

**TECHNICAL MANUAL**

**OPERATOR, UNIT, DIRECT SUPPORT, AND  
GENERAL SUPPORT MAINTENANCE MANUAL**

**(INCLUDING REPAIR PARTS AND  
SPECIAL TOOLS LIST)**

**SUCTION APPARATUS  
PROGRAMMABLE INTERMITTENT  
SUCTION-ASPIRATOR SYSTEM  
MODEL 306M**

**6515-01-267-2726**

**APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**May 1999**



SAFETY STEPS TO FOLLOW IF SOMEONE IS THE  
VICTIM OF ELECTRICAL SHOCK

Do not try to pull or grab the individual.

If possible, turn off the electrical power.

If you cannot turn off the electrical power, pull, push, or lift the person to safety using a dry wooden pole or a dry rope, or some other insulating material.

Send for help as soon as possible.

After the injured person is free of contact with the source of electrical shock, move the person a short distance away and immediately start artificial resuscitation.

Throughout this manual are WARNINGS, CAUTIONS, and NOTES. Please take time to read these. They are there to protect you and the equipment.

## WARNING

Procedures which must be observed to avoid personal injury, and even loss of life.

## CAUTION

Procedures which must be observed to avoid damage to equipment, destruction of equipment, or long-term health hazards.

## NOTE

Essential information that should be remembered.

TECHNICAL MANUAL

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, DC

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OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL  
SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)  
SUCTION APPARATUS PROGRAMMABLE INTERMITTENT  
SUCTION-ASPIRATOR SYSTEM, MODEL 306M  
6515-01-267-2726

You can help improve this manual. If you find any mistakes or if you know a way to improve procedures, please let us know. Mail your memorandum, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 (Recommended Changes to Equipment Technical Publications) located in the back of this manual to: U.S. Army Medical Materiel Agency, 1423 Sultan Drive, Suite 100, ATTN: MCMR-MMM, Fort Detrick, MD 21702-5001. A reply will be furnished directly to you.

Approved for public release; distribution is unlimited.

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## HOW TO USE THIS MANUAL

This manual provides all the information needed to understand the capabilities, functions, and characteristics of this equipment. It describes how to set up, operate, test, and repair the equipment. You must familiarize yourself with the entire manual before operating or beginning a maintenance task.

The manual is arranged by chapters, sections, and paragraphs followed by appendixes, a glossary, an index, and DA Forms 2028-2. Use the table of contents to help locate the chapter or section for the general subject area needed. The index will help locate more specific subjects.

Multiple figures and tables are provided for your ease in using this manual. Words that are both capitalized and bold are names of components or words that you will actually see on the equipment.

Chapter 3 provides a systematic method of inspecting and servicing the equipment. In this way, small defects can be detected early before they become a major problem causing the equipment to fail. Make a habit of doing the checks and services in the same order each time and anything wrong will be detected quickly.

Only perform maintenance functions specified in the maintenance allocation chart for your level of maintenance. Maintenance functions specified for higher levels of maintenance frequently require additional training; test, measurement, and diagnostic equipment; or tools.

# CHAPTER 1

## INTRODUCTION

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### Section I. GENERAL INFORMATION

#### 1-1. Overview.

This manual describes the suction apparatus (fig 1-1); provides equipment technical data; and provides operational and maintenance functions, services, and actions. Additional information follows.

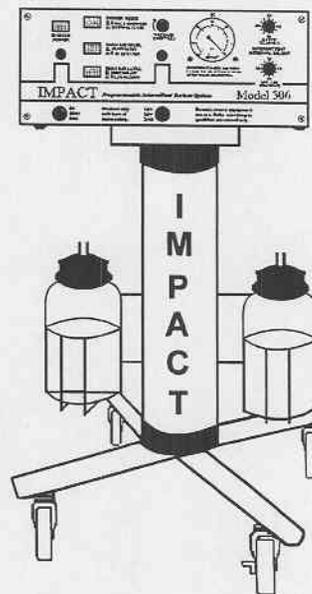


Figure 1-1. Suction apparatus.

- a. *Type of manual.* Operator, unit, direct support (DS), and general support (GS) maintenance (including repair parts and special tools list).
- b. *Model number and equipment name.* Model number 306M, Suction Apparatus, Surgical.
- c. *Purpose of equipment.* To provide continuous or intermittent oral, nasal, and tracheal suctioning during surgery.

#### 1-2. Explanation of abbreviations and terms.

Special or unique abbreviations, acronyms, and terms used in this manual are explained in the glossary.

### 1-3. Maintenance forms, records, and reports.

a. *Reports of maintenance and unsatisfactory equipment.* Department of the Army forms and procedures are used for equipment maintenance.

b. *Report of packaging and handling deficiencies.* Fill out and forward SF380 (Report of Survey).

### 1-4. Destruction of Army materiel to prevent enemy use.

AR 40-61 contains instructions for destruction and disposal of Army medical materiel. Also, the SB 8-75 series publications provide periodic information and/or instructions on the disposal of medical materiel that are hazardous.

### 1-5. Administrative storage.

a. Placement of the suction apparatus in administrative storage should be for short periods of time when a shortage of maintenance effort exists. This equipment should be in mission readiness condition within 24 hours or within the time factors as determined by the directing authority. During the storage period, keep appropriate maintenance records.

b. Perform preventive maintenance checks and services (PMCS) listed in tables 3-1 and 3-2 before placing Army equipment in administrative storage. When equipment is removed from storage, perform PMCS to ensure its operational readiness.

c. Inside storage is preferred for equipment selected for administrative storage.

### 1-6. Preparation for storage or shipment.

Procedures to prepare the suction apparatus for storing or shipping are listed in chapter 3, section IX.

### 1-7. Quality control (QC).

AR 702-18/DLAR 4155.37/NAVSUPINST 4410.56/AFR 69-10/MCO 4450.13 contains QC requirements and procedures.

### 1-8. Nomenclature cross-reference list.

Table 1-1 identifies official versus commonly used nomenclatures.

Table 1-1. Nomenclature cross-reference list.

<i>Common name</i>	<i>Official nomenclature</i>
Suction apparatus	Suction apparatus, surgical
Aspirator	Suction apparatus, surgical
Vacuum adjust control knob	Electronic vacuum regulator (EVR)
Collection bottles	Collection canisters

### 1-9. Reporting and processing medical materiel complaints and/or quality improvement reports.

AR 40-61 prescribes procedures for submitting medical materiel complaints and/or quality improvement reports for the suction apparatus.

### 1-10. Warranty information.

A warranty is not applicable.

## Section II. EQUIPMENT DESCRIPTION AND DATA

### 1-11. Equipment characteristics, capabilities, and features.

a. The suction apparatus is a self-contained, mobile unit, with integral cart, capable of providing programmable intermittent suction during surgery. Depending on the type of suction required, the 306M will remove accumulated fluids via tubing inserted into a patient's surgical opening, oral, or nasal passages. Suctioned fluids empty from the patient tubing into the collection system consisting of two reusable glass collection bottles located below the suction unit on the integral suction cart.

b. The suction apparatus is capable of operating from an internal 12 VDC battery, external 12 VDC, or external 115/220 VAC, 50/60 Hz power source.

c. The suction apparatus is capable of providing user selectable vacuum within the range of 0-200 mmHg (0-8 in Hg) **LOW VACUUM**, and 0-550 mmHg (0-22 in Hg) **HIGH VACUUM**. The suction apparatus is capable of being user programmed to provide any of at least 144 intermittent timing cycles.

d. The unit is settable to provide on timer periods from 5 to 60 seconds in 5 second increments; and off timer for the same time periods. The settings are independent of each other.

e. The suction apparatus is provided with a castered cart/stand with detachable mounting bracket system to hold the unit.

### 1-12. Component and accessory descriptions.

#### a. Components (fig 1-2).

(1) *Control/pump chassis.* The control/pump chassis incorporates the vacuum pump, the control printed circuit board (PCB), the battery pack, and the operational controls.

(2) *Electrical power cable assembly.* The electrical power cable assembly, hanging from the rear of the control pump/chassis, is connected directly into a receptacle for 115-volt operation.

(3) *Tip-resistant cart.* The tip-resistant cart incorporates four casters and the brackets for holding the dual collection bottles.

#### b. Accessories.

(1) *Dual collection bottles.* Two reusable glass collection bottles, capable of holding up to 1500 mL of liquid, are supplied with each suction apparatus.

(2) *Filter, disposable, hydrophobic/bacterial.* The bacterial filter prevents fluid and aerosol contamination of the suction apparatus. The filter has a hydrophobic, microporous membrane which filters air with maximum efficiency while blocking the flow of aqueous fluids.

(3) *Tubing.* The disposable tubing package contains a 3/8-in id by 10 ft length, 1/4-in id by 1 1/2 ft length, 1/4-in by 5 ft length, 1/4-in by 1 ft length, clear tubing used to connect the bottles, filter, and the suction control. An 8-in long corrugated hose is also provided to connect the vacuum inlet to the overflow shutoff valve.

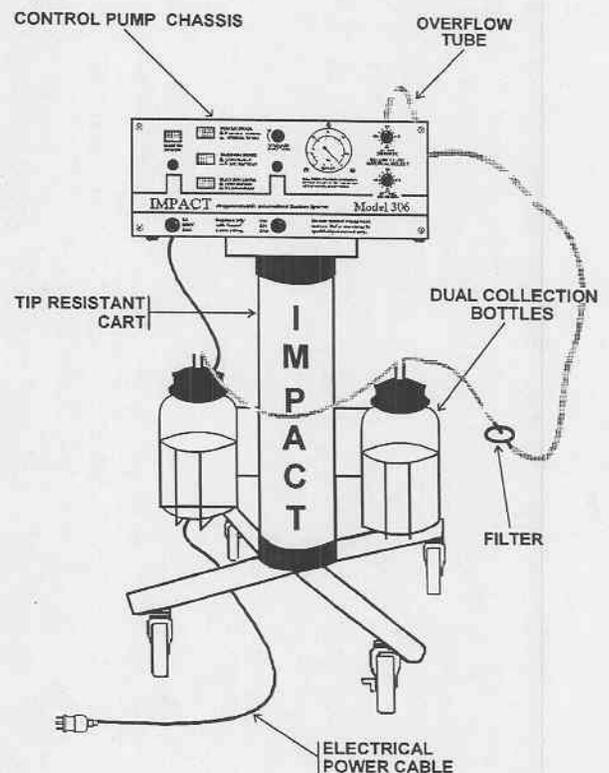


Figure 1-2. Components and accessories.

### 1-13. Tabulated data, decals and data plates.

The tabulated data provides miscellaneous characteristics, specifications, and other information for the suction apparatus.

a. *Specifications and miscellaneous characteristics.* Table 1-2 and table 1-3 provide a broad range of miscellaneous characteristics and specifications to include operating voltages, vacuum ranges, flow rates, operating/storing temperature ranges, dimensions, and weights.

**Table 1-2. Specifications.**

Voltage/frequencies .....	115 VAC, 50/60 Hz 230 VAC, 50/60 Hz 12 VDC
Internal power .....	12 VDC, recharge batteries
Operating time .....	1 hour at maximum vacuum
Recharge time .....	16 hours
Vacuum ranges	
Continuous	
Low .....	0-200 mmHg, ± 25 mmHg
High .....	0-550 mmHg, ± 50 mmHg
Intermittent .....	0-200 mmHg, ± 25 mmHg
Free airflow range .....	24-35 liters per minute

**Table 1-3. Miscellaneous characteristics.**

Dimensions	
Case	
Height.....	18 cm (7 in)
Width.....	46 cm (18 in)
Length.....	25 cm (10 in)
Weight.....	11 kg (24 lb)
Cart	
Height.....	75 cm (30 in)
Width.....	46 cm (18 in)
Depth .....	46 cm (18 in)
Weight.....	11 kg (24 lb)
Collection bottle capacity .....	1500 mL ea
Free airflow range .....	24-35 liters per minute
Duty cycle.....	Continuous/intermittent
Operating range	
Temperature .....	-60°C to 60°C (-76°F to 140°F)
Battery long term storage	
Temperature .....	10°C to 30°C (50°F to 86°F)
Apparatus storage	
Temperature .....	-15°C to 40°C (5°F to 104°F)

b. *Identification, instruction, and warning plates, decals, or markings.*

(1) The suction apparatus manufacturer data plate (located on the center of the rear panel) is illustrated in figure 1-3.

(2) Imprinting (located on the front panel of the control/pump chassis) providing danger and caution notices are illustrated in figure 1-4.

SER. NO.	
CONTRACT: DLA120-88-C-8510	
IMPACT INSTRUMENTATION, INC.	
SUCTION APPARATUS, SURGICAL, MODEL 306M	
115/230VAC, 50/60 HZ; 12 VDC	10A, 120W
DES. ACT. 89875	FSCM: 63346
PART NO. DPSC-DEPMEDS-AT/224(DM)	
NSN: 6515-01-267-2727	MFD:2Q88
US	

Figure 1-3. Manufacturer data plate.

Replace only with fuse of same rating.	Do not remove equipment covers. Refer servicing to qualified personnel only.
--	--

Figure 1-4. Front panel imprinting.

### 1-14. Model differences.

Model differences are not applicable since this manual covers a single model.

### 1-15. Safety, care, and handling.

- a. Observe each WARNING, CAUTION, and NOTE in this manual.
- b. Read the operating instructions in this manual before operating the unit. Refer servicing to qualified Medical Equipment Repairer personnel.
- c. Install the bacteria filter carefully to prevent damage to the filter and hoses.
- d. The use of a collection bottle without an overflow shutoff valve may cause damage to the vacuum pump.
- e. Operator/user personnel will not remove the instrument covers. There is a danger of electric shock.
- f. There is possible explosion hazard if used in the presence of flammable anesthetics.

## Section III. PRINCIPLES OF OPERATION

### 1-16. General description (fig 1-5).

- a. The vacuum is generated by a vane-type vacuum pump, which is attached to an electric motor.
- b. When unit is turned on and **CONTINUOUS** operation is selected, the motor speed (variable vacuum is on) is controlled by the motor speed control.
- c. When **INTERMITTENT** operation is selected, the motor speed control still controls the speed of the motor but the control and relay circuits control the amount of time the motor is on and off.

d. When the vacuum pump is on, the solenoid is off (de-energized), and the valve is closed (no path to outside air). When vacuum pump turns off, the solenoid energizes and opens a path from the vacuum line to the outside air. This reduces the vacuum to 0 mmHg instantly.

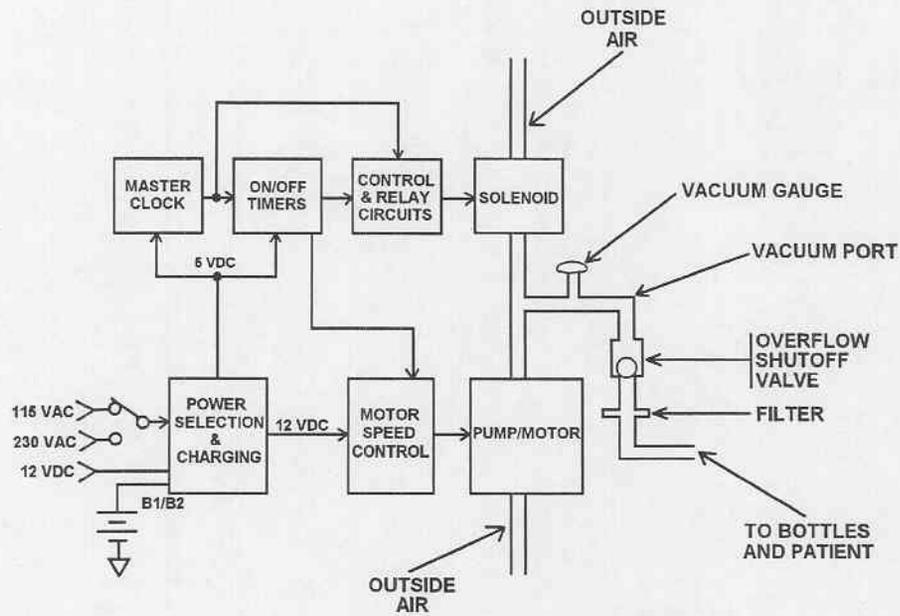


Figure 1-5. Vacuum cycle.

## CHAPTER 2

# OPERATING INFORMATION AND INSTRUCTIONS

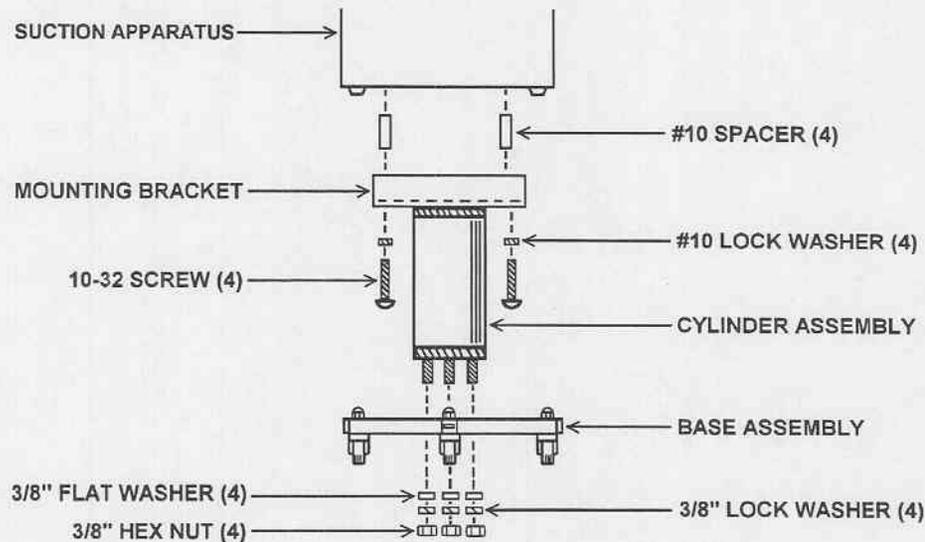
### Section I. PREPARATION FOR OPERATION

#### 2-1. Scope.

This manual is primarily intended to provide information, instructions, and procedures for the maintenance of the suction apparatus. The operating information and instructions, while valid, do not provide sufficient information for use of the suction apparatus on a patient. Only qualified medical personnel are trained in specific suctioning techniques and procedures.

#### 2-2. Assembly and interconnections.

a. *Assembly.* The suction apparatus may or may not require assembly dependent upon the standard operating procedures of your unit. If required, assembly procedures for the cart assembly (fig 2-1) are as follows:



*Figure 2-1. Cart assembly.*

- (1) Insert cylinder assembly into the base assembly.
- (2) Secure cylinder assembly to base as shown using 3/8-in flat washers, lock washers, and hex nuts.

#### NOTE

Each threaded rod passes completely through the cylinder assembly. When tightening hex nuts to base assembly, use a wrench on the opposite end of the corresponding rod to maintain uniform tightness.

- (3) Align the base of the suction apparatus with the cart assembly. Place spacers in mounting bracket channel and tighten securely with 10-32 screws.

(4) Casters with wheel locks prevent wheels from turning; they do not lock the swivel mechanism. Depress red button to lock wheel. Lift to release.

b. Interconnections (fig 2-2).

