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FIGURE

APPENDIX

HEALTH AND SAFETY PLAN
MERCURY METER SITE INVESTIGATION/REMEDIATION
EL PASO NATURAL GAS COMPANY

1.0 PROJECT IDENTIFICATION

Project: Mercury Meter Site Investigation/Remediation
El Paso Natural Gas Company
Farmington Division
Farmington, New Mexico

Date of Plan: March 1, 1990

Dates of Work: May 1, 1990 to December 31, 1993

Activity: Plan Expiration Date: December 31, 1993
Investigation, Removal and Disposal of Mercury Contaminated Materials, and Sampling

2.0 INTRODUCTION

This site specific Health and Safety Plan (HSP) establishes guidelines and requirements for the safety of EPNG and EPNG subcontractors field personnel while conducting field activities associated with the above referenced project. The specific activities addressed by this plan are defined in EPNG's Mercury Meter Station Site Investigation/Remediation Work Plan. All project team employees of El Paso Natural Gas Company (EPNG) and its subcontractors are required to read this plan, sign the attached Compliance Agreement, and abide by the provisions herein. Additional health and safety procedures for the field activities may be implemented by subcontractors, but health and safety standards will meet this HSP as a minimum.

This HSP is based on a review of available information and an evaluation of the potential hazards associated with the referenced project. This plan outlines the health and safety procedures and equipment required for activities at this site to minimize the potential for exposure of field personnel to potentially contaminated materials.

2.1 Project Description and History

EPNG will conduct a voluntary cleanup of mercury contaminated metering facilities located in its Farmington Division. This program will also be extended to areas outside of the Division. The cleanup will be conducted by EPNG personnel assisted by contract labor. The Health and Safety Plan will be implemented by EPNG personnel. EPNG personnel and its subcontractors will be subject to this Health and Safety plan.

The Project involves the investigation and remediation of an estimated 9,000 sites in the Farmington Division, plus additional sites at other EPNG Divisions. These sites are metering stations which may be contaminated with mercury (Hg).

2.2 Applicability

This Health and Safety Plan is applicable only to the investigation, sampling, and remediation of potential mercury-contaminated metering stations during EPNG's Mercury Meter Site Investigation/Remediation Project.

3.0 RESPONSIBILITY AND AUTHORITY

Personnel responsible for project safety are the Field Specialist (FS) and the Division Health and Safety Officer (DHSO). The designation of FS and DHSO will be conducted by EPNG management. The Farmington Health and Safety officers are listed in Appendix H.

The DHSO is responsible for reviewing and approving site safety plans and any addenda and for advising the FS on health and safety matters. The DHSO has the authority to audit compliance with the provisions of the site safety plan(s), suspend work or modify work practices for safety reasons, and to dismiss from the site any individual whose conduct on site endangers the health and safety of others.

Field Specialist

For the Mercury Meter Site Investigation/Remediation Project, the Field Specialist has the following responsibilities:

- To see that the Mercury Meter Site Investigation/Remediation Project is performed in a manner consistent with the guidelines set forth in the EPNG Safety Policy and Procedure Manual.
- To provide the Division Health and Safety Officer with project information related to health and safety matters.
- To conduct a review of this HSP with all EPNG Personnel and subcontractors prior to commencing work at each run or for each change in crew members.
- To implement the Health and Safety Plan.
- To monitor daily compliance with the Health and Safety Plan.
- To verify the availability of proper protective equipment on the site at all times.
- To immediately report any safety incident to the Division Health and Safety Officer.
- To coordinate with the Division Health and Safety Officer Representative on health and safety matters.

- The Field Specialist has the authority to temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the Division Health and Safety Officer.

Division Health and Safety Officer

The Division Health and Safety Officer has the following responsibilities:

- To direct and perform health and safety activities on site, as specified in this Health and Safety Plan, and report results to the Field Specialist.

- To interface with the Field Specialist as may be required in matters of health and safety, including documentation and reporting safety-related incidents.

- To monitor compliance with this Health and Safety Plan.

- To assist the Field Specialist in seeing that proper health and safety equipment is available for the project.

- To verify personnel to do work on the sites with regard to medical examinations and health and safety training.

The Division Health and Safety Officer has the authority to take the following actions:

- To suspend work or otherwise limit exposure to personnel, if the Health and Safety Plan appears to be unsuitable or inadequate.

- To direct personnel to change work practices, if they are deemed to be hazardous to the health and safety of personnel.

- To suspend personnel from the project, if their actions or condition endangers their safety or the health and safety of co-workers.

4.0 FIELD ACTIVITIES

EPNG has developed a work plan to be implemented during the investigation and remediation activities. An outline of the major activities are presented below:

- Initial site screening for mercury vapors and inspection for potential mercury contamination
- Determination of contaminated areas
- Excavation of contaminated materials
- Verification sampling after excavation
- Disposal of excavated soil and materials
- Follow-up procedures (e.g., final screening, installation of HPDE liner, backfilling with clean soil)

For a detailed description of the above, please refer to EPNG's Mercury Meter Site Investigation/Remediation Work Plan.

5.0 HAZARD ASSESSMENT

Potential exposure to chemical hazards associated with sampling and investigation/remediation activities at various site locations include:

- Skin and eye contact with mercury contaminated materials
- Inhalation of mercury vapors and mercury contaminated dust
- Ingestion of mercury contaminated particulates (dust)
- Inhalation of hydrogen sulfide (H_2S)

Physical hazards associated with the sampling and investigation/remediation activities include:

- Physical hazards associated with the use of sampling equipment, support equipment, and handling of bulk containers.
- Heat and Cold Stress
- Tripping and falling due to obstructing objects

Biological hazards associated with the sampling and investigation/ remediation activities activity include:

- Reptiles
- Insects
- Rodents

5.1 Hazards Overview

Mercury, mercury contaminated materials, and hydrogen sulfide have been identified as the principal chemical hazard for the Mercury Meter Site Investigation/Remediation Project. Exposure to mercury can cause central nervous system disorders, respiratory disorders, renal damage, sensitization of dermatitis, stomatitis and other acute and chronic affects. See Appendix A for a material safety data sheet of mercury.

5.1.1 Routes of Exposure. Personnel can be exposed to mercury through four routes of exposure: inhalation, ingestion, and skin and eye contact.

Inhalation

Inhalation of mercury and hydrogen sulfide presents the greatest exposure hazard. Mercury and hydrogen sulfide vapors may be inhaled if proper

personal protective equipment is not utilized and there is insufficient ventilation of the exposure area.

Ingestion

Ingestion of mercury may be accomplished by swallowing particulates (dust) generated during the investigation, sampling and remedial activities.

Skin and Eye Contact

Absorption of mercury into the system can be accomplished by contact with the skin and eyes. Absorption of mercury into the system can increase the toxic effects of mercury vapor inhalation.

5.1.2 Symptoms and Effects of Overexposure to Mercury.

Short-term Exposure

Short-term exposures (i.e., less than one day) to mercury at levels above 1.0 mg/m^3 may cause headaches, cough, chest pains, chest tightness, and difficulty in breathing. It may also cause chemical pneumonitis. Liquid mercury (skin contact) may irritate the skin.

Long-term Overexposure

Repeated or prolonged exposure (i.e., greater than one day) to mercury at levels above 0.05 mg/m^3 causes effects which develop gradually. The first effects are often fine shaking of the hands, eyelids, lips, tongue, or jaw. Other effects are allergic skin rash, headache, sores in the mouth, sore and swollen gums, loose teeth, insomnia, excess salivation, personality changes, irritability, indecision, loss of memory, and intellectual deterioration.

5.1.3 Summary of Mercury Toxic Effects. Acute exposure to mercury at high levels causes severe respiratory irritation, digestive disturbances, and marked renal damage; chronic mercurialism, the form of intoxication most frequently caused by occupational exposure, is characterized by neurologic and psychic disturbances, anorexia, weight loss, and stomatitis. Skin absorption of inorganic mercury probably adds to the toxic effects of vapor inhalation. Intraperitoneal injection of metallic mercury in rats has produced sarcomas. Exposure of humans to mercury vapor in concentrations of 1.2 to 8.5 mg/m^3 for eight hours causes cough, chest pain and dyspnea, leading to bronchitis and pneumonitis. Metallic mercury readily vaporizes at room temperature, and the vapor has no warning properties. At low levels, the onset of symptoms resulting from chronic exposure is insidious; fine tremors of the hands, eyelids, lips and tongue are often the presenting complaint. Coarse jerky movements and incoordination may interfere with the fine movements considered necessary for writing and eating. Psychic disturbances such as insomnia, irritability, and indecision occur; headache, excessive fatigue, anorexia, digestive disturbances, and weight loss are common; stomatitis with excessive salivation is sometimes severe; muscle weakness has been reported. Proteinuria may occur, but is relatively infrequent. Mercury has been reported to be capable of causing sensitization dermatitis. Examination of urine for mercury may be of value. There is no "critical" level of mercury in urine above or below which poisoning cannot be seen. Various observers have suggested from 0.1 to 0.5 mg of Hg/l of urine as having clinical significance. Mercury, particularly organic forms, is known to adversely affect the fetus if the mother if exposed during pregnancy.

5.1.4 Summary of Hydrogen Sulfide. Hydrogen sulfide is an irritant of the eyes and respiratory tract at low concentrations. At high concentrations, it rapidly causes respiratory paralysis. The characteristic "rotten eggs" odor of hydrogen sulfide is unreliable as a warning because of olfactory fatigue.

The OSHA Permissible Exposure Limit (PEL) for hydrogen sulfide is 10 parts per million (ppm). The Immediately Dangerous to Life or Health (IDLH) level is 300 ppm.

First aid for hydrogen sulfide includes removing the affected individual from the exposed area, providing CPR if breathing has stopped, and prompt medical evaluation.

5.2 Physical Hazards

There are risks of physical injuries associated with the investigation, sampling and remedial activities to be conducted during the Mercury Station Site Investigation/Remediation. Presented below are some of the identified potential physical hazards which may be present at the metering stations (sites).

- There is risk of physical injury associated with entering metering stations which are not structurally sound. Metering stations which have been subject to the forces of nature (rain, wind, erosion, etc.) may not be as structurally sound and prone to collapsing. An external inspection of the metering station and its apparent stability should be conducted prior to entering the station. All safety equipment as specified in EPNG's Safety Policy and Procedure Manual for this operation should be used.

- There is a risk of physical injury associated with the handling of drums and sampling and support equipment. Field personnel should be aware of the hazards associated with handling drums such as sharp drum lids and rims and dropping of drums on ones feet. Hazards associated with sampling and support equipment may include sharp edges, potential for breakage (sample containers), slipping, tripping and falling. Field personnel should take steps to observe and minimize these potential physical hazards. Gloves should be worn when handling hand trowels and sample containers. Tripping, slipping and falling hazards should be minimized by implementing good "housekeeping' procedures.

- In addition, heat stress induced by the climate and the use of personnel protective equipment may present potential physical hazards. Heat exhaustion and strokes are possible, especially during warm weather.

The Heat Stress Casualty Prevention Plan presented in Appendix B will be implemented as deemed necessary by the Field Specialist and the Division Health and Safety Officer. This plan outlines heat stress identification, treatment, prevention, and monitoring.

5.3 Biological Hazards

Biological hazards which may be present at the sites include reptiles, insects and rodents. A visual inspection for these biological hazards should be conducted prior to entering the metering stations. Care should be taken not to locate equipment and clothing in areas prone to support these hazards such as ant hills, bushes, etc.. Personnel may utilize insect repellant before donning personnel protective equipment and while working in areas prone to insects. Care should be taken when lifting possible habitats of snakes and spiders such as debris and cover. Field treatment of snake bites should be limited to submerging and or covering the bite area with wet ice and/or cold compress. The victim can then be transported to the nearest emergency facility or hospital (refer to Appendix C).

5.4 Flammable Hazards

Mercury is not combustible nor considered flammable. However, a fire supported by combustion of other materials such as natural gas etc., may increase the volatilization of mercury. Mercury forms a solid product which is shock sensitive and can initiate fires upon contact with acetylene, acetylene products, or ammonia gasses. Care should be taken not to expose mercury to these materials. In the event of a fire the following procedures shall be followed:

a. Evacuate to a distance and location (upwind or crosswind) to avoid inhalation of combustion products (smoke).

b. Notify the Division Health and Safety Officer of the fire and implement standard pipeline emergency procedures.

c. If possible, utilize dry chemical fire extinguisher to prevent the spread of the fire. Care should be taken to remain upwind at all times.

6.0 HEALTH AND SAFETY PRECAUTION

6.1 Health and Safety Precautions

a. AVOID INHALATION OF MERCURY VAPORS. To minimize exposure to mercury vapors personal protective equipment as specified in Section 8.0 shall be utilized. The area is also to be monitored for mercury vapors prior to and during investigation, sampling and remedial activities. A monitor (such as the Jerome 411) suitable for detecting mercury vapors will be employed. Additionally, inhalation exposure is to be minimized by ventilating the work area. All personnel shall attempt to stay upwind of the metering station when possible.

b. AVOID INGESTION OF MERCURY CONTAMINATED MATERIALS. Ingestion of mercury contaminated particulates will be minimized by utilizing the personnel protective equipment as specified in Section 8.0. No eating, drinking or smoking is to be permitted in the work areas, nor in areas where mercury contaminated materials are handled or stored. When working with potentially mercury contaminated materials, hands and other potentially exposed areas of skin are to be washed with soap or a mild detergent before eating, drinking, smoking or using the toilet.

c. AVOID SKIN AND EYE CONTACT WITH MERCURY. To minimize the potential for exposure to mercury and absorption into the system, personal protective equipment as specified in Section 8.0 is to be utilized during investigation, sampling and remedial activities. Contaminated personnel clothing is to be removed and disposed of with other contaminated waste. Hands and other potentially exposed skin areas are to be washed with soap or a mild detergent after handling potentially mercury contaminated materials.

d. AVOID PHYSICAL HAZARDS. To minimize physical hazards, field personnel should be aware of potential physical hazards at the site, and should adhere to EPNG's Safety Policy and Procedure. Drum handlers or dollies with tie-down straps should be utilized to move drums containing materials. Hard hats and steel-toed boots should be worn in the work areas when working with 55-gallon drums. Gloves should be worn when handling sharp instruments or fragile equipment such a sample containers. Good housekeeping procedures should be implemented to reduce potential tripping, slipping, and falling hazards.

Heat stress is to be minimized by implementing the Heat Stress Casualty Prevention Plan presented in Appendix B. Electrolytic fluids and water will be provided on site to maintain body fluid levels of the field personnel. Consumption of alcoholic beverages between shifts should be minimized due to alcohols effect of increasing heat stress.

e. AVOID FLAMMABLE CONDITIONS. Do not use acetylene, acetylene compounds or ammonia gasses in areas where mercury may be present. Sources of acetylene may include welding equipment and cylinders.

6.2 First Aid Procedures

First aid kits will be supplied to each Field Specialist and are required to be located on site at all times. A generic first aid kit for common treatments, burns, insect bites, sprains etc., will be present at all times. Additionally, a first aid kit will be located at the site at all times. A minimum of two emergency eye wash kits will be located at the site at all times.

a. FIRST AID: INHALATION. Move the exposed person to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Take the affected person to the nearest emergency clinic or hospital. Notify hospital of exposure to mercury. Notify Division Health and Safety Officer of incident.

b. FIRST AID: INGESTION. If victim is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not attempt to make an unconscious person vomit. Get medical attention immediately. Notify Division Health and Safety Officer of incident.

c. FIRST AID: SKIN EXPOSURE. If liquid mercury or potentially contaminated mercury materials come in contact with the skin, promptly wash the affected area using soap or mild detergent and water. If liquid mercury or potentially contaminated mercury materials penetrate through the clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention. Notify Division Health and Safety Officer of incident.

d. FIRST AID: EYE EXPOSURE. If liquid mercury or potentially mercury contaminated materials comes into contact with the eyes, wash eyes immediately with copious amounts of water. While washing, occasionally lift the lower and upper eye lids. If irritation persists after washing, get medical attention. Notify Division Health and Safety of incident.

e. FIRST AID: HEAT STRESS. Remove affected person from heat to cooler place. If affected person is wearing personal protective equipment, remove the equipment from the person. Have the person rest and elevate feet. Cool affected person by fanning or applying cold packs or wet towels. Give affected person one-half glass of water every 15 minutes for 1 hour if conscious. Notify Division Health and Safety Officer of incident.

f. FIRST AID: HEAT STROKE. Remove affected person from heat to cooler place. Remove personnel protective equipment (if applicable). Cool affected person by wrapping with wet sheets or towels or fanning. Treat person for shock. Do not give affected person anything by mouth. Get medical attention and notify Division Health and Safety Officer.

7.0 HEALTH AND SAFETY REQUIREMENTS

7.1 General Health and Safety Requirements

7.1.1 Medical Surveillance. Prior to any field work, all EPNG personnel and subcontractors involved in investigation, remediation and sampling activities will be required to have taken and passed an EPNG approved medical examination. The medical examination would be performed by a licensed physician and would consist of the procedures and requirements listed in Appendix I. The Physician will release to EPNG his opinion in the form described in Appendix J.

A medical examination consisting of only the mercury blood serum test will be provided to each individual each year.

This requirement may be waived for those individuals who have taken the examination during the past 12 months and have not worked at a hazardous materials facility within that time frame.

7.1.2 Health and Safety Training. EPNG employees and subcontractors shall not participate in field activities, associated with the Mercury Meter Site Investigation/Remediation Project, until they have been trained to a level required by their job function and responsibility. All personnel engaged in field operations will receive training in chemical hazards, safe operating procedures, and the use of protective clothing and equipment. All EPNG field personnel and subcontractors, directly involved with the Mercury Meter Site Investigation/Remediation, are required to participate in an EPNG approved Health and Safety Training Course, which fulfills the requirements of 29 CFR 1920.120, prior to working in the field. Certificates evidencing such training by EPNG personnel and its subcontractors should be kept on file.

7.1.3 Medical Record. All personnel including subcontractors that may need to wear respirators will provide certification from a licensed physician declaring that the personnel is capable of using respiratory protection based on review of medical exam by a licensed physician, preferably a occupational physician.

7.2 Site-Specific Health and Safety Requirements

7.2.1 Personnel Clearance. EPNG employees and subcontractors must be trained in mercury procedures and requirements as specified in EPNG's Safety Policy and Procedure Manual.

7.2.2 Site-Specific Safety Briefing. The Field Specialist will complete the Site Specific Health and Safety Form (Appendix C). To complete this form the Field Specialist will need to identify the work crew and location of the closet emergency facilities. This form is to be completed for each run or for groups of specific sites. Before field work begins, all personnel must be briefed on their work assignments and safety procedures contained in this document. The safety briefing is to be conducted by the Field Specialist before commencing work on each group runs or groups of specific sites. The following will be discussed at this meeting:

- Names of health and safety personnel and alternatives responsible for site health and safety
- Health and safety organization
- Hazards at the site
- Exposure risk
- Personnel protective equipment to be used
- Personnel and equipment decontamination procedures
- Air monitoring and action levels
- Emergency procedures

Each of the field personnel working at the site will be provided with a copy of this document and will be required to submit a signed Safety Compliance Agreement (Appendix D) to the Field Specialist before commencing work. Individuals refusing to sign the agreement will be prohibited from working.

If a new employee or subcontractor is assigned to the site who has not gone through the site-specific safety orientation meeting, the Field Specialist must present a similar briefing to the new employee before he/she participates in any field activities.

7.2.3 Mercury Monitoring Program. All EPNG personnel and subcontractors involved in the investigation, sampling, and remedial activities, in which the potential for exposure to mercury exists, will undergo biological monitoring for mercury. Initial blood and urine analysis for mercury will be conducted with periodic urine testing.

Normal blood mercury values are less than 3.0 micrograms/100 ml blood. An upper limit of 6.0 micrograms/100 ml blood is recommended for mercury workers.

Normal urine mercury levels are less than 100 micrograms/liter. An upper limit of 250 micrograms/liter is recommended for mercury workers.

Any site workers with blood mercury above 3.0 µg/100 ml blood, or 250 µg/liter urine will be referred to the occupational physician for decision on withdrawal from the mercury exposure.

7.2.4 Controlled Areas. A controlled area is defined as an area within which all entry and activities are regulated by EPNG due to intrusive activities underway at the site. Intrusive activities are those activities conducted in a work area, such as sampling, soil excavation and other related activities, in which the potential for exposure to a contaminant is likely. Rational for the establishment of a controlled area includes the need to control exposure of non-EPNG personnel to any operational upset, and to protect EPNG personnel from the consequences of non-EPNG at the site.

7.2.5 Work Zones. Three work zones will be established around an intrusive activity: the Exclusion Zone, the Contamination Reduction Zone, and the Support Zone (see Figure 1).

Exclusion Zone. The Exclusion Zone is the area where contaminants could or do occur. All individuals entering this area must be approved by the Location Supervisor. Only personnel medically approved will be allowed in the Exclusion Zone. The Exclusion Zone will be defined as the boundary around the meter house and/or meter skid and will be delineated by traffic cones as illustrated in Figure 1. No personnel is to enter the Exclusion Zone without proper personal protective equipment, which at a minimum will be level C.

Contamination Reduction Zone. The Contamination Reduction Zone is established outside of the Exclusion Zone to minimize the migration of contaminants from the Exclusion Zone to clean or support areas. The outer boundaries of the Contamination Reduction Zone are to be a minimum distance of 5 feet from the Exclusion Zone, as illustrated in Figure 1, delineated by traffic cones and a yellow "caution" tape barrier suspended by wooden lathes. The Contamination Reduction Zone is also utilized to reduce the exposure of individuals leaving the Exclusion Zone. The decontamination of equipment and personnel is to be conducted within specified areas of the Contamination Reduction Zone. Additional information on these zones is given in Section 9. Only personal medically approved to wear respirators and that are wearing at a minimum level D personnel protective equipment will be allowed to enter the Contamination Reduction Zone.

Support Zone. The Support Zone is located in a clean area, preferably upwind and immediately outside of the Contamination Reduction Zone. Supplies, emergency equipment, and support personnel are located in the Support Zone. Site trailers and vehicles may be located in the Support Zone.

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1 Level D

Level D Personal Protective Equipment (PPE) for EPNG personnel conducting investigative, sampling, monitoring, and remedial activities at the metering sites are specified as follows:

- Disposable Saranex® or Tyvek® suit with optional hood or equivalent
- Hard hats with safety eye wear
- Milled nitrile chemically resistant outer gloves with optional inner latex chemically resistant gloves.
- Waterproof PVC rubber, or nitrile boots.
- Disposable boot covers (optional)

Gloves will be taped to the sleeves of the protective clothing and boots will be taped to the leg of the protective clothing.

Level D personal protective equipment is to be worn when the potential for exposure to mercury contaminated materials is low.

8.2 Level C

Level C PPE for EPNG personnel engaged in investigation, sampling, monitoring, and remedial activities at the metering stations are specified as follows:

- Disposable Saranex® or Tyvek® suit with optional hood or equivalent
- Hard hats with safety eye wear
- Milled nitrile chemically resistant outer gloves with inner latex chemically resistant gloves
- Waterproof PVC rubber, or nitrile boots.
- Disposal boot covers (optional for site assessment)
- Full-face or optional half-face respirator with cartridges rated for organic and inorganic mercury vapors and particulates.

Gloves will be taped to the sleeves of the protective clothing and boots will be taped to the leg of the protective clothing.

Level C personal protective equipment is to be worn when there is potential for mercury vapors in the breathing zone (see Section 14.2). At a minimum, personal protective equipment that is to be worn in the Contamination Reduction Zone during decontamination procedures will be at the same Level as the work.

Level C personal protective equipment should be worn when conducting the initial monitoring of the metering station (site). Level C personal protective equipment is to be worn when mercury vapors in the breathing zone are present at elevated levels. See Section 14.2-Action Levels.

8.3 Level B

Level B PPE for EPNG personnel engaged in investigation, sampling, monitoring , and remedial activities at the metering stations are specified as follows:

- Supplied air, pressure-demand full-face respirators
- Inner launderable cotton coveralls/Tyvek® coveralls
- Outer disposable Saranex® or Tyvek® suit with hood or equivalent
- Milled nitrile chemically resistant gloves (outside)
- Latex chemically resistant gloves (inside)
- Waterproof PVC rubber, or nitrile boots. Additional steel toe and shank required for drum handling.
- Disposal boot covers

Gloves are to be taped to the sleeves of the personnel protective equipment. Legs of protective clothing will be taped to the overboots. Hoods will be drawn tight to the respirator but not taped.

8.4 General Protection Equipment

The level of personal protective equipment to be worn during the Mercury Cleanup Project will be based on the type of activities being conducted and the potential for exposure to mercury contaminated materials. In general, the following personal protective equipment is to be utilized at all times

Head Protection - Hard hats must be worn by all personnel working in the vicinity of heavy equipment and when working inside structures (metering station).

Eye Protection - Safety glasses must be worn at all times. Safety goggles must be worn by all personnel performing activities where potential for eye exposure exists due to dust or flying objects. Contact lenses will not be allowed on site. An eye wash station will be setup by the Field Specialist prior to commencing field activities.

Skin Protection - Tyvek® coveralls must be worn by all personnel engaged in all sampling and remedial activities at the site. Inner latex gloves and external nitrile gloves will be worn by all personnel engaged in sampling and remedial activities at the site. Coveralls and gloves will be decontaminated prior to removal. These will be disposed of in designated sealable containers with proper markings after each use or when they become worn or punctured. Face and handwashing facilities will be available at the site.

Foot Wear - Boots will be worn by field personnel engaged in all activities at the site. Chemically protective boots and overboots will be worn while in the Exclusion Zone. Overboots (optional) are to be decontaminated and disposed of in a designated container.

Respiratory Protection - Full-face or half-face respirators suitable for mercury protection will be provided to all personnel. All personnel must be fit-tested for the specific brand of respirator to be used. A respirator which has not been successfully fit-tested cannot be used by an individual on the project. To ensure a proper fit, no facial hair will be allowed that will interfere with mask operation. The Farmington Health and Safety Officer and Field Specialist will determine if facial hair represents such an interference. No contact lenses will be allowed under a full-face piece respirator or used anywhere in the work area. Procedures for the proper use and care of respirators are provided in Appendix E.

- Additional considerations and requirements for site use of respiratory protection are:
  - Positive and negative test shall be performed everyday as required.
  - No facial hair in area of respirator mask seal
  - Cartridges are to be replaced at a minimum as required per the manufacturer's specifications.

