ARRAY

OPERATION & MAINTENANCE MANUAL

API 6A FAIL-SAFE BONNET ASSEMBLY

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INTRODUCTION

Array Fail Safe Bonnet Assemblies are specifically designed to move a gate valve to a fail closed or fail open position using the upstream fluid pressure entering the valve. A non-balanced pressure biased bonnet stem in combination with the mating actuator return spring insures that the gate valve will open or close. The valve will remain in the fail-safe position until operated by an actuator mounted to it. This actuator can be any Array Pneumatic or Hydraulic actuator.

This manual gives the factory required procedures for insuring reliable and safe operation of Array "Fail-Safe" Bonnet Assemblies. Recommended maintenance steps, disassembly/assembly and installation instructions are provided. This manual should be used in conjunction with the Array maintenance and operating manual for the appropriate mating actuator model as well as the gate valve manufacturer's recommended maintenance and operating manuals.

When an Array "Fail-Safe" Bonnet Assembly is used on a Surface Safety Valve (SSV), as the second valve in the wellhead flow stream it is to be considered an integral part of the SSC and be tested in accordance with procedures given in API 6A. SSV's located in federal waters should only be services by technicians that meet qualifications by the U.S. Mineral Management Service.

FAIL SAFE BONNET ASSEMBLY OPERATION

An Array "Fail-Safe" Bonnet Assembly provides the required force to close a fail-closed or open a fail-open gate valve. They are specifically designed to provide stops for full gate valve movement while maintaining valve drift and valve pressure integrity. All Array "Fail-Safe" Bonnet Assemblies incorporate an externally tamperproof drift system.

The main operating elements in Array bonnet assemblies are:

1. Bonnet Stem – this element provides the required thrust to over come gate drag as the gate in a fail-closed valve shuts against differential pressure or open a gate against differential pressure in a fail-open valve.
2. Bonnet/Bonnet Stem packing elements – these provide a positive pressure seal while allowing the bonnet stem to move the valve gate to the open and closed position.
3. Drift Shims – The gate position downstop is precisely controlled by these when the attached actuator is pressurized.
4. Bonnet to Bonnet Stem "Fire Seal" – this provides two functions. The first is to be the gate position upstop. The second function is to provide a metal-to-metal seal to prevent process fluids from reaching the packing elements when the actuator is de-pressurized. This is important should excessive temperatures cause the Polypak Seals elements to fail.

Array Bonnet assemblies also incorporate access ports to verify the integrity of the bonnet elements as well as the functionality of the "Fire Seal".

BONNET SELECTION

Array bonnet assemblies are designed specifically to fit gate valves for most popular sizes and manufacturer's. Any Array actuator for a particular size may be used on any Array bonnet assembly for the same size valve. To select a bonnet for an application or verify that an existing bonnet assembly is suitable for the particular valve size, manufacturer and service that it is being used in, consult the Array "Fail-Safe" Bonnet product bulletin or contact factory.

ORDERNG INFORMATION

The following information should be provided when requesting a quote or issuing a purchase order to Array Products for an Array Bonnet Assembly.

Gate Valve Bore Size:

Rated Working Pressure of Gate Valve:

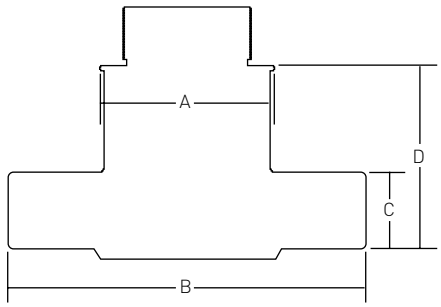
Temperature Rating:

Material Class:

PSL Rating:

Interface Drawing Availability:

