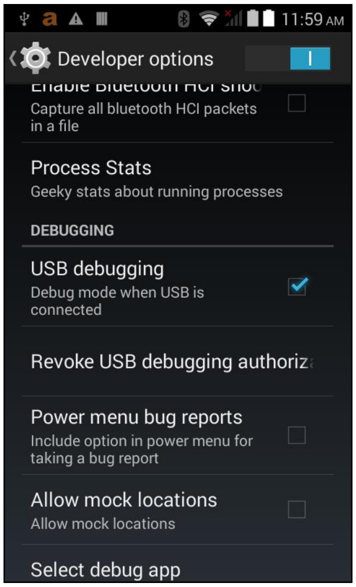
- Go to Control Panel > Devices and Printers
- Right click on the Computer icon and select “Device installation Settings”
- Select “Yes” to automatically download device drivers

5.3 Enable Developer Mode for your handheld

Go to the “Settings” app on the handheld, tap on “About Phone”. Then tap the “Build Number” 7 times. This will enable Developer Mode for your handheld.
Go back to the “Settings” and you will see a new “Developer options” menu item right above the “About Phone”.:



Tap on “Developer options”, check “USB Debugging” and click OK to enable USB debugging:



Enable Bluetooth HCI sno
Capture all bluetooth HCI packets in a file ☐

Process Stats
Geeky stats about running processes

DEBUGGING

USB debugging
Debug mode when USB is connected ☑

Revoke USB debugging authoriz

Power menu bug reports
Include option in power menu for taking a bug report ☐

Allow mock locations
Allow mock locations ☐

Select debug app

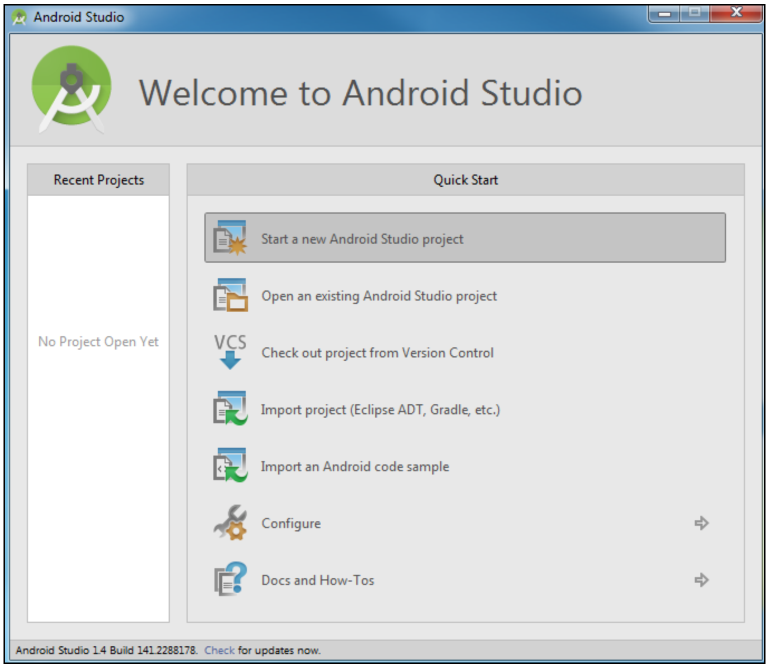
Verify your device is properly detected by your PC:
- Connect the cradle to the PC with a USB cable and insert the handheld into the cradle.
- Open the Device Manager to verify that the device has been identified under “Android USB Devices”

Now you are ready to develop applications for the handheld.

5.4 Developing your first RFID application

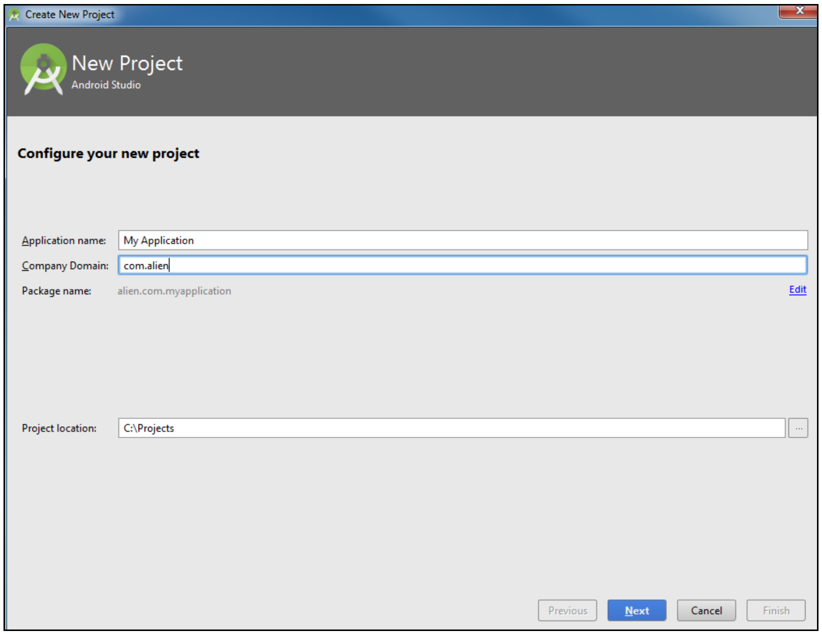
5.4.1 Create Android Project

To create a new project, open Android Studio and click “Start new Android Studio project”:


Android Studio
Welcome to Android Studio
Recent Projects
No Project Open Yet
Quick Start
Start a new Android Studio project
Open an existing Android Studio project
VCS
Check out project from Version Control
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure
Docs and How-Tos

Android Studio 1.4 Build 141.2288178. Check for updates now.

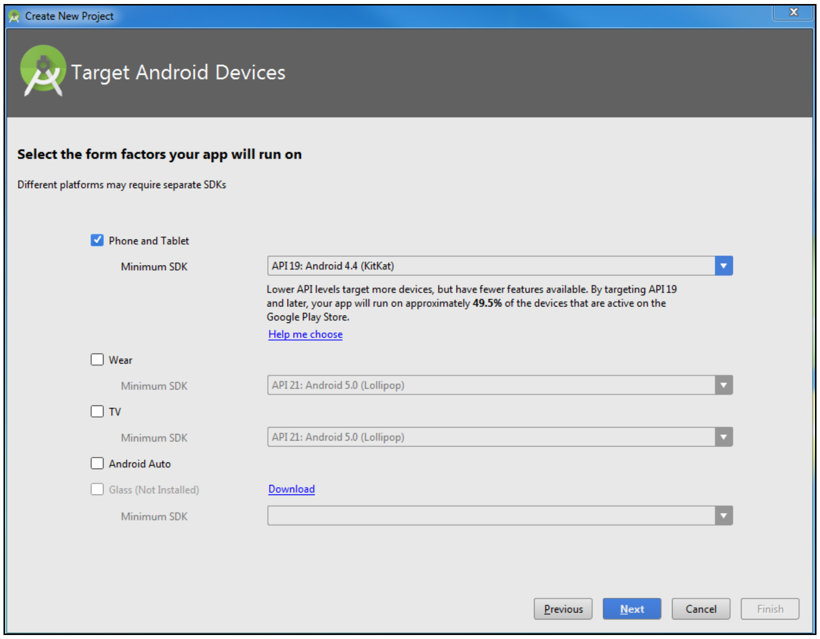
In the “New Project” dialog, use the default settings or enter new names for Application Name, Domain and Project location for your project. Click “Next”:



Configure your new project

Application name: My Application
Company Domain: com.alien
Package name: alien.com.myapplication
Project location: C:\Projects

In the “Target Android Devices” dialog, check the “Phone and Tablet” checkbox and select “API19: Android 4.4 (KitKat)” as the Minimum SDK. Click “Next”:

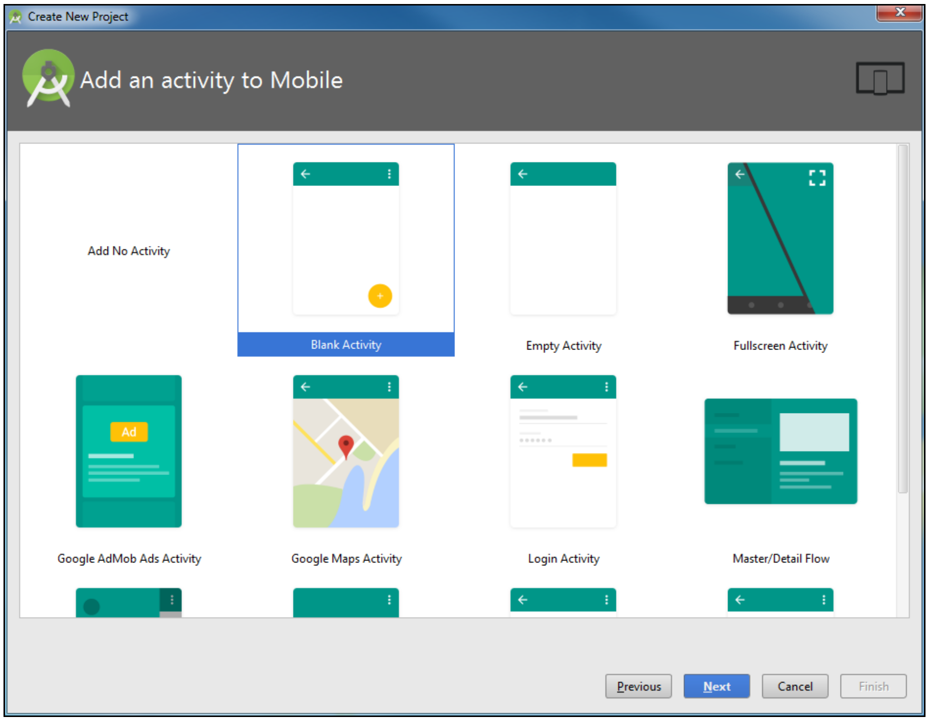


Select the form factors your app will run on

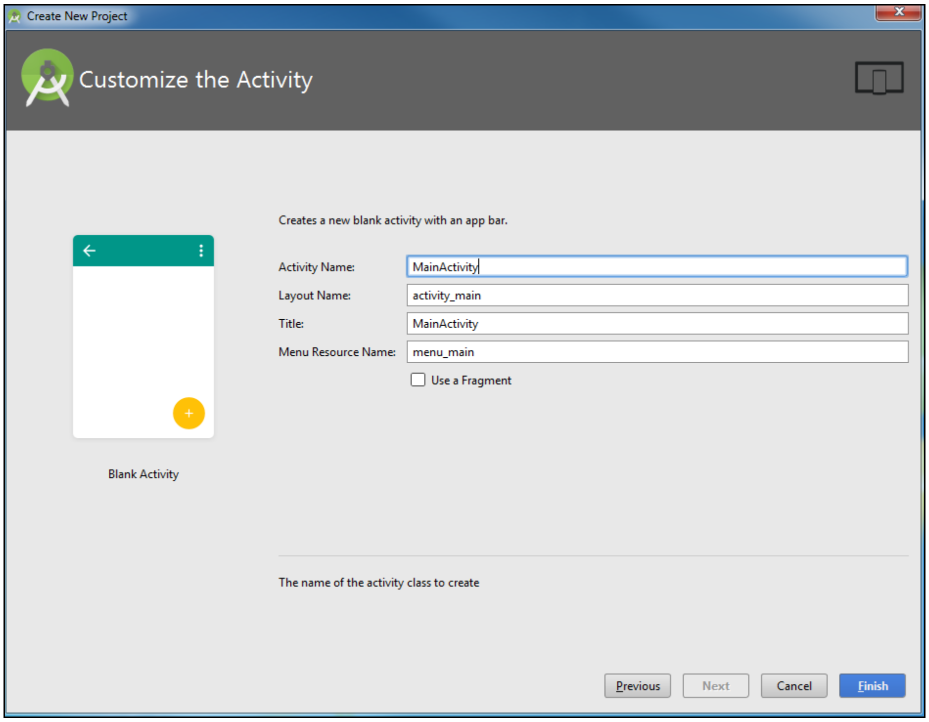
Different platforms may require separate SDKs

☑ Phone and Tablet
Minimum SDK: API 19: Android 4.4 (KitKat)
Lower API levels target more devices, but have fewer features available. By targeting API 19 and later, your app will run on approximately **49.5%** of the devices that are active on the Google Play Store.
☐ Wear
Minimum SDK: API 21: Android 5.0 (Lollipop)
☐ TV
Minimum SDK: API 21: Android 5.0 (Lollipop)
☐ Android Auto
☐ Glass (Not Installed)
Minimum SDK:

In the “Add an activity to Mobile” dialog, select “Blank Activity” and click “Next”:



In the “Customize the Activity” dialog, use the default names or enter new names for Activity Name, Layout Name, Title and Menu Resource Name. Click “Finish”:



Creates a new blank activity with an app bar.

