STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES
FOR
AIR QUALITY MONITORING

APPENDIX K

RESEARCH APPLIANCE CORPORATION
AISI TAPE SAMPLER

MONITORING AND LABORATORY DIVISION

MARCH 1989

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STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES
FOR
AIR QUALITY MONITORING

APPENDIX K.1

STATION OPERATOR'S PROCEDURES
RESEARCH APPLIANCE CORPORATION
AISI TAPE SAMPLER

MONITORING AND LABORATORY DIVISION

MARCH 1989

K.1.0 GENERAL INFORMATION

The Research Appliance Corporation (RAC) manufactures the soiling index tape sampler used by the Air Resources Board and calls it an American Iron and Steel Institute (AISI) tape sampler. We will use AISI throughout this manual to depict the RAC tape sampler. The AISI collects ambient air particles on a paper filter tape. Light transmittance through the filter tape is then measured and expressed in terms of coefficient of haze (COH) units, per 1000 linear feet of air sampled. COH units are determined as light transmittance (T) through clean filter tape decreases over a sampling period. COH units are defined in terms of optical density (O.D.) and are specifically: "that quantity of particulate which produces an O.D. of 0.01 on the filter tape".*

$$\text{Optical Density (O.D.)} = \log_{10} \frac{100}{\%T} \quad \frac{\text{(new tape transmittance \%)}}{\text{(sample spot transmittance)}}$$

$$\text{COHs/1000 ft} = \frac{\text{(O.D.) (10)}}{L}$$

Where L = Total linear feet of air drawn through the filter paper.

$$L = \frac{\text{Sample Time (minutes) x Air Flow (C.F.M.)}}{\text{Sample Spot Area (square feet)}}$$

Diameter of AISI Sampler Spot = 1 inch

$$\text{Spot Area} = \frac{\pi(1/12)^2}{4} = 5.45 \times 10^{-3} \text{ ft}^2$$

The COH units can be used to assess mass concentration of particulate matter in the ambient air through empirical relationships. The relating of COH units to mass concentrations requires site specific comparison with a collocated gravimetric device (e.g. Hi-Vol Sampler).

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* Operating Instructions, AISI Automatic Samplers, Research Appliance Company.

K.1.0.1 SYSTEM DESCRIPTION

The AISI chassis is 14 - 1/4" wide x 11" high x 11 - 1/2" deep. Figure K.1.0.1 is an illustration of the AISI tape sampler. Figure K.1.0.2 shows the sample flow diagram. The AISI draws 6.25 liters per minute of ambient air sample into an inlet tube. This sample passes through the inlet tube to a nozzle which holds a section of filter paper. The filter tape periodically advances to a clean section to collect a new sample spot. A light source is located above the filter tape and a photocell below the filter tape. As the filter tape collects particles, it darkens and decreases the amount of light transmitted through the filter tape to the photocell. The opacity of the sample spot is determined by transmittance of light through the filter tape. The photocell output is amplified by the action pak signal conditioner. Figure K.1.0.3 shows the AISI electrical diagram. Table K.1.0.1 relates the percent transmittance to COHs per 1000 linear feet of ambient sample for a flow rate of 6.25 liters per minute and does not hold for other flow rates.

NOTE: A flow rate of 6.25 liters per minute provides a one to one relationship between COHs and T from 100% to 78% of chart, thus requiring reference to Table K.1.0.1 only for change in strip chart readings greater than 22%. For example, if the clean filter tape reading was set to 95% of chart and the final chart reading at the end of sampling interval is 85% of chart, the change in chart reading of 10.0 (COH x 10) corresponds to a COH value of 1.0 in the table. Figure K.1.0.4 shows typical chart traces.

K.1.0.2 CAUTIONS

1. To avoid electrical shock, disconnect the 115 VAC power before working on the inside of the AISI case.

2. Always feed the tape through the nozzle from left to right. Movement of tape in the reverse direction may damage the index switchwire actuator arm.

3. After checking flow meter indication, make sure the "Push to Test Knob" is pulled out to provide a proper seal.

Table K.1.0.1
COH Units Vs. Percent Transmittance

Change in Chart Scale Divisions	Percent Transmittance	COHs Per 1000 Feet
0.0	100	0.1
1.0	99	0.1
2.0	98	0.2
3.0	97	0.3
4.0	96	0.4
5.0	95	0.5
6.0	94	0.6
7.0	93	0.7
8.0	92	0.8
9.0	91	0.9
10.0	90	1.0
11.0	89	1.1
12.0	88	1.2
13.0	87	1.3
14.0	86	1.4
15.0	85	1.5
16.0	84	1.6
17.0	83	1.7
18.0	82	1.8
19.0	81	1.9
20.0	80	2.0
21.0	79	2.1
22.0	78	2.2
23.0	77	2.4
24.0	76	2.5
25.0	75	2.6
26.0	74	2.7
27.0	73	2.8
28.0	72	3.0
29.0	71	3.1
30.0	70	3.2
31.0	69	3.3
32.0	68	3.4
33.0	67	3.6
34.0	66	3.7
35.0	65	3.9
36.0	64	4.0
37.0	63	4.1
38.0	62	4.2
39.0	61	4.4
40.0	60	4.6
41.0	59	4.7

