

RTP 3000

Advanced Modular Redundant Technology
for Critical Safety and Control Systems
DCS/SIS/ESD/F&G





Johnson Controls is a customer led and technology driven organisation that is passionate about providing its customers with critical solutions designed to the highest levels of safety and integrity.

We are at the forefront in the supply of Critical Safety and Control Systems to the Oil & Gas and Energy industries.

To not only sustain but enhance our market position and strong reputation in Safety & Control, we needed to find the right Controller. A Controller that “made a difference”, a new breed of Safety Instrumented System that addressed the industries growing demands for enhanced safety and tighter control.

RTP 3000 takes the way we look at Process Control into a whole new paradigm. Its speed, integrity, availability and flexibility makes it a powerful and fast TÜV rated Controller. We secured a unique partnership with the manufacturer, RTP Corp, to promote RTP 3000 in the Oil, Gas and Energy industries. Our close relationship with RTP Corp enables us to provide critical operational support throughout the life of the installation.

Where we work

Offshore Installations • Petrochemical Plants • Marine
Chemical Plants • Military Vessels • Industrial Military Sites • Power Plants
Industrial Complexes • Renewable Energy Sites • LNG Facilities • Terminals
and Refineries

Who has contractual responsibility?

Under the terms of the partnership, we have full OEM responsibility. Adopting this approach, we can offer customers a complete life-cycle for their investment from HAZOP through to long term supportability.

Does RTP Corp have a proven track record?

RTP products have established a 20 million I/O installed base spanning over 40 years. Installations range from Mining, Fossil Fuel Power Plants and Pipelines through to Petrochemical & Chemical Complexes, Refineries and Offshore Environments. However, for over 20 years RTP controllers have been the standard plant process solution in what might be the most stringent industry there is, Nuclear Power.

Product support is vital, what does RTP Corp offer?

Every product manufactured by RTP Corp from first generation I/O cards to the latest third generation controllers such as RTP 3000 are still produced and manufactured.

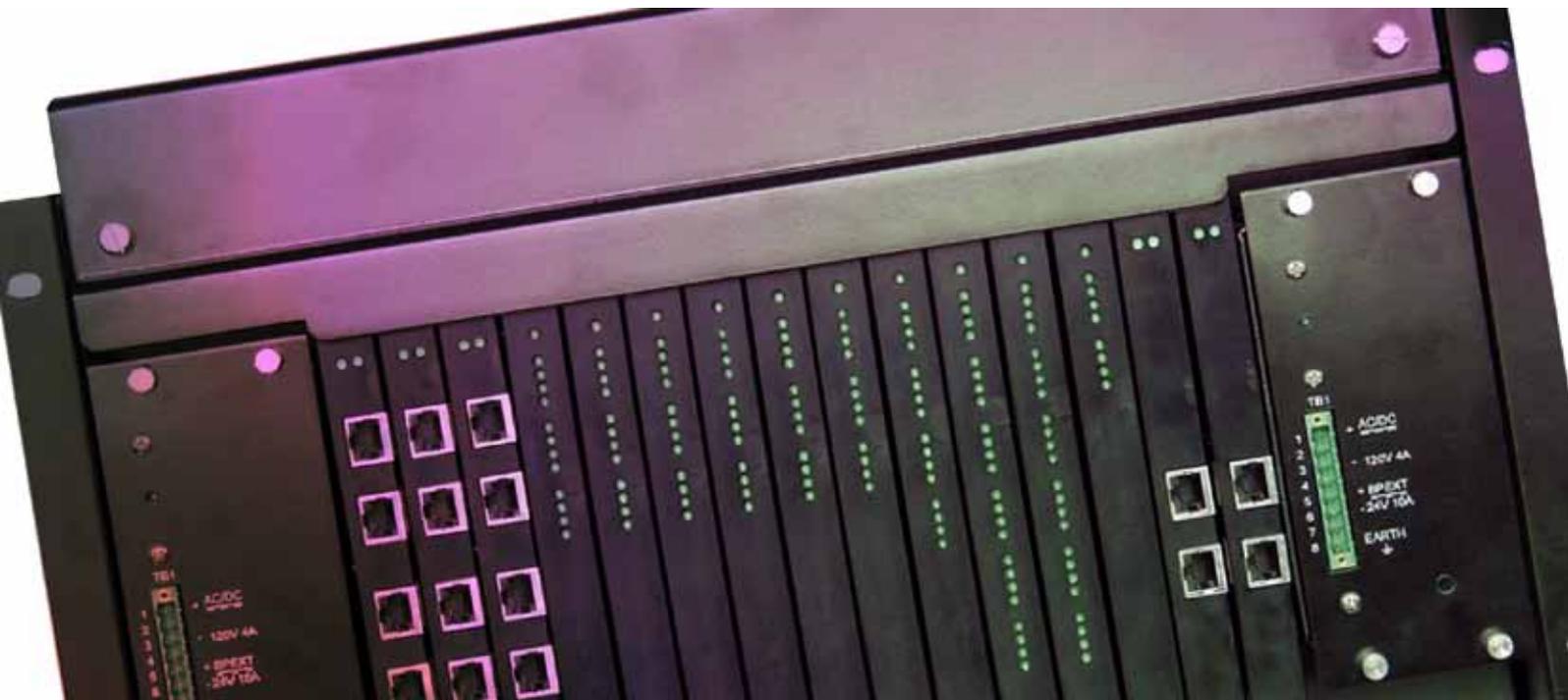
What are the Capital and Operating Costs?

