PART NO. 4G59523 RECOVERY / RECYCLE SYSTEM
MODEL FM-200

OPERATIONS MANUAL

(11/16/10)

2320 Lakecrest Drive, Pekin, Illinois 61554
Telephone: 888-747-4389 Fax: 309-495-0625
Website: www.getzequipment.com

Limited Warranty

Products manufactured by Getz Equipment Innovators (with exception of electrical products or components) will be free from defects for a period of one year from shipment date. Electrical products and/or components used in manufactured products will have a (6) month warranty from shipment date. During the warranty period, customers who experience any manufacture-related service issues with our products, the product may be returned for repair or replacement. Customer must contact Getz Equipment for approval prior to any product return. Notwithstanding the foregoing, the limited warranty set forth shall be immediately void of customer uses any replacement parts other than those provided by Getz Equipment Innovators. The warranty does not cover normal wear and tear items, defects resulting from modification, alteration, misuse, exposure to corrosive conditions, extremely high temperatures, improper installation or maintenance. Warranties on component items not manufactured by Getz Equipment Innovators are provided by others whose warranty, evaluation and judgment will be final.

All implied warranties, including, but not limited to, warranties of fitness for purpose and merchantability, are limited to the time periods as stated above. In no event shall Getz Equipment Innovators be liable to incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts or the exclusions or limitation of incidental or consequential damages, so that the above limitations or exclusions may not apply to you. Getz Equipment Innovators neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than as expressly set forth herein.

Mobile Service Vehicles:
The warranty does not cover:

- Defects in the chassis and or power unit
- Defects in separately manufactured products not produced by Getz Equipment Innovators
- Deterioration due to normal wear, tear, and exposure
- Repairs made necessary by negligent use, misuse, abuse, loading the service vehicle beyond its gross vehicle weight limitations, accident, acts of God, or other contingencies beyond the control of Getz Equipment Innovators.
- Repairs deemed necessary by reason of the failure to follow ordinary maintenance procedures.
- Repairs deemed necessary by reason of alterations done without Getz Equipment Innovators' written approval.

Warranty Service: All warranty repairs will be performed by Getz Equipment Innovators in Pekin, IL, unless otherwise authorized by Getz Equipment Innovators.

Freight: Getz Equipment Innovators will not be liable for shipping or transportation charges to or from customer's location.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. To obtain performance to the obligation of the warranty, write to Getz Equipment Innovators, 2320 Lakecrest Drive, Pekin IL 61554, USA for instructions.

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BASIC SYSTEM COMPONENTS:

AIR POWERED FM-200 PUMP

CONTROL CONSOLE AND STAND

REQUIRED ADAPTERS (4)

REQUIRED HOSES

300LB SCALE

LEAK DETECTOR

REQUIRED REGULATORS

OPTIONAL EQUIPMENT:

P/N 1G52456	**10 H.P. AIR COMPRESSOR (OTHER AIR COMPRESSORS AVAILABLE)**
P/N 3G59599	**HFC-227 RECEIVER TANK 250# CAPACITY**
P/N 3G595297	**HFC-227 RECEIVER TANK 500# CAPACITY**

MODEL FM-200 RECOVERY/RECYCLE SYSTEM

SYSTEM OPERATION REQUIREMENTS:

1. "Cast iron air compressor" delivering 100 – 120 PSI at 18 CFM minimum.

WARNING – Do not use aluminum air compressors, unrepairable damage will occur.

NOTE – Customer supplied air compressor must have an adjustable pressure regulator and an air line from compressor to the FM-200 system.

2. Weighting scale – digital or mechanical – rated for the total full weight of the receiver tank

3. FM-200 liquid/vapor receiver tank

WARNING - Receiver tank must have pressure relief devices and be pressure rated for nitrogen charged FM-200 service.

4. Two (2) nitrogen cylinder (-77 deg. Dew point nitrogen)

AREA REQUIRED:

DEPTH - 3 FT. WIDTH - 4 FT. HEIGHT - 5 FT.

	WEIGHT	DIMENSIONS
CONSOLE & STAND	165 LBS.	24" D x 35" W x 40" H

MODEL FM-200 RECOVERY/RECYCLE SYSTEM

SYSTEM SPECIFICATIONS:

VACUUM - 15 INCHES MAXIMUM

INLET PRESSURE - 1000 PSI MAXIMUM

OUTLET PRESSURE - 400 PSI

FM-200 LIQUID PER MINUTE - 16 LBS. AVERAGE

FM-200 VAPOR PER MINUTE - 2 LBS. AVERAGE

MOISTURE EYE - 10 PPM (GREEN = DRY) 65 PPM (YELLOW = WET)

FILTERS - 15 MICRONS PARTICULATE MATTER

SYSTEM CAPABILITIES:

RECOVER FM-200 LIQUID AND VAPOR FROM CYLINDERS

RECOVER NITROGEN FROM CYLINDERS

RECHARGE LIQUID FM-200 AND NITROGEN TO CYLINDERS

TRANSFER LIQUID FM-200 FROM BULK STORAGE TANK TO CYLINDERS

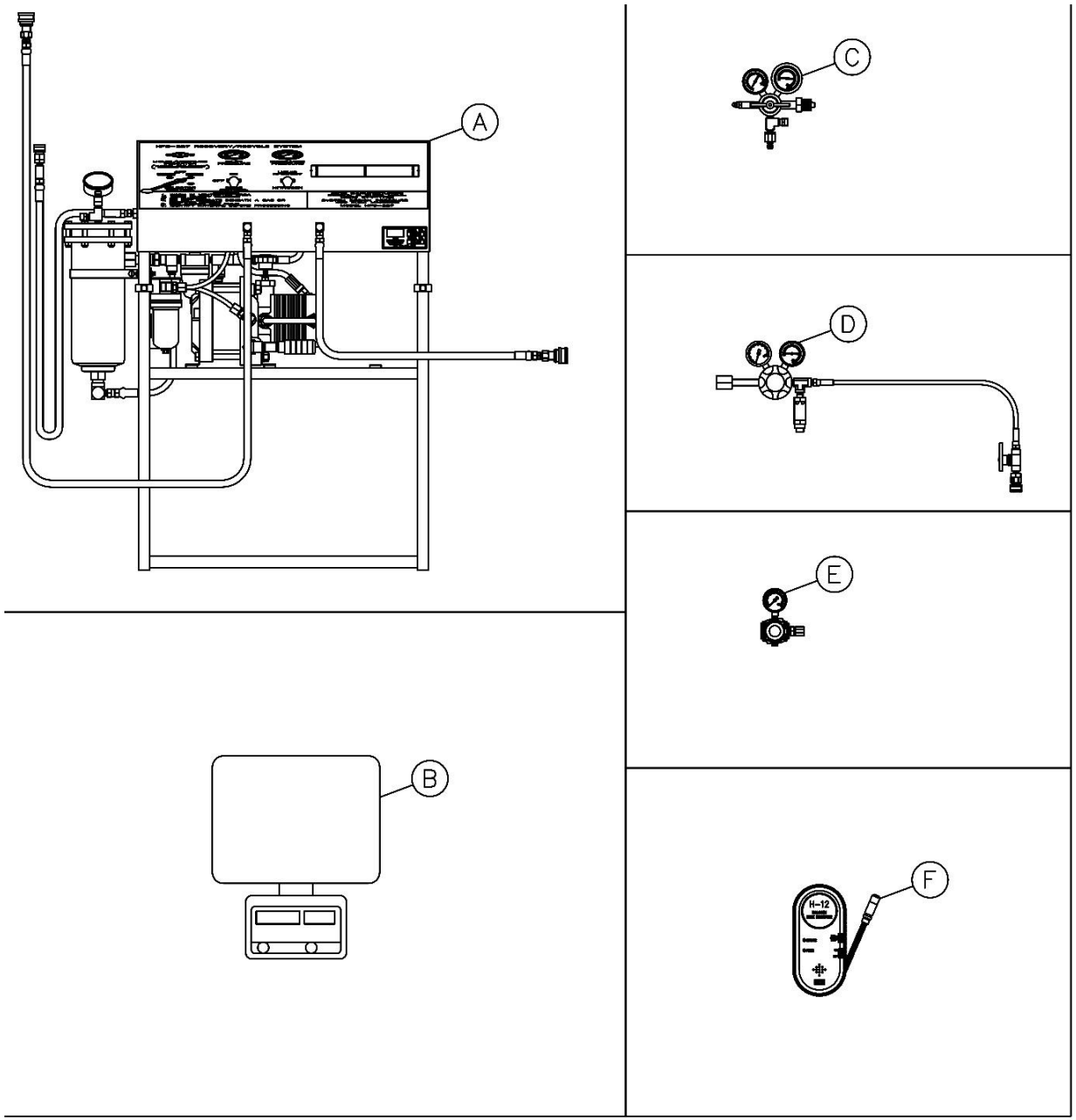
RECOVER AT A MINIMUM 99% EFFICIENCY RATE

DETECT MOISTURE IN FM-200

FILTER MOISTURE DOWN TO 10 PPM

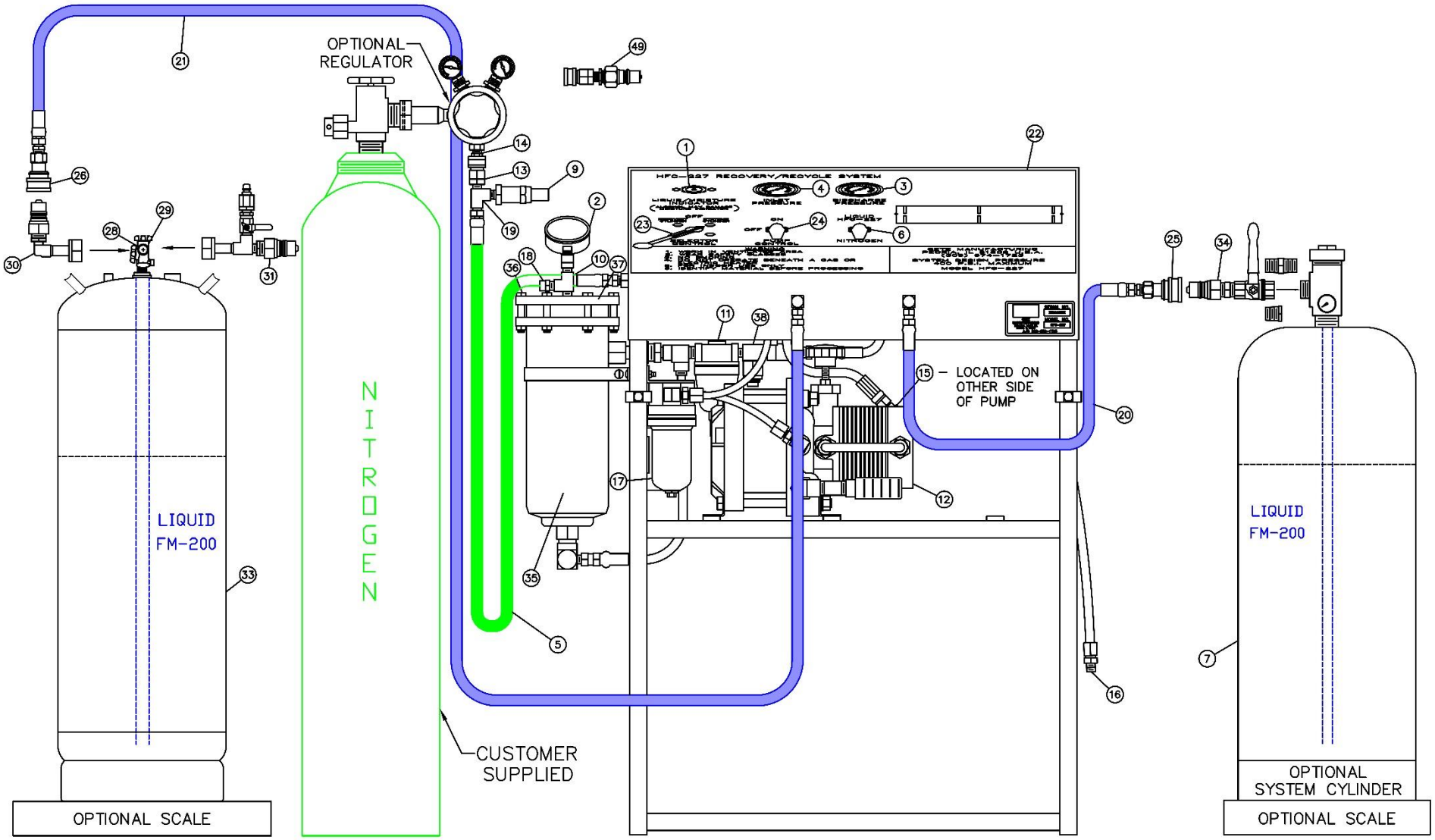
FILTER PARTICULATE MATTER DOWN TO 15 MICRONS

