3M | **Design Operations**

3M Corporate Reference Document 158

Description: Printing and Location Requirements for ITF-14 (Interleaved Two of Five) Bar Code Symbols

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Change Record: Minor updates throughout specifically section 4.

SCOPE: This Corporate General Specification defines the requirements and responsibilities for the printing and location of ITF-14 (Interleaved Two of Five) bar code symbol that are used on shipping containers.

NOTE: There are specific requirements identified throughout this document that apply to specific business groups.

1.0   GENERAL INFORMATION

1.1   This Corporate General Specification covers bar code symbols which use the Interleaved Two of Five (ITF) symbology as outlined in the GS1 General Specifications document referenced below.

1.2   Implementers of the ITF-14 symbols for 3M Company should familiarize themselves with the following publications which are used as the framework for Corporate General Specification 158. These are:

- GS1 General Specifications
  Global Website http://www.gs1.org
  USA Website http://www.gs1us.org

- ISO/IEC 15416 Bar Code Print Quality Test Specifications - Linear Symbols http://www.iso.org

  Note: Reference 3M Global Shipping Container Labeling Policy document

2.0   PRINTING METHODS/BAR CODE USAGE

See appropriate sections referenced below for printing methods and bar code usage.

2.1   ITF-14 bar code symbols printed on paper labels or non-corrugated intermediate packages - See Section 7.1

2.2 ITF-14 bar code symbols printed directly on corrugated - See Section 7.2

2.3 ITF-14 bar code symbols on small intermediate (not shipper) packages - See Section 7.3

2.4   On-Demand Printing: Dimensions, format and quality parameters of bar code symbols produced by in-plant printing processes must comply with this specification (CGS 158), as do purchased packaging supplies. In general, settings should cover the following bar code symbol attributes:

- Symbology - Interleaved Two of Five (ITF or I25)
- Narrow bar width (x dimension) minimum .0195 IN (0.495 mm) maximum .040 IN (1.016 mm)
- Wide to narrow ratio 2.5 to 1 (or 5:2)
- Bar height 1.25 IN (32 mm)
- Horizontal bearer bars twice the x dimension in thickness must butt both top and bottom edges of bar code symbol
- Encodes 14 digits only (14 includes check digit)

3.0   PURPOSE

3.1   To assure the printing of ITF-14 bar code symbols which conform with GS1 General Specifications. This Corporate General Specification 158 shall also supplement the 3M individual IPM Item Specification(s). Instructions in the 3M individual Item Specification(s) take precedence over any instructions contained in this Corporate General Specification.

3.2   The GS1 General Specifications allow for a full range of ITF-14 symbol sizes based on minimum and maximum narrow bar widths (x dimension). 3M has standardized on fewer sizes in order to make graphics design and implementation easier. These sizes are described by the following elements:

3.2.1 Magnification factor (if appropriate)

3.2.2 Nominal narrow bar or space width (x dimension)

3.2.3 Wide bar or space width (or ratio of wide to narrow)

3.2.4 Bar/space width tolerance

3.2.5   Bar height

3.2.6 Minimum quiet zones

3.2.7 Nominal width of symbol

3.3   If a size other than those contained in this specification is required, all elements contained in Section 3.2 must be fully described on the individual item specification or contained in artwork file and approved by Global Labeling, Global 3M Design Operations or other 3M Design Operations Project Managers.

4.0   3M'S RESPONSIBILITIES

4.1   Specify 14-digit number to be encoded, bar code symbol location, orientation, size, and color. This is in the 3M Item Specification.

4.2   Communicate Supplier Quality expectations as defined in 5.0.

4.3   All bar codes should appear on the side of the shipping container in vertical bar configuration (picket fence). Determining the "side", "top", and "bottom" of shipping containers (for the purpose of bar code placement and orientation) is based upon how the shipping container would normally be oriented as it moves through the supply chain.

4.3.1   **Consumer Business Group** - The bar code symbols are to be placed on two adjacent side panels horizontally*. Bar code symbol placement on two opposite length panels may be used as an alternate when width panel is too small. In the scenario the shipping container is too small to have two bar codes due to other required markings, then one barcode is acceptable. * The only exception to this would be if there is not a panel wide enough to place horizontally.

All other Business Groups – A minimum of one bar code is to be placed horizontally. If there is a customer need to place the UPC on 2 adjacent surfaces a second bar code may be required. Bar code symbol placement on two opposite length panels may be used as an alternate when width panel is too small.

4.3.2   For shipping containers less than 39 IN (1 m) in height, the bottom edge of bar code symbol (the bars themselves) should appear 1.25 IN (32 mm) from bottom edge, no closer than 0.75 IN (19 mm) from vertical edges.

