

<b>Document: BMFG901 (ex)</b> Multimode Tumblebox Operations Guide	Rev -
<b>Purpose:</b> The purpose of this document is to provide set up procedures and troubleshooting guidance for the Multimode Tumblebox.	
<b>Scope:</b> Applies to Multimode Tumblebox Operators	

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## 1. Setting up the Multimode Tumblebox

**IMPORTANT: Do not put water into the unit until it is pressurized with the air turn ball valve handle location #9 (ref: figure 2) to close before starting.**

- Attach the HP hose from the pump to location #2 (ref: figure 1). **DO NOT TURN THE WATER ON.**
- Attach HP hose from location #1 (ref: figure 1) to the back of the Aqua Gun.
- Attach the larger air line from the bottom of the air motor to location #3 (ref: figure 1).
- Attach the smaller air line from the unused fitting on the second trigger of the gun to location #4 (ref: figure 1).
- Attach the inlet air line from the compressor to location #7 (ref: figure 2).
- Ensure ISO 32 hydraulic fluid is in the oiler location #13 (ref: figure 2).
- Fill through opening location #15 (ref: figure 2). Tighten the cap securely when finished.
- Use sight glass location #14 (ref: figure 2). - **DO NOT OVERFILL.**
- Verify the air inlet line from the compressor to location #7 (ref: figure 2) is now pressurized.
- Move the ball valve handle location #9 (ref: figure 2) to the straight position as shown. This will open the ball valve and pressurize the unit.
- Set the gauge location #10 (ref: figure 2) on the regulator to 100-110lbs of air pressure. Change the regulator pressure by pulling up on location #12 (ref: figure 2) and turning it clockwise to increase and counter clockwise to decrease the pressure. The greater the air pressure, the better the valves work. **DO NOT EXCEED 120 LBS OF AIR PRESSURE.**
- Open the valve from the pump to the tumblebox increasing the water pressure. At 100lbs of air pressure and 15,000lbs of water pressure, the dump valve should begin working and water should begin coming out of the dump drain location #5 (ref: figure 1).
- \*Allow the box to dump for 1-2 minutes to allow the air bubbles to pass through the primary system.
- \*Start the Aqua Gun, rotating and squeezing the second trigger until it closes. This will send an air signal to the box to stop dumping water and to now pressurize the gun. During this step, the operator must slightly open the bleed plug location #6 (ref: figure 1) and bleed off some water to allow any trapped air in the system to be removed. When the gun becomes pressurized, close the bleed plug location #6 (ref: figure 1). The unit is now ready to operate. **NOTE: Always bleed the lines when setting up to blast as excess air will either prevent the valve from working or cause poor performance during operation.**

\*If the gun does not pressurize after a few seconds, repeat the last two steps of this set up procedure. (Allow the water enough time to travel from the box to the gun before retrying)

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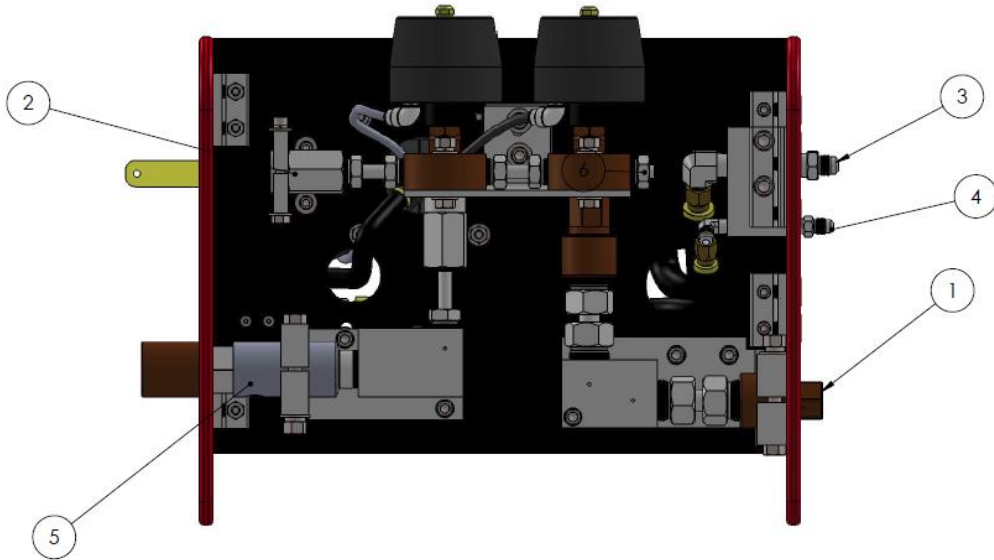


Figure 1: 408800A-1 Multimode Tumblebox, Front View

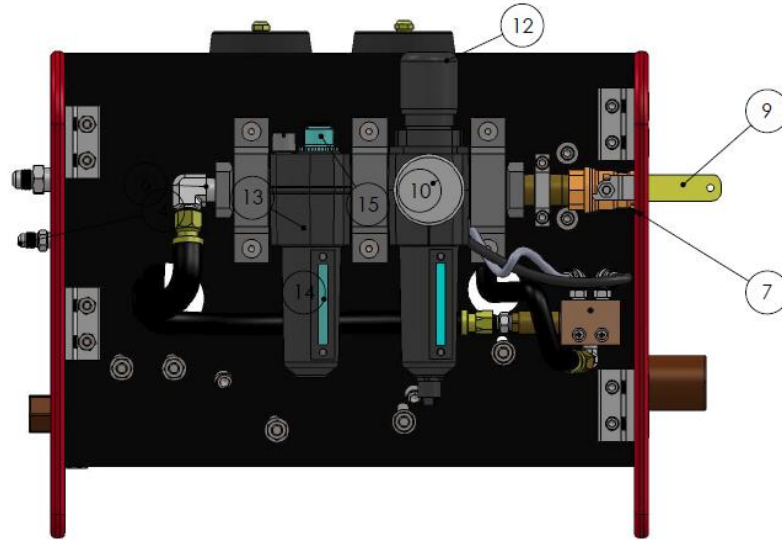


Figure 2: 408800A-2 Multimode Tumblebox, Rear View

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## 2. Troubleshooting the Tumblebox

### 2.1 Troubleshooting Steps

#### **Water will not dump when the gun is shut off**

- Verify the system is pressurized with air. Use at least 100lbs of inlet air pressure. The box may operate at less pressure, however the box was designed to run at between 100-110lbs of inlet air pressure.
- Verify the handle in location #9 (ref: figure 2) is turned on to open the valve.
- Verify high-pressure water is being sent to the box from the pump. The dump side typically opens at around 15,000 PSI.

