

MHL-SERIES

HEATLESS DRYER

INSTALLATION, OPERATION & MAINTENANCE MANUAL



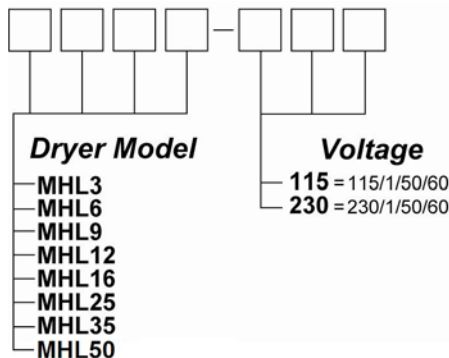
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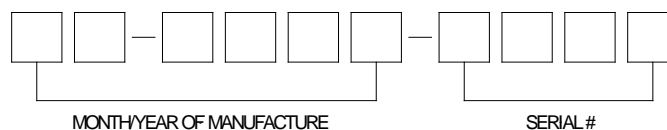
SECTION 1 GENERAL INFORMATION

1.1 MODEL NUMBER CODING

Note: Tower Pressure Gauges & outlet Moisture Indicator are standard equipment.



1.2 SERIAL NUMBER CODING



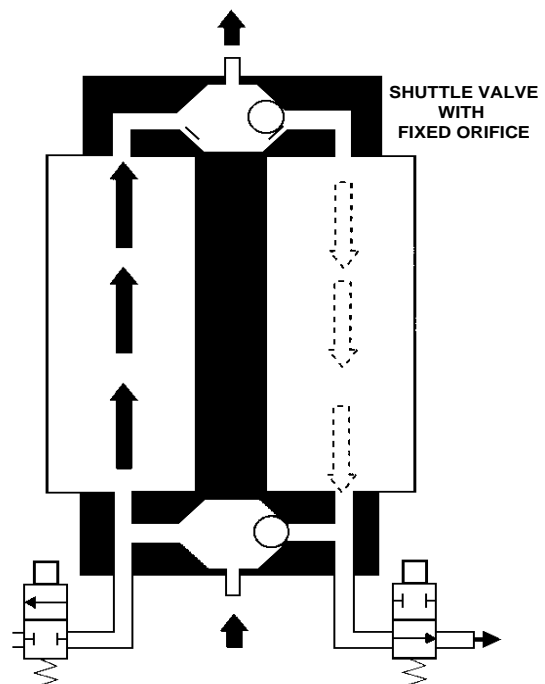
1.3 DESCRIPTION OF OPERATION

The MHL-SERIES Air Dryers use the pressure swing adsorption method of drying compressed air. This requires two identical towers containing beds of hygroscopic desiccant.

Incoming wet air enters the dryer through a shuttle valve where it is directed to the bottom of the tower containing dry desiccant. The desiccant in this tower removes 99.7+% of the water vapor from the air when operated at catalog conditions. The dried air leaving the top of the tower is directed to the outlet through a second shuttle valve. In this outlet shuttle valve a built-in orifice allows a portion of the dried air to flow into the other tower being regenerated. The orifice reduces the high pressure air down close to atmospheric pressure which lowers the dew point of the dried air even further.

The tower being regenerated/purged of moisture is connected to an energized solenoid valve for a controlled period of time. The electrical signal to the solenoid is monitored by an LED light on the solid state timer. After the desiccant is regenerated, the timer de-energizes the solenoid valve. Air continues to flow through the orifice to repressurize the regenerated tower to line pressure. The middle light on the timer indicates the repressurization function.

Next, the timer opens the valve on the tower containing the wet desiccant. This shifts the shuttle valves, and the tower with the wet desiccant is regenerated while the other tower continues to dry the air. Examining the flow schematic to the right demonstrates the dryer process operation.



