

Deep Well Submersible Pumps

The dealer from whom you purchased your pump has a thorough knowledge concerning its operation and maintenance. If trouble develops, consult your dealer.

The Submersible Pump

The submersible pump is a precision built machine. It will give many years of trouble-free service if care is exercised in the initial installation. Please follow these instructions carefully to ensure top efficiency of your unit. Keep these instructions near the pump for ready reference.

Carefully remove your pump from the packing case. Make a visual inspection for any apparent shipping damage. For single phase motors, check voltage, phase and horsepower on motor nameplate with that of control box.

The Water Supply

Since a submersible is a high capacity pump, it follows that the well in which it is installed should be worthy of it. It should be free of sand, straight and of sufficient capacity to warrant the installation. Before installing the submersible, the well should be pumped clean of sand or any other foreign matter with a test pump since the warranty of the submersible is voided if it is used to clean the well. Where the water supply is a lake, stream or spring, an extra screen cage of some kind is required to keep leaves and other debris from clogging the screen of the pump.

Pumps will operate efficiently in a horizontal position in shallow pools.

Power Supply

The power supply for a submersible pump should be a separate circuit, independent of all other circuits. It should be equipped with a fuse and disconnect switch of suitable capacity. See Table 1 for recommended fuse sizes.

On rural installations, it is advisable that the power supply be free of any building, preferably on a direct line from the transformer so that, in the event of a fire, the wires will not be burned and the water supply cut off.

We recommend external lightning protectors on motors which do not have "built-in" lightning protection. All wiring should conform to national and local codes and be done by a competent electrician. Check voltage and phase at the fuse box before connecting to the pump.

Accessories

Listed in our Price List is a fittings package containing the accessories to complete the usual submersible installation. It contains a pressure switch which can be mounted on the tank or in the line. A pressure relief valve is recommended on any installation where the pumping system pressure can exceed the tank's pressure rating.

On three phase motors, a magnetic starter with quick trip heaters must be used. Failure to use proper heaters will void the motor warranty. Where the well is of lower capacity than that of the pump, a low water level control should be installed.

Cable Splice

After first checking the cable size against Table 2, proceed with the splice. This is a very important step and extreme care must be used. A mechanical bond between the pigtail wire of the motor and cable should be made with Stakon connectors which are supplied with the splice kit. If using the Stakon connector, special crimping pliers should be used. When splice is completed, check pump by running it in a barrel of water for continuity of wiring connections. Insulation check with OHM meter should be made at this time. See "Insulation and Continuity Test" section.

Insulation and Continuity Test

It is recommended that this test be made in a tank of water at the time the splice is completed and preliminary test run is made. The same test can be repeated when pump is installed in well and before the final electrical connections are made to the control box or starter.

1. Zero the OHM meter by clipping the leads together and adjusting the zero OHM knob until needle is over zero. (Always zero the OHM meter before using and every time selector switch is used.)
2. Clip one OHM meter lead to cable lead.
3. Clip the other lead to edge of steel tank in which pump and cable have been submersed or to the drop pipe or well casing if it is in well.

A reading of less than 1,000,000 OHMS indicates cable or splice is grounded. Slowly raise cable from the water at the OHM meter end. If the needle moves toward infinity or no reading, trouble is where the cable, splice or pigtail has just emerged from the water.

Three Phase Motor Rotation

Our submersible pumps rotate in a counter-clockwise direction (looking into the discharge outlet). Three phase motors will operate in reverse rotation if improperly connected to the power supply or magnetic starter. A three phase pump motor unit running backwards will develop about 50% of its rated output.

To check rotation, momentarily touch the three motor leads to the magnetic starter before installation. The motor should "kick" in a clockwise direction. Three phase motors may be reversed by interchanging any two of the three motor leads at the magnetic starter.

Placing of Pump in Well

When connecting the first length of pipe and placing the pump in the casing, care should be exercised to avoid misaligning the pump. A wrench should never be applied to the shell of the pump or to the motor casting but should be used on the top discharge casting. Some installers find it easier to handle the pump if a short piece of pipe is installed rather than a whole length. The cable should be taped to the pipe just above the pump and at 10 foot intervals thereafter. This will keep the cable from snarling. Do not let the cable drag over the edge of the well casing since this may cause the insulation to become cut or chafed. Never allow the weight of the pump to hang on the cable. We recommend attaching a safety rope or cable to the pump before installation.

