NKL CASH HANDLING

NKL AUTOBANK

D8C

SERVICE MANUAL

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1 INTRODUCTION

AUTHORIZED PERSONNEL

This service manual is intended to be used only by personnel authorized to service NKL Autobank safes. Possession or use of this manual by unauthorized personnel does not constitute authorization. For information about service authorization contact NKL Technical Service.

SCOPE

This manual supports NKL Autobank D8C dispensing safes. This manual is intended to be used by authorized service technicians only. Unauthorized service will void the safe warranty and/or service agreement.

This manual contains abbreviated operation and programming instructions. Complete safe operating instructions are found in documentation supplied with the safe.

This manual contains basic theory of operation, troubleshooting help, repair instructions, and electrical and mechanical parts information.

The original version of this service manual was written in 2001 and it covered all Autobank safes with AuditLok XLV electronics. This updated edition covers the D8C only. Other models now have their own service manuals. Contemporary manufacturing is assumed unless specifically noted otherwise.

AUDITLOK XLV

AuditLok XLV is an electronic access control and accounting package. This electronics is used on several safe models in various configurations. Users log in with an electronic key and PIN or User Number and PIN. Fingerprint access is also available with the optional biometric reader. Up to 99 users may be enrolled in any combination of six permission levels. All lock and vend parameters are programmable.

C AND R CONCEPT

Every AuditLok XLV system must have one controller (C) unit. If the system consists of only one safe, that safe must be a C-unit. If the system includes any additional safes, those safes must be remote (R) units. R-units cannot function without a C-unit. Up to 15 R-units may be controlled by one C-unit. R-units are connected to the C-unit by a data bus using shielded cat-5 cable.

SAFE HARDWARE

D8C safes have a capacity of 80 tubes (eight columns of ten tubes each). The manager loads tubes filled with rolls of cash or coins, then cashiers dispense the tubes as needed during the course of the business day. Tubes are loaded through openings in the exterior of the door so that the door need not be opened. Tubes are dispensed by motor control. D8C safes are equipped with a manual drop drawer and in most cases a locked inner compartment (D8CI model).

OTHER VENDING SAFES WITH AUDITLOK XLV

NKL does not offer a D8R version of the D8 hardware. A version called D8X is a stand-alone model with limited functionality beyond basic tube dispensing. Refer to the D8X service manual. Another vending product, Max Vend, is a 4- or 6-hopper high capacity vending unit. Max Vend is only available in a C-unit configuration.

VALIDATING SAFES WITH AUDITLOK XLV

V1 safes have one bill validator. V2 safes have two bill validators. Various hardware configurations are available depending on the specific bill validator used. V1 and V2 safes are available in C-unit and R-unit configurations. The D8C can serve as controller for one or more V1R or V2R safes. Communication with R-units is a critical function covered by this manual even though V1 and V2 hardware is beyond the scope of this document.

2 CHASSIS
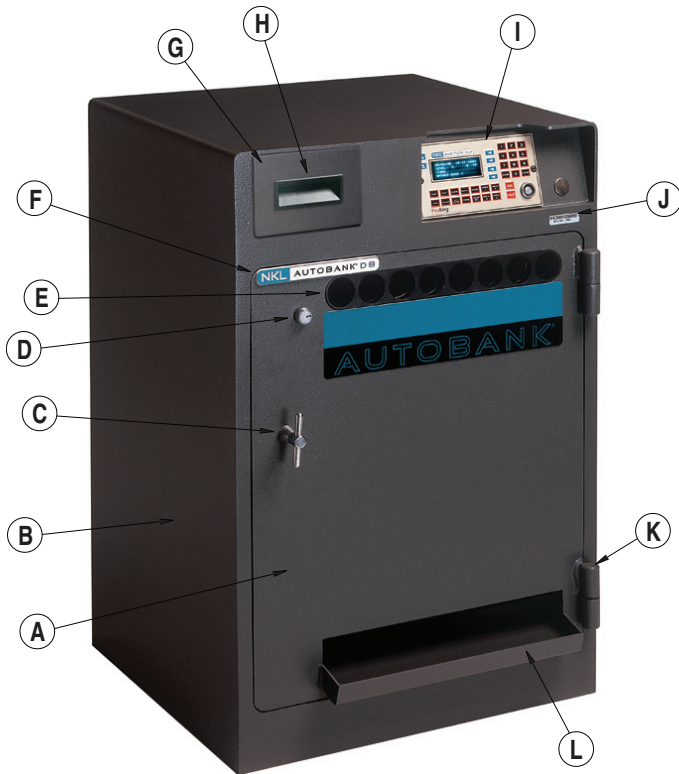
A—DOOR
The outer door is made of 3/8 inch A-36 steel. The door is laser cut for a perfect fit. It is equipped with a high quality, low profile boltwork for the best security and most efficient operation.

B—BODY
The body is 1/4 inch steel. Inner compartment optional. All electrical connections via rear panel (not shown).

C—HANDLE
The "T" style handle on this safe turns 90° left (counter-clockwise) to open. When the handle is turned, its bolts retract and lock open. When the door shuts, a spring loaded detent mechanism fires the bolts to lock the door and the handle automatically returns to the locked position.

D—TUBE LOCK KEY SWITCH
This Medeco® key switch is used to open and close the tube lock blocking bar. It is used to prevent fishing.

E—LOAD COLUMN OPENINGS
Tubes are loaded here. Column 1 is to the left as you look at the front of the safe; column 8 is to the right as you look at the front of the safe.

F—LABEL
Safe logo.

G—MANUAL DROP DRAWER
Pull out, insert drop envelop, push in. The drop will fall into the inner compartment, if present, or the bottom of the safe if there is no inner compartment. The drawer includes an anti-fish feature.

H—DRAWER HANDLE
The plastic insert handle makes it easy to grab and pull the drawer out and it is nearly flush with the front of the safe to prevent accidental injury.

I—AUDITLOK XLV KEYPAD
The keypad features a touch-membrane surface for protection from spills and a 20x4 fluorescent display.

J—CHASSIS SERIAL NUMBER
The serial number begins with SP to indicate manufacture by the FireKing Security Products plant location (early D8 safe serial numbers began with NK to indicate NKL brand). The first four numbers indicate year of manufacture. The next three numbers indicate week of manufacture. The last three numbers indicate sequential number of unit built during that week of that year.

K—HINGE
Safes have two welded hinges on which the door swings open, up to 180°. Do not attempt to clean hinges. Commercial cleaning chemicals will cause the hinge lubricant to break down, making it difficult to open or close the door.
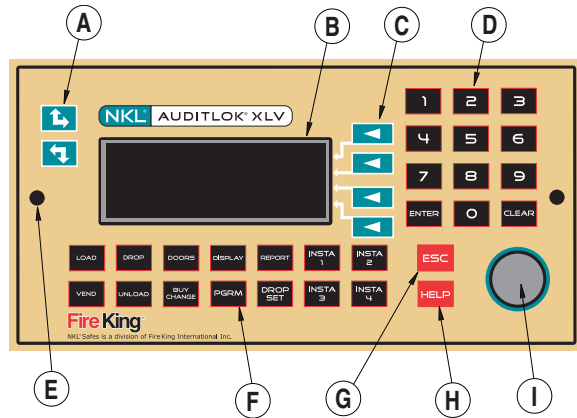
L—DISPENSARY TRAY
When tubes are vended, they drop into this tray area where they may be retrieved.

REAR PANEL:
The external power supply transformer connects to the rear panel of the safe. An external printer connects to the rear panel. RJ45 connectors on the rear panel allow connection of a printer, one or more R-units, and connection to a remote PC running NKL Edge software.

3 AUDITLOK XLV KEYPAD/DISPLAY

F—ACTION BUTTONS

Not all action buttons apply to every safe, but any given system could use almost any combination of action buttons depending on the application.

LOAD: Used to add tubes to the D8C.

VEND: Used to vend.

DROP: Used when making manual drops to the D8C or validated drops to attached V1R or V2R safes.

UNLOAD: Used to empty all tubes from a column.

DOORS: Used for door access.

BUY CHANGE: Used to vend change in exchange for currency dropped to an attached validating safe.

DISPLAY: Check delays or error messages.

PGRM: Used to manage users or configure settings.

REPORT: Used to print any of several available reports.

DROP SET: Configure Extended Drop or Insta-Drop.

INSTA 1, 2, 3, 4: One-button drop action.

G—ESC BUTTON

Used to cancel or end an action, back out of a menu, or from the idle screen use to access diagnostic and information menus.

H—HELP BUTTON

Not used.

I—KEY PORT

Present electronic keys to this reader port.

A—SCROLL BUTTONS

Use on menu screens to scroll up or down or on certain screens to scroll left or right.

B—DISPLAY

This is an 80 character (4 rows, 20 columns) fluorescent display. It can easily be read at some distance in almost any lighting condition.

C—SELECT BUTTONS

Use to select menu items.

D—NUMERIC KEYPAD

This is a standard number pad. Use the **ENTER** button to accept an entered value. Use the **CLEAR** button to start over entering a number.

E—MOUNTING

For security the display module is mounted to the chassis or EPR using two Torx (T-25) security screws.

4 OPERATION

SERVICE OPERATION

Only those operations relevant to D8C service are included here. Instructions are abbreviated for simplicity. It will be assumed during service that you have a User Number or key available with sufficient permission to perform the desired operation. If not, call NKL Technical Support to obtain log in instructions.

LOG IN

You must log in to perform most operations, including programming. Log in requires a User Number and a PIN, an electronic key and a PIN, or a fingerprint (if the system has a biometric reader). You may press the Action Button for the operation you are performing before or after these steps:

1. Present your electronic key or enter your User Number and press ENTER.
2. Enter your PIN.

OPEN DOORS

In many cases it is necessary to open one or both D8C doors for service purposes. Door delay and/or timelock may be set to zero for service purposes provided the settings are restored after service.

1. Log In.
2. Press DOORS.
3. When prompted to remove cash select NO.
4. Select the D8C.
5. Select the desired door to open. If you select the inner door the safe should unlock and let you open the outer first.

VEND

Vending tubes will verify operation of motors, sensors, and several other electronic and mechanical components. You may operate the vending system with the door open for test purposes. You may set the Vend Delay to zero if necessary for test purposes, but if you do you must return the vend delay to its normal setting after testing is complete.

1. Log In.
2. Press VEND.
3. Select the column number to vend from.
4. One tube from the selected column should dispense to the tray at the bottom of the outer door.
5. A vend receipt should print automatically. If the vend receipt says "UNVERIFIED" no tube was vended, the tube vended was empty, or the output sensor was unable to detect the tube as it was vended.

LOAD TUBES

Normally the manager loads the tubes each day. During the course of servicing the safe use this procedure to load tubes. Loading tubes will verify the input sensors.

1. Log In.
2. Press LOAD.
3. Insert tubes into the proper columns.
4. Verify the screen shows the proper total after each tube is loaded.
5. Press ESC after all tubes are loaded.
6. A load receipt should print automatically. Verify totals are correct. If a column shows no tubes were loaded either an input sensor is faulty or the system thought the column was already full.

UNLOAD TUBES

Use this procedure to empty a column and reset the tube count for that column. For service purposes you may unload with the safe door open. You may set the unload delay to zero for service purposes provided you return the unload delay to its original value.

1. Log In.
2. Press UNLOAD. If there is a delay, when the safe begins to beep repeat steps 1 and 2.
3. To unload one column select the column number using the number pad. To unload all columns select ALL from the menu.
4. Retrieve tubes as they are ejected. Do not allow tubes to pile up in the tray as this will cause a tube jam.
5. An unload receipt should print automatically. Verify totals are correct. If the receipt shows no tubes were unloaded the output sensor is blocked or otherwise faulty.

PRINT REPORTS

The Config Report and Cash Report are both very important for service. Various other receipts and reports, including the audit and other financial reports, are also useful for service under certain circumstances.
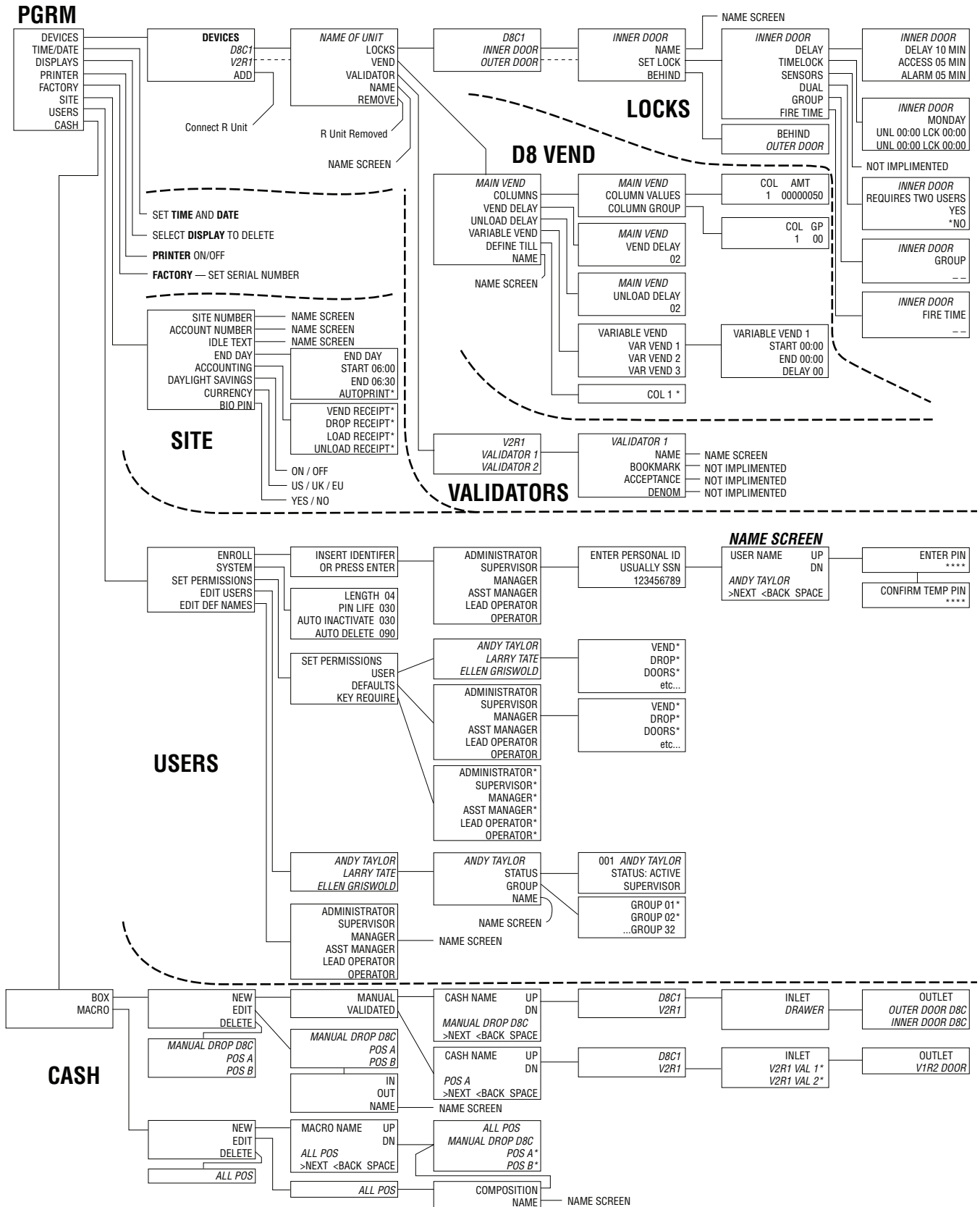
1. Log In.
2. Press REPORT.
3. Select the type of report to run.
4. Retrieve the report from the printer.

