Dimensionair®

Operating Instructions

(Manual P/N 2237590)

Mahr FEDERAL

EXACTLY

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Contents

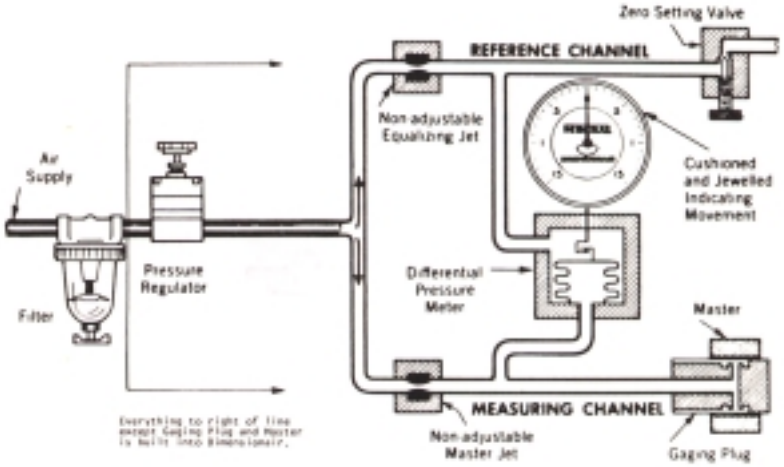
Description

Dimensionair®…a Different Air Gage

The Mahr Federal Dimensionair® is unique among dimensional air gages. Basically a back air pressure pneumatic gage, it is the only instrument that gives you the advantages of fixed magnification and a balanced air system. A linear, calibrated scale which gives you graduations of definite known values, greater plug clearance for longer wear, "zero" mastering, and immunity to air pressure fluctuations are all plus features that are direct results of the robust design of the Dimensionair® system.

How the Balanced System Works

With the balanced type air system, the air from the supply line first passes through a regulator , then it is divided into two channels. The air in one leg (the reference channel) escapes to atmosphere through the zero adjust valve, while the air in the opposite leg (the measuring channel) escapes to atmosphere through the jets of the gage head. The two channels are bridged by a precise pressure meter which indicates differential in air pressure between the two channels. This bridge system is the pneumatic equivalent of the electrical Wheatstone Bridge. This concept is illustrated in the diagram below.

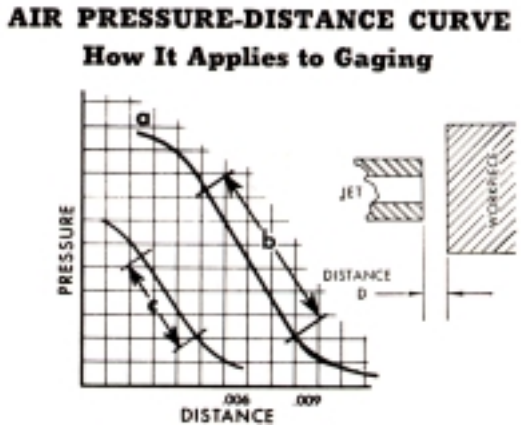


Zero Setting - Simple and Stable

With the Dimensionair's balanced system, setting zero is entirely independent of the measuring and magnifying functions of the gage. Magnification is fixed and cannot be affected by the setting up process.

To set up the gage, a master is placed on the measuring head (thus restricting the air flow). The zero setting valve is then adjusted to equalize the air pressure in the two channels. When this condition exists, the dial reads zero. No further adjustment is necessary. Any deviation in the size of the-work piece from the master size will change the pressure in the measuring leg and produce a change in meter reading.

AIR PRESSURE-DISTANCE CURVE - How It Applies to Gaging.



The relationship between air pressure and distance "**D**" of a restriction (work piece) to the air escape (jets) can be plotted on a graph (as shown above). As the distance between jets and work surface increases, pressure decreases and the ratio becomes linear as represented by the straight section "**b**".

This straight portion of the curve can be accurately calibrated and represents dimensional changes. Compare its length with "**C**" on the other curve, which is the usable portion of other air gage scales. This longer linear scale gives the Dimensionair® its longer usable measuring range.

Note: The Dimensionair® scale is displaced further to the right. This provides more initial clearance between air plug and work piece surface for easier gaging.

Installation

Supplying Air

To be certain of establishing proper conditions for Operation of the Dimensionair®, follow one of the suggested piping arrangements shown in Figure 1 and install some kind of Trap ahead of the Filter, preferably Mahr Federal Model AFL-24 Oil and Water Separator Trap which has been designed for use with the Dimensionair® and is available as accessory equipment.

Dimensionair ® Shown with Master Ring & Plug

RECOMMENDED PIPING INSTALLATION

GOOD GAGING PRACTICE STARTS WITH A CLEAN AIR LINE

These piping arrangements suggest "preferred" and "acceptable" layouts to suit your facilities. Both are extremely simple to set up and very effective in overcoming the problem of dirt, oil and water affecting air gage operation.

In general these arrangements show that all air outlets should be taken off the top side of all piping. The Air Gaging Unit, Filter and Separator Trap (recommended as accessory equipment) should be located above the point of take off from the riser. This arrangement provides every opportunity for oil and water to drain back away from the gage.

