



WEBCAN

BARCODE VERIFIERS



Webscan TruCheck User Manual

101/201 Family
101-R/201-R Family
401-R Family

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Introduction

The TruCheck system is the most advanced bar code verifier available today. The main features of the system are:

- Automatic laser movement for multiple scan grading
- CCD Imager with Integrated Illumination (Model 401R)
- Repeatable results
- High performance regardless of operator training or skill
- Calibrated to traceable standards
- Rapid Verification Speed
- Detailed reporting
- Easy to use
- Verifies PDF417, RSS14™/Composite Symbology Multi Row Symbologies (Model 201/201R only) and matrix codes (Data Matrix ECC200 and QR Code) (Model 201RPM/401 only)

This manual will guide you in using the system and in fully understanding the available features. It will also assist you in understanding the verification results shown on the display or printed on the optional report printer. Most of the information in this manual pertains equally to the Model 101 (1D linear barcodes) and Model 201 (2D barcodes) and Model 401 (Data Matrix, QR Code and Aztec Code symbols). Specific information about each version is noted when necessary.

Validation for Pharmaceutical Applications

Webscan has developed a Validation Protocol in order to fulfill requirements of pharmaceutical and medical companies for Validation of equipment used in their quality control process.

The FDA has issued many documents offering guidance on computer software validation principles generally directed to medical devices. More specifically "General Principles of Software Validation; Final Guidance for Industry and FDA Staff" was issued on January 11, 2002.

The TruCheck barcode verifier is not a medical device. However, the guidance document is based upon generally recognized software validation principles and, therefore, can be applied to any software. The TruCheck Models 101/101R/201/201R/401R does contain software and is used in the quality systems of manufacturers subject to FDA regulations. Therefore this validation protocol is designed to help insure the highest quality standards are being met and follows the previously mentioned guidance. This validation protocol is expected to be used in combination with the customer's own quality systems to assure themselves and FDA inspectors that their manufacturing practices meet quality and health standards.

Please contact Webscan for more information if Validation applies to you.

RSS14 and Composite Symbology are trademarks of the GS1 (formerly The Uniform Code Council.)

Getting To Know Your System

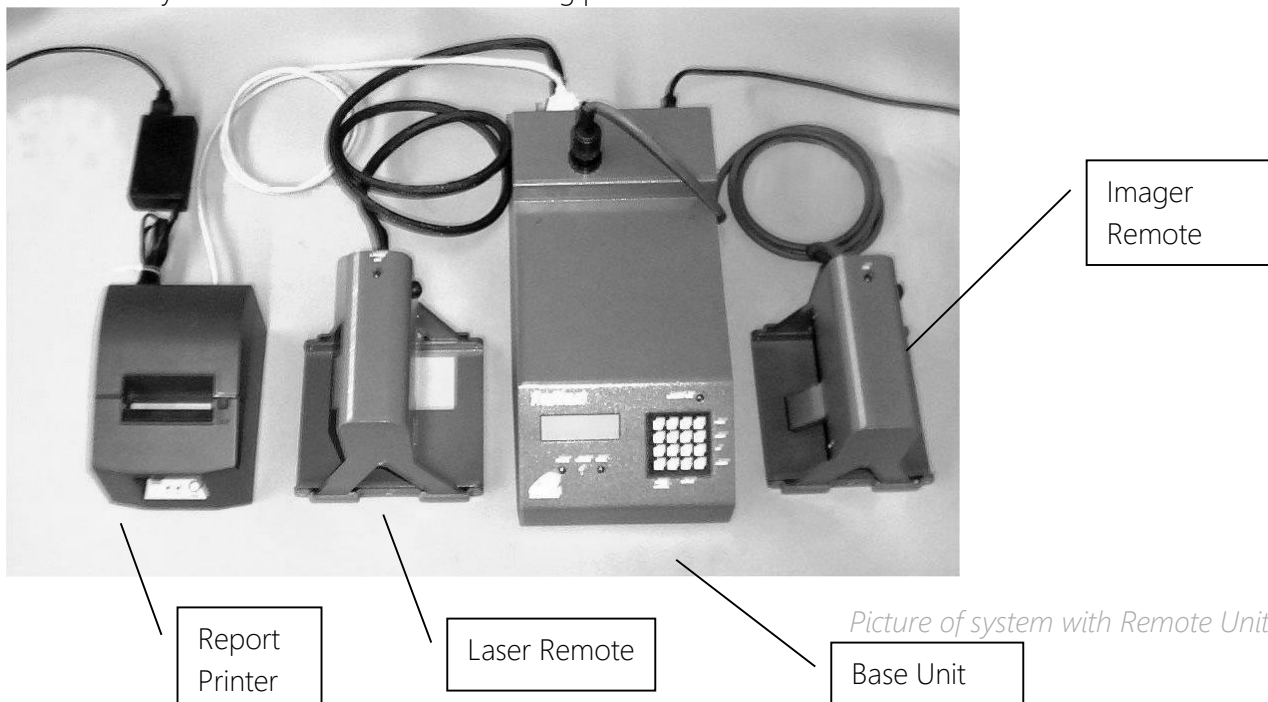
The following diagram shows the TruCheck system for reference.



Picture of integrated one-piece system

Your TruCheck barcode verifier comes complete with everything you need to begin verifying barcodes.

- One TruCheck Unit (or Base unit and Remote Scanner with attached cord in the case of 101R/201R models)
- One Report Printer (if purchased)
- One Calibration Symbol (if purchased)
- All necessary cables and connectors including power cords and download interface cables



Picture of system with Remote Units

Special Keypad Functions

'←'	This symbol is your "Enter" or "Select" key.
'+'	This symbol accesses additional features and also operates as an "Escape" key to leave or abort an operation.
'0'	When a system setting is set on '0' (zero) that particular function is disabled. To enable a system setting, select the feature by pressing '←' "Enter", press the '←' back arrow key, and then press '1'. This will enable the feature.
'1'	When a system setting is set on '1' that particular function is enabled. To disable a system setting, select the feature by pressing '←' "Enter", press the '←' back arrow key, and then press '0'. This will disable the feature.

NOTE: There are special "Hot Keys" that will allow you to perform your most used functions simply by pressing the 1, 2, 3, 4, 5 or 6 keys. The specific function of these keys is user definable, but there are default functions set at the factory for keys 1 through 3. Please see the *Setting up Hot Keys* section on *Page 52*.

Selecting Among Multiple Scanner Units

If your TruCheck system incorporates more than one scanning unit, you can select from among them. To select a Remote scanner unit, press the "Start" button on that unit. To select an internal scanner, such as on a TC-101 or TC-201 unit, press the "Enter" button. An internal scanner is one that does not have a "Start" button to activate it.

Note: When the "Enter" button is pressed on a system that does not contain any internal scanner unit, the currently selected scanner unit will begin a verification.

Note that separate copies of each setting parameter exists for each scanning unit. Therefore, you may have the parameter "Auto Print" set to 1 on one scanner unit but not another scanning unit. You must set all parameters for each scanner unit to their desired settings.

Each scanner unit must be selected and calibrated independently. When you calibrate one scanner unit, no affect is made to the calibration of any other scanner unit. When you select any scanner unit, the calibration that was saved for that unit is brought into effect. Once you have calibrated each scanner unit, you may switch back and forth among them without needing to calibrate each time you switch. Each scanner unit should be calibrated on the recommended frequency, according to the calibration procedure outlined later in this manual.

Quick Start

The following information shows the proper setup procedures for your new TruCheck unit. Before proceeding, locate the power cord and any accessories you purchased.

If you have purchased the Remote scanner, you must plug it into the mating connector on the base of the TruCheck system. The connector is located on the top portion of the rear part of the base unit. Be careful to orient the connector properly. Look at white dots on the connector and the base unit and the plastic notches on the connector rings to see how to align the. **Do not force** the connector in, if it requires force to insert, it must be oriented incorrectly. Once the connector slips into place, gently turn the plastic retaining screw until it “clicks” in place.

Setup With Optional Report Printer:

1. Connect the AC power cord to the back of the TruCheck unit and plug it in.
2. Connect the power supply to the printer and plug the power supply in.
3. Connect one end of the printer cable to the 25-pin connector located on the back of the TruCheck unit and plug the other end into the connector on the back of the printer.
4. Set the power switch on the TruCheck to 'ON'. Next, set the power switch on the printer to 'ON'. **Note: it is important to sequence the power switches to insure proper operation of the TruCheck.** Alternatively, the TruCheck and printer may be turned on simultaneously by connecting both cords to a power strip. Then use the power strip switch to turn the power on and off to both devices.
5. Wait for TruCheck to start up. Press “1” when the display prompts you to do so. Press any key when the display prompts you to do so. (Note that you may see the revision number of the software in the unit at this time.)
6. Once you press a key, you will see the main menu. 'VERIFY' is the currently selected choice.

Setup without Optional Report Printer:

1. Connect the AC power cord to the back of the TruCheck unit and plug it in.
2. Set the power switch to 'ON'.
3. Wait for TruCheck to start up. Press “1” when the display prompts you to do so. Press any key when the display prompts you to do so.
4. Once you press a key, you will see the main menu. 'VERIFY' is the currently selected choice.

NOTE: The TruCheck system may be set up to automatically print after each verification. If you do not have the optional printer, you should ensure that this setting is turned off. To change this setting see Page 40.

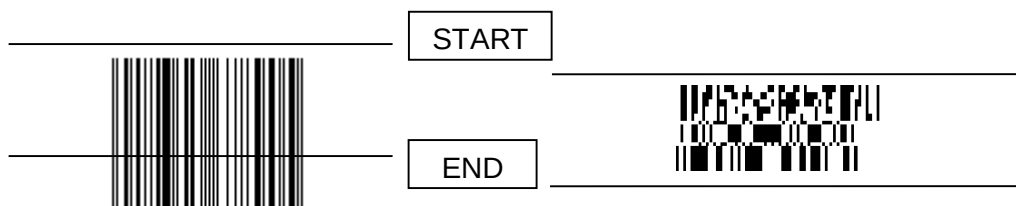
Scanning a 1D Linear Barcode

After following the setup instructions, you are ready to perform your first verification.

To use the remote scanner place it over the barcode to be verified, being careful to center the barcode in the center of the scan line. (For ease of centering, an optional Guide Plate is available from Webscan. Be sure to align the center of the barcode to the arrow like notches on the guide plate as shown in the picture below.)

1. To use the TruCheck model 101 or 201 without a remote scanner, place the symbol on the center of the platform being careful to center the barcode in the scan line. There is a white line in the center of the platform to help you align the barcode to the center.

For a standard type, 1 dimensional barcode, place the symbol with the laser line crossing the code near the top as shown below. For a stacked symbology, such as PDF417, or RSS14, the laser line should start and end outside of the code -- see the next section Changing the Laser Movement – SETUP Menu.



2. Press the '⇐' (ENTER) key or press the Start button on the side of the Remote Scanner. The laser will scan the code 10 times and perform full ANSI analysis of the code.

NOTE: Models 201/201R/401 equipped with the capability to read 2D symbols – PDF417 and RSS – processing will be significantly faster on 1D codes, such as UPC/EAN, Code 39, and Code 128, etc. by skipping the 2D processing. If you know that the symbol you are verifying is not PDF417 nor RSS14, you may press the "0" key instead of the enter key to Skip the 2D processing. You may also press "8" to go directly into PDF417 processing. You may also turn off any 2D code with the Admin Settings menu.

3. The report will be automatically generated from the printer within seconds.

NOTE: If you did not purchase a report printer, the diagnostic information will be shown on the integrated LCD display. Press the right arrow key to view more detailed report information on successive screens, such as a list of each ANSI parameter, nominal element size, and more. Press '⇐' (ENTER) to return to the main menu. To view this information again (or at any time to recall the report from the last verification), simply select 'REPORT' from the main menu by moving the cursor with the up or down arrow key and then pressing enter. For more information on the reports, please see Page 18). On Model 201/401 units, when a Composite Symbol is read, you can change the results screen between the primary barcode and the composite barcode by pressing the + key while viewing the results and selecting the other set of results from the menu.

Changing the Laser Movement – SETUP Menu

The range of movement of the laser can be easily adjusted to verify different size barcodes.

1. Place a barcode on the platform. Position the code with the laser line crossing through the barcode near the top as shown below.
2. From the main menu, use the down arrow key and select 'SETUP'. Then press '⇐' (ENTER).

The 'SETUP' menu contains these choices:

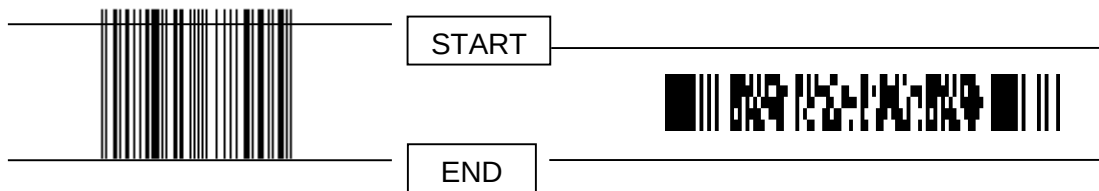
'STEP BACK' – Select this choice to move the scanner away from you

'STEP FORWARD' – Select this choice to move the scanner towards you

Hold the enter key down to move the laser to the desired stopping point.

'SET START' - Select this choice to set the current scanner position as the starting point for verification. This can be at any position on the code (usually at the top).

NOTE: the start and stop positions should be INSIDE of linear (1D) barcodes, but totally above and below PDF (2D) barcodes.



NOTE: Symbols of any and all RSS-14 varieties (with or without composite components) are treated as 2D codes as shown on the right above. Thus, the laser movement should be started above the code and end below the code for all formats of RSS14™ and RSS14 Composite Symbology™.

You may make changes using STEP BACK or STEP FORWARD to alter the desired end point as needed. When you have the laser set on the spot you wish the scanning range to end, select 'SET END'.

DONE - Select this prompt to return to the main menu. The selections/changes you made are saved for your next verification.

TOP - Select this choice to move the laser back to the original factory set position. Normally, it is not necessary to use this feature.

The SETUP menu also contains other settings that can be customized.

Changing the Number of Scans

#SCANS - Select this choice to enter the number of scans to be used for verification. Press enter on this prompt to see the current number of scans used. Use the back arrows to erase the number and enter the new number of scans with the numeric keypad.

NOTE: Once specific START and END positions have been set, the space between them will be divided equally to provide the selected number of scans within the range. The START and END positions are always included in the count.

The recommended number of scans is 10 for a formal ANSI grade. However, you may wish to select a different value. For example, if you want to focus on a single part of the barcode you may set the unit for a single scan.

If you select 1 scan, a single scan will be used at the position specified as the START position. If you select 2 scans, the START and END positions will be used. Selecting zero has the same effect as selecting 1. The highest number of scans that can be made is 10.

Saving and Recalling the Laser Movement Setup

Since you may have several different barcode sizes, you may save many laser movement setups in the system. In the SETUP menu, use the arrow keys to select SAVE. Enter a number between 1 and 20 and press enter. The settings will be saved. To recall the settings, use the arrow keys to select RECALL. Enter the number that you entered when you saved the settings, and press ENTER. The setup will be recalled. The SAVE and RECALL feature is often used in conjunction with the hot-key feature, to recall a common job, perform verification and produce a printout. See Setting up Hot Keys on page 53.

Instructions for scanning GS1/UCC Composite Symbols

For GS1 composite symbol in which the primary component is a UPC/EAN or a UPC/EAN-128 the start and end positions of the laser should be set as follows. The start position should be above the composite region. The end position should be set near the bottom but within the primary component.