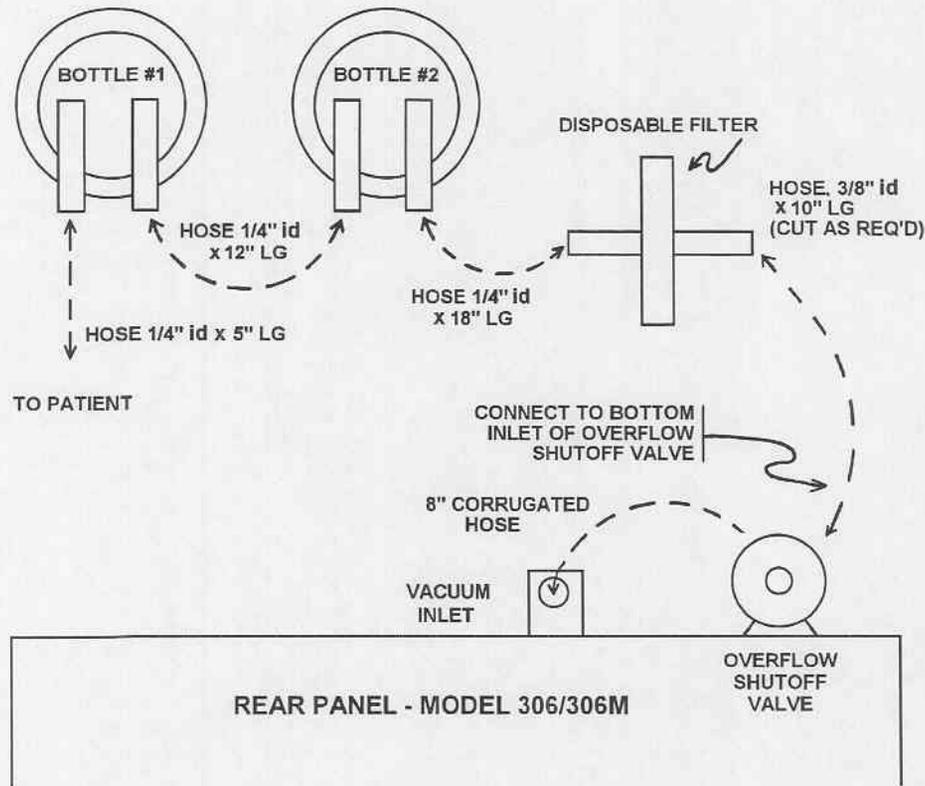


Figure 2-2. Hose interconnection.

- (1) Locate and open a tubing package.
- (2) Install the overflow valve in the U-shaped spring clamp on the rear panel of the main assembly.

**NOTE**

Black end of shutoff valve should be facing up.

- (3) Connect the 8-in corrugated hose from the vacuum inlet to the top of the overflow shutoff valve.
- (4) Connect the 3/8-in id by 10-in hose (cut 10-in of hose from tubing packaging) from the bottom of the shutoff valve to the vacuum side of the disposable filter.
- (5) Connect 1/4-in id by 18-in hose from the fluid side of the disposable filter to the pump side of the collection bottle.
- (6) Connect 1/4-in id by 12-in hose from the patient side of bottle #2 to fluid side of bottle #1.
- (7) Connect 1/4-in id by 5-in hose from the patient side of bottle #1 to patient.

c. *Battery installation.*

- (1) Remove top cover by removing six screws; three located along the rear lip and three along the top edge.
- (2) The battery pack is secured by two brackets connected to the main chassis. One bracket snugs the battery pack to the left, sub-side panel. The other bracket snugs the battery pack to the rear panel and straddles the lower terminals of each battery.
- (3) Each bracket is secured with two #10-32 keps nuts.
- (4) To install the battery pack, remove the four keps nuts securing the brackets mentioned earlier. Use the 3/8-in socket with drive handle or 3/8-in open end wrench to remove keps nuts and brackets.
- (5) Install the battery with battery terminals (- and +) toward top facing forward toward the control panel. The jumper (small orange wire) is on bottom facing forward.
- (6) Replace the two brackets removed earlier and tighten the #10-32 keps nuts with a 3/8-in socket and drive handle.
- (7) Install the RED wire to the "+" terminal and the BLACK wire to the "-" terminal.
- (8) Replace the top cover and the six screws.

## Section II. OPERATING INFORMATION

### 2-3. Controls and indicators.

a. *Front panel controls and indicators (fig 2-3).*

(1) **MASTER POWER on/off pushbutton (S1).** The green **MASTER POWER** pushbutton switch is a push-push switch. In is on and out is off. With no AC power connected to the suction apparatus, the pushbutton energizes the suction apparatus with battery power. If the power cord is plugged into an AC line source, the suction apparatus will operate on AC line power and the indicator light (L1) will illuminate.

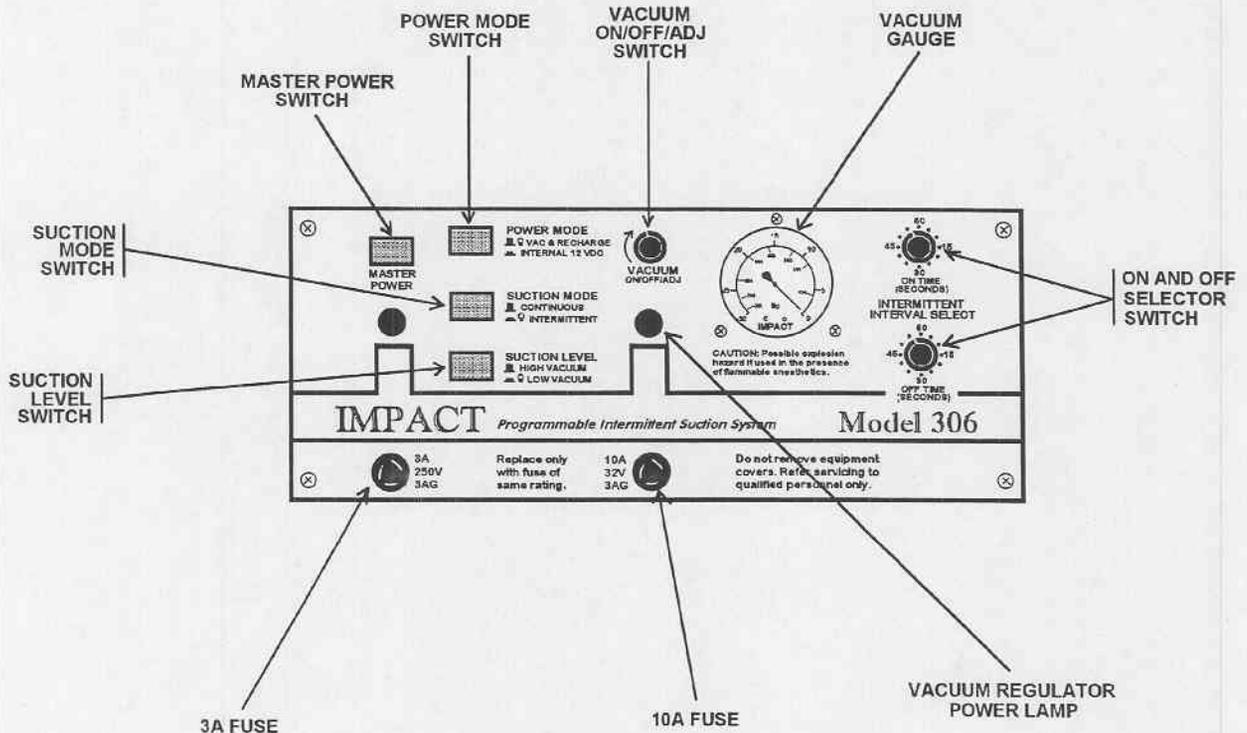


Figure 2-3. Front panel controls and indicators.

(2) **MASTER POWER indicator lamp (L1)**. The green **MASTER POWER** indicator lamp is an incandescent lamp designed to illuminate and verify that there is a live power source available to operate the unit.

(3) **Master POWER MODE pushbutton (S2)**. The green master **POWER MODE** pushbutton switch is a push-push switch with an integral indicator lamp. This pushbutton will only operate with the **MASTER POWER** pushbutton in the on position. When the pushbutton is in the out position and the unit plugged into an AC line source, the indicator light (L2) in the switch will illuminate and the suction apparatus will operate on AC line power and simultaneously recharge the battery. When the pushbutton is in the in position, the indicator light will be off and the suction apparatus will operate from the internal 12 VDC battery power source regardless of whether the AC power cord is plugged into an AC line.

#### CAUTION

When operating the suction apparatus from an external 12 VDC source and simultaneous AC recharging of the batteries is desired, ensure the external 12 VDC source is diode protected against potential high current draw.

(4) **SUCTION MODE pushbutton (S5)**. The green **SUCTION MODE** pushbutton, just below the **POWER MODE** pushbutton is a push-push switch with an integral indicator lamp (L4). In is **INTERMITTENT** suction and out is **CONTINUOUS** suction. This pushbutton, in conjunction with the **SUCTION LEVEL** pushbutton, determines whether the suction apparatus is in either **INTERMITTENT** or **CONTINUOUS** suction operation. **CONTINUOUS** suction operation is indicated when the **SUCTION MODE** indicator lamp is off and **INTERMITTENT** suction operation will be indicated when the lamp is illuminated.

(5) **SUCTION LEVEL pushbutton (S4)**. The green **SUCTION LEVEL** pushbutton, just below the **SUCTION MODE** pushbutton is a push-push switch with an integral indicator lamp (L5). This pushbutton, in conjunction with the **SUCTION MODE** pushbutton, determines whether **HIGH VACUUM** or **LOW VACUUM** is provided by the suction apparatus. **HIGH VACUUM** can only be achieved when the suction apparatus is in **CONTINUOUS SUCTION MODE** of operation and is verified by the indicator lamp being off. Low **CONTINUOUS** suction operation is indicated when the **SUCTION MODE** indicator lamp is off and **INTERMITTENT** suction operation will be indicated when the lamp is illuminated.

(6) **VACUUM ON/OFF/ADJ switch (S3)**. The black **VACUUM ON/OFF/ADJ** switch is located in the center of the control panel. This switch is used to control the level of vacuum of the suction apparatus. The precise level of suction achieved by the use of this switch will also be dependent on how the **SUCTION LEVEL** pushbutton is set. When the **SUCTION LEVEL** is set to **HIGH**, the **VACUUM ON/OFF/ADJ** switch will allow adjustment of the suction between 0-22 in Hg. When the **SUCTION LEVEL** is set to **LOW**, only 0-8 in Hg of suction can be obtained.

(7) **Vacuum regulator power lamp (L3)**. The vacuum regulator power lamp illuminates whenever the suction apparatus **VACUUM ON/OFF/ADJ** switch is in the on position and adjustment of suction level can be made.

(8) **Vacuum gauge**. The vacuum gauge can easily be read from several feet away. It is a mechanical gauge used to indicate the level of suction that is being delivered by the suction apparatus. It is graduated in 0-769 mmHg and 0-30 in Hg.

(9) **ON TIME selector switch**. The **ON TIME** selector switch (S6) is a 1 pole, 12 position rotary switch used during **INTERMITTENT** suction operation. This switch allows the user to program the **ON TIME** in 12 increments of 5 seconds each.

(10) **OFF TIME selector switch**. The **OFF TIME** selector switch (S7) is a 1 pole, 12 position rotary switch used during **INTERMITTENT** suction operation. This switch allows the user to program the **OFF TIME** in 12 increments of 5 seconds each.

(11) **Fuse, 3A, 250V, 3AG (F1)**. Fuse F1 is located on the front panel of the suction apparatus and is used to protect against excessive current draw by the unit in the event of an electrical fault.

(12) **Fuse, 10A, 32V, 3AG (F2)**. Fuse F2 is located on the front panel of the suction apparatus and is used to protect the suction level and motor control circuits from overcurrent conditions.

b. Rear panel controls and indicators (fig 2-4).

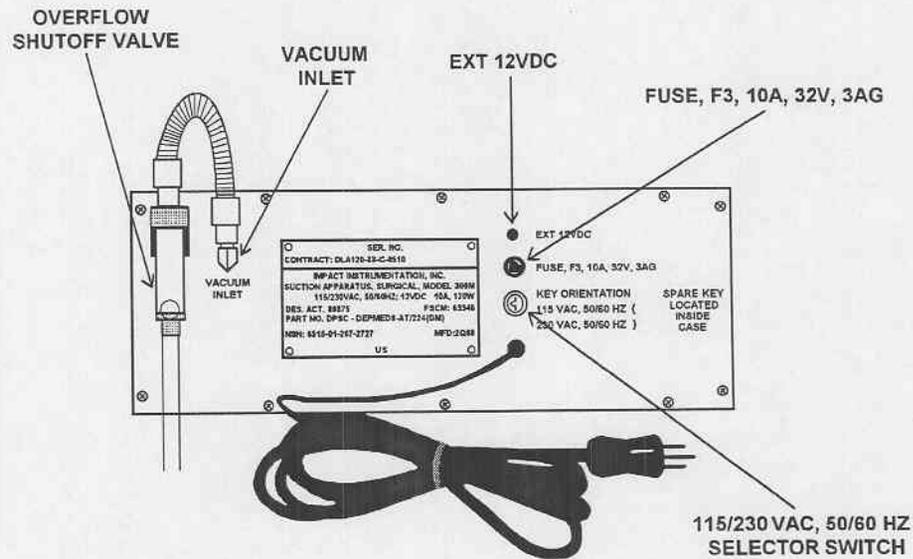


Figure 2-4. Rear panel controls and indicators.

- (1) **Overflow shutoff valve.** The overflow shutoff valve is located on the extreme left side of the rear panel. This valve is clear, approximately 3 inches in length, and is used to prevent liquids from entering the suction apparatus pump motor.
- (2) **VACUUM INLET.** The **VACUUM INLET** is located on the left upper side of the rear panel of the suction apparatus. This chrome elbow receives the flex hose from the overflow shutoff valve.
- (3) **EXT 12VDC.** The external 12 VDC connection is a 2-conductor PMF power jack used to connect the suction apparatus to a diode protected external 12 VDC power source.
- (4) **FUSE, F3, 10A, 32V, 3AG.** Fuse F3 is located on the rear panel of the suction apparatus and protects the battery pack from high current discharges in excess of 10A.
- (5) **KEY ORIENTATION, 115 VAC, 50/60 HZ, 230 VAC, 50/60 HZ selector switch (S8).** The 115/230 VAC, 50/60 Hz selector switch is a keyed two position switch used to select the operating voltage of the suction apparatus. With the key inserted and the key in the vertical position, the unit is configured to operate on a 115 VAC source. If the key is in a horizontal position, then the unit is configured to operate on a 230 VAC source.

## Section III. OPERATING INSTRUCTIONS

### 2-4. Initial start-up procedures.

- a. Roll the suction apparatus either to an equipment preparation area or to the area of use.
- b. Ensure that the **MASTER POWER** switch is in its off position (button is out) or depress the switch to its off position.

**NOTE**

Verify operating power selections at 115 or 230 VAC, internal rechargeable batteries and external 12 VDC, at the back of the unit.

- c. Remove the coiled electrical power cable assembly and connect it to the proper voltage. The unit may also be powered by the internal 12 VDC batteries or external 12 VDC.
- d. Ensure that the collection bottle assembly is in place and assembled in accordance with the procedures contained in paragraph 2-2b.
- e. Depress the **MASTER POWER** switch to the on position. The indicator lamp illuminates to verify a live power source.
- f. Verify continuous operation at both high and low ranges in each of the operating power modes. The indicator lamp for continuous operation will not illuminate in this mode.
- g. Verify that intermittent suction operates only in the low vacuum range in each of the operating power modes. The **SUCTION MODE** indicator lamp will illuminate in this mode.
- h. Test the EVR by adjusting vacuum in the high and low ranges in each of the operating power modes.
- i. Submerge the end of the polyvinyl chloride (PVC) patient tubing into a container of water and observe the aspiration of the water into the collection bottle.
- j. Remove the PVC patient tubing from the container of water. The suction apparatus is now ready for patient use by qualified medical personnel.

**2-5. Routine start-up procedures.**

Routine start-up procedures will follow the initial start-up procedures except for differences involving assembly and interconnections in accordance with your unit's standard operating procedures.

**2-6. Operating procedures.**

- a. Observe periodically the level of liquid in the collection bottles and empty it in accordance with your unit's standard operating procedures.

**CAUTION**

Failure to empty the collection bottle prior to a liquid level reaching its 1500 mL graduation will result in shutoff of the vacuum to the patient and pose a potential risk to the patient. In addition, if the overflow protection device would fail, the bacteria filter would also fail from liquid contamination and shut off the suction with a higher resultant patient risk.

- b. Observe the flow of patient fluids within the clear PVC tubing. Fluids should be drawn into the collection bottle only when the vacuum pump is running.
- c. Always use the overflow shutoff valve provided with this unit to protect the suction mechanism from overflows which may permanently damage the vacuum pump. Ensure that the overflow shutoff valves do not stick.
- d. A disposable filter which is both hydrophobic and bacterial is provided. This filter connects between the overflow shutoff valve and final collection bottle. This filter should be replaced when discoloration of its membrane occurs, the membrane contacts aspirate, or following 150 cumulative hours of use. This filter is designed to retain bacteria which would otherwise be exhausted into the immediate vicinity. **DO NOT** bypass this filter.

## 2-7. Shut-down procedures.

Shut-down procedures are as follows:

- a. Depress the **MASTER POWER** switch so the power light is not lit.
- b. Disconnect the tubing from the patient to the collection bottle.
- c. Dispose of the tubing and collected patient fluids in accordance with your unit's standard operating procedures.

## Section IV. OPERATION OF AUXILIARY EQUIPMENT

### 2-8. Associated support items of equipment.

The suction apparatus requires no associated support items of equipment other than an electrical power generator or battery operation.

### 2-9. Associated material.

Associated material is identified in appendix D and appendix E.

## Section V. CLEANING, DISINFECTING, AND STERILIZING PROCEDURES

### 2-10. General.

- a. The suction apparatus and operating accessories should be clean at all times. Specific cleaning, disinfecting, and/or sterilizing procedures are provided in subsequent paragraphs.
- b. Accessories identified as disposable should not be cleaned or reused. These accessories were designed and manufactured for a one time use only.
- c. The collection bottle assembly should be removed from the base assembly to facilitate cleaning.

### 2-11. Suction apparatus.

#### a. *Cleaning.*

- (1) Turn off the suction apparatus by depressing the **MASTER POWER** switch to the off position.
- (2) Disconnect the electrical power cable assembly from the electrical receptacle.
- (3) Remove the collection bottle assembly.

#### CAUTION

Do not allow liquids to enter the control system.

- (4) Wipe the suction apparatus using a mild detergent with a soft cloth.
- (5) Dry the suction apparatus with a soft cloth.

*b. Disinfecting.* Disinfect the suction apparatus by wiping it with a liquid disinfectant or lightly spraying it with disinfectant in accordance with your unit's standard operating procedures.

*c. Sterilizing.* The suction apparatus cannot be sterilized.

## 2-12. Collection bottle assembly.

### a. *Cleaning.*

- (1) Turn off the suction apparatus by depressing the **MASTER POWER** switch.
- (2) In general, the following hoses are not reusable and should be disconnected and disposed of after each use:
  - (a) Patient hose
  - (b) 1/4-in id by 12-in jumper hose between bottles
- (3) The following items can be reused after cleaning, provided it can be established that they have not been in contact with patient fluids:
  - (a) 1/4-in id by 18-in Lg hose between bottle #2 and bottom of disposable filter
  - (b) 3/8-in id by 10-in Lg hose between top of disposable filter and bottom of overflow shutoff valve
- (4) Remove the caps from the collection bottles.
- (5) Immerse the caps and those hoses not specified in a(2) above in a warm detergent solution in accordance with your unit's standard operating procedures.