Activity Name: MainActivity

Layout Name: activity_main

Title: MainActivity

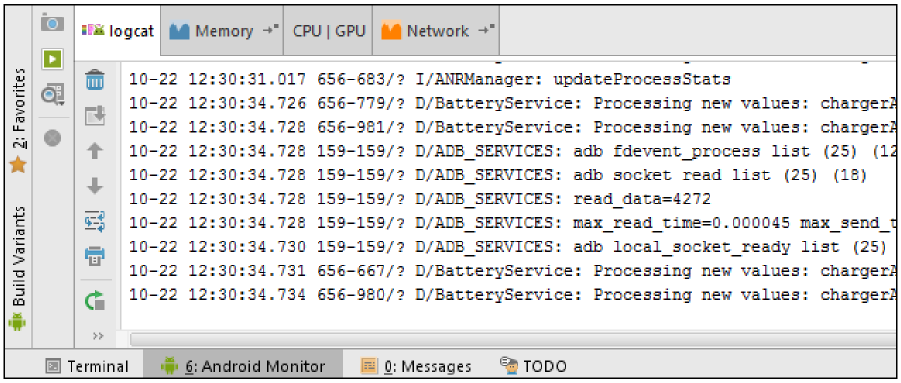
Menu Resource Name: menu_main

☐ Use a Fragment

The name of the activity class to create

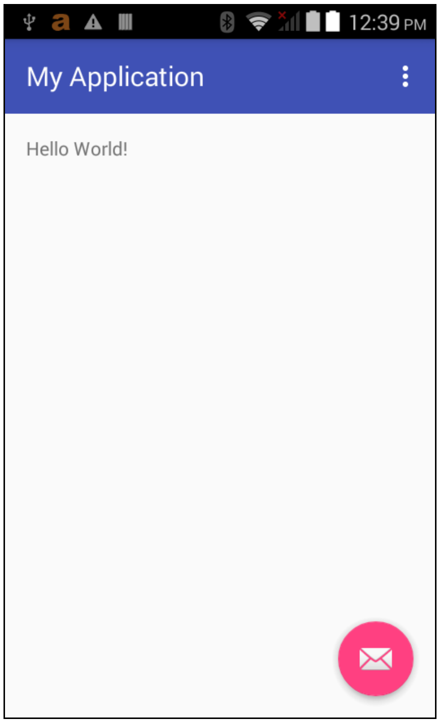
Connect the cradle to your PC, and insert the handheld into the cradle. You should see “Connected as USB storage” and “USB Debugging Enabled” notifications on the handheld screen.

In Android Studio, click “Android Monitor” at the bottom left. Then the “Allow USB debugging” will show up on your handheld’s screen. Check “Always allow from this computer” and tap OK. This will allow Android Studio to deploy the application into your handheld as well as to get log info from the handheld. Logs from the handheld will display in the “logcat” tab:



```
10-22 12:30:31.017 656-683/? I/ANRManager: updateProcessStats
10-22 12:30:34.726 656-779/? D/BatteryService: Processing new values: chargerA
10-22 12:30:34.728 656-981/? D/BatteryService: Processing new values: chargerA
10-22 12:30:34.728 159-159/? D/ADB_SERVICES: adb fdevent_process list (25) (12
10-22 12:30:34.728 159-159/? D/ADB_SERVICES: adb socket read list (25) (18)
10-22 12:30:34.728 159-159/? D/ADB_SERVICES: read_data=4272
10-22 12:30:34.728 159-159/? D/ADB_SERVICES: max_read_time=0.000045 max_send_t
10-22 12:30:34.730 159-159/? D/ADB_SERVICES: adb local_socket_ready list (25)
10-22 12:30:34.731 656-667/? D/BatteryService: Processing new values: chargerA
10-22 12:30:34.734 656-980/? D/BatteryService: Processing new values: chargerA
```

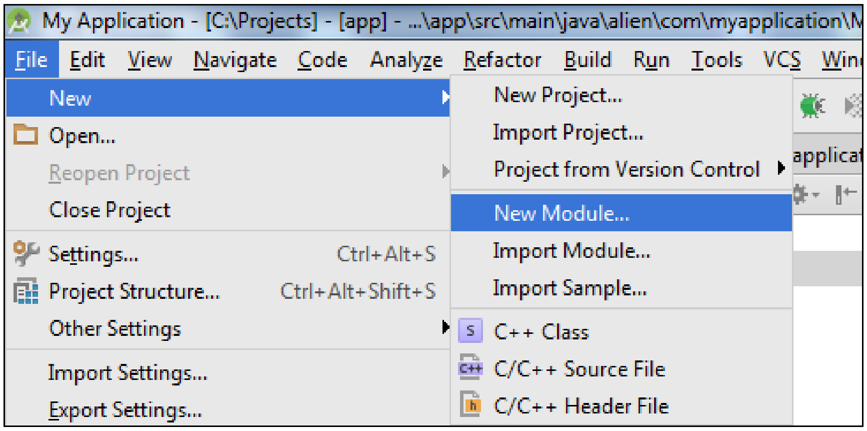
In Android Studio, click “Run app” toolbar button to run your application. The “Device Chooser” dialog will pop up. Select your device and click OK to run your “Hello World” application on the handheld:



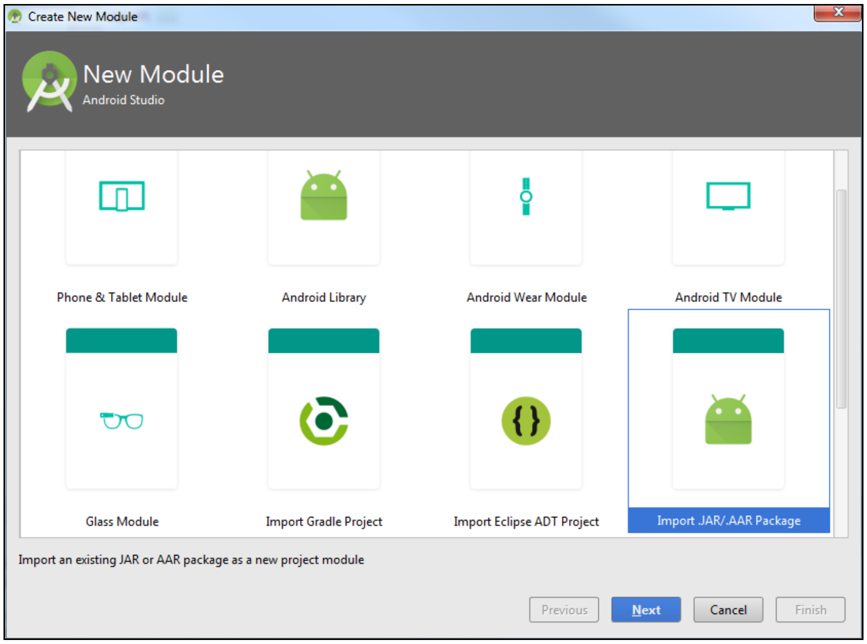
5.4.2 Use RFID functionality in your project

In order to use RFID functionality, you have to add the Alien `alienapi.aar` library to your project.

Select menu: File > New > New Module:

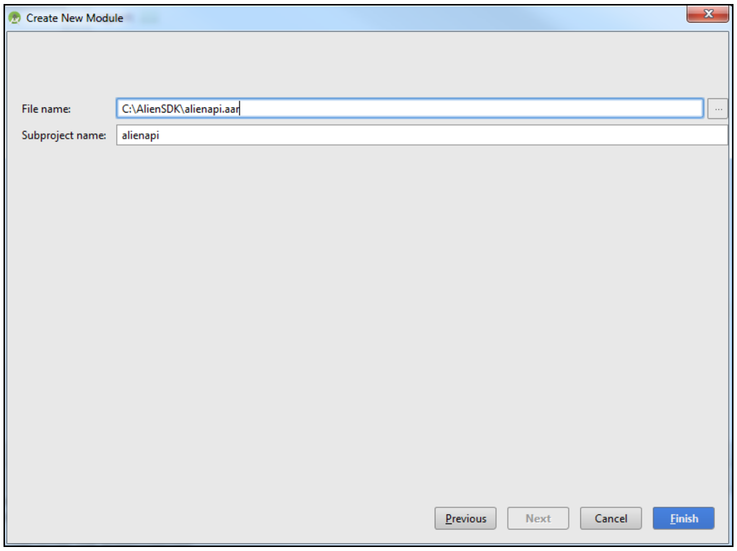


In the “New Module” dialog, select “Import .JAR/.AAR Package” and click “Next”:



Import an existing JAR or AAR package as a new project module

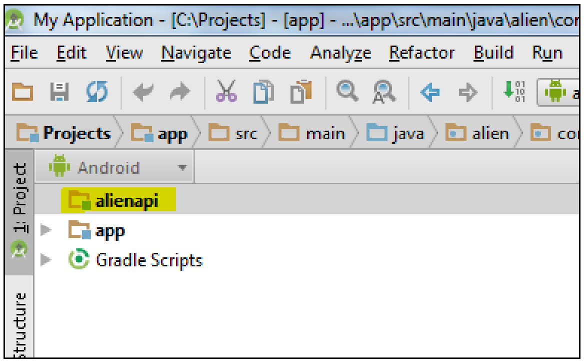
Browse to select the `alienapi.aar` library file and click “Finish”:



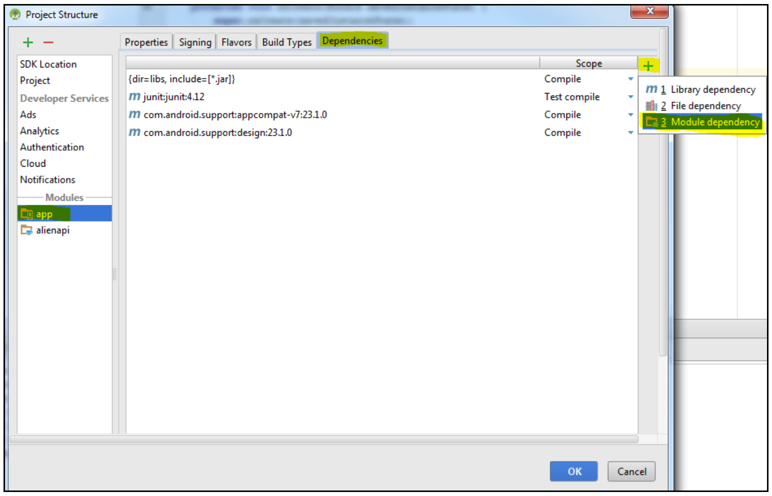
File name: C:\AlienSDK\alienapi.aar

Subproject name: alienapi

Now, you should see the “**alienapi**” module added to your project:

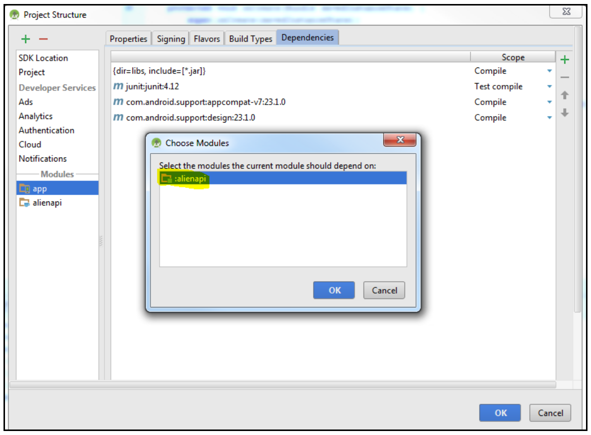


Next, you need to configure the “app” module to use “alienapi” module. To do this:
- Right click on the “app” module, and select “Open Module Settings”.
- Select the “app” module, select the “Dependencies” tab, click “+” button and select “Module dependencies”.



	Scope
{dir=libs, include=[*.jar]}	Compile
m junit:junit:4.12	Test compile
m com.android.support:appcompat-v7:23.1.0	Compile
m com.android.support:design:23.1.0	Compile

Select ":alienapi" and click OK:

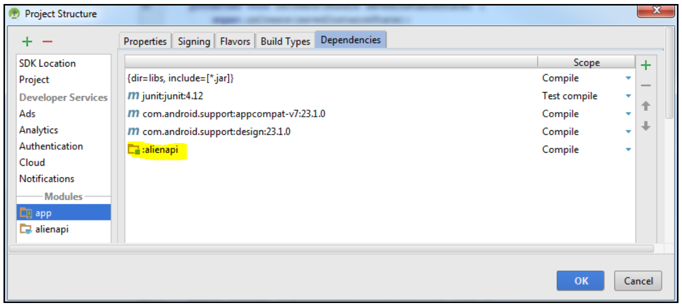


	Scope
{dir=libs, include=[*.jar]}	Compile
junit:junit:4.12	Test compile
com.android.support:appcompat-v7:23.1.0	Compile
com.android.support:design:23.1.0	Compile

Select the modules the current module should depend on:

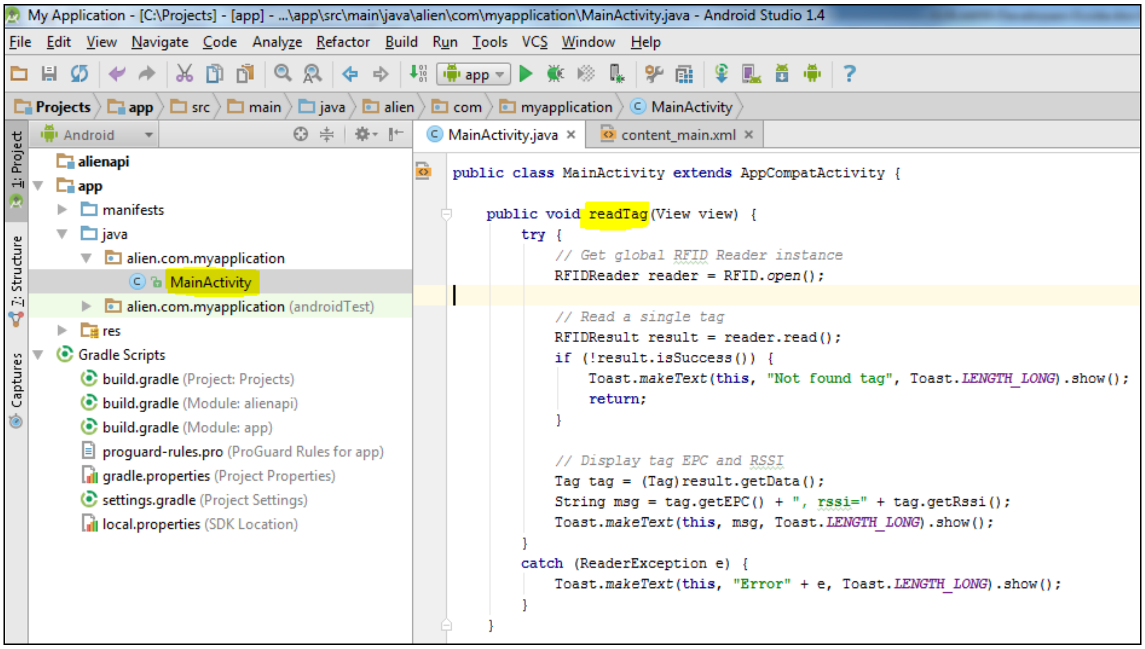
:alienapi

Now you should see the ":alienapi" in the Dependencies list. Click "OK":



