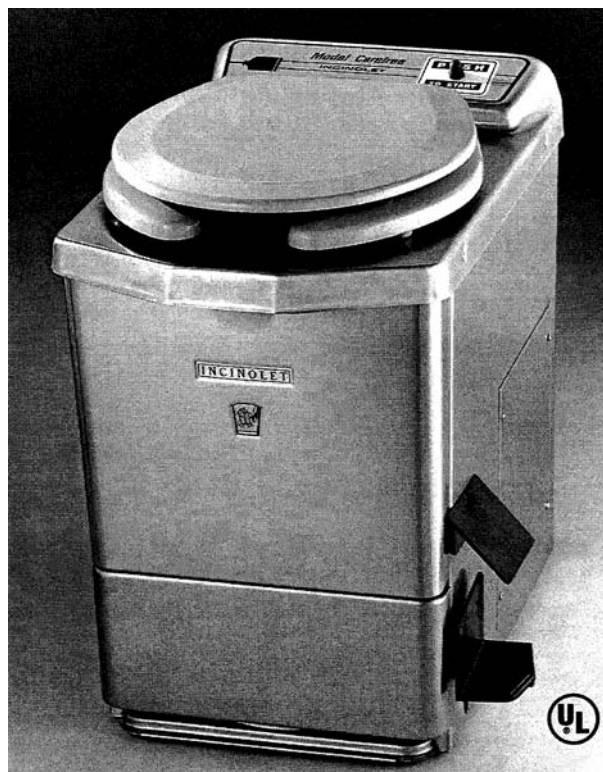


TM 55-1945-219-14&P

TECHNICAL MANUAL

OPERATOR, UNIT, DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)
FOR

**INCINOLET (RESEARCH PRODUCTS)
MODEL # WB
NSN 4510-01-470-8101**



DISTRIBUTION STATEMENT A - Approved for public release; distribution is unlimited.

**HEADQUARTERS, DEPARTMENT OF THE ARMY
JUNE 2004**

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:

Original01 JUNE 2004

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1-3/1-4	0
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ERRATA SHEET

The Incinolet toilet is a 208 volt model WB.

The following pages do not apply to the Incinolet toilet installed on the Modular Causeway System (MCS).

**IDENTIFYING TECHNICAL PUBLICATION SHEET
FOR
INCINOLET (RESEARCH PRODUCTS)**

1. **PURPOSE:** This technical publication is issued to identify and authorize the following commercial manual for Army use.

MANUFACTURER: Research Products, 2639 Andjon, Dallas, TX 75220; CAGEC (23989)

PURCHASE ORDER OR CONTRACT NUMBER: DAAE 07-01-D-T026

REQUISITION NUMBER: N/A

EQUIPMENT: Incinerator Toilet, Model WB

NATIONAL STOCK NUMBER: 4510-01-470-8101

TITLE: Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts & Special Tools List)

ADDITIONAL IDENTIFICATION: None

DATE: 1 July 2002

2. **ADDITIONAL COPIES:** Additional copies are available from the US Army Publishing Agency.
3. **FILE LOCATION:** The above described commercial manual is filed in _____.
(Each library will fill this in if this identifying technical publication sheet is filed separately from the commercial manual.)
4. **AUTHORITY NOTICE AND DISTRIBUTION STATEMENT:** Published Under Authority of the Secretary of the Army. Distribution Statement A - Approved for public release; distribution is unlimited.

SUPPLEMENTAL DATA

1. **LIST OF AFFECTED PAGES IN BASIC MANUAL.** This list will identify supplemental pages by number, and date thereon that have been deleted and added by incorporating supplemental data. This page will also identify information not applicable to the equipment used on the Modular Causeway System (MCS).
2. **SUPPLEMENTARY INFORMATION.** The information contained in the above identified commercial manual is supplemented as follows:
 - a. Identifying Technical Publication Sheet.
 - b. Front Manual Cover.
 - c. Title Block Page.
 - d. List of Effective Pages.
 - e. Table of Contents.
 - f. Chapter Identification Pages.
 - g. Maintenance Allocation Chart (MAC) Introduction.
 - h. Maintenance Allocation Chart (MAC).
 - i. Maintenance Allocation Chart (MAC) Remarks.
 - j. Repair Parts List.
 - k. DA Form 2028.
 - l. Metric Conversion Chart.

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 1 JUNE 2004

TECHNICAL MANUAL
OPERATOR, UNIT, DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL
FOR
INCINOLET (RESEARCH PRODUCTS)
MODEL # WB
NSN 4510-01-470-8101

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is <http://aeeps.ria.army.mil>. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter or DA Form 2028 direct to: AMSTA-LC-CI / TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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CHAPTER 1

GENERAL INFORMATION
FOR
INCINOLET (RESEARCH PRODUCTS)

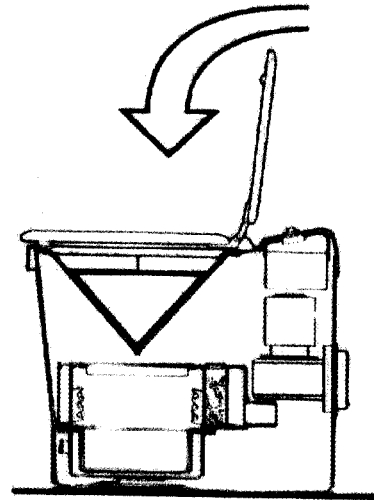
OPERATING INSTRUCTIONS

INCINOLET (pronounced " in-sin-o-let ") uses electric heat to incinerate waste to a tablespoon of clean ash. The ash is sterilized by incineration .

Step One

ALWAYS
Use a Bowl Liner !

INCINOLET remains immaculately clean because waste never touches the bowl surface. A treated paper bowl liner dropped into the toilet before each use captures waste; then both liner and contents fall into the incinerator chamber when the foot pedal is pressed.



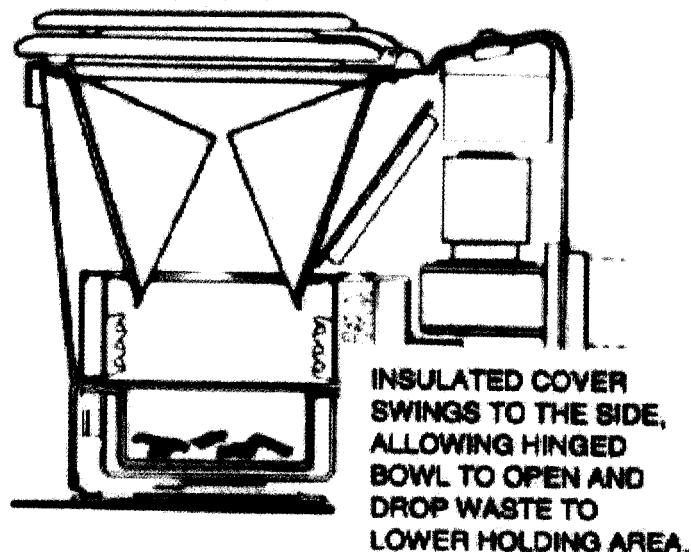
- 1.** Drop bowl liner into toilet bowl. Bowl liner catches and contains all waste plus paper.

Step Two

Step on the Foot Pedal

When the pedal is depressed, the insulated cover of the incinerator chamber lifts and moves back as bowl halves separate. The liner and contents drop into the incinerator.

When the pedal is released, bowl halves return to normal position and incinerator lid returns, sealing the incinerator chamber.



- 2.** Flush bowl by stepping on foot pedal.

Step 3

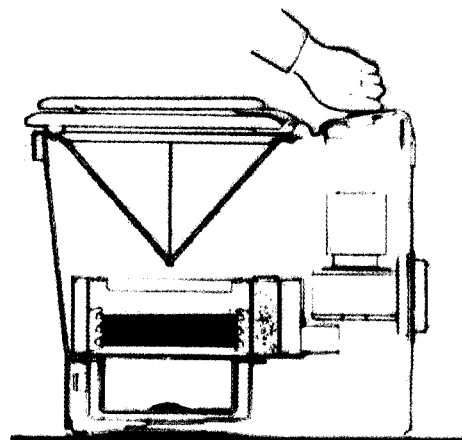
Push the Start Button

Incineration is initiated by pressing the start button. Both blower and heater come on.

The heater cycles on and off for a preset period of time. The blower continues after incineration is complete to cool the incinerator chamber.

INCINOLET can be used at any time; even while in operation. Simply drop in a new bowl liner and continue as from step one.

The standard unit, Model TR, serves the needs of one to eight persons.