MHL3 - MHL12 TIMING CYCLE
▪ V ₂ energized (open) 33 seconds
▪ T ₂ repressurizing 12 seconds
▪ V ₁ energized (open) 33 seconds
▪ T ₁ repressurizing 12 seconds
Total cycle is 90 seconds with 45 seconds drying per tower.

MHL16 - MHL50 TIMING CYCLE
▪ V ₂ energized (open) 66 seconds
▪ T ₂ repressurizing 24 seconds
▪ V ₁ energized (open) 66 seconds
▪ T ₁ repressurizing 24 seconds
Total cycle is 180 seconds with 90 seconds drying per tower.

SECTION 2 SAFETY INSTRUCTIONS

2.1 INSTALLATION/MAINTENANCE SAFETY

Before starting or installing the dryer, be sure that all power to the unit is off, valves are shut, and the air circuit is at atmospheric pressure. DO NOT remove, repair, or replace any component, control filter, or part, while the air circuit is energized or under pressure. Turn off the main to the dryer and de-pressurize the unit before starting installation or maintenance procedures.

MANUFACTURER WILL NOT BE RESPONSIBLE FOR DAMAGE TO EQUIPMENT AS A RESULT OF IMPROPER WIRING OR ELECTRICAL INSTALLATION. IT IS THE CUSTOMERS RESPONSIBILITY TO ENSURE THAT THE ELECTRICAL INSTALLATION IS CORRECT AND UP TO APPLICABLE CODES.

When installing the dryer, ensure that the NEMA rating of the control box is applicable to the installation.

Dryer is rated NEMA 4.

2.2 OPERATION SAFETY

DO NOT OPERATE THE DRYER ABOVE THE STATED WORKING PRESSURE (SEE SPECIFICATION TABLE). FAILURE, INJURY AND EQUIPMENT DAMAGE COULD RESULT.

CAUTION:

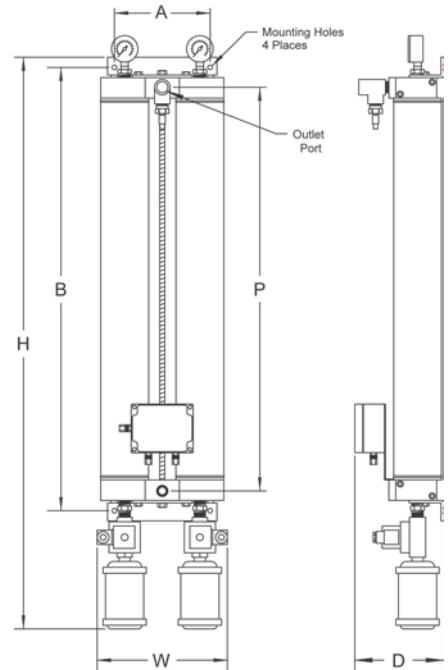
EXCEPT as otherwise specified by the manufacturer, this product is specifically designed for compressed air service and use with any other gas or liquid is a misapplication. Use with or injection of certain hazardous liquids or gases in the system (i.e., alcohol or liquid petroleum gas) could be harmful to the unit and result in a combustible condition or cause hazardous external leakage. Manufacturer's warranties are void in the event of a misapplication and manufacturer assumes NO RESPONSIBILITY for any resulting loss. Before using equipment with fluids or gases other than air, or for non-industrial applications, consult Van Air Systems for written approval.

SECTION 3 SPECIFICATIONS

3.1 DIMENSIONS & WEIGHTS

MODEL	H	W	D	P	A	B	PORTS (npt)	MTG HOLE DIA.	WEIGHT (lbs)
MHL3	13.6	7.4	5.2	9.3	5.8	2.8	3/8	0.3	8
MHL6	18.2	7.4	5.2	13.0	5.8	2.8	3/8	0.3	9
MHL9	17.3	7.4	5.2	12.1	5.8	2.8	3/8	0.3	10
MHL12	20.1	7.4	5.2	14.9	5.8	2.8	3/8	0.3	11
MHL16	33.0	9.5	6.5	20.7	7.0	23.6	1/2	0.4	29
MHL25	41.9	9.5	6.5	29.5	7.0	32.5	1/2	0.4	34
MHL35	39.3	10.0	7.0	26.5	9.0	30.1	1/2	0.4	59
MHL50	47.4	10.0	7.0	33.5	9.0	37.1	1/2	0.4	65

NOTE: MHL16-MHL35 dryer shown with bracket top and bottom. MHL3-MHL12 has single 4-hole bracket. Dimensions shown in inches.