### **CAUTION**

Discard overflow valve if it has been in contact with patient fluids. Never use alcohol based detergents on rubber products, as it will potentially lead to dry rotting and cracking of the rubber.

- (6) Dispose of any patient drainage fluids in accordance with your unit's standard operating procedures. Then immerse the collection bottles in the detergent solution.
- (7) Scrub the cap assemblies lightly with a nylon brush in warm detergent solution.
- (8) Rinse all assemblies thoroughly in warm water and allow them to dry.

*b. Sterilizing.* Steam sterilize the reusable caps and collection bottles for 15 minutes in accordance with the steam sterilizer's manufacturer instructions and your unit's standard operating procedures.

## **Section VI. OPERATION UNDER UNUSUAL CONDITIONS**

### 2-13. Unusual conditions.

The mobile suction apparatus is designed to operate only within a medical treatment facility environment.

## CHAPTER 3

# UNIT LEVEL MAINTENANCE

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### Section I. GENERAL INFORMATION

#### 3-1. Overview.

*a. Unit level maintenance.* This level of maintenance is the responsibility of and performed by a using unit on its assigned equipment. Responsibilities are stratified as follows:

(1) *Operator maintenance.* This segment of unit level maintenance is performed by operator/user personnel and consists of equipment operational functions; routine services like cleaning, dusting, washing, checking for frayed cables, and stowing items not in use; and checking for loose hardware, replacing operator accessories, and replacing operator repair parts. Replacing operator parts will not require extensive disassembly or reassembly of the end item, critical adjustments after replacement, or the extensive use of tools.

(2) *Specialist maintenance.* This segment of unit level maintenance is performed only by trained Medical Equipment Repairers. The functions and services include—

(a) Scheduling and performing PMCS, electrical safety inspections and tests, and calibration/verification/certification (CVC) services.

(b) Performing unscheduled maintenance functions with emphasis on replacing assemblies, modules, or PCBs, when available.

(c) Operating a repair parts program to include Class VIII repair parts as well as other commodity class repair parts used on medical equipment.

(d) Maintaining a library of technical manuals (TMs), manufacturers' literature, repair parts information, and related materials.

(e) Conducting inspections on new or transferred equipment.

(f) Establishing administrative procedures for the control and administration of maintenance services in accordance with TB 38-750-2.

(g) Notifying support maintenance battalions of requirements and/or evacuating unserviceable equipment, assemblies, or modules.

*b. Maintenance functions.* Maintenance functions, both preventive and corrective, which are beyond the scope of the operator/user are assigned to unit level Maintenance Equipment Repairer personnel. These personnel will perform the majority of maintenance required for the equipment except some tasks involving the vacuum pump, PCBs, or stand.

#### 3-2. Tools and test equipment.

Common tools and test equipment required for unit level maintenance of the equipment are listed in appendix B, section III of this manual. Refer to your unit's modified table of organization and equipment (MTOE) for authorized items.

#### 3-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III of this manual.

#### 3-4. Expendable supplies.

Expendable and durable supplies and materials required for maintenance of the equipment are listed in appendix D, section II of this manual.

### 3-5. Repair parts.

Repair parts required for unit level maintenance are listed in appendix E, section II of this manual.

### 3-6. Special tools.

Special tools required for unit level maintenance of the equipment are listed in appendix E, section III of this manual.

## Section II. SERVICE UPON RECEIPT OF EQUIPMENT

### 3-7. Unpacking the suction apparatus.

- a. Open the top flaps of the shipping container.
- b. Remove the two boxes from inside the shipping container.
- c. Open the top of the large box.
- d. Remove the foam blocks from the box and set them aside.
- e. Lift and roll the suction apparatus out of the box.
- f. Open the small box with accessories and remove the contents. Set the box aside.
- g. Verify receipt of the following:
  - (1) Suction apparatus.
  - (2) Assembly, overflow shutoff valve.
  - (3) Hose, corrugated, 8-in long.
  - (4) 3/8-in id by 10 ft length of tubing, clear.
  - (5) 1/4-in id by 1 1/2 ft length of tubing, clear.
  - (6) 1/4-in id by 5 ft length of tubing, clear.
  - (7) Maintenance and service manuals (2).
  - (8) Operation manuals (2).
  - (9) Spare fuse, type 3AG, 10A, 32V (2).
  - (10) Spare fuse, type 3AG, 3A, 250V.
  - (11) Filter, disposable, hydrophobic/bacterial.
  - (12) Reusable collection canister system (2 bottles with caps).
  - (13) Holder, collection canister (2).
  - (14) Wall mounting bracket (for collection canisters).
  - (15) Screws, self-tapping (for wall mounting brackets) (4).
  - (16) Cart for suction apparatus.
  - (17) Battery pack.

## Section III. LUBRICATION INSTRUCTIONS

### 3-8. General.

No lubrication of the suction apparatus is required.

## Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 3-9. General.

a. The suction apparatus must be inspected and serviced systematically to ensure that it is ready for operation at all times. Inspection will allow defects to be discovered and corrected before they result in serious damage or failure.

b. Table 3-1 contains a list of items to be performed by unit level operator/user personnel. This PMCS table is also referred to as "-10 PMCS" requirements. Preventive maintenance by operator/user personnel is not limited to performing the checks and services in table 3-1. There are things operator/user personnel should do any time they need to be done, such as checking general cleanliness, observing for improper operational indicators, and maintaining the proper quantities of accessories.

c. Table 3-2 contains a list of items to be performed by unit level Medical Equipment Repairers. This PMCS table is also referred to as "-20 PMCS" requirements.

d. Some items to be inspected will be listed in both table 3-1 and table 3-2 to stress their importance, to provide a quality control check on multiple operator/user personnel, and to identify more comprehensive procedures to be accomplished by unit level Medical Equipment Repairers.

e. The following is a list of both PMCS table column headings with a description of the information found in each column:

(1) *Item number*. This column shows the sequence in which to do the PMCS, and is used to identify the equipment area on the Equipment Inspection and Maintenance Worksheet, DA Form 2404.

(2) *Interval*. This column shows when each PMCS item is to be serviced: **B** - Before Operation, **D** - During Operation, **A** - After Operation, **Q** - Quarterly, and **S** - Semiannually. **B**, **D**, and **A** should be performed with daily use of the equipment.

#### NOTE

When the suction apparatus must be kept in continuous operation, check and service only those items that will not disrupt operation. Perform the complete daily checks and services when the equipment can be shut down.

(3) *Item to be Inspected and Procedure*. This column identifies the general area or specific part to be checked or serviced.

(4) *Equipment is not Ready/Available If*:. This column lists conditions that make the equipment unavailable or unusable.

Table 3-1. Operator preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1						<b>Suction apparatus.</b>	Missing components or accessories prevent operation of the suction apparatus. The operational tests indicate incorrect operation or a hazardous situation.
	X		X		X	a. Ensure that all components and accessories are on hand.	
2	X		X		X	b. Verify performance of the operational tests.	A broken, damaged, or inoperable switch prevents operation. A broken or inoperable indicator lamp prevents operation. The bacteria filter is improperly installed. It can contaminate the system and cause damage. The condition of the cable assembly prevents operation or causes a safety hazard.
						<b>Control/suction system.</b>	
3	X		X		X	a. Check for broken, damaged, or inoperable control switches.	The physical assembly of the suction apparatus prevents safe operation.
	X		X		X	b. Check for broken or inoperable indicator lamps.	
	X				X	c. Ensure that the bacteria filter is new or unused and properly installed into the vacuum line.	
	X				X	d. Inspect the electrical power cable assembly for cuts, deterioration, fraying, or other physical damage.	
4	X				X	<b>Upright assembly.</b>	The physical assembly of the suction apparatus prevents safe operation.
					X	Check that the upright assembly is tightly connected to the control/pump assembly.	
5	X	X			X	<b>Base assembly.</b>	There are missing or broken bottle bracket(s) enabling the collection bottle assembly to fall off the base assembly.
						Ensure that the bottle brackets hold the collection bottle assembly in place.	
6	X		X		X	<b>Collection canister system.</b>	The condition of the collection bottle assembly prevents proper operation. The overflow shutoff valve permits overflow and interruption of suction apparatus.
	X		X		X	a. Check the bottle openings for nicks or cracks.	
6					X	b. Test overflow shutoff valve for easy movement and proper operation.	A low or dead battery prevents operation.
	X		X		X	<b>Battery operation.</b>	
					X	Check internal battery operation with no AC power connected.	

Table 3-2. Repairer preventive maintenance checks and services.

ITEM NO	INTERVAL					ITEM TO BE INSPECTED AND PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	Q	S		
1					X	<p><b>Suction apparatus.</b></p> <p>a. Verify that components and accessories have been inventoried and/or requisitioned by operator/user personnel.</p> <p>b. Verify the results of operator/user tests.</p> <p>c. Verify operation by performing repairer tests.</p>	<p>Missing components or accessories prevent operation.</p> <p>Operator/user tests indicate improper operation.</p> <p>Test results indicate improper or unsafe operation.</p>
2					X	<p><b>Control/suction system.</b></p> <p>a. Check for broken, damaged, or inoperable control switches.</p> <p>b. Check for broken or inoperable indicator lamps.</p> <p>c. Ensure that the bacteria filter is new or unused and properly installed into the vacuum line.</p> <p>d. Inspect the electrical power cable assembly for cuts, deterioration, fraying, or other physical damage.</p>	<p>A broken, damaged, or inoperable switch prevents operation.</p> <p>A broken or inoperable indicator lamp prevents operation.</p> <p>The bacteria filter is improperly installed. It can contaminate the system and cause damage.</p> <p>The condition of the cable assembly prevents operation or causes a safety hazard.</p>
3					X	<p><b>Upright assembly.</b></p> <p>Check that the upright assembly is tightly connected to the control/pump assembly.</p>	<p>The physical assembly of the suction apparatus prevents safe operation.</p>
4					X	<p><b>Base assembly.</b></p> <p>Ensure that the bottle brackets hold the collection bottle assembly in place.</p>	<p>There are missing or broken bottle bracket(s) enabling the collection bottle assembly to fall off the base assembly.</p>
5					X	<p><b>Collection canister system.</b></p> <p>Check the bottle openings for nicks or cracks.</p>	<p>The condition of the collection bottle assembly prevents proper operation.</p>
6					X	<p><b>Battery operation.</b></p> <p>Check internal battery operation with no AC power connected.</p>	<p>A low or dead battery prevents operation.</p>

### 3-10. Reporting deficiencies.

Operator/user personnel will report problems with the suction apparatus discovered during their "-10 PMCS" that they are unable to correct. Refer to TB 38-750-2 and report the deficiency using the proper forms. Consult with your unit's Medical Equipment Repairer or request help through the telemaintenance system if you need assistance.

## Section V. OPERATIONAL TESTING

### 3-11. General.

This section contains procedures for operational testing of the suction apparatus by both operator/user personnel and Medical Equipment Repairer personnel. Deficiencies identified by operator/user personnel should be reported to Medical Equipment Repairer personnel.

### 3-12. Operator/user tests.

#### NOTE

Notify your unit's Medical Equipment Repairer if any operator/user tests fail.

#### a. **CONTINUOUS** suction operation.

(1) Verify operating power selections at 115 or 230 VAC, internal rechargeable batteries, external 12 VDC, and size of unit for voltage selections.

(2) Verify that the components and accessories of the suction apparatus are assembled and interconnected in accordance with the procedures contained in paragraph 2-2.

(3) Depress the **MASTER POWER** switch to the on position.

(4) Select **CONTINUOUS** suction from the **SUCTION MODE** switch. The indicator lamp for this switch will not illuminate in this mode.

(5) Select **LOW VACUUM** with the **SUCTION LEVEL** switch. An indicator lamp illuminates when **LOW VACUUM** is selected.

(6) Turn the **VACUUM** switch clockwise to its on position and continue rotating it to the desired vacuum level. The EVR indicator lamp will remain on until the **VACUUM** switch (EVR) is clicked off by turning fully counterclockwise.

(7) Using your thumb, close the open end of the PVC patient tubing to allow the vacuum to reach its selected level. Remember that the maximum vacuum limit is regulated by the **SUCTION LEVEL** switch and the **VACUUM** switch.

(8) Allow air to evacuate from any collection bottle system when preselecting the vacuum limit.

(9) Open the end of the PVC patient tubing and submerge it into a container of water and observe the aspiration of water into the collection bottles.

(10) Vacuum readings may be read directly from the front panel vacuum gauge.

(11) Verify **CONTINUOUS** operation at both high and low ranges of the **SUCTION LEVEL** switch.

(12) Remove the PVC patient tubing from the container of water and perform the next test.

#### b. **INTERMITTENT** suction operation.

(1) Perform the first three steps from **CONTINUOUS** operation.

(2) The **SUCTION MODE** and **SUCTION LEVEL** switches must be depressed and illuminated for **INTERMITTENT** operation.

**NOTE**

To prevent dangerous **HIGH VACUUM** levels from appearing at the pump output during **INTERMITTENT** suctioning, a safety lockout allows this mode to operate in the **LOW VACUUM** level range only.

- (3) Preselect the desired vacuum level as described in the previous section.
- (4) Adjust the **ON** and **OFF TIME** at the **INTERMITTENT INTERVAL SELECT** section to the desired range. Each circuit is programmable in 12 increments of 5 seconds each for a total of 144 combinations.
- (5) Close the open end of the PVC patient tubing to allow the vacuum to reach its selected level.
- (6) Open the end of the PVC patient tubing and submerge it into a container of water and observe the aspiration of water into the collection bottles.
- (7) Vacuum readings may be read directly from the front panel vacuum gauge.
- (8) Remove the PVC patient tubing from the container of water and dispose the water in accordance with your unit's standard operating procedures.

**3-13. Medical Equipment Repairer tests.***a. Vacuum levels.*

- (1) Verify operating power selections at 115 or 230 VAC, internal rechargeable batteries, or external 12 VDC. Select and apply the power that is going to be used. If battery power is used, make sure batteries are fully charged to check calibration.
- (2) Verify that the components and accessories of the suction apparatus are assembled and interconnected in accordance with the procedures contained in paragraph 2-2.
- (3) Connect a mercury manometer, a calibrated vacuum gauge, or the calibrator-analyzer into the open end of the PVC patient tubing.
- (4) Depress the **MASTER POWER** switch to the on position.
- (5) Select **CONTINUOUS** and **LOW VACUUM** operation.
- (6) Turn vacuum regulator on and fully clockwise.
- (7) Observe the mercury manometer, the calibrated vacuum gauge, or the calibrator-analyzer. Verify that the vacuum level is at 200 mmHg +/- 25 mmHg. Adjust R2 if necessary.
- (8) Select **HIGH VACUUM** and **CONTINUOUS** operation. Maximum vacuum should be 550 mmHg +/- 50 mmHg.
- (9) Perform the applicable troubleshooting procedures in accordance with this chapter, section VI, if either vacuum level is less than or more than the specified levels.
- (10) Depress the **MASTER POWER** switch to the off position.
- (11) Remove the mercury manometer, the calibrated vacuum gauge, or the calibrator-analyzer from the PVC patient tubing.
- (12) Shut down the suction apparatus by following the procedures in paragraph 2-7.

*b. Intermittent on/off timing cycles.*

- (1) Verify operating power selections at 115 or 230 VAC, internal rechargeable batteries, or external 12 VDC. Select and apply the power that is going to be used. If battery power is used, make sure batteries are fully charged to check calibration.
- (2) Verify that the components and accessories of the suction apparatus are assembled and interconnected in accordance with the procedures contained in paragraph 2-2.
- (3) Depress the **MASTER POWER** switch to the on position.
- (4) Select **INTERMITTENT** and **LOW VACUUM** operation.

- (5) Set on/off times for 5 seconds on and 5 seconds off.

**NOTE**

An oscilloscope may be used to calibrate the on/off timing circuits as described in this section. However, the technician may find it easier to calibrate the suction apparatus using a stopwatch. In such cases, the technician can utilize the pump turning on and off as the reference for keying the stopwatch.

- (6) Adjust R36 to set the **ON TIME** circuits for 5 seconds. Adjustment should be within +/-0.5 seconds.
- (7) Adjust R35 to set the **OFF TIME** circuits for 5 seconds. Adjustment should be within +/-0.5 seconds.
- (8) Record the vacuum pump cycle on/off periods if less than or more than the specified period.
- (9) Perform the applicable troubleshooting procedures in accordance with this chapter, section VI, if the unit cannot be calibrated to specification.
- (10) Depress the **MASTER POWER** switch to the off position.
- (11) Shut down the suction apparatus by following the procedures contained in paragraph 2-7.

**Section VI. TROUBLESHOOTING**

**3-14. General.**

a. Troubleshooting information for suction apparatus operator/user personnel and for Medical Equipment Repairer personnel is provided in this section. Corrective actions beyond the capability or authority of operator/user personnel will be indicated by the phrase "Notify your unit's Medical Equipment Repairer."

b. This manual cannot list all possible malfunctions. If a malfunction is either not listed or is not determined by routine diagnostic procedures, notify your appropriate maintenance support unit.

**3-15. Operator/user troubleshooting.**

Operator/user troubleshooting procedures are provided in table 3-3. Each symptom is followed by possible causes and corrective maintenance.

Table 3-3. Operator/user troubleshooting.

**SYMPTOM**

**POSSIBLE CAUSE**

**CORRECTIVE MAINTENANCE**

**1. POWER INDICATOR LAMP DOES NOT ILLUMINATE.**

**MASTER POWER** switch not depressed to on position.

Depress **MASTER POWER** switch.

Electrical power cable assembly not connected to an AC source of electrical power.

Connect the electrical power cable to the correct electrical receptacle.

When operating off an internal battery, battery may be discharged.

Recharge battery; if problem persists, notify unit's Medical Equipment Repairer.

Fuse (F1) 3A 250 V blown.

Check fuse; if blown, notify unit's Medical Equipment Repairer.

Table 3-3. Operator/user troubleshooting - continued.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE MAINTENANCE
<b>2. POWER MODE INDICATOR LAMP (L2) DOES NOT ILLUMINATE WHEN MODE SWITCH IS IN VAC &amp; RECHARGE MODE.</b>		
	MASTER POWER switch not in on mode.	Press MASTER POWER switch in.
	POWER MODE lamp defective.	Notify unit's Medical Equipment Repairer.
	POWER MODE lamp defective.	Notify unit's Medical Equipment Repairer.
	Component failure.	Notify unit's Medical Equipment Repairer.
<b>3. SUCTION MODE INDICATOR (L4) DOES NOT ILLUMINATE IN INTERMITTENT MODE.</b>		
	SUCTION LEVEL pushbutton (S5) in HIGH VACUUM mode.	Ensure LOW VACUUM is selected.
	Component failure.	Notify unit's Medical Equipment Repairer.
<b>4. SUCTION LEVEL INDICATOR (L5) DOES NOT ILLUMINATE IN LOW VACUUM MODE.</b>		
	LOW VACUUM indicator defective.	Notify unit's Medical Equipment Repairer.
	Component failure.	Notify unit's Medical Equipment Repairer.
<b>5. VACUUM ON/OFF INDICATOR (L3) DOES NOT ILLUMINATE IN VACUUM ON MODE.</b>		
	VACUUM on indicator lamp burned out.	Check lamp and replace if necessary.
	Component failure.	Notify unit's Medical Equipment Repairer.
<b>6. NO SUCTION (VACUUM PUMP MOTOR WORKING).</b>		
	Loosen or open tubing connection(s).	Check and tighten tubing connections.
	Cap assembly loose/dry rotted.	Check cap assembly and replace if necessary.

