SQRL Codes:

Standardized Quick Response for Logistics, Using the 12N Data Identifier

Standard Version 0.41

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1 Overview

This document provides an overview of a framework for organizing product-embedded and packaging-embedded information for pre-sales support, marketing, distribution, customer service, technical support, reverse logistics, refurbishing, disposition, and product disposal. The fields created under this standard are SQRL codes: Standardized Quick Response for Logistics. This standard is published for use under the 12N Data Identifier by the ANSI MH10.8.2 Committee, and the following document outlines the standard, as approved by the Reverse Logistics Association Standards Committee on SQRL codes. It is, essentially, a data dictionary.

Although this standard is named SQRL codes, it is technologically agnostic. The same scheme and data dictionary can be implemented in QR codes, or many other current or future technologies such as 2D (DataMatrix) bar codes or RFID. This framework should not be confused with the Secure Quick, Reliable Login (also known as SQRL), created by Steve Gibson (https://www.grc.com/sqrl/sqrl.htm), which is a system for using QR codes for securely logging into websites.

Our standard is intended to provide a framework so that all manufacturers, OEMS, distributors, retailers, processors and recyclers can have a common labelling system and vocabulary for organizing, storing and retrieving information that may be helpful to themselves, customers, or any other parties. The intent is to allow customers and supply chain partners the ability to easily access any information that may be required by the other parties, and for the creators of the information to control who has access to that information, in a way that minimizes duplication of effort and reduces the total effort required to share this information.

SQRL codes are not intended to replace existing bar coding systems, or other applications of QR codes. The SQRL codes are designed to supplement existing labels by presenting a condensed way to present whatever additional information would be useful to front-line service personnel and consumers. Additional information such as documentation, contact phone numbers, product specifications or recycling data can be included by being directly included, or Internet links.

Each company can choose which information Fields (described below) to store in the SQRL code. The company can also determine which information is available to customers, what will only be available to service professionals, and what will only be available to the manufacturer, depending on the access granted by the manufacturer.

For example, a customer may scan the SQRL code on the back of their TV to find and download a quick-start guide for how to hook up their cable TV and external speakers. A different customer may return that same model of TV to the retailer, where a customer service employee will scan the SQRL code to find out which cables and accessories were originally included in the box. A third customer may someday take their TV in to a factory authorized service center, where the employees will scan the SQRL code to access information needed to complete the repairs, and access a different SQRL code located inside the device that contains information necessary for diagnostics and repair, but useless to end consumers.

2 Why is a standard necessary?

Regular QR codes are produced using an open standard, so there is nothing to stop any manufacturer from creating its own labeling system—except the fact that if every company develops its own proprietary system of storing and displaying information, every customer and supply chain partner will need a different software application for every manufacturer, and those who do not have the proper software will be locked out.

If each retailer and manufacturer developed its own software, few customers would collect specialized readers from each and every manufacturer, and need for so many applications would discourage end users from making the effort to use it. Having a standard makes the codes much more useful and valuable to the end consumers.

2.1 SQRL Codes an ANSI-Approved Standard

MH10.8.2 is the ANSI-approved, international standard for encoding information on packaging, but is primarily implemented as one-dimension (1D) barcodes. It is used globally for sharing information on product packaging. The SQRL standard is compliant with the ISO 15434 standard which allows companies to place multiple data elements inside one barcode. The SQRL standard conforms to and builds on this existing, accepted standard. It functions as an XML Tag.

SQRL codes have been formally approved and added to the ANSI MH10.8.2 standard, which can be downloaded for free from the MHI website at www.MHI.org. As is detailed later in this document, SQRL codes are created the 12N Data Identifier from the MH10.8.2 standard.

As an ANSI-certified standard, all SQRL codes are a globally-accepted standard. As the standard becomes more widely implemented, the number of vendors offering scanners capable of reading SQRL codes is expected to steadily increase.

2.2 Benefits of Standardized SQRL Codes

Most QR code implementations currently available to customers primarily to take the user to a website. In order for customers and supply chain partners to access the information stored in the QR code, the SQRL reader has to look at the information stored in the tag and know what it is, and how to display it properly:

- The name of the manufacturer and the product name might be displayed as text
- If the code contains a link to download a manual, the reader needs to display it as an HTML link
- If the code contains a phone number, the user needs to be able to click on it to make a call

With our standardized codes, boxes traveling past a scanner in a distribution center can easily be read, and it is easy for the scanner to extract the manufacturer's name and the product's name and model number from each SQRL code, because every supplier will use the same system for identifying "this is the product name, this is the model name, this is the model number." If each supplier used its own system for labeling the information, the task for the distribution center would be infinitely more complicated.

SQRL code labels can also be placed directly onto products, etched onto the surface, and placed inside the product, where they are not visible to the customer. Packing and manuals are often discarded; having an optically scannable label directly on the product will facilitate the identification of products with links to support and product information.

Standardization is critical to the success of any labeling schema that is designed to communicate information to consumers. The Reverse Logistics Association is providing field-name arbitration services so that label-readers can be created that will work on labels produced by any manufacturer.

3 Definitions

Code – a complete tag or label following the SQRL protocol, 12N. May be presented as a QR or DataMatrix code, RFID or any of the other available formats.

Consumers - Members of the general public who can read information from the Code.

Creator - person or company who creates the SQRL Code.

Data Record - a Field Identifier followed by the Data to be stored.

Dictionary – the listing of all Fields, their Field Identifiers, the formatting of the information contained within each one, the maximum length of each, and any optional

Encryption Field Identifier – Specifies an Asymmetric Public Key encryption key which may be used to encrypt Data Records in the Code.

Environment – Specifies the language, currency, measurement system to be used for subsequent Data Records. Also specifies whether those Data Records can be viewed by Consumers, Professionals, or Enterprise employees.

Enterprise – employees of the manufacturer of record or OEM, who may be granted visibility of even more sensitive information on the Code than Consumers or Professionals.

Field – a piece of information which is to be conveyed to the recipient

Field Identifier – a four-character code which allows the recipient to know what type of information a Field represents.

Flag – options available with any Field Identifier, through which the Visibility, and Units of measurement can be set, temporarily overriding the options set for that Environment. Flags also indicate if a Table is to be used.

Label – synonymous with Code

Professionals – people employed by retailers, distributors, field service technicians, repair companies, refurbisher's, recyclers, etc. In the Environment Settings, these people may be granted access to more Data Records than Consumers.

Reader – software which allows the user to read the information stored in the Code.

Setting – options associated with the Environment FI, through which the Language, Currency, Units of measurement and Visibility and Encryption can be set, and are in effect until the next Environment FI.

Table – a lookup array in which meanings can be associated with the User Data contained in a Data Record.

Tag – synonymous with Code.

Title – the text that lets the User know what the information contained in the Data Record is to represent. For example "Company Name:", "Model:" or "Date of Production:", etc.

User Data – the data contained in a Data Record

User – a person retrieving information off of the Code. May be either a Consumer, Professional, or Enterprise employee.

Visibility Settings – an optional parameter which allows the creator of the Code to specify who may read the information in the Code. (The options are Consumer, Professional, or Enterprise)

3.1 Reserved Characters

The following characters have special meaning in the 12N format, and must not be used for other purposes. With the exception of the Concatenator, all are unprintable characters, but are represented by the characters shown below.

$^{E}O_{T}$ End of transmission, ASCII 30, only to be used in the End of Transmission at the end of the 12N Label.

$^{F}_{S}$ Delimiter, ASCII 28, which is used in conjunction with an FI, if Flags are being set, between the last Flag and the start of the User Data.

$^{G}_{S}$ Group Separator, ASCII 29, used in the Header, and if any other Data Identifiers from the MH 10.8.2 standard are to be used, the Group Separator must be placed after each Data Identifier and its data.

$^{R}_{S}$ Record Separator, ASCII 30, only to be used in the End of Transmission of the 12N Label, and in the Header.

$^{U}_{S}$ Unit Separator, ASCII 31, which is placed after each Data Record, except not after the last one.

+ Concatenation operator, ASCII 43, is used to include multiple separate pieces of information with one FI. For example, listing multiple countries could be included by saying “US+MX”. User Data which is made up of multiple words should not use the concatenator: “Extra Large Widget”.

4 Expandability

The SQRL standard is extremely flexible, and a process is in place for easily expanding the standard to include additional Field Identifiers.

4.1 Revisions to Standard

If companies discover shortcomings in the Standard, they are encouraged to suggest improvements to the Committee to make the Standard as useful as possible. Anyone may suggest new fields at any time, free of charge. Membership in the RLA is not required to suggest new fields.

It is easy to suggest new fields, modifications, extensions, or revisions, at any time, via the RLA website at http://rla.org/12Ncodes. The proposal must include:

- a suggested field title,
- data type (text, phone number, web URL, etc.)
- description of the information that would be visible on the reader screen, and
- a simple argument for the need for the field.

Proposed changes will be circulated for discussion amongst Committee Members and Associates for comment and a public review period. The Committee may make suggestions for clarifying and refining the intended role for the new fields, to minimize confusion and duplication between the proposed and existing fields. After all, a standard is only valuable if everyone understands the meaning of the information to be stored in the fields, and when to use which field. But the intention of the Committee is to make the standard as flexible and useful as possible for those implementing it.

After time for comment by Committee Members, the changes will be voted on by the Members. Once approved, the Standards Committee will publish revisions to the Standard, as needed, on a quarterly basis. Upon acceptance, the published field will be disseminated to all registered users as an update to the dictionary.

Over time, the SQRL schema will grow and be modified, and it seems possible that revisions to the standard, may, at some point, lead to changes in the way fields are stored or displayed. In the future, a Field Identifier will be implemented which contains information about which version of the standard was used to develop the label. This way, if future revisions to the standard lead to changes that affect the way older tags are displayed, the reader software can take into account the version of the standard that was used when the tag was created.

4.2 Companies Have 5 Fields they Can Use for Any Purpose at Any Time

If, at any time, companies determine that the existing set of Field Identifiers is missing a field they would find very useful, there are five (5) fields which are set aside for companies to use in any way which they desire. As described below, these FIs (described in Field Identifier Category “M” below), companies have complete control over which fields are visible by consumers, professionals, and within their own company, and have the ability to encrypt and data they desire.

Companies can use these 5 fields if there is any information they wish to share for which there is no existing Field that meets their needs. In order for their trading partners to be able to understand the meaning of the information in these fields, they will need to share that information with each trading partner. And then, if those trading partners also interact with other companies that have chosen to create their own meanings for these 5 fields, the trading partner will face the very difficult situation of having Fields which mean different things to different companies, significantly complicating things for them.

However, instead of using fields that are unique and used only by their closest trading partners, companies are encouraged to suggest new Field Identifiers to be created for general usage, so that all of their supply chain partners may access them. Field Identifiers developed for internal usage, are, by definition, not useful for sharing information with a wider audience.

In addition, a special designation is provided for manufacturers to encode proprietary information that is encrypted such that each manufacturer may control access to the information (see the section below, Code Readers). This allows manufacturers to tightly control who has access to any field. Manufacturers may do this for as many Fields as they desire.

4.3 Fair Use

Companies are free to use the standard to produce labels for their products, but the Reverse Logistics Association Standards Committee controls the list of Field Identifiers. The list of Field Identifiers and their definitions are copyrighted by the Reverse Logistics Association and any use of them other than for the creation of labels by manufacturers must be authorized. Implementation Technologies

The first technology that is being used to implement this framework is the QR code, but this framework is in no way limited to only QR codes. QR codes are just a very compact way to store printed information. Many other methodologies can be used to store the information from the fields.

4.4 SQRL Codes on Products and Packaging

In a QR implementation, the QR code will be printed onto the packaging or product and accessed by a QR code reader (as described below).