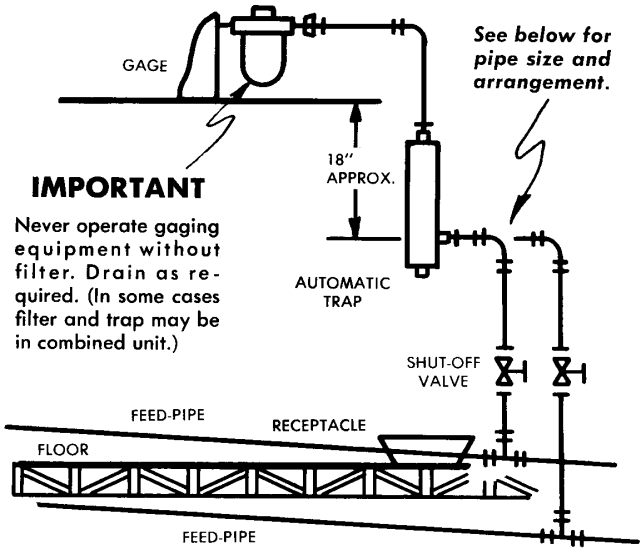
AIR REQUIREMENTS

For 1, 2 or 3 jet applications only:

MODEL	PRESSURE	VOLUME (per meter)
D-1250	40-150 psig.	2¼ scfm.
D-2500	"	1¼ scfm.
D-5000	"	"
D-10000	"	less than 1 scfm.
D-20000	"	"

NOTE: For multiple Dimensionairs, add — to the minimum pressure listed above — 5 psig. for each additional meter. Additional meters require additional volume (as listed above); however do not exceed 6½ scfm. per Pressure Regulator or Regulator-Filter unit.

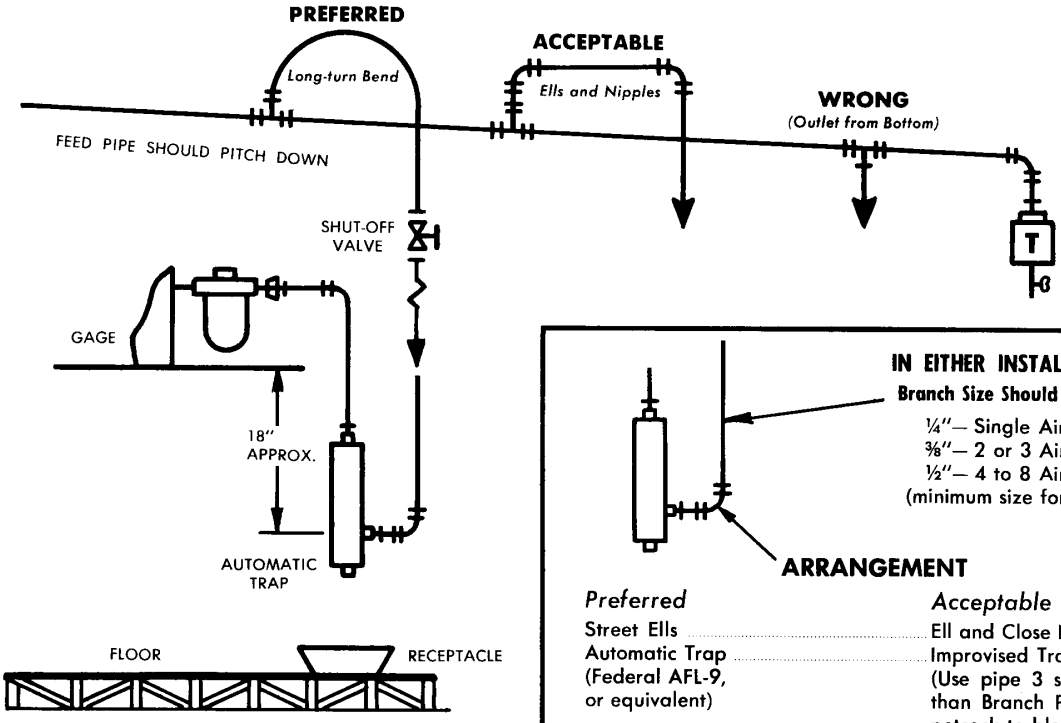
USE THIS ARRANGEMENT IF AIR IS SUPPLIED FROM FLOOR LEVEL OR CEILING BENEATH



IMPORTANT

Never operate gaging equipment without filter. Drain as required. (In some cases filter and trap may be in combined unit.)

USE THIS ARRANGEMENT IF AIR IS SUPPLIED FROM OVERHEAD



IN EITHER INSTALLATION . . .

Branch Size Should Be At Least

¼"— Single Air Meters
⅜"— 2 or 3 Air Meters
½"— 4 to 8 Air Meters
(minimum size for 40 psig.)

ARRANGEMENT

Preferred	*Acceptable*
Street Ells	Ell and Close Nipple
Automatic Trap (Federal AFL-9, or equivalent)	Improvised Trap (Use pipe 3 sizes larger than Branch Pipe. Allow petcock to bleed slightly)

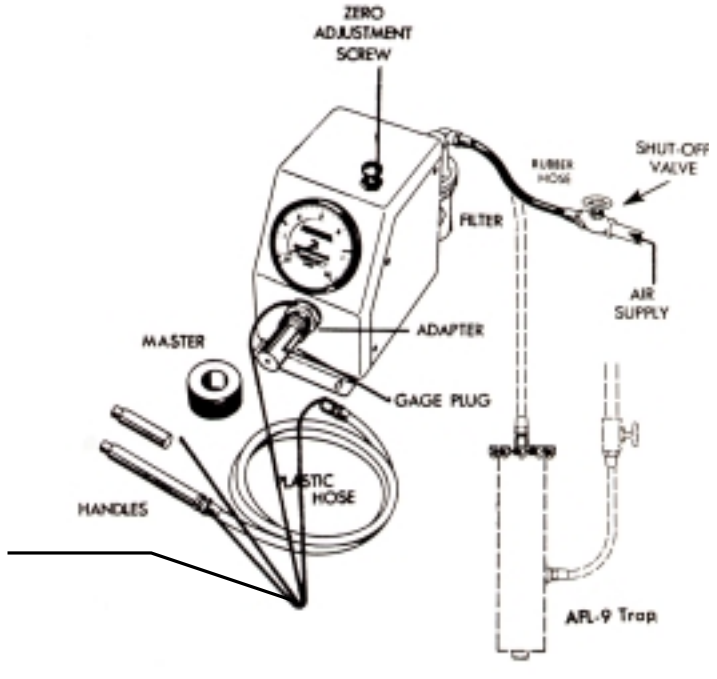
Figure 1 Choose a Suitable Piping Arrangement

Operation

Setting Up

IMPORTANT:
High reliability and performance can be expected from this air gage **IF** clean air is provided. The filter furnished can take care of reasonable amounts of foreign matter but it cannot be expected to handle the exceptional amounts of dirt, oil and water found in many air lines. Again, it is highly recommended that one of the "piping arrangements suggested in Figure 1 be used to supply air to the Dimensionair®.