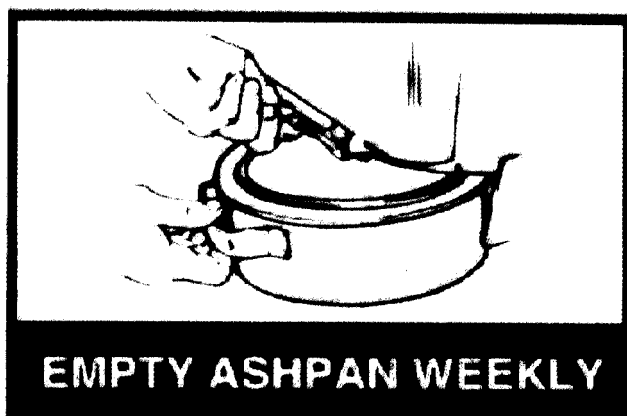
3. Push start button to incinerate waste automatically.

Lastly

Empty the Ashpan

It is important to empty the ashpan at appropriate intervals, before ashes have accumulated to about one-half inch.

It is suggested this activity be linked to some other regular household routine, such as putting out garbage.



INCINOLET OPERATION and
RECOMMENDED MAINTENANCE
ALL MODELS of
INCINOLET Electric Incinerating Toilet

DAILY USE

1. Before each use place a new bowl liner into toilet bowl.
2. After using the toilet "flush" liner and waste into incinerator chamber by stepping on the foot pedal. Allow liner to fall completely into the incinerator, then release foot pedal.
3. Push start button at back of toilet to start an incineration cycle. This is required even if the toilet is operating from a previous use.

Note: INCINOLET can be used anytime - even during incineration of a previous cycle. Just follow the above steps.

WEEKLY, OR MORE OFTEN AS REQUIRED

1. Empty the ashpan at regular intervals (perhaps once or twice a week). Ash should not accumulate more than one-half inch.
2. Clean outer stainless steel surfaces including bowl halves with detergent and water or stainless steel polish. Do not hose down or steam clean the toilet. Keep bowl halves clean to prevent liners from sticking.

EVERY 90 DAYS, DEPENDING ON USAGE (OR IF EXCESSIVE NOISE OR VIBRATION OCCURS)

1. DISCONNECT TOILET FROM SOURCE OF ELECTRICITY.
2. Remove top of the toilet complete with the bowl sections by removing four screws and unscrewing the rubber pushbutton cover.
3. Clean interior of bits of paper and dust.
4. Lightly grease all moving joints of the flushing assembly and foot pedal.
5. Clean the blower assembly by removing three screws which hold blower motor in position. Lift out the motor with attached blower wheel. Turn the assembly to one side to clean the blower wheel, using a small brush. Replacement of an extremely dirty or corroded blower wheel helps eliminate noise, rattles and vibration. Clean inside the blower housing and ventline elbow as needed.
6. Replace the unit top while holding bowl halves together. Replace four screws, and protective cap on the start switch.

YEARLY

1. Inspect the level of catalyst. If low, add additional catalyst.

INCINOLET Electric Toilet

Frequently Asked Questions

General

Q. Can an INCINOLET be used at any time?

A. Yes, even while incinerating a previous use.

Q. How long does an INCINOLET stay on?

A. A complete cycle lasts from 1-1/2 hours to 1-3/4 hours. The heater cycles on and off for 60 minutes to provide optimum combustion and the blower continues to run for about 30 minutes to cool the incineration chamber. The INCINOLET can be used at any time during the entire cycle.

Q. Is the paper bowl liner always necessary?

A. It is ABSOLUTELY NECESSARY with each use. The bowl liner carries waste into the incinerator, keeps toilet bowl clean, and protects the heater from direct contact with waste.

Q. Can INCINOLET be used several times without starting an incineration cycle? That is, can waste be accumulated?

A. The practice is generally not recommended.

Electrical Load & Service Capacity

Q. How much energy does an INCINOLET use?

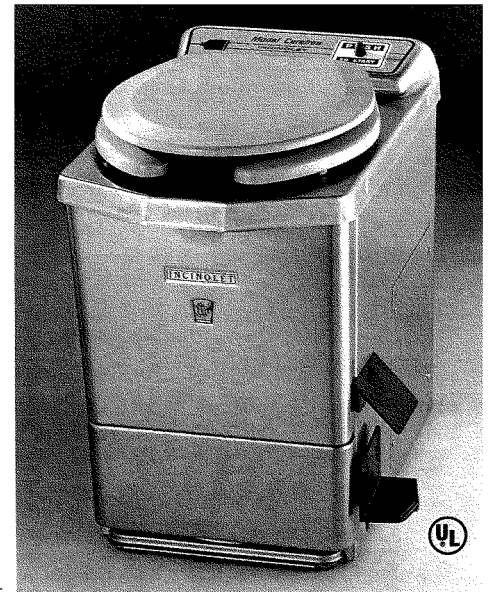
A. One kilowatt hour per cycle, approximately.

Q. What voltage is required for operation of an INCINOLET?

A. INCINOLET is available to suit one of three voltages listed in the table below. The electrical installation should provide a dedicated 20 amp circuit supplying only the INCINOLET.

SPECIFICATIONS and SERVICE CAPACITY

Model TR or Model WB *			
Volts	120	208	240
Watts	1800	3600	3600
Amps	15.0	17.5	15.0
People Served	4	8	8
Blower Capacity	100 cfm	100 cfm	100 cfm
* Model WB carries USCG Certification # 159.015/2701/0 and includes a vibration resistant, bolt-down baseplate for use in movable or mobile installations.			



Installation

Q. What is the size of an INCINOLET?

A.

Installed Dimensions		Center of Ventline from Floor	
Width.....	15 inches	Model CF	9 - 3/4 "
Height.....	20 inches	Model RV	10 "
Front to Back	24 inches	Model TR	10 - 7/8 "
		Model WB	11 - 1/8 "

Q. How much time is required to install an INCINOLET?

A. Under ordinary conditions where suitable electric power is available nearby and venting to outdoors is easily accomplished, from 2 to 4 hours.

Q. What type of vent is required?

A. INCINOLET can be vented directly through the wall or up through the roof. The unit comes complete with basic PVC materials suitable for a through-wall vent.

Q. Can INCINOLET be installed in an air-tight room?

A. No. INCINOLET is force vented with a blower, and the room must have sufficient openings for make-up air.

Odour Control

Q. What happens to odour during the incineration process?

A. Odours generated during the incineration cycle are removed by being drawn across a heat activated catalyst before entering the vent line.

More Information

For a free brochure or other information				
	Telephone	FAX	Toll Free	e-mail
CANADA	(519) 938-9108	(519) 938-9214	1-800-263-0379	incinolet@on.aibn.com
ELSEWHERE	(214) 358-4238	(214) 350-7919	1-800-527-5551	incinolet@incinolet.com

