

Polson City/Rural FIRE DEPARTMENT Operating Guidelines

Issued by: Chief John Ed Fairchild
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326.00 Filling SCBA and SCUBA Cylinders

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326.01 – PURPOSE:

The following steps are to be followed when operating the Mako Stored Air Compressor for the Polson City and Rural Fire Department. These steps are meant to insure that the operator and cylinder are kept safe.

326.02 - SAFETY CHECKS BEFORE USE:

1. Before operating the compressor the oil level must be checked. The oil sight gauge is located on the motor of the compressor. The sight gauge is marked where the full line is and must be up to this line before starting compressor. The oil level is to be read before each use.
2. Check that all gauges are reading properly and all valves are closed; to ensure that air pressure is not lost.
3. Check that all tanks and packs have current HYDROSTATIC (hydro) Test on the cylinders before filling. The Hydro Test will be stamped on the top of the cylinder near the cylinder valve. All cylinders must be tested according to Department of Transportation (D.O.T) Regulations.
4. Ensure emergency stop switch is pulled out.

D.O.T. REGULATIONS:

- CHECK EVERY FIVE (5) YEARS FOR STEEL AND ALUMIUN CYLINDERS.
- CHECK EVERY THREE (3) YEARS AND LESS THAN FIFTEEN (15) YEARS OLD FOR COMPOSITE CYLINDERS.
- COMPOSITE BOTTLES ARE TO BE CONSTRUCTED OF FIBER GLASS WRAP.

Any cylinder that does not meet the above criteria will be placed out of service and not filled.

326.03 - FILLING PROCEDURE:

1. Open the sliding cabinet door by pushing down.
2. There are enough filling tubes to fill three cylinders at one time. Place the cylinders in the filling tubes.
3. After placing the cylinders in the filling tube remove the filling connector from their position located behind each filling tube. Place the fill connector into cylinder valve where the high-pressure hose connects and hand tighten; be careful not to cross thread.
4. After all filling connectors are connected open all cylinders so all cylinder pressure will equal out and to ensure no leaks.
5. Return all the filling tubes to the upright position and close the safety door.
6. Then adjust in the inlet pressure to read 4500 psi. The Turn the wet/dry switch to the wet position this switch is located on the front of the compressor above the safety door. **ONLY FILL CYLINDERS IN THE DRY POSITION.** After this is done you may begin to fill the cylinders. The fill switch is located on the front of the compressor above the safety door. The fill switch is to be turned clockwise and you will hear the sound of air entering the cylinder. Fill the cylinder to its proper pressure, which is stated on the cylinder.
7. After the proper cylinder pressure is reached turn of the filling switch by turning it counter clockwise. Open the safety door, release the filling tube lever, and allow the tube to move outward. Turn off all cylinders and open the pressure bleeder to drain the system of excess pressure.
8. Disconnect the fill connectors and reattach them to their proper position hand tight only. After this is done you may remove the cylinder(s).

Attached is the operator's manual of Mako Air Compressor provided by the manufacture for further explanation.

326.04 SCBA/SCUBA BOTTLE FILLING PROCEDURES:**326.05 STANDARD BAC FILL CONTROLS:**

1. Conduct daily oil level check. Add oil if necessary.
2. Check auto drain reservoir. Drain if necessary and dispose of waste.
3. Check CO/Moisture sight glass.

WARNING: STOP FILLING OPERATION AND REPORT CONDITION TO APPROPRIATE SUPERVISOR IF INDICATOR SHOWS CONTAMINATED AIR HAS PASSES.

4. Bottles can be filled without turning machine on if sufficient storage system pressure is available. Otherwise, turn on machine.
5. Turn selector valve for CO Monitor to the "ON" position, if this option is implemented.

NOTE: **THE COMPRESSOR WILL SHUT DOWN WHEN THE MAXIMUM AIR PRESSURE IS REACHED.**

CAUTION: UNIT WILL RESTART AUTOMATICALLY WHEN PRESSURE DROPS.

6. Make sure all fill valves on fill panel are closed.
7. Check regulator outlet pressure.

CAUTION: SETTLING SHOULD BE COMPATIBLE WITH THE TYPE OF BOTTLE BEING FILLED. CHECK SCBA BOTTLE LABLING IF UNCERTAIN AS TO FILL PRESSURE.

8. Open fill station sliding doors.
9. Load SCBA bottles into the bottle cells and connect fill hose assemblies.
10. Close bleed valve on air hose.
11. Open SCBA bottle valves.
12. Close fill station sliding doors.

