

# **C•CURE *apC/L***

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## **Technical Manual**

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# Before You Begin

This *C•CURE apC/L Technical Manual* is for experienced technicians who need to install, set up, and/or configure the apC/L system hardware. This manual describes the following procedures:

- Configuring and installing card readers
- Installing the apC/L and optional module boards
- Wiring equipment to the apC/L
- Setting apC/L switches
- Testing the installation

This manual assumes that you are familiar with the apC/L and its operation. This introduction provides the following information:

- A description of the individual chapters in this manual
- A guide to where you can find additional information about the apC/L
- A list of the conventions used in this manual

## Installation Overview

While you do not have to perform apC/L installation in any particular order, the following checklist gives a logical order for the steps necessary to install your apC/L.

- Check the apC/L physical requirements (Chapter 2)
- Check the apC/L hardware to make sure nothing is missing (Chapter 3)
- Check the dimensions for mounting the apC/L with the cabinet and mounted the apC/L (Chapter 3)
- Wire the readers and optional equipment to the apC/L (Chapter 4)
- Configure any input and output modules (Chapter 5)
- Set up the apC/L panel (Chapter 6)
- Test your installation (Chapter 7)



### **IMPORTANT**

Before handling and installing any component, follow these precautions:

Discharge your body's static electricity charge by touching a grounded surface.

Wear a grounding strap and work on a grounded static protection mat.

Do not slide a component over any surface.

Limit your movements during the installing process to reduce static electricity.

# How to Use this Manual

This manual has seven chapters and six appendices.

## **Chapter 1: Overview**

Gives an overview of the apC/L unit and describes the optional modules and card readers.

## **Chapter 2: apC/L Physical Requirements**

Gives the minimum requirements for the apC/L including wiring requirements, power supply limitations, and apC/L event storage. The chapter also describes how to connect the apC/L to the host and how to connect relay outputs.

## **Chapter 3: Identifying Hardware and Mounting the apC/L**

Lists the hardware supplied with the apC/L and describes how to mount the unit.

## **Chapter 4: Wiring Card Readers**

Provides information on card reader wiring configurations, installing a card reader, and optional installations such as keypads and heaters.

## **Chapter 5: Input and Output Modules**

Describes the optional modules the apC/L supports and how to install them.

## **Chapter 6: apC/L Panel Setup**

Gives instructions for setting up the apC/L panel, including switch and jumper settings.

## **Chapter 7: Testing the apC/L Installation**

Explains how to test the apC/L installation, including the readers and the apC/L main board.

## **Appendix A: Equipment Specifications**

Lists the apC/L operating specifications, and dimension and weight specifications.

## **Appendix B: Calculating Maximum Wire Lengths**

Contains the procedures for calculating maximum wire lengths for the apC/L installation.

**Appendix C: Packing and Shipping the apC/L**

Describes what to do if your apC/L needs to be returned or repaired.

**Appendix D: Templates and Technical Drawings**

Contains the template for the apC/L main board and other optional boards. These templates show the locations of jumpers, switches, and major components.

**Appendix E: System Specific Information**

Lists apC/L switches that are set according to the specific C•CURE system you are using.

**Appendix F: Modem Setting**

Contains information about configuring the apC/L for dialup and leased lines.

# Conventions

This manual uses the following text formats, and symbols.

Convention	Meaning
<i>Regular italic font</i>	Indicates a new term.
<b>Note</b>	Indicates a note. Notes call attention to any item of information that may be of special importance.
	Indicates an important note. Important notes contain information essential to proper operation of the system.
	Indicates a caution. A caution contains information essential to avoid damage to the system. A caution can pertain to hardware or software.

## UL Listed System

The following is necessary for UL 294 or UL 1076 compliance:

All equipment connected to the supervised inputs of the RM module must reside within the same room as the RM module.

## Important Safety Information

Operating problems are often caused by failure to ground system components properly. Be sure to follow all instructions for grounding described in this manual.



### IMPORTANT

Changes to the apC/L not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

The following precautions apply to all procedures described in this manual.

1. To meet life safety requirements, a fail-safe mechanism override must be installed at each card reader exit to allow people to leave the secure area in case of electro-mechanical device failure.
2. The apC/L unit described in this manual could cause electrical shock. Installation and maintenance should be performed only by qualified personnel. Make sure power is removed before the system is installed.
3. The apC/L and printed circuit boards in the reader devices are susceptible to damage by static electricity. When handling these devices:
  - Make sure your work area is safeguarded
  - Transport all components in static-shielded containers
4. On the apC/L, the power wiring to RMs and readers is power limited through PTC protection devices.

## C H A P T E R 1



# Overview

The Sensormatic apC/L *advanced processing Controller* is an intelligent access control field panel that serves as the basic building block for Sensormatic C•CURE systems. It is practical for parking garages, small office buildings, retail outlets and apartment complexes or remote site monitoring.

Regardless of system configuration, each apC/L supports Wiegand or magnetic stripe card technologies. The Wiegand technology includes proximity, swipe, and biometrics. With a complete database downloaded from the server, the apC/L responds to access requests in less than one half second.

### In This Chapter

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- apC/L Basics 1-2
- Card Readers 1-4

## apC/L Basics

The apC/L is housed in a 16 AWG metal wall-mounted cabinet which has tamper switches on the front and rear, and can be used in a wide variety of configurations. The apC/L has two reader ports, capable of handling a maximum of two readers and two relay outputs. In the basic configuration, the apC/L's two card readers are wired in a multidrop configuration. The panel's static RAM consumes minimal power for storing memory and data.

The apC/L's basic memory capacity is 256K of RAM expandable to 512K. Eight supervised inputs are available on each Input Module; the apC/L can support a maximum of four Input Modules. Eight additional relays are available on each Output Module; the apC/L supports a maximum of four Output modules. While the apC/L does not have any onboard supervised inputs, supervised input support exists on the Input Module. See Chapter 5 for a description.

The apC/L is compatible with Sensormatic systems, including the C•CURE 1 Plus Ultra, C•CURE 750, and C•CURE 800/8000 systems.

### Software-Controlled Options

The apC/L offers optional software-controlled features such as timed activation/deactivation commands, 32-bit card numbers, elevator access, dialup mode operation, and anti-passback control. A single apC/L can use multiple card technologies, site codes, and company codes. The apC/L's full-year real time calendar/clock allows activation and deactivation of cards on specified days. If the apC/L is configured with the optional backup battery, the unit has a power fail input that can be configured to let you know when the unit has lost its main source of power.

### apC/L Optional Modules

The apC/L supports two optional modules that enhance the apC/L's capabilities:

- apC/L I/8 Input Module
- apC/L R/8 Output Module

**I/8 Input Module** The I/8 (input module) or *board* has eight supervised inputs. *Supervised* inputs report on the status of the wiring between the apC/L and an alarm device. If that wiring is cut, the system reports an open circuit. If someone tries to jumper across the wiring (prevent the device from reporting), the system reports a shorted circuit. Supervised inputs can report a total of five conditions to the apC/L:

- Short
- Open Loop
- Line Fault
- Normal
- Alert

Since a short circuit, open loop, or line fault can mask an alarm condition, supervised inputs enhance system security.

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**Note** An *unsupervised* input does not monitor the wiring. Unsupervised inputs can report two conditions: Normal or Alert. The I/8 (input module) has no unsupervised inputs.

---

As a separate module connected to the apC/L reader bus, the I/8 provides eight Class-A supervised inputs. A total of four I/8s (input modules) can be connected to the apC/L, providing up to 32 Class-A supervised inputs. A 1 K ohm resistor is factory-installed on all inputs. These resistors must be clipped out when you use the associated input. Tolerance on states is  $\pm 5\%$ . The I/8 (input module) will not function until the apC/L is configured by the host computer.

**R/8 Output Module** The R/8 (output module) connects to the apC/L reader bus, and provides eight auxiliary relay outputs. Each output is rated at 30V DC/AC at 1Amp inductive, 2Amps non-inductive. You can connect up to four R/8s (output modules) to the apC/L, providing up to 32 auxiliary relay outputs. Note that the R/8 (output module) cannot function until the host configures the apC/L.

## Card Readers

A card reader is made up of a read head or reader electronics and a small circuit board, called a *personality board* or *module*. The apC/L uses the RM series personality module.

The RM module is approximately 4.5" x 3.5" (11.8 by 9 cm) and can be installed in the reader housing or in a 6" x 4" (minimum) junction box. Electronics for accepting either the magnetic stripe or Wiegand reader technologies are located on the RM series personality module.

### RM Series Readers

The RM series readers incorporate either magnetic stripe, Wiegand, or proximity read head technology into the same polycarbonate all-weather housing. Two types of proximity read heads are available as well as a magnetic stripe (only one type of magnetic stripe is available) and a Wiegand read head to cover any type of application.

Each reader is configured with a six position DIP switch. A 0-F rotary switch defines the address and an onboard tamper switch protects the electronics. See "Setting the apC/L Switches" on page 6-4 for a complete description.

A 2-line, 16 character per line, backlit display is offered as an option with the RM2 series (reader with keypad). Each reader provides two class A supervised inputs on the personality module and two logic driven relay outputs for use by ARM-1s (#131-912).

See "Setting Up a Reader" on page 4-9 for further information.

### Magnetic Stripe Readers

The magnetic stripe reader is enclosed in an all weather housing with a slot through which a magnetically coded card is passed, or "swiped." The RM-4 personality module decodes the data on the card and transmits it to the apC/L for processing.

## Wiegand Readers

There are three types of Wiegand card readers:

- Swipe reader, through which a card is passed
- Insertion reader, into which a card is inserted and removed
- Key reader, into which a key shaped card is inserted and removed

A sensing coil inside a Wiegand reader creates a magnetic field. When the wires inside the card interact with the magnetic field, they create low voltage impulses in the coil. Depending on the arrangement of the wires in the card, the voltage is either positive or negative. The personality module translates the impulses and transmits the information to the apC/L for processing.

Each swipe, insertion, and key Wiegand Reader has a single bi-colored LED which indicates the status of the door. Sensormatic RM Wiegand readers have a 3 LED display.

### Proximity Readers (Also uses Wiegand format)

The proximity reader transmits a radio frequency signal. A proximity card is a radio frequency transponder, or tag, which consists of an antenna coil, and an integrated circuit chip encoded with a unique identification number. When a card is passed near the reader, it energizes the card's antenna, causing it to send its identification number to the reader. The card and reader do not make physical contact. LED indicators for proximity readers vary according to manufacturer.

## The Auxiliary Relay Module

The Auxiliary Relay Module, or ARM-1 (part # 131-912), is an optional relay module that takes a logic-driven signal from the reader and drives or switches a 12/24V relay for the door strike or for other use. The ARM-1 is 1.7" by 0.75" (4.3 by 1.91 cm) in size. It is mounted inside the protected area no more than 25 feet (7.6 m) from the RM. The ARM-1 contains 1 Form C relay capable of driving a 30V, 2A non-inductive or 1A inductive load.

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**Note** You can connect two ARM-1 modules to each RM-4 module.

---

## Paired Readers

You can pair any two readers if they are configured with the same door contact at the host computer. Paired readers coordinate door strike control and door contact shunting between themselves.

---

**Note** The request-to-exit will not function if a door is configured with two readers.

---

## CHAPTER 2

# 2

# apC/L Physical Requirements

This chapter describes the physical requirements for the apC/L and describes how to replace EPROMs.

### In This Chapter

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- External Devices and the apC/L 2-2
- Equipment Wiring Requirements 2-2
- Cabling 2-4
- apC/L Event and Card Storage 2-5
- apC/L Power Supply Limitations 2-8
- Connecting the apC/L Relay Outputs 2-9
- Connecting the apC/L to the Host 2-12
- Replacing the apC/L EPROMs 2-18

## External Devices and the apC/L

External devices connect to the apC/L via numbered ports located on the left and right sides of the board. Groups of ports are reserved for connecting specified types of devices. Connectors and device types are listed in Table 2.1.

**Table 2.1 External Device Connectors**

Device(s)	Connector
Reader Bus or Input/Output modules	P6
Reader Bus or Input/Output modules	P7
Relay output 1	P4
Relay output 2	P5
Power failure input	P3*
Auxiliary/Diagnostic port	P11
Host computer	P10
Backup Battery connection	P9
AC Transformer Connection	P8

\*Only functional on certain models, contact Sensormatic for further information.

## Equipment Wiring Requirements

Table 2.2 lists the wiring requirements for apC/L and components. Consult the Belden specifications for information on capacitance and resistance.

Signal	From	To	Belden #	Gauge	# Prs	Shielded	Max Length
RS-232 Comm	Host	apC/L	9855	22	2	Yes	50 ft.
RS-232 Comm (5-wire)	Host	apC/L	8303	22	3	Yes	50 ft.
RS-485 Comm	Host	apC/L	9842*	24	2	Yes	4000 ft.
Comm	apC/L	RM-4	9841*	24	1	Yes	4000 ft.
Power	apC/L	RM-4	8442/8461	22/18	1	No	See Appen B
Control	apC/L/ ARM	Strike	8641	18	1	No	See Appen B
Supervised Input	Input Module	Contact/Switch	8442/8461	22/18	1	No	2000 ft.
Request-to-exit	RM-4	Switch	8442/8461	22/18	1	No	2000 ft.
Door contact	RM-4	Contact	8442/8461	22/18	1	No	25 ft.
Relay	RM-4	ARM	9462	22	1	Yes	25 ft.
Reader Data	RM-4	Wiegand/ Prox Read Head	9536	22	3	Yes	500 ft.

Table 2.2 Equipment Wiring Requirements

\* For plenum or underground applications, use Manhattan M63995 for 2 pair only, (host wiring) 150 ohm, 8.8pf/ft or Belden 89182 for 1 pair (reader wiring) 22AWG, 100 ohm, 12.95pf/ft.

## Cabling

If you need a plenum-rated cable for the host-to-apC/L or apC/L-to-RM communications, you can substitute the following for the cables referenced in this manual:

- Use Manhattan (# M63995) for 2-pair only, 24 AWG, 120 ohm, 12.5 pf/ft, with foil shield. For the apC-to-RM connection, use only one of the pairs.
- Use Belden 89729 for 2-pair, 24 AWG, 150 ohm, 8.8 pf/ft. Use Belden 89182 for 1-pair 22 AWG, 100 ohm, 12.95 pf/ft., with foil shield. These two cables are also rated for underground burial.

## apC/L Event and Card Storage

Event storage space in the apC/L's memory is automatically adjusted according to the space required for storing cardholder information. Increasing the number of records stored decreases the number of events (transactions) that the memory can hold. Adding optional software features, such as elevator control (10 bytes), anti-passback (4 bytes) activation and expiration dates (4 bytes each), and 32-bit card records reduces cardholder counts and event storage space. Use the following formula to estimate the number of cards that can be supported for a given memory size.

$$\text{number of cards} = \frac{(\text{memory\_size} - 64) \times 1024 - (\text{events} \times 10)}{\text{card\_record\_size}}$$

where:

Memory\_size is the total APC RAM in kbytes.

Card\_record\_size is the number of bytes comprising a record. A typical card\_record\_size for an 800 system can be estimated as follows:

Item	Bytes
Card number	4
Issue + PIN	4
Activation date	4
Expiration date	4
Clearances	10
<b>TOTAL</b>	<b>26</b>

Events are the average number of events that an apC must store between uploads to the host. A typical value is 1000.

Table 2.3 lists the apC/L memory requirements according to the number of cardholder records supported.

---

**Note** The values in this table are approximate. Your exact memory requirements depend on the host system used and the number of cards and optional features in your system. The calculations assume an event record memory of 10k bytes, or 1000 events. The more options you add, the fewer the number of cards the apC/L can support.

---

**Table 2.3 apC/L Memory Requirements**

If SRAM Is	Number of Cardholder Records with No Elevator	Number of Cardholder Records with One Elevator
256K	7,177	5,184
512K	17,260	12,465

## Calculating apC/L Memory Requirements

Use the following formula to determine the exact memory requirements in kilobytes for a given number of cardholder records and events if the data from the above table is not sufficient

$$\text{memory\_size} = 64 + \frac{\text{card\_record\_size} \times \text{num\_cards} + (\text{events} \times 10)}{1024}$$

#### Sample Calculation

Suppose your site had the following requirements:

- 5,000 26-byte cardholder records must be maintained in memory
- The apC/L must buffer 1,000 offline events
- The apC/L is configured for local anti-passback and elevator control

Substituting these values in the formula:

$$\text{memory\_size} = 64 + \frac{26 \times 5000 + (1000 \times 10)}{1024}$$

The result from the above calculation is 200.718, so you would need to purchase an apC/L with 256K of memory.

## apC/L Power Supply Limitations

The apC/L internal power supply supplies power to the readers with certain limitations as shown in Table 2.4.

**Table 2.4 Power Supply Limitations**

Reader Type	Model		Max #	Local Power
Motorola/Indala	ASR-110	ASR-112	2	Optional
	ASR-103	ASR-105	2	Optional
	ASR-101	PR-10	2	Optional
	PR-12	PR-5	2	Optional
	PR-3	PR-1	2	Optional
Motorola/Indala	ASR-120	ASR-122	2	Recommended
	PR-20	PR-22	2	Recommended
Sensor Eng.	5VDC Sensor		2	Optional

## Connecting the apC/L Relay Outputs

This section describes how to connect the apC/L to relay outputs. It also describes connecting the unit to the host computer.

### Connecting Relay Outputs

Pins for apC/L relays are arranged in groups of three on the lower right side of the board.

The pins are labeled **COM** (Common), **NC** (Normally Closed), **NO** (Normally Open). Use twisted, 18 AWG (0.902 mm) Belden #8461 or twisted 22 AWG (0.357 mm) Belden #8442 for wiring of all relay outputs.



### CAUTION

Maximum relay contact voltage is 30V AC or DC.