Maximum Working Pressure: 150 PSIG

Maximum Ambient Temperature: 120° F

3.2 AIR FLOW CAPACITIES

Flow Capacities (in SCFM) at 100 PSIG/100°F Inlet for -40°F/C Outlet Pressure Dew Point								
MODEL NO.	MHL3	MHL6	MHL9	MHL12	MHL16	MHL25	MHL35	MHL50
Inlet Flow	3	6	9	12	16	25	35	50
Purge Flow	0.8	1.6	2.4	3.2	3.4	5.4	7.8	10.8
Outlet Flow	2.2	4.4	6.6	8.8	12.6	19.6	27.2	39.2

FLOW MULTIPLIERS FOR VARIOUS PRESSURES

PRESSURE	80	90	100	110	120
MULTIPLIER	0.683	0.833	1.000	1.087	1.174

SECTION 4 INSTALLING THE DRYER

4.1 LOCATION

DO NOT INSTALL DRYER IN AN ENVIRONMENT OF CORROSIVE CHEMICALS, EXPLOSIVE GASES, OR AREAS OF HIGH AMBIENT TEMPERATURE CONDITIONS.

Install the dryer indoors. Dryers are not meant to be installed outdoors exposed to the weather. If the dryer must be installed outdoors, it must be in a weatherproof enclosure that provides for proper temperature control.

When mounting, allow 2.5 inches above unit for tower removal and replacement.

The dryer may be installed in a vertical or horizontal (laying flat) orientation. Installation on its side may contribute to possible shuttle valve shifting problems.

4.2 ELECTRICAL CONNECTIONS

Before wiring, check the dryer nameplate for electrical characteristics. Standard electrical characteristics are 115 volt, 1 phase, 50/60 Hz. Models operating on 230 volts are available.

IMPORTANT! No overload protection is provided in the dryer and unit should be wired into a protected circuit.

IMPORTANT! When installing electrical service to this machine, comply with the National Electrical Code as well as state and local building codes.

NOTE: Dryer cycle timer has infinite memory capacity. Dryer may be wired to compressor pressure switch or auxiliary contacts to allow dryer to start and stop with compressor or machine tool. Contacts must supply same voltage and phase as dryer requires.

A six foot power cord is installed as standard on the dryer. The cord on the 115V dryers has a plug. The cord on the 230V dryers does not have a plug. The control box and bulkhead fittings are NEMA 4 rated.

- *If a NEMA 1 installation is desired:*

- A. You may simply plug the power cord into a standard outlet.

- or -

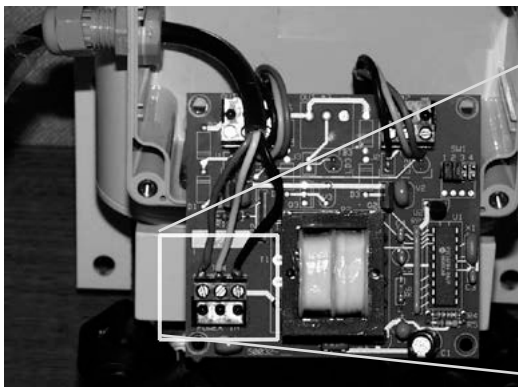
- B. Use standard flexible conduit, and follow the instructions for installing liquid-tight conduit below. Use only flexible conduit as installing rigid conduit may damage polycarbonate control box. Connect to inlet power terminal strip with 18 gauge stranded wire only.

