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# Table of Contents

1 INTRODUCTION ............................................................................................................. 1
   1.1 Audience .................................................................................................................. 1
   1.2 Type Conventions .................................................................................................... 1
   1.3 Overview .................................................................................................................. 1
   1.4 Documentation and Sample Code ........................................................................... 1
   1.5 System Requirements ............................................................................................. 1

2 RFID READER ................................................................................................................. 2
   2.1 Introduction ............................................................................................................. 2
   2.2 Enumerations ......................................................................................................... 3
       2.2.1 Bank .................................................................................................................. 3
       2.2.2 Target .............................................................................................................. 3
       2.2.3 Session ............................................................................................................ 3
       2.2.4 LockType ....................................................................................................... 3
       2.2.5 RFIDInfo ....................................................................................................... 3
   2.3 Connecting to RFID Module ................................................................................... 4
   2.4 Tag Operations ....................................................................................................... 4
       2.4.1 Mask ................................................................................................................ 4
       2.4.2 Reading a single tag ....................................................................................... 5
       2.4.3 Continuous Inventory ................................................................................... 6
       2.4.4 Reading and Writing tag’s memory ............................................................... 7
       2.4.5 Lock Fields ................................................................................................... 9
       2.4.6 Locking and Unlocking Tag Memory ............................................................ 9
       2.4.7 Kill tags ......................................................................................................... 10
       2.4.8 Tag class ....................................................................................................... 11
   2.5 Setting RFID Parameters ....................................................................................... 12
       2.5.1 Transmit Power ............................................................................................. 12
       2.5.2 Q Parameter ................................................................................................ 12
       2.5.3 Session Parameter ....................................................................................... 13
       2.5.4 Inventory Target ......................................................................................... 13
       2.5.5 RFID Subsystem Information ..................................................................... 14
       2.5.6 Device Information ..................................................................................... 14

3 BARCODE READER ...................................................................................................... 15
   3.1 Introduction ............................................................................................................ 15
   3.2 Controlling Barcode Reader .................................................................................. 15
       3.2.1 Scan 1D and 2D barcode ............................................................................ 15
       3.2.2 Controlling Barcode Parameters ................................................................. 16
   3.3 Symbology Parameters ......................................................................................... 17
       3.3.1 List of Barcode Symbology Parameters ..................................................... 17
       3.3.2 Barcode Symbology Parameter Values ..................................................... 19

4 KEY CODES ................................................................................................................. 27
   4.1 ALR-H450 (Android 4.4.2) .................................................................................. 27
   4.2 ALR-H460 (Android 6.0) ....................................................................................... 27

5 DEVELOPING APPLICATIONS WITH ANDROID STUDIO .................................. 28
   5.1 Install Android Studio ........................................................................................... 28
   5.2 Install Google USB Driver .................................................................................... 28
   5.3 Enable Developer Mode for your handheld ....................................................... 29
   5.4 Developing your first RFID application ............................................................. 30
       5.4.1 Create Android Project .............................................................................. 30
       5.4.2 Use RFID functionality in your project .................................................... 34
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:

```java
// 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.

<table>
<thead>
<tr>
<th>Library</th>
<th>Hardware Module</th>
<th>ALR-H450/H460 (Android)</th>
</tr>
</thead>
<tbody>
<tr>
<td>alienapi.aar</td>
<td>RFID Reader</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>1D/2D Barcode Scanner</td>
<td>✓ ✓ 1D &amp; 2D</td>
</tr>
</tbody>
</table>

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 Gen2 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.
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.

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

2.2.2 Target

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

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

2.2.3 Session

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

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

2.2.4 LockType

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

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

2.2.5 RFIDInfo

Defines the available RFID subsystem information.

```java
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:

```java
// 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.

```java
// 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:**

```java
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:

```java
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:**

```java
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.

```java
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”.

```java
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.

```java
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

```java
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.

