nexteer
AUTOMOTIVE

Studio 5000 Serial Generation

Global Common

SD-1053

ISSUED	August 27, 2021
REVISED	

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1   Scope and Purpose

1.1   Scope

1.1.1   This specification describes the traceability application configuration and PLC logic design requirements for Nexteer Automotive facilities utilizing Nexteer's Traceability System.

1.1.2   This specification applies to the equipment requiring Traceability communication for process flow, electronic error proofing, and data collection. Refer to the Manufacturing Engineer's written specification for details regarding traceability requirements.

1.1.3   This specification has associated PLC logic routines and HMI screens that reflect the requirements of this specification. In addition, the logic library provides the required routines and examples that may be applied to new equipment designs. All files are available at www.nexteerdataexchange.com.

1.1.4   The use of the word "shall" indicates requirements and the use of the word "should" indicates recommendations. The use of the word "may" indicates permission or allowance and the use of the word "can" indicates a possibility.

1.2   Purpose and Objectives

1.2.1   The purpose of this specification is to provide Nexteer requirements and guidance to Original Equipment Manufacturers (OEM) for use in their PLC logic designs to interface with Nexteer's Traceability System and to provide device configuration guidance for the Traceability application.

1.2.2   The objective of this specification is to provide common, maintainable, and cost-effective traceability controls systems that enhance both the productivity and ease-of-use of the system, while ensuring the quality of Nexteer products produced. The application of this specification will result in common traceability controls systems.

1.2.3   The Nexteer traceability systems are integrated at the machine, cell (group of machines), or asynchronous assembly line level. Depending on the configuration of the traceability system, it may cover multiple cells and / or multiple asynchronous assembly lines.

1.2.4   The Nexteer traceability system uses a Traceability computer, which runs the Nexteer Traceability Application and interfaces with the SQL Server traceability database.

1.2.5   This Document shall be used in conjunction with the Nexteer Traceability Input Document to configure and program the Traceability Program and PLC Logic

2 Serial Number Generation (R28_Trace_V1_SerialGen)

2.1 Traceability Application Configuration

2.1.1 Add a device connection.

1. Create a new device by clicking menu Edit > Add Device , or by right clicking the Devices list on the left side of the app and using the context menu.
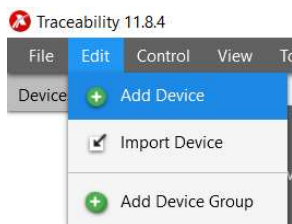
2. A dialog that is used to configure the new device connection will appear.

   a. Enter a name for the device. For example: SD123456X01, SD123456X51, SD123456OP010.1, SD123456ST020, etc…

   b. Set the device type to Serial Generator v2.0.

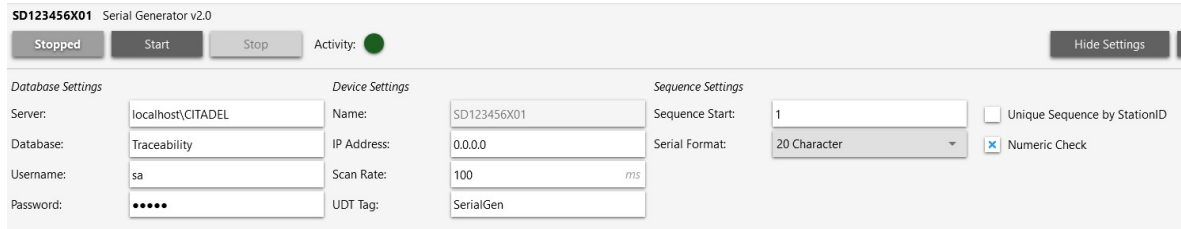   c. Click OK to finish adding the device connection.

2.1.2 Device settings panel.

1. Ensure that the newly added device connection is selected by clicking on it in the Devices list on the left side of the app. Click the Show Settings button to display the device settings.
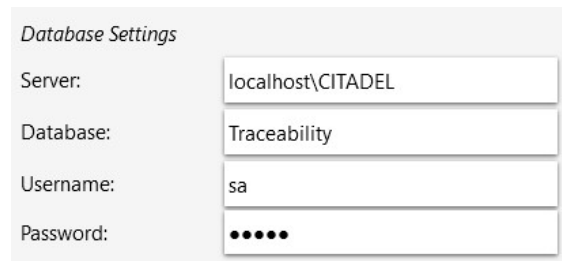
2. The following panel will be displayed. It is used to configure the database and PLC connection settings.

