

## Overview

MicroCODE LADDERS® is family of Programmable Logic Controller (PLC) support tools, including:

- **Compare** – a near instantaneous look at the differences between two PLC programs with an interactive HTML Report
- **Batch Compare** – a tool to schedule compares on uploaded files against known good production logic and email a summary and compare reports on change
- **Active Compare** – a tool monitors live PLCs, detect logic changes, upload, and generate compare reports on change – directly to an email list

The heart of the LADDERS products is the Compare Report itself. See 'Quick Start' on page 4 for more information.

## Hardware Requirements

The LADDERS products are offering in various ways to suit the user's requirements:

- **Cloud Service** – ad hoc compare at any time. (An open internet connection and web browser for file uploads, and email, and viewing the compare report).
- **User Hosted Server** – for supporting a production facility. (Windows or Linux Server or VM).
- **Desktop App** – for Controls Engineers doing development and deployment work. (Windows 10+).

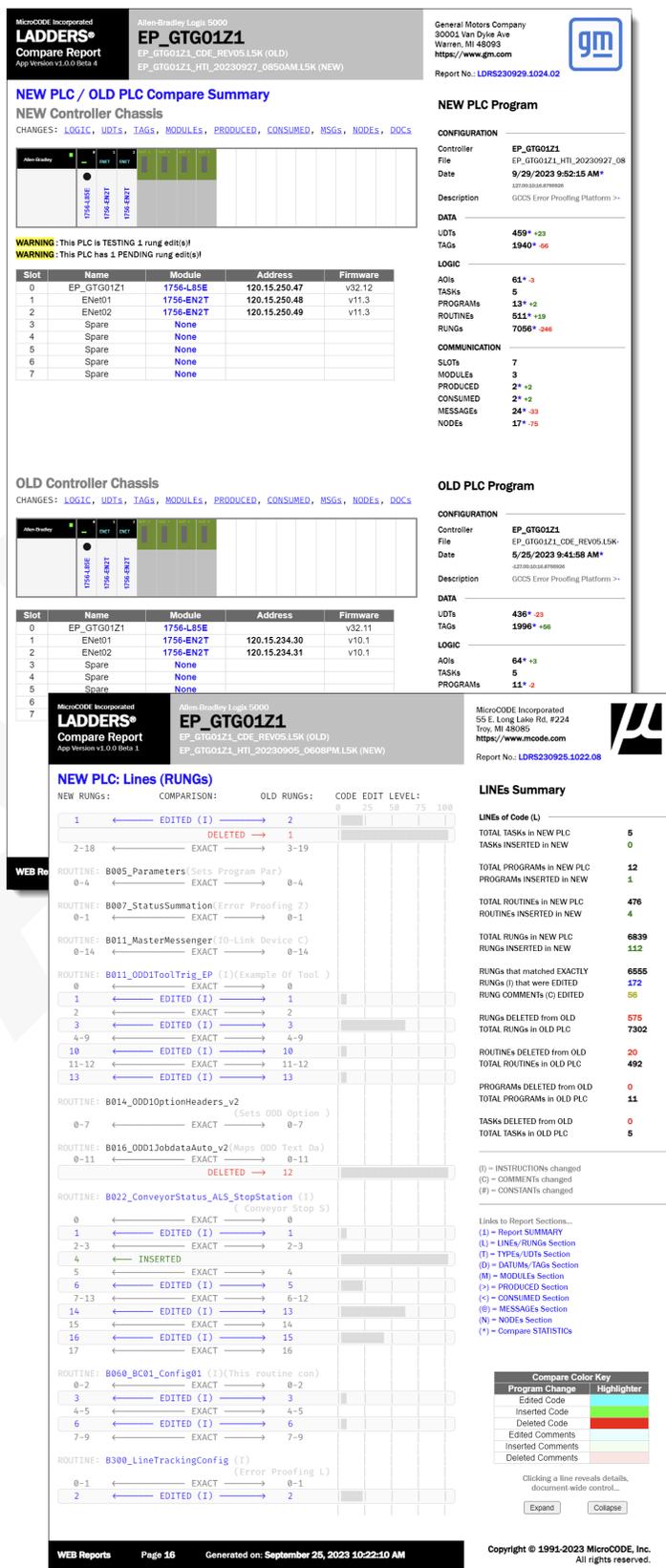
## Software Requirements

The LADDERS App requires the following software for proper execution:

- **Web Browser** – for viewing all Compare reports or using the Cloud-based compares
- **Windows 10+** – for LADDERS® Desktop (optional)
- **Windows 10+ or Linux** – for LADDERS® Server (optional)

The LADDERS® does **\*not\*** require any additional software licenses, this is a MicroCODE owned application licensed directly to our end users:

- No Rockwell Automation software required
- No 3<sup>rd</sup> Party OPC Server
- No 3<sup>rd</sup> Party Communication Software



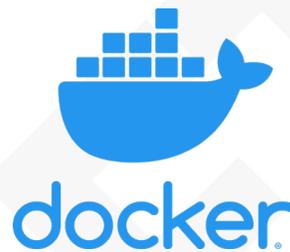
The screenshot displays the LADDERS Compare Reports interface for a comparison between a 'NEW PLC / OLD PLC Compare Summary' and an 'OLD Controller Chassis'. The interface includes a header with user information, a report number, and a GM logo. It features a 'NEW PLC Program' and an 'OLD PLC Program' section, each with a 'CONFIGURATION' table showing details like Controller, File, Date, Description, DATA, TAGS, LOGIC, and COMMUNICATION. A 'NEW PLC: Lines (RUNGS)' section shows a comparison of rungs between the two programs, with columns for 'NEW RUNGS', 'COMPARISON', 'OLD RUNGS', and 'CODE EDIT LEVEL'. A 'LINES Summary' table provides a detailed breakdown of changes, including total tasks, programs, routines, and rungs inserted or deleted in both the new and old PLCs. A 'Compare Color Key' legend explains the color coding used in the comparison, such as green for edited code, red for deleted code, and blue for inserted code. The interface also includes a 'WEB Reports' section and a footer with page information and copyright details.

## LADDERS® App Software

### Application Architecture

The MicroCODE App Framework under LADDERS:

- **.NET 6+** – supports our core code, whether in the Cloud, on the Server, or on your Desktop. The new .NET 6 'Core' is designed to run on Windows, Linux, or MacOS.
- **C#** – our language of choice for the intense backend work that provides the LADDERS services. This is the key to our speed, sub-10 second compares of large Logix 5000 programs, including the generation of the HTML5 interactive compare report!
- **Docker** – the de facto standard for deploying modern web applications, and for virtualization on any hardware. Our Cloud offerings are built on this technology from the ground up.
- **CSS 3** – the LADDERS Compare Report leverages the latest web browser technology, and CSS lets us control the appearance... precisely.
- **JavaScript 5/ES6** – tightly integrated code in the interactive HTML Report that working hand-in-hand with the C# code that generated it. This is key to using the LADDERS compare report to update a PLC to the latest version of template logic.
- **HTML 5** – state-of-the-art visualization of the PLC changes, folding reports, and connected JavaScript interactivity... all inside a file that can be easily viewed on any browser with no other software required.
- **LADDERS (ABCLX5)** for the **Allen-Bradley Logix 5000** – our first product after bringing LADDERS back from the demise of Digital Equipment Corporation, a 25 year sabbatical!



**Allen-Bradley**

## The LADDERS® Compare Report

### Summary Page (1<sup>st</sup> Page of the Report)

The first page of the report gives an at-a-glance view of how the two PLC programs compare to one another. The report may seem 'dense' at first glance, but everything you see on each page has a reason for being there, all from lessons learned during decades of PLC program support.