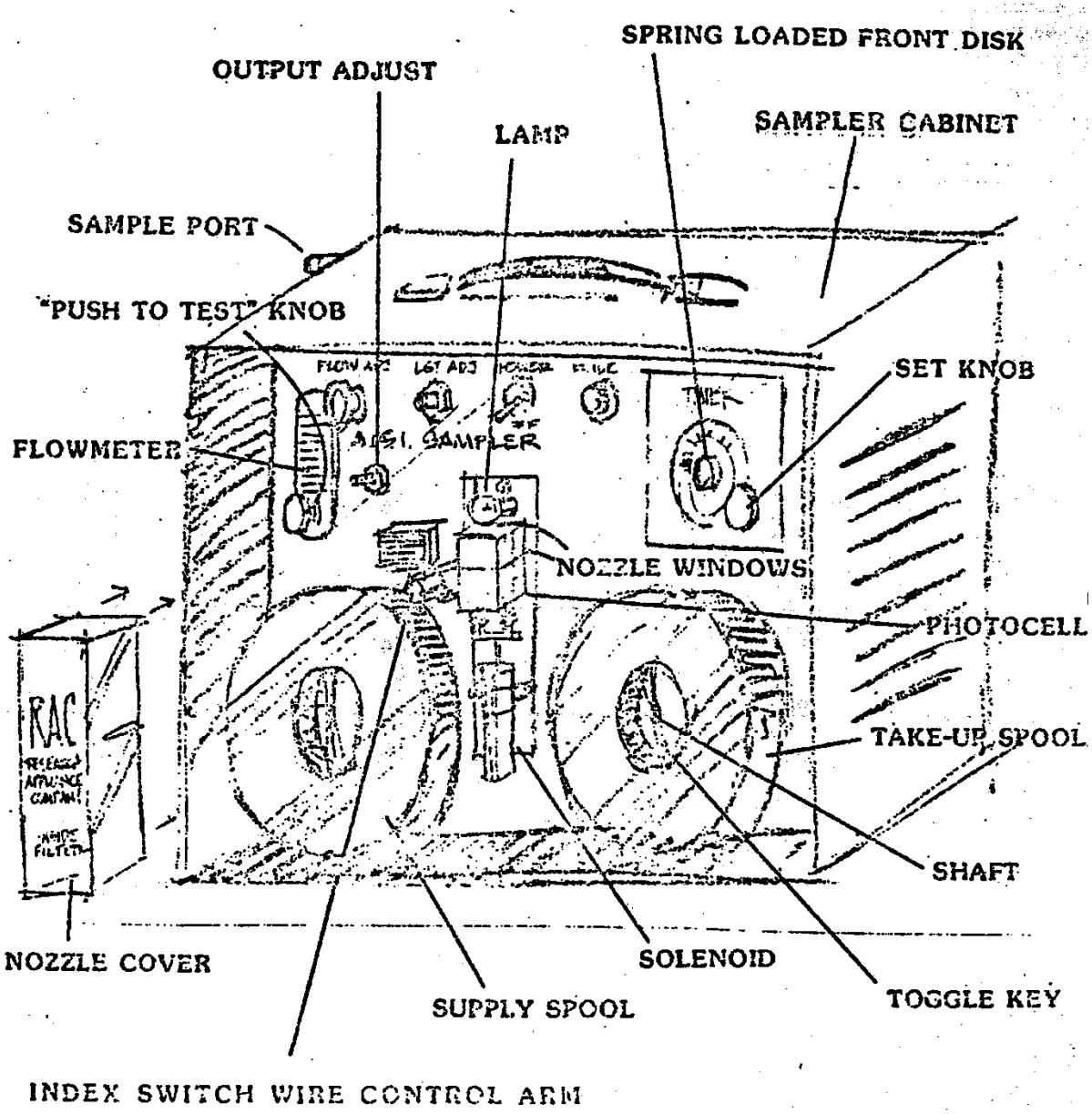


Figure K.1.0.1
AISI Tape Sampler

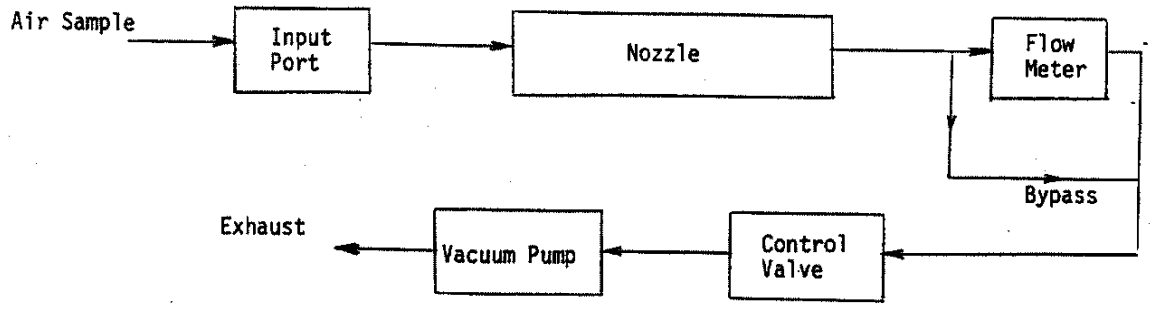


Figure K.1.0.2
AISI Sample Flow Diagram

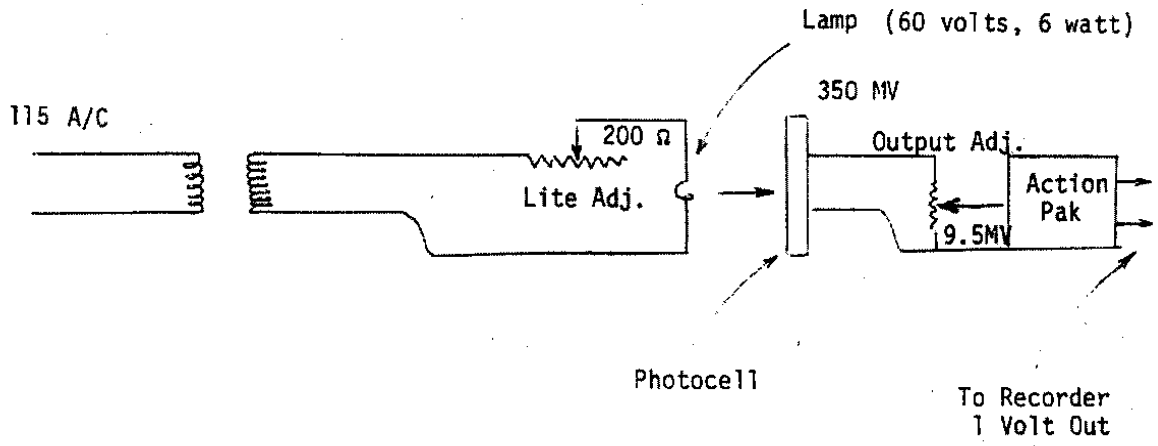


Figure K.1.0.3
AISI Electrical Diagram

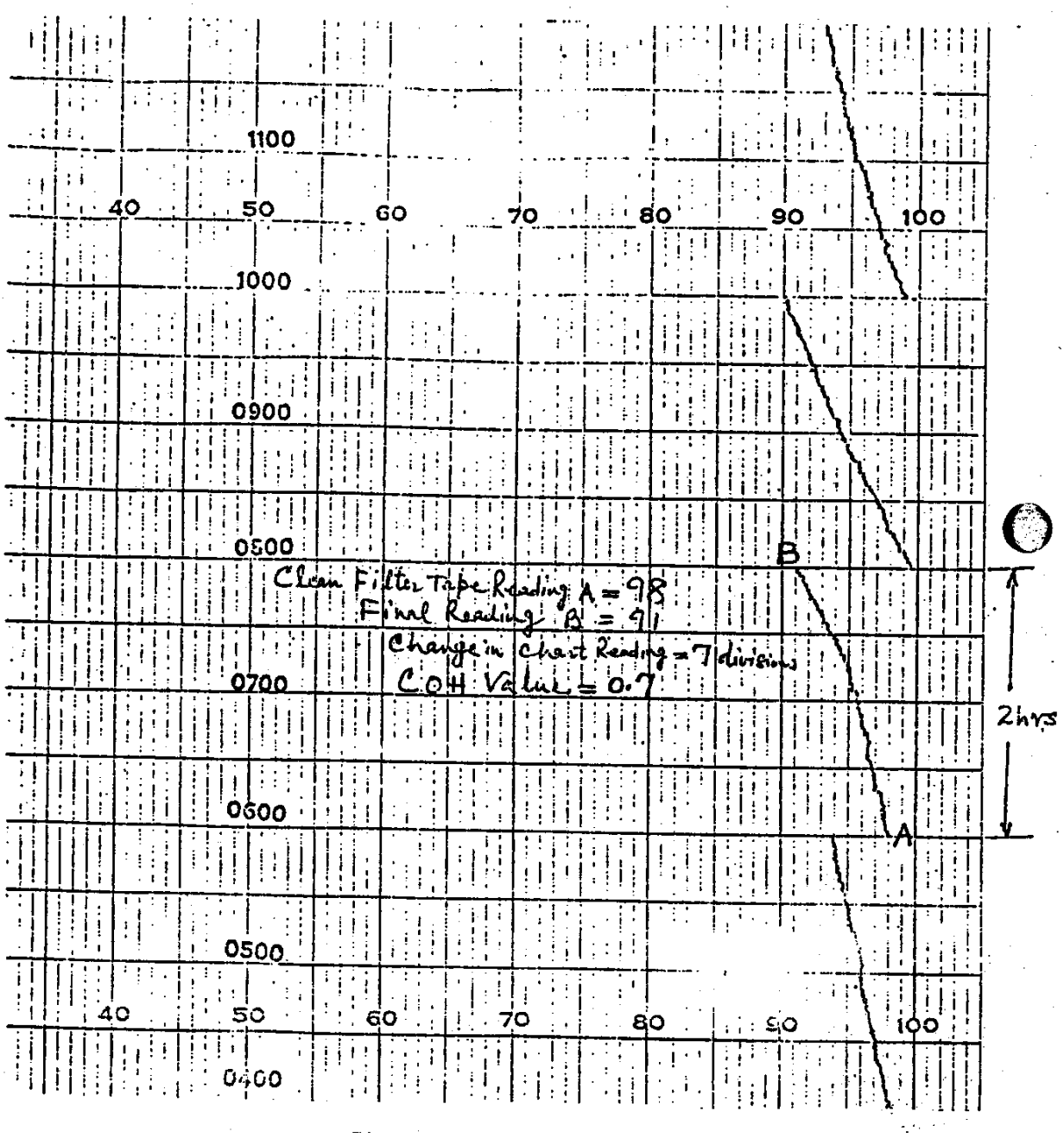


Figure K.1.0.4
Typical Two Hour Chart Traces

K.1.1 INSTALLATION PROCEDURE

K.1.1.1 PHYSICAL INSPECTION - Unpack the AISI sampler and check for shipping damage. Remove the front cover. Remove the front panel holding screws. Slide the front panel and internal chassis from the cabinet. Inspect tubing connections and filter jars for tightness. Slide the chassis back into the cabinet and secure panel with holding screws.

