OPERATING INSTRUCTIONS
AND
MAINTENANCE MANUAL
FOR

HAMMONDS MODEL 600-1Q2

FLUID POWERED
ADDITIVE INJECTOR SYSTEM

Manufactured by:

HAMMONDS TECHNICAL SERVICES, INC.

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SPECIAL NOTICE TO USERS

PLEASE READ CAREFULLY BEFORE OPERATING EQUIPMENT

This fluid powered additive injector system is designed to give consistent, dependable performance when operated and maintained according to manufacturer's recommendations. However, being a mechanical device, it is subject to failure from improper installation, wear, human error and operating environments beyond the control of the system. Because of this fact, it is the responsibility of the operator to make certain that:

A. The system is installed properly.
B. The system is being operated properly.
C. The system is actually running during product transfer.
D. The system is checked after the transfer operation to make certain the proper amount of additive was injected during the operation.

The performing of these checks by the operator eliminates the possibility of product not having the proper customer required additive ratio. Therefore, since the manufacturer cannot be present during each transfer operation, the responsibility for checking the performance of the system is that of the operator. Should there be any questions whatsoever, the operator should consult the distributor from whom the unit was purchased.

DO NOT TAKE CHANCES.....DO NOT GUESS.....BE ABSOLUTELY CERTAIN THAT THE SYSTEM IS INSTALLED AND WORKING AS IT SHOULD.

The user/ operator carries the final responsibility to make certain the system is operating properly.

INSTALLATION AND PREPARATION FOR STARTUP

In most cases, the Hammonds fluid powered injector is shipped complete and ready to operate. The system should include appropriate fittings to suit your specific application. Flow direction is marked on the fluid motor housing, additive pumps and check valves. Any and all flow restricting devices such as ON/OFF ball valves, remote panels, sight flow indicators or suction strainers must be installed on the suction side of additive pumps.

CAUTION

Do Not Attempt To Use This Device Without Understanding And Following Proper Safety Precautions Regarding System Grounding, Fire Safety And Special Handling For Potentially Dangerous Additives.

Consult your Engineering Department for their specific instructions. Make certain all personnel involved with this system are thoroughly familiar with safe operating practices.

If your system has been purchased "bare," consult your equipment distributor for help in selecting hoses, fittings and other related accessories. Selection of materials compatibility, location of unit within the system, effect of the unit on the system and injection point of the additive are also factors that should be discussed by factory authorized personnel.

If no factory-authorized distributor is available, consult the factory directly for assistance.

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INSTALLATION CONSIDERATIONS OF BARE UNITS

Hammonds additive injector systems may be installed in a wide variety of applications, systems, and operating conditions. **This Manual Makes The Assumption That The Purchaser Has Consulted With A Factory Authorized Distributor Or The Factory And Has Approval For The Application And Installation**. If this is not the case, listed below are a few considerations that should be reviewed before installing a unit in an existing system.

FLOW CONSIDERATIONS

The Hammonds Model 600 requires a minimum of 20 and up to 200 GPM to deliver consistent ratios. This does not mean that the system cannot be used in cases where startup and shutdown fall under the 20 GPM minimum. However, these installations require calibration to compensate for the lower flow rates during these periods of operation. Check with the factory if you have any questions in the area of performance.

MATERIALS OF CONSTRUCTION

The standard material in a Hammonds Model 600 fluid driver is anodized cast aluminum housing. Optional material is carbon steel.

INJECTION POINT OF ADDITIVE

Some additives may adversely affect other components in the product handling systems, for example seals in meters, valve seals, aluminum and filter elements to name a few. The Hammonds injector systems do an excellent job of mixing the additive in the fuel systems, while injecting at an almost continuous rate. Because of this superior mixing and very small concentration of additive in any one point, many customers feel that this is not a problem. **SOME DO**, and therefore, should use their own judgment as to the effect of these additives. **Hammonds Technical Services, Inc. Can Only Advise You Of The Possible Hazards**. It is up to the owner of the equipment to decide his preference as to location of the additive injection point. It can be placed at any point in the system. The 600 comes with the injection point directly ahead of the fluid motor for good blending. It can be located elsewhere very easily. If the injection point is moved from the body of the injector, the 1/4" tapped hole must be plugged, the inlet check valve moved to the new location, and the injection tubing rerouted to the new location. An injection check valve must always be used regardless of location.

WHERE TO PHYSICALLY MOUNT THE INJECTOR ON A REFUELER

If the unit is to be installed upstream of the filter separator (monitor), it can be placed at any place that is convenient between the system pump and the filter separator. If installation is to be downstream of the filter separator, the most ideal location is just after the filter separator, ahead of the de-fueling valve or pressure control valve. The unit can be installed between the de-fueling valve and the hose reels. However, this will cause some loss of efficiency in the de-fueling capability, since the system pump will be pulling through the injector motor. It does not harm the unit to run backwards. If the system is installed after the pressure control valve, overall flow may be effected since the control valve monitors system pressure and compensates accordingly. The nominal backpressure produced by the injector could have an effect on the operation of the pressure control valve and its reaction to changing system conditions, you may effect flow volumes. If you are in doubt about this particular subject, and feel that your chosen mounting location will effect the valve, consult the factory. Most systems can be adjusted to compensate for this minor loss.

