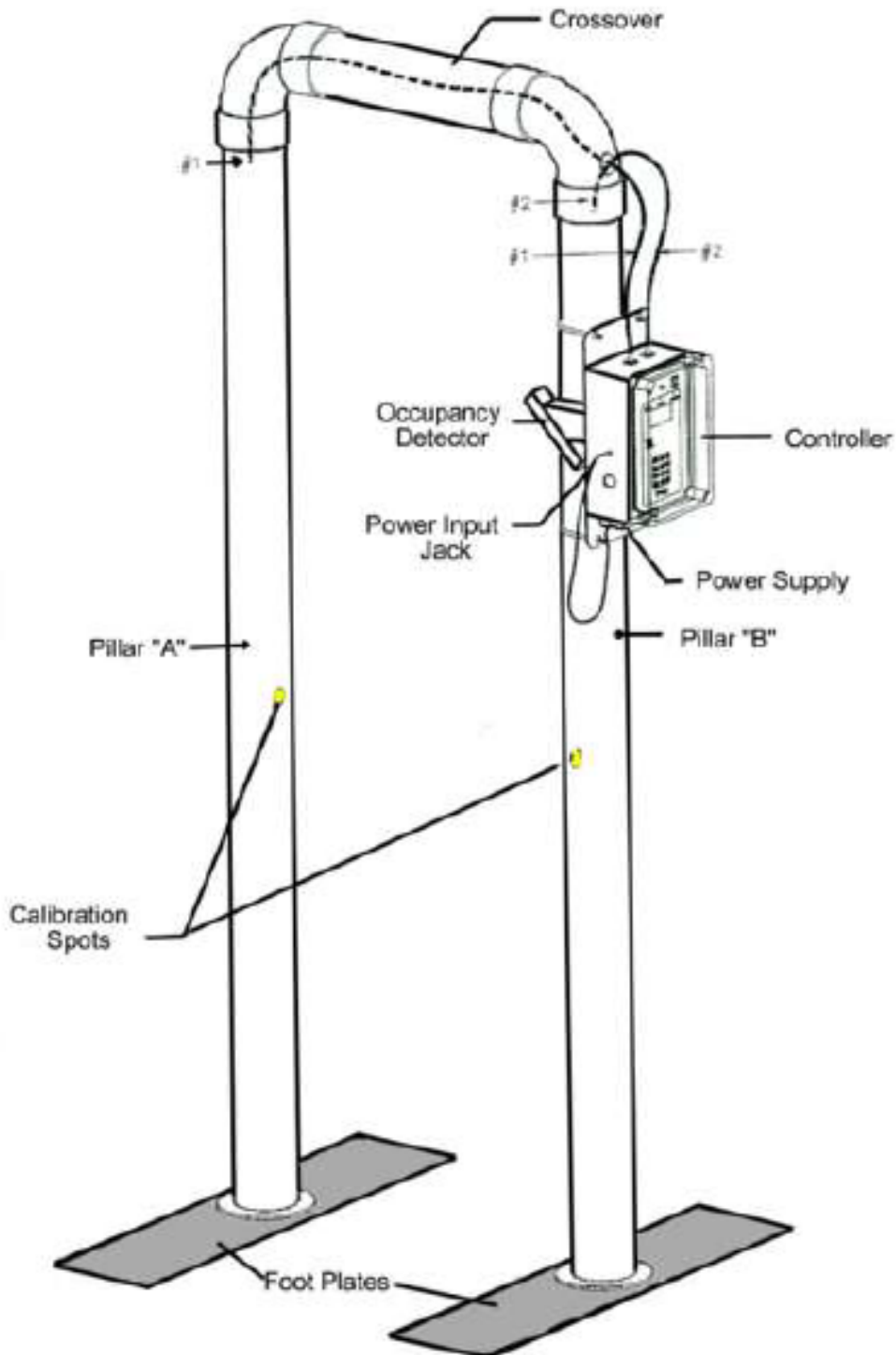




Portal Monitor for Screening Radiation Victims

A Thermo-Electron portal monitor is used to rapidly screen radiation victims for radioactive contamination. Below are the various components of the monitor;



Portal Monitor Assembly – Components



Infrared Patient Counter

Control Console

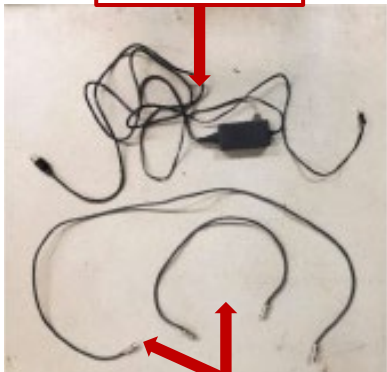


PVC Tubing which connects the top of the Vertical Columns and Cables Run Through



Cs-137 Check Source & Lead Container

Power Cord



Cables
(hook each detector to Control Unit);
Cables either have BNC or Phone jack connectors

