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TM 11-2413

WAR DEPARTMENT TECHNICAL MANUAL

HYDROGEN GENERATOR ML-303/TM

WAR DEPARTMENT · 15 JUNE 1944

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HYDROGEN GENERATOR ML-303/TM

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WAR DEPARTMENT,
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TM 11–2413, War Department Technical Manual, Hydrogen Generator ML–303/TM is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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As prescribed in paragraph 9a, FM 21–6:

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IBn 1: T/O 1–627, Wea Serv. Regional Control Hq.

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For explanation of symbol, see FM 21–6.

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DESTRUCTION NOTICE

WHY— To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW— 1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—Generator body, screw cap, charge cans, punch.

2. Cut—Gasket, generator body, screw cap.

3. Burn—Gasket, punch.

4. Bend—Generator body, screw cap, charge cans.

5. Bury or scatter—All of the above.

DESTROY EVERYTHING

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SECTION I

DESCRIPTION

1. PURPOSE. Hydrogen Generator ML–303/TM is used to generate hydrogen gas for the inflation of 30-gram and 100-gram meteorological balloons. The hydrogen is produced by the reaction of calcium hydride with water.

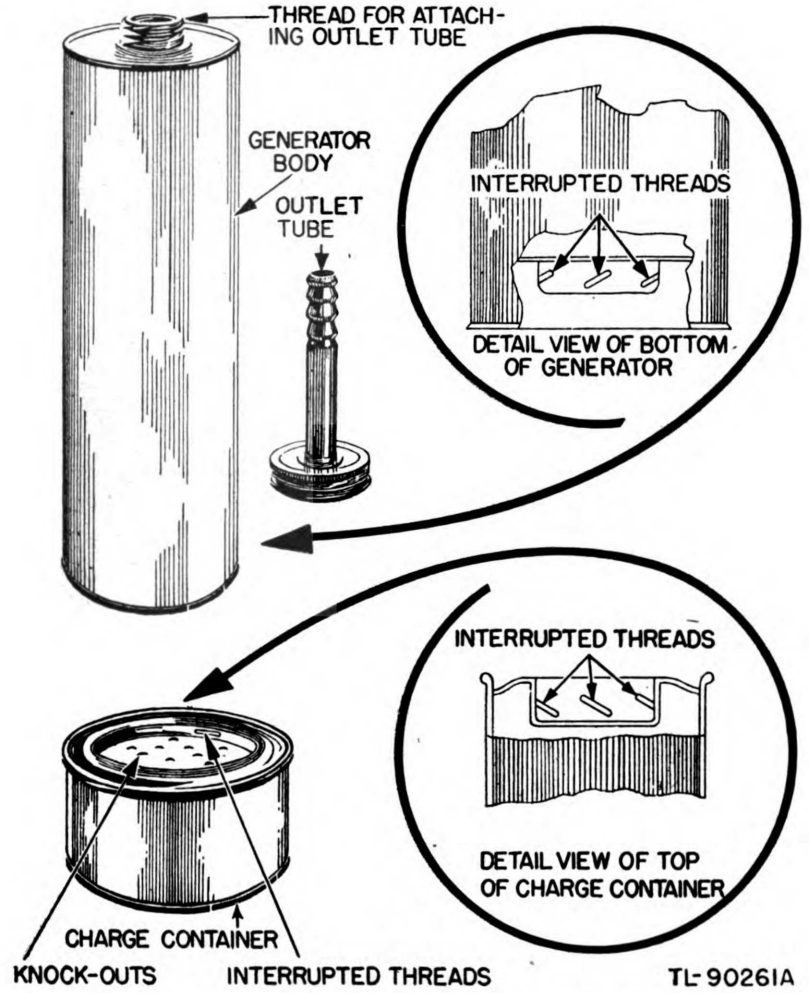


Figure 1. Hydrogen Generator ML–303/TM and Calcium Hydride Charge ML–304/TM.

2. COMPONENTS. Hydrogen Generator ML–303/TM consists principally of a generator body and an outlet tube (fig. 1). The generator is used with Calcium Hydride Charges ML–304/TM and ML–305/TM. A punch is provided.

