COGNEX

In-Sight® Track & Trace

User Manual

IN-SIGHT
Vision Systems

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Track & Trace Overview

In-Sight® Track & Trace works with your In-Sight vision system to form a comprehensive identification and data verification solution for labels on pharmaceutical and medical device packages. Combining high-performance ID code reading, Online quality grading for DataMatrix codes, and high reliability printed text verification, Track & Trace has everything needed for product serialization applications. With full support for GS1, sNDC and securPharm data standards, Track & Trace is prepared for global traceability requirements.

Track & Trace features a ready-to-deploy user interface that makes it easy to configure and monitor run-time operation using the Cognex VisionView® Operator Interface Panel or VisionView PC software. Developers can quickly embed this same interface into a PC-based HMI or custom application interface using the included .NET control.

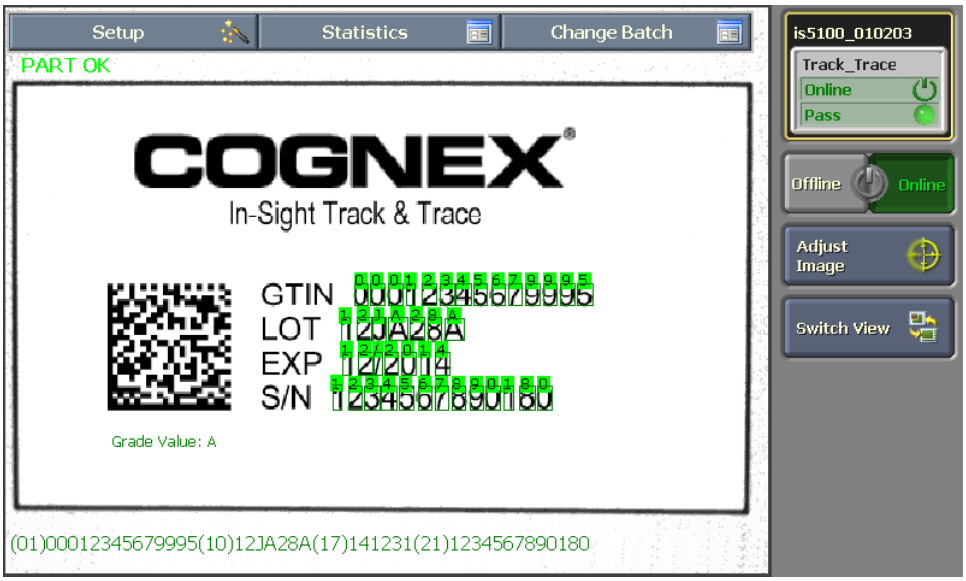

Figure 1-1: Example Track & Trace Run-Time Display

Contents

In-Sight Track & Trace includes several components, described in the following table:

Table 1-1: In-Sight Track & Trace Product Contents

Component	Description
In-Sight Track & Trace Job	The essential component of In-Sight Track & Trace, this job file is pre-configured to inspect and validate the data printed on a label or package. Running on your In-Sight vision system, the Track & Trace job provides the user interface for configuring all inspection and communications parameters, monitoring run-time performance, and initiating a batch changeover. A pre-trained font to work with the sample labels with 640x480 resolution is also included in the job file. **Note**: A license must be installed on each vision system that will run the Track & Trace job. Contact your Cognex representative for details.
Cognex HMI Display Control	This .NET control integrates the Track & Trace user interface into a custom Windows application. The "touch screen" friendly look-and-feel of the HMI Display Control is similar to that of the Cognex VisionView Operator Interface Panel. An API is provided to expose selected features of the HMI Display Control, based on the operator controls required for your deployment. **Note**: The In-Sight Software Development Kit (ISDK) is recommended for custom applications requiring more comprehensive access and control of In-Sight vision systems than is provided with the HMI Display Control. Contact your Cognex representative for details.
Cognex HMI Display Control Sample Application	This executable program demonstrates the capabilities of the Cognex HMI Display Control for hosting the Track & Trace user interface in your application. Source code is provided to help speed up your integration. The HMI Display Control Sample application can also be used to help you start learning how to set up the Track & Trace job for your inspection application.
Cognex Audit Message Demo Sample Application	The Cognex Audit Message Demo demonstrates how audit messages can be received from one or more vision systems on the network. Audit messages are time stamped data records (XML format) that contain changes to system parameters, user logins and other system events, as necessary for FDA 21 CFR Part 11 compliance. Your application software constructs an audit message server to retrieve new In-Sight audit messages, which you can then archive to a database or write to an audit trail file.
Cognex Audit Message Server Sample	Track & Trace installs a Visual Studio 2010 project containing sample code for an audit message server at C:\Program Files\Cognex\In-Sight\In-Sight Track and Trace 2.0.0\Cognex Audit Message Server\Sample Code.
Configuration Utility	The Track & Trace Configuration Utility includes the In-Sight Explorer Configuration Utility and Track & Trace Language Utility. The In-Sight Explorer Configuration Utility allows you to set the default view to Spreadsheet View and enable the Audit Message Settings dialog in In-Sight Explorer. The Track & Trace Language Utility allows you to change the language to use in the Custom View of the Track & Trace job. English (default), French, German, Spanish, Italian, Portuguese and Korean languages are supported.
Sample Labels	A printable PDF file containing 24 sample labels is provided, along with four sets of 24 images of these labels for 640x480, 800x600, 1280x1024 and 1600x1200 resolutions(.bmp format).

Requirements

The following table lists the requirements for installing and operating In-Sight Track & Trace:

Table 1-2: In-Sight Track & Trace Requirements

Requirement	Notes
In-Sight Micro series, In-Sight 5000 series or In-Sight 7000 series vision systems running firmware 4.8.0 or higher[1]	Track & Trace supports the following models[2]: • In-Sight Micro 1100, 1100C, 1110*, 1400, 1400C, 1402, 1412*, 1410*, 1403, 1403C, 1413* • In-Sight 5100, 5100C, 5110*, 5400, 5400C, 5400CS, 5401, 5403, 5410*, 5411*, 5413*, 5600, 5603, 5604, 5605, 5610*, 5613*, 5614*, 5615* • In-Sight 7200, 7200C, 7210*, 7400, 7400C, 7402, 7402C, 7410*, 7412*
In-Sight Explorer software 4.8.0 or higher[1]	In-Sight Explorer is used to manage vision system network settings, update firmware, manage users, enable Audit Message Settings, and more.
VisionView Operator Interface Panel running firmware 1.6.0 and higher and VisionView PC software 1.6.0 or higher[3]	VisionView Operator Interface Panel and VisionView PC software support the following Track & Trace features: • OCRMax Font training • English (default), French, German, Italian, Korean, Portuguese and Spanish user interface
PC with 1GB RAM and Microsoft Windows XP SP3 (32-bit edition)	Windows 7 (32-bit and 64-bit edition) are also supported.
Microsoft Visual Studio 2010	Required to integrate the Cognex HMI Display Control into your HMI or custom application.

[1] In-Sight firmware/software versions older than 4.8.0 may work with Track &Trace 2.0.0; however, Cognex only tests and supports Track & Trace 2.0.0 with In-Sight Explorer 4.8.0 and higher.

[2] Track & Trace pattern fixture and label position inspection features are not available on In-Sight ID reader models (indicated by '*').

[3] VisionView 1.6.2 and higher is required when using the Authorization Mode.

Getting Started

Install Track & Trace

This section describes how to install the In-Sight Track & Trace software on your In-Sight vision system and on the PC that will be used to host the user interface. The following instructions assume that your In-Sight vision system has 4.8.0 or later firmware version installed and is already available on the network.

1. Install In-Sight Explorer 4.8.0 or later software. (This is only necessary if 4.8.0 or later is not already installed.)
2. Install In-Sight Track & Trace 2.0.0 software.
3. Launch In-Sight Explorer from the Windows Start Menu.
4. Log on to the vision system and navigate to the Spreadsheet View.
5. From the Sensor menu, open the Active Cells Limit dialog and increase the number of cells to **7168** cells. Click **OK** to exit the dialog. The vision system will automatically reboot.
6. Locate the Track & Trace license you received from Cognex. From the Sensor menu, open the Licensing dialog and enter the license in the Enter a new license field. Click the **Add** button to add the license to the vision system. Click **Close** to exit the dialog.

   Note: The license is a unique 48 character alphanumeric string encoded with the MAC address of a specific vision system. You must install a license on every vision system that will run the Track & Trace job. If you receive a "The license is not valid" error message, the license you are trying to enter is not valid for the current vision system. Please contact the Cognex representative who issued the license for further assistance.

7. From the File menu, select the Open Job dialog. Navigate to the In-Sight Track & Trace installation directory; the default is: C:\Program Files\Cognex\In-Sight\In-Sight Track and Trace 2.0.0\Job File. Highlight the Track_Trace.job file and click **Open**.
8. Save the Track_Trace.job file to the vision system.
9. From the In-Sight Network tree, right-click on the vision system and select **Properties**. Note the IP address of the vision system.

   Note: For more information on using In-Sight Explorer, refer to the *In-Sight® Explorer Help* file, an online HTML Help file provided on the In-Sight Explorer DVD.

10. To verify that the installation was successful, log off the vision system in In-Sight Explorer and launch the Cognex HMI Display Control Sample application from the Windows Start Menu.

11. In the Sample Controls dialog, enter the IP address, user name and password of the vision system and click **Connect**.

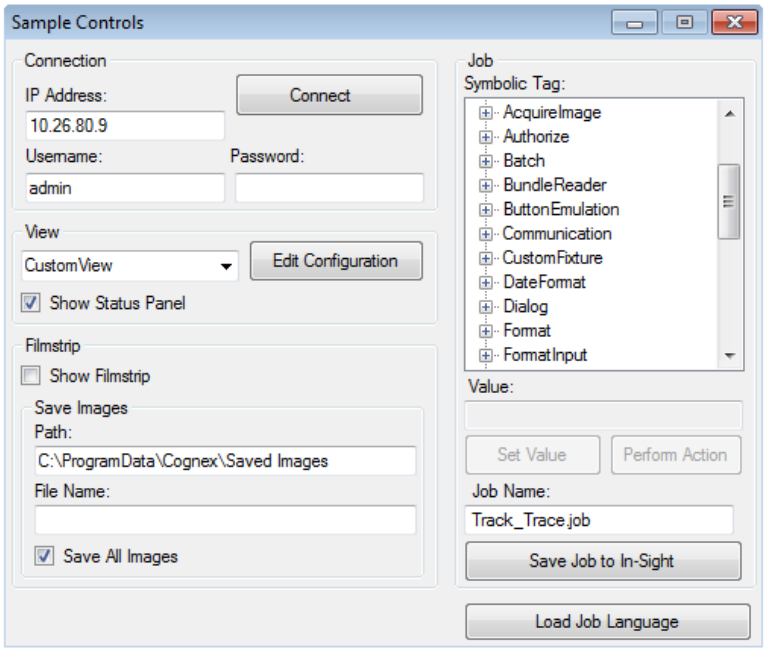

Figure 2-1: HMI Display Control Sample Application, Sample Controls Dialog

If you have correctly followed the previous steps, you will be connected to your In-Sight vision system and the main screen of the Track & Trace job will be visible at the top of the image.

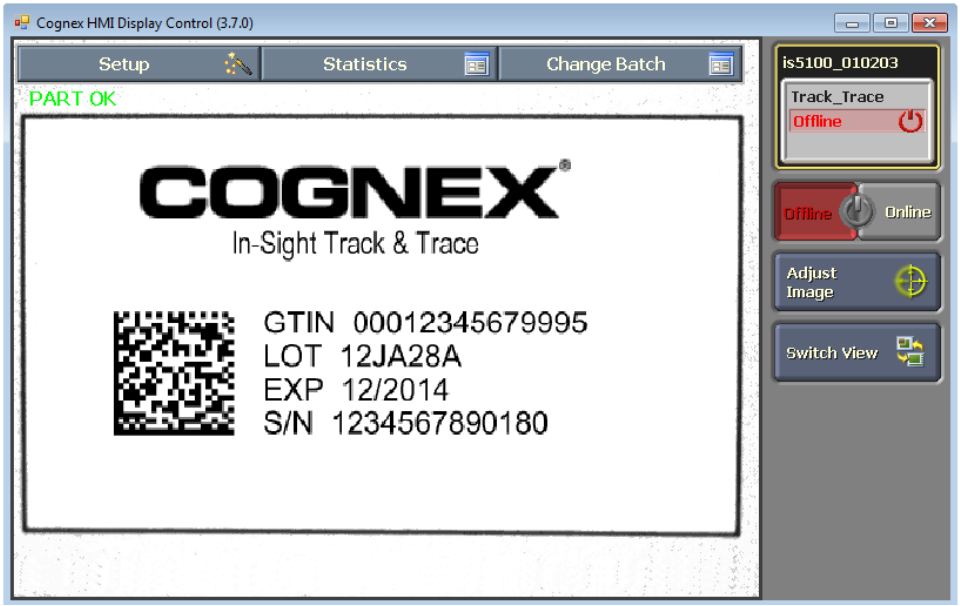

Figure 2-2: HMI Display Control Sample Application, Status Panel

Set Up the Image

Before you can begin configuring Track & Trace, you need to obtain an image of a label. Click the **Adjust Image** button, then click **Focus** to enter live acquisition mode. Position a label in the image, focus the lens and adjust the image until you have a clear image of the label data. You can also load an image or a job file on a vision system by dragging-and-dropping it onto the image area of the Cognex HMI Display Control Sample application.

Note: The Cognex HMI Display Control Sample application provides focus, pan/zoom and rotate settings for the image. If you need to adjust brightness, light intensity, white balance or other AcquireImage parameters, please go to the In-Sight Explorer and adjust those parameters in the Spreadsheet View. For more information, refer to the AcquireImage topic in the *In-Sight® Explorer Help* file provided on the In-Sight Explorer DVD.

Figure 2-3: Live Acquisition Mode

Configuration Utility

The Configuration Utility includes the In-Sight Explorer Configuration Utility and Track & Trace Language Utility.

In-Sight Explorer Configuration

The In-Sight Explorer Configuration Utility allows you to set the default view to Spreadsheet View and enable the Audit Message Settings dialog in In-Sight Explorer. To edit the In-Sight Explorer Configuration:

1. Launch the In-Sight Track & Trace Configuration Utility by opening the Windows Start Menu and clicking **All Programs > Cognex > In-Sight > In-Sight Track & Trace 2.0.0 > Configuration Utility**.

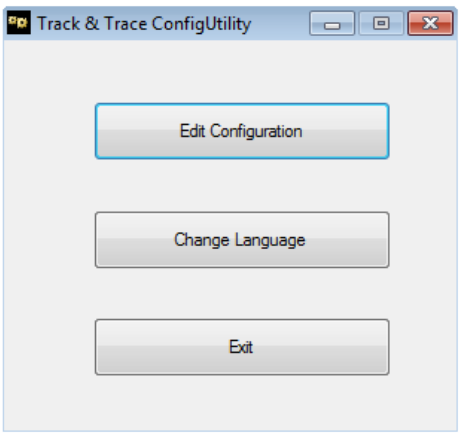

Figure 2-4: Configuration Utility Menu, Edit Configuration

2. Click the **Edit Configuration** button to open the In-Sight Explorer Configuration Change dialog. All In-Sight Explorer versions installed on your PC will be listed in the dialog.

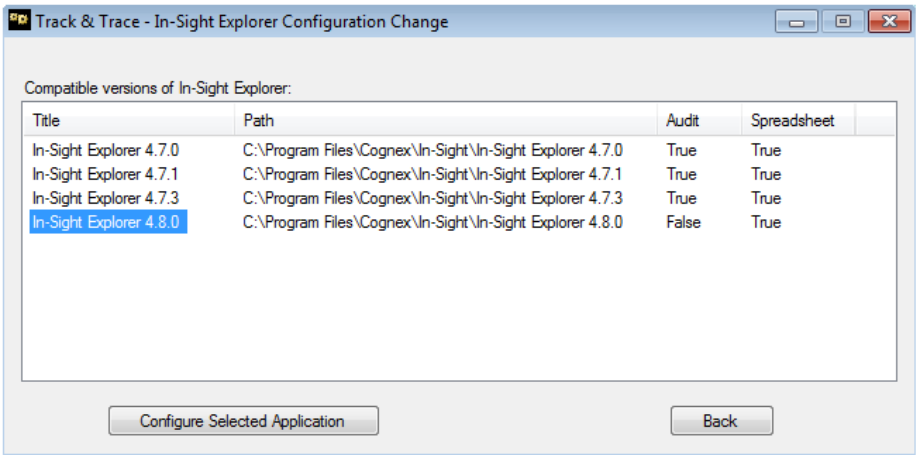

Figure 2-5: In-Sight Explorer Configuration Change Dialog

3. Select the In-Sight Explorer version you want to configure, and click the **Configure Selected Application** button. Once the configuration is completed, the corresponding Audit and Spreadsheet options will be changed to **True**.

> **Note**: If the Spreadsheet status is changed to True, The Make Spreadsheet View the Default View checkbox (located under System --> Options --> Job View) in the In-Sight Explorer will be automatically checked.

4. Click the **Back** button to close the In-Sight Explorer Configuration Change dialog and exit the In-Sight Track & Trace Configuration Utility.

Set Up the Language

Optionally, you can change the language to use in the Track & Trace job using the Configuration Utility. English (default), French, German, Spanish, Italian, Portuguese and Korean languages are supported.

Note: The In-Sight Track & Trace Configuration Utility only changes the localization of the text contained in the Track & Trace job. Changing the language will not change the localization of the Status Panel in the Cognex HMI Display Control. To change the language localization of the Cognex HMI Display Control, see *Language Localization* on page 104, or refer to the Cognex HMI Display Control Reference help file installed with Track & Trace.

1. Make sure that the Track & Trace job is already loaded to your vision system.
2. Launch the In-Sight Track & Trace Configuration Utility by opening the Windows Start Menu and clicking **All Programs > Cognex > In-Sight > In-Sight Track & Trace 2.0.0 > Configuration Utility**.

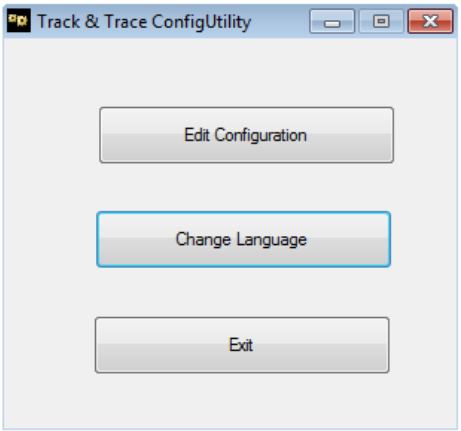

Figure 2-6: Configuration Utility Menu, Change Language

3. Click the **Change Language** button to open the Track & Trace Language Change dialog.

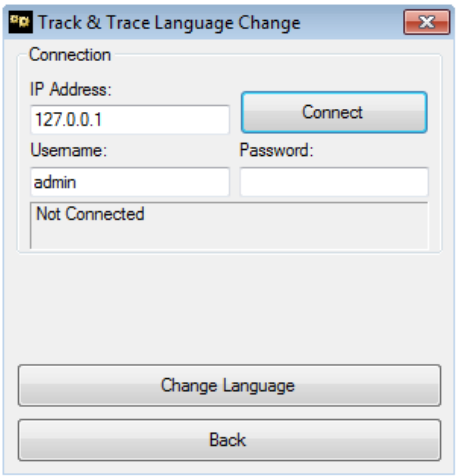

Figure 2-7: Track & Trace Language Change Dialog

4. Enter the **IP Address**, **Username** and **Password** of your vision system, and press the **Connect** button. Once the connection is established, the active job name will be displayed and the Change Language button will be enabled.
5. Press the **Change Language** button.

6. In the Open dialog, select the language file of your choice and click **Open**. The default location of the language files is: C:\Program Files\Cognex\In-Sight\In-Sight Track and Trace 2.0.0\Job File\Language Files. A progress bar will be displayed to track the load process.
7. Once the language transfer is completed, close the Track & Trace Language Change dialog and exit the In-Sight Track & Trace Configuration Utility.

Setting Up Track & Trace

This chapter describes how to configure Track & Trace to inspect label data, verify ID codes and OCR line data and to output the results to an MES, serialization database or PLC.

Track & Trace Setup Overview

All of the settings needed to configure the Track & Trace job for inspecting label data can be accessed by clicking the **Setup** button on the Track & Trace main menu.

Figure 3-1: Track & Trace Main Menu

The Setup menu presents the list of screens you will use to configure all of the inspection and communications settings. The following sections describe each screen in detail.

Figure 3-2: Setup Menu

IMAGE SETTINGS Screen

The IMAGE SETTINGS screen configures the vision system's image acquisition settings.

Note: For detailed information on the image acquisition settings, see the AcquireImage topic in the *In-Sight® Explorer Help* file.

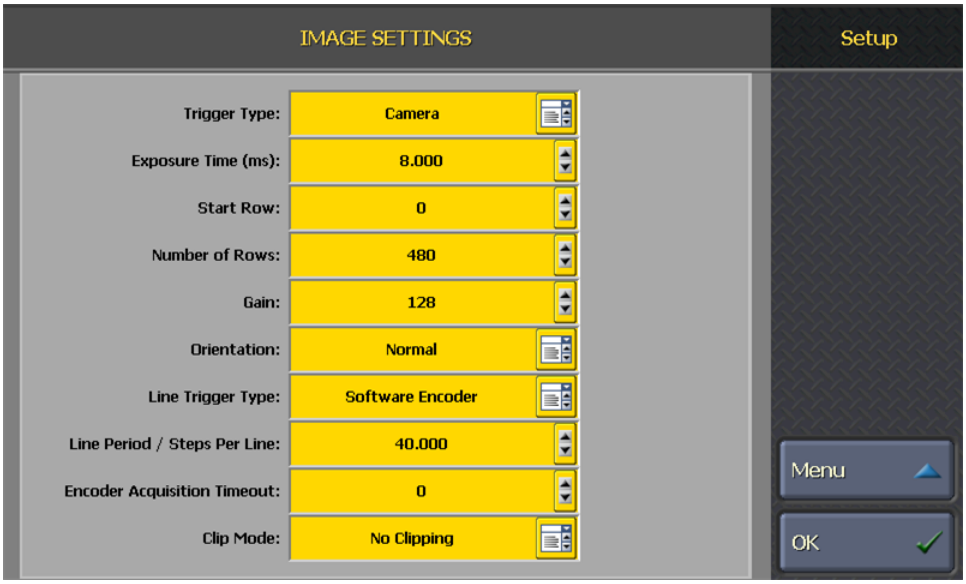

Figure 3-3: IMAGE SETTINGS Screen

Trigger Type

Specifies the source of the image acquisition trigger when the vision system is online:

- **Camera** (default): Acquisition will be triggered on a rising edge sensed at the vision system's acquisition trigger input.
- **Continuous**: Acquisition will be "free running" (as fast as possible).

  Note: Continuous trigger is intended for demonstration mode only, and should not be used during production.

- **External**: Acquisition will be triggered on a rising edge sensed at a discrete input bit configured as the Acquisition Trigger.
- **Manual**: Acquisition will be triggered when F5 is pressed.

Exposure Time

Specifies the image exposure time, in milliseconds; when connected to an In-Sight 5604 line scan vision system, the exposure time is set in microseconds (µsec).

Start Row

Specifies the first row of pixels to be transferred from the image sensor into memory on the vision system.

Number of Rows

Specifies the number of rows of pixels to be transferred into the memory on the vision system. The maximum number of rows allowed is determined by the resolution of the connected vision system.

Gain

Specifies the gain (0 to 255) of the amplifier stage that precedes the analog-to-digital converter.

Note:

- When connected to an In-Sight 5604 line scan vision system, the Gain setting may be incremented by 0.25 increments, with the range remaining from 0 to 255, providing for very fine gain adjustments.
- When connected to an In-Sight Micro 1402 or In-Sight 7000 series vision system, the Gain setting is more sensitive than other In-Sight models. If a job is developed on another In-Sight model (with the default Gain value of 128) and loaded onto the In-Sight Micro 1402 or In-Sight 7000 series vision system, the acquired images will be saturated.

Orientation

Specifies the orientation of the image.

- **Normal** (default)
- **Mirrored horizontally**
- **Flipped vertically**
- **Rotated 180 degrees**

Note: The In-Sight 5604 line scan vision system only supports Normal and Mirrored horizontally Orientation settings. Choosing Flipped or Rotated will have no effect.

Line Trigger Type

Specifies the type of encoder. The Line Trigger Type control is supported only when connected to an In-Sight 5604 line scan vision system.

- **Hardware Encoder**: Specifies that the Steps Per Line setting and an external hardware encoder that will be used to drive the line triggers.
- **Software Encoder** (default): Specifies that the Line Period setting will be used as a clock to drive the line triggers at a defined interval.

Line Period/Steps Per Line

Specifies the time between lines in either microseconds (µsec) when the Line Trigger Type is set to Software Encoder, or encoder steps when the Line Trigger Type is set to Hardware Encoder. The Line Period/Steps Per Line control is supported only when connected to an In-Sight 5604 line scan vision system.

- **Line Period**: Specifies the period of time, in microseconds, per image line; 10.0 to 1,000,000 µsec (default = 40 µsec) when the Line Trigger Type is set to Software Encoder.
- **Steps Per Line**: Specifies the number of encoder steps per image line; 0.25 to 256 (default = 40 µsec) when the Line Trigger Type is set to Hardware Encoder.

Note:

- To prevent missing line triggers, the Line Period value must be set so that the shortest time between any two lines is 21.47 µsec greater than the Exposure setting (at a minimum of 1.33 µsec).
- The Steps Per Line value should be incremented by 0.5 for single line hardware encoders, or 0.25 for quadrature hardware encoders.

Encoder Acquisition Timeout

Specifies the maximum amount of time, in milliseconds, to acquire an image (0 to 300,000; default = 0). If the image acquisition has not been completed within the specified time, the acquisition will be aborted and an Acquisition Error will be issued. The Encoder Acquisition Timeout control is supported only when connected to an In-Sight 5604 line scan vision system. If the value of Encoder Acquisition Timeout is set to 0, then no timeout will be applied.

Clip Mode

Specifies an action if an image acquisition trigger is received but the specified number of lines have not yet been acquired. The Clip Mode control is supported only when connected to an In-Sight 5604 line scan vision system.

Note:

- When either Fill Black or Reduce Image Lines are selected, the In-Sight 5604 line scan vision system may only receive acquisition triggers from the Camera Trigger.
- The Fill Black option requires roughly 2 µsec per line of fill (e.g., 0.2 milliseconds for 100 lines). For time-critical applications, select the **Reduce Image Lines** option, or, if using the Fill Black option, keep the fill under a few hundred lines.

- **No Clipping** (default): Specifies that the image trigger will be ignored and an "Acquisition error" event will be generated.
- **Fill Black**: Specifies that the remaining lines will be filled with black pixels, and a new image will be immediately started. An "Acquisition error" event will not be generated.
- **Reduce Image Lines**: Specifies that the current image will be reduced to the size of the number of rows currently acquired, and a new image will be immediately started.

Note:

- When using a color In-Sight vision system, image white balancing must be performed following these steps:
    1. Using In-Sight Explorer, logon to an In-Sight system as a user with admin-level (Full) access.
    2. Load the Track & Trace job file, and navigate to row 3 in the spreadsheet.
    3. Press the **White Balance** button in cell N3 of the Track & Trace job file and specify the white balance region.
    4. Check the **Enable White Balance** checkbox in cell O3.
    5. Trigger the vision system to acquire a single image, which will set the white balance.
    6. Uncheck the **Enable White Balance** checkbox in cell O3.

LOCATION TOOLS Screen

The LOCATION TOOLS screen provides optional tools that can help to locate the ID codes and OCR lines in the image and check that the label itself is positioned correctly. By default, all controls in the LOCATION TOOLS screen are disabled.

Note: Location Tools are not available on In-Sight ID readers. When a Track & Trace job is loaded on an In-Sight ID reader, all of the selections in the LOCATION TOOLS screen will be inaccessible.