- *If maintaining the NEMA 4 installation is desired:*

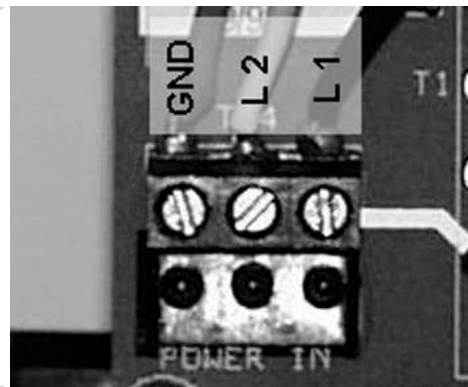
- A. Cut off the plug and use a NEMA 4 gasketed bulkhead fitting suitable for .180" diameter power cord to enter a NEMA 4 rated junction box.

- or -

- A. To use flexible liquid-tight conduit and stranded 18 gauge wire:
 1. Remove clear cover from control box.
 2. Loosen nuts on (3) bulkhead connectors and push an inch or two of each of the electrical cords back into the control box to allow slack to pull out solid state timer board. Remove four screws holding solid state timer board and pull back gently to expose the "power in" terminal block. With small screwdriver, loosen wire clamps on terminal block and disconnect power cord wires.
 3. Remove (1) backing nut from inlet power cord bulkhead fitting and remove power cord and bulkhead fitting.
 4. Enlarge existing hole to proper size to install your own liquid-tight conduit fitting. Use only flexible liquid-tight conduit as installing rigid conduit may damage polycarbonate control box.
 5. Connect to "power in" terminal block with 18 gauge stranded wire only.



BACK SIDE OF
TIMER BOARD



POWER IN
TERMINAL BLOCK

4.3 PIPING AND CONNECTIONS

Inlet and outlet piping should be schedule 40 pipe or equivalent I.D. tubing. See specification chart for inlet/outlet NPT thread size. All piping should be deburred and threaded to a proper depth and length before installation. Threads should be inspected for cleanliness and depth of cut. Good quality pipe compound or Teflon tape should be used in the makeup of joints to ensure a good, airtight fit of piping components.

NOTE ON INLET PIPING AND PIPE JOINTS: Make sure piping is clean inside. Apply pipe thread sealant sparingly to the male threads of fittings, keeping the sealant back from the first two threads. Contamination getting into inlet shuttle valve could cause dryer to malfunction.

Install a pipe union at the inlet and outlet ports for easy disconnection prior to tower replacement.

NOTE: If purge air is required to be piped to a remote location, it is necessary to use oversized tubing or piping to prevent back-pressure. Restricting the purge flow can cause the dryer to malfunction.

