

06D, 06E Installation Instructions Capacity Control Accessory Package

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

06D ACCESSORY CAPACITY CONTROL PACKAGES

Package No. 06DA660089 Electric (Less Coil) Package No. 06DA660090 Pressure Activated Control

ITEM	QTY.	DESCRIPTION	PACKAGE 06DA660089***	PACKAGE 06DA660090**
1	1	Cylinder Head Assembly*	06DA404944	06DA404954
2	1	Cylinder Head Gasket	05GA502223	05GA502223
3	8	Cylinder Head Bolts	AA06GS239	AA06GS239
4	2	Cylinder Head Fan Studs	06DA503313	06DA503313
5	1	Valve Plate Gasket	05DA500153	05DA500153

Includes capacity control valve.

06E ACCESSORY CAPACITY CONTROL PACKAGES

Package No. 06EA660138 Electric (Less Coil) Package No. 06EA660139 Pressure

ITEM	QTY.	DESCRIPTION	PACKAGE 06EA660138	PACKAGE 06EA660139
I I EIVI	GII.		00EA000136	00EA000139
1	1	Cylinder Head Assembly	06EA405254	06EA405264
2	1	Cylinder Head Gasket	06EA503334	06EA503334
3	1	Valve Plate Gasket (06ER)	06EA501853	06EA501853
4	1	Valve Plate Gasket (06EM/06EA)	06EA506414	06EA506414
5	1	Cylinder Head Gasket Cap Screw	06EA501543	06EA501543
6	1	Cap Screw Washer	06EA500992	06EA500992

Rev. F 12/02 Lit. No. 806-003

^{**} Not recommended for refrigeration applications.

^{***}Coil not included.

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.
- 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 screws.
- 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 cutoff 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 the cylinder head is removed (see 06D and 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 capscrew and washer (items 5 & 6). Torque this capscrew to 4 to 6 ft. lbs. Note: the 06D unloader cylinder head, being slightly higher than the plain cylinder head uses 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 6cylinder 06D or 06E compressor.
- b. The unloader cylinder head assembly can be installed on either side bank of a 4cylinder 06E compressor.
- c. On 4-cylinder 06D compressors, 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 lb. ft. 06E 90-100 lb. ft. 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. For electrically operated valve, continue the installation step that follows.
- 9. For electric capacity control valves, place solenoid coil (Alco or Parker) with applicable control circuit voltage on unloader valve stem and secure with a snap-on retainer. Parker and Alco coils are interchangeable in older Alco and newer Parker unloader capacity control assemblies. Make necessary wire connections. When solenoid valve is energized, cylinders unload when coil id de-energized, cylinders load. Check solenoid valve for proper operation. An audible click can be heard when the valve actuates.

AVAILABLE COILS

Carrier Part No.	Voltage	Ref. Alco Part No.
EF19ZE024	24-1-50/60	X13904-C7145
EF19ZE120	120-1-50/60	X13904-C7245
EF19ZE240	208/240-1-50/60	X13904-C7045

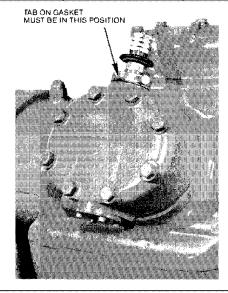
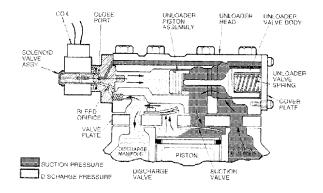


Fig. 1 – Capacity Control Valve Installed on Suction Cutoff Unloader Head

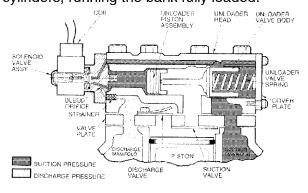
Capacity Control System - Electric

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 passageways 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 deenergized, the valve loads the cylinder bank (2 cylinders) as shown in the first figure. 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 cylinders, running the bank fully loaded.

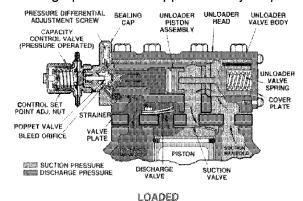


Unloaded Operation

As the suction pressure drops below the set point of an external controller, the solenoid soil is energized. This open the capacity control valve port, allowing the discharge gas behind the unloader piston assembly to vent back to the 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 the cylinders and no compression takes place.

