Clean, Inspect, and Alarm Test ARGOS 5AB Automated Personnel Monitor

Tank Farm Maintenance Procedure

Changes “Other Than Inconsequential” Require These Additional Reviews:

Radiological Control
Central Radcon Organization

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1.0 PURPOSE AND SCOPE

1.1 Purpose

The purpose of this procedure is to provide a safe, uniform method to clean, inspect, and functionally check the Canberra ARGOS 5AB Automated Personnel Monitoring (APM) equipment in accordance with 10 CFR 835.401(a)(1)-(6), 10-CFR-835.401(b).

1.2 Scope

This procedure applies to cleaning, inspecting, and functionally checking the Canberra ARGOS 5AB APM equipment.

This procedure interfaces between multiple facilities.

2.0 INFORMATION

2.1 Terms and Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>APM</td>
<td>Automated Personnel Monitor</td>
</tr>
<tr>
<td>dpm</td>
<td>disintegrations per minute</td>
</tr>
<tr>
<td>RCFLM</td>
<td>Radiological Control First Line Manager</td>
</tr>
<tr>
<td>USB</td>
<td>universal serial bus</td>
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</table>

2.2 General Information

2.2.1 If performance of any step(s) in this procedure is not required for procedure completion, “N/A” should be marked for step(s) not performed in appropriate Data Sheet.

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.

2.2.2 The APM is a gas-proportional (using P-10 gas), automatic, whole body, personnel monitoring instrument.

2.2.3 The ARGOS-5AB model is capable of monitoring for alpha and beta contamination.
2.2 General Information (Cont.)

2.2.4 When using the “count in 2 steps” mode, alarm test of top of head detector zone and bottom of foot detector zones may require sources to be left in position for two full count cycles. An alarm after one count cycle is a successful alarm test for that zone. A failure to alarm after one count cycle should be ignored and the source left in place for a second count cycle to determine success or failure.

2.2.5 Source checks are referred to as “Alarm Test” by the ARGOS-5.

2.2.6 Menu and menu flow diagrams are provided in Attachment 1.

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, and will be identified in accordance with TFC-ESHQ-S_SAF-C-02.

3.1.2 Handle radioactive sources with extreme care; keep covered and protected at all times when not in use.

3.1.3 Compliance with DOE–0359, Hanford Site Electrical Safety Program is required when working with this procedure.

3.2 Equipment Safety

CAUTION - Care must be used when cleaning, vacuuming, or removing debris to prevent damage to the detector’s thin Mylar covering material.

CAUTION - The alarm test jig assembly shall not be used on the detectors for the palm, back of hand, and bottom of feet.

3.2.1 Electrical isolation can be achieved by disconnecting the 3-prong power inlet connector located on the roof of the ARGOS-5.
3.3 Radiation and Contamination Control

3.3.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.

3.3.2 Sealed radioactive sources are required for calibration and performance testing. Handle sealed sources with extreme care, especially avoiding scratching and abrasion of the active area of the sealed source surface that might impact source integrity.

3.3.3 Prior to checking out a source for use, it should be inspected for damage. Immediately notify Radiological Controls if damage is observed.

3.3.4 When not in use, keep beta sources as far away as possible from the detectors to avoid background effects. Changes in background can affect APM performance. During performance testing, ensure personnel do not shield the monitor from normal background in the area by standing too close.

3.3.5 Use only high-purity P-10 gas in ARGOS 5AB APM units.

3.4 Environmental Compliance

If any waste is generated during performance of this instruction, consult Facility/Plant/Area Hazardous Waste Coordinator for specific instructions to ensure compliance with WRPS and DOE environmental standards, as applicable, for disposal per procedure TO-100-052.
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 personnel monitoring device.

- Portable survey instruments (calibrated and response-checked)
- One to three planar (100 cm<sup>2</sup>) 4,800-6,000 dpm <sup>137</sup>Cs or 5,000 to 6,500 dpm <sup>36</sup>C<sub>1</sub> (beta) alarm check sources
- One to three planar (100 cm<sup>2</sup>) 480-600 dpm <sup>239</sup>Pu (alpha) alarm check source(s) (for alpha-capable monitors)
- Source holder Jig assembly (up to three sources installed) provides a planar geometry of approximately 1 cm between the source surfaces and the detector surface. Jig is held in place by magnets
- Source holder jig spacer, if using the thin planar sources
- ARGOS 5AB APM computer/instrument access door keys
- Portable vacuum cleaner
- Small hand brush
- Clean cloths
- Spray cleaner (Glass Plus, Fantastik, or equivalent)
- Can Air (for dusting)
- Leather gloves.

