AK-31

Digital Keyless Entry System

Installation and Programming Instructions
LINEAR'S AK-31 IS A DIGITAL KEYLESS ENTRY SYSTEM DESIGNED FOR ACCESS CONTROL APPLICATIONS. THE KEYPAD IS HOUSED IN A RUGGED, PLASTIC ENCLOSURE AND IS DESIGNED TO BE MOUNTED IN A STANDARD SINGLE-GANG ELECTRICAL BOX. THE DIE-CAST KEYS HAVE BRIGHT, EASY-TO-READ YELLOW GRAPHICS.

UP TO 480 ENTRY CODES, FROM 1 TO 6 DIGITS IN LENGTH, CAN BE PROGRAMMED. THEY CAN ACTIVATE EITHER, OR BOTH, OF THE RELAY OUTPUTS. THE "ANTI-PASSBACK" FEATURE PREVENTS USING THE SAME CODE AGAIN BEFORE THE PROGRAMMED TIME ELAPSES.

ALL SYSTEM INDICATORS ARE LONG-LASTING, SOLID-STATE LEDS. TWO INDICATORS SHOW THE STATUS OF THE ENTRY SYSTEM. THE LEFT INDICATOR LIGHTS RED TO INDICATE POWER, THEN TURNS GREEN WHEN ACCESS IS GRANTED. THE RIGHT INDICATOR LIGHTS YELLOW WHEN THE KEYPAD IS IN "LOCKOUT" CONDITION (FROM TOO MANY INCORRECT CODE ENTRIES). AN INTERNAL SOUNDER BEEPS WHEN EACH KEY IS Pressed. AN INTERNAL JUMPER SETS THE SOUNDER VOLUME HIGH OR LOW.

THE SENSE INPUT CAN BE USED TWO WAYS. IF PROGRAMMED FOR "DOOR SENSE" THE INPUT IS Wired TO A NORMALLY CLOSED SWITCH ON THE DOOR TO DETECT WHEN THE DOOR IS OPEN OR CLOSED. FORCED ENTRY OR DOOR AJAR SITUATIONS CAN THEN BE DETECTED. USING DOOR SENSE, THE "AUTO-RELOCK" FEATURE WILL PREVENT "TAILGATING" BY TURNING OFF THE MAIN RELAY OUTPUT IMMEDIATELY WHEN THE DOOR IS CLOSED AFTER ACCESS HAS BEEN GRANTED. IF THE SENSE INPUT IS PROGRAMMED FOR "INHIBIT", THE INPUT CAN BE WIRED TO A "SERVICE" SWITCH OR AUTOMATIC TIMER THAT WILL DISABLE THE MAIN RELAY WHEN REQUIRED.

THE REQUEST-TO-EXIT INPUT CAN BE WIREP TO A PUSHBUTTON TO PROVIDE CODELESS ACTIVATION OF MAIN RELAY, AUXILIARY RELAY, OUTPUT #3, OR OUTPUT #4 (PROGRAMMABLE).

THE ALARM SHUNT OUTPUT ACTIVATES WHEN ACCESS IS GRANTED. THIS OUTPUT CAN BE WIREP TO SHUNT ALARM CONTACTS ON THE ACCESS DOOR/GATE TO PREVENT TRIGGERING OF AN ALARM WHEN AUTHORIZED ACCESS OCCURS.

THE AK-31 IS POWERED FROM A 12-24 VOLT AC OR DC SOURCE. POWER CAN BE OBTAINED FROM THE ACCESS DEVICE OR A SEPARATE POWER SUPPLY. THE EEPROM MEMORY RETAINS ENTRY CODES AND PROGRAMMING, EVEN WITHOUT POWER. AN INTERNAL JUMPER IS PROVIDED TO RESET THE MASTER CODE. THE MAIN RELAY HAS A 5 AMP CAPACITY. THE AUXILIARY RELAY HAS A 1 AMP CAPACITY. TWO SOLID STATE OUTPUTS, CAPABLE OF SWITCHING 100 mA TO COMMON, ARE PROGRAMMABLE TO SIGNAL FORCE ENTRY, DOOR AJAR, LOCKOUT, ALARM CIRCUIT SHUNTING, REQUEST-TO-EXIT, AND KEYPAD ACTIVE CONDITIONS.
COMPONENT LOCATIONS

