

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 14
ANCHOR, MOORING AND TOWING EQUIPMENT**

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.

*This manual supersedes TM 55-1930-209-14&P-14, 30 January 1989.

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 retdag 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 multimedia filters 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 clear 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 close 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.

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INTRODUCTION TO
TM 55-1930-209-14&P-14

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.

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-14

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 14
ANCHOR, MOORING AND TOWING EQUIPMENT

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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* Supersedes TM 55-1930-209-14&P-14, 30 January, 1989

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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 55-1930-209-1 4&P-20.

- COMPONENTS OF END ITEM LIST (COEIL) AND BASIC ISSUE ITEMS LIST (BIILL)
- ADDITIONAL AUTHORIZED ITEMS LIST (ML)

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CHAPTER 1 INTRODUCTION

Section I. General

1-1 Purpose. This Technical Manual (TM) describes the operation and maintenance of anchoring, mooring, and towing equipment on Water Purification Barges. Information on other systems onboard is in TM 55-1930-209-14&P-1 thru P-13 and P-15 thru P-17. TM 55-1930-209-14&P-18 and TM 55-1930-209-14&P-20 contain appendices common to all TM's. Location of major barge components is shown in Figure 1-1. Procedures for anchoring site selection and anchoring are in TM 55-1930-209-14&P-1.

1-2 Scope. Anchoring, mooring, and towing equipment provides a method for holding (anchoring) the barge in a fixed position offshore, at dockside, or next to another vessel and a method of moving the barge from one location to another.

1-3 Warranties and guarantees. Manufacturers' warranty/guarantee information is in Section VI of Chapter 2.

1-4 Maintenance forms and records. These are explained in DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-5 Destruction of Army materiel to prevent enemy use. This shall be as directed in TM 750-244-3.

1-6 Storage. For storage of this equipment, refer to Section V of Chapter 2 and Section V of Chapter 3.

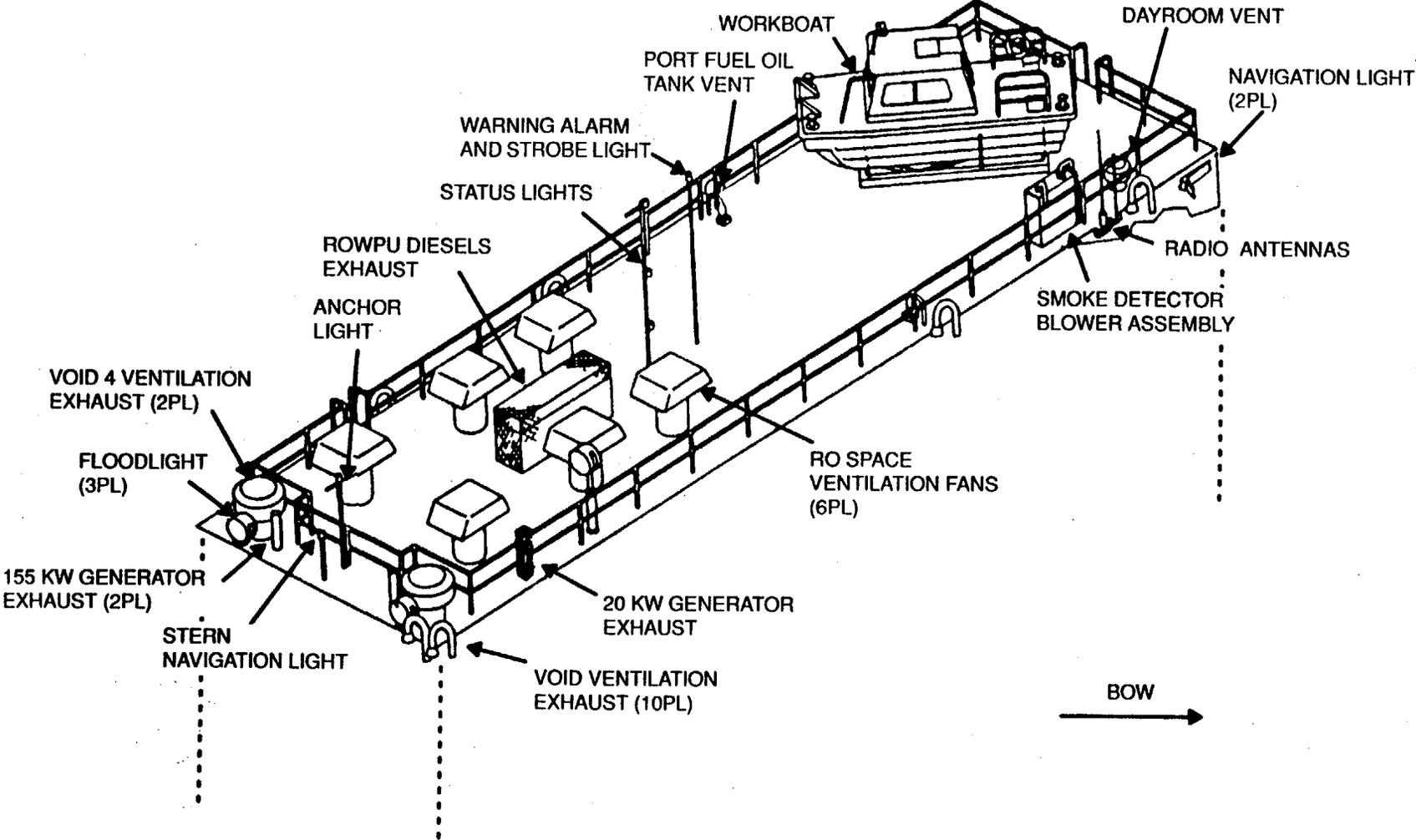


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse Roof (Sheet 1 of 3)

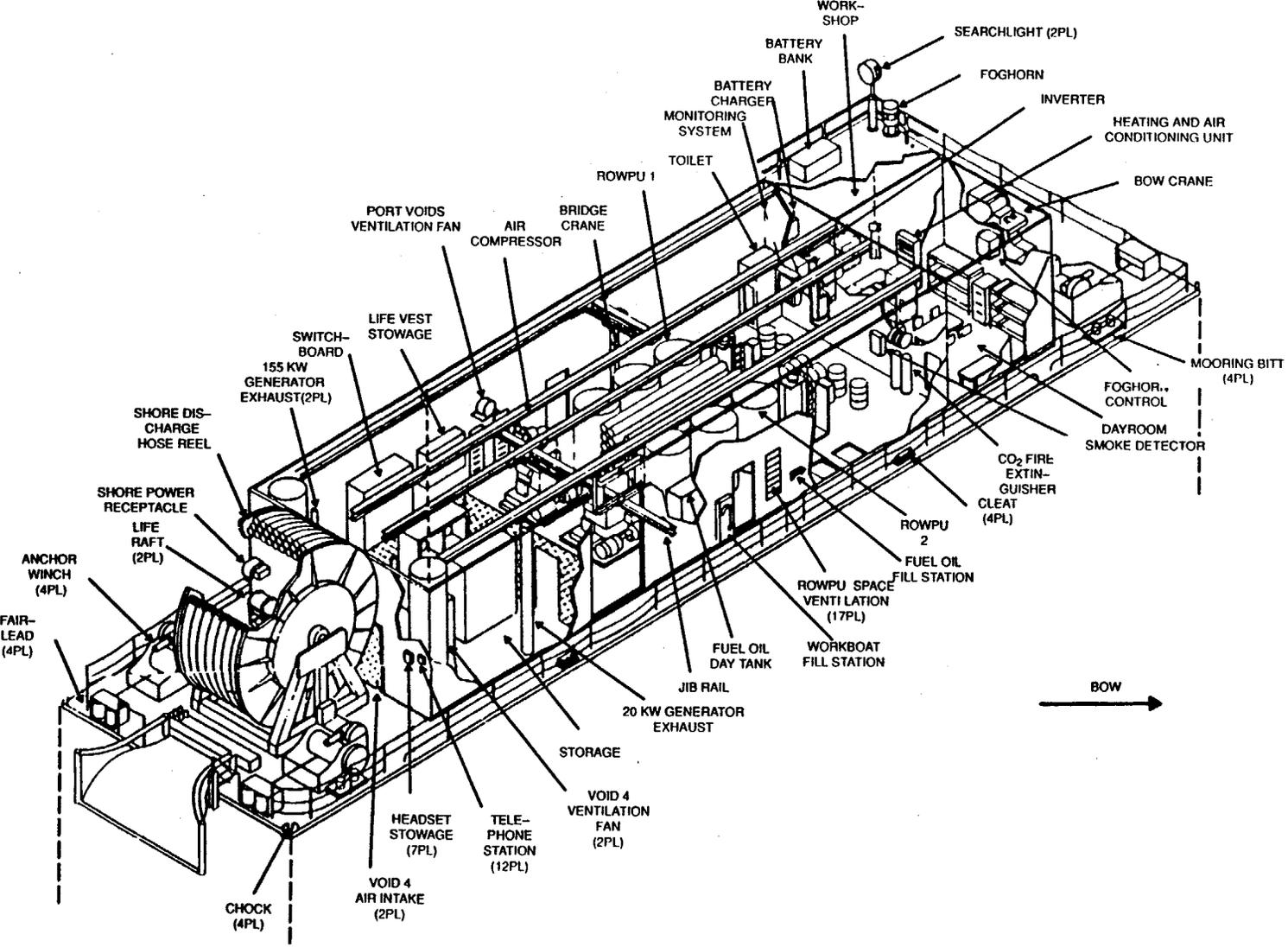


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse (Sheet 2 of 3)

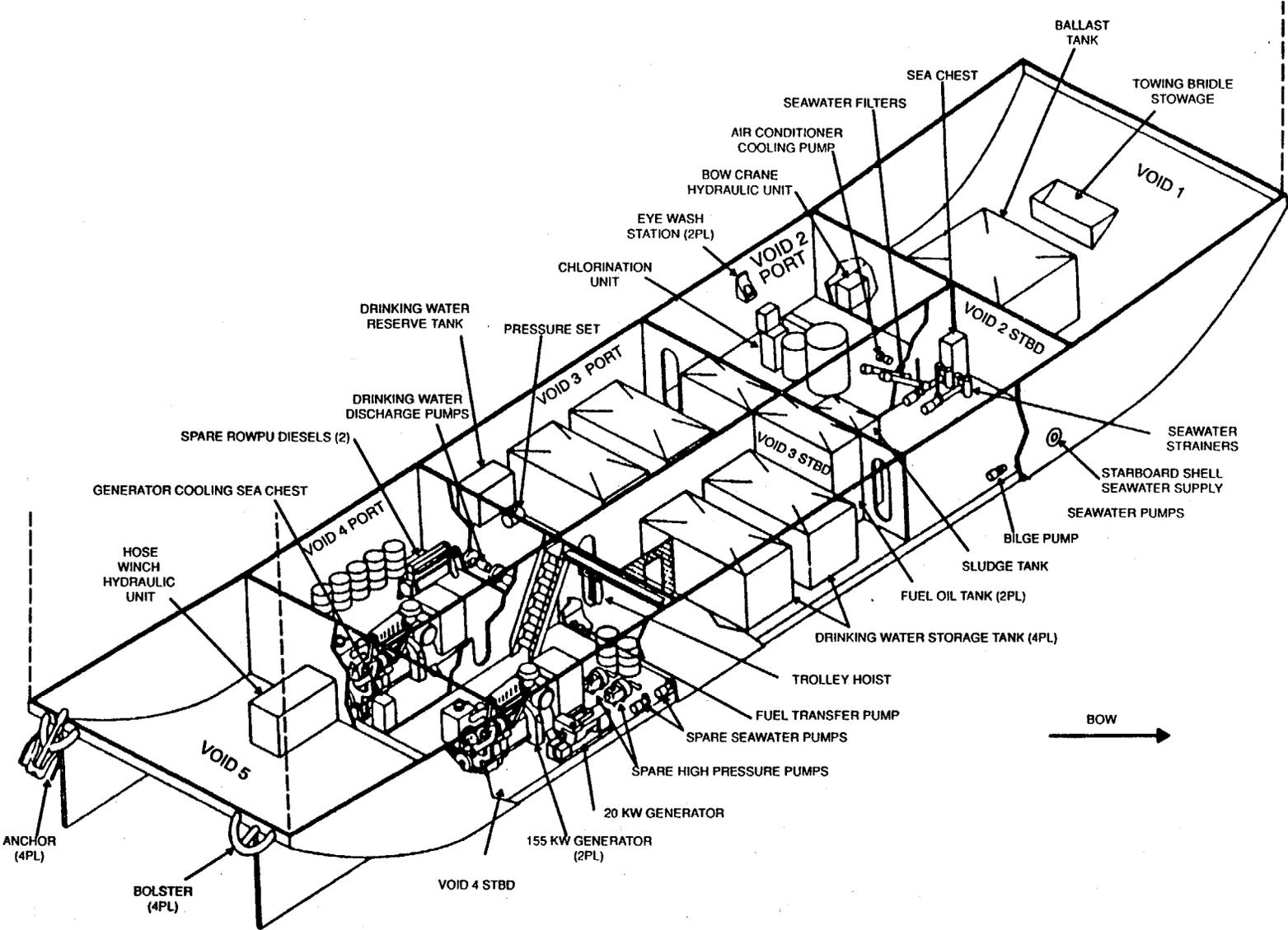


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Voids (Sheet 3 of 3)

CHAPTER 2 ANCHORING AND MOORING EQUIPMENT

Section I. Description and data

2-1 Description

2-1.1 This system provides, when required, a four-point anchoring system to hold the barge in a fixed offshore position while processing water and for mooring the barge at pierside or to another vessel. The installation is shown on drawings listed in Appendix A.

2-1.2 Anchoring system has four electrically powered winches, two on the bow and two on the stern, each with 600 feet of 1-inch wire rope (cable) hooked to a 1 000-pound Danforth type anchor. Winches have both manually and electrically operated brakes.

2-1.3 Each winch is powered by a 10 hp Dresser electric gear motor in a totally enclosed housing specifically designed for maritime use. For added protection against moisture and corrosion, the motor has an internally mounted 120 V, single phase electric space heater that will maintain internal temperature between 38 to 55 degrees F depending upon outside ambient temperature. This motor drives the winch through a drive chain and gears which are running in lubricant in a sealed housing on the side of the winch frame.

2-1.4 Within the motor housing is a Stearns 105 ft-lbs self-adjusting electric disc brake. This brake is always on except when voltage applied to a solenoid depresses the spring and allows the disc and motor to turn freely. For anchor winch manual operation (without power), this solenoid operated electric brake is manually turned off. This brake has a 120 V, 25-watt space heater to minimize adverse effects of condensation. To work in a saltwater atmosphere, this brake has naval brass friction discs instead of the usual fiber discs.

2-1.5 Each winch is designed so reeling-in action pulls cable onto the drum underside (bottom-spooling) and is equipped with a heavy duty levelwind assembly to ensure proper spooling of cable. To assist in spooling cable onto the nongrooved drum, each winch uses only "right-lay" cable (wire rope).

2-1.6 Each winch has electrical controls including an ON/OFF switch, an OUT button, an IN button, a STOP button, and a RESET button. Manual controls provide for engaging/disengaging levelwind mechanism, operating manual drum brake, and selecting either manual or electrical power for the winch.

2-1.7 The manual method of operating the winch, when selected, may be used to allow anchor to free-fall. This is not recommended. For cautions, see paragraph 2-12. Anchor cannot be manually retrieved with this system. With two ship service generators providing electrical power, a manual backup system with full capability is not considered necessary.

2-1.8 Each winch cable passes through a fairleader before attaching to the anchor. This prevents the anchor cable from becoming entangled with other equipment on the weatherdeck.

2-1.9 Anchoring and mooring system components are listed in Tables 2-1 and 2-2.

2-2 Capabilities. When the seabottom provides firm anchor holding, this equipment is capable of holding the barge in an offshore position in a Sea State 3 condition in depths not exceeding 50 feet. Sea State 3 is defined as moderate seas, with waves of 3 to 5 feet and wind velocity of 11 to 16 knots.

2-3 Limitations

- a. Electrical power must be available for complete operation of anchor winches.
- b. Barge anchoring system may not hold barge in position if water depth exceeds 50 feet. See TM 55-1930-20914&P-1 for details.

Table 2-1. Anchoring Components

<u>Component</u>	<u>Qty</u>	<u>Function</u>	<u>Location</u>
Anchor winch right-hand	2	Anchor deployment	1 & 3, bow starboard corner, stern port corner
Anchor winch left-hand	2	Anchor deployment	2 & 4 bow port corner, stern starboard corner
Fairleads	4	Cable routing	Two on stern, two on bow, paired with anchor winch and cable
Anchors	4	Anchoring barge	Two on stern, two on bow, attached to anchor cable and stowed on bolsters
Chocks (Barge 1 only)	4	Not used	Two on bow corners, two on stern corners
Bolsters	4	Stowing anchors	Two on bow near winches, two on stern near winches

Table 2-2. Mooring Components

<u>Component</u>	<u>Qty</u>	<u>Function</u>	<u>Location</u>
Bits	4	Mooring barge	Two on port weatherdeck, two on starboard weatherdeck.
Cleats	4	Mooring barge	Two on port weatherdeck, two on starboard weatherdeck
Cleats	8	Mooring workboat	Four on port weatherdeck, four on starboard weatherdeck

2-4 Performance characteristics

- a. Anchor winches
 - Rated line pull (2d layer) 8000 lbs (approx)
 - Rated line speed (2d layer) 24 fpm (approx)
 - Drum capacity 105 lb/ft
 - Shock load capacity 30 tons (plus)
 - Band brake capacity 30 tons (plus)

2-5 Equipment specifications

- a. Anchor
 - Supplier Washington Chain and Supply Co. Inc.
 - CAGEC 50194
 - Part no. Not available
 - Type 1000-4b standard Danforth w/ 1 in. bending shackle, swivel & No.2 detachable anchor connecting link
 - Material Cast steel
 - Quantity 4

b. Turnbuckles with jamnuts	
CAGEC	81348
Federal specification	FF-T-791
Size	7/8 X 12 in.
Class	7
Type	1
Part no.	FF-T-791 CL7TY1
Form	1
Material	Steel
Finish	Zinc coated
Quantity	4
c. Fairleads	
Manufacturer	A. C. Hoyle Co.
CAGEC	16288
Type	4 rollers
Part no.	Model 475
Quantity	4
d. Winch wire rope	
Part no.	RR-W-410, type IIII, class 3
Supplier	W.W. Patterson Co.
CAGEC	77134
Size	1 inch
Length	600 ft
Quantity	4
e. Anchor winches	
Manufacturer	W.W. Patterson Co.
CAGEC	77134
Model no.	65-106001-1
Type	Right-hand or left-hand w/ levelwind, 10 Hp motor & auxiliary mechanical brake
Part no.	W-1 02183-IL W-102183-IR
Quantity	4 total: 2 right-hand, 2 left-hand
f. Winch electric gear motors	
Manufacturer	Electra Motors Operation Power Transmission Div., Dresser Industries, Inc.
CAGEC	95779
Part no.	W-102183-1 R
Rating	10 Hp, 440 Vac, 60 Hz, 3 ph
Type	Enclosed marine type
Quantity	4 total: 2 right-hand, 2 left-hand
g. Rope	
Supplier	McMaster-Carr Supply Co.
Part no.	3828T1 7
CAGEC	39428
Size	1/2 in.
Material	Dacron
Strength	5750 lb breaking
Quantity	100 feet

h. Rope	
CAGEC	81349
Military specification	MIL-R-17343
Size	3 in. circumference, 1 in. diameter
Part no.	Not available
Material	Nylon
Quantity	600 feet (cut in 4 - 150 foot lengths)

2-6 Items furnished

2-6.1 Components installed as part of anchoring and mooring equipment are listed on the parts list of drawings referenced in Appendix A and in the Components of End Item List in TM 55-1930-209-14&P-20.

2-6.2 Common and bulk items onboard are listed in the Expendable Supplies and Materials List in TM 55-1930-209-14&P-20.

2-6.3 Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List in TM 55-1930-209-14&P-18.

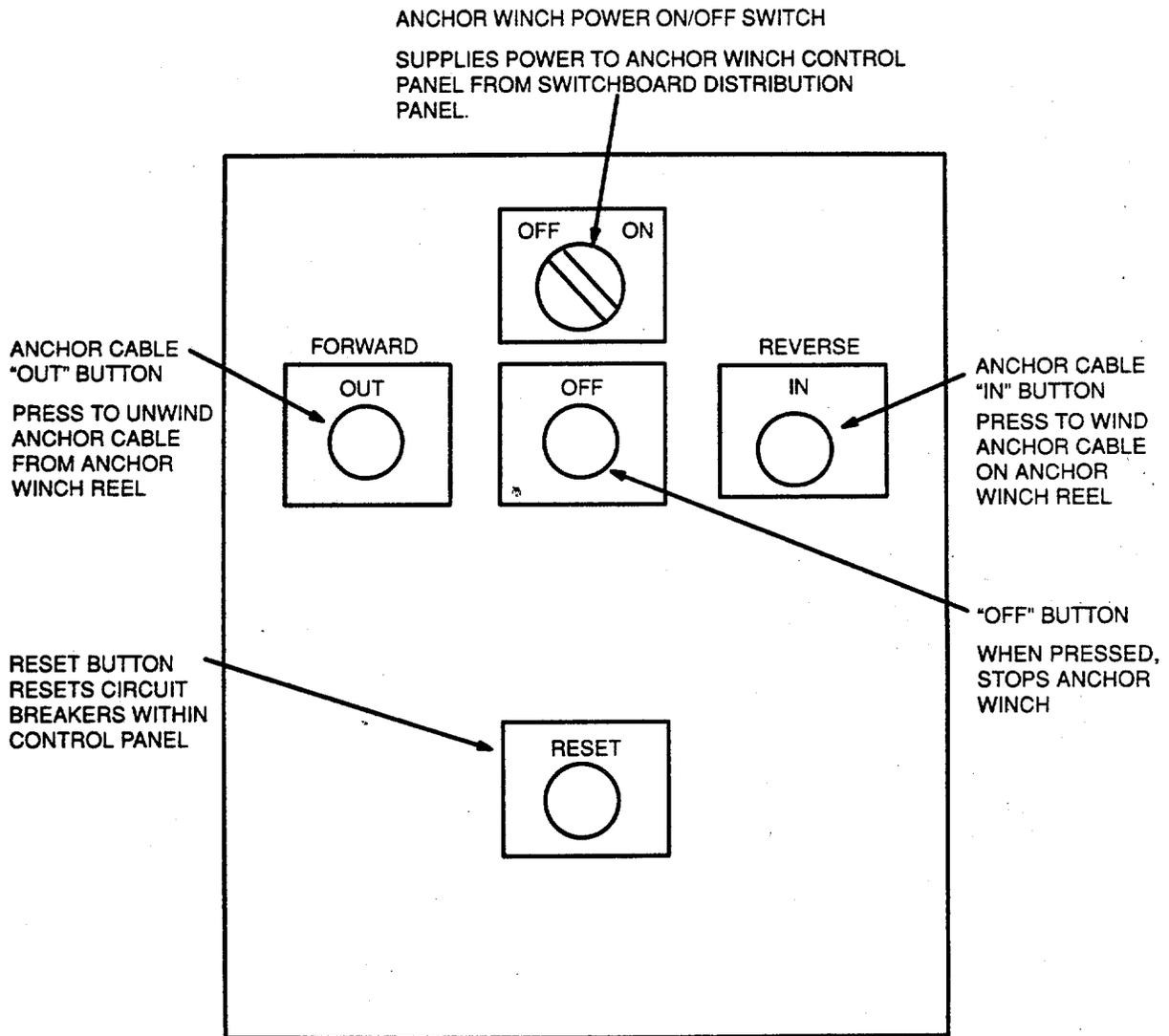
2-7 Items required but not furnished. Items required to maintain and service operating winches are furnished. For critical required but unfurnished items for anchoring, see TM 55-1930-209-14&P-1.

2-8 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is in the Tools and Test Equipment List in TM 55-1930-209-14&P-18.

Section II. Operating Instructions

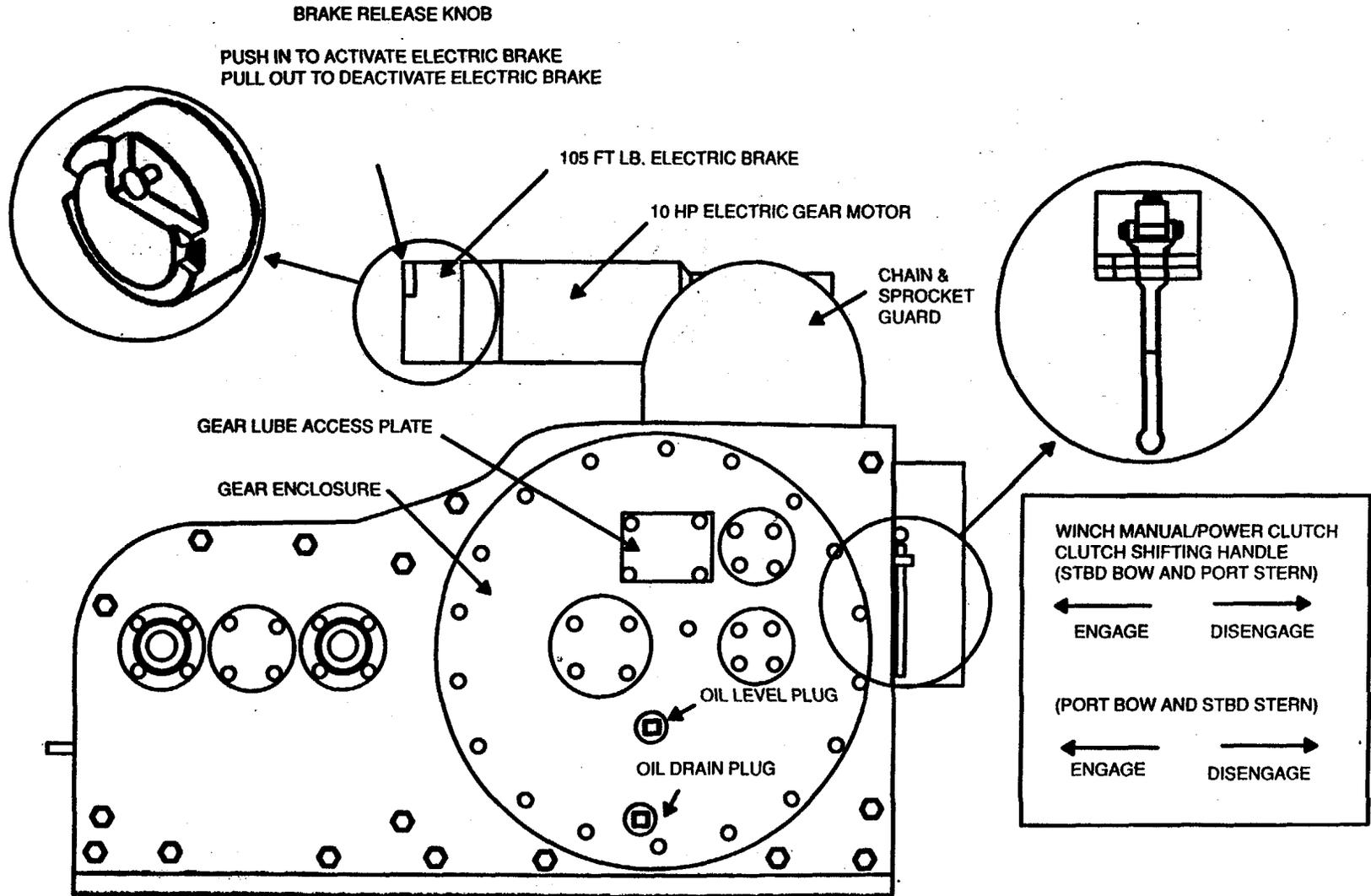
2-9 Operating controls and Indicators

- a. Black ON/OFF switch. Located on top of anchor winch control panel (see Figure 2-1). The ON position closes circuit for power to reach control panel from switchboard. OFF position opens circuit and stops power from reaching anchor winch control panel.
- b. Black REVERSE (IN) button. Right-hand button on anchor winch control panel (Barge 1) or button closest to deckhouse (Barges 2 and 3) (see Figure 2-1). When pushed in, winds anchor cable onto winch reel. Touch lightly for momentary retrieval or push firmly to lock in continuous retrieval position.
- c. Black FORWARD (OUT) button. Left-hand button on anchor winch control panel (Barge 1) or button closest to anchor (Barges 2 and 3) (see Figure 2-1). When pushed in, unwinds anchor cable from winch reel. Touch lightly for momentary extension or push firmly to lock in continuous payout position.
- d. Red OFF button. Center button on anchor winch control panel between black REVERSE (IN) and FORWARD (OUT) buttons (see Figure 2-1). When pushed in, stops anchor winch.
- e. RESET button. Located near bottom left of anchor winch control panel (see Figure 2-1). Push to reset circuit breakers within winch control panel.
- f. Electric brake release. Located on end of electric motor/brake on top of winch (see Figure 2-2). Pull out to release electric brake. Push in to engage electric brake.
- g. Winch manual/power clutch. Located on rear of winch housing (see Figure 2-2). Place winch in power operation by moving handle inboard (ENGAGE). An electric motor engages the winch through a gear system. Moving handle outboard (DISENGAGE), disengages electric motor and selects manual operation. By selecting DISENGAGE, anchor can be allowed to free-fall with the manual brake providing the only control. This action is not recommended unless electrical power is unavailable during anchoring. See cautions in paragraph 2-12. Normal setting is ENGAGE.
- h. Levelwind clutch. Located on inboard side of winch near center (see Figure 2-3). Pull handle out to turn levelwind off. Push handle in to turn levelwind on. Normal position is on (handle in).
- i. Manual brake operating handle. Located on inboard side of winch above mechanical brake (see Figure 2-3). Operate by placing handle on top of ratchet. Turn clockwise (looking down on handle) to tighten brake. Reverse pawl and turn counterclockwise to release brake.



