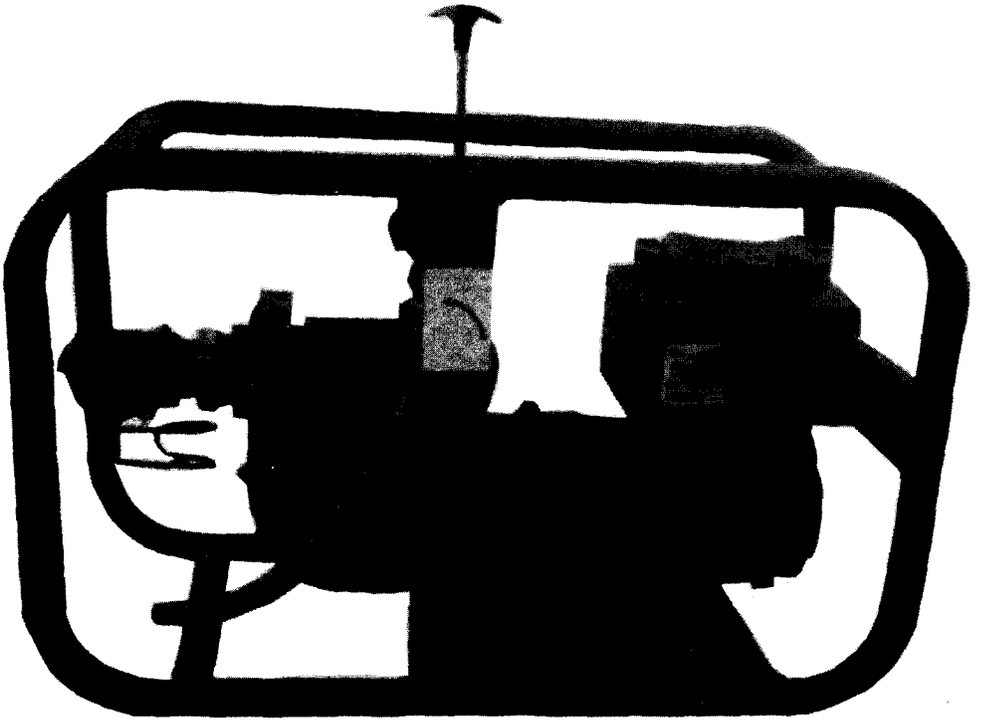
TECHNICAL MANUAL

OPERATOR'S UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL

CENTRIFUGAL PUMP UNIT
1 1/2" SUCTION & DISCHARGE
24 VOLT DC ELECTRIC MOTOR DRIVEN



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HEADQUARTERS, DEPARTMENT OF THE ARMY
15 June 1990

CHANGE
NO. 1

HEADQUARTERS
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Operator's, Unit and Direct Support
Maintenance Manual

CENTRIFUGAL PUMP UNIT
1-1/2" SUCTION & DISCHARGE
24 VOLT, DC, ELECTRIC MOTOR DRIVEN

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Current as of 10 January 1990

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual directly to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR–MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and the content requirements normally associated with Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

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APPENDIXES

*This manual supersedes **TM 5-4320-314-10, 15** May **1989.**

LIMITED WARRANTY

We guarantee our products to be free from defects in material and workmanship for one year

Warranty, statutory or otherwise, is limited to the replacement or repair at our factory, or at a point designated by us, of such part as shall appear to us, upon inspection at such point, to have been defective in material or workmanship.

This warranty does not obligate us to bear the cost of labor or transportation charges in connection with the replacement or repair of defective parts, nor shall it apply to a machine upon which repairs or alterations have been made unless authorized by us.

We make no Warranty in respect to the electric motors. This item is subject to the warranty of the respective manufacturer.

No express, implied or statutory Warranty other than herein set forth is made or authorized to be made for us.

Returned Goods: Written permission must be obtained before returning any material. Material returned for credit will be subject to a factory inspection. Credit for products within the warranty period will be subject to a rehandling charge. Returns must be shipped with transportation charges prepaid. Special non-catalog items cannot be returned.

Freight F.O.B. shipping point. Examine shipment upon arrival to ascertain if in good order. Any shortages or damage should be noted on Bill of Lading before signing.

SAFETY PRECAUTIONS

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance of the equipment covered herein. Should situations arise that are not covered in the general or specific safety precautions, the Commanding Officer or other authority will issue orders deemed necessary to cover the situation.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the voltage supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position. To avoid casualties, always remove power and discharge and ground a circuit before touching it, or connecting or disconnecting meters or test leads.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should repair or adjustment of energized equipment be attempted alone.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modem methods of resuscitation. Should someone be injured and stop breathing, initiate resuscitation immediately. A delay could cost the victim's life.

GENERAL PRECAUTIONS

All circuits not known to be dead must be considered alive at all times.

Do not wear loose clothing when working on rotating equipment.

When working near electricity, do not use metal rules, flashlights, metallic pencils or any other object having exposed conducting material.

Before making any test, repairs or adjustments, be sure to protect yourself against grounding and be sure the frame of the motor and the motor controller are securely grounded.

Priming and sample taking operations using the centrifugal pump unit results in fuel being discharged directly from the sample hose on the ground in the immediate vicinity of the pump. All precautions to prevent fuel ignition, explosion and fire must be taken.

Do not operate DC motor until motorpump case is full of fuel. Dry operation will harm the motorpump mechanical seal.

SECTION 1
INTRODUCTION

1-1. DESCRIPTION.

1–2. The centrifugal pump unit, hereinafter referred to as the unit, is a self-contained fueling system Consisting of the major Components illustrated in figure 1-1.

1–3. The motorpump is powered by a 1/2 Horsepower 24 Volt DC permanent magnet motor. Fuel enters through the suction strainer. The fuel flows through two 25 foot suction hoses to the motorpump. The motorpump discharges the fuel through two 25 foot discharge hoses. The fuel flows under pressure to the discharge nozzle and into vehicles or containers.

1-4. The unit contains a hand pump which is used to sample fuel and initially fill the motorpump case. This process of falling the motorpump case prior to operation is called priming.

1–5. The hand pump is a hand operated plunger piston pump. It is connected to the motorpump case by a hose. The hand pump is isolated from the motorpump by a ball valve.

1-6. The unit is connected to the 24 Volt DC power source by a 15 foot power cable. The cable terminates with a power plug.

1–7. The electrical controls include a circuit breaker for overload and short circuit protection, The motor contains an electrical thermal protection device which senses approaching overheat conditions in the motor housing and shuts the motor off before damage occurs.

1-8. The motorpump is a self priming centrifugal capable of transferring from 25 to 50 GPM of diesel fuel at 20 feet of head. The unit will operate at rated conditions when positioned at an angle up to 15 degrees from the horizontal. The unit primes within two minutes on a 10 foot static suction lift after initial filling of the pump case. Electrical power requirement is 24 VDC, 30 amps. The physical parameters of the unit are:

a. Length — 26.5 inches

b. Width — 12.5 inches

c. Height — 17 inches

d. Cube — 3.25 cubic feet

e. Weight — 75 pounds

1–9. The unit is a self contained system and ships with all major Components listed above. Additional items required for operation are a grounding point, a fuel source and a 24 VDC power supply

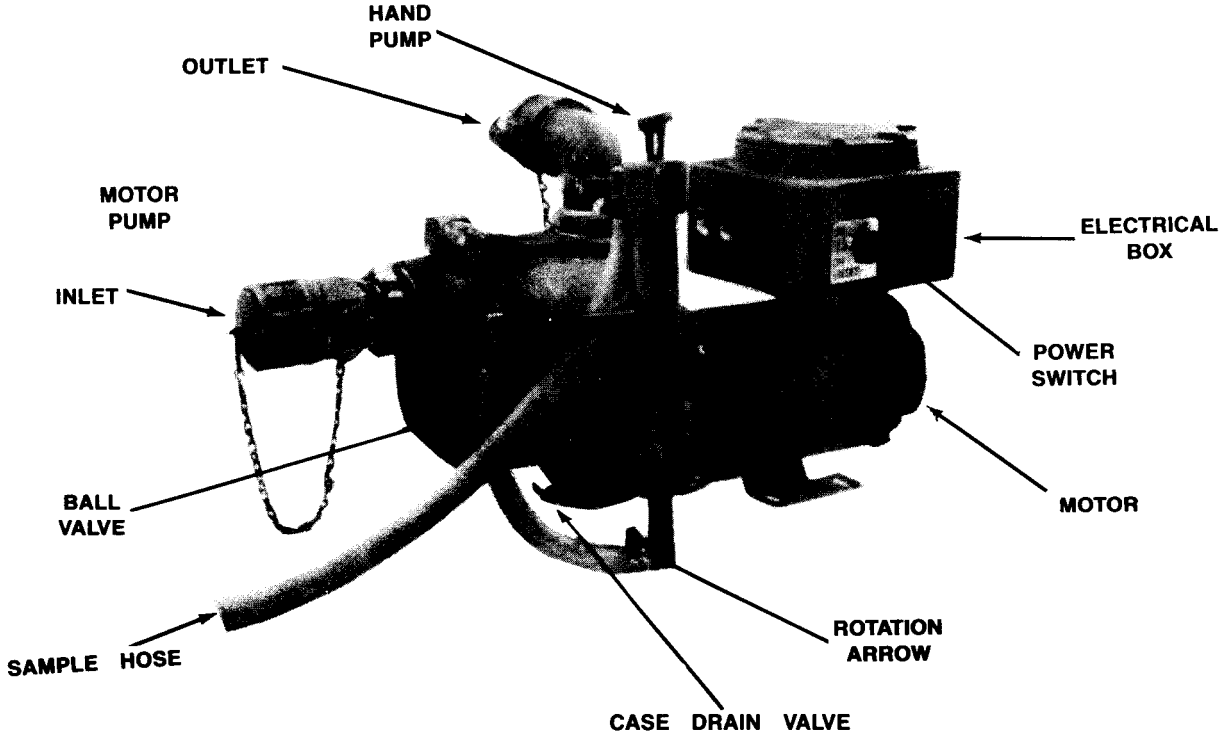
1–10. To store the unit, drain all lines and pump case in accordance with operating procedures, Unit storage temperature conditions can range from + 155 °F to -65 °F.

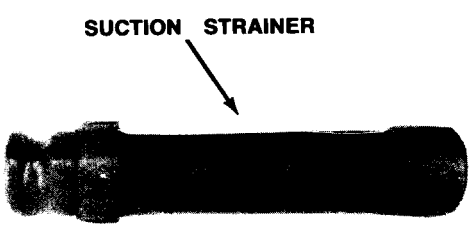
1–11. Operating temperature conditions can be from +125 °F to –25 °F.