PROGRAMMING

Programming, particularly when replacing electronics, is critical to service and may include a wide range of settings.

1. Log In.
2. Press PGRM.
3. Choose the appropriate menu items to reach the desired parameters to set. Refer to the chart in Section 5 for guidance.

5 PROGRAMMING FLOW CHART

PGRM

DEVICES
TIME/DATE
DISPLAYS
PRINTER
FACTORY
SITE
USERS
CASH

DEVICES
D8C1
V2R1
ADD

Connect R Unit

NAME OF UNIT
LOCKS
VEND
VALIDATOR
NAME
REMOVE

R Unit Removed

NAME SCREEN

D8C1
INNER DOOR
OUTER DOOR

INNER DOOR
NAME
SET LOCK
BEHIND

NAME SCREEN

INNER DOOR
NAME
SET LOCK
BEHIND

BEHIND
OUTER DOOR

INNER DOOR
DELAY
TIMELOCK
SENSORS
DUAL
GROUP
FIRE TIME

LOCKS

INNER DOOR
DELAY 10 MIN
ACCESS 05 MIN
ALARM 05 MIN

INNER DOOR
MONDAY
UNL 00:00 LCK 00:00
UNL 00:00 LCK 00:00

NOT IMPLIMENTED

INNER DOOR
REQUIRES TWO USERS
YES
*NO

INNER DOOR
GROUP
— —

INNER DOOR
FIRE TIME
— —

D8 VEND

MAIN VEND
COLUMNS
VEND DELAY
UNLOAD DELAY
VARIABLE VEND
DEFINE TILL
NAME

NAME SCREEN

MAIN VEND
COLUMN VALUES
COLUMN GROUP

MAIN VEND
VEND DELAY
02

MAIN VEND
UNLOAD DELAY
02

VARIABLE VEND
VAR VEND 1
VAR VEND 2
VAR VEND 3

COL 1 *

COL   AMT
1   00000050

COL   GP
1   00

VARIABLE VEND 1
START 00:00
END 00:00
DELAY 00

SET **TIME** AND **DATE**

SELECT **DISPLAY** TO DELETE

PRINTER ON/OFF

FACTORY — SET SERIAL NUMBER

SITE NUMBER ——— NAME SCREEN
ACCOUNT NUMBER ——— NAME SCREEN
IDLE TEXT ——— NAME SCREEN
END DAY
ACCOUNTING
DAYLIGHT SAVINGS
CURRENCY
BIO PIN

END DAY
START 06:00
END 06:30
AUTOPRINT*

VEND RECEIPT*
DROP RECEIPT*
LOAD RECEIPT*
UNLOAD RECEIPT*

ON / OFF

US / UK / EU

YES / NO

SITE

V2R1
VALIDATOR 1
VALIDATOR 2

VALIDATOR 1
NAME
BOOKMARK
ACCEPTANCE
DENOM

NAME SCREEN
NOT IMPLIMENTED
NOT IMPLIMENTED
NOT IMPLIMENTED

VALIDATORS

ENROLL
SYSTEM
SET PERMISSIONS
EDIT USERS
EDIT DEF NAMES

INSERT IDENTIFER
OR PRESS ENTER

ADMINISTRATOR
SUPERVISOR
MANAGER
ASST MANAGER
LEAD OPERATOR
OPERATOR

ENTER PERSONAL ID
USUALLY SSN
123456789

NAME SCREEN
USER NAME   UP
            DN
ANDY TAYLOR
>NEXT <BACK SPACE

ENTER PIN
****

CONFIRM TEMP PIN
****

LENGTH 04
PIN LIFE 030
AUTO INACTIVATE 030
AUTO DELETE 090

SET PERMISSIONS
USER
DEFAULTS
KEY REQUIRE

ANDY TAYLOR
LARRY TATE
ELLEN GRISWOLD

ADMINISTRATOR
SUPERVISOR
MANAGER
ASST MANAGER
LEAD OPERATOR
OPERATOR

ADMINISTRATOR*
SUPERVISOR*
MANAGER*
ASST MANAGER*
LEAD OPERATOR*
OPERATOR*

VEND*
DROP*
DOORS*
etc...

VEND*
DROP*
DOORS*
etc...

USERS

ANDY TAYLOR
LARRY TATE
ELLEN GRISWOLD

ANDY TAYLOR
STATUS
GROUP
NAME

NAME SCREEN

001 *ANDY TAYLOR*
STATUS: ACTIVE
SUPERVISOR

GROUP 01*
GROUP 02*
...GROUP 32

ADMINISTRATOR
SUPERVISOR
MANAGER
ASST MANAGER
LEAD OPERATOR
OPERATOR

NAME SCREEN

BOX
MACRO

NEW
EDIT
DELETE

MANUAL DROP D8C
POS A
POS B

MANUAL
VALIDATED

MANUAL DROP D8C
POS A
POS B

CASH NAME   UP
            DN
MANUAL DROP D8C
>NEXT <BACK SPACE

CASH NAME   UP
            DN
POS A
>NEXT <BACK SPACE

IN
OUT
NAME

NAME SCREEN

D8C1
V2R1

D8C1
V2R1

INLET
DRAWER

INLET
V2R1 VAL 1
V2R1 VAL 2

OUTLET
OUTER DOOR D8C
INNER DOOR D8C

OUTLET
V1R2 DOOR

CASH

NEW
EDIT
DELETE

ALL POS

MACRO NAME   UP
             DN
ALL POS
>NEXT <BACK SPACE

ALL POS

ALL POS
MANUAL DROP D8C
*POS A **
*POS B **

COMPOSITION
NAME

NAME SCREEN

6 SETTINGS

PROGRAM – DEVICES

Name — A name is a 15 character text title stored in the CPU. Users, devices, locks, vend, validators, cashes and default permission levels have names.

Device — For practical purposes a device is a safe. A device is comprised of one or more locks and may have a hopper board, vend board, or one or two validators. Use the device menu to access lock, vend and validator settings.

Add Device — Add an R-unit to the system inventory.

Remove Device — Remove an R-unit from the system inventory (except EPR).

LOCK BOARD PARAMETERS

Lock — Each physical lock has its own lock board. All lock settings except the lock name and behind parameters are stored on the lock board.

Behind — When one door is physically behind another the Behind parameter lets the safe know this. This is how the safe knows to open the outer door before the inner door. Behind must be set to "none" unless the door is an inner door.

Door Delay — Requires user to log in and select the door to open or cash to remove, wait for the delay to complete, then repeat login and door/cash selection. The primary purpose is to serve as a robbery deterrent. Only one log in is required if Door Delay is set to zero.

Access Time — The period following a door delay during which the second login can be accomplished. Default value is 5 minutes.

Alarm Time — Maximum time a door may remain open after which an audible alarm sounds and a violation is logged in the audit. Default time is 5 minutes.

Fire Time — Safe doors with an ACO switch: This is how long you've got to activate the ACO switch; the value must be 1 minute or higher. Safe doors without an ACO switch: The lock remains energized for the designated time; set to zero to limit lock energized time to 7 seconds.

Timelock — The door may be accessed only during the period between UNL and LCK time. Set UNL and LCK to 00:00 to never enter timelock. Set UNL and LCK to 01:00 to put the door in permanent timelock. Only one timelock needs to be set per day to be active.

Dual — Enable dual to require two users with door permission to log in to open the door.

Group (Door) — Only users with door permission and who are assigned to the door's group may open that door.

VEND BOARD PARAMETERS

Vend — All vend parameters except the name of the vend are stored on the main vend board in the D8C.

Column Value — Financial value assigned to each individual tube in the column.

Column Group — Only users with group permission may vend from the column. Set to Group 00 to allow all users with vend permission to vend from the column.

Vend Delay — Period following a vend or unload until another vend or unload operation is permitted.

Variable Vend Delay — Establish different vend delay times based on time of day.

Unload Delay — Similar to a door delay, you must log into the Unload feature, wait for the delay cycle, then repeat before you can actually unload. The access period following the delay cycle is fixed at 5 minutes.

Till — Each user with Vend Till permission may vend one till one time in any twelve hour period. Use the Define Till setting to define which columns are included in a till.

UNIVERSAL INTERFACE BOARD (UIB) PARAMETERS

Validator — Each validator has an associated UIB. Validator names are stored in the CPU. Acceptance and denomination restrictions are set on validator hardware.

PROGRAM – CLOCK

Time — System time is set in military format.

Date — System date is set in MM/DD/YY format.

PROGRAM – PRINTER

Printer ON/OFF — Printer must be set to ON to enable all vend, validator and other financial features.

PROGRAM – FACTORY

Serial Number — This is a five digit number assigned by NKL to the organization who owns the safe. The Serial Number must be correctly set in order to allow remote Edge software users to access the safe.

PROGRAM – SITE

Site Number — This appears on all reports and receipts. It should be set to the store number.

Account Number — This appears on Deposit Reports. The bank account number is necessary in order to produce a fully bank-ready deposit slip.

Idle Text — Set to the business name; appears at the top of the screen at idle.

End Day — If AUTOPRINT is ON: Sets the End Day Report to run automatically at the START END DAY time. If AUTOPRINT is OFF: Sets the message "RUN END DAY NOW" to appear on the screen from the START END DAY time until the End Day report is ran (or until the END END DAY time is reached) and allows any enrolled user to run the End Day Report regardless of their permission level. If the END END DAY time is reached, it switches off the RUN END DAY NOW screen message and cancels universal permission to run the End Day report.

6 SETTINGS

Accounting (Receipt Print) — By default all receipts print automatically, however to conserve paper you may disable automatic printing of specific types of receipts.

Daylight Savings — If enabled, the system clock will automatically move forward or backward one hour on the proper date. Version 3.411 and higher CPU software supports the USA 2007 daylight savings time schedule. Older software versions support the pre-2007 USA daylight saving schedule.

Currency — Sets the printed symbol for financial value to US ($), UK (£) or EURO (€).

Bio PIN — If a biometric reader is present, set to Yes to require users to enter their PIN after their fingerprint is read. This feature is only necessary for Duress alarm.

PROGRAM – CASH

Box Cash — Box Cash is defined as the financial value associated with a specific physical compartment. May be manual or validated. Defined by inlet (manual drop or one or two validators) and the outlet (lock) for the compartment. When opening doors the user is asked whether they are removing cash. If they answer yes, they select the name of the cash rather than the name of the door. Value is added to the cash when a user makes a drop (manual or validated). Value is reset to zero when the door physically opens and the user has chosen to remove cash. Configuring box cash requires creating a box cash name, assigning type (validated or manual), assign a safe, if validated assign validators, assign the safe door. No validated or manual drops can be calculated and validators will not function until box cash is fully and properly configured.

Macro Cash — Used by armored car to allow access to multiple validated box cashes with only one keypad operation. Macro Cash should only be setup if more than one validated box cash exists in the system and are reasonably nearby in the same building. After configuring box cashes, create a macro, name the macro, then assign validated box cashes to the macro.

PROGRAM – USERS

User — Up to 99 users may be enrolled. Any user may be enrolled with any six available permission levels. The #8 ACO electronic key is hard-coded with its own unique permission. User 0 is the "Factory" user number. User 0 is automatically deleted once the first user is enrolled.

Identifier — User Number, electronic key, or fingerprint.

User Number — Number assigned sequentially as new users are enrolled. Keyless users must enter their User Number each time they log in to uniquely identify themselves.

Personal ID — This is a number up to 9-digits long assigned at the time a user is enrolled. It must be a different number for every user.

Permission Levels — The system has six progressive permission levels. A user may only enroll another user of equal or lower permission level. Each permission level has a default name which is editable.

Permissions — An exhaustive list of permissions is available for each permission level. Default permissions are established for each permission level including groups. Changing a permission for a level will not affect users already enrolled. Permissions for individual users are editable separately. For a complete list of possible permissions refer to the Permission Chart.

Key Require — Set based on permission level; if enabled for a given level, all users enrolled at that level may only be enrolled with an electronic key (or fingerprint).

PIN Length — Factory default is 4-digits. The alternate setting (6-digits) should not be selected except where required for high security applications.

PIN Life — Frequency in days that users must change their PIN.

Auto-Inactive — Number of days after a user's last log-in until their status is changed to inactive.

Auto-Delete — Number of days after a user's last log-in until their status is changed to deleted.

