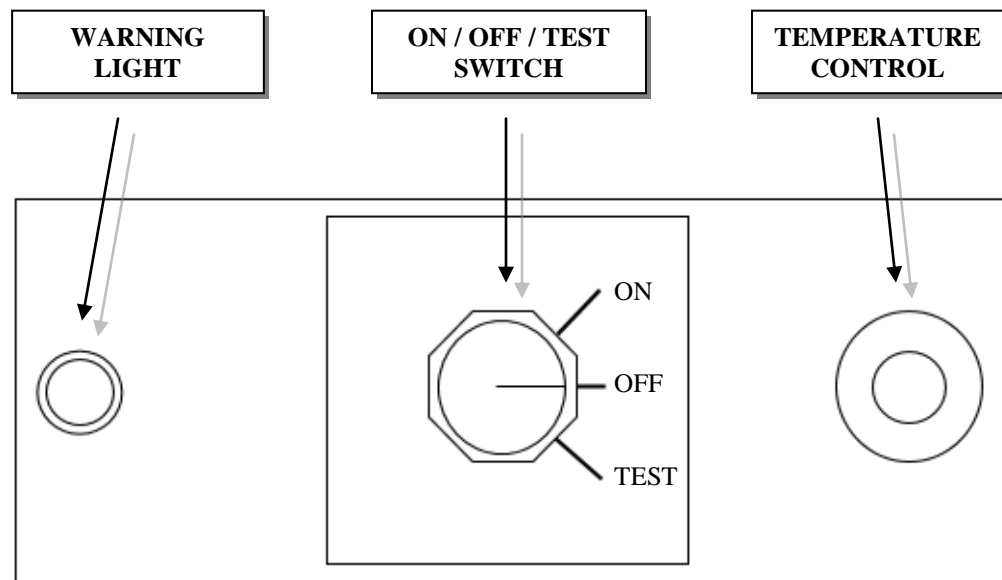


## CO<sub>2</sub> BACK-UP SYSTEM

### INSTRUCTIONS



### TABLE OF CONTENTS

- 1.1 Pre-Installation Instructions
- 1.2 Back-up System Instructions
- 1.3 Back-up Information
- 1.4 Wiring & Valve Diagram, Carbon Dioxide Documents
- 1.5 Backup System Battery
- 1.6 Backup System Parts List

## 1.1 PRE-INSTALLATION INSTRUCTIONS

---



Before connecting the CO<sub>2</sub> back-up system, perform all actions below to prevent self injury or damage to system mechanics:

- Connections to back-up only preformed by qualified personnel.
- Back-up switch is in the **OFF** position.
- Liquid Siphon valve on cylinder is closed.
- Connect flare fitting to the liquid valve on cylinder.
- Open valve on cylinder to check all fittings for leaks.
- Close valve until freezer is put into service.



All hoses and connections should be inspected by qualified personnel every 30 days for worn or damaged parts, failure to do so could result in a hazard.

## 1.2 BACKUP SYSTEM INSTRUCTIONS

---

Before operating the CO<sub>2</sub> back-up system, be sure that the switch is turned to the **OFF** position.

The switch should remain in the **OFF** position until the desired temperature of the freezer is reached. Then set the back-up system control to the desired temperature. When the freezer temperature control indicates the desired temperature put the back-up system switch in the **ON** position. The back-up system will not operate until the temperature of the freezer rises warmer than the back-up system temperature control setting. The switch should remain in the **ON** position as long as the unit is operating.

### TEST

The switch has a TEST position that can be used anytime to see if the battery is charged or if the back-up system is working properly.