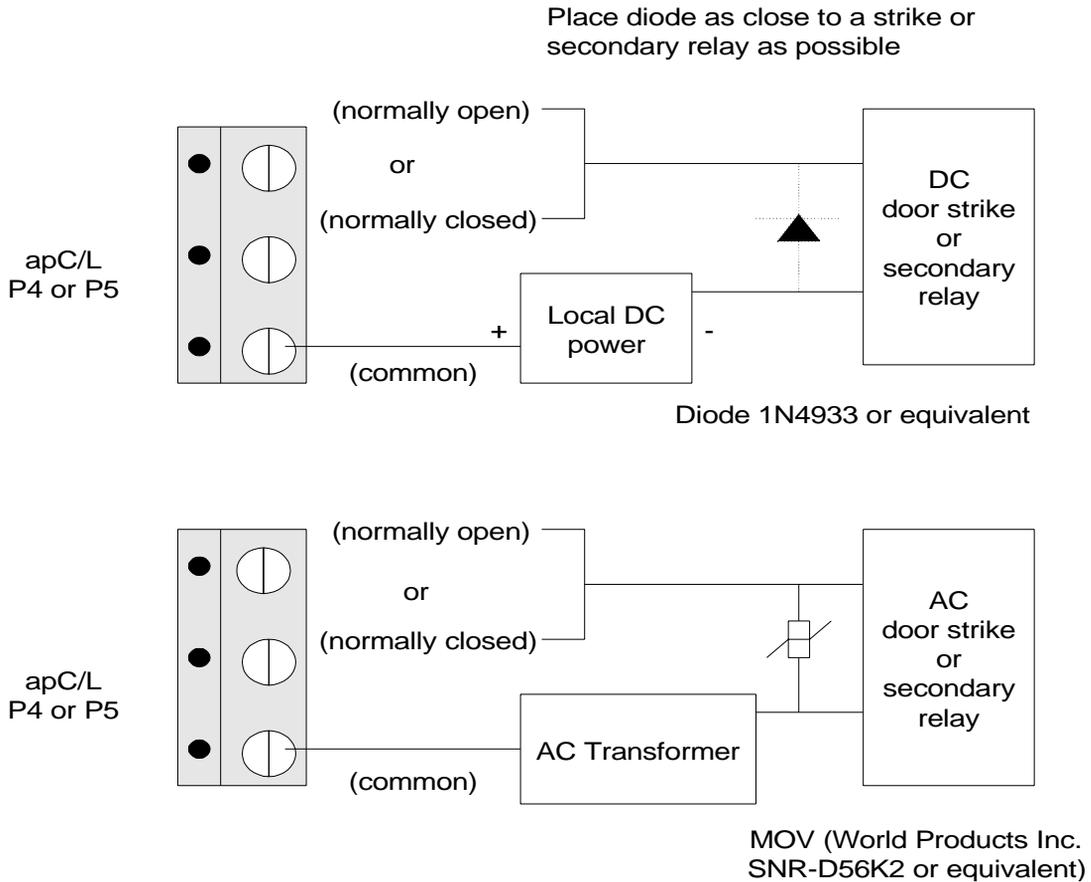
Do not use apC/L relays to switch power, because this may exceed the ratings for the relay contacts. Use a secondary switching relay instead. All secondary relays must have a diode or MOV connected for proper suppression as shown in Figure 2.1.

When using an apC/L relay for controlling a DC door strike or for driving a secondary relay, you must install a diode (Motorola diode type #1N4933 or equivalent) across the strike or relay to suppress noise.

When using a relay for controlling an AC door strike, you must install a MOV (World Products, Inc. part # SNR-D56K2 or equivalent) across the strike to suppress noise.

Figure 2.1 illustrates the diode and MOV installations for door strikes.

<u>Voltage</u>	<u>Resistive</u>	<u>Inductive</u>
30VDC	2.0A	1.0A
125 VAC	0.4A	0.2A



**Figure 2.1** Door Strike Relays for the apC/L

---

**Note** Typically, normally closed = fail-safe strike and normally open = fail-secure strike.

---

## Determining the Relay Locations for RM Readers

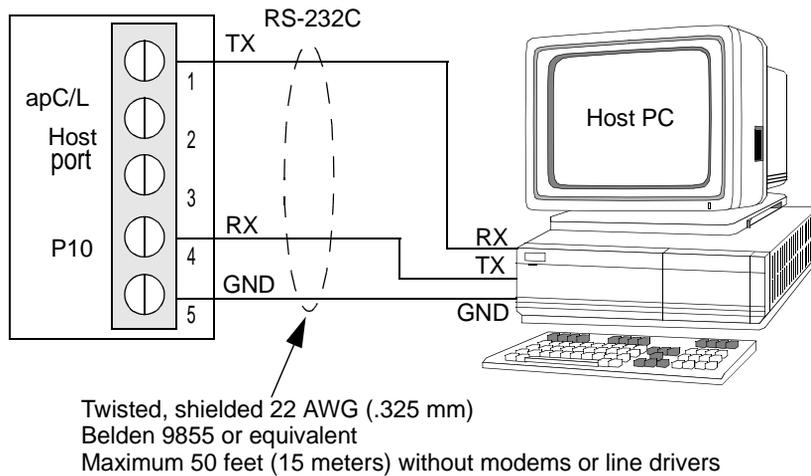
Table 2-5 lists the location and connector number for the relays on RM readers.

**Table 2.5** Relay Location for RM Readers

Relay #	Location	Connector
3, 4	RM-1	P5-1, P5-2/P5-1, P5-3
5, 6	RM-2	P5-1, P5-2/P5-1, P5-3

## Connecting the apC/L to the Host

P10 is the port used for connecting the apC/L to a host computer (see Figure 2.2). A single apC/L can connect to the host via RS-232C format. Multiple apC/Ls communicate via an RS-485 chain, but the apC/L chain must be connected to the host through an RS-232 to RS-485 converter.



**Figure 2.2 RS-232C Three-wire Connection between apC/L and Host**

To increase the distance between the host and the apC/L, you can use modems, line drivers, or other communications devices. The next two sections describe RS-232C and RS-485 connections.

---

**Note** You must configure jumpers W9-W14 on the apC/L for the communications protocol being used. For host communication using the RS-232C communication protocol, set jumpers W9-W14 to the B position. See “Setting apC/L Jumpers” on page 6-7 for further information on jumper settings.

---

**RS-232C** For RS-232C transmission, follow these steps:

1. Use twisted, shielded 22 AWG (0.325 mm) Belden #9855.
2. Connect the cable shield to the apC/L chassis ground.

The apC/L can be no further than 50 ft. (15 m) from the host, unless you extend this distance with a modem, line driver, or other communications device. Connect the apC/L directly to the host as shown in Table 2.6.

---

**Note** Connect the apC/L chassis to a proper ground only at one end.

---

**Table 2.6** apC/L Connection to Host PC

apC/L		Host		
apC/L Pin	apC/L Signal	DB-25 Pin	DB-9 Pin	Host Signal
P10-1	Data transmit (TX)	3	2	Data receive (RX)
P10-4	Data receive (RX)	2	3	Data transmit (TX)
P10-5	Ground (GND)	7	5	Ground (GND)

**RS-485** Use RS-485 transmission to connect apC/L panels in a chain. A multidrop line can have a total length of 4,000 ft. (1,219 m). Host signals must be converted to an RS-485 by using an RS-232 to RS-485 converter.



#### **In a multidrop configuration**

1. Remove jumpers W4 and W5 on all apC/Ls except the last in the chain.
2. Connect the apC/Ls using twisted, shielded 24 AWG (0.288 mm) Belden #9842.
3. Tie the shield wires together where the two meet, but do not connect the shield at the apC/L.
4. Ground the shield wires at the RS-232/RS-485 converter.

If your converter does not have an available point to connect the shield to chassis ground, connect the shield at the chassis ground connection on the **last** apC/L only.

### **RS-232C to RS-485 Converter**

If you are using RS-485 transmission, you must use an RS-232C to RS-485 converter to convert the chain to RS-485 at the host. Sensormatic recommends using Black Box model #IC108A or an equivalent device.

---

**Note** For more information on Black Box devices, go to the Black Box web site at <http://www.blackbox.com>.

---

Plug connectors from the apC/L and the host into the converter. The pin connections for the apC/L, converter, and host are listed in Table 2.7 and Table 2.8.

**Table 2.7 apC/L Pin to Converter Pin Connections**

apC/L P10		Converter	RS-485
Signal	Pin #	Signal	Pin#
TX-	1	RX-	6
TX+	2	RX+	24
RX+	3	TX+	22
RX-	4	TX-	4
GND	5		

**Table 2.8 Converter to Host Connections**

Converter	RS-232 (DB-25)	Host	RS-232 (DB-9)
Signal	Pin #	Signal	Pin#
RX	2	TX	3
TX	3	RX	2
GND	7	GND	5

For instructions on setting the jumpers and switches in the converter, see the documentation supplied with the Converter.

## Line Drivers for directly connected apC/Ls

You can use a line driver (sometimes called a short haul modem) to extend the distance the apC/L can be located from the host.

Communication between the line driver and the apC/L adds two additional signals to the three required for communication between the apC/L and the host. For information about connecting a line driver to the host, see the appropriate documentation for your host.

Connect the line driver and apC with a 5-wire RS-232C cable. Note that SW3:3 must be in the closed or ON position if the apC uses 5-wire RS-232C connections. Connect the apC/L and the line driver as described in Table 2.9.

**Table 2.9 apC/L to Line Driver Connections**

apC/L P10 Pin #	apC/L signal	Line Driver signal	Line Driver Pin #
1	TXD	RXD	2
2	RTS	CTS	4
3	CTS	RTS	5
4	RXD	TXD	3
5	GND	GND	7

## Modems for dialup mode apC/Ls

You can use dialup mode to connect an apC/L at a remote location to the host using standard, voice-grade telephone lines instead of hardwired or leased telephone lines. For many of your applications, dialup mode can be more convenient and cheaper than other communications modes.

In dialup mode, the apC/L modem must use DTR.



### CAUTION

Connect DTR to the apC only if you are connecting the apC/L to a modem. Using DTR with an apC/L connected directly to the host can result in hardware damage.

The pins used for dialup are listed in Table 2.10. See Table F.3 in Appendix F for information about DIP switch settings.

**Table 2.10 apC/L to Dialup Modem Connections**

apC/L P10 Pin #	DB-25 Pin #	Signal
1	2	Data transmit (TX)
2	20	DTR (connected for dialup only)
(3)	(5)	Required for some modems; close SW1:3 if this wire is used. Do not use this wire for the MultiTech modems.
4	3	Data receive (RX)
5	7	Ground (GND)

## Replacing the apC/L EPROMs

When Sensormatic updates an apC/L EPROM, you may need to replace the EPROM at your site. If your panel is equipped with flash EPROMs and the host supports flash downloading, firmware updates and enhancements are made through the host. You will not need to replace EPROMs.

For FlashROM, follow the instructions provided with the software.



### CAUTION

EPROMs are sensitive to electrostatic discharge. Change the EPROMs only when wearing a grounding wrist strap.



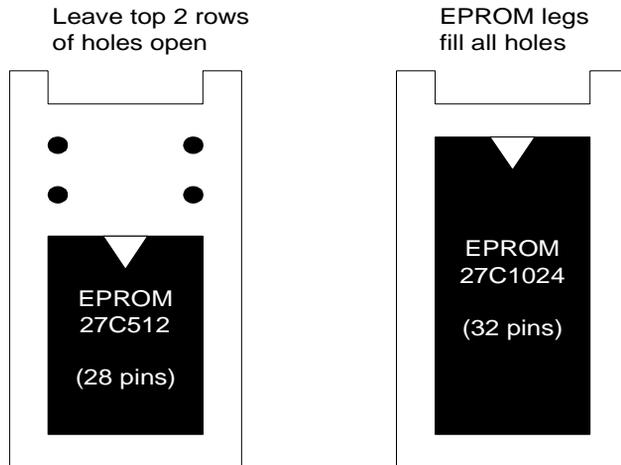
#### To replace the apC/L EPROMs:

1. Remove power from the apC/L.
2. Using an IC extraction tool, carefully remove the EPROMs from sockets U9 and U10.
3. Place the new U9 EPROM in the U9 socket. Place the new U10 EPROM in the U10 socket.
4. Carefully check the orientation of the EPROMs. The notch on the EPROM should be placed toward the top of the apC/L module. Ensure that all legs fit into the socket correctly.

---

**Note** EPROMs fit into the socket differently, depending on the size of the EPROM. The legs of EPROM 27C512 (28 pins) do not fill every hole in the socket. Leave the top two rows of holes open. The legs of EPROM 27C1024 (32 pins) fill the entire socket. Figure 2.3 shows this difference.

---



**Figure 2.3** Replacing EPROMs on the apC/L



## CHAPTER 3



# Mounting the apC/L Cabinet

This chapter describes how to mount the apC/L cabinet and connect the apC/L input voltage and backup battery.

### In This Chapter

---

- apC/L Hardware Check List 3-2
- Mounting the apC/L 3-2
- Connecting the apC/L Input Voltage 3-4
- Connecting the Optional Backup Battery 3-4

## apC/L Hardware Check List

Before you mount the apC/L, make sure the following hardware is included with your unit.

1 transformer, 18 VAC, 50 VA (input voltage)

1 cable assembly for connecting the transformer to the apC/L

1 instruction sheet for AC hookup

1 set of keys for the apC/L cabinet door

Sensormatic battery cable (part # 0650-1298-01)

---

**Note** If your site is using the optional battery backup, you will receive a 12 volt, 4 Amp-hour battery.

---

## Mounting the apC/L

Before you begin any installation, make sure the installation locations provide enough space for the apC/L, the card readers, and the necessary electrical conduit. Appendix A in this manual lists the system hardware dimensions.

Figure 3.1 gives the dimensions for mounting the apC/L board and the distance between mounting holes.

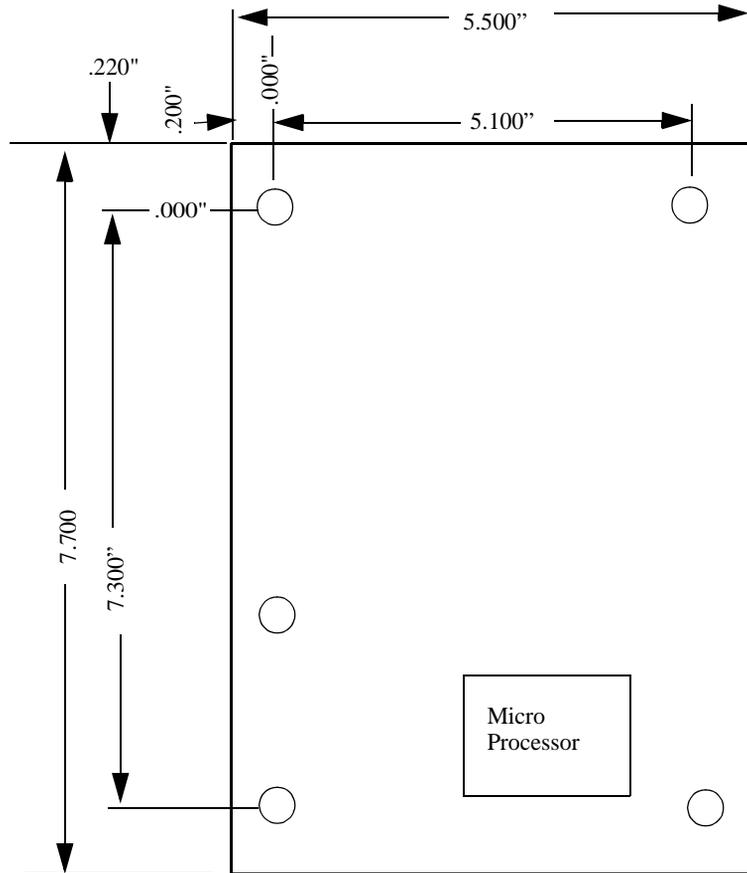


Figure 3.1 apC/L Mounting Specifications

## Connecting the apC/L Input Voltage

The apC/L is shipped with an external transformer. The Class-2 transformer is connected to the apC/L with the supplied cable assembly. The transformer will only accept 120 VAC, 60 Hz. The cable assembly consists of two Red and one Green wire. Connect the Red wires to the transformer connectors marked (AC). Connect the green wire to the middle connector marked (GND) then to P8 on the apC/L which is marked with an ~ for AC and a ground symbol for the ground connection.



### CAUTION

The output of the transformer is internally fused. Do not short the output of the transformer.

The AC input is fused with a 5A, AGC5 fuse; replace it only with a fuse of the same type and rating. Do not cut or remove the ground lug from the transformer.

## Connecting the Optional Backup Battery

The apC/L has a built-in battery charging circuit. A 4 Amp-hour battery and cable are supplied with the purchase of the battery back-up option. Connect the red lead of the cable to the positive (+) side of the battery and the black lead to the negative (-) side of the battery. Connect the other end of the battery cable to P9 on the apC/L which is marked positive (+) and negative (-).



### CAUTION

The battery output is fused with a 3A AGC3 fuse. For continued protection, replace with the same type and rating fuse.

## C H A P T E R 4

# 4

## Wiring Card Readers

This chapter gives detailed instructions for installing, mounting, and wiring a card reader with an RM-4 personality module. The chapter also describes how to install the Auxiliary Relay Module (ARM-1).

The only special tool required for wiring is a security screwdriver (#132-183), used to install the security screws in the RM series reader.

### In This Chapter

---

- Card Reader Configurations 4-3
- Reader Wiring Configurations 4-6
- Setting Up a Reader 4-9
- Installing the Auxiliary Relay Modules (ARM-1) 4-12
- Wiring Inputs to the RM 4-17
- RM-4 Personality Module with Third Party Reader 4-21
- MRM-4 Personality Module Reference Drawing 4-29
- Optional Heater Kits 4-31

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**Note** The RM reader must be wall mounted.

---



### **IMPORTANT**

Before you begin installation, read all the instructions in this chapter. Be sure to follow these precautions when handling any equipment:

Discharge your body's static electricity charge by touching a grounded surface.

Wear a grounding wrist strap and work on a grounded static protection mat.

Do not slide a component over any surface.

Do not touch any circuitry or connector pins on the circuit board.

