

MIL-A-62048A(AT)  
 5 March 1975  
 SUPERSEDING  
 MIL-A-62048(AT)  
 12 August 1966

## MILITARY SPECIFICATION

### AIR CLEANERS, AUTOMOTIVE: HEAVY DUTY, DRY-TYPE (FOR INTERNAL-COMBUSTION ENGINES)

This specification is approved for use by all Departments and Agencies of the Department of Defense

#### 1. SCOPE

1.1 This specification covers heavy duty, dry-type air cleaners with a replaceable filter element for use in automotive applications.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### Military

- |             |   |
|-------------|---|
| MIL-T-704   | - Treatment and Painting of Material.     |
| MIL-B-5924  | - Batting, Insulation, Glass Fiber.       |
| MIL-D-13570 | - Dust, Testing by Exposure to.           |
| MIL-B-46707 | - Blower, Air filter, Engine.             |
| MIL-E-46736 | - Element, Air Cleaner, Intake, Dry Type. |

#### STANDARDS

##### Federal

- FED. STD. 595 - Colors.

##### Military

- |             |  |
|-------------|--|
| MIL-STD-105 | - Sampling Procedures and Tables for Inspection by Attributes. |
| MIL-STD-130 | - Identification Marking of U. S. Military Property.           |
| MIL-STD-202 | - Test Methods for Electronic and Electrical Component Parts.  |

(Copies of specifications, standards and publications required by suppliers in connection with specific procurement functions should be obtained from the processing activity or as directed by the contracting officer.

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### 3. REQUIREMENTS

3.1 Preproduction sample. Unless otherwise specified (see 6.2), preproduction samples of the air cleaners to be furnished under this specification shall be produced prior to the manufacture of these items in production quantity. The preproduction samples shall be submitted to the Government for preproduction inspection to determine conformance to the quality assurance provisions of this specification (see 4.2). The preproduction samples submitted by a contractor shall be fully representative of the air cleaners to be supplied from production facilities and tooling.

3.2 Materials. Materials shall be as specified herein, and in applicable drawings or standards. Materials or equipment not designated on the drawings or standards and not specifically covered by this or other specifications shall be uniform in quality and free from imperfections or defects which affect their serviceability.

3.2.1 Sheet metal parts. Sheet metal parts shall be free of pipes, laminations, stringers, tears and excessive metal thinning at drawn sections.

3.2.2 Filter element. Filter elements shall comply with MIL-E-46736.

3.2.3 Air filter blowers. Air filter blowers, if used, shall comply with MIL-B-46707.

### 3.3 Design and construction.

3.3.1 Interchangeability. All units and their replaceable components shall be fabricated to the form and dimensions specified on the applicable drawing or military standard and in accordance with detail requirements of this specification.

3.3.2 Servicing. Servicing, cleaning, and reassembly shall be accomplished without the use of special tools and without disturbing the clean air connections to the engine. The number of parts required to be removed for servicing shall be held to a minimum and shall be so designed as to prevent improper reassembly.

3.3.3 Tubular joints. Air cleaner tubular joints shall have externally beaded ends of sufficient strength to withstand external pressure caused by hose clamps or other fastening devices.

3.3.4 Flanged joints. Flanged joints shall have smooth faces suitable for use with gaskets, and when assembled, shall provide air-tight joints under all conditions of service. There shall be no holes in flanges opening into the clean-air passage.

3.3.5 Rated air flow and dimensions. Unless otherwise specified (see 6.2) dimensions and rated air flow shall be in accordance with the applicable drawing or MS standard specified in the contract.

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### 3.4 Performance.

3.4.1 Air leakage resistance. When tested as specified in 4.5.3.2, the air cleaner shall not leak air at 50 inches water vacuum or two pounds per square inch pressure.

3.4.2 Air flow restrictions. When tested as specified in 4.5.3.3, the initial air cleaner restriction shall not exceed 9 inches water at rated air flow.

3.4.3 Efficiency. When tested as specified in 4.5.3.4, the air cleaner minimum efficiency shall be 99.5 per cent using fine test dust.

3.4.4 Vibration resistance. When tested as specified in 4.5.3.5, the air cleaner shall show no evidence of structural or seal damage.

3.4.5 Air leakage resistance after vibration. When tested as specified in 4.5.3.6, the air cleaner shall not leak air at 50 inches water vacuum or two pounds per square inch pressure.

3.4.6 Efficiency after vibration. When tested as specified in 4.5.3.7, the air cleaner minimum efficiency shall be 99.5 per cent using fine test dust.

3.4.7 Dust capacity. When tested as specified in 4.5.3.8, the air cleaner dust capacity shall be sufficient to permit operation for a minimum of 20 hours to a restriction of 20 inches water using coarse test dust.

3.4.8 Air flow restriction after dust capacity. When tested as specified in 4.5.3.9, the air cleaner after servicing shall not exceed its original restriction by more than one inch water.

### 3.5 Painting, marking, and data plates.

3.5.1 Painting. Unless otherwise specified (see 6.2), the preparation, conditioning, and painting of the air cleaner shall be in accordance with applicable provisions of MIL-T-704, type A.

3.5.2 Color. Unless otherwise specified (see 6.2), the exterior color shall be in accordance with FED. STD. No. 595.

3.5.3 Identification marking. Unless otherwise specified (see 6.2), identification marking shall be in accordance with MIL-STD-130 and shall include the maximum rated air flow capacity.

3.6 Workmanship. Workmanship shall be such that the air cleaners shall be free of burrs, sharp edges, surfaces out of alignment or out of contour (visually apparent), loose metal particles or other foreign materials.