- Respirators are to be cleaned following use with soap and water

- No safety glass temple side pieces are allowed under facepiece seal.

- If corrective lens are required, install as recommended by respirator manufacturer

- Supplied air is to be Grade D breathing air. Supplied air shall not be reconstituted air by the supplier/ vendor.

- Documentation of supplied air source should be kept

- Flow gauge and audible low-level indicator required for supplied air

- Air compressors used only in clean air zones (use monitor to detect mercury, hydrocarbons and carbon monoxide). Over-temperature devices will be installed to indicate lubricant decomposition to low-molecular weight hydrocarbons and carbon monoxide.

- Use of hearing protection in vicinity of air compressor (if used)

In addition to the personal protective equipment listed above, the following general equipment will be provided by the field personnel, first-aid kit (s), fire extinguishers, and insect repellent/treatment.

Action levels specifying the level of personal protective equipment required are presented in Section 14.2.

8.5 Area Control

Access to the site and work zones will be restricted by the use of suitable barricades and notices. Controlled access is necessary to minimize the probability of occurrence of physical injury or chemical exposure of field personnel, visitors, and the general public.

The boundaries of the Work Zone areas must be identified by warning tape, cordons, barricades, or emergency traffic cones. Signs should be posted identifying the zone and warning of unauthorized entry.

Only personnel medically approved for wearing respirators and personal protective equipment will be allowed in the Exclusion Zone and the Contamination Reduction Zone. All other personnel will be limited to the Support Zone.

Entry to the site and work zones should be limited to individuals which must work in those areas. Unofficial visitors must not be permitted to enter the site without authorization by the Farmington Health and Safety Officer or Field Specialist. Official visitors should be discouraged from entering the work zones, but may be allowed to enter only if they agree to abide by the provisions of this document, follow orders issued by the Farmington Health and Safety Officer, and are informed of the potential hazards and dangers encountered in the areas.

8.6 Other Protection Considerations

The Field Specialist's vehicle safety flag will be used to monitor wind direction. The flag should be observed throughout the day and the direction of the wind noted. Care should be taken by all on-site personnel to stay upwind of the metering station.

At all times a "buddy system" will be carried out. During investigation, sampling, monitoring, and remedial activities in potentially contaminated areas, a second or standby person will be present, equipped with the same level of safety gear, in the event of an emergency. At all times line of sight contact will be kept with the working personnel and standby person.

All visitors to the site must be cleared by EPNG personnel and the Field Specialist. Visitors are not allowed in the Exclusion Zone.

9.0 DECONTAMINATION

To minimize the potential for migration of potentially mercury contaminated materials from the site, decontamination of personnel and equipment will be conducted within the Contamination Reduction Zone (Figure 1).

9.1 Support Zone

The Support Zone is the area surrounding the Contamination Reduction Zone (defined below). The Support Zone is to be equipped with the following:

- First Aid Station
- Office Station
- Changing Station
- Personal Hygiene Washing Facility
- Restrooms
- Eating, Drinking and Smoking Areas
- Parking Areas

The First Aid Station should be located at the interface between the Support Zone and the Contamination Reduction Zone. The location should provide immediate access to first aid supplies for both designated zones.

The Office Station is to be used for field documentation and reports. The Office Station may be a portable trailer or personnel vehicle.

The Changing Station is to be located near the interface between the Support Zone and Contamination Reduction Zone. The Changing Station is to be used by personnel to change from their street clothes into their working clothes. The Changing Station may be equipped with personal hygiene showering facilities.

The Personal Hygiene Washing facility is to be located near the Changing Station. The personal hygiene washing facility is to be used by employees and subcontractors at the end of the day. The personal hygiene washing facility is not to be used for decontamination of equipment.

Restrooms are to be located outside the Contamination Reduction Zone. Either portable units or trenches may be utilized.

Areas outside the Contamination Reduction Zone should be designated for eating, drinking, and smoking. Gatorade or other electrolyte liquids should be kept on site to replenish body fluid levels.

Parking areas should be designated by the Field Specialist.

9.2 Contamination Reduction Zone

Due to the potential for exposure to mercury contaminated materials, a Contamination Reduction Zone will be located outside the Exclusion Zone. Personnel and equipment decontamination will be conducted within the Contamination Reduction Zone. The Contamination Reduction Zone is to be delineated by traffic control cones. The Contamination Reduction Zone will be established and prepared prior to conducting investigation, sampling, and remediation activities.

The Contamination Reduction Zone will be used to provide first stage personnel decontamination and decontamination of personal protective equipment and equipment. The Contamination Reduction Zone is to be equipped with the following:

- Plastic ground tarps to control splash and minimize contamination of underlying soils.
- Long handle brushes and paper towels.
- Personal hygiene soap or other mild detergents
- Wash and rinse tubs for personal protective equipment and personal hygiene
- Pump sprayer (s) to wash and rinse residue from Personal Protective equipment and personal hygiene.
- Plastic bags and sealable open-top containers for disposal of contaminated protective clothing and equipment. Plastic bag(s) to be inserted into the containers as lining. Label the container CONTAMINATED EQUIPMENT.
- Closed-top drums (maximum 15-gallon capacity) for disposal of large amounts of potentially contaminated rinse and wash water
- Potable water for rinsing protective clothing, equipment, and personal hygiene

9.3 Personal Decontamination Procedures

Personal decontamination will be performed in the Decon (Decontamination) Area of the Contamination Reduction Zone. Gloves and boots will be decontaminated by scrubbing with a solution of soap and water followed by a water rinse. Buckets and tubs will be available for boot and glove decontamination. Clean water and soap will be available to personnel to

wash their hands and face. Tyvek® suits, gloves, and other disposable safety supplies will be disposed in plastic bags and then placed in sealable open-top containers for transportation and disposal.

The following steps are to be implemented in the Contamination Reduction Zone:

- Wash remedial equipment with detergent, followed by water rinse
- Dispose of contaminated equipment in open-top containers labeled CONTAMINATED EQUIPMENT
- Wash rinse and dry outer boots and outer gloves utilizing long-handled brushes, wash tubs and pump sprayers.
- Remove tape from suit and place in open-top container labeled CONTAMINATED EQUIPMENT
- Remove outer boots and outer gloves and place them in the bucket designated for contaminated gloves and boots for reuse.
- Remove suit and place in CONTAMINATED EQUIPMENT open-top container, unless suit may be reused
- Remove respirator and place in bucket designated for cleaning respirators
- Remove inner latex gloves and place in CONTAMINATED EQUIPMENT open-top container
- Wash hands and face with soap and water. If suspected exposure to mercury is indicated, wash affected area immediately.

At the end of a work period or upon completion of the remedial activities at the site, large amounts of rinse and wash water should be transferred

into the closed-top container for transportation and disposal. This container should be labeled contaminated wash water. Small amounts of rinse and wash water may be placed/added with the contaminated soil containers.

10.0 RESTRICTED ACTIVITIES

The following practices are expressly restricted within the Exclusion and Contamination Reduction Zones.

- No contact lenses even if wearing full-face respirator
- No smoking, chewing (gum, tobacco, etc) eating or drinking
- No ignitable flammable liquids other than those necessary to complete the job (e.g., sample preservatives, equipment fuel)
- No alcoholic beverages
- No metal hard hats
- No horseplay
- No leaving the zones in potentially contaminated personal protective equipment

11.0 HEAT STRESS

Heat stress is expected to be a potential problem during the use of coated coveralls and respirators. Hot summer days and warm afternoons may compound the individuals susceptibility to heat stress. The primary physical hazards of heat stress include heat exhaustion and heat stroke. The following sections discuss the proposed work/rest schedules and heat stress monitoring plan to help mitigate the problems created by heat stress. Appendix B provides additional information on identification, treatment, prevention, and monitoring of heat stress.

11.1 Work/Rest Schedule

The work/rest schedule will be dependent on weather conditions and the level of protection required. If the adjusted temperature remains below 70°F, the following work/rest schedule is recommended for Level B or Level C work:

90 minutes - work
15 minutes - break
90 minutes - work
15 minutes - break
90 minutes - work
90 minutes - lunch/break
90 minutes - work
15 minutes - break work

If you adjusted temperature exceed 70°F, the rest schedule shall be modified as follows:

Adjusted Temp. °F*	(Permeable Clothing) Work Duration Prior to Break (min)	(Impermeable Clothing) Work Duration Prior to Break (min)
90 or above	30	15
80 - 90	60	30
70 - 80	90	60
60 - 70	120	90
< 60	120	120

* Calculate the adjusted air temperature °F + (13 x % sunshine)

The above are guidelines and shall be used in conjunction with heat stress monitoring.

Extended rests are expected to be needed near lunch time due to the heat during the early afternoon. Longer mornings and shorter afternoon times will be implemented to help mitigate heat stress.

11.2 Heat Stress Monitoring

All personnel will be responsible for monitoring personnel for signs of heat stress. The frequency of monitoring, by taking heart rates, will be performed at a minimum every time employees break. The amount of fluids lost must be replaced. Potable water and Gatorade or other electrolyte replacement fluid will be available. Workers should be encouraged to drink fluids during breaks.

If the heart rate exceed 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the work cycle by another third.

Attachment B presents the Heat Stress Casualty Prevention Plan outlining monitoring and treatment procedures.

12.0 DOCUMENTATION

A daily log will be maintained to record the following information:

- Daily equipment functional verification log (all monitoring instruments will be calibrated according to manufacturers specifications)
- Date and time of personnel and site visitor entries and exits
- All other logs as dictated and required per EPNG's Safety Policy and Procedures

All documentation is to be recorded by the Field Specialist and submitted to the Farmington Health and Safety Officer for review.

Additional documentation will include the site specific health and safety form to accompany this Health and Safety Plan.

13.0 EMERGENCIES AND ACCIDENTS

13.1 General Procedures

Prior to conducting any work at the site (metering station) the Field Specialist will locate the nearest emergency facility and the nearest hospital equipped to handle personnel exposure to mercury.

EPNG should use a minimum two-man crew during all inspection, sampling and remedial activities at the site. This crew is to be qualified to wear level B equipment and participate in all activities taking place in the Exclusion Zone. Other EPNG personnel will be allowed in the Support Zone to monitor, inspect, or audit overall work activities.

The field crew should include at least one individual who has received certification through an American Red Cross first-aid course. Illnesses, injuries, and accidents occurring on site must be attended immediately in the following manner:

- Remove the injured or exposed person(s) from immediate danger.
- Render FIRST AID if necessary. Decontaminate affected personnel, if necessary and only if decontamination does not interfere with essential treatment.
- Transport to local emergency center or regional hospital identified for site by the Field Specialist in accordance with EPNG's Safety Policy and Procedures Manual.
- Evacuate other personnel on site to a safe place until the Field Specialist determines that it is safe for work to resume.

- Report the incident/accident to the Farmington Health and Safety Officer immediately.

- Complete incident/accident report. Field Specialist should interview personnel witnessing the incident.

- Develop procedures, in accordance with the Farmington Health and Safety Officer and Field Specialist to prevent a recurrence.

13.2 Accident/Incident Reporting

In the event of an accident or incident, the Field Specialist will immediately notify the Farmington Health and Safety Officer. The Farmington Health and Safety Officer will in turn notify the appropriate EPNG authorities. Types of accidents or incidents which are considered reportable are listed below:

- Illness resulting from chemical exposure or unknown causes.

- Physical injury, including injury which does not require medical attention.

- Fire, explosions, and flashes resulting from activities performed by EPNG and its subcontractors.

- Infractions of safety rules and requirements.

- Unexpected chemical exposures

Work will be suspended to correct the cause of the accident/incident and to modify this plan as necessary. Interviews of personnel witnessing the accident or incident are to be conducted by the Field Specialist. An EPNG accident/incident report form (Appendix F) must be submitted to the Farmington Health and Safety Officer within 24 hours of occurrence.

14.0 AIR QUALITY MONITORING

During the investigative, sampling, and remedial activities at the EPNG sites, an air quality survey will be performed continually using a variety of monitoring equipment. These monitoring equipment and action levels established for the Mercury Station Site Investigation/Remediation Project are presented below.

14.1 Air Monitoring Equipment

The air monitoring equipment for protection of workers will be as follows:

a) Combustible Gas Monitor. A monitor, such as a MSA Explosimeter or approved equivalent, will be used to monitor the work area (metering station) for the presence of explosive mixtures of air and gas.

b) Either a Jerome 411 or Bacharach MV-2 monitor will be used to monitor for mercury vapors in the work area. See Appendix G for operating procedures (Jerome 411).

14.2 Action Levels - Mercury Monitoring

For all intrusive activities, personnel shall wear as a minimum Level D protective equipment as described in Section 8. Additionally, Level C personal protective equipment should be worn when conducting initial monitoring of the metering stations prior to conducting work activities.

Prior to entering the metering station, EPNG personnel should monitor for mercury vapors using the Jerome 411, Bacharach MV-2 or equivalent mercury sniffer. The personnel conducting the initial monitoring should be equipped in Level C personal protective equipment. Measurements should be taken in the breathing zone of the worker when conducting work activi-

ties. The monitor measurements will indicate the level of personal protective equipment required to conduct the work activities.

In addition to the initial monitoring, routine measurement of the breathing zone is to be conducted during the time that the investigation, remediation and sampling activities are taking place.

At a minimum, the following personal protective equipment and standards will be required for the following conditions occurring in the Breathing Zone of the monitored area:

Level D:

- Non-recordable levels
- Levels equal to or less than 0.05 mg/m^3

Level C:

- Levels greater than 0.05 mg/m^3 but less than 0.5 mg/m^3

Level B:

- Levels greater than 0.5 mg/m^3 but less than 5.0 mg/m^3. If levels greater than 2.0 mg/m^3 are recorded, stop everything and back off upwind immediately. Contact the Division Health and Safety Officer (DHSO) who will then provide further instructions. Any work requiring level B equipment will need to be pre-approved by the DHSO and will be performed only under the DHSO's direct surveillance.

14.3 Combustible Gas Monitoring

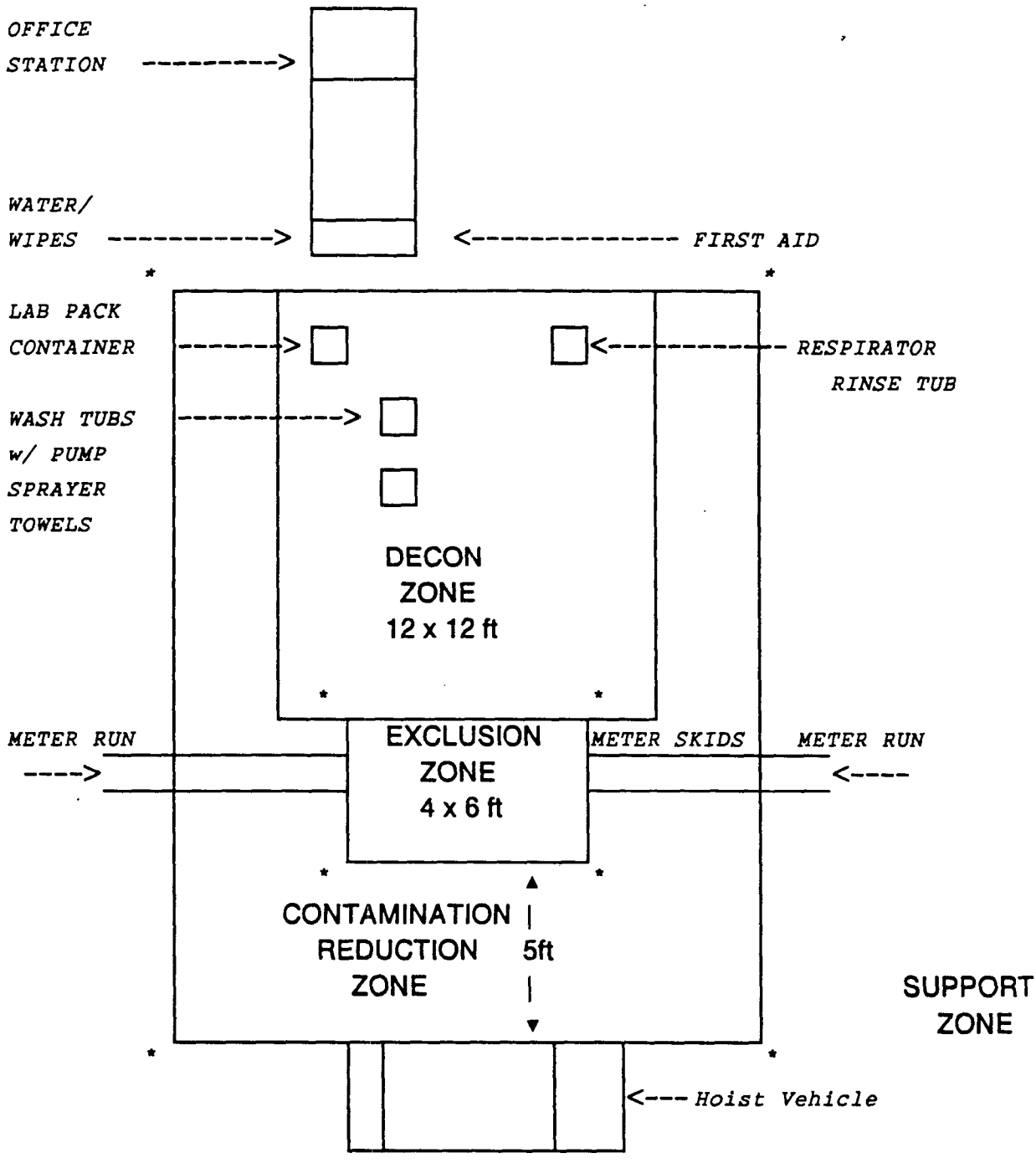
Prior to entering the metering station to conduct investigative sampling and remedial activities, an air quality survey will be performed utilizing a combustible gas monitor, such as the MSA Explosimeter or equivalent.

The monitor will be used to measure the concentration of flammable vapors and gases in the air within the metering station. Flammable gas concentrations are measured as percentages of the Lower Explosive Limit (LEL). The LEL is the minimal amount of flammable gases present in air which may support combustion. The Upper Explosive Limit (UEL) is the maximum amount of flammable gases in air in which combustion may occur.

All work activities will be in accordance with EPNG's Safety Policy and Procedures.

FIGURES

Figure #1



* Designates orange traffic cone markers for zone boundaries, with caution tape placed around contamination reduction zone boundaries.

APPENDIX A

MERCURY MATERIAL SAFETY DATA SHEET

Arizona Instrument
Jerome Division

MATERIAL SAFETY DATA SHEET
Date of Issue 4-1-88

Resisorb -
Mercury Vapor Absorbent

ARIZONA INSTRUMENT CORPORATION
Jerome Division
GOLD FILM TECHNOLOGY
P.O. Box 336, Old High School, Hwy 89A
Jerome, Arizona 86331
INFORMATION HOTLINE (800) 952-2566

Product Identification:
PRODUCT NAME: Resisorb - Mercury Vapor Absorbent
FORMULA CAS NO.: 00000-00-0
MOLECULAR WEIGHT: .00
CHEMICAL FORMULA: Proprietary Mixture
PRODUCT CODES: 4455

Section 1 - Physical Data

APPEARANCE & ODOR: Black solid with Halogen-like odor
BOILING POINT: N/A
MELTING POINT: N/A
VAPOR PRESSURE: N/A
SPECIFIC GRAVITY: N/A

Section 2 - Fire and Explosion Hazard Data

FIRE: Combustible, keep away from heat, sparks, flame.
EXPLOSION: Contact with strong oxidizers may cause explosion.
FIRE HAZARD: Use water spray to soak, class A extinguisher, full protective clothing & NIOSH approved self-contained breathing apparatus, move exposed containers from fire area if it can be done without risk, if not, use water to keep fire-exposed containers cool.

Section 3 - Reactivity Data

STABILITY: Stable, no hazardous polymerization.
CONDITIONS TO AVOID: Heat, flame, sources of ignition.
INCOMPATIBILITIES: Strong oxidizing agents, nitric acid, ammonia, alkali metals, strong reducing agents.

Section 4 - Leak/Spill Disposal Information

PRODUCT CLEAN-UP: Protective clothing & respiratory protection, scoop up spilled material, avoid dusting, flush spill area with water.
DISPOSAL: Transfer to clean, dry container & dispose of in accordance with local, state & federal environmental regulations.

Section 5 - Health Hazard Information

OVEREXPOSURE EFFECTS: Dust may irritate skin or eyes, inhalation may cause tightness & chest pain, coughing & difficulty in breathing; Ingestion may cause nausea, vomiting, headaches.
FIRST AID: Ingestion - get medical attention, if conscious, immediately induce vomiting. Skin & Eyes- immediately flush with water for 15 min. minimum; remove contaminated clothing.

Section 6 - Special Protection Information

Use adequate general or local ventilation to keep fume or dust levels as low as possible. If airborne concentration is high, use respirator or dust mask. Wear rubber gloves & eye protection.

Section 7 - Storage and Special Information

Keep in tightly closed container, in cool, dry ventilated area, away from heat, sparks or flame, isolate from incompatible substances.

Arizona Instrument
Jerome Division

MATERIAL SAFETY DATA SHEET
Date of Issue
4-1-88

Mallcosorb

ARIZONA INSTRUMENT CORPORATION
Jerome Division
GOLD FILM TECHNOLOGY
P.O. Box 336, Old High School, Hwy 89A
Jerome, Arizona 86331
INFORMATION HOTLINE (800) 952-2566

Product Identification:
SYNONYMS: Soda lime solid; sodium hydroxide mixed with lime
FORMULA CAS NO.: 8006-28-8
MOLECULAR WEIGHT: N/A
HAZARDOUS INGREDIENTS: N/A
CHEMICAL FORMULA: N/A

Section 1 - Physical Data

APPEARANCE: White deliquescent pellets
ODOR: Odorless
BOILING POINT: No information found
MELTING POINT: No information found
VAPOR PRESSURE @ 20°C: Essentially zero
SPECIFIC GRAVITY: No information found.

Section 2 - Fire and Explosion Data

FIRE: Not combustible, contact with moisture may generate heat to ignite combustibles.
EXPLOSION: Possible when in contact with incompatible materials.
FIRE HAZARD: Full protective clothing & NIOSH approved self-contained breathing apparatus.

Section 3 - Reactivity Data

STABILITY: Causes no hazardous decomposition products or hazardous polymerization.
INCOMPATIBILITIES: Water, steam, acids, fluorine & many organics; contact with nitro compounds cause formation of shock-sensitive salts; contact with aluminum, tin & zinc cause formation of flammable hydrogen gas.

Section 4 - Leak/Spill Disposal Information

PRODUCT CLEAN-UP: Protective clothing & respiratory protection, scoop up spilled material, avoid dusting, neutralize traces with dilute acid.

DISPOSAL: Transfer to closed metal container & dispose of according to local, state & federal regulations. DO NOT CONTACT WITH WATER.

Section 5 - Health Hazard Information

OSHA Permissible Exposure Limit (PEL):
Calcium Oxide 5 mg/m^3 (TWA)
Sodium Hydroxide 2 mg/m^3 (TWA)
ACGIH Threshold Limit Value (TLV): Sodium Hydroxide 2 mg/m^3 (TWA)
Calcium Oxide 2 mg/m^3 (TWA)

EXPOSURE/HEALTH EFFECTS: Inhalation- upper respiratory tract damage, pneumonitis; ingestion - severe mouth, throat & stomach burns, severe tissue scarring & death may result; skin & eyes - irritation or severe burns, possible blindness resulting.
FIRST AID: Inhalation - remove to fresh air; if not breathing, give artificial respiration; if breathing is difficult, give oxygen; get medical attention. Ingestion - DO NOT INDUCE VOMITING! Give large quantities of water or milk; get medical attention immediately. Skin & Eyes- immediately flush with water for 15 min. minimum; remove contaminated clothing.

Section 6 - Special Protection Information

Ventilation must be sufficient to meet TLV. Wear rubber gloves & eye protection.

Section 7 - Storage and Special Information

Keep in tightly closed container, in cool, dry ventilated area, away from incompatible substances.

Arizona Instrument
Jerome Division

MATERIAL SAFETY DATA SHEET

Date of Issue 5-25-86

Mercury

ARIZONA INSTRUMENT CORPORATION
Jerome Divison
GOLD FILM TECHNOLOGY
P.O. Box 336, Old High School, Hwy 89A
Jerome, Arizona 86331

INFORMATION HOTLINE (800) 952-2566

Product Identification:

CHEMICAL NAME: Mercury Metal
TRADE NAME & SYNONYMS: Quick Silver
CHEMICAL FAMILY: Metals
FORMULA: Hg
FORMULA WEIGHT: 200.59

SECTION 1 - Physical Data

APPEARANCE: Gray liquid
ODOR: Odorless
SPECIFIC GRAVITY (H_20 = 1): 13.54
VAPOR PRESSURE AT 20°C: 0.0012
BOILING POINT, 760 mm Hg (°C): 356.9
MELTING POINT (°C): -38.9

SECTION 2 - Fire and Explosion Data

FIRE HAZARD: Nonflammable
UNUSUAL HAZARDS: Extremely toxic vapors upon exposure to high temperatures

SECTION 3 - Reactivity Data:

STABILITY: Stable at room temperature
INCOMPATIBILITIES: azide, acetylene, ammonia, chlorine dioxide, nitric acid

SECTION 4 - Leak/Spill Information

PRODUCT CLEAN-UP: recover with suction cup equipped with a capillary
DISPOSAL METHOD: perform in compliance with all current local, state and federal regulations

SECTION 5 - Health Hazard Information

THRESHOLD LIMIT VALUE:
0.1mg/m^3 (OSHA ceiling)
0.05mg/m^3 (ACGIH level with a proposed absolute ceiling of 0.15 mg/m^3+)
EXPOSURE/HEALTH EFFECTS: coughing, bronchitis, pneumonia, tremor, insomnia, irritability, headache, fatigue, weakness, stomatitis, weight loss, GI disorder. Can irritate skin and eyes.
FIRST AID: skin - wash with water, get medical assistance; eyes - wash with water, get medical assistance; inhalation - remove to fresh air, get medical assistance; ingestion - get medical attention

SECTION 6 - Special Protection Information

Ventilation must be sufficient to meet TLV.
Wear rubber gloves and eye protection.

SECTION 7 - Special Handling and Storing Precautions

Do NOT heat mercury unless appropriate safety precautions for highly toxic vapors have been taken. Store in a sealed container.