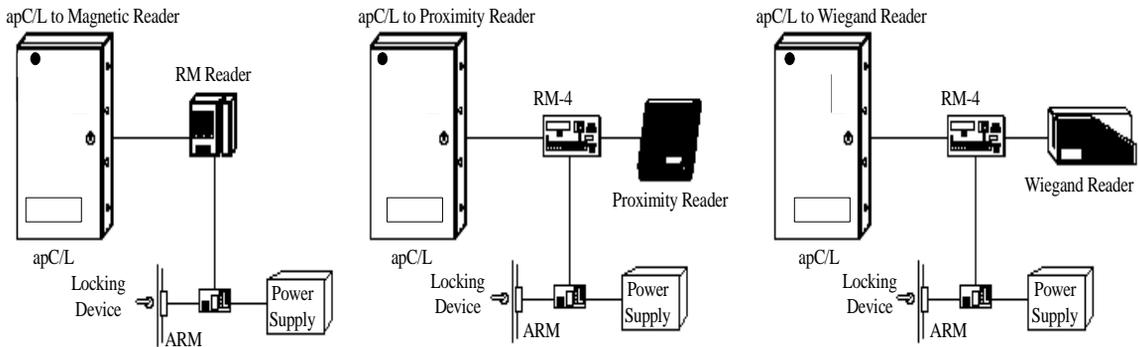
Limit your movements during the installation process to reduce static electricity.

# Card Reader Configurations

The apC/L supports several types of card readers. All of these readers connect to the apC/L reader ports via the RM-4 personality module.

- Devices which produce Wiegand output, including:
  - Wiegand card readers
  - Biometric devices
  - Bar code readers
- Proximity readers which produce Wiegand output, including:
  - Motorola/Indala one and two-stage
  - HID
  - Newmark Cryptag
  - Keri Systems
- Standard magnetic stripe readers
- Magnetic stripe mullion readers

Figure 4.1 shows sample wiring configurations for magnetic, proximity, and Wiegand card readers.

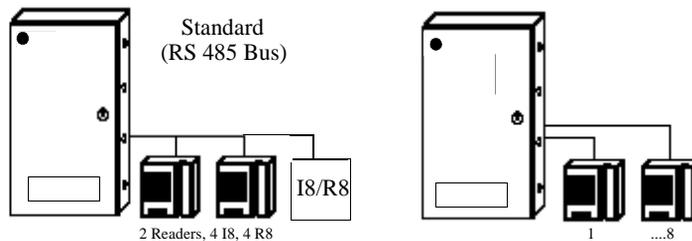


**Figure 4.1 Wiring Configurations with Personality Modules for Some Reader Types**

## Reader Wiring Configurations

You can wire RM readers in a multidrop or star configuration. A multidrop line uses an RS-485 bus to connect up to two readers and up to four I8 Input Modules and up to four R8 Output Modules to the apC/L reader port. See Figure 4.2 for an illustration.

The star configuration is the simplest way to connect readers to an apC/L. An RS-485 bus connects each single reader to its own port on the apC/L.



**Figure 4.2 Multidrop Configuration**

Although these two methods differ physically, they are the same electrically because Reader Ports A and B are actually tied together in the apC/L.

---

**Note** This also means that the maximum distance of 4,000 ft. from the last reader to the host is the combination of the distances for the two ports. It is not 4,000 ft. for each port.

---

**Multidrop Configuration** When connecting readers in a multidrop configuration, locate them no more than 3 ft. (0.91 meters) from the multidrop line.

See Appendix B for information about calculating this maximum distance and cable requirements for readers.

See Figure 4.3 for information on connecting the readers to the apC/L reader ports.

For information on *Star Configuration* connections, see “To connect readers to the apC/L in a star configuration:” on page 4-7.

---

**Note** Be careful to ensure that all pin numbers 1 are tied together on the reader bus. Reversing the +12V and ground will cause damage to the equipment.

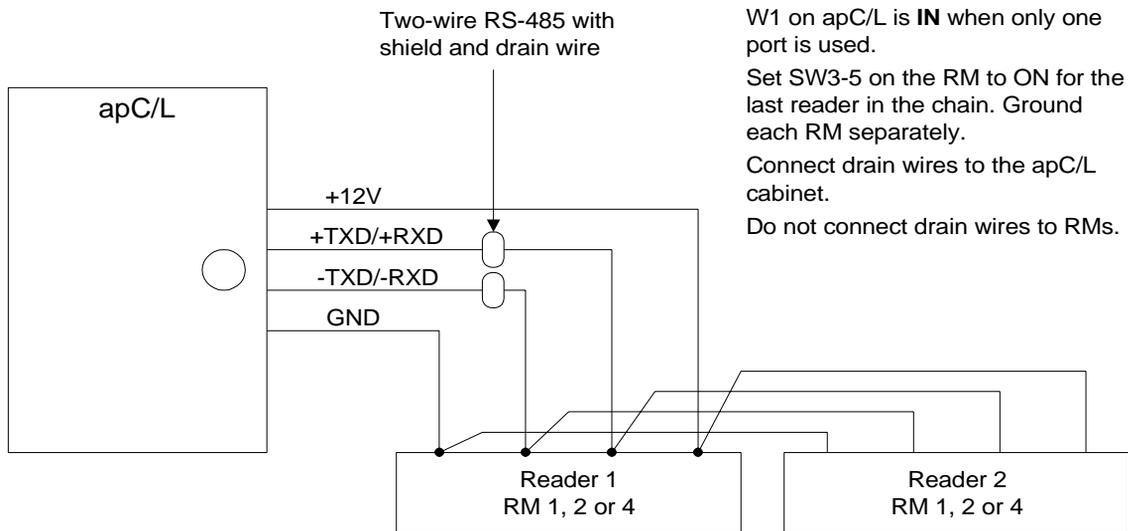
---

## Reader Wiring Configurations



### To connect readers to the apC/L in a multidrop configuration:

1. Connect the P1:1 connector of each reader to either RDR Port A or RDR Port B.
2. Connect the remaining pins in sequence.
3. Figure 4.3 shows the connections for a multidrop line configuration.
4. Wire the reader bus as in Figure 4.3; daisy-chain readers as needed.

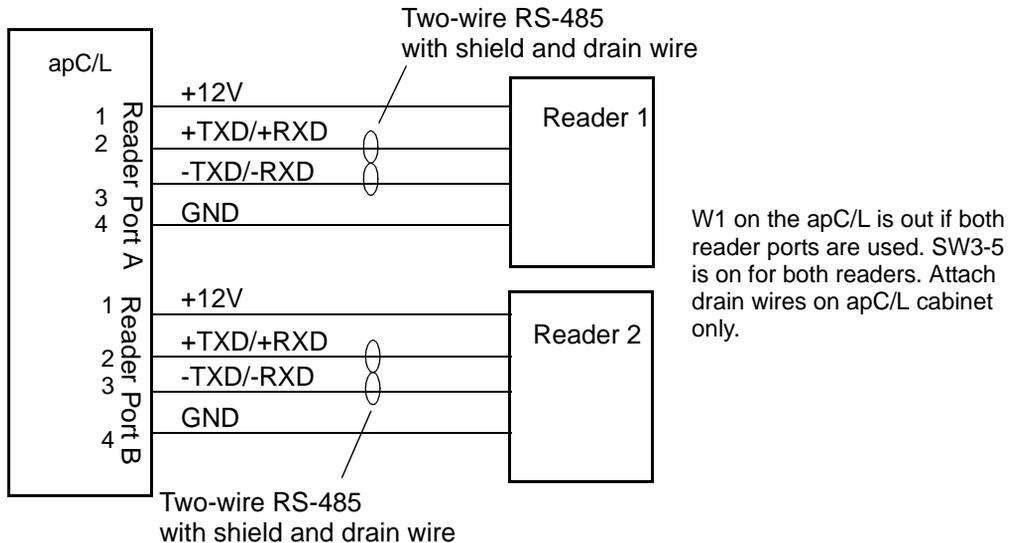


**Figure 4.3 Connecting Devices to the apC/L in a Multidrop Configuration**



**To connect readers to the apC/L in a star configuration:**

1. Follow Figure 4.4 to connect the apC/L in a star configuration with the maximum of two readers.

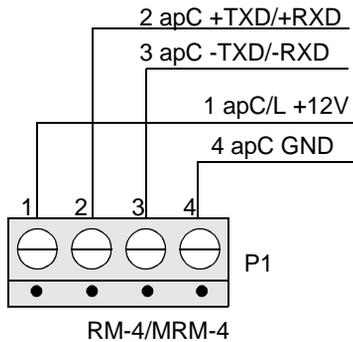


**Figure 4.4 Connecting the apC/L and Readers in a Star Configuration**

Table 4.1 shows the P1 apC/L reader port wiring (See Figure 4.5).

**Table 4.1 P1 apC/L Reader Port Wiring**

Pin	Signal
1	+12V
2	+TXD/RXD
3	-TXD/RXD
4	GND



**Data line to apC:** twisted pair, shielded 24AWG Belden #9841 (4000 ft. max)

**Power line to apC:** twisted pair, 18AWG (.902mm) Belden #8461 or 22AWG (.357mm) Belden #8442

**Note:** Failure to use proper cable types can cause reader failure or erratic behavior.

**Figure 4.5** Wiring for the apC/L Reader Port

## Setting Up a Reader

### Setting Reader Type for an RM-4 Personality Module

Set the reader type using DIP switch SW3-1 on the RM-4. If you are setting up a magstripe reader, set SW3-1 to the Open (Off) position. If you are connecting a Wiegand or proximity reader, set SW3-1 to Closed (On). If you are setting up the last reader on a multidrop line, set SW3-5 to On.

Use the information in the following table to set the reader type.

Reader Description	Switch Number	Switch Setting
Magnetic Stripe	SW3-1	Open (OFF)
Wiegand/Proximity	SW3-1	Closed (ON)

There are 5 other reader configuration switches. Table 4.2 indicates what each switch controls and how to set them for your site.

---

**Note** The RM must be powered off then back on for changes to take effect.

---

### Setting the Reader Address for an RM-4 or Personality Module

The SW1 switch determines the communication address for the readers.

---

**Note** On the RM personality module it is a 16-position rotary switch.

---

Each reader connected to an apC/L must use either 1 or 2 as its address. If SW1 is set to 0 or if SW1 is set between two address numbers, the red LED on the reader flashes rapidly when the reader is turned on. Use a screwdriver to turn the arrow on the switch to the desired address. The system reads the address switch setting after several seconds.

Setting SW1 to 9 starts a test program when the reader is turned on. This test is explained in Chapter 7.

**Table 4.2 SW3 Reader Configuration Switch Settings**

This Switch...	Controls...	When OFF (Open)	When ON (Closed)
SW3-1	Reader type	Magnetic stripe	Wiegand/proximity
SW3-2*	LCD	Present (RM2L only)	You do not have an LCD display
SW3-3: Set this switch ON when using external reader heads which have bi-colored LED's. Wire the green control wire to the green LED (J4-4) and the red control to the red LED (J4-2).	LED option	Normal	External bi-color
SW3-4	Tamper switch	Enabled	Disabled
SW3-5	End of line terminator	Not last	Last unit in line

**Table 4.2 SW3 Reader Configuration Switch Settings**

This Switch...	Controls...	When OFF (Open)	When ON (Closed)
SW3-6: Set this switch ON when mixing RM personality modules with the older MRM personality modules (typically retrofit installations). This provides for uniform LED operation throughout the installation as MRM's do not directly support external bi-color LED's. SW3-3 should be OFF when using this switch.	LED option	Normal	J4-3 pulses low when either the red or green LED is activated.

\*The improper setting of this switch may cause the reader to behave erratically.

## Installing the Auxiliary Relay Modules (ARM-1)



### IMPORTANT

Before handling and installing any component, follow these precautions:

Discharge your body's static electricity charge by touching a grounded surface.

Wear a grounding wrist strap and work on a grounded static protection mat.

Do not slide a component over any surface.

Do not touch any circuitry or connector pins on the circuit board.

Limit your movements during the installation process to reduce static electricity.

If you are not installing the ARM-1, continue to the next section, "Wiring Inputs to the RM" on page 4-17.

---

**Note** All strike relays **MUST** have a diode or MOV connected as described in this section. Figure 4.7 shows the diode used for a DC door strike, and Figure 4.8 shows the MOV used for an AC door strike. **DO NOT** exceed the contact ratings of the relay.

---

---

**Note** The ARM-1 (#131-912) uses a logic-driven signal from the RM-4 to drive a 12/24V relay for the door strike.

---

**To install the ARM-1:**

1. The ARM-1 is 1.7” by .75” (4.3 by 1.91 cm) in size. It is mounted inside the protected area no more than 25 ft. (7.6 m) from the RM.
2. Pull a twisted, shielded pair of 22 AWG (0.357 mm) Belden #9462 in between each ARM-1 and the reader personality module. The maximum length for this cable is 25 ft. (7.6 m).
3. Pull a twisted pair of wires between the ARM-1 and the associated relay controlled device.
4. With the shielded wire, connect pin 1 of P5 on the RM-4 module to Pin 1 of P2 on the ARM-1. Then connect Pin 2 of P5 on the RM-4 module to pin 2 of P2 on the ARM1.

You can connect a second ARM-1 to the RM-4. P5-1 on the RM-4 module is the common pin for either ARM-1. P5-2 is the output for the first ARM-1 and P5-3 is the output for the second. (Figure 4.6) See Figure 4.8 for the layout of connector P5.

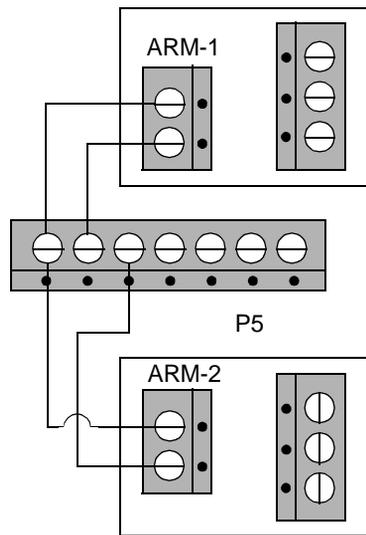
- Wire the ARM-1 to the RM-4 as follows:

ARM #1 - P2-1 to P5-1

P2-2 to P5-2

ARM #2 - P2-1 to P5-1

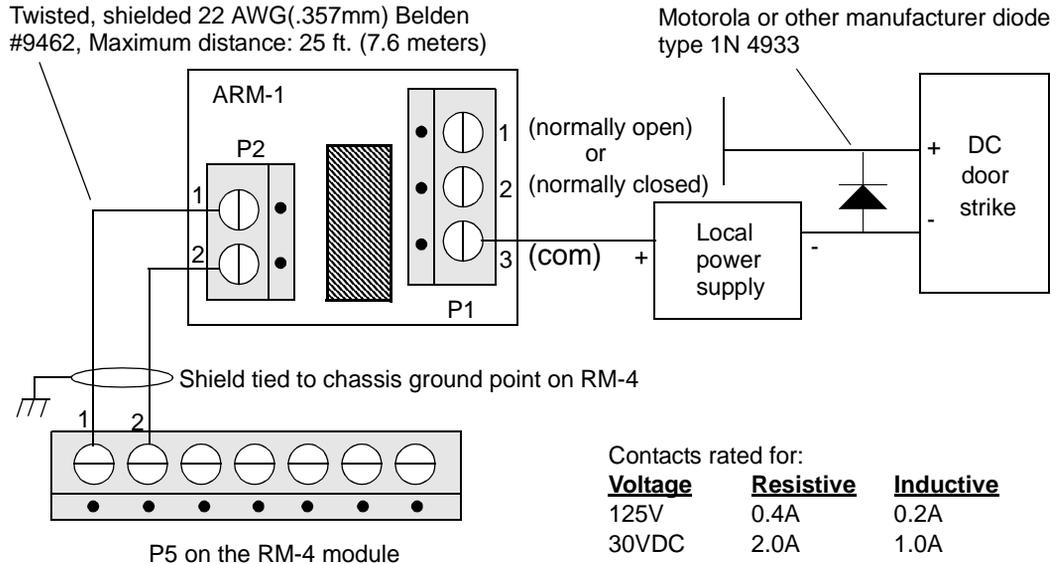
P2-2 to P5-3



**Figure 4.6 Connecting Two ARMs to an RM-4**

5. Connect the second twisted pair to the relay contact terminal connector (**COM** and **NO** or **NC**) as required for the controlled device. Connect the other end of the cable to the controlled device itself.
6. If the power supply is DC, install a diode (Motorola or other manufacturer #1N4933) across the door strike to suppress noise. The

cathode must be on the positive side of the strike. The ARM-1 wiring for an installation with DC power is shown in Figure 4.7.



**Figure 4.7 ARM-1 Wiring for DC Door Strike**

If the power supply is AC, install a varistor (World Products, Inc. #SNR-D56K2 or equivalent) across the door strike to suppress noise. Figure 4.8 shows the ARM-1 wiring for an installation with AC power.

---

**Note** The wiring for Relay Outputs is configured the same way as ARM-1

---

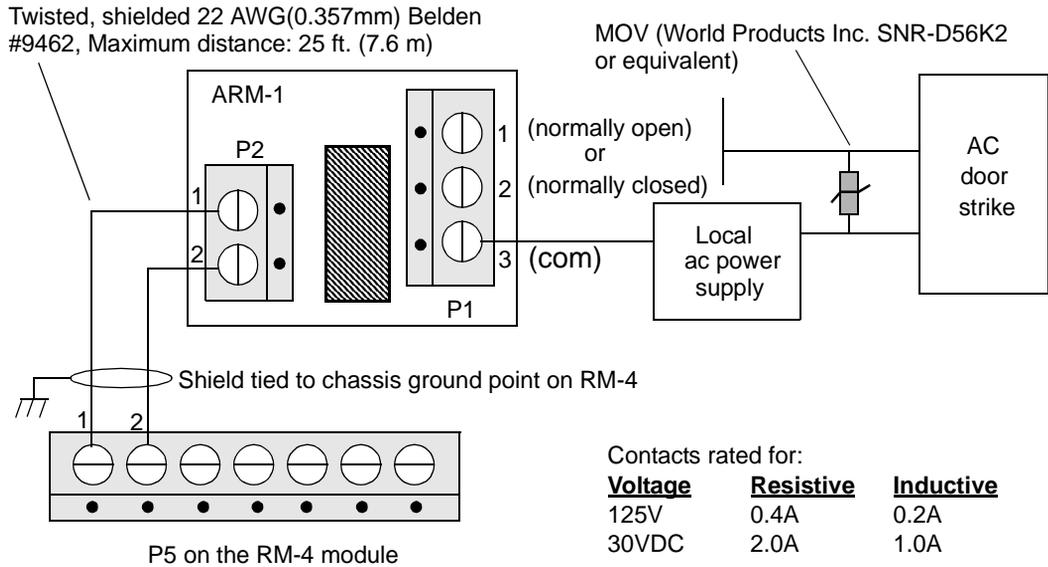


Figure 4.8 ARM-1 Wiring for AC Door Strike

## Wiring Inputs to the RM



### CAUTION

Improper grounding can result in reader failure or equipment damage. Follow all instructions for grounding to ensure successful operation of your readers.