3.6.1 Filter element. The filter element shall be firmly positioned in the housing but easily removable for servicing.

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## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Preproduction inspection. If required (see 3.1 and 6.2), a preproduction sample of three air cleaners shall be submitted for preproduction inspection. Preproduction inspection shall be performed by the Government, at a place designated by the Government and shall consist of examinations for the defects specified in table II and performance of tests as specified in table I.

Table I. Tests

Test Paragraph	Test	Quality		
		Qualification	Conformance	Control
4.5.3.2	Air leakage resistance	X	X	X
4.5.3.3	Air flow restriction	X	X	X
4.5.3.4	Efficiency	X	X	X
4.5.3.5	Vibration resistance	X		
4.5.3.6	Air leakage restriction after vibration	X		
4.5.3.7	Efficiency after vibration	X		
4.5.3.8	Dust capacity	X		X
4.5.3.9	Air flow restriction after dust capacity	X		X

4.3 Quality conformance.4.3.1 Sampling.

4.3.1.1 Lot formation. Unless otherwise specified (see 6.2), a lot shall consist of all air cleaners of one part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.3.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with MIL-STD-105.

4.3.1.3 Sampling for testing. Samples for quality conformance testing shall be selected in accordance with inspection level S of MIL-STD-105 from each lot that has passed the inspection specified in 4.3.2.2.

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**4.3.2 Examination.**

4.3.2.1 Acceptable quality level. Each air cleaner selected in accordance with 4.3.1.2 shall be examined for conformance to the following acceptable quality levels (AQL) on the basis of percent defective:

Classification	AQL
Major	1.0
Minor	2.5

4.3.2.2 Classification of defects. For examination purposes, defects shall be classified as specified in table II.

Table II. Classification of defects

Major	Defect	Examination method
101	Dimensions not as specified	Visual
102	Materials not as specified	Visual
103	Welding or brazing not as specified	Visual
104	Bent or defective tubular or flanged joints	Visual
105	Disassembly and assembly difficult or not possible	Visual
106	Filter element not secure	Visual
107	Assembly incorrect	Visual
108	Assembly incomplete	Visual
<u>Minor</u>		
201	Identification illegible or missing	Visual
202	Paint application and color not as specified	Visual

**4.3.3 Testing.**

4.3.3.1 Quality conformance tests. Samples selected in accordance with 4.3.1.2 shall be subjected to the tests specified in table I, in the order specified using an AQL of 6.5 on the basis of percent defective.

**4.4 Control tests.**

4.4.1 Sampling for control tests. Control test samples shall be selected at the rate of two air cleaners for each 100 produced except that not more than four or less than two may be selected in any 30 day period. Samples shall be selected from a lot which has passed the quality conformance examination specified in 4.3.2.2 and the tests specified in table I.

4.4.2 Failure. Failure of a control test sample unit to pass any specified examination or test may be cause for the Government to refuse to accept subsequent lots until it has been proved to the satisfaction of the Government that the faults revealed by the tests have been corrected.

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4.5 Tests and test procedures.4.5.1 Test conditions.

4.5.1.1 Temperature. Ambient temperature during testing shall be  $80 \pm 10^{\circ}\text{F}$ .

4.5.1.2 Relative humidity. Relative humidity during testing shall be  $35 \pm 5$  per cent.

4.5.1.3 Dust feeding rate. When the feeding of dust is required as part of any test, the dust shall be fed at an average rate of 0.025 gram per cubic foot of air. The dust feed rate shall not vary more than  $\pm 0.005$  gram per cubic foot during any part of the test.

4.5.1.4 Test dust. The chemical analysis of the dust shall be as specified in MIL-D-13570. The particle distribution by weight shall be as shown below:

<u>Size in microns</u>	<u>Per cent of total weight</u>	
	<u>Coarse grade</u>	<u>Fine grade</u>
0 - 5	12 $\pm$ 2	39 $\pm$ 2
5 - 10	12 $\pm$ 3	18 $\pm$ 3
10 - 20	14 $\pm$ 3	16 $\pm$ 3
20 - 40	23 $\pm$ 3	18 $\pm$ 3
40 - 80	30 $\pm$ 3	9 $\pm$ 3
80 - 200	9 $\pm$ 3	-

4.5.1.5 Air flow. Specified values of air flow are for standard atmospheric conditions of 29.92 inches mercury barometric pressure and  $80^{\circ}\text{F}$  ambient temperature (0.073 pound per cubic foot). Actual air flow values shall be corrected to standard conditions and shall be within plus or minus two per cent of specified values.

4.5.1.6 Air flow restriction. Actual air flow restriction values shall be corrected to air flows at a density of 0.073 pound per cubic foot and shall be accurate to plus or minus 0.1 inch water.

4.5.1.7 Air cleaner mounting position. The air cleaner shall be mounted in its normal operating attitude. The air cleaner shall be electrically grounded.

4.5.2 Test equipment.

4.5.2.1 Piezometer tubes transition ducts adapter, manometer and flowmeter. Piezometer tubes conforming to figure 1 and equal to or the next size larger (maximum of 1/2 inch larger) than the air cleaner inlet shall be installed at the inlet and outlet of the air cleaner. Transition ducts (if required) shall

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be installed from the flanges of the air cleaner inlet and outlet to the piezometer tubes. These transition ducts and any adapter installed after the outlet piezometer tube shall have sides at angles no greater than 7 degrees as measured from the center line of the transition duct. A smooth approach (ideal flow nozzle, figure 2) shall be installed at the front of the inlet piezometer tube. A manometer (water type shall be installed between the two piezometer tubes. See figures 3 and 4. A flow meter of adequate capacity shall be connected to the outlet of the adapter.

