LabelVal Application Functional Overview

1. Introduction

LabelVal is a comprehensive WPF-based desktop application designed for advanced barcode label validation and verification. It provides a robust suite of tools for capturing, analyzing, and managing label images from various hardware devices. The application allows for detailed inspection of barcodes, comparison against master or "golden" images, and generation of in-depth quality reports.

2. Core Concepts

The application is built around several key concepts:

• Devices: LabelVal interfaces with multiple types of hardware for image acquisition and verification. The primary supported devices identified are:

• L95 (Verifier): A barcode verifier.

• V5 (Scanner): An image scanner.

• V275: Another distinct device, likely a scanner or verifier. The application provides dedicated manager views for configuring and interacting with these devices.

• Image Rolls: An "Image Roll" is a collection or sequence of captured images. This concept allows users to group related scans, such as from a single batch or production run, for organized analysis and management.

• Sectors: A "Sector" represents a specific region of interest within a captured image, typically a barcode. LabelVal performs detailed analysis on these sectors, extracting data and quality metrics according to various industry standards.

• Results Management: The application features a powerful results management system where captured images and their sector data can be compared. A key workflow is the comparison of a "Current" scan against a "Stored" (or golden) reference image and its data.

3. Key Features

3.1. Device and Results Management

• Device-Specific Views: The UI provides dedicated views for managing different device types, such as ScannerManager and VerifierManager.

• Results Comparison: The core of the application is the results view, which presents a side-by-side comparison of a Current image/scan against a Stored reference. This includes visual image comparison and detailed parameter differences for each sector.

• Data Persistence: Users can "Store" a current result, making it the new reference for future comparisons. Results can also be cleared or deleted.

3.2. Image and Sector Analysis

• Advanced Image Viewing: The application includes a sophisticated image viewer with pan and zoom capabilities. It can display overlays on the images to highlight sector locations, quality grades, and other metadata.

• 2D and 3D Visualization: Users can inspect captured images in both 2D and 3D, which is particularly useful for analyzing Direct Part Marking (DPM) codes on various surfaces.

• Barcode Quality Grading: LabelVal grades barcodes against established standards like ISO/IEC 15415, ISO/IEC 15416, and ISO/IEC TR 29158 (DPM). It analyzes numerous parameters, including:

• Symbol Contrast

• Modulation

• Decodability

• Fixed Pattern Damage

• Grid and Axial Non-uniformity

• GS1 and Application Standards: The system validates barcode data structure against GS1 and other application standards (e.g., MIL-STD-130).

3.3. Barcode Support and Reporting

• Extensive Symbology Support: By integrating the Zint barcode library, LabelVal supports a vast range of 1D and 2D barcode symbologies, from common types like Code 128 and QR Code to specialized ones like Aztec Code and DotCode.

• Data Export: Analysis data can be easily exported. Users can copy individual sector reports or entire result sets to the clipboard in various formats:

• Delimited Text (CSV): For easy import into spreadsheets.

• JSON: For integration with other software systems.

• Image Export: Users can save rendered images of sectors or full labels as PNG files or copy them directly to the clipboard.

4. User Interface Overview

• Splash Screen: On startup, a splash screen appears, indicating the application's loading status.

• Main Window: The main application window features a modern interface, likely with a central content area and a navigation menu.

• Manager Views: Different sections of the application, such as ScannerManager, VerifierManager, and ResultsManagerView, are displayed in the main content area. These views allow users to control devices and analyze results.

• Dialogs and Drawers: The application uses dialogs and slide-out "drawer" panels to present detailed information, such as scanner settings or sector details, without cluttering the main view.

• Interactive Overlays: Images are displayed with interactive overlays. Hovering over a sector can highlight it and display summary information, while clicking can open a detailed view.