UNITED SAFETY
& SURVIVABILITY CORPORATION™

VEHICLE LOCK

Security wherever you go.

comprehensive brake lock solutions • automatic parking locks

BRAKE LOCK INSTALLATION GUIDE

Important Safety Information

Please read this guide

Please take the time to carefully read and follow this guide before installing or operating the Vehicle Lock system. Save this guide for future reference.

All United Safety products must be used in accordance with all applicable local, state, federal, and industry regulations.

Warning and caution symbols

WARNING: A black triangle with an orange exclamation mark indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION: A black triangle with a yellow exclamation mark indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

Warning and cautions

WARNING: Park the vehicle on a level surface, apply the parking brakes, and always block the wheels with the appropriate wheel chocks. Always wear safety glasses.

WARNING: Stop the engine and remove ignition key when working under or around the vehicle.

WARNING: Drain the air pressure from all reservoirs before beginning work on the vehicle. If the vehicle is equipped with an air dryer reservoir module, be sure to drain the purge reservoir.

WARNING: Follow the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that removes all power from the vehicle.

CAUTION: Installation of the Vehicle Lock system must be done by a trained or qualified professional. Do not attempt installation if you are not a trained or qualified professional.

CAUTION: Install the Vehicle Lock system in accordance with the instructions provided in this guide. Failure to do so may result in improper installation and serious risk of injury.

CAUTION: Do not make any modifications to the Vehicle Lock system. Unauthorized alterations may compromise safety, regulatory compliance, and system performance, and may void the warranty.

Document Revision

Revision	Date Released	Description
1.0	2020-11-05	Initial release
1.1	2020-12-16	Updates to Keypad, Legacy moved to Appendix
1.2	2020-01-12	Add ECU mounting screw torque specification
1.3	2020-01-29	Add OO Terminator
1.4	2023-01-05	Add dual supply air connection
1.5	2025-05-07	Add additional troubleshooting, functional checks, pinout

Contents

Your Vehicle Lock System

Advanced vehicle safety and security

The Vehicle Lock is an advanced system that uses an electronic control unit and keypad, accompanied by sensors, that improve the safety and security on apparatus equipped with air brakes.

Safety

The Vehicle Lock system will monitor the operators seat for occupancy and the position of their door. The system will automatically deploy the parking brake if the door is open and the seat is not occupied for more than 2 seconds.

If equipped with officer override option, the covered switch may be used in case of EMERGENCY due to driver incapacitation or unresponsiveness, allowing the parking brake to be set.

Security

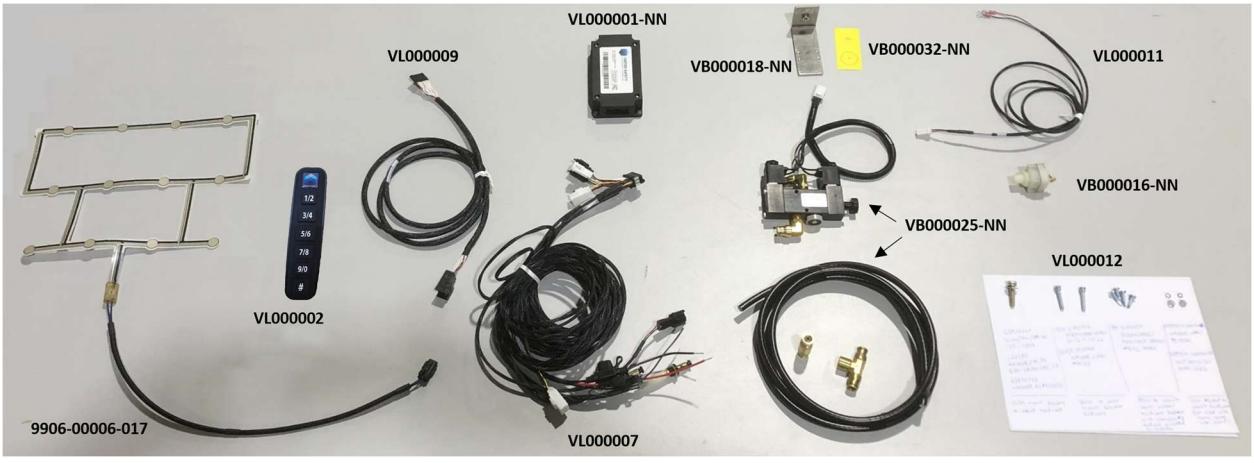
“Pull to set, Code to release”. Using the keypad, the operator must enter the correct code for the Vehicle Lock system to allow the release of the parking brake.

Unpacking the System

System components

The system is composed of these parts:

- ECU
- 1 Keypad:
    - Slim keypad (vertical or horizontal orientation)
    - Or legacy keypad (with 4 mounting nuts), see Appendix C
- Seat sensor
- Brake light switch
- Air manifold kit
    - Air manifold and solenoids
    - 12 ft of 3/8” air tubing
    - Brass tee and straight air fittings
- Harnesses:
    - Main ECU (with door sensors attached)
    - Keypad
    - Brake light switch
- Mounting hardware:
    - Keypad bracket, screws, and template
    - Air manifold bracket and template
    - Hardware kit of fasteners



Hardware kit

VALVE MOUNT BRACKET TO VEHICLE HARDWARE

(X1) 61A02560
SCREW/HEX/1/4-20/1.25/G8YZ

(X1) 120380
WASHER, LOK,1/4,REG SPRNG,GR5,CZ

(X1) 63A02502
WASHER FLAT/1/4/SS

VALVE TO VALVE MOUNT BRACKET HARDWARE

(X2) 61A01916
SCREW/PAN HEAD/10-32X1.25LG

(X2) 63A01904
WASHER LOCK\#10\SS

ECU TO VEHICLE SHEET METAL HARDWARE

(X4) 61A01634
SCREW/PHIL/PAN/SELF DRILL/#8X1/ZINC

(REPLACE WITH ALTERNATIVE #8 HARDWARE AS NEEDED BY INSTALLER)

