Cormant Barcode Labeling Best Practices

11 July 2014

Prepared by: Brad Beamish

CORMANT™

DCIM And Beyond

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Summary

Cormant-CS leverages barcoded infrastructure to facilitate accurate and easy data entry. While barcode labeling is not a requirement to run the Cormant-CS solution, barcoded infrastructure adds tremendous functionality to mobile clients.

This document defines best practices and recommendations around barcode labeling of infrastructure components. This document examines the benefit of barcoded infrastructure and the questions of what, where and how to label the infrastructure.

Publication

This document is published by:
Cormant Inc.
www.cormant.com
sales@cormant.biz
+1 805 747 4178 / +44 203 397 2911
+65 3158 2022 / +61 2 8518 1298

Why Label?

While this document promotes the use of barcode labels on equipment and cables, the reality is they are optional, but highly useful. There is no part of the Cormant-CS DCIM system that forces the use of a barcode. The best analogy is products in a supermarket: it's possible for the check-out person (or even you) to find anything by typing in a number or searching through a hierarchy of items, but that barcode makes it quicker and far more accurate. So the question becomes "why wouldn't you use a barcode?"

The document generally assumes there is no accessible barcode on an item already; however, if there is a unique, readable barcode already then that can be used. Examples of these types of barcodes include:

- Corporate asset tags
- Serial numbers
- MAC addresses
- License key labels

Barcodes vs. RFID

This document is about barcode labeling, but it would not be complete without a short discussion of RFID tags. RFID tags are another type of identifier. They can be read by Cormant-CS supported mobile computers or RFID readers with a Bluetooth link to a tablet running the Cormant-CS application. Both barcodes and RFID tags fall into the category of Auto-identification technologies and both can be leveraged by Cormant-CS. Barcodes are excellent for pin-point identification and Cormant-CS uses this for precise identification of a piece of equipment or cable connection. RFID are very poor for pin-point identification, but are useful for general "this tag is in this area" identification. Cormant-CS uses that property for fast audits of equipment. Please contact Cormant for more information if you plan to use RFID.

What to label

Cormant-CS allows users to assign barcodes to any component in the database, though not always practical.

Barcoded labels act as shortcuts to data on the handheld device. Scanning the barcode on a switch brings you to that switch in the Cormant-CS handheld client.

Cormant recommends a minimum of adding a barcoded label to all

- Racks, Cabinets
- Patch Panels, Panel Modules
- Chassis and Cards
- Switches, Servers and other rack mounted hardware
- PDUs, UPSs and other electrical hardware

Cormant recommends consideration of additional barcoded labels on

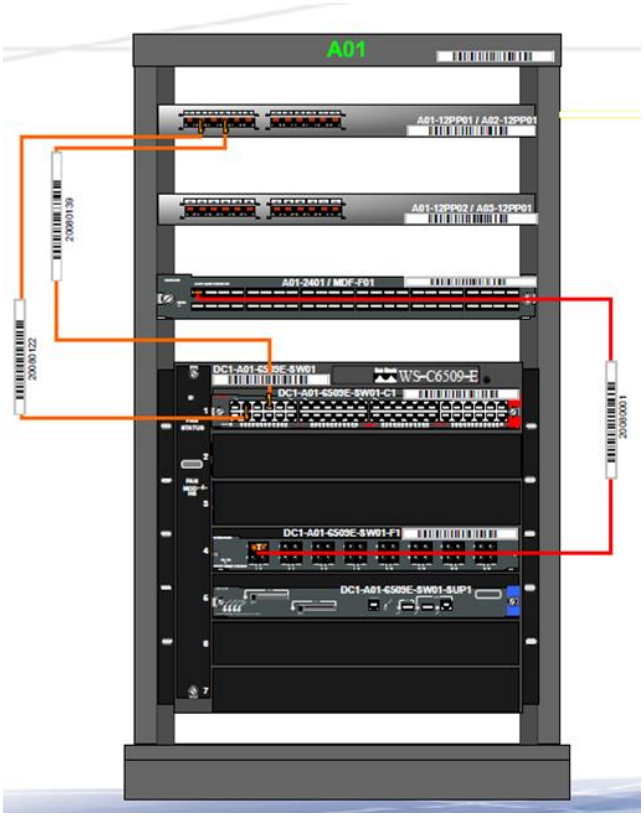
- All cables, copper, fiber and power (one on either end of the cable)
- Spaces such as Rooms, Offices, Closets
- Faceplates, floor monuments and other termination hardware
- Peripheral and Workspace Equipment
- Pathways such as Conduit, Cable tray and Cable Ducts