CHAPTER 2

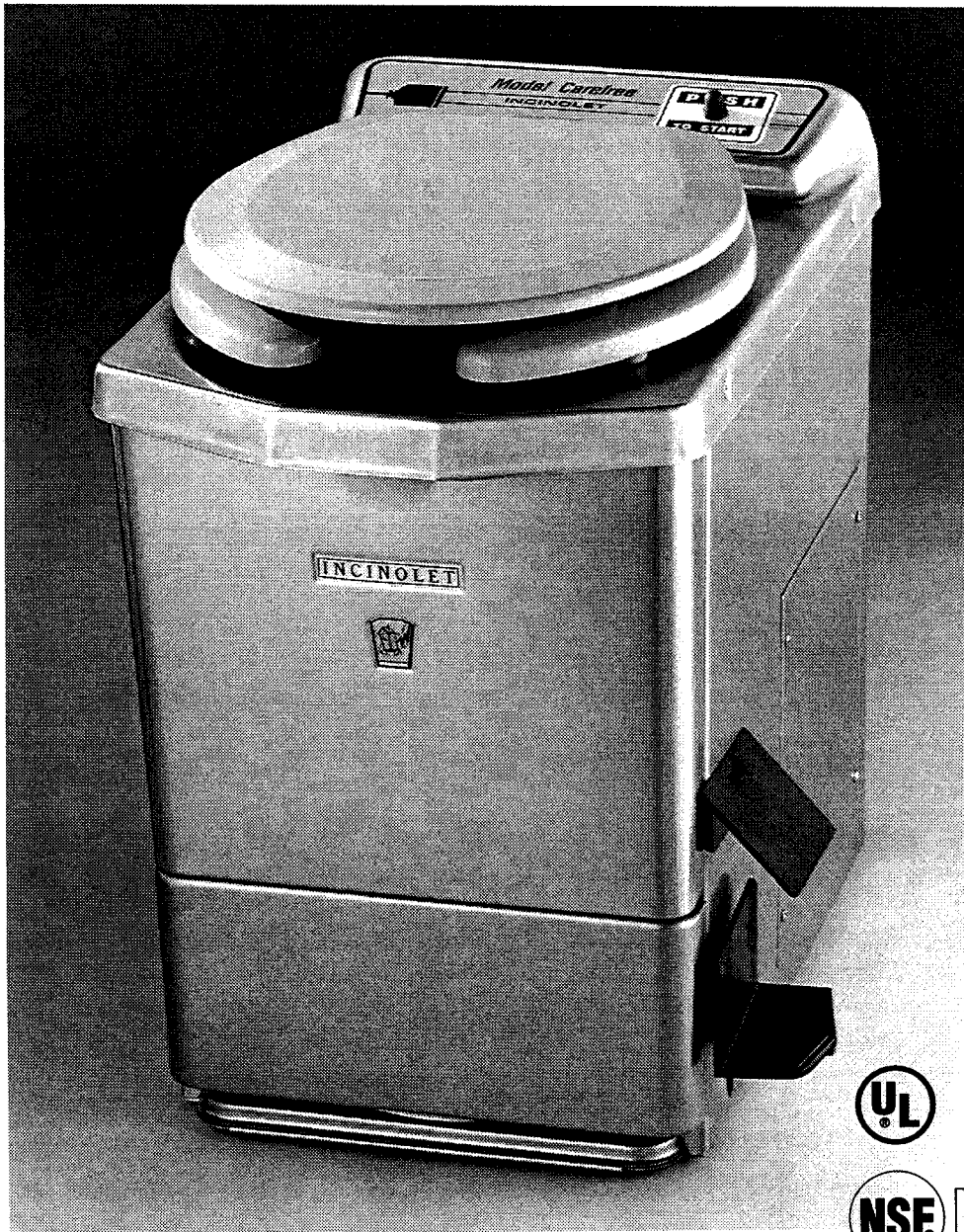
**INSTALLATION/MAINTENANCE MANUAL
FOR
INCINOLET (RESEARCH PRODUCTS)**

INCINOLET

ELECTRIC TOILET SYSTEM

INSTALLATION / MAINTENANCE MANUAL

Models CF, TR, RV and WB - 120 and 240 Volt 208 V.



Model _____
Serial # _____
Voltage _____
Date installed _____

Please have this information handy
when ordering parts. It can be found
on ID plate on back of toilet.

WARNING: Do not operate INCINOLET until you have read thoroughly and understand completely all instructions and safety rules contained in this manual. Save this manual and review frequently for continuing safe operation, and instructing possible third-party users.

For questions or assistance call 1-800-527-5551

Thank you...

for purchasing INCINOLET electric toilet. We have manufactured your toilet with the finest materials and workmanship to give you many years of dependable service.

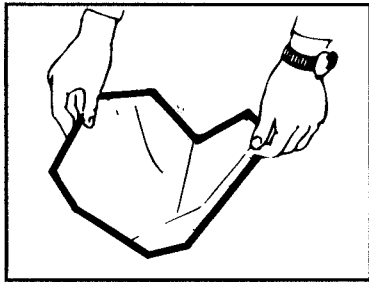
Manufacturer's Statement

INCINOLET toilets provide sanitation without pollution when used by persons familiar with its operation and responsible for its proper installation, use and maintenance. Not recommended for use by general public or in some rental properties.

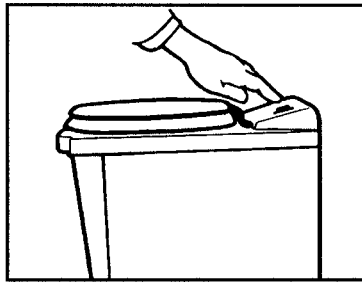
Warranty Information

A copy of the warranty will be furnished free of charge upon request.

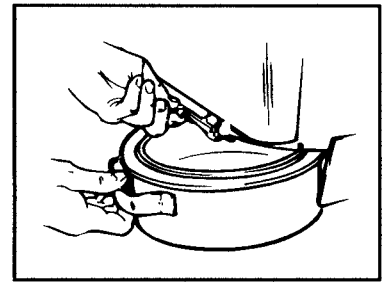
Tips for Success



Use a bowl liner for each and every use.



Push button to start after each use.



Empty ashpan **OFTEN** – when ash is 1/2 inch deep

Fig. 1

Important Safeguards

1. Read all instructions carefully.
2. Never burn trash or garbage in toilet.
3. Do not install in areas where atmosphere may become explosive.
4. Children, when using this toilet, must be supervised by a responsible adult.
5. Never depress foot pedal while using toilet.
6. Competent personnel must perform all tests or repair work.
7. Do not attempt to remove ashpan while toilet is in operation.
8. Do not install on carpet or vinyl flooring or close to bedding and linens.
9. Do not operate any appliance with a damaged cord or plug or after the appliance malfunctions or has been damaged in any manner.
10. Turn off electric power to toilet before doing any electrical maintenance.

INCINOLET is designed to incinerate human feces, urine, tampons, and toilet paper only. Using INCINOLET to burn items of household trash or food scraps will void your warranty and could cause damage to the INCINOLET and possibly cause property damage or even personal injury.

Save These Instructions

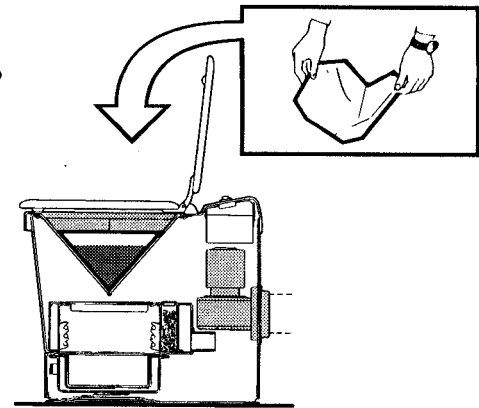
HOW TO USE INCINOLET

1 Place liner in bowl before each and every use.

(Using without a liner will cause urine to run out on the floor, damage to the unit, and odor.)

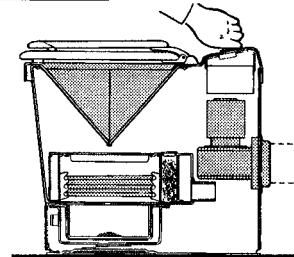
After use, facing toilet, step on foot pedal to open bowl and allow waste to drop into incineration chamber.

Make certain that top edges of liner are below lid when lid closes.

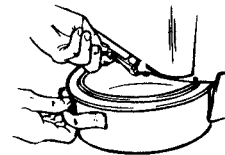


2 Push start button after each use. (Accumulated waste will cause odor.)

Unit may be used at any time, even while incinerating a prior deposit.



3 Empty ashpan frequently – usually when ash is no more than 1/2" deep. (Ash build-up shortens heater life.)



Note: Capacity of ashpan is about 1 gallon. Accumulating waste or allowing excessive ash build-up causes overload that can cause early heater failure, odor, and overflow of waste inside the toilet and onto floor.

Fig. 2

How INCINOLET Works

When you push the start button, heater and blower both come on. Heater alternates off and on for an hour. Blower stays on for an additional 30 to 55 minutes. **YOU CAN USE INCINOLET ANY TIME DURING THE INCINERATION CYCLE.** Push start button after each use.

YOU SHOULD INCINERATE WASTE AFTER EACH USE. ACCUMULATED WASTE, PARTICULARLY SOLIDS, RESULTS IN ODOR AND CAN REDUCE LIFE OF THE HEATER.

If INCINOLET is used primarily in the morning, with little or no use during the day, then reset the timer to 1 1/2 or 2 hours to insure complete incineration. (See pages 2 - 10.)

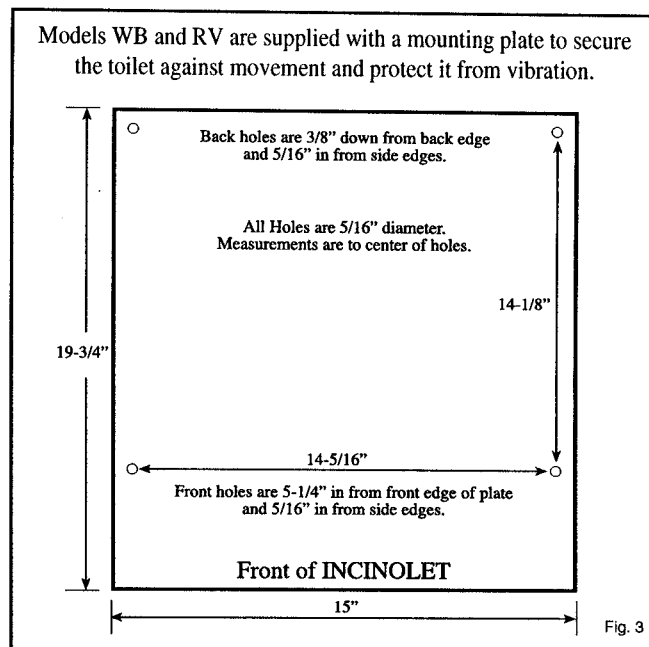
Ash is not suitable to use as fertilizer or compost. It should be disposed of in household trash in accordance with state and local codes – just as you would with any other ash waste.