## 1.3 BACKUP INFORMATION

---

<b>Type of CO2 tank to use:</b>	Liquid Siphon
<b>Liquid Siphon Cylinder Pressure at room Temperature:</b>	Approximately 300-400 PSIA
<b>Line Filter:</b>	Mesh Filter Recommended (Obtained from CO2 Supplier)
<b>BTU's Per LB:</b>	400 pound bulk tank : 119 BTU / L One or more 50 pounds : 64 BTU / L
<b>How long will the tank last?:</b>	Example: 12 Cu. Ft. Chest (Empty) (1) 50 Lbs tank : 12 Hours (8) 50 Lbs tank : 96 Hours (1) 400 Lbs tank : 240 Hours
<b>How often will CO2 cycle?:</b>	CO2 will cycle every 15 minutes and run every 15 seconds. At this rate, you will use 4 and ¼ pounds of CO2 an hour.
<b>Recommended temperature setting:</b>	-40°C TO -60°C
<b>Coldest temperature obtainable with a CO2 Liquid:</b>	-79°C
<b>Tank Connection Furnished:</b>	CGA-320

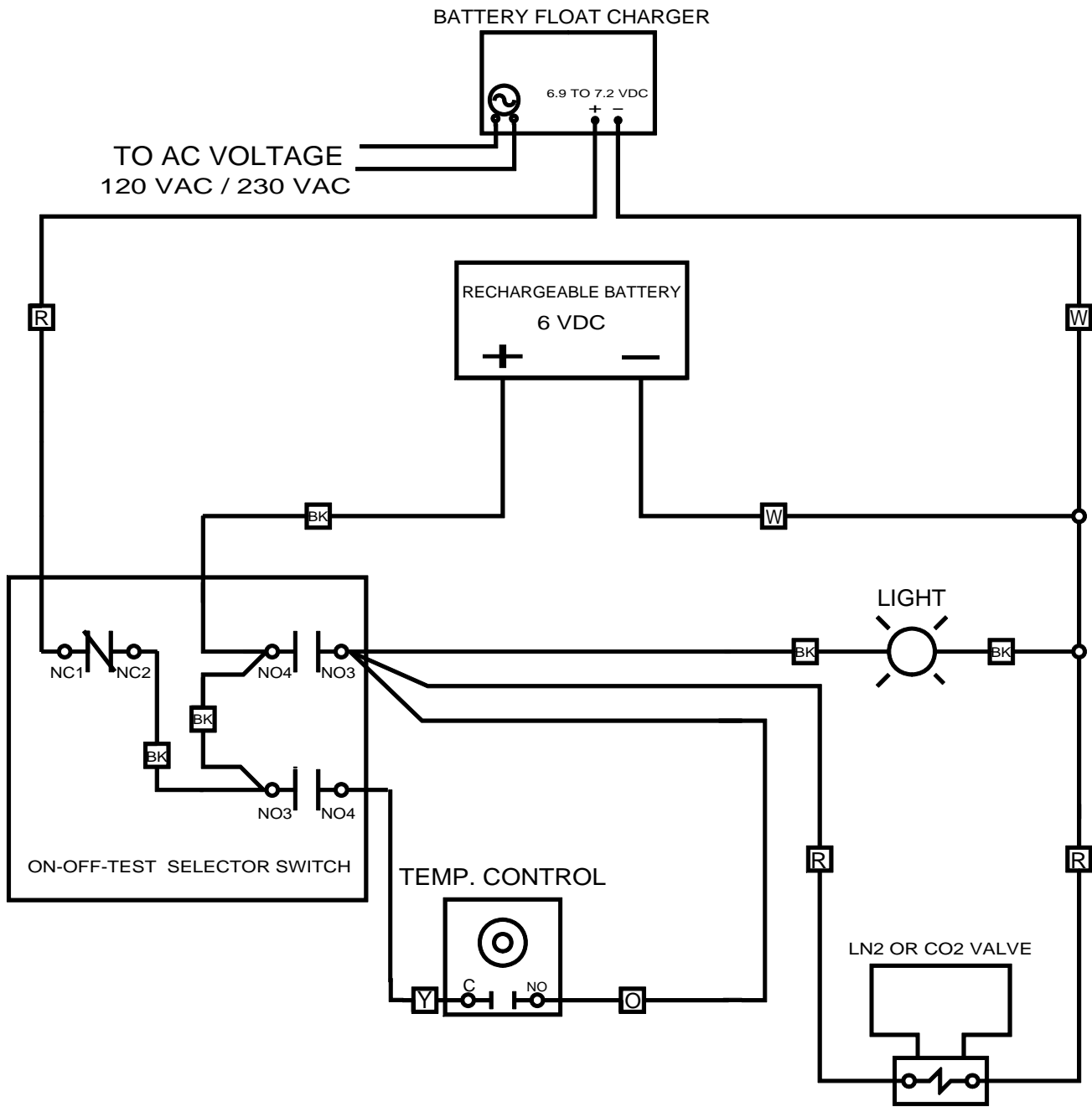


### **Any Questions?**

If you have any questions or concerns hooking up this system, please feel free to contact our service department.

## 1.4 WIRING & VALVE DIAGRAM, NITROGEN DOCUMENTS

---



COLOR CODE	
O	= ORANGE
R	= RED
W	= WHITE
B	= BLUE
Y	= YELLOW
BK	= BLACK

<h1 style="margin: 0;">Installation &amp; Maintenance Instructions</h1>  <p style="margin: 0;"><b>OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS</b></p>	<p><b>SERIES</b></p> <p><b>8016G/H</b></p>
---	--

—SERVICE NOTICE—

ASCO® solenoid valves with design change letter “G” or “H” in the catalog number (example: 8210G1) have an epoxy encapsulated ASCO® Red Hat II™ solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

**DESCRIPTION**

Catalog numbers 8016G/H1 and 8016G/H2 are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2" conduit connection is designed to meet Enclosure Type 1-General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed “EF” is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, Type 7, Explosionproof Class I, Division 1, Groups A, B, C, & D and Type 9,-Dust-Ignitionproof Class II, Division 1, Groups E, F, & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class “H” solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a .0250–28 UNF–2B tapped hole, 0.38 minimum full thread.

