

MIL-HDBK-740

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MILITARY STANDARDIZATION HANDBOOK

DISHWASHING OPERATIONS



FSC 7930

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## FOREWORD

Theoretically, the cleaning of tableware is a simple operation. Under some conditions, however, it can become difficult. In its simplest form, the dishwashing procedure consists of scrapping, preflushing, washing, rinsing and sanitizing. For these operations, it requires the satisfactory performance of good operating dishwashing equipment, trained operating personnel, routine maintenance, and prescribed supplies. Unfortunately, frequently, various parts of dishwashing equipment break down, the training of maintenance and operating personnel is inadequate, and supplies are improperly used.

In many instances, the unsatisfactory cleaning of tableware has been attributed to the inadequacy of the supplies. Investigations have repeatedly shown that the poor performance is the result of improper original installation of the dishwasher or accessory equipment (detergent dispenser, detergent concentration meter and rinse aid injector), or the use of improper type of racks, inadequate training of the personnel operating the dishwasher, or inadequate repair and maintenance of the equipment.

This handbook is expressly designed to instruct operating and supervisory personnel in the proper equipment and techniques for the cleaning of tableware. Contents of this handbook will be included in a new Department of the Army Technical Manual on Dishwashing Operations.

## ABSTRACT

This handbook contains information concerning the equipment, supplies, and procedures for the cleaning of tableware in single-tank and multiple-tank dishwashing machines, hand washing in kitchens and hand washing in the field. It includes information on the operation and the care and maintenance of the dishwasher, detergent dispenser, rinse aid injector and detergent concentration meter. It also includes information on tableware, dishwashing machine racks, and dishwashing machine supplies. There is also information for instructing and training personnel engaged in dishwashing. Safety precautions which were developed as a result of problems experienced by dishwashing personnel are listed. Photographs and sketches are included as visual aids for further clarification of the instructions. Observations, adjustments and repairs which can be made by the operator and those that should be performed by the maintenance engineer are outlined.

Operating personnel should have this handbook available for ready reference; supervisory personnel should use it as a guide in training operators and detecting deficiencies and all concerned should be aware of the proper procedures, requirements and safety precautions involved in cleaning and sanitizing tableware.

The U. S. Army Natick Laboratories (NLABS) is currently preparing an Army Standard entitled "Contractual Service Requirements for Automatic Dishwashing Machine Accessory Equipment and Supplies", which provides information, guidance and requirements needed in procuring commercially supplied dishwashing compounds, the installation and use of accessory dispensing equipment, and requirements necessary for contractual service from accessory equipment and dishwashing compound manufacturers. This Army Standard will be mandatory for inclusion in all "Invitation for Bids" on machine dishwashing service and/or supply contracts issued by the Department of Army procurement agencies.

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## SECTION I - INTRODUCTION

At the request of the Office of Assistant Secretary of Defense, the U. S. Army Natick Laboratories (NLABS) initiated a study in 1970 to prepare a DOD Handbook on Dishwashing Operations which would be a self-sufficient document for use by military personnel concerned with dishwashing operations at military installations, in the field and at sea. This handbook has been prepared by U. S. Army Natick Laboratories based on studies performed at various posts, camps, and stations including Fort Devens, Mass., Fort Bliss, Texas, Fort Meade, Md. and various Army hospitals. This handbook contains information on dishwashing operations including dishwashers, detergent concentration meters, detergent dispensers, rinse aid injectors, racks, tableware, flatware and dishwashing supplies, to train military personnel in the installation, maintenance, and operation of dishwashers and accessory equipment.

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## SECTION II - DISHWASHING MACHINES

### A. CLASSIFICATION

#### 1. SINGLE-TANK STATIONARY RACK, DOOR-TYPE DISHWASHING MACHINE- MULTIPLE-TANK (CONVEYOR-TYPE) DISHWASHING MACHINE.

a. Description: The single-tank stationary rack, door-type dishwashing machine (Figure - 1), and the multiple-tank (conveyor-type) dishwashing machine (Figures 2, 3, & 4) should conform to the requirements specified in the National Sanitation Foundation Standard No. 3, "Commercial Spray-Type Dishwashing Machines". The single-tank dishwashing machine is capable of handling 50 racks of tableware (1000 dishes) and other serving utensils per hour and may be either manually or automatically operated. The multiple-tank dishwashing machine is capable of handling 250 racks of tableware (6,250 dishes) and other serving utensils per hour, depending upon conveyor speed and personnel. The capacity of the multiple-tank rackless conveyor type dishwashing machine is based on the number of pieces of tableware washed and rinsed per hour.

In the rack-type machine, items of tableware are placed in appropriate racks. The racks are placed on the conveyor. In the rackless type machine, dishes are placed directly on the conveyor, held in position and supported by pegs in the conveyor belt (Figure 5). Other serving utensils are placed in appropriate racks.

Above each wash and rinse tank in a multiple-tank dishwashing machine is a wash and rinse chamber. The wash and rinse chambers are enclosed in a rectangular housing. Each chamber is fitted with a battery of spray manifolds (Item #2, Figure 6), two or more at the top and two or more at the bottom of each chamber. The bottom manifolds are below or even with the conveyor chains (Item #6, Figure 6), which move the racks through the dishwasher. Open ends of the chamber housing are fitted with splash curtains. Other splash curtains are located in the interior of the dishwashing chamber.



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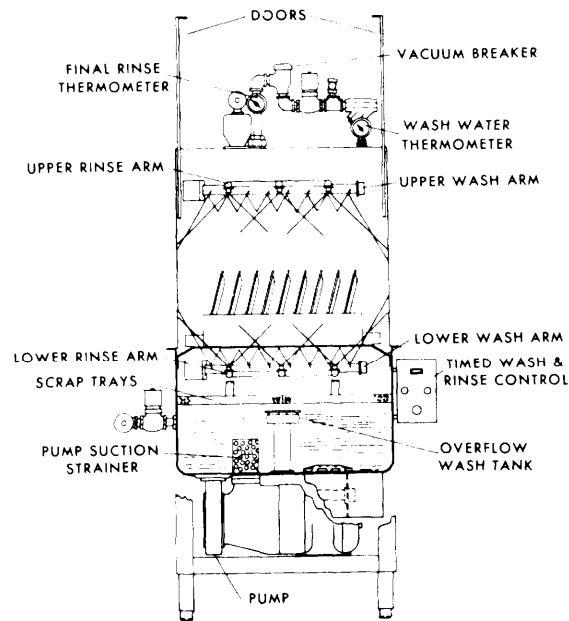


Figure 1 - Single-Tank Stationary Rack, Door-Type Dishwashing Machine

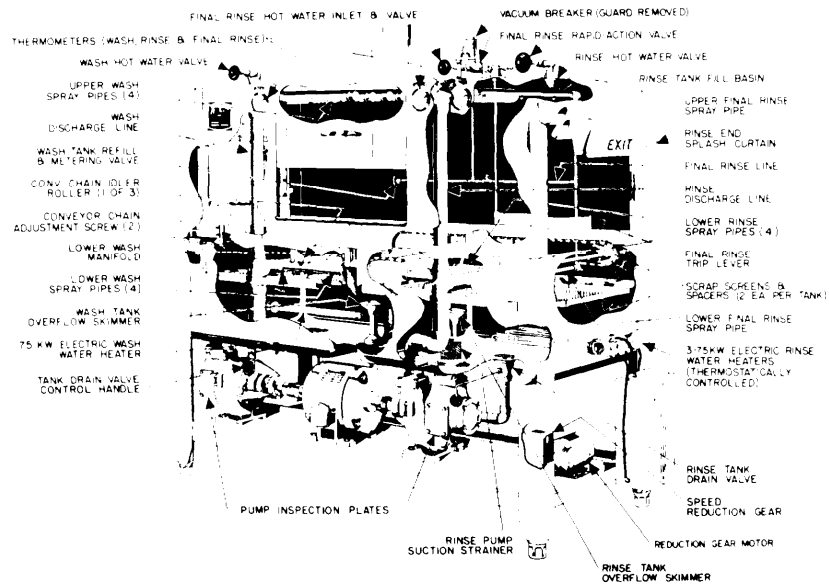


Figure 2 - 250-Rack Per Hour Capacity, Left-To-Right Feed

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Figure 3 - Multiple-Tank Rack Conveyor Mechanical Dishwashing Machine

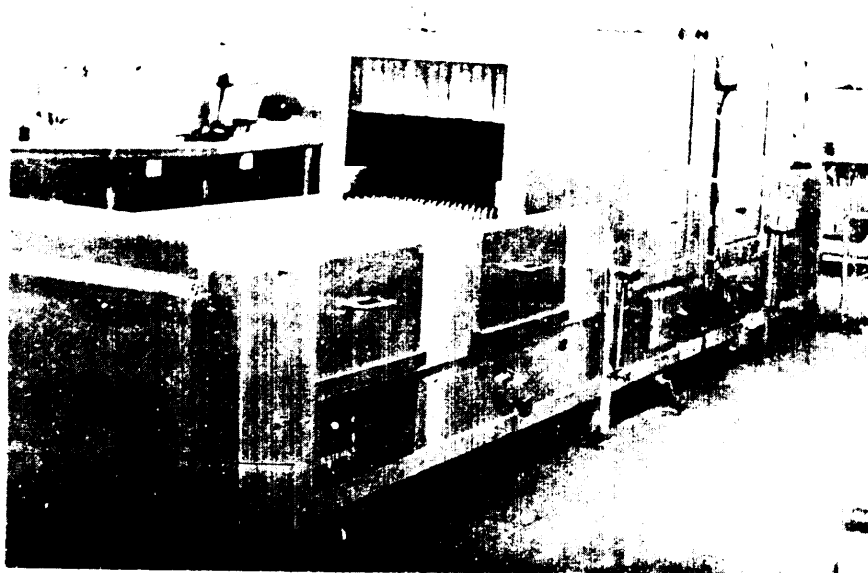


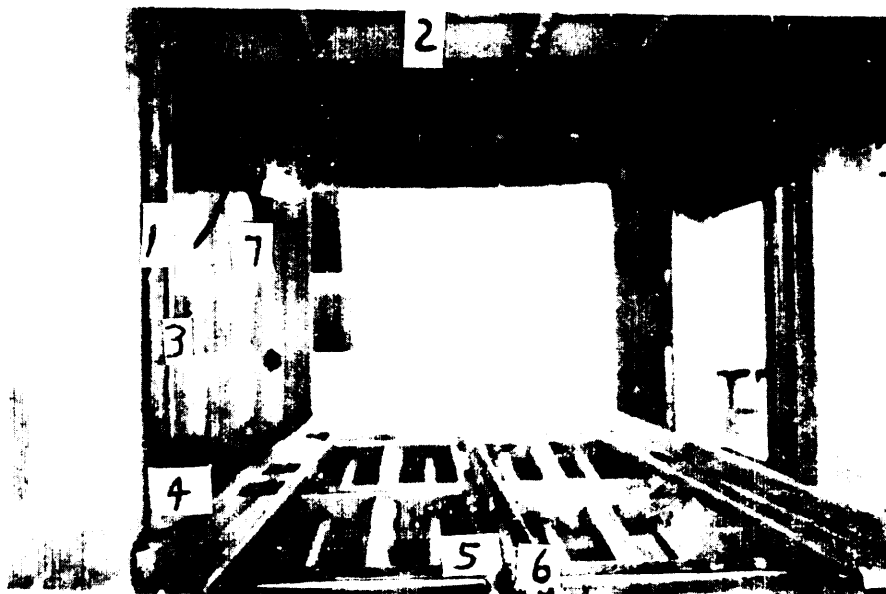
Figure 4 - Multiple-Tank Rackless Conveyor-Type Machine (Flight-Type)

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Figure 5 - Filling Multiple-Tank Rackless Conveyor Type Machine

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Rinse supply pipe  
Rinse manifolds  
Final rinse valve control shaft  
Final rinse acculating valve lever  
Dish rack driving lug  
Conveyor chain  
Bleeder tube

Figure 6 - Interior Of Rinse Chamber

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The replenishing line (bleeder tube) in the multiple-tank dishwashing machine is tapped off the final rinse line after the shut-off size. The design should be such that under normal operation, the rate of replenishment can be varied from zero to one and one half gallons per minute at rated water pressure. Improper installation of the bleeder tube is shown in Figure 7 (see Figure 6 for proper installation of the bleeder tube).

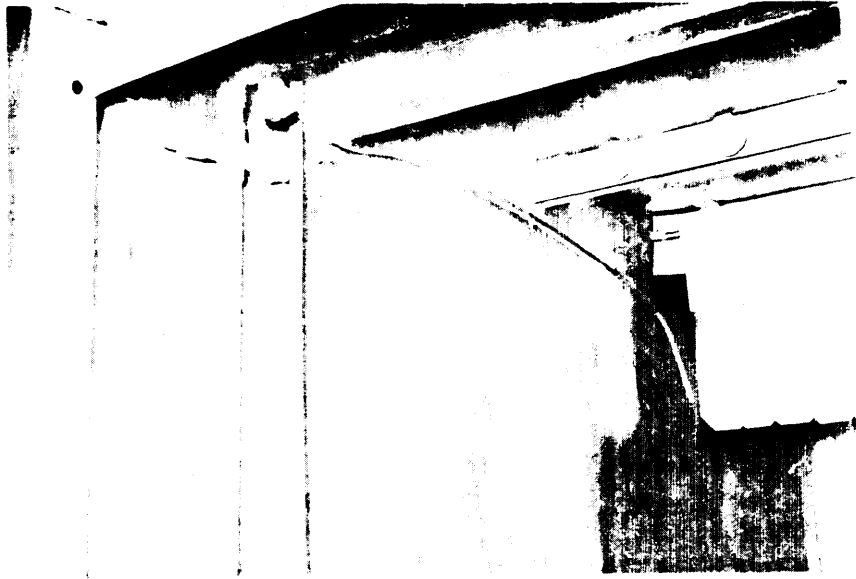


Figure 7 - Improper Installation Of Bleeder Tube On  
Mechanical Dishwashing Machine

b. Instrument Readings

(1) Single and Multiple Type Dishwashing Machines

(a) Wash water thermometer (Single, Multiple) .- The wash water thermometer should be maintained at a temperature of 150°F to 165°F.

(b) Rinse water thermometer (Multiple). - The rinse water thermometer should be maintained between 160°F and 180°F.

(c) Final rinse water thermometer (Single, Multiple).- The final rinse water should be maintained at a temperature of 180°F nor more than 195°F.

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(d) Wash solution pressure gage (Multiple). - A reading of 4 to 6 psi (measured at the wash manifold) on the gage dial indicates that the operating pressure is being achieved.

(e) Rinse water pressure gage (Multiple). - The operating pressure is a reading from 4 to 6 psi (measured at the work manifold) on the gage dial.

(f) Final rinse water pressure gage (Multiple). - The operating pressure should be maintained at 20 pounds per square inch. (A suitable readily accessible valve with a 1/4 inch IPS connection shall be provided immediately adjacent to the supply side of the control valve in the line carrying final rinse water to the dishwashing machine.)

(g) Detergent concentration meter (Single, Multiple). - Dishwashing machines may be equipped with a detergent concentration meter (Figure 8) which indicates but does not control the concentration of the dishwashing solution in the wash tank. The detergent concentration meter should conform to the requirements specified in MIL-M-11495, Meter, Detergent Concentration, for Dishwashing Machine. The installation facilities engineer should be contacted to clean the electrodes of the detergent concentration meter when coated with lime deposits. The installation and adjustment of the meter should be made by installation facilities engineer in accordance with the instructions furnished with the meter. The meters should be adjusted so that the needle is in the middle of the green area when the detergent concentration of the wash solution is between 0.20 and 0.25 percent by weight.

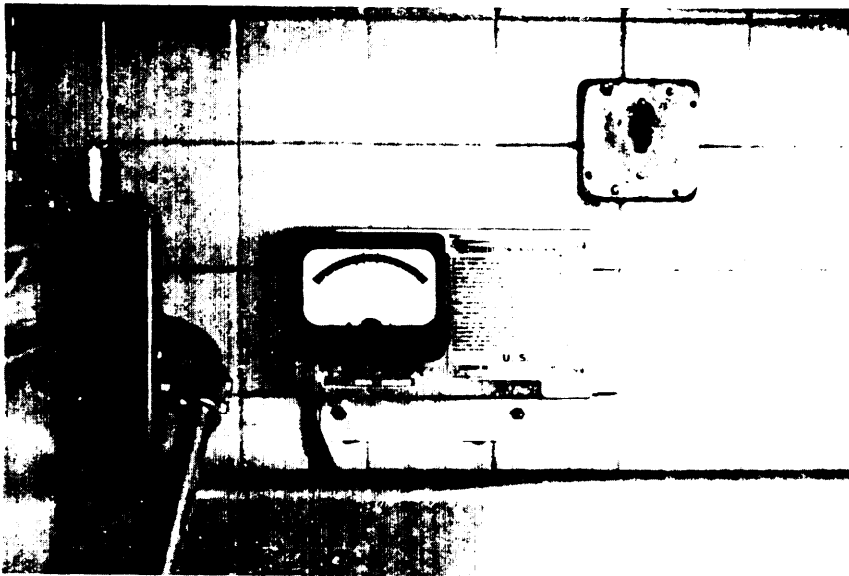


Figure 8 - Detergent Concentration Meter

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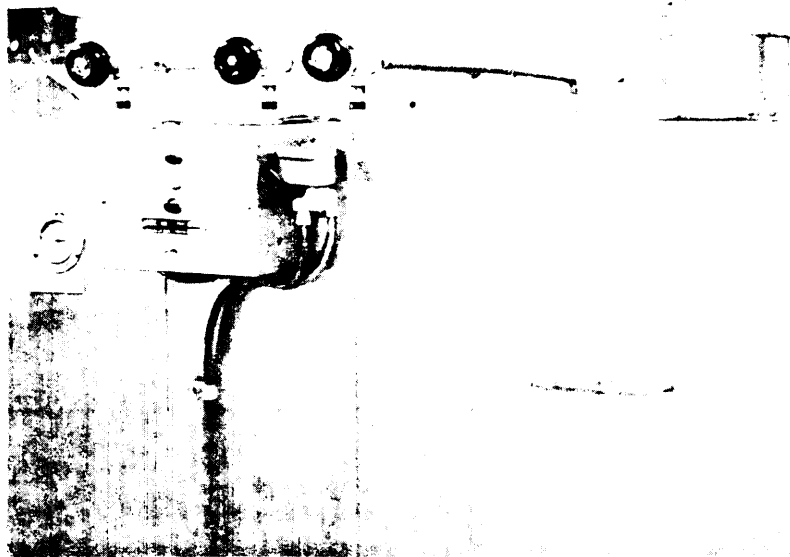


Figure 8A - Detergent Concentration Meter

(h) Automatic detergent dispenser (Single, Multiple). - The automatic detergent dispenser should conform to the requirements of MIL-D-43729 (Figure 9). It consists of an electrical control unit, a low voltage solenoid valve, detergent reservoir) sensing electrode or conductivity cell, copper tubing, and wiring to form a complete automatic dispensing system. The units are adjustable to maintain a detergent concentration of 0.15 to 0.40 percent by weight and automatically feed and maintain a detergent concentration of the wash solution between 0.20 and 0.25 percent by weight. The electrical control unit registers changes in the conductivity of the wash solution as sensed by the electrode. As the concentration of the detergent solution is weakened by dilution or by neutralization, the resistance to the flow of electrical current is increased. This increase in electrical resistance or a decrease in detergent concentration below a preset concentration actuates the automatic dispensing mechanism by opening the solenoid valve. When this valve is opened, water enters the reservoir. The addition of water causes the saturated solution in the reservoir to overflow into the wash tank. When the desired detergent concentration is attained, the water valve closes. The control unit has also an "ON" and "OFF" switch for operating the unit, a white light to indicate that the unit is operating, and a red light and buzzer to indicate that more detergent should be added to the reservoir. Two different types of reservoirs are available. One is mounted on the top of the dishwashing machine and the other is mounted on the side of the machine or on a nearby wall.