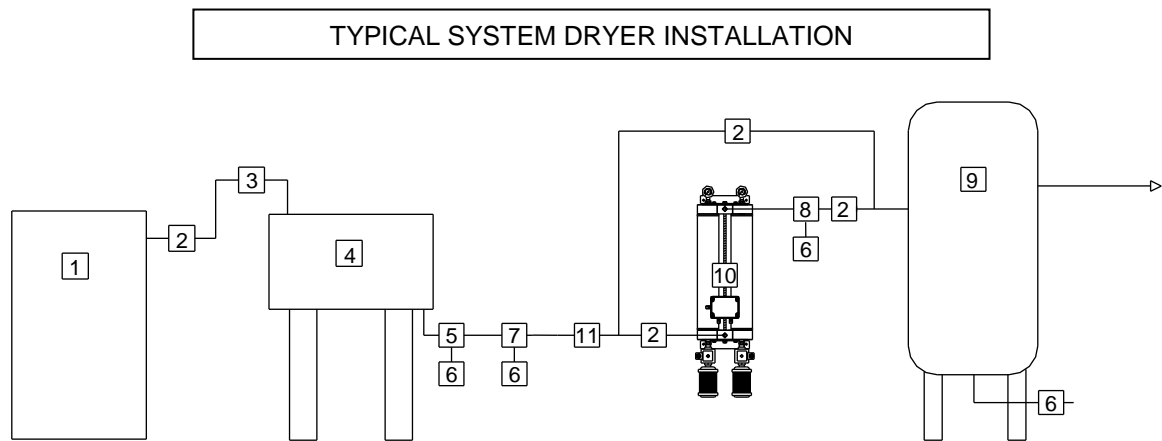
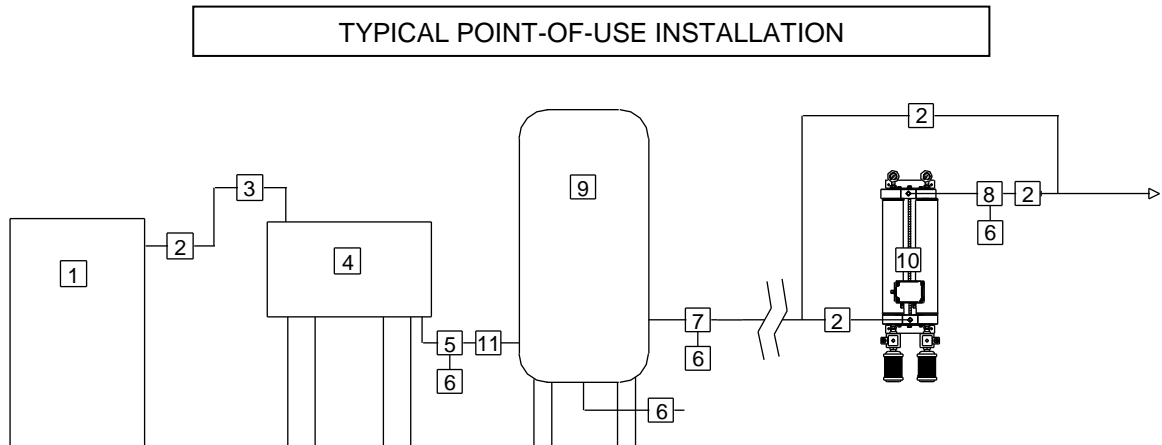
It is recommended that a bypass line with shut-off valves be installed to provide constant air flow to the system should the dryer require servicing.

4.4 REQUIRED FILTERS

Always install a 0.01 micron coalescing prefilter with automatic drain before dryer to remove entrained particulates, liquid moisture and oil which can cause damage to the desiccant beds. A 1.0 micron particulate afterfilter should be installed after the dryer to remove any desiccant dust that may migrate from the desiccant beds.

Recommended Filters			
For Model		Pre-Filter	After-Filter
		0.01 Micron Coalescing	1.0 Micron Particulate
MHL3	Filter <i>Replacement Element</i>	F200-25-3/8-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-3/8-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL6	Filter <i>Replacement Element</i>	F200-25-3/8-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-3/8-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL9	Filter <i>Replacement Element</i>	F200-25-3/8-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-3/8-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL12	Filter <i>Replacement Element</i>	F200-25-3/8-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-3/8-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL16	Filter <i>Replacement Element</i>	F200-25-1/2-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-1/2-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL25	Filter <i>Replacement Element</i>	F200-25-1/2-C-AD-PD6 <i>E200-15/25-C</i>	F200-25-1/2-RB-MD-PD6 <i>E200-15/25-RB</i>
MHL35	Filter <i>Replacement Element</i>	F200-55-1/2-C-AD-PD6 <i>E200-55-C</i>	F200-55-1/2-RB-MD-PD6 <i>E200-55-RB</i>
MHL50	Filter <i>Replacement Element</i>	F200-55-1/2-C-AD-PD6 <i>E200-55-C</i>	F200-55-1/2-RB-MD-PD6 <i>E200-55-RB</i>

4.5 RECOMMENDED DRYER INSTALLATION



Ref.#	Description	Ref.#	Description
1	Compressor	7	Pre-Filter, 0.01 Micron Coalescing, With Automatic Drain
2	Shut-off Valve	8	After-Filter, 1.0 Micron Particulate, With Manual Drain
3	Flex Connector	9	Storage Tank
4	Aftercooler	10	MHL-Series Desiccant Dryer
5	Liquid Separator	11	Check Valve
6	Drain Valve		

SECTION 5 START UP PROCEDURE

BEFORE STARTING THIS DRYER, FOLLOW THE INSTALLATION INSTRUCTIONS AND PROCEDURES COMPLETELY.