K.1.2.2 INITIAL SET UP

1. Set the AISI sampler on a flat surface.

2. Connect a signal lead from a strip chart recorder (analog voltage input range -0.05 to 1.05 volts) to the two lugs marked "OUTPUT" on the rear of the AISI sampler. See Figure K.1.1.1 - Electrical Hookup Schematic.

3. Connect the sample inlet port to the site's sample manifold with 1/4" teflon tubing, or equivalent.

4. Connect the AISI sampler to A/C power and turn the power switch to the "ON" position.

5. Install a roll of clean filter tape and set the timer (see Sections K.1.1.4 and K.1.1.6).

   NOTE: New roll of filter tape lasts approximately 60 days.

6. Advance the filter tape to a clean section. Turn the "LGT. ADJ." fully counterclockwise and then 1/8 turn clockwise (just off its lower limit). Then adjust the output voltage level to 95% of full scale on the strip chart recorder with the "OUTPUT ADJUST" potentiometer on the front panel.

   NOTE: To advance the filter tape, lift up the tape index switch wire arm. The tape will continue to advance until the arm is released and enters an index hole.

7. Connect a Vol-o-Flo to the sample inlet port and measure the air flow rate and adjust as required. Perform optical filter checks. (Refer to Section K.1.2.3 - Monthly Checks for details.)

8. At sites with Dasibi or CSI calibrator, the AISI pump must be deactivated during nightly calibrations. Connect the 24 VDC solenoid actuation voltage

from the Dasibi "Auto-Cal" to the terminals marked "24 VDC RELAY" or the 12 VDC solenoid actuation voltage from the CSI calibrator to the terminals marked "12 VDC RELAY" on the rear of the AISI. See Figure K.1.1.1.

CAUTION: Check the AISI relay for proper actuation voltage for the calibrator being used. AISI samplers marked "24VDC RELAY" must be used with Dasibi "Auto-Cals" and AISI samplers marked "12 VDC RELAY" must be used with CSI calibrators.

9. Switch the "REMOTE-LOCAL" toggle switch on the rear of the AISI to the "LOCAL" position if telemetry system control of the tape advance time is not required.

NOTE: Some AISI samplers do not have telemetry system control capability and therefore do not have "REMOTE-LOCAL" switches.

10. If telemetry system control of the tape advance is required, perform the following steps:

    a. Turn the power off to the AISI.

    b. Turn the power off to the 9400.

    c. Inset a contact closure output (CCO) printed circuit board in the card rack at the rear of the 9400. A CCO may be obtained from the Instrumentation and Standards Laboratory stockroom in Sacramento.

    d. Connect a two-conductor wire (AWG 22) to the two connectors marked "REMOTE" on the rear of the AISI.

    e. Connect the other end of the wires to pin "5" and "J" of the 22 pin dual inline connector. Polarity does not matter.

    f. Attach the 22 pin dual inline connector to the upper connector paddle on the CCO card.

    g. Apply power to the 9400.

    h. Apply power to the AISI.

    i. Contact the Instrumentation Laboratory at (916) 323-5926 (ATSS 473-5926) to check out the telemetry control function.

K.1.1.3 REMOVING SPENT FILTER TAPE ROLL - Remove the AISI front cover. Carefully lift up on the index switch wire, allow the tape to advance approximately six inches and then cut off the remainder. Push the take up spool (right) in, turn the toggle key in line with the shaft, and lift the spool off the shaft. Separate the black plastic discs and remove spent filter tape. Label the tape with the date and time and retain it at the monitoring station for at least six months.

K.1.1.4 INSTALLING CLEAN FILTER TAPE ROLL - Push in on the supply (left) spool, turn the toggle key in line with the shaft, and lift spool off the shaft and remove supply core (cardboard bobbin). Insert the spent cardboard bobbin on the back half of the take up (right) spool and press on the from half of the spool. Align the slot in the front disc hub with toggle key and turn the key to lock the spool in place. Label the clean tape with the time and date and place it (holes toward cabinet) on the supply discs. Align the slot in front of the supply disc hub with the toggle key and turn the key to lock the spool in place. Remove the nozzle cover by lifting it up and pulling it out. Carefully lift up on the index switch wire arm and feed the supply roll tape end through the under the alignment bar wire. Do not bend or misalign the index switch wire. Slide the end of the clean supply tape between the upper and lower half of nozzle. Pull the filter tape over to the take up spool and attach it to the cardboard bobbin with masking tape. Now the AISI is ready to start or continue sampling. The tape should last approximately 60 days at two hours per sample.

K.1.1.5 SAMPLING FREQUENCY - The AISIs are run continuously with an even Pacific Standard starting time, and generally on a two hour sampling period. The 2 hour COH values are reported on the Hourly Data Summary Report (Form TSD-1) in the spaces for odd numbered hours (see Figure K.1.0.4). For special projects, the sampling period may be increased or decreased.

K.1.1.6 TIMER ADJUSTMENTS - For on the hour automatic sampling, pull forward on the front timer disc and turn it so that the two hour normal sampling period interval hole will engage the red drive pin (see Figure K.1.0.1). Turn the set knob clockwise until the notches of all three discs are in alignment under the switch control are. Turn power ON, on the hour. Now the timer is set to activate the switch control arm and advance the tape every two hours.

For one-half hour pre-cycle starting, with the set knob, advance the dial six divisions (5 minutes per division) and turn power ON. The first sample taken will be one-half hour; the others will be of two-hour duration, on the hour.

K.1.1.7 FLOW METER ADJUSTMENTS - The required air flow through the sample filter is 6.25 liters per minute (LPM). The flow meter reading can be checked by depressing the "Push to Test" button adjacent to the flow meter. Set the flow with the Sample Flow Control Valve (FLOW ADJ.). Make sure the "Push to Test" button is pulled completely out after the flow is set.