### Live Report

You can follow along with this guide with a real LADDERS Compare Report at this link:

<https://www.mcode.com/assets/documents/example-ladders-differences.html>

MicroCODE Incorporated  
**LADDERS®**  
Compare Report  
App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTG01Z1**  
EP\_GTG01Z1\_CDE\_REV05.L5K (OLD)  
EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW)

Warren, MI 48093  
<https://www.gm.com>  
Report No.: LDRS230929.1024.02



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### NEW PLC / OLD PLC Compare Summary

#### NEW Controller Chassis

CHANGES: [LOGIC](#), [UDTs](#), [TAGs](#), [MODULEs](#), [PRODUCED](#), [CONSUMED](#), [MSGs](#), [NODEs](#), [DOCs](#)



**WARNING:** This PLC is TESTING 1 rung edit(s)!

**WARNING:** This PLC has 1 PENDING rung edit(s)!

| Slot | Name       | Module    | Address       | Firmware |
|------|------------|-----------|---------------|----------|
| 0    | EP_GTG01Z1 | 1756-L85E | 120.15.250.47 | v32.12   |
| 1    | ENet01     | 1756-EN2T | 120.15.250.48 | v11.3    |
| 2    | ENet02     | 1756-EN2T | 120.15.250.49 | v11.3    |
| 3    | Spare      | None      |               |          |
| 4    | Spare      | None      |               |          |
| 5    | Spare      | None      |               |          |

#### NEW PLC Program

**CONFIGURATION**

Controller: EP\_GTG01Z1  
File: EP\_GTG01Z1\_HTI\_20230927\_08  
Date: 9/29/2023 9:52:15 AM\*  
Description: GDCS Error Proofing

**DATA**

UDTs: 459\* +23  
TAGs: 1940\* -56

**LOGIC**

AOIs: 61\* -3  
TASKs: 5  
PROGRAMs: 13\* +2  
ROUTINEs: 511\* +19  
RUNGs: 7056\* -246

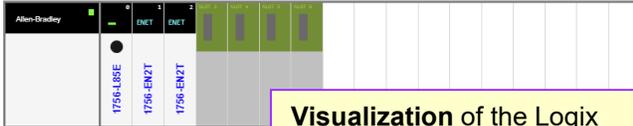
**COMMUNICATION**

SLOTs: 7  
MODULEs: 3  
PRODUCED: 2\* +2  
CONSUMED: 2\* +2  
MESSAGEs: 24\* -33  
NODEs: 17\* -75

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#### OLD Controller Chassis

CHANGES: [LOGIC](#), [UDTs](#), [TAGs](#), [MODULEs](#), [PRODUCED](#), [CONSUMED](#), [MSGs](#), [NODEs](#), [DOCs](#)



| Slot | Name       | Module    |
|------|------------|-----------|
| 0    | EP_GTG01Z1 | 1756-L85E |
| 1    | ENet01     | 1756-EN2T |
| 2    | ENet02     | 1756-EN2T |
| 3    | Spare      | None      |
| 4    | Spare      | None      |
| 5    | Spare      | None      |

#### OLD PLC Program

**CONFIGURATION**

Controller: EP\_GTG01Z1  
File: EP\_GTG01Z1\_CDE\_REV05.L5K\*  
Date: 5/25/2023 9:41:58 AM\*  
Description: GDCS Error Proofing

**DATA**

UDTs: 436\* -23  
TAGs: 1996\* +56

**LOGIC**

AOIs: 64\* +3  
TASKs: 5  
PROGRAMs: 11\* -2  
ROUTINEs: 492\* -19  
RUNGs: 7302\* +246

**COMMUNICATION**

SLOTs: 7  
MODULEs: 3  
PRODUCED: 0\* -2  
CONSUMED: 0\* -2  
MESSAGEs: 57\* +33  
NODEs: 92\* +75

Customer report branding is available.

The NEW PLC program, usually the one that is 'live' on the plant floor running production. If something fails, this is the code causing the issue.

Pending and Testing Edits are displayed right up front.

High level summary of all differences between the NEW and OLD PLCs. These are hyperlinked into the report that shows the differences.

Visualization of the Logix 5000 Racks to immediately show any differences in hardware configuration.

The OLD PLC program, typically a copy of 'known good' logic that has run production without incident for weeks or months.

**Interactive Report**  
Almost everything on the Summary Page is hyperlinked into the report for more information.

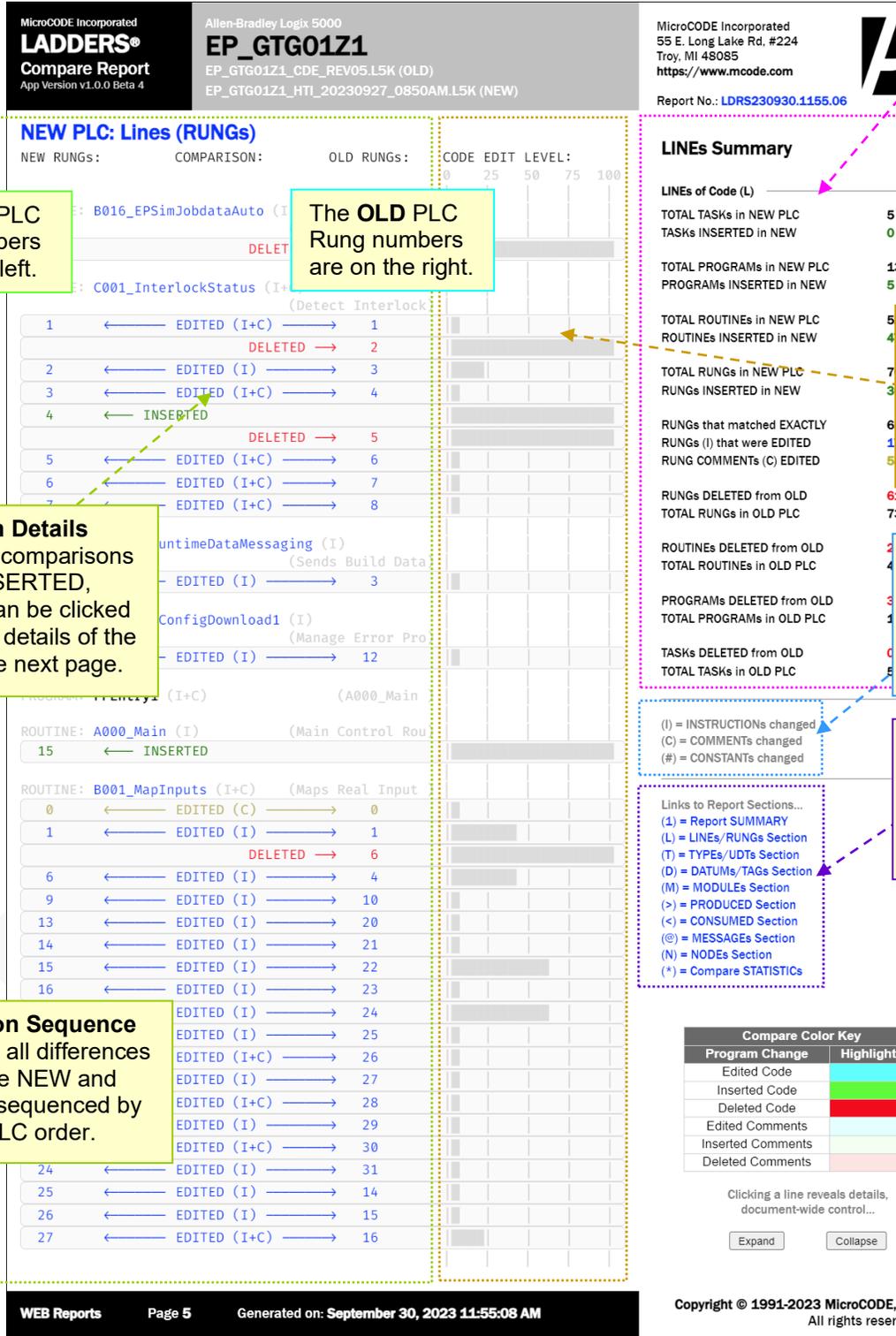
WEB Reports Page 1 Generated on: September 29, 2023 10:24:14 AM Copyright © 1991-2023 MicroCODE, Inc. All rights reserved.

