

# ***CRYPTO LOCK***

## **Model CC-8521A**

# **Single Door Access Control System**

Revision-3.0  
(05/01)

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**Crypto Lock  
Model CC-8521A  
Rev. 3.0  
INSTRUCTION MANUAL**

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# 1. INTRODUCTION

The Crypto-Lock Model CC-8521A is a versatile, easily installed and operated single door access control system. It provides reliable keypad access control using a single 3, 4 or 5-digit PIN code for all users.

The system, pictured in Figure 1, includes a built-in 12Vdc and 24Vdc, 2A power supply to power electric strikes and magnetic locks, eliminating the need for a separate power supply unit. It provides the high in-rush currents required to reliably open heavy duty locking devices such as Von Duprin\* rim latch retraction units and Sargent & Greenleaf Brute\* electric locks. A unique, switch selectable current limiter safely achieves continuous activation of large solenoid-operated locks. This feature limits the current to a value that will reliably hold the lock open without damaging its solenoid.

The power supply includes a battery charger and monitoring circuit that automatically maintains optional batteries in a fully charged condition and activates audible and visual warnings when the charge level is low. Two 12V, 7AH sealed lead acid batteries (not included) can be housed in the enclosure.

The length of time that the lock remains released after entry of the valid PIN is adjustable from 3 to 60 seconds. An invalid PIN penalty feature provides for ignoring all keypad entries for from 3 to 60 seconds after an invalid digit is entered. This greatly reduces the possibility of gaining access by guessing PIN codes, and is particularly effective when shorter PIN lengths are used.

The stainless steel keypad includes a green LED that illuminates when the lock is released.

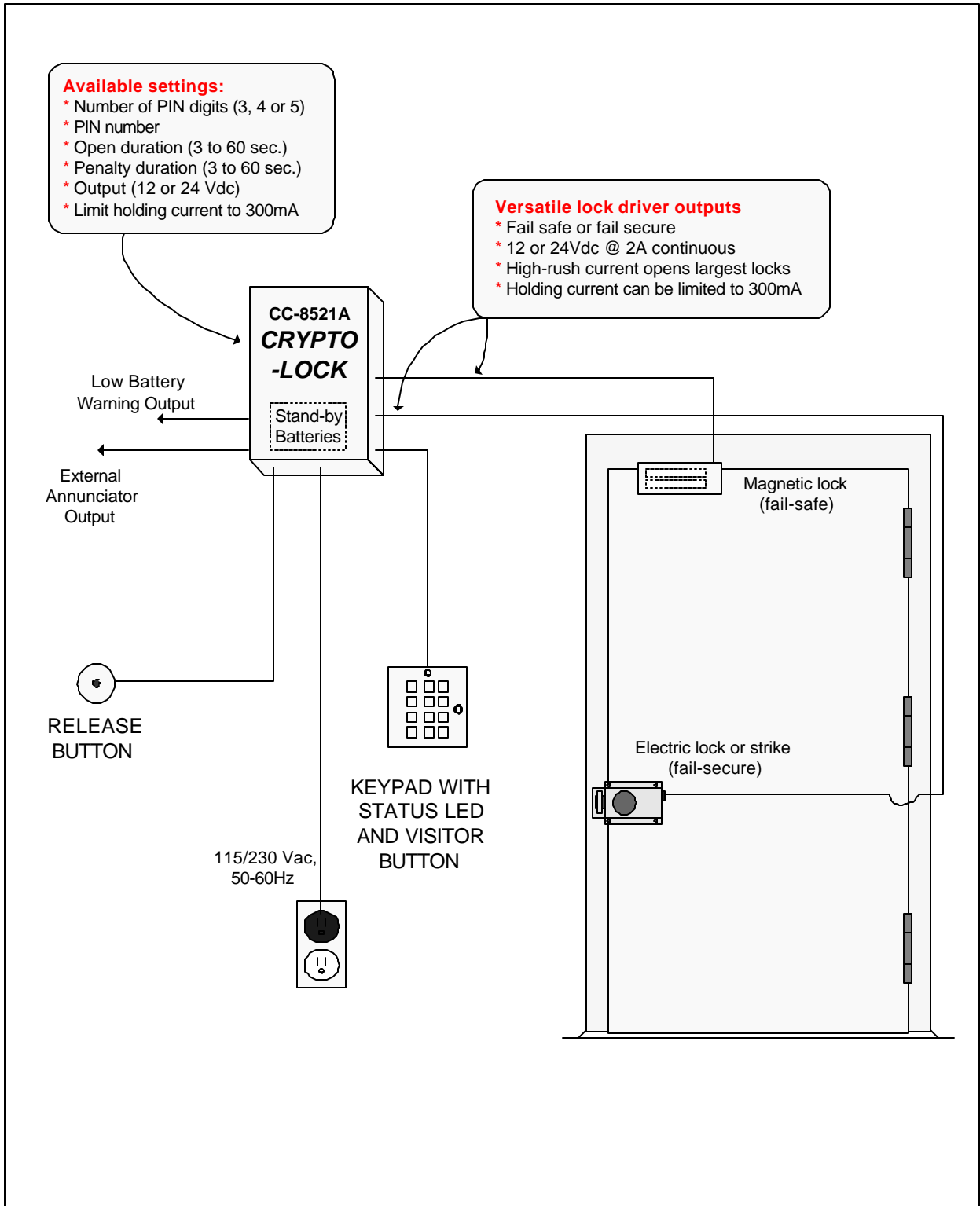
A visitor button on the keypad activates an annunciator in the control unit and also generates an output voltage for an external device.

