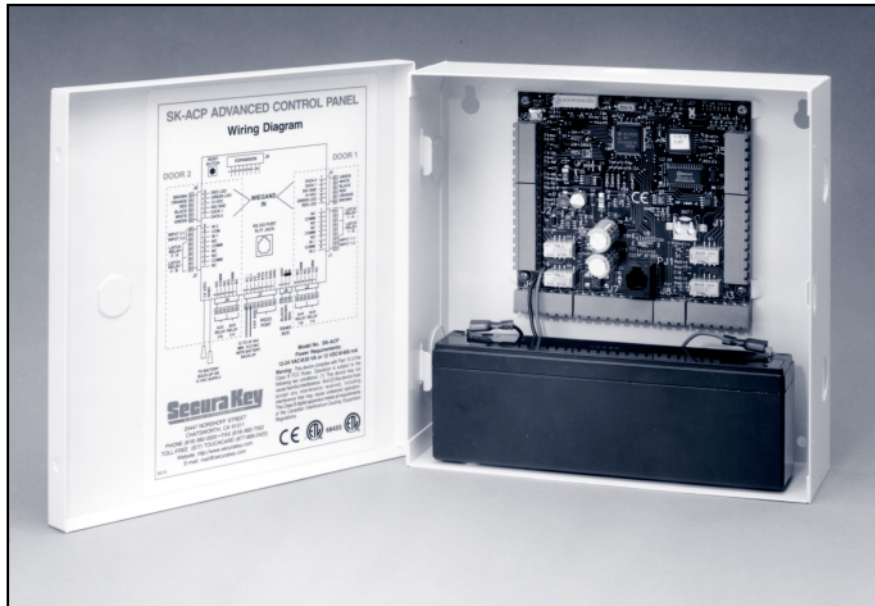


# SK-ACP

## User/Installation Manual



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## **INTRODUCTION**

**T**he **SK-ACP** Advanced Control Panel is a highly sophisticated, yet simple to use, two door access control unit. The unit accepts readers of almost any technology, with a Wiegand output up to 40 bits, including Proximity, Touch Card, Wiegand, Magnetic Stripe, Bar Code, Optical, and Biometric. Each of the two passageways controlled by the unit is completely independent of the other and is configured, programmed and viewed separately.

Up to 100 **SK-ACP** Panels may be linked together on a twisted pair (plus signal ground) RS-485 bus. When used with SK-NET software, a highly featured, easy to use, distributed intelligence access control system can be created.

Each of the two passageways controlled by the **SK-ACP** has two programmable inputs which may be programmed by the user to function as a Door Monitor, Tamper Monitor, Remote Open, Remote Inactive, Bell, Arming Circuit, or User Defined Input.

Each of the two passageways controlled by the **SK-ACP** has two outputs. One output is the Relay that operates the door operating device. The other output is programmable by the user to activate under one of several possible alarm or special conditions.

**SK-ACP** will control access for up to 65,535 individuals in 15 weekly time schedules (Time Zones) independently for each of the two passageways. Time Zones include a holiday schedule that is followed when one of the 32 user programmable holidays occur.

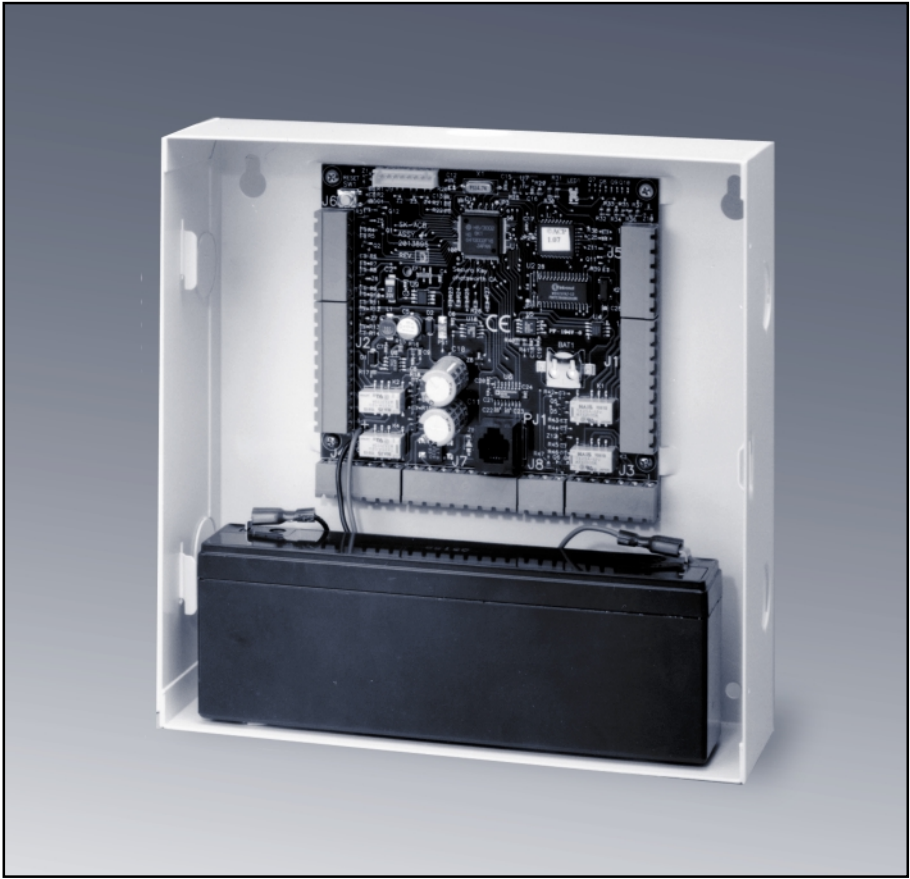
Certain Access Cards may be designated as "Limited Use" cards, and their use may be restricted to allow access for a given number of days or weeks or for a given number of times.

The **SK-ACP** may be programmed with a terminal or PC. Transaction information is stored by the unit and may be downloaded to a terminal, PC, or serial printer. Up to 4,864 transactions are stored.

Since the **SK-ACP** has nonvolatile memory, reprogramming after a power loss is unnecessary.

### **CARD ID NUMBERS AND FACILITY CODES**

Access cards used with the SK-ACP have two encoded numbers: the ID number which is different on each card, and the Facility Code, (also called a system or site code) which is normally the same for all cards at a given site. When a card is read, the system first verifies the Facility Code, then it checks the ID Number against its internal "card list" in memory to see if the card is void or valid. It also checks the Time Zone, the card's Antipassback status, and the Limited Use count.



## SETTING THE FACILITY (SYSTEM) CODE

### **IMPORTANT**

**Before programming or using a new unit, the correct Facility Code must be set.**

When power is first applied, or when the reset button is pushed (see Figure 1) the LED on each of the two readers will flash red and green alternately. While the LED is flashing, present an Access Card with the proper facility code to one of the readers and remove it (note LED turns solid green for about 1 second and the beeper beeps to indicate that the card has been read). The **SK-ACP** will “remember” the facility code and retain it until reprogrammed. It is not necessary to present the access card to the second reader since it is automatically set for both passageways. After setting the facility code, wait for the LED to stop flashing before attempting to use the reader.

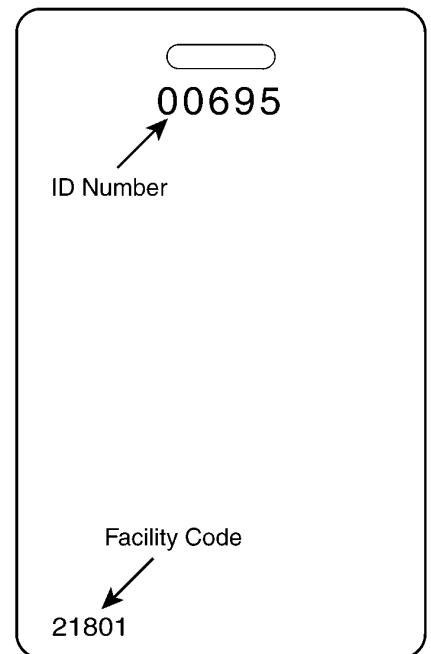
To change a facility code (or to set the facility code if the LED is not flashing red/green), momentarily depress the reset button. The LED indicator will flash red and green alternately. If the reset button is pushed, but no card is presented to the reader before the LED indicator times out, the system code will be unchanged.

In some cases it may be necessary for the unit to recognize more than one facility code. Typical instances are when it is necessary to read cards that work in two independent locations that already have different facility codes or when two different reader technologies are used in the same system, each of which has a different facility codes.

The **SK-ACP** can be set to recognize up to sixteen different facility codes. To program multiple facility codes, follow the procedure above for programming a single facility code, but present a card with the second facility code (and additional facility codes if necessary) to the reader before the red/green LED indicator times out.

**Note that it is not generally recommended to combine sets of cards with different facility codes, because the unit cannot distinguish between access cards having different facility codes and the same ID number.**

For example, if you have two sets of cards numbered 1-100, with facility codes 12345 and 23456, and you delete cards 1 - 10 from the reader’s internal “card list,” then cards 1 - 10 with either facility code will be denied entry at the reader.