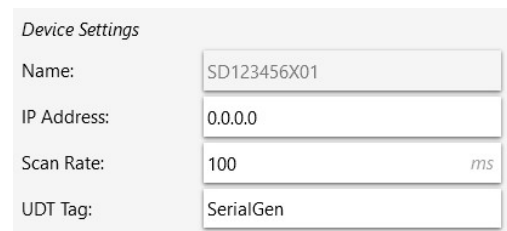
2.1.3 Configure Database Settings

The default database configuration settings normally do not require modification.

1. Server : The default Microsoft SQL server name is "localhost\CITADEL" which contains the standard Nexteer traceability database.

2. Database : The default database name is "Traceability".

3. Username/Password : This contains the credentials for the authorized database user. The default username is "sa" and password is "admin".
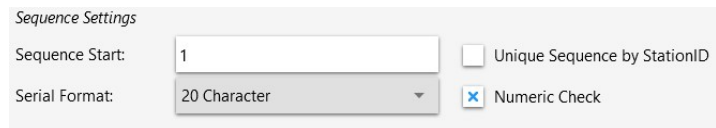

2.1.4 Configure Device Settings

1. IP Address : Enter the IP Address of the PLC.

2. Scan Rate : The default scan rate of how often the software polls the machine for new data is "100" milliseconds. This should not require modification.

3. UDT Tag Name : The default tag name is "SerialGen". This is a user defined tag in the R28_Trace_V1_SerialGen routine containing the tag structure needed to interface with the traceability application. When multiple R28_Trace_V1_SerialGen exist in the same program, this tag name shall be unique.

2.1.5   Configure Sequence Settings

1. Sequence Start : The default
    Sequence Start number is 1 and
    should never be changed unless
    approved by Central
    Manufacturing IT.

2. Serial Format : 20 Characters and 14 Characters are the Nexteer standard serial lengths.

3. Unique Sequence by StationID : The default for this checkbox should be left unchecked and
    should never be changed unless approved by Central Manufacturing IT.

4. Numeric Check : The default for this checkbox should be checked and should never be
    changed unless approved by Central Manufacturing IT. This verifies that the part number
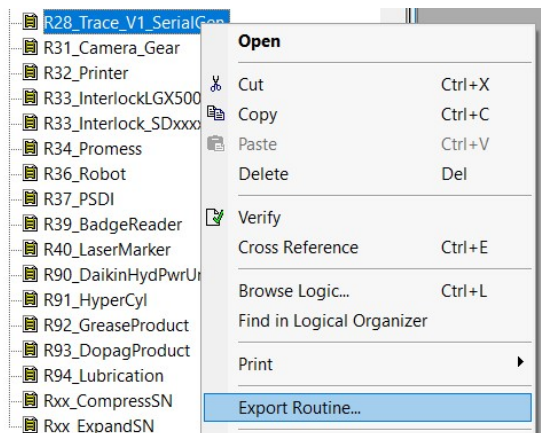   and the two user characters sent from the PLC are numeric.

2.2   Logic Configuration

2.2.1   Importing the Routine

1. Export the R28_Trace_V1_SerialGen from the Nexteer PLC library program by right clicking
   on the routine and clicking Export Routine… . Save the file to a location on your hard drive.