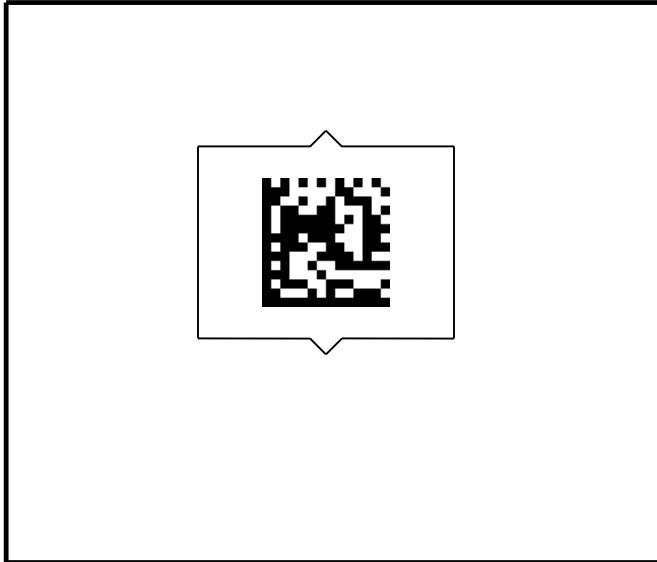
Instructions for scanning GS1/UCC Coupon Extended Codes

GS1/UCC Coupon Extended Codes consist of a UPC/EAN symbol on the left and a UCC/EAN-128 symbol on the right. These two barcode symbols, while functioning as a single unit for the purpose of the coupon, can be read as individual barcodes. On the TruCheck, they shall be verified separately as individual barcodes. The overall grade for the Coupon Extended Code shall be taken as the lower of the two individual grades. Thus, a Coupon Extended Code is verified on a two-step process on the TruCheck.

NOTE: GS1 is formerly known as UCC/EAN. This organization has changed the names of RSS (Reduce Space Symbology) to GS1-DataBar, and UCC/EAN-128 to GS1-128. All references in this manual and reports from the TruCheck to the old names shall be equivalent to references to new names respectively.

Verifying a Data Matrix Symbol

Place the TruMatrix imager over the Data Matrix symbol, using the opening in the guide plate to be sure that the symbol is in the “field of view.” Press the start button. You do not have to align the symbol as it can be read omnidirectionally but be sure to center the code within the guide plate opening. The image captured by the TruMatrix imager can be observed on the optional VGA monitor (it should be plugged into the “AUX” port). **Webscan strongly recommends the use of a monitor for proper positioning of the target.**



Center the 2D Matrix symbol within the square cutout in the guide plate. The whole 2D Matrix symbol (including its “quiet zones”) must fit within the field of view of the imager. The field of view of the imager is smaller than the cutout. **The best way to position the symbol is using the optional VGA monitor, which shows the picture taken by the imager.**

Setting the Aperture Size

The Aperture Size used to process the image according to ISO 15415 can be adjusted. To change the Aperture setting:

1. From the main menu, use the down arrow key and select ‘SETUP’. Then press ‘ $\leftarrow$ ’ (ENTER).
2. Select ‘Aperture’. Then press ‘ $\leftarrow$ ’ (ENTER).
3. Use the Left Arrow key to erase the current setting.
4. Now enter a number using the Number Keys. The value that you enter should be the number of MILS (.001 inch) times 10. (This enables you to enter a value to a resolution of one tenth of a MIL without using a decimal point, which does not exist on the keypad). Then press ‘ $\leftarrow$ ’ (ENTER).

NOTE: The correct value for Aperture depends upon the Specification to which you are verifying your symbols, but the normal value is 80% of the size of the Minimum x-dimension (cell size) allowed for your symbols. For more information, see ISO 15415 and any Specification pertinent to your application.

Imager Setup Menu

The following settings appear in the Setup menu, when an Imager is selected.

'Aperture'

Use this option to adjust the synthetic aperture size. This setting is specified in tenths of a mil, so 50 equals 5 mil (.005 inch). The range of settings is 30 through 200.

'Display'

Select this option to display on screen after a symbol was decoded one of the three following symbol images:

- Original Image
- Blurred Image (after "smoothed" by the aperture blur)
- Black and White Image (after thresholding to a binary image)

'HideGrid'

Set this option to '1' to display the symbol grid on the displayed image selected at the 'Display' option.

'Bad ASTM'

This option is used for symbols graded under the AS9132 document. Set this option to '1' to display on the image selected at the 'Display' option, the modules that failed under the AS9132 quality grading.

'New Set'

Select this option to start decoding a symbol in the five angles according to ISO 15415.

'Angle(0-5)'

Select this option to set the last angle, from 1 to 5, when decoding a symbol using the angles specified in ISO 15415. When 'New Set' option is chosen, this setting is set by default to '5'. Set this option to '0' to turn off the five angles decoding.

'Start Angle'

Select this option to set the angle, from 1 to 5, to start when decoding a symbol using the five angles according to ISO 15415. This feature is valid only when 'Angle(0-5)' is on. This option defaults to the first angle, which is 45 degrees. This angle can be set to replace one of the other scans in the average.

'Img Hist'

Select this option to display on screen the histogram of the image that was decoded. This histogram shows the number of modules with each gray level value and diagrams the modulation value for each of these levels. The histogram is shown in color with green indicating modules with A or B modulation grades, yellow indicating modules with C modulation grades and red indicating modules with D or F modulation grades.

'Live ON'

Set this option to '1' to enable live video mode.

'Dot Peen'

Set this option to '1' to decode a dot peen symbol.

'Stick'

This option is also used to select the minimum and maximum aperture setting when utilizing the DPM Grade option. The minimum and maximum stick size should correspond to the minimum and maximum allowed x-dimension used in the application. The size is to be entered in tenths of mils, i.e. enter the value 50 for 5 mils and 150 for 15 mils.

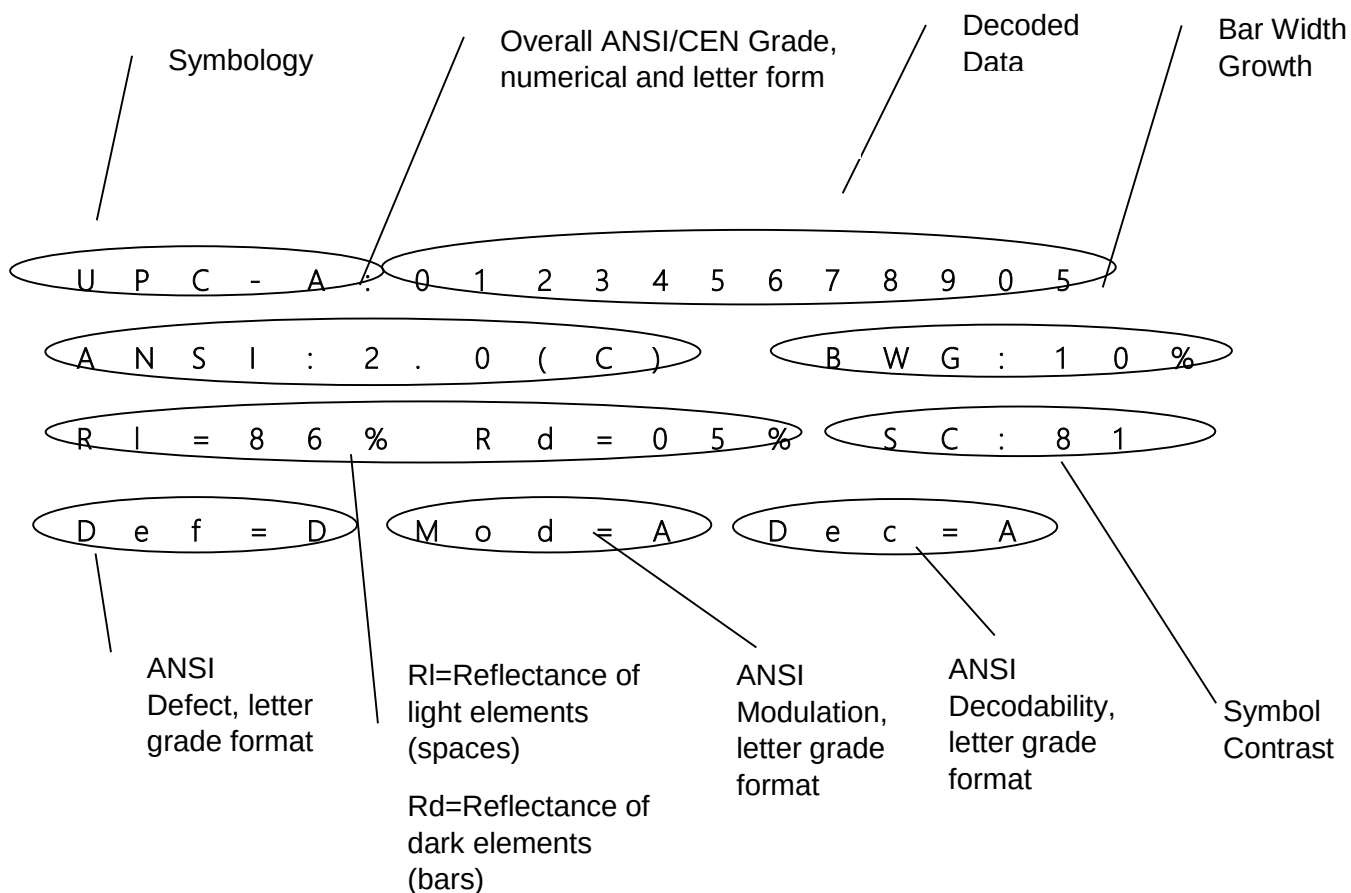
The values for Stick minimum and maximum also sets the range of "stick" sizes used in decoding a dot peen symbol, whether or not DPM Grade is enabled. This use of the Stick is only in effect if 'Dot Peen' option is set to '1'.

'Save Screen'

Select this option to save the image displayed on screen that was selected from the 'Display' option. The image will be saved as tcdisp.jpg and can be transmitted through the serial output port by selecting "Transfer Img".

Verification Results (Screen)

After each verification, a report is shown on the display. The 'REPORT' prompt in the main menu will also show the results of the most recent verification. The following example will be used to explain the main results screen:



NOTE: The unit can be set to automatically print a report and immediately return to the 'VERIFY' prompt. Please see Page 40 for more details on the 'Don't Wait, Auto Print' setting.

As you can see, the detailed ANSI parameters are shown in letter format only in some cases. This is so the significance of the measurement will be immediately clear. However, the actual measured values are available at the touch of a button. Simply press the RIGHT ARROW key to view the detailed results screens. In the next section, the Detailed Results Screen and the meaning of the ANSI measurements will be explained.

Detailed Results (LCD Display Screen)

Press the RIGHT arrow key from the main results screen to see the **Detailed Results** screen. In this screen, each ANSI parameter is shown on its own line, which gives enough space for several important pieces of information. In some cases even more detail is available by pressing the RIGHT ARROW key again to reveal a second detailed results screen.

Three parameters are shown on the screen at a time. To view more parameters in the list, press the DOWN ARROW (↓) key or the UP ARROW key (↑).

The top line of the display provides header labels for the columns of data. The columns are:

- Name of Parameter
- Measured Value
- Letter Grade

Some of the following ANSI parameters are graded with letters A, B, C, D and F. These are:

Symbol Contrast (SC), Modulation (MOD), Defects (DEF), and Decodability (DCD).

The other parameters only use the letters A and F -- in other words they are pass or fail. These are:

EDGE, RI/Rd (Minimum Reflectance), Min EC (Minimum Edge Contrast), DCD, and Min QZ (Quiet Zone)

Please see Page 15 for a technical description of each measurement

PASS/FAIL

Example of detailed results screen #1

	PARAM	%%%	A-F	OK
1.	EDGE	59	A	✓
2.	RI/Rd	60	A	✓
3.	SC	81	A	✓
4.	Min EC	86/5	A	✓
5.	MOD	92	A	✓
6.	DEF	26	D	X
7.	DCD	1/1	A	✓
8.	DEC	90	A	✓
9.	Min QZ	>15	A	✓

Press the RIGHT ARROW key to reveal the second detail result screen which shows which element of the bar code was responsible for the grade given. In the example below, ' example shown above, the 27th element in the bar code contains a large defect that was measured as 26%. The previous detail screen indicated that this defect was big enough to be graded a 'D'.

Example of detailed results screen #2

	PARAM	%%%	A-F	OK
1.	EDGE	59	A	✓
2.	RI/Rd	60	A	✓
3.	SC	81	A	✓
4.	Min EC	86/5	A	✓
5.	MOD	92	A	✓
6.	DEF	26% at	27	X
7.	DCD	1/1	A	✓
8.	DEC	90	A	✓
9.	Min QZ	>15	A	✓

You may wish to print a report of the verification. To print the report, press the + key while the results of a verification are displayed. Then select Print and press Enter. From the Main menu, you may Select Reports to return to viewing the results of the last verification performed. From there you may press + to access the print function. Reports can also be printed automatically for every verification by turning on the setting "AutoPrint". See section Customizing Reports on page 38.

Defining ANSI Parameters

Sample Report

Webscan TruCheck			
Wed 19-Apr-2000 10:19AM			
C39:380351688			
1.EDGE:	109	A	Pass
2.RI/Rd:	76/11	A	Pass
3.SC:	65%	B	Pass
4.MinEC:	40%	A	Pass
5.MOD:	62%	B	Pass
6.Def:	0%	A	Pass
7.DCD:	10/10	A	Pass
8.DEC:	73%	A	Pass
9.QZ:	>15	A	Pass
Overall ANSI Grade: B(3.0)			

Description of Each ANSI (CEN or ISO) Parameter

The ANSI parameters section lists each of the nine ANSI parameters and gives a summary of the measurements based on all scans taken. Each parameter is completely explained below. Note that some of these parameters are average values over all of the scans, and the averages may skew or alter the apparent results. For a rigorous review of the ANSI process given on each of your codes, you should check the ANSI Matrix for each code, described in the next section.

This section may be very helpful in situations where the barcode cannot even be read. Therefore, the descriptions of each parameter below will explain what is measured in the case where a code is read and not read. When a code is not read, the scan is analyzed for apparent quiet zones and the bars and spaces in between are used for the ANSI analysis.

1. EDGE: EDGE DETERMINATION

Checks that each edge between bar and space can be detected and no false bars or spaces appear due to "splitting" of bars or ink splattered into spaces. If at least one scan results in a decoded barcode, the EDGE value is the number of

bars and spaces, not including quiet zones, in the code. If no scans result in a decoded barcode then the EDGE value shown is the number of bars and spaces found between quiet zones (or apparent quiet zones) on the scan on which the most bars and spaces were found. The Scan Reflectance Profile graph can also be very helpful in analyzing a code that cannot be decoded.

2. RL/RD: MINIMUM REFLECTANCE

Checks that the darkness of the bars is sufficient. Strictly speaking, the amount of light reflected by the bars (bar reflectance) must be less than half the light reflected by the spaces (space reflectance). The values shown are the light reflectance and the dark element reflectance separated by a slash. The light reflectance is the maximum reflectivity found in the scan (lightest or best space), and the dark reflectivity is the minimum reflectivity found in the scan (darkest or best bar). The requirement is for the minimum reflectivity to be no more than half the maximum reflectivity. If this requirement is met, the grade will be A, otherwise it will be F.

3. SC: SYMBOL CONTRAST

Measures the contrast between the brightest space and darkest bar. The result is assigned a letter grade of A, B, C, D or F, with A being the highest contrast. The contrast is the difference between the maximum reflectivity (lightest or best space) and the minimum reflectivity (darkest or best bar). Note that Symbol Contrast is the *difference* between light and dark, and RI/Rd above checks the *ratio* of these values.

A	> 70	B	55-70	C	40-55	D	20-40	F	<20
---	------	---	-------	---	-------	---	-------	---	-----

4. MINEC: MINIMUM EDGE CONTRAST

Checks that the contrast between adjacent bars and spaces is high enough. When a barcode is scanned, a reading device must locate the edges between each bar and space. If the difference in the light and dark elements is not significant, this may not be achieved. Note that MinEC finds the worst-case contrast difference between each bar to space transition, whereas Symbol Contrast finds the best-case difference at any point across the barcode.

