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TM 55-1930-209-14&P-9-4

TECHNICAL MANUAL

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

FOR

WATER PURIFICATION BARGES (NSN 1930-01-234-2165) VOLUME 9-4 ELECTRIC POWER SYSTEM

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and content requirements normally associated with the Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY 15 OCTOBER 1992

WARNINGS AND SAFETY NOTICES

WARNING

DANGEROUS VOLTAGES AND HAZARDOUS MATERIALS
ARE USED IN THIS EQUIPMENT.
DO NOT TAKE CHANCES!

GENERAL WARNINGS

- Always redtag electrical equipment, controls, circuits, and switches before beginning repairs.
- Do not service or adjust high voltage electrical equipment when alone.
- Do not overload circuits.
- Always use authorized, insulated tools and test equipment when working on electrical equipment.
- Remove all jewelry before working on or around electrical equipment with exposed current-carrying areas.
- Do not wear clothing with exposed metal fasteners when working on electrical equipment. Always use approved breathing apparatus when working with chemicals.
- · Avoid chemical contact with eyes, skin, and clothing.
- Always wear safety glasses, gloves, and rubber aprons when handling chemicals.
- Wear protective clothing and safety glasses as required when working on barge equipment.
- Always wear approved ear protection in noise hazard areas.

SPECIFIC WARNINGS

- Do not connect any new circuit to an existing circuit.
- Do not energize circuits if water condensation is present.
- If any sparks are seen, stop operation immediately. Determine cause and take corrective action.
- Never touch radio antennas of fixed-base radio transmitters. When transmitting, antennas contain high voltage.
- Always use approved breathing apparatus when handling material in multimediafilters and chlorination unit descaling acid crystals. Do not breathe dust from these materials.
- Avoid breathing vapors from coagulant aid chemicals. Use in a well-ventilated area In case of chemical contact with skin, wash with water. For eyes, immediately flush at eyewash station and obtain medical help as soon as possible.
- Always wear work gloves and shirts with full length buttoned sleeves when handling fuel oil and gasoline.

- Do not smoke or have open flames within 10 feet when handling fuel oil or gas. Only minimum number of personnel necessary to conduct fueling operation is permitted in area.
- Before starting any repairs on compressed air system, always release pressure from air receiver and compressor and open and redtag circuit breakers. On air compressor, do not adjust automatic regulator switch (pressure switch. and pilot valve settings.
- To avoid flying particles lodging in eyes, do not use compressed air to "dust-off" clothing or workspace.
- Stay dear of anchor cables when operating anchor winches.
- Always wear safety glasses or face shield when using power tools.
- Always wear lifevests when on weatherdeck and throughout the barge during storm conditions.
- Lifevests are to be worn at all times aboard workboat.
- Only qualified persons will operate and maintain arc and fuel gas welders.
- When welding, always make sure those working with or near the welder wear proper clothing: heavy, hole-free gloves, heavy shirt, cuffless trousers, high shoes, and cap. Keep clothing dry and free of oil and other flammable substances.
- Use dry heavy canvas drop cloth to cover work area and adjacent deck when arc welding.
- Before welding on bulkheads, deck plating and similar surfaces, always check carefully to make sure that the other side of the surface to be welded does not hide fuel or compressed gas tanks, flammable or hazardous materials, or electrical equipment or wiring.
- When welding, keep your head out of the fumes and make sure area is well ventilated.
- Before welding on surfaces which have been cleaned with cleaning solutions containing chlorinated hydrocarbons, always wash with water, dry and ventilate area thoroughly.
- Use shield with proper filter lens when welding. Do not allow others near welding operations to assist or observe without proper eye protection. This must include side shields during slag chipping operations.
- Warn personnel in area during welding operations not to look at arc or expose themselves to hot spatter or metal.
- In an extreme emergency, when welding is required in void 2 port, shut down chlorination system. Close all valves. Cover the parts of chlorination system not being welded with a heavy canvas drop cloth. Turn on vent 8 and, if available, provide additional forced air ventilation.

