Changes “Other Than Inconsequential” Require These Additional Reviews:

Radiological Controls:
Central Radcon Organization

USQ # GCX-2

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<tr>
<td>E-2</td>
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<tr>
<td>E-1</td>
</tr>
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<td>E-0</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for a safe, uniform method for calibrating, troubleshooting and repairing of Eberline Personnel Contamination Monitor (PCM), Model PCM-1B.

1.2 Scope

This procedure applies to Eberline Personnel Contamination Monitor (PCM), Model PCM-1B.

2.0 INFORMATION

2.1 Terms and Definitions

- DPM - disintegrations per minute
- CPM - counts per minute.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - HV Switch MUST be OFF when making connection to high voltage circuit.

3.1.1 Comply with DOE-0336 Hanford Site Lock/Tagout.

3.1.2 Refer to Work Package for specific lock and tag instructions.

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

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

3.2 Radiation and Contamination Control

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 Environmental Compliance

Waste generated during the performance of this instruction must be handled per procedure TO-100-052. Contact Waste Operations for assistance in resolving any questions or issues that arise.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following NIST traceable M&TE may be required to perform this procedure:

- Digital Multimeter (DMM)
- High Voltage Meter (i.e. Electrostatic voltmeter, or DMM with High Voltage Probe, minimum impedance 1000 Megohms, capable of measuring 2500 VDC)
- Oscilloscope
- Pulse generator, Eberline MP-1/MP-2, or equivalent
- Sound [decibel] (db) meter.

National Institute of Standards and Technology (NIST) traceable sources:

- Alpha source, $^{239}$Pu, 400 to 630 DPM (for source check.)
- Alpha source, $^{239}$Pu, >18,000 DPM (for calibration.)
- Beta Gamma source, $^{137}$Cs or $^{36}$Cl, between 50,000 and 300,000 DPM
- Beta Gamma source, $^{137}$Cs, 4,000 to 6000 DPM or $^{36}$Cl, 5000 to 6500 DPM [for source check] (for all monitors set up with an RDA of 5,000 DPM or 83.3 DPS.)
- Source holder to maintain source to detector distance of approximately three inches (beta-gamma sources only.)
- PCM-1B keys or password
- 100K ±10% ohm resistor.

NOTE - If during the use of this procedure any of the following components are deemed necessary for replacement a B.O.M. must be added to the work package and the necessary items identified for replacement.

The following items may be needed for replacement during use of this procedure:

- Bulb (14 V) Standard #382
- Bulb (6 V) Standard #328
- Fuse (1 amp. Slo-blo) Eberline Part # FUSB12 (or equivalent)
- Sonalert Eberline Part # ADSS1
- Chime Eberline Part # ADAM10
- Battery (3.6 V) Eberline Part # BTXX2 (Lithium)
- Amp. Disc. Board Eberline Part # YP10722000
4.1 Special Tools, Equipment and Supplies (Cont.)

- H.V. Power Supply Eberline Part # P201B
- ESBC Board Eberline Part # YP10963000
- Memory II Board Eberline Part # YP11392000
- 15 – Channel Board Eberline Part # YP11169000
- Display Module Eberline Part # OPDS13
- Power Supply (5 Vdc) Eberline Part # MEVE30
- Power Supply (12 Vdc) Eberline Part # MEVE29
- Coaxial Cable Eberline Part # CA-22-XX (XX = Lengths)
- Keyboard - Touch Eberline Part # YP11170075
- Key Switch and Key Eberline Part # SWKY2
- Reflective Tape Eberline Part # HDTA39
- Solenoid Valve Eberline Part # MEVE28
- Pressure Switch Eberline Part # SWM127
- Toggle Switch Eberline Part # SWT012
- Annunciator Board Eberline Part # YP11170066
- Relay – Solid State Eberline Part # RLSS2
- Pressure Regulator Eberline Part # PUHD38
- Fuse Holder Eberline Part # FUH03
- PVC Tubing - 3/16” ID x 5/16” OD (Tygon or equivalent)
- PVC Tubing - 1/8” ID x 1/4” OD (Tygon or equivalent)
- Detector Screen Eberline Part # ZP11229022
- Mylar Eberline Part # MMMY
- Wire Eberline Part # MEW13
- LED Eberline Part # OPLP28
- Photoelectric Control Eberline Part # YP11351030
- Alarm Ack. Switch Eberline Part # SWPB2.
4.2 **Performance Documents**