The model 600 can be mounted in most any convenient location. The standard product connection is 3" 150# RF flanges. The performance of the 600 is not affected by changes in pipe direction or other components such as valves, strainers or meters directly before or after the injector. However, care should be taken in placing the unit too close to other items such as turbine meters that may be sensitive. Consult other manufacturers for advice in placing the fluid motor adjacent to their specific equipment.

MOUNTING ATTITUDE

The Model 600 can be mounted in a horizontal, vertical, or even a slanted pipe with one condition. The main motor shaft that powers the injector **MUST** always be horizontal. If this is not done, premature wear will occur in the unit, causing close design tolerances in the unit to become excessive. This will lead to a loss in the system's ability to operate correctly at low flow rates. **Study The Installation Drawing At The End Of The Manual Carefully. Consult Your Local Distributor Or The Factory If You Have Any Questions Whatsoever.**

LOCATION RELATIVE TO METERS

Hammonds injectors can be installed at any point in the system. If the unit is placed upstream of the meter, it will precisely inject additive to the system, whether a single hose or dual hoses are used.

SPACE REQUIREMENTS

The system is designed with easy service in mind. The entire rotor and pump assembly can be removed, where possible, from the housing without disturbing the system piping. Ample room should be reserved in the installation for this removal. The injector pump is removed from the side on which it is mounted. Approximately 2" should be allowed for complete removal of the pump. Should the fluid motor need service, a clearance of 12" is required on the pump side to remove the rotor and side plate. Also, allow room for the operator to have visual access to the

pump controls for calibration adjustment purposes.

ON/OFF OPERATION

AVOID DRY OPERATION. There is only one method for providing ON/OFF operation to the system. Simply record the stroke setting on the calibration scale then stroke the pump to zero. This will extend the life of all the moving parts. When injection is needed, set the dial to the recorded position. The on/off valve provided on the panel is for servicing the pump and/or cleaning the y-strainer.

CAUTION

NEVER, NEVER turn the injector off by placing an ON/OFF control valve on the discharge side of the pump. This blocks the discharge of the pump, causing damage to the ceramic pump parts.

LOCATION OF THE ADDITIVE

The additive tank should always be placed as close to the injector as possible. Ideally, the tank should be at the same level, or slightly higher than the unit. If this is not possible, the injector will have to pull a suction lift. Special care should be taken to assure there are absolutely no leaks in the suction line of the injector. A pinhole will prevent the system from priming and/or operating efficiently. Tape all threaded connections carefully with Teflon® sealant. The injector should not be required to lift additive more than four (4) feet.

TUBING AND CONNECTIONS

Stainless steel tubing is recommended and would be more desirable although Synflex tubing is easier to install and less expensive. Make sure all tubing is carefully secured and grouped together, whenever possible. USE CAUTION TO NOT CRUSH OR KINK TUBING WHEN INSTALLING. Tubing runs should be as straight and level as possible with a minimum of low spots or “traps” that can trap air during startup. Tubing should not be allowed to “thump” or vibrate during operation, as this will cause premature fatigue and failure.

PREPARATION FOR CALIBRATION AND STARTUP

Before Attempting To Start The System Or Make Calibrations, Please Read The Following Information Carefully.

During startup and calibration, you will be bleeding the system of air, collecting samples of additive during the calibration and checking for possible leaks throughout the system. Provisions should be made for collection or clean up of spilled fluid. Attempts should be made to minimize losses during these procedures. If the additive being handled is flammable, fire safety precautions should be taken. (Since the installation may also be tested at this time, extreme caution should be used in checking for leaks of the main line.) If you wish to set the system up for leak-free testing and calibration with zero spillage, please consult your local distributor or the factory for help in doing so. Hammonds is glad to suggest any necessary parts and

procedure for "zero-spill" startup and calibration.

A WORD ABOUT ADDITIVES

Most additives being used in fuels today have at least some degree of toxicity. Many are very dangerous. Extreme caution should be taken in handling additives. Remember, the additive is placed under pressure when being injected into the line, and when collecting samples during calibration, some spillage may occur. Be careful; wear protective clothing including eye protection. Be sure you have facilities to wash off any additive that may come in contact with your skin. Read all additive manufacturers safety precautions and Material Safety Data Sheets, following them to the letter.

HERE IS WHAT IS NEEDED:

- Appropriate safety protection equipment.
- Eye protection in the form of safety goggles.
- An assortment of wrenches that fit the various fittings on the system. Note: two (2) 10" crescent wrenches will normally take care of any adjustments to fittings you may have to make. <u>One to hold the fitting, and one to hold the adjacent fitting.</u>
- A marked graduated glass bottle that is marked in either cc's or ounces. (At least 16 oz.)
- A stop watch.
- A means of determining the flow rate of the main system.
- A small pocket calculator is helpful.
- A clipboard is helpful with pad of paper.
- AT LEAST ONE, AND PREFERABLY TWO HELPERS
- A large container or catch basin to collect the output of the pump while you are not actually calibrating the system.

REMEMBER: Any plumbing system varies with temperature and fluid being pumped. The system also changes as parts of the pump wear.