5. MOD: MODULATION

Modulation checks the edge contrast as a fraction of the overall or best case contrast measured in Symbol Contrast. Modulation is an important measure of minimum edge contrast since most barcode reading devices employ “adaptive thresholding circuits” of some type that are sensitive to a symbols contrast in order to detect transitions between bars and spaces. If all bars and spaces were the same brightness, the minimum edge contrast would be equivalent to symbol contrast. In this case, Modulation would be 100 percent. If some spaces are less bright than the brightest one, modulation will be some fraction of the overall contrast. Modulation therefore measures the amount of *available* contrast that is manifested in the worst-case bar to space transition. The percentage is assigned a letter grade.

Excessive ink spread or bar growth can result in low modulation because very narrow spaces appear to be filled in by the encroaching bars in the Scan Reflectance Profile. If you’ve read down to here, you deserve a reward! Call Webscan at 1-877-WEBSCAN for your FREE gift.

6. DEF: DEFECTS

The worst-case change in reflectance within a single bar or space is a defect. The largest difference in reflectivity found in a single bar or space is measured as a percentage of the Symbol Contrast and assigned a letter grade. Defects normally measure breakups or voids within bars, or ink spots in spaces, or even the grain of a substrate in spaces. This very serious issue for scanners was not directly addressed by Traditional verification techniques.

7. DCD: DECODE

The widths of each bar and space is measured and used to interpret the data content of the barcode according to a specific mathematical formula appropriate for the barcode type. If the barcode cannot be decoded according to the formula, the accuracy of the bar and space widths are inadequate. The printout shows the number of scans decoded over the number of scans taken, e.g. 8/10 means 8 out of 10 scans decoded.

8. DEC: DECODABILITY

Determines how accurate the bar and space widths are and how easily the widths can be determined. A perfectly accurate barcode will have 100 percent decodability, but decodability as low as 25 percent is often acceptable. Decodability is always measured in terms of the formula used to interpret the bar and space widths into the data content of the barcode. In order to read barcodes, thresholds between element widths are normally established according to prescribed “decode algorithms”. Decodability is normally the percentage of the overall tolerance range for a bar or space width that is not used up by inaccuracies. See Appendix B for an example.

9. QZ: QUIET ZONE

This checks for adequate space on the left and right of the barcode. Each symbology specifies a minimum quiet zone. For example, UPC-A barcodes should have at least a nine module quiet zone on each side, whereas an EAN-13 barcode permits legal quiet zones to be as small as seven modules.

Traditional Parameters

PCS, MRD, SC, MinEC and MOD – Ways of Quantifying Contrast)

PCS, Print Contrast Signal, is an older and largely no longer used measure of contrast. Contrast is intended to quantify the difference between the bars and the spaces in reflectance. PCS is defined mathematically as:

$$PCS = (R_{max} - R_{min}) / R_{max}$$

In other words, the percentage of the light background accounted for by the difference between the bars and spaces.

This measure was defined as a measure of perceived contrast by the human eye, long before and outside the context of measuring barcode contrast. Notice that the measurement is made relative to the brightness of the background. The fact that it is relative to the background means that the darker (worse) the background color is, the higher (supposedly better) the value of PCS. This may correspond with the way people view things, but not really, how scanners work. Rather, scanners are sensitive to the absolute difference between the reflectance of bars and spaces. Scanners are especially sensitive to variations in contrast within the same scan.

Another measurement, called MRD (minimum reflectance difference) quantifies the minimum difference anywhere across the barcode. MRD considers the brightest (worst) bar and the darkest (worst) space anywhere in the barcode. These worst case bar and space need not be adjacent to one another.

Note that the ANSI grading system defines yet a different way of measuring contrast: SC (symbol contrast) and MinEC (Minimum Edge Contrast.) SC is the difference between the brightest (best) space and darkest (best) bar. Minimum Edge Contrast is the smallest difference occurring between adjacent bars and spaces (across a single edge). MOD (Modulation) is simply the ratio between MinEC and SC, in other words, the percentage of available contrast that is manifest in the worst-case edge.

Bar Width Growth

Bar Width Growth is a measure of ink spread. The measurement of bar width growth is different on each symbology, and requires at least one successful decode of the symbol for measurement. Generally, bar width growth is taken on groups of bars and spaces, sometimes large groups. This results in stable results when bar width growth is uniform, but does not catch isolated cases of a single bar widening or shrinking. In fact, it is possible to have a very low (good) reading of bar width growth when in fact a large number of even all the bars and spaces are incorrectly grown or reduced, as these may tend to cancel each other out. Such bar width inaccuracies will normally be detected by low grades of Decodability.

Printed Reports for Linear Barcodes

The printed report will include the time and date, ISO/ANSI Averages, Results of each scan, Traditional Parameter results (if function is enabled), and the plot of the Scan Reflectance Profile (if function is enabled). Please see Page 38 to learn more about customizing reports. The next section shows a sample report and explains each section.

Webscan TruCheck

Wed 19-Apr-2000 10:19AM

C39:380351688

1.EDGE:	109	A	Pass
2.RI/Rd:	76/11	A	Pass
3.SC:	65%	B	Pass
4.MinEC:	40%	A	Pass
5.MOD:	62%	B	Pass
6.Def:	0%	A	Pass
7.DCD:	10/10	A	Pass
8.DEC:	73%	A	Pass
9.QZ:	>15	A	Pass

ANSI Results:

All 9 ANSI
parameters are

Overall ANSI Grade: **B(3.0)**

Results of each scan:

	M		D		G
	i		e		r
	n	M			a
S	E	R	I	c	
C	D	e	n	M	D
A	G	f	S	E	O
N	E	I	C	C	D
1.	A	A	B	A	B
2.	A	A	B	A	B
3.	A	A	B	A	B
4.	A	A	B	A	B
5.	A	A	B	A	B
6.	A	A	B	A	B
7.	A	A	B	A	B
8.	A	A	B	A	B
9.	A	A	B	A	B
10.	A	A	B	A	B

Per-scan Analysis:

ANSI grades are
show

Global Threshold:

Midpoint between
RI/RD (Light & Dark)

Minimum Edge Contrast:

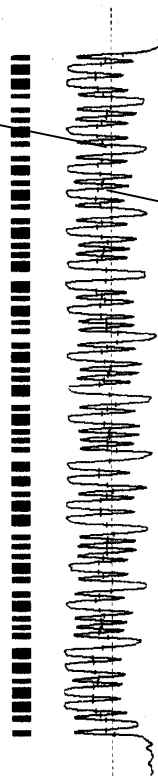
Shows edge between two
elements which have the
smallest difference in
reflectance. This edge gives

"Tick Marks":

Indicate edge determination
threshold from bar to space.

Biggest Defect:

This element contains the
largest non-uniformity in
reflectivity, which is "noise"
for a reader.



Code 128 Encodation

When a Code 128 symbol is decoded (including UCC/EAN-128, or GS1-128) the printout will include this section which shows the exact Code 128 symbol character values that are used to encode the barcode's data. Code 128 employs 106 unique graphical character patterns. These character patterns are interpreted according to one of three character subsets, named A, B and C, depending upon which character subset is active for each character in the symbol.

All Code 128 characters begin with one of three start character patterns, named Start-A, Start-B and Start-C. The following symbol data character will be interpreted in the subset associated with the start character that is used. Within each subset, it is possible to switch to another subset, to be used for the following character(s). A Code 128 symbol that begins with a Start-A character is sometimes referred to as a Code 128A symbol, and so on for the other start characters. The first line on the printout within the Code 128 Encodation section shows the start character value in parenthesis, as in Code 128 (A).

The Code 128 Encodation portion of the printout shows you exactly which character patterns are used, and the final interpretation of these characters according to the subset that is active for each character. The chart of character values is to be read left-to-right, and each column represents one Code 128 character. So, to understand the meaning of each Code 128 character you must look at the whole column (vertically) for each character. For example, the first column will (and must) show the start character which is represented by the * character and a letter A, B, or C which will be under the * character. In fact, each character in the symbol is represented in a similar way, with a two-digit code to indicate the meaning of the character.

The two digit codes for each character are derived from the name of the ASCII code, such as CR for Carriage Return. Or, for functions that are unique to Code 128, such as a character that switches character subset a unique two digit code is used:

- *A = Start-A
- *B = Start-B
- *C = Start-C
- AA = switch to Code Set A.
- BB = Switch to Code Set B
- CC = Switch to Code Set C
- ^A = Shift to Code Set A for next character only (then back to B)
- ^B = Shift to Code Set B for next character only (then back to A)
- F1 = Function 1
- F2 = Function 2
- F3 = Function 3
- F4 = Function 4
- CK = Check digit
- ** = Stop character (always occurs at the end of a Code 128 symbol)

Below the two digit, code which shows the meaning of the characters, a three-digit value is shown (again, vertically) which identifies the Code 128 character pattern value for that character. For example, start A will always have the value of 103 because Code 128 character pattern number 103 is defined as the Start-A character. Likewise, the Code 128 stop character will always be shown with the value of 106. Other data values, however may be encoded with different characters, depending on the character subset in use. Hence, in Code Set A, the value of 77 encodes a carriage return whereas in Code Set B, the same value encodes the lower case letter "m". So, the Code 128 Encodation shows you which character subset is used at the beginning of the symbol, and by reading each column it shows you how each character in the barcode is encoded.

NOTE: Unprintable ASCII codes are represented using a special notation. See ASCII code representation.

Printed Report for PDF 417 Barcodes

Here is a picture of a sample label containing a PDF symbol. On this symbol, some PDF Codewords have been “crossed out” so that we can illustrate the way that the TruCheck system identifies and reports this type of label damage. Notice that the left part of one of the rows is crossed out. Also, an entire column is crossed out. You will see in the report a “map” of the label, showing these code words as having been unreadable. Due to the error correction capability of PDF417, the overall data content of the code is still retrievable.

FROM: ACME IDEAL AUTO PARTS 1 ROADRUNNER WAY TUCSON AZ 90150 PROBLEM@IDEAL.COM ASSEMBLED IN USA		TO: GENERAL MOTORS CORP ORION ASSEMBLY PLANT LAKE ORION OH 48359 PLANT DOCK: 54321 ZES	
12345678			
160 PCS UNIVERS WIDGET	MATERIAL HANDLING CODE A6-987	REFERENCE G1155	
LICENSE PLATE (1)  UN 123456789 A2BGC6D8E		SHIPMENT DATE: 14AUG2000 CONTAINER TYPE: SC151208 GROSS WEIGHT: 10 KG	
ZEBRA TECHNOLOGIES CORPORATION 333 Corporate Woods Parkway Vernon Hills IL 60061 Printed on a 300dpi Zebra 170XiIII printer (designed with BarOne V5.0) Inquiries: (800) 423-0422		PCI-CODE VALUE Z13 PCI-CODE VALUE Z14 PCI-CODE VALUE Z15 PCI-CODE VALUE Z16 PCI-CODE VALUE Z17	

Error Correction Usage:

PDF417 symbols contain built in “error detection and correction” capability. A certain number of extra code words are printed in the symbol in order to allow errors be tolerated when the symbol is read. An “error” is any code word, which can not be read at all, or which the reading algorithm thinks it can read, but actually is read wrong (decodes as a different code word.) Code words that cannot be read are called “erasures”. Code words that are mistakenly read with the wrong value are called “errors”. The number of erasures and errors, which can be tolerated, depends upon the number of extra codewords that are printed in the symbol. This is called the error budget and is determined by the “Security Level” of the PDF 417 symbol.

Each “erasure” uses up one error correction code word from the error budget. Each “error” uses up two error correction code word from the budget. The total number of code words used up is therefore two times the number of errors, plus the number of erasures. The unused error correction is any left over budget after errors and erasures are corrected. The percentage of the original budget that is left over, is graded as the UEC parameter (unused error correction.) The overall grade for the symbol is the lower of the UEC grade or the ANSI grade obtained from the start/stop characters.

Symbol Matrix Information:

This shows the basic layout of the PDF symbol, the number of rows and columns.

Error Correction Usage

General characteristics:

Bar Width growth, as percentage of a nominal element width. Nominal element widths in mils, and PCS.

Map of raw PDF code words. Any code words that

"Hash marks" indicated code words that were decoded incorrectly (solid black) and those which were determined to be unreadable (gray).

ANSI Parameters measured on the Start/Stop Characters

Webscan TruCheck
Wed 04-Oct-2000 11:01AM

Symbol Matrix Info:
PDF Decode: 147 CWS
21 Rows by 7 Cols
Security Level: 5
Total Error Detection and Correction Code Words: 64
Error Correction Budget: 62
Codewords decoded incorrectly: 2
Codewords not decodable: 23
Error Correction used: 27
Error Correction not used: 35
Unused Error Correction Grade = B
Start/Stop ANSI Param Grade = A

Overall Grade: B

General Characteristics:
BWG= 3%
Nominal X Dim = 10. mi
PCS = 96.5%

Decoded PDF Data:
[]><x1e>06<x1d>P12345678<x1d>Q160<x1d>1JUN123456789A2B4C6D8E<x1d>20LA6-987<x1d>21L54321 ZES<x1d>15K61155<x1d>BSC151208<x1d>7Q10GT<x1e><x04>

Raw PDF Codewords:

1.	083	901	152	693	366	547	#266
2.	029	900	478	032	094	156	#218
3.	924	049	117	447	134	725	#900
4.	841	849	613	841	063	125	#187
5.	249	840	842	841	844	842	#846
6.	#843	#848	#844	#913	029	842	#028
7.	330	846	489	247	913	029	#061
8.	851	845	123	061	808	754	#569
9.	913	029	841	178	306	841	#035
10.	179	913	029	841	542	841	#151
11.	060	269	913	029	238	508	#030
12.	846	599	901	030	004	900	#481
13.	111	510	487	447	239	925	#289
14.	473	908	564	608	326	310	#283
15.	826	633	795	757	391	877	#560
16.	524	130	502	739	354	294	#036
17.	691	112	472	759	066	765	#263
18.	760	426	159	815	219	544	#317
19.	228	298	194	257	825	464	#086
20.	346	050	052	074	113	583	#913
21.	782	121	161	499	444	514	#303

■=Fixed by Error Correction
■ (Decoded Wrong)
#=Filled in by Error Correction
#=(Not Decoded)

Quality Parameters:

1.UEC:	56	B	Pass
2.R1/Rd:	86/3	A	Pass
3.SC:	85%	A	Pass
4.MinEC:	75%	A	Pass
5.MOD:	89%	A	Pass
6.Def:	1%	A	Pass
7.DEC:	84	A	Pass

The Data Matrix Report

Webscan TruCheck

Fri 02-Apr-2004 02:09:08PM
Firmware 2.69

Symbology: Datamatrix
Data:
12345abcdefg123569003

Overall Grade: F
0.0/10/650

General Characteristics:
Matrix Size: 18x18 (Data: 16x16)
Horizontal BWG: 7%
Vertical BWG: 9%
Total Codewords: 32
Data Codewords: 18
Error Correction Budget: 12
Errors Corrected: 5
Error Capacity Used: 10
Image is Black on white
Nominal X Dim = 20.3 mil

Datamatrix Codewords:
■8E A4 EF 3A 80 ■66 BB 79
E6 FE ■99 ■AF BA D0 DC 81
85 1C F7 5E 47 23 15 BD
AE 6E ■B5 98 1D 87 26 7C
■=Fixed by Error Correction

Print Quality Parameters:
1.UEC: 17% F Fail
2.SC: 77% A Pass
3.MOD: 0.0 F Fail
4.ANU: 0% A Pass
5.GNU: 8% A Pass
6.LLS: 4.0 A Pass
7.BLS: 0.0 F Fail
8.LQZ: 1.0 D Fail
9.BQZ: 4.0 A Pass
10.TQZ: 4.0 A Pass
11.RQZ: 4.0 A Pass
12.TTR: 6% A Pass
13.RTR: 0% A Pass
14.TCT: 4.0 A Pass
15.RCT: 4.0 A Pass
16.AG: 2.6 D Fail



Enlarged
Replica of
symbol



Actual Data Matrix Symbol with:
Dirt in Top Quiet Zone
Dirt in Left Quiet Zone
A break in bottom L side
5 Module Errors

Bottom L Side
"Damage"

Actual Data Matrix Code Cords,
showing any that are "fixed" by
error Correction

Print Quality Parameters defined
for data matrix. See section
"Data Matrix Parameters" for
more details.