BONNET DIMENSIONS AND WEIGHTS



SIZE	PRESS	A		B		C		D		WT.	
		in	mm	in	mm	in	mm	in	mm	lbs	kgs
2 1/16"	2000	3.30	83	6.38	161	1.18	29	4.45	114	17	7
2 9/16"	2000	3.62	91	7.28	184	1.38	35	4.96	125	31	14
3 1/8"	2000	4.00	101	8.50	215	1.35	34	5.13	130	32	14
4 1/16"	2000	4.75	120	11.06	280	1.58	40	5.44	138	58	26
6 1/8"	2000	5.20	132	13.07	331	2.68	68	6.88	174	109	49
7 1/16"	2000	7.59	192	15.53	394	2.95	74	7.41	188	204	92
3 1/8"	3000	4.00	101	9.06	230	2.00	50	5.13	130	42	19
4 1/16"	3000	4.75	120	11.93	303	2.25	57	5.44	138	75	34
5 1/8"	3000	5.20	132	13.07	331	2.68	68	6.88	174	109	49
7 1/16"	3000	7.59	192	15.53	394	2.95	74	7.41	188	204	92
2 1/16"	5000	3.30	83	7.19	182	1.28	32	4.45	113	19	8
2 9/16"	5000	3.62	91	7.83	198	1.77	44	4.96	125	31	14
3 1/8"	5000	4.00	101	9.06	230	2.00	50	5.13	130	42	19
4 1/16"	5000	4.75	120	11.93	303	2.25	57	5.44	138	75	34
5 1/8"	5000	5.20	132	13.07	331	2.68	68	6.88	174	109	49
7 1/16"	5000	7.59	192	15.53	394	2.95	74	7.41	188	204	92
1 13/16"	10000	3.59	91	7.68	195	1.93	49	5.12	129	30	13
2 1/16"	10000	3.90	99	8.65	219	1.93	49	4.87	123	36	16
2 9/16"	10000	4.75	120	9.75	247	2.31	58	5.56	141	54	24
3 1/16"	10000	5.00	127	11.56	293	2.50	63	6.83	173	82	37
4 1/16"	10000	6.00	152	13.00	330	3.80	96	6.94	176	145	65
5 1/8"	10000	9.00	228	15.00	381	5.50	139	8.00	203	190	86
7 1/16"	10000	7.10	180	18.00	457	5.75	146	10.00	254	235	106
1 13/16"	15000	4.00	101	10.00	254	3.00	76	6.00	152	61	27
2 1/16"	15000	4.00	101	10.00	254	3.00	76	6.00	152	58	26
2 9/16"	15000	5.00	127	11.00	279	4.00	101	7.00	177	98	44
3 1/16"	15000	4.38	111	11.38	288	4.50	114	7.65	194	125	56
4 1/16"	15000	6.50	165	13.75	349	5.00	127	8.00	203	160	72

Note: Dimensions and weights provided above only apply to bonnets manufactured for Array gate valves and are provided for reference. Bonnets made for other manufactures' valves will likely have different key dimensions and weights.

Note: Swept volumes represent the maximum actuator stroke.

PARTS LIST

#	DESCRIPTION
1	Stem Nut
2	Bonnet Stem
3	Drift Shims
4	Packing Retainer
5	O-Ring (Inner) (RK)
6	O-Ring (Outer) (RK)
7	Polypak Seals (RK)
8	Bonnet
9	Test Fitting
10	Bonnet Assembly ID Tag (NS)
11	Drive Screw (NS)
12	Drift Spacer (NS)
13	Packing Integrity Fitting (NS)