```java
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.

```java
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.

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

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

```java
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"

```java
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:

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

To check if continuous inventory is running:

```java
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.

```java
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

```java
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:**

```java
public LockFields(int fields)
```

**Parameters:**
- `fields` a bitmap of fields to be locked

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

```java
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.

```java
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.

**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 PERMANLOCK` — the results are **permanent**! If a field is permanently locked, it cannot be unlocked. If a field is permanently unlocked, it cannot be locked.

```java
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.

```java
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.

```java
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):**
  ```java
  public String getEPC();  // tag’s EPC
  public double getRSSI();  // tag’s Returned Signal Strength
  ```

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

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

  **Read/Write ACCESS PWD:**
  ```java
  public RFIDResult readAccessPwd() throws ReaderException
  public RFIDResult writeAccessPwd() throws ReaderException
  ```

  **Read/Write KILL PWD:**
  ```java
  public RFIDResult readKillPwd() throws ReaderException
  public RFIDResult writeKillPwd() throws ReaderException
  ```

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

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

  **Read/Write tags’s memory:**
  ```java
  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:**
  ```java
  public RFIDResult lock(LockFields fields, LockType lockType, String accessPassword [optional]) throws ReaderException
  ```

  **Kill tag:**
  ```java
  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.

```java
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.
```

```java
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 ($2^Q$).

```java
public int getQ() throws ReaderException

Parameters:
None

Returns:
int the starting Q parameter value

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

```java
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.

```java
public Session getSession() throws ReaderException {
    Parameters:
    None
    Returns:
    Session the Gen2 protocol Session parameter
    Exceptions:
    ReaderException is raised if there is an error.
}
```

```java
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.

```java
public Target getTarget() throws ReaderException {
    Parameters:
    None
    Returns:
    Target the Gen2 protocol inventory target parameter
    Exceptions:
    ReaderException is raised if there is an error.
}
```

```java
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.

```java
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
```

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

Parameters:

None

Return:

Map a Map object containing all available device information
```

Example

```java
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.

```java
public String getDeviceID()

Return:

String device ID returned as a string.
```

```java
public String getModel()

Return:

String device model returned as a string.
```

Example

```java
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.