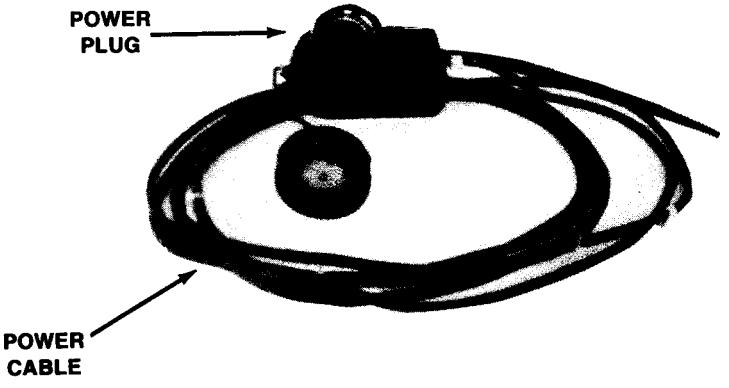
1–12. No special tools or test equipment are required for normal operation.

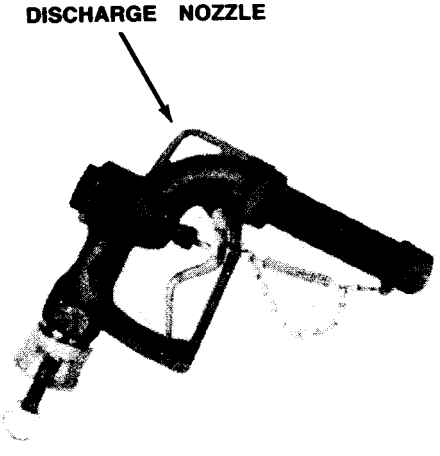
1–13. The unit is warranted in accordance with the limited warranty contained in this manual.

Figure 1–1. Centrifugal Pump Unit (Cradle removed for component visibility)
(Sheet 1 of 2)









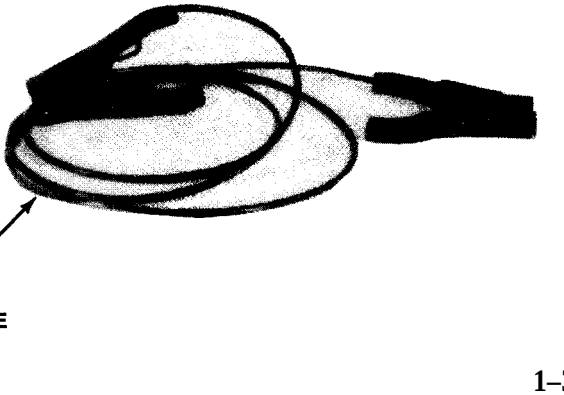
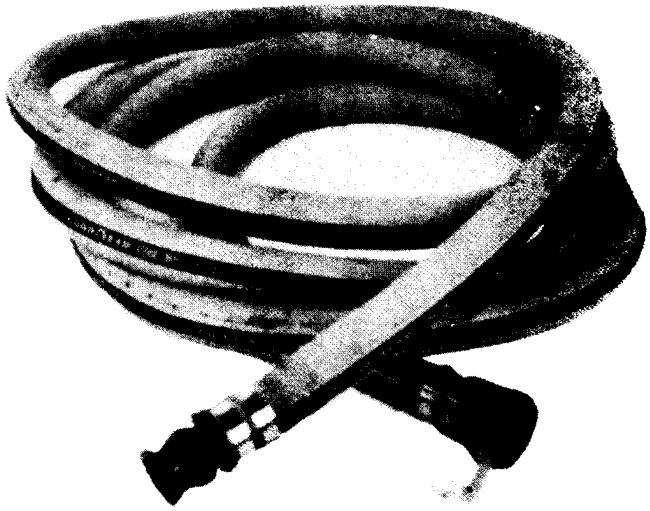
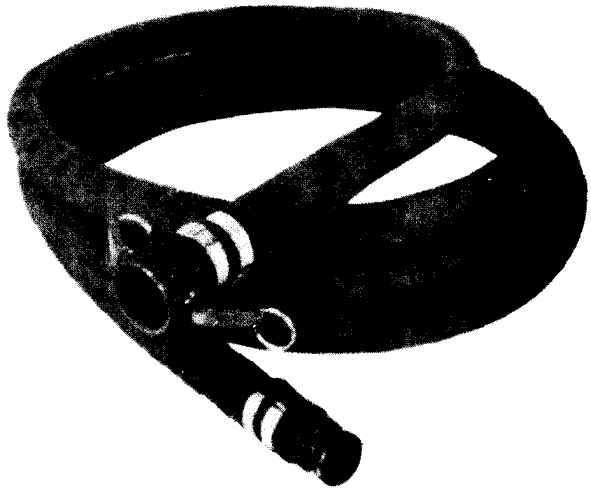


Figure 1–1. Centrifugal Pump Unit (Sheet 2 of 2)



SUCTION
HOSE



DISCHARGE
HOSE

SECTION 2
SET-UP

2–1. **SET-UP.**

2–2. Set up the unit following these steps.

a. Remove unit components from transportation vehicle. Locate on the ground near fuel source.

b. Electrically ground unit using ground wire. Connect one ground clamp to unit cradle and other ground clamp to fueling ground point.

c. Remove dust plug from inlet and dust cap from outlet.

d. Connect two suction hoses (black stripe) together. Connect to motorpump inlet.

e. Connect suction strainer to suction hose.

f. Connect two discharge hoses together. Connect to motorpump outlet.

g. Connect discharge nozzle to discharge hose.

h. Place suction strainer end of suction hose below surface of fuel source. Strainer must be below surface of fuel source at all times or unit will not work.

i. Uncoil power cable. Connect power plug to 24 volt DC power source.

j. Unit is now ready for start-up.

WARNING

Do not disconnect ground clamps or power plugs while unit is running. Disconnection will generate sparks and cause fire or explosion.

SECTION 3
OPERATION

3-1. PRIMING.

WARNING

Priming and sample taking operations using the unit results in fuel being discharged directly from the sample hose on the ground in the immediate vicinity of the pump. All precautions to prevent fuel ignition, explosion and fire must be taken.

3–2. Unit will not prime until the following conditions are met:

a. Suction strainer must be under surface of fuel source. Any air entering the suction strainer will cause the unit to lose prime or cease pumping.

b. There must be not air leaks in suction or discharge hoses. All hose camlock connections must be firmly seated before unit can be primed. Check to insure each camlock joint has its washer firmly seated prior to closing camlock joint.

c. Motorpump case drain valve located below motorpump inlet connection must be closed.

d. Discharge nozzle must be closed during hand pump operation and when motorpump is self–priming. Opening discharge nozzle will allow air into the hoses prior to priming being completed and will result in loss of prime and an inoperable unit.

3-3. START-UP SEQUENCE.

3-4. Start-up the unit in accordance with the following steps.

a. Turn ball valve handle to vertical “PRIME/SAMPLE” (open) position. Close motorpump case drain valve.

b. Operate hand pump using steady, short, up and down strokes. Time to prime motorpump will vary from 1 to 3 minutes.

c. Pumping hand pump removes air from hoses and motorpump case. Steadily pump hand pump until a continuous stream of fuel discharges from sample hose.

d. Take clean sample of fuel from sample hose end.

e. Continue to operate hand pump until steady stream of fuel flows. Once steady stream of fuel flows from sample hose, close ball valve by moving handle from “PRIME/SAMPLE” (open) position to “RUN” (close) position.

f. Turn power switch on electrical junction box to “ON’ position.

g. Unit is now running on DC motor and is ready to transfer fuel.

h. Transfer fuel by opening fuel discharge nozzle. Initial operation may produce slugs of air and fuel prior to steady operation.

CAUTION

Do not operate DC motor until motorpump case is full of fuel. Dry operation will harm the motorpump mechanical seal.

3–5. NORMAL OPERATION.

3-6. The unit is now operation. The discharge nozzle can be opened and closed, as required to transfer fuel into containers or vehicles. With the discharge nozzle closed, the pump can run up to 5 minutes. If no fuel is to be transferred, turn the power switch to the "OFF" position. The motorpump will retain its prime as long as the discharge nozzle remains closed and no air is allowed into hoses. In a fuel lifting application, if the discharge nozzle is opened when the electric motor is turned off air will flow into the nozzle and fuel will flow (back siphon) through the hoses and motorpump back into the fuel tank and the unit will lose its prime.

3-7. LOSS OF PRIME.

3--8. If the liquid prime of the MOTORPUMP is lost, reprime MOTORPUMP by repeating START–UP sequence Steps a – h.

3-9. SHUT DOWN SEQUENCE.

3–10. Shut down the unit in accordance with the following steps:

a. Turn power switch to "OFF" position.

b. Disconnect power plug from power supply and coil power cable on cradle.

c. Open discharge nozzle and allow fuel to drain from hoses and motorpump.

d. Disconnect suction and discharge hoses from unit. Disassemble suction and discharge hose draining fuel from hoses.

e. Open motorpump case drain valve and drain fuel from motorpump case.

f. Turn ball valve handle to "PRIME/SAMPLE" position and stroke hand pump five or six times to remove fuel from hand pump.

g. After fuel has drained from motorpump, close motorpump case drain valve, turn ball valve handle to "RUN" position. Replace inlet dust plug and outlet dust cap.

h. Unit is now fully drained.

SECTION 4
TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
LOSS OF SUCTION	1. Airleak in suction and discharge hose lines.	1. Check camlock connections for missing gaskets or open joints.
	2. Suction lift is too high.	2. Lower unit closer to fuel level.
	3. Suction strainer exposed.	3. Push suction strainer below fuel surface to bottom of fuel tank.
PUMP LEAKS	1. Worn mechanical seal.	1. Replace mechanical seal.
LITTLE OR NO DISCHARGE	1. Motorpump case not filled with fuel (not primed or loss of prime).	1. Fill motorpump case using hand pump. Reprime using start-up sequence steps a through h.
	2. Discharge nozzle too high.	2. Shorten suction lift and/or discharge nozzle level.
	3. Suction strainer plugged.	3. Remove suction strainer from hose. Clean, reassemble and reprime.
	4. Hole or leak in suction hose.	4. Repair or replace suction hose.
	5. Discharge nozzle strainer plugged.	5. Remove discharge nozzle strainer, clean and replace.
	6. Suction strainer not submerged deep enough.	6. Submerge strainer lower in fuel tank.
	7. Suction or discharge hose kinked.	7. Straighten out hose.
	8. Suction hose collapsed.	8. Suction lift greater than hose suction rating.
	9. Power supply insufficient.	9. Obtain correct 24 VDC power with 30 ampere capacity.
	10. Pump running backwards.	10. Check rotation arrow on motorpump case and confirm motorpump shaft is rotating in direction of arrow on case. Change power source polarity to change direction of transfer pump rotation.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
CANNOT OBTAIN SAMPLE OR WILL NOT PRIME	1. Air leaks in suction or discharge hose.	1. Check hose joints for air leakage or missing gaskets.
	2. Discharge nozzle open.	2. Close discharge nozzle.
	3. Suction strainer not fully submerged.	3. Submerge suction strainer to tank bottom.
	4. Fuel lift greater than 10 feet.	4. Move unit closer to fuel source.
	5. Motorpump case drain valve open.	5. Close motorpump case drain valve.
	6. Pump shaft seal leaking.	6. Hand rotate pump shaft to dislodge any dirt on seal face. Replace worn seal.
MOTOR WILL NOT START	1. Power supply not operating.	1. Connect to live 24 VDC power supply.
	2. Circuit breaker tripped.	2. To reset circuit broker, turn power switch lever to "RESET" position then turn back to "ON'.
	3. Circuit breaker trips when turned to "ON' position.	3. Electrical short in motor power cable or electrical box. Repair at maintenance location.
	4. Motor overheated.	4. Place unit in shade, let it cool, then restart.
MOTOR STOPS	1. Circuit breaker tripped.	1. Reset circuit broker.
	2. Motor overheated.	2. Allow motor to cool then restart.
	3. Loss of electric.	3. Find operable power supply power.

