Certification Test Report

433.92 MHz Alarm System

FCC ID: Q6K 1000-7251

FCC Rule Part: 15.231

ACS Report Number: 04-0056-15C231

Manufacturer: 3SI Security Systems
Model: MCU

Installation and Operators Guide

Overview:

The Octopus® ATM Defense System is a wireless system consisting of an ATM Monitor and Control Unit (MCU) and Cassette Staining Units (CSU). This system, once installed into an ATM, becomes a closed wireless protection network within the ATM.

The operational frequency of the system is set to allow worldwide operation and deployment of the protection system. Currently, the system is UL, FCC, IC, and CE compliant.

The system is designed for continuous monitoring and protection of ATM cassette based currency for two years. Both the MCU and CSU are powered via custom battery packs which allow installation without requiring interface to external power. The mechanical dimensions of the product allow the MCU to be placed almost anywhere within the ATM safe, while the bracket design of the CSU allows for fast field installation.

Actual Stained Currency ---
Deny the Prize

Features:

- Self-contained battery operated system with life cycle greater than 2 years.
- Continuous wireless communications status monitoring.
- Fast installation time, usually less than 1 hour
- Provides protection against tilt, motion, power failures and breach of the ATM safe.
- Compatible with most leading ATM sensor array packages.
- Requires single wire interface to begin protection
- Uses industry preferred currency staining method.
- Proprietary wireless communications protocol.
- Can provides external remote monitoring signals.

SecurityPac ELECTRONIC PROTECTION SYSTEM Scorpion SecuriSafe Octopus SecuriDab

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Warranty

The information contained in this document is subject to change without notice.
3SI Security Systems makes no warranty of any kind with respect to this information.
3SI SECURITY SYSTEMS SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

FCC regulations

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

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

All Equipment:

Warning: Changes or modifications to this device not expressly approved by 3SI Security Systems could void the user's authority to operate the equipment.

RF Exposure (Intentional Radiators Only)

In accordance with FCC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of (20cm).

Note: The FCC and IC may require additional information to the user be included in the manual after review of the application.

Industrie Canada Compliance Statement

This ISM device complies with Canadien ICES-001

Cet appereil ISM est conforme à la norme NMB-001 du Canada.

CE Mark Warning

This is a class B product. IN a domestic environment, this product may cause radio interference, in which the user may be required to take adequate measures.

Packing List:

The Octopus® ATM defense installation package for a typical two cassette ATM contains a Monitor and Control Unit (MCU), two Cassette Staining Units (CSU), and a sensor array cable assembly for interface of the MCU to the ATM. Figure 1 below is a representative picture.

*** Note: Units arrive with ink delivery system disconnected, and power off. Opening of both the MCU and CSU enclosures is required to power the units and connect the ink staining system to the electronics assembly.*

Two CSUs are shown installed on their respective bracket assemblies. Below the CSUs are the RJ45 sensor array cable and the system battery packs. To the right of the CSU brackets are the vacuum form CSU covers which have been removed for clarity. Below the vacuum form covers is the MCU unit with cover removed.

The battery packs are attached using velcro tape attached to PCB and battery pack.

Product Specification:

Monitor and Control Unit (MCU)

Description	Specification	Comments
Size:	3.3 x 5.6x 1.25 “	
Operational Frequency:	International Acceptance	Frequency is not given for security reasons.
Inputs:	Press-to-test button	User accessible allows system testing during service and installation.
	One RJ45, 8 wire, sensor array cable Contains: Door Contact Interface Power Loss Interface All Safe Interface Manual Fire 1 N/C generic input 2 N/O generic input 1 system ground wire	Door Contact must be used either through the sensor cable or via the terminal block in order to activate the system. Power Loss Interface is optically isolated.
	Terminal Blocks: 2 system ground inputs 1 Door Contact Interface 1 Manual Fire Interface/Breach Power Loss Interface 1 N/C generic input	Terminal blocks accept wire from 18-24 AWG. Manual Fire Interface is generally used with a breach sensor.
	Battery Pack connector	
	External Power Connector	Currently not populated
	14 Pin factory programming header	Not for customer use
Outputs	Three RJ11, 4 wire 2 Remote Indicator connectors (J14 & J15) Contains: Alarm Status Indication Fault Status Indication 1 RS232 Interface (J2)	An optional remote indicator assembly will be available to allow visual and aural indication of system state to allow authorized personnel system status indication. Remote Indicator connections are mutually redundant. Optional siren may be connected to these connectors. (Future options - not installed)
	Squib output	For connection to optional smoke generator.
Onboard Sensors	4 LED indicators	See Appendix A for explanation of operation.
	Tilt 50° , 2 axis Motion / Vibration, 2 axis. Thermal –50 to +150 °C Light Sensor	Operation using the light sensor and thermal sensor are optional on the standard product.

Battery Pack	Custom design dual output	Long Life Lithium Technology for unsurpassed performance.
Onboard jumper options	Power jumper, J4 H/V jumper, J22 DM, J24 DS, J3 Configuration jumper J25 Configuration jumper J26	Configuration jumper information can be found in Appendix D.
Agency compliance	UL, FCC, IC, CE	

Cassette Staining Unit (CSU)

Size	Defined based on manufacturer and model of the currency cassette	
Supported Currency Cassette:	Deibold MMD Diebold MDDM NCR narrow-body NCR wide body Perto DeLarue NMD Wincor-Nixdorf	
Input	Press-to-test button	User accessible allows system testing during service and installation.
	Battery Pack Connector	
	14 Pin factory programming header	
Outputs	Two wire Squib output cable	
Onboard Sensors	Tilt 50° , 2 axis Motion / Vibration, 2 axis. Thermal –50 to +150 °C Light Sensor	
Onboard jumper options	Power jumper, J4 H/V jumper, J11 DS, J3 Configuration jumper J13 Configuration jumper J14	Configuration jumper information can be found in Appendix D.
Battery Pack	Custom design dual output	Long Life Lithium Technology for unsurpassed performance.
Agency Compliance	UL, FCC, IC, CE	

Table 1. Product Specification

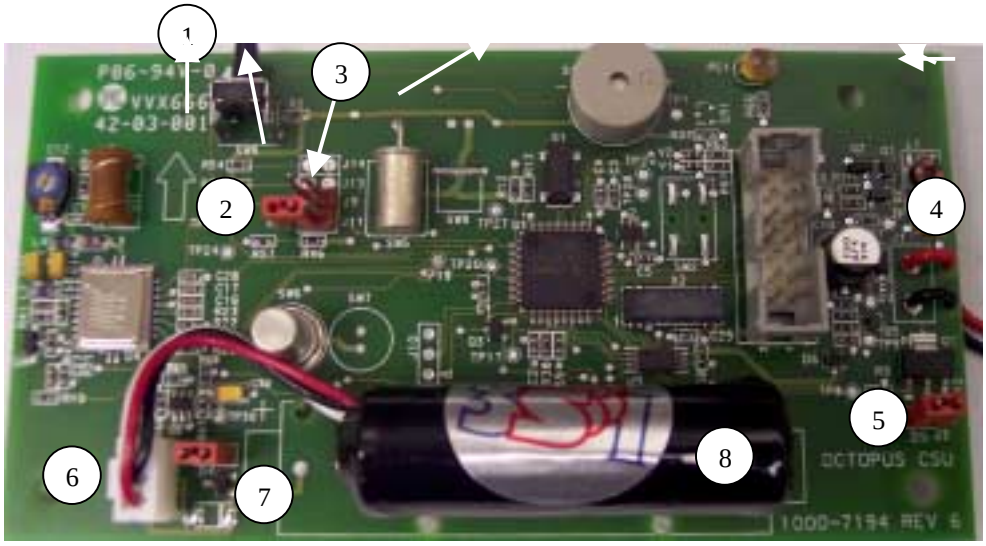
Components Overview:

Cassette Staining Unit (CSU)

The CSUs are a complete self-contained staining system. The CSU has a custom battery pack, a vacuum form cover, an electronics assembly, a mounting bracket, an ink reservoir, and an ink delivery system.

The electronics assembly (EAS) is generic and exists in all system installations; however, the ink reservoir, bracket, and ink delivery system are specific to the manufacturer and model of the cassette. Further, positioning of the ink spray bar is specific to the type of currency to be protected. A user accessible self-test button is provided for system troubleshooting and periodic battery and maintenance testing.

Basic system configuration is an EAS attached to a bracket that holds the ink reservoir and the ink delivery system. The EAS is attached with a squib wire to the ink reservoir for activation of the staining process. No other physical connections are interfaced with the CSU.



Bubble	Identification/Explanation
1	Power On Self Test Button SW9. When activated the unit will perform a built in self test. If no errors or faults present the unit will beep 1 time. If the unit beeps twice, there is an error.
2	Horizontal/Vertical jumper J11. When jumper is on, the unit expects to be orientated with component side down. When the jumper is removed (as shown) the unit expects to be orientated vertically with the POST button on top.
3	Disable Light Jumper J13. When the jumper is on, the unit will detect light. When off, the presence of light will be ignored.
4	Squib wire for connection of electronic assembly to the ink delivery system.
5	Disable Squib jumper, J3. When installed allows proper operation. When removed renders the unit unable to activate the ink delivery system.
6	Battery pack connector J12.
7	Power Jumper. Installation or removal of this jumper controls power to the unit.
8	Battery Pack.

Table 2. CSU layout explanation.

Both the SQUIB Jumper J3 and the ink delivery unit must be connected for the system to work properly. The CSU will give an error message if either of these two items is not installed correctly.

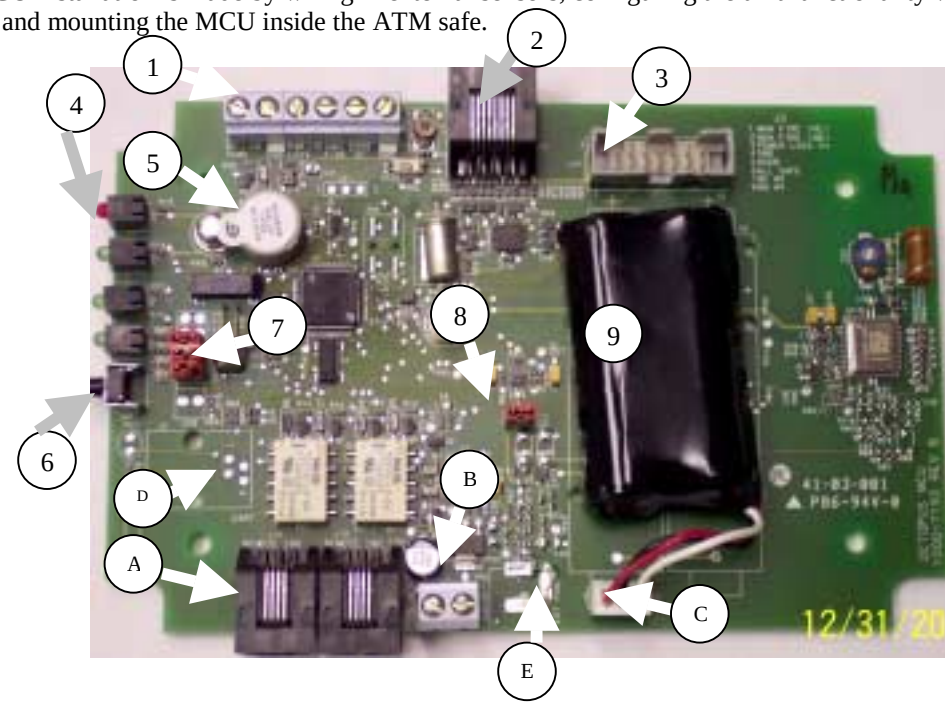
Monitor and Control Unit (MCU)

The MCU is the monitor and control unit. It has 8 selectable sensor inputs for monitoring ATM status. The sensor inputs contain normally-open (NO), normally-closed (NC), and an optical isolated inputs. The MCU also contains on-board sensors for tilt, continuous motion, light sensor(s), and thermal violation. Details about the inputs may be found in section 2.0 Installation Guides and in section 4.0 Functional Operation.

The external sensor inputs are accessed either through a RJ45 style connector or by direct interface into terminal block on the PCB. As with the CSU a user accessible self-test button is provided for troubleshooting and installation. On the MCU printed circuit board there are several jumper blocks present to enable/ disable certain functionality.

Outputs include two RJ11 remote interface monitors and a terminal block for the optional smoke generator. Internal to the unit is an RJ11 connector for future expansion of the system to allow remote communications.

Basic MCU installation is made by wiring in external sensors, configuring the unit functionality via the on-board jumpers, and mounting the MCU inside the ATM safe.



Bubble	Identification
1	Terminal Block, left to right, NC Input 2, GND, Power, Breach, Door, GND
2 (RJ45)	RJ45, 8 pin terminal for attachment of the sensor array cable. See Appendix C.
3	Programming header, no field usage at his time.
4	LED indicators
5	Buzzer
6	Press to test button (self-test)
7	Configuration jumpers, top to bottom, Unused, Unused, Enable Motion, Orientation Select, Squib Enable, Enable Light Sensor. (See Appendix D for Proper Configuration)
8	Power jumper
9	Custom battery pack, with dual output and 3 pin locking plug for mating with “C” below.
A (RJ11 x2)	Remote indication dry contact outputs for Fault, Alarm, and Fire status detection.
B	Squib output terminal block for use with optional MCU smoke generator.
C	Battery pack connector, 3 pin locking header for mating with “9” above.
D	RS-232 interface (RJ11) - not populated and not currently in use.
E	External Power Input – not populate and not currently in use

Table 3. MCU layout explanation.

All input Level specific sensors must be terminated properly to prevent MCU error conditions.

Installation Instructions:

First the CSUs should be installed into the ATM cassettes, then the MCU can be installed.

Installation of the CSU depends on the manufacturer make and model of the cassette. The instructions for modification of the supported cassettes are attached in Appendix E through I. Please refer to the table of contents in order to determine the make and model of the cassette you wish to install.

Insure that all external sensors and switches (DOOR, SMOKE, BREACH, SIREN, etc.) are installed prior to configuring the MCU. Appendix B contains instruction for these items.

CSU Installation

Upon receipt of the CSU ink delivery system, the vacuum form cover should be removed for initialization and installation.

1. Verify and install jumpers using Appendix D as required.

   The Power jumper (J4), Disable Squib jumper (J3), and either the ink delivery assembly or a squib jumper attached inside the squib wire connector should be installed.

2. Press the POST button with the unit in the correct orientation for installation into the cassette.

   If the self test is good (1 long beep) disconnect the ink delivery system and continue installation.
   If there is a fault or error reported use Appendix A to isolate and correct problem.

Squib wires must be shorted or ink block connected for the unit to pass self-test.

3. Follow the bracket installation guides in Appendix E though I depending on the make and manufacturer of the cassette.
   - Appendix E -Installation Instruction Diebold MMD
   - Appendix F -Installation Instruction DeLaRue MDDM
   - Appendix G -Installation Instruction Perto “A” C-130
   - Appendix H -Installation Instruction DeLaRue NMD
   - Appendix I -Installation Instruction NCR

4. Once the bracket is installed correctly, re-attach the squib connection from the PCB to the ink delivery unit.

5. Press the POST button with the cassette in the correct orientation.

   If the self test is good (1 long beep) the installation is complete.
   If there is a fault or error reported use Appendix A to isolate and correct problem.

6. Remove ink block from Squib connection and place jumper across CSU wires to safe the system for testing.

CSU INSTALLATION COMPLETE

Test mode may be used to verify unit functionality see Appendix T for instruction.

MCU Installation

Installation of the MCU is as follows:

1. Open the MCU enclosure by removing the four screws from the cover.
2. Attach power jumper J4. Verify Configuration jumpers using Appendix D.
3. With CSU's installed into the cassettes with their ink bocks replaced with a jumper on the CSU Squib cable. Holding it in your hand, place the MCU in the position decided for installation.
4. Press the POST button. Insure proper discovery. Because the MCU will not have all of its input terminated correctly you should expect error messages; however, ignore them for now. If discovery conditions are good, proceed to step5. Else move the MCU to a new location and re-initiate the self-test. Repeat until all units are discovered.
5. Remove power jumper until installation is complete.
6. Place, install, and secure all accessory items. (ie. Bolt indicator switch, door contact switch, siren, breach sensor, et al.)
7. Run wires to the installation location, with enough slack for later trimming.
8. Determine sensor inputs are to be used. Either the sensor array cable or the onboard terminal block. If using only the sensor array cable assembly (RJ45 Ethernet cable), skip to step 12.

See picture on page 8.

9. Connect all used contacts to the MCU terminal blocks. See picture and note below.

CAUTION: This system uses a common ground. Polarity of the wires is critical to operation. The ground pins on the terminal block are highlighted with a bold line at back of the terminal block.

10. Attach wires to the terminal blocks, fastening them by tightening the screw in a clockwise direction.

Note **Loosening the terminal block may be required based on wire guage used and received condition.**

NOTE: From right to left the terminal block connections are:

1. Generic NC input # 2
2. GND
3. Power Loss,
4. Manual Fire/Breach
5. ATM Door NC
6. GND

11. Skip to step 16 if the Sensor Array Cable is not used.

12. Connect all used sensor array wires to the ATM sensor array (or provided sensors). Refer to Appendix C for a wire color chart of provided cabling.
13. Any unused sensor inputs should be shorted to the ground wire if the are normally closed. If the sensor input is normally open, caution should be used to insure that they do not make accidental contact to ground.
14. If Test Mode is to be initiated hold down the POST button will re-installing the power jumper J4.
15. If Test Mode is selected got Appendix T for instructions. Else continue below.
16. Fasten case together securely using the 4 screws provided. Insure that no wires or electronic components are strained or trapped.
17. Using the provided alcohol wipes, insure that the mounting surface is free of debris and oily residue.
18. Remove the protective coating from the velcro strips while they are still attached to the MCU.
19. Place the MCU into place pressing firmly to allow the tape to adhere to the ATM.
20. The cassettes should be installed into the ATM rack.
21. Actuate the MCU's POST button.
22. Self-test will commence. The first indication will be the flashing of the green LED while the CSU counts the number of CSUs it found.
23. If all CSUs are reported, then the area of install is acceptable.

24. The second indication will be the self test.
    If the self test is good (green led flashed , 1 long beep) proceed to step 26.
    If there is a fault or error reported use Appendix A to isolate and correct problem.