SECTION 8 - Hazardous Ingredients

Mercury and Mercury Vapor

APPENDIX B

HEAT STRESS CASUALTY PREVENTION PLAN

APPENDIX B
HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

A. IDENTIFICATION AND TREATMENT

1) Heat Exhaustion

a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, blurred vision, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, his breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur.

b) First Aid: Immediately remove the victim to the Personnel Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make him lie down, raise his feet 6-12 inches and keep him warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him sips of Gatorade or other electrolyte replenishing fluids. Transport victim to a medical facility as soon as possible.

2) Heat Stroke

a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107° - 110°F. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

b) First Aid: Immediately evacuate the victim to a cool and shady area in the Personnel Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay him on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place him in a tub of cool water. The main objective is to cool him without chilling him. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. PREVENTION OF HEAT STRESS

1) One of the major causes of heat casualties is the depletion of body fluids. On the site there will be plenty of fluids available. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

2) A work schedule should be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.

3) A work/rest guideline will be implemented for personnel required to wear Level B protection. This guideline is as follows:

Ambient Temperatures Degrees Fahrenheit	Work Duration Prior to Break (min)	Maximum Wearing Time
Above 90	15	1/2 hour
80-90	30	1 hour
70-80	60	2 hours
60-70	90	3 hours
<60	120	4 hours

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations.

C. HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degrees Fahrenheit, workers must be monitored for heat stress after every work period. Monitoring will be conducted by an EPNG H&S Officer or another designated site worker with Red Cross training and Health and Safety program certification.

- Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%. The HR measurements will be administered by the DSSO or the WSSO, or their approved designee.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99 degree Fahrenheit. If it does, the next work period should be shortened by 10 minutes (Or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degrees Fahrenheit.

- Body water loss (BWL) (optional) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5% of the total body weight. If it does, workers should be instructed to increase their daily intake of fluids by the weight lost.

Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. A second pair of clothing kept onsite is recommended to allow adequate drying of wet clothing.

Persons who notice skin problems should immediately consult medical personnel. Skin problems to observe for are: rashes, blisters, dermatitis or flaking of skin, discoloration and other skin anomalies.

APPENDIX C

SITE SPECIFIC HEALTH AND SAFETY FORM

APPENDIX C

MERCURY METER SITE INVESTIGATION/REMEDIATION PROJECT

FARMINGTON DIVISION

HEALTH AND SAFETY PLAN SITE INFORMATION

Date of Issue: _____ Effective Dates _____

Issued by: _____, _____

ADMINISTRATIVE INFORMATION

Run Identification _____ (Run Sheet and Site Map Attached)

Field Office _____ Phone _____ Radio _____

Authorized Field Personnel	Function	Radio #	Home Phone
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

* Qualified to enter Exclusion and Contamination Reduction Zones

APPENDIX C

MERCURY METER SITE INVESTIGATION/REMEDIATION PROJECT

FARMINGTON DIVISION

HEALTH AND SAFETY PLAN SITE INFORMATION

Other Key Personnel:

	Work Phone	Home Phone	Page Phone	Radio #
Project Field Coordinator				
_____	_____	_____	_____	_____
Field Inspectors				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Health and Safety Officers				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Project Manager				
_____	_____	_____	_____	_____

APPENDIX C

MERCURY METER SITE INVESTIGATION/REMEDIATION PROJECT

FARMINGTON DIVISION

HEALTH AND SAFETY PLAN SITE INFORMATION

EMERGENCY INFORMATION

	Contact	City	Telephone
Fire Department	_____	_____	_____
Police Department	_____	_____	_____
Ambulance	_____	_____	_____
Poison Control Center	_____	_____	_____
Company Physician	_____	_____	_____
Hospital	_____	_____	_____

APPENDIX D

SAFETY COMPLIANCE AGREEMENT FORM

SAFETY PLAN COMPLIANCE AGREEMENT

I, _____ (print name), have received a copy of the Safety Plan for the _____ (Specify site) EPNG Mercury Station Site Investigation/Remediation Project. I have read the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the plan.

Signed:

_____ _____

Signature Date

Firm: _____

APPENDIX E

RESPIRATOR INSPECTION, CARE, MAINTENANCE AND STORAGE

OPERATING PROCEDURE NO. HS-203

203.0 Respirator Inspection, Care, Maintenance, and Storage

203.1 Purpose

The purpose of this document is to provide guidance on the proper care and use of respiratory protective devices, to assist in adequately protecting personnel as well as complying with OSHA respiratory protection standard 1910.134. Guidance in the selection of respiratory devices is provided in OP No. HS 201.

203.2 Applicability

This procedure is applicable for use in caring for half-face and full-face respirators of either air-purifying or air supplying type. proper care of respirators is essential for their satisfactory performance. Of importance is respirator inspection, care, maintenance, and storage.

203.3 Requirements

OSHA requires, as part of an inspection program, that all respirators be leak checked, a determination that the complete assembly is gas tight. Follow field inspection procedures to examine the freshly cleaned, reassembled respirator.

Cleaning and Disinfecting - OSHA 1910.134 states "routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to ensure that proper protection is provided..." and that emergency use respirators "shall be cleaned and disinfected after each use."

The OSHA standard states that "replacement or repair shall be done by experienced persons with parts designed for the respirator". Besides being contrary

- correctly mounted full facepiece lenses, or broken or missing mounting clips
- cracked or broken air-purifying element holder(s), badly worn threads or missing gasker(s), if required.

Examine the head straps or head harness for:

- breaks
- loss elasticity
- broken or malfunctioning buckles and attachments
- excessively worn serrations on head harness, that might permit slippage (full facepieces only)

Examine the exhalation valve for the following after removing its cover:

- foreign material, such as detergent residue, dust particles or human hair under the valve seat
- cracks, tears or distortion in the valve material
- improper insertion of the valve body in the facepiece
- cracks, breaks, or chips in the valve body, particularly in the sealing surface
- missing or defective valve cover
- improper installation of the valve in the valve body

Examine the air-purifying element for:

- incorrect cartridge, canister or filter for the hazard
- incorrect installation, loose connections, missing or worn gasket or cross threading in the holder
- expired shelf-life date on the cartridge or canister
- examine the protective face shield, if any, for cracks or breaks or impaired vision
- make sure the protective screen is intact and secured correctly over the face shield.

Examine the air supply systems for:

- integrity and good condition of air supply lines and hoses, including attachment and end fittings
- correct operation and condition of all regulators, or other air flow regulators.

In addition to the above, for self-contained breathing apparatus (SCBA) units also determine that:

- The high pressure cylinder of compressed air or oxygen is sufficiently charged for the intended use, preferably fully charged.
- On closed circuit SCBA, a fresh canister of CO_2 (carbon dioxide) sorbent is installed.
- On open circuit SCBA, the cylinder has been recharged if less then 25 percent of the useful service time remains.

All SCBAs are required to have a warning device that indicates when the 25 percent level is reached. However, it is recommended that an open-circuit SCBA be fully charged before use.

203.4.3 Respirator Disassembly

The used respirators should be collected and deposited in a central location. They are taken to an area where the filters, cartridges or canisters are removed and discarded. Canisters should be damaged or marked to prevent accidental reuse. If facepieces are equipped with reusable dust filters, they may be cleaned.

Where respirators are individually assigned (a practice to be encouraged), they should be identified to ensure that the worker always receives the same device. Identification markers must not penetrate the facepiece, block the filter, cartridge parts or exhaust valves.

When a relatively small number of respirators are used, or where workers clean their own respirators, the generally accepted procedure is washing with detergent and warm water using a brush, thoroughly rinsing in clean water, and drying in a clean place. Precautions should be taken to percent damage from rough handling during this procedure.

When large numbers of respirators are used, it is recommended that centralized cleaning and maintenance be performed and that specialized equipment and personnel trained in respirator maintenance be utilized.

203.5.1 Cleaning and Sanitizing

The actual cleaning may be done in a variety of ways. A commercial dishwasher can be used. A standard domestic clothes washer may also be used if a rock is installed around the agitator to hold the facepieces in fixed positions. If the facepieces are placed loose in the washer, the agitator may damage them. A standard domestic dishwasher may be used, but it is not preferred because it does not immerse the facepieces. Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Disinfection is not

absolutely necessary if the respirator is reused by the same person. However, where individual issue is not practical, disinfection is strongly recommended. Reliable, effective disinfectants may be made from readily available household solutions, including:

- Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Chlorox) to one liter.

203.5.4 Reassembly and Inspection

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be throughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.

203.6 Maintenance and Repair

Maintenance personnel must be throughly trained. They must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

These restrictions apply primarily to maintenance of the more complicated devices, especially closed- and open-circuit SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. There should be no

major problems in repairing and maintaining most respirators, particularly the commonly used air-purifying type.

An important aspect of any maintenance program is having enough spare parts on hand. Only continual surveillance of replacement rates will determine what parts and quantities should be kept in stock. It is desirable to have a recording system to indicate spare parts usage and the inventory on hand.

Workers who are adequately trained should develop a respect for respirators that will be an automatic incentive to protect respirators from damage. Besides providing better assurance of adequate protection, this training will lower maintenance costs by decreasing damage.

203.8 Recordkeeping

Records should be maintained to document that proper care and maintenance has been performed on respiratory protection devices. Records should indicate when and what was done to clean, sanitize, or decontaminate each respirator, and also by whom.

203.9 References

U.S. Department of Labor, OSHA, Safety and Health for General Industry (29 CFR Part 1910), Respiratory Protection 1910.134, U.S. Department of Labor Occupational Safety and Health Administration.

American National Standard, Practices for Respiratory Protection, ANSI 788.2-1980, American National Standards Institute.

Birkner, L. R., Respiratory Protection A Manual and Guideline, American Industrial Hygiene Association, 1980.

APPENDIX F

EPNG INCIDENT REPORT FORM

SS-238 AND SS-157

2. Injury Report (Form SS-238): For reporting purposes, injuries are divided into four categories: First aid or incidence cases not requiring medical treatment, first aid cases requiring medical treatment, recordable injuries, and recordable - lost time injuries.

   a. First aid or incidence injury requiring no medical attention, but first aid rendered and the incident reported as follows:

      (1) Employee shall report first aid injuries to their immediate supervisor as soon as possible.

      (2) The supervisor shall complete the injury report shown below, forward a copy to the location safety representative, and maintain a copy at the location.

   b. First aid cases involving one visit to the doctor for treatment, (i.e. particle in the eye, splinter in arm, step on nail requiring tetanus shot, etc.).

      (1) As soon as the supervisor returns from the physician, he/she shall investigate the circumstances surrounding the injury and complete the Injury Report.

      (2) Supervisors are required to telephone the information required to complete the Injury Report to the location safety representative.

   c. Recordable cases: There are injuries or illnesses that require medical care more than once, where time is lost, or where jobs must be modified, (i.e. cuts requiring sutures, broken bones, serious burns, etc.).

      (1) Supervisors will follow procedures for reporting as in Paragraph b above.

      (2) Supervisors will assure that physician's recommendations are adhered to.

      (3) Supervisor must post the "Recordable" injury to the OSHA 200 log.

SUBJECT: GENERAL ADMINISTRATIVE

Form SS-238 (10-77)

[redacted]

INJURY REPORT

NAME	LOCATION PHONE NO.	DATE OF INJURY	TIME AM PM	SHIFT HOURS FROM TO AM PM
LOCATION	PLACE OF ACCIDENT	STATE		COU
CLASSIFICATION		NATURE OF INJURY		
DOCTORS NAME AND ADDRESS		HOSPITAL		

DUTY

☐ REGULAR ☐ OTHER ☐ NO LOST TIME ☐ LOST TIME ☐ FURTHER TREATMENT ☐ FIRST AID

INJURED'S DESCRIPTION OF ACCIDENT _____

WITNESSES _____

DOCTOR'S COMMENT _____

SUPERVISOR'S COMMENT _____

_____

Supervisor's Signature

3. Injury Status Report (Form SS-143): This report is designed to provide updated information on an employee who is currently off on a prolonged occupational injury. Counting from the date of injury, the supervisor will prepare the Injury Status Report Form on the 30th day of lost time. This report does not release the injured of his/her responsibility to contact his/her supervisor at least once a week and apprise him/her of present condition and any other facts that may be pertinent to the injury. This shall be done in accordance with the Employee Relations Policy Manual.

4. Reimbursement For Occupational Injury Expense (Form SS-157): This form has been designed to enable a quick reimbursement to an employee who has been injured on the job and was required to pay for prescription drugs out of his/her pocket.

   a. The supervisor will determine the need for securing reimbursement to an injured employee.

   b. Supervisor shall complete Form SS-157, attach copies of prescriptions and sign the form.

      (1) Original of prescription or other documentation is to be attached to yellow copy of form.

      (2) Duplicates of prescriptions or other documentation is to be attached to yellow copy of form.

   c. The employee or supervisor will present yellow copy of completed form, with attached documentation to a petty cash location for reimbursement.

   d. The petty cash custodian accepts Form SS-157, with attachments, for payment (limited to $50), makes payment, and processes with normal miscellaneous expenses and reimbursements.

   e. Supervisor will then distribute remaining copies of form as indicated on form.

   f. If assistance is needed in this area, inform the Safety Representative assigned to your location.

APPENDIX G

JEROME 411 OPERATING MANUAL

Arizona Instrument Corporation

Jerome Division

JEROME 411

MERCURY VAPOR ANALYZER

Operation Manual

If you have any questions regarding the operation of your new instrument, please call our Technical Service's number, Toll Free: (800) 952-2566. From Arizona or international phones, call (602) 634-4263; TELEX II (TWX) 5101002363 or FAX (602) 634-9304.

REV 7/15/88

Arizona Instrument Corporation
Old High School
PO Box 336
Jerome, Arizona 86331

Table of Contents

THE JEROME 411
GOLD FILM MERCURY VAPOR ANALYZER

The Jerome 411, GOLD FILM MERCURY VAPOR ANALYZER, is designed for the easy and accurate analysis of mercury vapor in the workplace environment and for the location of mercury spills. This portable instrument will operate five hours on fully charged batteries. The 10-second SAMPLE mode provides an integrated, direct reading of mercury vapor concentration in mg/m^3. The 1-second SURVEY mode allows quick checks to locate high concentration areas.

The microprocessor automatically rezeroes the digital meter at the start of each sample cycle and freezes the meter reading until the next sample cycle is activated, thus eliminating drift between samples.

PRINCIPLE OF OPERATION

A thin gold film, in the presence of mercury vapor, will undergo an increase in electrical resistance proportional to the mass of mercury in the sample. The gold film is selective in its adsorption of elemental mercury, thus eliminating interferences common to UV mercury analyzers such as water vapor, particulates, cig-arette smoke, and organic solvents.

Activating either the 10-second SAMPLE or 1-second SURVEY mode starts an internal pump which draws a precise volume of air over the Gold Film Sensor. The Gold Film Sensor adsorbs and integrates the mercury vapor, and the resulting signal is displayed on the digital meter.

As mercury adsorbs on the sensor, the percentage of saturation is indicated on the digital meter by pressing the SENSOR STATUS button. Approximately forty 10-second samples containing 0.1 mg Hg/m^3 may be taken before the sensor reaches saturation. At that point, a 15 minute heat cycle is manually activated to desorb the accumulated mercury from the sensor. An internal charcoal filter prevents contamination from the desorbed mercury.

DIRECTORY OF DIGITAL METER DISPLAY CODES

METER DISPLAY	EXPLANATION
.0 0 0	Ready to Sample
.H.H.H	Film Heat in Progress *(.H.H.H flashes)*
LO BAT	Recharge Batteries *(Refer to page 11.)*
.L.L.L	Bridge Balance is below 0. *(Refer to page 5, step 6.)*
.8.8.8	Press SENSOR STATUS. *If the digital meter displays 100, the Gold Film Sensor is saturated. No further operation is possible until a Film Heat is performed. Refer to page 4 for Film Heat procedure.* *If the digital meter does not read 100, the sample was over range. Further operation is possible with samples of lower concentration, or with the use of a Dilution Module. For Dilution Module information call (800) 952-2566.*

SENSOR STATUS BUTTON PRESSED:

. 10	10% Sensor Saturation
. 50	50% Sensor Saturation
.100	100% Saturation - Film Heat Required

OPERATIONAL TEST

Before each day's use of the Jerome 411, perform the following 4 steps to verify the instrument is operational: (See Outside View page 23.)

PROCEDURE:

1. Press power ON .

   The digital meter displays .0 0 0. (Disregard the digital meter's initial momentary readings.) Recharge or replace the battery pack if the LO BAT indicator ***remains on.*** *Refer to page 11 for the procedure.*

2. Perform a Film Heat.

   Refer to page 4 for the procedure.

3. Press SENSOR STATUS.

   The digital meter displays the percent of mercury saturation of the sensor. The SENSOR STATUS must be between 01 and 99 for the instrument to operate.

   Refer to page 5, step 6 for the adjustment procedure.

4. Press SAMPLE (10 SEC).

   The digital meter counts up 9 sec., as indicated by EO1 through EO9. At the end of the 10 sec. cycle, the digital meter displays the level of mercury present in the air.

FILM HEAT PROCEDURE

Line voltage must be between 115 and 120 VAC for the films to clean properly. (For 230 VAC models, line voltage must be between 230 and 240 VAC.)

CAUTION: Once a FILM HEAT is initiated, DO NOT interrupt the cycle.

PROCEDURE:

1. Insert a zero air filter in the instrument's intake and tighten the intake tube nut to ensure an airtight seal.

   This filter prevents mercury in the atmosphere from entering the Jerome 411.

2. Attach the line cord to the 411 and plug into a VAC outlet.

   The line cord is used during a FILM HEAT to provide line voltage to the films.

3. Connect the battery charger to the 411 and plug into a VAC outlet.

   This ensures completion of the FILM HEAT cycle. The battery charger supplies operating voltage to the instrument.

   NOTE: IF LO BAT is ON, charge the batteries at least one hour before activating a film heat.

4. Press power ON.

5. Press FILM HEAT.

   The digital meter flashes .H.H.H for the duration of the 15-minute cycle.

   DO NOT INTERRUPT THIS CYCLE.

   Wait until the cycle is completed before continuing with the next step.

6. Press SENSOR STATUS and hold down. Adjust the BRIDGE BALANCE using the trimmer tool until the digital meter reads greater than 02, less than 06.

   See Outside View, page 23. If the meter reads less than 02, turn the BRIDGE BALANCE counter clockwise; if greater than 06 turn the BRIDGE BALANCE clockwise.

   IMPORTANT: The BRIDGE BALANCE should be adjusted only after a FILM HEAT cycle.

7. Press power OFF.
8. Disconnect the battery charger.
9. Disconnect the line cord.
10. Remove the zero air filter.
11. The Jerome 411 is ready for sampling.

    NOTE: If FILM HEAT is activated with the line cord unplugged, there is no voltage applied to the film chamber. Under these circumstances, the cycle may be discontinued by pressing power OFF.

SAMPLING FOR MERCURY

SAMPLE 10-SECOND

The SAMPLE 10-second mode is the recommended sampling mode for routine monitoring.

PROCEDURE:

1. Press SAMPLE (10 SEC).
2. Read the digital meter.

   The number displayed at the end of the count is the mercury concentration in mg/m^3. This value remains displayed until the next sample is taken. The digital meter automatically zeroes at the start of each sample.

3. Occasionally check SENSOR STATUS.
4. Press power OFF when not in use.

   The Jerome 411 will operate 5 hours on a fully charged battery.

SURVEY 1-SECOND

The SURVEY 1-second mode DOES NOT provide for accurate analysis of mercury concentrations. This mode is used to assess areas of potentially high mercury concentrations. If sampling unknown mercury levels or locating spills, use this 1-second mode first.

PROCEDURE:

1. Press SURVEY (1 SEC).
2. Read digital meter.
3. Occasionally check SENSOR STATUS.

The probe may be used for locating mercury vapor in hard to reach places. Plug the probe directly into the instrument's intake.

CAUTION: The Jerome 411 is intended for vapor use only, DO NOT allow the probe or the instrument's intake to come in contact with liquids, dust or other foreign material.

OPERATING ON BATTERY POWER

Battery power enables you to use the Jerome 411 as a portable instrument. If battery power is necessary for your use, please be aware of the following:

A fully charged battery pack provides power for 5 hours of operation.

For operation more than 5 hours, an extra fully charged battery pack is needed. Refer to NOTE on page 10.

20 minutes of sampling remains after LO BAT is indicated.

Complete battery recharging takes 16 hours. Refer to page 11 for the procedure.

Refer to page 10 for battery maintenance.

OPERATING ON POWER SUPPLY

For stationary use, the optional Continuous Operation Power Supply Kit (COPS) is available for the Jerome 411. The COPS kit eliminates the need for the battery pack and its necessary maintenance. Installation steps follow:

PROCEDURE:

1. Unplug line cord.
2. Remove the 2 side screws from the digital meter end of the instrument and open the case lid.
3. Locate the battery jacks and disconnect them.

   See figure #1 page 25.
4. Remove the battery pack from the instrument.
5. Plug the jumper assembly into the instrument battery jack.

   The jumper assembly is included in the COPS kit
6. Close the case and replace the side screws.
7. Plug the power supply into the battery charger receptacle on rear of the Jerome 411.

   When the power supply line cord is plugged into 115 VAC (or 230 VAC), the instrument is ready for use.

WARNING!!!

With the COPS jumper assembly installed in the Jerome 411, the battery charger should NOT be plugged into the charging jack. The battery charger does not supply adequate current to operate the instrument, and damage to the instrument and/or the battery charger will result.

PREVENTIVE MAINTENANCE CALENDAR

To keep the Jerome 411 operating at peak performance, follow this maintenance schedule:

Charge Batteries	After 1 month storage or at end of day of use	pg. 11
Change Intake Filter Disc	After 20 hours of use, or as needed	pg. 13
Change Internal Filter System	After 6 months of use, or as needed	pg. 14
Change Hg Exhaust Filter	Annually	pg. 15
Check Instrument's Functioning	After 20 hours of use, every 3 months, or as needed.	pg. 18
Replace Zero Air Filter*	Annually	

NOTE: Plug the Zero Air Filter in the instrument's intake during storage.

***The zero air filter contains Resisorb Mercury Vapor Absorbant. For safety information, see the Resisorb Material Safety Data Sheet included in this manual.**

OBTAINING MAXIMUM BATTERY LIFE

There are certain inherent limitations to NiCd batteries. A major limitation is a "memory" effect that occurs if the batteries are partially discharged and then recharged, repeatedly. This "memory" leads to a drastic reduction of usable battery capacity. To prevent this, periodically allow the battery pack to discharge until "LO BAT" appears on the digital meter. Then recharge battery pack. To obtain maximum battery life, follow these 3 steps:

1. At least once a month wait until LO BAT appears on the digital meter before recharging the battery pack.
2. Charge the battery pack when the LO BAT indicator comes on. Excessive discharge can damage the battery pack.
3. Use the plastic button guard on the power ON/OFF switch when packing the instrument in the carrying case. This will prevent the power being turned on and running down the batteries. Before storing the instrument verify the power is OFF.

When batteries fail to hold a charge, the battery pack should be replaced. Battery life under normal usage is approximately 1 year depending on the number of charge and discharge cycles.

Note: Instead of recharging the batteries with the Jerome 411, a spare battery pack may be recharged with the battery charging adapter and battery charger, outside the instrument.

When the instrument indicates LO bat, simply exchange the discharged pack with a fully charged spare for continued operation.

The discharged pack may then be connected to the adapter and charger, then recharged for the full 16 hours without putting the instrument out of service.

CHARGING BATTERIES

PROCEDURE:

1. Press power OFF.
2. Connect the battery charger to the Jerome 411.
3. Plug the charger into a VAC outlet.

   Complete battery recharging takes 16 hours.

REPLACING BATTERY PACK

PROCEDURE:

1. Press power OFF.
2. Unplug the line cord.
3. Ensure the battery charger is disconnected from the Jerome 411.
4. Remove the 2 side screws from the digital meter end of the instrument.
5. Open the Jerome 411 case lid.
6. Disconnect battery jacks.

   (See Inside View, page 24.)
7. Loosen the 2 captive screws holding the battery pack bracket and remove the bracket.
8. Remove the old battery pack and replace with a new battery pack.
9. Replace the battery pack bracket and tighten the captive screws.
10. Reconnect the battery jacks.
11. Close the case and replace the screws.

FLOW SYSTEM

The Jerome 411's flow system is the crucial link between the sensor and the sample. For the instrument to perform correctly, the flow system must be properly maintained. This system consists of the intake assembly, internal filter system, and Hg exhaust filter.

Follow the Preventive Maintenance Calendar (page 9) for information on when to change filter disc and filters. For proper flow, the Tygon tubing on the filter systems must be free of crimps.

CHECK THE INSTRUMENT'S FLOW RATE (REFER TO THE FOLLOWING SECTION) AFTER CHANGING ANY FILTERS.

CHECK FLOW RATE

The flow rate has been factory set at 750 cc/min (0.75 liters). Check the flow rate by following these steps: (See figure #2 page 25.)

PROCEDURE:

1. Attach your flow meter to the Jerome 411 intake using the black tubing adapter supplied in the Accessory Kit.
2. Tighten the intake tube nut around the tubing adapter to ensure an airtight seal.
3. Unplug the line cord.
4. Press power ON.
5. Press FILM HEAT.

   NOTE: When FILM HEAT is activated with the line cord unplugged, there is no voltage applied to the film chamber. This *FALSE* FILM HEAT causes the pump to run for 15 minutes to allow sufficient time to check and adjust the flow rate if necessary.

6. Wait 30 seconds to allow the flow meter to stabilize.

   Ensure your flow meter is in a vertical position.

7. The flow meter should read 750 cc/min +\- 50 cc/min. If not, follow these steps to adjust the flow rate:

   Remove the 2 side screws from the digital meter end of the instrument and open the case lid.

   Locate the pump flow adjust. (See Inside View page 24.)

   Using the trimmer tool supplied in the Accessory Kit, or a small screwdriver, turn the pump flow adjust until the proper setting is reached.

If unable to set the flow rate to 750 cc/min +\- 50 cc/min, please call Technical Services, Toll Free (800) 952-2566.

INTAKE FILTER DISC

Replace the intake filter disc after 20 hours of sampling. In dusty environments the filter disc may need replacement as often as once a day. Replacement .25 dia. intake filter discs are available from Arizona Instrument Corporation, (#2600-3039).

