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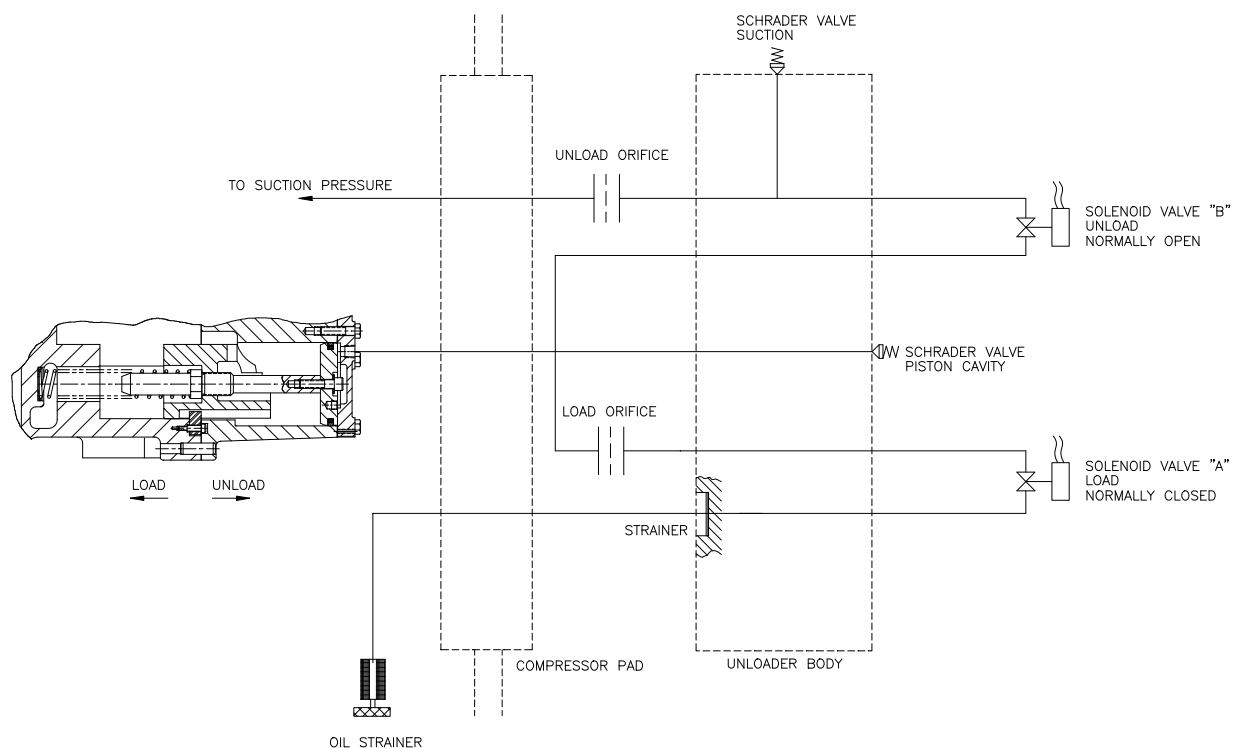
## SERVICE BULLETIN : MSC Unloader Operation And Troubleshooting

In March of 2000 HCI introduced a new pad mounted unloader assembly for use with MSCs (Medium Screw Compressors).

There are several major differences between this unloader and the previous version.

First, the load and unload throttling valves were removed. To compensate for this change, fixed orifices were installed to slow down the load/unload rate. The internal relief valve was removed and an additional schrader access valve was installed. Please refer to the following schematic when reading the text that follows.

### 1.) Schematic



**2.) Operation**

Position	“Load” Solenoid A Normally Closed	“Unload” Solenoid B Normally Open
UNLOAD	OFF	OFF
HOLD	OFF	ON
LOAD	ON	ON

OFF = Solenoid is de-energized

ON = Solenoid is energized

**UNLOAD:** When both solenoids are de-energized, the compressor is in the “UNLOAD” position. In operation, this makes a differential pressure of suction to discharge across the piston, which overcomes the pressure differential across the slide-valve. The slide-valve is spring loaded so that when the compressor is off, with no pressure differentials, the slide-valve can move to the fully unloaded position.