All input switches can be located up to 2,000 ft. (609.6 m) from the main apC/L module.

Supervised inputs can be either normally open or normally closed.

Use twisted, 18 AWG (0.902 mm) Belden #8461 or twisted 22 AWG (0.357 mm) Belden #8442 to connect the input switches to the input pins. Place a piece of wire across the screw terminals of any unused active unsupervised inputs.

Other types of inputs are:

- Unsupervised inputs, which are normally closed
- AC power fail input, which is normally closed
- Front and rear tamper switches, which are normally closed



### To wire the RM to the apC/L:

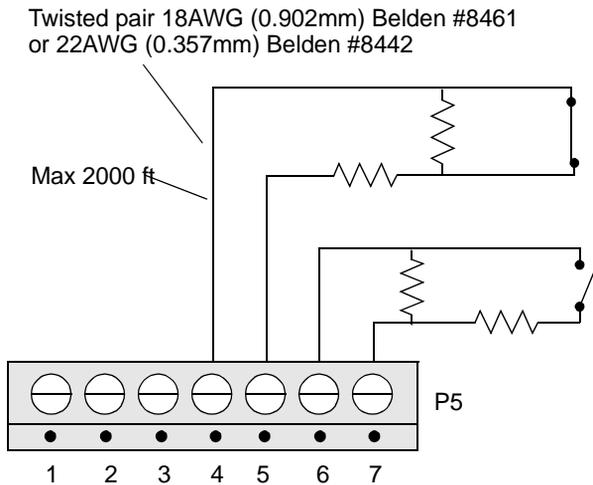
1. For the *data line*, pull a twisted shielded pair, 24 AWG Belden #9841 from the apC.

For the *power line*, pull a twisted pair, 18AWG (0.902 mm) Belden #8461 or 22AWG (0.357 mm) Belden #8442.



### CAUTION

See Appendix B of this manual to determine the maximum wire length for readers without an independent power source.



**Normally Closed (Door contact or Exit)**

Contact closed	=1K $\Omega$	=Secure
Contact open	=2K $\Omega$	=Alarm
Short circuit	<400 $\Omega$	=Trouble
Open circuit	>21K $\Omega$	=Trouble

**Normally Open (Door contact or Exit)**

Contact open	=1K $\Omega$	=Secure
Contact closed	=500 $\Omega$	=Alarm
Short circuit	<400 $\Omega$	=Trouble
Open circuit	>21K $\Omega$	=Trouble

**Note:** If the exit button or door contact is not used, place a 1K ohm resistor across the inputs.

**Figure 4.9 Request to Exit and Door Contact Wiring**

2. If ARMs are used, pull the positive and negative terminal wires. Each should be a shielded twisted pair Belden #9462 with a maximum length of 25 ft. (7.6 meters).
3. **Wiring standard Sensormatic readers**

Remove the reader backplate and feed the wires through the hole in the backplate.

**Wiring Mullion and Non-Sensormatic readers**

*On the RM:* Plug the reader's sensor wire connector into J3.

*On the MRM:* Plug the reader's sensor wire connector into P3.

These wires may be no longer than 25 feet for mullion and 500 feet for Wiegand readers. Do not run these lines near high voltage lines or motorized equipment (such as elevators or compressors).

---

**Note** Reader data lines and power lines must be separate pairs. Tie the drain wire for the data pair to the earth ground at the apC/L end only.

---

4. Connect the data wires to the pins on the personality module as follows:

Connect the apC/L +TXD/+RXD data wire to pin 2 of P1

Connect the apC/L -TXD/-RXD data wire to pin 3 of P1

Do not connect the drain wire at the RM or MRM

5. Connect the power wires to the pins on the personality module as follows. See Appendix B for information about calculating maximum wire lengths.

Connect the +12V power line to pin 1 of P1

Connect the ground wire to pin 4 of P1

6. If the *door monitor* input is not used, place a 1K ohm resistor across the unused contacts. To use the *door monitor* input, connect the door monitor wires to the pins on the personality module as shown in Figure 4.9.

*For an RM:*

Connect one lead to pin 4 of P5

Connect the other lead to pin 5 of P5

*For an MRM:*

Connect one lead to pin 8 of P5

Connect the other lead to pin 9 of P5

7. If the *exit push-button* input is not used, place a 1K ohm resistor across the unused contacts. To use the *door monitor* input, connect the exit push-button wires to the pins on the personality module as shown in Figure 4.9.

*For an RM:*

Connect one lead to pin 6 of P5

Connect the other lead to pin 7 of P5

*For an MRM:*

Connect one lead to pin 10 of P5

Connect the other lead to pin 11 of P5

**8.** Connect the reader leads as follows

*For an RM:*

Connect the keypad leads to pins 1-8 of J2. Not all readers use the keypad (J2) terminal

Connect the data leads to pins 1-6 of J3

Connect the LED leads to pins 1-4 of J4. Not all readers use the LED (J4) terminals

*For an MRM:*

Connect the keypad leads to pins 1-8 of P2. Not all readers use the keypad (J2) terminal

Connect the data leads to pins 1-5 of P3

Connect the LED leads to pins 1-4 of P4

---

**Note** Not all readers use the LED (J4) terminals.

---

## RM-4 Personality Module with Third Party Reader



### IMPORTANT

All circuit boards are sensitive to electrostatic discharge (ESD). Be careful when installing any board and use the appropriate precautions.

### The RM-4 Personality Module

The RM-4 personality module sets reader characteristics and provides connections to inputs, door strikes, and the apC/L. (See Figure 4.10.) When used with an ARM-1, card readers with an RM-4 personality module provide two supervised inputs and two outputs.

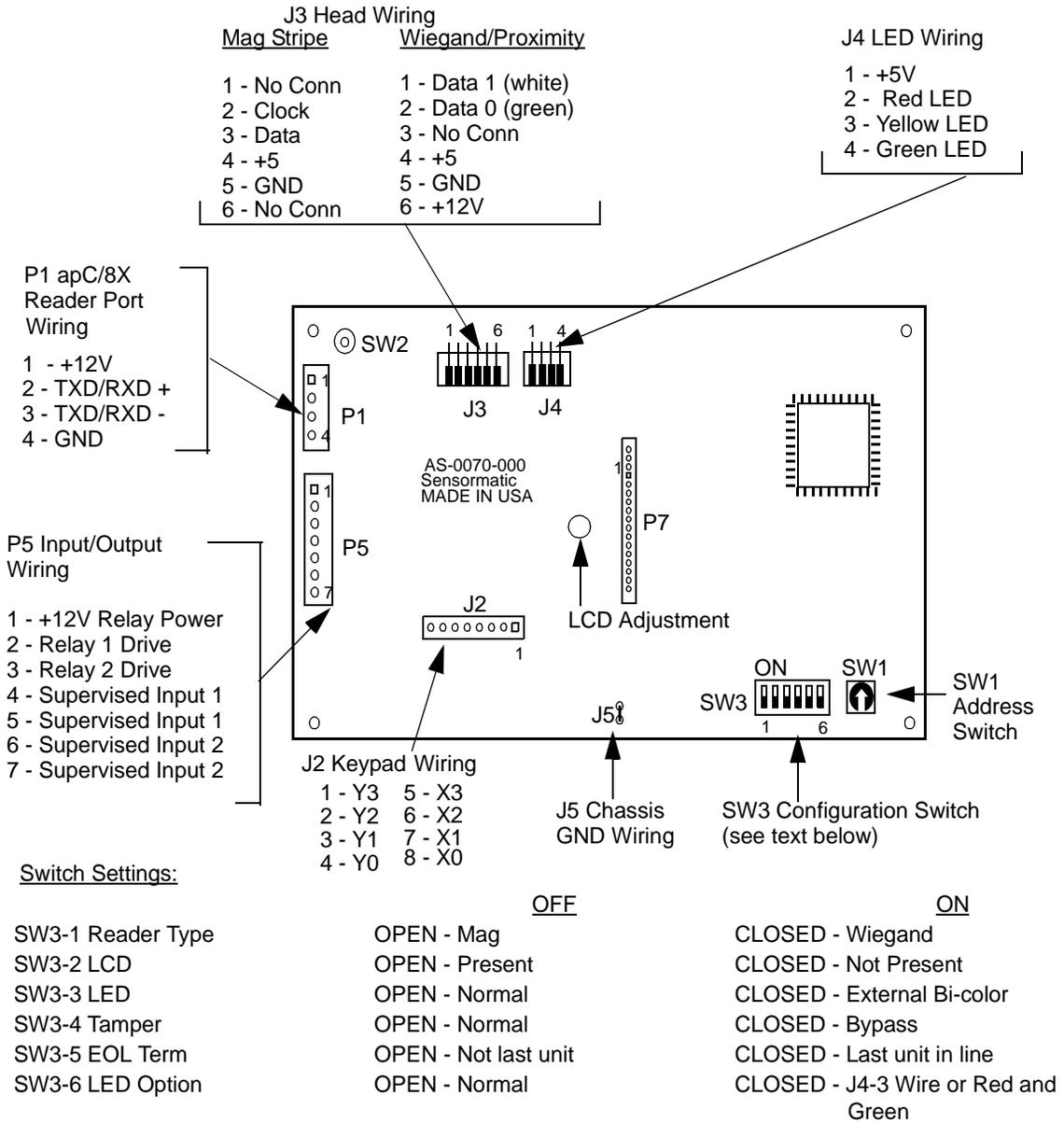


Figure 4.10 RM Personality Module

Tables 4.3 to 4.5 show the RM reader connector pinouts.

**Table 4.3 J4 LED Reader Wiring**

Pin	Signal
1	+5V
2	Red LED
3	Yellow LED
4	Green LED

**Table 4.4 J3 Read Head Wiring**

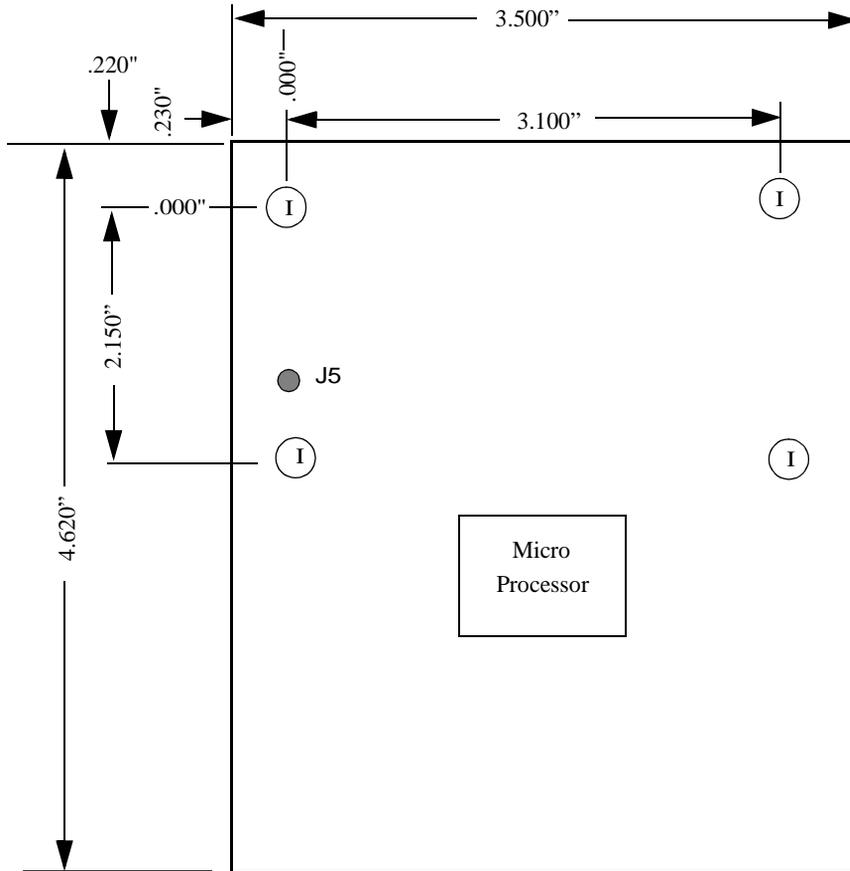
Pin	Mag Stripe	Wiegand/Proximity
1	Card Load	Data 1 (White)
2	Clock	Data 0 (Green)
3	Data	No connection
4	+5V	+5V
5	GND	GND
6	No connection	+12V

**Table 4.5 J2 Keypad Wiring**

Pin	Signal
1	C
2	B
3	A
4	
5	G
6	F
7	E
8	D

When you install the RM-4 personality module, make sure it is at least two feet away from any high voltage sources (such as computer monitors or power lines) or motorized equipment (such as elevators or compressors).

Figure 4.11 illustrates mounting specifications in inches for the RM-4 Personality Module.



**Legend - Hole Size**  
 I = .125"

**Figure 4.11 Mounting Specifications for the RM-4 Personality Module**



**To install the RM-4 module in the junction box:**

1. Insert metal standoffs (not supplied) in the module's screw holes and mount the module to the box.
2. Use 3/16" diameter round M/F 4-40 standoffs, with lengths appropriate to your installation. For example, Globe part #A-6701-440 is an acceptable 1/4" standoff.

---

**Note** Ensure that the mounting hole nearest the grounding lug (J5) of the RM-4 is grounded to a proper earth ground or ground directly to lug J5. See Figure 4.11.

---

## Installing the RM1 or RM2 Reader Assembly



**CAUTION**

Do not apply power to any equipment while it is being installed. Apply power only after all procedures in this chapter are completed, and the system is ready for testing. Failure to follow this warning could result in damage to equipment, personal injury, or death.



**To install reader assembly:**

1. Secure the reader backplate and gasket to the junction box with the four mounting screws.

When RM or MRM readers are installed outdoors, the foam gasket forms a weather seal.

2. Align all holes in the gasket with the holes in the backplate. Leave an equal amount of gasket overlap on all sides of the plate.

If the reader is located in a high-static area or if it is not connected to a grounded circuit, run a ground strap from the reader backplate to a local AC ground or cold water pipe. Use as short a wire as possible.

**CAUTION**

Outdoor readers **MUST** be installed in a vertical position to allow for proper drainage. Install a fitted gasket between the backing plate of these readers and the wall. Ensure that the “weep” holes in the bottom of the housing are unobstructed.

3. Hook the top of the reader over the top of the backplate, and press the reader firmly against it.
4. Use a security screwdriver (part #132-183) to install the two security screws in the bottom of the reader.

## Installing the RM-4 Personality Module

**To install a third-party reader:**

1. For non-Sensormatic Wiegand readers such as Sensor Readers, install the RM-4 in a grounded 6" x 4" (minimum) metal junction box no more than 25 feet from the read head.
2. Remove the knockout plugs from the junction box.
3. Install the box in the desired location, and attach the conduits.
4. Mount the RM-4 module using metal standoffs and screws.
5. Earth grounding the module is required to reduce electrical noise in the circuit. To ground the module to the box, either make a connection from lug J5 to earth ground or use a metal standoff and screw in the mounting hole next to C2 and V4 (the voltage regulator).
6. Make sure that the connection is continuous to the box. See Figure 4.10 for the location of the grounding lug J5.

**To install a magnetic stripe Mullion reader:**

1. Install the RM-4 for a magnetic stripe mullion reader RM-3 in a grounded, 6" x 4" (minimum) metal junction box no more than 10 feet (3.05 m) from the read head.

2. Install the box in the desired location and attach the conduits.

If you must install the module in the door frame instead, cut a hole in the mullion to accommodate the reader wiring, then install the reader backplate over the hole.

3. Mount the RM-4 module with screws and standoffs.
4. To ground the module to the box, either make a connection from lug J5 to earth ground or use a metal standoff and screw in the lower right mounting hole. Make sure that the connection is continuous to the box. See Figure 4.10 for the location of the grounding lug J5.

# MRM-4 Personality Module Reference Drawing

The MRM-4 personality module sets reader characteristics and provides connections to inputs, door strikes, and the apC/L. (See Figure 4.12.) This module is no longer offered and has been replaced by the RM-4. This diagram is for reference only.

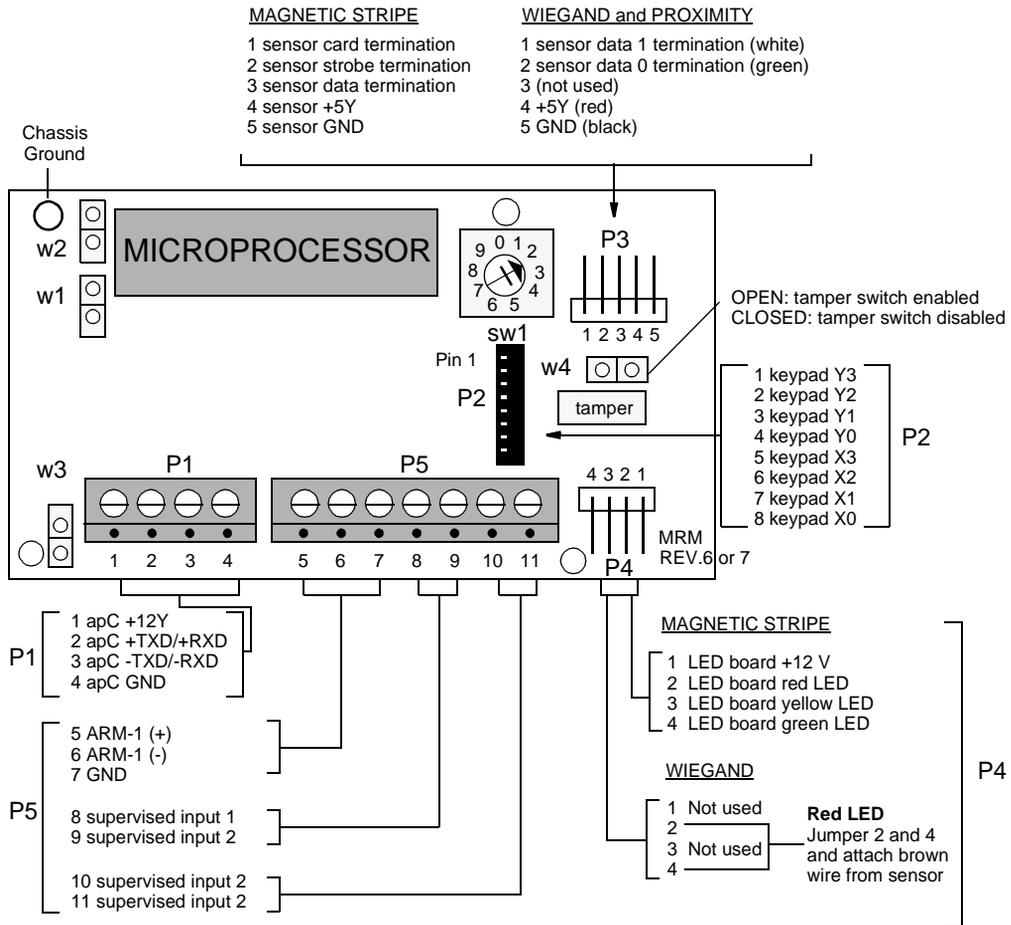


Figure 4.12 MRM-4 Personality Module

## Setting Reader Type for an MRM-4 Personality Module

Set the reader type using jumpers on the MRM-4. All readers have jumpers W1, W2, and W3. If you are setting up a magstripe reader, open W1 and W2. For Wiegand and proximity readers, close W1.

