Spotlight Part Two:
Do You Know What the "RAIN Alliance ISO Numbering System" Is?

Last edition, in Part One of this spotlight on the RAIN Alliance ISO Numbering System, we outlined the critical basics of when you should use it and why. Now, this article will give an overview of actually encoding a RAIN tag with a sample value.

The first step is to understand a little about Memory Bank 01 (MB01). This is your basic bread-and-butter memory bank in RAIN chips. It is where users normally encode unique item numbers like your "EPC number," or an SGTIN-96 for the Retailer mandates (Walmart, Dick's Sporting Goods, Macy's, etc.), or an SSCC-96 to identify logistics units. You probably know MB01 as "EPC memory," but that is a somewhat inaccurate name, so I try to use MB01. What you may not know is that there is more to MB01 than just a space to encode an "EPC number."

Here is a diagram of MB01:

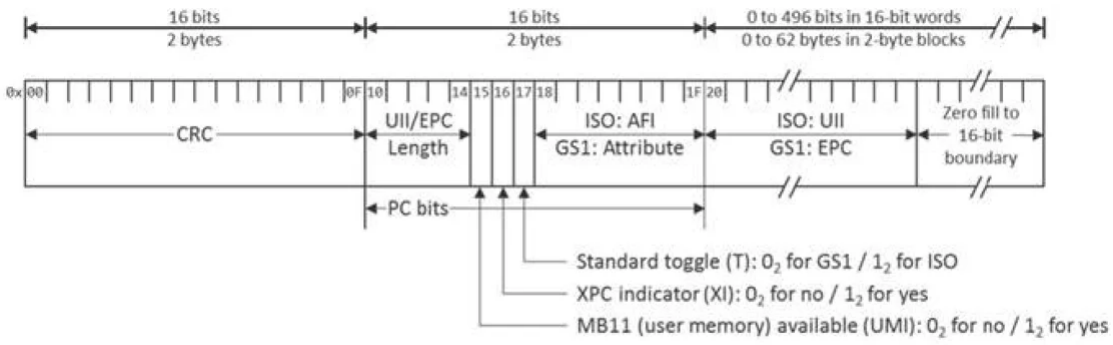

Figure A.2 — ISO/IEC 18000-63 and ISO/IEC 18000-3, Mode 3 structure of Memory Bank 01

Most users just encode an “EPC number” to MB01 starting at bit 0x20 (that’s the 33rd bit in the sequence of bits in MB01). There are 32 bits in MB01 that precede this. The first 16 bits compose the so-called Cyclic Redundancy Check (CRC) value. Don’t worry about these bits, as the chip calculates them for you. The next 16 bits compose the so-called PC Word (a Word is 16 bits), or PC bits. Although most people ignore these bits, that is a mistake when encoding and/or reading RAIN tags. You should start paying attention to encoding these bits and paying attention to your reader system to make sure that you are leveraging these bits for proper filtering.

Within the PC Word, the first value you need to encode is the Length. This value is 5 bits long. This value tells a reader how many Words of MB01 to read when decoding a typical encoding. Normally, the Length value corresponds to the same number of Words you encoded to the tag in the “normal” portion of MB01 (starting at bit 0x20), but note that you can set a different Length value to speed up initial filtering. A basic label software like BarTender will automatically generate this value for you based on the number of Words you encode as your “EPC number.” I won’t get into detail on this topic here, so we will presume that we will set the Length value to correspond to the number of Words we will encode to MB01 starting at 0x20.

Next up is the UMI bit. This bit will soon be renamed to the RUM bit. Until then, whatever you try to encode to the bit will be overwritten by the chip to the value the chip manufacturer used (0 = There is no User Memory on the chip; 1 = There is User Memory). In the future when this bit becomes the RUM bit, you will be able to set the value to 0 = Do not read User Memory or 1 = Read User Memory.

The next bit is the XI bit. Whatever you try to encode here will be overwritten by the chip with the manufacturer’s value, so do not worry about this bit.

The next bit is the “famous” T bit. T stands for Toggle in this case. 0 means that the encoding follows GS1 standards. 1 means that the encoding is ISO based. Because the RAIN Alliance ISO Numbering System is ISO based, you need to set this bit to 1 in your encoding.

Lastly, there are 8 bits that comprise either GS1 Attribute bits or the ISO Application Family Identifier (AFI). Again, we are doing an ISO encoding, so you need to

encode the correct AFI here. For the RAIN Alliance ISO Numbering System, you need to encode the AFI of 0xAE here.

To recap what we have so far:

- Set the value for Length. If you are using a label software like BarTender, the application should automatically generate this value for you.
- Disregard the UMI / RUM and the XI bits, as the chip will generate these values and overwrite anything you try to encode.
- Set the T bit to 1.
- Encode 0xAE to the AFI portion.

Now, we can begin encoding to the "normal" section of MB01 starting at 0x20. For a RAIN Alliance ISO Numbering System encoding, the only requirement is that you encode a RAIN Company Identification Number (CIN) using EBV-8* character-to-bit conversion as the initial part. You will need a RAIN CIN, which can be obtained from the RAIN Alliance here. Note that RAIN-issued CINs are ISO compliant, so you can use a RAIN CIN for any ISO-based encoding, not just the RAIN Alliance ISO Numbering System.