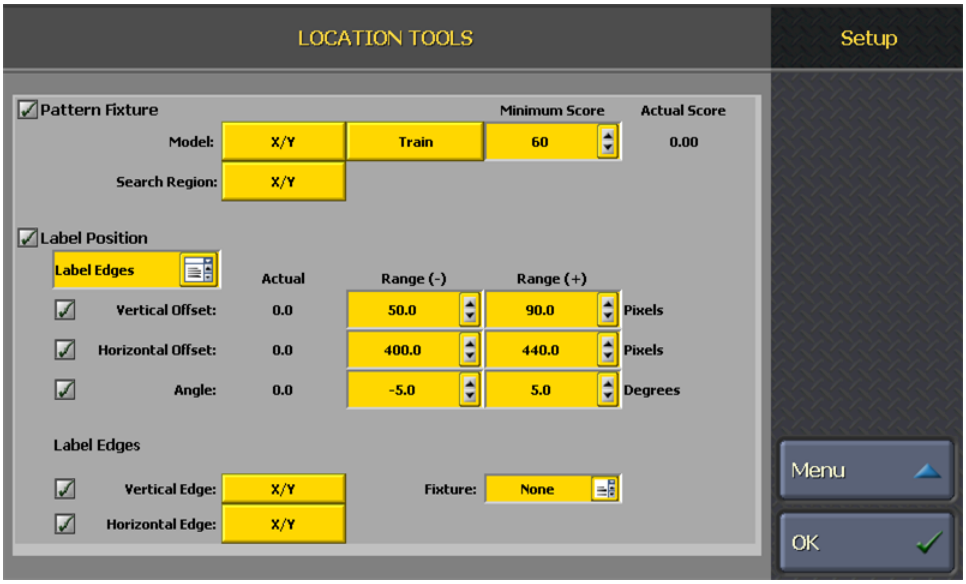

Figure 3-4: LOCATION TOOLS Screen

Pattern Fixture

The Pattern Fixture tool can be used to train a model of a feature that is present on every label. The position of this pattern can then be used as a fixture from which to locate the ID codes and text printed on the label. Check the Pattern Fixture checkbox to train a model that can be used as a fixture.

Model

Click the **X/Y** button to select the area of the image containing the feature that will be trained as a model, then click the **Train** button to teach the model. Make sure you select a feature that will be present in every image.

Search Region

Click the **X/Y** button to select the area of the image in which to search for a pattern that matches the trained model. During operation, the pattern must be present within the search region to be found. If Pattern is selected as the Fixture for the ID codes or OCR lines and the model cannot be found, the inspection will fail.

Minimum Score

Specify the minimum acceptable score for finding the pattern in the image. If the **Actual Score** is lower than the specified Minimum, the inspection will fail (default = 60).

Label Position

Optionally, the Label Position tool can inspect whether a label has been correctly applied to a package. You can configure the Label Position tool by locating label edges, an ID code or a pattern, and defining the range of tolerances

for the label position or skew. If the label is located outside of the specified area and/or at greater than the specified angle, the inspection will fail even if the label can be located.

- **Label Edges** (default): The label position will be determined relative to the edges of the image. Configure the label edges using the **Vertical** and **Horizontal Edges** controls.
- **ID Code 1**: The label position will be determined relative to the position of ID code 1 in the image.
- **Pattern**: The label position will be determined relative to the position of the pattern in the image.

Note: ID Code 2 cannot be used for the Label Position tool.

Vertical Offset and Horizontal Offset

Specify the position tolerance by adjusting the **Range (-)** and **Range (+)** values, which defines minimum and maximum allowable distance (in pixels) from the reference point. (Vertical Offset: -2448 to 2448, Range (-) default = -50, Range (+) default = 90; Horizontal Offset: -2048 to 2048, Range (-) default = -400, Range (+) default = 450).

When **None** is selected for the Fixture (default), the reference point is the upper-left corner of the image. When **ID Code 1** is the selected Fixture, the reference point is the upper-left corner of the code. When **Pattern** is the selected Fixture, the reference point is the center of the pattern.

Note:

- The Vertical and Horizontal Offset controls will not be enabled when the Label Position checkbox is unchecked, or when the Vertical and/or Horizontal Edge checkboxes are unchecked.
- If both the Vertical Offset and the Horizontal Offset checkboxes are disabled, the Label Position tool only inspects whether the selected Label Position option has been found or not.

The location (in pixels, below **Actual**) will be displayed for each edge of the selected Label Position option that can be located. When Edges are used without a fixture, or Pattern or ID code is used without Edges, the displayed location will be relative to the image. When a pattern or ID code is used to fixture Edges, the displayed location will be relative to the pattern or ID code. If one or both Offset checkboxes are enabled and an edge cannot be found, or if an edge is located outside of the specified tolerance, the inspection will fail. The range of offset varies depending on the resolution of the camera.

Note: If Label Edges is the selected Label Position tool, and each edge of the label cannot be located, “Edge Not Found” will be displayed.

Angle

If either the vertical or horizontal edge of the selected Label Position option can be found, the angle of the label (in degrees, below **Actual**) will be displayed. Specify the angle tolerance by adjusting the **Range (-)** and **Range (+)** values, which defines minimum and maximum allowable rotation (in degrees) of the label in the image. If the checkbox is enabled and an angle is outside of the specified tolerance, the inspection will fail. (Angle: -180 to 180, Range (-) default = -5.0, Range (+) default = 5.0).

Label Edges

The Label Edges controls are enabled only when Label Edges is the selected Label Position tool.

Vertical Edge and Horizontal Edge

Click the **X/Y** buttons to position and size the regions in which to search for the vertical and horizontal edges of the label. If one or both edge checkboxes are enabled and an edge cannot be found, the inspection will fail.

Note:

- If the Vertical Edge checkbox is disabled, the Horizontal Offset control is grayed out. If the Horizontal Edge checkbox is disabled, the Vertical Offset control is grayed out.
- If both the Vertical Edge and Horizontal Edge checkboxes are disabled, the Label Position inspection will always pass.

Fixture

Optionally, the Fixture tool can be used to inspect whether the label is positioned correctly relative to a nearby, visible feature on the package, regardless of where the package is in the image. If the fixture cannot be located, the inspection will fail.

- **None** (default): No Fixture will be used. The label position will be located by its Vertical and/or Horizontal Edge locations in the image.
- **Pattern**: The label position will be located by its Vertical and/or Horizontal Edge locations relative to the trained Pattern in the image.
- **ID Code 1**: The label position will be located by its Vertical and/or Horizontal Edge locations relative to the position of the ID code in the image.

Note:

- Always reposition the **Vertical** and **Horizontal Edges** after selecting **Pattern** or **ID Code 1** for the Fixture. Otherwise, selecting a fixture may cause the Vertical and Horizontal Edge's regions to shift to new locations in the image that do not contain the edges, and the inspection may fail.
- When attempting to reposition the Vertical and Horizontal Edges, the regions may be out of the image area. In this circumstance, press the **Pan/Zoom** button to enter Pan/Zoom Mode (if using the Cognex HMI Display Control or VisionView application). Click the **Zoom Out** button repeatedly until the region appears within the image area, and click **OK**. Then, reposition the region using Interactive Graphics Mode.

ID CODE 1 and ID CODE 2 Screens

Track & Trace can read 1D or 2D codes on a single label or package, validate the encoded data, and grade the quality of DataMatrix codes. Each ID code is set up using separate screens: ID CODE 1 and ID CODE 2. The contents of both screens are identical. By default, all controls in the ID CODE 1 and the ID CODE 2 are disabled.

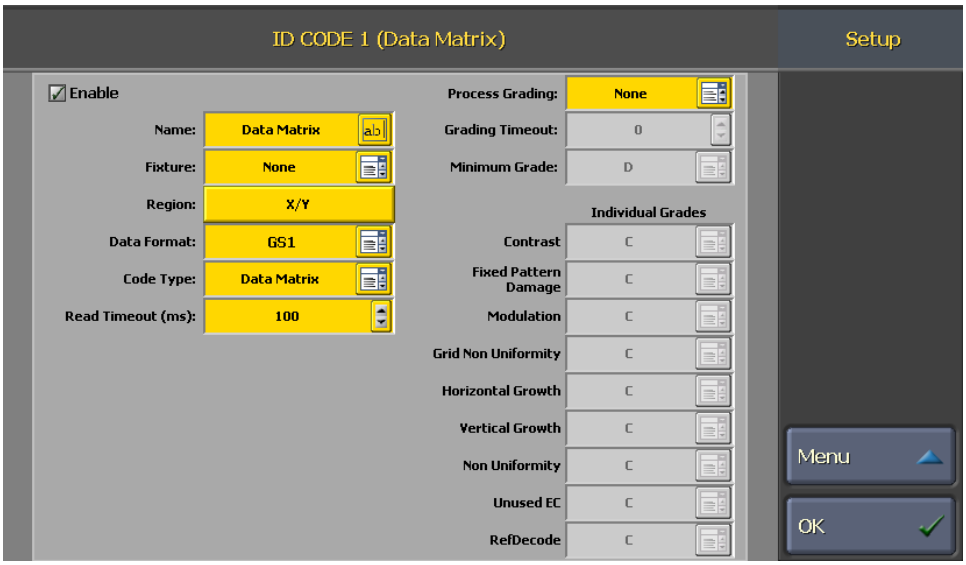

Figure 3-5: ID CODE 1 Screen

ID Code Reading Settings

The following settings must be configured to read an ID code, which is a prerequisite for validating the encoded data and for grading the quality of a DataMatrix code.

Enable

Check this checkbox to read the ID code. When the checkbox is disabled, the ID code will not be used in determining the overall inspection result. However, the inspection will fail if the ID code is disabled, but ID code has been selected as the Label Position or Fixture tool in the LOCATION TOOLS screen, as the Fixture in the OCR LINES screen, or as the Source in the VERIFICATION screen.

Name

Enter the name of the ID code. This name appears in the title of the ID CODE screen, which is useful if ID CODE 1 and ID CODE 2 are configured to read different code types. The default name for the ID CODE 1 screen is "DataMatrix", and the default name for the ID CODE 2 screen is "Code 2".

Fixture

Specify the fixture to use to position the ID code region in the image.

- **None** (default): Fixture will not be used. A fixture is usually not necessary when reading a 2D code, such as DataMatrix.
- **Pattern**: The Pattern Fixture will be used. A Pattern Fixture is most useful when reading a 1D barcode.
- **ID Code 1** (ID CODE 2 screen only): The ID code 1 will be used as a fixture.
- **Custom**: The Custom Fixture will be used. The Custom Fixture value can be edited by users in cells R3, S3 and T3 of the Track & Trace job in the In-Sight Explorer spreadsheet. For more information, see *User-Configurable Parameters* on page 61.

Region

Click the **X/Y** button to define the area of the image in which to search for the ID code. Move and resize the region using the buttons in the panel on the right, or directly using the interactive region graphic displayed on top of the image.

Note: Always reposition the ID code region after changing Fixture options. Otherwise, changing the Fixture options may cause the ID code region to shift to a new location in the image that does not contain the ID code, and the read may fail.

Figure 3-6: Position and Size the ID Code Region

Data Format

- **None**

  Select **None** if the data in the ID code was not encoded according to the GS1, the FDA serialized National Drug Code (sNDC) or the German pharmaceutical industry barcode packaging system (securPharm) standard.

- **GS1**

  Select **GS1** if the data in the ID code has been encoded according to GS1 standards (http://www.gs1.org/). Track & Trace job supports GS1 data items: GTIN, Lot Number, Exp Date, Production Date, Best Before, Serial Number and Price. The encoded data must meet the following requirements:

  - The data string must begin with the FNC1 symbology identifier character (which is never displayed or printed).
  - All of the data elements in the ID code must be preceded by a valid GS1 Application Identifier (AI), which is a two or three digit number, depending on the AI.
  - All of the data elements must contain the correct number of characters for their corresponding AI.
  - For AIs that specify variable-length data, an FNC1 field separator must immediately follow the data element.

- **sNDC**

  Select **sNDC** if the data in the ID code has been encoded according to the FDA serialized National Drug Code (http://www.fda.gov/downloads/RegulatoryInformation/Guidance/UCM206075.pdf). The encoded data must meet the following requirements:

  - The data string must consist of a 10-digit NDC number immediately followed by a unique serial number of up to 20 alphanumeric characters.
  - The three sections of the NDC number can be separated by a space or a dash; however, the data string must not contain any other special formatting, application identifiers or checksum characters.

- **securPharm (strict)**

  Select **securPharm (strict)** if the data in the ID code has been encoded according to the German pharmaceutical industry barcode packaging system using DataMatrix symbols.The encoded data must include the following elements:

  - Pharmacy Product Number (PPN)
  - Serial Number
  - Lot and Expiration
  - GTIN (optional)

- **securPharm (loose)**

  Select **securPharm (loose)** if the data in the ID code has been encoded according to the German pharmaceutical industry barcode packaging system using DataMatrix symbols.The encoded data requires that only Pharmacy Product Number (PPN) be included, with the other information being optional.

Note:

- If the encoded data fails to meet one or more of the requirements, the ID code is not compliant with the selected Data Format. The inspection will fail even though the contents of the ID code can be read.
- ID Code 1 must be used for codes that contain GS1, sNDC or securPharm data. The GS1, sNDC or securPharm data, as selected Data Group in the OUTPUT screen, are only available for ID Code 1.
- The sNDC number can also be included as part of the GTIN data element in a GS1 code. If this is the case, select GS1 for the Data Format.

Code Type

Select the type of 1D barcode or 2D code to read.

- **1D/Stacked** (default)
- **DataMatrix**
- **QR Code**

Read Timeout

Specifies the maximum amount of time (in milliseconds) allowed to read the ID code. The inspection will fail if the ID code cannot be read before the Read Timeout has been reached. The maximum Read Timeout is 2000 milliseconds. If the value of Read Timeout is set to 0, then no timeout will be applied.

DataMatrix Code Grading Settings

Optionally, Track & Trace can grade the quality of 2D DataMatrix codes while the vision system is Online. This feature can be used to detect changes in the quality of the ID code, which could indicate that the printing system requires servicing.

Note: Online grading detects relative changes in DataMatrix code quality, but it does not measure absolute quality. A verifier is needed to accurately measure the quality of a DataMatrix code. Contact your Cognex representative for information on DataMan verifiers.

Figure 3-7: DataMatrix Code Grading Settings

Process Grading

Selects the standard to use for Online grading of DataMatrix code quality.

- **None** (default): Select **None** if the ID code type is not DataMatrix, or if quality grading is not required.
- **ISO 15415**: Select **ISO 15415** grading metrics for Online quality inspection of DataMatrix codes printed on pharmaceutical and medical device packaging.
- **ISO 16022**: Select **ISO 16022** grading metrics if more rigorous code quality inspection is required. However, the ISO 16022 grading standard requires a precisely controlled lighting system to ensure accurate results, and is generally better suited to Offline code quality inspection.
- **AIM Process Control** and **AIM Contract Compliance**: AIM Process Control and AIM Contract Compliance are used to grade direct part marks (DPM), such as on medical instruments.
- **Custom**: Select **Custom** if a user defined grading metric is used. The formula that defines the custom grading metric must evaluate to an A - F grade, which must be contained in cells P3 (ID Code 1) and Q3 (ID Code 2) of the Track & Trace job in In-Sight Explorer spreadsheet. When Custom grading is selected, all of the controls for the Individual Grades will be disabled. For more information, see *User-Configurable Parameters* on page 61.

Grading Timeout

Specifies the amount of time (in milliseconds) allowed for code grading. The grading will fail if the ID code cannot be graded before the Grading Timeout has been reached. The maximum Grading Timeout is 5000 milliseconds. If the value of Grading Timeout is set to 0, then no timeout will be applied.

Minimum Grade

Select the minimum grade (**A - F**) required for passing the DataMatrix code quality inspection. Each of the **Individual Grades** must meet or exceed the Minimum Grade, or the inspection will fail. For example, if the Minimum Grade is C, then all of the nine individual metrics must score C or better, or the inspection will fail.

Select **Individual Grades** to specify the minimum grade for quality metric. This allows you to fine tune the DataMatrix code quality inspection criteria by requiring higher or lower grades for specific metrics. For example, the Grid Non Uniformity metric could have a minimum grade of D, and all the other metrics have minimum grades of C.

Individual Grades

If the Minimum Grade is set to Individual Grades, a minimum grade can be individually specified for each of the nine quality metrics:

- **Contrast**
- **Fixed Pattern Damage**
- **Modulation**
- **Grid Non Uniformity**
- **Horizontal Growth**
- **Vertical Growth**
- **Non Uniformity**
- **Unused EC**
- **RefDecode**

During inspection, each quality metric must score at or above its specified grade, or the inspection will fail.

Note: For more information on DataMatrix code grading, see the Verifying 2D Symbol Quality topic in the *In-Sight® Explorer Help* file.

OCR LINES Screen

Track & Trace can verify up to six lines of printed text on a single label or package.

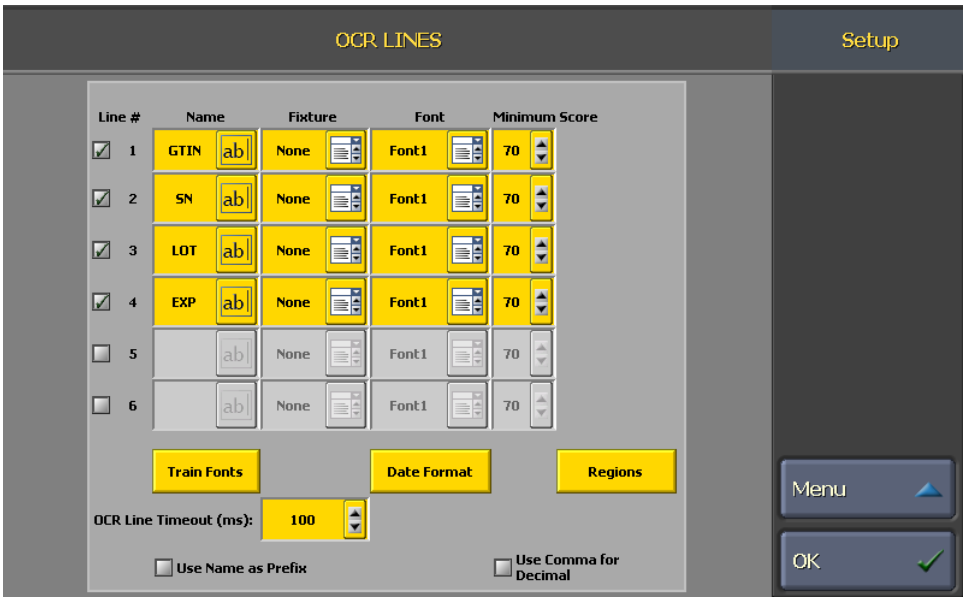

Figure 3-8: OCR LINES Screen

OCR Line Settings

Up to six OCR lines can be included in the inspection. Each OCR Line is configured individually.

Line

Enable the checkbox next to each of the lines that will be inspected. If the checkbox for a line is disabled, that line will not be included in the inspection. By default, all checkboxes are disabled.

Name

Click on the field to open the on-screen keyboard, and enter a name reference for the OCR line. Optionally, when the Use Name as Prefix checkbox is checked, this name will be added to the OCR match string for the OCR line.

Note: Make sure that the name entered in the Name field matches the name of the OCR line in the match string when the Use Name as Prefix checkbox is checked, otherwise the inspection will fail.

Fixture

Select the fixture to use for each OCR line. For reliable OCR performance, the position of the printed text in the image must be highly repeatable from one image to the next. Using a fixture ensures that the region for each OCR line will always be located around the text, even if the text position varies slightly in successive images.

- **None**: Fixture will not be used. Choose this option if the ID code 1 is not enabled, or none of the fixtures below are supported on the vision system.
- **ID Code 1**: The OCR line will be fixtured relative to the location of ID code 1 in the image. This selection offers the fastest performance if a DataMatrix code is printed on the label.
- **Pattern**: The OCR line will be fixtured relative to the location of the pattern in the image, if a model was trained in the LOCATION TOOLS screen.
- **Label**: The OCR line will be fixtured relative to the location of the label position in the image, if a model was trained in the LOCATION TOOLS screen.

- **Custom**: The OCR line will be fixtured relative to the custom fixture in the image. The custom fixture value can be edited by users in cells R3, S3 and T3 of the Track & Trace job in In-Sight Explorer spreadsheet. For more information, see *User-Configurable Parameters* on page 61.

Font

Select the font to use for each OCR line. Track & Trace supports up to five fonts in a single job, and there is no requirement that the same font be used for all lines.

Note: The Track & Trace job includes a pre-trained font (Font #5, Demo), which is designed to work with the sample images included with Track & Trace. In most cases, however, you should train your own font using actual samples of your labels or packages as they will be marked during manufacturing. For instructions on training and editing fonts, see *TRAIN FONTS Screen* on page 26.

Minimum Score

Specify the minimum score (0-100; default = 70) that the OCR line must receive to pass.

Regions

Click the **Regions** button to define the area of the image in which to locate OCR lines. Each OCR line has a corresponding region box with a line name on the upper-left side. You can select and modify the regions of all selected OCR lines simultaneously in one screen.

You can move and resize regions using the buttons in the panel on the right, or directly using the interactive region graphic displayed on top of the image. The region should be sized large enough to contain all of the characters, but not so large that it encompasses any potentially confusing background features, or portions of other characters.

Note: Always reposition the regions for each OCR line after changing Fixture options. Otherwise, changing the Fixture options may cause the OCR line regions to shift to a new location in the image that does not contain the printed text, and the inspection may fail.

Figure 3-9: Set Regions for OCR Lines

Train Fonts

Click the **Train Fonts** button to train and edit fonts in the TRAIN FONTS screen. For instructions on training and editing fonts, see *TRAIN FONTS Screen* on page 26.

Date Format

Click the **Date Format** button to specify the date format in the DATE FORMAT screen. For detailed information, see *DATE FORMAT Screen* on page 33.

OCR Line Timeout

Specifies the maximum amount of time (in milliseconds) allowed to read the OCR lines. The inspection will fail if the OCR lines cannot be read before the OCR Line Timeout has been reached. The maximum OCR Line Timeout is 5000 milliseconds. If the value of OCR Line Timeout is set to 0, then no timeout will be applied.

Note: The value specified in the OCR Line Timeout represents the timeout for one OCR line verification/match. If all six lines are activated, the execution time could be 6 x OCR Line Timeout (ms). If one OCR line reaches its timeout setting, the result of that line will be failed, but the other OCR lines will still be executed.

Use Name as Prefix

Check the Use Name as Prefix checkbox to include the name of the OCR line in the match string that will be used to inspect the printed text. The region for each OCR line must be resized to include all of the characters in the match string.

Figure 3-10: Use Name as Prefix

Use Comma for Decimal

Check the **Use Comma for Decimal** checkbox if a comma (,) is used to represent a decimal point in an OCR line containing price.

Note: This checkbox is only enabled when one of the OCR lines is selected as the Source option and **GS1 - Price** is selected as the Data Type option in the *VERIFICATION Screen*.

TRAIN FONTS Screen

A Track & Trace job supports up to five fonts at a time. Displayed adjacent to each font (numbered 1 – 5) are the Font Name, Train String, Train buttons and Train Regions button.

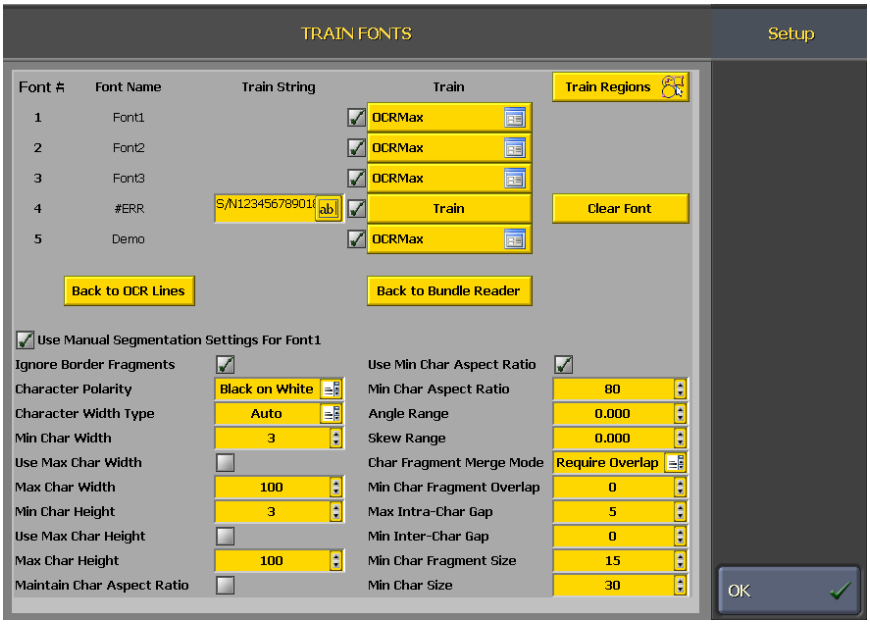

Figure 3-11: TRAIN FONTS Screen

TRAIN FONTS screen supports two types of font training: the OCRMax font training and the Show & Go font training, which allows users to adjust the region and train the font in one step during run-time.

OCRMax Font Training

1. Identify the OCRMax **Font #** (Font 1, 2, 3 or 5) to train, and check the corresponding checkbox next to the **OCRMax** button to enable the OCRMax font training.

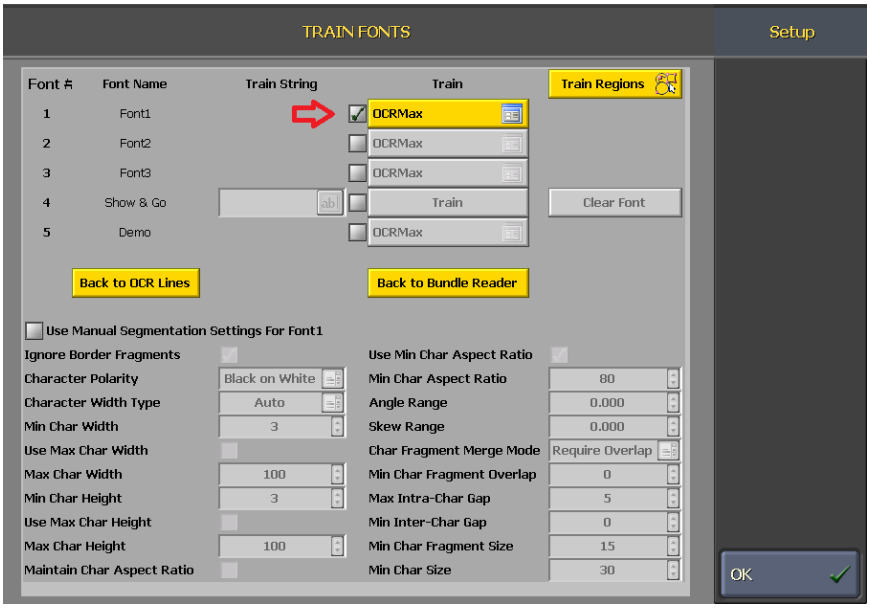

Figure 3-12: Enable OCRMax Font Training

2. Click the **Train Regions** button. If one or more fonts are enabled, the Train Regions of all enabled fonts will be displayed and can be specified simultaneously in one screen. Specify the area of the image in which to locate characters that need to be trained, then click **OK**.

Note:

- Train Regions must be defined first before starting OCRMax font training. Otherwise clicking the OCRMax button will return #ERR.
- When specifying the Train Regions, make sure that the train region is larger than the line of text by at least half a character width on all sides. If doing so results in the inclusion of other features enclosed within the train region, enable the Ignore Border Fragments checkbox to improve the training result.
- If you choose to use the same font for several OCR lines, specify the region separately each time before training an OCR line.

Figure 3-13: Specify Font 1 Region

3. Click the **OCRMax** button to open the OCRMax Font Training screen, which allows you to train, view, rename and remove characters. For detailed instructions on training and editing fonts using the Track & Trace user interface, see Appendix A - *OCRMax Font Training* on page 67.

