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Modicon TSX Quantum Hot Standby Option

The Modicon TSX Quantum Hot Standby option processor delivers high system availability for TSX Quantum Automation Series controllers.

General Description

The Modicon TSX Quantum Hot Standby option processor provides Quantum Series controllers with the high availability and security critical process applications demand. Central to the system is the standby controller with current system status for automatic switchover in the event of a primary controller failure. This means critical processes are unaffected by control system hardware failures. The result – productivity goes up while downtime is minimized.

At the beginning of every primary controller scan, the current register and I/O state table is transferred to the Hot Standby across a high-speed, secure fiber optic communication link. In the event of a primary controller failure, the standby option processor takes control of the system with up-to-date I/O and register status information for a bumpless, controlled transfer with minimal process impact. Critical processes which cannot tolerate any disruption of control are assured a fast, smooth switchover.

Features / Benefits

- A single-board Modicon Hot Standby option processor in each controller system improves reliability by eliminating the intermediate supervisor controller.
- System control transfers occur in either direction increasing system uptime by eliminating the master-slave relationship.
- Integrity of the user programs are verified and compared in both controllers to ensure high security.
- High-speed fiber optic communication link between processors minimizes scan impact and improves productivity.
- Primary I/O state table transfers to the standby controller every scan or in multiple scans providing up-to-date system status and higher system integrity.
- Software control of Modbus and Modbus Plus ports allows host computer communications to either controller with no custom communication drivers.
- New configuration extension mode provides greater flexibility in state RAM transfer.
- An optional ladder logic function block delivers an easy migration path for 984/800 Series hot standby users.
- The Hot Standby system is compatible with all Modicon TSX Quantum controllers and S908 remote I/O systems for cost-effective system design.



Key Benefits

The Modicon TSX Quantum Hot Standby system provides high availability to the Quantum controller by adding the following high performance capabilities:

Redundant processors that reduce system downtime in critical applications.

A control system failure can cause hours or even days of lost production in many of today's critical automation applications. The Hot Standby provides the Quantum control system with a standby processor with up-to-date system status. Should the primary controller system fail, the hot standby processor takes control of the system. The control system sees uninterrupted control which ensures maximum productivity and product quality.

High speed backplane and fiber optic communications minimize scan impact, improve security, and provide fast response time.

The Hot Standby option processor configuration extension option allows the transfer of as much as 64k of State RAM information, in one or multiple scans across the high speed fiber optic link. In addition, the fiber optic link is used to pass status messages between processors to verify the fiber optic link and processor health. Similar messages are simultaneously transmitted between the Quantum remote I/O processors. Both messages are verified to ensure accurate failure detection and fast control transfers. Two available paths of communication ensure that no single point of failure can isolate the primary and standby control systems.

For added security, the Hot Standby system is compatible with the dual cable version of the TSX Quantum Remote I/O system. Dual remote I/O cabling provides protection against simple I/O cable breaks and provides higher system integrity. Should one I/O link be damaged or broken, the other link continues to operate and control the process.

Verification of user logic integrity ensures a secure and reliable process.

User logic comparisons are performed to verify the integrity of the application programs. These comparisons are performed at start-up and runtime. Mismatches in user logic force the standby processor off-line to ensure proper control actions in the event of a control transfer.

The user can select to allow logic mismatches for higher availability during maintenance periods. If minor process changes are required, the user can make these changes without disturbing the hot standby operation. Status information provides the user with an indication of a mismatch.

User program download option allows easy system maintenance in the event of a controller failure.

Most applications require that identical programs reside in both the primary and standby controllers. In the event of a controller failure the Hot Standby option processor can copy the user program from the primary to the standby controller. Copying the program is a simple two-step procedure using the keyswitch and update button located on the front of the standby processor. After the program download is executed and the controller performs all powerup diagnostics and comes up running, the system then assumes the state selected by the keyswitch (run or off-line.) This is done by the maintenance person from the position of the replaced controller without a programming panel.

Flexible user interface simplifies maintenance and offers many debugging options.

The Hot Standby option processor comes standard with switches and LEDs to provide control functions and indicate status. Primary and standby LEDs on the front lens indicate the status of each controller. The keyswitch allows qualified operators to take manual control of the system while protecting the system's integrity from inadvertent actions.

In addition, command and status registers can be assigned which provide the same control functions from a remote I/O location or through host computers. During start-up or maintenance periods, the hot standby system can be controlled via programming panels or man-machine interfaces for greater flexibility and ease of use.

Software control of Modbus and Modbus Plus port addresses allows unlimited access by programming panels, man-machine interfaces and host computers.

The Hot Standby system controls addressing of the Modbus and Modbus Plus communication ports so control transfers are transparent to host computer communications. Host computers simply poll the primary controller's address for process data. In the event of a control transfer, the station address follows the primary controller function, not the physical unit.

The host computer can also access the standby controller directly for maintenance requirements such as upload/download or diagnostic information.

Key Applications

The Quantum Hot Standby option processor system provides optimal security and availability for critical applications like these.

Interlocking Systems

- User logic comparisons are performed every scan to verify the integrity of the interlock sequence.
- Bumpless control transfers eliminate false tripping.
- Modbus and Modbus Plus access provides necessary system status to host computers of distributed control systems.
- Dual cable remote I/O and Modbus Plus systems provide an additional system security for critical I/O and communications.

