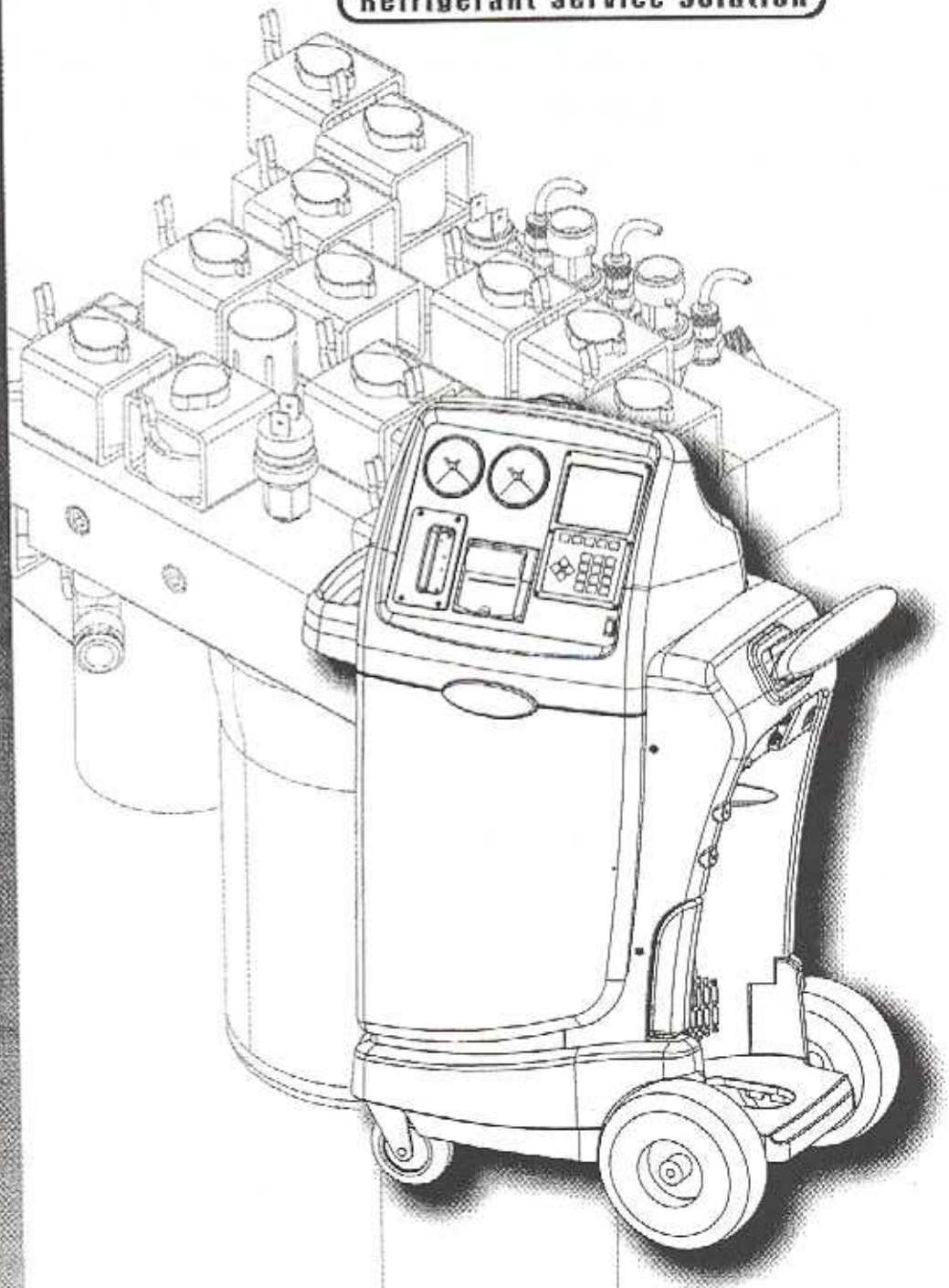
ACR 2000

Refrigerant Service Solution



SERVICE MANUAL

Safety Precautions

WARNING!

Always wear safety goggles when working with refrigerants. Contact with refrigerant can cause eye injury. Disconnect lines and hoses with extreme caution! Pressurized refrigerant may be present in lines and hoses. Always point lines and hoses away from you and anyone nearby.

Always unplug the station from the power source before removing any of the shrouding or beginning any service work.

To order parts, please phone your order to 1-800-822-5561

All service related questions should be directed to the Robinair Technical Assistance Line at 1-800-822-5561.

TABLE OF CONTENTS

THEORY OF OPERATION

The ACR2000 is a complete air conditioning service center that is used to service vehicles that contain R-134a refrigerant only. The ACR2000 Refrigerant Service Solution equipment recovers, recycles, evacuates and recharges refrigerant quickly, accurately and automatically with little attention needed from the technician. The ACR2000 also has the capability to perform a complete A/C system flush. There are many other internal checks and procedures that occur unknown to the technician during the operation of the ACR2000. It is suggested that the ACR2000 is left running through out the entire work day for the machine to perform its necessary checks.

The A/C unit contains a built-in refrigerant identifier that determines the percent of refrigerant, air and contaminants within the vehicles system before the recovery process begins. The technician will have the opportunity to abort the procedures if contaminants are detected. The refrigerant is recovered and stored within the ACR2000 in the Internal Storage Vessel (ISV). During normal operation the A/C unit will automatically fill the ISV from the external source tank mounted on the outside of the ACR2000. The external source tank on the outside of the machine does not store recovered refrigerant. All R-134a refrigerant source tanks have an internal check valve that will only allow the flow of new refrigerant from the source tank. It is not possible to fill or refill R-134a source tanks. The Internal Storage Vessel (ISV) will maintain a constant 12-15 lbs. (5.45-6.82kg.) of refrigerant. The only time that the ISV will have to be manually filled with R-134a refrigerant is during the initial set-up of the ACR 2000 and after service if the ISV is drained. This procedure is known as *first time tank fill.*

Some of the additional features of the A/C unit include automatic air purge, automatic oil drain and single pass cycle. The unit will automatically clear and recover the excess refrigerant that will remain in the hoses after each use. When a specific process is completed, the technician is notified by a flashing of the red lamp on top of the machine and an audible beep.

The main electronics of the ACR2000 receive power from the Power Supply unit that is located within the machine. The Power Supply can accept 110 volts or 220 volts (50-60hz). The ACR2000 will self-protect during times of reduced or low voltage. If the power to the unit is 90 volts or less, the ACR2000 Refrigerant Service Solution equipment will enter the self-protection mode and shut down.

The Power Supply controls voltage to the following components:

- 5 volts to the printer
- 12 volts to the identifier
- 12 and 110 volts to the relay board
- 12 and 24 volts to the control board (display panel)
- 5 volts to the transducers from the control board

The ACR2000 Refrigerant Service Solution is protected by two circuit breakers that are on the rear of the machine. The circuit breakers are 3 amp and 15 amp.

CAUTION: Refrigerant must be internally recovered by using the service clear mode from the *Service Diagnostic Menu* before any service or component replacement is performed. After the service clear, be sure to close the service valves on the Internal Storage Vessel (ISV) and source tank before disconnecting lines or removing components.

Testing

The testing or sampling procedure is done to determine the content of the refrigerant that will enter the ACR 2000 machine. It is extremely important that no contaminated refrigerant enters the internal storage vessel of the machine.

When the testing procedure begins, the inlet test solenoid will be powered to open and allow the flow of refrigerant from the vehicle. At the same time the ID drain solenoid (normally open) will be powered to close.

The operation of the solenoids is controlled by the identifier switch. The switch allows the inlet test solenoid to open and close controlling the flow of refrigerant to the identifier. The identifier switch opens at 25 psi (172 kPa) and closes at 40 psi (276 kPa).

Anytime a procedure requires refrigerant from the vehicle to enter the ACR2000, testing of the incoming refrigerant will be done automatically. The actual testing of the refrigerant is done by the identifier assembly located on the front of the machine.

If the testing procedure fails, the test will be automatically repeated one time only. If the test fails a second time, the ACR2000 will automatically perform a clearing procedure to remove the contaminated refrigerant from the hoses.

If testing of the refrigerant is acceptable, the ID drain solenoid will open to allow any trapped oil from the testing sample to be expelled into the external recovery bottle.

When the ACR2000 Refrigerant Service Solution equipment is powered and idle, the testing procedure will activate and test the refrigerant in the internal storage vessel. The sample of refrigerant is tested for purity of the R-134a refrigerant and percent of air.

Recovery

The recovery process will not begin until the ACR 2000 has determined that there is a minimum 25 psi (172 kPa) of system pressure in the vehicle to be recovered. The necessary 25 psi (172 kPa) of system pressure is determined by the low side transducer. When the recover process is activated, the identifier will examine the refrigerant to be recovered. At this point the technician will be notified about the content of the refrigerant, air and contaminants within the system. If purity of the refrigerant is acceptable the recovery process begins automatically. The recovery process will not proceed automatically if contaminants are detected. This prevents contamination of the refrigerant within the Internal Storage Vessel (ISV).

During the recovery process the refrigerant will travel through the high and low side hoses, through the recovery solenoid, expansion valve and into the accumulator. Part of the recovery process is to filter the refrigerant to remove acid, moisture and particles. Replacement of the filter assembly will be after approximately 300 lbs. (136.36kg) of refrigerant has been recycled by the filter. The prompts on the display screen will advise the technician when changing the filter is required. Follow the filter change prompts from the *Main Menu* for service of the filter assembly. The refrigerant will also enter the oil separator to remove oil from within the refrigerant. The oil from the refrigerant will be collected in the external container when the oil drain solenoid opens. The external oil drain bottle is marked for measurement purposes.

Evacuation/Vacuum

The air conditioning system must be evacuated whenever the system is serviced. Evacuation removes the air and moisture from the system by activation of the vacuum pump. When the system is pulled to a vacuum the excess moisture and refrigerant in the system will boil due to the low vacuum condition. The vacuum pump will also remove the excess air from the system. At or near sea level the vacuum pump can achieve an approximate value of 28" Hg (94.8 kPa). Elevation affects the ability to achieve the same vacuum readings at sea level. For each 1,000 feet (305 meters) of elevation the value will be approximately 1" Hg (3.4 kPa) higher. For example, at 5,000 feet (1524 meters) the vacuum reading value will be approximately 24" Hg (81.27 kPa).

When the vacuum mode is requested, the free air (normally open) solenoid will close after the vacuum pump begins to run. The free air solenoid eases the start-up of the vacuum pump. Vacuum is pulled from the high and low sides of the vehicles A/C system. The vacuum pump will continue to run for a specified default time period of three minutes. The default vacuum time is adjustable.

If at the end of the vacuum time limit the vacuum pressure measured in inches of mercury (" Hg) does not satisfy the preset value, the vacuum pump will continue to run. For this reason, it important that the change elevation setting from the *Set-Up Menu* is reviewed and properly adjusted.

Charging

After the evacuation/vacuum procedure and the system has proven to hold vacuum, charging may begin. Select the charge mode from the *Main Menu.* The default of 2.00 lbs. (.91 kg) of refrigerant will be shown on the screen. The default can be changed and reprogrammed for other weights. During the high side charging mode the charge solenoid will open to allow flow of liquid refrigerant from the Internal Storage Vessel (ISV) to the high side of the vehicle's system.

Charging refrigerant into the vehicles high side is a default preprogrammed setting. Charging into the low side is also an option by manually operating the low side charge and following the screen prompts.

If pressures do not allow full transfer of the refrigerant, the ACR2000 will enter the power charge mode. During the power charge mode the high or low side inlet solenoid will close and the compressor will run for 15 seconds to build pressure within the internal storage vessel. The high or low side [redacted] solenoid will reopen to attempt transfer of the refrigerant for a second time. If the full transfer of refrigerant can not be completed the pressure build procedure will be repeated four times before the unit shuts down and notifies the operator.

It is important the proper charge setting is programmed during the charge mode.

[redacted]; the ACR2000 will use the power charge and clearing 2 solenoids to pressurize the internal storage vessel.

After the charging process is complete, the display will prompt the user to recover the refrigerant that remains in the hoses. Be sure the hoses are disconnected from the vehicle and the service couplers are closed.

COMPONENTS

Note: All solenoids are normally closed and powered opened unless noted. Numbers correspond to Parts Illustration List.

Ambient Board(47) (RA19609) — Circuit board that measures temperature and humidity.

Analog Board(44) (RA19605) — On the top rear of the ACR 2000. The analog board is where the external sensors are connected. The RS-232 serial port is also on the analog board.

Capacitor(50) — Device for storing electrical charge. The capacitor is part of the vacuum pump.

Caster(13) (RA19631) — 5" x 2" wheel assembly.

Charge Check Valve — Prevents incoming refrigerant from opening the charge solenoid and entering the liquid side of the ISV.

Charging Solenoid — Prevents flow of refrigerant from the tank into the inlet while not powered. (Solenoid Rebuild Kit RA19258)

Check Valve Rebuild Kit (Pipe) (RA19645) — Check valves under pipe plugs.

Check Valve Rebuild Kit (Sand) (RA19646) — Check valves between sandwiched blocks.

Clearing 1 Solenoid — Powered only during the clearing cycle. When powered, the solenoid allows the compressor to recover the high side of the machine.

Clearing 2 Solenoid — Without power, this three way solenoid is open between the compressor discharge and the compressor oil separator. During the self-clear cycle, the solenoid receives power and opens between the compressor and the clearing capillary tube.

Clearing Check Valve — Prevents the discharged pressure from the compressor from entering the clearing capillary tube.

Compressor(50) (110 volt) (RA19458) — 1/3 hp. hermetic piston type compressor with o-ring and fittings.

Compressor(50) (220 volt) (RA19457) — 1/3 hp. hermetic piston type compressor with o-ring and fittings.

Compressor Oil Separator — Separates compressor oil that has migrated out with passing refrigerant. The oil is stored in the separator until the equalization/oil return solenoid receives power and allows the oil to be returned to the compressor.

Condenser(57) (RA19615) — Turns vapor refrigerant to liquid refrigerant for delivery to the Internal Storage Vessel (ISV).

Control Board (RA19606) — Front display panel and main control of the ACR2000.

Discharge Check Valve — Allows flow in one direction only. Prevents refrigerant and pressure from the Internal Storage Vessel (ISV) being equalized back into the low side of the unit when the equalization/oil return solenoid opens to return compressor oil and repressurize the system oil separator.

Door Latch Kit (RA19632)

Equalization/Oil Return Solenoid — Prevents flow of refrigerant from the high side of the unit back into the low side while not powered. When powered, it returns compressor oil from the compressor oil separator to the compressor and equalizes the pressure on the high and low side of the compressor. The solenoid receives power for three seconds when the compressor is energized and for 20 seconds after the compressor is de-energized. The solenoid will again be energized for 3 seconds every 10 minutes of compressor operation. If the pressure transducer reads 0 psi the solenoid will be energized for 3 seconds. (Solenoid Rebuild Kit RA19258)

Expansion Valve — Meters the flow of refrigerant into the system oil separator. The allowable tolerance of the valve is 35 ± 5 psi (241 ± 34 kPa).

Fan[42] (RA17416) — Runs when powered by the circuit board. Fan does not operate during the power charge mode.

Filter Vacuum Check Valve — Prevents incoming refrigerant from opening the filter vacuum solenoid during normal operations.

Filter/Drier Spin-On Type (34724) — Removes acid, moisture and particles from the refrigerant during the recycle process. Average life expectancy is approximately 300 lbs. (136 kg.) recovered refrigerant. Includes O-rings.

Filter/Vacuum Solenoid — Powered during the filter/drier change procedure. Allows the vacuum pump to draw a vacuum on the filter/drier after replacement.

Free Air Solenoid — Normally open solenoid receiving power one second after the vacuum pump starts. This process allows the vacuum pump to start with free air on the inlet. The solenoid should maintain power for the complete vacuum cycle.

Gauge Lens (RA19639)

High Pressure Cutout Switch (RA19427) — Switch opens at 435 ± 10 psi (2999 ± 69 kPa) and resets at 320 ± 20 psi (2066 ± 137 kPa). If pressure in the high side of the system exceeds 435 psi (2999 kPa), the switch opens stopping all functions.

High Side Charge Solenoid — Allows refrigerant from ISV to enter the vehicle.