Lower the pump into the well slowly without forcing it. Use a vise or foot clamp to hold the pipe while connecting the next length. A boom or tripod is recommended. Lower pump to approximately 10 feet below maximum draw-down of the water if possible and approximately 10 feet from bottom.

DO NOT set pump on bottom of well. When pump is at a desired depth, install throttle valve for preliminary test run. Wire through the control box or starter following instructions in box regarding color of wires, etc.

Test cable for continuity with OHM meter. Throttle pump and run until water is clear of sand or any other impurities. Gradually open throttle valve. If pump lowers water in the well to a point at which it loses its prime, either lower pump in well if this is possible or throttle the pump to the capacity of the well. A low water level control should be used on low capacity wells.

Install sanitary well seal if required. When a well seal is used, a coupling, elbow or tee is installed on the end of the last length of pipe and allowed to rest on the well seal to support pipe and pump. Most well seals provide a fitting to seal the power cable. If it does not have a wire seal, conduit must be used to protect the wire (including ground) and to prevent water from leaking into the well around the cable. If a ground wire is used it must then be wired back to ground at power supply.

Install check valve, relief valve, union and gate valve in line to the tank in which the air control gauge and pressure switch have been installed. The accompanying drawings illustrate the sequence of these accessories.

Motors and Lighting

A direct lightning strike will cause readily apparent damage to pump motor or other electrical equipment. For all practical purposes, there is no protection against it.

Much more common is the damage caused by high voltage surges on power lines. All overhead power lines are subject to extremely high voltage during electrical storms. It is not necessary for the power line to be actually struck by the lightning to induce the high voltage which immediately seeks the closest and best path to ground.

These voltages, if they travel through an electric motor on their way to ground, usually puncture a very small hole in the motor insulation. If the motor is running at the time, the normal voltage (110 or 220 V) will follow through the insulation in the path established by the high voltage surge. It is this power follow current which causes motor damage. It will be extremely high (almost as a short circuit) and will result in severe burning of windings and insulation.

This may happen immediately or the hole in the insulation caused by the lightning induced high voltage may slowly become larger until the normal motor operating voltage and current goes through the hole and damages the winding. For this reason the motor may become shorted and stop operating some time after the initial damage caused by the lightning.

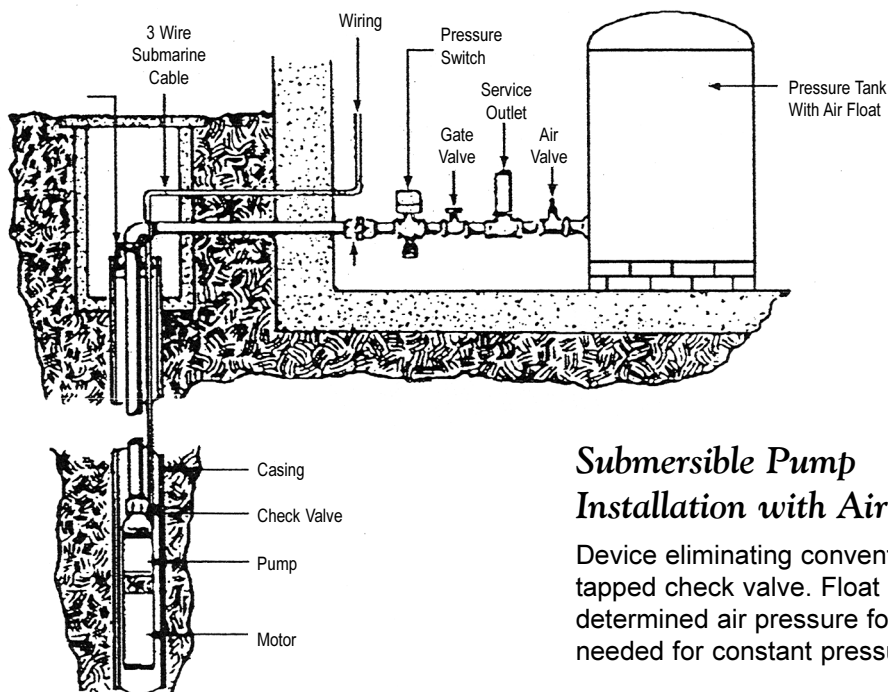
Submersible motors are no more or less likely to suffer this type of damage than any other motor. However, they are usually more expensive to repair or replace.

Motor damage due to lightning induced high voltage surges can, in most cases, be prevented by a properly installed lightning arrester.