Party Stress For times when you are having a party or house guests, when the INCINOLET may have to serve more than the stated capacity for a short time, follow these tips:

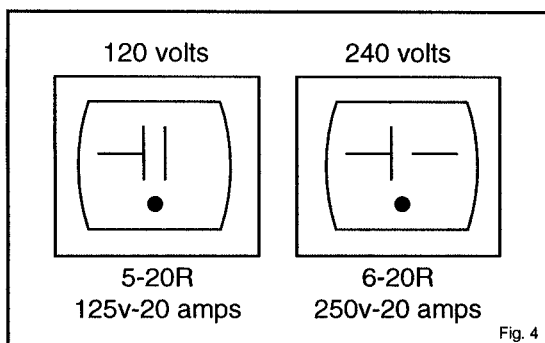
1. Empty the ashpan before guests arrive.
2. Be sure guests are instructed as to proper use and that a **bowl liner is required for each and every use.**
3. Push button after each use and check occasionally to be sure it's not over filled.
4. You may need to run an extra cycle or two to insure complete burn.

HOW TO INSTALL INCINOLET

1. Remove all packing materials – including cardboard inside ashpan panel.
2. Set unit on level floor in desired position:
Allow clearance at rear for wiring and vent-line connection. Allow at least 2" on left side and plenty of room on the right side to operate foot pedal.
3. Prepare electrical supply within 4 feet of toilet location.
(see instructions below)
4. Install mounting plate to floor (RV and WB only - Fig. 3).
5. Connect vent-line.
6. Plug INCINOLET into the proper receptacle on a 20-amp circuit. Dedicated circuit recommended.



Electrical Preparation



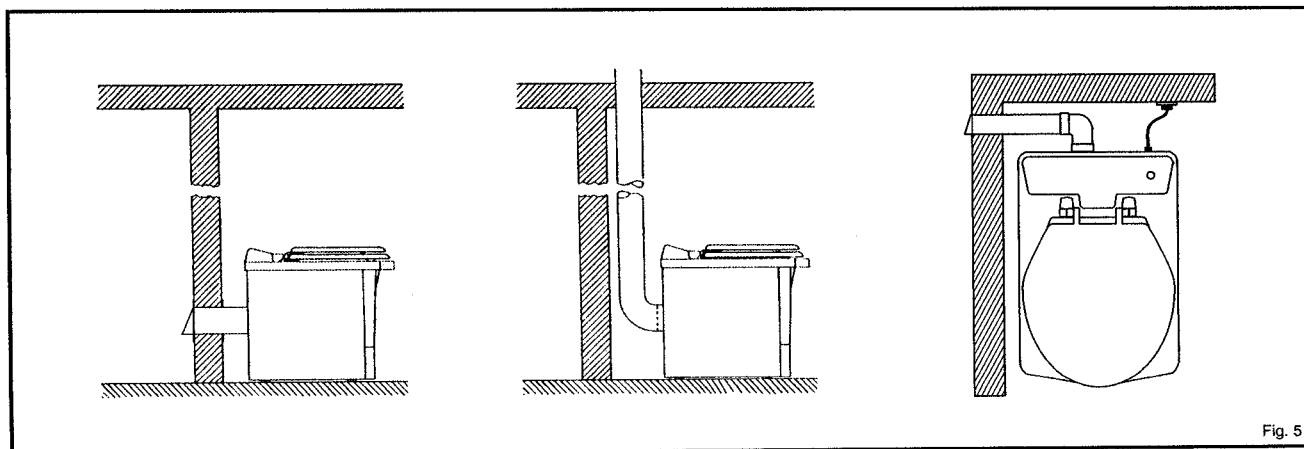
This appliance has a 20-amp plug and is meant to fit **only** into a 20-amp receptacle. (Fig. 4) If the outlet you intend to use for the INCINOLET is not the proper type, then change the receptacle. You must have a circuit suitable for 20 amps, headed by a 20-amp circuit breaker. Do not attempt to defeat this safety feature by modifying the plug in any way. Power cord is 4 feet long.

Extension cords should not be used with this appliance.

Preparing Vent-Line

Vent pipe can run horizontally or vertically. Venting materials can be placed within a wall and INCINOLET can be placed close to a wall at the back. Allow 6 to 8 inches on the right side (facing the toilet) to operate the foot pedal.

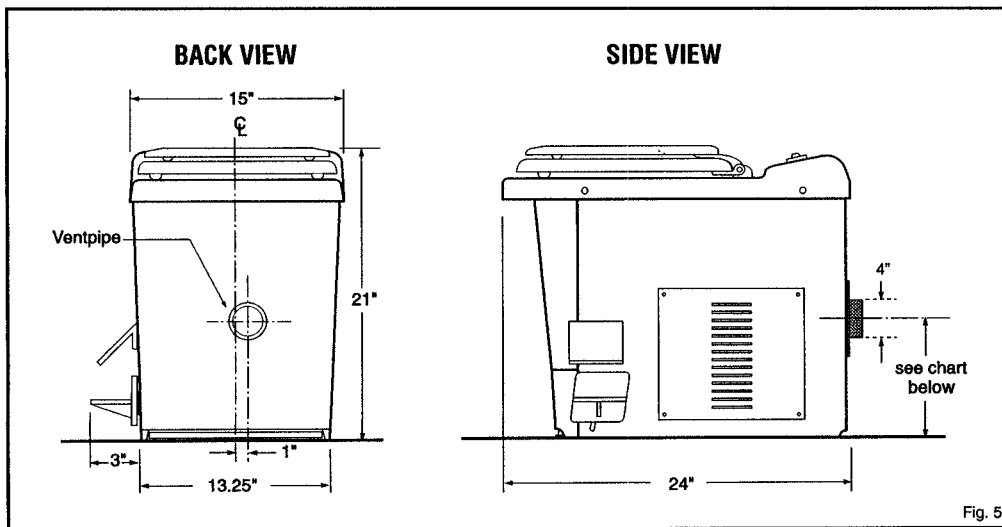
Vertical vent-line should terminate with a rain cap. For horizontal venting use a dryer flap or add a PVC elbow turned downward to prevent back-drafting.



Tips for Best Venting

1. Allow for plenty of make-up air into toilet room with door louvers or an air gap along bottom of room door.
2. **NEVER USE AN OVERHEAD EXHAUST FAN WHILE INCINOLET IS RUNNING.** It might overpower the exhaust fan within the unit and cause smoke and odor to come into the room.
3. **DO NOT** cover the end of the vent-line with fine mesh window screen. Use 1/4 inch mesh ("hardware cloth") if you must use something to keep "critters" out of the vent-line.
4. Increase diameter of vent pipe if 2 elbows or more than 20 feet of vent-line is required.

**Center of vent collar on the back of INCINOLET varies by model.
Use this chart to find the correct measurement for your toilet.**



Center of vent hole – up from floor:

Model CF	9 3/4"
Model RV	10"
Model TR	10 7/8"
Model WB, 120 v.	10"
Model WB, 240 v.	11 1/8"
Model WB, 208 v.	11 1/8"

For proper operation, vent-line must be as straight as possible with a minimum of elbows. Maximum length of pipe at the 4" diameter is 20 feet plus 2 elbows. Use larger diameter pipe for longer runs. Contact factory if you have questions about special installations.

Improper venting can cause odor within the room and overheating of the unit. This unit is equipped with an exhaust blower, which draws air from the room into the unit for cooling. The blower also draws smoke from the incinerator through the catalyst to remove odors. If the vent line is too small, too crooked or too long, the blower cannot push enough air through the vent-line to do its function. Overheating and odor will result.

For best performance, use the shortest possible run and a minimum number of elbows. Do not vent into an attic or crawl space. Assemble vent pipe pieces securely. Tape all connections. Connect PVC coupling and pipe to the vent collar at the rear of the unit. Due to variances in pipe size, you may want to wrap a bit of tape around the vent collar or use a little silicone caulk to make a snug fit. Secure the PVC coupling to the collar with a few drops of silicon rubber cement. **DO NOT USE MUCH, AS YOU MAY WANT TO REMOVE THE COUPLING AT A LATER TIME.**

START-UP PROCEDURE - Once Incinolet is connected to vent line and plugged into a 20 amp receptacle on a 20 amp circuit of the appropriate voltage, it's a good idea to run a test cycle using a cup of water poured into a bowl liner.

