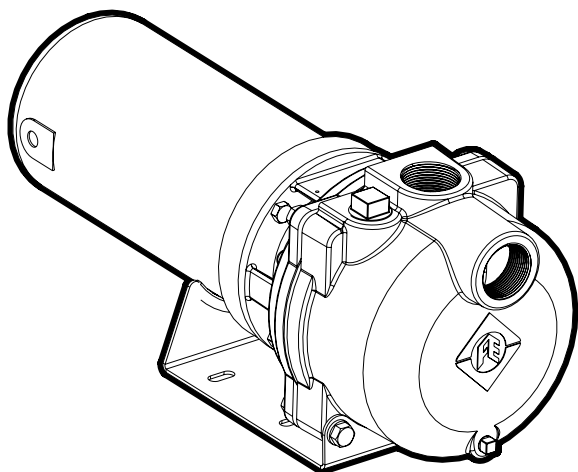




Franklin Electric



Self Priming Sprinkler Pump OWNER'S MANUAL



BEFORE YOU START

BEFORE INSTALLING PUMP, BE SURE TO READ THIS OWNER'S MANUAL CAREFULLY.

REFER TO PRODUCT DATA PLATE(S) FOR ADDITIONAL OPERATING INSTRUCTIONS AND SPECIFICATIONS.

⚠ CAUTION

- Keep work area clean, well-lit and uncluttered.
- Keep safety labels clean and in good condition.
- Replace missing or damaged safety labels.
- Wear safety glasses while installing or performing maintenance on pump.
- Adhere to the guidelines of the National Electric Code (NEC) or Canadian Electric Code (CEC), and any other state and local codes for ALL electrical installations. Check with the appropriate agencies or contact a licensed electrician.

Most water system problems result from improper installation. It is suggested that you read this manual carefully before installing your pump. The "TROUBLESHOOTING SECTION" will assist you in locating and eliminating the cause of any trouble you may encounter after installation. Check and make available all the tools you will need to install your pump. Required tools may include wrenches, pipe sealant, pipe fittings and nipples, screwdriver, etc.

Be sure to have available proper and adequate wiring material to complete the installation correctly.

READ AND FOLLOW SAFETY INSTRUCTIONS

⚠ This is the safety alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words and be alert to the potential for personal injury:

⚠ DANGER warns about hazards that will cause serious personal injury, death or major property damage if ignored.

⚠ WARNING warns about hazards that **can** cause serious personal injury, death or major property damage if ignored.

⚠ CAUTION warns about hazards that **will or can** cause minor personal injury or major property damage if ignored.

NOTICE indicates special instructions, which are important but not related to hazards.

Carefully read and follow all safety instructions in this manual and on pump.



⚠ WARNING HAZARDOUS PRESSURE: Do not run pump against closed discharge. Release all system pressure before working on any component.

⚠ CAUTION Do not run pump dry. Fill pump with water before starting or pump will be damaged.

The motor on this pump is guaranteed by the manufacturer and in event of failure it must be returned to an authorized service station for repairs. Motor warranty is void if repairs aren't made by an authorized repair station.

ELECTRICAL SAFETY

⚠ CAUTION Make sure all ELECTRICAL POWER IS OFF before connecting any electrical wires.

⚠ WARNING Capacitor voltage may be hazardous. To discharge motor capacitor, hold insulated handle screwdriver BY THE HANDLE and short capacitor terminals together. Do not touch metal screwdriver blade or capacitor terminals or electrical shock could occur. If in doubt, consult a qualified electrician.

⚠ WARNING



Hazardous voltage. Can shock, burn, or cause death.

Ground pump before connecting to power supply. Disconnect power before working on pump, motor or tank.

⚠ Wire motor for correct voltage. See “Electrical Installation” section of this manual and motor nameplate.

⚠ Ground motor before connecting to power supply.

⚠ Meet National Electrical Code (NEC) or Canadian Electrical Code (CEC) and local codes for all wiring.

⚠ Follow all pump wiring instructions provided in this manual.

⚠ CAUTION DO NOT touch an operating motor. The surface of the motor may be HOT. Allow the motor to cool for thirty (30) minutes before handling.

GENERAL SAFETY

- Do not allow pump or any system component to freeze. To do so will void the warranty.
- This pump has been evaluated for pumping water only. Pumping liquids other than water may void warranty.
- Periodically inspect pump and system components.

INTRODUCTION

You have purchased one of the most user friendly pumps available. The Turf Boss pumps are made with high quality materials which are designed to provide you with years of reliable service. Lawn sprinklers are designed to maximize output flow, while still maintaining the ability to draw water from a source up to 25 feet below the pump. All mechanical parts, motor, impeller, electrical controls, etc., are above ground within easy reach. If service is ever necessary, simple hand tools will do the job. This lawn sprinkler pump installs easily and quickly without the need for special tools or pump rigs. You can install it yourself provided you follow closely the instructions contained in this manual.

INSPECT YOUR SHIPMENT

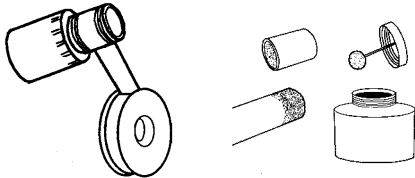
All Turf Boss lawn sprinkler pumps are carefully tested, inspected, and packaged to insure their arrival in perfect condition. When the pump is received, examine it closely to make sure there is no damage or broken parts that may have occurred in shipping. If damage is evident, report this immediately to your shipping carrier and dealer. This shipping carrier assumes full responsibility for the shipment's safe arrival. Any claim for damage to the shipment, either visible or concealed, must be made through the shipping carrier first.

