Inspector 5000™
Auto Optic

Operator's Guide

THIS MANUAL APPLIES <u>**ONLY**</u> TO **FIRMWARE 1.109 OR LATER**

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1.0 Preface

1.1 Proprietary Statement

The Inspector 5000 Operator's Guide contains proprietary information of RJS. It is intended solely for the use of parties operating and maintaining the equipment described herein. This information may not be used, reproduced, or disclosed to any other parties for any other purpose without the express written permission of RJS.

1.2 Statement of FCC Compliance: USA

The equipment described in this manual has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this operator's manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the problem at their own expense.

1.3 Statement of FCC Compliance: Canada

This Class A digital apparatus meets all requirements of the Canadian interference-Causing Equipment Regulations.
Cet appareil numénque de la classe A respecte toutes les exigences du Règlement sur le maténel brouilleur du Canada.

1.4 CE:

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in

accordance with this operator's manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the problem at your their expense.

1.5 Documentation Updates

RJS strives to provide the best possible documentation. This manual, or any of our manuals, may be updated without notice.

1.6 Copyrights

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1.7 Unpacking and Inspection

Carefully unpack the components and save the container. If the container is crushed, punctured or water damaged you can use the container to prove a claim against the carrier. RJS is not responsible for transportation damage. Your Inspector 5000 is packaged in a custom made container. After removing the unit from the shipping box make sure you have:

- Main display unit
- Auto-optic scan head and cable
- Calibration plaque
- Operator's manual
- Print Test sheets
- Battery charger

1.8 Batteries

The Inspector 5000 has an integrated lithium ion battery pack installed in the unit.
The battery is not field replaceable and must be returned to RJS for repair/replacement.

> **Warning:**
> **DO NOT** use any battery chargers other than the Inspector 5000 battery charger. Use of non-RJS battery chargers could damage your bar code verifier and/or result in a fire.

1.9 Technical Support

Please read the manual.

If you need assistance over the phone, please have the following information ready:
- Model and serial number of your unit
- Have a test print available, if applicable
- Detailed explanation of the problem or question
- Your company's phone and email information

1.10 Trademarks

The following are trademarks of RJS:
- RJS
- RJS Systems International
- Inspector
- RJS Inspector

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2.0 Warranty

2.1 General Warranty

Warranty information: +1 (763) 746-8034
RJS warrants your Inspector 5000 to be free from defects in material and workmanship for a period of 1 year from the date of shipment from RJS' factory location.

The liability of RJS under this warranty is limited to repairing or replacing the defective part and/or unit. RJS may optionally choose to issue credit for any unit returned during the warranty period.

You must promptly notify RJS of any defect in order to receive the full protection of this warranty.

2.2 Warranty Limitations
The warranty set forth above is exclusive and no other warranty, whether written or oral is expressed or implied. RJS specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Some states or provinces do not allow limitation on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you. However, any implied warranty of merchantability or fitness is limited to the one year duration of this written warranty.

RJS shall in no event be liable for any indirect, incidental, or consequential damages, including but not limited to damages which may arise from loss of anticipated profits or production delivery delays, spoilage of material, increased costs of operation of business or otherwise.

2.3 Service during the Warranty Period
If your Inspector 5000 should fail during the warranty period, contact RJS or its authorized representative

immediately upon discovery of the defect. A Return Authorization Number (RMA number) may be obtained by visiting our website address:
http://www.rjs1.com/rma-request/

You will be asked to ship the product in its original packing, freight prepaid, with the RMA number visibly written on the outside of the carton to the RJS factory in Minneapolis, MN U.S.A

Be sure to include any samples or printouts or other information that will help us to understand the problem. Your repair will be given priority treatment, or your unit may be replaced at RJS's option. The repaired item will be returned UPS/United States Postal Service ground, freight prepaid. At your request we will ship express or overnight if you need premium service and agree to pay the additional cost.

3.0 Introduction

3.1 Inspector 5000 Description and Features

The Inspector 5000 is an advanced technology bar code verifier that makes it easy to decode bar code symbols and to evaluate symbol compliance with industry standards.

Features

- Four aperture sizes selectable from setup screen
- Two light wavelengths selectable from setup screen
- Provides scan head light color and aperture size *(display/print)*
- Auto-discriminates between many different symbologies
- Auto-print mode
- Bi-directional scanning
- Profile display with color coded indications for *Decodability*, *Modulation*, and *Defects*
- Calculates the Narrow Bar Width (NBW) of bar code symbols
- Calculate and display print contrast signals (PCS)
- Low battery indicator
- Multiple scan averaging
- Power-down is automatic after short period of disuse
- Programmable, multi-scan analysis
- Specially designed Auto Optic ensures accurate scanning angle
- Store and print capabilities
- Visual and audible signals

3.2 Maintenance

To ensure the best possible scanning conditions, keep the display window clean. Use a soft, damp, lint-free cloth to clean the window.

> ***Do not use solvents on the unit or on any of the components. You may use alcohol to clean the unit.***

3.3 Temperature Specs

Do not operate or store your unit or components in temperatures outside the range of 20° - 105°.

Do not operate or store your unit in conditions of high humidity—over 80%.

4.0 The Inspector 5000 Auto Optic

Battery Charger
Serial interface

Ethernet
USB

LCD
Window

Keypad
Buttons

Auto Optic Scanner
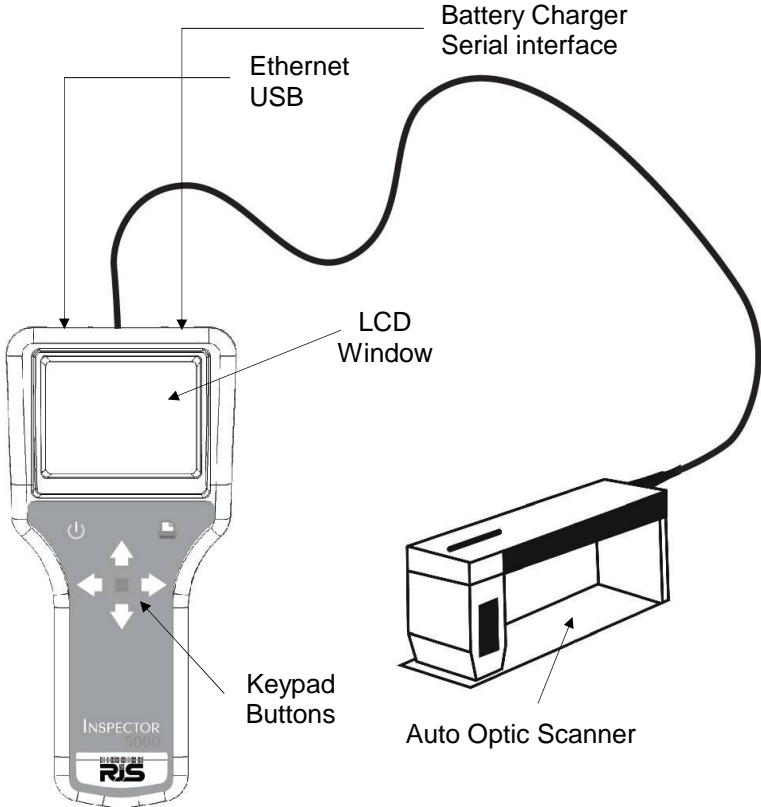
5.0 Main Menu Selections

5.1 Power On/Off

Power button
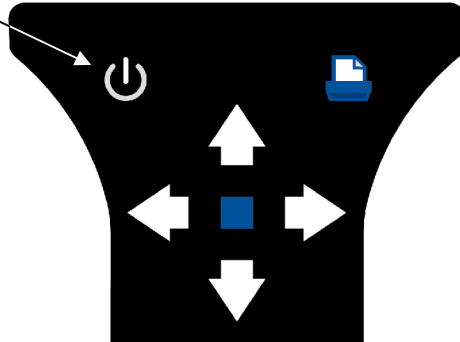
Press and hold the *Power* button for 1 second to turn **On** the Inspector 5000. The RJS logo will be displayed for three seconds (on the bottom of the screen is the firmware version), then the **Grade** *screen* will displayed.

The Inspector 5000 can be turned **Off** by the following methods:
1. Press and hold the *Power* button for 4 seconds
2. System time out (default is sleep mode after 1 minute (screen turns off) and power down after 15 minutes)

5.2 Screen Navigation

The Inspector 5000 screens are navigated by using the seven buttons on the keypad.
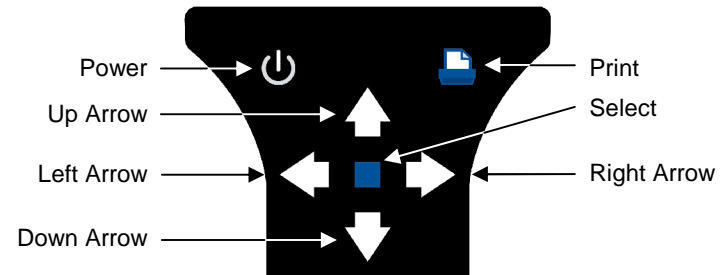
For normal operations

Left Arrow and *Right Arrow* buttons change which screen (**Grade**/**Encode**/**Profile**/**Report**) is displayed

Up Arrow and *Down Arrow* buttons move the cursor up and down on the current screen

Print button will send the inspection report(s) to either the TP140A printer or the VCIR PC software program.

Special Functions

Power button, in addition to turning the unit **On** and **Off**, the *Power* button will toggle between normal operations and displaying the **Instruction** screens

To display the **Calibration** screen - press and hold the *Print* button and then press the *Left Arrow* button

To display the **Setup** screen - press and hold the *Print* button and then press the *Right Arrow* button

To display the **System Information** screen - press and hold the *Print* button and then press the *Power* button

To jump the cursor to the bottom of the screen, press and hold the *Print* button and then press the *Down Arrow* button

To jump the cursor to the top of the screen, press and hold the *Print* button and then press the *Up Arrow* button

Power On

When the Inspector 5000 is turned **On**, the **GRADE** (grading) screen will display the last bar code inspected:

```
 GRADE   |  ENCODE  | PROFILE |  REPORT
Symbology                        UPCA+2
0 12345 67895 0 12

ISO  Overall Grade      4.0/06/660
ANSI Overall Grade        A/06/660

Decodes                 01 of 01
Decodability               A    68%
Worst Decodability              10
Modulation                 A    85%
Symbol Contrast            A    84%
Defects                    A     5%
Minimum Edge Contrast Pass      72%
Application Compliance     A
Ref Decode                 A
Edge Determination    Pass
Reflectance Minimum   Pass
Quiet Zone (left)     Pass      26X
```

In addition to **GRADE**, the other screens are **ENCODE**, **PROFILE**, and **REPORT**.

> **Note:** *A bar code can be scanned at any time except:*
> 1. When the unit is printing
> 2. Setup screen is open
> 3. Profile screen is open
> 4. When a pop-up window is displayed
> 5. During calibration

5.3 Field Calibration

The Inspector 5000 requires periodic field calibration. The interval depends on the environment where the bar code verifier is used.

Inspector 5000 calibration interval

A clean room may be able to go two weeks between calibrations while a dusty, high temperature, high humidity environment may require daily calibration. Once per week is appropriate for most facilities.

The **Setup** screen has a parameter "Days between calibration" that is used to designate the required calibration interval (default is 7).

The date of the last field calibration (and last factory re-certification) can be viewed from the **Status** screen (press and hold *Print* and then *Power arrow*), when expired the fields will be highlighted in red.

```
 GRADE  | ENCODE | PROFILE | REPORT

IP ADDR            192.168.1.2

NET MODE           DHCP CLIENT

BATTERY            63%

VERSION            1.101

SERIAL NUM         987543999995

DATE/TIME          07-28-20 08:56:00

       -- HARDWARE DATES --

AO  FIELD CAL   07-28-20
CAM FIELD CAL   NOT ATTACHED
FACTORY ReCert  04-27-20
MANUFACTURE     04-21-20
```

The Inspector 5000 will prompt the user when there is one day before the field calibration will expire:

```
 GRADE  │ ENCODE │ PROFILE │ REPORT
Symbology                    GS1-128
567RSTUVW

IS                                60
AN                                60
De                                03
De        **** WARNING ****       2%
Wo       LAST DAY BEFORE           1
Mo    RE-CALIBRATION REQUIRED     4%
Sy                                0%
De       PRESS UP TO CANCEL       1%
Mi                                4%
Ap
Re
Edge Determination      Pass
Reflectance Minimum     Pass
Quiet Zone (left)       Pass 25.5X
```

The Inspector 5000 will prompt the user when the field calibration has expired. The inspection results will be viewable on the screen but will not be saved in the database and may not be printed:

```
 GRADE  │ ENCODE │ PROFILE │ REPORT
Symbology                    GS1-128
567RSTUVW

        **** WARNING ****

   FIELD CALIBRATION EXPIRED

ISO/ANSI RESULTS MAY BE INVALID

CALIBRATE VERIFIER IMMEDIATELY


      PRESS UP TO CANCEL

Reflectance Minimum     Pass
Quiet Zone (left)       Pass 25.5X
```

Press and hold *Print* button then press *Left Arrow* button (at the same time) to display the **Calibration** screen:

Verifying the Inspector 5000 is calibrated

From the main calibration screen the unit is setup to measure reflectance. This allows you to check the calibration of the unit by placing the Auto Optic on the RJS Calibration Plaque *(P/N 002-7410)*, white or black fields, and verifying that the reflectance value matches the stated values.

Verify that reflectance values are within +/- 2% *(of the value written the calibration plaque – "High Reflectance Value Target Values:* **Red (660nm)***"*) for white and +/- 2% *(of the value written the calibration plaque – "Low Reflectance Value Target Values:* **Red (660nm)***"*) for black.