If the reader you are setting up is in a star configuration or is the last reader on a multidrop line, close W3. Leave W3 open if the reader is not the last one in a multidrop line.

## Optional Heater Kits

If the reader is installed outdoors, a thermostatically controlled heater (#130-915 or 130-915A) may be necessary. The 130-915 heater kit is supplied with a 12 V, 40VA transformer for operation on 110 VAC. The heater switches on at 40° F. Heater kits are available from Sensormatic.

- For non-Sensormatic readers

No heater is required and operating temperatures are specified by the manufacturer. The RM4 should be installed indoors.

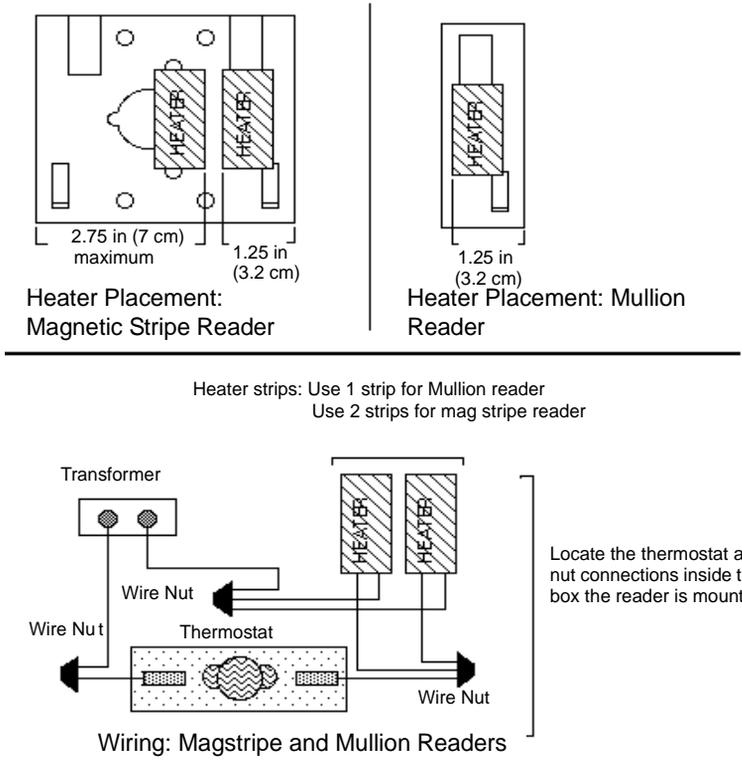
- For Standard RM series readers

The current draw for each strip is 1.25 A at 12V. Figure 4.13 illustrates heater placement for these readers.

---

**Note** Installation instructions are included with the reader kits.

---



**Figure 4.13 Heater Installation for Standard Magnetic Stripe and Mullion Readers**

## CHAPTER 5



# Input and Output Modules

This chapter describes the optional modules and how to wire them.

### In This Chapter

---

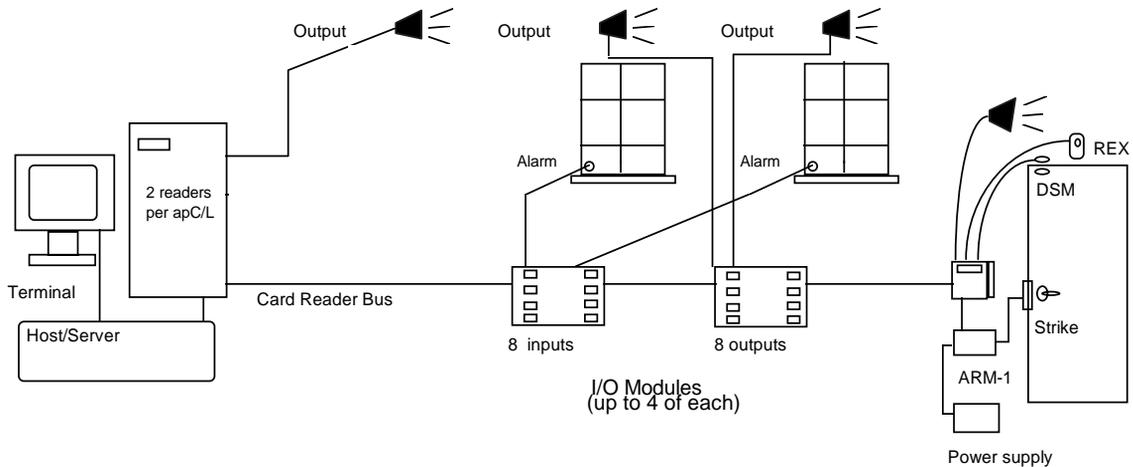
- The I8 Input Module 5-3
- R8 Output Module 5-5
- Installing Optional Modules 5-6
- Input/Output Number Map 5-6
- Setting Up Input/Output Module Addresses 5-6

The apC/L supports two optional modules:

- apC/L I8 Input Module (#AS0073-000)
- apC/L R8 Output Module (#AS0074-000)

The C•CURE 1 Plus, C•CURE 750 and C•CURE 800 systems all support these modules. Make sure that the apC/L firmware is at Version 10.3C or later.

Figure 5.1 shows how you might set up and wire your optional modules.

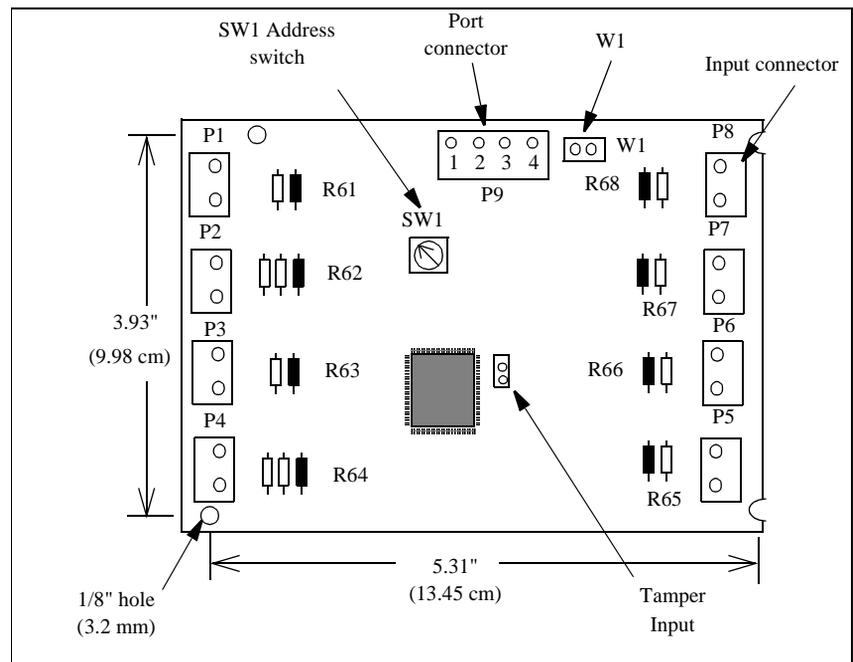


**Figure 5.1 Sample I/O Module Setup**

## The I8 Input Module

The apC/L I8 (also referred to as an *RM Input Module*), provides eight Class A supervised inputs. You can connect a total of four Input Modules to one apC/L. Input Modules connect directly to the RS-485 reader bus, which reduces wiring.

Figure 5.2 shows the layout of an Input Module.



**Figure 5.2** apC/L Input Module

All input switches can be located up to 2,000 ft. (609.6 meters) from the Input Module. Use twisted 18 AWG (0.902 mm) Belden #8461 or twisted 22 AWG (0.357) Belden #8442 to connect the input switches to the input pins.

If the unit is “last in line,” put in jumper W1. If the unit is not “last in line,” put in jumper W1 or one or the pins.

All supervised inputs on the I8 Input Module are terminated with on-board 1K ohm resistors. These resistors stand off the module approximately 0.25". Before you use the associated input, clip the resistor out completely.

---

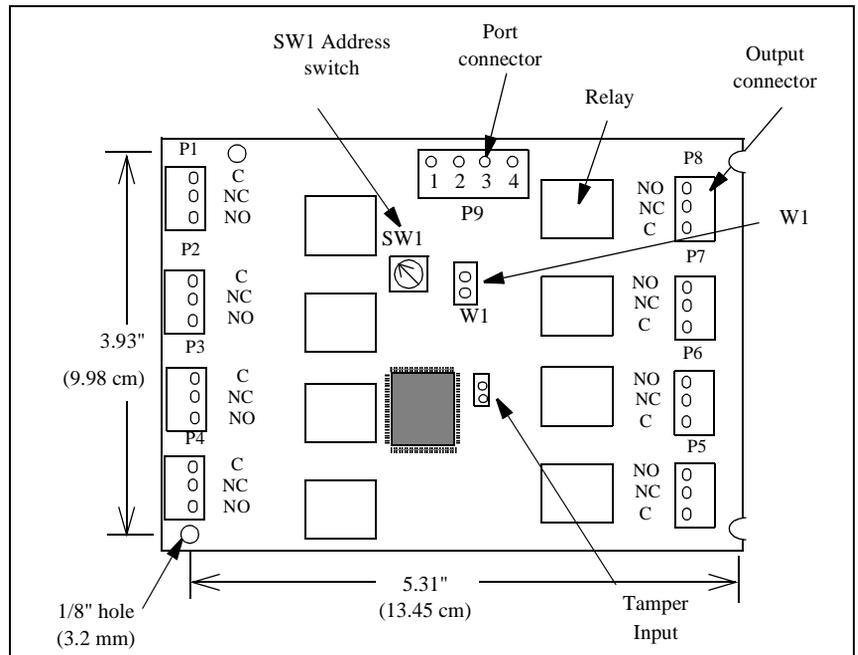
**Note** Do not use the standoff resistor as part of the supervised input wiring. For supervised inputs, the resistors should be as close as possible to the input switch.

---

## R8 Output Module

The apC/L R8 Output Module (also referred to as the *RM Output Module*), provides eight outputs. You can install a total of four Output Modules on one apC/L. Like the Input Module, Output Modules connect directly to the RS-485 line for the reader, which reduces wiring.

Figure 5.3 shows the layout of an Output Module.



**Figure 5.3** apC/L Output Module



### CAUTION

Maximum relay contact voltage on the output module is 30V - AC or DC.

If the unit is “last in line,” put in jumper W1. If the unit is not “last in line,” put in jumper W1 or one or the pins.

## Installing Optional Modules

You install the optional modules on the reader bus, just as you would install a reader. The mounting slot in each corner serves as a connection for earth ground. For ESD considerations, make sure at least one corner is tied to earth ground.

## Input/Output Number Map

Numbering for inputs and outputs differs depending on which C•CURE system you are using. For a numbering map of these inputs and outputs, see Appendix E of this manual.

Every input device, including door contacts, request-to-exit, or standard monitoring equipment, has a unique input number determined by the Input module pins to which it connects. Input pins are located on the RM personality module and the Input Module.

## Setting Up Input/Output Module Addresses

For each Input or Output Module you use, you must configure an address. Different types of modules can have the same address, but the same type of module cannot have the same address.

Table 5.1 indicates how to set up addresses for the modules. Note that each device has a unique address from 1 to 4, and that an RM's address maps to the physical number of the module.

**Table 5.1 Available Address for RM Modules**

Device Type	Device Address			
RM Reader	1	2	-	-
Input Module	1	2	3	4
Output Module	1	2	3	4

## CHAPTER 6



# apC/L Panel Setup

This chapter describes how to set up the main apC/L panel.

### In This Chapter

---

- Setting Up the apC/L Panel 6-2
- Setting the Panel Address 6-14

## Setting Up the apC/L Panel

Setting up the apC/L panel involves setting the panel's jumpers and DIP switches.

Figure 6.1 shows the location of the apC/L's jumpers and switches.

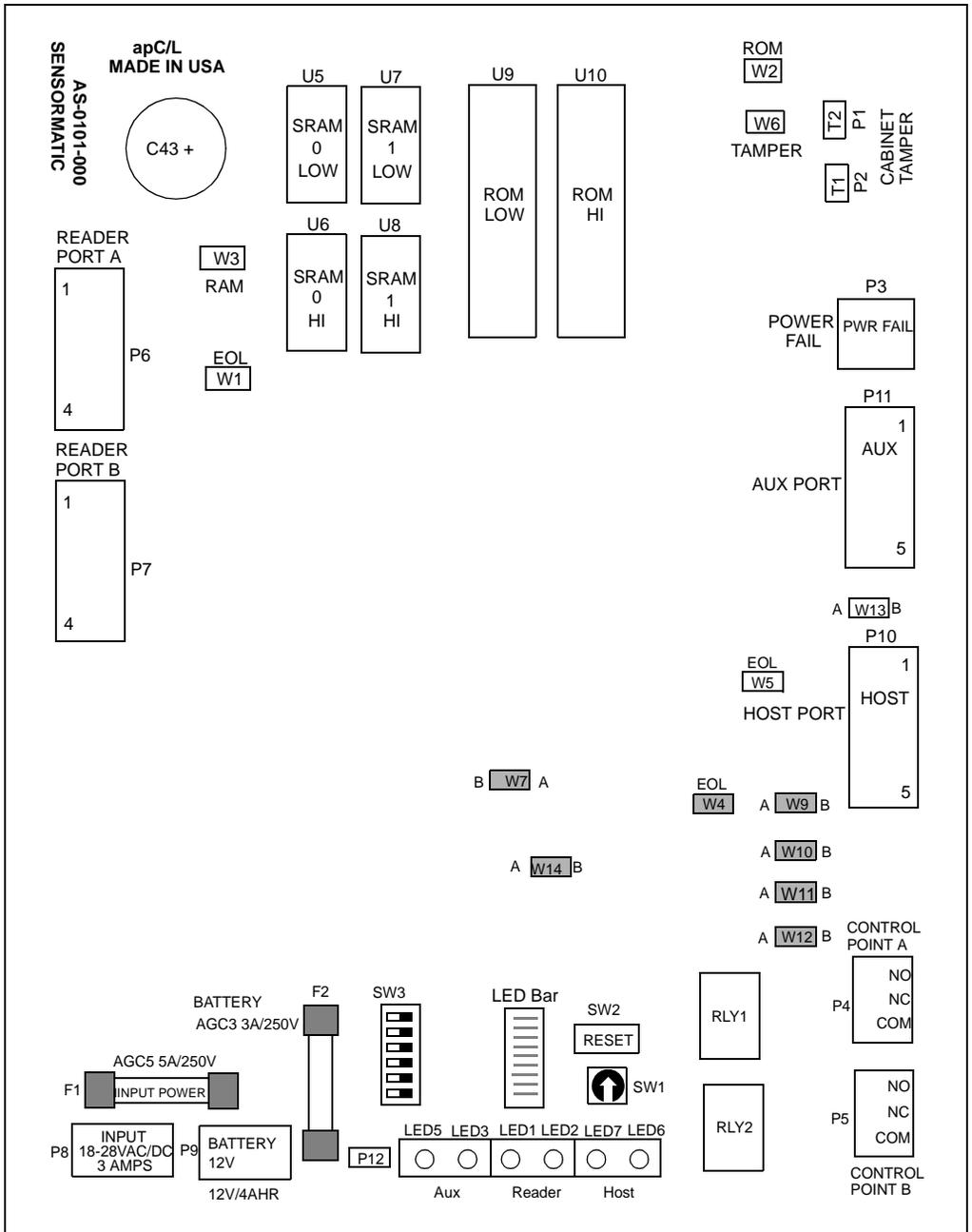
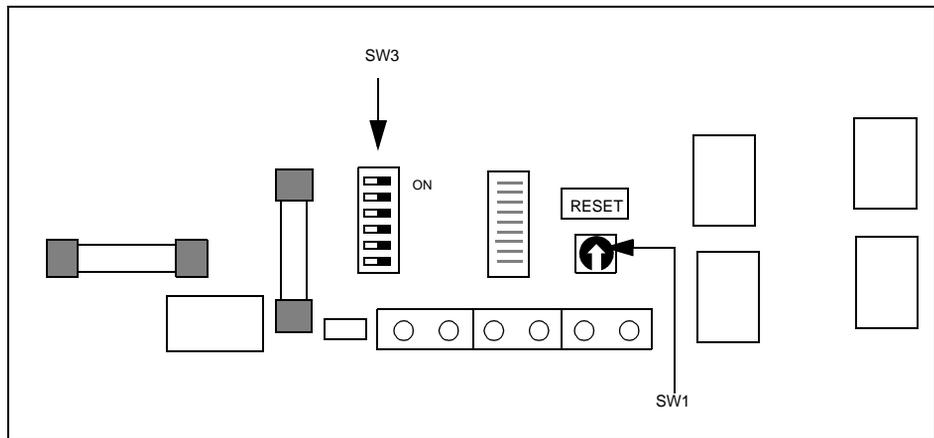


Figure 6.1 apC/L DIP Switch and Jumper Locations

## Setting the apC/L Switches

The bottom of the apC/L has one switch package labeled **SW3** and a rotary switch labeled **SW1**. (See Figure 6.2.)



**Figure 6.2 SW3 and SW1 Switches**

Use rotary switch SW1 to indicate the apC/L's unique address. You can set the SW1 rotary switch by using a screwdriver to turn the arrow to the number you want. You need to set SW3:8 correctly to indicate the address.