Actual Data Matrix Symbol with:
Dirt in Top Quiet Zone
Dirt in Left Quiet Zone
A break in bottom L side
5 Module Errors

Bottom L Side
"Damage"

ISO 15415 Data Matrix Parameters

UEC: Unused Error Correction

This is the percentage of error correction capability that is available for further incorrect modules. The assignment of grade is according to the following table:

UEC %	Grade
>62	A
>50 (but less than 62)	B
>37 (but less than 50)	C
>25 (but less than 37)	D
<25	F

SC: Symbol Contrast

This is the difference in reflectivity between the brightest module and the darkest module. The assignment of grade is according to the following table:

SC %	Grade
>70	A
>55 (but less than 70)	B
>40 (but less than 55)	C
>20 (but less than 40)	D
<20	F

MOD: Modulation

This is a grade based on the amount of variability in reflectivity of the modules. A multi-step process is used to get the modulation grade.

First, the reflectivity of each module is compared to the global threshold and the overall Symbol Contrast according to the following formula:

$$\text{MOD} = 2 * (\text{abs}(R - \text{GT})) / \text{SC}$$

The Global Threshold GT is the midpoint between the reflectance of the brightest module and the reflectance of the darkest module.

Next, the grade level *for each module* is determined from the MOD value according to the following table:

MOD %	Grade
>50	A
>40 (but less than 60)	B
>30 (but less than 50)	C
>20 (but less than 50)	D
<20	F

Finally, the value of the grade for the MOD parameter will be the highest modulation level for which the modules meeting that level will result in an Unused Error Correction grade of that level or higher. Note that a module, which is decoded in error, can still yield a high MOD value, and therefore is more related to printing contrast than RM. See RM next.

RM: Reflectance Margin

Same as Modulation, except that when a module is decoded in error (a bar whose reflectivity is higher than GT, or a space whose reflectivity is less than GT), MOD is set to 0, and therefore considered an F. RM will always be equal or lower than MOD and is more related to readability than is MOD.

ANU: Axial Non-uniformity

This is the amount of “out of square” a symbol is, or in other words a measure of the overall aspect ratio of the symbol.

ANU %	Grade
≤6	A
< 8 (but more than 6)	B
<10 (but less than 8)	C
<12 (but less than 10)	D
>12	F

GNU: Grid Non-uniformity

This is the worst-case distance between the calculated center of a module and the ideal location for the center of the module based on perfectly evenly spaced modules. The calculated center of the module is determined using the clock tracks. The value is reported as a percentage of a module size.

GNU %	Grade
≤38	A
<50 (but less than 38)	B
<63 (but less than 50)	C
<75 (but less than 63)	D
>75	F

FPD Finder Pattern Damage

This is the grade for the entire finder pattern, which is the lowest of all the following grades. (The following grades are all components of the finder pattern.)

LLS: Left ‘L’ Side

This is a grade based on imperfections in the left ‘L’ side of the finder pattern. There are two checks required to pass. The first requires gaps to be three modules or less and that gaps are separated by stretches of at least four correct modules. The second assigns a grade based on the overall percentage of correct modules according to the following table:

% of incorrect modules	Grade
0	A
<9 (but more than 0)	B
<13 (but more than 9)	C
<17 (but more than 13)	D
>17	F

The grade is the highest modulation level in which the first (gap test) passes and the correct module percentage results in a grade of that level or higher.

BLS: Bottom ‘L’ Side

This is a grade based on imperfections in the bottom ‘L’ side of the finder pattern (see Left ‘L’ Side).

LQZ: Left Quiet Zone

This is a grade based on imperfections in the quiet zone, which is a one-module area to the left of the left ‘L’ side. The grade is based on the percentage of modules, which are correct using the same grading table as for the ‘L’ sides.

BQZ: Bottom Quiet Zone

This is a grade based on imperfections in the quiet zone, which is a one-module area below the bottom ‘L’ side.

TQZ: Top Quiet Zone

This is a grade based on imperfections in the quiet zone, which is a one-module area above the top clock track.

11A. ULQZ: Top Quiet Zone above the upper left quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the segment of the quiet zone above the top clock track of the left quadrant.

11B. URQZ: Top Quiet Zone above the upper right quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the segment of the quiet zone above the top clock track of the right quadrant.

RQZ: Right Quiet Zone

This is a grade based on imperfections in the quiet zone, which is a one-module area to the right of the Right Clock Track.

12a. RUQZ: Right Quiet Zone to the right of the upper right quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the segment of the quiet zone to the right of the upper right quadrant.

12b. RLQZ: Right Quiet Zone to the right of the lower right quadrant

Only for 4-quadrant symbols, this is the grade based on the segment of the quiet zone to the right of the lower left quadrant.

TTR: Top Transition Ratio

This is a grade based on imperfections in the top clock track, with relation to its adjoining quiet zone. The ratio is the number of transitions, from light to dark or dark to light, in the quiet zone divided by the number of transitions in the clock track. Since the number of transitions in the quiet zone should be zero, the ideal value for this parameter is zero. However, a small number of transitions can be tolerated as long as the ratio remains relatively low. As the number of teeth in the clock track increases (larger symbols) more transitions in the quiet zone can be tolerated. Also, more transitions in the clock track (which are really imperfections) will tend to *improve* this measurement. The grading scheme for this transition ratio is:

Transition Ratio %	Grade
<6	A
<8 (but more than 6)	B
<10 (but more than 8)	C
<12 (but more than 10)	D
>12	F

The value of the grade will be the highest modulation level for which the ratio gives a grade from the above table of that modulation level or higher.

13a. ULQTTR: Transition ratio for Upper Left Quadrant Top Clock Track

Only for 4-quadrant symbols, this is the grade based on the clock track segment at the top of the upper left quadrant. For a 2-quadrant symbol, this will be labeled LQTTR.

13b. URQTTR: Transition ratio for Upper Right Quadrant Top Clock Track

Only for 4-quadrant symbols, this is the grade based on the clock track segment at the top of the upper right quadrant. For a 2-quadrant symbol this will be labeled RQTTR.

13c. LLQTTR: Transition ratio for Lower Left Quadrant Top Clock Track

Only for 4-quadrant symbols, this is the grade based on the clock track segment at the top of the lower left quadrant.

13d. LRQTTR: Transition ratio for Lower Right Quadrant Top Clock Track

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment at the top of the lower right quadrant.

RTR: Right Transition Ratio

Transition ratio (see Top Transition Ratio) for the right clock track in relation to the right quiet zone.

14a. ULQRTR: Transition ratio for Upper Left Quadrant Right Clock Track

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment to the right of the upper left quadrant. For a 2-quadrant symbol this will be labeled LQRTR.

14b. URQRTR: Transition ratio for Upper Right Quadrant Right Clock Track

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment to the right of the upper right quadrant. For 2-quadrant symbols this will be labeled RQRTR.

14c. LLQRTR: Transition ratio for Lower Left Quadrant Right Clock Track

Only for 4-quadrant symbols, this is the grade based on the clock track segment to the right of the lower left quadrant.

14d. LRQRTR: Transition ratio for Lower Right Quadrant Right Clock Track

Only for 4-quadrant symbols, this is the grade based on the clock track segment to the right of the lower right quadrant.

TCT: Top Clock Track

This is a grade based on imperfections in the top clock track. Some imperfections in the clock track can be tolerated. However, the rule that must be maintained for a passing grade is that three out of every five modules (on a consecutively rolling window of five modules) must be correct. The value of the grade will be the highest modulation level for which this test passes.

15a. ULQTCT: Top Clock Track for Upper Left Quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment at the top of the upper left quadrant. For 2-quadrant symbols, this will be labeled LQTCT.

15b. URQTCT: Top Clock Track for Upper Right Quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment at the top of the upper right quadrant. For 2-quadrant symbols this will be labeled RQTCT.

15c. LLQTCT: Top Clock Track for Lower Left Quadrant

Only for 4-quadrant symbols, this is the grade based on the clock track segment at the top of the lower left quadrant.

15d. LRQTCT: Top Clock Track for Lower Right Quadrant

Only for 4-quadrant symbols, this is the grade based on the clock track segment at the top of the lower right quadrant.

RCT: Right Clock Track

This is a grade based on imperfection in the right clock track (see Top Clock Track).

16a. ULQRCT: Right Clock Track for Upper Left Quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment to the right of the upper left quadrant. For 2-quadrant symbols this will be labeled LQRCT.

16b. URQRCT: Right Clock Track for Upper Right Quadrant

Only for 2 and 4-quadrant symbols, this is the grade based on the clock track segment to the right of the upper right quadrant. For 2-quadrant symbols this will be labeled RQRCT.

16c. LLQRCT: Right Clock Track for Lower Left Quadrant

Only for 4-quadrant symbols, this is the grade based on the clock track segment to the right of the lower left quadrant.

16d. LRQRCT: Right Clock Track for Lower Right Quadrant

Only for 4-quadrant symbols, this is the grade based on the clock track segment to the right of the lower right quadrant.

AG: Average Grade (of Damage across many parts of the Finder Pattern)

This is a grade that considers the accumulated effect of damage to several parts of the finder pattern. Five values are averaged together. One of these is the lowest of all the grades associated with all the clock track segments, namely TCT, TTR, TQZ and RCT, RTR, RQZ. The other four are LLS, BLS, LQZ, and BQZ. The average must fall in the range of 0.0 through 4.0 and is given a grade according to the following.

Ave Grade	Grade
Equals 4.0	A
≥ 3.5 (but less than 4.0)	B
≥ 3.0 (but less than 3.5)	C
≥ 2.5 (but less than 3.0)	D
< 2.5	F

Note that the effect of the AG parameter is to lower the overall grade of symbols, which have several individual parameters at or near the same level. For instance, with enough B grades in individual parameters the overall grade may come out as a C grade rather than a B.

Note that even though this parameter is named "Average Grade" it is NOT the average of the other parameters. (It is a grade derived from the average of a selected subset of the finder pattern damage parameters.)

AIM-DPM 2006 Data Matrix Parameters

The AIM-DPM method of grading data matrix symbols modifies the process of ISO-15415 and is more appropriate for direct part marking applications. This standard was developed to be a more representative of the scanning performance of modern readers which in some cases are specifically designed for these demanding applications.

In this method, the image brightness is adjusted to produce an image of the symbol that fills most or all of the dynamic range of the imager, resulting in an image that is easier to see. Additionally, the threshold between dark and light is calculated from the statistics of the image brightness histogram. Thus, the measurements calculated by AIM-DPM differ from those of ISO 15415 significantly. Some of the parameters reported in ISO 15415 are changed so drastically, in order to remove the possibility of confusion between these two methods, the parameters have been renamed. These parameters are:

AIM-DPM Parameter Name	ISO 15415 Parameter Name	Summary of Change(s)
CC (Cell Contrast)	SC (Symbol Contrast)	Made relative to light background
CM (Cell Modulation)	MOD (Modulation)	Threshold calculated from statistics, rather than the maximum and minimum reflectance. Grading scale range set to Mean of distribution, rather than maximum and minimum reflectance
DD (Distributed Damage)	AG (Average Grade)	Modulation overlay uses only A, B and F levels instead of A, B, C, D and F.
MR (Minimum Reflectance)	Not necessary since SC is measured on an absolute scale	An absolute limit on SC of 5% added to temper the relative nature of CC.

All of the Fixed Pattern Damage grading (other than AG shown above) are not renamed, but are functionally different since the global threshold and modulation grading scale are different. In general, symbols will obtain a significantly higher grade according to AIM-DPM than ISO 15415. Therefore, grading according to AIM-DPM is appropriate only when called for in an application specification. Another significant difference is the allowance for a variety of illumination options. These include the four sided 45° light that is the default for ISO 15415. Additionally allowed are: 30° lighting from four sides, 30° from two sides (which can be either North/South or East/West), and 90°diffuse on axis lighting. The light source that is used is reported using a notation that includes the angle, and a letter (Q for 4, T for two).

AIM-DPM also varies the size of the aperture until the symbol is decoded, and then the grading is repeated with two different aperture sizes (50% and 80%) and the better of the two grades is reported as the final grade. The parameters which are new or significantly modified for AIM-DPM are explained below:

1. CC (Cell Contrast): This is the relative contrast value between bars and spaces, taken from the means of the light and dark element, $CC = (L_{mean} - D_{mean}) / L_{mean}$.

CC %	Grade
≥ 30%	4
≥ 25%	3
≥ 20%	2
≥ 15%	1
< 15%	0

2. CMOD (Cell Modulation): Similar to MOD in ISO 15415, this parameter measures the deviation in the reflectivity of dark and light elements. A range for each group (light and dark) is created from the global threshold to the mean reflectance of the elements. Each module is graded along this range, and then error correction capability is considered to “discount” the effect of one or a few elements with low values, and a final grade for this parameter is computed.

3. DDG (Distributed Damage Grade): Similar to AG in ISO 15415, this parameter takes into account the effect of multiple segments of the fixed pattern having imperfections. Where multiple segments have a low grade, the effect of this “distributed damage” is reflected in a lower grade for DDG than the lowest of the individual segments.

4. MR (Minimum Reflectance): This is a requirement for at least 5% reflectance difference between light and dark elements, as a restraint on the purely relative CC parameter.

5. Decode: Decode grade A or F depending upon whether the reference decode algorithm succeeds in decoding the symbol with the required final aperture size.

Results on Display Monitor (for Matrix Codes)

After a 2D Matrix symbol (Data Matrix, QR Code or Aztec Code) is successfully decoded, the image of the barcode on the display monitor will be re-drawn (on the VGA monitor). Along with the symbol, there will be a grid shown in yellow, and a set of circles. The circles are color coded as green, yellow and red.

The size of the circle corresponds to the size of the aperture. Thus, you can see the relationship between the size of the aperture and the size of the modules of the symbol.

The color of the circle corresponds to the modulation value for that cell (module) of the code. The circle will be drawn in green if the modulation for that cell is A or B. The circle will be drawn in yellow if the modulation for that cell is C. The circle will be drawn in red if the modulation for that cell is D or F. See section 0 in ISO 15415 Data Matrix Parameters on page 24 to see how the modulation of each cell is calculated and assigned a letter grade.

The modulation of each individual cell is extremely important, and this display provides a tool for quickly identifying problem areas in the code (by red circles).

You can also modify the picture that is shown on the screen. As mentioned in this manual on page 12 in the section titled "Imager Setup Menu" you can select to display the Original, or blurred, or black and white version of the image. You can also turn on or off the grid and modulation circles (with Hide Grid). You can also choose to display a histogram of the modulation values by selecting Image Hist. The histogram is also color-coded.

The modulation values of each cell in the finder pattern is used to calculate the grade for Finder Pattern Damage, and all its components (such as LLS for the left L side, etc.)

The modulation values of the data cells are used to calculate the grade for Modulation.

For more detail on how these values are used to compute the grades, please refer to ISO 15415, especially Annex A and Annex F.

AS9132 Data Matrix Parameters

Distortion Angle (DA)

The angle between the left side and the bottom side of the 'L' finder pattern should be 90 degrees. The distortion angle is the deviation from 90 degrees exhibited by the 'L' in this symbol. A distortion angle of 7 degrees or less will pass, while a larger distortion angle will fail.

Cell Fill (Size)

The size of the cells must be printed at least 60% of the cell spacing, and no more than 105% of the cell spacing.

Ovality

For dot peen symbols (where the cells are allowed to be round), the cells should be circular. As a measure of ovality, the ratio of the widest diameter to the smallest diameter is checked and must be less than 20% different in order to Pass.

Center Offset

The center of each cell must not be offset from its correct grid location by more than 20% of the cell spacing in order to Pass.

Symbol Contrast

Symbol contrast should be at least 20% to Pass.

