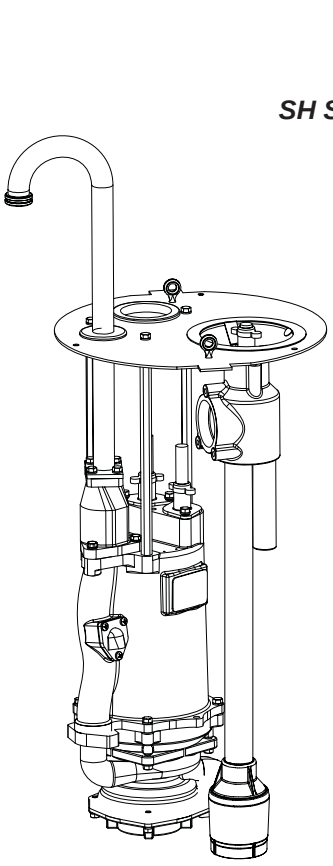
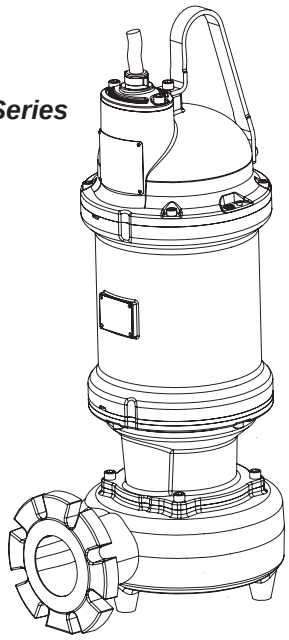
BARNES®

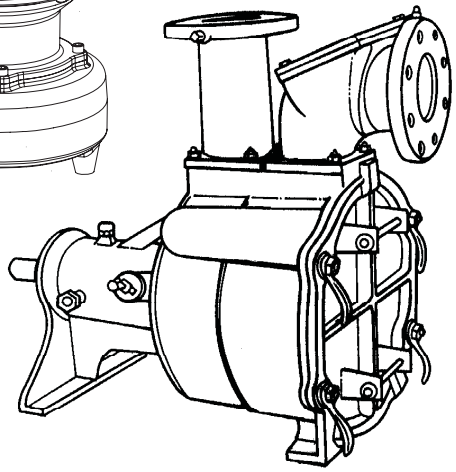
PUMP STATION START-UP
and TROUBLESHOOTING MANUAL



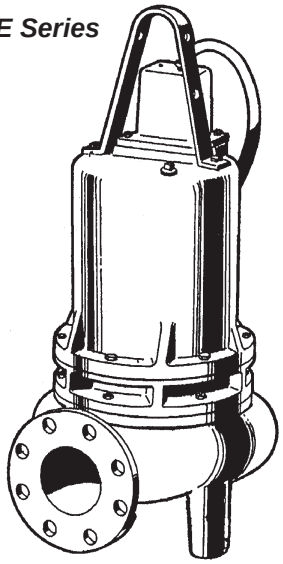
OGP



SH Series



Crown PO6



SE Series

IMPORTANT!

Read all instructions in this manual before operating pump.
As a result of Crane Pumps & Systems, Inc., constant product improvement program, product changes may occur. As such Crane Pumps & Systems reserves the right to change product without prior written notification.

CRANE®

A Crane Co. Company

PUMPS & SYSTEMS

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Submersible Wastewater Pump Association SWPA MEMBER

Form No. 101686-Rev. B

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SPECIAL TOOLS AND EQUIPMENT
INSULATION TESTER (MEGGER)
DIELECTRIC TESTER
SEAL TOOL KIT (see parts list)
PRESSURE GAUGE KIT (see parts list)

SAFETY FIRST!
PLEASE READ THIS BEFORE INSTALLING OR OPERATING PUMP.

GENERAL

1. Most accidents can be avoided by using **COMMON SENSE**.
2. Read this operation and maintenance instruction manual.
3. Do not wear loose clothing that may become entangled in the impeller or other moving parts.
4. Always wear appropriate safety gear, such as safety glasses, when working on the pump or piping.
5. Bronze/brass and bronze/brass fitted pumps may contain lead levels higher than considered safe for potable water systems. Various government agencies have determined that leaded copper alloys should not be used in potable water applications. For non-leaded copper alloy materials of construction, please contact factory.
6. Minimize the amount of cooking grease entering the system.
7. Do Not leave pump cover off the basin, except while servicing, to prevent entrance of foreign materials such as rocks, metal, soil, animals or humans.
8. Prevent large articles of clothing, large amounts of chemicals, other materials or substances such as are uncommon in domestic sewage from entering the system.
9. During power black-outs, discontinue water consumption at the home(s) to prevent sewage from backing up into the house.
10. Prevent infiltration or direct flow of rain or run-off water into the pump basin to minimize pump cycling. This will prevent overloading the treatment facility, and will facilitate swift transportation of sewage.
11. Always keep the shut-off valve completely open when system is in operation (unless advised otherwise by the proper authorities).
12. Keep the control panel locked or confined to prevent unauthorized access to it.
13. If the pump is idle for long periods of time, it is advisable to start the pump occasionally by adding water to the basin.
14. Before removing the pump from the basin, be sure to close the shut-off valve. (This prevents back flow from the pressure sewer.)
15. Make sure level controls are provided at time of installation.
16. This basin system is intended for use with water, sewage and effluent applications. This basin must be vented in accordance with local codes. This basin system is not to be installed in locations in which the basin interior would be classified as a hazardous location in accordance with NEC ANSI/NPFA 70.

PUMPS

17. Recommended no more than 10 starts per hour.
18. Pumps build up heat and pressure during operation-allow time for pumps to cool before handling or servicing.
19. Only qualified personnel should install, operate and repair pump.
20. Keep clear of suction and discharge openings. DO NOT insert fingers in pump with power connected.
21. Do not pump hazardous materials (flammable, caustic, etc.) unless the pump is specifically designed and designated to handle them.
22. Do not block or restrict discharge hose, as discharge hose may whip under pressure.
23. Make sure lifting handles are securely fastened each time before lifting.
24. Do not lift pump by the power cord.
25. Do not exceed manufacturers recommendation for maximum performance, as this could cause the motor to overheat.
26. Secure the pump in its operating position so it can not tip over, fall or slide.
27. Keep hands and feet away from impeller when power is connected.
28. Submersible Pumps are not approved for use in swimming pools, recreational water installations, decorative fountains or any installation where human contact with the pumped fluid is common.
29. Do not operate pump without safety devices in place.
30. Always replace safety devices that have been removed during service or repair.

ELECTRICAL

31. To reduce risk of electrical shock, pump must be properly grounded in accordance with the National Electric Code (NEC) and all applicable state and local codes and ordinances.
32. To reduce risk of electrical shock, always disconnect the pump from the power source before handling or servicing. Lock out power and tag.
33. Any wiring of pumps should be performed by a qualified electrician.
34. Never operate a pump with a power cord that has frayed or brittle insulation.
35. Cable should be protected at all times to avoid punctures, cut, bruises and abrasions - inspect frequently.
36. Never handle connected power cords with wet hands.
37. Do not remove cord and strain relief. Do not connect conduit to pump.
38. To reduce risk of electrical shock, all wiring and junction connections should be made per the NEC and applicable state and local codes. Requirements may vary depending on usage and location. See wiring diagrams in manual.
39. Do Not operate the pump in the “HAND” control position and leave the pump unattended.
40. CAUTION - This unit may have more than one connection to the source of supply. To reduce the risk of electric shock, disconnect all such connections before servicing.
41. All connections inside this tank and/or junction box must be made with listed watertight connectors.

IMPORTANT! BARNES® PUMPS, INC. IS NOT RESPONSIBLE FOR LOSSES, INJURY, OR DEATH RESULTING FROM A FAILURE TO OBSERVE THESE SAFETY PRECAUTIONS, MISUSE OR ABUSE OF PUMPS OR EQUIPMENT.

SECTION A: GENERAL INFORMATION

A-1) To the Purchaser:
Within the manual you will find the necessary information to verify correct start-up and registration of your Barnes Pump system. This manual will also provide helpful information concerning proper maintenance and troubleshooting procedures.

A-2) Service Centers:
For the location of the nearest Barnes Pumps Service Center, check your catalog, your Barnes Pumps, Inc., representative or Barnes Pumps, Inc., Service Department in Piqua, Ohio, telephone 937-778-8947 or go to www.cranepumps.com.

SECTION B: START UP / WARRANTY REGISTRATION FORM

B-1) Start Up Form:
Included at the end of this manual is a start-up report sheet which should be completed as applicable. Return one copy to Barnes and store the second in the control panel or with the pump manual. It is important to record this data at initial start-up since it will be useful to refer to should servicing the pump be required in the future.

B-2) Sample Form:
We have also included a sample form (see Pages 11-12) that has been filled out, to help you better understand some of the information Barnes is asking for. Refer to the sample form as each section of the start up warranty registration is explained.

SECTION C: NECESSARY GENERAL INFORMATION

C-1) Owner Name & Address:
In most cases, this will be the party that will pay for and be responsible for service of the unit. This may be a municipal water or sewer district, or it may be individual home owners.

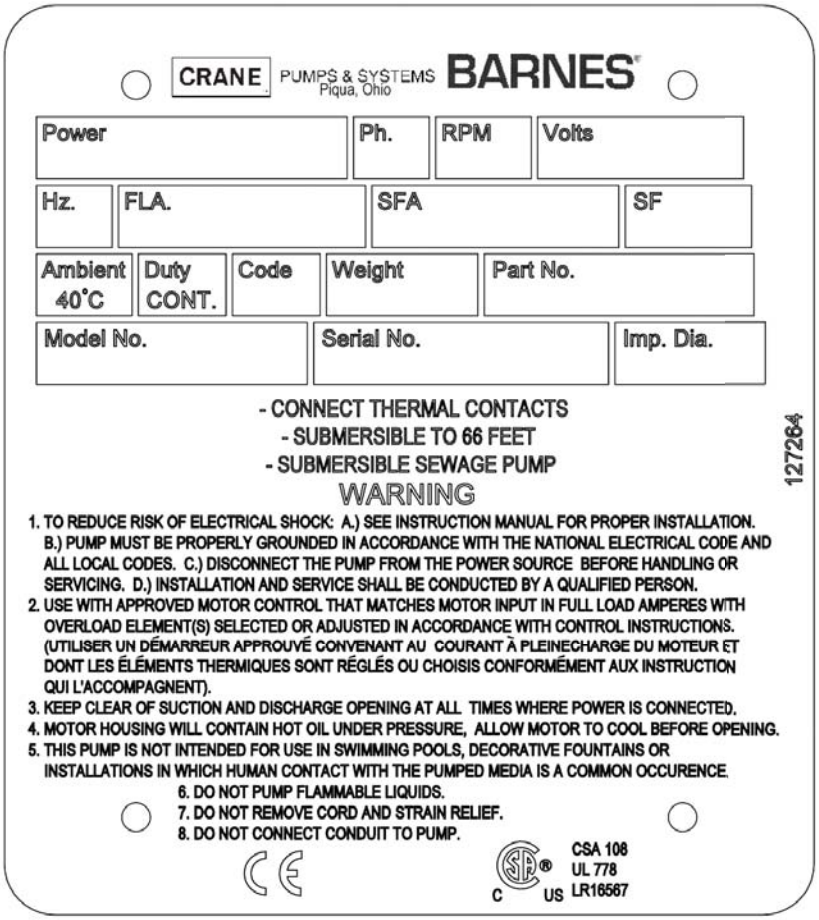
C-2) Location of Installation & Contact:
The address of where the basin is physically located and who is main contact.

As shown on the sample form, the owner if City of Piqua, but they have installed the basin at a house located at 234 Second Street.

C-3) Pump Model Number:
Pump model number will give Barnes information on your pump size and performance rating, it can be found on the pump nameplate attached to the pump.

Pump Model Number: 4SHVA30042
C-4) Pump Serial Number:
Like the basin serial number, the pump serial number will tell Barnes the plant location of where the pump was built, information specific to the pump, and date pump was built. This can also be found on the pump nameplate.

Pump Serial Number = C575824-0897
C = Covington Avenue Plant, T = Third Street Plant
575824 = Specific pump information
0897 = Built in August, 1997 (Date Code)



SECTION D: CONTROLS

D-1) Panel Model Number:
The panel model number will tell Barnes whether your control panel is a Simplex or Duplex and what options you may have. The panel model number can be usually found inside the control panel cover.

Control Panel Model Number = UGP -101-21
UGP = Pump Series
101 = Panel Options
2 = Horsepower
1 = Voltage & Phase

D-2) Is Interior Dry:
Check YES or NO. The interior of the control panel must be clean and dry at startup. If moisture is present, determine cause and correct. Check to make sure that all conduit entries in the panel are sealed!