The following documents may be needed to perform this procedure:

- Drawing H-6-11002, "Annunciator Module Schematic Modification"

4.3 **Field Preparation**

4.3.1 **OBTAIN** release from Operations management and Radiological Control organization prior to beginning performance of this procedure.

4.3.2 **IF** potential for radiological contamination exists, **PERFORM** equipment survey prior to beginning maintenance or removal of equipment or component from installed location.

**NOTE** - Some units may not be equipped with disconnects capable of being locked. It may be necessary to remove fuses, disconnect wires, un-plug power cords, etc., in order to satisfy the requirements of DOE-0336 Hanford Site Lock/Tagout.

4.3.3 **ENSURE** lock and tag or over-tagging requirements have been satisfied (Refer to Work Package for specific lock and tag instructions).

4.3.4 **RECORD** M&TE name, equipment number, and calibration due date on applicable Data Sheet.

4.3.5 **ENSURE** unit has purged a minimum of four hours.

4.3.6 **CLEAR** all trouble indications before starting calibration.

4.3.7 **RECORD** Source Isotope, ID Number, Activity, and Certification Date on applicable Data Sheet.
5.0 PROCEDURE

Special Instruction - If performance of any steps in this procedure is not required for procedure completion, steps not performed are to be marked, "N/A" in appropriate Data Sheet signoff space, and explained in comments/remarks section of Data Sheet.

NOTE - As-Found values should be taken prior to Repairs, Parts replacement and Cleaning, (if that cleaning could affect As-Found value accuracy).

- During performance of this procedure, troubleshooting may be performed per Section 5.13 at any time.

- Starting at the beginning of this section, re-performance of calibration should be performed after troubleshooting and repair(s) are completed.

- Parts replacement, repairs performed and failure mode should be documented on calibration Data Sheet.

- Section 5.4 may be performed independent from the rest of the procedure.

5.1 Detector Condition

5.1.1 PRIOR to beginning calibration, PERFORM a source check on detectors.

5.1.2 RECORD As-Found condition of detectors on Work Record.

5.2 Clean and Inspect

5.2.1 INSPECT detectors for damage.

5.2.2 HPT PERFORM contamination survey of any areas requiring vacuum cleaning.

5.2.3 PRIOR to performing any work that could affect As-Found values, OBTAIN AND RECORD “As Found” readings per Steps in Sections 5.3, 5.4, 5.5, 5.6, 5.7, 5.10 and 5.12.

5.2.4 IF the instrument is dirty, CLEAN AND DUST instrument.

NOTE - Removal of Foot pad cover should be performed prior to any HPT survey in support of vacuum cleaning the foot pad.

5.2.5 IF unit is dirty, CLEAN unit with vacuum cleaner.

5.2.6 IF plastic is torn, REPLACE plastic wrap on detectors.

5.2.7 RECORD any discrepancies in comment Section of Data Sheet.
5.3 P-10 GAS

NOTE - P-10 gas bottle pressure must exceed 200 psig prior to proceeding.

5.3.1 IF P-10 gas bottle pressure is less than or equal to 200 psig, REQUEST gas bottle be replaced with full bottle.

5.3.2 RECORD P-10 gas bottle pressure (regulator) values in As-Found column of Data Sheet.

5.3.2.1 IF gas is fed through building supply, MARK "Building Supply" in regulator section of Data Sheet.

5.3.3 IF As-Found values are within tolerance specified on Data Sheet, and NO adjustments are desired, RECORD As-Found values in As-Left column AND

GO TO Step 5.3.6.