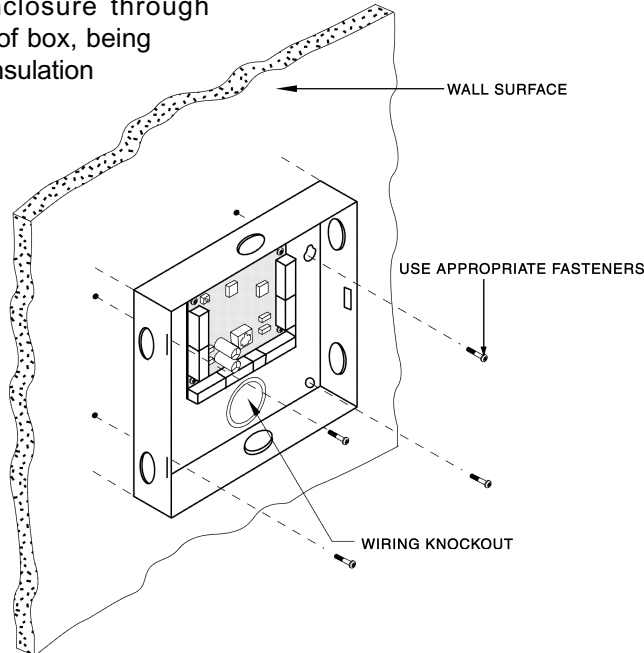
**FIGURE 1**

## INSTALLATION

**CAUTION SHOULD BE TAKEN NOT TO TOUCH CIRCUIT BOARD OR ELECTRONIC COMPONENTS PRIOR TO AND DURING INSTALLATION TO AVOID ELECTRO-STATIC DISCHARGE (ESD) DAMAGE.**

### INSTALLING THE SK-ACP

1. Select a location for the **SK-ACP** unit that is secure and sheltered from weather and extreme humidity. Choose a location that facilitates access to power and is reasonably close to the doors that are to be controlled (no further than 500 feet).
2. Using the unit as a template, mark on the mounting surface the location of the four mounting holes.
3. Install appropriate mounting hardware (anchors, retainers, etc.) to the mounting surface if necessary.
4. Screw #6 or #8 mounting screws into the top 2 mounting holes of the mounting surface, leaving about 1/4" clearance.
5. Place panel top key-way mounting holes over installed mounting screws and slide panel down.
6. Tighten top mounting screws.
7. Install two bottom mounting screws (see figure 2).
8. Route cables into the enclosure through knockouts in sides or back of box, being careful not to nick or scrape insulation on any rough edges.

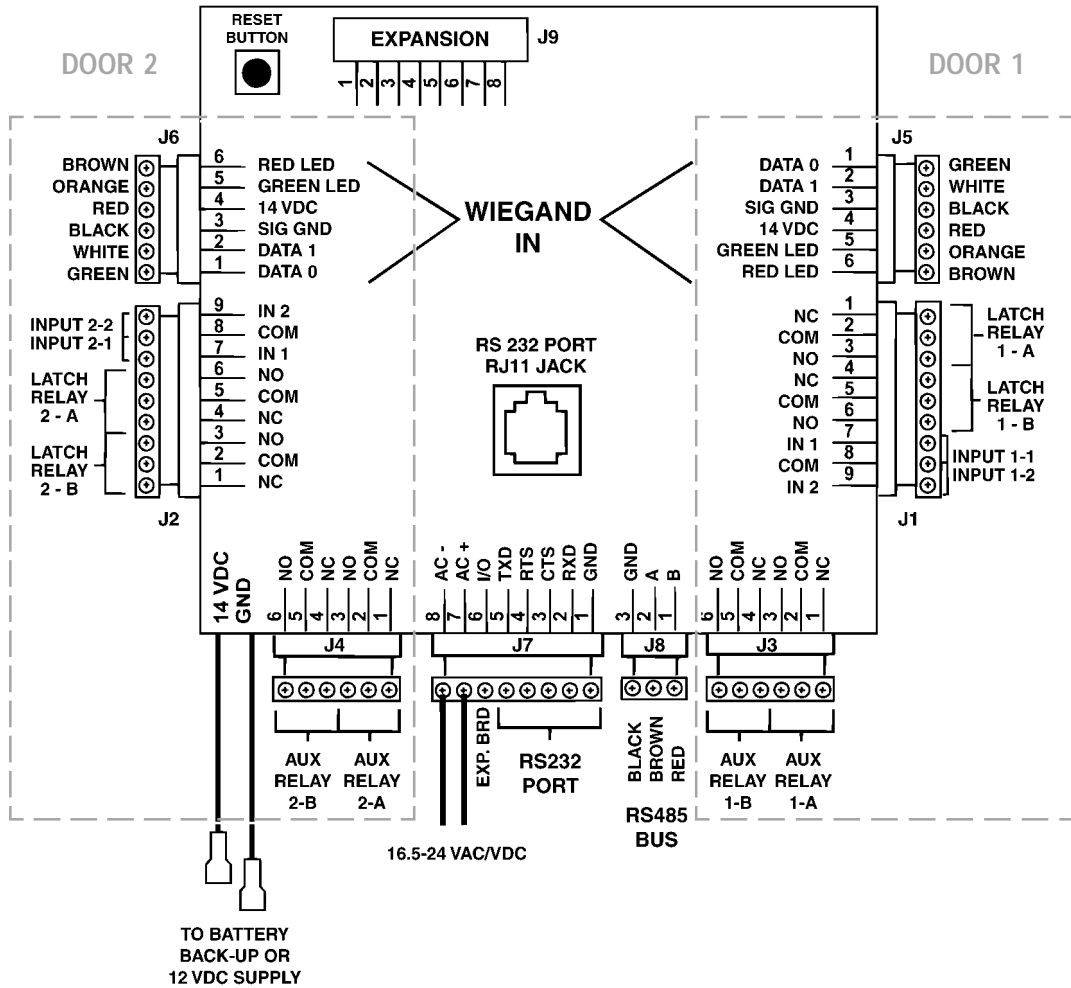


**FIGURE 2**

## WIRING

The **SK-ACP** unit is organized so that the wiring for door #1 is on the right side of the panel and the wiring for door #2 is on the left side of the panel (see figure 3).

For ease of installation and servicing, plug-in terminal blocks are provided.



**FIGURE 3**

**POWER & BATTERIES**

The **SK-ACP** unit must be connected to a source of low voltage power. The **SK-ACP** should **NOT** be connected to the same power supply that is providing power to an electric lock or strike. We recommend that you use the Secura Key SK-ACP-PS, which includes a 16.5VAC, 40VA transformer and a 12VDC, 1.9AH standby battery, to power the SK-ACP

Terminals 7 & 8 on plug “J7” must be connected to 16.5 to 24 volts, AC or DC. You may also connect the **SK-ACP** to 12 VDC, but in this case you must connect your power supply to the red (+) and black (-) wire leads on the lower left corner of the panel instead of the “J7” plug. If you use 12 VDC you cannot install a standby battery in the SK-ACP.

When 16.5 – 24 volts is used to power the **SK-ACP**, you may connect the red and black wires to a 12 volt standby battery. Polarity (+/-) must be observed. The standard **SK-ACP** has space for a small (1.9AH) battery, while the 10” X 11” **SK-ACP-LE** can accommodate larger batteries. A battery up to 4.5 Amp-hours can be connected to each **SK-ACP**.

Do not energize the **SK-ACP** until all other connections are made.

**READERS**

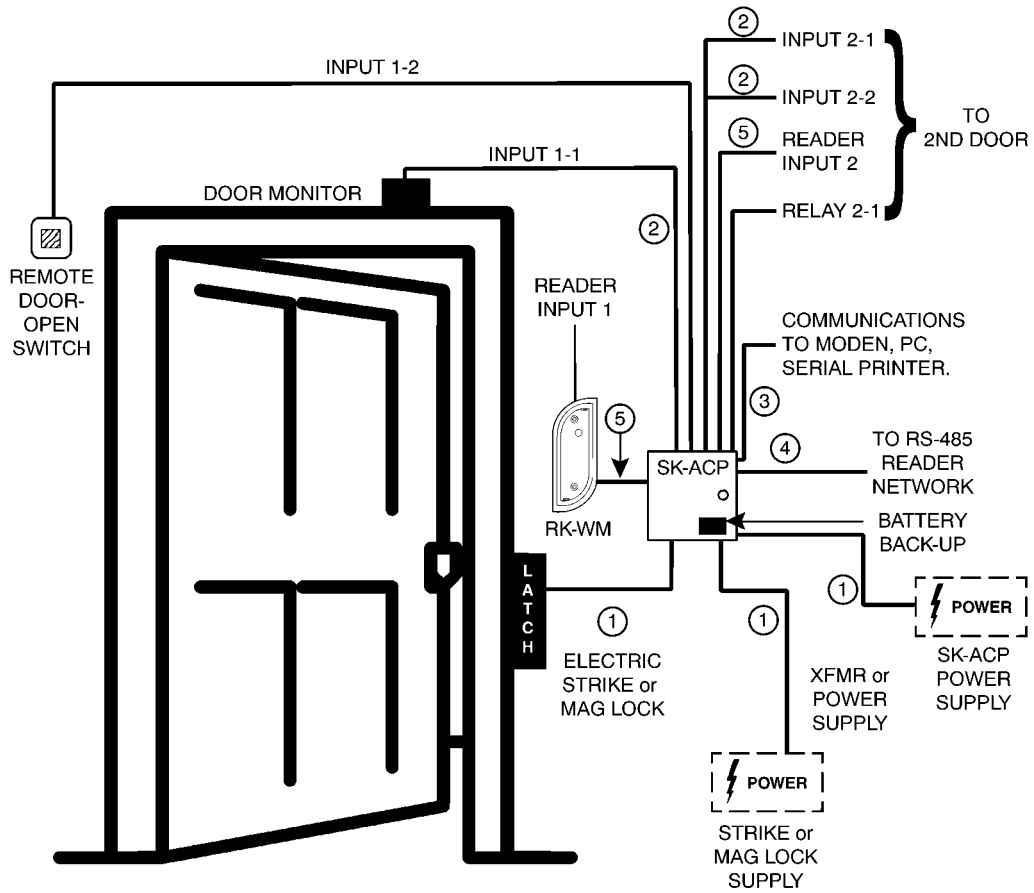
**SK-ACP** is designed to accept any reader or keypad with a standard Wiegand interface. The reader for door #1 is connected to plug “J5”, the reader for door #2 is connected to plug “J6”. (See figure 3) SUGGESTED CABLE IS BELDEN 9931. The **SK-ACP** will provide up to 150mA to power each reader. If the readers you use require more current, an external power supply must be used.