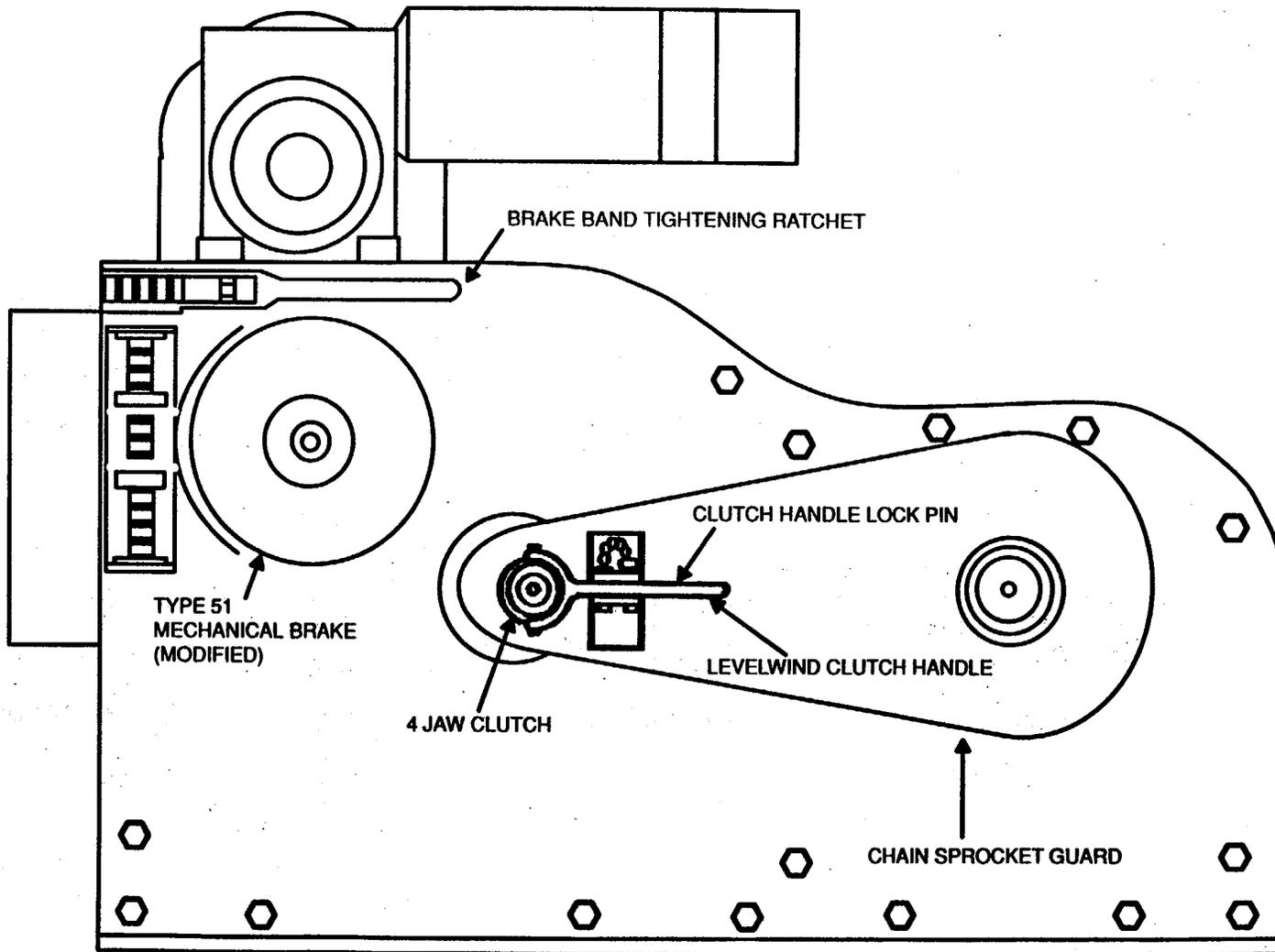
NOTE:
 LOCATED INBOARD ON TOP OF EACH OF FOUR
 ANCHOR WINCHES. ON BARGES 2 AND 3,
 "OUT" BUTTON ALWAYS CLOSEST TO ANCHOR
 AND "IN" BUTTON ALWAYS CLOSEST TO
 DECKHOUSE.

Figure 2-1. Anchor Winch Control Panel



NOTE: ANCHOR WINCH CONTROLLER NOT SHOWN

Figure 2-2. Outer Side of Anchor Winch



NOTE: ANCHOR WINCH CONTROLLER NOT SHOWN

Figure 2-3. Inner Side of Anchor Winch

2-10 Prestart procedures

- a. At switchboard, start one of two ship service generators (155 kW) by following procedures in TM 55-1930-209-14&P-9. Close generator circuit breaker to provide power to switchboard bus.
- b. On switchboard, make sure circuit breaker P10 is closed to provide power to anchor winches 1 and 2 and circuit breaker P11 is closed to provide power to anchor winches 3 and 4.

NOTE

Electric heaters in winch electric motors and brakes reduce humidity inside motor/brake housing and extend life of these motors and brakes. Power is provided to these heaters from power panel 3 (120 Vac) circuit breaker 11P13.

- c. Make sure power panel 3 circuit breaker 11P13 is closed to provide power to winch heaters.
- d. Visually check each anchor, exposed cable and connections, fairleader, and anchor winch for damage. If damaged, notify intermediate support maintenance unit of repair requirements. If not operational, modify anchoring procedures to adjust for nonfunctioning anchor winch.
- e. Using a grease gun with extender, lubricate each winch and fairleader as follows:
 - (1) Eight grease fittings on fairleader (two on each of four rollers).
 - (2) Eleven grease fittings on levelwind traveler (two on each of four rollers and three on top of Barge 1 traveler). On Barges 2 and 3, traveler has four fittings on top instead of three.
 - (3) One grease fitting on gear case (outboard) side.
 - (4) Two grease fittings on brake (inboard) side (one on levelwind release mechanism, one on water end of cover on levelwind gears).
 - (5) Three fittings on inside shaft behind the manual/power selector.
 - (6) Levelwind compound helix shaft and guide bars.
- f. Check oil level in gear motor reduction box (see Figure 2-4).

CAUTION

If unit has been in storage, gear motor reduction box may be full of oil and must be drained to operation level prior to operation.

- (1) Remove gearbox breather plug/oil filler plug near top of gearbox.
- (2) Remove gear oil check plug located 4 inches from bottom of gearbox on end of unit. Oil should be level with bottom of check hole.
- (3) If overfull from storage requirements, allow excess oil (about 3 quarts) to run out of check hole into a container. When oil stops flowing, replace plug. Dispose of excess oil into bilge system.
- (4) If oil level is lower than bottom of check hole, add oil through breather and oil filler plug on side of gearbox until oil flows out of check hole. Use nontoxic rust-inhibiting worm gear oil, AGMA No.7. Replace both plugs.
- (5) Check gearbox breather plug/oil filler plug on side near top of gear motor reduction box. Inner portion of plug must be screwed out to uncover breather holes. Make sure breather holes are not covered with paint.

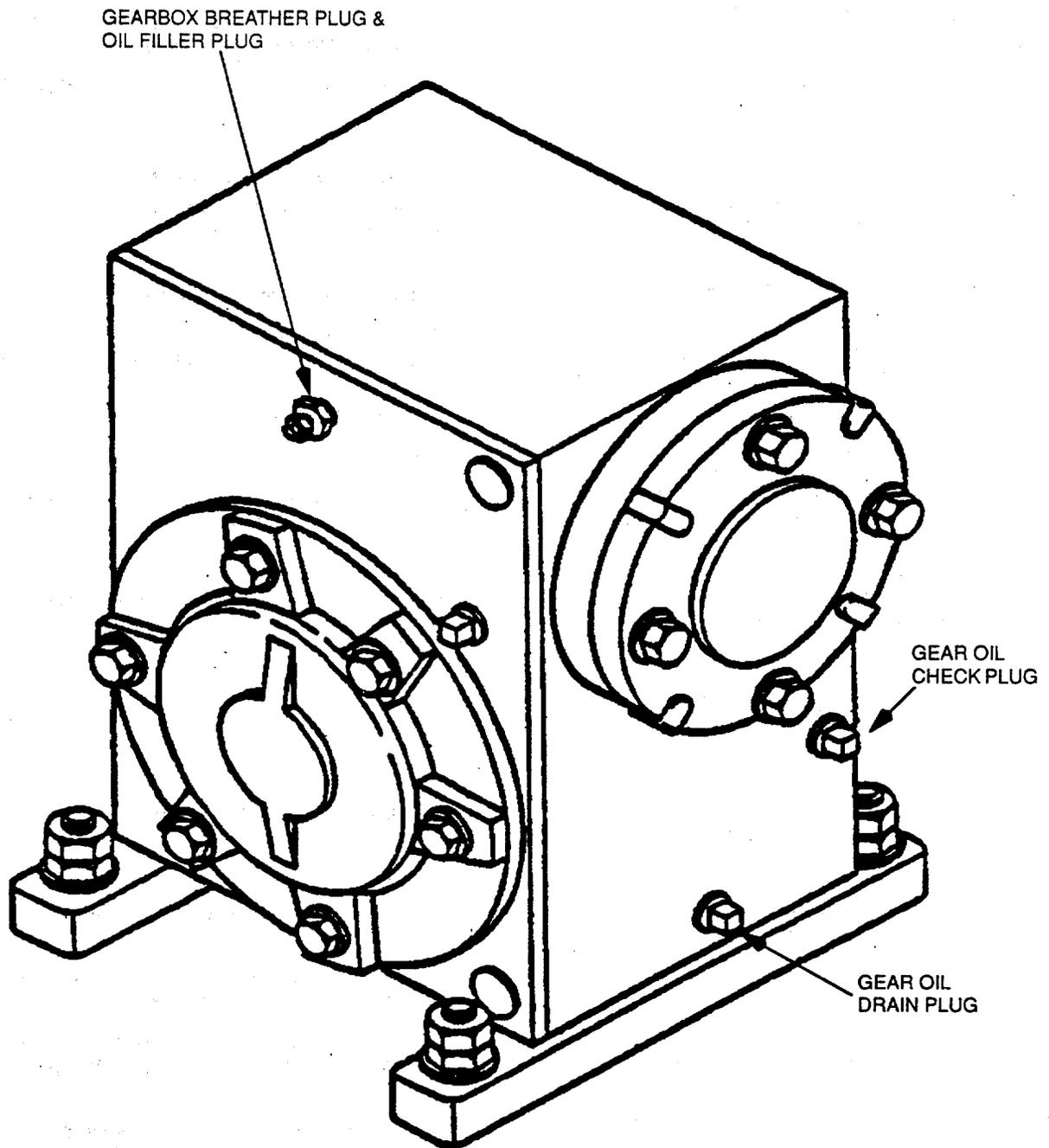


Figure 2-4. Servicing Points on Anchor Winch Gear Motor Reduction Box

- g. Check oil level in gear case on outer side of winch (see Figure 2-2).
 - (1) Unscrew oil level plug just below center line of gear case. Oil should be level with bottom of hole.
 - (2) Remove gear lube access plate above oil level check hole.
 - (3) Add 90 weight gear oil until it runs out of hole.
 - (4) Replace oil level plug in hole.
 - (5) Replace access plate.

CAUTION

Do not pay out anchor cable unless a weight (anchor) or force keeps cable tight. A slack cable may become twisted, tangled, and unusable. This is called "birdcaging" because the twisted mass of cable resembles a birdcage. Severe birdcaging can only be corrected by cuffing out twisted cable and replacing with new cable.

2-11 Operating procedures with power

- a. On anchor winch control panel (Figure 2-1), turn black ON/OFF switch ON.
- b. Apply multipurpose, water-resistant grease (MIL-G-24139A) on anchor cable fairleader rollers prior to anchor deployment.
- c. Release mechanical brake (Figure 2-3).
- d. Activate electric brake (Figure 2-2) by pushing selector knob in.
- e. Push black FORWARD (OUT) button (Figure 2-1) to extend anchor cable. This releases internal electric disc brake and electric motor turns drum to pay out cable.
- f. Push red OFF button (Figure 2-1) to stop cable. This turns off electric motor and removes power from electric brake. Springs in electric brake automatically clamp disc brake on.

CAUTION

During anchor retrieval, if winch panel circuit breaker trips several times during operation, this may indicate a wrong recovery method. Continuing to operate winch under these conditions will damage winch motor.

- g. Push black REVERSE (IN) button (Figure 2-1) to retrieve anchor cable. This releases brake allowing motor to turn drum and pull in anchor cable.
- h. As cable is pulled onto drum, check condition of cable. If seriously frayed, cut, or smashed, note location on drum and replace as in paragraph 2-19.3.4.
- i. As cable is pulled onto drum, apply liberal coat of multipurpose, water-resistant grease (MIL-G-24139A) to cable.

2-12 Operating procedures without power. Anchor cables may be deployed without electrical power. However, anchor cables can not be retrieved unless electrical power is available.

- a. On inner side of winch, remove brake ratchet handle from holder and place on manual brake control ratchet (Figure 2-3). Using brake handle, tighten manual drum brake snug.

CAUTION

Do not operate motor with electric brake in manual release position. This overheats and damages friction disc in brake.

- b. On rear side of winch housing (Figure 2-2), move winch manual/power clutch to outside (DISENGAGE) position for manual operation.
- c. On end of electric motor on top of winch, pull out BRAKE RELEASE knob (Figure 2-2). This releases spring that holds disc brake on when power is not applied.
- d. Release anchor from anchor holding position on barge bolsters.

CAUTION

Free-falling an anchor with only manual braking control has a high probability of causing "birdcaging" unless crewmembers are extremely alert and quick to apply mechanical brake.

- e. Using ratchet handle, loosen manual drum brake until anchor or other force pulls cable from winch drum.
- f. Regulate and control pay out of cable by adjusting amount of drag that brake is applying to winch drum.
- g. Stop anchor winch by tightening manual brake drum.
- h. Push ELECTRIC BRAKE knob in. When power is available to the winch, the electric brake will be engaged.

2-13 Shutdown procedures

2-13.1 Anchors deployed. When winches are shut down while anchors are deployed, perform the following:

- a. On anchor winch control panel (Figure 2-1), turn ON/OFF switch to OFF.
- b. Make sure electric brake is engaged by pushing in on electric brake release knob (Figure 2-2).
- c. Set mechanical brake by turning ratchet handle (Figure 2-3) until brake drum is tight.
- d. Make sure power panel 3 (120 Vac) circuit breaker 11P13 is closed (ON) to provide heat to electric motors and brakes to combat moisture and corrosion.

2-13.2 Anchors retrieved. When anchor retrieval is complete, perform the following:

- a. On anchor winch control panel (Figure 2-2), turn ON/OFF switch to OFF.
- b. Apply liberal coat of multipurpose, water-resistant grease (MIL-24139A) to all exposed portions of cable and all exposed, nonpainted surfaces.
- c. Clean and touch up all painted surfaces in accordance with TB 43-0144.
- d. Make sure power panel 3 (120 Vac) circuit breaker 11P13 is closed (ON) to provide heat to electric motors and brakes to combat moisture and corrosion.

2-14 Emergency shutdown

2-14.1 General. The barge has two emergency shutdown modes. One mode shuts down individual systems such as the ventilation system or a diesel high pressure pump, and the other mode shuts down all barge operating systems.

Both modes are activated by pushing a red button protected by a metal guard. On individual system shutdowns, this button shuts off either fuel or electrical power to that system only. On total shutdown, this button shuts off all fuel and electrical power to all operating systems. Any system emergency shutdown that stops a generator supplying power to the switchboard will also shut down the anchoring system.

Seven red system shutdown buttons are located on the ROWPU space starboard bulkhead just aft of the personnel door. These system shutdown buttons (Figure 2-5) control shore power, ventilation systems, ROWPU 1 diesel high pressure pump, ROWPU 2 diesel high pressure pump, ship auxiliary generator, shipservicegenerator2, and ship service generator 1.

Six red total shutdown buttons are located as follows:

- * On ROWPU space starboard bulkhead aft of personnel door, above and forward of row of system shutdown buttons.
- * Outside ROWPU space starboard door on weatherdeck.
- * Outside ROWPU space port door on weatherdeck.
- * Inside ROWPJU space port door to weatherdeck.
- * Outside dayroom door to weatherdeck.
- * Inside dayroom door to weatherdeck.

2-14.2 Emergency shutdown procedures

- a. In an emergency, push appropriate red button to shut down either a selected system or all operating systems.
- b. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise. Button will pop out and again be in ready position.
- c. When emergency button is reset, prepare anchor winches for use by following procedures in paragraphs 2-10 and 2-11.

2-15 Operations under extreme conditions

2-15.1 For operations in extreme humidity, winch motors and electric brakes have built-in electric heaters that are effective in reducing corrosion damage.

2-15.2 For operations in extreme high temperatures, electric motors may become overheated from a combination of high ambient temperatures and heavy use, and winch panel circuit breaker may break to open. Push RESET button on anchor winch control panel. If circuit breaker continues to break to open, turn off electric heaters by opening power panel 3 circuit breaker 11P13. If anchor winch panel control circuit breaker continues to trip to open, allow motor to cool and consider other methods of retrieving anchor to reduce load on winch motor.

2-15.3 For operation in extreme cold, use cold weather lubricants. Keep winches clear of snow and ice. Turn on winch motor heaters at least 30 minutes prior to using winches.

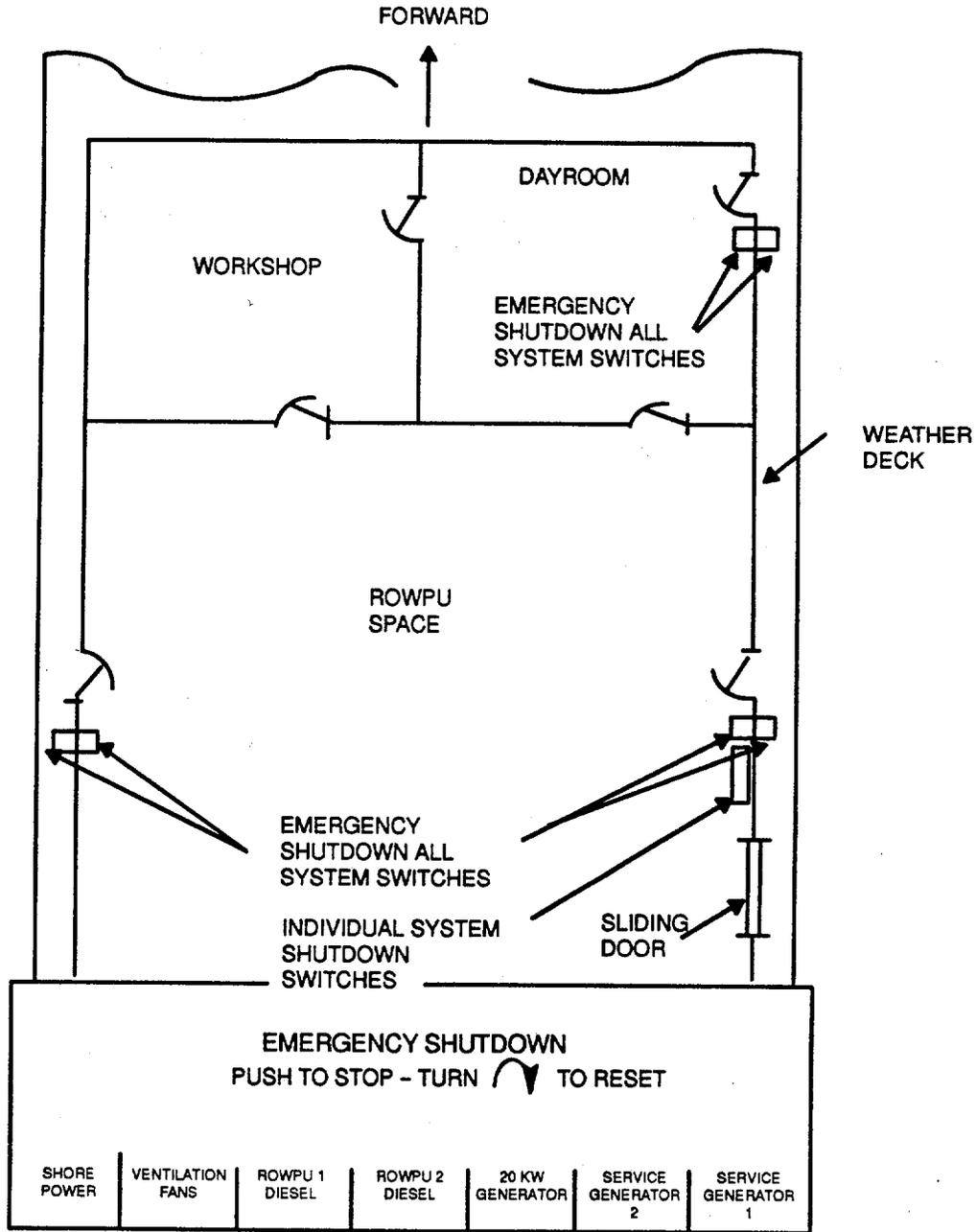


Figure 2-5. Location for Controls for Emergency Shutdown Systems

Section III. Maintenance Instructions

2-16 General

2-16.1 Maintenance concept

2-16.1.1 Unit level and Intermediate Direct Support and Intermediate General Support (IDS/IGS) maintenance on anchoring and mooring equipment is performed onboard by barge crewmembers whenever possible.

2-16.1.2 IDS/IGS maintenance beyond capability of crewmembers is provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

2-16.1.3 Intermediate support maintenance is accomplished by replacing components or major end items.

2-16.1.4 Unless other intermediate support procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

2-16.1.5 Maintenance Allocation Chart (MAC) is in TM 55-1930-209-14&P-18. For maintenance of other equipment onboard, consult appropriate manual.

2-16.2 Maintenance instructions. Maintenance instructions are presented in the following paragraphs: Appendix C, Preventive maintenance checks and services; paragraph 2-18 , Troubleshooting; and paragraph 2-19, Maintenance procedures.

2-17 Preventive maintenance checks and services. See TM 55-1930-209-14&P-14, paragraph 2-18 for preventive maintenance checks and services for the anchor, mooring and towing equipment. See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all ROWPU Barge Systems.

2-18 Troubleshooting. Follow troubleshooting procedures provided in W. W. Patterson Company Instructions for Winch Model M65-10-6001 and Table 2-3.

Table 2-3. Anchor Winch Troubleshooting

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
1. Winch does not operate.	a. Switchboard circuit breaker P 0 (anchor winches 1 and 2) or P11 (anchor winches 2 and 3) open (OFF)	a. Close (ON) appropriate circuit breaker
	b. Control panel malfunctioning	b. Test and repair; see para 2-19.3.5.2 or replace; see para 2-19.3.5.3
2. Winch heaters do not operate.	a. Power panel 3 circuit breaker 11P13 closed (OFF)	a. Close (ON) circuit breaker 11P13
	b. Heaters malfunctioning	b. Test, repair or replace, see para 2-19.3.6
3. If electric brake does not stop properly or overheats.	a. Manual release engaged	a. Disengage
	b. Discs excessively worn, charred or broken	b. Replace brake assembly; see para 2-19.3.1.3
	c. Hub loose, shifted on shaft	c. Tighten set screw

Table 2-3. Anchor Winch Troubleshooting (continued)

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
	d. Hub not clean; discs don't slide freely	d. Clean system (see CAUTIONS)
	e. Are controls which govern start of braking cycles operating properly?	e. Check input power to solenoid
	f. Pressure spring may be improperly assembled or broken	f. Check spring. If broken, replace brake assembly; see para 2-19.3.1
	g. Solenoid air gap adjusted incorrectly	g. Check and adjust if needed; see para 2-19.3.1.2
	h. Solenoid actuation and condition of coil	h. Check linkage for binding. Do not overlook bent, worn or broken plunger guides as a possible cause for binding. Check voltage at coil if is not energizing the solenoid. Replace brake assembly; see para 2-19.3.1.3
4. If electric brake hums, solenoid pulls in slowly or coil burns out, check the following:	a. Solenoid air gap excessive	a. Adjust air gap; see para 2-19.3.1.2
	b. Low voltage at coil	b. Check voltage input at coil
	c. Shading coils may be broken	c. Replace brake assembly; see para 2-19.3.1.3
	d. Plunger guides may be excessively worn. Plunger rubs on solenoid frame laminations	d. Replace brake assembly; see para 2-19.3.1.3
	e. Solenoid dirty	e. Clean solenoid (see CAUTIONS)
	f. Solenoid mounting screws loose	f. Tighten screws and set alignment
5. If electric brake is noisy during stopping	a. Outside diameter of the friction disc(s) rubbing on the inside diameter of the endplates	a. Replace brake assembly and check shaft alignment. File inside diameter to fit
	b. Bad motor bearing	b. Replace motor
6. Brake heater inoperable (no heat)	a. Input power faulty	a. Test heater; see para 2-19.3.6
	b. Heat strip defective	b. Replace heat strip
7. Chain drive noisy, slips	a. Out of adjustment	a. Make adjustment 3/4 in to 1 in. See para 2-19.3.2
	b. Needs lubrication	b. Lubricate periodically; see para 2-19.2

Table 2-3. Anchor Winch Troubleshooting (continued)

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
8. Manual brake system does not hold	a. Out of adjustment	a. Make adjustment; see para 2-19.3.3
	b. Oil on brake drum and brake band	b. Clean drum and replace brake band; see para 2-20.3.3
	e. Brake band worn	c. Replace brake band; see para 2-19.3.3
9. Unable to adjust with ratchet gear lever	a. Brake pawls and pawl springs worn	a. Replace pawls and springs; see para 2-19.3.3
	b. Needs lubrication	b. Lubricate; see para 2-19.2
	c. Brake band worn	c. Replace brake band; see para 2-19.3.3

2-19 Maintenance procedures

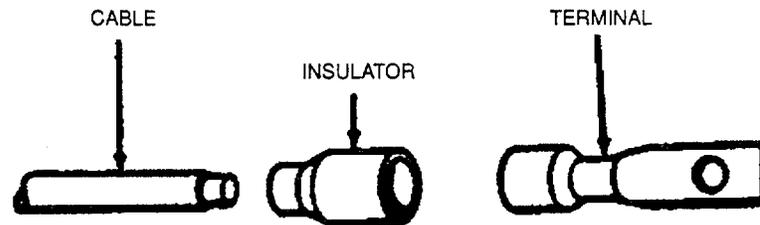
2-19.1 General. Maintenance instructions for the mooring system follow. Repair concerns lubricating, disassembling, repairing, replacing, and reassembling equipment using repair parts listed in TM 55-1930-209-14&P-18. No special tools are required. A list of tools and test equipment is in TM 55-1930-209-13&P-18.

When performing maintenance, be sure to observe safety precautions in this manual, the manufacturers' manual/instructions, and the following general shop practices:

- a. Always use new seals and gaskets, same as original, when reassembling components that have been disassembled for repair. Carefully install so as not to damage during assembly.
- b. When replacing gaskets, make sure all mating surfaces are dean and free of old gasket material, adhesive oil, or grease. These precautions will ensure a leakproof joint.
- c. When replacing O-ring seals, make sure all surfaces are thoroughly clean and free of grit, dirt, and foreign material. Prior to installation, apply a thin coat of protective lubricant to O-ring for ease of assembly. Protect the O-ring by applying tape over threads, sharp comers, or edges.
- d. When replacing or repairing electrical components, follow procedures for soldering in TB SIG 222. Crimp connections as shown in Figure 2-6. Check all groundings. Check that all current-carrying members are properly insulated to avoid short circuiting. Check for abrasion and chafed insulation on wires and cables. Repair with tape or replace as necessary.
- e. When replacing bearings, follow procedures in TM 9-214. Lubricate bearings with recommended lubricant. When installing bearing on shafts, apply pressure to inner race. When installing bearings in housing, apply pressure to outer race.
- f. Weld in accordance with TM 9-237. Welding can be used to repair cracks and breaks in steel parts such as bracket, panels and light framework Weld only when replacement parts are not available because of a chance of failure later.

WARNING

Be sure that electric power is off before performing maintenance. Observe all safety precautions in this manual and manufacturers' manuals/instructions.



- (1) Strip cable insulation equal to depth of terminal well.
- (2) Slide insulator (if used) over cable.
- (3) Insert cable into terminal well and crimp.
- (4) Slide insulator (if used) over crimped end of terminal.

Figure 2-6. Replacement of Crimped Terminals

NOTE

Due to this vessel's mission and crew capabilities, maintenance normally assigned to organizational level or higher echelons may be assigned to the crew by the Bargemaster.

2-19.2 Lubrication. Use lubricants specified on page 4 of 4 in the W. W. Patterson service manual in Appendix B to lubricate anchor winch. Lubricate anchor winches and fairleaders as instructed in the preventive maintenance checks and services in Appendix C. Change lubricants as instructed in the periodic checks and services.

2-19.3 Repair or replacement of anchor winch components

WARNING

Shut down anchor winches before attempting maintenance. Be sure to open (OFF) circuit breaker P10 on switchboard to shut down anchor winches 1 and 2, circuit breaker P11 on switchboard to shut down anchor winches 3 and 4, and circuit breaker 11 P13 on power panel 3 to shut down heaters in anchor winches.

2-19.3.1 Anchor winch electric brake repair and replacement. The electric brake is a Stearns, 105 lb-ft. 87,000 series self-adjusting disc brake with an internal space heater.

2-19.3.1.1 Cleaning and inspection

- a. Make sure anchor winch is electrically dead by opening (OFF) switchboard circuit breakers P10 or P11 and power panel 3 circuit breaker 11P13. Redtag circuit breaker with: "WARNING -DO NOT ACTIVATE. REPAIRS BEING MADE."
- b. Visually inspect exterior for damage, corrosion or chipped paint. Remove corrosion and touch up paint according to TB 43-0144. Do not paint threads or labels.
- c. Wipe clean exterior of electric brake and motor with clean rag.

