

13 - DATA ACQUISITION AND INVENTORY MANAGEMENT

Title: Data Acquisition and Inventory Management **Doc. No.** 2015-MMTS-13

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NOTE: This document will be reviewed at least annually to ensure its suitability.

Revision History

Rev. No.	Change description	Author
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)
	Saber Engineering – 212057 Mercury Transfer Operation and Maintenance Manual, Revision 1.0, December 22 2013
	Video describing MMTS data acquisition system

13.1 PURPOSE

This procedure describes operations related to the MMTS data acquisition system.

13.2 SCOPE

This procedure covers the following types of activities related to operation and data archiving for the data acquisition system:

- Data acquisition system operation.
- Data archiving and backup.
- Report creation

13.3 OPERATIONS

13.3.1 Pre-Operations Check

Because the data acquisition system continuously monitors facility environmental conditions as well as process progress, it should be in operation at all times except during system maintenance or repair. At the start of a workday, the Facility Manager performs the following actions:

- Confirms that the computers for PCDAS and the MMS are turned on and the computer displays are working.
- If the computers are off, power up the systems by following the instructions in Section 13.5 on page 13-19.
- Inputs his name on the USERS screen under SUPERVISOR NAMES (see Section 13.5, page 13-10). Inputs the name of all MMTS staff present under STAFF NAMES.
- If the systems do not respond as expected, notify the Facility Manager who will contact Maintenance to correct the problem if he/she is unable to resolve the concern.

At the start of workday, a Flask Handling Area worker performs the following actions:

- Retrieves a wireless handheld data input unit and touches the screen to gain access. Verifies that the PCDAS input screen is present (an image of the input screen is shown in Section 13.5 on page 13-21).
 - If the input screen fails to appear, turns on the wireless handheld data input unit; checks for sufficient battery reserve; and initiates the PCDAS application by following the instructions in Section 13.5 on pages 13-19 through 13-21.
 - If the battery reserve is insufficient to turn on or to complete a full day of operations, attaches the wireless handheld data input unit to a charger and repeats the verification process with another wireless handheld data input unit.
- Verify that process equipment is in a safe and ready condition to begin operations.

NOTE: The Facility Manager shall be notified if any of the above checks are not satisfactorily met and cannot be corrected by the data acquisition system operator.

13.3.2 Data Acquisition and Control System Operation

The data acquisition and control system for the MMTS monitors local environmental conditions as well as manages all process control necessary to support mercury transfer operations and material inventory. Environmental monitoring includes 16 channels of mercury concentration in air, inside and outside temperature and humidity, and barometric pressure. MMTS process monitoring and control includes 1-MT container weighing during mercury transfer operations, mercury transfer pump monitoring and control, and any process annunciators to alarm off-normal conditions.

A camera monitoring system and a fire protection and security system exist to support the facility. However, they function completely independently of the data acquisition and control system. The fire protection and security system is part of the MMTS and HWAD site monitoring. The camera system operates as a standalone system. The camera system provides multiple views back to a dedicated computer in the Facility Manager's office (Computer Area).

13.3.3 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

- Sixteen (16) sensors/data recorders for mercury concentration in air
- Environmental data logging system [inside and outside thermometers and humidity and barometric pressure(equal inside and outside)]
- Process monitoring and control includes weight sensors/recorders for two scales
- Mercury transfer pump sensor

Process annunciators

13.3.4 Maintenance

- Maintenance on PCDAS should be performed as directed by and to the schedule suggested in the manufacturer's operation and maintenance manual (see reference in Section 13).
- The Facility Manager or designee should shut down the PCDAS and MMS, including the computers, prior to maintenance or power outage by following the instructions in Section 13.5 on pages 13-17 and 13-18.
- Following maintenance or power outage, the Facility Manager or designee should restore power to the PCDAS and MMS by following the instruction in Section 13.5 on page 13-19.

13.4 RECORDS

The data acquisition system can generate reports from the records it collects automatically (see description of data acquired in Section 13.2) and the data input into it. The reports may be generated from the PCDAS computer in the Computer Area. The Facility Manager or designee accesses the computer screen shown in Section 13.5 on page 13-9. Instructions for creating a new report or retrieving a previously created report are given in Section 13.5 on page 13-16.

The details of the two report types (summary and detailed) are given below.