D-3) Are All Connections Tight:
Check YES or NO. It is recommended that all wire connections be checked for tightness in addition to the pump power, control wires, level sensor, and service wires. Check factory connections in the panel to assure that no connections were loosened during shipping.

SECTION E: JUNCTION BOX INFORMATION

CAUTION!
Check to be certain that all power is off.

E-1) Debris in Piping or Wet Well:
Indicate by checking YES or NO.Inspect the basin for anything that may have been inadvertently left in the bottom or rocks and excessive amounts of dirt that may have been dropped in the basin during installation.

E-2) Is Junction Box / Control Panel Dry:
Check YES or NO. The junction box must be dry to avoid power/control problems. If any moisture is present, wipe dry or use a blow dryer if necessary.

E-3) Are all Wire Connections Tight:
Check YES or NO. All wire nut connections in the junction box should be tight. In addition, look for wires that may be exposed beyond the end of the wire nut.

E-4) Are Pump Cords away from Pump:
Check YES or NO. Do not allow excess pump or control cords to hang any lower than the top of the pump.

SECTION F: ELECTRICAL CHECK

F-1) Single Phase:
Check and record incoming voltage to the control panel circuit breaker with the pump off, the reading is taken across L1 and L2 of the circuit breaker on the incoming side (see Figure 1).The voltage reading should be within ±10% of pump rated volts (pump rated volts can be found on the pump nameplate). If your pump is three phase, mark N/A.

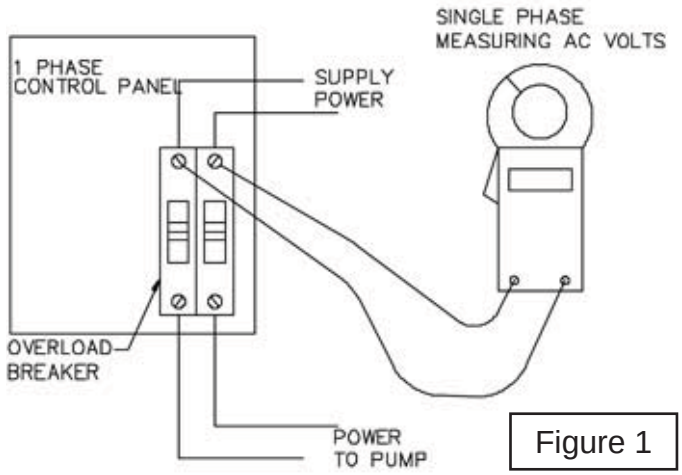


Figure 1

F-2) Three Phase:
Check and record incoming voltage to the control panel circuit breaker with the pump off. Readings should be taken across L1 - L2, L2 - L3, and L3 - L1 on the incoming side of the circuit breaker, (see Figure 2). The voltage reading should be within ± 10% of pump rated volts and should be balanced within ± 1%. Pump rated volts can be found on the pump nameplate. If your pump is single phase, mark N/A.

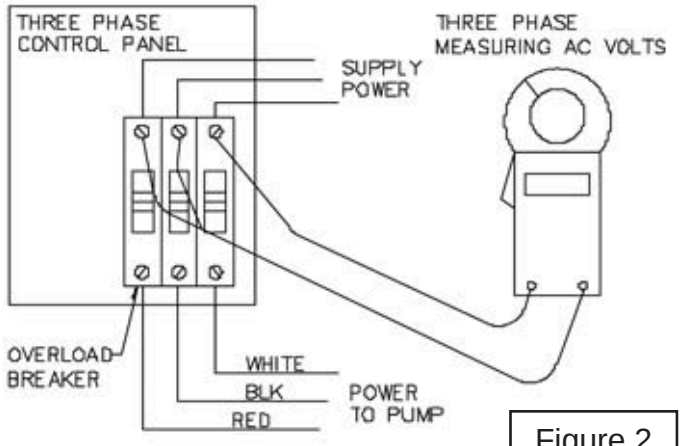


Figure 2

If incorrect power supply readings are recorded, contact local power source.

F-3) Resistance of Pump Power Connections:
Record the ohms (resistance) reading of the motor windings at the pump power connections on the control panel terminal strip with power off. Readings should be taken between red/black, black/white, red/white, (see Figure 3).Compare your ohms readings to the electrical chart in the pump operations manual, you should be within ±5% of resistance listed on the chart.

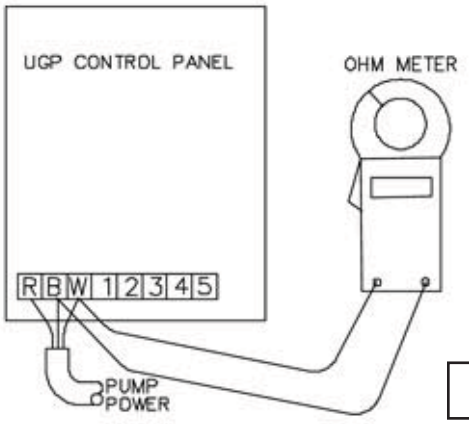


Figure 3

1 Phase	
Red - Black	Start + Run Resistance
Red - White	Start Resistance
Black - White	Run Resistance
3 Phase	
Red - Black	All Three Resistance readings should be the same.
Red - White	
Black - White	

NOTE:
If OHMS reading are not within range, disconnect wires at terminal strip and check again.

F-4) Resistance Between Ground Lug and outside Pump Case/Rail:
Record the ohms (resistance) reading between the control panel ground lug and the pump case or the stainless steel rail, if your basin has the rail system (see Figure 4). Resistance readings of less than 1 ohm indicate a good safe ground. (If basin is not located next to the panel, a temporary extension wire from the basin to the meter may be required to take this reading.)

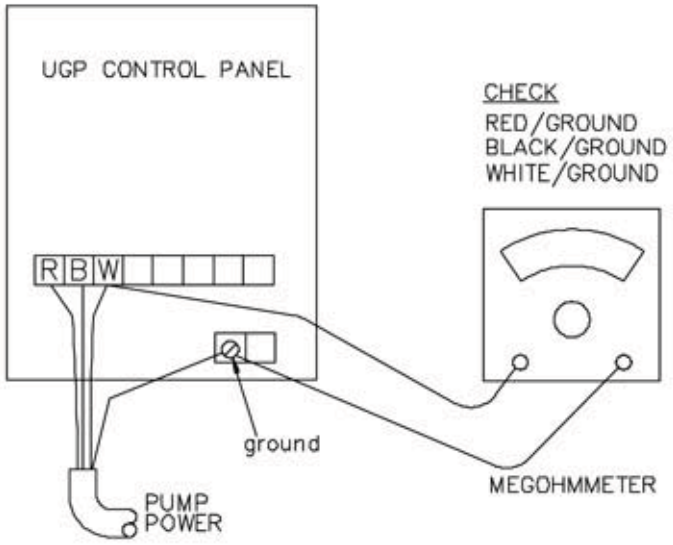


Figure 5

F-5) Insulation Check at Control Panel: (MEG-OHM)
The insulation check of the pump power leads is taken at the control panel terminal strip between red/ground, black/ground, and white/ground with the power off, record your readings in meg-ohms (see Figure 5). Readings of 5 meg-ohm and higher are acceptable. Note “0” readings indicate a dead short.Correct the problem before proceeding. THIS TEST MUST BE PERFORMED AFTER THE GROUND RESISTANCE CHECK IN SECTION F-4.

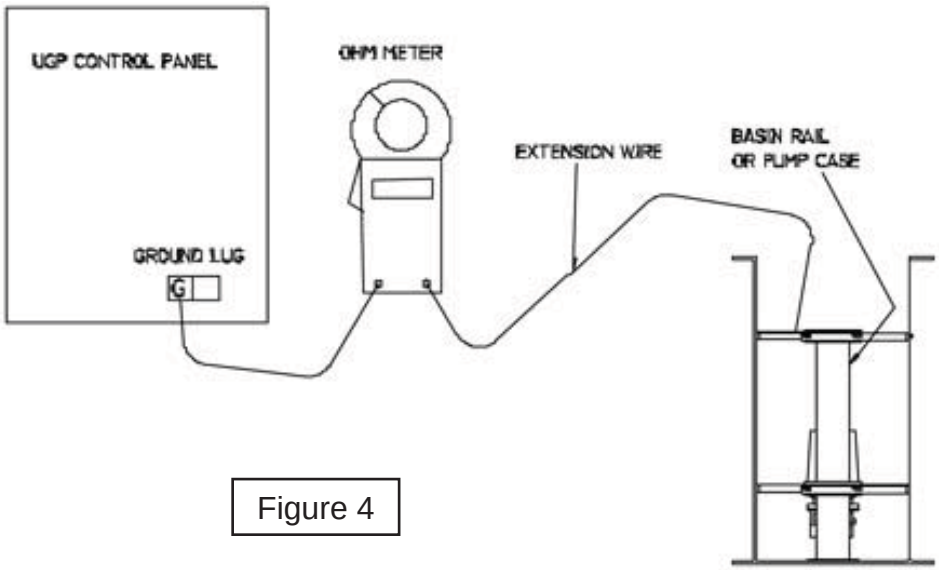


Figure 4

SECTION G: PERFORMANCE CHECK

G-1) With discharge valve(s) closed, pull pump and rotate impeller by hand, replace pump.

IMPORTANT!
All power must be off

NOTE:
With the pump power off (circuit breaker) fill the wetwell with enough water to trip the high water alarm float. Open discharge valve in the wetwell and, if necessary, the discharge valve at the force main.

G-2) Is the High Water Alarm On:
Check YES or NO.Turn power on, is the high water alarm on (red light on top of control panel).

NOTE:
If your control panel is equipped with an alarm horn, push the button on the panel cover to silence.

Let the pump run until the alarm light turns “off”, and manually turn power off at the control panel circuit breaker.

G-3) Alarm Shut Off at Appropriate Level:
Check YES or NO.
Measure the water depth (with pump off) when the alarm shuts off and record if desired.

G-4) Amperage Load at Line Connection:
Single Phase: Using a clamp on amp meter, clamp amp meter to the L1 wire between the service drop and control panel circuit breaker. Turn pump power on at the control panel circuit breaker, (see Figure 6).

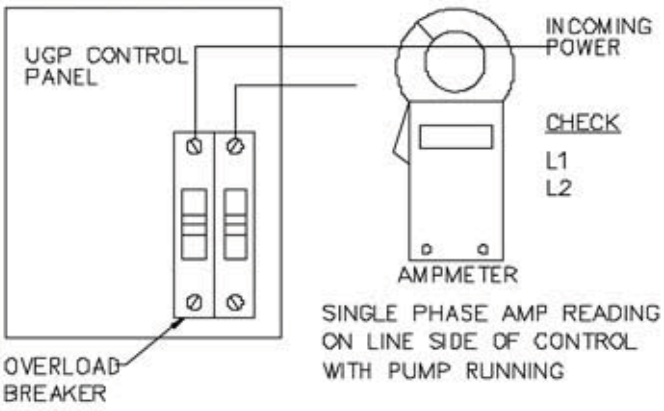


Figure 6

NOTE:
If pump does not come on, push the start button in the control panel. Record the amperage readings of L1 and L2, they should not exceed more than 10% over the pump nameplate amps. If your pump is a three phase, mark N/A.

G-5) Amperage Load at Line Connection:
Three Phase: Using a clamp on amp meter, clamp the amp meter to the L1 wire between the service drop and control panel circuit breaker, (see Figure 7).

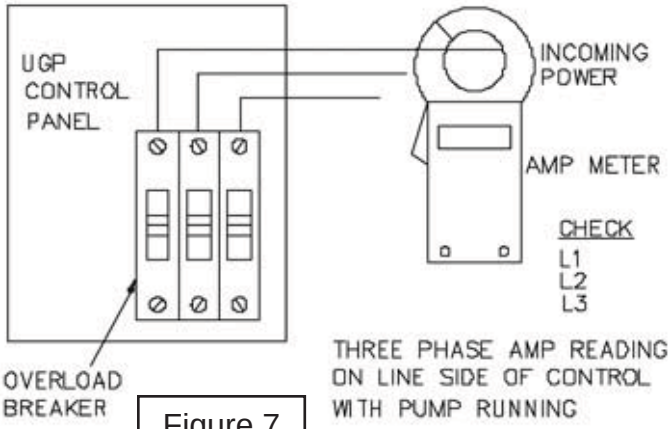


Figure 7

NOTE:
If pump does not come on, push the start button in the control panel.

Record the amperage readings on L1, L2, and L3, they should not exceed 10% over the pump nameplate amps. If your pump is a single phase, mark N/A.

