nexteer
AUTOMOTIVE

Machine Traceability Specification

Asia-Pacific Driveline

SD-2034

| ISSUED | June 3, 2019 |
| REVISED | <mark>February 25, 2020</mark> |

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1. SCOPE

The intent of this specification is to outline the requirements for data traceability for equipment within Nexteer Asia-Pacific Driveline. This specification can also be used in conjunction with Nexteer equipment within other regions as well. This specification explains how the Nexteer standard data traceability functions with non-standard equipment utilizing controllers other than Allen Bradley. If Allen Bradley PLC's are used, please reference SD-1034 available on the Nexteer Data Exchange Website (here).

Vendors are required to understand the controls system and follow the direction set in this specification. The requirements in this document cover only the data traceability portion of the machine procurement process. Although this document includes specific CPU's, a CPU cannot be acceptable for the entire application.

Abbreviations

NDT	Nexteer Data Traceability
TIA	Siemens TIA Portal
SIMATIC	Siemens Simatic Manager
SN	Serial Number
NOK	Not OK

2. GENERAL

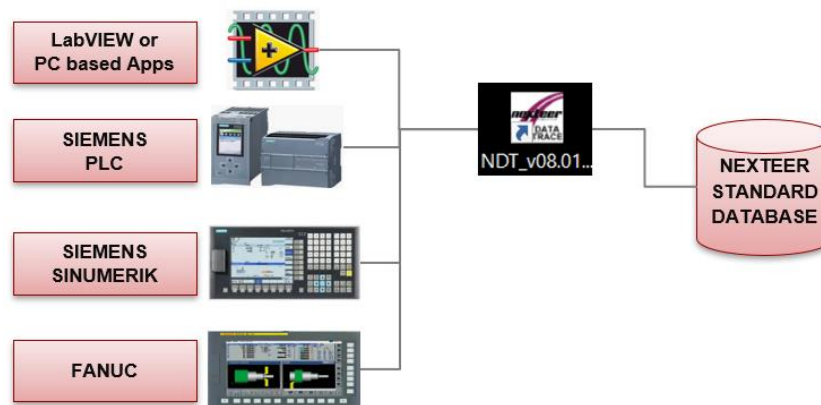## 2.1   System Architecture

Figure 1:   AP Driveline Traceability Architecture

2.1.1   The Nexteer Data Traceability Application (NDT) runs on the Plant Floor PC, or Plant Server.

2.1.2   NDT is the communication link between the machine PLC and the Nexteer Standard SQL Server.

2.2 Responsibility

2.2.1 During the MQ1 process, if a Plant Floor server is unavailable, the SQL Server can be installed on any laptop or PC and be connected to the machine network. The Vendor should provide a supporting PC for MQ1 purposes.

2.2.2 Software installation and initial settings will be supported by Nexteer Engineering.

2.2.3 A PLC Program Template is available for Siemens based controllers, however, the Vendor is responsible to modify the logic per application requirements.

3. Siemens

3.1 Recommended Hardware and Software

3.1.1 CPU

1. Preferred: S7-1200 / S7-1500

2. S7-200, S7-300, and S7-400 are acceptable with responsible CE and ME approval.

3. One CPU is capable of maximum 16 Stations / Operations.

3.1.2 Software

1. Preferred: TIA Portal

2. SIMATIC Manager is acceptable with responsible CE and ME approval.

3.2 Data Block

3.2.1 The CPU shall have proper data blocks.

3.2.2 The first DB number can be configured.

1. Address (or offset) shall be used as defined by Nexteer. The Vendor is not allowed to change the DB location.

3.2.3 Default Data Block
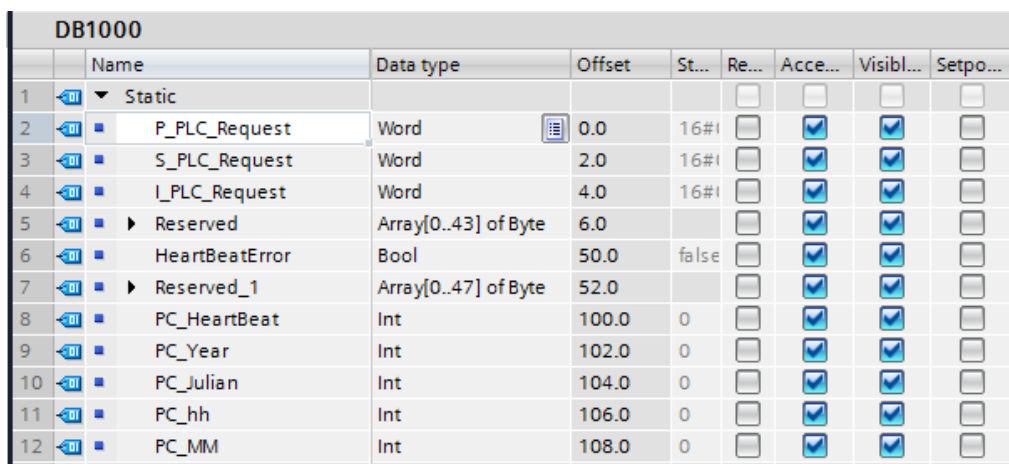
1. DB1000: Assigned for CPU

2. DB1001: Assigned for 1st Station / Operation

3. DB1002: Assigned for 2nd Station / Operation

4. … DB1016: Assigned to the 16th Station / Operation

5. If the CPU has only one Station / Operation, DB1000 and DB1001 shall be used.

6. If configuration for the first DB is set at 100, DB100 and DB101 shall be used.

3.2.4 Tag Naming

1. "Sequence Type" _ "Data Source" _ "Detail"