**INPUTS**

Each reader may be associated with up to two auxiliary inputs. Inputs might include remote switches, door contact sensors, vehicle presence detectors, etc. If you connect inputs to the **SK-ACP** you must define those inputs using **SK-NET** software (see SK-NET manual, section 3). Note that input 1 (#7) and input 2 (#9) share a common terminal (#8) on plugs “J1” and “J2”. All inputs are configured as normally open circuits. However, in many cases a “Door Monitor” input should be a normally closed circuit. To convert any input defined as “Door Monitor” to normally closed, disconnect power from the panel, remove the jumper from pins 3 and 4 in the J9 expansion slot and place the jumper on pins 4 and 5. Restore power to the panel and test the “Door Monitor” input.

**OUTPUTS**

Each door controlled by the **SK-ACP** has two double pole, double throw relays associated with it. The “latch relays” are located on “J1” and “J2”, terminals 1-6. The “auxiliary relays” are located on “J3” and “J4”. One pole of the latch relay is typically used to open or close a circuit to unlock a door or activate a gate operator. The other pole of the latch relay operates simultaneously and may be used to shunt an alarm contact, start a video recorder, etc. The auxiliary relay may operate according to a variety of user-defined conditions. These must be



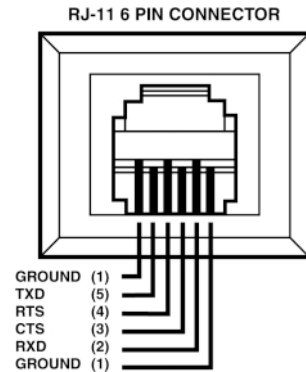
- CABLE TYPES:**
- ① 2 COND, UNSHIELDED 16-18 AWG
  - ② 2 COND, UNSHIELDED 18-24 AWG
  - ③ 5 COND, SHIELDED 18-24 AWG
  - ④ RS-485-SINGLE TWISTED PAIR, PLUS GROUND AND SHIELD, 18-24 AWG
  - ⑤ 5 TO 7 CONDUCTOR SHIELDED, 20 AWG (DEPENDS ON LED AND BUZZER CONTROLS USED)

**FIGURE 4**

programmed using **SK-NET** software (see SK-NET manual, section 3) NOTE: Two MOVs (metal-oxide varistors) are provided with each **SK-ACP**. These must be installed between the “Common” and either the “Normally Open” or the “Normally Closed” terminals where power to the electric lock or strike is being switched. (see Figures 6 and 7)

PIN NUMBER CONNECTIONS						
SK-ACP ADVANCED CONTROL PANEL		PC OR TERMINAL		PRINTER	MODEM	MODEM
SIGNAL DESCRIPTION	J7	DB-25S (FEMALE) PIN #	DB-9S (FEMALE) PIN #	DB-25P (MALE) PIN #	DB-25P (MALE) PIN #	DB-9P (MALE) PIN#
SIGNAL GROUND	1	1 & 7	5	1 & 7	7	5
RECEIVE DATA (RXD)	2*	2	3	N/C *	3	2
CLEAR TO SEND (CTS)	3	4	7	20	8	1
REQUEST TO SEND (RTS)	4*	5	8	6 & 8	4	7
TRANSMIT DATA (TXD)	5	3	2	3	2	3

\* FOR HARD-WIRED PRINTER MODE, CONNECT TERMINAL 2 TO TERMINAL 4 .

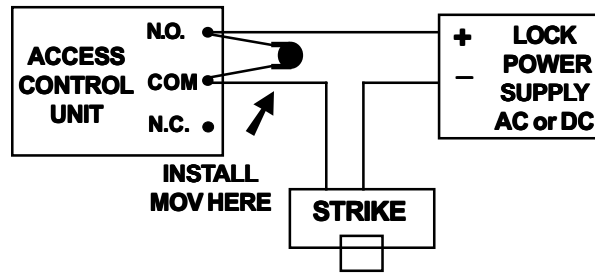


**FIGURE 5**

## RS-232

You may connect RS-232 communications to the **SK-ACP** either by using plug “J7”, terminals 1-5, or by plugging into the RJ11 jack in the center of the circuit board. (See figure 3) RS-232 requires at least 5-conductor cable. SUGGESTED CABLE IS BELDEN 9931. RS-232 is used to connect the COM port of a p.c. to a single **SK-ACP**, or as a gateway to a network of **SK-ACPs**. (COM ports are typically DB9 male or DB25 male jacks on the back of a personal computer.) When connecting a p.c. via RS-232 the distance from the panel to the computer should not exceed 100'. (For longer distances, see “RS-485” below.) A serial printer may also be connected to the RS-232 port of any **SK-ACP**. This will allow all system transactions to be printed as they occur. (A printer may be connected to one SK-ACP even if a computer is connected to another SK-ACP in the same network.) An external modem might also be connected to the RS-232 port of an **SK-ACP** for dial-up applications using SK-NET-MLD software. While any Hayes compatible 56K modem may be used, we highly recommend that you use the Secura Key SK-MDM. The SK-ACP contains the configuration data, or “setup string” which allows this modem to be configured in the field without the use of a computer and without setting DIP switches. (See Appendix C for modem instructions.) Figure 5 shows the RS-232 pin connections for a p.c., printer, or modem. **WARNING:** Never connect a telephone line directly to the RJ11 jack on an **SK-ACP**!

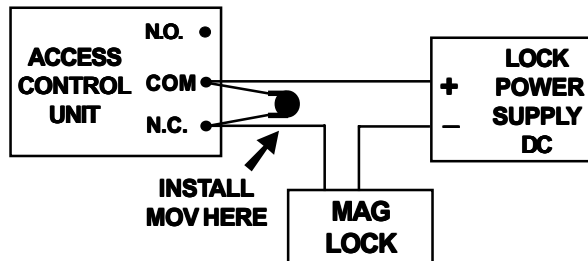
**Installation of Metal Oxide Varistor  
with Electric Strike**



Install the enclosed 40-volt MOV (Metal Oxide Varistor) across the relay contacts in the access control unit, as shown. The Access Control Unit must have its own power supply.

**FIGURE 6**

**Installation of Metal Oxide Varistor  
with Magnetic Lock**



Install the enclosed 40-volt MOV (Metal Oxide Varistor) across the relay contacts in the access control unit, as shown. The Access Control Unit must have its own power supply.

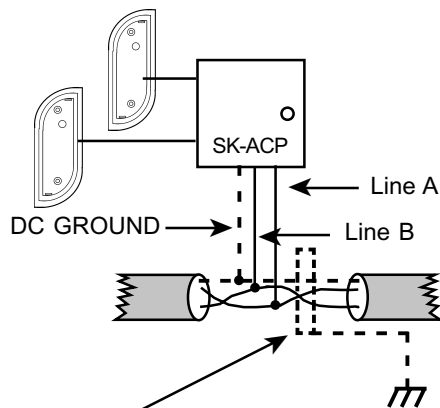
**FIGURE 7**

## RS-485

The RS-485 bus is used to link multiple **SK-ACP** units into a network. Where two or more **SK-ACP**s are linked, you must run cable between the “J8” plugs on each panel. Terminals 1 & 2 must be a twisted pair of wires. SUGGESTED CABLE IS BELDEN 9842. Terminal 3, if used, may be connected to one conductor of another twisted pair. (Terminal 3 is a “signal ground”. If used, this must be an insulated conductor and it should NOT be connected to earth ground.)

RS-485 cable must have an overall shield (usually a foil wrapper with a bare sink wire). This shield should be connected to earth ground at one end only. Where the distance from the p.c. to any one of the **SK-ACP** units is greater than 100', you may install an RS-232 to RS-485 converter (Secura Key p/n NET-CONV-P) to the COM port of the computer. From the converter you then run RS-485 cable and connect it anywhere along the RS-485 bus. The total RS-485 cable distance, including the distance between all **SK-ACP**s, may be up to 4000'.

Figure 8 shows how each **SK-ACP** is connected to the RS-485 bus.



Earth Grounded Shield is highly recommended in environments subject to high voltage electrical discharge (ie. lightning). Shield should be connected to earth ground only at one end of the cable. DC Signal Ground may be necessary in networks with very long wire runs. DC Ground wire is NOT to be connected to earth ground.

**FIGURE 8**

## QUICK START GUIDE

### SK-ACP Advanced Control Panel with SK-NET™ Software

#### 1.0 INSTALLATION

##### 1.1 Make a Site Plan:

For multi-reader systems you should begin by making a simple diagram of the job site, noting the location of each reader and panel. List the serial number of each SK-ACP. The reader connected to the right side will be serial number + “-1” and the reader connected to the left side will be serial number + “-2”.

##### 1.2 Install Panels and Readers:

Install all readers and panels as per instructions provided, being sure to use the correct types of wire. Do not apply power until all connections are made.

##### 1.3 Power Up:

After all connections are made apply power to the panels. The LEDs on the readers will flash alternately Green and Red. Hold a card with the correct facility code near each reader to set the facility code in the panel.

##### 1.4 Install Software:

Install SK-NET on your PC according to instructions in the SK-NET manual.

#### 2.0 CONFIGURE THE SYSTEM

##### 2.1 Configure the Primary Location:

A Location is a single contiguous network of readers connected to a single PC COM port. *SK-NET-MLD can support more than one location.*

1. Click on Explorer (globe icon)
2. Right click on “This Location” *Select “Rename”* if you want to change the name of the location. In this manual we will continue to refer to it as “*This Location*”.
3. Select Properties. *Fill in optional address info if you wish.* If the PC is wired directly to the reader network check “Local Connect” If a modem is used uncheck “Local Connect” and type in the modem phone number. If locally connected with a NET-CONV RS-232 to RS-485 converter uncheck “Gateway(RS232)”. If connected without a converter check “Gateway(RS232)”. Check “Auto Login” if you want to login to the location whenever you launch SK-NET (recommended).