Note **Not correcting the fault or error condition may reduce the protection capability of the system.**

25. Once all errors and or faults are cleared
26. Clean-up any excess wiring and use cable ties, cable stays, or saddle wires to secure any loose wiring.
27. Close ATM door, listen for CSU beeps, MCU count, and fault indication.
28. If a fault exists go to step 24 repeat until all errors are resolved.

MCU INSTALLATION COMPLETE

29. Remove cassettes, open them, re-attach the ink blocks.
30. Install the cassettes into ATM, replenish as required.

SYSTEM INSTALLATION COMPLETE

Basic Operation:

A high level functionality follows, but for more detailed operation use the flow diagrams and the discussion on page 14. Software flow diagrams on pages 15 to 18, shows operation of the Octopus ATM Defense System. Following the flow diagram each state and its characteristics are discussed in detail.

1. With the CSU installed in the cassettes and the MCU installed in the ATM safe cavity. If power is supplied to the MCU and CSUs they will be in STANDBY mode. STANDBY is the lowest level of protection, allowing service and maintenance of the sensors, cassettes, and the ATM itself without fear of activation. While in this mode, it is possible to detect and correct all sensor errors by using the press-to-test button located on the MCU.

2. TEST mode may be selected by holding down the POST button while removing and re-installing power to the unit. See Appendix T for detailed description.

3. Holding the POST button for 2 seconds and then releasing it will perform system self-test. See Appendix A for Self-Test operation and detailed description.

4. Securing the door will upgrade the system status to ARMED mode. In Level III and Level V operation this is simply closing the ATM door or actuating the door contact switch. Level II operation requires a bolt indicator switch to check for authorized door opening. The process steps are discovery (find all units), self-test (find all errors or faults), report (beep indicate self-test status). This take 10-12 seconds.

5. While armed, the system will wake every second to check for polled alarms, react instantly to interrupt driven alarms, and periodically poll the CSU to get status and sensor information. Any sensor or input error is disabled from operation during the STANDBY to ARMED process.

   MCU alarms that lead from ARMED to ALERT mode, which are processed every second are:
   a) Thermal variation and
   b) Motion > 15 seconds.
   c) Light detection (in Level V only).

   MCU alarms that lead from ARMED to ALERT mode, which are interrupt processed are:
   a) Generic NO input # 1,
   b) Generic NO input # 2,
   c) Generic NC input # 1,
   d) Generic NC input # 1 (or Bolt Indicator in Level II), and
   e) Power Loss (if power was monitored).

   MCU alarms that lead from ARMED to FIRE mode, which are interrupt processed are:
   a) Thermal violation (> 72ºC or < 0ºC)
   b) Tilt > 2 seconds
   c) Manual Fire / Breach.

   No CSU alarms lead from ARMED to ALERT or to STANDBY.

6. To disarm an ARMED system follow authorized procedure and open door. In Level III and Level V operation this is simply opening the ATM door or de-actuating the door contact switch. Level II operation requires a bolt indicator switch to check for authorized door opening.

7. Activation of any sensor leading to the ALERT mode places the CSUs into ALERT mode. They then activate their internal sensors (Tilt, Light, Thermal) and listen for instruction from the MCU. The CSUs beep one time per second to indicate the ALERT mode.

MCU alarms that lead from ALERT to FIRE mode, which are processed every second are:

a) Thermal violation,
b) Motion > 60 seconds.
c) Light detection (in Level V only).

MCU alarms that leads from ALERT to ALERT mode, which are interrupt processed are:

a) Generic NO input # 1,
b) Generic NO input # 2,
c) Generic NC input # 1,
d) Generic NC input # 1 (or Bolt Indicator in Level II), and
e) Power Loss (if power was monitored).

MCU alarms that leads from ALERT to FIRE mode, which are interrupt processed are:

a) Thermal violation (> 72ºC or < 0ºC)
b) Tilt > 2 seconds
c) Manual Fire / Breach.

CSU alarms that lead from ALERT to FIRE (for a particular CSU) are:

a) Thermal violation (> 72ºC or < 0ºC)
b) Tilt > 2 seconds

Additionally in the Level V Octopus

c) Light Detection

8. The All Safe signal can be used to reset an ALERT system to the ARMED mode. All Safe will ignore any alarms that may be active in the system.

9. ALERT mode last 60 minutes from the last ALERT event. After 60 minutes if the condition that caused the event is still asserted, ALERT will continue for 30 minutes longer. If the condition is still asserted it will be ignored and the system will reset to ARMED mode.

10. Activation of any sensor or condition leading to the FIRE mode will stain the currency. During activation of the ink staining system, the CSU beep a solid 10 second tone. The MCU also beeps a short tone and sets the fault and alarm relays while firing its own optional squib.

    Level II and Level III functionality will not stain the money if the CSU detects light.

11. After firing the MCU and CSU exchange status information and store this information in an NVRAM log. The MCU then waits for the POST button to be pressed to reset the system.

12. **END BASIC OPERATION**

Detailed Operation:

Software flow diagrams on pages 22 to 25, shows operation of the Octopus ATM Defense System. Following the flow diagram each state and its characteristics are discussed in detail.

The numbered bubbles (*) are directly correlated between the flow diagram and the discussion which follows.

POR

Upon application of power, battery installed and Jumper J4 shorted. The unit will initialize all ports and sensors. It will the check for the presence of the POST button activation signal.

TEST MODE

1 Placing the unit in TEST mode:

If the POST button is held down while power is applied (POR) the unit will beep 5 times and go immediately to test mode. See Appendix T for operation and detailed description of TEST mode operation.

If the POST is not active the unit will go to STANDBY mode.

STANDBY MODE

STANDBY is the lowest level of protection, allowing service and maintenance of the sensors, cassettes, and the ATM itself without fear of activation. While in this mode, it is possible to detect and correct all sensor errors by using the press-to-test button located on the MCU.

The Octopus system is automatically placed in this mode, if no alarm is active, by authorized door opening. This state will remain until either the press-to-test button is pushed, or the door contact switch changes to a normally closed state.

2 Arming the system:

For Octopus Level III (US) and Level V (Brazil), closing the door is the action which upgrades the system from STANDBY mode to ARMED mode. Octopus Level II (Canadian) requires a bolt indicator switch connected to Generic NC input # 2 before arming the system see 2A..

2A Arming Octopus Level II (Canadian)

Octopus Level II requires two signals be present, the ATM door contact closed and a Bolt Indicator contact closed when the bolt is closed to be present before arming the system.

3 System Self-Test:

While the system is in STANDBY mode it is possible to perform a system test by pressing and holding the POST button for 2 seconds. The following events will occur:

3.1 a) Discovery
A proprietary method for determining how many CSUs are in the system and assigning them communications channels

b) Beep Count
An indication by the MCU of the number of CSUs in this ATM protection system. This is accomplished by beeping the MCU buzzer a short beep for each CSU found, while blinking a green LED. I beep and 1 blink for each CSU.

c) CSU self-test

The MCU will cause the CSU to self-test all sensors and inputs. After completion if no errors are found the CSU will beep once to indicate no faults. If an error exists the CSU will beep 2 times to indicate a fault condition. Further it will report this error to the MCU for BIST code readout.

d) MCU self-test

The MCU will do an internal self test to determine if errors or faults exist.

e) Fault/error indication

If no errors or fault conditions are found the MCU will beep 1 time and flash the green LED 1 time to indicate good self-test.

If there are any faults or errors which cause BIST errors in the systems both CSU and MCU the MCU will beep two times and flash the red led 2 times to indicate self-test failure.

3.2 BIST error readout:

If during a STANDBY mode self-test a failure occurs which has a BIST error associated with it, each error will be readout individually using the LEDs to display the errors. The errors will be displayed in one second intervals until all errors have been shown. See Table 4 below which shoes which errors cause BIST codes for each Level of the Octopus ATM Defense System. Appendix A should be referenced to decode and troubleshoot any BIST error code.

<table>
<tr><th>Possible BIST error source</th><th>Level II (Canadian)</th><th>Level III (US)</th><th>Level V (Brazil)</th></tr>
<tr><td>ATM_Door open or closed</td><td colspan="3" rowspan="6">NO BIST ERROR</td></tr>
<tr><td>All Safe Signal open or closed</td></tr>
<tr><td>Power Loss open</td></tr>
<tr><td>MCU motion detection</td></tr>
<tr><td>MCU light detection</td></tr>
<tr><td>CSU light detection</td></tr>
<tr><td>Generic NC input # 2 closed & ATM Door open</td><td>BIST Error</td><td colspan="2" rowspan="2">NO BIST Error</td></tr>
<tr><td>ATM Door closed & Generic NC input # 2 open</td><td>BIST Error</td></tr>
<tr><td>Generic NO input # 2 closed</td><td colspan="2" rowspan="4">NO BIST Error</td><td rowspan="4">BIST Error</td></tr>
<tr><td>Generic NO input # 2 closed</td></tr>
<tr><td>Generic NC input # 1 open</td></tr>
<tr><td>Power Loss detection</td></tr>
<tr><td>Generic NC input # 2 open</td><td colspan="3" rowspan="8">BIST Error</td></tr>
<tr><td>MCU battery low error</td></tr>
<tr><td>MCU tilt error</td></tr>
<tr><td>MCU thermal error</td></tr>
<tr><td>CSU battery low error</td></tr>
<tr><td>CSU tilt error</td></tr>
<tr><td>CSU thermal error</td></tr>
<tr><td>CSU squib disconnected or disabled</td></tr>
<tr><td colspan="4">Table 4. Possible BIST error v/s Octopus Level</td></tr>
</table>

4 ARMED mode operation:

Once a unit enters ARMED mode it is ready to protect the currency inside the ATM cassettes. The beginning of ARMED mode is very much like the POST operation while in (door open) STANDBY mode. However, now that the door is secure no BIST readout will occur.

5 Pre-arm checking of the system.

1) Discovery
A proprietary method for determining how many CSUs are in the system and assigning them communications channels

2) Beep Count
An indication by the MCU of the number of CSUs in this ATM protection system. This is accomplished by beeping the MCU buzzer a short beep for each CSU found, while blinking a green LED. I beep and 1 blink for each CSU.

3) CSU self-test
The MCU will cause the CSU to self-test all sensors and inputs. After completion if no errors are found the CSU will beep once to indicate no faults. If an error exists the CSU will beep 2 times to indicate a fault condition. Further it will report this error to the MCU for BIST code readout.

4) MCU self-test
The MCU will do an internal self test to determine if errors or faults exist.

6 Fault/error indication:

If no errors or fault conditions are found the MCU will beep 1 time and flash the green LED 1 time to indicate good self-test.

If there are any faults or errors which cause BIST errors in the systems both CSU and MCU the MCU will beep two times and flash the red led 2 times to indicate self-test failure. All active sensors are disabled and not used for protection of the system.

7 Sleep / power conservation.

99.84 % of the time the MCU in the ARMED state will be sleep state. It will wake every second to check for polled sensors (thermal and motion), upon any interrupt capable sensor, or when poll timeout occurs.

8 Wakeup Event or interrupt:

The system will wake every second to check for polled sensors (thermal and motion), upon any interrupt capable sensor, or when poll timeout occurs. The CSU listens to determine if a polled communications is pending.

8.1 Wakeup Timeout /Check Alarms

=> Every 1 second, the MCU wakes up to check the alarms and sensors.

Regardless of whether the sensor are active all inputs are checked. Then after debounce processing the alarms are registered as real events. The debounce registration process protects against short duration glitches and EMI fields.

8.2 Wakeup Contact Change

Every time a interrupt occurs it is debounce processed and immediately compared for action based on the software protocol.

8.3 Wakeup Polling Timeout

This is a periodic time which causes a interrogation of the CSU status and exchanges information of state condition between the CSU and MCU.

9 Alarm verification:

When an alarm event occurs it is said to be "triggered", this immediately causes the system to verify the validity of the event by de-bouncing the input. After it is debounced, if the alarm still exists it is verified. Then it is compared to the logic process to allow determination of action.

10 Disarming the armed system:

In Level III (US) and Level V (Brazil) the act or disarming an ARMED system is by having the authority to open the door.

Level II operation requires a bolt indicator switch to check for authorized door opening. Both the Bolt and the Door must open, in that order. This protects against ATM vandals who remove the ATM door without actuating the bolt mechanism (unauthorized opening).

11 Processing ALERT events

The following events can cause an ARMED system to goto ALERT mode, if the sensors are connected and operational:

a) Generic NC input # 1 open
b) Generic NO input # 1 closed
c) Generic NO input # 1 closed
d) Power Loss
e) Motion > 15 seconds, and
f) Thermal Rise (>30 ºC in two minutes).

In Level III (US) and Level V (Brazil)
g) Generic NC input # 2 open

In Level V (Brazil)
h) Light detection transition from dark to light.

12 Processing FIRE events

The following events can cause an ARMED system to go to FIRE mode, if the sensors are connected and operational:

a) Manual Fire/ Breach open
b) Tilt > 2 seconds

In Level II (Canadian)
c) Door opening without bolt (Generic NC input # 2) opening.

If no alarms upgrade the system to ALERT or FIRE mode the unit returns to sleep.

13 ALERT mode operation:

ALERT mode is the only mode in which the CSUs can protect themselves. The CSUs are protected againt thermal, light detection and tilt. This will prevent removal of the CSU from the ATM rack without activation.

14 Sending ALERT messages to CSU.

The first job of the MCU when going to alert is to notify the CSUs within the ATM system of the event. Including the reason for the event.

15 Sleeping.

As with ARMED mode the majority of the ALERT time is spent in a sleep state (~ 98.72%). It will wake every second to check for polled sensors (thermal and motion), upon any interrupt capable sensor, or when poll timeout occurs.

16 Wakeup event or interrupt.

The system will wake every second to check for polled sensors (thermal and motion), upon any interrupt capable sensor, or when poll timeout occurs. The CSU listens to determine if a polled communications is pending.

17.1 Wakeup Timeout /Check Alarms

=> Every 1 second, the MCU wakes up to check the alarms and sensors.

Regardless of whether the sensor are active all inputs are checked. Then after debounce processing the alarms are registered as real events. The debounce registration process protects against short duration glitches and EMI fields.

17.2 Wakeup Contact Change
Every time a interrupt occurs it is debounce processed and immediately compared for action based on the software protocol.

17.3 Wakeup Polling Timeout
This is a periodic time which causes a interrogation of the CSU status and exchanges information of state condition between the CSU and MCU.

18 Alarm verification:

When an alarm event occurs it is said to be “triggered”, this immediately causes the system to verify the validity of the event by de-bouncing the input. After it is debounced, if the alarm still exists it is verified. Then it is compared to the logic process to allow determination of action.

19 Disarming the armed system:

Level II operation requires a bolt indicator switch to check for authorized door opening. Both the Bolt and the Door must open, in that order. This protects against ATM vandals who remove the ATM door without actuating the bolt mechanism (unauthorized opening).

20 Processing ALERT events

The following events can cause an ALERT system to stay in ALERT mode, if the sensors are connected and operational:

a) Generic NC input # 1 open
b) Generic NO input # 1 closed
c) Generic NO input # 1 closed
d) Power Loss
e) Motion > 15 seconds, and
f) Thermal Rise (>30 ºC in two minutes).

21 Resetting all ALARM counters.

There a two main timers used in ALERT mode:

TIMEOUT_1	=	60 minute alert condition. All alert events cause the unit to stay in ALERT mode for 60 minutes from the last ALERT event. At the end of TIMEOUT 1 the status of the ALERT event is rechecked see 24.
TIMEOUT_2	=	30 minute secondary timer. If the last ALARM to cause alert is still asserted After the end of TIMEOUT_1 it is held in ALERT mode for an additional 30 minute interval see 26.

22 Processing FIRE events

The following events can cause an ALERT system to go to FIRE mode, if the sensors are connected and operational:

a) Door opening
b) Manual Fire/ Breach open
c) Tilt > 2 seconds

In Level II (Canadian)
d) Door opening without bolt (Generic NC input # 2) opening.

23 Disarming an ALERT system.

Provision has been made the an ALL_SAFE signal, to denote authorized access, is incorporated in the system for those who wish to deactivate the system and gain access to the safe without causing a fireable condition. This signal is a NC to NO transition. The system is not deactivated on ALL_SAFE operation but it is placed in ARMED mode and all alarm conditions and timers are reset to allow opening the door to DISARM the system.

In Level II (Canadian) operation the bolt indicator acts to disarm the system.

24 Checking for last ALERT condition timeout.

As stated in 21 above, an ALERT system will remain in ALERT mode for a minimum of 60 minutes unless the ALL_SAFE signal is applied.

25 Verifying that the last ALERT event is still active after 60 minutes.

If the event is still active it will be disabled; however, the system will continue in the ALERT state for an additional 30 minutes.

26 Checking for last still active ALERT condition timeout.

As stated in 21 above, an ALERT system will remain in ALERT mode for a minimum of 30 minutes after the initaial 60 minute count if the contact which caused the last alert is still active.

27 Final ALERT event check.

After 90 minutes of ALERT mode, the system looks to make sure that all ALERT events that are inactive have been held for 60 minutes minimum, and any active ALERT event has been in affect for 90 minutes. Any active ALERT event at this time is disabled, the system will return to the ARMED mode until either a STANDBY event or another ALERT event occurs.

28 Logging all events.

All alert conditions are logged to a LIFO register in non-volatile random access memory (NVRAM). The purpose of the log file is to generate the trail of events leading to activation. Currently the only way to retrieve the NVRAM information is to export the unit back to the factory for investigation. Using specialized software a report can be generated of the events.
Keep in mind that the events are only those which cause the unit to go to ALERT and FIRE mode, no real time clock is installed to allow event tracking to a specific time.

29 FIRE mode operation

Fire mode in the last stage of an ATM attack. Any unit elevated to this level will stain the currency. This state is irrevocable. The unit sends a message to the CSU to degrade the currency, then the MCU warns of the event be beeping. Further any optional device atached to the MCU (siren or smoke) is also activated.

Setting the output relays.

Two outputs on RJ11 jacks are provided for customer and internal monitoring of system status. The are called FAULT and ALERT. When an error condition or fault in the system occurs, the FAULT relay is closed. When an ALERT event occurs, the ALERT RELAY is closed. When a fire EVENT is processed both the FAULT and ALERT relays are closed. The reasoning is that if both a system fault and an ALERT condition exist, the ATM need service or police intervention. And, when the system fires the system will require maintenace.