4.2 **Field Preparation**

The following activities must be completed before this procedure may commence:

4.2.1 **PERFORM** an inspection for damage to any sources that are to be used in the performance of this procedure.

4.2.1.1 **IF** damage to the source is observed, **RESPOND** per Section 5.1.
5.0 PROCEDURE

NOTE - Testing and Operational steps for Canberra personnel monitors are software-driven. The user may use alternate pathways to access the desired menu(s) other than the steps described in this procedure.

- Sections 5.1 through 5.5 may be worked individually or in any logical order as required.

- Step 2.2.1 may be referred to for instructions on steps not required for procedure completion and their documentation and N/A requirements.

5.1 Response to a Damaged Source

NOTE - A “damaged source” is defined as exposed radioactive surface area, most commonly a tear or puncture of the Mylar, or a scratch on electroplated sources. (Small imperfections or concave impressions on otherwise intact Mylar is not considered “damage.”)

5.1.1 IF at any time during the performance of this procedure a source becomes damaged, PERFORM the following:

5.1.1.1 CONTROL the source to prevent the spread of contamination.

5.1.1.2 CONTROL any object or surface that caused the damage or came in contact with the damaged source.

5.1.1.3 NOTIFY Shift Office and radiological control management of the damaged source and location.

5.1.1.4 REQUEST contamination survey of the affected area.
5.2 Record and Adjust P-10 Gas

5.2.1 IF P-10 gas is supplied from building manifold, GO TO Step 5.2.4.

5.2.2 CHECK P-10 gas bottle pressure AND
RECORD in "As Found" on Data Sheet.

5.2.3 IF pressure is less than desired range pressure noted on Data Sheet, NOTIFY FWS that gas bottle change-out is needed.

NOTE - There may be multiple regulators for the ARGOS. The Data Sheet can be used to verify this as one being nearest the bottle is the “bottle” regulator with the other being the “Inlet” regulator.

- If ARGOS has only one (1) regulator; it is the “Inlet” regulator.

5.2.4 CHECK bottle regulated pressure AND
RECORD in "AS-FOUND" on Data Sheet.

5.2.5 ADJUST regulator pressure to within desired range on Data Sheet.

5.2.6 RECORD the bottle regulator pressure in "AS-LEFT" section of Data Sheet.

5.2.7 RECORD the ARGOS-5 inlet gas pressure in "As-Found" section of Data Sheet.

5.2.8 ADJUST inlet gas pressure to within desired range on Data Sheet.

5.2.9 RECORD inlet gas pressure in "As-Left" section of Data Sheet.

5.2.10 CHECK inlet flow rotameter(s) (A to D) AND
RECORD in "As-Found" in Data Sheet.

5.2.11 CHECK outlet flow rotameter(s) (E and F) AND
RECORD in "As-Found" in Data Sheet.

5.2.12 ADJUST inlet rotameter(s) to desired flow on Data Sheet.

5.2.13 RECORD rotameter(s) inlet and outlet flows in "AS-LEFT" section of Data Sheet.

5.2.14 IF inlet/outlet flow is still not within desired range per Data Sheet, THEN
REPLACE APM from service per Section 5.5.
5.3 Clean and Inspect

5.3.1 INSPECT monitor and detector for damage and cleanliness.

5.3.2 IF monitor and detector are clean and not damaged, RECORD on Data Sheet AND GO TO Section 5.4.

5.3.3 PERFORM a beta contamination survey of the threshold AND IF monitor is alpha-capable, PERFORM an alpha survey of the threshold.

5.3.4 IF contamination is detected, INITIATE response actions to restore contamination control.

5.3.5 IF contamination control has been restored, CONTINUE with procedure.

5.3.6 INSPECT monitor for damage.

5.3.7 RECORD result of inspection on Data Sheet.

5.3.7.1 IF damage was noted during inspection, RECORD deficiencies in Comments section of Data Sheet.

5.3.8 IF foot grills need to be removed, CAREFULLY REMOVE the foot grills from each of the foot detectors.
5.3 Clean and Inspect (Cont.)

