INSTRUCTION MANUAL

OPERATION & SERVICE

306 SERIES

PROGRAMMABLE INTERMITTENT SUCTION - ASPIRATOR SYSTEM

NSN 6515-01-267-2726

NSN 6515-01-267-2727

IMPACT INSTRUMENTATION, INC.

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LIST OF ILLUSTRATIONS

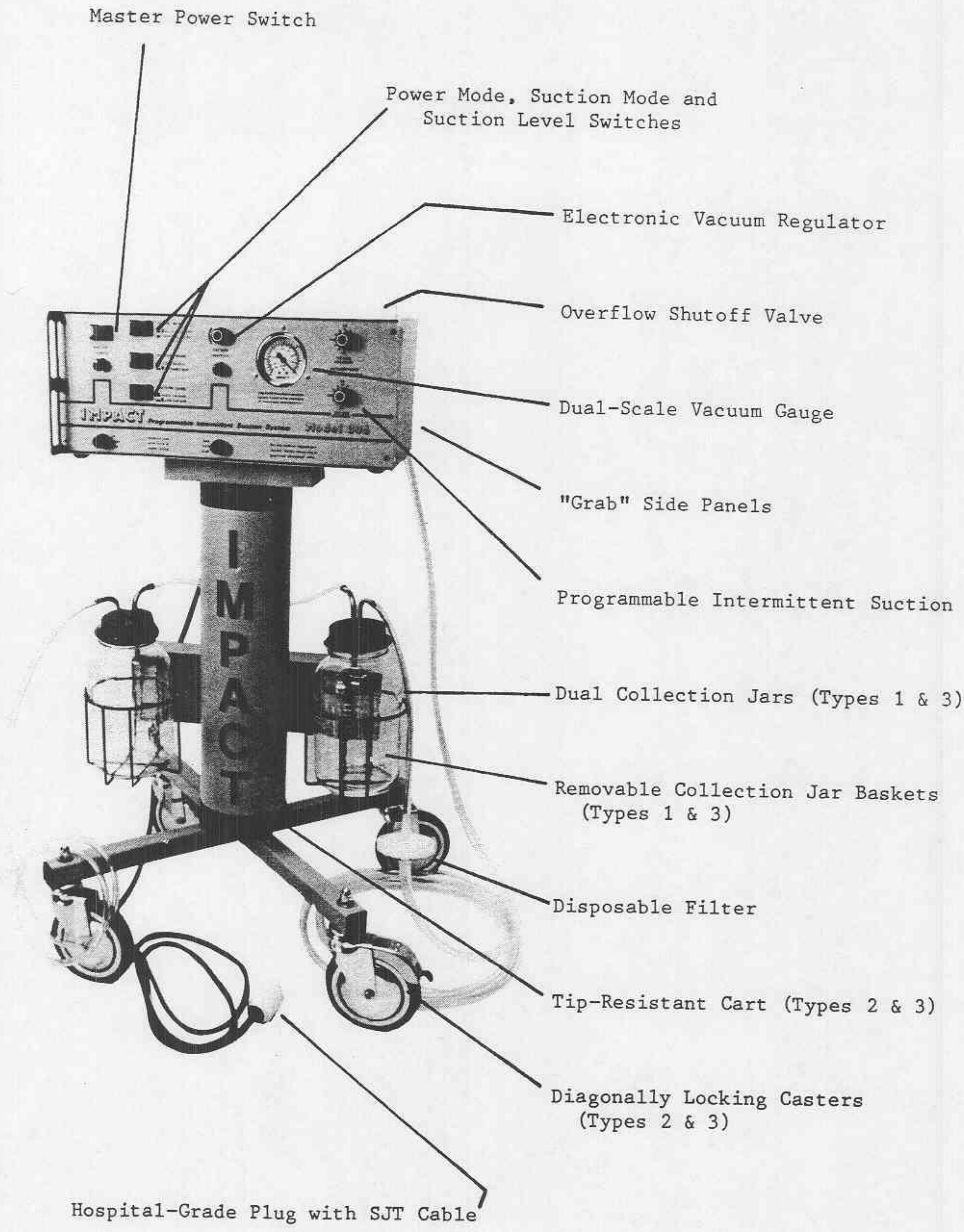


Figure 1. Model 306/306M Main Features

SHIPPING CONTENTS

306 Series Programmable Intermittent Suction Systems are shipped in commercial and military versions. Shipping contents for each version appears below.

Model 306 (Commercial Model):

1 ea. Model 306M Programmable Intermittent Suction System
1 ea. Model 306 Cart (when specified)
1 ea. Reusable Collection Canister System (when specified)
1 ea. Assembly, Overflow Shutoff Valve
1 ea. Hose, Corrugated, 8" Long
1 ea. 3/8" I.D. x 10 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 1/2 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 5 ft. Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 ft. Length of Tubing, Clear
2 ea. Instruction Manual, Operation & Service
2 ea. Spare Fuse, Type 3 AG, 10A, 32V
1 ea. Spare Fuse, Type 3 AG, 3A, 250V
1 ea. Filter, Disposable, Hydrophobic/Bacterial

NSN 6515-01-267-2727 Suction Apparatus with Collection System (Military Model):

1 ea. Model 306M Programmable Intermittent Suction System
1 ea. Assembly, Overflow Shutoff Valve
1 ea. Hose, Corrugated, 8" Long
1 ea. 3/8" I.D. x 10 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 1/2 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 5 ft. Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 ft. Length of Tubing, Clear
2 ea. Instruction Manual, Operation & Service
2 ea. Spare Fuse, Type 3 AG, 10A, 32V
1 ea. Spare Fuse, Type 3 AG, 3A, 250V
1 ea. Filter, Disposable, Hydrophobic/Bacterial
1 ea. Reusable Collection Canister System
2 ea. Holder, Collection Canister
2 ea. Wall Mounting Bracket (for Collection Canisters)
4 ea. Screws, Self-tapping (for Wall Mounting Brackets)
1 ea. Battery Pack

NSN 6515-01-267-2726 Suction Apparatus with Cart (Military Model):

1 ea. Model 306M Programmable Intermittent Suction System
1 ea. Assembly, Overflow Shutoff Valve
1 ea. Hose, Corrugated, 8" Long
1 ea. 3/8" I.D. x 10 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 1/2 ft Length of Tubing, Clear
1 ea. 1/4" I.D. x 5 ft. Length of Tubing, Clear
1 ea. 1/4" I.D. x 1 ft. Length of Tubing, Clear
2 ea. Instruction Manual, Operation & Service
2 ea. Spare Fuse, Type 3 AG, 10A, 32V
1 ea. Spare Fuse, Type 3 AG, 3A, 250V
1 ea. Filter, Disposable, Hydrophobic/Bacterial
2 ea. Holder, Collection Canister
2 ea. Wall Mounting Bracket (for Collection Canisters)
4 ea. Screws, Self-tapping (for Wall Mounting Brackets)
1 ea. Model 306 Cart
1 ea. Battery Pack

ACCESSORIES LIST

The Accessories List contains common items, required from time to time. Each item is preceeded by its part number. Accessories may be ordered direct from Impact. When ordering, please include the part number, description and quantity required.

Send written purchase orders to: Impact Instrumentation, Inc.
P.O. Box 508
27 Fairfield Place
West Caldwell, New Jersey 07006

Telephonic orders: 201/882-1212

Part Number	Description
081-0004-00	Fuse, 3AG, 10A, 32V
081-0005-00	Fuse, 3AG, 3A, 250V
334-0030-00	Holder, Collection Jar
465-0005-00	Filter, Disposable, Hydrophobic
540-0002-00	Tubing, PVC, 5' Long, 1/4" I.D.
540-0029-00	Tubing, PVC, 12" Long, 1/4" I.D.
540-0048-00	Tubing, PVC, 10' Long, 3/8" I.D.
540-0063-00	Tubing, PVC, 18" Long, 1/4" I.D.
704-0317-02	Assembly, Overflow Shutoff Valve
802-0306-06	Assembly, Collection Jar, Reusable
820-0037-00	Hose, Corrugated, 8" Long
906-0306-06	Instruction Manual, Operation & Service

LIMITED COPYRIGHT RELEASE

Permission is hereby granted to the Department of Defense to reproduce all material furnished under this contract for use in a military service training program and other technical training programs.

CALIBRATION NOTICE

This device should be incorporated into a regular preventative maintenance program to insure compliance with operating specifications. Calibration measurements should be made on a biannual basis unless significant usage warrants a shorter period between preventative maintenance inspections. A calibration check should be made following each cumulative period of 300 hours of operation. Recommended maintenance checks can be found in the SERVICE section of this Manual.

UNPACKING

Check the contents of the shipping case(s) against the enclosed packing list. Examine the instrument for any obvious signs of shipping damage. If there is no apparent sign of mechanical damage, read the instructions contained within this manual before attempting to operate the instrument.

LOCATION OF USE

The Model 306/306M is a portable device, therefore, its physical area of use will vary. When operated in a wet environment, user's should take precautions and protect this device by covering it with a protective barrier (small tarp, plastic sheet, etc.).

WARNINGS REGARDING USE

This equipment is intended for use by qualified medical personnel only.

Danger - Possible explosion hazard if used in the presence of flammable anesthetics.

Caution - Electric shock hazard, do not remove instrument covers. Refer servicing to qualified service personnel only.

Do not operate this instrument prior to reading the instructions contained within this manual.

Always use overflow shutoff valve to protect pump mechanism.

External 12VDC Operation - Operate only from diode protected external 12VDC sources when simultaneous AC power is applied (see SERVICE section EXTERNAL 12VDC OPERATION).

MILITARY VERSIONS - DO NOT operate suction apparatus until the battery pack (shipped separately) is installed.

Assembly: Minimal or no assembly is required before placing this device into operation. Instructions and a pictorial describe the Cart Assembly, below. Battery installation (military versions only) is discussed in the SERVICE section of this manual.

CART ASSEMBLY

1. Insert cylinder assembly into cart base.

2. Secure cylinder assembly to base as shown using the 3/8" hardware provided.

   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 cart assembly over Model 306/306M bottom cover. Place spacers in mounting bracket channel and tighten securely with 10-32 hardware provided.

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.

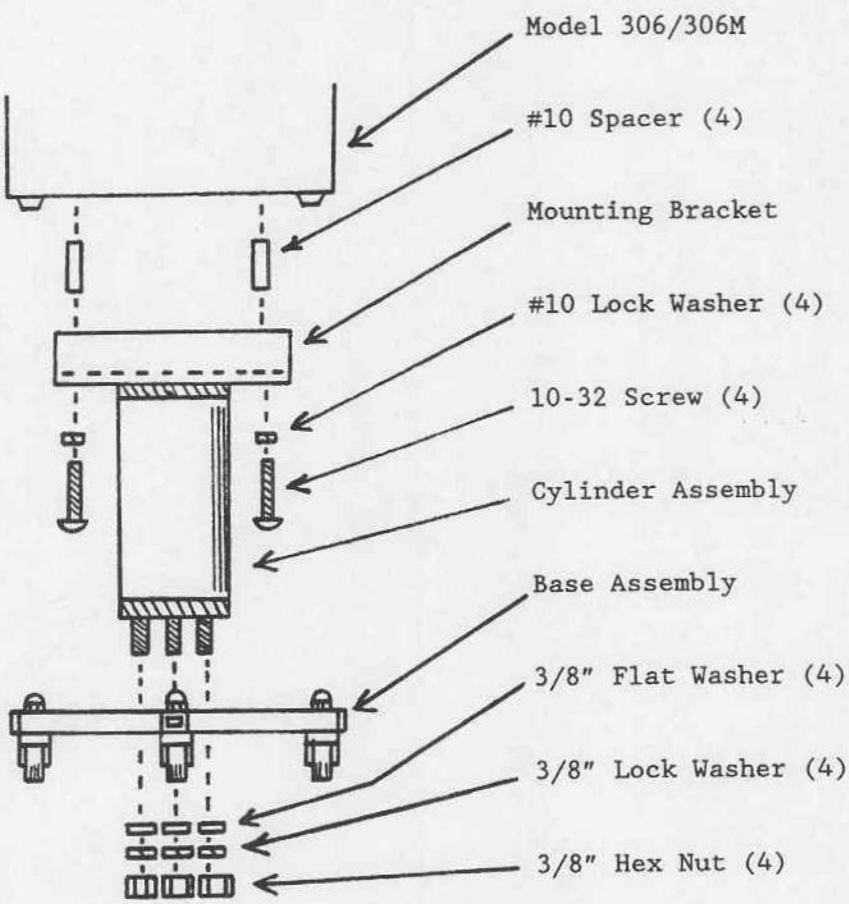


Figure 2. Cart Assembly

Interconnections: The following interconnections are required to connect the Model 306/306M to its Overflow Shutoff Valve, Hydrophobic Filter and Collection Jar System. When using a collection system other than Impact's, utilize the connection instructions provided by the respective collection jar manufacturer.