WARNING

Always wear a filtered mask or respirator while removing dust from the inside of the brake while servicing or adjusting brake. Brake friction discs contain asbestos which is dangerous to your health if inhaled.

- d. Upon opening electric brake, vacuum clean or use a soft electrician's brush to remove dust. When brushing, avoid causing the dust to become airborne. Collect the dust in container which can be sealed.

2-19.3.1.2 Repair

a. Removal

- (1) Remove manual release knob (148), housing nuts (15) and housing (7) (see Figure 2-7).
- (2) Disconnect solenoid wires.
- (3) Depress solenoid plunger (29) and pull release rod (146) back to lock brake mechanism in manual release position. Tie plunger (29) to frame (79) when manual release rod (146) is not provided.
- (4) Remove entire support plate assembly (142) by evenly unscrewing screws (142S). Remove screws and lockwashers (142W).
- (5) Remove pressure plate (5), friction disc (4), and stationary disc (3).
- (6) Remove hub (16) and key by unscrewing set screws (16S).
- (7) Remove endplate (2) from end of motor unscrewing four 1/2-13 socket head cap screws.

b. Repair and adjustments. Before installing the electric brake, if necessary replace the solenoid coil, friction discs, or solenoid lever and pinion assembly and reset the brake as follows:

- (1) Replace solenoid coil as given in paragraph IV, A in the Stearns service manual in Appendix B.
- (2) Replace friction discs as given in paragraph IV, B in the Stearns service manual in Appendix B.
- (3) Replace solenoid lever and pinion assembly as given in paragraph IV, E in the Stearns service manual in Appendix B.
- (4) The solenoid is factory set with a 3/4 in. to 15/16 in. air gap, and requires no resetting, even when changing friction discs. The gap is determined by the position of wrap spring stop (76) (see Figure 2-). Due to wear-in of parts the normal operating gap is 11/16 in. to 1 in. If (stop) screw (76S) has been loosened and retightened, the air gap may require resetting. Should the air gap need adjusting, reset as follows:
 - (a) Measure air gap between mating surfaces of plunger (29) and solenoid frame (79). Increase by raising slightly, or decrease by lowering slightly, wrap spring stop (76). Be sure to retighten (stop) screws (76S). Manually lift plunger to maximum travel and release. Depress plunger, manually, repeat several times, then recheck air gap.
 - (b) Make sure tang of wrap spring (71) is below, and contacts with wrap spring stop (76) when solenoid lever (28) is manually raised. If stop is bent outward, allowing tang to bypass it, rebend to square position, assemble correctly, and reset solenoid air gap as described in step (a).

c. Installation

- (1) Attach endplate (2) (see Figure 2-4) to the end of motor using four 1/2-13 socket head cap screws, torque per manufacturer's specifications.

NOTE

Head of screws must not project above friction surface.

- (2) Position hub (16) and key on the motor shaft so outboard face of hub will protrude approximately 1/32 in. to 1/16 in. beyond face of the last outboard friction disc.

NOTE

Position may be determined by assembling friction disc(s) and stationary disc(s) onto hub, noting hub positions, and removing disc(s) using set screws (16S); torque to specifications. Table below:

Set Screws (16S)

5/16 diameter	110 to 165 in-lb
3/8 diameter	200 to 190 in-lb
1/2 diameter	500 to 620 in-lb

(3) Reassemble friction discs.

NOTE

Insure friction discs slide freely; file inside diameter if necessary.

The universal mounting pressure plate presently used has three tapered reliefs on outboard face. Some older brakes used a pressure plate with a single tapered relief marked top, which must be installed with relief facing manual release rod (146).

- (4) Mount support plate assembly, torque screws to 90 in-lbs in aluminum endplate and to 120 in-lbs in cast iron endplate. Be sure that assembly is mounted with the solenoid in a vertical position (plunge above frame) same as Figure 2-7. If release rod (146) is not in manual release position and has allowed the mechanism to over adjust, it will have to be reset before mounting support plate. In this case the lever arm (17) (see Figure 2-8) throat will be near, or touching, the pinion (32) teeth. Refer to para 2-19.3 for self-adjustment maintenance. Loosen pressure spring cap screw (19) until pressure spring (11) is free, mount support plate assembly to endplate, and retighten spring cap screw until snug.

CAUTION

Do not over tighten.

- (5) Manually lift solenoid plunger to maximum travel, release and check air gap. See para 2-19.3 if adjustment is needed. Complete electrical connections. Depress and allow it to snap up. Repeat this process several times to set air gap on solenoid.
- (6) Connect wires to solenoid.
- (7) Replace housing, nuts (15) and manual release knob (148).

2-19.3.1.3 Replacement

- a. Removal. Remove electric brake as given in paragraph 2-19.3.1.2a.
- b. Installation. Install electric brake as given in paragraph 2-19.3.1.2c after disassembling as given in step 2a.

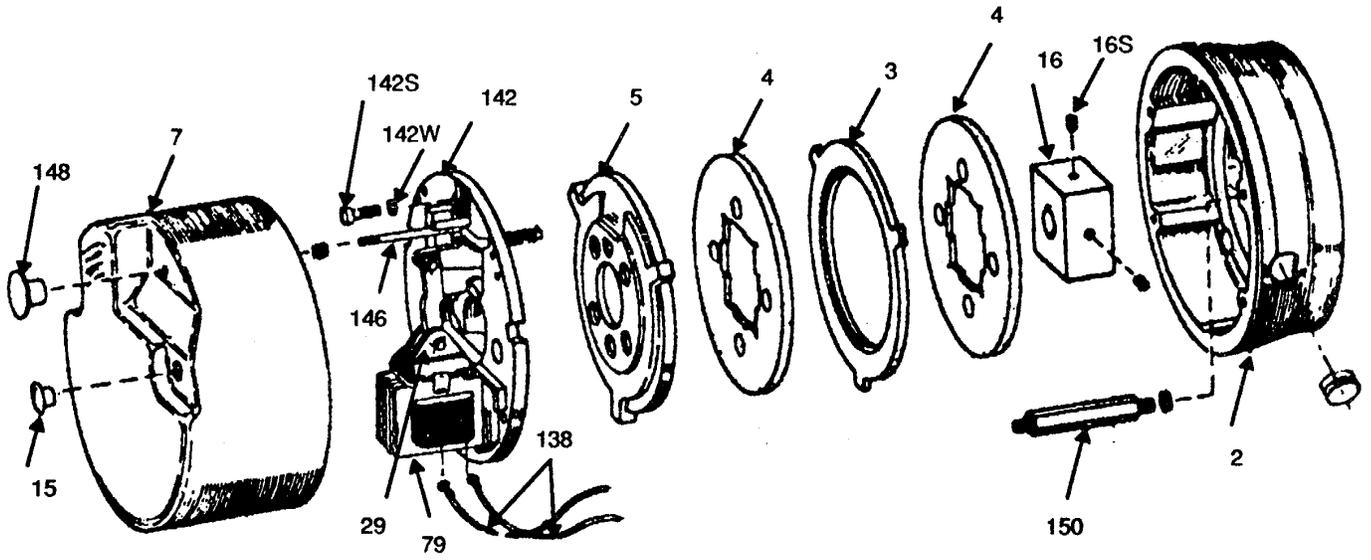


Figure 2-7. Spring Set Disc Brake

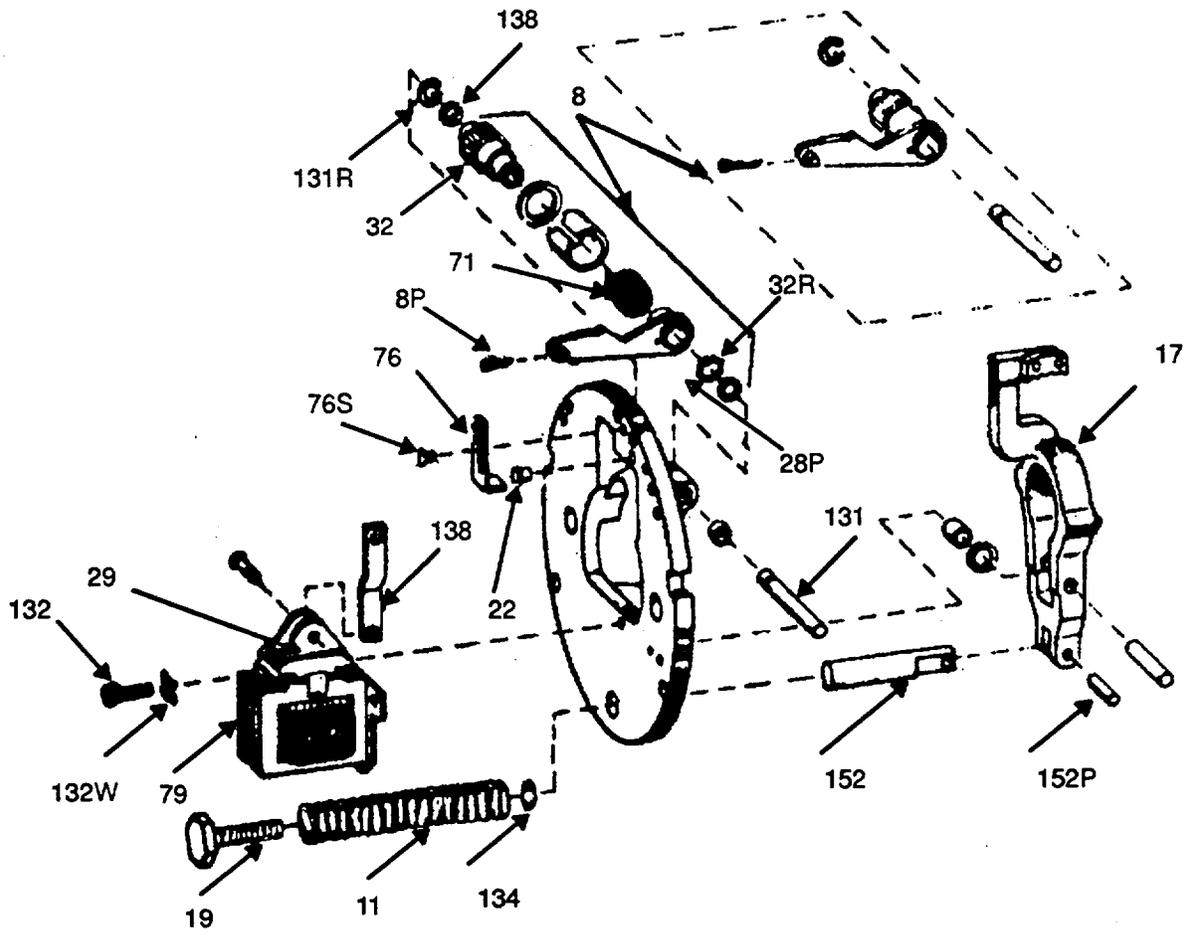


Figure 2-8. Self-Adjust Maintenance

2-19.3.2 Anchor winch roller chain adjustment. Adjust top-plate bolts until maximum back and forth chain movement (when pushed and pulled by hand) is between 3/4 in. and 1 in. (see Figure 2-9).

NOTE

Check tension periodically and at same time oil with a brush or spout can.

2-19.3.3 Manual brake system repair

- a. See Appendix B page 3 of 4 of the W. W. Patterson Company service manual in Appendix B for replacement of pawls, ratchet gear or brake band.

2-19.3.4 Anchor cable replacement

- a. For anchor winch operating instruction refer to paragraph 2-9.
- b. Secure anchor directly to padeye on fairlead using turnbuckle.
- c. Slowly unwind cable from drum until anchor cable is loose.
- d. Disconnect old cable from anchor shackle.
- e. Using an empty cable spool, have two persons winding old cable up on spool while another person is controlling the unwinding of cable from the drum.

NOTE

A carriage or A-frame assembly may be used for ease of winding old cable on spool.

- f. When cable is completely unwound from drum loosen U-bolt nuts to remove cable from drum, remove cable and secure cable to spool.
- g. Insert new cable through levelwind, into U-bolt and tighten nuts.
- h. Reel new cable onto drum with two persons unwinding new cable from spool and one person controlling the winding of cable onto drum.

NOTE

Apply a liberal amount of multipurpose water-resistant grease (MIL-G-24139) to cable while winding cable onto drum, to prevent corrosion.

- i. When cable is completely wound on drum reconnect cable end to anchor shackle.
- j. Remove turnbuckle from fairlead padeye and anchor when authorized by Bargemaster.

2-19.3.5 Anchor winch control panel repair and replacement

WARNING

Make sure anchor winch control panel and anchor winch heaters are electrically dead before starting repair or removal. Redtag switchboard circuit breaker P10 for anchor winches 1 and 2 or circuit breaker P11 for anchor winches 3 and 4, and power panel circuit breaker 11P13 for anchor winch heaters. Redtag circuit breaker with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

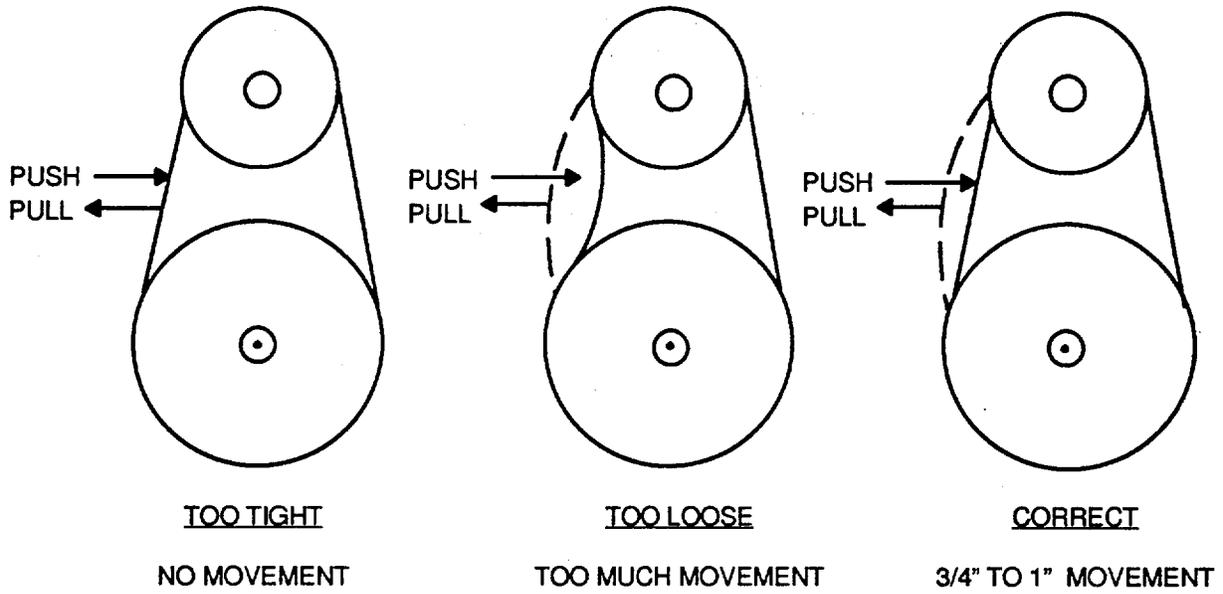


Figure 2-9. Tensioning of Roller Chain

2-19.3.5.1 Cleaning and inspection

- a. Make sure anchor winch control panel and anchor winch heaters are electrically dead by opening (OFF) switchboard circuit breakers P10 or P11 and power panel 3 circuit breaker 11P13. Redtag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- b. Wipe clean exterior of motor controller with clean rag. Open motor controller door and vacuum clean or clean inside with electrician's brush. Avoid using solvents for cleaning inside of motor controller. Solvents leave a greasy film on components that may reduce electrical continuity.
- c. Check fuse. Replace if necessary.
- d. Visually inspect for indications of burns, corrosion, loose connections, damaged parts, or chipped paint. Clean corrosion from contacts and terminals, tighten loose connections, and replace damaged parts. Clean electrical contacts with silver polish, fine sandpaper, or burnishing tool. DO NOT use emery paper or steel wool. Vacuum to remove residue. Touch up paint according to TB 43-0144. Do not paint threads or labels.

2-19.3.5.2 Test and repair

- a. With switchboard circuit breaker P10 or P11 and power panel 3 circuit breaker 11P13 closed (ON), check electric winch input line voltage. Check this voltage at main contactor across terminal pairs 1A1 and 1A2, 1A1 and 1A3, and 1A2 and 1A3 for 440 Vac (see Figure 2-10). If voltage across any terminal pair is not 440 Vac, go to step b. If voltage across all terminal pairs is 440 Vac, go to step c.
- b. Check circuit breaker P10 or P11 output voltage across all three terminal pairs for 440 Vac. If voltage across any terminal pair is not 440 Vac, circuit breaker or power source is at fault. If voltage across all terminal pairs is 440 Vac, repair or replace power cable from circuit breaker P10 or P11 to main contactor.
- c. Position ON/OFF switch to ON position and depress reset and forward buttons. Check output voltage of forward contactor (1M) across terminal pairs 1B1 and 1B2, 1B1 and 1B3, and 1B2 and 1B3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, go to step d. If voltage across all terminal pairs is 440 Vac, go to step e.
- d. With forward button depressed, check voltage of magnetic coil of contactor (1M) across points L1 and L2 for 440 Vac. If voltage is not 440 Vac, go to step (1). If voltage is 440 Vac, replace magnetic starter.
 - (1) Open (OFF) switchboard circuit breaker P10 or P11 and make continuity checks as follows.

WARNING

Make sure anchor winch control panel is electrically dead before making continuity checks. Redtag main switchboard circuit breaker P10 or P11 and power panel 3 circuit breaker 11P13 with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

- (a) With ON/OFF switch on, check continuity of same, between points N1 and N2.
- (b) With FORWARD button depressed, check continuity of same, between points P1 and P2.
- (c) Check continuity of STOP switch between points P1 and P2.
- (d) Check continuity of REVERSE switch between points S1 and S2.
- (e) If all checks indicate continuity, go to step (2). If any check indicates an open circuit, replace faulty switch(es).

(2) Check continuity of overload contacts between points L1 and L2, and M1 and M2. If continuity exists from both checks, go to step (3). If open circuit exists, reset or replace overload contacts.

(3) Check continuity of wires between points 1A2 and M1, M2 and I2, E1 and E2, E2 and H2, H2 and R1, H1 and R2, R2 and S2, S1 and Q1, Q1 and P2, P1 and N2, and N1 and 1A1. If continuity exists from all checks, replace magnetic starter (1M). If open circuit exists from any check, repair or replace faulty wire(s).

e. Close (ON) circuit breaker P10 or P11 at main switchboard and check voltage at inputs to contactor 2M across terminal pairs 2A1 and 2A2, 2A1 and 2A3, and 2A2 and 2A3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step g. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s) from inputs of 1M to inputs of 2M.

CAUTION

Before checking reverse operation, insure that anchor cable is unwound at least 15 feet to prevent winch damage. This can be done with or without power. (See TM 55-1930-209-14&P-1 para 16-21, 16-22.) See caution on free falling of cable.

f. Position ON/OFF switch to ON position and depress reset and reverse buttons. Check output voltage of reverse contactor (2M) across terminal pairs 2B1 and 2B2, 2B1 and 2B3, and 2B2 and 2B3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, go to step g. If voltage across all terminal pairs is 440 Vac, go to step h.

g. With reverse button depressed, check voltage at magnetic coil of contactor (2M) across points J1 and J2 for 440 Vac. If voltage is not 440 Vac, go to step (1). If voltage is 440 Vac, replace magnetic starter. (1) Open (OFF) switchboard circuit breaker P10 or P11 and make continuity checks as follows:

WARNING

Make sure anchor winch control panel is electrically dead before making continuity checks. Redtag main switchboard circuit breaker P10 or P11 with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

(2) With REVERSE button depressed, check continuity of reverse between points F1 and F2 and check continuity of FORWARD switch between points Q1 and Q2. If all checks indicate continuity, go to step

(3). If any check indicates an open circuit, replace faulty switch(es). (3) Check continuity of overload contact between points G1 and G2. If continuity exists, go to step (4). If open circuit exists, reset or replace overload contact.

(4) Check continuity of wires between points 12 and J1, J2 and G1, G2 and K2, K1 and F2, K2 and F1, and F2 to O2. If continuity exists from all checks, replace magnetic starter (2M). If open circuit exists from any check, repair or replace faulty wire(s).

h. Check continuity of wires from contactor 1M to contactor 2M between points 1B1 and 2B1, 1B2 and 2B2, and 1B3 and 2B3. If continuity exists between all checks, go to step i. If an open circuit exists, repair or replace faulty wire(s).

- i. Check continuity of thermal overload between points C1 and D1, C2 and D2, and C3 and D3. If continuity exists between all points, go to step 9. If an open circuit exists from any check, replace thermal overload.
- j. Check continuity of wires between points D1 and T1, D2 and T2, and D3 and T3. If continuity exists from all checks, replace motor. If an open circuit exists, repair or replace wire(s).
- k. Check voltage at inputs of AC brake between points U1 and U2 for 440 Vac. If voltage is 440 Vac and magnetic coil is not releasing, replace magnetic coil. If voltage is not 440 Vac, replace wire(s) to AC brake.

2-19.3.5.3 Replacement

a. Removal

- (1) Make sure anchor winch control panel is electrically dead before replacing control panel by opening (OFF) switchboard circuit P10 or P11 and power panel 3 circuit breaker 11P13.
- (2) Redtag main switchboard circuit breaker P10 or P11 with: WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- (3) Remove attaching hardware and remove control panel.

b. Installation

- (1) Install control panel using attaching hardware.
- (2) Connect wiring.
- (3) Close (ON) switchboard circuit breaker P10 or P11 and power panel 3 circuit breaker 11P13.
- (4) Check that control panel operates normally.

2-19.3.6 Anchor winch heater test and repair. With circuit breaker 11P13 (11P13 provides power to motor, brake and panel heaters) at power panel no. 3 closed (ON), check voltage at inputs to heater terminal board across points X1 and X2 for 115 Vac (see Figure 2-10). If voltage is not 115 Vac, go to step (3). If voltage is 115 Vac, go to step c.

- a. Check voltage at terminal box between power panel no. 3-circuit breaker 11P13 and terminal board for 115 Vac. If voltage is not 115 Vac, go to step b. If voltage is 115 Vac, replace wires from terminal box to heater TB.
- b. Check circuit breaker 11P13 output voltage for 115 Vac. If voltage is not 115 Vac, circuit breaker or power source is at fault. If voltage is 115 Vac, repair or replace wire(s) from circuit breaker 11P13 to terminal box.
- c. Check voltage at inputs to heaters across points V1 and V2, W1 and W2, and Z1 and Z2 for 115 Vac. If voltage across any pair is not 115 Vac, repair or replace input wire(s) to heater(s). If voltage across all pairs is 115 Vac, replace faulty heater.

2-19.4 Fairlead maintenance. Maintenance of the fairlead is limited to removal of corrosion, touch up paints according to TB 43-0144, lubrication as previously stated in paragraph 2-19.2, and replacement of the roller bearings or rollers.

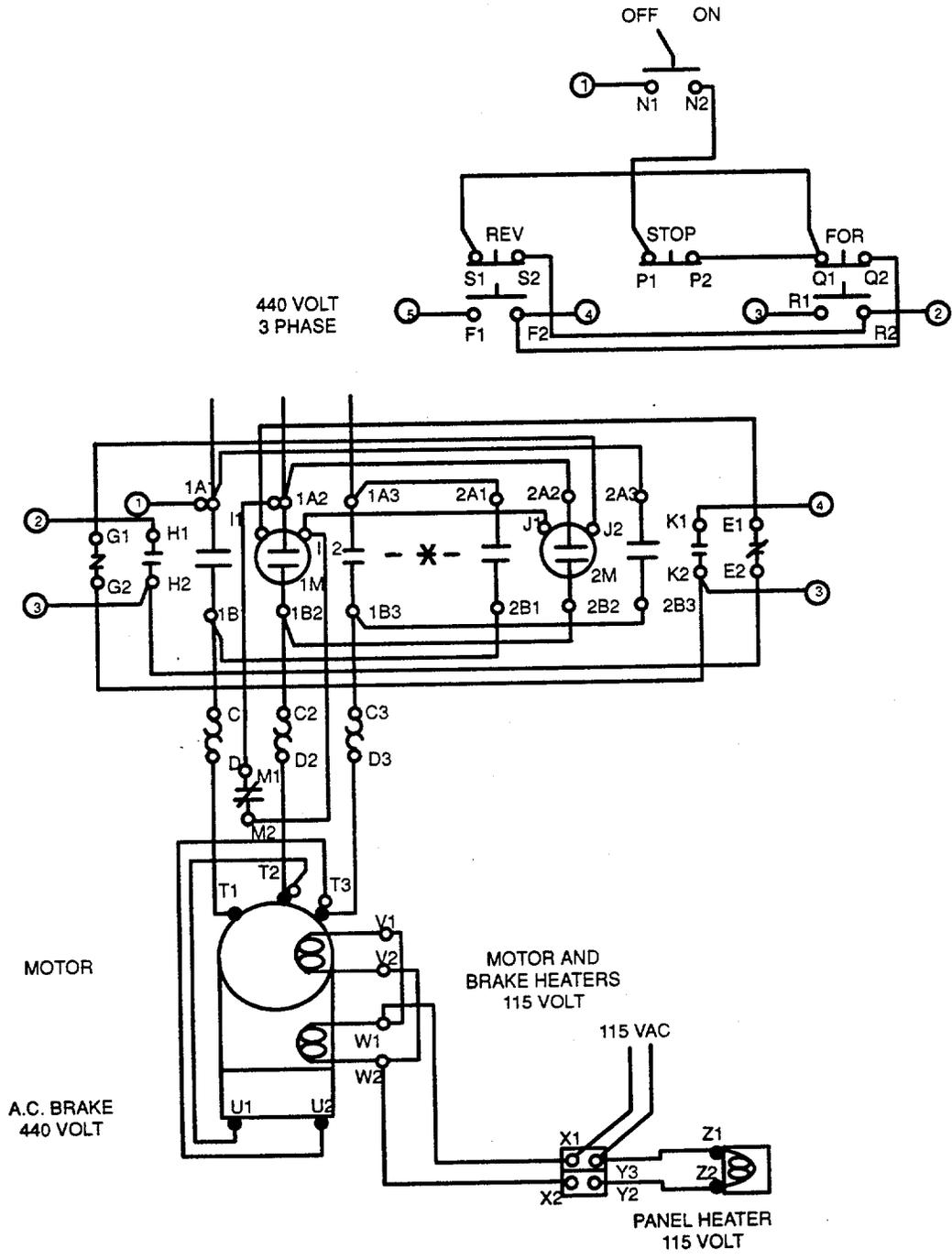


Figure 2-10. Anchor Winch Control Panel

2-19.5 Anchor replacement

a. Removal

CAUTION

Turnbuckle must be secured to both the anchor shackle and padeye on top of fairlead.

- (1) Make sure turnbuckle is securely connected to anchor shackle and padeye on top of fairlead.
- (2) Disconnect anchor winch cable from anchor shackle.

NOTE

To remove forward anchors, use bow crane. For aft anchors, removal crane must be provided.

- (3) Start up and operate crane. Operate bow crane as given in TM 55-1930-209-14&P-13.
- (4) Attach crane hook to anchor shackle. Raise hook until there is tension on crane cable.
- (5) Disconnect turnbuckle from anchor shackle and padeye on top of fairlead.
- (6) Lower anchor until anchor is clear of bolster.
- (7) Move anchor forward until anchor is clear of barge.
- (8) Bring anchor onboard barge, lower to deck, and free hook from anchor shackle.

b. Installation

NOTE

To install forward anchors, use bow crane. For aft anchors installation, crane must be provided.

- (1) Start up and operate crane. Operate bow crane as given in TM 55-1930-209-14&P-13.
- (2) Attach crane hook to anchor shackle, raise anchor, and move anchor to anchor bolster.
- (3) Lower anchor until anchor flukes are lower than bolster.
- (4) Move anchor toward bolster and carefully raise anchor until flukes are positioned under bolster.
- (5) Securely connect turnbuckle to anchor shackle and padeye on top of fairlead.
- (6) Slowly lower crane hook to clear anchor shackles.
- (7) Return crane to stowed position.
- (8) Connect anchor winch cable to anchor shackle.

Section IV. Storage

2-20 Short-term storage. If barge is taken out of service for more than 7 days but less than 30 days, and anchor winches are not used while in storage, follow normal shutdown procedures in paragraph 2-13. Inspections are not required of this system during short-term storage.

2-21 Administrative storage. If barge is taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and is maintained by unit personnel.

2-21.1 If placed in administrative in-water storage at anchor, anchor winches not being used will be processed for dockside storage as specified in paragraph 2-21.2.

2-21.2 For administrative in-water dockside storage, perform the following:

- a. Perform semiannual inspections and services in Chapter 3, TM 55-1930-209-14&P-19.
- b. Replace breather plug (Figure 2-4) and screw inner plug into outer plug to cover breather holes.
- c. Cover all exposed gears, chains, chain drives, and cable with a heavy coat of multipurpose, water-resistant grease (MIL-G-24139).

NOTE

Manufacturer recommends, storing winch gear motors indoors in a dry, warm location.

- d. If winch gear motors cannot be stored indoors in a dry and warm location, perform the following:
 - (1) Make sure that power panel 3 circuit breaker 11P13 is closed (ON) to provide power for motor heaters. Internal heating will reduce humidity and corrosion.
 - (2) If possible, cover anchor winch with waterproof canvas cover installed in such manner that air circulates around winch.

2-22 Administrative storage inspections. Winches, if not in use during storage, will be inspected at least once every 30 days. Check for corrosion, damage, or pilferage. Correct as necessary.