Installation and set-up are readily accomplished using the wiring diagram affixed inside the enclosure door and also contained in this manual. Slide switches set the PIN length (3, 4 or 5 digits), output voltage (12 or 24 Vdc), and enable or disable holding current limiting. Five 10-position DIP switches are used to set the PIN. The open duration time and penalty time are set using analog control knobs.

The CC-8521A can be wired to operate on either 115 or 230 Vac, 50-60 Hz. It is wired at the factory for 115 Vac.

A typical installation of the CC-8521A is illustrated in Figure 2.

*\*Von Duprin is a registered trademark of the Ingersoll-Rand Company, Brute is a registered trademark of Sargent & Greeleaf, Inc.*



**Figure 2, Typical Installation of the Crypto Lock**

## 2. SPECIFICATIONS

Power required	115/230 Vac, 50 or 60 Hz, 60 W
Output	12 or 24 Vdc, 2A continuous
Holding current	Can be limited to 300mA (switch selectable)
In-rush current capacity	16A
Relay contacts	10A, SPDT (Form C)
Battery back up	12Vdc or 24Vdc, automatic transfer and charging (batteries optional)
Battery monitoring	Warning lamp, beeper and output signal activate when battery is low
PIN code length	3, 4 or 5 digits, switch selectable
Open duration	Adjustable, 3 to 60 seconds
Penalty function	Invalid digits temporarily disable operation
Penalty time	Adjustable, 3 to 60 seconds
Remote release	Dry contact closure input
Keypad cable:	
Keypad	12-conductor, #22
Annunciator	2-conductor, #22
Supplied cable	10 ft., 15-cond., #22
Maximum length	200 ft.
Enclosure	19 gauge steel, powder painted, gray, knockouts for conduit, and cam lock (included), holes to accommodate padlock (not included)
Dimensions	12H x 9W x 4.5D in.
Option available:	CC-BATT, 12Vdc, 7AH rechargeable battery (two required)

### **Narrative description:**

Model CC-8521A Crypto Lock single door access control system including control unit, weather-proof 10-button keypad in stainless steel spy-proof housing with visitor button and 10 ft. cable, user code cannot be re-programmed, changed or revealed in any way from keypad. Includes a penalty time adjustment (3-60 sec.), open time adjustment (3-60 Sec.), code length switch (3, 4 or 5 digits), five 10- position DIP switches to set the PIN code, output voltage switch (12 or 24 Vdc, 2A continuous, 16A in-rush current), holding current limit switch (2A or 300mA, fail-safe and fail-secure lock outputs, external annunciator output, release input, and low-battery, penalty, and power warning lamps. The metal enclosure accommodates two 12V, 7AH batteries, includes a cam lock and has provisions for a padlock. Input power is 115/230 Vac, 50-60Hz. Supplied with instruction manual, all mounting hardware and a remote release push-button switch.

### 3. SUPPLIED EQUIPMENT

The CC-8521A consists of two main units, the Keypad and the Control Unit and various accessories and mounting hardware to facilitate installation. The table below lists all of the items that comprise the Model CC-8521A Crypto Lock along with a brief description of each to aid identification and use.

