

MODEL 2070

ADVANCED TRANSPORTATION CONTROLLER

OVERVIEW

The 2070 controllers from Quixote Traffic Corporation are configurable field processor and communications systems for traffic management applications such as adaptive intersection control, field masters, integrated corridor management and other applications requiring field processing.

Two configurations are available, both of which retrofit into industry standard cabinets. Both systems are designed based on Caltrans and City of Los Angeles requirements (one being compatible with Caltrans/NY DOT 170 traffic cabinet standards and the other is compatible with NEMA cabinets).

FEATURES AND BENEFITS

- ▶ 170 or NEMA cabinet compatibility.
- ▶ Open architecture.
- ▶ Flexible system implementation.
- ▶ Powerful and expandable.
- ▶ Incorporates VMEbus, an IEEE and ANSI standard.
- ▶ Designed to meet UL and FCC class B certification requirements.
- ▶ Designed to industry standard traffic controller specifications.

OPEN SYSTEMS ARCHITECTURE

Hardware

- ▶ NEMA TS1, TS2/Type 2 compatible digital interfaces (2070N).
- ▶ Caltrans/NY DOT 170 cabinet digital interfaces (2070).
- ▶ NEMA TS2/Type 1 compatible serial interface.
- ▶ VMEbus-based computer with multiple-slot card cage.
- ▶ 32-Bit microprocessor.
- ▶ 4 or 8 Lines by 40 characters LCD display with backlight.
- ▶ Modular 115-Watt power supply (with surge protection).
- ▶ Flexible communications options (e.g., serial twisted pair 202 modem, fiber, etc.).

Software

- ▶ Supports OS-9 and other real-time operating systems.
- ▶ Third-party software available for intersection control, communications, and other applications.

Standards

- ▶ Incorporates VMEbus, an IEEE and ANSI standard.
- ▶ Designed based on industry standard traffic controller specifications.
- ▶ Designed to meet UL and FCC class B certification requirements.





RUGGED ENVIRONMENTAL SPECIFICATIONS

- ▶ Operating range of -40° to +85°C (-40° to +185°F) for system modules.
- ▶ High-reliability, low-wattage design.
- ▶ Designed to limit EMI emissions.

The 2070 platforms bring new features, functionality, and flexibility to the traffic controller market. These controllers, conceived by Caltrans, City of Los Angeles, and others, provide the advantages of a high performance, open standard, hardware controller, while being compatible with existing 170 or NEMA cabinet standards. These characteristics enable modern ITS deployments while minimizing the stocking of any new spare components and maintaining maintenance personnel's familiarity with cabinet design, layout, and testing.

The 2070 controllers offer significant benefits over current controller offerings. They have additional computational capability to run improved (e.g., adaptive) traffic control strategies and have broader communication capabilities. Further, the controllers can be expanded to incorporate other functions, through add-on VMEbus modules or serial ports, such as:

- ▶ Changeable message signs (CMS).
- ▶ Environmental monitoring equipment (e.g., pollution or weather).
- ▶ Video detection systems.
- ▶ Camera control (pan/tilt/zoom).
- ▶ Emergency monitoring systems or other pre-emption interfaces devices.
- ▶ Highway advisory radio (HAR).
- ▶ Police/emergency call box.
- ▶ Additional intersection devices (e.g., detectors, signal heads, switches, etc.).

Such features and enhancements enable the 2070 to be critical elements for improving traffic control strategies and for better use of traffic control infrastructures.

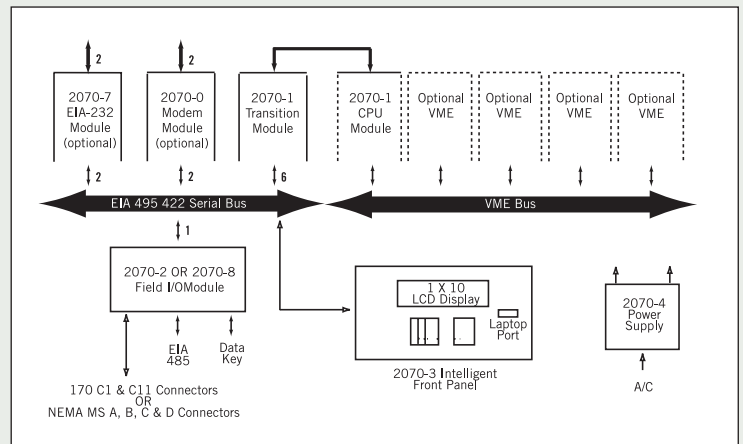
OPEN ARCHITECTURE

A key concept of the 2070 controllers is that they are truly open systems. That is, they:

- ▶ Support off-the-shelf operating systems, like OS-9.
- ▶ Are based on non-proprietary computer architecture.
- ▶ Can run open communication protocols (e.g., NTCIP).
- ▶ Are defined by open standards maintained by Caltrans and the City of Los Angeles.

This means that the 2070 are competitively priced, and they can be deployed in most non-proprietary traffic control systems.

The 2070 contains a VMEbus computer platform, front panel, I/O module, and power supply. The 2070 is software compatible, enabling users to select applications from a wide range of software developers. Contact Quixote Traffic Corporation for a current list of suppliers.



A MODULAR APPROACH

As shown in the diagram on the prior page, the 2070 uses a modular approach that simplifies maintenance, provides isolation, and enables future system upgrades without replacing the total controller. The central processing element is a VMEbus processor that communicates directly to intelligent modules (e.g., Front Panel or Field I/O Module) and other 2070/2070N interfaces (e.g., serial ports). Each intelligent module has its own diagnostics, in addition to a systems-level test run by the VME system. The following paragraphs list the major components and a brief functional description of each module.

VMEBUS COMPUTER PLATFORM

The core of the 2070 architecture is the VMEbus computer, which interfaces to all other modules. The VMEbus architecture was chosen by Caltrans and other 2070 specification authors, because it is the leading worldwide computer architecture used in control and communications applications. It provides high performance processing capability, flexibility, and modularity. The Quixote Traffic Corporation standard 2070 configurations use only one VMEbus slot for the main processor, leaving four additional slots for expansion. This enables the user to plug-in modules for camera control, video detection, additional communications functions, etc. If an application ever needs more than four slots, Quixote Traffic Corporation can provide an expansion chassis.

Most transportation field processor applications require two key functions, control and communications. The 2070's MSX-CPU360 provides both functions. This processor delivers high computational power (4.5 MIPS) and large amounts of memory. Literally, the processing and memory capacity is hundreds, if not thousands, of times more capable than a 170 or most NEMA systems. This empowers the 2070 to run advanced control algorithms, perform high accuracy data collection, and run other compute-intensive tasks. The MSX-CPU360 also incorporates advanced communications capability, such as SDLC, HDLC, Ethernet, and other protocol and data packet formats. In addition, it can connect to T1 telecommunication lines. These features enable the 2070s to readily use high bandwidth communication interfaces or to be deployed without compromising future communications adaptability.

2070 with MSX-CPU360

FRONT PANEL

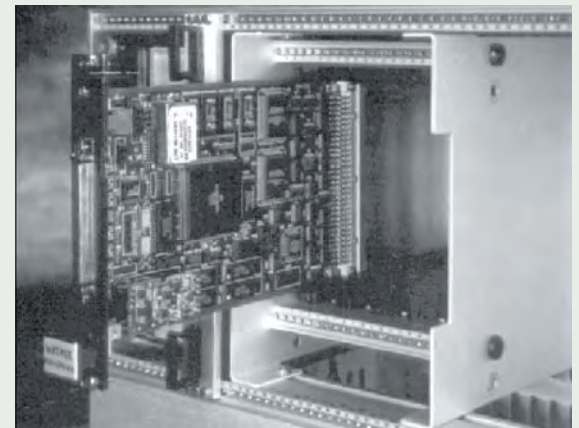
2070 systems include a hinged Front Panel with a 4 or 8 x 40 display, keypads, and LEDs driven by a local processor. It connects to the VMEbus processor through a differential serial interface for electrical protection. The onboard Front Panel processor provides for very high display update rates without imposing on the main traffic control processor for display control functions.

FIELD I/O MODULE

The 2070 controller can be supplied with a different Field I/O Module that meets the respective 170 (Caltrans & NY DOT) or NEMA load switch and detector interfaces. Like the Front Panel, the Field I/O Module contains a local processor that responds to commands from the main VMEbus CPU over a serial interface. The Field I/O Module uses a power source that is isolated from the rest of the VMEbus system for electrical protection and reliability. The local processor is designed to pre-scan detector inputs hundreds of times per second, eliminating this time consuming task from the main VMEbus CPU. The Field I/O Module is designed to be an option so future network-based traffic cabinets can use 2070 configurations that do not have the additional cost of an I/O module if one is not needed.