2-23 Long-term storage. If barge is to be taken out of service for 6 months or more, turn in barge, including anchor winches with anchors and cables, for depot processing into long term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process barge and winches for normal operations before releasing to depot for long-term storage.

Section V. Manufacturers' service manuals/instructions

2-24 General. These references provide additional information on anchoring and mooring equipment. A ready reference copy is in Appendix B. Refer to both this manual and drawings listed' in Appendix A while performing procedures in these manuals.

<u>Component</u>	<u>Document Title</u>	<u>Manufacturer</u>
Anchor winches	Instruction Manual	W.W. Patterson Co. 830 Brocket St Pittsburg, PA 15233 (412) 322- 2012
Gear motor	Instruction Manual	Electric Motors Corporation Power Transmission Division Dresser Industries Anaheim, CA 92803 (714) 535-6061
Electric brake	Instructions	PT Components Incorporated Stearns Division 120 North Broadway Milwaukee, WI 53202 (414) 272-1100

Section VI. Manufacturers' warranties/guarantees

2-25 General. Information on anchoring and mooring equipment warranties/guarantees is listed below.

<u>Component</u>	<u>Manufacturer</u>	<u>Duration</u>	<u>Coverage</u>
Winches	W.W. Patterson Co. 830 Brocket St Pittsburg, PA 15233 (412) 322- 2012	6 months* workmanship	Materials, design &
Gear motor	Electria Motors Operation Power Transmission Div. Dresser Industries Anaheim, CA 92803 (714) 535-6061	1 year	Material & workmanship

* Six months from date of final acceptance, or a maximum of 12 months from date of shipment from factory.

CHAPTER 3 TOWING EQUIPMENT

Section VII. Description and data

3-1 Description

3-1.1 This equipment consists of components shown in Figure 3-1. The towing bridle includes flounder plate, two chains, four detachable chain links for attaching each chain to flounder plate and to shackles, and two bolt type shackles for attaching towing bridle to barge padeyes. Two padeyes provide attaching points for hooking towing bridle to barge. This equipment is fabricated by the shipyard in accordance with drawings referenced in Appendix A.

3-1.2 This equipment is stowed in void 1 through a access hatch on the forward weatherdeck. The bow crane is used to move and handle the towing bridle.

3-2 Capabilities. This equipment provides capability for towing barge to and from deployment site.

3-3 Limitations. While this equipment is in use, barge cannot be towed in excess of 8 knots in Sea State 3 conditions.

3-4 Equipment specifications

a.	Link, chain	
	Manufacturer	Baldt, Inc.
	CAGEC	83644
	Part no.	Not available
	Type	Detachable
	Size	15/16 to 1 3/8 in. nominal
	Material	Steel
	Quantity	4
b.	Chain	
	Federal specification	RR-C-271
	CAGEC	81348
	Part no.	Type I, grade C, class 1
	Type	Welded
	Size	1 1/4 in. nominal
	Length	50 ft
	Material	Alloy steel
	Quantity	2
c.	Shackle	
	Federal specification	RR-C-271
	CAGEC	81348
	Part no.	Type IV, class 6
	Type	Bolt
	Size	1 5/8 in. nominal
	Quantity	4
d.	Flounder plate	
	Part no.	13226E1918
	CAGEC	97403
	Specification	ASTM 36
	Type	Plate, 2-in. stk
	Material	Steel
	Quantity	1

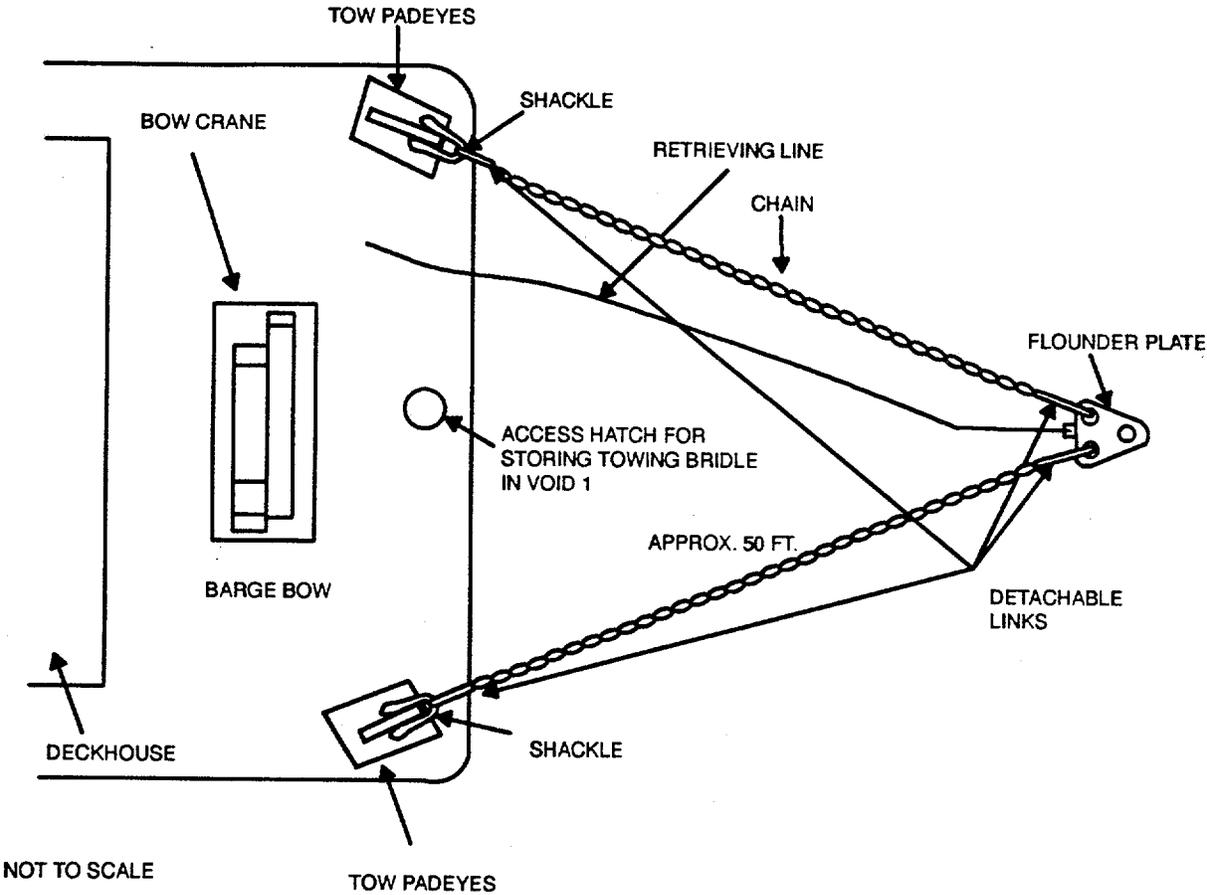


Figure 3-1. Towing Equipment Installation

3-5 Items furnished

3-5.1 Components installed as part of the towing equipment are listed on the parts list of drawings referenced in Appendix A and in the Components of End Item List in TM 55-1930-209-14&P-20.

3-5.2 Common and bulk items onboard are listed in the Expendable Supplies and Materials List in TM 55-1930-209-14&P-20.

3-5.3 Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List in TM 55-1930-209-14& P-18.

3-6 Items required but not furnished. Towing vessel must be obtained from commander of terminal operating area where barge is operating or from commander providing support for the barge.

3-7 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is in the Tools and Test Equipment List in TM 55-1930-209-14&P-18.

Section VIII. Description of operation

3-8 General. This towing equipment is used primarily for open-water tows by either commercial or military tugs. For shorter moves and within congested areas or in close waters, the barge is normally moved by a tug with the barge "on the hip" (see TM 55-1930-209-14&P-1).

Section IX. Operating instructions

3-9 Towing bridle installation

- a. Remove towing bridle from forward storage in void 1.
 - (1) Activate bow crane by following procedures in TM 55-1930-209-14&P-13.
 - (2) Open void 1 towing bridle access hatch.
 - (3) Hook bow crane cable hook into flounder plate of towing bridle in void 1 storage area.

CAUTION

Make sure flounder plate clears sides of access hatch.

- (4) Make sure long dimension of flounder plate is vertical so plate will clear void 1 access hatch. Lift flounder plate out of void 1 storage.
 - (5) Continue lifting until towing bridle shackles are free of access hatch.
 - (6) Lay towing bridle on deck and remove crane cable hook from flounder plate.
- b. Attach towing bridle shackles to barge tow padeyes.
 - (1) Use nut and bolt to attach shackles to padeyes on port and starboard corners of forward weatherdeck. Make sure each nut is tight.
 - (2) Secure nut with a cotter pin inserted in bolt hole. Bend it 90 degrees to make sure it cannot slip out
 - (3) Attach anchor cable to chain link, close to flounder plate before the tug boat receives the tow line.

- c. Reattach bow crane cable hook to flounder plate. Raise and hold plate at working level while attaching tow line, or pass flounder plate to tug to attach tow line. Remove crane cable hook.
- d. When passing tow chain to the tug boat, freefall the anchor winch cable that is connected to tow chain.

CAUTION

Make sure installed towing bridle clears all deck equipment and anchors prior to tug taking a pull on the tow line.

- e. Close void 1 towing bridle access hatch.
- f. Place bow crane in stowed position by following procedures in TM 55-1930-209-14&P-13.

3-10 Preparation for towing. Trim barge to raise bow 9 inches above stern as indicated on draft marks and secure the following:

- a. Workboat, if being transported on barge.
- b. All deck hatches and soft patches.
- c. All deckhouse hatches, port lights, and doors.
- d. All deck equipment machinery, including shore discharge hose reel, bridge crane outside extension (jib rail), and anchors and winches.
- e. All interior equipment machinery, including bridge crane and void 4 trolley hoists.
- f. All loose equipment and repair parts.

3-11 Towing operations. In towing operations, tug commander is towmaster and has final decision and responsibility for:

- a. Methods of towing and lashing.
- b. Lighting and marking the barge.
- c. Number of personnel, if any, on barge during tow. Such personnel are under control of towmaster.

3-12 Towing bridle storage. Upon completion of tow and when barge is secured, store towing bridle as follows:

- a. Activate bow crane by following procedures in TM 55-1930-209-14&P-1 3.
- b. After the tug boat drops the towing bridle, turn on the anchor winch attached to the tow chain.
- c. Retrieve anchor winch until it is possible to hook bow crane to flounder plate.
- d. Attach crane cable hook to flounder plate. Use bow crane to bring plate to forward weatherdeck.
- e. If tug personnel have not done so, remove tug tow line and hardware from flounder plate.
- f. Remove rivet or cotter pin on each shackle nut and bolt, remove nut and bolt, and remove shackles from tow padeyes.
- g. Replace nut, bolt, and cotter pin/rivet in each shackle and tighten. Always use a new cotter pin.
- h. Open void 1 towing bridle access hatch.

- i. Inspect towing bridle as follows:
 - (1) Using bow crane to hold flounder plate at eye level, inspect plate and attaching hardware for twists, cracks, or other damage or weaknesses.
 - (2) Lift towing bridle and inspect chains for cracks, twisted links, or other damage or weaknesses.
 - (3) Inspect shackles for cracks, twisted or bent metal.
- j. If towing bridle is damaged or shows signs of possible weakness, tag bridle with red tag showing it is not serviceable. Notify intermediate support maintenance unit of requirement for repairing towing bridle.
- k. Inspect towpads for cracks, excessive wear, broken welds and twisted or bent metal. If either tow padeye shows signs of damage or possible weakness, notify intermediate support maintenance unit of requirement for repairing a towpad.
- l. Using bow crane, suspend towing bridle over storage hatch and apply multipurpose, water-resistant grease (MIL-G-24139) to shackles, chains, and plate.
- m. Lower towing bridle into void 1 storage area.
- n. Make sure long dimension of flounder plate is vertical so plate will clear storage hatch. Lower flounder plate into storage area. Unhook bow crane cable hook.
- o. Secure towing bridle access hatch.
- p. Place bow crane in stowed position by following procedures in TM 55-1930-209-14&P-13.
- q. Reattach anchor cable to anchor.

Section X. Maintenance instructions

3-13 General

3-13.1 Maintenance concept

3-13.1.1 Unit level and Intermediate Direct Support and Intermediate General Support (IDS/IGS) maintenance on towing equipment is performed onboard by barge crewmembers whenever possible.

3-13.1.2 IDS/IGS maintenance beyond capability of crewmembers is provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

3-13.1.3 Intermediate support maintenance is accomplished by replacing components or major end items.

3-13.1.4 Unless other intermediate support procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

3-13.1.5 Maintenance Allocation Chart (MAC) is in TM 55-1930-209-14 &P-18. For maintenance of other equipment onboard, consult appropriate manual.

3-13.2 Maintenance instructions. Maintenance instructions are presented in the following paragraphs: Appendix C, Preventive maintenance checks and services, paragraph 3-15, Maintenance procedures.

3-14 Preventive maintenance. See TM 55-1930-209-14&P-14, Appendix C for preventive maintenance checks and services for the anchor, mooring and towing equipment. See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all ROWPU Barge Systems.

3-15 Maintenance procedures. Replace damaged shackles, including hardware, detachable links, or sidle chain. Always use a new cotter pin. Notify intermediate direct support if other towing bridle components are damaged. Intermediate direct support must repair or replace damaged components or replace towing bride as shown on Drawing 13226E1918.

NOTE

Welding must be in accordance with MIL-STD-278 class M-2. Painting must be in accordance with TB 43-0144.

Section XI. Storage

3-16 General. If barge is to be placed in either unit administrative storage or depot long-term storage and procedures in paragraph 3-12 have been followed when towing bridle was last used, no additional storage procedures are necessary. If procedures in paragraph 3-12 have not been followed, process towing brick for storage by following those procedures.

APPENDIX A

REFERENCES

A-1 Drawings

US Army Belvoir Research, Development, and Engineering Center (97403)

13226E1905	Mooring System
13226E1918	Towing Arrangement
13226E1932	Electrical Power Schematic Diagram
13226E1935	Electrical Power System Layout

A-2 Painting

TB 43-0144	Painting of Vessels
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A-3 Fire Protection

TB 5-4200-200-1 0	Hand Portable Fire Extinguishers Approved by Army Users
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A-4 Demolition to Prevent Enemy Use

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
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A-5 Maintenance

DA PAM 738-750	The Army Maintenance Management System (TAMMS)
TM 9-214	Inspection, Care and Maintenance of Antifriction Bearings
TM 9-237	Welding Theory and Application
TB SIG 222	Solder and Soldering

A-1/A-2 blank)

INSTRUCTION MANUALS
PATTERSON ELECTRIC WINCH
MODEL 65-10-6001
WITH LEVEL-WIND

W. W. PATTERSON COMPANY

JUNE 27, 1985

VSE CORPORATION P.O.-NO. 48515
U. S. GOVT. CONTRACT NO. DAAK70-83-C-0108

ESTABLISHED
1858



CABLE ADDRESS
"PATTERSON"

W. W. PATTERSON COMPANY

830 BROCKET STREET
PITTSBURGH, PA. 15233
TELEPHONE 412 322-2012
July 11, 1985

V.S.E. Corporation
2550 Huntington Ave.
Alexandria, VA 22303

Reference: Your PO No. 48515
Certificate of Compliance

Attention: Bob Coyle, Purchasing

Gentlemen:

WINCH TESTS

This is to certify that each of the four anchor winches supplied against your Purchase Order No. 48515 has been tested electrically, mechanically and functionally on our test stands and were found to be in complete compliance with the requirements of your Exhibit A, Section 4.3, Test Methods.

See page 2 of our acknowledgement of your order for previously-agreed-upon substitution of our "standard" testing method for that described in your original inquiry. Basically, our system involves the working of two winches simultaneously, one against the other, and where required, using our Type 51 manual brake to induce rated and 150% of rated loads on each winch in turn. Results of these tests are attached.

WIRE ROPE CERTIFICATION

Also attached is a copy of the Manufacturer's Certificate of Examination and Test for the wire ropes mounted on each of the four winches.

GUARANTEE

As required, all parts of each of these winches are guaranteed against defective materials, design and workmanship for a period of six months from date of final acceptance, or a maximum of 12 months from date of shipment from our factory.

MANUFACTURERS OF STEAMBOAT RATCHETS • CONTAINER LASHINGS • WINCHES

W. W. PATTERSON COMPANY

V.S.E. Corporation
July 11, 1985

STORAGE PROCEDURES

Each of the four winches has been securely mounted to heavy-duty pallets for shipment and storage prior to installation. Gross pallet weight is approximately 7000-lbs. and may be handled easily by a fork lift truck of sufficient capacity. In addition, each winch is fitted with "lifting eyes" so that winch and pallet may be lifted as a unit by overhead crane.

No special storage procedures are required: enclosed oil-bath gearing, extensive use of stainless steel for all shafts, tie-rods, spacers, clutches, brake drum components and fasteners, plus successive applications of inorganic zinc primer, catalyzed epoxy primer and silicone alkyde enamel (two coats) on all carbon steel components assure long-time corrosion protection under all likely conditions

PERFORMANCE CHARACTERISTICS

As required, characteristics of the Model 65-10-600I-1" Electric Anchor Winch are as follows:

Rated Line Pull (2nd. layer)	8000# prox.
Rated Line Speed (2nd. layer)	24 fpm prox.
Drum Capacity	600 ft. of 1" dia. wire rope
Electric Brake	105 lb. ft.
Power Supply	10-HP, 208 volts, 3 phase, 60 Hertz, TENV, 30-min. duty
Shock Load Capacity	30-tons plus
Band Brake Capacity (Type 51).....	30-tons plus

PREVENTIVE MAINTENANCE

No matter how well constructed and protected, all machinery should have some preventive maintenance. However, due to the extremely infrequent use to which these anchor winches will be subjected, any cautionary procedures are minimal:

- (1) Lubricate the roller claims and sprockets after every voyage and before placing winches in operation;
- (2) Lubricate the diamond shaft and guide bars of the level-wind also;
- (3) Apply general purpose grease at all alemite grease fittings;

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- (4) Before each voyage, secure wire rope and apply moderate tension with power or by hand. This will forestall bird's-nesting of remaining wire rope on winch rope drum during voyage.

MECHANICAL INSTALLATION

Locate the winch on barge winch platform with center of rope drum lined up with center of barge fairlead. Weld all-around each 4"x4" x3/4" angle foot-mount 3/8" fillet. Should winch ever need to be removed, simply take out bottom stainless steel tie-rods and lift winch out of foot mounts.

ELECTRICAL INSTALLATION

These winches require a separate 120-volt, single-phase, power source for continuous operation of the moisture-preventive heaters in the control panel, motor and electric brake. (See schematic diagram in the panel and also in the Technical Manual).

Power for the motor is 440-volts, 3-phase, 60 Hertz. Both this power and the heater power should be connected to the stainless steel NEMA TYPE.4X control panel enclosures with water-tight fittings.

START UP/SHUT DOWN PROCEDURE

No special actions are necessary for operation of the winch as delivered: the wire rope will already be tightly spooled on the drum and level wind will be in proper position relative to the rope drums.

- TO PAY ROPE OUT:
- (a) Turn panel switch ON
 - (b) Depress FORWARD pushbutton while pulling rope off drum.
 - (c) Depress STOP button to shut down winch.
 - (d) Turn panel switch OFF.

- TO REEL IN ROPE:
- (e) Turn panel switch ON.
 - (f) Depress REVERSE button to start reeling in rope.
 - (g) Depress STOP to shut winch down.
 - (h) Turn panel switch OFF.
 - (i)

With this letter and other information added to the final version of this Technical Manual, we believe all requirements of your order have now been met.

Thank you.

WINCH TEST

WINCH MODEL M165-10-600T-1 DATE 7/30/85

Test Methods & Results:

(1) NO LOAD: Run each winch under no load for 1/2 hour in each direction
Check for abnormal heating (above 150°F).

<u>WINCH SERIAL NO.</u>	<u>DIRECTION</u>	<u>HEATING</u>
053085-5-8	For.	OK
"	Rev.	OK
053085-6-8	For.	OK
"	Rev.	OK
053085-7-8	For.	OK
"	Rev.	OK
0530-85-8-8	For.	OK
"	Rev.	OK

(2) RATED LOAD: Pull rated load 5 times, with each winch, for a distance of 20 feet. Record load, time and linespeed.

<u>WINCH SERIAL NO.</u>	<u>LOAD (lbs)</u>	<u>TIME (sec.)</u>	<u>LINE SPEED (fpm)</u>
053085-5-8	8000		25
"	"		24
"	"		22
"	"		24
"	"		21
053085-6-8	8000		23
"	"		24
"	"		25
"	"		24
"	"		24
053085-7-8	8000		24
"	"		24
"	"		23
"	"		23
"	"		23

053085-8-8	8000		22
"	"		24
"	"		22
"	"		23
"	"		24

(3) OVERLOAD: Pull at least 150% of rated load twice with each winch, for a distance of 20 feet. Record load, time and line speed.

WINCH SERIAL NO.	LOAD (lbs.)	TIME (sec.)	LINE SPEED (fpm)
053085-5-8	12000		22
"	"		24
053085-6-8	12000		23
"	"		22
053085-7-8	12000		22
"	"		19
053085-8-8	12000		22
"	"		22

(4) PANIBRAKE: Disengage electric brake and manually tighten band brake. Apply at least 150% of rated load to the winch. Record the initial load, final load, and whether or not the brake slipped during the one minute waiting period.

WINCH NO.	INITIAL LOAD (lbs.)	FINAL LOAD (lbs.)	INDICATED BRAKE SLIPPAGE
053085-5-8	20,000	19,900	none
"	21,000	20,600	none
053085-6-8	21,400	21,200	none
"	22,200	22,000	none
053085-7-8	18,200	18,000	none
"	19,000	19,000	none
053085-8-8	16,000	16,000	none
"	16,600	16,400	none

WINCH TEST

(5) ELECTRIC BRAKE: Disengage manual brake and engage electric brake. ... Apply at least 150% of rated load to the winch. Record the initial load, final load, and whether or not the electric brake slipped during the one minute waiting period.

WINCH SERIAL NO.	INITIAL LOAD (lbs.)	FINAL LOAD (lbs.)	SLIPPAGE
053085-5-8	22,000	21,600	none
"	22,000	21,600	none
053085-6-8	22,400	22,200	none
"	22,400	22,200	none
053085-7-8	16,000	15,800	none
"	16,200	16,000	none
053085-8-8	19,400	19,200	none
"	19,600	19,400	none

Test Certificate No. 72305

Form No. 5

CERTIFICATE OF EXAMINATION AND TEST OF WIRE ROPE BEFORE BEING TAKEN INTO USE

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR 91.25-25(a)3, 71.25-25(a)5, and 29 CFR 9.12(a).

Name and address of maker or supplier of rope Henry Stewart Co.

Phila., Pa. 19125

Diameter of rope 1" (8 x 600' long)

Number of strands 6

Number of wires per strand 24

Lay Right Regular

Quality of wire IPS, PRM, RRL, GALV. FC

Date of test of sample of rope 5/28/84

Load at which sample broke 65,600 pounds

Safe working load, subject to any stated qualifying conditions such as minimum pulley diameter, direct tensile load, etc.

5:1 design factor

Name and address of public service, association, company or firm making the examination and test

same

Position of signatory in public service, association, company or firm making the examination and test

supervisor

I certify that the above particulars are correct, and that the examination and test were carried out by a competent person.

(Signature) *John P. Pallante*

(Date) 5/15/85

NOTE: For the purpose of this certificate a competent person is defined as a surveyor of a classification society or a responsible and technically qualified employee of the supplier of wire rope or of a recognized testing laboratory or company.

*Delete what does not apply.

W. W. PATTERSON COMPANY

July 11, 1985

INSTRUCTIONS

MODEL M65-10-600I ELECTRIC ANCHOR WINCHES

These PATTERSON Electric Anchor Winches operate and are maintained in the same manner as our experience-proven, anti-corrosion, enclosed-gearing I-Series mooring winches. Air, electric, and hydraulic powered versions have been in service since 1969.

The Model M65-10-600I represents a major design advance over those previous models: All fasteners are stainless steel, as are tie rods, spacer tubes, shafts, roller chain and sprockets, brake pawls and pawl springs, brake band components, brake drum and internal brake ratchet gear. Essentially, stainless steel has been used for anti-corrosion purposes wherever feasible. Remaining carbon steel components, such as the main frame plates and motor base plate, have been sandblasted to SSPC "near white" and primed with inorganic zinc before applying epoxy and enamel finish coats.

A further distinction of these anchor winches is the addition of a "level-wind" assembly to ensure proper spooling of wire rope. Of massive construction, this level-wind has been designed to withstand lateral forces that could result from strains equal to the ultimate strength of the wire rope. Again, the guide bars, diamond shaft and vertical and horizontal rollers are stainless steel, as are the roller chain drive and sprockets.

Central to the proper operation of the level-wind is the large, cylindrical butterfly pawl (LW-6) that rides in the grooves of the diamond shaft (LW-5). Made of a high strength aluminum-bronze alloy, AMPCOLOY No. 45 (228 BHN, 75/118 KIPS), this pawl is readily accessible from the top of the level-wind for lubrication or inspection purposes.

Adjustment of the level-wind's tranverse position with respect to the wire rope drum is achieved by means of a 4-jaw clutch on the rope drum shaft extension. Rotation of the disengaged male component (D-16) will result in the relative displacement of spooled wire rope to level-wind. (To rotate the male half of the clutch, the electric motor can be jogged or the pull-up ratchet can be used with both electrical and mechanical brakes released).

These anchor winches are designed for bottom spooling. That is, as viewed from in front of the level-wind, the reeling-in action pulls the wire rope onto the underside of the rope drum. Starting at the left flange, the wire rope progresses to the right, as does the level-wind.

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But because the first layer spools onto a bare or non-grooved drum, a "right-lay" wire rope has been supplied with the original winches. This rope construction tends to provide a tighter, more closely spaced first layer of rope when working from left to right and with the drum rotation described above.

Gearing of the basic winch is completely enclosed and runs in an extreme pressure 90-weight gear-lube. Seals (H-2N, D-10) in the 'No. 1 and No. 3 shaft bearing housings minimize contamination of this lubricant by green sea water or other foreign elements. A removeable access plate in the gear cover makes inspection of the gearing and lubricant quick and easy.

All basic winch bearings are made of high-strength phosphor bronze. Exterior bearings are grease-lubricated through stainless steel Alemite fittings; the interior ones by the gear lubricant.

The 4-bolt, flanged housings of the No. 1 and No. 3 shafts, as well as the level-wind diamond shaft, are removeable to facilitate bearing replacement in the field. These removeable bearing housings also make possible complete on-site disassembly of the entire winch with relative ease.

Sprockets and roller chain used on this winch are extremely heavy and strong for long, maintenance-free service and should last the life of your winch. But please-lubricate occasionally and expecially before you start to use the winch.

ABOUT THE ELECTRIC GEARMOTOR

The 10-HP DRESSER electric gearmotor is a totally-enclosed, fan-cooled type with special insulation and other features for marine use. It is ready to use as shipped to you except that the breather plug should be installed in the gearhead (this is attached to the motor along with the instruction tag). Also, please follow lubrication instructions of the manufacturer.

As an added protection against moisture and corrosion, this 10 HP, 440-volts, 3-phase, 60 Hertz motor has an internally-mounted 120-volt, single-phase space heater that will maintain the temperature 10 to 20 degrees Celsius above ambient.

Integral with the motor is a STEARNS, 105 lb.-ft., 87,000 Series self-adjusting electric disk brake. Spring-applied and "normally-on", this solenoid-released brake operates on 440-volts, single-phase and has a 110-volt, 25-watt space heater to minimize the effect of condensation. In addition, naval brass friction disks have been substituted for the usual fiber disks to also resist the effects of a salt-water atmosphere.

ABOUT THE MECHANICAL BRAKE

A PATTERSON Type 51 brake is a key part of your anchor winch. Because of this brake's unique construction, this winch can be operated safely and surely, with or without power, with or without the electric brake.

POWER PULL-UP WITHOUT ELECTRIC BRAKE

- (a) Tighten brake band
- (b) Depress FORWARD pushbutton
- (c) Depress STOP button when proper tension is attained

The winch is now fully loaded and held by the semi-automatic, mechanical Type 51 brake. In this case the electric brake, if operable, can act as a "back-up". However, either brake is capable of holding normal loads, and can be used individually or in unison.

POWER RELEASE:

- (a) Loosen brake band (if manual brake has been applied)
- (b) Pay out by reversing motor (if operable, electric brake releases automatically).
- (c) Depress STOP button to shut down winch

MANUAL PULL-UP:

- (a) Disengage 2-jaw clutch on No. 1 shaft
- (b) Tighten brake band
- (c) Engage pull-up ratchet and turn in proper direction to tighten wire rope

MANUAL RELEASE:

- (a) Loosen brake band
- (b) Pay out with pull-up ratchet

BASIC WINCH MAINTENANCE

WINCH MAINTENANCE is characteristically simple. All bearing surfaces are pre-lubricated at the factory. However, grease fittings have been provided for lubrication of all friction areas. General purpose grease is sufficient.

BRAKE DETAILS:

- (a) Brake band assembly bolted to winch frame
- (b) Ratchet gear keyed to shaft
- (c) Brake drum (with internal spring-loaded pawls) mounted on the ratchet gear hubs

Depending upon proper lubrication and the severity of usage, it may become necessary at some time to replace the pawls,

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ratchet gear or brake band. Because the brake is somewhat complex, we recommend the following procedure when inspecting or repairing it:

- (a) Unbolt and remove entire brake band assembly
- (b) Remove brake drum retaining washer
- (c) Slide brake drum and ratchet gear off shaft
- (d) Slide ratchet gear out of drum
- (e) Remove pawls and springs
- (f) Clean and replace any damaged or excessively worn parts

NOTE: Before re-assembly, coat working parts with a light grade of motor oil--makes assembly easier.