High Side Gauge[54] (RA19613) — Displays the high side pressure. Maximum pressure marker stays at the highest pressure the needle attained.

High Side Hose (red) (63096) — Provides flow from the high side of an A/C system to the high side manifold valve.

High Side Inlet Solenoid — Allows refrigerant from the high side of a system to enter the ACR 2000 unit.

High Side Pressure Transducer (RA19633) — Measures the pressure of incoming refrigerant from the high side of a system. Pressure readings are then relayed to the main circuit board.

High Side Service Coupler (red) (18191A) — Allows access to the high side of an R-134a automotive system. (Replacement Front O-Ring RA19115)

ID Drain Solenoid — Normally open solenoid closes when identifier samples.

ID Oil Filter — Removes oil from the refrigerant sample.

ID Oil Separator (RA19657) — Prevents oil from entering ID unit.

ID/Air Purge Solenoid — Opens when the ID detects air in the ISV.

Identifier (ID Unit)[33] (RA19604) — Unit that samples refrigerant for air content, contaminants and refrigerant type.

Identifier Switch (RA19634) — This normally closed switch will cause the inlet test solenoid to close if the pressure of the sampled refrigerant is above 40 ± 3 psi (276 ± 21 kPa). The switch controls flow of refrigerant to the identifier. The switch will reset at 27 ± 3 psi (276 ± 21 kPa).

Inlet Check Valve — Allows flow in one direction only, towards the recovery solenoid. Prevents refrigerant from escaping after recovery, during recycling, and during evacuation.

Inlet Screen (RA19203) — Replacement in-line disc screen filter for copper tubing.

Inlet Test Solenoid — Opens during the sampling process.

Internal Storage Vessel (ISV)[60] (RA19612) — ISV container used to store refrigerant. Vapor and liquid access is from the top of the tank. The internal liquid draw tube extends to within two inches (5cm) of the bottom of the tank. Tank rests atop the electronic scale.

ISV Air Purge Hose (RA19635) — Allows air pressure trapped at the top of the ISV to enter the lower cavity of the air purge device during recycling.

ISV Check Valve — Prevents the vapor from the top of the ISV returning to the condenser when the compressor shuts off.

ISV Liquid Hose (RA19636) — Allows flow from the liquid side of the ISV into the manifold block.

ISV Source Tank Hose (RA19637) — The hose attached to the external supply tank.

ISV Vapor Hose (RA19638) — Allows flow from the discharge of the compressor to the vapor side of the ISV during recovery or recycling.

Key Pad(65) (RA19644) — Touch-pad cover for the front of the control board.

Low Side Charge Solenoid — Allows refrigerant from ISV to enter the vehicle when low side charge is manually selected.

Low Side Gauge(55) (RA19614) — Displays the low side pressure. Maximum pressure marker stays at the highest pressure the needle attained.

Low Side Hose (blue) (62096) — Provides flow from the low side of an A/C system to the low side manifold valve.

Low Side Inlet Solenoid — Allows refrigerant from the low side of a system to enter the ACR 2000 unit.

Low Side Pressure Transducer (RA19640) — Measures the pressure of incoming refrigerant from the low side of a system. Pressure readings are then relayed to the main circuit board. Also determines if recovery is needed based on pressure. stops recovery at 9 PST

Low Side Service Coupler (blue) (18190A) — Allows access to the low side of an R-134a automotive system. (Replacement Front O-Ring RA19115)

Main Circuit Board — Controls unit functions, automatic or programmed.

Manifold Assembly(52) (RA19600) — Internal block assembly that contains solenoids, check valves and switches. Refrigerant will pass through the manifold assembly for proper distribution.

Manifold Block Check Valve Kit (RA19326) — Kit includes three check valves and three springs.

Neutronics ID(33) — This is the refrigerant identifier that determines the purity of incoming refrigerant. It also regularly samples the ISV for contaminants and air. The ID is an air purge device. Never adjust the identifier.

Oil Drain Block(53) (RA19601) — Lower block assembly.

Oil Drain Check Valve — Check valve stops outside air pressure from entering the oil drain.

Oil Drain Male Coupler (RA19581) — Coupler that oil drain bottle attaches to.

Oil Drain Solenoid — Solenoid opens during the oil drain sequence.

Oil Drain Switch — The pressure feedback solenoid opens to supply refrigerant pressure to the accumulator. The oil drain switch reads the pressure and closes the pressure feedback solenoid at 16 psi (110 kPa). The oil drain solenoid opens to relieve the pressure and expel the stored oil from the bottom of the accumulator. At 9 psi (62 kPa) the oil drain solenoid closes. The oil drain solenoid will open and close several times.

Power Charge Solenoid — Opens to recirculate refrigerant to build pressure for power charging.

Power Cord (RA19641)

Power Supply[34] (RA19462) — Controls voltage to the internal components. Many of the circuits operate on reduced voltage.

- 5 volts to the printer
- 12 volts to the identifier
- 12 and 110 volts to the relay board
- 12 and 24 volts to the control board (display panel)
- 5 volts to the transducers from the control board

Pressure Feedback Solenoid — Used during the oil drain function. The solenoid will open after recovery to apply refrigerant pressure into the accumulator. The refrigerant pressure is used to clear the accumulator of oil when the oil drain solenoid opens. The solenoid is controlled by oil drain switch.

Pressure Relief (RA19499) — Spring loaded safety valve that opens at approximately 450 psi (3102 kPa) for internal tank relief.

Printer Assembly[43] (RA19611)

Recover Solenoid — Prevents flow of refrigerant into the system oil separator. (Solenoid Rebuild Kit RA19258)

Red Light[36] (RA19647)

Relay Board[49] (RA19602) — Control relays for ACR 2000.

Scale[35] (RA19603) — Sends a signal to the main board for refrigerant weight readings and ISV overfill protection.

Solenoid Rebuilt Kit (Normally Closed) (RA19258)

Solenoid Rebuilt Kit (Normally Open) (RA19648)

Step Down Transformer — Unit reduces voltage to the circuit board.

System Oil Separator — Heat exchanger with high side coils give the canister internal heat causing incoming saturated vapor and accumulated liquid refrigerant to evaporate. The liquid refrigerant is stopped from entering the compressor, allowing the refrigerant oil to drop off into the bottom of the separator.

Tank Fill Solenoid — Solenoid opens during the automatic tank fill procedure. It controls the flow of refrigerant into ISV from the external supply tank. The solenoid opens during routine operation to refill the ISV and maintain a chargeable refrigerant weight of 12 lbs. (5.44 kg). The tank fill solenoid will close if there is a reading of 13" Hg (44 kPa). The vacuum reading would indicate an empty external supply tank.

Tank Test Solenoid — Opens when sampling the ISV for contaminated refrigerant. With the ACR2000 idle and powered, the tank test solenoid will open momentarly and sample the refrigerant in the following sequence:

- 5 minute interval
- 5 minute interval
- 15 minute interval
- 15 minute interval
- 15 minute interval
- 15 minute interval

Air will be purged from the tank during this procedure. The solenoid is controlled by the identifier switch.

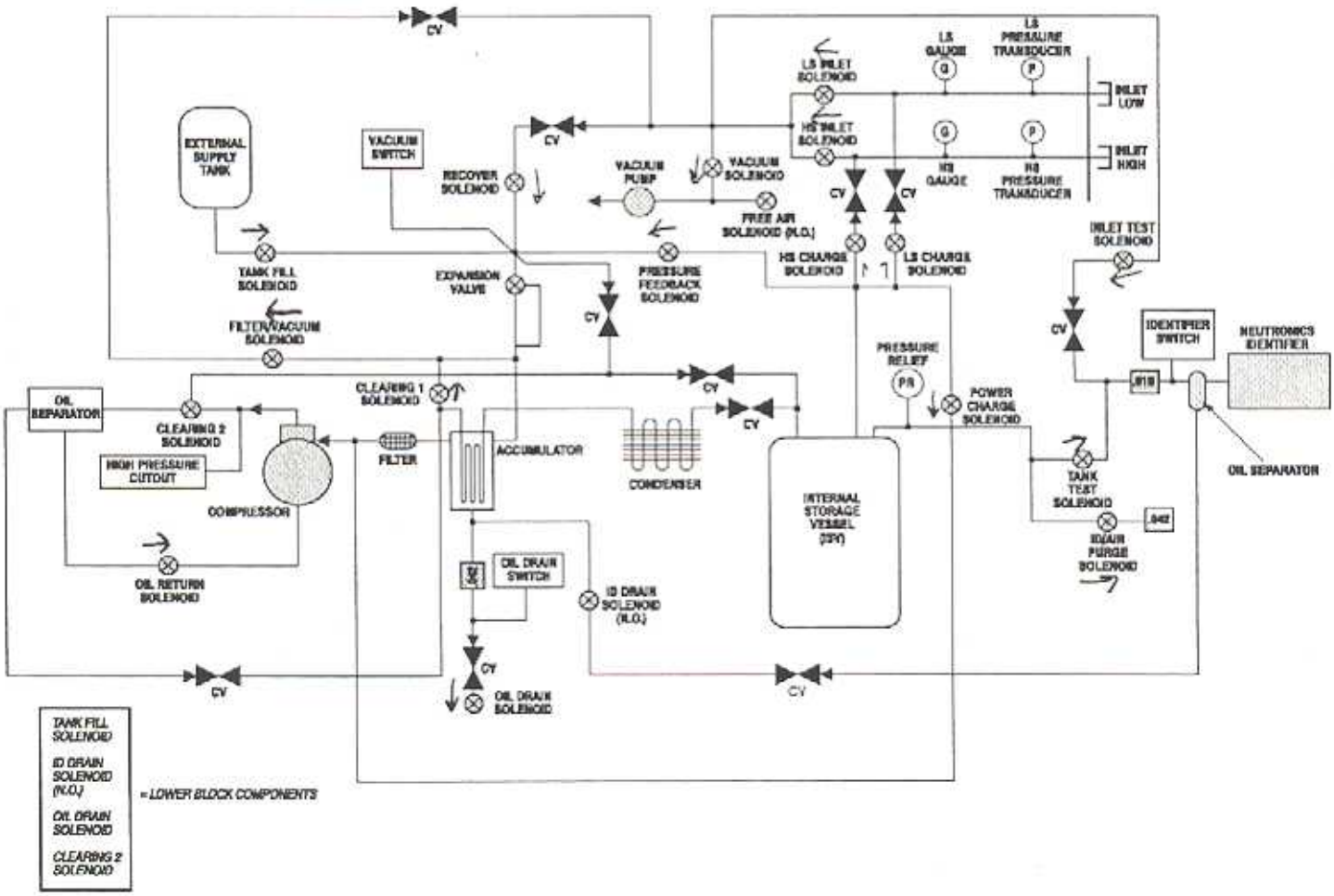
Vacuum Pump (110 volt)[59] (RA19610) — Oilless pump designed to remove moisture and air from an A/C system.

Vacuum Solenoid — Prevents flow of refrigerant into the vacuum pump. Allows flow from the system to the vacuum pump when powered. (Solenoid Rebuild Kit RA19258)

Vacuum Switch (RA18752) — Normally closed sensor that opens at 13 ± 3" Hg (44 ± 10 kPa) vacuum and resets at 3 ± 3" Hg (10 ± 10 kPa) If the vacuum at the inlet is greater than 13" Hg (44 kpa), the switch opens and stops the ~~recovery or~~ clear process.

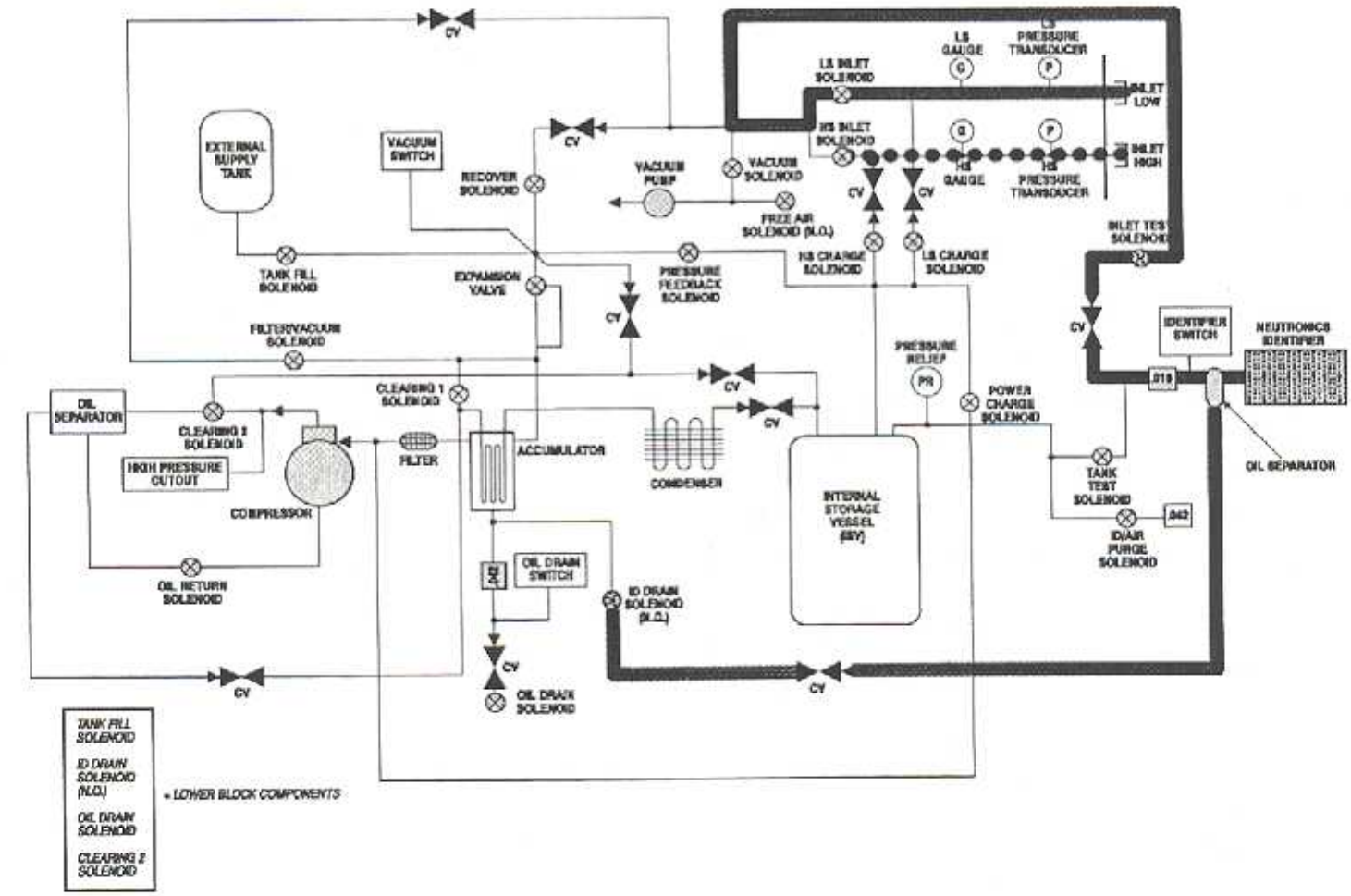
WIRING DIAGRAM POSITION

FLOW DIAGRAMS (1)