**Series 8016G/H solenoids are available in:**

- **Open-Frame Construction**  
The green solenoid may be supplied with 1/4" spade, screw, or DIN terminals (Refer to Figure 4).
- **Panel Mounted Construction**  
These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on *Installation of Panel Mounted Solenoid*).

**Optional Features For Type 1 – General Purpose Construction Only**

- **Junction Box**  
This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4" spade or screw terminals may have a junction box. The junction box provides a 1/2" conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034**  
Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

**OPERATION**

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 2.77 lb (12.32 N) and 0.31 lb (1.38 N) for DC.**

**INSTALLATION**

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

**▲ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.**

**FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY**

**▲ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165 C. On valves used for steam service or when a class “H” solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180 C. See nameplate/retainer for service.**

**NOTE:** These solenoids have an internal non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust-ignitionproof enclosures (Types 7 & 9).

**▲ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600 and 8601 for strainers.**

**Temperature Limitations**

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature.

**NOTE:** For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8016G Solenoids for use on Valves Rated at 6.1, 8.1, 9.1, 10.6, or 11.1 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
6.1, 8.1, 9.1, & 11.1	None, FB, KF, KP, SF, SP, SC, & SD	F	125°F (51.7°C)
6.1, 8.1, 9.1, & 11.1	HB, HT, KB, KH, SS, ST, SU, & ST	H	140°F (60°C)
10.6	None, KF, SF, & SC	F	104°F (40°C)
10.6	HT, KH, SU, & ST	H	104°F (40°C)

†Minimum ambient temperature -40°F (-40°C).

