

REASONS TO CHOOSE RTP

\$0 Maintenance contract

- 10 year hardware warranty

\$0 Software Maintenance

- One time registration fee
- Unlimited updates, upgrades, installations, tags
- Unlimited 10 year support

Training Programs - Versatile and Informal

- Customized and tailored to each client's needs, application assistance and development
- Software programming and hardware maintenance

Class 1E Safety Related Products

- Nuclear Grade quality program
- IEEE Std. 323 Standard qualification process

EMC Surge and Fast Transient Immunity:

- IEC 61000-4-4 Electrical fast transient/burst immunity
- IEC 61000-4-5 Surge immunity

Certifications:

- TUV- SIL 3 IEC61508-2010 and IEC61131-6
- EDSA- 300 Level 2
- ABS Certification

Advanced Technology/ Economically Priced

- 3200 Series I/O- DI \$13/pt. AI \$23/pt. DO \$18/pt.

Flexible Architecture

- Configurable redundancy- combination/variation of simplex, dual, triple, quad in one system
- Reduce cost by configuring redundancy only where required

Easy to use Advanced Voting Algorithms

- Built in diagnostics
- Selectable Degradation and Voting scheme

Comprehensive Diagnostics

- On-line diagnostic coverage, line supervision, field device checking, IO integrity checks
- Bus validation, communications validation, power supply monitoring and proof testing

Lowest MTTR

- Online replacement, field replaceable modules
- Extensive built-in diagnostics, system specific error messages, no programming required.

Superior Performance

- 1 msec Analog SOE, 1 msec Digital SOE
- 5 msec scan calculates > 20,000 float variables, IO scanning, alarm handling and peer to peer communications.

\$0 Maintenance contract

- **10 year hardware warranty**

RTP has set a new precedent by extending the standard warranty for the RTP3000 TAS system from 3 years to 10 years. Customers should not be lured in by a low discounted price and then forced to pay over and over again on the back end with some annual maintenance contract. Customers should pay for the product only once. Purchasing the RTP system comes with a 10 year warranty at no extra cost. Annual maintenance contracts are a thing of the past.

\$0 Software Maintenance

- One time registration fee
- Unlimited updates, upgrades, installations, tags
- Unlimited 10 year support

RTP has a long established unprecedented software policy. Since 1995 with introduction of the RTP2000 and NetArrays the first component of NetSuite, it was decided that customers would pay a one-time registration fee. There would be no costly software maintenance fees paid yearly. These customers received the full RTP NetSuite of software applications later released at zero cost. As RTP introduced newer systems with more advanced technology, the RTP NetSuite software also advanced with additional enhancements. The software upgrade cost to the customer again is \$0. Additionally, unlimited software support is provided for 10 year at no extra cost.

The RTP NetSuite software registration fee covers unlimited site installations, unlimited workstations, and unlimited points and applies to unlimited RTP systems.

Training Programs - Versatile and Informal

- Customized and tailored to each client's needs, application assistance and development
- Software programming and hardware maintenance

The RTP training program is unique for the industry. Each course is customized and tailored to the student's specific needs. Simply put, students are not subjected to hours of lecturing on unrelated topics, unrealistic theories of operation and a sales pitch on products they don't use. Many engineers get RTP training to learn how to design and write their customer application. The engineer is provided intensive instructions with extensive hands-on exercises utilizing his application. Upon course completion, the competent engineer has completed as much as half of the project application. Other engineers are tasked with maintaining the project application. These engineers will bring their project, which is already designed, installed and running in the plant. Intensive instruction is provided utilizing their application so that the competent engineer is able to understand, modify and maintain the project application. I&C technicians are tasked with troubleshooting and maintaining the hardware. These students are likewise provided with intensive training on their hardware system configuration and are provided with extensive hands-on labs to troubleshoot system faults in a classroom environment.

Class 1E Safety Related Products

- Nuclear Grade quality program
- IEEE Std. 323 Standard qualification process

RTP has 25 plus years experience delivering Class 1E safety products to the nuclear industry.

Product Qualification - RTP qualifies its nuclear Class 1E (safety-related) products using the methods in IEEE Std. 323 Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations. As part of the qualification process, we demonstrate and document the ability of equipment to perform safety function(s) under applicable service conditions of a typical nuclear plant's mild environment including design basis events such as earthquakes.

Environmental Qualification - The RTP products are tested under extreme service conditions including peak temperatures, humidity, voltage, etc to ensure that they can carry out their design function when required. This testing is performed by a combination of third party labs and our in-house staff as part of our design validation testing. Testing levels are consistent with the applicable environments in EPRI TR-107330 Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants and with IEC 61131-2 Programmable controllers – Part 2: Equipment requirements and tests.

Design Control - RTP's Class 1E program includes stringent design control procedures including engineering review of all proposed changes. The review also gives consideration to the safety impact of the proposed changes on previously supplied products.