Table 3-3. Operator/user troubleshooting - continued.

**SYMPTOM**

**POSSIBLE CAUSE**

**CORRECTIVE MAINTENANCE**

Unserviceable disposable bacteria filter.

Replace filter.

Defective overflow shutoff valve.

Replace overflow shutoff valve.

Component failure.

Notify unit's Medical Equipment Repairer.

**7. LOW SUCTION (CANNOT HEAR VACUUM PUMP MOTOR).**

Component failure.

Notify unit's Medical Equipment Repairer.

**3-16. Medical Equipment Repairer troubleshooting.**

Medical Equipment Repairer troubleshooting procedures are provided in table 3-4. Each symptom is followed by possible causes and corrective maintenance.

Table 3-4. Medical Equipment Repairer troubleshooting.

**SYMPTOM**

**POSSIBLE CAUSE**

**CORRECTIVE MAINTENANCE**

**1. MASTER POWER INDICATOR LAMP (L1) DOES NOT ILLUMINATE.**

Electrical power cable assembly is defective.

Repair or replace assembly.

Defective 115-volt electrical receptacle.

Notify your unit's power distribution personnel or correct the problem.

Defective **MASTER POWER** switch (S1).

Replace switch.

Possible component failure in AC to DC rectifier or power charging circuits.

Troubleshoot and isolate component failure. Repair and perform functional check as required.

**2. POWER MODE INDICATOR LAMP (L2) DOES NOT ILLUMINATE.**

**POWER MODE LAMP** defective.

Check and replace if necessary.

Table 3-4. Medical Equipment Repairer troubleshooting - continued.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE MAINTENANCE
	<b>POWER MODE</b> pushbutton (S2) defective.	Check and replace if necessary.
	Possible component failure to AC to DC rectifier or power charging circuits.	Troubleshoot and isolate component failure. Repair and perform functional check as required.
<b>3. SUCTION MODE INDICATOR LAMP (L4) DOES NOT ILLUMINATE.</b>	<b>SUCTION MODE</b> lamp defective.	Check and replace if necessary.
	<b>SUCTION MODE</b> pushbutton (S5) defective.	Check and replace if necessary.
	<b>SUCTION LEVEL</b> pushbutton (S4) defective.	Check and replace if necessary.
	Possible circuit component failure.	Troubleshoot and isolate component failure. Repair and perform calibration/functional checks as required.
<b>4. SUCTION LEVEL INDICATOR LAMP (L5) DOES NOT ILLUMINATE.</b>	<b>SUCTION LEVEL</b> lamp defective.	Check and replace if necessary.
	<b>SUCTION LEVEL</b> pushbutton (S4) defective.	Check and replace if necessary.
<b>5. VACUUM ON INDICATOR LAMP (L3) DOES NOT ILLUMINATE IN THE ON MODE AND VACUUM PUMP MOTOR WORKING.</b>	<b>VACUUM</b> indicator defective.	Check and replace if necessary.
<b>6. NO SUCTION (VACUUM PUMP WORKING).</b>	Loosen tubing connections inside chassis.	Check and tighten connections.
	Defective solenoid.	Check and replace if necessary.
<b>7. NO SUCTION IN CONTINUOUS MODE OF OPERATION.</b>	Defective <b>SUCTION MODE</b> pushbutton (S5).	Check and replace if necessary.

Table 3-4. Medical Equipment Repairer troubleshooting - continued.

---

**SYMPTOM**

**POSSIBLE CAUSE**

**CORRECTIVE MAINTENANCE**

---

Component failure in **SUCTION LEVEL** or motor speed control circuits.

Troubleshoot and isolate component failure. Repair and perform calibration/functional checks as required.

**8. NO SUCTION IN INTERMITTENT MODE OF OPERATION (L4 & L5 ILLUMINATED).**

Defective **SUCTION MODE** (S5) or **SUCTION LEVEL** (S4) pushbutton.

Check and replace if necessary.

Component failure in 5 VDC power supply circuit.

Troubleshoot and isolate component failure. Repair and perform calibration/functional checks as required.

Defective relay K1.

Check and replace if necessary.

Component failure.

Troubleshoot and isolate component failure. Repair and perform calibration/functional checks as required.

**9. LOW SUCTION.**

Defective solenoid.

Check and replace if necessary.

Defective or bad tubing connections.

Check and tighten or replace as necessary.

Improper circuit calibration.

Perform calibration procedures.

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**Section VII. CIRCUIT DESCRIPTIONS**

**3-17. General.**

a. The control circuit PCB is provided in figure 3-1 to assist you in locating components and in understanding the operation of the control circuit.

b. PCB control circuit adjustments are also provided in this section.

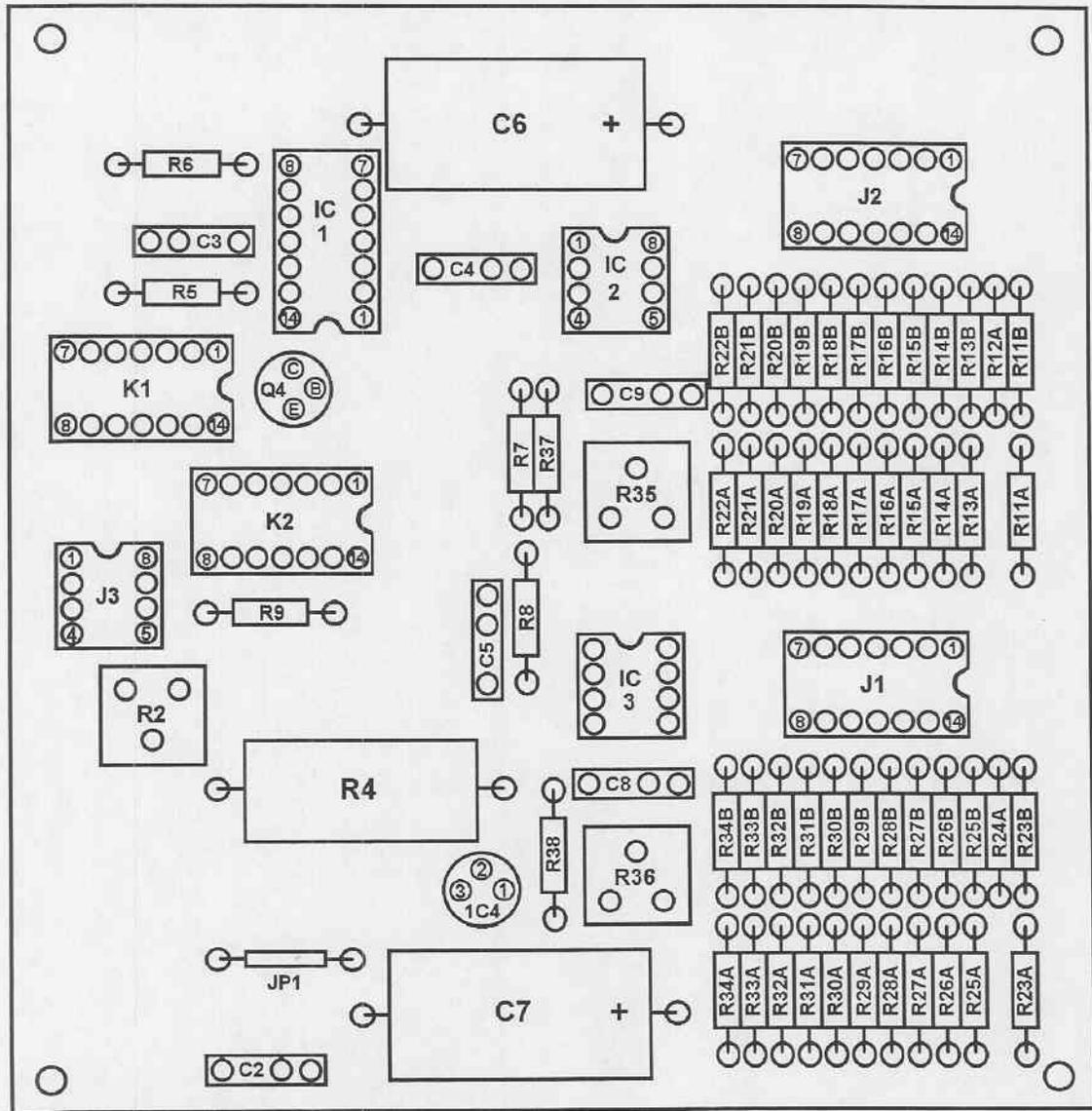


Figure 3-1. Control circuit PCB layout.

### 3-18. AC to DC rectifier, power and charging circuits (fig 3-2).

a. Components P4, S1A, F1, S2A, T1, D1-4, and C1 represent a full wave bridge rectifier circuit which enables simultaneous operation and recharging capability. Lamp L2 (which is part of S2) indicates the presence of battery charging current which is limited by R1. Charging current will be higher, initially, when a discharged battery state exists, but will taper downward towards the 50-75 ma level as the batteries replenish.

b. Switch S1A and S1B acts as a master power control, which unless activated, prevents operation from internal and external power sources and battery recharge.

c. Components D5 and D6 are blocking diodes which prevent false illumination of L2 during battery operation.



d. Lamp L1, associated with the **MASTER POWER** switch, illuminates in both internal and external power modes via battery power or rectified AC. Note that S2A and S2B reciprocate which prevents simultaneous operation from internal and external power.

e. F3 protects the battery pack from high current discharges in excess of 10A.

f. S8 permits user selection of the input AC source; either 115 VAC (nominal) or 220-240 VAC. J4 enables operation from an external 12 VDC source whenever the **MASTER POWER** switch is activated.

g. Blocking diodes D5 and D7 block external 12 VDC from any other power source. This allows simultaneous battery recharge and operation from AC power when external 12 VDC is connected.

h. Components D1-6, C1 and R1 are mounted to heat sink #2 (flat heat sink). T1 is chassis mounted, while the other components of this section appear at the front and rear panels.

### 3-19. Suction level and motor speed control circuits (fig 3-3).

a. Components F2, L3, S3/R3, R2, S4A, Q1-3 and M1 comprise this section.

b. Motor M1 is mechanically coupled to a rotary vane vacuum pump. The vacuum and airflow generated by this pump is relative to the motor speed driving it; hence, the motor speed control circuit acts as an EVR.

c. Component S3/R3 is a rotary switch/potentiometer which provides base drive to a two-stage emitter follower amplifier, Q1-Q3. Increasing the positive potential at the base of Q1 increases the paralleled outputs of Q2 and Q3 causing M1 to turn faster and generate higher vacuum and airflow levels.

d. Two vacuum ranges are possible, depending upon the position of S4A. When S4A is closed, full power potential can be applied to the base of Q1 which generates maximum vacuum levels. When S4A is opened, the maximum potential available to the base of Q1 is limited by the setting of R2 and can only provide a maximum pump output level of 200 mmHg when properly calibrated.

e. Switch S5A, when closed, provides a reciprocating direct input to the base of Q1. When S5A is open (intermittent operation) then relay K1 energizes to provide base potential to Q1. Note that S4A and S4B and S5A and S5B are reciprocating switches whose alternate functions will be described in the following sections.

f. Lamp L3 illuminates whenever S3 is closed. S3/R3, S4A and S5A are front panel mounted. R2 is located on the PCB, Q1-3 on the heat sink #1, and M1 is chassis mounted.

### 3-20. Intermittent operation (fig 3-2).

a. *Components.* Components S4B, S5B, L4 and L5 comprise this circuit. In order to prevent dangerously high vacuum levels from being presented to the patient, switches S4B and S5B must both be closed. This guarantees that intermittent operation can exist only in the **LOW VACUUM** mode.

b. *Lamps.* Lamp L4 which is part of S5 illuminates in the intermittent mode and L5 which is part of S4 illuminates when **LOW VACUUM** is selected. All components in this section are front panel mounted.

#### NOTE

The remaining descriptions apply to circuitry in use only during intermittent operation.

c. *5-Volt power supply (fig 3-2).*

(1) Components R4, IC4 and C2 provide a regulated low voltage power supply for the intermittent timing and switching circuitry. Resistor R4 acts as a current limiter to the regulator input while C2 provides output voltage filtering of transient power surges.

(2) The regulator output is typically 4.8V at maximum low vacuum levels (motor off), approximately 3V during motor turn-on (initial surge), and rises to about 4.5V for the duration of the motor on cycle. All components are mounted to the PCB.

d. *Clock oscillator (fig 3-4).* The clock oscillator is a 50 Hz, self-starting, square wave generator consisting of IC1 pins 8-13, R5, R6 and C3. Its purpose is to provide an initiating input to the **OFF TIME** monostable. IC1 is a quad-2 input NOR, dual-line package. All components are mounted to the PCB.

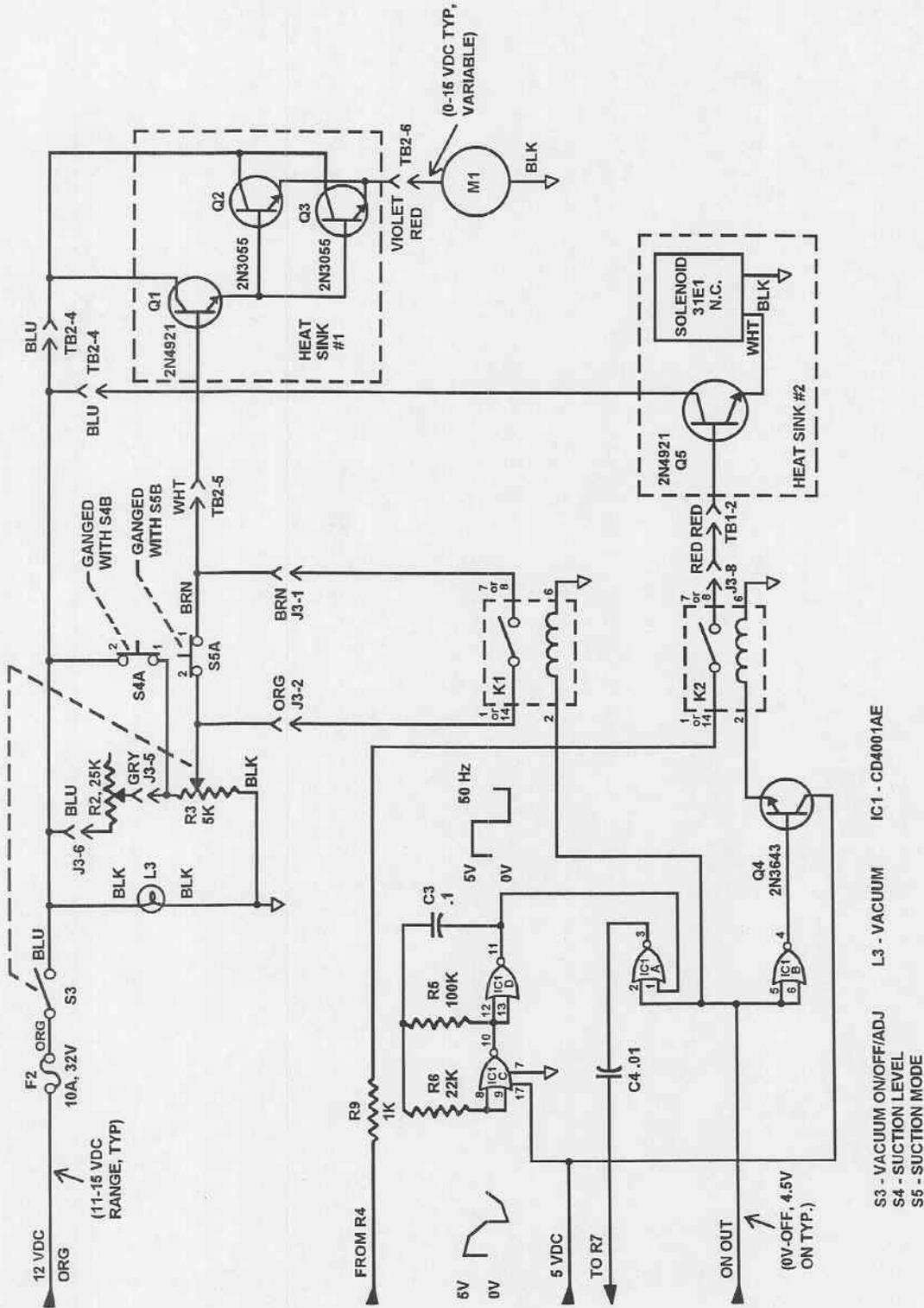


Figure 3-3. Suction level and motor speed control circuits.

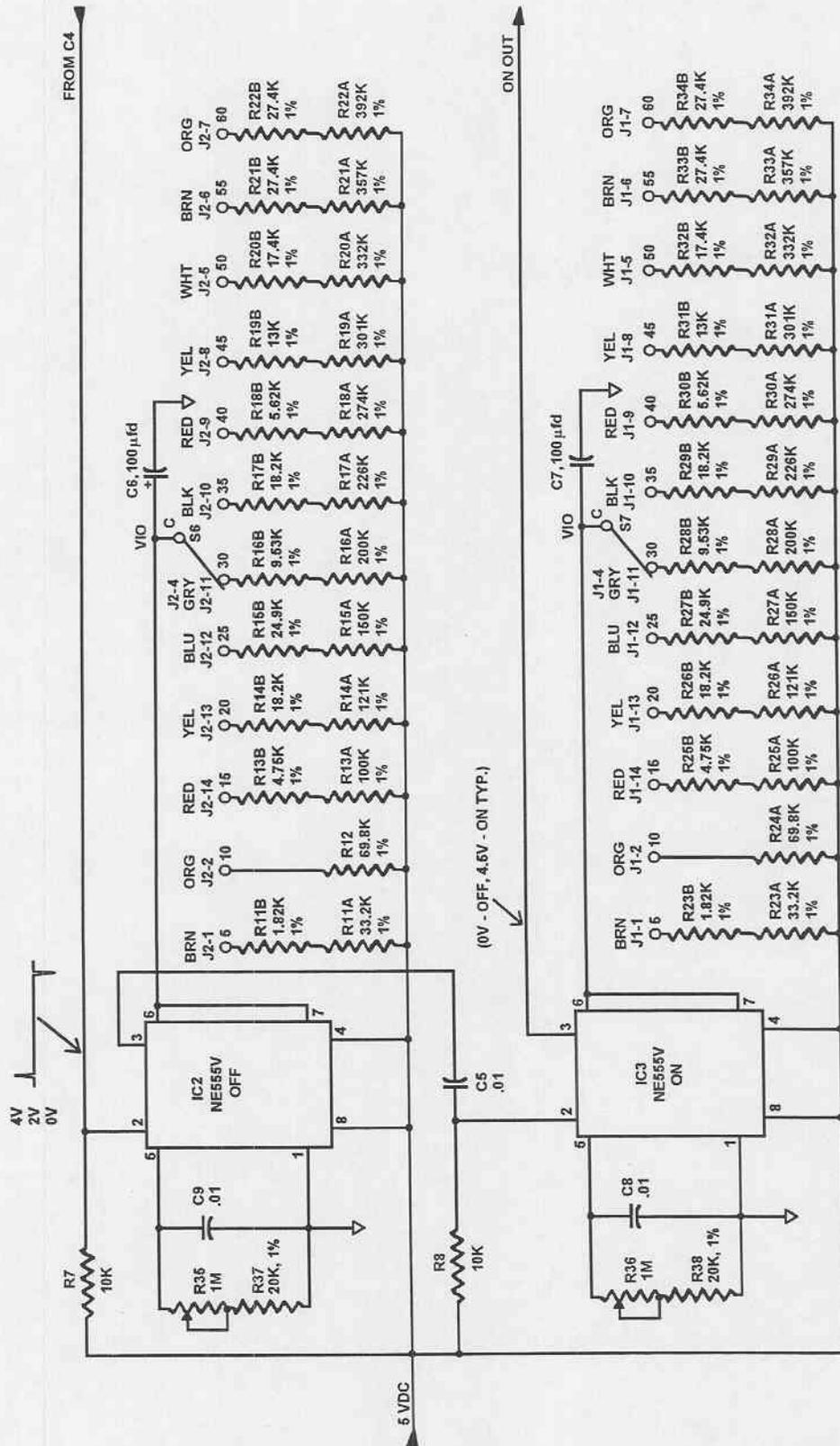


Figure 3-4. On/off one - shots schematic.

e. *Type 555 timer operation (fig 3-4).*

(1) These integrated circuits are used as functional monostable for the **OFF TIME** and **ON TIME** circuits.