The maximum number of characters that may be stored today in a QR code is currently 4,296 alphanumeric characters. This means that a tremendous amount of information may be stored in a current QR code, and as the resolution of lenses and cameras in cellphones improves, the number of characters that can be stored is only likely to increase. Resolution and granularity will improve as the technology continues to evolve.

There is a tradeoff to be made, however, in that as the amount of information stored in the tag increases, the number of squares in the QR code increases linearly, which means that the QR code will have to take up more space on the product. QR codes are most frequently seen printed onto paper or plastic labels, but they can also be laser-etched into metal, plastic, and even wood.

Companies may choose to put one QR code on the outside of the packaging that provides a potential customer with information about the product, and maybe basic warranty information, but may not have detailed information about placing a warranty claim, for example. But a QR code on the back of the product, (or some less visible location like the inside of the battery compartment) may provide the

consumer with detailed information for acquiring a Returned Material Allowance, calling technical support, etc.

Additional QR codes may be placed inside the product, where they will only be seen by service personnel involved in servicing the product.

4.5 Not Only for QR Codes

The standard can be used not only for QR codes, but implemented in other storage and retrieval technologies, such as NFC, internal memory, or any other means companies may want to use to store and or transmit the information. This allows companies to store the information in one format across all storage platforms. Because we believe QR codes will be the first technology to be widely implemented, we speak throughout this document about scanning QR codes, but nothing in this standard requires the use of QR codes. The 12N standard is compatible with any ISO 15434-compliant standard.

As said above, the 12N standard is a common way for manufacturers and retailers to share product information with supply chain partners and customers. If customers want to relay that information via black and white dots (i.e. QR codes), or any other technology that the recipients can understand, that is perfectly fine with us.

For example, in the future, it is possible that all of the electronic devices a person interacts with will be connected to the Internet (Internet of Things), or be able to communicate directly with the user via NFC, Bluetooth, Wi-Fi, USB, or some other method. The manufacturer can store whatever information it wants to, and share it with the end user, via the same or a similar app.

The fields are platform-independent, and may be stored in any of a variety of formats, including, but not limited to:

- Graphical images: QR codes/DataMatrix/2D barcodes
- Flash/Random-Access Memory
- Read-only memory in a device
- Magnetic stripe
- Other methods as new technologies are developed.

Depending on the storage medium used, the information may be accessed by the user by:

- Scanning with DataMatrix/2D/QR code scanner
- Connecting via direct (e.g. USB, FireWire, Ethernet) wired connection
- Wireless connection (Wi-Fi, NFC, Bluetooth)
- Reading from a magnetic stripe
- Other methods as new technologies are developed.

If the tag information is being stored in an electronic medium, the character restrictions of the QR code are no longer relevant. However, the need for a standardized system for organizing the information remains extremely relevant.

4.6 Modifying Contents in Electronic Storage

In QR codes and ROM storage, the fields will be created when the tag is created, and accessed via software. Alternatively, if a re-writeable form of memory is used, the company may give itself the ability

to modify the contents of the fields after the item has been sold. As above, for digital storage, the number of characters is limited only by the amount of data storage capacity that the manufacturer wants to allocate to the fields.

5 Label Creating and Reading Software

5.1 Label Reading Software

The vast majority of the people who will interact with SQRL codes will be end users, either consumers, retail partners, or logistics personnel who are scanning the label to gain information about the product. Theoretically, a label may contain dozens of fields. Some of the information would be of primary use to a consumer. Other information may be of interest to a logistics professional. Neither would wish to wade-through dozens of fields of irrelevant information. Therefore, visibility parameters can be set for pre-selected audiences for each field.

In different situations, different users will want to access different information, and different software readers will be created to allow the different users to access the software as quickly and easily as possible. As will be described below, manufacturers will work with retailers to decide which type of visibility to give to each field.

When customers access the tag, they will be able to use the software to navigate to find the information that they are looking for. Supply chain partners may use different software layouts that take their employees directly to the fields that are most useful for the given situation.

In the case of QR codes, customers and employees will be using different QR code readers to receive the information, which will control which information they will see, as described above in section 4. Codes that customers are most likely to want to access will be given the C designation and be readily available, and codes they are less likely to want to access will be less readily available (with P and E designations).

Those same QR codes may also be used by professionals to access other information, information that is important for them to do their jobs, but not useful to the consumer. Any fields that companies have defined which are unique to a particular company (with the E designation) will not be available to end users but will be available to employees. Any fields that are only for service professionals or the manufacturer will not be accessible via the consumer version of the software.

If a person tries to scan a SQRL code using a standard QR code reader, instead of taking them to a website, (like they expect) it will give them a long string of text which will not be at all useful to them. As described below, in this case, the tag has to contain information which directs the user to an app store where they can download a SQRL code reader, in order to access all of the information stored in the tag.

The software also needs to know the user's preferred language and weight system. European customers will prefer to have information presented in the metric system, US customers will prefer the Imperial system. Information may be stored in tags in multiple languages, and the software needs to know which language is preferred by the user.

As described below, tag designers have flexibility in the sequence in which they include fields in a tag. By default, it is assumed that the fields will be displayed in the order that they appear in the tag. However, the creators of reader software have flexibility to design the software to present the information in whatever order or structure they think will be most beneficial or convenient for their users.

In addition to displaying the information, the reading software will also display Titles for the Data, so that the user can know what the information represents. Software developers will likely give the User the ability to control which Titles are displayed. The RLA will translate the Titles into several languages, and Users will be able to select which of these languages they would like the Titles displayed in.

5.2 Use with Non-SQRL-Enabled Readers

When a customer scans a SQRL code, if the person is using a SQRL-enabled QR reader, it will offer them options for accessing the information they are looking for. However, if a customer does not have a SQRL code-enabled QR code reader, all of the fields and tags might be read by this less advanced reader as gibberish, because it will have no idea what to do with all of this information.

Generally, most of the less-advanced QR code readers will expect to find a URL when scanning a QR code. Many readers, when confronting unknown content, will skip over it, looking for the next group separator ($^{G}_{S}$) character, and will begin interpreting the characters after it.

For this reason, we suggest that after the last Data Record, the Creator places the 33L Data Identifier, which allows a URL be included in the data, and then the URL of a website which will inform the User that the QR code they have scanned is a SQRL code, and that, in order to access this information, they should download a SQRL-Enabled reader. When the User's device goes to the URL, their device's request will include information about which operating system their device uses, and they will be shown the version of the URL which is relevant for the device (iOS, Android, etc.).

On this webpage, they will be shown a link to the relevant App Store for their device, where they can go and download whichever app they choose.

Another alternative is to use the 33L Data Identifier to take the User directly to a URL created specifically to provide customer service information for the product, and which contains all of the information stored within the tag. This will help the User answer their questions about the product, but not help them learn how to read SQRL codes in the future, although it would be possible to put the information about the SQRL apps on this page, also.

The difficulty of this for the manufacturer, of course, is that the manufacturer will be responsible for maintaining the URL, and the manufacturer should keep in mind that these SQRL codes will, in some cases, remain visible on the sides and backs of items that will continue to exist for years or even decades, probably far longer than any one company will be interested in maintaining the integrity of a website devoted to the product.

5.3 Label Creating Software

In order for label scanning or reading software to be useful, the labels must, of course, be created in compliance with this standard.

The RLA will license tools for creating labels. However, manufacturers may create their own labeling system for internal use. Software that allows 12N label creators to easily manage version changes to software will be helpful, and automatically populate information such as manufacturer's name, product name, etc., will also simplify the process.

The standard allows companies to incorporate a serial number and date and time of production in the label. In either of these cases, obviously, the company will need label creating software that is capable of generating a new 12N label for every individual item, on the fly, in real time.

5.4 Best Practices

As explained below, every 12N Code should, at a minimum, contain the Field Identifier B000, which identifies the company whose product the Code appears on.

Also, each product should contain at least one 12N code which is visible to the Customer, which will allow them to get customer support information. Additional codes may be placed inside the product, inaccessible to consumers.

6 Companies Decide Who Has Access to Each Data Field

A critical component of this standard is the ability of each manufacturer to decide who can access each piece of information. One way to do this is through encryption. Secondly, the creator can classify each Field of information with one of three designations. The technical details will be spelled out below, but the creator of a Label has the ability to control who has access to each Field on the label: C for consumer, P for professional or E (for Enterprise) for manufacturer's proprietary information.

Different code readers are being developed for use by each level of user. Consumers will likely have a fairly simple set of basic questions they are looking for answers to. Service professionals (field repair agents, customer service personnel, refurbishers, etc.) will require more technical details, and manufacturing and other personnel within the original organization may require even more detailed information. The standard allows a tag to be available to a specified audience.

6.1 Encryption in 12N

Two levels of encryption are available in the 12N standard.

Asymmetric: an optional Encryption Record provides an asymmetric encryption key which can be used to encrypt any individual Data Records found in the Code.

Symmetric: Additionally, a second form of encryption is available, which can be controlled at the Environment level, explained below.

It is important to note that the manufacturer may choose IUI (public-key) asymmetric encryption to protect access to any of the fields of their choosing. Companies also have the ability to encrypt any and all Fields within a label, using Symmetric encryption.

Any un-encrypted fields, not being encrypted, are stored in what is essentially a flat text file. If a consumer were determined to read the other fields, they would undoubtedly be able to find, somewhere on the internet, some software that would let them view the fields that they would not normally have access to.

This is not a major reason for concern, however, as the information contained in the P and E fields would not be of a proprietary or competitive nature, but rather information that would not be of interest or use to the end consumer. These fields will generally contain information about where and when the item was produced, and the presence or absence of certain materials.

Because the use of P and E designations are not, by themselves, enough to truly prevent all unauthorized parties from accessing the information, companies have the ability to encrypt any and all fields they desire, as discussed below in the section on Encryption.

6.2 C Designation for Consumer Information

It is realized that the number of fields potentially available in this schema is relatively unlimited. This can be overwhelming to the normal consumer who has a relatively limited set of concerns when decoding a label created under this standard. Reader software must be well-designed to make it as easy as possible for consumers and professionals alike to find and access the information they are looking for.

If a consumer uses a QR code reader, NFC device (or any other means, discussed above) to access the information about a product, they will only be allowed to view the fields with a C designation. Examples of codes likely to have the C designation would be basic product information (manufacturer's name, retailer's name, customer support information, etc.). For food-related products, a production date or batch number may be helpful in recall situations. But the manufacturer is free to choose to make any fields Consumer fields that they feel will be useful for the consumer.

Anything designated as "C" will also be available to Professional and Enterprise readers.

6.3 P Designation for Professional Reader

Fields with a P designation will only be accessed by supply chain partners such as retailers, distributors, refurbishers, repairers, disposal facilities, etc. P class users will also have access to all P-designated fields. The Professional Reader will also be able to access all fields with the C designation.

The professional readers will enable users to prioritize and filter fields of information to decode and display information relevant to their query. For example, a field repair agent may access information that will aid in the diagnosis and repair of the product. A customer service agent will need to access consumer fields, such as the product model number, etc. But the customer service agent may also need to access other information not available to the consumer, like information about whether the item is to be returned to stock, returned to the vendor, etc.

6.4 E Designation for Manufacturer

Fields with an E designation will only be accessed by the manufacturer. E class users will have access to the C and P class information. This is the highest level of access, and only used for any information that the manufacturer doesn't want available to anyone else, which might include things like the plant the product was produced in, or more detailed information such as the production line, or batch or lot numbers of raw materials that were used.

7 Structure of 12N Tags

Regardless of the technology used to store the information (QR, 2D barcode, ROM, etc.), the whole collection of information is referred to as a Tag, or Label.