SLIM KEYPAD TO VEHICLE HARDWARE

(X2) 9904-000034-006
WASHER LOCK/#8/ZINC PLATED

(X2) 9904-000034-005
NUT HEX\8-32\ZINC\GR2

(NOT USED WITH LEGACY SQUARE KEYPAD)

TBD

SQUARE KEYPAD BRACKET TO VEHICLE HARDWARE

(X4) TBD

(USED WITH LEGACY KEYPAD ONLY)

Installing the Vehicle Lock System

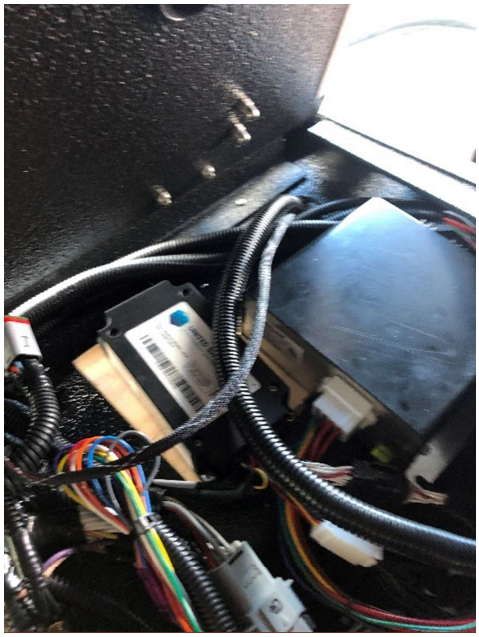
Install ECU

Materials needed:

- ECU
- ECU TO VEHICLE SHEET METAL HARDWARE

1. Find a flat location to mount the ECU. ECU **MUST BE** located in the cab or interior of the vehicle. Keep in mind the length of the associated wiring harness lengths to each system component:
    a. Main Power – 10 ft
    b. Air Manifold – 5 ft
    c. Brake Light Switch – 5 ft
    d. Driver Door Switch – 8 ft
    e. Seat Sensor – 15 ft
    f. Optional Officer Override – 5 ft
    g. Keypad – 6 ft

2. Use ECU TO VEHICLE SHEET METAL HARDWARE to secure ECU in place, torque screws to 4 in-lb.



Install Main Harness

Materials needed:

- Main ECU Harness (with door sensors attached)

1. The main harness connects all the components together with the ECU, as well as the connection to vehicle power. The door sensors, seat sensor, and air manifold branches of the harness extend from the ECU out towards those components.

2. The keypad, brake light switch, and optional officer override each have an extension harness that routes back towards the ECU from the components. See Appendix A for connection diagram. Keep this in mind when planning cable routes to and from the ECU while progressing through the component's installation.

3. Keep the main harness disconnected from the ECU and vehicle power until all components have been connected.

4. Once the component routing has been planned, proceed with the installation.

Install Door Switches

Materials needed:

- Main ECU Harness (with door sensors attached)

1. Locate space at the driver door hinge to accommodate the 2 door sensors.

2. Drill 2 holes in a location that will not interfere with any existing components or lessen the structural integrity of the pillar. See Appendix B for door sensor physical dimensions.

3. Remove door sensors from wire harness and route door sensor wiring to drilled holes at the driver door hinge.

4. Mount the door sensors and connect wires. Access to the back of the switch is preferred to connect wires after mounting switch.
    a. If access is limited, wire may be connected to switch prior to screwing in place. Twist wires counterclockwise before installing.
    b. When reconnecting cable to door sensor, the orientation of the cable does not matter. It must be oriented for the terminals to align.

Install Air Manifold

Materials needed:

- Air Manifold
- Air manifold bracket & template
- VALVE MOUNT BRACKET TO VEHICLE HARDWARE
- VALVE TO VALVE MOUNT BRACKET HARDWARE

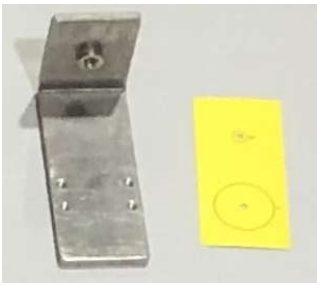
1. Find a location to mount the Air Manifold using the Air Manifold bracket. Keep in mind the proximity to the ECU and the wiring harness length of 5 ft. The manual override push valve on the air manifold should be concealed from view or hidden in location only known by authorized users, but the manual knob must be accessible to the driver or passenger. Also consider the location and air tubing route path to the Park Control Valve. 12 feet of 3/8" tubing is included in the kit.

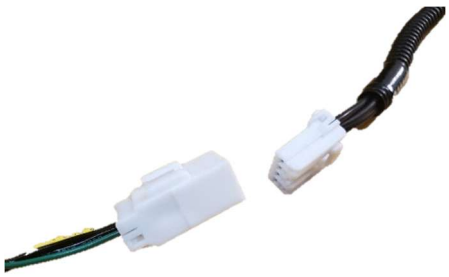
2. Use the Air Manifold template to mark and drill hole into vehicle for bracket mounting.

3. Use VALVE MOUNT BRACKET TO VEHICLE HARDWARE to secure bracket to vehicle, noting lock washer engagement.

4. Use VALVE TO VALVE MOUNT BRACKET HARDWARE to secure Air Manifold to bracket.

5. Route the air manifold wiring from the Main ECU harness to the manifold and connect.





Install Brake Light Switch

Materials needed:

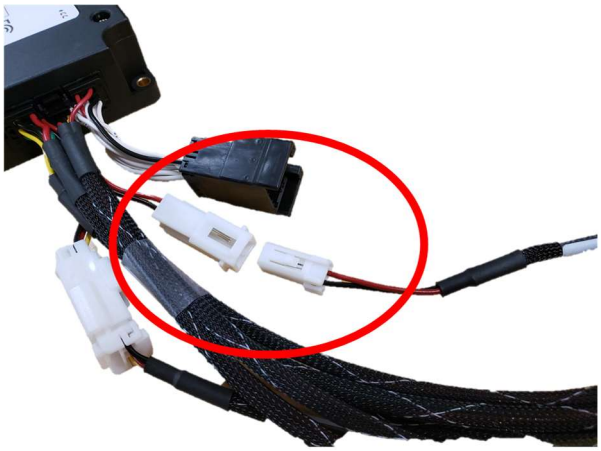
- Brake light switch
- Brass tee air fitting
- Brake light harness

1. Screw brass tee air fitting onto brake light switch. Use thread sealant to ensure leak free connection.

2. Secure brake light harness ring terminals to brake light switch. Polarity does not matter.

3. Install brake light switch inline between Park Control Valve and Spring Brake Modulating Valve as seen in section: Install Air Connections.