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The side mounted reservoir is preferred because it can be placed at or below eye-level for easy filling; however, available space dictates which reservoir to use and where to place it. The incoming water should be warm enough to dissolve the powdered detergent but not hot enough to decompose the stain removing compounds or to boil while dissolving the dishwashing compound.

Electrodes should be cleaned (weekly) using plastic scouring pad, FSN 7920-753-5242. This cleaning of the electrodes can be made by the operator of the dishwasher or by the installation facilities engineer. Any adjustment to increase or decrease the concentration of the wash solution should be made by qualified personnel, either the washer operator or installation facilities engineer, in accordance with instructions furnished with the detergent dispenser.

The normal amount of dishwashing compound required to clean tableware for each 1000 meals in either a single- or multi-tank dishwasher is approximately 8 to 10 pounds. The use of more than that amount indicates that an excess is being dispensed. This in turn could indicate that (1) detergent dispenser requires adjustment, (2) water line into wash solution is leaking or (3) detergent solution is not of the proper concentration.

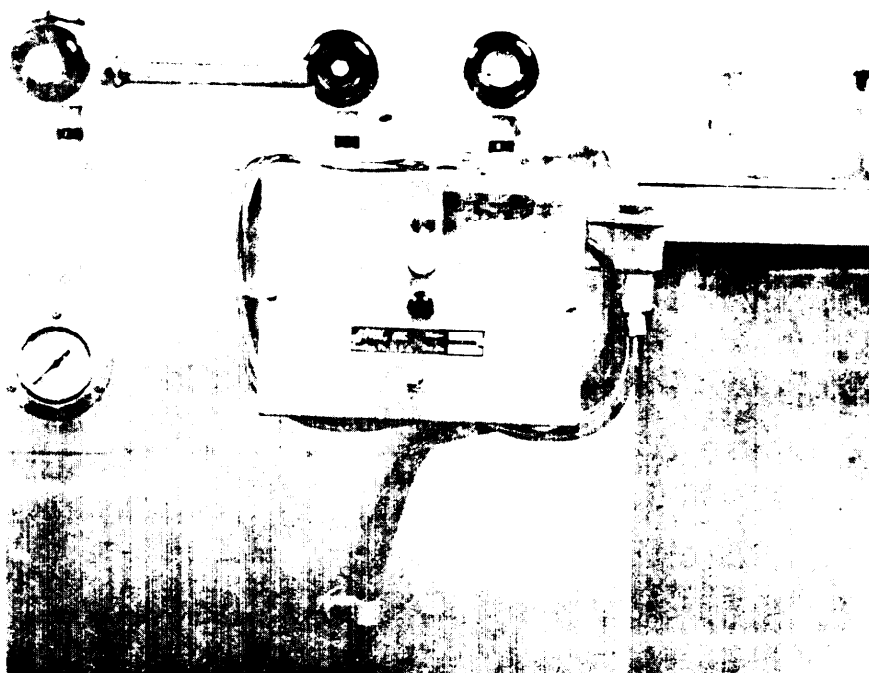


Figure 9 - Detergent Dispenser Control Unit And Reseroir



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Figure 9A - Detergent Dispenser Control Unit And Reservoir

(i) Rinse aid injector (Single, Multiple). -The rinse aid injector should conform to the requirements of MIL-I-43728 (Figure 10). It was developed to automatically inject a liquid wetting agent into the final rinse water at a concentration of 75 to 200 ppm to obtain sheeting and rapid drying for the purpose of eliminating streaks and spots on tableware, flatware, and other items. The injector should operate on the final rinse water line, be pressure-activated and should deliver a preset concentration of rinse agent in the final rinse water, during a water flow of 4 to 15 gallons per minute or 15 to 30 pounds per square inch water pressure regardless of the fluctuations in flow or pressure. The injector can be installed directly in the final rinse water line or mounted on the dishwashing machine body and should inject the rinse agent into the downstream side of the rinse valve. Rinse aid reservoir should be mounted on the machine or on an adjacent wall where it can be easily reached and viewed by the operator. The injector has manual means for adjusting the flow of rinse aid and for obtaining the desired concentration. This adjustment should be made by qualified personnel, the washer operator or the installation facilities engineer, in accordance with the instructions furnished with the rinse injector. The normal amount of rinse aid required for the tableware for each 1000 meals in either a single- or multiple-tank dishwashing machine is approximately 6 to 8 ounces. The use of more than that amount indicates that the rinse aid injector should be adjusted.

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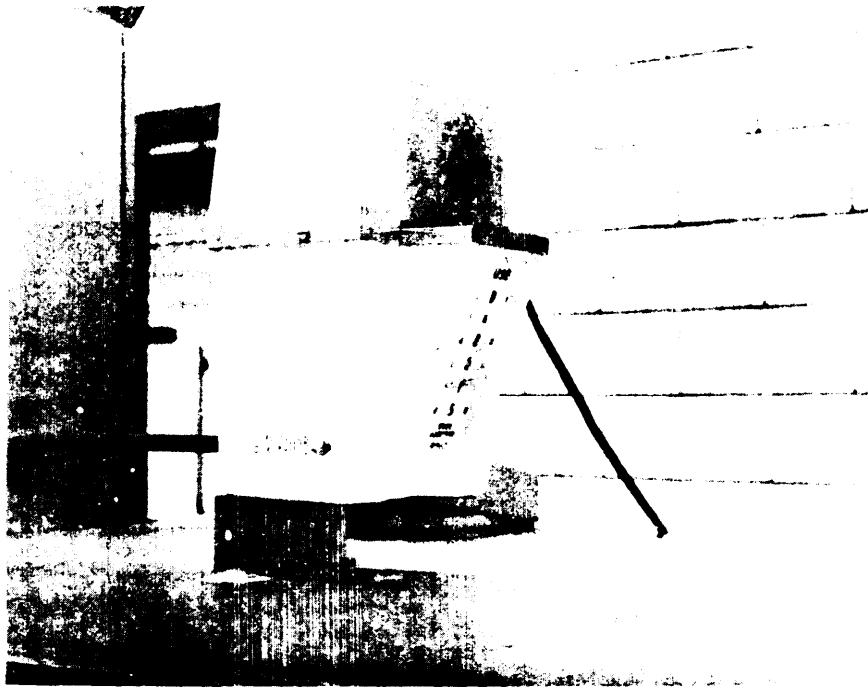


Figure 10 - Rinse Aid Injector

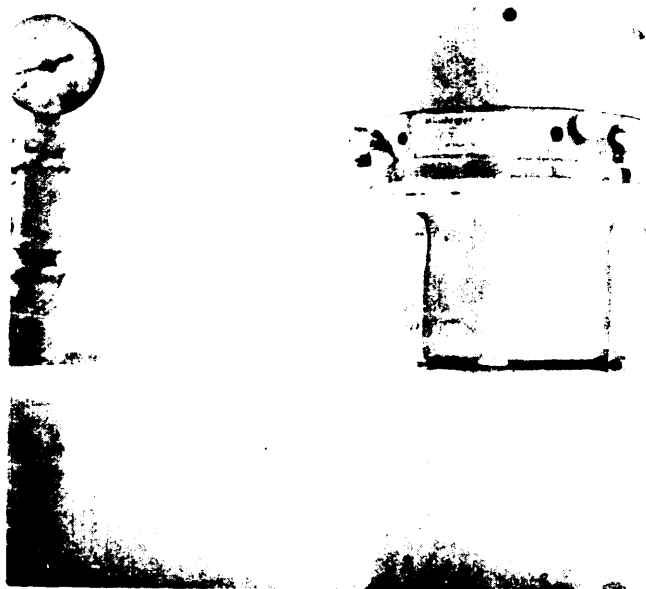


Figure 10A - Rinse Aid Injector

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c. Operation of single-tank and multiple tank dishwashers

(1) Preliminary procedures: (a) Close drain valve(s), (b) Open fill valve(s), and allow tank(s) to fill to level of overflow cup(s) and then close fill valve. (c) Place scrap trays in position, (d) "For multiple-tank dishwasher", - hang splash curtains. The single curtain hangs inside the housing between the wash and rinse chambers. The double curtain at the open end of the wash chamber hangs with the short curtain facing out. The double curtain at the end of rinse chamber hangs with the short curtain facing up. (e) Close both doors. (f) Adjust thermostat to keep the wash solution temperature between 150°F and 165°. (g) For multiple-tank dishwasher, open final rinse steam and water mixing valve, if it is equipped with one. Manipulate valve level until final rinse water temperature gage registers not less than 180°F nor more than 195°F. The final rinse supply line must be kept open during this operation. (h) Start pump motors and scatter the required amount of machine dishwashing compound (see Section III-A) by cup on the scrap trays in the wash chamber. If the machine is not equipped with a detergent concentration meter, determine the correct quantity of dishwashing compound according to the instructions outlined in Section III-A. If the dishwashing machine is equipped with detergent concentration meter, add machine dishwashing compound until needle on the meter stands at 12 o'clock. The meter should be used after the doors have been closed and the water has been well circulated.

d. Operation Procedures

(a) Scrap and preflush tableware, trays and other utensils, before placing them in the appropriate racks (see Section III-A).

(b) Start racks through dishwashing machine and continue to feed them in at a rate equal to speed of conveyor chains (7 seconds). As racks come out of the rinse chamber let them stand for a few minutes until utensils have air dried.

(c) Scrap trays should be cleaned periodically (30 minutes) and the tank(s) should be drained and filled with fresh water and proper amount of machine dishwashing compound as required.

(d) Throughout the operation, check all thermometers and pressure gages frequently.

(e) Inspect all cleaned items and rewash any dirty items. Do not put any dirty items with the cleaned items. The best food in the world is unappetizing when served on dirty plates or with soiled flatware.

e. Shutdown Procedures (Single-Tank, Multiple-Tank Dishwashers)

(a) Shut off gas or steam supply valve or electric switch adjacent to the dishwasher.

(b) Drain wash tank.

(c) Remove and dump scrap trays.

(d) Remove caps from upper and lower wash arms. With a scrub brush, FSN 7920-061-0038, remove food particles from spray outlets in wash arm tubes. Thoroughly clean inside of wash arm tubes with a wash arm brush.

(e) With scrap trays in place, fill wash tank with hot water, add the required amount of machine dishwashing compound, close door and run machine for 20 to 30 seconds. Turn off machine and open doors.

(f) Clean scrap trays with this solution and wash the sides of the tank using a long handled brush, FSN 7920-061-0038. Replace caps on wash arms and replace scrap trays.

(g) Drain and refill tank with Goldwater. Close doors and operate dishwasher for 30 seconds to rinse out pump and water lines. Stop machine and drain tank.

(h) Leave doors open until the next operation.

f. Operational maintenance.- Before operating the single-tank and multiple-tank dishwashing machines for the first time and periodically thereafter, the following maintenance services should be performed by the installation facilities engineer:

(a) The water, gas and steam lines, connections, components, instruments and controls should be inspected for leaks and to see if they are correctly installed, secure, and in good working condition.

(b) The wash arms should be inspected to see if they are working correctly.

(c) The electric wiring, connections and components should be inspected to see that they are dry, clean, secure and in good operating condition.

(d) The thermometers and pressure gages should be tested for accuracy weekly to assure proper operation.

(e) The detergent dispenser or detergent concentration meter and the rinse aid injector should be inspected, adjusted and maintained according to the requirements specified in each applicable specification.

(f) The instruction plate should be securely attached to the dishwashing machine at a height easily read by the operator.

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(g) A copy of the manufacturer's instructions for operational care and maintenance should be readily available to operating personnel.

g. Safety precautions. - When working with dishwashing equipment heated or powered by electricity, the following safety rules should be observed:

(1) Keep electric wiring and components free of grease, oil, and water.

(2) Never operate an electric switch with wet hands.

(3) Do not handle electric wiring at anytime. If any electrical work must be done, notify the installation facilities engineer.

h. Maintenance and operational requirements (Single-Tank and Multiple-Tank Dishwasher).- following services and operating procedures should be performed to insure satisfactory operation of dishwashing equipment:

(1) Installation facilities engineer

(a) The dishwashing machine should be thoroughly inspected on a weekly basis by the installation facilities maintenance personnel and all deficiencies should be corrected by replacing or repairing broken or worn parts so that the machine operates as intended by the manufacturer. In addition, the installation facilities maintenance Personnel, when notified by supervisory dining facility personnel, should replace or repair defective parts of dishwashing equipment such as valves, thermometers, pressure gages, motors, pumps, heaters, detergent concentration meters, automatic detergent dispensers, rinse aid injectors, wash and rinse arms and nozzles. If facilities are not available for chemical water analysis, water hardness kits and detergent concentration titrating kits should be available for verification testing and should be stocked by the installation facilities engineer.

(b) The heaters should maintain the proper temperature of the water throughout the wash and rinse cycles.

(c) Assure that adequate water heating equipment is available at each installation to obtain maximum efficiency of operation during peak loads and at all seasons of the year.

(2) Dining facility personnel

(a) The walls and floor area around the dishwashing machine should be kept clean at all times and dry as possible to prevent accidents.

(b) The spray holes should be checked after each dishwashing period to assure the free flow of wash solution and rinse water.

(c) The entire inside of the dishwashing machine should be washed with a solution of the dishwashing compound after each dishwashing period and thoroughly rinsed with fresh water.

(d) The scrap strainer pans and splash curtains on some dishwashers should be removed after each dishwashing period, cleaned and allowed to dry.

(e) The recommended wash and rinse water temperatures should be maintained in order to obtain adequate cleaning and effective sanitizing of the tableware, flatware and other utensils.

(f) The water, steam and drain valve should be checked for leakage daily before operation.

(g) The wash solution Pumps of dishwashing machines should never be turned on until the wash tank has been filled with water.

## B. Accessory Mechanical Dishwashing Equipment

### 1. Preflushing Machine

Description.- The preflushing machine (Figure 11) should conform to requirements of MIL-P-12390. It is used to remove most of the food particles and grease from tableware items and serving trays just before they are racked and placed in a dishwashing machine for washing and rinsing. Excess food particles or refuse should be removed from tableware and utensils by using the rubber bumper operation (see Section III-C). The preflushing machine is connected to the water system by means of a mixing valve (Item #3, Figure 11). The mixing valve has one fitting for connection to a hot water line and one for connection to a cold water line. When the machine is installed, each line is provided with a control valve. These valves (Items #4 and #5, Figure 11) are operated to mix hot and cold water in the blender in quantities required to maintain a flush water temperature of about 115°F + 5°F. The proper and improper preflushing procedures are shown in Figures 11 through 15. DO NOT USE SOAP.