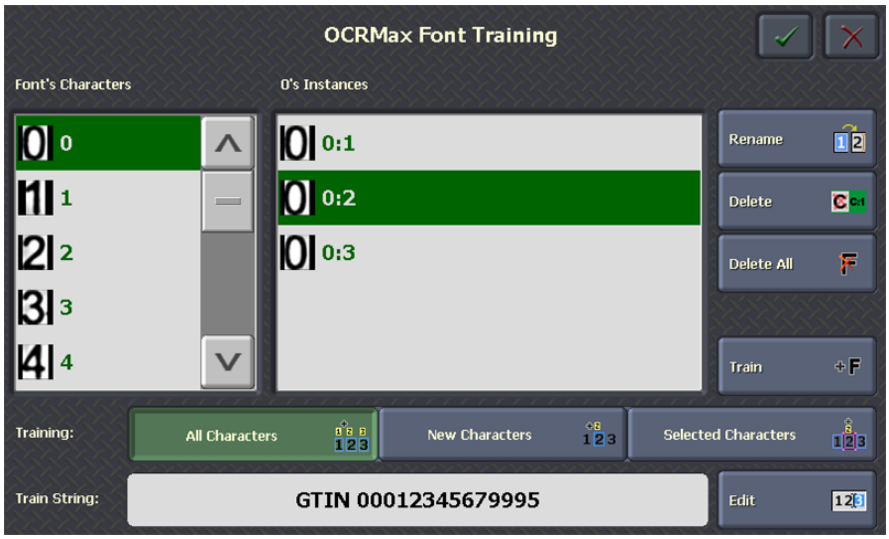

Figure 3-14: Open OCRMax Font Training Screen

4. If you have correctly trained the font using OCRMax Font Training, you will see labeled characters in **yellow** or **green** above the string in the main screen. Characters labeled in **yellow** means that the font training succeeded, but there is no string to match. Select the corresponding OCR line in the Verification screen, and all characters will be labeled in **green**. If font training fails, characters will be labeled in **red** with question marks.

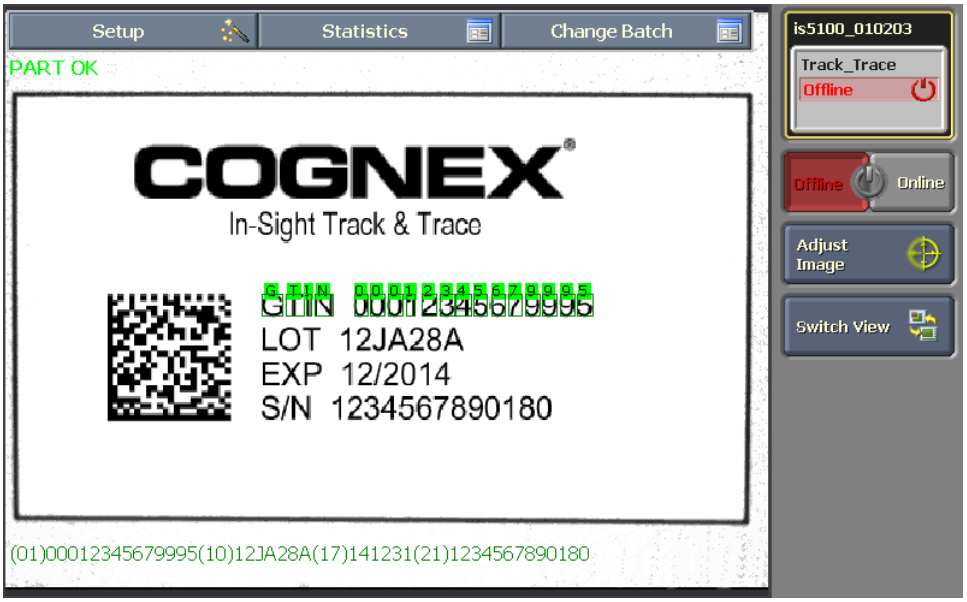

Figure 3-15: Training Result

Show & Go Font Training

1. Check the checkbox next to the **Train** button in Font #4 to enable the Show & Go font training.

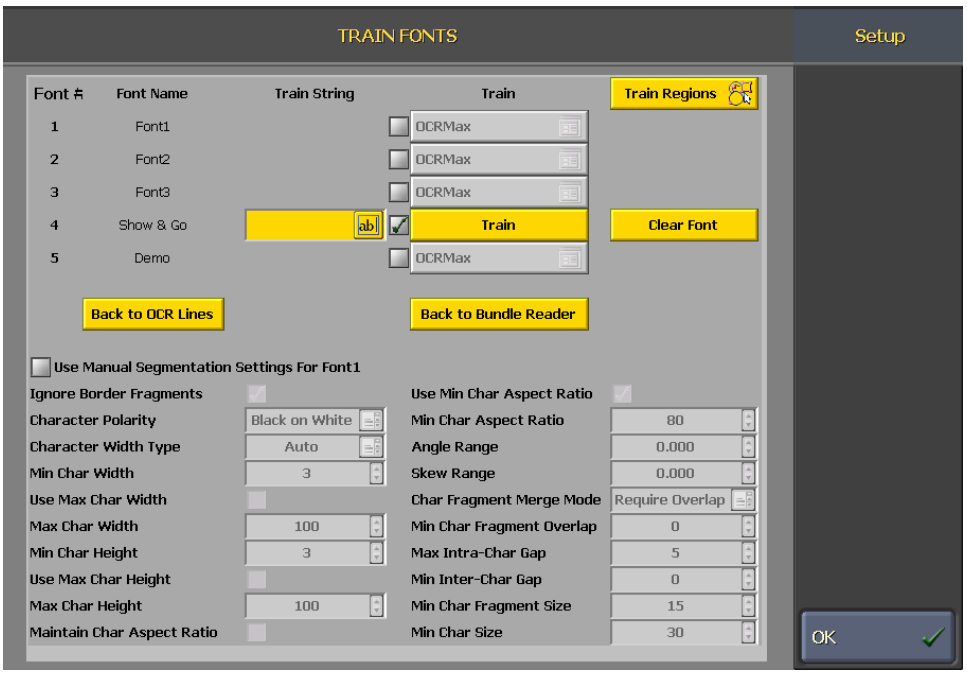

Figure 3-16: Enable Show & Go Font Training

2. Click the **Train Regions** button. If one or more fonts other than Show & Go are enabled, the Train Regions of all enabled fonts will be displayed and can be specified simultaneously in one screen. Specify the area of the image in which to locate characters that need to be trained, then click **OK**.

Note:

- The Show & Go region must be defined first before starting Show & Go font training. Otherwise clicking the Train button will return #ERR.
- When specifying the Train Regions, make sure that the train region is larger than the line of text by at least half a character width on all sides.
- If you choose to use Show & Go font training for several OCR lines, specify the region separately each time before training an OCR line.

Figure 3-17: Specify Show & Go Font Region

3. Click the **Train String** text box next to the Show & Go font name to open the on-screen keyboard, and enter the string that needs to be trained. The string entered should not contain any spaces. Click **OK** to close the on-screen keyboard.

Figure 3-18: Enter Show & Go Train String

4. After the string is entered, press the **Train** button to train the font.

> **Note**: When the **Train** button is pressed, the new font will be added to the previously trained fonts. If you want to clear all previously trained characters from the Show & Go font, click the **Clear Font** button.

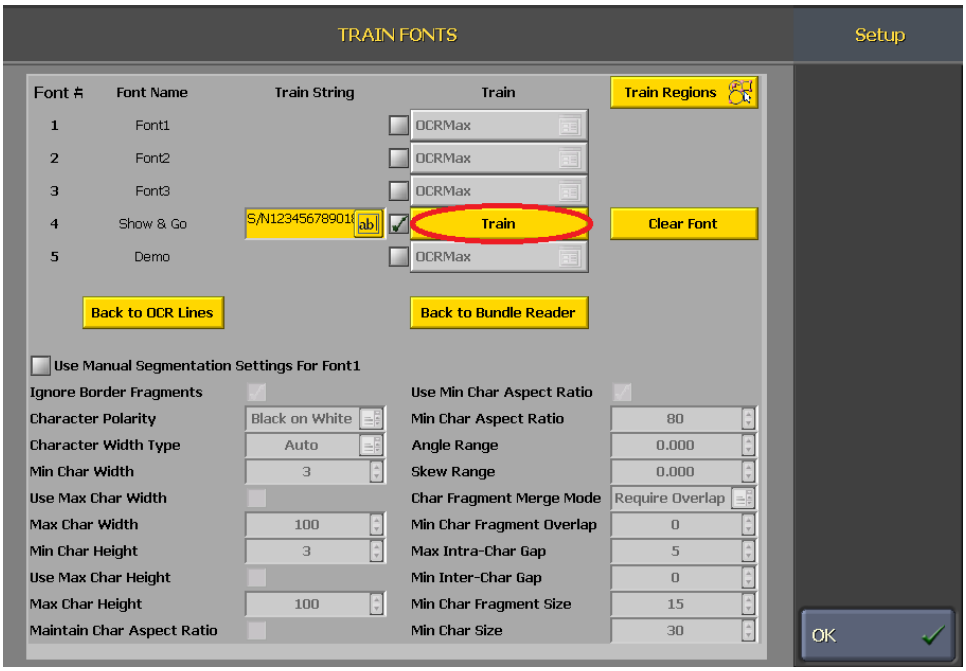

Figure 3-19: Train Show & Go Font

5. Click **OK** to go back to the main screen. If you have correctly followed the previous steps, you will see labeled characters in either **yellow** or **green** above the string. Characters labeled in **yellow** means that the font training succeeded, but there is no string to match. Select the corresponding OCR line in the Verification screen, and all characters will be labeled in **green**. If font training fails, characters will be labeled in **red** with question marks.

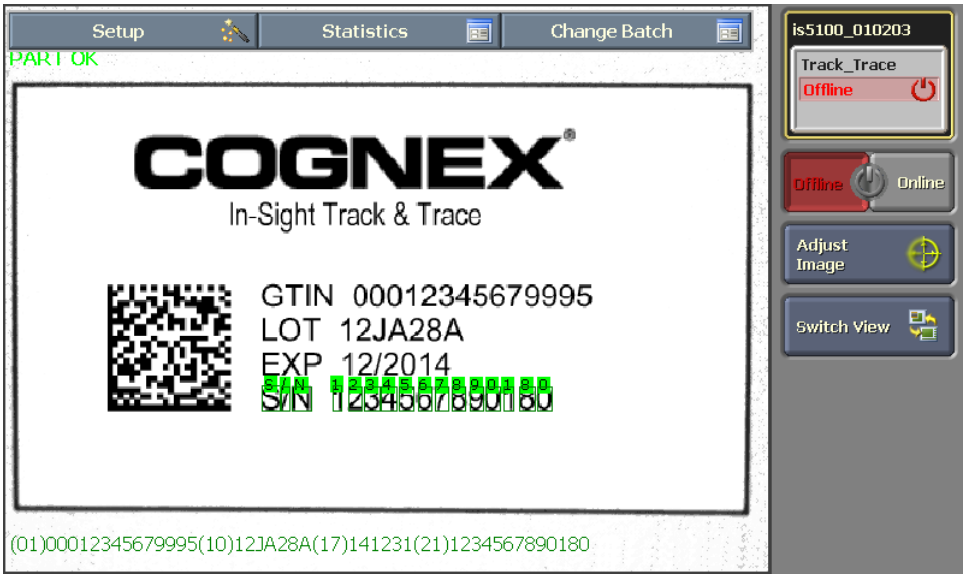

Figure 3-20: Show & Go Font Training Result

Back to OCR Lines

Click this button to go back to the OCR Lines screen.

Back to Bundle Reader

Click this button to go back to the Bundle Reader screen.

Use Manual Segmentation Settings For Font1

Check the **Use Manual Segmentation Settings For Font1** checkbox to adjust and modify the settings that segment characters in Train Regions.

Note: In order to use the **User Manual Segmentation Settings For Font1** function, Font1 needs to be enabled first.

- **Ignore Border Fragments**: Specifies whether or not the function will completely ignore any fragments that touch any border of the train region. Ignoring such fragments can be useful for non-text features, such as the edges of labels, that might be included within the train region. By the fault, the Ignore Border Fragments checkbox is enabled.

  Note: If a fragment extends from the border of the character region to the mainline of the text, the fragment will be considered to be a character. The fragment must not extend into the mainline of the text to be excluded when the checkbox is enabled.

- **Character Polarity**: Specifies the polarity of the characters in the train region. Black on White (dafault), White on Black or Auto.
- **Character Width Type**: Specifies how the widths of characters in the font are expected to vary. Auto (default), Fixed or Variable.
- **Min Char Width**: Specifies the minimum width of a character's character region, in pixels (1 - 1000; default = 3).
- **Use Max Char Width**: Check the checkbox to use the maximum allowable width of a character's character region.
- **Max Char Width**: Specifies the maximum allowable width of a character's character region, in pixels (1 - 5000; default = 100). This setting is only available when the Use Max Char Width is enabled.
- **Min Char Height**: Specifies the minimum height of a character's character region, in pixels (1 - 1000; default = 3).
- **Use Max Char Height**: Check the checkbox to use the maximum allowable height of a character's region.
- **Max Char Height**: Specifies the maximum allowable height of a character's character region, in pixels (1 - 5000; default = 100). This setting is only available when the Max Char Height is enabled.
- **Maintain Char Aspect Ratio**: Specifies whether or not to maintain the aspect ratio when re-sampling the unwrapped image at run-time.
- **Use Min Char Aspect Ratio**: Check the checkbox to use the minimum allowable aspect ratio of a character, where the aspect ratio is defined as the height of the entire line of characters, divided by the width of the character's region.
- **Min Char Aspect Ratio**: Specifies the minimum allowable aspect ratio (0 - 500; default = 80) of a character. This setting is only available when the Use Min Char Aspect Ratio is enabled.
- **Angle Range**: Specifies the angle search range (-90 to 90; default = 0), in degrees.
- **Skew Range**: Specifies the skew search range (-90 to 90; default = 0), in degrees.
- **Char Fragment Merge Mode**: Specifies how the function should merge character fragments when forming characters during segmentation. Require Overlap (default), Set Min Inter-Character Gap or Set Min Inter-Character/Max Intra-Character Gap.

- **Min Char Fragment Overlap**: Specifies the minimum fraction (0 - 100; default = 0) by which two character fragments must overlap each other in the X direction, in order for the two fragments to be considered as part of the same character.
- **Max Intra-Char Gap**: Specifies the maximum gap size, in pixels (0 - 1000; default = 5), that can occur within a single character, even for damaged characters.
- **Min Intra-Char Gap**: Specifies the minimum gap size, in pixels (0 - 1000; default = 0), that can occur between two characters.
- **Min Char Fragment Size**: Specifies the minimum number of foreground (i.e., text) pixels (0 - 1000; default = 15) that a fragment must have in order to be considered for possible inclusion in a character.
- **Min Char Size**: Specifies the minimum number of foreground (i.e., text) pixels (0 - 5000; default = 30) that a character must have in order to be reported.

Note: For detailed information on Font Training settings, see the OCRMax topic in the *In-Sight® Explorer Help* file.

DATE FORMAT Screen

Most standard ID codes format the date value as **YYMMDD**. However dates on pharmaceutical labels are often printed in a different format. The DATE FORMAT screen allows you to convert different date formats to the actual format that is printed on the label. This makes it possible to use the date information contained in a standard ID code as the match string for OCR lines of printed date information.

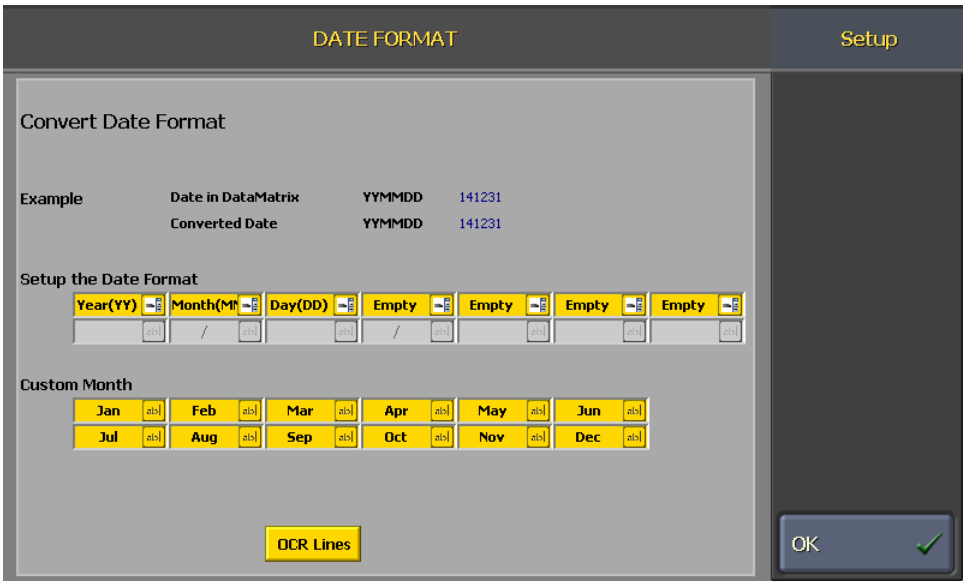

Figure 3-21: DATE FORMAT Screen

To convert a date to match the format of the text printed on your label, make selections from the **Setup the Date Format** lists to define the format of the date as it is printed on your label, including separator characters, punctuation and spacing. For reference, the auto-generated result is displayed in the **Converted Date** field.

- **Empty**: No date information will be included.
- **Year(YY)**: The two-digit year.
- **Month(MM)**: The two-digit month.
- **Cust(MM)**: The month, converted according to the entries in the **Custom Month** table. For example, if MM is “12”, the default Cust(MM) would be “Dec”. If needed, click on each entry in the Custom Month table to change the text for each month, for example “DEC” or “December” instead of “Dec”.
- **Day(DD)**: The two-digit day.
- **String**: User-definable text. This selection must be used when the printed date contains spacing or punctuation, or the year is printed in YYYY format (see the table below).

Using these above selections in various combinations, it is possible to convert a date to match the format of the date as it is actually printed on your labels.

Table 3-1: Date Conversion Examples

Printed Date Format	Date Format Selections						
MM/YY	Month(MM)	String “/”	Year(YY)	Empty	Empty	Empty	Empty
MM/YYYY	Month(MM)	String “/”	String “20”	Year(YY)	Empty	Empty	Empty
DD/MM/YYYY	Day(DD)	String “/”	Month(MM)	String “/”	String “/20”	Year(YY)	Empty
DD.MM.YY	Day(DD)	String”.”	Month(MM)	String “.”	Year(YY)	Empty	Empty
Month-YYYY	Cust(MM)	String “-“	String “20”	Year(YY)	Empty	Empty	Empty

COMMUNICATION Screen

Before Track & Trace can exchange data with MES software, a database or PLC, the appropriate settings must be configured in the COMMUNICATION screen.

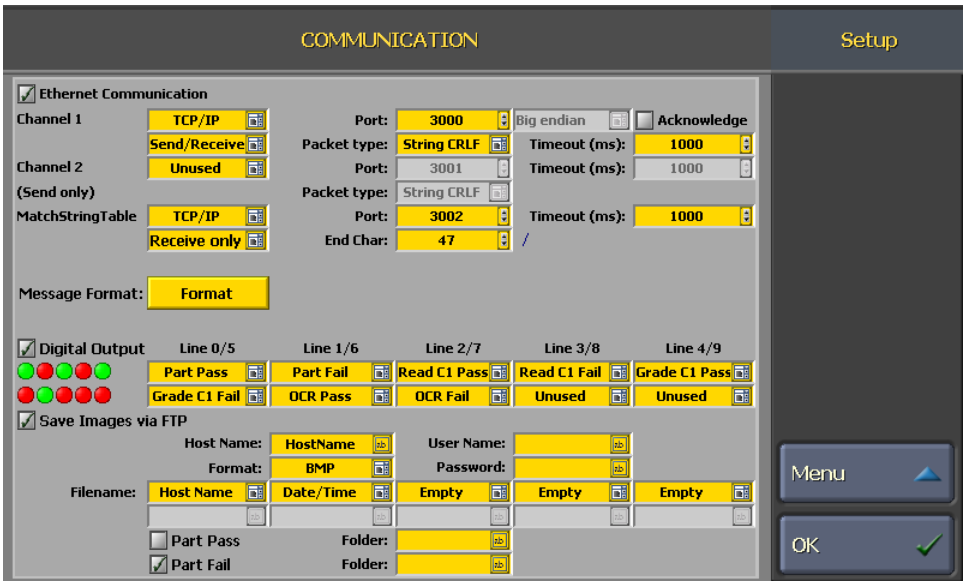

Figure 3-22: COMMUNICATION Screen

Ethernet Communication

Track & Trace can receive batch setup information and send out inspection results over Ethernet. Ethernet communication contains three channels: **Channel 1**, **Channel 2** (send only) and **MatchStringTable**. For each Ethernet communication channel, select the protocol that will be used to send or receive data. All three Ethernet communication channels support standard TCP/IP.

Channel 1

Supported protocols used to exchange data with the most commonly used PLCs are TCP/IP, EIP, PROFINET and Modbus TCP/IP. Additionally, Channel 1 can be set to **Unused** or to receive batch information using the **Native Mode** command, Send Message.

- When Modbus TCP/IP is the selected protocols for Channel 1, the byte order must also be selected. Choose **Big Endian**, **Little Endian**, **Big Endian (16-bit swap)**, or **Little Endian (16-bit swap)** to match the settings used by the remote device.
- When Native Mode is the selected protocol for Channel 1, the Acknowledge checkbox is disabled.

Note:

- The Send Message command must be issued in the format SM"[Batch Data]"0. Batch Data is user-defined in the *Message Format* screen. Example: SM"@1-00012345679995-10JA28A-121231-1234567890181/"0.
- If EIP, Profinet or Modbus is selected, after sending a message to the Track & Trace job, you should trigger Soft Event 1 manually.
- For more information on these communications protocols, see the Communications Reference topic in the *In-Sight® Explorer Help* file.

Channel 1 can be configured for **Receive only**, **Send only** or **Send/Receive**. When Channel 1 is set to **Receive only** or **Send/Receive**, check the **Acknowledge** checkbox to return a message acknowledgement to the sender, when a message is received with the correct input format. If a message is received with an incorrect input format, Track & Trace

will reply with a “FORMAT ERROR” message. In this case, verify that the format of the input string (as defined in the *Message Format* screen) matches that of the message is actually being received.

Port, Packet Type and Timeout: Configure the Port, Packet type, and Timeout settings to match the settings used by the devices with which Track & Trace is communicating.

Channel 2 (Send Only)

Channel 2 is used for sending data only. To activate Channel 2, choose the **TCP/IP** option.

Port, Packet Type and Timeout: Configure the Port, Packet type, and Timeout settings to match the settings used by the devices with which Track & Trace is communicating.

MatchStringTable

The MatchStringTable function allows the job to receive up to 500 match strings (ID code serial numbers) at once, with a maximum data size of 65,000 bytes over Ethernet.

Note:

- To optimize the usage of the MatchStringTable, it is recommended to send no more than 250 match strings per batch. Otherwise, reporting unmatched codes might be interrupted and not all unmatched codes will be reported.
- The strings are separated from each other with a separator character. The separator character can be edited in the *Message Format* screen.

The MatchStringTable supports one protocol: TCP/IP. To activate the MatchStringTable, choose the **TCP/IP** option.

If the **Receive Only** option is selected, the Track & Trace job will verify received strings, but the list of not verified strings will not be sent out. If the **Send/Receive** option is selected, the Track & Trace job will verify received strings, and the list of unverified strings will be sent out .

Note: If the **Receive Only** option is selected and the **MST No Matched** is one of the selected options for Digital Output, the Digital Output will signal that some of the ID codes are not verified.

Port, Packet Type and Timeout: Configure the Port, Packet type, and Timeout settings to match the settings used by the devices with which Track & Trace is communicating.

For use case on how to set up a MatchStringTable, see *Set Up the MatchStringTable* on page 36.

Set Up the MatchStringTable

The following instruction provides basic setup information for the MatchStringTable function.

1. Click the **Setup** button on the Track & Trace main menu, and click the **ID Code 1** button to open the ID CODE 1 screen.

   Note: Both ID Code 1 and ID Code 2 can be used with the MatchStringTable function. If you want to match strings with codes read as ID Code 2, use the ID Code 2 screen instead of ID Code 1 screen.

2. Specify the Name, Fixture, Region, Data Format, Code Type and other options in the ID Code 1 screen for the code, and click **OK**.
3. Open the COMMUNICATION screen from the Setup menu and enable the Ethernet Communication.
4. Select the **TCP/IP** option to activate the MatchStringTable, and click **OK**.
5. If you want to verify received strings without sending out the list of unverified strings, select the **Receive Only** option. If you want to verify received strings and send out the list of unverified strings, select the **Send/Receive** option.
6. Configure the Port, the string's End Character and Timeout settings to match the settings used by the devices with which Track & Trace is communicating.
7. Optionally, you can customize the Input Format or Output Format of the MatchStringTable by clicking the **Format** button in the COMMUNICATION screen. For more detailed information on Message Format, see *Message Format on page 37*.

   Note: Changing the Input Format or Output Format in the FORMAT screen will affect the format of all strings, including the strings being transferred via Channel 1 and Channel 2.

8. Enable the **Digital Outputs** and choose the output conditions for the selected lines to send MatchStringTable pass/fail conditions to a PLC, switch or other automation control. The MatchStringTable digital output options are MST Pass, MST Duplicate, MST Not Found and MST Not Matched. Select corresponding options according to your job's requirements.
9. After setting all communication options, click **OK** to exit the COMMUNICATION screen.
10. Open the VERIFICATION screen from the Setup menu.
11. Enable the ID Code 1 or ID Code 2, depending on which ID code you choose to match strings with.
12. Select **String Table** from the Serial Number Check list, and click **OK**.

    Note: Only one ID code can be used to verify the MatchStringTable. If both ID Code 1 and ID Code 2 are enabled, and String Table is the selected Serial Number Check type for both codes, only the ID Code 1 will be functional.

13. Click **OK** to exit the VERIFICATION screen and click **Finish** to go back to the main screen.
14. Switch to Online operation by clicking **Online** button in the main screen.

If you have correctly followed the previous steps, you can start to test the MatchStringTable function by sending batch strings via Ethernet and match those strings with ID codes. To optimize the usage of the MatchStringTable, it is recommended to send no more than 250 match strings per batch. Otherwise, reporting unmatched codes might be interrupted and not all unmatched codes will be reported.

Note: If the **End of Batch Character Before Data** checkbox in the FORMAT screen is checked and the new string with the first value of 1 is sent via Channel 1 , or the CHANGE BATCH button is manually pressed, all previously stored statistics will be reset to zero and all strings will be cleared. To get the unmatched code list from the last batch, send a "dummy" code (e.g., EndData) before the CHANGE BATCH button is pressed.

Message Format

From the COMMUNICATION screen, click the **Format** button to specify the starting, ending and separator characters included in input and output strings.

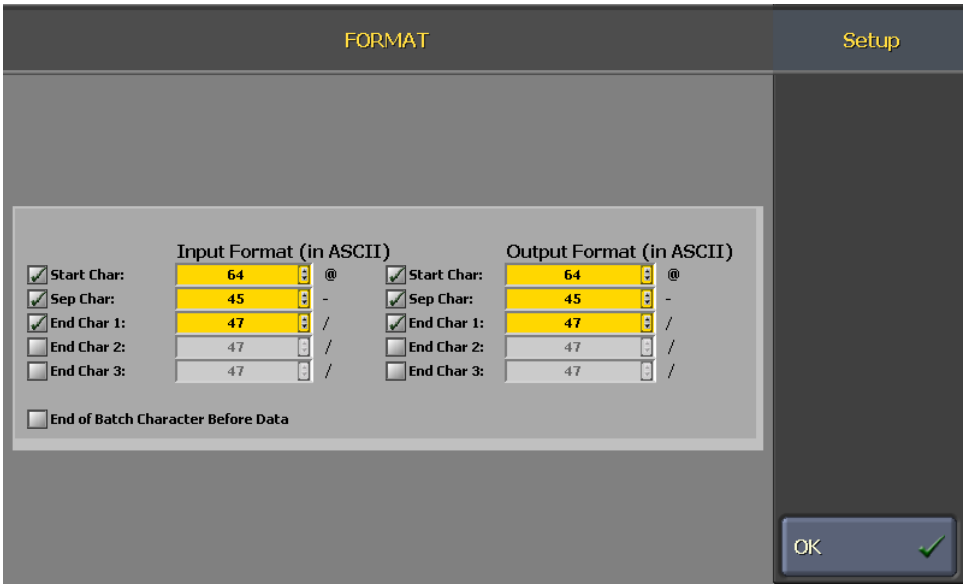

Figure 3-23: FORMAT Screen

Input Format

Specify the ASCII decimal values for the starting, ending and separator characters that will be included in the input string received by Track & Trace. The character values you select will depend on the format of the data at the output source (for example, your MES software or serialization database).