30 FIRE event.

The Octopus ATM Defense system communicates wirelessly to the CSUs to cause staining. Further, any optional device attached to the MCU is activated. A charge pump is used to generate sufficient energy density to fire the pyrotechnic actuators. This pump take > 2 seconds to accomplish this task. Further the charge is pumped and applied a minimum of 3 times to the pyrotechnic device to insure proper activation.

31 Logging all events.

All fire conditions are logged to a LIFO register in non-volatile random access memory (NVRAM). The purpose of the log file is to generate the trail of events leading to activation. Currently the only way to retrieve the NVRAM information is to export the unit back to the factory for investigation. Using specialized software a report can be generated of the events.

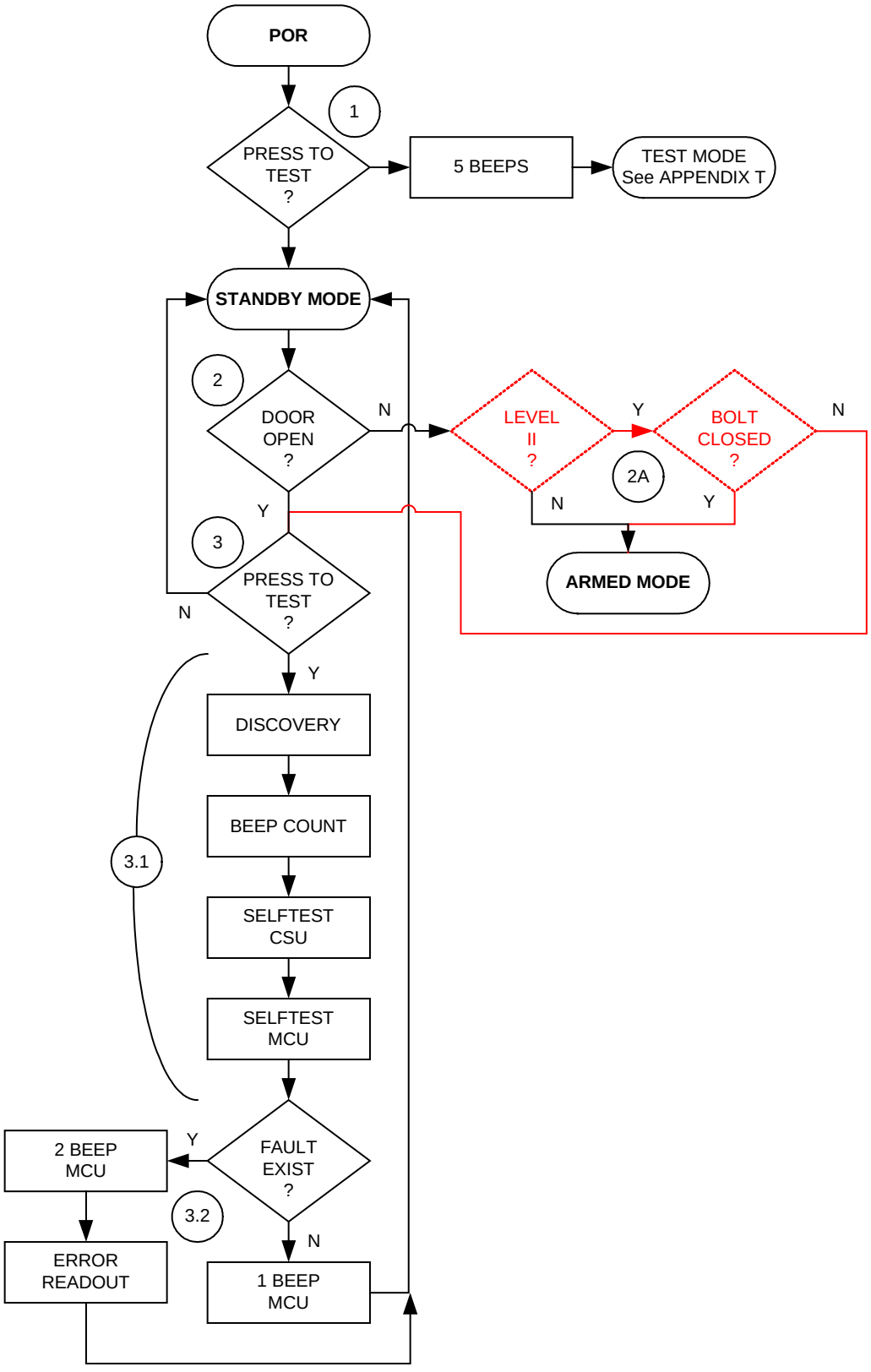
Keep in mind that the events are only those which cause the unit to go to ALERT and FIRE mode, no real time clock is installed to allow event tracking to a specific time.

32 After system activation:

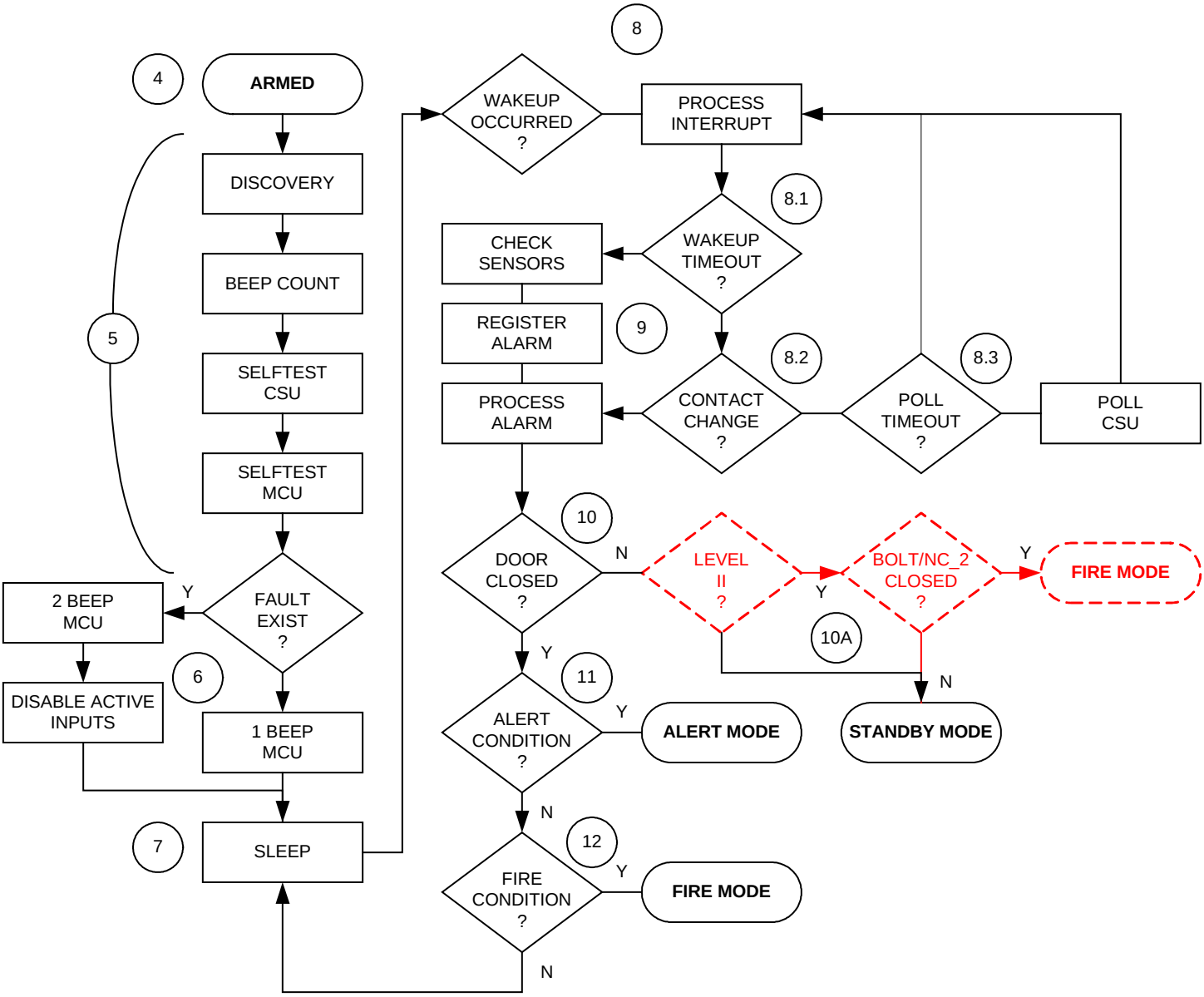
After system activation all units wait for their POST buttons to be pressed before continuing operation. This is the safe condition to prevent degradation of the NVRAM data with after FIRE event tasks.

End of Detailed Operation.

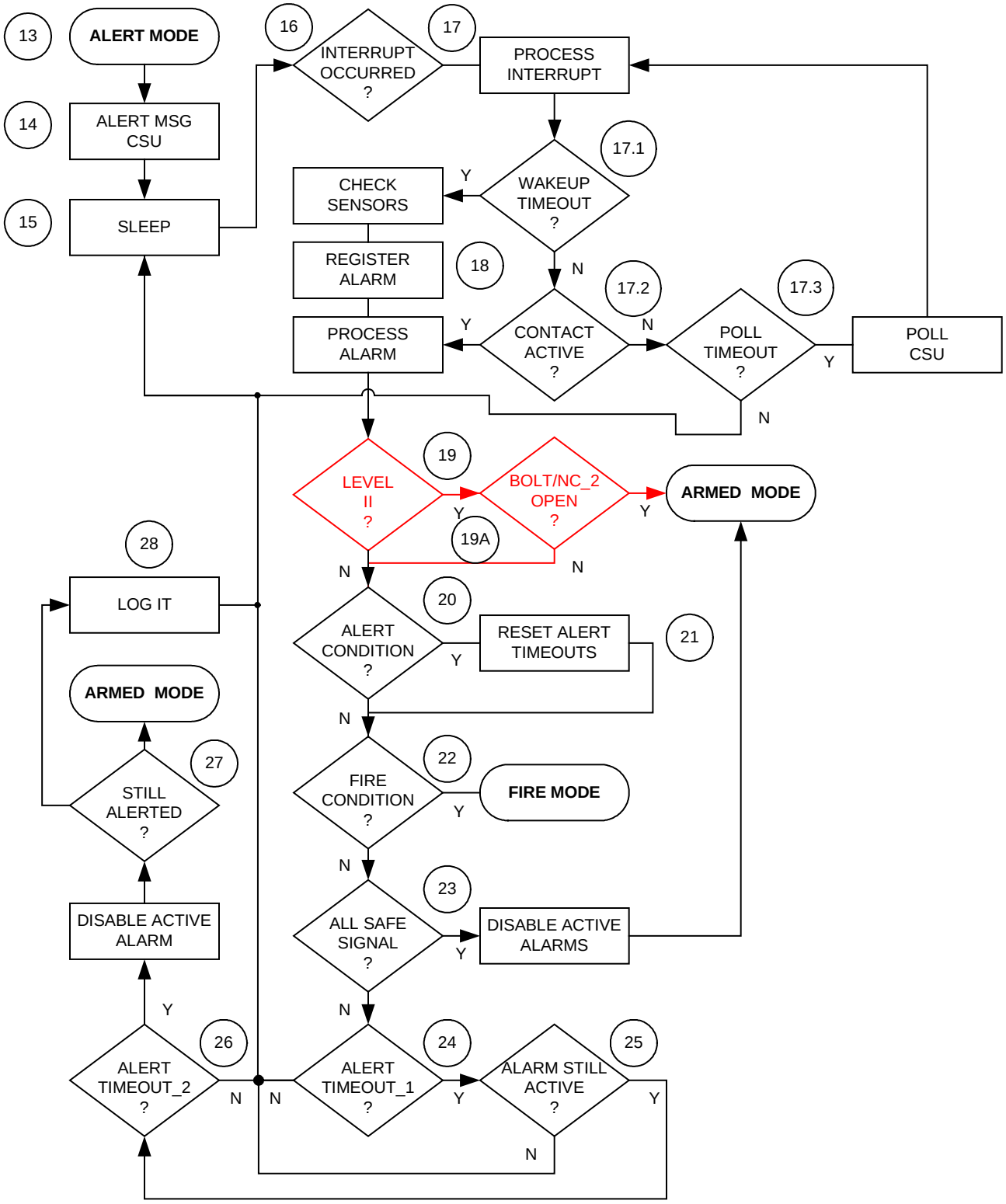
POR and STANDBY mode flow chart



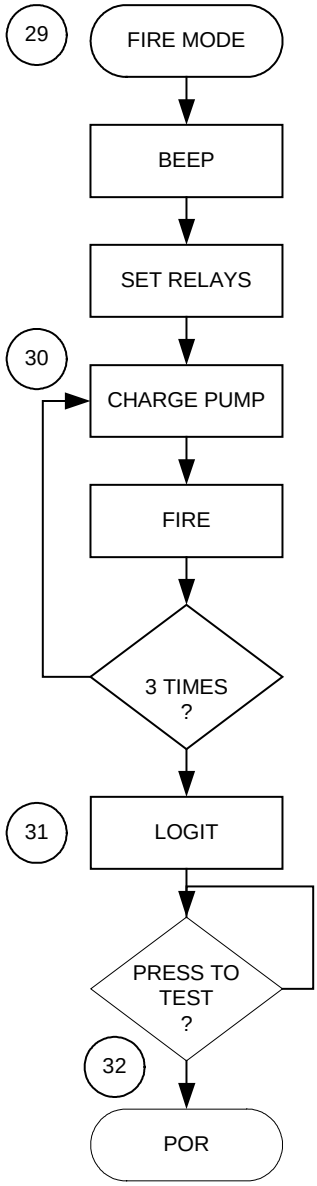
ALERT mode software flow diagram



ALERT mode software flow diagram.



FIRE mode software diagram.



Appendix A

System Indications and Error Code Readout

When the door is open and the press to test button in the MCU is activated. A sequence of events occurs.

All LEDs light momentarily  to indicate self test start

Discovery of CSU and registration into the ATM system
MCU beeps and blinks one green LED for every CSU in system

 "BEEP" -> (X number of CSUs)

If self-test passes the MCU beeps one long beep and lights a green led

"BEEEEEEP" -> 

If self-test fails the MCU beeps two short beeps and lights the red led

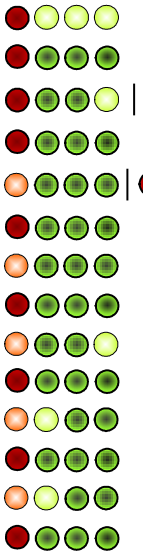
"BEEP" ->  BEEP" -> 

Then the fault or error code readout occurs.

First all leds off -> 

Then followed by AREA word, SPACER word, ERROR CODE, then off and then the next code until all error codes are readout.

i.e.



Press to Test button released
Test in progress (~10 seconds)
 BEEP, BEEP two CSUs found
Spacer
 BEEEEP,BEEEEP error found
Spacer
AREA WORD (MCU ONBOARD SENSOR)
Spacer
ERROR CODE MCU Low Battery Indication
Spacer
AREA WORD (MCU SENSOR INPUT)
Spacer
ERROR CODE (Generic NC input # 2 not shorted)
Spacer

Each code is readout every 2 seconds. Table 1 on the next page gives the complete error code chart in graphical and text format. Table 2 gives problem details.

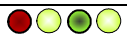
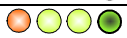
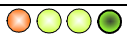
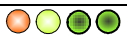
AREA WORD	ERROR CODE	AREA	ERROR	ERROR CONDITION
MCU INTERNAL SENSOR				
		1000	1001	MCU battery low
		1000	1010	MCU tilt error
		1000	1011	MCU thermal error
MCU EXTERNAL INPUTS				
		1100	1001	Generic NC input # 1 error
		TEST MODE ONLY		Power Loss (No V+) indicator
		1100	1011	Generic NO input #1 error
		1100	1100	Generic NC input # 2 error
		TEST MODE ONLY		DOOR closed indicator
		1100	1110	Generic NO input # 2 error
		1100	1111	Manual Fire NC/Breach error
		TEST MODE ONLY		All Safe signal activated indicator
CSU ONBAORD SENSORS				
		1110	1001	CSU battery low
		1110	1010	CSU tilt error
		1110	1011	CSU squib error
		1110	1100	CSU thermal error

Table 1. BIST Error Readout Indication Matrix

Error	Possible Cause
MCU Low Battery	a) Low battery – replace b) Faulty electronics – new unit required
MCU Tilt Error	a) MCU is in horizontal position and jumper J22 (H/V) is removed. b) MCU is in vertical position or upside down and jumper J22 (H/V) is installed.
MCU Thermal Error	a) Unit is too hot > 70 ºC. b) Unit is too cold < 0 ºC.
Generic NC input # 1 error	a) Sensor Array cable pin # 7 is not shorted to ground when connected. b) Contacts reversed so that unit ground and ATM chassis ground are not common. c) Faulty RJ45 plug.
Generic NO input # 1 error	a) Sensor Array cable pin # 7 is not open to ground when connected. b) Contacts reversed so that unit ground and ATM chassis ground are not common. c) Faulty RJ45 plug.
Generic NC input # 2 error	a) Terminal block J31 is not shorted when connected. b) Contacts reversed so that unit ground and ATM chassis ground are not common. c) Wire gauge too small.
Generic NO input # 1 error	a) Sensor Array cable pin # 1 is not open to ground when connected. b) Contacts reversed so that unit ground and ATM chassis ground are not common. c) Wire gauge too small.
Manual Fire NC / Breach error	a) Sensor Array cable pin # 2 is not shorted to ground when connected or Terminal Block J10 not shorted when connected. b) Contacts reversed so that unit ground and ATM chassis ground are not common. a) Faulty RJ45 cable or wire gauge too small.

Appendix B

Optional Components

1 Door Contact Switch

Required in the basic installation kit, the door contact is a long throw normally-closed to activate. The purpose of the door contact switch is to detect the door position as open or closed. Most ATMs already have door contacts available that can be used; however, in the event that a door state indicator is not available the door contact switch must be used to arm the system.

1 Smoke Generator

A simple two lead smoke canister may be purchased as an additional deterrence against robbery. When the system activates to stain the currency, the MCU will also fire the smoke canister to fill the ATM safe with dye staining smoke.

1 Remote Interface Monitor (RIM) – Future Option Unavailable with initial release.

A self-contained remote monitor may be purchased to allow for visual and/or aural indication. Using the RJ-11 style 4 wire output the RIM may be conveniently placed in a suitable spot to alert service and maintenance personnel of system status. The RIM has a buzzer and two light emitting diodes (LED's) which indicate the state of the system. For complete operational details please refer to the I/O guide for the Remote Interface Monitor.