5.3.4 ADJUST output pressure to Data Sheet value.

5.3.5 RECORD As-Left output pressure values.

5.3.6 IF unit does not have a Gas Manager, GO TO Step 5.3.34.

5.3.7 IF unit has already been purged, GO TO Step 5.3.23.

5.3.8 TURN "System Adjustment" control on Gas Manager fully clockwise.

5.3.9 PRESS "Control Knob" located below the flowmeters (the display will prompt the operator to enter a 4 digit password).

5.3.10 ROTATE knob until first number "1" shows, PRESS knob.

5.3.11 REPEAT Step 5.3.10 for the other 3 digits.

5.3.12 AT "Pressure Setting," RECORD value in the As-Found column of Data Sheet.
5.3 **P-10 GAS (Cont.)**

5.3.13 **IF** As-Found value is within tolerance specified on Data Sheet, and NO adjustments are desired, **RECORD** As-Found values in As-Left column **AND**

**GO TO** Step 5.3.17.

5.3.14 **ADJUST** Pressure Setting to Data Sheet value.

5.3.15 **ROTATE** knob to change displayed value **AND**

**WHEN** displayed value is correct, **PRESS** knob.

5.3.16 **RECORD** As-Left Pressure Setting value.

5.3.17 **AT** "Edit Purge Mode," **SET** purge mode to ON.

5.3.17.1 **ROTATE** knob to change purge mode from OFF to ON.

5.3.17.2 **WHEN** purge mode is ON, **PRESS** knob.

5.3.18 **AT** "Edit Purge Time," **SET** purge time to 240 minutes.

5.3.18.1 **ROTATE** knob to increase or decrease purge time.

5.3.18.2 **WHEN** correct value is displayed, **PRESS** knob.

5.3.19 **AT** "Auto Purge Delay," **SET** delay to OFF.

5.3.19.1 **ROTATE** knob counterclockwise until display indicates that Auto Purge Delay is OFF.

5.3.19.2 **WHEN** display is correct, **PRESS** knob.

5.3.20 **USING** the System Adjustment control, **ADJUST** flow rate on Purge Rate rotameter to 750 ± 25 cc/min.

5.3.21 **AFTER** purge cycle is complete, **PRESS AND HOLD** "Control Knob" for 3-4 seconds, **THEN**

**RELEASE** knob. (This will re-set gas use counters to zero.)

5.3.22 **GO TO** Section 5.4, Detector Efficiency Check.
5.3 P-10 GAS (Cont.)

5.3.23 PRESS "Control Knob" located below the flowmeters (the display will prompt the operator to enter a 4 digit password).

5.3.24 ROTATE knob until first number "1" shows, PRESS knob.

5.3.25 REPEAT Step 5.3.24 for the other 3 digits.

5.3.26 AT "Pressure Setting," RECORD value in the As-Found column of Data Sheet.

5.3.27 IF As-Found value is within tolerance specified on Data Sheet, and NO adjustments are desired, RECORD As-Found values in As-Left column AND

GO TO Step 5.3.31.

5.3.28 ADJUST Pressure Setting to Data Sheet value.

5.3.29 ROTATE knob to change displayed value AND

WHEN the displayed value is correct, PRESS knob.

5.3.30 RECORD As-Left Pressure Setting value.

5.3.31 AT "Edit Purge Mode," SET purge mode to OFF.

5.3.31.1 ROTATE knob to change purge mode from ON to OFF.

5.3.31.2 WHEN purge mode is OFF, PRESS knob.

5.3.32 AT "Auto Purge Delay" it will say "Auto Purge OFF" (the display will cycle to the default display on its own, without having to press the knob).

5.3.33 GO TO Section 5.4, Detector Efficiency Check.
5.3 P-10 GAS (Cont.)

NOTE - Rotameters are located inside cabinet and labeled A, B, C, Spare.

5.3.34 RECORD flow rate (rotameter) values in As-Found column of Data Sheet.

5.3.35 IF As-Found values are within tolerance specified on Data Sheet, and NO adjustments are desired, RECORD As-Found values in As-Left column AND

GO TO Section 5.4, Detector Efficiency Check.