UNDERSTANDING ELECTRICAL OPERATION

1. Pushing the Start Button closes the Start Switch which engages a timer. Timer begins a new cycle each time start switch is closed. Timer doesn't accumulate time, merely starts over again.
2. Timer is set to 60 minutes at factory. Timer activates temperature controller. Controller output is connected to the coil of a Relay, which controls the electric current to the heater.
3. Temperature Controller responds to the output from a Thermocouple, which measures Heater temperature. When the temperature of the lower coil of the heater reaches approximately 1200 degrees F., controller shuts down the relay, which cuts off the heater. When heater temperature falls to about 1000 degrees F., controller again activates relay and heater comes on. Heater is off, then on, about twice a minute.
4. Timer also controls exhaust blower. Blower and heater come on and both stay on for 60 minutes together. After heater cuts off, blower continues on until incinerator area has cooled to about 130 degrees F.
5. Blower Thermostat (ITS) closes when it senses a temperature of 130 degrees F., and stays closed after the heating cycle is over, until incinerator temperature falls below 130 degrees F., about 30 to 50 minutes later.

Power Consumption

One complete cycle uses about 1 1/2 to 2 kilowatt hours of electricity. Because you can use INCINOLET any time during the cycle, your "per use" cost is lower.

During a Power Failure

If waste is burning in the INCINOLET when the electric service is interrupted, you may get smoke and odor in the room. Open a window to ventilate as best you can. When power comes back on, the fan should start automatically, if needed, and run until unit is cool enough. Heater does not come on until you push the button. You can push foot pedal to check contents of ashpan then start a cycle if needed.

To Interrupt an Incineration Cycle

In normal use, it is never necessary to stop a cycle to add waste. (See "How to Use", pages 2 - 5.) However, on rare occasions (doing repairs, etc.), you may want to stop a cycle in progress. Turn the circuit breaker off momentarily (or unplug INCINOLET) to cancel the cycle. Then turn the circuit breaker back on (or plug in INCINOLET) so that the toilet is ready for use. If unit is hot enough to need it, the blower should come back on automatically to cool it. NOTE: If blower does not come on, smoke and odor may come directly into room. In this case, you may want to start the cycle again for a few minutes to finish burning off the waste remaining in the ashpan.

Thermostats

Your INCINOLET is equipped with three thermostats.

1. SAFETY THERMOSTATS (STS) shuts heater off if air temperature inside toilet reaches about 145°F. It is located on the front surface of the control box at the upper right rear of the unit. To replace, disconnect voltage, remove top of unit, disconnect lead wires to old thermostat, and replace. (Fig. 9)
2. BLOWER THERMOSTAT (ITS) turns fan off when outside skin of chamber cools to 130°F and will turn fan on again if temperature increases. It is accessible through access panel opening, just to the left of the heater terminals. To replace, follow same procedure as for STS above. (Fig. 12)
3. LIMIT THERMOSTAT (TS) turns heater off if skin of chamber reaches a temperature of 325°F. It is located below the ITS blower thermostat and heater terminals, outside ashpan compartment. To replace, follow same instructions as for other thermostats. (Fig. 12)

CARE AND CLEANING

Keep your INCINOLET clean to prevent odors.

- Empty ashpan when ash is about 1/2 inch deep. **EXCESSIVE ASH BUILD-UP CAUSES ODOR, SHORTENS HEATER LIFE, AND DECREASES EFFICIENCY.** If ash is caked and hard to remove, just soak insert pan for a few minutes in warm water.
- Wipe up urine spills as they happen.
- Every 6 months – clean blower wheel and inside of INCINOLET.
 1. Unplug unit and remove top. (See instructions below.)
 2. Clean inside with a detergent or a spray cleaner such as Formula 409. (Do not use pine oil cleaners.)
 3. Remove blower wheel and clean. (See pages 2 - 12.)
 4. **DO NOT STEAM CLEAN.**
 5. Stainless steel polish can be used on outside surfaces to keep INCINOLET's finish lustrous.

TIP: If blower becomes noisy or vibrates, clean or replace blower wheel. (See pages 2 - 12.)

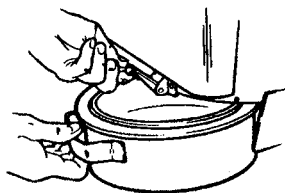
Bowl Liners

BE SURE that the top edges of the liner are below the lid when it closes. Otherwise, paper will burn outside the chamber and cause momentary smoke and odor. **CAUTION:** Failure to use bowl liner for each and every use will always cause odor and urine on the floor.

Bowl liners are made of a special paper coated with polyethylene film. This liner is necessary to catch and contain the waste, then convey it into the incineration chamber. **USE A BOWL LINER FOR EACH AND EVERY USE.** Liner protects the bowl and prevents urine from draining to the floor.

How to Remove Ashpan

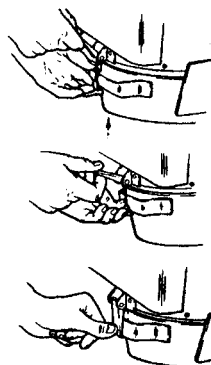
Remove ashpan only when pan is cool and toilet is not operating.



TO REMOVE ASHPAN

Remove ashpan panel. Raise camloc handle and unhook it from ashpan handle. Pull ashpan out. Empty ash in garbage.

CAUTION: ASHPAN MUST BE SECURELY IN PLACE FOR PROPER OPERATION.



TO REPLACE ASHPAN

Push ashpan firmly into place.

Lift up on ashpan handle and engage hook of camloc under ashpan handle.

Push down on camloc handle. Replace ashpan panel.

Fig. 7

Removing the Top (Seat, Lid, Bowl Halves)

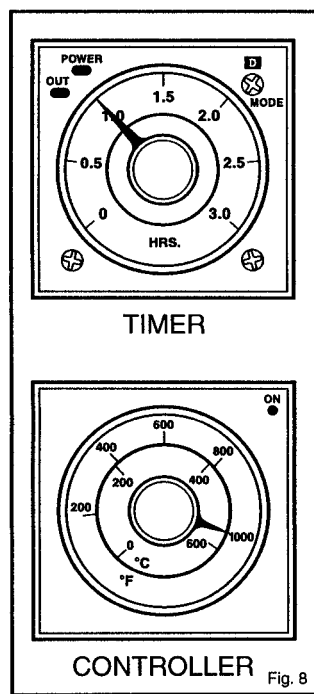
Top is held in place with four screws, two per side and a rubber boot which protects the start button. Remove them, and then lift top up.

To replace top: With incinerator lid closed, hold bowl halves together and lower top into position. Replace four screws and rubber boot over start button. **Tip:** If you have trouble holding bowl halves in closed position while placing it back on toilet, just use a small piece of masking tape to hold them together, then slice through it from the top later.

Access Panel

Four screws hold on Access Panel, located on the right side of toilet (same side as foot pedal). Remove panel to expose blower thermostat, limit thermostat, thermocouple, and heater terminals. (Fig. 12)

TROUBLESHOOTING



TIMER & TEMPERATURE CONTROLLER THE KEY TO TROUBLESHOOTING

Timer limits heating cycle, Controller limits heater temperature. Timer and temperature controller are within control box in upper right corner of housing, accessible with top removed.

Timer has two lights: **green** and **red**.

Temperature controller has one **red** light. A **steady green light** on timer indicates unit has power and is ready for operation. When start button is pushed, **green light begins blinking** and the **red light** comes on and stays on for a timed interval, during which time temperature controller is activated and its **red light** is on. Controller **red light** means that the relay is activated and supplying power to heater. Controller **red light** stays on until timer cuts off after the timed interval, or heater reaches maximum allowed temperature and thermocouple signals controller to open relay. In actual operation, when timer reaches end of timed

interval, its **red light** goes off, and **blinking green light turns steady** again. During the timed interval, controller **red light** will be on constantly until heater reaches about 1200 degrees F, at which point controller **red light** goes off and the relay opens. Controller **red light** comes on again after 30 seconds or so, stays on for about 40 seconds, then goes off again, and so on until the end of timed interval.

TIMER ADJUSTMENT: (See Fig. 8.)

Timer dial reads 0 to 3 hrs. Timer pointer is set to 1.0 hrs. If INCINOLET is used primarily for solids deposits in rapid succession and incineration is incomplete, move pointer to 2.0 hrs. If used throughout the day, both for urine and solids, timer would be best set at 1.0 hr. To adjust timer, remove top of toilet and turn dial so timer reads new setting. (See pgs. 2 - 9.)