7.1 Overview of Structure

Figure 1 shows the logical structure of the Tag.

The information in each Tag is stored in a series of Fields, the individual pieces of information (model number, weight, etc.). An identifying code known as a Field Identifier indicates what the information represents. Field Identifier is abbreviated as "FI." The combination of a Field Identifier and the information it is to store, is referred to here as a Data Record.

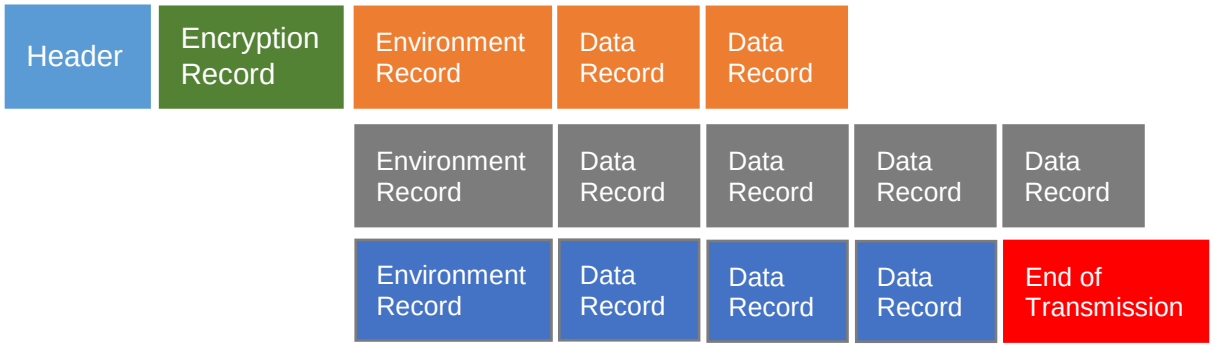

Figure 1. Logical Structure of SQRL Tag

At the start of the Tag there is a Header which lets the end user know that the information is stored using the 12N standard.

After the Header, there is an (optional) Encryption Header which allows the creator of the code to control access to the information in the code, using encryption.

The Data Records are grouped together with other Data Records that share the same measurement system (e.g. Metric) and language, etc. An Environment Record specifies things like language, measurement system, currency, etc., and all of the Data Records that come after an Environment Record will have those attributes in common.

Visually, we may represent the information in the tag as shown in Figure 1 above. The light blue Header is the first item in the tag, followed by the (optional) Encryption Record, whose information applies to all Records in the tag. After those two items, there are a series of Environment Records, each followed by the Data Records which use the same language, currency, etc. In the picture, all of the orange Data Records share the same attributes as specified by the orange Environment Record, all of the dark grey Data Records share the same attributes as specified by the grey Environment Record, etc.

For the purposes of the Figure, the different environments and records were shown on separate lines because they could not all be displayed together on one line of this document. In practice, of course, the fields are all written consecutively within the tag, one after the other, as in the following Figure.

Figure 1. Label Structure, Concatenated View

Figures 3 and 4 show another view of the structure of the Tags. Each Tag begins with a Header and ends with an End of Transmission, with the Data Records in between. In Figure 3, after the Header, five Data Records come immediately, and are not preceded by an Environment FI. These first five all use the default Environment settings. After this, an Environment FI is used, which means that the following two Data Records use the settings for that Environment FI.

In Figure 4, the Header is followed by an Encryption FI, which means that any Data Records in the Tag may be (but do not have to be) encrypted using the key provided in the Encryption FI. In this example, no Data Records use the default Environment settings. The first three use the settings from an Environment FI, and the final two use the settings from a second Environment FI.

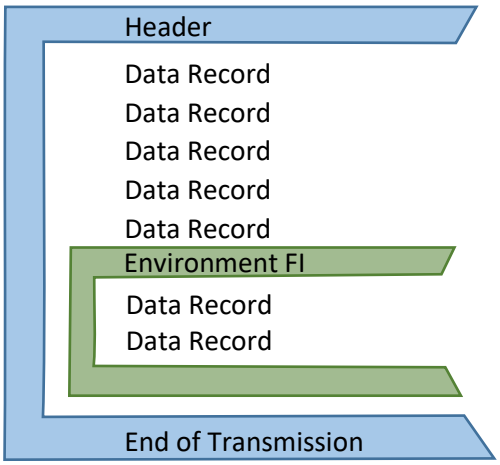

Figure 3: No Encryption FI and one Environment FI

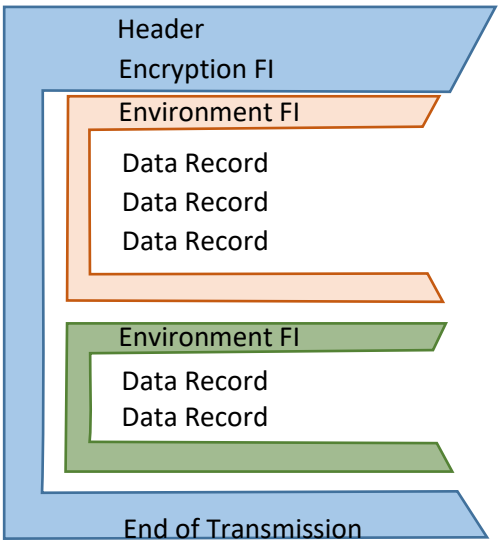

Figure 4: Encryption FI and two Environment FIs

7.2 Code Headers

Each SQRL Label must begin with the following series of characters.

"[)>$^{R}_{S}$06$^{G}_{S}$12N"

Beginning the Label with this exact header is necessary for the Label to conform to the ISO 15434 standard.

- "$^{R}_{S}$" is the Record Separator (ASCII 30),
- "06" indicates that the data uses the FACT Data Identifiers
- "$^{G}_{S}$" is the Group Separator (ASCII 29), and
- "12N" signals the use of the 12N standard. (A capital "N" must be used.)

The Record Separator, Group Separator, and Unit Separator are all represented in this document as a combination of one superscript character and one subscript character, but in reality each one is a single ASCII character, which is not printable.

7.3 End of Transmission

After the Header, the optional Encryption Record comes next, then an optional Environment Record, then one or more Data Records. After the last Data Record, the Label must end with

$^{R}_{S}\,^{E}O_{T}$

Where "$^{R}_{S}$" is the Record Separator (ASCII 30) followed by End of Transmission character, (ASCII 04). The End of Transmission character is also an unprintable single character, but represented in this document as a superscript "E", an "O", and a subscript "T".

As is the case for the Header, this exact combination of characters is required to alert the Reader that the Label conforms to the ISO 1434 standard.

7.4 Encryption Record

The use of encryption is optional, and as described above, both Asymmetric and Symmetric encryption are available. To use Asymmetric encryption, the (optional) Encryption Record should be used at the start of the Label. An Encryption Record consists of the Encryption Field Identifier, ZENC, immediately followed by the Certificate ID of the X.509 certificate containing the Asymmetric Encryption key, (aka "public key"), followed by the Unit Separator ($^{U}_{S}$).

All encryption records look like the following: "ZENCx…x$^{U}_{S}$" where "x…x" represents the Certificate ID of the X.509 certificate for the encryption key.

This Encryption Record applies to all of the data in the Tag, and allows the user to encrypt any individual Data Record all of the data in the Tag. If the Encryption FI is not present, the entire tag is readable by the public, unless Symmetric encryption is used in Environment FI, as described below.

7.5 Environment Records and Settings

Within a tag, the company can optionally use an Environment Record to specify the Language, Currency, Units, and Visibility (and Encryption) Settings that are being used for the fields that follow. Once the Settings are used, they remain in effect until another Environment Record is found. Each Environment Record must provide a value for all 4 Settings.

If no Environment Record is used, the default values are used.

Environment Records are used to specify the following:

- Language (default value = US English)
- Currency (default value = US dollars)
- Units to used (default value = metric)
- Visibility and Encryption (default value = Consumer, unencrypted, available for all to see)

The Environment Record takes the form "ZENVLLCCCUV$^{U}_{S}$".

- "ZENV" is the Field Identifier that signals that all of the Data Records after it (until the next Environment FI) will use the same Language, Currency, measurement Units, and Visibility and Encryption.
- The string "VLLCCUV" represents the Settings whose values must be set. All 6 characters must be present.

- "$^{U}_{S}$" is the Unit Separator.

Even if the user only wants to change one of these attributes, values for all three must be presented.

7.5.1 Language Setting

"LL" is a two-character (lower case) string which indicates which Language the User Data is presented in, (e.g. English, German, French, Chinese, etc., reference ISO 639-1:2002). For example, en = English, de = German, etc.

Companies may want to present product information in multiple languages, and a separate environment record would be used for each language. For example, product information might be given first in English (and since it is the default value, no Environment Record is needed to set this), and then a second Environment Record could be used to give that same information in Spanish, etc. The list of supported languages is included in Table B in the Appendix. Currently, 49 languages are supported, but additional languages can be added, as requested.

7.5.2 Currency Setting

"CCC" is a three character (upper case) string which indicates which Currency is being used (reference ISO 4217 3-digit code). For example, USD = US Dollars, EUR = Euros, GBP = British pounds sterling, CNY = Chinese yuan, etc.

The list of supported currencies is included in Table C in the Appendix. Currently, over 200 currencies are supported, and any additional currencies that may need to be added can be added, as requested.

7.5.3 Units (Measurement System) Setting

The third Setting in the Environmental Record indicates the measurement system to be used. Currently, only five are supported, listed in Table 1. "U" is a single (lower case) character indicates which measurement Units are being used: metric, US standard, imperial, etc.

A complete listing of the units available under each option can be found in the "Units Settings Defined Value" document at the RLA website listed above.

Indicator	System
i	Imperial
m	metric (default)
u	US
p	power
t	time

Table 1. Available Measurement Systems

If the company so chooses, it can put in one Environment Record that specifies that the units are in the Metric system, and the fields that follow will be displayed using Metric terminology, and then it can put in a second Environment Record, changing to the Imperial system, and the fields that follow will be displayed using Imperial terminology.

For example, a company may want to list the thickness of a piece of plastic film in mm, but display the dimensions of the box the roll comes in using feet and inches. Because the default is the metric system, the company can begin by listing the thickness in mm, and maybe an FI for the width of the product (perhaps also in mm), and maybe an FI for the weight of the product (grams per square meter, perhaps), perhaps ending with an FI for the weight of the material (in kg) and the weight of the entire packaged product (also in kg). Then they could put in another environment record specifying the US system, with FIs for the height, width, length and weight of the package in inches and ounces.

Measurements of power (e.g. watts or kw) have their own category, as does time. A complete list of the units available for each system is shown below in Table 3. The most recent version of the Defined Values for the Units Setting can be found at the RLA website.

The table shows the different units which are available for each system. Below, in the section on Data Identifiers, the Table Designator section explains how to indicate which value is to be used (e.g. mm, cm, m, etc.).

RLA 12N Standard, 2017-01-17
Units Setting Defined Values

Units Flag Value	"m" Metric	"u" US	"i" Imperial	"t" time	"p" power
0	Mm	mil (1/1,000 inch)	thou (1/1000 inch)	nanoseconds	watts
1	Cm	1/100 of inch	Inch	miliseconds	kw
2	M	1/32 of inch	Foot	1/100 of second	Newtons
3	Km	1/16 of inch	Yard	tenths of second	horsepower
4	Mg	1/8 of inch	chain	seconds	volts
5	G	1/4 of inch	furlong	minutes	kv
6	Kg	1/2 of inch	Mile	hours	amperes
7	Tons	Inches	league	minutes	hz
8	Ml	Feet	fathom	days	khz
9	L	Yards	cable	weeks	Mhz
0	Kl	Miles	nautical mile	fortnights	Ghz
A	degrees, C	oz (weight)	Link	months	Thz
B	mm^2	Pounds	Rod	years	bits
C	cm^2	hundred weight (cwt)	perch	decades	Bytes
D	m^2	Tons	rood	centuries	KB
E	mm^3	oz (fluid)	acre		MB
F	cm^3	Cups	fluid ounce		GB
G	m^3	Pints	Gill		TB
H	km per hour	Quarts	pint		PB
I		Gallons	quart		EB
J		degrees, F	gallon		

K		sq. inches	minim		
L		sq. feet	fluid scruple		
M		sq. yards	fluid drachim		
N		Acres	stone		
O		cu. Inches			
P		cu. Feet			
Q		cu. Yards			
R		miles per hour			

Table 2. Defined Values, Units Setting

7.5.4 Visibility and Encryption Setting

As described above, the creator can determine who can access information, and together with the Encryption Record, this setting makes this control possible.