PERMISSION	ADMINISTRATOR	SUPERVISOR	MANAGER	ASST. MANAGER	LEAD OPERATOR	OPERATOR
Groups	00-05	00-05	00-05	00-01	00	00
Drop	✔	✔	✔	✔	✔	✔
Vend	∗	∗	∗	∗	∗	∗
Vend Till	∗	∗	∗	∗	∗	∗
Door	∗	∗	∗	∗	∗	
Report, User	✔	✔	✔	✔	✔	
Report, Cash	✔	✔	✔	✔		
Report, View Audit	✔	✔	✔	✔		
Report, Print Audit	✔	✔	✔	✔		
Report, End Day	✔	✔	✔	✔		
Report, Config	✔	✔	✔	✔		
Drop Set Delete	✔	✔	✔	✔		
Load	✔	✔	✔	✔		
Unload	✔	✔	✔	✔		
Edit/Delete User	✔	✔	✔	✔		
Enroll User	✔	✔	✔			
Set Vend Delay	✔	✔				
Set Unload Delay	✔	✔				
Set Var Vend	✔	✔				
Set PIN Length	✔	✔				
Set Timelock	✔	✔				
Set Delay	✔	✔				
Set Access	✔	✔				
Set Alarm	✔	✔				
Set Dual key	✔	✔				
Setup Cash	✔	✔				
Set Col Values	✔	✔				
Set Receipt Print	✔	✔				
Set End of Day	✔	✔				
Set Time	✔	✔				
Set Date	✔	✔				
Set Key Require	✔	✔				
Edit Permissions	✔					
Edit Default Permissions	✔					
Edit Permission Names	✔					
Set PIN Auto-Delete	✔					
Set PIN Auto-Inactive	✔					
Set PIN Life	✔					
Device Add	✔					
Device Delete	✔					
Device Name	✔					
Set Door Behind	✔					
Set Door Fire Time	✔					
Set Idle Text	✔					

∗*Access to components in assigned GROUPs.*

7 SYSTEM COMMUNICATION

COMMUNICATION RULES

1. Up to 15 R-units (any combination of V1R and V2R), may be added to one C-unit.
2. Up to 4 displays (built in and EPR) may be connected to the system.
3. All R-units, including EPRs (after the first display), must be added using the Add Device procedure.
4. As soon as an R-unit is added, that R-unit is available on the Device Menu list to configure and use.
5. Once an R-unit is added, it will no longer respond to an Add Device request (until it receives a Remove Device command).
6. One display at Display Address 00 will communicate with the CPU. Only one display may be at Display 00. Any additional displays in the system are treated like R-units and must be added before they will communicate properly.
7. The rated maximum data bus length is 300 feet. Actual maximum length depends on wire quality, routing, and the presence of electronic noise in the environment.
8. S/N SP2008032034 and later (or upgraded older safes): Use shielded twisted pair for all data bus connections. The data bus must always be properly terminated to protect against electronic noise interference. A termination plug must be plugged into the DATA END port on the last R-unit on the data bus (V1R, V2R or EPR).

ADD DEVICE

When a system includes one or more R-units there are times during the course of service, such as after certain electronics are replaced, when it is necessary to add an R-unit (or EPR) to the C-unit. Establish communication with a V1R, V2R, or EPR as follows:

1. All components must be powered. The data bus is not connected to the R-unit(s) to be added until directed.
2. Log In.
3. Press PGRM.
4. Select DEVICES.
5. Select ADD.
6. While the screen indicates ADD DEVICE NOW connect the data bus from the D8C (DATA OUT) to the first R-unit (DATA IN).
7. If the system has one or more R-units already connected and communicating, connect the data bus from the last R-unit already connected (DATA OUT) to the next R-unit (DATA IN).
8. Connect the Terminator Plug to the DATA END port on the last R-unit on the data bus (furthest from the D8C on the data bus). ***Note:*** *The DATA END jack does not exist on R-units built prior to serial number SP2008032034. On older R-units the termination plug is not required unless R-unit electronics are replaced.*
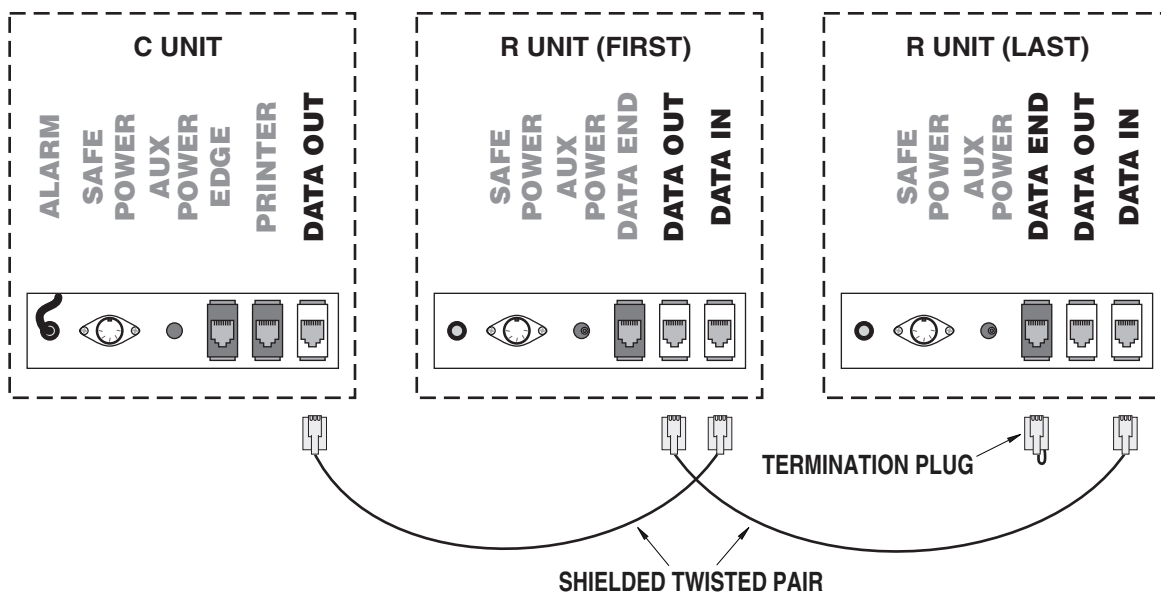
Example system with one C-unit and two R-units.
Communication connections form a data chain. Shielded twisted pair RJ45 cables are used.
A termination plug is connected to the DATA END port on the last R-unit on the data bus.

7 SYSTEM COMMUNICATION

REMOVE DEVICE

Before taking any action that involves or requires removing a V1R or V2R, run all necessary financial reports and in particular a Cash Report if possible. When the CPU is to be replaced, all R-units must be removed first, if possible. If that is not possible the R-units must be removed by factory override after the CPU is replaced. When electronics are replaced in an R-unit, that R-unit must be removed (from C-unit inventory) before attempting to add the replacement electronics. R-units must have power when being removed regardless of the means.

NORMAL REMOVE DEVICE (V1R/V2R) PROCEDURE

The V1R and V2R-units being removed must be connected to the C-unit via data bus for it to receive the Remove Device command.
1. Log In.
2. Press PGRM.
3. Select DEVICES.
4. Select the V1R or V2R to be removed.
5. Select REMOVE.
6. The selected R-unit is no longer in the inventory of the C-unit. If it was properly connected and communicating at the time, it received the Remove Device command and is now available to be added to a C-unit. The data bus should be disconnected after all devices are removed.

REMOVE DEVICE (V1R/V2R/EPR) BY OVERRIDE

The V1R, V2R or EPR units being removed must be connected to the C-unit via data bus for it to receive the Remove Device command. For additional information about overrides refer to Section 10.
1. Contact NKL Technical Service (1.800.452.4655) when you are physically in front of the safe.
2. The NKL technician will guide you through performing the "50" override.
3. After the override is complete, disconnect the data bus to all R-units (do not disconnect Display 00 if it is mounted in an EPR case).

NORMAL REMOVE DISPLAY (EPR) PROCEDURE

Since EPRs have no configurable settings they do not appear on the DEVICE menu. Use this procedure to remove a display from the C-unit inventory and, if it is connected to the C-unit at the time, its Display Address is reset to 00.
1. Log In.
2. Press PGRM.
3. Select DISPLAYS.
4. Select the display to be removed (Display 00 cannot be removed).
5. The selected display is no longer in the inventory of the C-unit. If it was properly connected and communicating at the time, it received the Remove Device command and is now available to be added to a C-unit. The data bus must be disconnected immediately after removing the display to avoid serious communication problems (you may remove power from the display if the data bus cannot be broken at this time).

MANUAL RESET TO REMOVE DISPLAY (EPR)

Reset the software address of a Display manually if it is the main or only display (Display 00) and it will not respond; reset an auxiliary display if you are attempting to add it and it will not respond to the Add Device procedure (it should be removed from Display inventory before attempting to add it back in).
1. Remove the security screws holding the display to the safe front panel or EPR box.
2. If the display is built into the header disconnect the RJ45 cable from the can or if the display is in an EPR remove power from the EPR.
3. Press and hold down the reset button on the display circuit board.
4. Reconnect the display (RJ45 if header mounted or power if EPR mounted).
5. After 30 seconds release the reset button.
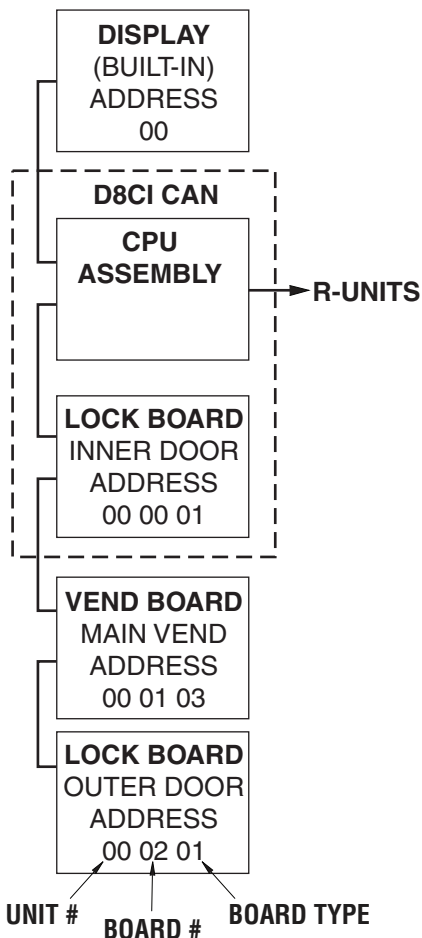6. Cycle power to the display and test operation. If it is an auxiliary display it may now be added.
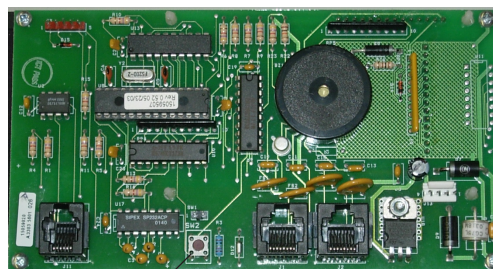
Reset Button

Display Board (Rear)

8 INTERNAL COMMUNICATION

COMMUNICATION RULES

1. C-unit internal communication (CPU to lock and vend boards) is established independently from any external (R-unit) communication.
2. If the D8C has a built-in display, it is operated from a CPU port separate from other internal devices. A built-in display is always the primary (Address 00) display.
3. If the primary (Address 00) display is external it is effectively treated as an R-unit except that it may be connected to the data bus even during a Device Search.
4. All R-units (except the primary display) must be disconnected when performing a Device Search.
5. The Device Search procedure must be performed in order to establish communication between the CPU and internal devices (lock boards, vend board, UIB).
6. The internal data bus must be terminated to protect against electrical noise interference.

```
          ┌──────────────┐
          │   DISPLAY    │
          │  (BUILT-IN)  │
          │   ADDRESS    │
          │      00      │
          └──────────────┘
      ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
      │     D8CI CAN        │
      │  ┌──────────────┐   │
      │  │     CPU      │   │
      │  │   ASSEMBLY   │──────► R-UNITS
      │  └──────────────┘   │
      │  ┌──────────────┐   │
      │  │  LOCK BOARD  │   │
      │  │  INNER DOOR  │   │
      │  │   ADDRESS    │   │
      │  │   00 00 01   │   │
      │  └──────────────┘   │
      └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
         ┌──────────────┐
         │  VEND BOARD  │
         │  MAIN VEND   │
         │   ADDRESS    │
         │   00 01 03   │
         └──────────────┘
         ┌──────────────┐
         │  LOCK BOARD  │
         │  OUTER DOOR  │
         │   ADDRESS    │
         │   00 02 01   │
         └──────────────┘
          UNIT #    BOARD TYPE
             BOARD #
```

This example system depicts a D8CI.

INTERNAL DATA BUS TERMINATION

Set the D8C outer door lock board SW1 Segment 8 set to ON to terminate the internal data bus. If the D8C has a built-in display, a jumper (part 15187001) should be installed at SW1 on the back of the display board.

DEVICE SEARCH

Perform a Device Search if the physical inventory of C-unit boards does not match the virtual inventory (Section 9). This normally happens after replacing one or more boards in the C-unit when all boards are not replaced as a pre-configured kit (can, main vend board and outer door lock board) from the factory. Check the device inventory via diagnostic screen. A D8C should indicate one vend board and one or two lock boards (two lock boards if the D8C has an inner door). The Device Search establishes communication between the CPU and all boards inside the C-unit.

1. Print End Day, Enrolled User, and Configuration reports if possible.
2. Disconnect all R-units from the data bus.
3. Remove power from the C-unit safe.
4. Set Inner Door Lock Board SW1 Segment 1 to ON, all other segments OFF (this step is only required if the CPU or Inner Door Lock Board are replaced).
5. Set Outer Door Lock Board SW1 Segments 1, 6 and 8 to ON, all other segments OFF.
6. Set Vend Board SW1 Segment 8 to ON, all other segments OFF.
7. Restore power to the safe.
8. Perform a "52" override (requires phone contact with NKL Technical Service: 1.800.452.4655).
9. Wait at least one full minute after the Device Search is complete.
10. Remove power from the safe.
11. Set Inner Door Lock Board SW1 Segment 1 to OFF (if set to ON in step 5).
12. Set Outer Door Lock Board SW1 Segment 1 to OFF.
13. Set Vend Board SW1 Segment 8 to OFF.
14. Restore power to the safe. Wait at least one full minute (until the CPU full initializes) before continuing.
15. Check the inventory. Repeat this procedure if all boards in the C-unit are not found.
16. Reconnect R-units.
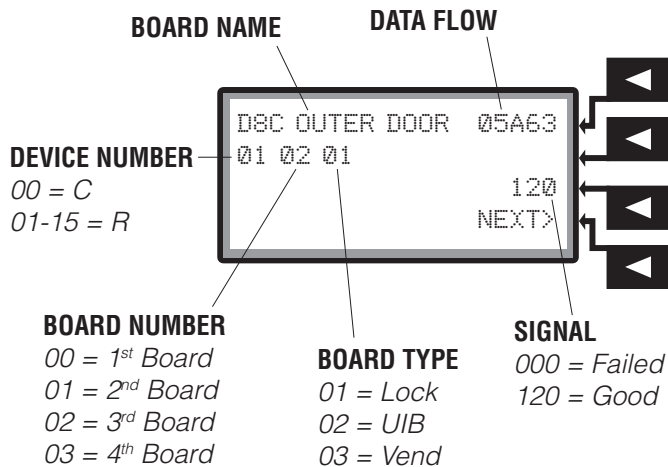
9 COMMUNICATION DIAGNOSTICS

SOFT ADDRESS

Lock boards, main vend boards and validator boards (UIBs) have a soft address made up of three parts. These parts include the unit number, board number, and board type.