(2) When a negative impulse brings the trigger input (pin 2) below  $1/3 V_{cc}$ , the output (pin 3) goes to a high logic level ( $V_{cc}$ ). Simultaneously, the voltage across the timing capacitor rises exponentially through the timing resistor, and after a period of time, the comparator input (pins 6 and 7) reaches  $2/3 V_{cc}$ , resetting the internal flip-flop, causing the capacitor to discharge to ground and the output to return to a low logic level (ground).

(3) The timer, in this application is sometimes 20% triggered when intermittent operation is initiated, thus, the unit may cycle once before stabilizing to its correct time period. The following two sections describe each timing circuit.

f. *OFF TIME monostable (fig 3-3, 3-4).*

(1) The purpose of this circuit is to control the time period that the **ON TIME** monostable output remains low (pin 3).

(2) The **OFF TIME** monostable consists of IC1 pins 1-3, IC2, C4, C6, C9, R7, R11-22, R35 and R37. IC1 pins 1-3 comprise a NOR gate of which pin 3 is its output. This output is an inversion of the clock oscillator when the **ON TIME** monostable is low.

(3) Pin 3 is held low when the **ON TIME** monostable is high.

(4) R7 and C4 shape the NOR gate output into positive and negative impulses, biased at  $V_{cc}$  to prevent mistripping of the monostable and are applied to IC2 pin 2.

(5) C6 and R11-22 determine the time periods for which the **OFF TIME** monostable is high.

(6) C9, R35 and R37 are used to adjust the delay multiplier in the time period equation:  $T = (.975 + \text{or} - .125) RC$ .

(7) All components are mounted to the PCB.

g. *ON TIME monostable (fig 3-3, 3-4).*

(1) The **ON TIME** monostable controls the relay system and determines for how long the **OFF TIME** monostable remains low (pin 3).

(2) Components IC3, C5, C7, R8, R23-34, R36 and R38 compromise this circuit.

(3) Essentially, this monostable and its corresponding components act in the same manner as the **OFF TIME** monostable.

(4) The **ON TIME** output triggers the **OFF TIME** monostable via IC1 pin 3 and the relay system both direct and through IC1 pin 4.

(5) All components are PCB mounted.

h. *Relay system (fig 3-3).*

(1) The relay system provides two functions: first, it interfaces the **ON TIME** monostable with the motor speed control circuit, and as a secondary function, "dumps" the vacuum collections system to atmospheric pressure during off cycles. The relay system consists of K1, K2, Q4, Q5, R9, and the solenoid.

(2) During **ON TIME** cycles, relay K1 is closed and provides base bias to Q1 from the R2, R3 series combination. The motor speed is then fixed by the R2, R3 combination during each on cycle unless changed by the operator. Relay K2 is not energized during the on cycle, thus allowing the vacuum to exist.

(3) During off cycles, K1 is normally open and stops M1. Relay K2 is energized as IC1 pin 4 goes high and turns Q4 on. When K2 closes, Q5 turns on and energizes the solenoid to a normally open state. When the solenoid opens, the vacuum collection system is "dumped" to atmospheric pressure and remains so until the next on cycle.

(4) Switch S3 must be closed to operate the motor speed control circuit and solenoid.

(5) Components K1, K2, Q4 and R9 are mounted to the PCB; Q5 and the solenoid to heat sink #2.

**NOTE**

Waveforms and voltage measurements have been noted at various locations on each schematic drawing. In most cases, considerable leeway has been given as to what constitutes an acceptable voltage value in order to maintain device performance over a broad range of conditions.

**3-21. Control circuit adjustments.***a. Maximum low vacuum level limit.*

- (1) Ensure that the **MASTER POWER** is in its off position or depress the switch to its off position.
- (2) Ensure that the electrical power cable assembly is disconnected from the power source.
- (3) Remove the six Phillips screws from the top cover. Three are located along the rear lip and three along the top front edge. Set them aside.
- (4) Remove the cover and set it aside.
- (5) Connect the electrical power cable assembly into a 115 volt electrical receptacle.
- (6) Verify that the components and accessories are in place and assembled in accordance with the procedures contained in paragraph 2-2.
- (7) Depress the **MASTER POWER** switch. The **MASTER POWER** switch will illuminate.

**WARNING**

An electrical shock hazard is present with the top cover removed and the suction apparatus operating.

- (8) Set controls for either AC or DC operation (ensure that batteries have been fully charged if calibrating from battery power).
- (9) Select **CONTINUOUS** and **LOW VACUUM** operation.
- (10) Turn vacuum regulator on and fully clockwise.
- (11) Occlude the rear panel vacuum inlet and adjust R2 for a 200 mmHg reading on the front panel vacuum gauge. This reading may be verified using a calibrated vacuum gauge.

*b. INTERMITTENT on/off timing circuits.***NOTE**

An oscilloscope may be used to calibrate the on/off timing circuits as described below. However, the technician may find it easier to calibrate the suction apparatus using a stopwatch. In such cases, the technician can utilize the pump turning on and off as the reference for keying the stopwatch.

- (1) Set controls for either AC or DC operation (ensure that batteries have been fully charged if calibrating from the battery power).
- (2) Select **INTERMITTENT** and **LOW VACUUM** operation.
- (3) Set on/off times for 5 seconds on and 5 seconds off.
- (4) Turn vacuum regulator on and fully clockwise.
- (5) Connect the oscilloscope across the motor leads (red and black).
- (6) Trigger the oscilloscope sweep to begin when the motor turns on and adjust R36 to set the **ON TIME** circuit for a 5 second sweep. Close verification can be made using a storage type oscilloscope. Adjustments should be within +/- 0.5 seconds.

(7) Trigger the oscilloscope sweep to begin when the motor turns off and adjust R35 to set the **OFF TIME** circuit for a 5 second sweep. Adjustments should be within +/- 0.5 second sweep. Again, the use of a storage type oscilloscope will simplify measurement.

## Section VIII. REPAIR PROCEDURES

### 3-22. General.

a. Procedures for disassembly, repair or replacement of components, services, and reassembly are provided in this section of the manual.

b. Repair procedures are continuous from the first disassembly to the final reassembly step.

#### WARNING

Hazardous voltages are accessible beneath the top cover when it is removed for testing and/or repair.

#### NOTE

For calibration and many servicing procedures, the Medical Equipment Repairman need only remove the top cover of this device. For greater accessibility, however, the front panel should be disengaged.

c. Perform all appropriate testing of the suction apparatus after each repair to ensure proper operation.

### 3-23. Top cover.

#### a. Disassembly.

(1) Depress the **MASTER POWER** switch to the off position.

(2) Disconnect the electrical power cord from the AC power source.

(3) Remove the top cover. The cover is secured by six screws, three along the top and three along the rear lip of the cover.

(4) Remove the top cover by lifting it upward. Set it aside.

#### b. Reassembly.

(1) Replace the top cover.

(2) Secure the top cover with the six attaching screws.

### 3-24. Front panel.

When it becomes necessary, replacement of components mounted on the front panel can be accomplished more easily and effectively by removing the front panel from the suction chassis. Additionally, this approach will also lessen the chance of damaging surrounding components. The following procedures will guide you through the process of front panel disassembly and reassembly.

#### a. Disassembly.

(1) Disconnect the ribbon cable P1 and P2 from their respective PCB sockets.

(2) Disconnect vacuum tubing attached to the rear of the vacuum gauge.

(3) Removal of the front panel is accomplished by removing the seven screws. First, remove the three screws across the front bottom edge of the apparatus. Then remove the remaining four screws, located on each corner of the front panel.

(4) Grasp the front panel and carefully pull the panel forward and lay the panel (exterior side facing down) on a supporting surface to prevent undue strain on the remaining wire of the wiring harness.

**NOTE**

The front panel is still attached to the chassis by the wire harness service loop and ribbon cable P3, which is hardwired to components on both the front panel and components located within the chassis.

(5) Service or remove the defective component from the front panel in this position.

*b. Reassembly.*

(1) Check all solder connections on the components of the front panel.

(2) Grasp the front panel and slide back into position on the chassis. Take care not to pinch wires between chassis and front panel.

(3) Secure front panel by reinstalling all seven screws.

(4) Reconnect ribbon cables to their respective sockets (wires connected to S6 from ribbon cable P1 and wires connected to S7 from ribbon cable P2).

(5) Reconnect tubing on the rear of the vacuum gauge.

(6) Prior to applying power to the unit, verify no bare wires are in contact with the chassis and ensure all tubing connections are secure.

**3-25. PCB.***a. Disassembly.*

(1) The PCB is located on the left, sub-sided, sub-assembly.

(2) Disconnect ribbon cables P1, P2 and P3 from their respective PCB jacks.

(3) Remove the four screws which secure the PCB to the sub-side panel.

(4) A green wire connected to a ring terminal is secured to the sub-side panel by one of the four screws. Its purpose is to maintain a ground connection with the front panel whenever the front panel is disengaged for general access.

*b. Reassembly.*

(1) Position the PCB over four threaded female studs and secure with screws.

(2) Make sure the green wire is secured beneath the lower left-hand screw.

(3) Connect P1, P2 and P3 to their respective PCB jacks (observe pin polarity).

**3-26. Battery pack (B1 and B2).***a. Disassembly.*

(1) The battery pack is secured by two brackets connected to the main chassis. One bracket snugs the battery pack to the left, sub-side panel. The other bracket snugs the battery pack to the rear panel and straddles the lower terminals of each battery.

(2) Each bracket is secured with two #10-32 keps nuts.

(3) To remove the battery pack, remove the four keps nuts securing the brackets. Use the 3/8-in socket with drive handle or 3/8-in open-end wrench.

(4) Disconnect the "fast-on" connected red and black wires.

(5) Remove the existing battery pack and remove the orange jumper wire used to connect them in series.

(6) Prior to installing the replacement battery pack, ensure the orange jumper wire is installed correctly.

(7) Install the replacement battery pack carefully, so as not to dislodge the jumper wire.

*b. Reassembly.*

- (1) Connect the batteries, B1 and B2, in series with the small orange jumper.
- (2) Connect the black wire to the remaining negative terminal and the red wire to the remaining positive terminal.
- (3) Secure the battery pack in place with both brackets and tighten the four keps nuts.

### 3-27. Motor and pump assembly.

*a. Disassembly.*

- (1) Remove the six #6-32 keps nuts securing the motor and pump assembly to the chassis.
- (2) A flexible coupling joins the motor and pump shafts together.
- (3) Each side of the coupling is secured to its respective shaft via two set screws (1/16-in hex) stacked one on top of the other. Stacking prevents the coupling from loosening due to vibration or temperature extremes.
- (4) Disconnect the black and red wires exiting the motor. The black wire is connected to chassis ground and the red wire to TB2-6.
- (5) Disconnect the vacuum tubing from pump inlet.
- (6) Disengage the motor and pump as one unit by removing the six keps nuts. The motor or pump can be removed individually by removing the stacked set screws in the coupling and respective keps nuts.
- (7) Perform the necessary repairs to the pump housing or replace the motor if required, which ever necessitated this procedure.

*b. Reassembly.*

- (1) Mount the motor and pump to the chassis, allowing coupling to "float" freely on shafts.
- (2) Carefully position motor and pump shafts for in line alignment.
- (3) Tighten keps nuts without disturbing alignment. Do the same with pump shaft.
- (4) Position motor shaft (flat edge) and tighten respective coupling set screw to shaft. Do the same with pump shaft.
- (5) Insert and tighten stacked (second) set screws in each half of coupling.

### 3-28. Heat sink #1.

#### NOTE

Heat sink #1 is mounted to the right, sub-side panel.

*a. Disassembly.*

- (1) Remove the two #10 keps nuts.
- (2) Disconnect the violet wire going to TB2-6, the white wire going to TB2-5, and the blue wire going to TB2-4.
- (3) The keps nuts can be removed using the 3/8-in socket with drive handle.
- (4) Replace the defective transistor.

*b. Reassembly.*

- (1) Secure the heat sink #1 to the right, sub-side panel with the keps nuts and a 3/8-in drive handle.
- (2) Reattach the violet, white and blue wires.

### 3-29. Heat sink #2.

#### NOTE

This item is indirectly chassis mounted through two standoffs.

#### a. Disassembly.

- (1) Before removing these screws, six wires must be disconnected at terminal boards 1 and 2 (TB1 and TB2) and other locations as noted.
- (2) Disconnect the yellow wire with the male in-line "fast-on" terminal positioned along side of transformer (T1).
- (3) Disconnect the two yellow wires from TB1-1.
- (4) Disconnect the red wire from TB1-2.
- (5) Disconnect the orange wire from TB2-2.
- (6) Disconnect the blue wire from TB2-4.
- (7) Disconnect the red wire from TB2-3.
- (8) The two green wires from T1 (secondary) can be removed at the D1-4 "fast-on" terminals.
- (9) Remove the two slotted screws securing heat sink #2 to the standoffs.

#### NOTE

Two black wires are ring terminal connected to ground through one screw.

- (10) Disconnect vacuum tubing entering solenoid.

#### NOTE

When replacing components that are surface mounted on the heat sink, and silicone grease was used, ensure an adequate amount is placed between the insulating disk and heat sink to facilitate heat transfer. If replacing the power transistor, ensure RTV is used to insulate the connections against possible arcing after replacement and application of power to the circuit.

- (11) Replace the defective component which necessitated the removal of heat sink #2. If the component being replaced required soldering and desoldering, take care all connections are free of sharp edges. Sharp edges can lead to arcing to surrounding chassis components.

#### b. Reassembly.

- (1) Position heat sink #2 over its respective standoffs and secure.
- (2) Ensure both ground wires (black) are tightened beneath the front screw.
- (3) Connect vacuum tubing to solenoid.
- (4) Reattach the wires to their respective locations.

### 3-30. Transformer.

#### a. Disassembly.

- (1) Remove the transformer from the chassis by removing two #10-32 keps nuts.
- (2) Disconnect the two green wires (transformer secondary) at D1-4 ("fast-on" connections).
- (3) Disconnect the gray wire from the transformer at TB2-1 (model 306M only).
- (4) Disconnect the purple and orange wires on the transformer primary.
- (5) Remove the transformer using the 3/8-in open end wrench.
- (6) Replace the transformer.

*b. Reassembly.* Secure transformer to chassis and reconnect wires as previously noted.

- (1) Disconnect the black wire (via ring terminal) to ground on heat sink #2.
- (2) Disconnect the brown wire with ring terminal at TB2-5.
- (3) Disconnect the blue wire with ring terminal at TB2-4.
- (4) Disconnect the red wire with ring terminal at TB2-3.

### 3-31. Rear panel assembly.

When it becomes necessary, replacement of components mounted on the rear panel can be accomplished more easily and effectively by removing the rear panel from the suction chassis. Additionally, this approach will also lessen the chance of damaging surrounding components. The following procedures will guide you through the process of rear panel disassembly and reassembly.

#### NOTE

In order to disengage the rear panel assembly, the bottom cover must first be removed.

*a. Disassembly.*

- (1) The bottom cover is secured with six screws, three located on the panel underside and three along the rear edge. Remove the screws and set them aside.
- (2) Disconnect vacuum tubing connected to rear panel.
- (3) Remove four screws holding the rear panel to the sub-side panels. The panel can now be positioned face down.
- (4) Disconnect the AC line core wires.
- (5) Disconnect the green wire to chassis ground.
- (6) Disconnect the black wire at TB1-4.
- (7) Disconnect the white wire at TB2-1.
- (8) Disconnect the red wires from F3 at B3 "+" terminal ("fast-on") and at TB2-3.
- (9) Disconnect the external power jack (J4) wires, black at chassis ground, yellow at TB1-1 and yellow from its in-line "fast-on" connector.
- (10) Disconnect the AC voltage select switch (S8) wires, gray at TB1-3, violet and orange at T1 ("fast-on" connections).

*b. Reassembly.*

- (1) To reassemble, reconnect all wires in reverse order.
- (2) Secure the rear panel to each sub-side panel.
- (3) Connect the vacuum tubing.
- (4) Remount the bottom cover.

## Section IX. STORING AND SHIPPING PROCEDURES

### 3-32. Preparation for storing.

*a. Shut-down procedures for the suction apparatus are as follows:*

- (1) Depress the **MASTER POWER** switch to the off position.
- (2) Disconnect the electrical power cable assembly from the electrical receptacle.
- (3) Coil the electrical power cable and secure it with a tie wrap or rubber band.
- (4) Clean, disinfect, and sterilize the suction apparatus and components in accordance with the procedures in chapter 2, section V.

- b.* Inventory the components. Replace unserviceable or missing items.
- c.* Pack the components and manufacturer's manuals into a small container.
- d.* Disassemble the suction apparatus from the cart. In some cases, the suction apparatus and the cart may be packed in a separate container.
- e.* Place the suction apparatus into the container or the original shipping container.
- f.* Place the cart into the container or the original shipping container. In some cases, the suction apparatus and the cart may be packed in a separate container.
- g.* Place packing material into the container(s) to secure the apparatus and the cart.
- h.* Close the container(s) and secure with tape or strapping.

### **3-33. Preparation for shipping.**

- a.* The suction apparatus packed in the original shipping carton is suitable for shipping.
- b.* The suction apparatus packed in a military chest or other available container should be appropriately packed for shipping. Notify your unit's transportation point for assistance, if necessary.

# CHAPTER 4

## DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

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### Section I. GENERAL INFORMATION

#### 4-1. Overview.

This chapter provides for maintenance that is beyond the capability, capacity, and authorization for unit level maintenance personnel. The procedures in this chapter should not be attempted at the unit level.

#### 4-2. Tools and test equipment.

Common tools and test equipment required for support maintenance of the equipment are listed in appendix B, section III. Refer to your unit's MTOE or installation table of distribution and allowances (TDA) for authorized items.

#### 4-3. Components of end item and basic issue items.

Components of end item and basic issue items are listed in appendix C, sections II and III.

#### 4-4. Expendable supplies.

Expendable and durable supplies and materials for support maintenance are listed in appendix D, section II.

#### 4-5. Repair parts.

Repair parts required for support maintenance are listed in appendix E, section II.

#### 4-6. Special tools.

Special tools required for support maintenance are listed in appendix E, section III.

### Section II. MAINTENANCE PROCEDURES

#### 4-7. General.

- a. There are no specific troubleshooting procedures for DS/GS levels of maintenance.
- b. Rebuild procedures for the PCB have not been developed.