(17V) 93742

(1P) 12414398-009

(S) 25006010024

NSN 2815-01-505-1476



Webscan TruCheck

Fri 18-Nov-2005 12:54:52PM
Firmware 2.83Y

MIL-130 Application format PASSES

[]><RS>06<GS>	HEADER	PASS
17V	DI for Cage#	PASS
1RWL9	Value	PASS
<GS>	Group Separator	PASS
1P	DI for Product#	PASS
425-438-2533	Value	PASS
<GS>	Group Separator	PASS
S	DI for Serial#	PASS
LASER-ANODIZED	Value	PASS
<RS>	Rec Separator	PASS
<EOT>	Message Trailer	PASS

Symbology: Datamatrix

Data:

[]><RS>06<GS>17V1RWL9<GS>1P425-438-2
533<GS>SLASER-ANODIZED<RS><EOT>

Datamatrix Codewords:

5C	2A	3F	1F	88	1E	93	E6
DB	A8	E4	F6	04	8E	86	87
38	75	33	25	08	27	39	60
04	A9	9E	91	75	5A	4D	4C
B1	BF	F6	A2	FE	1F	05	81
A7	3E	04	6B	E4	56	CA	49
12	E3	38	B7	29	A1	87	D1
7F	18	93	E6	AF	69	38	31
E1	A5	94	54	53	1D	1E	13

■=Fixed by Error Correction

AS9132 Quality Parameters:

DA(Degrees): 0.04 Pass
Symbol Contrast: 31%
Total Modules: 676
Total Modules failed: 3
Total Modules failed: 0.4%
Size failed: 0.4%

AS 9132 parameters:
DA, Cell Fill, Ovality,
Center Offset, Symbol
Contrast.

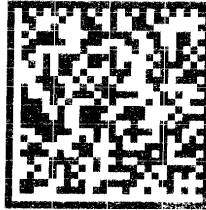
AS9132 Grade: PASS

ASCII Values:

091 041 062 030 048 054 029 049
055 086 049 082 087 076 057 029
049 080 052 050 053 045 052 051
056 045 050 053 051 051 029 083
076 065 083 069 082 045 065 078
079 068 073 090 069 068 030 004

General Characteristics:

Matrix Size: 26x26 (Data: 24x24)
Horizontal BWG: 3%
Vertical BWG: -11%
Encoded characters: 48
Total Codewords: 72
Data Codewords: 44
Error Correction Budget: 26
Errors Corrected: 0
Error Capacity Used: 0
Image is White on Black
Nominal X Dim: 13.4 mil



ISO 16022 (USS AIM Specification) Data Matrix Parameters

NOTE: These parameters are according to the original published ISO 16022 document, which mirrored the AIM USS Data Matrix specification. These parameters were defined in ISO/IEC 16022 prior to the publication of ISO/IEC 15415. A second version of ISO/IEC 16022 now exists which references ISO/IEC 15415 for quality verification and so these parameters are obsolete. Nonetheless, these parameters can be measured by the TruCheck system and reported for users who need to conform to application specifications that were created at the time that the original ISO/IEC 16022 document was in effect.

DCD – Decode grade is equal to A or F depending on successful decode according to the reference decode algorithm.

SC - Symbol contrast value thresholds are as follows

SC %	Grade
>70	A
>55 (but less than 70)	B
>40 (but less than 55)	C
>20 (but less than 40)	D
<20	F

BWG – Print Growth (Bar Width Growth) – Grading thresholds are as follows;

NOTE: BWG according to this grading system is calculated as a percentage of an allowed tolerance of 30% of a module size. For example, if there is 15% bar width growth, then this measurement would be 50% at the boundary between A and B in the following table. That is why the percentage values of BWG in the table are so large.

BWG %	Grade
50%	A
70%	B
80%	C
< 100%	D
> 100%	F

ANU – Axial Non Uniformity – grading thresholds are as follows;

ANU %	Grade
< .06	A
< .08	B
< .10	C
< .12	D
> .12	F

UEC- Unused Error Correction – Grading thresholds are as follows;

UEC %	Grade
> .62	A
> .50	B
> .37	C
> .25	D
< .25	F

Webscan TruCheck

Fri 18-Nov-2005 01:48:33PM
Firmware 2.83Y

MIL-130 Application format PASSES

```
[ ]><RS>06<GS>    HEADER      PASS
17V                DI for Cage#  PASS
70974              Value        PASS
<GS>              Group Separator PASS
1P                DI for Product# PASS
1128ABM61009-101  Value        PASS
<GS>              Group Separator PASS
S                  DI for Serial# PASS
0001              Value        PASS
<RS>              Rec Separator  PASS
<E0T>             Message Trailer PASS
```

Symbology: Datamatrix

Data:

```
[ ]><RS>06<GS>17V70974<GS>1P1128ABM61
009-101<GS>S0001<RS><E0>
```

AIM (ISO16022) Grade: A

4.0/05/660

ASCII Values:

```
091 041 062 030 048 054 029 049
055 086 055 048 057 055 052 029
049 080 049 049 050 056 065 066
077 054 049 048 048 057 045 049
048 049 029 083 048 048 048 049
030 004
```

General Characteristics:

```
Matrix Size: 24x24 (Data: 22x22)
Horizontal BWG: 8%
Vertical BWG: 11%
Encoded characters: 42
Total Codewords: 60
Data Codewords: 36
Error Correction Budget: 22
Errors Corrected: 0
Error Capacity Used: 0
Image is Black on white
Nominal X Dim = 11.7 mil
```

Datamatrix Codewords:

```
5C 2A 3F 1F 88 1E 93 57
C8 E3 35 1E 32 51 8D 9E
42 43 4E BF 82 3A 2E 8C
32 1E 54 82 83 1F 05 81
F0 88 1F B5 F9 16 53 9D
0B 3D EB FB B7 48 8C FD
14 42 27 C9 23 92 CD 05
A5 36 60 95
```

■=Fixed by Error Correction

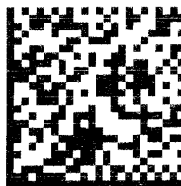
AIM (ISO16022) Quality Parameters:

```
1.DCD:      A      Pass
2.SC:      78% A      Pass
3.BWG:      37% A      Pass
4.ANU:      0% A      Pass
5.UEC:     100% A      Pass
```

ISO 16022 Parameters:

Decode (DCD), Symbol Contrast (SC),

Bar Width Growth (BWG), Axial Non-Uniformity (ANU), Unused Error Correction (UEC)



Webscan TruCheck

Wed 09-Nov-2005 10:35:27AM
Firmware 2.83Y

MIL-130 Application format PASSES

[]><RS>06<GS>	HEADER	PASS
17V	DI for Cage#	PASS
37695	Value	PASS
<GS>	Group Separator	PASS
1P	DI for Product#	PASS
726356-801	Value	PASS
<GS>	Group Separator	PASS
S	DI for Serial#	PASS
21620	Value	PASS
<RS>	Rec Separator	PASS
<EOT>	Message Trailer	PASS

Format
Checking

Symbology: Datamatrix

Data:

[]><RS>06<GS>17V37695<GS>1P726356-80
1<GS>S21620<RS><E0>

Overall ISO15415 Grade: B

3.0/05/660

ASCII Values:

091 041 062 030 048 054 029 049
055 086 051 055 054 057 053 029
049 090 055 050 054 051 053 054
045 056 048 049 029 083 050 049
054 050 048 030 004

General Characteristics:
Matrix Size: 22x22 (Data: 20x20)
Horizontal BWG: 16%
Vertical BWG: 13%
Encoded characters: 37
Total Codewords: 50
Data Codewords: 30
Error Correction Budget: 18
Errors Corrected: 0
Error Capacity Used: 0
Image is Black on white
Nominal X Dim = 15.4 mil

Datamatrix Codewords:

5C	2A	3F	1F	88	1E	93	57
A7	C7	36	1E	32	51	CA	C1
BA	2E	D2	32	1E	54	97	C0
31	1F	05	81	96	2D	D0	A6
59	42	65	85	A1	C0	D2	59
A7	DB	EC	8A	86	77	B4	47
30	B6						

■=Fixed by Error Correction

Print Quality Parameters:

1.UEC:	100% A	Pass
2.SC:	59% B(61/3)	Pass
3.MOD:	A	Pass
4.ANU:	0% A	Pass
5.GNU:	9% A	Pass
6.LLS:	A	Pass
7.BLS:	A	Pass
8.LQZ:	A	Pass
9.BQZ:	A	Pass
10.TQZ:	A	Pass
11.RQZ:	A	Pass
12.TTR:	0% A	Pass
13.RTR:	0% A	Pass
14.TCT:	A	Pass
15.RCT:	A	Pass
16.AG:	4.0 A	Pass



This report shows the UID data, with explicit parsing of the Data Identifiers (DI's) and the syntax formatting characters (GS, RS, EOT, etc.) that are required according to ISO 15434.

QR CODE REPORT PARAMETERS

FPD: Finder Pattern Damage overall grading. The grade is the lowest of the following parameters:

For each of the following QR Code parameters, Annex A of ISO 15415 gives the exact grade based on the number of modules that are wrong (or low modulation) in each pattern.

ULP (Upper Left Pattern): The grade of the upper left finder pattern.

URP (Upper Right Pattern): The grade of the upper right finder pattern.

LLP (Lower Left Pattern): The grade of the lower left finder pattern.

HCT (Horizontal Clock Track): The grade of the horizontal timing pattern.

VCT (Vertical Clock Track): The grade of the vertical timing pattern.

ALP (Alignment Pattern): The overall grade of all the alignment patterns.

VIB (Version Information Block): The grade of the version information block.

FIB (Format Information Block): The grade of the format information block.

AZTEC CODE REPORT PARAMETERS

The finder pattern grading of Aztec Code symbols consists of two segments, known as SEG A and SEG B. Note that SEG B applies to Full (not Compact) Aztec code symbols.

SEG A (Segment A) includes all the modules in the rings (or bulls eye) pattern in the center of the symbol, as well as the alignment indicator modules which exist at the corners of the bulls eye pattern.

SEG B (Segment B) includes all the modules of the vertical and horizontal clock tracks of the Aztec symbol.

The number of incorrect modules in each segment is counted and graded in accordance with ISO/IEC 24778.

ASCII Code Representation

Some barcode symbologies (especially 2D symbologies) can encode ASCII characters, which are unprintable and therefore difficult to represent in the printed reports. A special pattern is used to represent these characters using a consistent notation of two letters, which represents the ASCII code, surrounded by brackets.

The codes are as follows:

ASCII Code Value (decimal)	ASCII Code name	Special Pattern Used
0	NULL	<NU>
1	SOH	<SH>
2	STX	<ST>
3	ETX	<ET>

4	EOT	<EO>
5	ENQ	<EN>
6	ACK	<AC>
7	BEL	<BE>
8	BS	<BS>
9	HT	<HT>
10	LF	<LF>
11	VT	<VT>
12	FF	<FF>
13	CR	<CR>
14	SO	<SO>
15	SI	<SI>
16	DLE	<DL>
17	DC1	<D1>
18	DC2	<D2>
19	DC3	<D3>
20	DC4	<D4>
21	NAK	<NK>
22	SYN	<SY>
23	ETB	<EB>
24	CAN	<CA>
25	EM	
26	SUB	<SU>
27	ESC	<ES>
28	FS	<FS>
29	GS	<GS>
30	RS	<RS>
31	US	<US>

NOTE: The special patterns always consist of two letters, even though the name of the ASCII code sometimes contains more than two characters (example EOT, BEL, etc.). This is to preserve regular column spacing in the printed reports and to make it easier to parse the data strings.

The 'REPORT' Screen

The 'REPORT' screen of the model TC 101 and TC 101-R offer the following options:

'Print'	Print a report for the most recent verification
'ANSI'	Displays the ANSI results screens for the most recent verification
'Element'	Show the element widths of the bar code from the most recent verification
'Traditional'	Show a report of element width pass/fail against traditional tolerances
'SEND RS232'	Sends the most recent report results to the RS232 port
'Done'	Returns you to the main menu

All other models; TC 201, TC 201-R and TC 401-R offer the following options:

'Print'	Print a report for the most recent verification
'Show Compos'	Displays the secondary component results screens for the most recent verification. This menu option is only available when primary results are displayed
'Show Primary'	Displays the primary component results screens for the most recent verification. This menu option is only available when the secondary results are displayed
'SEND RS232'	Sends the most recent report results to the RS232 port
'Done'	Returns you to the main menu

To access these options after a verification:

Choose 'Report' from the main menu and press '⇐' (ENTER).

When the results are displayed, press the '+' key

Select 'Done' and press '⇐' (ENTER) to return to the main menu

Customizing Reports

There are many different report options that can be turned ON and OFF. To access the Printed Report Options:

1. Select 'Admin' from the main menu and press '⇐' (ENTER).
2. Choose 'Settings' from the 'Admin' menu and press '⇐' (ENTER).
3. The list of options appear on the screen
4. Select an option by using the Down or Up arrows and press '⇐' (ENTER) to access them.

To turn an option OFF – Select the option, press the LEFT arrow key, (the 1 is replaced by a flashing cursor) press the 0 key and hit '⇐' (ENTER).

Printed Report Options:

'Print SRP'

This setting causes the TruCheck to print out the entire Scan Reflectance Profile. For 2D Matrix codes, this prints a replica of the symbol on the report.

'Print GRID'

This setting causes the TruCheck to include the Grid table, with one row for each scan and one column for each of the 9 ANSI parameters. The table shows the ANSI letter grade given to each parameter, on each scan. The table has an additional column which shows the lowest letter grade that is selected as the overall grade for the scan, according to the ANSI methodology.

'Print BARS'

For linear barcodes, this setting causes the widths of all bars and spaces in mils (thousands of an inch), and the deviation from the nominal for each bar and space to be printed out in the report.

For 2D matrix codes, this setting causes the modulation percentage for each module to be printed.

'Print Ave'

This setting causes average values of the ISO/ANSI parameters to be included in the printed report. The letter associated with the average value is also shown.

Print AIM

For data matrix, evaluates and prints the grade from ISO 16022. For linear barcodes this parameter is ignored.

Print AS9132

When set to "1" on data matrix, evaluates and prints the Pass/Fail grade from SAE AS9132. When set to 2 will work in conjunction with ISO-15415 and will be suppressed on the report if the grade is failing. For linear barcodes this parameter is ignored.

Print MIL130

When selected you are prompted to select the appropriate version of the MIL-STD based on your contract. Checks that labels pass the requirements of MIL130 (L, L-chg1, M, M-chg1, and N) (includes the exception to SC and MOD for ISO 15415 for labels).

UID Format

When set to "1" the ISO-15434 data format is parsed and graded for structure and character legality. The system supports DI (06), TEI (12 or DD) and AI (05) data libraries with respect to the MIL-STD's.

DPM Grade

When set to "1" the system grades in accordance to the AIM-DPM-2006 quality standard. This setting overrides the ISO-15415 grading and should be recalibrated to support the different method.

'Print Trad'

For linear barcodes, this setting causes Traditional barcode specifications to be included in the printed report, such as Element Dimensional Tolerance, Number of Elements out of tolerance, Ratio, PCS (Print Contrast Signal), and MRD (Minimum Reflectance Difference).

For 2D matrix codes, this prints the decimal ASCII values of the decoded data.

'Print CWs'

Two-dimensional codes only. This setting causes the map of rows and columns of raw code word values to be included in the report.

'Print Sec'

Two-dimensional codes only. This setting causes the detailed information about used and unused error correction budget to be included in the report.

'Auto Print'

This setting causes the TruCheck to automatically print out a report immediately after verification is complete.

'Don't Wait'

This setting is usually used along with Auto Print. When set to 1(ON) the TruCheck will not display the results screen after a verification. Rather, the system will go right back to 'Verify' in the main menu. This is so the operator does not have to press '⇐' (ENTER) to go back to the main menu. Even with this setting enabled, you can go back to view the results of the most recent verification by selecting 'REPORTS' from the main menu.