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3. HYDROGEN GENERATOR ML–303/TM. The entire weight of Hydrogen Generator ML–303/TM is 1 pound, 9 ounces.

a. Body for Hydrogen Generator ML–303/TM. The generator body is a cylindrical can constructed of iron which is electrogalvanized, bonderized, and painted. It is approximately 15½ inches long and 5⅛ inches in diameter. The top of the cylinder is provided with a neck threaded to mesh with the outlet tube when the generator is in use (fig. 1). The bottom of the generator is recessed and has a protruding screw opening with male interrupted screw threads provided for attaching the calcium hydride charge (figs. 1 and 2). Eighteen holes, each approximately ⅜ inch in diameter, are arranged in a concentric circle around the center opening; these openings serve as vents for the passage of water.

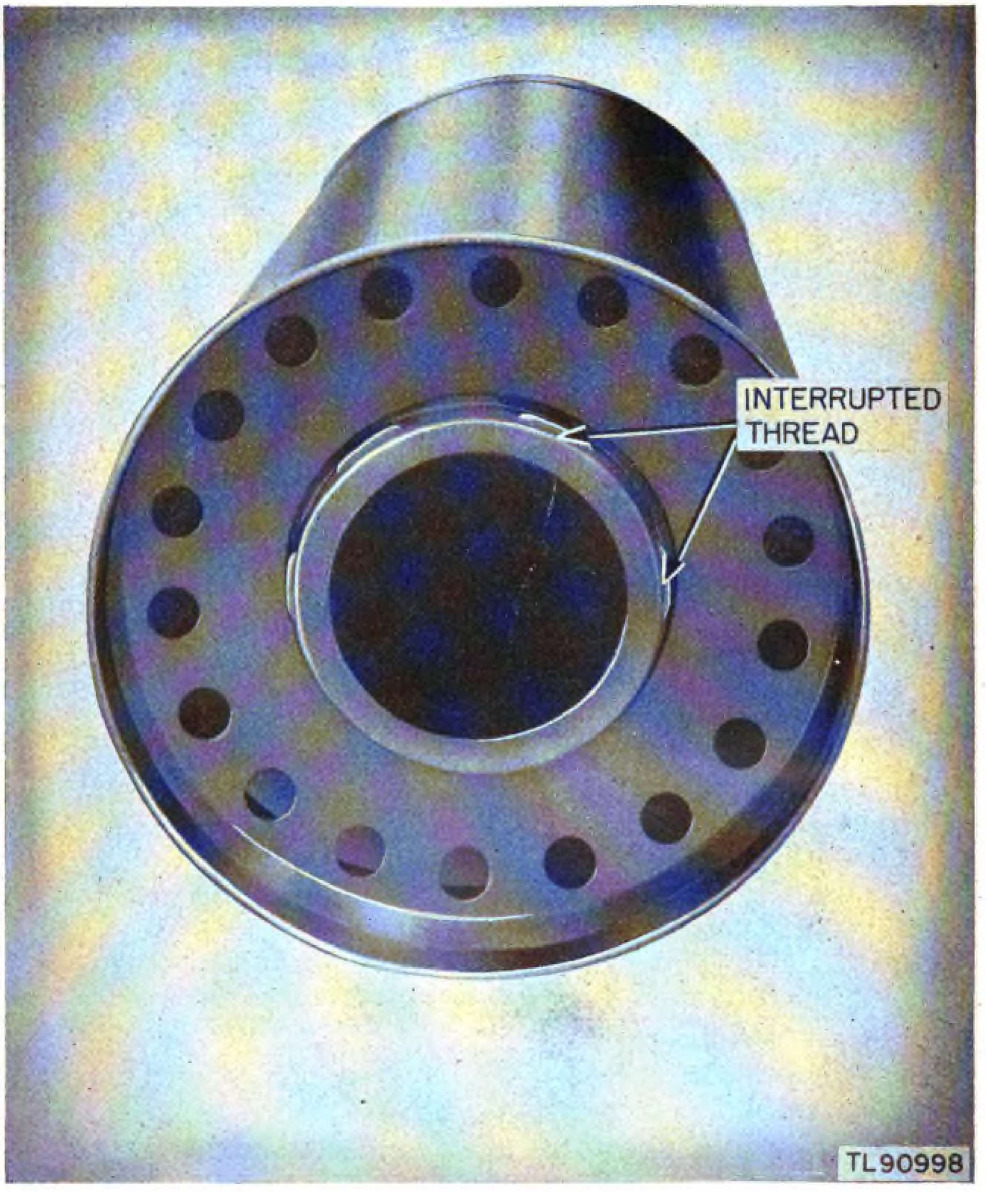


Figure 2. Hydrogen Generator ML–303/TM—bottom view.

b. Outlet tube for Hydrogen Generator ML–303/TM. The outlet tube is made of enameled, bonderized, steel tubing. It consists of a

