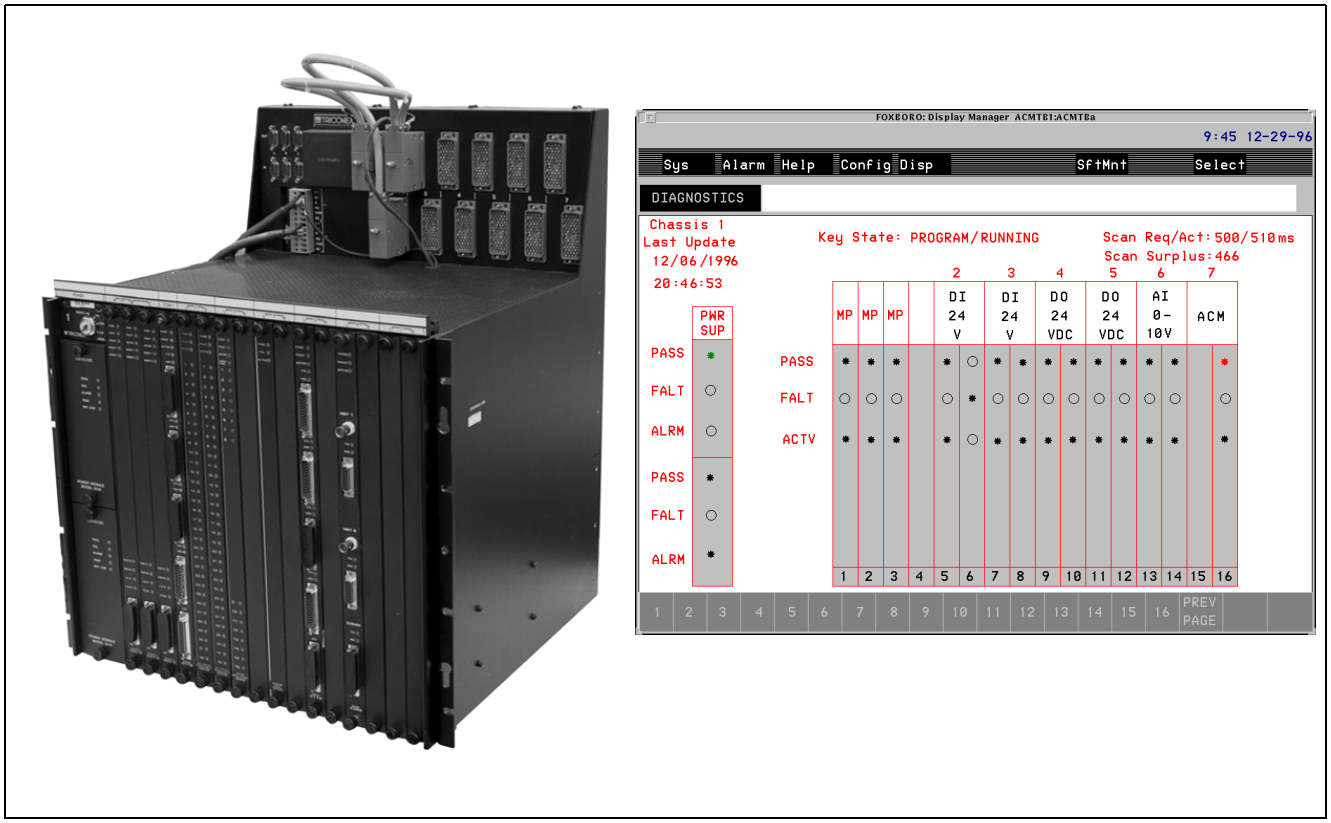
FOXBORO®

PSS 21H-7G8 B3

I/A Series® Hardware
FoxGuard Manager for Triconex Safety Systems



INTRODUCTION

The Foxboro Company and Triconex Corporation offer a direct connect interface between the I/A Series open control system environment and Triconex Triple-Modular Redundant (TMR) Programmable Controllers. The FoxGuard Manager consists of an I/A Series Nodebus station installed in the TRICON chassis and connected to the Nodebus via the standard Dual Nodebus Interface (DNBI).