- Before welding on fuel oil or sludge tank, make sure tank is gas-free by: 1) removing all liquid from tank, 2) cleaning tank thoroughly, 3) seeing that tank is thoroughly dry, and 4) force ventilating tank.
- Connect arc welding work cable as dose to welding area as possible. Work cables connected to barge framework or
 other locations far from welding site increase the possibility of the welding current passing through lifting chains, crane
 cables or other possible circuit paths. This can create fire hazards or weaken lifting chains or crane, cables until they
 break or fall.
- Always weld with all doors, portholes, and hatches propped open and necessary ventilation systems operating.
- Take frequent breaks away from the area where you are welding.
- Do not take oxygen and acetylene tanks into confined areas when welding.
- Always use a friction lighter to start oxyacetylene torch.
- Always maintain all welding equipment in proper working condition. If you have any doubts about the safety of any
 welding equipment do not use the welder.

ELECTRICAL SHOCK SAFETY STEPS

Five safety steps to follow if someone is the victim of electrical shock.

- 1. Do not try to pull or grab individual.
- 2. Turn off electrical power when possible.
- 3. If you can not turn off electrical power, pull, push, or lift person to safety using a wooden pole, rope, or some other insulating material.
- 4. Get medical help as soon as possible.
- 5. After the injured person is free of contact with the source of electrical shock, move the person a short distance away and, if needed, start CPR immediately.

INTRODUCTION TO

TM 55-1930-209-14&P-9-4

You can help improve this manual. If you find any mistakes or if you know of away to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

1. SCOPE

TM 55-1930-209-14&P covers the Reverse Osmosis Water Purification Barges, Models 300-WPB-1, 300-WPB-2 and 300WPB-3, NSN 1930-01-234-2165. This manual consists of twenty-one volumes.

2. REVERSE OSMOSIS WATER PURIFICATION BARGES

The Reverse Osmosis Water Purification Barges provide up to 300,000 gallons of drinking water per 24-hour period. The drinking water, converted from seawater or brackish water, is for use by a Rapid Deployment Force in a forward area. When needed, the drinking water can be pumped to a shore facility or to another vessel. This manual provides operation and maintenance procedures for all the component systems on the barges.

3. VOLUME 1 -- NORMAL OPERATIONS

This volume provides information and procedures on normal Reverse Osmosis Water Purification Barge operations, including barge movement and deployment, communications and electrical power systems, drinking water production, shutdown, and required operational maintenance. Emergency shutdown procedures are also provided.

4. VOLUME 2 -- SEAWATER SYSTEM

This volume describes operation and maintenance of the seawater system which supplies seawater to the Reverse Osmosis Water Purification Units (ROWPUs) for processing to the air conditioning unit for cooling to the ballast tank for barge trimming to the chlorination unit for priming and cooling, and to the diesel generators for cooling.

5. VOLUME 3 -- REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) SYSTEM

Volume 3 provides operation and maintenance procedures for the ROWPU System which processes seawater or brackish water to produce drinking water. Normally, this system processes seawater supplied by the seawater system (TM 55-1930-209-14&P-2) to create product water. Chlorine is then added to this product water by the chlorination system (TM 55-1930-209-14&P-4). The resultant drinking water is discharged into four storage tanks that are part of the drinking water system (TM 55-1930-209-14&P-5).

6. VOLUME 4-- CHLORINATION SYSTEM

Operation and maintenance procedures for the chlorination system onboard the Water Purification Barges are contained in this volume. This system produces chlorine in a sodium hypochlorite solution, upon demand, to water processed by the ROWPU system just before the water enters the four drinking water storage tanks.