PRE-INSTALLATION CHECK

- Pump must not be more than 25 feet above the surface of the water.
- Use as few elbows and fittings as possible to reduce friction and maximize flow.
- Be sure pipe, fittings, and foot valve are clean and free of debris.
- There should be no air pockets or leaks in the suction pipe.
- Teflon tape should be used to seal threaded pipe connections.

INSTALLATION TIPS

- Wrap all threaded male pipe ends and fittings with teflon tape. This will ensure a good seal around all pipe connections.
- PVC Pipe Connections: Use PVC pipe primer on all glue joints before applying PVC cement. After applying PVC cement to both surfaces to be glued, connect pipe and fitting, turn pipe one-quarter turn and hold for 30 seconds. This will ensure a positive cementing of all joints.



INSTALLATION

LOCATION OF PUMP

Decide on an area for the pump installation that is suitable based on the enclosure rating of the electric pump motor. All Turf Boss pumps are UL778 approved and will be marked "ACCEPTABLE FOR OUTDOOR or INDOOR USE."

• INDOOR PUMP INSTALLATION OPTION:

Choose a clean, well-ventilated, weatherproof location that affords protection from freezing, flooding, and excessive heat. In addition, it should provide access for servicing and allow convenient draining of the pump and service pipes. A prepared foundation is not essential, provided the surface is hard and level. It can be located in the basement or utility room of your house, at the well or between the point of use and the well.

• OUTDOOR PUMP INSTALLATION OPTION:

When installing outside of the house, the pump should be protected by a pump house with auxiliary heat to prevent possible freezing.

Choose a clean location best suited for the water system. A prepared foundation is not essential, provided the surface is hard and level. It should provide access for servicing and allow convenient draining of the pump and service pipes. When installing outside of the house, the pump and piping system must be drained completely of water to prevent possible freezing when weather dictates.

Decide how to seal the well from surface contamination as required by local authorities. The most common device for this purpose is the **SANITARY WELL SEAL**. If the pipes from the well have to be kept below the

frost line, either bury the wellhead or use a **PITLESS ADAPTER** that leaves the wellhead exposed for servicing while providing sealed openings in the well casing below the frost line.

Following are three well and water source applications for the Turf Boss sprinkler pump. Wells may differ slightly but the application is essentially the same.

Single Shallow Well (Figure 1)

The single shallow well is typically a drilled well with a 4" or 6" steel or plastic casing running vertically into the ground. The surface of the water should not exceed 25 feet in depth.

Connect the foot valve to the first length of suction pipe and lower into well. Add pipe sections as needed, securing them using one of the sealing methods previously mentioned. The foot valve should be AT LEAST five feet below the surface of the water to allow for water draw down.

Seal the top of the 4" or 6" well casing with a well seal to prevent debris from falling into the well.

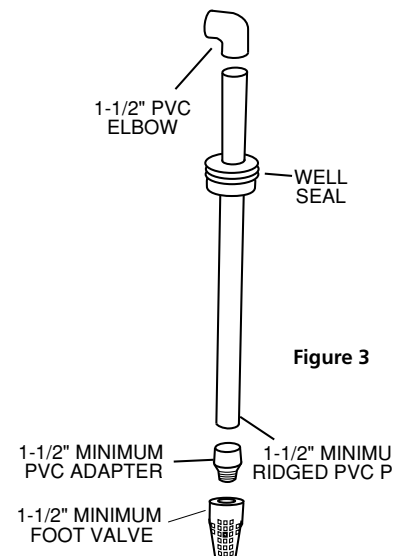


Figure 1

Multi-shallow Well Points (Figure 2)

The multi-point shallow well configuration consists of two or more wells as a water supply. The wells should be at least five feet apart. The wells may be spaced as a straight line (two or more wells), a triangle (three wells), or a square (four wells).

Install a check valve or a fine screen well point on each well to ensure the pump maintains prime. The flow arrow on a check valve must point toward the pump.

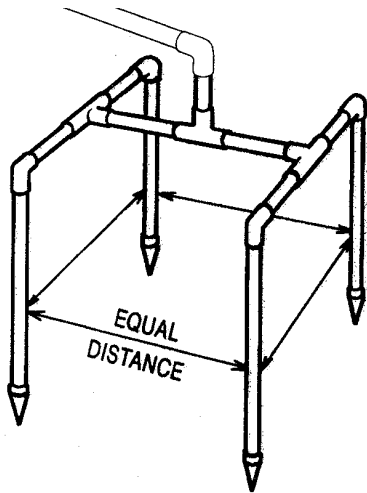


Figure 2

Lake Or Pond Installation (Figure 3)

Using a surface water source such as a lake or pond is similar to using a single shallow well. The suction pipe is placed in the water source and leads back to the pump. This application may require a long horizontal distance between water source and pump.

The suction pipe size should increase by one size to minimize pressure loss caused by friction from pipe distance.

Place a foot valve at the end of the suction pipe to protect the pump from debris.

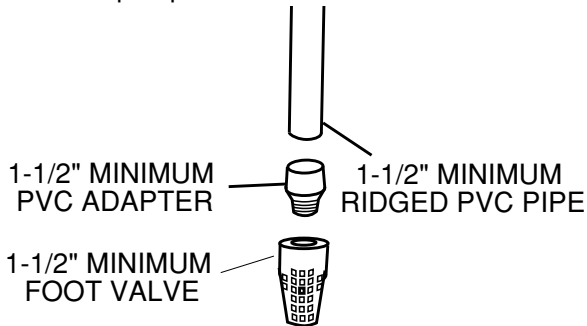


Figure 3

PLUMBING

Bolt the pump to a level, solid foundation, if possible. Position the pump with the suction port facing the water source pipe(s). Avoid 90° angles whenever possible and minimize turns when connecting pump to your water source. Install the pump as close to the water source as possible. This will help reduce friction and maximize water pressure.