This direct connect interface enables the process operator to monitor safety system operation using familiar I/A Series displays. FoxGuard Manager also provides access to TRICON data for a variety of applications including Sequence of Events Processing, Data Scanning, and Remote Setpoint Control.

The FoxGuard Manager is implemented on a Triconex Model 4609 Advanced Communications Module (ACM), which concurrently supports other proprietary Triconex interfaces such as the Tristation protocol for the TRISTATION MSW Programming System.

FoxGuard Manager is available in a single-module configuration and as a redundant pair in which the second module serves as a hot spare to take over operation should the first module fail.

FoxGuard Manager provides an alternative to the I/A Series Integrator 30 for Triconex Safety Systems, a Modbus interface which uses an RS-232 connection between the TRICON and an I/A Series communications module.

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Product Specifications

Like the Integrator 30, the FoxGuard Manager offers I/A Series users real-time access to safety system data. However, the FoxGuard Manager provides greater integration between the I/A Series system and the controller, superior performance and better security.

The FoxGuard Manager supports a set of standard I/A Series software blocks (as listed in the Features section) plus a set of blocks specific to the FoxGuard Manager. Together, they enable you to program a variety of control applications, thereby integrating operations of the TRICON with the I/A Series system.

FEATURES

The FoxGuard Manager features include:

- Reliable, high-performance communications between the TRICON controller and the I/A Series Nodebus.
- Onboard firewall protection of TRICON setpoints, controller operation and I/O. The interface does not change the operation of the safety shutdown system, and in no way affects TUV certification.
- Support for the following standard I/A Series block types:

ACCUM	COUT	MSG
AIN	LONG	PACK
AOUT	MAIN	REALM
BOOL	MCIN	STA
CALCA	MCOUT	STALM
CIN	MEALM	STRING

- Support for standard I/A Series alarm functions.
- FoxGuard Equipment Control Block (ECB85), providing remote monitoring of TRICON operations and diagnostic information.
- Configurable ECBs that enable access to TRICON memory, system and I/O aliases.
- New I/A Series TRISOE block for Sequence of Events applications.
- Object Manager read access to any TRICON alias value.
- Ability to deny access through the firewall from either the Triconex side or the I/A Series environment.

PACKAGING AND ARCHITECTURE

The single-module FoxGuard Manager interface consists of the Triconex ACM installed in a TRICON controller chassis and connected to the Nodebus via a DNBI. In the redundant configuration, two ACMs are installed in the same logical slot, and connected to the Nodebus with separate cabling and DNBIs.

Communications Module

The FoxGuard Manager module is an intelligent, multifunction communications device that can be installed in the TRICON Main Chassis or in Chassis #2 (which can be either an Expansion Chassis or RMX). The FoxGuard Manager module plugs directly into the TRICON backplane and communicates with the Main Processors and other TRICON modules via the triple-redundant TRICON bus.

All external connections are made via the front edge of the module. The I/A Series Nodebus connectors and indicators are arranged in the upper half of the card edge just below the TRICON module status indicators.

In addition to providing the direct connect interface between the TRICON controller and the I/A Series environment, the FoxGuard Manager module can be simultaneously used for a variety of Triconex protocols and applications including the Tristation protocol for the TRISTATION MSW Programming System.

Redundant Operation

At startup, the first FoxGuard Manager module to initialize assumes the role of *Monitoring* station while the partner module becomes the *Tracking* station. The Monitoring station requests inputs from the TRICON, processes the control database, manages peer-to-peer connections, and initiates required writes to the TRICON. The Tracking station exchanges station health information with its partner via the TRICON and the I/A Series Nodebus.

When the Tracking station detects a fault with its partner, the module takes over the Monitoring role by broadcasting the station letterbug and initializing the control database with the last know values. All Object Manager sets and writes are captured by the Tracking station.

In this implementation, the modules are loosely coupled, that is, the Tracking station does not receive control database updates from the Monitoring station, and the two modules may not have the same information.

With the loose coupling between the two modules, the redundant FoxGuard Monitor configuration is not a fault-tolerant station. Control strategies which involve time-sensitive sequences are implemented in a fault-tolerant control processor (CP) which interacts with the FoxGuard Manager station through interprocess connections.