Document: MCX-R01 (LADDERS - ABCLX5 - Release Notes) v1.0.0b4.docx  
Updated: 9/30/23 Copyright © 2018-2023 MicroCODE Incorporated

MicroCODE LADDERS® - User Documentation Page 4

## NAVIGATION (Finding your way around the Report)

Every page after the Summary Page includes the following elements for quick navigation to anything else in the PLCs...



**MicroCODE Incorporated**  
**LADDERS®**  
Compare Report  
App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTG01Z1**  
EP\_GTG01Z1\_CDE\_REV05.L5K (OLD)  
EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW)

MicroCODE Incorporated  
55 E. Long Lake Rd. #224  
Troy, MI 48065  
https://www.mcode.com  
Report No.: **LDRS230930.1155.06**

**NEW PLC: Lines (RUNGs)**

| NEW RUNGS:                                     | COMPARISON:       | OLD RUNGS: | CODE EDIT LEVEL: |
|--|-------------------|------------|------------------|
|  |                   |            | 0 25 50 75 100   |
| B016_EPSimJobdataAuto (I)                      | DELETED           |            |                  |
| C001_InterlockStatus (I) (Detect Interlock)    |                   |            |                  |
| 1 ← EDITED (I+C) → 1                           |                   |            |                  |
|  | DELETED → 2       |            |                  |
| 2 ← EDITED (I) → 3                             |                   |            |                  |
| 3 ← EDITED (I+C) → 4                           |                   |            |                  |
| 4 ← INSERTED →                                 |                   |            |                  |
|  | DELETED → 5       |            |                  |
| 5 ← EDITED (I+C) → 6                           |                   |            |                  |
| 6 ← EDITED (I+C) → 7                           |                   |            |                  |
| 7 ← EDITED (I+C) → 8                           |                   |            |                  |
| runtimeDataMessaging (I) (Sends Build Data)    | EDITED (I) → 3    |            |                  |
| ConfigDownload1 (I) (Manage Error Pro          | EDITED (I) → 12   |            |                  |
| ... (I+C) (A000_Main                           |                   |            |                  |
| ROUTINE: A000_Main (I) (Main Control Rou       |                   |            |                  |
| 15 ← INSERTED →                                |                   |            |                  |
| ROUTINE: B001_MapInputs (I+C) (Maps Real Input |                   |            |                  |
| 0 ← EDITED (C) → 0                             |                   |            |                  |
| 1 ← EDITED (I) → 1                             |                   |            |                  |
|  | DELETED → 6       |            |                  |
| 6 ← EDITED (I) → 4                             |                   |            |                  |
| 9 ← EDITED (I) → 10                            |                   |            |                  |
| 13 ← EDITED (I) → 20                           |                   |            |                  |
| 14 ← EDITED (I) → 21                           |                   |            |                  |
| 15 ← EDITED (I) → 22                           |                   |            |                  |
| 16 ← EDITED (I) → 23                           |                   |            |                  |
|  | EDITED (I) → 24   |            |                  |
|  | EDITED (I) → 25   |            |                  |
|  | EDITED (I+C) → 26 |            |                  |
|  | EDITED (I) → 27   |            |                  |
|  | EDITED (I+C) → 28 |            |                  |
|  | EDITED (I) → 29   |            |                  |
|  | EDITED (I+C) → 30 |            |                  |
| 24 ← EDITED (I) → 31                           |                   |            |                  |
| 25 ← EDITED (I) → 14                           |                   |            |                  |
| 26 ← EDITED (I) → 15                           |                   |            |                  |
| 27 ← EDITED (I+C) → 16                         |                   |            |                  |

**LINES Summary**

| LINES of Code (L)          |      |
|----------------------------|------|
| TOTAL TASKs in NEW PLC     | 5    |
| TASKs INSERTED in NEW      | 0    |
| TOTAL PROGRAMs in NEW PLC  | 13   |
| PROGRAMs INSERTED in NEW   | 5    |
| TOTAL ROUTINEs in NEW PLC  | 5    |
| ROUTINEs INSERTED in NEW   | 4    |
| TOTAL RUNGs in NEW PLC     | 7    |
| RUNGs INSERTED in NEW      | 3    |
| RUNGs that matched EXACTLY | 6    |
| RUNGs (I) that were EDITED | 1    |
| RUNG COMMENTS (C) EDITED   | 5    |
| RUNGs DELETED from OLD     | 615  |
| TOTAL RUNGs in OLD PLC     | 7302 |
| ROUTINEs DELETED from OLD  | 2    |
| TOTAL ROUTINEs in OLD PLC  | 4    |
| PROGRAMs DELETED from OLD  | 3    |
| TOTAL PROGRAMs in OLD PLC  | 1    |
| TASKs DELETED from OLD     | 0    |
| TOTAL TASKs in OLD PLC     | 0    |

(I) = INSTRUCTIONs changed  
(C) = COMMENTs changed  
(#) = CONSTANTs changed

Links to Report Sections...  
(1) = Report SUMMARY  
(L) = LINES/RUNGs Section  
(T) = TYPEs/UDTs Section  
(D) = DATUMs/TAGs Section  
(M) = MODULEs Section  
(>) = PRODUCED Section  
(<) = CONSUMED Section  
(@) = MESSAGEs Section  
(N) = NODEs Section  
(\*) = Compare STATISTICs

**Compare Color Key**

| Program Change    | Highlighter |
|-------------------|-------------|
| Edited Code       | Yellow      |
| Inserted Code     | Green       |
| Deleted Code      | Red         |
| Edited Comments   | Light Blue  |
| Inserted Comments | Light Green |
| Deleted Comments  | Light Red   |

Clicking a line reveals details, document-wide control...

Expand Collapse

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**Section Summary**  
This is a hyperlinked summary that is specific to the elements being viewed in the 'Comparison Sequence' on the left.

The **NEW** PLC Rung numbers are on the left.

The **OLD** PLC Rung numbers are on the right.

**Change Scale**  
This visualizes the amount of editing that has occurred in the element of the Comparison.

**Comparison Details**  
All colored comparisons EDITED, INSERTED, DELETED can be clicked to toggle the details of the changes, see next page.

**Change Code Key**  
This defines the codes that appear in the 'Sequence Report' on the left.

**Navigation Key**  
This is a direct link to the start of every report section, this repeats on every page.

**Comparison Sequence**  
This shows all differences between the NEW and OLD PLC, sequenced by the NEW PLC order.

**Change Color Key**  
This defines the colors used to highlight actual code, comments, and definition changes.

**Comparison Control**  
The 'Expand' and 'Collapse' open and close all 'Difference Details' document wide.

**LINEs (of Code / RUNGs) Pages**

The comparison of the PLC logic immediately follows the summary page. This details all the changes made to the actual code—AOIs, Rungs, etc.—between the NEW and OLD programs.

MicroCODE Incorporated  
**LADDERS®**  
 Compare Report  
 App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTGO1Z1**  
 EP\_GTGO1Z1\_CDE\_REV05.L5K (OLD)  
 EP\_GTGO1Z1\_HTI\_20230927\_0850AM.L5K (NEW)

General Motors Company  
 30001 Van Dyke Ave  
 Warren, MI 48093  
 https://www.gm.com  
 Report No.: LDRS230929.134

**NEW PLC: Lines (RUNGs)**

| NEW RUNGS:   | COMPARISON:    | OLD RUNGS: | CODE | EDIT | LEVEL: |    |     |
|--|----------------|------------|------|------|--------|----|-----|
|  |                |            | 0    | 25   | 50     | 75 | 100 |
| ROUTINE: B022_ConveyorStatus_ALS_StopStation (I) (Conveyor Stop S) |                |            |      |      |        |    |     |
| 1  | ← INSERTED     |            |      |      |        |    |     |
|  |                |            |      |      |        |    |     |
| 14   | ← EDITED (I) → | 14         |      |      |        |    |     |
| 16   | ← EDITED (I) → | 16         |      |      |        |    |     |
| ROUTINE: J001_JobDataEP (I) (Footprint JobDat)                     |                |            |      |      |        |    |     |
| 5  | ← INSERTED     |            |      |      |        |    |     |
| 7  | ← EDITED (I) → | 6          |      |      |        |    |     |
| ROUTINE: M001_Model (I) (Footprint Model)                          |                |            |      |      |        |    |     |
| 1  | ← EDITED (I) → |            |      |      |        |    |     |

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the Rung or its Comments, switch to Logix 5000 and **Paste** the changes into an edited rung.