4. Route brake light harness back to ECU location and connect with Main ECU harness.



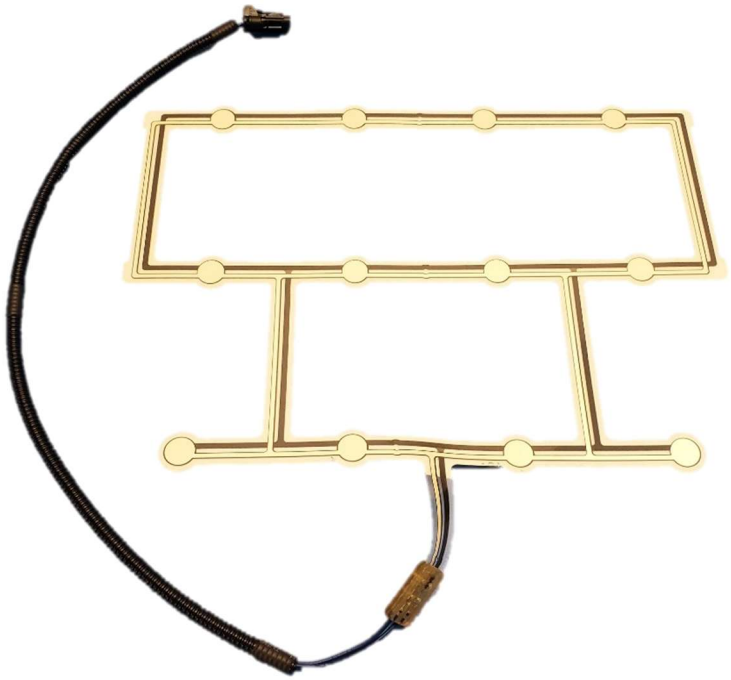
Install Seat Sensor

Materials needed:

- Seat Sensor

1. Install seat sensor in bottom pad of vehicle seat or use existing United Safety sensor if pre-installed.

2. Route the seat sensor wiring from the Main ECU harness to the seat sensor and connect.



Install Keypad

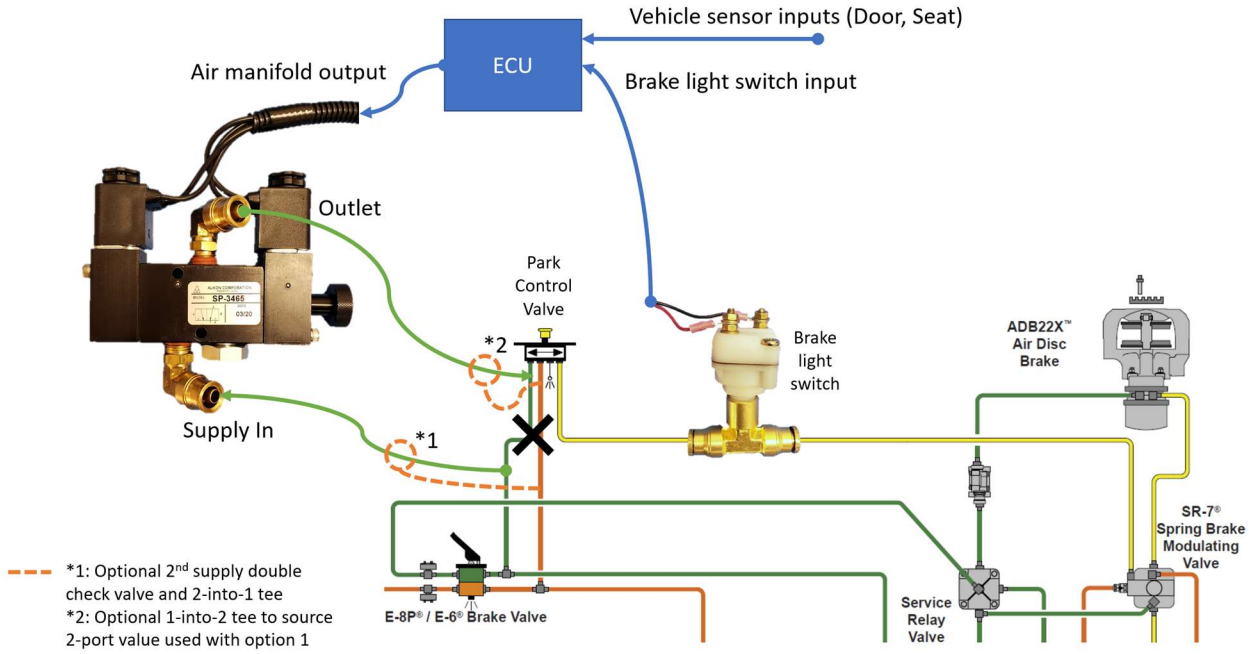
See Appendix D for Square Keypad installation.

Materials needed:

- Keypad
- Keypad harness
- Keypad template

1. Find a location on the vehicle dashboard to mount the Keypad keeping in mind the length of the Keypad harness connection back to the ECU (6 ft). Also keep in mind that the rear of the dashboard must be accessed to install retaining hardware and wire harness connection.
2. Drill mounting holes into vehicle dashboard for keypad mounting.
    a. Use slim keypad template to mark and drill 2 holes and connector knock-out into vehicle dashboard for direct slim keypad mounting.
3. Plug keypad wiring harness into back of the keypad.
4. Mount keypad assembly using SLIM KEYPAD TO VEHICLE HARDWARE.
5. Route keypad harness back to Main ECU harness and connect.