4.5.2.2 Master filter. The master filter shall consist of one layer of 1/2 inch fiber glass batting conforming to MIL-B-5924 installed in a suitable housing with the nap side of the fiber glass batting facing up stream. The master filter batting shall be of sufficient size to prevent excessive restriction. The face velocity of air against the master filter batting shall not exceed 200 feet per minute. A new master filter batting shall be installed if during the dust capacity test the air pressure drop across the master filter increases 10 inches of water above its original restriction. A manometer shall be located in the test set up to measure the pressure drop across the master filter. Figures 3 and 4 show the test set up for dust feeding and figure 5 shows the dust feeder. The filter housing shall be electrically grounded during tests.

4.5.2.3 Preparation of master filter. The fiber glass batting shall be hung in an air oven and dried for six hours at a temperature of 200 to 240°F. This drying time may be reduced and the batting considered as completely dry if there is no change in oven weighings of the batting at two consecutive 10 minute intervals. This drying and weighing procedure shall be observed before and after each test involving dust feeding.

4.5.2.4 Scavenge air. In all tests of air cleaners (equipped with scavenging blowers) in which air flow through the air cleaner is required, scavenging flow is to be provided by the electric blower which is provided as an essential component of the air cleaner assembly. Blower voltage and amperage readings are to be taken and recorded whenever readings specified in the particular test are recorded. In all tests, the electrical leads to the blower shall be connected of a suitable DC power supply with a minimum of 300 watts output for each blower connected to it at any one time. The voltage input to the blower shall be set at  $26 \pm 0.2$  volts DC when the air cleaner is operating at rated flow. During any test the voltage setting shall be adjusted only when the air cleaner is operating at rated air flow. In tests in which dust is fed to the air cleaner, a means such as is shown in figure 4 must be provided to carry away the air and dust discharged from the blower. Care must be taken to be sure that atmospheric pressure around the blower discharge is not changed by the method used to carry off the discharged air and dust. In all tests of air cleaners equipped with scavenge air aspirators or to other methods of ejecting dust, the air cleaner test set-up shall duplicate the vehicle installation.

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4.5.2.5 Dust feeder. The dust feeder, figure 5 should be of a type that will deliver dust to the air cleaner neither breaking down the particles nor creating conglomerates. The feeder also shall deliver the dust uniformly throughout the test with the dust at the beginning of testing having the same particle distribution as at the end of testing.

#### 4.5.3 Tests.

4.5.3.1 Test outline. One air cleaner housing and two elements are required to conduct the tests. The tests to be conducted and the order of condition are outlined below:

##### First element

Air leakage resistance  
 Air flow restriction  
 Efficiency  
  
 Vibration resistance  
 Air leakage resistance after vibration  
 Efficiency after vibration

##### Second element

Dust capacity  
 Air flow restriction after  
 dust capacity

4.5.3.2 Air leakage resistance. One of two air leakage tests can be used to determine conformance with 3.4.1. In one test, the inlet of the air cleaner and the discharge of the blower, if any, shall be sealed to prevent air leakage. The outlet of the air cleaner shall then be connected to a flow meter. The flow meter shall be as accurate as a 3/16 inch orifice connected to a plus or minus 0.01 inch water manometer. Care must be taken to assure tight flow meter connections. The flow meter shall indicate no air flow when the air cleaner is subjected to a vacuum of 50 inches water as measured at the air cleaner outlet. The optional test consists of sealing the inlet, outlet and blower discharge, if any and pressurizing the interior of the air cleaner to 2 psi air pressure through a pipe coupling inserted in a drilled and tapped hole in the inlet/outlet sealing plate. There shall be no evidence of air leakage in the flow of bubbles escaping from the air cleaner when the air cleaner is submerged in water.

4.5.3.3 Air flow restriction. To determine conformance with 3.4.2, the following test shall be conducted. With the air cleaner set up in accordance with 4.5.1 and 4.5.2, and as shown in figures 3 or 4, air flow restriction shall be determined at rated flow.

4.5.3.4 Efficiency. To determine conformance with 3.4.3, the following test shall be conducted. With the air cleaner set up in accordance with 4.5.1 and 4.5.2, and as shown in figures 3 or 4, adjust the air to rated flow. Fine dust shall be fed at 0.025 gram per cubic foot air until 110 grams have been fed or until 30 minutes have been reached whichever results in a greater quantity



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of dust. In those air cleaners where the rated air flow face velocity through the filter element media is six feet per minute or less, the dust shall be fed for 60 minutes. Restriction at start of test and at 10 minute intervals throughout the test shall be recorded. The master filter and conductors shall be removed and weighed in accordance 4.5.2.3, taking care to retain all entrapped dust. Efficiency shall be determined by means of the following equations:

$$\text{Efficiency in per cent} = \frac{W_1 - (W_2 - W_3)}{W_1} 100$$

Where  $W_1$  - Weight of dust fed into air cleaner inlet.  
 $W_2$  - Weight of master filter and entrapped dust.  
 $W_3$  - Weight of master filter before test.

NOTE: All dust and master filter weighings shall be accurate to 0.01 gram. Other weighings shall be accurate to 0.01 gram wherever possible but never less accurate than 0.1 gram.

4.5.3.5 Vibration resistance. To determine conformance to 3.4.4 the air cleaner shall be mounted and supported in its normal manner on a vibration machine. The air cleaner shall be subjected to a vibration as specified in method 201A of MIL-STD-202, except that the double amplitude shall be .033. The duration of vibration shall be 12 hours in a vertical direction and 12 hours in the horizontal direction. The vibration duration in the horizontal direction shall be half parallel to one axis and half parallel to the other axis.

4.5.3.6 Air leakage restriction after vibration. After the vibration test, the air cleaner shall be subjected to the air leakage test prescribed in 3.4.5.