DO NOT REMOVE, REPAIR OR REPLACE ANY ITEM ON THE DRYER WHILE THE DRYER IS UNDER PRESSURE.

INITIAL START UPS

1. Confirm that all piping and electrical connections are proper.
2. Shut off electrical power.
3. If a bypass is installed around the dryer, open the inlet and outlet isolation valves. Close the bypass valve.
WARNING - When operating this dryer without the mufflers, use hearing protection.
4. Wait approx. 20 seconds to equalize pressure in the desiccant chambers.
5. Turn on the electrical power. Dryer should start cycling.
6. Verify purge cycle timing as described in Dryer Operation section.
7. Verify that a small amount of air is purging from the moisture indicator. When sample air is dry, the silica gel remains dark blue. If the sample air is moist, indicating a problem, the color changes to light pink. At start-up the moisture indicator may show pink, but it should return to blue after 30 to 40 minutes of dryer operation.

SECTION 6 MAINTENANCE AND REPAIR

WARNING - DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THE DRYER WHILE THE DRYER IS UNDER PRESSURE.

BEFORE BEGINNING ANY REPAIRS, MAINTENANCE, OR INSTALLATION WORK, VERIFY THAT THE POWER IS OFF AND THE DRYER IS DEPRESSURIZED.

BEFORE WORKING ON THE DRYER OR RELATED EQUIPMENT, ENSURE THAT ALL PERSONNEL HAVE READ AND UNDERSTAND THE SAFETY AND OPERATION INSTRUCTIONS IN THIS MANUAL.

PREVENTIVE MAINTENANCE SCHEDULE

This is a suggested schedule based on average dryer conditions. As conditions such as dirty environment, humidity conditions, ambient temperature, etc. change, the frequency of the inspections may change.

Daily

1. Inspect the dryer for proper operation.
2. Inspect inlet filters and drains for proper operation.
3. Verify proper inlet and ambient air conditions.

Weekly

1. Check pop-up indicators on prefilter and afterfilter. If indicator shows red, change filter element.

Semi-Annually

1. Inspect entire assembly for loose connections, screws, etc.
2. Perform audible inspection of purge cycling and purge flow.
3. Visual inspection of exhaust area for signs of oil or desiccant attrition.