2. Examples:

   a. "P_PLC_Request" – Permission Sequence / Data from PLC to PC / Request

   b. "S_PC_Response" – Save Data Sequence / Data from PC to PLC / Response

   c. "I_PLC_Request" – In-Process sequence / Data from PLC to PC / Request
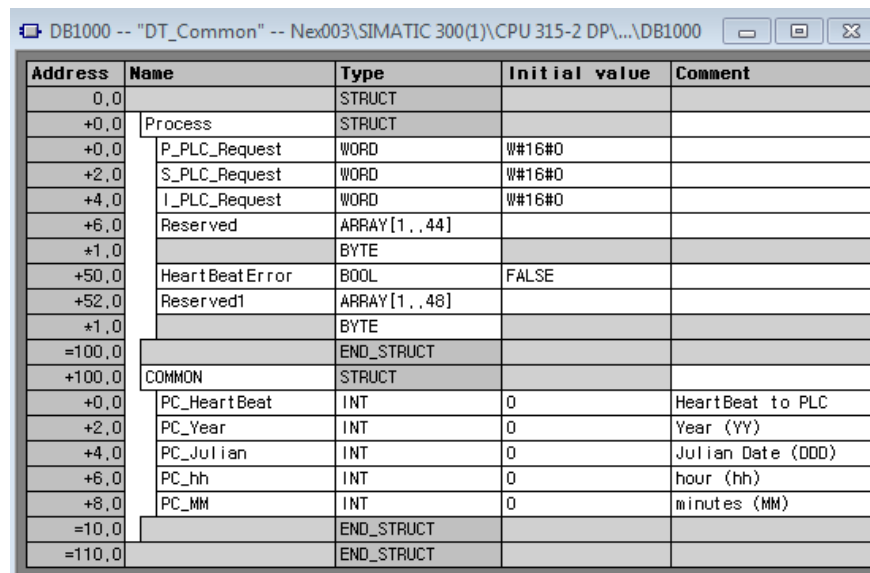
3.2.5 CPU Common DB Addressing

1. TIA

Figure 2:   Example Siemens TIA Portal CPU DB Addressing

2. SIMATIC

Figure 3:   Example Siemens SIMATIC Manager CPU DB Addressing

3.2.6   Station DB Addressing

1. TIA

		Name	Data type	Offset	
1		▼ Static			
2		▶ P_PLC_SN	Array[0..39] of Byte	0.0	
3		P_PLC_FUNCTION	Int	40.0	
4		▶ P_PLC_RESERVED1	Array[0..57] of Byte	42.0	
5		P_PC_STATUS	Int	100.0	
6		P_PC_ELAPSTIME	Int	102.0	
7		▶ P_PC_LASTOP	Array[0..19] of Byte	104.0	
8		▶ P_PC_MODEL	Array[0..19] of Byte	124.0	
9		▶ P_PC_DATA	Array[0..55] of Byte	144.0	
10		▶ S_PLC_SN	Array[0..39] of Byte	200.0	
11		S_PLC_FUNCTION	Int	240.0	
12		S_PLC_STATUS	Int	242.0	
13		▶ S_PLC_MODEL	Array[0..19] of Byte	244.0	
14		▶ S_PLC_DATA_STR	Array[0..139] of Byte	264.0	
15		▶ S_PLC_DATA	Array[0..49] of Real	404.0	
16		▶ S_PLC_RESERVED2	Array[0..295] of Byte	604.0	
17		S_PC_RESPONSE	Int	900.0	
18		▶ S_RESERVED	Array[0..47] of Byte	902.0	
19		I_PC_RESPONSE	Int	950.0	
20		▶ I_PLC_SN	Array[0..39] of Byte	952.0	
21		I_PLC_FUNCTION	Int	992.0	
22		I_PLC_STATUS	Int	994.0	
23		▶ I_PLC_MODEL	Array[0..19] of Byte	996.0	
24		▶ I_RESERVED	Array[0..83] of Byte	1016.0	
25		P_OkToRun	Bool	1100.0	
26		P_NOkToRun	Bool	1100.1	
27		I_ResponseOk	Bool	1100.2	
28		I_ResponseNOk	Bool	1100.3	
29		S_ResponseOk	Bool	1100.4	
30		S_ResponseNOk	Bool	1100.5	

NDT_DB_OP1

Figure 4:   Example Siemens TIA Portal Station DB Addressing

2. SIMATIC

Address	Name	Type	Initi	Comment
0,0		STRUCT		
+0,0	P_PLC_SN	ARRAY[1,,40]		
*1,0		BYTE		
+40,0	P_PLC_FUNCTION	INT	0	
+42,0	P_PLC_Reserved	ARRAY[1,,58]		
*1,0		BYTE		
+100,0	P_PC_STATUS	INT	0	
+102,0	P_PC_ELAPSTIME	INT	0	minutes
+104,0	P_PC_LASTOP	ARRAY[1,,20]		
*1,0		BYTE		
+124,0	P_PC_MODEL	ARRAY[1,,20]		
*1,0		BYTE		
+144,0	P_PC_DATA	ARRAY[1,,56]		
*1,0		BYTE		
+200,0	S_PLC_SN	ARRAY[1,,40]		
*1,0		BYTE		
+240,0	S_PLC_FUNCTION	INT	0	
+242,0	S_PLC_STATUS	INT	0	
+244,0	S_PLC_MODEL	ARRAY[1,,20]		
*1,0		BYTE		
+264,0	S_PLC_DATA_STR	ARRAY[1,,140]		
*1,0		BYTE		
+404,0	S_PLC_DATA	ARRAY[1,,50]		
*4,0		REAL		
+604,0	S_PLC_RESERVED	ARRAY[1,,296]		
*1,0		BYTE		
+900,0	S_PC_RESPONSE	INT	0	
+902,0	S_RESERVED	ARRAY[1,,48]		
*1,0		BYTE		
+950,0	I_PC_RESPONSE	INT	0	
+952,0	I_PLC_SN	ARRAY[1,,40]		
*1,0		BYTE		
+992,0	I_PLC_FUNCTION	INT	0	
+994,0	I_PLC_STATUS	INT	0	
+996,0	I_PLC_MODEL	ARRAY[1,,20]		
*1,0		BYTE		
+1016,0	I_RESERVED	ARRAY[1,,84]		
*1,0		BYTE		
+1100,0	P_OkToRun	BOOL	FALSE	
+1100,1	P_NokToRun	BOOL	FALSE	
+1100,2	S_SuccessToSave	BOOL	FALSE	
+1100,3	S_FailToSave	BOOL	FALSE	
+1100,4	I_SuccessToSave	BOOL	FALSE	
+1100,5	I_FailToSave	BOOL	FALSE	
=1102,0		END_STRUCT		