To Connect the Gage



Please Note:
An "O" ring is required in each of these connections. **Be sure they are always in place.**

Figure 2 Major Components of the Dimensionair® System

1. Connect the gage to any air supply line carrying between 45 and 150 psi.
2. Attach the rubber hose (AHO-2) to the air supply and turn on the air to blow out any foreign matter from the hose. Be sure to turn off the air before proceeding to next step.
3. Remove cap from the fitting on the back of the filter and attach rubber gage hose to fitting. **Be sure you have** completed Step 2 and the hose is clean and free of foreign matter.
4. Check the adapter on the front of the Dimensionair® to be sure it is tight. If its loose, turn the knurled ring until finger-tight.
5. **BENCH USE**
   Check to be sure there is an “O” Ring in the gage plug or fixture. Screw plug or fixture onto the adapter. Do Not Over-Tighten, finger-tight is sufficient.
6. **PORTABLE PLUG USE**
   Check to be sure there is an “0” Ring in the plug, hose and handle. Screw one end of the plastic hose to the adapter. Screw long black plug Handle to plastic hose. (Handle can be made into any desired length by adding short extensions or additional Handles). Screw gage Plug onto Handle and set gage.
7. It is good practice to replace cap on air inlet on filter when moving the Dimensionair® from one job to another.

To Set the Gage

1. Turn on the air.
2. Put Master on gage plug (or in gage ring), over jets. Note: Only one master is required because gage measures directly just the same as a Dial Indicator. The value of each graduation varies according to model:

Magnification	Graduation Value
1250:1	.0001”
2500:1	.00005"
5000:1	.00002”
10,000:1	.000010”
20,000:1	.000005”

3. Turn “Zero Adjustment" screw (Shown in Fig. 2) and bring the hand to zero setting.
4. Set Tolerance Hands to suit work piece tolerances. Note: rotate outer bezel and use its tolerance hand to set the Inner tolerance hand. Rotate bezel in opposite direction to set outer tolerance hand.

Gaging the Work Piece

Using the Dimensionair® is simple and very little instruction is necessary in order to obtain dimensional values. However, as with any fine instrument, there are certain practices which have been found, through experience, to substantially increase the gage and operator's effectiveness.

Guidelines for Good Gaging

The following guidelines should be used to insure continued accuracy and stability:

1. MASTER THE GAGE UNDER THE SAME CONDITIONS THAT WILL PREVAIL WHEN GAGING THE WORK

The operating pressure of the Dimensionair is sufficiently high to permit gaging parts that are covered with coolant, oil, or water; dirty or clean, provided it is in the fluid state. When checking such parts, however, you will obtain greater accuracy by putting the same material on the master when setting or checking the gage.

Differences in temperature between the master and the workpiece is likely to affect gaging accuracy. In the interest of best results, the master should be brought to approximately the same temperature as the work before it is used.

2. KEEP THE DIMENSIONAIR® GAGING HEAD JETS CLEAN

While they are normally not affected by the presence of most liquids or by loose particles of dirt, they can be affected by finger smears, grease, slushing compound, paint, coagulated oil, etc. Gaging plugs, rings, AirProbes, etc. should be kept clean of such deposits so that - jets do not become clogged. Jets can be cleaned with solvents. **DO NOT USE ANY HARD MATERIAL TO UNCLOG JETS; IT IS SURE TO DAMAGE THE PRECISION JETS.**

3. ROTATE A BENCH-MOUNTED PLUG TO MINIMIZE PLUG WEAR

While Dimensionair® plugs will withstand considerable wear because gaging jets are recessed, rotating the position of the plug 180° from time to time doubles the surface exposed to wear and, therefore, greatly prolongs plug life. Refer to Figure 3, shown below:

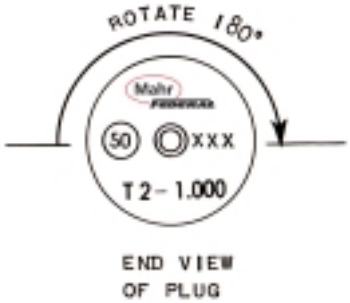


Figure 3 Rotate 180°

Applying Swivel Fittings

Modification of AHO-1 Hose

If the length of the AHO-1 Hose Assembly needs to be modified or when constructing new or custom hose assemblies from lengths of plastic tubing and separate fittings, use the following procedure.

Step 1

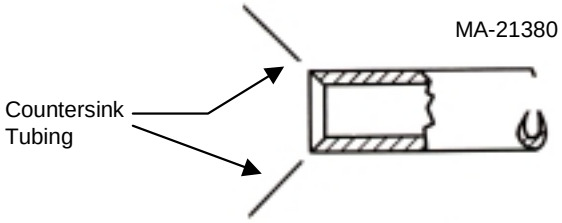


Figure 4 Countersink Tubing

Step 2

Screw the tubing into the Adapter AAD-7

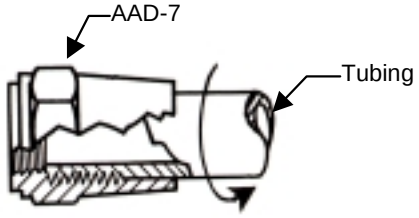


Figure 5 Assemble Tubing to Adapter

Step 3

Male Swivel Fitting

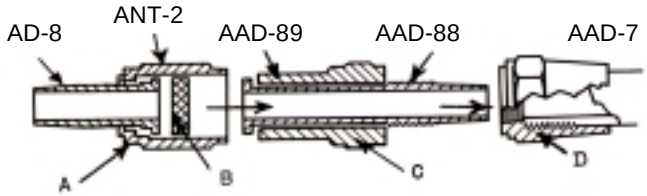


Figure 6a Male Swivel Fitting

Use Female fitting (A) and a .325" dia. X 1/4" disc (B) as tools to lock swivel of male fitting (C) so fitting can be screwed into Adapter (D).