Network Connections

Each FoxGuard Manager module is connected to the I/A Series Nodebus via a Dual Nodebus Interface (DNBI), the same interface used to connect remote 50 Series stations such as the Workstation Processor 51 and Application Processor 51.

An Attachment Unit Interface (AUI) cable provides for data transmission between each FoxGuard Manager and its DNBI (Figure 1). A separate RS-423 control cable between the modules enables the FoxGuard Manager to switch between two redundant Nodebus cables. The FoxGuard Manager also uses the control cable for ancillary functions such as controlling the DNBI front panel LEDs, verifying the status of the Nodebus transceivers, and reading the DNBI letterbug. The DNBI uses multiconductor cable with a maximum cabling distance of 50 meters (150 feet).

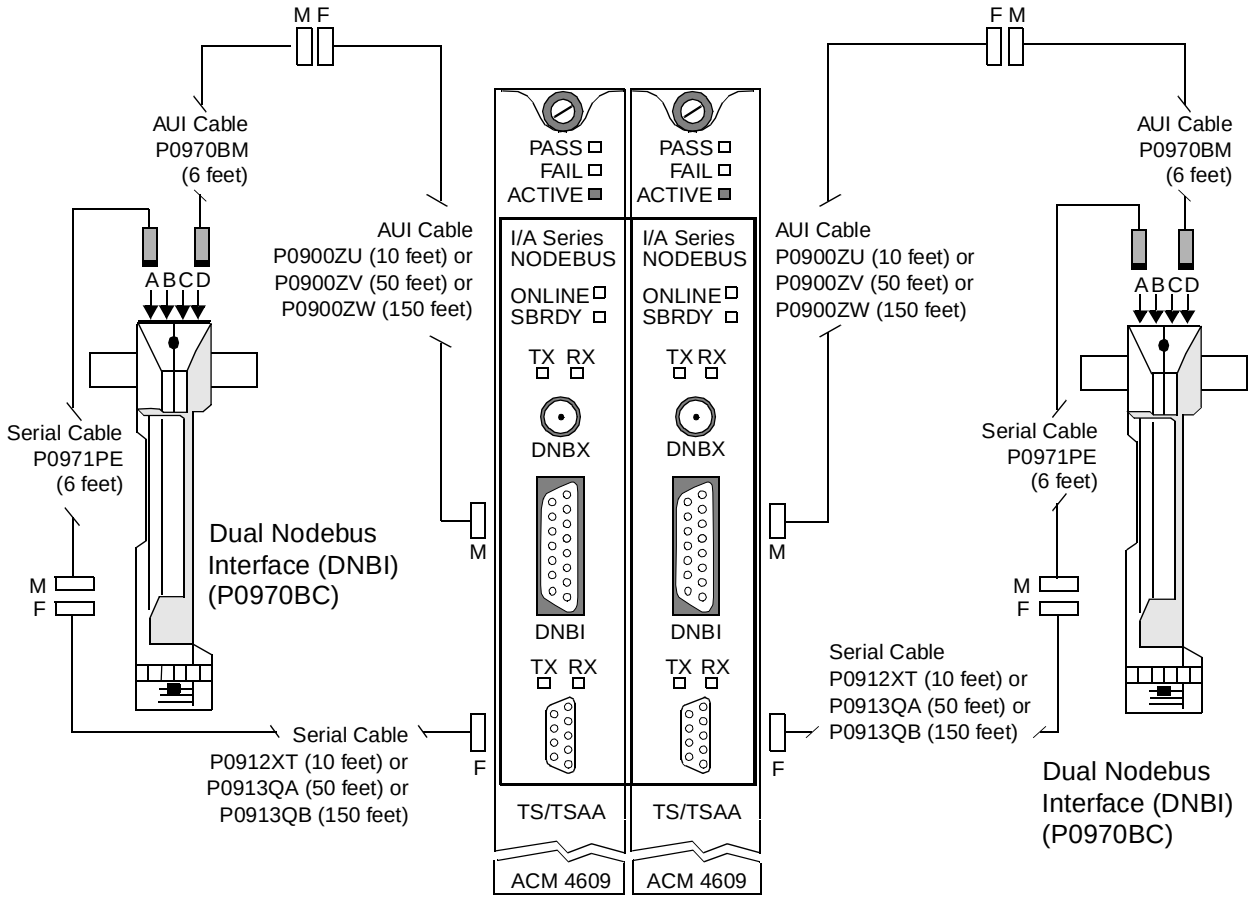

Figure 1. FoxGuard Manager Front Panel Connections for DNBI Setup

DISPLAYS