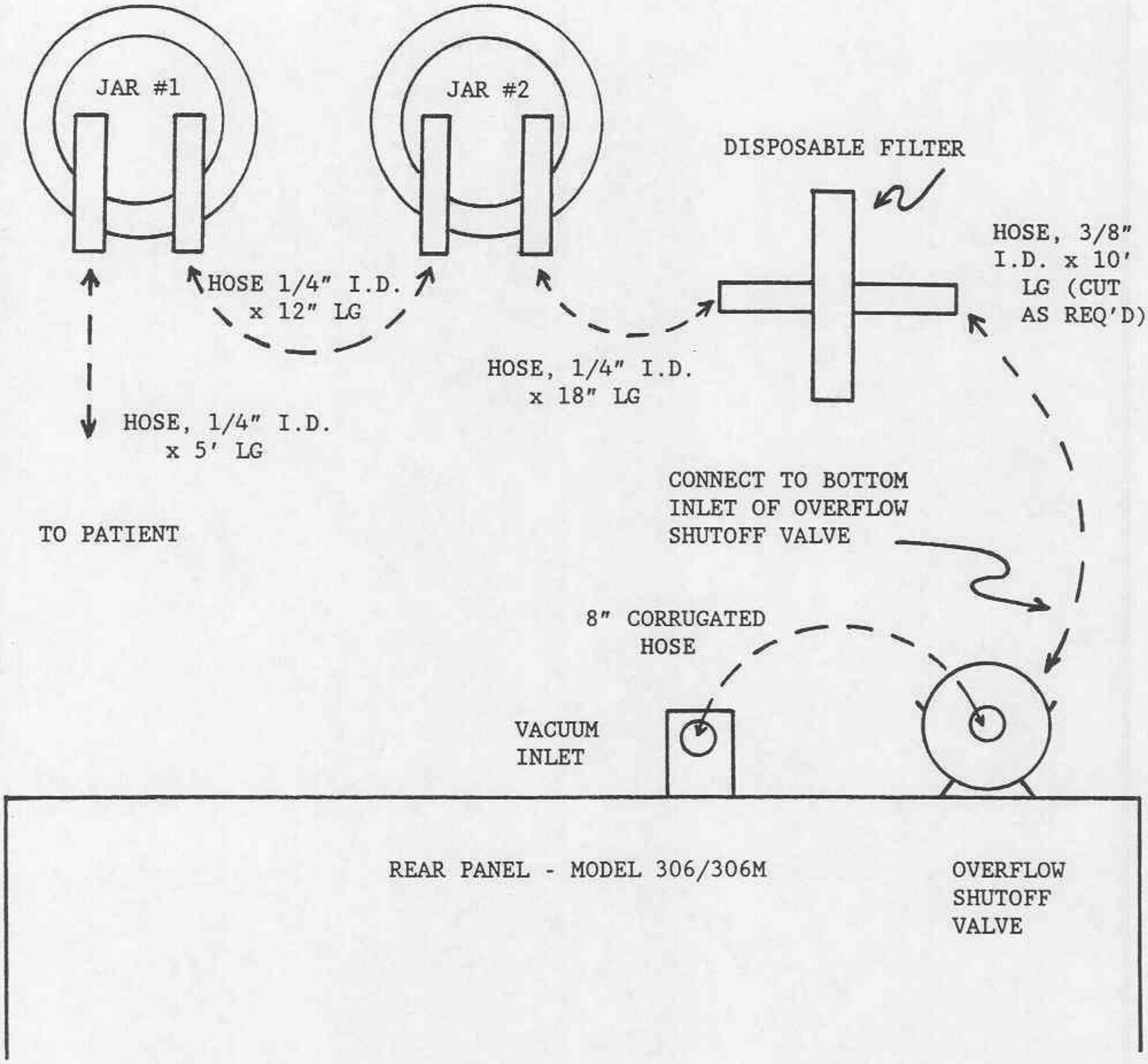


Figure 3.

Interconnection Diagram - Rear Panel/Overflow Shutoff Valve/
Hydrophobic Filter/Collection Jar System

Initial Adjustments: Before placing this device into operation read the section entitled OPERATION, Description of Controls and Indicators. Make control settings and verify device performance prior to interfacing with patient.

SECTION I. OPERATION

INTRODUCTION

The Model 306M Programmable Intermittent Suction System represents the state of the art in portable suction apparatus. This device will provide years of reliable service when used in accordance with the instructions contained within this manual. The following text highlights several of its key features.

Electronic Vacuum Regulator - This circuit differs from conventional mechanical regulators in several ways. First, the regulator is eliminated from the vacuum path and, therefore, cannot leak, clog, jam or stick. Second, the regulator is energy efficient; it only draws current proportional to the amount of vacuum you require. Third, the regulator can precisely select vacuum levels with micrometer precision for your most critical suction needs.

Electronic Intermittent Suction Circuits - These circuits determine ON and OFF times, selectable in 144 different combinations. The OFF circuit shuts down virtually the entire unit during its time period thereby maximizing energy efficiency. The ON circuit immediately energizes the system for prompt response.

Emergency Battery - A sealed lead-acid (GEL Cell) battery is provided for emergency and transitory use. Its operating time varies depending upon the vacuum levels drawn. With this in mind, a high capacity battery was chosen which can provide over one hour of continuous use at maximum vacuum (550 mm/hg). At 200 mm/hg cycled intermittently at 5 seconds ON and 5 seconds OFF, the battery will provide more than twelve hours continuous use. Because this battery is not considered the primary power source, its use should be restricted to emergencies and transport to insure available power.

OPERATION

Description of Controls and Indicators

Refer to the reference pictorial on the following page. Numbers contained within this text (in parentheses) correspond to the numbers indicated in the pictorial.

(1) Master Power Switch

(2) Master Power Indicator Lamp

(3) Power Mode Switch

(4) Suction Mode Switch

(5) Suction Level Switch

(6) Vacuum ON/OFF/ADJ Switch

(7) Vacuum Regulator Power Lamp

(8) Vacuum Gauge

(9) On Time Selector Switch

(10) Off Time Selector Switch

(11) Fuse, 3A, 250V, 3AG

(12) Fuse, 10A, 32V, 3AG

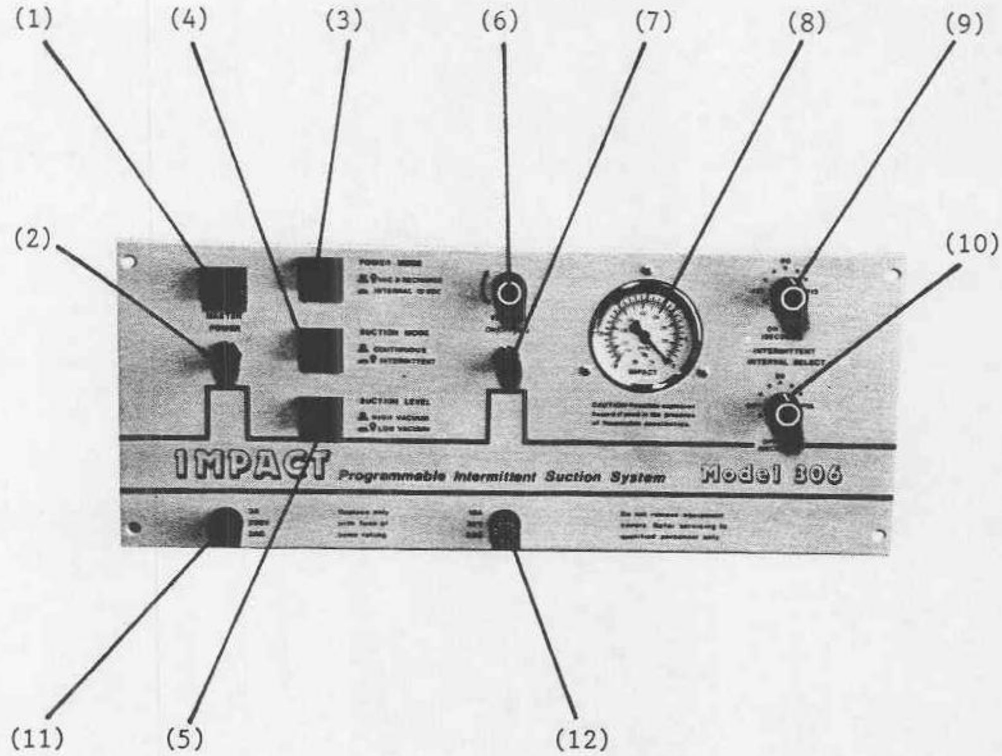


Figure 4. Front Panel Controls, Fuses and Indicators

OPERATION (cont'd)

Operating Power Selection & Stopping

The Model 306M (Military) is designed to operate on 115/230 VAC, 50/60 HZ; internal 12 VDC rechargeable batteries; or external 12 VDC. The Model 306 operates from 115 VAC, 50/60 HZ; internal 12 VDC rechargeable batteries; or external 12 VDC. The Master Power Switch (1) energizes the entire system. Its respective indicator lamp (2) illuminates to verify a live power source. Select the Power Mode (3) desired, AC and battery recharge or internal 12 VDC. An indicator lamp on the Power Mode Switch (3) illuminates in the AC/Recharge position. **Note:** When operating from an external 12 VDC source, simultaneous battery recharge can be accomplished from an AC source by activating the Master Power Switch (1) and placing the Power Mode Switch (3) in the AC/Recharge position (see WARNINGS REGARDING USE).

The Master Power Switch permits the operator to cease operation including recharge at any time. When stopping operation, the operator should consider disconnecting any indwelling catheter so that risk of backflow is eliminated.

Continuous Suction Operation

Select "Continuous" suction by depressing the Suction Mode Switch (4). The indicator lamp for this switch will not illuminate in this mode. The Suction Level Switch (5) selects two operating limits for vacuum; 0-200 mm/hg (Low Vacuum), or 0-550 mm/hg (High Vacuum). An indicator lamp illuminates when Low Vacuum is selected. To operate the Electronic Vacuum Regulator (EVR), turn the control (6) clockwise to its "ON" position and continue rotating it to the desired vacuum level. Preselecting the desired vacuum limit can be accomplished by blocking the free flow of air through the system. Allow air to evacuate from any collection jar system when preselecting the vacuum limit. Remember that the maximum vacuum limit is regulated by the Suction Level Switch (5). The EVR indicator lamp (7) will remain on until the EVR Control Switch (6) is "clicked off" by turning fully counterclockwise. Vacuum readings may be read directly from the front panel Vacuum Gauge (8).

Intermittent Suction Operation

The Suction Mode and Suction Level Switches (4, 5) must be depressed and illuminated for intermittent operation. 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. After preselecting the desired vacuum level as described in the previous section, the ON (9) and OFF (10) time suction circuits may be set to the desired range. Each circuit is programmable in 12 increments of 5 seconds each. A total of 144 programmable combinations are available to "custom tailor" the Model 306M to your patient's needs.

Electronic Vacuum Regulator

The EVR (6) works in conjunction with the Suction Level Switch (5). Precise vacuum levels may be selected with extreme accuracy for most procedures. Variability from 0-200 mm/hg and 0-550 mm/hg adds additional versatility and power when needed for emergencies or surgical applications. The EVR is an energy efficient circuit, drawing only an amount of current proportional to the level of vacuum desired. Unlike conventional regulators which "bleed" an efficient system running at full power, the EVR runs at lower speeds unless full power is required.

Collection Jar System

ALWAYS use the Overflow Shutoff Valve provided with this unit to protect the suction mechanism from overflows which may permanently damage the vacuum pump. Vacuum tubing is provided for interconnection of Collection Jars, Hydrophobic Filter, Overflow Shutoff Valve and rear panel barbed hose inlet (see Figure 3).

A disposable filter which is both hydrophobic and bacterial is provided. This filter connects between the Overflow Shutoff Valve and final collection jar. 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.

Operator Performance Checks

Before placing this device into operation, the operator can perform various operational checks to insure proper performance.

1. Verify operating power selections at 115 or 230 VAC, internal rechargeable batteries and external 12 VDC.

2. Verify continuous operation at both high and low ranges, in each of the operating power modes.

3. Verify that intermittent suction operates only in the low vacuum range in each of the operating power modes.

4. Test the Electronic Vacuum Regulator by adjusting vacuum in the high and low ranges, in each of the operating power modes.

BATTERY CARE

The Model 306/306M utilizes sealed GEL Cell batteries which offer excellent charge retention characteristics, particularly during long periods of storage. This ensures an ample amount of power during emergencies and transitory procedures. The battery pack in this device is not intended for routine, day-to-day use, therefore, it should be used with discretion and its design understood. To provide long life and maximum performance capabilities, the Model 306M requires sixteen hours to fully recharge its fully discharged batteries. Of course, the batteries are rarely discharged this much so the subsequent recharge time is usually less. GEL Cell batteries require little user care to provide optimum performance and life expectancy. Because their self-discharge rate is extremely low (approximately 1-1/2% per month), lengthy periods of disuse without replenishment charging is possible.

The life of these batteries depends to a great extent upon the care they receive. Following these simple guidelines will prevent premature charge depletion and reduction of battery life.

1. **DO NOT** operate this unit where the temperature range exceeds -60°C to 60°C (-76°F to 140°F).

2. **DO NOT** charge this unit where the temperature range exceeds -20°C to 50°C (-4°F to 122°F).

3. **DO NOT** store this unit with the batteries discharged. Always store in a charged condition.