```java
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.

```java
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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ID</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UPC/EAN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPC-A</td>
<td>1</td>
<td>Enable</td>
</tr>
<tr>
<td>UPC-E</td>
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<td>EAN-8/JAN 8</td>
<td>4</td>
<td>Enable</td>
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<td>EAN-13/JAN 13</td>
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<td>Bookland EAN</td>
<td>83</td>
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<td>Decode UPC/EAN/JAN Supplementals (2 and 5 digits)</td>
<td>16</td>
<td>Ignore</td>
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<td>UPC/EAN/JAN Supplemental Redundancy</td>
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<td>Decode UPC/EAN/JAN Supplemental AIM ID</td>
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<td>Transmit UPC-A Check Digit</td>
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<td>Convert UPC-E1 to A</td>
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<td>Check ISBT Table</td>
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<td>Convert Code 39 to Code 32 (Italian Pharmacy Code)</td>
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<td>Code 32 Prefix</td>
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<td>Set Length(s) for Code 39</td>
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<td>Transmit Code 39 Check Digit</td>
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<td>Code 93</td>
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<td>Set Length(s) for Code 93</td>
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<td>Code 11 Check Digit Verification</td>
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<td>USPS 4CB/One Code/Intelligent Mail</td>
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<td>UPU FICS Postal</td>
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<td>GS1-128 Emulation Mode for UCC/EAN Composite Codes</td>
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<td>Data Matrix</td>
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<td>Data Matrix Inverse</td>
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<td>Decode Mirror Images (Data Matrix Only)</td>
<td>537</td>
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<td>Maxicode</td>
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<td>Han Xin Inverse</td>
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<td>Symbology-Specific Security Levels</td>
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<td>Redundancy Level</td>
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<td>Security Level</td>
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<td>Intercharacter Gap Size</td>
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</tr>
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**Notes:**
- Mod 10/Mod 10
- Disable
- Normal
- Never Linked
### 3.3.2 Barcode Symbology Parameter Values

**NOTE:** Asterisk (*) designates the default value

<p>| | | | |</p>
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<tr>
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<tbody>
<tr>
<td>1</td>
<td>UPC-A</td>
<td>• 1* - Enable</td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>2</td>
<td>UPC-E</td>
<td>• 1* - Enable</td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>12</td>
<td>UPC-E1</td>
<td>• 0* - Disable</td>
<td>• 1 - Enable</td>
</tr>
<tr>
<td>4</td>
<td>EAN-8/JAN-8</td>
<td>• 1* - Enable</td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>3</td>
<td>EAN-13/JAN-13</td>
<td>• 1* - Enable</td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>83</td>
<td>Bookland EAN</td>
<td>• 0* - Disable</td>
<td>• 1 - Enable</td>
</tr>
</tbody>
</table>

**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

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<tr>
<td>16</td>
<td>Decode UPC/EAN/JAN Supplementals</td>
<td><strong>Supplementals</strong> 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:</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• 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.</td>
<td></td>
</tr>
</tbody>
</table>
|   |   | • 1 - Decode UPC/EAN with Supplementals - the decoder only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplemen
tals. |
|   |   | • 2 - Autodiscriminate UPC/EAN Supplementals - decoder decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supple
mental, 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. |

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>• 4 - Enable 378/379 Supplemental Mode</td>
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<tr>
<td></td>
<td></td>
<td>• 5 - Enable 978/979 Supplemental Mode</td>
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</table>

**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 |

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<tr>
<td></td>
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<td>• 7 - Enable 977 Supplemental Mode</td>
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<td>• 6 - Enable 414/419/434/439 Supplemental Mode</td>
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<td></td>