5.3.36 ADJUST flow rate to Data Sheet value.

5.3.37 RECORD As-Left flow rate values.
NOTE - Section 5.4 may be performed independent from the rest of the procedure.

5.4 Detector Efficiency Check

NOTE - Count rate and efficiency are displayed at end of count.
- For “Count Time-Test” values refer to Table 1.

Conversions:
- \( \text{CPM} \div 60 = \text{CPS} \)
- \( \text{DPM} \div 60 = \text{DPS} \)

5.4.1 Place TEST/OPERATE Switch to TEST.
5.4.2 Press (+) key until “DISPLAY SYSTEM PARAMETERS” is displayed.
5.4.3 Press and release ENTER key.
5.4.4 Press and release (+) and (-) keys until "COUNT TIME, TEST" is displayed.
5.4.5 Press EDIT.
5.4.6 Using Table 1, ENTER the count time for source being used.
5.4.7 Press and release ENTER key.
5.4.8 Press and release (+) and (-) keys until "COUNT-RATE MODE" displays.
5.4.9 Press and release ENTER key to enter COUNT RATE MODE.
5.4.10 Press and release (+) and (-) keys until "[ENTER] TO CALCULATE NEW EFFICIENCIES" displays.
5.4.11 Press and release ENTER key (calculates new efficiencies).
5.4.12 Press EDIT.
5.4.13 Type in DPS strength of beta-gamma calibration source (with keypad), then

Press and release ENTER key.
5.4.14 Press (+) key until beta-gamma detector channel under test is displayed.
5.4 Detector Efficiency Check (Cont.)

NOTE - Using a source holder for beta-gamma source placement is the desired method (except on foot detector).
- Placement of foot detector source should be directly on detector protective screen.

5.4.15 PLACE beta-gamma calibration source as close to center as possible on detector under test.

5.4.16 PRESS AND RELEASE ENTER key (starts source count.)

5.4.17 RECORD the As-Found efficiency on Data Sheet.

5.4.18 REPEAT Steps 5.4.14 through 5.4.17 for remaining Beta-Gamma detectors listed on Data Sheet.

5.4.19 GO TO Section 3 of the Data Sheet to determine what the unit measures for, (i.e. beta-gamma and/or alpha).

5.4.19.1 IF unit measures beta-gamma only, GO TO Section 5.5.

5.4.20 RE-ENTER Count Rate Mode.

5.4.21 PRESS AND RELEASE (+) and (-) keys until "[ENTER] TO CALCULATE NEW EFFICIENCIES" displays.

5.4.22 PRESS AND RELEASE ENTER key.

5.4.23 PRESS EDIT.

5.4.24 TYPE IN DPS strength of alpha calibration source (with keypad), THEN PRESS AND RELEASE ENTER key.

5.4.25 PRESS (+) key until alpha detector channel under test is displayed.

5.4.26 PLACE alpha calibration source directly on applicable detector.

5.4.27 PRESS AND RELEASE ENTER key.

5.4.28 RECORD As-Found efficiency on Data Sheet.

5.4.29 REPEAT Steps 5.4.25 through 5.4.28 for remaining alpha detectors.
5.5 **Low Voltage Power Supplies**

NOTE - Card cages and power supplies may be accessed by swinging main chassis assembly out from cabinet. Panel is hinged on left and secured by screws on right.

- Figure 1 provides location of DC power supplies.
- VDC adjustment is clearly marked on the circuit board of each supply.

5.5.1 **CONNECT** DMM negative lead to TB-10, terminal 7 or 8 (common).

5.5.2 **CONNECT** DMM positive lead to each terminal listed below AND **RECORD** As-Found voltages on Data Sheet.