Location: This Location

Properties | Reader Groups | Access Groups

Address: 20447ordhoff Street

City: Chatsworth

Zip Code: 91311

Country: USA

Phone #: 818-882-0020

Com Port: 4

Baudrate: 9600

Modem Phone #:

Auto Login:  Gateway(RS-232):

Local Connect:  Password:

Connection Wizard:

Connect Close

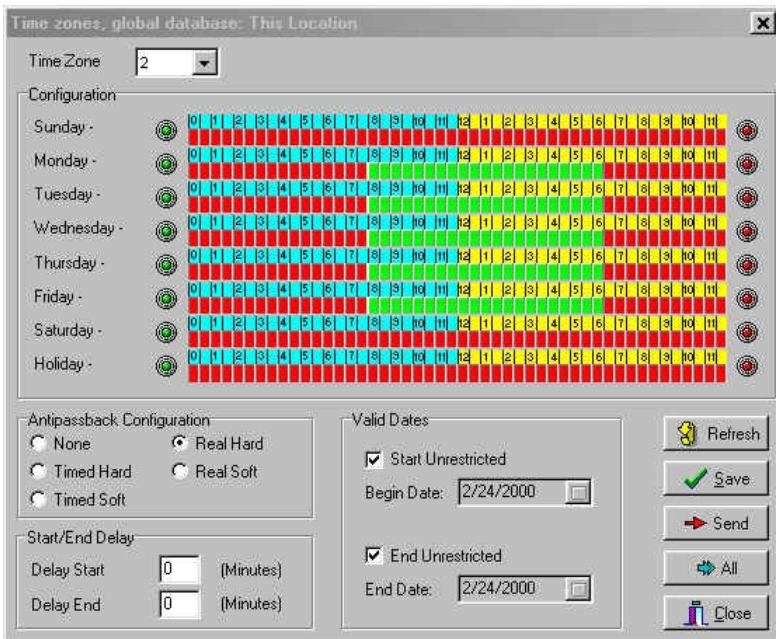
4. Click on "Connection Wizard" icon. Click on "YES". Connection wizard will try every COM port at every baud rate until it finds your reader network. If the readers are found, accept the settings. (If the readers are not found, go to Troubleshooting Guide) Click on "Connect". You will get the message "There are no readers in location, to login, scan for readers now?" Select "Yes". The software will then give you a list of new readers found. Select "OK". When asked "Do you wish to login all readers at this time?" select "Yes". When the message box says "Job Complete" click on "OK".
5. Close the Location Properties box.

2.2 Enter Reader Names

- I. There should now be a "+" symbol next to ALL READERS. Click on the "+" symbol to display readers found. Note that each reader name will be the same as the serial number. Right click on any reader and select "Rename". Replace the serial number with the name you have chosen for that reader and click "OK". Repeat for each reader.

2.3 Set Latch Timers

1. Right click on "All Readers".
2. Select Properties.
3. Click on "Configuraion".
4. Change latch timer to appropriate time.
5. Click on "Send" Then Click on "Close" *This sets all readers to the same latch time. If you want a different latch time on a specific reader see section 4.4 of the SK-NET manual.*



2.4 Define Time Zones

There are 16 Time Zones in this system. Time Zone 0 is always void and Time Zone 1 is always valid. These may not be edited. You may edit Time Zones 2-15 to meet your specific needs. Time Zones may be unique in every reader but it is usually better to set them for the entire location. To set Time Zones globally:

1. Double click on "Time Zones" under This Location.
2. Select the time zone you wish to edit (2-15). *Each time zone is predefined and you may find one that already meets your needs by browsing through them all. If not, you will need to edit a time zone.*

3. Each Time Zone has seven daily schedules and a special holiday schedule. Each green block represents a half-hour time increment when cards in this time zone will work and each red block represents a period when they will not work. You may turn an entire day green or red by clicking on the buttons at either side of the row. You may turn any single block to another color by clicking on it. You may turn a group of blocks in a single day from red to green by holding down the "CONTROL" key, clicking on the first block and then clicking on the last block of the group. *As you point at a block you will see a prompt describing exactly what that half-hour increment represents.*
4. *Other settings in each Time Zone allow delayed start and end, antipassback and date restrictions. If you need these features see section 3.7 of the SK-NET manual for more details.*
5. After you have edited all the Time Zones that you need, click on the double red arrow key to send all time zones to all readers.
6. Click on "Close".

#### 2.5 Create Access Groups:

An Access Group is used to give a group of cardholders access to a specified list of readers during a specified Time Zone. You may create as many Access Groups as you wish.

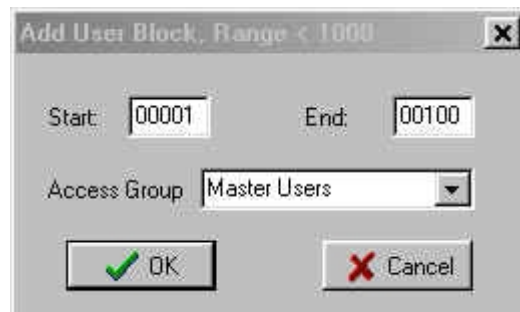
1. Right click on "This Location".
2. Select "New", then click on "Access Group".
3. Type in the name of the Access Group and the time zone that should apply. Click "OK".
4. The new group should appear in the left part of the screen under the location. There will not be a "+" symbol next to this Access Group yet.
5. Click on "ALL READERS". On the right-hand side of the screen icons should appear representing every reader in the location. Drag-and Drop the readers you want from the right side of the screen into the new Access Group. You may place one or more readers in the group. *After you drop the first reader into the group you will notice a "+" symbol appears next to the group name. Click on the "+" symbol to see which readers are in that group.*



#### 2.6 Block Load Cards:

In most new installations you will start with a block of cards. You may load all of these cards quickly and easily into the system and then assign them to users individually later.

1. Click on the User Manager Icon (2 faces).
2. Click on "Users" in the top toolbar.



3. Select "Add User Block".
4. Enter the lowest card number and the highest card number you want to add.
5. Select an Access Group. *Placing the block in "Void Users" is safest because lost or stolen cards will not open any doors. Cards can be changed to the appropriate Access Group later when they are assigned to specific users.*
6. Click "OK" and "OK" again. Then click on the double green arrows on the toolbar to send all cards to all readers. *Any changes you make in the software are meaningless until you send them to the readers.*

## 2.7 Enter Card Users:

1. Click on the User Manager Icon (2 faces).
2. Double click on the first card number you wish to assign.
3. Enter the cardholder's first name, last name and middle initial. Tab past the card number

and select an appropriate Access Group for this cardholder. The remaining fields are optional. Click on "OK".

4. Double click on the next card number you wish to assign and repeat the process.
5. Click on the red arrow icon in the toolbar to send all of your card changes to the readers.
6. *The installer may wish to activate a single card in his own name and as sign it to the Master User group so he can go out and test all of the readers at this time.*

## 2.8 Test Your Programming:

1. Take a Master User card to each reader and try it. You should get a long green LED and the latch relay should activate.
2. Click on Transactions (magnifying glass icon). Each card presentation should appear in Transactions with accurate time and date.

This Quick Start Guide describes basic programming of a system. Your system should now be up and running. Refer to Sections 3 and 4 of the SK-NET manual to learn how to activate additional features. Section 5 of the SK-NET manual provides the basic day-to-day operating instructions that the end-user will need to know.

User Properties

Enter or modify user information here.

User Information

First: Andrew

Last: Chess

MI:

Card #: 9

Access Group: Office Staff

Title: Engineer

Tel Ext: 497

Dept: Engineering

Employee #: 39

User Fields

Vehicle Make: Jeep Vehicle Model: Cherokee

Vehicle Color: Blue

Vehicle Information

Parking ID: 27 License 1: 170-PPL License 2:

OK New Next >> Cancel

**FACTORY SETTINGS**

When shipped from the factory, the **SK-ACP** has the following settings:

Facility Code	None*
All Cards	Time Zone 0 (void)
Settings	No Limited Use Cards
	Latch timer = 1 Second
	APB Timer = 0 Minutes (off)
	Baud Rate = 9600*
	Reader ID = (none)
	Password = 12345*
	Date = Undetermined*
Time Zones	Time = Undetermined*
	APB = Timed Hard*
	Date Restrictions = None
	0 = Always Void
	1 = Always Valid (no restriction)
	2 = Mon - Fri, 8am - 5:30pm
	3 = Mon - Fri, 6am - 6pm
	4 = Sat & Sun, 24 hours
	5 = Sat & Sun, 6am - 6pm
	6 = Always Valid (Timed Antipassback)
7 & Up = Mon-Sun, 6am - 6pm	
Door Zone	Off For All Time Segments
Holidays	None Set
Daylight Savings	Automatic*
Inputs 1	Door Monitor
	2
Auxiliary Output	Disabled
Anti-Passback Parameters	
Reader (In/Out)	None
Daily APB Forgive Hour	00

\* Common to Panel, all other settings are per reader (2 readers per panel)

**READERS AND CARDS****USING SK-ACP WITH SECURA KEY PROXIMITY READERS AND CARDS**

Secura Key offers proximity readers in a variety of sizes for use with the SK-ACP panel. Secura Key proximity readers read Secura Key cards only. Secura Key proximity cards have two encoded numbers: the ID Number which is different on each card, and the Facility Code (also called a system or site code) which is normally the same for all cards at a given site. When a card is read, the system first verifies the Facility Code, then it checks the ID Number against its internal “card list” to see if the card is void or valid. It also checks the card’s Antipassback Status, Time Zone and Limited Use count.