**Comparison Details**  
 Clicking on a Rung Comparison line toggles open the Rung Logic and Rung Comments for both the NEW and OLD PLCs with the changes highlighted.

**LINEs Summary**

**LINEs of Code (L)**

TOTAL TASKS in NEW PLC TASKS INSERTED in NEW

TOTAL PROGRAMS in NEW PLC PROGRAMS INSERTED in NEW

TOTAL ROUTINES in NEW PLC ROUTINES INSERTED in NEW

TOTAL RUNGS in NEW PLC RUNGS INSERTED in NEW

RUNGS that matched EXACTLY 6514

ROUTINE: J001\_JobDataEP (I+C) (Footprint JobDat)

← EDITED (C) → 1

← EDITED (I) → 6

Copy New Comments Copy New Rung ✓ Copy Old Comments Copy Old Rung

**NEW RUNG**

```
<@INFO>
#####
# When the Job leaves the Conveyor FPS, Copy Job Data,
# Build Data & Backup Data from the Previous Buffer To the Footprint's
# Job Data, Build Data & Backup Data and Clear the Buffer.
#####
BST XIC(ConvStatus.DataShiftONS) NXB XIC(_HIT_ClearModel.13) BND BST
XIO(_HIT_ClearModel.13) COP(TrackingBufferPrev.JobData.Data,Jobdata.Data,1)
COP(TrackingBufferPrev.BuildData,BuildData,1)
COP(TrackingBufferPrev.BackupData,BackupData,1) NXB
FLL(0,TrackingBufferPrev.JobData.Data,1) FLL(0,TrackingBufferPrev.BackupData,1) NXB
FLL(32,TrackingBufferPrev.BuildData.ID[0],72)
FLL(0,TrackingBufferPrev.BuildData.ID[72],928) BND ;
```

**OLD RUNG**

```
<@INFO>
#####
# When the Job leaves the Conveyor FPS, Copy Job Data,
# Build Data & Backup Data from the Previous Buffer To the Footprint's
# Job Data, Build Data & Backup Data and Clear the Buffer.
#####
XIC(ConvStatus.DataShiftONS)BST COP(TrackingBufferPrev.JobData.Data,Jobdata.Data,1)
COP(TrackingBufferPrev.BuildData,BuildData,1)
COP(TrackingBufferPrev.BackupData,BackupData,1) NXB
FLL(0,TrackingBufferPrev.JobData.Data,1) FLL(0,TrackingBufferPrev.BackupData,1) NXB
FLL(32,TrackingBufferPrev.BuildData.ID[0],72)
FLL(0,TrackingBufferPrev.BuildData.ID[72],928) BND ;
```

### TYPES (UDTs / Datatypes) Pages

Next are all the changes to the User Defined Datatype (UDTs) between the NEW and OLD PLCs.

#### Change Copy & Paste

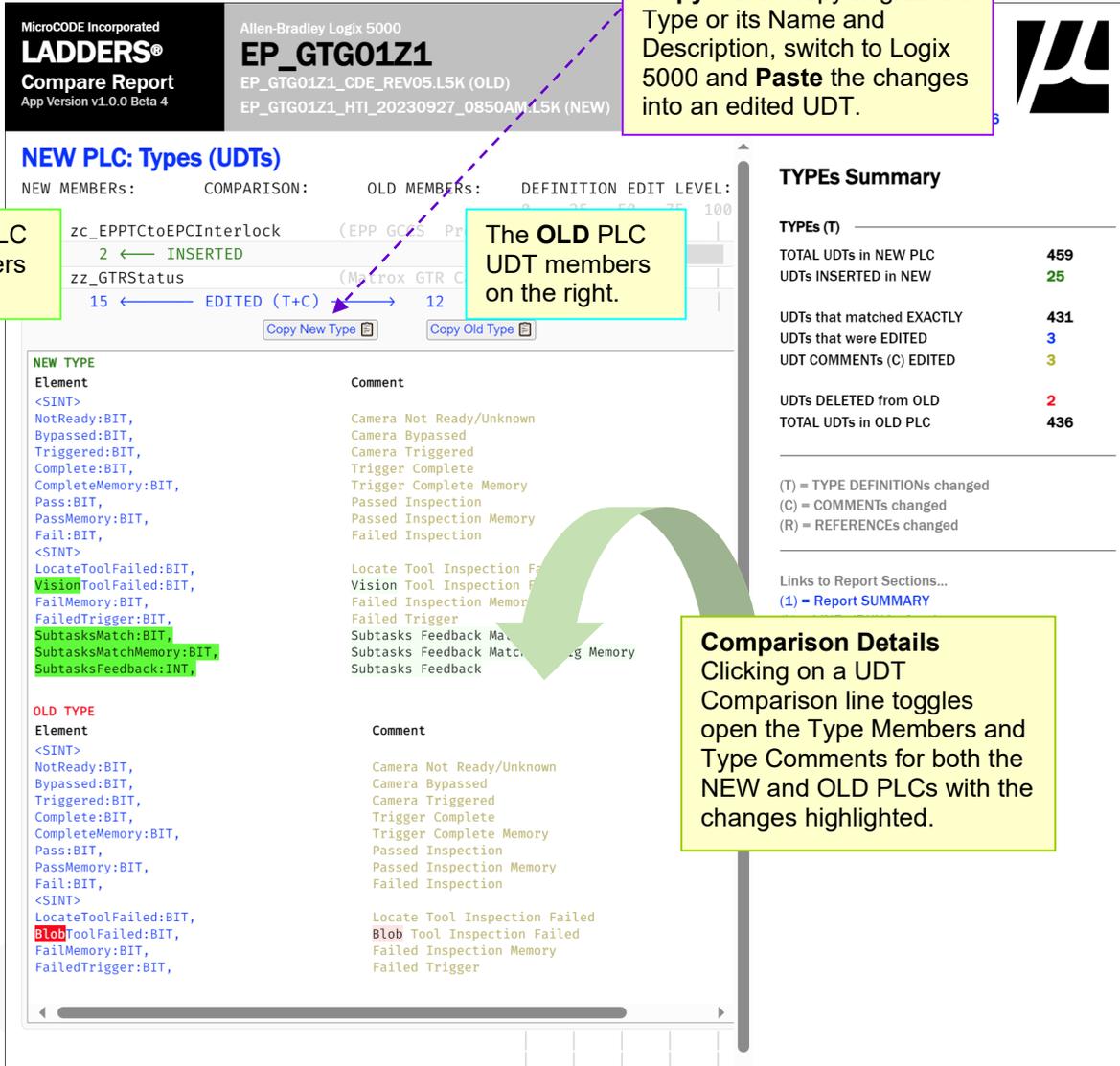
These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.

**Copy** – click copy to grab the Type or its Name and Description, switch to Logix 5000 and **Paste** the changes into an edited UDT.



The **NEW PLC** UDT members on the left.

The **OLD PLC** UDT members on the right.