<table>
<thead>
<tr>
<th>SUPPLY MEASURED (VDC)</th>
<th>TERMINAL</th>
<th>DESIRED (VDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)5</td>
<td>TB-10, Terminal 5</td>
<td>5.0 (4.9 to 5.1)</td>
</tr>
<tr>
<td>(+)12</td>
<td>TB-10, Terminal 2</td>
<td>(+)12.0 (11.9 to 12.1)</td>
</tr>
<tr>
<td>(-)12</td>
<td>TB-10, Terminal 6</td>
<td>(-)12.0 (-12.1 to -11.9)</td>
</tr>
</tbody>
</table>

5.5.3 **IF** As-Found values are within tolerance specified on Data Sheet, and NO adjustments are desired, **RECORD** As-Found values in As-Left column AND **GO TO** Section 5.6, System Parameters.

5.5.4 **ADJUST** each out-of-tolerance power supply until DMM indicates within tolerance.

5.5.5 **RECORD** As-Left values on Data Sheet.
5.6 System Parameters

5.6.1 PRESS (+) key until "DISPLAY SYSTEM PARAMETERS" displays.

5.6.2 PRESS AND RELEASE ENTER key.

5.6.3 PRESS AND RELEASE (+) key to step through display system parameters AND

RECORD As-Found values on Data Sheet.

5.6.4 ENSURE As-Found values agree with required values listed on Data Sheet AND

RECORD As-Left values on Data Sheet.
5.7 Battery Voltage MEM II Board

NOTE - Battery replacement is required, at a minimum, every five years. Installation date should be marked on back of new batteries when installed.

5.7.1 CONNECT 100K ohm resistor across leads of DMM.

5.7.2 USING DMM (with resistor), MEASURE voltage between TP1 and TP2 of MEM II board for approximately one second AND RECORD As-Found voltage on Data Sheet.

5.7.3 CHECK date on back of battery, if marked.

5.7.4 IF installation date is not marked on battery, but MEM II voltage is greater than or equal to 2.65 Volts, PERFORM the following:

5.7.4.1 RECORD date of test on battery.

5.7.4.2 RECORD As-Found voltage in As-Left column AND

5.7.4.3 GO TO Section 5.8, System Diagnostics.

5.7.5 IF battery is more than five years old, OR voltage is less than 2.65 Volts, PERFORM the following:

5.7.5.1 IF the battery is in stock, REPLACE the battery AND RECORD in the comment section of the Data Sheet and J5 Work Record that the battery was replaced.

5.7.5.2 IF the battery is not in stock, INITIATE Work Request to replace battery.

5.7.5.3 ENSURE installation date is recorded on new battery.

5.7.5.4 REPEAT Steps 5.7.1 and 5.7.2 AND RECORD As-Left voltage on Data Sheet.
5.7 Battery Voltage MEM II Board (Cont.)

NOTE - When AC is turned off and battery voltage is low, or when the battery is replaced, all parameters will reset to default values programmed by Eberline.

5.7.5.5 REPEAT Section 5.6, System Parameters, without recording any As-Found or As-Left values.

5.7.5.6 ENSURE values are within required values listed on Data Sheet.
5.8 System Diagnostics

5.8.1 PRESS AND RELEASE (+) key until "SYSTEM DIAGNOSTICS" displays.

5.8.2 PRESS AND RELEASE ENTER key and ENSURE "DISPLAY TEST" displays.

5.8.3 PRESS AND RELEASE ENTER key AND ENSURE all display LED segments illuminate.

5.8.4 PRESS AND RELEASE (+) key and ENSURE "KEYBOARD TEST" displays.

5.8.5 PRESS AND RELEASE ENTER key.

5.8.6 PRESS AND RELEASE the following keys (in sequence) AND

ENSURE key pressed is displayed:

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- . (period)
- EDIT
- ENTER
- RUBOUT
- - (minus).

5.8.7 PRESS AND RELEASE (+) key AND

ENSURE "ALARM ACKNOWLEDGE" displays.

5.8.8 PRESS AND RELEASE ALARM ACK switch.
5.8 System Diagnostics (Cont.)

5.8.9 WHEN "LIGHT TEST" displays PRESS AND RELEASE ENTER key AND

CHECK the following:
• All lamps except bottle empty lamps illuminate
• Alarm sounds.