QTY	ITEM	PURPOSE
1	Control Unit	Main processor and power supply
1	Keypad with 10" cable	Accepts PIN code entries
1	Manual, Crypto Lock CC-8521A (this manual)	Installation and operating instructions
1	Line cord with U.S. 3-prong plug, 10 ft.	Connection to AC power
2	Threaded rod, #8 X 12"	Keypad mounting, thru-wall
1*	Cam Lock w/ two keys	Lock Control Unit door
2*	Screw, slotted, sheet metal, #6, 1/2"	Hold Control Unit door closed
1*	Surface-mount push-button, SPST	Lock release button (by-pass switch)
2*	Battery cables, #18 AWG, black/red	Connect batteries to Lock Driver Board
1*	Diode (1N4007) with red and black wires	Connect at lock to suppress spikes
1*	Grounding lug, ring, #10 screw	Connect AC ground lead to chassis
2*	Fuse, 5x20MM, 2A, Slo-Blo	Spares
4*	Hex Nut, #8	Keypad mounting
2*	Acorn nut, #8	Keypad mounting, thru-wall
6*	Lock washer, #8	Keypad Mounting
2*	Washer, #8, 1-1/2 in. dia.	Keypad mounting, thru-wall
8*	Pan head combo drive screw, #8 x 1-1/2"	Keypad and Control Unit Mounting
2*	Bushing, black nylon, 7/8"	Protects cable going into Control Unit
4*	Vent plug, black nylon, 7/8"	Ventilate Control Unit in warm environments
2*	Cable connector for 7/8" knock-out hole	Protects AC power cord and keypad cable
2*	Anchor, nylon, adhesive back, 1" x 1"	Secure cables within Control Unit
6*	Tie wrap, nylon, 4"	Secure cables within Control Unit
1	Template, Keypad mounting holes	Keypad installation

\* Items packed in zip-lock poly bag

## **4. FUNCTIONS OF CONTROLS AND INDICATORS**

### **A. KEYPAD**

Keys 1 through 0 are used to enter the PIN code. Keys \* and # are not used.

Green LED indicator - Illuminates when the correct PIN code has been entered and the door is released.

Annunciator Button - Pressing sounds an annunciator in the control unit and also activates a 12 Vdc signal for use with an external device.

### **B. LOGIC BOARD**

PIN Code DIGIT Select Switches - Used to set the PIN code. One number on each switch is selected corresponding to digit-1 through digit-5 of the PIN code. To select a number, slide the corresponding switch to the ON position. If the PIN code is less than 5 digits, the slide switches for the unused digits can be left in the OFF position.

DURATION Control - Determines how long the door relay will remain energized after the correct PIN code is entered or the Release Button is pressed. The range is adjustable from approximately 3 to 60 seconds.

PENALTY Control - The penalty feature is designed to temporarily disable the system when an invalid digit is entered on the Keypad. The range is adjustable from approximately 3 to 60 seconds.

PENALTY Lamp - Illuminates when the penalty feature is activated.

# OF DIGITS Switch - Selects either 3, 4, or 5 digits for the length of the PIN code.

POWER Indicator LED - Indicates that the Logic Board is powered.

### **C. LOCK DRIVER BOARD**

OUTPUT VOLTAGE SOURCE (INT 24V, EXT, or INT 12V) - Selects the voltage that will operate the locking device attached to the system. Always remove power (AC and batteries) before resetting this switch. In the INT 24V and INT 12V positions the internal power supply provides either 24VDC or 12VDC respectively to the locking device. In the EXT position the external voltage applied to pin 12 of T1 on the Lock Driver Board is applied through the relay to the locking device.

OUTPUT MODE (DIRECT or LIMIT HOLDING CURRENT) - In the DIRECT position provides up to 2A of continuous holding current. In the LIMIT HOLDING CURRENT position the holding current is limited to approximately 300 mA after the locking device is initially energized. This setting permits holding an electric lock or strikes open without damaging its solenoid. Note: Current limiting operates only when the OUTPUT VOLTAGE SOURCE Switch is set to INT 24V.

L1 Indicator LED - Indicates that the Lock Driver Board is powered.

L2 Indicator LED - Flashes approximately every 15 seconds when the battery is low.

B1 Beeper - Sounds approximately every 15 seconds when the battery is low.

F1 and F2 - AC low voltage, 2A Slo Blo

F3 - Batteries, 2A Slo Blo

F4 - Lock current, 2A Slo Blo

F5 - AC Primary Voltage - 2A Slo Blo

## 5. INSTALLATION AND SETUP

Installation of the CC-8551A Crypto Lock consists of mounting the Keypad and Control Unit, connecting the Keypad cable, power cord, external lock and other devices and installing the batteries (optional). Setup includes setting switches to determine the lock voltage and current limits and setting the PIN code length and digits.