**NEW PLC: Types (UDTs)**

NEW MEMBERS:      COMPARISON:      OLD MEMBERS:      DEFINITION EDIT LEVEL:

z\_c\_EPPTCtoEPCInterlock (EPP GC25 Pr)      2 ← INSERTED      12

z\_z\_GTRStatus (Matrox GTR C)      15 ← EDITED (T+C)      12

**NEW TYPE**

| Element                  | Comment                           |
|--------------------------|-----------------------------------|
| <SINT>                   |                                   |
| NotReady:BIT,            | Camera Not Ready/Unknown          |
| Bypassed:BIT,            | Camera Bypassed                   |
| Triggered:BIT,           | Camera Triggered                  |
| Complete:BIT,            | Trigger Complete                  |
| CompleteMemory:BIT,      | Trigger Complete Memory           |
| Pass:BIT,                | Passed Inspection                 |
| PassMemory:BIT,          | Passed Inspection Memory          |
| Fail:BIT,                | Failed Inspection                 |
| <SINT>                   |                                   |
| LocateToolFailed:BIT,    | Locate Tool Inspection Failed     |
| VisionToolFailed:BIT,    | Vision Tool Inspection Failed     |
| FailMemory:BIT,          | Failed Inspection Memory          |
| FailedTrigger:BIT,       | Failed Trigger                    |
| SubtasksMatch:BIT,       | Subtasks Feedback Matching Memory |
| SubtasksMatchMemory:BIT, | Subtasks Feedback Matching Memory |
| SubtasksFeedback:INT,    | Subtasks Feedback                 |

**OLD TYPE**

| Element               | Comment                       |
|-----------------------|-------------------------------|
| <SINT>                |                               |
| NotReady:BIT,         | Camera Not Ready/Unknown      |
| Bypassed:BIT,         | Camera Bypassed               |
| Triggered:BIT,        | Camera Triggered              |
| Complete:BIT,         | Trigger Complete              |
| CompleteMemory:BIT,   | Trigger Complete Memory       |
| Pass:BIT,             | Passed Inspection             |
| PassMemory:BIT,       | Passed Inspection Memory      |
| Fail:BIT,             | Failed Inspection             |
| <SINT>                |                               |
| LocateToolFailed:BIT, | Locate Tool Inspection Failed |
| BlobToolFailed:BIT,   | Blob Tool Inspection Failed   |
| FailMemory:BIT,       | Failed Inspection Memory      |
| FailedTrigger:BIT,    | Failed Trigger                |

**Types Summary**

| TYPES (T)                 |     |
|---------------------------|-----|
| TOTAL UDTs in NEW PLC     | 459 |
| UDTs INSERTED in NEW      | 25  |
| UDTs that matched EXACTLY |     |
| UDTs that were EDITED     | 431 |
| UDT COMMENTS (C) EDITED   | 3   |
| UDTs DELETED from OLD     |     |
| TOTAL UDTs in OLD PLC     | 436 |

(T) = TYPE DEFINITIONS changed  
(C) = COMMENTS changed  
(R) = REFERENCES changed

Links to Report Sections...  
(1) = Report SUMMARY

**DATUMS (TAGS / Variables) Pages**

After the TYPEs any changes to PLC variables, tags, parameters, are all shown in the DATUM pages.

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the Tag or its Name and Description, switch to Logix 5000 and **Paste** the changes into an edited TAG.

**NEW PLC: Datums (TAGS)**

| NEW VALUE(s):   | COMPARISON: | OLD VALUE(s):          | DATA | EDIT | LEVEL: |    |     |
|---|-------------|------------------------|------|------|--------|----|-----|
|   |             |                        | 0    | 25   | 50     | 75 | 100 |
| TAG: GEPICS9_BDRx_Flat  | EDITED (C)  | (INT[])                |      |      |        |    |     |
| TAG: JobID1WorkComplete   | INSERTED    | (BOOL)                 |      |      |        |    |     |
| TAG: kValue   | EDITED (C)  | (DINT[])               |      |      |        |    |     |
| <b>NEW TAG</b><br>kValue<br>PFE kValue List<br>Use Only 1<br>Per Value<br>in Controller<br>DINT[] |             |                        |      |      |        |    |     |
| <b>OLD TAG</b><br>kValue<br>PFE kValue List<br>DINT[]   |             |                        |      |      |        |    |     |
| TAG: L_CPU_PortCapAttrList  | EDITED (C)  | (INT[])                |      |      |        |    |     |
| TAG: L_CPU_PortCopyData   | EDITED (C)  | (INT[])                |      |      |        |    |     |
| TAG: RuntimeStatus  | EDITED (C)  | (SINT[])               |      |      |        |    |     |
| TAG: TempEntryString1   | INSERTED    | (zz_String20)          |      |      |        |    |     |
| TAG: TrackingBuffer2  | INSERTED    | (zc_EPTrackingImage[]) |      |      |        |    |     |
| TAG: TrackingBuffer3  | INSERTED    | (zc_EPTrackingImage[]) |      |      |        |    |     |
| TAG:  | INSERTED    | (zc_EPTrackingImage[]) |      |      |        |    |     |

**Datums Summary**

| DATUMs (TAGs) (D)         |      |
|---------------------------|------|
| TOTAL TAGs in NEW PLC     | 1940 |
| TAGs INSERTED in NEW      | 165  |
| TAGs that matched EXACTLY | 2548 |
| TAGs DATATYPEs (T) EDITED | 12   |
| COMMENTs (C) EDITED       | 32   |
| TAGs DELETED from OLD     | 252  |
| TOTAL in OLD PLC          | 1996 |

**Comparison Details**  
 Clicking on a TAG Comparison line toggles open the Tag Definition and Tag Description for both the NEW and OLD PLCs with the changes highlighted.

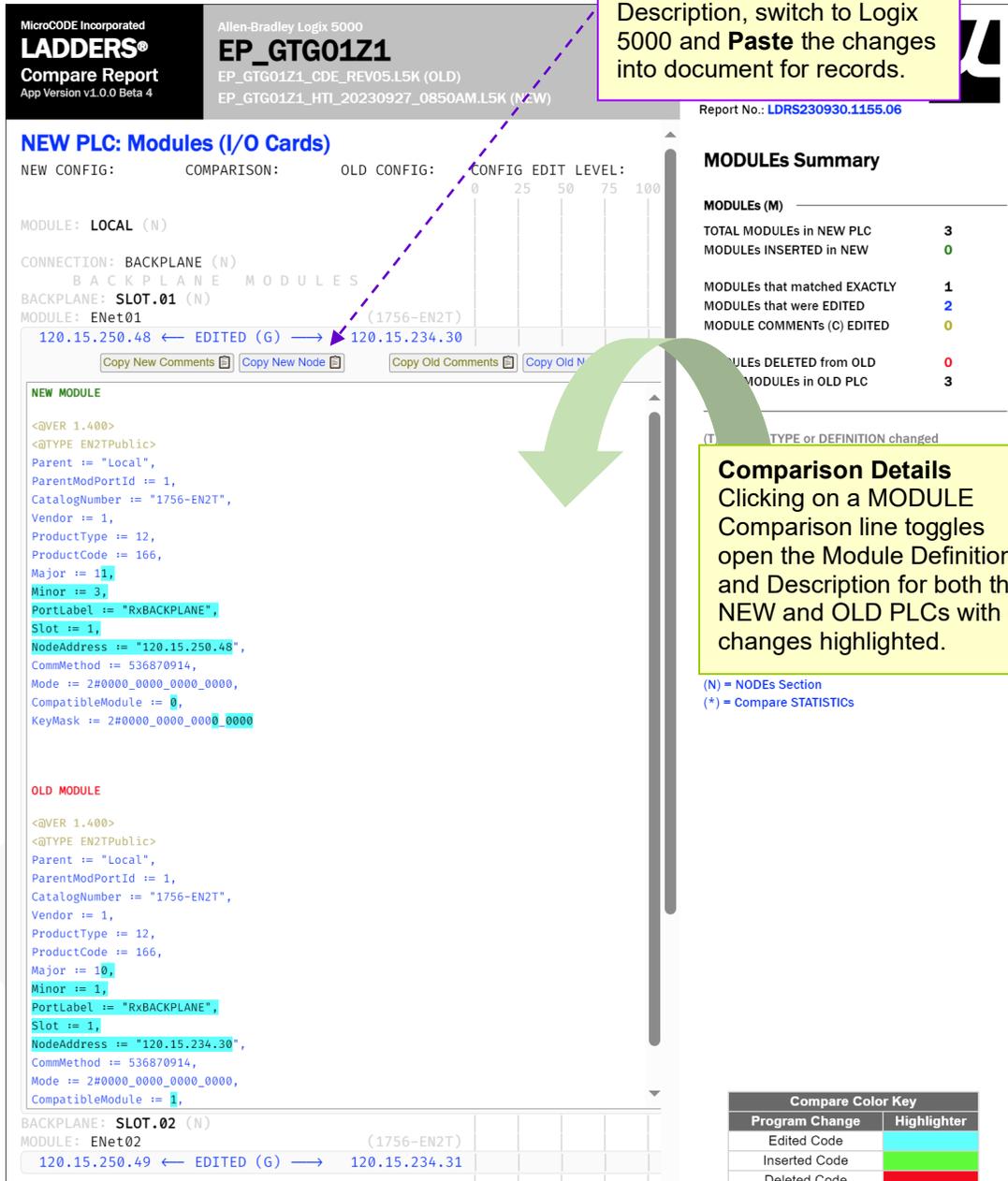
**Legend:**  
 (D) = DATUMs/TAGs Section  
 (M) = MODULEs Section  
 (>) = PRODUCED Section  
 (<) = CONSUMED Section  
 (M) = MESSAGEs Section  
 (N) = NODEs Section  
 (\*) = Compare STATISTICS