Calibrating the Inspector 5000

After displaying the **Calibration** screen, press the *Select* button to begin calibration:

```
 GRADE  |  ENCODE  | PROFILE |  REPORT
        CALIBRATION  SETTINGS

HIGH/LOW PLAQUE (RED)        89/05
REFLECTANCE     (RED/006)    91%




      PRESS SELECT TO CALIBRATE
          PRESS UP TO EXIT
```

From the reflectance menu press *Select* button, the Calibrate menu will display:

```
 GRADE  |  ENCODE  | PROFILE |  REPORT




   PLACE SCANNER OVER WHITE IMAGE




      PRESS SELECT TO START
         PRESS UP TO CANCEL
```

Remove the Calibration plaque from the protective plastic sleeve. Place the Auto Optic on the <u>white</u> section of the calibration plaque with the inspection hole in the bottom of the Plexiglas plate <u>flat</u> against the surface. Press *Select* button and hold auto-optic scanner head still while this screen is displayed:

After completing the White calibration this screen is displayed:
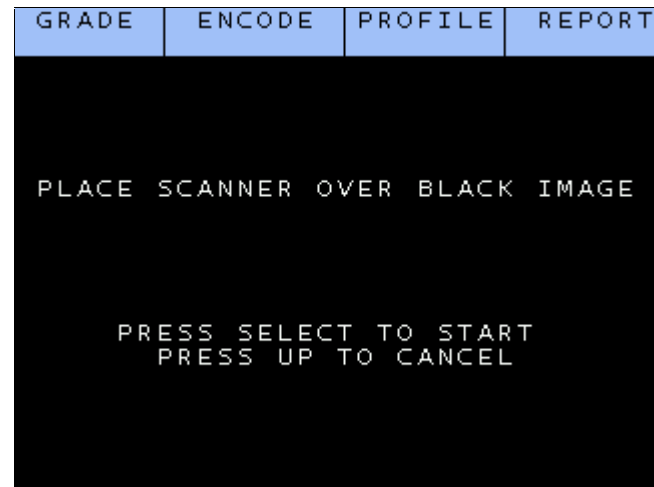
Place the Auto Optic on the <u>black</u> section of the calibration plaque with the inspection hole in the bottom of the Plexiglas plate <u>flat</u> against the surface. Press **Select** button and hold auto-optic scanner head still while this screen is displayed:

```
 GRADE  | ENCODE | PROFILE | REPORT




            CALIBRATING BLACK

```

When both the light and dark reflectance values have been calibrated you hear a "chirp" sound and the following screen will display:

```
 GRADE  | ENCODE | PROFILE | REPORT


        CALIBRATION COMPLETE

      Check both WHITE/BLACK
       reflectance squares to
      verify that reflectances
     are within +/-2% of values
        written on the plaque.


        PRESS UP TO CONTINUE
```
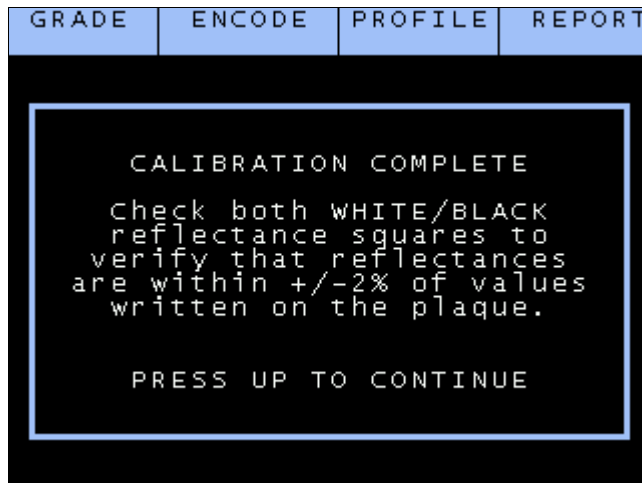
Press **Up** button to display the reflectometer mode and to verify that the unit is calibrated within tolerance placing the Auto Optic on the light or dark area of the plaque.

```
┌──────────┬──────────┬──────────┬──────────┐
│  GRADE   │  ENCODE  │ PROFILE  │  REPORT  │
└──────────┴──────────┴──────────┴──────────┘
        CALIBRATION  SETTINGS

HIGH/LOW  PLAQUE  (RED)          89/05
REFLECTANCE       (RED/006)      91%




        PRESS  SELECT  TO  CALIBRATE
             PRESS  UP  TO  EXIT
```

Reflectance values should be within +/- 2% *(of the value written the calibration plaque – "High Reflectance Value Target Values: **Red (660nm)**"*) for white and +/- 2% *(of the value written the calibration plaque – "Low Reflectance Value Target Values: **Red (660nm)**"*) for black.

If the *Unable to Calibrate* screen displays, then repeat the calibration.

```
GRADE    ENCODE   PROFILE   REPORT



        CALIBRATION FAILED


     USE COMPRESSED AIR TO
    CLEAN HOLE IN AUTO OPTIC
          AND TRY AGAIN

       PRESS UP TO CANCEL

```
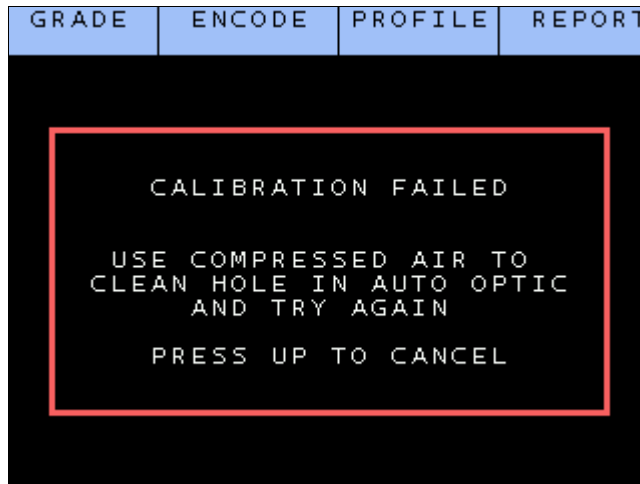
>   ***Note:*** *Once the unit is calibrated, the calibration data will remain saved in memory; the proper Symbol Contrast and Modulation readings depend on field calibration.*

After three failed attempts to calibrate your unit, it is an indication that your bar code verifier will need to be Factory calibrated and serviced.

A Return Authorization Number (RMA number) may be obtained by visiting our website address: ***http://www.rjs1.com/rma-request/***

5.4 Setup

Press and hold *Print* button then press *Right Arrow* button (at the same time) to bring up the **Setup** screen:

The *Down Arrow* and *Up Arrow* buttons allow for changing the selected **Setup** parameter.

The *Left Arrow* and *Right Arrow* buttons allow for modification of the selected **Setup** parameter.

The **Symbology Settings** page of the **Setup** screen:

```
 GRADE  | ENCODE  |PROFILE| REPORT


------ Symbology Settings ------

UPC/EAN MAGNIFY        90-115% MAG

UPC RANDOM WEIGHT              NO
         L/R for Options


INTERLEAVE 2 of 5          ITF-14
CODE 39                  CODE 3of9
CODE 128                      GS1
```

Symbology Settings

***The first selection allows you to select a range of
UPC/EAN symbol magnifications:***
The magnification options are:
>   **80   - 89   % Mag**
>   **90   - 115 % Mag**
>   **116 - 150 % Mag**
>   **151 - 200 % Mag**
See Appendix H for an explanation of magnifications

*The next selection allows you to select if UPC/EAN
symbols will be inspecting Random Weight bar codes:*
The options are **Yes** or **No**

The next selection is Decode Interleaved 2 of 5:
This selection is for choosing the Interleaved 2 of 5 sub-specifications for analysis:

> **STD I2of5**
> **I25 w/MOD 10**
> **ITF14**
> **ITF18**

The next selection is Decode 3 of 9 as:
This selection is for choosing the Code 39 sub-specifications for analysis:

> **CODE 3 of 9**
> **3of9 w/43**
> **AIAG B-1**
> **AIAG B-3/4/5/10**
> **LOGMARS**
> **HIBC 3of9**

When using the Inspector 5000 Auto Optic (not applicable to the Inspector 5000 Laser), if either AIAG choice is entered, the scan reflectance profile analysis will performed per the AIAG grading thresholds and display numbers 4.0, 3.0, 2.0, 1.0 and 0.0 in place of the letter grades.

The next selection is Decode C128:
This selection is for choosing the Code 128 sub-specifications for analysis:

> **Standard**
> **GS1**

See Appendix G for an explanation of Code 128 options

The second page **Symbology Settings** of the **Setup** screen:

```
 GRADE   |  ENCODE  | PROFILE |  REPORT
CODE 39                        CODE 3of9
CODE 128                             GS1
DATAMATRIX                      STANDARD

GS1 END FNC1              NOT ALLOWED
              L/R for Options


------- Camera Settings --------

BAR CODE SEARCH              1D ONLY
1D APERTURE                     AUTO
```

The next selection is Datamatrix:
This selection is for choosing the Datamatrix sub-specifications for analysis:
> **Standard**
> **GS1**

The next selection is GS1-128 End FNC1:
This selection is for choosing the Code 128 sub-specifications for analysis:
> **Allowed**
> **Not Allowed**

The GS1 General Specification is ambiguous making it allowable to have an unnecessary FNC1 character at the end of GS1-128 bar codes. This adds to the overall length of the bar code and should be avoided.

The **Camera Settings** page of the **Setup** screen:

Camera Settings

The next selection is Barcode Search:
This selection applies ONLY when using the 2D Camera and is for choosing the search order for bar code types:
>**1D Only**
>**2D Only**
>**1D Preferred**
>**2D Preferred**
>**Auto**

Auto remembers which type of bar code (1D or 2D) was last located and uses this as preferred search type. If a different type of bar code is found this type will be searched first on the next bar code inspection.

The next selection is 1D Aperture Override:

This selection applies ONLY when using the 2D Camera scanner and will replace the selected Auto Optic aperture with the value entered in this field.

> **Auto (based on selected Specification and bar code size)**
> **None (No aperture)**
> **03 (3 mil)**
> **06 (6 mil)**
> **10 (10 mil)**
> **20 (20 mil)**

The next selection is 2D Aperture Override:

This selection applies ONLY when using the 2D Camera scanner and will replace the selected Auto Optic aperture with the value entered in this field.

> **Auto (based on selected Specification and bar code size)**
> **None (No aperture)**
> **01 to 99 mil (1 mil intervals)**

The next selection is Specifications:

This selection is for choosing the Specifications that should be applied to bar code inspection analysis:

> **Standard**
> **General Distribution**
> **Direct Corrugate**
> **Regulated Healthcare**
> **Pharmacy**
> **Non-Regulated Healthcare**

> *Note:*
> *This selection ONLY applies when using the 2D Camera*
> *See Appendix F for an explanation of the options*

The next selection is Days Between Camera Calibration:

The maximum number of days allowable before the system must be field calibrated (2D Camera only).

The system will display a warning message one day before expiration and after calibration expires inspection results may be captured but the results will not be stored in the database and may not be printed.

The **Auto Optic Settings** page of the **Setup** screen:

Auto Optic Settings

The next selection is Aperture Size:

Two Auto Optic options are available:

- *3, 6, 10, and 20 mil apertures Standard*
- *3, 5, 10, 20 mil apertures for Europe and Japan*

Choose the Aperture size by pressing **Left Arrow** or **Right Arrow** buttons:

     3 MIL   *0.003 inches*
     *5 MIL   *0.005 inches (for Europe and Japan)*
     6 MIL   *0.006 inches*
     10 MIL   *0.010 inches*
     20 MIL   *0.020 inches*

See Appendix I for an explanation of how to select the correct aperture size

The next selection is Wavelength:

This selection allows you to select one of two light wavelengths which are **Red** (660nm) or **Infrared** (925nm - invisible). The default it RED and Infrared is used by very few customers.

The next selection is Auto Optic number of scans:

Bar code quality varies throughout the height of a bar code. It is best to take multiple scans from top to bottom and average the scan grades to calculate the overall scan grade. This parameter can be set from **1** to **10**.

The next selection is Auto Optic Days Between Calibration:

The maximum number of days allowable before the system must be field calibrated (Auto Optic only).

The system will display a warning message one day before expiration and after calibration expires inspection results may be captured but the results will not be stored in the database and may not be printed.

The **Laser Settings** page of the **Setup** screen:


```
 GRADE   │ ENCODE  │PROFILE│  REPORT
AUTO OPT # OF SCANS              1
DAYS BTWN AO CALIB             07
-------- Laser Settings --------

LASER # OF SCANS       CONTINUOUS
        L/R for Options

LASER COMPARE MODE           OFF
------- System Settings --------
MIN MARGINAL GRADE           2.5
```

Laser Settings

The next selection is Laser number of scans:
Bar code quality varies throughout the height of a bar code. It is best to take multiple scans from top to bottom and average the scan grades to calculate the overall scan grade. This parameter can be set from **1** to **10** or **Continuous**.

Continuous mode is recommended In this mode - start with the laser beam above the bar code, slowly drag the laser through the height of the bar code, and release the trigger after passing the bottom of the bar code. The Inspector 5000 will then average the *Decodability* of all scans captured to provide an overall *Decodability* average grade.

The next selection is Laser Comparison Mode:
Choices are **Off**, **New**, or **On**. When **New** is selected, the
next bar code scanned will be recorded as the "master"
bar code. Then any future bar codes scanned where the
encoded data does not match the saved Master bar code
will result in an error sound and the results will not be
displayed on the display. Once a "Master" bar code is
saved, the comparison mode can be turned **On** or **Off**.

The **System Settings** page of the **Setup** screen:

```
GRADE  |  ENCODE  | PROFILE|  REPORT
------- System Settings --------
MIN MARGINAL GRADE            2.5
MIN PASSING GRADE             1.5

PASS/FAIL SCREEN               NO
        L/R for Options

OUTPUT DEVICE              TP140A
AUTO PRINT                     NO
SET UNITS                STANDARD
```

System Settings

The next selection is Minimum Marginal Grade:
Select one of the threshold numeric grades, **0.0** - **4.0**.
This value or above will be Good "green" and below this
value (but above the *Minimum Passing Grade*) will be
Marginal "yellow"
See Appendix A for an explanation of ISO/ANSI grades

The next selection is Minimum Passing Grade:

Select one of the threshold numeric grades, **0.0** - **4.0**.
Below this value will be Failing "red"
See Appendix A for an explanation of ISO/ANSI grades

The next selection is Pass/Fail Screen:
This setting can be set to **Off** or **1 Sec, 2 Sec, 3 Sec, 4 Sec, or 5 Sec.** When a time is set, after the completion of a bar code inspection the Pass/Fail screen will be displayed for the number of seconds selected or until the ***Select*** button is pressed.

If "Auto Optic Number of Scans" is set to more than 1, the Pass/Fail screen will only be displayed following the last scan.

See section *6.3 Pass/Fail Screen* for a description and example of the Pass/Fail Screen.

The next selection is Output Device:
Three output choices are available:
   1. When **Computer** is enabled, data is output in computer readable format (text and graphics)
   2. When **TP140A** is enabled, data output is in the format of analysis only (text)
See Section 10.0, Viewing Saved Inspection Reports

The next selection is Auto Print mode:
The options are **Yes** or **No**

The next selection is Set Units:
The units used can be either **Standard** or **Metric**. The bar code data will be presented either in inches (in) or in millimeters (mm).
The second page **System Settings** of the **Setup** screen:

```
┌──────────┬──────────┬──────────┬──────────┐
│ GRADE    │ ENCODE   │ PROFILE  │ REPORT   │
├──────────┴──────────┴──────────┴──────────┤
│ DAY OF WEEK                       THURSDAY │
│ DAYLIGHT SAVINGS                       YES │
│ DATE FORMAT                         MMDDYY │
├────────────────────────────────────────────┤
│ SET DATE                        10-07-21   │
│              SEL to Edit                   │
├────────────────────────────────────────────┤
│ SET TIME                        09:26:15   │
│ SET DB ERASE DATE               10-07-21   │
│ ERASE DB                                   │
└────────────────────────────────────────────┘
```

The next selection is Day of the Week:

For printed reports, the day of the week is used with the real-time clock.