The SW3 DIP switch package contains eight switches with two positions: **ON** (or closed) and **OFF** (or open). For most installations, all switches should be in the **OFF** position.

The apC/L reads the SW3:2 switch (dialup mode enable) only when it is powered up with the SW3:1 switch set **ON**. Changes to the SW3:2 switch setting do not take effect until the next power up with SW3:1 set **ON**.

Table 6.1 lists the settings for the apC/L DIP switches. The following sections describe the switches and their function.

Table 6.1 apC/L DIP Switch Settings

Switch/Jumper	Setting	Default=*	System Feature
SW3:1	ON		Database cleared on power up and/or reset
	OFF	*	Database not cleared on power up and/or reset
SW3:2	ON		Dialup mode communication is enabled
	OFF	*	Dialup mode communication is disabled
SW3:3	ON		CTS is enabled (for 5-wire RS 232 applications)
	OFF	*	CTS is disabled
SW3:4	ON		Host parity none, 8 data bits, 1 stop bit
	OFF	*	Host parity even, 8 data bits, 1 stop bit
SW3:5-7			Host baud rate (see separate table later in this chapter)
SW3:8	ON		apC/L unit number 17 -32 etc. in use
	OFF		apC/L unit number 1 through 16 in use

---

**Note** Switch setting **OFF** is the factory default. If set to off, the switch is open. Switch setting **ON** means the switch is closed.

---

**SW3:1** If SW3:1 is set on, the database is cleared whenever the apC/L recovers from power loss or when the reset switch SW2 is pressed. This switch is used only during your initial database set-up. For normal operation, set the switch off.

---

**Note** When you are installing a new apC/L or an apC/L that has been unused for a period of time, power up with SW3:1 **ON** to clear the apC/L memory, then turn SW3:1 **OFF**.

---

**SW3:2** Switch 2 enables apC/L dialup communication mode. Set switch 2 **ON** to operate in dialup mode. Set it off to disable dialup communication.

**SW3:3** Enables Clear To Send (CTS) as an input for RS-232 when set to **ON**.

**SW3:4** Switch 4 sets the parity for communications with the computer or modem. Set it **ON** for no parity, **OFF** for even parity. Use even parity (**OFF**) with directly connected apC/Ls. For modem communications, including apC/L dialup mode, match the apC/L's parity to the host's parity. With either setting, the apC/L communicates 8-bit characters with one stop bit. Note that the apC/L and the host will not communicate if the host, the apC/L, and the modem parity settings are not the same.

**SW3:5-7** Switches 5 through 7 set the baud rate at which the apC/L communicates to the host computer and X.25 parameters. Set the baud rate to the highest rate compatible with the host. If the devices are far apart or if communications errors result, lower the baud rate. All apC/Ls in a chain must run at the same rate. If you are using a modem, set these switches to match the modem's baud rate. Baud rates and their corresponding switch settings are as follows:

---

**Note** The first 5 select the baud rate for direct connect or dialup communication. The last three select the baud rate for X.25 communications.

---

**Table 6.2 Baud Rate Settings**

Baud Rate	SW3:5	SW3:6	SW3:7
1200	ON	OFF	OFF
2400	OFF	ON	OFF
4800	ON	ON	OFF
19,200	OFF	OFF	ON
2400 x.25	ON	OFF	ON
4800 x.25	OFF	ON	ON
9600 x.25	ON	ON	ON
9600	OFF	OFF	OFF

**SW3:8** Unit Low-Address or Unit Hi-Address. When switch 8 is set **OFF** (Default), the unit switch (SW1) addresses the apC/L as units 1 through 16. When switch 8 is **ON**, the unit switch (SW1) addresses the apC/L as units 17 through 32.

## Setting apC/L Jumpers

The apC/L uses several jumpers. Some of these control communications features of the apC/L and they must be properly set for the apC/L to function. Most of the jumpers are two-post and are either open or closed. Some jumpers have three posts for an A or B setting. You can close section A or B of a three-post jumper, by installing a jumper housing between the center post and the A or B post.

See Figure 6.1 for the location of the jumpers on the apC/L and Table 6.3 for the settings of the apC/L jumpers and their function.

Table 6.3 apC/L Jumper Settings

Switch/Jumper	Setting	Default=*	System Feature
SW2	Push button		Push to reset the apC/L
W1	OPEN		Both reader Port A and reader Port B are in use
	CLOSED	*	Either Port A or Port B are in use
W2	A		4 Mbyte Flash/ EPROM
	B	*	27C512 through 2 Mbyte Flash/EPROM
W3	IN		512K x 8 SRAM (40K or 80K)
	OUT	*	128K x 8 SRAM (10K or 20K)
W4 - W5	OUT		Not the last unit in RS485 chain
	IN	*	Last unit in RS485 chain
W7	A	*	Normal system operation
	B		Do not use this setting
W8 (Rev. C circuit board only)	IN	*	Internal power fail enabled
	Out		External power fail enabled at P3
W9 - W14	A closed		apC/L communicates with host through RS-485 format
	B closed	*	apC/L communicates with host through RS-232C format

**W1 Reader Port A/B usage** When open, this jumper indicates that both reader ports are being used. Terminate each reader as an end-of-line reader. If you are using only the A or B reader, close jumper W1 and terminate the last reader in the chain.

**W2 EPROM size settings** Jumper W2 determines if the apC/L is equipped with EPROMs or Flash EPROMs up to 2 Mbyte in size or 4Mbyte EPROMs. When W2 is in the A position, 4 Mbyte EPROMS or FLASH are installed. When W2 is in the B position, EPROM or FLASH sizes from 512 Kbyte up to 2 Mbyte are installed.

Leave these settings in the factory default position.

**W3 SRAM Size** Jumper W3 determines the size of RAM installed on the apC/L. When W3 is in the IN position, 512 Kbyte SRAM is installed. When W3 is in the OUT position, 128 KByte SRAM is installed.

Leave these settings in the factory default position.

**W4 - W5** When jumpers W4 & W5 are in the OPEN position, the apC/L is not the last unit in a RS-485 multidrop line. When jumpers W4 & W5 are in the CLOSED position, the apC/L is the last unit on the RS-485 multidrop line.

**W6 Cabinet Tamper Override** Leave W6 open for normal operation. Closing W6 overrides the wall and door tamper switches. Close the jumper for diagnostic purposes only or when using the apC/L outside the apC/L cabinet.

**W7** Leave W7 in the A position for normal operation. The apC/L will not operate properly if W7 is not in the A position.

**W8** Jumper W8 is not implemented on the apC/L, circuit board Rev. A or B. On Rev. C boards, normal operation of the power fail condition while running with an internal battery backup is achieved with W8 installed. This condition disables the external power fail P3 connection (leave open). With W8 removed, P3 is enabled. A short across P3 indicates that the power is okay, while an open on P3 indicates a power fail condition.

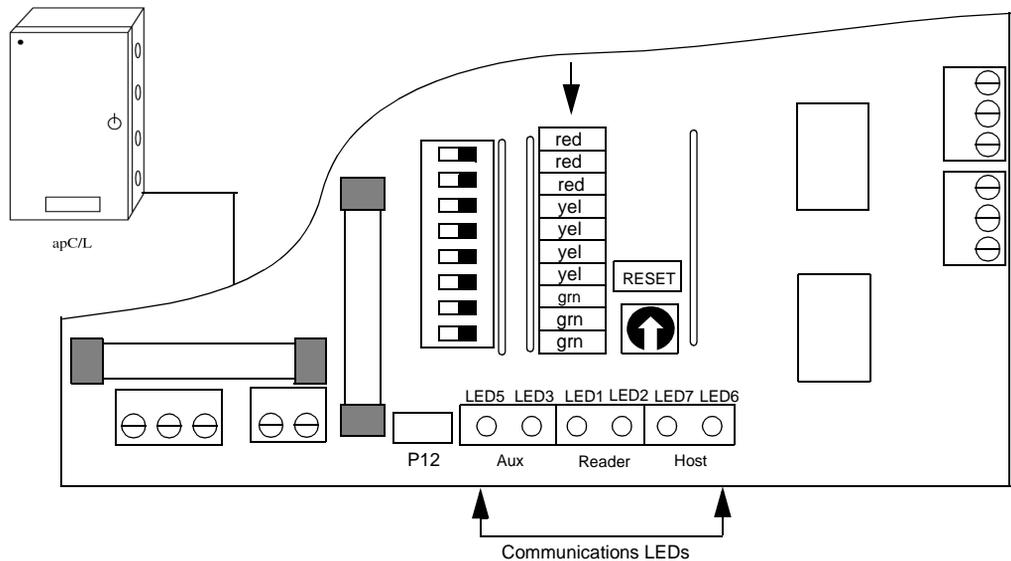
**W9 - W14 Host Port Communication Protocol** Jumpers W9 through W14 determine the type of transmission at the host port. Close the A section of W9 through W14 if the apC/L connects to the host through the RS-485 communications format. Close the B section of these jumpers if the apC/L connects to the host through RS-232C format.

## apC/L LEDs

The apC/L has several types of LEDs:

- Communications LEDs, which indicate when data is transmitted and received from the AUX port, host computer, or reader
- LED bar, which indicates various system status
- LED on the apC/L's cabinet door

**Communications LEDs** The communications LEDs are located at the bottom of the apC/L panel. (See Figure 6.3).



**Figure 6.3 Communications LED and LED Bar**

Table 6.4 lists the communications LEDs and what they mean.

**Table 6.4 apC/L Communications LEDs**

<b>LED</b>	<b>Indication</b>
Aux port, LED 5	AUX port receiving data when on
Aux port, LED 3	AUX port transmitting data when on
Reader port, LED 1	Receiving data from reader bus when on
Reader port, LED 2	Transmitting data to reader bus when on
Host port, LED 7	Receiving data from host when on
Host port, LED 6	Transmitting data to host when on

**LED Bar** The LED Bar is located above the communications LEDs. (See Figure 6.3).

Table 6.5 indicates the color of the LEDs in the bar, their state, and their meaning.

**Table 6.5 apC/L LED Bar**

LED	ON	OFF	Flashing
Red1	Reset/Fault	Normal operation	
Red2	Reader error; a configured reader or RM module is offline	Normal operation	
Red3	Reserved for system use	Normal operation	
Yellow1	DTR enabled for dialup and modem on hook	DTR disabled	DTR enabled for dialup and modem off hook. Direct connect will flash when apC/L transmits to host
Yellow2	DTR enabled but apC/L on hook with a modem that is not reporting as if it is online	Normal operation	
Yellow3	0.5 second flash when monitor point changes (online monitor point only)	Normal operation	
Yellow4	Offline from host	Normal operation	Message received from host
Green1	0.5 second flash while scanning monitor points	Hardware problem	
Green2	1 second flash during normal operation (program heartbeat)	Hardware problem	
Green3	Power on	Power off	

When Red3 and Yellow1 LEDs are both on, the flash ROM is being updated; all other LEDs except the power LED are off.

**LED on the apC/L cabinet** The single LED on the apC/L cabinet door can display three different colors, each signifying various states of the apC/L.

**Table 6.6 apC/L Door LED**

<b>LED Color</b>	<b>State</b>
Red	Reset Condition which is seen at initial power up or when you push the reset switch (SW2). If the LED cycles between yellow and red after power up, there is a problem with the unit.
Yellow	The unit has successfully completed its power up sequence, but is not yet on line with the host computer, or it has been on line but lost communication with the host computer. (The color yellow is a combination of the internal green and red LEDs and may appear to be a dull red color.)
Green	The unit is on line with the host.

## Setting the Panel Address

The SW1 switch on the apC/L is a 16-position rotary switch that determines the communication address for the panel when used with SW3:8, giving up to 32 addresses. SW3:8 must be set on or off to correctly determine the apC/L addresses.

Each panel must have a unique address. Assign address numbers to the panels using any convenient sequence, such as the order in which the panel are wired to the host.

---

**Note** The dialup panels cannot be set to communication address 0.

---

---

**Note** Table 6.7 on the next page applies only to the C•CURE 1 Plus Ultra and the C•CURE 750.

---

To determine an address, find the apC/L's address (set at the host) in Table 6.7. Turn the arrow on the switch to the number in the corresponding row of the SW1 Setting column of the following table.

**Table 6.7 Switch Settings**

SW1 Setting	Unit Number (SW3:8 OFF)	Unit Number (SW3:8 ON)
0	1	17
1	2	18
2	3	19
3	4	20
4	5	21
5	6	22
6	7	23
7	8	24
8	9	25
9	10	26
A	11	27
B	12	28
C	13	29
D	14	30
E	15	31
F	16	32

Use a screwdriver to turn the arrow on the switch to the desired address. The system reads the address switch setting after several seconds.

---

**Note** On the C•CURE 1 Plus Ultra and the C•CURE 750, do not configure unit address 1 for dialup or X.25 apC/Ls, since problems then arise when the apC/L makes a call to its host. Use only addresses 2-32 for these apC/Ls.

You can safely use unit address 1 for direct connect units. (Unit 1 is configured when SW1 is set to 0 and SW3:8 is off for the 1 Plus and 750).

---

## CHAPTER 7

# 7

# Testing the apC/L Installation

This chapter describes installation test procedures for the apC/L. Read the entire chapter before testing any apC/L component or reader. Follow instructions carefully.



### CAUTION

Do not connect readers while power is on. Connect all readers before you apply power to the system.

### In This Chapter

---

- Testing Readers 7-2
- Testing the apC/L Main Circuit Board 7-6

## Testing Readers

This section describes the test procedures for magnetic stripe and Wiegand readers. You can bench test readers by not connecting them to the apC/L. When you complete the test, reset the address switch to its original setting.



### To test a reader for normal operation:

1. Set the reader address switch to 9.
2. Power up the reader. (Use 12V DC from the apC/L or a regulated power supply.)

For standard RM-2 readers, the LEDs on the reader indicate whether the test procedure is successful. The next 17 steps describe each LED response. If your reader does not have a keypad, perform only Steps 17 and 18.

3. Press the 1 key. The red LED lights up.
4. Press the 1 key again. The red LED flashes slowly.
5. Press the 1 key again. The red LED flashes rapidly.
6. Press the 1 key again. The red LED goes out.
7. Press the 2 key. The amber LED lights up.
8. Press the 2 key again. The amber LED flashes slowly.
9. Press the 2 key again. The amber LED flashes rapidly.
10. Press the 2 key again. The amber LED goes out.
11. Press the 3 key. The green LED lights up.
12. Press the 3 key again. The green LED flashes slowly.
13. Press the 3 key again. The green LED flashes rapidly.
14. Press the 3 key again. The green LED goes out.

15. Press the 4 key. If an ARM-1 is connected, the relay should activate. Press the 4 key again to deactivate the relay.

---

**Note** Pressing the 4 key activates both relay outputs on an RM reader.

---

16. Press the 5 key to activate the card swipe test. The LEDs make no response when the key is pressed.

17. Swipe a card in the forward direction.

The green LED lights up for 2 seconds. If the red LED lights up, there is an error in the card read.

18. Swipe the card in the reverse direction. The amber LED lights up. If an error is read, the red LED lights up. This only applies to magnetic stripe readers.

19. Press the 6 key to test supervised input number 1. The LEDs indicate the following:

LED Response	Condition
Green LED lights	Input is in secure condition (1K)
Amber LED lights	Input is in alarm condition (500Ω)
Red LED lights	Input is in alarm condition (2K)
Amber LED flashes slowly	Input is left open (open)
Red LED flashes rapidly	Input is shorted (shorted)

---

**Note** Use resistors across the inputs to simulate the conditions listed in the previous table.

---

20. Press the 7 key to test supervised input number 2. The LED response indicates the conditions listed in the previous table.
21. Press the 8 key to test the tamper switch. If the tamper switch is depressed, the red LED is off. When the switch is released, the red LED lights up.

## RM LEDs

Each RM reader has three LEDs: red, green, and amber. The various conditions indicated by these LEDs are described in Table 7.1.

**Table 7.1 Reader LED Indications**

Red LED	Amber	Green	Indication
Brief flash	Brief flash	Brief flash	Power up
Off	Off	Off	Online (software flag enabled)
Off	On	Off	Online
On	Off	Off	Offline or reader tamper
Solid for 1 sec.	Off	Off	Access denied
Fast flash for 2 sec.	Off	Off	Access denied (Software Flag Enabled)
Off	Off	On	Access granted or door unlocked (Software Flag Enabled)
Off	Off	Fast flash	Access granted
Off	Off	Slow flash	Door unlocked
Off	Slow flash	Off	Enter second card (escorted access only)
Off	Fast flash	Off	Enter PIN
Off	Fast flash	Off	Enter floor # (systems configured for elevator control only)

**Table 7.1 Reader LED Indications**

<b>Red LED</b>	<b>Amber</b>	<b>Green</b>	<b>Indication</b>
Flash w/ each key press	Off	Flash w/ each key press	Keypad input
Slow flash	Off	Off	Reader not configured
Fast flash	Fast flash	Fast flash	Alarm: door forced/held open
On	On	On	Error condition: Remove power to prevent damage to RM

### **Non-Sensormatic Readers**

Swipe a card in the forward direction. The red LED on the reader lights up. If you have questions regarding testing non-Sensormatic readers, contact Sensormatic Customer Support Center for assistance.

## Testing the apC/L Main Circuit Board

Disconnect the apC/L from the host when you test it. The LEDs on the apC/L main circuit board indicate whether the board is functioning properly.



### To test the main circuit board:

1. Remove power from the apC/L and disconnect the reader wiring.
2. Apply power to the apC/L.
3. About one second after turning on power, the top RED LED on the LED BAR turns ON for approximately one-half second.
4. RED1 goes OFF, and the other nine LEDs turn ON.
5. After a delay of approximately 5 seconds, the LED BAR cycles from RED2 through YELLOW2. If larger memory options are installed, the other LEDs turn on, indicating a memory test.
6. GREEN3 remains ON, GREEN2 flashes every second, GREEN1 flashes every 1/2 second, and YELLOW4 remains ON.
7. Reader Data LED1 at the bottom of main board should flash rapidly about every three seconds. This indicates that the apC/L is attempting to poll a reader.

If the test procedure does not complete all of the preceding steps, contact Sensormatic Customer Support.