5.8.10 PRESS AND RELEASE (+) key AND

ENSURE "CHIME TEST" displays and chime sounds.

5.8.11 PRESS AND RELEASE (+) key AND

ENSURE "READ/WRITE MEMORY TEST" displays.

5.8.12 PRESS AND RELEASE ENTER key AND

ENSURE "RAM-OK" displays, followed by "PROGRAM MEMORY TEST" display.

5.8.13 PRESS AND RELEASE ENTER key AND

ENSURE "PROGRAM MEMORY OK" displays.

5.8.14 PRESS AND RELEASE (+) key until "SYSTEM DIAGNOSTICS" displays.

5.8.15 IF all system diagnostics results were correct, GO TO Section 5.9, Amplifier Discriminator (Amp-Disc) Gain.

5.8.16 IF any system diagnostics results were incorrect, PERFORM the following.

5.8.16.1 RECORD negative results in COMMENTS/REMARKS on Data Sheet.

5.8.16.2 INITIATE Work Request to troubleshoot and repair.

5.8.16.3 REPEAT Section 5.8, System Diagnostics, after repairs are completed.
5.9 Amplifier Discriminator (Amp-Disc) Gain

5.9.1 PLACE HV Switch of card cage under test to OFF.

5.9.2 DISCONNECT detector HV input to card being adjusted.

5.9.3 CONNECT Pulse Generator to detector input with MHV connector.

NOTE - See Figure 2 for component location.

5.9.4 CONNECT oscilloscope to Amp-Disc TP-2 (+) and TP-3 (-).

5.9.5 ADJUST Pulse Generator output to 1.0 (0.9 to 1.1) mV negative pulse at approximately 1666 cps (100 Kcpm).

5.9.6 ADJUST GAIN control (R411) for a signal amplitude of approximately 2 Volts on the oscilloscope.

5.9.7 REPEAT Steps 5.9.1 through 5.9.6 for each Amp-Disc board.

5.9.8 DISCONNECT M&TE.

5.9.9 CONNECT detector HV input to card.

5.9.10 PLACE HV Switch of card cage under test to ON.

5.9.11 REPEAT Steps 5.9.1 through 5.9.10 for remaining card cages.
5.10 Detector High Voltage

NOTE - Figure 2 identifies component location unless noted otherwise.

5.10.1 IF not already positioned, PLACE ANTI-COIN switches on all Amp-Disc boards to the IN position.

5.10.2 CONNECT DMM to Amp-Disc TP-4 (+) and TP-3 (-) (upper arm det.)

5.10.3 RECORD As-Found B-G Threshold Voltage (DMM) on Data Sheet.

5.10.4 IF As-Found voltage is within tolerance per Data Sheet, and NO adjustments are desired, RECORD As-Found value in As-Left column AND GO TO Step 5.10.7.

5.10.5 ADJUST R412 for desired voltage (DMM) per Data Sheet.

5.10.6 RECORD As-Left B-G Threshold Voltage on Data Sheet.

5.10.7 MOVE DMM (+) lead on Amp-Disc board to TP-5.

5.10.8 RECORD As-Found Alpha Threshold Voltage (DMM) on Data Sheet.

5.10.9 IF As-Found voltage is within tolerance per Data Sheet, and no adjustments are desired, RECORD As-Found value in As-Left column AND GO TO Step 5.10.10.

5.10.9.1 ADJUST R413 for desired voltage (DMM) per Data Sheet.

5.10.9.2 RECORD As-Left Alpha Threshold Voltage on Data Sheet.

5.10.10 REPEAT Steps 5.10.2 through 5.10.9 for each remaining Amp-Disc card without recording values on Data Sheet.
5.10 Detector High Voltage (Cont.)

NOTE - Figure 3 identifies component locations.

WARNING

HV Switch must be OFF when making connections to high voltage circuit, failure to comply may cause serious personnel injury.