SECTION 5
MAINTENANCE

5-1. CLEANING.

a. Remove oil, dust and dirt from exterior of unit.

b. Using fuel as a cleaning agent, brush lint and dirt from exterior of suction screen. Use a non–metallic bristle brush being careful not to distort screen wire structure.

c. Remove, clean and replace discharge nozzle strainer.

d. Pump and motor do not require periodic lubrication.

e. Junction box contains supplier factory-sealed components and no lubrication, adjustment or cleaning is required.

f. Clean dirt from power cable with dry cloth. Remove sand and fine grit from plug end prior to replacing cap.

5-2. MECHANICAL SEAL REPLACEMENT.

A. Disassembly.

1. Turn power switch to off. Disconnect power cable.

2. drain unit and disconnect hoses from motorpump.

3. Disconnect hose between motorpump case and hand pump.

4. Remove case cap screws.

5. Remove case from motorpump.

6. Insert 7/8” open end wrench between openings in adapter and place on flats of shaft. Hold shaft to stop rotation.

7. Leave the 7/8” open end wrench on flats of shaft and unscrew the impeller by turning counter clockwise when facing the impeller (see figure 5–l).

8. The impeller half of the seal can now be removed from the impeller (see figure 5-2).

9. Remove the four cap screws holding adapter to motor. Remove adapter.

10. Place adapter on flat surface and push out the adapter half of the mechanical seal (see figure 5–3).

B. Reassembly.

1. Clean the case and adapter flange gasket faces. Clean the adapter seal and bore. Clean the impeller seal cavity bore shaft. Clean the shaft shoulder fitting against impeller.

Figure 5-1. Removing Impeller

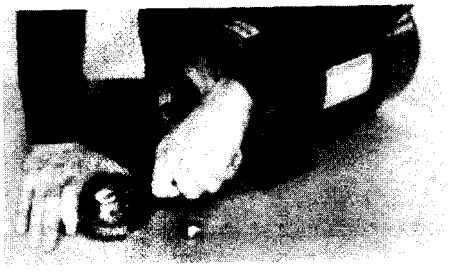


Figure 5–2. Removing Impeller
Half of Mechanical Seal

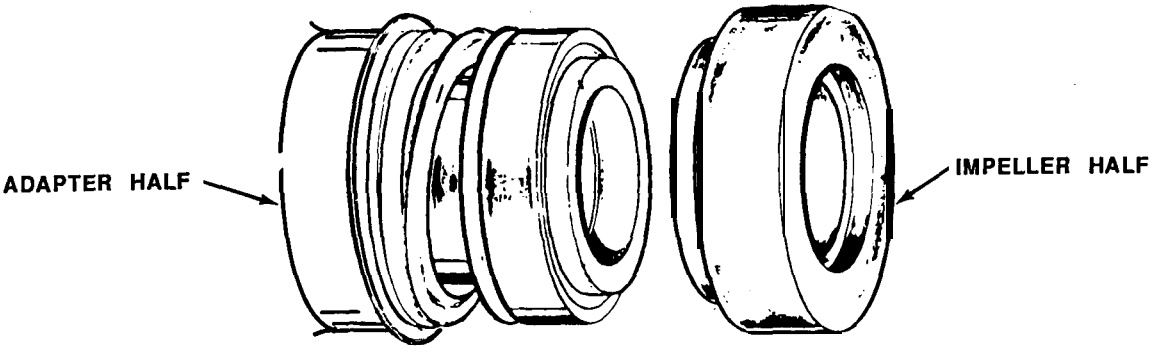


Figure 5–3. Mechanical Seal Parts

2. Lubricate the impeller seal cavity. Coat the impeller half rubber cup exterior with a soapy water solution. Press the rubber cap with impeller half of seal squarely and evenly into the impeller seal cavity. Use caution not to chip or scratch the lapped face of seal.

3. Apply pipe sealant on outside of the cup portion of the adapter seal to ease cup into adapter.

4. Install the cup by pressing on the cup lip (a 3“ long piece of 1 1/4” PVC pipe or similar device will ease/aid in installation). Make certain that cup is fully seated.

5. Assemble adapter to motor and secure the four cap screws.

6. Hold shaft against rotation by inserting 7/8” open end wrench between openings in adapter and place on flats of shaft (see figure 5–1). Thread impeller on shaft until it is tight against the shaft shoulder.

7. Install O-ring gasket on adapter pump side flange shoulder.

8. Replace case on adapter.

9. Tighten case cap screws alternately and evenly.

10. Check for free rotation after assembly is completed.

11. Connect hand pump hose to case.

12. Fill case with fuel before restarting. Do not start unit until case is filled.

5-3. **CABLE ASSEMBLY MAINTENANCE.**

5-4. **Inspection.**

5–5. Inspection of the power cable assembly conforms generally to standard visual inspection procedures performed on electrical equipment. Be certain to perform the following visual checks and inspections on the power cable for the specific conditions noted.

a. Check the connector for distortion, dents, corrosion and a broken insulator. Check that the center contact pin is not bent, misaligned or otherwise deformed.

b. Check the power cable insulation for cuts, tears, abrasion and other similar damage.

5-6. **Test.**

5–7. Test the power cable for continuity to ascertain its integrity as follows:

a. Remove junction box cover (2.14, figrue 5-4) to gain access to power cable terminations and disconnect power cable from circuit breaker (2.3) and radio frequency interference filter (2.4).

b. Use a multimeter (Simpson Model 260 or equal) and check between each electrical lead lug terminal and appropriate connector termination (negative or positive) for continuity. There should be a zero resistance reading. If either reading is other than zero, replace a defective connector, electrical lead or lug terminal.

5-8. **Repair and Replacement.**

5-9. Connector.

a. No connector repair is possible other than the removal of corrosion and straightening of a slightly bent center contact pin. To replace the connector, remove the cover attaching screws.

b. Remove the attaching bolts and lock washers securing the electrical leads to the connector.

c. Reattach the electrical leads to the new connector and install the connector cover.

5–l0. Electrical Lead(s).

a. Repair of the electrical leads is limited to replacement of damaged lug terminal(s). To replace a lug terminal(s), clip off the damaged terminal(s).

b. Strip off the electrical lead insulation, being careful not to cut the stranded conductors, just enough so that when the conductors are fully inserted into the lug terminal, the insulation almost makes contact with the lug terminal barrel. Clip off excess conductor length or strip off additional electrical lead insulation as required.

c. Insert conductors fully into leg terminal barrel and crimp terminal barrel to fully secure onto electrical lead.

5-11. **HAND PUMP MAINTENANCE.**

5-12. **Inspection.**

a. Inspection of the hand pump is limited to the detection of fuel leakage.

b. Inspection for the detection of fuel leakage is accomplished during the “PRIME/SAMPLE" function when the hand pump is operated with short up and down strokes. If leakage is detected during this function between the discharge end (3.3, figure 5-4) and tube (3.5) or elbow (32), the suction end (3.12) and tube (3.5) or nipple (38), or around rod (3.6), the hand pump must be removed from the unit for repair.

5-13. **Test.**

a. Testing of the hand pump is limited to the detection of wear of the seal cup (3.7, figure 5-4) and excessive scoring or damage of the tube (3.5).

b. Testing to detect wear of the seal cup (3.7) and excessive scoring of the tube (3.5) is accomplished during the “PRIME/SAMPLE” function. If the “PRIME SAMPLE" function

takes more than 4 minutes and the suction strainer is under the surface of the fuel source (no air leakage to the suction side of the hand pump), the seal cup is worn and/or the tube is excessively scored and the hand pump must be removed from the unit for repair.

5–14. **Repair and Replacement.**

WARNING

Do not disconnect the inlet or outlet hoses from the hand pump while the unit is hot. A fire or explosion could occur if spilled fuel contacts excessively hot components.

a. To remove the hand pump from the unit, be certain all components are cool to the touch and then loosen hose clamps (28, figure 5-4) and pull hoses (26 and 29) off elbows (32). Fuel will be spilled as the hoses are disconnected. Take out four screws (24) and lock washers (25) securing the hand pump to the unit and remove the hand pump.

b. If fuel leakage was observed between the discharge end (3.3) and tube (3.5) or elbow (32), the suction end (3.12) and tube (3.5) or nipple (38) check for a loose connection between the interconnecting parts where leakage was detected. Tighten the mating parts if possible to eliminate the leakage or replace both mating parts if the connection is tight and then reinstall the hand pump.

c. If fuel leakage was observed around rod (3.6), unscrew handle (3.1) from rod (3.6) and discharge end (3.3) from tube (3.5). Remove and discard gaskets (3.2) and using new gaskets, reassemble and reinstall the hand pump being certain the hose clamps (28) are sufficiently tight to prevent fuel leakage from around elbows (32).

d. If testing denotes wear of the seal cup (3.7) and/or excessive scoring of the tube (3.5) has occurred, proceed as follows:

1. Remove the hand pump from the unit, being certain all components are cool to the touch, by loosening hose clamps (28) and pulling hoses (26 and 29) off elbows (32). Fuel will be spilled as the hoses are disconnected. Take out four screws (24) and lock washers (25) securing the hand pump to the unit and remove the hand pump.

2. Unscrew discharge end (3.3) from tube (3.5) and pull tube off assembled internal components. Inspect internal bore of tube for excessive wear, scoring or distortion. Discard a damaged tube.