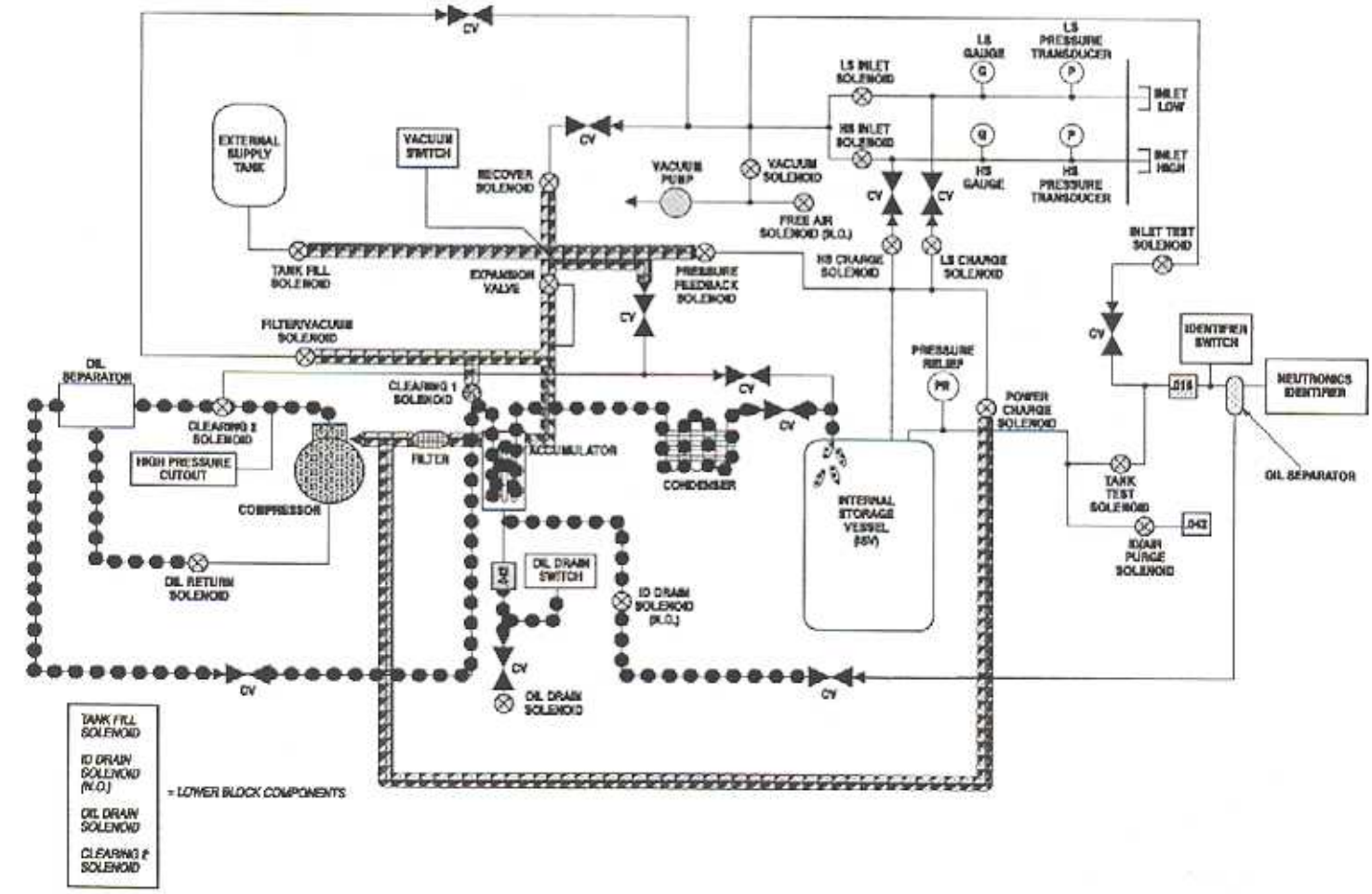
FLOW DIAGRAMS (2)

TESTING



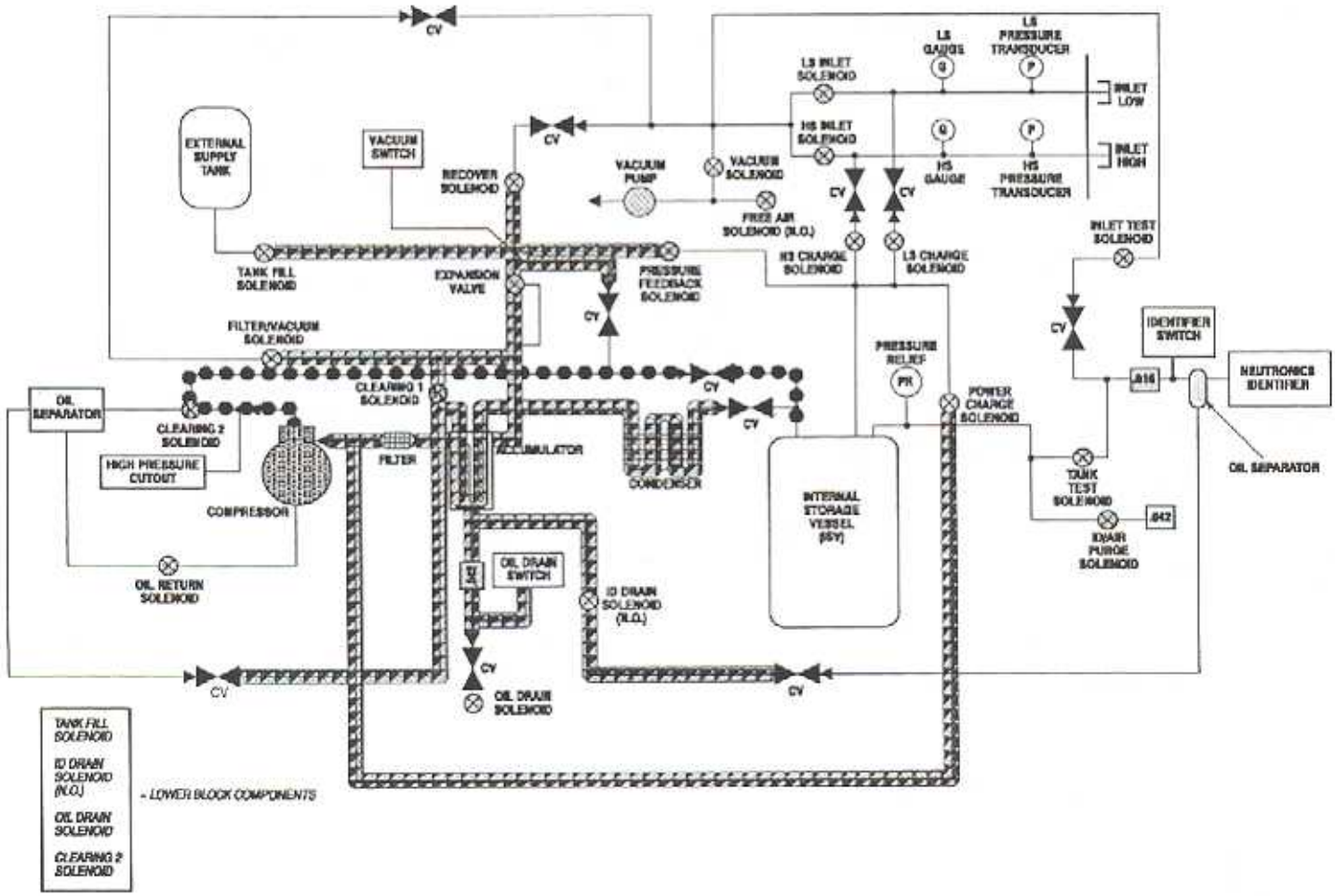
FLOW DIAGRAMS (3)

LOW SIDE CLEAR



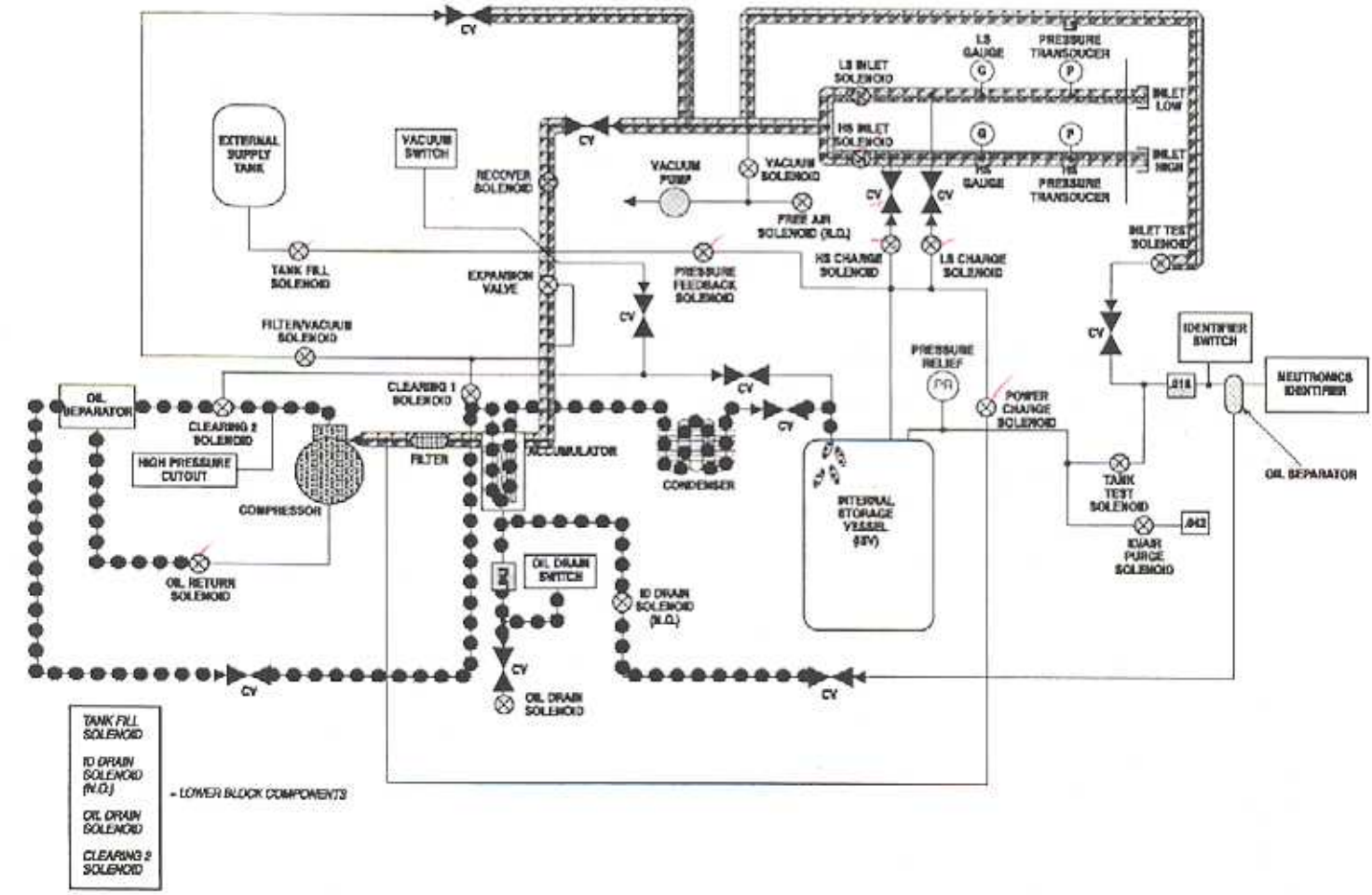
FLOW DIAGRAMS (4)

High Side CLEARING



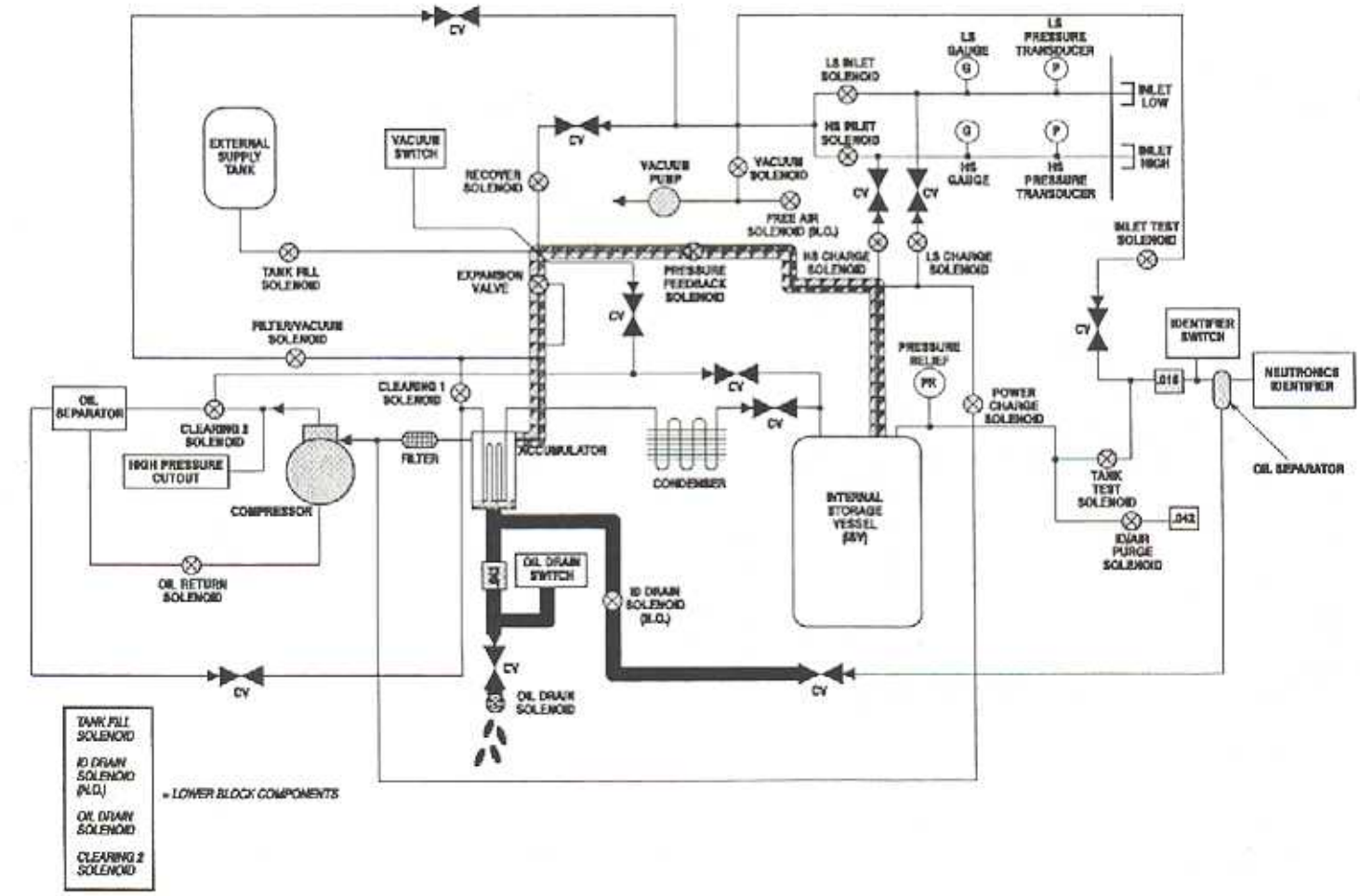
FLOW DIAGRAMS (5)

RECOVERY



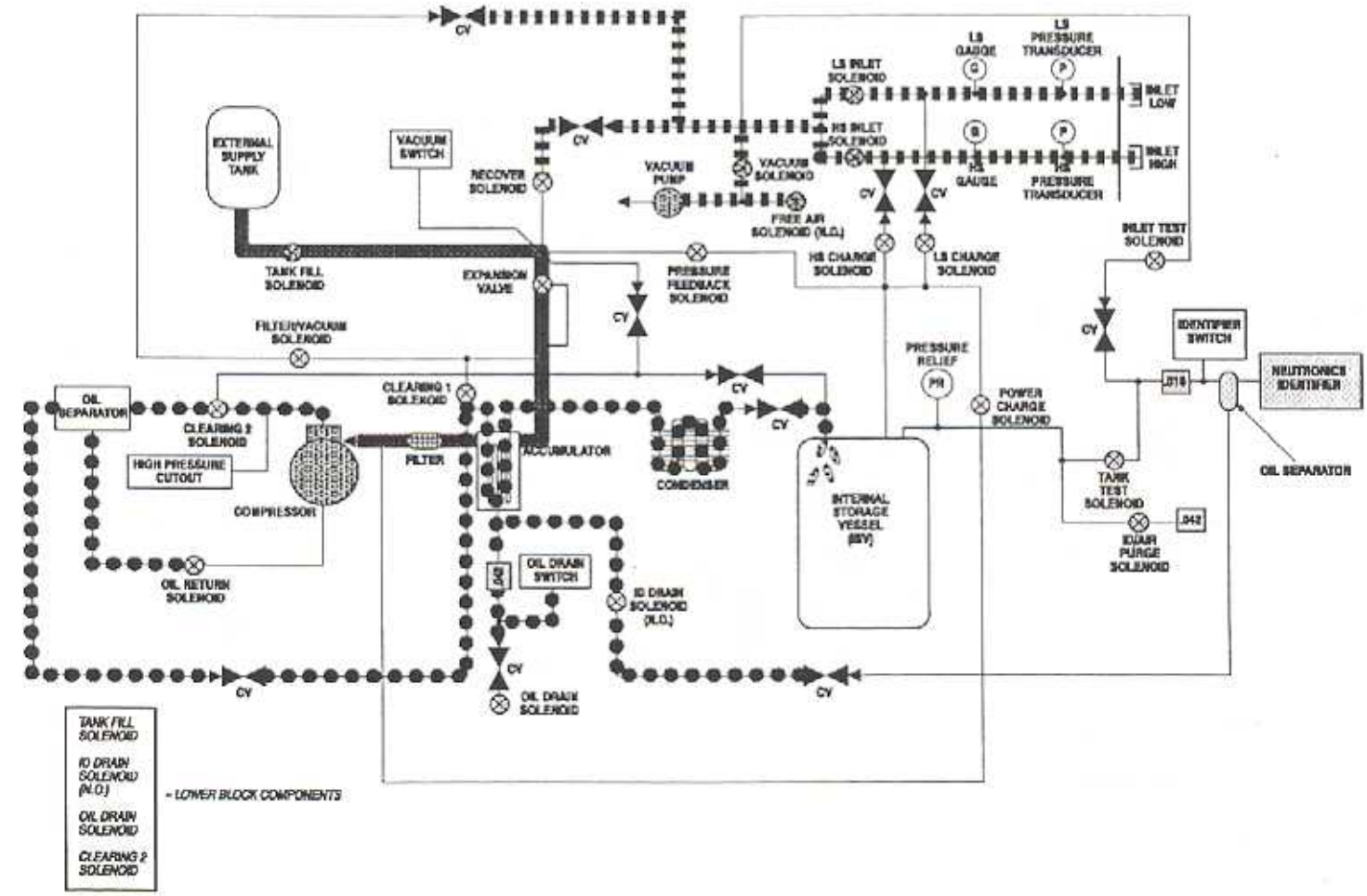
FLOW DIAGRAMS (6)