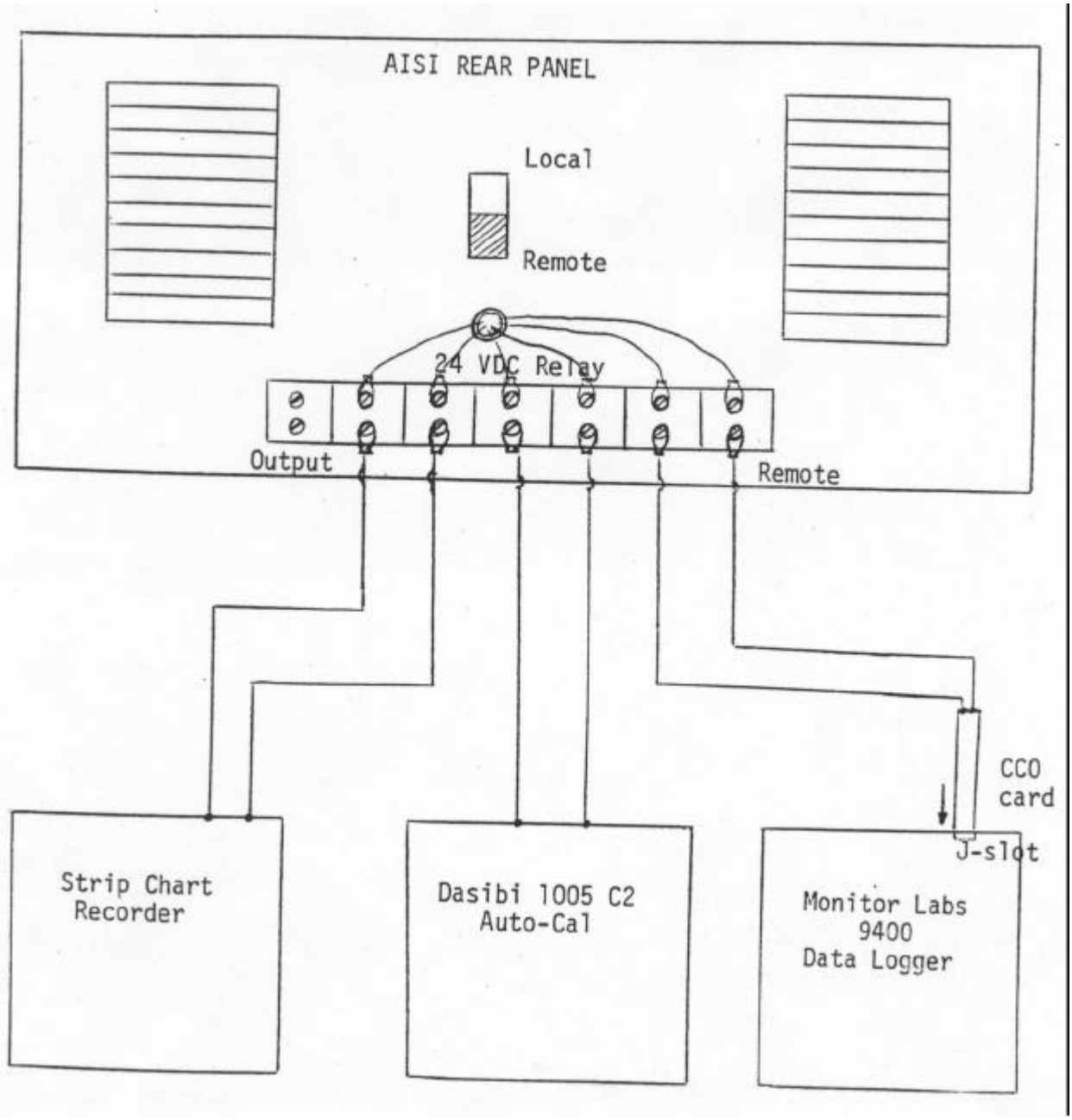


Figure K.1.1.1
Electrical Hook Up Schematic

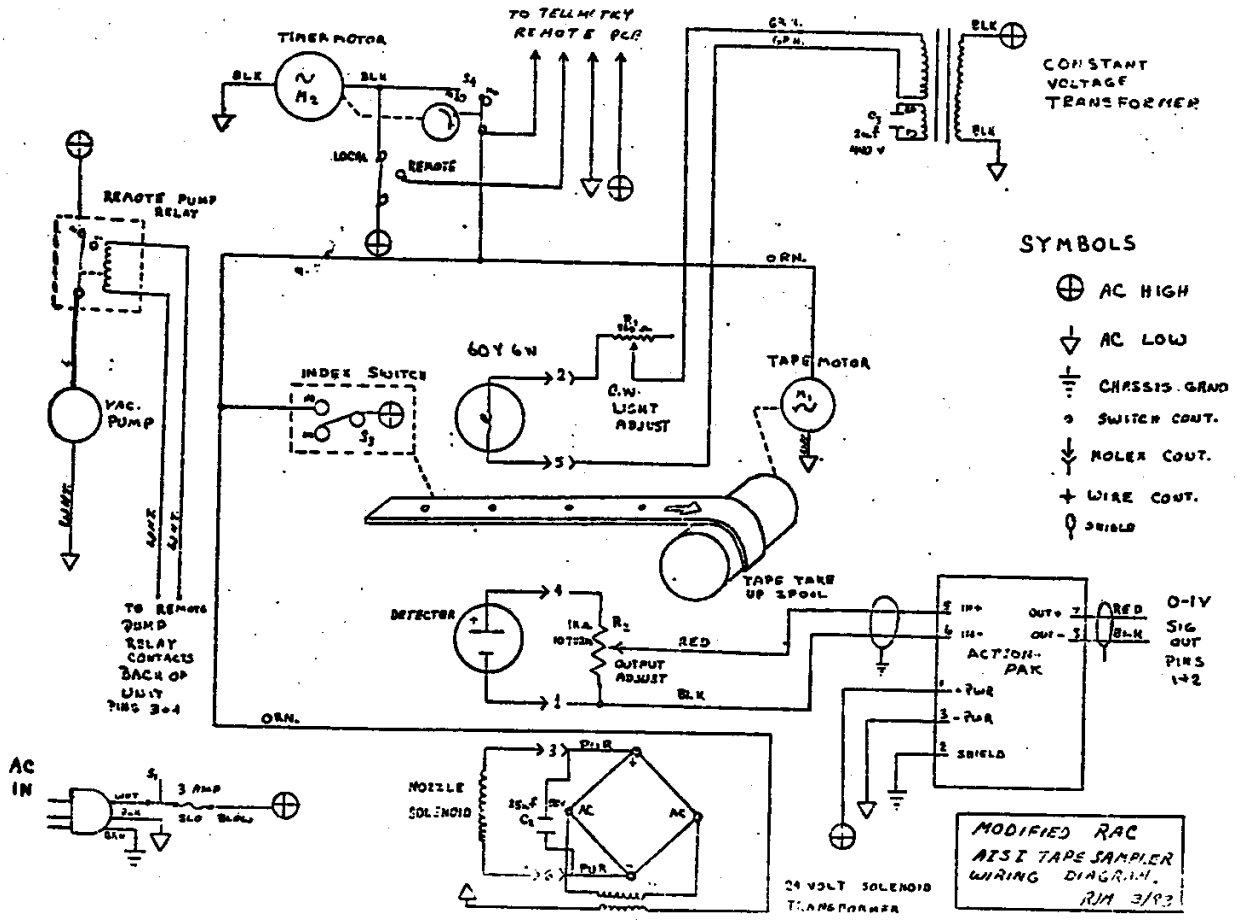


Figure K.1.1.2
AISI Internal Electrical Diagram

K.1.2 ROUTINE SERVICE CHECKS

K.1.2.1 GENERAL INFORMATION - Perform the following checks on the AISI at the intervals specified in the service schedule (Table K.1.2.1). Checks may be performed more frequently but should be performed at least at the prescribed intervals. The Quality Control Maintenance Checksheet (Figure K.1.2.1) should be completed and forwarded to your supervisor monthly.

K.1.2.2 DAILY CHECKS

Daily checks are primarily visual checks to assure data are not lost due to flow malfunctions, inadequate supply of filter tape, burned out lamp, or a pump failure. Note any unusual noises. A new noise or absence of a familiar noise may indicate a malfunction. Check that the flow rate reading is being maintained at 6.25 liters per minute (LPM). To allow for changes in paper density, maintain a span setting of 95% of chart when a clean section of filter tape is in the photometer.

K.1.2.3 MONTHLY CHECKS

Clean the photometer lamp and nozzle window external surfaces with a soft, clean cloth. In highly contaminated environments, clean the inside of the nozzle windows as necessary. Take care in properly tightening the window holder and seating the "O" rings to avoid air leaks. Record the date cleaned on the strip chart recorder and on the Monthly Quality Control Maintenance Checksheet (Figure K.1.2.1).

CAUTION: Overtightening of screws may cause the glass nozzle windows to break.

Check the flow meter response as follows:

1. Disconnect the sample inlet probe from its sample manifold port and cap the manifold port.

2. Attach a 0-10.0 SLPM Vol-o-Flo to the AISI sampler probe.

3. Advance the filter tape to a clean section.

4. When the Vol-o-Flo gauge has stabilized, record the As Is pressure drop (ΔP) reading on the AISI Monthly Quality Control Maintenance Checksheet.

5. Refer to Vol-o-Flo calibration curve and obtain the true standard air flow rate corresponding to the As Is ΔP reading and record on the Monthly Quality Control Maintenance Checksheet.

6. Record the AISI flow meter reading on the Monthly Quality Control Maintenance Checksheet.

7. If the flow rate through the filter tape is 6.25 LPM, skip Steps 8 and 9. If the flow rate is not 6.25 LPM, perform Steps 8 and 9.

8. Refer to Vol-o-Flo calibration curve and obtain the ΔP reading corresponding to 6.25 LPM and record on the Monthly Quality Control Maintenance Checksheet under the "FINAL" column.