Quality Program - RTP's qualification program is based on 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants that is the same program followed by nuclear power plants. This qualification program governs the activities in all facets of our company from engineering to qualification to manufacturing. Our program also complies with 10 CFR Part 21 Reporting of Defects and Noncompliance with regard to notifying customers and regulators of any product defects. The US NRC deems the 10CFR50 Appendix B quality program to be superior to other commonly used industrial quality programs such as ISO9001. For example, the quality requirements for a product produced under an Appendix B program are always linked to the product's importance to safety and compliance testing for that product is performed under the most adverse design conditions.

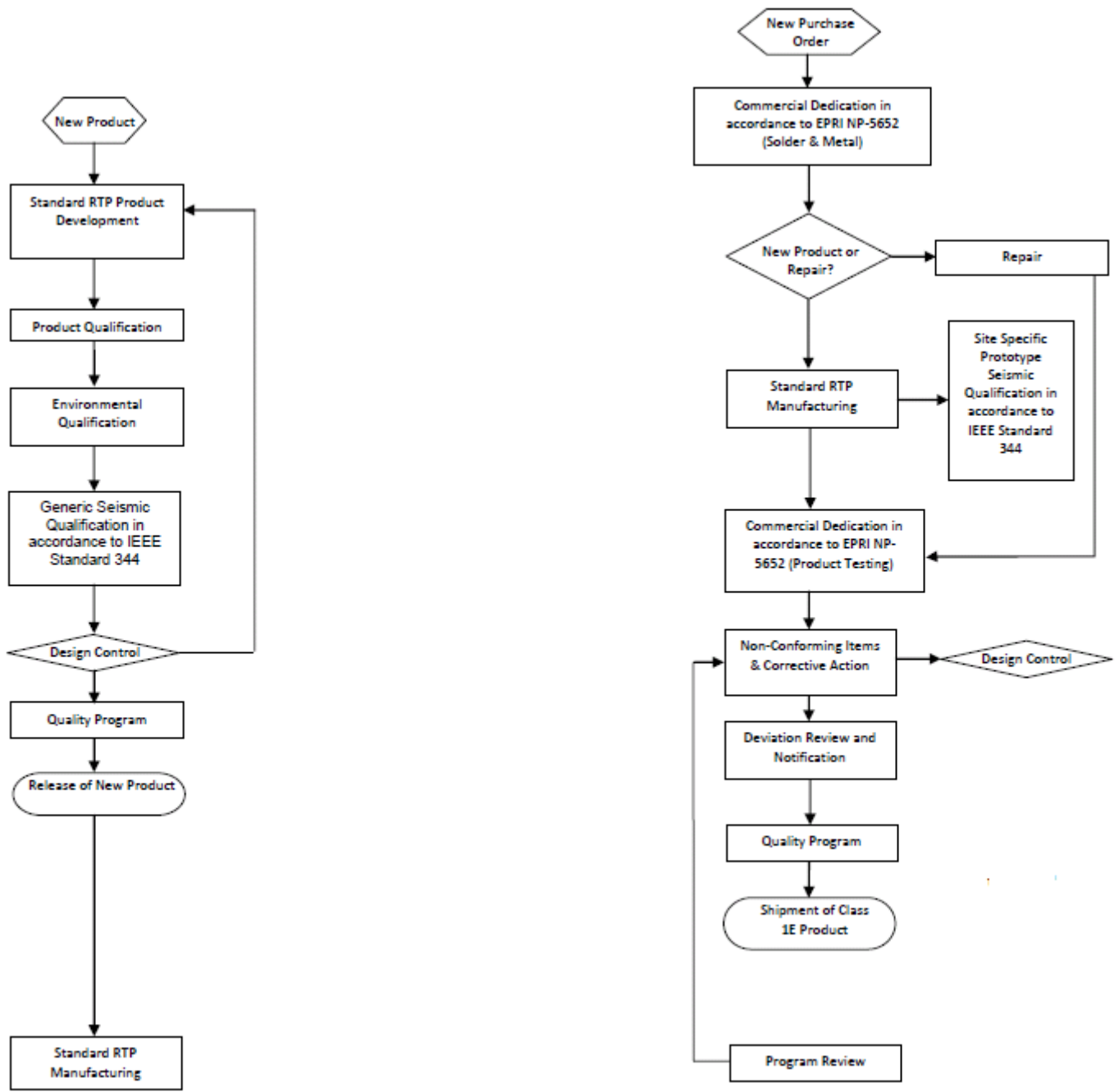
Commercial Grade Dedication - RTP purchases commercial grade components and dedicates them for use in our Class 1E products. Our commercial grade dedication procedures are based on EPRI NP-5652 Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications. As part of this process, critical characteristics are identified for the components and among other things; special tests are performed to ensure that these commercial grade items are suitable for safety related applications.