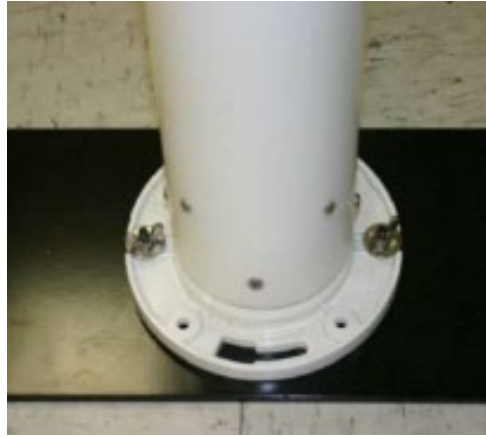


Foot Plates for Vertical Columns (have wing nuts to attach)

Putting the Portal Monitor Together

The vertical columns are heavy and recommended that 2 people set the portal monitor up. It's also useful to have a chair or small step ladder to stand on (*Note: some facilities have the portal partially/fully set up*).

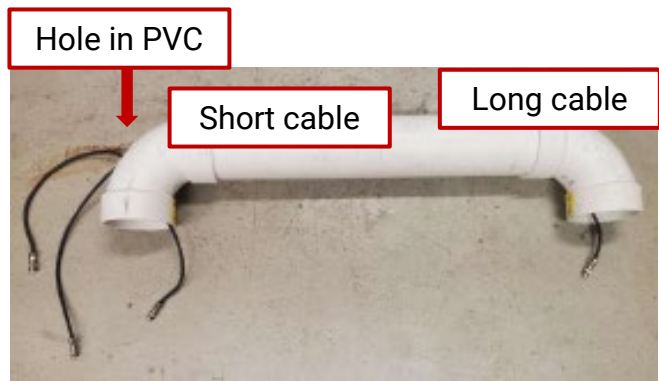
1. Attach Vertical Columns to floor plates (wingnuts/washers on plate). The yellow dots (or letters) on the Vertical Columns must face inside (e.g., towards other column).



2. Determine where you wish to place the Portal Monitor and then place crosspiece on floor to space foot plates.



3. Put the two cables into the crosspiece. Both cables will come out the hole in the elbow of the crosspiece. Note that some of the cables have BNC connectors while newer ones have phone jack connectors.



Detector connector

4. Connect one end each cable to a Vertical Column while connecting the columns with the crosspiece.



5. Connect the cables coming out of the hole in the crosspiece to the Control Console (for BNC connectors it's on the top of the unit; for phone jacks it's on the bottom).



6. Connect the power cord to Control Console (connector on new units on bottom). The Portal Monitor can also be run on 6 "D" batteries (12 hour run)

Power Switch

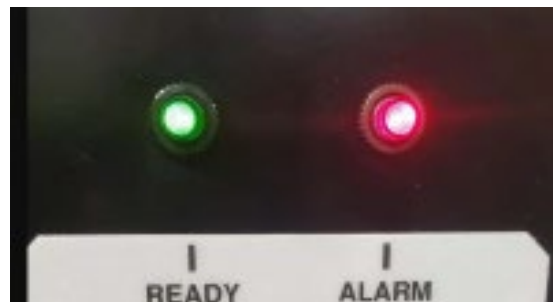
Power Cord Connector



Batteries



7. Power on Portal Monitor. Confirm system starts and runs initial self-test without errors. Both "READY" and "ALARM" lamps will light, a tone will be heard, and the system will perform a 20 second background count. If no errors are found, then a "ready" message will be displayed.



8. Perform walk-through test.
- Walk through detector with no source to ensure it does not alarm.
 - Place the Cs-137 check source on the yellow circle on each pillar. The unit must alarm when the check source is placed on the circles.
 - Slowly walk through the Portal Monitor with a the Cs-137 source located at:
 - Belt level,
 - Head level, and
 - Shoe/ankle level and make sure source alarms.



If the Portal Monitor DOESN'T alarm with the Cs-137 source, the Alarm Sigma may need to be lowered. Conversely, if the monitor seems to alarm without the source present the Alarm Sigma may need to be increased. The complete Field Calibration Procedure is provided on the next page.