1 Remote Light Sensor – Future Option Unavailable with initial release.

A self-contained remote light sensor may be purchased to allow for penetration sensing in the event that the ATM safe is breached through the side and or top without activation the door switch. This allows the MCU to be placed anywhere within the ATM safe will still being able to remotely see the penetration attack.

1 Penetration Sensor

The penetration sensor is used to detect drill or torch attempts on the ATM safe through the wall onto which it is mounted. It is a normally open circuit until penetration occurs. In order to use this device, the MCU must be a "Nervous" system (see Appendix C). Its two leads should be attached to ground and Manual Fire NC.

1 External Power Source – Future Option Unavailable with initial release.

A universal input (90-260 VDC) DC output power supply module. This device will allow the MCU to be powered by line power while conserving it batteries for power outage situations.

1 External RS232 – Future Option Unavailable with initial release.

The external RS232 module will level shift the MCU UART to allow for connection to a remote PC host, or interface with option 11. At the writing of this document the protocol interface has not been defined.

8 Sensor Array Cable / Assembly

The sensor array cable is envisioned to be a straight through cable with RJ45 termination on the end for interface the MCU for connecting an ATM alarm suite directly into the MCU. This combination will allow the ATM sensors to directly control the operation of the system. A PCB which translates the RJ45 inputs into terminal blocks for ease of installation may be developed.

9 Siren Module – Future Option Unavailable with initial release.

The siren module is a self powered 128 dB swept audio oscillator. It is intended as a deterrent device much like the smoke generator to warn the crook of imminent staining. It is readily audible outside the immediate area of the attack to alert onlookers and possible witnesses. Once activated the siren will require battery replacement before proper operation can be insured.

10 Remote/ Local System Reset Signal – Future Option Unavailable with initial release.

The MCU has an input reserved for a signal which allows the Octopus ATM system to be reset to the lowest threat level, allowing authorized personnel the ability to open the ATM without fear of staining the money. This circumvents the alert time-out which usually takes from 60 to 90 minutes to allow access. This input event is currently used in the Canadian version to allow the monitoring of the ATM bolt/lock assembly.

11 Status Web Client Server Interface – Future Option Unavailable with initial release.

Along with the RS232 interface, a remote SBC (Single Board Computer) may be used to remotely monitor the Octopus system and remotely command authorized access, system reset, or remote activation of a security device like the siren or smoke.

Appendix C

MCU Sensor Array Cable and RIM wiring

On the MCU there is an RJ45 connector for installation of the sensor array cable input.

Table 4 below shows the contact and compares its pin-out to standard wire coloring for Category 5 enhanced ethernet cable. If another cable is used the color schem will be different.

Pin of connector	Wire Color CAT5e	Contact
1	Orange Stripe	NO generic input #2
2	Orange	Manual Fire N/O contact
3	Green Stripe	Power loss contact (optically isolated)
4	Blue	System Common Ground
5	Blue Stripe	Door contact N/C
6	Green	All Safe contact for authorization before opening (VDC+)
7	Brown Stripe	N/C generic input #1
8	Brown	N/O generic input #1
RJ11 connector wiring designation.		

The sensor array cable must be wired straight through. There are to types of RJ45 cables, cross-over and straight. Crossover cables cannot be used !

Also on the MCU are two RJ11 style connectors for installation of either a remote indication board or interface into an external monitoring system. These are dry contact outputs, normally closed when activated.

Table 5 below shows the contact and compares its pin out to standard wire coloring for 4 conductor modular wire plugged .

2	Green	Fault Relay N/C contact
3	Red	Fault Relay common return
4	Yellow	Alarm Relay N/C contact
5	Black	Alarm Relay common return
Table 5. RJ11 connector wiring designation.		

Appendix D

Configuration Jumper Selection

On both the MCU and CSU a number of jumpers provided to allow for configuring operation.

Definition:

Jumper, JXX -2 pin header assembly attached to PCB.
Shunt -2 pin shorting bar used to plug onto jumper to change state from open to closed circuit/

Jumper Silkscreen Indicator	Name	Description
MCU		
J4	POWER	With Battery installed, and connected, installation of this jumper enables power to the MCU.
J25	UNUSED	For future expansion.
J26	UNUSED	For future expansion.
J24	ENABLE MOTION	On power-up of the MCU, if this shunt is installed (default) motion detection for alert and fire conditions will be enabled. If motion detection is not required, remove shunt and POWER shunt, re-install POWER shunt to affect configuration change.
J22	TILT SELECTION	On power-up of the MCU, if this jumper-shunt is not installed (default), the MCU expects that it will be mounted in the vertical plane with the sensor array jack (RJ45) facing upwards. If horizontal mounting is required, install shunt, cycle power by removing and installing the POWER shunt.
J3	ENABLE SQUIB	On power-up of the MCU, if this jumper-shunt is installed (default), the MCU will upon system fire also charge and fir a Squib for use with external smoke, or ink. If no external squib device is required remove the shunt. No power cycling is required.
J28	ENABLE LIGHT	On the Brazil model of ctopus, a light sensor is attached for increased functionality (see Software Flow Diagram). Placing this shunt enable the light detection circuitry (only if light sensor, PC1, adjacent to self-test button, is installed). Removing it will disable the light circuitry. No power cycling is required.
CSU		
J4	POWER	With Battery installed, and connected, installation of this jumper enables power to the CSU.
J13	UNUSED	For future expansion.
J14	UNUSED	For future expansion.
J9	ENABLE LIGHT SENSOR	If this jumper-shunt is installed (default), the CSU will use the light detector to determine if the cassette lid is open or closed. Removing this shunt disables light detection.
J11	TILT SELECTION	On power-up of the CSU, if this jumper-shunt is not installed, the CSU expects that it will be mounted in the vertical plane battery along the lower edge. If horizontal mounting is required, install shunt, cycle power by removing and installing the POWER shunt.
Jj3	ENABLE SQUIB	If this jumper-shunt is installed (default), the unit is capable of firing the ink staining system. If not installed the unit will report error during self-test. **Squib Jumper must be installed to pass self-test.**

Appendix E

Octopus Installation Instructions for the Diebold MMD Cassette

INFORMATION TO THE USER

Tools Required

The following tools(not included in the installation kit) may be required to install the Octopus ATM Defense system:

•Hand Grinder (Dremel™ Type) with cutoff saw, rotary file and ground burs.
•Common Screwdrivers
•Phillips Screwdrivers
•Razor Knife
•Hacksaw w/assorted blades
•Slip-Joint pliers
•Vice Grip, locking pliers

1.0 Introduction

Prior to bracket installation, the Diebold MMD Cassette must be modified to accept the Octopus ATM Defense System. The procedure includes trimming and cutting several existing cassette components.

2.0 Shorten Guide Rails

Top, currency guide rails must be trimmed to provide 70mm clearance between the rail and the inside front of the cassette (A) Figure 1. Measure 70mm, mark rails and cut rails and black inserts. Reinstall Rails.

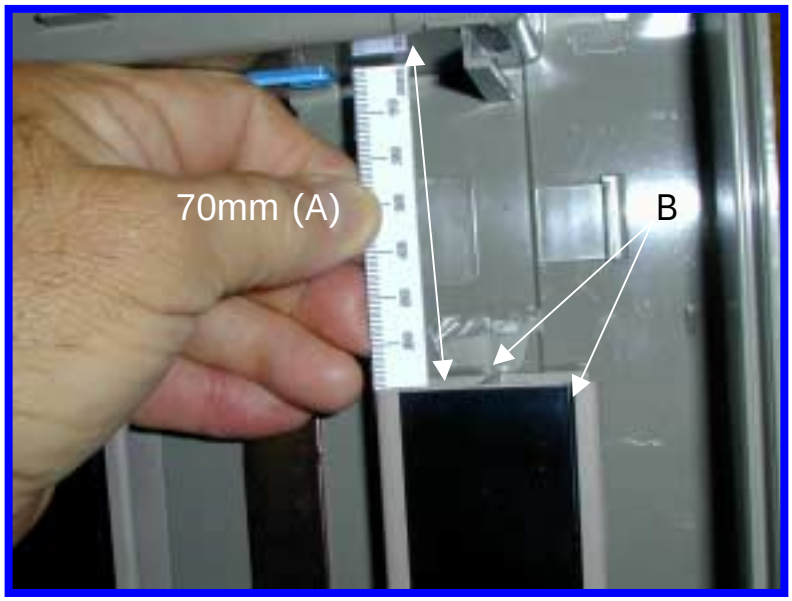


Figure 1

3.0 Adhesive

Place a small amount of silicone adhesive between the edge of the rails, the cassette top, and the black insert (B) Figure 2.

4.0 Remove Guide Rail Supports

Grind the two Rail Guide Supports flush with the Cassette top (C) Figure 2.

Figure 2

5.0 Trim

Cut-away the left rail-stop for 22mm clearance as shown in Figure 3.

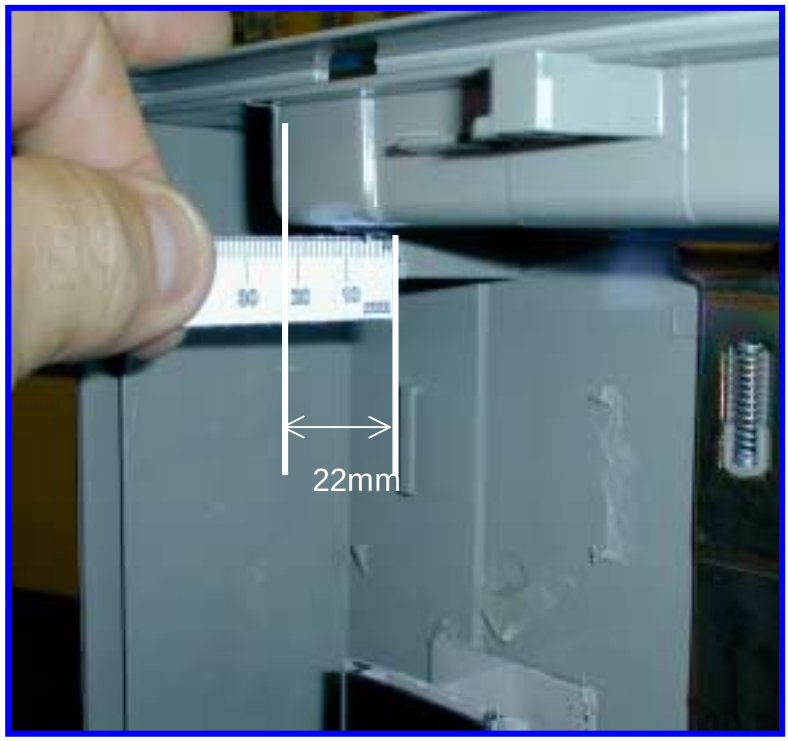


Figure 3

6.0 Trim Bottom Currency Guides

Trim **both** bottom currency guides flush with the front edge of the rubber locking pads (D) Figure 4.

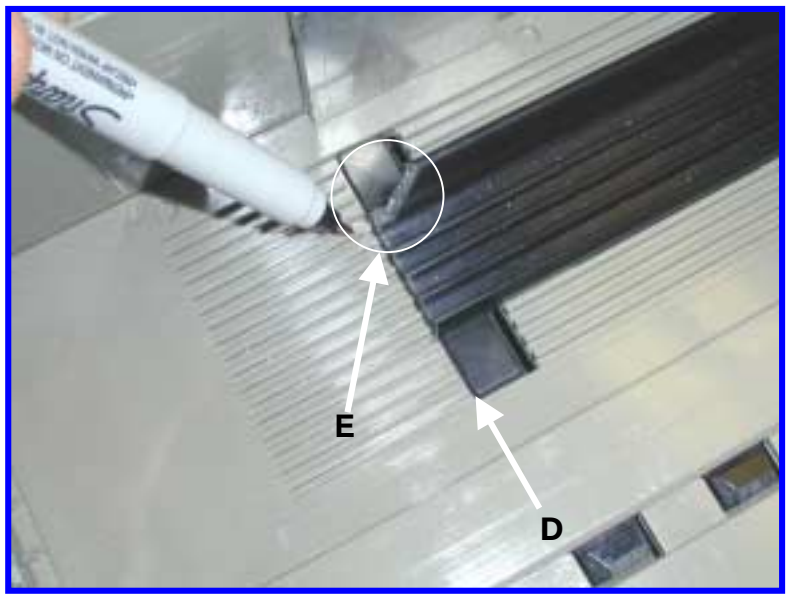


Figure 4

7.0 Trim Bottom Left Currency Guide

Trim the left, bottom currency guide at a 45° angle (E) Figure 4 as shown.

8.0 Clean Cassette Bracket Mounting area

Temporarily place the bracket assembly in the cassette, note where the three, elongated, slotted mounting holes line up with the cassette sides. Remove the Bracket Assembly and, **(IMPORTANT)**thoroughly clean the sides in the noted area with the alcohol wipes.

9.0 Mark Location for Bracket Mounting Plates (3)

Place the Bracket Assembly into the cassette and set the distance between the front of the bracket and the inside of the cassette front to 42mm Figure 5. With the Bracket Assembly in place, mark a small dot in the center of each elongated mounting slot, one on the left side of the cassette and two on the right side, Figure 6

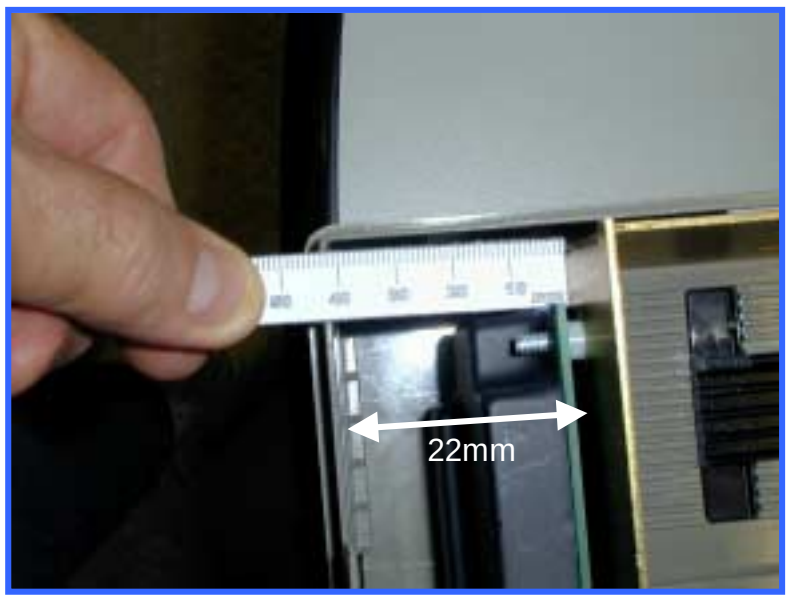


Figure 5

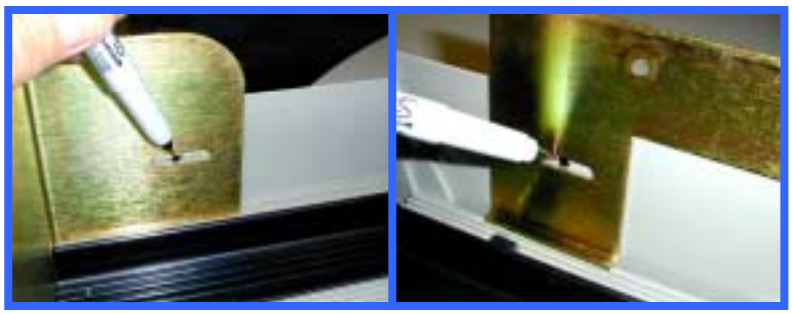


Figure 6

10.0 Mount Bracket Mounting Plates

Remove the release backing from the Bracket Mounting Plates and mount the plates with the holes over the previously applied dots as shown in Figure 6.

Figure 7

11.0 Prepare Bracket for Installation

Prepare the bracket and ink delivery system by removing the four nuts and the CSU plastic cover. Locate J3 (Firing circuit) and J4 (Power). Remove the red shunts and replace, bridging the two posts on each connector (Figure 7). Replace the plastic cover and securing nuts. Make certain that the two-wire electrical cable between the CSU electronics and the Ink Block is connected.

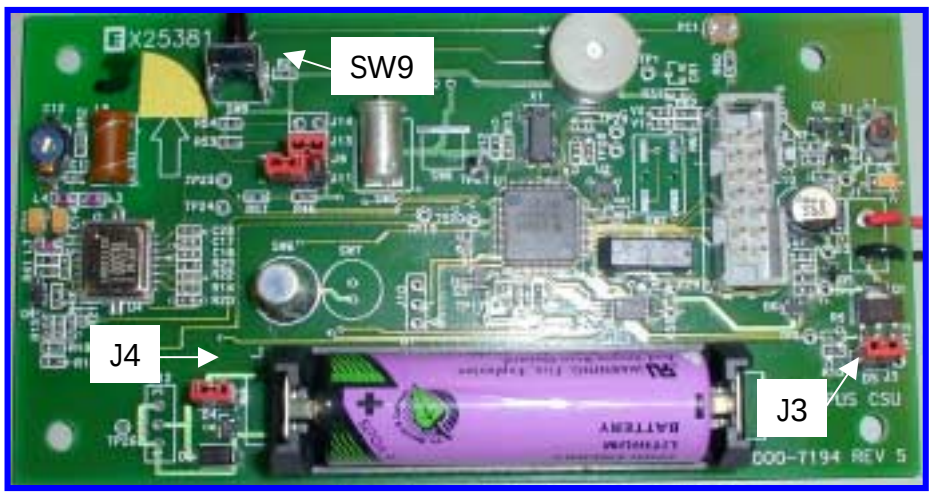


Figure 8

12.0 Secure Bracket Assembly
Reinsert the Bracket assembly, install the three mounting screws with fiber washers. Do not tighten.

Reset the distance between the front of the bracket and the inside of the cassette front to 42mm Figure 5 and tighten the three mounting screws.

Open and close the cassette cover to check for interference. Adjust as required.