Note:
- The contents and order of the batch information that will be supplied to Track & Trace from a remote data source over Ethernet Channel 1 or MatchStringTable can be defined in the VERIFICATION screen.

Output Format

Specify the ASCII decimal values for the starting, ending and separator characters that will be used to format the output string.

Note:
- The contents and order of the outgoing inspection results can be defined in the OUTPUT screen.
- When String is one of the selected options in the OUTPUT screen and the Sep Char checkbox is enabled, a separator character is not appended to the text string.

End of Batch Character Before Data

When checked, the first part of the incoming string (before the first separator character) will be used as a new batch flag to indicate that the rest of the string received through Ethernet Channel 1 is a new batch for verification. The statistics will be created and reset when switching to a new batch. All stored strings will be cleared. The incoming Ethernet string will be automatically indexed from 0, so the Ethernet Slot in the VERIFICATION screen does not need to be changed manually.

Digital Outputs

Track & Trace allows up to 10 digital outputs to be used to signal pass/fail conditions to a PLC, switch or other automation control. The 10 outputs are represented along two rows, numbered Line 0 – 4 and Line 5 – 9. For each output line, select the pass/fail condition on which the output line will be activated.

Note: The number of available outputs depends on whether an In-Sight I/O module is connected to the vision system. Without an I/O module, the In-Sight 5000 series and the In-Sight Micro series vision systems have only two, built-in high speed outputs and the In-Sight 7000 series vision system has four, built-in high speed outputs. See your Cognex representative to increase the number of outputs available to your vision system using an In-Sight I/O module.

The available conditions are:

- **Unused**: The output will never be activated.
- **Part Pass**: The overall inspection passed.
- **Part Fail**: The overall inspection failed.
- **Read C1 Pass**: ID Code 1 was read successfully.
- **Read C1 Fail**: ID Code 1 could not be read.
- **Grade C1 Pass**: ID Code 1 passed the code quality inspection.
- **Grade C1 Fail**: ID Code 1 failed the code quality inspection.
- **Read C2 Pass**: ID Code 2 was read successfully.
- **Read C2 Fail**: ID Code 2 could not be read.
- **Grade C2 Pass**: ID Code 2 passed the code quality inspection.
- **Grade C2 Fail**: ID Code 2 failed the code quality inspection.
- **OCR Pass**: All of the enabled OCR Lines were successfully verified.
- **OCR Fail**: One or more of the enabled OCR Lines could not be verified.
- **Label Pos Pass**: The Label Position inspection passed.
- **Label Pos Fail**: The Label Position inspection failed.
- **Custom Part Pass**: The custom inspection passed.
- **Custom Part Fail**: The custom inspection failed.

  Note: The result of the Custom Part Pass/Fail will affect the final inspection result. If the result of the Custom Part Pass/Fail is **Fail**, the final inspection result will be **Fail**. When error occurs, the displayed message will be **Custom Error**.

- **OCR Line 1...6 Pass**: The specified OCR Line # was successfully verified.
- **OCR Line 1...6 Fail**: The specified OCR Line # could not be verified.
- **MST Pass**: ID Code serial numbers were successfully verified.
- **MST Duplicate**: The same ID Code serial number was verified more than one time.
- **MST Not Found**: One or more ID Code serial numbers were not found among stored serial numbers.
- **MST No Matched**: Not all ID Code serial numbers were verified.

  Note: The MST No Matched will signal a valid value only when a new batch of serial numbers arrive. Otherwise it will signal 0, indicating that no unmatched code was found.

- **Custom A1...3 Pass**:The specified custom alarm # indicates pass.
- **Custom A1...3 Fail**: The specified custom alarm # indicates fail.

Note: The result of the 3 Custom Alarms will NOT affect the final inspection result. Even if the result of the Custom Alarm is **Fail**, the job's final inspection result could be **Pass**.

Save Images via FTP

Check the **Save Images via FTP** checkbox to enable Track & Trace to transmit inspection images to a remote FTP server for archiving or offline failure analysis.

Host Name

Enter the host name (or IP address) of the FTP server on the network where the image files will be saved.

User Name, Password

Enter the login credentials for the FTP server where the image will be saved. The user does not need to exist on the vision system.

Format

Select BMP to save images in Windows bitmap format (.BMP extension). Select JPEG to save images in standard encoded format (.JPG extension).

Filename

Specify the format of the image filename by defining the contents of up to five fields.

- **Empty**: The field will not be used.
- **String**: The field will contain user-definable text.
- **Lot Number**: The field will consist of the lot number extracted from the GS1-standard ID code (if available).
- **OCR Line 1…6**: The Name of the selected OCR Line, as specified in the OCR LINES screen.
- **Date/Time**: The vision system date and time. Requires that the vision system is set up to have its time set by an SNTP server on the network.
- **MAC Address**: The unique identifier of the vision system.
- **Host Name**: The network name of the vision system.
- **Counter**: The 6-digit number of the last inspection, in nnnnnn format. When Counter is also a selection in the OUTPUT screen, this allows inspection results to be associated with the corresponding image.

Part Pass, Part Fail

Check **Part Pass** to save images from passed inspections. Check **Part Fail** to save images from failed inspections.

Folder

Specify the folder location on the FTP server where the images will be saved.

Note: For more information, see the WriteImageFTP topic in the *In-Sight® Explorer Help* file.

VERIFICATION Screen

The data contained in the ID code or OCR lines can be validated to ensure that it has been encoded according to either the GS1, the FDA serialized National Drug Code (sNDC) or the securPharm standard, and that the decoded data matches the data that is expected.

Note: The VERIFICATION screen can be accessed from the Setup Menu or the *CONFIRM CHANGE BATCH Screen*.

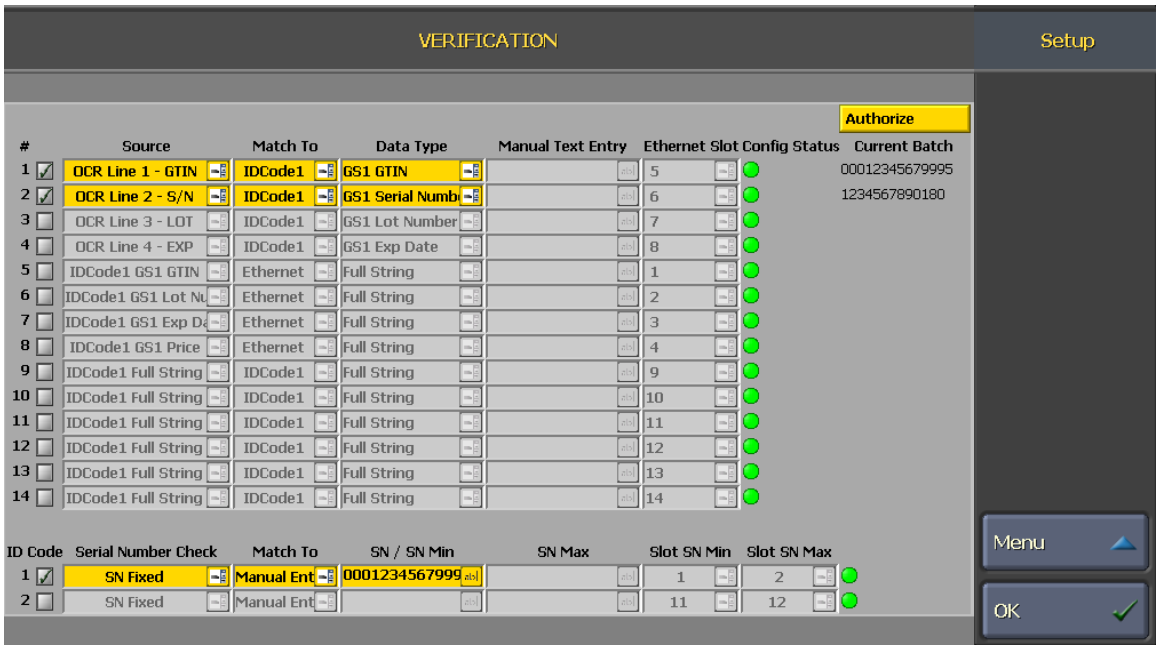

Figure 3-24: VERIFICATION Screen

Line Verification

Enable the checkbox next to each of the lines that will be configured to verify match strings. If the checkbox for a line is disabled, that line will not be included in the verification. By default, all checkboxes are disabled.

Source

Select the data Source that will be verified for each enabled verification line. The following items are available:

- **OCR Line 1 … OCR Line 6**
- **ID Code 1/ID Code 2 Full String**
- **ID Code 1/ID Code 2 GS1 GTIN**
- **ID Code 1/ID Code 2 GS1 Lot Number**
- **ID Code 1/ID Code 2 GS1 Exp Date**
- **ID Code 1/ID Code 2 GS1 Production Date**
- **ID Code 1/ID Code 2 GS1 Best Before**
- **ID Code 1/ID Code 2 GS1 Price**
- **ID Code 1/ID Code 2 sNDC NDC**
- **ID Code 1/ID Code 2 SP PPN**

- **ID Code 1/ID Code 2 SP Batch Number**
- **ID Code 1/ID Code 2 SP Exp Date**

If neither ID Code 1 nor ID Code 2 contains GS1, sNDC or securPharm-compliant data, select **ID Code 1/ID Code 2 Full String** as the data Source. In this case, the entire string contained in the ID code will be verified.

Match To

Every verification line must have a match string to specify the characters to match during the inspection. The match string for all verification lines can be from the same Source, or verification lines can have different data types.

- **ID Code 1** or **ID Code 2**: The match string for the verification line is contained in the specified ID code. A **Data Type** must be selected to automatically extract the corresponding data from the ID code.
- **Manual Entry**: The match string for the verification line will be typed into the Manual Text Entry field.
- **Ethernet**: The match string for the verification line will be received over the network from the MES or database. Ethernet Channel 1 must be configured in the *COMMUNICATION Screen*, and the input string must be defined in the *Message Format* screen.

Data Type

If the Match To option is configured to either ID Code 1 or ID Code 2 and the ID code contains GS1, sNDC or securPharm data, Track & Trace will automatically extract the match string from the ID code according to the data type you choose. Select the corresponding data type from the following list:

- **Full String**
- **GS1 - GTIN**
- **GS1 - Lot Number**
- **GS1 - Exp Date**
- **GS1 - Production Date**
- **GS1 - Best Before**
- **GS1 - Serial Number**
- **GS1 - Price**
- **CIP13**
- **sNDC NDC**
- **sNDC Serial Number**
- **SP PPN**
- **SP Batch Number**
- **SP Exp Date**
- **SP Serial Number**

Note:

- Select **Full String** if neither ID Code 1 nor ID Code 2 contains GS1, sNDC or securPharm-compliant data. In this case, the entire string contained in the ID code will be used as the match string for the verification line.
- Select the **CIP13** when the ID code contains a GS1 GTIN, but the printed text is in the CIP13 format. The CIP13 Data Type will automatically strip the leading 0 from the GTIN so that it can be used as the match string for the printed CIP13.
- The Data Type will be ignored if the Match To option is configured to either Manual Entry or Ethernet.

Manual Text Entry

If the Match To option is set to **Manual Entry**, the Manual Text Entry field will be enabled. Click on the field to open the on-screen keyboard and enter the match string.

Ethernet Slot

If the Match To option is set for **Ethernet**, the **Ethernet Slot** will be enabled. Select the Ethernet Slot (1 - 14) from which the match string will be received.

Current Batch

For each enabled verification line, the current match string will be displayed under the Current Batch column if it can be determined. A blank Current Batch for a verification line indicates that the match string cannot be determined for one of the following reasons:

- The Match To option is set to **ID Code 1** or **ID Code 2**, but the code cannot be read. Go to the appropriate ID CODE screen and verify that the settings are correct.
- The Match To option is set to **Manual Entry**, but the match string has not yet been entered in the Manual Text Entry field.
- The Match To option is set to **Ethernet**. The match string will be updated after a batch changeover has been initiated.

ID Code Serial Number Verification

When the ID code Data Format is GS1, sNDC or securPharm and the ID code contains a serial number (for example, GS1 Application Identifier 21), the serial number can be checked to ensure that it is valid for the current batch.

ID Code

Enable the checkbox next to the ID code number. If the checkbox for an ID code is disabled, that ID code serial number will not be included in the verification. By default, all checkboxes are disabled.

Serial Number Check

Select the type of serial number check from the list:

- **SN Fixed**: The serial number contained in the ID code must match a known serial number. The match string will be received over Ethernet from the MES or serialization database, or entered manually in the SN/SN Min field, depending on the current Match To selection.
- **SN Different Than Previous**: The serial number in the current inspection must be different than the serial number that was read in the previous inspection.
- **SN Within Range**: The serial number must be included within a defined range of values. The minimum and maximum values for the range will be received over Ethernet from the MES or serialization database, or entered manually in the SN/SN Min box, depending on the current Match To selection.

  Note: The SN Within Range option works for numerical values only. The minimum and maximum values for the range do not allow alphabetical values.

- **String Table**: The serial number must match one of the serial numbers in a batch of ID code serial number strings. The match strings (up to 500 strings) will be received over Ethernet from TCP/IP. MatchStringTable must be enabled and configured in the *COMMUNICATION Screen*. The input string must be defined in the *Message Format* screen.

Match To

The data contained in the ID code can be compared to a known data string or a batch of strings. If the decoded data does not match the expected data, the inspection will fail.

- **Manual Entry**: The match string needs to be typed in when a new batch is initiated.
- **Ethernet**: The match string will be received over the network from the MES or a serialization database. Ethernet Communication Channel 1 must be configured in the *COMMUNICATION Screen*, and the input string must be defined in the *Message Format* screen.

SN/SN Min & SN Max

If the Match To option is configured to Manual Entry, and the Serial Number Check is set to SN Fixed, the **SN/SN Min** field will be enabled for entering string manually.

If the Match To option is configured to Manual Entry, and the Serial Number Check is set to SN Within Range, both the **SN/SN Min** and **SN Max** fields will be enabled. Click on each field to open the on-screen keyboard and enter the lowest serial number value allowed in **SN/SN Min** and the highest serial number value allowed in **SN Max**.

Slot SN Min & Slot SN Max

If the Match To option is configured to Ethernet, and the Serial Number Check is set to SN Fixed, the **Slot SN Min** filed will be enabled. Select the Ethernet slot (1 - 14) from which the match string will be received.

If the Match To option is configured to Ethernet, and the Serial Number Check is set to SN Within Range, both the **Slot SN Min** and **Slot SN Max** fields will be enabled. Click on the **Slot SN Min** to select the Ethernet slot (1 - 14) from which the lowest serial number value will be received and the **Slot SN Max** to select the Ethernet slot (1 - 14) from which the highest serial number value will be received.

Configuration Status

The Config Status LED indicates whether the configuration is correct (in green) or not (in red).

Note: The Config Status LED does not indicate the result of the verification.

The following list shows possible error conditions that would turn Config Status LED to red.

- When an OCR Line is selected in Source column, but the corresponding OCR line is not enabled in the OCR LINES screen.
- When an ID code related code part is selected in Source column, but the corresponding ID code is not enabled in the ID CODE screen.
- When a code part selected in the Source column does not match the Data Format selected in the corresponding ID CODE screen. For example, if the code part selected in the Source column is **IDCode1 GS1 GTIN** but the Data Format selected in ID CODE 1 screen is **securPharm (strict)**, the Config Status LED will be red.
- When Ethernet is selected in Match To column, but the Ethernet Communication is not enabled, the Channel 1 is **Unused** or its direction is set to **Send Only** in the COMMUNICATION screen.
- When the data format of a code selected in the Source column does not match the data type selected in the Data Type column. For example, if the code part selected in the Source column is **IDCode1 GS1 Exp Date** but the data type selected in the Data Type column is **SP Exp Date**, the Config Status LED will be red.
- For serial number verification, when **Ethernet** is selected in the Match To column but the Ethernet Communication is not enabled or Channel 1 is set to **Unused** or its direction is set to **Send Only** in the COMMUNICATION screen.
- For serial number verification, when **String Table** is selected in the Serial Number Check column but the Ethernet Communication is not enabled in the COMMUNICATION screen.

Authorize

To use the Authorize function, the Authorize option in the *ON-SCREEN DISPLAY Screen* must be set to either **Authorize-Only** or **Double-Blind**. When the Authorize-Only option is used, User 1 (typically an operator) makes changes and User 2 (typically a supervisor) verifies the changes. When the Double-Blind option is used, User 1 makes changes and User 2 is required to re-enter the changes made by User 1.

Note:

- The Authorize button does not work if the Authorize option in the ON-SCREEN DISPLAY screen is set to **None**.
- The authorization works only for the Manual Text Entry, the SN/SN Min and SN Max options.
- If User 1 has a Locked Access level, authorization is disabled.
- User 2 must be different than User 1 and have a Full access level. The default In-Sight *admin* user account has Full access.
- For more information on the Authorize function and Audit Messages, refer to the *In-Sight® Explorer Help* file.

Authorize-Only

Click the **Authorize** button to open the on-screen keyboard and manually enter the user name and password.

Figure 3-25: Enter the User Name

If the authorization level is set to **Authorize-Only**, the value entered by User 1 is displayed in the Authorize screen.

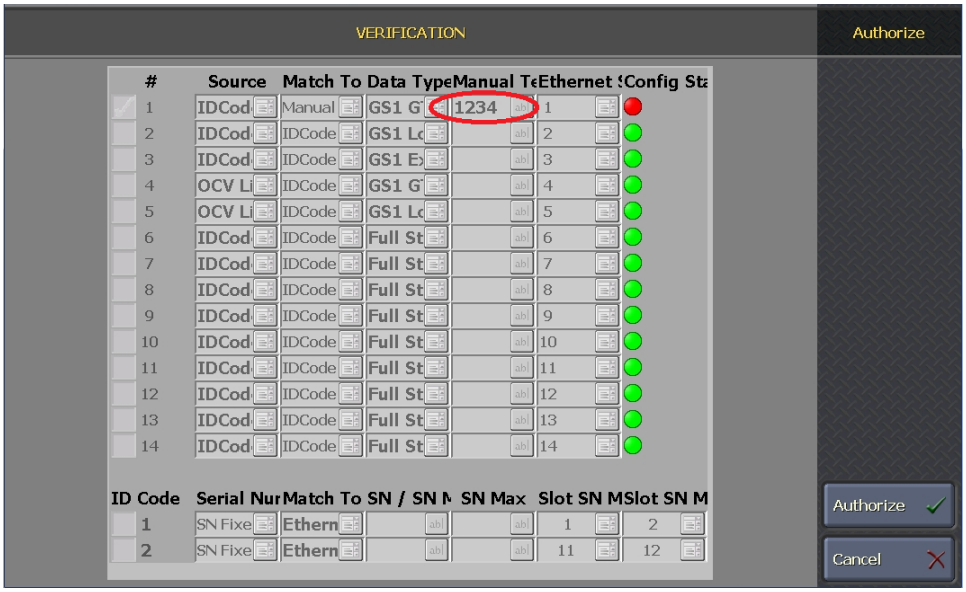

Figure 3-26: Authorize Screen (Authorize-Only)

If User 2 determines the new value is correct and clicks the **Authorize** button, the change is authorized. If User 2 determines the new value is incorrect and clicks **Cancel**, the change is not authorized.

Double-Blind

If the authorization level is set to Double-Blind, after the Authorize button is clicked, the field where User 2 needs to re-enter the value will be highlighted in the Authorize screen. When using Double-Blind authorization, the new value entered by User 1 is hidden in the Authorize screen (the last authorized values are displayed), and any interactive controls that are not supported by the Authorize function are disabled.

In following example, the new value "6789" entered by User 1 is hidden. The last authorized value "1234" is displayed.

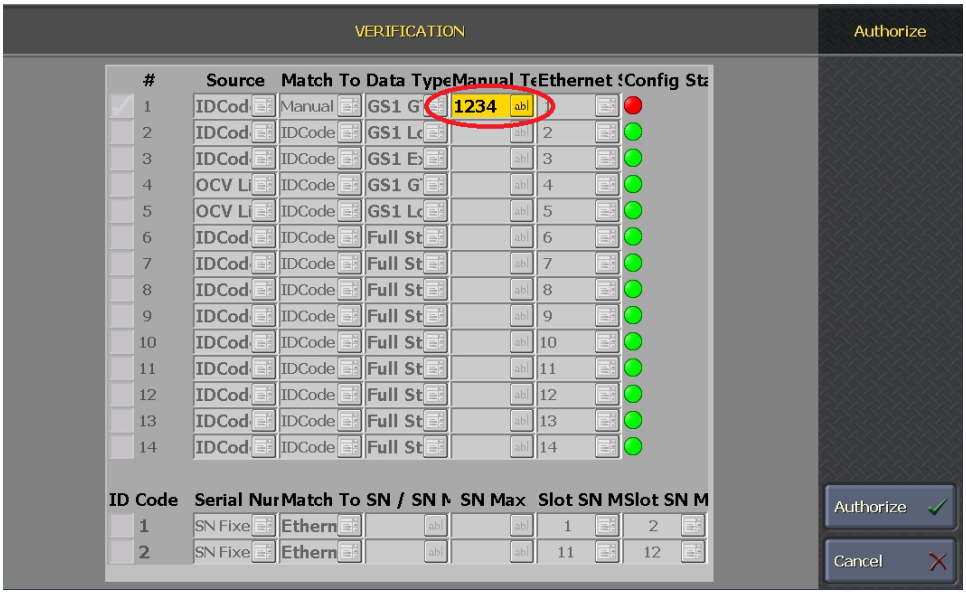

Figure 3-27: Authorize Screen (Double-Blind with Last Authorized Value)

Click on the highlighted field to open the on-screen keyboard. Manually enter the string and then click **OK**.

Figure 3-28: Enter String

The new value will show in the highlighted field.

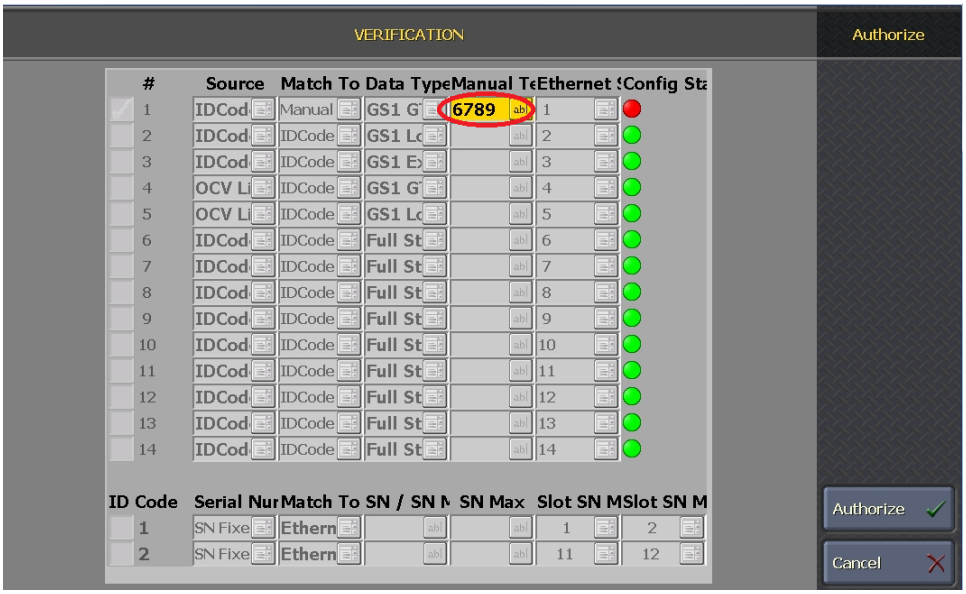

Figure 3-29: Authorize Screen (Double-Blind with New Value)

If User 2 clicks the **Authorize** button, the change is authorized. If User 2 clicks **Cancel**, the change is not authorized.

Note: If User 2 enters one or more incorrect values and authorization fails, the Authorize dialog appears again. In this case, the value entered by User 2 is displayed in the dialog. If User 2 attempts the Double-Blind authorization again, User 2 must re-enter User 1's value to have a successful authorization.

BUNDLE READER Screen

Track & Trace can read up to 128 ID codes from one image and match each ID code with a maximum of four OCR lines. The BUNDLE READER screen also allows the user to specify the search region for ID codes and up to four OCR lines simultaneously.

Note:

- The ID codes read in the BUNDLE READER screen can be matched only with the OCR lines next to each ID code in the BUNDLE READER screen.
- The bundle reader results can be sent out only via channel 1. Before using the BUNDLE READER, the Ethernet Communication Channel 1 must be enabled and properly configured in the *COMMUNICATION Screen*. The communication mode should be set to **TCP/IP** and the communication direction should be set to **Send Only** or **Send/Receive**.

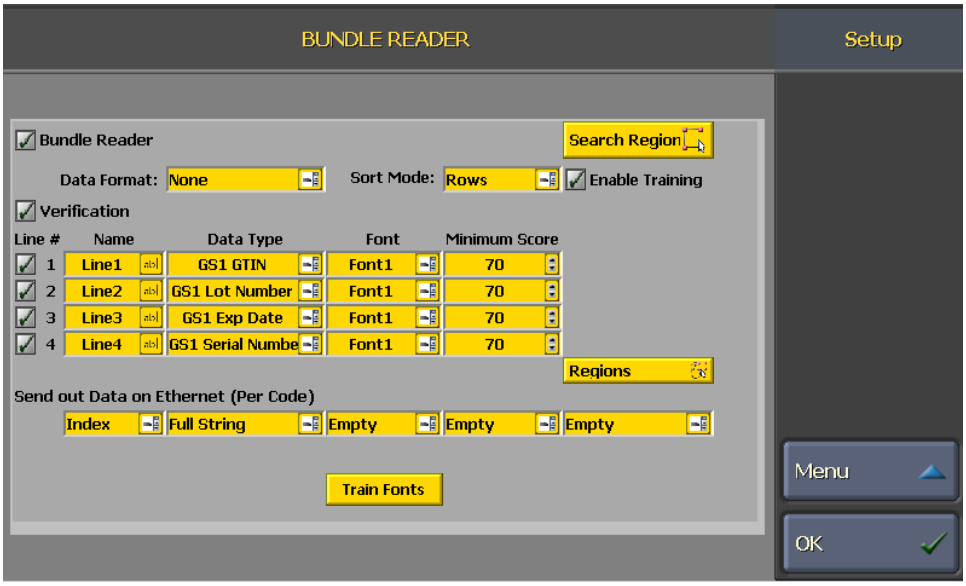

Figure 3-30: BUNDLE READER Screen

Bundle Reader

Click the **Bundle Reader** checkbox to enable the Bundle Reader. By default, the checkbox is disabled.

Note: Before the Bundle Reader is enabled, an image with at least one ID code should be loaded.

Data Format

Select the type of Data Format for ID codes.

- None
- GS1
- securPharm (strict)
- securPharm (loose)

Note: For more detailed information on the ID code Data Format, see ID code *Data Format* on page 19.

Search Region

Click the **Search Region** button to specify the area where all ID codes will be searched.

Note: At least one ID code should be in the search region, otherwise the Bundle Reader will fail.

Sort Mode

Select the type of ID code reading mode.