***If the valve still will not dump – continue with the following steps.***

#### **IMPORTANT: DO NOT USE HP WATER FOR THESE STEPS**

- Test and verify the pilot valve is operating correctly. Turn off the air pressure to the box and bleed off excess air pressure. Turn off the high-pressure water to the box and bleed off any excess pressure.
- Remove the hose from location #6 in drawing 408072 (ref: figure 5) – remove either at the pilot valve or at the black canister on the dump side of the tumblebox.
- Turn the air back on and verify the ball valve handle is opened and the unit is properly pressurized to 100lbs. Air should be coming from the hose that you removed from the canister or the fitting it came out of on the pilot valve. This is the dump air that opens the valve.

#### **The pilot valve will not blow air**

- Replace the hose back into the fitting it was removed from.
- Test the pilot valve to verify the pilot valve is operating correctly. Turn off the air pressure to the box and bleed off excess air pressure. Turn off the high-pressure water to the box and bleed off any excess pressure.
- Remove the hose from location #3 (ref: figure 1) either at the pilot valve fitting or at the black canister.
- Turn the air back on and verify the ball valve handle is opened and the unit is properly pressurized to 100lbs. Air should be coming from the hose that you removed from the canister or the fitting it came out of on the pilot valve. This is the dump air that opens the valve.
- If air comes out of this hose or fitting, switch hoses either from one black canister to the other, or one fitting on the pilot valve to the other. The hose that is on when the air to the box is turned on is the dump hose – it should be routed to the dump canister.

***If the pilot valve still will not blow air – continue with the following steps.***

- Turn off all air to the box, bleed off any excess, and air close the ball valve location #9 (ref: figure 2).
- Replace all hoses per drawing 408072 (ref: figure 5).

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- Remove the hose at location #4 (*ref: figure 1*) of the pilot valve.
- Turn on the compressor and open the ball valve handle location #9 (*ref: figure 2*) allowing air into the regulator. Air should stream out of the removed hose.
  
- ❖ If air does not come out of the removed hose:
  - Air is not on. Fix: Turn on the air
  - Ball valve is closed or broken. Fix: Replace or open the ball valve
  - Regulator is broken. Fix: Replace the regulator
  
- ❖ If air comes out of the hose location #4 (*ref: figure 1*) but NOT out of the pilot valve lines at locations #3 or #6 (*ref: figure 1*) during troubleshooting, the pilot valve assembly is either defective or worn out and must be replaced.

The most common cause associated with the dump valve not opening is a worn or defective pilot valve, no air going to the valve canisters, the air pressure is too low, or the ball valve is closed.

**Air comes out of the pilot valve at fitting #6 when air is applied to the system, but the valve will not dump water**

- Re-pressurize the air by turning on the compressor and opening the ball valve location #9 (*ref: figure 2*) and pressurizing the air to 100-110 psi. Increase the air pressure to 120 PSI for test purposes if possible.
- Verify the dump drain location #5 (*ref: figure 1*) is clear.
- Turn the high-pressure water on and raise the pressure slowly. The valve should open at around 15,000 PSI and begin dumping water. By raising the air pressure, the valve should open at a lower pressure. By 25,000 to 30,000 the valve should be open and dumping water without issue. If the valve is not open, there may be an issue in the black canister of the valve.

The mechanical loads on the valves are set at the factory and typically never require reset during the life of the valve. Only after several hundred hours of use will the canister require cleaning and rebuild.

The typical problems with the valve opening are not enough air pressure, or not enough water pressure.

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**2.2 Troubleshooting Chart**

The compressor for this application must produce the following (minimum):

- 100 PSI (6.89 bar)
- Air Flow 75SCFM per minute

All air hoses from the compressor to the air guns must be kept as short as possible to avoid air loss in the air lines

Fault Finding:	Cause:
Not enough air pressure (minimum 100 PSI 6.89 bar)	Air hose to tumblebox must be 3/4" inside diameter minimum size
	Air hose is leaking
	Air hoses loose or burst
	Air coupling is loose
Tumblebox 1/2" turn gate valve is not fully open and is restricting air flow	Air fittings are leaking
	Oil feed (1 drip every 2 minutes)
	Air gauge should read 100 PSI (6.89 bar)
	Small brass pilot valve should give a burst of air when both gun triggers are pulled. If it doesn't give a burst of air, replace the brass pilot valve)
	Brass pilot valve faulty
Gun is not rotating	Valve plunger inside the dump valve is faulty (large mushroom valve above the dump side)
	Air fittings are leaking
	Burst or loose hoses
	Drive belt is worn or loose (replace or adjust)
	Shaft bearings failed (replace)
	Gun air motor is faulty (replace or repair the air motor)
	Double air triggers are not passing air to make the head rotate (Repair the triggers)
Pilot air valve coming from the gun air motor does not maintain 40 PSI	

**2.3 Valve Canister Reset Procedure**

**IMPORTANT: VERIFY THERE IS NO UHP WATER IN THE SYSTEM BEFORE PERFORMING THE VALVE CANISTER RESET PROCEDURE**

- Turn off the air to the Tumblebox. (Ball valve handle closed)
- Remove the black canister that needs to be reset.
- Reinstall the black canister by threading it down onto the valve body.
- At a specific point, resistance will be felt from the firing pin in the canister touching the top of the poppet. Stop at this point.
- Turn the air to the Tumblebox back on.
- Tighten the canister 2 more wrench flats (1/3 of a full rotation)