Device Number — The C-unit is always Device 00. The first V1R or V2R in inventory is Device 01, the second R-unit is Device 02, and so on.

Board Number (C-unit) — The first board found in a C-unit by the CPU during a Device Search is Board 00. The second board found is Board 01, the third is Board 02, and so on.

Board Number (R-unit) — The UIB connected to the external data bus is always Board 00. The next board is Board 01, the third is Board 02, and so on. Board 00 establishes its own inventory of boards inside the R-unit and reports this inventory to the CPU at the time the R-unit is added.

Board Type — A lock board is Type 01. A UIB (validator board) is Type 02. A main vend board is Type 03.

BOARD NAME   DATA FLOW

DEVICE NUMBER
00 = C
01-15 = R

```
D8C OUTER DOOR  05A63
01 02 01
                  120
                NEXT>
```

BOARD NUMBER
00 = 1ˢᵗ Board
01 = 2ⁿᵈ Board
02 = 3ʳᵈ Board
03 = 4ᵗʰ Board

BOARD TYPE
01 = Lock
02 = UIB
03 = Vend

SIGNAL
000 = Failed
120 = Good

Device List / Diagnostic Screen

INVENTORY CHECK VIA DIAGNOSTIC

Check inventory and data bus communication using the Diagnostic screen:
1. At the idle screen press ESC.
2. Select DEVICES.
3. Interpret the information displayed as shown in the Device List /Diagnostic Screen example. *All other information beyond what is shown below may be ignored.* In the case of displays (shown at the end of the inventory cycle), only the Display Address is shown (Display Address is one two-digit number).
4. Select NEXT to cycle forward to the next board in the system.

INVENTORY CHECK VIA PRINT

One way to find the inventory of safes and circuit boards in a system is to run a Config Report (see Section 4). The Config Report will not list displays. A Config Report that is incomplete or prints with errors may indicate a communication problem.

DEVICES

Each time you find a line that includes the term "CONTROLLER" that line denotes the start of information about that unit. A D8C will appear as the first controller on the report and should appear as a VEND CONTROLLER. A V1R or V2R will appear as a VAL CONTROLLER. R-units are listed in Device Number order following the C-unit.

BOARDS

Each board is listed by name, type, and firmware version. The name is a 15-character user-defined text string. If a board has never been named it will have a 12-digit hexadecimal number as its name. The board type describes its function (LOCK, VEND, or UIB). After the CONTROLLER entry on the Config Report, each board is listed in order by Board Number.

10 SERVICE

POWER

One of the most common problems with electronic products is partial or complete loss of power. External power supplies are used with NKL safes so that a safe does not need to be drilled open to service the more common types of power supply failures.

POWER SUPPLY TEST

The three-level main power supply transformer output ($\pm12\,V_{DC}$ and $+5\,V_{DC}$) may easily be checked with a multimeter. The pin-out is shown below. To prevent power supply failure due to surges or spikes, always use an uninterruptible power supply (UPS) with your safe.

1 = COM
2 = COM
3 = $+5\,V_{DC}$
4 = $-12\,V_{DC}$
5 = $+12\,V_{DC}$

Power Supply Connector Voltages
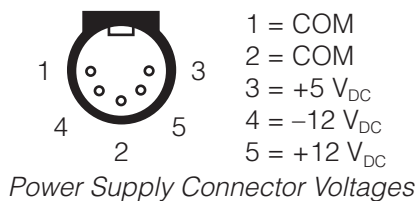
INTERNAL POWER DISTRIBUTION - BEFORE SP2009xxx

The DC power input from the rear panel feeds directly into the CPU assembly and the Vend Power jack on the can. The header-mounted display (if present) and inner door Lock Board (if present) receive power from the CPU with data and power carried on the same cable. The outer door Lock Board receives its power and data from the Vend Board. The Vend Board receives power and data on a pair of cables sharing the armored cable harness between the can and the door. The can in this configuration does not include a Power Distribution board or internal Network Board.

DC SOURCE

POWER
DATA
POWER & DATA
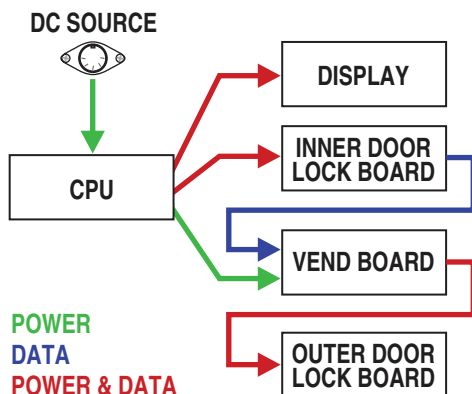
Power Distribution (Without Power Distribution Board)

INTERNAL POWER DISTRIBUTION - AFTER SP2009xxx

DC power from the rear panel feeds into the Power Distribution Board inside the electronics can. This board distributes power to the CPU assembly, Network Board, inner door Lock Board (if present), Vend Board and outer door Lock Board. In each case power is carried on a separate cable from the data, although the outer door Lock Board and Vend Board power cables share the same armored cable harness from the can to the door. The CPU provides power to the header mounted display (if present) with data and power sharing the same cable.

DC SOURCE

POWER
DATA
POWER & DATA
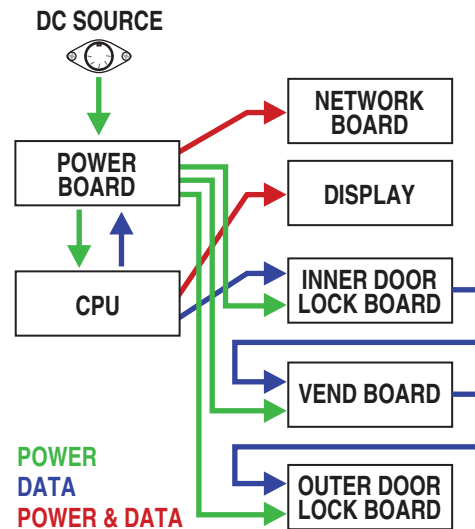
Power Distribution (With Power Distribution Board)

KIT VS. BOARD LEVEL REPAIR

In some cases it is more cost/time effective to replace the electronics can, main vend board and outer door lock board as a complete kit regardless of which board is suspected of failure. Installing a complete electronics kit will prevent having to perform the fairly tedious and time consuming task of performing a Device Search (Section 7) to get all boards in the D8C to communicate. This is because kit components have already been configured by the factory to work together. Introducing a new CPU, lock board or vend board will usually require you to perform a Device Search in order to establish internal communication.

ELECTRONICS KITS

The can in the D8C Kit can does not include the inner door lock board. The D8CI Kit does include the inner door lock board. Refer to the Electrical Parts list for a complete list of part numbers.

10 SERVICE

ELECTRONICS CAN

The electronics can inside the D8C contains the CPU assembly, the Lock Board for the inner door (if applicable), the internal power harness, and various other interconnecting cables.

Major Versions

Prior to serial number SP2009xxx the can included the CPU and lock board (D8CI). Start with SP2009xxx the can was redesigned to add a power distribution board and an internal network interface board (Edge port becomes an Ethernet port, previous was RS232).

Can Removal

Perform all of the following steps that are applicable and possible. The following procedure assumes the CPU assembly is being replaced, whether individually or as part of a complete can replacement. If the CPU has failed steps 1 through 5 will not be possible.

1. Print a Config Report.
2. Print an Enrolled User Report.
3. Print an End Day Report.
4. If the system includes one or more R-units: Perform the Remove Device procedure (Section 7) to remove all V1R and V2R-units.
5. If the system has more than one display: Perform the Remove Display procedure (Section 7) to remove Display 01 and above.
6. Open the doors.
7. Disconnect cables to the can at the rear panel of the safe.
8. Disconnect cables to the can inside the safe.
9. Remove the 11/32 hex nuts holding the can.
10. Carefully pull the can out of the safe.

Power Distribution Board Replacement

This procedure is only applicable if the can has a Power Distribution Board (SP2009xxx and above). This board is mounted to a special mounting plate designed to accommodate mounting above the CPU assembly.

1. Perform the Can Removal procedure (see above).
2. Remove the four small Phillips head screws from the can cover plate.
3. Remove the cover plate and set aside.
4. Mark each cable with a permanent marker to ensure cables are replaced in the correct position later.
5. Disconnect all cables from the Power Distribution Board.
6. Remove the mounting screws.
7. Replace the board.
8. Reverse this procedure to install the replacement Power Distribution Board.

CPU Replacement

The CPU is the brain of any Autobank system. When the system includes a D8C, the D8C is the unit with CPU. One CPU can manage up to 15 R-units attached to it. The CPU assembly is comprised of the CPU top and bottom boards. These two boards always come as an assembly. Do not attempt to separate them or swap individual parts. The assembly is always mounted inside the electronics can. **ALWAYS OBSERVE PROPER GROUNDING AND STATIC PRECAUTIONS WHILE WORKING WITH EXPOSED ELECTRONICS.**

1. Perform the Can Removal procedure (see above).
2. Remove the four small Phillips head screws from the can cover plate.
3. Remove the cover plate and set aside.
4. The CPU is a two-board assembly mounted toward the top (closest to the back panel connector plate). The inner door lock board (if present) is mounted below the CPU. If the can is equipped with a Power Distribution board, remove it and its mounting plate and set aside (see above procedure).
5. Use a permanent marker to mark each cable connected to the top row of ports on the CPU assembly, then disconnect each of these.
6. Use a permanent marker to mark each cable connected to the bottom row of ports on the CPU assembly, then disconnect each of these.
7. Disconnect the power harness from the other side of the CPU assembly.
8. Remove the mounting screws from the CPU assembly and Remove the old CPU.
9. Install the new CPU assembly.
10. Reverse the above steps to reconnect cables and reinstall the Power Distribution Board (if applicable) inside the can.
11. Connect Safe Power, Vend Power, Vend Data, and Display cables inside the safe and connect external power to the rear of the can, but do not yet mount the can inside the safe.
12. Check device inventory and if necessary perform a Device Search (see Section 8).
13. Disconnect cables to the can.
14. Reinstall the can cover plate.
15. Perform the Can Installation procedure (below).
16. Perform System Restoration (below).
18. **DEFAULT NEW CPU LOGIN IS USER 0 AND PIN 1536.**
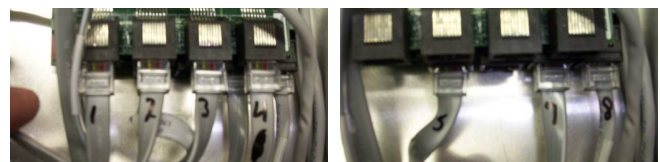
CPU Assembly Top Board Cables (shown left)
CPU Assembly Bottom Board Cables (shown right)

10 SERVICE

INNER DOOR LOCK BOARD REPLACEMENT

Observe proper grounding and static precautions while working with exposed electronics. **ALWAYS OBSERVE PROPER GROUNDING AND STATIC PRECAUTIONS WHILE WORKING WITH EXPOSED ELECTRONICS.**

1. Perform the Can Removal procedure (above).
2. Remove the four small Phillips head screws from the can cover plate.
3. Remove the cover plate and set aside.
4. Disconnect all cables from the lock board.
5. Remove the Lock Board mounting screws.
6. Replace the Lock Board.
7. Reinstall the Lock Board mounting screws.
8. Reconnect cables to the Lock Board.
9. Connect Vend Power, Vend Data, and Display cables to the can (this will require setting the can inside the safe, but do not mount it at this time).
10. Connect safe power to the can.
11. Check device inventory and if necessary perform a Device Search (see Section 8).
12. Disconnect Safe Power, Vend Power, Vend Data, and Display cables.
13. Reinstall the can cover plate.
14. Perform the Can Installation procedure (below).
15. Perform System Restoration (below).

NETWORK INTERFACE BOARD REPLACEMENT

This procedure is only applicable if a Network Board exists inside the can.

1. Perform the Can Removal procedure (above).
2. Remove the four small Phillips head screws from the can cover plate.
3. Remove the cover plate and set aside.
4. Disconnect all cables from the Network board.
5. Remove the mounting screws.
6. Replace the Network board.
7. Reverse the above steps to reinstall the can and restore operation.

CAN INSTALLATION

If the can is replaced without also replacing the Vend and Outer Door Lock boards refer to CPU Replacement procedures (below) before installing the can.

1. Place the can in position over the mounting studs inside safe.
2. Reinstall the mounting nuts.
3. Reconnect internal cables to the can.
4. Reconnect the printer to the rear of the safe.
5. If applicable: Reconnect the Lantronix or external modem to the rear of the safe. Reconnect the alarm cable.

6. If the main display for the safe is mounted in an EPR rather than the front of the safe: reconnect the data bus to the EPR only. **DO NOT RECONNECT THE DATA BUS TO ANY V1R, V2R OR EPR DISPLAYS AT THIS TIME.**
7. Reconnect the main safe power supply. An audible door alarm may sound when the safe powers up. If so, ignore it. **DO NOT CLOSE ANY SAFE DOOR UNTIL DOOR OPERATION IS VERIFIED.**
8. Verify door operation before closing doors.

SYSTEM RESTORATION

This procedure assumes the CPU assembly and/or inner door lock board was replaced, whether individually or as part of a complete can replacement.

1. If the system includes R-units and/or additional displays: Perform the Add Device procedure (Section 7) to add the R-units (including extra displays) back to the system.
2. Print a Config Report.
3. Mark the Config Report with all of the differences from the pre-repair Config Report. This will allow you to see what settings must be reprogrammed.
4. Reprogram device settings as required. *In particular all board names will need to be entered. If the safe has two doors it may be necessary to try opening each door listed to verify which door is which. Note that the D8C Inner Door must be set Behind the D8C Outer Door and the D8C Outer Door must be set behind None.*
5. Create box cash for each manual and validated drop compartment.
6. Create macro cash made up of all validated drop box cashes if and only if the system includes more than one validating safe.
7. Print another Config Report and a Cash Report. Verify them against the originals and make any additional changes required.

NETWORK INTERFACE

Many Autobank safe customers use NKL's Edge software to pull daily financial data from their safe. This requires proper configuration of the network interface.

PRIOR TO SERIAL NUMBER SP2009XXX

An external Lantronix network interface is used. It is connected via RS232 to the "EDGE" port (or "MODEM" port on older safes). The external Lantronix interface TCP/IP settings can be configured via RS232 or Ethernet.

SINCE SERIAL NUMBER SP2009XXX

The network interface is installed inside the electronics can. The "EDGE" port is an Ethernet port. TCP/IP configuration requires an Ethernet connection to the safe.