2070 MODEM MODULE

The 2070-6 module is intended to be the main communications link running to an operations center or regional hub. The modular approach of the 2070 allows users to use older Bell 202 style modems, higher speed modems, fiber interfaces (including DS-1), or swap out one interface type for another in the future.



COMMUNICATIONS MODULE

The 2070 also have two general purpose serial channels that can be configured for EIA-232, -422, -485, and other electrical interfaces. The standard electrical interface is configured for EIA-232. Contact Quixote Traffic Corporation for additional requirements.

EXPANSION MODULES

For applications needing additional or remote I/O, Quixote Traffic Corporation offers a 170 and NEMA Expansion Module. The unit is self-contained with its own power supply, and it communicates to a 2070 or 2070N controller via a serial communications channel. Numerous Expansion Modules can be managed by a single 2070 or 2070N controller. Expansion Modules can reside in the same cabinet as the 2070s, or they can be remote. Expansion Modules provide a flexible and more cost-effective alternative to using multiple controllers, for example, at complex diamond interchanges.

NEMA Expansion Module



SOFTWARE

The 2070 include licenses for OS-9, an industry standard real-time operating system that may or may not be used in the end application. Application software is not an integral part of the 2070 controllers. Instead, application software is available from an extensive list of third-party software company suppliers, integrators, and DOTs. Contact Quixote Traffic Corporation for a current list of software suppliers. To support developers, Quixote Traffic Corporation offers software tool kits that simplify development and reduce engineering time.

MAINTENANCE AND RELIABILITY

The 2070 consist of replaceable modules, so the units are easy to maintain. Software upgrades are performed by serial downloads, eliminating the need to handle electronic components, which is one of the primary causes of system failures. Each module within the controllers is built using modern, low-wattage, high-quality components that meet or exceed IPC quality standards.

SPECIFICATIONS

System Level

Standard compliance	ANSI/IEEE Standard 1014-1987.
Safety	Electromechanical design consistent with UL Standard 1950: Safety of Information Technology Equipment, Including Electrical Business Equipment.
Temperature	<ul style="list-style-type: none">▶ Ambient Operating -34° to +74°C▶ Storage -45° to +85°C▶ Maximum Ambient 17°C per hour Change Rate
Relative humidity	95% max., noncondensing (4.4-43.3°C)
Strength, shock	Max. 10G in orthogonal axis.
Strength, vibration	5-30 Hz up to 0.5G in orthogonal axis.
Height x Width x Depth	10.5" x 17" x 14"

Front Panel

Display	4 lines by 40 characters.
Keypads	4 x 4 Hex and 3 x 4.

Power Supply

Wattage	115
Voltage	89-135 VAC applied line range.
Frequency, operating	47-63 Hz
Outputs	<ul style="list-style-type: none">▶ +5 VDC @ 12A, +12 VDC @ 1A,▶ -12 VDC @ 1A, +12 VDC (isolated) at 2A▶ 2070 TS3 only: 24 VDC (isolated) at 3A

MSX-CPU360

VMEbus interface	<ul style="list-style-type: none">▶ Dual-Port DRAM SA24:SD16▶ Mailbox Interrupt SA16:SD16▶ Master MA16, MA24:MD16▶ Interrupt Handler All seven VMEbus levels ACFAIL and SYSFAIL
VMEbus arbiter	Priority or round robin with Auto-SYSCON.
VMEbus requester	FAIR, ROR
Serial ports	Up to six EIA-232/422/485 ports.
Power	+5 VDC, 0.9A, typical.

VMEbus Backplane

Slots	4 spare — Incorporates Automatic Bus Grant and Interrupt Acknowledge Daisy Chain.
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WWW.QUIXTRAFFIC.COM



9603 John Street • Santa Fe Springs, CA 90670
Tel: (562) 923-9600 • Fax: (562) 923-7555
Toll Free: 1-800-733-7872

ISO 9001: 2000 Certified Manufacturer



Specifications are subject to change without notice to reflect improvements and upgrades.