CAUTION
Care must be used when cleaning, vacuuming, or removing debris to prevent damage to the detector’s thin Mylar covering material.

5.3.9 DO NOT USE a bristle brush attachment on vacuum, to prevent damage to the Mylar covering material.

5.3.10 CLEAN foot detector with vacuum cleaner.

NOTE - The foot grills have position sensor holes and must be installed correctly to ensure proper operation.

5.3.11 IF foot grills were removed, REPLACE both foot grills in the correct configuration.

5.3.12 IF detectors are dirty, CLEAN with vacuum cleaner.

5.3.13 IF Instrument is dirty, CLEAN AND DUST instrument AND RECORD on Data Sheet.

5.3.14 IF damage was found, NOTIFY FWS.

5.3.15 RECORD any discrepancies in Comments section of Data Sheet.
5.4 Routine Alarm Response Test

NOTE - Beta (and alpha, if alpha-capable) alarm test must be performed, as well as an inspection of the gas flow, before the APM is returned to service after repair or calibration.

- ARGOS-5 units refer to source checks as “Alarm Test”.
- If the instrument repair consists of a detector replacement, then a calibration and source alarm check is required for only the detector(s) replaced.

5.4.1 CHECK expiration date on the calibration sticker AND

IF calibration is current, RECORD Calibration Due Date on Data Sheet

OR

IF calibration is not current, GO TO Section 5.5.

5.4.2 CHECK whether ARGOS-5 unit is in the normal operating mode with green “Ready” light illuminated AND

IF unit is in the normal mode with “Ready” light illuminated, RECORD results on Data Sheet

OR

IF unit is not in the normal mode with “Ready” light illuminated, GO TO Section 5.5.

Usage Check

5.4.3 OPEN keyboard panel.

5.4.4 PRESS escape (ESC) key to access main Service Menu (See Figure 1).

5.4.5 PRESS F5 for Information Menu.

5.4.6 PRESS F1 for Monitor History.

5.4.7 RECORD values for the following on Data Sheet:

- From / To [elapsed run time]
- Clean
- Clean Rn Rej (if radon rejection is enabled)
- Contaminated.
5.4 Routine Alarm Response Test (Cont.)

5.4.8 PRESS “Ctrl+F4” to clear history.

5.4.9 PRESS escape (ESC) key to service menu.

5.4.10 PRESS F1 to place in normal service.

Beta Alarm Test

NOTE - Steps 5.4.11 through 5.4.27 may be worked individually, in parallel or any logical order.

5.4.11 RECORD source serial number(s), and source activity on Data Sheet.

5.4.12 TURN APM Alarm Test key switch to the ALARM TEST position.

5.4.13 CONFIRM the unit begins a timed countdown and repeats.

CAUTION

The alarm test jig assembly shall not be used on the detectors for the palm, back of hand, and bottom of feet.

NOTE - A source jig spacer may be required.

- The palm, back of hand, and bottom of foot detectors must be tested with the source on contact.

- All other detectors use source jig assembly.

5.4.14 POSITION the beta alarm test jig or source on contact for each detector subzone for a complete count cycle,

5.4.14.1 IF a complete count cycle is not obtained, DISREGARD any clean result AND

WAIT for the next cycle to begin the count.
5.4 Routine Alarm Response Test (Cont.)

5.4.14.2 IF testing the top of head detector or foot detectors, DETERMINE success or failure as follows:

- An alarm after one count cycle is a successful alarm test for that zone

OR

- A failure to alarm after one count cycle should be ignored and the source left in place for a second count cycle to determine success or failure.

5.4.15 CONFIRM the APM display indicates contamination detected for the detector subzone being tested AND CHECK that arrow LED lights (located above each detector) are illuminated after a successful alarm test.

5.4.16 REPEAT the beta alarm test Steps 5.4.14 through 5.4.15 for any detector subzone that did not indicate contamination for a total of two attempts maximum.

