INSTRUCTIONS

99TA516175B (for RCD use only)

Instruction Sheet Number: **99TA516175B**

Description: Capacity Control Accessory Packages (Pressure & Electronic)

Author: Engineering Date: May 6, 2019

Part Number: 06DA660090, 06DA660177, 06DA660180, 06DA660181, 06EA660139, 06EA660171, 06EA660173, 06EA660174

These packages were designed for use in converting compressors presently equipped with standard heads (or hot gas bypass type unloader heads) to the suction cutoff unloader style heads

06D Capacity Control Accessory Packages.

Package's **06DA660090/06DA660181** Pressure Activated
Package's **06DA660177/06DA660180** Electric Activated (Solenoid coil not included)

		06DA660090	06DA660177	06DA660180	06DA660181
Description	Qty.				
Cylinder Head Assembly. **	1	06DA404954	06DA404944	06DA409618	06DA409619
Cylinder Head Gasket	1	05GA502223	05GA502223	05GA502223	05GA502223
Cylinder Head Bolts 3/8-16 x 3"	8	AA06GT239	AA06GT239	AA06GT239	AA06GT239
Cylinder Head Fan Stud 3/8-16 x3"	2	05GA504052	05GA504052	05GA504052	05GA504052
Valve Plate Gasket	1	05DA500153	05DA500153	05DA500153	05DA500153

** Includes Capacity Control Valve. Does Not Include Solenoid Coil

Package's **06EA660139/06EA660174** Pressure Activated
Package's **06EA660171/06EA660173** Electric Activated (Solenoid coil not included)

		06EA660139	06EA660171	06EA660173	06EA660174
Description	Qty.				
Cylinder Head Assembly. **	1	06EA405264	06EA405254	06EA407209	06EA407210
Cylinder Head Gasket	1	06EA503334	06EA503334	06EA503334	06EA503334
Self Lock Screw (1/4-28 x .375	1	06EA501543	06EA501543	06EA501543	06EA501543
Washer	1	06EA500992	06EA500992	06EA500992	06EA500992
Suction Valve (Air Cond.)	2	06EA500153	06EA500153	06EA500153	06EA500153
Valve Plate Gasket (4 Tab)	1	06EA506414	06EA506414	06EA506414	06EA506414
Valve Plate Gasket (3 Tab)	1	06EA501853	06EA501853	06EA501853	06EA501853

** Includes Capacity Control Valve. Does Not Include Solenoid Coil

Available Solenoid Coils (Purchased Separately)
EF19ZZ001 – 24v
EF19ZZ002 – 120v
EF19ZZ003 – 208/240v

⚠ WARNING

Before beginning any modifications, be sure the main electrical disconnect is in the OFF position. TAG THE DISCONNECT SWITCH WITH A SUITABLE WARNING LABEL. Electrical shock can cause personal injury or death.

Installation:

Complete Electric or Pressure Head Assembly Replacement

1. Install discharge and suction pressure service gages.
2. Start compressor and allow it to run until warm, then front seat suction shutoff valve and let compressor pump down to approximately 2 psig.
3. Stop compressor and quickly front seat discharge shutoff valve. Remove remaining refrigerant from discharge side of compressor in an environmentally approved method.
4. Remove cylinder head hold-down bolts.
5. Tap cylinder head on top with wooden or lead mallet to free gasket and remove cylinder head. CAUTION: Excessive force on cylinder head can break dowel pins holding valve plate.
6. It is not necessary to change the valve plate when adding the suction cut-off unloading feature to any compressor. The suction cutoff method of unloading functions independently of the valve plate. The valve plate gasket is supplied in the event the original gasket is damaged when cylinder head is removed (see 06D & 06E notes for details).
7. Install the new cylinder head gasket and unloader cylinder head. On 06E models the cylinder head gasket is attached to the valve plate with special cap screw and washer included in kit. Torque this cap screw to 4 to 6 ft. lbs. Note: the 06D unloader cylinder head being slightly higher than the plain cylinder head you must use the longer bolts included in the 06D packages. The 06E unloader cylinder head is installed using the existing cylinder head bolts.
    a. The unloader cylinder head assembly can be installed on either side bank of a 6-cylinder 06D of 06E compressor.
    b. The unloader cylinder head assembly can be installed on either bank of a 4-cylinder 06E compressor.
    c. On a 4-cylinder 06D compressor the unloader cylinder head assembly installation is recommended on the side opposite the terminal box to avoid possible interference with the high and low pressure connections in the crankcase.
8. Tighten cylinder head bolts evenly by increments. Final torque: 06D 30 – 35 ft. lbs. and for the 06E 90 – 100 ft. lbs. Installation of the pressure operated unloader cylinder head is now complete. Control valve must be adjusted for proper cylinder load up point and the pressure differential between load and unload (See Adjustments section). For electrically operated valve continue the installation step that follows.
9. For electric capacity control valves place solenoid coil (not included in kit) with applicable control voltage on unloader valve stem and secure with snap on retainer. Make necessary wire connections. When solenoid valve is energized, cylinders unload – when coil is de-