OIL DRAIN



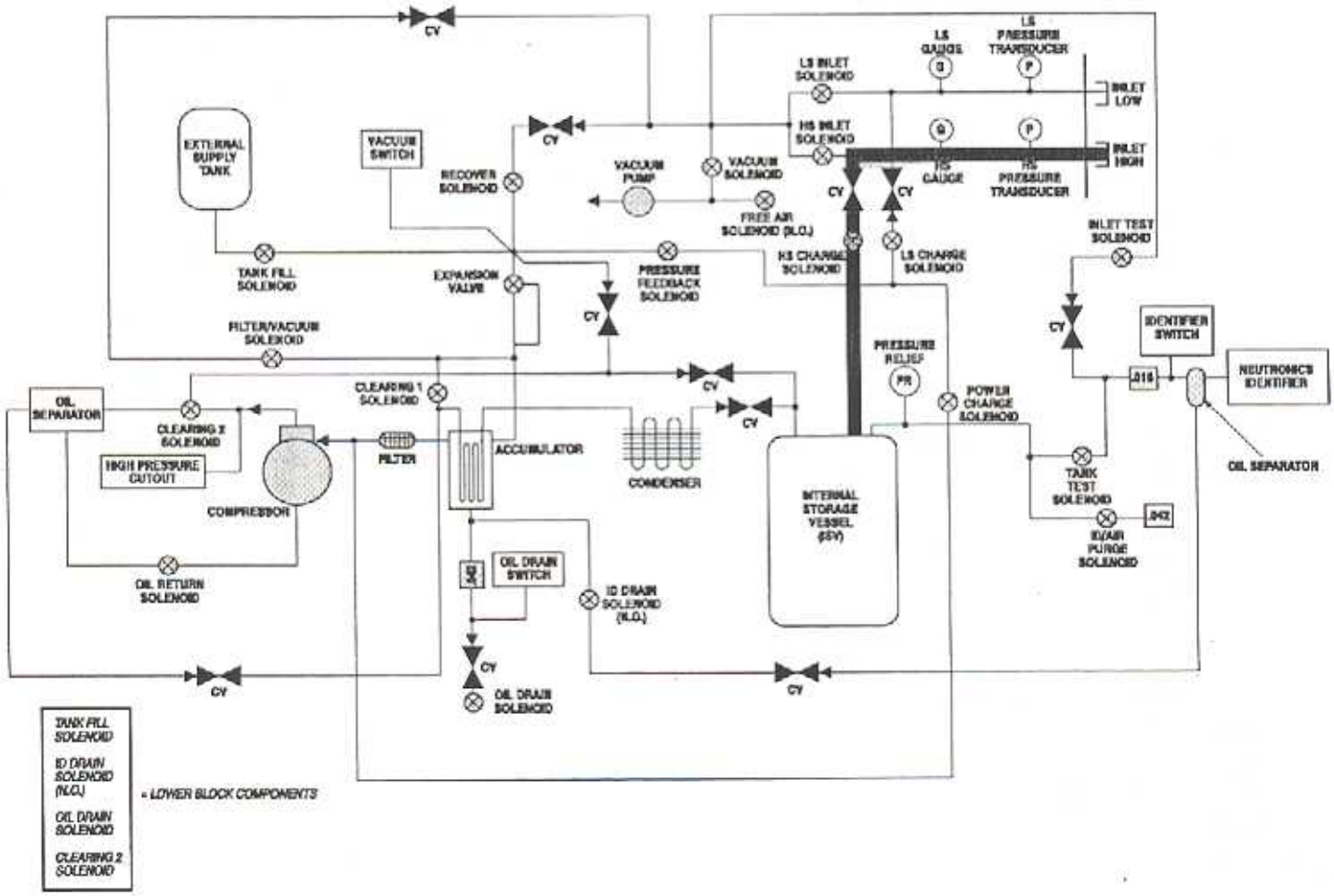
FLOW DIAGRAMS (7)

VACUUM/TANK FILL



FLOW DIAGRAMS (8)

CHARGE (HIGH SIDE)



ORANGE TRIANGLES- LIQUID/VAPOR MIX

BLUE- LIQUID

RED DOTS- VAPOR

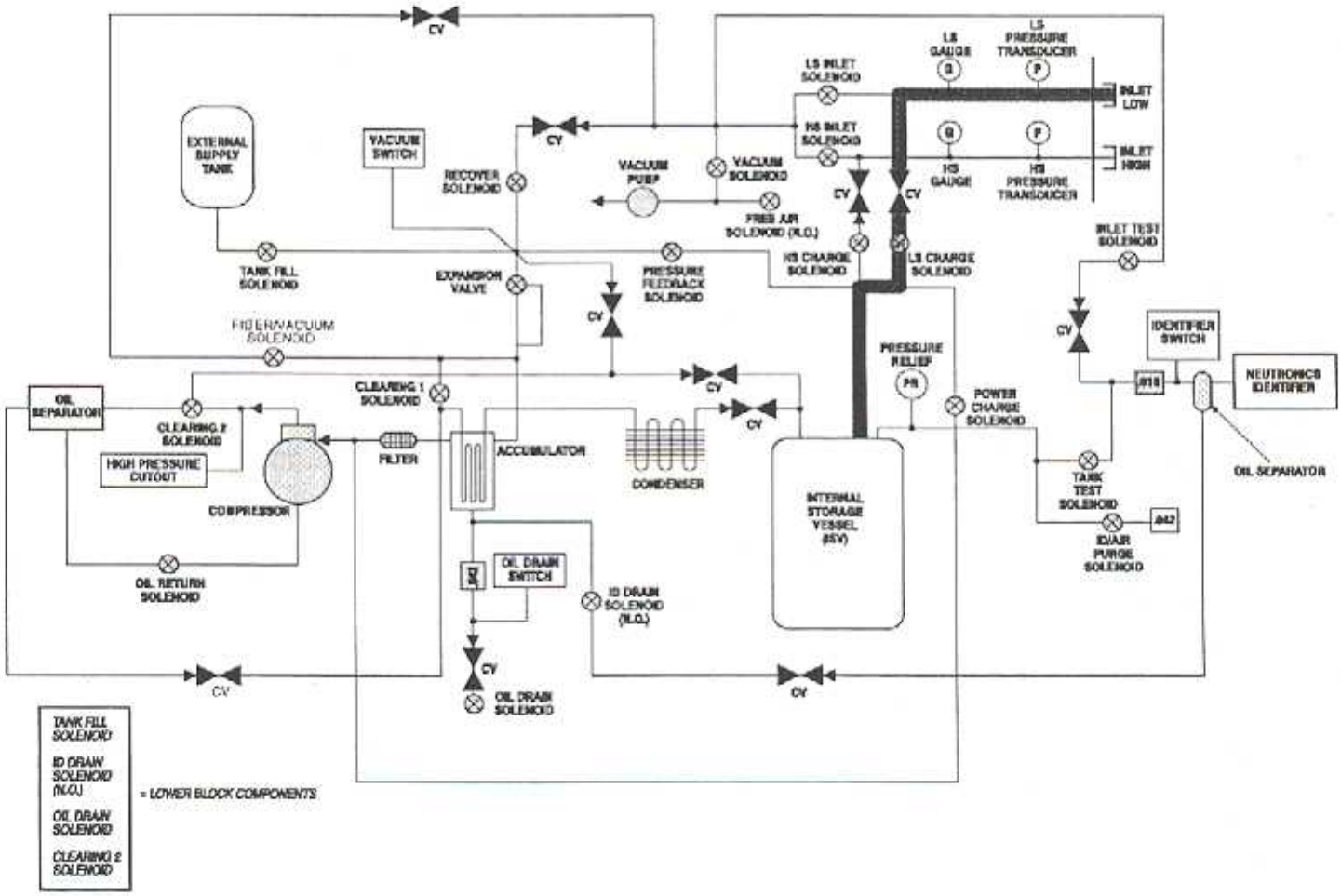
YELLOW/BLACK DOTS- POWER

GREEN LINES-VACUUM

BROWN-OIL

FLOW DIAGRAMS (9)

CHARGE (LOW SIDE)



ORANGE TRIANGLES- LIQUID/VAPOR MIX

BLUE- LIQUID

RED DOTS- VAPOR

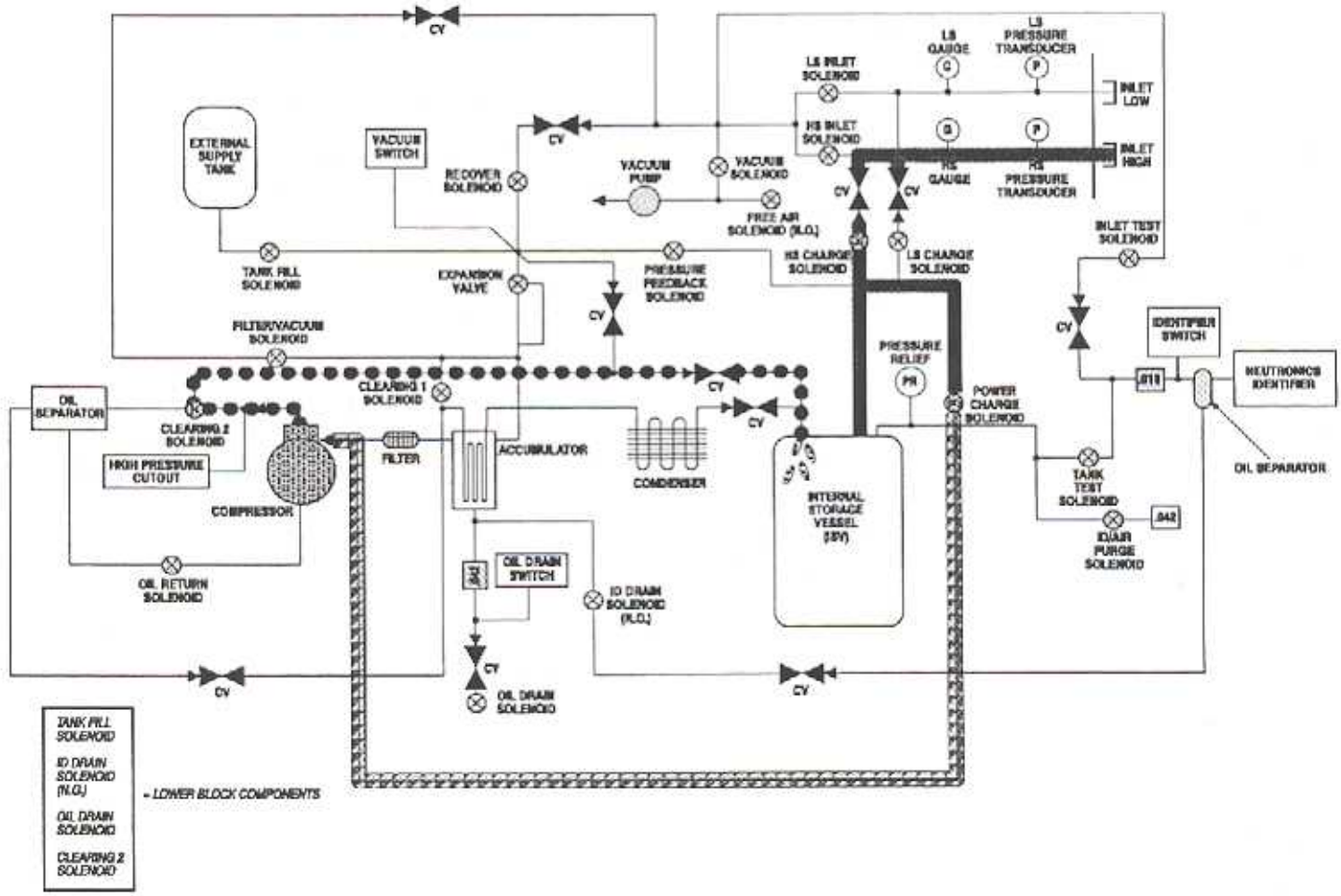
YELLOW/BLACK DOTS- POWER

GREEN LINES-VACUUM

BROWN-OIL

FLOW DIAGRAMS (10)

POWER CHARGE



ORANGE TRIANGLES- LIQUID/VAPOR MIX

BLUE- LIQUID

RED DOTS- VAPOR

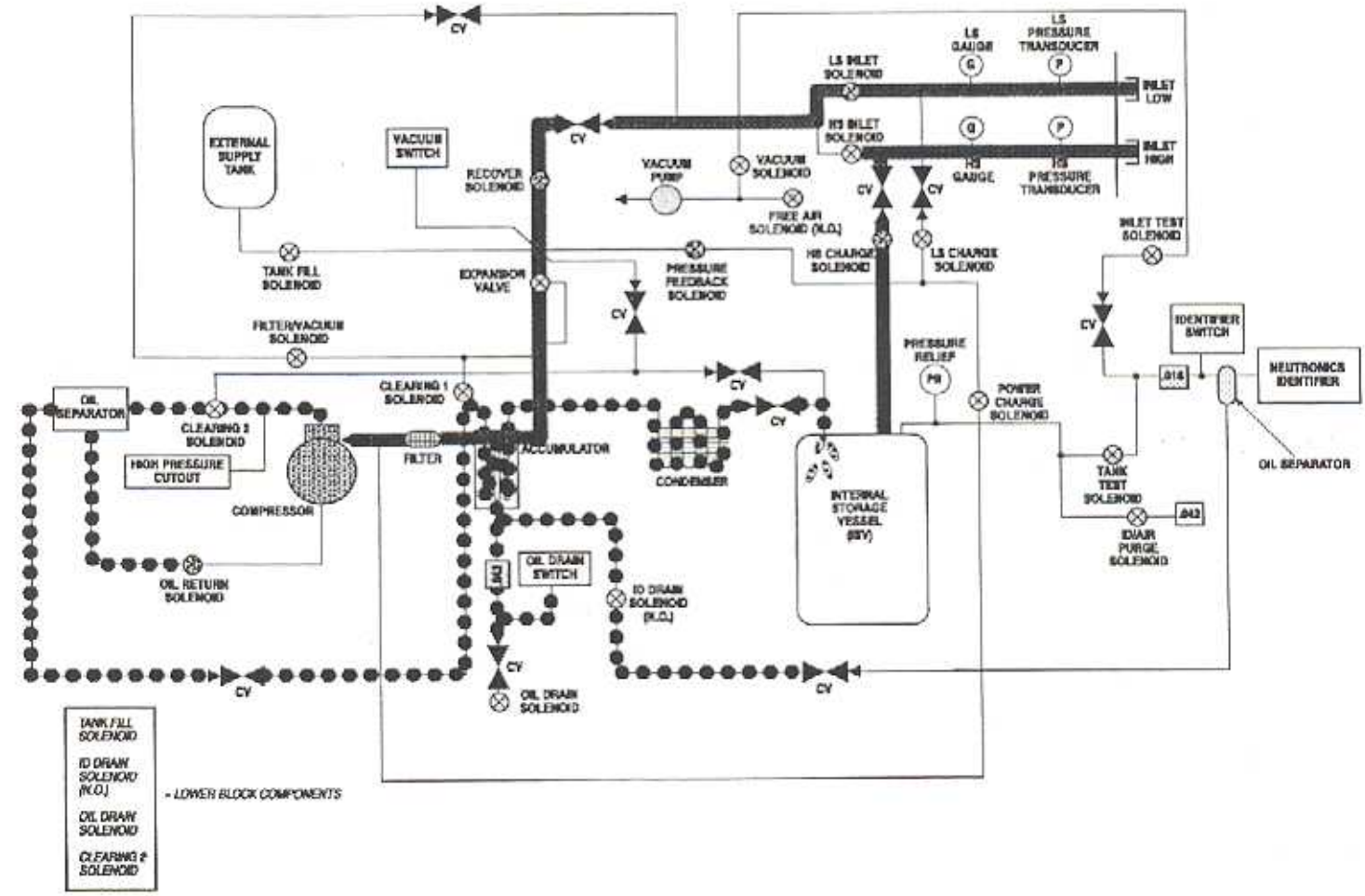
YELLOW/BLACK DOTS- POWER

GREEN LINES-VACUUM

BROWN-OIL

FLOW DIAGRAMS (11)