10 SERVICE

Configuring the Network Interface via RS232

You must have a PC with the HyperTerminal application and an RS232 null modem cable (DB9-DB25) for an external Lantronix network interface or a special service use only cable (15050088) to configure an internal Network board.

1. Disconnect power from the Lantronix.
2. Connect the null modem cable from the RS232 port on the Lantronix to the RS232 port on your PC (internal board: connect special cable).
3. Start HyperTerminal. Set to serial port communication at 9600 baud, 8 data bits, no parity, 1 stop bit, flow control none.
4. Connect power to the Lantronix.
5. At the PC: Immediately press "x" (must be lower case) at least 3 times until Lantronix connection is indicated in HyperTerminal. If nothing appears in the HyperTerminal screen and the diagnostic light on the Lantronix goes off you missed the connection window. If this happens disconnect Lantronix power and start again from Step 4.
6. Immediately press ENTER.
7. At the menu type "0" then press ENTER.
8. Set the following (press ENTER to accept defaults if they are correct):
   - Enter the IP Address (assigned by the network administrator or obtained from NKL). The address is entered one segment at a time.
   - Set Subnet Mask to the number of host bits (normally 8).
   - If a Gateway is used set to Y, otherwise N.
   - Enter the Gateway IP Address (assigned by the network administrator or obtained from NKL). The address is entered one segment at a time.
10. At the menu type "1" and press ENTER.
11. Set the following (press ENTER to accept defaults if they are correct; order and list of variables may vary depending on specific Lantronix model, if any variables appear which are not listed here then simply accept the default value):
    - Baud rate = 9600.
    - I/F Mode = 4C.
    - Flow = 0.
    - Port = 3729.
    - Connect Mode = C0
    - Datagram Type = N/A
    - Remote IP = 0.0.0.0.
    - Remote Port = 0
    - Pack Control = N/A
    - Disconnect Mode = 00
    - Flush Mode = 77
    - Disconnect Time = N/A
    - SendChar 1 = 0
    - SendChar 2 = 0

13. At the menu type "9" then press ENTER.
14. Disconnect the Lantronix from the PC. Connect it to the safe and the network.
15. Connect to the safe using the Edge software to verify operation.

Configuring the Network Interface via Ethernet

You must have the Lantronix device, a PC with Lantronix DeviceInstaller application (install from the CD provided with the Lantronix device), and both must be connected to the network.

1. Start the Lantronix DeviceInstaller application.
2. Click the Search icon to find the Lantronix device.
3. Select the Lantronix device from the appropriate folder.
4. Select the Web Configuration tab.
5. Click the Go button to start the Web Manager.
6. Select Network in the left navigation pane.
7. Configure Network settings as required: Select "Use the following IP configuration" and enter the IP Address, Subnet and Gateway (assigned by the network administrator or obtained from NKL); enable "Auto Negotiate".
8. Click OK.
9. Click Apply Settings in the left navigation pane.
10. Select Serial Settings in the left navigation pane.
11. Configure Serial Settings as required: Protocol RS232, Flow Control none, Baud 9600, Data bits 8, Parity none, Stop Bits 1, and set all Pack Control and Flush Mode options to No or disabled.
12. Click OK.
13. Click Apply Settings in the left navigation pane.
14. Select Connection in the left navigation pane.
15. Configure Connection settings as required: Protocol TCP, Accept Incoming yes with no password, Active Connect and Modem Mode none, Local Port 3729, Remote Port 0, Remote Host 0.0.0.0, TelnetMode disabled, Disconnect Mode default settings.
16. Click OK.
17. Click Apply Settings in the left navigation pane.
18. Close the DeviceInstaller application.
19. Connect via Edge software to verify operation.

10 SERVICE

DISPENSING SYSTEM

The dispensing system consists of the plastic vend assembly, tube blocking bar and key lock, vend board, motor board, motors, output sensors, and associated cables. D8C units hold up to 80 tubes.
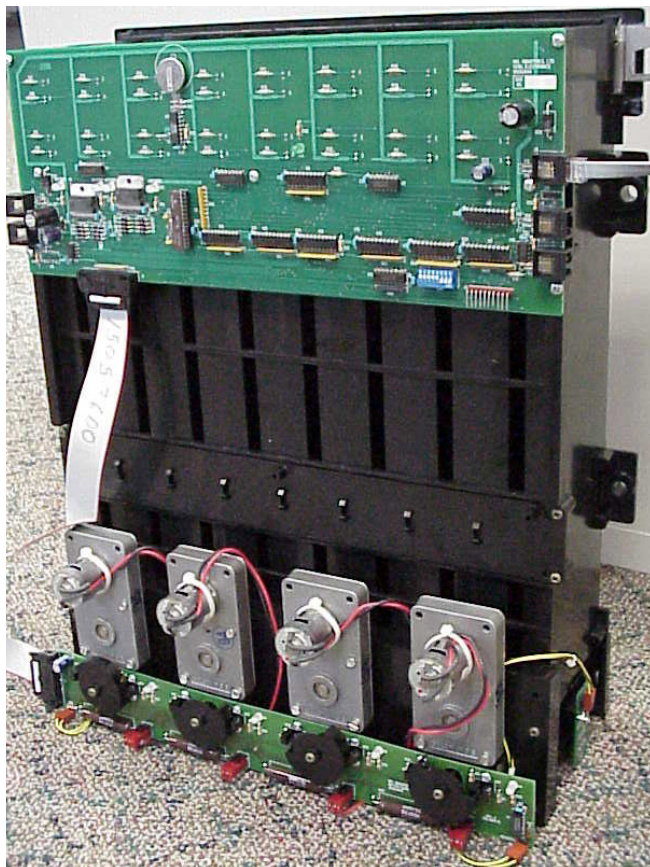
Vending Assembly

THEORY OF OPERATION

Tubes are loaded through the openings near the top of the door. Fishing is prevented by a key operated tube blocking bar. Tubes are held in columns according to their value. The assembly has four DC motors. Each motor serves two columns. Optic sensors on the motor board detect motor travel. At rest the motor sensors should indicate the cup is centered between columns. Tubes are vended out to the dispensing tray at the bottom of the door. As tubes dispense they pass through and break an optic beam. This beam allows the safe to count tubes during an unload operation.

VEND ASSEMBLY PLASTICS

The vend assembly body parts are constructed using patented plastics technology for tight tolerances and long sturdy life. If the plastics break the entire assembly can be replaced.

Plastics Assembly Replacement

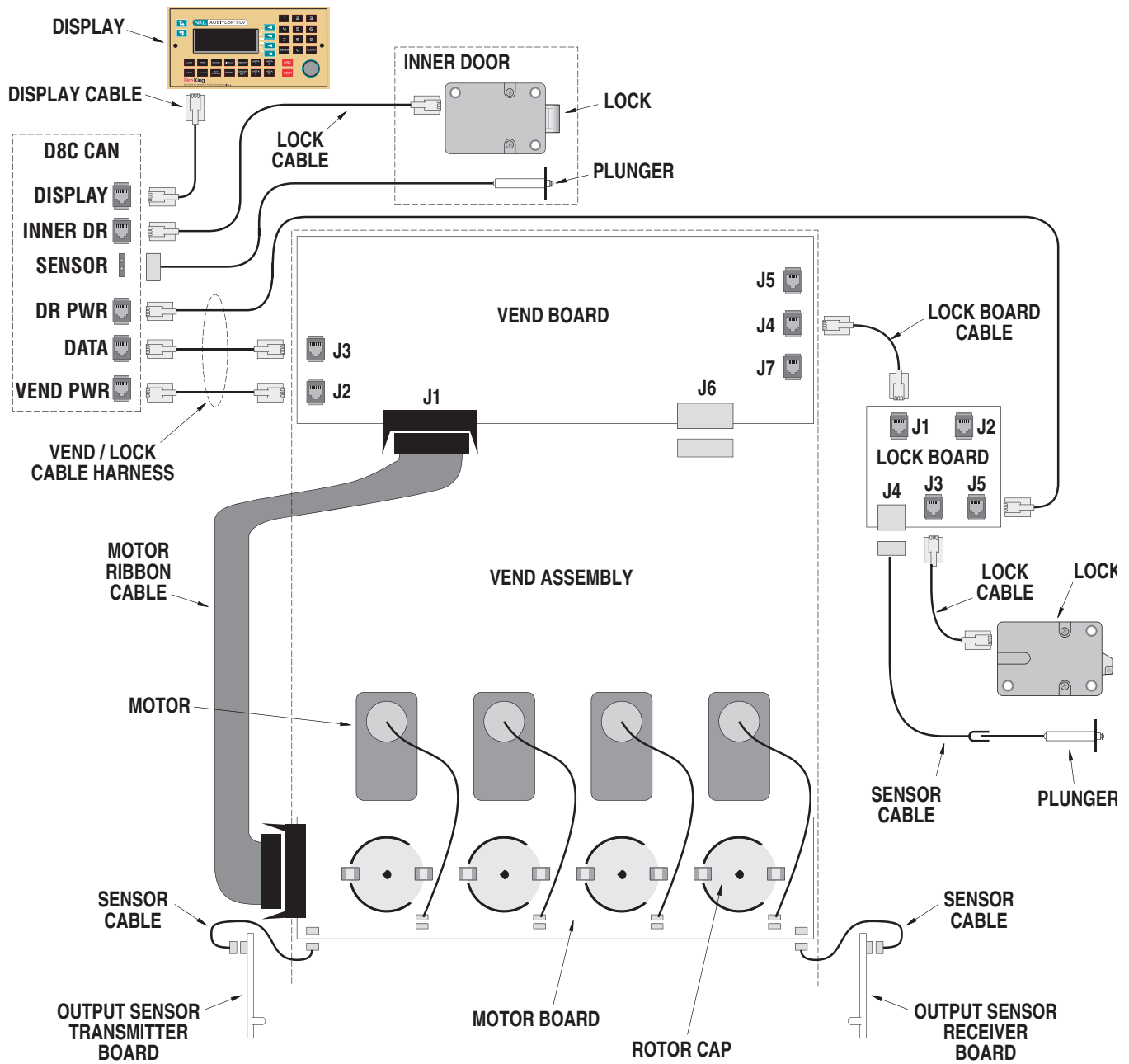Observe static precautions at all times when handling electronics.
1. Open the outer door and activate the detent to prevent accidental closure.
2. Remove power from the safe.
3. Disconnect all RJ45 cables to the vend board.
4. Remove the blocking bar yoke.
5. Remove the four shoulder bolts holding the assembly to the safe door.
6. Pull the assembly off the door and set it on a static free mat.
7. Strip off electrical components from the old assembly and mount them on the new assembly.
8. Reverse the above steps to install the replacement assembly.
9. After reconnecting all cables, apply power and verify that the CPU detects the vend assembly and outer door lock board. If not, perform a Device Search. **DO NOT close the safe door until you verify lock operation**.
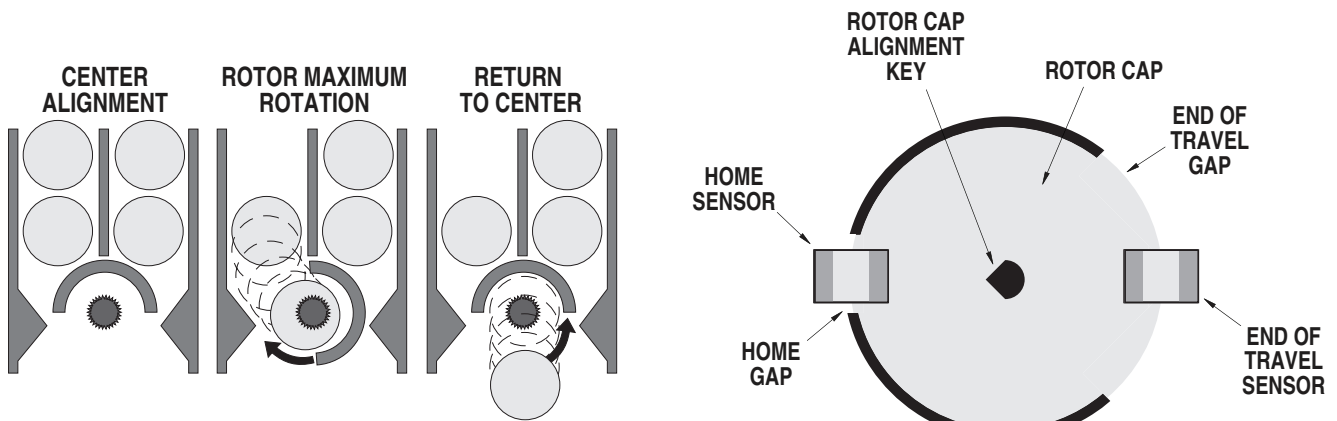

Tube Blocking Bar with Yoke and Key Switch

Tube Jam

A tube jam occurs when a motor is unable to complete its normal vend cycle. This is most often due to a tube or some foreign object being stuck inside a column such as when a tube falls in vertically. Before attempting to clear a tube jam by lifting tubes up and taking them out through the front of the safe be sure to remove Vend Board and set it aside to avoid input sensor damage. A vertical tube can be removed then by "walking" it up the column channel using a pair of long thin screwdrivers. Any horizontal tubes above the vertical tube (or whatever debris is blocking the channel) must be taken out through the front openings.

DISPLAY

DISPLAY CABLE

D8C CAN

DISPLAY

INNER DR

SENSOR

DR PWR

DATA

VEND PWR

VEND / LOCK
CABLE HARNESS

LOCK
CABLE

INNER DOOR

LOCK

PLUNGER

VEND BOARD

J5

J4

J7

J3

J2

J1

J6

LOCK BOARD
CABLE

J1   J2

LOCK BOARD

J4   J3   J5

MOTOR
RIBBON
CABLE

VEND ASSEMBLY

LOCK
CABLE

LOCK

MOTOR

SENSOR
CABLE

PLUNGER

SENSOR
CABLE

SENSOR
CABLE

OUTPUT SENSOR
TRANSMITTER
BOARD

MOTOR BOARD

ROTOR CAP

OUTPUT SENSOR
RECEIVER
BOARD

Internal System Electrical Diagram

CENTER
ALIGNMENT

ROTOR MAXIMUM
ROTATION

RETURN
TO CENTER

Cup & Tube Motion During Vending Cycle

ROTOR CAP
ALIGNMENT
KEY

ROTOR CAP

END OF
TRAVEL
GAP

HOME
SENSOR

HOME
GAP

END OF
TRAVEL
SENSOR

Cup Rotor Cap and Motor Sensors Detail

10 SERVICE

VEND BOARD

The Vend Board is mounted to the top of the vend assembly. Vend settings are stored in nonvolatile memory on the vend board. Input sensors face into the tube channels and are independently replaceable. Vend Power and Vend data cables (both are in the armored cable harness) connect to J2 and J3 on the left side of the vend board. Vend Power and Vend Data are interchangeable, but both must be connected for proper operation. The lock board data cable must be connected to Vend Board J4. A ribbon cable connects the Vend Board to the Motor Board to control the motors and sense cup position and output sensor status.
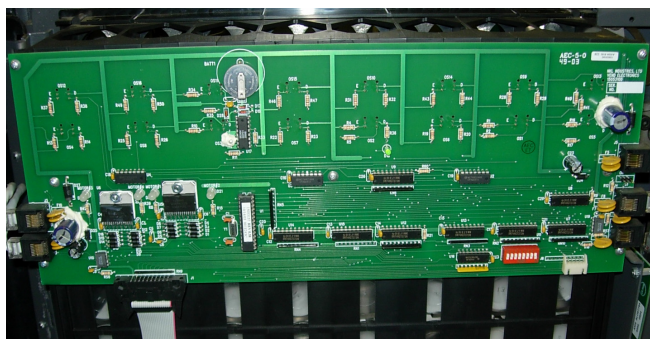
Vend Board, Shown Mounted on Assembly

Vend Board Replacement

Observe static precautions at all times when handling electronics.