9. Adjust the sample flow control valve (FLOW ADJ.) so that the Vol-o- Flo indicates ΔP reading corresponding to 6.25 LPM (see Step 8) and record the flow meter setpoint on the Monthly Quality Control Maintenance Checksheet.

   AISI optical filter "Calibrated Response" is determined at the Instrumentation and Standards Laboratory in Sacramento by checking the change in response caused by each working filter set in a standard AISI that has been calibrated with three standard optical filter sets. Expected change in response has been statistically calculated for each level of filtration (1, 2, 3, and 4 filter thicknesses) and response within $\pm$10% of that change has been established as acceptable.

   The actual change in response of each working filter set at each level is determined when tested in the standard AISI, and the "Calibrated Response" for each filter set is entered on the envelope of each filter set.

While the AISI is operating, perform optical filter checks as follows:

1. Advance the filter tape to a clean section and adjust the recorder's response with the "OUTPUT ADJUST" potentiometer to 95 recorder chart divisions and record under column marked "Tape Only" on the Monthly Quality Control Maintenance Checksheet.

2. Insert one optical filter thickness on top of the clean filter tape and record the stabilized chart response on the AISI Monthly Quality Control Maintenance Checksheet.

3. Calculate and record actual change in response from the 95 chart divisions in the applicable columns on the Monthly Quality Control Maintenance Checksheet.

4. Repeat Steps 2 and 3 for optical filters for two, three, and four thicknesses.

5. Enter the test filter's "Calibrated Response" on the AISI Monthly Quality Control Maintenance Checksheet.

6. Calculate percent change in response from the "Calibrated Response" and record.

7. If the AISI photocell response is within 10% of the indicated "Calibrated Response" skip Step 8. If the photocell response varied more than 10% of the indicated "Calibrated Response" for any filter, proceed with Step 8.

8. Refer to Figure K.1.3.3 (AISI Optics Assembly Details) and replace the photocell as follows:

   a. Remove the nozzle cover by lifting it up and out.

   b. Turn off power and unplug the power cord.

   c. Remove the thumb screws from the bottom of the nozzle and separate the photocell support plate and the bottom nozzle window.

   d. Replace photocell and reassemble the optics assembly.

      CAUTION: When reassembling, be sure to reinstall "O" ring in the hole first, then the glass window and finally the photocell with its support plate. Do not overtighten the thumb screws as the photocell may be damaged.

   e. Repeat Steps 1 through 7 (optical filter checks). Filter responses should fall within the calibrated limits.

K.1.2.4 SEMI-ANNUAL CHECKS

Replace the DeVilbiss vacuum pump filter felt and wash the filter jar as necessary. Record the date the pump filter jar is cleaned and filter felt replaced (as required) in the Comments Section and on the Monthly Quality Control Checksheet. Visually check the flow meter and tubing connections and clean or replace as necessary.

K.1.2.5 ANNUAL CHECK

Add a drop of SAE 20 weight oil or equivalent on the armature bearings of the take up spool motor; record the date of the lubrication in the Comments Section and on the Monthly Quality Control Checksheet.

CALIFORNIA AIR RESOURCES BOARD
MONTHLY QUALITY CONTROL MAINTENANCE CHECK SHEET
A.I.S.I. TAPE SAMPLER

Station Name: Bakersfield — Month/Year: May/83
Station Number: 15-203 — Technician: Wright
Property Number: 06542 — Agency: ARB

OPERATOR INSTRUCTIONS:

1)* DAILY CHECKS: Check flowmeter rate, adequate tape supply in the AISI; photometer lamp lit; vacuum pump operating properly; span set to 95% of chart.

2)** MONTHLY CHECKS: Clean photometer lamp and nozzle windows with a soft cloth; date last cleaned: 5/2/83. Measure air flow rate with a Vol-o-Flo, adjust as required and record results below.

MONTHLY FLOW CHECKS WITH A VOL-O-FLO (OPTIMUM RATE 6.25 LPM)						
	AS IS			FINAL		
Date	Vol-o-Flo "ΔP"	Air Flow LPM	Flowmeter Set Point	Vol-o-Flo "ΔP"	Airflow LPM	Flowmeter Set Point
5/2	1.08	6.00	5.75	1.12	6.25	6.00

Perform optical filter checks and record data in applicable columns below.

MONTHLY FILTER CHECKS - PHOTOCELL RESPONSE (CHART DIVISIONS)						
Date	Column #	0	1	2	3	4
	Calibrated Response	———	14.0	19.5	24.2	28.6
5/2	Filter Combination	Tape only	Tape and one thickness filter	Tape and two thickness filter	Tape and three thickness filter	Tape and four thickness filter
	Chart Response	95.0	80.0	74.5	70.0	65.5
Change From Tape Only Response		———	15.0	20.5	25.0	29.5
Percent Change From Calibrated Response		———	+7.1	+5.1	+3.3	+3.1

4)*** SEMI-ANNUAL CHECK: If the vacuum pump has a filter assembly, replace the felt and wash the filter jar as necessary. Check flowmeter and tubing; clean as necessary. Date pump last serviced: 2/10/83.

5) ANNUAL CHECK: Add a drop of SAE 20 oil on the armature bearings of the take up spool motor; date last oiled: 6/15/82. Vacuum clean entire housing; date last cleaned: 6/15/82.

DATE	COMMENTS OR MAINTENANCE PERFORMED
5/9	Installed clean filter tape roll
5/16	Replaced photometer lamp

*or each day the site operator is present.
**obtain laboratory calibrated filters from the Instrumentation and Standards Laboratory in Sacramento.
***service the vacuum pump filter jar and filter felt more often in highly contaminated environments.

REVIEWED BY: D.R. DATE: 5/31/83

TSD-56 (9/83)

Figure K.1.2.1
Monthly Quality Control Maintenance Checksheet

Table K.1.2.1

Maintenance Schedule for the AISI Tape Sampler

Parameter	Daily*	Monthly**	Semi-Annual***	Annual
Flowmeter Reading	X			
Adequate Filter Tape Supply	X			
Photometer Lamp Lit	X			
AISI Span Setting	X			
Vacuum Pump Operation	X			
Clean Photometer Lamp and Nozzle Windows		X		
Flowmeter Response Check		X		
Photocell Response Check		X		
Replace Filter Felt			X	
Wash Filter Jar			X	
Clean Flowmeter			X	
Clean Soiled Tubing			X	
Lubricate Motor Armature Bearings				X
Vacuum Clean Entire Housing				X

* or each day the site operator is present.

** Obtain laboratory calibrated filters from the Instrumentation and Standards Laboratory in Sacramento.

*** Service the vacuum pump filter jar and filter felt more often in highly contaminated environments.

K.1.3 DETAILED MAINTENANCE PROCEDURES

K.1.3.1 PUMP - AISIs have DeVilbiss or Gast - Model MOA diaphragm pumps.

Units that have the DeVilbiss pump are identified by having "INSIDE FILTER" dymotaped on the nozzle cover. These pumps have particulate felt filters which should be replaced periodically (see Table K.1.2.1). Figure K.1.3.1 illustrates the pump components and assembly sequence. Every six months (more often in dirty atmosphere) remove the filter jar by turning it counterclockwise. Wash the jar in any mild cleaning fluid (e.g. soap and water) and dry. To replace filter felts, remove the mounting bolt by turning it counterclockwise (see Figure K.1.3.1). There are two filter felts on the felt mounting bolt. Remove spent felts by sliding them off and replace with the new felts (obtain kit containing filter felts, rubber gasket and diaphragm from the Instrumentation and Standards Laboratory stockroom). Reinstall filter jar finger tight.

To replace head gasket and pump diaphragm on the DeVilbiss pump, use the following procedure (refer to Figure K.1.3.1).

1. Remove pump assembly unit from the AISI cabinet.

2. Remove the four screws, support posts, and base plate form the bottom of the DeVilbiss pump.

3. Remove the two screws and washers from the bottom of the pump head assembly.

4. Remove the lower portion of the head assembly, remove the Phillips screw and lift out the valve plate.

5. Replace the rubber head gasket being sure the notched rubber end fits over the metal notch and then reinstall the valve plate.