**ORDERING ADDITIONAL CARDS FOR YOUR SYSTEM**

The SK-ACP can learn up to 16 different facility codes, but it is not generally recommended that you combine sets of cards with different Facility Codes in the same system. The SK-ACP cannot distinguish between cards which have different Facility Codes and the same ID Number. For example, if you have a card with Facility Code A1 and ID Number 15 and you have a card with Facility Code B2 and ID Number 15, and the SK-ACP has been programmed to accept both Facility Codes, it will see these as the same card.

When ordering additional cards it is recommended that you place a factory order specifying the existing Facility Code and beginning with the ID Number which is one higher than the highest card already in use.

**SETTING THE FACILITY CODE**

When power is first applied to the SK-ACP the LED on each of the connected readers will flash alternately Red and Green. While the LED is flashing, hold an Access Card with the correct Facility Code near a reader for about one second. The LED should show a long Green flash and the reader will beep. If an additional Facility Code is to be

entered, present an Access Card with that Facility Code in the same manner. Repeat for each Facility Code to be entered. Let the LED stop flashing Red/Green before attempting to use an Access Card.

To change a Facility Code (or to set a Facility Code if the LED is not flashing Red/Green) momentarily depress the reset button on the SK-ACP. Depressing the reset button will NOT erase memory or disrupt other programming.

To add an additional Facility Code to a system, while retaining the existing Facility Code, you must depress the reset button and then present a card with each Facility Code to the readers while the Red/Green flashing is occurring. If you only present a card with the “new” Facility Code the system will “forget” the old Facility Code.

It is only necessary to present an Access Card to one of the two readers connected to each SK-ACP in the system.

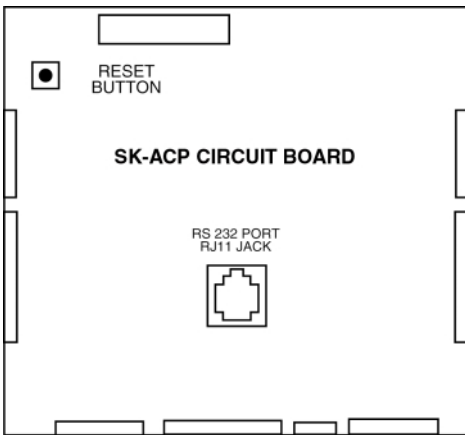
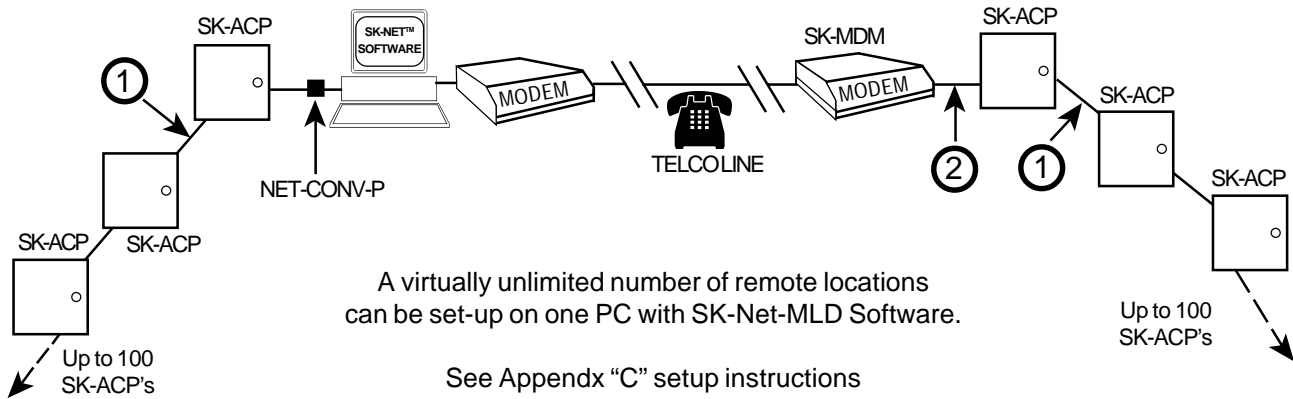


FIGURE 9



**MULTI LOCATION SYSTEM WITH SK-NET-MLD SOFTWARE**

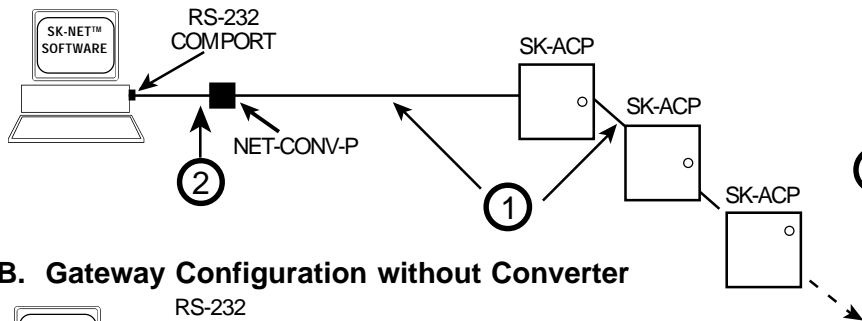


**OPTIONS FOR CONNECTION OF THE SK-ACP NETWORK TO A PC**

**There are two ways to connect a PC to the panel network:**

Option A is recommended for large systems or systems with high traffic volume.

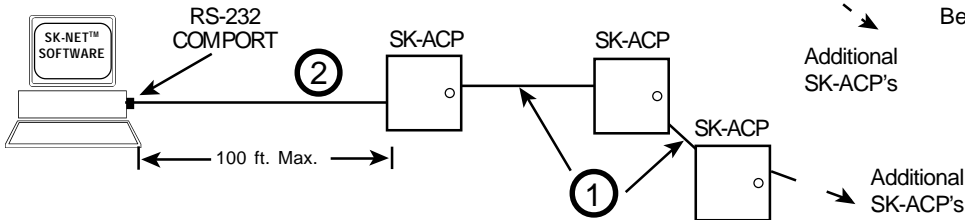
**A. Standard Configuration with Converter**



- 1 NETWORK CABLE:**  
RS-485 - Two Twisted Pair, Plus Ground and Shield, 18-24 AWG. Total system cable length: 4,000 ft. Suggested Cable: Belden #9842, (includes 1 spare conductor.)

- 2 SERIAL CABLE:**  
RS-232 - PC or printer to 28SA Plus, 6-Conductor, Shielded, 18-24 AWG. 300 ft. (9600 baud); 100 ft. (38.4 baud). Suggested Cable: Belden #9931

**B. Gateway Configuration without Converter**



## APPENDIX B

**SK-NET™ EQUIPMENT COMPONENTS & SPECIFICATIONS****SK-ACP:**

Two Door Access Control Unit

**RK-WM: or RK-WS or RK-WL**

Proximity Reader (2 per SK-ACP)

**RKCM-02 Molded Proximity Cards  
Specify Quantity**

or RKKT-02 Key Tags  
or RKCI-02 ISO Image-able cards

**PC- Pentium 200 (or Faster)**

- IBM-Compatible, Pentium 200 or compatible processor
- Windows® 95/98, or Windows®/NT 4.0 or greater
- 32 MB RAM
- 100 MB Hard Drive Capacity  
(more for multiple locations)
- CD-ROM Drive
- High-speed serial COM Port (38.4 K or better)
- VGA monitor
- IBM Compatible parallel printer

**Recommended PC Configuration**

- ZIP™ Drive or equivalent for system backup
- Windows NT® for best performance
- Pentium 400 or compatible processor
- 64 MB RAM
- 1 GB Hard Drive available capacity

**SOFTWARE**

SK-NET™ — Basic Software

SK-NET™ -MLD — Multi-Location Dial-Up Software

**ACCESSORIES**

NET-CONV-P — RS-232 to RS-485 Converter  
with Power Supply - one required per system  
(unless using a gateway connection)

CBLSA — Demo Cable & Connectors .....  
For Bench Testing or field connection with a laptop

SK-MDM — Modem - 56K Baud External Modem  
for dial-up connection to any SK-ACP with MLD  
software ACP-PWRPAK - Transformer and standby  
battery.

## SPECIFICATIONS

### PHYSICAL

Depth 2.5" (6.35 cm)	Weight 36 oz.(1.02 kg)
Width 8.0" (20.32 cm)	Material All Steel
Height 8.0" (20.32 cm)	Color Beige

### POWER REQUIREMENTS

Power Supply Sold Separately

16.5-24 VAC, 20 VA or 16-30 VDC, 100 mA plus reader current draw

\* A 12 VDC Power Supply may be used if connected to Battery Back-Up Leads.

### BACK-UP BATTERY

12 V, 1.2 - 6 Ah (Optional, Sold Separately)

### CARD READERS

Connect two card readers with two-line Wiegand output, up to 40 bits.  
Provides 14 VDC, 150 mA max. power for each card reader.

### SOFTWARE

SK-NET™ Software Version 2.0 or greater

### OUTPUTS - 2 Per Door (Total of 4)

Latch & Alarm Shunt  
Auxiliary

DPDT contact, 2A, up to 220 VAC or 30 VDC  
DPDT contact, 2A, up to 220 VAC or 30 VDC

### INPUTS - 2 Per Door (Total of 4)

Auxiliary 1  
Auxiliary 2

Requires SPST contact closure  
Requires SPST contact closure

### COMMUNICATION

RS-232  
RS-485  
Wiegand Input (2)  
  
Modem  
Printer

5-Wire Shielded Cable, up to 38.4K baud, full duplex, (8N1)  
Single Twisted Pair, shielded cable with a signal ground  
Programmable up to 40 bits  
14 VDC @ 150 mA supplied to each reader,  
Requires Hayes compatible - 1.2 to 38.4k baud  
Serial Printer (or Parallel printer with serial converter)

### ENVIRONMENT

Ambient Temperature  
Humidity

-40° F to 158° F (-40° C to 70° C)  
0% to 95% relative humidity (non-condensing)

### OPERATIONAL

Per Door

Card Capacity  
Time Zones

65,535/Door (Highest card number = 65,535)  
15 for card access, one door unlock; full week plus  
holiday in one-half hour segments; 32 programmable  
holidays; selectable automatic daylight saving time.