Despite the sophistication of the RTP 3000 architecture and its highest speed, integrity and availability features, it has one of the lowest capital and operating costs in its class. The commonality of hardware, simple software tools and no bespoke designs also means that we can guarantee:

- 3 year hardware guarantee as standard
- Life-time guarantee on software as standard
- NO LIMITS on the number of installs, tags, applications or controllers used in the life of your plant.

Ultimate TMR flexibility and performance

In the past, traditional TMR systems have been extremely rigid leaving safety and control design engineers feeling frustrated and constrained by the product's abilities. For example, all CPU's must be in the same rack every other slot must be empty and all redundant I/O points must be on one High Density card. All these factors mean that traditional TMR systems are susceptible to the potential risk of damage and shutdown from a single accident, have an unnecessarily large footprint and have limited flexibility.



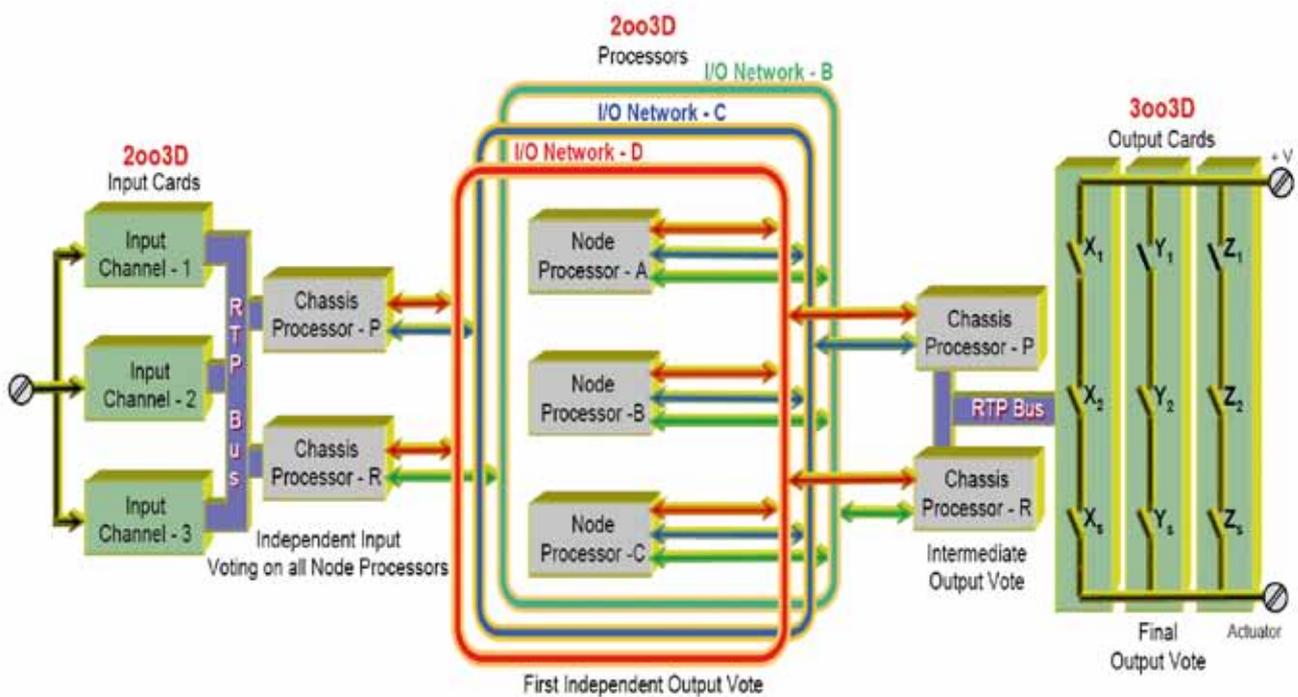
A new breed of high performance controller that takes Integrity, Availability and Flexibility into a whole new dimension. RTP 3000 offers unrivalled flexibility in how it can be applied (single, dual or TMR CPU's and I/O structure) meaning you can create an application that best benefits your plant requirements.

The RTP 3000 system is not bound by traditional hardware design limitations and constraints: At last, your system can have truly flexible redundancy from Single point up to TMR.

- RTP 3000 CPU's can be located in a single chassis or in a separate chassis

This prevents a physical accident causing a potential shutdown offering increased system availability

- Every slot in every chassis can be filled and utilised
 - No 'spare slots' for redundancy and card swaps thus lower footprint
 - Every module in the RTP 3000 is on-line and hot-swappable without interrupting the process
- Distributed redundant I/O points ensure that I/O decisions are made at the point level and not at module level