4.5.3.7 Efficiency after vibration. After the vibration test, the air cleaner (with the vibrated element installed) shall be subjected to the efficiency test prescribed in 3.4.6.

4.5.3.8 Dust capacity. The following dust capacity test shall be conducted to determine conformance with 3.4.7. A new element will be installed for this test. With the air cleaner setup in accordance with 4.5.1 and 4.5.2, and as shown in figures 3 or 4, adjust the air to rated flow. Restriction at the start of testing and at 10 minute intervals throughout the test shall be recorded. After obtaining the initial restriction at rated air flow, vary the air flow as shown in figure 6. Average actual air flow for this cycle is 60 percent of rated flow. Coarse dust shall be fed at 0.025 gram per cubic foot of actual air flow. The dust capacity test shall be terminated when the air flow restriction reaches 20 inches of water.

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4.5.3.9 Air flow restriction after dust capacity. To determine conformance with 3.4.8, after the dust capacity test, the element or filter pack assembly shall be removed from the air cleaner. In filter pack type cleaners, the element shall be disassembled from the basket and specers. The filter element shall be compressed air cleaned as follows: Insert the air hose nozzle into each element pocket and blow the deposited dust from the filter element using a back and forth motion. The element must be first blown in a direction opposite to normal air flow and then in a direction normal to air flow. Special attention must be given to removing dust from the edges and seams. Line air pressure shall be 100 ± 10 psi, and the nozzle inside diameter shall be a nominal 1/8 inch. After the filter element is thoroughly cleaned it shall be reassembled in the air cleaner. Air flow shall be adjusted to rated flow and the restriction determined.

#### 4.6 Inspection or preparation for delivery.

4.6.1 Materials and processes. The Government inspector shall, at unscheduled intervals, inspect all materials and processes involved in the preparation for delivery, to determine conformance to requirements of section 5 and specifications referenced therein. Any evidence of deviation from specified requirements shall be cause for refusal to conduct further inspection until objective evidence has been provided by the contractor that corrective action has been taken.

### 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. Preservation, packaging, packing and marking shall be in accordance with the applicable packaging standard or packaging data sheet specified by the procuring activity (see 6.2).

### 6. NOTES

6.1 Intended use. The air cleaners covered by this specification are intended for use with internal combustion engines for automotive applications.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Applicable MS part or drawing number.
- c. Preproduction sample, if other than that specified (see 3.1).
- d. Rated air flow if not specified on drawing or standard (see 3.3.5).
- e. Protective finish, if other than that specified (see 3.5.1).
- f. Color required (see 3.5.2).
- g. Identification marking, if other than that specified (see 3.5.3).
- h. Address to where preproduction samples should be sent (see 4.2).
- i. Lot size, if other than that specified (see 4.3.1.1).
- j. Selection of applicable level of preservation, packaging, packing and marking document (see 5.1).