Facility Code  
Latch/Alarm Shunt Timer  
Antipassback  
Auxiliary Inputs (2)

Up to 16 different codes simultaneously  
Programmable from 1/4 to 30 seconds  
Real or Timed (1 to 30 minutes); hard or soft  
Programmable for door monitor, tamper monitor, remote  
open, remote inactive, bell, arming circuit or user defined  
Output is programmable to activate under one of many  
possible alarm conditions, time zone or card violations.

Auxiliary Output (1)

4,000 (in a block within 65,535) programmable from  
1-500 uses, days, weeks or number of days after first use.

Limited Use Cards

4,864 events

Transaction Storage  
Memory

Non-volatile

This product complies with UL 294 Standards, CE (European Standards), and with Part 15 of Class B FCC Rules.

## APPENDIX C

## CONNECTING A MODEM TO SK-ACP

### Using the SK-MDM Modem with the Secura Key 28SA-Plus Access Control Unit and/or SK-ACP Advanced Control Panel

The SK-MDM Modem (Best Data Smart One 56SPX) has been selected by Secura Key for use with 28SA-Plus Access Control Unit and the SK-ACP at remote locations. The SK-MDM is connected directly to the RS232 port of a 28SA-Plus or an SK-ACP.

The 28SA-Plus and SK-ACP contain the configuration data or “setup string” for the SK-MDM, which allows the modem to be configured in the field by the reader without the use of a computer, and without setting DIP switches.

Note that the setup string stored in the 28SA-Plus and SK-ACP is only used for modems at remote locations. If you are using a SK-MDM at the PC location, use the setup information provided with the modem for installation with your PC.

#### MODEM REAR PANEL CONNECTIONS - REMOTE SITE

Line	Connect to the phone line at the remote site	( <b>not</b> the RJ-11 Jack on the panel).
Phone	Not required.	
Serial Port	Connect to 28SA-Plus or SK-ACP RS232	Port (see Manuals for wiring details).
Power	Connect the 9VAC plug-in transformer	supplied with the unit.

#### SETTING UP THE BEST DATA 56SPX MODEM

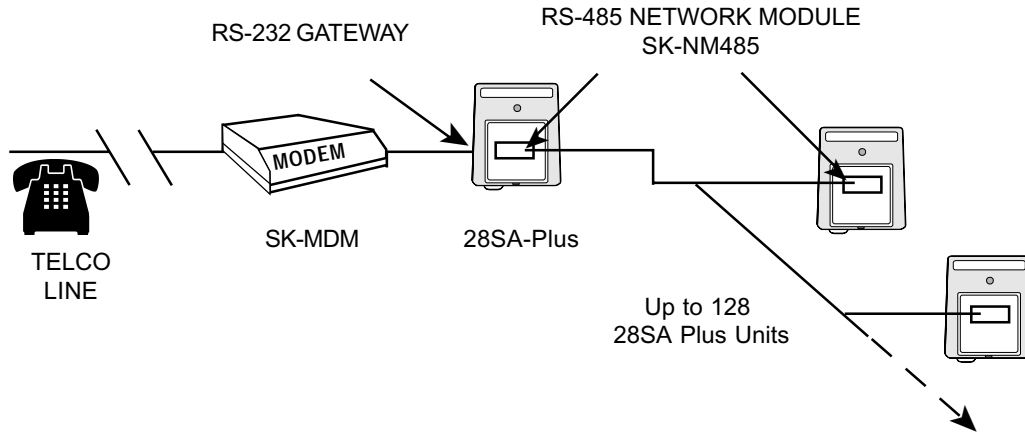
**The order of these steps is critical**, particularly when turning power on to the modem and reader or SK-ACP.

1. Remove power to the 28SA-Plus or SK-ACP
2. Connect cable from reader to modem
3. Turn power to the modem on
4. Turn on power to the 28SA-Plus or SK-ACP

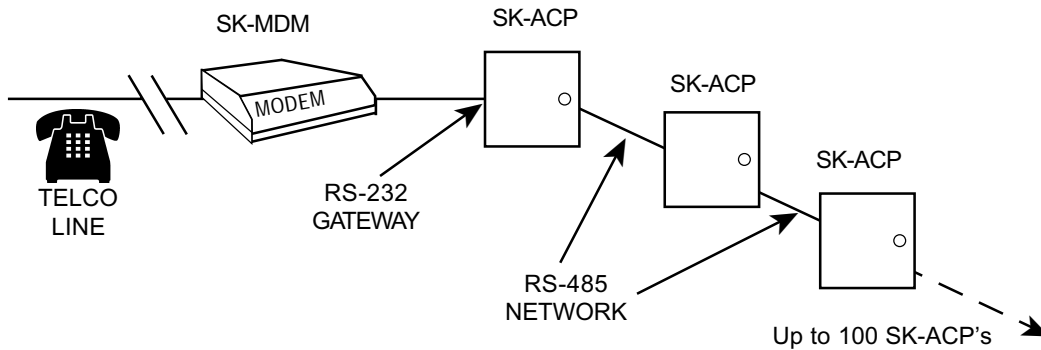
The modem is now set to "auto answer" and "dumb" mode. You can now connect to reader from the PC location. Verify that the TR, CD and AA lights are lighted (on) on the modem display.

**NOTE:** The default baud rate is 9600 baud. A 38,400 baud rate is recommended. You can change the baud rate of a 28SA-Plus using the PD-26 program deck, and the SK-ACP using SK-NET™ or a terminal program.

## REMOTE SITE MODEM CONFIGURATION with 28SA-PLUS



## REMOTE SITE MODEM CONFIGURATION WITH SK-ACP



## APPENDIX D

**TROUBLE SHOOTING GUIDE****1.0 Erratic or No Communication Between Readers and PC**

**One of the most common problems with on-line systems is communications between reader stations and the PC. There are two different configurations for connecting the PC to the network, through the RS-232 Gateway, or with a Converter. Select the configuration of your system from the list below and follow all the troubleshooting steps listed in the appropriate section.**

1. System Using the NET-CONV-P (RS 485 to RS232 converter).
  - a) See section 2.0
2. System Using the Reader Gateway (RS232 com port).
  - a) See section 3.0

**2.0 System Using NET-CONV-P (RS232 to RS485 Converter)****2.1 Recommended Wiring: (refer to figure 1)****Check the following connections to the NET-CONV-P:**

1. Cable Type: Belden 9842 or equivalent (2 **twisted pair** with overall shield - includes one spare conductor).
2. The **SK-NM 485 module** must be installed into each reader. (For 28SA-Plus only, SK-ACP has a built-in 485 module)
3. Verify that both the brown and red wires from the SK-NM485 module or terminals 1 and 2 on J8, (s) are connected as a **twisted pair**.
4. Verify that the brown wire is connected to TD (A), and that TD (A) and RD (A) are jumpered together.
5. Verify that the red wire is connected to RD (B), and that RD (B) and TD (B) are jumpered together.
6. Verify that the black wire is connected using one conductor of the second pair, and then to the converters GND or (-) side of the power supply.
7. Verify the converters power supply is connected to the 485 power input.
8. Verify JP1 is open (not jumpered), and JP2 is jumpered.

**2.2 Setup Location Properties:**

1. Select SK-Net's Explorer (Globe Icon).
2. Right click on the location name, and select Properties from the pull down menu.

- a) Com Port: PC serial port number to which the converter is connected.
- b) Baud Rate: Leave set at the default of 38400.
- c) Auto Login: Check this box (recommended) if you want to download all transactions into the database as soon as you connect to the location.
- d) Reader Gateway: Do not check the box.
- e) Local Connect: Check the box
- f) Modem Phone #: Cannot enter any phone number.

**2.3 Voltage Measurements:**

1. Voltages: Measure voltages at the converter.

- a) Measure input voltage from the converter power supply. Should read from 9VDC to 16 VDC.
- b) Measure the voltage from the GND or (- side of the power supply) to TD (A), should read 0 v DC, from GND to TD (B), should read from 2.5 to 5VDC.

**2.4 Power Reset: (for initial setup only!)**

1. Power Reset: This will change the node address, set password to 12345 (default), and set the baud rate to 9600 (default).

- a) Turn off the power to the reader, push the reset button, turn on the power with reset button pushed for approximately 3 seconds after turning on power. Repeat for all readers.

**2.5 Steps to find new readers:**

- 1. Right click on location name.
- 2. Select Connect. Message on Screen: "Connecting to location (Name), continue." Click OK.
- 3. Message on Screen: "There are no readers in Location (Name), to be logged in. Scan for new readers now?" Click YES.
- 4. Message on Screen: "New Readers Found!", select OK. Now the software will make backup files for all the settings in all of the readers except for the card status.
- 5. If no readers are found, continue to section 2.6.

**2.6 Use a Laptop PC Connected Directly to Each Reader: (The CBLSA cable kit is recommended.)**

- 1. Use SA-Link, SA-Net, or Hyper Terminal (included with Windows Program) setup with 9600 baud (Readers factory default) and connect to the readers RJ11 plug located at the bottom of the reader or the RJ11 jack in the middle of the SK-ACP board using the CBLSA cables. At the password prompt, enter 12345 and the main menu will appear. Select #7 "Utilities", and verify you have item #5 "Global Network Options". This will indicate the RS485 network circuit is working.
- 2. Start SK-NET™, enter the Explorer, select location properties, select "Reader Gateway" and change the baud rate to 9600 (reader default). Now follow the steps in section 2.5. If you can locate all the readers, you have a problem with the desktop PC com port, converter, or the converter wiring.

