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DIFFERENCES BETWEEN THE TRICON V9.52.1 SYSTEM AND THE TRICON V10.2.4 SYSTEM

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1.0 Introduction

This document has been created specifically for the purpose of describing the hardware and software differences between the Tricon 9.52.1 system (the current v9 system identified in the existing SER) and the Tricon 10.2.4 system. The information in this document is derived from various internal formal requirements and/or design documents, nuclear qualification documents, the Nuclear Qualified Equipment List (NQEL), etc. (Reference 9100278-001, Rev1.2).

This document is not a specification for the Tricon systems. If there is any discrepancy between this document and the formal documents, the formal documents shall prevail.

1.1 Background

IOM initiated the Tricon V10 Nuclear Qualification Upgrade Project to address the contingencies identified in *Triconex Topical Report 7286-545-1-A, Qualification Summary Report* and the *NRC Safety Evaluation Report (SER)* dated December 12, 2001. NRC staff noted that the Tricon PLC system did not fully meet the guidance of TR-107330 for seismic, EMI/RFI conducted and radiated emissions, surge withstand, and ESD withstand, requiring the nuclear power plant engineering staff to verify that reported results envelop the specific plant application.

Recognizing that such requirements increase plant contingencies, IOM initiated modifications of the Tricon to elevate its performance to that required in TR-107330 and the recently issued R.G. 1.180, Revision 1. In addition to EMC hardening of components, IOM also introduced new processors and features, which required evaluation and verification and validation testing.

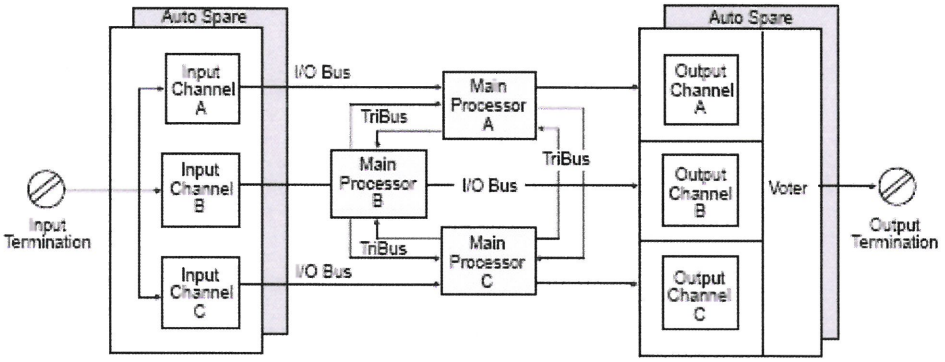
The Tricon 10.x system has been developed in accordance with approved Invensys Operations Management (IOM) processes and procedures. These processes and procedures are substantially the same as those that were reviewed and approved as part of the V9 SER issuance, but have since been strengthened based upon Continuous Process Improvement principles and best practices.

As part of the product development cycle, all Tricon V10 system versions have been verified and validated at the system, subsystem, and module levels by the Triconex Product Assurance group and by an independent, external third party (TÜV), as per IOM processes and procedures.

IOM is interested in mitigating project risk and schedule risk for both our customers and ourselves. We believe we can do this by adhering to guidelines proposed by the NRC in recent public forums and ANS meetings. By requesting the NRC to revise its safety analysis to reflect upgrade of the Tricon V9 to the Tricon V10, we will enable a licensee to propose an approved platform that is currently within the boundaries of its approval, as described in the topical report. We believe this will decrease the risk to our customers and potentially minimize the review cycle.

1.2 System Architecture and System Level Differences between V9 and V10 System

The Tricon V10 system architecture is the same as that of the previously qualified Tricon V9 system. The following figure shows the Triple Modular Redundant (TMR) architecture of all Tricon systems:



The TriStation 1131 application programming model architecture for the Tricon V10 system is the same as that of the previously qualified Tricon V9 system.