## APPENDIX A

### REFERENCES

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#### A-1. Army regulations.

AR 40-61	Medical Logistics Policies and Procedures
AR 702-18/DLAR 4155.37/ NAVSUPINST 4410.56/ AFR 69-10/MCO 4450.13	Materiel Quality Control Storage Standards
AR 710-2	Supply Policy Below the Wholesale Level
AR 725-50	Requisitioning, Receipt, and Issue System
AR 750-1	Army Materiel Maintenance Policy and Retail Maintenance Operations

#### A-2. Technical manual.

TM-DPSC-6500-RPL	Medical Materiel: Medical Repair Parts Reference List
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#### A-3. Technical bulletins.

TB MED 7	Maintenance Expenditure Limits for Medical Materiel
TB 8-6500-MPL	Mandatory Parts List for Medical Equipment
TB 38-750-2	Maintenance Management Procedures for Medical Equipment

#### A-4. Field manual.

FM 21-11	First Aid for Soldiers
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#### A-5. Supply bulletin.

SB 8-75-()-series	Army Medical Department Supply Information
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#### A-6. Other publication.

(This publication may be obtained from U.S. Army Medical Materiel Agency, 1423 Sultan Drive, Suite 100, ATTN: MCMR-MMM, Fort Detrick, MD 21702-5001.)

Instruction Manual, Operator and Service, (October 1987), Impact Instrumentation, Inc., 27 Fairfield Place, West Caldwell, New Jersey 07006.

# APPENDIX B

## MAINTENANCE ALLOCATION CHART

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### Section I. INTRODUCTION

#### B-1. General.

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

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance levels.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions, explanatory notes, and/or illustrations required for a particular maintenance function.

#### B-2. Explanation of columns in section II.

a. *Group Number, Column 1.* The assembly group number (Group No.) column is a numerical group assigned to each assembly. The applicable assembly groups are listed in the maintenance allocation chart (MAC) in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. *Assembly Group, Column 2.* This column contains a brief description of the components of each assembly group.

c. *Maintenance Functions, Column 3.* This column lists the various maintenance functions (A through K) and indicates the lowest maintenance level authorized to perform these functions. The symbol designations for the various maintenance levels are as follows:

- C - Operator or crew
- O - Unit maintenance
- F - Direct support maintenance
- H - General support maintenance
- D - Depot maintenance

The maintenance functions are defined as follows:

A - Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - Service. To clean, to preserve, to charge, and to add lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - Adjust. To rectify to the extent necessary to bring into proper operating range.

E - Align. To adjust specified variable elements of an item to bring it to optimum performance.

F - Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison 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 with the certified standard.

G - Install. To set for use in an operational environment such as tents or International Standards Organization shelters.

H - Replace. To replace unserviceable items with serviceable like items.

I - Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage to a specific failure. Repair may be accomplished at each level of maintenance.

J - Overhaul. Normally the highest degree of maintenance performed by the Army in order to minimize time work in process consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by a maintenance standard in technical publications for each item of equipment. Overhaul normally does not return an item to like new condition.

K - Rebuild. The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance level.

*d. Tools and Equipment, Column 4.* This column is provided for referencing by code, the tools and test equipment (sec III) required to perform the maintenance functions.

*e. Remarks, Column 5.* This column is provided for referencing by code, the remarks (sec IV) pertinent to the maintenance functions.

### **B-3. Explanation of columns in section III.**

*a. Reference Code, Column 1.* This column correlates to section II, column 4.

*b. Maintenance Level, Column 2.* This column identifies the maintenance levels using the tools and test equipment.

*c. Nomenclature, Column 3.* This column identifies the tools and test equipment.

*d. National Stock Number, Column 4.* This column provides the national stock number (NSN) of the specific tools or test equipment.

### **B-4. Explanation of columns in section IV.**

*a. Reference Code, Column 1.* This column correlates to section II, column 5.

*b. Remarks, Column 2.* This column provides supplemental information or explanatory notes pertinent to the maintenance function in section II.

## Section II. MAINTENANCE ALLOCATION CHART FOR SUCTION APPARATUS

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A	B	C	D	E	F	G	H	I	J	K		
00	Suction Apparatus	○ 0.3	○ 0.5		○ 0.6				○ 0.3	○ 1.1	F 3.0	D 6.5	01,02,03, 04,05,06, 07,08,09	A,B
01	Suction System Control Unit												01,02,03, 04,05,06, 07,08,09	A,B
	MASTER POWER Switch		○ 0.2						○ 0.3					
	MASTER POWER Lampholder		○ 0.2						○ 0.3					
	POWER MODE Switch/Indicator		○ 0.2						○ 0.3					
	SUCTION MODE Switch/Indicator		○ 0.2						○ 0.3					
	SUCTION LEVEL Switch/Indicator		○ 0.2						○ 0.3					
	VACUUM ON/OFF/ADJ Switch		○ 0.3						○ 0.3					
	Vacuum Adjust Indicator		○ 0.1						○ 0.2					
	Vacuum Gauge		○ 0.5						○ 0.3					
	ON TIME Switch		○ 0.4						○ 0.3					
	OFF TIME Switch		○ 0.4						○ 0.3					

## Section II. MAINTENANCE ALLOCATION CHART FOR SUCTION APPARATUS

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS		
		A	B	C	D	E	F	G	H	I	J	K				
	Fuse Holder	○ 0.1							○ 0.3							
	Electrical Power Cable Assembly	○ 0.1							○ 0.3							
	Assembly Front Panel	○ 0.1							○ 3.9							
	Assembly Rear Panel	○ 0.1							○ 2.9							
	Assembly Bottom Panel	○ 0.1							○ 4.9							
	Assembly Side Panel, R or L	○ 0.1							○ 1.0							
	Clip, Retaining	○ 0.1							○ 0.3							
	Elbow, Chrome Vacuum Inlet	○ 0.1							○ 0.2							
	Disposable Filter	○ 0.1														
	Overflow Shutoff Valve	○ 0.1														
	Battery Pack		○ 0.1						○ 0.2							
	Vacuum Pump	○ 0.3	○ 0.3	○ 0.6					○ 0.3	○ 1.1	H 1.1					
	Heat Sink #1		○ 0.5						○ 0.3	○ 0.5			D 1.7			

## Section II. MAINTENANCE ALLOCATION CHART FOR SUCTION APPARATUS

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS	
		A	B	C	D	E	F	G	H	I	J	K			
02	Heat Sink #2		O 0.5						O 0.3	O 0.3			D 1.7	01,02	A,B
	T1		O 0.3						O 0.3						
	Motor		O 0.3						O 0.3	H 0.5			D 1.1		
	Printed Circuit Board		O 0.5						O 0.2	H 0.5			D 1.7		
	Cart Assembly														
	Cylinder		O 0.3							O 0.4					
	Casters		O 0.1							O 0.2					

**Section III. TOOLS AND TEST EQUIPMENT  
FOR  
SUCTION APPARATUS**

(1) REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER
01	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Repairmans	5180-00-611-7923
02	O,F,H,D	Tool Kit, Medical Equipment Maintenance and Repair: Organizational	5180-00-611-7924
03	O,F,H,D	Multimeter, AN/USM 486 or Multimeter, AN/PSM 45A	6625-01-145-2430 6625-01-265-6000
04	O,F,H,D	Tester, Current Leakage, TS 2514/P	6525-01-142-8233
05	O,F,H,D	Calibrator-Analyzer, Hospital Equipment (Test Vacuum Gauge/ Test Flowmeter)	6695-01-255-2855
06	F,H,D	Oscilloscope, AN/USM 488 or Oscilloscope, OS291/G	6525-01-187-7847 6625-01-258-0022
07	F,H,D	Test Set, Circuit Component, TS4138/P	6625-01-255-0839
08	F,H,D	Generator, Signal, SG1288/U	6625-01-226-9421
09	F,H,D	Counter, Electronic, Digital, AN/USM 459	6625-01-271-3012

**Section IV. REMARKS  
FOR  
SUCTION APPARATUS**

<b>(1) REFERENCE CODE</b>	<b>(2) REMARKS</b>
A B	Tools and test equipment are listed for each assembly group. Perform an annual electrical safety inspection and test. Perform the inspection and test after repair or replacement of electrical/electronic components.

# APPENDIX C

## COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

---

### Section I. INTRODUCTION

#### C-1. Scope.

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

#### C-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.* 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.

*b. Section III. Basic Issue Items.* These are the minimum essential items required to place the equipment in operation, to operate it, and to perform emergency repairs. Basic issue items must be with the equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request or requisition basic issue items, based on MTOE authorization of the end item.

#### C-3. Explanation of columns.

The following provides an explanation of columns found in both listings:

- a. Item Number, Column 1.* This column indicates the item number assigned to the item.
- b. National Stock Number, Column 2.* This column indicates the national stock number assigned to the item.
- c. Description, Column 3.* This column 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 commercial and government entity (CAGE) code in parentheses followed by the part number.
- d. Unit of Measure, Column 4.* This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation. These abbreviations are listed in the glossary.
- e. Quantity, Column 5.* This column indicates the quantity (QTY) of the item(s) provided with the equipment.

**Section II. COMPONENTS OF END ITEM  
FOR  
SUCTION APPARATUS**

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1		Cart Assembly (63346) 802-0306-02	EA	1
2		Accessory Kit (63346) 802-0306-05	EA	1
3		Collection Jar Assembly (63346) 802-0306-06	EA	2

**Section III. BASIC ISSUE ITEMS  
FOR  
SUCTION APPARATUS**

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
1		Instruction, Operation & Service Manual (Oct 87) (63346) 906-0306-06	EA	2
2		Fuse, 3AG, 10A, 32V (63346) 081-0004-00	EA	1
3		Fuse, 3AG, 3A, 250V (63346) 081-0005-00	EA	1
4		Holder, Collection Jar (63346) 334-0030-00	EA	1
5		Filter, Disposable, Hydrophobic (63346) 465-0005-00	EA	1
6		Tubing, PVC, 5-in Long, 1/4-in id (63346) 540-0002-00	EA	1
7		Tubing, PVC, 12-in Long, 1/4-in id (63346) 540-0029-00	EA	1
8		Tubing, PVC, 10-in Long, 3/8-in id (63346) 540-0048-00	EA	1
9		Tubing, PVC, 18-in Long, 1/4-in id (63346) 540-0063-00	EA	1
10		Assembly, Overflow Shutoff Valve (63346) 704-0317-02	EA	1
11		Assembly, Collection Jar, Reusable (63346) 802-0306-06	EA	1
12		Hose, Corrugated, 8-in Long (63346) 820-0037-00	EA	1

# APPENDIX D

## EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST

---

### Section I. INTRODUCTION

#### D-1. Scope.

This appendix lists expendable and durable supplies and materials that are required to maintain the equipment. This listing is authorization to requisition and retain the items if not otherwise authorized.

#### D-2. Explanation of columns.

- a. Item Number, Column 1.* The item number (Item No.) is sequentially assigned.
- b. Level, Column 2.* This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.
- c. National Stock Number, Column 3.* This column indicates the national stock number assigned to the item.
- d. Description, Column 4.* This column 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 code in parentheses followed by the part number.
- e. Unit of Measure, Column 5.* This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by an alphabetical abbreviation. These abbreviations are listed in the glossary.
- f. Quantity, Column 6.* This column indicates the quantity (QTY) of the item(s) provided with the equipment.

**Section II. EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST  
FOR  
SUCTION APPARATUS**

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEASURE	(6) QTY
1	○	7920-01-004-7847	Cloth, Cleaning (97327) Rymple Cloth 301	RO	1
2	○	5970-00-419-4290	Tape, Insulation, Electrical (81349) MIL-I-24391	RO	1
3	○	6840-00-783-0050	Disinfectant, Spray, 7 oz (73820) Lysolspray	CN	AR
4	○	6840-00-782-2691	Disinfectant, Liquid, 1 gal (58536) A-A-1140	EA	AR
5	○	6515-01-371-6418	Gloves, Utility, Medical (IDR89) ASEP-GLUV	PK	1
6	○		Silicone Grease (63346) 606-0001-00	EA	AR
7	○		Sealant, Silicone, RTV, Translucent (63346) 602-0001-00	EA	AR

# APPENDIX E

## REPAIR PARTS AND SPECIAL TOOLS LIST

---

### Section I. INTRODUCTION

#### E-1. Scope.

This manual lists spare and repair parts, special tools, special test equipment; and other special support equipment required for the performance of unit level, direct support, general support, and depot level maintenance. It authorizes the requisitioning and issue of spare and repair parts in consonance with the MAC (app B).

#### E-2. General.

The Repair Parts and Special Tools List is divided into the following sections:

- a. *Repair Parts, Section II.* A list of repair parts authorized for the performance of maintenance in figure number and item number sequence.
- b. *Special Tools, Test, and Support Equipment, Section III.* A list of special tools, test, and support equipment authorized for the performance of maintenance.

#### E-3. Explanation of columns in section II.

a. *Illustration, Column 1.*

(1) *Figure Number.* This column indicates the figure number (Fig No.) of the illustration on which the item is shown.

(2) *Item Number.* This column indicates the item number (Item No.) used to identify each item on the illustration.

b. *National Stock Number, Column 2.* This column indicates the national stock number assigned to the item.

c. *Description, Column 3.* This column indicates the federal item name of the item. The last line for each item indicates the CAGE code in parentheses followed by the part number.

d. *Unit of Measure, Column 4.* This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

e. *Quantity, Column 5.* This column indicates the quantity (QTY) of the item(s) to be used with or on the illustrated component, assembly, module, or end item.

#### E-4. Explanation of columns in section III.

a. *Item Number, Column 1.* This number is sequentially assigned.

b. *Level, Column 2.* This column identifies the lowest level of maintenance that requires the listed item. An explanation of the alphabetical character is provided in appendix B, section I of this manual.

c. *National Stock Number, Column 3.* This column indicates the national stock number assigned to the item.

d. *Description, Column 4.* This column 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 code in parentheses followed by the part number.

e. *Unit of Measure, Column 5.* This column indicates the unit of measure used in performing the actual operational or maintenance function. This measure is expressed by a two-character alphabetical abbreviation.

f. *Quantity, Column 6.* This column indicates the quantity (QTY) of the item(s) to be used with or on the equipment.

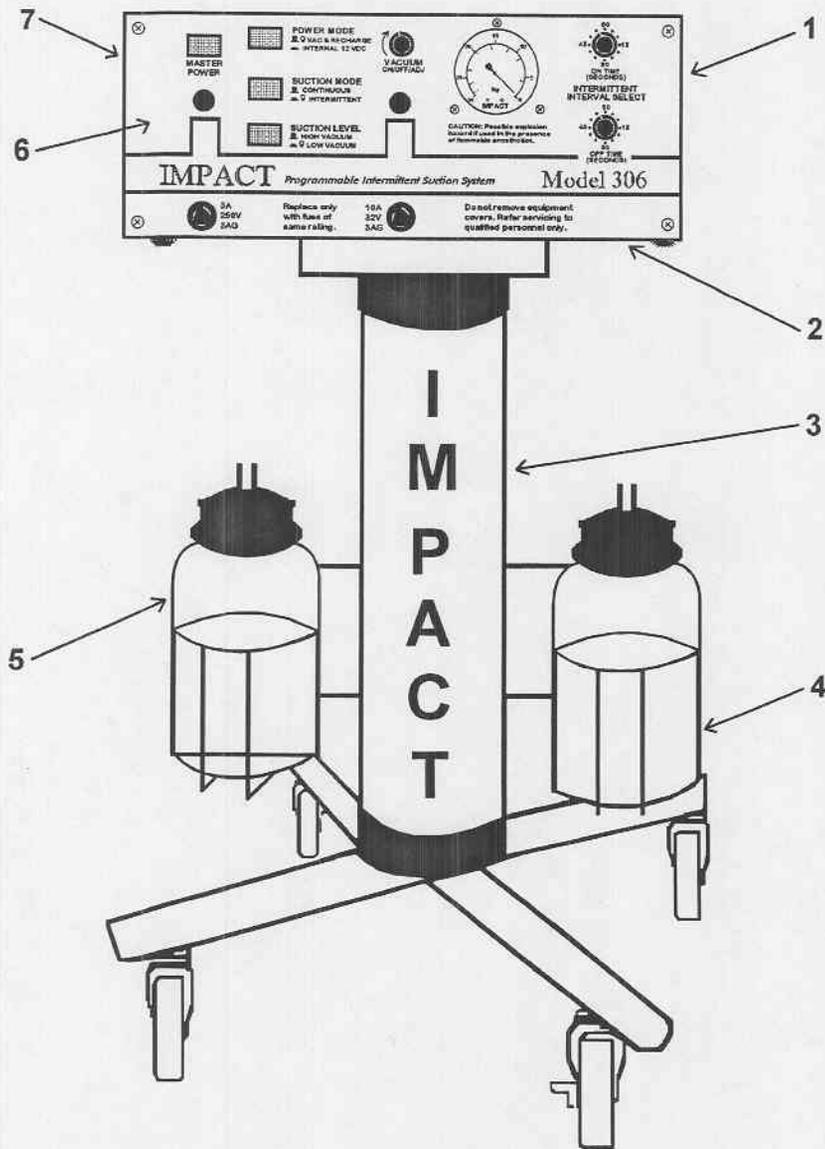


Figure E-1. Suction apparatus components.