### A. INSTALLATION

1) Mount the Keypad approximately 36 to 44 inches above the floor on the unsecured side of the door. Use the template packed with the equipment to mark and drill holes. Through-wall mounting can be accomplished using the #8 threaded rod, acorn nuts, hex nuts, lock washers and 1-1/2" washers. Alternatively, the Keypad can be mounted using four of the supplied #8 x 1-1/2" pan head combo drive screws.

2) Mount the electric lock, strike or magnet according to the manufacturer's instructions.

3) Mount the Control Unit on the secure side of door in an area convenient to the door and an electrical outlet. Four #8 x 1-1/2" pan head combo drive screws are provided for this purpose.

4) If required, install the supplied Cam Lock in the knockout hole provided for that purpose on the enclosure door. Alternatively, if a padlock (not supplied) is to be used remove the two 3/8" nylon plugs from the padlock holes. The padlock's shackle must be first inserted through the hole on the side of the enclosure, then the door can be closed so that the padlock hole on the door also passes over the shackle. If the door does not need to be locked, the two supplied #6 x 1/2" screws can be used in the door edge holes to hold it closed.

#### Note

All cables passing through the knockout holes in enclosure must be protected from chafing using the supplied 7/8" strain relief connectors or 7/8" nylon grommets. Route all cables to avoid the space that will be occupied by the batteries. Nylon tie wraps and self-adhesive nylon anchors are supplied for this purpose.

4. Connect the Keypad to the Control Unit as shown in Figure 3. Ten feet of cable is supplied with the Keypad. The Keypad can be located up to 200 feet from Control Unit using additional cable. (Requires 14 conductors, #22).

5. Connect the electric lock, strike or magnet as shown in Figure 3.

6. If used, connect the Release Button (supplied), and external 12VDC annunciator (not supplied), as shown in Figure 3. Note that an internal annunciator on the Logic Board will sound when the Keypad's annunciator button is pressed.

7. Install and connect the optional batteries as shown in Figure 3 using the two supplied battery cables. Use only 12V, 1.2 to 7AH rechargeable sealed lead acid batteries.

8. Connect the AC Power Cord to Terminal T4 in accordance with the available voltage (115 or 230Vac) as shown in Figure 3.

9. Connect the transformer primary wires to Terminal T3 in accordance with the available voltage (115 or 230 Vac) as shown in Figure 3. **CAUTION ! The Control Unit is shipped from the factory wired for 115Vac operation. Refer to Figure 3.**

## **B. SETUP**

1. Set the OUTPUT source switch in accordance with the voltage rating of the lock being used (12 or 24 Vdc).
2. Set the OUTPUT MODE switch to LIMIT HOLDING CURRENT for use with the Sargent Greenleaf Brute lock or other devices that can be damaged by holding currents in excess of 300 mA. For other locks and magnetic releases select the DIRECT position.
3. Set the # OF DIGITS switch to the desired number of PIN digits (3, 4 or 5)
4. Set the valid PIN code using the DIGIT DIP switches. DIP switches for unused digits can all be set to OFF.
5. Set the DURATION control to the approximate desired open time. (Min.=3 sec., Max.=60 sec.)
6. Set the PENALTY control to the approximate desired PENALTY time (Min.=3 sec., Max.=60 sec.)
7. Connect the power cord to an appropriate source of AC power and verify that the POWER indicators illuminate.
8. Enter the valid PIN code on the keypad and verify that the lock releases and that the green LED on the Keypad illuminates.