OIL FLUSH - STAGE 1
(Stage 2 is normal recovery cycle)



ORANGE TRIANGLES- LIQUID/VAPOR MIX

BLUE- LIQUID

RED DOTS- VAPOR

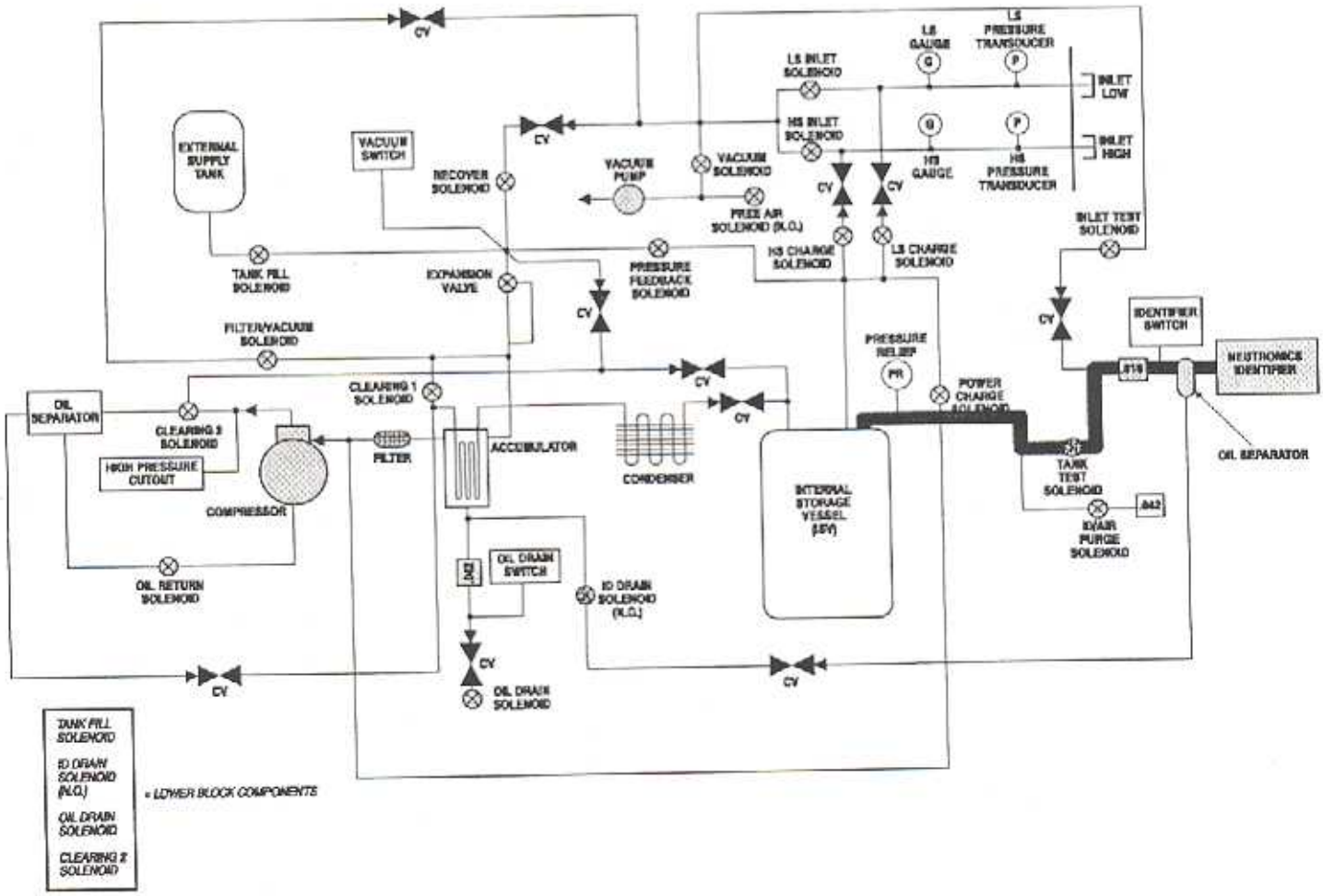
YELLOW/BLACK DOTS- POWER

GREEN LINES-VACUUM

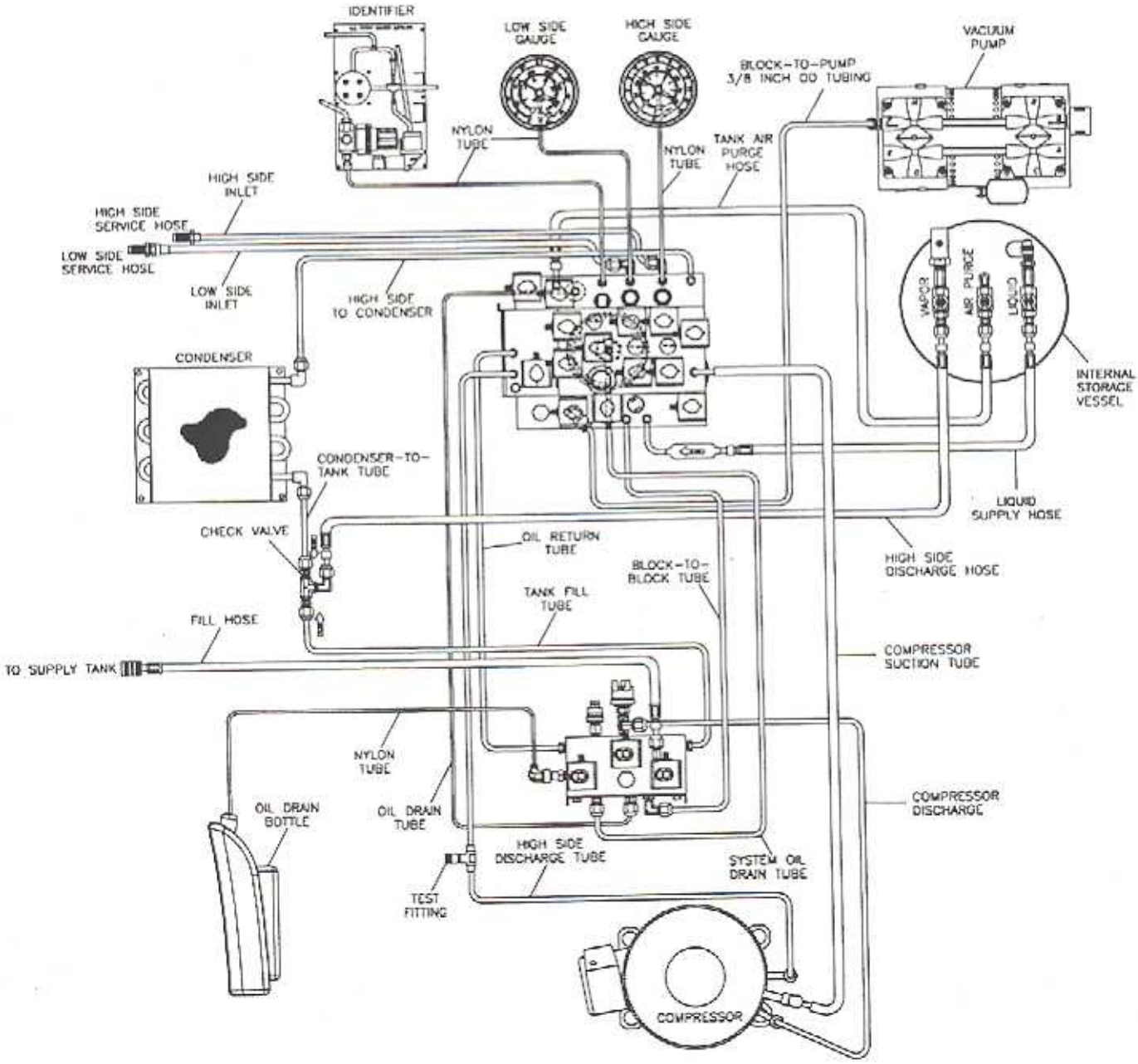
BROWN-OIL

FLOW DIAGRAMS (12)