"V" indicates the Visibility and Encryption Setting. SQRL code readers are available with three levels of Visibility access: Consumer (end users), Professional (retailers, installers, field agents, refurbisher's, etc.), and Enterprise (for the manufacturer or OEM).

By default, all Data Records are visible to all users: Consumers, Professionals, and Enterprise users. By changing this Setting, everything within the Environment can be restricted to only Enterprise users, or only Enterprise and Professional Users. It is not possible to make data visible only to Consumers or only to Professionals.

This Setting also allows and everything within the Environment to encrypted, either using public or private key encryption.

Which users can access the Data Records under each setting of "V" are summarized in Table 3 below. A value of "E" is the most restrictive, allowing the Data to only be read by Enterprise employees, and furthermore, it requires Asymmetric encryption, so the ZENC Encryption FI must be used, as described above. If the ZENC FI is not included, the data will not be readable by anyone.

A value of "P" (professional, encrypted), is the next most restrictive, allowing access to Professional and Enterprise users, using IUI (symmetric) encryption. "p" is the next most restrictive, allowing unencrypted access to Professional and Enterprise users. It should be noted that determined Consumers may find a way to obtain a Professional reader and access such unencrypted Data. Therefore, "p" should be used for data which is not highly sensitive, but technical details not of general interest to Consumers.

It is the responsibility of the label creator to choose an appropriate symmetric encryption algorithm (e.g., AES, Blowfish, CAST5, DES, IDEA, RC2, RC4, RC6, Serpent, Triple DES, Twofish, etc.).

A value of "c" is the least restrictive, allowing access to all users, and is the default value, in place when no Encryption or Environment values are set. "C" is more restrictive, using IUI (symmetric) encryption.

The final possible value for the Setting is "-" which leaves the Visibility and Encryption Setting unchanged from the last Environment FI, or from the default setting, if no previous Environment FIs have been used.

Who can see:	Value of "V" Setting: C	C	P	P	E
Consumers	unencrypted	IUI			
Professionals	unencrypted	IUI	unencrypted	IUI	
Enterprise employees	unencrypted	IUI	unencrypted	IUI	Asymmetric

Table 3

In Figure 3, earlier in the document, there is no Encryption FI, so everything in the whole Tag is open to read, unless individual Data Records are encrypted, as described below. In the other example, in Figure 4, access to the entire Code is controlled by the use of the encryption FI, ZENC, and the following Asymmetric public key. In Figure 3, the first five Data Records use the default Environment settings for language (English), currency (US dollars), measuring system (metric), and visibility (Consumer). But for the last two data Records, some of these settings have been changed by the use of the Environment FI. In Figure 4, one set of Environment Settings has been used for the first 3 Data Records, and different Settings has been used for the last two.

7.6 Data Records: Field Identifiers and Flags

As described above, each Data Record contains a Field Identifier, followed by the the User Data (which may be made up of many individual words and/or numbers), and ending with the unit separator, $^{U}_{S}$.

The Company Data Record, B001, must always be present, all other FIs are optional.

The Data Record begins with Field Identifier, (FI), like, for example 002, which is the FI for the product name. After the Field Identifier, the information follows immediately, with no leading spaces, although spaces may appear in the body of the data. For example, consider the following Data Record:

B002Widget Pro$^{U}_{S}$

The FI "B002" indicates that the information that follows is the product name, and then "Widget Pro" is the name of the product, and it is terminated by the unit separator, $^{U}_{S}$.

In addition, there are several optional **Flags** that the user may change which determine:

- who has Visibility to see the data (Consumer, Professional or Enterprise),
- the Encryption being used to protect the data,
- which Table to use to look up the meaning of the data (e.g. country codes)

The complete form of the Data Records is "XXXXVUT(TTT)$^{F}_{S}$x…x$^{U}_{S}$", where

- "XXXX" is the Field Identifier of four alphanumeric characters
- "x…x" is the User Data
- "$^{U}_{S}$" is the unit separator at the end of the Data Record. Required for all Data Records except the last one.
- "VUT(TTT)$^{F}_{S}$" Optionally, between the FI and the User Data, there may be three Data Flags and a delimiter of "$^{F}_{S}$" (ASCII decimal 28). If Flags are used all three must be present, and the delimiter "$^{F}_{S}$" must also be present.

Data Flags are optional. Data Flags must be placed immediately after the FI, be followed by the delimiter "!!" and immediately followed by the User Data as follows.

Flags: after the FI, a series of Flags may be included. Either all Flags must be present, or none.

"$^{F}_{S}$" Delimiter: Required if Flags are used. This unprintable character (ASCII decimal 28) indicates the end of the Flags, which lets the software know that the next character is the beginning of the User Data. They are required if Flags are used and must follow the Flags, and be immediately before the User Data.

"x…x" User Data: The User Data may consist of any alphanumeric characters. The only requirement is that the User Data must not contain the Unit Separator, Group Separator, or Record Separator characters. The concatenation operator must be placed in double quotes, as described below.

"+" Concatenation Operator: If multiple pieces of information are to be conveyed that require the same FI, within the User Data, the two pieces of information may be concatenated together with the Concatenation Operator, "+" (ASCII 43). For example, if the user wishes to provide multiple phone numbers for customer support, they would appear within the User Data as "8005551212+8005551234." If users wish to include this character anyplace within their data, it must be enclosed in double quotation marks (ASCII 34).

7.6.1 Visibility Flag

A Visibility Flag may follow after the FI. The Environment FI (described above) allows the creator to control who has access to all of the Data Records within an Environment, through the use of Visibility and Encryption Settings. The Visibility Flag allows the same type of controls to be placed on an individual Data Record, temporarily over-riding the settings of the Environment FI.

The meanings of the Flag values are the same as shown in Table 3 above. If no temporary override is needed, a value of "-" (ASCII decimal 45) should be used.

For example, if the Environment FI sets the Visibility to Professional, everything within the Environment is only visible to employees of the OEM, using Asymmetric encryption. However, the Visibility Flag for an FI can be set to Consumer, which will allow Consumers to see the User Data for that one FI. The visibility of the FIs before and after it within the Environment will remain at Professional.

Setting	Meaning
-	Visibility settings remain unchanged from last
c	Consumer, unencrypted
C	Consumer IUI encryption
p	Professional, unencrypted
P	Professional, IUI encryption
E	Enterprise, Symmetric encryption

Table 4: Visibility Flag Values

So, for example, the Data Record

```
B002cWidget Pro
```

contains a "c" immediately after the FI, which means that this User Data is unencrypted and visible to consumers. In this example,

```
B002CJx0/jcqsX8i6hShqh9aWFQ==
```

the capital "C" after the FI means that this User Data is visible to consumers, and encrypted, in which case, if a person doesn't have the key (which was "SQRL"), and the encryption type, (which was Blowfish), they will never be able to understand the information stored in that User Data field (which was "Widget Pro").

7.6.2 Units Flag

In the Environment FI above, the Units Flag shows whether metric, US standard, imperial, or power measurements are to be used. In the Units Flag of the Data Record, this alpha-numeric character indicates which level of units are to be used: m, cm, mm, etc. Rather than listing "cm", for example, the single alpha-numeric character designates the level from a pre-determined list. The "Units Settings Defined Values" document is available at the RLA website, and included above in Table 2.

For example, when a value of "m" is used in the Units Setting in the Environment, metric units are used. If the Units Flag is 5, that means the Data is being presented in g (grams). If the Units Flag is 6, the Data is being presented in kg (kilograms).

The value used in the Units Flag must be one assigned by the 12N Standard (or no one will know what it is supposed to represent), but possible values are a-z, A-Z, 0-9. The sole exception is that when a Table is used, (described next) the Units Flag should be set to "-", as no units are required.

The Units Flag allows the user to represent the weight of the item in whichever units they prefer. In US standard units, they could represent it as either ounces, pounds, or tons. By including multiple FIs, the company can include the weight in both ml and fluid ounces, or pounds and ounces as well as kilograms.

7.6.3 Table Designator

"T(TTT)" Table Designator is required if Flags are used. Many FIs (such as package weight, etc.), do not require any lookup table. When no table information is needed, and the data is to be returned "as is," a value of "-" (ASCII decimal 45) should be used in the Table Designator location.

The Table flag is 1 to 4 alphanumeric characters that indicate which 12N lookup table the meaning of the User Data is to be found in, so that the value included in the User Data can be translated into some result that will be meaningful to the end user.

For example, the RLA standard includes a table of User Return reasons. If the end customer returned an item because they changed their mind, the User Data would contain the value "U1A," and the software needs to know where to find out what this value represents. The TTTT value would be used to indicate that the RLA User Return reason table is to be consulted.

The Table Designator can be one to four characters, such as T, TT, TTT, or TTTT, and possible values for each T are a-z, A-Z, 0-9, but in addition, it must also be a valid table. If an invalid Table Designator is given, the software will have no way to know what User Data is intended to represent.

8 Best Practices

Best practices for the use of SQRL codes are still emerging. Below, Field Identifiers are grouped by categories, to help users identify the most appropriate one for their needs. Manufacturers can, of

course, put any selection of any codes from any category at any place they choose. The following are the recommendations from the committee:

A SQRL code label should be on the external shipping carton. That label should contain:

- Category B, BASIC Fields, with basic product information
- Category S, SHIPPING and CUSTOMS logistics information.
- Category G, GS1 and MSDS information

A SQRL code label should be in the individual product packaging, with the BASIC information plus Presales support, codes starting with B and P. Industry specific codes (codes beginning with I) such as "printer cartridges used" can also be included. Warranty information (W codes) would also be useful to users.

A SQRL code label should also be attached directly on the product. BASIC information plus User information and Warranty information should be included, codes beginning with B, U and W.

Specific applications, such as repair or fraud detection will require additional labels. Such labels should be placed either inside or on the bottom of a product such that it is not readily visible.

Ultimately, the placement of labels is determined by its intended audience. Information for logistics should be readily visible. Information for consumers should be on the product as packaging is generally not retained.

8.1 URLs

When including a Universal Resource Locator (URL) hypertext link in a label, companies should keep in mind that the more characters that need to be included in the label, the more squares that will need to be included in the label. This means that the label will either need to be made larger, which can affect the aesthetics of the packaging design, or if the size of the label has to stay of a given size, the squares will have to become smaller, which will make it harder for users to read the label.

To keep URLs as short as possible, it is suggested that companies use a link management program, (e.g. bit.ly, TinyURL, goo.gl, etc.) to make a greatly shorter version of the URL. The 12N standard committee has worked with the server 12N.IO to develop short codes customized for the use with 12N codes. More information may be found at http://12N.IO

Companies are also suggested to keep in mind that a 12N code, once printed on a device, may continue to exist in the physical world for years and even decades, and users will not be impressed by links that don't work. If a company changes the structure of its website (which has a strong chance of occurring over time), companies should make note of any URLs that have been distributed via 12N codes and implement a redirection method that takes the end user to the relocated, relevant information, perhaps by engaging a third party to manage the links into the future.