- Weekly/monthly summary report
 1. Reporting period – accumulated weekly and reports generated as needed.
 2. Amount of mercury transferred from 3-L to 1-MT containers during the reporting period.
 3. Number of 1-MT containers filled during the reporting period.
 4. The specific warehouse(s) receiving 1-MT containers and the number of 1-MT containers received during the reporting period.
 5. The specific warehouses(s) contributing 3-L containers, drums and pallets and the number of each removed during the reporting period – make a note of any deviations from six flasks per drum and five drums per pallet.
 6. Maximum and minimum environmental parameters measured during the reporting period with the date and time of each measurement (timestamps).
 7. Maximum and minimum mercury concentrations measured during the reporting period with timestamps.
 8. Summary of any unexpected/off-normal events that occurred during the reporting period with timestamps (where possible) and all personnel involved.
- Weekly/monthly detailed report
 1. Reporting period – accumulated weekly and reports generated as needed.
 2. Amounts of total and daily transfers of mercury from 3-L to 1-MT containers during the reporting period.
 3. Total and daily number of 1-MT containers filled during the reporting period.
 4. Mercury content of each of the 14 warehouses at the beginning and end of the reporting period, designate any buffer stocks in Building 110-66 as such.
 5. The specific warehouses(s) contributing 3-L containers, drums and pallets and the number of each removed during the reporting period – make a note of any deviations from six flasks per drum and five drums per pallet – list drum and pallet numbers with timestamps – present incremental (time period) and total datasets.
 6. The specific warehouse, the drip tray locations within the warehouses [locations should be equivalent between warehouses (e.g., 110-52-1 should be at the same relative location as 110-93-1)] and number of 1-MT containers on each drip tray, including timestamps – present incremental (time period) and total datasets.

7. Daily maximum and minimum environmental parameters with timestamps.
8. Daily maximum and minimum mercury concentrations with timestamps.
9. Detailed explanation of any unexpected/off-normal events that occurred during the reporting period with timestamps (where possible) and all personnel involved.

The data acquisition system is designed to run periodic operating system backups and data archiving. Operating information is provided in the Saber operation and maintenance manual and in the video featuring the representative of the data acquisition system supplier.

13.5 ATTACHMENTS

Excerpted pages 6-22 of 28 from the Developer's Operation and Maintenance manual

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6 GUI Interface

There are 4 pages available to the operator for system control and reporting control.

Main
Trend
Alarms
Reports

6.1 Main

The main screen is where the operator will enter information for transferring MT's and filling MT containers.

There are three operations that happen on the Main screen

Transferring MT's to warehouses
Listing the names of current users
Filling MT's

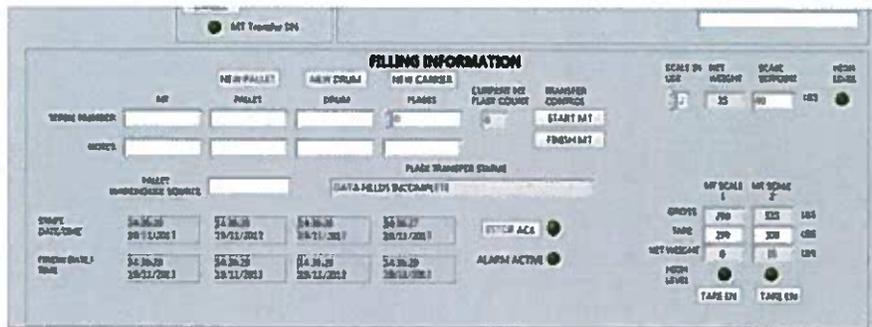
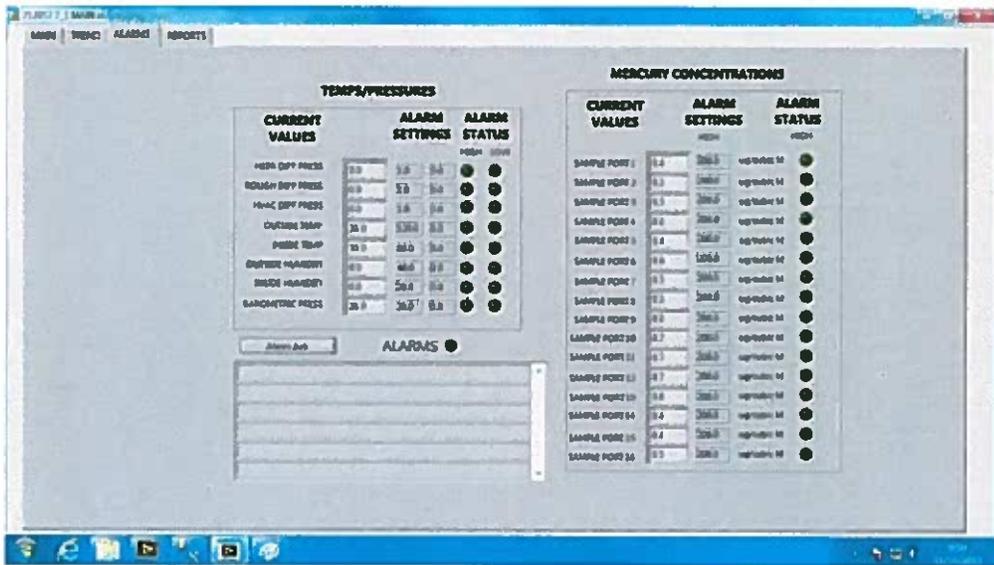
Transferring MT's and Listing Staff Names