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Custodian:  
Army - AT

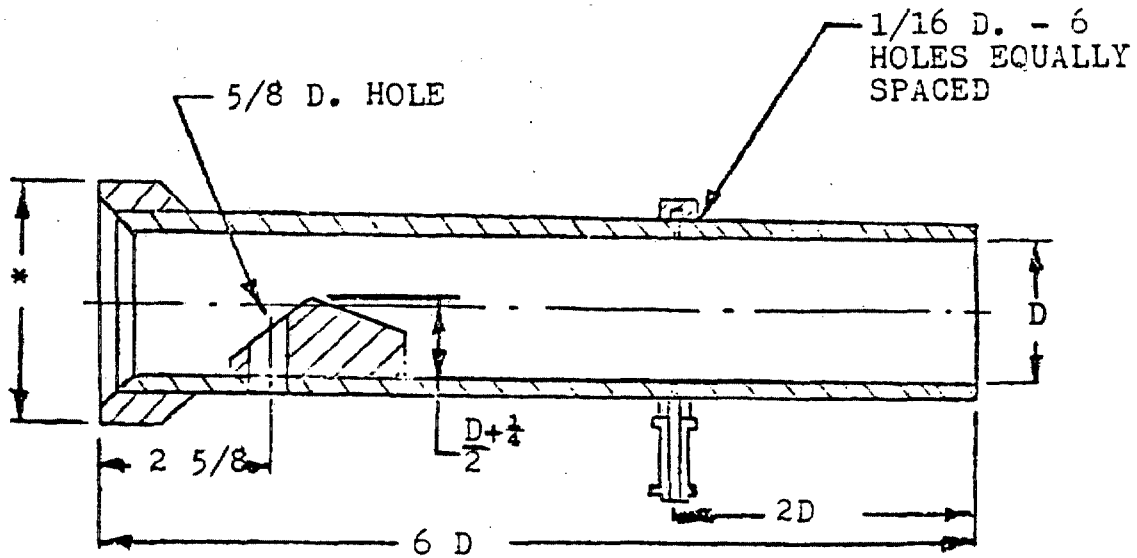
Preparing activity:  
Army - AT

Project No. 2940-A096

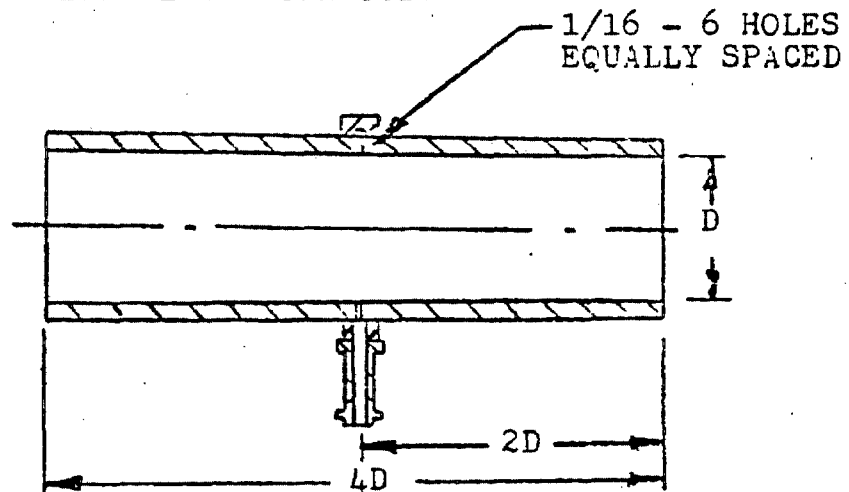
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\*7.5 DIA. FOR PIEZOMETER TUBES  
 3 1/4 I.D. AND LARGER  
 4.0 DIA. FOR PIEZOMETER TUBES  
 SMALLER THAN 3 1/4 I.D.