4. For long-term storage, the optimum temperature range is 10°C to 30°C (50°F to 80°F).

Recharging Batteries

Ensure that the AC line cord is connected to a 3-wire, grounded outlet. Turn the Master Power Switch (1) ON and verify that the Master Power Indicator Lamp (2) illuminates. Depress the Power Mode Switch (3) to the "AC and Recharge" position. Its built-in lamp will illuminate. Verify that the Vacuum ON/OFF/ADJ Switch (6) is "clicked" off and its respective indicator (7) is unlit. The unit is now in a recharge state. During normal AC operation, a charging current automatically flows into the batteries keeping them replenished while normal operating power requirements are met.

ROUTINE CARE AND MAINTENANCE

Cleaning

Periodically or when applicable, clean the exterior case using mild, non-abrasive cleansers. **DO NOT** allow liquids to enter the control system; a damp cloth will, in most cases, suffice. Disinfectant spraying is recommended at regular intervals.

Collection jar systems should be cleaned or disposed of in accordance with their respective instructions.

Impact's reusable collection jar, its cover and hose connectors may be autoclaved.

Maintenance

Routine maintenance should be performed on this apparatus at regular intervals and prior to being placed into service. Routine maintenance should consist of the following:

1. Cleaning checks - as described above.
2. Filter checks - replace when discolored, contact with aspirate occurs, airflow performance diminishes considerably or following 150 hours of cumulative use.
3. Overflow shutoff valve - clean in warm, soapy water or with a mild disinfectant solution when contacted with aspirate or following 150 hours of cumulative use. Dry thoroughly before reassembling.
4. Operational checks - as described in Operator Performance Checks.
5. Tubing checks - replace crimped, cracked or worn tubing as required.
6. Cart checks - verify smooth turning of casters and operation of locks. Replace worn casters.

IN CASE OF DIFFICULTY

Authorization to service this instrument by other than factory-trained and certified personnel will not be given, nor does Impact Instrumentation, Inc. assume any responsibility and/or liability resulting from such unauthorized servicing.

Impact will, upon request, provide competent biomedical engineering departments with service data and schematics. Such departments are encouraged to contact the factory for assistance when needed and it is recommended that staff members attend a factory training course. Details may be obtained by contacting the Impact Customer Service Department.

Operator Correctible Problems

Common problems may be quickly rectified by users. Should the Model 306/306M fail to operate properly, verify the integrity of all tube connections, tubing, fittings, and control settings. One can quickly isolate problems to an accessory item or the control unit by testing for vacuum at various locations.

To isolate a problem, check for vacuum at the inlet of each item, tracing backwards through the system, i.e.: vacuum from jar #1 to jar #2, vacuum from the filter to jar #1, vacuum from the Overflow Shutoff Valve to the filter, vacuum from the rear panel vacuum port to the Overflow Shutoff Valve.

Operator Problems Requiring Service

If the tests described above do not resolve an operating problem, service is required. Should servicing be necessary, contact your nearest Impact representative or the Impact Customer Service Department (201) 882-1212. Please have the Model and Serial Numbers ready and any other pertinent data you wish to include in your service request. The Model 306/306M Serial Number is located on the Rear Panel identification label.

STORAGE INFORMATION

For prolonged storage periods, the Model 306/306M should be stored indoors. The environment should be clean, and out of direct sunlight. Storage temperature range should be within 5° to 104°F (-15° to 40°C), humidity should be low.

When batteries are in extended storage, it is recommended that they receive a refresh charge at recommended intervals:

Storage Ambient	Recharge Interval
below 68°F (20°C)	18 months
68° to 86°F (20° to 30°C)	12 months
86° to 104°F (30° to 40°C)	6 months

LIMITED WARRANTY

Impact Instrumentation, Inc. warrants this instrument to be free from all defects in materials and workmanship for a period of one (1) year. Batteries, which by their nature are consumable and subjected to environmental extremes, will be warranted only for defects of manufacturing origin for a period of ninety (90) days. This warranty is neither assignable nor transferable, nor does it apply if this instrument is tampered with, misused or serviced by unauthorized personnel.

SPECIFICATIONS

Vacuum Range:	
Continuous:	
Low:	0 - 200 mm/Hg, +/- 25 mmHg (0 - 8" Hg, +/- 1" Hg)
High:	0 - 550 mm/Hg, +/- 50 mmHg (0 - 22" Hg, +/- 2" Hg)
Intermittent:	0 - 200 mm/Hg, +/- 25 mmHg (0 - 8" Hg, +/- 1" Hg)
Free Airflow Range:	24 - 35 Liters Per Minute (LPM)
Temperature Operating Range:	-60°C to 60°C (-76°F to 140°F)
Power:	
External:	115/230 VAC, 50/60 HZ; 12 VDC
Internal:	12 VDC (Rechargeable Batteries)
Operating Time:	1 Hour at maximum vacuum (typical)
Recharge Time:	16 Hours (typical)
Controls:	
Master Power:	ON/OFF
Power Mode:	AC & Recharge/Internal 12 VDC
Suction Mode:	Continuous/Intermittent
Suction Level:	High Vacuum/Low Vacuum
Suction:	ON/OFF/ADJUST
On Interval Select:	5 - 60 seconds in 5 second increments
Off Interval Select:	5 - 60 seconds in 5 second increments
Indicators:	Master Power Lamp AC & Recharge Lamp Intermittent Suction Mode Lamp Low Vacuum Level Lamp Suction "ON" Lamp Vacuum Gauge - Dual Scale, Metric/English
Case:	Aluminum, Epoxy Paint Combination
Size:	46cm W x 18cm H x 25cm D (18" W x 7" H x 10" D)
Weight:	11 kG (25 lbs.)
Cart:	
Size:	46cm W x 46cm D x 75cm H (18" W x 18" D x 30" H)
Weight:	11 kG (25 lbs.)

Specifications contained herein represent typical device performance. Impact Instrumentation, Inc. reserves the right to change these specifications without prior notification.

SECTION II. SERVICE

INTRODUCTION

The information contained herein is intended only for use by factory-trained, and certified personnel or military personnel trained in the care and servicing of this product. The manufacturer does not authorize or assume any obligations resulting from unauthorized servicing nor will it be held liable for any injuries or damages incurred therefrom.

Impact Instrumentation will provide service training at the manufacturing site at no schooling charge to users; however, travel and meal costs resulting therefrom shall be borne by the user. Training at the user's site will result in travel, meal and time costs charged to the user at prevailing rates.

The Impact service facility encourages dialogue from user service personnel towards rectifying any service related matter. All service requests may be addressed to the Service Manager, Impact Instrumentation, Inc., 27 Fairfield Place, West Caldwell, New Jersey 07006, 201/882-1212.

CAUTIONARY NOTES

External 12VDC Operation

Warning: If simultaneous AC recharging and external 12VDC operation is employed, insure that the external 12VDC source is diode protected against potentially high currents. This warning does not apply for independent operation from an external 12VDC source.

Internal Rechargeable Battery

Military versions of this product are shipped with batteries in separate cartons. Prior to placing this device into operation, the battery pack must be installed. **Do not** operate this unit until battery pack is installed.

HELPFUL HINTS

Before attempting to repair/calibrate this instrument, please take a few moments to insure that the problem is not accessory related.

Check the integrity of all vacuum hoses and tubing. Verify that the tubing has no crimps or cuts in it.

Insure that all collection jars seal properly. Insure that overflow shut-off valves do not stick.

Refer to the enclosed schematics and assembly drawings when electrically troubleshooting. Isolate the problem to a functional segment of the circuitry. Always insure the integrity of circuit ground and the correct power supply voltages.

Always safeguard your personal well being when troubleshooting electronic circuitry. Keep jewelry and liquids from the vicinity of active circuitry.

Required Tools

Screwdriver, slotted, medium size
Screwdriver, phillips head, medium size
Allen wrench, 1/16"
3/8" socket and drive handle
Pliers, medium size
Wrench, Open-end, 3/8"

General Access

For calibration and many servicing procedures, the technician need only remove the top cover of this device. For greater accessibility, however, the Front Panel should also be disengaged.

When disassembling, snap open applicable cable clamps before removing wires.

Top Cover - The Top Cover is secured by six (6) screws; three located along the rear lip, and three (3) along the top edge.

Insert and tighten each screw when reassembling.

Front Panel - The following steps are to be taken only to disengage the Front Panel from the Model 306/306M case. Additional steps to "electrically" disconnect the Front Panel are contained later in this section. Do Not disengage Front Panel to perform calibrations. When ribbon cables P1 and P2 are disconnected, ON and OFF Time circuits cannot be adjusted.

To disengage Front Panel, disconnect ribbon cables P1 and P2 from their respective Printed Circuit Board sockets. Disconnect vacuum tubing attached to rear of vacuum gauge. The Front Panel is secured by seven (7) screws; located at each front corner and three (3) across the front bottom edge (access from underneath). The Front Panel can now be pulled away from the Chassis and positioned flat (on its facing surface). The Front Panel is still captive to the Chassis by the Wire Harness service loop and ribbon cable P3. All sub-assemblies may be serviced or removed with the Front Panel in this position.

To reassemble, carefully reposition the Front Panel in place and secure tightly with the seven screws. Connect the two pieces of vacuum tubing to rear of vacuum gauge and connect P1 and P2 to their respective Printed Circuit Board jacks (observe pin polarity - see Schematics and Printed Circuit Board Assembly drawings).

Sub-Assembly Access

Printed Circuit Board - The PC Board is located on the left, sub-side, sub-assembly. Disconnect ribbon cables P1, P2 and P3 from their respective PC Board jacks. Remove the four screws which secure the PC Board to the sub-side panel. A green wire connected to a ring terminal is secured to the sub-side panel by one of these four screws. Its purpose is to maintain a ground connection with the Front Panel whenever the Front Panel is disengaged for general access.

DISASSEMBLY/REASSEMBLY (cont'd)

To reassemble, position the PC Board over four threaded female studs and secure with screws. Make sure the green wire is secured beneath the lower left-hand screw. Connect P1, P2 and P3 to their respective PC Board jacks (observe pin polarity - see Schematics and PC Board Assembly drawings).

Battery Pack - 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. Each bracket is secured with two (2) #10-32 keps nuts. To remove the Battery Pack, remove the four (4) keps nuts securing the brackets mentioned earlier. Use the 3/8" socket with drive handle or 3/8" open-end wrench. Disconnect the "fast-on" connected red and black wires. B1 and B2 are "fast-on" connected in series with a small orange jumper.

Reassemble the battery pack by first connecting the batteries, B1 and B2, in series with the small orange jumper, the black wire to the remaining negative terminal and the red wire to the remaining positive terminal (refer to Schematic drawing Sheet 1 of 3 for Battery Pack wiring). Secure the battery pack in place with both brackets and tighten the four (4) keps nuts.

Motor and Pump Assembly - The Motor and Pump Assembly is mechanically secured to the Chassis with six (6), #10-32 keps nuts. A flexible coupling joins the motor and pump shafts together. Each side of the coupling is secured to its respective shaft via two (2), set screws (1/16" hex) stacked one on top of the other. Stacking prevents the coupling from loosening due to vibration or temperature extremes. To disassemble the Motor and Pump Assembly, disconnect the black and red wires exiting the motor. The black wire is connected to chassis ground, the red wire to TB2-6. Disconnect vacuum tubing from pump inlet. The motor and pump can now be disengaged as one unit by removing the six (6) keps nuts or individually by removing the stacked set screws and respective keps nuts.

Reassemble as follows. Mount and loosely secure motor and pump to Chassis, allow coupling to "float" freely on shafts. Carefully position motor and pump shafts for inline alignment. Tighten keps nuts without disturbing alignment. Position motor shaft (flat edge) and tighten respective coupling set screw to shaft. Do the same with pump shaft. Insert and tighten stacked (second) set screws in each half of coupling. Connect red and black wires.

Heat Sink #1 - Heat Sink #1 is mounted to the right, sub-side panel. It is secured by two #10 keps nuts. To disassemble, disconnect the violet wire going to TB2-6, the white wire going to TB2-5 and the blue wire going to TB2-4. The keps nuts can be removed using the 3/8" socket with drive handle.

Reassemble by securely mounting Heat Sink #1 to the right, sub-side panel and then reattaching the violet, white and blue wires.

Heat Sink #2 - Heat Sink #2 is indirectly Chassis mounted through two standoffs. Two slotted screws secure Heat Sink #2 to these standoffs. Before removing these screws, six wires must be disconnected at terminal boards 1 and 2 (TB1 and TB2) and other locations as noted. Disconnect the yellow wire with the male in-line "fast-on" terminal positioned along side of Transformer (T1). Disconnect the two yellow wires going to TB1-1, the red wire going to TB1-2, the orange wire going to TB2-2, the blue wire going to TB2-4, and the red wire going to TB2-3. The two green wires from T1 (secondary) can be removed at the D1-4 "fast-on" terminals. Remove the two screws, previously, mentioned. Note that two black wires are ring terminal connected to ground through one screw. Disconnect vacuum tubing entering solenoid.

To reassemble, position Heat Sink #2 over its respective standoffs and secure, insuring that both ground wires (black) are tightened beneath the front screw. Connect vacuum tubing to solenoid and reattach the remaining wires to their respective locations.

Transformer - The Transformer is secured to the Chassis by two (2) #10-32 keps nuts. Disconnect the two green wires (Transformer secondary) at D1-4 ("fast-on" connections), one gray wire at TB1-3 (Model 306 only) and the other gray wire at TB2-1.* The Transformer can now be removed using the 3/8" open-end wrench.

> ***Model 306M only.** Disconnect the orange and violet wires connected to the transformer primary ("fast-on" connections).