### 3.0 System Using A Reader Gateway (PC to Reader RS232 port)

#### 3.1 Recommended Wiring: (refer to figure 2)

1. Cable Type: Belden 9931 or 9929, or equivalent (5 conductor shield, not twisted).

#### 3.2 Setup Location Properties:

1. Select SK-NET Explorer (Globe Icon).
2. Right click on the location name and select "Properties" from the pull down menu.
  - a.) Left click on the "Connection Wizard" icon. Connection Wizard will try each COM port at each baud rate until the reader network is located. Accept the settings suggested by Connection Wizard and click on "Connect". If the connection cannot be made, recheck your wiring.
  - b.) Left click on "Auto Login" if you want to download all transactions from the reader(s) as soon as you launch SK-NET and connect to the network. (Recommended for local connect applications.)
  - c.) "Reader Gateway" should be checked if you are using an RS-232 connection.
  - d.) "Local Connect" should also be checked if the computer is not communicating via modem.
  - e.) "Modem Phone Number" is only available in "MLD" version software when "Local Connect" is not checked.

#### 3.3 Voltage Measurements:

1. Voltages: Measure voltages at the gateway reader's terminal block, communication pins 1 to 5. Connect the ground lead to pin 1 (logic ground) for all measurements.
  - a) Pin 2 (Receive Data, RXD). The voltage should read between -5 VDC to -12 VDC. This voltage comes from the PC. If the voltage is wrong or missing, disconnect the reader from the PC, and measure the voltages at the reader (should be 0.0 VDC) and at the PC (should be between -5 VDC to -12 VDC).
  - b) Pin 3 (Clear to Send, CTS). The voltage should read between +5 VDC to +12 VDC. This voltage comes from the PC. If the voltage is wrong or missing, disconnect the reader from the PC, and measure the voltages at the reader (should be 0.0 VDC) and at the PC (should be between +5 VDC to +12 VDC).
  - c) Pin 4 (Request to Send, RTS). The voltage should read between -5 VDC to -12 VDC. This voltage comes from the Card Reader. If the voltage is wrong or missing, disconnect the reader from the PC, and measure the voltages at the reader (should be -9.5 VDC) and at the PC (should be 0.0 VDC).
  - d) Pin 5 (Transmit Data, TXD). The voltage should read between -5 VDC to -12 VDC. This voltage comes from the Card Reader. If the voltage is wrong or missing, disconnect the reader from the PC, and measure the voltages at the reader (should be -9.5 VDC) and at the PC (should be 0.0 VDC).

### 3.4 Power Reset: (for initial setup only!)

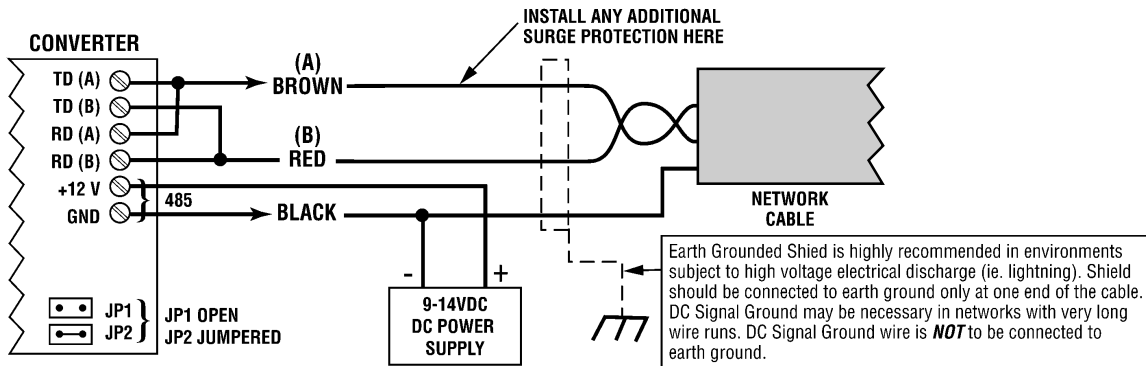
1. Power Reset: This will change the node address, set password to 12345 (default), and set the baud rate to 9600 (default).
  - a) Turn off the power to the panel, push the reset button, turn on the power with reset button pushed for approximately 3 seconds after turning on power. Do not have any cards near the reader while this process is being done. Repeat for all panels.

### 3.5 Steps to find new readers:

1. Right click on location name.
2. Select Connect. Message on Screen: "Connecting to location (Name), continue." Click OK.
3. Message on Screen: "There are no readers in Location (Name). To be logged in, scan for new readers now?" Click YES.
4. Message on Screen: "New Readers Found!", select OK. Now the software will make backup files for all the settings in all of the readers except for the card status.
5. If no readers are found, continue to section 3.6.

### 3.6 Use a Laptop PC Connected Directly to the Gateway Reader (The CBLSA cable kit is recommended.)

1. Use SA-Link, SA-Net, or Hyper Terminal (included with Windows® Program) setup with 9600 baud (Readers factory default) and connect to the readers RJ11 plug located at the bottom of the reader or middle of SK-ACP board using the CBLSA cables. At the password prompt enter 12345 and the main menu will appear. Select #7 "Utilities", and verify you have item #5 "Global Network Options". This will indicate the RS485 network module is working.



**SK UTILITIES**

SK-Utility is a communications software program for the IBM-compatible PC, which is used to assist troubleshooting RS232 communication problems while using the SK-ACP or 28SA Plus with the SK-NET software. **SK-NET location must be disconnected, or SK-NET must be shut down while running SK-Utility.**

SK-Utility uses an RS232 serial data link which can automatically search up to a total of 6 RS232 Com Ports, to verify communications using the SK-ACP or 28SA Plus. You will see immediately whenever the panel/reader is found.

SK-Utility also allows you to upgrade the firmware for the SK-ACP or 28SA Plus.

How to use:

- 1) Connect the SK-ACP/28SA Plus to one of the Com Ports of your PC.
- 2) Find the SK-ACP/28SA Plus by selecting the "Connection Wizard"
  - A) You will be given the choice of selecting "Find Reader or Panel" or "find Com Port Loopback".
  - B) Select "Find Reader or Panel" first. If you find the SK-ACP/28SA Plus you are ready to setup SK-NET and use the baud rate and com port shown, or if you want to load new firmware (see step 3). If the communications are bad and you get the "Connect Failure, check the connection" message, you need to determine weather you have a bad Com Port, wiring problem, or a bad panel/reader (see step 4).
- 3) Loading new firmware, select "Device"
  - A) Enter the password (default is 12345).
  - B) The software will backup the current settings in the SK-ACP/28SA Plus and then restore the settings after completing the firmware load. If you check the "Firmware Only" box, the factory defaults will be loaded into the SK-ACP/28SA Plus.
- 4) Loopback test, with the use of a Loopback tester (**pins 2 and 3 jumpered on a DB9 or DB25 female connector**) you can verify that the TXD and RXD signals are working for any Com Port on your PC,. If you are using the NET-CONV-P (RS485 to RS232 converter) it can also be used as a loopback tester after the required jumpers have been installed. This allows you to not only test the TXD and RXD signals of the Com Port in your PC, but verifies the converter is ok as well.
  - A) Select the "Find com port loopback"
  - B) Plug in the loop back tester or the NET-CONV-P into the Com Port.
  - C) If this test fails you have a bad com port.
  - D) If this test passes, then go to the troubleshooting guide in the SK-NET manual and follow this procedure to verify the RS232 com port voltages.

Once you have connected to the panel/reader and enter the password, (default is 12345) you will be able to use the menu for the terminal mode for the SK-ACP/28SA Plus.

## **Windows® 95/98 Hyper Terminal Setup**

In order to connect to a ENTRACOMP® 28SA-Plus OR SK-ACP access control unit using only Windows, follow these steps:

1. Click on the start button on the lower left corner of the screen.
2. Select Programs.
3. Select Accessories.
4. Select Hyper Terminal.
5. Double click on Hypertrm.
6. Type Secura Key in the name field.
7. Click OK.
8. The next window will have a selection at the bottom of "Connect Using". Be sure it is set to "Direct to Com1", or whatever com port is available.
9. Click the settings tab at the top of the box.
10. Under Emulation, select VT100.
11. Click OK.
12. Verify the following setting in the next properties box:
  - (a) Bits per second: 9600
  - (b) Data bits: 8
  - (c) Stop bits: 1
  - (d) Flow control: None
13. Click OK.
14. The next box should display the greeting and the "Enter Password" prompt. Enter 12345, or the appropriate password.
15. If this greeting does not appear, press the Enter or Return key once.
16. If the greeting still does not appear, check the wiring between the unit and the PC and test the com port.
17. To exit, click the (X) box on the upper right. Be sure to answer Yes to save the session.

Obtain the technical bulletin "Programming an SK-ACP Using a Terminal Program" from [www.securakey.com](http://www.securakey.com)

**Recommended Tools & Supplies:****MULTI-READER SYSTEMS:**

- Network is twisted-pair, shielded cable
- Total system cable length, 4000 feet (1219.2 m)
- PC connects to Network using RS-232/485 converter, Model NET-CONV-P, or it can connect to the network without the converter using the RS-232 port on any reader or panel
- PC also can connect to remote locations with multiple reader, via modem
- See Diagram for System Configurations

**SINGLE READER SYSTEM:**

- PC connects directly to reader or panel or via modem

**SK-NET™ MINIMUM PC REQUIREMENTS**

- IBM-Compatible, Pentium 200 or compatible processor
- Windows® 95/98, or Windows®/NT 4.0 or greater

- 32 MB RAM
- 100 MB Hard Drive Capacity (more for multiple locations)
- CD-ROM Drive
- High-speed serial COM Port (38.4 K or better)
- VGA monitor
- IBM Compatible parallel printer

**RECOMMENDED PC CONFIGURATION**

- ZIP™ Drive or equivalent for system backup
- Windows NT® for best performance
- Pentium 400 or compatible processor
- 64 MB RAM
- 1 GB Hard Drive available capacity

Software upgrades can be downloaded from  
[www.securakey.com](http://www.securakey.com)

**Tech Support Options:**

*Web Page:* [www.securakey.com](http://www.securakey.com)

*E-Mail:* [techsupport@securakey.com](mailto:techsupport@securakey.com)

*Fax:* 818 882-7052

*Toll-Free Telephone:* 800 891-0020

*Tech Support Hours:* 7:30 am to 5:00 pm P.S.T.