Figure 5:   Example Siemens SIMATIC Manager Station DB Addressing
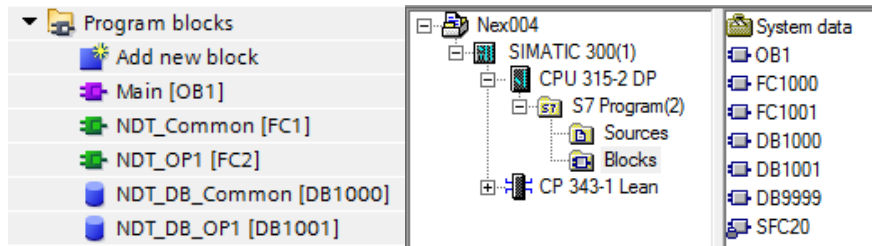
3.3 Program Blocks

3.3.1 Structure

Figure 6: Program Block Structure

1. NDT Common: Common FC for each CPU

2. NDT_OP1: FC for each Station / Operation. Each Station / Operation shall have its own FC.

3. OB1 is calling "NDT_Common" and "NDT_Common" is calling all Station / Operation FC's.

3.3.2 CPU shall have one common FC ("NDT_Common") and FC's ("NDT_OP#") for each Station / Operation.

3.4 Sequence

There are three main sequences (Request Permission, Save Data, and Save In-Process) in the Nexteer Data Trace interface with one common sequence. Each Station / Operation shall have its own main sequence. The CPU shall have one common sequence.

3.4.1 Common Sequence

1. Main functionality of the "Heartbeat" signal is to reflect the health of the PLC to PC communication. If the "Heartbeat" is not healthy (active), the PLC will recognize that communication between the PLC and PC is not functioning.

2. In addition, the PC is providing data and time information to the PLC:

   a. PC_Year (Year)

   b. PC_Julian (Julian Date)

   c. PC_HH (Hour)

   d. PC_MM (Minute)

3.4.2   Request Permission

Requesting permission is used by the PLC to obtain information to help determine if a part has permission to run on the Station / Operation. The PLC shall run a part only with "OK to Run" conditions are met.
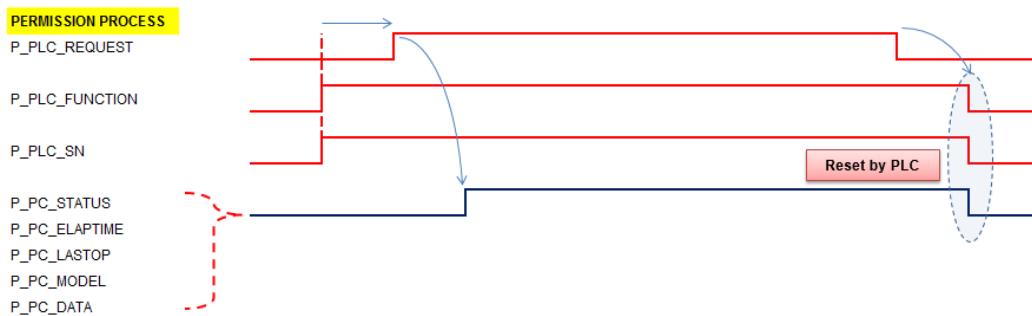
1. Timing Chart.

Figure 7:   Permission Request Timing Chart

2. "OK to Run" versus "Not OK to Run"

    The PC does not provide an "OK" or "NOK" signal to the PLC. Upon request by the PLC, the PC provides the most current database information for the specific Serial Number requested. Data is sent from the PC to the PLC where it is determined, through logic, if part permissions are acceptable. Each Station / Operation shall have unique permissions requirements outlined by the Manufacturing process. If the data received from the PC is determined to be "OK to Run," the part shall continue the assembly operation. If the data received from the PC is determined to be "Not OK to Run," the part shall not be run through the assembly operation.

3. Data from PLC to PC

    a. P_PLC_Function: describes the Nexteer Standard Function Code. Refer to the function code table in the Appendix.

    | Function 1 | Get the data of the most recent record. |
    | Function 2 | Get the data of the most recent record from a specific Station / Operation. The Station / Operation can be specified at the NDT Station Configuration, "STATION LOOK UP ID" index #1. |
    | Function 3 | Get the data of the most recent record and process data associated (Function 1 + Data). |
    | Function 4 | Get the data of the most recent record from a specific Station / Operation and process data associated (Function 2 + Data). |

    b. P_PLC_SN: Serial Number of the part the PLC is determining permission to run.