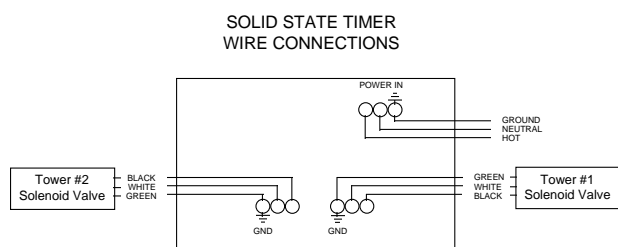
SECTION 7 TROUBLESHOOTING GUIDE

A PROBLEM: AIR DRYER DELIVERS WET AIR			
	POSSIBLE CAUSE	CHECK	CORRECTIVE ACTION
A1	No power to unit.	Power supply.	Correct power problem.
A2	High inlet air temperature.	The inlet air temperature should not exceed 100°F.	Reduce inlet air temperature to proper level. An aftercooler may need to be installed after compressor.
A3	Air flow through dryer in excess of rated capacity.	Make sure inlet flow to dryer (compressor output, or if installed at point-of-use, total of air usage downstream of dryer plus purge flow) does not exceed inlet flow rating of dryer.	Reduce air usage downstream.
A4	Low inlet pressure.	The inlet air pressure should be 100 psig.	Increase inlet pressure or call factory to resize dryer for actual inlet conditions.
A5	Dirty or obstructed inlet air filter.	Check inlet airline filter elements.	Replace.
A6	Purge orifice plugged.	Remove and inspect purge orifice.	Clean orifice hole of debris. Use air gun to clean.
A7	Solenoid coil burned out.	Check magnetic field from coil operation. Place iron or steel material (a screwdriver works well) at top of coil to feel the magnetic effect when coil should be energized. (Note: see Section 1, for timing cycle for your unit.)	Replace.
A8	Oil contamination of desiccant beds.	Verify coalescing inlet filtration is adequate and functioning properly.	Towers must be replaced if contamination is suspected.
A9	Timer not operating properly.	Verify correct timing cycle by observing tower indicator lights on front panel. (Note: see Section 1, for timing cycle for your unit.)	Replace timer if defective.
A10	Purge flow restricted.	Check mufflers (or purge piping if installed) for excessive back-pressure. Note: unit is originally supplied with "no-clog" mufflers.	If purge air is piped away from unit, oversized piping should be used and length of run should be as short as possible.
B PROBLEM: RESTRICTED FLOW THROUGH UNIT			
	POSSIBLE CAUSE	CHECK	CORRECTIVE ACTION
B1	Improper operating conditions.	See A2, A3, A4 above.	
B2	Dirty or obstructed inlet air filter.	See A5 above.	
B3	Plugged air passages.	Check inlet and outlet air passages and piping for blockages.	Clear restrictions.
C PROBLEM: EXCESSIVE PURGE / BLOWDOWN			
	POSSIBLE CAUSE	CHECK	CORRECTIVE ACTION
C1	Inlet or outlet shuttle not shifting.	See A3, A4, A5, A6 above.	
C2	Inlet or outlet shuttle not shifting.	Check for damage or contamination of inlet and outlet shuttles.	Clean or replace as necessary.
C3	Purge orifice plugged.	See A6 above.	
C4	Timer not operating properly.	See A9 above.	
C5	Timer not operating properly.	Incoming power may not be "clean". Fluctuations in voltage can occur in power circuits shared by devices such as electric motors and welding equipment.	Supply line voltage from another source.
C6	Dirty or obstructed inlet air filter.	See A5 above.	
C7	Leakage.	With dryer pressurized, remove power from dryer. Check purge ports on dryer and air system connections for large leaks.	Repair as necessary.

See Exploded View on previous page for reference numbers.