## APPENDIX A



# Equipment Specifications

### In This Appendix

---

- Operating Environment A-2
- Equipment Dimensions and Weights A-2

## Operating Environment

**Power consumption:** Less than 10 Watts typical

**Temperature range:** 32 deg F to 158 deg F (0 deg C to 70 deg C)

**Temperature Range with optional battery backup:**

32 deg F to 122 deg F (0 deg C to 50 deg C)

## Equipment Dimensions and Weights

Unit	Height	Depth	Width	Weight
ARM-1	1.7 in. (4.3 cm)	.53 in (1.3 cm)	0.75 in (1.91 cm)	1 oz. (.03 kg)
apC/L w/Cabinet	14 in. (25.56 cm)	3.24 in. (8.26 cm)	8.0 in. (20.32 cm)	8.25 lb. (3.71 kg)  12 lb. with optional battery backup (5.4 kg)
Reader module RM-4	4.65 in. (11.81 cm)	0.6 in. (1.5 cm)	3.55 in. (9.02 cm)	9 oz. (252 g)
Magnetic stripe reader (RM-1, RM-2)	5.10 in. (12.95 cm)	1.95 in. (4.95 cm)	5.6 in. (14.22 cm)	21 oz. (588 g)
Mullion reader (RM-3)	5.10 in. (12.95 cm)	1.81 in. (4.6 cm)	1.91 in. (4.85 cm)	10 oz. (280 g)

## APPENDIX B

# B

# Calculating Maximum Wiring Lengths

### In This Appendix

---

- Voltage Power B-2
- Using the Worksheet B-3

## Voltage Power

The RM-4 must have voltage of at least 7.5 volts to operate properly. While the apC/L supplies 12 volts at its connectors, the amount of power that actually reaches each RM-4 in a chain is less than 12 volts. The voltage is lowered by each reader and by the resistance of the wire. Whether an RM-4 or Input/Output module chain needs a local power supply depends on **all** of the following factors:

- Number of readers and Input/Output in the chain
- Distance between the first RM-4 board and the apC/L
- Distance between the readers in the chain
- Wire gauge used to connect the readers and the apC/L

This guide gives you a way to determine the maximum wire lengths you can use in a particular chain. The appendix also gives you a worksheet for determining power in a chain. Be sure you read and understand the instructions and the examples before you begin to calculate the maximum wiring lengths for your application.

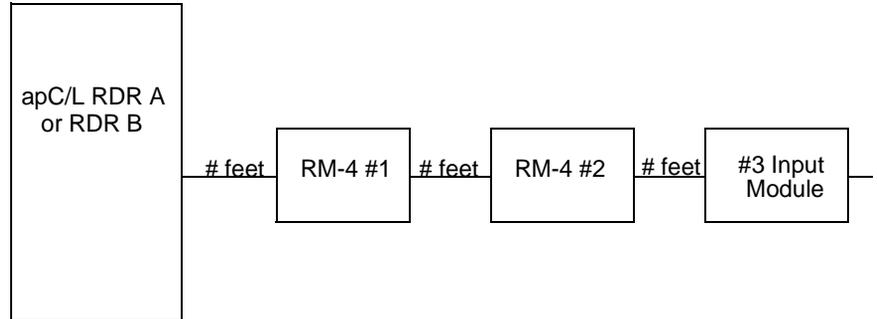
## Using the Worksheet

Use this worksheet to determine whether the readers in your layout fall within the allowable wiring length range. To use the worksheet, you need to know the type of wire used to connect the RMs or Input or Output modules to the apC/L and the distances between each element of the chain.



### To determine wiring length range:

- Fill in the blanks in the figure with the wiring distances between the apC/L and the first device and between each of the following devices. If you estimate the distances, be sure to overestimate, rather than underestimate. Use only the spaces corresponding to the RMs you have.



- In the following table, find the wire resistance (ohms per foot) for the type of wire you are using.

Wire Type	Resistance (ohms per foot)
18 AWG	0.01277
22 AWG	0.03227

- Write the resistance value from step 2 in each box of the Wire resistance per foot column in the wire length worksheet shown in Table B.1.
- On the worksheet, find the intersection of the Wire length (ft) column and the row corresponding to the total number of devices in the chain. In that box, enter the distance between the apC/L and the first reader. Check the diagram in step one for the distances.

5. In each of the boxes in the wire length column below the box used in step 4, enter the wire lengths between the readers in the chain. Use only the rows corresponding to your number of readers. You will not use all rows unless you have two readers and four input and four output modules.
6. Multiply the figures across in each row. Enter the result in each box of the Total power drop column.
7. Add the Total voltage drop column. The total cannot exceed 4.5 volts. If your total is greater than 4.5 volts, you must do one of the following to ensure proper operation of the RM module:

Shorten the wire lengths

Use a heavier wire

Use a local power supply

Table B.1 Wire Length Worksheet

RM # or Input/output module	Current drawn by module	Wire resistance per ft.	Wire length from previous reader	Total voltage drop of this reader
10	X 0.2	X		
9	X 0.2			
8	X 0.2			
7	X 0.2			
6	X 0.2			
5	X 0.2			
4	X 0.2			
3	X 0.2			
2	X 0.2	X	X	=
1	X 0.2	X	X	=
	Total Voltage drop for the chain of readers:			

### Example calculation Using the Worksheet

This example shows you how to use the worksheet to make sure that your RMs have adequate power. Suppose your installation uses 18 AWG wire to connect two RMs to the apC/L. The first RM is 250 ft. from the apC/L. The second RM is 500 ft. from the first. This is the same layout described in the previous example using the wiring length tables.



**To perform the example calculation:**

1. Enter the wiring lengths in the blanks in the worksheet. Note that not all spaces are filled in.

**Table B.2 Sample Worksheet**

RM # or Input/output module	Current drawn by module	Wire resistance per ft.	Wire length from previous reader	Total voltage drop of this reader
2	X 0.2	X 0.01277	X 250 =	1.277
1	X 0.2	X 0.01277	X 500 =	1.277
Total Voltage drop for the chain of readers:				2.544

2. The wire resistance per foot for 18 AWG wire is 0.01277 ohm per foot.
3. The total voltage drop for this chain is 2.544. Since this is less than the 4.5 maximum, the wiring is adequate for this installation.

## A P P E N D I X C



# Packing and Shipping the apC/L

This appendix contains instructions for packing an apC/L unit and shipping it in for repair. Before shipping the unit, call Sensormatic Material Support Center at 1-781-466-6660 to get a Return Authorization Number.

---

**Note** You must get a Return Authorization Number from Material Support Center before returning an apC/L unit. Parcels that are not marked with a Return Authorization Number will be refused at the factory and returned to you C.O.D.

---

When you call the Material Support Center, please have available:

- A complete description of your reason for returning the equipment.
- The apC/L unit's serial number and part number. This is located on the inside door template.
- A purchase order number to cover any non-warranty repairs even if the unit is under warranty.

Always ship the apC/L unit in the specially designed box and unique packing material in which you received it.



#### **CAUTION**

The printed circuit boards inside the apC/L units may be damaged by static electricity. When handling circuit boards:

- Make sure your work area is static safeguarded.

Transport all apC/L components in static shield containers.

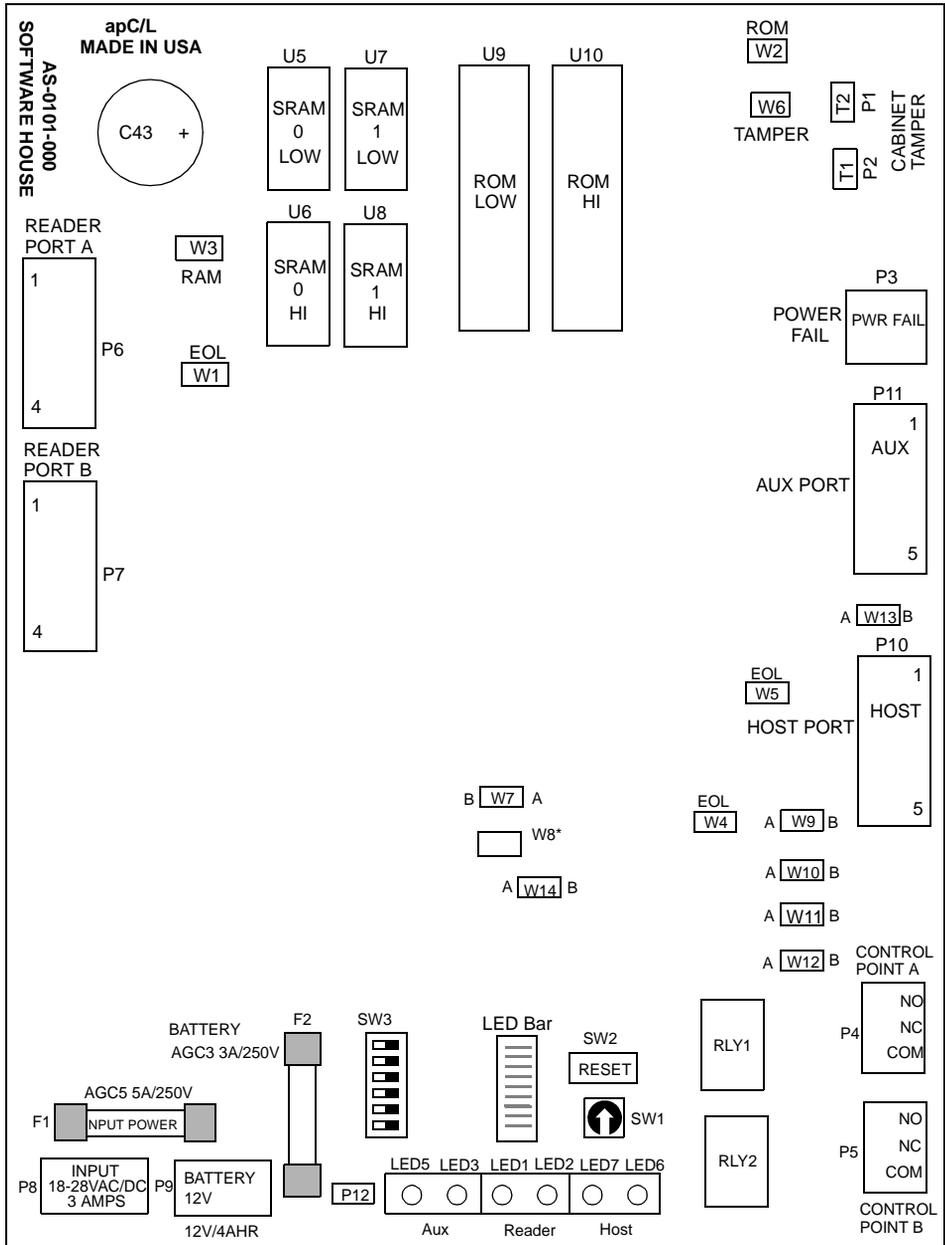
Pack the unit carefully to avoid damage in transit, and make sure each package is marked with the Return Authorization Number assigned to you by the Customer Support Center. Reference this number in all further communications about the returned equipment.

## A P P E N D I X   D



# Templates and Technical Drawings

This appendix contains the template for the apC/L board showing the location of all jumpers, switches, and major components. The appendix also contains a template of the Input and Output Modules.



\* Rev. C PCB only

Figure D.1 apC/L Template

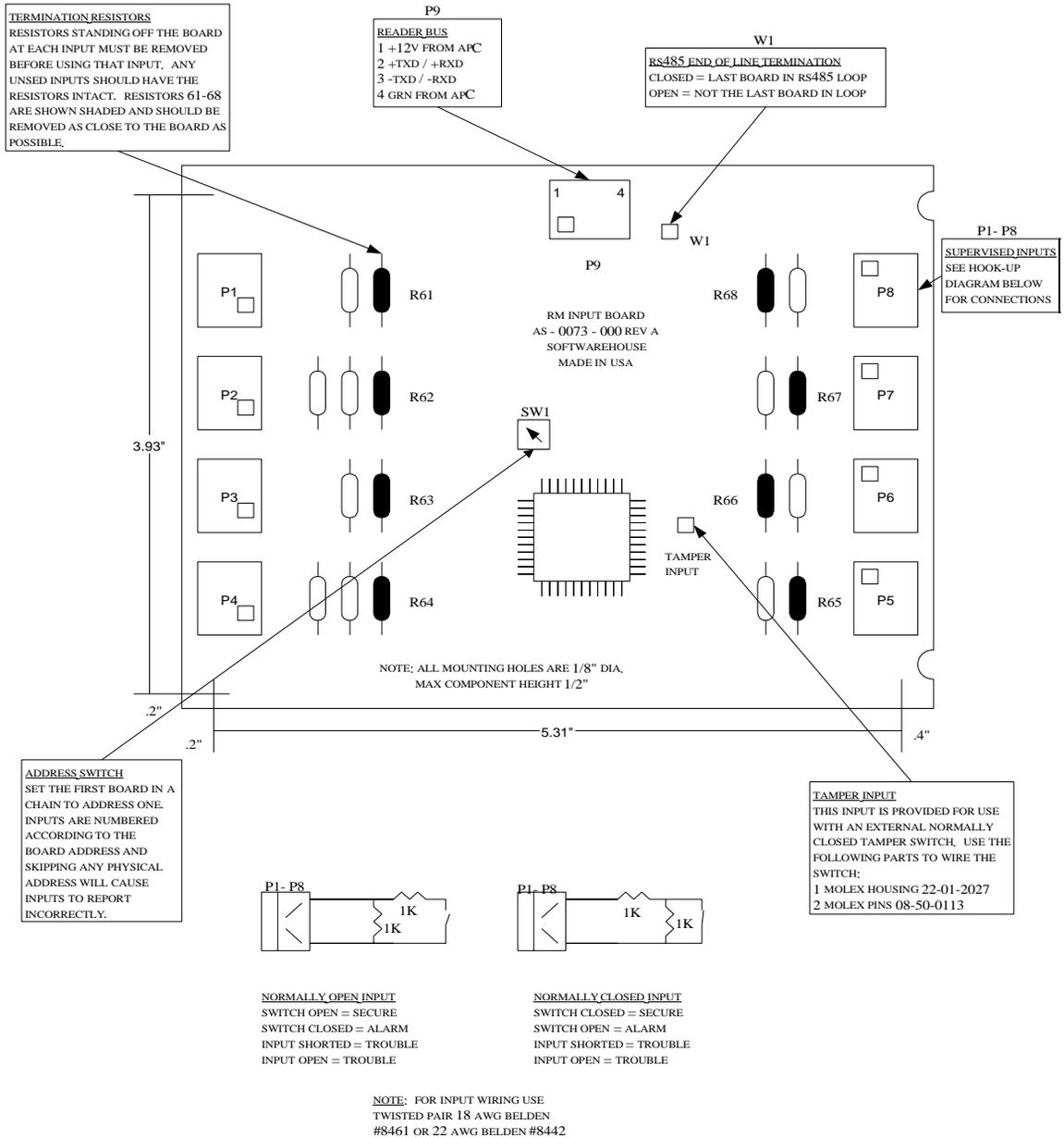
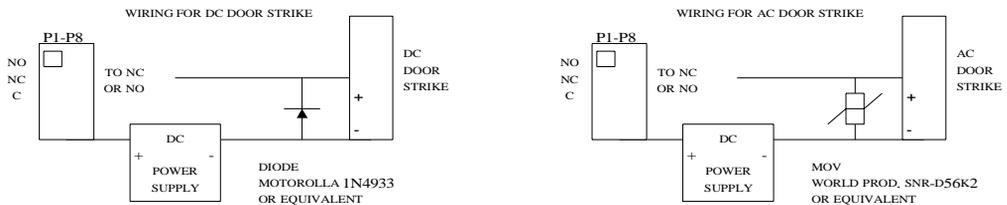
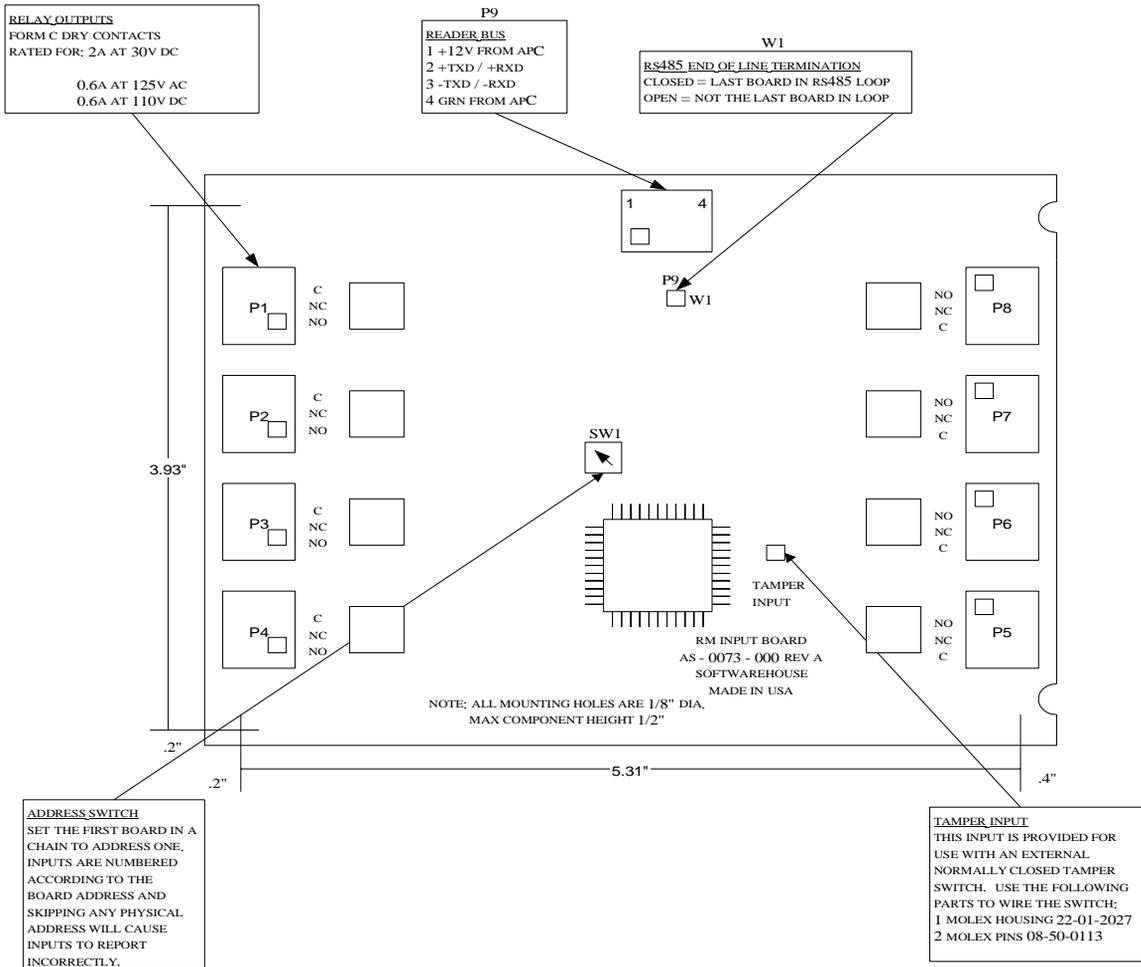


Figure D.2 RM Input Module



NOTE: LOCATE DIODE OR MOV AS CLOSE TO STRIKE AS POSSIBLE

Figure D.3 RM Output Module

## APPENDIX E



# System Specific Information

### In This Appendix

---

- Input/Output Number System Specifications E-2
- Setting Software Switches E-6

# Input/Output Number System Specifications

Table E.1 describes the apC/L User Interface input/output numbering map used with the C•CURE 1 Plus or C•CURE 800 host.