4. Data from the PC to PLC

      P_PC_STATUS   Status Code from the previous or last Station / Operation.

      P_PC_ELAPTIME   Elapsed time from the previous or last Station / Operation.

      P_PC_LASTOP   Last Station / Operation Code.

      P_PC_MODEL   Model Code from the previous or last Station / Operation.

      P_PC_DATA   Data from the previous or last Station / Operation (Function 3 or Function 4).

5. "OK to Run" conditions shall be proved by the Nexteer responsible ME for each Station / Operation.

6. Functions 3 and 4 Use

    a. DB1001.DBB42: Total Data Qty

    b. DB1001.DBB43: Address 1

    c. DB1001.DBB44: Address 2

    d. …DB1001.DBB99

    e. Examples:

        • DB1001.DBB42: 3

        • DB1001.DBB43: 0

        • DB1001.DBB44: 3

        • DB1001.DBB45: 7

        - Returned Data (P_PC_DATA): Data000,Data003,Data007

3.4.3 Save Data

Save Data allows the PLC to save the defined process data to the Data Trace Server.

1. Timing Chart

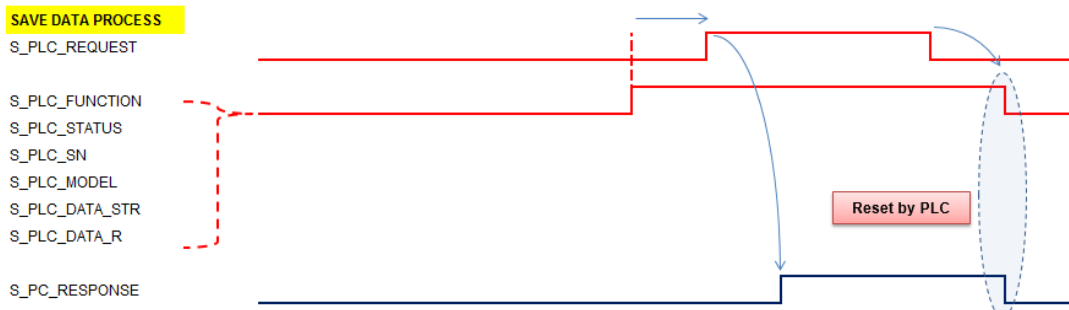All process data shall be updated before the PLC actives the request bit.

Figure 8: Save Data Timing Chart

2. Data from the PLC to PC

S_PLC_FUNCTION	Describes the Nexteer Standard Function Code. Refer to the Appendix for additional details. Function 10 typically used.
S_PLC_STATUS	Status code of the processed part. Refer to the Status Code List in the Appendix.
S_PLC_SN	Serial Number of the processed part.
S_PLC_DATA_STR	String Type process data. 140 bytes are reserved. Each data shall be separated by a comma (","). The first and last bytes shall also include a comma.

S_PLC_DATA_STR (cont.) Example: if 3 data strings are to be sent ("abc" "defg" and "hijklm"), data shall be documented as ",abc,defg,hijklm,"

S_PLC_DATA_R   Real Type process data. 50 pieces of data are allowed. "999999" shall follow the last data string.

Example: if 3 real data are to be sent ("11.11" "22.22" and "33.33")

1. S_PLC_DATA_R[1] = 11.11
2. S_PLC_DATA_R[2] = 22.22
3. S_PLC_DATA_R[3] = 33.33
4. S_PLC_DATA_R[4] = 999999

S_PC_RESPONSE   Response code from the PC to the PLC

1: OK to Save

5101: Missing the first comma

5102: String Type Data count error

5103: Missing the last comma

5104: String Type Data format error

5105: Real Type Data format error

Data count shall match the Configuration in the NDT Configuration window.

Figure 9:   NDT Configuration Window

3.4.4   Save In-Process

In-Process is used for the PLC to save In-Process data before finishing the machine cycle.

1.   Timing Chart
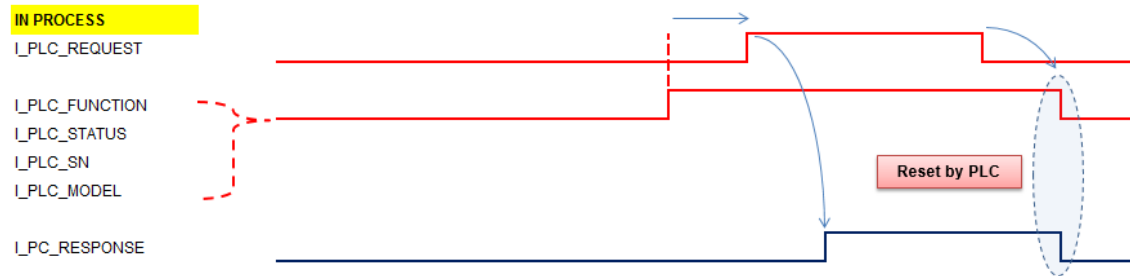
Figure 10:   In-Process Timing Chart

2.   The Nexteer responsible ME will decide if the Station / Operation will include In-Process Data.

   a.   I_PLC_STATUS: will be overwritten by NDT as "9000". It is now "reserved" with an In-Process status.

3.   Why and when to use:

   a.   If the Station / Operation does not allow in-Station rework after a specific point in the Operation (typically press applications), it can be used to ensure a subsequent Operations cannot be run.