G-6) Did the Pump Shut Off at the Normal Off Point:
Check YES or NO. The pump should have pumped the water level down to the predetermined “Off” point and shut off automatically.

G-7) Visible Leaks:
Check YES or NO. Did you notice any visible leaks when pump was running. You should look for leaks around discharge fitting within the basin, and possible ground water entering the basin around the inlet pipe or cord entries.

G-8) Equipment Difficulties:
List any difficulties encountered during start up and note what, if any, corrective action was taken.

NOTE:
If you encounter any problems during start up, refer to the trouble shooting section of this manual.

SECTION H: FINAL CHECK

H-1) Has the End User Received All Manuals:
After completion of a successful start up, the end user (homeowner) should receive the Installation Manual, Control Panel Installation/Operation Manual, Pump Installation/ Operation Manual, User Guide, if applicable, and this Start Up Manual.

H-2) Has the End User been Briefed on Warranty:
A copy of the warranty is in the back of all manuals and should be pointed out to the end user.

H-3) Are the Operation / Maintenance Manuals Saved:
Advise end user to save all Installation/Operation Manuals and keep for future reference.

H-4) Received Above Information:
If possible, have those present at start up, sign and date the start up form if the system is operating properly.

NOTE:
If duplex system is being started, fill out duplicate forms, mark first set PUMP #1 or LEAD, mark second set PUMP #2 or LAG.

CRANE PUMPS & SYSTEMS

A Crane Co. Company

START-UP REPORT

General Information

Pump Owner's Name: JOHN SMITH - CITY OF PIQUA
Address: 123 FIRST ST.
Location of Installation: 234 SECOND ST.
Contact Person: JIM SMITH Phone: 333-4444
Purchased From: BARNES PUMPS & SERVICE

Nameplate Data

Pump Model #: 4SHVA30042 Serial #: C575824-0897
Part #: 127452 Impeller Diameter: 195 mm
Voltage: 460 Phase: 3 Ø Hertz: 60 Horsepower: 30
Full Load Amps: 36.7 Service Factor Amps: 44.3
Motor Manufacturer: BARNES

Controls

Control panel manufacturer: BARNES
Model/Part number: VERSATROL (960BCR)
Number of pumps operated by control panel: 2
Short circuit protection? YES X NO___ Type: CIRCUIT BREAKER
Number and size of short circuit device(s): 2 Amp rating: 50 AMP
Overload Type: HEATER Size: _____ Amp rating: 40 AMP
Do protection devices comply with pump and motor Amp rating? YES X NO___
Are all electrical and panel entry connections tight? YES X NO___
Is the interior of the panel dry? YES X NO___
Liquid level Control Brand and Model: BARNES P/N 125522-15

Pre-Startup

All Pumps

Type of equipment: NEW X REBUILT___ USED___
Condition of equipment at Start-Up: DRY X WET___ MUDDY___
Was Equipment Stored? YES___ NO X Length of Storage: _____
Liquid being pumped: WATER Liquid Temperature: ~75° F
Supply Voltage/Phase/Frequency matches nameplate? YES X NO___
Shaft turns freely? YES X NO___
Direction of rotation verified for 3Ø motors? YES X NO___
Debris in piping or wet well? YES___ NO X
Debris removed in your presence? YES X NO___
Pump case/wet well filled with liquid before startup? YES X NO___
Is piping properly supported? YES X NO___

Non-Submersible Pumps

Is base plate properly installed / grouted? YES___ NO___ N/A X
Coupling Alignment Verified per I&O Manual? YES___ NO___ N/A X
Grease Cup/Oil Reservoir Level checked? YES___ NO___ N/A X

Submersible Pumps

Resistance of cable and pump motor (measured at pump control):

Red-Black: 0.35 Ohms(Ω) Red-White: 0.36 Ohms(Ω) White-Black: 0.36 Ohms(Ω)

Resistance of Ground Circuit between Control Panel and outside of pump: 0.00 Ohms(Ω)

MEG Ohms check of insulation:

Red to Ground: >500 White to Ground: >500 Black to Ground: >500

Operational Checks

Is there noise or vibration present? YES___ NO X Source of noise/vibration: _____

Does check valve operate properly? YES X NO___ N/A___

Is system free of leaks? YES X NO___ Leaks at: _____

Does system appear to operate at design flow rate? YES X NO___

Nominal Voltage: 460 Phase: 1Ø (3Ø) (select one)

Voltage Reading at panel connection, Pump OFF: L1, L2 453 L2, L3 457 L1, L3 461

Voltage Reading at panel connection, Pump ON: L1, L2 453 L2, L3 454 L1, L3 457

Amperage Draw, Pump ON: L1 29.4 L2 29.8 L3 28.9

Submersible Pumps

Are BAF and guide rails level / plumb? YES X NO___

Is pump seated on discharge properly? YES X NO___

Are level controls installed away from turbulence? YES X NO___

Is level control operating properly? YES X NO___

Is pump fully submerged during operation? YES X NO___

Follow up/Corrective Action Required

YES___ NO X

Additional Comments:

NO ISSUES TO REPORT

Startup performed by: JOE PUMP Date: 8-3-10

Present at Start-Up

(X) Engineer: JIM DESIGNER (X) Operator: SAM USER

( ) Contactor:_____ ( ) Other:_____

All parties should retain a copy of this report for future trouble shooting/reference

CRANE PUMPS & SYSTEMS

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Fax: (905) 457-2650

SECTION I: TROUBLE SHOOTING

I-1) Trouble Shooting Flow Charts:
How to read flow charts

1. Based on your observations and initial inspection of the system, select a Flow Chart I.1.1 through I.1.10.

2. All flow charts start at the top left hand corner, follow the chart in the direction of the arrows. Note the reference number at the top of each block.

3. The Reference Number can be found in Section I.2, (see pages 26 - 32) Corrective Action.

4. Corrective Action instructions, Section I.2.1 through I.2.34 will give details on trouble shooting your problem

CAUTION!
Shut off power unless otherwise noted before making electrical/mechanical checks.

TROUBLE SHOOTING

ELECTRICAL SAFETY POINTS

Before attempting any repair be sure incoming power is OFF, double check with a volt meter.

1. Visually check power cable for signs of deterioration.

2. Visually check for water intrusion in control panel.

3. Check for low resistance between control panel and ground.

4. Make sure ground (green) in control panel is properly secure.

5. Pull fuses and keep in safe place.

6. Tag control panel with “CAUTION” tag.

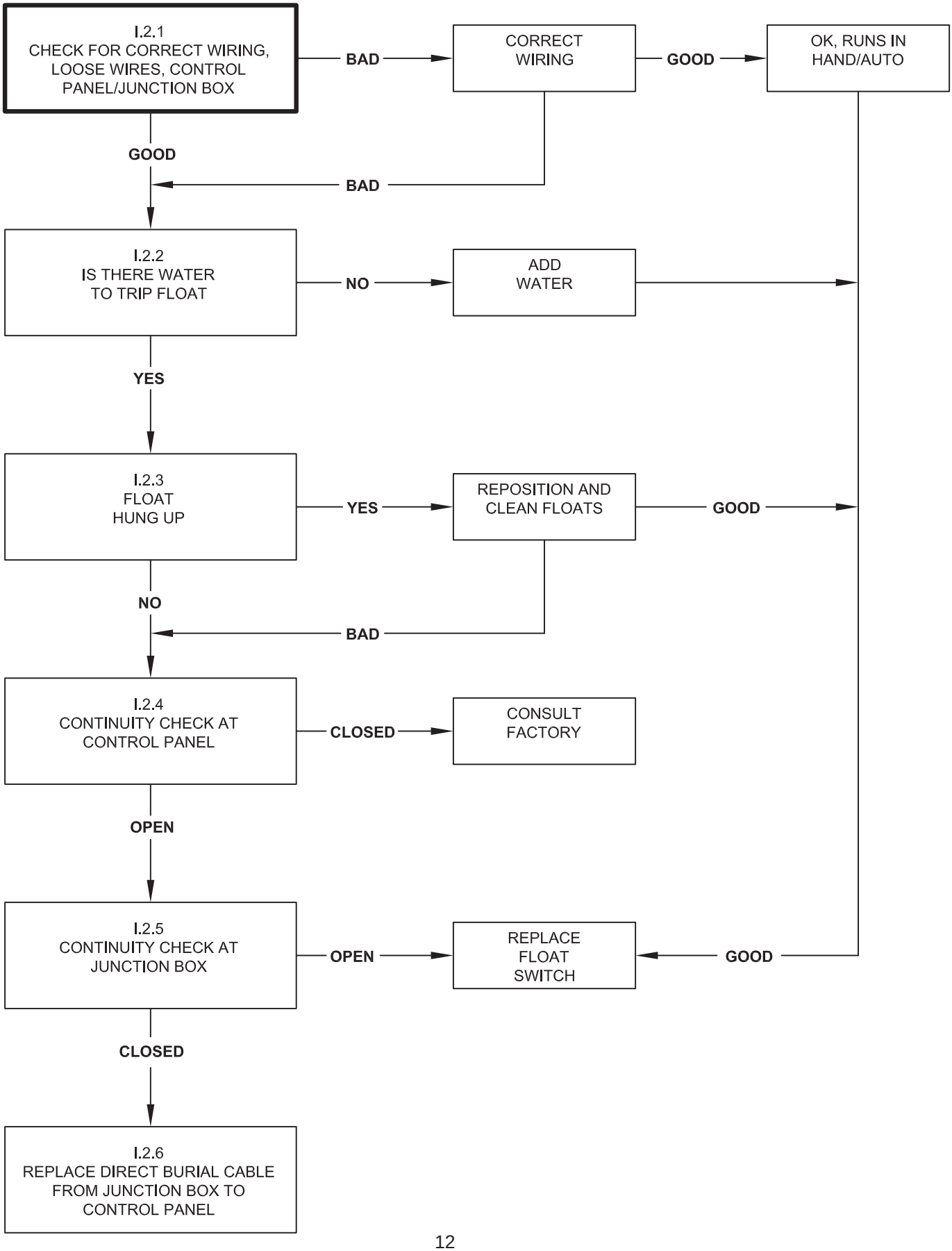
7. Secure control panel with padlock.

8. **ALWAYS** disconnect the pump from the power source before handling or servicing.

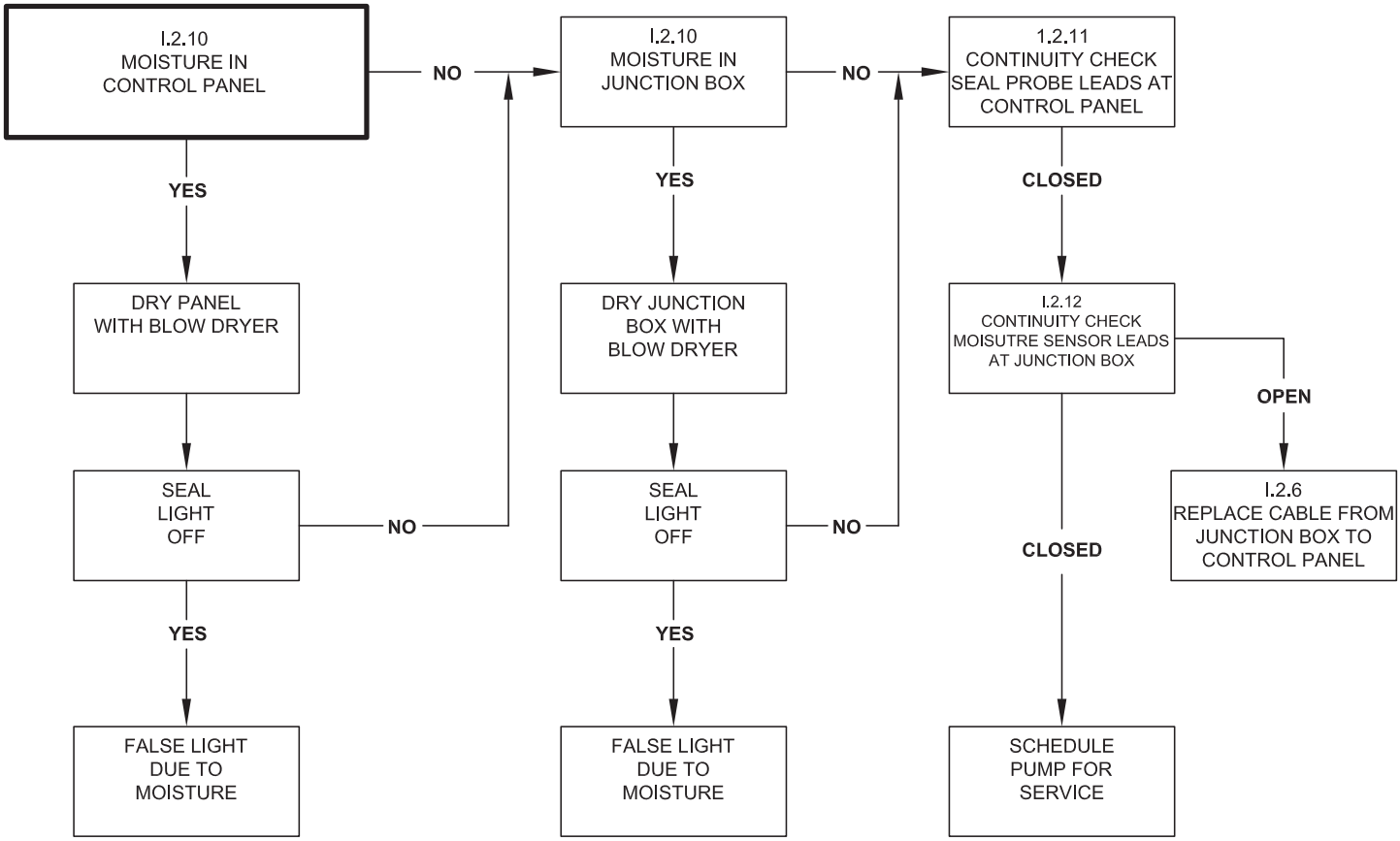
9. **NEVER** handle connected power cords with wet hands.