13.0 Test Electronics
Test the CSU electronics by depressing and releasing SW9 (Figure 7). One beep indicates that the CSU is fully functional. Two beeps indicates a failure and requires troubleshooting. Recheck cable connections and shunt connections (Section 11.0). This completes the installation

Appendix F

Octopus Installation Instructions for the DeLaRue MDDM Cassette

INFORMATION TO THE USER

Tools Required

The following tools(not included in the installation kit) may be required to install the Octopus ATM Defense system:

•Hand Grinder (Dremel™ Type) with cutoff saw, rotary file and ground burs.
•Common Screwdrivers
•Phillips Screwdrivers
•Razor Knife
•Hacksaw w/assorted blades
•Slip-Joint pliers
•Vice Grip, locking pliers

1.0 Introduction

Prior to bracket installation, the DeLaRue MDDM Cassette must be modified to accept the Octopus ATM Defense System. The procedure includes trimming and cutting several existing cassette components.

2.0 Trim Currency Pressure Plate

Cut out a section of the currency pressure plate, as shown in Figure 1, to clear the spray bar on the Octopus bracket.

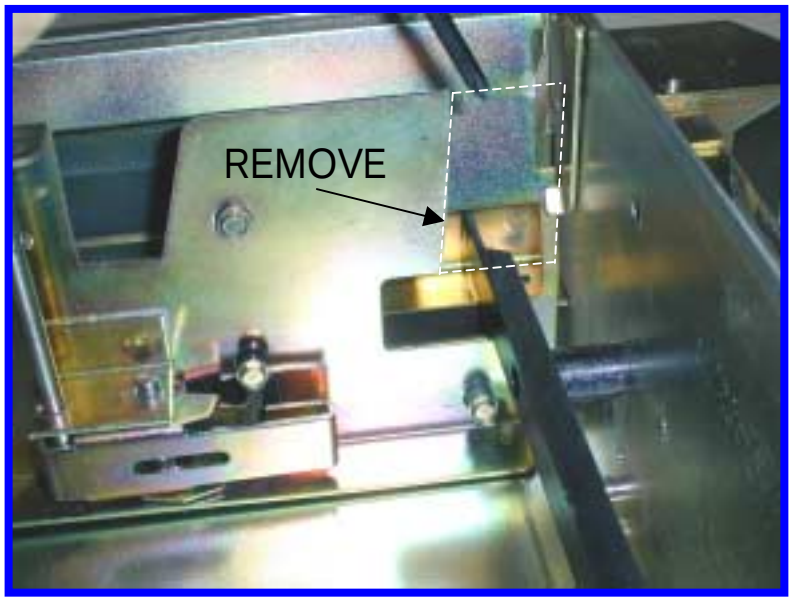


Figure 1

3.0 Trim Currency Guides

Trim left and right currency guides flush with the mounting posts as shown in Figures 2 and 3.

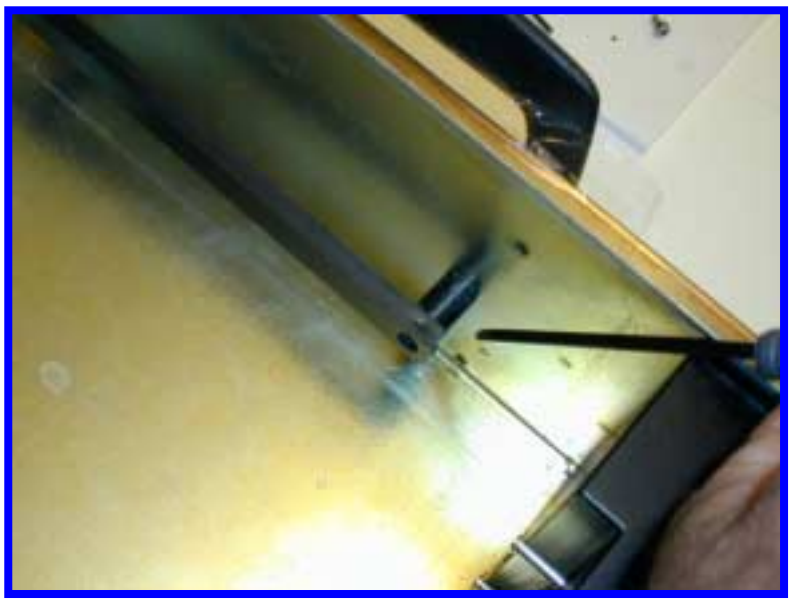


Figure 2

Figure 3

4.0 Trim Top Guide & Add Support

Remove top currency guide and trim to 210 mm as shown in Figure 4. Clean metal cassette lid and top currency guide in area labeled A with an alcohol wipe. Remove the release paper from the top rail support, and place the smaller end into the cut end of the top rail support. Screw the top rail support to the cassette lid while centering the cut end of the support in the lid. Press the rail support firmly to seat the adhesive tape.

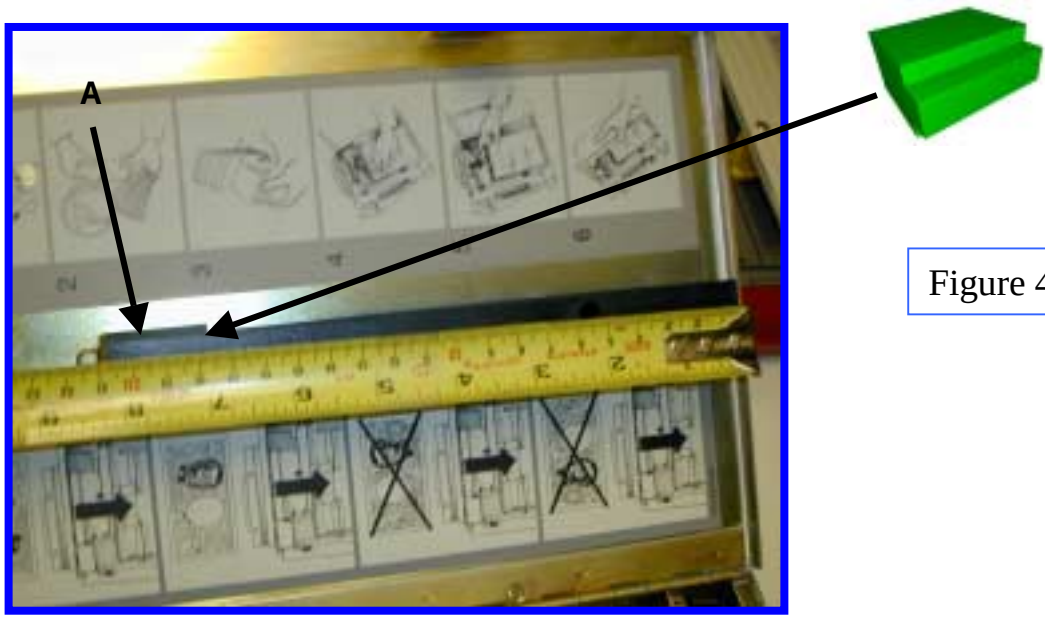


Figure 4

5.0 Remove Screws
Remove, and retain, the three securing screws, **B**, Figure 5.

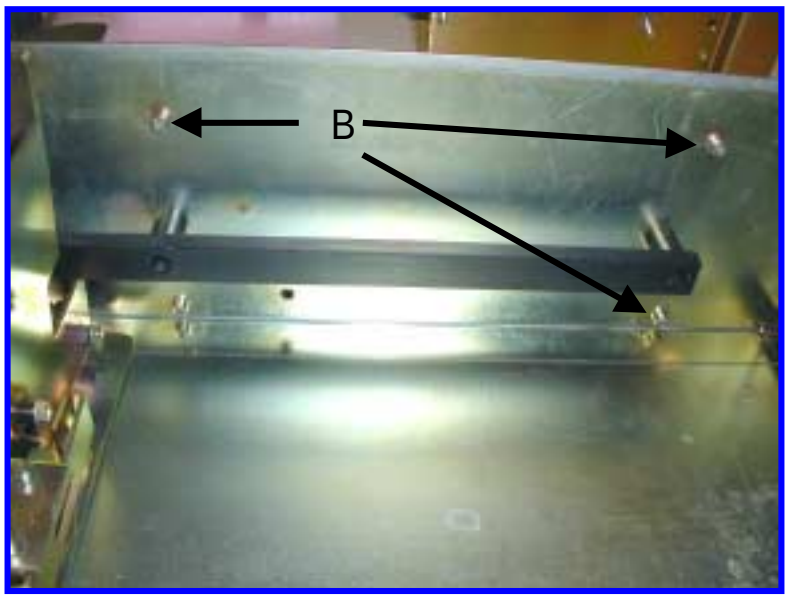


Figure 5

6.0 Prepare Bracket for Installation
Remove the four nuts and remove the CSU plastic cover. See Figure 6. Locate J3 (Firing circuit) and J4 (Power). Remove the red shunts and replace, bridging the two posts on each connector. Replace the plastic cover and securing nuts. Make certain that the two-wire electrical cable between the CSU electronics and the Ink Block is connected.

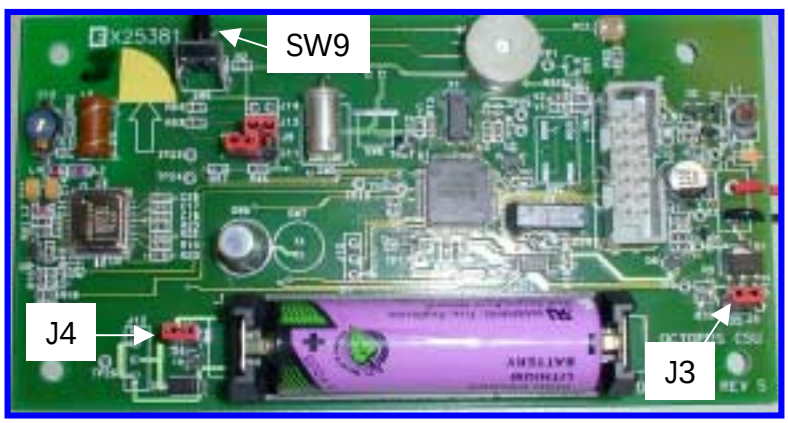


Figure 6

7.0Install Bracket Assembly

Install the Octopus bracket assembly into the cassette as shown in Figure 7. Slide the bracket forward to maximize the currency capacity, replace and tighten the three screws (Figure 8). Note: it may be easier to replace the screws if they are temporarily fixed the the tool tip with tape.

Slide the Currency Pressure Plate, close and open the cassette lid to make sure that there is no interference.

Figure 7

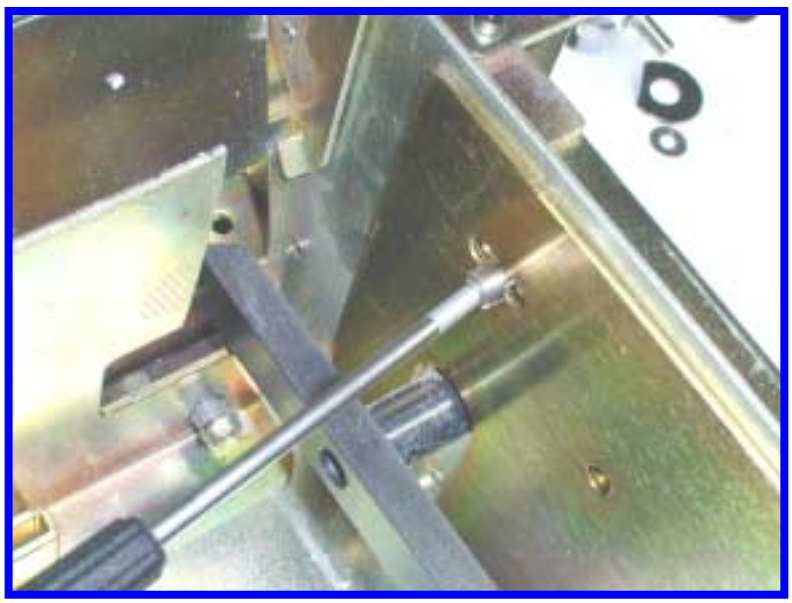


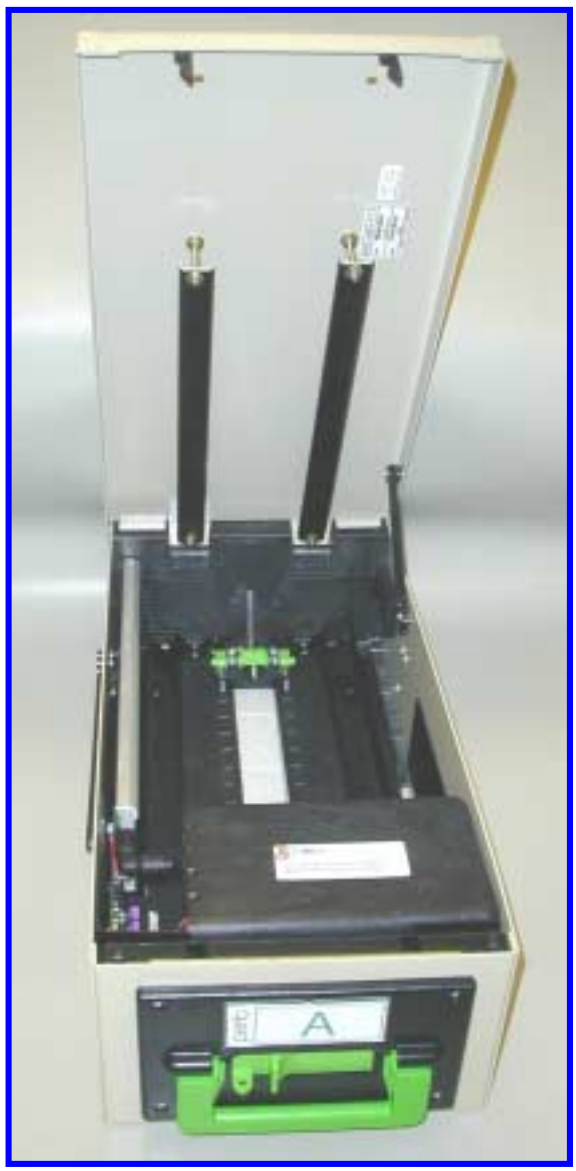
Figure 8

8.0 Test Electronics

Test the CSU electronics by depressing and releasing SW9 (Figure 7). One beep indicates that the CSU is fully functional. Two beeps indicates a failure and requires troubleshooting. Recheck cable connections and shunt connections (Section 6.0). This completes the installation

Appendix G

Octopus Installation Instructions for the Perto "A" C-130 Cassette



INFORMATION TO THE USER

Tools Required

The following tools(not included in the installation kit) may be required to install the Octopus ATM Defense system:

•Hand Grinder (Dremel™ Type) with cutoff saw, rotary file and ground burs.
•Common Screwdrivers
•Phillips Screwdrivers
•Razor Knife
•Hacksaw w/assorted blades
•Slip-Joint pliers
•Vice Grip, locking pliers

1.0 Introduction

Prior to bracket installation, the Perto Cassette must be modified to accept the Octopus ATM Defense System. The procedure includes trimming and cutting several existing cassette components.

2.0 Modify Currency Guides

Remove the left (looking from the front) currency guide. Remove 11 cm of the vertical portion flush with the horizontal portion (Figure 1).

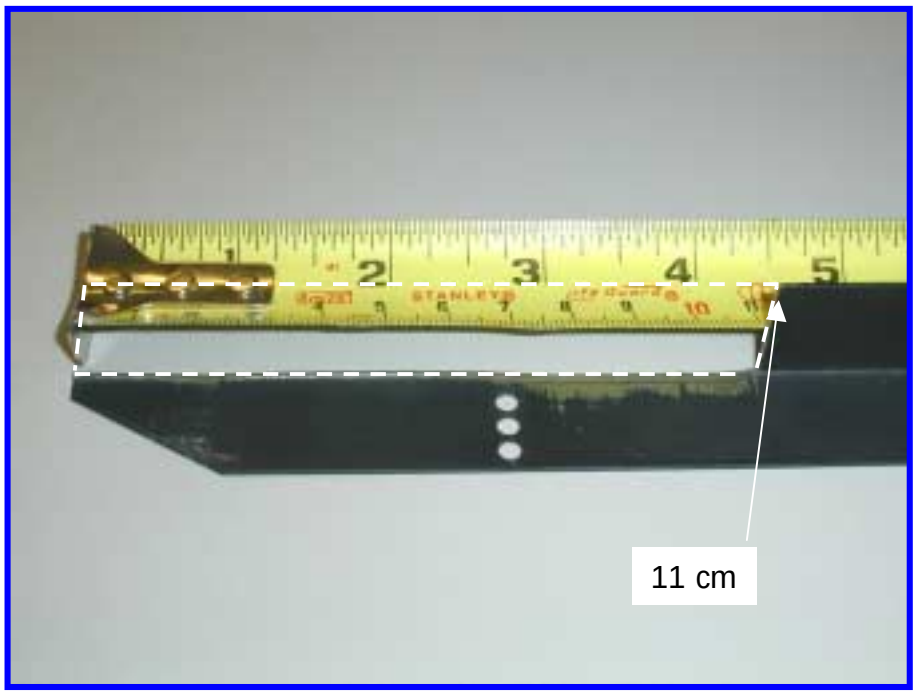


Figure 1

3.0 Modify Top Guide Length

Trim the top currency guide rails to 278 mm length (Figure 2).

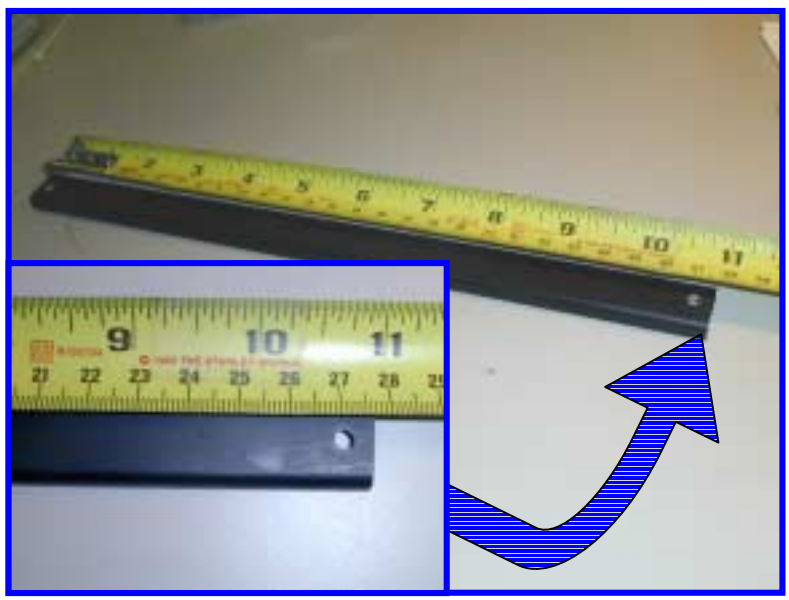


Figure 2

4.0 Drill Top Guides

Drill a 4 mm diameter centered hole 6 mm back from the cut end of the guide rail on both pieces (Figure 3).