CALIBRATION AND STARTUP

IF YOUR INJECTOR SYSTEM IS EQUIPED WITH A CALIBRATION GAUGE OR REMOTE PANEL, FOLLOW THE INSTRUCTIONS FOR THEIR USE IN THE BACK OF THIS MANUAL.

Please Follow These Steps In Their Given Order. Read Them Over Carefully Before Starting, Then Follow Them To The Letter. If There is Any Part Of The Procedure That Is Not Clear, Consult Your Local Distributor Or The Factory Directly.

1. Make certain the additive tank is full of the proper additive.

2. Open the on/off valve on the panel.

3. All systems are calibrated at the factory to customer specified requirements. So if adjustments are required, they should only be minor. If this is the case, go directly to step 5.

4. If you are starting from scratch in the calibration and adjustment, refer to the **FMI "Q" Pump Instructions** at the end of this manual.

5. Set the calibration valve (3-way valve on the panel) pointing to the "calibrate position." When this is done the valve is positioned so that additive will exit through the short tube on the side of the panel. A check valve sized for the application should be installed on the end of this tube. If no check valve is there, contact your distributor or the factory.

6. Make certain all product connections going to and from the system are in their proper, locked position to ensure safe, leakproof flow of product through the fluid motor. Double check the flow direction arrows located on the fluid motor housing.

7. At this point, consider the information you will have to gather during the next few steps of the calibration process.

A. What will the product flow rate through the unit be?

B. What is the length of time that the calibration will cover?

C. What is the amount of additive in ounces or cc's that you will need to collect based on the duration of the calibration?

You Should Have the Answer To All Of These Questions Before Your First Trial Run.

8. Before starting the main product flow through the system, make certain everyone understands that you will run the system for, let's say, one (1) minute or two hundred (200) gallons. Even shorter runs are fine, especially if you are running at high flow rates.

9. Place the measured graduate under the calibration tube. (The short tube with the check valve on the end.) Put on your eye protection.

10. At the command of the timekeeper, or the person watching the flow meter, start the main product pump.

11. Give the system a few seconds to gather momentum and flow through the fluid motor. Confirmation that the fluid motor is running may be obtained by watching for rotation of the “Q” pump drive shaft.

12. If the pump is being started up for the first time, it will take a few seconds to prime itself and begin discharging fluid from the calibration tube. Is your eye protection on? If not, PUT IT ON NOW! If the pump is not priming itself, remove the check valve on the end of the tube. This will allow the pump to completely discharge all air from the system. Re-install the check valve.

13. As soon as the pump begins discharging a clear, air free stream of fluid from the calibration tube, you are ready to begin your calibration. At this point, the system is primed.

14. You will now prepare to make your first actual calibration run. Empty your collected additive back into the tank, putting the bottle back

under the calibration tube. Notice the setting on the main product meter, set your stop watch at zero.

15. When ready, start the system again. Stop it at the decided time interval or meter reading. Calculate the amount of product that traveled through the system. Measure the amount of additive gathered, and record the amount of elapsed time.

16. It will be at this time that you will have to calculate how much additive you should have collected for the amount of fuel that the system pumped. This, of course, depends upon the ratio that is required. The following example is the easiest way of explaining the procedure without getting too complicated. It is not the only way...use it if you like.

Example condition:
Amount of product pumped: 200 gallons
Ratio of additive desired: 400 PPM (Parts per million)

It is assumed that the operator will know how much product is being pumped through the system in a given length of time. If, for example, you have a meter that registers the flow in gallons, you simply record the gallons at the beginning of the timed run, and then again at the end of the run. If you run for one (1) minute, you simply subtract the beginning number on the meter from the number registered after the run. This will give you the gallons per minute (GPM). Having to make this calculation is the only reason for timing the run. You can accomplish the same result by just watching the meter and stopping the system when you have totaled the desired amount of gallons through the system. In any case, you must know the amount of product passing through the system before calibration can begin.

First, change the gallons pumped into ounces by multiplying total gallons (in our example 200) by 128 (128 oz. to a gallon). The answer is 25,600 ounces.

Second, divide by 1,000,000. The answer is .0256. Since you are dealing in 1/1,000,000 (one part per million) of the total for your ratio, you must find out what 1/1,000,000 of the 200 gallons is, .0256 ounces is 1/1,000,000th (one part per million) of 200 gallons of fuel pumped.

Third, multiply the .0256 x 400 (for 400 PPM ratio). The answer is 10.24 ounces.

So, you should collect 10.24 ounces of additive for every 200 gallons of fuel pumped.

These are all large, round numbers. You may, for example, only be running at 50 GPM, not 200. Use the same procedure; just change the numbers to fit your application.

No two systems will ever perform exactly the same. For this reason, the procedures given for calibration are general in nature. Obviously, it is impossible to provide a graph or table that would be absolutely accurate in every case. With that in mind, all tables and graphs should be used as general guidelines. Remember, the calculated, timed and measured output that you gather is absolute. Trust your figures and your calculations.

NORMAL OPERATION

Following initial start up and calibration, the system requires very little attention other than making certain that additive tank levels are maintained.

Assuming the system remains set up and operating at least intermittently, calibration is required perhaps every 1 – 3 months. Good record keeping of additive inventory and use levels compared to fuel handled can give a good indication that additive ratio is on specification.

See the section on preventative maintenance for suggestions as to regular maintenance.