6. Remove the Phillips screw from the upper portion of the head assembly and remove diaphragm retainer plate.

7. Remove the diaphragm and replace it with a new one.

8. To reassemble pump components, reverse these steps.

Units that have a Gast diaphragm pump installed are not labelled with "INSIDE FILTER" on the nozzle cover. The Gast pumps contain particulate filter elements which should be replaced periodically. Figure K.1.3.2 shows pump components and their assembly sequence. To replace the pump filter elements and/or rubber gasket, remove

the four Phillips head screws on the top plate of the pump. The filters and gasket are located beneath this top plate. Replace the filters, the gasket, and the top plate.

To replace the diaphragm, remove the four socket cap screws from the head of the pump. The diaphragm is held in place by a retainer plate and two Phillips head screws. Remove two Phillips head screws, retainer plate and replace the diaphragm. Checked side should be placed down for vacuum and up for pressure. Reinstall the plate with the two Phillips head screws. Align the four holes and reinstall the pump head with the socket cap screws.

The following precautions should be taken when replacing pump components:

1. Do not lubricate parts with oil, grease, or petroleum products, nor clean with acids, caustics or chlorinated solvents.

2. Be careful to keep the diaphragm from contacting petroleum products.

3. Be careful not to raise burrs on the two Phillips head screws when replacing the diaphragm. Burrs may cause damage to the inlet leaf valve.

K.1.3.2 OPTICS - The photocell and the nozzle windows are delicate and require careful handling. Figure K.1.3.3 show sampler optics components and their assembly sequence for Model "G SE".

To clean the photometer lamp and the top of the nozzle window surfaces, remove the nozzle cover and clean with a soft cloth (see Table K.1.2.1). In highly contaminated environments, clean the inside of the nozzle windows as necessary. To remove the window, remove the screws and hold down plate; clean with a soft cloth and reassemble. Remove the bottom window by dropping the photocell support by loosening the thumb screws. Clean the window with a soft cloth and reassemble. Take care to seat "O" rings properly. Do not overtighten the top nozzle hold down plate screws or the bottom thumb screws. Uneven or overtightening the plate screws can cause the nozzle windows to crack.

K.1.3.3 FLOW METER - Check the flow meter and tubing semi-annually. As necessary clean internal components with mild cleaning fluid (soap and water), rinse with distilled water, and dry. Refer to Figure K.1.3.4 to remove various flow meter components. The flow meter may require more frequent cleaning in highly contaminated environments. Reassemble flow meter components per assembly sequence depicted in Figure K.1.3.4. Replace "O" rings as necessary. Flow meter "O" ring kit may be obtained from the Instrumentation and Standards Laboratory stockroom in Sacramento.

K.1.3.4 AISI CLEANING - The interior and exterior of the AISI tape sampler should be vacuum cleaned annually to remove accumulated dust. Be sure that louvers are also cleaned and not blocked with dust. The AISI must have adequate ventilation.

ITEM	QTY.	NUMBER	DESCRIPTION
1	1	991596	Pump 110V
		991608	Pump 220V
2	2	990427	Spacers (Long Support Posts)
3	2	990425	Spacers (Short Support Posts)
4	2	990087	Screws
5	2	990085	Screws
6	1	996504	Base
7	4	990461	Feet
8	1	998165	Hose bib elbow
9	1	998091	Bushing
10	1	998061	Street ell
11	1	998127	Nipple
12	1	997076	Muffler
13	1	998160	Hose bib (Not Shown)
14	1	991597	Pump Rebuild Kit (Not Shown)
15	1	997077	Jar (Only)
16	2	990590	Felts (Only)
17	1	991563	Motor Body Assembly
18	1		Felt Mounting Belt
19	1		Pump Head Assembly

VACUUM PUMP
991567

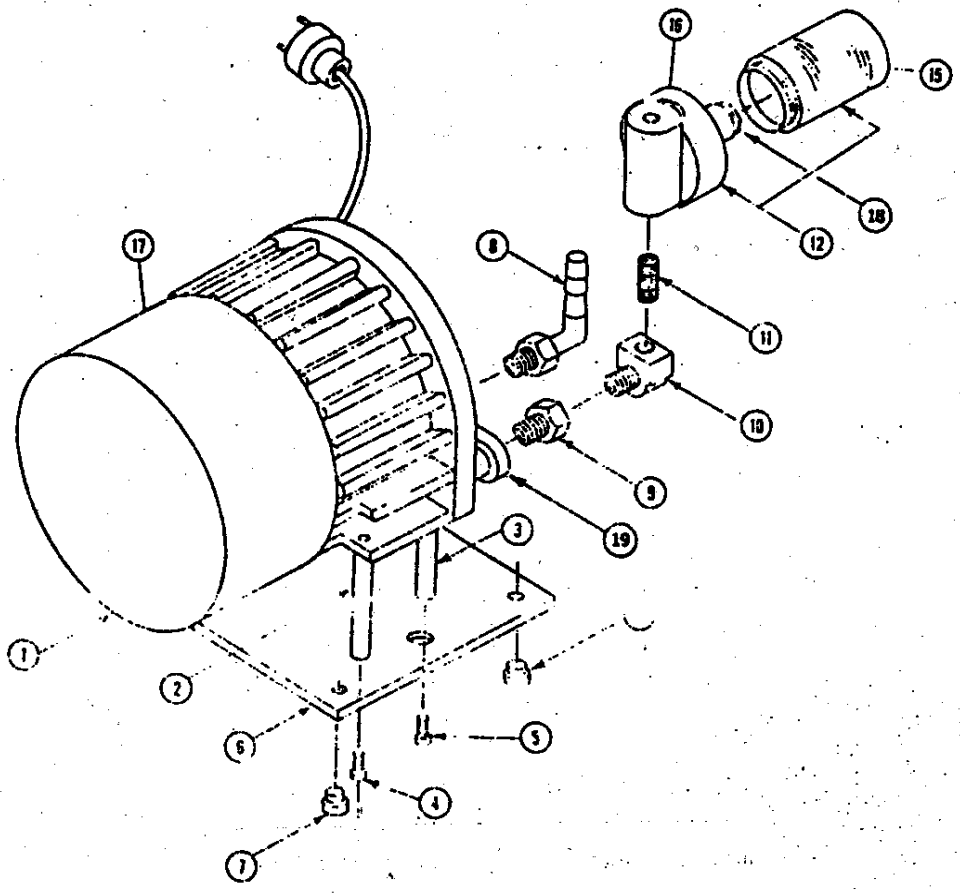
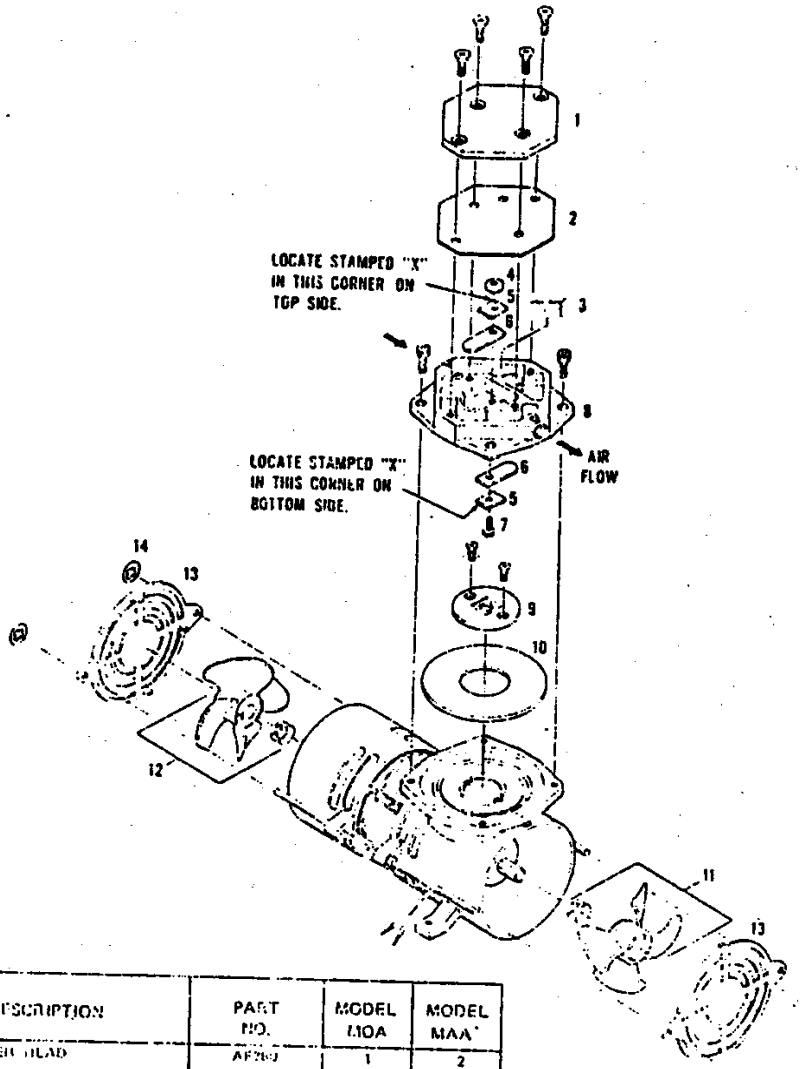