	Scope
{dir=libs, include=[*.jar]}	Compile
junit:junit:4.12	Test compile
com.android.support:appcompat-v7:23.1.0	Compile
com.android.support:design:23.1.0	Compile
:alienapi	Compile

Add the `readTag()` method to your `MainActivity` class as below:

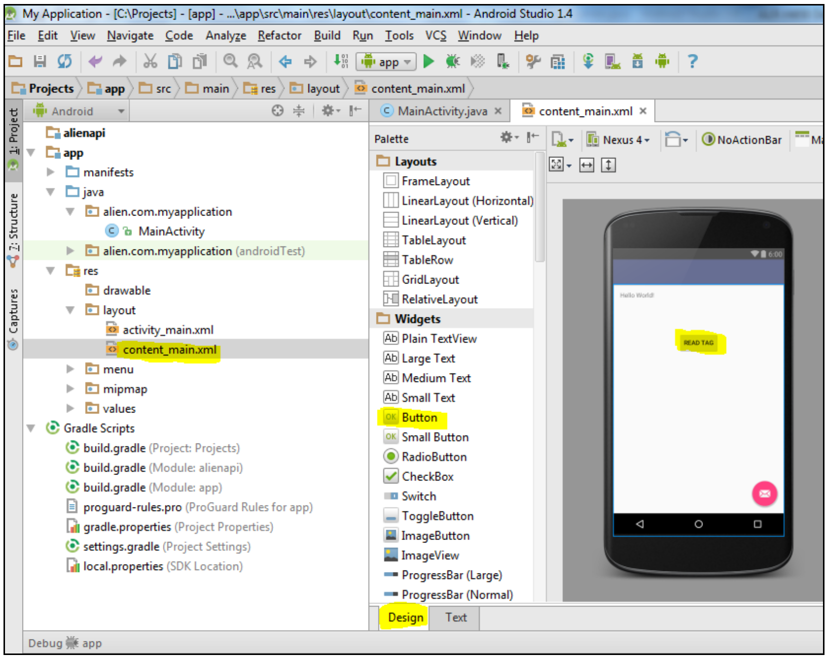

My Application - [C:\Projects] - [app] - ...\app\src\main\java\alien\com\myapplication\MainActivity.java - Android Studio 1.4
File
Edit
View
Navigate
Code
Analyze
Refactor
Build
Run
Tools
VCS
Window
Help
app
Projects
app
src
main
java
alien
com
myapplication
MainActivity
Android
1: Project
7: Structure
Captures
MainActivity.java
content_main.xml
alienapi
app
manifests
java
alien.com.myapplication
MainActivity
alien.com.myapplication (androidTest)
res
Gradle Scripts
build.gradle (Project: Projects)
build.gradle (Module: alienapi)
build.gradle (Module: app)
proguard-rules.pro (ProGuard Rules for app)
gradle.properties (Project Properties)
settings.gradle (Project Settings)
local.properties (SDK Location)

```
public class MainActivity extends AppCompatActivity {

    public void readTag(View view) {
        try {
            // Get global RFID Reader instance
            RFIDReader reader = RFID.open();

            // Read a single tag
            RFIDResult result = reader.read();
            if (!result.isSuccess()) {
                Toast.makeText(this, "Not found tag", Toast.LENGTH_LONG).show();
                return;
            }

            // Display tag EPC and RSSI
            Tag tag = (Tag)result.getData();
            String msg = tag.getEPC() + ", rssi=" + tag.getRssi();
            Toast.makeText(this, msg, Toast.LENGTH_LONG).show();
        }
        catch (ReaderException e) {
            Toast.makeText(this, "Error" + e, Toast.LENGTH_LONG).show();
        }
    }
```