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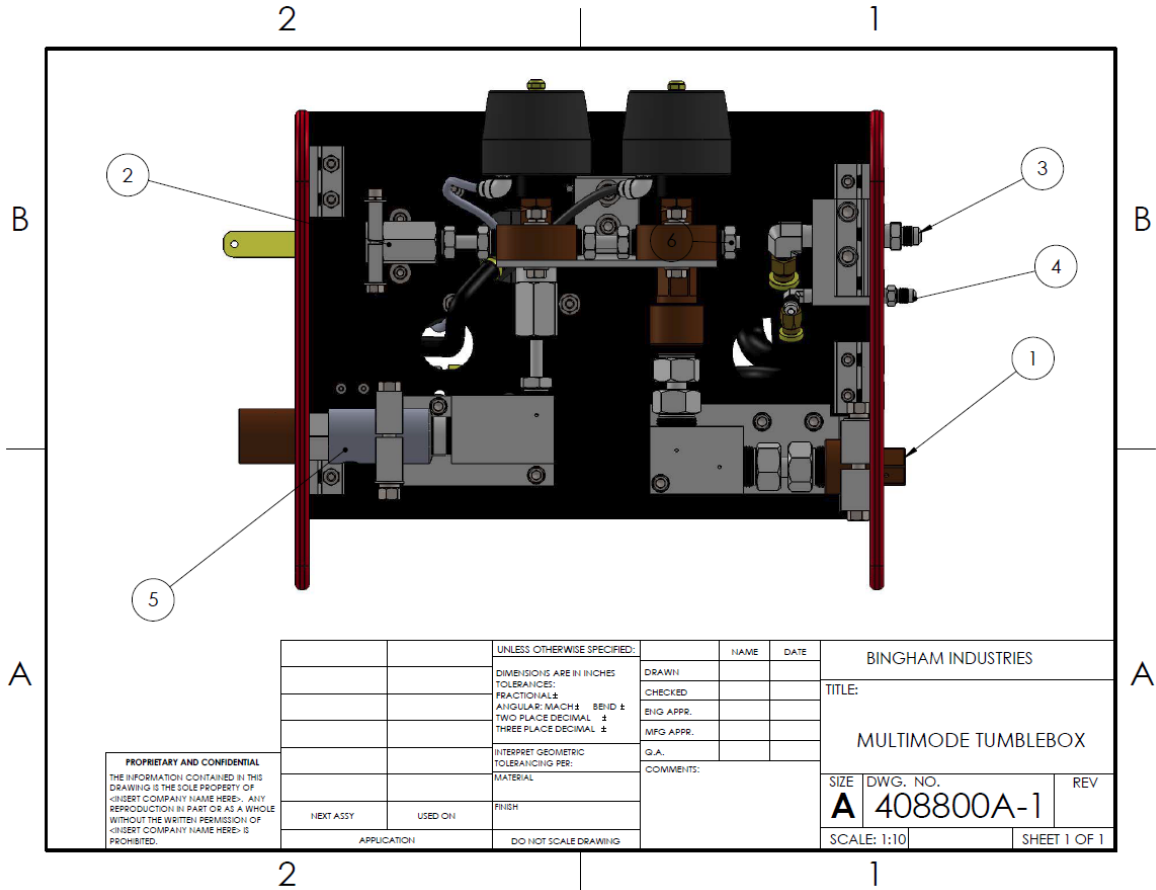
The proper area for valve activation is based on reload. As the firing pin wears, it may be necessary to tighten the valve canister based on the wear pattern. Always use this procedure when the valve canister has been removed.

During the canister reset procedure, it may be possible for an air pocket to develop in the valve body. If this occurs, very slightly loosen one of the gland nuts on the valve body to release the air pocket and then re-tighten the gland nut.

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**3. Drawings**



**Figure 3: Drawing 408800A-1 Multimode Tumblebox**

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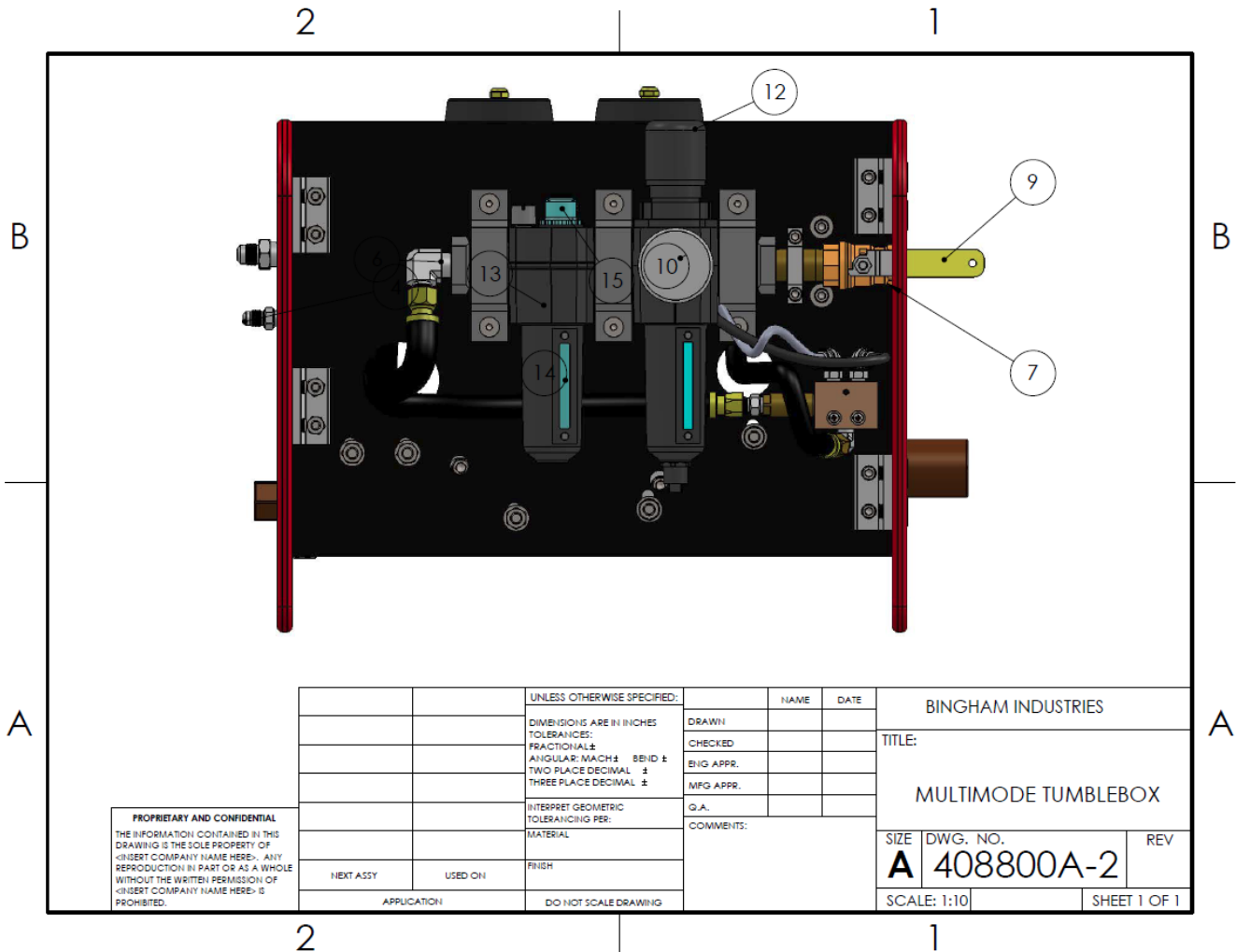