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screw cap, 1¾ inches in diameter, and of an extended tube, ⅝ inch in diameter. The over-all length of the outlet tube is 3⅞ inches. A synthetic rubber gasket is fitted in the outlet-tube cap to prevent any leakage of hydrogen through the base of the cap. The tip of the extended tube is corrugated to receive Hose ML–81.

4. CALCIUM HYDRIDE CHARGE ML–304/TM (figs. 1 and 3). Calcium Hydride Charge ML–304/TM contains between 13 and 14 ounces of calcium hydride, 40 percent pure. This quantity generates approximately 6 cubic feet of hydrogen for the inflation of a 30-gram balloon. The charge is sealed in an airtight metal can approximately 3⅝ inches in diameter, 2½ inches high, and about 17 ounces in weight. The top of the charge can is recessed and is provided with a screw fitting by means of which the charge can is attached to the bottom of the generator body. The screw threads are interrupted so that only one-sixth of a turn is required to attach the charge to the generator. The top of the can is provided with 10 knock-out holes, which are punched out immediately before the charge is used, to expose the calcium hydride.

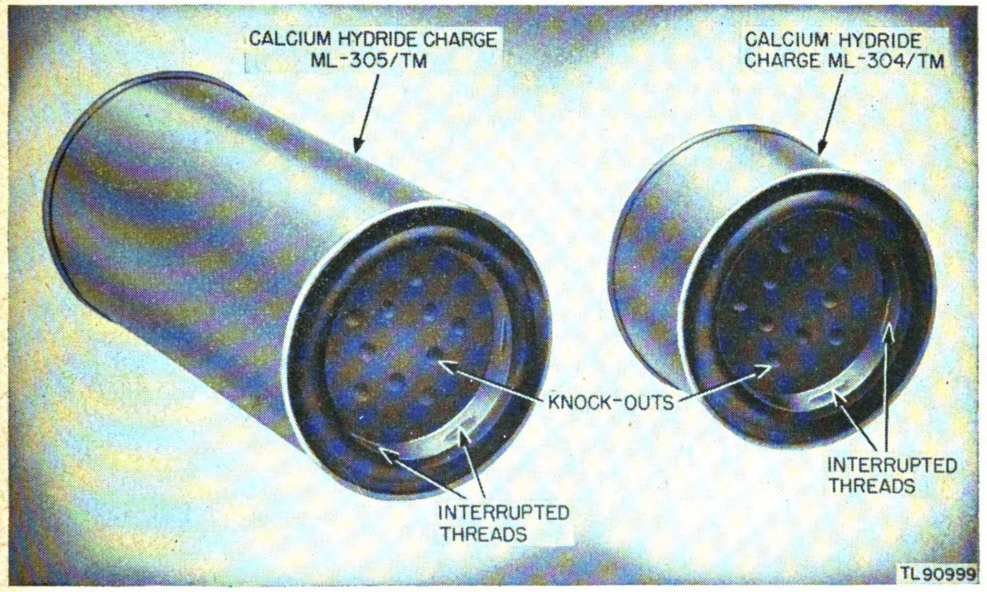


Figure 3. Calcium Hydride Charges ML–304/TM and ML–305/TM.