(NS) = Not Shown

(RK) = Bonnet Repair Kit

MAINTENANCE OF ARRAY FAIL SAFE BONNET ASSEMBLIES

GENERAL REQUIREMENTS

1. Prior to servicing the bonnet assembly, it is recommended that this manual be read in its entirety. Should the service technician have any questions or feel that a certain procedure cannot be performed safely, contact the factory for assistance.
2. For safety precautions and due to the weight and /or size of some bonnet assemblies and the presence of pressurized fluids in the actuator and valve, personnel should be wearing the proper personal safety equipment such as steel toe shoes, hard hats, safety goggles and lifting support belts when servicing a bonnet assembly.
3. When moving a bonnet assembly or any heavy parts, suitable lifting devices such as hoists and a come-a-long should be used. It is recommended that the weights of the equipment being serviced be obtained from the appropriate Array and gate valve manufacturer's technical bulletins to confirm that any lifting equipment to be used is adequate.
4. **DO NOT** attempt to remove any items from the bonnet assembly while there is pressure in the mating valve body. BLEED OFF ALL pressure in the valve before performing any service functions. Failure to do so could result in equipment damage or personnel injury.
5. The work area should be clean and free of contaminants such as dirt, sand, metal shavings, etc.
6. All grease or lubricants must be free of any contaminants. Any utensils such as brushes or applicators must also be free of any foreign particles.
7. All tools used should be clean, in good working order and be the proper tool for the operation to be performed.
8. Keep all elastomers and/or replacement parts in the original storage or shipping packaging until installed.
9. Prior to installing any new or used component, it must be cleaned prior to inspection or installation. A suitable fluid should be used that is compatible with the part being cleaned. Most naptha based solvents are good for heavy de-greasing of metallic parts. A solution of warm soap and water is recommended for all non-metallic pieces or simply wipe with a clean cloth. The use of commercially available aerosol dispensed brake cleaners may be used on metal parts only.
10. All new or used parts must be examined after cleaning for burrs, dings, anomalous marks, cuts, nicks, etc. prior to using them.
11. Lightly lubricate all seals and sealing surfaces with a suitable grease prior to installing them.
12. When handling any parts that have sealing surfaces, care should be taken not to mar those surfaces.
13. **CAUTION:** Failure to follow the procedures given in this manual may result in equipment damage, operating problems and/or personal injury.

REMOVAL DISASSEMBLY "FAIL-SAFE" BONNET ASSEMBLIES FOR SERVICING

Note: It is recommended that the bonnet assembly be removed from the gate valve to replace the **(Polypak Seals # 7)**. Should removal of the bonnet assembly not be practical in certain applications consult the factory for repair options.

1. Remove any actuators mounted to the bonnet assembly per procedures given in the appropriate actuator maintenance manual. Note: The actuator Bonnet Ring does not have to be removed.
2. Slide the **(Drift Shims #3)** and any **(Drift Spacers # 12)** off of the **(Bonnet Stem #2)**.
3. Loosen and remove the nuts that attach the **(Bonnet #8)** to the gate valve body. It may be necessary on certain bonnet assemblies to remove the **(Test Fitting #9)** from the Bonnet in order to perform this step.
4. Using proper support and lifting equipment, pull the Bonnet from the valve body. If the Bonnet Stem with the attached gate moves with the Bonnet, try to keep the gate in the valve body by pushing the Bonnet Stem toward the valve while removing the Bonnet.
5. Thread the Actuator stem nut completely onto the Bonnet Stem and grasp it to pull the bonnet stem/valve gate from the valve body. **Note:** It is not necessary to remove the Bonnet Stem and attached gate from the valve if seal replacement is all that is being performed. This step and Step 6 may be omitted.
6. Refer to the appropriate manufacturer's operation manual for procedure to remove the gate from the bonnet stem. For an Array gate valve see **"ARRAY BONNET TO GATE VALVE ASSEMBLY"** procedures on page 13 of this operation manual.
7. Rotate the **(Packing Retainer #4)** in a counterclockwise direction to unthread and remove it using a suitable wrench.
8. Using a packing pick, remove the **(Polypak Seals #7)** from the seal bore in the Bonnet.
9. Remove the **(Inner O-Rings #5)** and **(Outer O-rings #6)** from the Packing Retainer.