Operational Settings

'Try PDF'

This must be set to 1 for the system to look for a PDF417 symbol, when the enter key is pressed. When the 8 key is pressed to initiate a verification, PDF is tried regardless of this setting.

'Try uPDF'

This must be set to "1" for the system to look for a Micro PDF symbol, when the enter key is pressed.

'Try RSS'

This must be set to 1 for the system to look for an RSS symbol, when the enter key is pressed. Note that the RSS symbology is now known as GS1 DataBar.

TRYDMX

This option must be set to "1" in order to decode a data matrix symbol. If it is set to "0" data matrix symbols will not be decoded.

TRYQR

This option must be set to "1" in order to decode QR symbols. If this option is set to "0" QR symbols will not be decoded.

TRYAZTEC

This option must be set to "1" in order to decode AZTEC symbols. If this option is set to "0" AZTEC symbols will not be decoded.

NOTE – processing will be significantly faster, if the symbology types not in used are turned off (set to 0).

'Set Date'

The current date and time are printed in the heading of the report. To change the date, follow the prompts after hitting '⇐' (ENTER). Use the LEFT arrow key to change the month, day, and year. Use the keypad to

enter the correct information. The month and day are in 2 digit format while the year is 4 digits. Hit '⇐' (ENTER) after each selection to complete the process. The system will ask you to confirm your changes. Press '⇐' (ENTER) to confirm or the '+' key to exit and start over.

'Set Time'

To change the time, follow the prompts after hitting '⇐' (ENTER). Use the LEFT arrow key to change the hour and minutes. Use the keypad to enter the correct information. Hit '⇐' (ENTER) after each selection to complete the process. The system will ask you to confirm your changes. Press '⇐' (ENTER) to confirm or the '+' key to exit and start over.

'Incl. ND?'

This option can be set to 0, 1 or 2 and controls how scans that cannot be successfully decode are used for overall CEN/ANSI grade and also the calculation of the average values reported for some of the CEN/ANSI parameters.

If this option is set to 0, the system will ignore scans that were not decoded. In this mode, even if you set the system to use 10 scans, fewer scans will be used for the overall CEN/ANSI grade if any do not decode. You can see how many scans were actually decoded and included in the overall grade by checking the value of DCD. For example, if DCD is 6/10, then only 6 scans actually could be decoded. These scans only will be included in the overall CEN/ANSI grade when Include ND? Is set to 0.

If this option is set to 1, the system will include scans to could not be decoded in the overall CEN/ANSI grade, as an F (or 0.0) for the scan. However, the individual parameter average values reported for MOD, DEF and DEC will not include any values for the scans which did not decode.

If this option is set to 2, the system will include the values measured for MOD, DEF and DEC even for scans which did not decode. The value for DEC (Decodability) for scans which could not decode is taken as zero. Please take care in interpreting the reported values of any of these parameters when including non-decoded scans. For example, if an element falls below the global threshold, it will not be included in the calculation of MOD (even though it is an element with very low MOD) and will instead contribute to a very high value of DEF (Defect) for that scan. However, this mode may be useful for evaluating the characteristics of substrates and also to evaluate patterns which do not constitute a valid recognized symbology.

'Auto Send'

When to set to 1, the verification results will be output through the selected RS232 port automatically. The format for serial output is a comma delimited text string with a field name followed by a colon and then the data for the field.

'LED MODE'

- 0 = ANSI grade governs the LEDs. A,B=Green, C=Yellow, D,F=Red
- 1 = Traditional – Green = No element out of tolerance Red= 1 or more out of tolerance
- 2 = Worst of ANSI or Traditional will govern the LEDs.

'Lock Out'

If you wish to protect your system settings, a password protection function has been added to the system. This is a key feature if you will have multiple (unsupervised) operators using the system.

'Change PsWd'

Used to change the password associated with Lock Out.

'Pre-press Neg'

If this feature is set to 1, the system will verify negatives such as films used to develop printing plates. (Bars white and black spaces). This mode should be used by pre-press negatives that are not final barcodes and hence contain bar width reduction meant to compensate for print growth in the printing process. In this mode, the system will also attempt to correct for bar width reduction in the decoding process, yet report the bar width reduction.

'Invert Image'

This option is used for images printed in reverse. White bars on Black spaces. Used for both linear and 2D codes printed in this manner. In this mode, the system expects the barcode to be in its final form and will measure and report bar width growth directly as seen in the bar code. Note, that many barcodes are not meant to be produced in inverse print and thus a code printed this way may be unreadable by normal barcode readers.

'UPC Supp'

Models 101/101R only. Set to 2 to check for a 2 character supplemental code. Set to 5 to check for a 5 character supplemental. Set to 0 for no supplemental. If checking for a supplemental, any scans will fail (no decode) if no supplemental is present.

'Pharmacode'

Set to 1 to check for Pharmacode. Keeping this setting ON (set to 1) when you are not actually verifying Pharmacode symbols is not recommended, so it should be set to 0 when you are not actually verifying a Pharmacode.

'MSI Plessey'

Enables the symbology variously known as MSI Code or Plessey Code (each of which is slightly different.) Set to 1 to enable, with a first check digit algorithm, and set to 3 to enable with a second check digit algorithm. Try each setting until you find that it works with the particular codes that you are using in your application. For more information, contact Webscan.

'HIBC'

Set to 1 to parse and error check according to Health Industry Barcode format. (Code 39 starting with a + sign, etc.) Non HIBC symbologies will be flagged as an error, unless it is a valid UCC format and UCC is also enabled (see below).

'UCC'

Set to 1 to parse UPC, ITF14, and RSS barcodes. Any other symbologies will be flagged as an error, unless it is a valid HIBC format and HIBC is also enabled (see above). Set this option to "2" for GS1 data parsing and coupon code data checking.

'125_SSC14'

Specifies which decode algorithm for Interleaved 2 of 5. Set to 1 for ITF14 (also known as SSC14) and set to 0 for the algorithm originally specified in ANSI X.182. Symbols that are not printed in accordance with ITF

guidelines may get lower grades when checking for ITF14 than with the original algorithm. Be sure to set the appropriate algorithm for your application.

'Save Mode'

When set to 1, diagnostic data from the most recent verification will be saved. This is useful for Webscan to help diagnose problems. The system will operate more slowly when this feature is enabled. Use only under the direction of Webscan technical support.

'ComPort'

Selects which of the two RS232 ports will be used. When set to 1, the port labeled RS232 is used. When set to 2, the port that is labeled Serial Upgrade is used. Note that the system defaults to 2. When this setting is changed, the unit must be restarted before the new setting will take effect.

'Baud'

Selects the baud rate to be used on when results are transmitted from the selected RS232 port. Valid settings are 9600, 19200, 38400 and 115. When this setting is changed, the unit must be restarted before the new setting will take effect.

'PrnType'

Selects the type of printer that is connected. Some graphical printer features are only available with Webscan supported printers. Generic, text only parallel printers may be used however. The available settings are as follows:

Set to 0 for Webscan's direct thermal graphic printer

Set to 1 for Generic Text Only printing (Carriage Return and Newline will be sent at end of line)

Set to 2 for Webscan's dot matrix plain paper printer (SRP printing is not supported)

Set to 3 for Generic Text Only printing (only Carriage Return will be sent at end of line)

Set to 4 for Generic Text Only printing (only Newline will be sent at end of line)

Delay

Specifies a delay between activation of a Verification (by Start button or Enter Key) and the actual start of the verification. This allows you to position the symbol to be read after pressing the button before the laser movement will start. This parameter may be set to any value between 0 and 10.

Metric

This option changes reporting numeric values of X dimensions to the metric numbering system, using millimeters or microns.

Shift JIS

This option changes the transmission of data through the serial port for QR symbols that contain Shift JIS character sets, so that these characters can be received and displayed correctly by the Webscan Data Capture spreadsheet.

CBAR Caps

This option selects how the start and stop characters of Codabar symbols will be represented. The start and stop characters of Codabar symbols are letters (a, b, c or d) and usage varies with regard to these being upper or lower case letters. You can choose upper or lower case by setting this to 1 or 0.

Settings to Support Generic printers

WrapLen

Specifies the number of columns before a new line will be inserted during the output of the data encoded in a symbol.

PrintPass

This parameter is used to control how to send Carriage Return (CR), Linefeed (LF, also known as newline or NL), Tab and Form Feed (FF) characters to a printer. The choice depends upon whether you need to see ASCII representations of these characters (expressed as a hexadecimal value) as opposed to having these characters sent out verbatim in order to format the printed output "correctly". The value set can have any of the values listed below with the corresponding affect:

0	Don't pass through anything (show ASCII values)
1	Pass through CR or LF
2	Pass through CR or LF or Tab
3	Pass through CR or LF or Tab or FF
4	Pass through only CR
5	Pass through only LF

PrintExpand

This parameter allows you to tailor the output of the data encoded in a PDF417 symbol so that the printed data has the intended format. For example, if the PDF417 symbol uses a Carriage Return character between lines, but your generic printer requires a Carriage Return and Line Feed, then you would want to expand CR to CRLF. Expansions possible are listed in the following table.

0	Don't expand anything
1	Expand LF to LF plus CR
2	Expand CR to LF plus CR

Print C.O.C

Set to 1 to print a heading at the top of your printed reports that contains the contents of a text file named "coc.txt" which you can load into the unit using the same process as for a loading a software update. This file may contain your company name, space for written information such as a job number or operator name, or anything else that you include in the text file.

'Done'

When you are finished making changes, you need to select 'Done' to save them. Simply select this option and press '⇐' (ENTER).

SHORTCUT: If you press the '+' key while you are in this menu it will automatically move your selection down to 'Done'. You do not have to scroll down through all of the options.

Using the Admin Menu

The following 'Admin' options are available:

'Calibrate'	To periodically calibrate your TruCheck.
'Settings'	A list of settings that you can set according to your preferences. See Page 40.
'Setup Hotkey'	Allows you to setup keys (1-6) to perform your most used function.
'Advanced'	Not intended for user access. Use only under supervision of Webscan Tech Support.
'Special'	Contains the reflectometer feature. NOTE: This menu option is only available in Models 101/101R.
'Done'	Returns you back to the main menu.

Calibrating Your Unit

Your TruCheck system is a precision opto-electronic instrument. Periodic calibration is necessary to account for changes in environment. Ambient light and temperature are typical environmental conditions that frequently change. Electrical components also drift (change characteristics) over time and this can affect the accuracy of measurements made by the TruCheck system.

The Required Calibration schedule depends upon the user environment. Calibration is required any time that the Test for Calibration does not pass. If ambient lighting conditions change (either by installing new lighting, or moving the system to a new location) calibration should be performed. In the absence of any such changes, Webscan recommends that you calibrate on a monthly basis. The Test for Calibration is required after the calibration (as specified in Step 8 below) to be sure that the Calibration completed successfully.

Calibration is performed using a Calibrated Conformance Standard. The Calibrated Conformance Standard is a card that is N.I.S.T. traceable and provides known target reflectivity values. These known Target Reflectivity Values are called Rmax and Rmin.

There are several possible Calibrated Conformance Standards available. You must have and use the appropriate card for the type of unit that you have. If you have a unit with more than one type of laser or imager you may need a different card for each.

CALIBRATED CONFORMANCE STANDARD TYPES

For this type of unit	You must use:
6 Mil laser (TC-103, TC-203)	UPC-A
3 Mil Laser (TC-107, TC-207)	UPC-A
10 Mil Laser (TC-108, TC-208, TC-112, TC-212)	EAN-128 or UPC-A
20 Mil Laser (TC-111, TC-211, TC-311)	ITF-14 or EAN-128
Standard Resolution Imager (TC-403)	UPC-A or EAN-128 or ITF-14 or Data Matrix
High Resolution Imager (TC-407)	UPC-A or Data Matrix
Low Resolution Imager - White or Red LED (TC-408, TC-411)	UPC-A or EAN-128 or ITF-14
Other	Call Webscan to check

The following table gives the Applied Image part number, UCC/GS1 part number, and Webscan part number for each of the cards.

CALIBRATED CONFORMANCE STANDARD PART NUMBERS

Part Number	Description	List Price
4899	Applied Image 3 mil Calibration and Conformance Symbol (UPC/EAN)	\$625.00
6288	Applied Image #AI-CCS-UPC/EAN 6 mil UPC/EAN Calibrated Conformance Standard Test Card. (This is most similar to discontinued item #1556 (GS1 EAN/UPC Calibration Card)).	\$439.00
6289	Applied Image #AI-CCS-128 10mil GS1-128 Calibrated Conformance Standard Test Card. (This is most similar to discontinued item #2633 (GS1-128 Calibration Card)).	\$439.00
6290	Applied Image #AI-CCS-ITF-14 20mil ITF-14 Calibrated Conformance Standard Test Card. (This is most similar to discontinued item #2222 (ITF-14 Calibration Card)).	\$439.00
4744	GS1 Data Matrix Calibration and Conformance Symbol	\$600.00
5136	Webscan Calibration Card contains Master Grade 1D and 2D symbols. For calibration only, does not contain any ISO/IEC 15426 conformance test symbol. (Not applicable to calibrating 10 or 20 mil Laser Units.)	\$149.00
6204	Applied Image 6 mil Calibration Card	\$439.00

NOTE: The RSS14 Calibrated Conformance Card, which is available from UCC/GS1 may be used to check conformance, but is not used for Calibration of the system.

Test for Calibration:

To determine if calibration is necessary, and to verify correct calibration

FOR LASER BASED SYSTEMS: First perform a verification of the UPC-A Master Grade Symbol, EAN-128 Master Grade Symbol, or ITF-14 Master Grade Symbol as appropriate for your system type (per above table "Calibrated Conformance Standard Types").

FOR IMAGER BASED SYSTEMS:

You may use any of the above listed Calibrated Conformance Standards.

If you are using the UPC-A card:

Center the imager over the right hand side of the UPC-A Master Grade Symbol, and initiate a verification.

Otherwise, if you are using the EAN-128 card:

Place the imager over the right end of the UCC/EAN-128 Master.

Otherwise, if you are using the ITF-14 card:

Place the imager over the right end of the ITF-14 Master.

The system will attempt to decode a 2D matrix symbol (but it will not be able to.) At the end of the attempt, the display will read No Decode, and it will give R_{max} and R_{min} values on the LCD Display. (You may shorten the time it takes to complete the attempt to decode a 2D matrix symbol by pressing and holding the + (Abort) key until the display shows the word "Aborted".

VERIFY VALUES IN RANGE:

Check the R_{max} / R_{min} values using the *Calibrated Conformance Standard* sheet. (This is the "Judge" report that accompanies the Calibrated Conformance Standard.) Note that the values for R_{max} and R_{min} that are printed on that sheet are reported in tenths, which means that the value that should be 85.7 will actually be shown as 857. So you must divide by 10, the values for R_{max} and R_{min} that are shown on the "Judge" report. Additionally, you must round the resulted quotient to the nearest whole number.

Compare the R_{max} and R_{min} values that are measured and reported by the TruCheck system. For laser based systems the report shows R_{max} and R_{min} on the line labeled "2. RI/Rd". For example, it may show 2. RI/Rd 86/6. R_{max} is the first value and R_{min} is the second value. For example, R_{max} would be 86 and R_{min} would be 6 in the example just given.

R_{max} should match the target value with +- 4, and R_{min} should match the target value with +- 2. If this is so, then no calibration is necessary. Note that the units of the tolerance (+-4 for R_{max} and +-2 for R_{min}) are actual values, not percentage of the reading. Example: For a Test Symbol with R_{max}=86%, a reading for R_{max} in the range 82% through 90% is within these tolerances. Likewise, for a test symbol with R_{min} of 6%, a reading of 4% through 8% is within these tolerances.

NOTE: The tolerance for Test for Calibration given above are for use on the Calibration Target symbol only. These tolerances do not supersede the measurement tolerances on other samples, which are given in Appendix E.