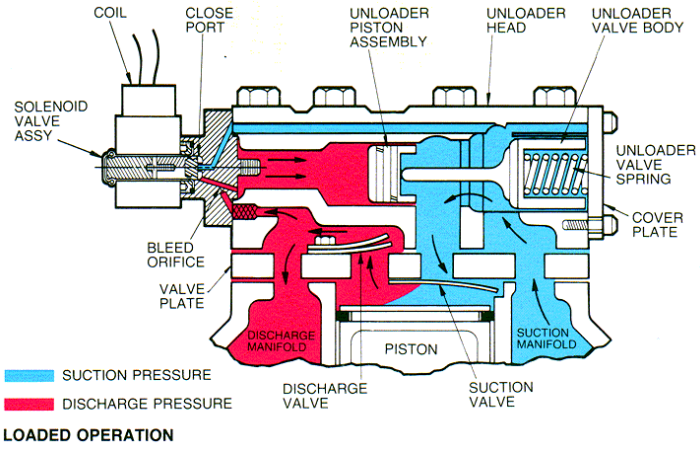
energized, cylinders load. Check solenoid valve for proper operation. An audible click can be heard when the valve actuates.

Capacity Control System – Electric

Electrically operated control valve is actuated by remote signal to the electric solenoid coil which has the same voltage as the unit control voltage. No manual adjustments to the electric unloader valve are necessary. When the solenoid is “de-energized” the passageway in the valve are aligned for “loaded” conditions. When the solenoid is “energized” the valve passageways are aligned for unloading.

Loaded Operation

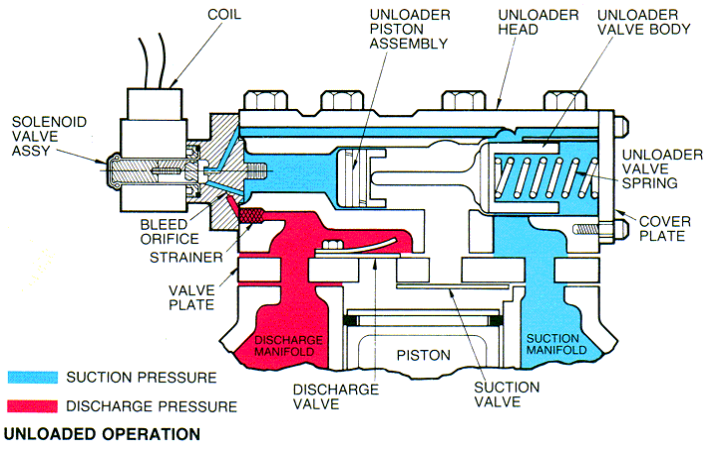
This capacity control valve is controlled by an electric solenoid. When the solenoid is de-energized the valve loads the cylinder bank (2 cylinders) as shown. When the suction pressure rises above a set point, an external controller de-energizes the solenoid coil. This closes the capacity control valve port, allowing discharge pressure to build-up behind the unloader piston assembly. A high enough pressure (25 to 40 psig above suction) will compress the unloader valve spring, opening the unloader suction port. Suction gas can now be drawn into the cylinder, running the bank fully loaded.



LOADED OPERATION

Unloaded Operation

As the suction pressure drops below the set point of the external controller, the solenoid coil is energized. This opens the capacity control valve port, allowing the discharge gas behind the unloader piston assembly to vent back to suction side. The unloader valve spring at this point can move the unloader valve body to the left, blocking the unloader suction port. The cylinder bank is now isolated from the compressor suction manifold, unloading these two cylinders. No refrigerant is allowed into cylinders and no compression takes place.



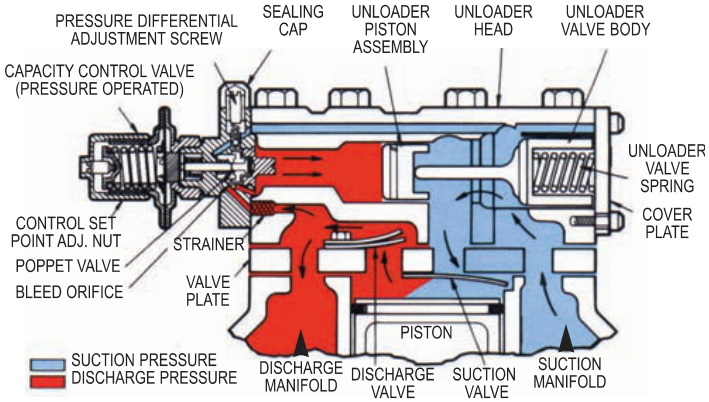
UNLOADED OPERATION

Capacity Control System – Pressure

Pressure-operated control valve is controlled by suction pressure and activated by discharge pressure. Each valve controls 2 cylinders (one bank). On start-up, controlled cylinders do not load up until differential between suction and discharge pressures is approximately 25 psig.