ALL DIMENSIONS IN INCHES



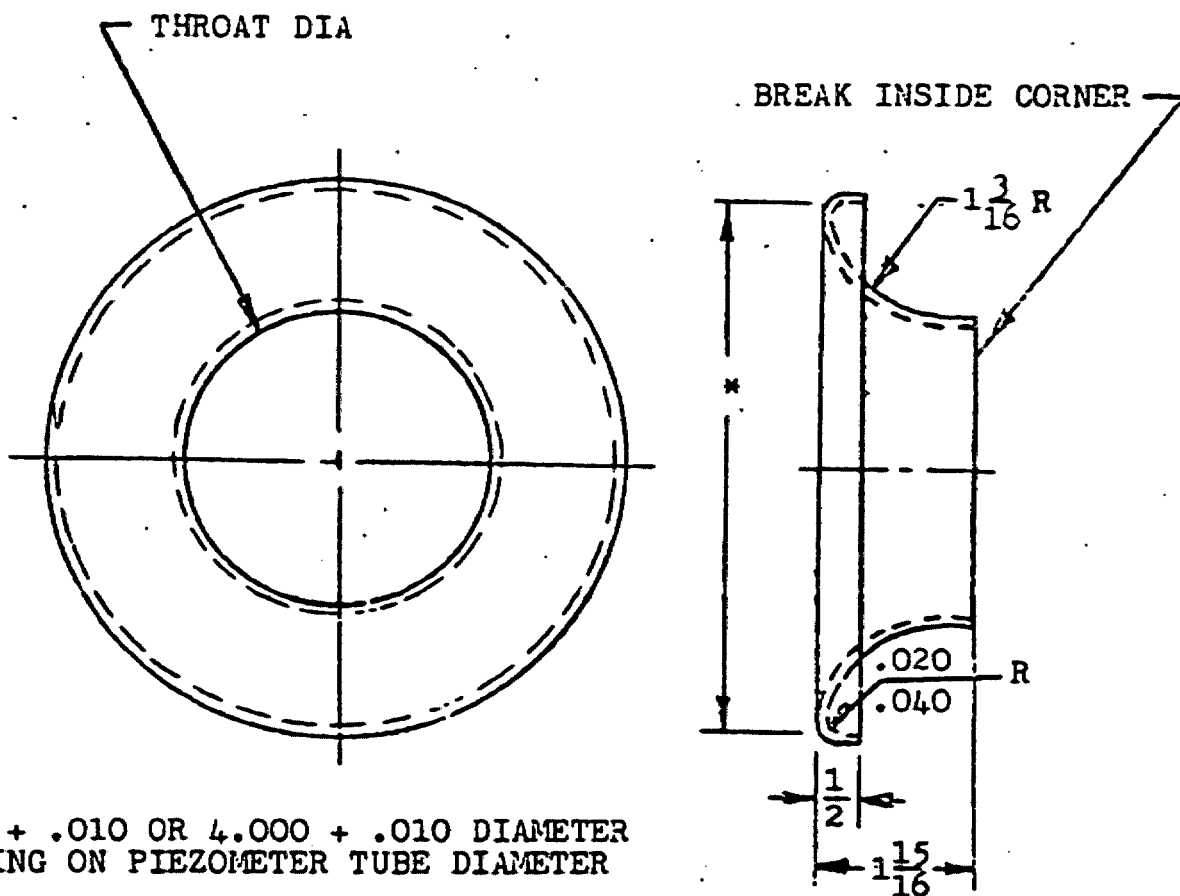
INLET PIEZOMETER TUBE



OUTLET PIEZOMETER TUBES

FIGURE 1 - PIEZOMETER TUBES

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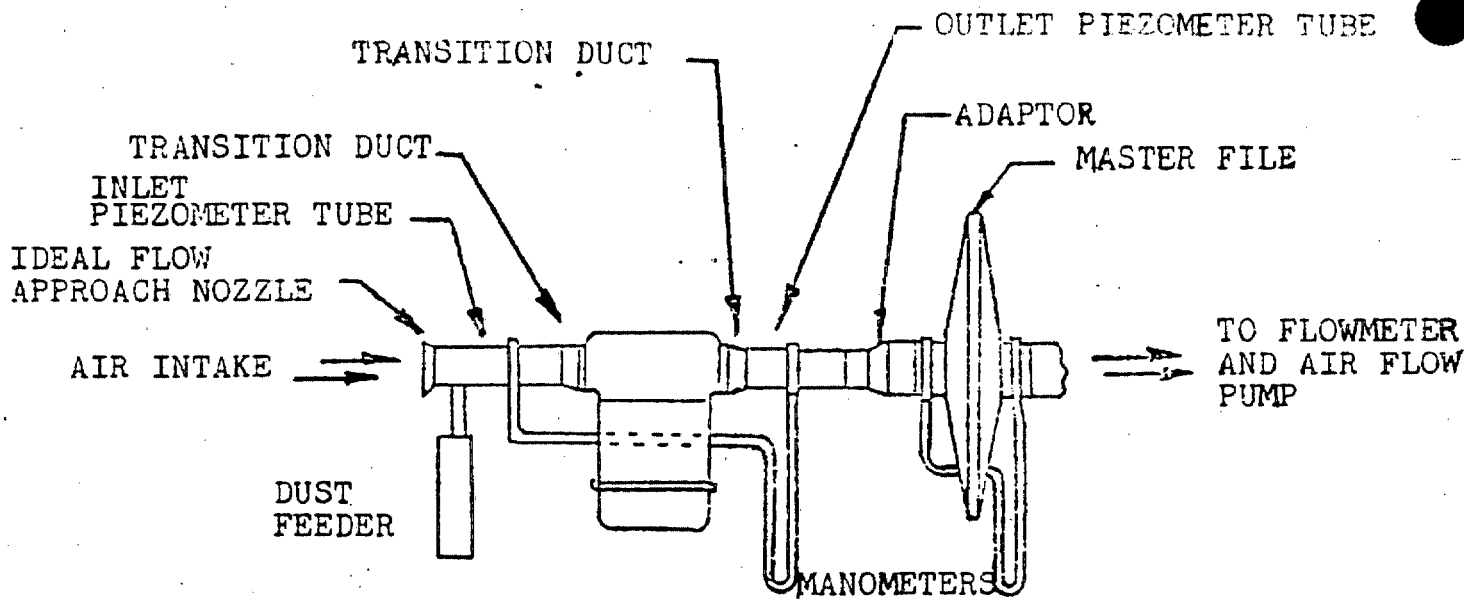
\*7.500 + .010 OR 4.000 + .010 DIAMETER  
 DEPENDING ON PIEZOMETER TUBE DIAMETER

THROAT DIAMETER	CFM	THROAT DIAMETER	CFM
4 3/8	1000	1 3/4	165
4 1/8	900	1 1/2	120
3 3/4	800	1 3/8	100
3 1/2	700	1 1/4	85
3 3/8	600	1	55
3 1/8	500	13/16	35
2 3/4	400	5/8	20
2 3/8	300	7/16	10
1 15/16	200		

ALL DIMENSIONS IN INCHES

FIGURE 2 - IDEAL FLOW NOZZLE

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TUBULAR INLET AIR CLEANER

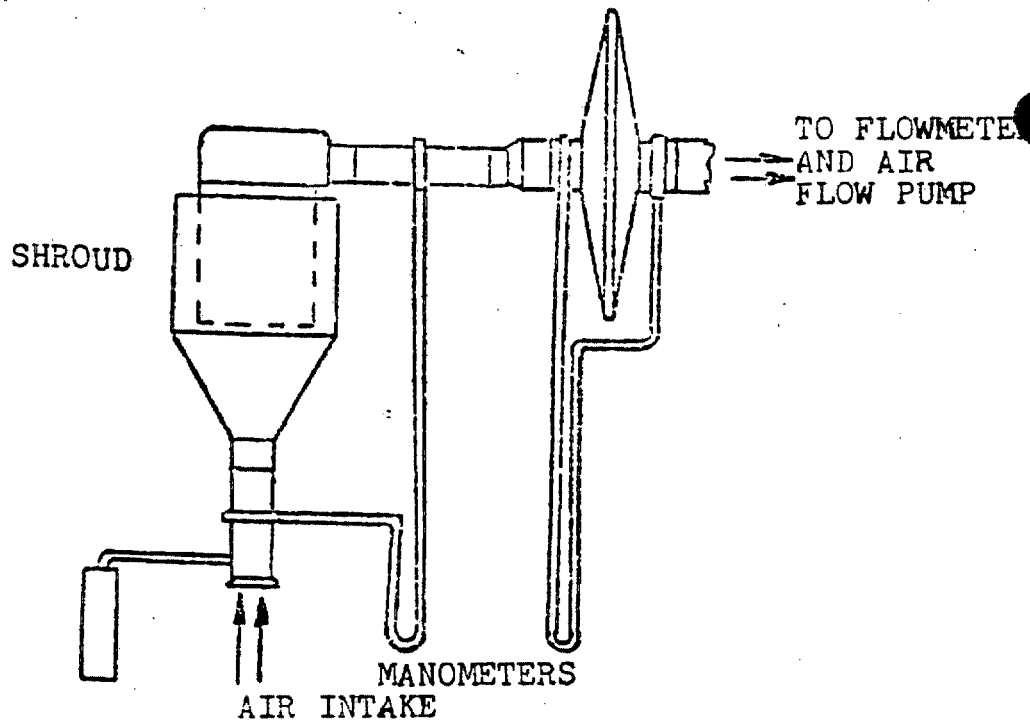


FIGURE 3 - TEST SETUP  
(AIR CLEANERS WITHOUT SCAVENGING BLOWERS)