FILTERS ACID, WAX, SLUDGE

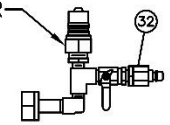


ITEM	PART#	DESCRIPTION	UM	QPA
A	3G59274	SYS HFC-227 RECOVERY/RECYCLE	EA	1
B	1G53983	SCALE 300# DIGITAL L/TRADE	EA	1
C	3G59521	REG UL FM200 CHARGE	EA	1
D	3G59522	REG UL FM200 VLV SET	EA	1
E	3G0011	LOW PRESSURE REGULATOR	EA	1
F	2G0002	BATTERY OPERATED LEAK DETECTOR	EA	1

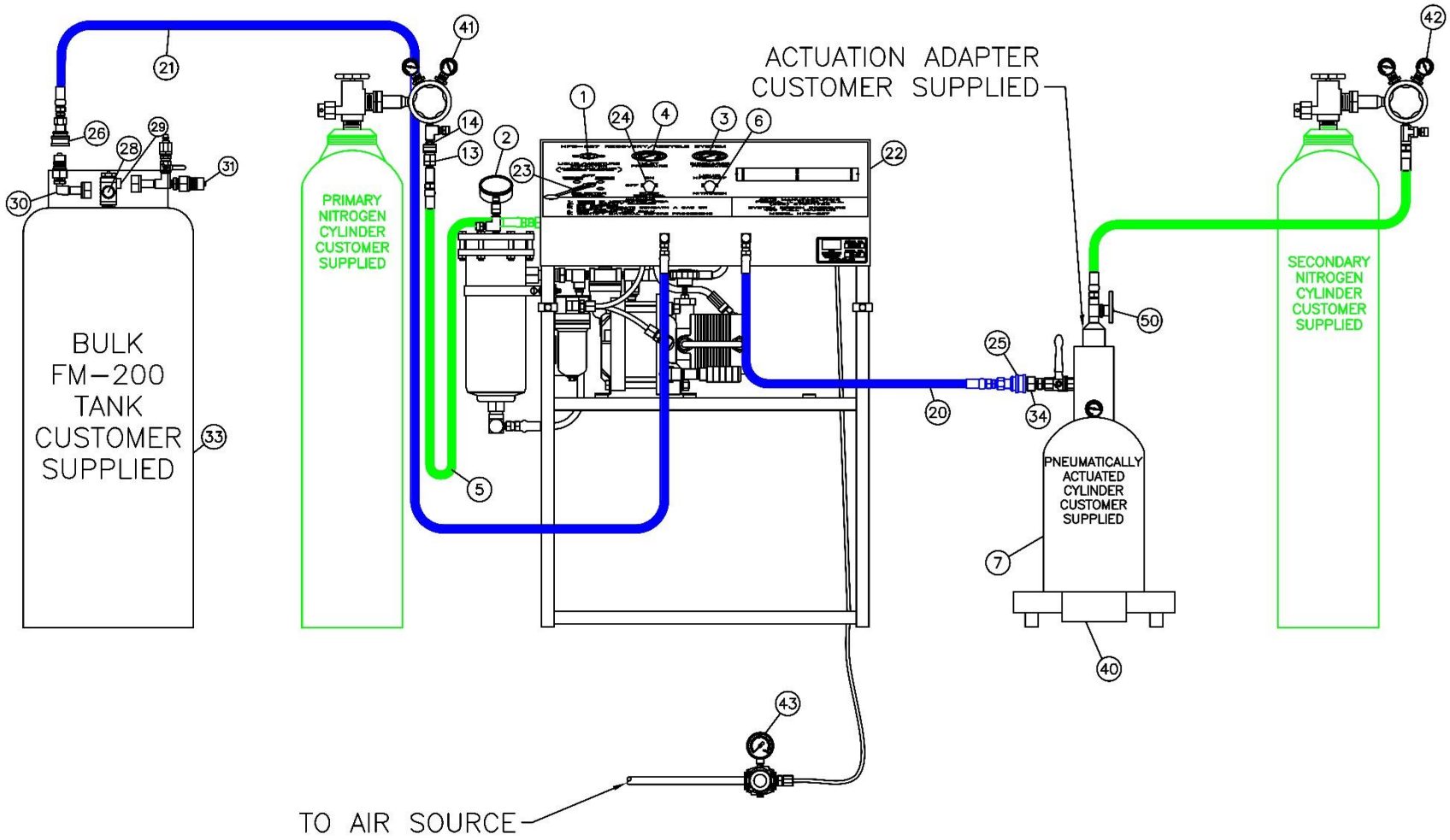
RECOVERY PROCEDURE



1 TON TANK VAPOR ADAPTER



PNEUMATICALLY ACTUATED CYLINDER RECOVERY PROCEDURE



MODEL FM-200 RECOVERY/RECYCLE SYSTEM

ITEM NUMBERS / DESCRIPTION:

1. MOISTURE INDICATOR
2. PRESSURE / VACUUM GAUGE
3. DISCHARGE PRESSURE GAUGE
4. INLET PRESSURE GAUGE
5. NITROGEN SUPPLY HOSE
6. FM-200 LIQUID / NITROGEN VALVE
7. FM-200 CYLINDER
8. MALE QUICK CONNECT (VAPOR)
9. 850 PSI PRESSURE RELIEF (NITROGEN HOSE)
10. 1/4" BRASS ST TEE (FILTER CAP - ITEM 37)
11. HIGH PRESSURE REDUCING VALVE
12. FM-200 PUMP
13. FEMALE QUICK COUPLER (NITROGEN HOSE)
14. MALE QUICK COUPLER (NITROGEN HOSE)
15. BRASS STRAINER (ON PUMP) (NOT SHOWN)
16. 1/4" NPT PLASTIC CONNECTOR (AIR INLET)
17. MOISTURE FILTER
18. 425 PSI PRESSURE RELIEF (FILTER CAP - ITEM 37)
19. 1/4" BRASS TEE (NITROGEN HOSE)
20. SYSTEM CYLINDER HOSE
21. RECEIVER TANK HOSE
22. CONTROL CONSOLE
23. SELECTOR VALVE
24. PUMP VALVE

ITEM NUMBERS / DESCRIPTION:

25. FEMALE QUICK COUPLER (SYSTEM CYL. HOSE)
26. FEMALE QUICK COUPLER (RECEIVER TANK HOSE)
27. LIQUID ADAPTER ASSEMBLY (AUXILIARY TANK)
28. RECEIVER TANK LIQUID PORT
29. RECEIVER TANK VAPOR PORT
30. LIQUID FILL ADAPTER ASSEMBLY
31. VAPOR ADAPTER ASSEMBLY (VERTICAL TANK)
32. VAPOR ADAPTER ASSEMBLY (HORIZONTAL TANK)
33. FM-200 RECEIVER TANK (OPTIONAL)
34. 1/2" BALL VALVE ASSEMBLY
35. FILTER CANISTER
36. BOLTS
37. FILTER CANISTER CAP
38. BRASS STRAINER (BEHIND REAR ACCESS COVER)
39. TEST SAMPLE TEE ASSEMBLY (CUST. SUPPLIED)
40. 300LB “LEGAL FOR TRADE” SCALE
41. CHARGING REGULATOR
42. VALVE SETTING REGULATOR
43. LOW PRESSURE AIR SUPPLY REGULATOR
44. LEAK DETECTOR
45. VAPOR ADAPTER ASSEMBLY (AUXILIARY TANK)
46. LIQUID HOSE ASSEMBLY (AUXILIARY TANK)
47. AUXILIARY 250# TANK (OPTIONAL)
48. VAPOR HOSE ASSEMBLY (SYSTEM CYLINDER/RECEIVER)
49. QUICK COUPLER ADAPTER
50. 1/4” BALL VALVE

SET-UP PROCEDURE:

1. **After all cartons and boxes have been opened and all parts and components unwrapped, lay out all items for ease of assembly. Carefully check all parts for evidence of concealed damage. Notify the delivering carrier immediately if anything appears to have shipping damage.**

2. **Start with the receiver tank (item 33). Install the liquid adapter assembly (item 30) to the liquid valve of the receiver tank.**

3. **Install vapor adapter assembly (item 31) on a vertical tank or (item 32) on a horizontal tank, to the vapor valve on the receiver tank (item 33).**

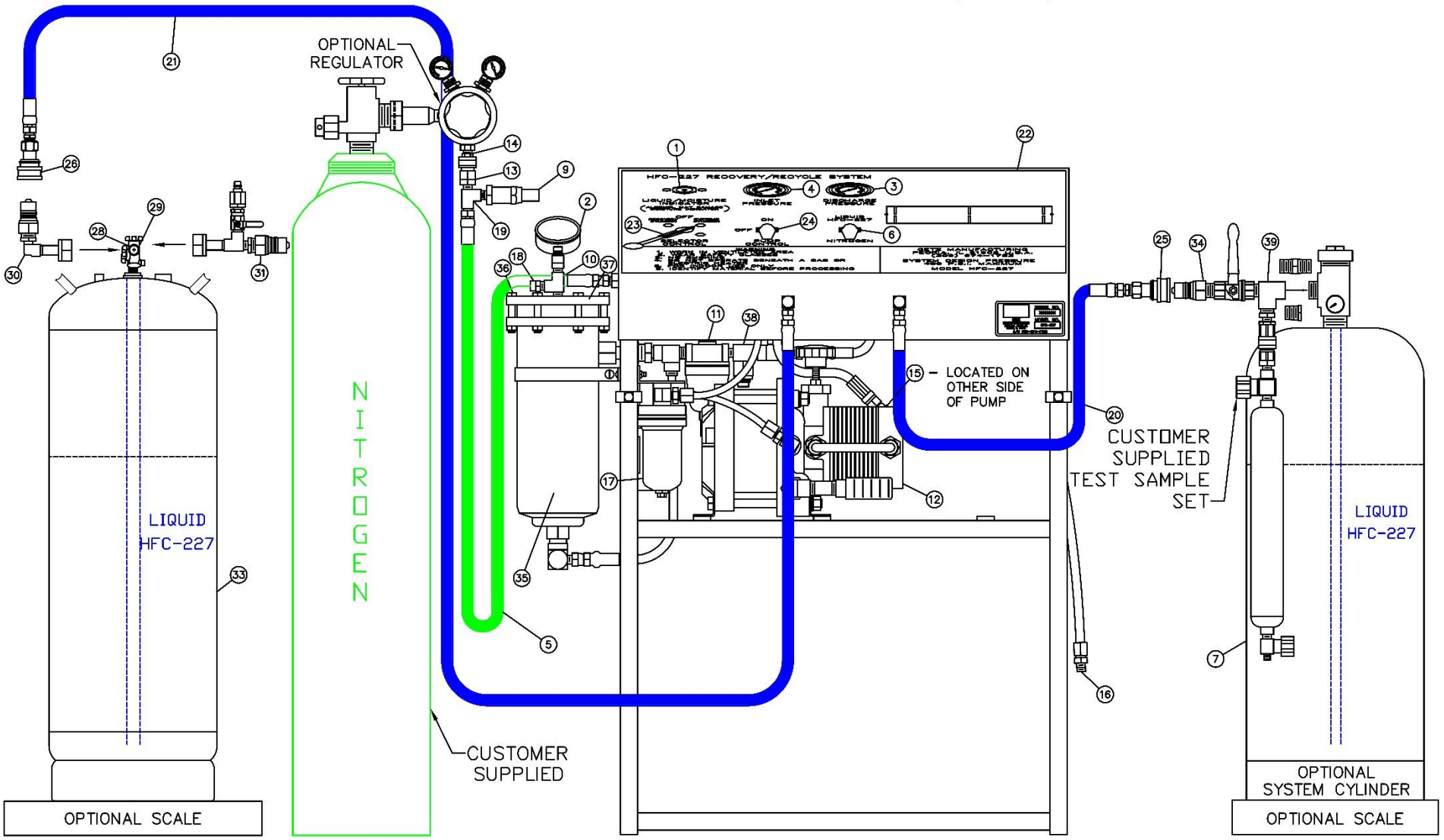
4. **Connect the female quick coupler (item 26) to the male quick coupler on the liquid adapter assembly (item 30).**

5. **The nitrogen regulators must be set to zero (0) PSI output pressure during assembly. Install the male quick coupler (item 14) in your nitrogen regulator's (item 41) output port. Connect the female quick coupler (item 13) on the nitrogen supply hose (item 5) to the male quick coupler (item 14). Install the other nitrogen regulator (item 42) to a secondary nitrogen cylinder.**

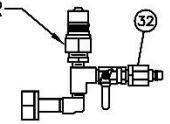
6. **Turn pump valve (item 24) on the control console (item 22) to the *OFF* position. Turn the liquid/nitrogen valve (item 6) on the control console to the *LIQUID* position. Connect the 1/4" NPT plastic connector (item 16) to your air compressor's pressure regulator. Set nitrogen regulator to 100-120 PSI.**

7. Place the receiver tank on a scale of adequate weighting capacity to inform the operator when the receiver tank has reached the full liquid weight capacity and over filling does not occur.