Loaded Operation

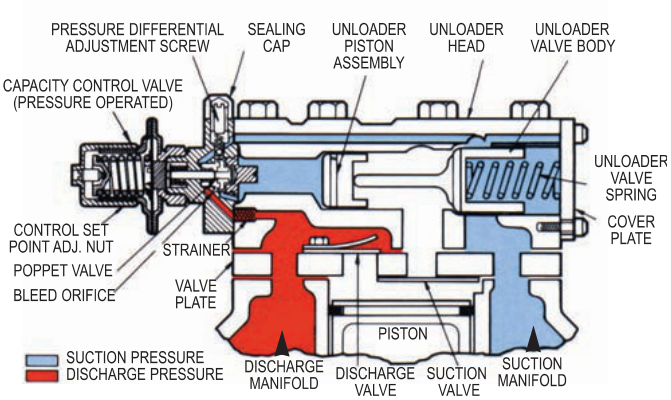
When suction pressure rises high enough to overcome control set point spring, the diaphragm snaps to the left and relieves pressure against the poppet valve. The drive spring moves the poppet valve to left and it seats in the closed position. With poppet valve closed, discharge gas is directed into the unloader-piston chamber and pressure builds up against the piston. When pressure against unloader valve spring, piston moves valve to the right, opening suction port. Suction gas can now be drawn into cylinders and the bank is running fully loaded.



LOADED

Unloaded Operation

As suction pressure drops below set point, control spring expands, snapping diaphragm to right. This forces poppet valve open and allows gas from discharge manifold to vent through base of control valve to suction side. Loss of full discharge pressure against unloaded piston allows unloader valve spring to move valve left to closed position. The suction port is blocked, isolating the cylinder bank from the suction manifold. The cylinder bank is now unloaded.



UNLOADED

Adjustments

Control Set Point (cylinder load-up point) is adjustable from 0 psig to 86 psig. Refer to fig. 1 & 2. Turn adjustment nut clockwise to the bottom stop. In this position, the cylinder load up pressure is 86 psig. Control set point is regulated to desired pressure by turning the adjustment nut counterclockwise. The number of turns can be determined from the curve. Each full turn counterclockwise decreases the load-up point by approximately 7.2 psi. Approximately 12 turns changes the pressure from 85 psi to 0 psi.

Pressure Differential between cylinder load-up point and unload point is adjustable from 6 psi to 16psi. Refer to fig. 1 & 3. Turn adjustment screw counterclockwise to the backstop. In this position, the differential is 6 psi. Differential is set by turning the adjustment screw clockwise. The number of turns to the desired differential can be determined from the curve. Each full turn clockwise increases the differential by approximately 0.8 psi. Approximately 5 turn changes the differential 6 psi to 10 psi.