2. Right click on the program that R28_Trace_V1_SerialGen needs to be imported into and click Add > Import Routine in the context menu. Browse to the location that exported routine was saved to and click Open.
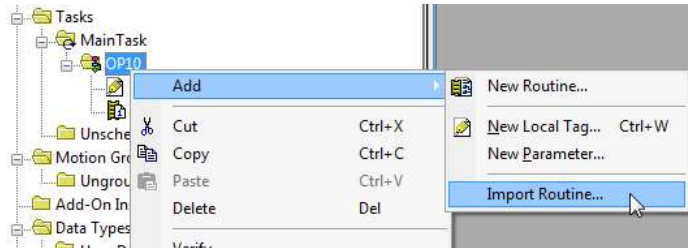
3. The Import Configuration dialog will appear. Ensure that the Operation is set to Create by entering a unique value for the Final Name setting. In the example below the Name was changed to Spider. This Name should be a description of the component that will be used.
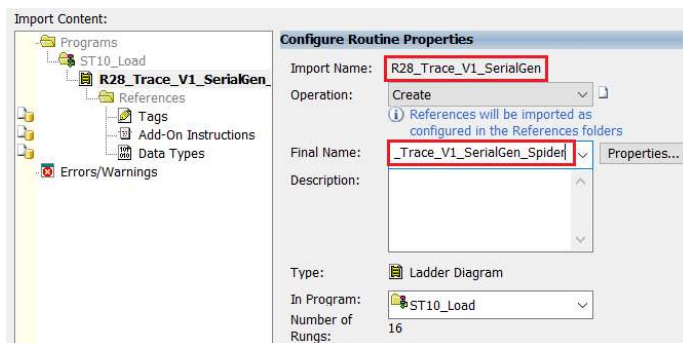
4. Click on the Tags option in the Import Content tree. There is 1 tag that needs to be renamed prior to importing the routine. This tag is the SerialGen tag, shall be replaced with the same name that was used added for the routine name.
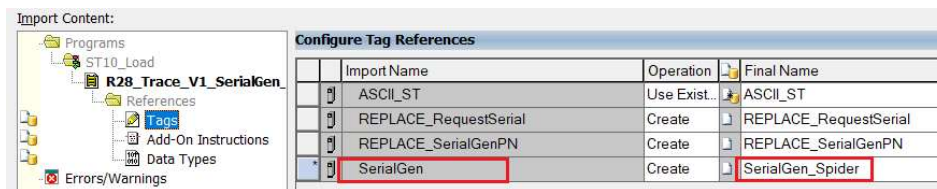
2.2.2 General Configuration

The R28_Trace_V2_SerialGen routine shall be utilized when an Operation must generate a product Serial Number. It is constructed using the standard 20-character Serial Number format PPPPPPPPYYJJJSSSSSUU where:

- PPPPPPPP = 8-digit part number (supplied by the PLC)
- YY = 2-digit year (calculated by the Trace PC)
- JJJ = 3-digit Julian day (calculated by the Trace PC)
- SSSSS = 5-digit sequence (calculated by the Trace PC)
- UU = User specified characters (supplied by the PLC)

This routine works in conjunction with the R23_ASCIIChar routine.

Requirements

2.2.3 The R28_Trace_V2_SerialGen routine shall be present within the MainProgram under the MainTask of the Controller.

2.2.4 The Main routine shall call R28_Trace_V2_SerialGen unconditionally through a JSR instruction.

2.2.5 The R28_Trace_V1_SerialGen routine shall be provided with a unique SerialGen.ID_Station which is used to identify each PLC communicating with the traceability PC. The SerialGen.ID_Station shall be configured according to the machine SD Number with a unique identifier. The SerialGen.ID_Station is constructed as follows:

1. Char1 & Char2: ASCII characters "S" and "D" indicating the beginning of the machine asset number.

2. Char3 – Char8: ASCII characters 0-9 conclude the identity of the machine asset number.

3. Char9: ASCII character to identify the machine controller letter code.

4. Char10 & Char11: two-digit ASCII character to identify the Station communicating with the Trace PC.
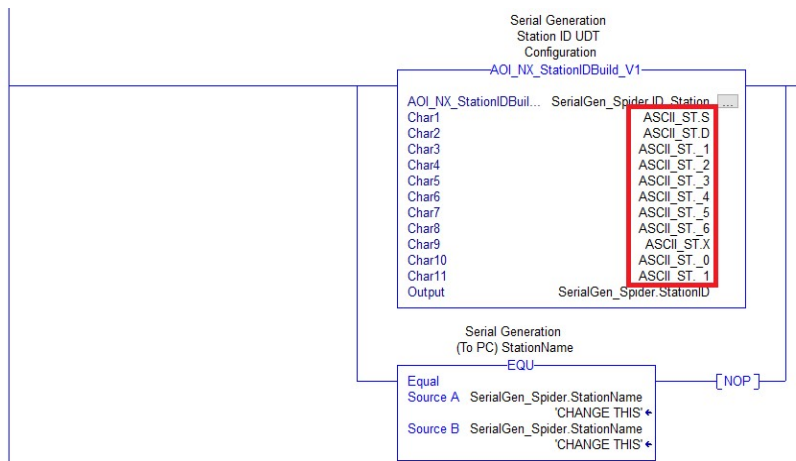
2.2.6   Multiple R28_Trace_V1_SerialGen routines may exist in a single PLC, however, each routine shall:

1.   Have a uniquely named routine (other than R28_Trace_V1_SerialGen).

2.   Have a uniquely named "SerialGen " PLC tag.

3.   Have a unique SerialGen Station ID ("02, 03, 04, …").

4.   Have a uniquely named Station Name.

2.2.7   The Station Name shall be programmed in the SerialGen.StationName PLC tag.
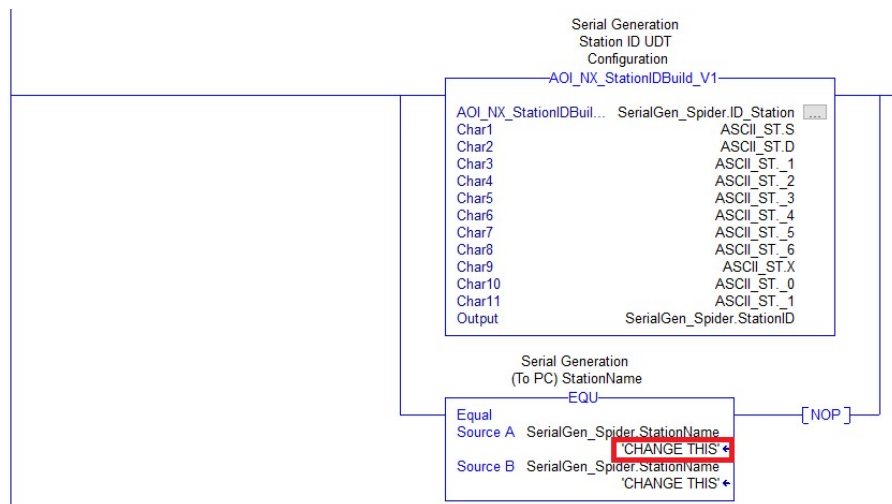
2.2.8   SerialGen.PartNumber : shall be loaded with the part number of the product.

Note: A STRING data type containing more than 8 characters will result in an error.

2.2.9   SerialGen.UserCharacter1 and SerialGen.UserCharacter2 : shall be loaded with a user specified values as needed.

Note: A STRING data type containing more than 1 character in either of these PLC tags will result in an error.
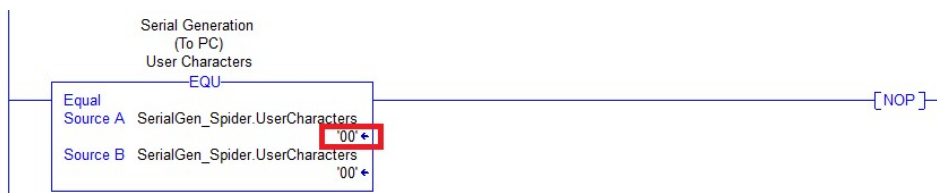
2.2.10   The SerialGen.RequestSerial   OTE instruction triggers the Serial Number Generation request to the Nexteer Traceability application. The SerialGen.RequestSerial   OTE instruction shall be enabled by the machine sequence step that requests a serial number be generated.
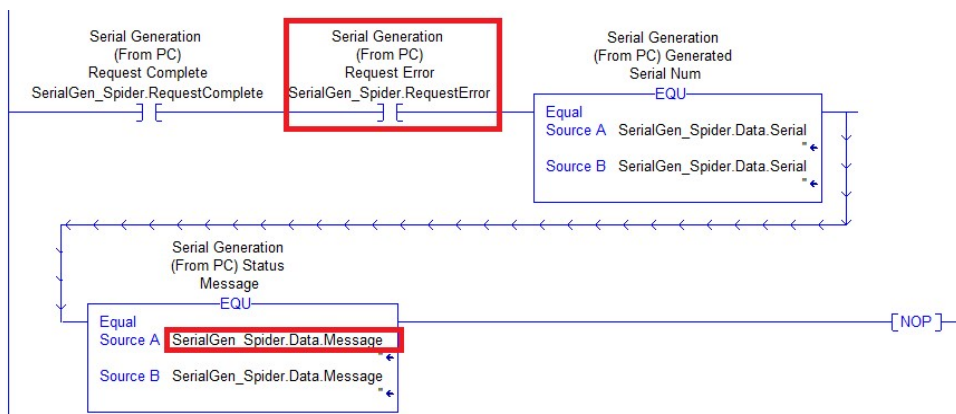