To reassemble, secure Transformer to Chassis and reconnect wires as previously noted.

Front Panel/Wire Harness - These combined assemblies should be removed together. Follow the General Access instructions first. Starting from the left, disconnect the green ground wire secured to the bottom left-hand corner of the Printed Circuit Board. Disconnect the ribbon cables P1, P2 and P3 from the Printed Circuit Board. The following wires are also disconnected: black at TB1-4, gray at TB1-3, red at TB1-2, yellow at in-line "fast-on" positioned along side of T1, yellow at in-line "fast-on" to Rear Panel, black (via ring terminal) to ground on Heat Sink #2, brown at TB2-5, blue at TB2-4, red at TB2-3, orange at TB2-2. The Front Panel with Wire Harness can now be removed.

To reassemble, connect wires listed above and as directed in General Access instructions.

Rear Panel Assembly - In order to disengage the Rear Panel Assembly, the bottom cover must first be removed. The bottom cover is secured with six (6) screws, three located on the panel underside and three along the rear edge. Disconnect vacuum tubing connected to Rear Panel. Remove four (4) screws holding the Rear Panel to the sub-side panels. The Panel can now be positioned face down. Disconnect the following AC line cord wires: green to Chassis ground, black to TB1-4, white to TB2-1. Disconnect the red wires from F3 at B2 "+" terminal ("fast-on") and at TB2-3.

> **Model 306M only:** Disconnect the External Power Jack (J4) wires as follows: black at Chassis ground, yellow at TB1-1 and yellow from its in-line "fast-on" connector. Disconnect the AC Voltage Select Switch (S8) wires as follows: gray at TB1-3, violet and orange at T1 ("fast-on" connections). To reassemble, reconnect all wires as indicated. Secure the Rear Panel to each sub-side panel. Connect the vacuum tubing. Remount the bottom cover.

CALIBRATION PROCEDURE

Required Equipment

A. Oscilloscope, DC, Triggered, with a minimum 5 second horizontal sweep, storage capability desirable.

B. Small, slotted screwdriver.

C. Stopwatch, minimum 0.1 second resolution.

Procedures

A. Maximum Low Vacuum Level Limit

1. Set controls for either AC or DC operation (insure that batteries have been fully charged if calibrating from battery power).
2. Select CONTINUOUS and LOW VACUUM operation.
3. Turn Vacuum regulator ON and fully clockwise.
4. Occlude the Rear Panel Vacuum Inlet and adjust R2 for a 200 mm/Hg reading on the Front Panel vacuum gauge.
5. This reading may be verified using a calibrated vacuum gauge applied to the vacuum inlet.

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 Model 306/306M 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 (insure that batteries have been fully charged if calibrating from battery power).
2. Select INTERMITTENT and LOW VACUUM operation.
3. Set ON/OFF times for 5 seconds ON, 5 seconds OFF.
4. Turn Vacuum regulator ON and fully clockwise.
5. 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 to within +/- 0.5 seconds.
6. Trigger the oscilloscope to begin when the motor turns off and adjust R35 to set the OFF Time circuit for a 5 second sweep. Adjustments should be to within +/- 0.5 seconds. Again, the use of a storage type oscilloscope will simplify measurement.

NOTE: Steps 5. and 6. above may be monitored at various points. For simplicity and convenience, the positive voltage motor input should be used and the oscilloscope triggering slope set for the ON circuit, then reset for OFF circuit.

CIRCUIT DESCRIPTIONS

Refer to the enclosed schematic diagrams.

AC to DC Rectifier, Power and Charging Circuits - 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. Switch S1A and S1B acts as a Master Power control, which unless activated, prevents operation from internal or external power sources and battery recharge. Components D5 and D6 are blocking diodes which prevent false illumination of L2 during battery operation. 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. F3 protects the battery pack from high current discharges in excess of 10A. S8 (Model 306M) permits user selection of the input AC source; either 117VAC (nominal) or 220-240VAC. J4 (Model 306M) enables operation from an external 12VDC source whenever the Master Power switch is activated. Blocking diodes D5 and D7 block external 12VDC from any other power source. This allows simultaneous battery recharge and operation from AC power when external 12VDC is connected. 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.

Suction Level and Motor Speed Control Circuits - Components F2, L3, S3/R3, R2, S4A, S5A, Q1-3 and M1 comprise this section. 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 electronic vacuum regulator. 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. 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. However, if 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 mm/Hg when properly calibrated. Switch S5A, when closed, provides a direct input to the base of Q1. Note that S4A and S4B and S5A and S5B are reciprocating switches whose alternate functions will be described in the following sections. Lamp L3 illuminates whenever S3 is closed. S3/R3, S4A and S5A are Front Panel mounted, R2 is located on the Printed Circuit Board, Q1-3 on Heat Sink #1, and M1 is Chassis mounted.

Intermittent Operation - 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. 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.

5-Volt Power Supply - 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. 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 Printed Circuit Board.

Clock Oscillator - 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 in-line package. All components are mounted to the Printed Circuit Board.

Type 555 Timer Operation - These integrated circuits are used as functional monostables for the OFF Time and ON Time circuits. When a negative impulse brings the trigger input (pin 2) below 1/3 Vcc, the output (pin 3) goes to a HIGH logic level (Vcc). 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 Vcc, resetting the internal flip-flop, causing the capacitor to discharge to ground and the output to return to a LOW logic level (ground). 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.

Off Time Monostable - The purpose of this circuit is to control the time period that the On Time Monostable output remains LOW. 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. Pin 3 is held LOW when the On Time Monostable is HIGH. R7 and C4 shape the NOR gate output into positive and negative impulses, biased at Vcc to prevent mistriggering of the monostable and are applied to IC2 pin 2. C6 and R11-22 determine the time periods for which the Off Time Monostable is HIGH. C9, R35 and R37 are used to adjust the delay multiplier in the time period equation: $T = (.975 \pm .125)\ RC$. All components are mounted to the Printed Circuit Board.

On Time Monostable - The On Time Monostable controls the relay system and determines for how long the Off Time Monostable remains LOW. Components IC3, C5, C7, C8, R8, R23-34, R36 and R38 comprise this circuit. Essentially, this monostable and its corresponding components act in the same manner as the Off Time Monostable. The On Time output triggers the Off Time Monostable via IC1 pin 3 and the Relay System both direct and through IC1 pin 4. All components are Printed Circuit Board mounted.

Relay System - 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 collection system to atmospheric pressure during off cycles. The Relay System consists of K1, K2, Q4, Q5, R9, and the solenoid. 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. 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. Switch S3 must be closed to operate the Motor Speed Control circuit and solenoid. Components K1, K2, Q4 amd R9 are mounted to the Printed Circuit Board; Q5 and the solenoid to Heat Sink #2.

* * * N O T E * * *

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.

PREVENTATIVE MAINTENANCE INSPECTIONS

Preventative maintenance inspections should be incorporated on a routine basis to insure proper device performance. These inspections should consist of both visual and performance checks, and cleaning when warranted.

Preventative maintenance inspections (PMI) should be made as follows:

If monthly usage is less than 50 hours - PMI bimonthly.

If monthly usage is greater than 100 hours - PMI monthly.

Visual Checks: Visual checks should include, but not be limited to:

1. Inspection of tubing, fittings and collection jars for cracks, crimps, leakage and general wear. They should be replaced as necessary.

2. Check the vacuum gauge for a "zero area" reading when the device is turned off.

3. Check the disposable Hydrophobic Filter for discoloration. Replace if discolored.

4. Check collection jars for chips or cracks in bottle, for worn or loose fitting lids. Replace as required.

Performance Checks: Performance checks should include, but not be limited to:

1. Check that all lamps illuminate as required.

2. Check tactile feel and operation of switches and controls.

3. Check various operating modes (refer to the "Operator Performance Checks" section in the OPERATION portion of this manual).

4. Check the Overflow Shutoff Valve. Insure that the ball float does not stick and is debris free.

5. Check cart casters for rotation and locking mechanism performance.

Cleaning: Refer to the ROUTINE CARE AND MAINTENANCE "CLEANING" section in the OPERATION portion of this manual.

Continuous Suction

Symptom: No Vacuum or Weak Vacuum.

Controls: Master Power Switch - ON
Continuous Suction Mode - select
High Vacuum Level - select
Vacuum ON/OFF/ADJUST - ON, fully clockwise.

Check: Hose and hose connections for cracks or crimps. Verify that pump turns easily, coupling set screws are tight between pump and motor.

If L1 and L3 are illuminated, check for voltage at the motor input, Q1-Q3, S5A and R3. Momentarily select Low Vacuum Level and verify voltage at R2.

If L1 is on and L3 fails to light, test L3 for open. Check F2 (10A fuse) and S3 for voltage presence.

If L1 and L3 are both off, test L1 for open. Check S1A and S1B connections. Check for voltage outputs from D1-5, T1, S2A and F1 on AC power. Check for voltage output from B1, B2 and S2B on internal 12 VDC.

Symptom: No Internal Battery Power.

Controls: Master Power Switch - ON
AC and Recharge - select

Check: Verify voltage at D6. Check for charging current going through R1 into B1, B2. See that L2 illuminates. Select Internal 12 VDC power and test for output of B1, B2 through S2B (allow adequate recharge time before testing for battery output).

Verify that in-line "fast-on's" (yellow) are not interchanged thus reversing D7 anode and cathode connections.

Intermittent Suction

Symptom: Poor Intermittent Operation.

Controls: Master Power Switch - ON
Intermittent Suction Mode - select
Low Vacuum Level - select
Suction ON/OFF/ADJUST - ON, fully clockwise.
ON Time - 5 seconds
OFF Time - 5 seconds

Check: Relay K2 for proper solenoid input signal. Verify that there is no voltage to the base of Q5 during "ON" cycles and about 12 VDC during the "OFF" cycle. This voltage can also be checked at the solenoid and collector of Q5.

Check relay K1 to see that proper turn-on and turn-off signals are applied to its coil and voltage "switched" across S5A to the base of Q1.

Check for proper control signal gating on IC1 and Q4.

Check the 5V regulator for proper output, and the overall appearance of the PC board for shorts, bad solder connections and/or loose connector cables when erratic operation occurs.

Symptom: Motor will not turn on, but Solenoid properly activates.

Check: IC3 and its associated elements.

Symptom: On or Off Cycle does not end.

Check: Loose or open connection between the timing resistors R11-34 to IC2 pins 6 and 7 or IC3 pins 6 and 7. For On cycle problem, check R23-34 and IC3; for the Off cycle, R11-22 and IC2.

TECHNICAL DOCUMENTATION

NOTE: Refer to applicable Bill Of Material for Part Number description.