Seismic Qualification - In the environment in the nuclear plant where plant monitoring or control equipment is installed, seismic events are typically the design basis event; therefore our products must be tested to prove they can withstand these events. Seismic qualification is performed in accordance with IEEE Std 344 Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations to the plant-specific seismic vibrations associated with anticipated operating basis earthquakes (OBE) and safety shutdown earthquakes (SSE). An accredited third-party laboratory performs type testing of the RTP product for seismic immunity. These labs typically expose the RTP product to greater than 16 G's of acceleration force over a wide range of frequencies. This far exceeds the magnitude of the largest recorded earthquake.

Non-Conforming Items & Corrective Actions - Our program includes procedures for conducting reviews of non-conforming items as well as developing corrective actions to prevent reoccurrence of any non-conformance identified.

Deviation Reviews and Notification - In compliance with 10 CFR Part 21 Reporting of Defects and Noncompliance, deviations from a technical requirement are reviewed as to their potential impact on previously supplied products. If any deviations are found to be defects, our program includes provision for notifying affected customers and the regulators.

Program Review - Finally, regular reviews are an important part of our quality program as they provide feedback as to how well we are doing at meeting our quality objectives. We perform internal reviews of our own processes and our customers are welcomed to review our IEEE Std. 323 implementation.



EMC Surge and Fast Transient Immunity

- IEC 61000-4-4 Electrical fast transient/burst immunity
- IEC 61000-4-5 Surge immunity

IEC 61000- Part 4-4

Electrical fast transient/burst immunity tests

Part 4-4 of the IEC 61000 relates to the immunity of electrical and electronic equipment to repetitive electrical fast transients. It gives immunity requirements and test procedures related to electrical fast transients/bursts. It additionally defines ranges of test levels and establishes test procedures.

The objective of the standard is to establish a common reproducible reference for evaluating the immunity of electrical and electronic equipment when subjected to electrical fast transient/bursts on supply, signal control and earth ports.

Test levels

Open circuit output test voltage and repetition rate of the impulses				
Level	On power port, PE		On I/O (input/output) signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0,5	5 or 100	0,25	5 or 100
2	1	5 or 100	0,5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X ^a	Special	Special	Special	Special

NOTE 1 Use of 5 kHz repetition rates is traditional; however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types.

NOTE 2 With some products, there may be no clear distinction between power ports and I/O ports, in which case it is up to product committees to make this determination for test purposes.

^a "X" is an open level. The level has to be specified in the dedicated equipment specification.

IEC 61000- Part 4-5

Surge immunity tests

Part 4-5 of IEC 61000 relates to the immunity requirements, test methods, and range of recommended test levels for equipment to unidirectional surges caused by over voltages from switching and lightning transients. Several test levels are defined which relate to different environment and installation conditions. These requirements are developed for and are applicable to electrical and electronic equipment.

Test levels

Level	Open-circuit test voltage $\pm 10\%$ kV
1	0,5
2	1,0
3	2,0
4	4,0
X	Special

NOTE X can be any level, above, below or in between the other levels. This level can be specified in the product standard.

Please reference the RTP Corp website, nuclear section to see the full testing requirements in the IEC 61000-4-4.pdf and IEC 61000-4-5.pdf.

Certifications:

- TUV - SIL 3 IEC61508-2010 and IEC61131-6
- EDSA-300 Level 2
 - RTP applications software protected against intrusions
 - RTP Node processor protected against flood attempts on host network
 - Encryption option on the host network provides another layer of security, which prevents unauthorized access to RTP system
- ABS Certification
Marine and offshore applications such as load distribution pumping, ventilation, centrifuges, and waste water treatment

Certified to IEC-61508 Rev 2 - Revision 2 of the IEC61508 standard has brought about more stringent requirements to meet the SIL 3 certification. This has forced some to downgrade their systems to SIL 2. RTP technologically advanced system meets the new standard with its enhanced diagnostic coverage to detect safe and dangerous failures. Due to the enhanced diagnostics in the system, there is no need to proof test the system. Unlike traditional systems, RTP employs Complex Markov modeling by TUV in determining failure modes, which allows more dangerous failures to be detected. The new standard also requires security threat analysis. Since 2012, the RTP system has been EDSA-300 certified as Level-2. RTP is one of the few to meet the more difficult requirement of this newest and later standard.

Certified to IEC-61131-6- While others are capable of meeting the general standard of the IEC61508, there are tighter requirements that apply only to the PLC under the new IEC61131-6 standard. Once again RTP is meeting the newest and latest standards and rising above other typical safety systems.

Advanced Technology/ Economically Priced

- 3200 Series I/O- DI \$13/pt. AI \$23/pt. DO \$18/pt.