PROCEDURE:

1. Unscrew the intake from the Jerome 411.
2. Remove the old filter disc using a trimmer tool.

   See figure #3, page 25 .

3. Use tweezers to insert new filter disc.

   Avoid touching the new filter disc with your fingers.

4. Using your trimmer tool, seat the disc firmly against the inner ledge of the intake.
5. Screw the intake back on the Jerome 411.
6. Check the instrument's flow rate.

   Refer to page 12 for the procedure.

INTERNAL FILTER SYSTEM

Replace the Internal Filter System after 6 months of use, or as needed.

PROCEDURE:

1. Unplug the line cord.
2. Remove the 2 side screws on the digital meter end of the instrument and open the case.
3. Carefully disconnect the Tygon tubing from the intake and from the Gold Film Sensor (to the left side of the sensor in the diagram).

   See Inside View, page 24.
4. Remove the old internal filter system* and discard using proper disposal methods.
5. Attach the new internal filter system.

   Ensure the arrow on the filter is pointing in the direction shown on page 24.
6. Push the filter into the mounting clips.
7. Remove any crimps in the tubing and check that tubing connections are secure.
8. Close the case and replace the screws.
9. Check the instrument's flow rate.

   Refer to page 12 for the procedure.

***The internal filter contains Mallcosorb. For safety information, see the Mallcosorb Material Safety Data Sheet included in this manual.**

HG EXHAUST FILTER

The Hg Exhaust Filter traps mercury released during FILM HEAT. Change this filter once a year. See Inside View, page 24.

CAUTION: Old filters contain mercury. For safety information, see the Mercury Material Safety Data Sheet included in this manual. Use proper disposal methods.

PROCEDURE:

1. Unplug the line cord.
2. Remove the 2 side screws on the digital meter end of the instrument and open the case.
3. Carefully disconnect the Tygon tubing from the Gold Film Sensor (right side) and slide the Hg exhaust filter* out of the mounting clip.
4. Remove the Tygon tubing from the Hg exhaust filter.

   Do not remove the Tygon tubing from the pump.
5. Discard the old Hg exhaust filter using proper disposal methods.
6. Connect the Tygon tubing from the pump to the new Hg exhaust filter.

   Ensure the arrow on the Hg exhaust filter is pointing in the direction shown on page 24.
7. Connect the remaining Tygon tubing to the new Hg exhaust filter and connect the other end to the Gold Film Sensor.
8. Slide the Hg exhaust filter into the mounting clip.
9. Remove any crimps in tubing and check that tubing connections are secure.
10. Close the case and replace the screws.
11. Check the instrument's flow rate.

    Refer to page 12 for the procedure.

***The Hg Exhaust filter contains Resisorb Mercury Vapor Absorbent. For safety information, see the Resisorb Material Safety Data Sheet included in this manual.**

FUNCTIONAL TEST

If your application requires frequent verification of instrument functionality, this test will benefit you. If the test results fall within the expected range, you may assume the instrument is functioning properly. This test does not calibrate the instrument.

NOTE: The functional test should only be performed after a Sensor Regeneration.

011 FUNCTIONAL TEST KIT

The accessories necessary to perform this test are contained in the 011 Functional Test Kit:

- thermos (1)
- stopper/thermometer assembly (1)
- vial of Hg (1)
- syringe assembly (1)
- syringe needles (5)
- septum holder assembly (1)
- septa (20)

CAUTION: The vial and thermometer contain liquid mercury and are possible sources of mercury contamination. Follow the instructions carefully.

THERMOS SET UP

PROCEDURE:

1. Unwrap the thermometer assembly carefully.
2. Remove the cap from the thermos.
3. Remove the cap from the vial containing mercury (labeled CAUTION: MERCURY) and carefully pour the liquid mercury into the thermos.

   Pour over a lipped container to trap any spilled mercury.
4. Install the thermometer assembly securely in the mouth of the thermos.
5. Place the thermos in a location with a stable ambient temperature.

   The temperature range for the test is 18-22°C. Avoid temperature fluctuations.

CAUTION: Do not use the thermos as a portable container. If the thermos is upset or greatly agitated, mercury droplets will cling to the thermometer stem, the rubber stopper, the mouth of the thermos and the needle guide.

FUNCTIONAL TEST PROCEDURE:

NOTE: The functional test should only be performed after a Sensor Regeneration.

1. Leave the thermos at stable room temperature for at least 2 hours.

   The temperature range for the test is 18-22°C.

   Temperature fluctuations during the test procedure will produce erratic results.

2. Unplug the line cord and battery charger.

3. Replace the intake filter disc.

   See figure #3, page 25.

4. Check the instrument's flow rate

   Refer to page 12 for the procedure.

5. Replace the septum.

   Remove the septum from the setpum assembly. Place a new septum's small end into the septum holder and fold the top down. See figure #4, page 25.

6. Plug the septum assembly into the instrument's intake and tighten the intake tube nut to ensure an airtight seal.

   See figure #4, page 25.

7. Attach a zero air filter to the septum assembly.

8. Press power ON.

9. Note the temperature of the thermos.

10. Inject 1cc of mercury vapor according to the Syringe Technique described on page 26.

    NOTE: To minimize error, it is important to carefully follow this procedure.

11. Record the meter reading.

12. Repeat step 10 and 11 three times.

    The last three 1cc injections should be within +/- 5% of each other. If not, refer to page 26 for proper syringe technique and repeat the procedure.

13. Refer to the Temperature Conversion Chart, page 20, for the acceptable range.

    The average of the last three digital meter readings should fall within the range indicated in the chart.

    IF THE AVERAGE IS WITHIN RANGE, THE JEROME 411 IS FUNCTIONING PROPERLY.

    If the average is not within range, proceed to the next step.

14. Perform a FILM HEAT.

    Refer to page 4. Wait 1 hour before proceeding with step 15. Wait 1 hour before proceeding to step 15.

15. Adjust the BRIDGE BALANCE, using the trimmer tool, until the digital meter reads not less than 02, and not greater than 06.

    Refer to page 5, step 6.

16. Repeat steps 6-13 of this test procedure.

    If the average of the digital meter readings is still not within range, refer to page 21, Functional Test Trouble Shooting.

TEMPERATURE CONVERSION CHART

Temp °C	Digital Meter Response
16	.064 to .086
17	.070 to .094
18	.076 to .102
19	.082 to .112
20	.090 to .122
21	.097 to .131
22	.105 to .143
23	.115 to .155
24	.124 to .168

FUNCTIONAL TEST TROUBLE SHOOTING

If the proper results were not achieved during the test procedure, go over the following to discover the cause:

- Ensure the battery charger and line cord are unplugged.
- Perform a flow rate check, procedure page 12.
- Ensure the thermos temperature is stable.
- Ensure the mercury drop in the thermos is not oxidized.
- Replace a clogged, bent or contaminated syringe needle.
- If the internal tubing is crimped or blocked, straighten or replace the affected tubing.
- Ensure the instrument's intake is not blocked with foreign matter.

If none of the above conditions exist, follow these steps to determine if the flow system is contaminated:

1. Insert your zero air filter in the instrument's intake and tighten the intake tube nut to ensure an airtight seal.
2. Take 3 samples.

   If the average meter reading is less than .005, there is no mercury contamination. If the average meter reading is greater than .005, proceed to step 3.

3. Remove and replace the zero air filter.
4. Take 3 samples.

   If the average reading is less than .005, the old zero air filter was contaminated. If still greater than .005, proceed to step 5.

5. Change the internal filter system.

   Refer to page 14.

6. Take 3 more samples.

   If the average meter reading is less than .005, the internal filters were contaminated. If the average is still greater than .005--

   Please call Technical Service, Toll Free (800) 952-2566 for assistance.

REPLACING MERCURY

An oxide coating will form on the drop of mercury and will cause lower readings in your testing. Replace your mercury on a yearly basis or when a filmy coating is evident on the surface of your mercury drop.

PROCEDURE:

1. Carefully remove the stopper assembly from the thermos.

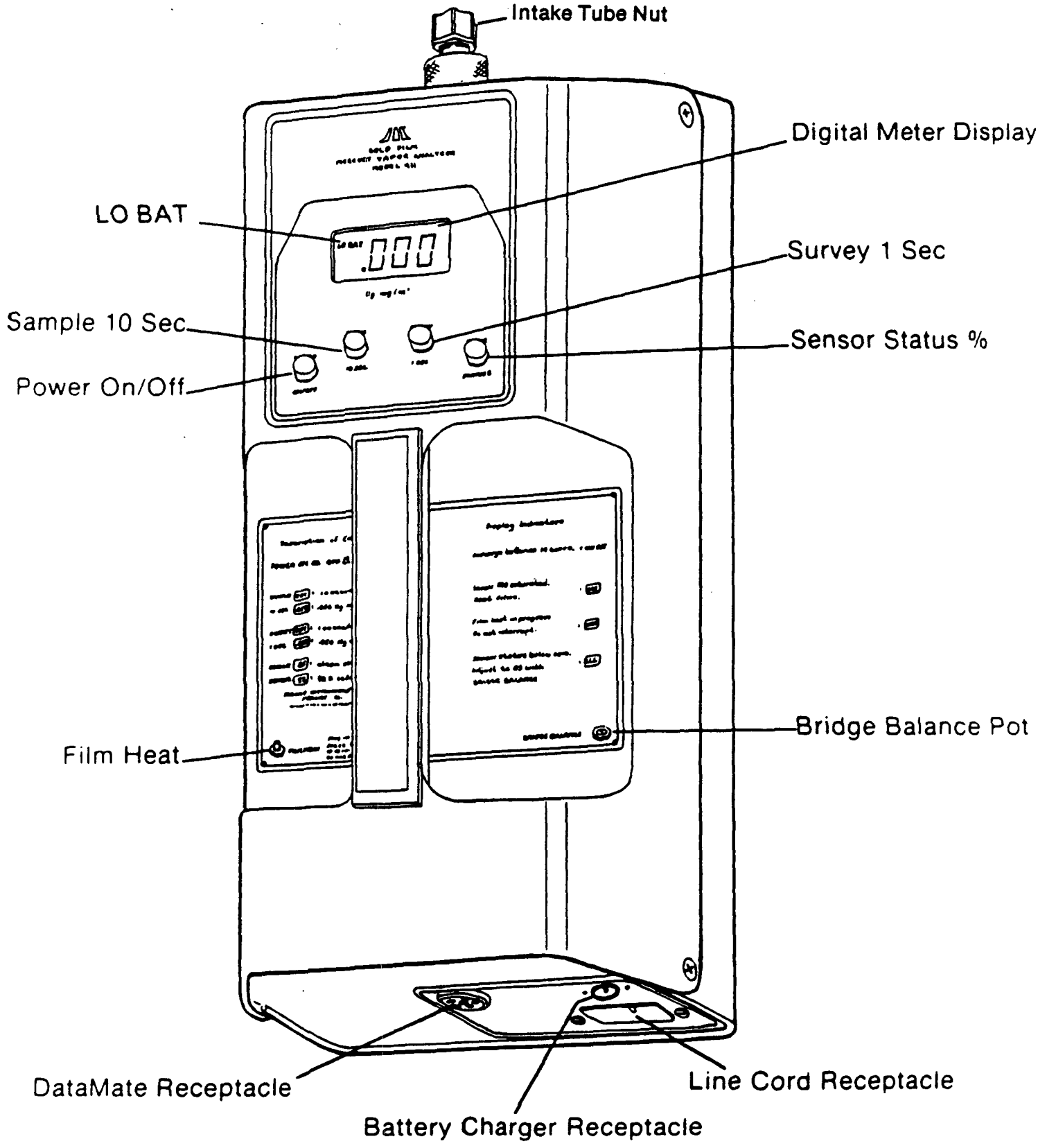
   BE SURE NEEDLE GUIDE IS FREE OF LIQUID MERCURY.

2. Replace the oxidized mercury with approximately 1/2cc fresh mercury.

   Do NOT use the syringe for measuring liquid mercury. Dispose of oxidized mercury properly.

3. Reinstall the stopper assembly.

OUTSIDE VIEW - JEROME 411



INSIDE VIEW - JEROME 411

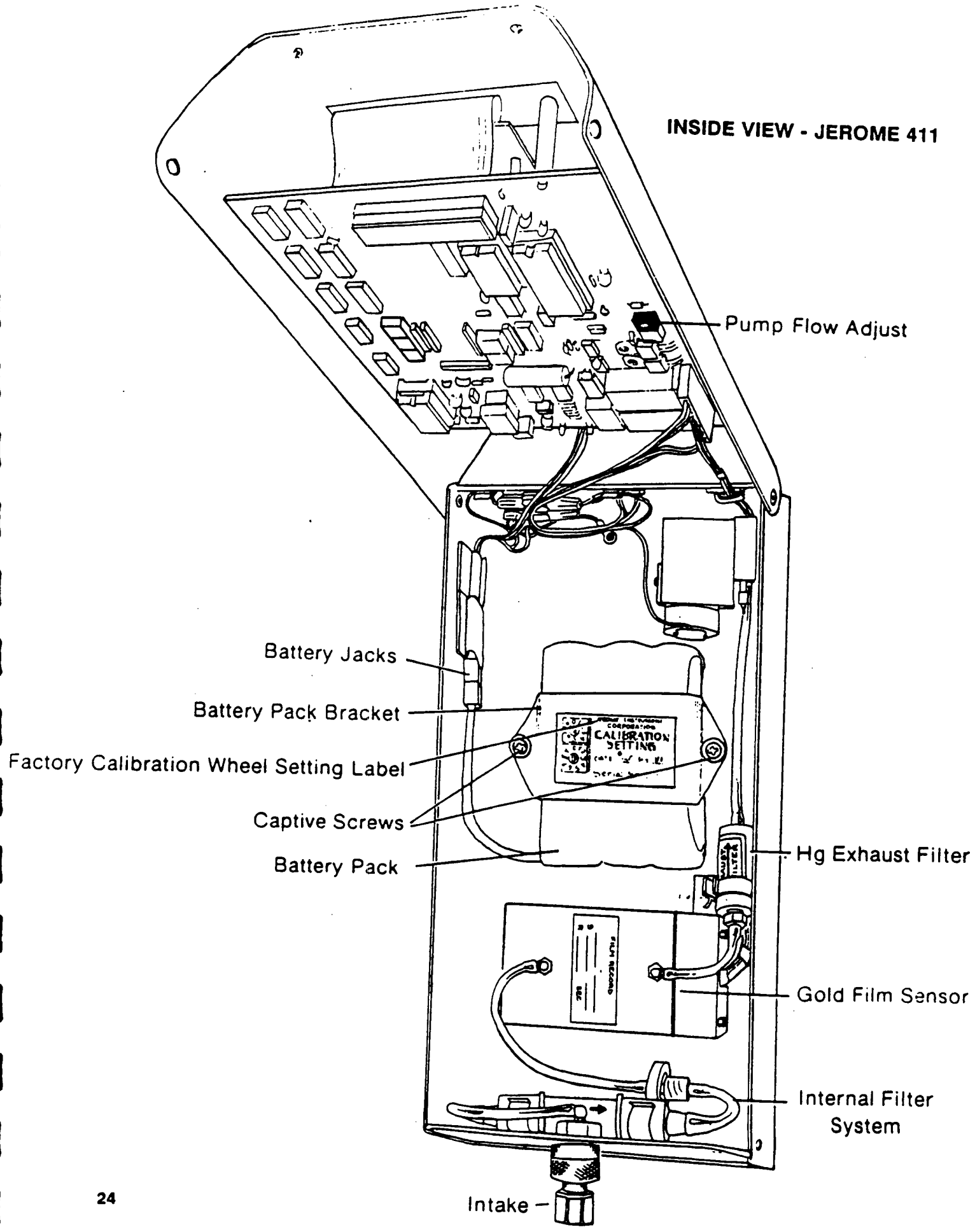


FIGURE 1

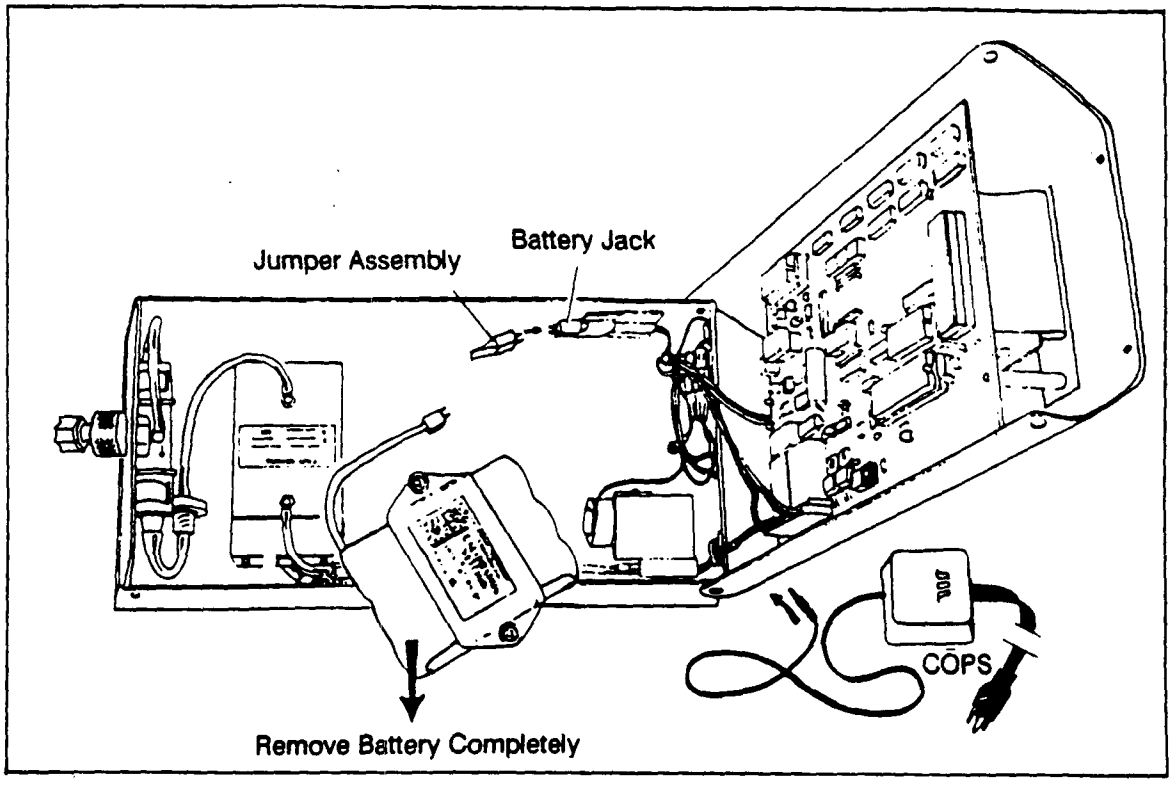


FIGURE 2

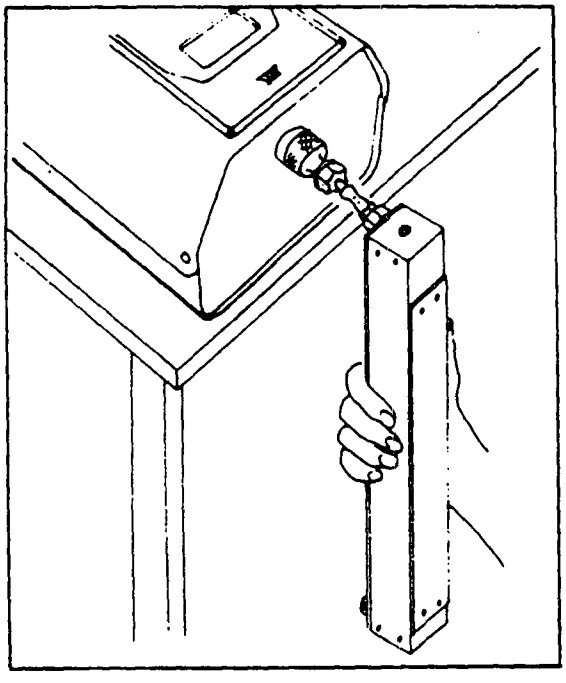


FIGURE 3

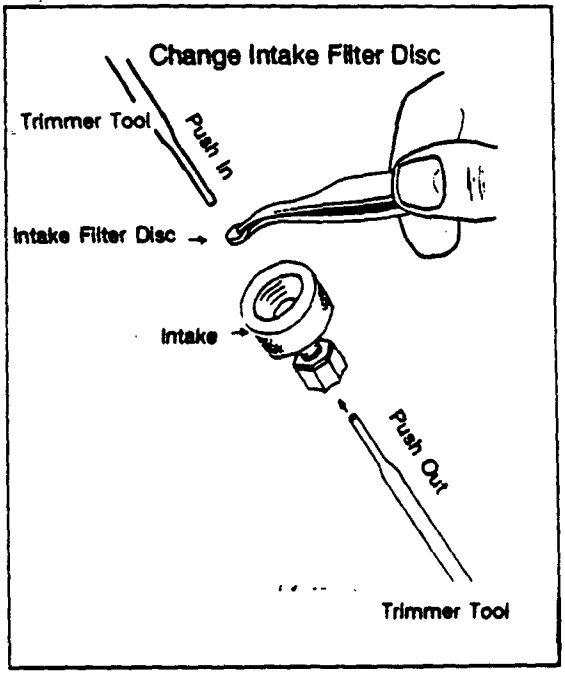
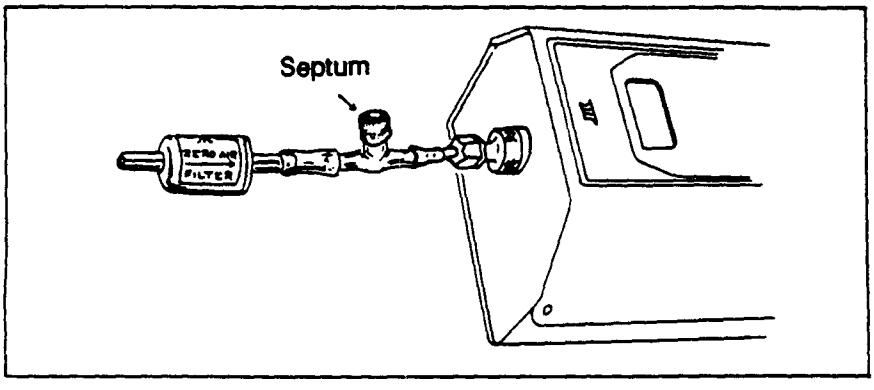
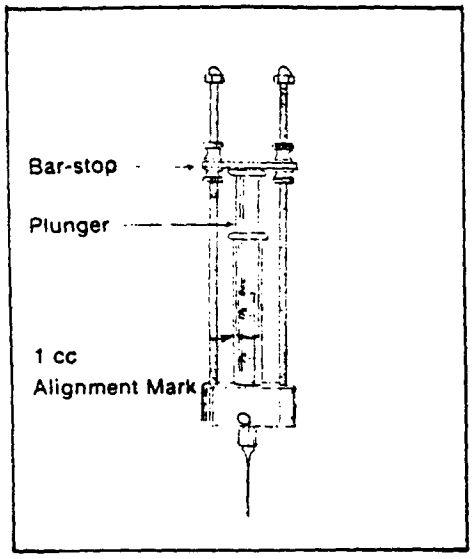


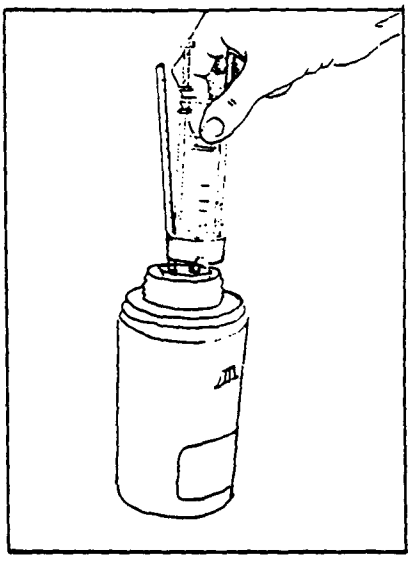
FIGURE 4



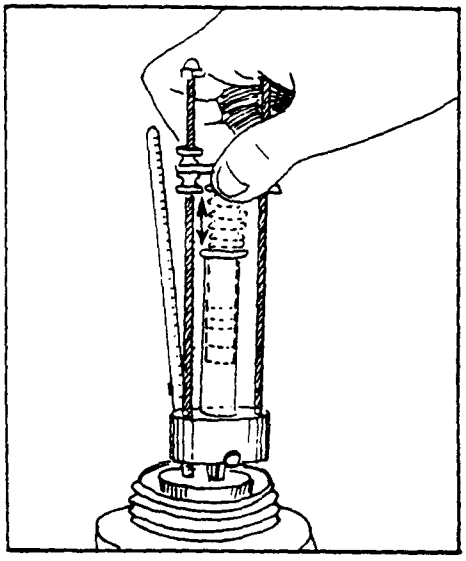
SYRINGE TECHNIQUE



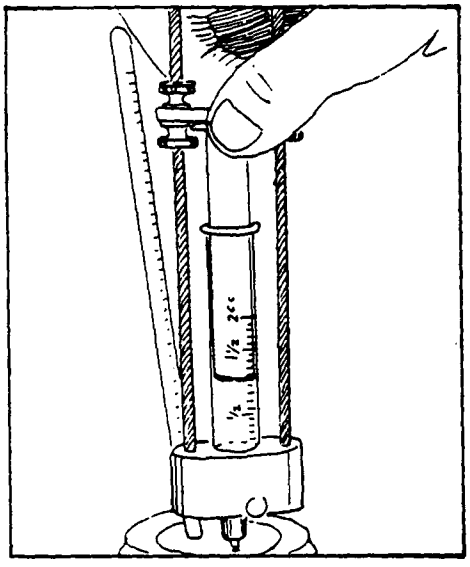
1. Check bar-stop setting (1 cc)



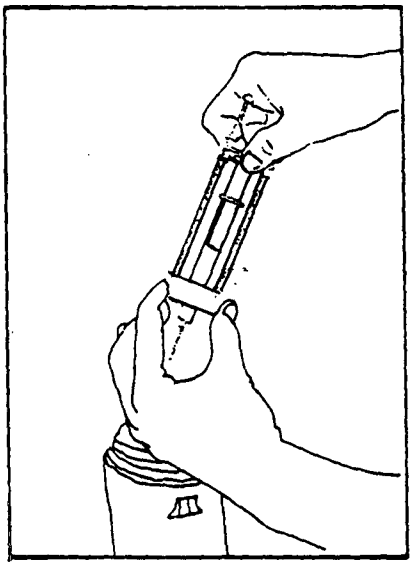
2. Insert needle into calibration vessel



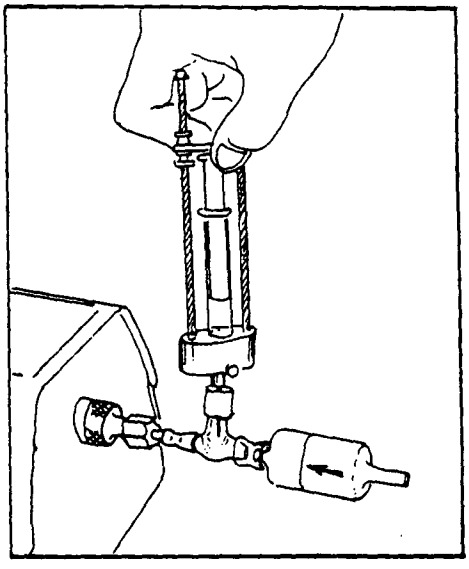
3. Pump plunger 2 times



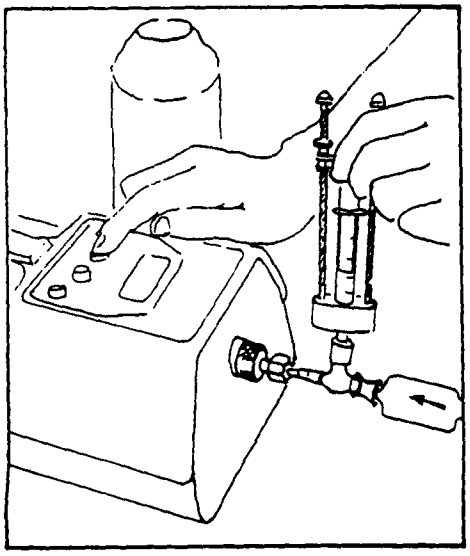
4. Pull plunger quickly and smoothly to bar-stop



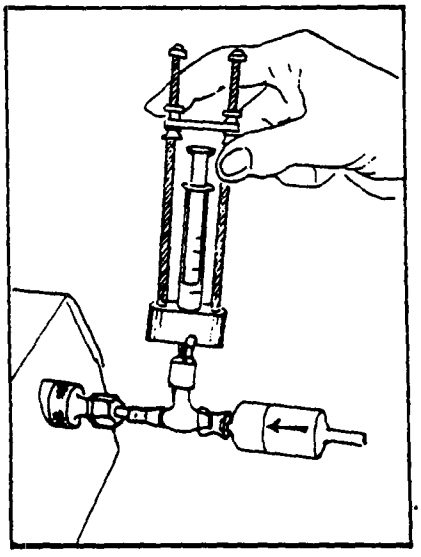
5. Hold plunger firmly against bar-stop and remove syringe from vessel



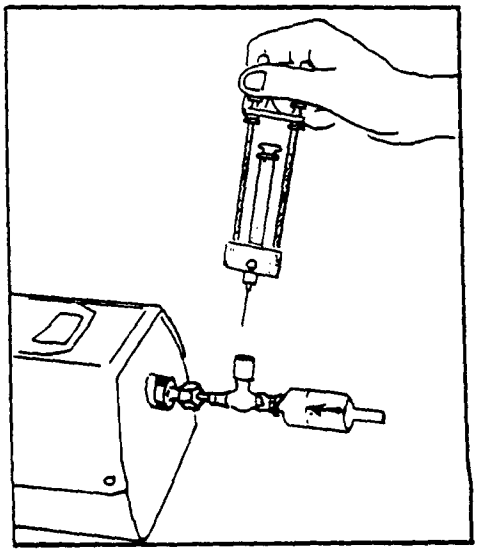
6. Insert syringe needle to septum



7. Press SAMPLE



8. Release plunger so that gravity feeds Hg vapor into 411 airstream. Aid if necessary, by pushing plunger completely closed.