8.2 Sequence of Fields

As described above, by default, the fields will be displayed in the order they appear in the label, (although the reader software can be configured to present it in any order). As a result, tag designers are encouraged to put the most widely interesting information first, which is likely to include:

- Company name
- Product name
- Model number
- Customer support contact information (phone, email, website)

8.3 Internet Connectivity

Label creators are recommended to remember that there may be users who may not have internet access when they need to access the information, for instance field repair agents. In general, it is better to include as much information as reasonably practical actually in the tag, as opposed to creating hyperlinks to the information online.

9 Field Identifier Taxonomy

Below is a list of the Field Identifiers (FIs) that have currently been defined, but the list expected to grow quickly as the number of implementations increase. Please refer to the Master listing, hosted at www.RLA.ORG/12Nformat for the most up to date listing, and to request additional fields. The Field Identifiers, once posted will not change: they are permanently assigned. More FIs will be created, but once a given FI has been assigned a meaning, that meaning will not be changed.

9.1 Use of Field Identifiers

Companies are free to use as many or as few of these Fields as meets their needs. A product may contain multiple Labels using the 12N format. As recommended above, one label may be placed to be readily accessible to the end consumer. Thereafter, there may be multiple additional Labels with specialized data such as recycling information or product support and warranty instructions. Other Labels may contain specialized logistics information or regulatory information.

In many of the following Fields, manufacturers have a choice about how the information is to be displayed: for example, using text information or a URL linking to a website. The company is encouraged to remember that often people may not have an internet connection when trying to access the information in the SQRL code, and companies are recommended to make as much information as possible available without an Internet connection.

Some of the Fields are seemingly duplicated due to regulatory vocabulary. For example, some forms require a “country of origin” and others require a “country of manufacture.” We include both. The distinction might be moot, but regulatory forms are rigid, and the goal of the 12N format is to provide companies the ability to share whatever information is necessary with their supply chain partners and regulators.

Another example of duplication is the multiple choices for displaying a company name. FI B001 is the company name. It is recommended that this always be used. However, additional company name fields may be used as well such as FI B057 for a legal name. This additional name may be required for various shipping labels or legal requirements. In addition, a label creator will probably wish to include U007 for the company web site. The user may not be able to access the website right then, but the user should always be able to identify the manufacturer, at least by brand name.

The same FIs can be used more than once in a Label, perhaps to use different units (e.g. metric or U.S.), or to provide the same information in different languages. If multiple pieces of the same information are

to be provided, the FI can be used once, and multiple pieces of data may be concatenated together using the "+" operator, as described in the section on Data Records. Some fields benefit from a lookup table such as Computer Repair Codes or Reasons for Return Codes, as described above in the section on Table Designators. The standard has developed these in an auxiliary database that is appended. Manufacturers designing labels will also be able create and point to a proprietary database maintained by the manufacturer, but the technical details of this implementation are still under development.

9.2 Field Identifier (FI) Categories

As described above, the FIs are simple four character, alpha-numerical strings. The first character is an upper case letter, followed by 3 alpha-numeric characters. If all numbers 0-9, and all (uppercase) characters A-Z are used, this allows the creation of $26*36^3 = 1,213,056$ different FIs. It is hard to imagine this not being enough possibilities. For the present, FIs are created using only numbers in the final 3 digits, which provides $26*10^3 = 26,000$ possible combinations, which would seem to be more enough for the foreseeable near-term.

For ease of explanation, the FIs are sorted into categories. The categories are general, and may be somewhat arbitrary in that an FI may be useful in more than one context, and could have been listed in more than one category. This arrangement will hopefully, on balance, be a helpful tool for finding FIs when constructing labels.

9.2.1 Field Identifier Categories:

A	(reserved)
B	BASIC product info
C	CERTIFICATIONS
D	DIGITAL toe tag
E	ERROR codes
F	Food/Pharma
G	GS1 AI codes/ GHS (Globally Harmonized System)/ ANSI MH10 (Material Handling)
H	(reserved)
I	INDUSTRY specific
J	(reserved)
K	(reserved)
L	(reserved)
M	MANUFACTURER/refurbisher

N	(reserved)
O	(reserved)
P	PRESALES support
Q	(reserved)
R	RECYCLING
S	SHIPPING and customs
T	(reserved)
U	USER information
V	(reserved)
W	WARRANTY/registration
X	(reserved)
Y	(reserved)
Z	Administrative Content

Fourteen of the categories are currently reserved for future use. As explained above, the 12N format will expand to meet the needs of the users, so it is nice to have over half of the alphabet still available, with the possibility of up to 1,000 FIs for each letter.

Currently, there are three designated categories for information likely relevant to consumers:

- Category B (for Basic) is considered the basic information that should be available on all products.

- Category P (Presales Support) contains fields relevant for labels that might be created for external packaging to be accessed publically. Its URL addresses can be customized to provide targeted information.
- The U category provides User information such as documentation and links to product support. Fields in the U category should be incorporated into a label actually on the product (unobtrusively of course).

9.3 FI Category B: Basic Product Information

These FIs are for general information about the product that is applicable to all items produced. This is the minimal information that should be included in each RL encoded label.

In the charts below, the column FI represents the Field Identifier codes. These FIs should generally be on all products, inconspicuously. They should also be posted on product packaging except for the Serial Number which may be only inside the package.

FI	Title	Meaning	Type	Usage
B000	Company Name	Brand Name	Alpha	This may not be the same as the legal name but rather the common brand name
B001	Product Name	Product Name	Alpha	
B002	Model Number	Model Number	Alpha Num	
B003	Product Data Sheet	Product Features	URL	Full product specs
B004	Date of Production	Date of Production	Date	
B005	Product Serial #	Product Serial #	AN	For security purposes, the FI should normally, when practical, not be included on packaging but always on the product.

It is recommended that this basic information be included in labels placed directly ONTO actual products that are shipped to consumers. The other categories related to this basic information for consumers is **Category U** for User Information and **P for Pre-Sales support**. The later data, as discussed below, is appropriate for a label placed on the product packaging.

9.4 FI Category C: Certifications

Certifications are generally listed on product packaging and often on the inside of a product. They may be on a separate label. For economy of space, they may be merged with Recycling and Environmental safety information.

FI	Title	Meaning	Type	Usage
C06B	Product Certifications		URL or Alpha	Lists all certifications
C01E	RoHS		A-N	
C01F	WEE		A-N	
C020	FCC Certification		A-N	

C021	FDA Certification Level		A-N	
C022	CE Certification		A-N	
C026	EPEAT Level		A-N	
C027	Energy Star Rating		A-N	
C028	Energy Consumption (CEA R7.8)		A-N	
C04F	Image of Certification Sticker		Image/URL	

The certification listings of agencies will become grow as global regulatory requirements increase. This often requires manufacturers to dedicate significant labeling real-estate to indicate compliance. A consolidated 12N code can replace this clutter. An alternative schema (C04F) would be to include a small logo image and/or a URL address where the certification is discussed. Remember that the scanner may or may not have access to the Internet.

9.5 FI Category D: Digital Toe Tags

These codes are used to create an optically scan-able repair record. This label is expected to be inside the computer, or unobtrusive on another device. It is optically scan-able since power and/or connectivity may be an issue. Only one DTT should be visible.

FI	Title	Meaning/Display	Type	Usage
D051	Diagnostic Event	[Date][a-n][xx][ID] Where [Date][FI050][FI059][FI054]	A-N Model	Date, List of error codes, disposition and facility. Manuf. has choice of using standardized codes or posting proprietary data. See below This is posted to the Master Repair Record
D052	Manufacturers Master Repair Record (MRR)	Listing of every repair record related to specific product	URL	Aggregation of repair events, more detail stored on line. The Master repair record should contain F151 and FI53, FI54, FI58, FI050 and FI5F. These fields should compose one record.
D053	Diagnostic Site	Name, ID or URL	A-N or URL	Identification of diagnostic site
D054	Repair Site	Name, ID or URL	A-N or URL	Identification of repair site.
D058	Date of Return	When item was released from repair	Date	In conjunction with FI059
D059	Disposition	Proprietary Code or Standardized Code	A-N XX	In conjunction with FI058
D05A	Count of Events	Incremented number of repair events	NN	Displayed on FI051 if record count in MRR >1. Thus [Date][FI050][FI059][FI054][FI05A]

D05F	Repair Notes	Technician notes	Alpha	This information is generally not encoded into an optically scan-able record, but is entered directly into the cloud MRR. If it is produced as an optical record, it should be uploaded when practical to do so.
D073	Reason for Customer Return	List of reasons for product return	code	Manufacturers and channel partners have codes for product returns. As part of the 12N protocol, a standardized listing is in Appendix R.
D111	Reason for Partner Return	List of reasons for return from retail partner	code	Listing of reasons for returns found in Appendix R.
D074	Place Returned	Identification of place product returned	Alpha or Code	May represent a retail chain, or physical location. Manufacturer can either use text or use a proprietary coding system
D111	Product Condition	Visual inspection	code	Describes condition of product (visual)
D112	Missing parts		Code	Codes for missing parts
D113	Destination		Code	Describes the process or facility unit should be sent to. Not a physical address. See Appendix R.
D114	Disposition Action	**Disposition Action**	Code	Instructs supply chain partner what action is to be taken

9.6 FI Category E: Error Codes

FI	Title	Meaning	Type	Usage
E050	Error Codes Computer		A-N	This is a look up table for a standardized listing of computer error codes. Many manufacturers and diagnostic systems have proprietary systems. Label designers may point to or use their proprietary codes in lieu of the listing but must point to any maintain their own data base. See instructions above to use proprietary look up tables. The details for our Standardized Codes are included in Appendix E
E05B	Printer Error codes		A-N	Under Development
E05C	IoT error codes		A-N	Under Development
E094	Error Code	**a-n**	**Code or URL**	Proprietary error code

E095	SC Connector Failure:	**a-n**		Telecom product Code For Failure
E096	Frame Relay Failure	**a-n**		Telecom Product Code For Failure

In Section 9 there is an exploration of how to create and use Digital Toe Tags.

There are different regulatory/standards bodies that are universally recorded on products. Having the AI codes from GS 1, such as the UPC code, scan-able in a consolidated label with other related information would be a convenience. This may duplicate existing bar-codes. Likewise, the Globally Harmonized System (GHS) Material Data Safety Sheets can be encoded into a single scan-able label. This is discussed below. ANSI MH10, likewise offers standardized codes that are relevant to logistics.

9.7 FI Category F: Food and Pharma

This category is primarily directed to provide product information to the consumer. Much of this information is required by law for consumer protection. Food packaging often restricts the real-estate resulting in illegible content. SQRL codes address this issue. Other relevant information may be found in other categories.

FI	Title	Display	Type	Usage
F061	Ingredients	Ingredients	URL or Alpha	Food, pharma
F0162	Contains GMOs?	GMO contents?	y/n	
F063	Contains Allergins	Known Allergins	alpha	
F064	Recipes:	Click for Recipes:	URL	
F09A	Inactive ingredients	Inactive ingredients	URL or Alpha	
F09B	Active ingredients	Active ingredients	URL or Alpha	
F09C	Alcohol content	% alcohol (by volume)	n.n%	
F09D	Beer bitterness	Bitterness rating, (IBU)	nn	International Bitterness scale
F09E	Heat scale	Scoville units	nn,nnn,nnn	“Heat” of peppers, etc., measured in Scoville units
F09F	Serving size	Serving Size	nnnn.n	Units based on Environment settings
F101	Servings per package	Servings per package	nnnn.n	
F10D	Calories per Serving	Calories per Serving	nnn.n	
F062	Food/Pharma: GMOs	GMOs: Does this product conain GMOs?	Y/N	
F063	Food/Pharma: allergens	Allergens: does this product contain known allergens	Alpha (if yes, list)	Dairy, soy, peanuts, almonds, etc.