The Tricon 10.x system includes the following **new modules**:

- A new Main Processor (Model 3008):
  - Two 50 MHz, 32-bit Freescale Semiconductor MPC860EN microprocessors along with 25 Mb/second Tribus provides quadruple performance of the v9 Main Processor (Model 3006).
  - 16 Mbyte of DRAM versus 2 Mbyte of static RAM for the application and Sequence of Events Data
- New SMT-based I/O modules (AI 3721N and DO 3625N):
  - These are next generation I/O module that uses the same basic TMR (Triple Modular Redundant) architecture of the previous I/O modules. The interface to the I/O bus and I/O protocol for communication to the MP is the same as previous I/O modules.
  - Each channel (leg) of the module has an ATMEL AT91R40008 ARM microcontroller and a Xilinx Spartan IIE 1.8V Field Programmable Gate Array (FPGA). Each channel has a separate 2 MB flash memory. The microprocessor's 16-bit bus connects to the FPGA and flash memory.
  - The 3721N AI module provides the following advantages over the previous AI modules for the Tricon V9 system:

        - A 10 msec scan rate for all the field inputs, compared to the 50 msec scan rate for all the field inputs of previous AI modules (such as the 3700AN).
        - Can be configured for unipolar input (0 to 5 VDC) or bipolar input (-5 to +5 VDC).
        - 14-bit resolution, versus the 12-bit resolution of previous AI modules.
    - The 3526N DO module provides the following advantages over the previous DO modules for the TriconV9 system:
        - 32 output points, compared to 16 points for the old modules
        - Can be configured as supervised or unsupervised
    - Replace the following V9 modules:
        - AI 3700AN (0-5 VDC) and AI 3704EN (0-5/0-10 VDC, High Density)
        - DO 3604EN (24 VDC) and DO 3624N (24 VDC, Supervised)
- A new communication module (TCM 4325AN Fiber Optic):
    - Combines the functionality of the three Tricon V9 communication modules (EICM 4119AN, NCM 4329N, and ACM 4609N)
    - Improves communication capabilities, including MODBUS TCP protocol support.
- AO 3805HN (4-20 mA) module:
    - Supports increased inductive loads
    - Replaces AO 3805EN (4-20 mA)
- Existing Through Hole I/O modules converted to SMT modules(Form, fit, and function compatible)
    - 3701N (0-10 VDC) - Through Hole to 3701N2 (0-10 VDC) – SMT
    - 3501TN 115V AC/DC – Through Hole to 3501TN2 115V AC/DC – SMT
    - 3502EN 48V AC/DC – Through Hole to 3502EN2 48V AC/DC – SMT
    - 3503EN 24V AC/DC – Through Hole to 3503EN2 24V AC/DC – SMT

1.3 Summary of Differences

1.3.1 Hardware

Module	Tricon V9.52.1 System	Tricon V10.2.4 System
Main Processor	3006N	3008N
	Hardware floating point processor	Embedded floating point software
Communication Module	Three modules: ▪ 4119AN (EICM) ▪ 4329N (NCM) ▪ 4609N (ACM)	One module: ▪ 4352AN (TCM) Fiber Optic
I/O Modules Analog Input (AI)	3700AN (0-5 VDC)	3721N (0-5 or -5 to +5 VDC, Differential) Next Generation Module, SMT
	3701N (0-10 VDC) – Through Hole	3701N2 (0-10 VDC) - SMT
	3510N (Pulse Input)	3511N (Pulse Input) – Faster Input Scan
	3703EN (Isolated)	Same
	3708EN (ITC)	Same
	3704EN (0-5/0-10 VDC, High Density)	Removed
	3706AN (NITC)	Removed
I/O Modules Analog Output (AO)	3805EN (4-20 mA)	3805HN (4-20 mA) – Supports increased inductive loads
I/O Modules Digital Input (DI)	3501TN 115V AC/DC – Through Hole	3501TN2 115V AC/DC – SMT
	3502EN 48V AC/DC – Through Hole	3502EN2 48V AC/DC – SMT
	3503EN 24V AC/DC – Through Hole	3503EN2 24V AC/DC – SMT
	3504EN 24/48 VDC – Through Hole	Removed
	3505EN 24 VDC – Through Hole	Removed
I/O Modules Digital Output (DO)	3604EN 24 VDC 3624N 24 VDC, Supervised	3625N 24 VDC, Supervised/ Unsupervised Next Generation Module
	3601TN 115 VAC	Same
	3603TN 120 VDC	Same
	3607EN 48 VDC	Same
	3623TN 120 VDC, Supervised	Same
	3636TN (Relay Output)	Same