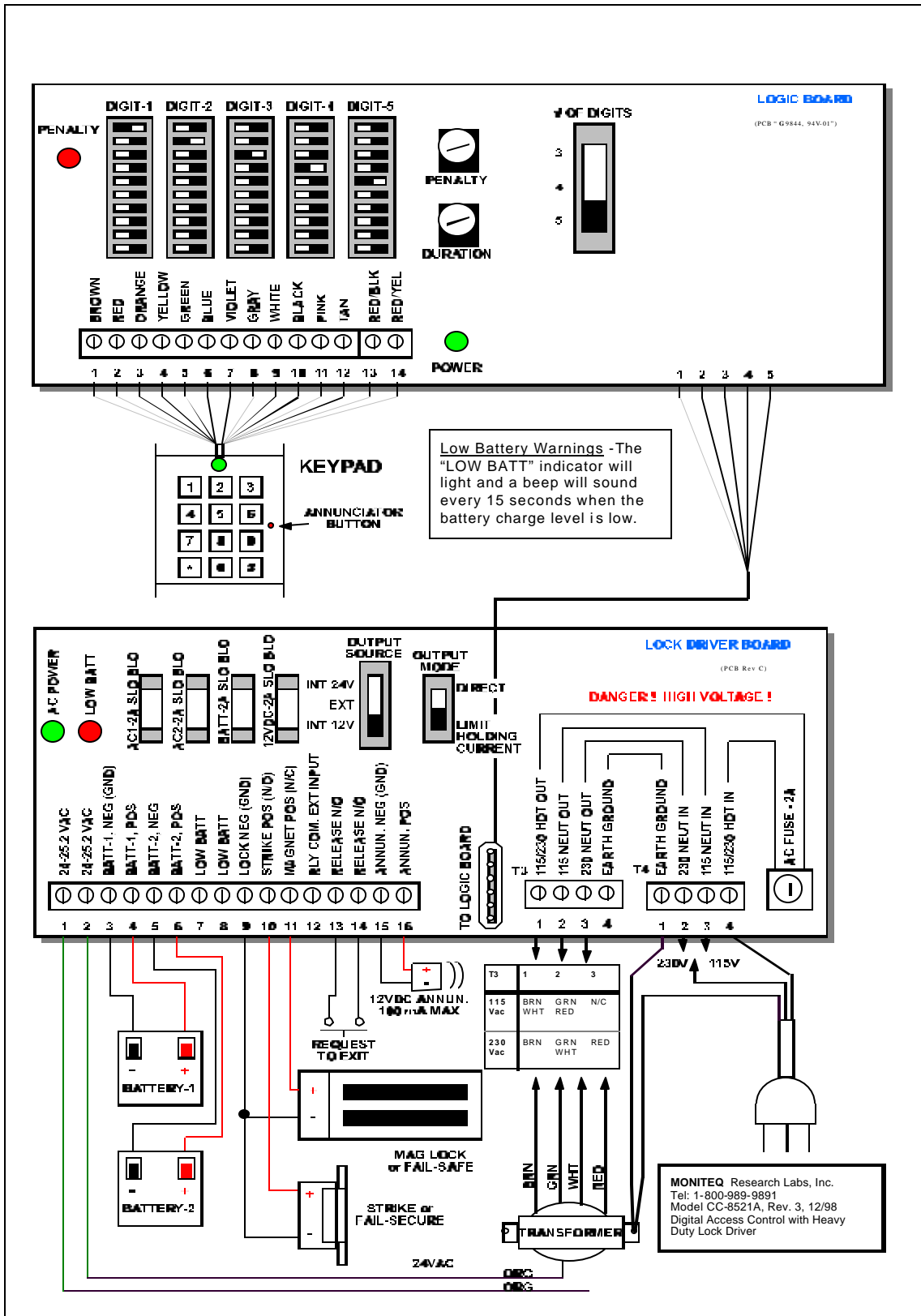


Figure 3, Crypto Lock Wiring Diagram

## 6. OPERATING PROCEDURE

To operate the CC-8521A, enter the valid 3, 4, or 5 digit PIN code on the keypad. When the valid PIN code is entered, the green LED on the Keypad will illuminate and the door will release.

The CC-8521A Keypad has a built-in annunciator button. Pressing this button causes an annunciator to sound in the Control Unit. If an external annunciator is connected as shown in Figure 3 it will also sound when this button is pressed.

If one or more incorrect PIN code digits are entered the system will enter a penalty mode and will not recognize any digits for the time period set by the PENALTY control on the Logic Board in the Control Unit. After the penalty time has elapsed the unit will return to normal operation and entering the valid PIN code on the Keypad will release the door.

If the external Release Button has been installed it can be used by an attendant to release the lock from the secure side of the door.

## 7. THEORY OF OPERATION

### A. GENERAL

The CC-8521A Crypto Lock consists of two main units, the Keypad and Control Unit.

### B. KEYPAD

The Keypad contains a telephone-type key switch, an LED indicator lamp and an annunciator push button. Refer to Figure 4, Keypad Schematic Diagram.

The Control Unit contains the Logic Board, the Lock Driver Board and the Power Transformer.

