Membrane Filter Tester
Instruction Manual

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SECTION 1
DESCRIPTION

Much information about an injection water can be determined from membrane filtration tests. These tests are most valuable when investigating to determine plugging tendencies of an injection sample and in the identification of the solids on the filter which causes plugging of the formation.

Membrane filter tests can be used to pinpoint the exact sources of trouble within a system.

Once the problem has been alleviated, a membrane filter can be used for verification purposes.

If the problem cannot be resolved by mechanical means, chemical treatment will be necessary. The membrane filter can be used to determine the effectiveness of the chemical treatment employed.

Routine filtration tests can be performed to avert a problem in an injection system which might go undetected until the problem became so severe that it would become necessary to shut down the injection program.

Membrane filtration tests are of use in determining impurities and un-dissolved salts in Brine solutions.

SECTION 2
SAFETY

Safe operation of the Membrane Filter Tester requires that the personnel doing the tests be familiar with the proper operation and potential hazards associated with pressurized equipment. Pressurizing the water reservoir poses the potential hazards of the reservoir or associated pressurization equipment leaking and releasing sample or pressurizing gas which could cause serious injury. Several precautions that should be observed are listed below:

1. Always use Nitrogen, Carbon Dioxide, or compressed air. Never connect the Membrane Filter Tester to Oxygen, Natural Gas, or any other non-recommended or flammable gas.

   Carbon Dioxide is supplied in small cartridges which contain about 900 psig (6206 kPa) pressure. They are primarily used for field operations. Do not allow these cartridges to be heated or exposed to fire. They can explode if overheated.

   Nitrogen is supplied from various sizes cylinders usually at high pressure. It must be supplied in an approved Nitrogen gas cylinder using a Nitrogen regulator. Nitrogen Cylinders must be secured and meet all safely standards.

   If compressed air is used, its maximum pressure should not exceed 150 psig (1035 kPa). A regulator equipped with an inlet trash filter must be used to reduce the pressure to 20 psig (139 kPa) maximum.

2. Maintain pressure regulators in good condition. Never use oil on pressure regulators. Leaking pressurization systems should be repaired or replaced. Refer to REGULATOR REPAIR Section 6-C.

   Periodically test the safety relief valve mounted on the top cover of the reservoir to verify it will relieve if 25 psig (173 kPa) or higher pressure should occur. Never plug or bypass this safety valve.

3. When preparing to pressurize the Reservoir always make sure the regulator is closed (Tee screw backed all the way out, counterclockwise). Do not attempt to pressurize higher than 20 psig (139 kPa).