Install Air Connections



<u>Single Supply:</u>

Materials needed:

- 3/8” air tubing

1. Disconnect or interrupt supply air tubing to Park Control Valve and reroute to supply inlet of Air Manifold. Use 3/8” DOT air fittings if needed.

2. Use supplied 3/8” air tubing to connect outlet of Air Manifold to supply inlet of Park Control Valve. Cut to length.

<u>Dual Supply:</u>

Materials needed:

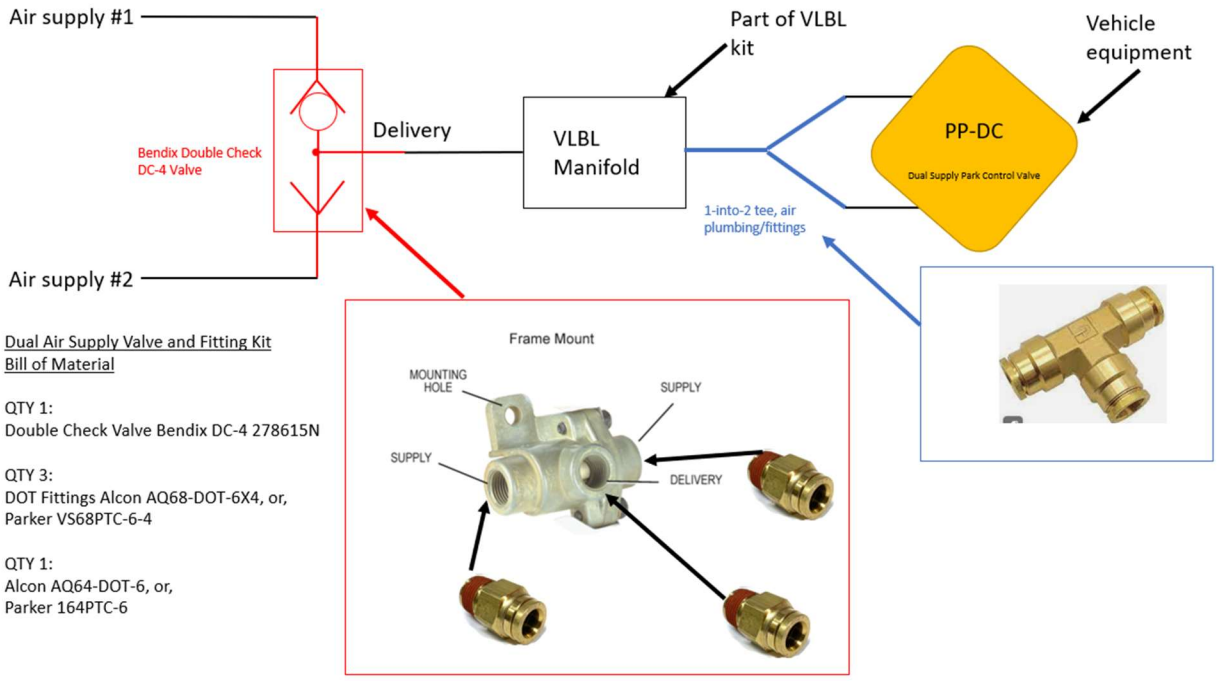
- 3/8” air tubing
- Dual Supply Valve and Fitting Kit, USSC Part Number VLBL0014

1. Disconnect or interrupt supply air tubing to Park Control Valve and reroute to supply inlets of double check valve. Use supplied 3/8” DOT air fittings, ensure threads are sealed.

2. Use supplied 3/8” air tubing and 3/8” DOT air fitting to connect outlet/delivery of double check valve to supply inlet of Air Manifold.

3. Use supplied 3/8” air tubing to connect outlet of Air Manifold to 3/8” DOT air Tee fitting.

4. Use supplied 3/8” air tubing to connect to supply inlets of Park Control Valve from Tee fitting.



Dual Air Supply Valve and Fitting Kit
Bill of Material

QTY 1:
Double Check Valve Bendix DC-4 278615N

QTY 3:
DOT Fittings Alcon AQ68-DOT-6X4, or,
Parker VS68PTC-6-4

QTY 1:
Alcon AQ64-DOT-6, or,
Parker 164PTC-6

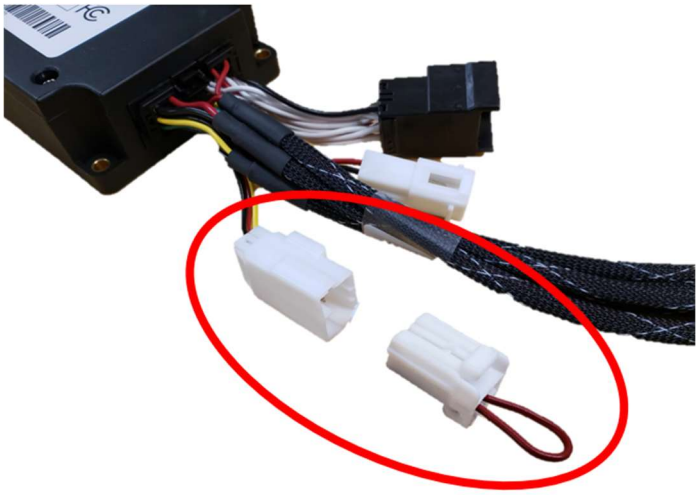
Install Officer Override Switch Terminator

If equipped with optional officer override switch the terminator is not required. Refer to section: Optional, Install Officer Override Switch

Materials needed:

- Officer override switch terminator

1. Connect the officer override switch terminator to the Main ECU harness.



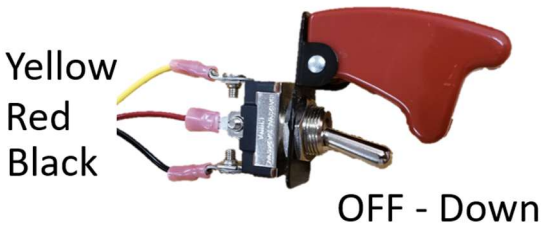
Optional, Install Officer Override Switch