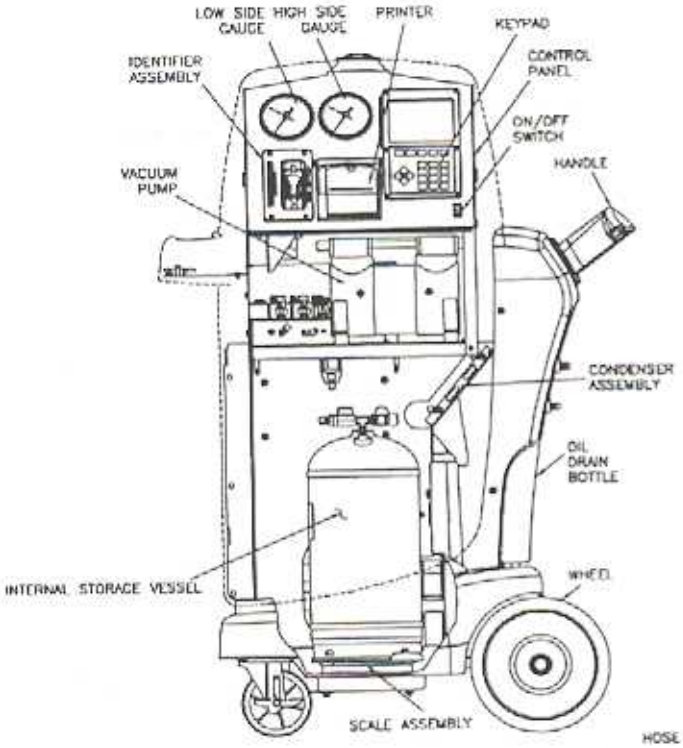
TANK TEST

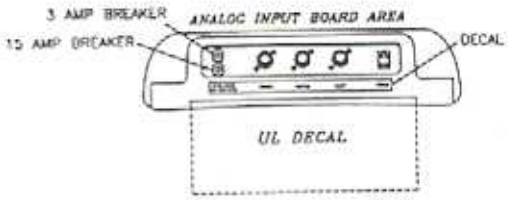


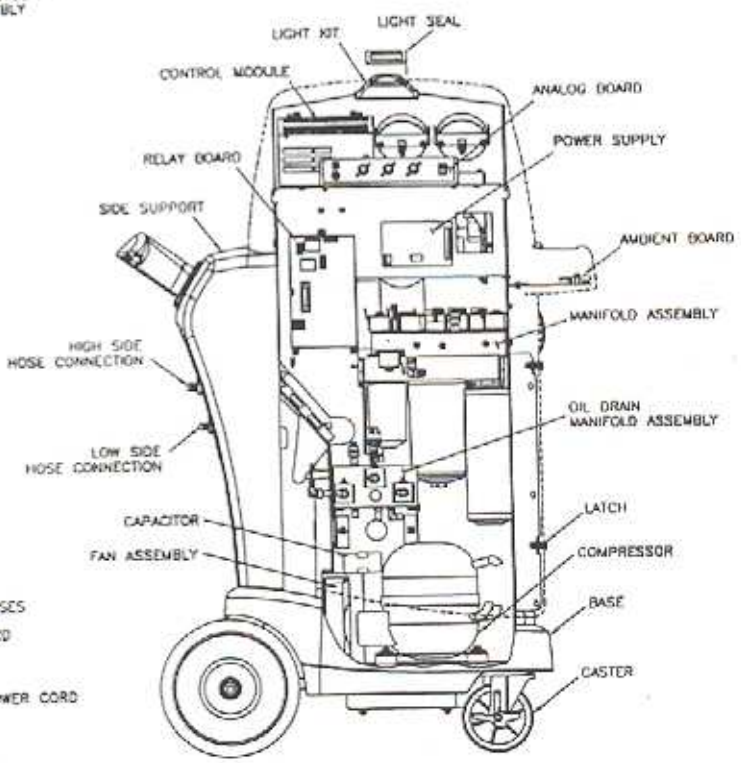
PLUMBING DIAGRAM

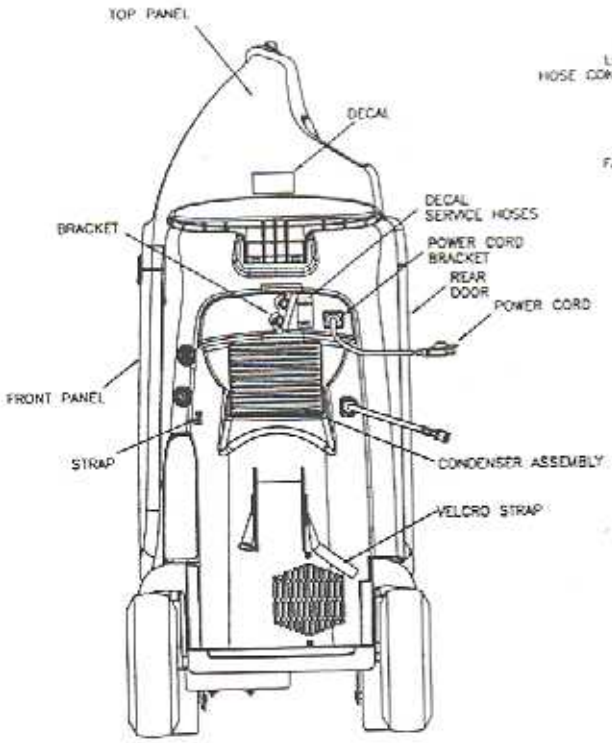


ACR2000
VIEWS

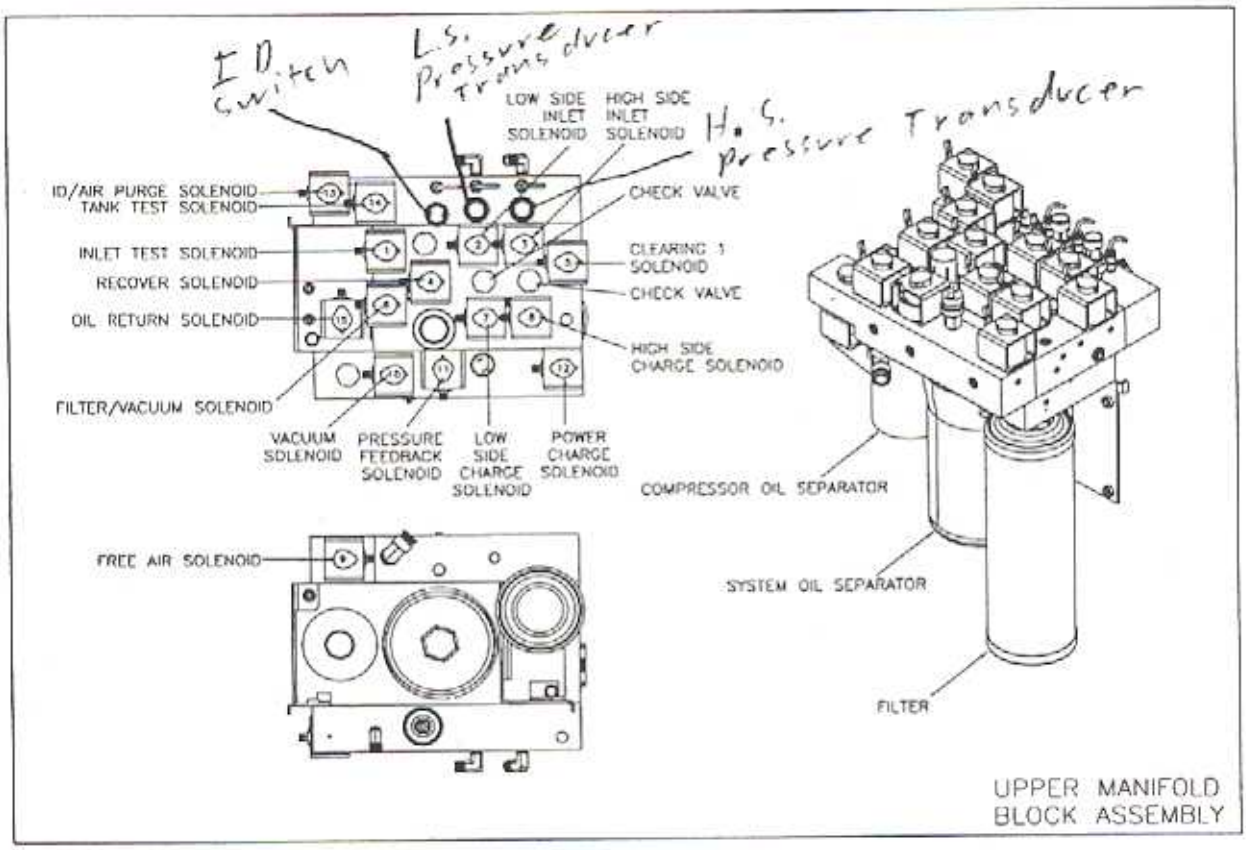




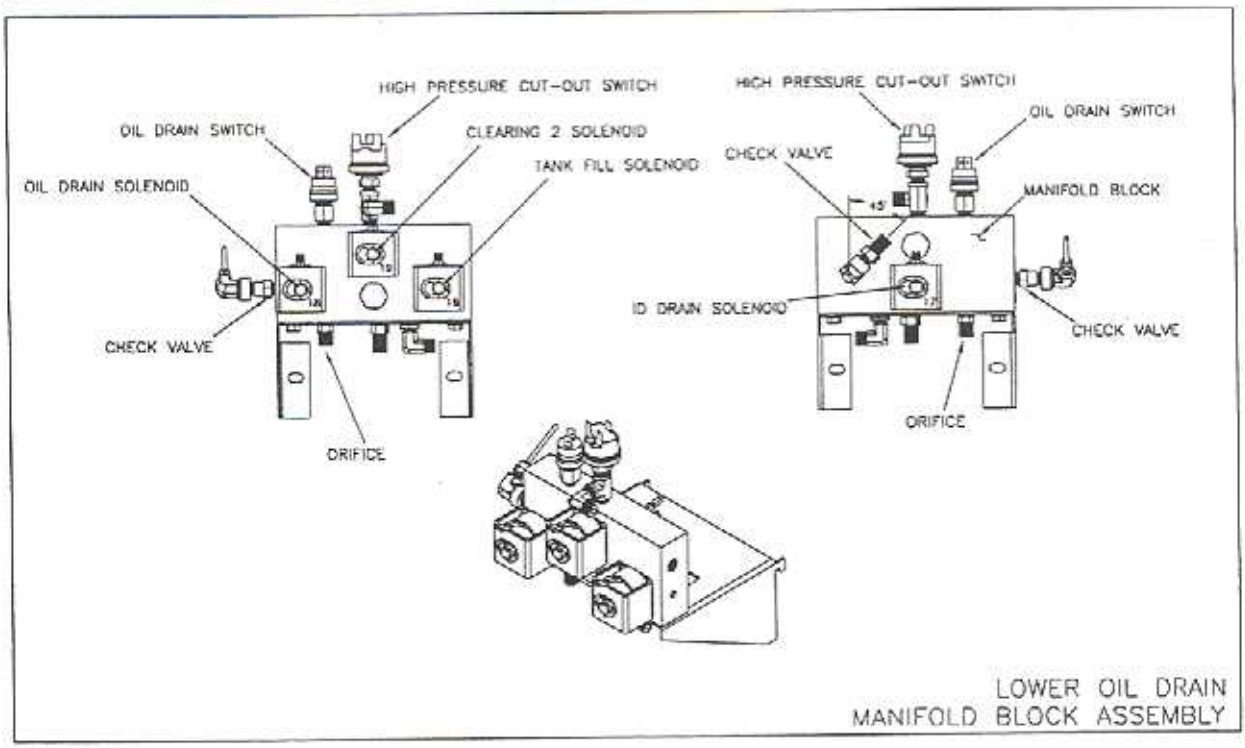




SOLENOID IDENTIFICATION



UPPER MANIFOLD BLOCK ASSEMBLY



LOWER OIL DRAIN MANIFOLD BLOCK ASSEMBLY

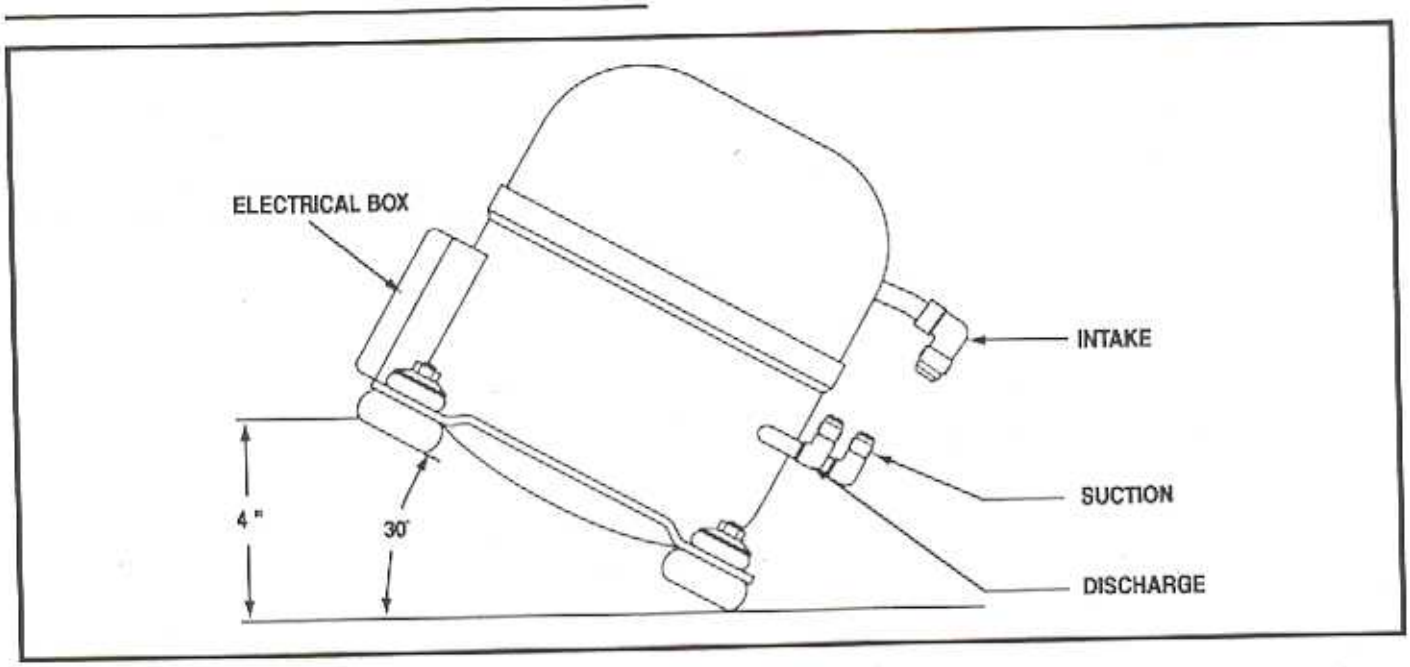
SOLENOID APPLICATION CHART

SOLENOID APPLICATION CHART

	Charging (High Side)	Charging (Low Side)	H.S. Clearing	Low Side Clearing	Oil Drain	Oil Flush (Stage 1)	Power Charge	Recovery	Sampling	Tank Test	Vacuum/ Tank Fill
Clearing 1 Solenoid			ON	[illegible]							
Clearing 2 Solenoid			ON				ON				
Compressor			ON	ON		ON	ON	ON			ON
Equalization/ Oil Return Solenoid											
Fan Motor			ON	ON		ON		ON			ON
Filter/vacuum Solenoid											
Free Air Solenoid*											ON
High Side Charge Solenoid	ON					ON	[illegible]				
High Side Inlet Solenoid								ON			ON
ID Drain Solenoid*									ON	ON	
ID/Air Purge Solenoid											
Identifier									ON	ON	
Inlet Test Solenoid									ON		
Low Side Charge Solenoid		ON									
Low Side Inlet Solenoid						ON		ON	ON		ON
Oil Drain Solenoid					ON						
Oil Return Solenoid						[illegible]					
Power Charge Solenoid							ON				
Pressure Feedback Solenoid					ON						
Recover Solenoid						ON		ON			
Tank Fill Solenoid											ON
Tank Test Solenoid										ON	
Vacuum Pump											ON
Vacuum Solenoid											ON

* = Normally open solenoid

COMPRESSOR SPECIFICATIONS



COMPRESSOR SPECIFICATIONS

Type:	1/3 hp hermetic (piston type) compressor
Oil Capacity:	11 ounces of 150 viscosity (POE) refrigeration oil
Amperage:	4-6 running amperage/3-4.5 20-25 locked rotor amperage/16-19
Voltage:	110V/220V

PROCEDURE FOR CHECKING OIL

1. Depressurize the unit.
2. Remove the compressor from the unit.
3. Place the compressor on a flat surface.
4. Tilt the compressor 30 degrees (see figure above). At this angle, there should be oil in the suction fitting.

PROCEDURE FOR ADDING OIL

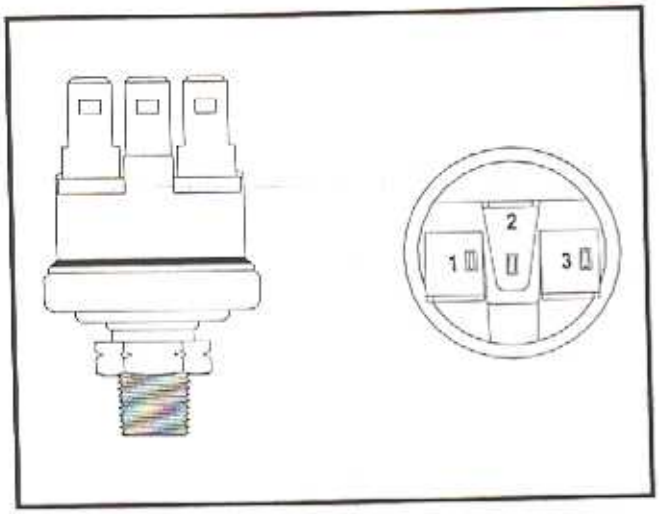
1. Install a hose on the suction fitting and place the loose end of the hose into a bottle containing 2 ounces of oil.
2. Start the compressor. Plug the intake fitting with a cap but leave the discharge fitting open. The compressor will pull the oil from the bottle.
3. Recheck the oil level. If it is still low, add 2 ounces until a proper level is achieved.

TROUBLESHOOTING

Compressor Won't Run

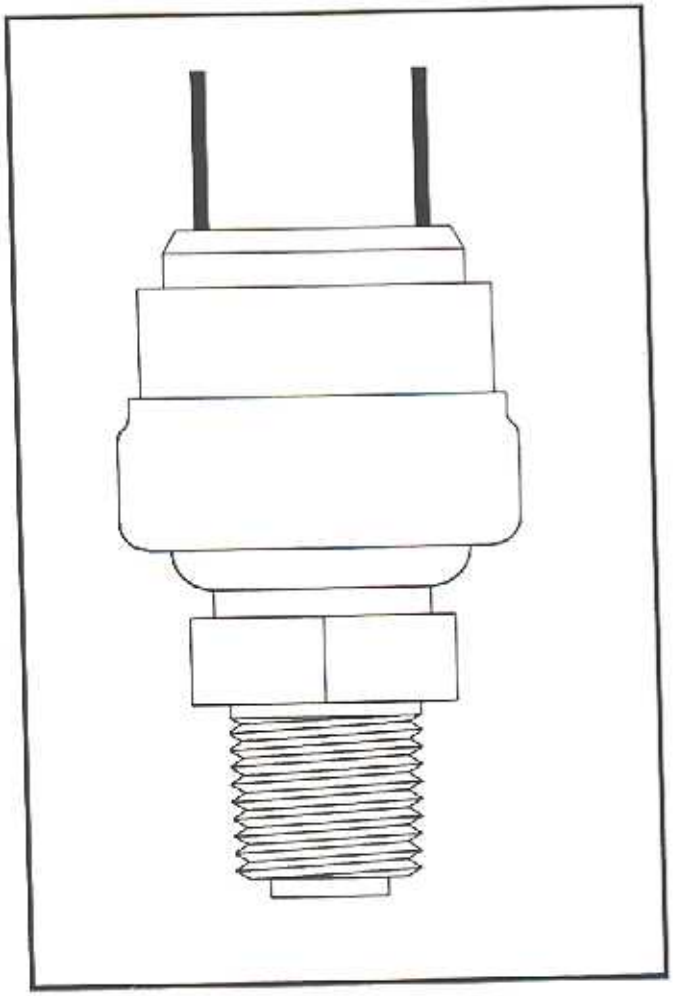
1. Check for voltage to the compressor (110/220V). If there is no voltage, check the power supply for defects.
2. Jumper the thermal overload. If the compressor runs, take an amp draw on the compressor. If it is okay, replace the thermal overload. If the compressor still doesn't run, take another amp draw. If it is drawing locked rotor amperage, replace the compressor. If there is no amp draw, inspect the start components and replace as necessary.

COMPONENT SPECIFICATIONS



RA19427 High Pressure Cutout Switch

The high pressure cutout switch is a normally closed switch designed to open and shut the unit off if the discharge pressure reaches 435 ± 10 psi . The switch will reset and close at 320 ± 20 psi. Pressure is detected through the orifice in the base of the switch. In the normal setting (less than 435 psi on orifice), the 1 and 3 contacts are closed. When 435 psi is introduced to the orifice, the pressure forces up on the drive pin which forces the center contact to disengage the 1 and 3 contact and engage the 1 and 2 contacts. When this takes place, the unit shuts off.



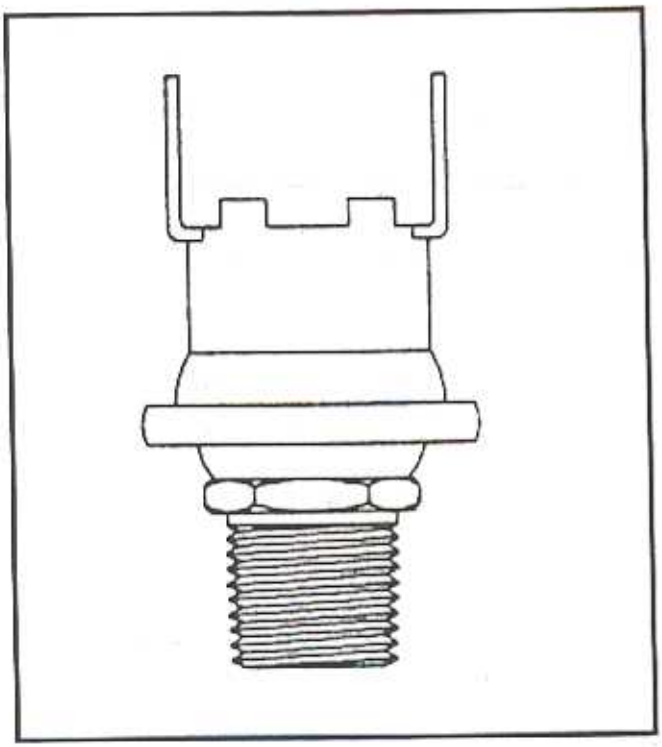
RA19634 Identifier Switch

The identifier switch is a normally closed switch designed to control refrigerant flow to the identifier The switch will open if the pressure reaches 40 ± 3 psi. The switch will reset and close at 27 ± 3 psi. The switch is a two pin pressure switch with an orifice in the base of the switch.