9. Remove syringe needle from septum

TECHNICAL SPECIFICATIONS

Sensitivity	0.003 mg/m^3 Hg
Precision	5% Relative Standard Deviation @ .107 mg/m^3 Hg
Accuracy	+/-5% @ 0.107 mg/m^3 Hg
Range	0.000 to 1.999 mg/m^3 Hg
Response Time	
SAMPLE mode	10 seconds
SURVEY mode	1 second
Flow Rate	750cc/min 0.75 liters/min = 750cc/min
Power Requirements	115VAC or 230VAC 115 watts maximum
Batteries	Rechargeable Nickel-Cadmium
Construction	Aluminum Alloy
Dimensions	6" W X 13" L X 4" H
Weight	5 pounds
Digital Meter	Liquid Crystal Display
Operating Environmental Range	0 - 40°C, non-condensing, non-explosive
Data Output	Digital, Serial; Voltage levels: Logic 0 = +5V, Logic 1 = 0V Transfer Rate: 150 Bits/Second Data String: 1 Start Bit (+5V) 7 Data Bits (ASCII Format) LSB 1st 1 Parity Bit (Always 0) 2 Stop Bits (0V)

ACCESSORIES & MAINTENANCE PARTS

PART #	ITEM DESCRIPTION
411 FLOW SYSTEM	
2600-3901	Internal Filter
A2600-3918	Hg Exhaust Filter
Z2600-3905	Zero Air Filter
Z2600-3907	411 Internal Filter System Includes: Acrodisc, internal filter & Tygon tubing (assembled)
1400-3010	Tubing Adapter
2600-3039	.25 Dia. Intake Filter Disc
2500-3001	Tygon Tubing - 1/8" I.D.
2600-3015	Acrodisc - 5 micron
CALIBRATION EQUIPMENT	
2600-0030	Thermos
A2600-0902	Stopper Assembly Includes: rubber stopper, thermometer & needle guide
A2600-0903	Calibration Syringe Assembly Includes: syringe, syringe holder & needle
2600-0022	Syringe Needle
Z2600-3914	411 Septum Holder Assembly - Std.
3200-0011	Septum
A2600-0904	Vial with Hg
REPLACEMENT PARTS	
Z4000-0901	Battery Pack Assembly - 411
Z4000-0902	Battery Charging Adapter Assembly
1400-2002	Probe - 411
2300-0001	Trimmer Tool
4000-1003	Battery Charger - 115VAC
6000-4003	Line Cord (411) - 115VAC

PART #	ITEM DESCRIPTION
Y411-0901	**411 Accessory Kit** Includes: battery charger (1), zero air filter (1), .25 dia. intake filter discs (20), trimmer tool (1), probe (1) & tubing adapter (1)
Y411-0902	**011 Functional Test Kit** Includes: thermos (1), stopper assembly (1), vial of Hg (1), syringe assembly (1), syringe needles (2), 411 septum holder assembly (1) & septums (20)
Y411-0903	**Maintenance Kit** Includes: .25 dia. intake filter discs (20), battery pack assembly (1), charging adapter (1), 411 internal filter system (1), Hg exhaust filter (1), zero air filter (1) & 1' Tygon tubing - 1/8" I.D.
Y411-0904	**411 Carrying Case Assembly** Includes: case & die cut foam rubber. Holds: Jerome 411, 412 Dosimeter Controller, Personal Mercury Dosimeters & accessories
Z2600-3911	10X Dilution Module Assembly
X422-0001	422 Dosimeter Controller
Y422-0902	422 Accessory Kit Includes: line cord & dosimeter lead set
2100-6017	Dosimeter Lead Set
X412-0901	Personal Mercury Dosimeter
X405-0115	Datamate Assembly - 115VAC Includes: Datamate, Datamate cord assembly & 1 pkg. thermal paper
A6000-0905	Datamate Cord Assembly
6100-0003	Datamate Thermal Paper (3 roll pkg.)
Y411-0905	Continuous Operation Power Supply Kit (COPS) - 115VAC

FACTORY CALIBRATION & MAINTENANCE SERVICE
Service includes instrument reconditioning & recalibration to bring to manufacturer's specifications.
Call JIC Technical Service Department for authorization & scheduling.

FACTORY CALIBRATION SERVICE
Service includes checking & adjusting instrument calibration.
Call AZI Technical Service Department for authorization & scheduling.
Toll Free (800) 952-2566

Call AZI for current prices and delivery information.
Toll free: (800) 952-2566.

WARRANTY

Seller warrants to buyer that products delivered pursuant to this Agreement shall, at the time of delivery, and for a period of one (1) year thereafter (the Internal Battery Pack, where applicable, is warranteed for a period of ninety [90] days only), be free from defects in material or workmanship and shall conform to seller's specifications or such other specifications as seller has agreed to in writing. Seller's obligations with respect to claims under this warranty shall be limited, at seller's option, either to the replacement of defective or non-conforming product or to an appropriate credit for the purchase price thereof subject to the provisions of seller's Warranty Policy as amended from time to time, said Policy being incorporated herein by reference.

Return products under warranty claims will be shipped to seller's plant by buyer at buyer's expense and shall be accompanied by a statement of the reason for the return and an approved Return Material Authorization Number issued by seller. Buyer remains responsible for payment for products not accepted for warranty adjustment and freight and handling costs associated therewith.

Notwithstanding the foregoing, no warranty shall be enforceable in the event that product has been subjected to environmental or stress testing by buyer or any third party without written approval of seller prior to such testing. Further, no warranty shall be enforceable if the alleged defect is found to have occurred as a result of misuse, neglect, improper installation, repair, alteration, accident, or improper return handling procedure by buyer.

Discontinued product is warranteed only for a credit or replacement at seller's option.

THE EXPRESS WARRANTIES GRANTED ABOVE SHALL EXTEND DIRECTLY TO BUYER AND NOT TO BUYER'S CUSTOMERS, AGENTS, OR REPRESENTATIVES AND, EXCEPT FOR WARRANTY OF TITLE, IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, SUCH OTHER WARRANTIES BEING SPECIFICALLY DISCLAIMED BY SELLER. IN NO EVENT SHALL EITHER PARTY'S LIABILITY FOR ANY BREACH OR ALLEGED BREACH OF THIS AGREEMENT EXCEED THE TOTAL EXTENDED PRICE OR PRICES SHOWN ON UNFILLED ORDERS, NOR SHALL EITHER PARTY BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OR ALLEGED BREACH.

Notwithstanding the foregoing, if any product covered by order(s) placed hereunder is designated as "developmental" "prototype" or "experimental", no warranty whatsoever except a warranty of title to component materials, will be applicable therto and buyer shall indemnify seller for any claims for liability asserted seller in connection therewith.

Medical Applications: Seller's products are not designed for use in medical appliances, devices, or systems where malfunction of buyer's product can result in personal injury. Buyer's customers using or selling buyer's products for use in medical applications do so at their own risk and agree to fully indemnify buyer.

The foregoing state the entire liability of seller in connection with products supplied hereunder.

INSTRUCTIONS 23-9510

Rev. 1 – November 1980

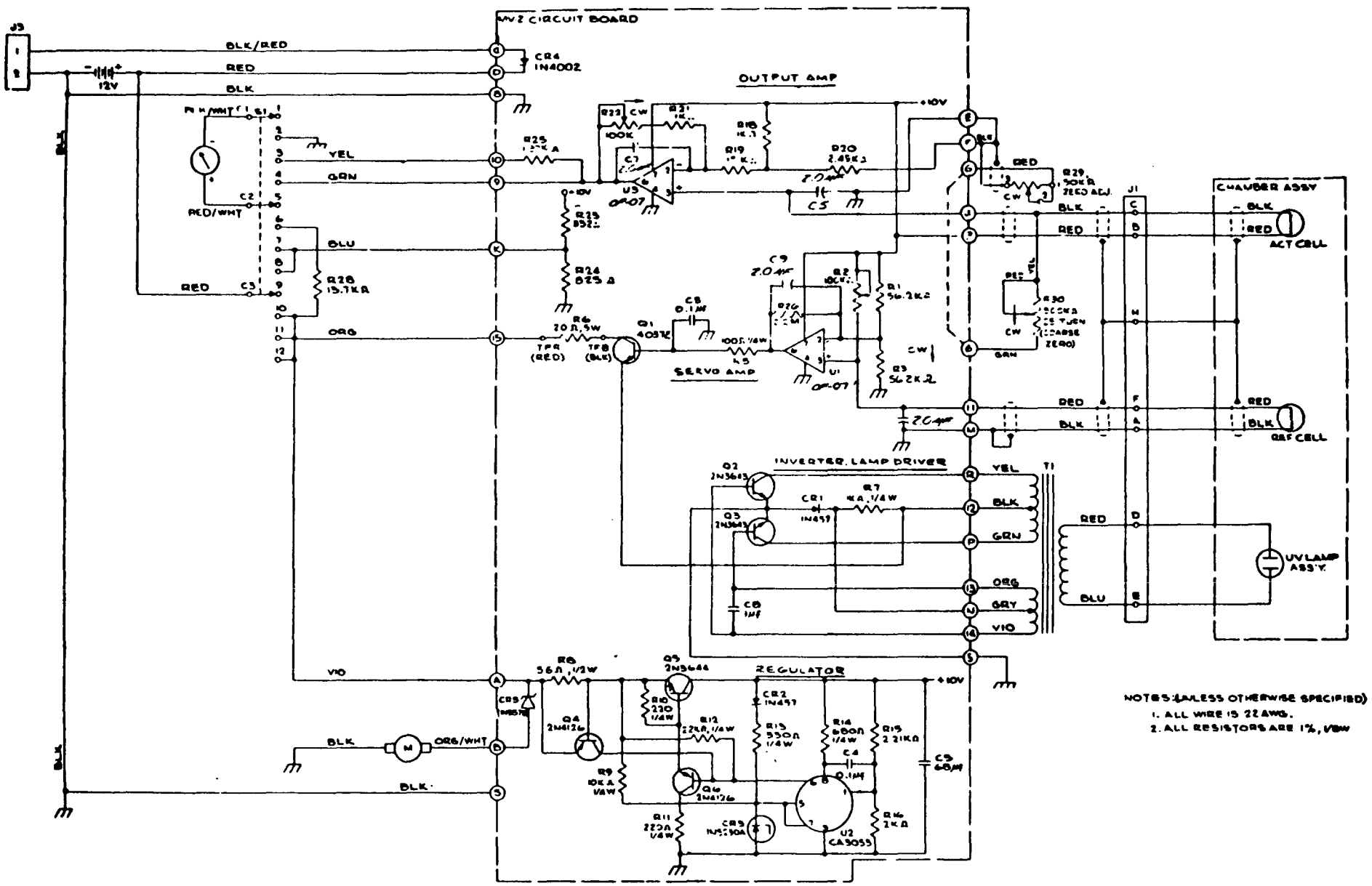
OPERATION & MAINTENANCE

MODEL MV-2 MERCURY VAPOR SNIFFER

CENTURY SAFETY INSTRUMENTS
and Supply Corporation
1230 W. Barkley Ave.
Orange,CA 92668
714 532-6602

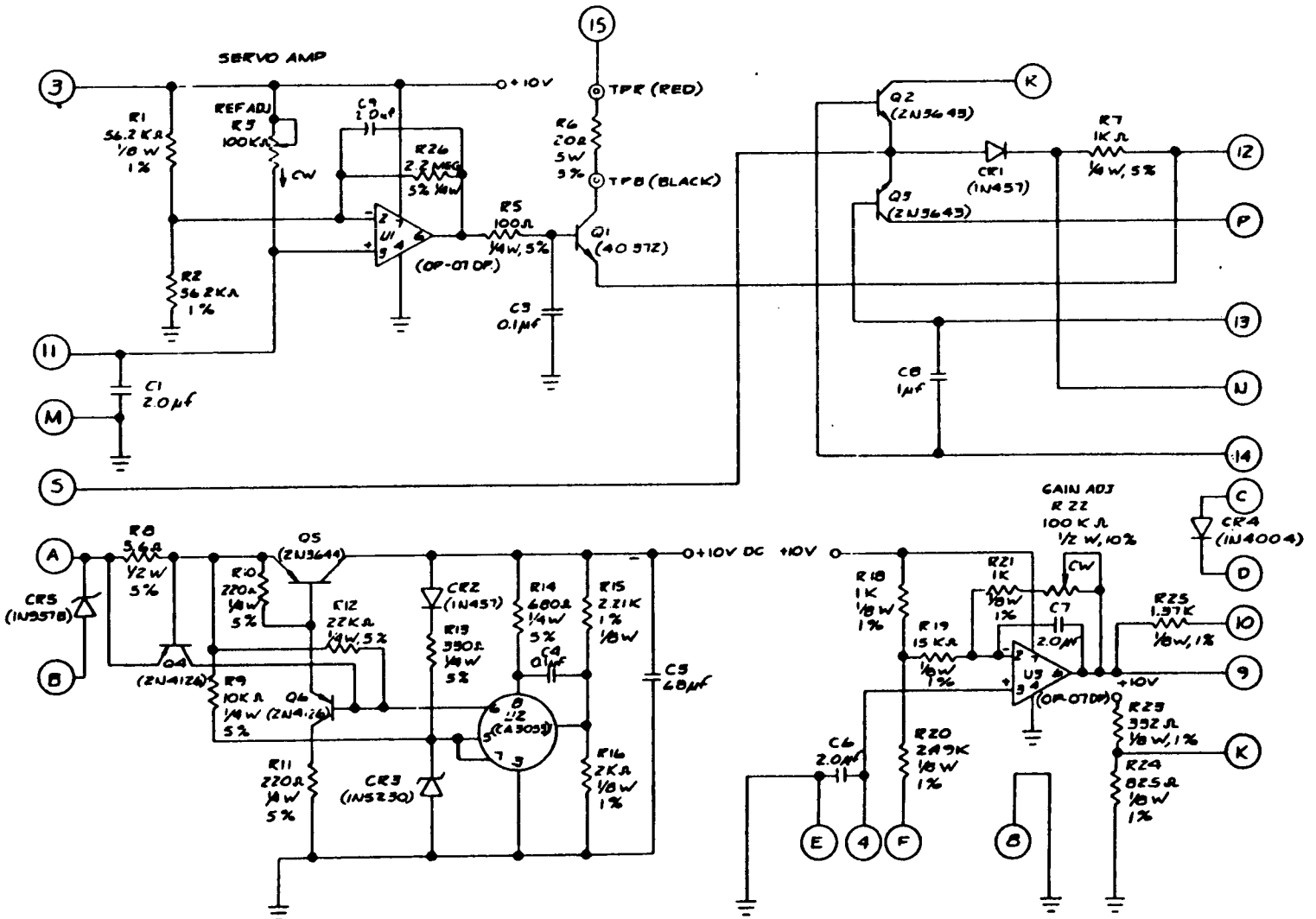
BACHARACH

Bacharach, Inc.
625 Alpha Drive, Pittsburgh, PA 15238 (412) 963-2000



MV-2 CHASSIS WIRING DIAGRAM

350-059.10	Meter, 0-1.0 mA dual scale, mg/m^3	357-293.10	Receptacle, Charger (two pin socket)
355-388.10	Control Switch, (3 pole, 4 position)	360-220	Battery Charger, 115/230 VAC and 50/60 Hz with Charging Indicator
04-4954	Potentiometer, Zero Adjust (50K ohm, 2W)	345-016	Optical Chamber Assembly, with Ultraviolet Lamp and Two Photo Cells
347-432	Filter Valve Assembly	347-432	Filter/Valve Assembly
04-0029	Battery, 12V Ni-Cad	340-931	Handle
370-003.20	Filter Charge (treated carbon)	357-440	Knob (round, black)
347-379	Motor Blower Assembly	104-6525	Knob Lock
364-065	Transformer	315-121	Foot, Rubber
23-4240	P. C. Board Assembly		
347-408	Sampling Probe		
23-4262	Field Calibration Probe		
314-082	Tubing, 3/8" PD x 1/16, Wall 1/4 ID		
357-441	Knob (fluted, skirted, black)		
340-161.50	Cover, Case (MV-2)		
04-4959	Potentiometer, Coarse Zero (500K, 25T)		



MV-2 P. C. BOARD SCHEMATIC DIAGRAM

ADDENDUM 1

INSTRUCTIONS 23-9510
Rev. 1 – November 1980

This addendum provides change information for Instruction Manual 23-9510 for the MV-2 Mercury Vapor Sniffer. Changes to the manual are as follows:

Pages 13 and 13A	The diagrams on the next two pages replace the Chassis Wiring and P. C. Board Schematic Diagrams in the manual.
Page 21	The parts list for the MV-2 Mercury Vapor Sniffer, part number 23-7205, has been revised. A new parts list appears on page 4 of this addendum.

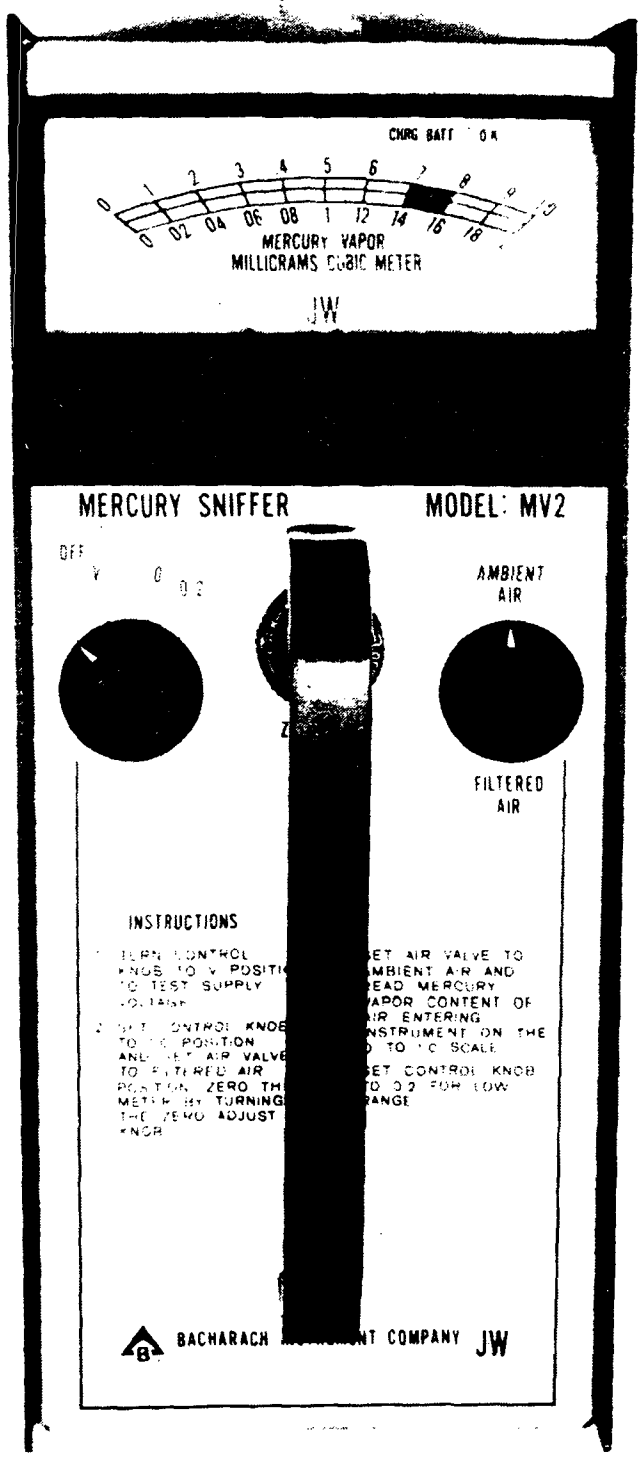

CHRG BATT OK
0 1 2 3 4 5 6 7 8 9 10
0 02 04 06 08 1 12 14 16 18
MERCURY VAPOR
MILLIGRAMS CUBIC METER
JW
MERCURY SNIFFER
MODEL: MV2
OFF
AMBIENT AIR
FILTERED AIR
INSTRUCTIONS
BACHARACH
COMPANY
JW

TABLE OF CONTENTS

WARRANTY

1. Bacharach Instrument Company, Division of AMBAC Industries, Incorporated warrants to Buyer that at the time of delivery this product will be free from defects in material and manufacture and will conform substantially to Bacharach's applicable specifications. Bacharach's liability and Buyer's remedy under this warranty are limited to the repair or replacement, at Bacharach's option, of this Product or parts thereof returned to Seller at the factory of manufacture and shown to Bacharach's reasonable satisfaction to have been defective; provided that written notice of the defect shall have been given by Buyer to Bacharach within one (1) year after the date of delivery of this product by Bacharach.

2. Bacharach warrants to Buyer that it will convey good title to this Product. Bacharach's liability and Buyer's remedy under this warranty of title are limited to the removal of any title defects or, at the election of Bacharach, to the replacement of this Product or parts thereof that are defective in title.

3. The warranty set forth in paragraph 1 does not apply to parts the Operating Instructions designate as having a limited shelf-life or as being expended in normal use.

4. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF (i) ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE: AND (ii) ANY OBLIGATION, LIABILITY, RIGHT, CLAIM OR REMEDY IN CONTRACT OR TORT, WHETHER OR NOT ARISING FROM BACHARACH'S NEGLIGENCE, ACTUAL OR IMPLIED. The remedies of the Buyer shall be limited to those provided herein to the exclusion of any and all other remedies including, without limitation incidental or consequential damages. No agreement varying or extending the foregoing warranties, remedies or this limitation will be binding upon Bacharach unless in writing, signed by a duly authorized officer of Bacharach.

IMPORTANT

DO NOT OPERATE THIS UNIT AS RECEIVED OR AFTER STORAGE UNTIL BATTERIES HAVE BEEN CHARGED OVERNIGHT (approximately 14 hours). Operation with low battery charge may cause permanent battery damage and void warranty.

A fully charged battery pack will self-discharge even when not in use (accelerated at temperatures above 70 degrees F). Recharge only with specified Bacharach battery charger.

CAUTION: MAKE CERTAIN TO RECHARGE BATTERY WHENEVER METER POINTER ENTERS RED-COLORED SECTION ON SCALE. AT THIS POINT BATTERY VOLTAGE IS RAPIDLY DECREASING AND INSTRUMENT NO LONGER INDICATES CORRECT MERCURY CONCENTRATION IN SAMPLE.

If properly cared for, the high-quality, nickel-cadmium battery pack or cells normally operate for over 1000 charge/discharge cycles.