The next selection is Daylight Savings:

The Inspector 5000 has the ability to automatically change the real-time clock to adjust for daylight savings. Choices are **Yes** or **No**.

The next selection is Date Format:

The date format can be either **MMDDYY** or **DDMMYY**. All reports and screens will be formatted to the selected method. However, GS1-128 bar codes with an Application Identifier that contains a date will follow the GS1 standards.

The next selection is Set Date:

To set the real-time clock date, press the **Select** button. The **Left Arrow** and **Right Arrow** buttons move the cursor and the **Up Arrow** and **Down Arrow** buttons increase or decrease the field. The format will be based on the previous field *Date Format*.

The next selection is Set Time:

To set the real-time clock time, press the **Select** button. The **Left Arrow** and **Right Arrow** buttons move the cursor and the **Up Arrow** and **Down Arrow** buttons increase or decrease the field. The format will using the 24 hour clock (14:00:00 is 2:00pm)

The next selection is Set DB Erase Date:

To delete any bar code inspection records prior to the date which is selected in this field. The **Left Arrow** and **Right Arrow** buttons move the cursor and the **Up Arrow** and **Down Arrow** buttons change the numbers selected. Press the **Select** button accept the date entered.

The next selection is Erase DB:

To the delete the all bar code inspection records prior to the date set in the field above **Set DB Erase Date**, press the **Select** button. After pressing the **Select** button, press **Up Arrow** button to cancel or press **Select** button again to confirm the database should be erased.

> **Note:**
> The database holds approximately 1,000 inspection reports. Once your database is full, the system will overwrite the oldest stored inspection report with the new inspection report.

The **Exit / Save** page of the **Setup** screen:

```
GRADE   | ENCODE  |PROFILE|  REPORT
--------- Exit / Save ----------
RESTORE DEFAULTS
EXIT WITHOUT SAVE

EXIT WITH SAVE
            SEL to Choose
```
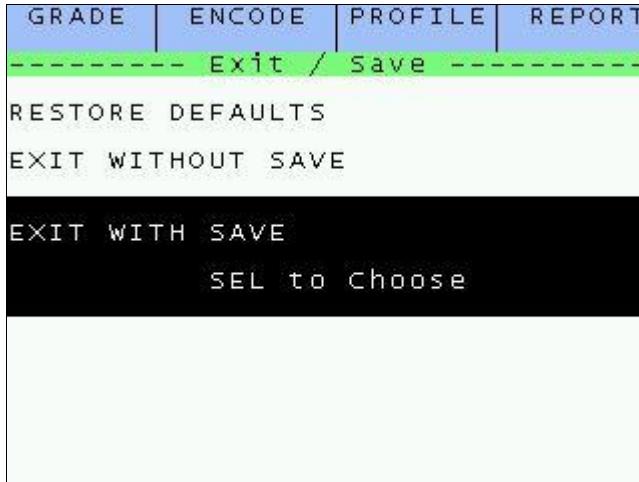
Exit / Save Settings

The next selection is Restore Default:
To restore the **Setup** parameters back to the system
defaults, press the *Select* button. After pressing the
Select button, press *Up Arrow* button to cancel or press
Select button again to confirm the default values should
be loaded.

The next selection is Exit Without Saving:
To exit the **Setup** screen without saving any changes,
press the *Select* button. After pressing the *Select* button,
press *Up Arrow* button to cancel and return to the **Setup**
screen or press *Select* button again to exit the **Setup**
screen without saving the changes.

The next selection is Exit With Saving:
To exit the **Setup** screen and save any changes, press
the *Select* button. After pressing the *Select* button, press
Up Arrow button to cancel and return to the **Setup** screen

or press *Select* button again to confirm the changes should be saved and to exit the **Setup** screen.

6.0 Scanning Symbols

6.1 Scanning Techniques

- Lay the symbol to be scanned on a flat, non-reflective surface.
- For greatest accuracy scan a symbol more than once, in both directions.
- Begin a scan from the *quiet zone*, two inches *(5 cm)* before the symbol.
  See Appendix E for quiet zone details
- Make sure the scan head is flat against the symbol.
- Move the scan head across the symbol in a smooth motion. A constant speed of 5 to 10 inches *(13-25 cm)* per second is ideal. Scanning too fast will cause the display to read "Please Scan Slower" but faster is ALWAYS better than slower.

6.2 Scanning Results

After a bar code is scanned, the Inspector 5000 will respond with a crisp, chirp *(or beep)* sound and the **Grade** screen will be displayed:

```
GRADE    |  ENCODE  | PROFILE |   REPORT
Symbology                        UPCA+2
0 12345 67895 0 12

ISO  Overall Grade      4.0/xx/yyy
ANSI Overall Grade        A/xx/yyy

Decodes                 01 of 01
Decodability               A   68%
Worst Decodability              10
Modulation                 A   85%
Symbol Contrast            A   84%
Defects                    A    5%
Minimum Edge Contrast Pass     72%
Application Compliance     A
Ref Decode                 A
Edge Determination    Pass
Reflectance Minimum   Pass
Quiet Zone (left)     Pass     26X
```

XX   = indicates the aperture size in mils
YYY = indicates the wavelength *(color)* of the light represented in nanometers

    Example: **10/660**
                This display indicates that the installed Auto Optic uses a 10 mil diameter aperture size and aRed light at 660nm wavelength.

If the **Setup** parameter **Pass/Fail Screen** is set to **Yes**, after the completion of a bar code inspection, the Pass/Fail screen will be displayed for 5 seconds or until *Select* button is pressed. If the **Setup** parameter **Auto Optic Number of Scans** is set to more than 1, the Pass/Fail screen will only be displayed following the last scan.

6.3 Pass/Fail Screen
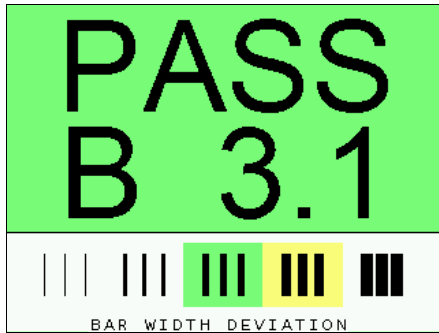
- The top section:
    - o **Pass** with a **Green** background is displayed if the ISO grade is <u>above</u> the **Minimum Passing Grade**
    - o **Fail** with a **Red** background is displayed if the ISO grade is <u>below</u> the **Minimum Passing Grade**
    - o The ANSI **Letter** grade and ISO **Numeric** grades are displayed
- The bottom section
    - o Displays the traditional (non-ISO/ANSI) bar width deviation chart (same information as the 5 LEDs on the Inspector D4000):

 Out of tolerance (narrow)

 Within -79 to -99%

 Within -50 to -78%

 Within -22 to -49%

 Within +21% to -21%

 Within +22 to +49%

 Within +50 to +78%

 Within +79 to +99%

 Out of tolerance (wide)
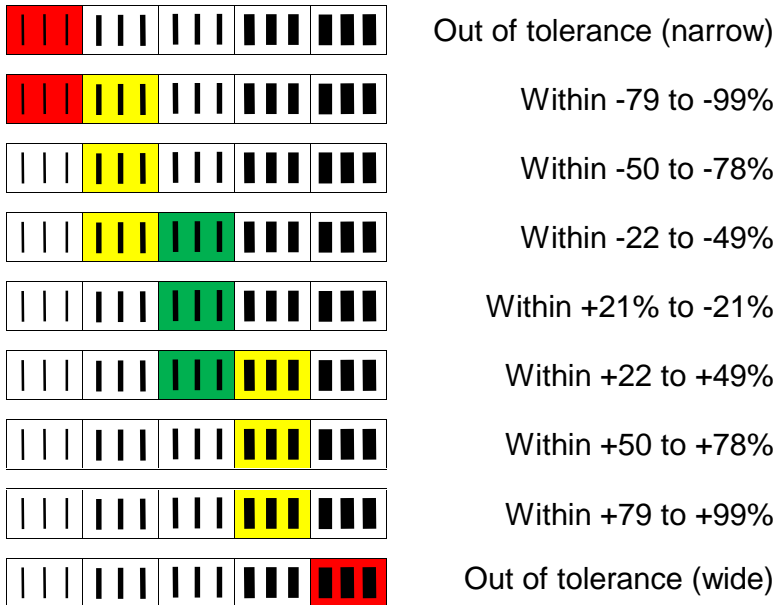
6.4 Multiple Scan Averaging Results

Inspector 5000 Display, when set to multiple scan analysis, will display the following line below the ANSI Overall Grade (highlighted below) showing how many scans have been captured and the total scans to be captured before the Overall Scan Grade is saved to the database:

```
 GRADE  │ ENCODE  │ PROFILE│  REPORT

Symbology                    std 128
567RSTUVW

ISO  Overall Grade       4.0/06/660
ANSI Overall Grade         A/06/660

Decodes                     03 of 10
Decodability                  A   82%
Worst Decodability               11
Modulation                    A   72%
Symbol Contrast               A   85%
Defects                       A    6%
Minimum Edge Contrast  Pass       62%
Application Compliance        A
Ref Decode                    A
Edge Determination     Pass
Reflectance Minimum    Pass
Quiet Zone (left)      Pass       26X
```

After the final scan is inspected, the Inspector 5000 will respond with two chirps *(or beep* sounds). The first is for the final scan and the second is for the overall average bar code scan grade.

> ***Note:***
> *See 7.0 Grade Analysis Screen section for details the inspection tests and results*

7.0 Grade Analysis Screen

After the symbol is scanned the *Grade Analysis Screen* will be displayed:

```
GRADE    |  ENCODE  | PROFILE |  REPORT
Symbology           ITF14 Case Code
1234567890012 8

ISO  Overall Grade       2.1/06/660
ANSI Overall Grade         C/06/660

Decodes                   10 of 10
Decodability            A       74%
Worst Decodability             RP
Modulation              A       82%
Symbol Contrast         A       84%
Defects                 C       24%
Minimum Edge Contrast  Pass     69%
Application Compliance  A
Ref Decode              A
Edge Determination     Pass
Reflectance Minimum    Pass
Quiet Zone (left)      Pass     13X
```

This first page of the **Grade** screen shows:
- The top section shows the symbology, symbology sub-type, and the encoded bar code data
- The second section provides the ISO and ANSI bar code quality grade, including the aperture size and light wavelength – color coded (Green/Yellow/Red) based on the "Minimum Passing Grade" and "Minimum Marginal Grade" (as selected in the **Setup** screen)
- The third section is the individual bar code inspection results – these parameters will be color coded (Green/Yellow/Red) based on the "Minimum Passing Grade" and "Minimum Marginal Grade" (as selected in the **Setup** screen)

Pressing the *Down Arrow* button will display the
additional results

```
GRADE    ENCODE   PROFILE   REPORT

Edge Determination         Pass
Reflectance Min            Pass
Quiet Zone (left)          Pass  25.5X
Quiet Zone (right)         Pass  25.5X
Narrow Bar Width           Press SEL
Ratio                      Pass    2.9
Inter Character Gap              0.97X
Reflectance Min                    3%
Reflectance Maximum               83%
Global Threshold                  43%
Lines of Inspection                1
Average Bar Deviation            +1%
Maximum Bar Deviation            +4%
Minimum Bar Deviation            +0%
Number Encoded Chars              12
Number of Bars/Spaces            139
Inspection Date           10-07-21
Inspection Time           09:53:53
```

This second page of the **Grade** screen shows:
- The top section shows the bar code structure
  information
- The bottom section is the date and time of the bar
  code inspection

7.1 Results explanation

Line 1

Displays the type of bar code inspected:

```
Symbology                    ITF14 Case Code
```

Table 7-A (Code Identifier Descriptions)

LOGMARS	Code 39 symbology
AIAG B-1	Code 39 symbology
AIAG B 3/4/5/10	Code 39 symbology
Code 3 of 9	Code 39 symbology
HIBC 3 of 9	Code 39 symbology
3of9 W/43	Code 39 symbology
I 2 of 5 w/mod10	Interleaved 2 of 5 symbology
Std I2of5	Interleaved 2 of 5 symbology
ITF14 Case Code	Interleaved 2 of 5 symbology
GS1-128	Code 128 symbology
Std 128	Code 128 symbology

X - Y % UPC-A	Uniform Product Code, Ver. A
X - Y % UPCA+2	Uniform Product Code, Ver. A with 2 digit Add
X - Y % UPCA+5	Uniform Product Code, Ver. A with 5 digit Add
X - Y % UPC-E	Uniform Product Code, Ver. E
X - Y % UPCE+2	Uniform Product Code, Ver. E with 2 digit Add
X - Y % UPCE+5	Uniform Product Code, Ver. E with 5 digit Add
X - Y % EAN-13	European Article Number 13 digit
X - Y % EAN13+2	European Article Number 13 digit with 2 digit Add
X - Y % EAN13+5	European Article Number 13 digit with 5 digit Add
X - Y % EAN-8	European Article Number 8 digit
X - Y % EAN8+2	European Article Number 8 digit with 2 digit Add
X - Y % EAN8+5	European Article Number 8 digit with 5 digit Add

Note:

X and Y represent the magnification range selected for UPC/EAN tolerances

Table 7-B (Abbreviated Code Identifier Descriptions)

Identifier	Symbology Type
B-1	Code 39; B-1 sub-specification for AIAG
B345	Code 39; B3, 4, 5, or 10 sub-specification for AIAG
LOG	Code 39; LOGMARS sub-specification
HIBC	Code 39; HIBC sub-specification
3 OF 9	Code 39; Traditional ISO/ANSI sub-specification
39+C	Code 39; with Mod 43
25+C	Interleaved 2 of 5 with Mod 10
I25	Interleaved 2 of 5
CC	Interleaved 2 of 5 ITF-14 sub-specification
GS1	GS1-128 Code 128
C128	Code 128
UPCA	UPC version A
UA+2	UPC version A plus 2 digit addendum
UA+5	UPC version A plus 5 digit addendum
UPCE	UPC version E
UE+2	UPC version E plus 2 digit addendum
UE+5	UPC version E plus 5 digit addendum
EAN8	EAN 8 character
E8+2	EAN 8 plus 2 digit addendum
E8+5	EAN 8 plus 5 digit addendum
EN13	EAN 13 character
13+2	EAN 13 plus 2 digit addendum
13+5	EAN 13 plus 5 digit addendum