1. Open the outer door and activate the detent to prevent accidental closure.
2. Remove power from the safe.
3. Disconnect all RJ45 cables to the Vend Board.
4. Remove the Vend Board.
5. Install the replacement Vend Board.
6. After reconnecting all cables, apply power and verify that the CPU detects the vend assembly and outer door lock board. If not, perform a Device Search. **DO NOT close the safe door until you verify lock operation**.

Input Sensors

Two "flag" type optic input sensors per column are mounted to the back of the Vend Board. Spring loaded flags allow the optic sensors to detect when a tube is loaded. Both sensors must activate in the proper order during the Load procedure in order to count. If an input sensors fails (broken flag, missing, etc), the safe will not count tubes when they are loaded. Check the load receipt and Cash Report to verify input sensor operation. If an input sensor is broken, bent out of position or is missing, the most likely reason is attempted fishing or failure to remove the Vend Board when fixing a tube jam. To replace an input sensor, remove the Vend Board and simply slide the defective sensor out of its socket and slide in the replacement sensor.
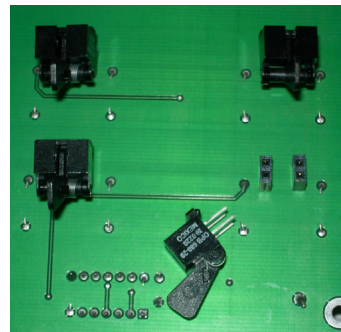

Input Sensors Located on the Back of the Vend Board
One Sensor Shown in Profile Removed

MOTOR SYSTEM

Four motors (12 V_{DC}) are connected to the motor board. Polarity determines the direction of rotation. Each motor controls vending from two columns. The motor gear turns the rotor cup in the appropriate direction until a tube drops into the cup. The motor then turns the cup back to center and the tube drops out. A cap is mounted to the cup shaft where it extends through the motor board. The cap is notched so that it can indicate to a pair of optic sensors when the cup is at the center or end of travel positions. When the Vend Board powers up it initializes the motors by checking and/or setting the cups to their center "home" position.

Motors

The DC motors are mounted directly to the plastics assembly. The motor gear engages the cup rotor pinion. Motor wires are routed between the motor board and the plastics then plug into the corresponding jack on the motor board. Motors are operated by 12 V_{DC} and they are polarity sensitive. For test purposes a standard 9 V_{DC} battery may be used to attempt to move a motor. To move a rotor cup by hand, first remove the motor mounting screws and loosen the motor from the rotor.
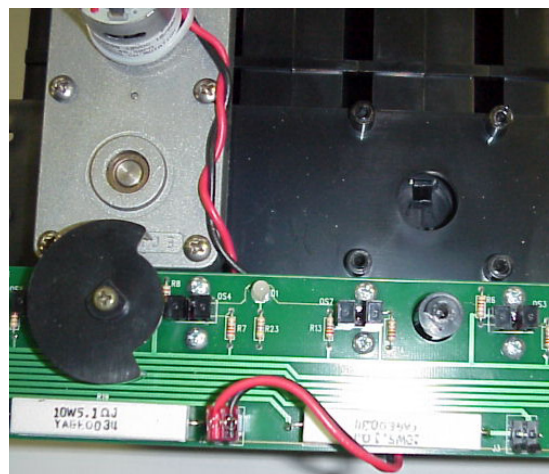
Motor, Rotor Cap, Sensors
Partially Assembly and Mounting Detail

10 SERVICE

Motor Board Cup Sensors

Optic sensors on the motor board track rotor cup movement to ensure proper operation. The rotor shaft cup extends through the motor board. A cap is installed on the end of the rotor shaft. This cap has a small notch on one side and a large notch on the other side. The small notch is used by one sensor to detect center "home" position and the large notch is used by the other sensor to detect the maximum travel limit. The shaft and cap are keyed to ensure correct alignment. The cap is pressure fit and anchored with a Phillips head screw. In the event a cup cap sensor fails, replace the motor board.

Motor Board

The motor board interfaces the motors, cup position sensors, and output sensors with the vend board. To replace the motor board disconnect the output sensors, motor wires, and the ribbon cable from the vend board. Remove each rotor cap and note which cap came from which rotor. Remove the anchor screws and replace the board. After reinstalling the screws, carefully reinstall the rotor caps. It works best if you put the same cap back on the same rotor. Reconnect all cables.

OUTPUT SENSORS

The output sensor is made up of two small circuit boards mounted to either side of the vend assembly such that they hang from the bottom. One side transmits a beam of light across the empty space beneath the assembly and the other senses the beam. The purpose of the output sensor is to detect and verify when a tube is dispensed during a Vend or Unload event.
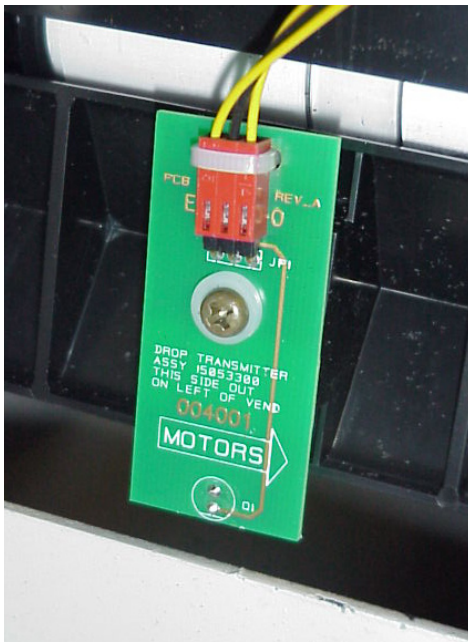
Output Sensor

Unverified Vend

An output sensor problem (in rare cases a motor board problem) is indicated by the error message "Unverified Vend" on vend receipts when tubes do actually vend. Another indication is failure to detect tubes as indicated by the Unload receipt. An output sensor problem may be caused by sensor failure, improper sensor mounting, debris or dirt blocking the sensor receiver or transmitter, or a sensor wire problem. If the source of the problem cannot be determined by visual inspection, replace both sensor modules. Sensor modules are marked to avoid confusion as to which is which. Output sensor wires are connected to the motor board.

OUTER DOOR LOCKING SYSTEM

A slide-bolt lock is used on outer doors today. Early safes used a LaGard swing-bolt lock. Either lock has an internal sensor to detect if the lock is in the locked position (bolts extended). An external plunger sensor detects door condition (open or shut). The outer door lock is connected to the lock board via crossover RJ45/RJ45 cable. The outer door lock board is mounted on a bracket on the outer door. CPU communication passes through the Main Vend board to reach the lock board. The outer door is equipped with a three-point "low profile" asymmetrical bolt work. The bolt work includes an automatic detent. Each bolt connects via cam linkage to a connector plate. The spring-loaded handle connects to the connector plate via yoke. The detent consists of an adjustable spring-loaded rod activated from the hinge-side when the door closes.

CONTINUOUS DOOR ALARM

A continuous alarm tone sounds if a sensor indicates that a door is open more than five minutes (Alarm Time) or if a sensor detects a door come open or unlocked without a signal to energize the lock. For the outer door this will happen if either the door plunger sensor or internal lock sensor activates. The inner door is equipped with a plunger sensor only. Plunger sensors are adjustable.

Lock Sensor Test

Disconnect the lock cable at the lock. Measure continuity between pins 3 and 2 (normally open) at the RJ45 jack on the lock. When the lock is in the locked position the meter should indicate open. When the lock is in the unlocked position the meter should indicate closed. If the lock sensor fails replace the lock.

Door (Plunger) Sensor Test

A simple spring loaded plunger sensor is used to detect physical door status. The plunger switch is normally open. When the plunger switch is pressed (door shut), the plunger switch closes. Disconnect the sensor cable from the can or lock board before checking continuity.

10 SERVICE

DOOR NOT RESPONDING MESSAGE

The message "Door Not Responding" indicates an internal communication problem. If this occurs, first attempt power cycling the safe. If the problem continues, perform the inventory diagnostic and if necessary perform a Device Search (Section 7). If the problem persists, call NKL Technical Service to see if any other action can be taken before drilling the safe. After the safe door is open check connections and if necessary replace the Lock board.

DOOR WILL NOT OPEN

Any of several things may be wrong: lock, lock cable, lock board, vend board, CPU, a configuration setting, or a mechanical problem.

Avoid the Drill When Possible

Drilling the door open is the last resort. If the door must be drilled, contact NKL Technical Service for drilling instructions. Drilling the door open will destroy the lock. After replacing the lock, test door operation with the door open (press and hold the door sensor to silence the alarm).

Internal Pressure

One possible problem is pressure against the inside of a door making it difficult to turn the handle. This problem can usually be overcome by pushing against the outside of the safe door while turning the handle.

Configuration Settings

Check and adjust lock settings:
1. Run a Config Report.
2. Verify that the outer door is not set behind the inner door. If it is, set the outer door behind none and the inner door behind the outer door.
3. Check the door delay and timelock settings. Check the safe clock. Correct any delay, timelock, or clock setting problems.
4. Set Fire Time for this door to zero. *Fire Time greater than zero will cause voltage to remain applied to the lock long enough to eventually cause solenoid damage.*

LOCK BOARD

The lock board is mounted on the outer door. The lock board may be replaced independently from the vend board. If the lock board is replaced it may be necessary to perform a Device Search (see Section 7) to initialize internal communication with the new lock board.

Lock Board Output Test

This test checks the control voltage output from the lock board. The recommended measurement points listed are on the lock jack (J3) of the lock board. Measure the opposite pin pair (pins 6 and 8) at the other end of the lock cable (the lock cable is a crossover type cable). The purpose of the test is to determine how much voltage is applied to energize the lock and for how long. With Fire Time set to zero the lock voltage ($\sim 12\ V_{DC}$) should only be applied for a few seconds (approx. 7 seconds). Note that applying voltage to the lock for more than several seconds will eventually cause internal solenoid failure.
1. Open the safe door.
2. Disconnect the lock cable at the lock.
3. Check and if necessary set Fire Time to zero. *Fire Time greater than zero will cause voltage to remain applied to the lock long enough to eventually cause solenoid damage.*
4. Measure lock voltage at lock board J3 PIN 6 with reference to PIN 8. Normally the voltage should be zero. About $12\ V_{DC}$ will appear when the lock is energized. Measure lock voltage while performing the normal outer door opening procedure. The lock board should apply voltage for a few seconds only. If voltage is applied longer, verify Fire Time is zero.

   If voltage remains applied replace the lock board.

Lock Board Replacement

Observe proper grounding and static precautions while working with exposed electronics. **ALWAYS OBSERVE PROPER GROUNDING AND STATIC PRECAUTIONS WHILE WORKING WITH EXPOSED ELECTRONICS.**
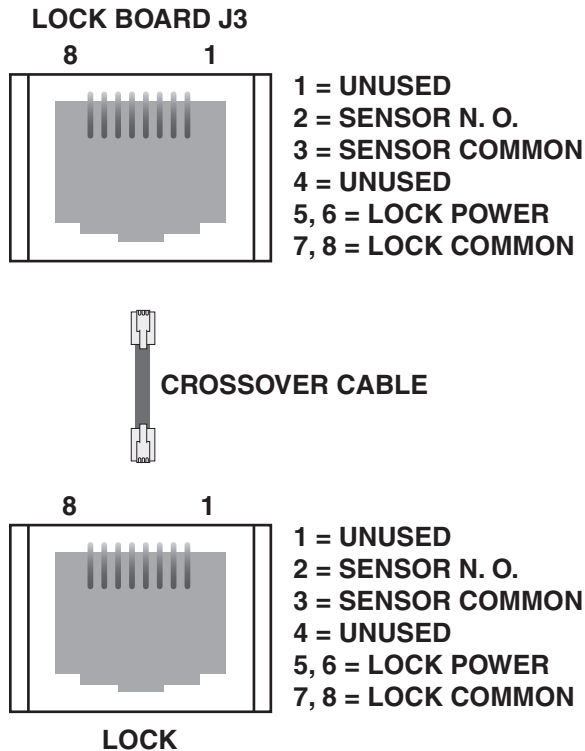1. Open the safe door.
2. Activate the detent to prevent door closure.
3. Remove power from the safe.
4. Disconnect all cables from the lock board.
5. Remove the lock board mounting screws.
6. Remove and replace the lock board.
7. Reinstall the lock board mounting screws.
8. Reconnect cables to the lock board.
9. Restore power to the safe.
10. Check device inventory and if necessary perform a Device Search (see Section 8).
11. Verify lock operation. The safe door may be closed at any time after lock operation is verified.
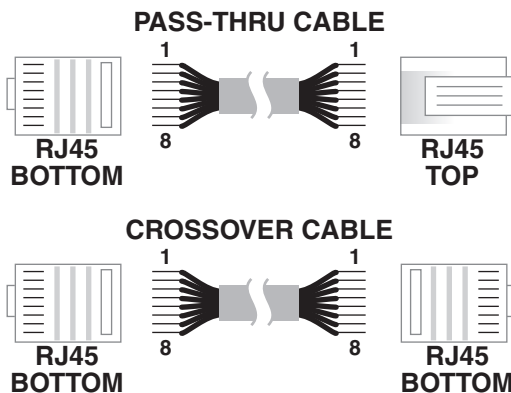12. Reprogram configuration settings as needed.