Remote Extender Modules: **Primary** **Remote**	 4210N (Single Mode Fiber Optic cable) 4211N (Single Mode Fiber Optic cable)	 4200N (Multi Mode Fiber Optic cable) 4201N (Multi Mode Fiber Optic cable)
I/O Module Term Panels	Version 8 Term Panels	Removed
Signal Conditioners	▪ Signal Conditioner (-100 to 100 °C) Pt (7B34-01-1) ▪ Signal Conditioner (0 to 100 °C) Pt (7B34-02-1) ▪ Signal Conditioner (0 to 200 °C) Pt (7B34-03-1) ▪ Signal Conditioner (0 to 600 °C) Pt (7B34-04-1)	Same
	Not included	Four additional Signal Conditioners: ▪ Signal Conditioner (0 to 200 °C) Pt (7B34-CUSTOM) ▪ Signal Conditioner (0 to 600 °C) Pt (7B34-CUSTOM) ▪ Signal Conditioner (0 to 100 mV) (7B30-02-1) ▪ Signal Conditioner (0 to 120 °C) Cu (7B14-C-02-1)
Power Supplies:	ASTEC Power Modules	Alternate Vicor Power Modules
120 V	8310N	8310N2
24 VDC	8311N	8311N2
230 VAC	8312N	8312N2
Chassis: **Main** **Expansion** **Remote Expansion**	 8110N 8111N 8112N	 8110N2 8111N 8112N

1.3.2 Software

Module	Tricon V9.52.1 System Software Version	Tricon V10.2.4 System Software Version
TriStation 1131 Developer's Workbench ***(Application Development Software)***	v4.1.419	v4.1.437
Main Processor Software:		
Application Processor	TSX 6218	ETSX 6198 (Build 113)
I/O Processor	IOC 5212	IOCCOM 6054 (Build 113)
COM Processor	COM 5206	
Communication Module Software:		
TCM	Not Applicable	TCOM 6136 (Build 113)
Common V9.52.1 COM	ICM 4930	Not Applicable
EICM	IICX 5276	Not Applicable
NCM	NCMGX 6250	Not Applicable
ACM	ACMX 5584	Not Applicable

I/O Module Software		
AI 3721N	Not Applicable	AI 6256 (Build 113)
DO 3625N	Not Applicable	DO 6255 (Build 113)
AI 3701N/N2	AI/NITC 5661	Same
IAI 3703EN	EIAI/ITC 5916	Same
ITC 3708EN	EIAI/ITC 5916	Same
PI 3510N	PI 4559	Not Applicable
PI 3511N	Not Applicable	PI 5647
AO 3805EN/HN	AO 5897	AO 5897
DI 3501TN/TN2 **DI 3502EN /EN2** **DI 3503EN/EN2**	EDI 5909	Same
DI 3505EN **DI 3504EN** **AI 3704EN**	HDI 5910	Not Applicable

DO 3601TN **DO 3607EN**	EDO 5781	Same
DO 3604EN	EDO 5781	Not Applicable
RO 3636TN	ERO 5777	Same
DO 3603TN	TSDO 6142	Same
DO 3623TN	TSDO2 5940	Same
DO 3624N	TSDO2 5940	Not Applicable
Remote Extender Modules	RXM 3310	Same

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1.3.5 Qualification Process

Overall Qualification Process was as per EPRI 107330 requirements for both Tricon V9 and Tricon V10 systems. The following new reports (equivalent to V9 reports) were developed, reviewed, and released:

- 9600164-545, Rev 3 (EQ Summary Report)
- 9600164-539, Rev 1 (TRICON V10_2_1 CDR)
- 9600164-535, Rev 1 (Software Qualification Report)
- 9600164-541, Rev 0 (System Description)
- 9600164-532, Rev 0 (Reliability-Availability Study)