1.0 INTRODUCTION

The J-W Mercury Vapor Sniffer Model MV - 2 is a highly sensitive instrument designed to detect minute concentrations of mercury vapor released into the atmosphere.

The Model MV - 2 is calibrated in milligrams/cubic meter and will detect mercury vapor concentration in two ranges: 0-0.2 mg/m^3 and 0-1.0 mg/m^3. The instrument is primarily used to monitor environments where mercury or its compounds are produced, processed, or stored, and where mercury vapors pose a health hazard to personnel.

A sample of the immediate atmosphere being monitored is drawn into an absorption chamber where a selective 253.7 millimicron ultraviolet light source is absorbed by the sample. (An inverter circuit provides high voltage AC power to excite the UV lamp.) At the other end of the chamber, a photo resistive element measures the intensity of radiation passing through the intervening space. The optical system is designed specifically to detect mercury, which has a strong absorption line in the ultraviolet region of the spectrum.

The presence of mercury vapor will reduce the radiation energy reaching the photoresistive element in proportion to the vapor concentration. This change affects a photoresistive element, which is connected as one arm of a Wheatstone Bridge, creating an unbalanced condition that is detected and displayed on the meter as the mercury vapor concentration in milligrams/cubic meter.

1.1 SPECIFICATIONS

FUNCTION - Surveying atmospheres for Hg concentrations below and above the accepted TLV (Threshold Limit Value).

DETECTOR - Ultraviolet Photometer

MEASURING RANGES - 0-0.2 and 0-1.0 mg/m^3

SENSITIVITY - 0.01 mg/m^3

REPEATABILITY - ± 5% FSD

RESPONSE TIME - approximately 3 seconds

OPERATING TEMPERATURE RANGE - 15C to 50C.

BATTERY - 12 volt Nicad, rechargeable

BATTERY LIFE - Four hours continuous usage between charges

CONSTRUCTION - Rugged, case with silver anodized front panel

DIMENSIONS - Instrument 11.375" x 4.75" x 4.375" (288.9mm x 30.7mm x 111.1mm)

WEIGHT - 6 lbs. (2.7 kg) Probe 12" (304.8mm) x .375" (9.525mm) O. D.

2.0 DESCRIPTION (Refer to Figure 1)

The Model MV-2 Mercury Sniffer is a compact, self-contained and completely portable instrument which indicates the amounts of volatile mercury in milligrams per cubic meter.

The indicating meter, controls and carrying handle are mounted in the top cover. A slip-on connection is provided in the end of the case, to accommodate an extension probe. In addition, a length of 0.375" diameter flexible tubing may be connected to the probe, for greater convenience when checking floor areas or gratings.

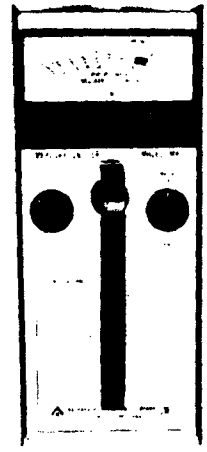


Figure 1: Mercury Vapor Detector Model MV-2

An advanced solid-state voltage regulator fully compensates for changes in battery voltage. A special integrated circuit amplifier provides temperature compensation.

The internal nickel cadmium battery is rechargeable from an automatic plug-in battery charger. The operating time between chargings is approximately four hours. Warm-up time is about 15 to 25 min., and direct readings are indicated on a dual-range, easy-to-read meter. A selection valve routes the sample through an internal filter, which removes all mercury vapor and allows the meter reading to be accurately set to zero even in a contaminated atmosphere.

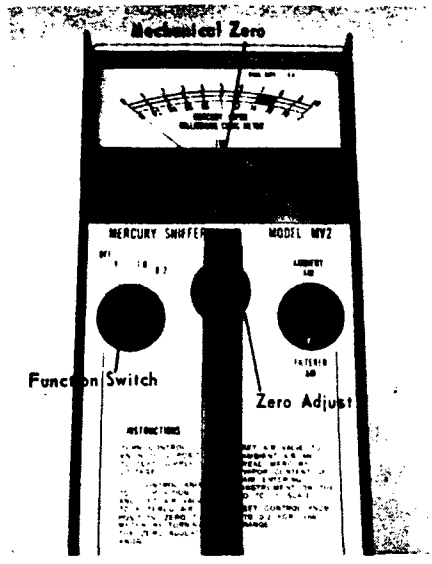


Figure 2: Locating MV-2 Operating Controls.

2.1 OPERATING CONTROLS (Refer to Fig. 2)

The Model MV-2 indicating meter and all operating controls are mounted on the front panel, where they are readily accessible when the unit is held in the operating position.

1. Function Switch/Range Selector (Control Knob on left side of panel)

"OFF" position: Battery disconnected from sensing and pump circuits.

"V" position: Connects the indicating meter to the battery circuit to check battery voltage and applies power to pump and sensing circuits.

Position "1.0": Connects indicating meter to sensing circuits to measure mercury concentrations between 0 and 1.0 mg/m^3 (less sensitive range).

Position "0.2": Connects indicating meter to sensing circuits to measure mercury concentrations between 0 and 0.2 mg/m^3 (more sensitive range).

2. "Zero Adjust" Knob (at center of panel under handle): a ten-turn potentiometer with locking clutch, used to set the meter pointer to zero in mercury-vapor-free atmosphere.

3. "Ambient Air/Filter Air" Knob (on right side of panel): Connects to a rotary valve, which may be turned to route the incoming sample either directly to the sensing circuits or divert the sample through an internal filter, which removes all mercury vapor and permits the indicating meter to be zeroed (equivalent to meter zero in fresh air).

4. "Mechanical Zero" Adjustment: Located on the meter below meter face, this slotted screw is used to mechanically set the pointer to scale zero, with the Function Switch in the OFF Position.

5. Indicating Meter: Displays battery condition; shows amount of mercury vapor in monitored environment on two ranges: 0-1 mg/m^3 (less sensitive range), and 0-0.2 mg/m^3 (most sensitive range). NOTE: The meter has a green index mark (0.75) on the scale for minimum battery voltage (12 volts). DO NOT ATTEMPT TO USE INSTRUMENT OR MEASURE MERCURY CONCENTRATION WHEN VOLTAGE INDICATED IS BELOW THIS LEVEL.

2.2 INTERNAL COMPONENTS
Refer to Figure 3

For access to the following internal components, remove the eight screws from the plastic enclosure.

1. Plug-in Control Circuit Board J-W Code 393-272.10.

Contains the solid state electronics which detect the unbalance in the Wheatstone Bridge due to the presence of mercury vapor in the detection chamber. A special integrated circuit amplifier provides temperature compensation, and the voltage regulator (10 volts) provides the precise control of detector circuit voltages and compensates for changes in battery voltage. The Control Board contains two potentiometer adjustments: one (R-3) LAMP ADJ. and (R-22) Gain Control.

NOTE: The LAMP ADJ. (R-3) is factory adjusted: DO NOT attempt to change setting without first consulting Section 7.0 Calibrating MV-2 using a known concentration of mercury vapor.

2. POWER SUPPLY

A rechargeable, 12-volt, nickel-cadmium battery with a 1.2-ampere-hour capacity and a continuous-duty cycle of 4 hours operation. The charge cycle for the battery is 8 to 16 hours, continuous, depending upon initial state of charge. The instrument may be operated continuously up to 12 hours provided the battery is fully charged and the MV-2 Charger is connected to a 115 VAC, 50-60 Hz. outlet.

3. ABSORPTION CHAMBER

The cylindrical metal tube which provides a means of passing the sample through the beam from the U.V. Lamp to the photo-sensitive element. A selective filter excludes all but ultraviolet light from entry.

4. MERCURY FILTER

A rechargeable filter of specially treated carbon (charcoal) is used to remove all mercury vapor from the sample stream for the purpose of zeroing the instrument when ambient air may contain mercury vapor. It is connected into the sample stream only when the air knob is in the Filtered Air position.

5. BLOWER ASSEMBLY

A constant-speed, vane-type blower driven by a 12 VDC motor draws the sample into the instrument and discharges it through the absorption chamber where mercury content is measured.

NOTE: The sample flow rate cannot be adjusted; instrument response to detected mercury sample occurs in approximately three seconds when equipped with standard 12" probe.

Pump is low pressure type. Do not connect excessive restrictions to flow path in the form of an extra long probe or filter.

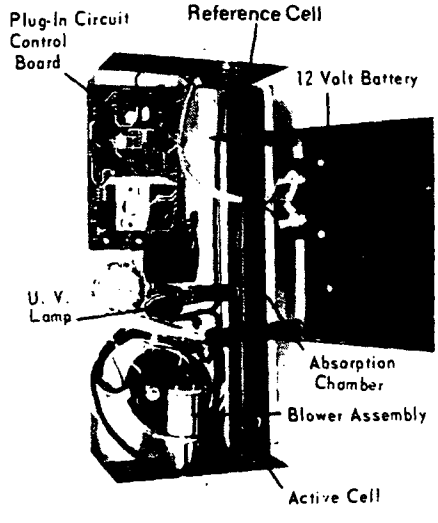


Figure 3: Locating Internal Components

Figure 4: Unlocking Zero Adjust Clutch

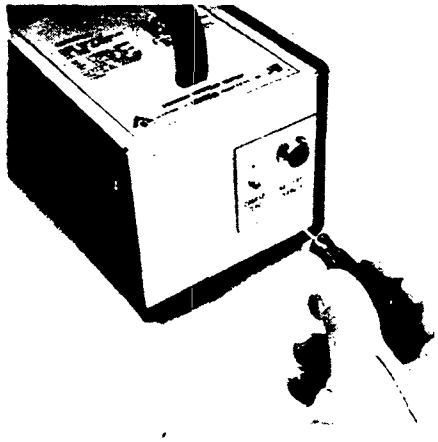


Figure 4 A Locating and Adjusting External Coarse Zero Adjust.

3.0 OPERATION AND PRECHECK

The instrument is initially calibrated at the factory using the partial pressure of mercury at a given temperature to produce a known concentration of mercury vapor in air.

Upon receipt, however, the instrument should be checked for sufficient voltage to sustain normal operation of controls, before attempting test for suspect mercury vapor concentrations in the atmosphere.

3.1 BASIC START-UP PROCEDURE (Refer to Figure 4A)

Position instrument with controls facing up, observe the meter pointer rests at scale zero. Insert and seat the aluminum probe into the air intake port on front end of the instrument. Secure into position with the plastic nut taking care not to over-tighten; then proceed with the following:

1. Turn Control Knob to "V" position. Pointer must indicate above the red colored area on the scale (A reading above .8 on upper scale). If not, recharge battery before proceeding to check out instrument.

NOTE: With the Function Switch in the "V" position, a meter reading of .9 or better will indicate a fully charged battery with sufficient power for eight hours of normal operation or four hours of continuous usage.

The meter reading should not be interpreted as an exact indication of the amount of operating time available before the battery requires recharge.

For this purpose, it is recommended that the operator maintain a time log and recharge the battery after accumulating approximately four hours of continuous operation.

CAUTION NOTE: MAKE CERTAIN TO RECHARGE BATTERY WHENEVER METER POINTER ENTERS THE RED COLORED SECTION ON THE SCALE. SINCE, AT THIS POINT BATTERY VOLTAGE IS RAPIDLY DECREASING AND THE INSTRUMENT WILL NO LONGER INDICATE CORRECT MERCURY CONCENTRATION IN THE SAMPLE..

2. Turn the Ambient/Filtered Air Knob to the "Filtered Air" position to assure that mercury-free air is supplied to the instrument. Turn Control Knob to the "1.0" position and and allow a 15 to 25 -minute warm-up period.

3. Unlock the clutch on the "Zero Adjust" Knob and zero adjust meter pointer to indi-

cate zero on the scale. Allow a few seconds to determine that meter pointer stabilizes at zero, then lock the clutch.

NOTICE: All MV-2 Mercury Vapor Sniffers manufactured after April 1, 1973, are provided with an external Coarse Zero control located near the battery charger connector (See Figure 4(a). This adjuster is designed to expand the range of Zero control available with the standard "Zero Adjust" located on the face of the instrument.

The Coarse Zero Adjuster is factory set for optimum new instrument performance. Where difficulty in obtaining a zero adjustment as described above in Section 3.1, is experienced, proceed as follows:

(a) Adjust "Zero Adjust" Knob on face of the instrument to mechanical mid-position, approximately 5 full turns from full counter-clockwise.

(b) Refer to Figure (4a). Using a small screwdriver, turn Coarse Zero as required to position meter pointer to approximately zero.

(c) Then use "Zero Adjust" procedure outlined in paragraph 3 above.

4. Turn "Ambient/Filtered Air" Knob to "Ambient Air" position Control Knob to 1.0 position. Meter pointer should locate on zero if no mercury is present in the air sample. Scale deflection on 0 - to 1.0 scale indicates mercury vapor content in air sample.

5. To check the more sensitive range (0 to 0.2 mg/M^3) turn Control Knob to the 0.2 position. Recheck instrument "Zero" by positioning the Ambient/Filtered Air Knob to "Filter Air" and wait for meter pointer to stabilize at scale zero. If zero is not attained unlock clutch on Zero Adjust Knob and adjust control until meter pointer indicates at scale zero, then lock clutch. If meter will not zero, refer back to paragraph 3 above for use of "Coarse Zero" adjust. Turn Ambient/Filtered Air Knob to Ambient Air position and observe meter (lower scale 0 to 0.2 mg/M^3) for indication of mercury vapor content in the ambient air sample.

3.2 TESTING MV-2 RESPONSE WITH MERCURY (Refer to Figure 5)

Check instrument response and condition of absorbent in the filter by placing one drop of mercury in a small glass container then proceed with the following:

Step 1. Turn Function Switch (Control Knob) to "V" position and check battery voltage.

Step 2. Place Ambient/Filtered Air Knob to "Filtered Air" position turn Function Switch

Figure 5: Checking MV-2 Response To Mercury Sample

to 1.0 position and Zero the instrument with the Zero Adjust Knob.

Step 3. Set the Ambient/Filtered Air knob to "Ambient Air" position then insert probe into glass container so that mercury vapor is drawn into air intake port. Observe that meter pointer deflects upscale then drops towards zero as the mercury vapor concentration is reduced in the container.

Step 4. Check condition of the absorbent in the filter by turning the Ambient/Filtered Air Knob to the "Filtered Air" position.

Observe that meter pointer rests at scale zero, if not, the absorbent is saturated with mercury and must be replaced.

Step 5. Return the Ambient/Filtered Air Knob to the "Ambient Air" position and observe that meter pointer deflects upscale indicating the concentration of mercury vapor.

Remove probe from mercury sample. This step completes response check. The instrument is ready for operational usage.

CAUTION NOTE: THE MV-2 SHOULD NOT BE USED IN POTENTIALLY EXPLOSIVE ATMOSPHERES OR AROUND FLAMMABLE VAPORS. Some other vapors in addition to mercury vapor will cause the instrument to indicate including particulate matter such as smoke from cigarettes.

Refer to Application Section 4.0 for the list of interfering vapors.

3.3 MAKING AN ANALYSIS (Refer to Figure 6)

Before making a test, turn on the MV-2, check battery voltage, zero the instrument in "Filtered Air", place Function Switch to the 0.2 position, then return Ambient/Filtered Air Knob to Ambient Air position. After performing the above operation proceed with the following:

(a) Insert and seat the aluminum probe into the air intake port. When required, connect a 3-4 foot length of 0.375" I. D. sample tubing (preferably teflon) to the probe.

NOTE: When sample tubing is connected to the probe, meter pointer may drift. Make certain to rezero the instrument in the 0.2 mg/m^3 position, with "Filtered Air," then return to "Ambient Air."

(b) Insert sample probe into suspect area or with sample tube trailing and operator walking at 1/2 normal pace (1-2 mph), observe meter pointer for an upscale deflection. The correct reading is taken where the meter pointer stabilizes at the indicated concentration of mercury vapor.

(c) If meter pointer should deflect to full scale, switch to the 0–1.0 range and take readings on the upper scale.

After taking a reading clear the instrument by placing the Ambient/Filtered Air Knob to the "Filtered Air" position. Check meter zero and make a second test to insure presence of a representative sample of mercury vapor.

NOTE: MV-2 response to mercury vapor sample is approximately three seconds when operated with the standard 12 inch aluminum probe. When using 0.375 I.D. teflon tubing to supplement probe length, allow for a time delay response of one second for every two feet of tubing used.

3.4 BATTERY CHARGER CODE 360-220 (Refer to Figure 7)

The Battery Charger supplied for the MV-2 is a device capable of delivering 120 ma at 12.5 VDC with input charging source of 115 VAC, 60 Hz. The charge cycle for the 12 volt nickle cadmium battery is 8-16 hours continuous depending upon the initial state of charge in the battery. Recharge the battery whenever the test voltage reading falls below (0.75) the green index marker on the meter scale. To recharge the battery, proceed as follows:

(a) Install the plug–in connector end of

Figure 6: Testing For Presence Of Mercury Vapor

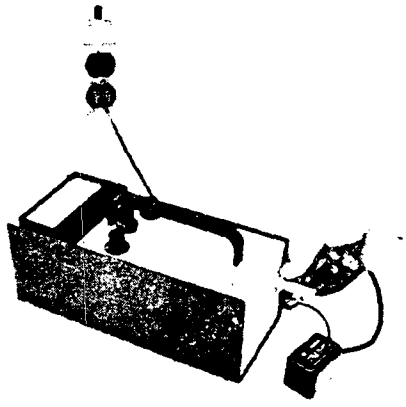


Figure 7: Battery Charger Properly Connected to the Instrument.

charging cable into the female receptacle recessed in the lower front of instrument panel as shown in Figure 7.

(b) Place the Function Switch to the OFF position.

(c) Plug the charger line cord into a 115 VAC, 60 Hz. outlet.

The charge rate is such that prolonged charging beyond the recommended 8 to 16 hour period will not damage the battery, and continuous charge is preferable to sustained storage without charging.

4.0 APPLICATION OF MV-2 MERCURY SNIFFER

The Model MV-2 Mercury Sniffer is primarily used to assure safe working conditions in environments where mercury vapor is produced, processed or stored.

4.1 MERCURY HAZARDS

Mercury amalgamates with gold, silver, nickel, stainless steels and copper alloys. Accidental trapping of mercury can cause serious damage to vital parts in electronic equipment, reactors and delicate instruments. Mercury is also toxic if inhaled, ingested, or absorbed through the skin or eyes.

The safe upper limit of airborne concentration for extended periods, based upon an exposure of 8 hours per day, is known as the Threshold Limit Valve (TLV). The generally accepted TLV for mercury vapor is 0.05 milligrams/cubic meter of air (approximately 0.005 ppm). When mercury is exposed to atmosphere, mercury vapor concentrations considerably higher than the TLV can be encountered.

4.2 INTERFERING VAPORS

Since the Mercury Vapor Detector depends on absorption of UV radiation by the sample it will be affected to some extent by any substance that has greater absorption of UV light than does normal air. Some of the substances commonly encountered are vapors of various hydrocarbons, water vapor, sulfur compounds and particles such as smoke.

There is no measurable interference from CO, CO_2, or ammonia. Water vapor interference is enough to be perceptible under some conditions, so it is best if the instrument can be zeroed at a humidity comparable to that of the sample

SUBSTANCE	MV-2 METER READING ON 1% SAMPLE	TLV PPM	INTERFERENCE READING AT TLV
Acetone	.22	1000	.022
Acetylene	.02	- - -	- - -
Benzene	Off Scale	25	.0051
Carbon Disulfide	.35	20	.0007
Ethanol	.07	1000	.007
Ethyl Acetate	.10	400	.004
Gasoline	Off Scale	500	.080
n-Hexane	.9	500	.045
Trichloroethylene	.08	100	.0008
Water	.035	- - -	- - -

4.3 INDUSTRIAL APPLICATIONS

The Model MV-2 is ideal for locating mercury vapor or its compounds that are used in over 80 industries, including the following:

1. Mining and refining of cinnabar and gold and silver ores.

2. Manufacture of scientific instruments-flow meters, level regulators, manometers, thermometers and barometers.

3. Manufacture and repair of electrical meters, mercury arc rectifier and dry-cell batteries.

4. Mercury cell Chlor-alkali plants.

5. Electronic assembly - neon signs, mercury arc lamps and electronic tubes.

6. Nuclear ion propulsion and research facilities.

7. Manufacture of mercury compounds for treatment of fungus diseases of plants and as a preservative of textiles and wood.

8. Production of marine anti-fouling agents in paint.

9. Manufacture of mercury fulminate for making detonators and percussion caps.

10. Pharmaceutical plants-surgical dressing and pharmaceutical compounds.

11. Pulp and paper manufacture.

12. Chemical, dental and hospital laboratories - Coulter Counters, Van Slyke blood gas apparatus, Cantor and Miller-Abbott tubes.

13. Manufacture of catalysts.

5.0 MAINTENANCE SCHEDULE

The MV-2 Mercury Sniffer, like any precision testing device is subject to normal wear, but proper care and periodic maintenance will extend the useful life of the instrument.

DAILY:

The instrument should be checked for response before operation each day as follows:

1. Check battery voltage with Function Switch in the "V" position for meter pointer indication above the "CHRG. BATT - OK" index mark 0.8 or more before testing for presence of mercury vapor.

2. Recharge battery after every four hours of continuous usage or whenever test voltage reading falls below (0.75) the green index marker on the meter scale.

3. Check instrument response with a mercury sample, also condition of absorbent in filter as outlined in Section 3.2.

EVERY THREE MONTHS (or as required):

Check Field Calibration as outlined in Section 5.1.2.

ANNUALLY (or as required)

Replace the specially treated carbon filter (charcoal-iodine mix) when meter pointer deflection occurs in the "Filtered Air Position". See Section 5.2 for reactivating charge in filter chamber.

5.1 STATIC CALIBRATION

Before proceeding with calibration of the MV-2 optical chamber sensor circuits, make certain that Battery is fully charged(12 volts or better) 0.9 indicated on the scale with Function Switch in the "V" battery check position.

For access to the optical chamber and calibrating probe, disassemble the instrument by removing the eight screws from the plastic enclosure.

5.1.2 FIELD CALIBRATION USING PROBE 23-4262 (Refer to Figure 8)

Locate the calibration probe assembly and

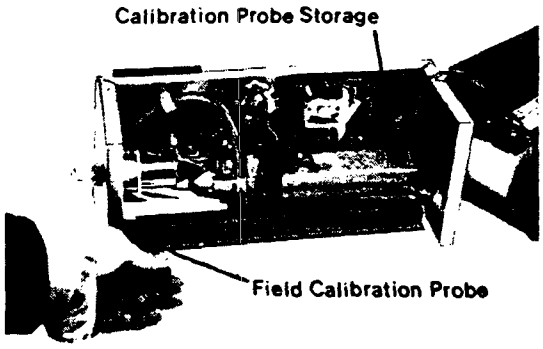


Figure 8: Locating Active Chamber Aperture Prior To Installation Of Field Calibration Probe Assembly.

unscrew from its storage position, then proceed with the following steps:

(a) Screw the probe into the absorption chamber hole with probe calibration wire facing outwards from the active chamber.

(b) Place the Ambient/Filtered Air Knob to the "Filtered Air" position and place Function Switch to the "V" position..

Battery voltage should indicate 0.9 or better on the scale.

(c) Connect a Voltmeter to test jacks marked TP-R and TP-B on P.C. Control Circuit Board. Observe meter indicates between 1.9 to 2.1 VDC.

(d) Refer to Figure 9: Locate the Gain Adjust potentiometer R-22 on the P.C. Control Board then cover instrument with a dark cloth.

(e) Turn Function Switch to 0.2 position and zero meter pointer with Zero Adjust Control.

(f) Allow one-half hour to elapse then reach under cloth and reverse calibration probe so that calibrating wire protrudes into the active chamber.

(g) Through a small hole in the cloth, adjust R22 Gain Control until meter reading on the 0-0.2 mg/m^3 scale is equal to the value written below the / line on gummed paper label affixed to chassis near calibration plug hole.

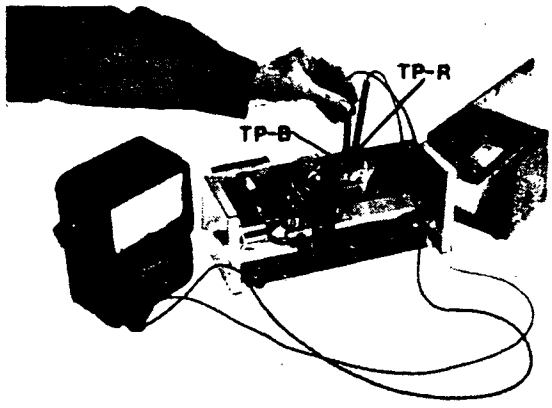


Figure 9: Checking for 1.9 - 2.1 VDC at TP-R And TP-B.

Figure 9(a): Adjusting R-22 Only For Indication On The 0-0.2 mg/m^3 scale.

NOTE: DO NOT ADJUST LAMP ADJ. CONTROL R-3; this is a special adjustment covered in Section 7.2 (Calibration of Model MV-2 with a known sample of mercury vapor).

Remove calibration probe from the absorption chamber and return it to the storage position. Reassemble instrument enclosure.