5. CALCIUM HYDRIDE CHARGE ML–305/TM (fig. 3). Calcium Hydride Charge ML–305/TM contains approximately 3¾ pounds of calcium hydride; this quantity generates 24 cubic feet of hydrogen for the inflation of a 100-gram balloon. The charge is sealed in an airtight metal can 3⅝ inches in diameter by 8 inches high. In all other details, Calcium Hydride Charge ML–305/TM is identical with Calcium Hydride Charge ML–304/TM (par. 4).

6. PUNCH. The punch consists of a wooden handle, 1⅝ inches in diameter by 1¾ inches long, and a steel shaft, $\frac{3}{16}$ inch in diameter by 1⅝ inches long, with a 45° point. It is used to punch out the knock-outs in the tops of calcium hydride charge cans.

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SECTION II

INSTALLATION

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7. PREPARATION OF HYDROGEN GENERATOR ML–303/TM FOR USE.

a. Obtain a can or container at least 25 inches high and 10 inches in diameter. (A 50-gallon drum is an ideal container.) Fill the container with either sea or fresh water to a depth of at least 24 inches when using Calcium Hydride Charge ML–305/TM, or 18 inches when using Calcium Hydride Charge ML–304/TM.

b. Screw the outlet tube tightly on the threaded opening in the top of the generator body.

c. Attach one end of Hose ML–81 to the corrugated tip of the outlet tube. The other end is later attached to Cock ML–56 for the inflation of a 30-gram balloon, or to Cock ML–201–A for the inflation of a 100-gram balloon. Be careful not to twist or kink the rubber hose since such twists or kinks restrict the flow of gas and cause hydrogen to escape from the bottom of the generator.

d. Attach the balloon to be inflated to the proper balloon cock (**c** above).

e. Punch out the knock-outs on the top of the proper charge can (pars. 4 and 5). Make sure that the knock-outs are punched out completely and that there is a space between the top of the can and the calcium hydride briquettes. If necessary pry up the top of the can. Be careful not to damage the interrupted threads. Never punch out the knock-outs until the charge is to be used, because the calcium hydride deteriorates when it is exposed to the moisture in the air.

NOTE.—If hydrogen is generated too rapidly when all 10 of the knock-outs are opened, punch out fewer holes in subsequent inflations until the desired rate of generation is attained.

f. Attach the calcium hydride charge to the bottom of the generator by engaging the interrupted threads.

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SECTION III

OPERATION

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8. USING HYDROGEN GENERATOR ML–303/TM. **a.** Grasp the outlet nozzle of the generator, and immerse the assembly *rapidly* in the supply of water to within 2 inches of the top of the generator body. A slight vibration indicates that hydrogen is being generated.

(1) If hydrogen escapes from the bottom of the generator, lower the generator so that the top of the generator body is below the water level.

(2) When the blow-off stops, raise the generator top about 2 inches out of the water.

NOTE.—Immerse the generator completely *only* when the gas escapes from the bottom, because completely immersing the generator may cause water to be blown into the balloon.

b. Allow the generated hydrogen to flow through the generator and hose for about 3 seconds in order to remove all the air. When the generator and hose are free of all air, slip the end of the hose on the balloon cock (to which the balloon is already attached).

c. Open the cock, and allow the balloon to inflate.

d. Move the generator assembly 2 or 3 inches up and down in the water. This agitation washes out chemical byproducts and constantly presents a cooler, fresher water supply to the reaction. As a result, the temperature of the hydrogen is lowered, and the rate of generation is increased. If the rate at which the hydrogen is being produced is too rapid, decrease the amount of agitation. If the rate of generation is too slow, increase the amount of agitation.

e. If prying up the top of the charge can does not result in a successful generation of hydrogen, discard the charge can *in water*, and prepare a new charge. *Never leave an unreacted charge exposed to the air.*

f. Continue the procedure described in **d** above until the vibration of the generator stops. The generation of hydrogen is now complete.