Tighten snug, then back off slightly so fitting will be able to swivel. Remove female fitting and disc.

Female Swivel Fitting

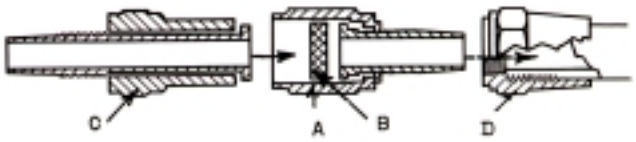


Figure 6b Female Swivel Fitting

Use Male fitting (C) and a .325" dia. X 1/4" disc (B) as tools to lock swivel of female fitting (A) so fitting can be screwed into Adapter (D).

Tighten snug, then back off slightly so fitting will be able to swivel. Remove male fitting and disc.

Step 4

Using a # 13 or 14 drill, ream I.D. of tubing to clear ragged edges. Blow out, insert "Oil Ring".

Notes:

Preventive Maintenance

Overview

The one requisite for long, trouble-free operation of the Dimensionair® is clean, dry air.

The fact that the Dimensionair® system is extremely tolerant of dirt, oil, and other foreign matter is no license to permit inadequate protection against a dirty air line. Most oil and moisture contains contaminants which deposit as a solid residue and, in a matter of time, build up to the point where gage operation is impaired. Therefore, preventative maintenance should not be overlooked, particularly since its demands in connection with the Dimensionair® are so small.

If installation is made according to instructions and suggestions in this manual and a Trap (preferably Mahr Federal type AFL-24) is included, no moisture or dirt will reach the gage for a period of time, even under adverse conditions.

Procedure

To keep the gage free of moisture and dirt, it is necessary to inspect regularly and:

1. Drain Filter before sediment reaches the level of the baffle.
2. Clean the Filter Cartridge when sediment has started to discolor it. Instructions, Page 16.
3. Replace the Filter Cartridge when cleaning efforts do not clear it of foreign matter.
4. Clean the Separator-Trap Cartridge when visible portion has become discolored from sediment. (Mahr Federal Trap AFL-24 is self-emptying. Instructions, Page 15.
5. Replace Trap Cartridge when cleaning does not remove at least half of material imbedded in visible portion.

(Procedure continued)

6. As a matter of routine, check tightness of air connections and clean gaging head at beginning of each days work.

If such a schedule is adhered to, the chances of having trouble are virtually non-existent. It's as simple as that!

It is difficult to say how often inspection should be made since it depends entirely on the quality of the air being supplied. This quality varies considerably from plant to plant and sometimes from location to location within the same plant. Initially, the inspections should be frequent, but can be relaxed when confident that the quality of the air being supplied is clean and dry.

Corrective Maintenance

Overview

When trouble does occur, it is usually evidenced by the gage's lack of ability to repeat readings accurately. (Any Dimensionair® should, when checked, repeat readings within 1/5 of a dial division or better.) Lack of repeat is sometimes known as "unstable zero',. The indicating hand on the main dial may respond sluggishly and erratically, it may flicker, or it may shift position after presumably having come to rest. These conditions are invariably caused by dirt or moisture or both having become lodged somewhere in the gage, obstructing the normal flow of air.

The step-by-step procedure outlined below provides the quickest way of properly restoring the Dimensionair® to normal operation. Since it applies corrective action to the more likely causes first, it is probable that you will restore normal operation after only a portion of the procedure has been completed.

Regulator Replacement

If corrective measures, outlined in the following instructions, do not restore the regulator to normal operation, any further repairs should be made ***only*** at the factory. Your Mahr Federal representative can arrange to provide you with an exchange replacement quickly and at a nominal cost.

Meter Overhaul or Replacement

The meter is well isolated from entry of dirt or moisture. In the exceptional case, however, foreign matter may become lodged in the meter.

It can be repaired by following the OVERHAUL INSTRUCTIONS on Page 21, provided qualified personnel are available, or an exchange replacement may be obtained at nominal cost from your Mahr Federal representative.

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Detailed Instructions

AFL-24 Oil & Water Separator/Trap

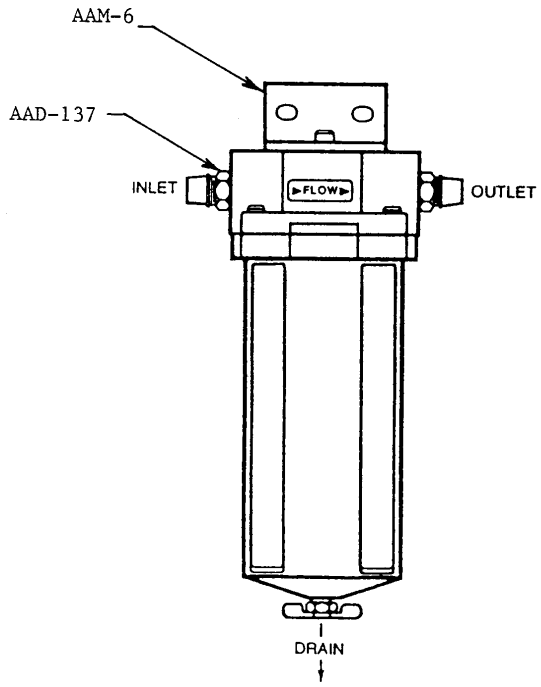

Figure 7 AFL-24 Oil & Water Separator/Trap

WHEN TO CLEAN

When exterior of cartridge has become discolored from sediment. The trap can be emptied manually by turning drain valve at bottom of trap.

WHEN TO REPLACE CARTRIDGE

When attempts to clean cartridge do not remove at least half of the material embedded in the visible portion.