PROCEDURE FOR OBTAINING A HFC-227 TEST SAMPLE: (EXAMPLE)



1 TON TANK VAPOR ADAPTER



RECOMMENDED ITEMS FOR OBTAINING A FM-200 TEST SAMPLE: (Example)

WARNING - Test cylinder shutoff valve, and quick connect must have a pressure rating equal to or higher than the system cylinder the sample is being obtained from.

A. Test cylinder with shutoff valve and quick connect
(Test cylinder and tee assembly must be clean and a vacuum pulled on both components prior to obtaining a sample).

B. Test sample tee assembly with shutoff valve and quick couplers.

PROCEDURE FOR OBTAINING A FM-200 TEST SAMPLE PRIOR TO RECOVERING OR RECYCLING: (Example)

1. **Install the manufacturer's recommended discharge adapter assembly in the system cylinder valve. Install a test sample tee assembly onto the discharge adapter. Close the ball valve on the tee assembly.**

2. **Connect the female quick coupler on a test sample cylinder to the male quick coupler on the test sample tee assembly.**

3. **Connect the female quick coupler (item 25) on the system cylinder hose to the male quick coupler on the nest sample tee assembly.**

4. **Open the needle valve on the test cylinder and discharge the system cylinder valve. After one (1) minute, close the needle valve on the test sample cylinder and close the system cylinder valve.**

5. **Open the ball valve on the test sample tee assembly. Turn the selector valve (item 23) on the control console to the *RECOVERY CYLINDER* position. Open the liquid valve on the receiver tank and turn the pump valve (item 24) to the *ON* position. Monitor the pressure/vacuum gauge (item 2) until a reading of 10 inches of vacuum is obtained. Turn the pump valve (item 24) to the OFF position and disconnect the test sample cylinder, test sample tee assembly, and the system, cylinder hose.**

PROCEDURE FOR OBTAING A FM-200 TEST SAMPLE (CONT):

6. Label the test sample cylinder and system cylinder as follows:

A. Date sample was obtained

B. Serial number of the system cylinder obtained from

C. Test laboratory sent to

TEST LABORATORIES FOR ANALYZING SAMPLES:

A INTEGRAL SCIENCES INCORPORATED
2818 FISHER ROAD
COLUMBUS, OHIO 43204-3538
PHONE #: (614) 279-8090

B ETL TESTING LABORATORIES, INC.
U.S. ROUTE 11 INDUSTRIAL PARK
CORTLAND, NEW YORK 1305-0950
PHONE #: (607) 753-6711

RECOVERY PROCEDURE:

1. WARNING - Before the contents of any cylinder is allowed to enter this system, a respective sample, needs to be analyzed for the determination of its contents.

WARNING - Pressure rated tanks used for the purpose of receiving the FM-200/nitrogen charge must be placed on a scale of precise weighting ability, to inform the operator when the liquid level inside the tank becomes full.

2. Install the manufacturer's recommended discharge adapter assembly onto the system cylinder valve, install the 1/2" ball valve assembly (item 34) on the discharge adapter. Connect the female quick coupler (item 25) to the male quick coupler on the ball valve assembly.

3. Place system cylinder (item 7) on a scale of precise weighting ability.

4. Turn the selector valve (item 23) on the control console to the *RECOVERY CYLINDER* position. Fully open the liquid valve on the receiver tank.

5. Locate the liquid/nitrogen valve (item 6) on the control console and turn the handle to the *LIQUID* position.

6. Discharge the system cylinder and open the 1/2" ball valve (item 34) on the discharge adapter. Watch the clear glass moisture indicator (item 1) of the liquid flowing through the indicator is anything other than clear, refer to the "recycle procedure" (page 20).

7. Turn pump valve (item 24) on the control console to the *ON* position when the inlet pressure gauge (item 4) and the discharge pressure gauge (item 3) reads within 50 PSI of equaling pressure.

8. Continue pumping, as you watch the clear glass moisture indicator (item 1). The clear glass moisture indicator will be flowing liquid and then turn to pumping vapor.

NOTE - If the clear glass moisture indicator turns yellow, refer to the "recycle procedure" (page 20).

RECOVERY PROCEDURE (CONT.):

9. **When the inlet pressure gauge (item 4) declines to zero (0), monitor the pressure/vacuum gauge (item 2) until a reading of 13 inches of vacuum is obtained. Turn the pump valve (item 24) to the *OFF* position. Verify the system cylinder has been recovered by checking the scale weight reading to the empty weight stamped on the system cylinder.**

Note: - More than one cylinder may be recovered until the discharge pressure gauge (item 3) reads approximately 400 PSI; of the scale weight reading indicates the receiver tank to be at 75 lbs. /ft. liquid fill density.

WARNING - Any cylinder or tank used for the purpose of receiving pure piqued FM-200 or nitrogen charged FM-200 must be either D.O.T. or ASME approved to withstand the high pressures and expansion characteristics associated with liquefied gases. These cylinders or tanks, must conation pressure relief devices in accordance with D.O.T.

10. **Before attempting to RECHARGE cylinders wait 15 minutes. This will allow the clear glass moisture indicator (item 1) to react if moisture is present in the FM-200 receiver tank. The moisture indicator will change from *GREEN* to *YELLOW* if moisture is present. If moisture is indicated, refer to the "recycle procedure" (page 20).**

11. **Disconnect female quick coupler (item 25) from 1/2" ball valve assembly (item 34).**

12. **Proceed to the next operating procedure or close all valves.**

RECOVERY PROCEDURE FOR PNEUMATICALLY ACTUATED CYLINDER:

NOTE: Refer to page 6 for schematic

1. **WARNING - Before the contents of any cylinder is allowed to enter this system, a respective ` sample, needs to be analyzed for the determination of its contents.**

   WARNING - Pressure rated tanks used for the purpose of receiving the FM-200/nitrogen charge must be placed on a scale precise weighing ability, to inform the operator when the liquid level inside the tank becomes full.