RA19297 Oil Drain Switch

The oil drain switch is a normally closed switch designed to open when the switch pressure reaches 16 ± 3 psi. The switch will reset and close at 9 ± 3 psi. The switch is a two pin pressure switch with an orifice in the base of the switch. When the switch detects the specific pressure the switch will signal the opening of the oil drain solenoid to remove the oil that has collected in the accumulator. The oil that passes through the solenoid is collected in the external bottle for measurement purposes.

COMPONENT SPECIFICATIONS



RA18752 Vacuum Switch

The vacuum switch is a normally closed switch. If a 13" ± 2" Hg rating is reached at the intake, the switch opens and breaks the coil contacts, shutting off the unit. When a 13" Hg vacuum is achieved in the lower cavity, the spring contact has room to force away from the mating contact. The switch functions during the clearing, recovery and tank fill modes.

TROUBLESHOOTING With pressure in the accumulator, open the oil drain solenoid be sure pressure is present. The switch should have continuity at this point. If it does not, replace the switch. If the unit is shutting off before reaching a 13" Hg vacuum, check the inlet for obstructions before replacing the switch.

FUNCTION TEST

Action	Expected Result	Diagnosis
Turn the ACR2000 ON - Calibrate Pressure Transducers	• Self-test should perform	• Check power source • Turn the unit OFF for 30 minutes and restart machine
From the *Main Menu* screen, charge the low side hose with 0.15 lbs. (0.068 kg.) of refrigerant. Turn unit OFF, then ON. Then charge the high side hoses with 0.15 lbs. (0.068 kg.) of refrigerant. Turn off / Turn on	• Observe the low and high side gauges for movement • Pressure readings should be equal	• Check Internal Storage Vessel (ISV) for open service valves and refrigerant • Check external supply tank for open valve and refrigerant • Defective low side charge solenoid • Defective high side charge solenoid
From the *Main Menu* screen, press the SNAPSHOT key Press Print	• Printout matches test results from screen	• Not connected to main baord • Printer out of paper • Defective printer
From the *Main Menu* screen, enable the recovery mode	• Unit should recover • Low and high gauges will read 13" Hg (44 kPa) • Oil drain solenoid will open	• Inoperative or defective oil drain solenoid • Defective recovery solenoid inlet check valve • Perform output step test from *Service Diagnostics Menu*
From the *Main Menu* screen, enable the vacuum pump	• Vacuum pump will operate • Vacuum gauges indicate vacuum	• Defective vacuum pump • Defective vacuum solenoid • Defective free air solenoid • Perform output step test from *ServiceDiagnostics Menu*
From the *Main Menu* screen, enable the tank refill mode	• Tank fill solenoid opens • Chargeable weight increases	• Check external supply tank for open valve and refrigerant • Check Internal Storage Vessel (ISV) for open service valves • Calibrate/defective scale • Defective tank fill solenoid
Remove external blue and red service hoses from machine	—	—
Install 1/2" x 1/2" acme testing hose to connect the external service ports	—	—
Attach external A/C gauge to the service port on the compressor	—	—
From the *Main Menu* screen, enable the oil flush mode for one minute	• Observe external compressor gauge for 30-40 psi (207-276 kPa)	• Refrigerant low • Inoperative compressor • Adjust expansion valve • Replace defective expansion valve
From the *Main Menu* screen press set-up menu	• Enters *Set-Up Menu*	• Follow screen prompts
From the *Set-Up Menu* screen press 8787 on key pad and press ENTER Next page	• Enters *Service Diagnostic Menu*	• Follow screen prompts

FUNCTION TEST (continued)

Action	Expected Result	Diagnosis
From Service Diagnostic Menu, use the arrow keys to highlight "output step test" and press enter (Tests 0 through 23) **NOTE: A magnetic solenoid tester should be used to check operation of the solenoids during the step tests.** **NOTE: The step test will activate the solenoid, valve or motor associated with the specific test. Do not perform any test for an extended time period.**	• Enters output step test • Step Test 0 – ~~Comp~~ Vac Pump • Step Test 1 – Tank Fill Solenoid / source Tank • Step Test 2 – Recover Solenoid • Step Test 3 – Low Side Charge Solenoid • Step Test 4 – Inlet Test Solenoid / I D vechile • Step Test 5 – Fan Motor • Step Test 6 – Low Side Inlet Solenoid • Step Test 7 – Clearing 2 Solenoid • Step Test 8 – High Side Charge Solenoid • Step Test 9 – Clearing 1 Solenoid • Step Test 10 – Compressor Motor • Step Test 11 – Vacuum Solenoid • Step Test 12 – Pressure Feedback Solenoid / Recycle • Step Test 13 – Power Charge Solenoid / Super charge • Step Test 14 – ~~Fresh Air Solenoid and~~ Vacuum Solenoid Lamp • Step Test 15 – Tank Test Solenoid • Step Test 16 – Filter /Vacuum Solenoid / clearing 3 • Step Test 17 – High Side Inlet Solenoid • Step Test 18 – ID/Air Purge Solenoid • Step Test 19 – ID Drain Solenoid • Step Test 20 – Spare / 34200 Oil Inject • Step Test 21 – Spare • Step Test 22 – Equalization/Oil Return Solenoid • Step Test 23 – Oil Drain Solenoid	• Follow screen prompts
Use the Arrow Keys to highlight "calibrate scale" and press ENTER	• Enters scale calibration	• Follow screen prompts
Use the Arrow Keys to highlight "change vacuum level" and press ENTER	• Enters change vacuum level	• Follow screen prompts
Use the ArrowKeys to highlight "change charge level" and press ENTER	• Enters change charge level	• Follow screen prompts
Use the Arrow Keys to highlight "change recovery level" and press ENTER	• Enters change recovery level	• Follow screen prompts
Use the Arrow Keys to highlight "hose length" and press ENTER	• Enters hose length	• Follow screen prompts
Use the Arrow Keys to highlight "first time tank fill" and press ENTER	• Enters first time tank fill	• Follow screen prompts
Use the Arrow Keys to highlight "service clear" and press ENTER	• Enters service clear	• Follow screen prompts Close liquid
Use the Arrow Keys to highlight "vacuum clear" and press ENTER	• Enters vacuum clear close tank valves	• Follow screen prompts
Use the Arrow Keys to highlight "Service Leak Check"		• Close all ISV Valves • Apply pressure to the source tank hose

TROUBLESHOOTING

Symptom	Test	Page
Identifier Problem	Perform Troubleshooting Test "A"	33
Will not charge	Perform Troubleshooting Test "B"	34
Will not clear high side	Perform Troubleshooting Test "C"	35
Will not clear low side	Perform Troubleshooting Test "D"	36
Will not drain oil	Perform Troubleshooting Test "E"	37
Will not evacuate	Perform Troubleshooting Test "F"	38
Will not recover	Perform Troubleshooting Test "G"	39

TROUBLESHOOTING TEST "A"

➢ Identifier Will Not Calibrate

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

NOTE: DO NOT attempt to adjust or calibrate the identifier. If defective, the complete identifier assembly must be replaced.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Turn the power to the ACR 2000 OFF for 30 minutes and then restart unit.
   - If the identifier calibrates perform funtion test.
   - If the identifier will not calibrate proceed to next step.
3. Remove the external covers from the ACR 2000 and check for internal refrigerant leaks.
   - If the refrigerant leaks are found, repair as necessary and perform function test.
   - If no refrigerant leaks are present, proceed to next step.
4. Using the output step test from the *Service Diagnostic Menu*, check for proper operation of the tank test solenoid.
   - If the tank test solenoid is defective, replace the solenoid and perform function test.
   - If the tank test solenoid is operational, proceed to next step.
5. Check identifier discharge hose for obstruction. Slight air volume should be felt from discharge hose during the identifier calibration.
   - If air volume is not felt from the discharge hose, check the hose for contamination and clear or replace the hose. Perform function test.
   - If the discharge hose is clear, replace the identifier assembly.
6. Perform function test.

➢ Identifier Reads R134a–0.09% and Air–99.9%

NOTE: DO NOT attempt to adjust or calibrate the identifier. If defective, the complete identifier assembly must be replaced.

1. Turn the power to the ACR 2000 OFF for 30 minutes and then restart unit.
   - If the identifier calibrates perform function test.
   - If the identifier will not calibrate and reads R134a–0.09% and Air–99.9%, proceed to next step.
2. Check identifier discharge hose for obstruction. Slight air volume should be felt from discharge hose during the identifier calibration.
   - If air volume is not felt from the discharge hose, check the hose for contamination and clear or replace the hose. Perform function test.
   - If the discharge hose is clear, replace the identifier assembly.
3. Perform function test after repairs.

TROUBLESHOOTING
TEST "B"

➢ Will Not Charge

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Check and ensure the vehicle has been evacuated.
3. Ensure that the high and low service hose couplers are connected and open.
4. Check the external source tank for refrigerant.
   - If the external source tank does not have refrigerant, replace the tank and perform function test.
   - If the external source tank contains refrigerant proceed to next step.
5. Use the calibrate scale procedure from the *Service Diagnostic Menu.*
   - If the scale does not calibrate, replace the scale assembly and perform function test.
   - If the scale calibrates proceed to next step.
6. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the high side charge solenoid.
   - If the high side charge solenoid is defective, replace the solenoid and perform function test.
   - If the high side charge solenoid is operational, proceed to next step.
7. Inspect the high side check valve for proper operation.
   - If the high side check valve is defective, replace the check valve and perform function test.
   - If the high side check valve is operational, proceed to next step.
8. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the low side charge solenoid.
   - If the low side charge solenoid is defective, replace the solenoid and perform function test.
   - If the low side charge solenoid is operational, proceed to next step.
9. Inspect the low side check valve for proper operation.
   - If the low side check valve is defective, replace the check valve and perform function test.
   - If the low side check valve is operational, perform function test.

TROUBLESHOOTING TEST "C"

➢ Will Not Clear High Side

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Perform low side clear.
   - If low side will not clear, perform **Troubleshooting Test "D" — Will Not Clear Low Side.**
   - If low side clears proceed to next step.
3. Perform high side clear.
   - If high side clears perform function test.
   - If high side will not clear after five minutes, replace the condenser check valve.
4. Perform function test after repairs.

TROUBLESHOOTING
TEST "D"

➢ Will Not Clear Low Side

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Disable the accurate recovery mode.
3. Close the external source line and then the liquid line in sequence approximately two minutes apart.
4. If the ACR 2000 clears from closing the external source line, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the tank fill solenoid.
   - If the tank fill solenoid is defective, replace the solenoid and perform function test.
   - If the tank fill solenoid is operational, proceed to next step.
5. If the ACR 2000 clears from closing the liquid line, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the pressure feedback solenoid.
   - If the pressure feedback solenoid is defective, replace the solenoid and perform function test.
   - If the pressure feedback solenoid is operational, proceed to next step.
6. If the ACR 2000 clears from closing the liquid line, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the power charge solenoid.
   - If the power charge solenoid is defective, replace the solenoid and perform function test.
   - If the power charge solenoid is operational, proceed to next.
7. Attach an external gauge to the ¼ inch fitting on the compressor assembly and measure the pressure with the compressor operating.
   - If the compressor pressure is not 10 psi (69 kPa), replace the defective compressor and perform function test.
   - If the compressor pressure is 10 psi (69 kPa) or more, proceed to next step.
8. If the compressor pressure is 10 psi (69 kPa) or more, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the oil return solenoid.
   - If the oil return solenoid is defective, replace the solenoid and perform function test.
   - If the oil return solenoid is operational, proceed to next.
9. If the compressor pressure is 10 psi (69 kPa) or more, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the clearing No. 1 solenoid.
   - If the clearing No. 1 solenoid is defective, replace the solenoid and perform function test.
   - If the clearing No. 1 solenoid is operational, proceed to next.
10. If the low side gauge reads 17" Hg (58 kPa) or greater, perform the output step test from the *Service Diagnostic Menu* and check for proper operation of the vacuum switch.
    - If the vacuum switch is defective, replace the switch and perform function test.
    - If the vacuum switch is operational, proceed to next.
11. Perform function test after repairs.

TROUBLESHOOTING
TEST "E"

➢ Will Not Drain Oil

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the pressure feedback solenoid.
   - If the pressure feedback solenoid is defective, replace the solenoid and perform function test.
   - If the pressure feedback solenoid is operational, proceed to next step.
3. Check the 0.042" orifice between the accumulator and the oil drain solenoid for debris.
   - If the orifice is contaminated or defective, replace or service the block assembly. Perform function test.
   - If the orifice is operational, proceed to next step.
4. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the oil drain solenoid.
   - If the oil drain solenoid is defective, replace the solenoid and perform function test.
   - If the oil drain solenoid is operational, proceed to next step.
5. Inspect the oil drain check valve for proper operation.
   - If the oil drain check valve is defective, replace the check valve and perform function test.
   - If the oil drain check valve is operational, proceed to next step.
6. Perform function test after repairs.

TROUBLESHOOTING

TEST "F"

➢ Will Not Evacuate

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the vacuum pump.
   - If the vacuum pump defective, replace the vacuum pump assembly. Perform function test.
   - If the vacuum pump is operational, proceed to next step.
3. If the vacuum pump operates, use the output step test from the *Service Diagnostic Menu* and check for proper operation of the vacuum solenoid (stuck closed).
   - If the vacuum solenoid is defective, replace the solenoid and perform function test.
   - If the vacuum solenoid is operational, proceed to next step.
4. Using the output step test from the *Service Diagnostic Menu,* check for proper operation of the free air solenoid (stuck open).
   - If the free air solenoid is defective, replace the solenoid and perform function test.
   - If the free air solenoid is operational, perform function test.

TROUBLESHOOTING
TEST "G"

➢ Will Not Recover

NOTE: It is suggested that a magnetic solenoid tester be used when troubleshooting the ACR 2000 Refrigerant Service Solution equipment.