Figure 4: Drawing 408800A-2 Multimode Tumblebox

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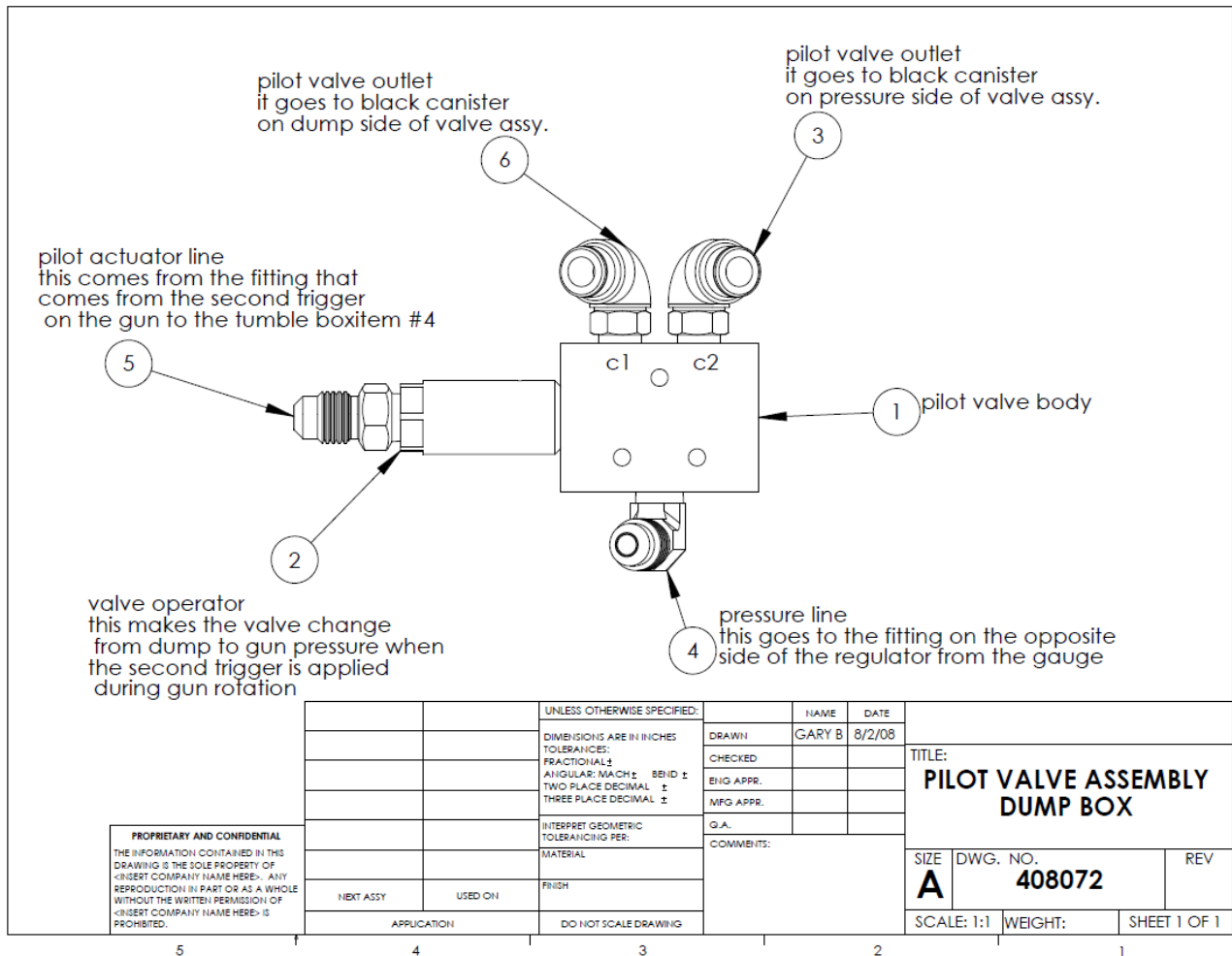