5.2 REACTIVATION OF FILTER CHAMBER (Refer to Figures 10, 11 and 12)

For access to the filter chamber; remove the eight screws from the plastic enclosure, then proceed with the following:

(a) Refer to Figure 10; locate the Calibration Probe, remove from its storage location to prevent damage during disassembly. Loosen and remove the two mounting screws from the optical chamber mounting bracket,

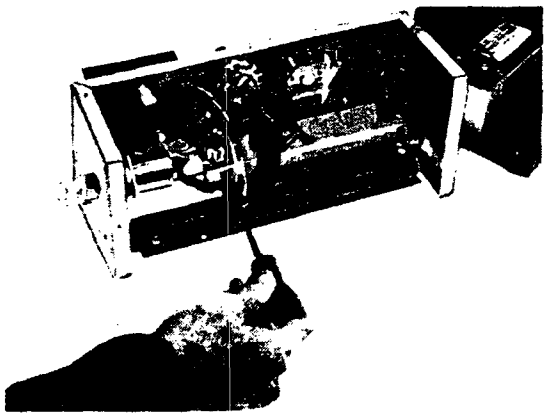


Figure 10: Removing Optical Chamber Mounting Bracket For Access To Mercury Filter Chamber

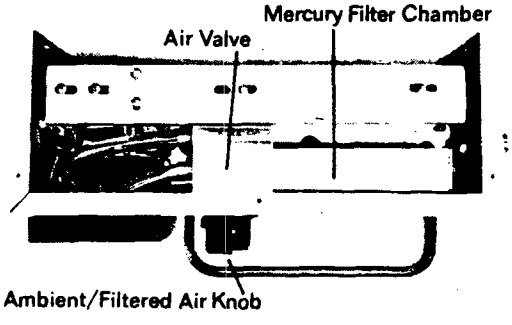


Figure 11: Location of Mercury Filter Chamber, Air Valve, and Control Knob

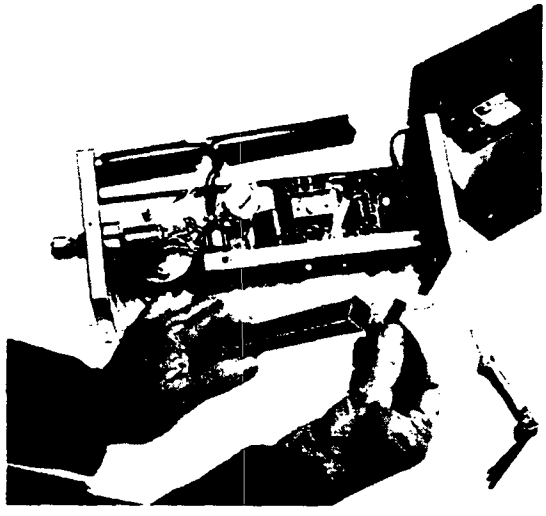


Figure 12: Replacing Iodine - Charcoal Mixture in Mercury Filter Chamber

then remove inlet tubing and gently lay bracket assembly aside.

(b) Loosen the two set screws in the Ambient/Filtered Air Knob and remove the hex retaining nut from the valve stem. Ease the filter chamber from its mounting location and disconnect the inlet/outlet tubing.

(c) Refer to Figure 12; remove the two retaining screws and end cap from the filter chamber. Discard the used filter charge by shaking out contents and replace with new filter charge, packed as tightly as possible.

(d) Refer to Figure 11; remount the filter chamber assembly without connecting tubing at this time. Place the optical chamber into position then insert mounting screws from the back side of bracket (Figure 10).

Return Calibration probe to its storage location and continue to reassemble in the opposite order of disassembly.

NOTE: After assembly make certain to check filter operation as outlined in Section 3.2.

5.3 BATTERY REPLACEMENT AND CHARGER CHECK (Refer to Figures 13, 14)

The most frequent form of maintenance will involve recharging the batteries as outlined in Section 3.4. The batteries can be recharged hundreds of times to render many years of useful service. Usually, the most probable cause of "apparent" battery failure can be traced to charger malfunction or connection problems. The battery can only be charged with the instrument in the OFF position.

NOTE: OBSERVE CORRECT POLARITY; INCORRECT BATTERY CONNECTIONS CAN RESULT IN DAMAGE TO BATTERY OR TO THE INSTRUMENT. The red power lead connects to battery (+) positive terminal with the red marker and the black leads to battery terminal (-) negative with black marker.

To insure that battery is being charged and the charger is functioning properly, perform the following check.

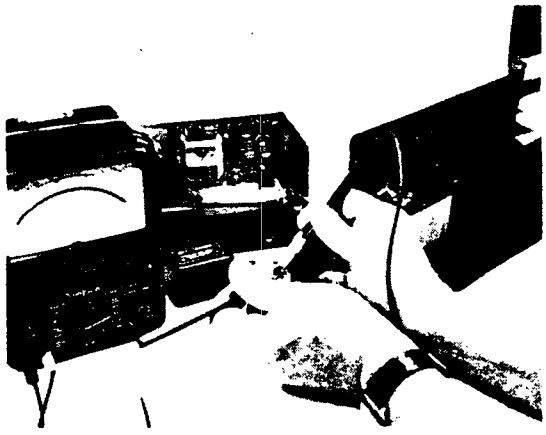


Figure 13: Checking Across Charger Pins For 13 VDC Nominal Output.

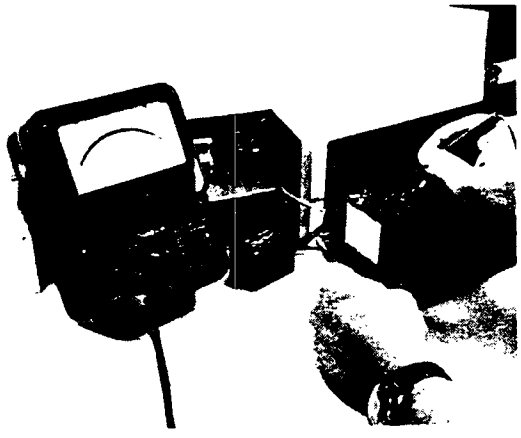


Figure 14: Checking Battery Charge Rate

(a) Plug Charger line cord into 115 VAC outlet. Obtain a Multimeter and place range selection to the 50 volt scale. Connect meter probes across charger pins as illustrated in Figure 13 and check output for approximately 13 volts (normal unloaded voltage).

(b) Remove the sheet metal enclosure for access to the battery. Place Function Switch to the OFF position and connect Charger to the instrument.

(c) Refer to Figure 14; remove the two black leads from the battery (–) negative terminal Place Multimeter range selection to 500 ma position. Connect meter (+) positive lead to battery (–) negative terminal then connect connect meter (–) negative lead to black power leads previously removed from battery terminal. Multimeter should indicate a charge rate to 50 to 120 ma (depending on battery state, line voltage, etc.): If Multimeter indicated "zero ma" refer to Trouble Shooting Section 6.0).

5.4 REPLACEMENT OF COMPLETE OPTICAL CHAMBER ASSEMBLY WITH SENSOR CELL/UV LAMP.
(Refer to Figures 15, 16)

The Sensor Cells of UV Lamp will occasionally require replacement whenever one of the following conditions occurs:

5.4.1 SENSOR CELL

The meter pointer pegs either up or down scale, there is no response to mercury and zeroing the meter pointer to scale zero is difficult. Expose the cells to ambient light (as illustrated in Figure 15) then proceed with the following:

Reference Cell (a): Refer to schematic wiring 23-9510 and Figure 16; locate pins "A" and "F" on the male plug-in connector. Connect an ohmmeter between these pins.

(b) With sensor cell face occluded from light source (inside optical chamber) meter should indicate resistance values as shown in table on page 12A. With sensor cell exposed to light source directed into Optical Chamber aperture, meter should indicate values shown on page 12A.

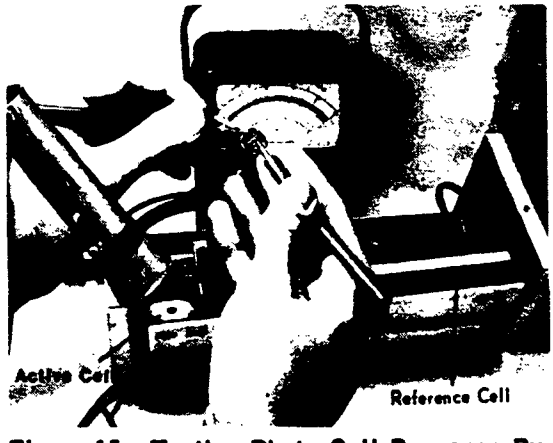


Figure 15: Testing Photo Cell Response By Directing A Light Source (flashlight) Into Optical Chamber Aperture

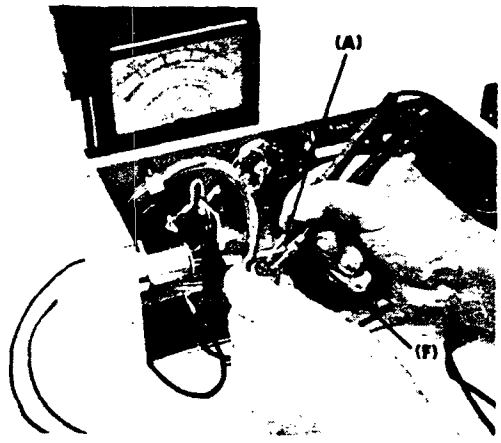


Figure 16: Testing Between Pins "A" And "F" On plug – in Connector For Proper Reference Cell Response.

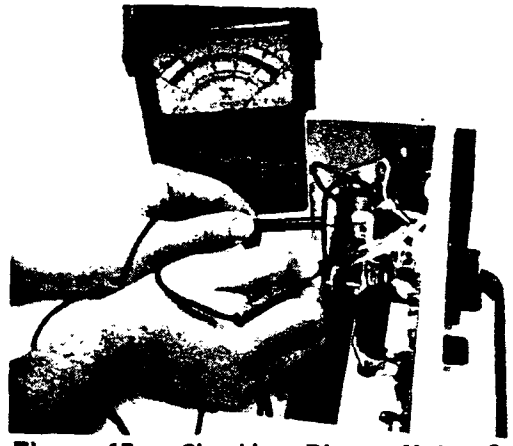


Figure 17: Checking Blower Motor Coil Resistance For Approximately 250 OHMS

NOTE: If change in resistance does not occur replace the Complete Optical Chamber Assembly Code 354-016-00.

(c) Locate Pins "B" and "C" on the plug-in connector; perform same test as outlined in (a) and (b) above. Replace complete Optical Chamber Assembly if required.

5.4.2 U. V. LAMP

There is no visible blue-violet light when instrument case is removed, or no response to mercury sample, the meter pointer pegs upscale and the instrument cannot be zero adjusted.

Before replacing U.V. Lamp and complete Optical Chamber Assembly Code 345-016-00 make certain to check the female socket of the plug – in connector for approximately 900 VAC between pins "D" and "E" as outlined in Trouble Shooting Section 6.0.

5.5 MOTOR BLOWER REPLACEMENT
(Refer to Figure 17)

When required the vane type blower motor is easily replaced by opening the sheet metal enclosure and removing the nylon retaining nut at the sample inlet port.

The power input leads to pump are the pressure clip type and are easily removed. The pump should be thoroughly checked to determine if replacement is required in the following manner.

(a) Inspect pump interior for possible obstruction in blower vanes or a disconnected power input lead.

(b) Check between pump input lead connections for 4.6 to 5.0 volts DC.

(c) Remove pump leads and check coil resistance for 250 ohms. If pump motor is shorted or open; discard and replace with a new unit.

5.6 METER REPLACEMENT CODE -
J-W 350-055.10

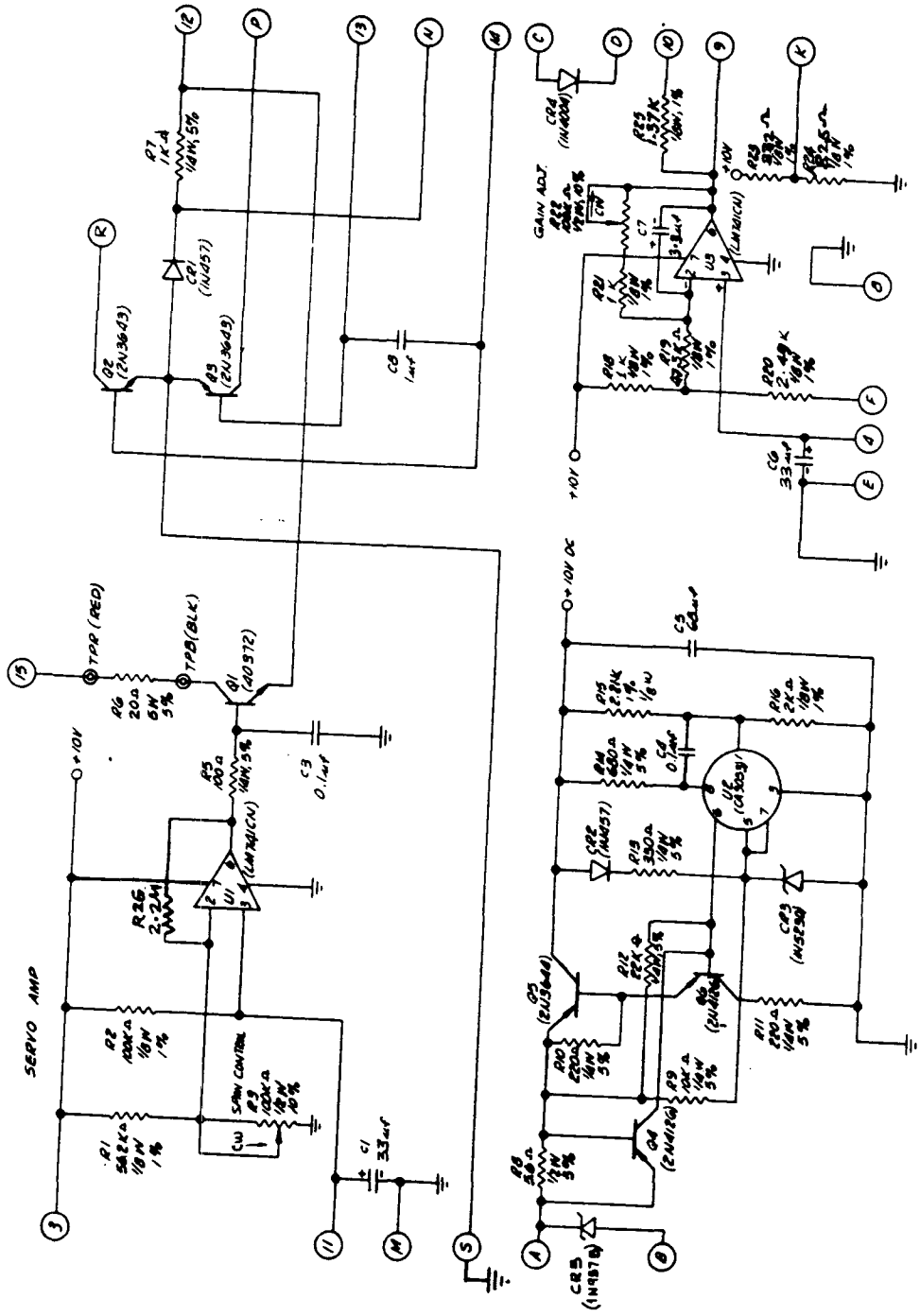
Meter trouble is usually indicated by erratic action; for instance, the indicator meter pointer will start to go up scale smoothly pause momentarily at a reading, and then jump quickly over the next few divisions on the scale.

Another sign of trouble is for a meter to be almost or entirely inactive and to "stick" or show a permanent displacement of the pointer. If meter is giving trouble it may be removed by taking off the meter nuts and the meter hold down screws. Field repair of meters is generally inadvisable unless a qualified instrument repair facility is available.

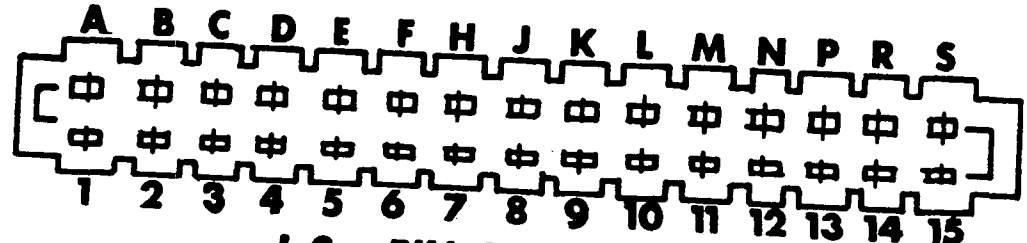
TABLE OF RESISTANCE VALUES OF PHOTO-CELLS (for troubleshooting)

	ACTIVE CELL (pins B & C)	REFERENCE CELL (pins A & F)
DARK	5 megohms or more	20 megohms or more
LIGHT *	1500 ohms	1.5 megohms

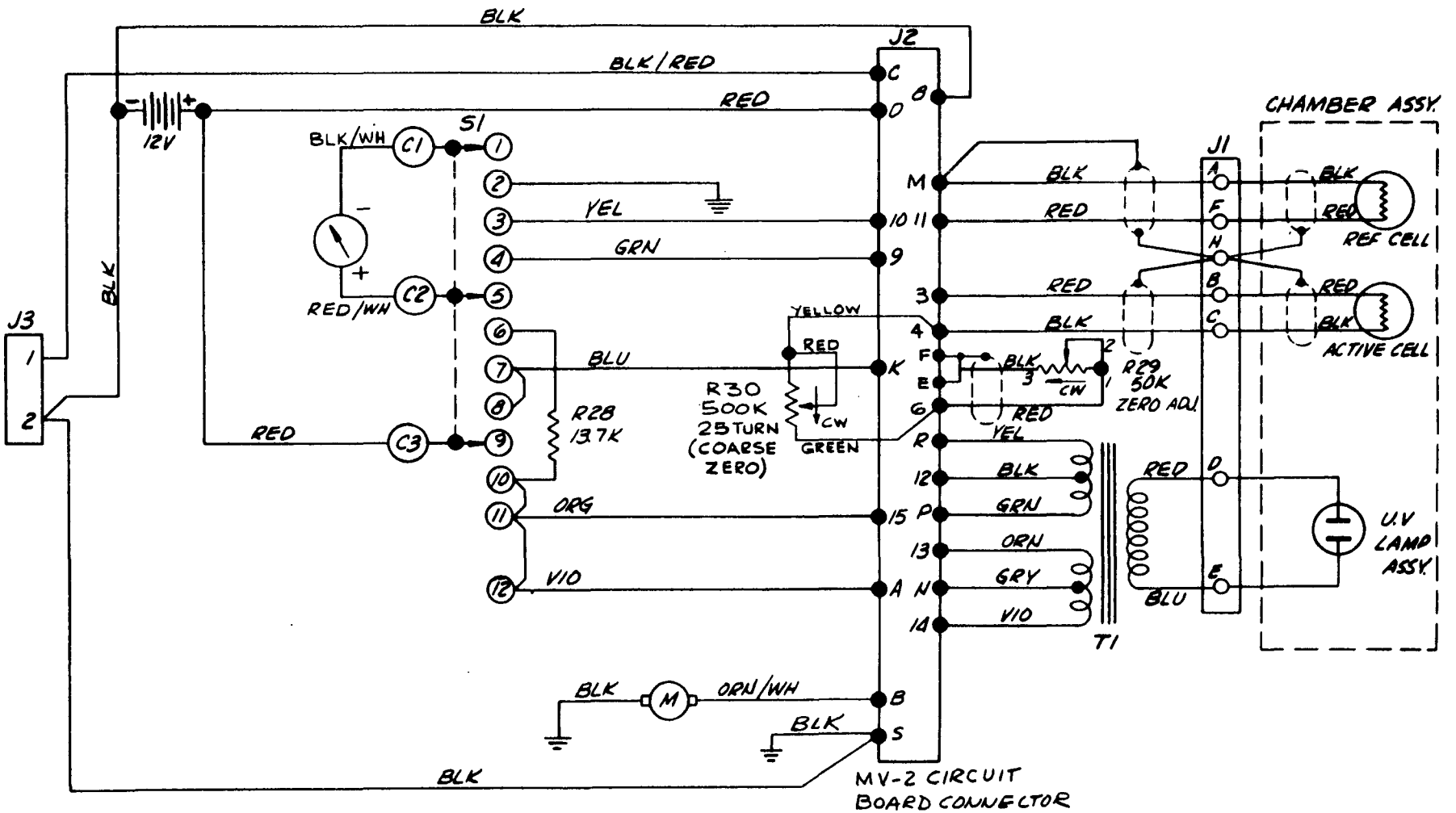
* Light resistance values are approximate only, depending on quality, intensity, proximity, and incident angle of illumination.



MV-2 P. C. BOARD SCHEMATIC DIAGRAM



J-2 PIN CONNECTIONS



MV-2 CHASSIS WIRING DIAGRAM

6.0 TROUBLE-SHOOTING GUIDE

NOTE: Before trouble-shooting make certain battery is fully charged, (.9 or better on the scale)

STEP 1. — **SYMPTOM**

Meter pointer pegs upscale. Cannot Zero Adjust. Battery Voltage normal and Blower Motor is operational. Disassemble instrument for access to test points.

→ **TEST POINT**

Connect Voltmeter between test points TPR (Red Jack) and TPB (Black Jack) Control P. C. Board.
Check for 1.9 to 2.1 VDC
Observe U.V. Lamp for visible blue-violet light.

STEP 2.

Same symptom as Step 1.

→

Disconnect the 7 pin plug-in connector J-1 from the chassis. Check between Pins "D" and "E" in the female socket for nominal 900 VDC.

Remove Power: check between pins "D" and "E" of J-1 for T-1 Secondary resistance of 250 ohms ± 50 ohms.

STEP 3

Meter pointer drifts and pegs either up or down scale.
Zero adjust erratic. No response to mercury vapor sample U.V. lamp is ON and Motor Blower is operational.

→

Refer to Wiring Schematic, pp. 13, 13A. Remove 7 pin male Amphenol connector and check plug connection between pins "A" and "F" (Reference Cell) for 20 meg ohms and "B" and "C" for 5 meg ohms.

NOTE: If you do not obtain readings required above, try the following before replacing Optical Chamber: Direct a floodlight or other light source into the optical chamber aperture to check Active Cell. Do the same for Reference Cell, which will require you to remove the U.V. lamp, which is secured by a small, hex-head setscrew.

Check for values shown on page 12A.

Perform all checks authorized in Section 5.4.1.

STEP 4

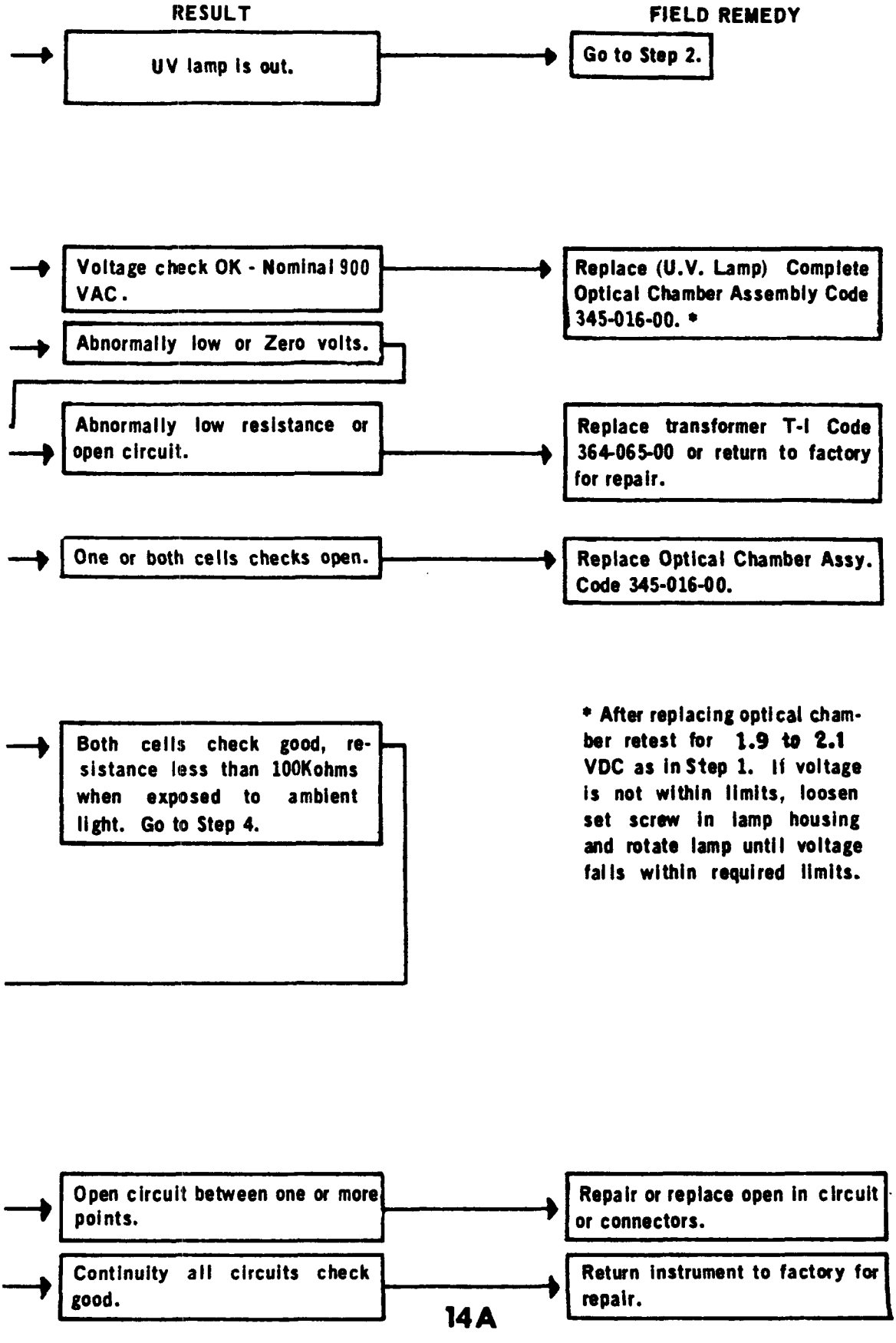
Same symptom as Step 3.

→

Refer to MV-2 Wiring Diagram, pp. 13, 13A. Remove Control P.C. Board from the 15 pin plug-in connection. Check P.C. Board tracks for continuity.