WIRING DIAGRAM

TYPICAL DOOR INSTALLATION WIRING

TERMINAL BLOCK 1

AK-31 TERMINALS

WIRE

1. AC OR DC 12-24 VOLT AC OR DC POWER
2. AC OR DC POWER
3. N.O.
4. COM
5. N.C.
6. N.O.
7. COM
8. N.C.

POWER SUPPLY

ELECTRIC DOOR STRIKE

TO ALARM SYSTEM

ALARM CONTACT

REQUIRED WIRING

OPTIONAL WIRING

OTHER WIRING

NOTES:
1. ALARM SHUNT SET FOR AUXILIARY RELAY
2. GRAY WIRE SET FOR DOOR SENSE

CAUTION

IF THE UNIT IS AC POWERED, MAKE SURE THE SECONDARY OF THE SYSTEM TRANSFORMER IS ISOLATED FROM EARTH GROUND.

Figure 1. Component Locations

Figure 2. Wiring Diagram
**INSTALLATION**

Before installing the keypad, the unit must be partially disassembled to access the mounting plate.

**Opening the Keypad**

The keypad assembly is secured with two screws that are hidden behind the keypad’s nameplate. Refer to Figure 3 for disassembly details.

- Use a small flat blade screwdriver to pry off the keypad’s nameplate.
- Use a philips head screwdriver to remove the two screws.
- Separate the mounting plate from the keypad assembly.

**Install the Electrical Box and Mounting Plate**

The keypad is designed to fit into a standard single-gang electrical box. Select a location near the controlled door and choose a convenient height for the keypad. Be sure there is good wiring accessibility for the unit’s power and the output to the door strike or access device.

- Install the electrical box in the wall.
- Screw the mounting plate onto the electrical box (see Figure 4).

**Final Keypad Installation**

After wiring the keypad (see next page), complete the installation by securing the keypad to the mounting plate.

- If a lower beeper sound level is required, before installing the keypad, remove Jumper at P4 (place the jumper block on one pin to save the jumper).
- Hook the keypad assembly onto the mounting plate tab (see Figure 5).
- Secure with two philips screws.
- Snap nameplate into position over screws.

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**Figure 3. Opening the Keypad**

**Figure 4. Installing the Mounting Plate**

**Figure 5. Connecting the Keypad to the Mounting Plate**
**Keypad Wiring**

See Figure 6 for an example of a basic door installation. The keypad is mounted adjacent to the door. An electric door strike is mounted in the door jamb to release the door lock. A magnetic switch is mounted on the top of the door jamb for detecting when the door is open.

Use the following steps to wire the keypad. Refer to the wiring diagram shown in Figure 7 to assist in the wiring.

- **OUTPUT**
  - Install a low voltage electric door strike for unlocking the door.
  - Route two wires between the door strike and the keypad box. Connect one of the door strike wires to the keypad’s **MAIN RELAY N.O.** terminal (TB1 #3). Connect the other door strike wire to the keypad’s **AC/DC +** terminal (TB1 #1). Connect a wire between the keypad’s **AC/DC -** terminal (TB1 #2) and the **MAIN RELAY COM** terminal (TB1 #4).

- **POWER**
  - Choose a location for the power supply or transformer.
  - Route two wires between the power supply and the keypad box. Connect the power supply’s output terminals to the keypad’s **AC/DC input terminals** (TB1 #1 & #2). Observe wiring polarity if using DC.

- **EARTH GROUND**
  - To avoid damage to the unit from static discharges, connect the **EARTH GROUND** black wires E1, 4, 5 or 7 to a good earth grounding point. Suggested wiring size is 18 AWG for earth ground.

- **SENSE INPUT**
  - **NOTE:** SENSE terminal (gray wire) can be programmed for either a door sense or inhibit input. Both features cannot be used at the same time.
  - To use the door sense feature to detect forced entry or door ajar conditions, install a normally closed door switch on the door and route two wires from the switch to the keypad box. Connect the door switch to the keypad’s SENSE input (gray wire, E8) and **COM** (any black wire).
  - If an inhibit switch or timer is going to be used for temporarily disabling the keypad, route two wires from the switch or timer to the keypad box. Connect the inhibit switch/timer normally open terminals to the keypad’s SENSE input (gray wire E8) and **COM** (any black wire).