Temperature Limitations for Series 8016H solenoids (Catalog Numbers 8262H & 8263H valves)						
Prefix <sup>①</sup>	Coil Class	Wattage Ratings			Max. Ambient Temperature	
		AC		DC	(°C)	(°F)
		60 Hz	50 Hz			
EF, EV	FT	6.1	8.1	-	52	125
EF, EV	FB	9.1	11.1	-		
	FT	6.1	8.1	-	40 <sup>②</sup>	104 <sup>②</sup>
	FB	9.1	11.1	-		
	HT	-	-	10.6		
	HB	-	-	18.6		
EF, EV	HT	-	-	10.6	60 <sup>③</sup>	140 <sup>③</sup>
EF, EV	HB	-	-	18.6		
	HT	6.1	8.1	-	60 <sup>③</sup>	140 <sup>③</sup>
	HB	9.1	11.1	-		
EF, EV	HT	6.1	8.1	-	60 <sup>③</sup>	140 <sup>③</sup>
EF, EV	HB	9.1	11.1	-		

①=EF, EV data applies to Explosionproof coils only.

②=DC solenoid valves can be operated at maximum ambient temperature of 55°C / 131°F with reduced pressure ratings. See valve I&M for maximum operating pressure differential ratings.

③=Steam service valves have a maximum ambient temperature of 55°C / 131°F.

## Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

## Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

## Additional Wiring Instructions For Optional Features:

### • Open-Frame solenoid with 1/4" spade terminals

For solenoids supplied with screw terminal connections use #12-18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10±2 in-lbs [1,0±1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10-32 machine screw. Torque grounding screw to 15-20 in-lbs [1,7-2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15-20 in-lbs [1,7-2,3 Nm], with a 5/32" hex key wrench.

### • Junction Box

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12-18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

### • DIN Plug Connector Kit No.K236-034

1. The open-frame solenoid is provided with DIN terminals to accommodate the DIN plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

**NOTE:** Connector cover may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5±1 in-lbs [0,6±1,1 Nm].

**NOTE:** Alternating current (AC) and direct current (DC) solenoids are built differently and cannot be converted from one to the other by changing the coil.

## Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid. The 3/4" bonnet construction (Figure 1) must be disassembled for installation and installed with a special wrench adapter.

### Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.

### 3/4" Valve Bonnet Construction

1. Install retainer (convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Then position spring washer over plugnut/core tube sub-assembly.
3. Install plugnut/core tube sub-assembly through retainer in customer panel. Then replace solenoid, nameplate/retainer and red cap.

### 15/16" Valve Bonnet Construction

1. Install solenoid base sub-assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub-assembly then replace.

### Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

## MAINTENANCE

**▲ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.**

### Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

### Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

### Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned-Out Solenoid:** Check for open-circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

### Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

**NOTE:** Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

**NOTE:** For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub-assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub-assembly.
5. Reassemble using exploded views for parts identification and placement

### Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove spring washer from solenoid base sub-assembly.
3. Unscrew solenoid base sub-assembly.

**NOTE:** Some solenoid constructions have a plugnut/core tube sub-assembly, bonnet gasket and bonnet in place of the solenoid base sub-assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No.K218948.