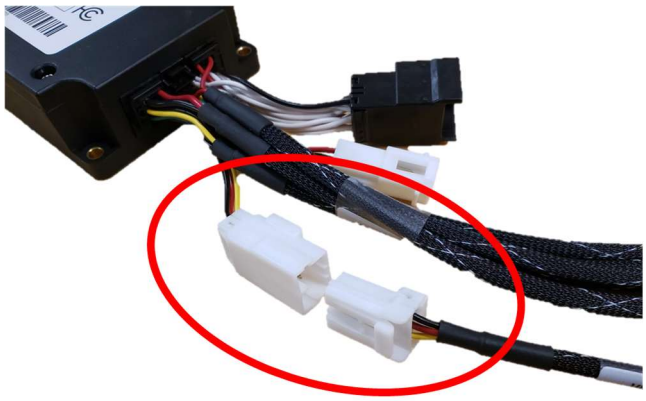
Materials needed:

- Officer override switch
- Officer override harness

2. Mount the switch in a location accessible to officer and consider length of wiring harness (5 ft).
3. Connect the Officer Override harness to the switch screw terminals as shown.
4. Route officer override harness back to Main ECU harness and connect.

WARNING: RED switch cover MUST BE IN PLACE along with warning label. Parking Brake application will occur if switch is activated regardless of vehicle movement or driver occupancy. This switch is for emergency use only in the event the driver becomes unresponsive or impaired.





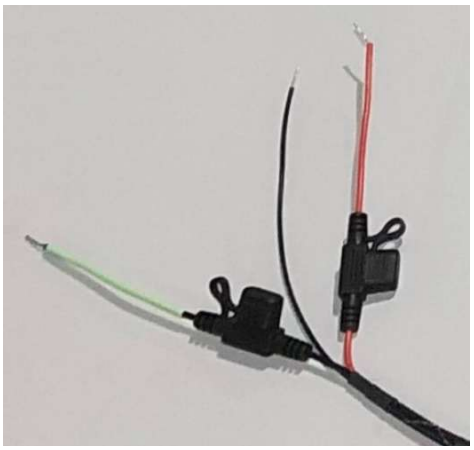
Connect ECU and Vehicle Power

Materials needed:

- Main ECU harness

1. Plug the Main ECU harness into ECU.

2. There are 3 wires in the Main ECU harness for vehicle power connections. Route the wires to the vehicle battery or main power source, and switched ignition, and connect.
    a. BLACK = Battery Negative (Ground)
    b. RED = Battery Positive (12 V), 5 A fuse
    c. GREEN = Switched Ignition, 2 A fuse



Testing the System

Understanding Status Indicators

To communicate system status to the operator, the keypad is backlit and contains a horn to provide visual and audible feedback. The keypad will flash or remain solid of either color, as well as sound the horn to aid in system troubleshooting or to indicate expected operator behavior, sensor and system status.

OPERATIONAL TEST

WARNING: Block vehicle wheels with appropriate wheel chocks

1. Ensure air supply pressure at approximately 60 - 120 P.S.I.
2. Take a position in the driver seat and close driver door.
3. Turn on ignition, keypad should be solid RED (indicating system is ready).
4. Remove weight from seat bottom; keypad should flash slow (~1 per second) red (indicating seat is empty).
5. Take seated position; keypad solid RED.
6. From a seated position, open the driver's door; keypad should flash fast (~2 per second) red (indicating driver's door is open).
7. Close driver's door; keypad solid RED.
8. Enter proper code and release parking brake by pushing in parking brake valve; keypad should go solid GREEN (indicating system self-checks and all circuits are complete). Audible tone will sound indicating the release.
9. Pull parking brake knob/set parking brake; keypad should go RED/GREEN flashing.
10. Release parking brake by pushing in parking brake valve; keypad should go solid GREEN.
11. Activation test: Open driver door and remove weight from driver seat bottom; keypad should start blinking fast RED, keypad horn will sound, and valve manifold will exhaust air from park control valve, setting the air parking brakes.

Keypad Illumination		System Status
	None	• Switched Ignition Off
	Solid Red	• Door closed • Operator seated • Waiting for passcode
	Flashing Green & Red	• Passcode entered; brake engaged • Confirmation of functional check routines
	Flashing Red	• Fast (2 per second), door open • Slow (1 per second), operator not seated • Heartbeat (2 fast & pause), Fault Mode
	Solid Green	• Door closed • Operator seated • Passcode entered; brake released
	Flashing Green	• Programming, code reset routines • Confirmation of functional check routines / passcode change
Horn Sound		**System Status**
	None	• Switched Ignition Off
	Any	• Short beep, key press or power up • Long beep, (un)lock state change • Multiple beeps, confirmation/activation

Care and Maintenance

System Programming

Entering a New Code:

Enter the current code and within 2 seconds press and hold down the number “1” key for 4 seconds. Release the number “1” key and the keypad LEDs will start flashing GREEN. Enter the new code (4-6 digits) and press “#” key within seven seconds of the start of the flashing GREEN LEDs.

Resetting Factory Defaults:

From the main power wiring harness, remove the 2 main fuses. Reinstalling both fuses with the “#” key pressed for at least four seconds will reset the unit to its factory default settings. (Code: 1,3,5,7) Green LEDs will flash fast for 2 seconds.

Troubleshooting

If the system fails the operational test or the keypad LED/horn are not matching the expected behavior, please review these common symptoms and perform the checks listed below.