RE-ASSEMBLY:

- (a) Replace springs and pawls
- (b) Align pawls so that sloping edges will engage sloping edges of ratchet gear teeth in final assembly (but keep in mind the correct direction of rotation of the ratchet gear during pull-up)
- (c) Push pawls into cavities and hold with dog-point set screws mounted in face of drum near grease fittings
- (d) Slide ratchet gear into drum bore
- (e) Turn dog-point set screws back 1/2 turn only to free spring-loaded pawls. These set screws also act as keys to keep pawls aligned correctly
- (f) Replace brake assembly on winch
- (g) Grease pawls moderately

RECOMMENDED LUBRICANTS:

Winch Gear Case: SAE 90 AGMA 6EP (KEYSTONE WG-1)
Gearmotor Gearhead: Same as above
Exterior Winch Bearings: General Purpose Grease (KEYSTONE 81 Lt.)

Butterfly Pawl: Molybdenum Disulfide Paste Lubricant (KEYSTONE MOLY 29)

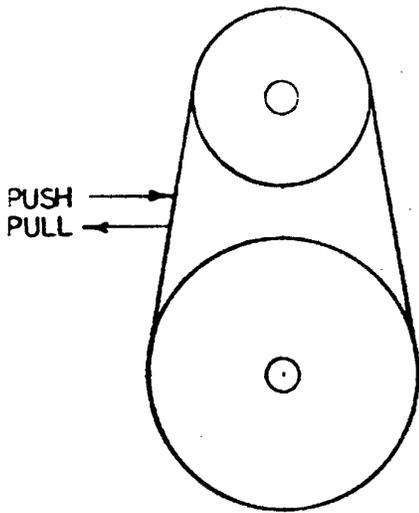
Diamond Shaft: Same as above

Guide Rolls: Same as above

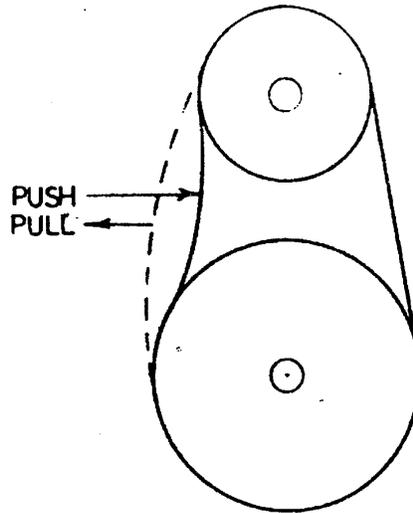
FINISH COATS:

1st coat: EZ-2 DIMETCOTE (INORGANIC ZINC)
2nd coat: Catalyzed Epoxy Tie-Coat Primer, MIL. SPEC. P-23377
3rd coat: Haze Gray Silicone Alkyd Enamel TT-P-490E
4th coat: Same as 3rd.

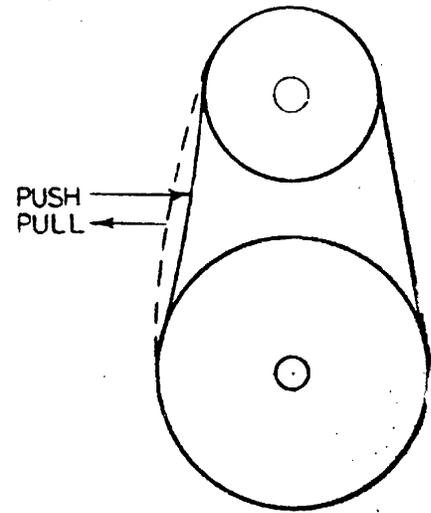
TENSIONING OF ROLLER CHAIN



TOO TIGHT
NO MOVEMENT



TOO LOOSE
TO MUCH
MOVEMENT



CORRECT
3/4" TO 1"
MOVEMENT

In order to achieve CORRECT chain tension as shown in the third diagram, adjust top-plate bolts until maximum back and forth chain movement (when pushed and pulled by hand) is between 3/4" and 1".

NOTE: Check tension periodically and at same time oil with brush or spout can.

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**MODEL M65-10-600I-1" ANCHOR WINCH
PARTS LIST**

<u>QUANTITY</u>	<u>ITEM</u>	<u>PART NO.</u>
1	Left Frame Plate	P-1
1	Right Frame Plate	P-2
1	Left Foot Mount	F-1
1	Right Foot Mount	F-2
1	Motor Base Plate	M-1
12	Plate Tie Rods (St. St.)	S-1
12	Plate Spacer Tubes (St. St.)	S-2
1	Front Anti-Rack Plate	AR-1
1	Rear Anti-Rick Plate	AR-2
 <u>GEAR CASE COVER COMPONENTS</u>		
1	Gear Case Cover	C-1
1	No. 1 Shaft Cover	C-2
1	Intermediate Shaft Cover	C-3
1	Drum Shaft Cover	C-4
1	No. 1 Shaft Bushing.	C-5
1	Drum Shaft Bushing	C-6
1	Gear Lubrication Cover	C-7
1	Gear Case Cover Gasket	C-8
1	No. 1 Shaft Cover Gasket	C-9
1	Intermediate Shaft Cover Gasket	C-10
1	Drum Shaft Cover Gasket	C-11
1	Gear Lubrication Cover Gasket	C-12
 <u>NO. 1 SHAFT COMPONENTS</u>		
1	No. 1 Shaft (St. St.)	H-2
1	Removeable Bearing Housing	H-21
1	Pinion Gear	H-2A
2	Bushings	H-2B
1	Pinion Gear Key (St. St.)	H-2C
1	Retaining Collar	H-2D
1	Combination Female Clutch & Sprocket (St. St.)	H-2R
1	Male Clutch (St. St.)	H-2E
1	Clutch Key (St. St.)	H-2F
1	Spacer (Pinion Gear)	H-2H
1	Shifting Yoke	H-2I
2	Yoke Bolts (St. St.)	H-2J
1	Pivot Nut and Bolt (St. St.)	H-2K
1	Support Bar	H-2L
2	No 1 Shaft Oil Seals	H-2N
1	Spacer (Sprocket - St. St.)	H-20
1	Removeable Bearing Housing & Oil Seal	H-22
1	Removeable Bearing Housing & Keeper Plate	H-23

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<u>QUANTITY</u>	<u>ITEM</u>	<u>PART NO.</u>
<u>BRAKE COMPONENTS</u>		
1	Brake Ratchet Handle Assembly	B-1X
1	Brake Ratchet Key (St. St.)	B-1Y
1	Vise Screw (St. St.)	B-2
1	Left Hand Nut (St. St.)	B-2C
1	Right Hand Nut (St. St.)	B-2D
1	Brake Band (St. St.)	B-3
1	Top Angle Support (St. St.)	B-3A
1	Bottom Angle Support (St. St.)	B-3B
1	Backup Plate	B-3C
1	Brake Drum (St. St.)	B-4
1	Brake Drum Ratchet Gear (St. St.)	B-4A
4	Pawls (St. St.)	B-4B
4	Springs (St. St.)	B-4C
1	Ratchet Gear Bushing	B-4D
1	Drum Bushing	B-4E
1	Key (St. St.)	B-4P
1	Brake Pull-up Ratchet Handle Assembly	B-4G
1	Key (St. St.)	B-4G1
1	Bolt & Nut (St. St.)	B-4G2
1	Pawl	B-4G3
1	Handle	B-4G4
1	Ratchet Wheel	B-4G5
1	Screw Thrust Bearing (Lower St. St.)	B-4H
1	Screw Thrust Bearing (Upper St. St.)	B-4I
<u>NO. 2 SHAFT COMPONENTS</u>		
1	No. 2 Shaft (St. St.)	I-1
1	Spur Gear	I-2
1	Pinion Gear	I-3
2	Bushings	I-4
2	Keeper Plates	I-5
1	Collar	I-6
2	Gaskets, Keeper Plate	I-7
<u>NO. 3 SHAFT COMPONENTS</u>		
1	No. 3 Shaft (St. St.)	D-1
1	Rope Drum	D-2
2	Bushings	D-3
1	Gear Spacer	D-4
1	Keeper Plate	D-5
2	U-BoltsD-;6	
2	Drum Hub Keys (St. St.)	D-7
2	Gear Keys (St. St.)	D-8
1	Spur Gear	D-9

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NO. 3 SHAFT COMPONENTS CONTINUED

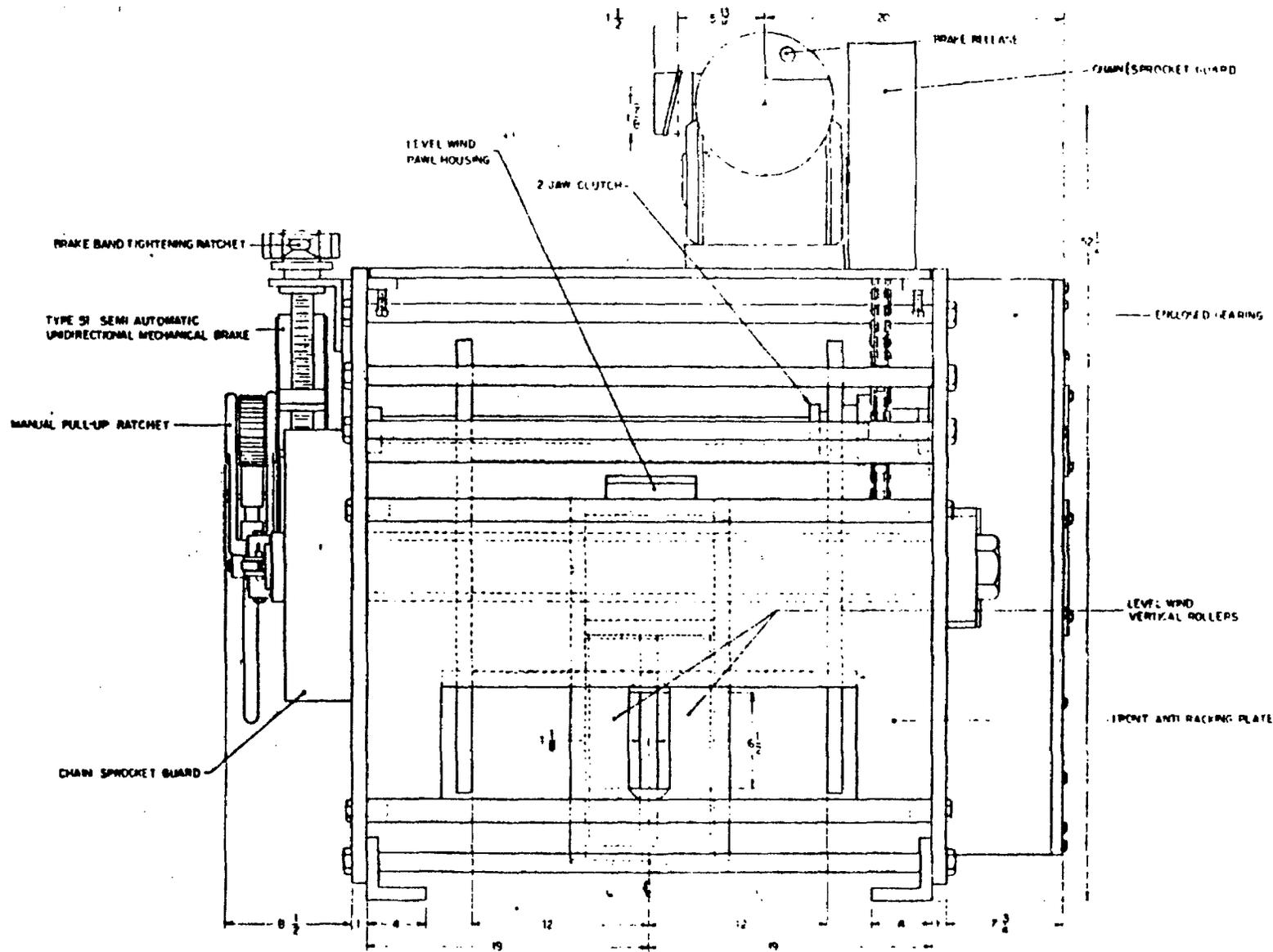
2	Shaft Oil Seals	D-10
2	Drum Thrust Washers (Bronze)	D11
2	Drum Spacers (St. St.)	D-12
2	Shaft Bosses	D-13
1	Boss Keeper Disk	D-14
1	Level Wind Drive-Female/Clutch Sprocket (4 Jaw St. St.)	D-15
1	Male Clutch (St. St.)	D-16
1	Male Clutch Key (St. St.)	D-17
1	Male Clutch Retaining Washer	D-18
1	Retaining Bolt (St. St.)	D-19

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<u>QUANTITY</u>	<u>ITEM</u>	<u>PART NO.</u>
<u>LEVEL-WIND ASSEMBLY</u>		
1	Drive Chain & Sprocket Guard	L-W1
1	Lube Access Plate	L-W1A
7	Bolts (St. St.)	LW-1B
1	Clutch Shifting Yoke & handle	LW-2
1	Clutch Handle Pivot Pin (St. St.)	LW-3
1	Clutch Handle Lock Pin (St. St.)	LW-4
1	Diamond Shaft (St. St.)	LW-5
1	Butterfly Pawl (Al. Br.)	LW-6
2	Diamond Shaft Bosses	LW-7
1	Diamond Shaft Keeper Plate	LW-8
1	Diamond Shaft Keeper Disk	LW-9
2	Flange Bearings	LW-10
1	Sprocket (Driven; St. St.)	LW-11
1	Sprocket Retaining Washer	LW-12
1	Sprocket Retaining Bolt (St. St.)	LW-13
2	Guide Bars (St. St.)	LW-14
4	Guide Bar Housings	LW-15
4	Guide Bar Nuts (St. St.)	LW-16
1	Traveling Roller Weldment	LW-17
2	Vertical Rollers (St. St.)	LW-17A
2	Horizontal Rollers (St. St.)	LW-17B
4	Guide Bar Bushings	LW-17C
2	Diamond Shaft Guide Bushings	LW-17D
2	Upper Bushings, Vertical Rollers	LW-17E
2	Lower Bushings, Vertical Rollers	LW-17F
4	Bushings, Horizontal Rollers	LW-17G
6	Roller Keeper Plates	LW-17H
1	Butterfly Pawl Cap Plate	LW-17J
28	Keeper Plate Bolts (St. St.)	LW-17K
9	Alemite Grease Fittings (St. St.)	LW-17L

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<u>QUANTITY</u>	<u>ITEM</u>	<u>PART NO.</u>
	<u>ROLLER CHAIN/SPROCKET COMPONENTS</u>	
1	Motor Shaft Sprocket (St. St.)	R-3
1	No. 1 Shaft Sprocket (St. St.)	H-2R
1	Strand Cotter Chain (St. St.)	R-7
1	Sprocket Cover	R-9
	<u>ELECTRIC GEAR MOTOR COMPONENTS</u>	
1	Electric Gear Motor	EM-1
4	Tie Down Bolts (St. St.)	EM-1A
1	Key (St. St.)	EM-3
1	Winch Control Panel Complete (St. St.)	EM-4
1	Control Panel Mounting Plate	EM-5

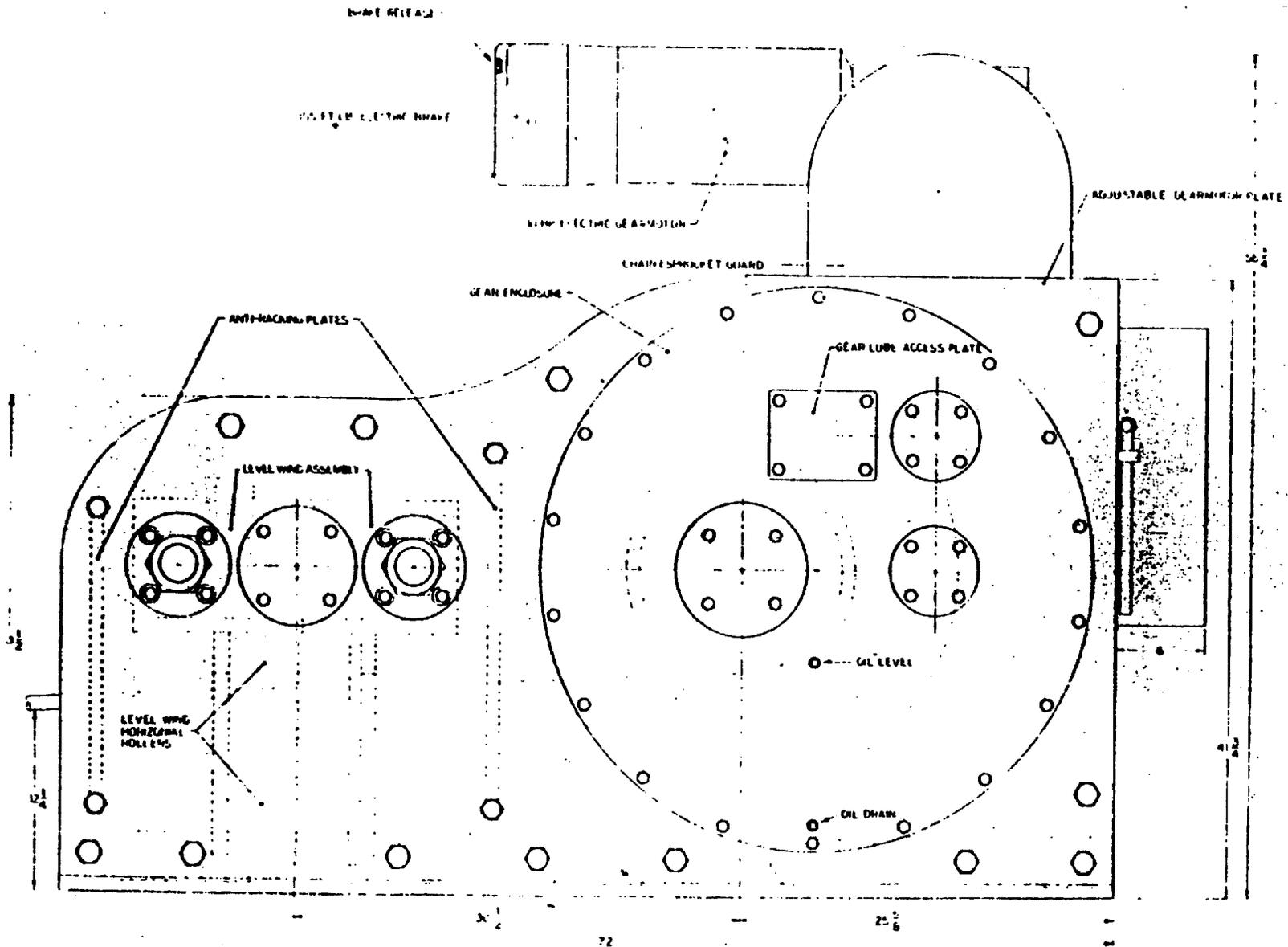


LEFT HAND UNIT SHOWN
 RIGHT HAND UNIT IS MIRROR IMAGE
 FRONT VIEW

WW PATTER.
 3 RIVERSEA
 DISTRICT

MODEL 55 10-50011 ELECTRIC
 WINCH WITH LEVEL WIND AND
 1500 LB CAPACITY

EWB	20	122001
CHD	20	
DATE	12 20 57	



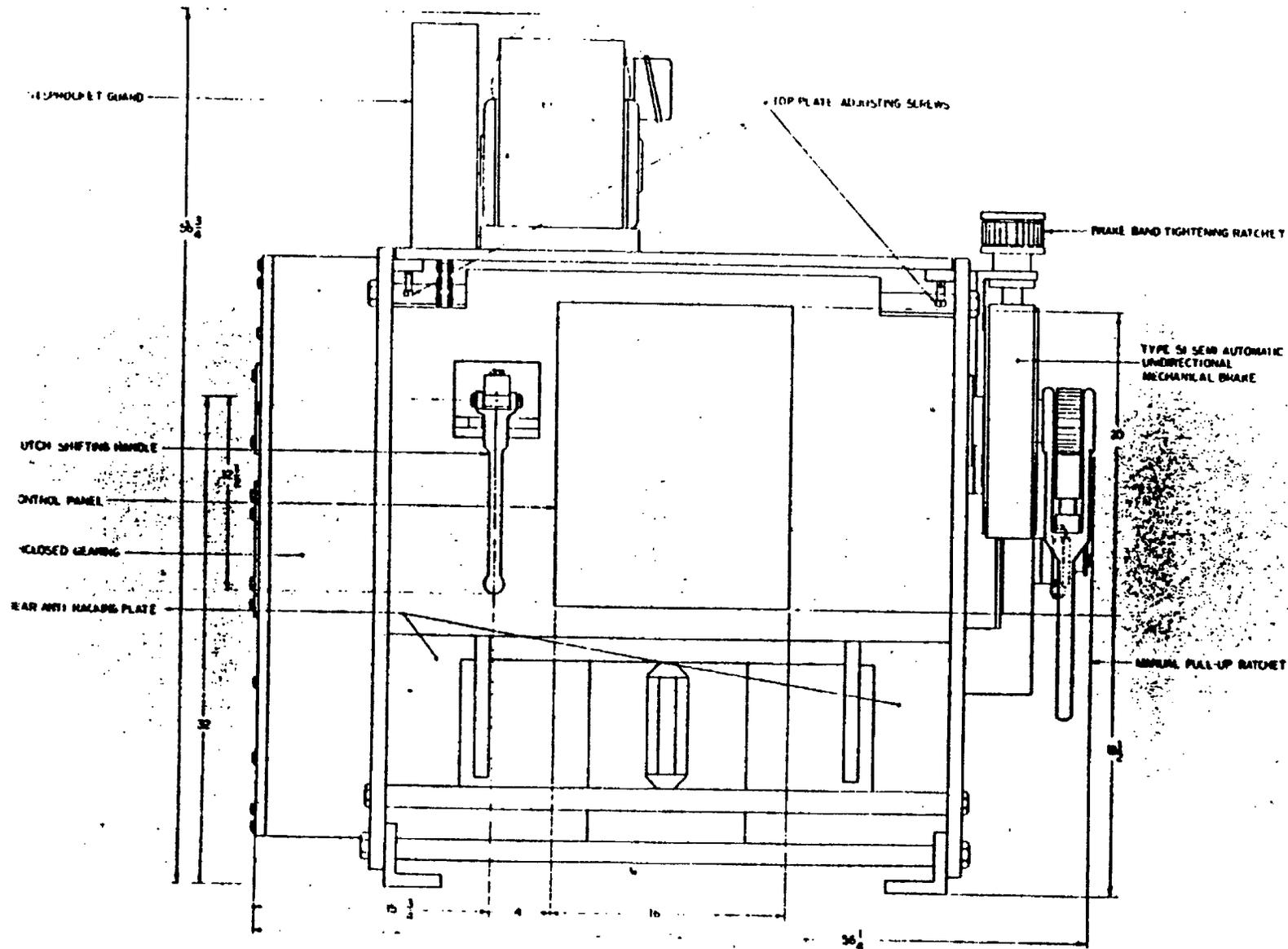
HAND UNIT SHOWN
 (HAND UNIT IS MIRROR IMAGE
 RIGHT SIDE)

NEW PATTERNS
 3 AUG 64 RD

MODEL 65 10-TON ELECTRIC
 WINCH WITH LEVEL WIND AND

DATE	6-8
BY	J. B. G.

DWG NO. W12150-2-1



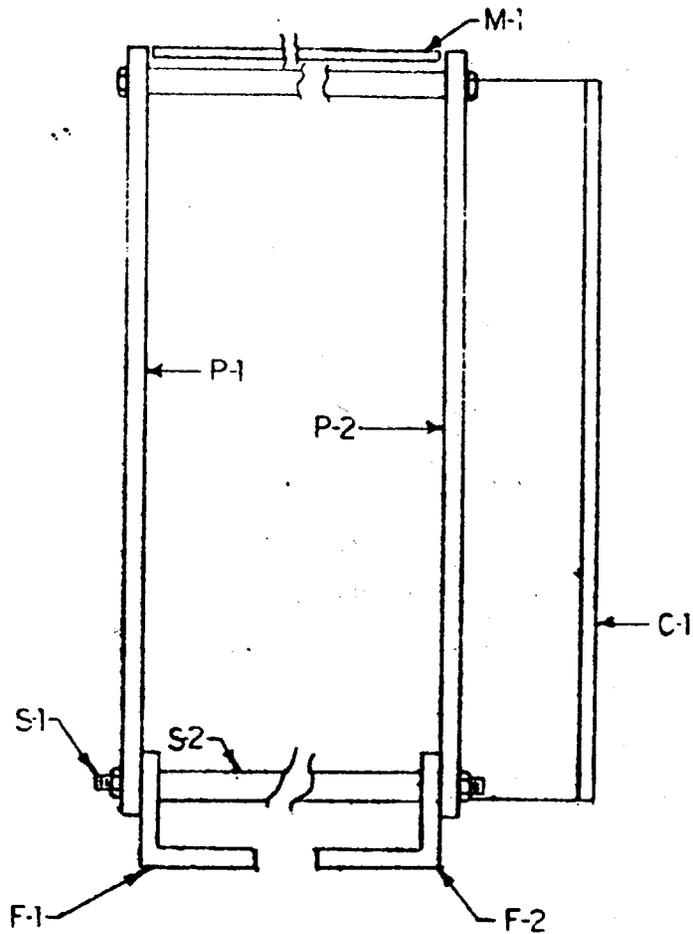
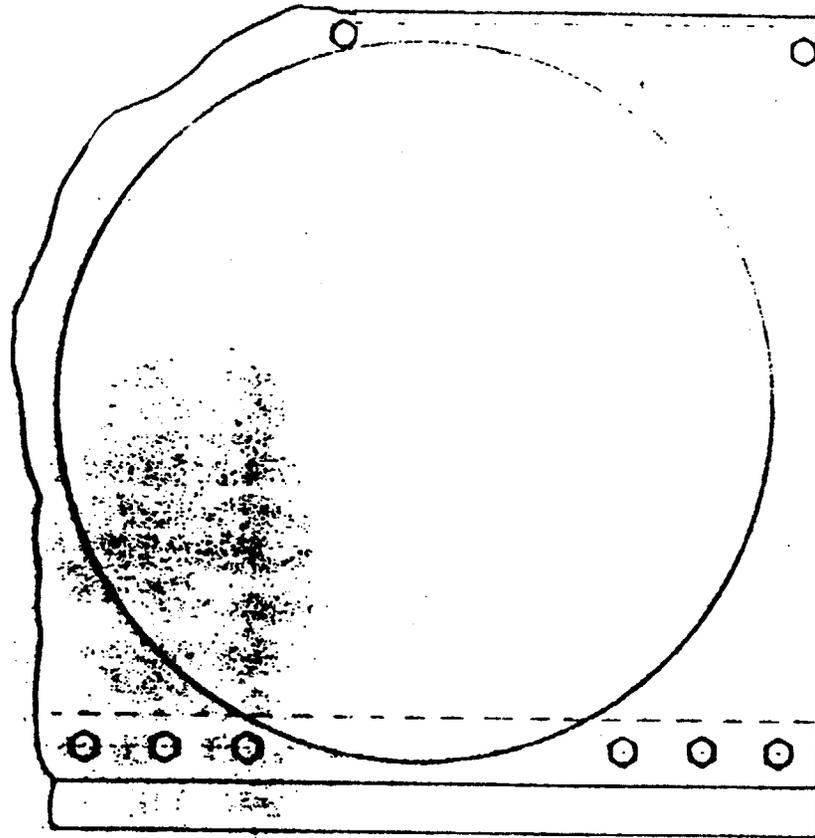
LEFT HAND UNIT SHOWN
 RIGHT HAND UNIT IS MIRROR IMAGE
 REAR VIEW