Figure 5: Drawing 408072 Pilot Valve Assembly Dump Box

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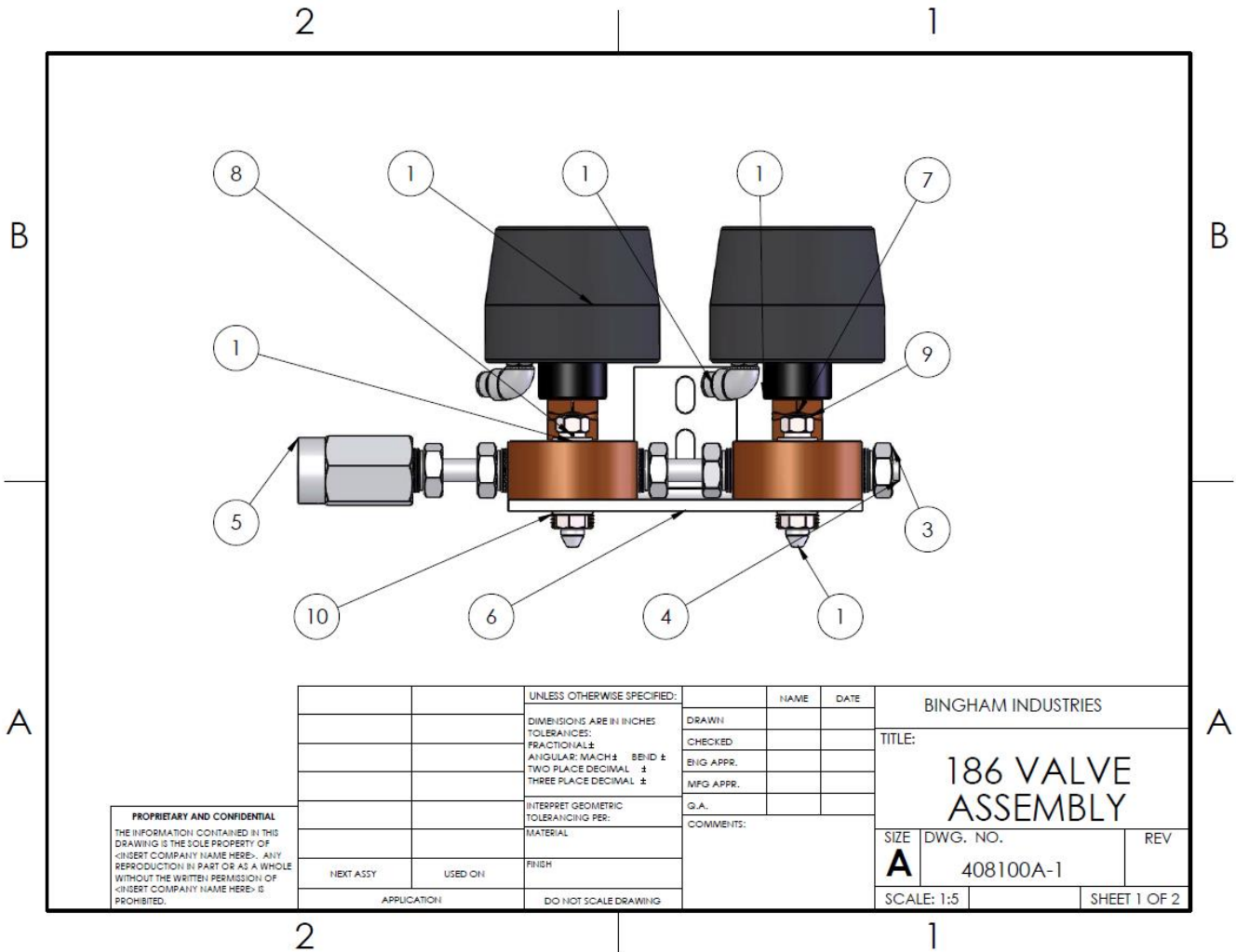


Figure 6: Drawing 408100A-1 186 Valve Assembly (sheet 1)

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ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	408001A 186A ACTUATOR ASSY	186 VALVE ACTUATOR ASSY.	2
2	402008A	3/8 3 INCH NIPPLE ASSEMBLY	2
3	402004 38 GLAND NUT.	402004 38 GLAND NUT.	1
4	402510 38 HP PLUG	402012 3   8 HP P LUG	1
5	408414	3/8HP INLET CONNECTOR	1
6	408705 186 VALVE MOUNT	408705 186 VALVE MOUN	1
7	HBOLT 0.3125-18x1.75x0.875-SS		4
8	Hi Collar LW 0.3125 SS		4
9	HNUT 0.3125-18-D-SS		4
10	Preferred Narrow FW 0.3125		8