Tricon V9.x System	**Tricon V10.x System**
IEEE 323-1983	IEEE 323-2003
Low Humidity, limited due to test	Low Humidity tested to TR-107330 requirements
Radiation qualification by analysis	Radiation qualification by test
EMC testing to TR-102323 **(Please see section 6.1 EMC tests differences between Tricon V9 and Tricon V10 Systems for details)**	EMC testing to R.G. 1.180 R1 (Please see section 6.1 EMC tests differences between Tricon V9 and Tricon V10 Systems for details)
Seismic envelope – 10G's	Seismic envelope – 14 G's
No electrostatic discharge testing	Electrostatic discharge testing performed to IEC 61000-4-2

1.4 References

The following documents were used as references in the development of this document:

- 9600164-545, Rev 3 (EQ Summary Report)
- 9600164-539, Rev 1 (TRICON V10_2_1 CDR)
- 9600164-535, Rev 1 (Software Qualification Report)
- 9600164-541, Rev 0 (System Description)
- 9600164-532, Rev 0 (Reliability-Availability Study)

2.0 Main Processor Differences

The following sections provide detailed information about the Main Processor (MP) hardware and software differences between the Tricon V9.52 and the Tricon V10.2.4.

2.1 Main Processor Hardware Differences

The following table details the hardware differences between the Tricon V9.52.1 Model 3006N Main Processor and the Tricon v10.2.4 Model 3008N Main Processor:

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3.0 I/O Modules

The following sections provide detailed information about the I/O Module hardware and software differences between the Tricon V9.52 and the Tricon V10.2.4.

3.1 I/O Module Hardware

The following sections detail the hardware differences between I/O Modules in the Tricon V9.52.1 and the Tricon V10.2.4.

3.1.1 Analog Input (AI) Modules

The following AI modules are the **same** for the Tricon V9.52.1 and Tricon V10.2.4:

- *3703EN – Isolated AI module (IAI)*
- *3708EN – Isolated Thermo Couple (ITC)*

The following modules from the Tricon V9.52.1 are **not included** in the Tricon V10.2.4:

- *3700AN – AI (0-5 VDC)*
- *3704EN – AI (0-5/0-10 VDC, High Density)*
- *3706AN – Non-isolated Thermo Couple (NITC)*
- *3510N – Pulse Input*

The following through-hole technology modules from the Tricon V9.52.1 have been **converted** to form-, fit-, and function-compatible Surface Mount Technology (SMT) modules, and qualified for the Tricon V10.2.4:

- *3701N – AI (0-10 VDC)*
  - The only changes required for conversion from the through-hole module to SMT module are the implementation changes:
    - A new PCB layout for the SMT module.
    - Use of SMT parts in place of through-hole parts.
  - This SMT module was reviewed and verified by TÜV (independent third-party).

The following modules (not in Tricon the V9.52.1) have been **added** to the Tricon V10.2.4:

- *3721N – AI (0-5 or -5 to +5 VDC, Differential); Next Generation Module, SMT*
  - This is a Next Generation AI module that uses the same basic TMR (Triple Modular Redundant) architecture of the previous I/O modules. The interface to the I/O bus and I/O protocol for communication to the MP is the same as previous I/O modules.

- Each channel (leg) of the 3721N module has an ATMEL AT91R40008 ARM microcontroller and a Xilinx Spartan IIE 1.8V Field Programmable Gate Array (FPGA). Each channel has a separate 2 MB flash memory. The microprocessor's 16-bit bus connects to the FPGA and flash memory.
- The 3721N AI module provides significant advantages over the previous AI modules for the Tricon V9.52.1:
  - A 10 msec scan rate for all the field inputs, compared to the 50 msec scan rate for all the field inputs of previous AI modules (such as the 3700AN).
  - Can be configured for unipolar input (0 to 5 VDC) or bipolar input (-5 to +5 VDC).
  - 14-bit resolution, versus the 12-bit resolution of previous AI modules.
- The module performs the same types of checks and verifications across channels as the Tricon V9.52.1 AI modules.
- This module replaces the following Tricon v9.52.1 modules:
  - 3700AN – AI (0-5 VDC)
  - 3704EN – AI (0-5/0-10 VDC, High Density)