Line 2
Displays the data encoded in the bar code:

```
0000500002225 1
```

Note:

> *If more than 32 characters are encoded, additional characters will wrap to the next row of the display*

Line 3

Displays the ISO numeric grade, the aperture, and the wavelength:

```
ISO  OVERALL GRADE              3.4/YY/XXX
```

Note: *YY is the aperture and XXX is the wavelength*

Line 4

Displays the ANSI letter grade, the aperture, and the wavelength:

```
ANSI OVERALL GRADE                B/YY/XXX
```

Note: *YY is the aperture and XXX is the wavelength*

Line 5

Displays the number of scans for the current bar code that have been captured and the total number of scans (as selected in the **Setup** screen) necessary to calculate the Overall Scan Grade:

```
Decodes                          3 of 10
```

Line 6

Displays the ISO/ANSI *Decodability* letter grade and percentage result:

```
Decodability                     B    56%
```

Line 7
Displays the ISO/ANSI *Worst Decodability* character in the barcode:

```
Worst Decodability                              4
```

This is the character in the bar code where the worst Decodability was measured. It is possible the worst Decodability is in the structure part of the bar code (character not shown in the human readable). Here are the possible structure characters:

> *LG* = Left guard bars
> *RG* = Right guard bars
> *CG* = Center guard bars
> *AG* = Add-on guard bars
> *LP* = Left pattern
> *RP* = Right pattern
> *ES* = Extra stop character

Line 8
Displays the ISO/ANSI *Modulation* letter grade and percentage result:

```
Modulation                              A    77%
```

Line 9
Displays the ISO/ANSI *Symbol Contrast* letter grade and percentage result:

```
Symbol Contrast                         A    79%
```

Line 10
Displays the ISO/ANSI *Defects* letter grade and percentage result:

```
Defects                                 B    17%
```

Line 11
Displays the ISO/ANSI *Minimum Edge Contrast* Pass/Fail result and percentage result:

```
Minimum Edge Contrast               Pass    61%
```

Line 12
Displays the ISO/ANSI *Application Compliance* Pass/Fail
result (as determined by the Check digit, Sub-Symbology
and Industry specifications/standards, Ratio, and Inter-
character Gap):

Application Compliance	Pass

Line 13
Displays the ISO/ANSI *Reference Decode* Pass/Fail
result, which includes testing for the Global threshold,
Character encodation, Start and stop patterns, Check
digits(s), *Quiet zones* and Inter-character gaps:

Ref Decode	Pass

Line 14
Displays the ISO/ANSI *Edge Determination* Pass/Fail
result:

Edge Determination	Pass

Line 15
Displays the ISO/ANSI *Reflectance Minimum* Pass/Fail
result (the percentage result is displayed on Line 19 with
the *Reflectance Maximum* result on Line 20):

Reflectance Minimum	Pass

This is the end of Page 1 results

Line 16
Displays the ISO/ANSI *Left Quiet Zone* Pass/Fail result
and the size of the *quiet zone (the minimum quiet zone
size varies by Symbology and Symbology Specification)*:

Quiet Zone (left)	Pass	11X

Line 17
Displays the ISO/ANSI *Right Quiet Zone* Pass/Fail result
and the size of the *quiet zone (the minimum quiet zone
size varies by Symbology and Symbology Specification)*:

```
Quiet Zone (right)              Pass    10X
```

Line 18
Displays the calculated *Narrow Bar Width* (NBW or X-dim)
by pressing the **Select** button:

```
Narrow Bar Width                   Press SEL
```

With the Narrow Bar Width screen displayed, use a ruler
to measure the distance from the left most bar to the right
most bar and enter this value into the *Barcode Width* field.
The Inspector 5000 will automatically determine and
display the Narrow Bar Width (or Magnification, depending
the Symbology). Press the **Select** button to return to the
Grading screen.

Line 19
Displays the *Ratio* Pass/Fail result and the numeric ratio
of the Wide to Narrow bar widths *(the acceptable ratio
values vary by Symbology and Symbology Specification,
see Table B-2)*:

```
Ratio                              Pass 2.3
```

Note: *The Ratio field will not be displayed if the ratio is not
applicable (UPC, EAN, or Code 128)*

Line 20
Displays the *Inter Character Gap* result and the space
between encoded characters and is expressed as a
multiple of the X dimension

```
Inter Character Gap                   1.02X
```

Note: *The Inter Character Gap field will only be displayed if
applicable (Code 39 and Codabar)*

Line 21
Displays the *Reflectance Minimum* percentage:

```
Reflectance Minimum                      5%
```

Line 22
Displays the *Reflectance Maximum* percentage:

```
Reflectance Maximum                     84%
```

Line 23
Displays the *Global Threshold* percentage, which is the
threshold which determines what is a *space* and what is a
bar in the bar code. It is calculated as the mid-point
between *Reflectance Minimum* and *Reflectance Maximum*
((Reflectance Maximum - Reflectance Minimum)/2) + Reflectance Minimum):

```
Global Threshold                        45%
```

Line 24
Displays the *Lines of Inspection*, with the Auto Optic this
total number of scans of the current bar code:

```
Lines of Inspection                      10
```

Line 25
Displays the *Average Bar Deviation* of all of the bars in the
bar code. This value is the deviation from the ideal bar
width for each bar in the bar code with all of the bar
deviations averaged together:

```
Average Bar Deviation                   +1%
```

Line 26
Displays the *Maximum Bar Deviation* of all of the bars in
the bar code. This value is the deviation from the ideal
bar width for the single bar with the largest print growth in
the bar code:

```
Maximum Bar Deviation                   +4%
```

Line 27
Displays the *Minimum Bar Deviation* of all of the bars in
the bar code. This value is the deviation from the ideal
bar width for the single bar with the smallest print growth
in the bar code:

```
Minimum Bar Deviation                        +0%
```

Line 28
Displays the *Number of Encoded Characters* that are
encoded in the bar code. This number includes any
hidden or system characters:

```
Number of Encoded Char                        14
```

Line 29
Displays the total *Number of Bars and Spaces* that are
encoded in the bar code.

```
Number of Bars/Spaces                         77
```

Line 30
Displays the *Inspection Date* of when the last bar code
inspection scan was captured – MMDDYY or DDMMYY is
displayed as selected in the Date Format parameter in the
Setup screen:

```
Inspection Date                         10-07-21
```

Line 31
Displays the *Inspection Time* of when the last bar code
inspection scan was captured:

```
Inspection Time                         09:53.53
```

This is the end of Page 2 Bottom Section results

7.2 ISO Parameter History Results

Press the *Down Arrow* to highlight a parameter to view the history for an individual ISO parameter then press the *Select* button.

```
 GRADE  │  ENCODE  │ PROFILE │  REPORT
Symbology                        UPC-A
3  05559  01258  1

ISO   Overall  Grade      0.0/06/660
ANSI  Overall  Grade         F/06/660

Decodes                    10  of  10
Decodability                 A      60%
Worst  Decodability                 RG
Modulation                   C      54%
Symbol  Contrast             A      90%
Defects                      F      39%
Minimum  Edge  Contrast  Pass       49%
Application  Compliance      A
Ref  Decode                  B
Edge  Determination      Pass
Reflectance  Minimum     Pass
Quiet  Zone  (left)      Pass       26X
```

Example from the **Decodability** history results:

```
 GRADE  │  ENCODE  │ PROFILE │  REPORT
Decodability                 A      60%

Scan  01                     B      45%
Scan  02                     B      55%
Scan  03                     A      78%
Scan  04                     B      55%
Scan  05                     A      65%
Scan  06                     A      59%
Scan  07                     A      65%
Scan  08                     B      54%
Scan  09                     A      60%
Scan  10                     A      61%
```

Example from the **Defects** history results:

GRADE	ENCODE	PROFILE	REPORT
Defects			F 39%
Scan 01			F 37%
Scan 02			F 41%
Scan 03			F 52%
Scan 04			F 37%
Scan 05			F 44%
Scan 06			F 45%
Scan 07			F 52%
Scan 08			D 29%
Scan 09			F 30%
Scan 10			C 23%

Press the *Power* for an explanation of the parameter selected:

GRADE	ENCODE	PROFILE	REPORT

These are the worst case of change in darkness within a single bar or space. Defects most commonly are caused by ink splatter in the spaces or voids in the bars.

Press the *Power* or the *Up Arrow* to close the explanation window.

When finished looking at the parameter history screen, press the *Select* button to return to the **Grading** tab

8.0 Encode Analysis Screen

After the symbol is scanned, the *Grade Analysis Screen* will be displayed. By pressing the **Right Arrow** button the *Encode Analysis* screen will be displayed.

Encode analysis screen layout:
- The top section, left shows encoded bar code data
- The top section, middle shows a brief explanation of the encoded bar code data
- The top section, right shows either a *P* or *F* for Pass/Fail for each line
- The bottom section shows a detailed explanation of the encoded bar code data and explains any errors

Acceptable GS1-128 Encode Analysis Screen

```
 GRADE     ENCODE   PROFILE   REPORT
Start C           Start Subset C   P
FNC1              Function 1 Char  P

01                AI(01)           P
0123456789012     GTIN             P
8                 GTIN Chk Digit   P

21                AI(21)           P
0123              Serial Number    P
FNC1              Function 1 Char  P

10                AI(10)           P
 (More Results? Up/Down Arrows)

Start in Subset C

Start Pattern in Subset C
        Acceptable
```

Pressing the **Down Arrow** button will display any remaining information for the GS1-128 bar code inspected.

Failure GS1-128 Encode Analysis Screen

```
 GRADE    ENCODE    PROFILE    REPORT
Start C            Start Subset C    P
FNC1               Function 1 Char   P

01                 AI(01)            P
0123456789012      GTIN              P
8                  GTIN Chk Digit    P

3931               AI(3931)          P
123                ISO Curr Code     P
45678<CB>A         Price/Item        F
 36                C128 Check DigitP
Stop               Stop Pattern      P
 (More Results? Up/Down Arrows)

45678.A   per item

Amount Payable, Price per Item
Numeric only: A
```

If an Error occurs, the cursor will highlight in red the first error and the *bottom section* will provide a detailed explanation of the error.

Failure UPC-A Encode Analysis Screen

```
GRADE    ENCODE   PROFILE   REPORT

1                 Reserved          P
2345678901        GTIN              P
5                 Check Digit       F




 (More Results? Up/Down Arrows)

Check Digit: 5        Expected: 2

Standard UPC/EAN Item
Invalid Character Expected: 2
```

If an Error occurs, the cursor will jump to the first error and the *bottom section* will provide a detailed explanation of the error.

9.0 Profile Analysis Screen

```
 GRADE    ENCODE   PROFILE   REPORT




      PRESS SELECT FOR IMAGE




```

Press the **Select** button to display the *Profile* data

An example of the Analog Profile Analysis screen:
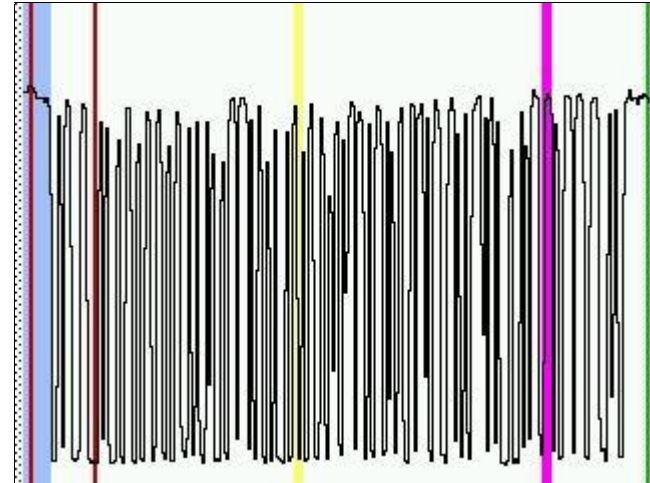
- The Yellow line identifies the worst case of *Modulation*
- The Magenta line identifies the worst case of *Decodability*
- The Light Blue line identifies the worst case of *Defects*
- The Dark Red lines identifies the *Symbol Contrast* (Rmax and Rmin)
- The Dark Green lines identify the *Minimum Quiet Zone* locations

The **Select** button scrolls through the zoom levels and exits the Profile Viewing screen

> **Full profile**
> **Zoom level 1**
> **Zoom level 2**
> **Zoom level 3**
> **Exit Profile Viewing**

The *Left Arrow* and *Right Arrow* buttons move the focused area left and right

While in the Profile Viewing screens, pressing and holding the *Print* button and pressing the *Down Arrow* buttons toggle **Profile** views – Analog Profile Analysis, Grey-scale image and Black/White Image

An example of the Grey-scale image screen:

An example of the Black/White image screen:

10.0 Viewing Saved Inspection Reports

The Inspector 5000 can store in memory over 1,000 bar code inspection results.

When the **Report** screen is selected, the last four inspection results will be displayed. The last inspection result will be highlighted and will show the Date, Time, Grade, Symbology, and Encoded data.

Example of the Report (Database) Screen:

```
GRADE    | ENCODE  | PROFILE | REPORT
10-07-21  UPC-A       3.3(B)/NA/660
10-07-21  UPC-A       0.0(F)/06/660
10-07-21  GS1-128     2.5(B)/06/660
10-07-21 14:10:14    1.0(D)/01/670
Datamatrix
F₁01008587010060492IPI20022697
```

The *Up Arrow* button is used to move the cursor to view older inspection reports. The *Down Arrow* button will move the cursor to newer inspection reports.

To view the *Grading* and *Encodation* information for a past inspection result, highlight the bar code inspection report to be viewed and press *Select* button. The report will be loaded and the **Grade** screen will be displayed. The *Right Arrow* button will display the **Encode** information for the highlighted inspection report. The **Profile** is not available.

Example of the Report (Database) Screen after scrolling to older reports:

GRADE	ENCODE	PROFILE	REPORT
10-06-21	GS1-128	0.0(F)/NA/660	
10-07-21	Code3of9	3.6(A)/06/660	
10-07-21	ITF14 Cas	0.0(F)/06/660	
10-07-21 10:05:55		0.0(F)/06/660	
GS1-128			
F101012345678901283931123456 78A			
10-07-21	UPC-A	3.4(B)/NA/660	
10-07-21	UPC-A	3.3(B)/NA/660	
10-07-21	UPC-A	0.0(F)/06/660	
10-07-21	GS1-128	2.5(B)/06/660	

11.0 Connect to other Devices

Connect to Computer

You may store and print the analysis *(and scan reflectance profile)* on a Windows PC computer using the *optional* VCIR software package.

Your Inspector 5000 Auto Optic will connect to a computer with a USB-to-Serial adapter or directly to an RS-232 port serial interface cable

Connect to Printer

Your Inspector 5000 will connect to an RJS TP140A printer with a serial interface cable.