10. **NEVER** operate a pump with power cord that is split, frayed, or has brittle insulation.

Problem I.1.1
Runs in Hand, Does Not Run in Auto
(Float Switch)

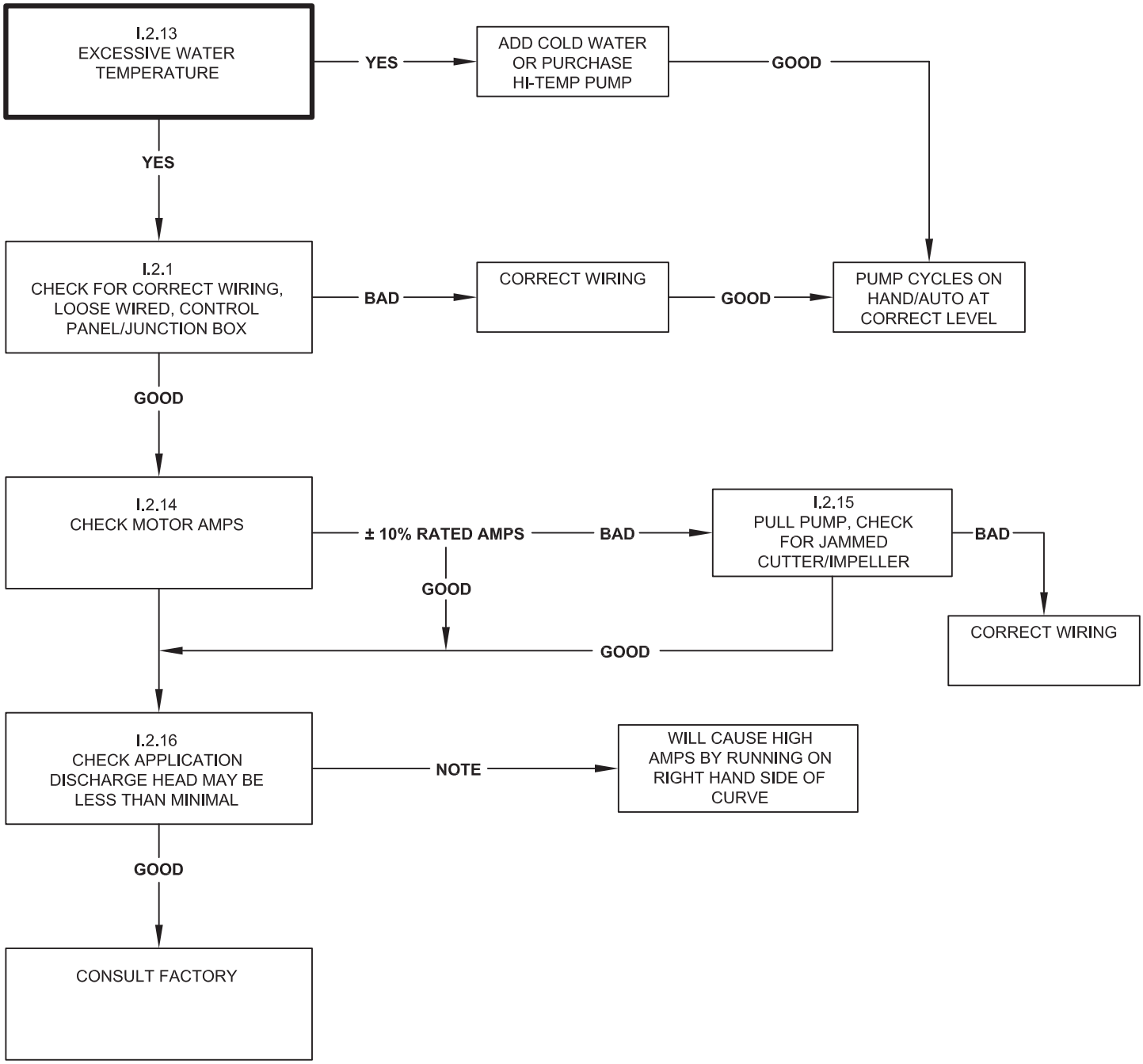


Problem I.1.2
Seal Failure Light

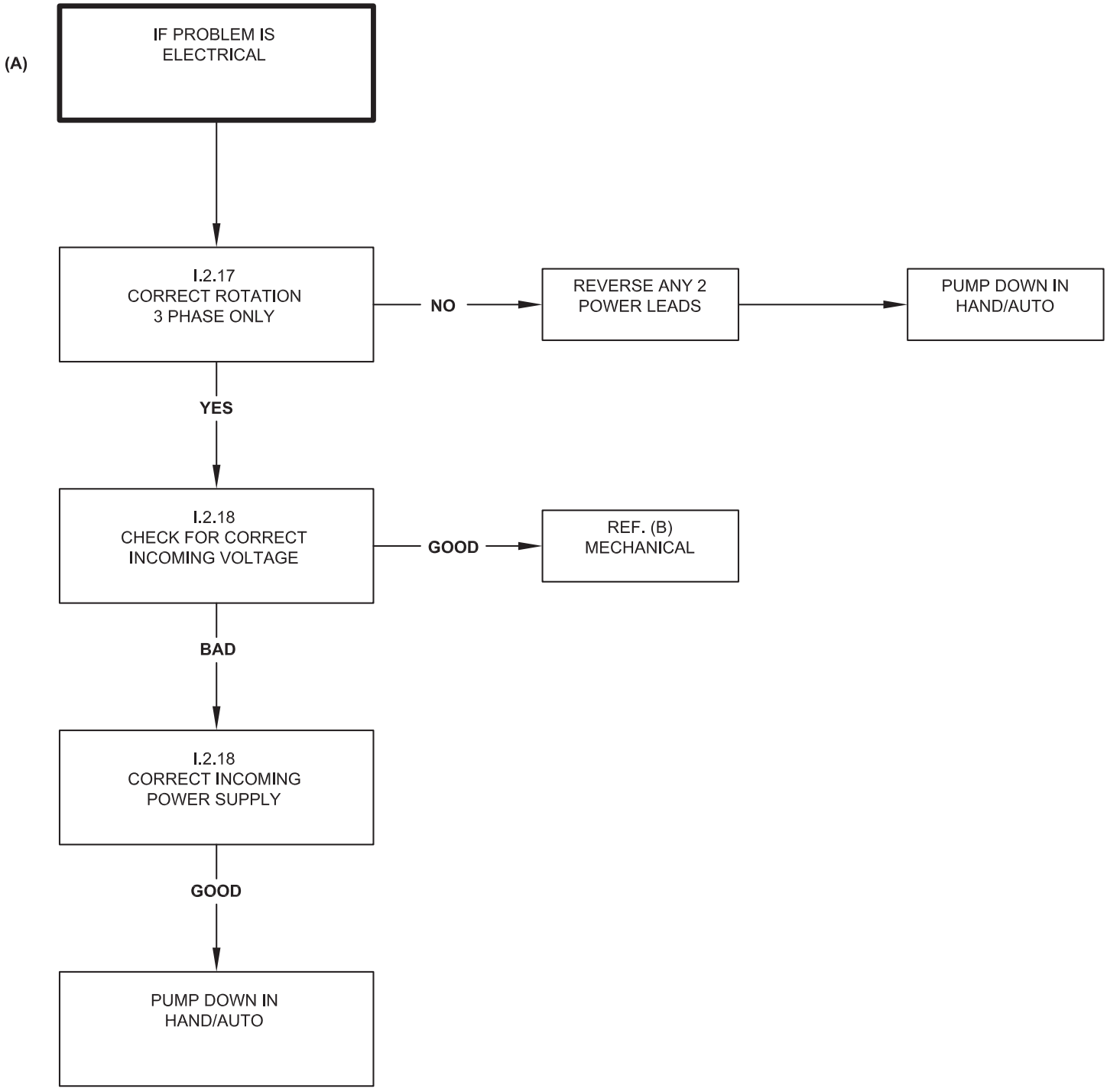


NOTE:
The Seal Probe (Moisture Sensor) is a Normally Open (N/O) Detector. SH Series and explosion proof pumps have a 330K Ohm test resistor across the probes. If a 330K reading is obtained, this should be considered “Open”

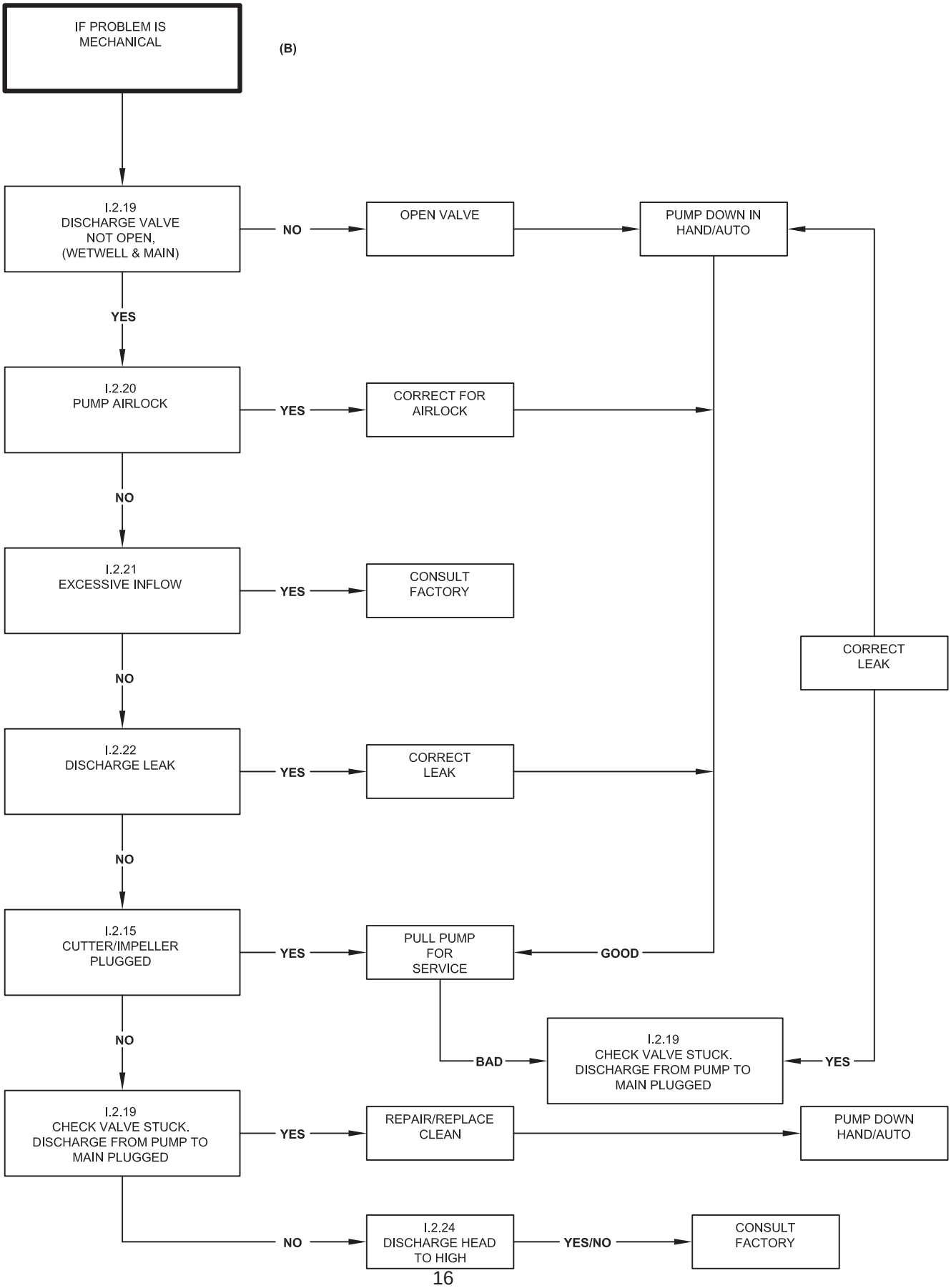
Problem I.1.3
Pump Shuts Off and Turns on Independent of Switch
Trips Thermal Overload