Number of Starts

An excessive number of starts will lead to difficulties with pump motors and their associated controls. For maximum pump-motor line and minimum trouble, installations should be sized so that:

- motors of less than 1 hp should not be started more than 300 times in a 24 hour period.
- motors of 1 hp and larger should not be started more than 100 times in a 24 hour period.
- 3 phase motors should not be started more than 300 times in a 24 hour period.



Submersible Pump Installation with Air Float

Device eliminating conventional bleeder orifice and tapped check valve. Float allows tank recharging to the determined air pressure for proper volume of air needed for constant pressure operation.

Service Checks

Electrical

1. Motor fails to start

- Check fuses
- Check for open or broken leads at terminal
- Check to determine if power is being delivered to fuse box of service entry
- Check relay, overload and capacitor in control box
- Check pressure switch
- Motor tries to start but blows fuses or trips overload
- Fuses too small

2. Motor or cable grounded

- Voltage too high or too low
- Control box in too warm location
- Check control box or starter
- Pump may be sandbound

Hydraulic

1. Pump does not deliver rated capacity

- Water in well not adequate - lower pump in well, use throttle valve, use smaller pump. Low water level control may be needed
- Horizontal check between pump and tank may be stuck or installed backwards
- Low voltage, reducing RPM
- Pump is air or gas locked. Three possible solutions:
 - a) Raise pump up and down to release air.
 - b) Remove check valve at top of pump. Install one 20 foot pipe length above the pump and then install a vertical check valve.
 - c) Drill 1/8" hole in top of pump discharge casting.
- Intake screen clogged
- Impellers and diffusers worn due to abrasives
- Incorrect rotation

2. Pump starts too frequently

- Water-logged tank - check air charger, bleed orifice may be clogged
- Pressure switch may be out of adjustment
- Leak in system, tank check valve, discharge line, etc.
- Milky water or air from faucet
- Air release on tank not functioning
- Gas in water supply (see 1)

3. Pump fails to shut off

- Pressure switch defective
- Weak well
- Worn pump
- Pump setting too deep

TABLE 1

**CURRENT & FUSE REQUIREMENTS
SUPER STAINLESS MOTORS**

2 AND 3 WIRE

Rating		Dia.	Service Factor	Circ. Brk or	Dual Element
HP	Volt			Std. Fuse (amp)	Fuse No.
1/4	115	4"	1.85	20	8
	230	4"	1.85	15	4
1/3	115	4"	1.75	25	10
	230	4"	1.75	15	5
1/2	115	4"	1.60	30	15
	230	4"	1.60	15	7
3/4	230	4"	1.50	20	9
1	230	4"	1.40	25	12
1-1/2	230	4"	1.30	30	15

MT-3 SINGLE PHASE MOTORS

Rating		Dia.	Service Factor	Circ. Brk or	Dual Element
HP	Volt			Std. Fuse (amp)	Fuse No.
1/4	115	4"	1.85	25	10
	230	4"	1.85	15	5
1/3	115	4"	1.75	30	12
	230	4"	1.75	15	6.25
1/2	115	4"	1.60	40	15
	230	4"	1.60	20	8
3/4	115	4"	1.50	45	20
	230	4"	1.50	25	10
1	230	4"	1.40	30	12

MT SINGLE PHASE MOTORS

Rating		Dia.	Service Factor	Circ. Brk or	Dual Element
HP	Volt			Std. Fuse (amp)	Fuse No.
1/4	115	4"	1.85	20	8
	230	4"	1.85	15	4
1/3	115	4"	1.75	25	10
	230	4"	1.75	15	5
1/2	115	4"	1.60	30	15
	230	4"	1.60	15	7
3/4	115	4"	1.50	40	17.5
	230	4"	1.50	20	9
1	230	4"	1.40	25	12
1-1/2	230	4"	1.30	30	15
2	230	4"	1.25	35	15
3	230	4"	1.15	45	20
	5	230	4"	1.00	80
5	230	6"	1.15	80	35
	7-1/2	230	6"	1.15	100
10	230	6"	1.15	150	60