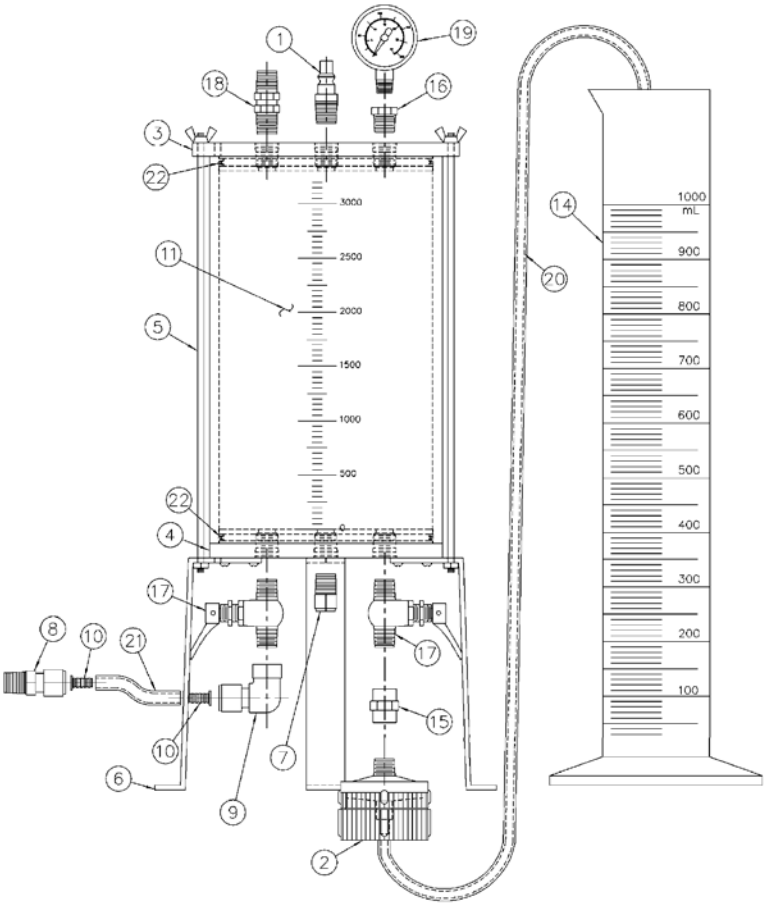

Fig.1

Membrane Filter Tester
Reservoir Assembly

PRESSURIZATION SYSTEMS

A. CO_2 System (Refer to Fig. 2)

A CO_2 pressurizing system is normally used with the Membrane Filter Tester for field tests. It attaches to the top of the reservoir with a Quick Coupler, and consists of the following:

1	CO_2 Cartridge
2	Barrel for CO_2 Cartridges
3	Adapter Head for CO_2 Cartridges
4	Felt Filter for Regulator
5	Bleeder Valve
6	Valve, Needle, 1/4 mnpt x 1/4 mnpt
7	Speed Coupler, Female
8	Regulator, for CO_2 Pressurizing Unit
9	Coupling, 1/4 pipe Chrome Plated
10	Plug, Pipe 1/8 NPT

B. Nitrogen System (Refer to Fig. 3)

A Nitrogen system may be more suited for pressurizing the Membrane Filter Tester when running the tests at a more permanent location. This assembly can be connected to either a small, or a standard Nitrogen cylinder. It consists of the following:

1	Air Hose, 3 foot
2	Nipple, 1/4 NPT x Eastman
3	Nitrogen Regulator Assembly with gauges
4	Bleeder Valve
5	Speed Coupler, Female

C. The reservoir can be pressurized from any air source that can provide 20 psig (139 kPa) pressure. Connection can be made by using a quick coupler as supplied in systems A and B above, or

by removing the male quick coupler in the reservoir top and replacing it with a suitable fitting having a 1/4 inch pipe thread on one end.

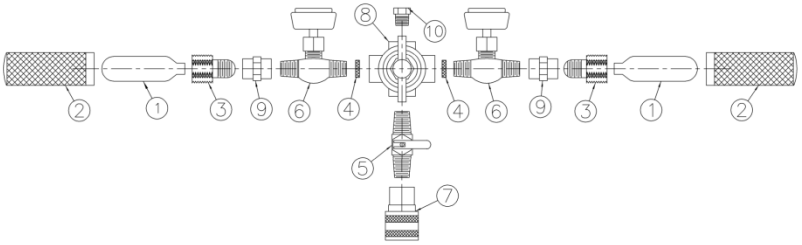

Fig. 2

Carbon Dioxide Pressurizing Unit

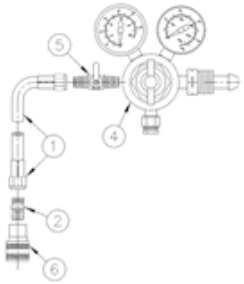

Fig. 3

Nitrogen Pressurizing Unit

SECTION 4
OPERATION

A. Check the reservoir to make sure it is clean. If the top has been removed, re-assemble it onto the reservoir and tighten the wing nuts.

B. 1. Unscrew the lower portion of the Membrane filter holder [2, Fig.1] and attach the 1/4 inch tubing [20, Fig.1] to the stem of it.

2. Make sure the filter "O" Ring [12 in Fig. 4] is in place then insert the membrane filter, [23 in Fig. 4],

3. Re-assemble the lower portion of the filter holder [2, Fig.4]. Make sure "O" Ring [13 in Fig.4], is in place on the lower portion of the filter, [2 of Fig. 4],

4. Tighten the filter holder lower portion 1/4 turn.

C. Fill the reservoir with the sample to be tested.

1. To fill the reservoir from the system to be sampled, connect the 3/8 inch tubing fitting [8, Fig.1] and attached to toggle valve [17, Fig. 1] under the reservoir to the system to be sampled, then open this toggle valve. Fill the reservoir to within 1/2 inch (1.27 cm) of the top.