The screenshot displays a software interface with a top navigation bar containing 'MAIN', 'TREND', 'ALARMS', and 'REPORTS'. The 'MAIN' section is active. On the left, there is a 'STOP APPLS TOG' button. The main area is divided into two panels: 'MT TRANSFER' and 'USERS'. The 'MT TRANSFER' panel includes a 'STOP APPLS TOG' button, a 'START DATE TIME' field with '08-15-12' and '08:15:00', a 'DESTINATION' field with '114 57', and an 'MT DESTINATION BY GWHOUSE' field with '78'. Below these is an 'ENABLE' button and a radio button labeled 'MT Transfer ON'. The 'USERS' panel shows a 'CURRENT DATE TIME' field with '08/15/2012 20:11:22'. It contains three columns of input fields: 'SUPERVISOR NAMES', 'PHONE NAMES', and 'STAFF NAMES', each with three empty rows. At the bottom of the interface, the text 'FILLING INFORMATION' is visible.

Filling MT's

6.2 Alarms

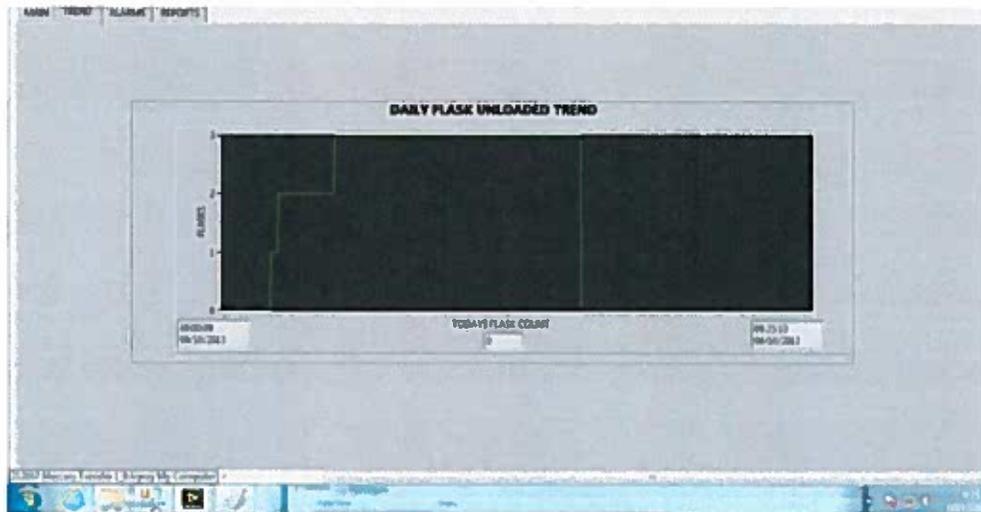
The alarm screen provides feedback for the user to identify if a measured value is out of range. It also provides access to the user to set the limits of the alarms and provides the current value of the measured variable. Also available on the alarms screen is a list of alarms that have occurred.