3. Unscrew retaining nut (3.4) from rod (3.6) and remove seal retainer (3.10), spacer (3.9) and seal cup (3.7). Discard seal cup and reassemble disassembled parts. Apply a light coating of vaseline to seal cup and install the assembled internal components into tube (3.5). Reinstall the hand pump onto the unit being certain the hose clamps (28) are sufficiently tight to prevent fuel leakage from around elbows (32).

5-15. JUNCTION BOX MAINTENANCE.

5–16. Junction box maintenance is limited to the replacement of defective components and testing of the RFI filter (2.4, figure 5-4) and the power solenoid (2.2). Inspection of the junction box conforms

generally **to** standard visual inspection procedures performed on **electrical** equipment. Be certain to perform the following visual checks and inspections **on the junction box** components for the specific conditions noted:

5–17. Inspection.

a. Remove cover (2.14, figure 5-4) and check electrical wiring insulation for cuts, tears, abrasion and overheating as evidenced by charred or brittle insulation.

b. Check that all connections to the RI filter (2.4), power solenoid (2.2) and circuit breaker (2.3) are tight. Tighten any loose connection and spray interior of junction box (2.1) with anti-moisture /fungus resistant varnish per MIL-V-173C after tightening any loose hardware or replacing any parts.

c. Check that gasket (2.15) is not torn or otherwise damaged.

5–18. Test.

a. Disconnect the power supply leads from the 24 volt DC power supply.

b. Connect a multimeter (Simpson Model 260 of equal) across circuit breaker (2.3, figure 5-4) terminals (LINE and LOAD) and check for proper operation as the circuit breaker operator is operated from the ON (O ohms resistance) to the OFF/RESET (infinite ohms resistance) positions and back again to the ON position.

c. Connect the multimeter across terminals B and C of the power solenoid (2.2) and check for 0 ohms resistance. Then check for O ohms resistance across terminals B and A. If an infinite resistance reading is observed, the motor thermal overload is open. If continuity (O ohms resistance) is not noted with the thermal overload closed, replace a defective power solenoid.

d. Remove screws (2.9) and washers (13) securing RFI filter (2.4), solenoid (2.2) and bracket (2.8) to junction box (2.1); remove RFI filter, solenoid and bracket from junction box. Remove cover from RFI filter.

e. Connect the multimeter across terminals 1 and 4 of RFI filter (2.4) and check for O ohms resistance. Then check for O ohms resistance across terminals 2 and 5, and then 3 and 6. Check also for infinite ohms resistance with the multimeter connected between terminals 1 and 6,2 and 6,3 and 4, and 3 and S. Any reading other than O and infinity is cause for replacement of the RFI filter. Reverse procedure to reinstall.

5–19. Repair and Replacement.

5–20. No repair of individual components within the junction box is possible. Replacement of individual components necessitates disconnecting and tagging leads from the defective component(s), removal of the defective components attaching self-tapping screws and replacement of the defective component(s). A small amount of silicone rubber adhesive sealant should be applied to the attaching self locking screws before their installation to assure integrity of the explosion proof junction box. Also,

after installation of the tagged leads onto the appropriate component terminals, spray the interior of junction box (2.1, figure 5-4) with anti-moisture/fungus resistant varnish per MIL–V–173C and firmly tighten the cover (2.14).

5-21. ELECTRIC MOTOR REPAIR.

5-22. Inspection.

a. During operation of the unit, observe the electric motor and inspect for excessive noise or vibration. Excessive noise or vibration necessitates removal of the pump from the unit in order to test the electric motor independently to determine whether the electric motor or pump is at fault.

b. If during operation, the motor thermal protector or circuit breaker tripped (adequate 24 volt DC power supply with 30 ampere capacity), removal of the pump from the unit is required in order to test the electric motor independently to determine whether the electric motor or pump is at fault.

c. At the completion of a transfer function, check that the electric motor does not feel uncomfortably hot to hand touch. An excessively hot electric motor (provided with an adequate 24 volt DC power supply) even though the motor thermal protector or circuit breaker did not trip, necessitates removal of the pump from the unit in order to test the electric motor independently to determine whether the electric motor or pump is at fault. Overheating is generally a result of undervoltage, binding of pump components or defective motor bearings.

5-23. Test.

5–24. In order to determine whether the electric motor or pump is at fault as a result of trouble found during inspection (excluding an insufficient power supply), be certain all components are cool to the touch and the pump is disconnected from its power source, and then disengage the pump from the electric motor and test the electric motor as follows:

a. Remove two screws (1.18, figure 5-4), two screws (1.2), four lock washers (1.6) and four flat washers (1.17) securing pump case (1.12) to adapter (1.3) and cradle (4).

b. Pull pump case (1.12) away from adapter (1.3) until pump case is clear of impeller (1.9)

c. Move pump case (1.12) out of the way (to the side of cradle (4) with the prime pump). Pump case may be repositioned while attached to prime pump hose (29).

d. Facing impeller (1.9), unscrew the impeller counterclockwise from shaft (1 .5). The shaft may be prevented from rotating with a 7/8” open end wrench. Flats have been provided on the shaft for this purpose. Remove the ring portion of mechanical seal (1.8) with impeller.

e. Try to turn shaft (1.5) by hand. If the shaft turns freely, connect an ammeter in series with the electric motor and apply the rated 24 volts DC. If the motor sounds normal and the ammeter reads 20% or less of the nameplate full load current, it can be assumed the deficiency is external

to the electric motor. If however, the motor **shaft** does not turn freely or the motor is noisy, it can be assumed the deficiency is internal to the electric motor. Remove and replace the electric motor in accordance with the following procedures.

5-25. Motor Assembly Removal.

5-26. Remove the motor as an assembly in accordance with the following procedure:

a. Remove pump case (1.12, figure 5-4), impeller (1.9) and ring portion of mechanical seal (1.8) in accordance with paragraph 5-24, steps a through d.

b. Remove two screws (16), two flat washers (48) and two lock washers (17) securing junction box (2.1) to cradle (4).

c. Remove four screws (18), eight flat washers (19), four lock washers (20) and four nuts (21) securing motor (1. 1) to cradle (4), and remove motor and junction box from cradle.

d. Remove four screws (1.2) and four lock washers (1.6) securing adapter (1.3) to motor (1.1). Remove adapter (1.3) from motor rabbet. O-ring (1.7) can remain with adapter.

e. Loosen three setscrews (1.13) securing shaft (1.5) to motor shaft. Remove shaft (1.5), key (1.14) and flinger (1.4) from motor (1.1)

f. Remove junction box cover (2.14). Remove screws (2.9) and washers (13) securing RFI filter (2.4), solenoid (2.2), and bracket (2.8) to junction box (2.1); remove RFI filter, solenoid, and bracket from junction box. Remove cover from RI filter and disconnect motor lead ring terminals from stud number 1, 2, and 3 on RI filter.

g. Remove terminals of power cable (2.17) from circuit breaker (2.3) and RFI filter (2.4).

h. Loosen locking rings connectors (2.11), unscrew connectors (2.11) from junction box **(2.1),** and remove power cable (2. 17) ends from junction box.

i. Unscrew junction box (2. 1) from nipple on motor end cover.

5–27. **Motor Assembly Replacement.**

5–28. Install a replacement motor assembly in accordance with the following procedure.

a. With defective motor removed, apply silicone sealant (27) to threads of nipple on rear cover of replacement motor (1.1).

b. Screw junction box (2.1) onto nipple on motor (1.1) rear cover until hand tight and power cord connector openings are facing the pump end. Face of junction box (2.1) with 1/4-20 tapped holes must be perpendicular to motor (1.1) shaft in order to assure alignment with cradle (4) mounting plate.

c. Insert power cable (2.17) ends into junction box (2.1) and screw connectors (2.11) into junction box. Tighten locking rings on connectors (2.1 1).

d. Attach teminals on power cable (2.17) to cicuit breaker (2.3) and RFI filter (2.4). Attach motor lead ring terminals to RI filter stud number 1, 2, and 3 (see schematic on figure 5–5). Replace cover on RFI filter, and reattach to junction box (2.1, figure 5-4) at back of junction box, using screw (2.9) and washer (13).

e. Place flange of solenoid (2.2) over remaining flange of RI filter and fasten both to junction box with screw (2.9) and washer (13). Place flange of bracket (2.8) over remaining flange of solenoid positioning operating fork (2.6) over lever on circuit breaker (2.3), and fasten both to junction box with screw (2.9). Install screw (2.9) in remaining hole in bracket (2.8) and fasten to junction box.

f. Apply silicone sealant (27, figure 5-4) to threads on cover (2.14) and install O-ring gasket (2.15) onto cover. Screw cover into junction box (2.1),

g. Install flinger (1.4) over motor (1.1) shaft. Place key (1.14) in keyway of motor shaft and slide shaft (1.5) over motor shaft. Do not tighten setscrews (1.13).

h. Attach adapter (1 .3) with O-ring (1 .7) to motor (1 .1) using four screws (1.2) and four lock washers (1.6).

i. Attach motor (1. 1) to cradle (4) using four screws (18), eight flat washers (19), four lock washers (20) and four nuts (21). Do not fully tighten nuts.

j. Attach junction box (2.1) to cradle (4) using two screws (16), two flat washers (48) and two lock washers (17). Tighten all fasteners attaching the junction box and motor to the cradle.

k. With the ring portion of mechanical seal (1.8) pressed into impeller (1.9) and the spring portion of mechanical seal pressed into adapter (1.3), screw impeller (1 .9) onto shaft (1 .5). The mechanical seal spring will push the shaft away from the adapter.

l. Place cradle end on a flat surface so that the motor shaft is vertical and the impeller is facing up.

m. Place a 0.015” thick shim (approximately equal to 3-4 sheets of this technical manual) on the face of the impeller.

n. Position case (1.12) over impeller (1.9) and press case down over adapter (1.3) rabbet. **Temporarily secure** case to adapter with two screws (1.18).

o. Tighten setscrews (1.13) to secure shaft (1.5) to motor (1.1) shaft.

p. Remove screws (1.18) and case (1.12). Remove shim from impeller. Reinstall case on adapter (1.3) and fasten case to adapter and cradle (4) with two screws (1.18), two screws (1.2), four lock washers (1.6) and four flat washers (1.17).