Cormant does not suggest trying to add barcoded labels to

- Individual ports
- Dongles
- SFPs, GBIC

The question of what to label in each organization is based on a number of criteria.

1. Existing labels – if there are existing barcode labels on the hardware, either from the manufacturer or corporate asset numbers, then these can often be used in Cormant-CS. If you are going to use existing barcode tags ensure that:
    a. The barcodes scan OK, test it!
    b. The barcodes are unique. Part number barcodes are no good here, serial and MAC address barcodes are usually unique. Additionally, ensure the barcode data does not conflict with other barcodes you may have generated for the site.
    c. The barcode is accessible. Sometimes the barcodes are placed in a position that is inaccessible once the hardware is rack mounted. The location of the barcode needs to be considered for practicality. Can you scan it?
2. Scope of Work – What parts of the infrastructure are being added into Cormant-CS? No point adding labels to PDU and UPS devices if they are not being documented. Only include the components to be documented.



The image to the left shows a typical Communications Rack with barcode labels added.

Note: there are barcodes assigned to the

- Rack
- Patch Panels
- Switch
- Chassis
- Blades
- Cables

In this example there is only one barcode per cable shown due to diagram space, but in reality two are always applied.

Where to label

Having decided what components to label, the question now turns to where to place new barcoded labels on the infrastructure components.

Equipment Labels

Cormant recommends creating and documenting a labeling convention to ensure as much consistency for the location of the labels as possible. Barcodes are only time saving when you know where to find them and they are accessible to the scanner's barcode reader.

Equipment labels can be printed in 1D and 2D formats. Factors such as the labels' size and contents as well as the mobile hardware being used will impact which encoding is most appropriate for your asset labels.

The labeling conventions are usually specific to the individual parts but ideally would have an overriding consistency.

A basic best practice convention for labeling assets might be:

1. Equipment will have 2 identical barcodes applied, 1 on the front and 1 on the back. (This gives the user access to the barcode without having to walk around to the other side of the cabinet.)
2. Equipment labels will be applied primarily to the upper right-hand side of the asset
3. Equipment labels will be applied secondarily to the lower right-hand side of the asset if the primary space is not appropriate
4. Specific parts where alternative practices are required should be documented as part of the labeling convention
5. An array of different label sizes and formats may be appropriate to cover all assets. Documenting what assets get which labels applied and where they will be applied will help to ensure consistency of labeling

Sample Documentation of labeling conventions

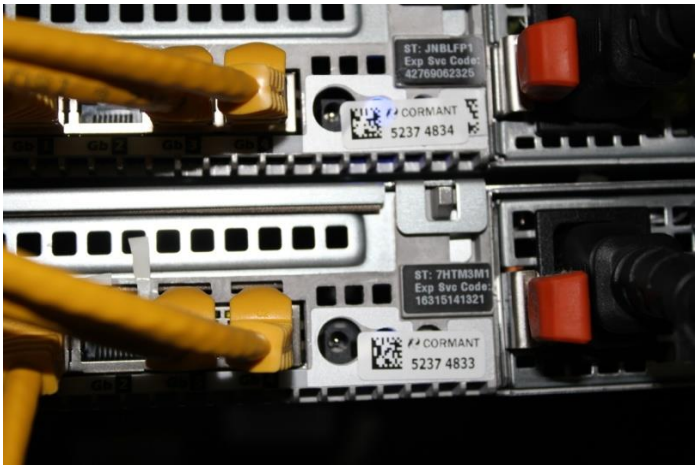
Template	Label Type	Label Quantity	Label Location Front	Label Location Back
Cisco 3750 24PS	Equipment Label 4	Front / Back	Top right	Top right
Cat 6 24 port PP	Equipment Label 2	Front Only	Top right	N/A
Comms Cabinet	Equipment Label 1	Front / Back	Top right	Top right
HP DL380 G6	Equipment Label 4	Front / Back	Top right	Middle bottom