 - Three I/O points on the same module (standard)
 - Three I/O points on three different modules in the same chassis (advanced)
 - Three I/O points on three different modules in three different chassis's (unique)



- Diagnostic tests performed every scan
 - Transmission status and field wiring
 - Field interface of input card
 - Backplane integrity
 - Communications integrity
 - Node processors integrity
 - Chassis process integrity
 - Integrity of all hardware
 - Field interface of output card
 - Actuator and field wiring



RTP 3000

- Flexibility in where your CPU's are housed
- Flexibility in where your I/O modules are housed
- All I/O slots can be populated

These benefits ensure:

- A single physical accident or card failure will never shut your plant down



Traditional TMR

- All CPU's must be in the same rack
- Every other chassis slot must be left empty for card swaps
- All I/O points must reside in the same high density module

These constraints can lead to:

- A shut down from a single accident or failure to a CPU chassis or an I/O module

• Unique Features

Parallel Processing

Recognised as being third generation fault tolerant, the RTP 3000 incorporates a unique multi-processor, parallel processing arrangement.

In addition to conventional node processor modules, we have a layer of chassis processor modules that have dedicated I/O responsibility. Both Node and Chassis Processor modules incorporate multiple sets of CPU's to carry specific tasks and functions.

The node processor module utilises a high speed, Intel Celeron Processor backed by a floating-point maths co-processor for logic solving. Another CPU set is used for Host and Peer-to-Peer communications and finally a third CPU set for I/O and Inter-Processor communications.

The chassis processor module also utilises multiple CPU sets, a super-fast, RISC Core Processor backed by a PLD for I/O scanning, another CPU for memory management and SOE handling and finally a third CPU for communications to the Node Processor.