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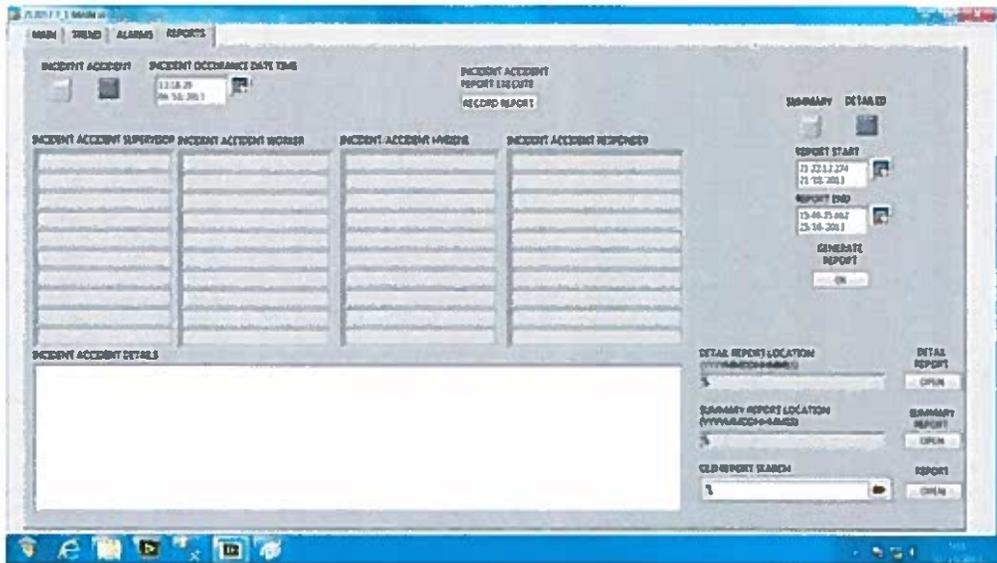
6.3 Trending

The trending screen displays how many flasks have been transferred in the last 24hrs. The current daily flask count is also displayed at the bottom of the screen.



6.4 Reports

The reports screen allows the user to create a incident/accident report as well as generate a report from the transfer data.

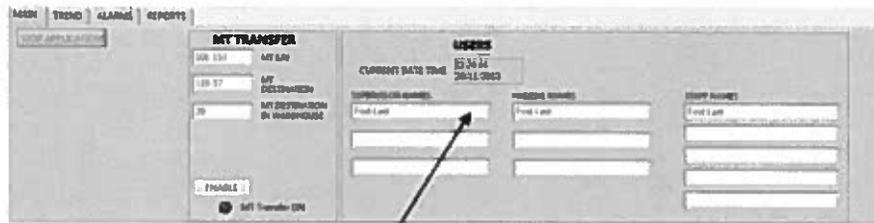


6.5 System Operation

The system is operated from the 4 screens listed above. The following instructions are to document the operation sequence of the different functionality of the system.

6.5.1 User Entry

The user entry section allows data entry of the staff on duty. Supervisors, workers, and hygiene staff must log in for the system to track whom was present during alarms.



1. Click in a box below the user column appropriate to the users duty.
2. Type the first and last name of the user.
3. Click anywhere outside the box.

6.5.2 MT Filling

1. The MT filling process is controlled from the MAIN page.
2. The operator selects the main page. (The wireless terminal is always on the main page. Use tabs at the top of the screen if using a stationary computer.)
3. The operator brings a carrier of flasks into the area where mercury transfer is accomplished.
4. The operator loads an MT on one of the scales
5. The operator selects which scale that the MT is loaded on.
6. The operator selects the scale maximum setpoint.
7. The operator Presses and releases the "TARE EN" button
8. The operator Enters the following information in the fields shown
9. MT Serial Number
10. Pallet Serial Number
11. Notes regarding the Pallet
12. Drum Serial number
13. Notes regarding the Drum
14. The quantity of flasks in the carrier
15. Notes regarding the flasks in the carrier
16. Warehouse that pallet was sourced from
17. Operator presses the "START MT" button.
18. The operator presses and holds the foot pedal to start the mercury transfer process.
19. When a flask is empty, the user releases the foot pedal and moves the suction hose to the next flask.
20. Step 9 is repeated until the all flasks in the carrier are empty.

Presenting a new CARRIER

1. DO NOT PRESS FINISH "MT UNLESS" THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW CARRIER" button on the MAIN page. (The button will stay selected after release)
4. The operator enters the flask count and carrier notes if necessary.
5. The operator presses the "NEW CARRIER" button on the MAIN page. (The button will now turn off)

Go to step 14 in "MT Filling" above.

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Presenting a new DRUM

1. DO NOT PRESS "FINISH MT" UNLESS THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW DRUM" button. (The button will stay selected after release)
4. The operator enters the "NEW DRUM" button. (The button will now turn off)

Go to step 14 in "MT Filling" above.

Presenting a NEW PALLET

1. DO NOT PRESS "FINISH MT" UNLESS THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW PALLET" button. (The button will stay selected after release)
4. The operator enters the "NEW PALLET" button. (The button will now turn off)

Go to step 14 in "MT Filling" above if necessary

Finishing an MT

1. The operator releases the foot switch and the pump stops.
2. Press the "FINISH MT" button

EMERGENCY STOP

There are two EMERGENCY STOP mushroom pushbuttons. If one of the emergency pushbuttons is pressed, perform the following.