Contact RJS to order either the VCIR software or printer:

RJS Technologies
701 Decatur Ave North, Suite 107
Minneapolis, MN 55427
+1 (763) 746-8034
Sales@rjs1.com

Appendix A (ISO/ANSI Parameter Analysis)

Table A-1 (Numeric to Letter Grade Conversion)

Numeric range	Letter grade
3.5 to 4.0	A
2.5 to <3.5	B
1.5 to <2.5	C
0.5 to <1.5	D
below 0.5	F

Decodability

This parameter can be graded 4.0 *to* 0.0 (A *to* F)

The *Decodability* grade indicates the amount of error in the width of the most deviant element in the symbol *(the lower the deviation, the higher the grade)*.

- Each symbology type has a specified method for calculating *Decodability* but the basic idea is the same for all symbologies.
- Each element size in a bar code symbol should be consistent across the symbol. In the case of Code 39 there are two element widths needed to produce a symbol, while a Code 128 has four element widths
- For optimum scanning, each narrow element *(bar or space)* should be the same dimension, and each wide element *(bar or space)* should be the same dimension.

Modulation

This parameter can be graded 4.0 *to* 0.0 (A *to* F)

Modulation grade is based on the relationship between the *minimum edge contrast* and the *symbol contrast*.

Ideally, the edge contrast should be equal to *symbol contrast*, but as an aperture size approaches an element size the amplitude of the signal received will decrease and the edge contrast will decrease.

The greater the difference between *minimum edge contrast* and *symbol contrast*, the lower the grade.

Note:

> *Aperture size has the greatest affect on Modulation. The substrate material can also have a major affect on Modulation*

Symbol Contrast

This parameter can be graded 4.0 *to* 0.0 (A *to* F)

Symbol contrast is the difference in reflectance values of the "lightest" space *(including the quiet zone)* and the "darkest" bar of the symbol *(the greater the difference, the higher the grade)*.

Note:

Bar code colors can have a large effect on this parameter.

Defects

This parameter can be graded 4.0 *to* 0.0 (A *to* F)

Defects are irregularities in bars, spaces and quiet zones.

For example, a dark spot in a space could cause a low enough reflectance to be mistaken for a bar, and the extra bar would cause a decode error.

The defect grade is determined by a relationship between the largest defect in the symbol and the symbol contrast *(the smaller the defect, the better the grade).*

Note:

In general, a small aperture used to analyze very wide elements will cause the largest defects.

Edge Contrast Minimum

This parameter can be graded 4.0 (A) *or* 0.0 (F), however multiple scan averaging can results in grading 4.0 *to* 0.0 (A *to* F)

Edge contrast is the difference of the reflectance values of the dark and light components of an edge.

Each element of a bar code has two edges which go from dark to light. Therefore, each edge has a dark and light reflectance value component.

Reference Decode

This parameter can be graded 4.0 (A) **or** 0.0 (F), however multiple scan averaging can results in grading 4.0 **to** 0.0 (A **to** F).

- If the *Reference Decode* parameter is 0.0 (F), then the overall symbol grade is also 0.0 (F) - *regardless of the grade of any other parameter*.
- If the *Reference Decode* parameter is 4.0 (A), then the overall symbol grade is determined by the lowest of the other parameter grades.

Note:

The Inspector 5000 decodes each symbology with a more aggressive algorithm. This enables many symbols to be scanned and decoded even though the Reference Decode grade is a 0.0 (F)

The overall symbol grade is averaged for the *Reference Decode* parameter.

Example:

If two scans are averaged and one passes reference decode and the other fails reference decode, (assuming all other parameters scan 4.0 (A)), the average would be a 2.0 (C), which is the average of 4.0 (A) and 0.0 (F).The average grade for the reference decode parameter would be 0.0 (F) however <u>as a warning that at least one scan failed this parameter</u>.

Edge Determination

This parameter can be graded 4.0 (A) *or* 0.0 (F), however multiple scan averaging can results in grading 4.0 *to* 0.0 (A *to* F)

When a symbol contains an *edge determination* failure *(an element does not cross the global threshold) all* other parameters cannot be analyzed.

- In the case of an *edge determination* failure, *symbol contrast* calculations are valid
- In the case of an *edge determination* failure, the Inspector 5000 will force the *Decodability* grade to 00% *(a 0.0 / F grade)*
- Other affected grades will be calculated only for that portion of the symbol which was scanned up to the point of the *edge determination* failure

Reflectance Minimum

This parameter can be graded 4.0 (A) *or* 0.0 (F), however multiple scan averaging can results in grading 4.0 *to* 0.0 (A *to* F)

The reflectance value of the "lightest" space must be at least twice as great as the reflectance value of the "darkest" bar; otherwise, the grade will be 0.0 (F).

The parameter grade is determined by:
1. Calculating the edge contrast of every element edge in a symbol
2. Finding the lowest value *(minimum edge contrast)*
3. Comparing it to a fixed threshold in the specification *(15%)*

If the value is at least as great at the threshold, the grade is 4.0 (A), otherwise the grade is 0.0 (F).

Traditional Bar Analysis Tolerance

```
 GRADE    ENCODE   PROFILE   REPORT
Edge Determination       Pass
Reflectance Min          Pass
Quiet Zone (left)        Pass 25.5X
Quiet Zone (right)       Pass 25.5X
Narrow Bar Width         Press SEL
Ratio                    Pass   2.9
Inter Character Gap            0.97X
Reflectance Min                  3%
Reflectance Maximum             83%
Global Threshold                43%
Lines of Inspection              1
Average Bar Deviation           +1%
Maximum Bar Deviation           +4%
Minimum Bar Deviation           +0%
Number Encoded Chars            12
Number of Bars/Spaces          139
Inspection Date          10-07-21
Inspection Time          09:53:53
```

On the Grading screen, the traditional bar analysis tolerance results are shown as Average, Maximum, and Minimum Print Growth. Print Growth results provide information about the bars being narrow or wide.

Based on bar reflectance crossing the Global Threshold, the results represent the total percentage width deviation that the bars in a symbol have when compared to the maximum traditional dimensional specifications.

The results are normalized to plus or minus 100% tolerance with no specific dimensions. Higher density symbols such as 80% UPC may indicate larger ranges of deviation than low density symbols such as ITF-14 case code.

Appendix B (Symbology Analysis)

Symbology Analysis Parameters

Table B-1 shows error messages that will be displayed for each parameter type checked by the Inspector 5000.

Table B-1 (Parameter/Error Message)

Parameter	Data Analysis Message
Ratio	Warning Ratio
Ratio <2 or more >3.2	Rejected Ratio
Inter-Character Gap (ICG)	Bad ICG
Invalid Data Character	Invalid format
Too Few Characters	Invalid format
I 2 of 5 Case code not 14 or 18 characters	Invalid format
Code 128 GS1 Case code not 14 or 18 characters or not all numeric characters	Invalid format
Mod Check Digits	Bad Mod. Check
Bar Width Deviation Edge of Range (Wide)	Warning Wide
Bar Width Deviation Edge of Range (Narrow)	Warning Narrow
Bar Width Deviation Out of Range (Wide)	Rejected Wide
Bar Width Deviation Out of Range (Narrow)	Rejected Narrow
Addendum Parity (UPC/EAN)	Invalid Format
ISO/ANSI Decodability	Warn D/bility (DCD, in initial Pass/Fail screen)
Object in Quiet Zone	Defects F, 50% or greater
Quiet Zone Too Small	Warning QZ/SS
<Fnc1> with Standard C128	Format Warning
No <Fnc1> with GS1 Selected	Warn Missing F1

Table B-2 (Parameters Checked by Symbology)

Symbology	Ratio 1	Ratio 2	ICG	Data Character	Mod Check	Tolerance
AIAG B-1	2.2-3.2	2.0-3.2	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
AIAG B-3 B-4 B-5	2.8-3.2	2.8-3.2	.5X-8X	$/+% Not Allowed	N/A	((12R-8)/81)X
LOGMARS	2.2-3.0	2.0-3.0	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
CODE 3 OF 9	2.2-3.0	2.0-3.0	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
3 OF 9 W/43	2.2-3.0	2.0-3.0	.5X-8X	STD CODE 39 4 CHARS Min	MOD 43	((12R-8)/81)X
HIBC 3 OF 9	2.2-3.0	2.0-3.0	.5X-8X	STD CODE 39 Min 4 CHARS 1ST. = "+"	MOD 43	((12R-8)/81)X
I 2 OF 5	2.2-3.0	2.0-3.0	N/A	Even number CHARS	N/A	((18R-21)/80)X
ITF-14 CASE CODE	2.3-3.0	2.3-3.0	N/A	14 Data Chars Only	MOD 10	((18R-21)/80)X
ITF-18 CASE CODE	2.3-3.0	2.3-3.0	N/A	18 Data Chars Only	MOD 10	((18R-21)/80)X
I 2 OF 5 W/CHECK DIGIT	2.2-3.0	2.0-3.0	N/A	Min 4 Data Chars	MOD 10	((18R-21)/80)X
CODABAR	2.2-3.0	2.0-3.0	.5X-8X	STD CODABAR	N/A	((5P-8)/20)X
CODE 128	N/A	N/A	N/A	N/A	MOD 103	.35X
GS1-128	N/A	N/A	N/A	<Fnc1> with AI 00 and 18 Data Char Or <Fnc1> with AI 01 and 14 data characters Application Mod Check	Mod 10 Mod 103	.35X
UPC/EAN	N/A	N/A	N/A	N/A	MOD 10	See Note 2

Note1:
- *Ratio 1 column, applies to Auto Optic 3,5,6,and 10 mil apertures*
- *Ratio 2 column, applies to Auto Optic 20 mil aperture*
- *X = X-dimension/NBW (see Appendix M for definition)*
- *R = Ratio in the calculations (see Appendix M for definition)*
- *Tolerance is expressed as a fraction of the X-dimension (+/- range)*

Note 2:

 UPC/EAN tolerances:

80 - 89%	=	0.14X
90 - 115%	=	0.30X
116 - 150%	=	0.34X
151 - 200%	=	0.38X

Appendix C (ISO/ANSI Decodability)

ISO/ANSI Decodability Calculations

There is a specified method for calculating *Decodability* for each symbology. But the method is generally the same for all. Each element width in a bar code symbol should be consistent across the symbol.

In the case of Code 39, two element widths are needed to produce a symbol. For optimum scanning, each narrow element, whether a bar or space, should have the same width dimension. Each wide element should have the same width dimension.

The *Decodability* grade indicates the amount of <u>tolerance remaining</u> in the width of the most deviant element in the symbol (the more tolerance remaining, the higher the grade). Grade 4.0 or "A" is the highest grade and grade 0.0 or "F" is lowest. (Even grade 0.0 or "F" may be decodable).

The grade is displayed in both its calculated numeric grade (ISO15416) and in its Letter grade (ANSI X3.182-1990) equivalent.

ISO/IEC 15416:2016(E) implemented an interpolation method as a way of reducing meaningless grade level fluctuations when small changes in measurements cause a grade to transition between grade levels.

***Table C-1 (Decodability percentage ranges to Numeric
and Letter Grades)***

Min	Max	Numeric	Letter
62.00	100	4.0	A
60.80	61.99	3.9	A
59.60	60.79	3.8	A
58.40	59.59	3.7	A
57.20	58.39	3.6	A
56.00	57.19	3.5	A
54.80	55.99	3.4	B
53.60	54.79	3.3	B
52.40	53.59	3.2	B
51.20	52.39	3.1	B
50.00	51.19	3.0	B
48.70	49.99	2.9	B
47.40	48.69	2.8	B
46.10	47.39	2.7	B
44.80	46.09	2.6	B
43.50	44.79	2.5	B
42.20	43.49	2.4	C
40.90	42.19	2.3	C
39.60	40.89	2.2	C
38.30	39.59	2.1	C
37.00	38.29	2.0	C
35.80	36.99	1.9	C
34.60	35.79	1.8	C
33.40	34.59	1.7	C
32.20	33.39	1.6	C
31.00	32.19	1.5	C
29.80	30.99	1.4	D
28.60	29.79	1.3	D
27.40	28.59	1.2	D
26.20	27.39	1.1	D
25.00	26.19	1.0	D
22.50	24.99	0.9	D
20.00	22.49	0.8	D
17.50	19.99	0.7	D
15.00	17.49	0.6	D
12.50	14.99	0.5	D
10.00	12.49	0.4	F
7.50	9.99	0.3	F
5.00	7.49	0.2	F
2.50	4.99	0.1	F
0.00	2.49	0.0	F

Appendix D (Reflectance parameter grading)

Table D-1 (Modulation percentage ranges to Numeric and Letter Grades)

Min	Max	Numeric	Letter
70	100	4.0	A
69	69.99	3.9	A
68	68.99	3.8	A
67	67.99	3.7	A
66	66.99	3.6	A
65	65.99	3.5	A
64	64.99	3.4	B
63	63.99	3.3	B
62	62.99	3.2	B
61	61.99	3.1	B
60	60.99	3.0	B
59	59.99	2.9	B
58	58.99	2.8	B
57	57.99	2.7	B
56	56.99	2.6	B
55	55.99	2.5	B
54	54.99	2.4	C
53	53.99	2.3	C
52	52.99	2.2	C
51	51.99	2.1	C
50	50.99	2.0	C
49	49.99	1.9	C
48	48.99	1.8	C
47	47.99	1.7	C
46	46.99	1.6	C
45	45.99	1.5	C
44	44.99	1.4	D
43	43.99	1.3	D
42	42.99	1.2	D
41	41.99	1.1	D
40	40.99	1.0	D
36	39.99	0.9	D
32	35.99	0.8	D
28	31.99	0.7	D
24	27.99	0.6	D
20	23.99	0.5	D
16	19.99	0.4	F
12	15.99	0.3	F
8	11.99	0.2	F
4	7.99	0.1	F
0	3.99	0.0	F

Table D-2 (Symbol Contrast percentage ranges to Numeric and Letter Grades)

Min	Max	Numeric	Letter
70	100	4.0	A
69	69.99	3.9	A
67	68.99	3.8	A
66	66.99	3.7	A
64	65.99	3.6	A
63	63.99	3.5	A
61	62.99	3.4	B
60	60.99	3.3	B
58	59.99	3.2	B
57	57.99	3.1	B
55	56.99	3.0	B
54	54.99	2.9	B
52	53.99	2.8	B
51	51.99	2.7	B
49	50.99	2.6	B
48	48.99	2.5	B
46	47.99	2.4	C
45	45.99	2.3	C
43	44.99	2.2	C
42	42.99	2.1	C
40	41.99	2.0	C
38	39.99	1.9	C
36	37.99	1.8	C
34	35.99	1.7	C
32	33.99	1.6	C
30	31.99	1.5	C
28	29.99	1.4	D
26	27.99	1.3	D
24	25.99	1.2	D
22	23.99	1.1	D
20	21.99	1.0	D
18	19.99	0.9	D
16	17.99	0.8	D
14	15.99	0.7	D
12	13.99	0.6	D
10	11.99	0.5	D
8	9.99	0.4	F
6	7.99	0.3	F
4	5.99	0.2	F
2	3.99	0.1	F
0	1.99	0.0	F

Table D-3 (Defects percentage ranges to Numeric and Letter Grades)

Min	Max	Numeric	Letter
0	15.00	4.0	A
15.01	15.50	3.9	A
15.51	16.00	3.8	A
16.01	16.50	3.7	A
16.51	17.00	3.6	A
17.01	17.50	3.5	A
17.51	18.00	3.4	B
18.01	18.50	3.3	B
18.51	19.00	3.2	B
19.01	19.50	3.1	B
19.51	20.00	3.0	B
20.01	20.50	2.9	B
20.51	21.00	2.8	B
21.01	21.50	2.7	B
21.51	22.00	2.6	B
22.01	22.50	2.5	B
22.51	23.00	2.4	C
23.01	23.50	2.3	C
23.51	24.00	2.2	C
24.01	24.50	2.1	C
24.51	25.00	2.0	C
25.01	25.50	1.9	C
25.51	26.00	1.8	C
26.01	26.50	1.7	C
26.51	27.00	1.6	C
27.01	27.50	1.5	C
27.51	27.99	1.4	D
28.00	28.49	1.3	D
28.50	28.99	1.2	D
29.00	29.49	1.1	D
29.50	30.00	1.0	D
30.01	100.00	0.0	F

ISO/IEC 15416:2016(E) established that the Defects grade shall be 0.0 for all values greater than 30%.