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<td>• 8 - Enable 491 Supplemental Mode</td>
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<tr>
<td></td>
<td></td>
<td>• 3 - Enable Smart Supplemental Mode - applies to EAN-13 bar codes starting with any prefix listed previously</td>
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<tr>
<td></td>
<td></td>
<td>• 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.</td>
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<tr>
<td></td>
<td></td>
<td>• 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</td>
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<tr>
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<td>• 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</td>
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<tr>
<td></td>
<td></td>
<td>• 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</td>
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</table>

**NOTE:** To minimize the risk of invalid data transmission, select either to decode or ignore supplemental characters.

### Barcode Symbolology Parameter Values

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<td>579</td>
<td>User-Programmable Supplemental 1</td>
<td>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</td>
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<td>580</td>
<td>User-Programmable Supplemental 2</td>
<td>select User-Programmable Supplemental 2 to set a second 3-digit prefix</td>
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### Barcode Symbolology Parameter Values

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<tr>
<td>80</td>
<td>UPC/EAN/JAN Supplemental Redundancy</td>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>
**672** | **RFID** | **CHAPTER 2**
--- | --- | ---
**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** | **Transmit Check Digit** | 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** | **Preamble** | 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** | **Convert UPC/EAN/JAN-8 to UPC/EAN-JAN-13** | Enable this to convert UPC-E/A/EAN 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/A/EAN decoded data is transmitted as UPC-E/A/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.  
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 add five leading zeros to decoded UPC-A bar codes starting with digit ‘5’, EAN-13 bar codes starting with digit ‘9’, and UPC-A/EAN-128 Coupon Codes. UPC-A, 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 reports a new 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
## Set Lengths for Code 128

<table>
<thead>
<tr>
<th>Length1</th>
<th>Length2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

### Code 39 Check Digit Verification

- **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.

### 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.

### Check ISBT Table

- **0**: Disable Check ISBT Table
- **1**: Enable Check ISBT Table

### ISBT Concatenation Redundancy

- **0**: Disable
- **1**: Enable

### Code 32 Prefix

- **0**: Disable
- **1**: Enable

**NOTE:** Code 39 must be enabled for this parameter to function.

### Code 32 to Code 39

- **0**: Disable
- **1**: Enable

**NOTE:** Code 39 must be enabled for this parameter to function.

### Trioptic Code 39

- **0**: Disable
- **1**: Enable

**NOTE:** Trioptic Code39 and Code39 Full ASCII cannot be enabled simultaneously.

### Code 39

- **0**: Enable
- **1**: Do Not Enable

**NOTE:** Code 39 must be enabled for this parameter to function.

### Lengths

<table>
<thead>
<tr>
<th>Length1</th>
<th>Length2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

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.

### GS1-128 (formerly UCC/EAN-128)

- **1**: Enable
- **0**: Disable

### ISBT 128

- **0**: Disable
- **1**: Enable

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.

### Lengths

<table>
<thead>
<tr>
<th>Length1</th>
<th>Length2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

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.
|   | 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 | Set Lengths for Code 93 | Length1 = 0..55, default=4  
| Length1 | Length2 = 0..55, default=55  
|   | for Code 93 |   |   |   |   | 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.  
| 28 | Set Lengths for Code 11 | Length1 = 0..55, default=4  
| Length1 | Length2 = 0..55, default=55  
|   | for Code 11 |   |   |   |   | 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 Digit(s) |   |   |   |   | • 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  
| 22 | Set Lengths for Interleaved | Length1 = 0..55, default=14  
| Length2 = 0..55, default=0  
| 5 of 2 Interleaved | Length1 = 0..55, default=14  
| Length2 = 0..55, default=0  
|   | 2 or 5 symbols |   |   |   |   | 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 range 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 With 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 barcode. 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  

22
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Settings</th>
</tr>
</thead>
</table>
| 44 | Transmit Interleaved 2 of 5 Check Digit | • 0*: Do Not Transmit 12 of 5 Check Digit (Disable)  
• 1 - Transmit 12 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 12 of 5 to EAN-13 (Disable)  