- *3511N - Pulse Input*
  - The Model 3511 Pulse Input module features a faster input scan, providing a faster speed measurement capability for the V10.x Tricon.
    - The worst case speed measurement update rate of the Model 3510 PI is 50 msec.
    - The PI 3511 measurement update rate is twice as fast as the 3510: 12.5 msec typical, 25 msec worst case.
  - The Model 3511 PI module is based upon the existing Model 3510 PI module hardware/software platform, with minor modifications. Specially, the internal reference frequency is changed from 1 MHz to 2 MHz, and the firmware calculations scaled appropriately. Other than an improved update rate, none of the other published specifications are affected.
  - This module replaces the Tricon V9.52.1 3510N module.

3.1.2 Analog Output (AO) Modules

The Tricon V9.52.1 *Model 3805EN (4-20 mA) Analog Output* module was modified to resolve the problem with high inductive loads connected to the output points during the periodic board switch. The problem details are presented below.

- To resolve the problem on the Model 3805EN, the loopback circuitry was modified to always power this circuitry from loop power. A rework change order was generated for this modification to the Model 3805EN module.
- A new model number—3805HN—was created to include the new PCB layout that incorporated the above modification.

Both the AO modules (Model 3805EN and Model 3805HN) are form-, fit-, and function-compatible.

The Model 3805H module was included in the Tricon V10.2.4 qualification.

3.1.3 Digital Input (DI) Modules

The following through-hole technology modules from the Tricon v9.52.1 have been **converted** to form-, fit-, and function-compatible Surface Mount Technology (SMT) modules, and qualified for the Tricon V10.2.4:

- *Model 3501TN DI (115V AC/DC)* through-hole module converted to *Model 3501TN2 DI (115V AC/DC)* SMT module.
- *Model 3502EN DI (48V AC/DC)* through-hole module converted to *Model 3502EN2 DI (48V AC/DC)* SMT module.
- *Model 3503EN DI (24V AC/DC)* through-hole module converted to *Model 3503EN2 DI (24V AC/DC)* SMT module.

The only changes required for conversion from the through-hole module to SMT module are the implementation changes:

- A new PCB layout for the SMT module.
- Use of SMT parts in place of through-hole parts.

The SMT modules were reviewed and verified by TÜV (independent third-party).

The following modules from the Tricon V9.52.1 are **not included** in the Tricon V10.2.4:

- *3504EN DI (24/48 VDC)*
- *3505EN DI (24 VDC)*

3.1.4 Digital Output (DO) Modules

The following modules from the Tricon V9.52.1 are **not included** in the Tricon V10.2.4:

- *3604EN DO 24 VDC*
- *3624N DO 24 VDC, Supervised*

The following DO modules are the **same** for the Tricon V9.52.1 and Tricon V10.2.4:

- *3601TN DO 115 VAC*
- *3603TN DO 120 VDC*
- *3607EN DO 48 VDC*
- *3623TN DO 120 VDC, Supervised*
- *3636TN RO (Relay Output)*

The following module (not in the Tricon V9.52.1) has been **added** to the Tricon V10.2.4:

- *3625N DO (24 VDC, Supervised/Unsupervised), Next Generation SMT Module*
  - This is a Next Generation DO module that uses the same basic TMR (Triple Modular Redundant) architecture of the previous I/O modules.
  - The interface to the I/O bus and I/O protocol for communication to the MP is the same as previous I/O modules.
  - Each channel (leg) of the Model 3625N module has an ATMEL AT91R40008 ARM microcontroller and a Xilinx Spartan IIE 1.8V Field Programmable Gate Array (FPGA). Each channel has a separate 2 MB flash memory. The microprocessor's 16-bit bus connects to the FPGA and flash memory.
  - The Model 3625N DO module provides significant advantages over the previous Tricon v9.52.1 DO modules:
    - 32 output points, compared to 16 points for the old modules
    - Can be configured as supervised or unsupervised
  - This module replaces the following Tricon v9.52.1 modules:
    - *3604EN DO 24 VDC*
    - *3624N DO 24 VDC, Supervised*

3.1.5 Remote Extender Modules

The following Remote Extender modules from the Tricon V9.52.1 are **not included** in the Tricon V10.2.4:

- *4210N (Single Mode Fiber Optic cable) Primary Remote Extender module*
- *4211N (Single Mode Fiber Optic cable) Secondary Remote Extender module*

The following Remote Extender modules are **included** in the Tricon V10.2.4:

- *4200N (Multi Mode Fiber Optic cable) Primary Remote Extender module*
- *4211N (Multi Mode Fiber Optic cable) Secondary Remote Extender module*

3.1.6 I/O Module Term Panels

All Tricon v8 I/O module term panels were removed from the Tricon V10.2.4.