Symptom	Check
Cannot release parking brakes after passcode entry but keypad LEDs green	Ensure adequate air supply pressure
System allows control of park control valve regardless of keypad passcode/sensor status	Check valve manifold override knob Check officer override switch and wire harness
Keypad indicating Fault Mode	Run Fault Mode Check
Keypad fails to light up	Check power supply and fuses, and switched ignition Check cable between keypad and ECU Run Keypad functional check
Keypad stays red after proper code is entered and brake is released	Check circuit to park brake valve and wire harness Run Keypad functional check
Keypad fails to flash slow red when driver's seat bottom is empty	Check seat sensor position, it should be directly under the occupant Check seat sensor and wire harness
Keypad fails to flash fast red when door is open	Check door sensors and wire harness Check adjustment of door sensor depth and sensor engagement
System fails to deploy parking brake valve upon exit from seat with door open	Check wiring connectors at ECU and solenoids Check solenoids for proper air plumbing Check solenoid activation
No audible tone after code is entered.	Improper code entered Re-enter proper code or reset to factory setting following programming guide Run Keypad functional check
System activates release tone with proper code but disconnect not active.	Ensure solenoid with manual override is active during release time after proper code is entered

Keypad Functional Check

Within 10 secs after turning the switched ignition (key) ON, begin keying in all the buttons in order, **1 press per number**. A short horn sound should be heard with each button press, and at the end of the sequence the keypad will flash slowly RED/GREEN and sound the horn for a few seconds to acknowledge a passed test.

Square Keypad Sequence: 1-2-3-4-5-6-7-8-9-*-0-#

Slim Keypad Sequence: 1/2-1/2-3/4-3/4-5/6-5/6-7/8-7/8-9/0-9/0-# (one press per number – which causes 2 presses pre button with a single press on the # button)

Fault Mode Check

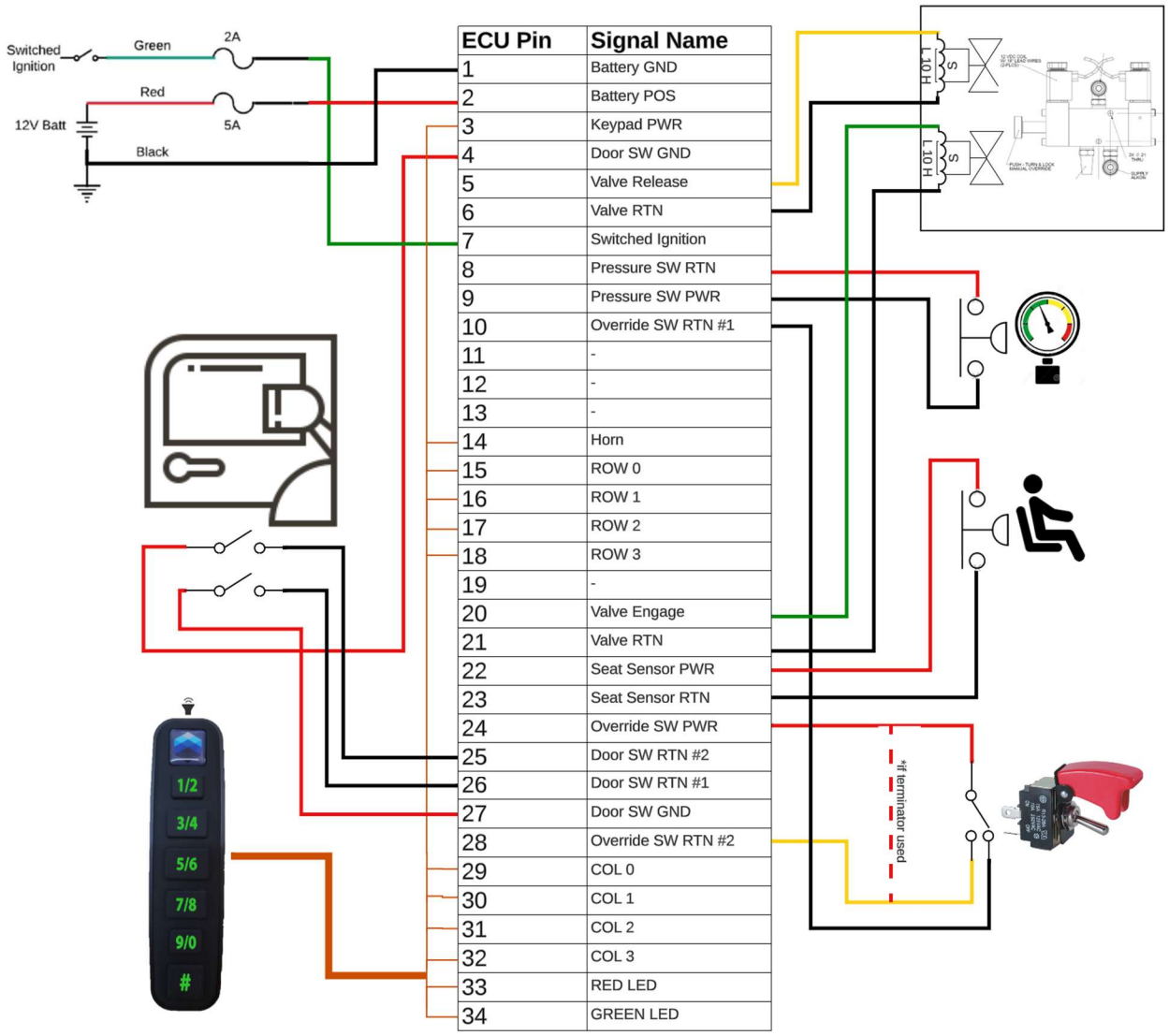
When in Fault Mode, indicated by the keypad flashing red in a heartbeat pattern (2x, followed by a pause), press the "#" key and count the number of times the keypad LEDs flash and the horn sounds to determine the fault cause:

Fault ID (# of flashes/beeps)	**Fault Description and recommended action**
1	Door sensor fault. Door sensor states do not match as measured by ECU, check sensors and wire harness. Clears once door sensors match again.
2	Officer override fault. Officer override switch signals are not complementary as measured by ECU, check switch and wire harness – OR, check that officer override terminator is in place of switch and harness.
3	ECU fault. Contact USSC.

Note: Additional fault modes may be added. Contact USSC if fault ID not listed or unable to clear fault after checking sensor, switches, and harnessing.