THREE PHASE MOTORS

Rating		Dia.	Service Factor	Circ. Brk or	Dual Element
HP	Volt			Std. Fuse (amp)	Fuse No.
1-1/2	200	4"	1.30	20	9
	230	4"	1.30	20	8
	460	4"	1.30	15	4
	575	4"	1.30	15	3
2	200	4"	1.25	25	10
	230	4"	1.25	20	10
	460	4"	1.25	15	5
	575	4"	1.25	15	4
3	200	4"	1.15	35	15
	230	4"	1.15	30	15
	460	4"	1.15	15	7
	575	4"	1.15	15	6
5	200	4"	1.15	50	25
	230	4"	1.15	45	20
	460	4"	1.15	25	10
	575	4"	1.15	20	8
	200	6"	1.15	50	25
	230	6"	1.15	45	20
	460	6"	1.15	25	10
	575	6"	1.15	20	8
7-1/2	200	4"	1.15	80	35
	230	4"	1.15	70	30
	460	4"	1.15	35	15
	575	4"	1.15	30	12
	200	6"	1.15	70	30
	230	6"	1.15	70	30
	460	6"	1.15	30	15
	575	6"	1.15	25	12
10	460	4"	1.15	45	20
	575	4"	1.15	40	20
	200	6"	1.15	100	40
	230	6"	1.15	80	35
	460	6"	1.15	40	20
	575	6"	1.15	35	15
15	200	6"	1.15	150	60
	230	6"	1.15	125	60
	460	6"	1.15	60	30
	575	6"	1.15	50	25
20	200	6"	1.15	200	80
	230	6"	1.15	175	70
	460	6"	1.15	80	35
	575	6"	1.15	70	30
25	200	6"	1.15	225	100
	230	6"	1.15	200	90
	460	6"	1.15	100	45
	575	6"	1.15	80	35
30	200	6"	1.15	300	125
	230	6"	1.15	250	110
	460	6"	1.15	125	50
	575	6"	1.15	100	40
40	460	6"	1.15	150	70
	575	6"	1.15	125	60
	460	8"	1.15	175	70
50	460	6"	1.15	200	90
	575	6"	1.15	150	70
	460	8"	1.15	200	90
60	460	8"	1.15	225	100
75	460	8"	1.15	300	125
100	460	8"	1.15	400	175

CAUTION: Three phase motors require the use of three (3) quick-trip overload protectors in the starter. Refer to Page 2. Failure to use these specified quick-trip overloads will void the warranty.

TABLE 2 - CABLE SELECTION

SINGLE PHASE MOTOR MAXIMUM CABLE LENGTH (Motor to Service Entrance)

Motor Rating		Copper Wire Size (1)								
Volts	HP	14	12	10	8	6	4	2	0	00
115	1/4	165	263	411	645	1000	1540	2340		
	1/3	134	212	333	522	810	1240	1890	2550	
	1/2	100	159	249	390	608	930	1410	1910	
230	1/4	661	1040	1650	2580	4020	6140	9355		
	1/3	533	850	1350	2110	3290	5025	7650		
	1/2	404	641	1003	1575	2450	3750	5710		
	3/4	293	473	740	1161	1810	2760	4210	5680	
	1	248	392	617	968	1507	2300	3510	4730	5920
	1-1/2	205	326	510	801	1248	1920	2930	3950	4940
	2	180	286	449	703	1096	1675	2550	3440	4300
	3		229	359	563	877	1339	2041	2750	3440
	5			216	315	490	750	1142	1540	1925
	7-1/2				270	362	553	842	1136	1420
10					250	425	650	875	1100	

CAUTION: Use of wire size smaller than listed will void warranty.

FOOT NOTES:

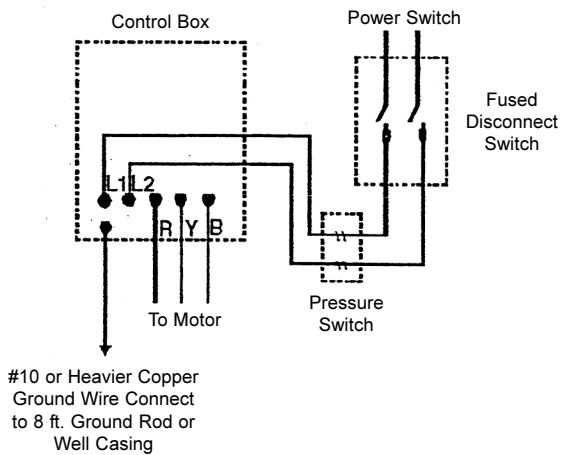
1. If aluminum conductor is used, multiply lengths by 0.5. Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3" diameter motor starter should not exceed 25% of the total maximum length to assure reliable starter operation. Single phase control boxes may be connected at any point of the total cable length.