3.1.7 Signal Conditioners

The following Signal Conditioners are the **same** for the Tricon V9.52.1 and Tricon V10.2.4:

- Signal Conditioner (-100 to 100 °C) Pt (7B34-01-1)
- Signal Conditioner (0 to 100 °C) Pt (7B34-02-1)
- Signal Conditioner (0 to 200 °C) Pt (7B34-03-1)
- Signal Conditioner (0 to 600 °C) Pt (7B34-04-1)

The following Signal Conditioners have been **added** to the Tricon V10.2.4:

- Signal Conditioner (0 to 200 °C) Pt (7B34-CUSTOM)
- Signal Conditioner (0 to 600 °C) Pt (7B34-CUSTOM)
- Signal Conditioner (0 to 100 mV) (7B30-02-1)
- Signal Conditioner (0 to 120 °C) Cu (7B14-C-02-1)

3.2 I/O Module Software

The following sections detail the software differences between I/O Modules in the Tricon V9.52.1 and the Tricon V10.2.4.

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The software provides improved functionality, with common routines for actions performed by all the new I/O modules. Please refer to section 2.2.2.1 (3721N AI module) for the detailed description.

3.2.5 Remote Extender Modules

The software for the remote extender modules in both Tricon V9.52.1 and Tricon V10.2.4 is the same. The software version number is RXM 3310.

4.0 Communication Processors

The following sections provide detailed information about the communication processor hardware and software differences between the Tricon V9.52 and the Tricon V10.2.4.

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6.0 Appendices

6.1 EMC Test differences between Tricon V9 and Tricon V10 systems

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6.2 V&V Summary Report Tricon V9.6 – Tricon V10.5 Releases

This Appendix provides a summary report of all V&V activity since the Tricon V9.6 release. The report lists all Major Revisions, and Maintenance releases since the release of V9.6. This summary report includes **ALL** releases for the complete commercial Tricon product line. This summary report is **not** limited to product that is listed on the Nuclear Qualified Equipment List (NQEL) only. Since Tricon V9.5x, only revisions V10.2.1, V10.2.2, and V10.2.4 have been qualified for Nuclear use (indicated below) and placed on the NQEL.

The V&V process has evolved over the years since the V9.5 SER (2001) from a process that was equivalent to an IEEE 1012 compliant process to a process in compliance with IEEE 1012. However, because the process change has been gradual and not retro-active not all V&V documentation, procedures and reports listed in this summary are fully IEEE 1012 compliant. The process has been steadily improved and hardened. Specifically the introduction and use of new tools like Synergy and DOORS have improved traceability, repeatability, configuration management, and record keeping.

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Table 2: Column legend

This table provides a brief description of the information provided in each column of Table 1 in this summary.

Column	Description
Major/Maintenance Release	Release identifier. Vx.y.z: x is the Major release number, y is the Revision number, and z is the Maintenance release number. (EDM 20.00)
Date	Date the Software Release Definition (SRD) was released.
Applicable V&V plans	Listing of the document number for the applicable V&V Plans.
Major Procedures executed	Listing of the major procedures that we executed as part of the formal Validation of the release.
Software release definition	The software Release Definition is the document that describes what is being released. It also contains information on compatibility, included bug fixes, and/or functional enhancements.
Release content summary	Major reason why the release was needed. This Column mostly refers to I/O Modules, Communication modules, Main Processor modules and their Firmware. See Table 3
V&V report	Pointer to the location of the V&V report. Historically V&V reports were kept in hardcopy only. Since V10.2 all reports are kept in electronic format only in our Synergy source control system database. The hardcopy is currently being scanned.