ITEM	QTY	PART NO.	DESCRIPTION	ACTUAL MFG/CAGE	ACTUAL MFG PART NO.
1.0	1	118 000 433	CENTRIFUGAL PUMP UNIT, MODEL #85	SCOT	3200K1
1.1	1	113 000 290	MOTOR, 112 HP 24 VDC	OHIO ELEC	C-481404X7879
1.2	6	105 000 155	SCREW,CAP,HEX HEAD	96906	MS90725-59
1.3	1	132 000 386	ADAPTER	SCOT	
1.4	1	104 000 171	FINGER	SCOT	
1.5	1	135 000 266	SHAFT	SCOT	
1.6	8	104 000 124	WASHER, LOCK	96906	MS35338-46
1.7	1	116 000 141	GASKET, BUNA	PARKER	2-246
1.8	1	101 000 169	SEAL	JOHN CRANE	H-SP-9327-1
1.9	1	131 000 780	IMPELLER	SCOT	
1.10	1	107 000 233	VALVE, DRAIN	KADDIS	100-A
1.11	1	116 000 206	GASKET	PARKER	2-112
1.12	1	130 000 347	CASE	SCOT	
1.13	3	105 000 477	SETSCREW	96906	MS51021-56
1.14	1	102 000 280	KEY	SCOT	
1.15	1	106 000 371	PLUG, PIPE, 1"NPT,CSK SQ HEAD	PITTSBURGH PLUG	526-1
1.17	4	104 000 194	WASHER, FLAT	96906	MS27183-15
1.18	2	105 000 156	SCREW,CAP,HEX HEAD	96906	MS90725-60
2.0	1	118 000 435	ELECTRICAL BOX	SCOT	
2.1	1	110 000 408	JUNCTION BOX-EXPL PROOF	SCOT	
2.2	1	120 000 305	SOLENOID	ESSEX	120-114721
2.3	1	120 000 306	BREAKER	CARLING SWITCH	AA1B0346405B1C
2.4	1	120 000 257A	FILTER, RFI	OHMIC FILTER	NF-262A
2.5	1	102 000 332	HANDLE, OPERATING	DAVIES	3090J
2.6	1	110 000 409	LEVER, OPERATING	CROUSE-HINDS	0200247
2.7	1	105 000 581	NUT, SELF-LOCKING, HEXAGON	96906	MS 17830-SC
2.8	1	110 000 410	BRACKET	SCOT	
2.9	4	105 000 341	SCREW, MACHINE		MS51957-28
2.10	1	117 000 546	TAG. ON-OFF/RESET	SCOT	
2.11	1	107 000 270	CONNECTORS, CABLE	PYLE NATIONAL	DB-338
2.12	10	120 000 308	WIRES (SEE SCHEDULE)	SCOT	
2.13	1	117 000 494	NAME PLATE	SCOT	

ITEM	QTY	PART NO.	DESCRIPTION	ACTUAL MFG/CAGE	ACTUAL MFG PART NO.
2.14	1	110 000 342	COVER	SCOT	
2.15	1	116 000 252	GASKET, BUNA	PARKER	2-253
2.16	3	105 000 238	SCREW, DRIVE	96906	MS21318-9
2.17	1	120 000 302	CABLE,POWER	SCOT	
2.18	1	105 000 116	NUT,PLAIN,HEX	96906	MS51967-6
2.19	1	110 000 421	STUD, HANDLE, OPERATING	SCOT	
2.20	2	105 000 590	SCREW, MACHINE	96906	MS35206-226
3.0	1	118 000 434	HAND PUMP	SCOT	
3.1	1	133 000 489	HANDLE	DIMCO-GREY	2-293-301
3.2	2	133 000 532	GASKET	PARKER	2-109
3.3	1	110 000 402	DISCHARGE END	SCOT	
3.4	1	105 000 116	NUT, PLAIN, HEX	96906	MS51967-6
3.5	1	107 000 264	TUBE, THREADED, BRASS	SCOT	
3.6	1	133 000 530	ROD (STEM)	SCOT	
3.7	1	133 000 531	SEAL CUP	SCOT	
3.8	1	110 000 404	SEAL RETAINER, TOP	SCOT	
3.9	1	110 000 405	SPACER	SCOT	
3.10	1	110 000 406	SEAL RETAINER	SCOT	
3.11	1	108 000 374	SPACER	SCOT	
3.12	1	110 000 403	SUCTION END	SCOT	
4	1	119 000 469	CRADLE	SCOT	
5	1	118 000 432	STRAINER, SUCTION	SCOT	
6	2	118 000 429	HOSE ASSEMBLY, DISCHARGE	81349	M11588-0307300
6.1	2	108 000 358	HOSE, DISCHARGE, RUBBER, 1 1/2" X 25'	BUCKEYE RUBBER	MIL-H-11588
6.2	2	108 000 363	ADAPTER,CAMLOCK	96906	MS27021-9
6.3	2	108 000 362	COUPLER, CAMLOCK	96906	MS27025-9
6.4	8	106 000 293	CLAMP, HOSE	BAND-IT	Q-208
7	1	107 000 272	CHECK VALVE	FLOWMATIC	5159
8	2	118 000 431	HOSE ASSEMBLY, SUCTION	81349	M370A05B2A3000
8.1	2	108 000 359	HOSE SUCTION RUBBER 1 1/2" X 25'	BUCKEYE RUBBER	MIL-H-370
8.2	2	108 000 363	ADAPTER, CAMLOCK	96906	MS27021-9
8.3	2	108 000 362	COUPLER, CAMLOCK	96906	MS27025-9

ITEM	QTY	PART NO.	DESCRIPTION	ACTUAL MFG/CAGE	ACTUAL MFG PART NO.
8.4	8	106 000 293	CLAMP, HOSE	BAND-IT	Q-208
9	1	108 000 368	NOZZLE DISCHARGE	DOVER/OPW	190G-5104
10	1	108 000 365	ADAPTER, CAMLOCK	96906	MS27022-9
11	2	108 000 366	COUPLER, CAMLOCK	96906	MS27024-9
12	1	120 000 307	CABLE, GROUNDING	97403	13220E1127
13	2	104 000 289	WASHER,LOCK	96906	MS35335-31
14	2	107 000 266	NIPPLE,CLOSE	NATIONAL EQPT	99CNAL 150
15		NOT USED			
16	2	105 000 147	CAP SCREW 1/4-2OUC X 5/8"	96906	MS90725-5
17	2	104 000 121	WASHER LCOK	96906	MS35338-44
18	4	105 000 151	CAP SCREW	96906	MS90725-34
19	8	104 000 111	WASHRE FLAT	96906	MS27183-12
20	4	104 000 123	WASHER LOCK	96906	MS35338-45
21	4	105 000 121	NUT, HEX	96906	MS35649-2312
22	AR	121 000 393	TAPE, TEFLON SEAL	GARLOCK	MIL-T-27730A
23	AR	121 000 116	PIPE JOINT COMPOUND	HERCULES	15-427
24	4	105 000 586	SCREW,CAP,HEX SOCKET HEAD	96906	MS16996-9
25	4	104 000 290	WASHER, EXTERNAL TOOTH LOCK	96906	MS35335-32
26	1	108 000 371	HOSE, BULK	DAYCO	8L3
27	AR	121 000 376	SEALANT,SILICONE	GE	G624
28	3	106 000 370	CLAMP, HOSE	TRIDON	620-006
29	1	108 000 371	HOSE, BULK	DAYCO	8L3
30	1	107 000 268	HOSE BARB	PARKER	125 HBL 8-8
31	2	107 000 269	ELL, STREET	PARKER	2202 P-8-8
32	2	107 000 271	ELBOW	PARKER	296 HB 8-6
33	1	108 000 370	CAP,DUST	96906	MS27028-9
34	1	108 000 369	PLUG, DUST	96906	MS27029-9
35	1	117 000 547	NAMEPLATE	SCOT	
36	4	105 000 238	SCREW, DRIVE	96906	MS21318-20
37	AR	121 000 369	SEALANT, PERMATEX	LOCTITE	2C
38	1	107 000 273	NIPPLE, PIPE, 3/8" NPT X CLOSE, BRASS	MC MASTER -CARR	4568K151
39	1	133 000 272	VALVE,BALL	GRINNELL	515-1/2 3500
40	1	107 000 274	NIPPLE, PIPE, 1/2" NPT X 2 1/2", BRASS	MC MASTER -CARR	4568K174

ITEM	QTY	PART NO	DESCRIPTION	ACTUAL MFG/CAGE	ACTUAL MFG PART NO.
41	2	105 000	RIVETS, POP, 1/8" DIA X 1 1/4", ALUM	MC MASTER -CARR	97517A015
42	1	117 000	TAG PRIME/SAMPLE RUN	SCOT	
43	10	108 000	CAP/PLUG	ALLLIANCE	TP 2 1/8
44	AR	121 000	SEALANT, THREAD LOCKING	PERMABOND	HH120
45	2	120 000	TERMINAL, RING (SEE 5-5)	ETC/MOLEX	C-830-14-R90
46	1	120 000	TERMINAL, RING (SEE 5-5)	ETC/MOLEX	AA-821-08-R90
47	1	120 000	TERMINAL,RING (SEE 5-5)	ETC/MOLEX	AA-822-14-R90
48	2	104 000	WASHER, FLAT	96906	MS 27183-10
49	7		GASKET	96906	MS27030-5

LIST OF MANUFACTURERS

NAME	ADDRESS
ALLIANCE PLASTICS, INC	3100 STATION ROAD ERIE, PA 16510
BANd-IT-lDEX, INC.	P. O. BOX 16307 DENVER, CO 80216
BUCKEYE RUBBER PRODUCTS, INC.	P. O. BOX DRAWER 389 LIMA, OH 45802
CARLINGSWITCH, INC CIRCUIT BREAKER DIVSION	60 JOHNSON AVENUE PLAINVILLE, CT 06062
CROUSE-HINDS ECM DIV. COOPER INDUSTRIES, INC.	SYRACUSE, NY 13221
DAVIES MOLDING COMPANY	4920 W BLOOMINGDALE AVENUE CHICAGO, IL 60639
DAYCO CORP.	333 WEST FIRST STREET DAYTON, OH 45401
DIMCO-GREY	8200 SOUTH SUBURBAN ROAD CENTERVILLE, OH 45458
DOVER CORP. - OPW DIV.	9393 PRINCETON GLENDALE ROAD P. O. BOX 40240 CINCINNATI, OH 45240
ETC/MOLEX	4820 PARK BLVD. PINELLAS PARK, FL 33565
FLOWMATIC	NORTH HOOSICK, NY 12133
ESSEX CONTROL DIV. UNITED TECHNOLOGIES	LOGANSPORT, IN 46947
GARLOCK DIV. COLT INDUSTRIES	FRIENDS LANE NEWTON, PA 18940
GENERAL ELECTRIC SILICONE	260 HUDSON RIVER ROAD WATERFORD, NY 12188
HERCULES CHEMICAL co., INC	29-T W. 38TH STREET NEW YORK, NY 10018
GRINNELL CORP.	260 WEST EXCHANGE STREET PROVIDENCE, RI 02901
JOHN CRANE, INC.	6400 OAKTON STREET MORTON GROVE, IL 60053
KADDISMFG.	OLD BEAHAN & WEIDNERROAD ROCHESTER, NY 14962