Instructions

1. After shutting off air, pull down on locking tab, then twist bowl.
2. Remove bowl.
3. Unscrew plastic cartridge holding nut .
4. Replace AFL-23 filter cartridge.
5. Re-assemble trap and connect to line.

AFL-10 R-2 Air Filter

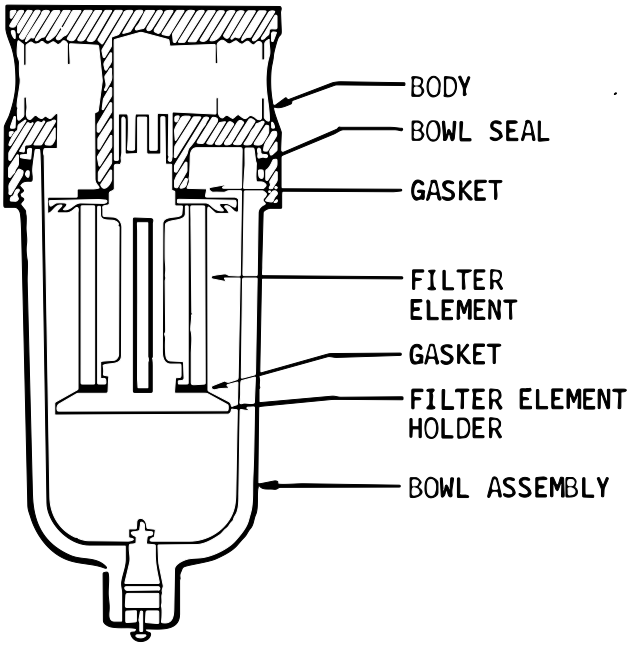

Figure 8 AFL-10 R-2 Air Filter

WHEN TO DRAIN FILTER

Always drain Filter before liquid or sediment reaches baffle.

WHEN TO CLEAN

Clean Filter whenever a visible coating of dirt or condensation accumulates on the filter element.

Instructions

1. With air off, unscrew nut at bottom of Bowl and remove Bowl.
2. Gripping Baffle, unscrew it and remove Filter Element, AFL - 21.
3. Wash Filter Element in any cleaning solvent and blow out with compressed air or replace.
4. Wash Bowl in any petroleum solvent.
5. Re-assemble components, making sure gasket is in place.

Air Pressure Regulator

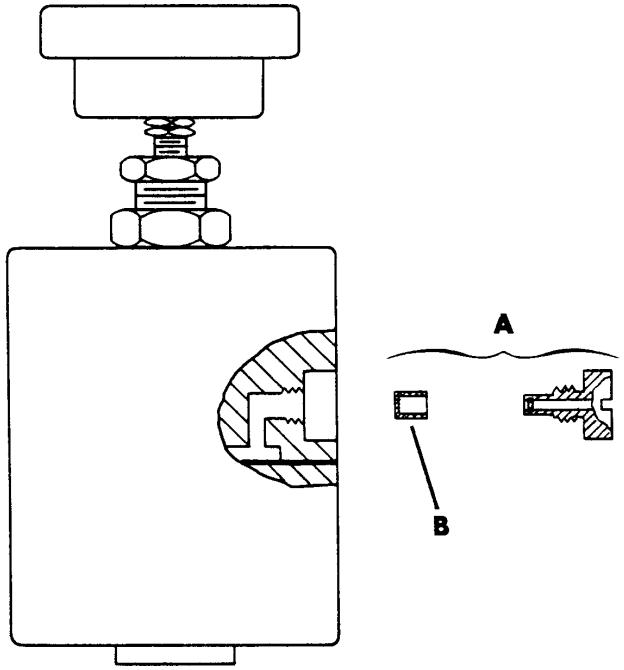

Figure 9 Air Pressure Regulator

Before using, the pressure setting must be verified using a suitable, accurate pressure meter. Calibration should also be verified using a Mahr Federal AMR Magnification Kit. (sold separately). Please refer to Appendix A, Calibration Table.

1. After Dimensionair® housing has been removed, unscrew the Bleed Screw Assembly (A) with an offset screwdriver.
2. Clean the small orifice in the tip of the Bleed Screw with solvent and blow it dry with compressed air. Clean the screen (B) in the same manner.
3. Re-assemble Bleed Screw and screen. Tighten securely.
4. If, after testing, the Regulator still does not operate properly, **D0 NOT ATTEMPT ANY FURTHER REPAIRS ON REGULATOR.**
   See Regulator Replacement, Page 13.