When labeling assets there are a number of factors to consider:

1. Form Factor. How much physical footprint exists to add the label? Many 1 RU devices have a limited space to add a label, which impacts the size of label and the symbology used to encode the barcode.
2. Existing labels and manufacturer's markings. Avoid placing labels that cover up the manufacturer's markings or indicator lights.
3. Heat and fan exhausts. Try to avoid placing the labels on the heat exhaust of the hardware's fans.
4. Removable modules and parts. Try to avoid placing the labels on any part of the asset that could be removed or swapped out. Expansion cards, power supplies, hard drives and mounting brackets are all less desirable locations for the asset label.
5. Labels should include a human readable counter in addition to the barcoded data.

Sample of 2D Equipment labels added to the Front of Equipment

Sample of 2D Equipment labels added to the Back of Equipment



Cable Labels

Cormant recommends labeling all cables that will be documented in Cormant-CS. These cables could include

- Copper Patch Cables
- Fiber Patch Cables
- Power Cables

Cormant does not recommend labeling structured cables and horizontal cables as these cables are often hidden from view and the barcode is inaccessible.

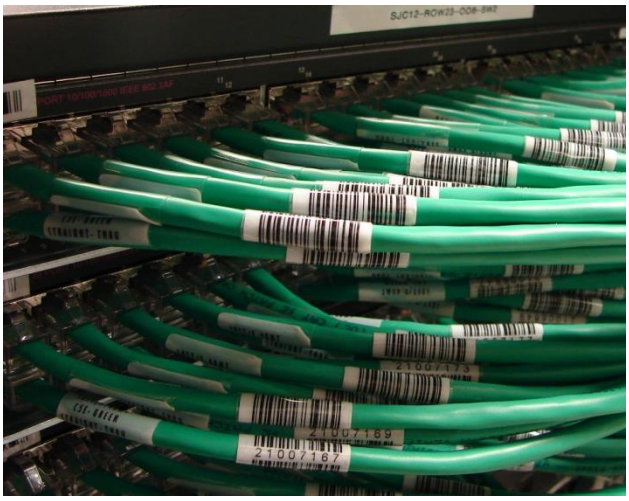
NOTE: Cable labels are only printed in 1D format to ensure the barcode is scannable from any place on the label. 2D formats do not lend themselves to being wrapped around a cable.

Best practices for labeling cables include:

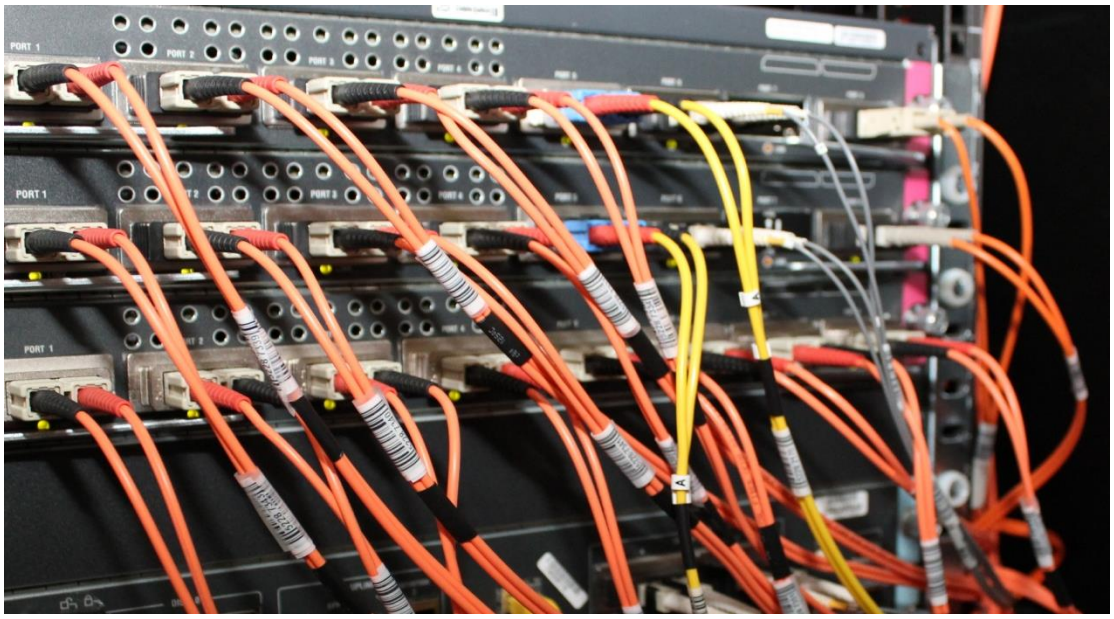
1. Adding an identical barcoded label to each end of the cable.
2. Adding labels 3 to 4 inches from the boot to allow the barcode to be easily isolated and scanned. Avoid adding labels any closer to the boot than 3 inches to minimize accidental disconnects when trying to scan the cable.
3. A label's printable area should be large enough to cover the circumference of the cable to avoid the need to twist the cable to scan the barcode.
4. A label's overwrap should be long enough to protect the printable area once applied to a cable. The overwrap must NOT be of a glossy finish as this will reflect the scanner's laser making scanning difficult or impossible.
5. Labels should include a human readable counter in addition to the barcoded data.
6. Avoiding the use of horizontal cable managers as the barcodes may be difficult to scan if deeply buried in the cable manager.
7. Making sure to keep track of the type of label ranges applied to each cable type. It is recommended to add these cables to the Cormant-CS system in batches.

See this link for a video describing the process for adding a cable label to a cable, https://www.youtube.com/watch?v=Y26VjNL4qyI

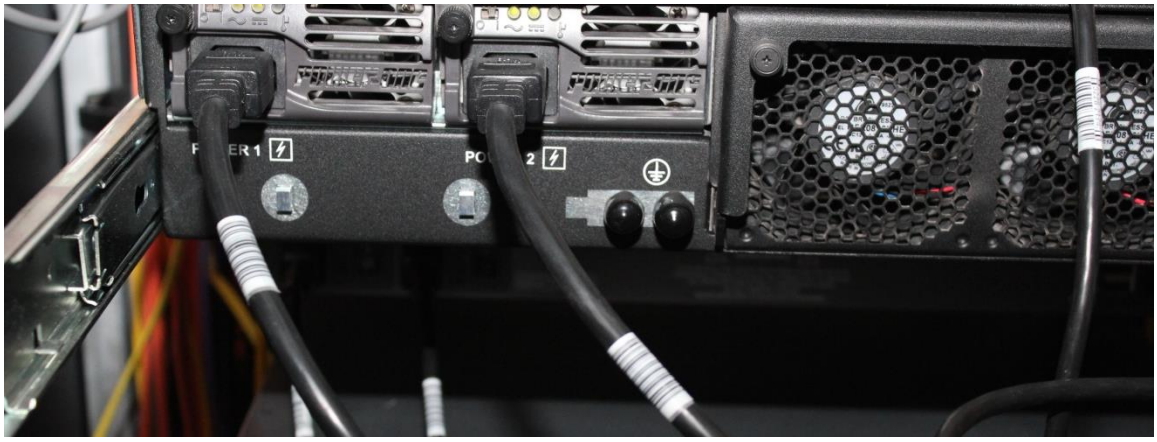
Sample of Copper Cable Labels



Sample of Fiber Cable Labels



Sample of Power Cable Labels



What kind of label

Cormant offers a number of different standard label sizes for various applications. A combination of sizes is often required to fit all applications.