- **REQUEST-TO-EXIT INPUT** (wiring shown on Page 1, Figure 2)
  - If a request-to-exit pushbutton is going to be used, route two wires from the keypad box to a normally open pushbutton mounted on the secured side of the door. Connect the wires to the pushbutton and to the keypad’s **EXIT** input (violet wire, E6) and **COM** (any black wire).

**Solid State Outputs**

The two solid state outputs (Output #3 & Output #4) can be programmed to activate during various conditions. These outputs can be used to activate indicators or sounders. See Figure 8 for wiring examples using the solid state outputs.
FACTORY DEFAULTS

MASTER PROGRAMMING CODE: 123456
ENTRY CODE LENGTH: 4 DIGITS
REQUEST-TO-EXIT OUTPUT RELAY: MAIN RELAY
ALARM SHUNT OUTPUT: DISABLED
FORCED ENTRY OUTPUT: OUTPUT #3
DOOR AJAR OUTPUT: OUTPUT #4
MAIN RELAY ON TIME: 2 SECONDS
ALTERNATE RELAY ON TIME: 2 SECONDS
SOLID STATE OUTPUT #3 ON TIME: 2 SECONDS
SOLID STATE OUTPUT #4 ON TIME: 2 SECONDS
DOOR SENSE/INHIBIT INPUT: DOOR SENSE
KEYPAD LOCKOUT OUTPUT: DISABLED
KEYPAD ACTIVE OUTPUT: DISABLED
BEEPER SOUNDS WHEN KEY Pressed: YES
BEEPER SOUNDS DURING RELAY #1: NO
BEEPER SOUNDS DURING RELAY #2: NO
BEEPER SOUNDS DURING OUTPUT #3: NO
BEEPER SOUNDS DURING OUTPUT #4: NO
KEYPAD LOCKOUT COUNT: 3 TRIES BEFORE LOCKOUT
ANTI-PASSBACK TIME: NO ANTI-PASSBACK
AUTO-RELOCK: ON

BASIC PROGRAMMING

When the AK-31 is in Programming Mode, both indicators will turn off until programming begins. After a programming option number is entered the yellow indicator will blink. This shows that the AK-31 is ready to accept the new programming data. After the new data entry is complete, the yellow indicator will flash while the data is being stored. The green indicator will light if the data is accepted. The red indicator will light if any programming data is entered incorrectly, and the command will have to be fully re-entered.

Adding a New Entry Code

Press: 01 # Code # Code # Action #

Code = The new entry code: 1-999999, depending on code length
Action = Relay output entry code will activate as follows:
1 = Relay #1, timed open
2 = Relay #2, timed open
3 = Both Relays, timed open
10 = Relay #1, toggled
20 = Relay #2, toggled
30 = Both Relays, toggled
12 = Relay #1 toggled; Relay #2, timed open
21 = Relay #1 timed open; Relay #2 toggled

Erasing All Entry Codes

* WARNING: PERFORMING THIS COMMAND WILL REMOVE ALL ENTRY CODES FROM THE MEMORY.

Press: 9 7 # 0 0 0 0 0 0 0 0 #

Erasing Single Entry Code

Press: 0 2 # Code # Code #

Code = The entry code to delete.

Erasing All Entry Codes

★ WARNING: PERFORMING THIS COMMAND WILL REMOVE ALL ENTRY CODES FROM THE MEMORY.

Press: 9 7 # 0 0 0 0 0 0 0 0 #

Erasing Single Entry Code

Press: 0 2 # Code # Code #

Code = The entry code to delete.

Erasing All Entry Codes

★ WARNING: PERFORMING THIS COMMAND WILL REMOVE ALL ENTRY CODES FROM THE MEMORY.

Press: 9 7 # 0 0 0 0 0 0 0 0 #

Erasing Single Entry Code

Press: 0 2 # Code # Code #

Code = The entry code to delete.

Erasing All Entry Codes

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Press: 9 7 # 0 0 0 0 0 0 0 0 #

Erasing Single Entry Code

Press: 0 2 # Code # Code #

Code = The entry code to delete.

