Clean, Inspect, and Function Check Eberline Monitors HM-6, HFM-4, 4A, 6, 7A, PCM-1B, PM-6, and 6A

Tank Farm Maintenance Procedure

CALIBRATION

Changes “Other Than Inconsequential” Require These Additional Reviews:

Radiological Controls:
Central Radcon Organization

USQ # GCX-2

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Attachment 1 - Usable APM Criteria
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method to clean, inspect, and functional check the Eberline Automated Personnel Monitor(s) (APMs), Models HFM-4/4A, HM-6/HFM-6, HFM-7-A, PCM-1B, and PM-6/6A.

1.2 Scope

This procedure applies to the Eberline APM(s), Models HFM-4/4A, HM-6/HFM-6, HFM-7-A, PCM-1B, and PM-6/6A, and provides follow up actions if monitors are found out of service, low P-10 gas bottles, or failed the functional check.

2.0 INFORMATION

2.1 General Information

2.1.1 This procedure is performed on a weekly basis or as necessary to meet operational requirements.

2.1.2 This procedure must be performed by a multi-discipline team consisting of Instrument Technician(s), Health Physics Technician(s), and Pipefitter for gas bottle replacement. This procedure does not establish jurisdiction of work assignment.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 This procedure is written in a generic manner to allow for the performance in multiple locations. Location specific hazards are not identified. As necessary, a hazard analysis on the hazards that may be encountered at a specific location may need to be performed in accordance with TFC-ESHQ-SAF_S-C-02.
3.2 Equipment Safety

CAUTION - Handle radioactive sources with extreme care or damage to the sources may occur.

3.2.1 Keep sources covered and protected at all times when not in use.

3.2.2 APM(s) continuously update background count rate, therefore sources must be kept at least three feet away from when not being used to test the APM(s).

3.3 Radiation and Contamination Control

3.3.1 This procedure is limited to radiological areas and work activities permitted by a general radiological work permit.

3.3.2 Any evidence of contamination requires additional surveys to determine extent of the problem.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

NOTE - All sources listed may not be applicable to each personal survey device.

- $^{239}$Pu source, 400 to 600 disintegrations per minute (DPM) (for all monitors requiring alpha sources) (Some instruments may use different source values as documented by facility specific documents. Source activity shall be equivalent (within ± 20%) to the instrument Reliably Detectable Activity (RDA) setting)
- $^{137}$Cs source, 4000 to 6000 DPM or $^{36}$Cl source, 5,000 to 6,500 dpm (for all monitors set up with a Reliably Detectable Activity [RDA] of 5,000 DPM or 83.3 disintegrations per second [DPS]) (Some instruments may use different source values as documented by facility specific documents. Source activity shall be equivalent (within ± 20%) to the instrument Reliably Detectable Activity (RDA) setting)
- Source holder to maintain source to detector distance of approximately three inches (PCMs only) (beta sources only)
- Portable vacuum cleaner
- Small hand brush
- Clean cloths
- Spray cleaner (Glass Plus [GHS-SDS and/or MSDS #17320], Fantastik [GHS-SDS and/or MSDS #017321B], or equivalent)
- Can Air (for dusting)
- Flashlight.

4.2 Field Preparation

4.2.1 CONFIRM all test radiation sources to be used are within calibration.
5.0 PROCEDURE

Special Instructions
If any step is not required for procedure completion, record “n/a” in the applicable space(s) on the data sheet and document explanation in the data sheet’s Comments/Remarks section.

5.1 Record and Adjust P-10 Gas

NOTE - Steps 5.1.1 through 5.1.6 may be worked in any logical order.

5.1.1 CHECK P-10 gas bottle pressure AND
RECORD in "As Found" section of Data Sheet for week under test.

5.1.2 CHECK regulated pressure AND
RECORD in "As-Found" on Data Sheet for week under test.

5.1.3 CHECK flow of P-10 gas AND
RECORD in "As-Found" section (under Gas Manager/Rotameter) for week under test.

5.1.4 IF P-10 gas bottle pressure is less than the minimum pressure noted on Data Sheet, RECORD in comment section of Data Sheet to have bottle replaced later.