### C. LOGIC BOARD

Refer to Figure 5, Logic Board Block Diagram, and Figure 7, Logic Board Schematic)

The Logic Board processes key strokes from the Keypad to determine if the lock relay should be energized based on the PIN code set on the DIGIT DIP switches. The Logic Board also accepts the input from the Annunciator Button on the Keypad for routing to the Lock Driver Board, and generates a signal to illuminate the green LED on the Keypad when a valid PIN code has been entered.

Chip U4 is a divide-by-8 counter that decodes successive inputs from the Keypad. The decoded outputs of U4 are coupled through the respective DIGIT DIP switches (S1,2,3,5 and 7) to U4's Clock Enable input. If a valid first digit is pressed the high signal on the "0" decoded output (U4, pin 2) is coupled through the valid number's key switch through T1 pin 11, U2C and Q4 to the clock enable input of U4, advancing the counter one count and causing the "1"

decoded output (U4, pin 1) to go high. If the second digit from the keypad is also valid the process repeats, again advancing the counter. When the last correct digit is entered a high signal is coupled to both inputs of gate U2:B which then triggers the Open Timer, U1:B. The output of U1:B then remains high for a time period set by the DURATION potentiometer R19. This output is coupled to Relay Driver Q5 which grounds the signal connected to the door control relay on the Lock Driver Board.

If an incorrect digit is entered on the Keypad the divide-by-8 counter U3 is advanced one count, thereby triggering Penalty Timer U1:A that resets Open Timer U1:B for a time period set by PENALTY potentiometer R8.

### D. LOCK DRIVER BOARD

(Refer to Figure 6, Lock Driver Board Block Diagram, and Figure 8, Lock Driver Board Schematic)

The Lock Driver Board contains the power supplies for both powering the internal circuits and driving the external locking device. It also manages the standby batteries and routes signals from the external release button to the Logic Board and from the Logic Board to the external annunciator.

The 24Vac output from the secondary of the power transformer is applied to bridge rectifier D2 and filter components C4, R3 and C2 and regulator Q2 to generate 27.3Vdc. When OUTPUT SOURCE switch S2 is set to INT 24V and OUTPUT MODE switch S1 is closed, this voltage is coupled through door control relay K1 to either pin 10 or pin 11 of T2 depending on the status of K1. Capacitor C3 provides additional "in-rush" current immediately after K1 closes to assure

activation of the solenoids in larger, heavy-duty electric locks. K1 is controlled by an input from the Logic Board on T1, pin 2 (RELAY-). When OUTPUT MODE switch S1 is in the LIMIT HOLDING CURRENT position the output current is limited to approximately 300mA after capacitor C3 discharges. This serves to prevent overheating and possible damage to solenoid-operated locks that otherwise could not be maintained open for long periods of time.

Regulator Q3 provides 13.5Vdc at up to 2A to relay K1 when the OUTPUT SOURCE switch is set to INT 12V.

Regulator Q4 provide operating voltage for circuits on both the Lock Driver Board and through T1, pin 4, to the Logic Board.

Regulator Q5 provides operating voltage for the battery monitoring circuits of U1 and U2. U1:A compares the battery voltage (T2, pin 6) with a reference voltage to determine the battery charge level. When the level falls below that of the reference the output of U1:A triggers timer U2, causing L2 to flash and beeper B1 to sound approximately every 30 seconds.

The annunciator control signal from the Logic Board enters through T1, pin 6 and is coupled directly to the external annunciator through T2, pin 16.

Terminals T3 and T4 are provided to allow wiring the power transformer primary winding for either 115VAC or 230VAC. Refer to Figure 3 for correct wiring of T3 and T4.

**E. REFERENCE DIAGRAMS**

The block and schematic diagrams provided below and on the following pages are provided for reference in installation and troubleshooting.