Erasing All Entry Codes

★ WARNING: PERFORMING THIS COMMAND WILL REMOVE ALL ENTRY CODES FROM THE MEMORY.

Press: 9 7 # 0 0 0 0 0 0 0 0 #

Erasing Single Entry Code

Press: 0 2 # Code # Code #

Code = The entry code to delete.
PROGRAMMING OPTIONS

There are several AK-31 programming options. For most installations, the factory set default options are sufficient. The keypad must be in Programming Mode to make these changes.

Select Door Sense or Inhibit Input  Default: Door Sense
The input (gray wire) can be programmed for DOOR SENSE or INHIBIT.

Press: 1 0 #  Input #

Input = 0 for Door Sense, = 1 for Inhibit

When programmed for DOOR SENSE, if an open condition on the input occurs before access is granted (with an entry code or with the request-to-enter input) a FORCED ENTRY output will occur. If an open condition remains 60 seconds after a relay activation for access, a DOOR AJAR output will occur.

When programmed for INHIBIT, a closed condition on the input will prevent Relay #1 from activating when access is requested with an entry code. This mode is typically used with an external timer to disable the access device at certain times.

Select Forced Entry Output  Default: Output #3
Sets which output activates if the DOOR SENSE input opens before access is granted. This output is not timed.

Press: 1 1 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Select Door Ajar Output  Default: Output #4
Sets which output activates if the DOOR SENSE input stays open 60 seconds after access is granted. This output is not timed.

Press: 1 2 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Select Keypad Lockout Output  Default: No Output
Sets which output activates when the keypad is “locked out” after too many incorrect entry code attempts. The lockout time is 60 seconds.

Press: 1 3 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Select Keypad Active Output  Default: No Output
Sets which output activates when any keys are pressed. This output is timed. If toggle mode is selected for the output, the timer value defaults to 2 seconds.

Press: 1 4 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Select Alarm Shunt Output  Default: No Output
Sets which output activates during the time access is granted. (Use this output to shunt alarm contacts attached to the access door.) This output may be timed or toggled.

Press: 1 5 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Select Request-to-Exit Output  Default: Main Relay
Sets which output activates when the Request-to-Exit input is grounded. This output may be timed or toggled.

Press: 1 6 #  Output #

Output = Output to Activate (0-4)
1 = Main Relay, 2 = Auxiliary Relay, 3 = Output #3, 4 = Output #4, 0 = No Output

Main Relay On-time  Default: 2 Seconds
Sets the length of time the Main Relay activates when triggered.

Press: 2 1 #  Seconds #

Seconds = Output time in seconds (0-60)

Auxiliary Relay On-time  Default: 2 Seconds
Sets the length of time Auxiliary Relay activates when triggered.

Press: 2 2 #  Seconds #

Seconds = Output time in seconds (0-60)

Solid-state Output #3 On-time  Default: 2 Seconds
Sets the length of time Output #3 activates when triggered.

Press: 2 3 #  Seconds #

Seconds = Output time in seconds (0-60), 99 = Toggle Mode

Solid-state Output #4 On-time  Default: 2 Seconds
Sets the length of time Output #4 activates when triggered.

Press: 2 4 #  Seconds #

Seconds = Output time in seconds (0-60), 99 = Toggle Mode

Beep Sounds on Keystrokes  Default: Yes
Selects whether or not the keypad beeps as each key is pressed.

Press: 4 0 #  Sound #

Sound = 1 for Yes, = 0 for No

Beep Sounds During Main Relay  Default: No
Selects whether or not the keypad beeps during Main Relay activation.

Press: 4 1 #  Sound #

Sound = 1 for Yes, = 0 for No

Beep Sounds During Auxiliary Relay  Default: No
Selects whether or not the keypad beeps during Auxiliary Relay activation.

Press: 4 2 #  Sound #

Sound = 1 for Yes, = 0 for No

Beep Sounds During Output #3  Default: No
Selects whether or not the keypad beeps during Output #3 activation.

Press: 4 3 #  Sound #

Sound = 1 for Yes, = 0 for No

Beep Sounds During Output #4  Default: No
Selects whether or not the keypad beeps during Output #4 activation.