- 7. VOLUME 5 -- DRINKING WATER SYSTEM The drinking water system provides storage for water produced by the ROWPUs and includes pumps and valves to move this water from onboard storage tanks to the shore discharge system, to another vessel, or overboard. The drinking water system also provides a pressurized water supply for drinking and washing onboard the barges.
- 8. VOLUME 6 --SHORE DISCHARGE SYSTEM This volume provides operation and maintenance procedures for the shore discharge system which transfers drinking water from barge storage tanks to holding/storage facilities ashore.
- 9. VOLUME 7 --COMPRESSED AIR SYSTEM Volume 7 describes the operation and maintenance of the compressed air system which provides compressed air to five air stations in the ROWPU space, one in the workshop, and one on stem weatherdeck This system also provides compressed air to two air stations for blowdown of seachests in void 2 starboard and void 4 port. Compressed air is used on the barges to operate air-powered impact tools, to propel air through the shore discharge hose, to blowdown seachest, and for general cleaning blowdown.
- 10. VOLUME 8 --FUEL OIL SYSTEM This volume provides operation and maintenance procedures for the fuel oil system which functions as a centralized receiving storage and distribution system for diesel fuel used for barge operations. This onboard fuel system provides fuel for two 155 kW diesel ship service generators, a 20 kW ship auxiliary generator, two ROWPU high-pressure pump diesel engines, and a fueling station for the barge workboat.
- 11. VOLUME 9 --ELECTRICAL POWER SYSTEMS Operation and maintenance procedures for the two electrical power systems installed aboard the Water Purification Barges are contained in Volume 9. The normal electrical power system generates, controls and distributes all electrical power for operating the water purification system and its auxiliary systems. The emergency electrical system supplies 24 Vdc from a battery bank to 24 Vdc equipment and converts to 24 Vdc through an inverter to 120 Vac to power emergency lighting and equipment.
- 12. VOLUME 10 -- LIGHTING SYSTEM Volume 10 contains operation and maintenance procedures for the onboard lighting systems for the Water Purification Barges. This system supplies interior and exterior lighting. Normal and emergency interior lighting is provided in the deckhouse ROWPU space, dayroom, workshop, and voids. Exterior lighting consists of searchlights and floodlights for use at night or during reduced visibility. Lights on the weatherdecks and standard navigation and status lights are for use during operation and towing.
- 13. VOLUME 11 -- EQUIPMENT MONITORING SYSTEM This volume provides operation and maintenance procedures for the equipment monitoring system which monitors the operation of several equipment components onboard the Water Purification Barges. This system monitors operating conditions such as amount of drinking water in storage tanks and temperature of diesel engine cooling water. Sensors detect unacceptable operating conditions, the main processor flashes at double intensity and remote alarms (horns, strobe lights and buzzer alert crewmembers that corrective action is necessary.

14. VOLUME 12 -- COMMUNICATIONS SYSTEM

Operation and maintenance procedures for the communications system are provided in Volume 12. This system consists of three separate communications methods, radio communications, foghorn and intercom telephones.

15. VOLUME 13 -HANDLING EQUIPMENT

This volume contains operation and maintenance procedures for handling equipment used for lifting, transporting and repositioning equipment and materials onboard the barges. The system includes a bridge crane, bow crane and a void 4-trolley hoist.

16. VOLUME 14 -ANCHOR, MOORING, AND TOWING EQUIPMENT

Volume 14 describes the operation and maintenance procedures for the anchor mooring, and towing equipment on the Water Purification Barges. This equipment provides a method to hold (anchor) the barges in a fixed position offshore, at dockside, or next to another vessel and a method to move the barges from one location to another.

17. VOLUME 15 -MISCELLANEOUS EQUIPMENT (DAYROOM, WORKSHOP, ACCESSES, AND SANITATION SYSTEMS)

Volume 15 addresses operation and maintenance procedures for miscellaneous equipment installed on the Water Purification Barges. This equipment includes the dayroom on the forward starboard side of deckhouse, the workshop on the forward portside of deckhouse, accesses such as deckhouse doors and portholes and various accesses to and from the voids, and two separate sanitation systems (toilets and bilge). Additional equipment addressed in this volume includes: guard rails, rubber fendering, removable rubber floor mats, eyewash stations, component labels, caution, warning and danger signs, and storage areas.

18. VOLUME 16 -VENTILATION, HEATING, AND AIR CONDITIONING SYSTEMS

This volume contains operation and maintenance procedures for the deckhouse and voids ventilation systems and the heating and air conditioning (HAC) system installed on the Water Purification Barges. The ventilation system provides fresh air circulation in the deckhouse and voids with 17 hatches and 10 ventilation fans. The HAC controls the temperature in the dayroom and deckhouse.

19. VOLUME 17 -WORKBOAT, LIFESAVING, AND FIREFIGHTING EQUIPMENT Volume 17 includes procedures for the operation and maintenance of:

- a. Workboat -provides water transportation for crew members and visitors, small cargo items, transportation of the messenger line for the shore discharge hose and similar work-related tasks associated with operating the Water Purification Barges.
- b. Lifesaving Equipment -installed on the barges and consisting of 2 liferafts, 15 Type II and 24 Type V lifevests and 4 lifesaving rings.
- c. Firefighting Equipment -installed on the barges and consisting of Halon 1301 system, 2 CO2 hose reel units, a smoke detector system, 17 portable CO2 fire extinguishers, 5 dry chemical fire extinguishers, 5 self-contained breathing apparatuses, and a portable, engine driven firefighting pump. The workboat also has a 10-pound, portable, dry chemical fire extinguisher.