The 3200 series I/O cards have been designed to the same rigorous design requirements as the 3100 series I/O. To keep the cards at a competitive price, the expensive safety certification has not been applied for. However, the unique design of these cards allow them to co-exist with safety I/O cards in the same chassis, communicating on the same bus, to the same processors and not interfere with the safety operation of the SIS. Additionally, all I/O communications are subjected to the same extensive diagnostics. The 3200 series I/O offers the same outstanding performance, providing high-speed sampling of 1000 times a second, with a 1 millisecond SOE resolution for both digital and analog inputs. Additionally, the analog input card is Hart compatible.

Each 32-channel I/O card includes a five foot cable that has a connector on one end and stripped wires on the other allowing termination to existing terminal blocks. Also available is a variety of space saving termination modules for signal conditioning and optional fuse protection. Analog Input termination modules support voltage or current inputs. Digital Input termination modules provide fused or non-fused inputs. Digital Output termination modules provides a variation of outputs including fuse protection, diode protection, and LEDs.

The 3200 series is competitively priced to provide substantial savings. The 3216 32-point DI card is economically priced at \$13 per point, which includes the cable mentioned above. The 3214 32-channel AI card and cable is priced at \$23 per point. The 3238 32-point DO card is priced at \$18 per point. The 3200 I/O cards prove high quality and high performance does not mean high price.

Flexible Architecture

- Configurable redundancy - combination/variation of simplex, dual, triple, quad in one system
- Reduce cost by configuring redundancy only where required

Configurable redundancy reduces costs as the redundant processors and IO cards are configured to the availability, integrity and system cost requirements. The node processors are configurable for simplex, dual, triple and quad redundancy. They may be placed in the same chassis or separated in different chassis spread up to 12 kilometers apart. The chassis processors in each chassis may be simplex or dual or a combination thereof across different chassis. There is no need to mirror redundant IO across separate chassis if all the IO does not require redundancy. The flexible architecture also allows redundant IO channels to be on the same card or different cards. Those cards may be placed in the same chassis or in different chassis. The user-friendly redundant termination module simplifies the wiring. A single sensor may be wired in parallel to redundant cards or multiple sensors may be wired to the same or multiple input cards and voted.

Easy to use Advanced Voting Algorithms

- Built in diagnostics
- Selectable Degradation and Voting scheme

Advanced voting algorithms are selectable for redundant inputs without requiring additional programming in logic. All inputs are read by the chassis processors and then presented to the logic solving processors to be voted independently. A choice of twelve advanced voting algorithms is selectable from a drop down list. The selectable algorithms include the degradation of available inputs, highest, lowest, average, and action to take if there are no valid inputs available. The status of the inputs is evaluated first then the selected algorithm is applied to produce the logical result for use as the process tag. Un-usable or faulted inputs are annunciated and reported in simple, easy to understand system status messages.

Comprehensive Diagnostics

- On-line diagnostic coverage, line supervision, field device checking, IO integrity checks
- Bus validation, communications validation, power supply monitoring and proof testing

Online diagnostic coverage - Built in safety switches allows the output card to turn off all channels during power up, or in response to a fault condition or watchdog timer timeout. Diagnostics test each switch to verify its operation. Fault detection of the load and field cabling, field wiring detection, load open, and load-shortened diagnostics are performed and reported in diagnostic status variables and simple easy to understand system status messages.

Bus validation - I/O bus checking diagnostics, card address tests, and configuration tests are performed each time the controller accesses the card. All data and control transfers are performed twice, once using the actual data and then using the data inverted. Both versions of the data are compared to verify that all I/O bus data bits are functioning properly. The configuration code from the card is compared to the I/O configuration to check that the correct card is installed in the rack. I/O Bus slot address and control signal contention tests are also performed. Any fault detected sets status bits in an error detection variable returned to the user application program and are reported in simple, easy to understand system status messages.

- **Power Supply Voltage Monitoring** - In a single power supply chassis, the power supply is constantly being monitored and all voltage outputs are displayed in NetArrays. Once every 10 seconds the power supply is adjusted to 5.0 volts without user intervention. This ensures optimal performance of the power supply. Power supply diagnostics are enhanced. If the power supplies adjustment fail it is reported in the chassis power supply error variable and shown in the chassis info object.
- **Proof Testing of Redundant power supply chassis** - In a redundant power supply chassis, the left power supply is considered to be the primary. It is constantly monitored and adjusted just as if it is in the single power supply chassis. The right power supply is secondary. It likewise is monitored and adjusted automatically every 10 seconds but to 4.95 volts. Once every 10 minutes a proof test is done to verify the secondary power supply can take over by raising the voltage and monitoring the resultant voltage that is read on the backplane.
- **Temperature monitoring** - Temperatures are monitored for all chassis power supplies and displayed in the chassis info object.