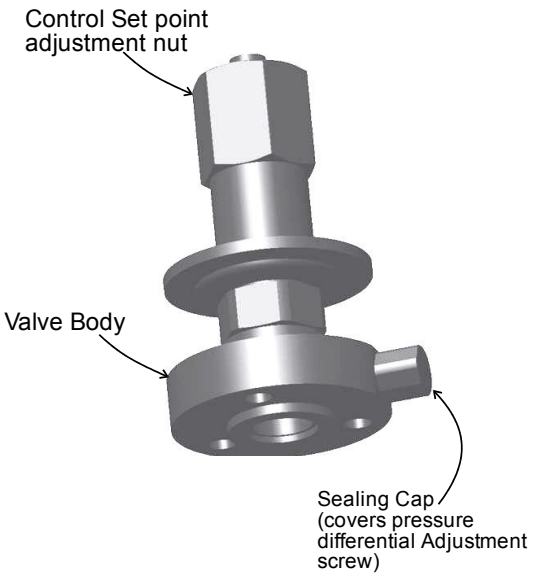


Fig. #1 Pressure-Operated Capacity Control Valve

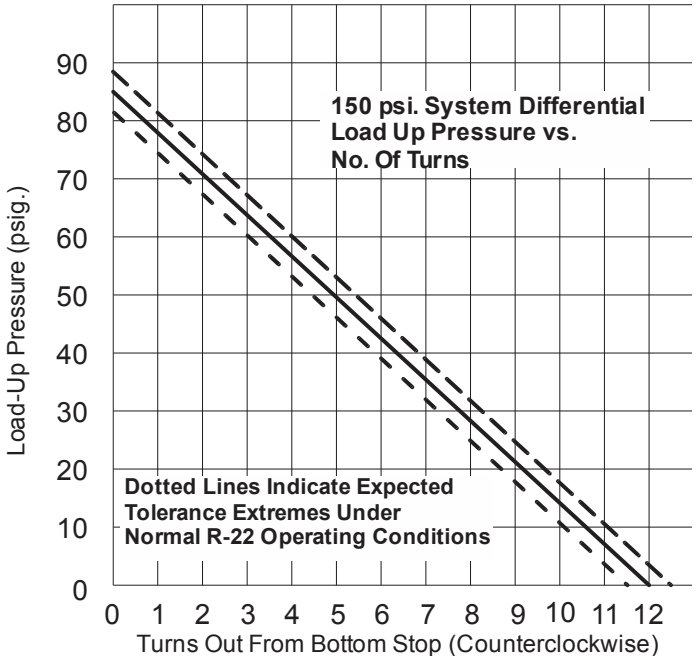


Fig. #2 Control Set Point

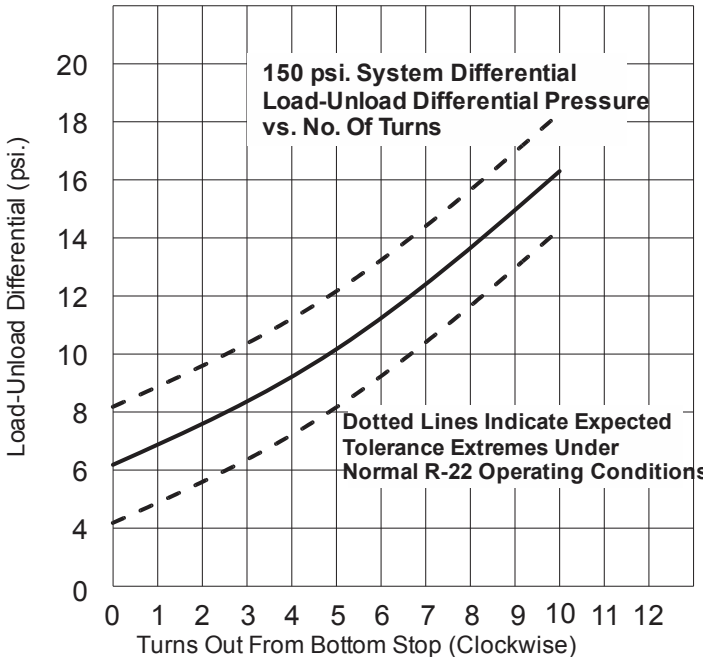


Fig. #3 Differential Set Point

06D Notes:

Once the old style cylinder head has been removed, the following procedures should be followed to insure proper installation and operation of the unloader head:

1) Make sure all of the old gasket material is removed.
2) Install the new cylinder head gasket on the valve plate assembly
3) Install the cylinder head assembly. Torque the cylinder head bolts to 30 – 35 ft. lbs.
4) New valve plate gasket is supplied in the event the original valve plate gasket is damaged or if the valve plate assembly is replaced, and it will fit the majority of 06D compressors.
5) The valve plate gasket included in the kit will not fit the old 13 cfm compressors (06DR013 & 06DM313 built before 1985). Valve plate gasket 6D40-1073 must be ordered separately. It will fit newer models.

Note: To re-use a hot gas bypass unloading valve plate for suction cut-off unloading, remove the check valve assembly on the bottom of the valve plate by removing the 3 slotted screws. A new valve plate gasket will be required.

06E Notes:

1) Cylinder head assemblies include the capacity control valve. For the electrically actuated head assembly, the customer must purchase the coil separately. For additional voltage selections, see note5.
2) Valve plate gaskets are supplied in the event the original valve plate gasket is damaged when removing the cylinder head. One valve plate gasket has a thickness of 0.32” to be used on 06ER/EY refrigeration models only. The other gasket has a thickness 0f 0.07” can be used on all other models.
3) Once the existing cylinder head has been removed, the stated procedure should be followed to insure proper installation and operation of the unloader head.
   a) Remove standard cylinder from compressor. From 4 cylinder 06E model remove the right hand head, as viewed from the pump end. On 6 cylinder models, either side bank can accommodate an unloader cylinder head.
   b) Make sure all old gasket material is removed
   c) Install new cylinder head gasket on valve plate assembly using the cap screw and washer provided torque to 4 to 6 ft. lbs. If valve plate is moved during unloader head assembly process, ensure suction valves under valve plate remain properly positioned on dowel pins.
   d) Install new unloader head assembly using existing bolts and tighten evenly by increments with final torque to be 90 – 100 ft. lbs.
   e) Pressure actuated control valve must be adjusted, see adjustment instructions.
4) On older compressors with hot gas unloaders the old hot gas bypass unloading valve can be reused by removing the check valve and housing from the valve plate itself and reinstall using new applicable valve plate gasket