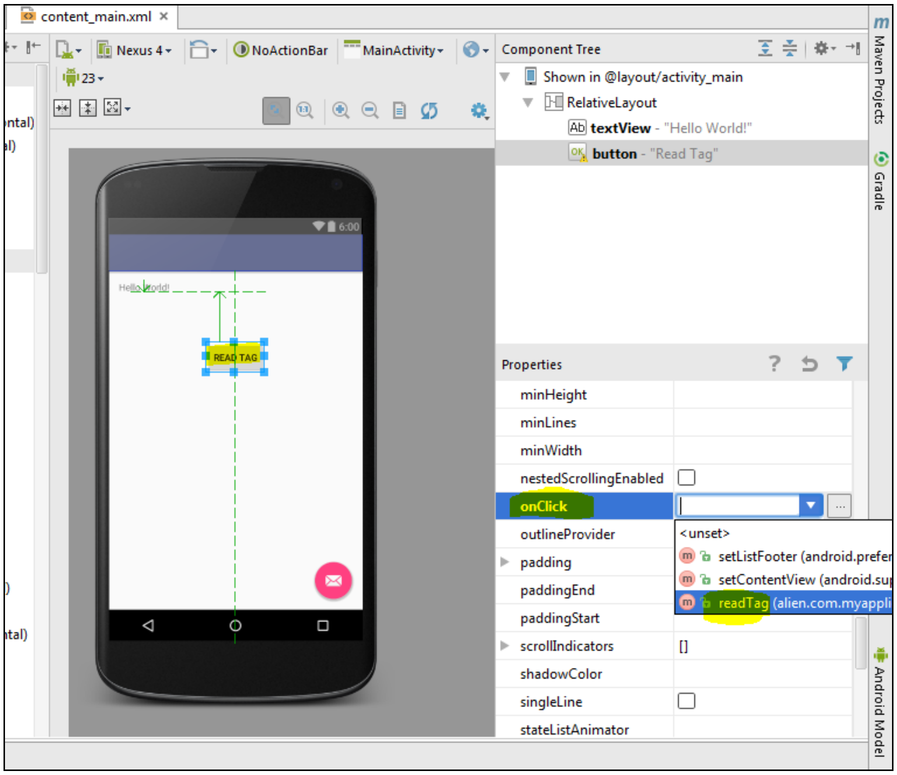
```
public void readTag(View view) {
    try {
        // Get global RFID Reader instance
        RFIDReader reader = RFID.open();
        // Read a single tag
        RFIDResult result = reader.read();
        if (!result.isSuccess()) {
            Toast.makeText(this, "No tags found ", Toast.LENGTH_LONG).show();
            return;
        }
        // Display tag EPC and RSSI
        Tag tag = (Tag)result.getData();
        String msg = tag.getEPC() + ", rssi=" + tag.getRSSI();
        Toast.makeText(this, msg, Toast.LENGTH_LONG).show();
    }
    catch (ReaderException e) {
        Toast.makeText(this, "Error: " + e, Toast.LENGTH_LONG).show();
    }
}
```

Next add a Button to call the `readTag` method that you just created:

- Double click on “content_main.xml”.
- Select “Design” tab.
- Drag and Drop a “Button” widget into the view.
- Double click the button and change the name to “READ TAG”.

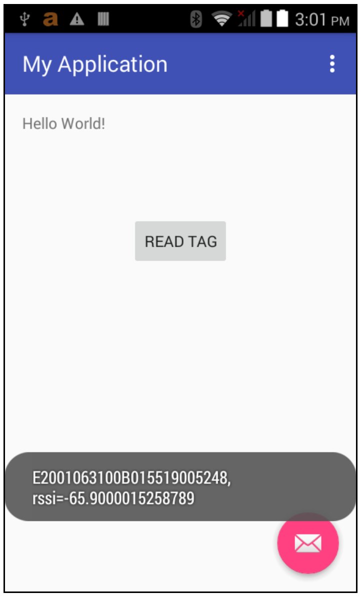

My Application - [C:\Projects] - [app] - ...\app\src\main\res\layout\content_main.xml - Android Studio 1.4
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Projects app src main res layout content_main.xml
Android
MainActivity.java
content_main.xml
alienapi
app
manifests
java
alien.com.myapplication
MainActivity
alien.com.myapplication (androidTest)
res
drawable
layout
activity_main.xml
content_main.xml
menu
mipmap
values
Gradle Scripts
build.gradle (Project: Projects)
build.gradle (Module: alienapi)
build.gradle (Module: app)
proguard-rules.pro (ProGuard Rules for app)
gradle.properties (Project Properties)
settings.gradle (Project Settings)
local.properties (SDK Location)
Palette
Layouts
FrameLayout
LinearLayout (Horizontal)
LinearLayout (Vertical)
TableLayout
TableRow
GridLayout
RelativeLayout
Widgets
Plain TextView
Large Text
Medium Text
Small Text
Button
Small Button
RadioButton
CheckBox
Switch
ToggleButton
ImageButton
ImageView
ProgressBar (Large)
ProgressBar (Normal)
Nexus 4
NoActionBar
Hello World!
READ TAG
Design
Text
Debug app
1: Project
2: Structure
Captures

- Select the button, then select “onClick” in the “Properties” panel, and choose “readTag”:



Now test the application:

- Click “Run App” toolbar button to start the application on your handheld.
- Place a RFID tag in front of your handheld.
- Tap the “READ TAG” button in the application window to read and display a tag as shown below



E2001063100B015519005248,
rssi=-65.9000015258789