ASSEMBLY OF "FAIL-SAFE" BONNET ASSEMBLIES FOR SERVICING

1. Examine the **(Packing Retainer #4)**. Verify that bore/threads are clean and in good condition and o-ring grooves are clean and in good condition.
2. Thoroughly clean the **(Packing Retainer #4)**, removing all foreign debris from the threads and o-ring grooves.
3. Install **(Inner O-Ring #5)** and **(Outer O-Ring #6)** to **(Packing Retainer #4)**.
4. Thoroughly lubricate the entire part with assembly lubricant then set aside.
5. Examine the **(Bonnet #8)**. Verify that bore/threads and backseat area clean and in good condition.
6. Thoroughly clean the bonnet bore and O.D. threads and lightly lubricate packing box with assembly lubricant.
7. Install the **(Polypak Seals #7)** in the bonnet packing box with the packing o-ring energizer facing down. Push the packing rings down to a positive stop.
8. Pick up the **(Polypak Seals #7)** and carefully thread the retainer into the Bonnet with clockwise rotation to a positive stop. Tighten retainer securely with a pipe wrench. Note: Remove any metal shavings or bits of residue from wrench operation.
9. Install a **(Test Fitting #9)** in the tapped hole in the Bonnet neck and tighten fitting securely. Use pipe tape or liquid Teflon®.
10. Examine the **(Bonnet Stem #2)**. Verify that threads are clean and in good condition, seal surface and backseat surface is clean and free of nicks, dings, burrs or scratches.
11. Lightly lubricate the entire seal surface of the stem with assembly lubricant.
12. Pick up the Bonnet and place it on its side.
13. Push the Stem through the Bonnet Bore and packing set, from the flange side of the Bonnet until the Stem backseats. **CAUTION:** Be careful not to nick I.D. sealing surface of packing by nose of bonnet stem. Note: The design of the Stem/Gate connection will vary depending on size, working pressure and manufacturer. Wipe off excess grease.

CAUTION: It is imperative that when assembling the Bonnet, the assembly area be clean and free of all debris.

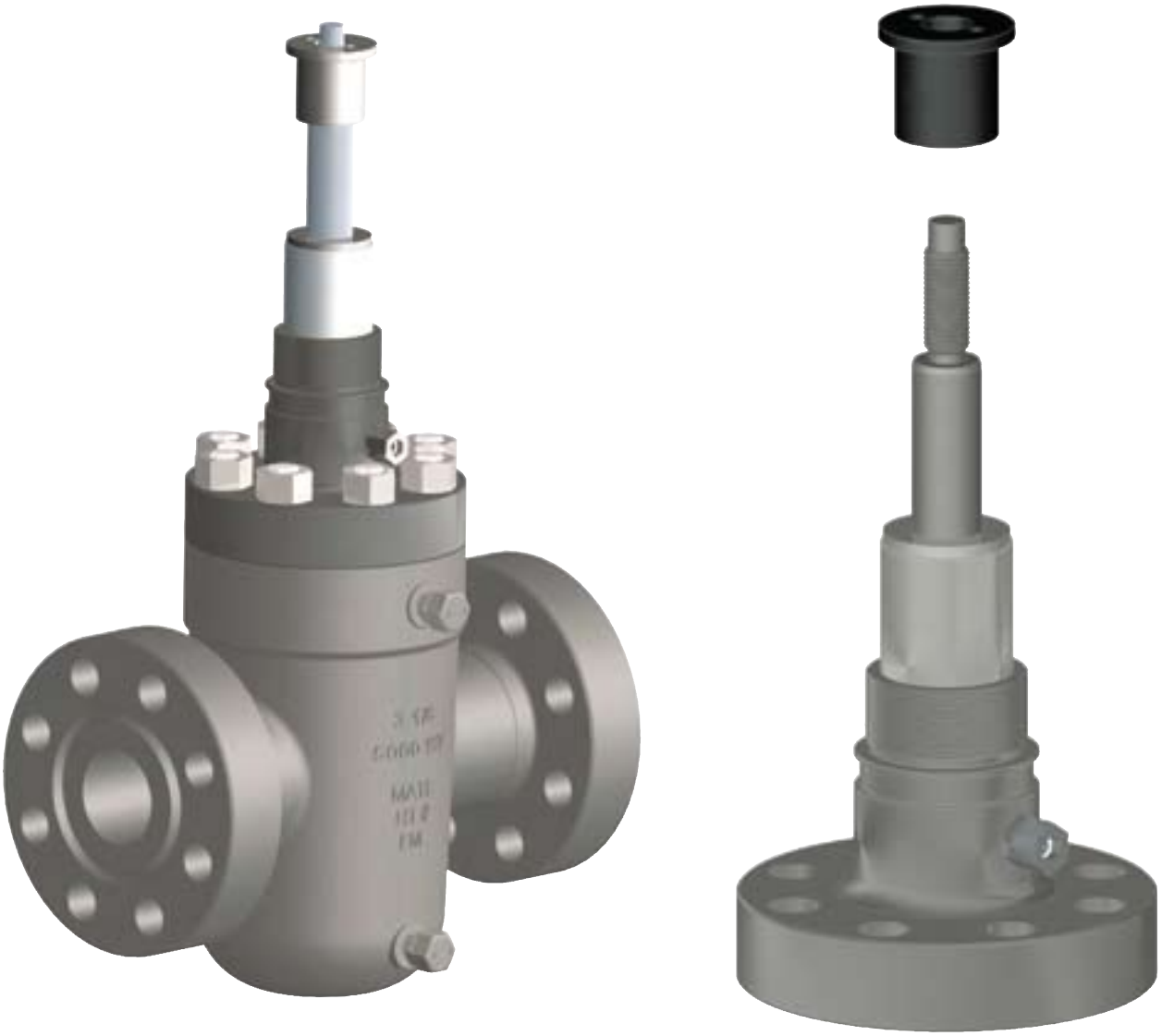
INSTALLATION OF NEW "FAIL-SAFE" BONNET ASSEMBLIES