TO CALIBRATE YOUR UNIT:

Locate your copy of the *Calibrated Conformance Standard* sheet that was included with your Calibration Target. **The Calibration Target that is required depends on your type of system and is given in the table "Calibrated Conformance Card Types."** These cards are available from Webscan or GS1.

Select 'Admin' from the Main menu

Select 'Calibrate'

The exact way to position the scanner over the Calibration Target barcode varies with the type of scanner you are calibrating.

TO CALIBRATE LASER BASED SCANNERS:

The system will ask you to place the calibration target on the platform. Make sure to place the target so that the laser passes through the PASS portion of the UPC-A Master Grade (upper right symbol on the card). The UPC-A Master symbol should be left-to-right, meaning that you can read the numerals under the barcode right-side-up. **The calibration target must be centered left-to-right under the laser and must lay flat.** (On the optional remote scanner guide plate, there are markers for the center of the scan line that should be used to line up with the center of the code.)

To calibrate Imager Based Scanners (Model TC-401/TC-401R/TC-403/TC-407, TC-408, TC-411):

The system will ask you to place the calibration target on the platform.

If you are using the UPC-A card:

Center the imager over the right hand side of the UPC-A Master Grade.

Otherwise, if you are using the EAN-128 card:

Place the imager over the right end of the UCC/EAN-128 Master.

Otherwise, if you are using the ITF-14 card:

Place the imager over the right end of the ITF-14 Master.

Otherwise, if you are using the Data Matrix card:

Place the imager over Symbol 1, Master Grade A.

The system will then ask you for the $R_{\max}$ and $R_{\min}$. These values can be found by using the chart on Page 1 of your *Calibration Conformance Standard-ANSI Print Quality Analysis* sheet.

Example:

Locate UPC-A Master Guide on the *ANSI Print Quality Analysis* sheet

Locate the $R_{\min}$ and $R_{\max}$ rows on the far left of the chart

Under the second column you will find the $R_{\min}$ and $R_{\max}$ values

To change the values you will need to press the LEFT arrow key (this will delete the values that were listed) and type in the correct $R_{\min}$ and $R_{\max}$ values from the *ANSI Print Quality Analysis* sheet.

NOTE: The report included with the calibration barcode gives all the values in tenths. i.e. 69 would be considered a 6.9. The TruCheck expects whole numbers so you would enter 7. 824 would be considered 82.4 so you would enter 82.

After you enter the values, TruCheck will ask you to press any key. The system is now being calibrated. This may take a few seconds. Numbers will flash on the screen until the system completes the process.

NOTE: Once the $R_{\min}$ and $R_{\max}$ values are entered during the initial calibration, they will be stored in the system for future use.

At the end of the Calibration process, the TruMatrix imager calibration screen will show:

Calibration Complete

If you are using the Data Matrix card, you will also see Pixel Dimension Set.

The laser calibration screen will show:

Calibration Complete
Center Points in Cal

The system will ask you to press ' ⇐ ' (ENTER) to save the calibration. The system is now calibrated.

Check that the Calibration settings are within range by according to the **Test for Calibration** above.

Software Upgrades

Software Upgrades are available by request via e-mail or on-line at www.webscaninc.com. A link to the updated software will be emailed to you.

The following instructions guide you through a software upgrade of the Webscan TruCheck system.

To perform this upgrade you will need:

A file called TCUPD.WUP – This file can be downloaded at www.webscaninc.com

Your TruCheck unit.

A PC running HyperTerminal, or other serial communication programs that support Z-modem file transfers. These instructions assume that you will use HyperTerminal to transfer the new software to your unit. You may use any other serial communications program provided that it can perform a Z-Modem protocol file transfer. If you are not using HyperTerminal, ignore the specific instructions relating to HyperTerminal and substitute the appropriate actions required with the software you are using to perform the file transfer.

A serial "NULL MODEM" cable. It should have a 9 pin DB-9F connector on one end to plug into the TruCheck. The other end should have a 9 pin or 25 pin connector depending on whether your computer's serial port has 9 pins or 25 pins.

Getting Started: Setting up HyperTerminal to communicate with the TruCheck

First, find an available Communications (RS-232) port on your computer. This port will usually be labeled as Com1 or Com2 and may have 9 pins or 25 pins and the pins will be male. Plug one end of the Webscan TruCheck upgrade cable (the Null Modem cable) into this port.

You need to know whether the port you are using is COM1 or COM2. If you have a modem in your system, that modem may be using COM1, and the serial port will be COM2. However, there are no definite rules with PC's and you may have to experiment to determine which port you are using.

Plug the other end of the cable into the TruCheck's Serial Upgrade Port using the 9 pin connector. The serial upgrade port is located on the back panel, below and to the right of the AC power cord.

In Windows 95/8 run HyperTerminal. This program can be found under:
Start->Programs->Accessories->Communications.

Selecting on the HyperTerminal icon will open the HyperTerminal window. Within the HyperTerminal window, there will be several icons.

1. Double click on the HyperTerminal icon.
2. This will now open the HyperTerminal program in new connection mode. HyperTerminal will prompt you for a name for this connection.
3. Type "TruCheck Upgrade" and click OK
4. HyperTerminal will now prompt you for a phone number and modem information.
5. Since you are connecting directly, using a cable, under the "Connect Using" drop down menu, select "Direct to Com1" if the TruCheck Upgrade cable is connected to port Com1 on the back of your computer. Select Com2 if the Com2 port is being used. Click OK. HyperTerminal will now prompt you for port settings.
6. Select 19200 bits per second. Leave all other settings at their default values.
7. Click OK to close this window.

In order for the new settings to take effect, HyperTerminal must be re-started.

8. Click the "Close Window" button in the upper right corner of the HyperTerminal Window. HyperTerminal may ask if "you are sure you want to disconnect now."
9. Select "Yes". HyperTerminal will now ask if you want to save this session. Select "Yes". The HyperTerminal window will now show an icon labeled "TruCheck Upgrade".
10. Double click this icon to re-start HyperTerminal with the proper settings for communicating with the TruCheck.

Upgrading: Performing the Upgrade

1. Power down the TruCheck.
2. Connect the upgrade cable to the TruCheck upgrade port. There are two 9 pin male connectors on the back panel. The upgrade port is labeled "Serial Upgrade". Make sure the cable is securely connected at the back of your computer and to the upgrade port.
3. Copy the upgrade file, tcupd.wup into the root directory of your C drive.
4. Re-connect power to the TruCheck.
5. When TruCheck prompts the user to "Press 1 to begin" press the 5 key on the TruCheck keypad. Pressing the 5 key at this screen puts the TruCheck into Upgrade mode.
6. TruCheck will then prompt for the user to press the + key to cancel, or any other key to begin the transfer. Press the 5 key once more to proceed with the upgrade. You can press the + key to cancel.
7. The TruCheck is now ready to receive the upgrade file.
 - In HyperTerminal, click 'Transfer->Send File' this will open the send file window
 - Under "filename" enter C:\tcupd.wup
 - Under "Protocol" select Zmodem
 - Click Send.

A progress bar should appear in HyperTerminal, showing the amount of data sent, and the amount remaining to be sent. TruCheck will also display this information.

NOTE: After the transfer, **DO NOT RESET AND DO NOT POWER DOWN** the TruCheck. TruCheck will reset automatically after the upgrade is complete. The TruCheck will now be running the new software. After you press a key as requested by the startup screen, the TruCheck initializes and displays the Firmware Version.

Using WinWedge™ (Software Wedge™)

The TruCheck system outputs verification results through an RS232 port. The output data is in a simple comma delimited text format. We distribute a software product called WinWedge (WinWedge is a trademark of TAL Technologies) which can receive RS232 data and make it available to Windows™ (Windows is a trademark of Microsoft Corp.) programs.

Along with WinWedge we distribute an Excel spreadsheet on a separate disk. This spreadsheet is set up to automatically receive data from WinWedge and fill it into the appropriate rows and columns of the spreadsheet.

To use the spreadsheet you must:

1. Install Winwedge from its installation disk
2. Copy the two files from the Webscan provided disk to your PC. One of the files is a setup file for WinWedge. The file contains setup information such as the record structure, and the baud rate, etc. The other file is the excel spreadsheet.
3. Double click the WinWedge file (normally called TRUCHK2.SW1). This will open WinWedge.
4. Double click the excel spreadsheet. This will open Excel. You must answer Allow Macros to use the spreadsheet.

NOTE: If an error message appears when opening WinWedge (Step 3 above) then the serial port Com1 is probably being used by another program on your PC. If you have a second serial port (Com2) you can change the WinWedge setup to use Com2. Otherwise, you will have to shut down the other program that is using Com1. A USB to RS232 port converter can be used on PC's that do not have any serial ports.

To have the TruCheck unit automatically transmit the verification result to the spreadsheet you must turn on AutoSend (Admin->Settings->AutoSend).

Connect the "null modem" cable between the TruCheck (connector labeled Serial Upgrade) and your PC's serial port.

Using I-guides

To use the TruCheck with I-guides, set AutoSend to 129. The TruCheck will send data to the I-guides system over the RS232 connection. Be sure to have the baud rate set to the same value as used on the I-guides PC. Within I-guides you must select the correct directory where the data will be sent to the PC.

Setting up Hot Keys

Hot Keys are the number keys 1 through 6 on the keypad that can be programmed to any sequence of keystrokes that you would otherwise enter in sequence to accomplish a function with the TruCheck.

For example, you could “record” the keystrokes required to load the saved Start and End position settings for a particular size barcode. These keystrokes would be saved in the TruCheck system and associated with a certain key on the keypad. Whenever you press that key again, the TruCheck will repeat all those keystrokes automatically.

Note: Do not use Step Forward or Step Back within the Setup menu while recording a HotKey. Instead, before recording your Hot Key sequence, set start and end positions as needed and use the Save option in the Setup Menu to store these. Then in the Hot Key sequence, use the Recall option to retrieve these previously stored start and end positions.

NOTE: When the TruCheck performs a Hot Key function, the actual actions performed will be quickly displayed on the LCD just as if you were typing the keys very fast.

The default Hot Key setup is as follows:

Press the 1 Key: Quick Verify with 1-scan

Press the 2 Key: Verifies a 1/2" high barcode with 10-scans

Press the 3 Key: Verifies a 100% UPC barcode with 10-scans

Press the 4 Key: Not set as a default – open for use

Press the 5 Key: Not set as a default – open for use

Press the 6 Key: Not set as a default – open for use

NOTE: Although keys 1 through 3 are set by default, they may be re-written by the user.

To program a key sequence and store it to a Hot Key:

Select 'Admin' from the Main menu, and then select 'Setup Hotkey'.

TruCheck will then ask "Record Hotkey?" Press '←' (ENTER) for Yes ('+' to abort)

Press any sequence of keys as you normally would to accomplish the desired function

At the end of the key sequence that you would like to record, press the '+' key

The system will then ask if you want to "End Macro?" Press '←' (ENTER) for Yes or '+' for NO

NOTE: If you did not want to end the key sequence but wanted to enter (and store) the '+' key in your sequence, you should press the '+' key again. To end and store the macro press '←' (ENTER).

TruCheck will then ask you which key you want the macro assigned to. You MUST enter a number between 1 and 6. Keep in mind that the TruCheck comes from the factory with the macros listed above. You may wish to use the 5 or 6 key for your macro.

NOTE: Pressing any other key than 1,2,3,4,5 or 6 will cause the sequence to be aborted and not saved.

A typical key sequence would change the setup for a particular size bar code, verify it, and print out the report. However, Hot Keys may be used to speed up other operations such as Turning ON and OFF 'Report' sections such as the Scan Reflectance Profile, or going in and out of Negative mode to name a few.

Routine Care and Maintenance

Besides periodic calibration, the TruCheck system requires a minimum amount of care and maintenance. Since the window is located on a bottom-facing surface, it is unlikely to become dirty. However, in a very dusty environment, it is necessary to clean the window surface from time to time.

It is recommended that you use a soft cloth, similar to the type used on eyeglasses or camera lenses. Warm water may be used along with a gentle cloth. Slowly wipe up and down making sure to clean the entire width of the window.

Be careful to not scratch the window!

WARNING! NEVER USE A DETERGENT WITH ANY ABRASIVE CONTENT

If You Are Having Trouble With Your TruCheck

If you are having trouble with your TruCheck system, please check a few basic things. Turn the system off, then on. See if this corrects the problem.

Make sure the system is not in Negative Mode, unless you are in fact trying to Verify a Negative. On 101/010R models, make sure UPC Supps is set to 0, unless you are trying to verify a UPC barcode with has an addendum.

Calibrate the unit. After calibration, verify the calibration bar code. See if the values given by the system match the values for the Calibration card. Make sure you are centering the barcode in the scan line.

If these actions do not correct the problem please call Webscan Technical support as described below.

If You Need Service

If you need service for your TruCheck system, please call Webscan Technical Support at **(303)485-6811**. Please be near the TruCheck system when you call and have your calibration card available. You may be instructed by Webscan to calibrate the system or to go into the Advanced Menu in an effort to find and/or fix the problem. If factory service is required for the system, you will be given an RMA# (Return Material Authorization Number) that Webscan will use to track and record service activity.

The address to send equipment to is :

Webscan Inc.
Attn: RMA#_____ (put in your RMA#)
1254 Sherman Drive, Unit#1
Longmont, CO 80501 USA

Routine factory preventative maintenance (FPM) is available from Webscan. This includes cleaning, replacing fan filters, testing, and firmware upgrade to the latest version of firmware such as would go into new systems. Please call Webscan, or your Webscan representative to schedule a FPM service.

FCC Class “A” Statement

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

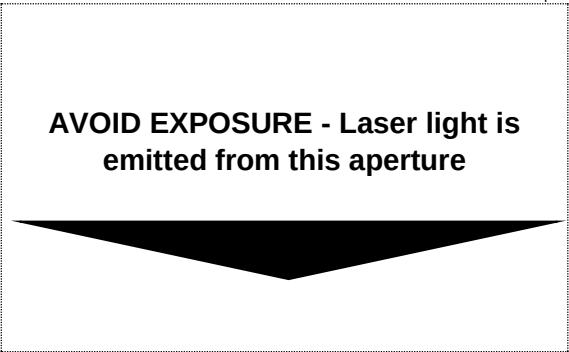
Laser Safety Information

This section contains essential information to properly install, operate and maintain your Webscan TruCheck 101/101R/201/201R Barcode Verifier. This section should be read in its entirety before proceeding to other sections of this manual. Should you have any questions as you read this manual please contact Webscan at (303) 485-6811 (9:00AM – 5:00PM Mountain Time) for clarification.

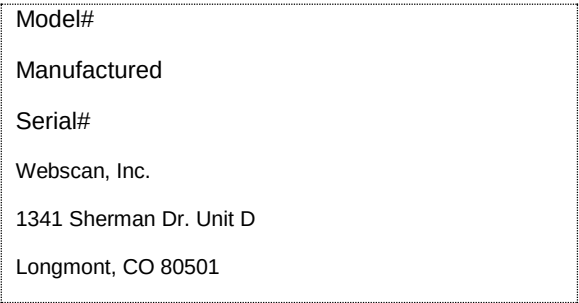
CDRH Compliance Statement

The Webscan TruCheck Barcode Verifier complies with standard 21CFR1040.10. Caution - use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure. The type and location of warning labels that comply with the CDRH standard are illustrated below:

The label below is located underneath the laser housing on Models 101/201, and on the side of the Remote scanner on the 101R/201R and indicates the location of the aperture:



The label below is located on the bottom of the unit and indicates the Model Number and Date of Manufacture:



The label below indicates that this product is a Class II laser device and contains the FDA Class II Warning logotype:



The label below contains the FCC Compliance Statement, the CDRH Compliance Statement and the caution statement for protective housings without interlocks.

This equipment complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received including interference that may cause undesired operation.

Complies with 21CFR1040.10

CAUTION - Laser light when open. DO NOT STARE INTO BEAM.

Appendix A: TruCheck Version Model Number's and Descriptions

The following list shows common system configurations. Other configurations are possible.