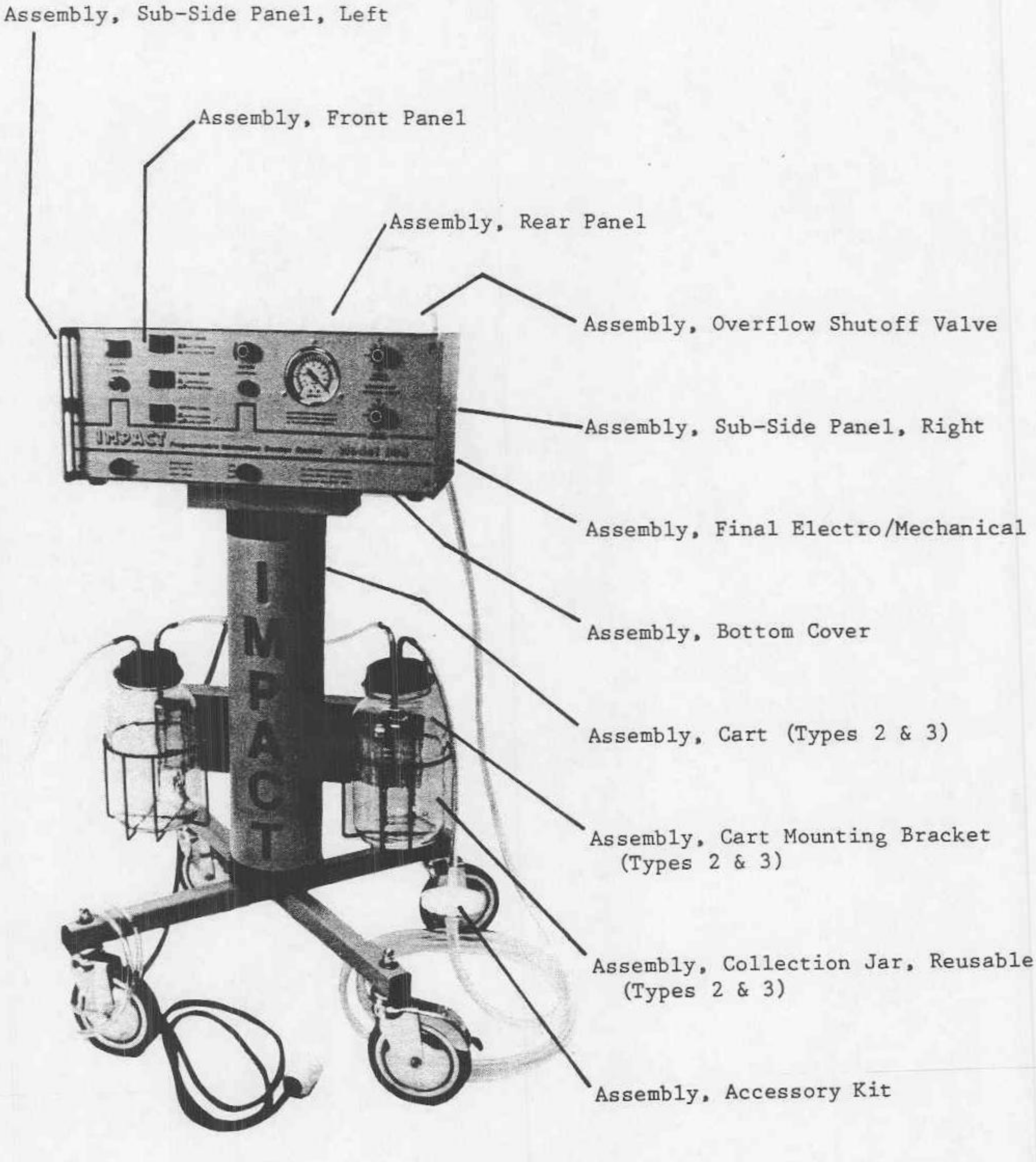
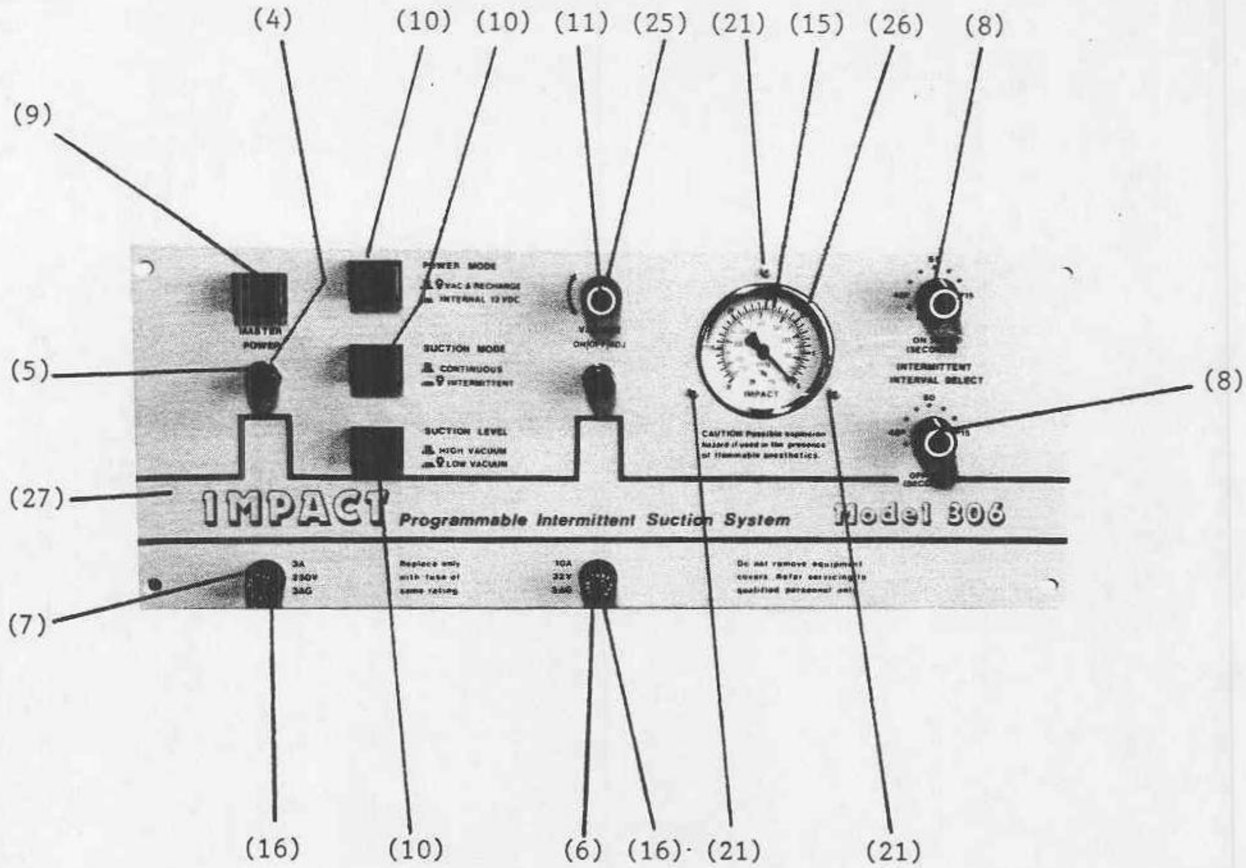


Figure 5. Composite Illustration Depicting Major Sub-Assemblies

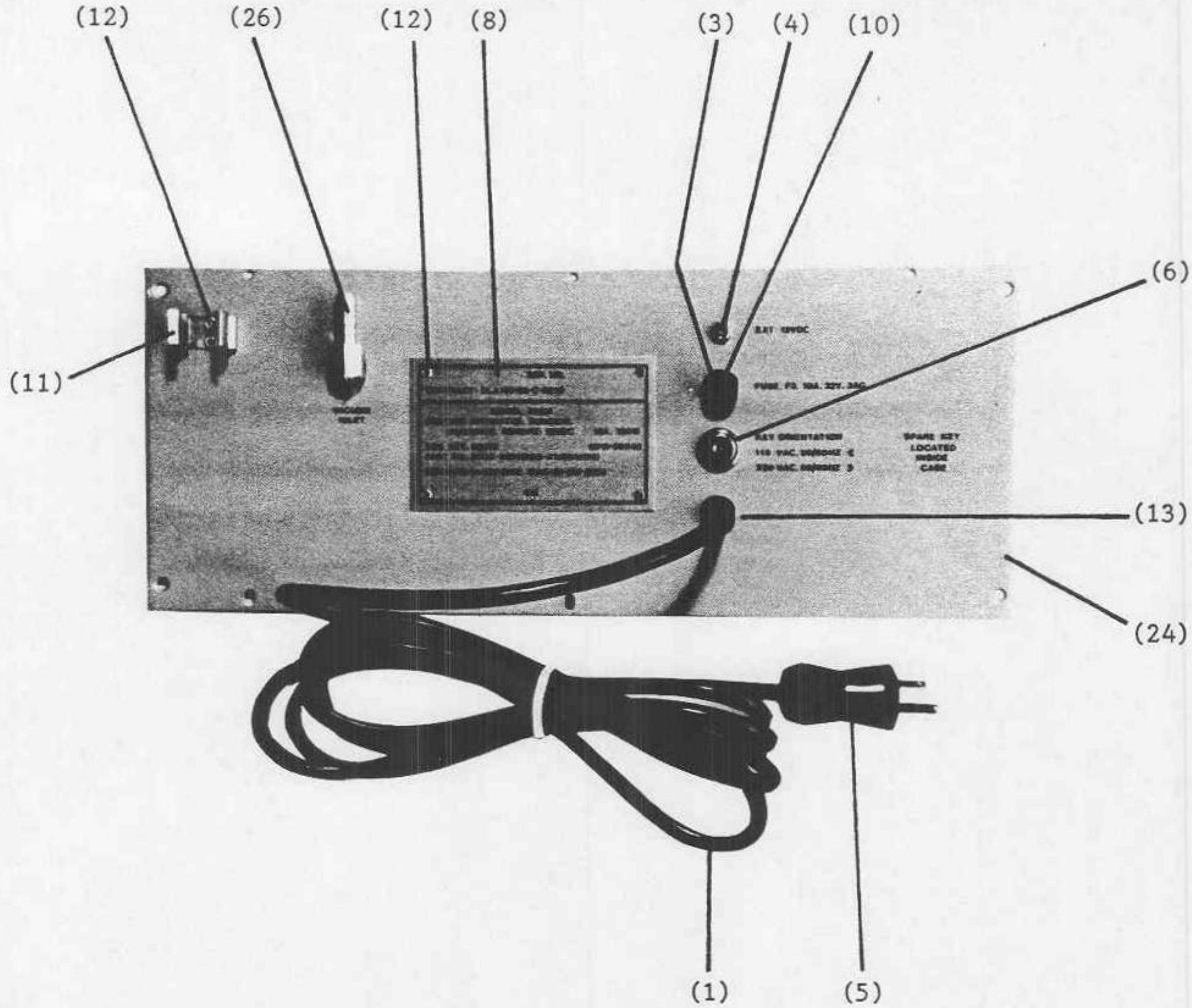


#	Part Number	#	Part Number	#	Part Number
* 1	010-0008-00	*13	312-0019-00	25	392-0001-00
* 2	010-0010-00	*14	312-0021-00	26	400-0002-00
* 3	016-0004-00	15	315-0001-00	27	422-0306-11
4	068-0004-00	16	334-0004-00	*28	480-0062-00
5	068-0005-00	*17	334-0012-00	*29	480-0027-00
6	081-0004-00	*18	334-0017-00	*30	700-0306-07,08,09,27,41,42,45-48
7	081-0005-00	*19	346-0440-01	*31	704-0306-07
8	117-0003-00	*20	346-0632-03		
9	121-0003-00	21	358-0440-05		
10	121-0004-00	*22	374-0005-00		
11	214-0502-03	*23	374-0006-00		
*12	305-0001-00	*24	376-0019-00		

* These components appear on back side of Front Panel.

See Bill of Material 703-0306-12 for complete Part Number description.

Figure 6. Front Panel Assembly

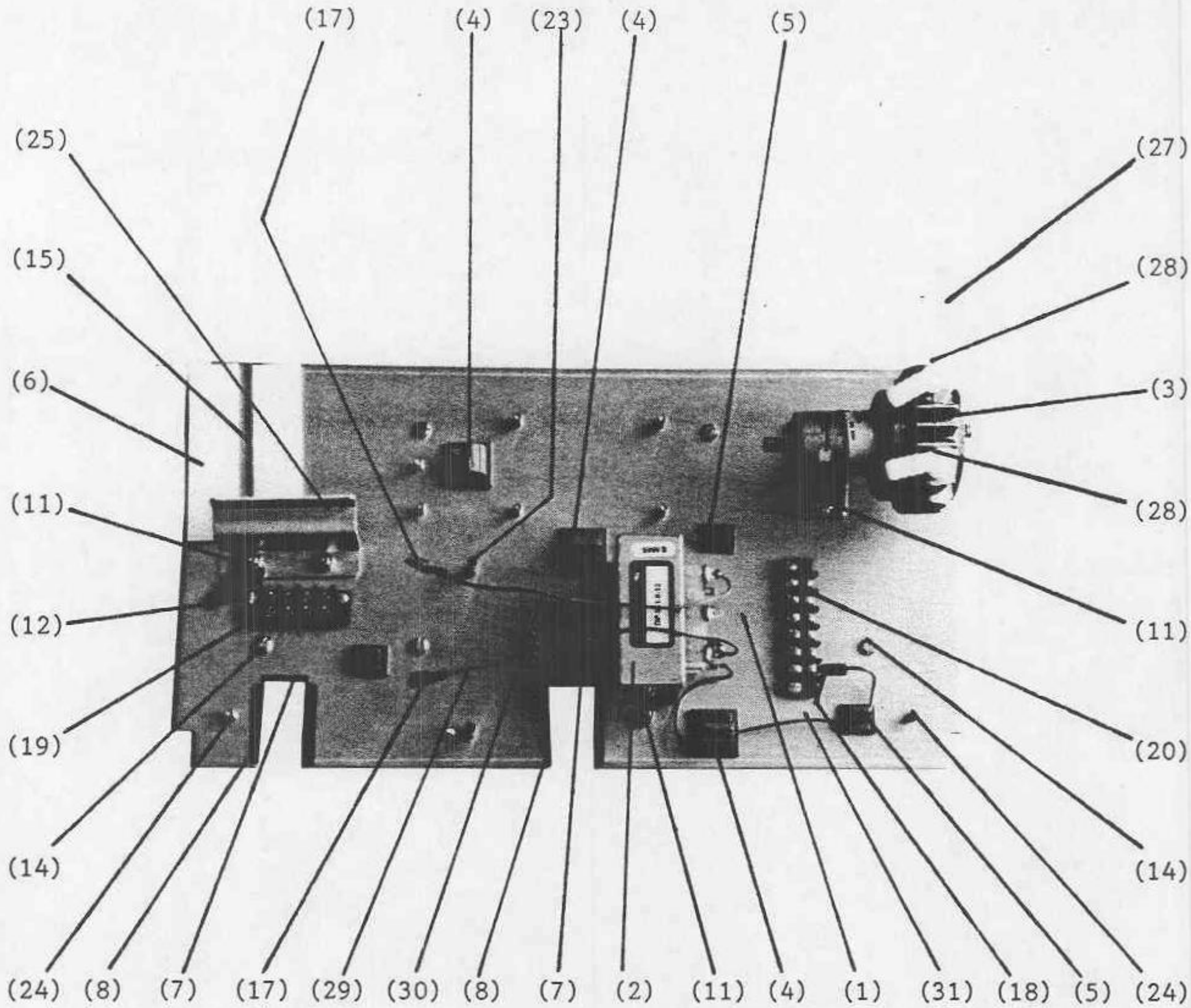


#	Part Number	#	Part Number	#	Part Number
1	003-1613-01	13	340-0003-00	*25	480-0049-00
* 2	016-0004-00	*14	346-0632-03	26	480-0118-00
3	081-0004-00	*15	368-0005-00	*27	700-0306-01,02,04,06,07,08,12,13
4	089-0007-00	*16	374-0003-00		
5	099-0006-00	*17	374-0005-00		
6	131-0007-00	*18	374-0006-00		
* 7	305-0001-00	*19	374-0012-00		
8	325-0306-01	*20	374-0015-00		
* 9	312-0018-00	*21	374-0016-00		
10	334-0004-00	*22	376-0014-00		
11	334-0029-00	*23	376-0031-00		
12	338-0006-00	24	422-0306-21		

* These components appear on back side of Rear Panel.