2. **Install the manufacturer's recommended discharge adapter assembly onto the cylinder valve, install the 1/2" ball valve assembly (item 34) onto the discharge adapter. Connect the female quick coupler (item 25) to the male quick coupler on the ball valve assembly.**

3. **Plug and secondary discharge ports or pilot ports. Install a manual discharge adapter to the actuation port on the top of the cylinder valve.**

4. **Place cylinder (item 7) on the 300lb scale (item 40).**

5. **Turn the selector valve (item 23) on the control console to the *RECOVERY CYLINDER* position. Fully open the liquid valve on the receiver tank.**

6. **Locate the liquid/nitrogen valve (item 6) on the control console and turn the handle to the *LIQUID* position.**

7. **Discharge the cylinder with the manual actuation adapter. Then open the 1/2" ball valve (item 34) on the discharge adapter. Watch the clear glass moisture indicator (item 1) if the liquid flowing through the indicator is anything other than clear, refer to the "recycle procedure" (page 20).**

8. **Turn pump valve (item 24) on the control console to the ON position when the inlet pressure Gauge (item 4) and the discharge pressure gauge (item 3) reads within 50 PSI of equaling pressure.**

RECOVERY PROCEDURE FOR PNEUMATICALLY ACTUATED CYLINDER(CONT.):

9. **Continue pumping, as you watch the clear glass moisture indicator (item 1). The clear glass moisture indicator will be flowing liquid and then turn to pumping vapor.**

NOTE – If the clear moisture indicator turns yellow, refer to the "recycle procedure" (page 20).

10. **When the inlet pressure gauge (item 4) decline to zero (0), monitor the pressure/vacuum gage (item 2) until a reading of 13 inches of vacuum is obtained. Turn the pump valve (item 24) to the OFF position. Verify the cylinder has been recovered by checking the scale weight reading to the empty weight stamped on the cylinder.**

NOTE - More than one cylinder may be recovered until the discharge pressure gauge (item 3) reads approximately 400 PSI, or the scale weight reading indicates the receiver tank to be at 75 lbs. /ft. liquid fill density.

WARNING - Any cylinder or tank used for the purpose of receiving pure liquid FM-200 or nitrogen charged FM-200 must be either D.O.T. or ASME approved to withstand the high pressures and expansion characteristics associated with liquefied gases. These cylinders or tanks, must contain pressure relief devices in accordance with D.O.T.

11. **Before attempting to RECHARGE cylinder wait 15 minutes. This will allow the clear glass moisture indicator (item 1) to react if moisture is present in the FM-200 receiver tank. The moisture indicator will change from GREEN to YELLOW if moisture is present. If moisture is indicated, refer to the "recycle procedure" (page 20).**

12. **Disconnect female quick coupler (item 25) from 1/2" ball valve assembly (item 34). Disconnect the manual actuation adapter from the cylinder valve.**

13. **Proceed to the next operating procedure or close all valves.**

MODEL FM-200 RECOVERY/RECYCLE SYSTEM

RECHARGE PROCEDURE:

1. **Complete all FM-200 cylinder internal inspection and maintenance procedures in accordance with manufacturer's recommendations. Install proper recharge adapter in the cylinder valve. Tighten securely. Install 1/2" ball valve assembly (item 34) onto the recharge adapter.**

2. **Turn the selector valve (item 23) toward the *RECOVERY CYLINDER* position. Fully open the liquid valve on the receiver tank.**

3. **Turn the pump valve (item 24) to the *ON* position. Allow the pump to cycle until the pressure/vacuum gauge (item 2) is reading 5 inches of vacuum. Turn the pump valve (item 24) to the *OFF* position.**

4. **Connect the female quick coupler (item 25) on the system cylinder hose (item 20) to the 1/2" ball valve assembly (item 34) and open the 1/2" ball valve.**

5. **Open the cylinder valve on the cylinder to be filled. Place the cylinder on the scale platform. If you are using a digital scale, "tare" extinguisher weight or for a mechanical scale, note the "tare" weight and lbs. needed to achieve full weight.**

6. **Turn the selector valve (item 23) on the control console to the *SYSTEM CYLINDER* position. This will allow liquid FM-200 to gravity feed into the cylinder being filled. "Check" recharge adapter, cylinder valve, and quick couplers for leaks.**

7. **When the inlet pressure gauge (item 4) and discharge pressure gauge (item 3) are reading within 50 PSI of each other, turn pump valve (item 24) on the control console to the ON position. Check scale for increased weight readings. As the cylinder weight reading approaches within one (1) pound of calculated charge weight, turn pump valve (item 24) to the OFF position and turn selector valve (item 23) to the OFF position, stopping the flow of the FM-200 to the cylinder.**

8. **Set the regulator on nitrogen cylinder to the manufacturer's recommended pressure gauge reading For the cylinder being pressurized. Turn the liquid/nitrogen valve (item 6) to the nitrogen position is obtained; agitate the cylinder to mix the FM-200 and nitrogen. Repeat step 7 if pressure drops below the manufacturer's recommended pressure.**

RECHARGE PROCEDURE (CONT.):

9. Close the cylinder valve according to the manufacturer's recommended procedure on the filled cylinder. Turn the liquid/nitrogen valve (item 6) to the LIQUID position and turn the selector valve (item 23) to the *RECOVERY CYLINDER* position. Turn the pump valve to the ON position and watch the pressure/vacuum gauge (item 2) until 5 inches of vacuum is obtained. Turn the pump valve (item 24) to the *OFF* position. Verify there is no pressure indication on the inlet pressure gauge (item 4). If a pressure reading is indicated, the cylinder valve may not have seated when closed. Reclose the cylinder valve and repeat step 8. After no pressure reading is indicated, disconnect the quick coupler (item 25) from the 1/2" ball valve assembly (item 34).

10. Remove manufacturer's recharge adapter from cylinder valve and continue cylinder recharge procedures.

11. Proceed to the next operating procedure or close all valves.

RECHARGE PROCEDURE FOR PNEUMATICALLY ACTUATED CYLINDERS:

NOTE: REFER TO PAGE 6 FOR SCHEMATIC

1. **Complete all FM-200 cylinder internal inspection and maintenance procedures in accordance with manufacturer's recommendations. Install proper recharge in the cylinder valve. Tighten securely. Install 1/2" ball valve assembly (item 34) onto the recharge adapters.**

2. **Attach your valve set adapter to the ball valve (item 50) on the end of the hose on the valve set regulator (item 42). Be sure that the ball valve (item 50) is closed. Attach your valve set adapter to the actuation port on the top of the cylinder (item 7) valve. Fully plug any secondary discharge ports or pilot ports.**

3. **Turn the selector valve (item 23) toward the RECOVERY CYLINDER position. Fully open the liquid valve on the receiver tank.**

4. **Turn the pump valve (item 24) to the ON position. Allow the pump to cycle until the pressure/vacuum gauge (item 2) is reading 5 inches of vacuum. Turn the pump valve (item 24) to the OFF position.**

5. **Connect the female quick coupler (item 25) on the cylinder hose (item 20) to the 1/2" ball valve assembly (item 34) and open the 1/2" ball valve.**

6. **Open the cylinder valve on the cylinder to be filled. Place the cylinder on the scale platform. Tare the extinguisher weight on the scale (item 40).**