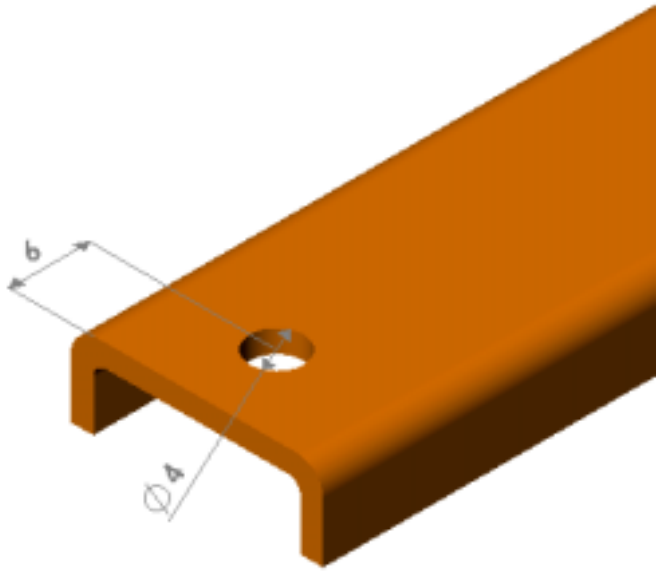


Figure 3

5.0 Drill Lid

Place the currency guides over the rear screws, making sure that the rails are parallel with the cover mark through the drilled hole onto the lid. Drill the holes through with a 4 mm drill bit (Figure 4).

Figure 4

6.0 Replace Top Guides

Reinstall the screws, washers nuts and guide rails. Adjust the height of the guide rails for the local currency.

7.0 Bracket Securing Screws

Remove and retain the four forward (leave the rear screws in place)screws holding the left and right external plastic guide rails (Figure 5).

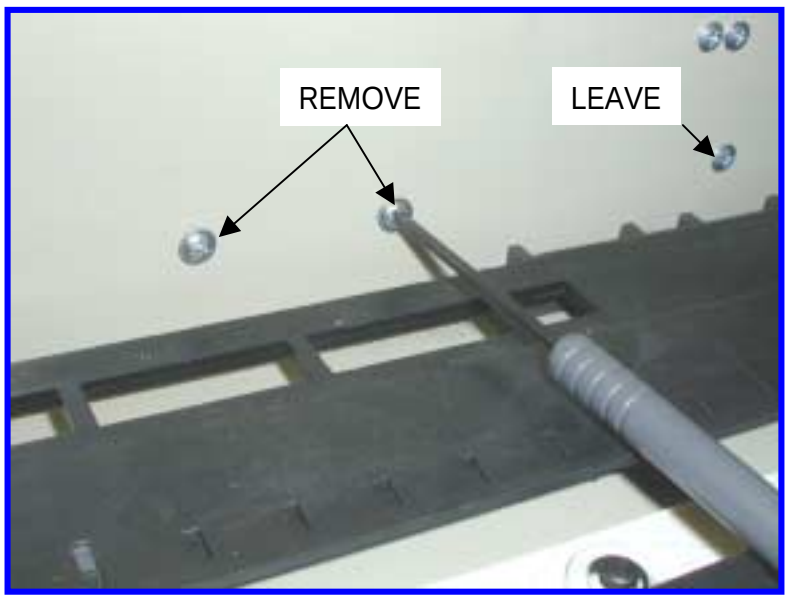


Figure 5

8.0 Bracket Preparation

Prepare the bracket and ink delivery system by removing the four nuts and the CSU plastic cover. Locate J3 (Firing circuit) and J4 (Power). Remove the red shunts and replace, bridging the two posts on each connector (Figure 6). Replace the plastic cover and securing nuts. Make certain that the two-wire electrical cable between the CSU electronics and the Ink Block is connected.

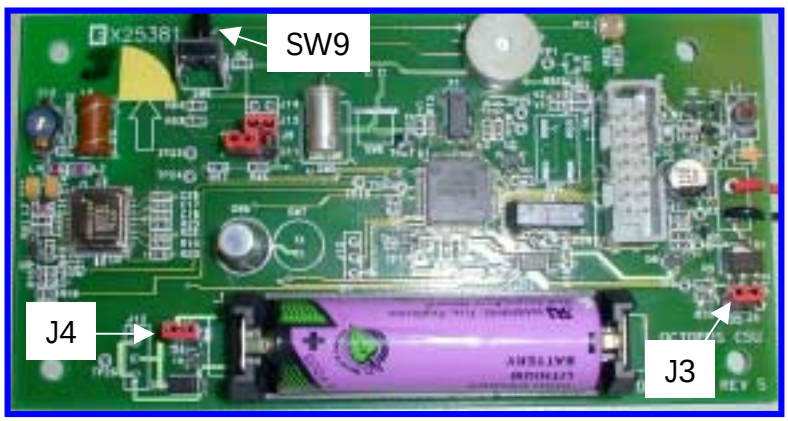
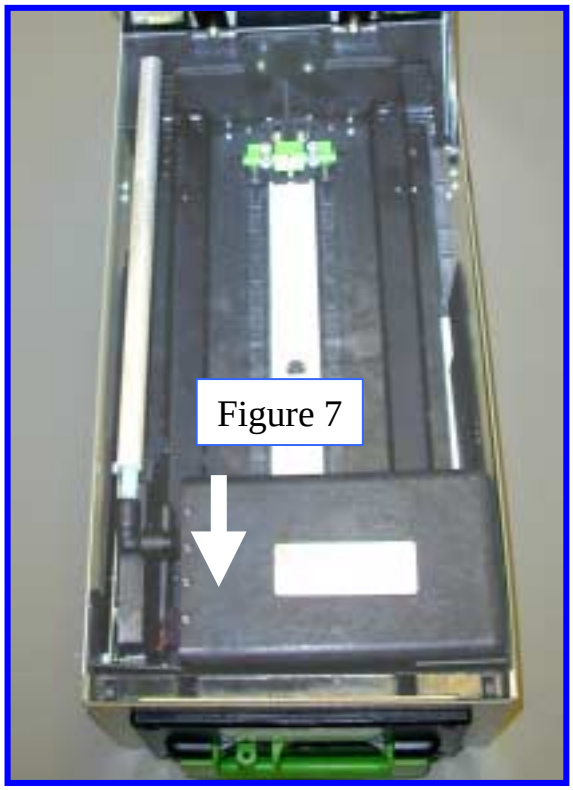
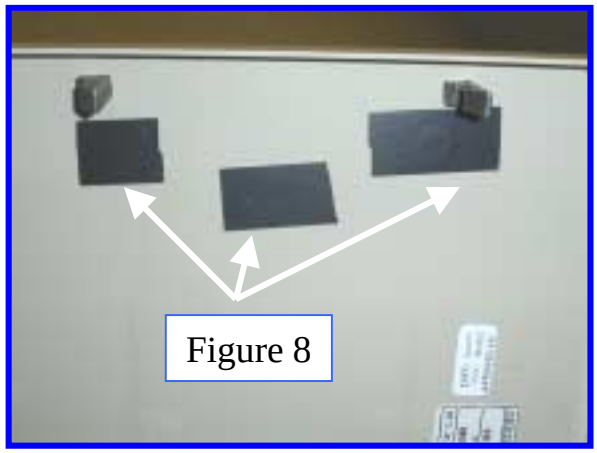


Figure 6

9.0 Install Bracket

Install the bracket assembly into the cassette with the bracket seated firmly on the bottom and positioned as far to the front of the cassette as possible (Figure 7). Replace the four screws to secure the bracket and external plastic guide rails.





10.0 Seal Lid Holes

Cover the three holes on the cassette lid with opaque tape (electrical tape) to shield the CSU light sensor when the lid is closed (Figure 8).

11.0 Check Fit

Close and open the lid several times to make sure that there is no mechanical interference.

12.0 Test Electronics

Test the CSU electronics by depressing and releasing SW9 (Figure 6). One beep indicates that the CSU is fully functional. Two beeps indicates a failure and requires troubleshooting. Recheck cable connections and shunt connections (Section 8.0)

Appendix H

Octopus Installation Instructions for the DeLaRue NMD Cassette

INFORMATION TO THE USER

Tools Required

The following tools(not included in the installation kit) may be required to install the Octopus ATM Defense system:

•Hand Grinder (Dremel™ Type) with cutoff saw, rotary file and ground burs.
•Common Screwdrivers
•Phillips Screwdrivers
•Razor Knife
•Hacksaw w/assorted blades
•Slip-Joint pliers
•Vice Grip, locking pliers

1.0 Introduction

Prior to bracket installation, the DeLaRue NMD Cassette must be modified to accept the Octopus ATM Defense System. The procedure includes trimming and cutting several existing cassette components.

2.0 Modify Guide Rails

Mark both aluminum guide rails at the edge of the plastic supports as shown in Figure 1.

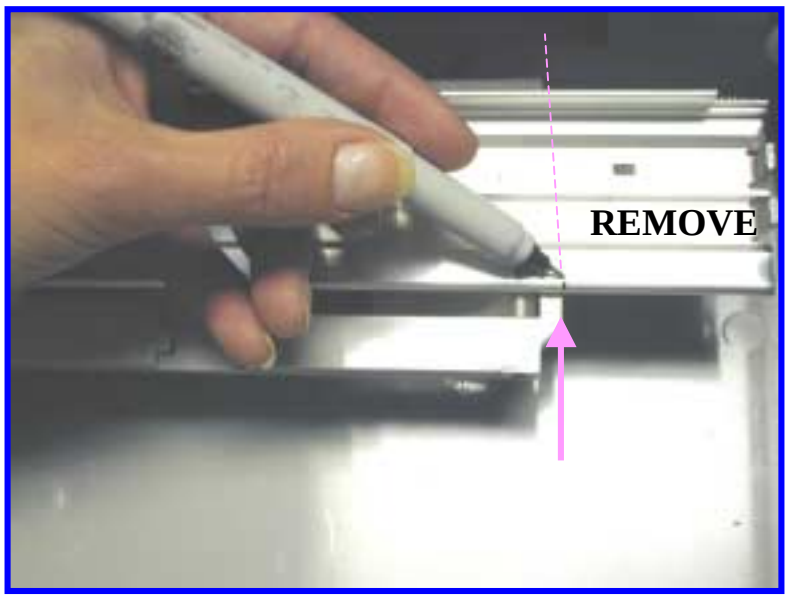


Figure 1

Remove the two aluminum currency guide rails and positioning springs and cut off the forward portion of the rails as marked in Figure 1.

Make an inset in the inside, front edge of the cut rails as shown 33 mm from the rear of the aluminum and 28 mm from the **INSIDE** edge as shown in Figure 2.

Figure 2

5.0 Modify Springs

Trim the straight spring extension and place a hook in the end as shown in Figure 3. This is to accommodate the shortened guide rail.

Figure 3

6.0 Re-install Guides

Replace currency guides and springs. Adjust separation and height for local currency size. Guide installation is shown in Figure 4.

Figure 4

7.0 Modify Currency Pressure Plate

Using a rotational cutter, modify the green plastic pressure plate (Figure 5). Temporarily place the spray bar and bracket in place to assure that there is no interference as the plate slides from from to back. The spray bar should be positioned within a few millimeters of the currency position.

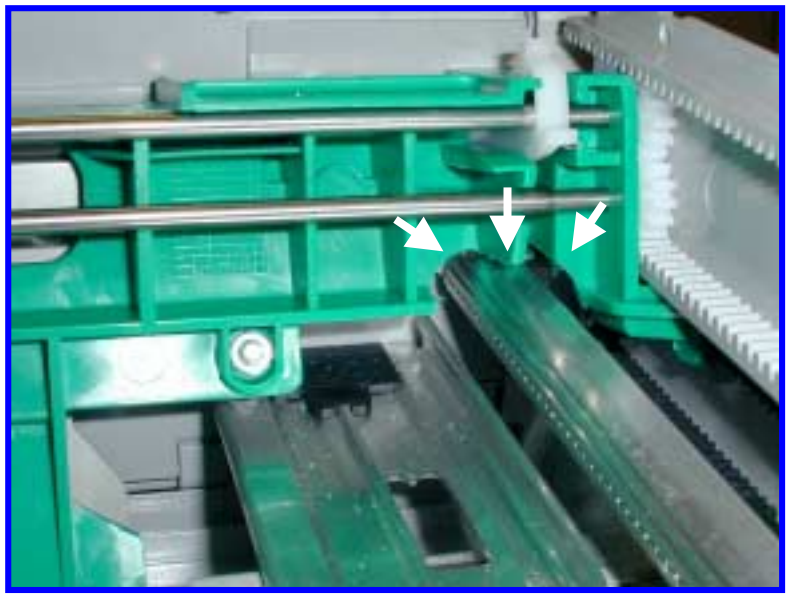


Figure 5

8.0 Prepare for Bracket Mounting Pad Installation

Place a small dot between the 20th and 21st tooth on the gear rack, both sides, as shown in Figure 6. Thoroughly clean the area between the dotted white lines with an alcohol wipe, both sides.

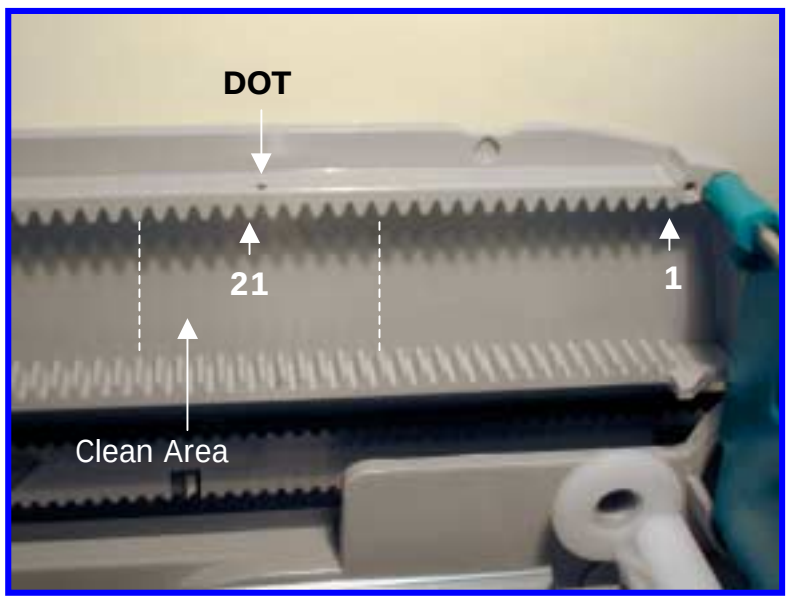


Figure 6

9.0 Install Bracket Mounting Pads

Remove the release backing from the Bracket Mounting Plates and mount the plates with the holes centered over the dots created in Section 8.0. See Figure 7.

Figure 7

10.0 Prepare Bracket for Installation

Prepare the bracket and ink delivery system by removing the four nuts and the CSU plastic cover. Locate J3 (Firing circuit) and J4 (Power). Remove the red shunts and replace, bridging the two posts on each connector (Figure 6). Replace the plastic cover and securing nuts. Make certain that the two-wire electrical cable between the CSU electronics and the Ink Block is connected (Figure 8).

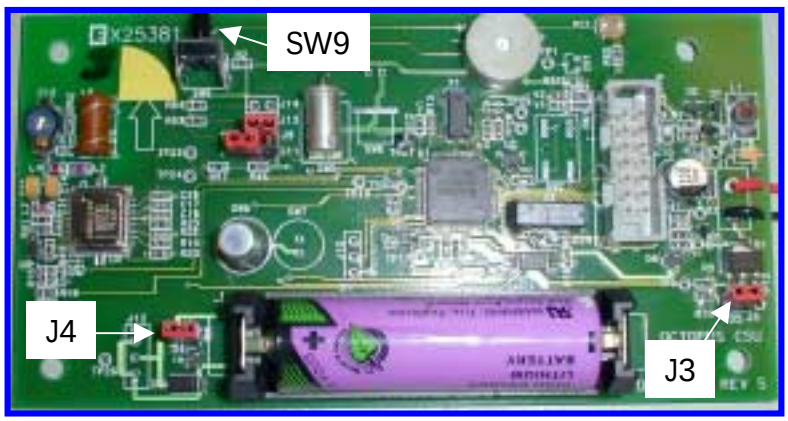


Figure 8

11.0 Clean Cassette Bracket Mounting area

Temporarily place the bracket assembly in the cassette(Figure 9) note where the bracket bottom flange touches the cassette bottom. Remove the bracket and thoroughly clean the area with the alcohol wipes.

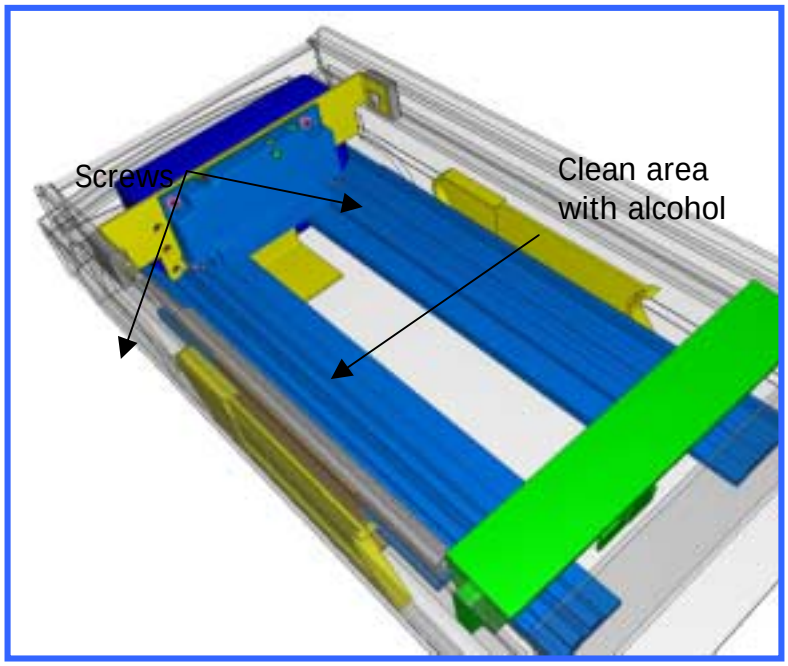


Figure 9

12.0 Install Bracket Assembly

Remove the release paper from bracket flange and install the bracket making sure that the bracket assembly clears the green latching mechanism on the front of the cassette. Install the two screws and tighten to secure the bracket.