The FoxGuard Manager operates as a station on the I/A Series Nodebus in much the same way as a Control Processor operates, with a control database ownloaded to the FoxGuard Manager over the Nodebus. In addition to executing a variety of control applications, the station provides current TRICON status information in a default station display Figure 2) that replicates the TRISTATION Diagnostic Display.

The FoxGuard ECB (ECB85), which is automatically downloaded with the FoxGuard Manager image when the module is initialized, builds the display by accessing the system aliases in the TRICON memory. The default station display includes an overlay for each chassis in the connected TRICON.

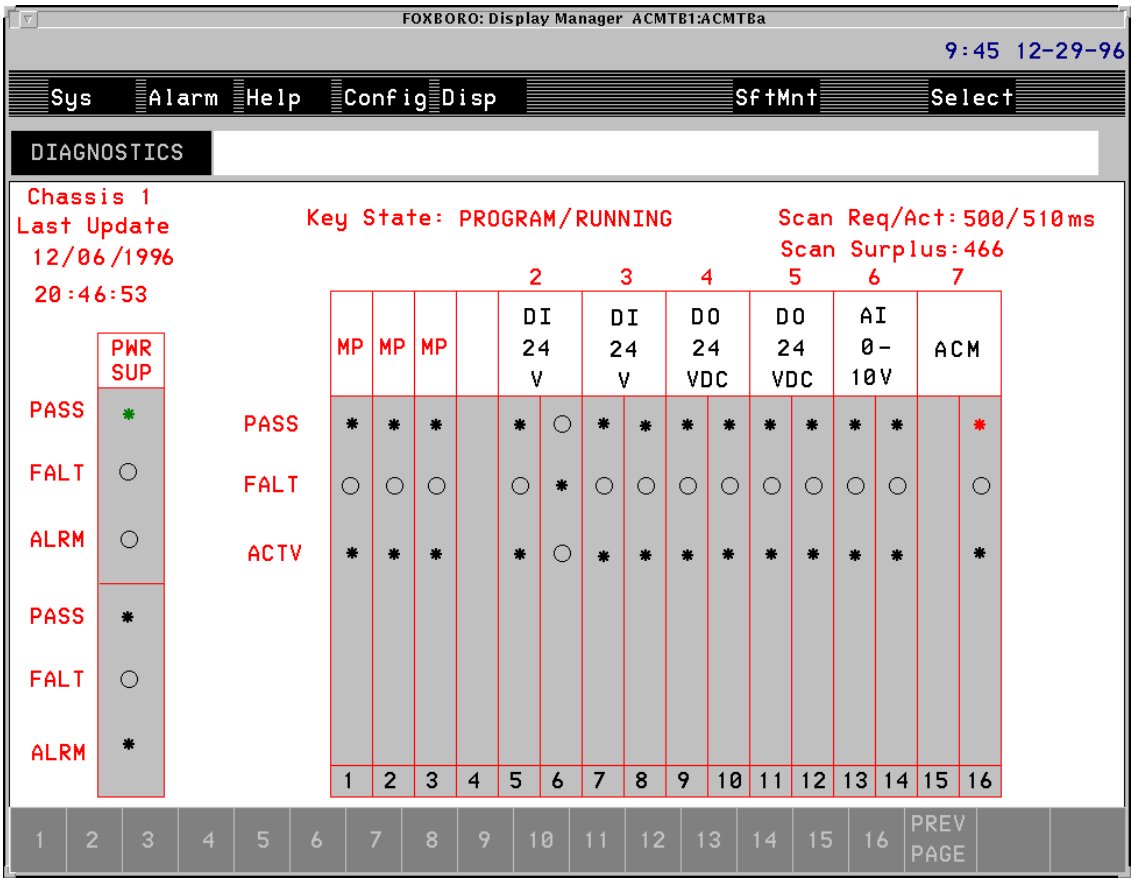

Figure 2. FoxGuard Manager Station Display

System Management Display Handler (SMDH) provides remote access to FoxGuard Manager operation with standard station, equipment information, and equipment change displays. For example, the FoxGuard Manager Equipment Information Display (Figure 3) is a two-level display with the FoxGuard Manager and the TRICON Main Processors on one level and the configured ECBs on the next level.