- None: Sorts by first decoded results. Any undecoded results will follow decoded results.
- Top Down: Sorts in ascending Row order.
- Left To Right: Sorts in ascending Column order
- Alphabetical: Sorts the results alphabetically.
- String Length: Sorts the results by string length (shortest to longest).
- Rows (default): Sorts the results by grouping the symbols into rows, and then sorting them from left-to-right within each row. When sorting by Rows, two symbols will be considered part of the same Row if the center of one symbol overlaps vertically with any part of the other symbol.
- Columns: Sorts the results by grouping the symbols into columns, and then sorting them from top-to-bottom within each column. When sorting by Columns, two symbols will be considered part of the same Column if the center of one overlaps horizontally with any part of the other symbol.

Enable Training

Check the **Enable Training** checkbox to train a model of the first symbol read. Trained information is retained until this checkbox is disabled. To retrain a symbol, disable the checkbox, then enable the checkbox again.

Note: It is recommended to have only one symbol in the Region when training is enabled.

Verification

Check the **Verification** checkbox to enable OCR line verification of each ID code. By default, the checkbox is disabled.

Note: The ID codes read in the BUNDLE READER screen can be matched only with the OCR lines next to each ID code.

Line

Enable the checkbox next to each of the applicable OCR line numbers. By default, all checkboxes are disabled.

Name

Click on the field to open the on-screen keyboard, and enter a name reference for the OCR line. By default, it is named by the line numbers (e.g., "Line 1", "Line 2", etc.).

Data Type

Click on the **Data Type** field to choose which data type of the match string will be extracted from the ID code and matched with OCR lines. The available data types are:

- **Full String**
- **GS1 - GTIN**
- **GS1 - Lot Number**
- **GS1 - Exp Date**
- **GS1 - Production Date**

- **GS1 - Best Before**
- **GS1 - Serial Number**
- **GS1 - Price**
- **SP PPN**
- **SP Batch Number**
- **SP Exp Date**
- **SP Serial Number**

Select **Full String** if the ID codes do not contain GS1 or securPharm-compliant data. In this case, the entire string contained in the ID code will be used as the OCR line match string.

Font

Select the font to use for each OCR line. Track & Trace supports up to five fonts in a single job, and there is no requirement that the same font be used for all lines.

Note: The Track & Trace job includes a pre-trained font (Font #5, Demo), which is designed to work with the sample images included with Track & Trace. In most cases, however, you should train your own font using actual samples of your labels or packages as they will be marked during manufacturing. For instructions on training and editing fonts, see *TRAIN FONTS Screen* on page 26.

Train Fonts

Click the **Train Fonts** button to train and edit fonts in the TRAIN FONTS screen. For instructions on training and editing fonts, see *TRAIN FONTS Screen* on page 26.

Minimum Score

Specify the minimum score that each line must receive for the verification to pass. (0 - 100; default = 70).

Regions

Click the Regions button to define the area of the image in which to locate OCR lines. Users can select and modify the regions of all selected OCR lines simultaneously in one screen.

Note: The OCR line regions should be specified relative to the first found ID code.

Figure 3-31: Specify Bundle Reader OCR Line Regions

Send out Data on Ethernet (Per Code)

After reading all the ID codes, the Bundle Reader tool will send out data via Ethernet. The output string can contain up to five data items, in any order:

- **Empty**: No data will be included at this position.
- **Index**: The index number of the currently processed or verified ID code.
- **Match Result**: Result of the ID code validation.
- **Full String**: Select **Full String** to include the entire ID code as a string.
- **Line 1...4**: Includes the data from selected line.
- **Match Line 1...4**: Result of the selected line validation.

Note:

- If the Verification checkbox is not checked, only the Empty, Index and Full String options can be used in the output string.
- The output string will be sent out on the TCP port specified in *COMMUNICATION Screen* (Ethernet Communication Channel 1 only) for each code.

OUTPUT Screen

The Output screen defines the data contents and order of the result string that Track & Trace sends out over Ethernet after each inspection.

Note: If the Ethernet Communication Channel 1 is set to **Send** or **Send/Receive** and Channel 2 is enabled, the output string will be transmitted on both channels.

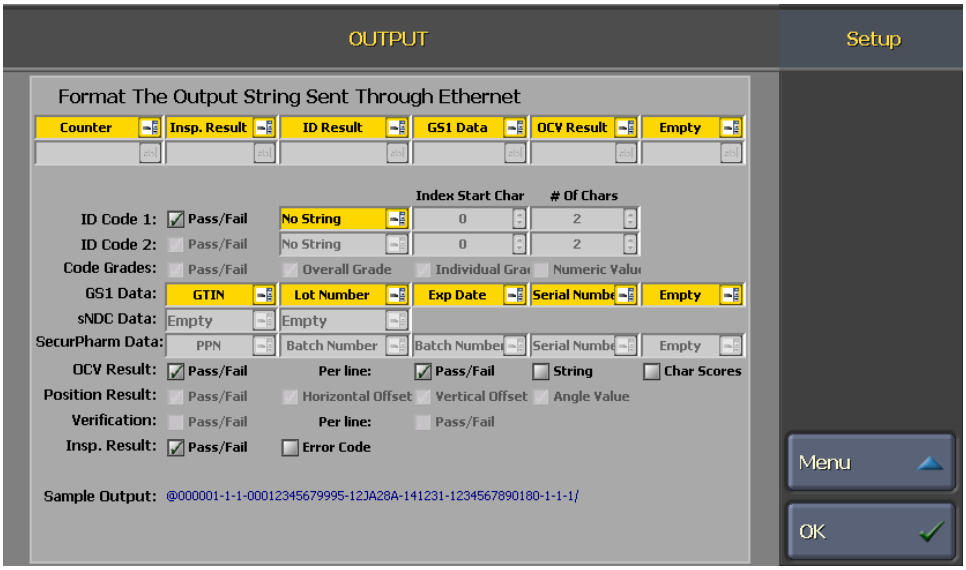

Figure 3-32: OUTPUT Screen

Data Groups

The output string can include data from up to six different sets of inspection results. Enable the data groups by selecting them from the six lists at the top of the OUTPUT screen, in the order (from left to right) you want the data to appear in the output string. The available data sets are:

- **Empty**: No data will be included at this position.
- **String**: Prepends a user-defined text string to the succeeding data in the output string.

  Note: When **String** is selected and the **Sep Char** checkbox is enabled in the *Message Format* screen, a separator character is not appended to the text string. For example, if **String** "Test", **Counter** (with a current value of "000000") and **Insp.Result** are the selected Data Groups and the **Sep Char** checkbox is enabled, the Sample Output would be "Test000000-1".

- **Insp. Result**: Outputs a 1 if the overall inspection passed, or a 0 if the inspection failed.
- **ID Result**: Includes pass/fail and read results for ID Code 1 and ID Code 2.
- **2D Code Grade**: Includes DataMatrix code quality grading results for ID Code 1.
- **GS1 Data**: Includes the values for the GS1 data encoded in the ID codes.
- **OCR Result**: Includes results for all enabled OCR lines.
- **Position Result**: Includes label position inspection results, if enabled.
- **Counter**: Includes the 6-digit number of the last inspection, in nnnnnn format. The Counter is equal to the total number of inspections that have been performed since the start of the current batch. The counter will

automatically reset to "000001" when a new batch has been initiated, or if the maximum of 999999 is reached in the current batch.

- **Custom**: Includes user-defined data in the output string. The custom data can be defined in cell A3 of the Track & Trace job file.
- **sNDC**: Includes the values for the sNDC data encoded in the ID codes.
- **Verification**: Includes the values for verification results.
- **securPharm**: Includes the values for the securPharm data encoded in the ID codes.

Note: ID Code 1 must be used for codes that contain GS1, sNDC or securPharm data. If ID Code 2 is used for GS1, sNDC or securPharm data, and **GS1 Data**, **sNDC Data** or **securPharm** is a selected Data Group, the data will not appear in the output string.

Inspection Results

As described in the preceding section, the inspection results that are available to be included in the output string depends on which data groups have been selected.

ID Code 1/ ID Code 2

If ID Result is one of the selected data groups, and either or both of the ID Code 1 and ID Code 2 inspection results are enabled, depending on which ID codes are enabled. Inspection results for each ID code are configured separately.

Enable the **Pass/Fail** checkbox to send the result of the ID Code read. The result will be 1 if the ID code was read successfully and 0 if the ID code could not be read.

All or part of the ID Code read result can be included in the output string. Select **Full String** to include the entire read result in the output. Select **Partial String** to transmit a substring. If Partial String is selected, the starting and ending position of the substring must be defined:

- **Index Start Char**: Specify the position in the Full String of the first character of the substring. For example, if the Full String is of the format **nnnnnnaaa** and you want to output only the alpha characters, the Index Start Char would be 6 because the first alpha character is the 7th character in the Full String (indexing starts at 0).
- **# of Chars**: Specify the number of characters to include in the Partial String. In the previous example of the string **nnnnnnaaa**, the # of Chars would be 3 to include all of the alpha characters.

Code Grades

If one of the selected Data groups includes 2D Code Grade, the Grading inspection results for ID Code 1 are enabled.

Note: Grading inspection results for ID Code 2 cannot be included in the output string.

Check the **Pass/Fail** checkbox to send the result of the ID Code 1 Grading inspection. The result will be **1** if the overall grade for the ID Code 1 Grading inspection meets or exceeds the Minimum Grade. The result will be **0** if the overall grade for the Grading inspection falls below the Minimum Grade.

Check **Overall Grade** to include the overall letter grade (A – F) for the Grading inspection.

Check **Individual Grades** to include the letter grade (A – F) for each of the 9 quality metrics measured during the Grading inspection. The Individual Grades are concatenated in the following order:

- Contrast
- Fixed Pattern Damage
- Modulation
- Grid Non-uniformity

- Horizontal Growth
- Vertical Growth
- Non-Uniformity
- Unused Error Correction
- Reference Decode

Check **Numeric Values** to include the actual measurements on which the individual quality metrics are graded, in the form n.nnn.

Note: For information on how the quality metrics are measured and graded, refer to the Verifying Symbol Quality topic in the *In-Sight® Explorer Help* file.

GS1 Data

If one of the selected data groups includes GS1 Data, the output string can contain the values for up to five GS1 Data items, in any order you choose:

- GTIN
- Lot Number
- Production Date
- Best Before
- Exp Date
- Serial Number
- Price

sNDC Data

If one of the selected data groups includes sNDC Data, the output string can contain the values for up to two sNDC Data items, in any order you choose:

- sNDC - NDC
- sNDC - Serial Number

securPharm Data

If one of the selected data groups includes securPharm Data, the output string can contain the values for up to five securPharm Data items, in any order you choose:

- PPN
- Batch Number
- Exp Date
- Serial Number
- Production Date
- GTIN

OCR Result

If OCR Result is one of the selected data groups, the output string can contain OCR inspection results. Check the first **Pass/Fail** checkbox to include the overall OCR inspection result in the output string. The result will be **1** if all of the individual OCR line inspections pass. The result will be **0** if one or more OCR line inspections fail.

To include inspection results for each of the individual OCR lines:

- Check the **Per Line: Pass/Fail** checkbox to include the inspection results for each OCR line. For each OCR line, the result will be **1** if the inspection passes. The result will be **0** if the inspection fails.
- Check the **String** checkbox to include the match string that was used for each OCR line inspection. If checked, the String will follow the Pass/Fail result for the OCR line in the output string.
- Check the **Char Scores** checkbox to include the match scores (00 – 99) at each character position, for each OCR line. If checked, the Char Scores will follow the Pass/Fail and String results in the output string.

Position Result

If Position Result is one of the selected data groups, the output string can contain the Label Position inspection results. Check the first **Pass/Fail** checkbox to include the Label Position inspection result in the output string. The result will be **1** if the label position is within the tolerances specified in the LOCATION TOOLS screen. The result will be **0** if the vertical or horizontal position of the label or the label rotation is outside of the specified tolerances.

To include the actual label position data in the output string:

- Check the **Horizontal Offset** checkbox to include the image pixel row at which the label edge was located.
- Check the **Vertical Offset** checkbox to include the image pixel column at which the label edge was located.
- Check the **Angle Value** checkbox to include the angle of rotation for the label in the image.

All label position data is in the form **nnnn.nn**.

Verification

If Verification is one of the selected data groups, the output string can contain the verification result.

- Check the **Pass/Fail** checkbox to send the result of the data verification. The result will be **1** if the general verification passes, or if none of the verification lines are enabled in the VERIFICATION screen. The result will be **0** if the general verification fails.
- Check the **Per Line: Pass/Fail** checkbox to include the inspection results for each of the individual verification lines. The result will be **1** if the verification passes. The result will be **0** if the verification fails.

Insp. Result

If Insp. Result is one of the selected data groups, the output string can contain the overall Track & Trace inspection result, and for failed inspections, an error code to indicate the failure cause.

- Check the **Pass/Fail** checkbox to include the overall inspection result in the output string. The result will be **1** if all of the individual inspections pass. The result will be **0** if one or more of the individual inspections fail.
- Check the **Error Code** checkbox to include a numeric identifier in the output string when the inspection fails. The Error Code is a 6-digit counter in the form of **nnnnnn**. Every failed inspection will increment the counter by one. The Error Code resets to 000000 when a new batch is initiated. The Error Code is always **000000** for passed inspection results.

ON-SCREEN DISPLAY Screen

The ON-SCREEN DISPLAY screen is used to select the language of the user interface, specify the image display update frequency, and to configure the informational graphics and text that will be displayed on top of the image. The graphics and text displayed on the image will be the same for every user, regardless of their Access Level or permissions.

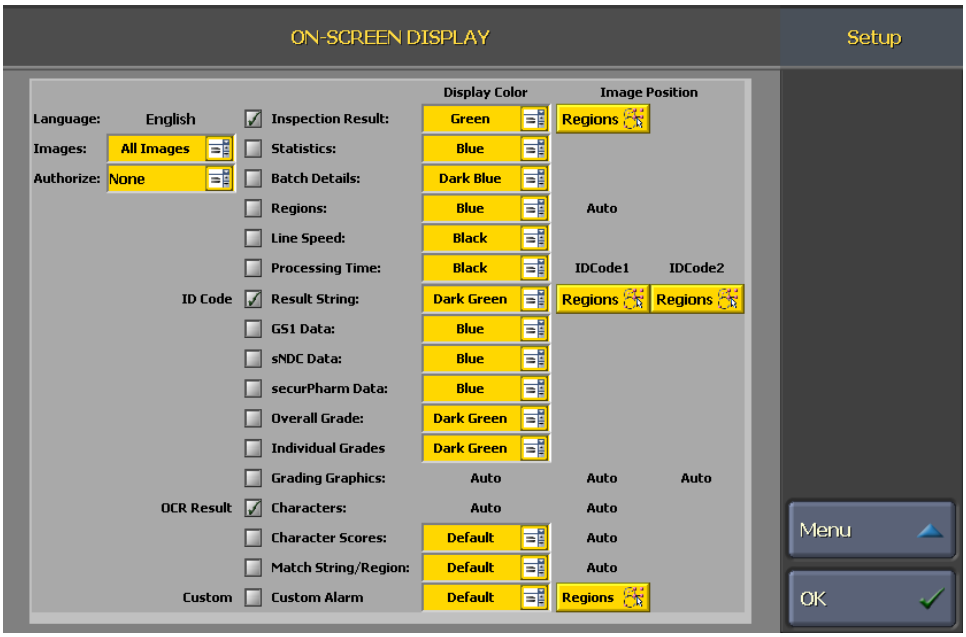

Figure 3-33: ON-SCREEN DISPLAY Screen

Language

Displays the language currently used in the Track & Trace job. The language can be changed using the In-Sight Track & Trace Configuration Utility. See *Set Up the Language* on page 9 for details.

Images

By default, Track & Trace will attempt to display every image that is acquired (although some images may not be displayed if the acquisition rate is very high). To reduce network traffic, the image display rate can be reduced to display images only at set intervals or after an inspection failure.

- **All Images**: The image display will update on every acquisition.
- **Defects Only**: The image display will update only after a failed inspection.
- **Defects / 50 /100 /200 /500**: The image display will update after every failed inspection, or after a specified number of images have been acquired, whichever comes first. For example, Defects / 100 will update the image display after every 100 acquisitions, or whenever an inspection failure occurs.

Authorize

The Track & Trace job allows the user to enable and set up different authorization levels. The available options are:

- **None**: Authorization is disabled. When the Authorize button is pressed, no pop-up screen appears.
- **Authorize-Only**: When the Authorize button is pressed, an on-screen keyboard appears. The second user needs to log in by entering the user name and the password to accept or reject the values entered by the first user.

- **Double-Blind**: When the Authorize button is pressed, an on-screen keyboard appears. The second user needs to log in by entering the user name, the password and re-enter the values entered by the first user. If the value entered by the second user matches the value entered by the first user, the change is authorized. If the second user enters one or more incorrect values, the authorization will fail.

Note: For more information on the Authorize function and Audit Messages, refer to the *In-Sight® Explorer Help* file.

Display Items

Click the checkbox next to an item to include it in the on-screen display. For most items, you can select the Display Color and define the Image Position by clicking the **Region** button. Note that for some items, the Display Color and Image Position are determined automatically.

Region Button

The **Region** button next to the Inspection Result can be used to specify the display areas of the Inspection Result, Statistics, Batch Details and Line Speed information. Users can specify all the regions simultaneously in one screen.

Inspection Result

Displays the overall pass/fail result for the inspection. PART OK is displayed in the color you choose if all of the individual inspections pass. DEFECT ON (failed inspections) is displayed in red if one or more individual inspections fail.

Statistics

Displays the Total number of inspections, Passed inspections and Failed inspections for the current batch. The counters are automatically reset to zero when a new batch is initiated.

Batch Details

Displays the Name and Current Match String for each of the OCR lines enabled in the OCR LINES screen.

Regions

Displays the search regions for the Pattern Fixture, ID Code 1 and ID Code 2, OCR lines and multiple ID codes, if enabled.

Line Speed

Displays the inspection rate, in parts per minute.

Processing Time

Displays the speed of the last inspection, in milliseconds.

IDCode – Region Buttons

The ID code 1 and ID code 2 **Region** buttons specify the display areas of Result String, GS1 Data, sNDC Data, securPharm Data, Overall Grade, Individual Grades and Grading Graphics of ID code 1 and ID code 2. Users can specify all the regions simultaneously in one screen.

ID Code – Result String

Displays the data contents of the ID code after a successful read. If the Data Type for the ID code is GS1, the Result String will be displayed with the GS1 application identifiers included.

ID Code – GS1 Data

Displays the data contents of a GS1-standard ID code after a successful read. The data is displayed along with the descriptions for its GS1 application identifiers. The Data Type of the ID code must be GS1.

ID Code – sNDC Data

Displays the data contents of an sNDC-standard ID code after a successful read. The Data Type of the ID code must be sNDC.

ID Code – securPharm Data

Displays the data contents of a securPharm-standard ID code after a successful read. The Data Type of the ID code must be securPharm.

ID Code – Overall Grade

Displays the overall quality Grade Value (A – F) after successfully reading a DataMatrix code. Grading must be enabled in the corresponding ID CODE screens. The grade is displayed in red if it scores below the specified Minimum Grade.

ID Code – Individual Grades

Displays the individual quality grades (A – F) for each of the 9 quality metrics after successfully reading a DataMatrix code. Grading must be enabled in the corresponding ID CODE screens. Individual Grades are displayed in red if they score below their specified minimums.

Figure 3-34: ID Code - Individual Grades

ID Code – Grading Graphics

Displays color-coded error graphics on top of the DataMatrix code after a successful read. Grading must be enabled in the corresponding ID CODE screens. A colored square indicates the grade for the Modulation metric, according to the quality grading standard selected in the ID CODE screen. The color of the square is determined by the grade:

- No square – A
- Blue square – B or C
- Yellow square – D
- Red square – F

A red X represents a bit error, which is a white bit where a black bit is expected and vice-versa.

OCR Result– Characters

Displays a box around each character position in each OCR line, and the character that was matched at each position. Correctly matched characters are displayed in green and incorrect matches are displayed in red.

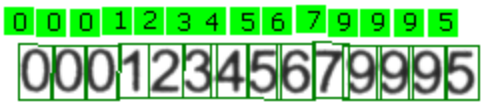

Figure 3-35: OCR - Characters

OCR – Character Scores

Displays the match score for each character in each OCR line.

OCR – Match String/Region

Displays the Region and Match String for each OCR line. If one or more character matches are incorrect, the Region, the Match String and the incorrectly matched characters will be displayed in red.

Custom - Custom Alarm

Displays up to three custom alarm messages. The display position of the alarm messages can be defined simultaneously in one screen by clicking the **Region** button.

Note: The custom alarm can be configured by users in the In-Sight Explorer spreadsheet. For more information, see *User-Configurable Parameters* on page 61.

Advanced Custom Features

Track & Trace provides advanced custom features, which allow you to add a custom screen to the Setup Menu with custom functionality, or to configure parameters of unlocked cells in the In-Sight Explorer Spreadsheet View.

In order to access the advanced custom features, the Track & Trace job needs to be unlocked first.

To unlock the Track & Trace job:

1. Navigate to the In-Sight Explorer Spreadsheet View.
2. From the File menu, open the Unprotect Job dialog and enter the password "**Cognex**" in the Password to unprotect job field.
3. Click **OK** to exit the dialog.

Note: To prevent accidental changes, it is recommended to relock the Track & Trace job after configuring the custom features. For more information on job protecting, refer to the Protect Job Dialog topic in the *In-Sight® Explorer Help* file.

Add Custom Screen to Setup Menu

Optionally, you can add a custom screen to the Setup Menu by creating a Dialog Interactive control in the In-Sight Explorer Spreadsheet View. The custom screen can be used to configure user-defined features, such as custom communications, extra OCR lines, etc.

Note: The Track & Trace job allows you to add up to two custom screens.

1. Launch In-Sight Explorer from the Windows Start Menu.
2. Log on to the vision system and navigate to the Spreadsheet View.
3. Make sure that the Track & Trace job is already loaded to your vision system.
4. Inserts a dialog box control into the spreadsheet by inserting a "Dialog" function in an empty cell in the bottom part of the spreadsheet. For example, cell A345.

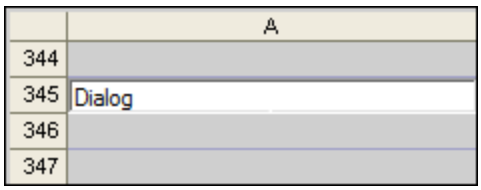

Figure 3-36: Insert a Dialog Box Control

5. Type the name of the custom screen you want to show in the Setup Menu in "Label" and "Dialog Title" field and configure other features as needed in the Dialog Property Sheet.

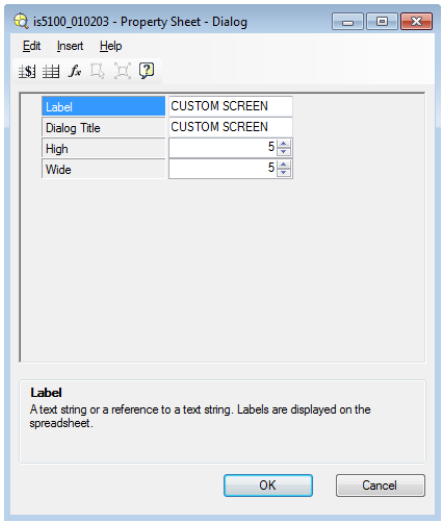

Figure 3-37: Configure the Property Sheet

6. Locate the Setup cell (T45) in the spreadsheet.
7. Add a cell reference of the newly created custom Dialog to the Setup cell, as a parameter.

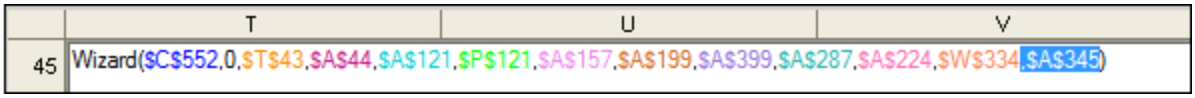

Figure 3-38: Add a Cell Reference

8. Save the Track & Trace job file to the vision system and go back to the Track & Trace user interface.

Note: For more information on using In-Sight Explorer, refer to the *In-Sight® Explorer Help* file, an online HTML Help file provided on the In-Sight Explorer DVD.

If you have correctly followed the previous steps, a new custom screen button will appear at the bottom of the Setup Menu.

Figure 3-39: Setup Menu with a New Custom Screen Button

User-Configurable Parameters

The Track & Trace job contains cells that can be configured by users in the In-Sight Explorer Spreadsheet View. These user-configurable parameters are mainly located in the third row of the spreadsheet. A list of all user-configurable parameters in a Track & Trace job along with their spreadsheet locations is provided below.

Note: For more information on using In-Sight Explorer, refer to the *In-Sight® Explorer Help* file, an online HTML Help file provided on the In-Sight Explorer DVD.

Table 3-2: User-Configurable Parameters

Configurable Parameter	Description	Spreadsheet Cell Location
Custom Field for Output Message	Specifies the custom field of the formatted output message. If the user selects the "Custom" option in the *OUTPUT Screen*, this string will be sent out over Ethernet. **Note**: This cell must be a string or an In-Sight function that outputs a string. Place a separator (B234) at the end of this string if you want a separator before the next field of the output message.	A3
Use Image Filter for ID Code 1	Specifies whether or not to use the NeighborFilter function for ID Code 1. If checked, the ID Code 1 reading and grading functions will be applied to the filtered image defined in cell B4.	B3, B4
Use Image Filter for ID Code 2	Specifies whether or not to use the NeighborFilter function for ID Code 2. If checked, the ID Code 2 reading and grading functions will be applied to the filtered image defined in cell C4.	C3, C4
Use Image Filter for OCR Lines	Specifies whether or not to use the NeighborFilter function for OCR Lines. If checked, the OCR Lines functions will be applied to the filtered image defined in cell D4.	D3, D4
Light Control Mode	Specifies whether the ring light on an In-Sight 5000 series or 7000 series vision system is only ON for the duration of specified exposure or is constantly ON. **Exposure Control**: Enables the ring light to be ON for the duration of the exposure. **Always On**: Enables the ring light to be always ON, reducing the strobe effect by keeping the LEDs lit at 50% intensity when not exposing an image.	E3
Light Enable 0/Light Enable 1	Specifies whether up to four LED light channels are ON or OFF. Any non-zero value (1 to 255) will turn on the light channel for the Exposure duration; if the parameter is zero, the light channel will remain off. The In-Sight 5000 series ring light (P/N 200-0187-1) is divided into two banks of LEDs: one horizontal, and one vertical. **Light Enable 0** controls the horizontal LED bank, while **Light Enable 1** controls the vertical LED bank. This parameter is only supported on In-Sight 5000 series vision systems.	F3, G3
Light Intensity	Controls the effective intensity [(0 to 100); default = 1; OFF = 0] of the LEDs. This parameter is only supported on In-Sight 7000 series vision systems.	F3
Offset	Specifies a DC level that is added or subtracted from the analog signal from the In-Sight vision system before the analog-to-digital conversion. The Offset affects the image's brightness and darkness, while maintaining the dynamic range within the image.	H3
Buffer Mode	Specifies the number of buffers used for image acquisition. **Overlapped** (default): Specifies that the maximum number of buffers will be used for image acquisition. **Single**: Specifies that only a single buffer will be used for image acquisition. This option is only supported when the Trigger parameter is set to Camera.	L3

Configurable Parameter	Description	Spreadsheet Cell Location
Trigger Delay	When the Trigger type is set to Camera or Network, specifies the delay, in milliseconds, between the time the trigger is received and the time the sensor begins acquisition. When the Trigger type is set to Continuous, specifies an interval, in milliseconds, between acquisitions. When connected to an In-Sight 5604 line scan vision system, and the Trigger type is set to Camera, specifies the number of lines to delay after the camera trigger occurs before starting an image acquisition.	M3
White Balance Region	Specifies the Region to use when calculating the White Balance.	N3
Enable/Disable White Balance	Specifies whether or not to use the White Balance calculation. If checked, the white balance calculation will apply to the image defined by the White Balance function in cell O4.	O3, O4
ID Code 1 Custom Code Grading	Specifies the custom grade [4 = A; 3 = B; 2 = C; 1 = D; 0 = F] for ID Code 1.	P3
ID Code 2 Custom Code Grading	Specifies the custom grade [4 = A; 3 = B; 2 = C; 1 = D; 0 = F] for ID Code 2.	Q3
Custom Row Fixture	Specifies the row offset of the fixture, in image coordinates.	R3
Custom Column Fixture	Specifies the column offset of the fixture, in image coordinates.	S3
Custom Angle Fixture	Specifies the orientation angle of the fixture, in image coordinates.	T3
Custom Alarm 1	Specifies the result of the first custom alarm algorithm. The result can be sent out via Digital Outputs (defined in the *COMMUNICATION Screen*) or displayed in a specified area (by checking the Custom Alarms checkbox in the *ON-SCREEN DISPLAY Screen*).	U3
Custom Alarm 2	Specifies the result of the second custom alarm algorithm. The result can be sent out via Digital Outputs (defined in the *COMMUNICATION Screen*) or displayed in a specified area (by checking the Custom Alarms checkbox in the *ON-SCREEN DISPLAY Screen*).	V3
Custom Alarm 3	Specifies the result of the third custom alarm algorithm. The result can be sent out via Digital Outputs (defined in the *COMMUNICATION Screen*) or displayed in a specified area (by checking the Custom Alarms checkbox in the *ON-SCREEN DISPLAY Screen*).	W3
Custom Pass/Fail Output	Specifies the result of the custom Pass/Fail function. The result will be sent out via Digital Outputs.	X3

Operating Track & Trace

This chapter describes how to initiate a batch changeover using the Track & Trace user interface and how to monitor Track & Trace operation during production.