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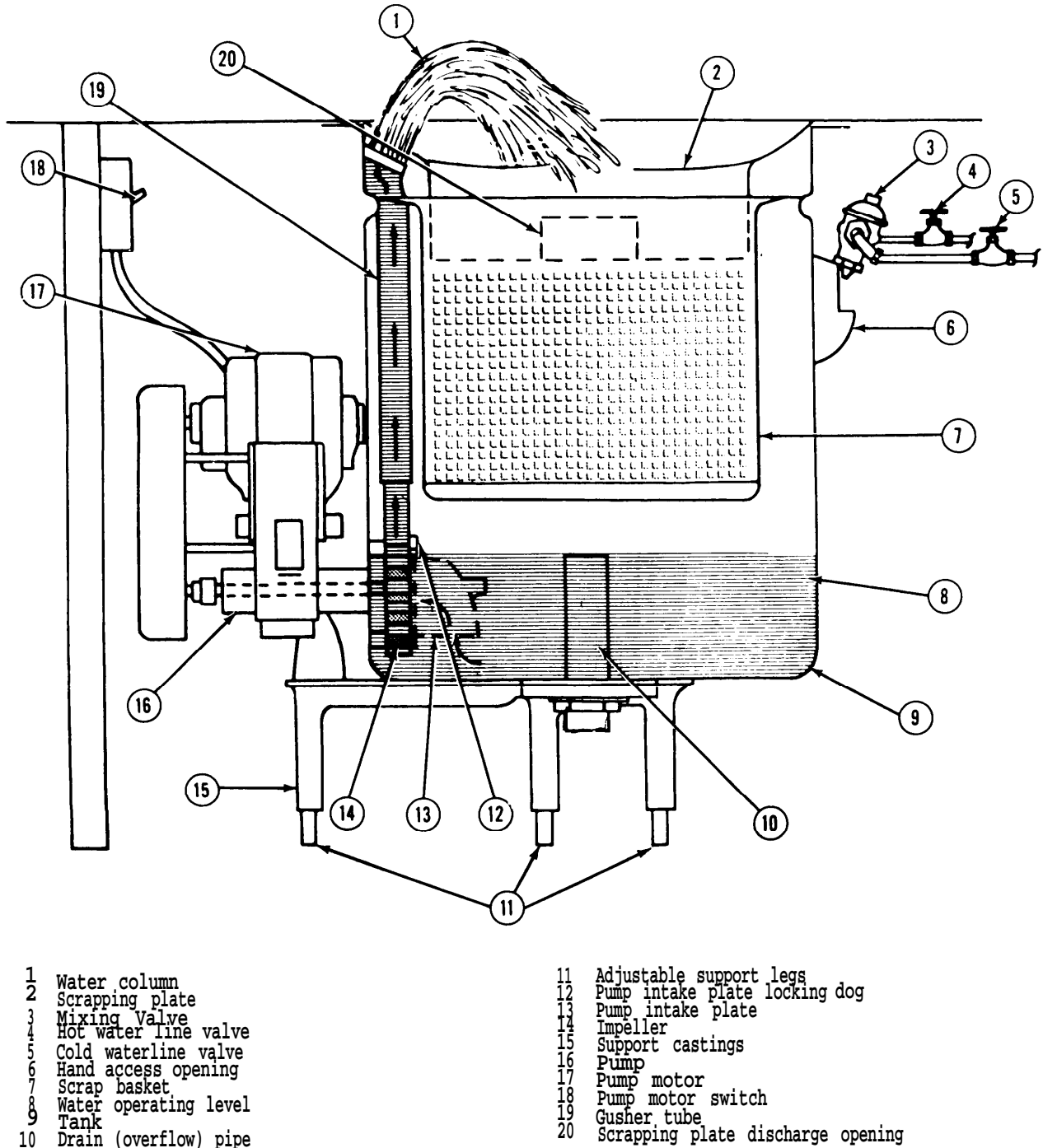


Figure 11 - Preflushing Machine

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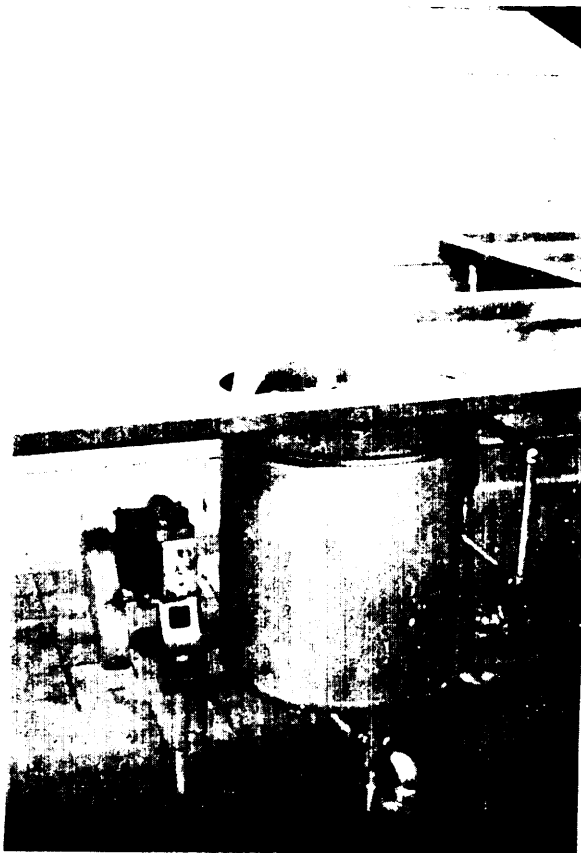


Figure 12 - Preflushing Machine



Figure 13 - Proper Preflushing Procedure - No Dishwashing  
Compound (Hand Or Machine), Soap Or Detergent



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Figure 14 - Improper Preflushing Procedure - Do Not  
Use Hand Or Machine Dishwashing Compound



Figure 15 - Improper Preflushing Procedure - Buildup  
Of Soap Or Detergent In Preflushing Tank

(1) The components of the preflushing machine may be divided into two systems, a scrapping system and a flushing system.

(a) The components of the scrapping system normally consist of a scrapping plate (Item #2, Figure 11), a scrap basket (Item #7, Figure 11) and a tank (Item #9, Figure 11). Food scraps from tableware and serving trays are scrapped onto the scrapping plate where they fall into the scrap basket and are trapped. The tank supports the scrapping plate and scrap basket and also acts as a reservoir for the flush water. The tank, scrapping plate, and scrap basket are of stainless steel. The top of the tank is provided with a mounting flange that is secured to the underside of the dish table.

(b) The components of the flushing system consist of an electric motor (Item #17, Figure 11) which drives a rotary pump (Item #16, Figure 11) by means of pulleys and belt. The pump impeller (Item #14, Figure 11) drains water from the tank into the pump intake plate (Item #13, Figure 11) and forces it through the gusher tube (Item #19, Figure 11). The height of the water column above the gusher tube is adjustable (see para. 1b(2) ).

b. Controls

(1) Pump motor switch. - The pump motor switch (Item #18, Figure 11) turns the motor on.

(2) Pump intake plate. - The pump intake plate (Item #13, Figure 11) controls the height of the water column from the gusher tube. When properly adjusted, the water column should fall into the center of the scrapping plate, if the machine is equipped with a scrapping plate. To adjust the pump intake plate, proceed as follows:

(a) Turn the pump intake plate clockwise to increase height of water column; turn plate counterclockwise to decrease height of water column.

(b) When the nearest full turn has been made (pump intake plate opening must be in down position), lock intake plate in position with locking dog (Item #12, Figure 11).

(3) Water valves. - Valves placed in the hot and cold water lines that are connected to the blender are usually gate valves.

c. Operation. - If the machine has a scrapping plate, follow operating procedures given below. If machine does not have a scrapping plate, follow all applicable procedures.

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(1) Preliminary procedures

(a) Turn cold water valve wheel counterclockwise until steady stream of cold water flows through blender and into tank.

(b) Place fingers of one hand into hand access opening (Item #6, Figure 11) and into stream from blender.

(c) Turn hot water valve wheel counterclockwise slowly until stream from blender is warm to the touch, but not hot enough to burn fingers (maximum 120°F).

(d) Install drain (overflow) pipe (Item #10, Figure 11) in tank drain opening.

(e) Install scrapping plate (Item #2, Figure 11) on top of tank (Item #9, Figure 11). Turn on switch (Item #18, Figure 11) to start pump motor. If water column from gusher tube (Item #19, Figure 11) does not fall close to center of hole in scrapping plate, adjust pump intake plate (see para. 1b Controls). When proper adjustment has been obtained, remove scrapping plate.

(f) Lower scrap basket (Item #7, Figure 11) into tank. Be sure that insert on rim of scrap basket is over gusher tube.

(g) Position scrapping plate on tank, making sure that insert on rim of scrapping plate is over gusher tube.

d. Operating procedures

(1) Pass the soiled tableware and serving trays, bottom side down, through the water column in such a way that the arc of the stream first strikes the eating surface of the item. Scouring pad, FSN 7920-753-5242, should be used to remove stubborn stains.

(2) Continue the motion through the water column. This will wash both sides of the item, removing most of the debris and grease.

e. Shutdown procedures

(1) Turn pump motor switch to OFF position.

(2) Turn hot and cold water valve wheels clockwise until fully closed.

(3) Remove scrapping plate and brush any residue from scrapping plate into scrap basket.

(4) Remove and empty scrap basket.

(5) Remove overflow pipe from drain, and drain tank.

f. Operational maintenance - Dining facility personnel

(1) After each operation

(a) Thoroughly clean scrapping plate and scrap basket.

(b) Operate cold and hot water valve wheels to provide a flow of water through blender and into tank. Water temperature should be slightly higher (120°F) than that of water used for preflushing.

(c) Install overflow pipe in tank drain. When water level is 1 or 2 inches below top of overflow pipe, shut off hot and cold water valves.

(d) Pour one cup (six ounces) of hand dishwashing compound, FSN 7930-281-4731, into warm water. Scrub all interior surfaces of tank thoroughly with a scrub brush, FSN 7920-061-0038.

(e) Remove overflow pipe and drain tank.

(f) Replace overflow pipe, fill tank with hot water to 1 or 2 inches below top of overflow pipe. Rinse tank interior thoroughly. Drain tank.

(2) After each day's operation. At the end of each operating day, perform cleaning procedures given in (1) above, and then clean pump and gusher tube as follows:

(a) Install overflow pipe in tank drain.

(b) Open hot water valve and fill tank to top of overflow pipe. Close hot water valve, and pour one cup (six ounces) of hand dishwashing compound, FSN 7930-281-4731, into hot water.

(c) Start pump motor and allow it to run for about 5 minutes.

(d) Stop pump motor. Remove overflow pipe from tank drain, drain water from tank, and then replace overflow pipe in tank drain.

(e) Refill tank to top of overflow pipe with hot water, start pump motor and operate for about 5 minutes, and then stop pump motor.

(f) Remove overflow pipe and drain tank.

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9. Safety precautions

(1) When operating the hot and cold water line valves to mix water in the blender, always open the cold water line valve first and place fingers in stream from blender.

(2) If pump motor smokes during operation, shut off motor and report condition to the installation facilities engineer.

(3) Make sure that all switches on the equipment are in OFF position before plugging into outlet.

(4) Keep electric wiring and components free of grease, oil and water.

(5) Never operate an electric switch with wet hands.

(6) Do not handle electric wiring at anytime. If any electrical work must be done, notify the installation facilities engineer.

(7) Pull the plug or turn switch to OFF position before attempting to clean or adjust the preflushing machine.

(8) When using the preflushing machine, follow all instructions posted on or near the machine, and never leave the machine while it is in operation.

(9) Keep floor free of boxes, trash, cleaning equipment, or any item that someone could trip over.

(10) Keep floor clean and dry. Cleanup any spilled food or liquid immediately.

(11) Get rid of dirt, grease, and trash promptly to reduce fire hazard.

2. Alternate Preflushing Equipment

a. Prerinse unit (Figure 16).- A complete prerinse unit with mixing faucet to insure correct water temperature. The gooseneck reaches 12 inches over the sink at the top, with a swivel type base for increased coverage.

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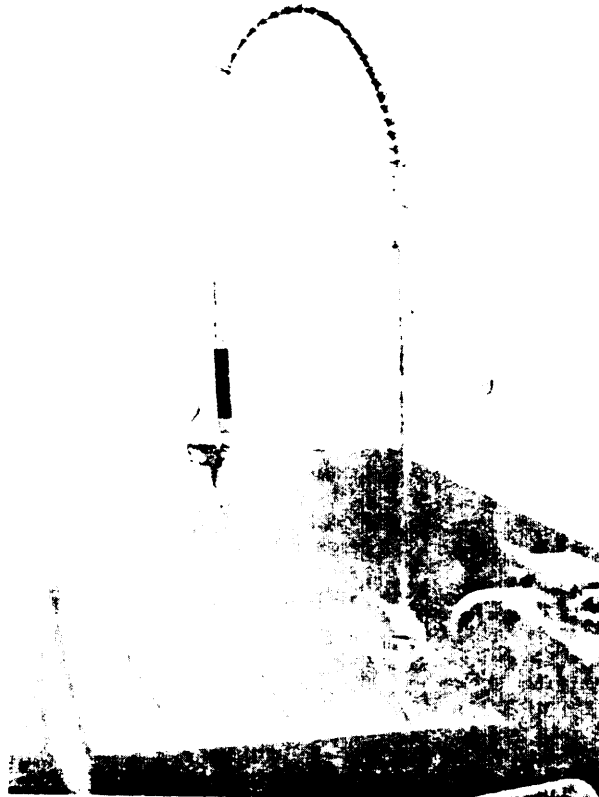


Figure 16 - Prerinse Unit

b. Garbage disposal/flushing attachment (Figure 17). - Food particles are rinsed off tableware and serving trays by means of a prerinse unit and are disintegrated in the garbage disposal.

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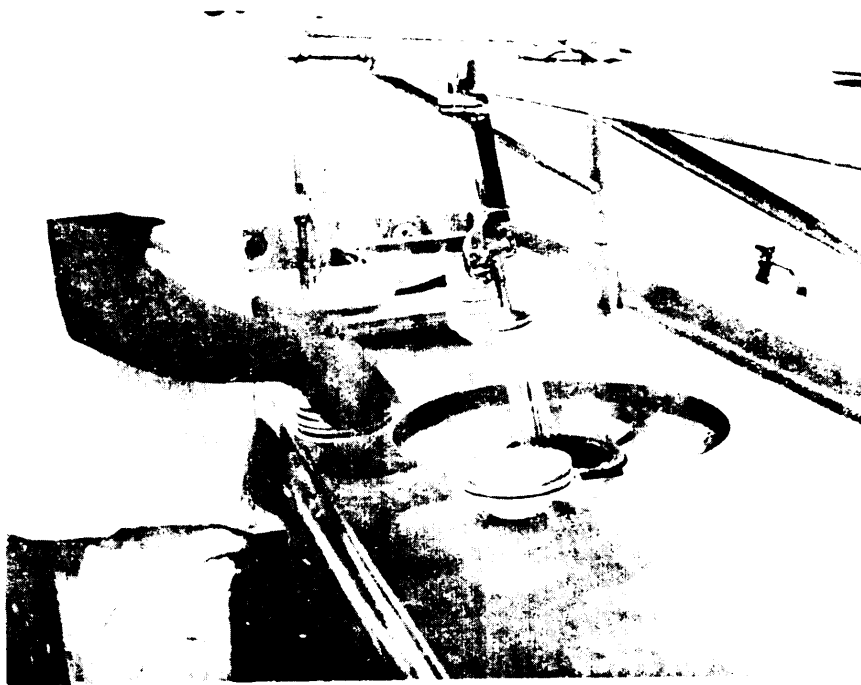


Figure 17 - Garbage Disposal/Flushing Attachment

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### SECTION III - MECHANICAL DISHWASHING PROCEDURES

A. Operations. - Two and one-half to three and one-half ounces of machine dishwashing compound, FSN 7930-205-1387, should be added to each 10 gallons of wash solution. NEVER USE HAND DISHWASHING COMPOUND, SOAP, OR DETERGENT (HAND OR LIQUID) IN THE DISHWASHING MACHINE. When the dishwasher is equipped with an automatic detergent dispenser, the dispenser should be set to maintain a concentration of 0.20 to 0.25 percent which is about 2.6 to 3.6 ounces per 10 gallons of wash solution. A detergent test kit, FSN 7320-144-6081, should be used to determine the specific detergent concentration. When a dishwasher is not equipped with a detergent dispenser, the standard dishwashing compound should be added directly to the dishwasher in measured amounts to maintain a uniform concentration. For the average wash tank (single/multiple), two and one-half to three and one-half ounces of machine dishwashing compound (1/2 of a small chinaware cup or 1/3 of a large white chinaware cup) should be added every ten minutes when automatic dispensers are not available or operable. If the dishwashing machine is equipped with a detergent concentration meter, add machine dishwashing compound, FSN 7930-205-1387, using the detergent test kit, make up the washing solution to a concentration of 0.20 percent, adjust temperature to 150°F and set needle on meter to 12 o'clock. The meter should be read after the doors have been closed and the water has been well circulated. When a rinse aid injector has been installed on a dishwasher, a rinse additive, FSN 7930-619-9575, in one gallon bottles should be used. To figure tank capacity when it is not given, multiply the length of the tank by the width of the tank by the height of the overflow level (in inches) and divide by 231. This will give the approximate capacity of the tank in gallons. The supervisory mess personnel should post the correct quantity of the standard dishwashing compound for the equipment on or near the dishwashing machine for use by subsequent operators.

#### B. Dishwashing Procedures

##### 1. Tableware

Chinaware, toughened glass, glassware, plasticware and trays (plastic serving, stainless steel serving and fiberglass carrying). - Chinaware, toughened glass, glassware, plasticware, and trays should be thoroughly washed in a dishwashing machine using the following dishwashing operation:

(1) Scrapping. Before being placed in the dishwashing machine, excess food soil should be removed immediately from chinaware, toughened glass, glassware, plasticware and trays by using the rubber bumper operation conforming to MIL-R-43767, Retainer (Bumper) Material, Liner, Trash Can (Figure 18). SCRUB BRUSHES SHOULD NOT BE USED (WILL CAUSE CONTAMINATION). Do not hit these items against refuse container (Figures 19 and 20)



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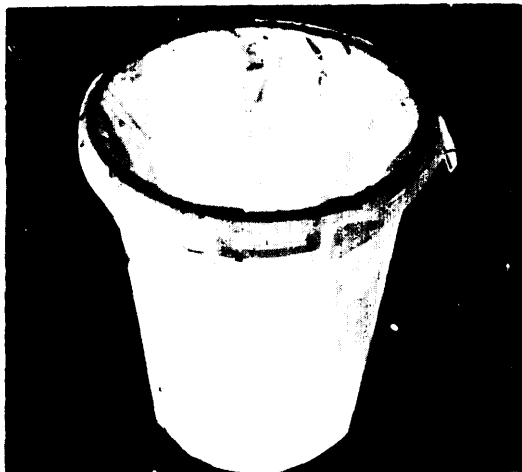


Figure 18 - Retainer (Bumper) Material, Liner Trash Can



Figure 19 - Improper Scrapping Procedure - Use Retainer (Bumper) Material, Liner Trash Can

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Figure 20 - Improper Scrapping Procedure - Do Not Strike  
Tableware Against Refuse Container

(2) Preflushing.- Chinaware, toughened glass, glass ware, plasticware and trays should be preflushed as soon as possible after scrapping in order to remove most of the food particles and grease before they are placed in the dishwashing machine. A preflush machine may be separate or an integral part of the dishwashing machine. The temperature of the water for preflushing should be maintained at  $115^{\circ}\text{F} + 5^{\circ}\text{F}$ .

(3) Sorting.- Chinaware, toughened glass, glassware, plasticware and trays of similar sizes and styles should be sorted according to the specific type of tableware items. The proper and improper sorting procedures are shown in Figures 21 and 22.