By running faster than anyone else and managing the process better by multi-tasking, the RTP 3000 achieves unrivalled scan times.

- 1 ms I/O scan pass (capture of all I/O points)
- 5ms Node scan pass (logic solving)
- 12mS screw-to-screw (total response time, inclusive of full system diagnostics)

As every I/O status point is requested by the Node Processors per 5mS scan pass, we are not "Polling" the I/O but effectively moving data around at a fixed time interval. This way, we ensure to capture, process and archive every I/O point regardless of size, criticality, rating or volume of the point.

Node Processor tasks include:

- Node logic solving
- Engineering unit conversion
- Results validation
- Alarm communications
- Data archiving communications
- HMI and other communications
- Peer-to-peer communications
- Communication validation

Chassis Processor tasks include:

- Chassis I/O scanning
- 1 ms SOE time stamp
- Results validation
- Bus validation
- I/O integrity checks
- Field device integrity
- Field wire checking

8000+ I/O points captured and processed within 5ms....what can your system achieve?

• System Architecture

Advantages of DCS/ESD/F&G on just one hardware platform:

- Increased product familiarisation
- Reduced spares
- Less diversification of hardware/software
- Less interface concerns
- Less training
- Improved technical support
- Reduced footprint

The RTP 3000 architecture incorporates multiple levels of redundancy and can extend to 16 Intelligent I/O Chassis's with 8,500+ I/O channels per Node Set.

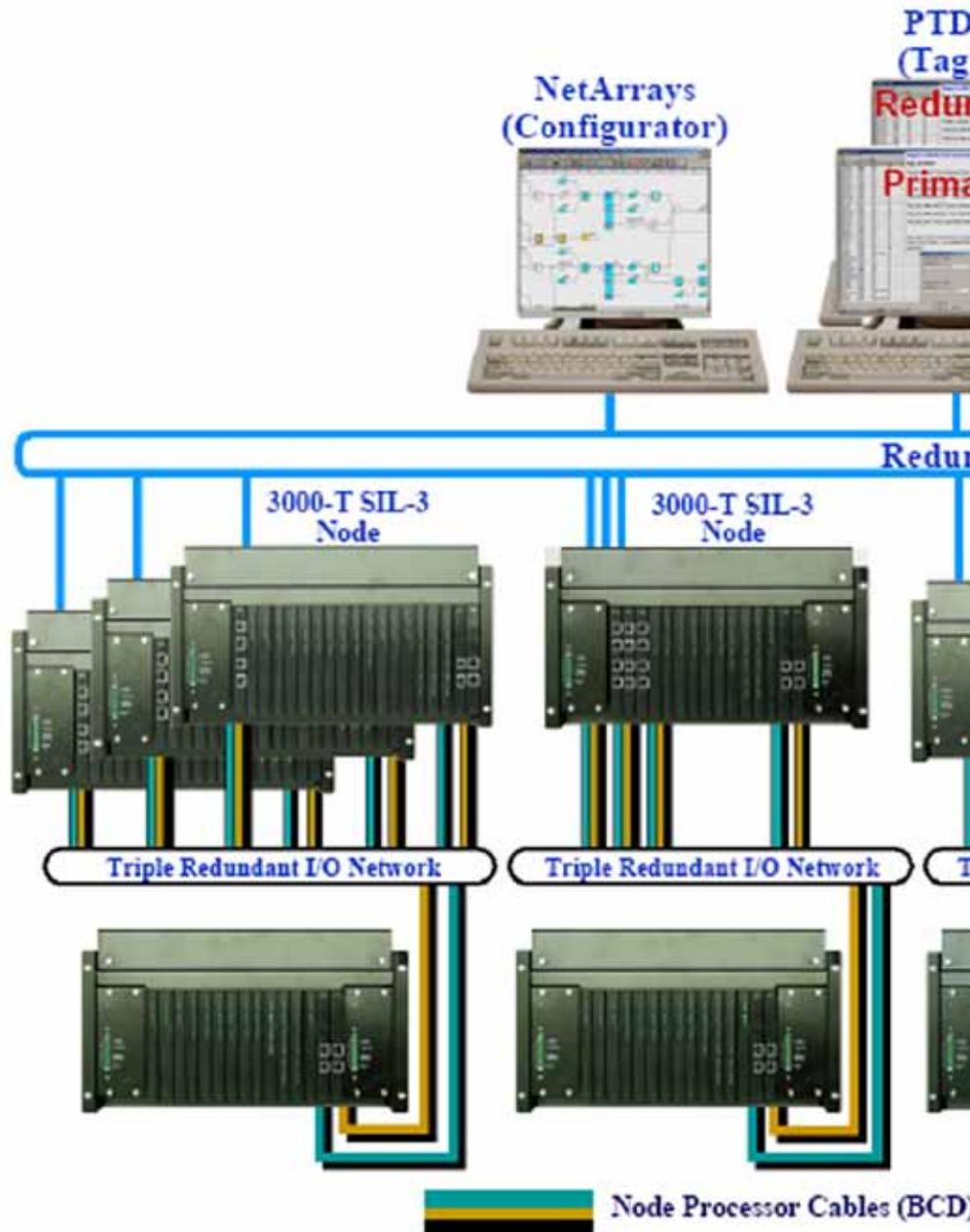
Because it was designed in accordance with IEC 61508 regulations, SIL (safety) and Non-SIL (process) loops can coexist in the same application thus making it a TRUE Safety & Control System.