1. Identify the problem that instigated the ESTOP condition.
2. Rectify the condition that instigated the ESTOP
3. Twist the ESTOP pushbutton to reset the button.
4. Press the ESTOP acknowledge button the MAIN screen to allow pumping to begin again.

6.5.3 MT Transfer

The MT transfer function allows the operator to move the MT from one warehouse to another or from the filling trailer to the warehouse. To perform an MT transfer, perform the following:

1. Navigate to the "MAIN" page. (Use the tabs at the top of the screen)
2. Enter the MT serial number in the "MT S/N" box on the MAIN page in the upper left hand corner of the screen.
3. Enter the warehouse that the MT will be sent to in the "MT DESTINATION" box
4. Enter the location within the warehouse that the MT will be sent to in the "MT DESTINATION IN WAREHOUSE BOX".
5. Press and release the "ENABLE" button

6.5.4 Trending

Trending allows the user to identify how many flasks have been transferred since midnight the day before. Therefore, each night at midnight the daily count will be set to zero. There are no controls on this screen.

6.5.5 Alarms

The alarm screen provides information to the user with regard to alarm limits. At the bottom left of the screen is also an alarm display to show the alarms that have occurred. Alarms are listed as follows.

Date-Time-Alarm type-Value of the variable-Alarm setpoint

Setting alarm limits

The alarm limits are located to the right of the variable displayed on the alarm screen. Except for the mercury levels, each setpoint has a high and low.

Changing Limits:

1. Navigate to the "ALARMS" screen. (Use the tabs at the top of the screen)
2. Click in the box to the right of the variable that you would like to change.
3. Verify that you are changing the "HIGH" or "LOW".
4. Enter the new value

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The MT transfer function allows the operator to move the MT from one warehouse to another or from the filling trailer to the warehouse. To perform an MT transfer, perform the following:

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Changing Limits:

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2. Click in the box to the right of the variable that you would like to change.
3. Verify that you are changing the "HIGH" or "LOW".
4. Enter the new value

5. Click anywhere outside the alarm limit box.

6.5.6 Reports

The reporting page allows the user to enter an accident/incident report or produce a report from the system database.

Accident/Incident reports:

Accident/Incident reports are based on the time and whom was present at the incident/accident occurrence.

To record an accident or incident report:

1. Navigate to the "REPORTS" page (Use the tab at the top of the screen)
2. Click the button at the top left of the screen that indicates the type of report desired. (The options are accident or incident)
3. Enter the date of the incident or accident (If the date icon is clicked, the date can be selected using a dialog box.)
4. Enter the time of the incident or accident (The time can be entered manually by clicking the icon as stated in item 3)
5. Enter the full names of the Supervisors on duty at the time of the incident/accident.
6. Enter the full names of the workers/staff on duty at the time of the incident/accident.
7. Enter the full names of the Hygiene staff on duty at the time of the incident/accident.
8. Enter the full names of the Responders on duty at the time of the incident/accident.
9. Enter the details and notes desired in the white space near the bottom of the screen labeled "INCIDENT ACCIDENT DETAILS" by clicking in the white area and typing the desired notes.
10. When all information is complete, click the "RECORD REPORT" button and the report will be saved to the database.

Summary/Detail reports

Summary and Detail reports are generated from the "REPORTS" page. To generate a Summary or Detail report, do the following:

1. Navigate to the "REPORTS" page (Use the tab at the top of the screen.)
2. Select the type of report desired by clicking the button under the report type.
3. Select the time and date for the beginning of the report by clicking the icon next to "REPORT START"
4. Select the time and date for the ending of the report by clicking the icon next to "REPORT END"
5. Click on the "OK" button below Generate Report.
6. The filename and path will be displayed in a window below the "OK" button.
7. The window displaying the report name will be based on which report is generated. Observe that titles of the windows. They are "DETAIL REPORT LOCATION" or "SUMMARY REPORT LOCATION".
8. Click the "OPEN" button that is located to the right of the report to be opened.
9. Report will open in wordpad.
10. Click the "X" in the upper right hand corner of word pad to close the report.