PROPER INJECTION RATIOS

Your system should be equipped with some sort of calibration device, i.e.; suction calibration gauge, additive meter, or a simple pressure check valve on the end of the bleed tube. If it is not equipped with any of these devices, calibration of your system will be done using only atmospheric pressure. Volumetric calibration at atmospheric pressure is not recommended. It will not necessarily bring you within an acceptable range of additive injection. Do not depend on volumetric calibration to ensure on-spec performance because line pressures can vary and additive injector parts wear over time.

TROUBLESHOOTING THE SYSTEM

The following conditions are given as a means of troubleshooting the system. Each condition lists a number of possible causes. In most cases, trouble can be solved by the use of this section or the **FMI "Q" Pump Instructions** at the end of this manual. Please read it carefully before attempting repairs or making any changes in the system.

FLUID MOTOR IS NOT TURNING

A. Insufficient flow to turn the motor. A minimum flow of about 20 GPM needed to start the system.

B. A rag or some other object is jammed in the line preventing the fluid motor from turning.

C. A diverter valve is blocked downstream of the system, blocking the fuel flow through the system.

D. On a truck or hydrant system, a de-fueling valve is left open starving the fluid motor for product flow.

E. If the unit has been recently serviced internally, the rotor might be installed backwards. Consult the factory before disassembly.

F. The fluid motor may be installed in the wrong direction of flow.

FLUID MOTOR IS TURNING AND PUMP RUNS, BUT WITH NO OUTPUT

A. Pump is air-locked. In some cases where there is a very long line running from the injector head and the point of injection into the system, there is sufficient air volume to cause the pump to act as a compressor. It is not able to pull a suction of fluid to the pump. Loosen and remove the calibration check valve and position the 3-way valve on the panel

to “calibrate” and allow the bleed tube to remain open until the pump begins pumping. Position the 3-way valve back to inject.

B. The pump is not getting additive. Check that the on/off valve on the panel and any valve between the pump and the tank is open. Check all the connections in the line between the pump and the tank.

C. The vent on the tank is not open causing the pump to pull a vacuum. Open the vent. Check to see if the cap has been removed from the dryer cartridge, if so equipped.

D. The pump stroke is set at neutral /zero-flow position.

E. The additive tank is empty...don't laugh, it happens.

INJECTOR IS OPERATING BUT WITH REDUCED OUTPUT

A. Leaking suction line or trash in the filter screen in the y-strainer.

B. Air leak in suction side of system. Note: leaks may be anywhere upstream of the additive pump, back to the additive container.

C. Defective tubing that has tiny holes or deterioration from ultra violet light.

D. Leaks in threaded connections on the suction side.

E. Performance of the system is slipping. Fluid motor vanes are badly worn. This would only be probable after a very high number of hours of operation.

PREVENTIVE MAINTENANCE

1. Make certain to use only clean, fresh additive that has been stored in a sealed container. Most additives are moisture sensitive. Some will form heavy crystals if allowed to accumulate moisture. These crystals will stop the pump in very short order, or cause calibration to be changed due to clogging of the pump.

2. Check the additive filter screen in the y-strainer at least every six months. More often if there is an indication of possible contamination.

3. Check the system for leaks at every use. This is an extremely important safety procedure, since some additives are flammable, caustic and corrosive.

4. Check for leaks from the seal that is located at the exit point of the injector output shaft in the side plate housing. This should be done at each operation. Leakage at this point usually indicates that the mechanical seal inside the fluid motor housing is leaking. A leak here will be fuel, and is not only dangerous from a fire standpoint, but will quickly ruin the bearings on the rotor shaft, since all lubricant will be washed away.

5. Check the fittings for leakage around the suction y-strainer. Check this fitting each time the filter is changed or cleaned. Make certain there are no leaks in the suction line. A very small leak will either change the operation of the pump or prevent it from operating altogether.

6. Visually check around the “Q” pump cylinder and make certain there is no leaking of additive around the fluid end.

Hammonds injectors are very dependable. If installed properly and sized appropriately to the application, they require very little maintenance. Remember, keep the additive and the suction y-strainer filter clean. If you have problems with the pump working, it is usually in the suction side of the system (between the additive tank and the injection pump). Suction lines and fittings are notorious for leaking just enough to

prevent the system from working. Always check to ensure optimum suction conditions, should problems occur.

Remember, a leak in the suction allows air from the outside to be introduced into the system. It does not always mean a visible leak of additive. If the pump loses its prime or output is erratic, chances are good that there are problems in the suction side. Otherwise, if it is working...leave it alone!

PREVENTATIVE MAINTENANCE SCHEDULE

NOTE: It is important to read the previous pages on preventative maintenance. These intervals are general, and may vary according to individual applications and severity of service. Check the **FMI "Q" Pump Instructions** at the end of this manual for other preventative maintenance tips.