Replace top.

**DON'T MAKE ANY ADJUSTMENT
REQUIRING SCREWDRIVER.**

BLOWER COMES ON BUT HEATER DOESN'T HEAT

Remove top, examine timer and controller as above. If both timer and controller lights are on, then heater has failed. To verify, remove access panel, measure voltage directly across heater terminals, not from terminal to ground. If voltage appears, **REPLACE HEATER**. If no voltage appears, check circuit further.

TIMER LIGHTS WORK BUT CONTROLLER RED LIGHT IS *NOT* ON

Test thermocouple. Unplug toilet, remove side access panel. Remove wire nuts from thermocouple leads (#6 & #7). Twist the gray and purple wires together, then plug unit in and push start button. If controller red light comes on, **REPLACE THERMOCOUPLE**.

CIRCUIT BREAKER OPENS WHEN START BUTTON IS PUSHED

This indicates heater may be shorted to ground. Unplug toilet, remove access panel. Remove orange lead wires to heater terminals. Again push start button. If blower comes on and circuit breaker does not open, heater is shorted. **REPLACE HEATER**.

Unplug toilet, examine all wiring which might be grounded by touching housing. **REPLACE OR TAPE ANY BARE WIRES**.

NOTHING COMES ON, BUT TIMER GREEN LIGHT IS ON

Inspect timer lights as you push start button. Red lights should come on, green light should begin blinking. If not, **CHECK START SWITCH OR REPLACE TIMER**.

BLOWER, HEATER WON'T STAY ON

If timer, blower and heater come on when start button is pushed but turn off as soon as start button is released, **REPLACE TIMER**.

BLOWER STOPS AT END OF HEATING CYCLE

Blower should be on from 30 to 55 minutes *after* heater cuts off. Unplug toilet, remove access panel, inspect for and tighten any loose wiring. **REPLACE BLOWER THERMOSTAT**.

BLOWER DOES NOT OPERATE

Blower must come on immediately when start button is pushed and should not stop while heater is on. If not, check blower wheel to be sure it's not binding. Listen to blower motor for a humming sound (like motor is trying to start). This would indicate bad motor bearings. **REPLACE BLOWER MOTOR**

BLOWER OFF & ON AT CYCLE END

It is normal for blower to stop for 4 or 5 minutes, then start again for a few minutes, a couple of times at end of cycle. If, however, blower stops and starts rapidly, blower (ITS) thermostat is faulty. **REPLACE ITS THERMOSTAT**

BOWL HANGS OPEN: PEDAL WON'T RETURN

1. Closing mechanism may be out of adjustment.
2. Foot pedal goes too far down and locks up. Place block under foot pedal to prevent excess travel.

**EXCESSIVE NOISE, VIBRATION
CLEAN OR REPLACE BLOWER WHEEL.**

INCOMPLETE INCINERATION

Can be any one of several causes:

1. Start button not pushed after each use.
2. Ashpan too full. Empty more often. (Empty when ash is 1/2 inch deep.)
3. Too many people using toilet.
4. Burn cycle too short. Add more time to the timer.

ODOR WITHIN ROOM

Can be any one of several causes:

1. **Failure to use bowl liner each and every time or careless use of liner.**
2. Solids not completely incinerated. May need more time on timer or additional incineration cycles.
3. Ashpan too full. Empty more often. (Empty when ash is 1/2 inch deep.)
4. Back-drafting. Use back-draft preventer on horizontal vent-line or run the vent vertically with a rain cap at the top.

ODOR OUTSIDE

Causes same as above, plus:

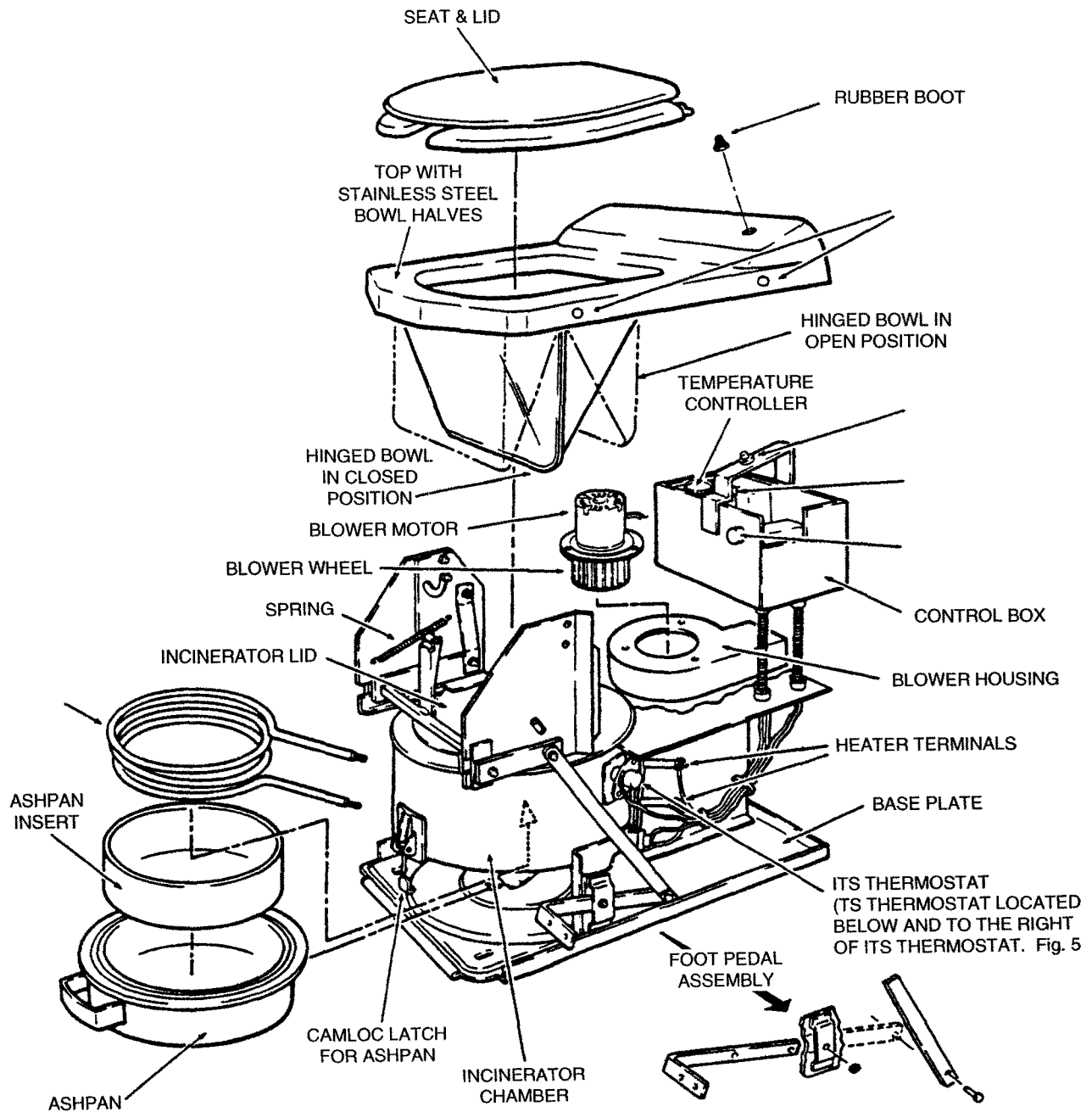
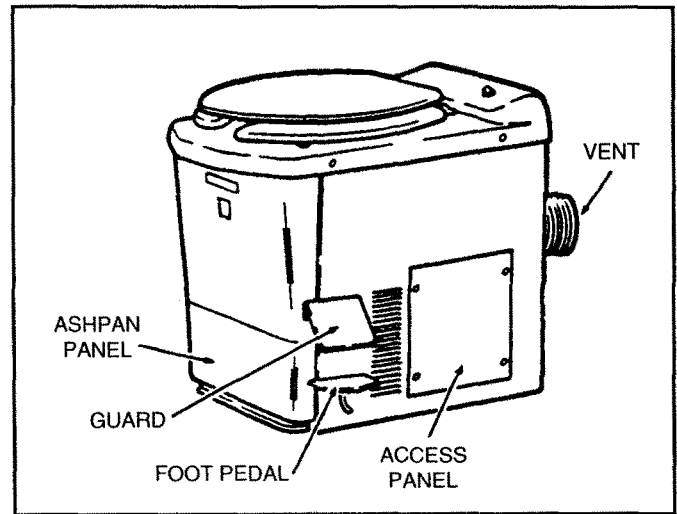
1. Catalyst port perforations are clogged. Clean chamber wall behind heater coil with small brush.
2. Catalyst has "set". Stir with small rod to loosen. (See catalyst pgs. 2 - 13.)
3. Incinerator lid hanging open, allowing odor to escape.