Figure 4-1: Track & Trace Main Menu

CONFIRM CHANGE BATCH Screen

To initiate a new batch, click the **Change Batch** button on the main menu, which opens the CONFIRM CHANGE BATCH screen.

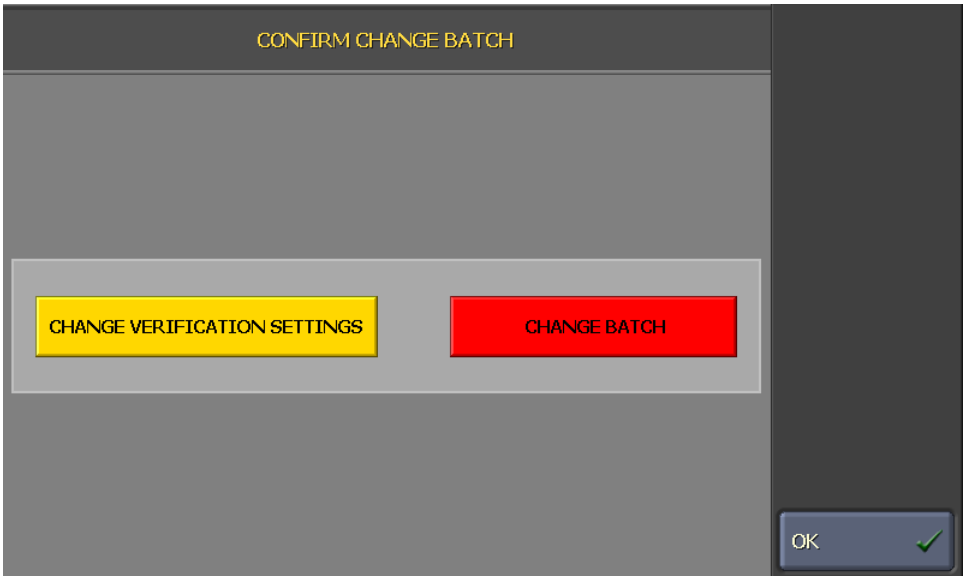

Figure 4-2: CONFIRM CHANGE BATCH Screen

Change Verification Settings

Click the **CHANGE VERIFICATION SETTINGS** button to open the VERIFICATION screen. Before initiating a batch change, the information for the new batch must be supplied and verified in the VERIFICATION screen. For more information on using the VERIFICATION function, refer to *VERIFICATION Screen* on page 40.

Change Batch

To manually initiate a batch change, click the **CHANGE BATCH** button. The current batch information will be updated, and all of the inspection statistics will be reset to zero.

Note: When switching to a new batch, all previously stored strings will be cleared.

STATISTICS Screen

Track & Trace maintains statistics of all inspections performed for the current batch. To view the statistics for the current batch, click the **Statistics** button on the main menu, which opens the STATISTICS screen.

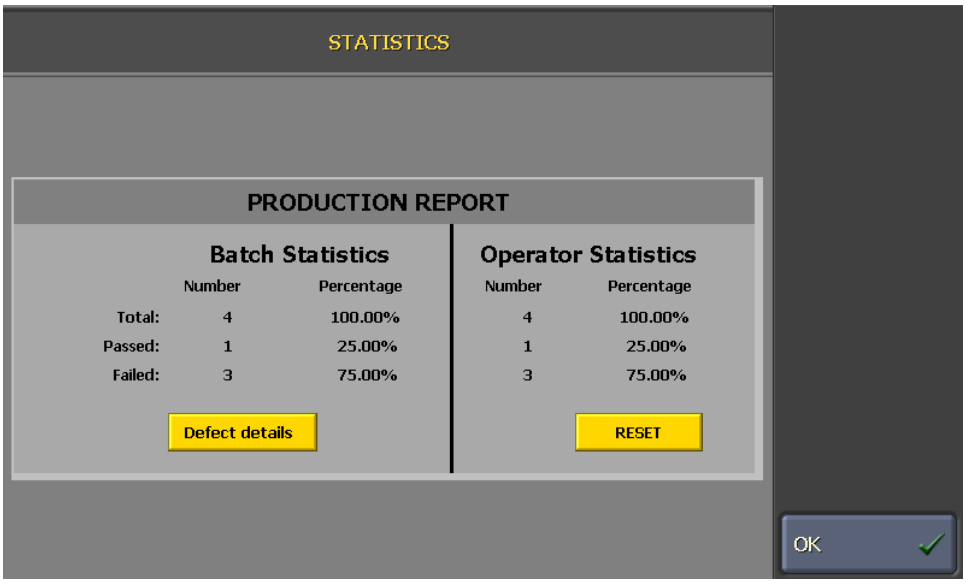

Figure 4-3: STATISTICS Screen

Batch Statistics

The Batch Statistics displays the overall pass/fail statistics for the current batch. Batch Statistics are reset to zero when a new batch is initiated. Click the **Defect details** button to see a count of defects for each of the OCR lines and ID codes that are enabled.

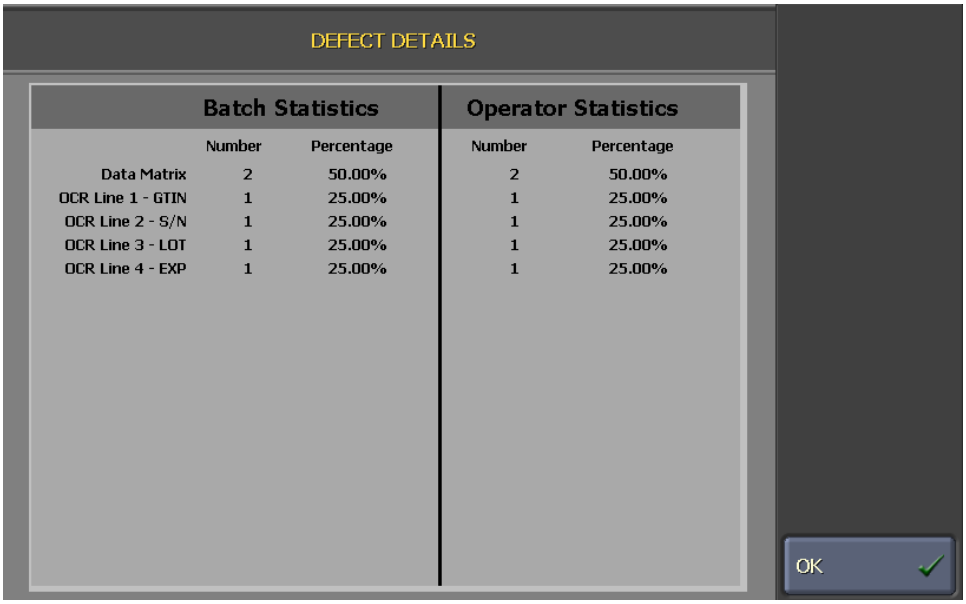

Figure 4-4: DEFECT DETAILS Screen

Operator Statistics

The Operator Statistics can be used to maintain a subset of statistics beginning from a particular point in time. For example, a line supervisor might be interested in seeing the pass/fail statistics for all inspections performed while they are logged on to Track & Trace. Click the **Reset** button to reset the Operator Statistics at any time; the Batch Statistics are not affected.

Appendix A - OCRMax Font Training

OCRMax Font Training allows you to train, view, rename and remove characters using the OCRMax Font Training screen.

Note: For more information on the OCRMax function, refer to the *In-Sight® Explorer Help* file.

Tip: Providing OCRMax with multiple training instances of each character to be read during run-time allows it to better discriminate between similar character types. However, training multiple instances of the same characters has advantages and disadvantages. The advantage to training multiple instances is that better classification performance can be expected, especially when reading text that could easily be mis-classified (e.g. 8 and B). The disadvantages of training multiple instances are: a decrease in the execution time; possible decreases in the confidence scores, because multiple training instances should not only improve the highest score, but also improve the second-highest score, as well; and possibly training bad characters.

Training Characters

There are three options to train characters: All Characters, New Characters and Selected Characters. When the All Characters option is selected, all of the characters in the region of interest will be trained. When the New Characters option is selected, only new characters in the region of interest will be trained. When the Selected Characters option is selected, specific characters in the region of interest will be trained. If creating a new custom font, select the All Characters option. To add additional characters to the font database, select the New Characters or Selected Characters options.

Once characters are trained, each trained character will be visible in the Font's Characters list, where the characters are assigned a folder and label, and grouped together (if the characters have matching labels). When a character model is selected in the Font's Characters list, the trained Instances for that model are also listed. The indicator adjacent to each character instance is <character label>:<instance number>. In the example below, the second instance of character '0' is indicated by '0:2'.

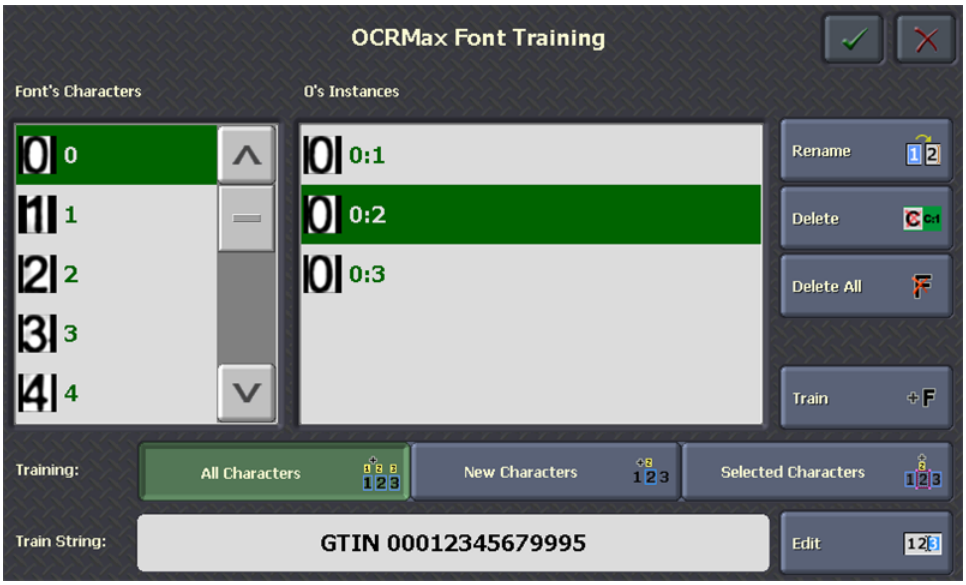

Figure A-1: OCRMax Font Training

Note:

- Before characters can be trained, they must be correctly segmented. If segmented incorrectly, adjust the settings in *Use Manual Segmentation Settings For Font1* in the *TRAIN FONTS Screen*, or adjust the OCRMax segmentation settings in In-Sight Explorer for other fonts until the text is correctly enclosed with individual character regions.
- Multiple-byte character model names (e.g. Kanji) are not supported. Multiple-byte characters can be trained, but the name given to the character model must be a single byte name.

All Characters Option

1. Click the **All Characters** button.
2. Click the **Edit** button. Using the on-screen keyboard, enter the characters expected to be trained. The number of characters entered must match the number of segmented characters.
3. Click **OK** to accept the characters, or **Cancel** to undo the changes. When **OK** is clicked, the entered characters are displayed in the Train String field.
4. Click the **Train** button. All the characters are trained and displayed in the Font's Characters list.
5. If a character model or instance is incorrect, highlight the mislabeled model or instance and click the **Rename** button to correct the label. If a character model is selected, Rename will change the name of every instance for that model. If a single character instance is selected, then only that instance will be renamed and moved to the corresponding character model. Rename will not take effect in the font database until **OK** is clicked.
6. To delete a character model, or individual instances from a character model, highlight the model or instance and click the **Delete** button. To delete all characters and individual instances, click the **Delete All** button. Delete will not take effect in the font database until **OK** is clicked.

   Note: Deleting a character model will permanently delete all trained instances of that character.
7. Click **OK** to add the trained font to the font database, or **Cancel** to undo the changes.

New Characters Option

1. Click the **New Characters** button.
2. Click the **Edit** button. Using the on-screen keyboard, enter the characters expected to be trained. The number of characters entered must match the number of segmented characters.
3. Click **OK** to accept the characters, or **Cancel** to undo the changes. When **OK** is clicked, the entered characters are displayed in the Train String field.
4. Click the **Train** button. Only new characters are trained and displayed in the Font's Characters list.
5. If a character model or instance is incorrect, highlight the mislabeled model or instance and click the **Rename** button to correct the label. If a character model is selected, Rename will change the name of every instance for that model. If a single character instance is selected, then only that instance will be renamed and moved to the corresponding character model. Rename will not take effect in the font database until **OK** is clicked.
6. To delete a character model, or individual instances from a character model, highlight the model or instance and click the **Delete** button. To delete all characters and individual instances, click the **Delete All** button. Delete will not take effect in the font database until **OK** is clicked.

   Note: Deleting a character model will permanently delete all trained instances of that character.
7. Click **OK** to add the trained font to the font database, or **Cancel** to undo the changes.

Selected Characters Option

1. Click the **Selected Characters** button. When this option is selected, the Edit button is disabled.
2. Click the **Train** button to launch the Train Selected Characters screen. This screen contains an unwrapped image of the region, with a label and text-entry boxes below each of the segmented characters. The label is the currently associated symbol for that character (a "?" denotes an unknown or untrained character).

Figure A-2: Train Selected Characters Screen

3. Enter a label for each segmented character in the text-entry box next to the label. Leave the text-entry box empty to not train characters.

Note:

- When selected, the character image will be highlighted and the corresponding text-entry box will be enabled. After entering a label in the text-entry box, the next character image will be automatically selected.
- If all characters cannot be displayed in the screen, an ellipsis (...) symbol will be displayed on the right and/or the left side of the character images group box. To display hidden characters, click the arrow key as many times as necessary to scroll through the group box.

The following explains the keyboard actions on the Train Selected Characters Screen.

Table A-1: Train Selected Character Screen Keyboard Actions

Keyboard	Action
Left arrow	Selects the previous character image.
Right arrow	Selects the next character image.
Space	Enters a space in the text-entry box to train a space character.
Backspace	Clears the text-entry box within the highlighted character image and selects the previous character image.

4. Click **OK** to accept the labels, or **Cancel** to undo the changes. The Train Selected Characters screen will be closed, and the OCRMax Font Training screen will appear. When **OK** is clicked, specific characters are trained and displayed in the Font's Characters list.

5. If a character model or instance is incorrect, highlight the mislabeled model or instance and click the **Rename** button to correct the label. If a character model is selected, Rename will change the name of every instance for that model. If a single character instance is selected, then only that instance will be renamed and moved to the corresponding character model. Rename will not take effect in the font database until **OK** is clicked.
6. To delete a character model, or individual instances from a character model, highlight the model or instance and click the **Delete** button. To delete all characters and individual instances, click the **Delete All** button. Delete will not take effect in the font database until **OK** is clicked.

   Note: Deleting a character model will permanently delete all trained instances of that character.

7. Click **OK** to add the trained font to the font database, or **Cancel** to undo the changes.

Appendix B - User Authentication

Before a user can log in to Track & Trace to configure batch settings, change a batch, or view batch statistics they must exist as a user on every In-Sight vision system they will need to access. After a user has been created on the vision system, their ability to interact with the Track & Trace user interface is determined by the Track & Trace user permissions that have been defined for them.

Creating In-Sight Users

In-Sight users are created using In-Sight Explorer software. Each In-Sight vision system supports up to 32 users. Every In-Sight user is assigned an Access Level:

- **Full** access level users have complete, unrestricted access to the vision system, including the ability to change system settings. Job files can be created, modified, loaded or saved, and all In-Sight Explorer software selections are available. However, the ability of Full access level users to interact with the Track & Trace user interface is determined by their Track & Trace user permissions. The default In-Sight *admin* user account has Full access.
- **Protected** access level users have limited access to the vision system, but without the ability to change system settings. Protected access level users can switch to live video mode, toggle the Online/Offline status of the vision system (if permitted by their Allow Online/Offline privileges) and open or save jobs (if permitted by their FTP Read/Write privileges). The ability of Protected access level users to interact with the Track & Trace user interface is determined by their Track & Trace User Permissions. The default In-Sight *operator* user account has Protected access.
- **Locked** access level users can login to the vision system to monitor its operation, and have no ability to change system settings or to interact with the Track & Trace user interface. The default In-Sight *monitor* user account has Locked access.

Only In-Sight users with a Full or Protected access level can interact with the Track & Trace user interface, regardless of their Track & Trace user permissions. In-Sight users with a Locked access level can log on to the Track & Trace user interface to monitor its operation; however, all of the controls will be disabled. Except for administrators who require access to vision system settings, most users who will log on to In-Sight through the Track & Trace user interface should have a Protected access level.

Note: For instructions on creating and maintaining users on In-Sight vision systems, refer to the User List topic in the *In-Sight® Explorer Help* file.

Setting Track & Trace User Permissions

The Track & Trace job file supports three different types of users: Operator, Supervisor and Administrator. The default user permissions in the Track & Trace job are most restrictive for an Operator, and most permissive for an Administrator. However, the permissions for each type of user can be modified in the USER PERMISSIONS screen.

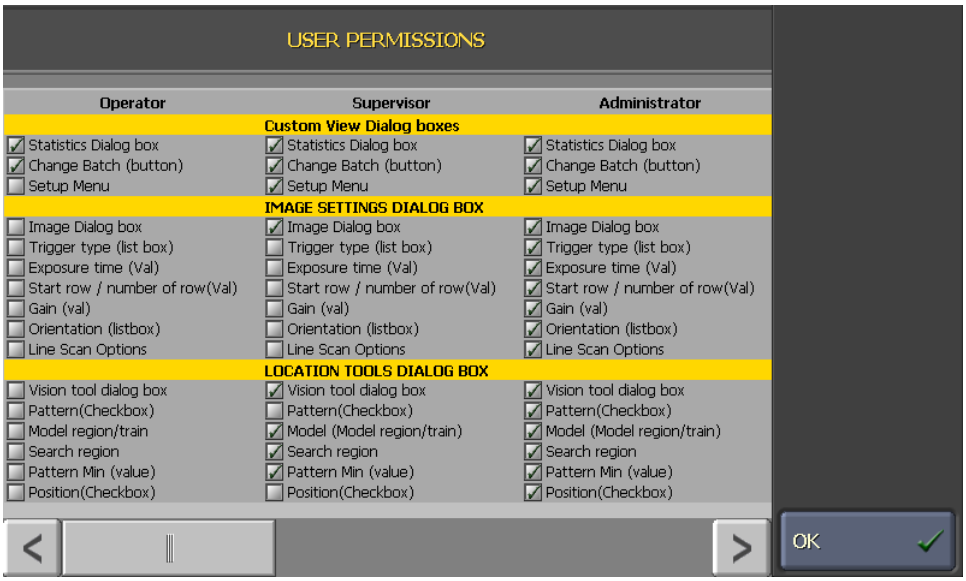

Figure B-1: USER PERMISSIONS Screen

If you are installing Track & Trace for the first time and want to set user permissions, you can access the USER PERMISSIONS screen from the HMI Display Control sample application installed with Track & Trace:

1. Launch the Cognex HMI Display Control sample application from the Windows Start Menu and log on to a vision system running a Track & Trace job.
2. In the Sample Controls dialog, click **Dialog** in the Symbolic Tag list. Scroll down through the list and select the **UserPermissions** tag.
3. Click the **Perform Action** button. The USER PERMISSIONS screen will open in the HMI Display Control sample application.
4. For each type of user, check the checkbox for each control that they will be able to access in the Track & Trace user interface, and uncheck the box for each control that will be inaccessible. Controls that are unchecked for a type of user will be grayed out for all users who log on with that user type.
5. Click **OK**.

The HMI Display Control sample application can also be used to test the user permissions you define:

1. Scroll down to the bottom of the Symbolic Tag list and click **UserGp** (User Group).
2. Select the **UserGroup** tag then click the **Set Value** button. The default value is **2** (Administrator). Change the value to **0** (Operator) or **1** (Supervisor) and click **OK**.
3. If you changed the UserGroup tag value to 0, the Setup button on the Track & Trace main menu in the HMI Display Control window will be grayed out and inaccessible. If you changed the UserGroup tag value to 1, click the **Setup** button on the Track & Trace main menu, then click the **ID CODE 1** button. Most of the controls in the ID CODE 1 screen will be grayed out and inaccessible.
4. Repeat steps 6 and 7, but this time change the UserGroup tag value back to 2 in order to restore access to all controls in the Track & Trace user interface.

Note:

- In order to apply Track & Trace user permissions, the UserGroup symbolic tag must be set programmatically whenever a user logs in to the Track & Trace interface from your custom application. Refer to the *Programming the HMI Display Control* section for more information.
- The USER PERMISSIONS screen is designed to be accessed programmatically using the HMI Display Control. Refer to the *Programming the HMI Display Control* section for information on how to open the USER PERMISSIONS screen from your custom application.

Idle Timeout

To prevent unauthorized users from changing Track & Trace settings, a timeout can be set to automatically log the previous user off of the vision system after a period of inactivity. If a user is automatically logged out, the next user to log on must enter their user name and password in order to access Track & Trace. The steps to set the idle timeout differ, depending on which user interface is used to log on to an In-Sight vision system running Track & Trace.

To set the idle timeout for the HMI Display Control in your application, refer to the *Integrating the HMI Display Control* on page 97.

To set the idle timeout for the VisionView Operator Interface Panel or the VisionView PC software, refer to the *VisionView® Software Manual*.

Note: When using In-Sight Explorer to log on to the vision system running a Track & Trace job, no idle timeout is available.

Appendix C - Creating an Audit Trail

In-Sight Track & Trace supports FDA 21 CFR Part 11 validation with the ability to automatically generate time-stamped audit messages that can be archived in your audit trail log file or compliance database. Audit messages are supported for the following types of activity:

- In-Sight system events, such as startup, user logon and logoff, switching into Online and Offline operation and job changes.
- Changes to In-Sight system settings.
- Changes to settings in a Track & Trace job, and batch changes.

Creating an audit trail for your In-Sight Track & Trace installations requires four steps:

1. Install and configure an audit message server on a PC. An audit message server “listens” for audit messages sent from one or more vision systems on the network. Cognex provides sample code for developers to create an audit message server when audit messages need to be recorded in a compliance database or written to an audit trail log file. Track & Trace also includes the Cognex Audit Message Demo, which writes audit messages in XML format to a plain text log file.
2. Configure Audit Message Settings on your In-Sight vision systems.
3. Connect to the audit message server from your database or logging application to collect audit messages received from In-Sight vision systems.
4. Import audit messages into your compliance database or audit trail log file.

The remainder of this section provides setup instructions, audit message specifications, and audit message server sample code for creating an audit trail for In-Sight Track & Trace vision systems.

Note: When using the Cognex Audit Message Demo application or the Cognex Audit Message Server Sample application on the Windows 7 operating system, if the User Account Control (UAC) settings are not disabled, run the application as an administrator.

Configure the Cognex Audit Message Demo Application

See *Sample Code – Visual Studio .NET C# 2010* on page 79 if you will create your own audit message server. But first, it is recommended that you configure the Cognex Audit Message Demo to see how audit messaging works.

Note:

- The Cognex Audit Message Demo application included in the Track & Trace installer is for demonstration and test purposes and not intended for deployment.
- If Track & Trace 2.0.0 is already installed on your PC, you must uninstall the Cognex Audit Message Service from your PC using the system tray uninstall option before using the Cognex Audit Message Demo application.

1. Launch the Cognex Audit Message Demo from the Windows Start menu (the default location is Programs\Cognex\In-Sight\In-Sight Track & Trace 2.0.0\).

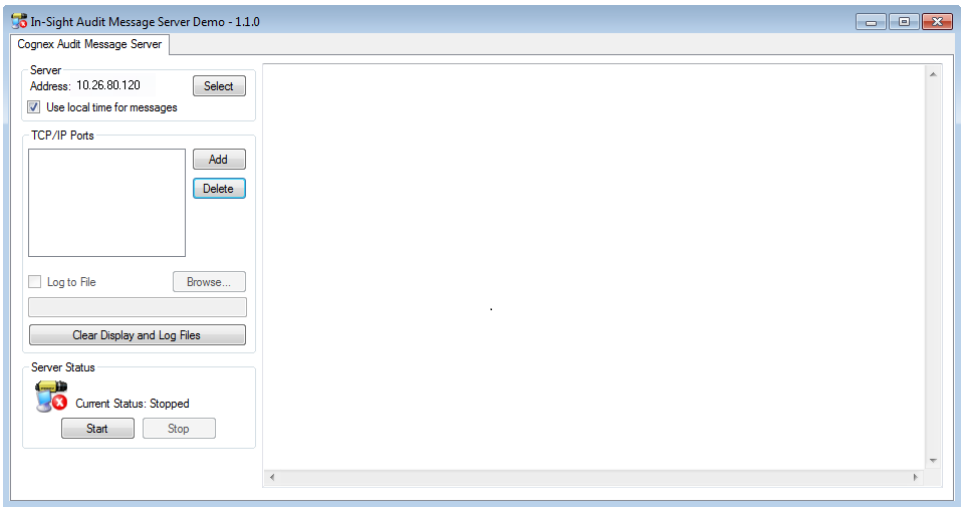

Figure C-1: Cognex Audit Message Demo Application

2. The Server Address is the IP address of the PC. If more than one network IP address is available on the PC, you can select a different IP address for the Audit Message Server. Click the **Select** button to see the IP addresses that are available on the PC, and select the IP address for the Audit Message Server from the list.
3. Check the **Use local time for message** checkbox to time stamp audit messages with the date and time of the PC. This ensures that all audit messages received from In-Sight vision systems on the network will have a correct time stamp even if those vision systems are not configured to use an SNTP server, or the SNTP server becomes unavailable.
4. Click the **Add** button to open the **Add Audit Message Port** dialog. Enter an unused TCP/IP port between 1024 and 65535 (the default is 5753). This is the port at which your database or audit trail logging software will connect in order to collect audit messages from In-Sight vision systems. Multiple vision systems can send messages to the same Audit Message Port, or multiple Audit Message Ports can be added, one for each vision system that has been configured for audit messaging.

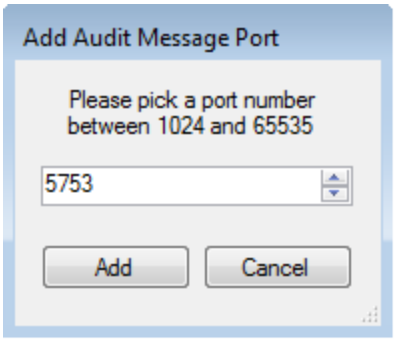

Figure C-2: Add Audit Message Port

Note: The following TCP/IP ports are within the allowed range, but they are reserved by In-Sight and can not be entered: 1069 (In-Sight Protocol), 1070 (Machine Status data), 1212 (Upgrade port), 2222 and 44818 (EtherNet/IP), and 50000 (DataChannel)

5. Check the **Log to File** box. At the prompt, enter a filename for the log file (with .txt or .log file extension). If you added multiple TCP/IP ports in the previous step, create a log file for each port.