See Bill of Material 703-0306-09 for complete Part Number description.

Figure 7. Rear Panel Assembly

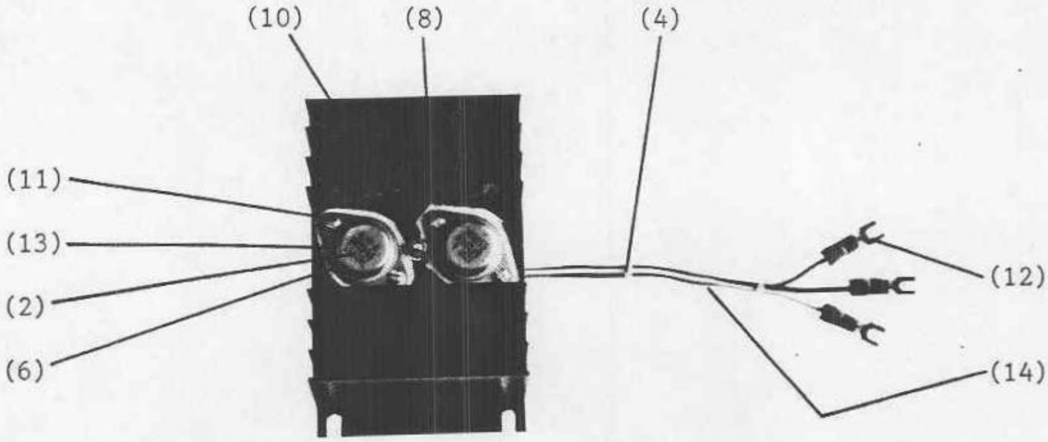


#	Part Number	#	Part Number	#	Part Number
1	012-0006-00	*13	356-0632-12	25	404-0306-111
2	023-0007-00	14	352-1032-08	*26	404-0306-71
3	041-0003-00	15	357-1032-08	27	414-0306-11
4	334-0012-00	*16	367-0632-02	28	480-0034-00
5	334-0016-00	17	374-0001-00	29	700-0306-28
6	312-0018-00	18	374-0005-00	30	700-0306-29
7	340-0007-00	19	374-0007-00	31	700-0306-39
8	340-0008-00	20	374-0008-00		
* 9	346-0632-01	*21	376-0004-00		
*10	346-0632-03	22	376-0022-00		
11	346-1032-01	23	378-0632-16		
12	352-0632-10	24	378-1032-08		

* These components appear on underside of Chassis or attach other Assemblies to Chassis.

See Bill of Material 703-0306-10 for complete Part Number description.

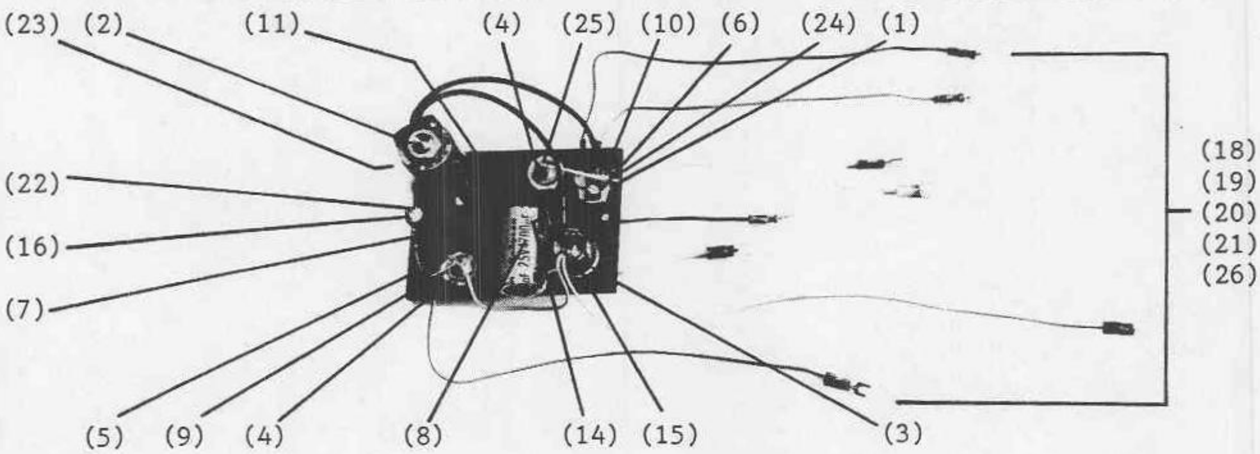
Figure 8. Chassis Assembly



#	Part Number	#	Part Number	#	Part Number
* 1	016-0004-00	* 7	310-0004-00	14	700-0306-20,33,34,35,36,43
2	051-3055-00	8	310-0304-11		
* 3	051-4921-00	* 9	344-0002-00		
4	305-0001-00	10	346-0440-01		
* 5	310-0002-00	11	352-0440-08		
6	310-0003-00	12	374-0005-00		
		13	606-0001-00		

* These components appear on underside of Heat Sink #1.

See Bill of Material 704-0306-01 for complete Part Number description.

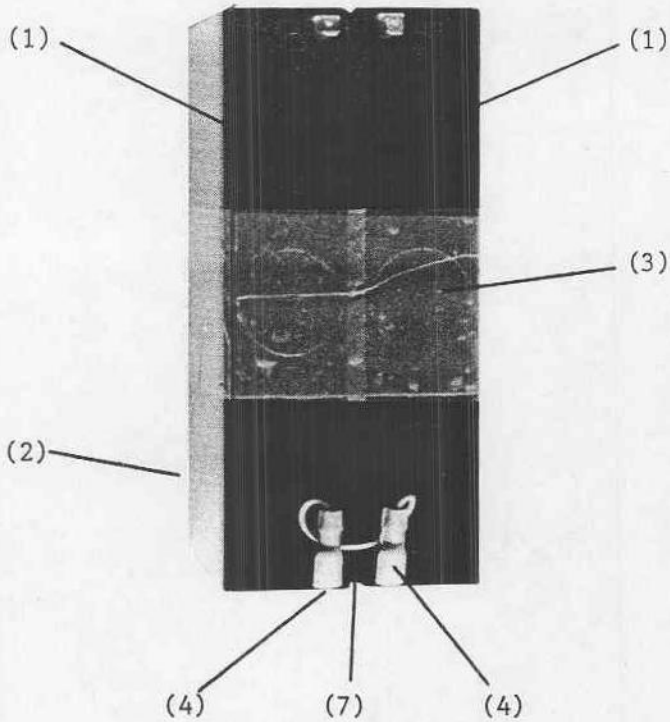


#	Part Number	#	Part Number	#	Part Number
1	016-0004-00	*12	346-0440-01	*23	480-0034-00
2	033-0001-00	*13	346-0632-02	24	602-0001-00
3	047-0005-00	14	352-0440-08	25	606-0001-00
4	047-3879-00	15	352-0632-10	26	700-0306-03,06,09,14,22, 23,26,30,44
5	047-4003-00	16	352-0632-36		
6	051-4921-00	*17	352-0832-04		
7	210-0120-00	18	374-0002-00		
8	252-4786-31	19	374-0005-00		
9	310-0001-00	20	374-0006-00		
10	310-0002-00	21	374-0012-00		
11	310-0306-11	22	376-0013-00		

* These components appear on underside of Heat Sink #2.

See Bill of Material 704-0306-02 for complete Part Number description.

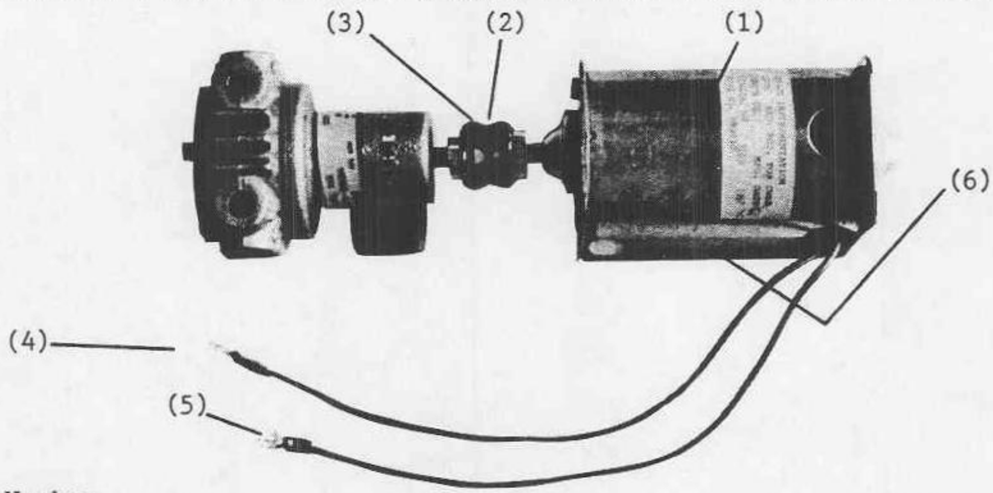
Figure 9. Heat Sink #1 & Heat Sink #2 Assemblies



#	Part Number
1	021-0015-00
2	312-0018-00
3	312-0020-00
* 4	374-0003-00
* 5	374-0006-00
* 6	700-0306-05
7	700-0306-21

* Jumper with terminals not shown.

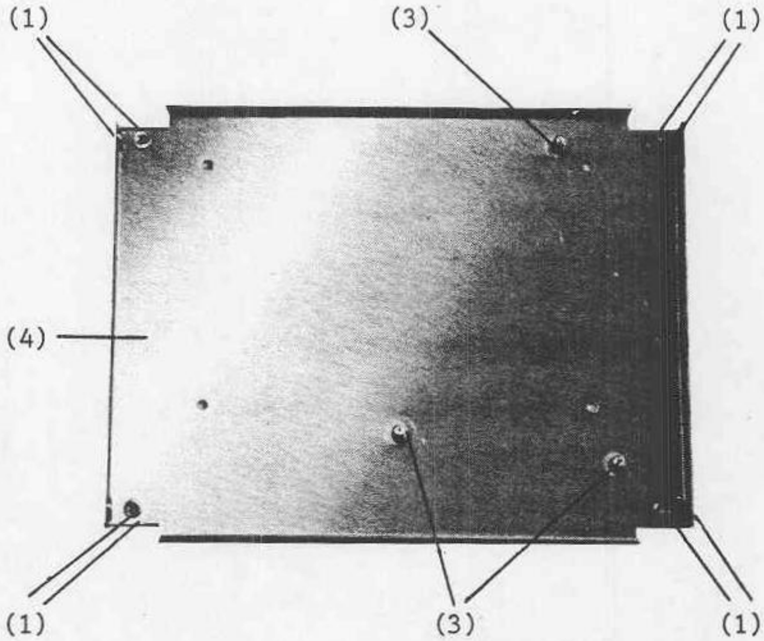
See Bill of Material 703-0306-07 for complete Part Number description.



#	Part Number
1	039-0002-00
2	336-0003-00
3	367-0632-02
4	374-0005-00
5	374-0006-00
6	404-0304-11

See Bill of Material 704-0306-03 for complete Part Number description.

Figure 10. Battery Pack & Pump Motor Assemblies



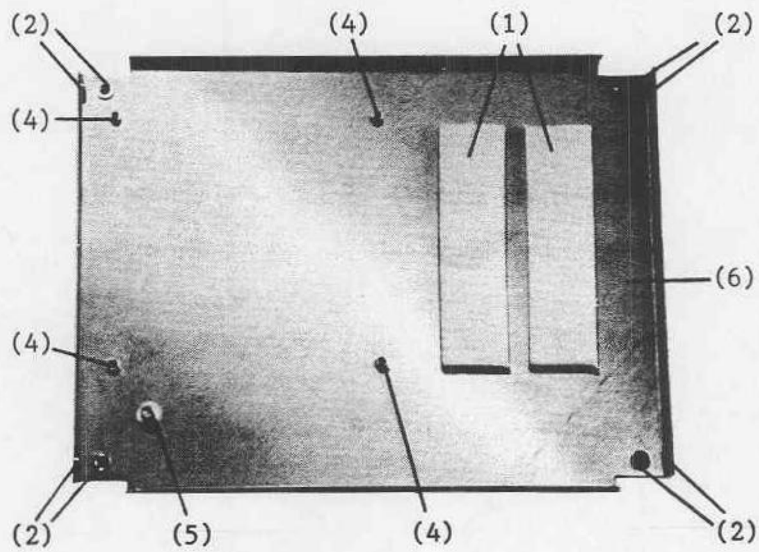
#	Part Number
1	346-0632-03
* 2	346-1032-01
3	378-1032-08
4	422-0306-31
* 5	704-0306-01

* Not shown, Heat Sink #1 and mounting hardware.