RESIDUE BLACK, LIKE CHARCOAL

Ash should be white to gray. Black lumps means insufficient air is being drawn into chamber. There may also be soot around ashpan lip at front and on inside of ashpan panel. Remove ashpan and use small brush to clean perforations in inner incinerator wall back of heating coils.

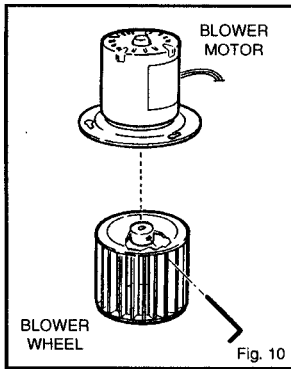
*For help with troubleshooting
or to order parts, call*

1-800-527-5551



MAINTENANCE AND REPAIRS

Clean Blower Wheel



Blower draws fresh air into toilet to provide oxygen for the burn, carries smoke and odor into the catalyst, then exhausts moist air outside. Clean blower wheel and housing every 90 days, or any time excessive noise and vibration occur.

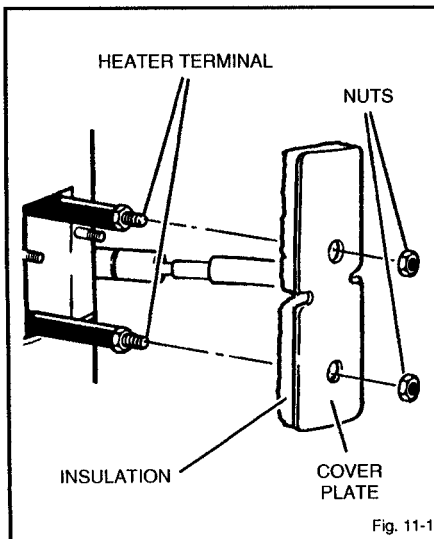
1. Remove top of INCINOLET.
2. Disconnect two wires on side of control box to free motor.
3. Loosen (no need to remove) 3 screws holding blower motor plate. (Fig. 10). Twist and lift motor over screw slots to remove it.
4. Use 1/8" Allen wrench to remove set screw in wheel hub.
5. Clean grease and dirt from wheel with hot soapy water or a degreasing cleaner.
6. Replace wheel if corroded or if vibration indicates it is out of balance.
7. Clean inside of blower housing occasionally.

Replace Heater

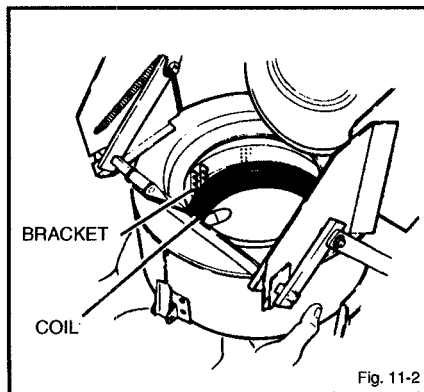
Note: For maximum heater life incinerate after each use, and keep ash level down to no more than 1/2 inch.

To Remove Old Heater:

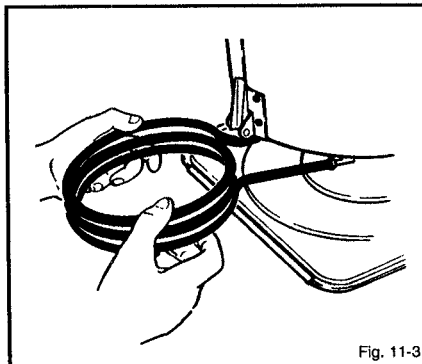
- Turn off voltage to INCINOLET. Remove ashpan. Remove access panel. Remove top. Hold incinerator open either by wedging down the foot pedal or blocking flushing mechanism in open position.
- Remove thermocouple but do not disconnect. (Fig. 12)
- Disconnect wiring to heater terminals. Remove cover plate and insulation around heater terminals. (Fig. 11-1)



- Push up on heater coils to clear heater brackets. (Fig. 11-2)



- Remove heater through ashpan opening. (Fig. 11-3)
Note: Brackets may be wedged tightly in slots in wall. It is okay to remove brackets, but not absolutely necessary.



To Install New Heater:

- Reverse above procedure. Locate heater in brackets, making sure brackets are seated in slots in the incinerator wall. (Fig. 11-2)
IMPORTANT: Locate heater at lowest position in heater bracket. Coils must not touch each other.
- Replace insulation and cover over heater terminals. (Fig. 11-1)
- On new heater coil, remove nut and only 1 of the 2 new washers. Slip heater wire's connector over the terminal, then the 2nd new washer and a nut. It is best to reuse the original lock nut, but the new nut can be used if needed. Always use the new washers, one on either side of the heater wire connector.
- **CAREFULLY tighten nut, using two (2) end wrenches to prevent twisting the heater stud terminals, which would break the moisture seal at end of heater (Fig. 11-1).**
- Replace thermocouple. Push knurled cylinder to compress spring. Turn to engage stud, then release. Spring must be compressed to insure that tip of thermocouple contacts outer surface of heater. (See pgs. 2 - 13.)
- Replace access panel, ashpan, top. Close circuit breaker.
- Start cycle to test heater and total operation.

Thermocouple

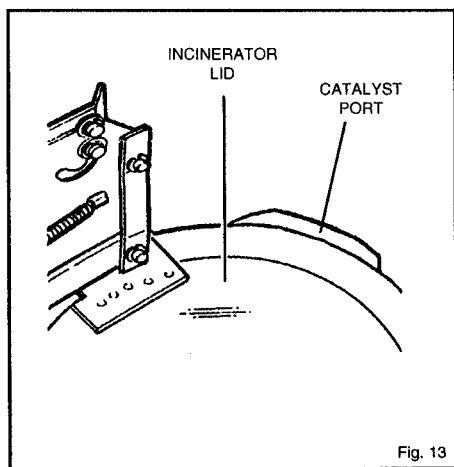
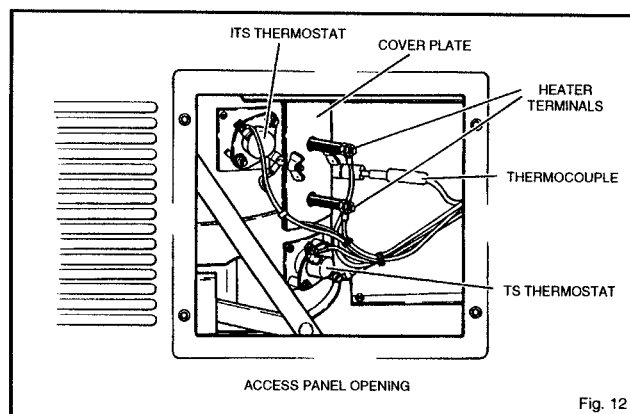
Thermocouple, in combination with the temperature controller, limits temperature of the heater and prevents overheating.

Thermocouple, Type K, develops a small voltage proportional to the temperature of the heater. Thermocouple is located to the right of and midway between heater terminals. (Fig. 12) Tip of thermocouple makes contact with the lower heater coil.

Thermocouple leads are color-coded. Wire with red core must be connected to purple lead #7 within the "F" wire nut. Wire with yellow core must be connected to gray lead #6 in "E" wire nut.

IMPORTANT: EXACT PROCEDURE MUST BE FOLLOWED TO PREVENT OVERHEATING AND HEATER FAILURE:

1. To replace thermocouple, disconnect wire leads with "E" and "F" wire nuts. Then push in knurled rod, turn to disengage, pull out thermocouple.
2. To install new thermocouple, reverse procedure. Make sure that wire with red core is connected to purple #7 and yellow core wire is connected to gray #6.
3. After inserting thermocouple, be sure that the tip is making contact with lower heater coil along outer surface of coil.



Catalyst

INCINOLET uses a heat-activated catalyst to suppress smoke and odor. The catalyst pellets are located at the back of the incinerator chamber. The chamber wall is perforated in this area to allow the blower to draw smoke and odor through the catalyst. Catalyst pellets should remain effective for many years. To check catalyst, remove protective cover on catalyst port. If catalyst port is not completely full, add catalyst till it is. It is normal for catalyst pellets to be dark in color.

Replace Relay

Relay acts as a switch that controls electric current to the heater within the time constraints of the Timer and the temperature constraints of the Controller. Relay is located in the control box beside the timer and controller, accessible with the top off.