2. To fill the reservoir without connection to a system, loosen the three wing nuts then disengage the retainer rods and remove the top.
Close both toggle valves [17] on the bottom of the reservoir. Pour the test sample into the reservoir to within 1/2 inch (1.27 cm) of the top. Re-assemble the top onto the reservoir and tighten the wing nuts.

D. Purge the membrane filter system of air

1. Lay the reservoir on its side with the membrane filter holder as high as possible.

2. Open the toggle valve [17, Fig. 1] between the membrane filter holder [2, Fig. 1] and the bottom of the reservoir to bleed all the air possible from the filter holder.

3. Close valve [17], right the reservoir and tighten the filter holder [2] until snug.

4. Open the toggle valve [17] again and allow the 1/4 inch (6mm) tubing [20, Fig 1] connected to the bottom of the membrane filter holder to fill with sample, then close the valve.

5. Position the free end of this tubing in the top of the 1000 ml graduate [14, Fig. 1].

E. Connect the pressurizing source to be used to the top of the reservoir.

1. If the carbon dioxide pressurizing system is being used (Refer to Fig.2), make sure both of the shut off valves [6] on the manifold are closed, and that the regulator [8] adjustment Tee screw is backed off, (turned counterclockwise) until it turns freely. Insert one CO_2 cartridge [1] into each barrel [2] on the regulator assembly and tighten sufficiently to puncture the cartridges.

2. If the Nitrogen pressurizing system is being used (Refer to Fig. 3). Make sure the regulator assembly [4] is properly connected to the Nitrogen cylinder [3] and that the regulator adjustment Tee screw is backed off, (turned counterclockwise) until it turns freely.

F. Apply 20 psig (139 kPa) of pressure to the reservoir.

1. If the CO_2 pressure manifold is being used (Fig.2), open both shut off valves [6] slowly, then adjust the pressure regulator [8] by turning the Tee screw clockwise until the pressure on the reservoir reaches 20 psig (139 kPa). This pressure should be maintained during filtration. If the pressure exceeds 20 psig (139 kPa), momentarily open the bleeder valve until the pressure drops to 20 psig 139 kPa). Readjust the pressure regulator.

2. If the Nitrogen pressure manifold is being used (Fig. 3), connect hose [1] to the bleed valve [5] on one end and onto the adapters [2] and [6] on the other end. Connect quick coupler [6] onto the male quick coupler fitting on the top of the cylinder. Open the cylinder valve slowly until cylinder pressure is observed on the high pressure (Right hand) gauge. Adjust the pressure regulator by turning the Tee screw clockwise until the pressure on the low pressure gauge (Left hand gauge) and on the reservoir gauge reaches 20 psig (139 kPa). This pressure should be maintained during filtration. If the pressure exceeds 20 psig (139 kPa), momentarily open the bleeder valve on the Nitrogen manifold until the pressure drops to 20 psig (139 kPa). Readjust the pressure regulator.