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Figure 21 - Proper Sorting Procedure

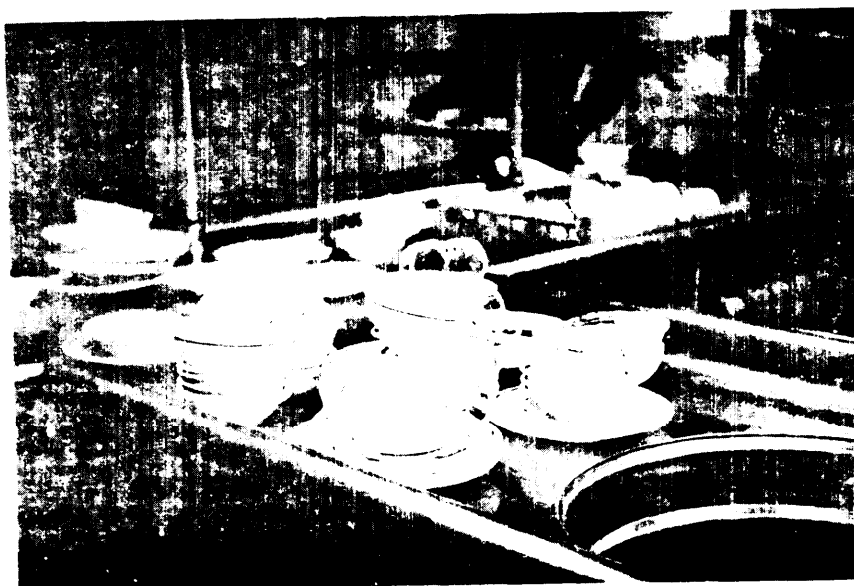


Figure 22 - Improper Sorting Procedure

(4) Racking: Chinaware, toughened glass, glassware, plasticware and trays should be racked as follows:

(a) Stand large (9-inch) dinner plates (china, glass or plastic) and compartment mess trays (15- $\frac{1}{2}$  X 11- $\frac{5}{8}$  X  $\frac{3}{4}$ ) in racks, FSN 7320-868-8942. This rack (approximately 20 inches square) should be loaded with not more than five trays or ten large dinner plates well spaced (not less than 3 inches apart) and slanted for the proper spray washing and rinsing of these items (Figures 23 and 24). Five service trays (15- $\frac{1}{4}$  X 20- $\frac{1}{2}$ ) should be placed in a rack, FSN 7320-868-8942 (Figure 25). One side of the rack should be cut off for proper fitting. The proper and improper racking procedures are shown in Figures 23 through 25.

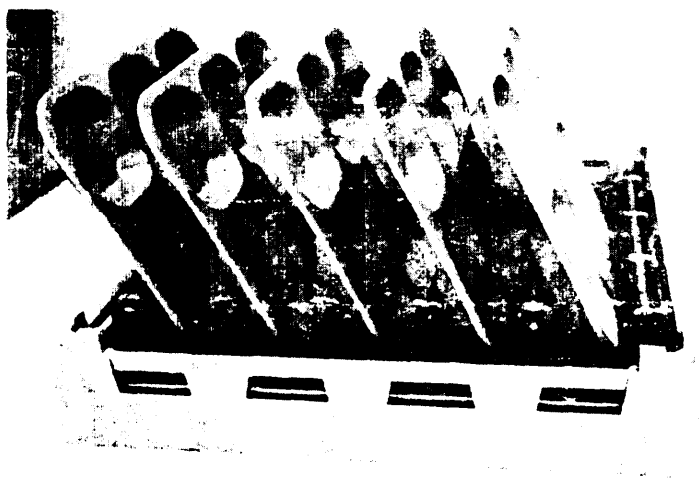


Figure 23 - Proper Racking Procedure - Compartment Messtray

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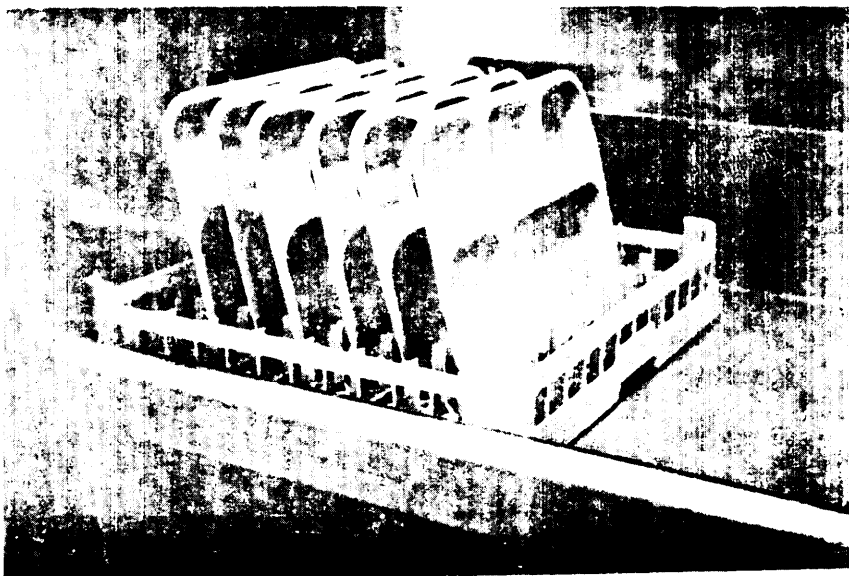


Figure 23A - Improper Racking Procedure (Compartment Messtray)  
(Improper Rack With Six Trays)

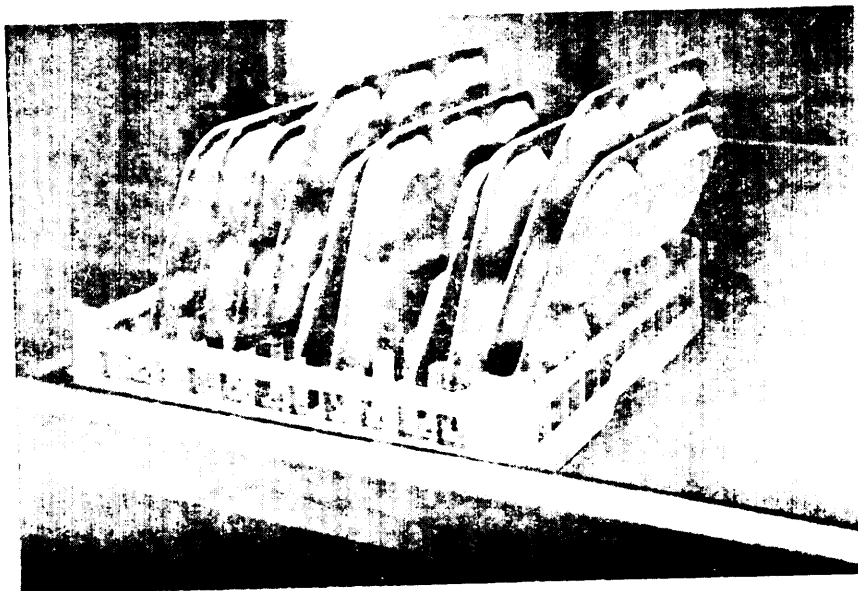


Figure 23B - Improper Racking Procedure (Compartment Messtray)

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Figure 23C - Improper Racking Procedure (Compartment Messtray)

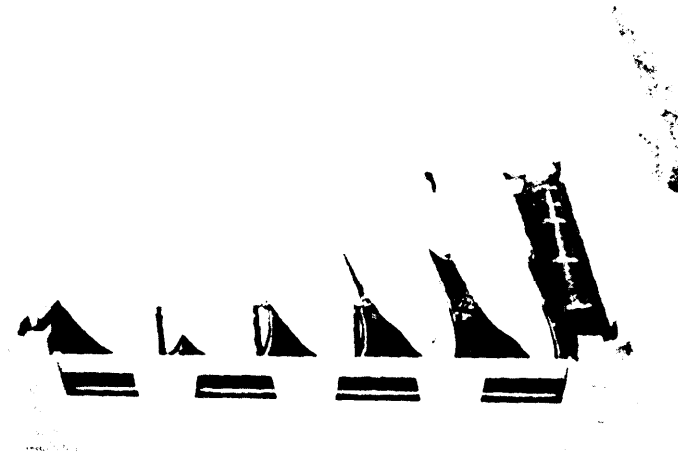


Figure 24 - Proper Racking Procedure (Plate, Eating, Dinner)

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Figure 24A - Improper Racking Procedure (Plate, Eating, Dinner)

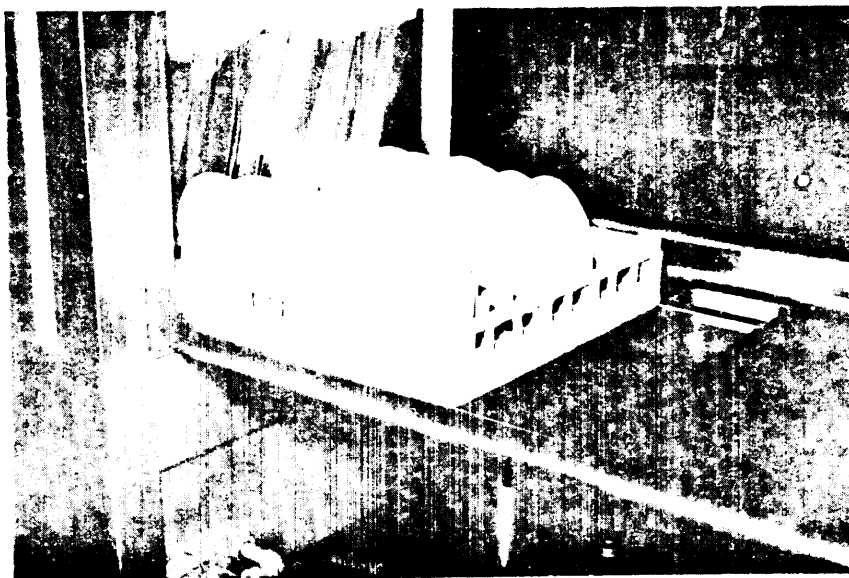


Figure 24B - Improper Racking Procedure (Plate, Eating, Dinner)

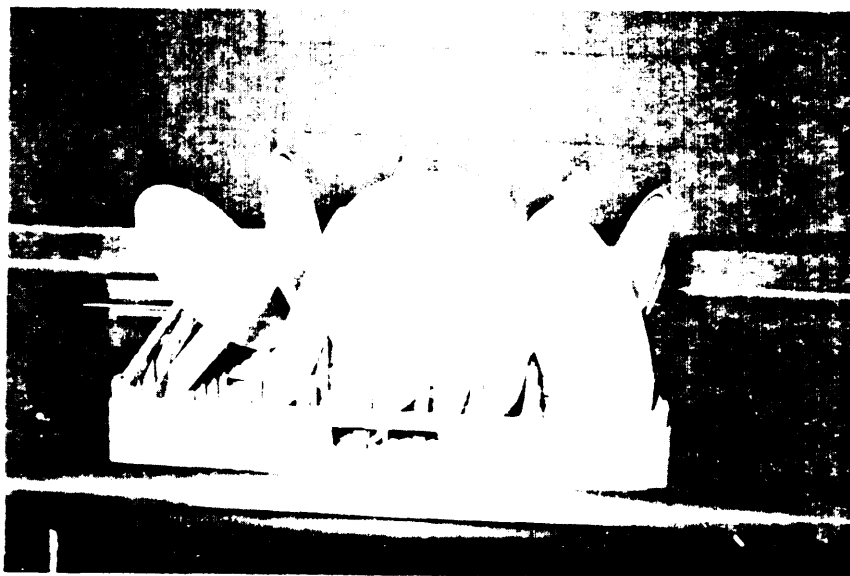


Figure 24C - Improper Racking Procedure (Plate, Eating, Dinner)

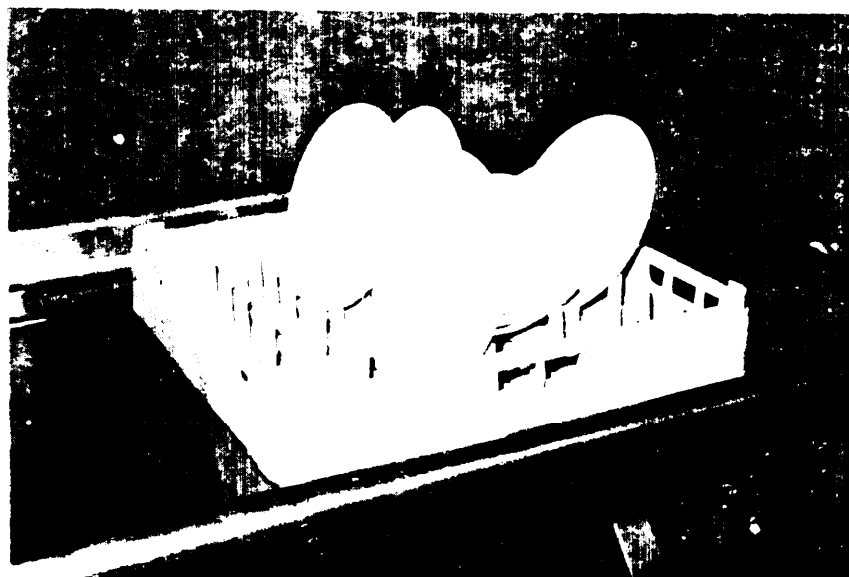


Figure 24D - Improper Racking Procedure (Plate, Eating, Dinner)



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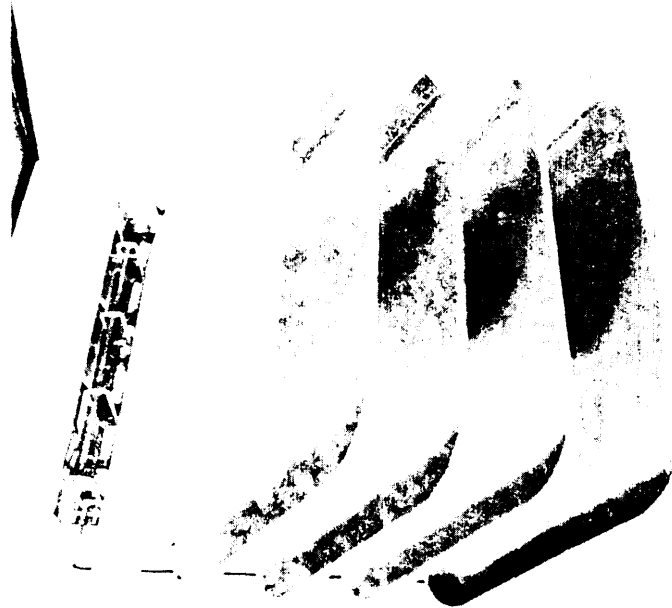


Figure 25 - Proper Racking Procedure

(b) Place sixteen 10-½ ounce drinking cups (china, glass or plastic) or nine 5-¾ inch diameter eating bowls (china, glass, or plastic) in the inverted position in a rack, FSN 7320-965-2141 (Figures 26 and 27). The proper and improper racking procedures are shown in Figures 26 and 27.

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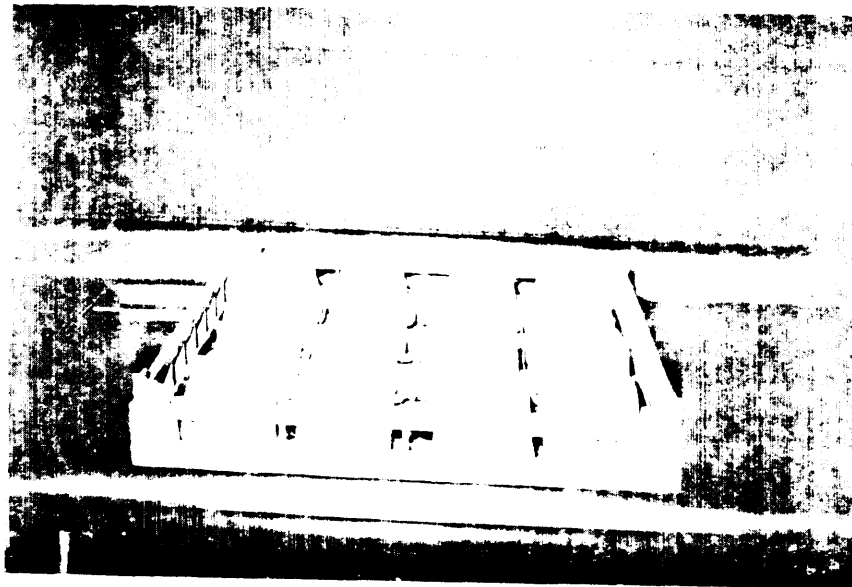


Figure 26 - Proper Racking Procedure (Cup, Drinking)

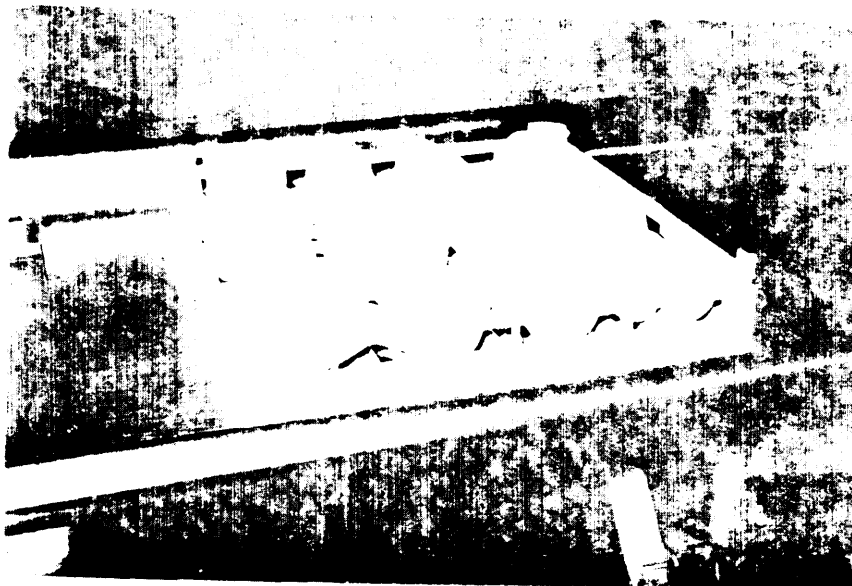


Figure 26A - Improper Racking Procedure (Cup, Drinking)