5.10.11 PLACE HV Switch of card cage under test to OFF.
NOTE - High Voltage is checked on spare HV connector of card cage.

5.10.12 CONNECT (+) lead of High Voltage Meter to spare HV connector on card cage under test.

5.10.13 CONNECT (-) lead of High Voltage Meter to case of card cage under test.

5.10.14 PLACE HV Switch of card cage under test to ON.

5.10.15 RECORD As-Found HV on Data Sheet.

5.10.16 IF As-Found HV is within tolerance per Data Sheet, and NO adjustments are desired, RECORD As-Found value in As-Left column AND GO TO Step 5.10.19.

5.10.17 ADJUST R101 for desired HV indication per Data Sheet.

5.10.18 RECORD As-Left HV on Data Sheet.

5.10.19 PLACE HV Switch of card cage under test to OFF.

5.10.20 DISCONNECT High Voltage meter.

5.10.21 PLACE HV Switch of card cage under test to ON.

5.10.22 REPEAT Steps 5.10.11 through 5.10.21 for remaining card cages.
5.10 Detector High Voltage (Cont.)

5.10.23 IF no adjustments/repairs were made throughout performance of this procedure (Sections 5.5 through 5.10), and As-Found efficiencies were within tolerance, RECORD As-Found efficiencies in As-Left column of Data Sheet AND

GO TO Section 5.11, Shield Factors.

5.10.24 IF adjustments/repairs were made, REPEAT Section 5.4, Detector Efficiency Check, without recording new As-Found data.

5.10.25 IF all detector efficiencies are now within tolerance, RECORD As-Left efficiencies on Data Sheet AND

GO TO Section 5.11, Shield Factors.

5.10.26 IF any detector efficiency is still out of tolerance, NOTIFY FWS AND PERFORM the following:

5.10.26.1 INITIATE Work Request to troubleshoot and repair AND RECORD action in COMMENTS/REMARKS on Data Sheet.

5.10.26.2 USE a new copy of Data Sheet and REPEAT entire procedure after repairs.

5.10.26.3 ATTACH both copies to Work Package.
5.11 Shield Factors

5.11.1 USE Calculate Shield Factors utility to calculate and enter all shield factors, ENTER program AND FOLLOW display prompts.

5.11.2 ALLOW PCM-1B to take five minute unoccupied background count.
NOTE - All shield factors are calculated and entered into respective channel files automatically at end of occupied background count time.

5.11.3 ENTER unit in normal counting position AND START an occupied background count.
5.12 Sonalert Output Level

NOTE - Test must be performed on all new or re-located monitors.

- All sound level readings are to be taken with meter set on C scale and fast response, if applicable.
- Section 5.12 may be used to verify operability and adjustability of output sound levels.

5.12.1 MEASURE background sound level at a distance of approximately three feet directly in front of Sonalert AND

RECORD on Data Sheet.

5.12.2 PRESS AND RELEASE (+) key until "SYSTEM DIAGNOSTICS" displays.

5.12.3 PRESS AND RELEASE ENTER key.

5.12.4 PRESS AND RELEASE (+) key until "LIGHT TEST" displays, THEN

PRESS AND RELEASE ENTER key.

5.12.5 MEASURE alarm sonalert output at distance of approximately three feet directly in front of sonalert AND

RECORD in As-Found column of Data Sheet.

5.12.6 MEASURE chime sonalert output at distance of three feet directly in front of sonalert AND

RECORD in As-Found column of Data Sheet.

5.12.7 IF As-Found output levels are within tolerance specified on Data Sheet, and NO adjustments are desired, ENTER As-Found values in As-Left column AND

GO TO Section 5.14, Restoration.

5.12.8 ADJUST output levels to value specified on Data Sheet AND

RECORD As-Left values on Data Sheet.

5.12.9 IF output level cannot be adjusted, OR unit has not been modified to allow adjustment, INITIATE Work Request to modify unit per Drawing H-6-11002.
5.13 Troubleshooting and Acquire Parts

NOTE - If troubleshooting and/or replacement parts are not necessary then this section may be skipped.