**Table E.1 apC/L User Interface input/output numbering map for use with the C•CURE 1 Plus and C•CURE 800/8000**

Inputs	Count	Description	Outputs	Count	Description
Non-expander inputs:			Non-expander outputs:		
1	1	RM 1 supervised input 1	1	1	apC/L board output 1 P4
2	1	RM 1 supervised input 2	2	1	apC/L board output 2 P5
3	1	RM 2 supervised input 1	3	1	RM 1 ARM 1
4	1	RM 2 supervised input 2	4	1	RM 1 ARM 2
			5	1	RM/MRM 2 ARM 1
			6	1	RM 2 ARM 2
Expander Board Inputs:					
ex1-8	8	Input board 1, supervised	ex1-8	8	Output board 1
ex9-16	8	Input board 2, supervised	ex9-16	8	Output board 2
ex17-24	8	Input board 3, supervised	ex17-24	8	Output board 3
ex25-32	8	Input board 4, supervised	ex25-32	8	Output board 4

## apC/L Local Elevator Floor

apC/L Local Elevator Floor to input/output map for C•CURE 1 Plus Hosted Systems (must be enabled with soft switches), requires firmware 10.2B or higher, 1+ V6.0J.

**Table E.2 apC/L Local Elevator Floor**

Inputs	Floor	Location	Output #	Floor #	Location
1	1	RM 1, input 1	1	1	apC/L board, output 1 P4
2	2	RM 1, input 2	2	2	apC/L board output 2 P5
3		RM 2, input 1	3		RM/MRM 1, ARM 1
4		RM 2, input 2	4		RM 1, ARM 2
exp 1	3	Input board 1, input 1	exp 1	3	Output board 1, output 1
exp 2	4	Input board 1, input 2	exp 2	4	Output board 1, output 2
exp 3	5	Input board 1, input 3	exp 3	5	Output board 1, output 3
exp 4	6	Input board 1, input 4	exp 4	6	Output board 1, output 4
exp 5	7	Input board 1, input 5	exp 5	7	Output board 1, output 5
exp 6	8	Input board 1, input 6	exp 6	8	Output board 1, output 6
exp 7	9	Input board 1, input 7	exp 7	9	Output board 1, output 7
exp 8	10	Input board 1, input 8	exp 8	10	Output board 1, output 8
exp 9	11	Input board 2, input 1	exp 9	11	Output board 2, output 1
exp 10	12	Input board 2, input 2	exp 10	12	Output board 2, output 2
exp 11	13	Input board 2, input 3	exp 11	13	Output board 2, output 3
exp 12	14	Input board 2, input 4	exp 12	14	Output board 2, output 4
exp 13	15	Input board 2, input 5	exp 13	15	Output board 2, output 5
exp 14	16	Input board 2, input 6	exp 14	16	Output board 2, output 6
exp 15	17	Input board 2, input 7	exp 15	17	Output board 2, output 7

**Table E.2 apC/L Local Elevator Floor**

<b>Inputs</b>	<b>Floor</b>	<b>Location</b>	<b>Output #</b>	<b>Floor #</b>	<b>Location</b>
exp 16	18	Input board 2, input 8	exp 16	18	Output board 2, output 8
exp 17	19	Input board 3, input 1	exp 17	19	Output board 3, output 1
exp 18	20	Input board 3, input 2	exp 18	20	Output board 3, output 2
exp 19	21	Input board 3, input 3	exp 19	21	Output board 3, output 3
exp 20	22	Input board 3, input 4	exp 20	22	Output board 3, output 4
exp 21	23	Input board 3, input 5	exp 21	23	Output board 3, output 5
exp 22	24	Input board 3, input 6	exp 22	24	Output board 3, output 6
exp 23	25	Input board 3, input 7	exp 23	25	Output board 3, output 7
exp 24	26	Input board 3, input 8	exp 24	26	Output board 3, output 8
exp 25	27	Input board 4, input 1	exp 25	27	Output board 4, output 1
exp 26	28	Input board 4, input 2	exp 26	28	Output board 4, output 2
exp 27	29	Input board 4, input 3	exp 27	29	Output board 4, output 3
exp 28	30	Input board 4, input 4	exp 28	30	Output board 4, output 4
exp 29	31	Input board 4, input 5	exp 29	31	Output board 4, output 5
exp 30	32	Input board 4, input 6	exp 30	32	Output board 4, output 6
exp 31	33	Input board 4, input 7	exp 31	33	Output board 4, output 7
exp 32	34	Input board 4, input 8	exp 32	34	Output board 4, output 8

**Table E.3 apC/L User Interface input/output numbering map for use with C•CURE 700/750 Host**

Inputs	Count	Description	Outputs	Count	Description
1	1	RM 1 supervised input 1	1	1	apC/L board output 1 P4
2	1	RM 1 supervised input 2	2	1	apC/L board output 2 P5
3	1	RM 2 supervised input 1	3	1	RM/MRM 1 ARM 1
4	1	RM 2 supervised input 2	4	1	RM 1 ARM 2
			5	1	RM/MRM 2 ARM 1
			6	1	RM 2 ARM 2
9-16	8	Input board 1, supervised	17-24	8	Output board 1
17-24	8	Input board 2, supervised	25-32	8	Output board 2
25-32	8	Input board 3, supervised	33-40	8	Output board 3
33-40	8	Input board 4, supervised	41-48	8	Output board 4

---

**Note** Input/Output board tamper and off-line reporting are not supported with C•CURE 700/750 Host.

---

## Setting Software Switches

Software switches extend the capabilities of the apC/L, allowing you to program functionality with the C•CURE system you are using.

### **C•CURE 1 Plus Ultra**

For elevator control, set Software Switches 11 and 12 to 1.

To enable second output on an RM reader, set Software Switch 8 to ON. This will disable the first RM 8 Output Module and allow the system to recognize the second RM output.

## A P P E N D I X F



# Modem Settings

An apC/L in dialup mode at a remote location connects to the host using standard, voice-grade telephone lines instead of hardwired or leased telephone lines. In many applications, dialup mode is more convenient and cheaper than other communications modes.

Sensormatic Access Control Division has identified a special OEM modem for dialup and lease-line applications. This modem has been manufactured to Sensormatic ACD specifications to guarantee optimal performance when used with the C•CURE 1 Plus Ultra, C•CURE 750, and C•CURE 800/8000 in either dialup or lease-line configurations.

Sensormatic ACD has tested modems made by various manufacturers and has found that due to constantly changing manufacturer's specifications, we could not guarantee that the next release of a particular modem would still function properly with previously defined setups and our system requirements. As a result, Sensormatic ACD does not guarantee operation nor offer technical support for any modem other than our OEM modem.

When using a modem for dialup mode, make sure the modem is operating with command echo off and Data Terminal Ready (DTR) enabled.

You can configure modems by using software commands or by setting DIP switches.

## Configuring Non-OEM Modems with Software

The apC/L automatically sets up modems that are configured using software commands, based on the modem's default settings. However, the default settings of some modems do not turn command echo off and enable DTR. This causes unpredictable behavior when the apC/L is used in dialup mode.

To ensure proper operation with modems normally configured with software commands, you must preprogram the modems manually at a terminal with the following pre-programming commands.

---

AT&F <CR>	Recall factory defaults
ATE0 <CR>	Command echo off
AT&D2 <CR>	Enable DTR
AT&W <CR>	Save as the first user-defined configuration

---

---

**Note** If your modem does not accept these commands, consult the modem documentation for the equivalent commands.

---

Perform this procedure only once after installation, since user-defined configuration will be restored with each power-up. Consult your modem documentation for more information about configuring your particular modem.

# Configuring OEM Modems

OEM modems work for dialup & leased line communications on the C•CURE 1+, C•CURE 750, and C•CURE 800/8000 hosts.

## Configuring Modems for Use with Dialup Lines

**Table F.1 apC/L Switch Settings for DialUp  
SW3**

Switch	Status	Description
1	ON	Clears memory on the panel, after communication, should switch to OFF.
2	ON	Enable dialup.
3	OFF	Do not use CTS. 4-wire communication (MUST BE 4 WIRE ONLY.)
4	ON	Host parity none, 8 data bits, 1 stop bit.
5	OFF	9600 baud.
6	OFF	9600 baud.
7	OFF	9600 baud.
8	ON/OFF	OFF = panel #1-16, ON = panel #17-32

**Table F.2    Jumper Settings for Dialup**

<b>Switch</b>	<b>Default Setting</b>	<b>Description</b>
W1	Open	Open for both reader Port A and Port B, Closed For Either Port A or Port B.
W2	B	27C512 for 2 Mbyte Flash/EPROM (Set to A for 4 Mbyte Flash/EPROM).
W3	OUT	128K X 8 SRAM (10K OR 20K) (Set to IN for 512K x 8SRAM (40K OR 80K).
W4	IN	Last Unit in RS485 chain. (OUT for Not last RS485 unit in chain).
W5	IN	Last Unit in RS485 chain. (OUT for Not last RS485 unit in chain).
W6	OUT	Cabinet tamper enabled (IN for cabinet taper disabled).
W7	A	Normal, B is for internal use only.
W8	IN	Internal Power Fail
W9	B	Host is RS232 (A is RS485).
W10	B	Host is RS232 (A is RS485).
W11	B	Host is RS232 (A is RS485).
W12	B	Host is RS232 (A is RS485).
W13	B	Host is RS232 (A is RS485).
W14	B	Host is RS232 (A is RS485).

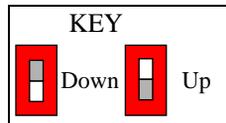
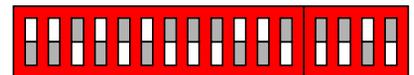
**\*\*NOTE\*\***These are basic panel settings and may require changes to meet your site-specific needs.

**Table F.3 OEM Modem Switch Settings for Dialup**

Switch	Host	apC
#1	DOWN	UP
#2	UP	UP
#3	DOWN	DOWN
#4	UP	UP
#5	DOWN	DOWN
#6	UP	UP
#7	DOWN	DOWN
#8	DOWN	DOWN
#9	DOWN	DOWN
#10	UP	UP
#11	UP	UP
#12	DOWN	DOWN
#13	DOWN	DOWN
#14	DOWN	DOWN
#15	UP	UP
#16	DOWN	DOWN

HOST

APC



## Configuring Modems for Use with Leased Line Configuration

You must set your panel using direct connect settings rather than the dial up settings for leased line. Also if you are using leased lines, it is very important that you understand the decibel (dB) loss specifications of the lease line to be used. Software House, Sensormatic ACD supports 0 or -10 dB Loss with the MT1932BL modem and -9 or -15 dB Loss with the MT2834BL modem. This is controlled on the OEM modem by switch 3.

The dB transmission rate is the strength of the signal being delivered by the telephone company. A 0-dB transmission level is the strongest signal possible. After that the -# dB's are used to weaken the strength of the signal. The telephone company sets most leased lines to a 0-dB loss. The only time you would need to set a -# dB loss is if you were located near the telephone company and needed to weaken the signal because of the close proximity to the source of the signal. In most cases a 0-dB level is the desired setting. Be sure you verify this information with the telephone company prior to ordering the OEM modem to ensure you have to proper model mode for the dB transmission level of your lease line.

### MT2834BL Series:

DIP-Switch #3 adjusts dB transmission levels required by some phone carriers. Place DIP-Switch #3 in the DOWN position to enable -9 dB transmission. Place DIP-Switch #3 in the UP position to enable -15 dB transmission.

-9dB Transmission = Switch #3 DOWN

-15dB Transmission = Switch #3 UP

Factory Default Setting = DOWN

### MT1932BL Series:

DIP-Switch #3 adjusts dB transmission levels required by some phone carriers. Place DIP-Switch #3 in the DOWN position to enable 0 dB transmission. Place DIP-Switch #3 in the UP position to enable -10 dB transmission.

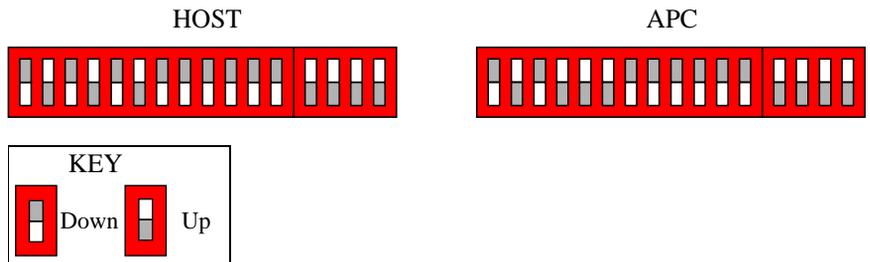
0dB Transmission = Switch #3 DOWN

-10dB Transmission = Switch #3 UP

Factory Default Setting = DOWN

**Table F.4 OEM Modem Switch Settings for 2-Wire Leased Lines**

Switch	Host	apC
#1	DOWN	DOWN
#2	UP	UP
#3	DOWN	DOWN
#4	UP	UP
#5	DOWN	UP
#6	UP	UP
#7	DOWN	DOWN
#8	DOWN	DOWN
#9	DOWN	DOWN
#10	DOWN	DOWN
#11	DOWN	DOWN
#12	DOWN	DOWN
#13	UP	UP
#14	UP	UP
#15	UP	UP
#16	UP	UP

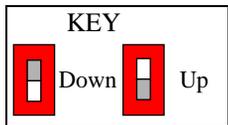
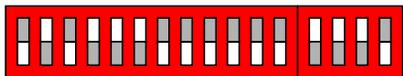
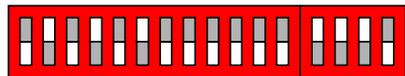


**Table F.5 OEM Modem Switch Settings for 4-Wire Leased Lines**

Switch	Host	apC
#1	DOWN	DOWN
#2	UP	UP
#3	DOWN	DOWN
#4	UP	UP
#5	DOWN	UP
#6	UP	UP
#7	DOWN	DOWN
#8	DOWN	DOWN
#9	DOWN	DOWN
#10	DOWN	DOWN
#11	DOWN	DOWN
#12	DOWN	DOWN
#13	UP	UP
#14	UP	UP
#15	UP	UP
#16	DOWN	DOWN

HOST

APC



## OEM HyperTerminal Edits for 4-Wire Leased Lines

From a HyperTerminal Session you will type the following commands:

---

**Note** You must switch the Dip Switch #10 to the UP position in order for your HyperTerminal session to work properly. Ensure that after these changes are made that you place Dip Switch #10 back to the DOWN position. It is normal to not see the commands as you type them. The only response you will see in your session is after you press <ENTER> following the list s-register command)

---

**ATL6** <ENTER> (Lists the S-Registers)

```
S0 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S13 S18 S19 S24 S25 S30
000 043 013 010 008 004 055 004 006 007 080 037 030 001 020 000 000
```

**ATS18=0** <ENTER> (Sets the ATS18 Register to 000)

**ATS19=0** <ENTER> (Sets the ATS19 Register to 000)

**AT&W** <ENTER> (Stores the changes you just made to the Registers)

**ATL6** <ENTER> (Verify your 18 and 19 Registers are now "000")

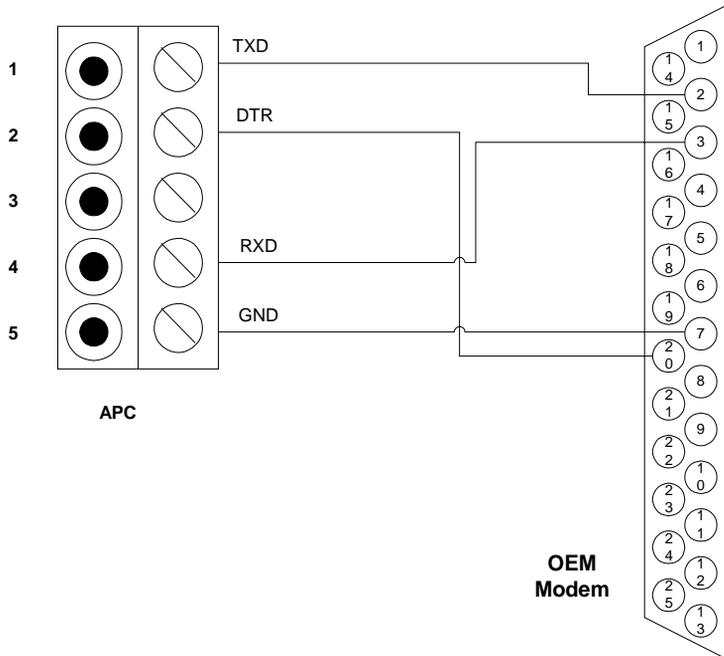
```
S0 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S13 S18 S19 S24 S25 S30
000 043 013 010 008 004 055 004 006 007 080 037 000 000 020 000 000
```

**Table F.6 Host Computer Settings**

Your communications port should have the following settings:

Baud Rate	9600
Bits	8
Parity	None
Stop Bit	1
Flow Control	None

**\*\*Do not add/configure the modem on the Windows control panel. Use the control panel to set only the port settings.\*\***



**Figure F.1 apC - OEM Modem Wire Diagram**

## **OEM to Host Computer Cable Connection**

Use an “off the shelf” straight-through modem cable (DB9 - DB25 or DB25 - DB25).



# I

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