Zero Adjustment 2237582

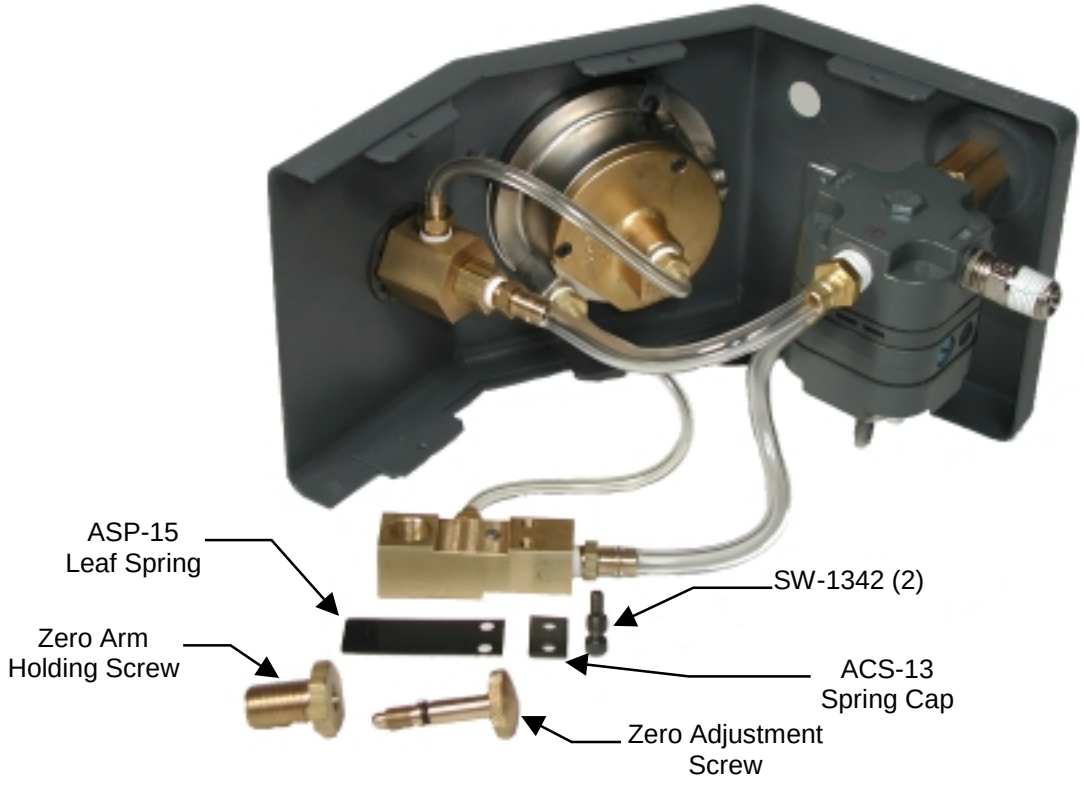

Figure 10 Zero Adjustment

Instructions

1. With Zero Adjustment Assembly in place, remove Adjustment Screw.
2. Using 3/4 " open end wrench remove Zero Arm Holding Screw.
3. Move Zero Adjustment Assembly for easy access to hex screws. (see photo)
4. Using 9/64" hex wrench, remove two cap screws SW-1342. Remove Spring Cap ACS-13 and Leaf Spring ASP-15. To prevent Leaf Spring ASP-15 from becoming set in one position, reverse it when reassembling Zero Adjustment.
5. Carefully clean exposed jet with solvent.
6. Blow out with compressed air.
7. Re-assemble.

Before using, the pressure setting must be verified using a suitable, accurate pressure meter. Calibration should also be verified using a Mahr Federal AMR Magnification Kit. (sold separately). Please refer to Appendix A, Calibration Table.

Master Jet: Equalizing Jet Tubing

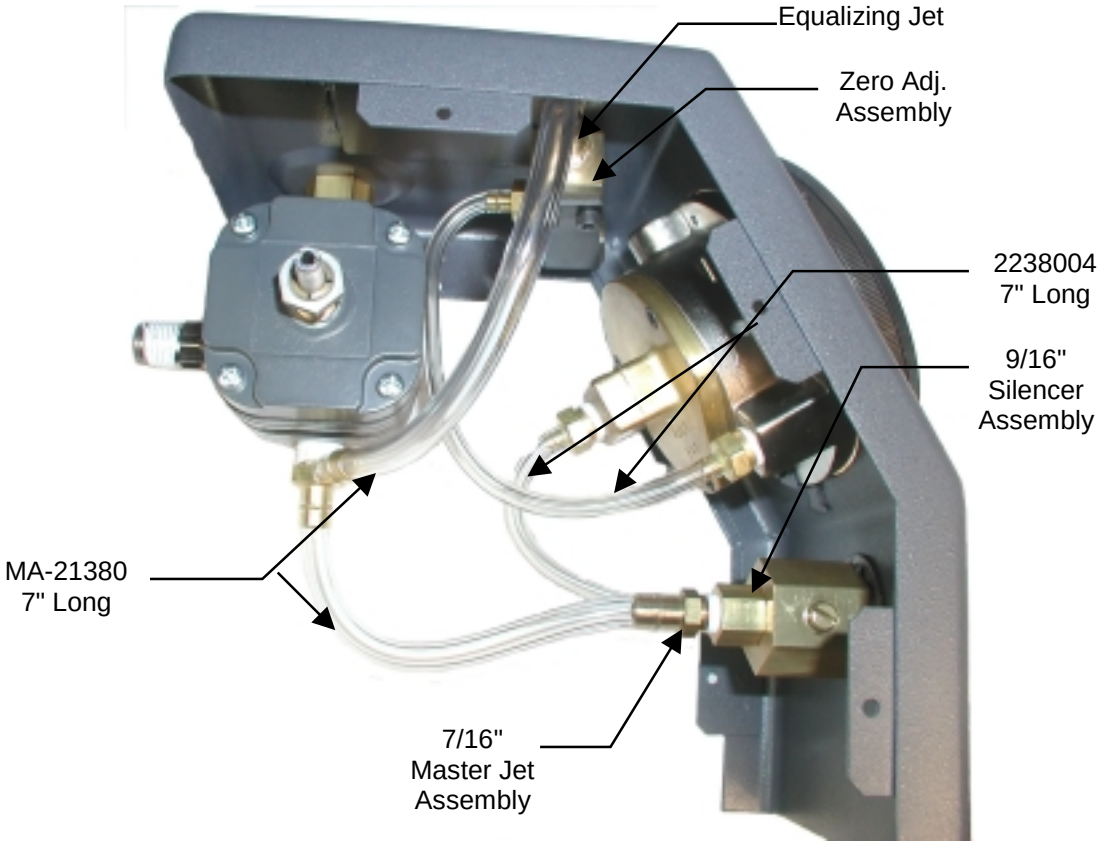

Figure 11 Master Jet: Equalizing Jet tubing

Before using, the pressure setting must be verified using a suitable, accurate pressure meter. Calibration should also be verified using a Mahr Federal AMR Magnification Kit. (sold separately). Please refer to Appendix A, Calibration Table.