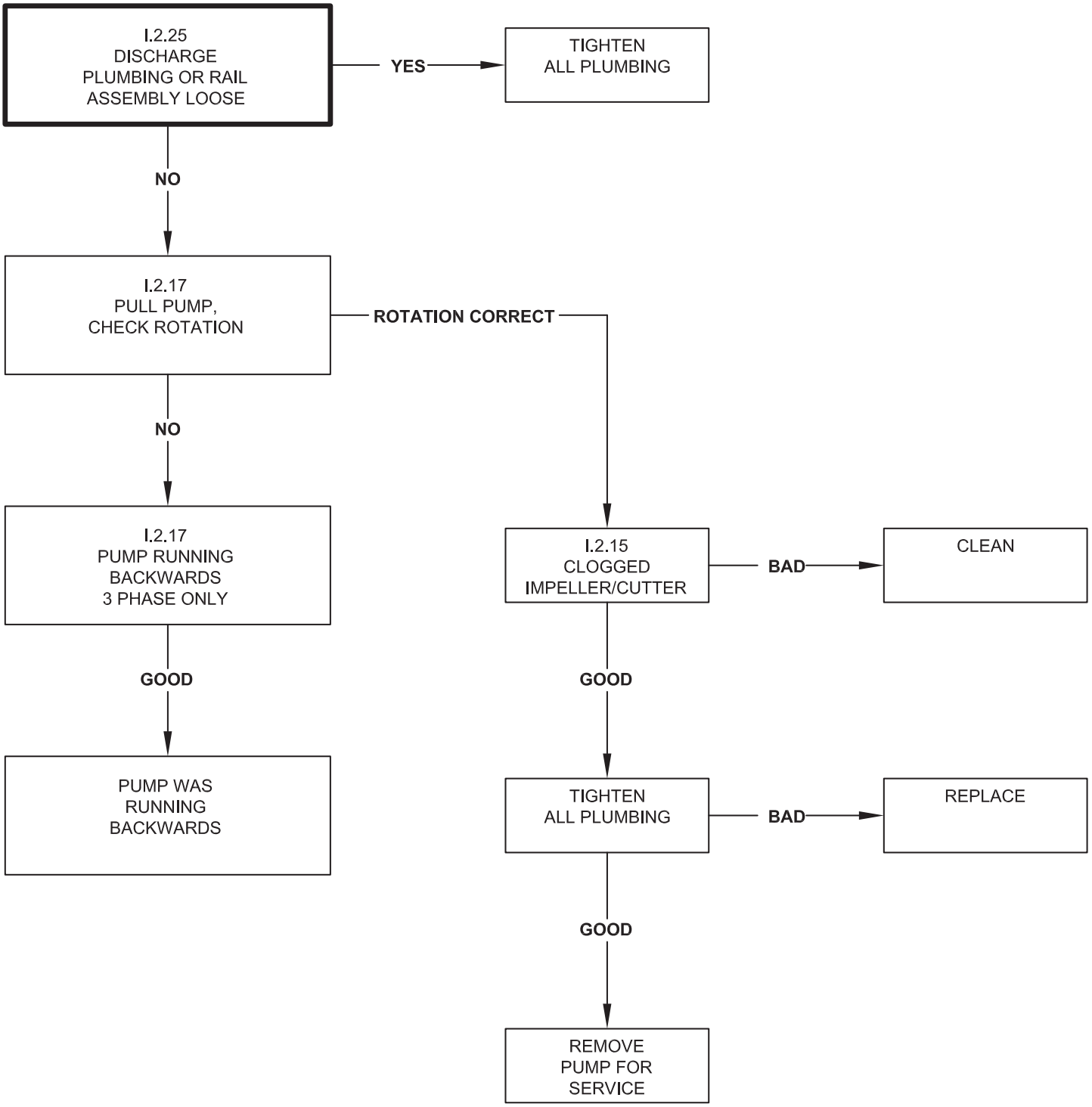
Problem I.1.4
Pump Runs but Does Not Pump Down in Hand or Auto.
Electrical



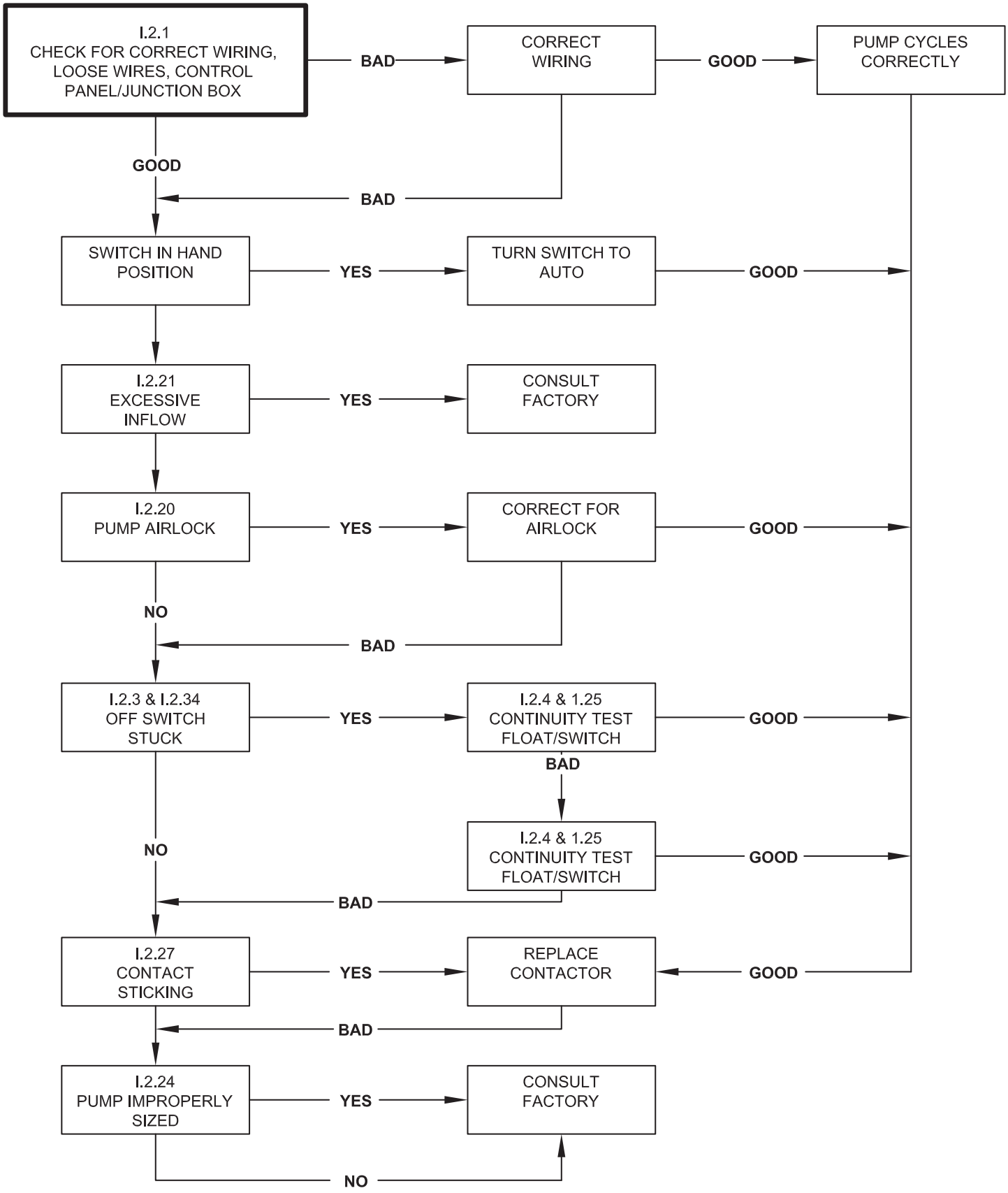
Problem I.1.5
Pump Runs but Does Not Pump Down in Hand or Auto.
Mechanical



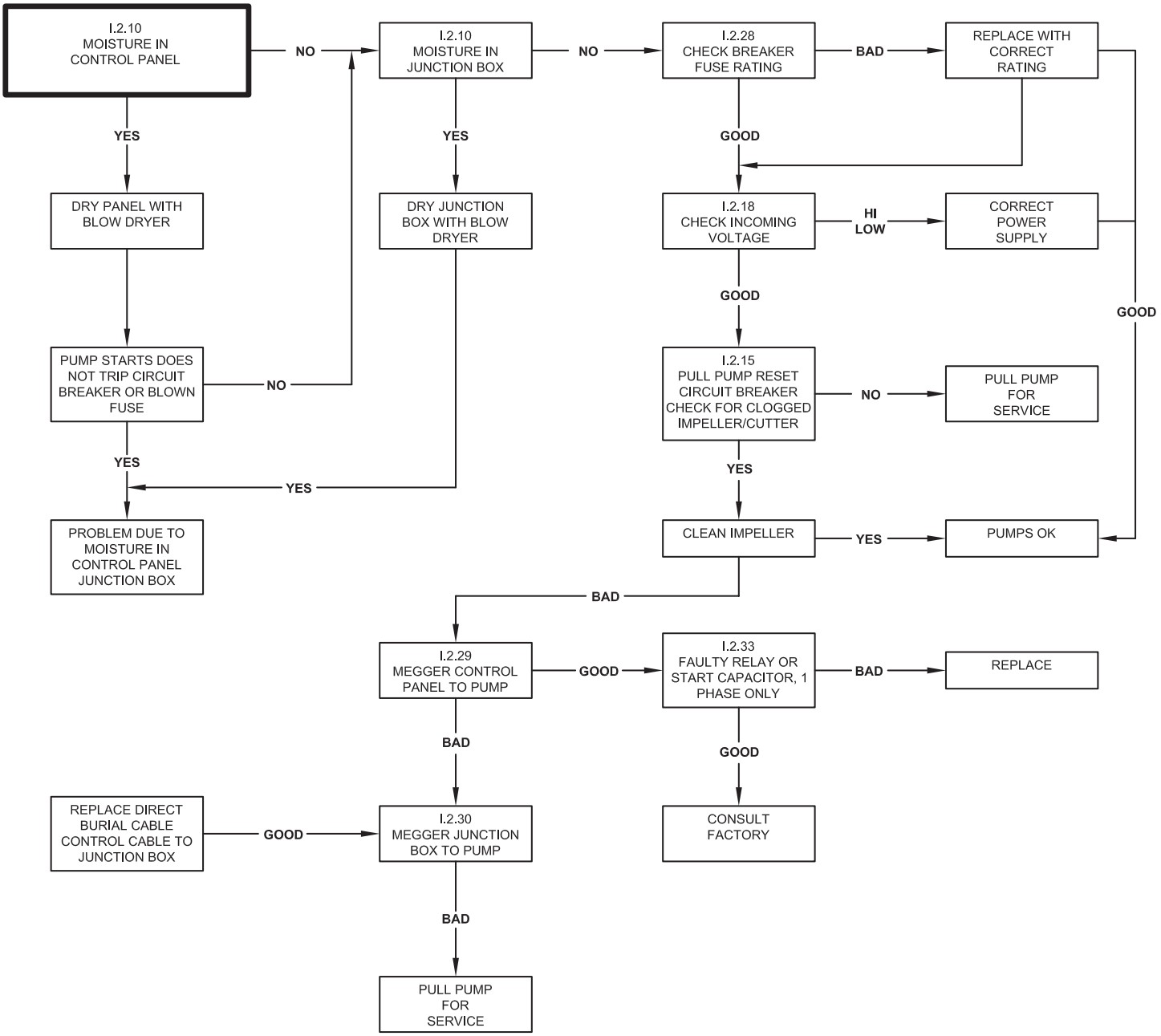
Problem I.1.6
Pump Noise
Excessive Vibration