Opening existing reports

1. The report page provides a tool for opening existing reports. To open an existing report:
2. Navigate to the "REPORTS" page (Use the tabs at the top of the page)
3. Locate the "OLD REPORT SEARCH" at the lower right hand corner of the screen.
4. Click the folder icon located to the right of the white box.
5. Use the windows dialog box to locate the file you would like to open.
6. Click on the desired file. (Not that the type of report is in the file name)
7. Click "OK".
8. After the windows dialog box closes, locate the "OPEN" button located under "Report".
9. Click the "OPEN" button.
10. The file will open in wordpad.
11. Click the "X" in the upper right hand corner of word pad to close the report.

6.5.7 Powering Down the system

Powering down the control system for the mercury transfer system requires several steps. They are listed below.

Control PC shutdown

1. From the User screen navigate to the "Main" page.
2. Click the "Finish MT" button.
3. Click the "STOP APPLICATION" button.
4. Click the "CLOSE APPLICATION" button on the popup screen.
5. Click the windows icon  in the lower left corner of the screen.
6. Click the "shut down" button.
7. Wait for the windows to shut down completely. (The screen will go dark)

Mercury Monitor PC shutdown (It has the label "Turtle" on the front)

1. Navigate to the top of the screen.
 - a. Click "measurement"
 - b. Click "stop measurement"
2. Click the "X" at the top right hand corner of the window.
3. Click "yes" on the confirmation box.
4. Click the windows icon  in the lower left corner of the screen.
5. Click the "shut down" button.
6. Wait for the windows to shut down completely. (The screen will go dark)

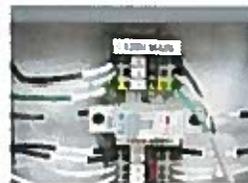
Mercury Monitor Control Cabinet (see photo at right)

1. Open the door to the control cabinet.
2. Turn the black switch at the bottom left corner of the cabinet to the "OFF" position.
3. Close the cabinet door.



Mercury Transfer Control Cabinet (see photo at right)

1. Open the door to the cabinet.
2. Locate the main circuit breaker. See photo below
3. Move the grey switch on the main circuit breaker to the "OFF" position. (Move to the right for the originally installed equipment.)
4. Close the door of the electrical panel.



Close all the electrical panels. The system is now powered off.

6.5.8 Powering up the system (Refer to the power down system instructions for figures)

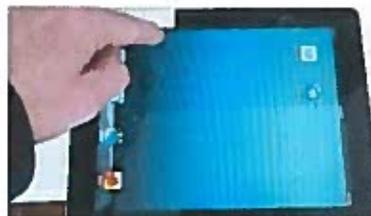
1. Turn on the power to the mercury transfer control cabinet
2. Turn on the power to the mercury monitoring cabinet.
3. Turn on the power to the mercury transfer PC. (The "GUI" pc)
4. Turn on the power to the mercury monitoring PC. ("Turtle")
5. Close all of the electrical panels. The system is now powered on. The PC's boot to their applications automatically.

6.5.9 Powering up the IPAD (wireless terminals)

1. Press and hold the power button at the top right corner of the IPAD.
2. Screen will show an apple to indicate the boot process has begun.
3. When boot is complete the following screen will be shown



4. Touch the screen and slide the white button in the direction of the arrow. This will unlock the screen.
5. From the page shown, touch and slide the screen to the left.



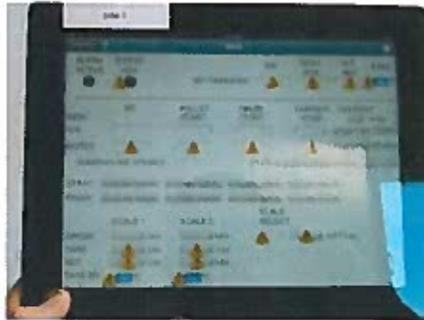
6. Double touch the "dashboard" icon.



7. You will see a "National Instruments" screen when the application is booting.
8. Single Touch the play button.



9. The application is now running. You may see warning icons as shown below. This indicates that the screen has not been updated yet. When the user begins entering data, the fields will update with each change. This only occurs when the system is powered off or the data connection is broken.



10. The wireless terminal is now ready to use. The controls are the same as that of the PC.

7 Database

The inventory management system utilizes two tables for tracking inventory. One table contains the contents of the mercury to be unloaded from pallets, and another table to track the mercury that has been transferred to the MT containers. Two tables are maintained so that a total mercury sum can be calculated.

8 Uploading data into database

At the startup of the system, it may be necessary to upload new data into the database. Saber Engineering uploaded data into the system that was provided on December 18 2013.

The database update December 18 2013 was performed using the following files.

- MONH ORNL Pallet numbers inventory.xls