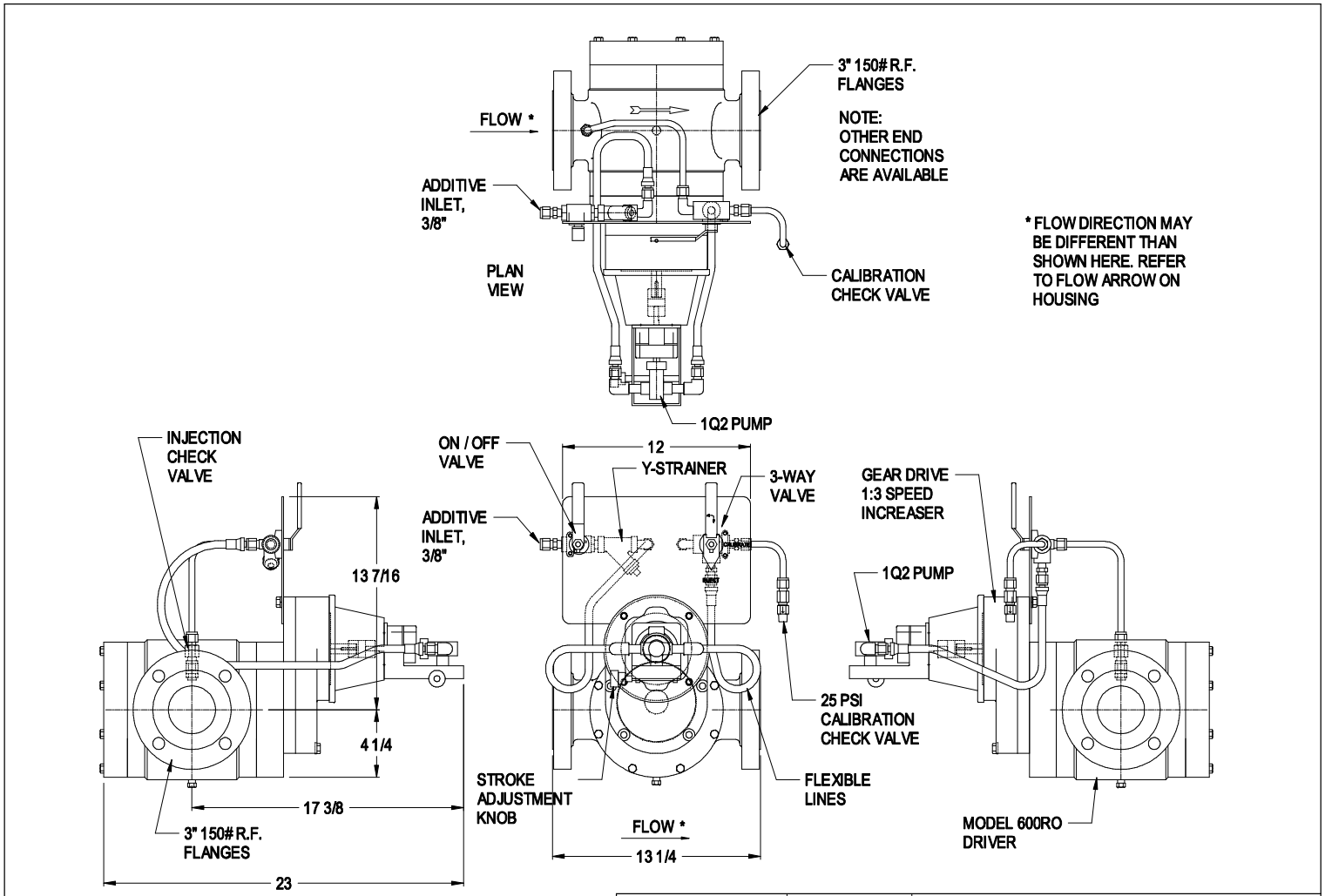
SERVICE FUNCTION	0-4 HRS DAILY	5-8 HRS DAILY	8+HRS DAILY
Check additive y-strainer filter screen	Monthly	Monthly	Monthly
Check system for additive/fuel leaks	Daily	Daily	Daily
Disassemble and inspect fluid motor housing and internal parts	24 Months	12 Months	8 Months

TYPICAL ADDITIVE RATIO CHART

GALLONS	400 PPM*
50	2.56
100	5.12
200	10.24
500	25.60
1000	51.20

*PPM amounts shown are in ounces

Hammonds Model 600-1Q2 Injector Manual



NO.	REVISION	DATE	BY	APPVD
X	X	X	X	X

DRAWING	LEVELS	VIEW
600-1	48-51	1

FROM SER#	DATE	TO SER#	DATE
X	X	X	X

TOLERENCES
ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED.

*TOL. DECIMALS:
.XXX= +/-.005
.XX= +/-.015
.X= +/-.030
FRAC.= +/-1/16

*TOL. ANGLES:
+/- .5 DEGREES

*CONCENTRICITY:
.005 T.I.R.