10 SERVICE

LOCK CROSSOVER CABLE

The cable from lock to lock board is a reverse wired (crossover) RJ45/RJ45 cable. The lock cable is always connected to J3 on the lock board. NKL uses a black crossover cable for easy identification. The crossover cable for the inner door lock is installed inside the can. Connecting the lock via a one-to-one (straight-through) cable to the J3 port on the lock board will definitely cause lock board failure.

LOCK BOARD J3

8   **1**

1 = UNUSED
2 = SENSOR N. O.
3 = SENSOR COMMON
4 = UNUSED
5, 6 = LOCK POWER
7, 8 = LOCK COMMON

CROSSOVER CABLE

8   **1**

1 = UNUSED
2 = SENSOR N. O.
3 = SENSOR COMMON
4 = UNUSED
5, 6 = LOCK POWER
7, 8 = LOCK COMMON

LOCK

Lock Board: J3 Lock Cable Connector.
J3 is located next to the door sensor connector.

PASS-THRU CABLE

1   1

RJ45 BOTTOM   8   8   **RJ45 TOP**

CROSSOVER CABLE

1   1

RJ45 BOTTOM   8   8   **RJ45 BOTTOM**

RJ45 Cable Wiring Diagrams
Standard Cable Above
Crossover (Lock) Cable Below

LOCK RE-TEST

Regardless of the part or parts replaced, verify proper lock and bolt work operation before closing the safe door.

HINGES

Doors are right-swing (hinges to the right as you look at the safe). Do not use chemical cleaners on hinges.

OUTER DOOR BOLTWORK

The boltwork is a relatively simple 3-point low-profile style. The lock is mounted on a bracket at a right angle with respect to the door surface. An "F" guide is mounted to the lock bracket to keep the main vertical bolt linkage aligned and secure.

OUTER DOOR DETENT

The boltwork assembly includes an automatic detent. The detent rod runs across the door between the interior door surface and the vend assembly. To adjust the detent, loosen the hex nut behind the brass end piece, turn the end piece as needed, then tighten the hex nut in place. The detent should reliably catch and hold the bolts retracted when opening the door and should throw the bolts automatically when the exterior surface of the door is about flush with the chassis front surface.

DETENT

SENSOR
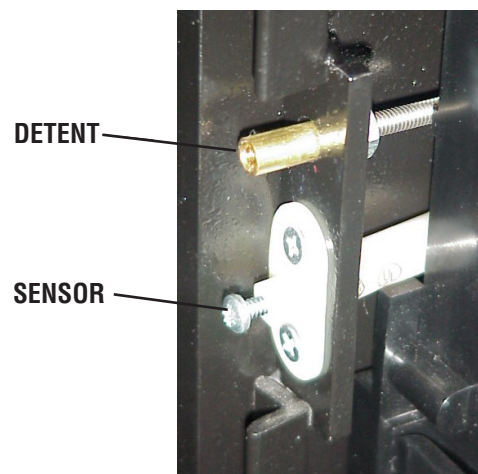
Detent and Door Plunger

11 HISTORY

PRODUCT HISTORY

The first D8C product was shipped from NKL late in the year 2000. As with any advanced technology product, the D8C has seen numerous updates and changes over the years. The information in this manual has thus far been provided to assist with general service of D8C as if there were nearer the writing of this document. This section attempts to describe significant product updates over the life of the product.

UPDATES

For a complete list of updates and to download bulletins, including those written after the publication of this manual, refer to our web site.

WARRANTY SEAL STICKER

Starting with SP2002019058 all D8C safes had a "Warranty Void If Seal Broken" sticker on the plastic door shield.

XLV 2.0

Released Version 2.0 at SP2002020149.

KABA MAS LOCK

Started using the Kaba Mas outer door lock (15017000) in place of the LaGard lock (15016000) at SP2002023166.

XLV 2.0.4

Released Version 2.0.4 at SP2002026018.

BOLTWORK "F" BRACKET

Added "F" bracket to align boltwork and resist attack at SP2002039180.

NEW DISPLAY

Introduced new display board with a push-button reset switch instead of DIP switches at SP2002048148. This display (15059020) is interchangeable with its predecessor.

HINGED DUST COVER FOR D8C OUTER DOOR

Removeable door cover replaced with hinged dust cover at SP2003016234.

XLV 3.0.

Released Version 3.0. (June 2003, serial number not available). This is the first version of XLV software to support NKL Edge remote software.

NEW DROP DRAWER

Larger drop drawer went into production at SP2003038002.

SERIAL NUMBER ON CAN

Began marking the can with the safe serial number at SP2003038151

UNINTERRUPTABLE POWER SUPPLY

Added UPS with each "C" unit safe at SP2004006001. Stopped including UPS as a standard item at SP2004022003 (UPS is available as an option today).

VEND MOTOR & FIRMWARE

Due to issues with motor speed and sensor sensitivity tolerances, higher speed vend motors were introduced at SP2003031038. The higher speed motors did not provide enough torque in some application. The lower speed motors were reintroduced along with a firmware update (version 0.58) on the main vend board to modify sensor tolerance at SP2004012113.

LOCK BOARD FIRMWARE

Lock board firmware update (version 0.49) to correct a minor issue with timelock settings (August 2004).

XLV 3.37

Released XLV software 3.37 with minor code corrections at SP2004037064.

XLV 3.411

Released XLV version 3.411 at SP2007009051 to support 2007 USA Daylight Saving Time schedule change.

XLV 3.53

Released XLV version 3.53 at SP2008028180 (most updates are related to bill validation).

DATA BUS

Electronics cans changed so that "C" unit has one "Data Out" port instead of "Data 1" and "Data 2" ports. "R" units also changed so that they now have a "Data In" port, a "Data Out" port, and a "Data End" port. A data bus termination plug is to be inserted in the Data End port on the last "R" unit (V1R, V2R or EPR) on the data bus. NKL also began terminating the internal data bus on all "C" and "R" units at the same time, at SP2008032034.

VEND MOTOR & FIRMWARE

Due to motor speed tolerances (lower speeds on some motors), main vend board firmware (version 0.66) was introduced at SP2008049032. This change also enhances the motor self-alignment at start-up.

POWER DISTRIBUTION & INTERNAL NETWORK INTERFACE

Added the Power Distribution Board and Network board to D8C/D8CI can beginning with SP2009xxx. This change requires a slightly larger electronics can (depth only) and a few different cables outside the can. This change increases overall stability and reliability.
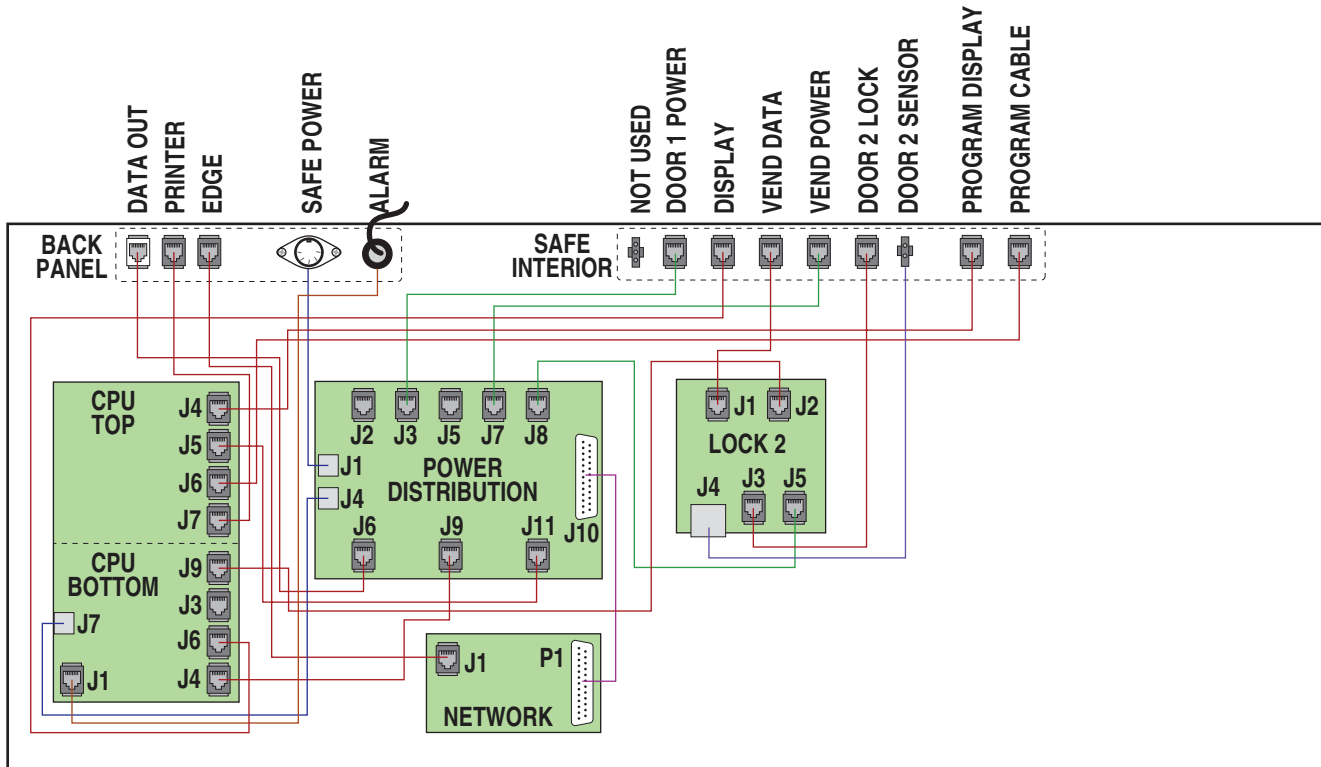
12 ELECTRONICS CAN PARTS
BEFORE SP2009XXX
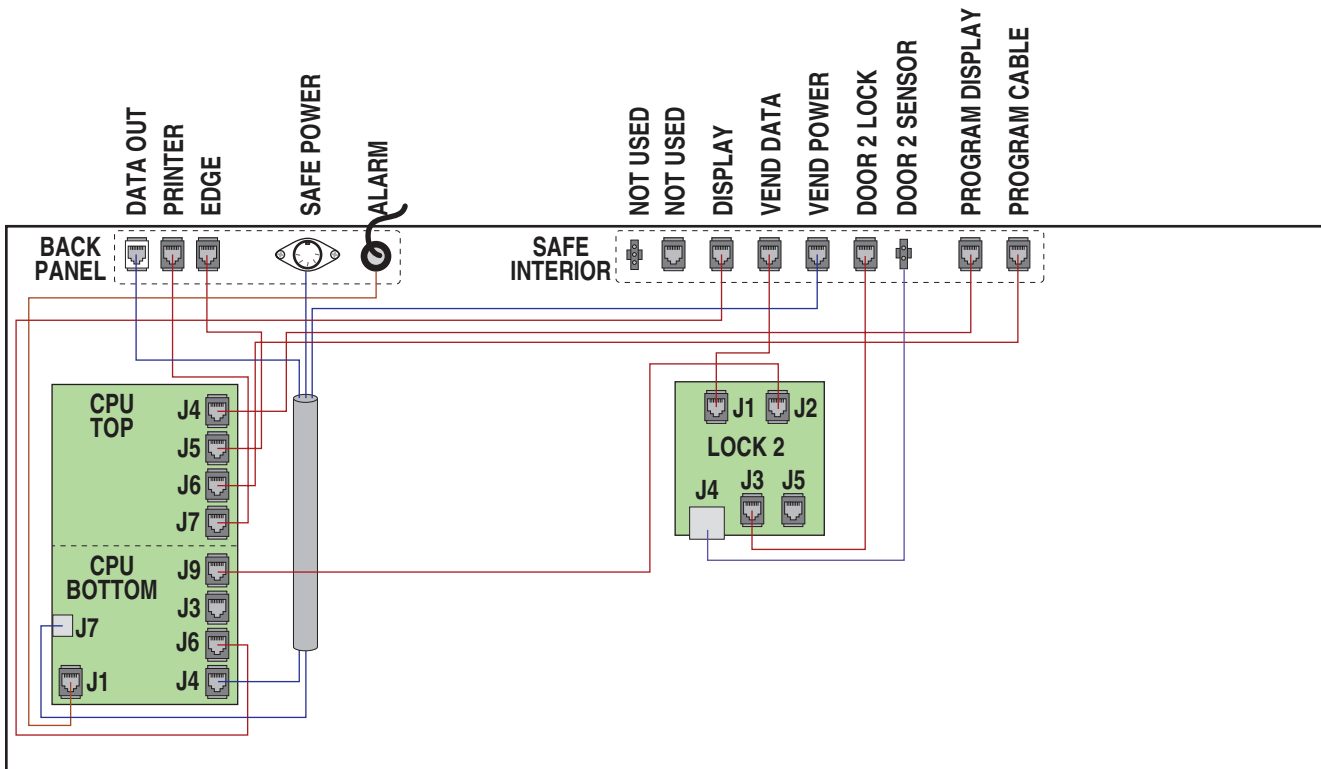
Cable colors are to aid in reading the schematic only and do not represent actual cable colors.

Part #	Can Versions
1505B010	D8CI (With Inner Compartment)
1505A010	D8C (No Inner Compartment)

Part #	Boards
15058400	CPU Assembly
15054000	Lock Board (D8CI) *J1 and J2 are interchangeable.*

Part #	Cables*
15052500	Power Harness: Data Out / Safe Power / Vend Power / CPU Bottom J7 & J4
15020610	Alarm Cable (CPU Bottom J7 to Alarm Output)
15009052	6" RJ/RJ Cable
15009053	10" RJ/RJ Cable
15009054	16" RJ/RJ Cable
15009080	4" RJ/RJ Cable
15009081	7" RJ/RJ Cable
15009083	10" RJ/RJ Cable, Crossover (Lock Board J3 / Lock Jack, black case, D8CI)
15054023	Lock Sensor Harness (2-wire, includes jack, D8CI)
	Quantity and connection of certain cables depend on safe model.