See Bill of Material 703-0306-05 for complete Part Number description.

Right Sub-Side

Left Sub-Side



#	Part Number
1	312-0018-00
2	346-0632-03
* 3	352-0440-04
4	378-0440-04
5	378-1032-08
6	422-0306-51
* 7	702-0306-01

* Not shown, Printed Circuit Board and mounting hardware.

See Bill of Material 703-0306-06 for complete Part Number description.

Figure 11. Left & Right Sub-Side Assemblies

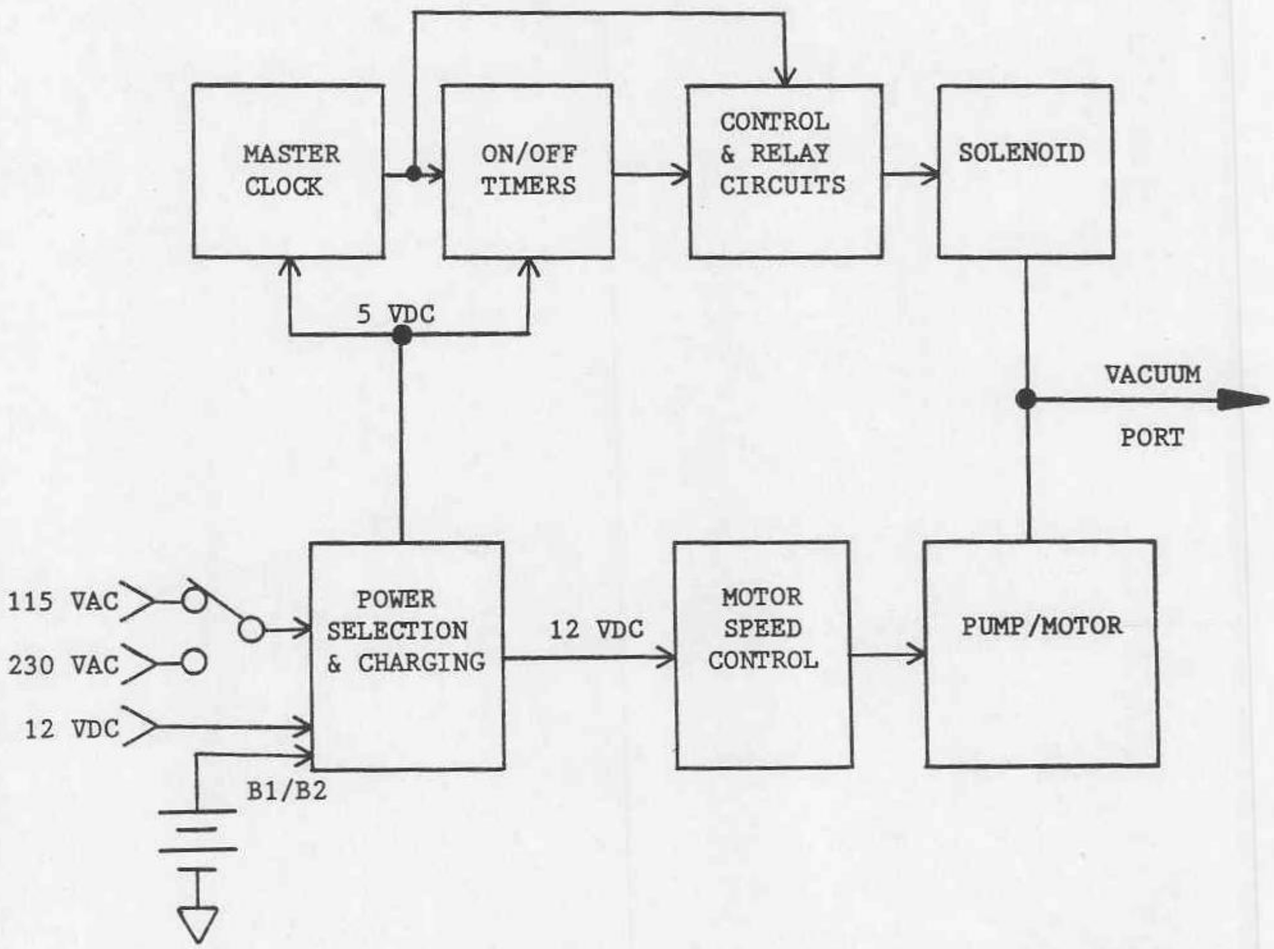


Figure 12. Functional Block Diagram

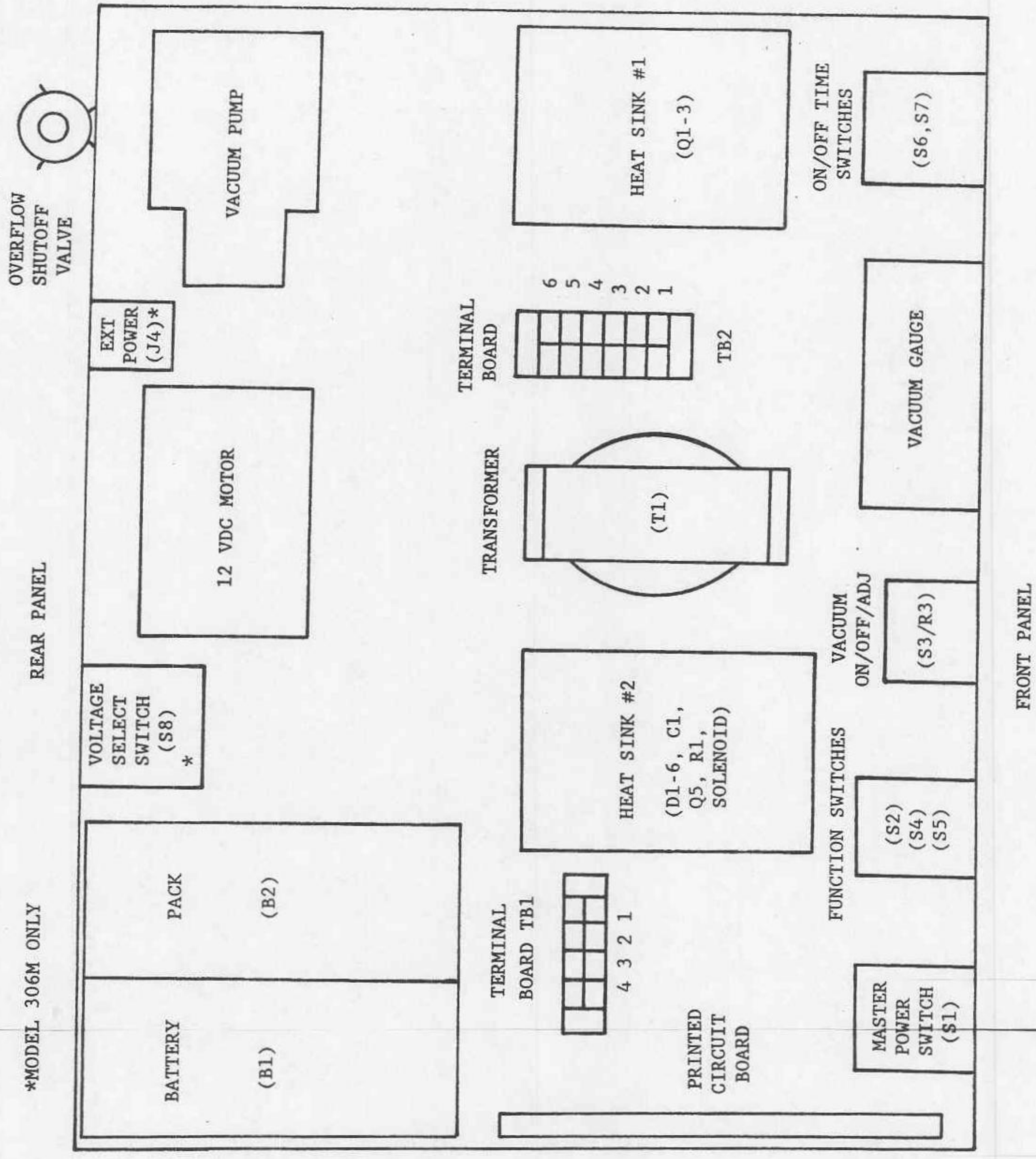


Figure 13. Chassis Layout

	QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
	1	701-0306-02	Assembly, Final Electro/Mechanical	PL701-0306-02	
	1	702-0306-01	Assembly, Printed Circuit Board	PL702-0306-01	
	1	WL702-0306-01	Wire List	WL702-0306-01	
	1	WL702-0306-02	Wire List	WL702-0306-02	
	1	703-0306-02	Assembly, Bottom Cover	PL703-0306-02	
	1	703-0306-05	Assembly, Sub-Side Panel, Right	PL703-0306-05	
	1	703-0306-06	Assembly, Sub-Side Panel, Left	PL703-0306-06	
		703-0306-07	-- voided old Bill of Material --		
	1	703-0306-09	Assembly, Rear Panel	PL703-0306-09	
	1	703-0306-10	Assembly, Chassis	PL703-0306-10	
	1	703-0306-12	Assembly, Front Panel	PL703-0306-12	
	1	703-0306-13	Assembly, Battery Pack	PL703-0306-13	
	1	704-0306-01	Assembly, Heat Sink #1	PL704-0306-01	
	1	704-0306-02	Assembly, Heat Sink #2	PL704-0306-02	
	1	704-0306-03	Assembly, Motor Mounting Bracket	PL704-0306-03	
		704-0306-04	-- voided old Bill of Material --		
*	1	704-0306-05	Assembly, Cart Mounting Bracket	PL704-0306-05	
		704-0306-06	-- voided old Bill Of Material --		
	1	704-0306-07	Assembly, Wire Harness	PL704-0306-07	
	1	704-0317-02	Assembly, Overflow Shutoff Valve	PL704-0317-02	
*	1	802-0306-02	Assembly, Cart	PL802-0306-02	
		802-0306-03	-- voided old Bill of Material --		
		802-0306-04	-- voided old Bill of Material --		
	1	802-0306-05	Assembly, Accessory Kit	PL802-0306-05	
	2	802-0306-06	Assembly, Collection Jar, Reusable	PL802-0306-06	

* Provide with NSN 6515-01-267-2726.

PL	TITLE	WHERE USED	REV.	DR	PAGE	OF
800-0306-02	MASTER BILL OF MATERIALS	MODEL 306M	D	LHS	1	1

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
7	346-1032-01	Nut, Keps, 10-32		
21	357-0632-05-1	Screw, Phillips, Flat Head, Yel/Cad Plate, 6-32 x 5/16		
7	358-0632-06-1	Screw, Phillips, Pan Head, Yel/Cad Plate, 6-32 x 3/8		
1	404-0306-21	Bracket, Battery Mtg. Clamp #2	B404-0306-21	
2	404-0306-31	Bracket, Chassis Mounting	B404-0306-31	
1	416-0306-11	Cover, Top	C416-0306-11	
1	422-0307-31	Panel, Side w/Handles, Left	C422-0307-31	
1	422-0307-41	Panel, Side w/Handles, Right	C422-0307-41	
1	540-0052-00	Tubing, 3/8" ID x 1 1/2" LG		
1	540-0053-00	Tubing, 3/8" ID x 2" LG		
1	540-0029-00	Tubing, 3/8" ID x 4 1/2" LG		
1	540-0039-00	Tubing, 3/8" ID x 2 1/2" LG		
1	703-0306-02	Ass'y, Bottom Cover	PL703-0306-02	
1	703-0306-05	Ass'y, Sub-Side Panel, Right	PL703-0306-05	
1	703-0306-06	Ass'y, Sub-Side Panel, Left	PL703-0306-06	
1	703-0306-07	Ass'y, Battery Pack	PL703-0306-07	
1	703-0306-09	Ass'y, Rear Panel	PL703-0306-09	
1	703-0306-10	Ass'y, Chassis	PL703-0306-10	
1	703-0306-12	Ass'y, Front Panel	PL703-0306-12	
1	820-0017-00	"Y" Fitting, Polypropylene, 3/8"		