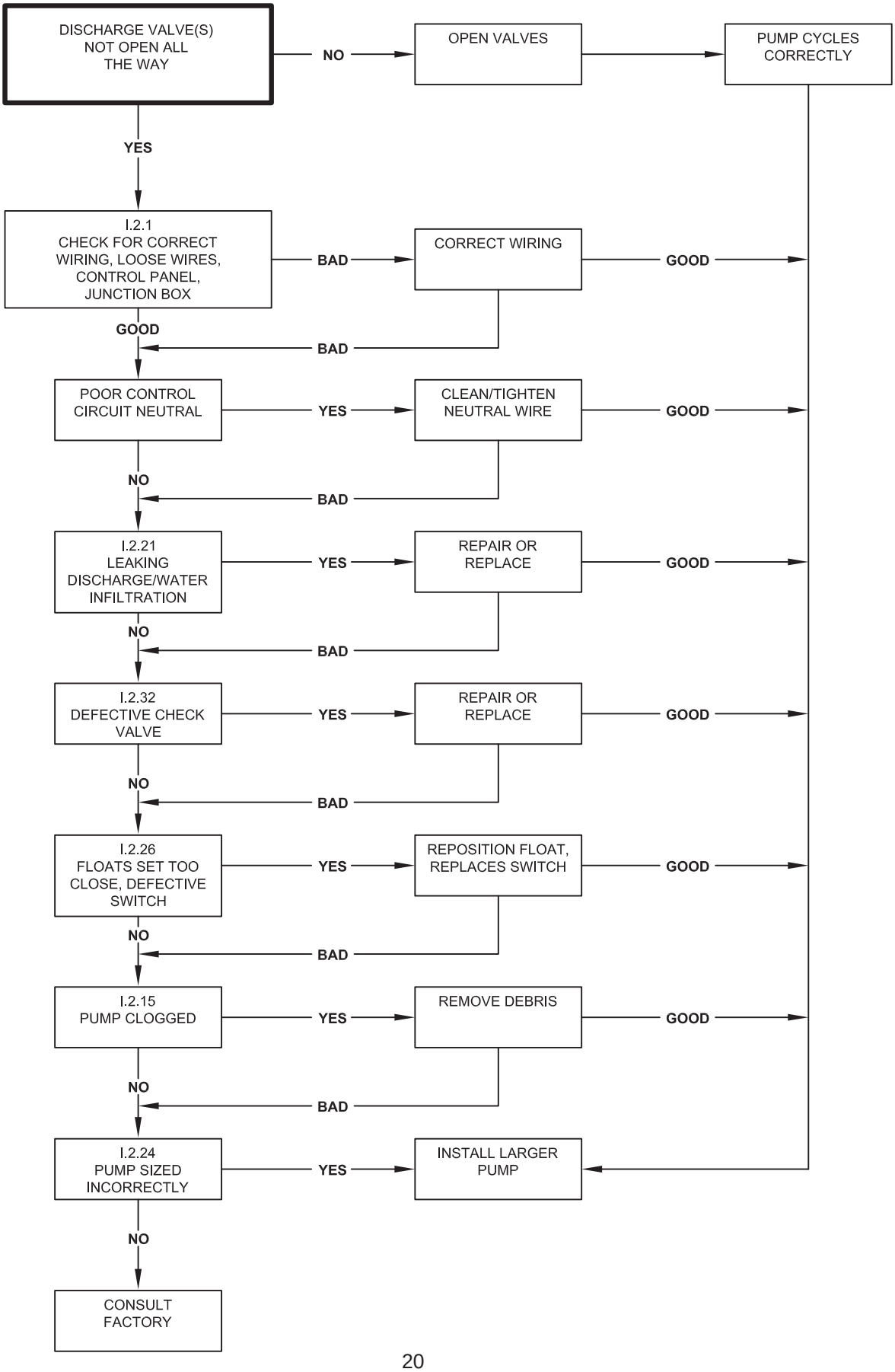
Problem I.1.7
Pump Will Not Shut Off



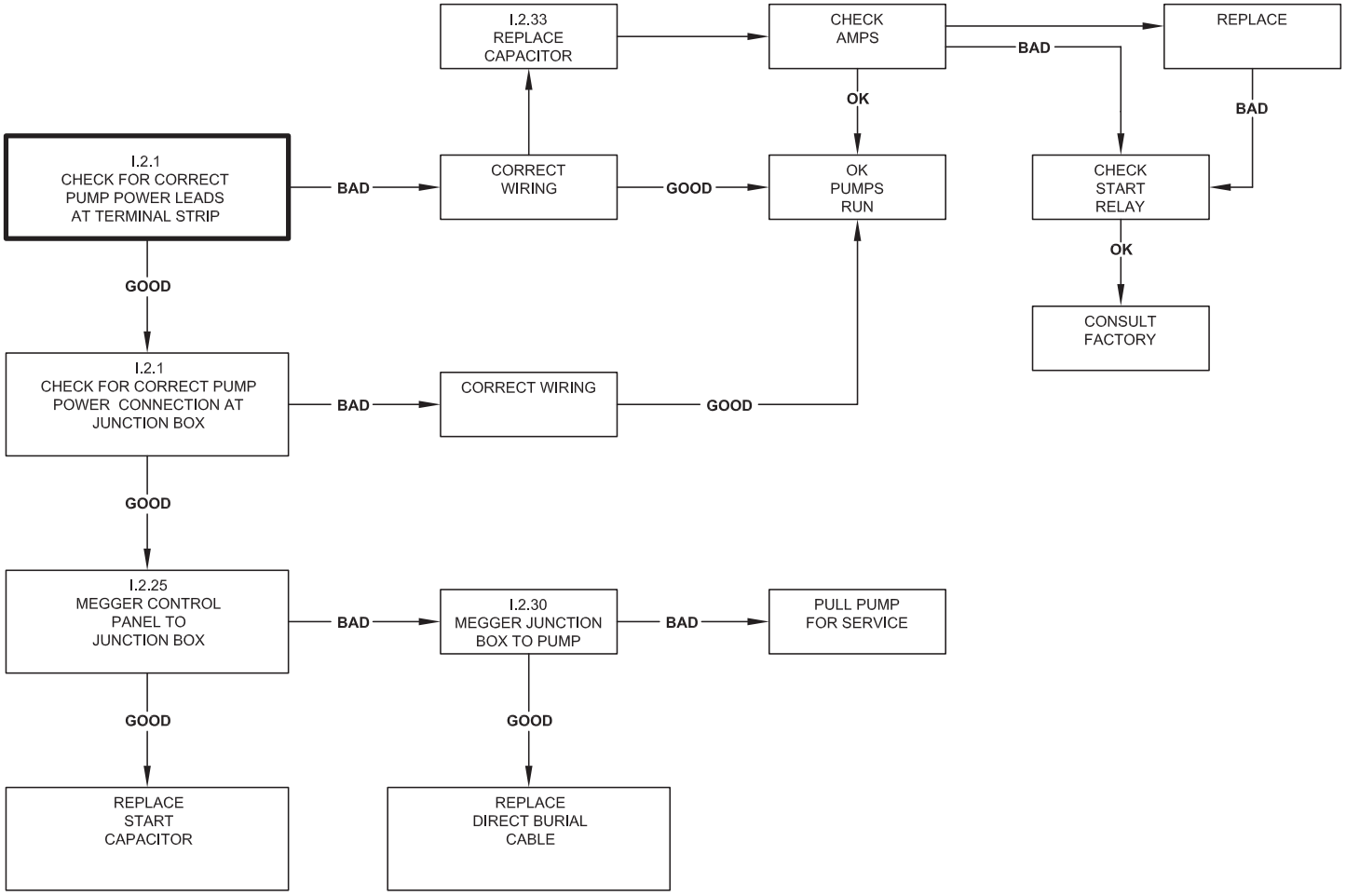
Problem I.1.8
Circuit Breaker Trips or Fuse Blows, Pumps Do Not Start



Problem I.1.9
Pump Cycles Frequently



Problem I.1.10
Failed Start Capacitor (SIngle Phase Units With Start Circuit in Panel) When Pump Turns On



I-2.1) Check for Correct Wiring:
Check all switch control leads for correct color coding or number marking. Trace all leads through junction box to correct terminal in the control panel. Refer to appropriate wiring diagrams in service manual, control panel, and junction box.

> **NOTE:**
> **Pump power leads at control panel terminal strip must be red to R, black to B, and white to W.**

When checking for correct wiring, look for moisture in the control panel or junction box, corrosion at wire connections, loose wire connections, and poorly stripped wires. All of the above can contribute to control problems.

I-2.2) Check Water Level:
Remove wetwell cover and check water level. If the water level is above the “On” float, this should be sufficient to close all switches.

I-2.3) Float Hang Up:
Visually check float movement while filling basin. If floats get hung up on pump or rail system, reposition floats and check again. Inspect floats for build-up of solids, clean, and check operation.

I-2.4) Continuity Check of Controls:
Turn off Main Circuit Breaker at control panel. Fill basin to a level above the discharge elbow, this will allow all switches to be closed. Referring to the wiring diagram supplied with panel, check for continuity at the control panel terminal strip. Off, On, and alarm switches should be closed (continuity), (see Figure 8).

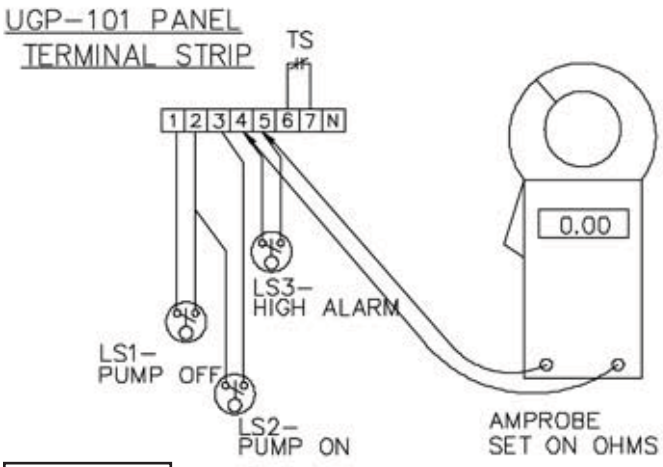


Figure 8

Turn on the Main Circuit Breaker and manually pump the basin down to the bottom of the pump volute. Turn off the Main Breaker and repeat the continuity check. Off, On, alarm switch should be open (no continuity). If these conditions are not met, go to L.2.5.

I-2.5) Continuity Check of Controls:
AT JUNCTION BOX. Fill wetwell to a level above the discharge elbow, this will allow all switches to be closed. Refer to the wiring diagram supplied with the basin, turn off the main breaker, disconnect all switch control leads at the junction box, check for continuity from switch controls to junction box. Off, On, and alarm switches should be closed (continuity), (see Figure 9).

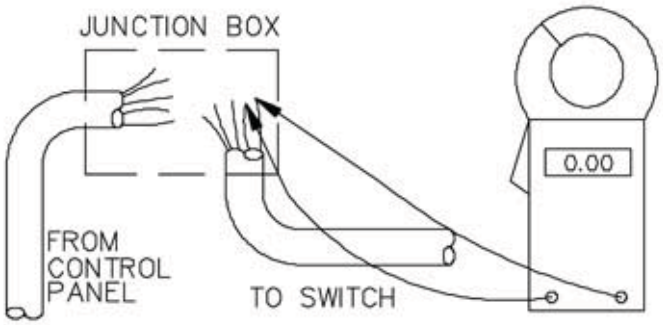


Figure 9

Turn on breaker and manually pump the basin down to the bottom of the pump volute, Off, On alarm switch should be open (lack of continuity). If these conditions are not met, replace switch.

CAUTION!
When the breaker is turned on, the control leads may be energized with 120 V. Make sure they are safely tied off and isolated.

I-2.6) Replace Cable between Panel & Junction Box:
If it is necessary to replace the direct burial cable, note the following:

1. Is the cable the same size/type.
2. Reseal conduit entering control panel.
3. Are the cord grip grommets in the junction box the correct size.
4. Use “NEW” wire nuts in the junction box.
5. How did the cable get damaged?

I-2.7) Moisture in Control Panel/Junction Box:
The accumulation of moisture in the controls can lead to a number of electrical problems. If moisture is evident, turn power to the control panel off and thoroughly dry with a blow dryer. After drying, check for loose or corroded connections, determine cause of moisture, and correct.

I-2.8) Continuity Check Moisture Sensor, Control Panel:

NOTE:
The moisture sensor is a (N/O) normally open detector. SH Series and explosion proof pumps have a 330K Ohm test resistor across the probes. If a 330K reading is obtained, this should be considered "Open".

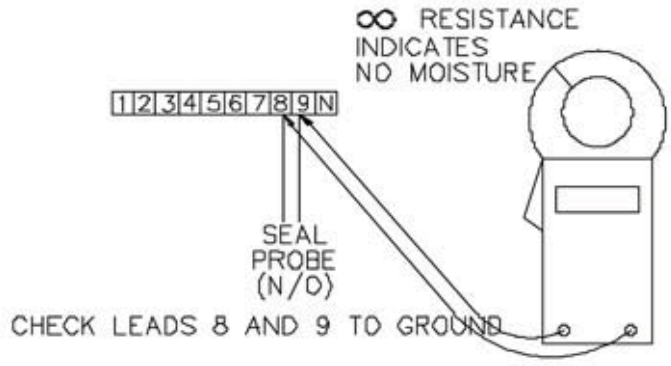


Figure 10

In the event of a moisture detect, check the moisture sensor leads for continuity. Refer to wiring diagram supplied with panel. If resistance is detected, check for continuity in junction box, (see Figure 10).

I-2.9) Continuity Check Moisture Sensor, Junction Box:

NOTE:
The moisture sensor is a (N/O) normally open detector. SH Series and explosion proof pumps have a 330K Ohm test resistor across the probes. If a 330K reading is obtained, this should be considered "Open".

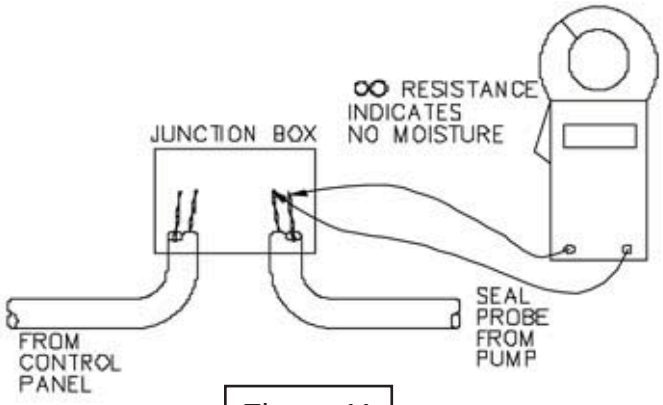


Figure 11

If checking moisture sensor leads at the control panel for continuity indicates the presence of moisture, disconnect the moisture sensor leads in the junction box and check for continuity from junction box to pump, (see Figure 11).

I-2.10) Excessive Water Temperature:
Continuous water temperatures above 100°F (38°C) may cause the pump temperature sensor to open and trip the thermal overload. To determine if this is happening, turn power off and fill the basin with cold water (allowing time for the pump to dissipate heat). Turn power on and check for normal pump cycle. Continuous operation with the pump unsubmerged may result in the same symptoms. Consult pump manual for minimum submergence requirements.

NOTE:
Water temperature not to exceed 160°F (71°C) intermittent.

I-2.11) Check Motor Amperage:
With the power off, clamp the amp robe around the appropriate lead. Fill basin so pump will be under load and turn pump on. Record amperage readings on all necessary leads. Compare your recorded amperage with the nameplate rating and the amperage recorded on the system start-up sheets. (See Figures 12 and 13). Amps will drop as motor becomes warm.

NOTE:
Must not exceed ± 10% nameplate amps at nominal voltage.

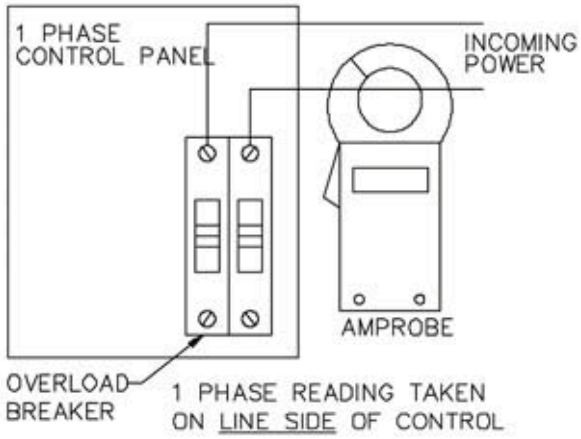


Figure 12

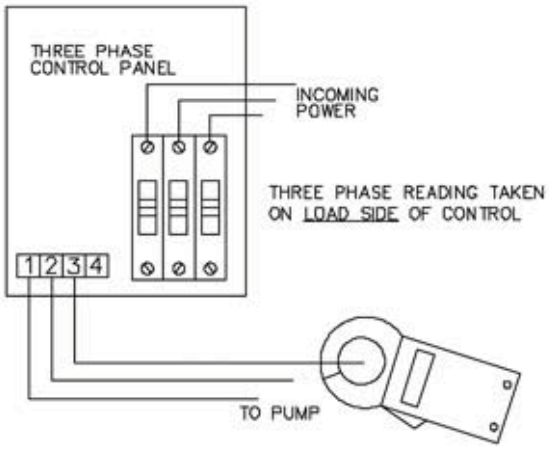


Figure 13

I-2.12) Jammed Cutter/Impeller:
With the power off and the control panel locked, check the cutter/impeller for freedom of movement, you should be able to move the cutter by hand.

If clogged, clear the cutter/impeller cavity of any obstruction. If all the debris cannot be removed, it may be necessary to remove the volute to clean around the impeller, refer to pump Installation/Operation Manual.

I-2.13) Check Application:
Check for undersized pump or incorrect impeller installed for conditions. Recheck performance curve. It is possible the original pump selection is at fault or system head has changed.

I-2.14) Correct Pump Rotation:
All Barnes Submersible Grinder Pumps rotate “clockwise” looking down at the pump. To check rotation, suspend the pump freely, momentarily apply power, and observe the “kickback”. Kickback should always be in a counterclockwise direction as viewed from the top of the pump motor housing.

Incorrect rotation three phase: In the event that the rotation is incorrect for a three phase pump, interchange any two power cable leads at the control panel. Do not change power cable leads in the pump. Recheck the “kickback” rotation again by momentarily applying power.

Incorrect rotation single phase: In the unlikely event that the rotation is incorrect for a single phase pump, contact a Barnes Pump’s Service Center.

I-2.15) Check for correct incoming voltage:
Single Phase: Check incoming voltage on the line side of the control panel circuit breaker. Readings of ± 10% of published voltage (nameplate) are acceptable. A true check of the voltage supply to the motor must be taken with the pump operating under load, (see Figure 14).

Take voltage readings with the pump “off” and readings with the pump “on”, compare the two readings and note any difference.

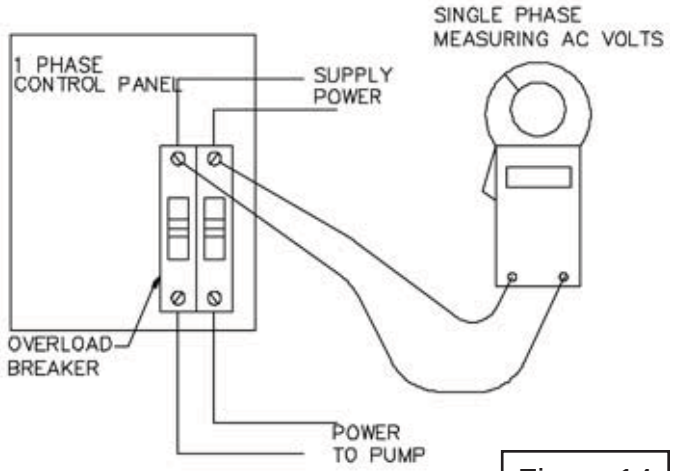


Figure 14

If incorrect power supply readings are recorded, contact local power source.

Three Phase: Check incoming voltage on the pump side of the control panel circuit breaker. Readings of ± 10% of the published voltage (nameplate) are acceptable. A true check of the voltage supply to the motor must be taken with the pump operating under load, (see Figure 15).

Take voltage readings between all three legs with the pump" off" and readings with the pump "on", compare the two readings and note any difference. Also note whether or not the voltages between all three legs are similar (balanced).

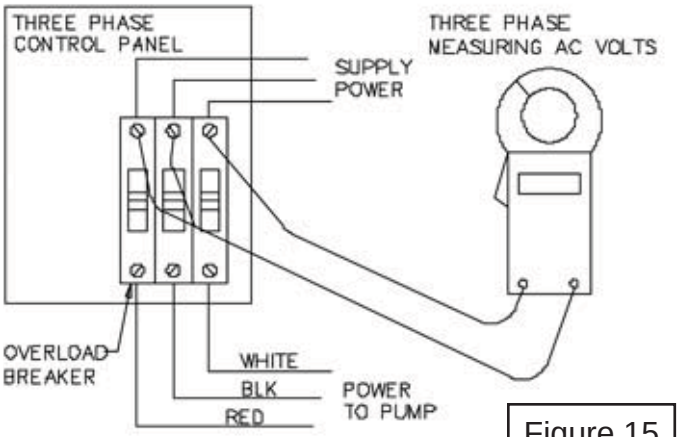


Figure 15

If incorrect power supply readings are recorded, contact local power source.

I-2.16) Discharge Valve Open:
Inspect discharge and check valves for correct installation. Are they installed backwards. (check valve). Is the valve at the basin and main open. Is the check valve stuck. Is discharge line from pump to main plugged.

I-2.17) Pump Air Locked:
If the pump has become air locked, it will not pump the basin down, air locked pumps may be corrected in one of the following manners.

- Shake pump up and down by the lifting rope, do not pull on the power or control cables.
- Close and open discharge valve a few times in quick succession.
- Start and stop pump a few times allowing 2 or 3 minutes between stop and restart.

I-2.18) Excessive Inflow:
Inflow may be at a rate greater than pumping rate, compare inflow with pump curve.

Excessive inflow may also be due to ground water infiltration. With wetwell level pumped down as low as possible, check for ground water leaks around inlet and discharge lines. Check for leaks through damaged or cracked basin wall. Note the wetwell installation, if the top of the basin is below grade level, ground water may be entering around the lid or vent.

I-2.19) Discharge Leak:
Pump wetwell down (below discharge plumbing) observing discharge line, check for plumbing leaks while line is under pressure, repair fixtures, or discharge gasket as required.

I-2.20) Impeller/Cutter Damage:
If the impeller and or cutter is damaged or excessively worn, it must be replaced, see appropriate disassembly/assembly section in this Pump manual. NOTE: If the cutter on grinder pumps is excessively worn the shredding ring may be reversed.

I-2.21) Discharge Head Too High:
Check total head and pump performance curve and that the correct impeller has been installed or consult factory.

I-2.22) Discharge Plumbing or Rail Assembly Loose:
With pump running, check for loose pipe attachments and/or loose rail assembly. Make any necessary adjustments.

I-2.23) Adjust Float or Replace Switch:
If floats are used, you may have to reposition "on" float to get a longer pump down cycle. You may also have a float stuck in the open position.

I-2.24) Connector Sticking:
The connector used in many control panels can be tripped on/off manually. With the liquid level above the "on" float, turn pump on, this will close the connector. Allow the system to pump down to the "off" level. If the pump does not shut off, manually turn it off. If the connector is still closed, it is sticking and should be replaced.

I-2.25) Check Circuit Breaker and Fuse Rating:

NOTE:
Control Panel Circuit Breaker (short circuit protection) should be rated at least 20% higher than pump full load amps, but no more than 3 times the full load amps. Current overloads should be sized in accordance with pump nameplate amps.

Conditions of Motor and Leads	OHM Value	MEG-OHM Value
A new motor (without Drop Cable).	20,000,000 (or More)	20.0
A used motor which can be reinstalled in the well.	10,000,000 (or More)	10.0
Motor in well. Ohm readings are for drop cable plus motor.		
A new motor in well.	2,000,000 (or More)	5.0
A motor in the well in reasonably good condition.	500,000 - 2,000,000	0.5 - 5.0
A motor which may have been damaged by lighting or with damaged leads. **DO NOT** pull the pump for this reason.	20,000 - 500,000	0.02 - 0.5
A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will not fail for this reason alone, but it will probably not operate for long.	10,000 - 20,000	0.01 - 0.02
A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced.	Less Than 10,000	0 - 0.01

I-2.26) Megger Control Panel to Pump:
With power “off” at the control panel, disconnect the pump power cable leads from the control panel.