HORIZONTAL OFFSET SUCTION PIPING

When the pump is offset from the well, the horizontal offset suction piping may have to be increased in

diameter to reduce friction loss. The friction loss in a system increases:

- 1.) As the flow rate increases
- 2.) As the piping size decreases

Consult included Turf Boss performance tables (Appendix III) and friction loss tables (Appendix IV) to determine the amount of head lost for a given application. Pipes from the well to the pump should slope upward (about 1" of rise for every 30" of run).

DISCHARGE PIPE SIZES FOR INSTALLATION

When the pump is located at a distance from points of water use, it is necessary to increase the discharge pipe size in order to reduce friction loss. The friction loss in a system increases:

- 1.) As the flow rate increases
- 2.) As the piping size decreases

Consult included Turf Boss performance tables (Appendix III) and friction loss tables (Appendix IV) to determine the amount of head lost for a given application.

A. Suction Port Connection (Figure 4)

Step 1:

Attach the foot valve or well point to pipe assembly and lower pipe and foot valve until it is at least five feet below the water level. If you are using a well, temporarily clamp the pipe to the well casing to prevent the pipe from sliding into the well. If well is in a 4" or 6" casing, use a well seal at the surface. Never use a suction pipe size smaller than the size of the suction port on the pump.

Step 2:

Connect the necessary elbows, fittings, check valves, and pipe from the water to the pump suction port on front of pump. When using PVC, pre-assemble pipe and fittings to the pump BEFORE applying PVC cement to ensure proper cuts and inventory. Use teflon tape on all male threads, wrapping clockwise (when facing pipe) 1 to 2 layers thick. Tighten all threaded pipe fittings until snug. DO NOT OVER TIGHTEN PIPE AND FITTINGS!! Tighten joints hand tight plus 1/2 turn with pipe wrench.

B. Discharge Port Connections (Figure 5)

Step 1:

Thread male adapter or pipe nipple into discharge port on top of pump. (Use teflon tape on thread)

Step 2:

Connect pipe between the sprinkler manifold and the pump discharge. Discharge pipe size should increase with long pipe runs. Discharge pipe size may equal discharge port size for distances up to 100'. Increase discharge pipe size by one size for distances of 100' to 300'. For 300' to 600', increase pipe size by two sizes. This will reduce pressure loss caused by friction.

Step 3:

Tighten all threaded pipe connections with pipe wrench until snug. Do not over tighten.

Figure 5

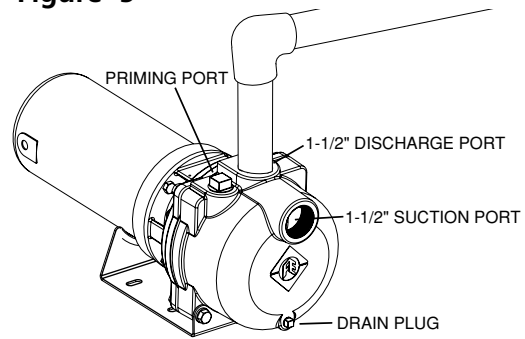
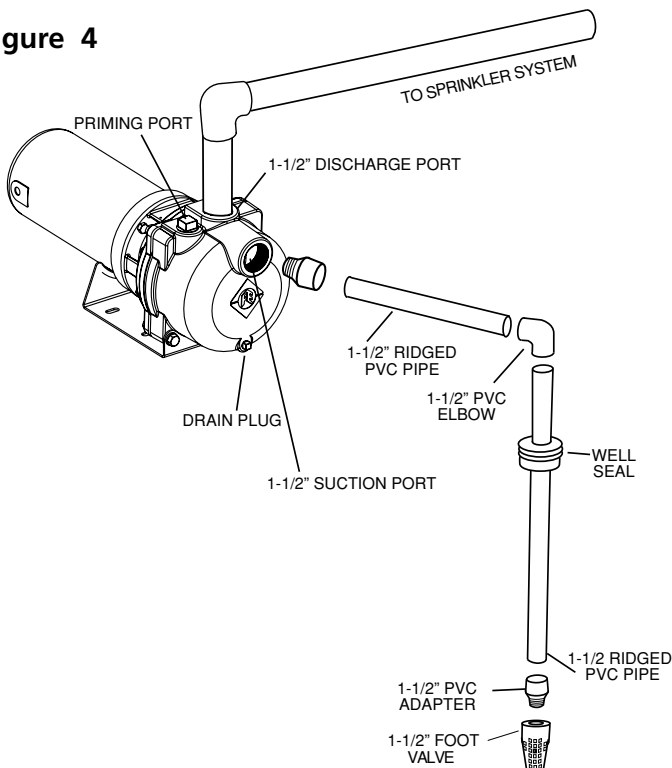
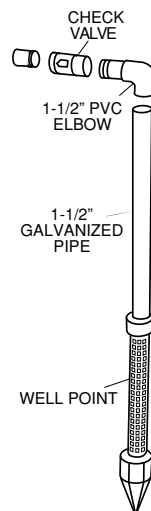


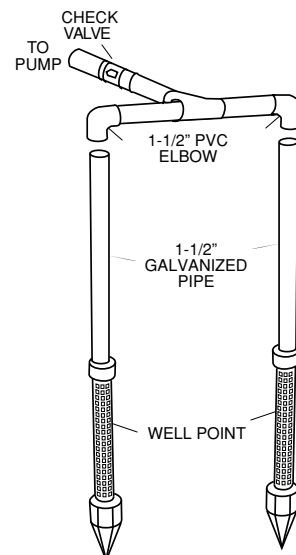
Figure 4



WELL POINT INSTALLATION



MULTIPLE WELL POINT INSTALLATION



INSTALLATION RECORDS

To keep an accurate record of your installation, be sure to fill out the data below:

Date of Installation:
Model:
Depth of Well (ft):
Depth to Water (ft):
Inside diameter of Well:
Suction Pipe Size:
Suction pipe length (ft):
Discharge pipe length (ft):
Motor:
HP:
Volts:
Wire gauge size:

ELECTRICAL INSTALLATION



⚠ WARNING Hazardous voltage can shock, burn or cause death.