General Overview of Portal Monitor

- Once the monitor is set up, individuals slowly walk through the two pillars (ensure that other victims waiting to be monitored are several feet from the portal monitor).
- If the portal monitor alarms, use a survey meter with a GM probe to determine where contamination is on the victim. In large scale events, the victim may be directed to remove clothing & shower.
- The portal monitor's alarm setting of 1 uCi of Cesium-137 is quite low. The dose rate from a 1 uCi source is 0.33 mrem per hour. To put this into perspective, you would need to be 1 meter away from a 1 uCi Cesium-137 source for 30 hours to receive the same amount of radiation you receive from a typical dental x-ray.
- For health care personnel, the major concern of receiving radiation dose from these patients is from themselves becoming contaminated. Therefore, good contamination procedures must be used when working with these patients.
- An infrared eye ("Occupancy Detector") at the entrance tells the unit to start counting the occupant. If the radiation level above a predetermined alarm level, the unit will audibly alarm. The alarm will stay on until 5 seconds after the alarm condition is cleared (e.g., contaminated individual leaves the portal monitor).
- Portal monitor will constantly monitor background radiation levels & will alarm if background levels become too high. The monitor may need to be powered off/on to determine the new background level or the portal monitor may need to be moved to a lower background area.



University of Nebraska Medical Center Radiation Health Center

TSA TPM-903A Portal Monitor Field Calibration Procedure and Verification Checklist (Reference: Thermo Electron)

Serial Number: _____ **Location:** _____

Purpose

The Field Calibration procedure is simple and will enable the user to complete the Performance Verification Checklist. For users who require a complete step by step procedure for performing the Performance Verification of the TPM-903A portal monitor, use RHC -IP-22B. A check source is required. This should be the FEMA recommended 1uCi of ¹³⁷Cs.

Procedure

1. Switch TPM on and ensure that system starts up and runs initial self-test without errors.

Green lamp OK _____
Red lamp OK _____
Sounder OK _____
No "FAIL" message _____

2. TPM will enter background mode automatically for 20 seconds then go to ready. Check that all modes are operational and display shows clear messages. This will show the timer counting down from 20. Then a ready message will be displayed on completion of the background count.

20 Second countdown OK _____
Ready Message displayed OK _____

3. Ensure that the check source is safely placed as far away as possible. Note the displayed total background count-rate. This will be approximately 2000cps in a typical 10uR/hr background environment.

Display counts _____
Note: Should be approximately 200cps per 1uR/hr (normally 2000cps))

4. Perform walk-through tests (Note: Must be repeated if any adjustments are made later).

A. Without source. Check for no alarm. No alarm OK _____

NOTE: If test A fails then go to #8, 4 and set alarm sigma higher by 0.2 sigma.

- B. With check source on head. Check for alarm. TPM alarms OK _____
- C. With check source on waistline. Check for alarm. TPM alarms OK _____
- D. With check source on foot. Check for alarm. TPM alarms OK _____

NOTE: If test B, C, or D fails to alarm go to #8, 4 and set alarm sigma lower by 0.2 sigma.

5. Enter "0" to enter password mode then enter "1,2,3,4".
Press "2" for Functions. Press "1" for Show Counts
 - A. Record background count-rate in each channel with no source present
Background Channel #1 _____ Background Channel #2 _____
NOTE: Should be 100cps per 1uR/hr approx. (normally 1000cps)
 - B. Place check source on center of detector #1 and note counts.
Counts for source on Detector #1 _____ (Original result _____)
 - C. Place check source on center of detector #2 and note counts. Press "#" to exit.
Counts for source on Detector #2 _____ (Original result _____)
6. Enter "2" for Discriminator Check.
Note value of LLD and ULD. Compare with previously noted or factory settings.
Press "#".
LLD _____ (Factory setting 0.098)
ULD _____ (Factory setting 5.040)
7. Enter "3" for Variance Check
Note value of Pass #5 for each detector. This should be less than 0.15.
Press "#" to exit.
Variance Channel #1 _____ (Less than 0.15)
Variance Channel #2 _____ (Less than 0.15)
8. Enter "1" for parameters
Then note parameter settings and compare with previously noted or factory settings.
 - A. Low alarm and high alarm
Low Alarm _____ (Factory setting 500)
High Alarm _____ (Factory setting 5000)
 - B. Occupancy hold in
Occupancy hold in _____ (Factory setting 5)
 - C. Alarm comparison intervals
Alarm comparison intervals _____ (Factory setting 5)
 - D. Alarm Sigma. May be set to a lower value if check source fails to alarm the unit.
Alarm sigma _____ (Factory setting 3.5)
Set to a higher value if too many false alarms occur when a source is not present.
9. Press "#" to return to operational mode.

Individual Performing Verification: _____ Date: _____