5.4.17 IF any subzone does not alarm given two attempts for beta alarm response test, PERFORM the following:

5.4.17.1 RECORD failed subzone in Comments section of Data Sheet.

5.4.17.2 INFORM FWS of the instrument failure.

5.4.17.3 PLACE the instrument Out of Service per Section 5.5.

5.4.18 TURN APM Alarm Test key switch to the NORMAL position.

5.4.19 IF this is a beta-only APM, GO TO Section 5.6.

Alpha Alarm Test

NOTE - Steps 5.4.11 through 5.4.27 may be worked individually, in parallel or any logical order.

5.4.20 RECORD source serial number(s), and source activity on the Data Sheet.

5.4.21 TURN APM Alarm Test key switch to the ALARM TEST position.

5.4.22 CONFIRM the unit begins a timed countdown and repeats.
5.4 Routine Alarm Response Test (Cont.)

CAUTION

The alarm test jig assembly shall not be used on the detectors for the palm, back of hand, and bottom of feet.

NOTE - A source jig spacer may be required.
- The palm, back of hand, and bottom of foot detectors must be tested with the source on contact.
- All other detectors use source jig assembly.

5.4.23 POSITION the alpha alarm test jig or source on contact for each detector subzone for a complete count cycle,

5.4.23.1 IF a complete count cycle is not obtained, DISREGARD any clean result AND WAIT for the next cycle to begin the count.

5.4.23.2 IF testing the top of head detector or foot detectors, DETERMINE success or failure as follows:
  • An alarm after one count cycle is a successful alarm test for that zone
  OR
  • A failure to alarm after one count cycle should be ignored and the source left in place for a second count cycle to determine success or failure.

5.4.24 CONFIRM the APM display indicates contamination detected for the detector subzone being tested AND CHECK that arrow LED lights (located above each detector) are illuminated after a successful alarm test.

5.4.25 REPEAT the alpha alarm test Steps 5.4.23 through 5.4.24 for any detector subzone that did not indicate contamination for a total of two attempts maximum.
5.4 Routine Alarm Response Test (Cont.)

5.4.26 IF any subzone does not alarm given two attempts for alpha alarm response test, PERFORM the following:

5.4.26.1 RECORD failed subzone in Comments section of Data Sheet.
5.4.26.2 INFORM FWS of the instrument failure.
5.4.26.3 PLACE the instrument Out of Service per Section 5.5.

5.4.27 TURN APM Alarm Test key switch to the NORMAL position AND GO TO Section 5.6.

5.5 Remove APM from Service

5.5.1 REMOVE instrument from service as follows:

5.5.1.1 RECORD each problem or failure condition in Comments section of Data Sheet.
5.5.1.2 PRESS escape (ESC) key until main service menu is displayed.
5.5.1.3 PRESS F7-Demonstration Display Menu.
5.5.1.4 PRESS F7-Out of Service.

5.5.2 POST a sign/tag at the APM, which provides personnel with one of the following:
- Alternate survey directions (for example: Survey with portable beta and/or alpha instruments)
- Directions to another survey instrument and location (for example: Go to APM-1 series in AY change trailer).

5.5.3 IF APM was removed from service, NOTIFY Shift Manager AND/OR FWS.
5.6 Restoration

5.6.1 RECORD PASS/FAIL test on Alarm Test Data Sheet.

5.6.2 CONFIRM instruments Setup parameters values identified in Table 1.

5.6.2.1 ACCESS the main service menu by repeatedly pressing the escape ("ESC") key—see NOTE at Figure 1.

5.6.2.2 SELECT “F6 - Print Menu”.

5.6.2.3 SELECT “F7 - all Setup Values”.

NOTE - Only use Beta Parameters for Beta only Argos 5AB.

5.6.2.4 SCROLL through text using keyboard arrow keys AND CONFIRM Table 1 setup values match on screen setup values.

5.6.2.5 RECORD result on Datasheet.

5.6.3 RECORD unit in/out service on Data Sheet.

5.6.4 IF any problems were encountered with alarm test and inspection, INFORM FWS.

5.6.5 PLACE monitor back in service as follows:

5.6.5.1 ACCESS the main service menu by repeatedly pressing the escape ("ESC") key—see NOTE at Figure 1.

5.6.5.2 SELECT “F1 - Place in normal service”.

5.6.6 OBSERVE that indications are consistent with expected conditions to ensure equipment system restoration.

5.6.6.1 IF indications are not consistent with expected conditions, NOTIFY FWS.

5.6.7 IF “Returning to Service”, NOTIFY Shift Manager AND/OR FWS.

5.7 Acceptance Criteria

Acceptance Criteria has been met when steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.
5.8 Review