⚠ CAUTION If you are not sure of proper electrical connections, consult a licensed electrician.

⚠ CAUTION Improper wiring can result in permanent damage to the motor. All electrical wiring should meet the local electrical code.

NOTICE

READ AND FOLLOW ALL INSTRUCTIONS!

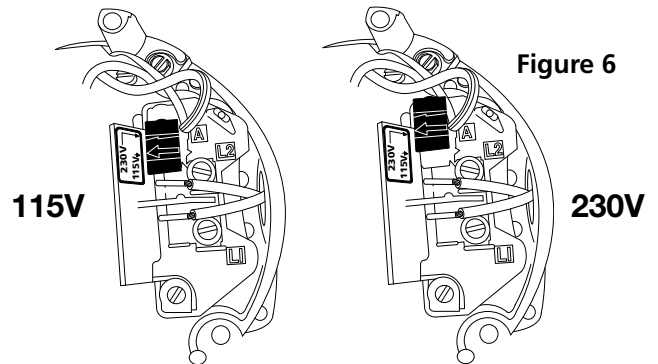
- Pump connection must comply with National Electric Code (NEC) or Canadian Electric Code (CEC), and all applicable local codes.
- All dual voltage units come factory preset for 230 volts. (Figure 3)
- Disconnect power at electrical panel before making any electrical connections.
- Supply voltage must be +/- 10% of motor nameplate voltage. Low or high voltage can damage the motor and will void the warranty.
- If possible, connect pump to dedicated branch circuit with no other appliances on it.
- Do not operate pump unless pump is grounded

NOTICE: If you purchased a 3 phase pump/motor assembly, the motor rotation must be checked after priming the pump, but before continuous operation. Check the rotation by “bumping” the power to the motor and observing the coupling rotation. Reverse the rotation as instructed on the motor if it does not match the rotation arrow on the bracket. If you purchased a pump end and are attaching a three-phase motor, the rotation must be checked before the pump is connected to the motor. See “Installing Motor on Pump Ends” in this manual. A fused disconnect switch or circuit breaker should be placed at or near the pump.

DUAL VOLTAGE ADJUSTMENT

(Single-phase pump motor assemblies only)

NOTE: To change the motor voltage (Figure 6) unplug the dual voltage connector on the motor and reconnect it in the position required to match the available electrical system. The motor can be set for 115 volts or 230 volts, except for 2 hp models which are 230 volts only. The voltage setting of the motor can be determined by looking at the alignment of the arrow on the plug and the arrow on the motor terminal board (located under the motor's end cover). Any questions as to which voltage setting is required for proper motor and pump operation in your system should be directed to an electrical professional. The factory preset is 230 volts.



Wiring Installation

NOTICE: Check motor terminal cover or nameplate for wiring instructions. The essential pump motor facts are as follows:

- 1.) 3450 RPM
- 2.) Single Phase
- 3.) Dual Voltage, 115/230 on 1 and 1-1/2 HP; 230 V only on 2 HP motors.
- 4.) 1/2, 3/4, 1, and 1-1/2 Horsepower motors are wired for 230 volts as a factory standard.

Step 1:

Remove motor access cover at back of motor.

Step 2:

Feed the grounding wire (green or bare copper) through the electrical conduit port in the side of the motor. First connect the ground wire then connect the power supply wires. Attach the grounding wire to the motor ground screw (green). Secure wires to prevent electrical shorts.

Step 3:

Connect the incoming power supply wires to the motor terminal.

Step 4:

Replace and secure motor cover.

NOTE: Single phase motors rotate counterclockwise only (when facing suction port) and cannot be reversed.

MOTOR

NOTICE: A motor operating under normal conditions maintains its rated performance, assuming a clean, dry motor with proper ventilation. A dirty motor, or one "protected" by a burlap or plastic bag, will overheat.

PRIMING AND START UP

⚠ WARNING

NEVER run pump dry. Fill pump with water before starting pump. Operating pump dry may cause damage to pump and will void warranty.

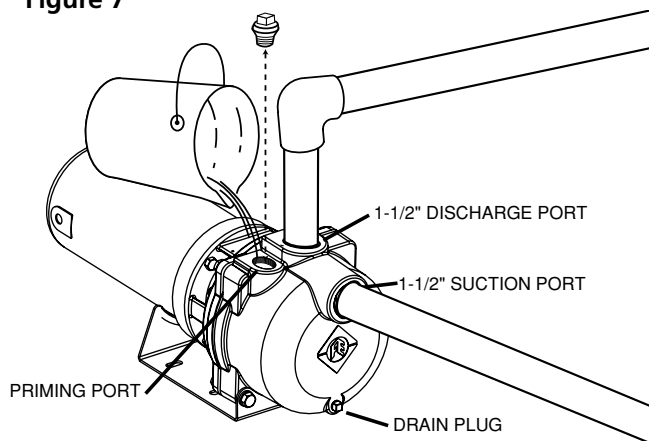
⚠ WARNING

NEVER run pump against a closed discharge. This may cause hazardous pressure and risk of explosion.