5.1.5 IF pressure and/or flow do not meet requirements of Data Sheet, ADJUST, regulator pressure valve and/or flow valve per Data Sheet.

5.1.6 RECORD the following in "As-Left" section of Data Sheet for week under test:
- Regulated Pressure
- P-10 gas flow (under Gas Manager/Rotameter)

5.1.7 IF P-10 regulated pressure or flow cannot be adjusted, TAG instrument Out of Service per Section 5.10.
5.2 Clean and Inspect

5.2.1 **PERFORM** contamination survey of any areas requiring vacuum cleaning.

5.2.1.1 **IF** contamination is found, **PERFORM** Section 5.11.

5.2.2 **ENSURE** an Electrical Risk Assessment (ERA) has been completed **AND COMPLY** with any identified controls.

5.2.3 **AVOID** contact with electrical components.

**NOTE** - Steps 5.2.4 through 5.2.6 may be worked in any order.

5.2.4 **INSPECT** monitor for damage.

5.2.5 **IF** dirty, **CLEAN AND DUST** instrument.

5.2.6 **IF** debris is present, **CLEAN** the detectors with vacuum cleaner.

5.2.7 **IF** damaged, **REPLACE** plastic wrap on foot detector.

5.2.8 **IF** “calibration due date” has expired or missing label, **TAG** instrument Out of Service per Section 5.10.

5.2.9 **RECORD** on Data Sheet whether any detector was found damaged during the inspection **AND**

**IF** damage was found, **TAG** instrument out of service per Section 5.10.

5.2.10 **IF** testing an instrument other than a PCM-1B, **GO TO** Section 5.7.
5.2 Clean and Inspect (Cont.)

5.2.11 IF “HIGH BACKGROUND” is displayed,

OR

IF “CONTAMINATED DETECTOR” is displayed,

OR

IF “HIGH/LOW COUNT FAIL” is displayed,

OR

IF “HIGH/LOW SENSITIVITY” is displayed, **PERFORM** Section 5.9.

5.2.12 IF APM is found “out of service”, or taken out of service, **NOTIFY** Shift Manager/OE. FWS and Radcon First Line Supervisor **AND**

**CONTINUE** as directed.

5.3 Test Ultrasonic Motion Sensor (PCM 1 Series)

**NOTE** - Some instruments have had the ultrasonic motion sensor deactivated.

5.3.1 IF ultrasonic motion sensor has been deactivated, **GO TO** Section 5.4.

**NOTE** - Before activation of ultrasonic motion sensor, display should read "COUNTING BACKGROUND."

5.3.2 **CHECK** display reads "COUNTING BACKGROUND."

5.3.3 **APPROACH** PCM 1 within ~ 3 feet **AND**

**CONFIRM** display changes to read "STEP UP INSERT RIGHT ARM", "READY" or "WAITING."

5.3.4 IF actuating motion sensor does not cause display change, **TAG** instrument Out of Service per Section 5.10.
5.4 Initiate Counting and Verify Counting Sensor Operation

5.4.1 DON hearing protection as necessary.

NOTE - A clean towel, or equivalent, may be used to initiate a PCM-1 series.

5.4.2 INITIATE counting in accordance with sensor interrupt design (hand, foot or towel).

5.4.3 INTERRUPT counting.

5.4.4 REPEAT Steps 5.4.2 and 5.4.3 for all sensor interrupts.

5.4.4.1 CONFIRM the following for each sensor interrupts:
- Alarm sounds
- "RECOUNT" light comes ON and/or similar message is displayed
- "COUNT INCOMPLETE" or similar message is displayed.

5.4.5 ALLOW count to complete.

5.4.6 CONFIRM one or more of the following occurs:
- Light comes ON indicating count is complete or “OK”
- Message “COUNT COMPLETE” is displayed
- Short beep sounds
- Flashing light goes OFF.