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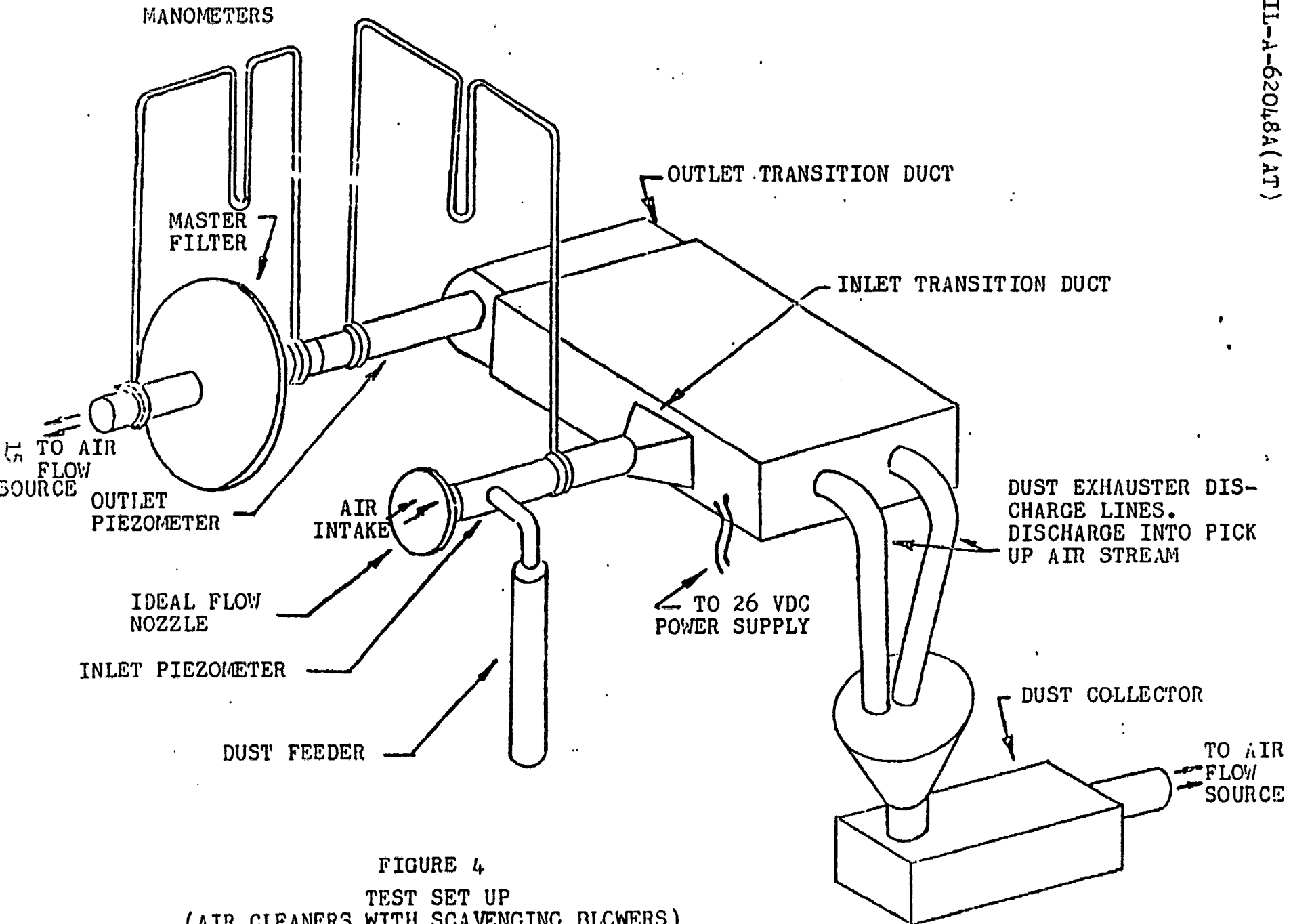
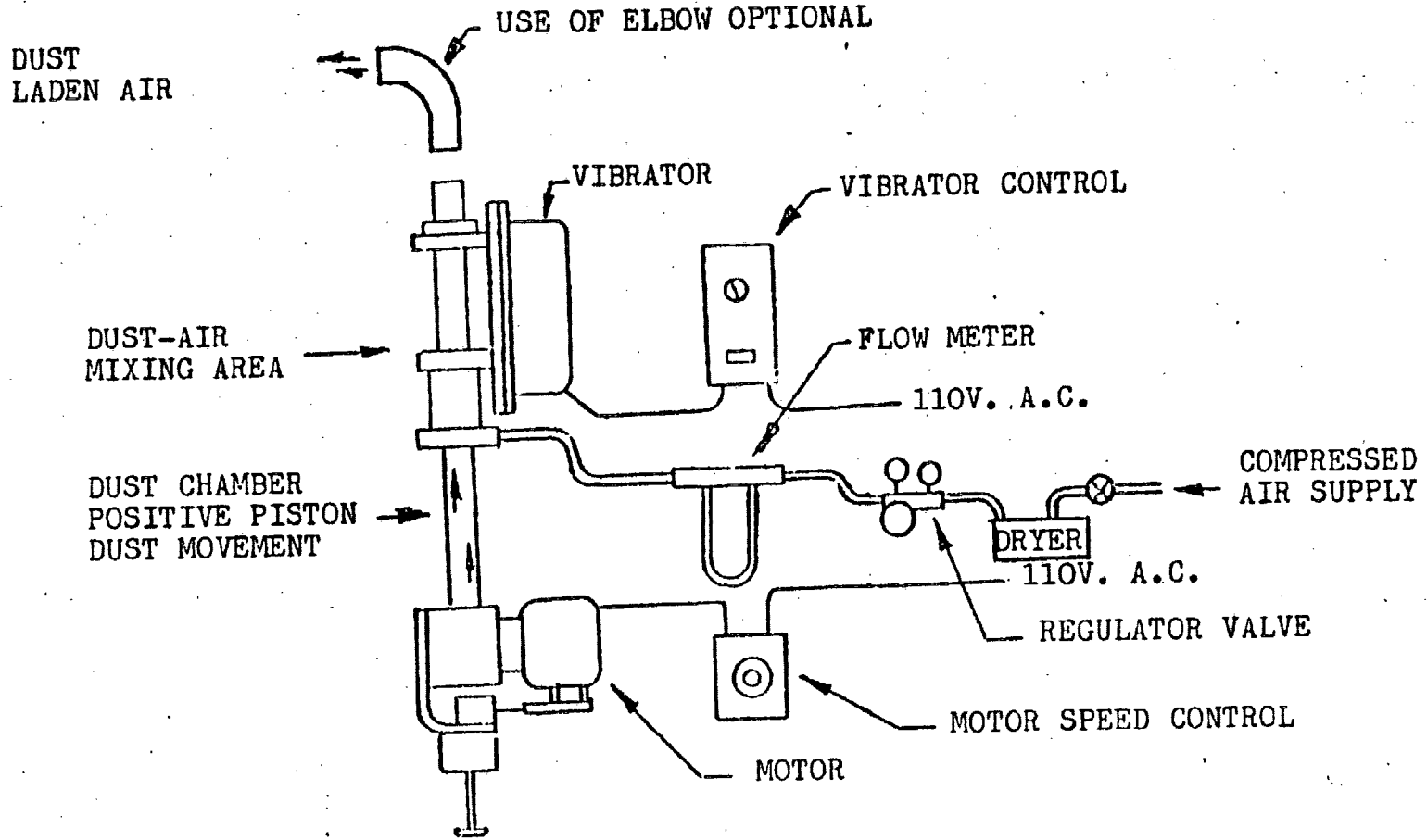