The unique RTP design utilises a common set of Hardware and Software components and a simple drag-and-drop philosophy for efficient programming making the RTP 3000 one of the most flexible controllers in the world.

The illustration below shows examples of possible configurations available with the RTP 3000 (from left to right):

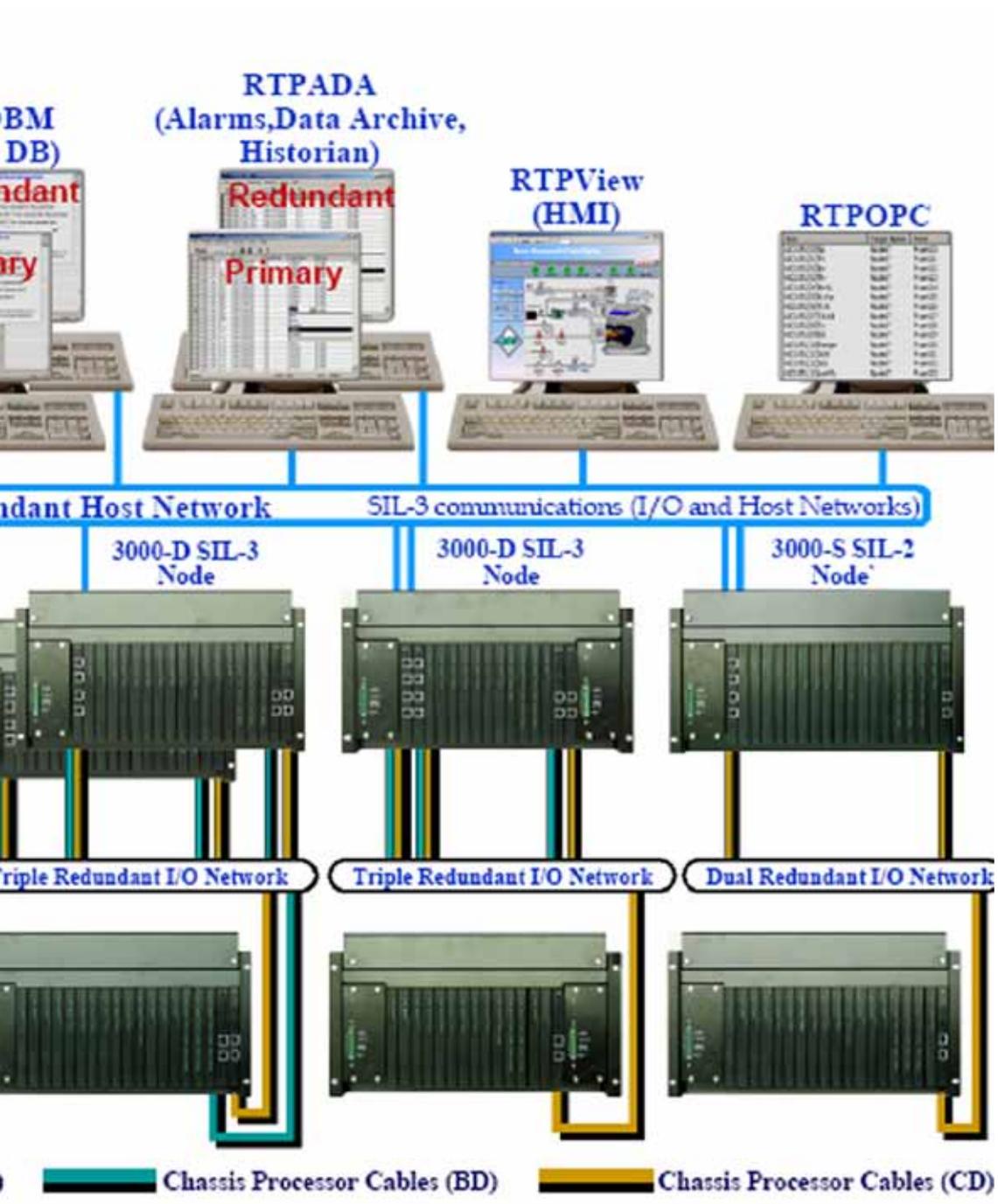
- a) 3000-T: TMR Node Processors in three separate Chassis's
- (b) 3000-T: TMR Node Processors in a single Chassis
- (c) 3000-D: Dual Node Processors in two separate Chassis's
- (d) 3000-D: Dual Node Processors in a single Chassis
- (e) 3000-S: Single Node Processor

All Node Processor arrangements have the flexibility for a mix of TMR, Dual or Simplex I/O points. The Nodes are shown integrated over a Fast Ethernet Network to RTP's NetSuite Supervisory Package.



Product	Configuration	Safety Rating	Availability
3000-T	TMR	SIL 3	99.9999%
3000-D	Dual Redundant	SIL 3	99.999%
3000-S	Simplex	SIL 2	99.99%

The true flexibility of the RTP 3000 allows for TÜV approved Dual and Simplex configurations. In fact, a Dual Redundant architecture is still SIL 3 certified and achieves 99.999% availability. Even in a simplex architecture, there is a credible 99.99% availability with SIL 2 certification.



- **True Redundancy**

The RTP 3000 is effectively one, two or three fully isolated, asynchronous Control Systems running in parallel over a Full Duplex, 100Mbit Fast Ethernet Network.

Because of this functionality, the RTP 3000 transmits on every leg on a continuous basis and redundancy in the RTP 3000 does not mean “stand-by” or “back-up”, it means more players.

By ensuring that I/O, Host and Peer-to-Peer Communications form a continuous and integral part of the process, we have eliminated any “Hot-Standby” elements which in turn significantly increases the integrity and availability of the system.

- **The Fastest Run Time**

The super-fast RISCORE CPU within each Chassis Processor Module can scan every I/O point and run a full diagnostic on the data, in just 1mS.

Every 5mS the Node Processor(s) requests information from the Chassis Processor(s) and/or gives back an instruction set.

In just 12mS we have completed not only the input-to-output reaction but full screw-to-screw response.

In an application where speed-of-response is critical to safety, having the fastest, TÜV approved controller in the world is comfortable to know.