5.4.7 IF testing a PCM 1 series, COMPLETE counting cycle for other side.

5.4.8 RECORD on Data Sheet for week under test, results of counter sensor operation check.

5.4.9 IF any counting sensors do not interrupt counting, TAG instrument Out of Service per Section 5.10.
5.5 Record Usage and Elapsed Time (Excluding HFM 7 series)

5.5.1 PRESS AND HOLD ALARM ACK button until display indicates "NO PASSWORD USE KEY" or "ENTER PASSWORD".

NOTE - When password is entered correctly, (unit will chime and "DISPLAY SYSTEM PARAMETERS" will appear.

5.5.1.1 IF "ENTER PASSWORD" is displayed, ENTER two-digit password within four seconds.

5.5.1.2 IF "NO PASSWORD-USE KEY" is displayed, USE key to place TEST-OPERATE switch in TEST position.

5.5.1.3 PRESS "+" key, until "USAGE" is displayed.

5.5.1.4 PRESS "ENTER" key.

5.5.1.5 RECORD on Data Sheet for week under test USAGE and ELAPSED TIME.

NOTE - More than one depression of "RUB OUT" key may be necessary depending upon installed options.

5.5.1.6 IF APM is a PCM 1 series, PRESS "RUB OUT" key to clear USAGE and ELAPSED TIME before continuing with Section 5.6.

5.5.1.7 RETURN APM to operation by performing one of the following steps:

- IF using key, PLACE TEST-OPERATE switch to OPERATE position using key.

- IF using password, PRESS "+" key until "ENTER OPERATE MODE? <ENTER=YES>" is displayed AND PRESS ENTER key.
5.6 Source Check PCM-1B

CAUTION
Handle radioactive sources with extreme care or damage to the sources may occur.

NOTE - For alpha-monitoring units, the following Source Check Steps will be performed with both alpha and beta source.

5.6.1 RECORD source serial number on the Data Sheet for week under test.
5.6.2 TURN key or ENTER password to access menu.
5.6.3 SELECT "source check" from menu AND PRESS <ENTER>.

NOTE - Foot detector does not require the holder.
- Do not use beta source clip with alpha source. Failure to comply will result in erroneous testing results.

5.6.4 IF using beta source, PLACE source in holder AND LOCATE as close to the center of detector under test as possible.

OR

IF using alpha source, PLACE alpha source directly on detector screen over center of a detector.

5.6.5 PRESS <ENTER>.

5.6.6 REPEAT Steps 5.6.4 through 5.6.6 for each remaining detector AND RECORD in the comment section of the Data Sheet any detector(s) that fail to alarm during the first source check.
5.6 Source Check PCM-1B (Cont.)

5.6.7 FOR each detector that failed to alarm on the first source check, **PERFORM** the following:

5.6.7.1 **RETURN** PCM-1B to service **AND**
   **UPDATE** the average background.

5.6.7.2 **IF** necessary to access menu, **RE-PERFORM** Steps 5.6.2 and 5.6.3.

5.6.7.3 **RE-PERFORM** Step 5.6.4 and 5.6.5 for each failed detector.

5.6.7.4 **IF** any detector failed to alarm on the second source check, **TAG** instrument Out of Service per Section 5.10.

5.6.7.5 **IF** APM is found “out of service”, or taken out of service, **NOTIFY** Shift Manager/OE. FWS and Radcon First Line Supervisor **AND**
   **CONTINUE** as directed.

5.6.8 **IF** PCM 1 series has alpha capabilities, **REPEAT** Steps 5.6.4 to 5.6.7 using alpha source for all alpha detectors.

**NOTE** - All detectors should alarm.

5.6.9 **RECORD** on Data Sheet for week under test, results of source check.

5.6.10 **SIGN AND DATE** data Sheet.

5.6.11 **IF** not tagged out of service, **RETURN** monitor to "Operate Mode" (with key or key pad).

5.6.12 **GO TO** Section 5.12.
5.7 Source Check HFM-7A

NOTE - For alpha-monitoring units, the following Source Check Steps will be performed with both alpha and beta source.