Appendix E (Quiet Zone Analysis)

Quiet Zone Analysis

The Inspector 5000 trims data gathered during a scan to approximately 10 times the X dimension on each side of a bar code for all symbologies except UPC and EAN. The areas are assumed to be *quiet zones* and are included in the symbol analysis. If a low reflectance object is detected in these areas, an Overall Symbol Grade of F will result. The *Defects* calculation will be the cause of the F grade and typically be a value greater than 50%.

Symbols should be scanned in both directions since the Inspector 5000 is designed to be bi-directional.

Quiet Zone Analysis for UPC and EAN symbols are described in the following tables. In cases where an addendum is included in the bar code, an addendum gap analysis is also performed.

Table F-1 (Acceptable Parameters - Symbols Without Addendums)

Symbology	Leading QZ	Trailing QZ
UPC-A	9X Minimum	9X Minimum
UPC-E	9X Minimum	7X Minimum
EAN-13	11X Minimum	7X Minimum
EAN-8	7X Minimum	7X Minimum

Table F-2 (Acceptable Parameters - Symbols With Addendums)

Symbology	Leading QZ	Trailing QZ	GAP Size
UPC-A	9X Minimum	5X Minimum	9 - 12X
UPC-3	9X Minimum	5X Minimum	9 - 12X
EAN-13	11X Minimum	5X Minimum	7 - 10X
EAN-8	7X Minimum	5X Minimum	7 - 10X

Appendix F (Specifications)

Specifications

There are many specifications that apply to different industries and bar code applications. The Inspector 5000 has the ability to check not only the bar code print quality but also that the Narrow Bar Width (NBW) is within an acceptable range, the Quiet Zones meet the minimum requirements, and that the correct aperture is utilized.

Below are the tables showing the acceptable values and also referencing which bar code specification defined these values.

Table F-1 (Specifications — Standard)

| | Quiet Zone | | | | | |
	Left	Right	NBW	Aperture	Outside of range	Source Document
UPC-A	9	9	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 1
UPC-E	9	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 1
EAN-13	11	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 1
EAN-8	7	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 1
Code 128	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 128	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 128	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	≥ 0.013 & < 0.025	10	Warning	Industry Accepted Practice
GS1-128	10	10	≥ 0.025	20	Warning	Industry Accepted Practice
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	< 0.013	6	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14 & ITF-18	10	10	< 0.013	6	N/A	GS1 Gen Spec - Table 6 + 10
ITF-14 & ITF-18	10	10	≥ 0.013 & < 0.025	10	N/A	ITF-14 Symbology Spec - 5.9.5.10.5
ITF-14 & ITF-18	10	10	≥ 0.025	20	N/A	ITF-14 Symbology Spec - 5.9.5.10.5
Code 39 (all sub-symbologies)	10	10	< 0.013	6	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Codabar	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Codabar	10	10	≥ 0.025	20	N/A	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Table F-2 (Specifications — General Distribution)

| | Quiet Zone | | | | | |
	Left	Right	NBW	Aperture	Outside of range	Source Document
PC-A	9	9	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
UPC-E	9	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
EAN-13	11	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
EAN-8	7	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
Code 128	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 128	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 128	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	0.0195 to 0.040	10	Failure	GS1 Gen Spec - Table 2 + 5
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	< 0.013	6	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14	10	10	0.0195 to 0.040	10	Failure	GS1 Gen Spec - Table 2
Code 39 (all sub-symbologies)	10	10	< 0.013	6	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Codabar	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Codabar	10	10	≥ 0.025	20	Warning	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Table F-3 (Specifications — Direct Corrugate)

	Quiet Zone		NBW	Aperture	Outside of range	Source Document
	Left	Right				
UPC-A	9	9	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
UPC-E	9	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
EAN-13	11	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
EAN-8	7	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 2 + 3
Code 128	10	10	≥ 0.013 & < 0.025	10	Warning	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	≥ 0.0195 & < 0.025	10	Failure	Industry Accepted Practice
GS1-128	10	10	≥ 0.025	20	N/A	Industry Accepted Practice
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	Warning	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14 & ITF-18	10	10	≥ 0.0195 & < 0.025	10	Failure	ITF-14 Symbology Spec - 5.9.5.10.5
ITF-14 & ITF-18	10	10	≥ 0.025	20	N/A	ITF-14 Symbology Spec - 5.9.5.10.5
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	Warning	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	Warning	ISO 15416
Codabar	10	10	≥ 0.025	20	N/A	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Table F-4 (Specifications — Regulated Healthcare)

	Quiet Zone					
	Left	Right	NBW	Aperture	Outside of range	Source Document
UPC-A	9	9	0.0067 to 0.026	6	Warning	GS1 Gen Spec - Table 6 + 10
UPC-E	9	7	0.0067 to 0.026	6	Warning	GS1 Gen Spec - Table 6 + 10
EAN-13	11	7	0.0067 to 0.026	6	Warning	GS1 Gen Spec - Table 6 + 10
EAN-8	7	7	0.0067 to 0.026	6	Warning	GS1 Gen Spec - Table 6 + 10
Code 128	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 128	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 128	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	0.0067 to 0.026	6	Failure	GS1 Gen Spec - Table 6 + 10
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	< 0.013	6	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14 & ITF-18	10	10	0.0067 to 0.026	6	Failure	GS1 Gen Spec - Table 6 + 10
Code 39 (all sub-symbologies)	10	10	< 0.013	6	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Codabar	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Codabar	10	10	≥ 0.025	20	N/A	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Table F-5 (Specifications — Pharmacy)

| | Quiet Zone | | | | | |
	Left	Right	NBW	Aperture	Outside of range	Source Document
UPC-A	9	9	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 8
UPC-E	9	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 8
EAN-13	11	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 8
EAN-8	7	7	0.0195 to 0.026	10	Warning	GS1 Gen Spec - Table 8
Code 128	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 128	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 128	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	0.0067 to 0.0195	6	Failure	GS1 Gen Spec - Table 6
GS1-128	10	10	0.0195 to 0.040	10	Failure	GS1 Gen Spec - Table 8
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	< 0.013	6	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14 & ITF-18	10	10	0.0195 to 0.040	10	Failure	GS1 Gen Spec - Table 8
Code 39 (all sub-symbologies)	10	10	< 0.013	6	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Codabar	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Codabar	10	10	≥ 0.025	20	N/A	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Table F-6 (Specifications — Non-Regulated Healthcare)

	Quiet Zone		NBW	Aperture	Outside of range	Source Document
	Left	Right				
UPC-A	9	9	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 4
UPC-E	9	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 4
EAN-13	11	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 4
EAN-8	7	7	0.0104 to 0.026	6	Warning	GS1 Gen Spec - Table 4
Code 128	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 128	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 128	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 128	10	10	≥ 0.025	20	N/A	ISO 15416
GS1-128	10	10	0.0098 to 0.0195	6	Failure	GS1 Gen Spec - Table 4
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	< 0.013	6	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Interleaved 2 of 5 (except ITF-14 & ITF-18)	10	10	≥ 0.025	20	N/A	ISO 15416
ITF-14 & ITF-18	10	10	0.0098 to 0.0195	6	Failure	GS1 Gen Spec - Table 4
Code 39 (all sub-symbologies)	10	10	< 0.013	6	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 39 (all sub-symbologies)	10	10	≥ 0.025	20	N/A	ISO 15416
Codabar	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Codabar	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Codabar	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Codabar	10	10	≥ 0.025	20	N/A	ISO 15416
Code 93	10	10	≥ 0.004 & < 0.007	3	Warning	ISO 15416
Code 93	10	10	≥ 0.007 & < 0.013	6	N/A	ISO 15416
Code 93	10	10	≥ 0.013 & < 0.025	10	N/A	ISO 15416
Code 93	10	10	≥ 0.025	20	N/A	ISO 15416

Appendix G (Code 128)

Code 128

Code 128 can encode all the characters currently encodable in the various code formats presently in existence. This includes: All ASCII alphanumeric characters *(numbers, letters, special characters, control characters in the 128 character set and the distinction of the 3 subsets, A, B and C).*

Code subset A includes the standard <u>alphanumeric</u> *(upper case only)* keyboard characters plus control and special characters.

Code subset B includes all the standard <u>alphanumeric</u> *(upper and lower case).*keyboard characters and special characters

Code subset C includes a set of 100 digit pairs from 00 to 99 inclusive, allowing two numeric digits per symbol, plus special characters.

The last 7 characters in Subsets A and B *(96 - 102)* and the last 3 characters in Subset C *(100 - 102)* are special characters that are specific to the scanning device.

Code 128 also offers the flexibility to "shift" to other subsets in order to combine the "unique" features into one condensed bar code.

As indicated before, each of the 3 subsets have "unique" features:
- **Subset A** allows for encodation of control codes but not lower case alpha characters
- **Subset B** allows for lower case alpha characters but not control codes
- **Subset C** allows for only numeric data in a compressed format

Refer to Code 128 tables (subsets) on the following pages.

Note:

On the following three tables (G-1, G-2, and G-3):
- *The top grid (unshaded) displays the Code 128 character set*
- *The bottom grid (shaded) displays the data on the Inspector's LCD screen*

Note:

If the bottom grid (shaded) displays two characters (one on top of the other) this is the two rows that will be shown on the Inspector's LCD screen

Table G-1 (Code 128 — Subset A)

Character Set / LCD Screen

SP	!	"	#	$	%	&	'	(	)
	!	"	#	$	%	&	'	(	)

*	+	,	-	.	/	0	1	2	3
*	+	,	-	.	/	0	1	2	3

4	5	6	7	8	9	:	;	<	=
4	5	6	7	8	9	:	;	<	=

>	?	@	A	B	C	D	E	F	G
>	?	@	A	B	C	D	E	F	G

H	I	J	K	L	M	N	O	P	Q
H	I	J	K	L	M	N	O	P	Q

R	S	T	U	V	W	X	Y	Z	[
R	S	T	U	V	W	X	Y	Z	[

\	]	^	_	NUL	SOH	STX	ETX	EOT	ENQ
¥	]	^	_	NL	SH	SX	EX	ET	EQ

ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
AK	BL	BS	HT	LF	VT	FF	CR	SO	SI

DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM
DE	D1	D2	D3	D4	NK	SN	EB	CN	EM

SUB	ESC	GS	RS	US	FNC3	FNC2	Shft	Code C	Code B
SB	EC	GS	RS	US	F3	F2	ST	CC	CB

FNC4	FNC1	Start A	Start B	Start C	Stop
F4	F1	*A	*B	*C	**

Table G-2 (Code 128 — Subset B)

Character Set
LCD Screen

SP	!	"	#	$	%	&	'	(	)
	!	"	#	$	%	&	'	(	)

*	+	,	-	.	/	0	1	2	3
*	+	,	-	.	/	0	1	2	3

4	5	6	7	8	9	:	;	<	=
4	5	6	7	8	9	:	;	<	=

>	?	@	A	B	C	D	E	F	G
>	?	@	A	B	C	D	E	F	G

H	I	J	K	L	M	N	O	P	Q
H	I	J	K	L	M	N	O	P	Q

R	S	T	U	V	W	X	Y	Z	[
R	S	T	U	V	W	X	Y	Z	[

\	]	^	a	b	c	d	e	f	g
¥	]	^	a	b	c	d	e	f	g

h	i	j	k	l	m	n	o	p	q
h	i	j	k	l	m	n	o	p	q

r	s	t	u	v	w	x	y	z	{
r	s	t	u	v	w	x	y	z	{

|	}	~	DEL	FNC3	FNC2	Shft	Code C	FNC4	Code A
|	}	→	DL	F3	F2	ST	CC	F4	CA

FNC1	Start A	Start B	Start C	Stop
F1	*A	*B	*C	**

Table G-3 (Code 128 — Subset C)

Character Set

LCD Screen

00	01	02	03	04	05	06	07	08	09
00	01	02	03	04	05	06	07	08	09

10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19

20	21	22	23	24	25	26	27	28	29
20	21	22	23	24	25	26	27	28	29

30	31	32	33	34	35	36	37	38	39
30	31	32	33	34	35	36	37	38	39

40	41	42	43	44	45	46	47	48	49
40	41	42	43	44	45	46	47	48	49

50	51	52	53	54	55	56	57	58	59
50	51	52	53	54	55	56	57	58	59

60	61	62	63	64	65	66	67	68	69
60	61	62	63	64	65	66	67	68	69

70	71	72	73	74	75	76	77	78	79
70	71	72	73	74	75	76	77	78	79

80	81	82	82	84	85	86	87	88	89
80	81	82	83	84	85	86	87	88	89

90	91	92	92	94	95	96	97	98	99
9 0	9 1	9 2	9 3	9 4	9 5	9 6	9 7	9 8	9 9

Code B	Code C	FNC1	Start A	Start B	Start C	Stop
C B	C C	F 1	* A	* B	* C	* *

Note:

On the LCD Screen the Inspector will show a Yen symbol "¥"instead of a backslash "\" however it will print out as a backslash

On the LCD Screen the Inspector will show a right arrow "→" instead of a tilde "~" however it will print out as a tilde.