Batch or Continuous Process Control

- No loss of process data in the event of hardware or software failures.
- Higher availability of CHS Controller Hot Standby system ensures higher productivity of process.
- Secure, bumpless transfer provides uninterrupted control process for better product quality.
- Host computer access is easily implemented by Modbus or Modbus Plus communication networks.
- Dual cable remote I/O and Modbus Plus systems provide additional system security for critical communications.

Material Handling

- Higher availability of the Hot Standby system ensures continuity of service.
- Fast data transfers minimize scan impact to ensure high productivity.
- High security of the Quantum Hot Standby system ensures availability of critical parts tracking data.

Hot Standby System Architecture



Application of Using The Quantum Hot Standby Option Processor

The Modicon TSX Quantum Hot Standby option processor easily plugs into the Quantum backplane. The fiber optic cable connects the two Hot Standby processors to provide a high speed communication path between the two controllers. No additional intermediate supervisor is required. This minimizes hardware and reduces panel space requirements. Simple installation makes the Quantum Hot Standby option processor an easy addition to any control system setup.

The new Quantum Hot Standby processor provides two methods for system configuration.

The Quantum Hot Standby system also delivers the power of user configurable State RAM transfers from the primary to standby controllers. This new option provides all of the power of the function block solution and more. As few as 16 inputs, 16 outputs, one input register, and one output/holding register or as many as 64k, in the Quantum 486 controllers, can be configured for transfer in one or multiple scans. This option provides true separation of system configuration and control programming.

Users that are comfortable with the 984/800 series hot standby solution can opt for the single function block. This option provides all of the programming necessary to perform the hot standby function. By simply entering and energizing the function block in each controller, the default settings will affect a secure and reliable control system.

Should the user select to implement some optional hot standby functionality, all user options are triggered by inputs or register bits in the function block. Using Modsoft 2.3 DX Zoom capability all register bit functions are described in easy to understand terms that eliminate guess work.

Options include remote control of the standby system, remote status information, reverse and non-transfer of key register data and control of Modbus port addresses.

A command register provides the user with the ability to remotely override the Hot Standby system keyswitches (run/off-line), control either Modbus port addresses, and select standby action (standby or off-line) in the event of user logic mismatch. A status register provides the user with the ability to remotely monitor each controller's status (primary, standby or off-line) and also monitor logic mismatch status. A non-transfer area (table of registers) which are not sent to the standby unit every scan can be defined to reduce scan impact and allow for internal diagnostic routines to be performed in the standby unit. Two reverse transfer registers are also provided to send data from the standby unit to the primary unit.



High Fault Tolerant Systems for maximum process performance.

Bi-directionally controlled transfers provide the highest control system availability, because they allow maintenance of each controller. Manual controller transfers using the Hot Standby system keyswitches or command register bits can be easily and safely performed. The standby unit can also be taken off-line with no adverse system side effects.

The Quantum Hot Standby option processor is compatible with all the Modicon TSX Quantum Series controllers version 2.0 or greater. This also applies to the S908 remote I/O Head Processor and Modbus Plus Network option modules. The Hot Standby system is also compatible with the remote I/O and Modbus Plus dual cable options that add higher system reliability by protecting I/O and network communications availability from cable breaks and noise.

The Modicon TSX Quantum Hot Standby Option Processor Specifications

Description

CHS Hot Standby Processor Option Processor for Standby Quantum Controller Family

Components

Part Number	140 CHS 110 00
CHS Installation Manual	840 USE 106 00, Rev. A
CHS Programming Manual	GM-S911-002, Rev. B
CHS Hot Standby Kit	140 CHS 210 00

Kit for CHS Hot Standby includes:

- Two CHS Hot Standby Processors
- One Fiber Optic (3m) Hot Standby Cable
- One CHS Loadable Software Package
- One S908 Terminator kit
- CHS Installation Manual

Controllers Supported

Quantum	140 CPU 113 0X 140 CPU 213 04 140 CPU 424 02 (plugs into any slot in Quantum backplane)
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CHS Hot Standby Topology

Two modules required per Hot Standby system

Performance

Switchover Time	13-48 ms for Hot Standby to assume control after primary fault detected
Scan Impact	3 ms + 6ms/k of configured State RAM

Communications

CHS Comm Rate	10 megabaud
Cable Between Quantum Systems	3m Fiber Optic

Indicators and Switches

LED Indicators	READY PRIMARY STANDBY COM ACT
Switches	RUN/XFER/OFFLINE Controller A Controller B
Push Buttons	Program Update

Software Requirements

Loadable Function Block	CHS block (Included with kit)
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Power Supply Requirements

Operating Voltages:	Supplied by CPS Power Supply
Current Requirements:	700MA

Environmental

Temperature Operating:	0-60°C
Storage:	-40 ±85°C
Humidity:	0-95% RH non-condensing
Shock:	15Gs for 11 msec
Free Fall:	1m unpacked
Vibration:	0-57 H Z @ 0.075mm d.A. 57-150 HZ @ 1 G.

Physical

Dimensions: (HxWxD)	9.84" x 4.09" x 1.59" (250 mm x103.85 mm x 40.34 mm) (One slot Quantum backplane)
Approximate Weight:	0.453kg (1 lb.)

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