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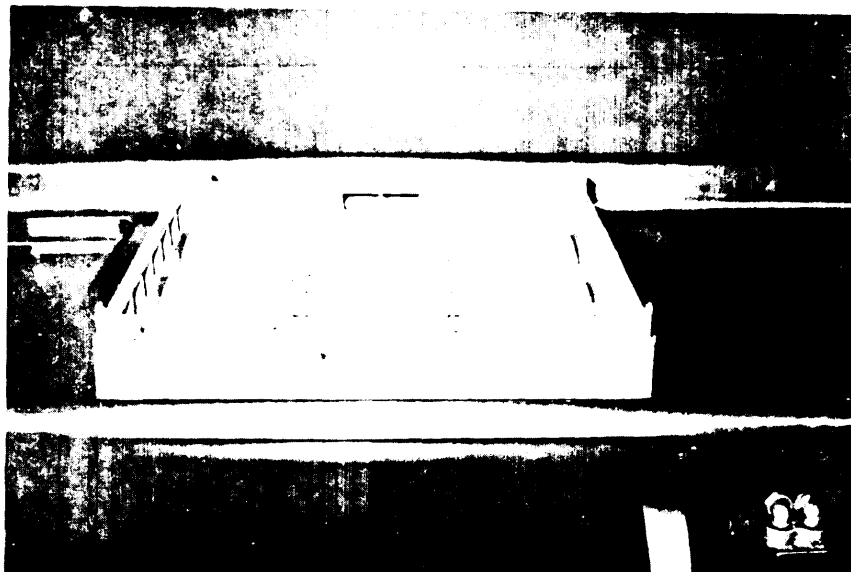


Figure 27 - Proper Racking Procedure (Bowl, Eating)

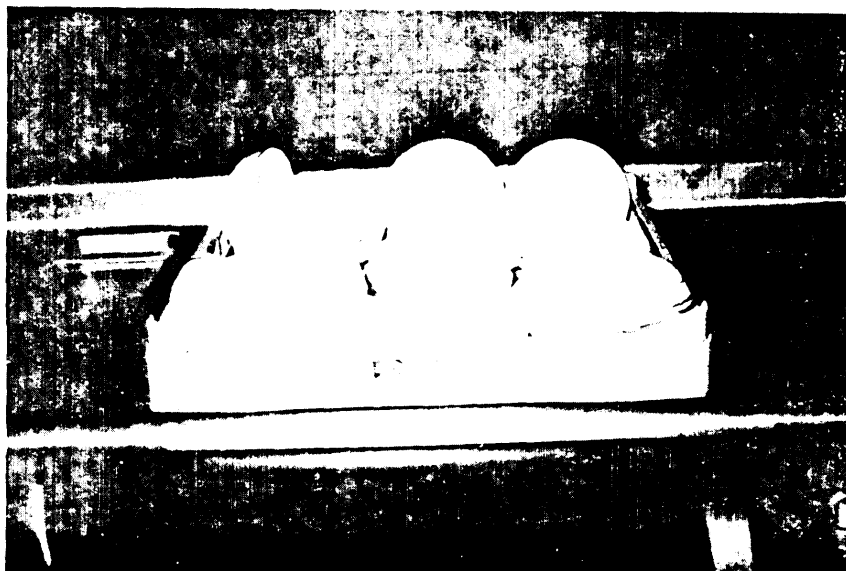


Figure 27A - Improper Racking Procedure (Bowl, Eating)

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(c) Place 36 tumblers in the inverted position in a rack, FSN 7320-926-6657 (Figure 28). The proper and improper racking procedures are shown in Figure 28.

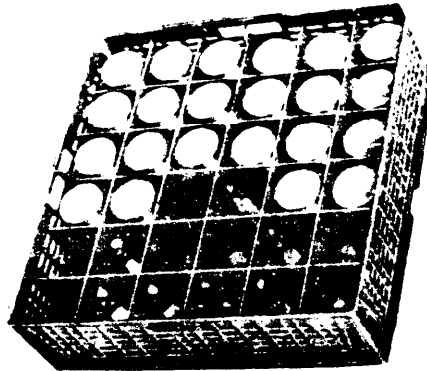


Figure 28 - Proper Racking Procedure (Glassware)

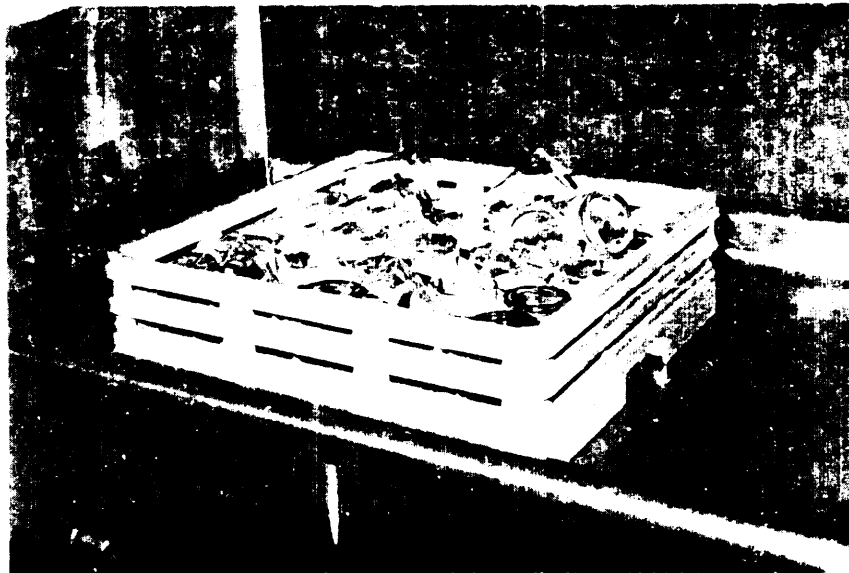


Figure 28A - Improper Racking Procedure (Glassware)

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(5) Washing.- Chinaware, toughened glass, glassware and plasticware items should be thoroughly washed in a single/multiple tank dishwashing machine using the recommended amount of machine dishwashing compound specified in Section III-A. If dishwashing operation continues over 30 minutes, shut down, drain both tanks, and start with fresh water and proper amount of machine dishwashing compound. Trays should not be washed with chinaware, toughened glass or glassware.

(6) Rinsing.- For chinaware, toughened glass, glassware, plasticware and trays, the temperature of the power rinse water in the dishwashing machine should be maintained at not less than 160°F. The final rinse water temperature should be not less than 180°F nor more than 195°F at the entrance of the final rinse manifold. When a rinse additive injector has been installed on a dishwasher, a rinse additive, in FSN 7930-619-9575, one gallon bottles, should be used. In the event that the rinse water cannot be kept hot enough to sanitize the tableware, flatware and glassware, they will be immersed for not less than 1 minute in a sanitizing solution containing at least 50 ppm of available chlorine at a temperature not less than 75 F or by following the "Instructions for Use" on the package of "Disinfectant, Food Service (Chlorine-Iodine Type)", FSN 6840-810-6396. Fresh solutions should be made for each 100 persons.

(7) Air drying.- When chinaware, toughened glass, glassware, plasticware and trays are washed and rinsed at the proper temperatures and with the proper use of machine dishwashing compound and rinse additive, the drying time of properly racked items in an adequately ventilated room is a few minutes. The surface of the chinaware and toughened glass that comes in contact with food should be untouched by the hands between washing and using. A sufficiently large clean table area and a sufficient number of racks should therefore be provided to permit at least a few minutes holding before the racks are unloaded. Washed chinaware, toughened glass, glassware, plasticware and trays should be inspected for minute film before being stored in a clean area for protection against contamination. If back of serving utensils have a grease film, they should be rewashed.

2\* Flatware (knives, forks and spoons).- Flatware should be washed as soon as possible after use to prevent tarnish and discoloration. Prolonged contact of food on flatware is the biggest corrosion and pitting factor and reducing the contact time is the most critical and essential step in the cleaning of flatware. Flatware should be washed in a dishwashing machine using the following operations:

a. Presoaking.- The flatware should be presoaked as soon as possible after use. Flatware should be completely immersed in a stainless steel sink or other suitable container containing one ounce of machine dishwashing compound per gallon of warm water (120°F to 125°F). DO NOT POUR MACHINE DISHWASHING COMPOUND OVER FLATWARE IN THE SOLUTION. DO NOT USE HAND DISHWASHING COMPOUND. Galvanized and copper alloyed containers should not be used to presoak flatware. A good presoak solution will thoroughly wet and

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loosen most solid film in a period of 15 to 20 minutes. NO PRESOAKING SHOULD EXCEED 30 MINUTES (WILL CAUSE CONTAMINATION). When the presoak solution becomes contaminated with food soil as is usually evident by the presense of a thin grease film on the solution's surface, the presoaked solution should be changed. When food soil loads are not excessive, the solution should be changed once every two hours at a minimum.

b. Sorting and racking.- Place approximately 15 assorted pieces of flatware (knives, forks, and spoons), "handles down", into flatware cylinders, FSN 7320-708-9568 (Figure 29) or FSN 7320-708-9580 (Figure 30). The flatware cylinders are then put in a flatware cylinder washing and transporting rack, FSN 7320-708-9540, and then placed in a flatware rack, FSN 7320-926-6658, for initial washing. Do not overcrowd flatware in the cylinder because water must reach all surfaces of each piece.

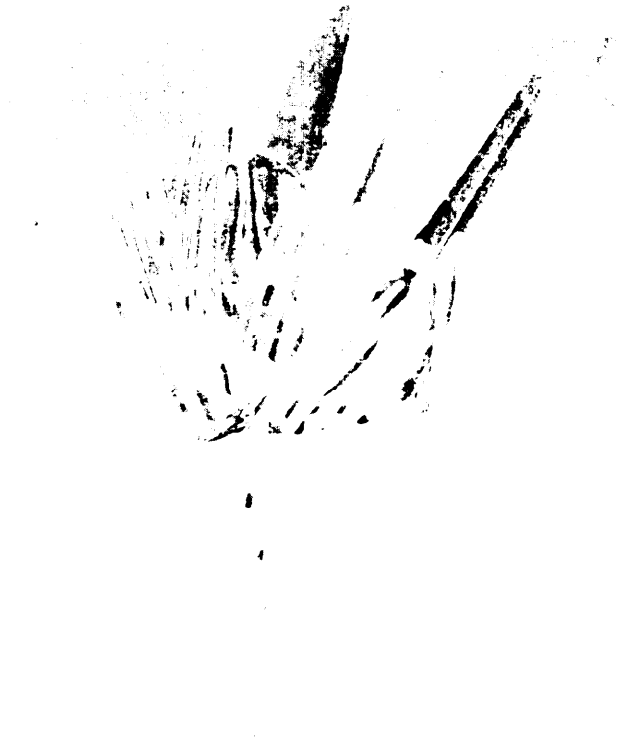


Figure 29 - Cylinder, Flatware (Plastic)  
(Initial Washing)

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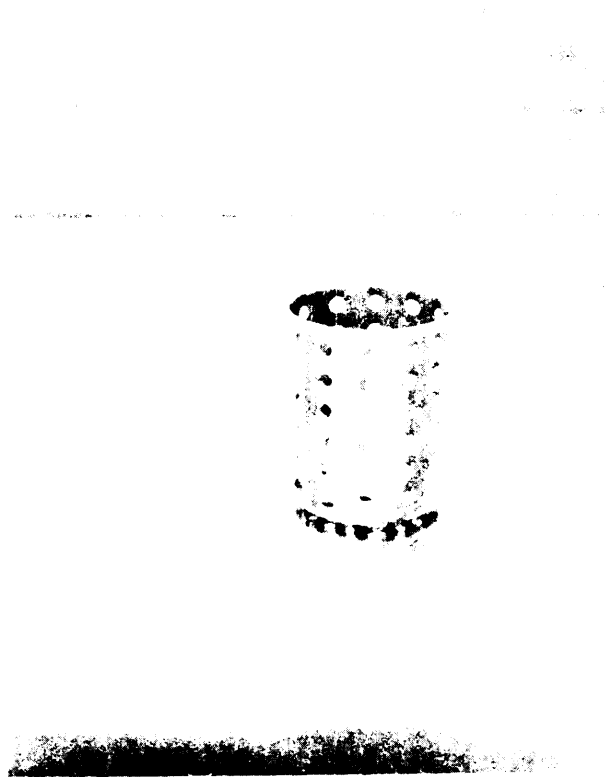


Figure 30 - Cylinder, Flatware (Corrosion-Resisting Steel)

c. Washing:- Flatware should be washed in a dishwashing machine according to the recommended washing requirements specified in Section III-A.

d. Rinsing:- After flatware cylinders have been rinsed and have cooled sufficiently to be handled, remove them from the washing and transporting rack. Sort the flatware and place approximately 15 pieces of the same kind of flatware handles down into flatware cylinders. Place the flatware cylinders in a flatware and transporting rack and place the rack in the dishwasher and repeat the washing operation (Figure 31). Invert them over cylinders of the dispensing rack so that the flatware will have handles up. Place the cylinders in the flatware dispensing racks (Figure 32) ready for the serving line.

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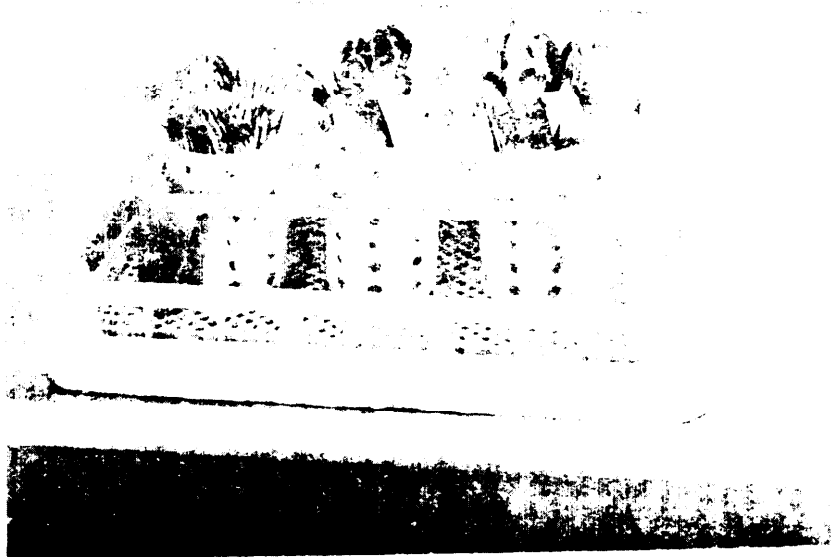


Figure 31 - Rack Cylinder Flatware, Washing And Transporting, And Rack Flatware, Washing (Final Washing)



Figure 32 - Flatware Cylinders In Flatware Dispensing Rack Ready For Serving Line



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e. Air Drying:- Flatware should be air dried and inspected for film deposits. Any rejects should be returned to the presoak solution. Towels should not be used to dry flatware.

3. Racks and cylinders.- Dishwashing machine racks and cylinders conforming to MIL-R-24039, Racks and Cylinders, for Mechanical Dishwashin& Machines, should be washed in a dishwashing machine according to the recommended washing requirements specified for tableware items. They should be air dried for a few minutes and stored in a clean area for protection against contamination.

4. Trouble shooting.- The following table should be used as a guide for correct dishwashing problems:

Table I - Check List for Correcting Dishwashing Problems

<u>Trouble</u>	<u>Check</u>	<u>Reason</u>	<u>Possible Solution to Problem</u>
1. Tableware not clean, grease film & food particles left on utensils	(a) Scrapping & pre-flush operations & procedures	(a) Excess food in pre-flusher; water greasy or cold.	(a)(1) Improve technique (2) Make sure the pre-flusher water is warm (comfortable to the touch). If you can not keep your hand in the water stream, it is too hot.
	(b) Washing solution concentration	(b) Too wet-poor cleaning Too strong-wasteful, unnecessary pollution & possible foaming	(b) Use "GSA Detergent Test Kit" to determine the proper concentration,* set meter or dispenser to maintain a 0.20 to 0.25% solution at 150° + 5°F. Be sure electrodes are clean before calibrating and during normal operations.
	(c) Washing solution temperature	(c) Too low-poor grease removal Too hi-food is cooked onto tableware. Detergent dispenser operation is effected by temperature change.	(c) Adjust wash solution temperature to 150° to 165°F.* Check temperature gauges for accuracy.
	(d) Washing solution pressure	(d) Too low-poor cleaning action Too hi-possible foaming	(d) Adjust pressure to a gauge reading of 4-6 psi measured at the wash manifold.*
	(e) Washing solution wash arm nozzles.	(e) Clogged nozzles-poor cleaning	(e) Daily clean up of machine
	(f) Wash scrap trays	(f) Dirty or improper installation, allowing solids to enter wash and rinse tanks. Refuse and solids can clog nozzles and stick to utensils.	(f) Daily clean up of machine

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Table I - Check List for Correcting Dishwashing Problems (cont'd)

<u>Trouble</u>	<u>Check</u>	<u>Reason</u>	<u>Possible Solution to Problem</u>
	(g) Curtain between wash and rinse tank.	(g) Missing curtain. Allow wash and rinse solutions to mix, allowing dishwashing compound in the rinse tank.	(g) Daily maintenance
	(h) Wash overflow level	(h) If wash level is below overflow, grease and scum are not removed and will deposit on tableware; also, it may cause foaming.	(h) Check drain valve and bleeder tube for operation.*
	(i) Bleeder tube	(i) Bleeder tube clogged - will eliminate overflow operation in wash tank.	(i) Clean and replace bleeder tube if required.*
	(j) Wash drain valve.	(j) Leaking drain valve: Excessive water is required to keep the wash tank filled to the overflow level - weak wash solution - or excessive consumption of dishwashing compound.	(j) Repair and replace if required.
	(k) Power rinse water temperature.	(k) Too low-poor rinsing and may cause foaming. Too high-dangerous to Personnel.	(k) Adjust temperature control to 160° to 180°F. Check thermometer for accuracy* Repair controls if required*
	(l) Power rinse water pressure.	(l) Too low-poor rinsing	(l) Adjust pressure to 4-6 psi measured at rinse manifold.* Check pressure gauge for accuracy* Repair or replace pressure gauge if required.*
	(m) Power rinse arm nozzle.	(m) Uneven or poor rinsing may indicate clogged nozzles.	(m) Daily maintenance