SURFACE FINISH 125

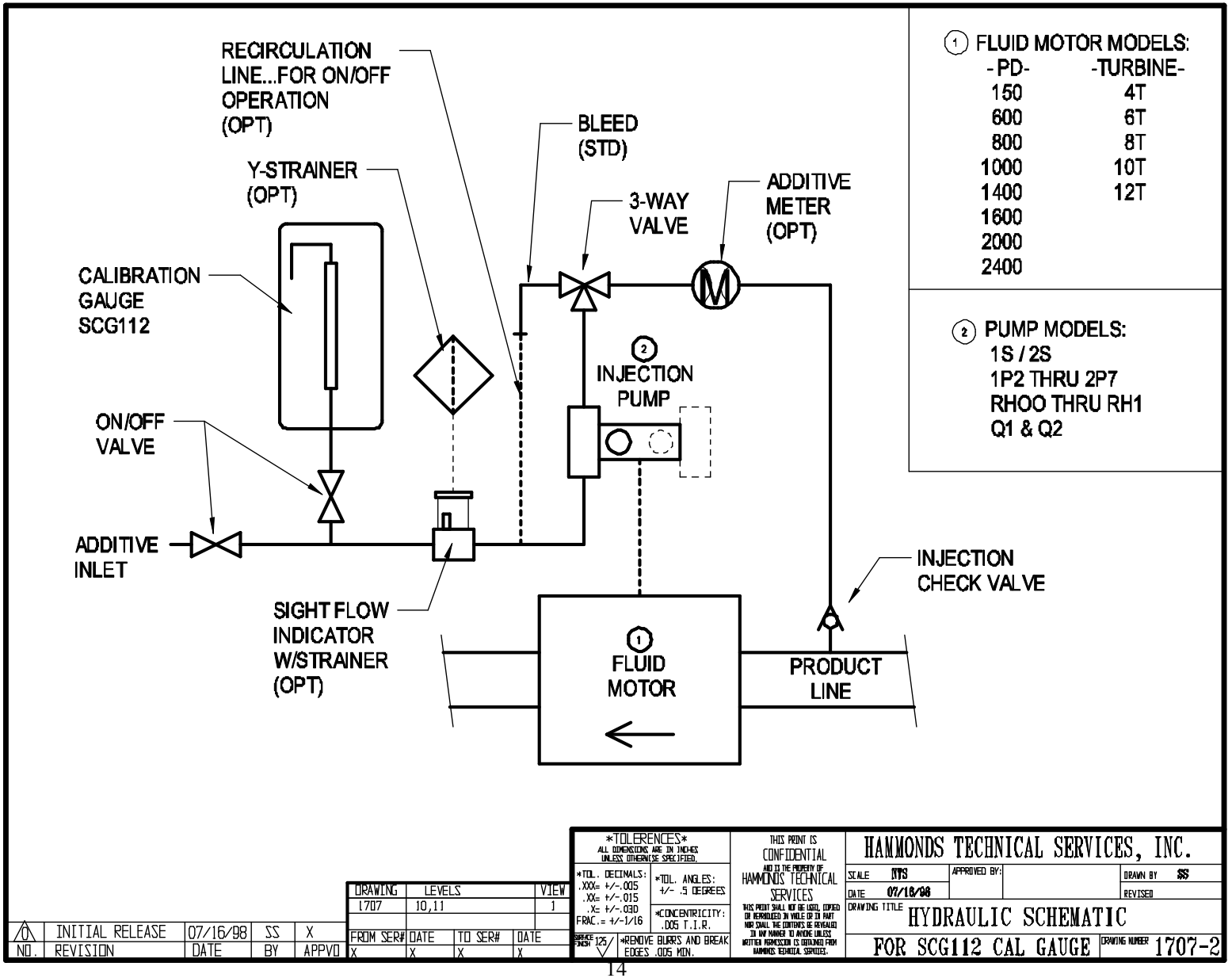
*REMOVE BURRS AND BREAK EDGES .005 MIN.

HAMMONDS TECHNICAL SERVICES, INC.