The System Management displays enable the operator to download and checkpoint the FoxGuard Manager control database, turn ECBs on and off, and view the operational status of TRICON modules. No equipment change action taken on the FoxGuard Manager affects operation of the safety system. The I/A Series interface can be shut down from the SMDH display, but operation of the TRICON cannot be turned off from the I/A Series side.

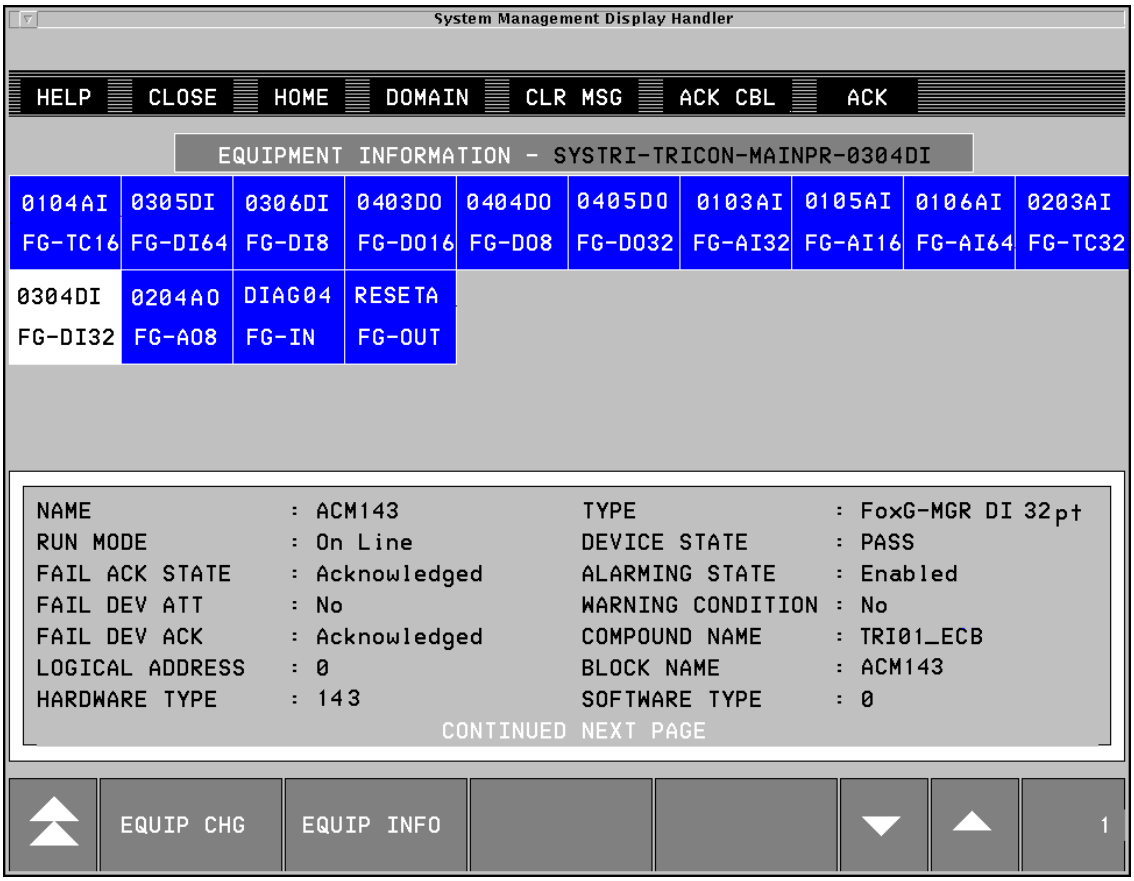

Figure 3. FoxGuard Manager I/O Module Equipment Information Display

FOXGUARD MANAGER SOFTWARE

The FoxGuard Manager is partitioned into two domains, one controlled by the Triconex software and the other executing control programs configured and downloaded from the I/A Series system. The Triconex software provides an electronic firewall between the two domains to prevent unintended writes to TRICON process variables.