LIST OF MANUFACTURERS (Continued)

NAME	ADDRESS
LOCTITE CORP.	999 N. MOUNTAIN ROAD NEWINGTION, CT 06111
MC MASTER-CARR	P.O. BOX 4355 CHICAGO, IL 60680
NATIONAL EQUIPMENT CORP.	P. O. BOX 2204 HOUSTON, TX 77252
OHIO ELECTRIC MOTORS	P. O. BOX 168 PAINT FORK ROAD BARNADSVILLE, NC 28709
OHMIC FILTER, INC.	125 GRACE STREET, P. O. DRAWER 1080 ST. MICHAELS, MD 21663
PARKER-HANNIFIN CORP. O-RING DIVISION	2360 PALUMBO DRIVE LEXINGTON, KY 40509
PARKER-HANNIFIN CORP. TUBE FITTINGS DIVISION	3885 GATEWAY BLVD. COLUMBUS, OH 43228
PERMABOND INTERNATIONAL	480 SOUTH DEAN STREET ENGLEWOOD, NJ 07631
PITTSBURGH PLUG AND PRODUCTS CORP.	P.O. BOX H EVANS CITY, PA 16033
PYLE-NATIONAL DIV. BRINTEC CORP.	1334 N. KOSTNER AVENUE CHICAGO, IL 60651
TRIDON NORTH AMERICA	P. O. BOX I600-T NASHVILLE, TN 37202

APPENDIX A

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

A-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section 111 lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

A-2. Maintenance functions. Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install maybe the act of emplacing, seating, or fixing into position

a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. “Replace” is authorized by the MAC and is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services, including fault location/trouble–shooting removal/installation and disassembly/assembly and maintenance actions identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

A-3. **Explanation of Columns in the MAC, Section II**

a. Column I, Group Number. Column I lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be “00.”

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph 8–2.)

d. Column 4. Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

APPENDIX A

C . . . . . Operator or Crew
O . . . . . Unit Maintenance
F . . . . . Direct Support Maintenance
H . . . . . General Support Maintenance
L . . . . . Specialized Repair Activity (SRA)
D . . . . . Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

A-4. Explanation Of Columns in Tool and Test Equipment Requirements, Section 111

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section Column S.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

A-5. Explanation of Columns in Remarks, Section IV

a. column 1, Reference Code. The code recorded in column 6, Section

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

APPENDIX A

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		D/S	G/S	DEPOT		
			C	O	F	H	D		
00	PUMPING UNIT	INSPECT						1	*
01	HOSE ASSY, SUCTION & DISCHARGE	INSPECT	.2						A
		REPAIR	.1						C
		REPLACE	.1						H
	SUCTION STRAINER	INSPECT	.1						A
		SERVICE	.2						I
		REPLACE	.1						
	DISPENSING NOZZLE	INSPECT	.1						A, F
		SERVICE		.3					I
		REPLACE		.1					H
02	JUNCTION BOX	INSPECT	.1						A
				.2					B
		TEST		.5					J
		REPAIR		1.0					E
		REPLACE		1.0					H
	POWER CABLE & PLUG	INSPECT	.1						A
		REPAIR		.7					E
		REPLACE		.5					H
03	HAND PRIME ASSY								
	HAND PUMP	INSPECT	.1						A
		REPAIR		.7					D
		REPLACE		.4					H
	CHECK VALVE	INSPECT		.1					A
		REPLACE		.3					
	ISOLATION VALVE	INSPECT		.1					A
		REPLACE		.3					
	HOSE ASSY	INSPECT	.1						A
		REPAIR		.3					E
		REPLACE		.2					
	FITTINGS & JOINTS	INSPECT	.1						A
		REPLACE		.2					
04	PUMP ASSY								
	FITTINGS	INSPECT	.1						A
		REPLACE		.3					

APPENDIX A

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		D/S	G/S	DEPOT		
			C	O	F	H	D		
04 (Cont.)	CAM–LOCK FITTINGS & COMPONENTS	INSPECT	.1						A
		REPAIR	.1						C
		REPLACE		.3					
	PUMP HOUSING	INSPECT	.1						A
		REPAIR			2.0			2	C, G
		REPLACE			1.0			2	
	DRAIN COCK	INSPECT	.1						A
		REPLACE		.2					
	IMPELLER	TEST		.2					F
		INSPECT			1.0				A
		REPLACE			1.0			2	
	ADAPTER	INSPECT	.1						A
		REPLACE			1.0			2	
	SHAFT SEAL	INSPECT	.1						A
		REPLACE			1.0			2	
	STUB SHAFT	INSPECT		.2					A, F
		REPLACE			1.0			2	
05	ELECTRIC MOTOR	INSPECT	.1						A
		TEST		.2					J
		REPLACE		1.0					H
06	CRADLE (FRAME)	INSPECT	.1						A
		REPAIR			1.4				G
		REPLACE		1.0					
07	GROUND ASSY	INSPECT	.2						A
		REPLACE		.1					

APPENDIX A

Section II. TOOL AND TEST EQUIPMENT REQUIREMENTS MAINTENANCE ALLOCATION CHART

(1) TOOL/TEST EQUIP. REF CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NSN	(5) TOOL NUMBER
1	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1, Less Power	491	SC–4910–95–CL–A74
2	F	Tool Kit, General Mechanics	5180–00–699–5273	SC–5 CL–NO5

Section IV. REMARKS FOR MAINTENANCE ALLOCATION CHART

REFERENCE CODE	REMARKS
A	SECURELY ATTACHED, VISUAL DAMAGE, EXTERNAL LEAKAGE
B	SECURELY ATTACHED, VISUAL DAMAGE, INTERNAL LEAKAGE
C	REPLACE GASKETS
D	REPLACE SEAL ASSEMBLY
E	REPAIR BY REPLACING DEFECTIVE COMPONENTS
F	OPERATIONAL TEST
G	WELD
H	REPLACE ASSEMBLY
I	CLEAN STRAINER
J	REQUIRES USE OF MULTIMETER CONTAINED IN TOOL KIT, SC 4910–95–CL–A74
*	ONLY TOOL KIT REQUIRED UNLESS OTHERWISE INDICATED

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists components of end item and basic issue items for the Centrifugal Pump Unit to help you inventory items required for safe and efficient operation.

B-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the Centrifugal Pump Unit in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the Centrifugal Pump Unit during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings.

a. Column (1) – Illustration Number (illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) – National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

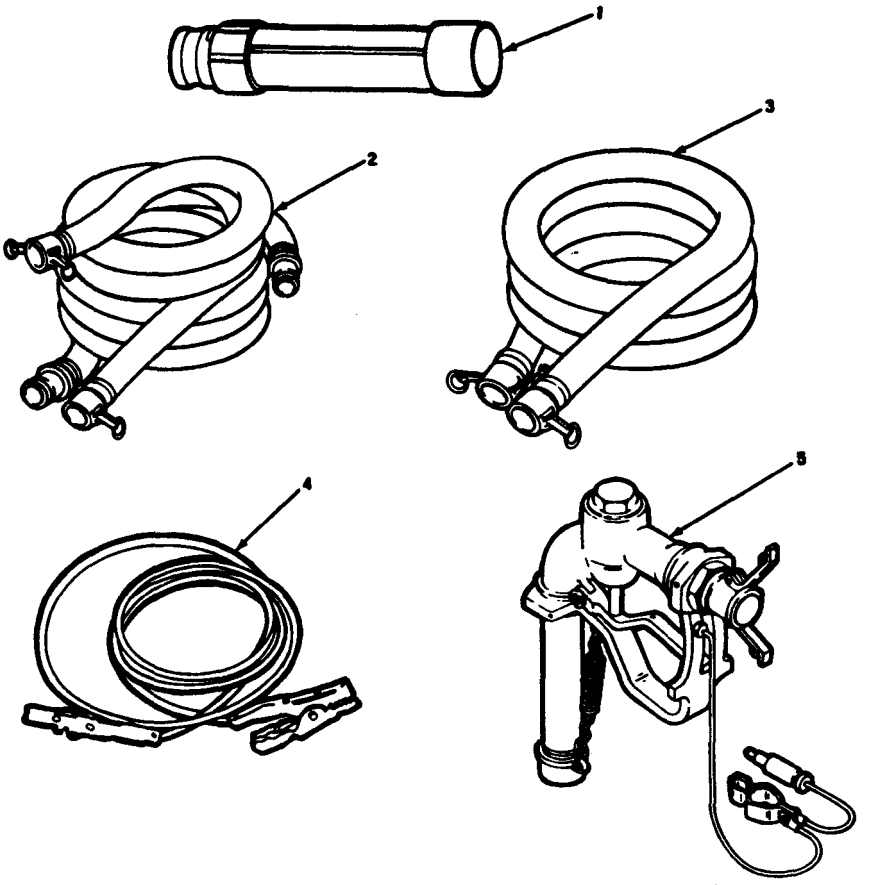
c. Column (3) – Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parentheses) following by the part number.

d. Column (4) – Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in pr).

e. Column (5) – Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

APPENDIX B

Section II. COMPONENTS OF END ITEM



(1) ILLUS/ ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE AND PART NUMBER	(4) U/M	(5) QTY RQR
		STRAINER, SUCTION (13646) 118.000, 432	EA	1
2		HOSE, SUCTION M370A05B2A3000 (81349)	EA	2
3	4720–01–215–7956	HOSE, DISCHARGE M11588–03–07–300 (81349)	EA	2
4	6150–01–197–6335	GROUND WIRE ASSY 13220E1 (97403)	EA	1
5	4390–00–902–4642	NOZZLE, FUEL DISPENSING 13217E2974 (97403)	EA	1

SECTION III. BASIC ISSUE ITEMS LIST

(1) ILLUS/ ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE AND PART NUMBER	(4) U/M	(5) QTY RQR
1	4320-01-247-2633	TM 5-4320-314-10	EA	1

APPENDIX C
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists additional items you are authorized for the support of the Centrifugal Pump Unit.

C-2. GENERAL

This list identifies items that do not have to accompany the Centrifugal Pump Unit and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

(1) ILLUS/ ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQR
1	5975–00–878–3791	GROUNDING ROD ASSY		EA	1
2	5120–01–013–1676	SLIP HAMMER, GROUND ROD		EA	1

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the Centrifugal Pump Unit.

D-2. EXPLANATION OF COLUMNS

a. Column (1) – Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5. App. D").

b. Column(2) –Level. This column identifies the lowest level of maintenance that requires the listed item.