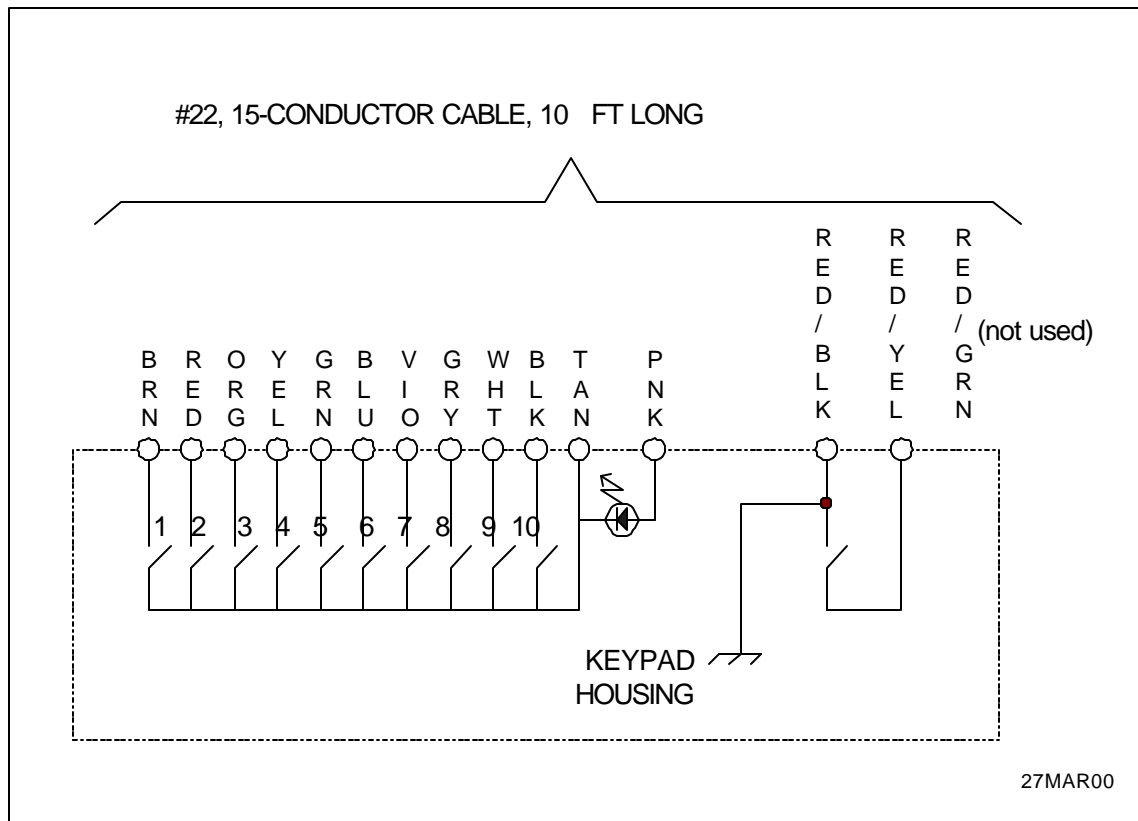


Figure 4, CC-8521A Keypad Schematic Diagram

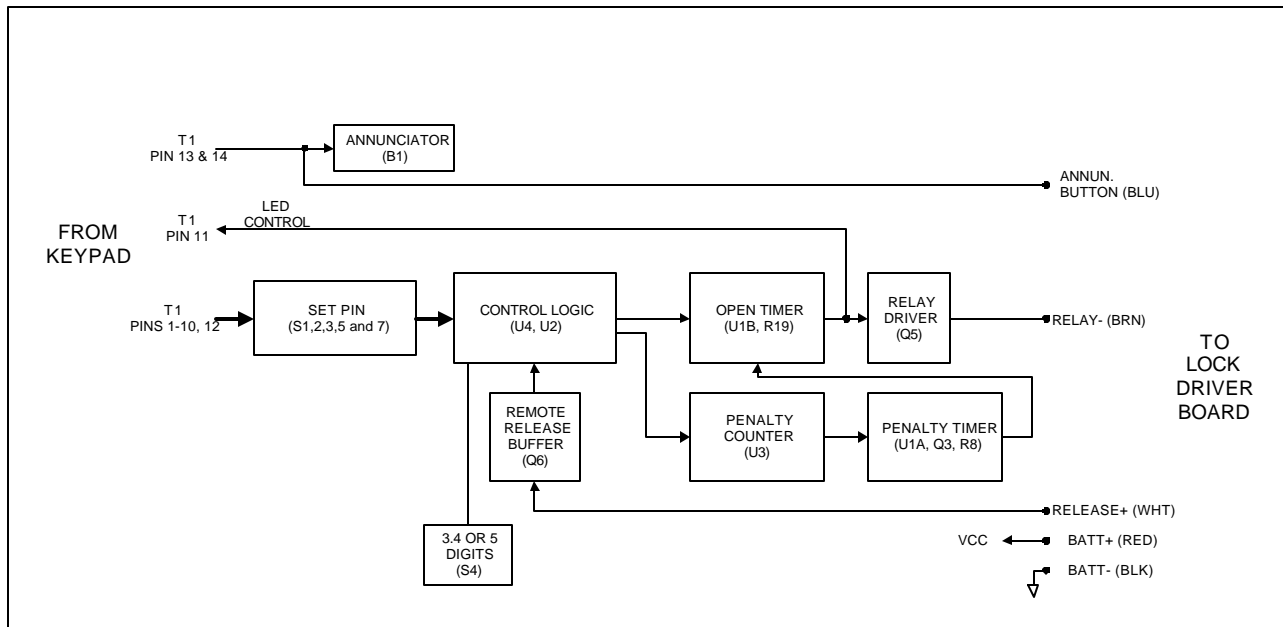