Wire Harness Check

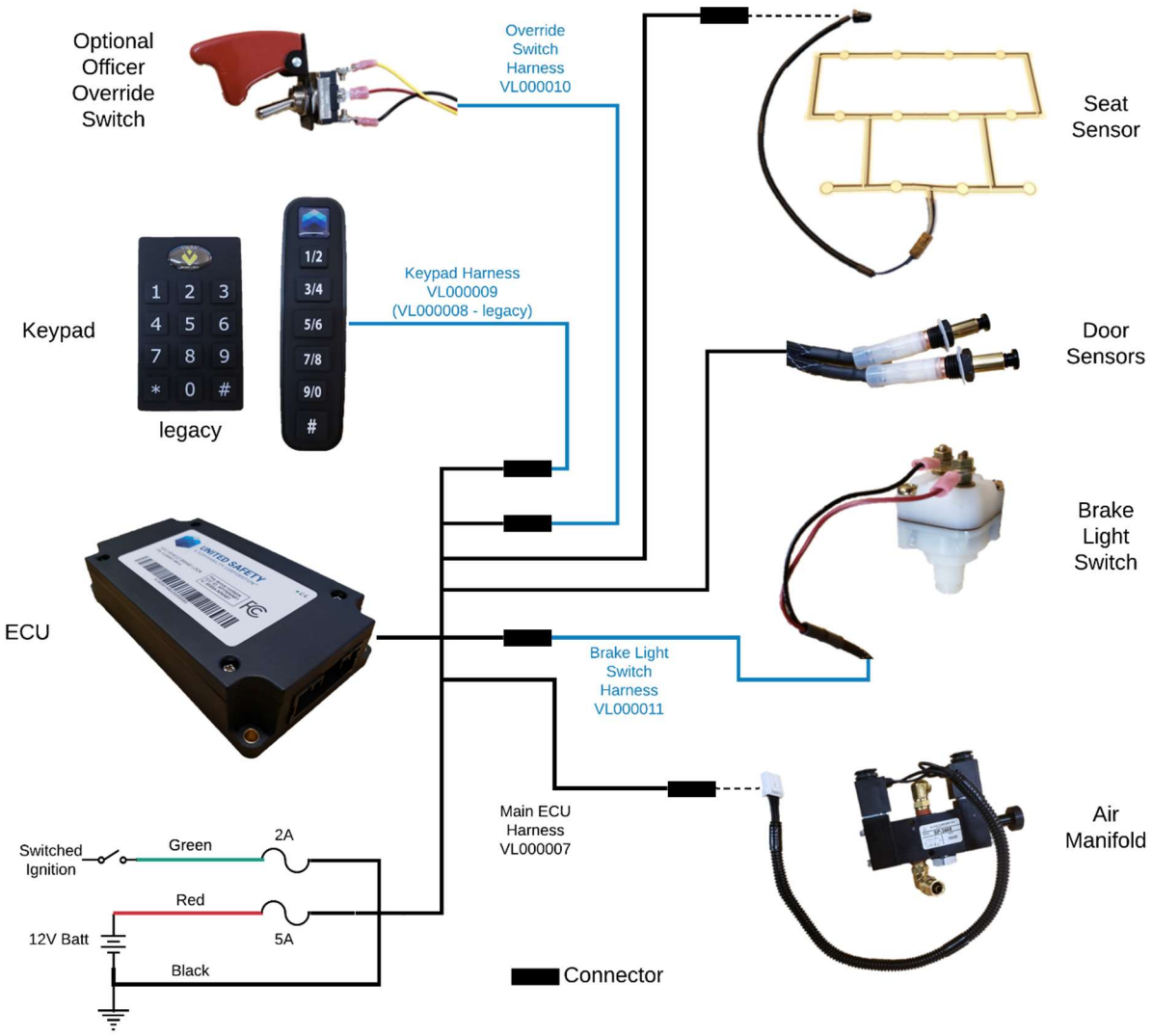
To check sensor circuits and wire harnessing, please refer to the following wiring table and Appendix E. It is recommended to use a multimeter to test conductivity at ECU connector and/or throughout harnesses, switches, and sensors. Actuate switches and sensors to ensure PWR/GND signals are sent out through device and are returned back to the ECU.



ECU Pin	Signal Name
1	Battery GND
2	Battery POS
3	Keypad PWR
4	Door SW GND
5	Valve Release
6	Valve RTN
7	Switched Ignition
8	Pressure SW RTN
9	Pressure SW PWR
10	Override SW RTN #1
11	-
12	-
13	-
14	Horn
15	ROW 0
16	ROW 1
17	ROW 2
18	ROW 3
19	-
20	Valve Engage
21	Valve RTN
22	Seat Sensor PWR
23	Seat Sensor RTN
24	Override SW PWR
25	Door SW RTN #2
26	Door SW RTN #1
27	Door SW GND
28	Override SW RTN #2
29	COL 0
30	COL 1
31	COL 2
32	COL 3
33	RED LED
34	GREEN LED