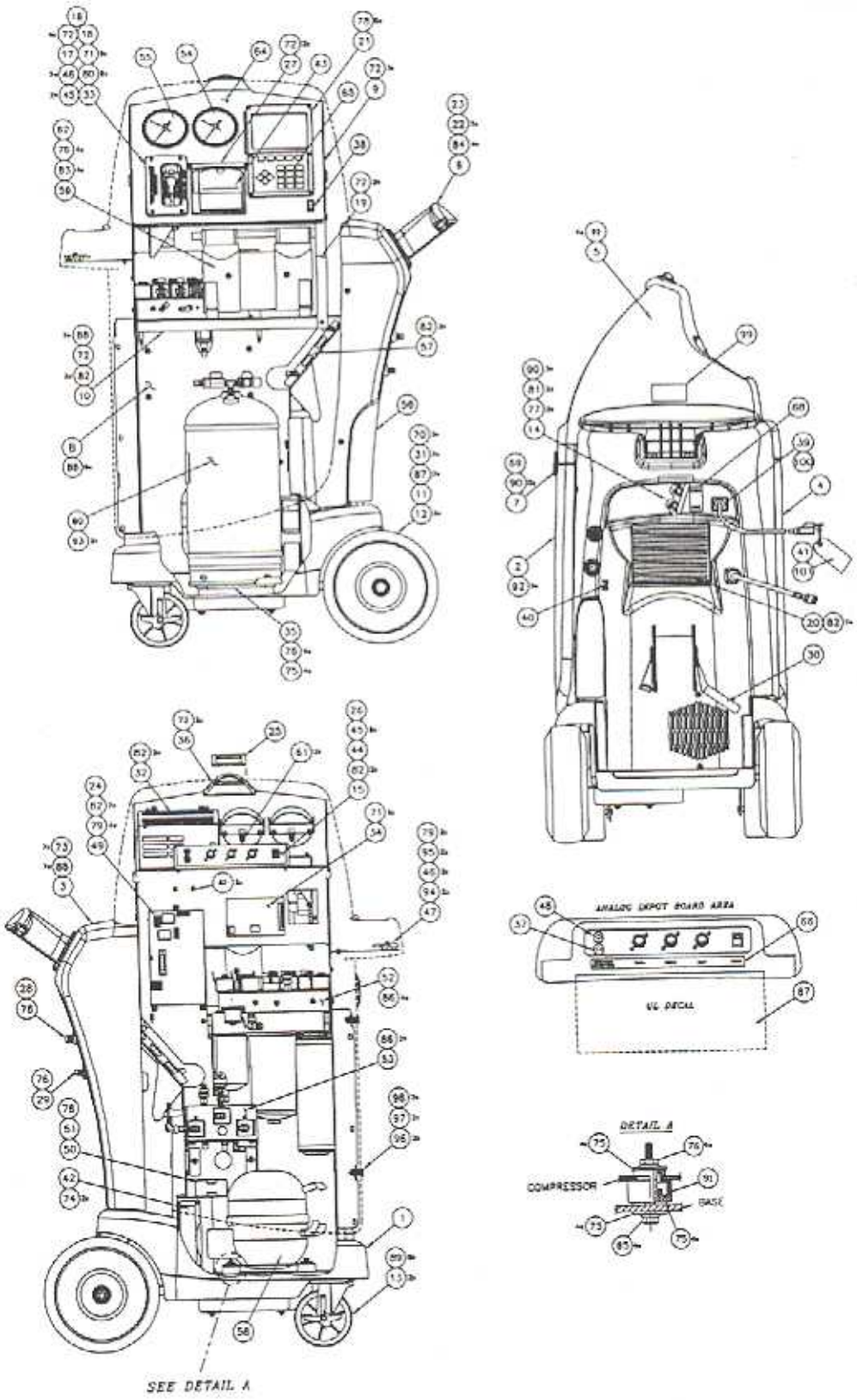
1. Check for proper power source, check circuit breakers and check electrical connectors for damage or corrosion.
2. Using the output step test from the *Service Diagnostic Menu*, check for proper operation of the recover solenoid.
   - If the recover solenoid is defective, replace the solenoid and perform function test.
   - If the recover solenoid is operational, proceed to next step.
3. Inspect the inlet check valve for proper operation.
   - If the inlet check valve is defective, replace the check valve and perform function test.
   - If the check valve is operational, proceed to next step.
4. Using the output step test from the *Service Diagnostic Menu*, check for proper operation of the high and low side inlet solenoids. Both solenoids would have to fail for this fault to be present.
   - If the high and low side inlet solenoids are defective, replace the solenoids and perform function test.
   - If the high and low side inlet solenoids are operational, perform function test.

ADJUSTMENTS

Expansion Valve

1. Turn on the ACR 2000 main power switch and allow the self-test to perform.
2. Noting the location for reassembly, remove the red and blue 96" external service hoses from the ACR 2000.
3. Install ½" x ½" acme testing hose to connect the external service ports of the ACR 2000 together.
4. Attach an external service gauge to the test fitting on the compressor assembly.
5. From the *Main Menu* screen, activate the oil flush mode and run for one minute.
6. Observe the attached external service gauge for a reading of 30-40 psi (207-276 kPa).
7. Adjust the expansion valve until the reading is 30-40 psi (207-276 kPa).
8. Exit the oil flush mode.
9. Clear the high and low side hoses.
10. Remove the testing hose.
11. Attach the red and blue high and low side hoses.

PARTS ILLUSTRATION



PARTS ILLUSTRATION LIST

NO	PART NO	QTY	DESCRIPTIONS
1	121572	1	BASE
2	121573	1	FRONT PANEL
3	121574	1	SIDE SUPPORT
4	121575	1	REAR DOOR
5	121576	1	TOP
6	121578	1	HANDLE
7	121658	1	LOGO
8	---------	1	CENTER DIVIDER
9	---------	1	CONTROL PANEL
10	---------	1	SHELF
11	---------	1	AXLE
12	---------	2	WHEEL
13	RA19361	2	CASTER
14	---------	1	BRACKET, BULKHEAD
15	---------	1	BRACKET, ANALOG BOARD
16	---------	1	BRACKET, IDENTIFIER
17	---------	1	BEZEL, IDENTIFIER
18	---------	1	CORD, BUNA-N
19	---------	1	SUPPORT FOR CONTROL PANEL
20	---------	1	PANEL, CONDENSER
21	---------	1	BENZEL, DISPLAY/KEYPAD
22	---------	2	MOUNTING PLATE
23	---------	1	BACKING PLATE
24	---------	1	COVER, RELAY BOARD
25	---------	1	SEAL, LAMP
26	---------	1	SEAL, ANALOG BOARD
27	---------	1	RAIN SHEILD
28	---------	1	SPUD, HIGH SIDE
29	---------	1	SPUD, LOW SIDE
30	---------	1	STRAP VELCRO
31	---------	2	BUSHING, WHEEL
32	RA19606	1	CONTROL MODULE/ LICENSE FEE
33	RA19604	1	IDENTIFIER
34	RA19462	1	POWER SUPPLY
35	RA19603	1	SCALE ASSY
36	RA19647	1	LIGHT KIT
37	---------	1	BREAKER, 15 AMP
38	---------	1	SWITCH, DPST
39	---------	1	BRACKET, POWER CORD
40	---------	1	STA-STRAP
41	---------	1	RED WIRE-TIE
42	RA17416	1	FAN, 115V
43	RA19611	1	PRINTER, THERMAL
44	RA19605	1	BOARD, ANALOG INPUT
45	---------	8	SCREW,#4-40x3/8
46	---------	4	NUT, #4-40 SEMS
47	RA19609	1	BOARD, AMBIENT
48	---------	1	BREAKER, 3 AMP
49	RA19602	1	BOARD, RELAY
50	RA19458	1	CAPACITOR, COMPRESSOR (110V)
51	---------	1	BRACKET, CAPACITOR
52	RA19600	1	MANIFOLD MODULE ASSY
53	RA19601	1	OIL DRAIN MANIFOLD ASSY
54	RA19613	1	GAUGE, HIGH SIDE
55	RA19614	1	GAUGE, LOW SIDE
56	17756	1	BOTTLE OIL DRAIN
57	RA19615	1	CONDENSER ASSY
58	RA19458	1	COMPRESSOR SOLDER ASSY
59	RA19610	1	VACUUM PUMP, THOMAS
60	RA19612	1	INTERNAL TANK ASSY
61	---------	2	CONNECTOR, 1/8MP x 1/8 PNEU
62	---------	1	ELBOW, 1/4MP x 3/8 PNEU
63			
64	RA19660	1	OVERLAY
65	RA19644	1	KEYPAD
66	121830	1	DECAL, ANALOG INPUT
67	---------	1	DECAL, UL
68	---------	1	DECAL, SERVICE HOSES
69	---------	1	DECAL, LOGO
70	---------	2	COTTER PIN

PARTS ILLUSTRATION LIST

NO	PART NO	QTY	DESCRIPTIONS
71	---------	13	NUT, #6-32 SEMS
72	---------	14	SCREW, #8-32 x 3/8
73	---------	7	WASHER, 1/4 FLAT
74	---------	2	SCREW, #10-24 x 1/2
75	---------	16	WASHER, 0.281 ID (FENDER)
76	---------	14	NUT, 1/4-20 FLANGED
77	---------	2	WASHER, 1/2 INT TOOTH
78		7	SCREW,#6-32 x 3/8
79	---------	6	SPACER, NYLON #8 x 1/2 LONG
80	---------	9	SPACER, NYLON #6 x 1/4 LONG
81	---------	2	NUT, 1/2 ACME
82	---------	19	NUT,#8-32 SEMS
83	---------	4	FOOT, VIBRATION MOUNT
84	---------	4	SCREW, 1/4-20 x 1 LONG
85	---------	4	SCREW, 1/4-20 x 2 LONG
86	---------	6	SCREW, 1/4-20 x 1/2 LONG
87	---------	2	WASHER, 1/2 ID FLAT
88	---------	18	SCREW, 1/4 x 3/4 PLASTITE
89	---------	8	SCREW, 1/4 x 1 PLASTITE
90	---------	5	SCREW, #8 x 1/2 PLASTITE
91	RA19458	1	COMRESSOR KIT

PARTS LIST

Description	Part Number
Ambient Board	RA19609
Analog Board	RA19605
Caster	RA19631
Charge Check Valve	RA19326
Charging Solenoid	Solenoid Rebuild Kit RA19258
Check Valve Rebuild Kit (Pipe)	RA19645
Check Valve Rebuild Kit (Sand)	RA19646
Clearing Check Valve	RA19645
Clearing 1 Solenoid	Solenoid Rebuild Kit RA19258
Clearing 2 Solenoid	Solenoid Rebuild Kit RA19258
Compressor (110 volt)	RA19458
Compressor (220 volt)	RA19457
Compressor Oil Separator	None
Condenser	RA19615
Control Board	RA19606
Discharge Check Valve	RA19282
Door Latch Kit	RA19632
Equalization/Oil Return Solenoid	Solenoid Rebuild Kit RA19258
Expansion Valve	RA19550
Fan	RA17416
Filter/Vacuum Check Valve	RA19645
Filter/Vacuum Solenoid	Solenoid Rebuild Kit RA19258
Filter/Drier Spin-On Type	34724
Flow Control Switch	RA19634
Free Air Solenoid	Solenoid Rebuild Kit RA19648
Gauge Lens	RA19639
High Pressure Cutout Switch	RA19427
High Side Charge Solenoid High Side Gauge	Solenoid Rebuild Kit RA19258, RA19613
High Side Hose (red)	63096
High Side Inlet Solenoid	Solenoid Rebuild Kit RA19258
High Side Pressure Transducer	RA19633
High Side Service Coupler (red)	18191A
ID/Air Purge Solenoid	Solenoid Rebuild Kit RA19258

PARTS LIST (continued)

Description	Part Number
ID Circuit Board	None
ID Drain Solenoid	Solenoid Rebuild Kit RA19648
ID Oil Filter	16912
ID Oil Separator	RA19657
Identifier	RA19604
Identifier Switch	RA19634
Inlet Check Valve	RA19326
Inlet Screen	RA19203
Inlet Test Solenoid	Solenoid Rebuild Kit RA19258
Internal Storage Vessel (ISV)	RA19612
ISV Air Purge Hose	RA19635
ISV Check Valve	RA19504
ISV Liquid Hose	RA19636
ISV Source Tank Hose	RA19637
ISV Vapor Hose	RA19638
Key Pad	RA19644
Low Side Charge Solenoid	Solenoid Rebuild Kit RA19258
Low Side Gauge	RA19614
Low Side Hose (blue)	62096
Low Side Inlet Solenoid	Solenoid Rebuild Kit RA19258
Low Side Pressure Transducer	RA19640
Low Side Service Coupler (blue)	18190
Main Circuit Board (Control)	~~None~~ RA 19606
Manifold Assembly	RA19600
Manifold Block Check Valve Kit	RA19326
Neutronics ID	None
Oil Drain Block	RA19601
Oil Drain Check Valve	RA19282
Oil Drain Male Coupler	RA19581
Oil Drain Solenoid	Solenoid Rebuild Kit RA19258
Oil Drain Switch	RA19297
Oil Return Solenoid	Solenoid Rebuild Kit RA19258
Power Charge Solenoid	Solenoid Rebuild Kit RA19258
Power Cord	RA19641

PARTS LIST (continued)

Description	Part Number
Power Supply	RA19462
Pressure Feedback Solenoid	Solenoid Rebuild Kit RA19258
Pressure Relief	RA19499
Printer Assembly	RA19611
Recover Solenoid	Solenoid Rebuild Kit RA19258
Red Light	RA19647
Relay Board	RA19602
Scale	RA19603
Solenoid Coil Assembly	RA19491
Solenoid Rebuilt Kit (Normally Closed)	RA19258
Solenoid Rebuilt Kit (Normally Open)	RA19648
Step Down Transformer	None
Supply Check Valve	None
Supply Solenoid	Solenoid Rebuild Kit RA19258
System Oil Separator	None
Tank Fill Solenoid Tank Test Solenoid	Solenoid Rebuild Kit RA19258
Solenoid Rebuild Kit	RA19258
Temp/Humidity Board	None
Vacuum Pump (110 volt)	RA19610
Vacuum Solenoid	Solenoid Rebuild Kit RA19258
Vacuum Switch	RA18752

BASIC ELECTRICAL THEORY

Current

Current is the rate of electron flow through a conductor. The amount of current flow is measured in "Amperes" or "Amps". The symbol for current is "I" because "I" stands for Intensity of electron flow. There are two ways of describing current flow. There is "Conventional Flow" and "Electron Flow". Conventional flow is from positive to negative while electron flow is from negative to positive. In reality, electrons flow from the negative battery terminal, where there is an excess of electrons, to the positive terminal, where there is a lack of electrons. Conventional flow is what most of us are familiar with.

Current flowing through a conductor can be compared to pushing ping-pong balls through a pipe. One will come out as soon as one is pushed in. You can compare the ping-pong balls to electrons. The conductor is made up of atoms which remain stationary. Only the electrons are moving from one atom to the next.

Voltage

Voltage is the electrical pressure or force used to move electrons through a conductor. Another name for voltage is electromotive force (EMF). The symbol for voltage is "E".

Resistance

Resistance is the opposition to current flow through a conductor. Resistance is measured in Ohm's. The symbol for ohms is "Ω". All electrical circuits need some type of resistance to operate properly. Without resistance, a short would occur resulting in circuit overload. Devices such as light bulbs, resistors, motors and solenoids are all types of resistance in a circuit. The symbol for resistance is "R".

Ohms Law

Ohm's law is the relationship between current, voltage and resistance. Ohm's law states that it takes one volt of electricity to push one ampere of current through one ohm of resistance. The following formulas will assist in finding an unknown amperage, voltage or ohm's specification:

E = I x R (Voltage = Amps x Ohms)
E ÷ I = R (Voltage ÷ Amps = Ohms)
E ÷ R = I (Voltage ÷ Ohms =Amps)

These formulas may be helpful when two values of a circuit are known and you need to determine the third. For example, if the current is two amps and the resistance is six ohms, the voltage must be 12 volts. You simply apply the two known values into the formula and calculate the third.

Using A DVOM

DVOM stands for Digital Volt Ohmmeter. The DVOM is used to accurately measure:

- Volts
- Ohms
- Amps

Choosing A Meter

Several types of quality digital meters are available. Choose a meter carefully to be sure it has all of the functions you will need. The meter should also have at least 10 Mega ohm per volt impedance. Impedance is the internal resistance of the meter. High resistance is important when it comes to making accurate measurements. Less expensive meters may not have the high impedance we desire. Meter impedance can be checked with a second meter. Set the meters dial to volts and connect its leads to another meter to measure the resistance. Ten million ohms (10 Mega Ω) is preferred.

Units of Measure

Digital meters use the metric system to abbreviate numbers because many of the units that we measure are too large, or too small for the meter to display on its screen. For example, 500,000 ohms can be written as .5 Mega ohms. The units of measure you will be using are as follows:

Mega

Mega represents million. One Mega equals one million. The abbreviation for Mega is M.

Examples:

25 M = 25,000,000
1M = 1,000,000
.5 M = 500,000

Kilo

Kilo represents thousand. One kilo equals one thousand. The abbreviation for Kilo is k.

Examples:
2.5 k = 2,500
1 k = 1,000
.7 k = 700

Milli

Milli represents thousandth. One milli equals one thousandth. The abbreviation for milli is m.

Examples:
40 m = .040
25 m = .025
.450 m = .000450

Micro

Micro represents millionth. One micro equals one millionth. The abbreviation for mico is µ.

Examples:
10 µ = .000010
365 µ = .000365
5.7 µ = .0000057

Voltage Drop

A voltage drop occurs when current travels through resistance. The resistance uses up or drops some of the voltage in the circuit. A resistor block for the heater blower motor is a good example of a voltage drop. The speed of the blower motor is adjusted by channeling the current through resistors for different values. On low speed, the current is channeled through all the resistors. The high resistance in the low speed circuit depletes some of the voltage, leaving the remaining voltage to run the motor. On high speed, the current is allowed to bypass the resistors and supply full voltage to the blower motor. This type of resistor arrangement is called a voltage divider network.