Note: All new Array bonnet assemblies are shipped ready for installation on a valve. On occasion an actuator assembly may already be installed. This procedure is written as if the actuator is attached to the new bonnet assembly.

1. Verify that the valve does not have any features such as stem balancing components, internal gate stops or adjustments for gate travel.
2. Check to be sure that the correct valve body to **(Bonnet #8)** sealing rings or gaskets is on the valve and in excellent condition.
3. Prepare the valve body per the valve manufacturers recommendations.
4. Remove any shipping plugs or protective coverings from the actuator and bonnet assemblies.
5. If the attached actuator has shipped with a Lock Open Cap, M.H.O.D. or H.S.L.O.D. installed on the actuator accessory threads, apply sufficient control pressure to the actuator and remove any of these items. Caution: Verify that the **(Bonnet Stem #2)** is not moving toward the Bonnet as the accessory device is being removed. Apply additional control pressure to the actuator if it does.
6. Bleed off any actuator control pressure to allow the actuator to fully stroke.
7. Follow procedures given in the actuator maintenance and operating manual to remove the actuator and ancillary parts such as the Spring, Spring Retainer and Stem Nut. Do not remove the actuator Bonnet Ring.
8. Remove one half of the number of **(Drift Shims #3)** that are installed on the bonnet assembly. **DO NOT** remove any **(Drift Spacers #12)**
9. Thread the actuator **(Stem Nut # 1)** completely onto the **(Bonnet Stem #2)**. **DO NOT** grasp any sealing surface on the Bonnet Stem with wrenches at any time.
10. Push on the Stem Nut until it contacts the Drift Shims.
11. The lower part of the Bonnet Stem should new be accessible to attach the gate. Follow the procedures given in the correct bonnet assembly technical bulletin.
12. Position the bonnet assembly with the attached gate over the valve body and begin installing it over the valve body studs. Follow the valve manufacturer's recommended steps for installing the gate into the valve body while the bonnet assembly is being mated with the valve body. Note: It is recommended that the **(Test Fitting #9)** be orientated in the same position as any valve body grease fittings.
13. Thread the nuts over the valve body studs and torque per the valve manufacturers recommendations. It may be necessary on certain bonnet assemblies to remove the **(Test Fitting #9)** from the Bonnet in order to perform this step.
14. If required, install the **(Packing Integrity Fitting #13)** and **(Test Fitting #9)**. Wrap the threads of each with one and half turns of Teflon tape in a clockwise position and tighten.
15. The valve/bonnet assembly is now ready to be drifted per instructions given below.