The TAG Types are shown on the right in gray.

### MODULEs (PLC Hardware) Pages

These pages detail any differences in the PLC hardware, local to the PLC processor, between the NEW and OLD configurations.

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the Module Definition or its Description, switch to Logix 5000 and **Paste** the changes into document for records.



The screenshot displays the 'NEW PLC: Modules (I/O Cards)' comparison page. It features a table with columns for 'NEW CONFIG:', 'COMPARISON:', and 'OLD CONFIG:'. A specific module is selected, showing its configuration details for both the new and old states. The 'NEW MODULE' section includes fields like 'Major', 'Minor', 'PortLabel', 'Slot', and 'NodeAddress', with some values highlighted in cyan. The 'OLD MODULE' section shows similar fields with some values highlighted in cyan. A 'Compare Color Key' table is located at the bottom right, defining colors for program changes: Edited Code (cyan), Inserted Code (green), and Deleted Code (red).

**MODULEs Summary**

| MODULES (M)                  |   |
|------------------------------|---|
| TOTAL MODULES in NEW PLC     | 3 |
| MODULES INSERTED in NEW      | 0 |
| MODULES that matched EXACTLY | 1 |
| MODULES that were EDITED     | 2 |
| MODULE COMMENTS (C) EDITED   | 0 |
| MODULES DELETED from OLD     | 0 |
| MODULES in OLD PLC           | 3 |

**Comparison Details**  
 Clicking on a MODULE Comparison line toggles open the Module Definition and Description for both the NEW and OLD PLCs with the changes highlighted.

(N) = NODEs Section  
 (\*) = Compare STATISTICS

## PRODUCED (Communication TAG) Pages

These pages detail any differences in the Produced communication tags (those sending data from the PLC), between the NEW and OLD configurations.

### Change Copy & Paste

These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the Tag Definition or its Description, switch to Logix 5000 and **Paste** the changes into document for records.

MicroCODE Incorporated  
**LADDERS®**  
 Compare Report  
 App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTG01Z1**  
 EP\_GTG01Z1\_CDE\_REV05.L5K (OLD)  
 EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW)

### NEW PLC: Produced Tags

| NEW CONFIG:   | COMPARISON: | OLD CONFIG: | CONFIG | EDIT | LEVEL: |    |     |
|---|-------------|-------------|--------|------|--------|----|-----|
|   |             |             | 0      | 25   | 50     | 75 | 100 |
| MODULE: LOCAL (N)   |             |             |        |      |        |    |     |
| CONNECTION: PRODUCED (N)  |             |             |        |      |        |    |     |
| PRODUCED: PUBLIC (N)  |             |             |        |      |        |    |     |
| TAG: EP_GTG01Z1toGA_TGGS01Interlocks  | (Produced)  |             |        |      |        |    |     |
| ← INSERTED  |             | LOCAL       |        |      |        |    |     |
| <input type="button" value="Copy New Comments"/> <input type="button" value="Copy New Node"/>   |             |             |        |      |        |    |     |
| <b>INSERTED PRODUCED</b>  |             |             |        |      |        |    |     |
| EP_GTG01Z1toGA_TGGS01Interlocks : u_EPPTtoPTInterlocks<br>ProduceCount := 1,<br>ProgrammaticallySendEventTrigger := No,<br>UnicastPermitted := Yes,<br>MinimumRPI := 0.200,<br>MaximumRPI := 536870.900,<br>DefaultRPI := 0 |             |             |        |      |        |    |     |
| TAG: EP_GTG01Z1toGA_TGGS02Interlocks  | (Produced)  |             |        |      |        |    |     |
| ← INSERTED  |             | LOCAL       |        |      |        |    |     |

### PRODUCED Summary

**PRODUCED TAGs (>)**

|                               |   |
|-------------------------------|---|
| TOTAL PRODUCED in NEW PLC     | 2 |
| PRODUCED INSERTED in NEW      | 2 |
| PRODUCED that matched EXACTLY | 0 |
| PRODUCED that were EDITED     | 0 |
| PRODUCED COMMENTs (C) EDITED  | 0 |
| PRODUCED DELETED from OLD     | 0 |
| PRODUCED in OLD PLC           | 0 |

### Comparison Details

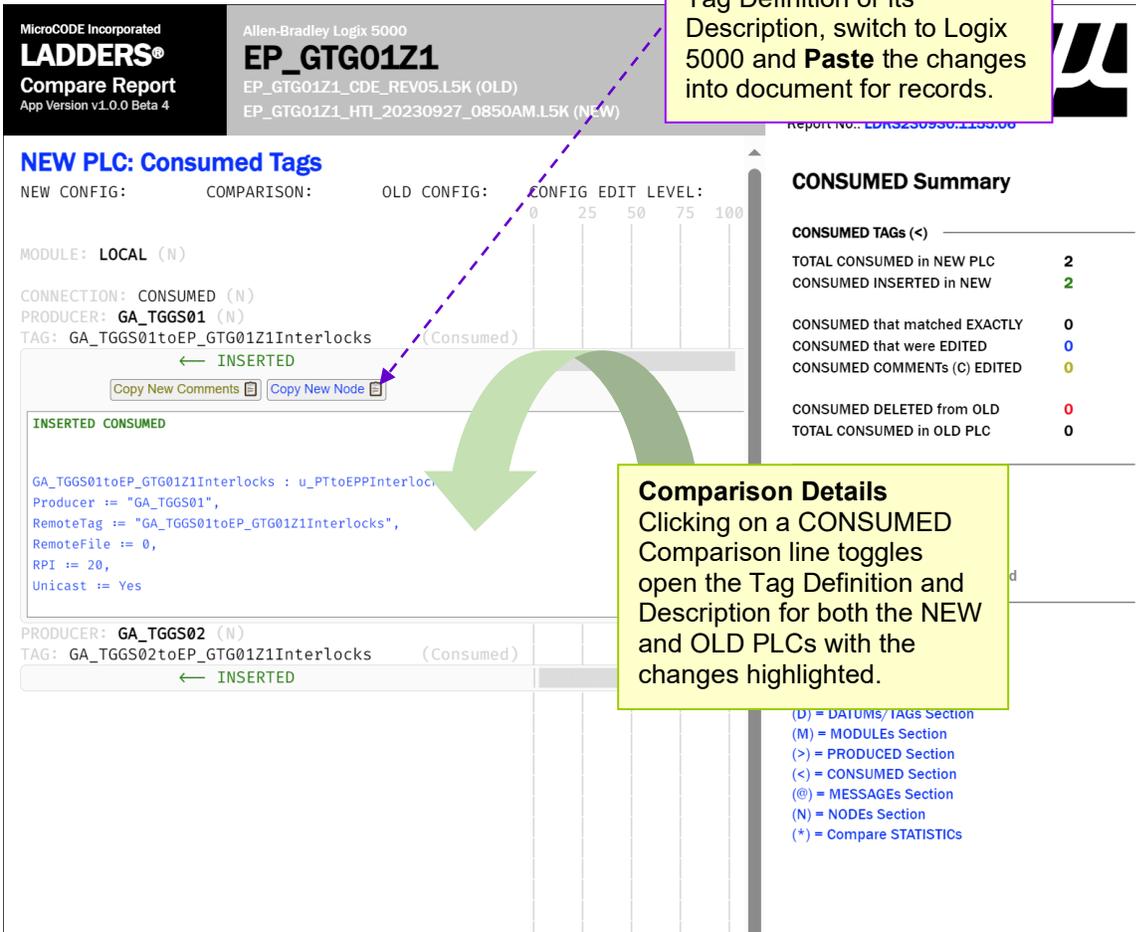
Clicking on a PRODUCED Comparison line toggles open the Tag Definition and Description for both the NEW and OLD PLCs with the changes highlighted.