Ordering #	Components	
	Included Parts	Description
TC 101	TC-101	Standard, integrated 6 mil laser for linear only
TC 101-R	TC-102, TC-103	Remote laser
TC 201	TC-201	Standard integrated 6 mil 2D System
TC 201-R	TC-202, TC-203	System Including Remote Laser for linear and stacked barcodes
TC-201-R+	TC-214, TC-203	System including Remote Laser (for linear and stacked barcodes), with higher speed processor board
TC-201-RPM	TC-215, TC-203	System Including Remote Laser (for linear and stacked barcodes) with higher speed processor board and connector for optional Data Matrix Imager
TC-201-RPM-I	TC-215, TC-203, TC-403	System Including Remote Laser (for linear and stacked barcodes) with higher speed processor board and with Remote Data Matrix Imager
TC-201R-6-10	TC-206, TC-203, TC-208	System including a 6 mil Laser and 10 mil Laser (both for linear and stacked barcodes)
TC-201R-6-3	TC-206, TC-203, TC-207	System including a 6 mil Laser and 3 mil Laser (both for linear and stacked barcodes)
TC 401	TC-401	System Including internal 6 mil Laser (for linear and stacked barcodes), and Remote Data Matrix Imager
TC-401-R	TC-402, TC-403	System including a Data Matrix Remote Imager (and connector for optional Remote Laser)
TC-401-R-6	TC-402, TC-403, TC-203	System including a Data Matrix Remote Imager and a Remote Laser (for linear and stacked barcodes)

The following is a list of available system components which can be combined into system configurations, such as those listed above.

Model# (part #)	Details
TC-101	Standard Integrated 6 mil linear System
TC-102	Base Unit for TC101R System
TC-103	6 mil laser Remote for TC101R System
TC-105	Standard with internal 6 mil scanner and MUX interface for a Remote
TC-106	Base with MUX for 2 Remotes
TC-107	3 mil laser Remote for TC-101R System
TC-108	10 Mil laser Remote for TC-101R System
TC-109	Standard 3 mil internal System
TC-110	6 mil 670 nm standard unit
TC-111	20mil laser Remote for TC-101R System
TC-112	10mil 670nm Remote for TC-101R System
TC-201	Standard integrated 6 mil 2D System
TC-202	Base Unit for TC-201R System
TC-203	Remote 6 mil laser for TC-201R System
TC-205	System with internal scanner and MUX interface
TC-206	2D Base Unit with MUX for 2 Remotes
TC-207	2D 3 mil laser Remote for TC-201R System
TC-208	2D 10 mil laser Remote for TC-201R System
TC-209	2D internal 3 mil laser System
TC-212	2D 10 mil 670 nm laser Remote for TC-201R System
TC-214	2 D Base unit with High Speed Processor
TC-215	2D Base unit with High Speed Processor Data Matrix Ready
TC-216	2D Base unit with MUX for 2 remotes and High Speed Processor
TC-217	2D Fixed Stand 10 mil Remote
TC-401	2D Imager System for Data Matrix
TC-402	2D Imager base unit for Data Matrix
TC-403	2D Imager Remote with 18mm FOV (Red 660nm LED Illumination)
TC-407	2D Imager Remote with 10mm FOV (Red 660nm LED Illumination)
TC-408	2D Imager Remote with 30mm FOV and White LED Illumination
TC-411	2D Imager Remote with 30mm FOV and Red 660nm LED Illumination
TC-412	2D Imager Remote with 15mm FOV and Specular 660nm Illumination
TC-418	Base unit supporting two imagers and one laser
TC-420	Base unit supporting two lasers and one imager
2423	Software Validation Package
2424	Software Validation Service Report

Accessories

Order #	Description
2126	3 mil Calibration Symbol
1556	6 mil Calibration Symbol
2163	10 mil Calibration Symbol
2222	20 mil Calibration Symbol
2309	Thermal Printer Paper, Box of 10 Rolls
2551	Thermal Printer Paper, Box of 50 Rolls
2367	Dot Matrix Printer Paper, 3.25" for SP312, Box of 25 Rolls
1290	Dot Matrix Printer Paper, 3.25" for SP312, Box of 50 Rolls
2600	Dot Matrix Printer Paper, 3.0" for SP500, Box of 25 Rolls
2535	Dot Matrix Printer Paper, 3.0" for SP500, Box of 50 Rolls
1740	Printer Ribbon for SP300 Dot Matrix Printer
2597	Printer Ribbon for SP500 Dot Matrix Printer
2208	Thermal Printer
2546	Dot Matrix Printer
2373	Guide Plate 'A' 2 1/2" W x 11/2"H opening
2247	Guide Plate 'B' 2 1/2" W x 2 3/8"H opening
2294	Guide Plate 'C' 1 3/4" W x 2 3/8"H opening
2179	Guide Plate 'D' 5" W x 2 3/8"H opening
2234	Guide Plate 'E' 2 1/2" W x 2 1/8"H opening

Appendix B: CEN/ANSI/ISO Parameter Grade Assignments

This appendix shows the range of measurement values assigned to each grade level bracket (letter or integer). For example, contrast is always measured on an absolute scale of 0 to 100%. Within this range, values above 70% are assigned the letter grade of 'A', or equivalently, the numerical grade level of 4. Similarly the grade letter 'B' is assigned to contrast higher than 55% but less than 70%. Every parameter that is measured is reduced to a grade level for each of understanding and interpretation. For example – no-one but an expert familiar with bar code reading systems might know whether a defect grade of 25% is good or bad. The grade level eases the interpretation since grades of A or B are easily understood to be good, whereas, grades of D and F are bad. A grade of C is generally accepted as passing but may indicate room for improvement (and less margin for further degradation in quality).

Contrast	A	At least 70%
	B	At least 55% but less than 70%
	C	At least 40% but less than 55%
	D	At least 20% but less than 40%
	F	Less than 20%
Modulation	A	At least 70%
	B	At least 60% but less than 70%
	C	At least 50% but less than 60%
	D	At least 40% but less than 50%
	F	Less than 40%
Defect	A	Less than or equal to 15%
	B	Less than 20% but more than 15%
	C	Less than 25% but more than 20%
	D	Less than 30% but more than 25%
	F	More than 30%
Decodability	A	At least 62%
	B	At least 50% but less than 62%
	C	At least 37% but less than 50%
	D	At least 25% but less than 37%
	F	Less than 25%

Compliance Statement

Webscan certifies that the TruCheck data matrix verifier (TC-401 Series) conforms to the UID quality requirements in MIL-STD 130L, MIL-STD 130L Chg. 1, MIL-STD 130M, MIL-STD 130M chg. 1 and MIL-STD 130N.

Webscan certifies that the TruCheck Barcode Verifier system (TC-101, TC-201, TC-401 Series) complies with GS1 system requirements for EAN/UPC Symbology, UCC/EAN-128 Symbololgy, ITF-14 Symbology, RSS Symbology, Composite Symbology.

Webscan certifies that the TruCheck Barcode Verifier system complies with the following applicable specifications:

- ISO 15415

- ISO 15416

- ISO 15426-1 and 15426-2

- UCC Quality Specification for U.P.C. Printed Symbol

- ANSI X3.182-1990 Barcode Print Quality – Guideline

- AIM DPM Quality Guideline

Webscan certifies that the TruCheck series of products measures non-intrusive and intrusive direct part marks (dot peen, laser etch and chem. Etch) per AS 9132 Draft#4 dated March 2004, by vision system means. Webscan offers a variety of hardware/illumination configurations to meet the needs of various direct part mark applications. The proper hardware configuration is necessary to support AS9132 measurements.

Evidence of compliance with the aforementioned standards and traceability to National Institute of Standards and Technology (NIST) is provided through the use of Applied Image Certified Calibrated Conformance Standards which are manufactured to exacting specifications by Applied Image, Inc. for GS1 (formerly The Uniform Code Council.) Webscan tests each unit for conformity within specified tolerances per ISO 15426 parts 1 and 2.

Applied Image certified U.P.C. Calibration Standards are manufactured to Applied Image, Inc. and Uniform Code Council, Inc. specifications, using ANSI X3.182-1990 methodology, and are calibrated using standards traceable to the National Institute of Standards and Technology.

Appendix D: Frequently Asked Questions

Why is SC sometimes off by one from what I would expect by calculating RI-Rd?

The reason for this is rounding. Here is an example. RI actual value to 1 decimal place (which is not shown) is 82.4, and Rd is 4.6. In this case, RI will be displayed as 82 and Rd will be displayed at 5. The difference between RI and Rd is $82.4 - 4.6 = 77.8$, which of course is displayed as 78. However, $82 - 5 = 77$. Therefore, when you calculate SC in your head from the displayed values of RI and Rd you will calculate 77, when the true value is 78. This is a well understood fact of measurement. Any number is displayed to a certain precision which implies that it has been rounded by up to one half of the value of the least significant digit. This can be considered an "error" or "uncertainty" in its value. When you add two numbers, the uncertainties also add. Therefore, the uncertainty in the sum is up to 1 least significant digit.

The step size (for a Model 101 only) in the Setup menu is 1/10" which is more than the height of my barcode. How can I set the movement in smaller increments than 1/10 inch?

The STEP FORWARD and STEP BACK choices in the Setup move the laser position in steps of 1/10". However, when in the Setup menu, the Right and Left arrow keys can be used to "jog" the laser position in much finer increments. The way this works is to press and hold the arrow key for as long as you wish the laser to move. The right arrow moves the laser forward and the left arrow moves it back. When the laser is at the position you want, select Set End.

When I press Verify, why doesn't the scan line move and I get a printout showing only 1 scan?

You may have the #Scans set to 1. (This is in the Setup menu. This value should normally be set to 10, but can be set to one to get a report focused on one cross-section of the barcode. Simply change this back to 10). Similar to the previous question, but I get 10 scans – just the laser doesn't move.

You may have the Start and End position set to the exact same place. In the Setup menu, use Step forward to move the laser line away from the Start position, and then Select "Set End."

How do I turn on Lockout?

Lockout is a parameter that can be set to 0 or 1. However, to access this parameter you must know a password. There is a default password in the system, which may be changed by the user (as long as you know the previous password.)

To access Lock Out, select it in the Admin->Settings menu, and then type the correct password. Then you will see the current value of Lock Out and you can change it, same as any other parameter.

I can calibrate fine, but then the system will not read anything. What can cause this?

You may have Negative Mode set 1. This is used for reading film negatives which have clear areas for bars and black areas for spaces. In this mode, the system cannot read a normal symbol (but it will calibrate because the system is programmed to expect a "positive" calibration symbol even if Negative Mode is set to 1).

I cannot calibrate. What can be wrong?

You may have UPC SUPP set to a non-zero value. This is used for reading symbols with UPC add-ons of either 2 or 5 characters (supported on Model 101 only). You must set this to 0 to read UPC symbols without an add-on, including the calibration target symbol.

I got a grade that was passing, but the Red Fail light came on. Why?

You may have LED Mode set to 1 or 2, which activates the FAIL light when a Traditional Element Tolerance is exceeded.

Why don't I have a Data Matrix Symbol to calibrate my imager, and instead I am using a linear barcode?

Calibration of the CCD imager is done by using one of the Calibrated Conformance Standard cards available from UCC/GS1 and/or Applied Image. Typically, this will be the UPC-A card. This is because calibration adjusts the measured values of Reflectance. This means that the amount of light collected by the CCD imager is calibrated, so that the system can report an absolute level of Reflectance which is a physical characteristic of symbol being measured.

The other parameters, such as Modulation or Finder Pattern Damage are all calculated mathematically from the reflectance values of the modules, which are represented by the values of the pixels in the image.

The calibration process, using the known reflectance values of the NIST traceable card from UCC proves that the reflectance values are measured correctly. Even though it is not a data matrix symbol, we use this card because the reflectance levels are not related to any symbology anyway.

Please note that ISO 15415 describes calibration and does not require that the calibration target is any kind of symbology. It only must be a traceable reflectance standard, and that is exactly what the UPC-A (and other linear symbology) Calibrated Conformance Standard card is.

I am printing an Interleaved 25 (I25) symbol and I am getting a report showing an "out of tolerance error". What does this mean?

The "Out of Tolerance" relates to the traditional dimensional tolerances for bars and spaces and not the ANSI/ISO grading system. Accordingly, it may or may not be significant to you, but it is very useful and indicative of printing accuracy.

The specific message is reporting how many bars and/or spaces deviate from their nominal size by more than the allowed tolerance. The specification for Interleaved 2 of 5 says what the dimensional tolerance for bars and spaces are. Actually the value is calculated in a formula that involves the "wide to narrow ratio" apparent in the symbol. Because of this, the system also gives you the "Traditional Tolerance" which will be a value in MILS (thousands of an inch). Any element that deviates from its correct size by more than this tolerance will be counted as an element "out of tolerance."

For even more detail, you may turn on "Print Bars" in the Admin->Settings menu, which will add a section on the report, which shows all of the widths for the bars and spaces, and it will show the deviations from the nominal size. The ones that are "out of tolerance" will be indicated with an "*" character. You should be able to correlate the printed list of bar width sizes to the actual barcode and thereby determine your printing control issue. (Note that for Interleaved 2 of 5, the printed bar widths will be staggered because the bars and spaces encode characters separately. That is not important for your purposes. Just read it left to right, despite the staggered line printout.)

Appendix E: Engineering Specifications

1. Accuracy to Industry Standards

Accuracy of the optical parameter measurements are to ISO15426-1 (Barcode Verifier Conformance Specifications), as follows:

The arithmetic mean of the measurements on 10 scans on a Primary Reference Test Symbol shall be within:

Decodability: $\pm 8\%$

Rmin: $\pm 3\%$

Rmax: $\pm 5\%$

Defect: $\pm 8\%$

Modulation: $\pm 12\%$ (not specified in ISO15426, but our specified tolerance)

NOTE: Refer to Section 2 of ISO15426. The units of the tolerance are percentage of 100%, in other words reported units, not percentage of the reading. For example: a Test Symbol with decodability of 88%, a reading in the range 80% through 96% is within these tolerances. In most cases, measurements are more accurate than those stated above.

Accuracy to ISO15426-2 are as follows:

Rmin: $\pm 3\%$

Rmax: $\pm 5\%$

Symbol Contrast: $\pm 8\%$

Modulation: $\pm 8\%$ (for the CU value on reduced module)

ANU: $\pm 2\%$

GNU: $\pm 8\%$

2. Resolution and Range:

Final Quality Grade

Scale of 0.0 to 4.0, to a resolution of 0.1

Reported also as letter grade as follows:

Final Grade Value	Letter Grade
≥ 3.5	A
≥ 2.5 and < 3.5	B
≥ 1.5 and < 2.5	C
≥ 0.5 and < 1.5	D
< 0.5	F

Individual Parameters:

Reported on a scale of 0 to 100 with resolution of 1.

Note that the resolution of measurement is not an indication of accuracy.

3. Calibration to Industry Standards

Refer to section 6.2 of ISO15426.

All TruCheck models have a means of calibrating reflectance values against reference reflectance calibration samples. Two calibration points are used, one near the high reflectance end of the range and the other near the low reflectance end of the range.

The reflectance calibration target specified by Webscan is the UCC Calibrated Conformance Standard. This NIST traceable standard is a product of the Uniform Code Council (UCC), and is available through Webscan, Inc. or from the UCC directly (www.uc-council.org).

The calibration procedure specified by Webscan, Inc. is documented in the User Manual.

4. Environmental

Temperature 0-40 C

Humidity: 5% - 95% non-condensing

5. Power

Selectable using voltage selector on rear panel:

100VAC 50/60 Hz, 1.2A

120VAC 50/60 Hz, 1A

220VAC 50/60 Hz, .6A

240VAC 50/60 Hz, .5A

} Voltage Tolerance: $\pm 20\%$ from nominal

6. Dimensional Measurements

± 0.5 MIL for average x-dimension and average bar width growth (both linear and 2D symbols)

± 2.0 MIL for worst-case individual bar or space width in a linear barcode

Appendix F: Data Matrix Parameters for 4 Quadrant Symbols