1. Remove Zero Adjustment Assembly (see previous page)
2. Remove all hoses.
3. Using 9/16” open-end wrench remove Silencer Assembly.
4. Place Silencer/Master jet assembly into vise clamping on the 9/16” Silencer.
5. Using 7/16” open-end wrench, remove Master Jet Fitting and Equalizing Jet Fitting.
6. Re-assemble all parts in proper order.
7. Replace jet fittings using thin film of Hercules pipe compound on male threads only. Do not allow compound to get into jets. Be sure each jet is in proper place.
   See illustration, Page 18

- *Master Jet in a 20/50 Dimensionair is a barb fitting with a Red dot.*
- *Master Jet in a 10/5 Dimensionair is a barb fitting with a Blue dot.*
- *Master Jet in a 100 Dimensionair is a barb fitting with a Green dot.*
- *Equalizing Jet is an barb fitting with an Orange dot.*

- *Master Jet in a 20/50 6-Jet Dimensionair is a barb fitting with a Purple dot.*
- *Master Jet in a 10/5 4-Jet Dimensionair is a barb fitting with a Brown dot.*
- *Equalizing Jet in Matched Dimensionairs is a barb fitting with a Black dot.*

Tubing

8. Replace all flexible Tubing.
9. Reconnect tubing and Filter AFL-10 R-2.
10. Using small brush, apply detergent solution over joints. Apply air and block escape through gaging plug adapter.
11. If leaks are present, bubbles will form. Tighten joints until bubbling ceases. When joints are tight enough, wipe detergent solution from tubing.

Overhaul Instructions

Differential Pressure Meter

The following operations should be performed only by an experienced meter repairman and only if all other recommended steps to restore normal operation have failed. (See procedures, Pages 15-20.)

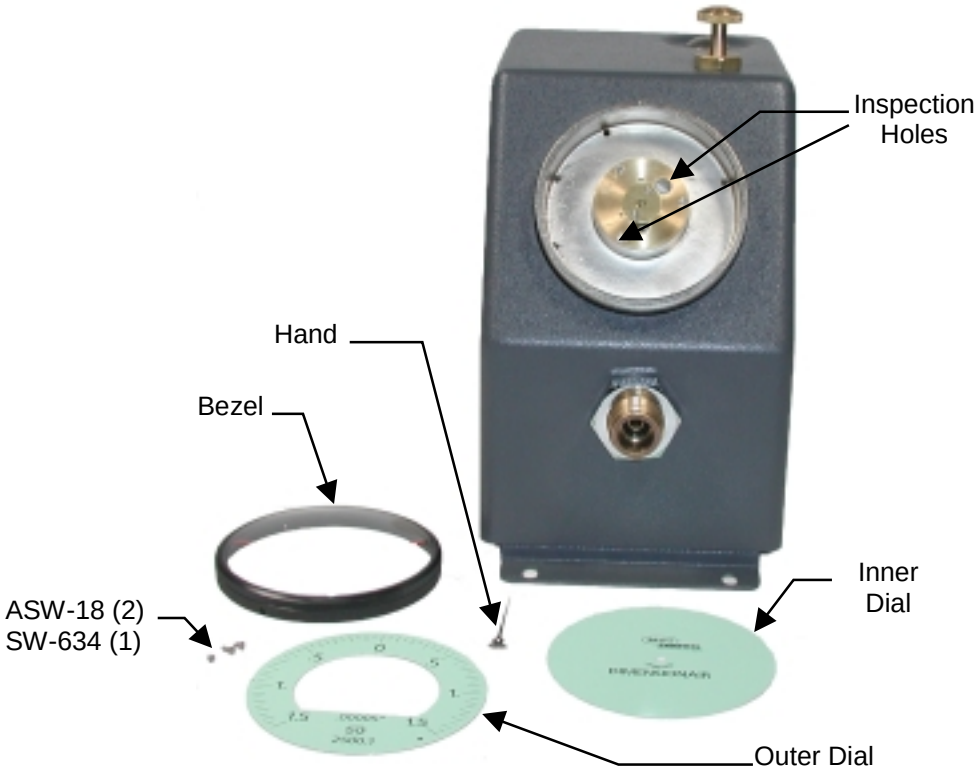

Figure 12 Differential Pressure Meter

Removal

1. With air pressure on and no gaging head connected to gage, remove meter bezel by taking out two short bezel screws ASW-18 and one bezel lock screw SW-634.
2. Remove outer dial (ring dial). Locating pin should remain in case.
3. Note and mark rest position of indicating hand on inner dial.

4. Disconnect air supply from filter.
5. Remove indicating hand using a hand puller.
6. Remove inner dial.
7. Remove three screws SW-155 using jewelers screwdriver. Lift meter movement from meter housing.
8. Dip movement in solvent and, using a LOW VELOCITY stream of air, blow dry. DO NOT use high velocity air, it may damage hair spring. DO NOT attempt to adjust or disassemble movement.
9. If gage is not already disassembled, remove all hoses.
10. Remove meter housing from Dimensionair® housing by removing three screws SW-67.

Contact any Mahr Federal office for information on the Dimensionair® Reconditioning and Replacement Plan

Disassembly & Cleaning

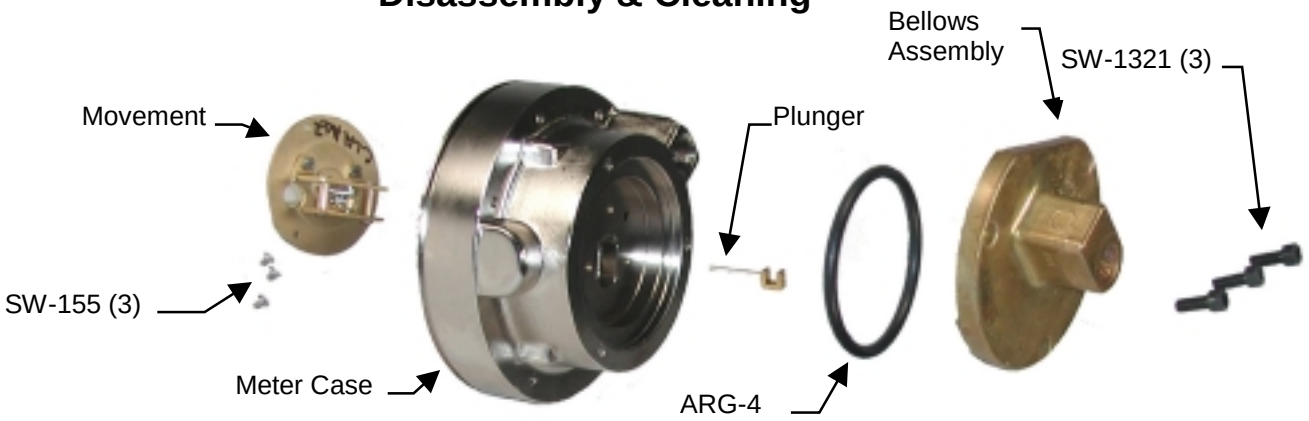

Figure 13 Meter Assembly (Components)