THREE PHASE MOTOR MAXIMUM CABLE LENGTH (Motor to Service Entrance)

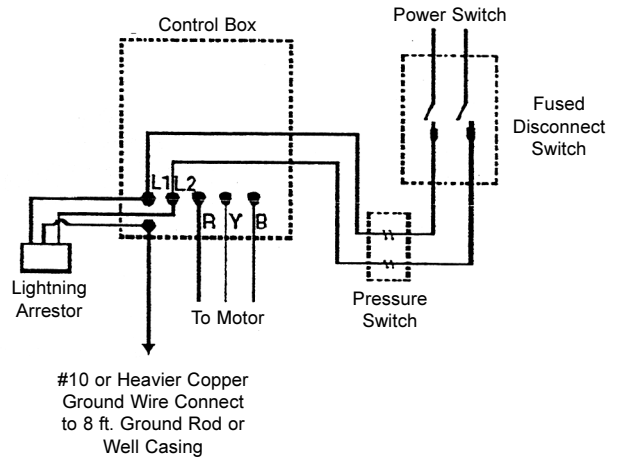
Motor Rating		Copper Wire Size (1)										
Volts	HP	14	12	10	8	6	4	2	0	00	000	0000
200V 60 Hz or 50 Hz	1.5	320	510	800	1260							
	2	250	390	610	960	1500						
	3	180	290	450	710	1110	1690					
	5			300	470	730	1110	1690				
	7.5				340	530	810	1230	1660			
	10				250	390	600	920	1240	1540		
	15					270	410	630	850	1060	1270	
	20						320	480	650	810	970	1150
	25							390	530	660	790	930
30								430	540	640	750	
230V 60 Hz and 220V 50 Hz	1.5	430	680	1070	1680							
	2	320	510	790	1250	1940						
	3	240	380	600	940	1470	2240					
	5		250	390	620	960	1470	2230				
	7.5			290	450	700	1070	1630	2200			
	10				340	520	800	1220	1640	2050		
	15					360	550	830	1130	1410	1680	
	20						420	640	860	1070	1280	1510
	25						340	520	700	870	1040	1230
30							420	570	710	850	1000	
460V 60 Hz and 380V 50 Hz (Divide lengths by 1.4 for 380V 60 Hz)	1.5	1720										
	2	1280	2030									
	3	960	1530	2400								
	5	630	1000	1570	2470							
	7.5	460	730	1150	1800	2810						
	10		550	850	1340	2090	3190					
	15			590	920	1430	2190	3340				
	20				700	1100	1670	2550	3440			
	25				570	890	1360	2070	2800	3500		
	30					730	1110	1690	2280	2850	3400	
	40						850	1300	1750	2190	2610	3070
	50						680	1040	1400	1750	2090	2450
	60							870	1180	1470	1760	2070
75								950	1190	1420	1670	
100									890	1060	1240	
575V 60 Hz	1.5	2640										
	2	1860										
	3	1490	2370									
	5	980	1560	2440								
	7.5	720	1150	1800	2820							
	10	540	850	1340	2090							
	15		590	920	1440	2245						
	20			700	1090	1700	2600					
	25				890	1390	2130	3240				
	30				730	1130	1730	2640	3560			
	40					870	1330	2030	2730	3280		
	50						1060	1620	2190	2620	3128	
	60						900	1360	1840	2210	2640	3100
75							1100	1490	1790	2130	2510	
100								1110	1330	1590	1860	