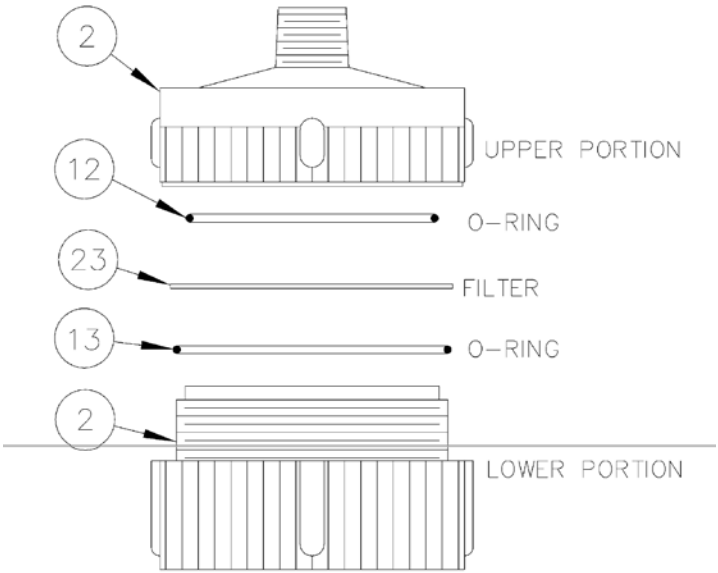

Fig. 4

Membrane Filter Assembly

SECTION 5
TESTS AND RESULTS

A Verify the 1/4 inch tubing [20, Fig. 1] is in the 1000 ml graduated cylinder [14 Fig. 1], and is filled with fluid. Open the toggle valve [17] above the filter holder [2] and at the same time start the stop watch.

B. Time and record the number of seconds for a given volume of through-put (for example 100 ml). Do not stop the Stop Watch at this time. Continue to time and record like volumes of through-put. In the example the second number of seconds recorded would be for a total of 200 ml. Continue as desired or until the 1000 ml graduated Cylinder is full.

C. An example of a data sheet is shown below:

{PRIVATE }MEMBRANE FILTER DATA SHEET 1000 ml					
Cumulative Volume, ml (X)	100 ml	200 ml	300 ml	400 ml	500 ml
Cumulative Time, Seconds					
Flow Rate, ml/second (Y)					
Cumulative Volume, ml (X)	600 ml	700 ml	800 ml	900 ml	1000 ml
Cumulative Time, Seconds					
Flow Rate, ml/second (Y)					

D. The data accumulated from a membrane filtration test can be plotted to compare the plugging tendency of one source water with another or when comparing co-mingled source water and formation water. This is done by plotting the flow rate, ml/sec, on the (Y) axis vs. the cumulative volume, ml, on the (X) axis.

SECTION 6
CLEANING AND MAINTENANCE

A. Disassembly

1. Close the toggle valve [17, Fig. 1] above the filter holder [2, Fig.1].

2. If the CO_2 pressurization system is being used, close the two needle valves [6, Fig. 2]. This will retain the CO_2 charge left in the Cartridges for the next test.

3. Back off (turn counterclockwise until free) the adjustment screw on the CO_2 regulator [8, Fig. 2] or for the Nitrogen regulator, [4, Fig. 3].

4. If air pressure is being used, back off (turn counterclockwise until free) the adjustment screw on the air regulator.

5. Open the bleeder valve [5, Fig. 2 or Fig.3] on the pressurization manifold being used or the bleeder valve on the air system, (if used) and bleed off the pressure in the reservoir.

6. Disconnect the quick disconnect [7, Fig. 2 or 6, Fig.3], or the connection to the air system (if used), then remove the pressurizing assembly.

7. Open Valve [17, Fig.1] attached to [9 Fig. 1]. and drain any sample left in the cylinder.

8. Unscrew the lower portion of the Membrane filter holder [2, Fig. 4] with the 1/4 inch tubing attached to it.

9. Carefully remove the membrane filter [23, Fig. 4] from the filter holder. The filter disc may be examined for the type and amount of foreign matter.

10. Remove the reservoir top by loosening the three wing nuts then disengaging the retainer rods.

B. Cleaning

After each test carefully clean the reservoir, top and bottom with soap and water. Rinse with distilled water and dry before re- assembly. Dis-assemble, inspect and clean the filter holder, and its "O" rings, [12, 13, Fig. 4.] Replace the "O" rings if found defective.

CAUTION

DO NOT USE ACETONE, ALCOHOL, CHLORINATED OR AROMATIC SOLVENTS FOR CLEANING THE RESERVOIR.

C. Pressure Relief Valve

The pressure relief valve on top of the reservoir is set to relieve at 25 psig (173 kPa). It must relieve full volume at this pressure.

CAUTION

THIS IS A SAFETY DEVICE AND SHOULD BE TESTED ANY TIME THE MEMBRANE HAS BEEN IN STORAGE AND FREQUENTLY DURING USE.