**HOLD:** When the compressor is put in the “HOLD” position, both solenoids are closed and the piston cavity is isolated.

In any part load condition, the piston cavity pressure rebalances so that the force created by the pressure differential of suction to discharge pressure, across the slide-valve, equals the force created by the pressure differential of cavity pressure to discharge pressure, across the piston.

**LOAD:** When the compressor is put in the “LOAD” position, the pressure across the piston is equalized and the pressure differential across the slide-valve causes the machine to move in the load direction.

**Note:** There is no direct indication of slide-valve movement, however, when the slide-valve moves, there are several indirect effects. With increasing load, current draw will increase and suction pressure will decrease.

Also the pitch of the compressor will change with load.

In the full load condition, the slide valve is positively stopped against the slide-stop. This does not allow the slight movement necessary to rebalance the piston cavity pressure. Thus, there is normally a significant time delay for the compressor to start unloading from the fully loaded position as the piston cavity bleeds down to the balance pressure.

**TYPICAL LOADING TIME**

MODEL	Unload (s)	Load (s)
1111NHF6X6K	22	16
1113NHF6X6K	28	16
1117NHF6X6K	31	18
1210NHF6X6K	28	22
1212NHF6X6K	35	25
1215NHF6X6K	45	31
1218NHF6X6K	49	36
1210NHF6W4K	35	40
1212NHF6W4K	40	53
1215NHF6W4K	45	54
1218NHF6W4K	49	55

**3.) Reading Compressor Pressures:**

There are two schrader valves on the unloader pad which allow various pressures to be measured inside of the compressor for start-up and trouble-shooting purposes.

***Suction Schrader Valve:***

- Suction pressure can be read from the suction schrader valve while the compressor is in the "HOLD" position. This is useful for measuring the suction pressure after the suction filter.

***Piston Cavity Schrader Valve:***

- Discharge pressure is read downstream the oil strainers when the unloader solenoids are in the "LOAD" position. This is best read when the compressor is fully loaded.
- Suction pressure is read when the unloader solenoids are in the

**"UNLOAD" position.** This is best read when the compressor is fully unloaded.

- An intermediate pressure is read when the unloader is in the "HOLD" position when the compressor is not at full load. This value is approximately  $(P_{disch} * 0.3 + P_{suct} * 0.7)$ .

**4.) Troubleshooting:**

In all cases, the first step is to ensure that the solenoids are actually being energized and in the proper sequence.

***Compressor won't load:***

- Read pressure at the suction schrader valve. Excessive pressure drop across the filter can give the appearance of the compressor not loading by reducing mass-flow and capacity.
- Read pressure at the piston cavity in the "LOAD" position. If the cavity pressure reads at or near suction pressure, then the problem is most likely a clogged strainer or orifice on the pad. Disassemble and check the pad for signs of dirt or debris.

***Compressor won't hold:***

- Read the pressure of the piston cavity with the compressor in the "HOLD" position. If this equals or approaches suction pressure, then there is a leak on the gasket or unload solenoid valve. If this reads discharge pressure, then the leak may be on the gasket, solenoid valve, or internal to the compressor.

***Compressor won't unload:***

- Read the pressure of the piston cavity with the compressor in the "UNLOAD" position. If this reads discharge pressure, there may be a leak between the piston cavity and the gasket, solenoid valve or internal to the compressor.

***Slide valve is "stuck":***

- If the cavity pressure reads normally, and no movement can be detected, then the valve may be "stuck". This can be checked by pumping the system down removing the pad, and pressurizing the piston cavity with dry air or nitrogen. Note that there is no fitting to connect to, but a small amount of pressure supplied to the piston cavity port should be enough to move the valve. A metallic "clink" can be heard when the valve is forced to the fully loaded position, and when the spring returns the valve to the fully unloaded position.