SETTING THE GATE VALVE DRIFT

1. Setting the drift can only be accomplished after the bonnet assembly has been installed on the gate valve. All studs and bolts have been torqued with all stem to gate connections completed.
2. With the gate valve in the vertical position, place four **(Drift Shims #3)** on top of the packing retainer.
3. Thread the **(Stem Nut #1)** onto the bonnet stem to a dead stop.
4. Using both hands, push down on the stem nut to bottom out on top of the shims.
5. Check the drift alignment by running the appropriate size drift tool through the bore. If the gate is not aligned with the valve bore, pull up on the stem to the fully closed position and remove the down stop and add or subtract shims as required to properly align the gate with the gate valve bore. (See Illustration)
6. The stroke length is now set permanent.



ADD SHIMS

REMOVE SHIMS

ARRAY BONNET TO GATE VALVE ASSEMBLY

The Array Products Bonnet Assembly when installed on an unbalanced valve is the interface between the Actuator and the gate valve. The Bonnet will provide leak free sealing. Before adapting the actuator, the bonnet stem should be stroked freely by hand in both directions. When the valve is pressured in the full closed position the stem will be urged outward because of the valve pressure acting on the bonnet stem diameter.

The Array Products bonnet is used as an up and down stop for the valve. This design prevents damage to the valve bonnet stem in the event of accidental over pressuring of the actuator. The bonnet provides positive stroke reliability by use of spacers (provided with the actuator). Once proper stroke has been set, a constant stroke distance will be maintained though the normal service life. All Array bonnet assemblies are shipped ready for installation on the valve. For Array Actuator to Bonnet and Gate Valve Assembly, see corresponding Actuator Maintenance Manual.

Warning: If you are installing a pre assembled Fail safe bonnet and Actuator assembly to a gate valve some precautions need to be taken to prevent damage to the assembly. While installing the gate to the bonnet stem the stem must not be back seated. Apply sufficient control pressure to the actuator to unseat the fire seal. This will prevent damage to the fire seal in the event the stem is rotated during installation of the gate. If the stem must be rotated to align the gate to the gate valve, it can only be rotated in the clockwise direction. If the stem is rotated in the counterclockwise direction it may unscrew from the down-stop. This will affect the drift setting of the valve and could cause damage to the actuator and the valve assembly. The stem will not rotate in the clockwise direction with full actuator control pressure applied. You must only apply enough control pressure to allow access to the gate to stem connection.

WARNING: During installation pay special attention to removal of any devices on the valve such as stem balancing components, internal gate down stop devices and any adjustments to gate travel.

PROCEDURE

1. Push the **(Bonnet Stem #2)** down out of the **(Bonnet #8)** until the stem end for gate adaptation is exposed.
2. Thread the gate onto the exposed portion of the stem in a closing direction. Position gate as required by valve manufacturer's installation procedure.
3. Rotate the gate slightly in either direction to align the slot in the stem with the mating hole in the gate lift nut. Drive the pin (supplied by the valve) through the gate pin hole in the stem slot.
4. Install new bonnet seal ring (supplied with the valve) in the valve body and then carefully lower the gate into the valve body, between the seats and allow the bonnet to pass over the valve body stud.
5. Install the valve body nuts on the studs and make up connection as required by valve manufacturer.
6. The **(Bonnet Stem #2)** should slide easily upwards by pulling the gate up to the fully closed position with your hands. The **(Stem Nut #1)** can be threaded onto the stem for better leverage. Do not use any other device or tool to lift the **(Bonnet Stem #2)** to the fully closed position other than previously mentioned.

FIELD REMOVAL AND REPLACEMENT OF BONNET SEAL PACKING

For removal of the actuator, refer to corresponding steps in the appropriate Actuator Maintenance Manual.