WARNING: BOTTLE MANUFACTURERS HAVE SPECIFIC INSTRUCTIONS ON FILL RATE. ALWAYS DETERMINE THESE LIMITATIONS BEFORE ANY FILLING OPERATION.

13. Open fill valves in accordance with bottle manufacturer's instructions. Typically filling is a slow process.
14. Shut off fill valve when bottle pressure equals regulator outlet pressure.
15. Open fill station doors.
16. Close bleed valves.
17. Open bleed valves.
18. Unscrew fill assembly from bottles.
19. Remove bottles.
20. Repeat Step 8 through 19 until all bottles are filled.
21. Shut the machine off when bottle filling is complete and the storage system pressure is topped off.
22. Drain auto drain reservoir and dispose of waste.
23. When operation is completed, turn the selector valve on the monitor panel to "OFF" when the CO Monitor option is implemented.

CAUTION: COMPRESSOR OIL LEVEL SHOULD BE CHECKED AT FOUR HOUR INTERVALS DURING CONTINUOUS OPERATION.

24. Record any abnormal noises, leaks or other operational problems in the maintenance log. Report such occurrences to maintenance management for dispensation.

326.06 DUAL REGULATOR FILL CONTROL OPTION:

1. Conduct daily oil level check. Add oil necessary.

2. Check auto drain reservoir. Drain if necessary and dispose of waste.
3. Check CO/Moisture sight glass.

WARNING: STOP FILLING OPERATION AND REPORT CONDITION TO APPROPRIATE SUPERVISOR IF INDICATOR SHOWS CONTAMINATED AIR HAS PASSED.

4. Bottles can be filled without turning machine on if sufficient storage system pressure is available. Otherwise, turn on machine.
5. Turn selector valve for CO Monitor to the “ON” position, if this option is implemented.

NOTE: THE COMPRESSOR WILL SHUT DOWN WHEN THE MAXIMUM AIR PRESSURE IS REACHED.

CAUTION: UNIT WILL RESTART AUTOMATICALLY WHEN PRESSURE DROPS.

6. Make sure all fill valves on fill panel are closed.
7. Check regulator outlet pressures.

CAUTION: SETTING SHOULD BE COMPATIBLE WITH THE TYPE OF BOTTLE BEING FILLED. CHECK SCBA BOTTLE LABELING IF UNCERTAIN AS TO FILL PRESSURE.

8. Open fill station sliding doors.
9. Load SCBA bottles into the bottle cells and connect fill hose assemblies.
10. Close bleed valve on air hose.
11. Open SCBA bottle valves.
12. Close fill station sliding doors.

WARNING: BOTTLE MANUFACTURERS HAVE SPECIFIC INSTRUCTIONS ON FILL RATE. ALWAYS DETERMINE THESE LIMITATIONS BEFORE ANY FILLING OPERATION.

13. To fill Low Pressure bottles, open corresponding fill valves in accordance with bottle manufacturer’s instructions. Typically filling is a slow process.
14. Shut off fill valve when bottle pressure equals regulator outlet pressure.
15. To fill High Pressure bottles, press the red button in the center of the fill panel. The red light will illuminate. Open corresponding fill valves in accordance with bottle manufacturer’s instructions. Typically filling is a slow process.
16. Open fill station doors.
17. Close bottle valves.
18. Open bleed valves.
19. Unscrew fill assembly from bottles
20. Remove bottles.
21. Repeat Steps 8 through 20 until all bottles are filled.

22. Shut the machine off when bottle filling is complete and storage system pressure is topped off.
23. Drain auto drain reservoir and dispose of waste.
24. When operation is completed, turn the selector valve on the monitor panel to "OFF", when the CO Monitor option is implemented.

NOTE: COMPRESSOR OIL LEVEL SHOULD BE CHECKED AT FOUR HOUR INTERVALS DURING CONTINUOUS OPERATION.

25. Record any abnormal noises, leaks or other operational problems in the maintenance log. Report such occurrences to maintenance management for dispensation.

326.07 CASCADING FILING:

To "cascade" is to age something in a series or in a succession of stages so that each stage derives from, or acts upon, the product of the preceding. It is a building block technique. A BAC can have space on the air management panel for up to four cascades. Figure 6-1, below is a flow diagram of a four bank cascade system. The following procedure describes the cascade filing process.