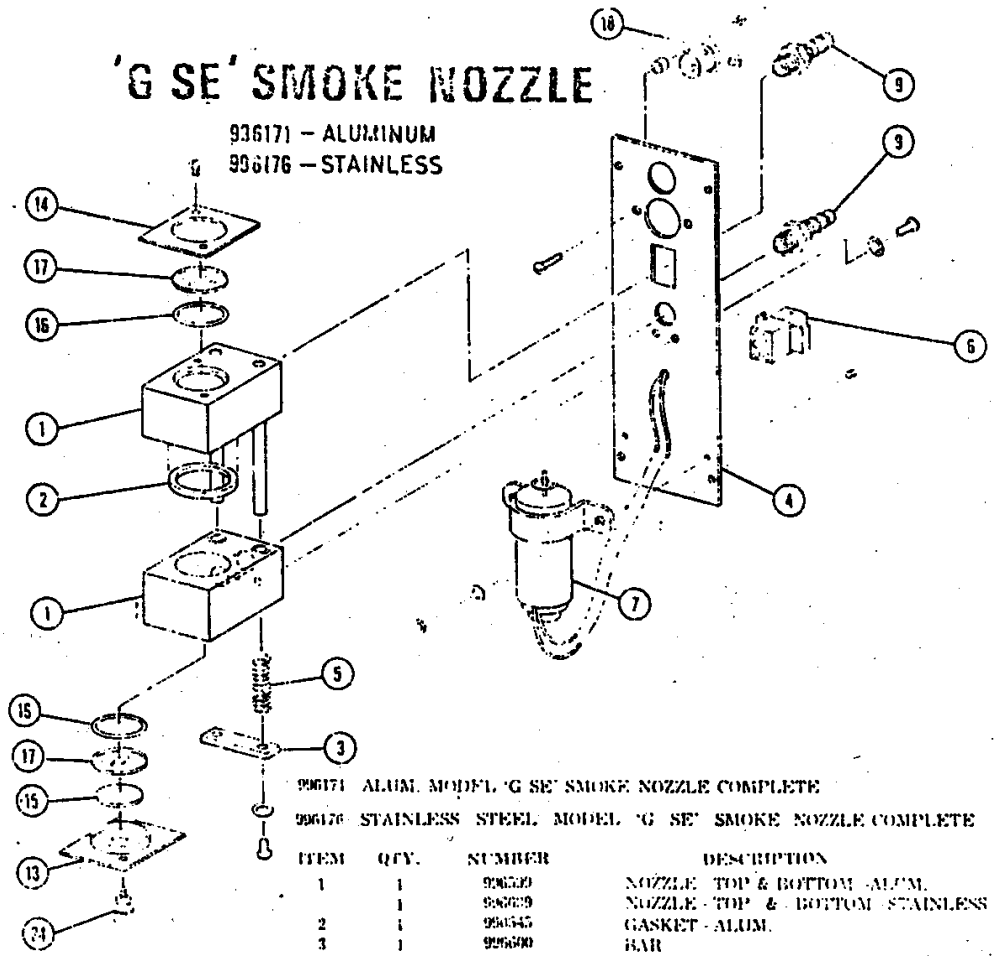
Figure K.1.3.1
DeVilbiss Pump Assembly



REF. NO.	DESCRIPTION	PART NO.	MODEL M0A	MODEL MAA
1	COVER, HEAD	AF760	1	2
*2	HEAD GASKET	AF780	1	2
*3	FILTER/MUFFLER ELEMENT	AF627A	1	2
*4	NUT	BC101	1	2
*5	REED VALVE	AF815A	2	4
*6	LEAF VALVE	AJ795	2	4
*7	SCREW	BC516	1	2
8	HEAD	AF779	1	2
9	RETAINER PLATE	AF778	1	2
10	DIAPHRAGM**	AG788	1	2
11	FAN	AF765A	1	1
12	FAN	AF765B	1	1
13	GRILLE	AG774	2	2

* INDICATES PARTS INCLUDED IN SERVICE KIT K 369

Figure K.1.3.2
Gast Model MOA Pump



936171 ALUM. MODEL 'G SE' SMOKE NOZZLE COMPLETE

936176 STAINLESS STEEL MODEL 'G SE' SMOKE NOZZLE COMPLETE

ITEM	QTY.	NUMBER	DESCRIPTION
1	1	936539	NOZZLE - TOP & BOTTOM - ALUM.
	1	936639	NOZZLE - TOP & BOTTOM - STAINLESS STEEL
2	1	936545	GASKET - ALUM.
3	1	936500	BAR
4	1	935412	PLAT - ALUM
5	2	936527	SPRING
6	1	930243	CONNECTOR - FEMALE
	1	930250	TERMINAL - MALE
7	1	902510	SOLENOID
9	2	903160	HOSE BIB
13	1	936130	COVER
14	1	[illegible]	[illegible]
15	1	936[illegible]	AGUGE GLA
16	2	936[illegible]	'O' RING
17	2	936[illegible]	GLASS
18	1	936[illegible]	LAMP [illegible]
24	2	930723	THUMB SCREW
	2	930011	SCREW
	2	930174	NUT
	2	930036	SCREW
	2	930129	LOCKWASHER
	2	930775	SPACER
	2	930007	SCREW
	2	930167	NUT
	2	930013	SCREW
	2	930064	LOCKWASHER