2.2.11   When the Serial Number Generation request is complete the SerialGen.RequestComplete   tag will be enabled. The SerialGen.RequestComplete   tag shall be used in the machine sequence steps to verify the traceability communications for the serial number generation have completed, prior to continuing on with the cycle.
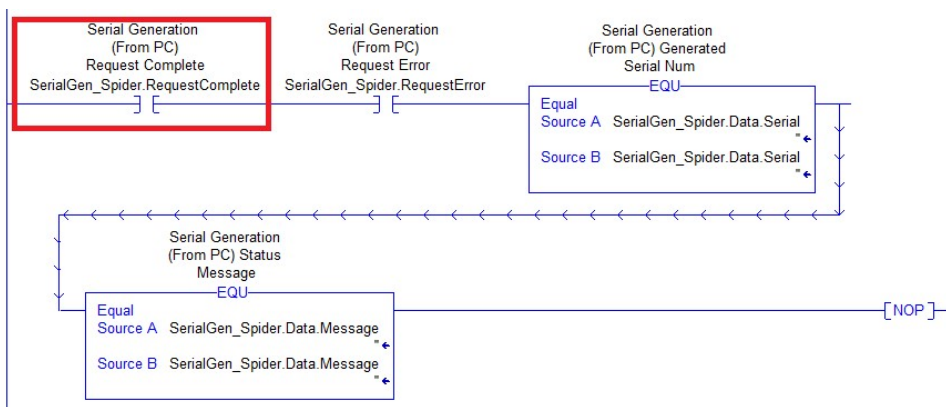

2.2.12   The SerialGen.RequestError   status shall trigger a fault to indicate an unsuccessful response from the traceability application. This shall be an immediate stop fault.

Note: Error message text will be copied to the SerialGen.Data.Message   tag to be used as needed in the PLC program.

2.2.13   The SerialGen.Data.Serial   tag will contain the generated serial number, when the SerialGen.RequestComplete   tag is enabled.
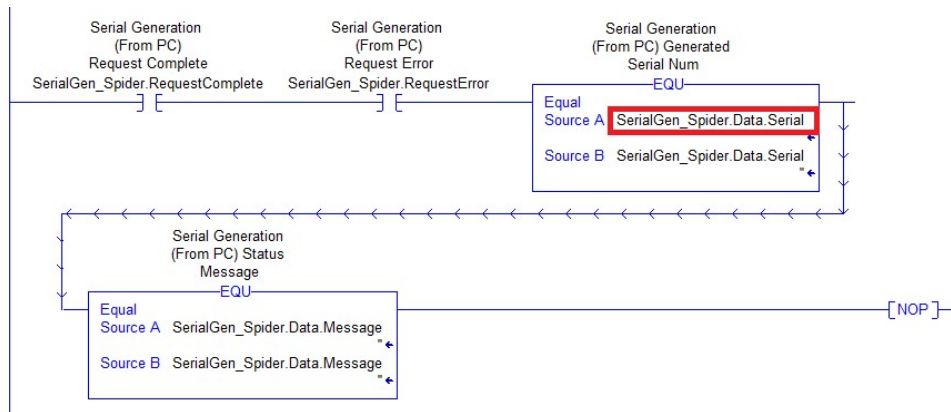
2.2.14   The SerialGen.HeartbeatTimeout   status shall be part of initial conditions to enter a machine cycle and shall trigger a fault to indicate a loss of communication between the PLC and the traceability application.