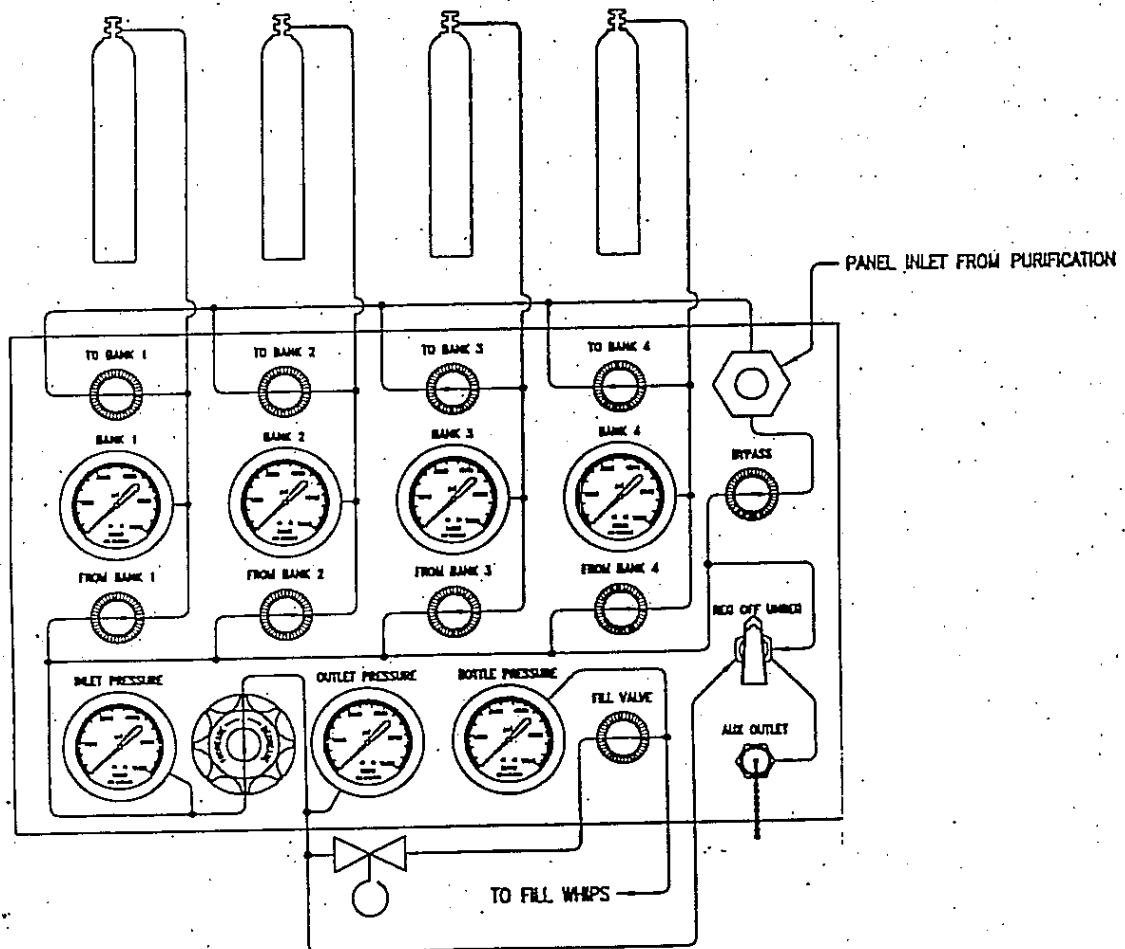


FIGURE 6-1 CASCADE FLOW SCHEMATIC

CAUTION: NEVER OPEN BOTH “TO” AND “FROM” VALVES OF THE SAME BANK WHILE REFILLING A BANK AND CASCADING OFF OF ANOTHER BANK.

1. Load SCBA/SCUBA bottles to be filled into the bottle compartments, connect fill hoses, close bleed valves, and open bottle valves.
2. Open “From Bank #1” valve.

NOTE: THE INLET PRESSURE GAUGE WILL IMMEDIATELY READ THE SAME PRESSURE AS THE “BANK #1” GAUGE.

3. Adjust regulator as necessary.
4. Open fill valve.
5. Close bottle valves when desired pressure is obtained.
6. Close fill valve.
7. Open bleed valves on fill hoses.
8. Disconnect fill hoses and remove bottles from fill station.
9. Close bleed valves on fill hoses.
10. Load another set of empty bottles and repeat steps 1 through 9 until Bank #1 will not pressurize the bottles to the desired pressures.
11. Close “From Bank #1” valve.
12. Open “From Bank #1” valve.

NOTE: THE INLET PRESSURE GAUGE WILL IMMEDIATELY READ THE SAME PRESSURE AS THE “BANK #2” GAUGE. THIS STEP WILL “TOP OFF” THE BOTTLES THAT COULD NOT BE COMPLETELY FILLED BY “BANK #1”.