20. VOLUME 18 SUPPORTING APPENDICES FOR VOLUMES 1-17.

Volume 18 contains the Maintenance Allocation Chart, Components of End Item List, Tools and Test Equipment List, Expendable/Durable Supplies and Materials List and the Repair Parts and Special

All of the information contained in this volume is common to volumes 1-17 and does not appear in each individual volume.

Appendix A in volumes 1-17 provides information unique to each volume. Appendix B in volumes 1-17 provides manufacturers manuals and instructions unique to the system described in each volume. Appendixes C-G are located in Volume 18.

21. VOLUME 19 -PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) Volume 19 contains PMCS pertinent to all onboard systems for the Reverse Osmosis Water Purification Barges.

22. VOLUME 20 -SUPPLEMENTAL DATA

Volume 20 contains the Basic Issue Items List, and additional Authorization List for all onboard systems for the Reverse Osmosis Water Purification Barges.

23. VOLUME 21 -WINCH, DOUBLE DRUM, DIESEL

This volume contains operation and maintenance procedures for the 20-ton double drum diesel engine winch used on the Water Purification Barges. Appendix B of Volume 21 contains the Maintenance Allocation Chart and the Repair Parts and Special Tools List for the winch.

TECHNICAL MANUAL NO. 55-1930-209-14&P-9-4

HEADQUARTERS DEPARTMENT OF THE ARMY, WASHINGTON D.C., 15 OCTOBER 1992

TECHNICAL MANUAL

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

FOR

WATER PURIFICATION BARGES (NSN 1930-01-234-2165) VOLUME 9-4 ELECTRICAL POWER SYSTEM

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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Continued from TM 55-1903-209-14&P-9-3

NOTE

The following appendices, common to all TM's in this series, are in TM-55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC) TOOLS AND TEST EQUIPMENT LIST (TTEL) EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (ESML) REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL) REPAIR PARTS LIST TO FIGURE NUMBER CROSS-REFERENCE LIST

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL) AND BASIC ISSUE ITEMS LIST (BIIL) ADDITIONAL AUTHORIZED ITEMS LIST (AAL)

APPENDIX B MANUFACTURERS' SERVICE MANUALS/INSTRUCTION

B-1. Normal Electric System

Document title Component Manufacturer

NOTE

The following documents can be found in TM 55-1930-209-14&P-9-2

Switchboard **Electric Power Controls Operation Electric Power Controls**

> Manual for Main Service Generation P.O. Box 5146 and Distribution Switchboard Springfield, IL 62705

Ph: (217) 629-8506

B-2. Emergency Electrical System

Component Document title Manufacturer

NOTE

The following documents can be found in TM 55-1930-209-14&P-9-2

Inverter LaMarche Instruction Manual for LaMarche Manufacturing Co.

> Model A-51 Inverter with Trouble 106 Braddock Drive **Shooting Information** Des Plaines, IL 60018

Ph: (312) 299-1188

LaMarche Installation Instruction Battery charger

Manual for Model A33-60-24V-A1

B-3. 155 kW Ship Service Generators

3306TA engine

Document title Manufacturer Component

NOTE

The following documents can be found in TM 55-1930-209-14&P-9-2

Caterpillar Operation and Maintenance

Manual for 3304, 3306, 3304B and 3306B

Industrial Engines, SEBU5779-01

Caterpillar Tractor Co, 100 N.E. Adams St. Peoria, IL 61629

Caterpillar Specifications for 3304B

and 3306B Generator Set Engine Attachments,

SENR2798

Caterpillar Systems Operation Testing and Adjusting Manual for 3304B and 3306B Generator Set Engine Attachments, SENR2799 Component **Document title Manufacturer**

NOTE

The following document can be found in TM 55-1930-209-14&P-9-2

Caterpillar Disassembly and Assembly Manual for 3304B and 3306B Generator Set

Engines, SENR2800

NOTE

The following documents can be found in TM 55-1930-209-14&P-9-3

Caterpillar Parts Manual for 3306 Generator Set Engine,

SEBP1406

NOTE

The following documents can be found in TM 55-1930-209-14&P-9-4

SR4 generator Caterpillar Operation and Maintenance

Manual for SR4 and SRCR Generators,

SEBUS5717-02

Caterpillar Service Manual for SR4

Generator SENR7968

Caterpillar Special Instructions for Alignment of Single Bearing Generators,

SMHS7259

Spring isolators Ace Mounting Co. Series 630 Spring Isolators

Ace Mountings Co., Inc.