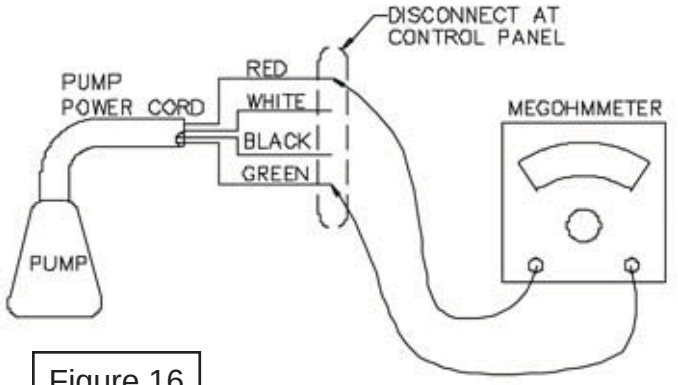


Figure 16

Connect one lead to ground (green) and check red, black, white power cord leads, (see Figure 16). A minimum insulation resistance readings of 5MΩ is considered acceptable. Readings of less than 5MΩ indicates a bad circuit between control panel and pump, (See Resistance Values on Page 30).

I-2.27) Megger Junction Box to Pump:
With power “off” at the control panel, disconnect the pump power cable leads at the junction box.

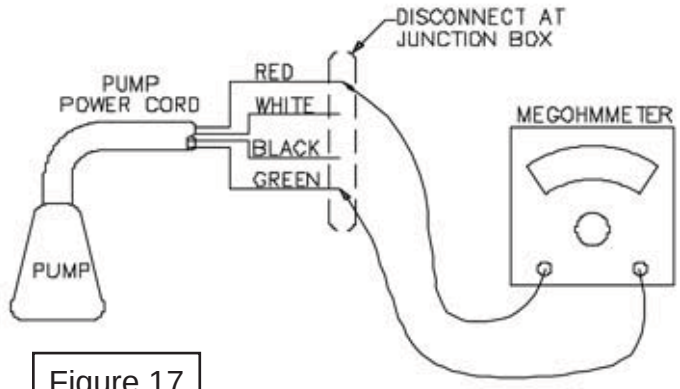


Figure 17

Connect one lead to ground (green) and check red, black, white power cord leads, (see Figure 17). A minimum insulation resistance reading of 5MΩ is considered acceptable. Readings of less than 5MΩ indicate a bad circuit between the junction box and pump, pull the pump for service.

I-2.28) Poor Neutral:
With power “off” check for “clean” tight neutral connection on control panel terminal strip, also check neutral connection at power supply. Refer to appropriate wiring diagram in service manual.

I-2.29) Defective Check Valve:
If the check valve is not installed properly or is defective, this will allow back flow at the end of the pump cycle. Remove and examine check valve for proper installation and freedom of movement, repair, or replace.

I-2.30) Faulty Relay or Start Capacitor:

Checking the start relay, (see Figure 18).

CAUTION!
Be sure to short out start capacitor and remove wires from relay terminals before making any resistance checks with ohmmeter. Always remove all power from circuits before making resistance measurements.

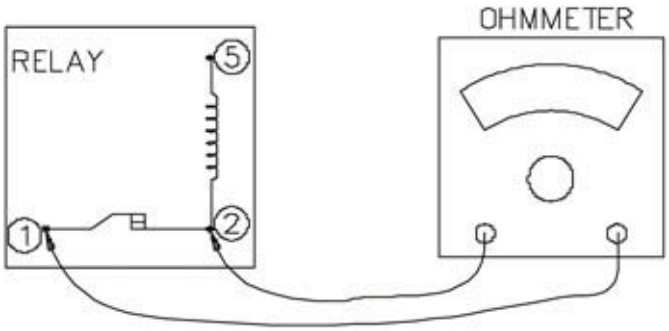


Figure 18

Measure Between Terminals 1 and 2: Zero Ohms.
Measure Between Terminals 2 and 5: Actual coil resistance.

Relay Check: The terminals on the relay used in this check are numbered. The numbers are stamped on the backlight housing next to the terminals. With Ohmmeter set on the R x1 scale, the reading between Terminals number 1 and number 2 should be all the way to the right of the scale or zero. **On some occasions due to higher than expected amp draws through the relay, the contact may permanently “weld” together.** A relay with welded contacts will cause start capacitors to overheat and become defective. A relay with welded contacts will often measure good with an ohmmeter (O) even though it is defective.

If start capacitor is found faulty, **it is suggested that the relay cover be removed (two screws) and the contact points physically checked for contact surface condition as well as freedom of movement.**

The reading between Terminal number 2 and number 5 should show the resistance in the relay holding coil. If it shows open, then the coil has burned up. If it shows no resistance, it may have shorted out. Either way, replace the relay.

I-2.31) Checking Run and Start Capacitors:

CAUTION!
IF CAPACITORS ARE BEING CHECKED WHILE STILL IN THE CONTROL, PROCEED WITH STEPS 1 - 4.

1. Remove and lock “off” all power to control.

2. Using a screwdriver, with an insulated handle, short circuit each capacitor by placing the blade of the screwdriver across the two terminals of each capacitor. This will “discharge” the capacitor.

3. Remove all leads connected to capacitor terminals. (It is most important to make note of the position of leads so that they will be properly reconnected after testing.)

4. Remove any resistors found across the capacitor terminals (usually found on start capacitors).

CHECKING CAPACITORS: The following checks made with a Simpson Ohmmeter, Model Number 372, or equivalent, apply to both **RUN** and **START CAPACITORS** except for the range setting or scale used. (If a digital meter with a capable of measuring capacitance is used, verify the reading obtained matches the capacitance on the capacitor case)

Use scale R x 100K for Run Capacitors and R x 10K for Start Capacitors.

The following check can be taken with capacitors on the bench or in the control.

Check each capacitor by clipping an ohmmeter lead to one of the capacitor terminals and touching the other ohmmeter lead to the other terminal for a few seconds. **NOTE:** Results as follows:

- A good Run Capacitor is indicated by pointer of ohmmeter moving towards zero (the figure “0” on right-hand side of scale) and then slowly drifting back towards the left.
- When checking a Start Capacitor, you will note (depending on MFD rating), that some of them will not move the ohmmeter needle to complete zero before it is on its way back and that, unlike the Run Capacitors, the needle will not always move all the way to the left side of the scale. The reason for this is the much higher rating of Start Capacitors.
- If the pointer remains at infinity (00), capacitor is “open”.
- If the pointer remains at zero (0), capacitor is “shorted” A shorted or open capacitor must be replaced.

NOTE:
The above test builds up a small charge in the capacitor which it will store. Before repeating test or reconnecting capacitors, discharge capacitor by shortening terminals with an insulated screwdriver. A good capacitor will discharge a small spark.

Check each metal Run Capacitor for grounds by clipping one ohmmeter lead to capacitor case and the other ohmmeter lead, in turn, to each of the two capacitor terminals. With ohmmeter set at R x 100K, pointer should remains at infinity(00) on extreme left of scale. Start Capacitors often have backlight case and cannot be checked by this method for ground.

BARNES® BARNES PRESSURE SYSTEMS CROWN

burks® WEINMAN® DEMING® PROSSER®

Limited 24 Month Warranty

Crane Pumps & Systems warrants that products of our manufacture will be free of defects in material and workmanship under normal use and service for twenty-four (24) months after manufacture date, when installed and maintained in accordance with our instructions.This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In the event the product is covered by the Federal Consumer Product Warranties Law (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our factory or nearest authorized service station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply. **THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. POINT OF MANUFACTURE OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE OR OTHERWISE.** Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees, in the nature of performance specifications must be in writing and such writing must be signed by our authorized representative. Due to inaccuracies in field testing if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. **RECOMMENDATIONS FOR SPECIAL APPLICATIONS OR THOSE RESULTING FROM SYSTEMS ANALYSES AND EVALUATIONS WE CONDUCT WILL BE BASED ON OUR BEST AVAILABLE EXPERIENCE AND PUBLISHED INDUSTRY INFORMATION. SUCH RECOMMENDATIONS DO NOT CONSTITUTE A WARRANTY OF SATISFACTORY PERFORMANCE AND NO SUCH WARRANTY IS GIVEN.**

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage (c) lightning (d) excessive sand or other abrasive material (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval.

This warranty is void if our inspection reveals the product was used in a manner inconsistent with normal industry practice and\or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product. **UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR FEES, UNAUTHORIZED REPAIR SHOP EXPENSES, LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND\OR WORKMANSHIP AND\OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE**.

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.

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PUMPS & SYSTEMS

A Crane Co. Company

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Fax: (937) 773-7157
www.cranepumps.com

83 West Drive, Brampton
Ontario, Canada L6T 2J6
Phone: (905) 457-6223
Fax: (905) 457-2650

IMPORTANT!
WARRANTY REGISTRATION

Your product is covered by the enclosed Warranty.
To complete the Warranty Registration Form go to:

http://www.cranepumps.com/ProductRegistration/

If you have a claim under the provision of the warranty, contact your local Crane Pumps & Systems, Inc. Distributor.

RETURNED GOODS
RETURN OF MERCHANDISE REQUIRES A "RETURNED GOODS AUTHORIZATION".
CONTACT YOUR LOCAL CRANE PUMPS & SYSTEMS, INC. DISTRIBUTOR.

Products Returned <u>Must</u> Be Cleaned, Sanitized,
Or Decontaminated As Necessary Prior To Shipment,
To Insure That Employees Will Not Be Exposed To Health
Hazards In Handling Said Material. All Applicable Laws
And Regulations Shall Apply.

CRANE PUMPS & SYSTEMS

A Crane Co. Company

START-UP REPORT

General Information

Pump Owner's Name: _____

Address: _____

Location of Installation: _____

Contact Person: _____ Phone: _____

Purchased From: _____

Nameplate Data

Pump Model #: _____ Serial #: _____

Part #: _____ Impeller Diameter: _____

Voltage: _____ Phase: _____ Ø Hertz: _____ Horsepower: _____

Full Load Amps: _____ Service Factor Amps: _____

Motor Manufacturer: _____

Controls

Control panel manufacturer: _____

Model/Part number: _____

Number of pumps operated by control panel: _____

Short circuit protection? YES___ NO___ Type: _____

Number and size of short circuit device(s): _____ Amp rating: _____

Overload Type: _____ Size: _____ Amp rating: _____

Do protection devices comply with pump and motor Amp rating? YES___ NO___

Are all electrical and panel entry connections tight? YES___ NO___

Is the interior of the panel dry? YES___ NO___

Liquid level Control Brand and Model: _____

Pre-Startup

All Pumps

Type of equipment: NEW___ REBUILT___ USED___

Condition of equipment at Start-Up: DRY___ WET___ MUDDY___

Was Equipment Stored? YES___ NO___ Length of Storage: _____

Liquid being pumped: _____ Liquid Temperature: _____

Supply Voltage/Phase/Frequency matches nameplate? YES___ NO___

Shaft turns freely? YES___ NO___

Direction of rotation verified for 3Ø motors? YES___ NO___

Debris in piping or wet well? YES___ NO___

Debris removed in your presence? YES___ NO___

Pump case/wet well filled with liquid before startup? YES___ NO___

Is piping properly supported? YES___ NO___

Non-Submersible Pumps

Is base plate properly installed / grouted? YES___ NO___ N/A___

Coupling Alignment Verified per I&O Manual? YES___ NO___ N/A___

Grease Cup/Oil Reservoir Level checked? YES___ NO___ N/A___

Submersible Pumps

Resistance of cable and pump motor (measured at pump control):

Red-Black:_____Ohms(Ω) Red-White:_____Ohms(Ω) White-Black:_____Ohms(Ω)

Resistance of Ground Circuit between Control Panel and outside of pump:_____Ohms(Ω)

MEG Ohms check of insulation:

Red to Ground: _____ White to Ground: _____ Black to Ground: _____

Operational Checks

Is there noise or vibration present? YES___ NO___ Source of noise/vibration: _____

Does check valve operate properly? YES___ NO___ N/A___

Is system free of leaks? YES___ NO___ Leaks at: _____

Does system appear to operate at design flow rate? YES___ NO___

Nominal Voltage: _____ Phase: 1Ø 3Ø (select one)

Voltage Reading at panel connection, Pump OFF: L1, L2 _____ L2, L3 _____ L1, L3 _____

Voltage Reading at panel connection, Pump ON: L1, L2 _____ L2, L3 _____ L1, L3 _____

Amperage Draw, Pump ON: L1 _____ L2 _____ L3 _____

Submersible Pumps

Are BAF and guide rails level / plumb? YES___ NO___

Is pump seated on discharge properly? YES___ NO___

Are level controls installed away from turbulence? YES___ NO___

Is level control operating properly? YES___ NO___

Is pump fully submerged during operation? YES___ NO___

Follow up/Corrective Action Required

YES___ NO___

Additional Comments:

_____

_____

_____

_____

_____

_____

_____

Startup performed by: _____ Date: _____

Present at Start-Up

( ) Engineer: _____ ( ) Operator: _____

( ) Contactor:_____ ( ) Other:_____

All parties should retain a copy of this report for future trouble shooting/reference

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PUMPS & SYSTEMS

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