(D) = DATUMs/ TAGs Section  
 (M) = MODULEs Section  
 (>) = PRODUCED Section  
 (<) = CONSUMED Section  
 (@) = MESSAGEs Section  
 (N) = NODEs Section  
 (\*) = Compare STATISTICS

## CONSUMED (Communication TAG) Pages

These pages detail any differences in the Consumed communication tags (those bringing data into the PLC), between the NEW and OLD configurations.

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the Tag Definition or its Description, switch to Logix 5000 and **Paste** the changes into document for records.



The screenshot displays the 'NEW PLC: Consumed Tags' section with a table of comparison details. A callout box points to the 'Copy New Node' button. Another callout box points to a comparison line, explaining that clicking it toggles between NEW and OLD configurations with changes highlighted. A 'CONSUMED Summary' table is also visible on the right.

| NEW CONFIG: | COMPARISON: | OLD CONFIG: | CONFIG EDIT LEVEL: |
|-------------|-------------|-------------|--------------------|
|             |             |             | 0 25 50 75 100     |

| CONSUMED TAGS (<)             |   |
|-------------------------------|---|
| TOTAL CONSUMED in NEW PLC     | 2 |
| CONSUMED INSERTED in NEW      | 2 |
| CONSUMED that matched EXACTLY | 0 |
| CONSUMED that were EDITED     | 0 |
| CONSUMED COMMENTS (C) EDITED  | 0 |
| CONSUMED DELETED from OLD     | 0 |
| TOTAL CONSUMED in OLD PLC     | 0 |

Legend:

- (D) = DATUMS/TAGS Section
- (M) = MODULES Section
- (>) = PRODUCED Section
- (<) = CONSUMED Section
- (@) = MESSAGES Section
- (N) = NODES Section
- (\*) = Compare STATISTICS

**MESSAGES (Communication TAG) Pages**

These pages detail any differences in the Message Instructions and their communication tags (those reading or writing data into or out of the PLC), between the NEW and OLD configurations.

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the MSG Definition or its Description, switch to Logix 5000 and **Paste** the changes into document for records.

**Comparison Details**  
 The LOCAL and REMOTE data are clearly shown in the Sequence line for an at-a-glance, 'What is this MSG for?'

**Comparison Details**  
 Clicking on a MESSAGE Comparison line toggles open the Tag Definition and Description for both the NEW and OLD PLCs with the changes highlighted.

The screenshot displays the LADDERS Compare Report interface for Allen-Bradley Logix 5000. The main window shows a comparison of message definitions between two configurations: EP\_GTG01Z1\_CDE\_REV05.L5K (OLD) and EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW). The interface is divided into several sections:

- Header:** MicroCODE Incorporated, LADDERS® Compare Report, App Version v1.0.0 Beta 4, Allen-Bradley Logix 5000, EP\_GTG01Z1.
- Message List:** A table showing message instructions with columns for Local and Remote data. The first message is 'EnetDevice\_ConnMngr (N)'. The Local data is 'EnetManager.ConnMngrSourceData' and the Remote data is 'EnetManager.ConnMngrReceiveData'. The comparison line shows '1, 0 ← EDITED (G) →' and 'ENet01'.
- NEW MESSAGE:** A detailed view of the selected message, showing parameters like MessageType, RequestedLength, ConnectedFlag, and ConnectionPath. The ConnectionPath is highlighted as 'ENet01'.
- OLD MESSAGE:** A detailed view of the message from the old configuration, showing the same parameters but with the ConnectionPath highlighted as 'ENet02'.
- MESSAGES Summary:** A table on the right side of the interface providing a summary of message counts:
 

| MESSAGES (@)                  |    |
|-------------------------------|----|
| TOTAL MESSAGES in NEW PLC     | 24 |
| MESSAGES INSERTED in NEW      | 2  |
| MESSAGES that matched EXACTLY | 12 |
| MESSAGES that were EDITED     | 10 |
| MESSAGE COMMENTS (C) EDITED   | 0  |
| MESSAGES DELETED from OLD     | 35 |
| TOTAL MESSAGES in OLD PLC     | 57 |
- Legend:** A key for message types: (I) = TYPES/UDTs Section, (D) = DATUMs/TAGs Section, (M) = MODULEs Section, (>) = PRODUCED Section, (<) = CONSUMED Section, (@) = MESSAGES Section, (N) = NODEs Section, (\*) = Compare STATISTICS.
- Compare Color Key:** A small table at the bottom right showing 'Program Change' and 'Highlighter'.

### NODEs (I/O Devices) Pages

These pages detail any differences in the physical I/O devices—both local and remote—that are connected to this PLC, between the NEW and OLD configurations.

**Change Copy & Paste**  
 These commands are available in all 'Comparison Details' to facilitate quick updates to a PLC program open in Logix 5000.  
**Copy** – click copy to grab the MSG Definition or its Description, switch to Logix 5000 and **Paste** the changes into document for records.

MicroCODE Incorporated  
**LADDERS®**  
 Compare Report  
 App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTG01Z1**  
 EP\_GTG01Z1\_CDE\_REV05.L5K (OLD)  
 EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW)



### NEW PLC: Nodes (Network Connections)

| NEW CONFIG:                             | COMPARISON: | OLD CONFIG:   | CONFIG | EDIT | LEVEL: |    |     |
|---|-------------|---------------|--------|------|--------|----|-----|
|   |             |               | 0      | 25   | 50     | 75 | 100 |
| MODULE: BUILT-IN (N)                    |             |               |        |      |        |    |     |
| CONNECTION: ETHERNET (N)                |             |               |        |      |        |    |     |
| BUILT-IN ETHERNET                       |             |               |        |      |        |    |     |
| ETHERNET: LAN 0 (N)                     |             |               |        |      |        |    |     |
| MODULE: EPGTG01Z1CAM1 (ETHERNET-MODULE) |             |               |        |      |        |    |     |
|   | ← INSERTED  | 120.15.250.55 |        |      |        |    |     |
| MODULE: LTC1BK01 (ETHERNET-MODULE)      |             |               |        |      |        |    |     |
|   | ← INSERTED  | 192.168.1.2   |        |      |        |    |     |
| MODULE: FP002BK01 (ETHERNET-MODULE)     |             |               |        |      |        |    |     |
|   | ← INSERTED  | 192.168.1.4   |        |      |        |    |     |
| MODULE: FP002BK02 (ETHERNET-MODULE)     |             |               |        |      |        |    |     |
|   | ← INSERTED  | 192.168.1.5   |        |      |        |    |     |
| MODULE: FP003BK01 (ETHERNET-MODULE)     |             |               |        |      |        |    |     |
|   | ← INSERTED  | 192.168.1.8   |        |      |        |    |     |
| MODULE: FP003BK02 (ETHERNET-MODULE)     |             |               |        |      |        |    |     |
|   | ← INSERTED  | 192.168.1.9   |        |      |        |    |     |