5.7.1 RECORD source Serial # on Data Sheet for week under test.

5.7.2 PRESS "Source Check" button on HFM-7A face panel AND ENTER password on keypad to access menu.

5.7.3 PLACE applicable source AND CENTER the source as close as possible on detector under test.

5.7.4 INITIATE count AND CHECK monitor alarms.

5.7.5 REPEAT Steps 5.7.3 through 5.7.5 for remaining detectors AND RECORD in the comment section of the Data Sheet any detector(s) that fail to alarm during the first source check.

5.7.6 FOR each detector that failed to alarm on the first source check, PERFORM a second source check per Steps 5.7.3 and 5.7.4.

5.7.6.1 IF detector fails second source check, TAG instrument Out of Service per Section 5.10.

5.7.7 RECORD on Data Sheet for week under test results of source check.

5.7.8 PRESS "Source Check" to exit out of source check mode.

5.7.9 GO TO Section 5.12 Restoration.
5.8 Source Check Instrument Other than PCM-1B or HFM-7A

NOTE - For alpha-monitoring units, the following Source Check Steps will be performed with both alpha and beta source.

5.8.1 RECORD source serial number on the Data Sheet for week under test.

5.8.2 PLACE applicable source on detector to be tested.

5.8.3 INITIATE count AND

CHECK monitor alarms.

5.8.4 REPEAT Steps 5.8.2 and 5.8.3 for all detectors to be tested AND

NOTE in the comment section of the Data Sheet any detector(s) that fail to alarm during the first source check.

NOTE - All detectors should alarm.

5.8.5 FOR each detector that failed to alarm on the first source check, PERFORM a second source check per Steps 5.8.2 and 5.8.3.

5.8.5.1 IF detector fails second source check, TAG instrument Out of Service per Section 5.10.

5.8.6 RECORD on Data Sheet for week under test results of source check.
5.9 Actions in Response to APM Problems

NOTE - This section may be skipped if no problems or failures occur during performance of this procedure. Steps in this section may be worked in any logical order depending on the problems that occur.

HIGH/LOW Sensitivity and/or HIGH BACKGROUND and/or CONTAMINATED DETECTOR and/or HIGH/LOW COUNT FAIL.

NOTE - Steps 5.9.1 to 5.9.8 may be repeated as necessary.

5.9.1 IF necessary to access menu, TURN key,

OR

ENTER password.

5.9.1.1 IF a “Trouble List” appears ATTEMPT to clear the list.

5.9.2 CHANGE “weighting factor” from 10 to 1.25 for several updates.

5.9.3 RETURN to Normal operation AND

CHECK display reads "COUNTING BACKGROUND."

5.9.4 WAIT for several updates (less than 5 minutes).

5.9.5 IF necessary to access menu, TURN key,

OR

ENTER password.

5.9.6 CHANGE “weighting factor” from 1.25 to 10.

5.9.7 IF “Trouble List” is populated, CLEAR “Trouble List”.

5.9.8 RETURN to Normal operation AND

CHECK display reads "COUNTING BACKGROUND."
5.9 Actions in Response to APM Problems (Cont.)

5.9.9 IF “CONTAMINATED DETECTOR” or “HIGH/LOW COUNT FAIL” or “HIGH Background” or “HIGH/LOW Sensitivity” will not clear after several tries, **PERFORM** the following:

5.9.9.1 **INITIATE** maintenance request **AND**

**PROCEED** as directed.

5.9.9.2 **RECORD** each problem condition in the Comments section of the Data Sheet (See Attachment 1).

5.9.9.3 **TAKE** APM out-of-service per Section 5.10.

5.9.10 **RETURN** to Step 5.2.12.
5.10  Tag Instrument Out of Service

NOTE - The Comments section may be used for additional detailed information.

5.10.1  IF no instruments need to be tagged “Out-Of-Service” SKIP Section 5.10.

5.10.2  RECORD each “Out of Service” condition on Data Sheet.

5.10.3  REMOVE instrument from service by posting an out of service sign/tag.

5.10.4  NOTIFY Shift Manager/OE and Radcon First-line Supervisor AND
       RECORD a RadCon-logbook entry of removal from service.