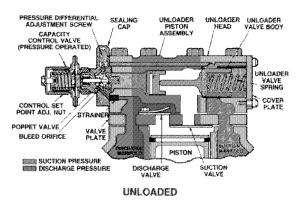
Capacity Control System – Pressure

Pressure-operated control valve is controlled by suction pressure and actuated 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 psi.



Loaded

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 piston is high enough to overcome the unloader valve spring, piston moves valve to the right, opening suction port. Suction gas can now be drawn into the cylinders and the bank is running fully loaded.



Unloaded

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.

Adjustments

Control Set Point (cylinder load-up point) is adjustable from 0 psig to 86 psig. Refer to Fig. 2 and 3. 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 psig.

Pressure Differential between cylinder loadup point and unload point is adjustable from 6 psi to 16 psi. Refer to Fig. 2 and 4. 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 turns changes the differential from 6 psi to 10 psi.

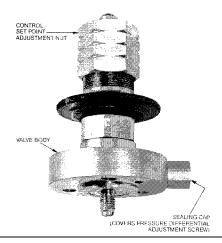


Fig. 2 – Pressure-Operated Capacity Control Valve

! Warning

Before beginning any modification, 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.

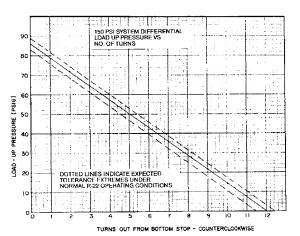


Fig. 3 - Control Set Point

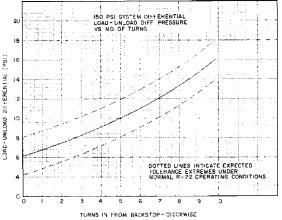


Fig. 4 - Differential Set Point

<u>**06D Notes:**</u> 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:

- Make sure all of the old gasket material is removed.
- 2. Install the new cylinder head gasket (05GA502223) on the valve plate assembly.
- 3. Install the cylinder head assembly. Torque the cylinder head bolts to 30-35 ft. lbs.
- 4a. Valve Plate Gasket, 05DA500153, 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.
- b. 05DA500153 will not fit the old 13 CFM compressors. (i.e. 06DR013 and 06DM313 built before 1985). Valve Plate Gasket, 6D40-1073, must be purchased separately for use on the older 13 CFM compressor, if required. 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 06EA405254 and 06EA405264 include the capacity control valve. For the electrically actuated head assembly, the customer must purchase the coil separately. For additional coil voltage selections, see note 5.
- 2. Valve plate gaskets are supplied in the event the original valve plate gasket is damaged when removing the cylinder head. The valve plate gasket, item 3, 06EA501863 (.32" thickness) is to be used on 06ER/EY refrigeration models only. Gasket, item 4, 06EA506414 (.070" thickness) is to be used on all other models.
- 3. Once the existing cylinder head has been removed, the stated procedures should be followed to insure proper installation and operation of the unloader head.

- a. Remove standard cylinder head 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 (item 2) on valve plate assembly using the capscrew and washer provided (items 5 and 6). Torque capscrew 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 cylinder head assembly using existing bolts. Tighten cylinder head bolts evenly by increments with final torque to be 90-100 ft. lbs. (122-136 N.m).
- e. Pressure actuated capacity control valve must be adjusted for proper cylinder load-up point and pressure differential between load and unload. See adjustment instructions.
- 4. On older compressors with hot gas unloaders, the old hot gas bypass unloading valve plate can be reused by removing the check valve and housing from the valve plate itself and reinstall using new applicable valve plate gasket. Review note 2.
- 5. Applicable Alco or Parker electrical capacity control coil packages. Each package includes 1 coil plus a snap-on coil retainer.

Available Coils

Part No.	Voltage	Alco Part No.
EF19ZE024	24-1-50/60	X13904-C7145
EF19ZE120	120-1-50/60	X13904-C7245
EF19ZE240	208/240-1-50/60	X13904-C7045
06DA401854	480-1-50/60	X13904-C8845