FIGURE 4  
TEST SET UP  
(AIR CLEANERS WITH SCAVENGING BLOWERS)



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FIGURE 5 - DUST FEEDER

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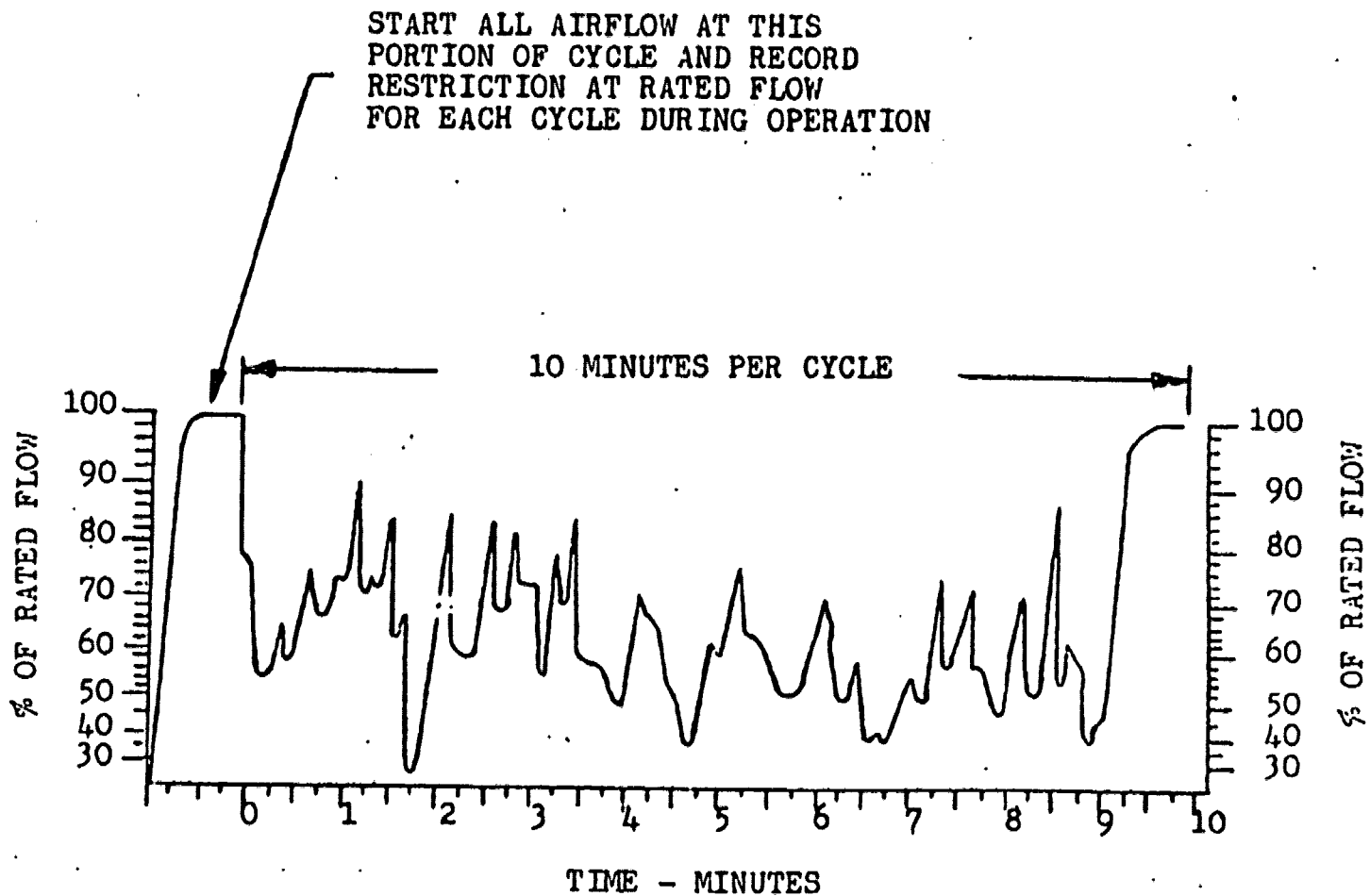


FIGURE 6

CYCLE OF AIRFLOW VARIATION



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