U.P.C. – Universal Product Code

The symbol is comprised of:

- Machine-readable bar code (UPC-A)
- The human readable interpretation of that bar code (GTIN-12)
GS1 Bar Code numbers map into EPC™

An Example of How GTIN Integration Works With the EPC

Illustrative Example (EAN-13): 12 34567 89012 8

EAN - 13: 0 1 2 3 4 5 6 7 8 9 0 1 2 8

Company Prefix

Item Reference

Check Digit

Remove Check Digit

EPC: 3 1234567 89012 000000123456

Header EPC Manager Number Object Class Number Serial Number

GTIN
**What is EPC™?**

**EPC – “Electronic Product Code™”**

- EPC is a naming scheme for objects
- Unique identifier for every object
- Decouples identity from data
- EPC used as an addressing scheme for data locations (usage similar to IP addresses)
Basic Format

- **Header**
  - identifies the length, type, structure, version, and generation of the EPC
- **EPC Manager Number**
  - entity responsible for maintaining the subsequent partitions
- **Object Class**
  - identifies a class of objects
- **Serial Number**
  - identifies the instance
### 96-bit SGTIN Scheme

<table>
<thead>
<tr>
<th></th>
<th>Header</th>
<th>Filter Value</th>
<th>Partition</th>
<th>Company Prefix</th>
<th>Item Reference</th>
<th>Serial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>96-bit GTIN</strong></td>
<td>8 bits</td>
<td>3 bits</td>
<td>3 bits</td>
<td>20-40 bits</td>
<td>24-4 bits</td>
<td>38 bits</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>8</td>
<td>999,999 -999,999,999,999,999 (decimal capacity)</td>
<td>9,999,999-9 (decimal capacity)</td>
<td>274,877,906,943 (decimal capacity)</td>
<td></td>
</tr>
</tbody>
</table>
Start with a UPC
• 614141 is the UPC Company Prefix
• 00734 is the Item Reference
• 9 is the Check Digit

Example

614141 00734 9
Turn it into a Global Trade Item Number (GTIN)

- Add “0” indicator and “0” number system carrier to build out full 14 digit format

  614141 00734 9

  0 0614141 00734 9
Encode into 96-bit EPC Tag

- Select header for SGTIN-96 (48)
- Filter Value (3 – shipping unit)
- Company Prefix (0614141)
- Item Reference Number (000734)
- Add the Serial Number (203886)

**Decimal representation:**

48 3 5 0614141 000734 203886
<table>
<thead>
<tr>
<th>Partition</th>
<th>Value</th>
<th>Binary Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>48</td>
<td>0011 0000</td>
</tr>
<tr>
<td>Filter Value</td>
<td>3</td>
<td>011</td>
</tr>
<tr>
<td>Partition</td>
<td>5</td>
<td>101</td>
</tr>
<tr>
<td>Company Prefix</td>
<td>0614141</td>
<td>000010010101111011111101</td>
</tr>
<tr>
<td>Item Reference</td>
<td>000734</td>
<td>00000000001011011110</td>
</tr>
<tr>
<td>Serial Number</td>
<td>203886</td>
<td>000000000000000000000110001110001101110</td>
</tr>
</tbody>
</table>

**Tag data in bits – encode/decode won’t be by hand!**
0011 0000 000 101 000010010101111011111101
00000000001011011110
000000000000000000000110001110001101110
What is RFID?

RFID - “Radio Frequency Identification”

• It is a technology that has existed for decades
• At a simple level, it is a technology that involves tags that emit radio signals and devices called readers that pick up the signal
• RFID technology is a fundamental element of the EPCglobal Network
<table>
<thead>
<tr>
<th>Feature</th>
<th>Bar Code</th>
<th>RFID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards?</td>
<td>UPC</td>
<td>EPC</td>
</tr>
<tr>
<td>Uniquely Identifies Items?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Room for Growth?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Automated Operation?</td>
<td>Not Easy</td>
<td>Yes</td>
</tr>
<tr>
<td>Mode of Read?</td>
<td>Optical</td>
<td>Wireless</td>
</tr>
<tr>
<td>(Line of Sight Required)</td>
<td>(Not Line of Sight)</td>
<td></td>
</tr>
<tr>
<td>Read many object at a time?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>(reads sequentially)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Importance of Global Standards

Currently RFID Frequencies & Power Levels Differ Across the World

A single standard, such as EPC Gen 2, will enable RFID to reach its full potential in our global economy.
UHF Gen 2 – why the excitement?

• Gen 2 is the first unified protocol
  • From C0, C1, ISO 18000-6A, ISO 18000-6B to Gen 2/ISO 18000-6C
• Better use of RF spectrum
  • In many applications, the number of readers can exceed the number of channels
  • Gen 2 has modes optimized for better spectrum use
• More data capacity specified in the standard, higher data rate, better security
UHF Gen 2 – why the excitement?

• Variety of ways to create logical sub-sets from all the tags in the read field.
  • E.g write to a single tag without affecting the others
• Significantly reduces/eliminates ghost reads
• Better singulation: tag-data separated from locator-data
• Bottom-line: Significant read and write performance improvements
Key features to look for in Gen 2

- Support for all mandatory features
  - Is the reader truly Gen 2 compliant?
  - EPCglobal Gen 2 certified?
- Support for dense-reader mode
  - Especially in fixed readers used in distributions centers, airports etc.
- Maximum data rate
  - Especially when tags/sec is high. E.g. dock doors moving item-tagged pharma, conveyer applications etc.
  - Maximum data rate is not applicable in Dense Reader Mode
## Concerns About Privacy

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2005</strong></td>
<td>• GS1 worked with an industry coalition to derail the bill for this year.</td>
</tr>
<tr>
<td>The California State Legislature and other states were working on bills to ban RFID.</td>
<td>• The coalition is developing an alternative bill to head off this problem next year.</td>
</tr>
<tr>
<td></td>
<td>• Symbol actively engaged the media and placed op-eds.</td>
</tr>
<tr>
<td><strong>2006</strong></td>
<td>• GS1 is proactively educating key lawmakers on the benefits of RFID and the realities about privacy concerns.</td>
</tr>
<tr>
<td>Privacy will be a front-burner issue in Congress, as the House and Senate plan privacy hearings and work on data broker legislation.</td>
<td>• A workgroup with SAP, IBM, Oracle and others was created to lobby Congress and the international community.</td>
</tr>
<tr>
<td>Separate RFID from identity theft in lawmakers minds.</td>
<td></td>
</tr>
</tbody>
</table>
Myth:
RFID enables...
- Identity theft
- Tracking of personal movements everywhere

Reality:
Passive tags are nothing more than a talking barcode

Analogy:
Without access to the database the information is meaningless and once the item leaves the store or warehouse it will be come out of range