**Section II. REPAIR PARTS LIST  
FOR  
SUCTION APPARATUS**

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-1	1		Assembly, Sub-Side Panel, Right (63346) 703-0306-05	EA	1
E-1	2		Assembly, Bottom Cover (63346) 703-0306-02	EA	1
E-1	3		Assembly, Cart (63346) 802-0306-02	EA	1
E-1	4		Assembly, Mounting Bracket, Cart (63346) 704-0306-05	EA	1
E-1	5	6515-01-288-4412	Assembly, Collection Jar (63346) 802-0306-06	EA	2
E-1	6		Assembly, Front Panel (63346) 703-0306-12	EA	1
E-1	7		Assembly, Sub-Side Panel, Left (63346) 703-0306-06	EA	1
E-1	*	6110-01-257-3175	Assembly, Rear Panel (63346) 703-0306-09	EA	1
E-1	*	4820-01-288-4392	Assembly, Overflow Shutoff Valve (63346) 704-0317-02	EA	1
E-1	*		Assembly, Accessory Kit (63346) 802-0306-05	EA	1

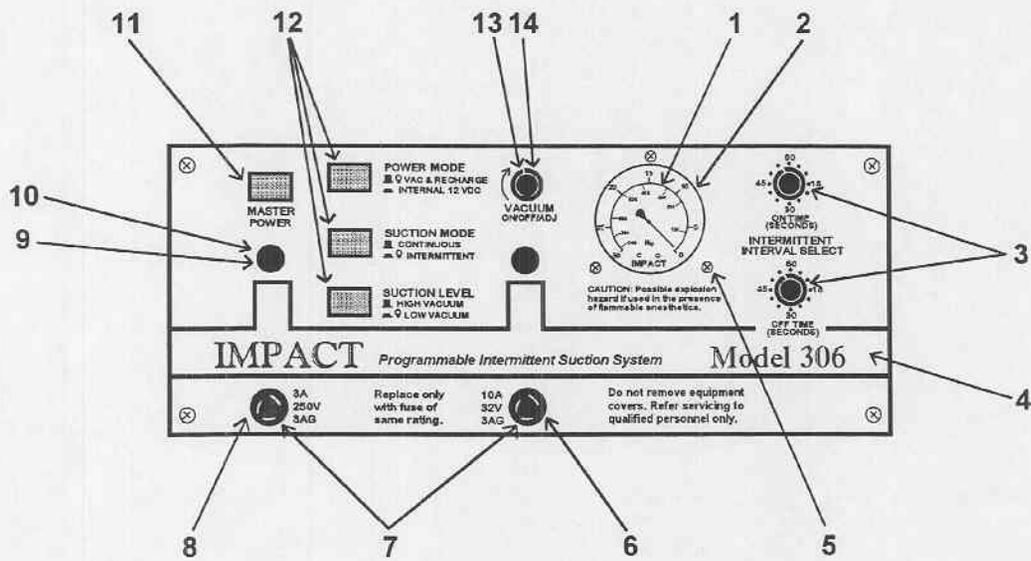


Figure E-2. Front panel assembly.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-2	1	6685-01-288-4417	Gauge, Vacuum (63346) 315-0001-00	EA	1
E-2	2		Bezel, Vacuum Gauge, Chrome (63346) 400-0002-00	EA	1
E-2	3	5930-01-288-4393	Switch, Rotary, 1 Pole, 12 Position (63346) 117-0003-00	EA	2
E-2	4		Panel, Front (63346) 422-0306-11	EA	1
E-2	5		Screw, Phillips, Pan Head, 4-40 by 5/16-in (63346) 358-0440-05	EA	3
E-2	6	5920-01-191-0893	Fuse, 10A, 32V, 3AG (63346) 081-0004-00	EA	1
E-2	7		Fuseholder, PM, 3AG (63346) 334-0004-00	EA	2
E-2	8		Fuse, 3A, 250V, 3AG (63346) 081-0005-00	EA	1
E-2	9	6210-01-288-4407	Lamp, Incandescent (63346) 068-0004-00	EA	2
E-2	10	6250-01-288-4402	Lampholder, w/Lens, Green (63346) 068-0005-00	EA	2
E-2	11	5930-01-288-4397	Switch, Pushbutton, DPDT, 2 Decks (63346) 121-0003-00	EA	1
E-2	12	5930-01-288-4396	Switch, Pushbutton, DPDT, 1 Deck (63346) 121-0004-00	EA	3
E-2	13	9605-01-288-4385	Resistor, Variable, 5K, 1/2-in W (63346) 214-0502-03	EA	1
E-2	14		Knob, Wind, 3/4-in od by 1/4-in id (63346) 392-0001-00	EA	1
E-2	*		Cable, Ribbon, 14 Cond., 22 AWG, 18-in Lg, w/Dip (63346) 010-0008-00	EA	2
E-2	*		Cable Ribbon, 8 Cond., 22 AWG, 13-in Lg, w/Dip (63346) 010-0010-00	EA	1
E-2	*		Tubing, Shrink, 1-in Lg (63346) 016-0004-00	EA	3

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-2	*		Tie Wrap, Miniature (63346) 305-0001-00	EA	5
E-2	*		Tape, Foam, 1/2-in by 1-in by 1/8-in Thick (63346) 312-0019-00	EA	1
E-2	*		Tape, Teflon (63346) 312-0021-00	RO	AR
E-2	*		Clip, Cable, P/S (63346) 334-0012-00	EA	3
E-2	*		Strap, Gauge (63346) 334-0017-00	EA	1
E-2	*		Nut, Keps, 4-40 (63346) 346-0440-01	EA	3
E-2	*		Nut, Self-Clinching, 6-32 (63346) 346-0632-03	EA	6
E-2	*		Terminal, Fork, #6, Red (63346) 374-0005-00	EA	1
E-2	*		Terminal, Ring, #10, Red (63346) 374-0006-00	EA	1
E-2	*		Washer, Lock, Internal Tooth, #4 (63346) 376-0019-00	EA	2
E-2	*		Elbow, Nylon, 1/4-in NPTM to 3/8-in id Tube (63346) 480-0062-00	EA	2
E-2	*		Tee, Brass, 1/4-in NPTF (63346) 480-0027-00	EA	1
E-2	*		Jumper (63346) 700-0306-07,08,09,27,41, 42,45-48	EA	1
E-2	*		Assembly, Wire Harness (63346) 704-0306-07	EA	1
			* Not illustrated.		

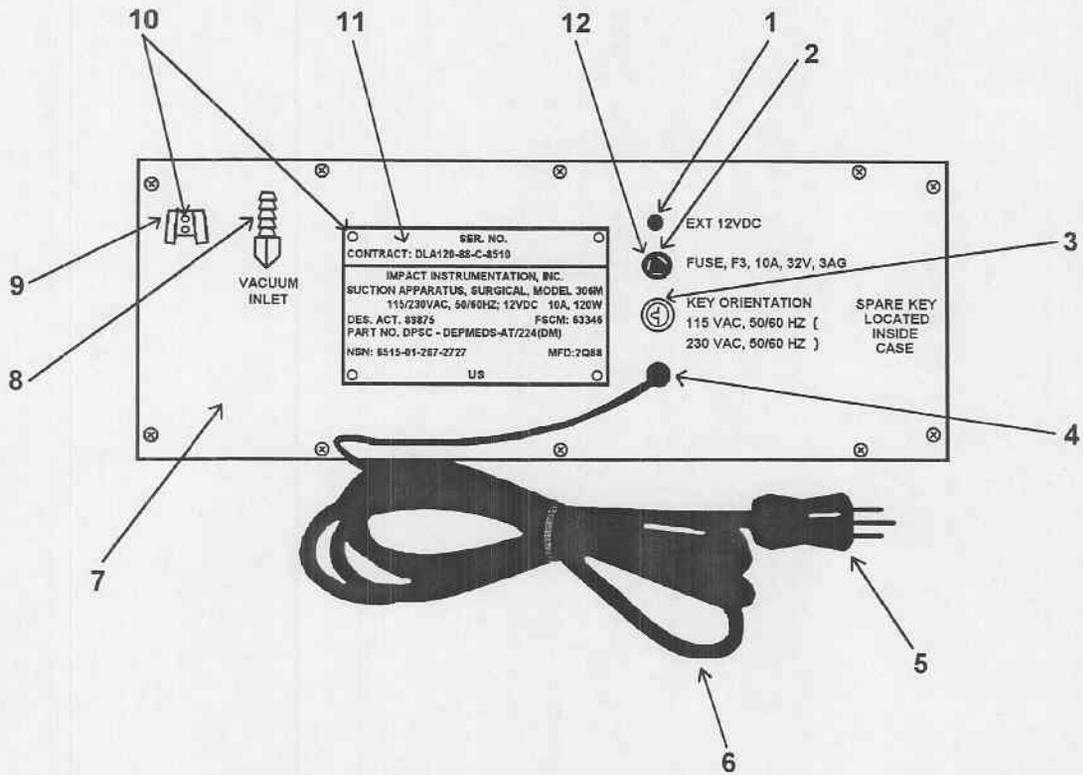


Figure E-3. Rear panel assembly.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-3	1	5930-01-295-3239	Connector, PMF @ Cond., Power Jack (63346) 089-0007-00	EA	1
E-3	2		Fuseholder, PM, 3AG (63346) 334-0004-00	EA	1
E-3	3		Switch, Key (63346) 131-0007-00	EA	1
E-3	4		Bushing, Strain Relief (63346) 340-0003-00	EA	1
E-3	5		Plug, Hospital Grade, 3 Cond. (63346) 099-0006-00	EA	1
E-3	6		Cable, 3 Cond., #16 AWG, 10 ft (63346) 003-1613-01	EA	1
E-3	7		Panel, Rear (63346) 422-0306-21	EA	1
E-3	8		Elbow, Chrome, 1/4 NPTM to 3/8-in id Tube (63346) 480-0118-00	EA	1
E-3	9		Clip, Retaining (63346) 334-0029-00	EA	1
E-3	10		Rivet, Pop, #4, 1/8-in to 3/16-in Range (63346) 338-0006-00	EA	6
E-3	11		5920-01-191-0893	Label, Metallic, Military id & Data (63346) 325-0306-01	EA
E-3	12	Fuse, 10A, 32V, 3AG (63346) 081-0004-00		EA	1
E-3	*	Tubing, Shrink, 1-in Lg (63346) 016-0004-00		EA	4
E-3	*	Cable, Tie, Nylon, Miniature (63346) 305-0001-00		EA	10
E-3	*	Tape, Foam, P/S, 4-in Lg (63346) 312-0018-00		EA	2
E-3	*	Nut, Self-Clinching, 6-32 (63346) 346-0632-03		EA	3
E-3	*	Spacer, Bushing (63346) 368-0005-00	EA	1	

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-3	*		Terminal, Female, .187 W, Fully Insulated, Red (63346) 374-0003-00	EA	3
E-3	*		Terminal, Fork, #6, Red (63346) 374-0005-00	EA	3
E-3	*		Terminal, Ring, #10, Red (63346) 374-0006-00	EA	1
E-3	*		Terminal, Male, .187 W, Fully Insulated, Red (63346) 374-0012-00	EA	1
E-3	*		Terminal, Fork, #6, Blue (63346) 374-0015-00	EA	2
E-3	*		Terminal, Ring, #10, Blue (63346) 374-0016-00	EA	1
E-3	*		Washer, Flat, SS, 1 3/8-in od by 9/16-in id (63346) 376-0014-00	EA	3
E-3	*		Washer, Flat, #4 (63346) 376-0031-00	EA	6
E-3	*		Hose Barb, 1/4-in NPTF to 3/8-in id Tube (63346) 480-0049-00	EA	1
E-3	*		Jumper (63346) 700-0306-01,02,04,06,07,08,12,13	EA	1
* Not illustrated.					

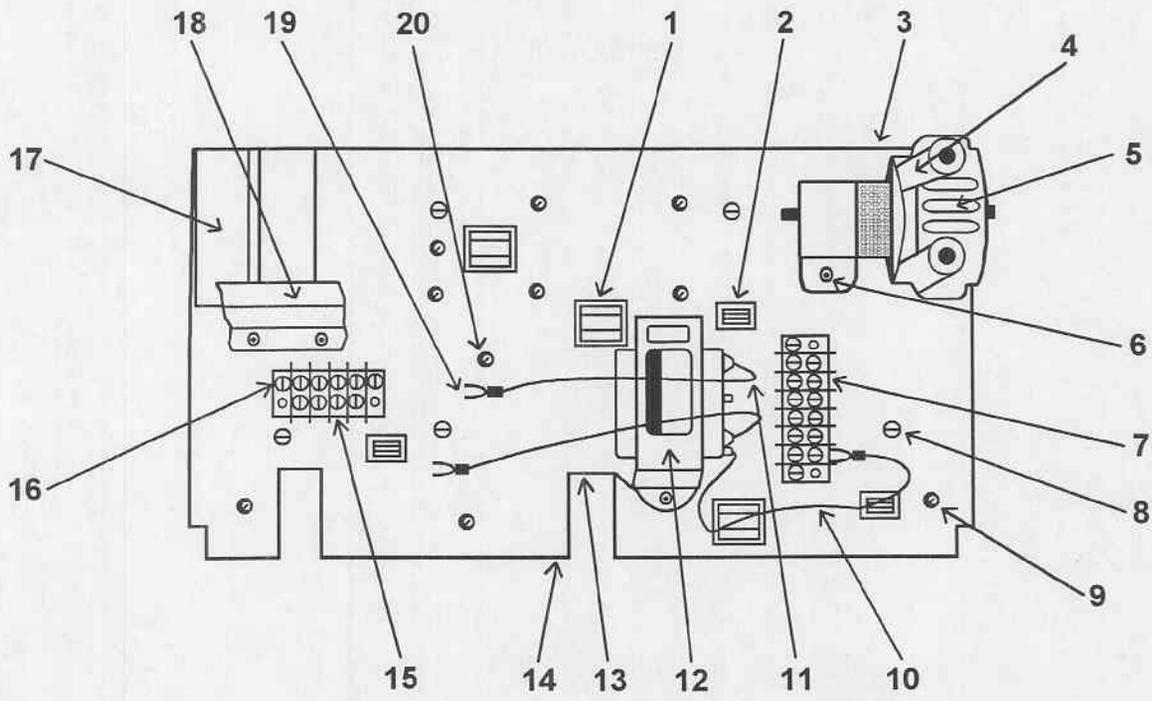


Figure E-4. Chassis assembly.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-4	1		Clip, Nylon, Tan, P/S, For 3/8-in Wire Bundle (63346) 334-0012-00	EA	3
E-4	2		Clip, Nylon, Tan, P/S, For 3/16-in Wire Bundle (63346) 334-0016-00	EA	3
E-4	3		Chassis (63346) 414-0306-11	EA	1
E-4	4	4730-01-288-4399	Elbow, Nylon, 1/8-in NPTM to 3/8-in id Tube (63346) 480-0034-00	EA	2
E-4	5	4310-01-258-6385	Pump, Vacuum (63346) 041-0003-00	EA	1
E-4	6		Nut, Keps, 10-32 (63346) 346-1032-01	EA	18
E-4	7		Terminal Board, Insulated, 6 Position (63346) 374-0008-00	EA	1
E-4	8		Screw, Slotted, BH, 10-32 by 1/2-in (63346) 352-1032-08	EA	7
E-4	9		Standoff, Self-Clinching, 10-32 by 1/2-in Stud (63346) 352-1032-08	EA	14
E-4	10		Jumper (63346) 700-0306-28,29,39	EA	3
E-4	11		Buswire, #18 AWG, 1 1/2-in Lg (63346) 012-0006-00	EA	1
E-4	12	5950-01-195-4519	Transformer, Power, Dual Primary (63346) 023-0007-00	EA	1
E-4	13		Grommet, 1-in Lg (63346) 340-0007-00	EA	2
E-4	14		Grommet, 1 1/2-in Lg (63346) 340-0008-00	EA	4
E-4	15		Terminal Board, Insulated, 4 Position (63346) 374-0007-00	EA	1
E-4	16		Screw, Slotted, BH, 6-32 by 5/8-in (63346) 352-0632-10	EA	4
E-4	17		Tape, Foam, P/S, 4-in Lg (63346) 312-0018-00	EA	2

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-4	18		Bracket, Battery Clamp #1 (63346) 404-0306-111	EA	1
E-4	19		Terminal, Fork, #6, Red (63346) 374-0005-00	EA	3
E-4	20		Standoff, Self-Clinching, 6-32 by 1-in, Nut (63346) 378-0632-16	EA	2
E-4	*		Nut, Keps, 6-32 (63346) 346-0632-01	EA	4
E-4	*		Nut, Self-Clinching, 6-32 (63346) 346-0632-03	EA	3
E-4	*		Screw, Slotted, BH, 6-32 by 3/4-in (63346) 352-0632-12	EA	2
E-4	*		Screw, Phillips, FH, 10-32 by 1/2-in (63346) 357-1032-08	EA	1
E-4	*		Screw, Socket, Set, Cone Point, 6-32 by 1/8-in (63346) 367-0632-02	EA	2
E-4	*		Washer, Lock, Int., Tooth, #6 (63346) 376-0004-00	EA	2
E-4	*		Washer, Rectangular (63346) 376-0022-00	EA	2
E-4	*		Bracket, Chassis Support (63346) 404-0306-71	EA	2
* Not illustrated.					

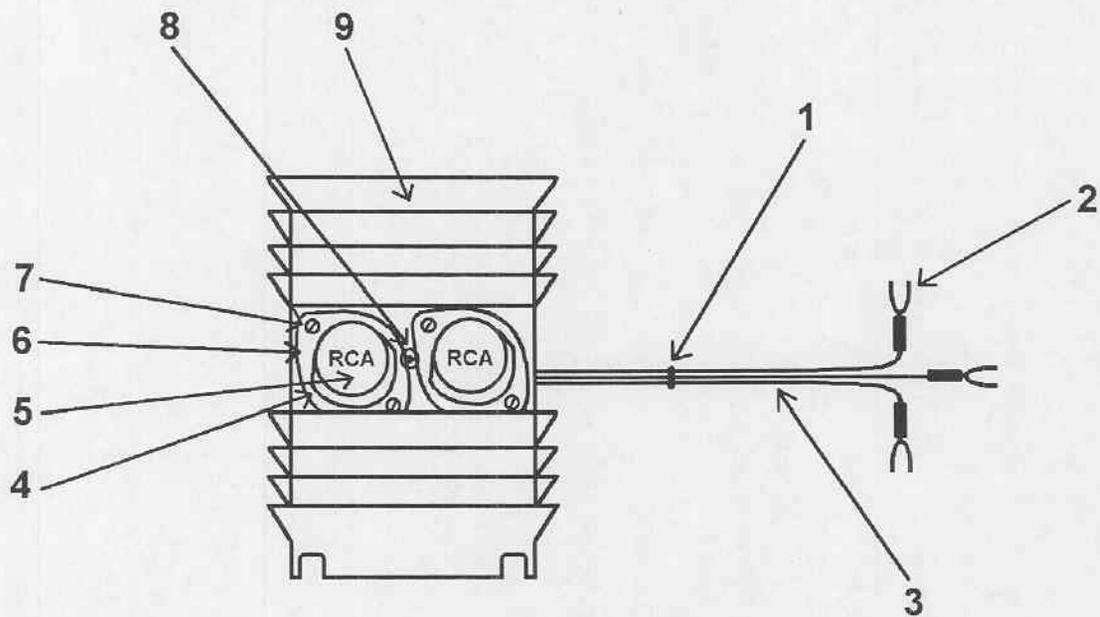


Figure E-5. Heat sink #1.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-5	1		Tie Wrap, Miniature (63346) 305-0001-00	EA	3
E-5	2		Terminal, Fork, #6, Red (63346) 374-0005-00	EA	3
E-5	3		Jumper (63346) 700-0306-20,33,34,35,36,43	EA	6
E-5	4	5970-01-290-8722	Insulator, MICA, Transistor, To-3 Case (63346) 310-0003-00	EA	2
E-5	5	5961-00-199-6008	Transistor, NPN, Power, 2N3055 (63346) 051-3055-00	EA	2
E-5	6		Silicone Grease (63346) 606-0001-00	EA	AR
E-5	7		Screw, Slotted, BH, 4-40 by 1/2-in (63346) 352-0440-08	EA	5
E-5	8		Nut, Keps, 4-40 (63346) 346-0440-01	EA	5
E-5	9		Heat Sink (63346) 310-0304-11	EA	1
E-5	*		Tubing, Shrink, 1-in Lg (63346) 016-0004-00	EA	1
E-5	*	5970-01-289-9816	Insulator, MICA, Transistor, Case Style 77 (63346) 310-0002-00	EA	1
E-5	*	5970-01-289-5284	Insulator, Spacer, Nylon, To-3 Case (63346) 310-0004-00	EA	2
E-5	*		Lug, Solder, #4 (63346) 344-0002-00	EA	2
			* Not illustrated.		