Table 3: Acronym Legend and Cross Reference

This table provides a cross reference between the Firmware acronyms (EEPROM) used in the release content summary column of table 1 and the actual Tricon Model number. Firmwares labeled "included in the build" are not in EEPROM. They are downloaded to Flash Memory. Model numbers ending with an N are included on the V10.2 NQEL.

Name / Description			Model#	Firmware Acronym
ACM	Advanced Comm. Module		4609	ACM
1.0	AI	0-10V DC	3701, 3701N2	NIAI
AI	0-5/0-10V DC		3703E, 3703EN	EIAI

Name / Description	Model#	Firmware Acronym
2.0 AI 0-5V DC	3700, 3700A	NIAI
AI DCCoupled Thermocouple	3706A	NIAI
AI 0-5/0-10V DC coupled, commoned	3704E	HDI
AI Isolated Thermocouple	3708E, 3708EN	EIAI
AI Differential Analog Input, 32 points	3721, 3721N	Included in the build
AI Single-ended Analog Input, 64 points	3720	Included in the build
AO 4-20	3805E, 3805HN	EAO
AO 4-20	3805H	EAO
AO 4-20,8-320 Hi Current	3806E	EAO
DI 115V AC/DC HiKV	3501T, 3501TN2	EDI
DI 115V AC/DC	3501E	EDI
DI 24/48V DC	3504E	HDI
DI 24V AC/DC	3503E, 3503EN2	EDI
DI 24V DC Single	3564	SDI
DI 24V DC Low Threshold	3505E	EDI
3.0 DI 48V AC/DC	3502E, 3502EN2	EDI

Name / Description	Model#	Firmware Acronym
DO 115V AC non Commoned	3601E, 3601TN	EDO
DO 115V AC non Commoned	3601T	EDO
DO 115V AC Supervised	3611E	SDO
DO 120V DC Commoned	3603E	TSDO
DO 120V DC Supervised HiKV	3623T, 3623TN	TSDO2
DO 120V DC Supervised	3623	TSDO2
DO 120V DC Commoned HiKV	3603T, 3603TN	HVDO
DO 24V DC Dual	3664	DDO
DO 24V DC FS	3674	DDO FS
DO 24V DC non Commoned	3604E	EDO
DO 24V DC Supervised	3624	TSDO2
DO 48V DC non Commoned	3607E, 3607EN	EDO
DO 24V DC Supervised	3614E, 3615E	ESDO
DO 120V DC Supervised	3613E	ESDO
DO 48V DC Supervised	3617E	ESDO
DO 24V DC Supervised, 32 points	3625, 3625N	
EICM Enhanced Intelligent Communication Module	4119A	ICM + IICX(A)

Name / Description		Model#	Firmware Acronym
HIM	Hiway Interface Module (EHIM)	4509	ICM+HCX
MP	EMP III	3008, 3008N	Included in the build
NCM	Network Interface Module	4329	ICM + NCMGX
NCMG	Network Interface Module	4329G	ICM + NCMGX
PI	Pulse Input	3511, 3511N	EPI
PT	24V DC	3515	PT
RO	Dry Contact	3636R, 3636T, 3636TN	ERO
RXM	Primary Single Mode Fiber	4210	SRXMP
RXM	Primary	4200, 4200N	RXMP
RXM	Remote Single Mode Fiber	4211	SRXMS
RXM	Remote	4201, 4201N	RXMS
SMM	Safety Manager Module	4409	SICM + SMMX
TCM	Tricon Communication Module	4351A, 4352A, 4352AN	Included in the build

Table 4: Other Abbreviation used in table 1

Abbreviation	Meaning
CR	Change Request – a Synergy Database record
PDR	Product Discrepancy report – a Synergy database record
SCAO	Servo Controller Analog Output Module (bi-polar)
PAN	Product Alert Notice
TAB	Technical Advisory Bulletin
Bug	Generic term for a product discrepancy usually reported in a PDR/PER
PER	Product Enhancement Request – a Synergy database record.
NGIO	Next Generation I/O modules (AI 3721N and DO 3625N)