for Seismic, Marine, & Mobile Applications,

catalog 83A-170

South Amboy, NJ 08879

Ph: (201) 721-6200

11 Cross Avenue

Master Control Systems Bulletin for Regulated Battery charger

Two Rate Battery Charger, Model MBC8, 474-2

Master Controls Systems 910 N. Shore Drive Lake Bluff, IL 60044 Ph: (312) 295--1010

Telex: 25-4636

Master Control Systems Installation and Operation Instructions for Models MBC8, MBC8/9(10000)-3

Engine crankcase filter system,

Oildex XCAD-13T

Oildex - How It Operates, Installation, Instructions, Dwg no. XCAD-12T/XCAD-14T Oildex Corporation P.O. Box 3755

Long Beach, CA 90803

B-4. 20 kW Ship Auxiliary Generator Set

generator

<u>Component</u> <u>Document title</u> <u>Manufacturer</u>

NOTE

The following documents can be found In TM 55-1930-209-14&P-9-4

4.236M engine Perkins Engines Operators Manual for Perkins Engines Inc.
Marine Diesel Engines, 4.236M 32500 Van Bom Rd

P.O. Box 697
Perkins Engines Workshop Manual, 4.236M
Wayne, MI 48184
Ph: (313) 595-9600

Perkins Engines Parts Manual, 4.236M Telex: 2

SC144E Newage Stamford 'C' Generator Range

Frames 1, 2, & 3 Series 4 A.V.R., Controlled Operation and Maintenance Manual Machine Designations PC1 64SC

and MSC 144, 244, 344, publication

no. 1 H-059 1 st edition

Newage Stamford 'C' Range Frames 1, 2, & 3 Series 4 A.V.R. Parts Manual

Spring Isolators Series 630 Spring isolators for Seismic,

Marine, & Mobile Applications,

catalog 83A-170

Battery charger Master Control Systems Bulletin for

Regulated Two Rate Battery Charger,

Model MBC8, 474-2

Master Control Systems Installation & Operation Instructions for Models MBC8, Regulated Two Rate Battery Charger,

MBC8/9(10000)-3

Gages Murphy A20T Series Temperature Swich-

gages Bulletin A20T-7974, effective 5-1 - 5-79, Catalog Section 10, Class R

Murphy A20 Series Pressure Murphygages and Swichgages, Bulletin A20P-7973, revised 12-30-81, Catalog Section 05,

Class (5)

Telex: 234002

Newage Engineers, Ltd. 3 Independence Court

Folcraft, PA 19032

Ph: (215) 534-9500

Telex: 43551

Ace Mounting Co., Inc.

11 Cross Avenue

South Amboy, NJ 08879 Ph: (201) 721-6200

Master Controls Systems,

Inc.

910 N. Shore Drive Lane Bluff, IL 60044 Ph: (312) 925--1010 Telex 25-4636

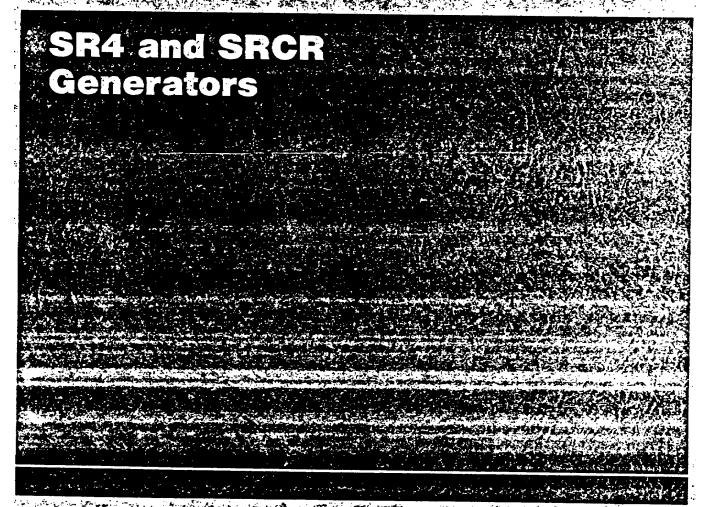
Frank W. Murphy & Co. P.O. Box 470248
Tulsa. OK 74147