F102	Vegetarian	Is the product vegetarian?	Alpha	
F103	Vegan	Is the product vegan?	Alpha	
F104	Kosher	Is the product kosher?	Alpha	List certifications
F105	Cage-Free			
F106	Free-range			
F107	rbGH	Farmers pledge to not use rbGH?		
F108	Organic			List certifying organization
F064	Food/Pharma: recipes, uses	Recipes, uses	URL	
F072	Nutritional Value	Nutritional Values	URL or Alpha	
F10A	Hallal?	Hallal? If yes	y/n	
F10B	Gluten Free?	Gluten Free? If yes	y/n	
F10C	Contains nuts?	Contains nuts? If yes	y/n	Specifically called out allergy

9.8 FI Category G: (For Governing) Mandated Codes

This standard recognizes that information contained in other industry standards is relevant to the supply chain. We therefore expect that this labeling protocol can and will be used to encode the content of other standards. Our protocol therefore has built-in recognition of other standards. We will add extensions as requested by either manufacturers or standards bodies. The 12N standard is not intended to replace other existing standards, but to allow companies to share with supply chain partners the information from those standards.

Some special information fields are also acknowledged: Manufacturers may have obtained certain certifications or designations from other groups such as the various RFID standards bodies, or Earth911 which track carbon footprints. Manufacturers participating in such programs may wish to encode certain information into the label. Provisions are made for this.

Finally, GS1 has many related Fields related to forward logistics, particularly their AI (Application Identifiers). Manufacturers may wish to encode information relevant to their GS1 codes into our protocol.

9.8.1 GS1 Fields

GS 1 is a global standard organization that licenses unique numbers that are used for shipping, inventory and record keeping. They are usually bar codes. This listing is not intended to replace the current labels, but offers a protocol to use the licensed numbers for additional applications. Their fields are referred to as AI codes. The following listing of AI codes are the most commonly related to reverse logistics.

FI	Title	Meaning/ Display	Type	Usage
G029	UPC Code	UPC #	A-N	

G02A	GTIN Trade Item Number	AI Code	A-N	
G02B	GTIN-8 Trade Item Number	AI Code	A-N	
G02C	GTIN-12 Trade Item Number	AI Code	A-N	
G02D	GTIN-13 Trade Item Number	AI Code	A-N	
G02E	GTIN-14 Trade Item Number	AI Code	A-N	
G02F	GLN Global Location Number	AI Code	A-N	
G030	GSCC Logistics Units	AI Code	A-N	
G031	GSIN Grouping of Logistics Units	AI Code	Image/URL	
G032	GINC Grouping of Logistic Units	AI Code		
G033	GIAI Individual Assets	AI Code		
G034	GRAI Returnable Assets	AI Code		
G035	GSRN Service Relationships	AI Code		
G036	GDTI Document Types	AI Code		
G037	GCN Coupons	AI Code		
G038	GPID Component and Parts	AI Code		

9.8.2 GHS MSDS Fields

The Globally Harmonized System (GHS) adopted by OSHA in the United States and most other countries. It is a system for the Classification and Labelling of Chemicals. GHS defines and classifies the hazards of chemical products, and communicates health and safety information on labels and safety data sheets, called MSDS for Material Safety Data Sheets. There is value in making some of this information available through an optical scan. Other GHS codes are included in Category S along with other Shipping information.

FI	Title	Meaning	Type	Usage
G075	MSDS Identification			MSDS Date Sheet Contents
G076	MSDS Hazard(s) identification			
G077	MSDS Composition/ information on ingredients			
G078	MSDS First-aid measures			
G079	MSDS Fire-fighting measures			

G07A	MSDS Accidental release measures			
G07B	MSDS Handling and storage			
G07C	MSDS Exposure control/personal protection			
G07D	MSDS Physical and chemical properties			
G07E	MSDS Stability and reactivity			
G07F	MSDS Toxicological information			
G080	MSDS Ecological information			
G081	MSDS Disposal considerations			
G082	MSDS Transport information			
G083	MSDS Regulatory information			
G084	MSDS Other information			

Other mandated or required labeling:

G090	CLIE Codes	Telecom Industry		Assigned by iConnectiv

It is expected that the data for the above Fields may be included in a separate label. Considering the current resolution of optical scanning technology, careful design would allow this data to reside comfortably with select data from Category S- Shipping. Such labels would ordinarily be placed on containers or cartons. Rarely would such information be required on a product or product packaging with a possible exception of FI078 First-aid measures.

9.9 FI Category I: Industry-Specific

There are many industries that require specific information unique to their products: e.g. only printers use cartridges. However, for the rest of their data, generalized codes work fine. Any industry can request a specialized FI. Manufacturers are also designated proprietary fields which they can use for this purpose and any unique requirements. But for any information need which may be widespread across an industry, companies are encouraged to request additional FIs for their industry. FIs can be requested at the RLA website at http://rla.org/12Nformat.

FI	Title	Meaning	Type	Usage
I018	Printer: cartridge	Cartridge or toner ID	A-N	
I03A	Refurb: Serial Number	Shows new serial number	A-N	

I03B	Refurb: original serial #	Stored OEM serial #	A-N	
I055	Refurb: warranty terms	Displays new warranty terms	URL or A-N	
I056	Refurb: Product registration	"Register warranty here"	URL	
I05D	TV: Remote Control ID model	Remote Control ID model	A-N	
I05E	TV: Remote Control Encoding scheme	Remote Control programming codes	URL	
I10E	Publishing: ISBN	International Standard Book Number	N	

9.10 FI Category M: Manufacturer information

Manufacturers often need to track a variety of data points that are not generally communicated. Sometimes this is because the information is proprietary. Sometimes, it is merely too much information and only required in specific instances. The SQRL code protocols allow for this by 1) allowing for manufacturers to elect to encrypt any field. There are two layers of encryption: for professional readers and another for manufacturer authorized personnel. This is discussed above in Section 4.4. Manufacturers may elect to assign any level of encryption to each and any of these fields.

FI	Title	Meaning	Type	Usage
M006	Product configuration	Product configuration	A-N	Product lines often have a range of options such as HD size, RAM, etc.
M019	Manufacturer Proprietary	Titles given by manufacturer	Set by Mfg.	As discussed above, these FIs may be assigned any Visibility Flag
M01A				
M01B				
M01C				
M01D				
M023	RFID: Product UID	Matched pair for RFID validation	Numeric	12N codes can be used in RFID environments
M024	RFID: UID Validation		URL	
M048	Top Assembly Form	Package contents	URL	
M049	Return product requirements	Must Include:	URL	Channel partners must include certain components of a returned prodcut. Companies specify mandatory components here.
M04A	Product image	Displays product image	URL	Useful in detection of counterfeits and differentiating required components

M057	Manufacturer Legal Name	Manufacturer Name	A-N	Required for some applications if different from Brand Name B000
M060	Recall Status	Product Recall	URL	Should be visible to consumers on all products
M06C	MAC Address	MAC Address	A-N	Unique identifier on all network interface devices
M06D	Product Code	Product Code	A-N	Assigned by manufacturer
M06E	Packaging ID	Packaging ID	A-N	Assigned by manufacturer, for internal use
M06F	EAN Number	EAN Number	13N	International Article Number
M070	Batch #	Batch #	A-N	For internal use, similar to Lot #
M10F	Plant #		A-N	For internal use, may be by geographic name, or internal plant code
M110	Line #	Production Line #	A-N	For internal use
M071	Version #	Version #	A-N	

9.11 FI Category P: Pre-Sales Information

While labeled as pre-sales support, this category is focused on the types of information that may be considered useful on the outside of product packaging.

FI	Title	Meaning	Type	Usage
P00E	Pre-sales support	Click here for sales support	Chat VOIP URL	Finding sales support at big box stores may be difficult. Some manufacturers may wish to supplement channel sales support by offering direct help to potential customers.
P00F	Manufacturer web site for pre-sales	Special website for pre-sales	URL	P00F goes to a pre-sales support. Other URLs may assume the customer has purchased the product.
P010	Accessories	Accessories specifically for the product	URL	
P066	Promotions	Details of promotions or coupons	URL	
P067	Product Brochure	Sales Brochure	URL	More sales content than the data sheet.
P068	Product Video	Promotional video	URL	
P069	Product Requirements	Abbreviated Data Sheet	URL	Including this information may help reduce No Fault Found returns

P06A	Compatible Products	Listing of compatible products	URL	Including this information may help reduce No Fault Found returns

9.12 FI Category R: Recycling Information

FI	Title	Meaning	Type	Usage
R011	Hazardous Material	Contains Hazardous Materials	coded	List of potentially hazardous materials, consumer version. Details in G076
R012	User data	Contains user data?	Y/N	Products contains user data must be scrubbed before being re-sold.
R013	Disposal instructions	How to dispose:	URL	Instruct consumers how to properly dispose of product
R014	Flammable?	Flammable?	Y/N	May be coded to indicate level of flammability
R015	Types of plastic	Types of plastic	Coded	List of metals in product
R016	Types of metals	Types of metals	Coded	List of plastics in product
R025	Recycling location	Recycling location	URL	Manufacturers may subscribe to Earth911 or other service which provides recycling locations to consumers
R117	UN numbers	UN hazardous material ID number	nnnn	UN Committee of Experts on the Transport of Dangerous Goods
R115	Recycling pick-up	Schedule pick-up	URL	Schedule pick-up of item for recycling

9.13 FI Category S: Shipping and Customs

This initiative began in the effort to supplement standardized labeling with additional fields of information related to reverse logistics, and logistics in general. It was realized that providing more information to consumers would expedite many reverse logistics processes. Business processes often require precise language. The same information is required in many different business processes but they use different vocabulary. Many fields are thus duplicative as the proper vocabulary may be critical. Likewise, some processes require exact data templates. The models of these templates are described herein as best as understood at this time. Please provide feedback regarding these templates.

FI	Title	Meaning	Type	Usage
S039	Ideal storage temp range	Ideal storage temperature range	nnn.n, nnn.n	Upper and lower storage temperature range. Single value interpreted as upper range value.
S03C	HS: Schedule B	Export codes	xxxx.xx.xxxx	Harmonized system number for product being shipped, used to collect trade statistics
S116	GHS classification	Physical, health and environmental hazards	alpha	Global Harmonization System of classifying and labeling substances.

S03D	Harmonized tariff Schedule	Tariff classification, based on origin and composition	xxxx.xx.xxxx	Determines duties owed
S03E	NMFC	NMFC standard	xxxxxx.x	National Motor Freight Classification system based on density, handling, storability and liability
S03F	Dangerous products	List of products not otherwise listed	alpha	
S040	ECCN	Export control classification number	nAnnn	Designation from Commerce Control List, determines need for Export license
S041	Hazmat identifier	Hazard identifier	n.n	Identifies level of danger of the product
S042	Country of origin	Country of origin	AN	Code may be alpha, or country code. May be proprietary or public (e.g. ISO 3166-3)
S043	Sub-assembly origin	Sub-assembly origin	AN	Code may be alpha, or country code. May be proprietary or public (e.g. ISO 3166-3)
S044	Country of manufacture	Country of manufacture	AN	Code may be alpha, or country code. May be proprietary or public (e.g. ISO 3166-3)
S045	Value for customs	Value for customs	xxxxxxx.xx	Declared value for customs
S046	Currency	Currency for customs value	Code	If different from Environment setting
S048	Max. stack height	Maximum height units may be stacked	Numeric	In feet or meters, according to Environment setting
S118	Max. stack units	Max. stack units	Numeric	Maximum number of units that may be stacked
S04C	Clamp truckable	Clampable	Y/N	Whether boxes can safely be picked up with a clamp truck
S04D	Expiration date	Expiration date	Date	Date after which product no longer useful
S04E	Lot Code	Manufacturer's Lot Code	A-N	Manufacturer's Lot code
S118	Controlled Substance	Drugs, explosives, weapons	alpha	May or may not be hazardous

9.14 FI Category U: User Information

There are many categories related to consumer facing information. Category B is Basic Information that should be on all products. Category P (Pre-sales support) includes information appropriate to place on packaging. Category U is information related to information relevant to owners of products that require support.