**Figure 7: Drawing 408100A-1 186 Valve Assembly (Sheet 2 - BOM)**

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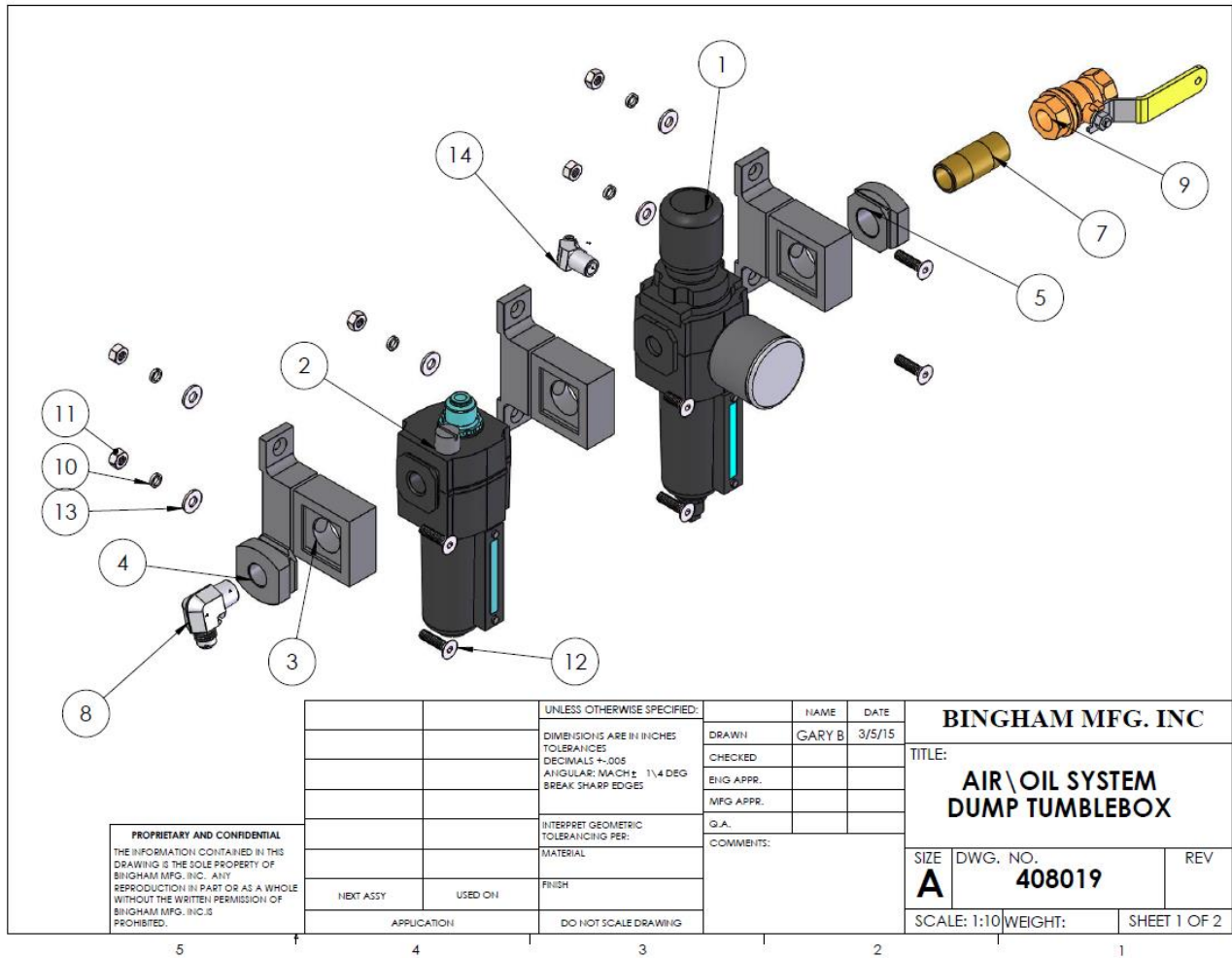


Figure 8: Drawing 408019 Air/Oil System Dump Tumblebox (Sheet 1)

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ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	408022	FILTER\REGULATOR ASSY	1
2	408023	LUBRICATOR ASSY	1
3	408029	WALL MOUNT	3
4	408024	3/8NPT WALL MOUNT ADAPTER	1
5	408025	1/2 NPT WALL MOUNT ADAPTER	1
7	408060	1/2 X 2 INCH BRASS NIPPLE	1
8	408037	3/8NPT X #6JIC 90 DEG FITTING	1
9	408065	1\2 NPT BRASS BALL VALVE	1
10	Hi Collar LW 0.25	HI COLLAR LOCK WASHER STAINLESS STEEL	5
11	HNUT 0.2500-20-D-SS	1\4-20 HEX NUT STAINLESS STEEL	5
12	SCHSCREW 0.25-20x1x1-HX-SS	1\4-20 X 1 ALLEN HEAD TAPER SCREW STAINLESS	6
13	Preferred Narrow FW 0.25	1\4 NARROW FLAT WASHER STAINLESS STEEL	5
14	408033	1/4NPT X #4JIC 45 DEG FITTING	1

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			DIMENSIONS ARE IN INCHES	DRAWN	GARY B	3/5/15		
			TOLERANCES DECIMALS +- .005	CHECKED				
			ANGULAR: MACHINE 1\4 DEG	ENG APPR.				
			BREAK: SHARP EDGES	MFG APPR.				
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.					
		MATERIAL	COMMENTS:					
	NEXT ASSY	USED ON	FINISH					
	APPLICATION		DO NOT SCALE DRAWING					

Figure 9: Drawing 408019 Air/Oil System Dump Tumblebox (Sheet 2 - BOM)