*Best Time to call:* Afternoons P.S.T.

## APPENDIX E

**PREVENTING LIGHTNING DAMAGE****SURGE PROTECTION FOR ACCESS CONTROL SYSTEMS**

Access Control equipment is susceptible to damage from lightning, especially when installed outdoors. Voltage spikes which travel through buried data cables, telephone lines or AC power lines can damage Access Control equipment indoors, as well.

While nothing can protect equipment from a direct lightning hit, surge protectors can help to minimize the damage caused by nearby lightning strikes. Surge protectors operate by connecting Transorbs or Varistors from data lines to ground. Surge protectors have no effect on normal circuit voltages, but can act quickly to divert large voltage spikes to ground and away from sensitive components.

Secura Key SA-Series Access Control Units are equipped with surge protection on all inputs and outputs. PC's, Printers, and Modems are designed for an indoor, office environment and do not have surge protection. However, by properly installing aftermarket surge protection devices on all inputs and outputs, these devices can also be protected from lightning damage.

**Where to Install Surge Protection**

- On the AC line voltage input to the PC.
- On the AC line voltage input to any transformer or DC Power Supply connected to a 28SA-Plus or Modem.
- On RS-485 data lines connecting a 28SA-Plus Units or to a PC, Printer or Modem, using a NET-CONV-P converter.
- On RS-232 data lines from SA Units (Readers) to PC's, Printers or Modems.
- On Telephone lines connected to Modems.

**Protect Both Ends of Data Lines**

Surge Protectors should be installed at both ends of all Data Lines.

**Wire Distance from the Surge Protector**

You must **locate the protector at least three wire feet away from the device being protected.** The additional wire resistance will dissipate the energy from leading edge of the spike. The wire can be coiled; a three-foot physical distance is not required.

## Grounding the Surge Protector

Surge protectors **must be connected to a verified good, nearby earth ground**. This can be AC Power Ground, a 10' Copper Ground Stake, or Building Ground. Run 16 AWG or heavier wire as short a distance as possible, and avoid any bends in the wire.

## Self-grounding Surge Protectors

**Do not use surge protectors unless they are equipped with a separate ground wire or ground screw.** Self-grounding Surge Protectors use the connector shell or Pin 1 as a ground path; however, the shell and Pin 1 are not always grounded.

## AC Power Surge Protectors

**AC Power Surge Protectors must be plugged into a properly grounded 3-wire socket.** If a 3-wire socket is not available, have one installed by an electrician; do not use a 2-prong socket by cutting off the 3rd prong on the plug, or by using a 3/2 converter, or the surge protector will be rendered useless.

## Terminating Cable Shields

Connect cable shields on data cables at one end only. You may terminate the cable shield to the same ground as the surge protector. Leave the cable shield unconnected at the opposite end.

## Grounding the Access Control Unit

At the Access Control Unit, connect the Green Ground Screw on the mounting plate to a good earth ground, to allow the built-in surge protection to work properly.

## Recommended Surge Protectors

There are many manufacturers of Surge Protectors for , RS-485, RS-232, AC power and telephone line applications; while we don't specifically endorse a particular product, we have listed several on the following page. These manufacturers can give you details on price, performance and installation methods. The model numbers specified are the minimum protection needed. Some areas may require additional protection. If lightning damage persists, consult these manufacturers.

### **Diversified Technologies** (Ditek) Tel: (800) 753-2345.

RS-485 Surge protectors with screw terminals, ground wire, clamping level 7 VRMS

- 4 wire, DTK-2LVLP-D

RS-232 Surge Protectors with screw terminals, ground wire, clamping level 7 VRMS

- 6 wire, DTK-3LVLP-D

Telephone Line Surge Protectors w/screw terminals, ground wire, clamping level 130VRMS

- 2 wire, DTK-1LVLPSCP-RUV

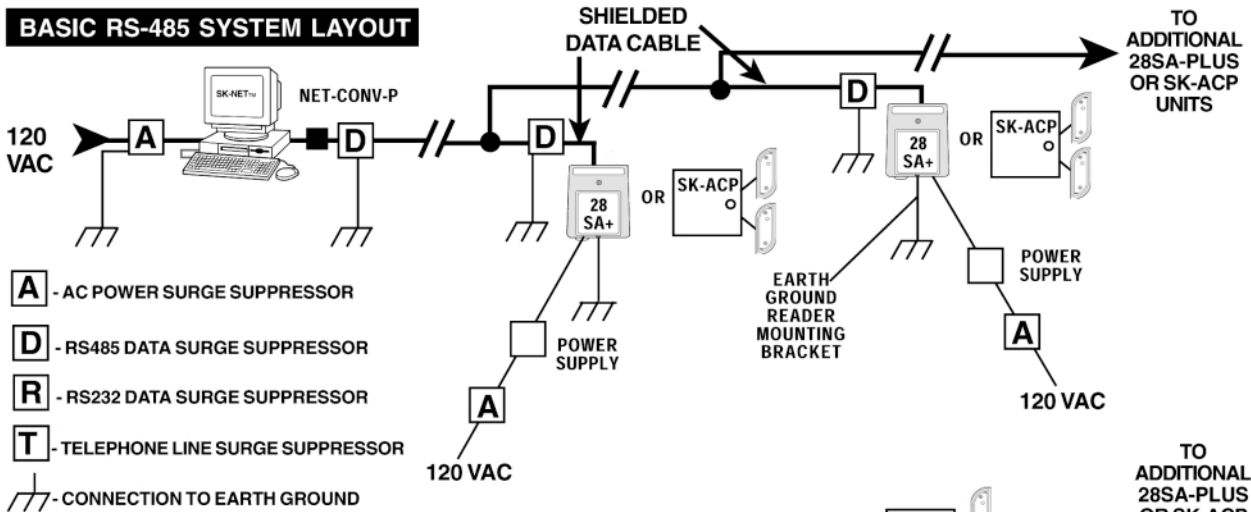
**Stormin Protection Products, Inc.** Tel: (888-471-1038) or (813) 548-5418

RS-485 Surge protectors with screw terminals, ground wire, clamping level 15 VRMS  
 • 4 wire, DUAL-3W-DTV/G-7V

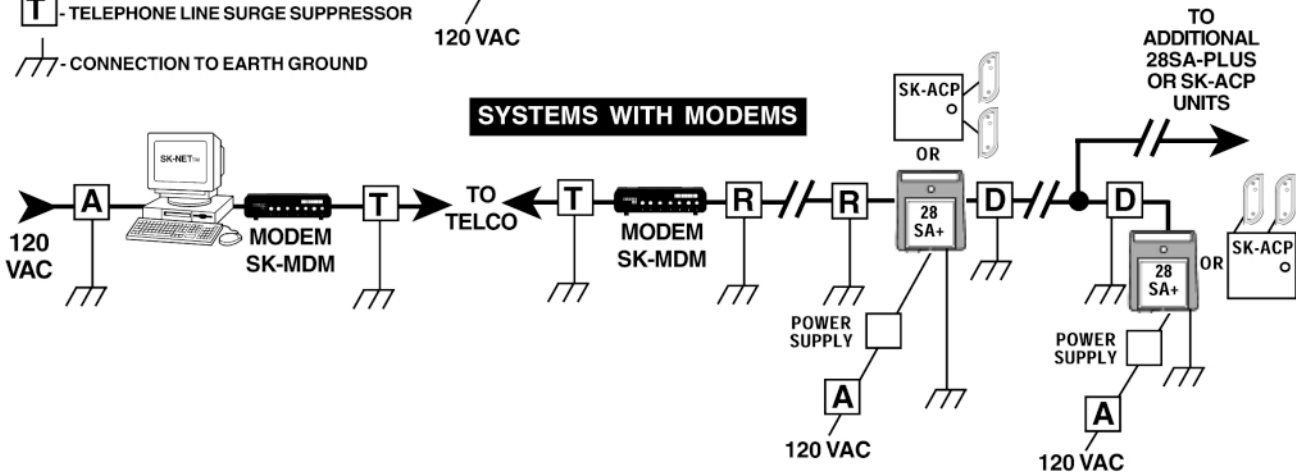
RS-232 Surge Protectors with screw terminals, ground wire, clamping level 15VRMS  
 • 5 wire, DUAL-5W-DTV/G-7V (With Screw Terminals one side, with DB-25  
 other side (pin # 2, 3, 4, 7 & 8)

Telephone Line Surge Protectors w/screw terminals, ground wire, clamping level 130VRMS  
 • 2 wire, DLT-TOS-200V (Specify Screw Terminals or RJ11)

## BASIC RS-485 SYSTEM LAYOUT



## SYSTEMS WITH MODEMS



**WARRANTY:**

These products are warranted against defects in materials and workmanship for one (1) year from the date of shipment. Secura Key shall, at its option, either repair or replace products which prove to be defective and are returned to Secura Key with freight prepaid, within the warranty period. The foregoing warranty shall not apply to defects resulting from abuse, misuse, accident, alteration, neglect or unauthorized repair or installation. Secura Key shall have the right of final determination as to the existence and cause of the defect. THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL IS EXPRESSED OR IMPLIED. SECURA KEY SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. The remedies provided herein are Buyer's sole and exclusive remedies. In no event shall Secura Key be liable for direct, indirect, special, incidental or consequential damages, (including loss of profits) whether based on contract, tort or any other legal theory.

**WARNING:****INSTRUCTION TO THE USER**

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet of a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.



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