3.5 Deliverables

a. NDT-TIA_vXX.XX: TIA Portal PLC Program Template

b. NDT_SiemensTIALib_vXX.XX: TIA Portal PLC Program Template Library

c. NexXXX: SIMATIC Manager PLC Program Template

4. NI LabVIEW

4.1 Recommended Hardware and Software

4.1.1 Hardware

1. One LAN Port shall be assigned for Data Traceability.

4.1.2 Software

1. NI LabVIEW with "Data Communication" Library.

4.2 UDP Configuration

4.2.1 Server Port No: 9001 (default) / can be configured in NDT configuration.

4.3 UDP Protocol

4.3.1 Request (LabVIEW -> NDT)

		Length (bytes)	Protocol (ASCii)	Example	Comments	Each Item shall be seperated by '+' (Plus) Each Data in a Item shall be seperated by ',' (Comma) Each Item can be left as empty per Function Code.
0	Head	3	"NDT"	NDT	Fixed	
1	Direction	1	"M"	M	M: Machine -> NDT / N: NDT -> Machine	
2	Function	Various	Numeric	0	00: Echo / 01 ~ 20: Function Code	
3	Serial	Various	String	123456789		
4	StationID #1	Various	String	SD123456X01	Machine StationID	
5	StationID #2	Various	String	SD123456X01	Source StationID for Function 2 & 4	
6	Status	4	XXXX	9999		
7	Model	Various	String	MyModel		
8	Requested Data No	Various	Seperated by Comma	001,003,011	for Function 3 & 4 / 001,003,011: Data000, Data003, Data011	
9	Data	Various	Seperated by Comma	Lot001,123.456,345	for Function 10	
10	Tail	3	"NDT"	NDT	Fixed	
Protocol Ex.		NDT+M+0+123456789+SD123456X01+SD123456X01+9999+MyModel+001,003,011+Lot001,123.456,345+NDT				

Figure 11:   UDP Protocol / Request

4.3.2 Response (NDT -> LabVIEW)

		Length (bytes)	Protocol (ASCii)	Example	Comments	Each Item shall be seperated by '+' (Plus) / Each Data in a Item shall be seperated by ',' (Comma) / Each Item can be left as empty per Function Code.
0	Head	3	"NDT"	NDT	Fixed	
1	Direction	1	"N"	N	M: Machine -> Nexteer Data Trace App / N: NDT -> Machine	
2	Function	Various	Numeric	0	Retern Requested Function Code: 00: Echo / 01 ~ 20: Function Code. If there is error, it is used for error code. 99: Syntax Error 98: StationID Error	
3	Serial	Various	String	123456789		
4	Last StationID	Various	String	SD123456X01	for Function 1 ~ 4	
5	StationID #2	Various	String	SD123456X01	Source StationID for Function 2 & 4	
6	Status	4	XXXX	9999		
7	Model	Various	String	MyModel		
8	Elapsed Time	6	XXXXXX	000060	Minutes	
9	Data	Various	Seperated by Comma	123.456,345	for Function 3 & 4	
10	Tail	3	"NDT"	NDT	Fixed	
	Protocol Ex.		NDT+N+0+123456789+SD123456X01+SD123456X01+9999+MyModel+000060+123.456,345+NDT			

Figure 12:   UDP Protocol / Response

4.4 Deliverables

4.4.1 NDT_LV_adapter.vi

1. Sub VI shall be used in customer LabVIEW app.

4.4.2 NDT_LV_main.vi

1. Example VI shows how to use "NDT_LV_adapter.vi".

5. FANUC

5.1 Recommended Hardware and Software

5.1.1 Hardware

1. One LAN Port shall be assigned for Data Traceability.

2. One PROFINET Port shall be assigned for a Barcode Reader.

3. Minimum 610 bytes memory shall be reserved for Data Traceability.

4. One CPU is capable of a maximum of 16 Stations / Operations.

5.1.2 Software

1. Software shall support communication via FOCAS Library.

5.2 Memory Address Map

5.2.1 Proper "D" address memory shall be reserved for Data Traceability.

5.2.2 The first address can be configured.

1. Following Addresses shall be used as defined by Nexteer. The Vendor is not allowed to change the address.

5.2.3 Default Address Map

1. D1001 ~ D1110: Assigned for CPU

2. D1111 ~ D1610: Assigned for 1st Station / Operation

3. D1611 ~ D2110: Assigned for 2nd Station / Operation

| B: Bool / BT: Byte W: Word (2 bytes) DW: Double Word (4 bytes)	Type	SD123456X01			SD123457X02			Remark
		Begin	Length (byte)	End	Begin	Length (byte)	End	
COMMON								
C_PC_HeartBeat	B	D1001.0						
RESERVED	BT	1002	1	1002				
C_PC_Year	W	1003	2	1004				YY
C_PC_Julian	W	1005	2	1006				DDD
C_PC_hh	W	1007	2	1008				hh
C_PC_MM	W	1009	2	1010				MM
COMMON_RESERVED		1011	90	1100				
PERMISSION PROCESS								
P_PLC_REQUEST	B	D1101.0			D1101.1			
P_PLC_SN	BT ARRAY	**1111**	40	1150	**1611**	40	1650	
P_PLC_FUNCTION	W	1151	2	1152	1651	2	1652	
P_PLC_RESERVED		1153	8	1160	1653	8	1660	
P_PC_STATUS	W	**1161**	2	1162	**1661**	2	1662	
P_PC_ELAPTIME	W	1163	2	1164	1663	2	1664	Minutes
P_PC_LASTOP	BT ARRAY	1165	20	1184	1665	20	1684	
P_PC_MODEL	BT ARRAY	1185	20	1204	1685	20	1704	
P_PC_DATA	BT ARRAY	1205	16	1220	1705	16	1720	
SAVE DATA PROCESS								
S_PLC_REQUEST	B	D1103.0			D1103.1			
S_PLC_SN	BT ARRAY	**1221**	40	1260	**1721**	40	1760	
S_PLC_FUNCTION	W	1261	2	1262	1761	2	1762	
S_PLC_STATUS	W	1263	2	1264	1763	2	1764	
S_PLC_MODEL	BT ARRAY	1265	20	1284	1765	20	1784	
S_PLC_DATA_VAL	DW	1285	24	1308	1785	24	1808	ex. Val type data 6ea
S_PLC_DATA_STR	BT ARRAY	1309	176	1484	1809	176	1984	Data: Total 200 bytes
S_PC_RESPONSE	W	**1485**	2	1486	**1985**	2	1986	
S_RESERVED		1487	14	1500	1987	14	2000	
IN PROCESS								
I_PLC_REQUEST	B	D1105.0			D1105.1			
I_PC_RESPONSE	W	1501	2	1502	2001	2	2002	
I_PLC_SN	BT ARRAY	1503	40	1542	2003	40	2042	
I_PLC_FUNCTION	W	1543	2	1544	2043	2	2044	
I_PLC_STATUS	W	1545	2	1546	2045	2	2046	
I_PLC_MODEL	BT ARRAY	1547	20	1566	2047	20	2066	
I_RESERVED		1567	44	1610	2067	44	2110	