Figure K.1.3.3
AISI Optics Assembly

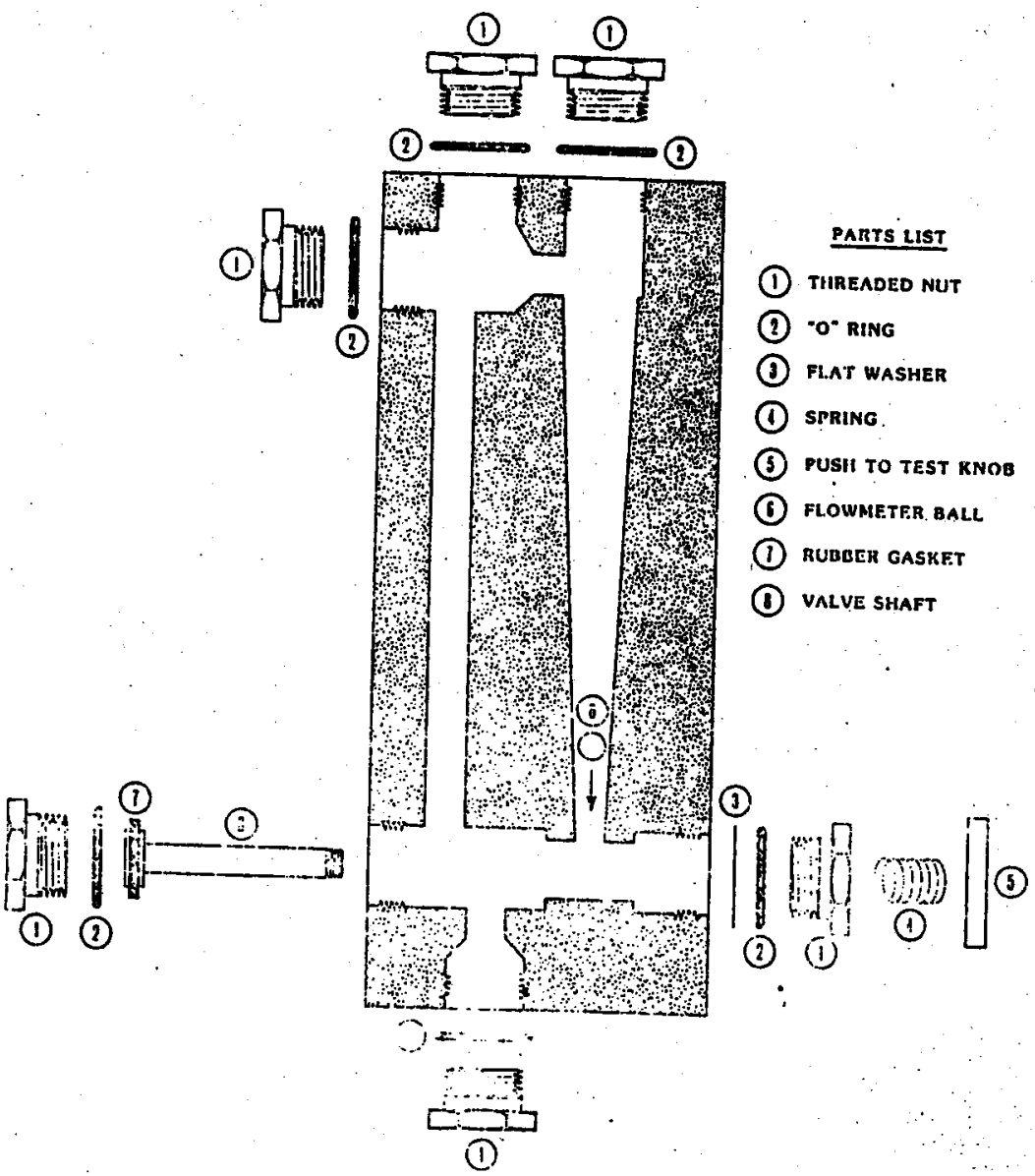


Figure K.1.3.4
Sampler Flow Meter Components

STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES
FOR
AIR QUALITY MONITORING

APPENDIX K.2
ACCEPTANCE TEST PROCEDURE
RESEARCH APPLIANCE CORPORATION
AISI TAPE SAMPLER

MONITORING AND LABORATORY DIVISION

SEPTEMBER 1983

K.2.0 PROCEDURES

K.2.0.1 GENERAL INFORMATION - The main purpose of acceptance testing an instrument is to verify conformity to the physical and performance specifications listed in the purchase order and stated in the manufacturer's operating manual. Acceptance testing is performed at the Instrumentation and Standards Laboratory in Sacramento. Failure to comply with the specifications results in rejection of the equipment. Before beginning acceptance testing of the AISI sampler, read the manufacturer's operating and service manual. Then, initiate an instrument log book and an Acceptance Test Mini-Report (Figure K.2.0.1).

K.2.0.2 PHYSICAL INSPECTIONS - Unpack the AISI sampler from its shipping container and check for shipping damage. Report any damage observed to your supervisor and record any defects on the "Mini-Report". Perform the following checks:

1. Check for loose parts, fittings, switches, knobs, etc.

2. Inspect tubing connections for tightness.

3. Verify that the AISI is complete upon receipt (i.e. manuals, pump sheets, etc.).

4. Be certain that the AISI power cord and plug are three-wire. with ground terminal.

Install a 1.0 K ohm - 10 turn "OUTPUT ADJUST" potentiometer. Then install an Action-Pak Signal Conditioner Model (AP4050) in the sampler cabinet to increase the nominal analog output voltage range from 0-10 millivolts to 0-1.0 volt (see Figure K.1.1.2). Connect to a 115 V A/C power supply (plug into a three terminal receptacle only). Check that switches, lamps, knobs, etc., operate properly.

K.2.0.3 OPERATIONAL TESTS - Set up the AISI sampler by following the installation procedure in Appendix K.1 - Station Operator's Procedures. Disconnect the timer and sample pump to conduct the following tests. Record the results on the strip chart and the mini-report as a permanent record of the tests performed (comments in ink). File the strip charts and the mini-report in the Air Quality Surveillance files under the assigned ARB property number.

1. Temperature/Voltage Tests - Place the AISI sampler in the environmental chamber and connect to the variable voltage power strip. Place a section of clean filter tape in the nozzle. Connect the AISI's output to a strip chart recorder. Adjust the recorder baseline percent transmittance reading to 95% of chart.

Perform a standard temperature/voltage run (Thermotron Program #7) and record the responses. Use optical filters to alter transmittance from 95% to approximately 30%. Obtain a stable transmittance reading on the strip chart. Repeat the standard temperature/voltage run and record the responses.

The following performance specifications are to be met:

a. For a ±10 VAC change in voltage from 115 VAC, the baseline (tape only) response shall not change more than ±0.5% of full scale and the span (with optical filters) shall not change more than ±2% of full scale.

b. For a ±10° C change in temperature from 25° C, both the baseline and span responses shall not change more than ±2% of full scale. After experiencing a ±20° C change in temperature, the response shall return to within ±1% of the original reading of 25° C.

2. Baseline and Span Stability Tests - Remove the AISI from the environmental chamber and place it on a flat surface (follow installation procedures in Appendix K.1). Perform 24 hour and 72 hour stability tests with and without optical filters. Obtain one span and one baseline trace after the 24 hours and an additional span and baseline trace after the 72 hours. The following performance specifications should be met:

   a. The baseline drift should be less that ±1% at approximately 95% transmittance response in 24 hours and less than ±2% in 72 hours.

   b. The span drift should be less than ±2% at approximately 30% transmittance response in 24 hours and less than ±3% in 72 hours.

3. Noise - During testing, noise should be less than ±0.5 percent transmittance of full scale.

4. Final Review - If the tests are satisfactory, complete an equipment relocation notification sheet and record pertinent information such as flow setting, modifications, etc., in the log book and on the Acceptance Test Mini-Report. Reconnect the timer and the sample pump.

   Record equipment numbers, date completed, and other appropriate information. The sampler is now reading for field use.

AISI TAPE SAMPLER
ACCEPTANCE TEST "MINI-REPORT"

Date 6/25/83 Make and Model No. AISI/GSE Serial No. 345-2
By John Doe ARB No. 04318 Reviewed By RKR
Date of Acceptance 7/1/83

	% FS Dev.				
	Baseline	Span	Passed	Failed	Final OK*
I. PHYSICAL INSPECTIONS					
A. Checked for shipping damage			✓		
B. Checked for loose parts, fittings, etc.			✓		
C. Sampler complete on receipt			✓		
D. Checked sampler power cord			✓		
II. OPERATIONAL TESTS (Attach Charts)					
A. Temperature and voltage variation					
Baseline and Span Shifts: 35°C, 115 V .	+1.0	+1.7	✓		
35°C, 125 V .	+1.2	+2.0	✓		
35°C, 105 V .	+1.0	+2.0	✓		
15°C, 115 V .	-1.0	-1.5	✓		
15°C, 125 V .	-0.9	-2.0	✓		
15°C, 105 V .	-0.5	-1.0	✓		
B. 24-Hour Drift	+0.9	+1.5	✓		
C. 72-Hour Drift	+1.5	+2.5	✓		
D. Maximum Noise Drift in Above Tests	+0.4	+0.4	✓		

III. SPECIAL TESTS

IV. COMMENTS/MAINTENANCE PERFORMED

Installed 1.0 K ohm potentiometer and Action P.K Signal Conditioner.

*Indicate corrective action taken.

TSD-58 (5/83)

Figure K.2.0.1
AISI Tape Sampler Acceptance Test Mini-Report