W. W. PATTERSON CO
 3 REVERSE RD
 PITTSBURGH, PA

MODEL 65-10-600T-1 ELECTRIC
 WINCH WITH LEVEL WIND AND
 ENCLOSED GEARING

Drawn	400
CHKD	6.86
DATE	12 22 65

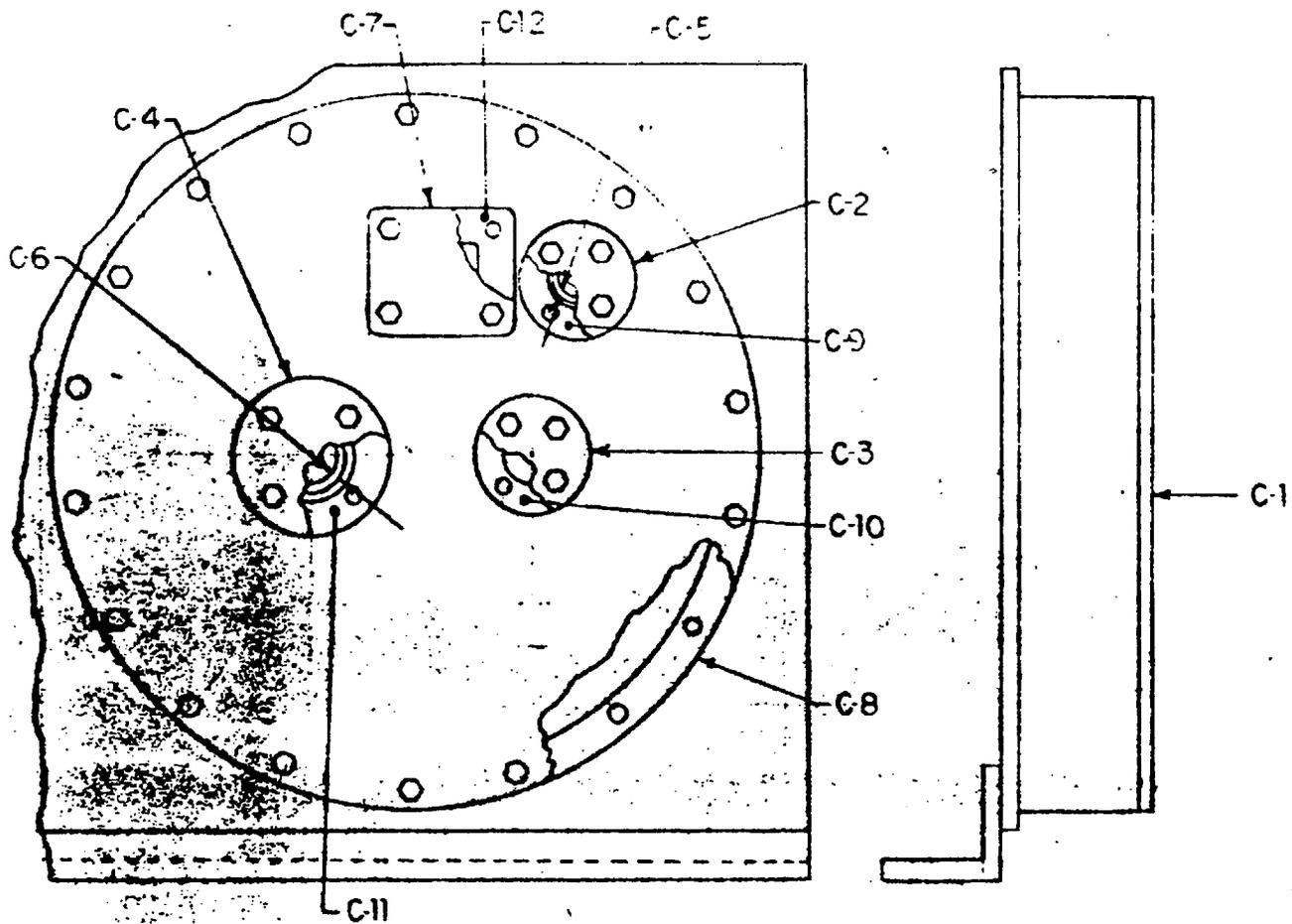
DWG NO. 100-12283-1



M65-10-600I
 M65-H-200I
 M65-H-450I
 M65-H-130I
 M65-A-130I
 M65-10-1450I

FRAME COMPONENTS

W W PATTERSON COMPANY	5-30-80 RCB	DWG. NO	5158
1830 BROOKET	RGH, PA. 9-18-70 MOW		



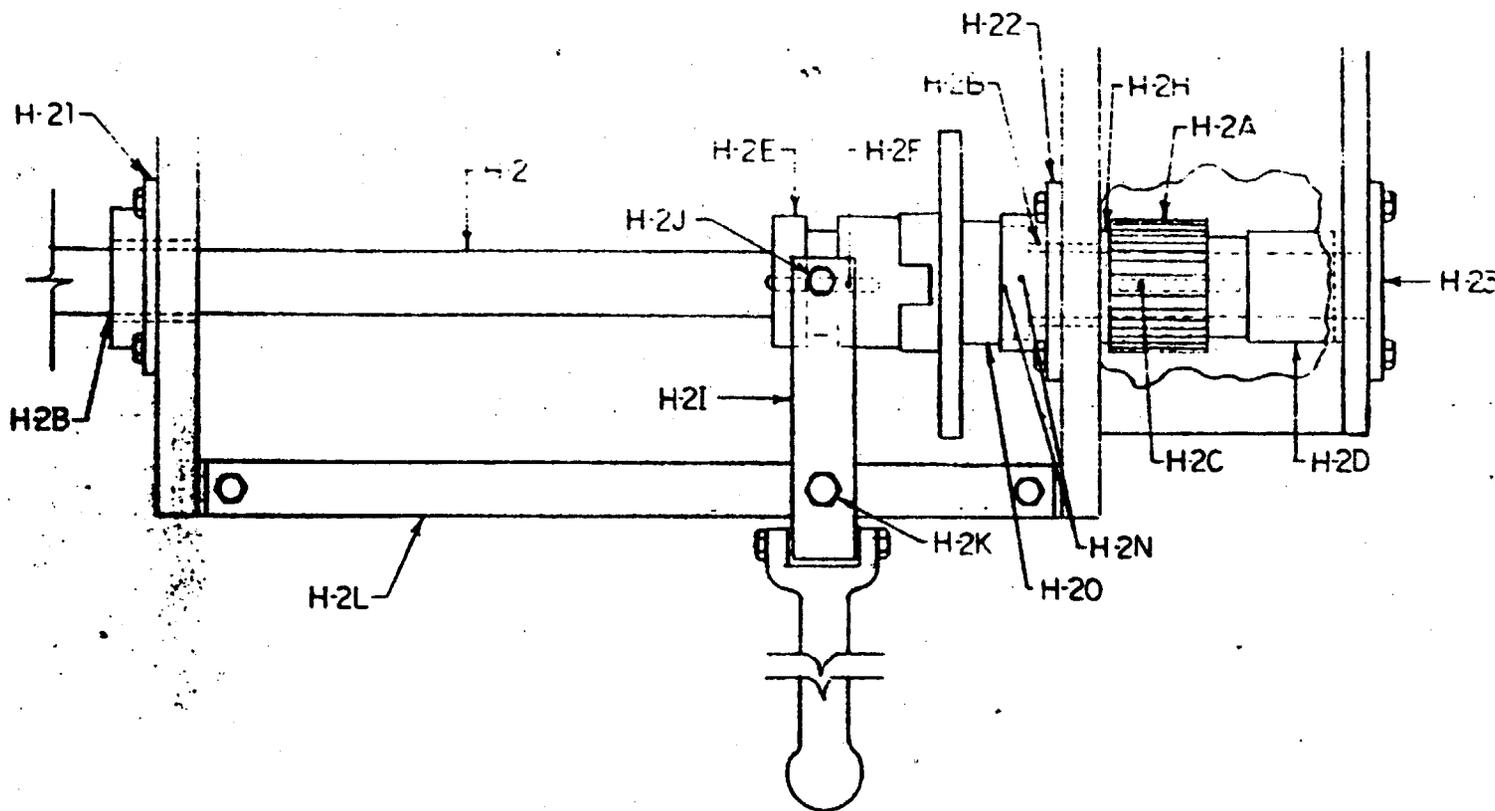
GEAR COVER ASSEMBLY.

M65-10-600I
M65-H-200I
M65-H-450I
M65-H-130I
M65-A-130I
M65-10-450I

W.W. PATTERSON COMPANY
830 BROCKET ST. PGH, PA.

DATE
5-30-80 RCB

DWG. NO. H-51580-9

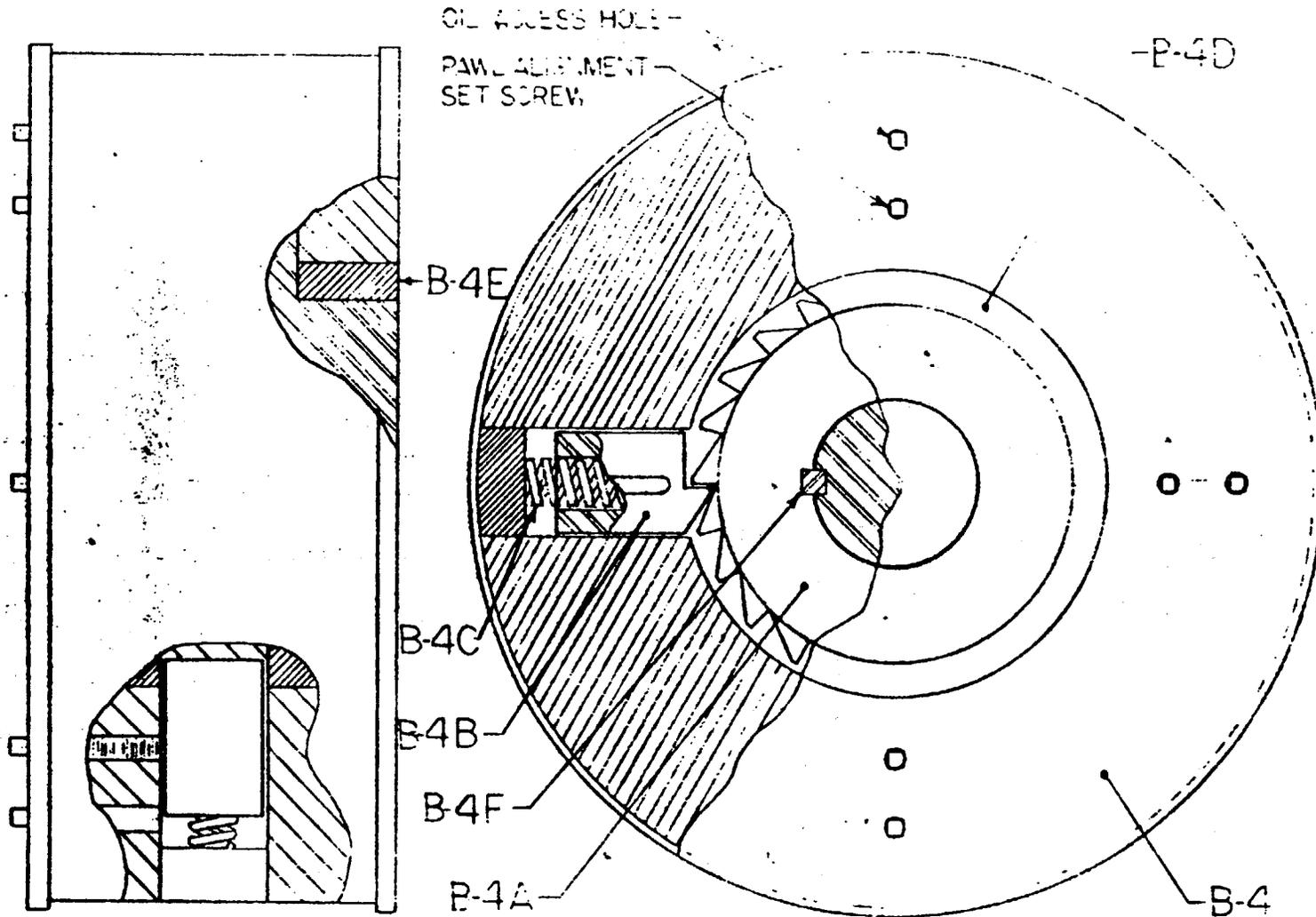


65-10-6001

NO. 1 SHAFT COMPONENTS

W. A. PATTERSON COMPANY 301 VEFSEA RD PITTSBURGH, PA	4-5-84 RCL	DWG. NO 4055
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TYPE 51 BRAKE DRUM COMPONENTS

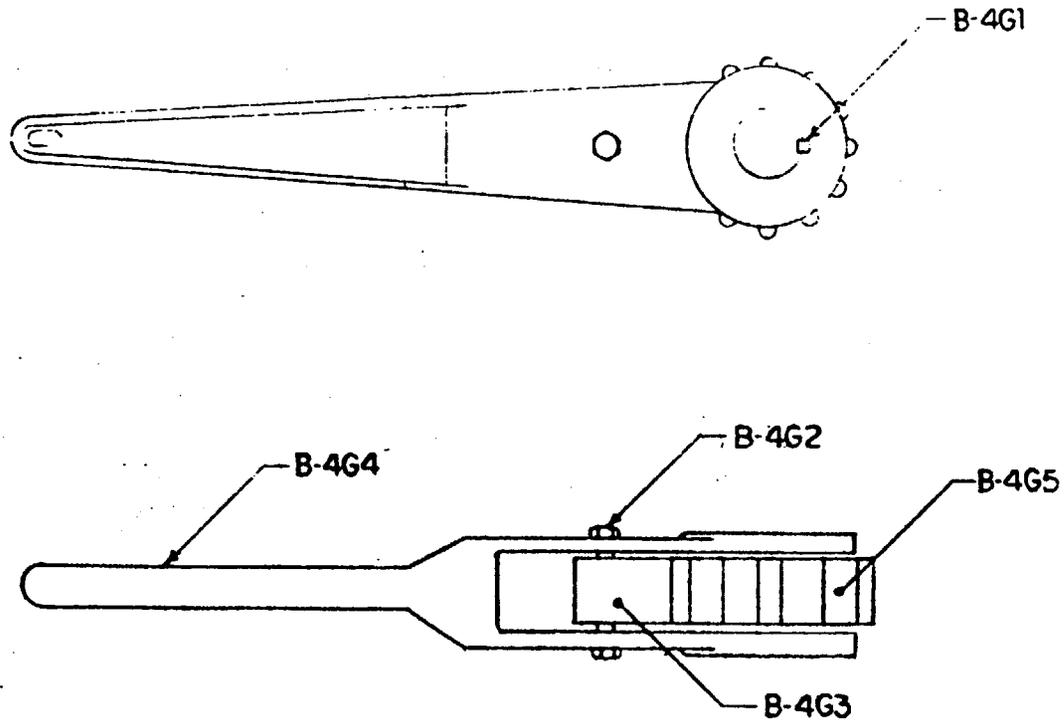


WW PATTERSON COMPANY
230 BROAD ST. P.O. BOX 1, FA.

5-18-80 RCE
9-21-70 MOW

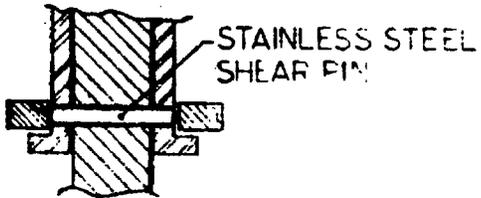
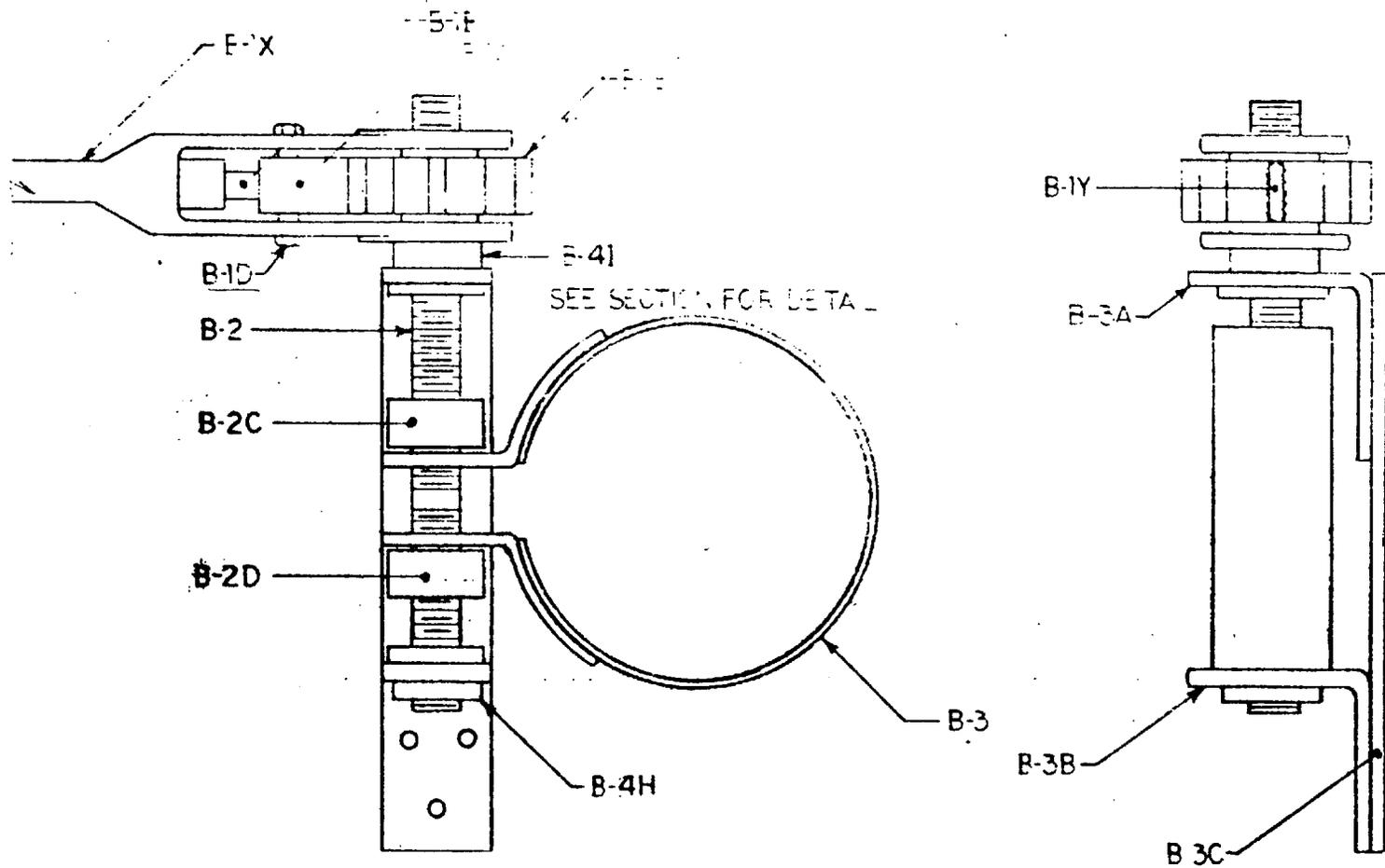
DWG. NO. H-51580-2

TYPE 51 PULL UP PATCHET COMPONENTS



COMPLETE ASSEMBLY B-4G

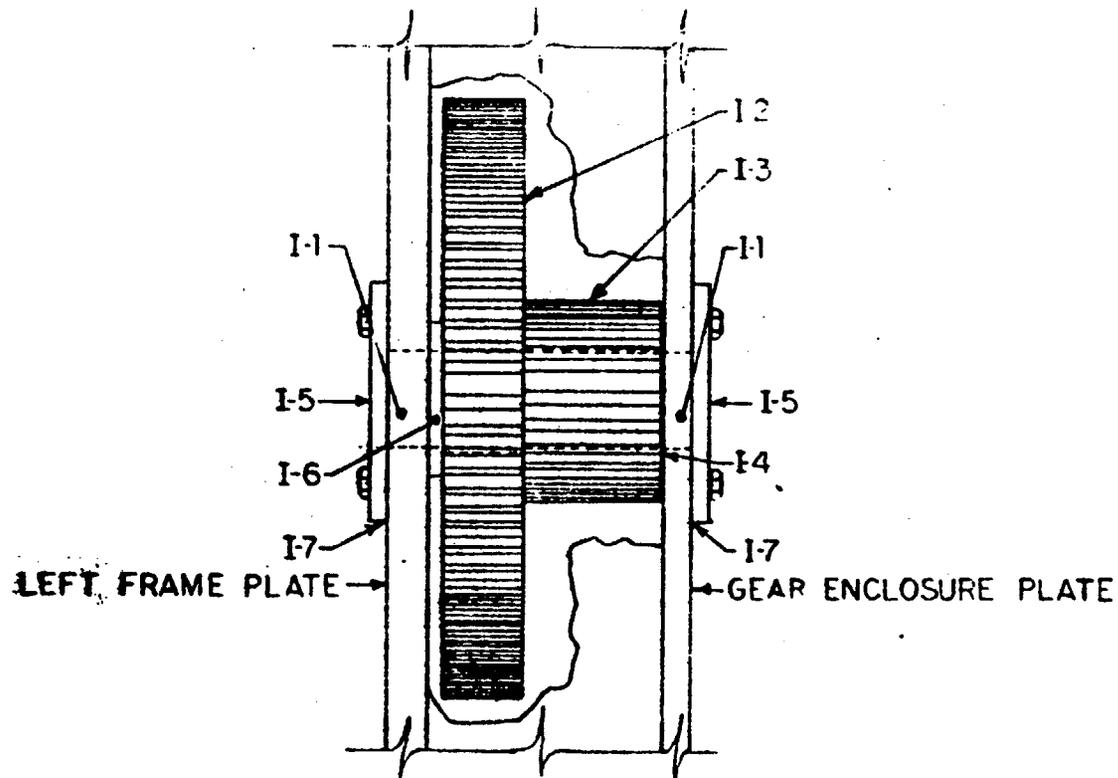
V. W. PATTERSON 830 ERGHE	COMPANY PGH., PA.	5-30-90 RCB 9-21-70 MOW	DWG. NO.	158C
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TYPE 51 BRAKE BAND COMPONENTS

W W PATTERSON COMPANY 830 BROCKET ST. PGH., PA.	5-30-80 RCB	DWG. NO. H-51580-3
	9-21-70 MOW	

TOP FRONT VIEW

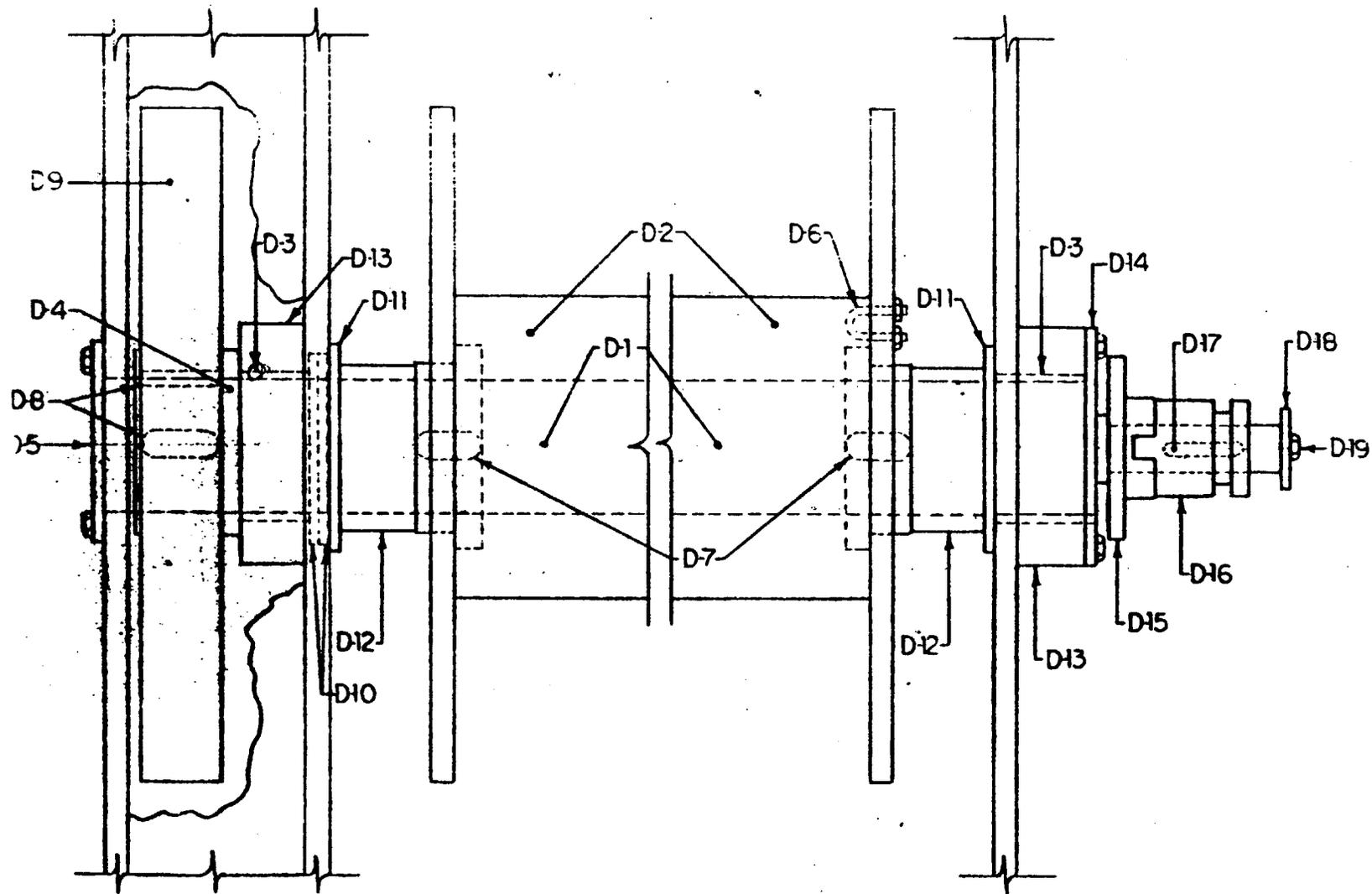


NO. 2 SHAFT COMPONENTS

M65-H-200I
M65-H-450I
M65-H-130I
M65-A-130I
M65-A-450I
M65-A-600I

W.W. PATTERSON COMPANY	DATE	DWG. NO. 158
930 BROCKET PCH, FA.	5-30-80 RCE	

NO. 3 SHAFT COMPONENTS

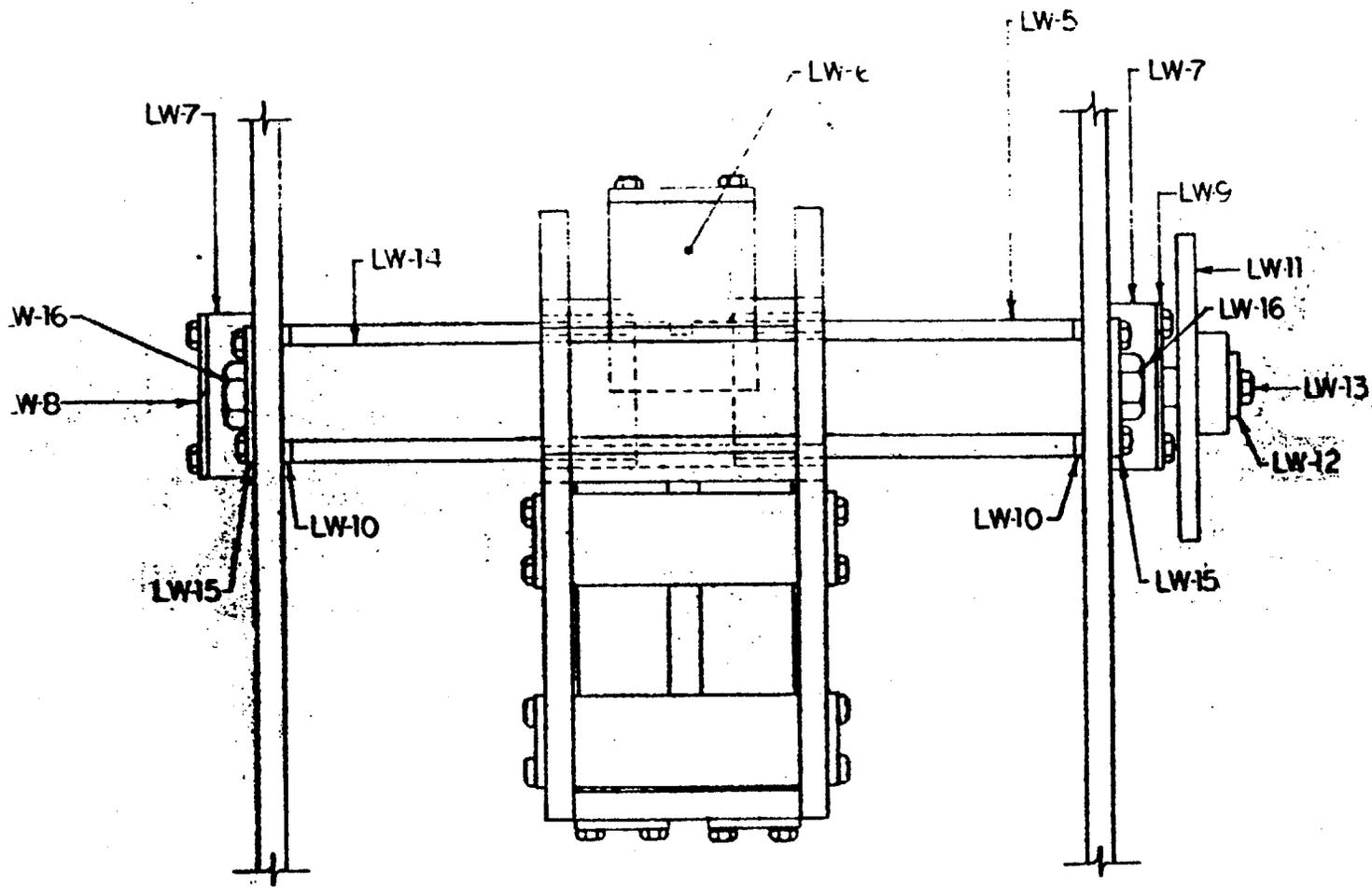


WW PATTERSON COMPANY
 3 RIVERSEA ROAD
 PITTSBURGH PA 15222

4-9-84

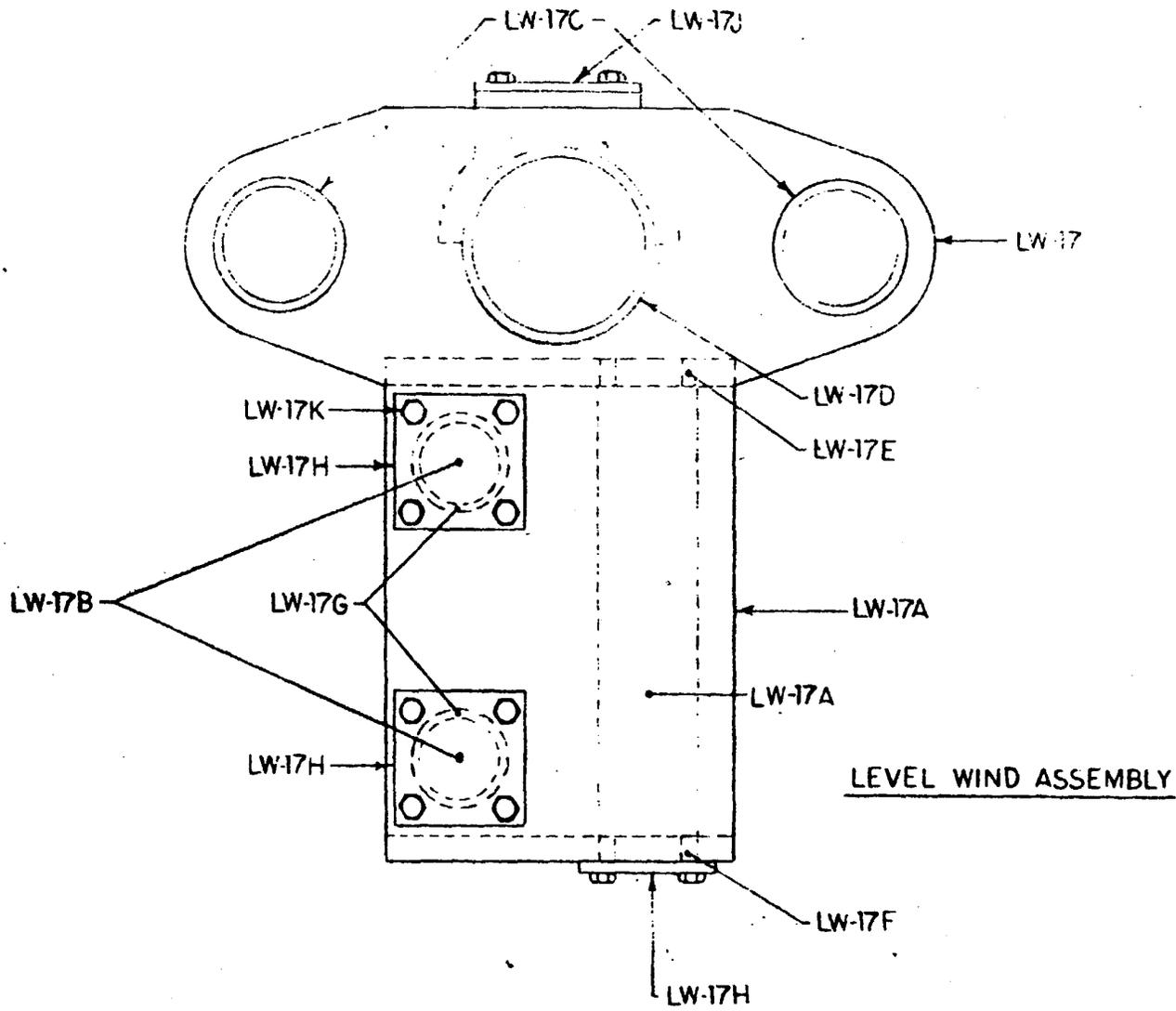
J.C.B.