SCALE	NTS	APPROVED	PART NUMBER	DRAWN BY	SS
DATE	06/03/09		-	REVISED	-

DRAWING TITLE
HAMMONDS MODEL 600-1Q2
1:3 SPEED INCREASER

DRAWING NUMBER 6146


RECIRCULATION LINE...FOR ON/OFF OPERATION (OPT)
BLEED (STD)
Y-STRAINER (OPT)
3-WAY VALVE
ADDITIVE METER (OPT)
CALIBRATION GAUGE SCG112
2 INJECTION PUMP
ON/OFF VALVE
ADDITIVE INLET
SIGHT FLOW INDICATOR W/STRAINER (OPT)
1 FLUID MOTOR
PRODUCT LINE
INJECTION CHECK VALVE
1 FLUID MOTOR MODELS:
-PD- -TURBINE-
150 4T
600 6T
800 8T
1000 10T
1400 12T
1600
2000
2400
2 PUMP MODELS:
1S / 2S
1P2 THRU 2P7
RHOO THRU RH1
Q1 & Q2
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*TOL. ANGLES: +/- .5 DEGREES
*CONCENTRICITY: .005 T.I.R.
SURFACE FINISH: 125
*REMOVE BURRS AND BREAK EDGES .005 MIN.
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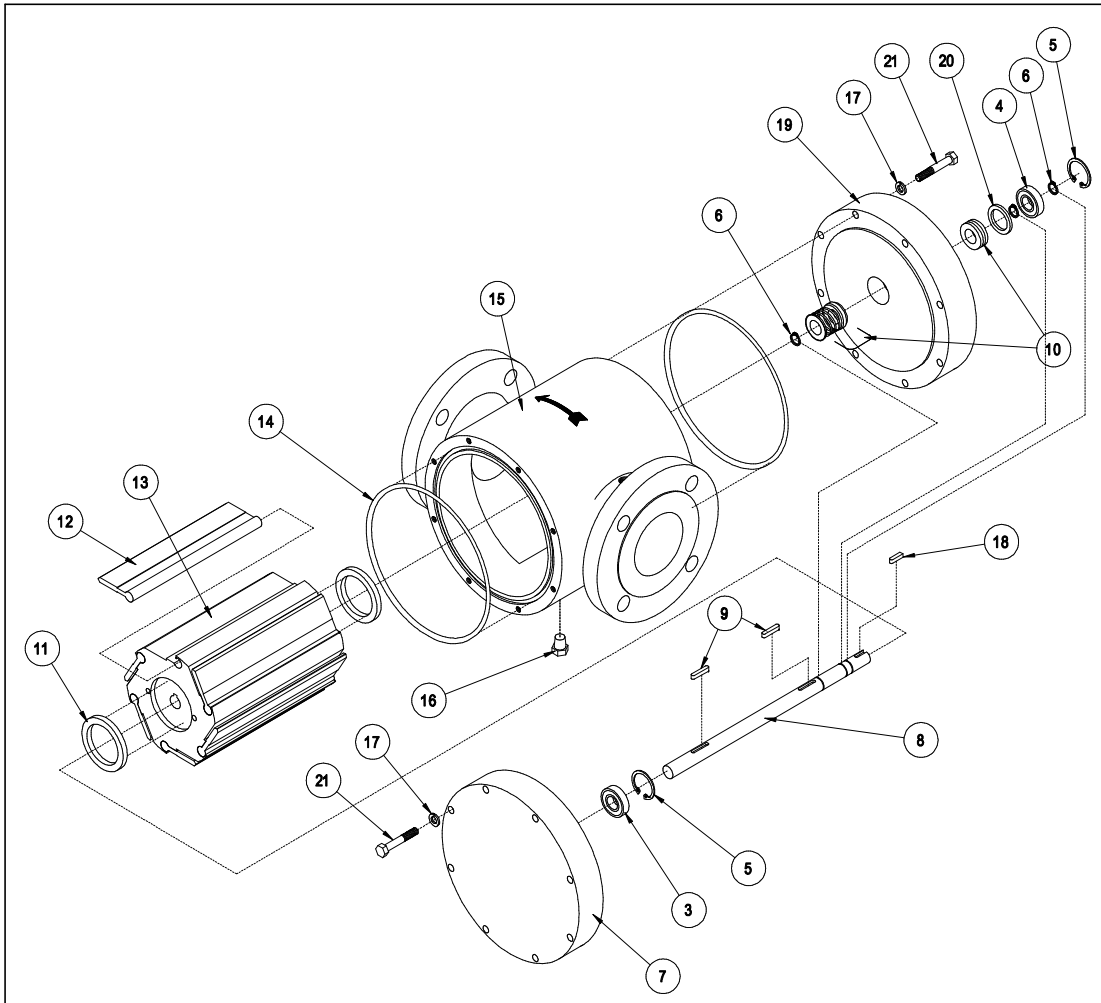
HAMMONDS TECHNICAL SERVICES, INC.
SCALE NTS
APPROVED BY:
DRAWN BY SS
DATE 07/16/98
REVISED
DRAWING TITLE HYDRAULIC SCHEMATIC
FOR SCG112 CAL GAUGE
DRAWING NUMBER 1707-2
DRAWING 1707
LEVELS 10,11
VIEW 1
FROM SER# X
DATE X
TO SER# X
DATE X
NO. REVISION DATE BY APPVD
INITIAL RELEASE 07/16/98 SS X



ITEM	PART NO.	QTY.	DESCRIPTION
1			
2			
3	212272	1	BEARING, SHIELDED
4	881120	1	BEARING, SEALED
5	881121	2	SNAP RING
6	881119	3	SNAP RING
7	212473	1	HD BACK PLATE
8	212273	1	SHAFT, 600RO
9	212002	2	KEY, 3/16" SQ. x 1"
10	141006	1	MECHANICAL SEAL
11	882012	2	WEAR RING
12	212097	6	VANE, TEFLON
13	212006	1	ROTOR
14	881910	2	O RING, VITON
15	212250	1	HOUSING, 3" 150#
16	151005	1	PIPE PLUG, 1/4"
17	881124	16	LOCKWASHER, 5/16"
18	884088	1	KEY, 3/16" SQ. x 11/16"
19	212015	1	SIDE PLATE
20	212016	1	SPACER, SEAL
21	881269	16	BOLT, 5/16" x 2 1/4"

NO.	REVISION	DATE	BY	APPVD
2	WAS QTY 2	01/13/14	SS	X
1	WAS #882013	02/18/08	SS	X
0	INITIAL RELEASE	10/25/99	SS	X

DRAWING	LEVELS	VIEW
600DRVR	140,151,155,166,	1
	196-198,202,203	

FROM SER#	DATE	TO SER#	DATE
X	X	X	X

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*CONCENTRICITY: .005 T.I.R.

SURFACE FINISH 125 *REMOVE BURRS AND BREAK EDGES .005 MIN.

HAMMONDS TECHNICAL SERVICES, INC.