5.8.1 IF any unit fails its alarm test, NOTIFY Radiological Engineering.

5.8.2 FWS REVIEW AND CHECK 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.

5.9 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

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.
Figure 1 - Service Menu

Service Menu

F1 - Place in Normal Service
   Shift + F1 = Place in Krypton Mode Service
F2 - Test Menu
   Shift + F2 = Additional Test Menu
F3 - Setup Menu
F4 - Faults
F5 - Information Menu
F6 - Print Menu
F7 - Demonstration Display Menu
F8 - Maintenance Log

Alt + F4 - Exit Program

NOTE - Some operation modes and parameters can be accessed by up to 4 submenus.
PRESSING escape (ESC) key from any sub menu returns to the next highest menu level. Repeatedly pressing the escape key will eventually lead back to the main Service Menu shown above.

- All screens provide a keystroke legend to determine which keys provide which function for a given menu.

- “PAGE UP” or “PAGE DOWN” can be pressed to toggle between individual detectors; the “+” (plus) key or “-” (minus) key can be pressed to change values when within the individual detector screens.
Figure 2 - ARGOS-5 Detector Gas Flow Path (Rotameters “A” through “D”)
Attachment 1 - Menu and Flow Diagrams

NOTE - Based on Access Level settings, not all options may be visible.
Attachment 1 - Menu and Flow Diagrams (Cont.)
Attachment 1 - Menu and Flow Diagrams (Cont.)

Print Menu
F1 - Monitor History
F2 - Service History
F3 - Calibration
F4 - Calibration Data
F5 - Contamination Check Results
F6 - Calibration Source List
F7 - All Setup Values
F8 - Calibration Check Results

Esc - Return to Service Menu

Setup Detection Zones Menu
F1 - Zone Configuration
F2 - Settings
F3 - Calibration
   Shift+F3 - Calibration Settings

F5 - Group Settings
F7 - Alarm Test Settings
F9 - Edit Calibration Source List
   Shift+F9 - Edit Calibration Log List

Esc - Return to Setup Menu
Attachment 1 - Menu and Flow Diagrams (Cont.)

Demonstration Display Menu
- F1 - Ready
- F2 - Position
- F3 - Count Down
- F4 - Clean
- F5 - Contaminated
- F6 - Turn
- F7 - Out of Service
- F8 - Messages
- F11 - Alarm Test

Esc - Return to Service Menu

Operation Instruction Menu
- F1 - Ready
- F2 - Position
- F4 - Clean
- F5 - Contaminated
- F6 - Turn
- F7 - Out of Service
- F8 - Messages
- F10 - Banners
- F11 - Alarm Test

Esc - Return to Setup Menu
### Table 1 - Setup Parameter Checks

<table>
<thead>
<tr>
<th>Setup Parameter Checks</th>
<th>Beta</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bkg False Alarm (K Alpha)</td>
<td>[3.000]</td>
<td>[3.000]</td>
</tr>
<tr>
<td>Extend Confidence (K Beta 1)</td>
<td>[0.440]</td>
<td>[0.440]</td>
</tr>
<tr>
<td>Alarm Confidence (K Beta 2)</td>
<td>[1.000] 68.27 %</td>
<td>[1.000] 84.13 %</td>
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<tr>
<td>Bkg Reset Level (K Delta)</td>
<td>[4.000] 1:15787</td>
<td>[5.000] 1:3488556</td>
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#### [F3 Setup] [F3 Detection Zones] [F1 Zone Configuration] [Alpha]

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<tbody>
<tr>
<td>[4600] dpm (4π)</td>
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#### [F3 Setup] [F3 Detection Zones] [F2 Settings] [Typical Detector] [Beta]

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#### [F3 Setup] [F3 Detection Zones] [F2 Settings] [Typical Intra Pair] [Beta]

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#### [F3 Setup] [F3 Detection Zones] [F2 Settings] [Typical Inter Pair] [Beta]

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#### [F3 Setup] [F3 Detection Zones] [F2 Settings] [Typical Quad] [Beta]

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