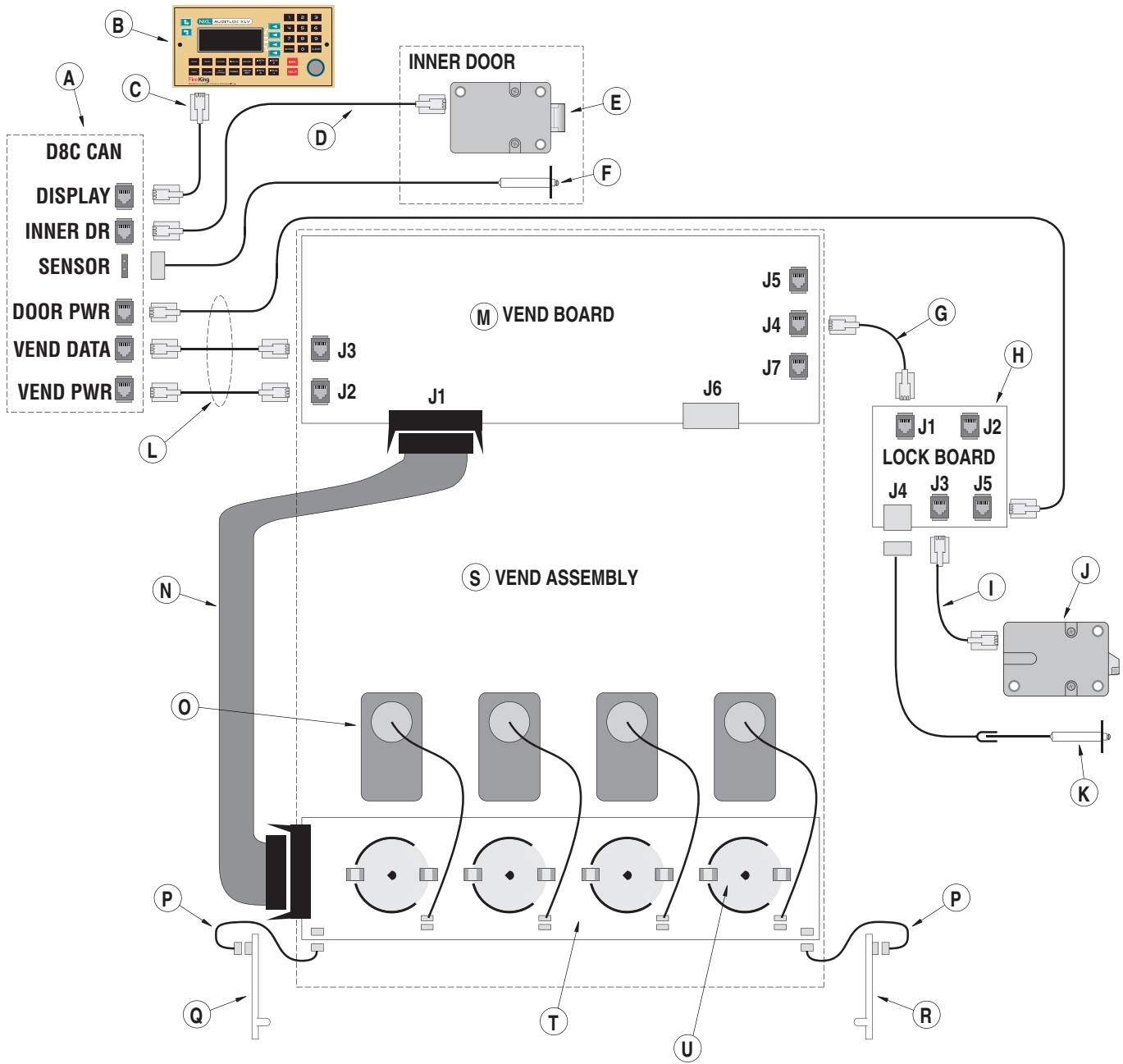| Part #	Connectors
15000191S	Shielded RJ45F/RJ45F Right Angle Jack (Data Out only)
15000191	Unshielded RJ45F/RJ45F Right Angle Jack (all others)

12 ELECTRONICS CAN PARTS
AFTER SP2009XXX

Cable colors are to aid in reading the schematic only and do not represent actual cable colors.

Part #	Can Versions
	D8CI with Power Distribution (With Inner Compartment)
	D8C with Power Distribution (No Inner Compartment)

Part #	Boards
15058400	CPU Assembly
15058500	Power Board *J2, J3, J5, J7 and J8 are all interchangeable.*
	Network Board
15054000	Lock Board (D8CI Only) *J1 and J2 are interchangeable.*

Part #	Cables*
15052551	Power Input Harness: Safe Power to Power Board J1
15052552	CPU Power Cable: Power Board J4 to CPU Bottom J1
15020610	Alarm Cable: CPU Bottom J7 to Alarm Output
	DB25 Cable (Power Board J10 / Network Board P1)
15050088	DB25/RJ/Aux Power Harness: Service Use Only (Network Board Programming)
15009128-4	4" RJ/RJ Data Cable (blue case)
15009128-6	6" RJ/RJ Data Cable (violet case)
15009128-9	9" RJ/RJ Data Cable (white case)
15009129-6	6" RJ/RJ Power Cable (gray case)
15009129-9	9" RJ/RJ Power Cable (red case)
15009083	10" RJ/RJ Cable, Crossover (Lock Board J3 / Lock Jack, black case)
15054023	Lock Sensor Cable: Lock J4 to Inner Door Sensor Jack (incl. jack, D8CI)
	Quantity and connection of certain cables depend on safe model.

Part #	Connectors
15000191S	Shielded RJ45F/RJ45F Right Angle Jack (Data Out only)
15000191	Unshielded RJ45F/RJ45F Right Angle Jack (all others)

13 ELECTRICAL PARTS

INNER DOOR

D8C CAN

DISPLAY

INNER DR

SENSOR

DOOR PWR

VEND DATA

VEND PWR

M **VEND BOARD**

J5

J4

J7

J3

J2

J1

J6

G

H

J1   J2

LOCK BOARD

J4   J3   J5

S **VEND ASSEMBLY**

13 ELECTRICAL PARTS

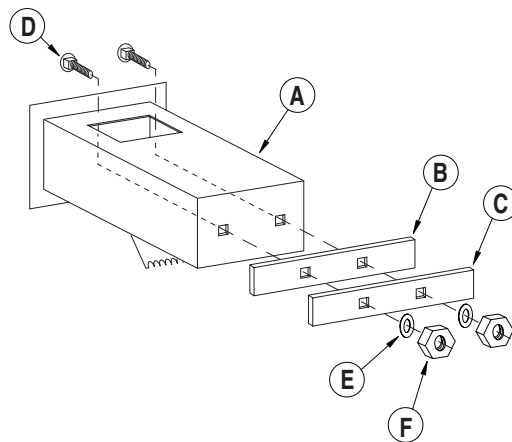| Item	Part	Description
A		Electronics Can (See Section 12 for Detail)
B	15059020	XLV Keypad/Display Module
C	15009069	Display Cable
D	15009070	Inner Door Lock Cable (D8CI models only)
E	15011000	Inner Door Lock (D8CI models only)
F	15054014	Inner Door Plunger Sensor (Includes Cable; D8CI models only)
G	15009080	Lock Board Cable (Before SP2009xxx)
G	15009128-4	Lock Board Cable (After SP2009xxx)
H	15054000	Lock Board
I	15009083	Lock Cable (crossover)
J	15017000	Outer Door Lock
K	15054015	Outer Door Sensor (includes cable)
L	15052504	Armored Data/Power Cable Harness (Before SP2009xxx)
L	15052504L	Armored Data/Power Cable Harness (After SP2009xxx)
M	1505310C	Vend Board
N	15053600	Vend Ribbon Cable
O	15003006	Motor (x4), (800130 Motor Gear is a separate part)
P	15053700	Output Sensor Cable (x2)
Q	15053300	Output Sensor Transmitter (Hinge Side)
R	15053400	Output Sensor Receiver (Open Side)
S	800135	Plastics Assembly (See Section 16 for Detail)
T	15053200	Motor Board
U	16000018	Rotor Cap (x4)
	15053000	Vend Assembly Kit (Includes items M-T)
	16000027	Motor Mount Plastics (part of 800135)*
	15000346	External Power Supply Transformer (Not Shown)
	600378	D8C Electronics Service Kit (1505A010, 1505310C, 15054000)
	600379	D8CI Electronics Service Kit (1505B010, 1505310C, 15054000)
		Available as a separate service replacement component.

14 DOOR HARDWARE PARTS
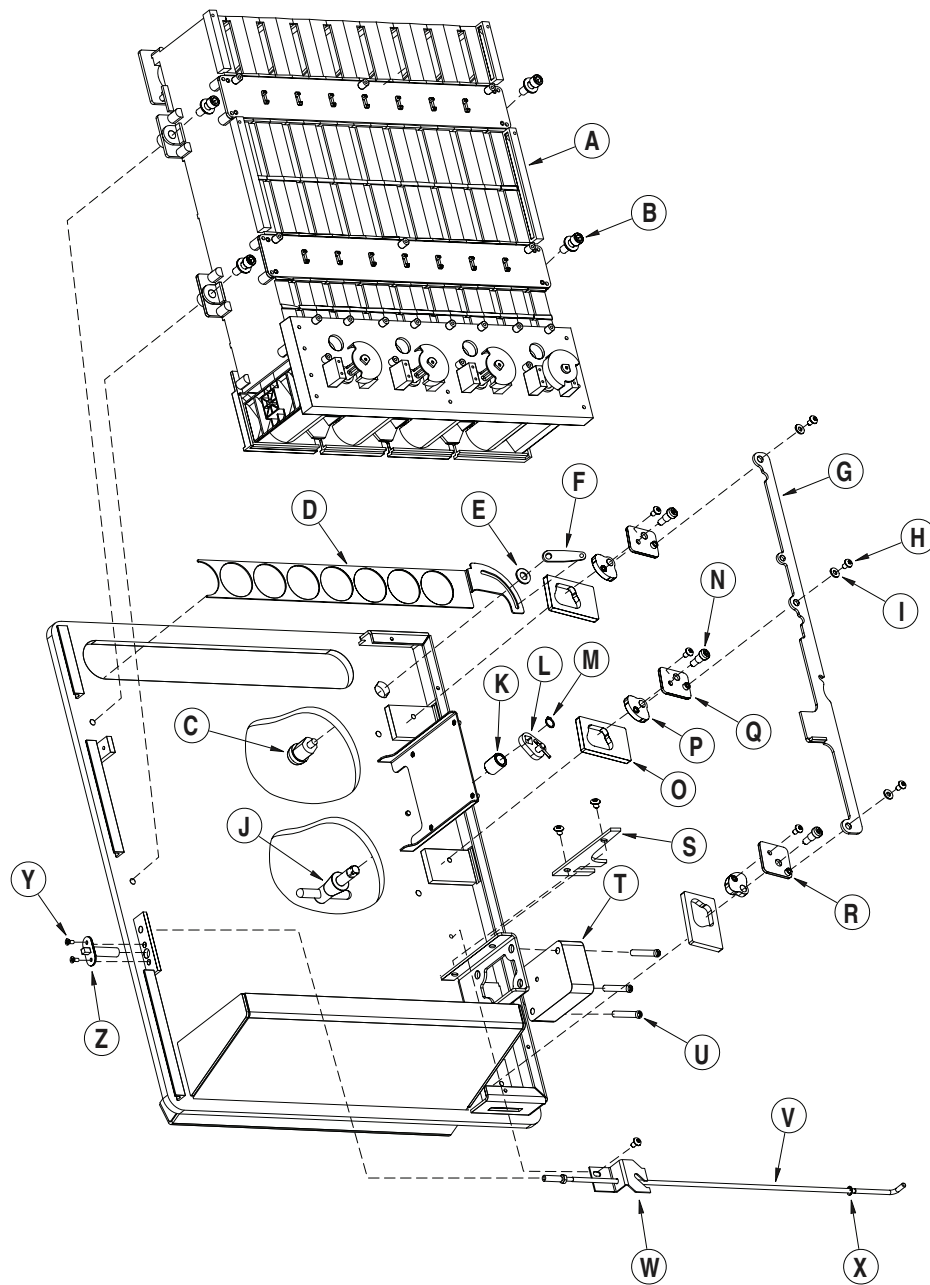
14 DOOR HARDWARE PARTS

Item	Part	Description
A	800135	Vend Plastics (See Electrical Parts Item U)
B	HS1206	Shoulder Bolt 5/16 (x4)
C	15097037	Medeco Key Switch Pair (MGR & Tube Lock Keyed Alike)
D	16000002	Tube Blocking Bar
E	800224	Washer 5/16
F	600113	Tube Lock Actuator
G	700041	Bolt Linkage
H	800182	Screw 10-32 x 5/16 (x8)
I	800175	Washer #8, 7/16 OD (x3)
J	800153	Handle
K	800113	Bushing 3/4, 7/16 ID, 5/8 OD
L	600029	Handle Actuator
	800218	Handle Spring (not shown, attached to handle actuator)
M	800152	Retaining Ring
N	800112	Shoulder Bolt (x3)
O	700007	Bolt (x3)
P	600025	Bolt Cam (x3)
Q	600027	Side Bolt Actuator (x2)
R	600028	Bottom Bolt Actuator
S	700272	Guide Bracket
T	15017000	Lock
U	6030022	Lock Screw 1/4-20 x 1 5/16
V	600048	Detent Rod Assembly
	700032	Detent Rod (included with 600048)
	800186	Detent Spring (included with 600048)
	800211	Detent Stand-off Sleeve (included with 600048)
	HN700	Hex Nut 8-32 (included with 600048)
W	700028	Detent Plate
X	800129	Retaining Ring 3/16
Y	800231	Screw 5/16 x 6-32 (x2)
Z	15054015	Sensor (includes cable)
	800184	Wave Washer 7/16 (not shown)

15 MANUAL DROP DRAWER

Item	Part	Description
A	600764	Drop Drawer (Since SP2003038002)
	600064	Small Drop Drawer (Before SP2003038002)
B	700385	Drop Drawer Nylon Stop Stop
C	700386	Drop Drawer Steel Stop Bar
D	HB201	Drop Drawer Backstop Carriage Bolt (x2)
E	6201050	Drop Drawer Backstop Washer (x2)
F	HN201	Drop Drawer Backstop Hex Nut (x2)

16 OTHER PARTS

Part	Description
800513	Dust Cover (latchable, since 2002)
800517	Dust Cover Latch
06030008	Dust Cover Screw, 4-40 x 1/4 (x7)
800328	Dust Cover Screw, 5/16-18 x 7/8 (x4)
800254	Dust Cover (old screw on style)
800234	Dust Cover Screw, 8-32 x 1/4 (for old style)
800149	Hinge Pin
800151	Hinge Ball Bearing
800208	D8 Label 1/2 x 3 7/8
800268	Autobank Label 3.5 x 14.25
800372	Anchor Kit
600131	Replacement Tubes (box of 80)
16000039	Magnetic Tube Rack
BT-1189	Dipstick
801082	APC Uninterruptible Power Supply

NOTES

**NKL TECHNICAL SERVICE
PHONE 800-452-4655
WWW.FIREKING.COM**