7. **Turn the selector valve (item 23) on the control console to the SYSTRM CYLINDER position. This will allow liquid FM-200 to gravity feed into the cylinder being filled. "Check" recharge adapter, cylinder valve, and quick couplers for leaks.**

8. **When the inlet pressure gauge (item 4) and discharge pressure gauge (item 3) are reading within 50 PSI of each other, turn pump valve (item 24) on the control console the ON position. Check scale for increase weight readings. As the cylinder weight reading approaches within one (1) pound of calculated charge weight, turn pump valve (item 24) to the *OFF* position and turn selector valve (item 23) to the OFF position, stopping the flow of the FM-200 to the cylinder.**

9. **Set the regulator on nitrogen cylinder to the manufacturer's recommended pressure gauge reading for the cylinder being pressurized. Turn the liquid/nitrogen valve (item 6) to the nitrogen position and watch the cylinder pressure gauge. When the correct cylinder pressure gauge reading obtained, agitate the cylinder to mix the FM-200 and nitrogen. Repeat step if pressure drops below the manufacturer's recommended pressure.**

RECHARGE PROCEDURE FOR PNEUMATICALLY ACTUATED CYLINDERS(CONT.):

10. Close the cylinder valve by increasing the pressure on the valve set regulator to 500 PSI. Open the ball valve (item 50) to arm the pressure switch. Turn the liquid/nitrogen valve (item 6) to the *LIQUID* position and turn the selector valve (item 23) to the *RECOVERY CYLINDER* position. Turn the pump valve to the ON position and watch the pressure/vacuum gauge (item 2) until 5 inches of vacuum is obtained. Turn the pump valve (item 24) to the *OFF* position. Verify there is no pressure indication on the inlet pressure gauge (item 4). If a pressure reading is indicated, the cylinder valve may not have seated when closed. Reclose the cylinder valve and repeat step 10. After no pressure reading indicated, disconnect the quick coupler (item 25) form the 1/2" ball valve assembly (item 34).

11. Remove manufacturer's recharge adapter and the valve set adapter from cylinder valve.

12. Proceed to the next operating procedure of close all valves.

RECYCLE PROCEDURE:

(FOR REMOVAL OF MOISTURE, PARTICULATE, AND/OR COLOR)

CAUTION: **If the clear glass moisture indicator (item 1) on the control console is YELLOW or the FM-200 is any color clear, the FM-200 must be recycle though the system before you refill the cylinder.**

1. **Turn the selector valve (item 23) on the control console to the *RECOVERY CYLINDER* position.**
2. **Turn the liquid/nitrogen valve (item 6) on the control console to the *LIQUID* position.**
3. **Fully open the liquid valve on the receiver tank (item 33).**
4. **Turn the pump valve (item 24) on the control console to the ON position and allow the system to cycle until the pressure/vacuum gauge (item 2) read 5 inches of vacuum.**
5. **With the system cycling, connect the female quick coupler (item 25) on the system cylinder hose (item 20) to the male quick coupler on the vapor adapter assembly (item 31 or 32).**
6. **Fully open the vapor valve on the receiver tank. Turn the selector valve (item 23) on control console to the SYSTEM CYLINDER position.**
7. **Allow the system to circulate the FM-20 through the filters until the clear glass moisture indicator (item 1) turn *GREEN* or the FM-200 looks clear through the moisture indicator glass.**

   NOTE: **Refer to the "filter replacement procedure" (page 21) if the moisture indicator (item 1) does not change to *GREEN* or the color does not return to clear within an hour.**

8. **Recycle procedure is complete when moisture eye (item 1) is GREEN or the FM-200 is clear flowing through the clear glass moisture eye.**
9. **Turn the selector valve (item 23) to the *RECOVERY CYLINDER* position. Allow the system to cycle for 1 minute, close the vapor valve on the receiver tank and monitor the pressure/vacuum gauge (item 2) until a reading of 5 inches of vacuum is obtained. Disconnect female quick coupler (item 25) and turn the pump valve (item 24) on the control console to the *OFF* position.**
10. **Close all valves or proceed to the next procedure.**

PROCEDURE FOR FILTER REPLACEMENT AND CLEANING BRASS STRAINERS:

1. **Turn the pump valve (item 24) on the control console to the *OFF* position.**

2. **Close any valve that is online with the female quick coupler (item 25). Turn the selector valve (item 23) on the control console to the *RECOVERY CYLINDER* position.**

3. **Turn the liquid/nitrogen valve (item 6) on the control console to the LIQUID position. Turn the liquid valve on the receiver tank fully open. Turn the pump valve (item 24) to the ON position.**

4. **Allow the system to cycle until the pressure/vacuum gauge (item 2) reads 5 inches of vacuum.**

5. **Turn the pump valve (item 24) to the OFF position and close the liquid valve on the receiver tank.**

   WARNING – If either of the gauges in step 6 are indicating a pressure reading, *DO NOT ATTEMPT TO SERVICE THE FILTERS*.

6. **Verify that the inlet pressure gauge (item 4) and the pressure/vacuum gauge (item 2) are at a (0) PSI pressure reading. Repeat steps 1 thru 6 is a pressure reading is indicated on either gauge. Refer to the trouble shooting guide on page 24-25 if steps 1 thru 6 do not correct the pressure readings.**

7 **Remove the bolts (item 36) from the filter canister (item 35). Left the filter cap (item 37) away from the filter canister and replace filter cores. Follow replacement procedures found on each replacement filter core canister.**

8. **Turn the brass hex nut from strainer bodies (item 15 & 38) counter clockwise. Remove and clean the fine mesh screens using an air gun at 30 PSI air pressure.**

   WARNING - Replace the fine mesh on either strainer if bent, torn, or frayed. SYSTEM DAMAGE WILL RESULT IF NOT MAINTAINED.

9. **Proceed to the next operating procedure or close all valves.**

WARNING: **FOLLOW PURGE PROCEDURE TO AVOID MIXING OF CLEAN AGENTS**

PURGE PROCEDURE FOR SWITCHING CLEAN AGENTS:

1. Turn the selector valve (item 23) on the control console to the RECEIVER position. Open the liquid valve on the receiver tank. Turn the pump valve (item 24) to *ON* and allow the system to cycle until the pressure/vacuum gauge (item 2) reads 5 inches of vacuum. Turn the pump valve (item 24) to *OFF*.