FI	Title	Meaning	Type	Usage
U008	User documentation	Link to user product manual	URL	Making this information readily available to users may significantly increase satisfaction
U115	Quick-start sheet	Simplified instructions	URL	
U009	Contact customer support	Click for customers support	URL, Chat, or VOIP	
U017	Types of batteries	Battery types	A-N	
U085	Internet of Things Address (IoT)	Connect by clicking here	URL	Automatically connect device
U086	IoT web site	Instructions	URL	Instructions for IoT connectivity

9.15 FI Category W: Warranty Information

Making accurate warranty information easily available will reduce call center activity and warranty fraud.

FI	Title	Meaning	Type	Usage
W00A	Warranty terms		URL or alpha	
W00B	Length of warranty		A-N	
W00C	Warranty Registration		URL	Link to direct warranty registration
W00D	Extended warranty		URL	Link to page to acquire an extended warranty

10 Reverse Logistics Codes

This is an auxiliary standardized database of codes to be used in conjunction with D073 Reasons for Return and D111 for item condition.

10.1 Item Condition

These codes are used to describe the condition of the returned item, and are used with the D111 FI for item condition. Multiple codes can be placed after the FI using the concatenation operator "+".

10 Unopened packaging
11 All parts present
12 Some parts missing
13 Unused
14 Has been powered on (electronics)
15 Worn (garments)
16 Washed (garments)
17 Damaged
18 Ripped (garments)
19 Soiled (garments)

1A	Old/obsolete packaging style
1B	Packaging damaged
1C	Packaging missing
1D	Past date code
1E	Less than one month before date code

10.2 Customer Return Reason

These codes are used to describe the reason that the consumer returned the item, and are used with the D075 FI for return reason. Multiple codes can be placed after the FI using the concatenation operator "+".

1F	Customer changed mind
20	Customer bought too many
21	Found lower price elsewhere
22	Cosmetic defect
23	Damaged packaging
24	Clothing does not fit correctly
25	Clothing does not go with other clothes
26	Product does not work with other products as expected
27	Instructions to difficult to understand
28	Customer could not get product to work
29	Product did not arrive in time for intended use
2A	Damaged in shipment
2B	Missing pieces/components (list missing items)
2C	Product does not turn on
2D	Product does not work correctly (list of symptoms, from 8.5.5)
2E	Product stops intermittently (list of components: screen, etc., from 8.5.6, Components needing repair)
2F	Product too close to date code
30	Product Expired
31	Product Recalled
32	Product obsolete
33	Incorrect product ordered
34	Incorrect quantity ordered
35	Incorrect product shipped
36	Incorrect quantity shipped
37	Incomplete shipment
38	Duplicate order
39	Duplicate shipment
3A	Miscellaneous

10.3 Retail Partner Reason Codes

In addition to the Consumer Return Codes above, the following reasons may be used for explaining why the retail partner has sent the product to the recipient, using the D111 FI for return reason. Multiple codes can be placed after the FI using the concatenation operator "+".

3B	Regular delivery
3C	Expedited delivery
3D	Product shelf-worn (cosmetic packaging damage)
3E	Product too close to date code
3F	Product expired
40	Product damaged
41	Packaging damaged
42	Product damaged in transit
43	Too many units on hand
44	Product not selling
45	Product needed at another location
46	Product recalled

10.4 Destination

Information is required about where the product should be sent next, using FI D113. These codes identify the facility that the product should be sent to. From one of these facilities, the product may next be sent to another of the facilities, so the code my contain information stating which Returns Center the product should go to, as well as which refurbishing center it will go to.

47	Send to Returns Center
48	Send to Distribution center
49	Send directly to customer
4A	Send to other retail location
4B	Send to outlet store
4C	Send to online sales
4D	Send to in-house refurbishing
4E	Send to external refurbishing
4F	Send to broker

10.5 Processing Codes

After diagnostic tests have been run, a decision must be made about what processes should be done to the unit.

50	Replace components (using component codes from above)
51	Upgrade components
52	Secure shredding (computer)
53	Secure shredding (paper)
54	Repackage

10.6 Disposition Activity Codes

When a product has been evaluated, a decision is made about what is supposed to be done with the product.

55 Sell as new
56 Sell as is
57 Repackage and sell as new
58 Repackage and sell as second quality
59 Recondition/refurbish and sell as refurbished
5A Return to vendor
5B Sell on secondary market/salvage market
5C Donate to charity
5D Recycle as is
5E Harvest parts
5F Destroy
60 Secure destruction
61 Landfill

10.7 Testing Process Codes

At any point in the logistics process, it may be determined that variety of tests and evaluations are required.

62 Full system scan
63 Remove spyware
64 Remove ransomware
65 Remove viruses
66 Test hard drive
67 Test memory
68 Test Ethernet jack
69 Test USB ports
6A Test power jack
6B Test headphone jack
6C Test mic jack
6D Test Speakers
6E Test mic

10.8 Testing Results Codes

The following are possible results from running diagnostic tests/inspections.
The following are binary (T/F) defects:

6F NFF – No Fault Found
70 spyware
71 ransomware
72 viruses
73 hard drive

74 memory
75 Ethernet jack
76 USB ports
77 power jack
78 headphone jack
79 mic jack
7A Speakers
7B Mic
7C Skin/case

11 Country and Currency Codes

The following country code listing should be used to identify countries.

Country Listing	**Definition for Language codeset: (L)**			
01	Afrikaans		1D	Lithuanian
02	Arabic		1E	Malay
03	Bosnian (Latin)		1F	Maltese
04	Bulgarian		20	Norwegian
05	Cantonese (Traditional)		21	Persian
06	Catalan		22	Polish
07	Chinese Simplified		23	Portuguese
08	Chinese Traditional		24	Queretaro Otomi
09	Croatian		25	Russian
0A	Czech		26	Serbian (Cyrillic)
0B	Danish		27	Serbian (Latin)
0C	Dutch		28	Slovak
0D	English		29	Slovenian
0E	Estonian		2A	Spanish
0F	Finnish		2B	Swedish
10	French		2C	Thai
11	German		2D	Turkish
12	Greek		2E	Urdu
13	Haitian Creole		2F	Vietnamese
14	Hebrew		30	Welsh
15	Hindi		31	Yucatec Maya
16	Hmong Daw			
17	Hungarian			
18	Indonesian			
19	Italian			
1A	Japanese			

1B	Kiswahili			
1C	Latvian			

The following codes should be used for Currencies in the Environment Record:

C	**Definition for Currency codeset:**		
00	AFGHANISTAN Afghani (AFN)	08	ANTARCTICA No universal currency ()
01	ÅLAND ISLANDS Euro (EUR)	09	ANTIGUA AND BARBUDA East Caribbean Dollar (XCD)
02	ALBANIA Lek (ALL)	0a	ARGENTINA Argentine Peso (ARS)
03	ALGERIA Algerian Dinar (DZD)	0b	ARMENIA Armenian Dram (AMD)
04	AMERICAN SAMOA US Dollar (USD)	0c	ARUBA Aruban Florin (AWG)
05	ANDORRA Euro (EUR)	0d	AUSTRALIA Australian Dollar (AUD)
06	ANGOLA Kwanza (AOA)	0e	AUSTRIA Euro (EUR)
0f	AZERBAIJAN Azerbaijanian Manat (AZN)	0G	CAMEROON CFA Franc BEAC (XAF)
0g	BAHAMAS (THE) Bahamian Dollar (BSD)	0H	CANADA Canadian Dollar (CAD)
0h	BAHRAIN Bahraini Dinar (BHD)	0I	CAYMAN ISLANDS (THE) Cayman Islands Dollar (KYD)
0i	BANGLADESH Taka (BDT)	0J	CENTRAL AFRICAN REPUBLIC (THE) CFA Franc BEAC (XAF)
0j	BARBADOS Barbados Dollar (BBD)	0K	CHAD CFA Franc BEAC (XAF)
0k	BELARUS Belarusian Ruble (BYN)	0L	CHILE Chilean Peso (CLP)
0l	BELARUS Belarusian Ruble (BYR)	0M	CHILE Unidad de Fomento (CLF)
0m	BELGIUM Euro (EUR)	0N	CHINA Yuan Renminbi (CNY)
0n	BELIZE Belize Dollar (BZD)	0O	CHRISTMAS ISLAND Australian Dollar (AUD)
0o	BENIN CFA Franc BCEAO (XOF)	0P	COCOS (KEELING) ISLANDS (THE) Australian Dollar (AUD)
0p	BERMUDA Bermudian Dollar (BMD)	0Q	COLOMBIA Colombian Peso (COP)
0q	BHUTAN Indian Rupee (INR)	0R	COLOMBIA Unidad de Valor Real (COU)
0r	BHUTAN Ngultrum (BTN)	0S	COMOROS (THE) Comoro Franc (KMF)
0s	BOLIVIA (PLURINATIONAL STATE OF) Boliviano (BOB)	0T	CONGO (THE DEMOCRATIC REPUBLIC OF THE) Congolese Franc (CDF)
0t	BOLIVIA (PLURINATIONAL STATE OF) Mvdol (BOV)	0U	CONGO (THE) CFA Franc BEAC (XAF)
0u	BONAIRE, SINT EUSTATIUS AND SABA US Dollar (USD)	0V	COOK ISLANDS (THE) New Zealand Dollar (NZD)
0v	BOSNIA AND HERZEGOVINA Convertible Mark (BAM)	0W	COSTA RICA Costa Rican Colon (CRC)
0w	BOTSWANA Pula (BWP)	0X	CÔTE D'IVOIRE CFA Franc BCEAO (XOF)
0x	BOUVET ISLAND Norwegian Krone (NOK)	0Y	CROATIA Kuna (HRK)