- This section may be performed at anytime and the steps may be performed in any order or in parallel as directed by the FWS.

5.13.1 TROUBLESHOOT per Eberline PCM-1B Technical Manual.

NOTE - Replacement parts are listed in Section 4.1.

5.13.2 IF parts replacement is required, ENSURE B.O.M. has been generated, and approved per TFC-BSM-FPM_MC-C-01.

NOTE - Replacement parts are available from the material coordinators and are staged in the East and West Tank Farm storage areas.

5.13.3 RECORD all repairs and parts replacement on calibration data sheet.

5.13.4 RETURN to applicable point in procedure.

5.14 Restoration

5.14.1 IF not already removed, DISCONNECT AND REMOVE all test equipment.

5.14.2 ENSURE instrument, equipment, or system restoration by observing indications, alarms, or computer points are consistent with expected conditions.

5.14.3 RE-SET OR CLEAR any alarms.

5.14.4 PLACE TEST/OPERATE Switch in OPERATE.

NOTE - Steps 5.14.5 and 5.15.1 may be performed concurrently.

5.14.5 PERFORM a source check of unit (to verify accuracy is acceptable) prior to applying required calibration labels AND INCLUDE month/day/year on calibration label.

5.15 Acceptance Criteria

5.15.1 PERFORM a Weekly Alarm and Function Test (3-RM-504) of unit prior to placing unit in service.
5.16 Review

5.16.1 **INFORM** FWS calibration is complete.

5.16.2 **RECORD** in COMMENTS/REMARKS section of Data Sheet the Work Request Number(s) of any work documents generated as a result of this procedure.

5.16.3 **RETURN** Work Package to FWS.

5.16.4 **FWS REVIEW AND ENSURE** that the completed Data Sheets meet the acceptance criteria and the comments sections are filled out appropriately.

   5.16.4.1 **ENSURE** that any work requests needed as a result of this procedure are identified and generated.

   5.16.4.2 **IF** the As-Found efficiency is outside of the specified tolerance for any detector, **NOTIFY** Radiological Engineering.

5.17 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 identified record custodian is responsible for record management in accordance with TFC-BSM-IRM_DC-C-02 or other applicable requirements.
Figure 1 Upper Chassis Components
Figure 2 Amplifier Discriminator Board
Figure 3 Amplifier Discriminator Card Cage

HIGH VOLTAGE CONNECTOR (TYPICAL OF 6)
### Table 1 - PCM-1B Count Time Test Parameter

<table>
<thead>
<tr>
<th>Calibration Source Activity (DPM)</th>
<th>Count Time Test (sec.)</th>
<th>Count Time Test (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300000 ≤ DPM &lt; 310,000</td>
<td>20</td>
<td>0.33</td>
</tr>
<tr>
<td>290000 ≤ DPM &lt; 300,000</td>
<td>21</td>
<td>0.34</td>
</tr>
<tr>
<td>280000 ≤ DPM &lt; 290,000</td>
<td>21</td>
<td>0.36</td>
</tr>
<tr>
<td>270000 ≤ DPM &lt; 280,000</td>
<td>22</td>
<td>0.37</td>
</tr>
<tr>
<td>260000 ≤ DPM &lt; 270,000</td>
<td>23</td>
<td>0.38</td>
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<tr>
<td>250000 ≤ DPM &lt; 260,000</td>
<td>24</td>
<td>0.40</td>
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<tr>
<td>240000 ≤ DPM &lt; 250,000</td>
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<tr>
<td>220000 ≤ DPM &lt; 230,000</td>
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<tr>
<td>210000 ≤ DPM &lt; 220,000</td>
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<tr>
<td>200000 ≤ DPM &lt; 210,000</td>
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<tr>
<td>190000 ≤ DPM &lt; 200,000</td>
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<tr>
<td>180000 ≤ DPM &lt; 190,000</td>
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<tr>
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<tr>
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<tr>
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<td>2.00</td>
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