• 1 - Convert 12 of 5 to EAN-13 (Enable) |
| 5 | Discrete 2 of 5 Set Lengths | • 0*: Disable  
• 1 - Enable |
| 20 | Length1 | 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 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. |
| 21 | 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. |
| 7 | Codabar Set Lengths for Discrete Lengths | 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. |
| 24 | Length1 | 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 length within a specific range.  
• 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. |
| 25 | 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 length within a specific range.  
• 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 Set Lengths for Discrete Lengths | 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 CLSI to decode either one or two discrete lengths, or a range of lengths.  
• One Discrete Length - To limit the decoding of CLSI 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 CLSI to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode CLSI codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2.  
• Length Within Range - To decode only CLSI 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 CLSI codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12. |
| 55 | NOTIS Editing Set Lengths for Discrete Lengths | 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 NOTIS to decode either one or two discrete lengths, or a range of lengths.  
• One Discrete Length - To limit the decoding of NOTIS 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 NOTIS to either of two specific lengths, assign the greater length to the Length1 parameter and the lesser to Length2. For example, to decode NOTIS codes of either 2 or 14 characters only, set Length1 = 14, Length2 = 2.  
• Length Within Range - To decode only NOTIS 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 NOTIS codes of length 4 through 12 characters, set Length1 = 4, Length2 = 12. |
| 11 | MSI | 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. |
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td><strong>MSI Check Digits</strong></td>
</tr>
<tr>
<td></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>• 0* - One MSI Check Digit</td>
</tr>
<tr>
<td></td>
<td>• 1 - Two MSI Check Digits</td>
</tr>
<tr>
<td></td>
<td>See MSI Check Digit Algorithm to select second digit algorithms</td>
</tr>
<tr>
<td>46</td>
<td><strong>Transmit MSI Check Digit(s)</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Do Not Transmit MSI Check Digit(s) (Disable)</td>
</tr>
<tr>
<td></td>
<td>• 1 - Transmit MSI Check Digit(s) (Enable)</td>
</tr>
<tr>
<td>51</td>
<td><strong>MSI Check Digit Algorithm</strong></td>
</tr>
<tr>
<td></td>
<td>Select one of two algorithms for the verification of the second MSI check digit:</td>
</tr>
<tr>
<td></td>
<td>• 1* - MOD 10/MOD 10</td>
</tr>
<tr>
<td></td>
<td>• 0 - MOD 10/MOD 11</td>
</tr>
<tr>
<td>408</td>
<td><strong>Chinese 2 of 5</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable</td>
</tr>
<tr>
<td>581</td>
<td><strong>Korean 3 of 5</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable</td>
</tr>
<tr>
<td></td>
<td>NOTE: The length for Korean 3 of 5 is fixed at 6</td>
</tr>
<tr>
<td>618</td>
<td><strong>Matrix 2 of 5</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable</td>
</tr>
<tr>
<td>619</td>
<td><strong>Set Lengths for Matrix 2 of 5</strong></td>
</tr>
<tr>
<td></td>
<td>Length1 = 0..55, default=14</td>
</tr>
<tr>
<td></td>
<td>Length2 = 0..55, default=0</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• 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</td>
</tr>
<tr>
<td>621</td>
<td><strong>Matrix 2 of 5 Redundancy</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable Matrix 2 of 5 Redundancy</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable Matrix 2 of 5 Redundancy</td>
</tr>
<tr>
<td>622</td>
<td><strong>Matrix 2 of 5 Check Digit</strong></td>
</tr>
<tr>
<td></td>
<td>The check digit is the last character of the symbol used to verify the integrity of the data.</td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable Matrix 2 of 5 Check Digit</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable Matrix 2 of 5 Check Digit</td>
</tr>
<tr>
<td>623</td>
<td><strong>Transmit Matrix 2 of 5 Check Digit</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Do Not Transmit Matrix 2 of 5 Check Digit</td>
</tr>
<tr>
<td></td>
<td>• 1 - Transmit Matrix 2 of 5 Check Digit</td>
</tr>
<tr>
<td>586</td>
<td><strong>Inverse 1D</strong></td>
</tr>
<tr>
<td></td>
<td>Set the 1D inverse decoder setting:</td>
</tr>
<tr>
<td></td>
<td>• 0* - Regular Only - the decoder decodes regular 1D bar codes only.</td>
</tr>
<tr>
<td></td>
<td>• 1 - Inverse Only - the decoder decodes inverse 1D bar codes only.</td>
</tr>
<tr>
<td></td>
<td>• 2 - Inverse Autodetect - decode both regular and inverse 1D bar codes.</td>
</tr>
<tr>
<td>89</td>
<td><strong>US Postnet</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>90</td>
<td><strong>US Planet</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>95</td>
<td><strong>Transmit US Postal Check Digit</strong></td>
</tr>
<tr>
<td></td>
<td>Select whether to transmit US Postal data, which includes both US Postnet and US Planet, with or without the check digit:</td>