13. Close bottle valves when desired pressure is reached.
14. Close fill valve.
15. Open bleed valves on fill hoses.
16. Disconnect fill hoses and remove bottles from fill station.
17. Close bleed valves on fill hoses.
18. Close “From Bank #2” valve.
19. Load another set of empty bottles.
20. Open “From Bank #1 valve.
21. Open fill valve.
22. Close “From Bank #1” valve.
23. Open “From Bank #2” valve to complete bottle filling.
24. Close fill valves.
25. Close “From Bank #2” valve.
26. Close bottle valves.
27. Open bleed valves on fill hoses.
28. Disconnect fill hoses and remove bottles from fill station.
29. Close bleed valves on fill hoses.

30. Load another set of empty bottles, connect fill hoses, and repeat steps 20 through 29 until Bank #2 will not pressurized the bottles to the desired pressure.
31. Close "From Bank #2" valve.
32. Open "From Bank #3" valve to complete filling.
33. Close fill valve.
34. Close "From Bank #3" valve.

NOTES:

1. **THE PROCEDURE ABOVE DESCRIBES THE CASCADING APPROACH TO BOTTLE FILLING. THE OPERATOR SHOULD PROGRESSIVELY APPLY THE BASIC CASCADING PROCEDURE SET FORTH IN THE PRECEDING INSTRUCTIONS TO THE REMAINING STORAGE BANKS TO FILL THE MAXIMUM NUMBER OF BOTTLES FROM A GIVEN CHARGE OR STORED AIR. THE LAST SET OF BOTTLES CAN BE "TOPPED OFF" DIRECTLY FROM THE COMPRESSOR BY CLOSING THE "FROM" VALVE ON THE LAST BANK, STARTING THE COMPRESS, AND OPENING THE BYPASS VALVE WHEN THE INLET PRESSURE REACHES A VALVE ABOVE THE BOTTLE PRESSURE.**
2. STORAGE BANKS MAY BE FILLED ONE AT A TIME BY OPENING ONLY ONE "TO BANK" VALVE. THIS WILL QUICKLY GIVE SOME HIGH PRESSURE STORAGE IN THE EVENT OF AN EMERGENCY.
3. THERE WILL COME A POINT WHERE BANK #1 IS SO LOW (APPROXIMATELY 1000 PSIG) THAT IT ADDS LITTLE TO THE CASCADE PROCESS. AT THIS POINT, IT IS WISE TO START THE CASCADE PROCESS OFF ON BANK #2 INSTEAD OF BANK #1. WHEN THIS IS DONE, THE "TO BANK #1" VALVE CAN BE OPENED TO ALLOW THE COMPRESSOR TO FILL BANK #1 BACK UP WHILE BOTTLES ARE STILL BEING FILLED OFF BANK #2 AND SUBSEQUENT BANKS.
4. WHEN FINISHED CASCADING, REFILL THE HIGHEST PRESSURE BANK FIRST.
5. A BYPASS VALVE IS LOCATED ON THE PANEL TO PERMIT BOTTLE FILLING DIRECTLY FROM THE COMPRESSOR.
6. ALWAYS CONSERVE THE HIGHEST PRESSURE STORAGE. USE THE LOWER PRESSURE BANKS TO GRADUALLY BUILD UP THE VOLUME IN THE BOTTLE.
7. THESE PROCEDURES CAN BE VARIED SLIGHTLY TO SUIT OPERATOR PREFERENCES; HOWEVER, SAFETY SHOULD NEVER BE COMPROMISED.

326.08 AUTO CASCADE FILLING: (see FIGURE 6-2)

1. Conduct daily oil level check. Add oil if necessary.
2. Check auto drain reservoir. Drain if necessary and dispose of water.
3. Check CO/Moisture sight glass.

WARNING: STOP FILLING OPERATION AND REPORT CONDITION

**TO APPROPRIATE SUPERVISOR IF INDICATOR
SHOWS CONTAMINATED AIR HAS PASSED.**

4. Bottles can be filled without turning machine on if sufficient storage system pressure is available. Otherwise, turn on machine.
5. Turn selector valve for CO Monitor to the "ON" position, if this option is implemented.

NOTE: THE COMPRESSOR WILL SHUT DOWN WHEN THE
MAXIMUM AIR PRESSURE IS REACHED.

CAUTION: UNIT WILL RESTART AUTOMATICALLY WHEN
PRESSURE DROPS.

6. Check regulator outlet pressure.

CAUTION: SETTING SHOULD BE COMPATIBLE WITH THE TYPE OF
BOTTLE BEING FILLED. CHECK SCBA BOTTLE LABELING
IF UNCERTAIN AS TO FILL PRESSURE.