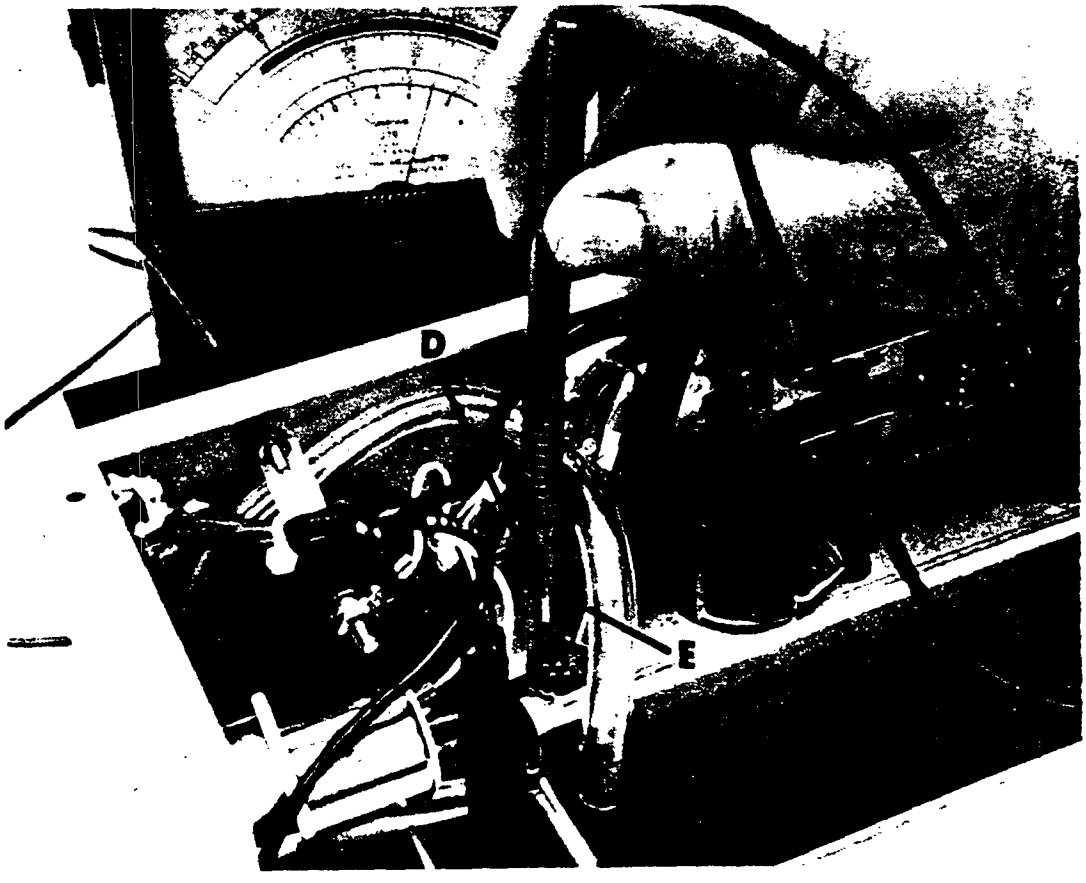
Check continuity between the J1 and J2 Connectors as follows:

J - 1 Pin		J - 2 Pin
B	and	3
C	and	4
A	and	M
F	and	11


RESULT
FIELD REMEDY
UV lamp is out.
Go to Step 2.
Voltage check OK - Nominal 900 VAC.
Replace (U.V. Lamp) Complete Optical Chamber Assembly Code 345-016-00. *
Abnormally low or Zero volts.
Abnormally low resistance or open circuit.
Replace transformer T-I Code 364-065-00 or return to factory for repair.
One or both cells checks open.
Replace Optical Chamber Assy. Code 345-016-00.
Both cells check good, resistance less than 100Kohms when exposed to ambient light. Go to Step 4.
* After replacing optical chamber retest for 1.9 to 2.1 VDC as in Step 1. If voltage is not within limits, loosen set screw in lamp housing and rotate lamp until voltage falls within required limits.
Open circuit between one or more points.
Repair or replace open in circuit or connectors.
Continuity all circuits check good.
Return instrument to factory for repair.

	SYMPTOM	TEST POINT
STEP 5	With Function Switch on "V" Voltage test or when Zero Adjust is operated in the 0-1.0 or 0-0.2 ranges; no meter pointer deflection.	Check meter coil circuit for continuity between terminal posts as follows: Shunt meter coil with 2 ohm resistor, connect a 100 ohm resistor in series with either ohm meter lead.
STEP 6	Battery voltage runs down after short operating period. Otherwise operation normal.	Perform Battery and Charger check as outlined in Section 5.3 Steps (a) through (c). Disconnect Battery from circuit. Connect Ohmmeter (+) positive lead to female charge socket in the instrument. Connect (-) negative lead to black pair of leads through the red pair.

Step 2: Checking Between Pins "D" And "E" Of J-1 Connector For Nominal 900 VAC



RESULT	FIELD REMEDY
Open circuit	Replace meter.
If meter deflects	Repair open connection to meter in circuit wiring.
Continuity OK - Black reads Zero and Red reads 10 phms.	Replace Battery
OPEN circuit.	Repair open circuit between battery terminals and charger jacks.

Step 4: Checking Primary Of T-1 For 0.25 OHMS Between Pins "N" And "13" On The 15 Pin Connector J-2

7.0 CALIBRATION

The Model MV-2 is factory calibrated to exacting standards using a known concentration of mercury vapor in air mixtures.Only customers equipped with a mercury vapor generator set at the proper flow rate should attempt calibration of the instrument.

7.1 CALIBRATION PROCEDURES FOR MERCURY VAPOR DETECTORS[1] (NIOSH)

NOTE: For customers that have a mercury generator and are familiar with its operation disregard the following and proceed with calibration of the instrument Section 7.2.

CALIBRATION PROCEDURES FOR MERCURY VAPOR DETECTORS

Mercury vapor detectors are calibrated using known concentrations of mercury vapor in air.

1. GENERATION OF AIRBORNE MERCURY CONCENTRATIONS

Mercury vapor concentrations are generated dynamically by means of a gas saturating technique. The system is diagramed in Figure 18. A stream of air containing a high concentration of mercury vapor is mixed with a purified air stream in appropriate ratios to achieve the desired concentrations.

To produce the stream of high concentration, a metered stream of purified dry air is passed through three impingers in series. These impingers are partially immersed in a breaker of water heated by an electrically operated heating mantle. The temperature of the bath is controlled by a variable auto transformer which supplies current to the heating mantle. The bottom of each impinger contains liquid mercury. The air stream passes over the surface of the mercury which is heated above 30 degrees Centigrade; in the process the air becomes super-saturated with mercury vapor. The air stream super-saturated with mercury vapor then passes through a water-cooled heat exchanger and is cooled well below room temperature, normally to 20 degrees Centigrade. Sufficient surface area and retention time is allowed so that the air stream is cooled to the temperature of the water within 0.1 degree Centigrade. At the inlet and exit sides of the heat exchanger, the stream flows through 150 mg beds of ordinary activated charcoal which are also temperature controlled and which provide surface area for the condensation of the excess mercury vapor. Therefore, the air stream leaving the condenser is saturated with mercury vapor at 20 degrees Centigrade. The charcoal initially absorbs much of the mercury vapor, but after about a half hour of running, equilibrium between absorption and desorption is established; vapor leaving the final charcoal bed is then at saturated conditions.

The concentration of the mercury vapor leaving the heat exchanger is then:

$$C = \frac{P_v \times M.W. \times 10^6}{22.4 \times \frac{T + 460}{492} \times 760}$$

Where

C = concentration of mercury vapor, mg Hg/m^3 air

P_v = vapor pressure of mercury (mm) at temperature T

M.W. molecular weight of mercury 200.59

T = temperature of air at exit end of heat exchanger, degrees F.

By bringing the mercury-air stream to saturation below room temperature, the stream will be less than saturated when it warms to room temperature, and hence, condensation of mercury vapor downstream is no problem.

To achieve the desired concentration, the stream of high mercury concentration is diluted with pure air in the necessary proportion.

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1. Extracted from Calibration Procedures for Mercury Vapor Detectors by Paul Roper, U. S. Department of Health, Education and Welfare. Public Health Service (NIOSH) dated June 1972.

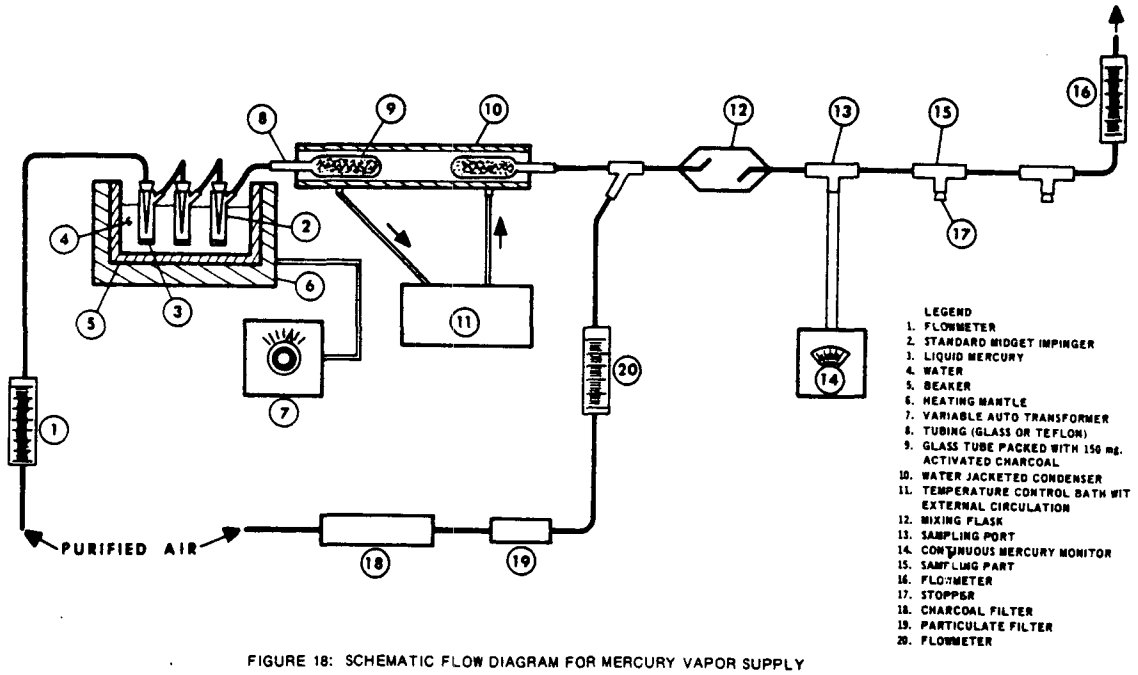

FIGURE 18: SCHEMATIC FLOW DIAGRAM FOR MERCURY VAPOR SUPPLY

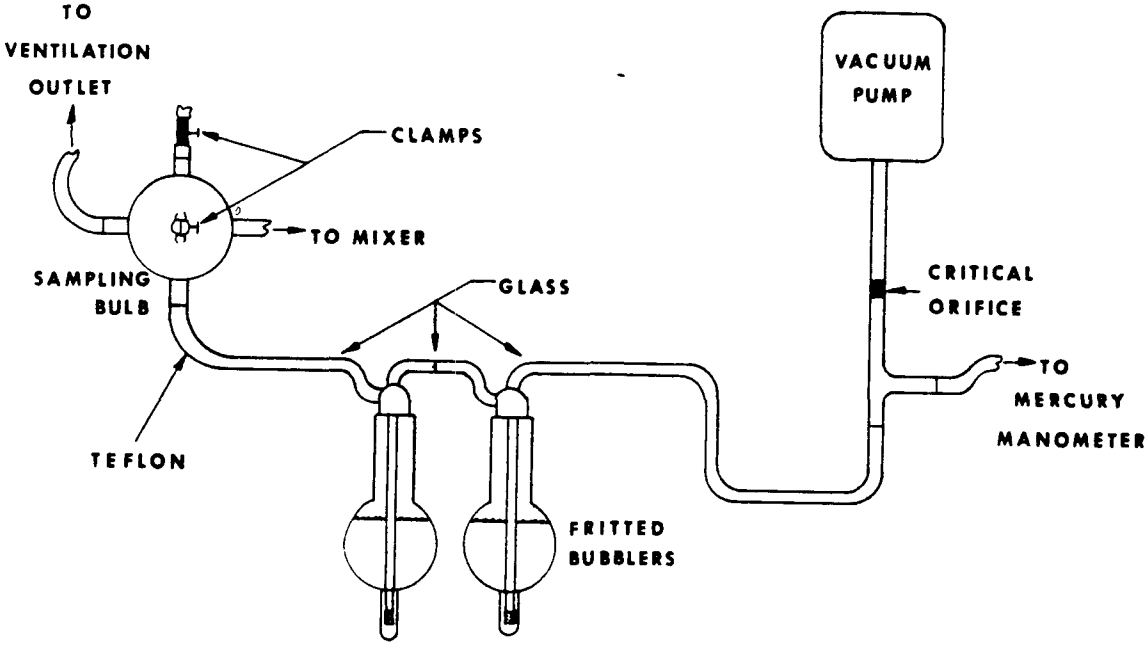

FIGURE 19. SAMPLING APPARATUS - FRITTED BUBBLERS

$$\frac{Q_m}{Q_d + Q_m} \quad X \quad C_m = C_f$$

Where

Q_m = flow rate of mercury-saturated stream

Q_d = flow rate of dilution air stream

C_m = concentration of mercury vapor in mercury saturated stream.

C_f = final diluted mercury vapor concentration.

The flow rate of the final mercury-air-mixture must be such that it exceeds the amount required for monitoring, calibration, and analysis at any given time.

II. CONCENTRATION VERIFICATION

Due to the sometimes impulsive behavior of dynamic contaminant generation systems, it is necessary to verify that the mercury vapor concentrations used for calibration on any given day are indeed accurate. There are two methods of concentration verification, which are best used in conjunction with each other. These methods are continuous monitoring and chemical analysis.

A continuous monitor, as shown in Figure 18, is useful for determining when the system has reached steady state and when upset occurs within the system which causes the generated concentration to vary.

This monitor may be pre-calibrated against chemically analyzed standards; the monitor can then be used to determine if generated concentrations are reproducible from time to time. Such a monitor is not generally used for exact quantitative measurement of generated concentrations, but rather as an indicator of proper generation system operation and stability. The mercury vapor concentrations should also be analyzed chemically to verify the attainment of the predicted mercury concentrations. The vapor generated by the system may be sampled as shown in Figure 19. The vapor-air mixture from the generation system may be drawn through fritted bubblers containing solution for mercury vapor. The flow rate through the bubblers may be measured by using a critical orifice calibrated in terms of absolute upstream pressure versus critical flow rate. The absolute upstream pressure during sampling may be measured by a manometer. The collected sample may then be analyzed according to the attachment, "Mercury collection and Analysis Procedure."

MERCURY COLLECTION AND ANALYSIS PROCEDURE

A. REAGENTS:

1. Hg absorbing solution: a mixture of 30 ml of concentrated H_2SO_4, 90 ml 5% $KMnO_4$ and 150 ml distilled water.

2. Concentrated nitric acid (16N)

3. Stannous chloride solution: 20%(w/v) in 6N HCl

4. Hydroxylamine hydrochloride crystals

B. PROCEDURE

1. Measure 50 ml of the absorbing solution into a bubbler or impinger.

2. Draw atmosphere to be sampled through the bubbler at flow rates up to 2 liters/m. This absorbing solution has not been investigated at flow rates over 2 liters/min.

3. After the completion of the sampling, pour the contents of the bubbler into a 300 ml BOD bottle. Add 50 ml of distilled water and a few hydroxylamine HCl crystals and swirl. If enough hydroxylamine HCl has been added to the solution, the excess permanganate is reduced which is evidenced by a solution color change from deep purple to water-clear.

4. Add 5 ml of concentrated nitric acid to BOD bottle and gently swirl.

NOTE: The addition of the HNO_3 often results in the creation of a vapor above the

surface of the solution. This vapor must be dissipated before analysis because of its light-absorbing properties. Gently blowing into the bottle will rapidly dissipate the vapor.

(5) Add 5 ml of 20% Sn Cl_2 and immediately insert a fritted bubbler tip, stem, and stopper into the BOD bottle. The porous tip of the bubbler should be immersed in the solution, and the stopper should be tapered to fit tightly onto the top of the BOD bottle. The bubbler outlet is connected to a Coleman MAS 50* U.V. mercury analyzer.

(6) Air flows through the bubbler and into the mercury analyzer at a constant, predetermined rate. The mercury vapor evolved upon addition of the Sn Cl_2 is swept from the BOD bottle and into the mercury analyzer. The maximum needle deflection is observed and recorded.

(7) PREPARATION OF THE STANDARD CURVE

The standard curve for the calibration of the mercury analyzer may be prepared prior to analysis of the sample, but should be done on the same day.

Mercury standard solutions are prepared by dissolving weighed amounts of liquid metallic mercury in nitric acid. Fifty milliliters of each standard solution is taken and treated by steps (3) through (5) above, same as for the sample, except that no hydroxylamine HCl addition is necessary. A standard curve is then prepared of maximum needle deflection versus mercury concentration. The maximum needle deflection observed with the sample can then be used in conjunction with the standard curve to determine the mercury concentration in the sample. The measured amount of mercury and the volume of vapor-air mixture sampled can then be used to calculate the mercury vapor concentration in the generation system at the time of sampling.

III. CALIBRATION OF THE MERCURY VAPOR DETECTOR (METER)

After the concentration of mercury vapor produced by the generation system has been verified, the generated vapor may be used for instrument calibration. Generated vapor is sampled directly into the meter to be calibrated. The meter may then be set to read directly in mg of mercury per cubic meter of air to correspond to the concentration by the system.

7.1.2 SAMPLE DILUTION:

In order to obtain various concentration suitable for calibration purposes, a dilution process must be used. This is accomplished by preparing mercury-laden air saturated at 0^oC warming it to room air temperature, then diluting with additional air in the correct proportions.

For concentrations of 1.00, 0.50 and 0.20 mg/m^3 the following table has been developed:

Concentration	Hg Flow	Air Flow
1.00 mg/m^3	1000 cc/min	1000 cc/min.
0.50 mg/m^3	500 cc/min.	1500 cc/min.
0.20 mg/m^3	200 cc/min.	1800 cc/min.

These flows may be read on any flowmeter by using the individual indicator calibration chart.

7.2 CALIBRATING MV-2 WITH A KNOWN CONCENTRATION OF MERCURY VAPOR.

Before proceeding with calibration of the MV-2 optical chamber sensor circuits, make certain that Battery is fully charge (12 volts or better) 0.9 indicated on the meter scale with Function Switch in the "V" battery check position.

For access to required adjustments, Lamp (R-3), Gain (R-22) on the Control P.C. Board,

* Mention of a commercial product or concern does not constitute endorsement. An equivalent instrument or an atomic absorption unit could also be used.

disassemble the instrument by removing the sheet metal enclosure, then proceed with the following:

(a) Prepare ice bath for mercury generator, allow one (1) hour minimum for temperature to stabilize at 0^{o} C.

(b) Refer to Figure 20; locate TPR (+) red and TPB (-) black test points on Control P.C. Board. Connect Voltmeter (+) positive lead to TPR and (-) negative to TPB. Place Voltmeter Range Selector to 3 VDC position.

(c) Drape the instrument sides with a dark cloth to prevent ambient light from entering the optical chamber. Make two small holes in the cloth for access to R-3 Lamp and R-22 Gain adjustments.

(d) Turn the Zero Adjust control completely counterclockwise, then turn clockwise five complete turns to its mid-range position.

(e) Place the Ambient/Filtered Air Knob to Filtered Air position, turn the instrument ON and place Function Switch to 1.0 mg/m^3 position. Allow warm up time of 10 minutes for meter pointer to stabilize at or near scale zero.

(f) Observe that Voltmeter connected at TPR and TPB indicates between 1.9-2.1 VDC. If not; adjust Lamp Control potentiometer R-3 (clockwise to increase reading) until voltage indicated is within the above limits.

(g) Turn Function Switch to 0.2 mg/m^3 position; again adjust front panel Zero Adjust control until meter is stable at zero.

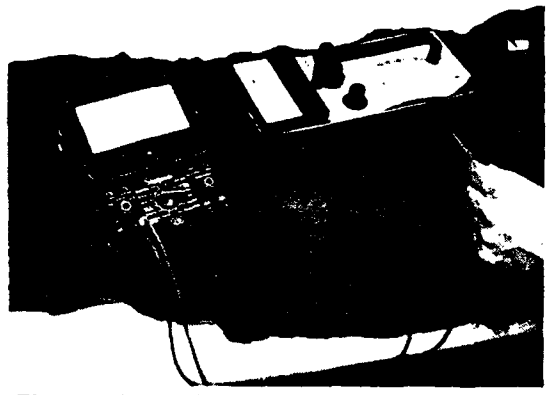

Figure 20: Adjusting Span Control R-3 As Outlined In Steps (f) and (g)

(h) Adjust mercury generator flow for a 0.20 mg/m^3 concentration. Connect the instrument (MV-2) to the generator and place the Ambient/Filtered Air Knob to Ambient Air position. Observe that the meter pointer deflects full scale and indicates a mercury vapor concentration of 0.20 mg/m^3. If not; adjust Gain potentiometer R-22 (clockwise to increase reading) until meter pointer indicates 0.20 mg/m^3 on the scale.

(i) Turn Function Switch to 1.0 mg/m^3 position observe that meter pointer indicates 0.2 on the scale. Now adjust mercury generator flow for 1.0 mg/m^3 concentration and check that meter pointer deflects full scale. If not; rezero the instrument in the Filter Air, position and repeat steps (f) through (i).

With the preceding steps completed, the MV-2 is calibrated and is ready for operational usage.

8.0 PARTS LIST

350-059.10	Meter 0-1.0 mA dual scale, mg/m^3, Simpson Model 524
355-388.10	Control Switch Stackpole 73-1121.4, 3 pole, 4 position
04-4954	Potentiometer, Zero Adjust, 50 K ohm, 2W 10%(CKT. Ref. R29)
347-432	Filter Valve Assembly
360-035	Battery 12V Ni-Cad, Burgess CD 201
370-003.10	Filter Charge (treated carbon)
347-379	Motor Blower Assembly
364-065	Transformer T-1 Laselco LA-1210302 (91-K-2)
23-4240	P. C. Board Assembly
347-408	Sampling Probe
23-4262	Field Calibration Probe
357-293.10	Receptacle, charger (two pin socket)
360-220	Battery Charger 115 VAC 60 Hz.
345-016	Optical chamber assembly complete with U. V. Lamp and two photo cells.
347-432-00	Filter/Valve Assembly
314-082-00	Tubing, (3/8" PD x 1/16, Wall 1/4 ID)
340-931-00	Handle, (Blk, Anodized)
357-440-00	Knob, (Round, Blk)
357-441-00	Knob, (Fluted, Skirted, Blk)
357-442-00	Knob, (Lock, Fluted, Blk)
347-297.7	Filter Screen
347-297.8	Screen Disc
340-161-50	Cover, Case (MV-2)
315-121-00	Bumper, Recessed
0023-4247	Ultraviolet Lamp Assembly
0004-4959	Potentiometer, Coarse Zero, 500K, 25T, Ckt. ref. R30

APPENDIX H

FARMINGTON DIVISION HEALTH AND SAFETY OFFICERS

APPENDIX H

FARMINGTON DIVISION
HEALTH AND SAFETY OFFICERS

	Office Phone	Radio #
J.E. Dolan	505-599-2106 326-8453 (Pager)	1757
R. Rojas	505-599-2107 326-8526 (Pager)	526

APPENDIX I

MEDICAL EXAMINATION PROTOCOL

EPNG MEDICAL PROGRAM ASSISTANCE
MEDICAL EXAMINATION PROTOCOL

Test		Testing Frequency Baseline	Annual	Other
1.	Cardiogram (1)	X		X
2.	Chest X-Ray (2)	X		X
3.	Audiogram	X	X	
4.	Blood Chemistry (3) Panel	X	X	
5.	CBC Count (4)	X	X	
6.	Serum iron and total iron binding capacity (TIBC)	X		
7.	Verification of Blood Chemistry Test (Y/N/U)	X	X	
8.	Urinalysis (5)	X	X	
9.	Morphology (6)	X	X	
10.	Treadmill (7)	X	X	
11.	Vision test (R & L)(8)	X	X	
12.	Height and Weight	X	X	
13.	Blood Pressure	X	X	
14.	Pulse (resting)	X	X	
15.	Temperature (oral)	X	X	
16.	Pulmonary Function Test (as on Rees-Stealy's form)	X	X	
17.	Stool for Occult Blood	X	X	

() SEE NOTES

EPNG MEDICAL PROGRAM ASSISTANCE
MEDICAL EXAMINATION PROTOCOL

NOTES

(1) Pre-placement. Every 3 years for less than or equal to 40 years old. Every year for more than 40 years old.

(2) Pre-placement. Every 3 years for less than or equal to 40 years old. Every 2 years for more than or equal to 40 years old to less than or equal to 55 years old. Every year for more than 55 years old.

(3) Required:
Glucose, Sodium, Potassium, Chloride, Bun, Creatinine, Uric Acid, Phosphate, Calcium, Cholesterol,Triglycerides, Total Protein, Albumin, Globulin, Total Bilirubin, Direct Bilirubin, Alk. Phosphatase, G-Glutamyl Transpep., Transaminase - SGO, Transaminase - SGP, LDH, Iron, Mercury, Magnesium, Albumin/Globulin Ratio, Bun/Creatinine Ratio

(4) Hemogram:
WDC, RBC, HGB, HCT, MCV, MCH, MCHC,

Differential White Count:
Seg, Band, Lymph, Mono, Eosin, Baso, Platelet, Platelet Count, Reticulocyte Count

(5) Appearance, Color, pH, Ketone, Direct Bilirubin, Total Bilirubin, Glucose, Blood, Urobilinogen, L. Esterase, WDC, RBC, Casts, Mucus, Bacteria, Eiptherlial, Crystals, Yeast, MCG/DL

(6) Present, Absent, Unknown:
Anisocytosis, Poikilocytosis, Hypochromia, Polychromasia, Basophilic Stippling

(7) Only if: Abnormal EKG (except sinus bradcardia, unless an otherwise healthy person) or history of angina or history of myocardia infarction (MI) or history of cardiac surgery

(8) Near-corrected and uncorrected; far-corrected and uncorrected peripheral (Visual Field); color; Depth Perception.

D:JBMEDICA

APPENDIX J

HEALTH STATUS MEDICAL REPORT

HEALTH STATUS MEDICAL REPORT

TYPE OF EXAMINATION

☐ Initial ☐ Exit

☐ Routine Periodic ☐ Other _____ Specify

	Position	Date of Exam
Employee	Location	
Employer	Social Security Number	

The following recommendation is based on a review of base history questionnaire, diagnostic tests, physical examination and the specific requirements of the position applied for or occupied by the individual named above. The recommendations comply with Federal OSHA standards.

	YES	NO	UNDECIDED
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure?	☐	☐	☐
Does the employee have any limitations in the use of personal protective equipment (e.g. clothing or respirators)?	☐	☐	☐

STATUS

1. ☐ The examination indicates no significant medical impairment, can be assigned any work consistent with skills and training.
2. ☐ The examination indicates non-occupational medical impairments, referred to personal physician for follow-up. Can be assigned to any work consistent with skills and training.
3. ☐ The examination indicates:

_____

_____

_____

_____

_____

Employee has been informed of the examination findings.

Signature: _____ Date: _____