10. Remove **(Packing Retainer #4)**, rotate in a counterclockwise direction, using a pipe wrench. Caution: Be careful not to nick the sealing surface O.D. of the **(Bonnet Stem #2)** with the removal of the **(Packing Retainer #4)**. **Caution:** A hissing noise may be evident indicating trapped pressure and well condensate. Be very careful with eye and hand protection. Remove packing retainer, lift off bonnet stem and set aside. **Caution:** Check for H2S ppm well content. Be prepared to wear proper protection if well content is above safe levels.
11. Remove **(Polypak Seals #7)**, 3 rings. Use o-ring pick to remove rings out of bore.
12. Clean packing bore and grease generously. Install **(Polypak Seals #7)** with o-ring energizer facing down toward gate valve. Do not use pointed or sharp objects to push packing down into bore. Completely set all three pieces of packing.
13. Re-install (**Packing Retainer #4)**. Tighten firmly.
14. Install same number of **(Drift Shims #3)** onto packing retainer.
15. Install the spring onto the Bonnet Ring at the free length position.

For installation of the actuator, refer to corresponding steps in the appropriate Actuator Maintenance Manual.

SERVICING

1. Prior to servicing the actuator assembly, it is recommended that this manual be read in its entirety. Should the service technician have any questions or feel that a certain procedure cannot be performed safely, contact the factory for assistance.
2. For safety precautions and due to the weight and/or size of some actuator assemblies and the presence of pressurized fluids in the actuator and valve, personnel should be wearing the proper safety equipment such as steel toe shoes, hard hats, safety goggles and lifting support belts.
3. When moving a bonnet assembly suitable lifting devices should be used.
4. **DO NOT** attempt to remove any items from the actuator assembly when it is pressurized. BLEED OFF ALL control pressure and disconnect the supply lines before performing any service functions. Failure to do so could result in equipment damage or personal injury.
5. The work area should be clean and free of contaminants. Any utensils such as brushes or applicators must also be free of any foreign particles.
6. All grease or lubricants must be free of any contaminants and all tools used should be clean.
7. Keep all elastomers and/or replacement pats in the original storage or shipping package until installed.
8. Prior to installing any new or used component, it must be cleaned prior to inspection or installation. A suitable fluid should be used that is compatible with the part being cleaned. Most naptha based solvents are good for heavy de-greasing of metallic parts. A solution of warm soap and water is recommended for all non-metallic pieces or simply wipe with a clean cloth. The used of commercially available aerosol brake cleaners may be used on metal parts only.
9. All new or used part must be examined after cleaning for burrs, dings, anomalous marks, cuts etc.
10. Lightly lubricate all seals and sealing surfaces with a suitable grease prior to installation.
11. When handling parts that have sealing surfaces, care should be taken not to mar those surfaces.
13. **Caution:** failure to follow the procedures given in this manual may result in equipment damage, operating problems and/or personal injury.

PERIODIC MAINTENANCE

The following maintenance schedule is recommended to insure safe and reliable operation of the Fail-Safe Bonnet Assembly.

	MAINTENANCE OPERATION	INTERVAL
1.	Cycle with actuator	Monthly
2.	Replace expendable items as designated in the Bill of Materials as repair kit items	Every three (3) years or when leakage occurs
3.	Inspect for fluid leakage from ports and flanged connections	Once a year

TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Mating actuator does not move on a valve whether the actuator is pressurized or not.	Bonnet stem binding	Remove actuator assembly and disassemble bonnet assembly sufficiently enough to examine the Packing Retainer (#2) ID and the sealing surfaces on the Bonnet Stem (#8) for damage. Replace parts as required
	Mechanical damage between gate and seats causing binding or excessive friction	Remove actuator and bonnet assembly. Follow procedures in valve manual for corrective action
	Debris in valve body cavity or in valve bore	Remove actuator and bonnet assembly. Follow procedures in valve manual for corrective action.
	Actuator malfunction	Consult actuator manual for corrective action.
Mating actuator does not move on a fail-closed valve or fully stroke a fail-open valve with no control pressure on the actuator and the valve pressurized	Actuator malfunction	Consult actuator manual for corrective action.
Mating actuator will not stroke to full "Fail Safe Position" with no control pressure on the actuator without pressure in the valve.	Damaged or improperly installed Polypak Seals	Remove actuator. Replace Polypak Seals per procedures in this manual
	Galling between valve gate and seats	Remove actuator and bonnet assemblies. Follow procedures in gate valve manual for repairs.
	Bonnet Stem Binding	Remove actuator assembly and disassemble bonnet assembly sufficiently enough to examine the Packing Retainer (#2) ID and the sealing surfaces on the Bonnet Stem for damage. Replace parts as required.
	Actuator malfunction	Consult actuator manual for corrective action.

TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Valve will not drift after bonnet assembly installed on valve with or without mating actuator installed.	Wrong # of Drift Shims installed	Remove actuator assembly (if required) and re-drift the bonnet assembly per procedures in this manual.
	Improper gate to stem attachment	Remove actuator assembly if required and bonnet assembly from valve. Verify required gate/bonnet stem engagement dimension as given on the bonnet assembly technical bulletin.
	Actuator malfunction	Consult actuator manual for corrective action.
Fluid leakage from Packing Integrity Fitting	Polypak Seals worn or damaged	Remove actuator (if required) and replace packing per procedures in this manual. Verify that the packing material is correct for the application.
	Bonnet stem scoured or damaged	Remove actuator assembly (if required). Disassemble bonnet assembly sufficiently enough to examine the Bonnet Stem sealing surfaces. Replace Bonnet Stem if damaged.
	Excessive corrosion in sealing bore of Bonnet	Remove actuator assembly (if required). Remove and disassemble bonnet assembly.
Fluid leakage from weep hole in Test Fitting	Fitting not closed	Insert hex wrench into top of fitting and rotate clockwise to close.
Fluid leakage past backseat	Debris on face of backseat	Stroke actuator with partial pressure in valve to flush debris from back seat area
	Damage to backseat surface on stem or bonnet	Disassemble bonnet assembly sufficiently enough to examine the Bonnet Stem sealing surfaces. Repair or replace bonnet stem or bonnet if damaged.
	Pressure in actuator	Ensure that 0 psi of control pressure is present in the actuator.

BONNET SPECIFICATIONS

Bonnets Available for Valve Brands:	Any Manufacturer (with current interface drawing)
Size Range Available:	API 6A $1^{13}/_{16}$" through $7^{1}/16$"
Pressure Ranges Available:	See Control Pressure Chart
API Material Classes Available:	AA, BB, CC (Non-Nace)
	DD-0, 5 / DD-1, 5/DD-NL
	EE-0, 5 / EE-1, 5/EE-NL
	FF-0, 5 / FF-1, 5/FF-NL
	HH-NL
API Product Specification Levels Available:	PSL-1/PSL-2
API Temperature Ratings Available:	L through X

LIMITED PRODUCT WARRANTY

The following warranty is exclusive and in lieu of all other warranties. Whether express, implied or statutory, including, but not by way of limitation, any warranty of merchantability or fitness for any particular purpose.

Array Products warrants to each original buyer of products manufactured by Array that such products are free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment provided that no warranty is made with respect to: Any product which has been repaired or altered in such a way in ARRAY's judgment, as to affect the product adversely; Any product which has, in ARRAY's judgment, been subject to negligence, accident or improper storage; Any product which has not been operated or maintained in accordance with normal practice and in conformity with recommendations and public specification of Array.

ARRAY's obligation under this Warranty is limited to use reasonable efforts to repair, replace or, at it's option, refunding the purchase price. The cost of labor for installing a repair or replacement product shall be borne by Purchaser. Replacement parts provided under the terms of this Warranty are warranted for the remainder of the warranty period of the products upon which they are installed to the same extent as if such parts were original components thereof. Warranty services provided there under do not assume any liability for damages caused by any delays involving warranty service. For complete specification information, prices and name, address and telephone number of the ARRAY representative nearest you, call or write to us at the address below.

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