**INSERTED NODE**

```

Balluff
IO-Link Master
<@VER 1.400><@NO EDITS>
<@TYPE EIP-508-105-2015>
Parent := "Local",
ParentModPortId := 2,
CatalogNumber := "ETHERNET-MODULE",
Vendor := 1,
ProductType := 0,
ProductCode := 18,
Major := 1,
Minor := 1,
PortLabel := "ENet",
NodeAddress := "192.168.1.9",
CommMethod := 536870916,
ConfigMethod := 8388612,
Mode := 2#0000_0000_0000_0000,
CompatibleModule := 0,
KeyMask := 2#0000_0000_0000_0000,
PrimCxnInputSize := 392,
PrimCxnOutputSize := 262,
SecCxnInputSize := 0,
SecCxnOutputSize := 0
                    
```

|  |            |               |  |  |  |  |  |
|--|------------|---------------|--|--|--|--|--|
| MODULE: GTG01Z1TC001 (ETHERNET-MODULE) | ← INSERTED | 192.168.1.122 |  |  |  |  |  |
| Z1TC002 (ETHERNET-MODULE)              | ← INSERTED | 192.168.1.123 |  |  |  |  |  |

| Compare Color Key |             |
|-------------------|-------------|
| Program Change    | Highlighter |
| Edited Code       |             |

### NODEs Summary

| NODEs (N)                  |    |
|----------------------------|----|
| TOTAL NODEs in NEW PLC     | 17 |
| NODEs INSERTED in NEW      | 16 |
| NODEs that matched EXACTLY | 1  |
| NODEs that were EDITED     | 0  |
| NODE COMMENTS (C) EDITED   | 0  |
| NODEs DELETED from OLD     | 91 |
| TOTAL NODEs in OLD PLC     | 92 |

(N) = NODEs changed  
 (C) = COMMENTS changed  
 (G) = CONFIGURATIONs changed

Links to Report Sections...  
 (1) = Report SUMMARY  
 (L) = LINES/RUNGS Section  
 (T) = TYPES/UDTs Section  
 (D) = DATUMs/TAGs Section  
 (M) = MODULEs Section  
 (>) = PRODUCED Section

**Comparison Details**  
 Clicking on a NODE Comparison line toggles open the I/O Node Definition and Description for both the NEW and OLD PLCs with the changes highlighted.

**Comparison Details**  
 The I/O Device addresses are shown in the Sequence report for a quick look at the network set-up.

**Compare Statistics (Last Page of Report)**

This page wraps up the report with information about how it was run, which options, and how fast LADDERS did the import of the L5K files, compared them, and generated the HTML5 report.

MicroCODE Incorporated  
**LADDERS®**  
 Compare Report  
 App Version v1.0.0 Beta 4

Allen-Bradley Logix 5000  
**EP\_GTG01Z1**  
 EP\_GTG01Z1\_CDE\_REV05.L5K (OLD)  
 EP\_GTG01Z1\_HTI\_20230927\_0850AM.L5K (NEW)

General Motors Company  
 30001 Van Dyke Ave  
 Warren, MI 48093  
 https://www.gm.com

Report No.: **LDRS230929.1346.15**

**LADDERS® technology since 1983...**

LADDERS® EDIT LEVEL: 0 25 50 75 100

**Report Information**

This app is based on the LADDERS® software products of WRB Associates, Inc. and MicroCODE, Inc. developed and sold from circa 1980 through 1998.

This product generates JavaScript 5, HTML 5, and CSS 3 from a backend of C#.NET 6. The backend was ported from the original MACRO-11 and MACRO-32 assembly language code written for Digital Equipment Corporation PDP-11/RT-11 and VAX/VMS computers. The support for the Allen-Bradley Logix 5000 PLCs was added in 2021 during the port.

The appearance of this report has been optimized for:

Google Font **Fira Code** for the monospaced 'Sequence' (Embedded).  
 Microsoft **Franklin Gothic** for the 'Summary' and 'Compare' columns.  
 Google Font **Libre Franklin** as a backup to 'Franklin Gothic'.  
 Microsoft **Arial** for general report text.

The HTML 5 syntax is verified by the **W3 Validator** every release.

**COMPARE Statistics**

**OLD PLC Program**

hh:mm:ss.msec  
 OLD File Import Time: **00:00:01.215**  
 OLD File Size (Bytes): **10,692,709 ~ 10MB**

**NEW PLC Program**

hh:mm:ss.msec  
 NEW File Import Time: **00:00:01.044**  
 NEW File Size (Bytes): **9,610,827 ~ 9MB**

**COMPARE Execution**

hh:mm:ss.msec  
 Programs Import Time: **00:00:02.262**  
 Compare Execution Time: **00:00:04.579**  
 Import and Compare Time: **00:00:06.843**  
 Report Generation Time: **00:00:02.193**  
 OVERALL Time to Report: **00:00:09.036**

**COMPARE Settings**

User Selected

Differences Only? **True**  
 Ignore Comments? **False**  
 Ignore Data Values? **True**  
 Ignore Text Casing? **False**  
 Detailed Report? **True**  
 Emailed to:  
**timothy.mcguire@gm.com**

Links to Report Sections...

- (1) = Report SUMMARY
- (L) = LINES/RUNGS Section
- (T) = TYPES/UDTs Section
- (D) = DATUMS/TAGS Section
- (M) = MODULES Section
- (>) = PRODUCED Section
- (<) = CONSUMED Section
- (@) = MESSAGES Section
- (N) = NODES Section
- (\*) = Compare STATISTICS

MicroCODE Incorporated  
**LADDERS®**  
 ladder design & documentation effort reducing system

**WEB Reports** Page 71 Generated on: September 29, 2023 1:46:25 PM

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...from whence we came.

**How fast?!?**  
 Yes, sub-10 seconds is normal for typical program compares, which includes generating this HMTL document.

**How was this compare run?**  
 These are the options that were selected before the compare started. These have some affect on speed, but very little.

|                   |             |
|-------------------|-------------|
| Entered Code      | Green       |
| Inserted Code     | Light Green |
| Deleted Code      | Red         |
| Edited Comments   | Light Blue  |
| Inserted Comments | Light Cyan  |
| Deleted Comments  | Light Pink  |

Clicking a line reveals details, document-wide control...

Expand Collapse

### LADDERS® Software Version Numbers

The SEP/GEP CE application software version numbers follow this convention...

**vM.m.R c (B)**

**M** = Major software version; represents application architecture, underlying technology, etc. Incrementing this number is associated with a **'Major Release'**.

**m** = Minor software version; represents new components within the application. Incrementing this number is associated with a **'Component Support Release'**.

**R** = Incremental Release Number; represents collections of new features within the application. Incrementing this number is associated with a **'New Feature Release'**.

**c** = Development Cycle as in ALPHA/DEMO, BETA/PILOT, or PRODUCTION. In the case of PRODUCTION, the Cycle label is removed. Changing this label is associated with a **'Code Cycle Promotion'**, i.e.: Internal Build Promotion. This is a rebuild/relabeling only no code is changed. e.g.: v2.0.0 Beta (017), vs. v2.0.0 (001).

**B** = Build Number. This is the internal build number of the application from within the development group; any time code is changed and released into the Support Staff this number must be incremented, no matter how small the change. Incrementing this number is associated with a **'Defect Correction Release'**.

### Current MicroCODE LADDERS® Version

This is the highest currently released version of the MicroCODE LADDERS application:

**v1.0.0b4**

### For More Information

See the LADDERS documentation on the software distribution **MicroCODE** Site:

<https://www.mcode.com/products-ladders-dec.html>

### Version Compatibility Matrix

This table explains our LADDERS App compatibilities...

| Version  |         | MicroCODE LADDERS – Build Matrix |            |               |
|----------|---------|----------------------------------|------------|---------------|
| System   | Win 10+ | .NET                             | Logix 5000 | 5000 FW       |
| v1.0.0a4 | Any     | 6                                | Up to L8x  | Any up to v34 |
|          |         |                                  |            |               |
|          |         |                                  |            |               |
|          |         |                                  |            |               |

**NOTE:** This release of the App now supports Logix 5000 PLCs up to the **L8x** Series.

This **application** was designed, developed, and is owned by:

