Introduction 1

In This Chapter
√ Manual Overview √ Hardware Overview √ Hardware Installation Guidelines

This manual is designed to introduce the Mercury Hardware offered by ACRE as well as provide wiring and configuration information for each device. For information regarding legacy products, refer to the Legacy Hardware Manual.

How This Manual is Organized

Chapter 1, "Introduction," provides an overview of the system hardware and installation guidelines.

Chapter 2, "Controllers," describes the LP/EP Series controllers and their configuration requirements.

Chapter 3, "Subcontrollers," covers the MR Series reader modules and their configuration requirements as well as provides information regarding input and output subcontrollers.

Chapter 4, "Multiplexers," describes the OptoHub and CI-8 communication multiplexers.

Chapter 5, "Power Distribution," includes information regarding the various power distribution options.

Chapter 6, "Allegion Locks," instructs the user how to connect Allegion AD Series locks and HandKey readers.

Chapter 7, "Specialty Products," highlights specialty hardware products offered by ACRE.

Appendix A, "Technical Drawings," includes wiring diagrams and dimensions for common field applications.

Appendix B, "UL Compliance," outlines the UL compliance requirements for ACRE products.

Appendix C, "Legacy Migration," explains how to replace legacy controllers with current models.

Icons and Conventions Used in This Manual

The following icons call attention to useful or important information:

	This icon highlights time-saving hints, useful tips, and helpful shortcuts.
	This icon designates information that is important enough to keep filed in an easily accessible portion of your gray matter.
	If an action could damage the system, cost big bucks, lock the operator out of the system, or otherwise bring an end to civilization as we know it, it will be marked by this icon.

In addition to the icons above, this guide uses several typeface conventions to improve readability:

- *Special*: Indicates a specific item on the hardware device or in the software application.
- **Boldface**: Indicates an instruction or user action; bold text usually appears in numbered steps.

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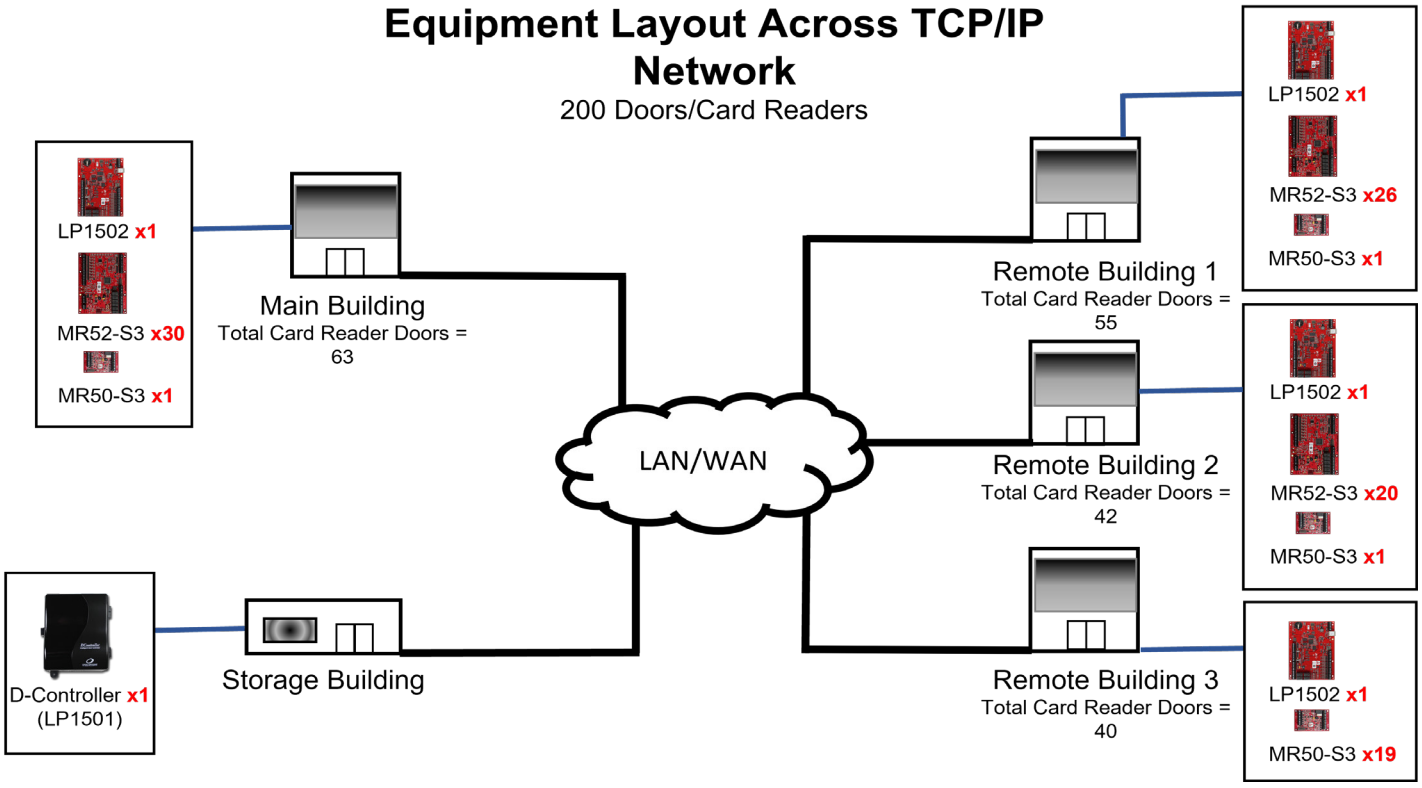
Hardware Overview

Controllers

Mercury Controllers are intelligent controllers that run on Linux. The controller functions as the brain of the ACRE hardware platform. The access control software, known as DNA Fusion, loads application-specific settings into the controller to control and monitor the access control system. The Controller contains the intelligence and decision-making capabilities necessary to maintain complete functionality when disconnected from the host computer.

The LP Series hardware is currently available in 4 models: the LP2500, LP1502, LP4502, and the D-Controller (LP1501) as well as the MP02. Each panel, except for the LP2500, has different port and memory configurations to suit a variety of customer application requirements. Most installations use the first serial port on the LP Controller for host communication (Comms). The host port supports direct or multidrop serial comms with baud rates up to 38,400. A TCP/IP interface is available for network operations that use standard network-interface hardware. All five models can be used on Ethernet via on-board RJ45 connectors.



Subcontroller Panels

Serial Input and Output (SIO) panels, or subcontrollers, collect data and interface to external field devices. These panels are connected to the controllers via "downstream" communication ports. The comm link, known as a channel, is established by using an Ethernet or multidrop RS-485 interface. Each channel can communicate up to 4,000 feet (roughly 1,200 meters).

External devices are connected to the subcontrollers to provide additional flexibility when installing the hardware. Subcontrollers are available in several primary models. This includes the MR50-S3, MR52-S3, MR62e (NSC-200), RSC-DT, MR16IN-S3, MR16OUT-S3, and Opto-Hub. However, different subcontrollers may be used for integrated products. The number of inputs, outputs, and reader ports varies with each subcontroller.

The DNA Fusion software defines the physical state of the input/output points and how to use them. The system operator can configure input points as *Normally Open* or *Normally Closed* in addition to *Supervised* or *Unsupervised*. DNA Fusion is also used to configure the reader properties for attached readers.

Subcontrollers interface to many of the common devices in the access control industry. The specific parameters for each device are configured through DNA Fusion.

NOTES:

Installation Guidelines

Hardware products operate with various power sources and communicate through a variety of interfaces. Understanding the power requirements and communication interfaces as well as their characteristics and limitations will ensure a successful installation. The installation and operation of ACRE hardware products will not prohibit the free exit granted by other emergency systems.

Power Supply

All current ACRE hardware products can use a DC power source as well as PoE (Power Over Ethernet). Connect the GND signal to earth ground at one location within the system.

> ***!*** *Multiple ground connections may cause ground loop problems and is not advised.*

Power Requirements

When planning a system, it is important to understand the power requirements of each hardware device as well as the actual output of the power supplies being used.

If multiple devices are expected to share a common power supply, proper care must be exercised to avoid excess voltage loss through the power wires/cables. Voltage loss can lead to intermittent communication problems when devices are consuming more power than the power supply can provide. When chsing a power supply, make sure the system will never max out its electrical load. For safe operations, always use at least a 25% overage factor when sizing the power supply.

When designing a system, install the power supply as close to the equipment as possible. The farther the power supply is placed from the equipment, the larger the wire gauge (dia.) must be to ensure adequate power is supplied to the hardware.

Unsupervised Inputs

Unsupervised alarm inputs sense whether a contact is open or closed. Configuration via DNA Fusion allows open circuits to be programmed as an alarm condition. Open contacts should result in terminal voltages of 3.5 to 5 Vdc. Closed contact terminal voltage should be between 0 and 0.8 Vdc.

Supervised Inputs

Several Mercury hardware products offered by provide contact supervision. If an alarm input is supervised, an End-of-Line (EOL) terminator must be installed for the monitored contact. When supervised inputs are configured, the circuit will report open and closed states as well as open circuit, shorted, grounded, and foreign voltage.

All alarm inputs require twisted-pair wires. Connect *Normally Closed* (NC) contacts in series and connect *Normally Open* (NO) contacts in parallel.