Step 1 (Figure 7):

Remove priming port plug from pump.

Figure 7



Step 2:

Open discharge valves and any hoses on discharge side of pump.

Step 3:

Fill pump with water through the priming port on top of pump. Allow trapped air to escape for a few minutes, then add more water until full.

Step 4:

Replace priming port plug and tighten with wrench, using teflon tape on pipe threads.

Step 5:

Start the pump. A properly primed pump should discharge water without air at a consistent pressure. If the pump does not produce water after five minutes, stop the pump, release all pressure, remove priming port plug, add more water, replace plug, and try again. (Make sure that a foot valve is properly installed on the suction pipe. See "Suction port connection". Figure 4)

MAINTENANCE

⚠ WARNING



⚠ WARNING

Failure to disconnect electrical power before attempting maintenance can cause shock, burns, or death.

⚠ WARNING

Before disconnecting pump, be sure fuse box leads are disconnected or power is turned off. After reassembling the pump, refer to priming instructions before running.

⚠ WARNING



HAZARDOUS PRESSURE!

-Do not run pump against closed discharge.

-Release all pressure on system before working on any component.

A. Draining (Figure 8)

The pump should be drained if it is in danger of freezing, if it will be out of service for an extended period of time, or if it requires service.

To drain pump, disconnect power source, remove priming port plug from pump case, remove drain plug (below suction port), and drain system. Replace drain plug.

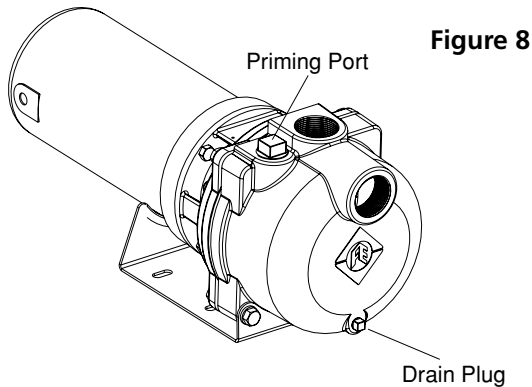


Figure 8

NOTICE: While this will drain the pump, it will not necessarily drain all other parts of the piping system. If there are any concerns with the proper procedure or necessity of draining the suction plumbing, contact your contractor.

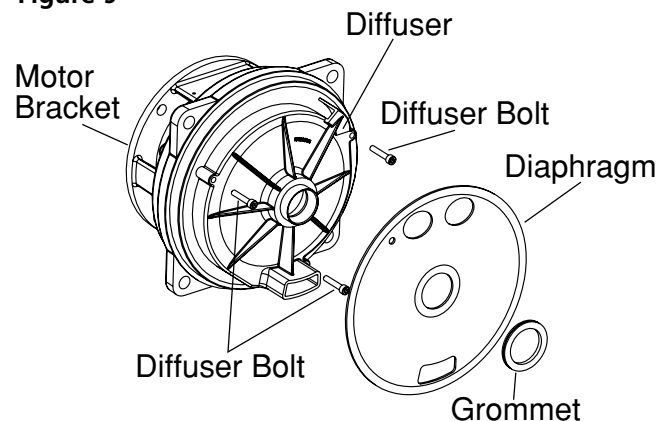
B. Pump Disassembly (Appendix I & Figure 9)

In order to access the internal components of the pump, review the exploded diagram of the pump assembly as shown on the repair parts page (Appendix I). Drain the pump as described above and then remove the four bolts that hold the pump case to the motor bracket. This will allow the motor and hydraulic sub-assembly to be removed from the case without disturbing the plumbing. Locate and inspect the diaphragm and grommet which are internal water seals. Make sure they are in good condition and are working properly. To remove the diffuser, loosen the 3 bolts that attach it to the motor bracket. This will expose the impeller and eye-seal. Remove the eye-seal. In order to remove the impeller, remove the cover from the opposite end of the motor and hold the shaft with a 7/16" open end wrench. The motor shaft is flatted behind the centrifugal switch, close to the motor end bell. The open end wrench can be inserted down into the shaft from behind the motor overload. Unscrew the impeller from the motor shaft by grasping the OD of the impeller with a gloved hand and rotating counter clockwise. This will reveal the mechanical shaft seal. This seal can then be removed from the motor shaft for inspection. The motor bracket can be removed from the motor by removing the 4 bolts on the backside of the motor bracket. To remove the ceramic shaft seal, press gently from the backside on the ceramic and it will fall out easily. Inspect, clean or replace parts as needed.

C. Pump Assembly

Reassemble unit by first pressing the ceramic seal into the seal plate. Use rubbing alcohol as a lubricant. Do not use an oil, vaseline or grease as this will damage the sealing surfaces of the shaft seal during operation. Next, install the motor bracket onto the motor using the four bolts. Tighten the bolts in a diagonal pattern to insure a proper fit. Place the shaft seal on the motor shaft and then install the impeller and eye-seal. The diffuser is positioned by three bolts that can only be installed when the diffuser is oriented properly (Figure 9). Position the diaphragm on the diffuser suction eye. (as shown in Figure 9). The grommet will slide over the diffuser eye on top of the diaphragm. Lift the motor assembly up into the pump case and attach it using the 4 bolts. When seating the pump case against the motor bracket, the diaphragm should be captivated between them around the entire perimeter. This allows the diaphragm to serve as a water seal between the two cast iron parts. If the diaphragm is not positioned correctly the unit will leak once the case is filled with water. Tighten all bolts to 185 in-lbs in a diagonal pattern to insure proper seating of all components.