Figure 13:   FANUC Memory Address Map

5.2.4 Tag Naming shall comply with Section 3.2.4 of this document.
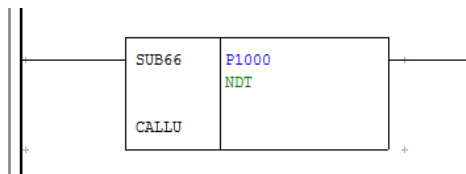
5.3   Sub Program

5.3.1   Structure
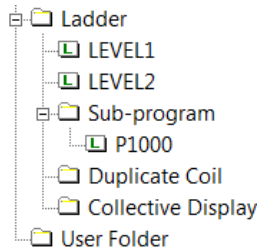
5.3.2   One Sub-program shall be called by main routine. Default name is P1000.

5.4   Sequence

See Section 3.4 of this specification – exception, Section 3.4.3.2.

5.4.1   Save Data

1. Data from the PLC to PC

   a. 200 bytes (D1285 ~ D1484) are reserved to save processed data.

S_PLC_DATA_VAL	DW	1285	24	1308	1785	24	1808	ex. Val type data 6ea
S_PLC_DATA_STR	BT ARRAY	1309	176	1484	1809	176	1984	Data: Total 200 bytes

   b. There are two types of data; Value and String.

   c. Each value type data uses 4 bytes (Double Word)

   d. Remaining bytes are to be used for String type data.

   e. Each string type data shall be separated by a comma.

   f. String type data shall begin and end with a comma.

2. Example: if there are 3 value type data and 2 string type data ("abc", "def").

   a. D1285: 1st Value Type Data

   b. D1289: 2nd Value Type Data

   c. D1293: 3rd Value Type Data

   d. D1297: Comma

   e. D1298 ~ D1300: "abc"

   f. D1301: Comma

   g. D1302 ~ D1304: "def"

   h. D1305: Comma

5.5 Deliverables

- NDT_Fanuc_LAD_vXX.XX: Fanuc PMC Program Template. It includes Sub-Program.

Appendix

A. NDT (Nexteer Data Traceability Application)

A.1 Installation

- Installation File: NDT_vAA.BB.CC_setup.exe
- Up to V7: Individual Application supported each controller, Siemens and Fanuc.
- V8: Support all controllers, Siemens, Fanuc and UDP, with one solution.
- Version Definition:
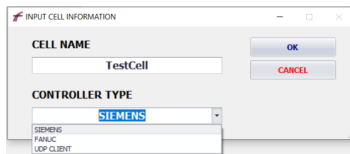 - AA: Major Change.
  - BB: Minor Change like adding new functions.
    CC: Debug purpose.

A.2 Application Master Window
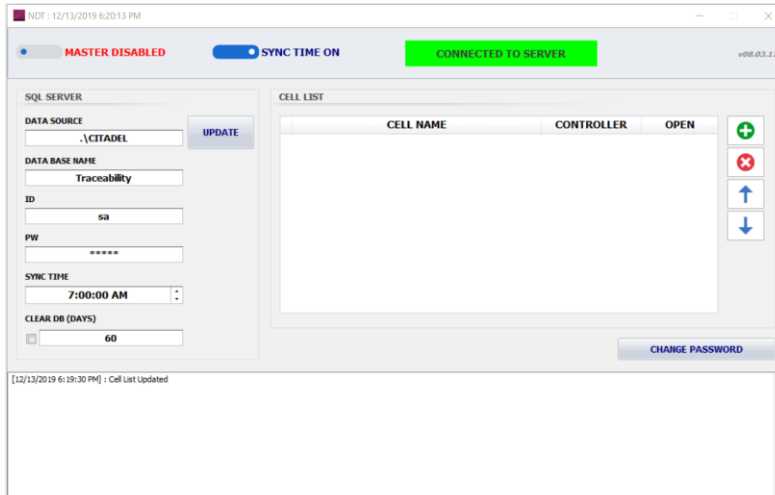
- MASTER DISABLED: Toggle switch to enable/disable whole application. If you turn it off, all cells would be disabled.
- SYNC TIME ON: Toggle switch to enable/disable time sync function. If you turn it on, NDT is to synchronize local pc time with server. If NDT is running on plant server, you don't need to turn it on.
- SQL SERVER: SQL Server related parameters.
- SYNC TIME: This time is to be used to sync time and clear DB. If SYNC TIME ON and CLEAR DB checked, NDT will perform those functions every day at this time.
- CLEAR DB (DAYS): If the check box checked, NDT is moving older than the specified days data from "status" table to "status_all" table by calling stored procedure, "NDT_clearDB" in the server.
- CHANGE PASSWORD: You can change the password. Default password is 1.
- CELL LIST: You can add, delete and move the cell items.
  CELL LIST / ADD ⊕ : You can add a new cell. Input CELL NAME and select CONTROLLER TYPE.
- CELL LIST / DELETE ⊗ : You can delete the selected cell from your list. It is password protected.