Appendix A

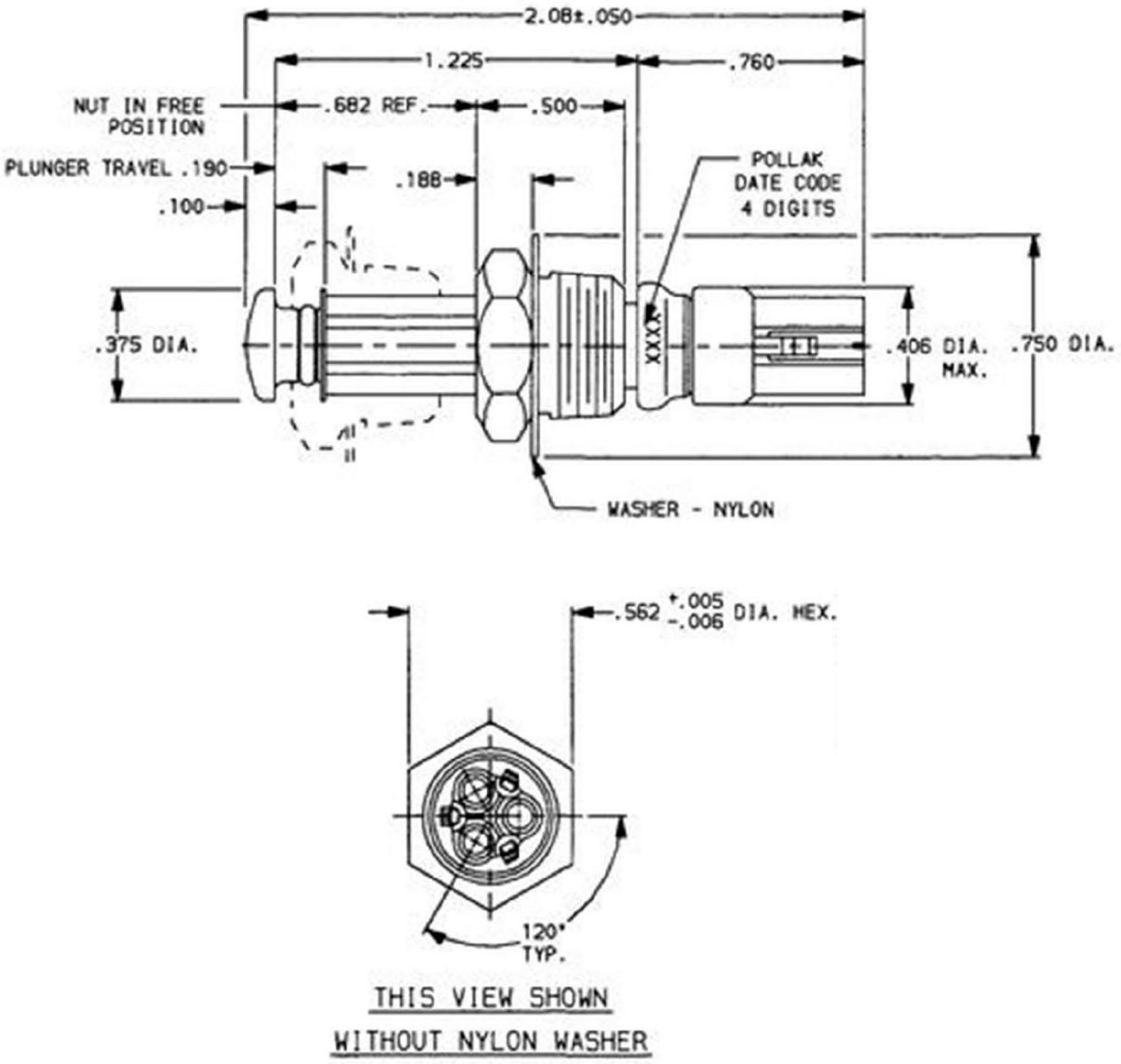
System Connection Diagram



Appendix B

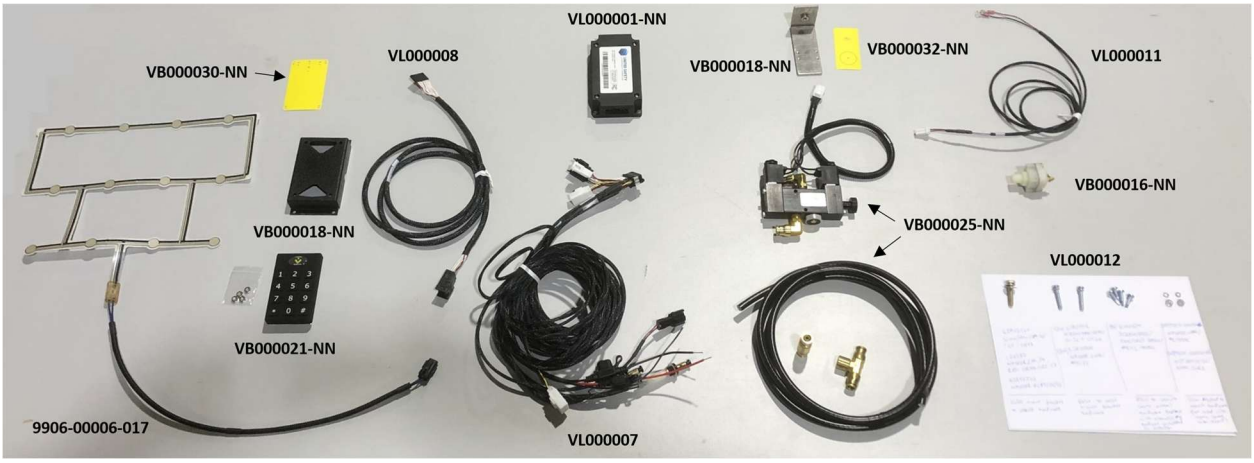
Door Switch Dimensions

Dimensions in inches



Appendix C

Square Keypad Parts Layout



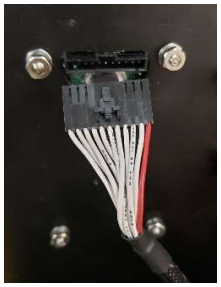
Appendix D

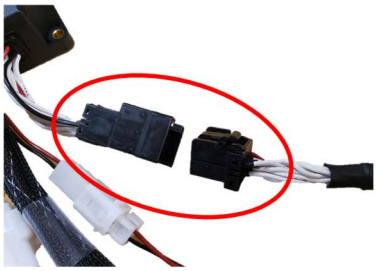
Install Legacy Keypad

Materials needed:

- Keypad
- Keypad harness
- Keypad bracket (optional)
- Keypad template

1. Find a location on the vehicle dashboard to mount the Keypad keeping in mind the length of the Keypad harness connection back to the ECU (6 ft). Also keep in mind that the rear of the dashboard must be accessed to install retaining hardware and wire harness connection.
2. Drill mounting holes into vehicle dashboard for keypad mounting.
    a. Use square keypad template to mark and drill 4 holes into vehicle dashboard for bracket mounting.
3. Mount square keypad to bracket using included 4 retaining nuts (optional).
4. Plug keypad wiring harness into back of the keypad.
5. Mount keypad assembly using SQUARE KEYPAD BRACKET TO VEHICLE HARDWARE.
6. Route keypad harness back to Main ECU harness and connect.





Appendix E

ECU Breakout Harness