0y	BRAZIL Brazilian Real (BRL)	0Z	CUBA Cuban Peso (CUP)
0z	BRITISH INDIAN OCEAN TERRITORY (THE) US Dollar (USD)	10	CUBA Peso Convertible (CUC)
0A	BRUNEI DARUSSALAM Brunei Dollar (BND)	11	CURAÇAO Netherlands Antillean Guilder (ANG)
0B	BULGARIA Bulgarian Lev (BGN)	12	CYPRUS Euro (EUR)
13	CZECH REPUBLIC (THE) Czech Koruna (CZK)	1s	GERMANY Euro (EUR)
14	DENMARK Danish Krone (DKK)	1t	GHANA Ghana Cedi (GHS)
15	DJIBOUTI Djibouti Franc (DJF)	1u	GIBRALTAR Gibraltar Pound (GIP)
13	CZECH REPUBLIC (THE) Czech Koruna (CZK)	1v	GREECE Euro (EUR)
14	DENMARK Danish Krone (DKK)	1w	GREENLAND Danish Krone (DKK)
15	DJIBOUTI Djibouti Franc (DJF)	1x	GRENADA East Caribbean Dollar (XCD)
16	DOMINICA East Caribbean Dollar (XCD)	1y	GUADELOUPE Euro (EUR)
17	DOMINICAN REPUBLIC (THE) Dominican Peso (DOP)	1z	GUAM US Dollar (USD)
18	ECUADOR US Dollar (USD)	1A	GUATEMALA Quetzal (GTQ)
19	EGYPT Egyptian Pound (EGP)	1B	GUERNSEY Pound Sterling (GBP)
1a	EL SALVADOR El Salvador Colon (SVC)	1C	GUINEA Guinea Franc (GNF)
1b	EL SALVADOR US Dollar (USD)	1D	GUINEA-BISSAU CFA Franc BCEAO (XOF)
1c	EQUATORIAL GUINEA CFA Franc BEAC (XAF)	1E	GUYANA Guyana Dollar (GYD)
1d	ERITREA Nakfa (ERN)	1F	HAITI Gourde (HTG)
1e	ESTONIA Euro (EUR)	1G	HAITI US Dollar (USD)
1f	ETHIOPIA Ethiopian Birr (ETB)	1H	HEARD ISLAND AND McDONALD ISLANDS Australian Dollar (AUD)
1g	EUROPEAN UNION Euro (EUR)	1I	HOLY SEE (THE) Euro (EUR)
1h	FALKLAND ISLANDS (THE) [MALVINAS] Falkland Islands Pound (FKP)	1J	HONDURAS Lempira (HNL)
1i	FAROE ISLANDS (THE) Danish Krone (DKK)	1K	HONG KONG Hong Kong Dollar (HKD)
1j	FIJI Fiji Dollar (FJD)	1L	HUNGARY Forint (HUF)
1k	FINLAND Euro (EUR)	1M	ICELAND Iceland Krona (ISK)
1l	FRANCE Euro (EUR)	1N	INDIA Indian Rupee (INR)
1m	FRENCH GUIANA Euro (EUR)	1O	INDONESIA Rupiah (IDR)
1n	FRENCH POLYNESIA CFP Franc (XPF)	1P	INTERNATIONAL MONETARY FUND (IMF) SDR (Special Drawing Right) (XDR)
1o	FRENCH SOUTHERN TERRITORIES (THE) Euro (EUR)	1Q	IRAN (ISLAMIC REPUBLIC OF) Iranian Rial (IRR)
1p	GABON CFA Franc BEAC (XAF)	1R	IRAQ Iraqi Dinar (IQD)
1S	IRELAND Euro (EUR)	2j	MADAGASCAR Malagasy Ariary (MGA)
1T	ISLE OF MAN Pound Sterling (GBP)	2k	MALAWI Malawi Kwacha (MWK)
1U	ISRAEL New Israeli Sheqel (ILS)	2l	MALAYSIA Malaysian Ringgit (MYR)

1T	ISLE OF MAN Pound Sterling (GBP)	2m	MALDIVES Rufiyaa (MVR)
1U	ISRAEL New Israeli Sheqel (ILS)	2n	MALI CFA Franc BCEAO (XOF)
1V	ITALY Euro (EUR)	2o	MALTA Euro (EUR)
1W	JAMAICA Jamaican Dollar (JMD)	2p	MARSHALL ISLANDS (THE) US Dollar (USD)
1X	JAPAN Yen (JPY)	2q	MARTINIQUE Euro (EUR)
1Y	JERSEY Pound Sterling (GBP)	2r	MAURITANIA Ouguiya (MRO)
1Z	JORDAN Jordanian Dinar (JOD)	2s	MAURITIUS Mauritius Rupee (MUR)
20	KAZAKHSTAN Tenge (KZT)	2t	MAYOTTE Euro (EUR)
21	KENYA Kenyan Shilling (KES)	2u	MEMBER COUNTRIES OF THE AFRICAN DEVELOPMENT BANK GROUP ADB Unit of Account (XUA)
22	KIRIBATI Australian Dollar (AUD)	2v	MEXICO Mexican Peso (MXN)
23	KOREA (THE DEMOCRATIC PEOPLE'S REPUBLIC OF) North Korean Won (KPW)	2w	MEXICO Mexican Unidad de Inversion (UDI) (MXV)
24	KOREA (THE REPUBLIC OF) Won (KRW)	2x	MICRONESIA (FEDERATED STATES OF) US Dollar (USD)
25	KUWAIT Kuwaiti Dinar (KWD)	2y	MOLDOVA (THE REPUBLIC OF) Moldovan Leu (MDL)
26	KYRGYZSTAN Som (KGS)	2z	MONACO Euro (EUR)
27	LAO PEOPLE'S DEMOCRATIC REPUBLIC (THE) Kip (LAK)	2A	MONGOLIA Tugrik (MNT)
28	LATVIA Euro (EUR)	2B	MONTENEGRO Euro (EUR)
29	LEBANON Lebanese Pound (LBP)	2C	MONTSERRAT East Caribbean Dollar (XCD)
2a	LESOTHO Loti (LSL)	2D	MOROCCO Moroccan Dirham (MAD)
2b	LESOTHO Rand (ZAR)	2E	MOZAMBIQUE Mozambique Metical (MZN)
2c	LIBERIA Liberian Dollar (LRD)	2F	MYANMAR Kyat (MMK)
2d	LIBYA Libyan Dinar (LYD)	2G	NAMIBIA Namibia Dollar (NAD)
2e	LIECHTENSTEIN Swiss Franc (CHF)	2H	NAMIBIA Rand (ZAR)
2I	NAURU Australian Dollar (AUD)	37	PUERTO RICO US Dollar (USD)
2J	NEPAL Nepalese Rupee (NPR)	38	QATAR Qatari Rial (QAR)
2F	MYANMAR Kyat (MMK)	39	RÉUNION Euro (EUR)
2G	NAMIBIA Namibia Dollar (NAD)	3a	ROMANIA Romanian Leu (RON)
2H	NAMIBIA Rand (ZAR)	3b	RUSSIAN FEDERATION (THE) Russian Ruble (RUB)
2I	NAURU Australian Dollar (AUD)	3c	RWANDA Rwanda Franc (RWF)
2J	NEPAL Nepalese Rupee (NPR)	3d	SAINT BARTHÉLEMY Euro (EUR)

2K	NETHERLANDS (THE) Euro (EUR)	3e	SAINT HELENA, ASCENSION AND TRISTAN DA CUNHA Saint Helena Pound (SHP)
2L	NEW CALEDONIA CFP Franc (XPF)	3f	SAINT KITTS AND NEVIS East Caribbean Dollar (XCD)
2M	NEW ZEALAND New Zealand Dollar (NZD)	3g	SAINT LUCIA East Caribbean Dollar (XCD)
2N	NICARAGUA Cordoba Oro (NIO)	3h	SAINT MARTIN (FRENCH PART) Euro (EUR)
2O	NIGER (THE) CFA Franc BCEAO (XOF)	3i	SAINT PIERRE AND MIQUELON Euro (EUR)
2P	NIGERIA Naira (NGN)	3j	SAINT VINCENT AND THE GRENADINES East Caribbean Dollar (XCD)
2Q	NIUE New Zealand Dollar (NZD)	3k	SAMOA Tala (WST)
2R	NORFOLK ISLAND Australian Dollar (AUD)	3l	SAN MARINO Euro (EUR)
2S	NORTHERN MARIANA ISLANDS (THE) US Dollar (USD)	3m	SAO TOME AND PRINCIPE Dobra (STD)
2T	NORWAY Norwegian Krone (NOK)	3n	SAUDI ARABIA Saudi Riyal (SAR)
2U	OMAN Rial Omani (OMR)	3o	SENEGAL CFA Franc BCEAO (XOF)
2V	PAKISTAN Pakistan Rupee (PKR)	3p	SERBIA Serbian Dinar (RSD)
2W	PALAU US Dollar (USD)	3q	SEYCHELLES Seychelles Rupee (SCR)
2X	PALESTINE, STATE OF No universal currency ()	3r	SIERRA LEONE Leone (SLL)
2Y	PANAMA Balboa (PAB)	3s	SINGAPORE Singapore Dollar (SGD)
2Z	PANAMA US Dollar (USD)	3t	SINT MAARTEN (DUTCH PART) Netherlands Antillean Guilder (ANG)
3u	SISTEMA UNITARIO DE COMPENSACION REGIONAL DE PAGOS "SUCRE" Sucre (XSU)	3N	TAIWAN (PROVINCE OF CHINA) New Taiwan Dollar (TWD)
3v	SLOVAKIA Euro (EUR)	3O	TAJIKISTAN Somoni (TJS)
3w	SLOVENIA Euro (EUR)	3P	TANZANIA, UNITED REPUBLIC OF Tanzanian Shilling (TZS)
3r	SIERRA LEONE Leone (SLL)	3Q	THAILAND Baht (THB)
3s	SINGAPORE Singapore Dollar (SGD)	3R	TIMOR-LESTE US Dollar (USD)
3t	SINT MAARTEN (DUTCH PART) Netherlands Antillean Guilder (ANG)	3S	TOGO CFA Franc BCEAO (XOF)
3u	SISTEMA UNITARIO DE COMPENSACION REGIONAL DE PAGOS "SUCRE" Sucre (XSU)	3T	TOKELAU New Zealand Dollar (NZD)
3v	SLOVAKIA Euro (EUR)	3U	TONGA Pa'anga (TOP)
3w	SLOVENIA Euro (EUR)	3V	TRINIDAD AND TOBAGO Trinidad and Tobago Dollar (TTD)
3x	SOLOMON ISLANDS Solomon Islands Dollar (SBD)	3W	TUNISIA Tunisian Dinar (TND)
3y	SOMALIA Somali Shilling (SOS)	3X	TURKEY Turkish Lira (TRY)

3z	SOUTH AFRICA Rand (ZAR)	3Y	TURKMENISTAN Turkmenistan New Manat (TMT)
3A	SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS No universal currency ()	3Z	TURKS AND CAICOS ISLANDS (THE) US
3B	SOUTH SUDAN South Sudanese Pound (SSP)	30	TUVALU Australian Dollar (AUD)
3C	SPAIN Euro (EUR)	31	UGANDA Uganda Shilling (UGX)
3D	SRI LANKA Sri Lanka Rupee (LKR)	32	UKRAINE Hryvnia (UAH)
3E	SUDAN (THE) Sudanese Pound (SDG)	33	UNITED ARAB EMIRATES (THE) UAE Dirham (AED)
3F	SURINAME Surinam Dollar (SRD)	34	UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND (THE) Pound Sterling (GBP)
3G	SVALBARD AND JAN MAYEN Norwegian Krone (NOK)	35	UNITED STATES MINOR OUTLYING ISLANDS (THE) US Dollar (USD)
3H	SWAZILAND Lilangeni (SZL)	36	UNITED STATES OF AMERICA (THE) US Dollar (USD)
37	UNITED STATES OF AMERICA (THE) US Dollar (Next day) (USN)	36	UNITED STATES OF AMERICA (THE) US Dollar (USD)
38	URUGUAY Peso Uruguayo (UYU)		
35	UNITED STATES MINOR OUTLYING ISLANDS (THE) US Dollar (USD)		
36	UNITED STATES OF AMERICA (THE) US Dollar (USD)		
37	UNITED STATES OF AMERICA (THE) US Dollar (Next day) (USN)		
38	URUGUAY Peso Uruguayo (UYU)		
39	URUGUAY Uruguay Peso en Unidades Indexadas (URUIURUI) (UYI)		
3a	UZBEKISTAN Uzbekistan Sum (UZS)		
3b	VANUATU Vatu (VUV)		
3c	VENEZUELA (BOLIVARIAN REPUBLIC OF) Bolívar (VEF)		
3d	VIET NAM Dong (VND)		
3e	VIRGIN ISLANDS (BRITISH) US Dollar (USD)		
3f	VIRGIN ISLANDS (U.S.) US Dollar (USD)		