Pressure test by applying 25 psig (173 kPa) pressure to the valve NOT TO THE CYLINDER, to verify the valve will reliably open.

D. Pressure Regulator Maintenance and Repair

Most regulator troubles are caused by leaking fittings or faulty pins and seats. Rarely does a diaphragm rupture.

If regulator will not hold pressure, check the fittings which are screwed into it. This is done by applying pressure to the system and looking for escaping gas in the form of bubbles. There are two methods of doing this. One method is to apply soap suds to the fitting areas, the other is to carefully immerse all but the pressure gauge in a container of water. If leaks are apparent, disassemble and apply tape thread sealant to the threads.

CAUTION
DO NOT USE OIL BASED THREAD DOPE OR OIL WHEN ASSEMBLING ANY REGULATOR.

If regulator connections do not leak, the seat and pin may need replacement. Use the following procedure:

1. Using a wrench on the hex of the spring case, unscrew the spring case. All parts down to and including the diaphragm will remain in the spring case.

2. Remove the thrust plate.

3. Unscrew the retainer and remove the seat with the pin.

4. Clean and inspect the regulator for evidence of dirt in the regulator body. An outlet filter (208626) is available to prevent this problem.

5. Replace the pin and seat.

6. Re-assemble the regulator.

SECTION 7
PARTS LIST

A. 209664 Membrane Filter Tester (Membrane)
Refer to Fig. 1 and 4

ITEM	PART	DESCRIPTION
*	206898	Stopwatch, Digital, Electronic (*not shown in figures)
1	209393	Speed Coupler, Male
2	209668	Holder, Filter
3	209669	Lid, Reservoir
4	209670	Cap, Bottom Reservoir
5	209671	Rod (3)
6	209672	Leg (3)
7	203974	Pipe Plug 1/4" Stainless Steel
8	203975	Coupling, Male, 1/4 pipe x 3/8 tube SS
9	203976	Ell, Female, 1/4 pipe x 3/8 tube SS
10	203977	Insert, SS for 3/8 OD Clear flexible tubing
11	204182	Tank, Reservoir
*	396460	Instruction Manual (*not shown in figures)
14	205233	Graduated Cylinder, 1000 ml
15	205587	Coupling, 1/4 pipe Chrome Plated
16	205588	Bushing, 1/4 pipe x 1/8 pipe
17	205604	Toggle Valve, 1/4 NPT, Stainless Steel (2)
18	205605	Pressure Relief Valve, 1/4 NPT, 25 PSIG (173 kPa)
19	205606	Gauge, 30 PSIG, 1-1/2 in Face, 1/8 NPT bottom conn.
20	205622	Clear Flexible Tubing, 3/16" x 1/16 wall
21	205623	Clear Flexible Tubing, 1/4" x 1/16 wall
22	205664	"O" Ring, 5-1/2 x 1/8 Nit. B-46 Reservoir (2)
23	206053	Filters, .45 Micron, 47mm (Pkg. of 100)

B. 209666 Pressurizing Unit CO_2 for Membrane Filter Tester
Refer to Fig. 2

ITEM NO.	PART NO.	DESCRIPTION
1	208608	CO_2 Cartridges, Box of 10
2	208612	Barrel for CO_2 Cartridges (2)
3	208614	Adapter Head for CO_2 Cartridges (2)
4	208626	Felt Filter for Regulator (4)
5	208653	Bleeder Valve
6	208655	Valve, Needle, 1/4 mnpt x 1/4 mnpt (2)
7	209390	Speed Coupler, Female
8	204893	Regulator, for CO_2 Pressurizing Unit
9	205587	Coupling, 1/4 pipe Chrome Plated (2)
10	205590	Plug, Pipe 1/8 NPT

C. 209667 Pressurizing Unit, Nitrogen, for Membrane Filter Tester Refer to Fig. 3.

ITEM NO.	PART NO.	DESCRIPTION
1	207929	Air Hose, 3 foot
2	208059	Nipple, 1/4 NPT x Eastman
3	208652	Nitrogen Regulator Assembly with gauges
4	208653	Bleeder Valve
5	209390	Speed Coupler, Female

D. 209665 Case for Membrane Filter Tester

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Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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