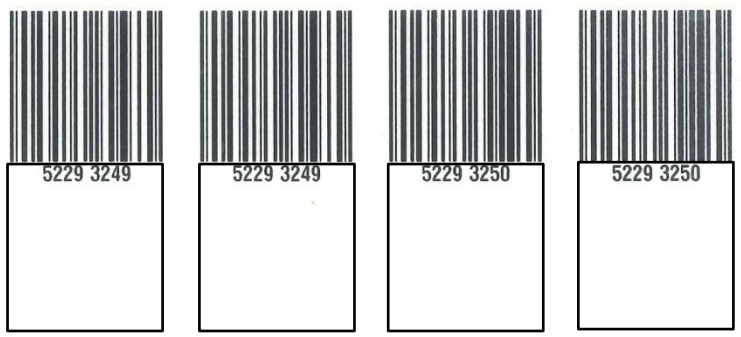
Cormant currently offers a number of standard-sized asset labels.

Equipment Label

Equipment Labels 1 Label Description: Self-Laminating Equipment labels (3 Across) Width 25.4 mm x Height 9.5 mm *Ideal for Patch Panels, Switches, PDU, UPS, Faceplates etc…*	 1D and 2D Available
Equipment Labels 2 Label Description: Self-Laminating Equipment labels (4 Across) Width 16.5 mm x Height 5 mm *Ideal for Patch Panels, Switches, PDU, UPS, Faceplates etc…*	 2D Recommended
Equipment Labels 3 Label Description: Self-Laminating Equipment labels (7 Across) Width 9.5 mm x Height 9.5 mm *Ideal for very small form factor devices where a label's space is limited*	 2D Only

Cable Wrap Labels

Note: Patch cables can be ordered from some manufacturers or distributors with the barcode labels already applied. This is always preferable and worth checking into if there are new cables being procured. Existing cables can be retrofitted with labels like the one described below. Only 1D labels can be used.

Cable Wrap labels Label Description: Self-laminating cable wrap labels Width 25 mm x Height 45 mm Printable area 25mm wide by 23mm high with 22 mm of non-glossy, clear overwrap (**indicated here by an added box for clarity)**	

Printing Labels and Label Selection

Cormant uses standard 3rd party hardware, software and material when printing barcode labels.

There is no requirement to purchase barcode labels from Cormant, however we do have years of experience of high quality printing. If you are considering the purchase of a printer, we suggest undertaking a cost-benefit discussion with Cormant or a Cormant partner.

Customers who choose to print their own barcode labels should follow some best practices such as:

1. Printer – Thermal Transfer printer with 600 DPI printing capability.
2. Ribbon – Resin ribbon in the thermal transfer printer.
3. Labels – Labels should be printed on self-laminating vinyl labels.
4. Label overwrap – should overwrap and protect the barcoded data, must not be glossy as this will reflect the light of the laser scanner.
5. Matching the right ribbon to the right label requires testing. Make sure the labels you purchase are optimized for the ribbon in the printer. Mixing manufacturers can produce best results.
6. Encoding 1D – Use Code 128 version C if possible, version B if not. See next section on 1D symbologies.
7. Encoding 2D – Always use DataMatrix.
8. Always include a human readable counter on the label.

1D vs 2D Barcodes

Both 1D and 2D barcodes have their place in the Cormant-CS solution.