Configure Cognex Audit Message Settings

Before an In-Sight vision system running Track & Trace can generate and send audit messages, the vision system's Audit Messaging Settings must be configured in In-Sight Explorer.

1. Open In-Sight Explorer and log on to a vision system running a Track & Trace job.
2. From the Sensor menu, select Audit Message Settings.

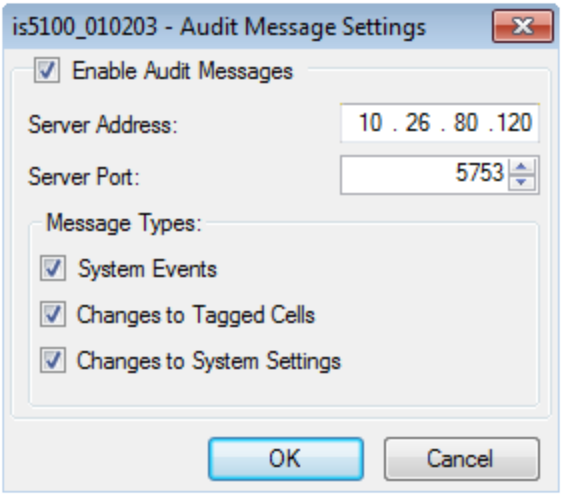

Figure C-3: Audit Message Settings dialog

3. Check **Enable Audit Messages** to turn audit messaging on for this vision system.
4. For the **Server Address**, enter the IP address of the PC running the audit message server, and the **Server Port** number. If you are using the Cognex Audit Message Demo, enter the IP Address and the Audit Message Port you configured in the previous section.
5. Select the message types for which this vision system will generate audit messages:
   - System Events
   - Changes to Tagged Cells
   - Changes to System Settings
6. Click **OK** to close the Audit Message Settings dialog.

7. If you have correctly configured the Audit Message Server and the vision system's Audit Message Settings, the first audit message will be displayed in the Audit Message Demo application.

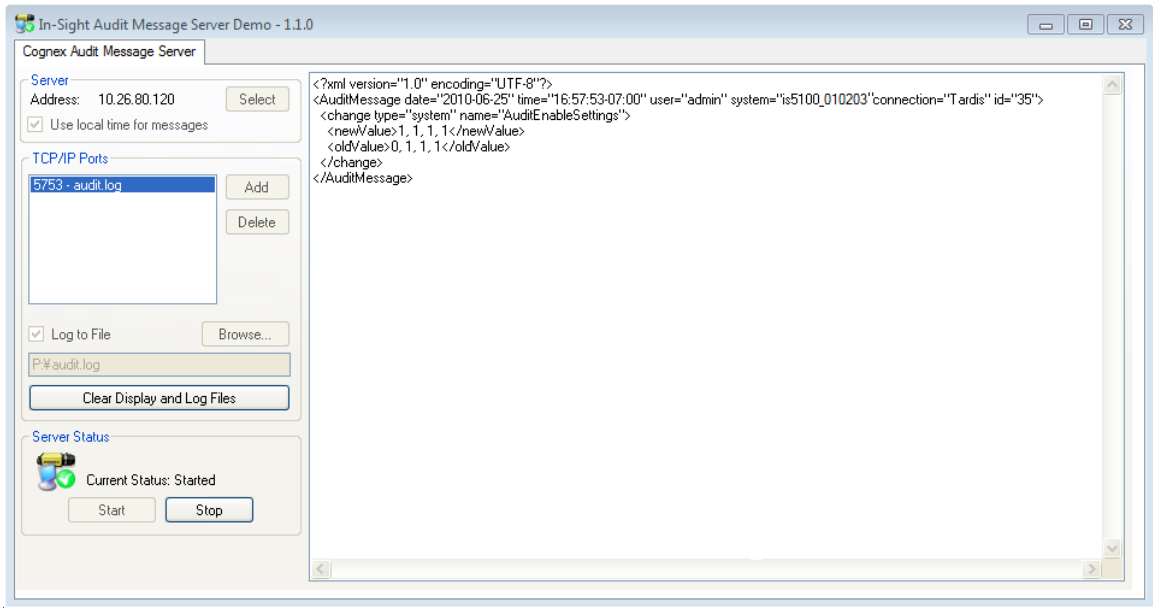

Figure C-4: Cognex Audit Message Demo, first audit message

Notice that In-Sight sends audit messages in XML format, which is described in *Audit Message Format* on page 80.

Sample Code – Visual Studio .NET C# 2010

The Cognex Audit Message Demo application is fully functional, but you will want to integrate an audit message server into your own application.

Track & Trace includes the source code for a basic audit message server. This sample logs audit messages to a file, but you can modify it as needed to collect audit messages and convert the XML data for your compliance database or audit trail logging system.

```
// Sample Audit Message Server Application
using System;
using System.IO;

// Make sure to add a reference in your project to "Cognex.AuditMsg.dll"
using Cognex.AuditMsg;

public class SampleAuditMessageServerApplication
{
  /// <summary>
  /// This console application shows how to use the Cognex Audit Message Server.
  /// </summary>
  /// <remarks>
  /// The messages received from devices will be displayed to the Console window as well
  /// as written to a file that is saved on exit.
  /// </remarks>
  public static void Main()
  {
    // Create file for logging audit messages
    _logFile = new FileStream(@"C:\logFile.txt", FileMode.Create, FileAccess.ReadWrite);
    _logWriter = new StreamWriter(_logFile);

    // Setup the server on port number 5753
    AuditMsgServer auditMsgServer = new AuditMsgServer(5753);

    // Handle audit messages that are received
    auditMsgServer.MessageReceived += new AuditMessageEventHandler(AuditMessageReceived);

    // Start the server, allowing it to receive audit messages
    try
    {
      auditMsgServer.Start();
    } catch (Exception ex) { Console.WriteLine("Server failed to start: " + ex.Message); }

    if (auditMsgServer.IsRunning)
    {
      Console.WriteLine("Audit Message Server\n");
      Console.WriteLine("   Listening on {0}:{1}", auditMsgServer.Address, auditMsgServer.Port);
      Console.WriteLine("\nWaiting for a connection.....\nPress any Key to abort\n");
      Console.ReadKey();

      // Stop the server, preventing it from receiving audit messages
      auditMsgServer.Stop();
    }

    // Close the log file
    _logWriter.Close();
    _logFile.Close();

    // Dispose of all resources used by the server
    auditMsgServer.Dispose();
  }

  /// <summary>The log file that saves the audit messages,</summary>
  private static FileStream _logFile;
  /// <summary>The writer used for writing audit messages to the log file.</summary>
  private static StreamWriter _logWriter;

  /// <summary>
  /// Handles the processing of an audit message received from a device.
  /// </summary>
  /// <param name="sender">The server instance that sent the message.</param>
  /// <param name="args">The audit message.</param>
  /// <remarks>
  /// NOTE: This method is called on a thread pool thread in a console application.
  ///       In a windowed application, this will be called on the GUI thread.
  /// </remarks>
  static void AuditMessageReceived(object sender, AuditMessageEventArgs args)
  {
    _logWriter.Write(args.AuditMessageXml);
    Console.WriteLine(args.AuditMessageXml);
  }
}
```

Figure C-5: Sample Code

Audit Message Format

In-Sight audit messages are in XML format, which provides maximum flexibility for converting the data into records for your compliance database or entries in your audit trail log file.

Note:

- The audit messages described in this section are based on In-Sight Audit Message version 1.1 included in the In-Sight Explorer firmware version 4.8.0 or higher.
- The firmware will not generate an audit message that exceeds 10000 bytes.

Audit Message Header

All Audit Messages are preceded by an XML declaration, containing the date and time; the name of the currently logged on user; the Host Name of the vision system; the name of the PC (or VisionView Operator Interface Panel) from which the action was initiated; and a message ID. This information is relayed in the attributes of the XML <AuditMessage> tag.

```
<?xml version="1.0" encoding="UTF-8"?>
<AuditMessage version="1.1" system="ism1400_010203" systemType="In-Sight" date="2009-08-17"
time="10:54:47-07:00" user="admin" connection="PC1" id="3">
</AuditMessage>
```

Figure C-6: Audit Message Header

XML Declaration

The Audit Message includes an XML declaration to indicate the formatting of the message as UTF-8.

Example: `<?xml version="1.0" encoding="UTF-8"?>`

Version

The version in the AuditMessage designates the schema of the XML sent by the In-Sight. "version=1.1" is sent in message from In-Sight vision systems with firmware version 4.8.0 and higher.

Example: `version="1.1"`

System

The system attribute is a string containing the vision system host name.

Example: `system="ism1400_010203"`

System Type

The system type attribute is a string containing type of the vision system.

Example: `systemType="In-Sight"`

Date

The date attribute follows the ISO 8601 calendar date format: **YYYY-MM-DD**.

Example: `date="2009-08-17"`

Time

The time attribute follows the ISO 8601 time format: **hh:mm:ss±hh:mm**.

Example: `time="10:54:47-07:00"`

User

The user attribute is a string containing the user name that is currently logged on to the vision system. If no user is currently logged on, an empty string "" is returned.

Example: `user="admin"`

Connection

The connection attribute is a string containing a description of the connection to the vision system. If no connection is established – during startup, for example – an empty string "" is returned.

Typically, the string is the host name of the PC or VisionView Operator Interface Panel through which the user is logged on to the vision system. There are two exceptions:

- **NativeMode**: Indicates the message was generated as a result of a Native Mode command using telnet to port 23.
- **DiscreteInput**: Indicates the message was generated as a result of a signal on the hardware input lines (either serial or internal).

Example:

```
connection="NativeMode"
connection="DiscreteInput"
connection="PC17689"
connection=""
```

ID

The ID attribute is a non-zero positive integer indicating the sequence number of the Audit Message from a particular vision system. This number starts at 1 when the vision system starts up, and increments with each message sent. When combined with the Date, Time and System attributes, every audit message sent can be uniquely identified.

Note: IDs can be repeated in messages from different vision systems or when a vision system is restarted.

Example: `id="3"`

Escaped Data in XML

Because XML requires that special characters be encoded (this is called escaped), the user who processes the XML must be able to unescape the XML. The following characters will be encoded when sent as part of the XML:

- “ with "
- ‘ with '
- & with &
- > with >
- < with <

Message Response

The firmware will send messages one at a time. These messages will not be deleted until they have been received and processed by an audit message server. When the message response is not received (or is incorrect), then the message will be resent.

Note: To maintain backwards compatibility, audit messages with version of 1.1 or higher will require a response. The audit message server will not generate a response for audit messages with no version indicated or for audit messages that have a "version" attribute less than 1.1. Modify the programs accordingly if the API/DLL is not used.

Response Format

The format for the audit message response sent by the audit message server is shown below:

```
<AuditResponse version="1.1" system="ism1400_010203" id="79" />
```

Figure C-7: Example: Response Format

- version: The version of the XML response.
- system: The system that generated the message that was received.
- id: "id" attribute contained in the Audit Message Header that was received.

Audit Message Samples

Change Messages (Data or Formula)

If a cell in a job spreadsheet has been assigned an Audit Message Symbolic Tag, and that cell is edited (e.g. changes are made to the cell's formula, or the user changes the value of an interactive control), a data or formula message is generated; both the old and new values are included in the message.

Button

The following message is generated when a Button cell is pressed in the job.

```
<change typeGroup="data" type="Button" name="ButtonTag">
<newValue>Initialized</newValue>
</change>
```

Figure C-8: Example: Button

CheckBox

The following message is generated when a CheckBox cell is modified in the job.

```
<change typeGroup="data" type="CheckBox" name="CheckBoxTag">
<newValue>Enabled</newValue>
<oldValue>Disabled</oldValue>
</change>
```

Figure C-9: Example: CheckBox

EditAnnulus

The following message is generated when an annulus graphic is edited in the job.

```
<change typeGroup="data" type="EditAnnulus" name="EditAnnulusTag">
  <newValue>
    <Row>227.000</Row>
    <Col>320.000</Col>
    <Radius0>60.083</Radius0>
    <Radius1>120.000</Radius1>
  </newValue>
  <oldValue>
    <Row>240.000</Row>
    <Col>320.000</Col>
    <Radius0>100.000</Radius0>
    <Radius1>120.000</Radius1>
  </oldValue>
</change>
```

Figure C-10: Example: EditAnnulus

EditCircle

The following message is generated when a circle graphic is edited in the job.

```
<change typeGroup="data" type="EditCircle" name="EditCircleTag">
  <newValue>
    <Row>256.000</Row>
    <Col>313.000</Col>
    <Radius>100.000</Radius>
  </newValue>
  <oldValue>
    <Row>240.000</Row>
    <Col>320.000</Col>
    <Radius>100.000</Radius>
  </oldValue>
 </change>
```

Figure C-11: Example: EditCircle

EditFloat

The following message is generated when an EditFloat cell is modified in the job.

```
<change typeGroup="data" type="EditFloat" name="EditFloatTag">
<newValue>1.000000</newValue>
<oldValue>0.000000</oldValue>
</change>
```

Figure C-12: Example: EditFloat

EditInt

The following message is generated when an EditInt cell is modified in the job.

```
<change typeGroup="data" type="EditInt" name="EditIntTag">
<newValue>1</newValue>
<oldValue>0</oldValue>
</change>
```

Figure C-13: Example: EditInt

EditLine

The following message is generated when a line graphic is edited in the job.

```
<change typeGroup="data" type="EditLine" name="EditLineTag">
  <newValue>
    <Row0>80.000</Row0>
    <Col0>100.000</Col0>
    <Row1>174.000</Row1>
    <Col1>328.000</Col1>
  </newValue>
  <oldValue>
    <Row0>80.000</Row0>
    <Col0>100.000</Col0>
    <Row1>240.000</Row1>
    <Col1>320.000</Col1>
  </oldValue>
</change>
```

Figure C-14: Example: EditLine

EditPoint

The following message is generated when a point graphic is edited in the job.

```
<change typeGroup="data" type="EditPoint" name="EditPointTag">
  <newValue>
    <Row>259.000</Row>
    <Col>368.000</Col>
  </newValue>
  <oldValue>
    <Row>240.000</Row>
    <Col>320.000</Col>
  </oldValue>
</change>
```

Figure C-15: Example: EditPoint

EditRegion

The following message is generated when a regional graphic is edited in the job.

```
<change typeGroup="data" type="EditRegion" name="EditRegionTag">
  <newValue>
    <Row>95.000</Row>
    <Col>125.000</Col>
    <High>320.000</High>
    <Wide>440.000</Wide>
    <Theta>0.000</Theta>
    <Phi>0.000</Phi>
  </newValue>
  <oldValue>
    <Row>80.000</Row>
    <Col>100.000</Col>
    <High>320.000</High>
    <Wide>440.000</Wide>
    <Theta>0.000</Theta>
    <Phi>0.000</Phi>
  </oldValue>
</change>
```

Figure C-16: Example: EditRegion

EditString

The following message is generated when an EditString cell is modified in the job.

```
<change typeGroup="data" type="EditString" name="EditStringTag">
  <newValue>new</newValue>
  <oldValue>old</oldValue>
</change>
```

Figure C-17: Example: EditString

ListBox

The following message is generated when a ListBox cell is modified in the job.

```
<change typeGroup="data" type="ListBox" name="ListBoxTag">
  <newValue>
    <Index>1</Index>
    <Value>two</Value>
  </newValue>
  <oldValue>
    <Index>0</Index>
    <Value>one</Value>
  </oldValue>
</change>
```

Figure C-18: Example: ListBox

TrainFont

The following message is generated when a font in the job has been trained.

```
<change typeGroup="data" type="TrainFont" name="TrainFontTag">
  <newValue>Font, 6, 0:1, 1:4, 2:2, 7:2, 8:1, 9:1</newValue>
  <oldValue>Font, 6, 0:1, 1:3, 2:1, 7:2, 8:1, 9:1</oldValue>
</change>
```

Figure C-19: Example: TrainFont

Formula Change

The following message is generated when an expression is changed in the job.

```
<change typeGroup="data" type="formula" name="FormulaTag">
  <newValue>GetCol(A12)</newValue>
  <oldValue>GetCol(A13)</oldValue>
</change>
```

Figure C-20: Example: Formula Change

System Change Events

If a system setting (any setting stored in the In-Sight vision system's proc.set file) is modified, a system message is generated. The Audit Message includes the name of the setting that was changed, and the new value.

Note: Unless otherwise noted, these settings may be changed in In-Sight Explorer, the In-Sight Software Development Kit (ISDK), or via a native mode command.

Serial Settings

```
<change typeGroup="system" type="SerialPort">
  <newValue>
    <PortNumber>1</PortNumber>
    <Mode>-1</Mode>
    <BaudRate>115200</BaudRate>
    <DataBits>8</DataBits>
    <StopBits>1</StopBits>
    <Parity>256</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>13</InputTerminator>
    <OutputTerminator>13</OutputTerminator>
    <FixedInputMode>13</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>1</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </newValue>
  <oldValue>
    <PortNumber>1</PortNumber>
    <Mode>0</Mode>
    <BaudRate>0</BaudRate>
    <DataBits>0</DataBits>
    <StopBits>0</StopBits>
    <Parity>0</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>0</InputTerminator>
    <OutputTerminator>0</OutputTerminator>
    <FixedInputMode>0</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>0</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </oldValue>
</change>
```

Figure C-21: Example: Serial Settings

FTP Settings

```
<change typeGroup="system" type="SerialPort">
  <newValue>
    <PortNumber>1</PortNumber>
    <Mode>-1</Mode>
    <BaudRate>115200</BaudRate>
    <DataBits>8</DataBits>
    <StopBits>1</StopBits>
    <Parity>256</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>13</InputTerminator>
    <OutputTerminator>13</OutputTerminator>
    <FixedInputMode>13</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>1</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </newValue>
  <oldValue>
    <PortNumber>1</PortNumber>
    <Mode>0</Mode>
    <BaudRate>0</BaudRate>
    <DataBits>0</DataBits>
    <StopBits>0</StopBits>
    <Parity>0</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>0</InputTerminator>
    <OutputTerminator>0</OutputTerminator>
    <FixedInputMode>0</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>0</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </oldValue>
</change>
```

Figure C-22: Example: FTP Settings

Network Settings

```
<change typeGroup="system" type="SerialPort">
  <newValue>
    <PortNumber>1</PortNumber>
    <Mode>-1</Mode>
    <BaudRate>115200</BaudRate>
    <DataBits>8</DataBits>
    <StopBits>1</StopBits>
    <Parity>256</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>13</InputTerminator>
    <OutputTerminator>13</OutputTerminator>
    <FixedInputMode>13</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>1</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </newValue>
  <oldValue>
    <PortNumber>1</PortNumber>
    <Mode>0</Mode>
    <BaudRate>0</BaudRate>
    <DataBits>0</DataBits>
    <StopBits>0</StopBits>
    <Parity>0</Parity>
    <Handshake>0</Handshake>
    <InputPacketSize>0</InputPacketSize>
    <OutputPacketSize>0</OutputPacketSize>
    <InputTerminator>0</InputTerminator>
    <OutputTerminator>0</OutputTerminator>
    <FixedInputMode>0</FixedInputMode>
    <FixedInputLength>0</FixedInputLength>
    <DeviceNetTrigger>0</DeviceNetTrigger>
    <InputTimeout>0</InputTimeout>
  </oldValue>
</change>
```

Figure C-23: Example: Network Settings

User List


```xml
<change typeGroup="system" type="UserList">
  <newValue>
    <User>
      <Name>admin</Name>
      <Password>***</Password>
      <Access>0</Access>
      <Read>1</Read>
      <Write>1</Write>
      <View>1</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
    <User>
      <Name>monitor</Name>
      <Password>***</Password>
      <Access>2</Access>
      <Read>0</Read>
      <Write>0</Write>
      <View>0</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
    <User>
      <Name>operator</Name>
      <Password>***</Password>
      <Access>1</Access>
      <Read>1</Read>
      <Write>0</Write>
      <View>0</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
  </newValue>
  <oldValue>
    <User>
      <Name></Name>
      <Password>***</Password>
      <Access>0</Access>
      <Read>0</Read>
      <Write>0</Write>
      <View>0</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
    <User>
      <Name></Name>
      <Password>***</Password>
      <Access>0</Access>
      <Read>0</Read>
      <Write>0</Write>
      <View>0</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
    <User>
      <Name></Name>
      <Password>***</Password>
      <Access>0</Access>
      <Read>0</Read>
      <Write>0</Write>
      <View>0</View>
      <OnlineAccessEnabled>0</OnlineAccessEnabled>
    </User>
  </oldValue>
</change>
```


Figure C-24: User List

Host Table

```
<change typeGroup="system" type="HostTable">
  <newValue>
    <Host>
      <Name>host1</Name>
      <IPAdress>1.2.3.4</IPAdress>
    </Host>
    <Host>
      <Name>host2</Name>
      <IPAdress>4.3.2.1</IPAdress>
    </Host>
  </newValue>
  <oldValue>
    <Host>
      <Name></Name>
      <IPAdress></IPAdress>
    </Host>
    <Host>
      <Name></Name>
      <IPAdress></IPAdress>
    </Host>
  </oldValue>
</change>
```

Figure C-25: Example: Host Table

Startup Settings

```
<change typeGroup="system" type="Startup">
  <newValue>
    <JobName>startup.job</JobName>
    <Online>1</Online>
  </newValue>
  <oldValue>
    <JobName></JobName>
    <Online>0</Online>
  </oldValue>
</change>
```

Figure C-26: Example: Startup Settings

Discrete Input

```
<change typeGroup="system" type="DiscreteInput 0">
  <newValue>
    <Name>Line 0</Name>
    <Type>0</Type>
    <Signal>2</Signal>
  </newValue>
  <oldValue>
    <Name></Name>
    <Type>0</Type>
    <Signal>0</Signal>
  </oldValue>
</change>
```

Figure C-27: Example: Discrete Input

Discrete Output

```
<change typeGroup="system" type="DiscreteOutput 0">
  <newValue>
    <Name>Line 0</Name>
    <Type>0</Type>
    <Pulse>0</Pulse>
    <PulseLen>10</PulseLen>
    <Delay>0</Delay>
  </newValue>
  <oldValue>
    <Name></Name>
    <Type>0</Type>
    <Pulse>0</Pulse>
    <PulseLen>0</PulseLen>
    <Delay>0</Delay>
  </oldValue>
</change>
```

Figure C-28: Example: Discrete Output

Time Settings

```
<change typeGroup="system" type="Time">
  <newValue>32400,2,4, -3600,3,3,1,2,0,&quot;Alaskan Daylight Time&quot;,
0,11,1,0,2,0,&quot;Alaskan Standard Time&quot </newValue>
  <oldValue>-32400,2,4, -3600,3,2,0,2,0,&quot;Alaskan Daylight Time&quot;,
0,11,1,0,2,0,&quot;Alaskan Standard Time&quot;</oldValue>
</change>
```

Figure C-29: Example: Time Settings

Default Settings

```
<change typeGroup="system" type="DefaultSettings" />
```

Figure C-30: Example: Default Settings

Job Languages

```
<change typeGroup="system" type="JobLanguage">
  <newValue>French</newValue>
  <oldValue>English</oldValue>
</change>
```

Figure C-31: Example: Job Languages

System Language

```
<change typeGroup="system" type="SysLanguage">
  <newValue>French</newValue>
  <oldValue>English</oldValue>
</change>
```

Figure C-32: Example: System Language

DeEnergeize Outputs

```
<change typeGroup="system" type="DeEnergizeOutputs">
  <newValue>1</newValue>
  <oldValue>0</oldValue>
</change>
```

Figure C-33: Example: DeEnergeize Outputs

DHCPTimeout

```
<change typeGroup="system" type="DHCPTimeout">
  <newValue>70</newValue>
  <oldValue>60</oldValue>
</change>
```

Figure C-34: Example: DHCPTimeout

RAMDISK Size

```
<change typeGroup="system" type="RAMDISK">
  <newValue>5000</newValue>
  <oldValue>0</oldValue>
</change>
```

Figure C-35: Example: RAMDISK Size

White Balance

```
<change typeGroup="system" type="WhiteBalance">
  <newValue>
    <Red>1.100000</Red>
    <Green>0.843000</Green>
    <Blue>2.123000</Blue>
  </newValue>
  <oldValue>
    <Red>1.000000</Red>
    <Green>1.000000</Green>
    <Blue>2.140000</Blue>
  </oldValue>
</change>
```

Figure C-36: Example: White Balance

Connection Timeout

```
<change typeGroup="system" type="ConnectionTimeout">
  <newValue>5</newValue>
  <oldValue>1</oldValue>
</change>
```

Figure C-37: Example: Connection Timeout

Telnet Port

```
<change typeGroup="system" type="TelnetPort">
  <newValue>1234</newValue>
  <oldValue>23</oldValue>
</change>
```

Figure C-38: Example: Telnet Port

LiveImage Settings

```
<change typeGroup="system" type="LiveImage">
  <newValue>
    <Mode>2</Mode>
    <FrameRate>1.000</FrameRate>
  </newValue>
  <oldValue>
    <Mode>2</Mode>
    <FrameRate>0.000</FrameRate>
  </oldValue>
</change>
```

Figure C-39: Example: LiveImage Settings

OnlineImage Settings

```
<change typeGroup="system" type="OnlineImage">
  <newValue>
    <Mode>2</Mode>
    <FrameRate>1.000</FrameRate>
  </newValue>
  <oldValue>
    <Mode>0</Mode>
    <FrameRate>0.000</FrameRate>
  </oldValue>
</change>
```

Figure C-40: Example: OnlineImage Settings

ImageCellGraphicsMode

```
<change typeGroup="system" type="ImageCellGraphicsMode">
  <newValue>
    <GraphicsDataMode>1</GraphicsDataMode>
    <GuiSync>1</GuiSync>
  </newValue>
  <oldValue>
    <GraphicsDataMode>1</GraphicsDataMode>
    <GuiSync>0</GuiSync>
  </oldValue>
</change>
```

Figure C-41: Example: ImageCellGraphicsMode

FormatOutputBufferErrData

```
<change typeGroup="system" type="FormatOutputBufferErrData">
  <newValue>1</newValue>
  <oldValue>0</oldValue>
</change>
```

Figure C-42: Example: FormatOutputBufferErrData

FormatOutputBufferErrString

```
<change typeGroup="system" type="FormatOutputBufferErrString">
  <newValue>New Error Message</newValue>
  <oldValue>Old Error Message</oldValue>
</change>
```

Figure C-43: Example: FormatOutputBufferErrString

Service Enabled - EIP and ProfiNET stacks

```
<change typeGroup="system" type="ServicesEnabled">
  <newValue>2</newValue>
  <oldValue>3</oldValue>
</change>
```

Figure C-44: Example: Service Enabled - EIP and ProfiNET stacks

IPProtAddLicense

```
<change typeGroup="system" type="IPProtAddLicense">
  <newValue>2ABF2C2745FF4FF817FCB2E8F25309C02E52CBB4149A3F2E</newValue>
</change>
```

Figure C-45: Example: IPProtAddLicense

IPProtRemoveLicense

```
<change typeGroup="system" type="IPProtRemoveLicense">
  <newValue>2ABF2C2745FF4FF817FCB2E8F25309C02E52CBB4149A3F2E</newValue>
</change>
```

Figure C-46: Example: IPProtRemoveLicense

ActiveCellLimit

```
<change typeGroup="system" type="ActiveCellLimit">
  <newValue>10400</newValue>
  <oldValue>6144</oldValue>
</change>
```

Figure C-47: Example: ActiveCellLimit

JobCompleteMode

```
<change typeGroup="system" type="JobCompleteMode">
  <newValue>1</newValue>
  <oldValue>2</oldValue>
</change>
```

Figure C-48: Example: JobCompleteMode

EnableCameraUpdateTimeout

```
<change typeGroup="system" type="EnableCameraUpdateTimeout">
  <newValue>0</newValue>
  <oldValue>1</oldValue>
</change>
```

Figure C-49: Example: EnableCameraUpdateTimeout

JobDialogsUndoOnCancel

```
<change typeGroup="system" type="JobDialogsUndoOnCancel">
  <newValue>0</newValue>
  <oldValue>1</oldValue>
</change>
```

Figure C-50: Example: JobDialogsUndoOnCancel

JobDialogsFastOnlineUndo

```
<change typeGroup="system" type="JobDialogsFastOnlineUndo">
  <newValue>0</newValue>
  <oldValue>1</oldValue>
</change>
```

Figure C-51: Example: JobDialogsFastOnlineUndo

AuditIPSettings

```
<change typeGroup="system" type="AuditIPSettings">
  <newValue>
    <IPAddress>10.26.80.32</IPAddress>
    <Port>5753</Port>
  </newValue>
  <oldValue>
    <IPAddress>10.26.80.123</IPAddress>
    <Port>5753</Port>
  </oldValue>
</change>
```

Figure C-52: Example: AuditIPSettings

AuditPerformanceSettings

Note: This setting may only be changed via a native mode command.

```
<change typeGroup="system" type="AuditPerformanceSettings">
  <newValue>
    <MemoryQueue>10</MemoryQueue>
    <FlashQueue>20</FlashQueue>
  </newValue>
  <oldValue>
    <MemoryQueue>30</MemoryQueue>
    <FlashQueue>2000</FlashQueue>
  </oldValue>
</change>
```

Figure C-53: Example: AuditPerformanceSettings

AuditEnableSettings

```
<change typeGroup="system" type="AuditEnableSettings">
  <newValue>
    <Enabled>1</Enabled>
    <EventsEnabled>1</EventsEnabled>
    <TagsEnabled>0</TagsEnabled>
    <SystemChangeEnabled>1</SystemChangeEnabled>
  </newValue>
  <oldValue>
    <Enabled>1</Enabled>
    <EventsEnabled>1</EventsEnabled>
    <TagsEnabled>1</TagsEnabled>
    <SystemChangeEnabled>1</SystemChangeEnabled>
  </oldValue>
</change>
```

Figure C-54: Example: AuditEnableSettings

ModbusMaximumConnections

```
<change typeGroup="system" type="ModbusMaximumConnections">
  <newValue>2</newValue>
  <oldValue>3</oldValue>
</change>
```

Figure C-55: Example: ModbusMaximumConnections

ModbusIdelTimeout

```
<change typeGroup="system" type="ModbusIdleTimeout">
  <newValue>1000</newValue>
  <oldValue>120</oldValue>
</change>
```

Figure C-56: Example: ModbusIdelTimeout

Event Messages

If an In-Sight system event occurs (logging on or off of a vision system, loading or saving a job file, transitioning from Online to Offline mode, system startup or firmware update), an event message type is generated. Certain events (start up, load job, save job, failed logon attempt and firmware update) convey additional information, with <value> tags surrounding the additional data.