- **Simple 10 year proof testing**

Because RTP run “a diagnostic on the diagnostics”, proof testing intervals are every 10 years and involves only the power to be cycled on the Node Processors.

As each Node Processor is independent and active at all times, cycling power is an on-line activity and no shutdown or card returns are required.

- **Highest Availability**

With its unique Parallel Processing concept and Multiple Levels of Redundancy, calculated in accordance with IEC 61508/61511 regulations and Exida Markov Model, the RTP 3000 achieves an astonishing availability of 99.9999% in TMR the highest in the world.

- **Highest Integrity**

RTP’s Third Generation, Multiple Fault Tolerant Hardware and critically acclaimed Advanced Diagnostics, ensures that the RTP 3000 achieves the Highest possible Integrity. The Advanced Diagnostics which are run on every scan pass (1mS at I/O level and 5mS at Node level), check,

re-check, validate and re-validate that every decision made is correct before any implementation.

The integrity is still further enhanced by carrying out a Multiple-Layer of Voting that includes the Node Processors, Chassis Processors and finally I/O Point Level.

Calculated in accordance with IEC 61508/61511 regulations and Exida Markov Model, the RTP 3000 achieves an MTTFS Integrity of 3000+ years in TMR, the highest in the world.

- **1 mS sequence of events (Time Stamp)**

SOE records are time stamped at the I/O level and stored at the target node (Node Processor Module) at a 1mS resolution. Each Node buffer is capable of storing 350,000 SOE events.

As the time stamping takes place as near to the process as possible, it ensures a true and precise representation of the event.

- **Common Hardware Platform**

As the RTP 3000 product is TÜV approved, it can be configured as a process or safety system (DCS/ESD/F&G) utilising the same hardware platform (no split of process and safety buses). This leads to less training, increased product familiarisation, reduced spares, less engineering and contracting companies, improved technical support, less diversification of hardware, less interface concerns, consistent engineering, configuration and software tools from a single source.





• Configurable Redundancy

Redundancy in the past has been hardware dependant thus limited to arbitrary rules set by the manufacturer. In the RTP 3000, redundancy is a feature of software and is not hardware dependant allowing redundant configuration at every level.

- Single / Dual / TMR / QMR Node Processors
- Single / Dual Chassis Processors
- Single / Dual Power Supplies

• Flexible Redundancy

Because the RTP 3000 uses external 100Mbit Ethernet connections between Processor Modules and we do not have the "constraints" of copper backplanes, Redundant or TMR Node Processors can be located in different chassis thus preventing a single, physical event taking out your safety system.

This same flexibility applies to the redundant I/O points where they can be wired to the same card, to different

Can your system accommodate a full program change including unlimited I/O additions on-line?

cards in the same chassis or different cards in different chassis's.

• Automatic Configuration and Validation

Programming and configuration is identical whether the target is Simplex, Dual or TMR.

Only one application program needs to be developed and validated using the built-in TÜV SIL 3 Simulator, the RTP 3000 takes care of the rest by "automatically" transferring the image to the other redundant controllers who then run their own set of diagnostics to validate the program

• Online and unlimited changes without system downtime

The RTP 3000 supports UNLIMITED on-line Configuration AND Program changes as there are no constraints of "download buffers". ANY CHANGE in the operating system, regardless of size, can be actively-implemented without any interruption to the process.

• Transparent Configuration

Designed around IEC 61508 regulations, the RTP 3000 is TÜV SIL 3 approved to allow safety and non-safety points to co-exist in the same hardware host utilising a single set of Node Processors.

This invaluable concept has been possible because the RTP 3000 is built using a common hardware platform and utilises a common set of IEC 61131 compatible software languages and tools.

This arrangement allows point-to-point configurations to provide ultimate flexibility in programming.

The possibility of co-existence of safety and non-safety (process) points in the same SIL 3 rated environment means we can offer the Highest Availability and Integrity in Process Control (DCS) as well as Safety (ESD/F&G).