DWG. NO. W040594-1

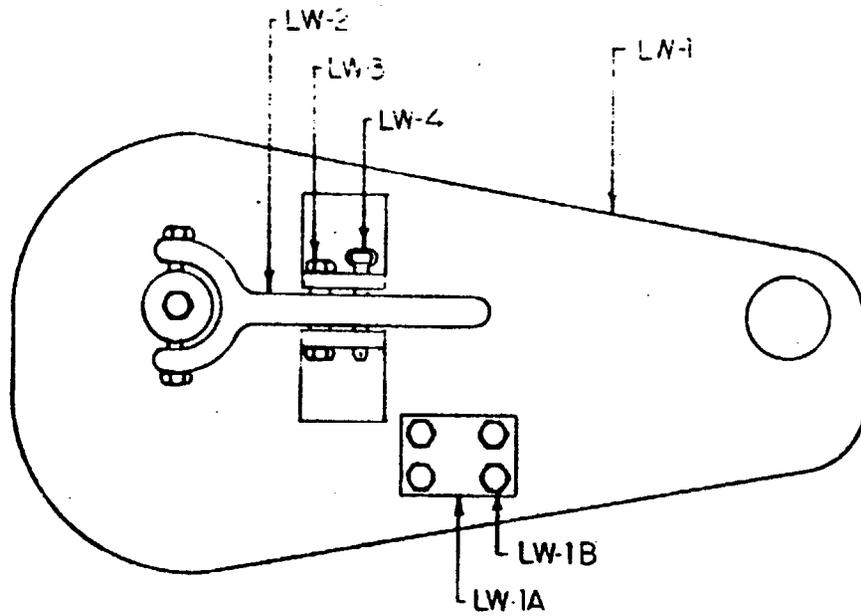


LEVEL WIND ASSEMBLY

WW PATTERSON COMPANY 3 RIVERSEA ROAD PITTSBURGH PA.	3	4-12-84	DWG. NO. W 284-
		R.C.B.	



WW PATTERSON COMPANY 3 RIVERSEA ROAD PITTSBURGH PA. 15233	4-12-84	DWG. NO. W041284-1
	PCB.	



LEVEL WIND ASSEMBLY

WW PATTERSON 3 RIVERSEA RO. PITTSBURGH PA 15	DANY 33	4-12-84 R.C.E.	DWG. NO. W	1284
--	------------	-------------------	------------	------



ELECTRA MOTORS OPERATIONS
Power Transmission Division
Dresser Industries, Inc.
Anaheim, California
(714) 535-6061

**PL - 1b
STANDARD
PRODUCT
PARTS LIST**

HOME OFFICE AND EXPORT SALES

OHIO, WORTHINGTON 43085
400 West Wilson Bridge Road 614/421-3123

U.S. FACILITIES

CALIFORNIA, Anaheim 92801
Electra Motors Operations
1110 North Lemon Street 714/535-6061

CONNECTICUT, Hartford 06102
Whitney Chain Operations
237 Hamilton Street 203/527-8261

ILLINOIS, Downers Grove 60515
Foote-Jones Operations
603 Rogers Street 312/968-5400

ILLINOIS, Chicago 60609
Foote-Jones Operations
5301 South Western Boulevard 312/471-3040

TENNESSEE, Morristown 37814
Jeffrey Chain Operations
2307 Maden Drive 615/586-1951

WAREHOUSE OPERATIONS

CALIFORNIA
27451 Industrial Boulevard
Hayward, California 94545 415/783-4400

GEORGIA
828 Great Southwest Parkway
Atlanta, Georgia 30336 404/349-2912

ILLINOIS
11100 West Belmont Avenue
Franklin Park, Illinois 60131 312/455-8210

OHIO
978 Freeway Drive, North
Columbus, Ohio 43229 614/438-3448
614/438-3449

PENNSYLVANIA
2588 Industry Lane
West Norriton Industrial Park
Norristown, Pennsylvania 19401 215/631-1791

TEXAS
636 Regal Row
Dallas, Texas 75247 214/631-5016

FIELD SALES OFFICES

ALABAMA
4 Office Park Circle, Suite 320
Post Office Box 7407
Birmingham, Alabama 35223 205/870-8660

CALIFORNIA
13353 Alondra Blvd.
Building 1, Suite 208
P.O. Box 3588
Santa Fe Springs, California 90670 213/921-0902
714/761-1684

27451 Industrial Boulevard
Hayward, California 94545 415/783-4400

COLORADO

The Galleria—Suite 1180
720 South Colorado Blvd.
Denver, Colorado 80222 303/758-8151

FLORIDA

410 Ware Boulevard, Suite 718
Tampa, Florida 33619 813/621-7751

GEORGIA

244 Perimeter Center Parkway, N.E.
Suite 380, P.O. Box 888076 (Zip 30938)
Atlanta, Georgia 30346 404/393-4810

ILLINOIS

5725 East River Road
O'Hare Plaza, Suite 325
Chicago, Illinois 60631 312/693-5335

INDIANA

500 Polk Avenue, Suite 19
Greenwood, Indiana 46142 317/882-2205

IOWA

3839 Merle Hay Road, Suite 118
Des Moines, Iowa 50310 515/276-3447
985 Lincoln Road
Georgian Square Office Bldg., Suite 213
Bettendorf, Iowa 52722 319/355-0723

KANSAS

7700 West 63rd Street
Burgundy Building, Room 203
Overland Park, Kansas 66202 913/432-8881

LOUISIANA

4948 Chef-Menteur Hy., Rm. 606
New Orleans, Louisiana 70126 504/943-1800
2620 Centenary Boulevard
Suite 222-A
Shreveport, Louisiana 71104 318/221-4143

MARYLAND

50 Scott Adam Road
Suite 2A2, MacKenzie Building
Cockeysville, Maryland 21030 301/666-9484

MASSACHUSETTS

2 Summer Street
Natick, Massachusetts 01760 617/853-5975

MICHIGAN

One Northfield Plaza
5600 Crooks Road
Troy, Michigan 48098 313/878-7220
1611 West Centre Street
Kalamazoo, Michigan 49002 616/327-5626

MINNESOTA

6971 Washington Avenue, South
Suite 201
Minneapolis, Minnesota 55435 612/941-7744

MISSOURI

3555 Sunset Office Drive
St. Louis, Missouri 63127 314/822-7272
314/822-7273

NEW JERSEY

7 Glenwood Avenue
East Orange, New Jersey 07017 201/675-1696

NORTH CAROLINA

500 East Morehead Street, Room 221
Charlotte, North Carolina 28202 704/375-8600
704/375-8809

OHIO

1313 East Kemper Road
Suite 114
Cincinnati, Ohio 45246 513/671-3777

5755 Granger Road, Suite 710
Cleveland, Ohio 44131 216/749-7203

1395 East Dublin-Granville Road
Suite 404
Columbus, Ohio 43229 614/438-3458

OREGON

1208 S.W. 13th Avenue
Portland, Oregon 97205 503/227-3638

PENNSYLVANIA

2588 Industry Lane
West Norriton Industrial Park
Norristown, Pennsylvania 19401 215/631-1370

1725 Washington Road
St. Clair Building
Pittsburgh, Pennsylvania 15241 412/631-7344

TENNESSEE

5050 Poplar Avenue
White Station Tower, Suite 821-9
Memphis, Tennessee 38157 901/682-5616
901/682-4575

TEXAS

636 Regal Row
Dallas, Texas 75247 214/631-5076

Design Center, Suite 334
3133 Buffalo Speedway
(P.O. Box 1407, Zip 77001)
Houston, Texas 77098 713/961-3401

UTAH

555 South 300, East
Suite 29
Post Office Box 1536
Salt Lake City, Utah 84110 801/322-1144

WASHINGTON

4000 Aurora Avenue, North
Room 109
Seattle, Washington 98103 206/632-1915

WEST VIRGINIA

333 Twelfth Street
Dunbar, West Virginia 25064 304/768-9781

WISCONSIN

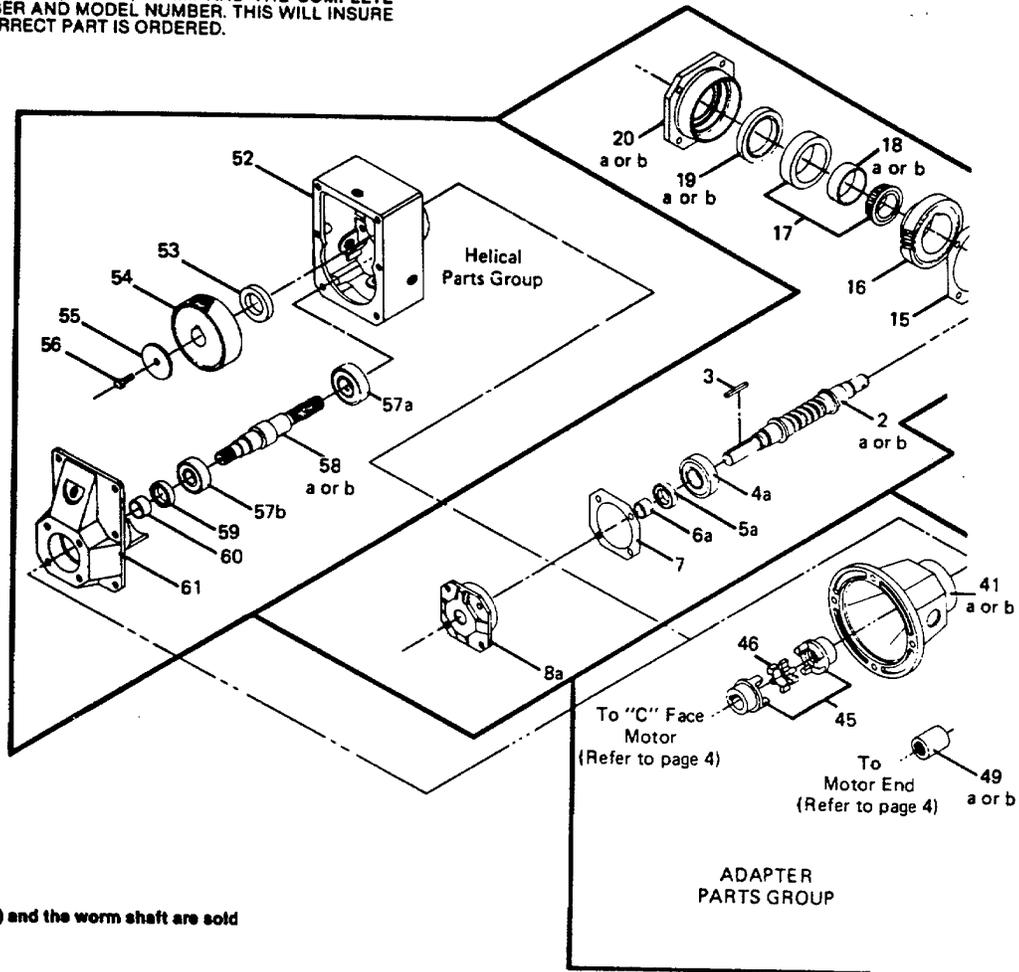
Greenbrook Professional Bldg.
6051 West Brown Deer Rd.
Milwaukee, Wisconsin 53223 414/355-6055
414/355-6056
414/355-6057

CANADIAN SALES OFFICE

ONTARIO, MISSISSAUGA L5N 1P8
6688 Kitimat Road 416/826-8411

CAUTION: WHEN ORDERING PARTS YOU MUST GIVE THE PARTS LIST NUMBER, ITEM NUMBER, PART DESCRIPTION, H.P., PHASE, HERTZ, VOLTS, R.P.M. AND THE COMPLETE FRAME NUMBER AND MODEL NUMBER. THIS WILL INSURE THAT THE CORRECT PART IS ORDERED.

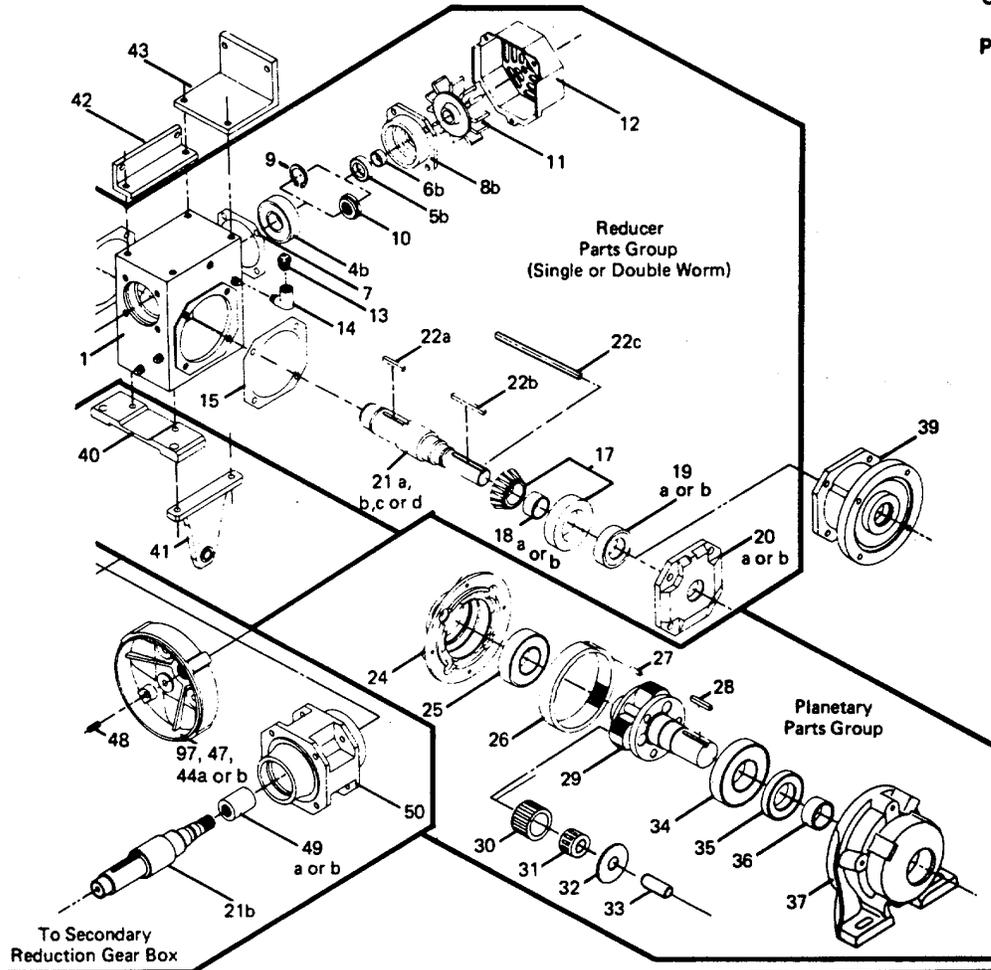
RF EF



The gear (bronze) and the worm shaft are sold as a set only.

Worm Reducer (or gear end for gearmotor) Parts Group (single or double worm)

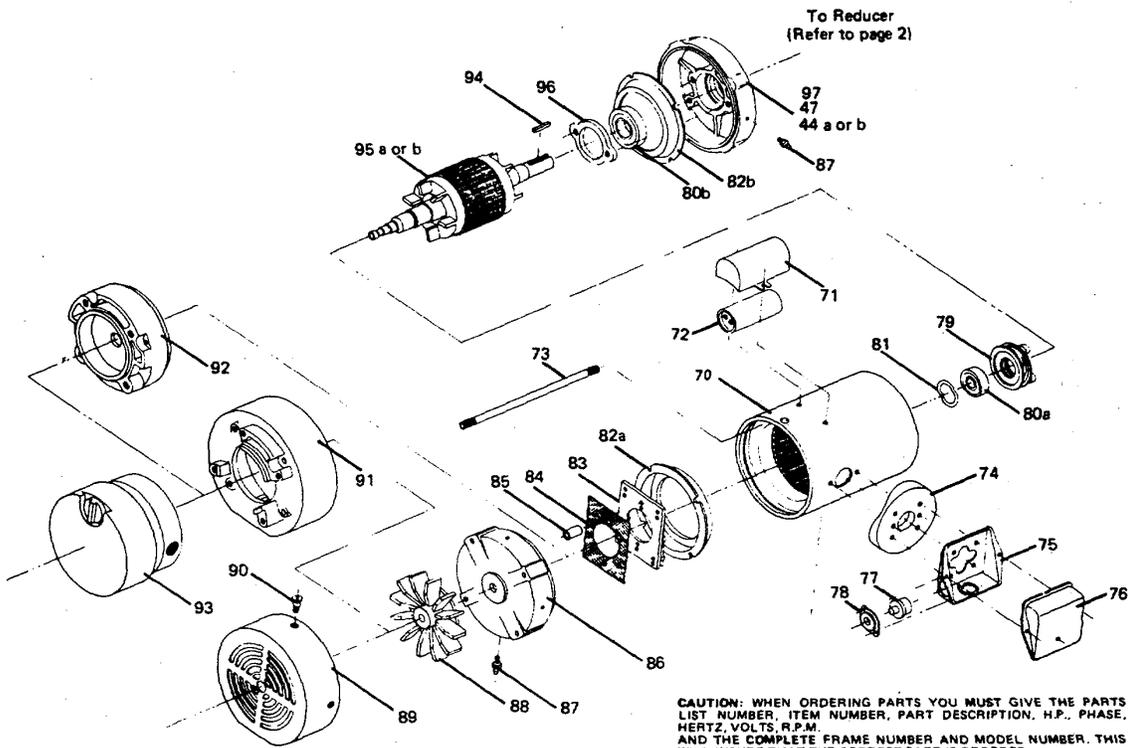
- | | |
|---|---|
| 1 Gear housing | 15 Shim set, output |
| 2a Worm shaft, keyed for reducer only | 16 Gear, bronze, specify gear ratio |
| 2b Worm shaft, splined for gearmotor only (gear end) | 17 Bearing, output, cup and cone set |
| 3 Key, input, worm shaft | 18a Seal sleeve, output- solid |
| 4a Bearing, input, specify as to ball, taper or roller | 18b Seal sleeve, output- hollow |
| 4b Bearing, input, fan end, specify as to ball, taper or roller | 19a Seal, output- solid |
| 5a Seal, input | 19b Seal, output- hollow |
| 5b Seal, input, fan end | 20a Side plate, open |
| 6a Seal sleeve, input | 20b Side plate, closed |
| 6b Seal sleeve, input, fan end | 21a Output shaft, single end, keyed |
| 7 Shim set, input | 21b Output shaft, single end, splined for planetary or double worm, specify |
| 8a Bearing cap, input | 21c Output shaft, standard double end, keyed |
| 8b Bearing cap, input, fan end | 21d Output shaft, hollow, specify as to bore diameter |
| 9 Snap ring | 22a Key, gear |
| 10 Lock nut, 500 and 600 only | 22b Key, output |
| 11 Fan | 22c Key, inside hollow shaft |
| 12 Fan shield | |
| 13 Pressure relief valve | |
| 14 Elbow or bushing | |



Worm Planetary Parts Group	Gear Case Mounting Parts Group	Helical Gear Case Parts Group
24 Planetary adapter 25 Bearing 26 Ring gear 27 Dowel pin, ring gear 28 Key, output shaft 29 Planetary gear shaft assembly 30 Gear, 3 required 31 Needle bearing, 3 required 32 Thrust washer, 6 required 33 Pin, 3 required 34 Bearing, output 35 Seal, output 36 Seal, sleeve 37 Planetary gear housing	39 Ring mount 40 Adaptable base, 2 required 41 Torque arm 42 "B" bracket 43 "JB" bracket <p style="text-align: center;">Adapter Parts Group</p> 44a NEMA "C" flange, specify as to motor frame size 44b NEMA "D" flange, specify as to motor frame size 45 Flexible coupling assembly 46 Rubber insert flex coupling 47 Motor adapter, specify as to motor frame size 48 Roll pin 49a Solid coupling, 17 tooth 49b Solid coupling, 19 tooth 50 Double worm adapter, to secondary gear box. Double worm reducers or gearmotors use the same basic parts in the primary or secondary reduction unit.	52 Gear housing 53 Spacer washer 54 Helical gear, specify gear ratio 55 Retain in washer 56 Retain in bolt 57a Bearing, input 57b Bearing, input 58a Input shaft, pinion gear, keyed 58b Input shaft, pinion gear, splined 59 Seal, input 60 Seal sleeve 61 End plate, helical

All dimensions, designs, prices, and specifications are subject to change without notice.

MOTOR PARTS LIST



All dimensions, designs, prices, and specifications are subject to change without notice.

MOTOR PARTS LIST FOR FOOT MOUNTED, FACE MOUNTED OR 1/4 MOTOR END (GEARMOTOR) (SINGLE PHASE OR THREE PHASE)

70	Wound stator assembly (specify as to with or without feet)	85	Spacer, stationary switch
71	Cover, capacitor	86	End cap, fan end, opposite drive end
72	Capacitor	87	Grease fitting (not std., only spl. units)
73	Stud, motor	88	Fan
74	Mounting pad, terminal box	89	Fan shroud
75	Terminal box	90	Shoulder screw
76	Terminal box cover	91	Brake mount for T.E.F.C.
77	Klixon T.M.	92	Brake mount of T.E.N.V.
78	Klixon retainer	93	Brake, specify as to torque, NEMA design, Volts, Hz.
79	Rotary switch	94	Key, rotor
80a	Bearing, fan end	95a	Rotor, Shaft assembly, keyed output
80b	Bearing, output end	95b	Rotor, Shaft assembly, splined output
81	Spring washer	96	Bearing retainer
82a	Air baffle, fan end	97, or 47 or 44a or 44b:	End Cap, output end, must specify as to type and size, etc.
82b	Air baffle, output end		
83	Stationary switch		
84	Insulation, stationary switch		



Dresser Industries, Inc.

**ELECTRA MOTORS
WARRANTY & REPAIR CENTERS**

West Coast Service Center
1110 North Lemon Street
Anaheim, California 92701
714 535 6061
MW 221 7778 (National) or
800-221-6677 (California)
TWX 910 501 1661

East Coast Service Center
2500 Industry Lane
West Newton Industrial Park
North Stover, Pennsylvania 19403
215-631-5365

WAREHOUSE OPERATIONS

California
27451 Industrial Blvd.
Hayward, California 94541
415-783 4400

1110 N. Lemon Street
Anaheim, California 92701
714 535 6061
800-221 7778 (National) or
800-221 6677 (California)
TWX 910 501 1661

Pennsylvania
2500 Industry Lane
West Newton Industrial Park
North Stover, Pennsylvania 19403
215 631 5365

Texas
1102 Quaker
Quaker Building II
Dallas, Texas 75207
214-634 2864

**U.S. FACILITIES
California**

Electra Motors Operations
1110 North Lemon Street
Anaheim, California 92701
714 535 6061
MW 221 7778 (National) or
800-221 6677 (California)
TWX 910 501 1661



**ATTENTION
KEEP WITH UNIT**

EM-2-6

LUBRICATION and MAINTENANCE MANUAL

LUBRICATION and MAINTENANCE MANUAL for Worm, Worm Planetary, Helical worm, single or double reduction Gearmotor or Gear Reducer.

WARNING

Improper installation or operation of the gear/motor may cause injury to personnel or gear/motor failure. Read all of the operating instructions. Motor must be installed and grounded per local and national electrical codes. To reduce potential of electrical shock, disconnect all power sources before initiating any maintenance or repairs. Keep fingers and foreign objects away from ventilation and other openings. Keep air passages clear. Motor lead wires must be connected per the wire diagram contained in the conduit box.

A. INSTALLATION

1. GENERAL

The Reducer or Gearmotor should be mounted on a flat surface on the machine or foundation, securely bolted down and accurately aligned. Shims under the mounting base should be used when required to provide a level mounting surface.

2. SOLID SHAFT MOUNTING

The input shaft should be connected to the load by flexible coupling, sprocket and chain, sheave and V-Belt or pinion. Check to insure proper alignment and tension of all loads. If sprocket, sheave or pinion is used, mount as close to gear housing as possible to minimize bearing load and shaft deflection. Overhung load must be checked to make certain it does not exceed published capacity.

3. HOLLOW SHAFT MOUNTING

The torque arm of the shaft-mounted worm gear/motors must not be mounted too rigidly. If the torque arm is held down without any flexibility, shaft eccentricity, which is usually present, can seriously overload the bearings of the gearmotor. The flexible grommet provided with all torque arms must be retained, or some other suitable means provided to allow the torque arm to be mounted with some flexibility. The torque arm should be in tension (Based on direction of rotation, not compression).

B. RUN-IN PERIOD

- The maximum efficiency of Electra Gear/motors is obtained after a "Run-in" period. The length of time required will depend on the load applied and will be two to four hours at rated load and considerably longer at light loads. Overloading will not decrease the "Run-in" time but may cause severe wear. During "Run-in" higher than normal motor currents, higher than normal temperature and lower efficiency and output torque can be expected.

C. LUBRICATION

CAUTION

All Electra WORM REDUCERS are shipped without oil - FILL BEFORE OPERATING or if storing for more than 6 months.

All Electra WORM GEARMOTORS are filled (except 400, 500, & 600) at the factory and shipped with the proper amount of oil, a non-toxic rust inhibiting worm gear oil (AGMA No. 7 compound) suitable for an ambient temperature of 50°F to 100°F.

- Worm Gear Reducer oil must be used to obtain satisfactory gear and worm operating life. Select the proper type of oil from the recommended lubricant chart depending on expected ambient temperature.
 - For Ambient temperatures below 15°F or above 100°F, refer to Factory for recommendations.
 - Worm Gear Reducer oils and compounds in accordance with AGMA specifications are commercially available from all major oil companies. Before placing in operation, make certain that the solid plugs located in the highest position on the gear housing are replaced with the vented breather plug supplied with the unit. If the mounting position is changed from the position ordered consult the oil level and mounting positions chart to obtain proper oil level.
- Drain and refill oil after first 100 hours of operation. Under normal operating conditions change oil every 2,000 hours of operation or every 6 months thereafter, whichever occurs first. The maximum input HP rating as shown in the published Rating Tables is based on a stabilized oil bath temperature not exceeding 200°F for normal ambients. Higher oil bath temperatures or continued operation in excess of rated input HP will tend to shorten the useful life of a lubricant. For high ambient temperatures in excess of 100°F, special lubricants or derating of the Gearmotor may be required. Consult the Factory or Local Office with complete application data.

D. MAINTENANCE

- This gear reducer was accurately adjusted and tested at the factory. Care must be taken when the gearcase is disassembled and reassembled. This should be done by an authorized service station as damage to internal parts may result if adjusted improperly. Frequent oil level inspection with the unit not running (preferably when warm) should be made by removing the proper oil level plug to see that the oil level is being maintained. If low (without replacing oil level plug) add lubricant through one of the upper openings until it comes out of the oil level hole.

E. SERVICE FACTOR

CAUTION

- Load conditions must be within the published catalog ratings and the recommended AGMA and NEMA service factors should be used.