Figure 9



PARTS FOR TURF BOSS SELF-PRIMING SPRINKLER PUMP

APPENDIX I

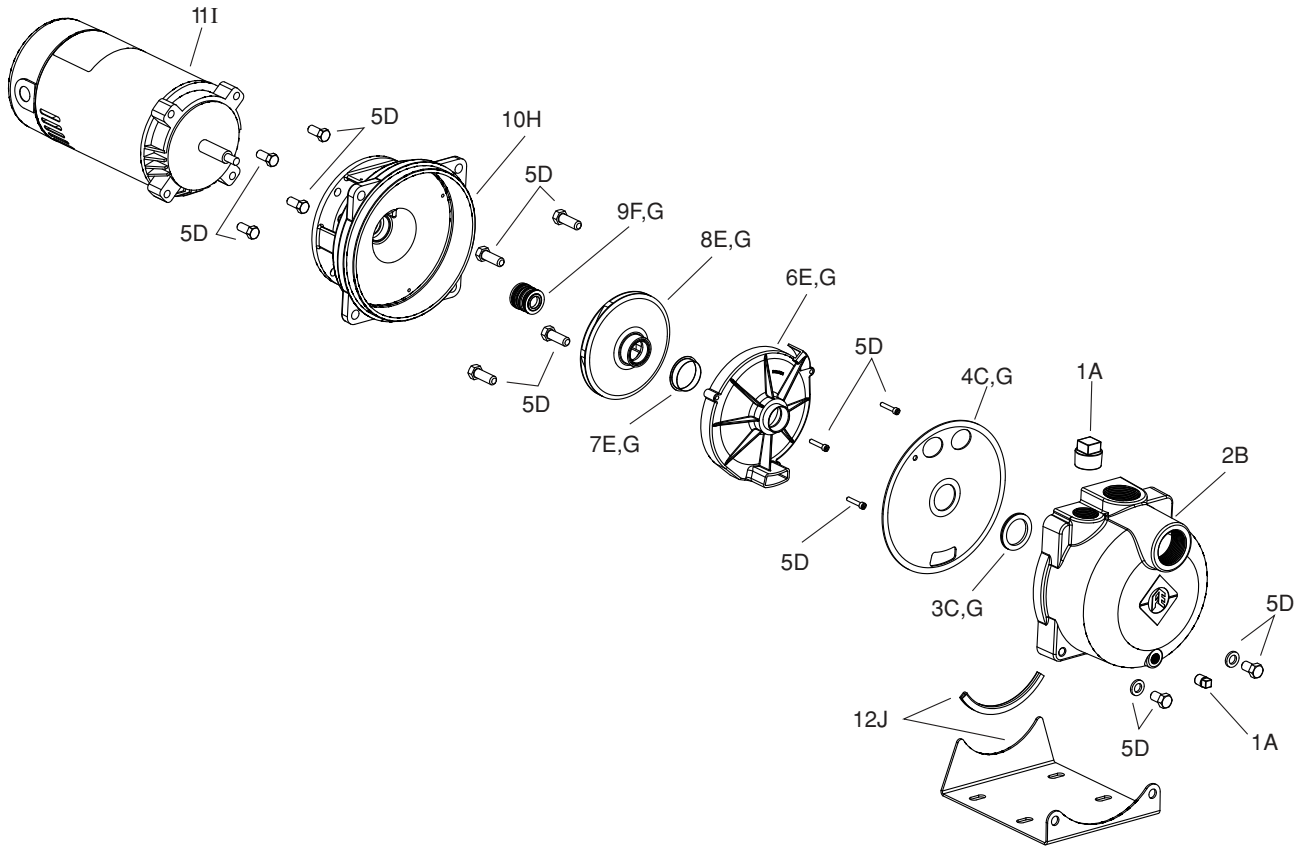


Figure Number	Description	Kit Grouping Identifier*	Repair Part Order Codes by Model Number		
			TB1CI	TB15CI	TB2CI
1	Plug Kits	A	305390901		
2	Pump Case	B	305391901		
3	Grommet	C	305392901		
		G	305396901	305396902	305396903
4	Diaphragm	C	305392901		
		G	305396901	305396902	305396903
5	Fastener Kit*	D	305393901		
6	Diffuser	E	305394901	305394902	305394903
		G	305396901	305396902	305396903
7	Wear Ring	E	305394901	305394902	305394903
		G	305396901	305396902	305396903
8	Impeller, Thermoplastic	E	305394901	305394902	305394903
		G	305396901	305396902	305396903
	Impeller, Stainless Steel	E	305394904	305394905	305394906
		G	305396904	305396905	305396906
9	Mechanical Seal	F	305395901		
		G	305396901	305396902	305396903
10	Motor Bracket	H	305397901		
11	Motor, Single-Phase	I	305398901	305398902	305398903
	Motor, Three-Phase	I	305398904	305398905	305398906
12	Base Assembly	J	305399901		