Please Note: Movement, Meter, Case, Plunger, Bellows Assembly, and Master Jet are <u>NOT INTERCHANGEABLE</u> with those of other Meters.

1. Place Meter face down, protecting the dial PIN locating pin as shown in illustration below.

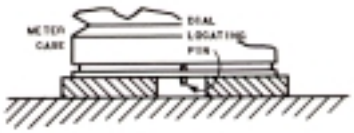

Figure 14 Dial Locating Pin Reference

2. With a 7/64” hex wrench, remove three screws SW-1321.
3. Remove Bellows assembly, "O” Ring ARG-4, and Plunger. Bellows must be lifted carefully and not allowed to drop back once disassembly has begun or jeweled bearing may become damaged.
4. Clean oil and dirt from all parts by dipping in solvent and blowing dry.

Reassembly

1. Replace 2”, diameter "O” Ring ARG-4.
2. Replace bellows and plunger assembly in meter by either one of two methods described below.

IMPORTANT: This operation should be performed with great care. All parts should enter freely, nothing should be forced. Sapphire jewels are extremely hard and, therefore, brittle and easily damaged.

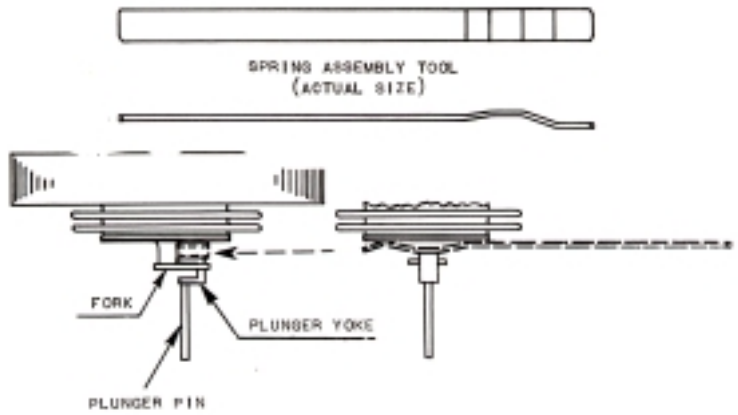

Figure 15 Method A

Method A

Using Spring Assembly Tool (above), secure plunger to bellows assembly by seating the Tool between the plunger yoke and the bellows (see above). This keeps the plunger in position while the bellows assembly is lowered. After the plunger enters top jewel, remove Tool and continue to lower the bellows assembly carefully. Several tries may be necessary before the plunger locates and enters bottom jewel.

Figure 16 Method B

Method B

If a Spring Assembly Tool is not used, position the bellows assembly as shown in the picture above and use tweezers to hold the plunger at the edge

of the hole in top jewel. Slide the bellows assembly over the dowel pins and lower gently until the plunger yoke can be hooked onto the fork. Keep the plunger in contact with hole in top jewel. Continue to lower the bellows assembly until the plunger locates and enters bottom jewel.

3. Replace three screws SW-1321. Remove dowel pins.
4. Place meter back in Dimensionair® housing, securing it with Screws SW-67. Movement of Meter should not be put back in place until rest of gage is reassembled.

IMPORTANT:

When reassembling components:

1. Make sure Master and Equalizing Jets are in correct place, see page 14.
2. Follow instructions regarding use of pipe compound on fittings, see page 15.
3. Test for leaks in all fittings of jets and tubing, see pages 15 and 16.

All components of gage should now be in place except for Meter Movement, outer and inner dials, indicating hand and bezel.

5. Place Movement back in Meter, securing it with three screws, SW-155, after it has been oriented so that the two inspection holes in the movement plate are in "the Two and Seven o'clock" positions, as shown below in Figure 17.

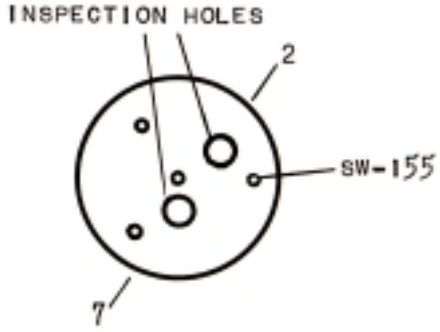

Figure 17 Inspection Holes

Before using, the pressure setting must be verified using a suitable, accurate pressure meter. Calibration should also be verified using a Mahr Federal AMR Magnification Kit. (sold separately). Please refer to Appendix A, Calibration Table.

6. Replace inner dial. Small slot at top of dial should engage locating pin.
7. With air turned ON and with no gaging member on the gage, place Indicating Hand on pinion with point on mark previously made.
8. Replace outer (ring) dial with small slot engaging locating pin.
9. Install Bezel using the two short screws, ASW-18,, and the longer Bezel Lock Screw, SW-634, which should engage hole in Meter housing.

Appendix A

Calibration Table

The following table illustrates the Mahr Federal Calibration Kits available and the optimum pressure setting for each magnification.

Magnification	Pressure	AMR Kit
1250:1	30.4 PSI	AMR-Spec-136
2500:1	30.4 PSI	AMR-12
5000:1	30.4 PSI	AMR-13
10000:1	30.4 PSI	AMR-14
20000:1	30.4 PSI	AMR-15