Note:

For Code 128, the Mod check character is displayed as the symbology's character value (a number from 000 to 102). One or two numeric Mod check characters may precede the 3-digit Code 128 Mod check described above. These digits represent the Mod 10 check character(s) that can be included depending on the format.

GS1-128 Symbology Specification

When a Code 128 symbol is decoded **AND** the first character *after* the Start character is **FNC1** then the symbol *must* follow the GS1-128 format and the verifier must have the following Code 128 sub-specifications setting from the **Setup** screen:

```
 GRADE    |  ENCODE  | PROFILE |  REPORT
UPC RANDOM WEIGHT                      NO
INTERLEAVE 2 of 5                  ITF-14
CODE 39                          CODE 3of9

CODE 128                              GS1
           L/R for options

DATAMATRIX                            GS1
GS1 END FNC1             NOT ALLOWED
-------- Camera Settings --------
```

For a Standard Code 128 the verifier must have the following Code 128 sub-specifications setting from the **Setup** screen:

```
 GRADE    |  ENCODE  | PROFILE |  REPORT
UPC RANDOM WEIGHT                      NO
INTERLEAVE 2 of 5                  ITF-14
CODE 39                          CODE 3of9

CODE 128                         STANDARD
           L/R for options

DATAMATRIX                            GS1
GS1 END FNC1             NOT ALLOWED
-------- Camera Settings --------
```

When a Code 128 symbol is decoded with the Code 128 sub-specifications setting of **Standard** but the first character *after* the Start character is a **FNC1** then the *Format* parameter on the **Grade** screen will be a Failure and on the **Encode** screen the error will be explained.

When a Code 128 symbol is decoded with the Code 128 sub-specifications setting of **GS1-128** and the first character *after* the Start character **is not** a **FNC1** then the *Format* parameter on the *Grading* screen will be a Failure and on the **Encode** screen the error will be explained.

Appendix H (Magnifications)

UPC/EAN Magnifications & Bar Width Deviations

UPC and EAN symbols have fixed lengths and formats; therefore, the only way to change their sizes is to magnify them. Specifications relative to bar/space tolerances are published for 80% to 200% magnifications.

While the Inspector 5000 does not measure the bars and spaces to derive a magnification, it does determine the relative sizes of the elements and therefore the bar width deviations.

When UPC and EAN symbols are analyzed, the approximate symbol magnification must be known in order to most accurately determine if the symbol is within tolerance.

For example, if a range of 90 - 115% magnification is selected and a 200% symbol is analyzed, there will be a greater chance of a warning message for the symbol *(despite its being within specification)* because of the stricter tolerances of a smaller symbol.

Conversely, if a range of 151% - 200% magnification is selected and a 100% symbol is analyzed, there will be a greater chance of an acceptance message for the symbol *(despite its possibly not being within specification)* because of the larger tolerances of a larger symbol.

> *Note:*
>
>   *Magnification choices affect only the traditional bar width deviation analysis*

Appendix I (Aperture Selection)

The Inspector 5000 Auto Optic has four different aperture (light) sizes that can be used for inspecting bar codes. It is very important that the aperture selected matches the aperture of the bar code scanner that will be used in the supply chain. The aperture is selected by the user from the **Setup** screen.

General Aperture size recommendation:

X-Dim / NBW Range	Aperture Size
0.0040" ≤ X ≤ 0.0070" 0.1016mm ≤ X ≤ 0.1778mm	0.003" (3 mil) 0.0762mm
0.0070" ≤ X ≤ 0.0130" 0.1778mm ≤ X ≤ 0.3302mm	0.006" (6 mil) 0.1270mm
0.0130" ≤ X ≤ 0.0250" 0.3302mm ≤ X ≤ 0.6350mm	0.010" (10 mil) 0.2540mm
0. 0250" < X 0. 6350mm < X	0.020" (20 mil) 0.5080mm

The X-Dimension/Narrow Bar Width (NBW) can be determined by inspecting a bar code and using the *Down Arrow* button on the **Grade** screen to scroll to the *Narrow Bar Width or Magnification/NBW* field (varies by symbology scanned) and pressing the *Select* button. This will display the **Narrow Bar Width Calculator** screen. Measure the distance from the left most bar to the right most bar and enter this value into the *Barcode Width* field using the **Arrow** buttons, the Inspector 5000 will automatically determine and display the *Narrow Bar Width* (or *Magnification* depending the Symbology) which can then be looked up on the chart above.

Note:
- *6 mil (0.152mm) is used for most UPC/EAN bar codes (5 mil (0.127mm) is used in Europe)*
- *10 mil (0.254mm) is used for most GS1-128 bar codes and 150% magnification or larger UPC/EAN*
- *20 mil (0.508mm) is used for most ITF-14 and ITF-18 bar codes*

Appendix J (Print Functions)

Bar code inspection data may be printed (requires optional devices) when the Inspector 5000 is connected to the TP140A printer or to a computer using the VCIR PC software program. The Inspector 5000 will automatically detect which type of printout device is connected.

Printing Reports

From any screen press and release the *Print* button, below are the screens that will be displayed:

VCIR Print Screen – New bar code inspection

```
 GRADE    ENCODE   PROFILE   REPORT


    PRINT OPTIONS (TO COMPUTER)

ANALYSIS ONLY
ANALYSIS + PROFILE
ANALYSIS + BAR/SPACE
PREVIOUS DAY
PREVIOUS 07 DAYS
DATE/TIME RANGE
EXIT




    UP/DOWN TO CHOOSE TYPE
    PRINT TO PRINT
    PRINT-LEFT TO EXIT
```
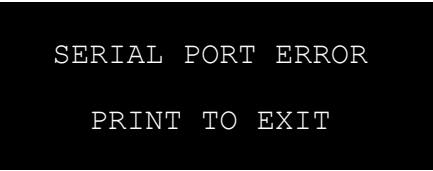
VCIR Print Screen – Bar code inspection from storage

```
 GRADE    ENCODE   PROFILE   REPORT

   PRINT OPTIONS (TO COMPUTER)

ANALYSIS ONLY
PREVIOUS DAY
PREVIOUS 07 DAYS
DATE/TIME RANGE
EXIT




   UP/DOWN TO CHOOSE TYPE
   PRINT TO PRINT
   PRINT-LEFT TO EXIT
```

TP140A Print Screen - Bar code inspection from storage

```
 GRADE    ENCODE   PROFILE   REPORT

   PRINT OPTIONS (TO TP140A)

ANALYSIS ONLY
PREVIOUS DAY
PREVIOUS 07 DAYS
DATE/TIME RANGE
EXIT




   UP/DOWN TO CHOOSE TYPE
   PRINT TO PRINT
   PRINT-LEFT TO EXIT
```

If the Inspector 5000 is unable detect a printout device the following pop-up message will be displayed:

```
         SERIAL PORT ERROR

          PRINT TO EXIT
```

Printout Options

Analysis Only

This option prints the *Text Analysis* data for the last symbol scanned. This option can also be used to print each individual symbol in the multiple scan mode prior to the last scan being completed. *(See Figure I-1)*

Analysis + Profile

This option is the same as *Text Analysis* but in addition prints an *Analog Scan Profile (See Figure I-2).*

Analysis + Bar/Space

This option is the same as *Text Analysis* but in addition prints the dimensions of each bar and space

Previous Day

This option prints the *Text Analysis* data for all bar codes inspected in the past 24 hours

Previous XX Days

This option prints the *Text Analysis* data for all bar codes inspected in the past XX days (XX is the number of days 01 to 99)

Date/Time Range

After selecting the date/time range for reports to be printed, move the cursor to the PRINT REPORTS option and press *Select* button. The reports will begin printing.

```
 GRADE  | ENCODE  |PROFILE|  REPORT


     DATE/TIME REPORT RANGE

START DATE (MM-DD-YY)     05-13-20
START TIME (HH:MM:SS)     08:03:37

END DATE    (MM-DD-YY)    05-26-20
END TIME    (HH:MM:SS)    08:03:37

PRINT REPORTS
EXIT TO MAIN MENU

   UP/DOWN TO SCROLL CURSOR
   SELECT TO CHOOSE LINE
   LEFT/RIGHT TO SCROLL FIELD
   UP/DOWN TO SCROLL DIGIT
   PRINT-LEFT TO EXIT
```

To cancel the print job press and hold the *Print* button and then press the *Left Arrow* button.

Report Range printing screen:

```
 GRADE    ENCODE   PROFILE   REPORT


          PRINT STATUS



 PRINTING REPORT  00000 OF 00017




          PRINT-LEFT TO CANCEL
```

Note:

> *Scan reflectance profiles and Bar/Space data are not stored in the database; only the analysis data is stored.*

Examples Reports

Figure J-1 (Analysis Only data)

```
                         Inspector 5000A
                          Version 1.108

                     On 10-07-21 @ 11:16:59
                     10-Scan Average Analysis
```

Encoded bar code data (stacked data to display packed Subset-C numeric characters) →

```
                         GS1-128
                *F006129501200115C  *
                C1101685013121063B8j*
```

Encoded bar code data (single line with brackets identifying control characters) →

```
                <*C><F1>0100611628955001132102011101653<
                CB>8<**>

                Mod Check is:...........1  74
                Mod Check expected:......1  74 PASS

                    Scan Profile Analysis
```

ISO/ANSI Results
See Appendix A
(Bar code definitions)

```
                Reference Decode...........4.0/A
                Decodability.........73%...4.0/A
                Symbol Contrast......73%...4.0/A
                Refl(MIN)/Refl(MAX)..08%...4.0/A
                Edge Contrast(MIN)...53%...4.0/A
                MODulation...........72%...4.0/A
                Defects..............06%...4.0/A

                Application Compliance.....4.0/A
```

Grade A/4.0 using a 10 mil aperture and 660nm wavelength (red) of light →

```
                    Overall Symbol Grade
                   A/10/660    4.0/10/660


                Acceptable...............PASS
```

See the next page for an explanation of the Traditional Analysis →

```
                  Traditional Analysis

                   -100% Tol. +100%
                   --------A+++++++
```

Traditional Results
See Appendix L
(Bar code definitions)

```
                Print Contrast Signal....91% PASS
                Required PCS.............75%
                Element Refl.(MAX).......80% PASS
                Reflectance(MIN)........07% PASS

                        Pass/Fail Analysis
                Passing Grade Selected.....1.5/C
                Final Results.............*PASS*
```

Traditional Analysis (Bar width deviations chart)

"R" letters represent "range" of bar widths in the code. "A" represents the average of all character bar width deviations.

The closer the "A" is to the center of the display, the better.

The following shows the percentage of the scanning tolerance used at each position on the display:

-93	-79	-65	-50	-36	-22	-8	-1	0	+8	+22	+36	+50	+65	+79	+93

- Negative numbers to the left indicate bars that are narrower
- Positive numbers to the right indicate bars that are wider

The closer the "A" is to the edge, the more likely the Reject.
A symbol is "Acceptable" until any calculated bar width deviation exceeds 100% of the tolerance for the symbology decoded; for example:

Bar Width - Acceptable

```
-100% Tol. +100%
------RRARR+++++
```

Bar Width - Warning

```
-100% Tol. +100%
--------++RRRARR
```

Bar Width - Rejected

```
-100% Tol. +100%
--------++++++R
```

"A" is out of tolerance and off the screen.

Figure J-2 (Scan Reflectance Profile data)

0% ++++++++++ Global Threshold +++++++ 100%
(Dark)   (Light)
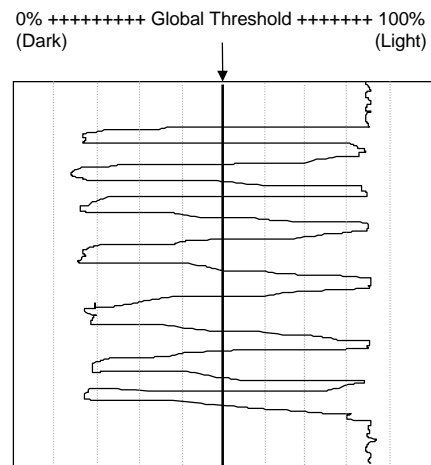
Appendix K (Battery Information)

Battery Level

With the Inspector 5000 turned **On**:

1. Press hold the *Print* button and then press the *Power* to toggle the display to the **System Status** screen
2. The third line (BATTERY) displays the battery charge level as a percentage
3. Press the *Power* button or *Up* button to return to the **Grade** screen

Low Battery Display

If the low Battery condition is displayed, there is still power left in the battery but your Inspector 5000 should be charged as soon as possible.

```
          Low Battery

       SELECT TO CANCEL
```

Battery and Charger

The Inspector 5000 has an integrated lithium ion battery pack installed in the unit

- The battery is not field replaceable and must be returned to RJS for repair/replacement

---

Warning:
DO NOT use any battery chargers other than the Inspector 5000 battery charger. Use of non-RJS battery chargers could damage your bar code verifier and/or result in a fire.

Additional Warnings:
NEVER open or disassemble the Inspector 5000

- Do not expose a battery to temperatures above 60 °C (140 °F)
- Always check all applicable local, national, and international regulations before transporting a Lithium-Ion battery

If the Inspector 5000 has a battery issue it must be returned to RJS for repair

---

Appendix L (Field Firmware Upgrade)

1. Power **Off** the Inspector 5000
2. Connect an Ethernet cable (not included) to your office network and the Inspector 5000
3. Turn **On** the Inspector 5000
4. After startup, press the *Power* button
5. Press the *Right Arrow* button twice to scroll to the System Status page which has the first line of "IP ADDR". The number most likely starts with 192.168…. (this depends on how your DHCP router is configured). Write down this number.
   *Note:*
   > *Occasionally it takes a minute for the IP address to refresh, exiting the Status screen (by pressing **Power**) and the re-entering the Status screen may be necessary*
6. Go to your computer and open a web browser and in the address bar enter the IP address written down in Step 5.
7. The Inspector 5000 web server will load the following page:

8. Click the **Continue** button
9. When prompted for a user name and password, use "admin" for the user name and "admin" for the password

10. Click **Update** and then **Firmware**

11. Select the new **.BIN** firmware file

12. Click the **Update Firmware** button
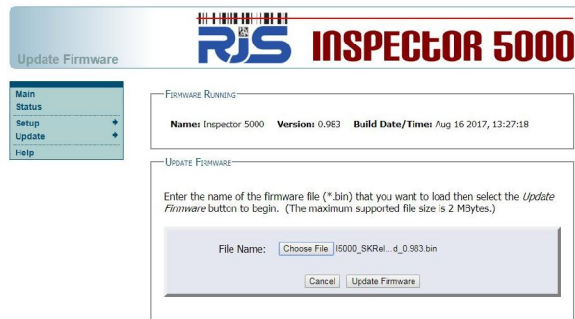
13. Wait for the firmware to be loaded and the
   "Complete" message to be displayed

14. Power **Off** the Inspector 5000
15. Disconnect the Ethernet cable
16. Turn **On** the Inspector 5000

<u>Appendix M (Bar code definitions)</u>

Achieved Width

The calculated element width based on measurements.