</tr>
<tr>
<td></td>
<td>• 1* - Transmit US Postal Check Digit</td>
</tr>
<tr>
<td></td>
<td>• 0 - Do Not Transmit US Postal Check Digit</td>
</tr>
<tr>
<td>91</td>
<td><strong>UK Postal</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>96</td>
<td><strong>Transmit UK Postal Check Digit</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Transmit UK Postal Check Digit</td>
</tr>
<tr>
<td></td>
<td>• 0 - Do Not Transmit UK Postal Check Digit</td>
</tr>
<tr>
<td>290</td>
<td><strong>Japan Postal</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>291</td>
<td><strong>Australia Postal</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable</td>
</tr>
<tr>
<td>718</td>
<td><strong>Australia Post Format</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Autodiscriminate (or Smart mode) - Attempt to decode the Customer Information Field using the N and C Encoding Tables</td>
</tr>
<tr>
<td></td>
<td>• 1 - Raw Format - Output raw bar patterns as a series of numbers 0 through 3.</td>
</tr>
<tr>
<td></td>
<td>• 2 - Alphanumeric Encoding - Decode the Customer Information Field using the C Encoding Table</td>
</tr>
<tr>
<td></td>
<td>• 3 - Numeric Encoding - Decode the Customer Information Field using the N Encoding Table</td>
</tr>
<tr>
<td>326</td>
<td><strong>Netherlands KIX Code</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable Netherlands KIX Code</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable Netherlands KIX Code</td>
</tr>
<tr>
<td>592</td>
<td><strong>USPS 4CB/One Code/Intelligent Mail</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable USPS 4CB/One Code/Intelligent Mail</td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable USPS 4CB/One Code/Intelligent Mail</td>
</tr>
<tr>
<td>611</td>
<td><strong>UPU FICS Postal</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable UPU FICS Postal</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable UPU FICS Postal</td>
</tr>
<tr>
<td>338</td>
<td><strong>GS1 DataBar-14</strong></td>
</tr>
<tr>
<td></td>
<td>• 1* - Enable GS1 DataBar-14</td>
</tr>
<tr>
<td></td>
<td>• 0 - Disable GS1 DataBar-14</td>
</tr>
<tr>
<td>339</td>
<td><strong>GS1 DataBar Limited</strong></td>
</tr>
<tr>
<td></td>
<td>• 0* - Disable GS1 DataBar Limited</td>
</tr>
<tr>
<td></td>
<td>• 1 - Enable GS1 DataBar Limited</td>
</tr>
</tbody>
</table>
| **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 |
| **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 |
<p>| <strong>587</strong> | QR Inverse | • 0*: Regular Only - the decoder decodes regular QR bar codes only. |</p>
<table>
<thead>
<tr>
<th>Code Type</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroQR</td>
<td>1&lt;sup&gt;*&lt;/sup&gt;</td>
<td>Enable</td>
</tr>
<tr>
<td>Aztec</td>
<td>1&lt;sup&gt;*&lt;/sup&gt;</td>
<td>Enable</td>
</tr>
<tr>
<td>Han Xin</td>
<td>1&lt;sup&gt;*&lt;/sup&gt;</td>
<td>Enable</td>
</tr>
<tr>
<td>78</td>
<td>Redundancy Level</td>
<td>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.</td>
</tr>
<tr>
<td>77</td>
<td>Security Level</td>
<td>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.</td>
</tr>
<tr>
<td>381</td>
<td>Intercharacter Gap Size</td>
<td>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.</td>
</tr>
</tbody>
</table>

- **1 - Inverse Only**: the decoder decodes inverse QR bar codes only.
- **2 - Inverse Autodetect**: decode both regular and inverse QR bar codes.
- **3 - 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.
- **4 - Security Level 2**: Select if Security level 1 fails to eliminate misdecodes.
- **5 - 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.
- **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.


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:

Select “SDK Manager”:

![Android Studio Welcome Screen](image)
Select “SDK Manager”, then “Android SDK”, then “SDK Tools” tab, and check the “Google USB Driver”. Click OK:

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:

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”:
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”:

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”: 
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”: 
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:

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

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”.


Select "alienapi" and click OK:

![Image of project structure with selected module]

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

![Image of project structure with dependencies]

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

```java
public class MainActivity extends AppCompatActivity {
    @Override
    public void readTag(View view) {
        try {
            // Get global RFID Reader instance
            RFIDReader reader = RFID.open();

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

            // Display tag EPC and RSSI
            String tag = result.getTag();
            Toast.makeText(this, "EPC: " + tag, Toast.LENGTH_LONG).show();
            Toast.makeText(this, "RSSI: " + result.getTagRSSI(), 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: ", 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".
- 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