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
1	012-0005-00	Jumper, 22 AWG, Busswire, 1" LG		JP1
2	037-0001-00	Relay, DIP, 6 VDC		K1, K2
1	051-3643-00	Transistor, 2N3643		Q4
1	054-4001-00	IC, CD4001AE, Quad, 2 Input Nor		IC1
1	055-0309-00	IC, LM309H, 5V Regulator		IC4
2	055-0555-00	IC, NE555V, Functional Block		IC2, 3
3	109-0001-00	Socket, IC, DIP, 14 Pin		
2	109-0005-00	Socket, IC, DIP, 8 Pin		
2	109-0007-00	Socket, IC, DIP, 14 Pin, Hi-Rel		J1, 2
1	109-0008-00	Socket, IC, DIP, 8 Pin, Hi-Rel		J3
1	200-0102-02	Resistor, Carbon Film, 1/4 W, 5%, 1K		R9
2	200-0103-02	Resistor, Carbon Film, 1/4 W, 5%, 10K		R7, 8
1	200-0104-02	Resistor, Carbon Film, 1/4 W, 5%, 100K		R5
1	200-0223-02	Resistor, Carbon Film, 1/4 W, 5%, 22K		R6
1	210-0400-00	Resistor, Power, WW, 5 W, 10%, 40 Ohms		R4
2	212-1003-00	Resistor, Precision, 1/8 W, 1%, 100K		R13A, 25A
2	212-1213-00	Resistor, Precision, 1/8 W, 1%, 121K		R14A, 26A
2	212-1302-00	Resistor, Precision, 1/8 W, 1%, 13K		R19B, 31B
2	212-1503-00	Resistor, Precision, 1/8 W, 1%, 150K		R15A, 27A
2	212-1742-00	Resistor, Precision, 1/8 W, 1%, 17.4K		R20B, 32B
2	212-1821-00	Resistor, Precision, 1/8 W, 1%, 1.82K		R11B, 23B
4	212-1822-00	Resistor, Precision, 1/8 W, 1%, 18.2K		R14B, 17B, 26B, 29B
2	212-2002-00	Resistor, Precision, 1/8 W, 1%, 20K		R37, 38
2	212-2003-00	Resistor, Precision, 1/8 W, 1%, 200K		R16A, 28A
2	212-2263-00	Resistor, Precision, 1/8 W, 1%, 226K		R17A, 29A
2	212-2492-00	Resistor, Precision, 1/8 W, 1%, 24.9K		R15B, 27B
4	212-2742-00	Resistor, Precision, 1/8 W, 1%, 27.4K		R21B, 22B, 33B, 34B
2	212-2743-00	Resistor, Precision, 1/8 W, 1%, 274K		R18A, 30A
2	212-3013-00	Resistor, Precision, 1/8 W, 1%, 301K		R19A, 31A
2	212-3322-00	Resistor, Precision, 1/8 W, 1%, 33.2K		R11A, 23A
2	212-3323-00	Resistor, Precision, 1/8 W, 1%, 332K		R20A, 32A
2	212-3573-00	Resistor, Precision, 1/8 W, 1%, 357K		R21A, 33A
2	212-3923-00	Resistor, Precision, 1/8 W, 1%, 392K		R22A, 34A
2	212-4751-00	Resistor, Precision, 1/8 W, 1%, 4.75K		R13B, 25B
2	212-5621-00	Resistor, Precision, 1/8 W, 1%, 5.62K		R18B,30B

PL	TITLE	WHERE USED	REV.	DR	PAGE	OF
702-0306-01	ASSEMBLY, PRINTED CIRCUIT BOARD	MODEL 306	C	LHS	1	2

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
2	212-6982-00	Resistor, Precision, 1/8 W, 1%, 69.8K		R12A, 24A
2	212-9531-00	Resistor, Precision, 1/8 W, 1%, 9.53K		R16B, 28B
2	218-0105-00	Resistor, Variable, Horiz, Trim, 1M		R35, 36
1	218-0253-00	Resistor, Variable, Horiz, Trim, 25K		R2
1	240-0306-01	Printed Circuit Board	C240-0306-01	
2	252-1076-31	Capacitor, Aluminum, Elect, 100 ufd, 25V (See Note 1)		C6, 7
4	257-1034-12	Capacitor, Mylar .01 ufd, 100V, 10%		C4, 5, 8, 9
2	257-1044-12	Capacitor, Mylar, .1 ufd, 100V, 10%		C2, 3

NOTES:
1. Select for 130 ufd.

RUN	COLOR	SLD-(AWG)-STR	LENGTH (")	STRIP (")	TIN	ORIGIN	STRIP (")	TIN	DESTINATION
1	Blk	18	23 1/2	3/8	Y	F1 in	3/8		TB1-4
2	Blk	18	7	3/8	Y	F1 out	3/8	Y	S1A-4
3	Blk	18	11	3/8	Y	S3/R3 Gnd	3/8		HS #2 Gnd
4	Blk	18	9	3/8	Y	S3/R3 Gnd	3/8	Y	S4 Pin a (L5)
5	Blk	18	8 1/2	3/8		B1 Neg	3/8		Chassis Gnd
6	Blk	18	4	3/8	Y	D1-4 (-)	3/8		HS #2 Gnd
7	Blk	18	5	3/8	Y	S2A-2	3/8	Y	S1A-3
8	Blk	18	3	3/8	Y	S2 Pin a (L2)	3/8	Y	S5 Pin a (L4)
9	Blk	18	3	3/8	Y	S5 Pin a (L4)	3/8	Y	S4 Pin a (L5)
10	Brn	18	19 1/2	3/8	Y	S5A-1	3/8		TB2-5
11	Red	18	20 1/2	3/8	Y	S2B-4	3/8		TB2-3
12	Red	18	16 1/2	3/8	Y	F3 out	3/8		TB2-3
13	Red	18	13	3/8		B2 Pos	3/8	Y	F3 in
14	Red	18	10	3/8	Y	Q5B	3/8		TB1-2
15	Org	18	7	3/8	Y	S3/R3 Wiper	3/8	Y	S5A-2
16	Org	18	6	3/8	Y	S3/R3 common	3/8	Y	F2 out
17	Org	18	12	3/8	Y	S1B-3	3/8	Y	F2 in
18	Org	18	7 1/2	3/8	Y	S1B-3	3/8	Y	S4B-3
19	Org	18	21	3/8	Y	S2 Pin b (L2)	3/8		TB2-2
20	Org	18	3	3/8	Y	Q2B	3/8	Y	Q3B
21	Org	18	4	3/8		B2 Neg	3/8		B1 Pos
22	Org	18	5	3/8	Y	D5 Anode	3/8		D1-4 (+)
23	Org	18	12	3/8		D1-4 (+)	3/8		TB2-2
*24	Yel	18	5	3/8	Y	S2B-3	3/8	Y	S1B-4
*25	Yel	18	18 1/2	3/8	Y	S1B-4	3/8		TB1-1
26	Yel	18	4	3/8	Y	D5 Cathode	3/8		TB1-1
27	Yel	18	2 1/2	3/8	Y	S5B-4	3/8	Y	S5 Pin b (L4)
28	Grn	18	7	3/8	Y	T1 Sec	3/8		D1-4 (#1 AC)
29	Grn	18	7	3/8	Y	T1 Sec	3/8		D1-4 (#2 AC)
30	Blu	18	8	3/8	Y	Q5C	3/8		TB2-4
31	Blu	18	9	3/8	Y	S3/R3	3/8	Y	S4A-2
32	Blu	18	15	3/8	Y	S3/R3	3/8		TB2-4
33	Blu	18	7 1/2	3/8	Y	Q2C	3/8		TB2-4
34	Blu	18	3	3/8	Y	Q2C	3/8	Y	Q3C
35	Vio	18	7	3/8	Y	Q3E	3/8		TB2-6
36	Vio	18	3	3/8	Y	Q2E	3/8	Y	Q3E
37	Gry	18	18 1/2	3/8	Y	S2A-1	3/8		TB1-3

RUN	COLOR	SLD-(AWG)-STR	LENGTH (")	STRIP (")	TIN	ORIGIN	STRIP (")	TIN	DESTINATION
38	Gry	18	8	3/8	Y	S3/R3 Pos	3/8	Y	S4A-1
39	Gry	18	9 1/2	3/8	Y	T1 Pri	3/8		TB2-1
*40	Gry	18	8 1/2	3/8	Y	T1 Pri	3/8		TB1-3
41	Gry	18	3 1/2	3/8	Y	S5B-3	3/8	Y	S4B-4
42	Gry	18	2 1/2	3/8	Y	S4B-4	3/8	Y	S4 Pin b (L5)
43	Wht	18	7 1/2	3/8	Y	Q1B	3/8		TB2-5
44	Red	18	11	3/8	Y	R1	3/8		TB2-3
45	Black	18	4 1/2	3/8	Y	L1	3/8	Y	S2-A
46	Gray	18	3 1/2	3/8	Y	L1	3/8	Y	S1B-3
47	Black	18	6 1/2	3/8	Y	L2	3/8	Y	S3/R3 (COM)
48	Gray	18	3 1/2	3/8	Y	L2	3/8	Y	S3/R3

*Run numbers 24, 25 & 40 are not used on the Model 306M.

RUN	COLOR	SLD-(AWG)-STR	LENGTH (")	STRIP (")	TIN	ORIGIN	STRIP (")	TIN	DESTINATION
1	Blk	18	8	3/8	Y	J4 Slv	3/8		Chassis Gnd
2	Org	18	13	3/8	Y	S8	3/8		T1 Pri CT
3	Yel	18	6	3/8	Y	D7 Cathode	3/8		TB1-1
4	Yel	18	13	3/8	Y	J4 Tip	3/8		TB1-1
5	Yel	18	24	3/8	Y	S1B-4	3/8		J4 Tip
6	Vio	18	13	3/8	Y	S8	3/8		T1 Pri
7	Yel	18	4	3/8	Y	J4 Tip	3/8		S1B-4
8	Gry	18	8 1/2	3/8	Y	S8 common	3/8		TB1-3
9	Yel	18	7 1/2	3/8	Y	D7 Anode	3/8		S2B-3
10	Yel	18	16	3/8		D7 Anode	3/8	Y	S2B-3

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
4	378-1032-03	Standoff, Self-Clinching, 10-32 x 3/16 Nut		
1	416-0306-21	Cover, Bottom	B416-0306-11	
4	450-0001-00	Bumper, Black, Rubber Feet, P/S		

PL	TITLE	WHERE USED	REV.	DR	PAGE	OF
703-0306-02	ASSEMBLY, BOTTOM COVER	MODEL 306	D	LHS	1	1

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
8	346-0632-03	Nut, Self-Clinching, 6-32		
2	346-1032-01	Nut, Keps, 10-32		
3	378-1032-08	Standoff, Self-Clinching, Stud, 10-32 x 1/2		
1	422-0306-31	Panel, Sub-Side, Right	C422-0306-31	
1	704-0306-01	Assembly, Heat Sink #1	PL704-0306-01	

PL	TITLE	WHERE USED	REV.	DR	PAGE	OF
703-0306-05	ASSEMBLY, SUB-SIDE PANEL, RIGHT	MODEL 306	C	LHS	1	1

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
2	312-0018-00	Tape, Foam, P/S, 4" LG		
8	346-0632-03	Nut, Self-Clinching, 6-32		
4	352-0440-04	Screw, Bind Head, 4-40 x 1/4		
4	378-0440-04	Standoff, Self-Clinching, Nut, 4-40 x 1/4		
2	378-1032-08	Standoff, Self-Clinching, Stud, 10-32 x 1/2		
1	422-0306-51	Panel, Sub-Side, Left	C422-0306-51	
1	702-0306-01	Assembly, Printed Circuit Board	PL702-0306-01	

PL	TITLE	WHERE USED	REV.	DR	PAGE	OF
703-0306-06	ASSEMBLY, PANEL, SUB-SIDE, LEFT	MODEL 306	C	LHS	1	1

QTY	PART NUMBER	DESCRIPTION	DWG. NUMBER	COMP. DES.
1	003-1613-01	Cable, 3 Cond, #16 AWG, Stranded, SJT, Black, 10'		
4	016-0004-00	Tubing, Shrink, 1" Lg		
1	081-0004-00	Fuse, 10A, 32V, 3AG		F3
1	089-0007-00	Connector, PMF, 2 Cond, Power Jack		J4
1	099-0006-03	Plug, Hospital Grade, 3 Cond.		P4
1	131-0007-00	Switch, Key		S8
10	305-0001-00	Cable Tie, Nylon, Miniature		
1	325-0306-01	Label, Metallic, Military I.D. & Data	B325-0306-01	
2	312-0018-00	Tape, Foam, P/S, 4" LG		
1	334-0004-00	Fuseholder, PM, 3AG		
1	334-0029-00	Clip, Retaining		
6	338-0006-00	Rivet, Pop, #4, 1/8 - 3/16" Range		
1	340-0003-00	Bushing, Strain Relief		
3	346-0632-03	Nut, Self-Clinching, 6-32		
1	368-0005-00	Spacer, Bushing		
3	374-0003-00	Terminal, Female, .187 W, Fully Insulated, Red		
3	374-0005-00	Terminal, Fork, #6, Red		
1	374-0006-00	Terminal, Ring, #10, Red		
1	374-0012-00	Terminal, Male, .187 W, Fully Insulated, Red		
2	374-0015-00	Terminal, Fork, #6, Blue		
1	374-0016-00	Terminal, Ring, #10, Blue		
3	376-0014-00	Washer, Flat, SS, 1 3/8 O.D. x 9/16 I.D.		
6	376-0031-00	Washer, Flat, #4 (use with 338-0006-00)		
1	422-0306-21	Panel, Rear	C422-0306-21	
1	480-0049-00	Hose Barb, 1/4 NPTF to 3/8" I.D. Tube		
1	480-0118-00	Elbow, Chrome, 1/4 NPTM to 3/8" I.D. Tube		
1	700-0306-12	Jumper, Red, 16 1/2" LG	WL702-0306-01	
1	700-0306-13	Jumper, Red, 13" LG	WL702-0306-01	
1	700-0306-01	Jumper, Black, 8" LG	WL702-0306-02	
1	700-0306-02	Jumper, Orange, 13" LG	WL702-0306-02	
1	700-0306-04	Jumper, Yellow, 13" LG	WL702-0306-02	
1	700-0306-06	Jumper, Violet, 13" LG	WL702-0306-02	
1	700-0306-07	Jumper, Yellow, 4" LG	WL702-0306-02	
1	700-0306-08	Jumper, Gray, 8 1/2" LG	WL702-0306-02	