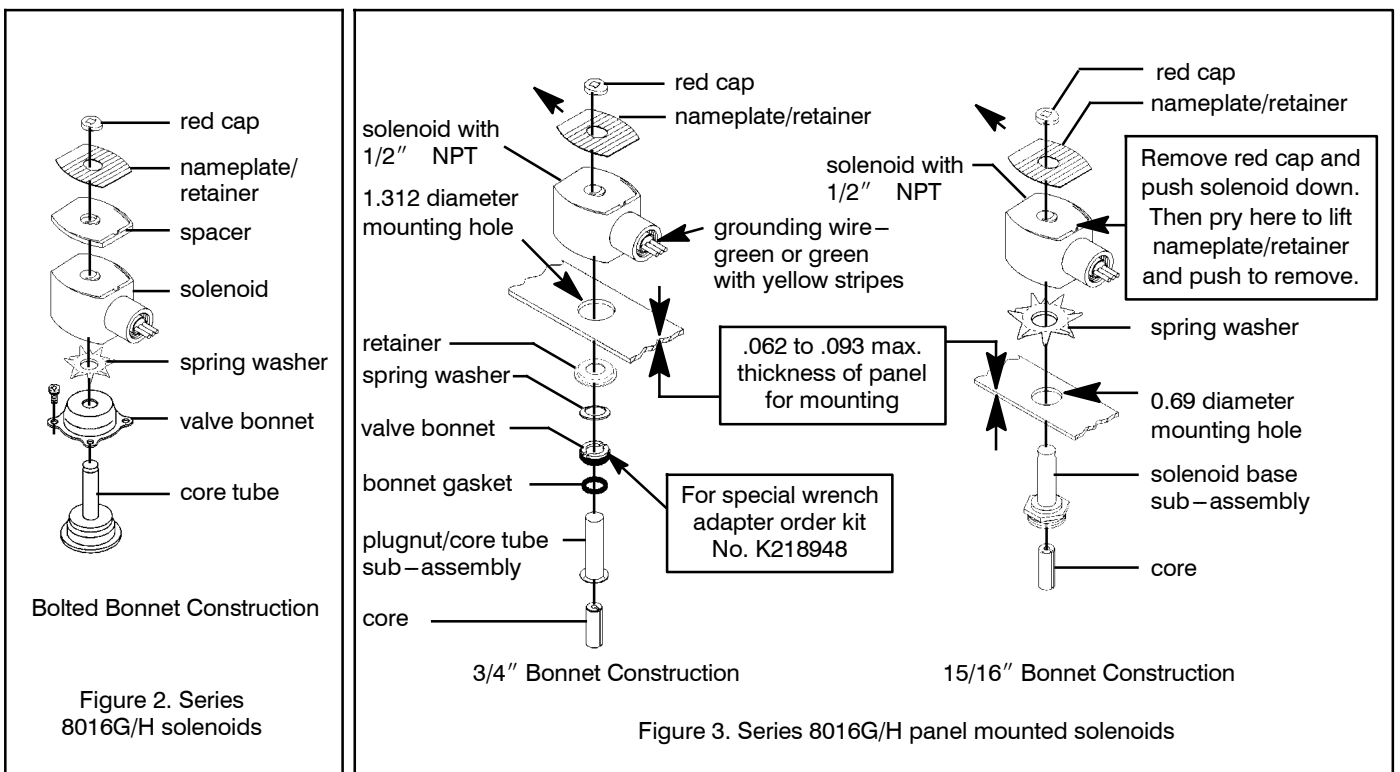
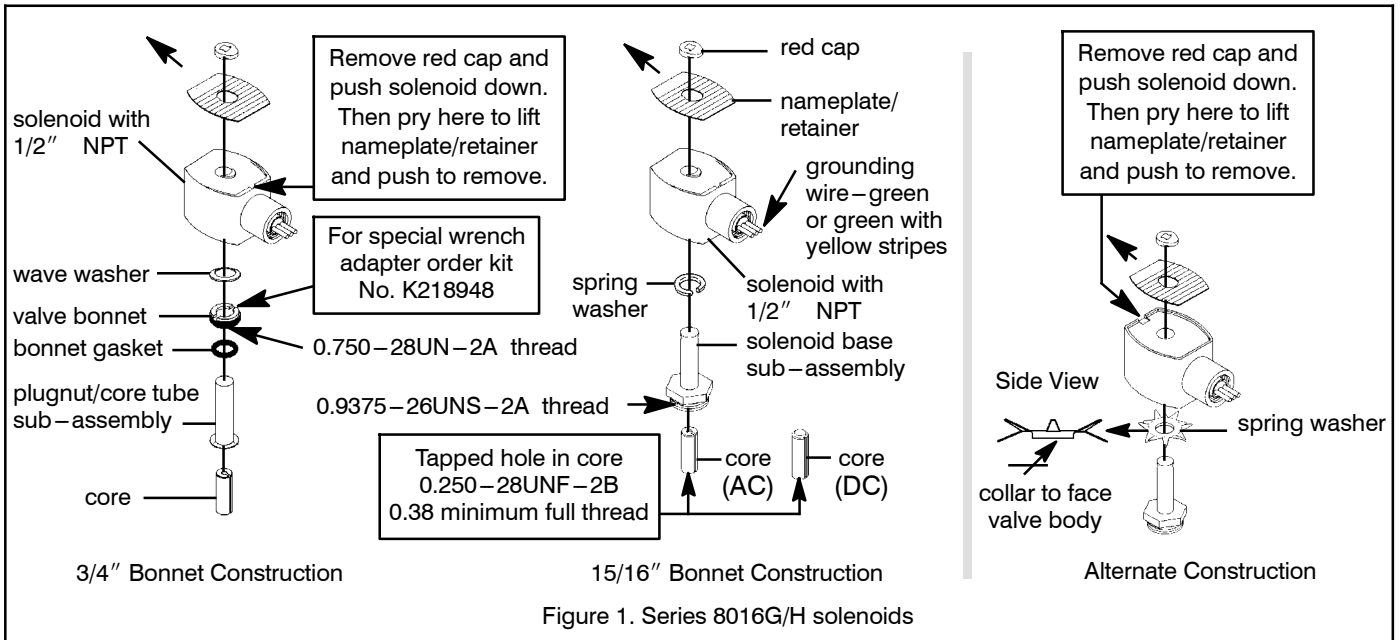
4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

## ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

## Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
valve bonnet (3/4" bonnet construction)	90 ± 10	10,2 ± 1,1
bonnet screw (3/8" or 1/2" NPT pipe size)	25	2,8
bonnet screw (3/4" NPT pipe size)	40	4,5





# Installation & Maintenance Instructions



SERIES  
8016G/H

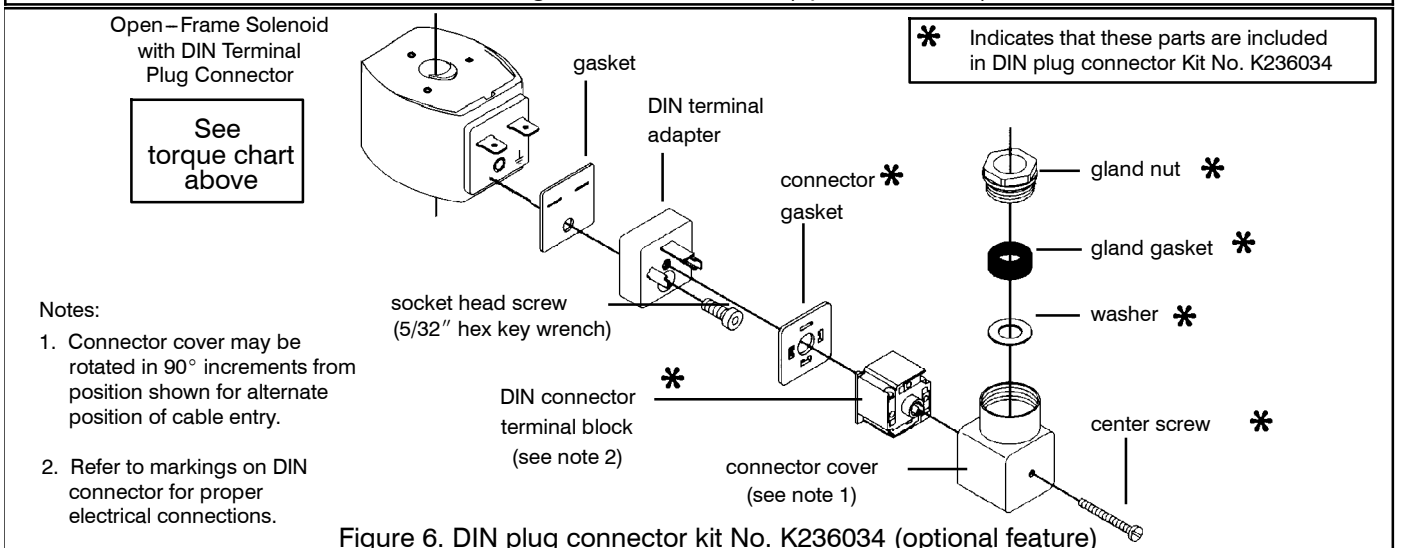
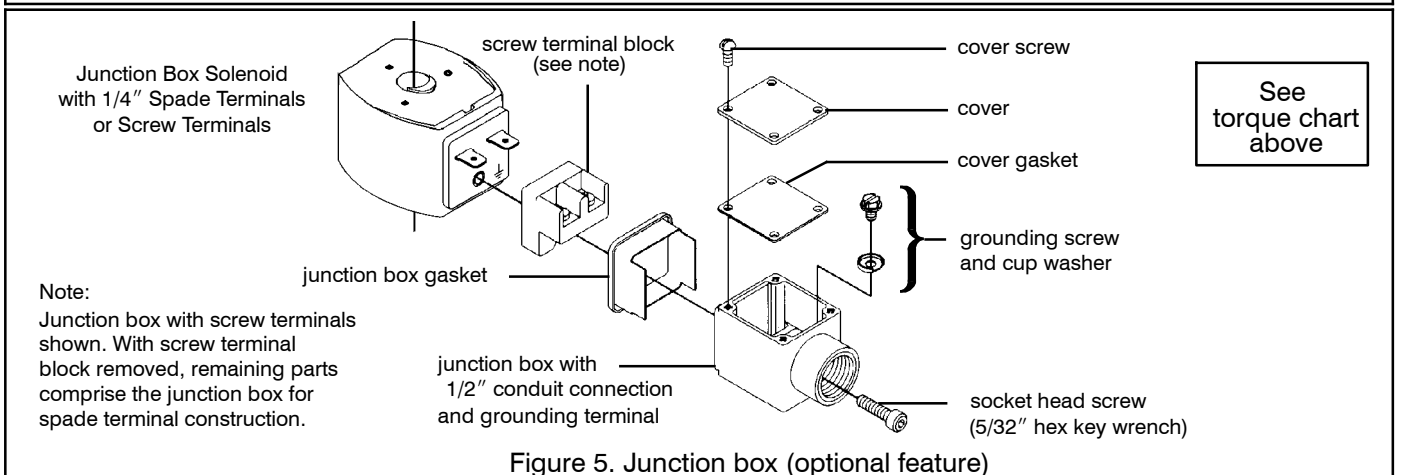
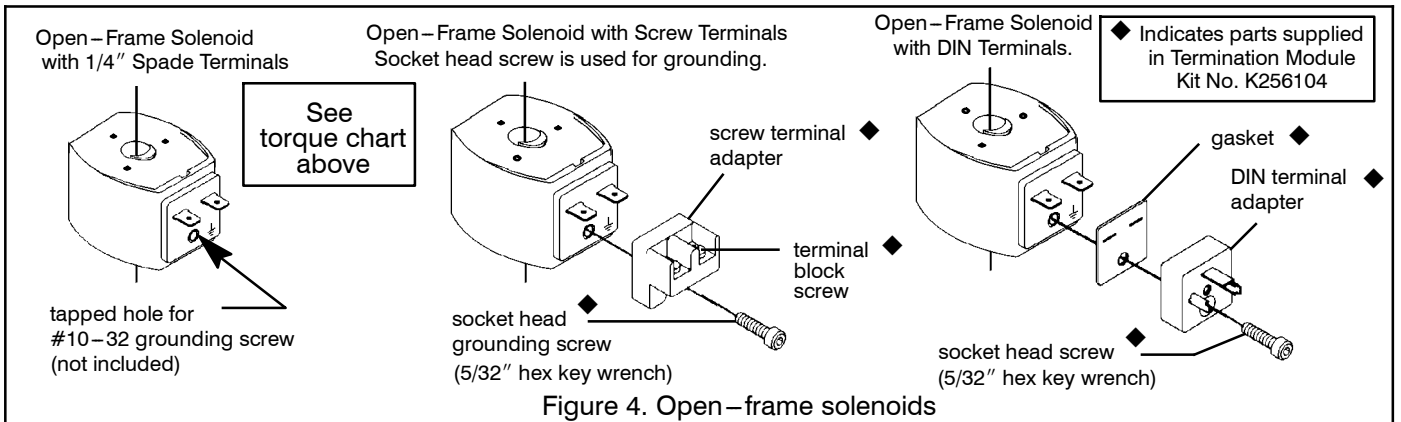
OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