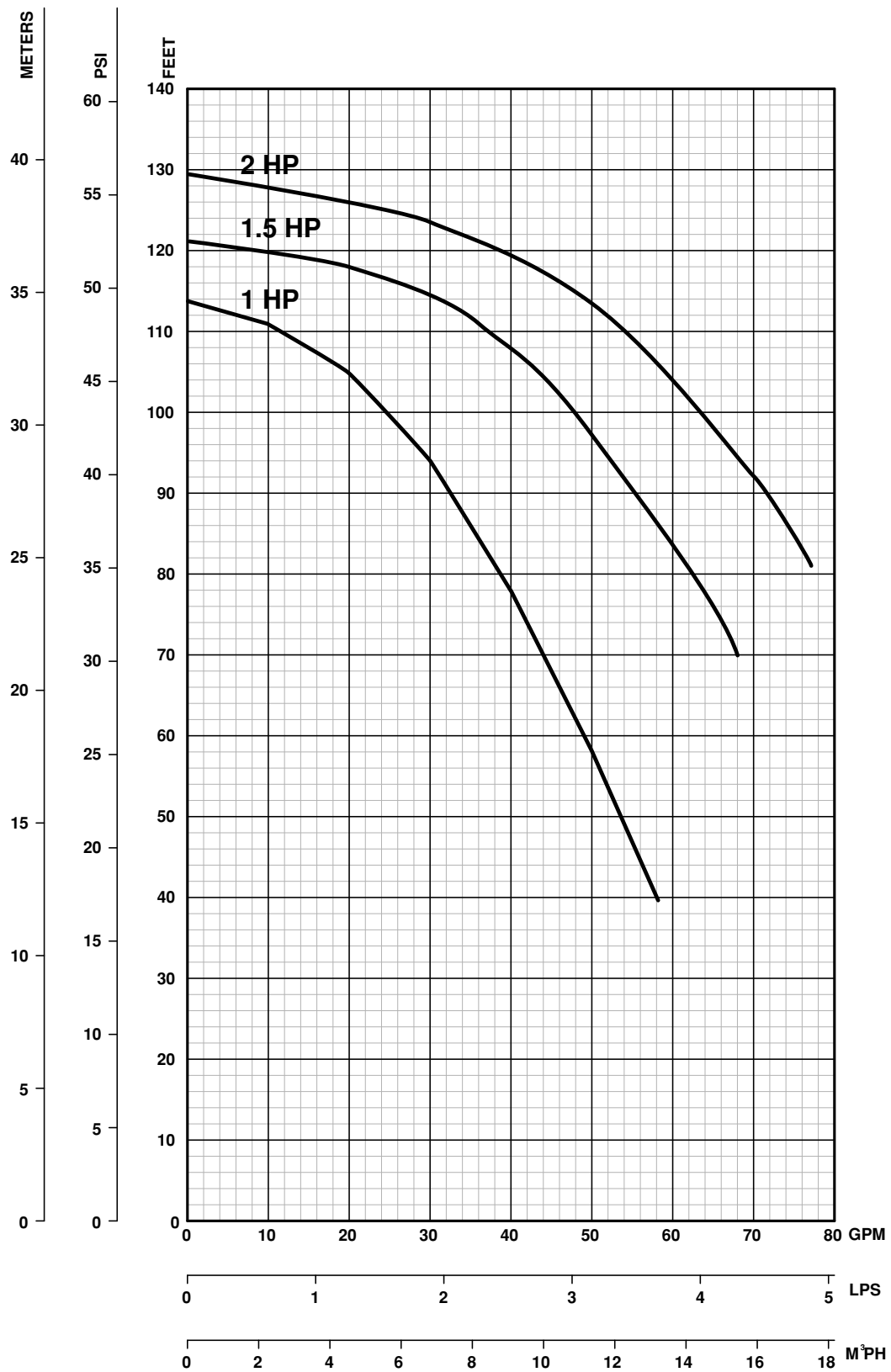
* Items with like identifiers are sold/packaged together

** Fastener kits (5D) is a complete set of the hardware used to assemble the Turf Boss. As a convenience all other repair kits contain the fasteners needed for the reassembly of its components.

APPENDIX II - TROUBLESHOOTING

Problem	Possible Cause	Remedy
Pump does not deliver water or pressure	1. The pump is is not full of water.	1. Stop the pump, fill it with water, check all pipe connections to make sure there are no air leaks and try again.
Low pressure	1. The motor is not up to speed. 2. The impeller is partially plugged. 3. Air is leaking into suction line.	1. Check for proper voltage and tight wiring connections. 2. Check impeller for rocks or debris. Refer to disassembly instruction for getting to impeller. 3. Check suction line connections.
Low capacity	1. Your water level is deeper than 25 feet. 2. You are using too long a pipe from the water to the pump. 3. You have a plugged impeller. 4. The pipe from the pump to the water is partially plugged. 5. The motor is rotating backwards. (3 phase only)	1. Pump can't pump below 25 feet. Call your Franklin Pump Systems dealer. 2. You should use a larger diameter pipe. 3. Check impeller. Refer to disassembly instructions above. 4. Check pipe. 5. Switch 2 leads to reverse rotation (3 phase only)
Motor overheats	1. Improper voltage or wiring connections. 2. Improper ventilation for the motor.	1. Check to see if your voltage is the same as indicated on the motor name on dataplate. Be sure all wiring connections are tight. 2. Check to see if motor is clean and properly vented.
Motor will not start	1. Open switches, blown fuses or loose connections. 2. Improper connections to motor.	1. Check switches, fuses and connection. 2. Make sure connections are tight.
Air logging (excessive air in pipe)	1. Air leaks in pipe. 2. Water drops below the end of the pipe.	1. Check connections. 2. Pump is out-producing well. Tighten down control valve gradually until pump starts operating properly.
Gravelly noises inside pump (cavitation)	1. Pump running over capacity (NPSHR exceeds NPSHA) 2. Suction pipe is too small or length of pipe is too long. 3. End of suction pipe is in mud or sand.	1. Call your Franklin Pump Systems dealer. 2. Use a larger diameter pipe. 3. Raise end of suction pipe or clean out well.

APPENDIX III - PERFORMANCE CURVE



APPENDIX IV - FRICTION LOSS TABLES

1"

Schedule 40 pipe 1.049 in. i.d. / Type L Copper tube 1.025 in. i.d.