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Table I - Check List for Correcting Dishwashing Problems (cont'd)

<u>Trouble</u>	<u>Check</u>	<u>Reason</u>	<u>Possible Solution to Problem</u>
<u>2. Water spots on table utensils.</u>	(n) Final rinse water temperature	(n) Too low-slow drying and no sanitizing of tableware. Too high-dangerous to operating personnel.	(n) Adjust temperature control to 180° to 195°F.* Repair controls if required.* Check thermometer for accuracy.
	(o) Final rinse water pressure.	(o) Too low-poor rinsing Too high-dangerous to operating personnel.	(o) Adjust pressure to 20 psi (A suitable readily accessible valve with $\frac{1}{4}$ inch IPS connection shall be provided immediately adjacent to the supply side of the control valve in the line carrying final rinse water to the dishwashing machine.* (Repair if necessary.)
	(p) Final rinse water spray jets.	(p) Clogged spray jets - cause poor rinsing to occur.	(p) Daily maintenance.
	(a) Rinse cycle	(a) Rinse water dirty, at wrong temperature, or water hardness is excessive, water low in tank, pressure low.	(a) Daily maintenance.
(c) Hardness of final rinse water.	(b) Final rinse cycle.	(b) Clogged rinse jets result in poor rinsing. When properly operating each jet should have a fan-like spray pattern.	(b) Daily maintenance.
	(c) Hardness of final rinse water.	(c) Excessive hardness - insoluble salts from dishwashing compound.	(c) Add water softener or water softener system.*
	(d) Time of final rinse.	(d) Time cycle too short-leaves soil on utensils.	(d) Adjust time to 7 seconds (minimum) to traverse the wash spray area.*

Table I - Check List for Correcting Dishwashing Problems (cont'd)

<u>Trouble</u>	<u>Check</u>	<u>Reason</u>	<u>Possible Solution to Problem</u>
	(e) Temperature of final rinse.	(e) Temperature too cold - promotes slow drying and leaves spots.	(e) Adjust temperature to 180° to 190°F.
	(f) Pressure of final rinse.	(f) Pressure too low-poor rinse Too high-may spray hot water on operator.	(f) Adjust pressure to 20 psi.* (A suitable readily accessible valve with a 1/4 inch IPS connection shall be provided immediately adjacent to the supply side of the control valve in the line carrying final rinse water to the dishwashing machine.)
	(g) Drying time	(g) Too cold-if rinse additive concentration is not sufficient, if final rinse is to cold, or if sufficient drying time is not allowed before stacking (3 minutes) spotting will occur.	(g) Adjust final rinse temp. to 180° to 195°F.* Use a specification rinse aid at the required conc. to product sheeting off of rinse water and reduce drying time.
3. Excessive foaming or sudsing in wash tanks	(a) Pre-flushing operation.	(a) No "Hand Dishwashing Compound" should be used.	(a) Minute residues of dishwashing compound, soap or detergent, carried into dishwashing machine will cause foaming and sudsing.
	(b) Machine dishwashing compound.	(b) Use specified concentration of the detergent for the water hardness of that area. "Do not use hand dishwashing compound in dishwashing machine."	(b) Determine correct concentration by using a "Detergent Test Kit"*. Instruct Mess Personnel not to use hand dishwashing compound in dish machines (cause suds).
	(c) Bleeder tube	(c) Make sure bleeder tube is not feeding rinse additive into wash tanks.	(c) Check bleeder tube installation to be sure it is installed prior to the point where the rinse additive is fed into final rinse line to allow only fresh water into final rinse tank.*

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Table I - Check List for Correcting Dishwashing Problems (cont'd)

<u>Trouble</u>	<u>Check</u>	<u>Reason</u>	<u>Possible Solution to Problem</u>
	(d) Cleanliness of tank.	(d) Wash solution on contact with grease may produce soap which in turn causes suds.	(d) Daily maintenance.
4. Excessive foaming or sudsing in rinse tank	(a) Curtain	(a) If curtains not present, detergent will carry over into rinse tank.	(a) Make sure the curtain is properly installed in the dishwashing machine.*
	(b) Machine dishwashing compound.	(b) Make sure no one has used "Hand Dishwashing Compound", in the dishwashing machine.	(b) Remove all hand dishwashing compound from the area and instruct personnel not to use it.
	(c) Rinse water temperature at 160°F. (Minimum)	(c) Some rinse additives foam at lower temperature.	(c) Keep at required temperature.*
5. Scale build up in machine	(a) Water hardness	(a) To determine the water hardness.	(a) Use a water softener or install water softener equipment.* Use the recommended de-scaling procedure.*
6. Black marks on chinaware (not toughened glass) and tableware	(a) Surface glaze on chinaware.	(a) Poor, rough or crazed glaze causes metal deposits to occur when flatware is rubbed on the surface. Broken glaze could allow glazing to occur under the glaze itself.	(a) Buy new chinaware and flatware that conforms to the applicable specification.
	(b) Washing procedures	(b) Dishwashing personnel using steel wool can break down glaze and cause metallic deposits on chinaware.	(b) Personnel should not be allowed to use steel wool in dishwashing area.

\* These operations should be performed by Installation Facilities Engineer.

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#### SECTION IV - HAND DISHWASHING PROCEDURES

(Hand dishwashing should be used only when the dishwashing machines are not available or not operating properly.)

A. Operations.- The detergents used for hand dishwashing must be much milder than those used for machine dishwashing because operator's hands are immersed in the detergent solution. MACHINE WASHING COMPOUNDS SHOULD NEVER BE USED FOR HAND DISHWASHING OPERATIONS. They are strongly alkali and may cause skin irritations. The hand dishwashing compounds are generally high sudsing products. Sudsing is desirable in hand dishwashing but would interfere with the washing action in dishwashing machines. The washing temperature for hand dishwashing is much lower than that for machine dishwashing. The maximum temperature that can be endured by humans over an extended period is about 120°F. Proper scrapping and preflushing as previously described in machine dishwashing procedures are also important preliminary steps in hand dishwashing. Dishwashing Compound, Hand, FSN 7930-281-4731 (50 lb. sack), should be used for hand dishwashing operations. The proper and improper hand dishwashing operations are shown in Figures 33 through 40. The arrangement recommended for hand washing serving utensils and tableware items consists of three sinks, one warm wash (120°F to 125°F), one warm rinse (120°F to 140°F), and one hot sanitizing (180°F). Immersion in the third sink using wire baskets will be for 30 seconds at 180°F., with a thermometer indicator and booster heater provided. An alternative method is two sinks, one warm wash (120°F to 125°F) and one warm rinse (120°F to 140°F) followed by a final rinse in a fixed nozzle spray rinse cabinet (not shown in Figure 34) delivering 10 gallons per minute of 180°F rinse water at the manifold for 5 seconds or 5 gallons per minute for 10 seconds.

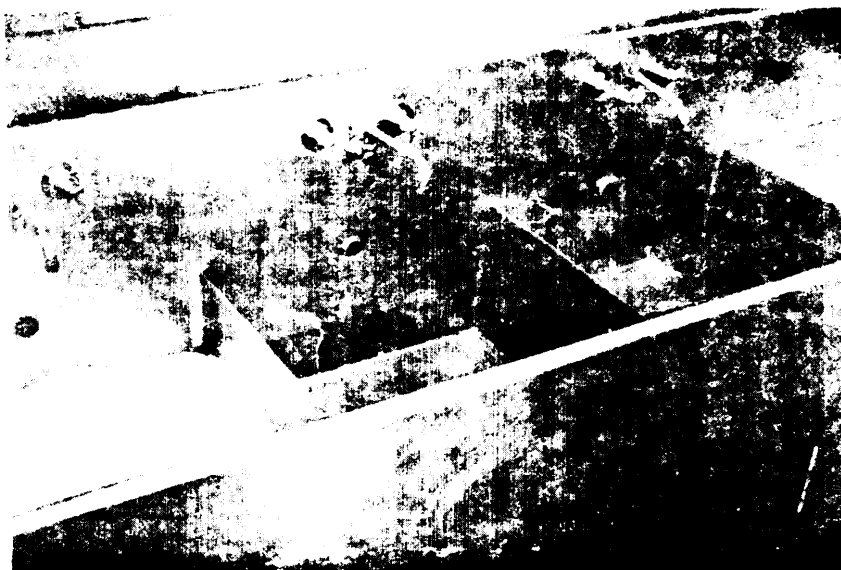


Figure 33 - Proper Hand Dishwashing Operation

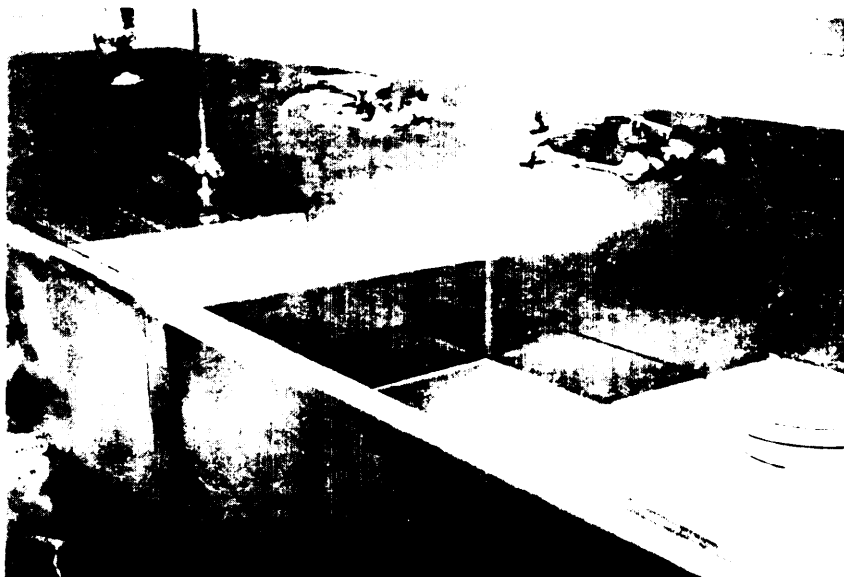


Figure 34 - Proper Hand Dishwashing Operation  
(Alternate Method)

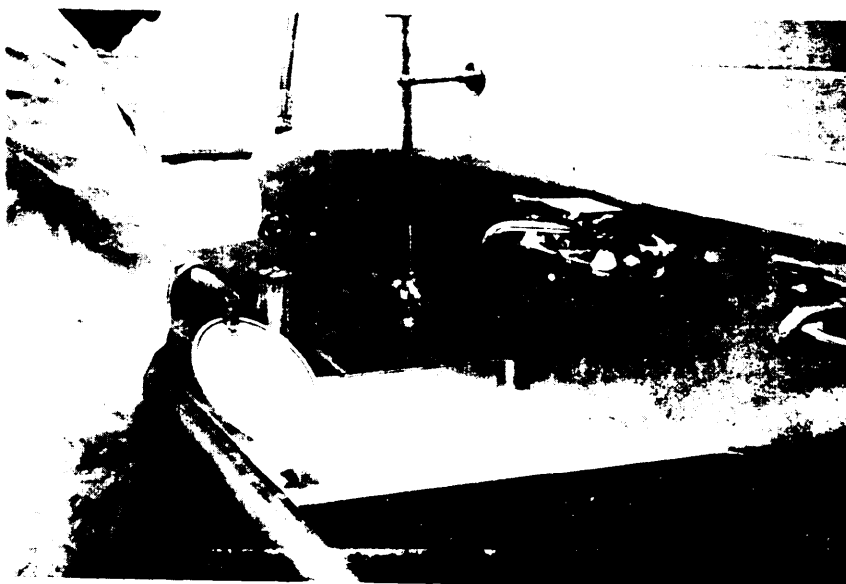


Figure 35 - Proper Hand Dishwashing Operation  
(Alternate Method)



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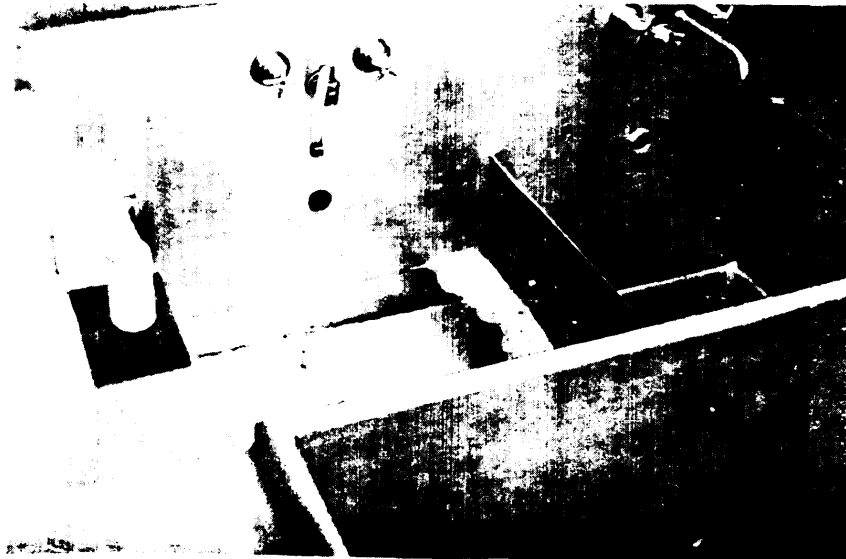


Figure 36 - Improper Hand Dishwashing Operation -  
Too Little Detergent In First Sink

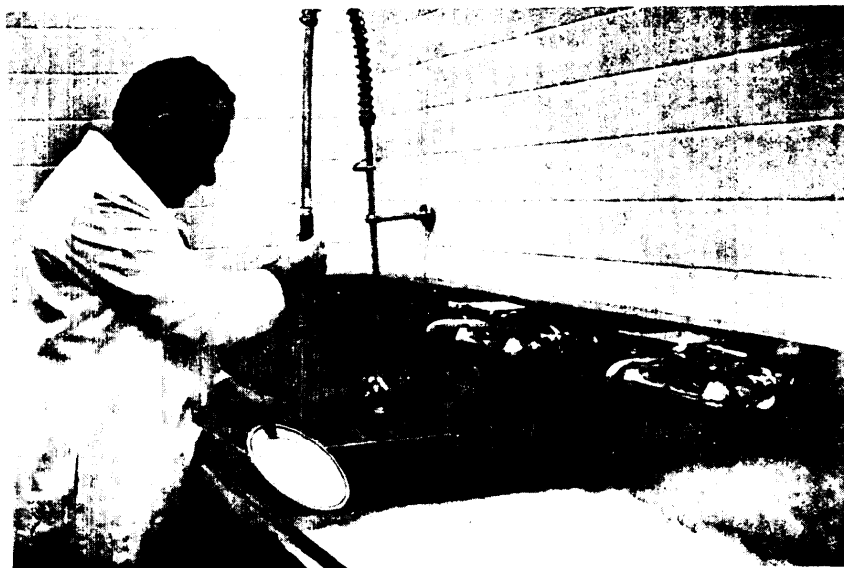


Figure 37 - Improper Alternate Hand Dishwashing Operation -  
Do Not Rinse Chinaware In The Final Rinse  
Sink First

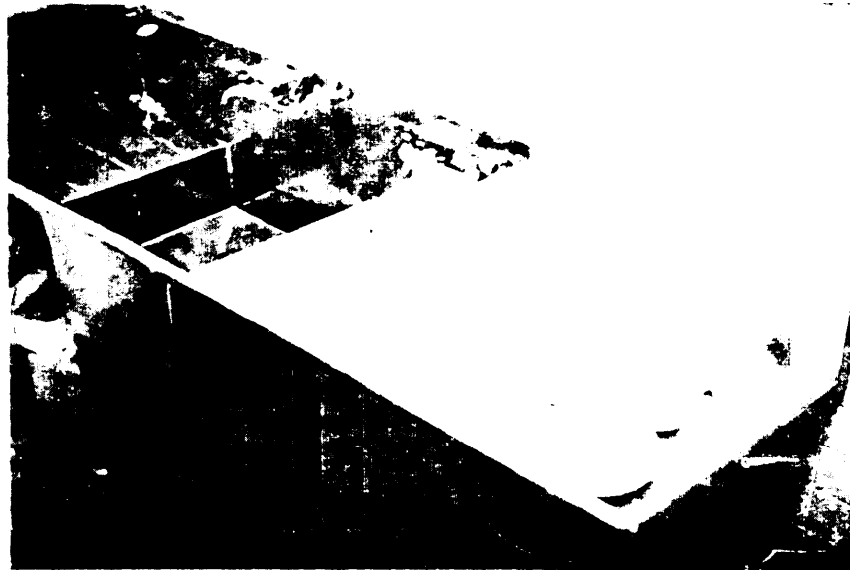


Figure 38 - Improper Alternate Hand Dishwashing Operation -  
Do Not Use Machine Dishwashing Compound