4.3.3   For shipping containers too shallow for vertical side labeling, the bar code symbol may be placed on top of box with bars perpendicular to shortest side, no closer than 1.25 IN (32 mm) from any edge. To get the required two barcodes a label is to be placed on the bottom of the box too.

4.3.4   On shipping containers greater than 39" (1m) in height, bar code symbols shall appear on two adjacent panels between 16 IN (400 mm) and 32 IN (800 from the base of unit, right of center, a minimum of 2 IN (50 mm) from either edge.

5.0   SUPPLIER RESPONSIBILITY

5.1   Print the ITF-14 bar code symbol in conformance with this 3M CGS 158 and the 3M Item Specification.

5.1.1   Supplier requirements - General:

- Understand the effect of print process on bar width and modify 3M bar code symbol artwork as necessary

- Use ANSI or ISO verifier, recommend an RJS 5000 Barcode Verifier or equivalent. A Barcode verifier is different than a Barcode Scanner and must have a Verifier.
- Use correct aperture setting.
- Calibrate verifier and ensure NIST traceable.
- Train operators to use the 10 scan average
- Have a barcode quality system in place to ensure that the human readable match the encoded data within the printed bar code symbol.

5.1.2   Supplier Requirements - Specific:

The barcode verification must receive an overall passing grade of C (1.5) or better. Natural Brown Kraft shippers are allowed a Symbol Contrast grade of D (0.5) or better.

Note: See exception on aperture setting when printing smaller bar codes in Section 7.3 of this document.

5.2   Suppliers are responsible to have a quality system to ensure the barcodes meet the grade specifications in 5.1.2 above. Recommend beginning and end of runs to verify a passing barcode grade throughout the run.

5.2.1   It is the supplier's responsibility to ensure the barcode meets the requirements of 5.1.2 when applying tape or label to the barcode area.

6.0   HUMAN READABLE CHARACTERS

6.1   Under NO circumstances are human readable characters to be deleted from the ITF-14 bar code symbol.

6.2   3M has established guidelines in alignment with GS1, which should be followed. The 3M guidelines on human readables are:

6.2.1 Nominal height of each character shall be 5.72 mm (0.23 IN), space permitting.

6.2.2   Minimum width of each character shall be 3 mm (.12 IN).

6.2.3 Human readable characters will be centered from left to right below the bar code symbol.

6.2.4   Spacing in human readable characters are to be as follows: spaces between first and second, third and fourth, eighth and ninth, thirteenth and fourteenth human readable characters will be approximately width of one character.

6.2.5   Type font is optional but has to be easily read. No script or fine fonts.

6.2.6   It is preferred to reduce size of human readables, rather than reduce height of bars in bar code symbol itself, when space is a problem.

7.0 BAR CODE SIZES

There are currently three sizes of ITF-14 bar code symbols commonly used on 3M shipper labels (see 2.4 for information when on-demand printing). If packaging specifications or artwork is still being used with bar code sizes other than the three shown below, contact your Global Labeling Dept (contact: Jim Shereck) to get these upgraded to the most current global requirements.

7.1 For ITF-14 bar code symbols printed on paper labels or non-corrugated intermediate packages, the following size is preferred as it meets global supply chain requirements:

Size D: Minimum ISO grade of 1.5/20/670 (C/20/660) required.

(X) Value Narrow Bar	Wide Bar	Printed Tolerance	Bar Height	Min. Quiet Zone	Nominal Symbol Width
.025 IN	0.0625 IN	+.005 IN	1.25 IN	0.250 IN *	3.627 IN
0.635 mm	1.588 mm	+0.13 mm	32 mm	6.4 mm *	92.13 mm
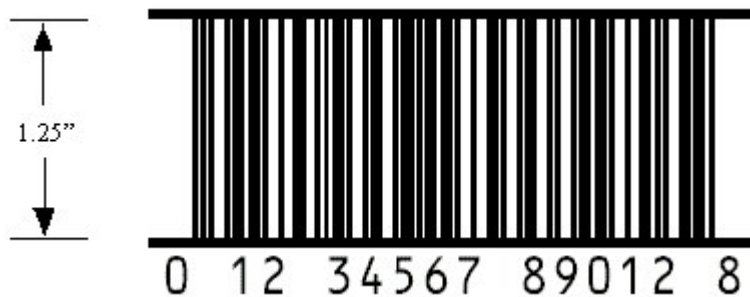
Note: Nominal 5,72mm human readable height shown. See Section 6.0.

* Stated is the industry minimum quiet zone width…to decrease many scanning/verification issues recommend 11X of the narrowest bar in the symbol.