A.2.1   How to add a New Cell:

A.2.1.1   Click ADD button ⊕ and input CELL NAME and select CONTROLLER TYPE.
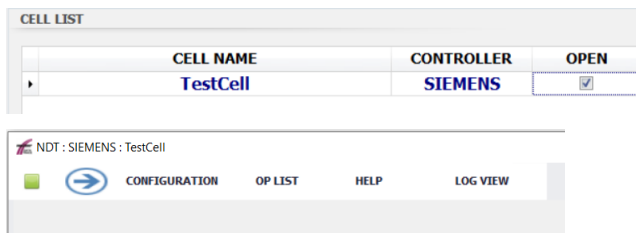
A.2.1.2   You will see the updated CELL LIST

A.2.1.3   Check OPEN check box. And you will see the new cell window with empty information.
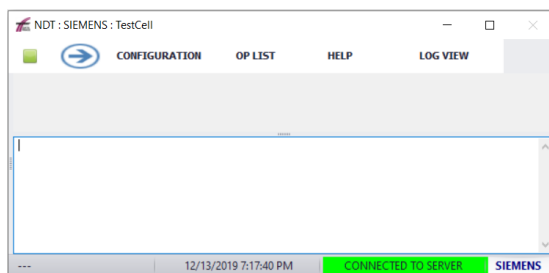
A.2.1.4   Open Configuration Window by clicking CONFIGURATION button. It is password protected.

A.2.1.5   Each cell has its own configuration.

A.3   Application Cell Window

- START / STOP ▪ : You can start and stop the cell.
- CONFIGURATION: Set configuration of the cell.
- OP LIST: Shows Operations List of the cell.
- HELP: It shows Status Code List, PLC Memory Map Address, UDP Protocol, Function Code List and etc.
- LOG VIEW: It shows log list.

A.3.1   How to set configuration / SIEMENS

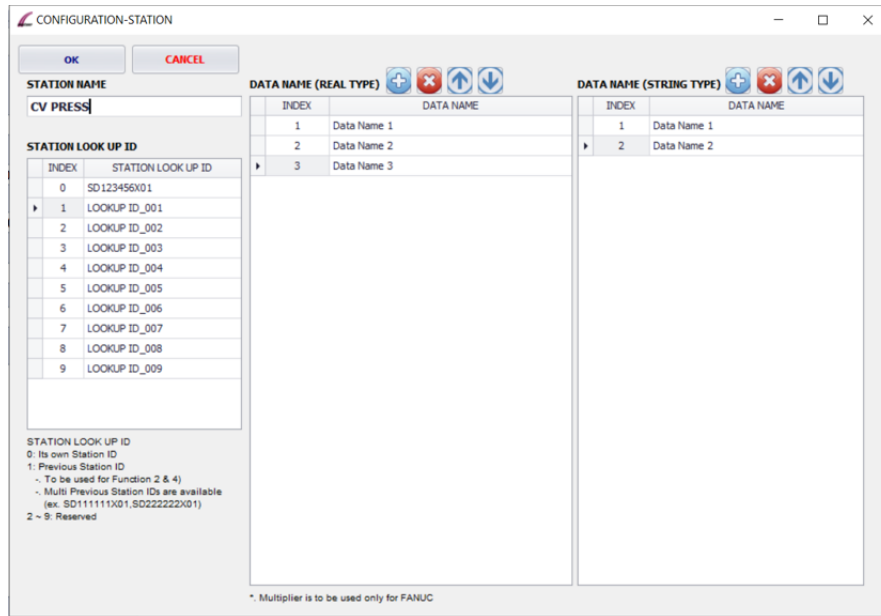**A.3.1.1   Open configuration window. It is password protected.**
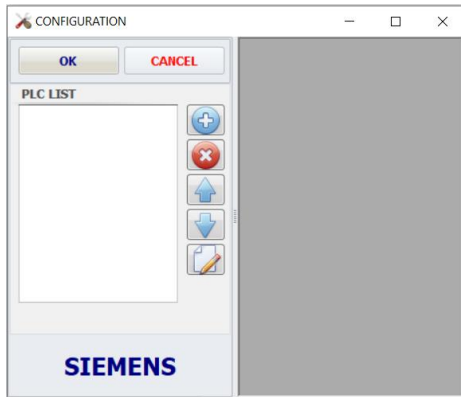
A.3.1.2   Add PLC
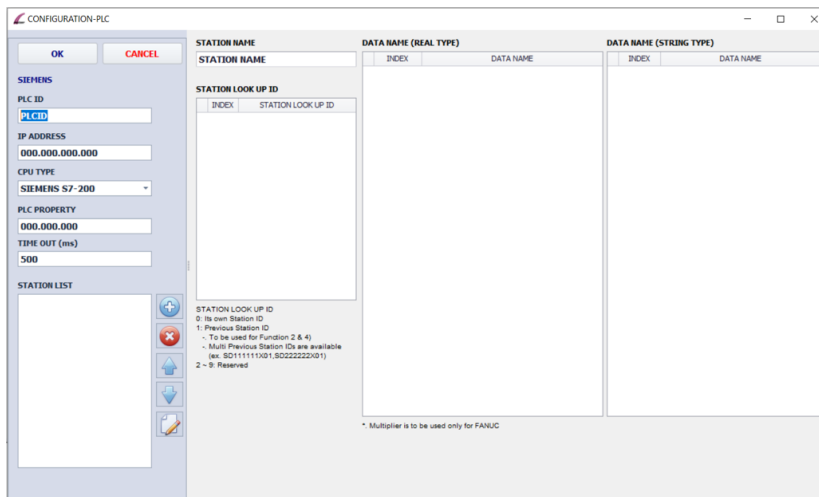
- PLC ID: Input proper PLC ID (ex. SD123456X)
- IP ADDRESS: Input proper PLC IP Address
- CPU TYPE: Select proper CPU type.
- PLC PROPERTY: Input proper PLC property. Format is "AAA.BBB.CCC"
  - AAA: Rack Number
  - BBB: CPU Slot Number
  - CCC: DB Address
  - Ex. 0.2.1000 -> 1st Rack / 2nd Slot / DB1000