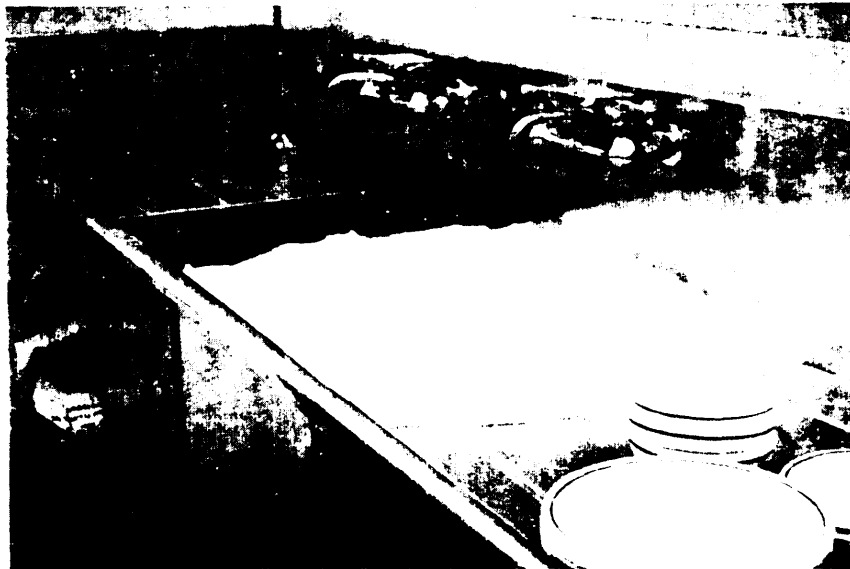


Figure 39 - Improper Alternate Hand Dishwashing  
Operation - Too Much Suds

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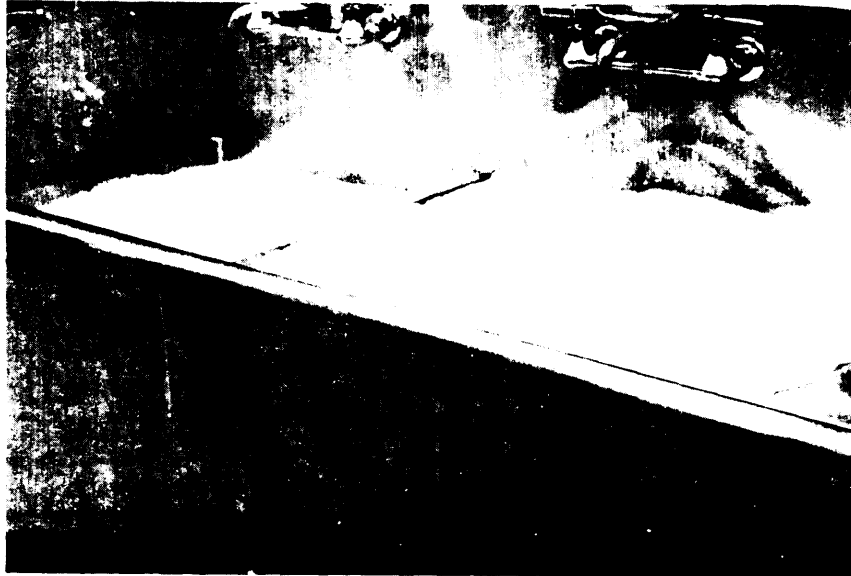


Figure 40 - Improper Hand Dishwashing Operation -  
Too Much Suds In Both Sinks

B. Hand Dishwashing Operations for Specific Tableware Items

1. Chinaware, toughened glass, plasticware glassware and serving trays (5-compartment, plastic, stainless steel and fiberglass).- These items should be individually hand washed in the referenced wash sink or other suitable container using the following hand dishwashing operations:

a. Scrapping.- Excess food soil should be removed by using the rubber bumper operation as specified in Section III-A.

b. Preflushing.- These items should be individually preflushed as specified in Section III-A.

c. Washing.- These items should be individually hand washed with a scouring pad, FSN 7920-753-5242, in a wash sink or other suitable washing container using 3 ounces of hand dishwashing compound, FSN 7930-281-4731, in every 10 gallons of warm water (120°F). The temperature of the wash water solution should be maintained at 120°F to 125°F. DO NOT USE COLD WATER TO DISSOLVE HAND DISHWASHING COMPOUND. The wash solution should be changed when it becomes contaminated with food soil, as is evident by lack of suds or the presence of a thin grease film on the solution's surface.

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d. Rinsing.- These items should be placed in suitable racks on wire baskets and rinsed in the wash sink or other suitable container using clear warm water (120°F to 140°F), and then rinsed for 30 second in hot water at a temperature of 180°F. If sufficient hot water is not available, these items should be rinsed according to the "Instructions for Use" specified on the package of Disinfectant, Food Service, MIL-D-11309. The clean tableware should be racked for air drying.

e. Air drying.- These items should be racked and air dried, as specified in Section III-A.

2. Flatware (knives, forks and spoons).- Flatware should be individually hand washed with scouring pad, FSN 7920-753-5242, in the wash sink or other suitable washing container as soon as possible after use in order to prevent--cnt tarnish and discoloration. The following hand dishwashing operations should be followed:

a. Presoaking .- The flatware should be presoaked as specified in Section III-A, except that 3 ounces of hand dishwashing compound should be used per 10 gallons of warm water (120°F to 125°F.).

b. Flatware should be individually hand washing with a scouring pad, FSN 7920-753-5242, in the wash sink or other container as specified for chinaware, toughened glass, plasticware , glassware and trays. The temperature of the wash soil.ltion should be maintained at 120°F. to 125°F.

c. Rinsing.- Flatware should be placed in separate flatware cylinders (approximately 10 to 15 knives, forks and spoons), handles down, and rinsed as specified for chinaware, toughened glass, plasticware, glassware and serving trays.

d. Air drying.- After the flatware has been rinsed, it should be allowed to air dry and be inspected for food soil do not handle surface that comes in contact with food). The cylinders are are inverted into the flatware dispensing racks "handles up". Any reject should be retured to the presoak solution.

3. Pots and pans.- Pots and pans should be hand washed according to the procedure specified in Figure 41. Excess food particles should be placed in the garbage disposal, then the pots and pans should be prerinsed before being hand washed. Three separate sinks should be used to wash pots and pans. The pots and pans are individually washed in the first wash sink (which contains a grease trap on side) using 3 ounces of hand dishwashing compound per 10 gallons of warm water (120°F to 125°F). They should be washed thoroughly inside and outside by means of a kitchen scrub brush, FSN 7920-061-9937 or FSN 7920-061-0038. Burned food and difficult to remove stains should be removed by using a small amount of scouring powder, FSN 7930-205-0442, on a damp abrasive scouring pad, FSN 7920-753-5242, and rubbing vigorously in a circular motion until the stains

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are removed. Pots and pans are then rinsed in the second sink at a temperature of 120°F to 140°F. The rinse water solution should be kept clean and free from a buildup of suds. The pots and pans are then immersed completely in the third sink which contains clear hot water (180°F) for a period of not less than 30 seconds. Where sufficient hot water is not available, pots and pans should be immersed for not less than one minute in a disinfectant solution according to the "Instructions for Use" on the package of Disinfectant, Food Service (Chlorine-Iodine Type). Finally, the pots and pans are allowed to be air dried (no towels) on a clean surface or rack and then stored in a clean area which is free from contamination.

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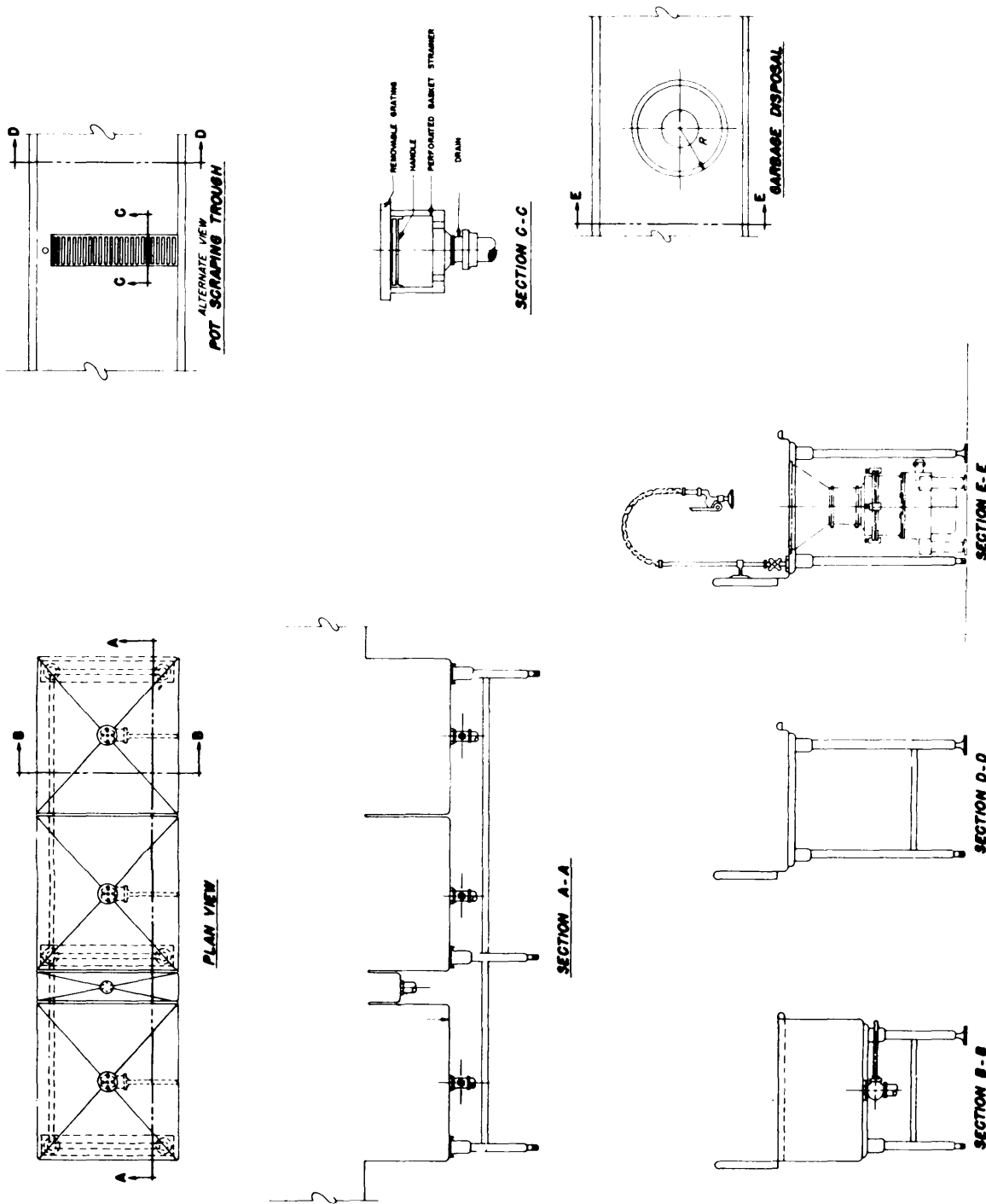


Figure 41 - Proper Washing Procedure For Pots And Pans

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c. Operating Precautions. - The following operating precautions should be taken by dining facility personnel in order to establish a satisfactory hand dishwashing operation:

1. The detergents used for hand dishwashing should be the standard product.
2. Machine dishwashing compounds should never be used for hand dishwashing.
3. Gross and unconsumed food soils on tableware and other serving utensils should be removed by scrapping and preflushing before placing them in the wash solution.
4. The temperatures of the preflush, wash solution and rinse water should be maintained at the specified temperatures in order to obtain effective washing and rinsing action.
5. The washing solution should be changed when the suds disappear and oil film forms on the surface.
6. Sponges should not be used to remove excess food soil from tableware and other serving utensils.
7. Tableware and other serving utensils should be preflushed as soon as possible after use.
8. Pots and pans should be rinsed in clear warm water (120° to 140°F) immediately after being used.
9. The eating surfaces of clean tableware and other serving utensils should not be touched. Only persons with clean hands should handle tableware in order to reduce the possibility of contamination.
10. Scouring powder should not be used to clean tableware and other serving utensils; it should be used only on pots and pans.
11. Disinfectant, " Food Service, should be used to santize tableware and other serving utensils where sufficient amount of hot water is not available.

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## SECTION V - FIELD DISHWASHING PROCEDURE (BOILING WATER METHOD)

A. Operations.- The detergents used for field dishwashing are the same as those used for hand dishwashing operations. MACHINE DISHWASHING COMPOUNDS SHOULD NEVER BE USED FOR FIELD DISHWASHING. The temperature of the wash solution should be maintained at a minimum of 130°F. The prerinse and rinse temperatures should be maintained at the boiling point of water. Proper scrapping and washing are important steps in field dishwashing. Dishwashing Compound, Hand, FSN 7930-281-4731 (50 lb. sack) should be used in field dishwashing procedures. The arrangement recommended for the field washing of mess kits consists of three 32-gallon galvanized steel corrugated cans, each with an immersion heater for use in field dishwashing (Figure 42). (See TM 10-4540-201-15 for operating instructions of the immersion heater). An additional 32-gallon can may be used as a prewash solution (change frequently) if the mess kits are extremely dirty. Each group of three or four cans is capable of washing the mess kits of approximately 80 persons. Mess kit should be individually washed in the field according to the following procedures:

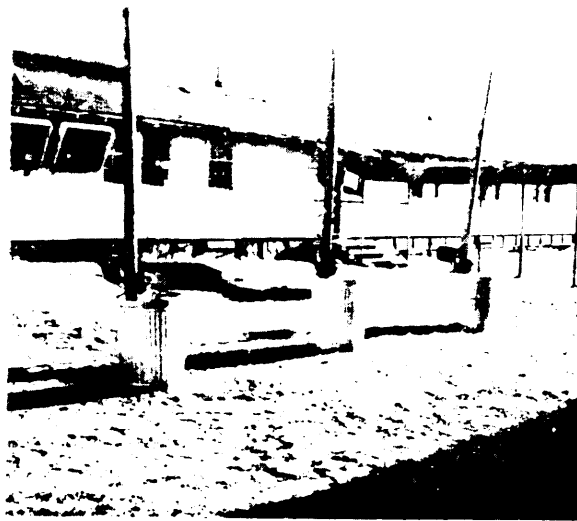


Figure 42 - Mess Kit Cleaning Operation (Additional Prewash Can May Be Used If Required)



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1. Scrapping.- Food particles should be completely scrapped as soon as possible after use from the mess kit into a garbage container by means of a long-handled scraper, FSN 7330-205-1950 or by using the rubber bumper operation.

2. Washing.- The first 32-gallon can is filled with warm wash solution (130°F minimum) (hot to touch) using twelve ounces of hand dishwashing compound, FSN 7930-281-4731. Stir vigorously to produce suds. The mess kit is then thoroughly washed in the wash solution using a long-handled brush. It is then removed from the wash solution and shaken vigorously to remove excess solution. The wash solution should be changed when it becomes contaminated with food soil, as is evident by lack of suds or grease film on surface. It is important that the wash solution temperature be maintained at a minimum of 130°F so as to soften greasy film soils.

3. Rinsing.- The second and third 32-gallon cans are filled with clear boiling water. The mess kit is prerinsed thoroughly in the second can, and then it is rinsed thoroughly for 30 seconds in the third can. The mess kit should be vigorously shaken before moving to each succeeding can in order to drain off excess water. It is important that the prerinse and rinse solutions be maintained at the boiling point. The prerinse and rinse waters should be changed when a grease film appears on the surface of the water.

4. Air drying.- The mess kits should be thoroughly air dried. Towels should not be used.

B. Operating Precautions.- The following operating precautions should be taken by dining facility personnel in order to establish a satisfactory field dishwashing operation:

1. After each meal, the 32-gallon galvanized steel corrugated cans should be thoroughly cleaned with a hot washing solution using a scrub brush followed by a boiling water rinse.

2. The detergent used should be the standard product.

3. Machine dishwashing compounds should never be used for field dishwashing operations.

4. Gross and unconsumed food soils should be scrapped from the mess kit as soon as possible after use and before placing it in the wash solution.

5. The washing solution and the rinsing waters should be changed periodically for proper washing efficiency.

6. The temperatures of the wash solution, prerinse and rinse waters should be maintained at the specified temperatures in order to obtain effective washing and rinsing action.

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c. Alternate Method for Field Dishwashing Procedure - Disinfectant Method.- Disinfectant, Food Service (Chlorine-Iodine Type), FSN 6840-810-6396, (4.77oz. pouch), was developed for low-temperature Disinfection mess kits, in lieu of the boiling water rinse. It is intended primarily for use in the field where the rinsing solution cannot be kept at the boiling point for disinfecting mess kits. When dissolved in water, Disinfectant, Food Service, releases both iodine and chlorine gas which disinfects the mess kit. The efficiency of this action is increased by the length of time it stays in contact with the mess kit and also by the agitation of the water. If the compound is dissolved in warm water (130°F), the halogen gases are released too rapidly and the disinfecting action is soon lost. A chlorine-iodine solution for rinsing the mess kits of approximately 100 men is made by dissolving the contents of one double compartment, one package of Disinfectant, Food Service, in 25 gallons of water. If the water is cold, mix the contents of the package with a small amount of water in a container (canteen cup) and pour the mixture into the rinse water. Stir thoroughly to dissolve. A fresh solution must be made up for each 100 men, and a solution should not be reused. The proper mess kit washing, rinsing and disinfecting procedures consist of a mess kit cleaning operation using three 32-gallon galvanized steel cans.

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## SECTION VI - STAIN REMOVING PROCEDURES

A. Operation.- A satisfactory stain remover has been developed by the military for use in either hard or soft water for the removal of coffee, tea and other absorbed food stains from tableware, glassware, plasticware and serving trays and for removing coffee stains from stainless steel coffee urns (not aluminum urns). This stain remover is covered by FSN 7930-282-0685. It should be stored in a tightly closed container in a cool dry place.  
STAIN REMOVER, TABLEWARE, SHOULD NOT BE USED ON ALUMINUM EQUIPMENT.

1. Removing stains from tableware, glassware, plasticware and serving

a. Sinks, steel or porcelain tubs, crocks, "GI" cans and similar containers may be used to hold the stain removing solution. A dial-type thermometer should be placed in the solution to determine the proper operating temperature. Rinse tanks of dishwashing machines can be used if other facilities are not available. Aluminum equipment should not be used. Avoid skin contact. Avoid breathing of dust from the stain remover.

b. Dissolve the stain removing compound in the ratio of 1 to 2 pounds to 12 gallons of hot water (170°F to 180°F). Completely immerse tableware and other serving utensils (except flatware) in the stain removing solution at 180°F for approximately one hour or until stains are removed.  
DO NOT STACK TABLEWARE IN THE SOAK SOLUTION.

c. Rinse tableware and other serving utensils (except flatware) thoroughly with a strong stream of cold water after removing the stain. Steel wool scrub brushes or other abrasives should never be used to remove stains from tableware and other serving utensils.

d. Wash and rinse the tableware, glassware, plasticware, and serving trays in a dishwashing machine using the recommended machine dishwashing procedures as specified in Section III.

e. Allow the tableware and other serving utensils to be air dried before placing them in a clean area.

2. Removing stains from coffee urns (except aluminum).- stain remover, FSN 7930-282-0685, should be used for destaining coffee urns according to the following procedures:

a. Fill and heat the hot water boiler (170°F to 180°F).

b. Drain leftover coffee from the urns.

c. With coffee faucet open, open top of urn and rinse with hot water (170°F to 180°F).