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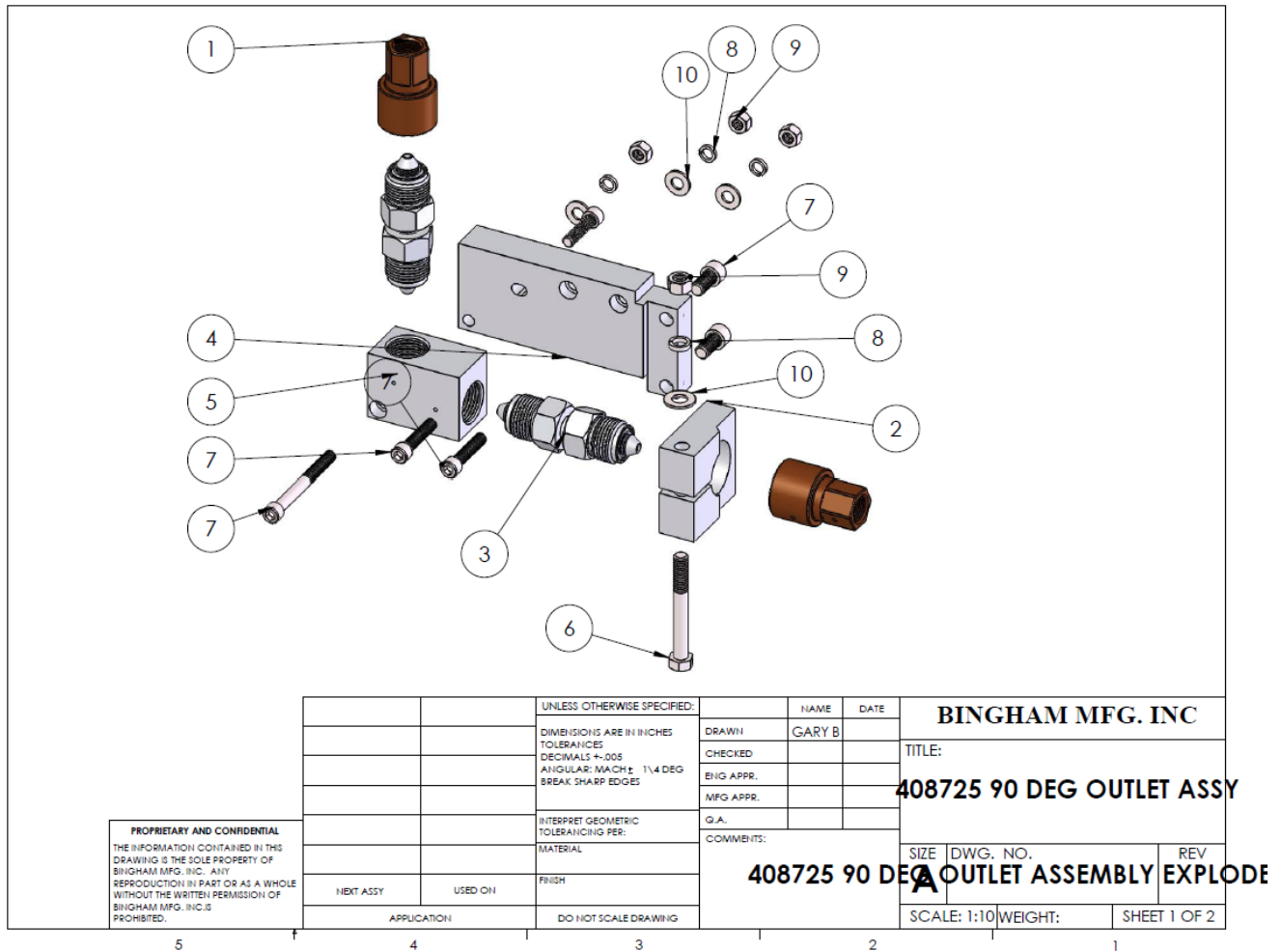


Figure 10: Drawing 408725 90° Outlet Assembly (Sheet 1)

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ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	408415	HI PRESSURE TUBE ADAPTER	2
2	408728HP	HP INLET\OUTLET MOUNT	1
3	402009	9/16 4 INCH NIPPLE ASSEMBLY	2
4	408740	90DEG OUTLET WATER L BLOCK	1
5	408733	9\16 90 DEG BLOCK L BLOCK	1
6	HBOLT 0.3750-16x3x1-S	3\8-16 X 3 HEX BOLT STAINLESS STEEL	1
7	HX-SHCS 0.3125-18x1.25x1.25-SS	5\16-18 X 1.25 ALLEN HEAD CAP SCREW STAINLESS STEEL	2
8	Hi Collar LW 0.3125 SS	3/8 HI COLLAR LOCKWASHER STAINLESS STEEL	4
9	HNUT 0.3125-18-D-SS	3\8-16 HEX NUT STAINLESS STEEL	4
10	Preferred Narrow FW 0.3125	3\8 NARROW FLAT WASHER STAINLESS STEEL	4

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		DIMENSIONS ARE IN INCHES		DRAWN	GARY B			TITLE:
		TOLERANCES		CHECKED				
		DECIMALS ±.005		ENG APPR.				
ANGULAR: MACH: 1\4 DEG		MFG APPR.						
BREAK SHARP EDGES		Q.A.		COMMENTS:		SIZE	DWG. NO.	REV
INTERPRET GEOMETRIC TOLERANCING PER:		408725 90 DEG OUTLET ASSEMBLY EXPLODE				SCALE: 1:10	WEIGHT:	SHEET 2 OF 2
MATERIAL				FINISH				
NEXT ASSY	USED ON	APPLICATION		DO NOT SCALE DRAWING				

Figure 11: Drawing 408725 90° Outlet Assembly (Sheet 2 - BOM)

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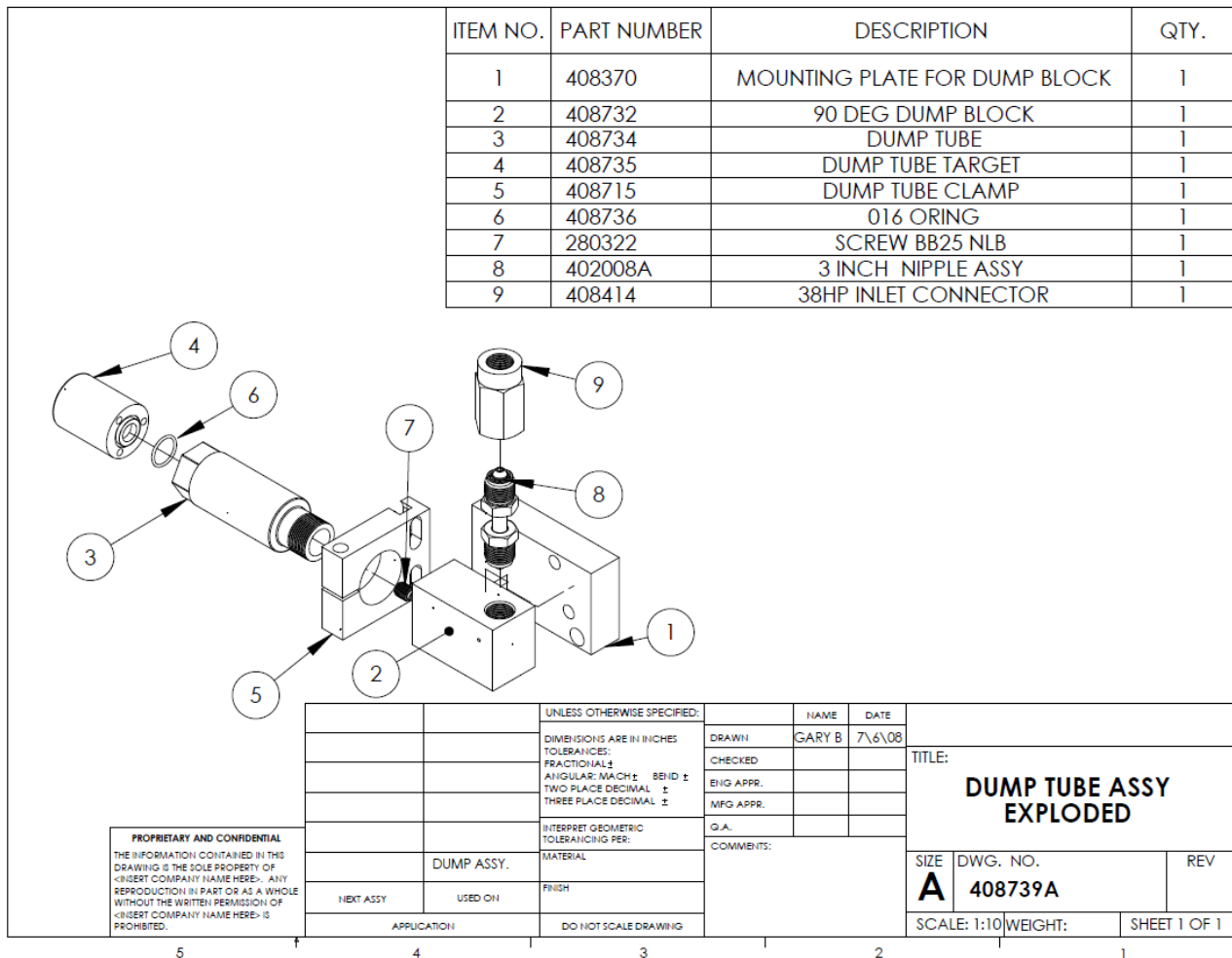