Write access to the TRICON via the interface is under the complete control of the TRICON. Remote writes are allowed when the TRICON key switch is set to PROGRAM or REMOTE, or when the switch is set to RUN and Gated Access is enabled by the TRICON control program. Gated Access allows writes to configured memory aliases within a time window defined in the TRICON program.

In addition, the FoxGuard Manager Module can be defined as a Read Only Module by the TRISTATION Module configuration program.

Access through the firewall can be denied from the I/A Series system by turning off the FoxGuard Monitor ECB or the Primary ECB.

APPLICATIONS

Using the Integrated Control Configurator, you can configure the FoxGuard Manager to execute control compounds. The compounds employ a set of standard I/A Series blocks and FoxGuard Manager specific blocks. These blocks provide data points for other I/A Series applications through peer-to-peer connections or Object Manager calls. With these resources, the FoxGuard Manager supports a variety of control applications, including:

- Safety system monitoring
- Sequence of events processing
- Data scanning
- Remote setpoint control

Safety System Monitoring

A key advantage of the FoxGuard Manager is that it allows the process operator to monitor safety system performance remotely using standard I/A Series displays and resources. As a Nodebus station, FoxGuard Manager operation is accessible through Default Displays which provide system health information about each TRICON module, and through the SMDH. The FoxGuard Manager also enables you to use TRICON diagnostic system aliases as sources for process alarms and state change messages.

Sequence of Events Processing

The TRICON system includes an integrated Sequence of Events (SOE) capability for system maintenance and shutdown analysis. During each scan of the control program, the Main Processors examine user-selected discrete variables for state changes, or events. The TRISTATION MSW program is used to configure SOE blocks which define the event variables and their alias numbers. SOE events can include discrete inputs, discrete memory read-only variables and discrete memory read/write variables. The TRICON allows the configuration of up to 14 SOE blocks for general use and two SOE blocks for specialized applications.

With the FoxGuard Manager, you can create an I/A Series compound that configures one of the 14 TRICON general purpose SOE blocks, receives the event information configured in the block, and passes the data to a user-defined application for storage and analysis. The I/A Series compound consists of one or more FoxGuard Manager specific TRISOE blocks which identify the event variables to be used in the Triconex SOE block configuration. FoxGuard Manager software regulates the message flow to the analysis application to assure capture of all event information.

Data Scanning

The FoxGuard Manager block set includes two varieties of configurable ECBs for reading and writing TRICON process data:

- Four ECB types are provided for accessing data from the TRICON I/O modules similar to ECBs that are configured for I/A Series Fieldbus Modules and Cluster I/O Fieldbus Cards. These I/O Module ECBs provide both the process points and status information such as bad data and out-of-range alarming. The process points in the ECBs are then connected to I/O type blocks which condition the data, convert the points to engineering units, and make them available to other blocks.
- Six ECB types are used to access aliases in the TRICON Main Processors. The Window ECBs can be configured to read or write up to 16 non-contiguous process variables of the same data type. These window-type ECBs can be connected directly to other blocks without the use of I/O blocks.

In addition to block connections, you can read TRICON process points with Object Manager calls by identifying the object using the I/A Series Compound:Block.Parameter syntax. The compound is the *<letterbug>*_ECB, the block is the FoxGuard monitor ECB name, and the parameter is the TRICON alias number.

Remote Setpoint Control

In its default configuration, the TRICON disables any remote writes to the controller program, relying instead on the TMR architecture to determine controller outputs. The FoxGuard Manager design protects the critical role of the TRICON controller while enabling you to enhance controller operation with I/A Series control blocks.

For example, you can develop remote supervisory setpoint applications that determine TRICON setpoint variables based on error-free inputs provided by the controller.

As an added measure of security, writes to the TRICON outputs can only be made through the configured ECBs and not through the Object Manager Write command.

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MB 021 Printed in U.S.A. 0998