5.10.5  IF instrument tagged out of service due to failure of source check, GO TO
       Section 5.11.

5.10.6  EXIT procedure.
5.11 Follow-Up Investigation for Contamination Detected on APM

NOTE - Any evidence of contamination spread requires additional surveys to determine extent of the problem.

5.11.1 PERFORM radiological surveys of the path to and from the PCM 1 series inside the change trailer, paying special attention to areas touched by hands and feet.

5.11.2 IF contamination is detected, PERFORM the following:

5.11.2.1 NOTIFY the following personnel:
- Shift Manager/OE
- FWS
- Radcon First-line Supervisor
- Project Radiological Control Manager.

5.11.2.2 DETERMINE personnel likely affected and notify Shift Manager.

5.11.2.3 AS directed, PERFORM follow-up surveys (e.g., work area, lockers, clothes and equipment).

5.11.3 NOTIFY Shift Manager/OE, FWS and Radiological Control Line Management of final survey results.

5.11.4 IF required by final survey results, SUBMIT a Problem Evaluation Request (PER) on the event.

5.11.5 EXIT this procedure.
5.12 Restoration

**Return Instrument to In Service After Successful Completion of Functional Test**

5.12.1 IF placing equipment back to In Service status following successful completion of functional testing, **PERFORM** the following:

5.12.1.1 **PLACE** equipment in service.

5.12.1.2 **OBSERVE** indications are consistent with expected conditions to validate equipment system restoration.

5.12.1.3 IF equipment indications do not meet expected conditions, **TAG** instrument Out of Service per Section 5.10.

5.13 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications, criteria and tolerance(s) per the Data Sheet and Attachment 1.

5.14 Review

5.14.1 **INFORM** FWS bottle change out/function test is complete.

5.14.2 IF any unit fails its weekly check, **NOTIFY** Shift Manager/OE and FWS.

5.14.3 **FWS REVIEW AND CHECK** for the following:

- Completed Data Sheets meet the acceptance criteria.
- Comments sections are filled out appropriately.
- Work requests needed as a result of this procedure are identified and generated.
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the Data Sheet.

5.15 Records

The performance of this procedure generates no records. However, PM Data Sheets associated with the procedure, are records and are maintained in the work package as record material.

The record custodian identified in the Company Level, Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Attachment 1 - Usable APM Criteria

"In Service" Criteria: The "As-Left" APM must meet all of the following criteria by mutual consensus of all members of the multi-discipline team:

- At least one "BOTTLE EMPTY" light is OFF (as equipped).
- Calibration sticker is attached and "calibration due date" is current.
- "TROUBLE" and "HIGH BACKGROUND" lights are OFF (as equipped).
- All counting sensors (pressure or light beam) functioning properly (as equipped).
- All detectors have passed a source alarm check, beta/alpha (as equipped).
- P-10 regulated pressure and flows are within Data Sheet specification (as equipped).
- APM is free of contamination.
- All detectors are free of damage.
- "HIGH BACKGROUND" and "HIGH/LOW SENSITIVITY" lights are OFF.
- "COUNTING" and "COUNT COMPLETE" lights are functioning properly.

"Out of Service" Criteria: The “As-Left” APM meets any one of the following criteria, or there is an unresolved concern with any member of the multi-discipline team:

- Both “BOTTLE EMPTY” lights are ON (as equipped).
- Calibration sticker is missing or “calibration due date” has expired.
- “TROUBLE” or “HIGH BACKGROUND” light is ON (as equipped).
- Any counting sensor (pressure or light beam) has malfunctioned (as equipped).
- Any detector does not pass a source alarm check, beta or alpha (as equipped).
- P-10 regulated pressure or flow are outside the Data Sheet specification (as equipped).
- APM is contaminated.
- Any detector shows damage.
- “HIGH BACKGROUND” or “HIGH/LOW SENSITIVITY” light is ON.
- “COUNTING” or “COUNT COMPLETE” light has malfunctioned.