2. Connect the female quick connect (item 25) to the receiver tank vapor port adapter (item 31).

3. Open the vapor valve on the receiver tank.

4. Turn the pump valve (item 24) to ON. Allow the pump to run for 1 minute to purge all liquid from the system.

5. Close the vapor valve on the receiver tank and allow the system to cycle until the pressure/vacuum gauge (item 2) reads 5 inches of vacuum. Turn the pump valve (item 24) to *OFF*.

6. Connect the female quick connect (item 25) to the male quick connect (item 14) using the adapter (item 49).

7. Set the pressure reducing regulator to zero (0) output pressure, and open the supply valve on the nitrogen cylinder.

8. Set regulator to 20 PSI above reading on pressure gauge (item 3) but not to exceed maximum receiver tank pressure.

9) Allow the nitrogen to flow until the pressure on gauge (item 3) equals the pressure on the regulator.

10. Set the pressure reducing regulator to zero (0) output pressure, and close the supply valve on the nitrogen cylinder. Turn the pump valve (item 24) to ON. Allow the system to cycle until the pressure /vacuum gauge (item 2) reads 5 inches of vacuum. Turn the pump valve (item 24) to OFF. Close the liquid on the receiver tank.

11. You may now use a different clean agent.

RECOMMENDED PERIODIC MAINTENANCE:

(MINIMUM RECOMMENDATIONS - PERFORM MORE FREQUENTLY IF REQUIRED)

1. **Every day, lubricate all male and female quick couplers (items 25, 26 & 34) with a light coat of FM-200 compatible O-ring lubricant.**

2. **Every day, empty the air line moisture filter (item 17).**

3. **Every day, remove the brass hex nut on the strainer body (item 15 & 38). Clean and inspect for damage. Refer to "procedure for filter replacement and cleaning brass strainer" on page 19.**

   WARNING - SYSTEM DAMAGE WILL RESULT IF NOT MAINTAINED.

4. **Once per month, check the complete system for leaks while "performing the recycling procedure" using a FM-200 leak detector or leak detecting fluid.**

   CAUTION: If a leak detecting fluid is utilized, proper care should be observed to remove all excess fluid after testing.

5. **Once per month, retighten all bolts and nuts securing component parts to the system.**

6. **Once per month, or if the pump slows while operating, lubricate spool valve in the FM-200 pump. Refer to the "FM-200 Pump Operation and maintenance manual", pages 27-33.**

7. **Once every six months or if clear glass moisture indicator (item 1) will not turn green, change the filter elements P/N 51250 (in item 35). Refer to the "procedure for filter replacement and cleaning brass strainer" on page 21.**

8. **Once per year, dismantle the pump. Clean and lube the O-rings on the air drive piston. Refer to the "FM-200 pump operation and maintenance manual"' pages 27-33.**

9. **Once per year, have your nitrogen regulator on the nitrogen supply cylinder cleaned and recalibrated.**

TROUBLE SHOOTING GUIDE:

PROBLEM:	SOLUTION:
A. FM-200 flows slowly or not at all through system.	**A. 1. Make sure all liquid valves are open and selector valve is in the proper position.** **2. Check or change filters inside of filter housing (item 35) and clean brass strainer (item 15 & 38). Refer to procedure on page 21.**
B. FM-200 leaks from female quick couplers (item 25 & 26)	**B. Replace O-ring seal on the inside of the quick coupler or replace the female quick coupler.**
C. Pump cycle is slow.	**C. 1. Check incoming air pressure to system. Set at 100 to 120 PSI and 13 CFM minimum.** **2. Refer to spool valve lubricating instructions in FM-200 pump maintenance manual. (Refer to procedure On pages 27-33)**
D. Pump valve or FM-200 liquid/ Nitrogen valve is leaking FM-200.	**D. Insert allen wrench is set screw on the side of the handle and turn counter clockwise until handle is free. Lift handle off valve and tighten slotted packing nut Around valve stem slightly. Replace handle and retighten set screw clockwise or replace valve.**
E. Pump cycles but will not build pressure.	**E. Refer to "operations manual" on the procedure you are performing and verify all valves are properly positioned and all fitting are properly connected.**
F. Moisture indicator will not turn green or is white.	**F. 1. Refer to the "procedure for filter replacement and cleaning brass strainers" on page 21.** **2. If moisture indicator is *WHITE* replace with new moisture indicator. Relieve all internal pressure in accordance with procedure on page 21.**

TROUBLE SHOOTING GUIDE (CONT.):

PROBLEMS:	SOLUTIONS:
G. Relief valve (item 18) exhausts FM-200	**G. Refer to "operations manual" on the procedure you are performing. Verify that all valves are in the proper position and all fittings are properly connected.**
I. Pump cycles but will not build a vacuum	**I. Leak test the system with FM-200 leak detector, repair leaks as necessary.**
J. FM-200 leaks around tank valve adapters (items 30, 31, 32, 27, 47).	**J. Tighten adapters or replace gaskets in adapters.**
K. FM-200 leaks out of pump.	**K. Refer to FM-200 pump maintenance manual on pages 24-30.**
L. System cylinder begins building weight but stops or builds pressure but little or no weight.	**L. There may be no liquid FM-200 in the receiver tank (item 33).**
M. Cylinder is recharged but pressure gauge on cylinder drops below manufacturer's recommended gauge pressure.	**M. Add nitrogen to the filled cylinder, and reagitate the FM-200 and nitrogen until pressure gauge stabilizes. Leak test the filled cylinder valve.**

RECOMMENDED MAINTENANCE KIT OR SPARE PARTS:

QUANTITY	PART #	DESCRIPTION
1 EACH	3G58941	KIT MAINTENANCE HR-200 PUMP AIR
1 EACH	3G58800	REPLACEMENT MOISTURE EYE CARTRIDGE
2 EACH	1G0418	FILTER CORE ELEMENTS
1 EACH	1G52534	FINE MESH REPLACEMENT FILTER (STRAINER)
2 EACH	1G51344	GASKET FOR RECEIVER TANK ADAPTERS
1 EACH	1G51445	SEAL KIT FOR SPOOL VALVE ON HFC-227 PUMP
1 EACH	3G58846	DOWEL ROD FOR SPOOL VALVE REMOVAL
4 EACH	3G58801	O-RING SEAL FOR FEMALE QUICK COUPLER
4 EACH	3G58802	O-RING SEAL FOR MALE QUICK CONNECT
1 TUBE	1G51515	SEAL LUBRICANT FOR HFC-227 PUMP AIR DRIVE
1 EACH	1G52535	BRASS NUT & REPLACEMENT MESH FILTER (STRAINER)
1 EACH	3G58835	ORING FOR BRASS NUT & REPLACEMENT MESH FILTER
1 EACH	1G52540	SELECTOR VALVE REPAIR KIT