Ph: (918) 627-3550 Telex: 492332

Component	Document title	Manufacturer
	Murphy Instructions for Installation & Maintenance of Pressure & Vacuum Swichgages, Series 20-P, 25-P, A20-P, A25-P, Instruction Booklet 2025P-INS, revised 9-28-84 Murphy Instructions for Installation & Maintenance of Temperature Swichgages, Installation Sheet 2520T-INS, revised 2-1-85	
Exhaust silencers	Nelson Industrial "100" Level Exhaust Silencers, two page fact sheet	Nelson Manufacturing
Oildex crankcase filter system	Oildex - How It Operates, Installation Instructions, Dwg. No. XPERK-1	Oildex Corporation P.O. Box 3755 Long Beach, CA 90803



Operation & Maintenance



Foreword

This Operation and Maintenance Guide contains operation instructions, and lubrication, and maintenance information application of this information should maximize' performance and life of the generator '

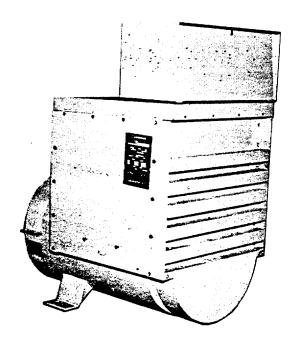
Whenever a question arises regarding your Caterpillar.product.or this publication, please consult your Caterpillar dealer for the latest available information.

'The services of authorized Caterpillar dealers are recommended. Your dealer is staffed with trained personnel who are equipped with proper tools necessary Caterpillar part, and are trained in the latest service procedures.

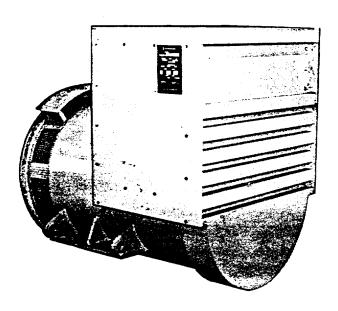
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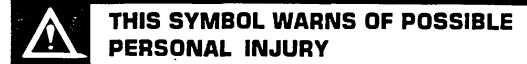


SR4



SRCR

Safety



Do not wear loose clothing around machinery.

Observe NO SMOKING signs.

Do not smoke around batteries. Hydrogen gas generated by charging batteries is explosive. Keep batteries in a well-ventilated area.

Be sure the engine room is properly ventilated.

All electrical equipment must be grounded according to local building codes.

Remove tools and electrical cords from the engine before starting.

All fans, shafts, pulleys, etc. must have guards.

Check all connections periodically for tightness and insulation.

Insulate all connections and disconnected wires.

Do not work on electrically "hot" equipment.

Do not use carbon tetrachloride fire extinguishers. Fumes are toxic and the liquid has a deteriorating effect on insulation.

Never operate a diesel engine with the governor linkage disconnected. Human reactions are not fast enough to control the fuel rack.

Never adjust or repair a machine while in operation.

Do not touch the heat sink on the generator regulator when the generator is running. It is electrically "hot".

Store oily rags in metal covered containers.

Never store flammable liquids near the engine.

Always disconnect and tape the ground battery lead before working on the electrical system.

Be sure the remote starting system is inoperative when the engine is being worked on. Disconnect the starter from the start switch.

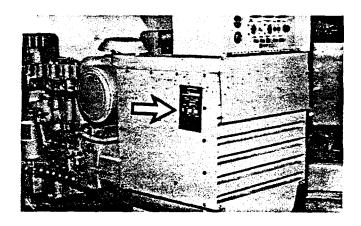
Always disconnect the engine starter circuit when working on the generator.

Keep the engine room and floor area clean.

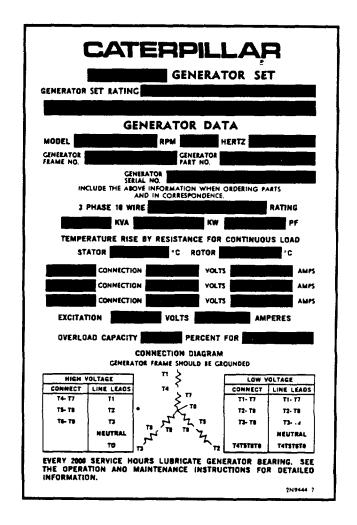
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Generator Identification

Identification Plate



The generator Information Plate is located on the lefthand side of the generator.



When service is required, use the information given on the Identification Plate.