*If you are like most people, you have no idea what EBV-8 means nor do you want to figure it out. When RAIN issues a CIN, you will receive the CIN in two or three formats: decimal number, hexadecimal value and possibly an alphanumeric value. Although RAIN CINs are first and foremost decimal numbers, the easiest format to encode to your tags is to use the hexadecimal format, because RAIN will have carried out the EBV-8 conversion for you already when generating the hex value. A label software like BarTender does not yet support EBV-8 for RFID, but it will allow you to directly input the hex value and tell the encoding device (like an RFID printer) to simply "encode the tag with this hex value." By using the hex value from RAIN, you save yourself from learning about EBV-8 – and overcome the fact that no commodity encoding software natively supports EBV-8 yet.

Following your RAIN CIN, you can encode "whatever the heck you want, as long as each encoding is unique." If you just need a simple serial number, probably the best is to use a hex value. The relevant standards dictate that encodings and readings of tags must be done in Words, so to make things easy, use groups of four hex characters for your serial numbers. For example, if you use a serial number range

of 0x0000 through 0xFFFF (four hex characters for each serial number), you will have 65,536 unique serial numbers and this is often enough for internal asset tracking solutions.

Here is an example encoding using TSC Auto ID's own RAIN CIN (0xD4D3C321) and a hex serial number of “12BC”:

Encode 0x1DAE to the PC Word.

This would set the:

- Length value to 3 because I will encode three Words starting at 0x20
- T bit to 1
- Encode 0xAE to the AFI portion

In binary this would be:

Length value	UMI	XI	T bit	AFI
00011	1	0	1	10101110
Equals 3 for the three Words I will encode	(Disregard)	(Disregard)	1 for an ISO encoding	Equals 0xAE for RAIN Alliance ISO Numbering System

Now, encode 0xD4D3C32112BC to the “normal” section of MB01 starting at 0x20. This would encode:

- 0xD4D3C321 which is TSC Printronix’s RAIN CIN as a hex value
- 0x12BC following the RAIN CIN as a sample serial number

Using the RAIN Alliance ISO Numbering System like this for closed-loop solutions gives you a cheap, easy, flexible and low-memory way to encode your tags without risking any Tag Clutter.

If you would like to learn more about how to use the RAIN Alliance ISO Numbering System for closed-loop applications, feel free to reach out to TSC Auto ID, or the RAIN website has some good materials.

Have a topic suggestion? Send ideas to Chris Brown at cbrown@tscus.com.

RFID News

RAIN RFID in Tires Masterclass

RAIN held our first “RAIN RFID in Tires Masterclass” in Germany last year. It was a huge success, and the RAIN Alliance will host the next Tires Masterclass in Yokohama, Japan, on 28 November, 2023. The class gets very technical and aims to really help tire companies and solution providers implement RAIN solutions. To learn more and register, click here.

RFID Healthcare Market Forecast

A new article by RFID Journal now projects a strong $2.6 billion dollar forecast in 2031, for RFID in the Healthcare market. The use of RAIN RFID in the Healthcare industry has traditionally been encumbered by complexity and challenges, but we are starting to break through and gain acceptance. From the Axia Institute’s pioneering work on tracking pharmaceuticals throughout the value chain to the RAIN

Healthcare workgroup to the AIM Pharmaceutical workgroup, we are starting to overcome the challenges.

Global Events

RAIN Healthcare Hosts Free Webinar

The RAIN Healthcare workgroup will be hosting a free webinar on “The Need for Source Tagging Medication and Medical Devices with RAIN” on 7 December, 2023.

Register

You're Invited! Join TSC at RFID Journal LIVE

Come see TSC Printronix at the Granddaddy of RFID trade shows, RFID Journal LIVE, April 9-11, 2024, at the MGM Grand in Las Vegas. Now in its 22nd year, LIVE! typically features more than 80 exhibitors from 26 countries showcasing best-in-class RFID tags, readers, software and implementation services. Visit the TSC booth and see our RFID products in action.

Save The Date! Join TSC in the Nordics

Come see TSC Printronix at RFID & IoT in the Nordics, 4. June 2024, in Copenhagen.

Recent RFID Blogs

1. **The Supplier's Ultimate Guide to Retailer RFID Mandates: From Surviving to Thriving** — As a supplier, we hope you are ready to begin applying RFID labels to your products for your retail customers. In this blog, we'll detail the steps you need to follow to properly tag your items with RFID.
2. **Tips to Comply with Retailer RFID Mandates** — Do you supply products to a major retailer? If so, your customer might have mandated you begin RFID-tagging your products. What are some RFID basics to help you comply with this requirement?
3. **RFID Tips to Support In-Store E-Commerce Operations** — Items with RFID labels are now arriving at your brick-and-mortar stores. Hopefully, you view this as great news. What do you need to keep in mind to take advantage of these newly tagged items?
4. **The Importance of RFID Standards for E-Commerce Solutions** — Successful RAIN RFID implementations in the retail industry depend on global standards to ensure that products are trackable across the value chain from the manufacturer through logistics partners and ultimately to the retailer.
5. **How RFID Can Help Optimize E-Commerce Operations** — From inventory management to choosing the most efficient labeling supplies, there's a lot to consider when integrating e-commerce operations into your enterprise.
6. **Implementing an E-Commerce Strategy Can Pose Challenges for the Value Chain, Can RFID Help?** — RFID has played a significant role in supporting e-commerce operations for major retailers like Walmart, Target, and Macy's. Even smaller retailers are adapting to the trends and putting up websites supported by RFID.

Find more blogs at https://usca.tscprinters.com/en/blog/rfid

Webinar Rewind: DLS & RFID

Are you a reseller just getting into RFID? If so, TSC Printronix Auto ID and our sister company, Diversified Labeling Solutions, recently hosted an introductory webinar to explain the basics of RFID printers and labels, and how resellers can begin joining the revolution.

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