1. Remove six lead wires to relay terminals. Carefully mark so you can reattach in the proper positions.
2. Hold back spring clips that hold relay in place.
3. Pry relay out. Replace and rewire.

Safety Features

1. Timer limits heating cycle.
2. Temperature Controller limits heater temperature.
3. Safety Thermostat (STS) prevents overheating if blower were to fail.
4. Limit Thermostat (TS) limits temperature if controller were to fail.

PARTS LIST

PART	120 VOLT UNITS	208 VOLT UNITS
ASHPAN, Composite, SS	PAN 022	PAN 023
ASHPAN INSERT, SS	PAN 028	PAN 027
BLOWER HOUSING, SS	HOU 004	HOU 003
BLOWER MOTOR	MOT 006	MOT 006
BLOWER WHEEL	WHE 002	WHE 001
BRACKET SET, for heater	BRA 009	BRA 009
CATALYST, 1/4# BAG	CAT 004	CAT 003
CONTROLLER, Temp., Omron	CON 017	CON 018
HEATER - for Model CF, RV	HEA 023 (1800 w)	—
for Model WB (S/N 3xxxx)	HEA 023 (1800 w)	—
for Model TR, WB (S/N 2xxxx)	—	HEA 009 (3500 w)
RELAY, Omron	REL 007	REL 008
SEAT & LID	SEA 001	SEA 001
SPRING, 1/4" diameter x 4" long	SPR 003	SPR 003
THERMOSTAT, TS – L-325	THE 012	THE 012
THERMOSTAT, ITS – F-130	THE 014	THE 014
THERMOSTAT, STS – L-140	THE 013	THE 013
THERMOCOUPLE	THE 009	THE 009
TIMER, Omron	TIM 016	TIM 016

Wiring Instructions

This unit is furnished with an electric cord and plug. It requires a circuit protected with a 20 amp circuit breaker and no other appliance on it. **NEVER CONNECT TO POWER BEFORE VENTLINE HAS BEEN INSTALLED.**

**NOTE: UNIT IS GROUNDED INTERNALLY THROUGH THE FURNISHED CORD AND PLUG.
MAKE CERTAIN THAT YOUR CIRCUIT HAS ADEQUATE GROUNDING.**

Wiring Diagram

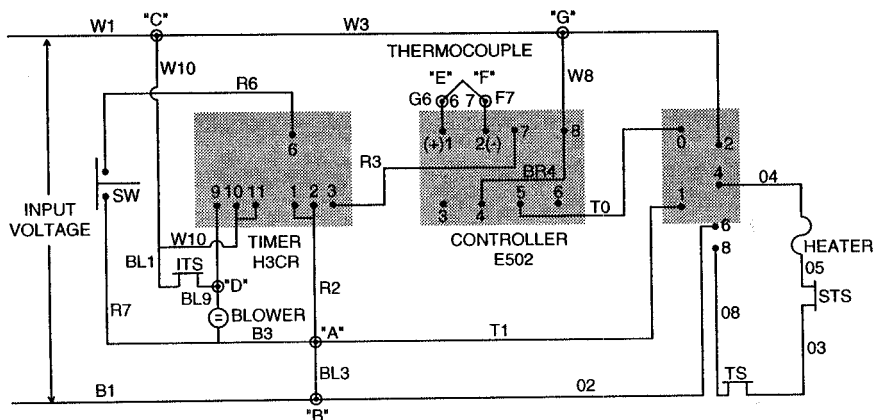
WIRE COLORS: Black=B Red=R Blue=BL Orange=O Gray=G Purple=P Tan=T White=W Brown=BR
Thermocouple Lead 6 is (+) Thermocouple Lead 7 is (-)

A, B, C, D, E, F and G are WIRE NUTS:

A connects BL3, R7, B3, R2, T1 E connects G6, G
B connects B1, BL3, 02 F connects P7, 7
C connects W1, W3, W10 G connects W3, W4, W,8
D connects BL9, BL9

CONTROL ELEMENTS:

ITS – Inverse thermostat to control blower – F-130
STS – Safety thermostat in case of blower failure – L-140
TS – Limit thermostat to prevent overheating – L-325
SW – Start Switch



**CALL TOLL FREE
NATIONWIDE
-800-527-5551**

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CHAPTER 3

**SUPPORTING INFORMATION
FOR
INCINOLET (RESEARCH PRODUCTS)**

**OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
INCINOLET (RESEARCH PRODUCTS)
MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION**

INTRODUCTION

This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

The MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel). This includes scheduled inspection and gaging, and evaluation of cannon tubes.
2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms.
4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

6. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
9. Repair. The application of the maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

NOTE

The following definitions are applicable to the "repair" maintenance function:

Services — Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting — The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly — The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions — Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

10. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
11. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

Column (1) — Group Number. Column (1) lists FGC numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

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

Column (3) — Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" outlined above.)

Column (4) — Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

C — Operator or crew maintenance

O — Unit maintenance

F — Direct support maintenance

L — Specialized repair activity (SRA)

H — General support maintenance

D — Depot maintenance

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) — Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) — Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) — Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) — Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) — Nomenclature. Name or identification of the tool or test equipment.

Column (4) — National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) — Tool Number. The manufacturer's part number, model number, or type number.

Explanation of the Columns in the Remarks

Column (1) — Remarks Code. The code recorded in column (6) of the MAC.

Column (2) — Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
INCINOLET (RESEARCH PRODUCTS)
MAINTENANCE ALLOCATION CHART (MAC)**

MAINTENANCE ALLOCATION CHART**Table 1. Maintenance Allocation Chart for Incinolet (Research Products).**

(1) GROUP NO.	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIP REF CODE	(6) REMARKS CODE
			UNIT		DS	GS		
			C	O	F	H	D	
	Incinolet Toilet	Inspect	.5					
		Replace			3.0			
		Repair			2.0			

**OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
INCINOLET (RESEARCH PRODUCTS)
MAINTENANCE ALLOCATION CHART (MAC)**

MAINTENANCE ALLOCATION CHART REMARKS

Table 1. MAC Remarks for Incinolet (Research Products).

REMARKS CODE	REMARKS
P	Preventive Maintenance Checks and Services (PMCS)

**OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
INCINOLET (RESEARCH PRODUCTS)
REPAIR PARTS**

(1) ITEM NO.	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
1		23989	PAN 023	Ashpan, Composite, SS	
2		23989	PAN 027	Ashpan, Insert, SS	
3		23989	HOU 003	Blower, Housing, SS	
4		23989	MOT 006	Blower Motor	
5		23989	WHE001	Blower Wheel	
6		23989	BRA 009	Bracket Set, for Heater	
7		23989	CAT 003	Catalyst, ¼# BAG	
8		23989	CON018	Controller, Temp, Omron	
9		23989	----	Heater (CF & RV)	
10		23989	----	Heater (WB)	
11		23989	HEA 009 (3500 W)	Heater (TR & WB)	
12	4510-01-470-9561	23989	LIN 001	Liner	BX/200
13		23989	REL 008	Relay, Omron	
14		23989	SEA 001	Seat & Lid	
15		23989	SPR 003	Spring, ¼ in. Diameter X 4 in. long	
16		23989	THE 012	Thermostat, TS - L-325	
17		23989	THE 014	Thermostat, ITS - L-130	
18		23989	THE 013	Thermostat, STS - L-140	
19		23989	THE 009	Thermocouple	
20		23989	TIM 016	Timer, Omron	

These are the instructions for sending an electronic 2028.

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17 and 27.

From: "Whoever" whoever@avma27.army.mil
To: whoever@avma27.army.mil
To: TACOM-TECH-PUBS@ria.army.mil

Subject: DA Form 2028

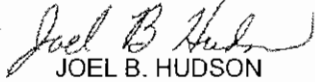
1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-1915-200-10
9. **Pub Title:** TM
10. **Publication Date:** 11-APR-88
11. **Change Number:** 12
12. **Submitter Rank:** MSG
13. **Submitter Fname:** Joe
14. **Submitter Mname:** T
15. **Submitter Lname:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 1
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.

TO: <i>(Forward direct to addressee listed in publication)</i>				FROM: <i>(Activity and location) (Include ZIP Code)</i>			DATE	
PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS								
PUBLICATION NUMBER				DATE		TITLE		
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
PART III - REMARKS <i>(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)</i>								
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION			SIGNATURE	

By Order of the Secretary of the Army:

Official:



JOEL B. HUDSON

*Administrative Assistant to the
Secretary of the Army*

0314803

PETER J. SCHOOMAKER
*General, United States Army
Chief of Staff*

To be distributed in accordance with the initial distribution number (IDN) 256780 requirements for
TM 55-1945-219-14&P.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .16 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

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

Square Measure

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

Cubic Measure

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

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.036
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

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

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