Alphanumeric

A character set that contains letters, digits, and other characters such as punctuation marks. Also, a character that is either numeric or alpha. (In programming an alphanumeric cannot be used to do arithmetic)

ANSI

American National Standards Institute, Inc. 25 West 43rd Street, 4th floor New York, NY 10036

Aperture

The effective opening in an optical system that established the field of view.

Application Specification

A set of rules for using bar code symbols.

Aspect Ratio

The ratio of height to width of a bar code symbol.

Bar

An element of a bar code symbol whose reflectance is less than the global threshold. A Bar is the dark (reflective) element of a bar-code. (As opposed to a space which is the light reflective element)

Bar code

A group of parallel bars and spaces constituting characters that are machine and human readable (the code numbers while readable must still be interpreted). See bar code symbol

Bar code Reader

A device used to identify and decode a bar code symbol.

Bar code symbol

An array of rectangular bars and spaces which are arranged in a predetermined pattern following specific rules to represent elements of data that are referred to as characters.   A bar code symbol typically contains a leading *quiet zone*, start character, data character(s) including a check character (if any), stop character and a trailing *quiet zone*.

Bar Height

The bar dimension perpendicular to the element width. The measurement of the long dimension of a bar element. (Also called bar length)

Bar Width

The lateral dimension of a bar; bar thickness.

Bar Width Ratio

The ratio of the widest bar or space to the narrowest.

Bar Reflectance (Rb)

The smallest reflectance value in a bar.

Bi-directional Code

A bar code that can be read left to right or right to left.

Bit

The narrowest code element (bar of space) that may contain information.

Character

The smallest group of elements assigned by a symbology to uniquely represent one or more numbers, letters, punctuation marks or other information.

Character Set

The numbers and/or letters and markings included in a bar code symbol.

Check Character (or Check Digit)

A character included within a bar code symbol whose value is used for performing a mathematical check of the validity of the decoded data.

Contact Code Reader

A light pen or other scanning device that must come into physical contact with the code medium in order to read the symbol.

Continuous Code

A bar code or symbol wherein the space between the characters is part of the code.

Decodability

This parameter grade can be "A," "B," "C," "D" or "F." The *Decodability* grade indicates the amount of error in the width of the most deviant element in the symbol. The less deviation, the higher the grade. *Decodability* is a measure of print accuracy using the symbology *reference decode* algorithm.

Decode
Determining the information which has been encoded in a bar code symbol.

Decoder
The portion of a bar code reading system that performs the decode function.

Defects
This parameter grade can be "A," "B," "C," "D" or "F."
Defects are of two types, voids and spots. Voids are light areas in bars, and spots are dark areas in spaces.
The defect grade is determined by a relationship between the largest defect in the symbol and *symbol contrast*. The smaller the defect, the better the grade. Aperture size can affect grade; for example, using a small aperture to analyze a very wide element will permit detection of the largest defects.
Defects are usually voids, and these defects can be reduced by increasing the amount of ink (or equivalent).

Diffuse Reflection
Reflected light which emanates uniformly in all directions from the reflecting surface.

Dimensional Deviation (DD)
The measured deviation of bars and/or spaces of a scanned symbol from the specification.

Discrete Code
A bar code or symbol wherein the spaces between the characters are not part of the data.

Edge Contrast (EC)   See Edge Contrast(min)

The difference between the space reflectance (Rs) and adjoining bar reflectance (Rb).

EC = Rs - Rb

Edge Contrast (min)

This parameter grade can be "A" or "F." Edge contrast is the Reflectance difference between adjoining bars and spaces. The *minimum edge contrast* is the smallest value of EC = R space – R bar found in the scan.

The grade is determined by calculating the edge contrast of every element in a symbol and then comparing the lowest value to a fixed threshold in the specification (15%).

If the value is equal to or greater than the threshold, the grade is "A." If the value is less than the threshold, the grade is "F."

Element

A generic term used to refer to either a bar or space in a bar code symbol.

Element Edge

The location where the scan reflectance profile intersects the midpoint between the space reflectance (R space) and bar reflectance (R bar) of adjoining elements. Visual measuring techniques will generally locate the element edge closer to the center of the bar.

Element Reflectance Non-uniformity (ERN)

The reflectance difference between the highest peak and lowest valley within each individual element and *quiet zone*. When an element consists of a single peak or valley, its element reflectance non-uniformity is zero.

Element Width

The thickness or width of a bar or space as measured from its leading edge to its trailing edge.

Encoded Area

The total linear dimensional space taken by all characters of a code pattern including start/stop and data.

First Read Rate

The percentage of successful "reads" of a bar code symbol on the first attempt.

Fixed Beam Scanner

A bar code reading device wherein coded items pass across a stationary incandescent or LED light source.

Flexo Film Master

A measurement standard symbol produced by printing the symbol on clear plastic film using the Flexographic printing process.

Gloss

A phenomenon related to the specular reflection of incident light. The effect of gloss is to reflect more of the incident light in a specular manner, and to scatter less. This effect occurs at all angles of incidence and should not be confused with the grazing angle which is specular reflection often referred to as sheen.

Global Threshold (GT)

The global threshold is drawn through the middle of a profile, to distinguish spaces above the line and bars below. The reflectance value is determined by dividing the *symbol contrast* (SC) by 2 and adding the minimum reflectance, Rmin.

$$GT = Rmin + (SC/2)$$

GS-1

GS1 designs and implements global standards and solutions to improve the efficiency and visibility of supply and demand chains globally.

Guard Bar

The first and last bars of a bar code symbol usually having the pattern 101. A guard bar generally follows the leading *quiet zone* and precedes the trailing *quiet zone.* This term is used mostly for UPC/EAN symbologies.

Infinite Pad Method

The method for measuring reflectance in which the sample substrate being measured is backed with enough thickness of the same type of substrate so that doubling the number of sheets does not change the measured value of reflectance.

Inspection Band

An area of the bar code symbol where measurements shall be taken spanning from 10% to 90% of the average bar height.

Inter-character Gap

In discrete barcodes, the space that separates two adjacent characters. When present, inter-character gaps are considered spaces (elements) for purposes of *edge determination* and reflectance parameter grades.

Interleaved

A bar code in which characters are paired together using bars to represent the first character and spaces to represent the second.

ISO

International Organization for Standardization, organization that maintains the standards related to bar codes and bar code verifiers.

Ladder Code

A bar code or symbol printed vertically with the individual bars looking like the rungs of a ladder.

Laminate

See Over-laminate

Laser Scanner

A bar code reading device that uses a low energy laser light source for illumination.

Magnification Factor

The size of a printed bar code compared to a standard (nominal) size.

Maximum Element Reflectance Non-uniformity (ERN max)

The largest element reflectance non-uniformity in a scan reflectance profile.

Maximum Reflectance (Rmx)

The greatest reflectance value in a scan reflectance profile including *quiet zone*.

Note: eRmx is the greatest reflectance value of an element, not including quiet zone)

Minimum Edge Contrast (Ecmn)

The smallest edge contrast in a scan reflectance profile.

Minimum Reflectance (Rmn)

The smallest reflectance value in a scan reflectance profile.

Misread

A condition that occurs when the data output of a reader does not agree with the encoded data.

Modulation (MOD)

This parameter grade can be "A," "B," "C," "D" or "F."
The *modulation* grade is based on the relationship between *minimum edge contrast* (Ecmin) and *symbol contrast* (SC).
MOD = ECmin/SC
The greater the difference between *minimum edge contrast* and *symbol contrast*, the lower the grade.

Scanners and verifiers perceive the narrower bars and spaces to have less intensity than wider bars and spaces; the comparison of this diminished intensity of narrow elements to wide elements is called *modulation*. This condition is affected by aperture size.

Note: Since "ink spread" will reduce the width and intensity of single module space within a symbol, this

is one thing to check in seeking to correct a low modulation grade

Module
The narrowest expected bar or space width.

Moving Beam Scanner
A laser device that dynamically searches for a bar code pattern by sweeping a moving optical   beam through a field of view.

N (wide to narrow ratio)
In symbologies with two element widths, the wide to narrow ratio of elements is calculated by summing the average wide bar width and average wide space width and dividing the sum by 2 times Z. Inter-character gaps, if applicable, are not included.

N = (avg.wide bar + avg. wide space) / (2*Z)

Nanometer (nm)
A unit of measure used to define the wavelength of light, equal to 10-9 meter.

Narrow Bar Width (or NBW)
The intended width of the narrow elements dictated by the application and/or symbology specification. Also referred to as X-Dimension (X-Dim)

Nominal
The intended value for a specific parameter. Tolerances are generally specified as positive and negative deviations from this value.

No-Read (Non-read, Non-scan)
The absence of data at the scanner output after an attempted scan because of no code, defective code or operator error.

Nominal Size
The target size for a specific element or group of elements.

Numeric
A character set that contains only numbers.

Omni-directional
The ability to read a bar code symbol from any angle as long as the bar code passes across the scanner window.

Opacity
The property of a material that minimizes the show-through of printing from the back side or the next sheet.

Overhead
The number of characters in a symbol required for start, stop and checking.

Over-laminate
A coating or material adhered to the scanning surface of a bar code symbol.

Parity
A system for encoding characters as "odd" or "even" for self checking of barcodes.

Peak
The graphical pattern on a scan reflectance profile which looks like an upside down "U" or "V." Within a profile a peak represents a space. One or more peaks could also be found within an element representing a reflectance change within an element.

Plaque

A template used as a reflectance calibration standard (RCS). The known reflectance values are posted on the back of the plaque.

Print Contrast Signal (PCS)

A comparison between the reflectance (brightness difference) of bars and spaces in a symbol. PCS under a given set of illumination conditions is defined as follows:

PCS is calculated as follows:

$$\frac{L - D}{L} \times 100\%$$

Where:
L = Lightest (highest reflectance)
D = Darkest (lowest reflectance)

Profile

See Scan Reflectance Profile

Quiet Zone

The area immediately preceding the start character and following the stop character in a bar code symbol as specified in a particular application and/or symbology specification.

Reference Decode

Each symbology type specifies a specific decoding method to be used in determining overall symbol grade.
This parameter grade can be "A" or "F." ("A" is pass and "F" is fail). If this parameter is "F" the overall symbol grade will also be "F" regardless of any other parameter. If this parameter is "A" the lowest of the other parameter grades determines the overall symbol grade.

Reflectance

A measure of the amount of light reflected from an illuminated surface.

Reflectance Minimum

This parameter grade can be 4.0 / "A" or 0.0 / "F." The reflectance value of the "lightest" space in a symbol must be equal to or greater than twice the reflectance value of the "darkest" bar.

Refl(max) = or > Refl(min) x 2   if "yes" 4.0 / "A" else 0.0 / "F"

Reflectance Calibration Standard

(See plaque) A standard or "known" reflectance value, usually printed on the back of a template or plaque. Bar code readers are calibrated for reflectance using these known values.

Required PCS

This is the minimum PCS percent required for the symbol.

Resolution

The dimension of the smallest code element that can be printed; the higher the resolution the clearer the image.

Scanner

An electronic device that converts printed information into electrical signals.

Scan Reflectance Profile

A record (usually graphically represented) of the reflectance measured using the reference reflectivity method as a function of distance across the entire bar code symbol.

Segment

Refers to the left and right grouping of modules or elements into segments to designate parity for checking validity of a scan.

Self-checking

A bar code or symbol that uses a checking algorithm that can be applied to each character, to guard against undetected errors. (Non-self-checked codes may use a check digit or other redundancy in addition to the data message).

Show-through

The generally undesirable property of a substrate that allows underlying markings of materials to affect reflectance.

Space

The element of a bar code symbol whose reflectance is greater than the global threshold. A Space is the light reflective element. (As opposed to a bar which is the dark reflective element.)

Space Reflectance (Rs)

The largest reflectance value in a space or *quiet zone*.

Specular Reflection

Reflection of light from a surface at an angle equal and opposite to the angle of incidence.

Start and Stop Characters

Characters typically used at the beginning and end of each bar code symbol.

Substitution Error

This error can be seen in a mis-encodation, mis-read or human operator error where characters that were to be entered were substituted with erroneous information.

Substrate

The material (paper, plastic, metal, etc.) upon which a bar code symbol is "printed" or reproduced.

Symbol

See Bar code symbol.

Symbol Contrast (SC)

This parameter grade can be "A," "B," "C," "D" or "F." *Symbol contrast* is the difference in reflectance values of the "lightest" space (including the *quiet zone*) and the "darkest" bar of the symbol. The greater the difference, the higher the grade.

$$\text{SC = Rmax - Rmin}$$

Symbol Grade

The simple average of all the overall profile grades using the standard weighing

    4.0 = A
    3.0 = B
    2.0 = C
    1.0 = D
    0.0 = F

The symbol grade may be stated as a decimal or converted to a letter grade. A measuring aperture number and nominal wavelength are also specified.

Symbology

A set of rules for encoding information in a bar code symbol.

Symbology Reference Decode Algorithm
A decoding algorithm that may be found in a particular application and/or symbology specification.

TAPPI
Technical Association of Pulp and Paper Industry. Technology Park/Atlanta, P.O. Box 105113 Atlanta, GA 30348-5115

Threshold (Global Threshold)
See Global Threshold)

Transmission Mode
The mode where light is transmitted through a film master symbol rather than reflected from a printed symbol.

Truncation
Decreasing the length of the bars in a bar code symbol below the normal specification. Truncation decreases a symbol's omni-directional readability and should be avoided.

Valley
The graphical pattern on a scan reflectance profile which looks like a "U" or "V." Within a profile a valley represents a bar. One or more valleys could also be found within an element representing a reflectance change within an element.

Vertical Redundancy
The availability of more than one scan path through a bar code symbol.

Visual Measurement

Measurements obtained by using human vision in the determination of characteristics of the bar code symbol.

Void

White or light reflective area in a bar caused by a printing error that can cause a bar to scan as a space.

Wide/Narrow Ratio

Ratio of narrow to wide elements.

X Dimension (or X-Dim)

The intended width of the narrow elements dictated by the application and/or symbology specification. Also referred to as Narrow Bar Width (NBW)

Zero Suppression

Technique used to shorten UPC symbols by omitting zeros from the bar-code.

Z Dimension

The achieved width of the narrow elements. Computation of Z is accomplished using different factors for some symbologies.