The installer must add two resistors to the supervised input circuit in order to facilitate proper reporting. The standard supervised circuit requires 1K Ohm 1% resistors and should be located as close as possible to the sensor.

State	Alarm N/C	Alarm N/O
Normal	1K ± 25%	2K ± 25%
Alarm	2K ± 25%	1K ± 25%
Fault–Line Short	0-50	0-50
Fault–Line Open	15K	15K
Fault–Foreign Voltage	50-70 1250-1500 2500-15K	50-70 1250-1500 2500-15K

Reader Data Input

Reader data input is a digital signal using either a Wiegand or Clock/Data signaling method. It interfaces to reader signals DATA 1/DATA 0 and produces a nominal signal swing of 0 to 5 volts.

Relay Outputs

Various Mercury hardware products offere by provide Form C relay contacts. These are dry contacts that are capable of switching signals as well as higher current loads. Each board has different relay contact ratings.

RS-485 Communication

RS-485 is a TIA/EIA protocol that defines a standard electrical interface for multidrop communication on bus wiring schemes. RS-485 interface allows multiple devices to communicate over a single cable and transfer data at high speeds over long distances (up to 4,000 feet).

RS-485 Wiring

Mercury hardware products offered by use a 2-wire RS-485 interface between devices. The total length of the communication cable must not exceed 4,000 feet (1,219 meters) for 24 AWG wire size per leg of the communication tree.

Device-to-Device Connection

RS-485 communication cables should be installed in the form of a daisy chain. Do NOT connect devices via star topology unless using the OptoHub™ or CI-8 board. There are also a variety of devices that are available that use a wireless configuration for connecting the controllers and subcontrollers to Wifi enabled readers.

Cable Termination

The RS-485 interface uses a balance of differential transmitters/receivers to reject common mode noise. RS-485 must be terminated at both ends of the RS-485 line. Terminating the line increases communication reliability by minimizing the signal reflection and external noise coupling. The installer should determine which device is at the end of the communication line.

Two methods can be used for end-of-line (EOL) termination:

- Termination from the Host to the Controller – The documentation for each hardware device will indicate how the termination should be configured.
- Termination from the Controller to Downstream Subcontrollers – Termination of this section of the RS-485 bus always remains the same. Each end of the RS-485 bus must be terminated using the on-board jumpers provided with each and Mercury hardware or device. Refer to the section of this manual for the specific board in question.

Mounting

Most board dimensions are 6 x 8 inches and contain mounting holes along the long edges. For smaller modules, only four of the mounting holes are used; the last two holes need support standoffs, which come installed from the factory.

System Start-Up

The system should never be wired and powered up all at once. recommends the following procedure:

1. **Verify** that the power supply is *NOT* applied to any system device.
2. **Check** all wiring and device switch settings.
3. **Disconnect** all devices from the RS-485 communication line and/or Ethernet port.
4. **Verify** that the Reader Power Select jumper is in the correct power setting before applying power to the board.
5. **Power up** the controller and verify that it is working properly.
6. **Configure** the controller in DNA Fusion/SMS and verify that it is online.

See ***page (pg.) 3-9*** in the *Technical Installation Manual* for more information.

7. **Connect** one port of the RS-485 communication line or Ethernet port to the controller.
8. **Power up** the subcontroller and verify that it is working properly.
9. **Connect** the subcontroller to the RS-485 line and/or Ethernet port.
10. **Configure** the subcontroller in DNA Fusion and bring it online with the controller.

    See pg. 3-17 in the *Technical Installation Manual* for more information.
11. **Verify** all functions of the subcontroller device.
12. **Repeat** steps 7-10 for each additional subcontroller.

Firmware Updates

 provides the current firmware version with the DNA Fusion software. The firmware, which allows communication between the hardware and software, is automatically installed during the initial DNA Fusion installation. Each subsequent software release will include the most recent firmware version.

For best system performance results, update the firmware when:

- Installing a new system
- Upgrading to a new DNA Fusion version
- Adding a new controller
- Replacing a controller
- Connecting to a controller for the first time

See **pg. 20-13** in the DNAFusion User Manual for instructions on updating the controllers and **pg. 3-20** in the *Technical Installation Manual* for information on upgrading subcontroller firmware.

Baud Rates

The table below provides the various baud rates for Series 3 controllers and subcontrollers.

Controller/Subcontroller	9600	19200	38400	115200
LP4502	Supported	Supported	Supported	Supported
LP1502	Supported	Supported	Supported	Supported
LP1501 (DController)	Supported	Supported	Supported	Supported
MP02	Supported	Supported	Supported	Supported
MR50-S3	Supported	Supported	Supported	Supported
MR52-S3	Supported	Supported	Supported	Supported
MR62e (NSC-200)	Supported	Supported	Supported	Supported

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