13.0 Install Spray Bar Assembly (Figure 10)
Clean the area under the aluminum currency guides with alcohol. Remove the release paper from the spray bar bracket.
Connect the ink delivery tube (on the spray bar) to the quick-connect elbow fitting on the ink block. Make sure that the tube is fully inserted and locked into the fitting. Rotate the spray bar bracket legs around the aluminum currency guides and position the spray bar on the bottom of the cassette and firmly push down to seat. **Note: make sure that the spray bar clears the currency by 1 –2 mm.**

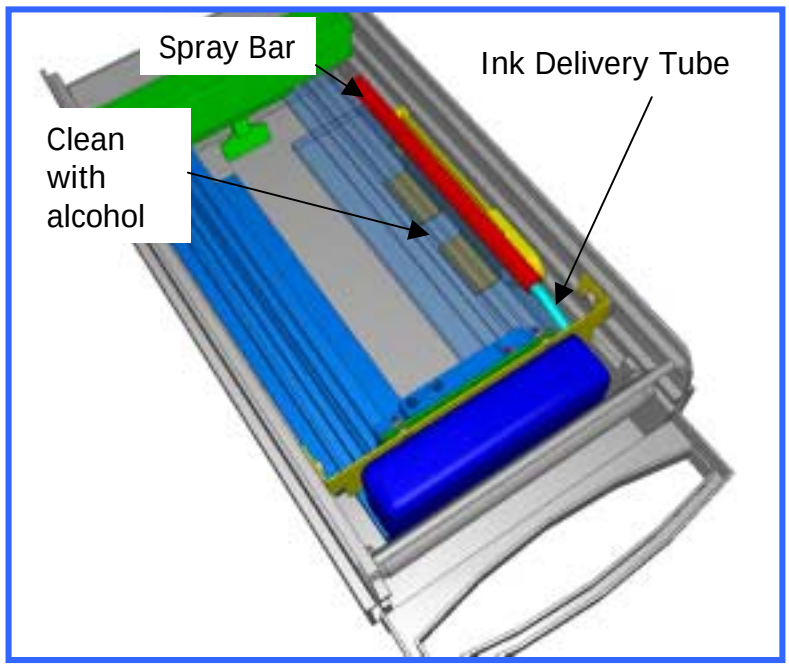


Figure 10

13.0 Check Fit

Close and open the lid several times to make sure that there is no mechanical interference.

12.0 Test Electronics
Test the CSU electronics by depressing and releasing SW9 (Figure 8). One beep indicates that the CSU is fully functional. Two beeps indicates a failure and requires troubleshooting. Recheck cable connections and shunt connections (Section 10.0)

Appendix I

Octopus Installation Instructions for the NCR Cassette

INFORMATION TO THE USER

Tools Required

The following tools(not included in the installation kit) may be required to install the Octopus ATM Defense system:

•Hand Grinder (Dremel™ Type) with cutoff saw, rotary file and ground burs.
•Common Screwdrivers
•Phillips Screwdrivers
•Razor Knife
•Hacksaw w/assorted blades
•Slip-Joint pliers
•Vice Grip, locking pliers
•4MM HEX Driver

1.0 Introduction

Prior to bracket installation, the NCR Cassette must be modified to accept the Octopus ATM Defense System. The procedure includes trimming and cutting several existing cassette components.

2.0 Modify cover

Remove the cover from the cassette. Remove the top currency guides and trim-off the **FRONT** portion of each to make the rails 265mm long (Figure 1).

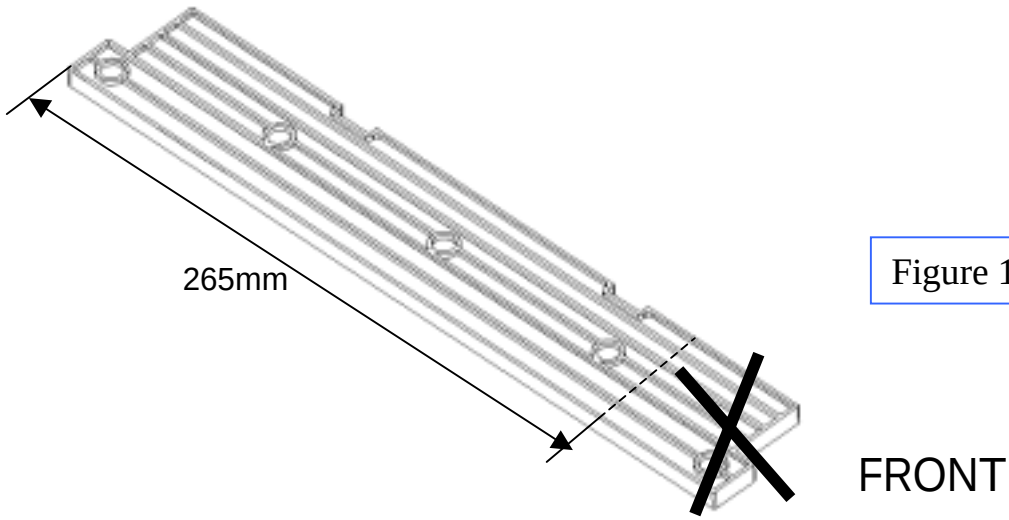


Figure 1

Referring to Figure 2, trim the outside edge of the rail identified to make the rail 37mm wide.

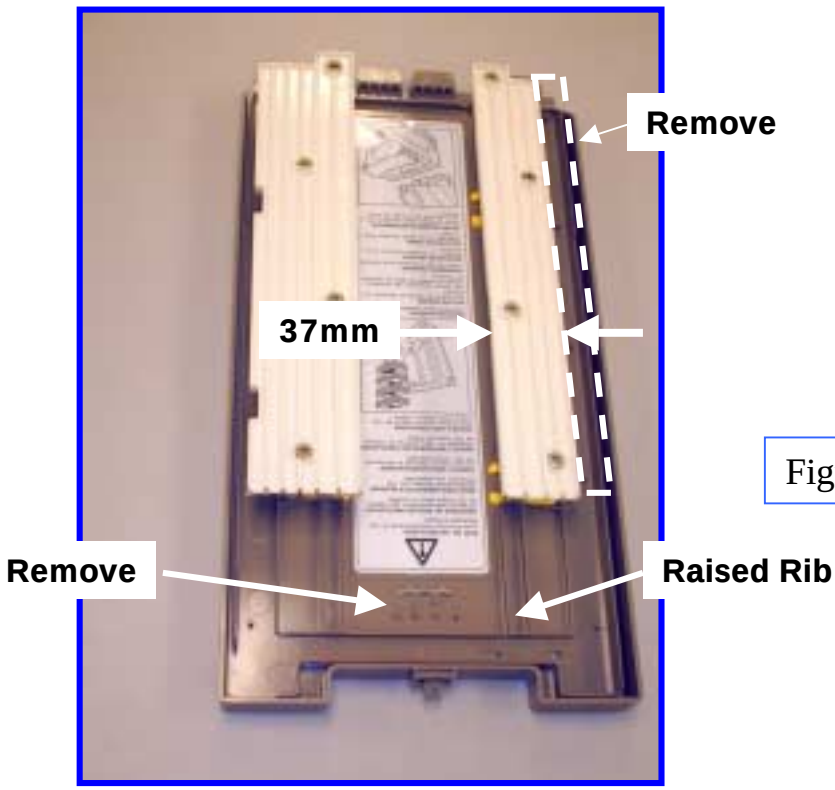


Figure 2

Remove enough of the center raised boss (Figure 2) until the boss is lower that the surrounding raised rib.

Reinstall top rail guides, this completes the cover modification.

3.0 Modify bottom guide

Remove the two, green, guide securing screws. Remove the right bottom currency guide and cut away 47mm of the front vertical portion flush with the horizontal portion (Figure 3).

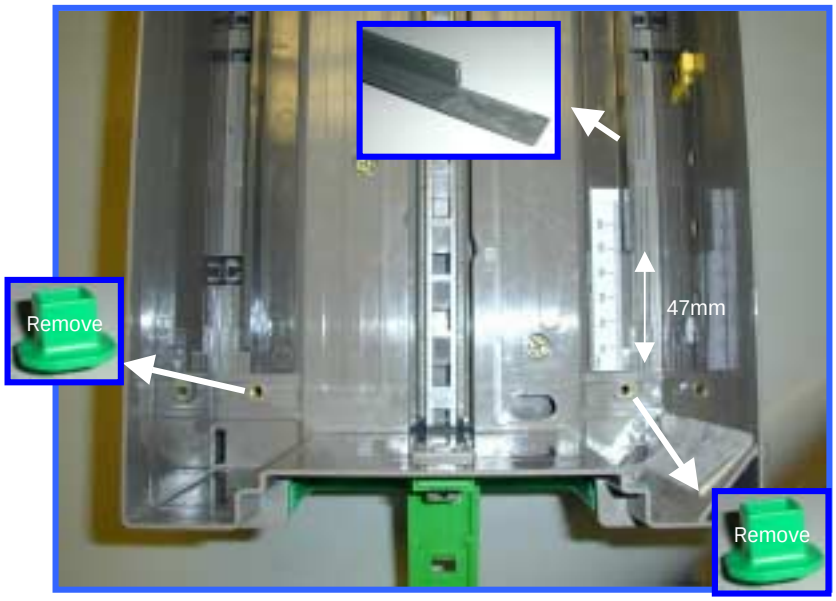


Figure 3

Reinstall the currency guides, do not reinstall green securing screws.

4.0 Clean Securing Pad Mounting Area

Thoroughly clean the area identified in Figure 4 with an alcohol wipe.

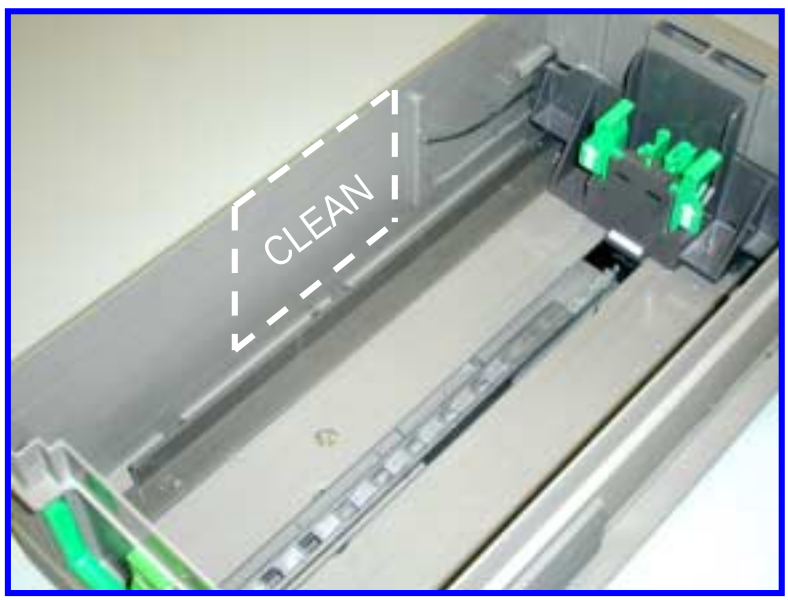


Figure 4

5.0 Install Side Securing Pad

Place the Octopus bracket in the cassette with the forward slotted holes centered over the 5mm tapped holes in the bottom (Figure 5).

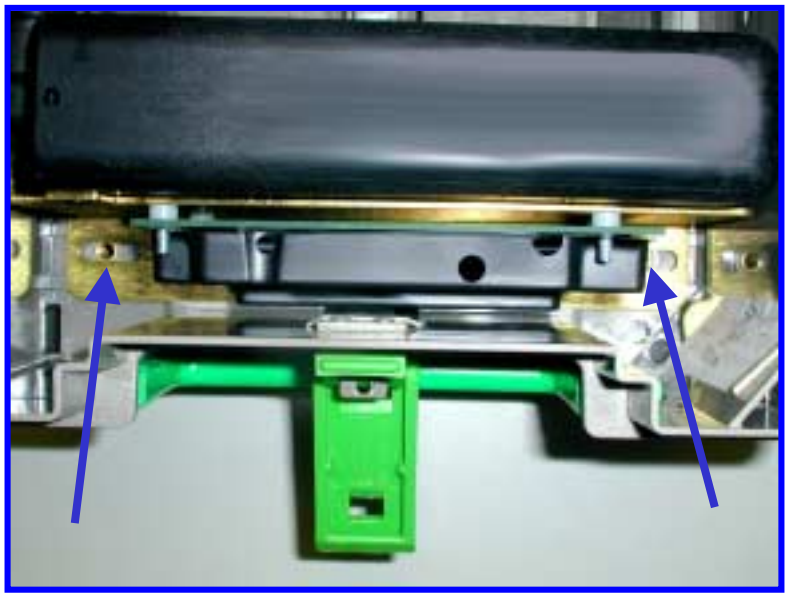


Figure 5

With the bracket aligned with the tapped holes, and making sure that the bracket is horizontal, place a mark on the cassette wall centered on the slotted hole in the bracket side under the spray bar (Figure 6).

Figure 6

Remove the bracket, remove the release paper from the securing pad and install with the hole centered over the marked dot on the cassette wall (Figure 7).

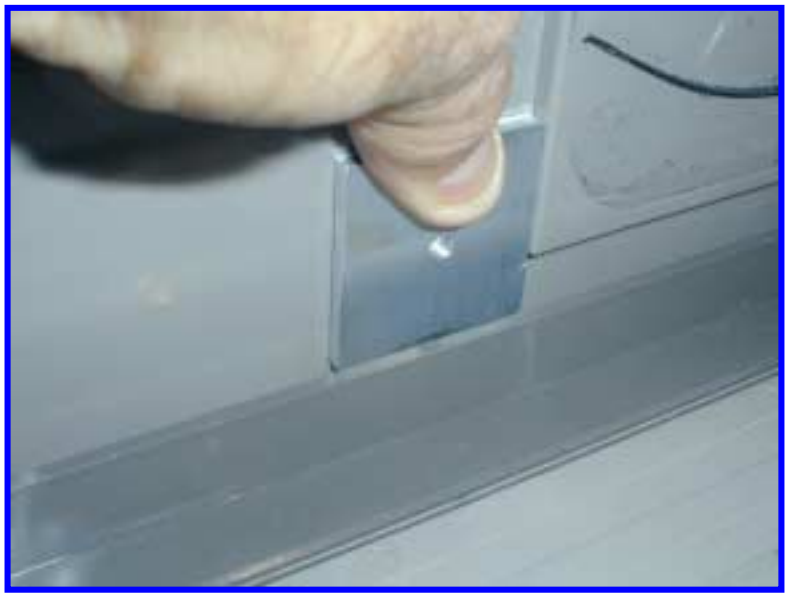


Figure 7

6.0 Prepare Bracket for Installation

Prepare the bracket and ink delivery system by removing the four nuts and the CSU plastic cover. Locate J3 (Firing circuit) and J4 (Power). Remove the red shunts and replace, bridging the two posts on each connector (Figure 8). Replace the plastic cover and securing nuts. Make certain that the two-wire electrical cable between the CSU electronics and the Ink Block is connected.

Figure 8

7.0 Install Bracket Assembly

Place the bracket in the cassette and install the two 5mm mounting screws through the slotted holes in the bracket front. Make sure that the bracket is adjusted to the left, touching the securing pad. Tighten the screws (Figure 9).

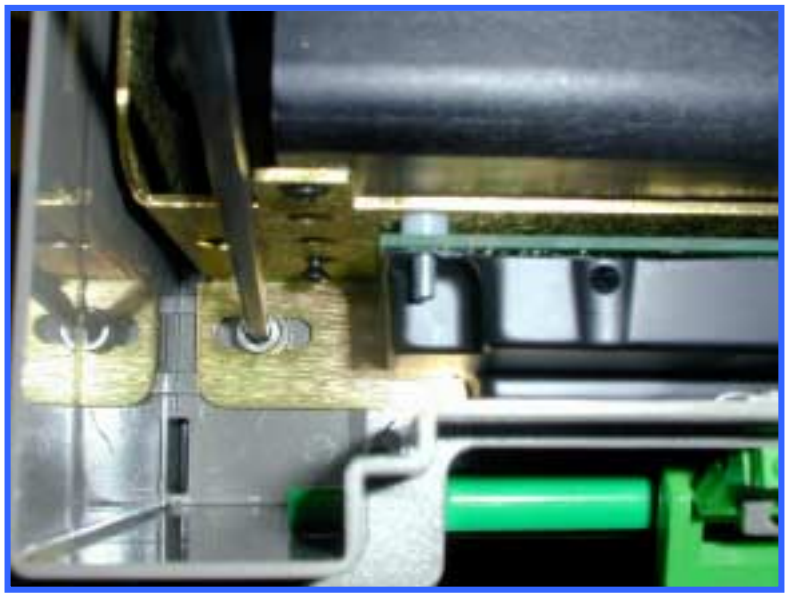


Figure 9

Using the 10-32 screw, attach the bracket to mounted securing pad (Figure 10).

Figure 10

8.0 Check Fit

Close and open the lid several times to make sure that there is no mechanical interference.

9.0 Test Electronics

Test the CSU electronics by depressing and releasing SW9 (Figure 8). One beep indicates that the CSU is fully functional. Two beeps indicates a failure and requires troubleshooting. Recheck cable connections and shunt connections (Section 6.0). This completes the installation

Appendix J

Mode Jumper Selection

On both the MCU and CSU two of jumpers provided to allow for selecting mode of operation. Addressed first is the H/V jumper. These jumpers are currently not populated.

If the H/V jumper is installed the unit must be placed horizontal with electronics facing downwards !

There are two other jumpers for selecting operating mode. On the MCU these jumpers are J25 and J26. On the CSU these jumpers are J13 and J14. In order to change these configurations the unit battery must be removed for a complete power-on reset. Table 5 below details the mode differences and Figure 6 shows the physical location of the jumpers on the MCU and CSU.

MCU Jumpers		**Mode**	**Differences from normal operation**
J25	**J26**		
off	off	LEVEL IV (US)	Operation as described within this document (US VERSION).
off	on	LEVEL III (CA)	Operation as described within Appendix J (LEVEL III CA VERSION)
on	off	LEVEL V (BZ)	Operation as described within Appendix K (LEVEL V BZ VERSION)
on	on	LEVEL II	OPERATION NOT DEFINED
CSU Jumpers			
J13	**J14**		
off	off	Normal	Operation as described within this document (US VERSION).
off	on	Not Assigned	
on	off	LEVEL V (BZ)	Operation as described within Appendix K (BRAZIL VERSION)
on	on	Not Assigned	

Table 5. Product Mode Configuration jumper settings.