(Section 2 of 2)

NOTICE: See Installation and Maintenance Instructions, I&M No. V6583R10– Section 1 of 2 for detailed instructions.

## Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1



PHYSICAL PROPERTIES OF CARBON DIOXIDE

Chemical Symbol.....CO<sub>2</sub>  
Molecular Weight.....44.01

Normal Boiling Point

Density of Liquid (@ Boiling Point).....63.69 LB/CF  
Density of Saturated Vapor.....3.443 LB/CF

Standard Conditions (70°F. & 14.696 psia)

Density.....0.1146 LB/CF  
Specific Volume.....8.73 CF/LB  
Weight Compared to Air (Air = 1.00).....1.53  
Volume Expansion Liquid to Gas @ 1 Atm.....556

Heat

Latent Heat of Vaporization.....120.1 BTU/LB  
Sensible Heat (Gas to 70°F.).....29.0 BTU/LB  
Total Heat (To 70°F.).....149.1 BTU/LB

Critical Point

Temperature.....+87.8°F.  
Pressure.....1066.3 psia

Triple Point

Temperature.....-69.88  
Pressure.....75.13 psia

Gas in Cylinder

Physical State in Cylinder (@ 70°F.).....Liquid & Gas  
Approximate Maximum Cylinder Pressure (@70°F.).....835 psig  
Typical Purity Cylinder Gas.....99.9+  
Typical Dew Point.....-45°F.

Liquefied Gas

Typical Purity.....99.96%  
Maximum Moisture Content (Liquid).....0.02% by Weight

NOTE: Wherever liquid or liquefied carbon dioxide is mentioned,  
the physical state is taken for liquid CO<sub>2</sub> at 0°F. and  
305.5 psia.

## 1.5 **BACKUP SYSTEM BATTERY**

---



### **BACK-UP SYSTEM BATTERY**

RECHARGEABLE BATTERY LIFE APPROXIMATELY 3 YEARS.

### **BATTERY REPLACEMENT**

Power Sonic PS-6100 F2 (6V,12 Ah/20 HR) OR EQUIVELENT

CAUTION! BATTERY SHOULD BE INSPECTED AND MAINTAINED BY QUALIFIED PERSONNEL ONLY.

	BLACK WITH YELLOW BACKGROUND	LIGHTNING BOLT	CAUTION: RISK OF ELECTRICAL SHOCK
	BLACK WITH YELLOW BACKGROUND	EXCLIMATION POINT	CAUTION: REFER TO ACCOMPANYING DOCUMENTS

## 1.6 **BACKUP SYSTEM PARTS LIST**

---

1. Temperature Control No. UE-E55S-E20BC
2. CO-2 Solenoid Valve No. ASCO-8264G9 6/DC
3. Hose Connection, 6' SMT Bore Teflon Hose #r115-4 w/ 1/8" Male Pipe/SS #Y50304-2-95. Hose Fitting, CGA-320.
4. Rechargeable Battery, No, Power Sonic – PS-6100 F2
5. Battery Float Charger No. CEUVBC6V
6. Selector Switch No. M22-WRK3-K22
7. Plunger Bridge No. M22-XW
8. Alarm Light (red) No. 1090A1