GPM	Velocity Ft/S	Friction Loss Ft Hd./100' of pipe		Velocity Ft/S	Ft Hd./ 100' Pipe Fric. Loss C=130
		Steel C=100	PVC C=140		
2.0	0.74	0.60	0.32	.078	0.41
3.0	1.11	1.26	0.68	1.17	0.87
4.0	1.49	2.14	1.15	1.56	1.48
5.0	1.86	3.24	1.75	1.95	2.23
6.0	2.23	4.54	2.45	2.34	3.13
8.0	2.97	7.73	4.16	3.11	5.35
10	3.71	11.7	6.31	3.89	8.08
12	4.46	16.4	8.85	4.67	11.3
14	5.20	21.8	11.8	5.45	15.0
16	5.94	27.9	15.1	6.22	19.2
18	6.68	34.7	18.7	7.00	23.9
20	7.43	42.1	22.8	7.78	29.0
25	9.29	63.6	34.6	9.74	43.9
30	11.1	89.2	48.1	11.7	61.4
40	14.9	152	82.0	15.5	105

1.5"

Schedule 40 pipe 1.610 in. i.d. / Type L Copper tube 1.505 in. i.d.

GPM	Velocity Ft/S	Friction Loss Ft Hd./100' of pipe		Velocity Ft/S	Ft Hd./ 100' Pipe Fric. Loss C=130
		Steel C=100	PVC C=140		
6.0	0.95	0.57	0.31	1.08	0.49
8.0	1.26	0.96	0.52	1.44	0.82
10	1.58	1.45	0.79	1.80	1.24
12	1.89	2.04	1.10	2.16	1.73
15	2.36	2.95	1.59	2.70	2.62
20	3.15	5.24	2.83	3.60	4.46
25	3.94	7.90	4.26	4.51	6.74
30	4.73	11.1	6.00	5.41	9.44
40	6.30	18.9	10.2	7.21	16.1
50	7.88	28.5	15.4	9.01	24.3
60	9.46	40.0	21.6	10.8	34.1
70	11.0	53.2	28.7	12.6	45.5
80	12.6	68.1	36.8	14.4	58.1
90	14.2	84.7	45.7	16.2	72.1
100	15.8	103	56.6	18.0	87.7

2.5"

Schedule 40 pipe 2.469 in. i.d. / Type L Copper tube 2.465 in. i.d.

GPM	Velocity Ft/S	Friction Loss Ft Hd./100' of pipe		Velocity Ft /S	Ft Hd./ 100' Pipe Fric. Loss C=130
		Steel C=100	PVC C=140		
20	1.21	0.66	0.35	1.34	0.40
30	2.01	1.39	0.75	2.02	0.85
40	2.68	2.36	1.27	2.69	1.46
50	3.35	3.56	1.92	3.36	2.20
60	4.02	4.99	2.69	4.03	3.08
70	4.69	6.64	3.58	4.70	4.11
80	5.36	8.50	4.59	5.37	5.25
90	6.03	10.6	5.72	6.04	6.52
100	6.70	12.8	6.90	6.71	7.94
110	7.37	15.3	8.22	7.38	9.44
130	8.71	20.9	11.3	8.73	12.9
150	10.0	27.3	14.7	10.1	16.8
200	13.4	46.3	25.0	13.4	28.6
250	16.8	81.7	44.1	16.8	43.4
300	20.1	98.1	52.9	20.1	61.1

1 1/4"

Schedule 40 pipe 1.380 in. i.d. / Type L Copper tube 1.265 in. i.d.

GPM	Velocity Ft/S	Friction Loss Ft Hd./100' of pipe		Velocity Ft /S	Ft Hd./ 100' Pipe Fric. Loss C=130
		Steel C=100	PVC C=140		
4.0	0.86	0.56	0.30	1.02	0.52
6.0	1.29	1.20	0.65	1.53	1.12
8.0	1.72	2.04	1.10	2.04	1.92
10	2.15	3.08	1.67	2.55	2.90
12	2.57	4.31	2.33	3.06	4.04
14	2.00	5.73	3.10	3.57	5.35
16	3.43	7.34	3.96	4.08	6.85
18	3.86	9.13	4.93	4.59	8.52
20	4.29	11.1	6.00	5.10	10.4
25	5.36	16.8	9.06	6.38	15.7
30	6.43	23.5	12.7	7.65	22.1
40	8.58	40.0	21.6	10.2	37.6
50	10.7	60.4	32.6	12.8	56.7
60	12.9	84.7	45.6	15.3	79.5
80	17.2	144	77.9	20.4	136

2"

Schedule 40 pipe 2.067 in. i.d. / Type L Copper tube 1.985 in. i.d.

GPM	Velocity Ft/S	Friction Loss Ft Hd./100' of pipe		Velocity Ft/S	Ft Hd./ 100' Pipe Fric. Loss C=130
		Steel C=100	PVC C=140		
10	0.96	0.43	0.23	1.07	0.35
15	1.44	0.92	0.50	1.60	.075
20	1.91	1.55	0.84	2.13	1.24
25	2.39	2.35	1.27	2.66	1.87
30	2.87	3.29	1.78	3.19	2.62
40	3.82	5.60	3.03	4.26	4.48
50	4.78	8.46	4.57	5.32	6.76
60	5.74	11.9	6.44	6.39	9.47
70	6.69	15.8	8.53	7.45	12.6
80	7.65	20.2	10.9	8.52	16.2
90	8.61	25.1	13.6	9.58	20.0
100	9.56	30.5	16.5	10.7	24.4
120	11.5	42.7	23.1	12.8	34.1
150	14.3	64.7	35.0	16.0	51.6
200	19.1	110	59.4	21.3	87.8

Note: Chart shows friction loss per 100' of pipe. To convert to friction loss per foot, move decimal point 2 places to the left.

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2. Product was not installed in accordance with applicable codes, ordinances and good trade practices;
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