NEED CLOSEUP PICTURE OF JUMPERS HERE

Appendix T

TEST MODE

I. Definitions:

Switch Terminal Markings

Normally Open, NO or N/O:	When the switch is not in an active state (plunger not depressed, switch not thrown, spring not tensioned). The resistance between the common terminal and the NO terminal, when measured with an Ohm-meter should be open.
Normally Closed, NC or N/C:	When the switch is not in an active state (plunger not depressed, switch not thrown, spring not tensioned). The resistance between the common terminal and the NC terminal, when measured with an Ohm-meter should be closed.
Common or COM	The terminal which has a common connection to either the NO or NC terminal when the switch is not active, and to the other terminal when the switch is a activated. This contact should always be used to connect the system ground.

Most mechanical switches whether they are NO or NC have both terminals available for connection.

II. General MCU Test Mode Operation:

1. Place unit in TEST mode by holding the POST button while powering the unit.
2. See page T7 for software flow diagram.
3. If unit is tilted beyond 50 degrees for 2 seconds it will beep 1 time.
4. If unit senses continuos motion for 15 seconds it will beep 2 times.
5. If there is a transition of light (dark to light, or light to dark) the unit will beep 3 times (if light sensor is installed and active).
6. If the unit senses thermal shock & senses temperature below 0 deg C or above 70 deg C the unit will beep 5 times.
7. If a sensor is activated (DOOR, BOLT, ALARM SUITE, BREACH, et al) the unit will display a hex code on the LEDs for the highest priority sensor which is active. This process can take ~ 1 second from event to display.
   Test Mode uses a hierarchy to manage multiple active inputs. This is not an assignment of importance; however, it will mask the lower priority inputs until higher priority inputs are cleared. See Table 3 for error code resolution.

   Available Sensor Array Cable Inputs:

Pin 1	**Manual Fire NC/Breach**
Pin 2	**Generic NO Input #2**
Pin 3	**Power Loss V++**
Pin 4	**Ground**
Pin 5	**ATM Door Switch**
Pin 6	**All Safe Signal**
Pin 7	**Generic NC Input #1**
Pin 8	**Generic NO Input #1**

   Terminal Block Inputs: (Referenced top-up, left to right)

Pin 1	**Generic NC Input #2**
Pin 2	**Ground**
Pin 3	**Power Loss V++**
Pin 4	**Manual Fire NC/Breach**
Pin 5	**ATM Door Switch**
Pin 6	**Ground**

8. If no sensors are active the unit will blink the red LED ~ 1 time per second: When the unit is received it will blink its red LED 1 time per second. ()
9. Power Loss detection can be enabled by applying 5 VDC to the power loss input on the terminal block or the sensor array cable.
10. Sensor array input NC_1 detection can be enabled by shorting pin 7 of the sensor array cable to pin 4.
11. Beeping and LED display can occur simultaneously.

12. Pressing the POST button while in Test mode releases the unit from test mode.

Procedure:

Cassette staining units should be complete and MCU position testing complete per installation instructions.

1. **Insure that all cassette staining units have their ink blocks disconnected. The ink block wiring must be replaced with a shorting shunt that was provided when the unit shipped. Without the shorting bars the CSUs will not pass self-test !**

2. Install all used sensor inputs to MCU. (Use caution to make sure polarity is correct as the system uses a common ground.)

SENSOR INPUT LOCATION	Octopus Level II (Canadian)	Octopus Level III (US)	Octopus Level V (Brazil)
ATM DOOR Terminal Block pin 5 & Ground pin 6. Or Array Cable pin 5 & Ground pin 4	**Required.** Connect to door contact switch.	**Required.** Connect to door contact switch.	**Required.** Connect to door contact Switch.
Generic NC input # 2 Terminal Block pin 1 & Ground pin 2.	**Required** Connect to bolt position indicator.	**Required** Will cause BIST error on POST.	**Required.** Connect to ATM alarm suite, alerts system only.
Generic NC input # 1 Array Cable pin 7 & Ground pin 4	**Optional** Does not cause BIST error on POST.	**Optional** Does not cause BIST error on POST.	**Required.** Connect to ATM alarm suite, alerts the system.
Generic NO input # 2 Array Cable pin 2 & Ground pin 4	**Optional** Does not cause BIST error on POST.	**Optional** Does not cause BIST error on POST.	**Required.** Connect to ATM alarm suite, alerts the system.
Generic NO input # 1 Array Cable pin 8 & Ground pin 4	**Optional.** Does not cause BIST error on POST.	**Optional.** Does not cause BIST error on POST.	**Required.** Connect to ATM alarm suite, alerts the system.
Power Loss input Terminal Block pin 3 & Ground pin 2. Or Array Cable pin 3 & Ground pin 4	**Optional.** Does not cause BIST error on POST.	**Optional.** Does not cause BIST error on POST.	**Required.** Connect to ATM alarm suite power output +5 VDC, alerts the system.
All Safe signal Array Cable pin 6 & Ground pin 4	**Optional.** Does not cause BIST error on POST.	**Optional.** Does not cause BIST error on POST.	**Required.** Connect to authorized opening detection, resets the system only.
Manual Fire NC/Breach Terminal Block pin 4 & Ground pin 2 or 6. Or Array Cable pin 1 & Ground pin 4	**Optional.** Will cause BIST error on POST.	**Required.** Will cause BIST error on POST.	**Required.** Terminal Block or Sensor Array Cable connected to breach sensor detection, fires the system. If unused Terminal block pin 4 must be shorted to ground with a buss strap.

Table 1. External sensor input selection table.

Required means that the input must be provided for either by installation of the sensor or using the provided buss-bar to short the contacts. Required contacts are monitored by the BIST errors during POST.
Optional means that input may be used; however, no BIST error will occur if contact is mis-wired.

All inputs are testable using the test mode.

3. Activate or select function for onboard sensors.

ON BOARD SENSOR	Canadian	U.S.	Brazil
Light Sensor	**Not placed**	**Not placed**	**Required** Function selected by jumper on J2
Tilt Sensor	**Required** Built in	**Required** Built in	**Required** Built in
Thermal Sensor	**Required** Built in	**Required** Built in	**Required** Built in
Motion Sensor	**Optional** Function selected by jumper on J24. The default condition is motion enabled.	**Optional** Function selected by jumper on J24. The default condition is motion enabled	**Optional** Function selected by jumper on J24. The default condition is motion enabled

Table 2. On-board sensor input selection table.

4. Pull the signal wires to a convenient place for testing the operation of the system. Depending on the configuration of the switch the mechanical contacts to be used should be the common connection (usually marked COM) and the N/O connection (usually marked NO or N/O).

   In cases where the indicator switch must be closed (activated) when the door is open the normally closed contact (usually marked NC or N/C).

5. To place the unit into TEST mode, hold down the Press-To-Test-Button while removing and reinstalling the power jumper. Unit will beep 5 times quickly to signal the mode. If the light sensor is attached the unit will see light and beep three times. This mode will last 10 minutes unless the user presses the POST button to release the unit to normal mode.

6. In its shipped configuration, a buss-bar will be shorting the Manual Fire/Breach input and the Generic NC input 2. If the unit has no connections or if all connections are in normal STANDBY mode configuration the unit will blink its red LED 1 time per second. ()

   TEST MODE LASTS FOR 10 MINUTES. If during the test the red LED stops blinking, you must remove the cover, and hold the Press-To-Test-Button while removing/re-installing the power jumper.

7. If any sensor is not in normal condition the LED will display a hex code of the highest priority sensor. With the following exceptions:
   a) Power Loss Detection is not enabled unless +2 to5 VDC is first applied between terminal block position 3 and ground (position 2 or 6).
   b) Generic NC input #1 is ignored unless the Generic NC input # 1 is enabled is enabled by first shorting pin 7 to pin 4 on the sensor array cable.

   Power detection and Generic NC input # 1 must be re-enabled each time the unit is placed in test mode.

   If Power Detection is enabled and all inputs except the shorting bar are removed  is displayed.
   If Generic NC 1 is used is and all inputs except the shorting bar are removed  is displayed.

8. Using table 3 below resolve any improper configuration.

The system is wants to see the default STANDBY Mode conditions:

- Door Open
- Generic NC input 2 open
- Manual Fire NC/Breach Closed (buss-bar)
- Generic NC input 1 closed if sensor array inputs are used (see step 7).
- +2 to 5 VDC on Power Loss input either terminal block or sensor array cable if power detection is to be used (see step 7).

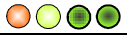
Priority	LED Code	HEX	Active Sensor Detected	Expected Input w/ system deactivated.
1	1101 	0xD	ATM_DOOR	Normally Open contact input from door switch.
2	1100 	0xC	Generic NC input 2 (Terminal Block Only)	Open contact input when bolt is open or system is in standby – no alarm exists
3	1110 	0xE	Generic NO input 2	Closed contact input when system is in standby – no alarm exists
4	1011 	0xB	Generic NO input 1	Closed contact input when system is in standby – no alarm exists
5	0101 	0x5	All Safe Signal	Open contact input when system in standby for test mode only. Signal transition from closed to open condition activates this input. LEDs will blink on for ~ 1 second every time a transition occurs.
6	1111 	0xF	Manual Fire	Closed contact input Closed contact input when system is in standby – no breach.
7	1001 	0x9	Generic NC input 1	Open contact input when system is in standby – no alarm exists. Must be activated to display.
8	1010 	0xA	Power Loss	+5 VDC and ground reference. Must be activated by applying +5VDC to terminal block pin 3 and ground. LEDs, will blink on/off in 1 second intervals while power is not connected,

Table 3. Test Mode LED Display Table.
 = Red LED on,  = Red LED off ,  = Green LED on, and  = Green LED off.

9. Once the unit is properly configured, display of 0x9 hexadecimal , ( , 1001) to indicate that Generic NC input 1 is not closed or by blinking LED . With the inputs in this condition, an input / output test can be performed and verified using the LEDs.

10. Activate any sensor input (close if open, open if closed) and the view the hex code associated with that sensor. Use Table 3 to identify the highest priority sensor which is active.

    If the Manual Fire is activated it will close the alarm contacts so that the siren or external strobe can be tested.

11. Tilt the unit beyond 50 degrees and hear 1 beep to indicate tilt.

12. Shake, tap, or vibrate unit for 15 seconds and hear 2 beeps to indicate motion.

13. Cover or expose the light sensor (if available) and hear 3 beeps to indicate light transition.

14. Heat or freeze the unit and here 5 beeps to indicate thermal violation.

Unit may be released out of test mode by:

a) Removing/re-installing the power jumper while not pressing the POST button
b) Pressing the POST button.
c) Waiting for it to time out ~ 10 minutes.

15. When released from test mode, the unit will beep 10 times to notify operator of mode transition.

16. When the unit leaves test mode it will return to standby mode if the door sensor is not active. If the door contact is active, the unit will progress to discovery, error testing, and arming the system.

    ***For Level II (Canada operation) Functionality both the Generic NC input # 2 (bolt position) and the door contact must be active (closed) to arm the system.

II. General CSU Test Mode Operation.

1. Place unit in Test mode by holding the POST button while powering the unit.
2. If unit is tilted beyond 50 degrees for 2 seconds it will beep 1 time.
3. If the squib jumper is not shorted or the Disable Squib jumper is not placed, the unit will beep 2 times.
4. If there is a transition of light (dark to light, or light to dark) the unit will beep 3 times (if light sensor is installed and active).
5. If the unit senses thermal shock or senses temperature below 0 deg C or above 72 deg C the unit will beep 5 times.

Available Test Inputs:

Tilt
Thermal shock
Squib shorted or Disable squib jumper missing
Light sensor

6. If no sensors are active the unit will do nothing.
7. Pressing the POST button while in Test mode releases the unit from test mode.

Procedure:

Cassette staining units should be complete and MCU position testing complete per installation instructions.

1. Insure that all cassette staining units have their ink blocks disconnected. The ink block wiring must be replaced with a shorting shunt that was provided when the unit shipped. Without the shorting bars the CSUs will not pass self-test.

2. Activate or select function for onboard sensors.

ON BOARD SENSOR	Canadian	U.S.	Brazil
Light Sensor	**Optional** Function selected by jumper on J8. The default condition is light enabled. Armed unit will not fire on light detection.	**Optional** Function selected by jumper on J8. The default condition is light enabled. Armed unit will not fire on light detection.	**Optional** Function selected by jumper on J8. The default condition is light enabled. Armed unit will fire on light detection.
Tilt Sensor	**Required** Built in	**Required** Built in	**Required** Built in
Thermal Sensor	**Required** Built in	**Required** Built in	**Required** Built in
Disable Squib	**Required** Default is jumper J3 installed. And squib wires connected to the ink block or shorting bar.	**Required** Default is jumper J3 installed. And squib wires connected to the ink block or shorting bar.	**Required** Default is jumper J3 installed. And squib wires connected to the ink block or shorting bar.

Table 4. On-board sensor input selection table.

3. To place the unit into TEST mode, hold down the Press-To-Test-Button while removing and reinstalling the power jumper. Unit will beep 5 times quickly to signal the mode. If the light sensor is attached the unit will see light and beep three times. This mode will last 10 minutes unless the user presses the POST button to release the unit to normal mode.

4. If all sensors are correctly configured (and the unit is in the correct orientation) the unit will do nothing.

TEST MODE LASTS FOR 10 MINUTES.
If during the test the red LED stops blinking, you must remove the cover, and hold the Press-To-Test-Button while removing/re-installing the power jumper.

The system is wants to see the default STANDBY Mode conditions.

- Light sensor enabled with light detected or disabled.
- Squib wire shorted and Disable Squib jumper installed.
- Unit in correct orientation (H/V)
- Temperature between 0 to +70 ºC

5. Tilt the unit beyond 50 degrees and hear 1 beep to indicate tilt.

6. Remove shorting bar from Squib wire or Remove Disable Squib Jumper (J32) and hear 2 beeps to indicate system disabled.

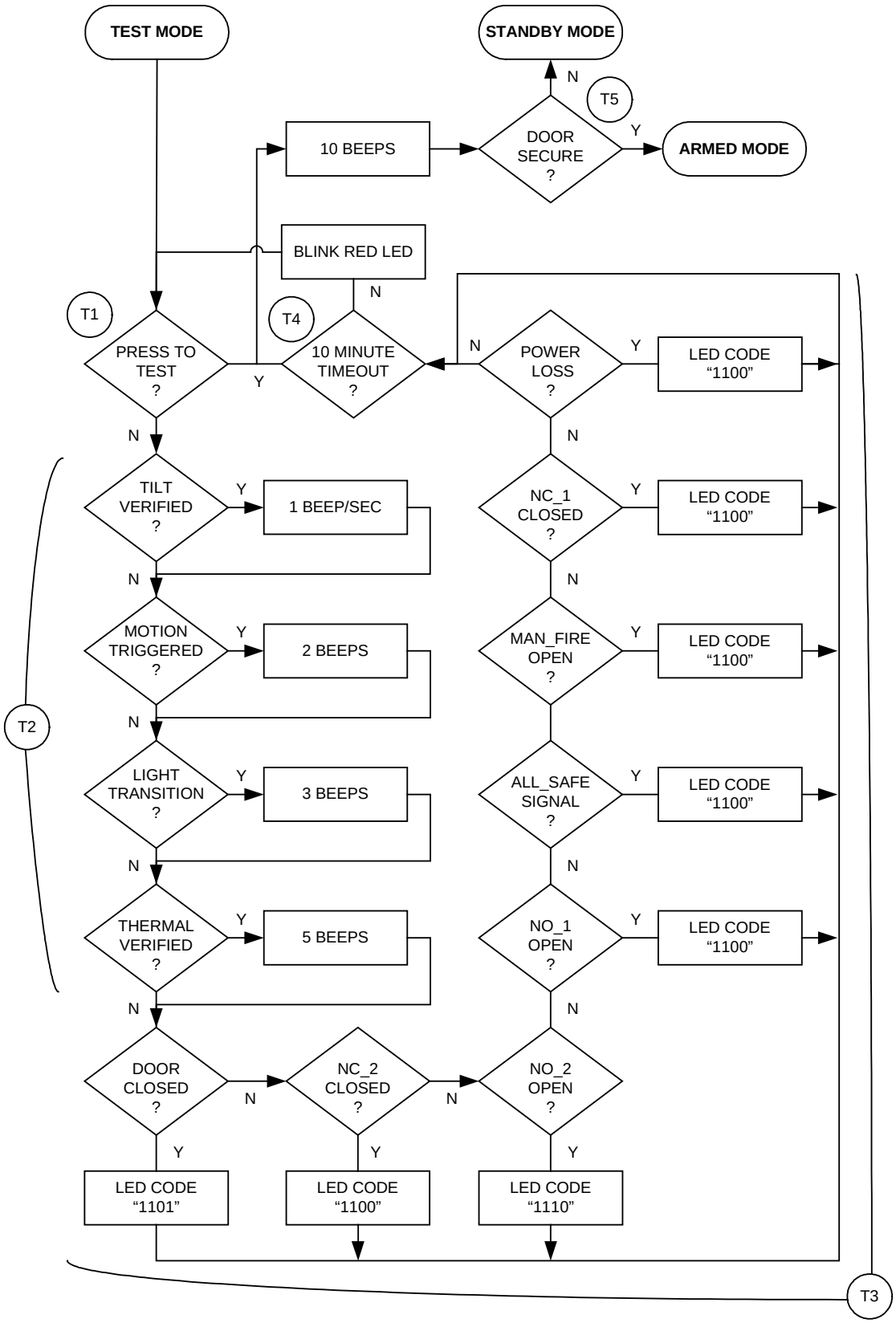
7. Cover or expose the light sensor (if enabled) and hear 3 beeps to indicate light transition.

8. Heat or freeze the unit and here 5 beeps to indicate thermal violation.

Unit may be released out of test mode by:
a) Removing/re-installing the power jumper while not pressing the POST button
b) Pressing the POST button.
c) Waiting for it to time out ~ 10 minutes.

9. When released from test mode, the unit will beep 10 times to notify operator of mode transition.

10. When the unit leaves test mode it will return to STANDBY mode.



TEST mode software flow diagram.