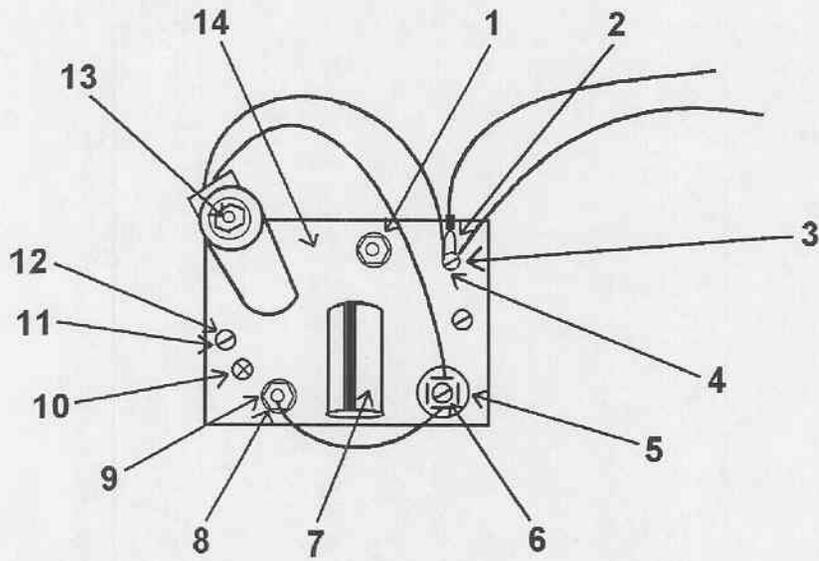


Figure E-6. Heat sink #2.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-6	1		Diode, 1N3879 (63346) 047-3879-00	EA	1
E-6	2	5970-01-289-9816	Insulator, MICA, Transistor, Case Style 77 (63346) 310-0002-00	EA	1
E-6	3	5961-00-107-2571	Transistor, NPN, Power, 2N4921 (63346) 051-4921-00	EA	1
E-6	4		Screw, Slotted, BH, 4-40 by 1/2-in (63346) 352-0440-08	EA	1
E-6	5	5961-01-289-4488	Diode, Bridge Rectifier, 12A (63346) 047-0005-00	EA	1
E-6	6		Screw, Slotted, BH, 6-32 by 5/8-in (63346) 352-0632-10	EA	1
E-6	7	5910-01-295-3209	Capacitor, Alum, Elect, 2200 ufd., 25V (63346) 252-2268-31	EA	2
E-6	8		Diode, 1N3879 (63346) 047-3879-00	EA	1
E-6	9		Insulator, Diode Mounting Kit, DO-4 (63346) 310-0001-00	EA	2
E-6	10	5961-00-957-6865	Diode, 1N4003 (63346) 047-4003-00	EA	1
E-6	11		Screw, Slotted, BH, 6-32 by 2 1/4-in (63346) 352-0632-36	EA	1
E-6	12		Washer, Flat, Nylon, #6 (63346) 376-0013-00	EA	2
E-6	13	5945-01-288-4404	Solenoid, 12 VDC (63346) 033-0001-00	EA	1
E-6	14		Heat Sink (63346) 310-0306-11	EA	1
E-6	*		Nut, Keps, 4-40 (63346) 346-0440-01	EA	1
E-6	*		Nut, Lock, 6-32 (63346) 346-0632-02	EA	2
E-6	*		Screw, Slotted, BH, 8-32 by 1/4-in (63346) 352-0832-04	EA	2

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-6	*	4730-01-288-4399	Elbow, Nylon, 1/8-in NPTM to 3/8-in id Tube (63346) 480-0034-00	EA	1
E-6	*		Terminal, Female, .250 W, Fully Insulated, Blue (63346) 374-0002-00	EA	1
E-6	*		Terminal, Fork, Red, #6 (63346) 374-0005-00	EA	6
E-6	*		Terminal, Ring, Red, #10 (63346) 374-0006-00	EA	1
E-6	*		Terminal, Male, .187 W, Fully Insulated, Red (63346) 374-0012-00	EA	1
E-6	*		Jumper (63346) 700-0306-03,06,09,14,22, 23,26,30,44	EA	1
			* Not illustrated.		

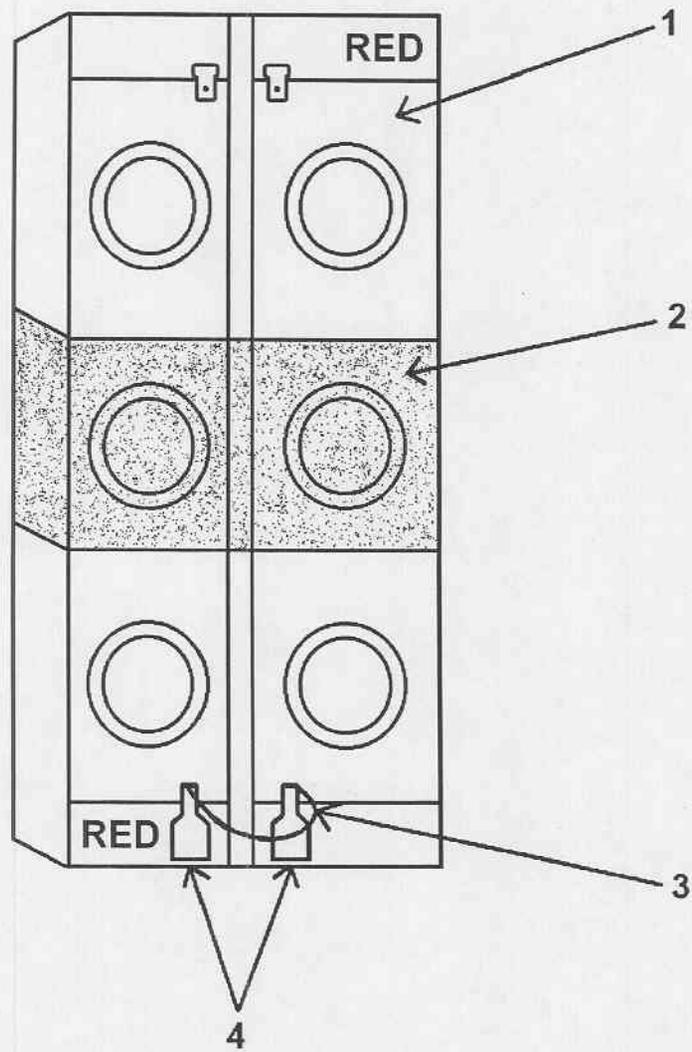


Figure E-7. Battery pack.

**Section II. REPAIR PARTS LIST  
FOR  
SUCTION APPARATUS**

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-7	1	6140-01-288-4416	Battery, Gel Cell, 6V, 6AH (63346) 021-0015-00	EA	2
E-7	2		Tape, Mylar, 2-in W (63346) 312-0020-00	EA	AR
E-7	3		Jumper, Orange, 4-in Lg (63346) 700-0306-21	EA	1
E-7	4		Terminal, Female, .187 W, Fully Insulated, Red (63346) 374-0003-00	EA	2
E-7	*		Tape, Foam, P/S, 4-in Lg (63346) 312-0018-00	EA	1
E-7	*		Terminal, Ring, #10, Red (63346) 374-0006-00	EA	1
E-7	*		Jumper, Black, 8 1/2-in Lg (63346) 700-0306-05	EA	1
			* Not illustrated.		

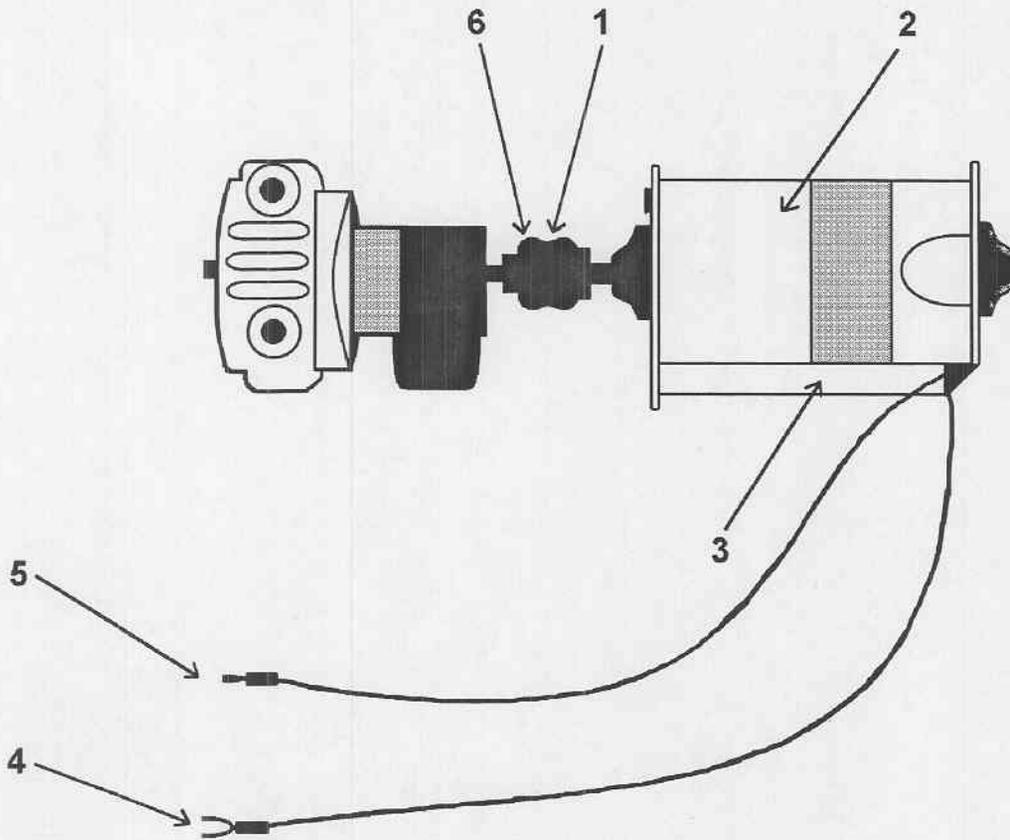


Figure E-8. Pump assembly.

**Section II. REPAIR PARTS LIST  
FOR  
SUCTION APPARATUS**

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-8	1	3010-01-289-5333	Coupling, Shaft, 5/16-in to 5/16-in (63346) 336-0003-00	EA	1
E-8	2		Motor, 12 VDC (63346) 039-0002-00	EA	1
E-8	3		Bracket, Motor Mounting (63346) 404-0304-11	EA	1
E-8	4		Terminal, Ring, #10, Red (63346) 374-0006-00	EA	1
E-8	5		Terminal, Fork, #6, Red (63346) 374-0005-00	EA	1
E-8	6		Screw, Socket, Set, Cone Point, 6-32 by 1/8-in (63346) 367-0632-02	EA	2

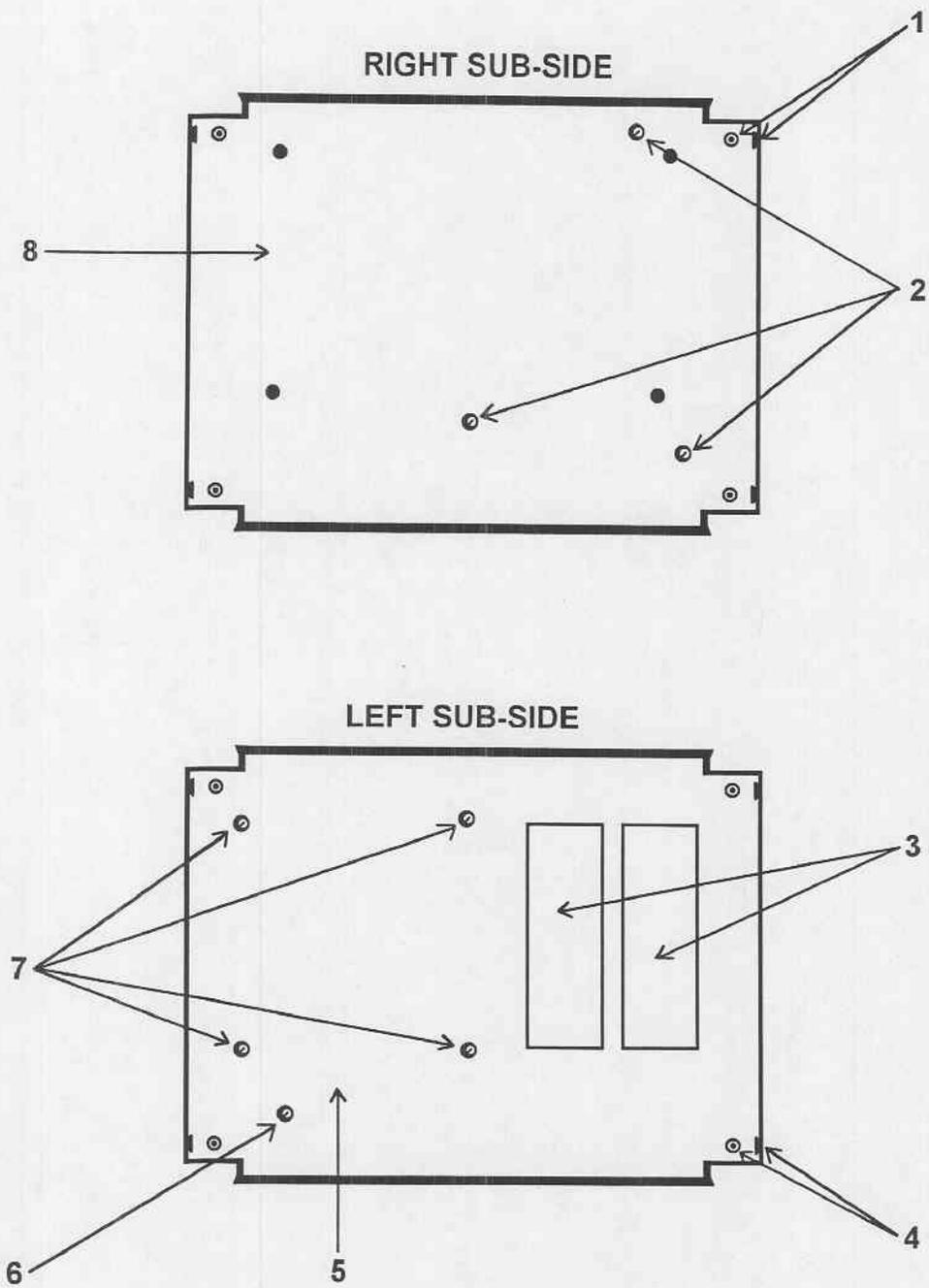


Figure E-9. Left and right sub-side assemblies.

## Section II. REPAIR PARTS LIST FOR SUCTION APPARATUS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEASURE	(5) QTY
FIG NO.	ITEM NO.				
E-9	1		Nut, Self-Clinching, 6-32 (63346) 346-0632-03	EA	8
E-9	2		Standoff, Self-Clinching, Stud, 10-32 by 1/2-in (63346) 378-1032-08	EA	3
E-9	3		Tape, Foam, P/S, 4-in Lg (63346) 312-0018-00	EA	2
E-9	4		Nut, Self-Clinching, 6-32 (63346) 346-0632-03	EA	8
E-9	5		Panel, Sub-Side, Left (63346) 422-0306-51	EA	1
E-9	6		Standoff, Self-Clinching, Stud, 10-32 by 1/2-in (63346) 378-1032-08	EA	1
E-9	7		Standoff, Self-Clinching, Nut, 4-40 by 1/4-in (63346) 378-0440-04	EA	4
E-9	8		Panel, Sub-Side, Right (63346) 422-0306-31	EA	1
E-9	*		Nut, Keps, 10-32 (63346) 346-1032-01	EA	2
E-9	*	5999-01-195-4520	Assembly, Heat Sink #1 (63346) 704-0306-01	EA	1
E-9	*		Screw, Bind Head, 4-40 by 1/4-in (63346) 352-0440-04	EA	4
E-9	*	5999-01-191-0934	Assembly, Printed Circuit Board (63346) 702-0306-01	EA	1
* Not illustrated.					

**Section III. SPECIAL TOOLS, TEST, AND SUPPORT EQUIPMENT  
FOR  
SUCTION APPARATUS**

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEASURE	(6) QTY
<p>THERE ARE NO SPECIAL TOOLS, TEST, OR SUPPORT EQUIPMENT APPLICABLE FOR THIS END ITEM.</p>					

## GLOSSARY

---

AC	Alternating current
AFR	Air Force regulation
app	Appendix
AR	Army regulation
AR	As required
C	Operator or crew
CAGE	Commercial and government entity
cm	Centimeter
CN	Can
CVC	Calibration/verification/certification
D	Depot level maintenance
DA	Department of the Army
DC	Direct current
°C	Degrees Celsius
°F	Degrees Fahrenheit
DLAR	Defense Logistics Agency regulation
DPSC	Defense Personnel Support Center (now DSCP)
DS	Direct support
EA	Each
ETO	Ethylene oxide
EVR	Electronic vacuum regulator
F	Direct support maintenance
fig	Figure
FM	Field manual
FT (ft)	Foot (feet)
GS	General support
H	General support maintenance
hrs	Hours
Hz	Hertz (cycles per second)
id	Inner diameter
in	Inch
Inc.	Incorporated
ISO	International Standards Organization
kg	Kilogram
lb	Pound
ma	Milliampere
MAC	Maintenance allocation chart
Max	Maximum
MCO	Marine Corps

mL	Milliliter
mm	Millimeter
mmHg	Millimeter of mercury
MPL	Mandatory parts list
MTOE	Modified table of organization and equipment
NAVSUPINST	Navy Supply Instruction
No.	Number
NOR	Not or
NPT	National pipe thread
NSN	National stock number
O	Unit maintenance
od	Outer diameter
oz	Ounce
para	Paragraph
PCB	Printed circuit board
PMCS	Preventive maintenance checks and services
PMF	Panel mount female
PVC	Polyvinyl chloride
QC	Quality control
QTY	Quantity
RO	Roll
RPL	Repair parts list
SB	Supply bulletin
sec	Section
Ser. No.	Serial number
SOP	Standard operating procedure
TB	Technical bulletin
TDA	Table of distribution and allowances
TM	Technical manual
VAC	Volts alternating current
Vcc	Voltage at the common collector
VDC	Volts direct current

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CUT ALONG PERFORATED LINE

# METRIC SYSTEM CONVERSIONS

CHANGE	TO	MULTIPLY	CHANGE	TO	MULTIPLY
inches	centimeters	2.540	centimeters	inches	.394
feet	meters	.305	meters	feet	3.280
yards	meters	.914	meters	yards	1.094
sq inches	sq centimeters	6.451	sq centimeters	sq inches	.155
sq feet	sq meters	.093	sq meters	sq feet	10.764
cubic feet	cubic meters	.028	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	milliliters	fluid ounces	.034
pints	liters	.473	liters	pints	2.113
quarts	liters	.946	liters	quarts	1.057
gallons	liters	3.785	liters	gallons	.264
ounces	grams	28.349	grams	ounces	.035
pounds	kilograms	.454	kilograms	pounds	2.205

## TEMPERATURE CONVERSION

Degrees Fahrenheit to Degrees Celsius:  $(^{\circ}\text{F} - 32) \times .5555 = ^{\circ}\text{C}$

Degrees Celsius to Degrees Fahrenheit:  $(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$

### WEIGHTS

- 1 gram = 10 decigrams = .035 ounce
- 1 dekagram = 10 grams = .35 ounce
- 1 hectogram = 10 dekagrams = 3.52 ounces
- 1 kilogram = 10 hectograms = 2.2 pounds

### LINEAR MEASURE

- 1 centimeter = 10 millimeters = .39 inch
- 1 decimeter = 10 centimeters = 3.94 inches
- 1 meter = 10 decimeters = 39.37 inches

### 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

### LIQUID MEASURE

- 1 centiliter = 10 milliliters = .34 fluid ounce
- 1 deciliter = 10 centiliters = 3.38 fluid ounces
- 1 liter = 10 deciliters = 33.81 fluid ounces