SCALE	NTS	APPROVED BY:		DRAWN BY	SS
DATE	10/25/99			REVISED	01/13/14

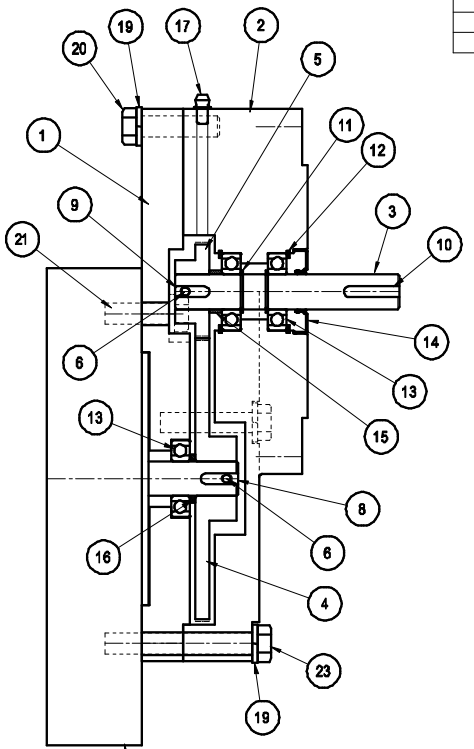
DRAWING TITLE: MODEL 600RO DRIVER

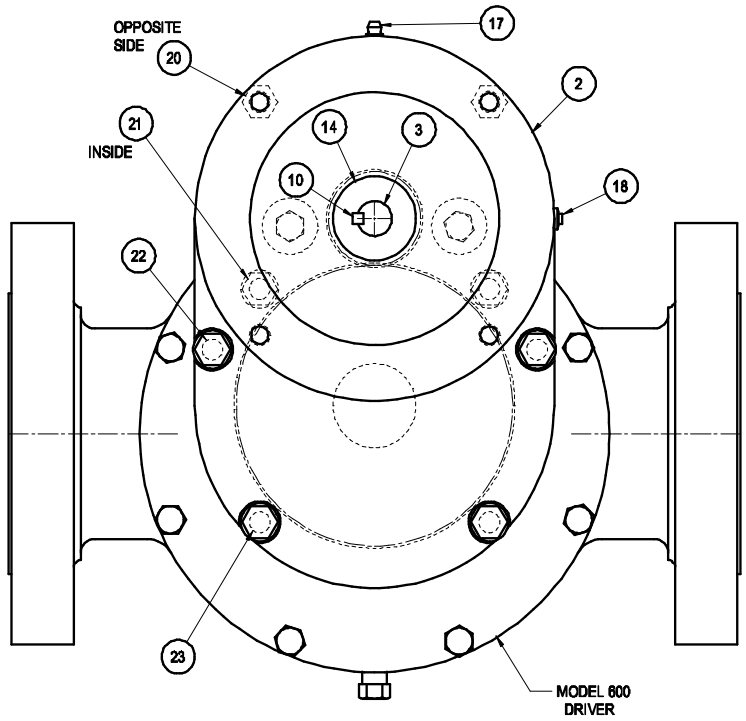
EXPLODED VIEW

DRAWING NUMBER 3829

ITEM	PART NO.	QTY.	DESCRIPTION
1	184186	1	BACK PLATE, 1:3
2	184178	1	GEAR CASE, 1:3
3	184179	1	OUTPUT SHAFT
4	190017	1	SPUR GEAR, 120 TOOTH
5	190011	1	SPUR GEAR, 40 TOOTH
1 6	881673	2	SET SCREW, 10-24 x 3/16"
7			
8	884088	1	KEY, 3/16" SQ. x 11/16"
9	882228	1	KEY, 3/16" SQ. x 5/8"
10	884089	1	KEY, 3/16" SQ. x 1"
11	881119	2	SNAP RING
12	881121	2	INT. SNAP RING

ITEM	PART NO.	QTY.	DESCRIPTION
13	881120	3	BEARING
14	882651	1	SEAL
15	881630	1	SPACER
16	184187	1	SPACER
17	881521	1	GREASE FITTING
18	881522	1	GREASE VENT RELIEF
19	881711	8	LOCK WASHER, 3/8"
20	883335	2	HEX BOLT, 3/8-16 x 1 1/2"
21	883233	2	HEX BOLT, 3/8-16 x 1 1/4"
22	883334	2	HEX BOLT, 3/8-16 x 1 3/4"
23	883775	2	HEX BOLT, 3/8-16 x 2 3/4"





NO.	REVISION	DATE	BY	APPVD
1	WAS 883025/881411	07/22/09	SS	X

DRAWING	LEVELS		VIEW
1000DRVR	174-177		1
FROM SER#	DATE	TO SER#	DATE
X	X	X	X

TOLERENCES
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

*TOL. DECIMALS:
.XXX= +/-.005
.XX= +/-.015
.X= +/-.030
FRAC.= +/-1/16

*TOL. ANGLES: +/- .5 DEGREES

*CONCENTRICITY: .005 T.I.R.

SURFACE FINISH 125 *REMOVE BURRS AND BREAK EDGES .005 MIN.

HAMMONDS TECHNICAL SERVICES, INC.

SCALE	NTS	APPROVED	PART NUMBER	DRAWN BY	SS
DATE	06/23/09		883615	REVISED	07/22/09

DRAWING TITLE
GEARBOX ASSEMBLY
INCREASER, 1:3 RATIO

DRAWING NUMBER 6143