NOTE.—The reaction time for Calcium Hydride Charge ML–304/TM is approximately 5 minutes. The time for Calcium Hydride Charge ML–305/TM is from 17 to 20 minutes.

g. Turn the handle of the balloon cock to its closed position, and detach the hose.

h. Remove the generator from the water, unscrew the calcium hydride charge can, and discard the can. *Never lift the generator out of the water until the balloon is completely inflated and the cock has been closed.*

i. Rinse the inside of the generator with water to remove the lime which results from the reaction. The lime and other end products are not injurious to the skin or clothing.

j. The same supply of water may be used over and over again until it becomes too full of lime. However, if water is scarce, delime this water for re-use as follows: allow the water to stand for about 2 hours until the

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Figure 4. Hydrogen Generator ML–303/TM, in operation.

sludge settles. Being careful not to stir up the sediment on the bottom, gently pour the water from the container into another receptacle.

9. SPECIAL INSTRUCTIONS FOR USE IN ARCTIC CLIMATES. In arctic climates, the water vapor in the generated hydrogen freezes and forms snow as it passes through Hose ML–81. The snow accumulates at the constriction in the balloon cock and forms a block which prevents the inflation of the balloon. To correct this condition, proceed as follows:

a. Inflation of 30-gram Balloons. Cut off approximately 2 inches from a Hose ML–81. Use this short length of hose instead of the standard length.

b. Inflation of 100-gram Balloons. (1) Slip the balloon neck directly over the gas outlet tube instead of using Hose ML–81 and the balloon cock.

(2) When the generation of hydrogen stops, pinch the neck of the balloon, and remove the balloon from the gas outlet tube. Slip the balloon over the balloon cock and weigh off.

10. DISPOSAL OF USED CHARGE CANS. Used charge cans may be thrown away without any precautions other than those generally followed in discarding metal cans.

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SECTION IV

MAINTENANCE

NOTE.—Unsatisfactory performance of this equipment will be reported immediately on W. D., A.G.O. Form No. 468. If form is not available, see TM 38-250.

11. PREVENTING LEAKS. Hydrogen Generator ML–303/TM requires no maintenance other than a check to make sure that the generator does not leak. Dip the generator in water. Replace any part that causes a leak.

12. REPLACING GASKET. If the synthetic rubber gasket becomes damaged, remove the gasket and replace it with a new one.

13. MOISTUREPROOFING AND FUNGIPROOFING. Moistureproofing and fungiproofing are not required for this equipment.

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SECTION V

SUPPLEMENTARY DATA

14. LIST OF MAINTENANCE PARTS.

NOTE.—Order maintenance parts by stock number, name, and description.

Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per major unit
7A975-303/T2..	Outlet tube for Hydrogen Generator ML-303/TM: Steel tube, 5/8 in. diam.; screw cap of enameled bonderized zinc-coated sheet metal, 1¾ by 6 in.; over-all length 3⅞ in., includes one gasket liner.	(*)	(*)	1
7A975-303/G1..	Gasket for outlet tube: Synthetic rubber; 1¾ in. OD, 1 in. ID, 1/16 in. thick.	(*)	(*)	1
6R7630.....	Punch: Pointed steel shaft, 1⅝ in. long by 3/16 in. diam., with 45° point; standard gravers wooden handle 1⅝ in. diam. by 1¾ in. long; catalogue No. C (William Dixon, Inc., 32 E. Kinney St., Newark, N. J.)	(*)	(*)	1

* Indicates stock available.

15. EXPENDABLE SUPPLIES.

NOTE.—Order parts by stock number, name, and description.

Signal Corps stock No.	Name of part and description	Quantity per major unit
6G134.....	Calcium Hydride Charge ML-304/TM: Sealed gastight can with body of Terne plate and ends of bonderized steel; 3⅝ in. diam. by 2½ in. high; contains enough calcium hydride to inflate a 30-gram balloon to a free lift of 132 grams; has ten ¼-in. knock-outs in top; interrupted thread on rim.	(*)
6G135.....	Calcium Hydride Charge ML-305/TM: 3⅝ in. diam. by 8 in. high; contains sufficient calcium hydride to inflate a 100-gram balloon to a free lift of 575 grams; otherwise, same as Calcium Hydride Charge ML-304 TM above.	(*)

* One Calcium Hydride Charge ML-304/TM or ML-305/TM is used each time the generator is operated to produce hydrogen gas. These charges are supplied in lots sufficient to last a predetermined length of time.

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