7.2 For direct printing ITF-14 bar code symbols on corrugated, the following size is preferred:

Size A: Minimum ISO grade of 1.5/20/670 (C/20/660) required (see 5.1.2 for natural brown kraft corrugated.

(X) Value Narrow Bar	Wide Bar	Printed Tolerance	Bar Height	Min. Quiet Zone	Nominal Symbol Width
.040 IN	0.100 IN	+0.012 IN	1.25 IN	0.400 IN *	6.000 IN
1.016 mm	2.540 mm	+0.305 mm	32 mm	10.2 mm *	152.4 mm

5 00 21200 05981 5

Note: Quiet Zones of .400 IN (10.2 mm) are included within vertical bearer bars of these symbols

*   Stated is the industry minimum quiet zone width…to decrease many scanning/verification issues recommend 11X of the narrowest bar in the symbol.

This smaller magnification for printing ITF-14 bar code symbols directly <u>on corrugated</u> can be used for shipper labeling only if space is a problem with using the symbol as shown above as Size A.

Size E:

(X) Value Narrow Bar	Wide Bar	Printed Tolerance	Bar Height	Min. Quiet Zone	Nominal Symbol Width
0.0320 IN	0.080 IN	+.010 IN	1.250 IN	0.320 IN *	4.876 IN
0.813 mm	2.032 mm	+0.254 mm	32.00 mm	8.1 mm *	123.85 mm

Minimum ISO grade of 1.5/20/670 (C/20/660) required (see 5.1.2 for details).

1.25"

5 00 51111 20028 0

Quiet Zones of .320 IN (8.1mm) are included within vertical bearer bars of these symbols.

*   Stated is the industry minimum quiet zone width...to decrease many scanning/verification issues recommend 1X of the narrowest bar in the symbol.

7.3   ITF-14 Bar Code Symbols <u>on Small Intermediate</u> (not shipper or pallet) Packages

To be used only as an exception to 7.1 Size D (.025"/0.635mm narrow bar) <u>on intermediates</u> when space is an issue.

Interleaved 2 of 5 symbols in smaller sizes are permitted as exceptions on containers that meet two conditions; they require a smaller symbol due to size restrictions, and they will not be scanned in a conveyorized environment at any point in the distribution channels (e.g. small intermediate packs). In no case may a symbol smaller than 0.025" narrow bar be printed directly on corrugated.

Note: It is important to understand the print process to be used prior to choosing one of the following sizes.

Overall ISO grade of C/10/670 (1.5/10/670) or higher for printed symbols must be maintained on an ongoing basis for the magnifications below.

Dimensions In Inches (IN)

Narrow Bar or Space Width (X-Dimension)	Wide Bar or Space Width	Bar/Space Width (+/-) Tolerance	Minimum Quiet Zone (each side)	Minimum Bearer Bars *	Symbol Length w/ Quiet Zones	Minimum Bar Height **
0.024	0.060	0.0072	0.24	0.048	3.536	0.750
0.022	0.055	0.0066	0.22	0.044	3.283	0.688
0.020	0.050	0.0060	0.20	0.040	3.030	0.625
0.018	0.045	0.0054	0.18	0.036	2.777	0.563
0.016	0.040	0.0048	0.16	0.032	2.524	0.500
0.014	0.035	0.0042	0.14	0.028	2.271	0.500
0.012	0.030	0.0036	0.12	0.024	2.018	0.500
0.010	0.025	0.0030	0.10	0.020	1.765	0.500

Dimensions In Millimeters (mm)

Narrow Bar or Space Width (X-Dimension)	Wide Bar or Space Width	Bar/Space Width (+/-) Tolerance	Minimum Quiet Zone (each side)	Minimum Bearer Bars *	Symbol Length w/ Quiet Zones	Minimum Bar Height **
0.61	1.52	0.183	6.1	1.22	89.81	19.05
0.56	1.40	0.168	5.9	1.12	83.39	16.97
0.51	1.27	0.152	5.1	1.02	76.96	15.88

0.46	1.14	0.137	4.6	0.92	70.54	14.30
0.41	1.00	0.122	4.1	0.82	64.11	12.70
0.36	0.89	0.107	3.6	0.72	57.68	12.70
0.30	0.76	0.091	3.0	0.60	51.26	12.70
0.25	0.64	0.076	2.5	0.50	44.83	12.70

*   The bearer bar shall be a minimum of twice the X dimension and need only appear on the top and the bottom of the symbol (butting directly against the top and the bottom of the symbol bars). The bearer bar need not extend into the clear area, although it is recommended to "reserve" the quiet zones.

** Excluding bearer bars

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