Figure 12: Drawing 408739A Dump Tube Assembly

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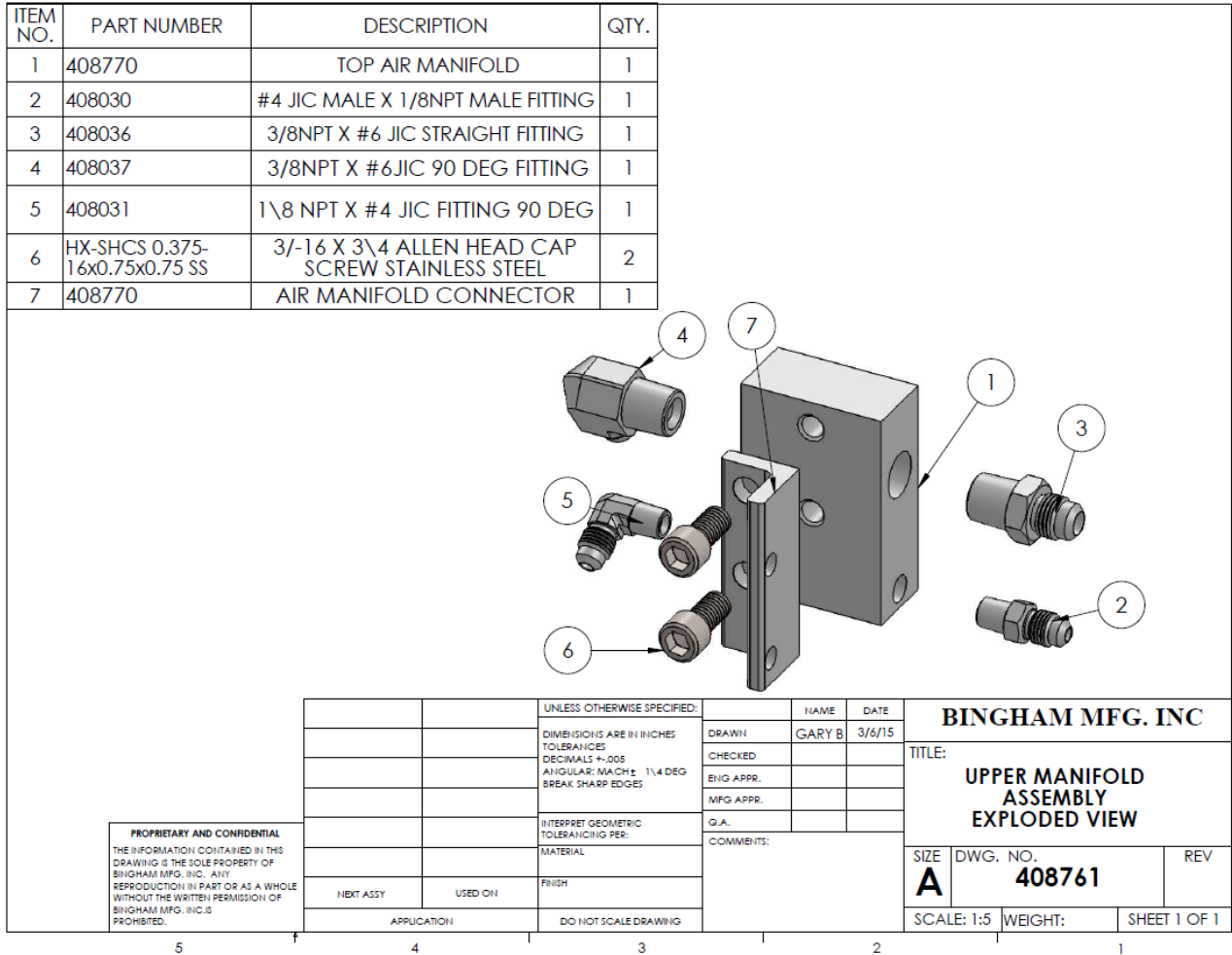


Figure 13: Drawing 408731 Upper Manifold Assembly

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**4. Record of Revision History**

<b>Date</b> <b>YYYY-MM-DD</b>	<b>Revision</b>	<b>Description</b>	<b>Change By</b>	<b>Approved By</b>
2017-09-25	-	Release	M.Ehrmin	J. Bingham

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