Press: 4 4 #  Sound #

Sound = 1 for Yes, = 0 for No
Keypad Lockout Count  Default: 3 Tries
Sets the number of incorrect entry code attempts allowed before the keypad “locks out”.

Press:  **5 0 # Attempts #**

Attempts = Number of attempts before lockout (2-7)

**Anti-passback Time**  Default: No Anti-passback
Sets the length of time an entry code will not function after it is used.

Press:  **5 1 # Minutes #**

Minutes = Time in Minutes (1-4), 0 = No Anti-passback

**RESETTING KEYPAD**

**Master Reset**

❖ **CAUTION:** Performing a master reset will clear the entire memory of the AK-31 and return all programmable options to the factory default values. **ALL ENTRY CODES WILL BE ERASED.**

**STEP 1** Disconnect power from the keypad.
**STEP 2** Press and hold down the * and # keys.
**STEP 3** Apply power to the keypad, continue holding the keys down until the red indicator starts flashing.
**STEP 4** Release the keys. The red and yellow indicators will remain lit until the process is complete, then the yellow indicator will go out.

**Resetting the Master Code**

**STEP 1** Open the AK-31 case.
**STEP 2** Locate jumper at P5. This jumper is used to reset the master code.
**STEP 3** With power applied to the keypad, remove the jumper at P5. The keypad will begin to beep, signaling that the code has been reset.
**STEP 4** Replace jumper on P5.
**THE MASTER PROGRAMMING CODE IS NOW 123456.**

**AK-31 OPERATION**

Keypad users request access by entering their code.

❖ Users of the AK-31 have up to 40 seconds to key in their entry code.
❖ Up to eight seconds are allowed between each keystroke.
❖ All digits of the entry code must be entered. Example: If the code is 0042, the user must enter “0 0 4 2”.
❖ If the wrong key is pressed, pressing the * key will reset the keypad. The correct code can then be re-entered.
❖ After a correct code is entered, the red indicator will turn green and the programmed relay will activate for the programmed time.
❖ If the number of incorrect codes entered exceeds the keypad lockout count, the yellow indicator will light, indicating that the keypad is locked out. The lockout will remain for one minute.
❖ After a valid code has been entered, it will be unusable until the anti-passback time expires.

**SPECIFICATIONS**

**MECHANICAL**

Dimensions: 3.00” W x 5.00” H x 3.00” D

**ELECTRICAL**

Voltage: 12-24 Volts AC or DC
Current: 30 mA typical, 150 mA maximum
Outputs:
- Main Relay: Form “C” 5 Amps @ 28 Volts maximum
- Auxiliary Relay: Form “C” 1 Amp @ 28 Volts maximum
- Solid state outputs (Outputs #3 & #4):
  - Short-to-common 100 mA @ 24 VDC maximum

**ENVIRONMENTAL**

Temperature: -22°F to 149°F (-30°C to 65°C)
Humidity: 5% to 95% non-condensing

**LINEAR LIMITED WARRANTY**

This Linear product is warranted against defects in material and workmanship for twenty-four (24) months. The Warranty Expiration Date is labeled on the product. This warranty extends only to wholesale customers who buy direct from Linear or through Linear’s normal distribution channels. Linear does not warrant this product to consumers. Consumers should inquire from their selling dealer as to the nature of the dealer’s warranty, if any. There are no obligations or liabilities on the part of Linear LLC for consequential damages arising out of or in connection with use or performance of this product or other indirect damages with respect to loss of property, revenue, or profit, or cost of removal, installation, or reinstallation. All implied warranties, including implied warranties of merchantability and implied warranties for fitness, are valid only until Warranty Expiration Date as labeled on the product. This Linear LLC Warranty is in lieu of all other warranties express or implied.

All products returned for warranty service require a Return Product Authorization Number (RPA#). Contact Linear Technical Services at 1-800-421-1587 for an RPA# and other important details.

**FCC NOTICE**

Changes or modifications not expressly described in this manual or approved by the manufacturer could void the user’s authority to operate the equipment.

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 on a circuit different from that to which the receiver is connected.
❖ Consult the dealer or an experienced radio/TV technician for help.