REPLACEMENT PARTS		FOR MODEL								
REF#	DESCRIPTION	KIT CONTAINS QTY	MHL3	MHL6	MHL9	MHL12	MHL16	MHL25	MHL35	MHL50
1	TOWER GAUGE KIT	2	50-0100	50-0100	50-0100	50-0100	50-0101	50-0101	50-0101	50-0101
2	DESICCANT TOWER	1	50-0102	50-0103	50-0104	50-0105	50-0106	50-0107	50-0108	50-0158
3	SHUTTLE DISC, INLET	1	50-0109	50-0109	50-0109	50-0109	50-0110	50-0110	50-0110	50-0110
4	SHUTTLE DISC, OUT W/ORIFICE	1	50-0111	50-0112	50-0113	50-0114	50-0115	50-0116	50-0117	50-0157
5	SCREW	1	50-0118	50-0118	50-0118	50-0118	50-0119	50-0119	50-0119	50-0119
6	END BLOCK, TOP-L OR BOTTOM-RT	1	50-0120	50-0120	50-0120	50-0120	50-0121	50-0121	50-0121	50-0121
7	END BLOCK, TOP-RT OR BOTTOM-L	1	50-0122	50-0122	50-0122	50-0122	50-0123	50-0123	50-0123	50-0123
8	SOLENOID VALVE ASSY 115 VOLT	1	50-0124	50-0124	50-0124	50-0124	50-0125	50-0125	50-0125	50-0125
8a	SOLENOID VALVE ASSY 230 VOLT	1	50-0126	50-0126	50-0126	50-0126	50-0127	50-0127	50-0127	50-0127
9	PURGE MUFFLER KIT	2	50-0128	50-0128	50-0128	50-0128	50-0129	50-0129	50-0129	50-0129
10	TIE ROD	1	CF	CF	CF	CF	CF	CF	CF	CF
11	INLET/OUTLET SHUTTLE VALVE SEAT	1	50-0131	50-0131	50-0131	50-0131	50-0132	50-0132	50-0132	50-0132
12	SHUTTLE VALVE BODY	1	50-0133	50-0133	50-0133	50-0133	50-0134	50-0134	50-0134	50-0134
13	DRYER MOUNTING BRACKET	1	50-0135	50-0135	50-0135	50-0135	50-0136	50-0136	50-0136	50-0159
14	SOLENOID DIN CONNECTOR	1	50-0137	50-0137	50-0137	50-0137	50-0138	50-0138	50-0138	50-0138
15	CONTROL BOX BRACKET	1	50-0139	50-0139	50-0139	50-0139	50-0140	50-0140	50-0140	50-0140
16	TIMER, SS, 115 VAC	1	50-0141	50-0141	50-0141	50-0141	50-0142	50-0142	50-0142	50-0142
16a	TIMER, SS, 230 VAC	1	50-0143	50-0143	50-0143	50-0143	50-0144	50-0144	50-0144	50-0144
17	CONTROL BOX ENCLOSURE	1	50-0145	50-0145	50-0145	50-0145	50-0145	50-0145	50-0145	50-0145
not shown	VITON O-RING KIT	*	50-0146	50-0146	50-0146	50-0146	50-0147	50-0147	50-0147	50-0147
not shown	Street Tee	1	50-0152	50-0152	50-0152	50-0152	50-0153	50-0153	50-0153	50-0153
not shown	Bushing	1	50-0148	50-0148	50-0148	50-0148	50-0149	50-0149	50-0149	50-0149
not shown	Moisture Indicator	1	50-0154	50-0154	50-0154	50-0154	50-0154	50-0154	50-0154	50-0154
NOTE: *VITON O-RING KIT INCLUDES ALL O-RING SEALS NOTE: CF - CALL FACTORY										

SECTION 9 WIRING DIAGRAM



SECTION 10 WARRANTY

Per Van Air Terms and Conditions

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious.

⚠ DANGER  DISCHARGE AIR USED FOR BREATHING WILL CAUSE SEVERE INJURY OR DEATH. CONSULT FILTRATION SPECIALIST FOR ADDITIONAL FILTRATION AND TREATMENT EQUIPMENT TO MEET HEALTH AND SAFETY REGULATIONS.	⚠ DANGER  AIR AND OIL UNDER PRESSURE WILL CAUSE SEVERE PERSONAL INJURY OR DEATH. SHUT DOWN COMPRESSOR AND RELIEVE SYSTEM OF ALL PRESSURE BEFORE REMOVING VALVES, CAPS, PLUGS, FITTINGS, BOLTS AND FILTERS.	⚠ WARNING  ELECTRICAL SHOCK FROM IMPROPER GROUNDING CAN CAUSE INJURY OR DEATH. GROUND UNIT AND RELATED EQUIPMENT ACCORDING TO NATIONAL ELECTRICAL CODE AND LOCAL REGULATIONS.	⚠ WARNING  READ THE OPERATOR'S MANUAL BEFORE STARTING OR SERVICING THIS UNIT. FAILURE TO ADHERE TO INSTRUCTIONS CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH. REPLACEMENT MANUALS CAN BE PURCHASED BY CONTACTING THE MANUFACTURER.
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