There are a number of factors to consider when determining the best symbologies for any customer environment such as:

1. Existing labels – Are there existing asset labels on the hardware? Do you want to stay consistent with legacy labels? Do you want to stand out as different from the existing labels?
2. Form Factor – Does the hardware offer a lot of space to add labels? If not, a smaller 2D label may be required.
3. Data – The data to be encoded within the barcode will determine the best format and symbology to use. Cormant recommends keeping the encoded data to a serialized, numeric-only sequence of 8 digits.
4. Application – Where are the labels being applied? 2D labels must be applied to a flat surface to scan properly, while curved surfaces are better for 1D labels (like cables).
5. Scanning hardware – Not all mobile devices support 2D barcode scanning imagers, be sure to understand the specifications of the mobile device.

When possible Cormant recommends

1. All Cable Wrap labels printed in 1D – Code 128 C
2. All Equipment Labels (any size) printed in 2D - DataMatrix

Basic comparison chart between 1D and 2D encoding

Barcode type	Information density	Information capacity	Information type
1D	Low	Small	Numbers, ANSI only
2D	High	Big	Numbers, ANSI and other character sets, XML data pictures, voice and other binary information. XML data can be used to add equipment into Cormant-CS.

About 1D Barcodes

1D barcodes are similar to the familiar "UPC" grocery store style barcodes. These are referred to as 1 Dimensional because the laser scans them from side to side, across the barcode. The data is linear.

The mapping between data and barcodes is called a symbology. There are a number of different symbologies used in 1D barcodes. Each symbology has its own advantages and disadvantages.

Cormant recommends the use of Code 128 symbology for encoding barcoded data.

The Code 128 barcode is a high-density linear symbology that encodes text, numbers, numerous functions and the entire 128 ASCII character set (from ASCII 0 to ASCII 128.)

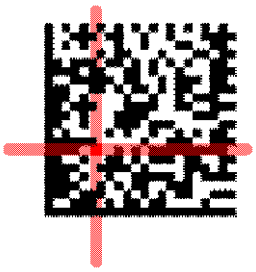
Code 128 has 3 formats that allow for different character sets to be encoded in the barcode:

- Version A: The Full ASCII set, except for the 26 lower-case letters.
- Version B: The Full ASCII set, except for the 26 "control" characters.
- Version C: Double-density numeric. This character set is numeric-only, but any one character actually represents two digits.

When printing 1D barcodes Cormant recommends:

- Code 128 Version C with the encoded data being a numeric only series of 8 digits.
- Avoid using any Alpha characters in the barcode, if Alpha characters must be included, use Code 128 B or consider a 2D encoding if appropriate.
- Ensure there is enough "quiet space" on either side of the barcodes. Barcodes require an area of free space on both the left and right of a symbol. These spaces need to be clear of any stray marks or graphics that the scanner may interpret as an errant bar.
- Always include a human readable counter on the label.

About 2D Barcodes



2D barcodes are becoming increasing popular for a number of reasons, mostly the ability to put a large amount of data into a very small barcode.

The mapping between data and barcodes is called a symbology. There are a number of different symbologies used in 2D barcodes. Each symbology has its own advantages and disadvantages.

Cormant recommends the use of DataMatrix symbology when encoding 2D barcodes.

Data Matrix is covered today by several ISO/IEC standards and is in the public domain for many applications, which means it can be used free of any licensing or royalties.

- ISO/IEC 16022:2006—Data Matrix bar code symbology specification
- ISO/IEC 15415—2-D Print Quality Standard
- ISO/IEC 15418:2009—Symbol Data Format Semantics (GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance)
- ISO/IEC 15424:2008—Data Carrier Identifiers (including Symbology Identifiers) [IDs for distinguishing different bar code types]
- ISO/IEC 15434:2006—Syntax for high-capacity ADC media (format of data transferred from scanner to software, etc.)
- ISO/IEC 15459—Unique Identifiers

When printing 2D barcodes Cormant recommends:

- DataMatrix encoding
- Always include a human readable counter on the label

Contacting Cormant

Cormant provides labeling services through Cormant or a Certified Partner. Please contact your Partner Technical Consultant or Cormant directly using the details in the **Publication** section on page 3 to discuss options. You can also visit us at www.cormant.com.

Learn more about Cormant-CS at www.cormant.com