This is TRULY a Seamless, Integrated ICSS solutionis yours??

NOTE: As with all things associated with the RTP 3000, this is a flexible "option" and single sets of Node Processors with dedicated I/O cards/ points can be utilised if DCS and ESD/F&G segregation is still preferred.



- **NETSUITE...the complete software package**

Fault tolerant, redundant software

The RTP 3000 utilises the highly acclaimed NetSuite software programme that is recognised as one of the most powerful and cost-effective packages in the industry.

It operates in a Fault-Tolerant and Redundant Mode and can create and run more algorithms (300+ PID's) in a fraction of the time (5mS) than any other system in its class.

Free lifetime software support and upgrades

Never pay for software again with RTP's NetSuite, the site license comes with a life-time guarantee and any software support or upgrades is offered by RTP free of charge.

Dedicated design engineers and project management teams work in partnership to provide fit for purpose solutions

Unlimited site license

NetSuite is the most complete software package on the market. For a one-off inexpensive price you get the following as standard.

- Project database manager
- Unlimited tags
- HMI workstation
- Alarm management
- Data archiving
- Crystal reports
- Trending
- Sequence of events (SOE) logging
- OPC connectivity

RTP Project Tag Data Base Manager (PTDBM)

This is the Central Tag Database and the repository for the tags in the system. It incorporates Client-Server technology and comes with a 1 million tag license as standard, which can be increased as a no cost option.

RTP NetArrays Configurator

Graphical, Object-Orientated "Logical Tool Box" that runs IEC 61131 programming languages with a point-and-click, drag-and-drop interface for simple and efficient configuration.

RTP Alarm and Data Archiving (RTPADA)

RTPADA is a super-fast, high resolution data archiving tool that includes an Historian and Crystal Reports.

It incorporates a Client-Server technology and 100,000 REDUNDANT tags can be archived per second (one of the fastest in the world).

Because of the site license, you are able to run multiple instances of NetSuite simultaneously thus giving UNLIMITED archiving.

RTP View

Provides Industrial-Strength, High-Speed OPC-enabled HMI. Multiple Screens can be visualised simultaneously with screen updates in less than 10mS.

RTP OPC and SOE

Secure OPC capability allows connectivity to third-party legacy systems. Repository for time-stamped data, accurate to 1mS including analogue signals.

- **Consultancy, Design & Systems Engineering**

Within its business streams, Johnson Controls has considerable resources. Staffed by fully qualified and experienced personnel with a keen focus on customer care. We ensure consistent delivery of a high quality service offering a complete suite of services to the Oil, Gas and Energy industries that deliver added value to our extensive client base enabling us to remain at the forefront in this highly demanding market sector.

Design

Each contract is allocated a dedicated team of project engineers responsible to an experienced project manager. These design teams work to 'Best Practice' providing innovative solutions to the design extremes and challenges we face.

Manufacture

System manufacture and assembly to BS EN ISO 9001:2008, 14001 and 18001.

Test and System Verifications

We provide full functional testing prior to customer acceptance and have the ability to tailor to individual requirements along with system verification and auditable testing for all system standards and designs.

Project Management

Planning, organisation, co-ordination and control - we provide a single reliable point of contact at all our locations.

Installation/Commissioning

An integral part of a project's requirements.

Service and Maintenance

One of the key services offered by us is the global provision of preventative maintenance and call-out support services for every installation we undertake. Service agreements are tailored to meet individual requirements.

Accreditations

The RTP 3000 hold TÜV approval to SIL 3, is UL and ABS approved and CE marked.

As system technology becomes increasingly complex, Johnson Controls provide comprehensive client support and training



Node Control Cards with High Speed Intel Processors



I/O Chassis Control Card with Intel RISCore Processors



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- Detection & Control
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- Deluge Verification
- De-scaling
- Interface Engineering
- Confined Space Management
- Training
- Fire & Safety Product

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