Online

The event occurs when the sensor goes online.

```
<event type="Online" success="true" />
```

Figure C-57: Example: Online

Offline

The event occurs when the sensor goes offline.

```
<event type="Offline" success="true" />
```

Figure C-58: Example: Offline

LogOn Failure

When a logon attempt fails, the following information is displayed within <value> tag:

```
<event type="LogOn" success="false">
  <value>Invalid Password</value>
</event>
```

Figure C-59: Example: LogOn Failure

- **Invalid Password**: The password entered is incorrect.
- **Invalid Username**: The User Name entered does not exist in the User List.
- **System Locked**: The vision system is locked by another user. This information is usually displayed when a firmware update is in process.
- **Access Not Permitted For User**: The user is not authorized access to the vision system.
- **Spreadsheet View Access Not Permitted**: The user does not have access to the Spreadsheet View on the vision system. This information is usually displayed when the user has access to the EasyBuilder View.
- **Unspecified Failure**: The logon attempt is unsuccessful for unknown reasons.

LogOn Success

The event occurs when successfully logging on to a sensor.

```
<event type="LogOn" success="true" />
```

Figure C-60: Example: LogOn Success

LogOff

The event occurs when successfully logging off from a sensor.

```
<event type="LogOff" success="true" />
```

Figure C-61: Example: LogOff

NewJob

The event occurs when a new, empty job is created.

```
<event type="NewJob" success="true" />
```

Figure C-62: Example: NewJob

LoadJob

The event occurs when a job is loaded on a sensor.

```
<event type="LoadJob" success="true" />
  <value>myjob.job</value>
</event>
```

Figure C-63: Example: LoadJob

SaveJob

The event occurs when the current job is saved on a sensor.

```
<event type="SaveJob" success="true" />
  <value>myjob.job</value>
</event>
```

Figure C-64: Example: SaveJob

StartUp

The event occurs when the sensor is powered-up or restarts.

```
<event type="Startup" success="true" />
  <value>4.04.02 (009)</value>
</event>
```

Figure C-65: Example: StartUp

FirmwareUpgrade

The event occurs when the sensor's firmware is upgraded.

```
<event type="FirmwareUpgrade" success="true">
```

Figure C-66: Example: FirmwareUpgrade

Native Mode Commands

The following native mode commands can get or set the audit message settings on the sensor.

Setup Audit Message IP Settings

Audit messages are sent to a server (IP Address) at a specified port. The IP Address and Port can be set using using native mode.

```
EV SetSystemConfig("AuditIPSettings", <IPAddress>, <Port#>, <WritetoProc>)
Example: EV SetSystemConfig(“AuditIPSettings”, 127.0.0.1, 5753, 1)
```

Enable Audit Messages

Audit messages can be enabled using native mode.

```
EV SetSystemConfig("AuditEnableSettings", <enabled>, <eventsEnabled>, <tagsEnabled>,
<sysChanges>, <WritetoProc>)
Example: EV SetSystemConfig("AuditEnableSettings", 1, 1, 1, 1, 1)
```

Audit Message Memory

Audit Message will be preserved on the vision system (by default, up to 2,000 messages) during network outages or when the Audit Server is unavailable. If Audit Messages are delayed, due to network outage, or server availability, they will be sent when a connection to the Audit Server is established.

Schema for Audit Messages

You can access to the Audit Message Schema file (AuditMessage.xsd) in the following directory (default):

C:\Program Files\Cognex\In-Sight\In-Sight Track and Trace 2.0.0\Cognex Audit Message Server\AuditMessage.xsd

Appendix D - Integrating the HMI Display Control

The Cognex HMI Display Control (CnxHmiDisplay) is a .NET control that allows developers to seamlessly integrate the In-Sight Track & Trace user interface into a custom application. For example, the Track & Trace interface can be integrated into an HMI that also hosts the user interfaces to other devices on the same packaging line such as a printer or a weigh station.

The “touch screen” friendly, look-and-feel of the HMI Display Control is similar to that of the Cognex VisionView Operator Interface Panel. Interactive graphical elements in the HMI Display Control provide easy access to essential functionality for interacting with the vision system, such as adjusting the image or switching the vision system Online and Offline. By simply dropping the HMI Display Control into a .NET application and setting a few properties, users have the power to view and interact with Track & Trace from within the context of your custom application.

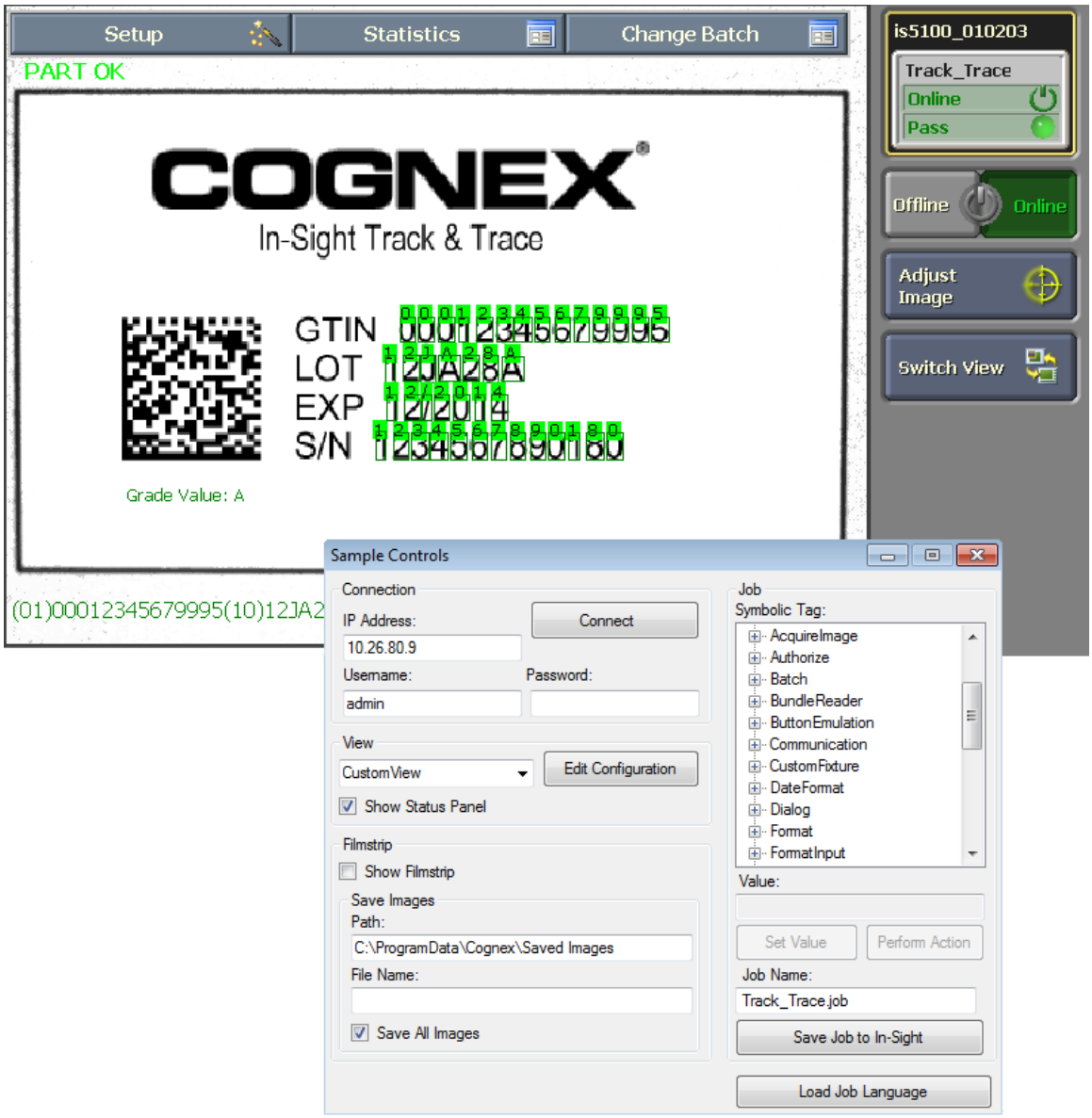

Figure D-1: Cognex HMI Display Control Sample Application

The HMI Display Control provides a rich API to access various Track & Trace and In-Sight vision system features and functions. To help you get started, use the Cognex HMI Display Control Sample application to understand how to integrate Track & Trace into your own application.

HMI Display Control Prerequisites

The following are requirements for use of the Cognex HMI Display Control:

- Visual Studio 2010:
- VB.NET or C# programming experience
- Cognex Track & Trace software installation

Adding the HMI Display Control to your Application

When you install In-Sight Track & Trace, a sample HMI application is also loaded as shown in *Integrating the HMI Display Control* on page 97. This section describes the steps necessary to develop a new application that consumes the HMI Display Control.

1. Start Microsoft Visual Studio and create a new Windows Application project.

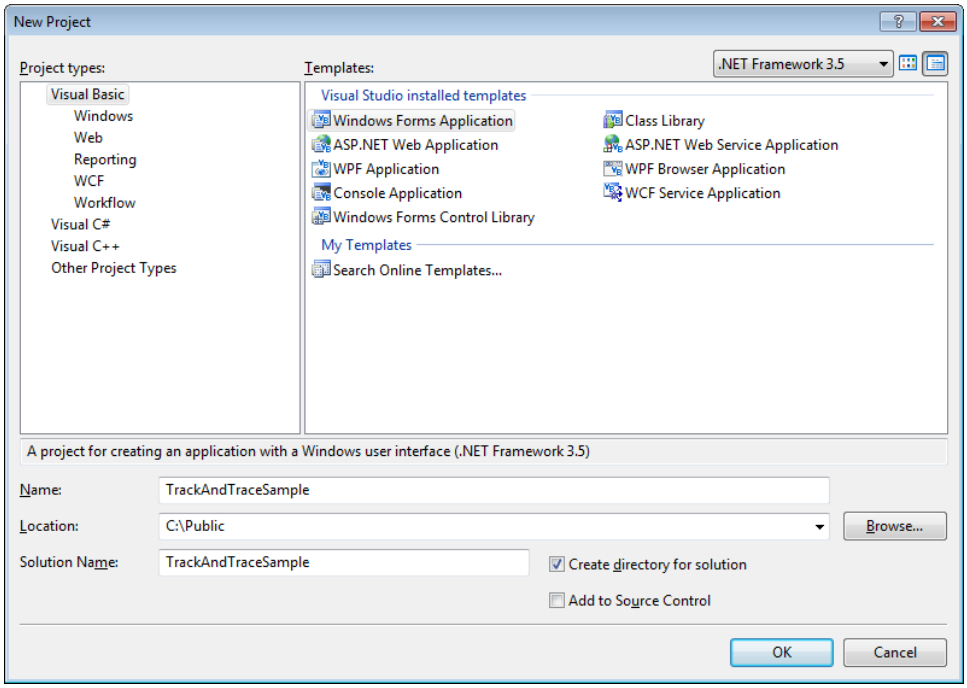

Figure D-2: New Project Dialog

2. If it is not already visible, open the Toolbox (**View** menu > **Toolbox**). In the Cognex In-Sight Components tab, right-click **Choose Items...**

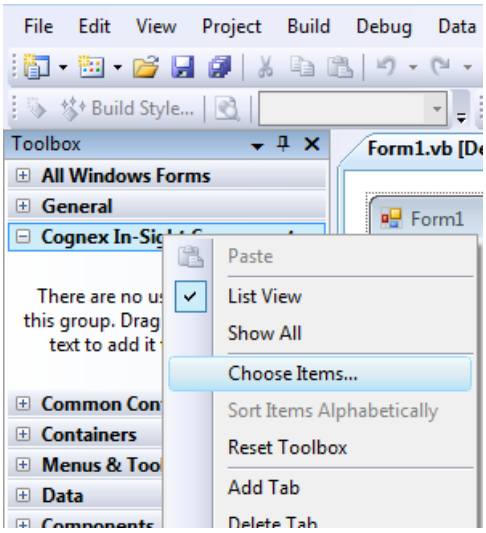

Figure D-3: Toolbox

3. In the Choose Toolbox Items dialog locate the CnxHmiDisplay component in the .NET Framework Components tab and make sure it is checked.

Note: If the CnxHmiDisplay component is missing from the list of components, it can also be manually located by selecting Browse… then navigating to the Track & Trace installation folder and selecting the Cognex.Cnx.Components.dll assembly (by default the installation folder is C:\Program Files\Cognex\In-Sight\In-Sight Track and Trace 2.0.0\Cognex HMI Control).

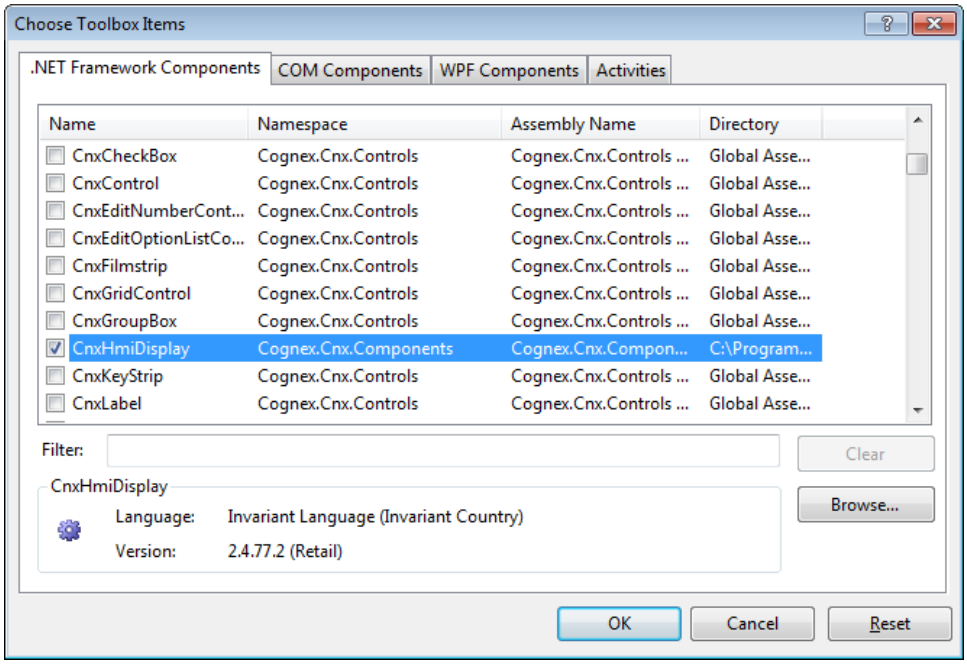

Figure D-4: Choose Toolbox Items

Once added to the Toolbox, the CnxHmiDisplay component can then be inserted into the application's form.

4. Adding the CnxHmiDisplay to the form automatically adds several required references to the project, specifically:
   - Cognex.Cnx.Controls
   - Cognex.Cnx.Components
   - Cognex.Cnx.Core
   - Cognex.Cnx.Framework

   There are two additional references that need to be added. Under the **Project** menu, select **Add Reference…**

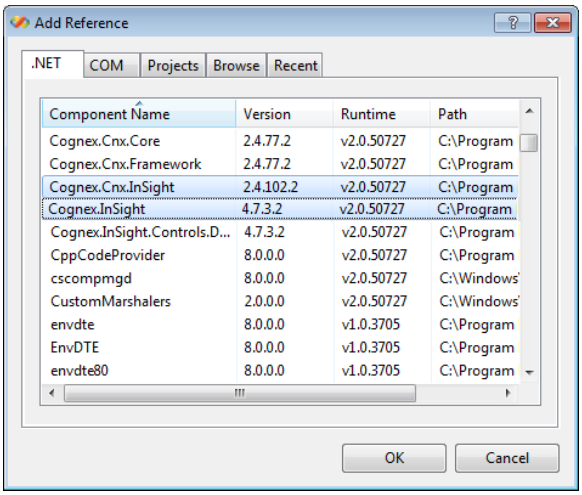

Figure D-5: Add Reference Dialog

You will need to locate and select the following two references:

- Cognex.Cnx.InSight
- Cognex.InSight

Using the HMI Display Control – Properties

The HMI Display Control can be used in a mode that emulates the VisionView Operator Interface Panel. No programming is required in this configuration. The connection and the appearance of the HMI Display Control can be configured simply using the control's properties. The following properties are available through the Properties pane when the HMI Display Control is selected:

- AutoConnectString: Allows connection to an In-Sight vision system running a Track & Trace job file. The format of the string is either "*IP,username,password*" (without the quotes) or "*IP,username*" if no password is required. For example, "*192.168.0.1,admin*" will allow connection to a vision system located at IP address *192.168.0.1* that has a user named *admin* and no password.

  Note: A successful connection requires that a valid Track & Trace job is loaded on the target In-Sight vision system. If a valid Track & Trace job is not loaded there will be no error, but the control will not connect.

- LiveImageQuality: Configures the sub-sampling (if any) of the live video image.
- OnlineImageQuality: Configures the sub-sampling (if any) of the inspected image.
- OperatorControls: Determines which user interface components are displayed.
- ShowFilmstrip: Determines if the image history filmstrip is displayed.
- ShowStatusPanel: Determines if the status panel is displayed.

> **Note**: It is highly recommended that ShowStatusPanel be set to True to determine if a connection to an In-Sight vision system has been established.

- StatusLevelStyle: Sets the visual style of the status panel widgets.

These properties can be accessed directly in the control's property sheet. The usage of these properties is defined in the CnxHmiDisplay class reference.

Programming the HMI Display Control

In addition to the properties available in the HMI Display Control property sheet, the control has additional properties and methods that can be accessed programmatically. In order to fully make use of these members, access to additional classes is needed. All of these classes are defined in the Cognex.Cnx.Components assembly. These classes can be accessed using a fully qualified path, or by simply importing the Cognex.Cnx.Components namespace by placing the following statement at the top of the form code:

For VB.NET
```
Imports.Cognex.Cnx.Components
```

For C#
```
using Cognex.Cnx.Components
```

The methods and properties of the HMI Display Control are listed in the *Cognex HMI Display Control Reference* help documentation. Example usages of these members are provided below; consult the documentation for further information.

Examples

The following examples assume a control has already been added with the default name CnxHmiDisplay1.

- Manually establishing a connection to a Track & Trace vision system at IP address 192.168.1.1

  ```
  CnxHmiDisplay1.Connect("192.168.1.1, admin")
  ```

- Determine if the Track & Trace vision system has a valid job loaded

  ```
  bIsValid = CnxHmiDisplay1.IsValidJob
  ```

- Setting the idle time (in minutes) before an operator user is logged out (default is 10 minutes)

  ```
  CnxHmiDisplay1.IdleTimeout = iTimeout
  ```

  > **Note**: The timeout can be disabled by specifying a value of zero.

- Retrieving the name of an available display view

  ```
  myBrowseName = CnxHmiDisplay1.AvailableViews(index).BrowseName
  ```

- Switching to a display view by name

  ```
  CnxHmiDisplay1.SelectView(myBrowseName)
  ```

Services

As noted previously, the Track & Trace job and In-Sight vision system are independent of the HMI Display Control. Services provide a way for the HMI Display Control to access the job and vision system to perform job-related actions such as changing jobs and job configuration. The services that are available are provided as members of the display control, and include:

`ChangeJobService`	(for accessing Track & Trace jobs)
`LiveAcquisitionService`	(for setting a vision system's live video mode)
`OnlineOfflineService`	(for setting a vision system's in/out inspection mode)
`ResultService`	(for retrieving or modifying job parameters)
`TrainFontScreenService`	(for training the OCR font)

For example:

- Retrieving available jobs from a connected Track & Trace vision system

  ```
  myJobNames = CnxHmiDisplay1.ChangeJobService.GetJobNames()
  ```

- Setting the current Track & Trace vision system job (not as the startup job)

  ```
  CnxHmiDisplay1.ChangeJobService.ChangeJob(myJobName, False)
  ```

Symbolic Tags

Services also provide the ability to retrieve and modify values in the job, as well as to display various dialog boxes that enable advanced configuration. This level of access is gained through the use of tags along with the services. Tags identify the specific items within the job. The following are two code examples of accessing and using tags to perform actions:

- Retrieving symbolic tags available in a Track & Trace job

  (collection of Cognex.Cnx.ComponentModel.CnxTaggedResultMetadata)

  ```
  myTags = CnxHmiDisplay1.ResultsService.SymbolicTags()
  ```

- Retrieving a value corresponding to a symbolic tag

  ```
  CnxHmiDisplay1.ResultsService.GetValue(myTag.BrowseName)
  ```

- Setting the value corresponding to a symbolic tag

  ```
  CnxHmiDisplay1.ResultsService.SetValue(myTag.BrowseName, valueString)
  ```

- Changing user access level using the UserGP.UserGroup tag

  ```
  cnxHmiDisplay1.ResultsService.SetValue("UserGP.UserGroup", iLevel)
  where iLevel can have the following values:
  0 (Operator)
  1 (Supervisor)
  3 (Administrator)
  ```

- Displaying a dialog to modify user access permissions using the Dialog.UserPermissions tag

  ```
  cnxHmiDisplay1.ResultsService.PerformAction("Dialog.UserPermissions")
  ```

- Displaying a dialog to modify user access permissions using the Dialog.UserPermissions tag

  ```
  cnxHmiDisplay1.ResultsService.PerformAction("Dialog.UserPermissions")
  ```

A list of the most useful symbolic tags in a Track & Trace job, along with their related services are provided below. To see all of the symbolic tags available in the Track & Trace job, refer to the Symbolic Tag list in the HMI Display Control Sample application.

Table D-1: Track & Trace Symbolic Tag Names

Tag	Description	Required Service and Method
JobVersion		
JobVersion	Gets the job version information.	ResultsService.GetValue()
System.BuildNumber	Gets the job build number.	ResultsService.GetValue()
Batch Statistics		
Statistics.Batch.Total	Gets the actual batch statistic: count of total parts.	ResultsService.GetValue()
Statistics.Batch.Passed	Gets the actual batch statistic: count of passed parts.	ResultsService.GetValue()
Statistics.Batch.Failed	Gets the actual batch statistic: count of failed parts.	ResultsService.GetValue()
Operator Statistics		
Statistics.Operator.Total	Gets the actual operator statistic: count of total parts.	ResultsService.GetValue()
Statistics.Operator.Passed	Gets the actual operator statistic: count of passed parts.	ResultsService.GetValue()
Statistics.Operator.Failed	Gets the actual operator statistic: count of failed parts.	ResultsService.GetValue()
Statistics.Reset	Resets the Operator statistics.	ResultsService.SetValue()
Batch Information (buttons)		
Verification.ChangeBatch	Accesses the “Change Batch” button that applies and activates any new batch information.	ResultsService.PerformAction()
Dialog Boxes		
Dialog.Setup	Opens the Setup menu.	ResultsService.PerformAction()
Dialog.Statistics	Opens the Statistics dialog.	ResultsService.PerformAction()
Statistics.DefectDetails	Opens the Defect Details dialog.	ResultsService.PerformAction()
Dialog.ChangeBatch	Opens the Change Batch screen.	ResultsService.PerformAction()
Dialog.ImageSettings	Opens the IMAGE SETTINGS screen.	ResultsService.PerformAction()
Dialog.LocationTools	Opens the LOCATION TOOLS screen to configure the PatMax or PatFind search tool.	ResultsService.PerformAction()
Dialog.IDCode1	Opens the ID CODE 1 screen.	ResultsService.PerformAction()
Dialog.IDCode2	Opens the ID CODE 2 screen.	ResultsService.PerformAction()
Dialog.OcrLines	Opens the OCR LINES screen.	ResultsService.PerformAction()
Dialog.Verification	Opens the Verification screen.	ResultsService.PerformAction()
Dialog.Communication	Opens the COMMUNICATION screen.	ResultsService.PerformAction()
Dialog.Output	Opens the OUTPUT screen.	ResultsService.PerformAction()
Dialog.Format	Opens the FORMAT screen.	ResultsService.PerformAction()
Dialog.BundleReader	Opens the BUNDLE READER screen.	ResultsService.PerformAction()
Dialog.TrainFonts	Opens the TRAIN FONTS screen.	ResultsService.PerformAction()
Dialog.DateFormat	Opens the DATE FORMAT screen.	ResultsService.PerformAction()
Dialog.Display	Opens the ON-SCREEN DISPLAY screen.	ResultsService.PerformAction()
Localization		
Localized.SelectedLanguage	Returns the current language.	ResultsService.GetValue()
Authorization		

Authorize.Type	Specifies the Authorization level (None, Authorize-Only, Double-Blind).	ResultsService.GetValue() and ResultsService.SetValue()
InspectionResult		
Inspection.FinalResult	Returns the Final Inspection Result.	ResultsService.GetValue()

Language Localization

As noted in at the beginning of this section, the HMI Display Control and the Track & Trace job are distinct and independent. Consequently, modifying the language in one does not affect the language in the other; both the HMI Display Control and the Track & Trace job need to be localized, as required.

Changing the language used for the HMI Display Control (but not the Track & Trace job) is performed using the following sequence:

```
Cognex.Cnx.CnxApplication.Culture = CnxHmiDisplay.InstalledCultures(i)
cnxHmiDisplay1.Refresh()
```

Changing the language in the job requires the use of the In-Sight Track & Trace Configuration Utility. See *Set Up the Language* on page 9 for details.

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