Figure 5, Logic Board Block Diagram

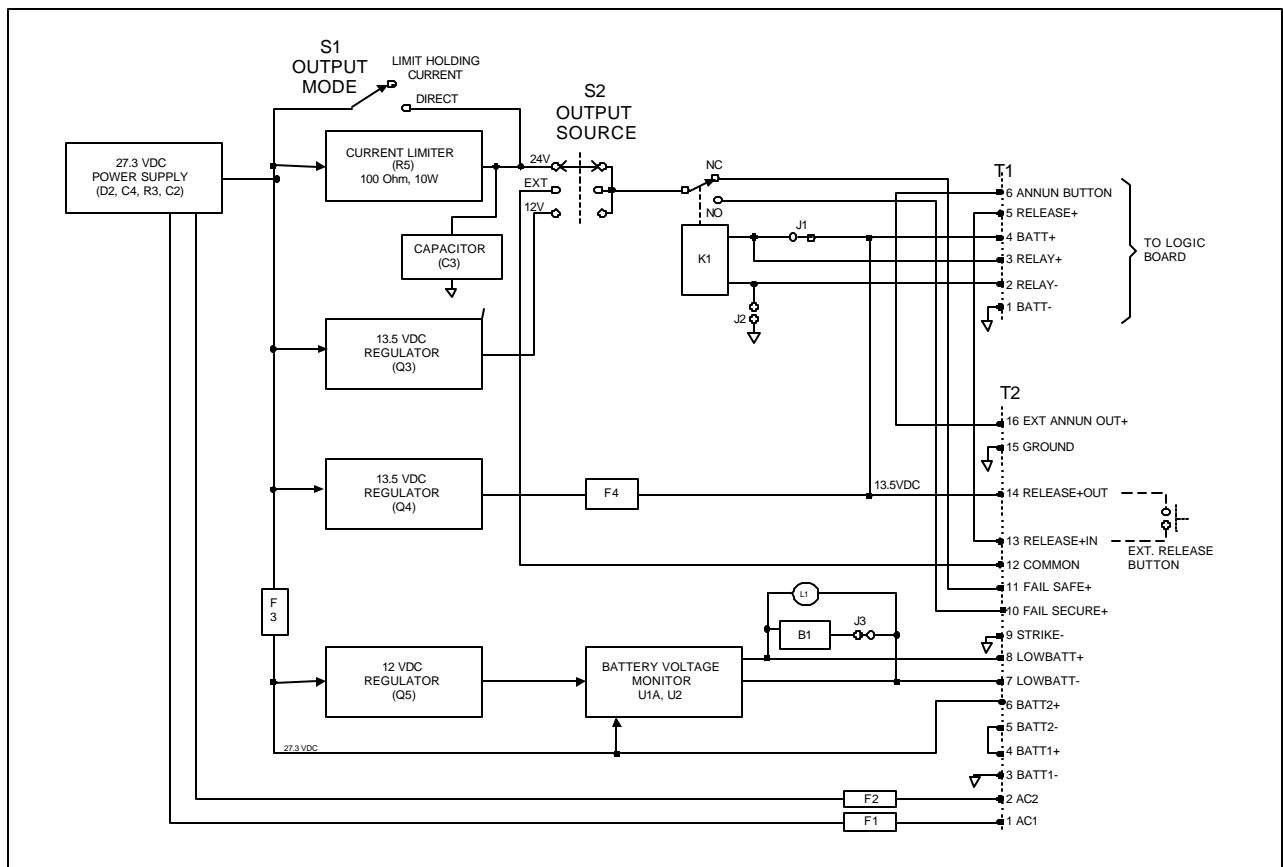


Figure 6, Lock Driver Board Block Diagram