- TIME OUT (ms): PLC connection time out in milliseconds.
- STATION LIST: ADD / DELETE / EDIT Stations that belong to the PLC.

A.3.1.3   Add STATION

- STATION NAME: Input proper Station Name. (ex. CV PRESS)
- STATION LOOK UP ID:
    - INDEX 0: Its own StationID (ex. SD123456X01)
    - INDEX 1: Previous StationID for Function Code 2 and 4.
    - INDEX 2 ~ 9: Reserved

- DATA NAME (REAL TYPE) / DATA NAME (STRING TYPE): It shall be matched with PLC data.

A.3.2   How to set configuration / FANUC

-. Same as SIEMENS except for followings.

- CPU TYPE: N/A
- PLC PROPERTY: Memory Address in D Area.
    - Ex. 1000 -> D1000

- TIME OUT (s): Timeout in seconds.
- DATA NAME (REAL TYPE): It has MULTIPLIER. NDT is to save the multiplied value into the server.

A.3.3 How to set configuration / UDP
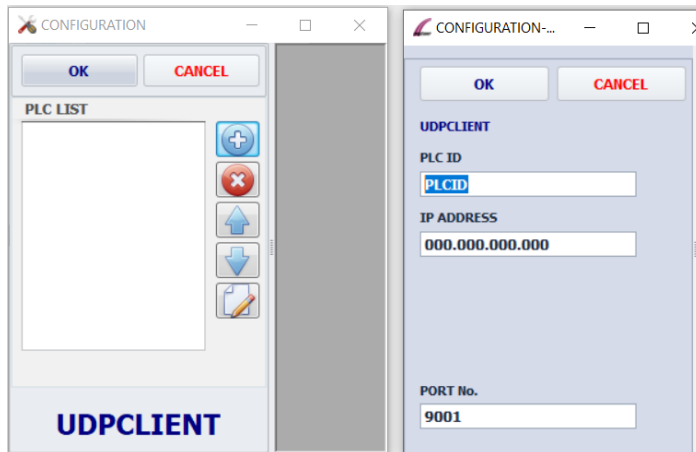
-. Same as SIEMENS except for followings.

- CPU TYPE: N/A
- PLC PROPERTY: N/A
- IP ADDRESS: Host IP Address. NDT is working as HOST with the specified port opened.
- PORT No.: Host UDP IP Port. All clients shall communicate through this port. Default is 9001.

A.3.4 CONFIGURATION Files:

- Updated Cell List

- You can find the attached configuration files in "NDT_Config" directory under your application.

  - CellName_ControllerType_NDT_Config.ndt8: Cell Configuration File

B.   NDT Function Codes

Function Code	Description
1	Get the data of the most recent record
2	Get the data of the most recent record from a specific Station/Operation
3	Get the data of the most recent record and process data associated (Function 1 + Data)
4	Get the data of the most recent record from a specific Station/Operation (Functon 2 + Data)
10	Save the processed data
2101	Save the processed data by BoxID (especially for Tempering)
	Previous Operation BoxID Data Name shall be defined at the last String Type Data (ex. Data001)
	Elapsed Time Upper Limit shall be defined at the last Real Type Data
	Previous OP ID shall be defined at the Station Lookup ID #1 at NDT Config
	Then,
	If Previous Status is not 9999, it will save the previous status.
	If Previous Status is 9999 but the Elapsed time is over upper limit, it will save 1001 status
	Else, it will save 9999 status
2102	BoxHandler. Match singular serial to BoxID by Manual Scanner

C.   Status and NDT Feedback Codes

STATUS CODE

9999	Good Part Completed / Good Part
9000	Cycle In Process
1000	Machine Fault Reject
1001	Operation Reject / Bad Part
2000 ~ 2999	User defined detailed reject code

PERMISSION FEEDBACK CODE (NDT -> PLC)

*	Status Code from Database or followings
5000	None or more than 1 record found
5012	Parameter Serial is missing
5099	Server is not connected
5199	Exceptional error

SAVE DATA FEEDBACK CODE (NDT -> PLC)

1	Ok to save
5010	Parameter PLC ID is missing
5011	Parameter Station ID is missing
5012	Parameter Serial is missing
5013	Parameter Status is missing
5020	Multiple parameters are missing
5099	Server is not connected
5101	String type data format error / missing the first comma
5102	String type data format error / incorrect length
5103	String type data format error / missing the last comma
5104	String type data format error
5105	Real type data format error
5199	Exceptional error

RECORD OF REVISIONS

Revision No	Date	Section	Description
001	03JN19	ALL	Initial release.
002	25FE20	Appendix A, B, C	NDT V8 released.
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