7. Open fill station sliding doors.
8. Load SCBA bottles into the bottle compartments and connect fill hose assemblies.
9. Close bleed valve on air hose.
10. Open SCBA bottle valves.
11. Close fill station sliding doors.

WARNING: BOTTLE MANUFACTURERS HAVE SPECIFIC
INSTRUCTIONS ON FILL RATE. ALWAYS DETERMINE
THESE LIMITATIONS BEFORE ANY FILLING
OPERATIONS.

12. Open fill valve.
13. Shut off fill valve when bottle pressure equals regulator outlet pressure.
14. Open fill station doors.
15. Close bottle valves.
16. Open bleed valves.
17. Unscrew fill assembly from bottles.
18. Remove bottles.
19. Repeat Steps 7 through 18 until all bottles are filled.
20. Shut the machine off when bottle filling is complete and the storage system pressure is topped off.
21. Drain auto drain reservoir and dispose of waste.
22. When operation is completed, turn the selector valve on the monitor panel to "OFF" when the CO Monitor option is implemented.

CAUTION: COMPRESSOR OIL LEVEL SHOULD BE CHECKED AT FOUR HOUR INTERVALS DURING CONTINUOUS OPERATION.

23. Record any abnormal noises, leaks or other operational problems in the maintenance log. Report such occurrences to maintenance management for dispensation.

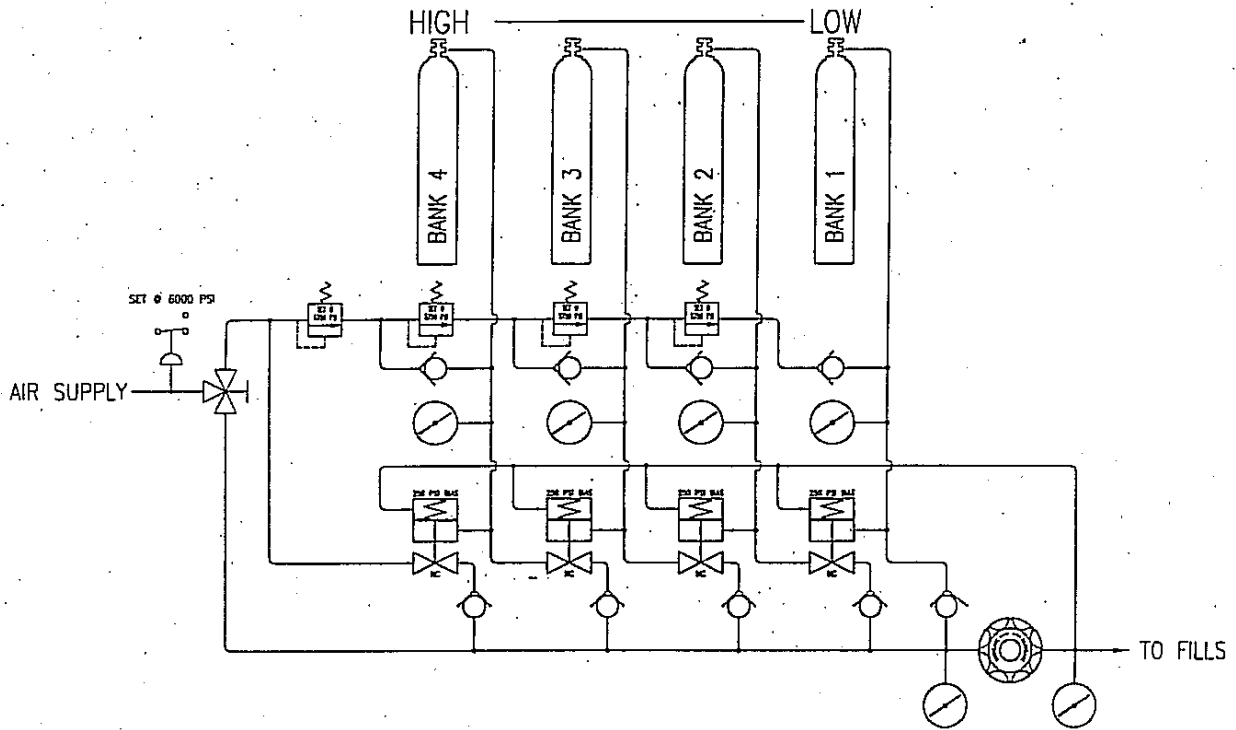


FIGURE 6-2 AUTO CASCADE FLOW DIAGRAM