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Close the coffee faucet and refill the urn with hot water (170°F to 180°). Add two tablespoons (2 oz.) of stain remover, FSN 7930-282-0685, per 5 gallons of hot water. Let the solution stand for 15 minutes or longer depending on the degree of stain. Agitate solution with a long-handled scrub brush to loosen deposits.

e. Drain and rinse well with hot water.

f. Allow the coffee urn to be air dried.

3. Removing stains from flatware.- The greatest single cause of corrosion to stainless steel flatware is food soil, especially from foods which are acidic. The presence of lactic, tannic, tartaric, citric and other acids present in such foods as mayonnaise, fruits, fruit juices and butter attack and remove the oxide film from stainless steel surfaces, causing pitting or surface corrosion to take place. The longer the food soil remains in contact with the flatware the greater the corrosion. FLATWARE SHOULD BE PRESOAKED IN THE WASH SOLUTION AS SOON AS POSSIBLE AFTER USE. The following operating procedures should be followed for removing stains from flatware:

a. Dissolve completely two ounces of hand dishwashing compound, FSN 7930-281-4731, for each one gallon of warm water (120°F to 125°F) in wash sink or some other suitable container.

b. Place flatware in the wash solution for five minutes. DO NOT OVERSTACK FLATWARE.

c. Remove the flatware from the wash solution, and immediately wash it in a dishwashing machine using the recommended machine dishwashing procedures specified in Section III.

4. Operating precautions.- The following operating precautions should be taken by dining facility personnel in order to establish a satisfactory stain removing operation:

a. The stain for glassware and plasticware remover should be of the oxygen releasing type. The stain remover for flatware should conform to P-D-410.

b. The temperature of the stain removing solution should be maintained at 170°F to 180°F.

c. Stain remover solution should not be used on aluminum equipment.

d. Tableware and coffee urns should be thoroughly rinsed after being subjected to the stain remover solution.

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e. Tableware, glassware, plasticware and serving trays should remain in the stain remover solution until all of the stains are removed.

f. Flatware should be washed as soon as possible after being removed from the presoak solution.

g. Flatware should be presoaked in the presoak solution as soon as possible after use.

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## SECTION VII - DISPENSING SYSTEMS FOR USE WITH LIQUID SUPPLIES

### A. Central Liquid System (Remote Type)

1. Operation. - The central liquid system (FIGURE 43 is recommended for use on high capacity flight type (rackless) dishwashing machines. The system consists of the control unit, detergent dispensing unit and rinse additive injector all within one main control panel or box, and subpanels containing a failure alarm to indicate when the concentration of detergent in the wash water is not as preset, when the system is not operating due to mechanical failure, or when the liquid supplies have been depleted and the containers require changing.

The liquid supplies are pumped or drawn through plastic tubing from their original packaging container into the dishwasher through the dispensing units. The liquid supplies can be stored in an area on the floor above or below the dishwashing machine or on the same floor as far as 20 feet from the dishwashing machine.

The dishwashine machine contains an electronic sensor (probe) as is used with powdered detergent systems, that senses the detergent concentration of the wash water solution and relays the information to the control box or panel by a connecting wire. If the wash solution is below the desired concentration, the dispensing system activates as a result of the signal and releases the dishwashing compound into the wash tank as necessary to maintain the proper detergent concentration.

The rinse injector portion of the system is connected to the final rinse line within the dishwasher. When the system contains subpanels, lights and bells indicate when the detergent or rinse additive drums require changing and also indicate when the system shuts down due to mechanical failure. This surveillance console can be placed anywhere in the mess area or mess supervisor's office for continual supervisory surveillance of the operating condition of the dishwashing dispensing equipment.

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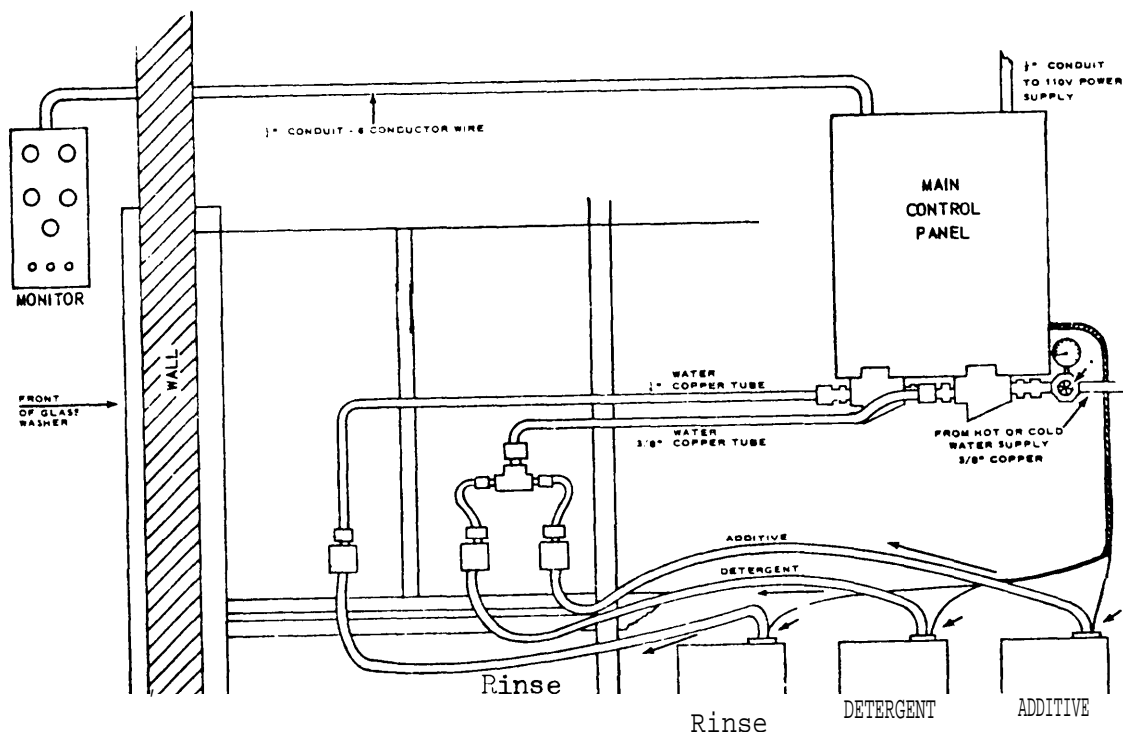


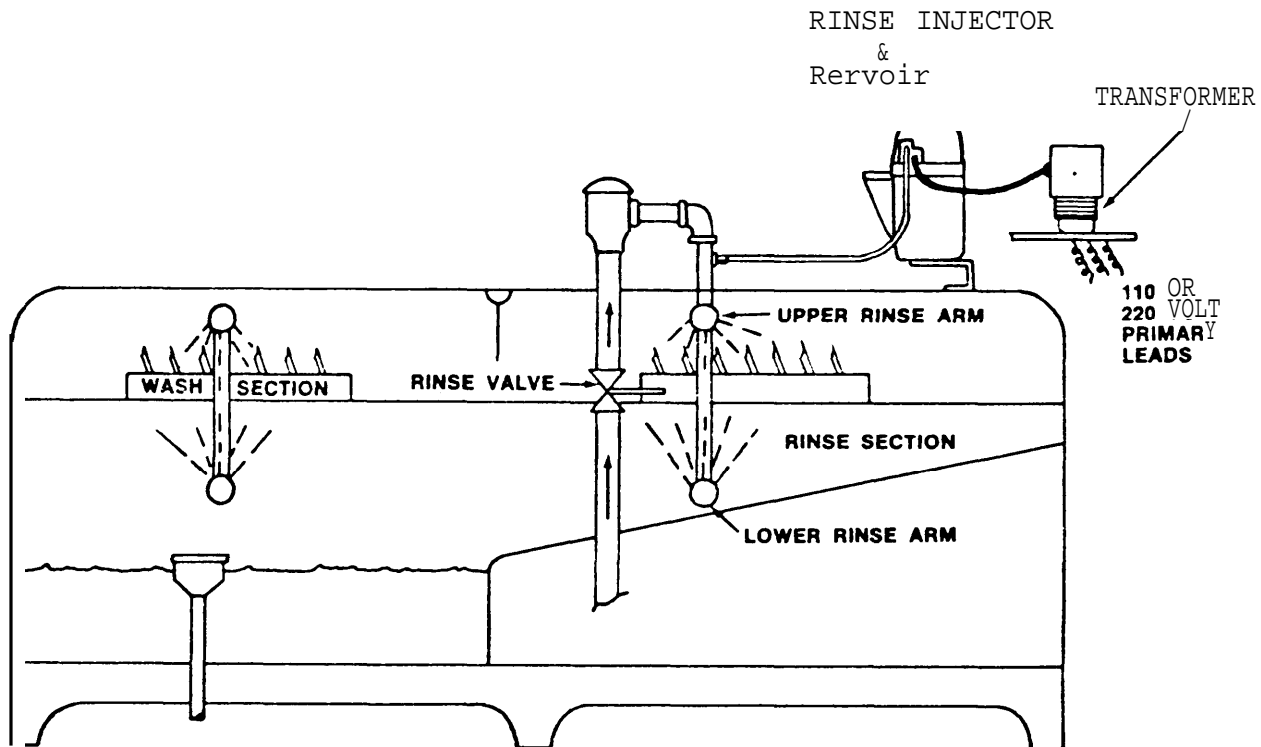
Figure 43 - Central Liquid System (Remote Type)

B. Liquid System (Proximate Type) (Figures 44 and 45)

1. Operation.- The smaller capacity dispensers used with single and multiple-tank rack type spray dishwashers are individually suited for the machine upon which they are to be used. They contain a detergent feeding mechanism consisting of a pump or syphon (like the larger central liquid system) and a completely separate unit for dispensing the rinse additive into the final rinse line of the dishwashing machine. These dispensers consist of a control unit and probe, however, they do not contain subpanels for surveillance purposes. The warning signals indicating a failure of the equipment to maintain the desired preset concentration are contained within the control box.

Supplies are stored next to the dishwasher and are of a smaller capacity container, proportionate to the size of the dishwasher with which they are to be used. The units operate in the same manner as the larger central liquid system.

APPLICATION : Used to inject a liquid drying agent into the final rinse of a dish-machine, as shown below.



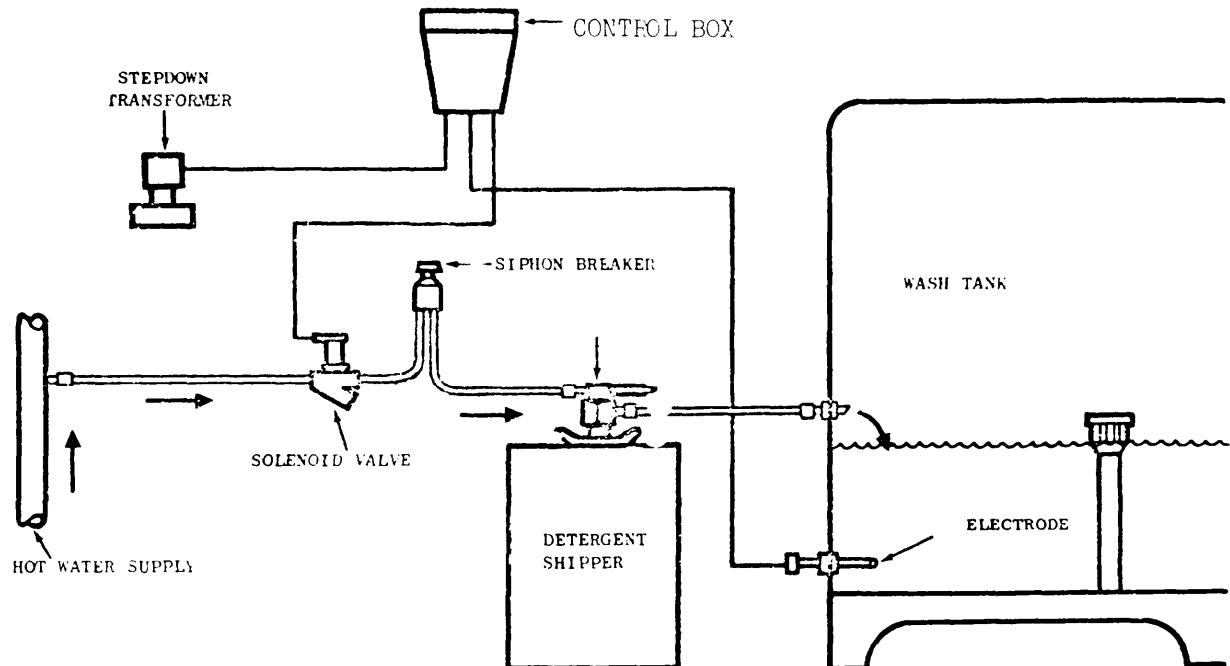
PRINCIPLES OF OPERATION: The piston pump is electrically operated and is controlled by pressure switch that is an integral part of the unit. Its self-contained reservoir, from which the pump draws the liquid additive, has a front opening refill inlet. When is in operation the upper portion is illuminated.

Figure - Liquid System (Proximate type)



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APPLICATION: This system is designed to control the concentration of the wash solution in dishwasher which use powdered compounds directly from the shipper.



PRINCIPLE OF OPERATION: The electrode in the wash tank measures the strength of the wash solution and transmits the signal to the head. If the concentration is low, power is supplied to the solenoid valve causing it to open and admit hot water into the detergent shipper. The concentrated solution contained in the detergent shipper is fed into the wash tank thus building up the solution strength. When the solution strength again falls below the predetermined level, the solenoid valve is again opened to correct the depletion.

In operation, the translucent white head cabinet is illuminated by pilot lamps according to three pre-determined patterns:

1. Cabinet illuminated by steady white light-head is on.
2. Cabinet illuminated by white light and green light--solution is slightly below operating level and the head is feeding compound.
3. Cabinet illuminated by white light, green light, and red light along with simultaneous buzzer operation--wash solution strength is less than 75% of operating level and, therefore, compound is either needed in reservoir or wash solution strength is low for some reason.

Figure 45 - Liquid System (Proximate Type)

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SECTION VIII - DESCALING PROCEDURES FOR MECHANICAL DISHWASHING MACHINES  
(SINGLE/MULTIPLE TANK)

A. Operation. - When noticeable deposits of scale are observed in the wash and rinse tanks of dishwashers, the following procedures should be used:

1. Drain both wash and rinse tanks.
2. Close the wash- and rinse-tank drain valves. Add about 12 gallons of hot water to the tank (or in each tank of a dual-tank machine).
3. Sprinkle approximately six ounces (one cupful) of scale-removing compound, FSN 6850-637-6142, on the scrap trays of both the rinse and wash compartments.
4. Start recirculation of the solution without the addition of water. Maintain a temperature between 160°F and 190°F. Check color of solution every 10 minutes. Carbon dioxide is evolved as long as scale and scale remover are present, and the solution will remain red as long as the scale remover is present.
5. If scale is not completely removed and solution is yellow, sprinkle another cupful of the scale-removing compound on each scrap tray. Continue recirculation. Swab untouched scaled areas with this solution. Add more remover if required. Scale on the final spray headers may be removed by using a scrub brush, FSN 7920-061-0038, and a small amount of remover made into a paste with water.
6. After the scale is removed, gases cease to form and the color of the solution remains pink-red. Drain solution.
7. Fill both wash and drain tanks with fresh water. Circulate for 5 minutes. Drain wash water.
8. Refill tanks and repeat operation in paragraph (7).

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## GLOSSARY

Central control system:	Dispensing detergent, water conditioning, and rinse additive products from a remote and isolated location directly to the dishwashing machine.
Cleaning:	Removal of residues of food, dirt, foreign material or other soiling ingredients or materials.
Detergent:	A cleaning agent which is suitable for use in spray-type dishwashing machines and which, when used effectively, aids in the removal of soil from dishes.
Detergent dispenser:	Device for adding detergents to wash water so that the desired concentration of detergent is maintained.
Detergent meter:	Device for indicating the concentration of detergent in the wash tank. It may be used with or without a detergent dispenser.
Disinfectant:	A substance that will destroy most harmful bacterial but will not necessarily destroy bacterial spores or viruses.
Preflushing:	Removing gross food particles either by means of a spray of water from the water system or by a stream of recirculated water before racking, or by a separate machine or portion of a dishwashing machine built for this purpose.
Racking:	Process of placing dishes and other serving utensils in racks or on conveyors so that each dish will be fully exposed to pre-flushing (if provided) and to washing and rinsing.
Rinse aid:	A Product with excellent wetting properties, will cause water to "sheet off" and dry faster and thus reduce the risk of water spotting.
Rinse aid injector:	Device which automatically injects or otherwise adds a drying agent to the final rinse.

Sanitized: Effective bactericidal treatment of clean surfaces of equipment and utensils by a process which has been effective in destroying microorganisms, including pathogens.

Scrapping: The removal of gross particles of food or refuse from dishes and serving utensils.

Soap: The product formed by the saponification or neutralization of fats, oils, waxes, resins or their acids with organic or inorganic bases.

Synthetic detergent: A detergent produced by chemical synthesis and comprising organic composition other than soap.

Water hardness: Water that contains dissolved calcium and magnesium salts which in turn react with soap to form insoluble soap is said to be hard. The amount of these salts dissolved in water represent the hardness of the water. Water hardness is normally expressed as parts per million (ppm) or grains per gallon (gpg).

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REFERENCES :

1. Department of the Army Technical Manual TM 10-415, Operation of Garrison Mess Equipment, January 1964
2. Department of the Army Technical Manual TM 10-405, Army Mess Operations, August 1967
3. National Sanitation Foundation Standard No. 3, Commercial Spray-Type Dishwashing Machines, The National Sanitation Foundation, Ann Arbor, Michigan, April 1965
4. National Sanitation Foundation Standard No. 5, Commercial Gas Fired and Electrically Heated Hot Water Generating Equipment, The National Sanitation Foundation, Ann Arbor, Michigan, May 1966
5. Department of the Air Force Manual AFM 161-16, Prevention by Dishwashing Techniques
6. Department of the Navy Publication 421, Cleaning and Sanitizing
7. Department of the Army Regulation AR 40-5, Preventive Medicine

Custodians:

Army - GL  
Navy - SH  
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# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS (Street, City, State, ZIP Code)

4. TYPE OF ORGANIZATION (Mark one)

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OTHER (Specify): \_\_\_\_\_

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

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