2.2.15   The Trace_V2_SerialGen   routine shall not be edited below the phrase "DO NOT EDIT ANYTHING BELOW THIS RUNG."
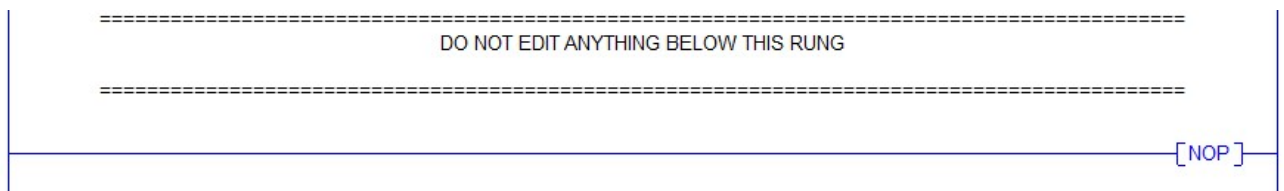
A. PLC Tags

The following PLC tag requires modification in the R28_Trace_V1_SerialGen routine. They are to be considered "inputs" to the Traceability System.

PLC tag	Description
SerialGen.StationID	The StationID tag is used to build the Station ID in the R28_Trace_V1_SerialGen routine. The Station ID does not need to be unique from the R26_Trace_V2_Station routine's Station ID, however, it is recommended that it be changed to lessen confusion. At a minimum, ASCII Char's 3 – 8 in the ID_StationFull Addon Instruction shall be modified to match the Machine's Asset Number.
SerialGen.StationName	The StationName tag is used to identify the name of the Station in the database. This tag is to be updated with specific text referring to the Operation and Machine Description. Please note that STRING Data Types are limited to 82 characters.
REPLACE_SerialGenPN	The OEM is responsible for replacing the tag with the appropriate tag from the machine application. The tag should reflect the part number being processed at the TraceStation.
SerialGen.UserCharacter1 SerialGen.UserCharacter2	When required, the OEM is responsible for completing the User Character Setup by altering the final characters of the standard 20-character Serial Number. When not required, the tags should remain the default value of '0'.
REPLACE_RequestSerial	The OEM is responsible for replacing the tag with the appropriate tag from the machine application. This tag should reflect the moment in the logic when a Serial Number is to be generated. A Sequence Step is the preferred input method. Once RequestSerial is active, the logic will send data to the Trace PC initiating the request.

PLC tag	Description
SerialGen.HeartbeatTimeout	The SerialGen.HeartbeatTimeout tag is used to signal a loss of communication with the Trace PC. When utilizing R28_Trace_V1_SerialGen , this tag must be utilized in the Fault_CycleStop routine to indicate a loss of communication. A loss of communication should prohibit the next cycle from initiating.
SerialGen.RequestComplete	When a Serial Number request is sent, RequestComplete will become active once the database has issued answered the request. This is a handshaking signal returned to the PLC as acknowledgement from the Trace PC. RequestComplete should be used in the Sequence Routine when a Serial Number is requested.
SerialGen.RequestError	When a Serial Number request is sent, RequestError will become active if an error occurs while attempting to generate a Serial Number. This is a handshaking signal returned to the PLC as acknowledgement of an error Trace PC. RequestError should be used in the Sequence Routine when a Serial Number is requested.
SerialGen.Data.Serial	Upon a successful generation of a Serial Number, Data.Serial will contain the completed 20-character Serial Number. The Serial Number will be unique and recorded in the database.
SerialGen.Data.Message	Upon an unsuccessful generation of a Serial Number, Data.Message may be used to provide a description of the error that occurred.

RECORD OF REVISIONS

Revision No	Date	Section	Description
001	27AU21	All	Original Approval & Issue Date
002			
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