(enter as applicable)

C - Operator / Crew
O – Unit Maintenance
F – Direct Support Maintenance
H – General Support Maintenance

c. Column (3) – National Stock Number. This is the National stock number assigned to the item, use it to request or requisition the item.

d. Column (4) –Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity (CAGE) code in parentheses followed by the part number.

e. Column (5) – Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea. in. pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
CENTRIFUGAL PUMP UNIT

(1) ITEM NUMBER	(2) MAINT LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	7920-00-282-2470	BRUSH, NON-METALLIC FIBER BRISTLE	EA
2	0	7930-00-526-2919	DETERGENT,GENERAL PURPOSE LIQUID 5 GAL PAIL	GAL
3	O	7920-00-148-9666	RAGS, WIPING	BALE
4	O	6950-00-281-1985	SOLVENT, DRY CLEAING P-D-680	GAL
5	O	5970-00-832-6950	VARNISH(AEROSOL)	CAN

By Order of the Secretary of the Army:

CARL E. VUONO
General United States Army
Chief of Staff

Official

WILLIAM J. MEEHAN, II
Brigadier General United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25E, Operator, Unit, Direct Support Maintenance requirements for Pump, Centrifugal, Portable Refueling System, Gas Driven, Base Mounted, 100 GPM, 1½ IN (114MX1A).

☆ U.S. GOVERNMENT PRINTING OFFICE : 1995 O - 388-421 (P.O. 02526)

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THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4320-314-13&P	15 June 1990	Pump Unit, Centrifugal 1½" Suction & Discharge 24 Volt DC

BE EXACT. . PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Clenge the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please Correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe
JOHN DOE

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TEAR ALONG PERFORATED LINE

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OFFICIAL BUSINESS

COMMANDER
U.S. ARMY TROOP SUPPORT COMMAND
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ST. LOUIS, MO 63120-1798

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PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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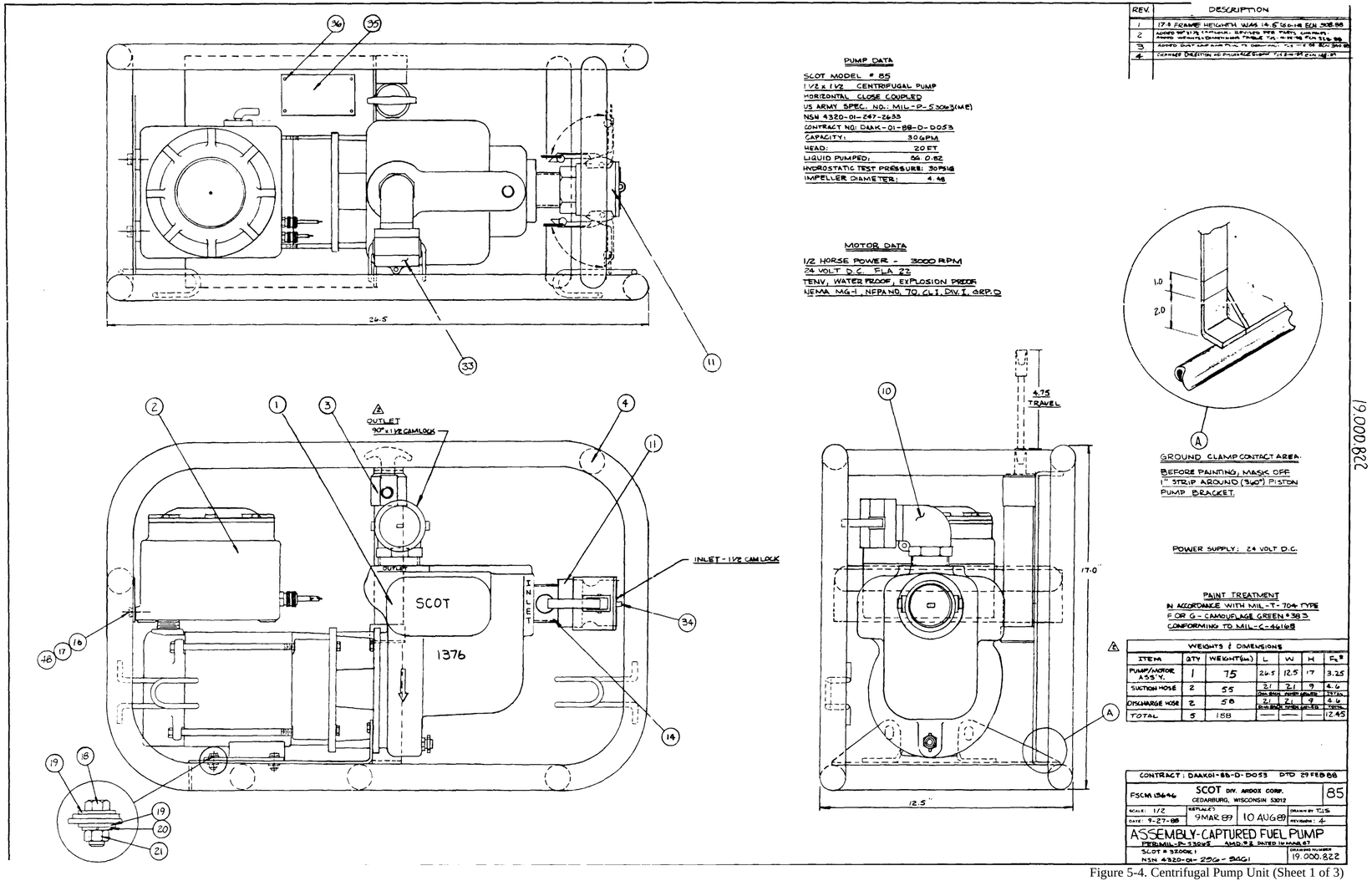
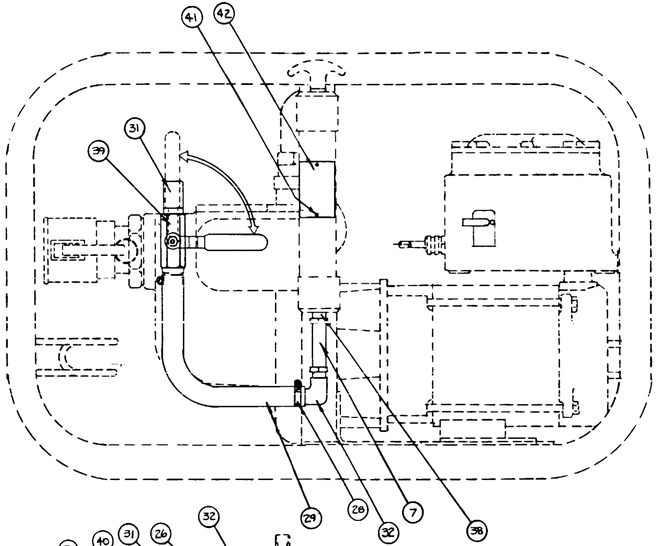
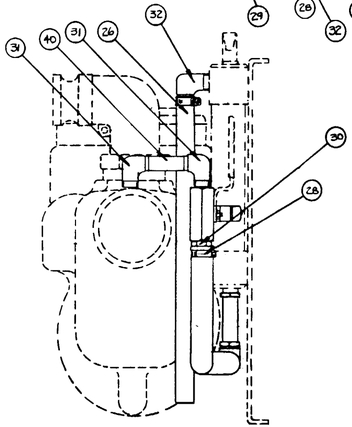


Figure 5-4. Centrifugal Pump Unit (Sheet 1 of 3)



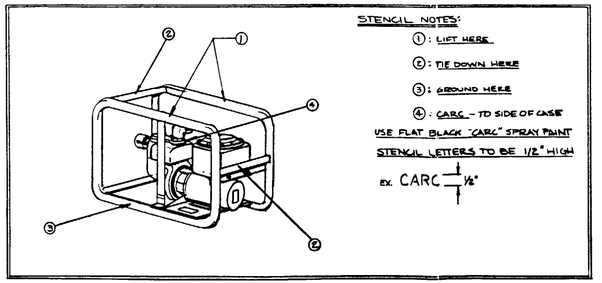


HAND PISTON PUMP
HOSE DETAIL

ASSEMBLY NOTES

1.) USE TEFLON TAPE P/N 121.000.595 OR PIPETHREAD SEALANT® 121.000.116 ON ALL PIPE JOINTS

2.) APPLY SILICONE SEALANT TO THREADS OF COVER ON EXPLOSION PROOF JUNCTION BOX (121.008.3714)



REV	DESCRIPTION
6	[illegible]
5	[illegible]
4	[illegible]
3	[illegible] ECN 840-88
2	[illegible]
1	[illegible]

CONTRACT: DAAK01-85-D-0065 DATED: 28 FEB 85

FSCM: 19640 — SCOT DIV. ARDOX CORP., CEDARBURG, WISCONSIN 53012 — 85

SCALE: NTS — REPLACES 128AUG89 — 24 SEP 89 — DRAWN BY: TJS

DATE: 10-4-88 — REVISED — 6

ASSEMBLY, CAPTURED FUEL PUMP

USE WITH: P-8200K — MODEL SIZE B IN MAR 87

SCOT # 82.00K1 PUMP 85

NSN 4320-01-228-9461

DRAWING NUMBER 19.000.822

19.000822

Figure 5-4. Centrifugal Pump Unit (Sheet 2 of 3)