WIRING DIAGRAMS

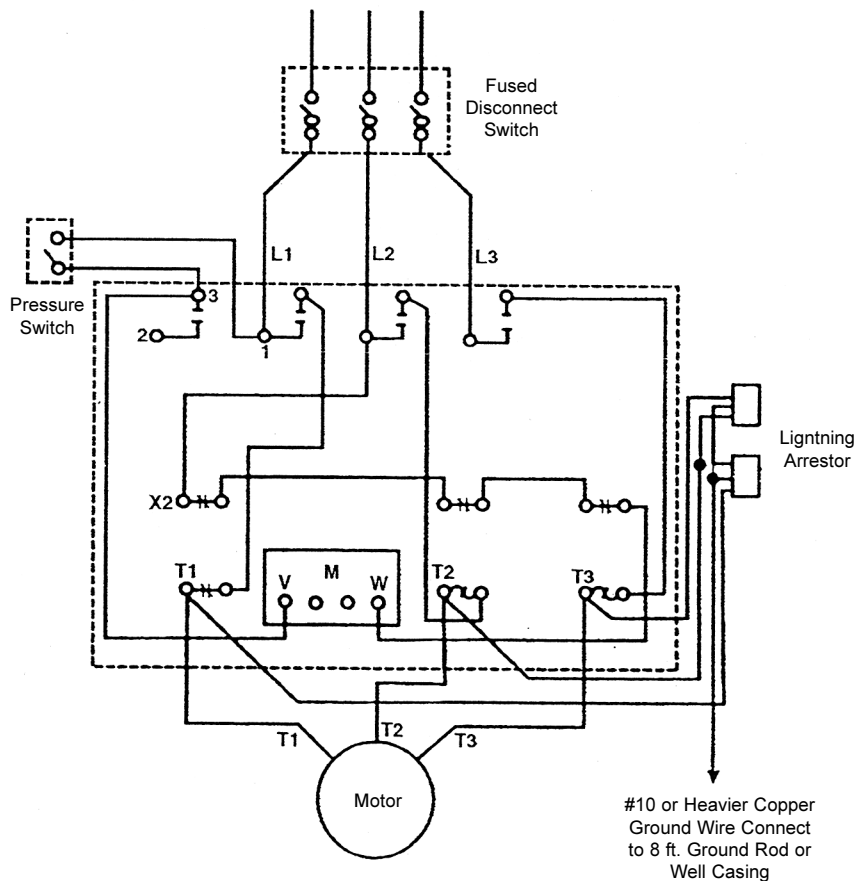
1/3 HP - 1-1/2 HP SINGLE PHASE WITH BUILT-IN LIGHTNING ARRESTOR IN MOTOR



2 HP - 3 HP SINGLE PHASE EXTERNAL LIGHTNING ARRESTOR



MAGNETIC STARTER - THREE PHASE



WARNING: Connect motor leads momentarily for correct rotation before installing pump in well.

GUARANTEE

This pump is guaranteed to do the work for which it is intended when properly installed and operated. It is warranted to be free of defects in material and workmanship for a period of five years from date of manufacture.

How to Claim Warranty

The dealer from whom you purchased your unit has a thorough knowledge of its operation and maintenance. If trouble develops, please consult the dealer.

If a unit or part should prove defective within five years (60 months), return it to your dealer, transportation charges prepaid. The repair will be made or a replacement unit or part will be supplied free of charge. The serial number of the unit or unit from which the defective part is taken must be supplied.

This warranty does not obligate the manufacturer to bear the cost of field labor or transportation in connection with the replacement or repair of defective parts or units nor shall it apply to any product upon which repairs or alterations have been made unless authorized by the manufacturer.

The manufacturer shall in no event be liable for consequential damages or contingent liabilities arising out of failure of any product, its power unit or its accessories to operate properly. No express, implied or statutory warranty other than herein set forth is made or authorized to be made by the manufacturer.

All products not manufactured by WaterGroup are subject to the warranties of their respective manufacturers.

IMPORTANT INFORMATION FOR INSTALLERS OF THIS EQUIPMENT

THIS EQUIPMENT IS INTENDED FOR INSTALLATION BY TECHNICALLY QUALIFIED PERSONNEL. FAILURE TO INSTALL IT IN COMPLIANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES AND WITH FRANKLIN ELECTRIC RECOMMENDATIONS, MAY RESULT IN ELECTRICAL SHOCK OR FIRE HAZARD, UNSATISFACTORY PERFORMANCE AND EQUIPMENT FAILURE. FRANKLIN INSTALLATION INFORMATION IS AVAILABLE FROM PUMP MANUFACTURERS AND DISTRIBUTORS AND DIRECTLY FROM FRANKLIN ELECTRIC. CALL FRANKLIN TOLL FREE 800-348-2420 FOR INFORMATION. RETAIN THIS INFORMATION SHEET WITH THE EQUIPMENT FOR FUTURE REFERENCE.

WARNING

SERIOUS OR FATAL ELECTRICAL SHOCK MAY RESULT FROM FAILURE TO CONNECT THE MOTOR, CONTROL ENCLOSURES, METAL PLUMBING AND ALL OTHER METAL NEAR THE MOTOR OR CABLE TO THE POWER SUPPLY GROUND TERMINAL USING WIRE NO SMALLER THAN MOTOR CABLE WIRES. TO REDUCE RISK OF ELECTRICAL SHOCK, DISCONNECT POWER BEFORE WORKING ON OR AROUND THE WATER SYSTEM. DO NOT USE MOTOR IN SWIMMING AREAS.



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