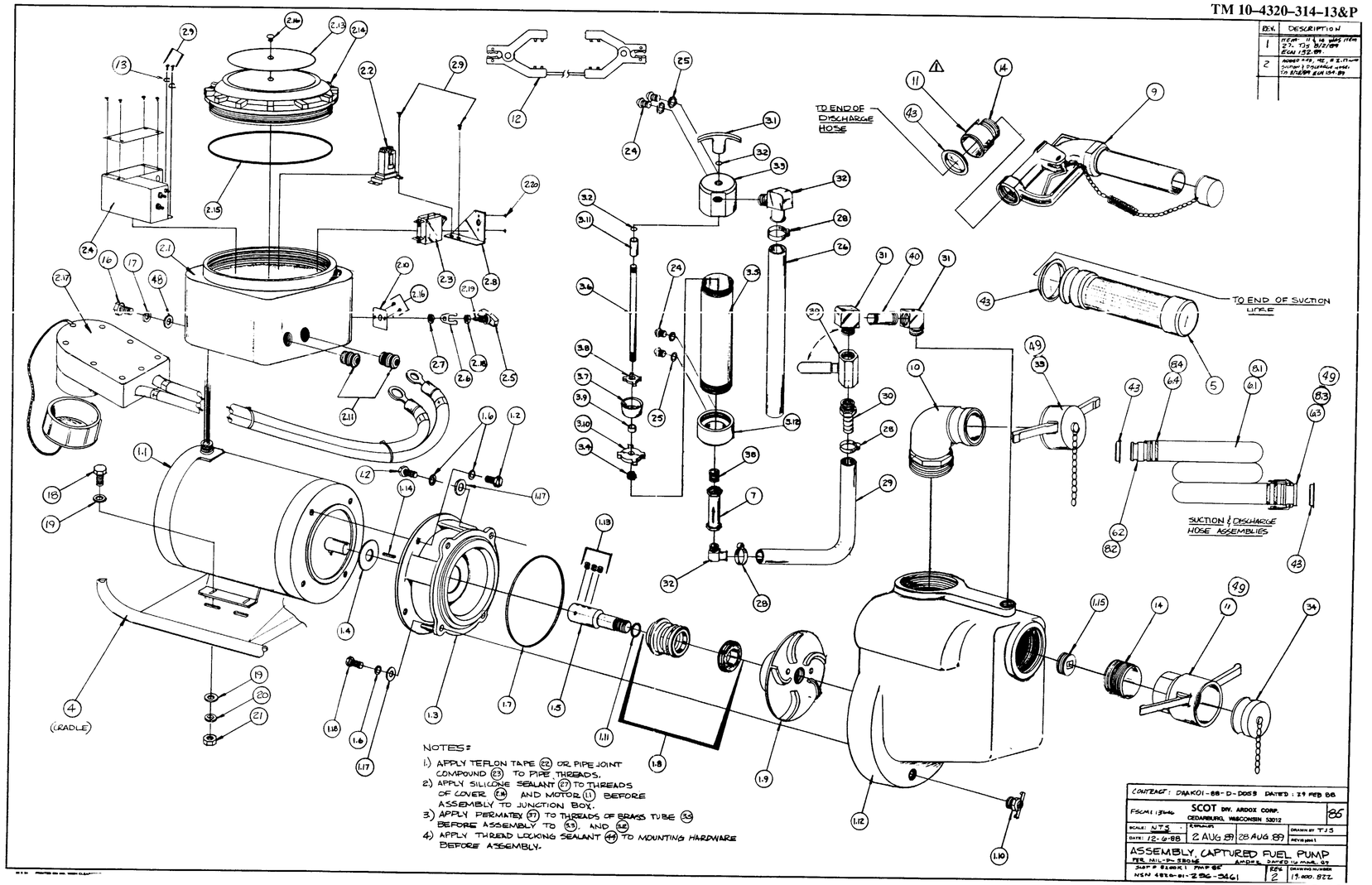
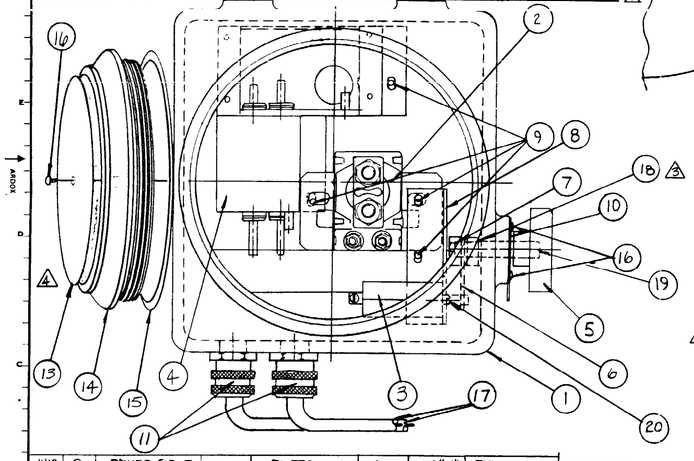


Figure 5-4. Centrifugal Pump Unit (Sheet 3 of 3)

ARDOX 18.001.723

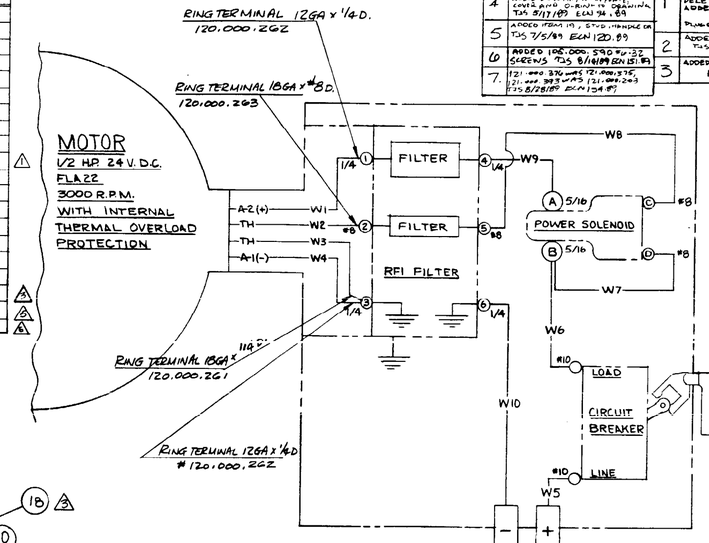
ELECTRICAL CONTROL COMPONENTS

ITEM	QTY	PART NUMBER	DRAWING NO.	DESCRIPTION	MATERIAL
1	1	110.000.408	19.000.814	JUNCTION BOX, EXPLOSION PROOF	ALUMINUM
2	1	120.000.305	16.002.241	SOLENOID, POWER	VARIOUS
3	1	120.000.306	16.002.243	BREAKER	VARIOUS
4	1	120.000.257A	18.001.437	FILTER, RFI	ALUMINUM
5	1	102.000.332	16.002.245	HANDLE, OPERATING	PLASTIC/BRASS
6	1	110.000.409	16.002.246	LEVER, OPERATING	STEEL
7	1	105.000.581	——	LOCK NUT 5/16-18 UNC	STEEL
8	1	110.000.410	16.002.242	BRACKET, BREAKER	ALUMINUM
9	4	105.000.341	——	#8x3/8 SCREW – SELF TAPPING	STAINLESS STEEL
10	1	117.000.546	16.002.244	TAG, ON-OFF/RESET	ALUMINUM
11	2	107.000.270	——	CONNECTORS-POWER	ALUMINUM
12	10	120.000.308	18.001.723	WIRES -SEE WIRE SCHEDULE	VARIOUS
13	1	117.000.494	16.001.860	NAMEPLATE, JUNCTION BOX	ALUMINUM
14	1	110.000.342	19.000.527	COVER	ALUMINUM
15	1	116.000.252	——	O'RING	BUNA
16	3	105.000.238	——	DRIVE PINS	ZINC PLATED
17	1	120.000.302	17.001.680	CABLE, POWER SUPPLY	VARIOUS
18	1	105.000.116	——	HEX NUT, 5/16-18UNC	ZINC STEEL
19	1	110.000.421	16.002.296	STUD, HANDLE OPERATING	ZINC STEEL
20	2	105.000.590	——	SCREW, #6-32x.25LG. BREAKER MTR.	ZINC STEEL



REV	DESCRIPTION
4	ADDED DRIVE PIN, NAMEPLATE, COVER WITH O-RING IN DRAWING. TAS 5/17/89 ECN 120.89
5	ADDED ITEM 19, STUD HANDLE ON TAS 7/5/89 ECN 120.89
6	ADDED 105.000.590 6-32 SCREWS TAS 8/16/89 ECN 151.89
7	121-000-376 was 121-000-375, 121-000-393 was 121-000-203 TAS 8/28/89 ECN 154.89

REV	DESCRIPTION
1	DELETED RUBBER GROMMET, ADDED NOTE 7, DELETED VENT PLUG. TAS 11-9-88 ECN 321.88
2	ADDED NOTES 2 & 3 TAS 11-9-88 ECN
3	ADDED #18 HEX NUT. TAS 11-16-88 ECN 340.88



WIRE NO.	GAUGE	FROM	TERM. NO./SIZE	TO	TERM. NO/SIZE	LENGTH
W10	8	POWER CABLE	–	FILTER	6 1/4"	6" *
W9	10	SOLENOID PWR.	A 5/16	FILTER	4 1/4"	6"
W8	18	SOLENOID COIL	C #10	FILTER	5 #8	6"
W7	18	SOLENOID PWR.	B 5/16	SOLENOID COIL	D #10	6"
W6	10	CIRCUIT BRKR.	LOAD #10	SOLENOID PWR.	B 5/16	6"
W5	8	POWER CABLE	+	CIRCUIT BRKR.	LINE #10	6" *
W4	12	#MOTOR PWR.	A-1	FILTER GRD	3 1/4"	8"
W3	18	#MOTOR TP	TH	FILTER GRD	3 1/4"	8"
W2	18	#MOTOR TP	TH	FILTER	2 #8	8"
W1	12	#MOTOR PWR.	A-2	FILTER	1 1/4"	8"

WIRE SCHEDULE (# FROM MOTOR)

PART NO.	SEE NOTE
120.000.308-W9	(5)
120.000.308-W8	(5)
120.000.308-W7	(5)
120.000.308-W6	(5)

* W5 & W10 HAVE 6" CABLE LENGTH INSIDE JUNCTION BOX FOR CONNECTION. EXTERIOR CABLE IS 15 FEET LONG.

P/N 118.000.435

NOTES

1.) SPRAY WIRE CONNECTIONS AND INSIDE OF HOUSING WITH ANTI-MOISTURE/FUNGUS RESISTANT VARNISH #111.000.165 PER MIL-V-173-C AT ASSEMBLY.

2.) ALL 1/8" HOLES FOR (9) SELF TAPPING SCREWS TO HAVE A SMALL AMOUNT OF SILICONE RUBBER ADHESIVE SEALANT #121.000.576 APPLIED BEFORE ASSEMBLY.

3.) ALL PIPE THREAD CONNECTIONS TO HAVE TEFLON TAPE PIPE THREAD SEALANT PART NUMBER 121.000.393 APPLIED TO THREADS AT ASSEMBLY.

4.) FOR ARRANGEMENT OF COMPONENTS, SEE DWG. 19.000.822 SHEET 3 ITEMS 2.1 THRU 2.18.

5) WIRE RATING, UL TYPE MTW 600 VOLT

CONTRACT : DAAK01-88-D-D053 DATED 29 FEB 88

SCOT DIV. ARDOX CORP.

NAME: ELECTRICAL CONTROLS 85

UNLESS OTHERWISE SPECIFIED:
1 - PLACE DEC ± ANGULAR
2 - PLACE DEC ± ±
3 - PLACE DEC ±
FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP PRACTICE STANDARDS
MACHINED SURFACE TEXTURE ✓

MATL: FSCM 13646

WT R F

DR TJS 9-22-88 SIMILAR TO
CH
AP
SCALE: NTS SHEET
REPLACES 14 AUG 89 28 AUG 89
DWG. NO. 18.001.723 REV. 7

Figure 5-5. Centrifugal Pump Unit Electrical Controls

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters .3.94 inches
1 meter = 10 decimeters =39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.06 feet
1 kilometer = 10 hectometers = 3,260.8 feat

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram .10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter= 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centers) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 CU. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.406	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C