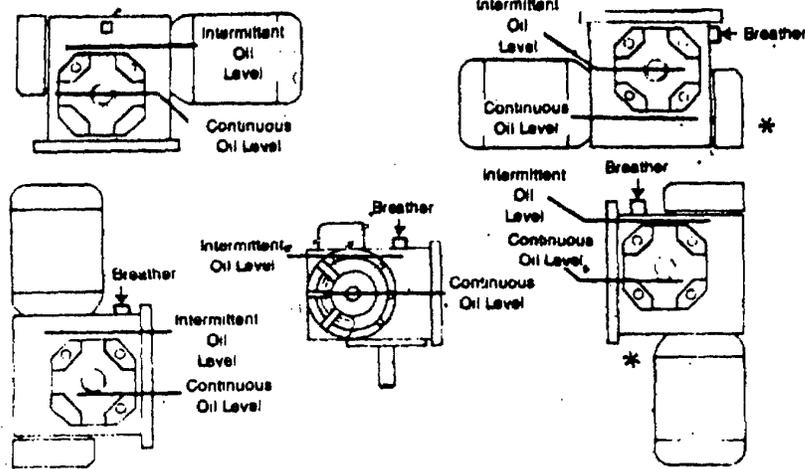
F. LONG TERM STORAGE (6 MONTHS OR MORE)

- Units should be stored indoors, in a dry, warm location
- Completely fill the unit with oil.
- Rotate the input shaft so that the output shaft rotates at least one revolution per month.
- Completely cover the input and output shaft with grease
- At time of start up, drain the storage oil, install the breather, and fill to the proper oil level (see page 4) with the correct lubricant for the operating condition.

G. WARRANTY (Limited)

- The warranty will cover all of the parts in an Electra gearmotor or reducer unit for 12 months from the date of shipment.
- The warranty is only for Electra parts and labor. In no event shall our liability exceed the original price of the unit, nor does it cover cost of on site repair, installation, or freight.
- Contact the service department for a complete explanation as to the full warranty policies and conditions of sale.

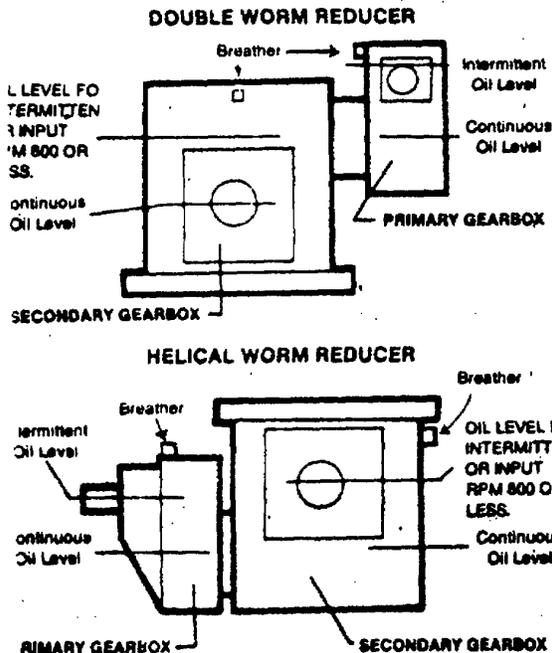
All dimensions, designs, and specifications are subject to change without notice.



CAUTION

The mounting positions shown are for single reduction. If you have a DOUBLE reduction unit, you MUST apply each mounting configuration to the primary and secondary gearbox as EACH gearbox has its own SEPARATE oil reservoir.
 Note: For worm planetary mounted "Output shaft up," consult the factory for proper oil level.

*This position is not recommended as the high speed oil seal must support the full head of gearcase oil. Consult the factory for mounting positions other than those shown above.
 For LOW SPEED applications (input RPM 800 or less) use an intermittent oil level.
 For CONTINUOUS DUTY applications, use a continuous oil level.
 For INTERMITTENT or CONTINUOUS - EXTREME load duty applications, we recommend filling to 85% level and using a 7 EP lubricant such as Shell Omala No. J-460 or equal.



CAUTION: Each gearbox of a Double reduction unit must be filled separately to its proper oil level, depending on its particular assembly and mounting position. For low speed applications (800 RPM or less) use intermittent oil level.
NOTE: On double reduction, generally the secondary gearbox is filled to the high oil level.

RECOMMENDED LUBRICANTS (FOR WORM GEARS)			
MANUFACTURER	LUBRICANT NAME	AMBIENT TEMPERATURE RANGE	A.G.M.A. RATING
Gully Refining Co.	Veedol Aeroskute 98	+100 to +160°F	6 EP
Gully Refining Co.	Veedol Aeroskute 98	+ 50 to +105°F	7 EP
Gully Refining Co.	Veedol Aeroskute 80	+ 40 to +100°F	6 EP
Gully Refining Co.	Veedol Aeroskute 66	+ 25 to + 80°F	5 EP
Lubrication Eng. Inc.	Almasol 808	+ 45 to +125°F	8
Lubrication Eng. Inc.	Almasol 808	+ 32 to +105°F	7
Lubrication Eng. Inc.	Almasol 807	+ 15 to + 70°F	5
Mobil Oil Corp.	Mobilgear 634	+ 50 to +110°F	8 EP
Mobil Oil Corp.	Mobil Extra Fleck Super	+ 50 to +125°F	8
Mobil Oil Corp.	Mobil Cylinder 600W	+ 32 to +100°F	7
Mobil Oil Corp.	Mobilgear 630	+ 25 to + 75°F	5 EP
Shell Oil Co.	Omala J-460	+ 40 to +115°F	7 EP
Shell Oil Co.	Velvet J-460	+ 40 to +105°F	7
Tesaco Inc.	Merops 660	+ 45 to +120°F	6 EP
Tesaco Inc.	Merops 460	+ 32 to +100°F	7 EP
Tesaco Inc.	Merops 220	+ 15 to + 75°F	5 EP
SPECIAL BROAD TEMPERATURE RANGE LUBRICANTS			
Electra Motors, Dresser	Electra Lube	+ 15 to +125°F	---
Kendall	3-Shu	10 to +100°F	7
Mobil Oil Co.	Mobil SHC 634	5 to +135°F	7 EP
Mobil Oil Co.	Mobil SHC 626	25 to +100°F	6 EP
Mobil Oil Co.	Mobil SHC 626	+ 40 to + 60°F	3 EP
SPECIAL COLD DUTY LUBRICANTS			
Conoco	Peter Bull 800	- 40 to + 10°F	---
Lubrication Eng. Inc.	Almasol 808	- 10 to + 40°F	3 EP
Mobil Oil Co.	Mobil SHC 634	- 65 to 5°F	---
Mobil Oil Co.	Gargoyle Arctic Oil "C"	- 30 to + 5°F	---
Mobil Oil Co.	Mobilgear 627	- 10 to + 40°F	3 EP
Shell Oil Co.	Donal A.T.F. T-6	- 55 to + 5°F	7

For Helical Gear Lube use A.G.M.A. 2 thru A.G.M.A. 5 grades

1. Ambient temperature range is based upon 1.0 service factor
2. Above lube are compounded for use in gear cases. Some contain anti-oxidative extreme pressure additives. DO NOT USE lube that contain sulfur and/or chlorine which are corrosive to bronze gears. Extreme pressure lube, in some cases, contain materials that are toxic. Avoid use of these lube where they can result in harmful effects. If in doubt, consult your local lube supplier.
3. Only use A.G.M.A. rated worm gear lube, except for helical pre-lubes.

Stearns® spring-set disc brakes

Installation and service instructions

87,000, 87,100, 87,200, 87,400 & 87,600

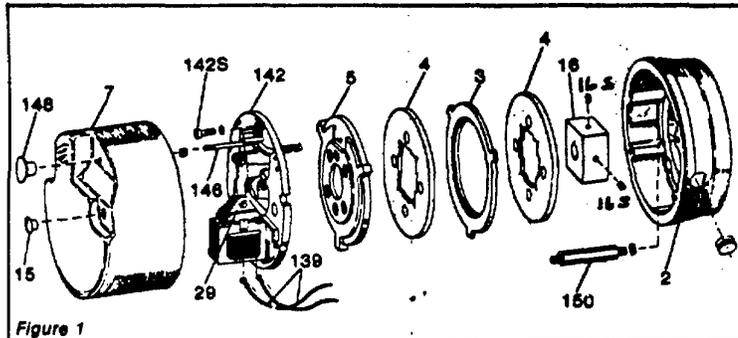


Figure 1

Important

Please read these instructions carefully before installing, operating, or servicing your Stearns brake. Failure to comply with these instructions could cause injury to personnel or damage to property if the brake is installed or operated incorrectly.

Caution

1. Installation must be made in compliance with all local safety codes including Occupational Safety and Health Act (OSHA). All wiring and electrical connections must comply with the National Electric Code (NEC) and local electric codes in effect.
2. Do not install the brake in atmospheres containing explosive gases or dusts.
3. To prevent an electrical hazard, disconnect power source before working on the brake. If power disconnect point is out of sight, lock disconnect in the off position and tag to prevent accidental application of power.
4. Make certain power source conforms to the requirements specified on the brake nameplate.
5. Be careful when touching the exterior of an operating brake. Allow sufficient time for brake to cool before disassembly. Surfaces may be hot enough to be painful or cause injury.
6. Do not operate brake with housing removed. All moving parts should be guarded.
7. Installation and maintenance should be performed only by qualified personnel familiar with the construction and operation of the brake.
8. For proper performance and operation only genuine Stearns parts should be used for repairs and replacements.
9. Most Stearns worn brake friction discs

contain burnt asbestos and degraded resin dust. Dust from the friction disc accumulates on the brake internal parts and in the housing. This dust must be removed before servicing or adjusting the brake.

DO NOT BLOW OFF DUST using an air hose. It is important to avoid dispersing dust into the air or inhaling it, as this may be dangerous to your health.

- a. Wear a filtered mask or a respirator while removing dust from the inside of a brake.
- b. Use a vacuum cleaner or a soft brush to remove dust from the brake. When brushing, avoid causing the dust to become airborne. Collect the dust in a container, such as a bag, which can be sealed off.

General description

The 87,X00 series is a spring set, electrically released disc brake for controlled stopping and holding of a load. It is self-adjusting for friction disc wear and mounts directly to a NEMA "C" face motor with 8 1/4" (AK) register and a 7 1/4" (AJ) bolt circle. The nominal static torque is factory pre-set and should not be altered.

Operating principle

The 87,X00 series brake utilizes one, two or three rotating friction discs driven by a hub which is mounted on the motor shaft. The solenoid air gap is factory set, and normally requires no resetting even when changing friction discs. A wrap spring clutch permits the solenoid air gap to be adjusted automatically to compensate for friction disc wear or normal expansion.

When brake is wired into motor circuit, starting the motor will energize the solenoid and compress the pressure spring. This action removes the force against the disc pack components and allows the friction discs to rotate freely. De-energizing the

motor de-energizes the solenoid and restores pressure spring force against the disc pack, thereby stopping and holding the load.

When the motor is off and the load is to be moved without energizing the motor, the manual release lever or rod should be used. This removes the holding torque from the motor shaft, allowing it to be rotated by hand, however drag may be noted. The brake will remain in the manual release position until the release lever or rod is returned manually to its set position, or until the brake is re-energized electrically and the release lever or rod returns to its set position automatically.

Note: The motor should not be run with the brake in the manual release position to avoid overheating of friction disc.

I. Installation procedure - 87,000, 87,400 and 87,600 (Covers 87,100 except endplate (2) mounts to 10 1/2" AK diameter register) (See figure 1)

- A. Remove manual release knob (148) (on pull type), housing nuts (15) and housing (7). Housings equipped with optional side manual release do not have release knob.
- B. Depress solenoid plunger (29) and pull release rod (146) back to lock brake mechanism in manual release position. Tie plunger (29) to frame (79) when manual release rod (146) is not provided.
- C. Remove entire support plate assembly (142) by evenly unscrewing screws (142S). Remove screws and lock washers (142W).
- D. Remove pressure plate (5), friction disc (4), and stationary disc (3).
- E. Attach endplate (2) to NEMA "C" face of motor using four 1/2-13 socket head cap screws (not supplied) torque per manufacturer's specifications. (Head of cap screws must not project above friction surface.) If foot mounted, secure foot mounting bracket to foundation. The use of dowels to insure permanent alignment is recommended. Foot, machine or "C" face mounted brakes must be carefully aligned within .004" on concentricity and face runout. Shaft runout should be within .002" T.I.R. Maximum permissible shaft endfloat is .020".

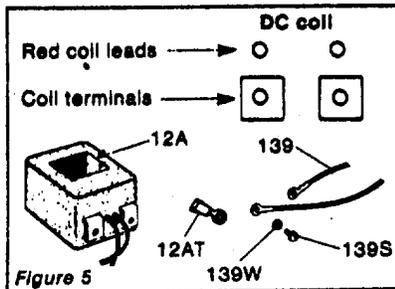
Note 1: Brakes with a single friction disc do not have stationary discs. Vertically mounted brakes will have special pins which hold spacer springs and, in some cases, spring washers. Note color coded sequence of springs and location of washers, if used, or refer to instruction sheet number 301.3 for proper assembly of vertical mounting components.

Note 2: If motor is to be ceiling mounted after assembly, entire brake will have to be rotated 180° or "upside down" so it will

1. All Stearns DC coils are single voltage and have dual windings. A high current pull-in winding is initially energized to start solenoid plunger movement, while a low current holding winding is momentarily short circuited via a normally closed switch mounted on solenoid frame. When the solenoid plunger is almost seated, an actuator arm, welded to it, opens the switch, removes the short circuit from the holding winding, and connects it in series with the pull-in winding. Due to the high initial current demand of a DC solenoid, a separate DC power source of adequate current capacity is usually required.

Caution! Never use a series resistor to drop power supply voltage to solenoid coil as brake malfunction will result!

2. All DC brake coils have two terminals and two lead wires, as shown in figure 5. Connect DC power source to terminals. The two coil leads are preconnected to a DC switch on the solenoid at factory.



IV. General maintenance - all models

Warning! Any mechanism or load held in position by the brake should be secured to prevent possible injury to personnel or damage to equipment before any disassembly of the brake is attempted or the manual release knob or lever is operated on the brake. Observe all cautions listed at the beginning of this manual.

Note: Replacement part kits for many items are available and contain retrofit instructions.

A. Coil replacement - all models

All standard NEMA AC voltage coils are available in kits. Select coil kit from appropriate replacement parts list for the particular brake series being serviced.

All standard NEMA DC voltage coils are available in assemblies and may also be obtained from appropriate parts list.

B. Friction disc replacement - all models

Note: Replace friction disc in single disc brakes when wear surface area is one half the original disc thickness. In multiple disc brakes, replace all friction discs when throat of lever arm (17) is within 1/16" of touching teeth of pinion (32).

1. Replacement friction discs for use with either square or splined brake hubs are available in kits. Select applicable kit from appropriate parts list for the brake being serviced.

bonded friction linings (part number 5-18-7001-00) for use with splined hub obtain required quantity. Then proceed as follows:

- a. Observe cautions and warnings preceding *Installation procedure*, section I. Follow step A, then disconnect solenoid lead wires.
- b. Continue with steps B through D and steps G through J. Be sure to reconnect coil leads before replacing housing (7).

C. Other standard replacement parts

The standard 87,000 and 87,200 series brakes use replacement part kits or components depending on the items involved. Consult appropriate parts list for material needed.

Note: The 87,400 maritime series and 87,600 Navy brakes as well as the 87,000 marine duty brakes, though similar in construction to the standard 87,000 series commercial brakes, utilize special materials such as brass, bronze, ductile iron, etc. To obtain correct replacement parts for the series 87,000 marine duty or the series 87,400 and 87,600 brakes, obtain brake serial number and consult factory.

D. Self-adjust maintenance (See figure 6)

Since the self-adjust brake automatically adjusts itself for friction disc wear, maintenance is held to a minimum. The solenoid is factory set with a 3/4" to 15/16" air gap, and requires no resetting, even when changing friction discs. The gap is determined by the position of wrap spring stop (76). Due to wear-in of parts the normal operating gap is 11/16" to 1". Should this change, follow the steps listed below:

1. If (stop) screws (76S) had been loosened and retightened, the air gap may require resetting. The gap is measured between mating surfaces of plunger (29) and solenoid frame (79), and may be increased by raising slightly, wrap spring stop (76). Be sure to retighten (stop) screws (76S). Manually lift plunger to maximum travel and release. Depress plunger, manually or

Repeat several times, then recheck air gap. (For vertically mounted brakes refer to note 3 in section I of *Installation procedure*.)

2. Tang of wrap spring (71) must be below, and must make contact with, wrap spring stop (76) when solenoid lever (28) is manually raised. If stop is bent outward, allowing tang to bypass it, rebend to square position, assemble correctly, and reset solenoid air gap as described in paragraph 1.

3. Should air gap disappear, oil or other lubricant may have been applied to solenoid lever and pinion assembly (8). Remove support plate assembly (142). Loosen pressure spring nut (19) until pressure spring (11) is free. Remove cotter pin (8P) from solenoid lever (28) and retaining ring (131R) from pivot pin (131). Note location of spacer washer (138) if used, and push pivot pin out to free affected assembly. Remove retaining ring (32R) from pinion (32) and disassemble. Parts should be thoroughly cleaned in a clean solvent that does not leave a film M.E.K. or equivalent. Dry all parts thoroughly and reassemble. Be sure that wrap spring (71) is tight against side face of solenoid lever (28), and that end of last turn touches (without preload) spiral pin (28P), which should protrude out of solenoid lever for width of this turn. Do not retighten cap screw (19) until support plate assembly is mounted on endplate. Refer to steps H and I of *Installation procedure* to complete assembly.

4. Check condition and positioning of pinion (32) and rack (part of lever arm assembly, 17). Replace parts as necessary with complete assemblies. See following sections.

E. Solenoid lever & pinion assembly replacement - all models except 87,600

If pinion (32) teeth are worn, replace entire assembly (8). Consult appropriate parts list for kit number. Check sector gear of lever arm (17) for wear.

Lever arm replacement - 87,000, 87,100 and 87,200 only.

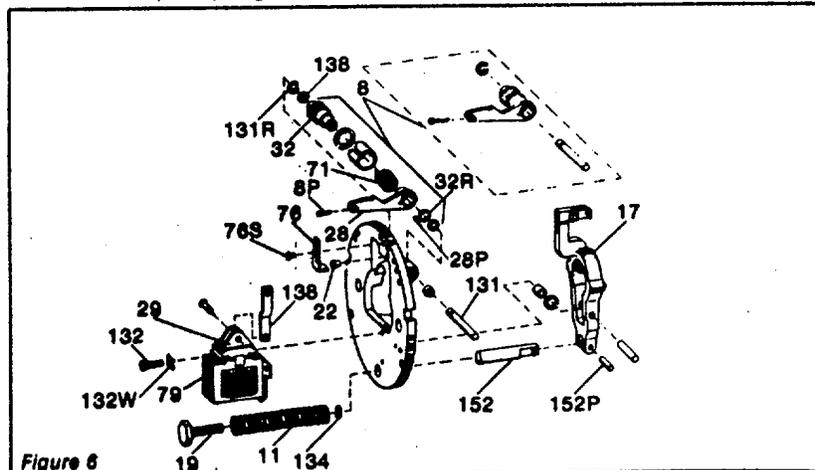


Figure 6

Replace entire lever arm assembly available as a kit from appropriate repair parts list. Also check pinion (32) teeth for wear. See Item 8. Do not attempt to use this aluminum lever arm with series 87,400 (maritime) and series 87,600 (Navy) brakes.

Pressure spring stud and nut replacement - series 87,000, 87,100, 87,200 & 87,400

On older designs of above brakes, item (152) was a threaded shoulder stud, item (152P) was a solid pin. These items have been replaced by a spring tube, cap screw and spring pin. Replacement of any individual component requires replacement of all three older style components. Consult appropriate repair parts list for complete retrofit kit. The 87,600 (Navy) brake uses the pressure spring stud and nut arrangement. Consult appropriate master plan drawing for piece part numbers.

V. Troubleshooting - general

A. If brake does not stop properly or overheats, check the following:

1. Is manual release engaged, and is motor energized?
2. Friction discs may be excessively worn, charred or broken.
3. Hub may have become loose and shifted on shaft.
4. Is hub clean and do friction discs slide freely?
5. Are controls which govern start of braking cycles operating properly?
6. Are limit switches, electric eyes, etc. functioning properly?
7. On vertically mounted brakes, are springs in place in disc pack? See sheet 301.3.
8. If brake is floor mounted, check alignment. See section I, step E.
9. Pressure spring may be improperly assembled or broken.
10. Is solenoid air gap adjusted correctly? (See *Self-adjust maintenance*, Section IV, item D.
11. Check linkage for binding. The approximate pressure applied to the top of the solenoid link to move plunger is:

#5 coil	3 lbs
#6 coil (15 lb-ft)	6-1/2 lbs
#6 coil (25 lb-ft)	9 lbs
#8 coil	16 lbs

If excessive force is required, determine cause of binding and correct. Do not overlook bent, worn or broken plunger guides as a possible cause for binding.

12. Solenoid lever stop (22) must be in place on support plate.

releasing the brake. Check voltage at the coil and compare to the coil and/or nameplate voltage rating.

14. Whether brake is AC or DC a voltage drop may be occurring. If excessive drop in voltage is noted, check wire size of power source. Correct as needed.

Note: A method to check voltage at coil is to insert a block of wood of the approximate thickness of the solenoid air gap between the solenoid frame and plunger. (The block will prevent brake from releasing when coil is energized.) Connect voltmeter leads at the coil terminals or lead wires. Energize coil. Voltmeter needle will not fluctuate and reading can be taken. Reading should be taken immediately and the coil de-energized to prevent overheating of the coil. Compare voltage reading with coil rating.

15. If brake is DC solenoid style, check switch actuation and condition of coil. The switch should open with the following approximate air gap. (This is plunger travel remaining before plunger seats to frame.) Solenoid size is used for reference:

#5 or 6 solenoid	3/16" to 7/32"
#8 solenoid	7/32" to 1/4"

If actuating arm is bent, replace plunger. Check switch contacts. If pitted, replace switch.

16. Check slots of endplate for wear at the areas where stationary discs are in contact. Grooves in the slots can cause hang-up or even breakage of ears of stationary discs. If grooving is noted, replace endplate.
17. Check that heads of mounting bolts do not extend above wear surface of endplate.
18. On vertical brakes with cast iron endplates, check the vertical mounting pins to be sure shoulder of pin is flush with wear surface of endplate. Be sure pins are straight and the pressure plate and stationary disc(s) are free to slide on the pins. Be sure springs and spacers are installed in proper order. See sheet 301.3.
19. Check pressure spring length to insure correct compressed height. Original spring lengths are given in the following table so that correct setting may be verified and corrected if necessary. With worn friction discs, add amount of wear to spring length shown.

Torque (lb-ft)	Spring length
10	3-17/32"
15	3-9/16"
25	3-3/8"
35	3-3/8"
50	3-3/8"
75	3-3/8"
105	3-3/8"

rusting has occurred on brake. Check power source to heater to be sure it is operating and that heater is not burned out.

21. If stopping time is more than two seconds (rule of thumb) and/or the application is more than five stops per minute, check thermal requirements of load versus thermal rating of brake

B. If brake hums, solenoid pulls in slowly, or coil burns out, check the following:

1. Voltage supply at coil versus coil rating.
2. Is solenoid air gap excessive? (See *Self-adjust maintenance*.)
3. Shading coils may be broken.
4. Plunger guides may be excessively worn. Does solenoid plunger rub on solenoid frame laminations? If so, replace plunger guides.
5. Solenoid frame and plunger may be excessively worn.
6. Is solenoid dirty?
7. Solenoid mounting screws may have become loose, causing frame to shift and plunger to seat improperly.
8. Sector gear and pinion teeth may be jamming due to excessive tooth wear.
9. Excessive voltage drop when motor starts. Check size of lead wires for motor starting current and solenoid inrush current. See section V-A, item 11, 12, 14 and 15.

C. If brake is noisy during stopping:

1. Check mounting face runout, mounting rubber eccentricity and shaft runout. See *Installation procedure* section I, step E. Correct as required.
2. Check for signs of the outside diameter of the friction disc(s) rubbing on the inside diameter of the endplate. This would indicate brake is eccentric with respect to the motor shaft and/or the shaft is deflecting during a stop. Check alignment and shaft diameter. Also check for worn motor bearings. If realignment does not correct the problem, a larger diameter shaft may be required. Shaft deflection may also be caused by excessive overhang of brake from motor bearing. Additional shaft support may be required.
3. In cases where motor shaft extends through a fan casing or guard, the clearance hole may not be adequate. Rubbing of the shaft may occur causing a noise during a stop. If required, enlarge clearance hole.
4. Check for bad motor bearings. Replace if necessary. Check for excessive shaft endfloat. Correct as required.

Stearns® spring-set disc brakes

Parts list for 87,000 and 87,100 series

Information required when ordering replacement parts:

- Give part number of parts or kits needed, brake model number, and brake serial number. The brake model and serial number may identify special brakes not covered by this parts list.
- When ordering hubs, specify shaft diameter (hub bore) and keyway.
- Enclosures are designated as follows:
 O = Standard
 E = Dust-tight, waterproof (DTWP)
- For 87,100 series see table 4.

For installation and service instructions see sheet 300.6. Detailed service instruction sheet is included with each kit.

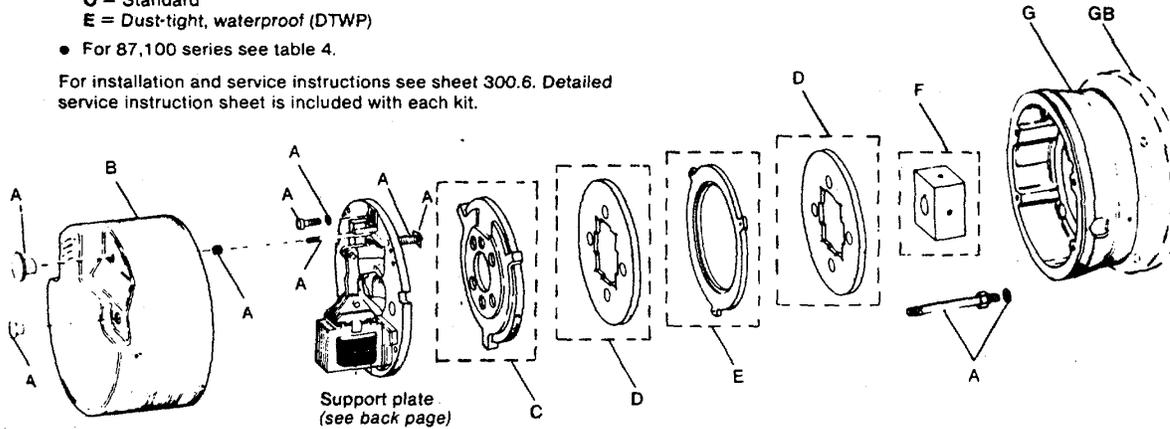
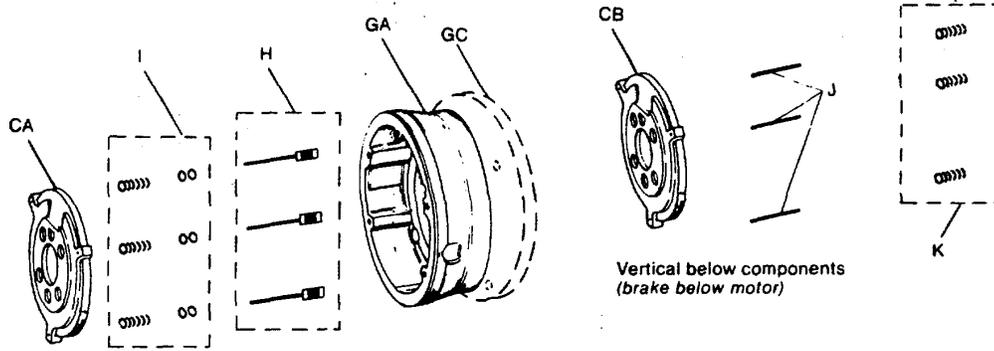


Table 1

Torque (lb-ft)	10		15		25		35		50		75		105	
Current	AC	DC	AC	DC										
Enclosure	O	E	O	E	O	E	O	E	O	E	O	E	O	E
Brake model number ▶														
1-087-011-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-012-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-015-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-016-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-021-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-022-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-025-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-026-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-031-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-032-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-035-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-036-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-041-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-042-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-045-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-046-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-051-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-052-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-055-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-056-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-061-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-062-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-065-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-066-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-081-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-082-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-085-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-086-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-087-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-088-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-089-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-087-090-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 1
 Components of standard AC or DC brake

Item	Description	Part number														
A	Hardware kit	5-66-1007-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
B	Housing and grommet assembly	5-07-7010-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Housing and seal assembly	5-07-7012-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Gasket and seal kit	5-66-1271-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Pipe plug (drain)	9-33-0325-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
C	Pressure plate kit	5-66-8571-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
D	Friction disc kit - standard	5-66-8472-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
E	Stationary disc kit	5-66-8372-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
F	Hub and set screw assembly (1-disc brake)	5-16-7101-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Hub and set screw assembly (2-disc brake)	5-16-7103-00								1	1	1	1	1	1	
	Hub and set screw assembly (3-disc brake)	5-16-7105-00											1	1	1	
	Hub and set screw assembly (1-disc brake)	5-16-7102-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Hub and set screw assembly (2-disc brake)	5-16-7104-00								1	1	1	1	1	1	
	Hub and set screw assembly (3-disc brake)	5-16-7106-00											1	1	1	
G	Endplate	5-02-7001-01	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Endplate	5-02-7002-01												1	1	
	Endplate	5-02-7003-01													1	
	Endplate and oil seal assembly	5-22-7001-00	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Endplate and oil seal assembly	5-22-7003-00												1	1	
	Endplate and oil seal assembly	5-22-7005-00													1	



Vertical above components
(brake above motor)

Vertical below components
(brake below motor)

Table 2

Torque (lb-ft)	10		15		25		35		50		75		105	
	AC	DC	AC	DC										
Enclosure	O	E	O	E	O	E	O	E	O	E	O	E	O	E
Brake model number	▶													
1-087-011-00														
1-087-012-00														
1-087-016-00														
1-087-021-00														
1-087-022-00														
1-087-025-00														
1-087-028-00														
1-087-031-00														
1-087-035-00														
1-087-036-00														
1-087-041-00														
1-087-042-00														
1-087-045-00														
1-087-046-00														
1-087-051-00														
1-087-052-00														
1-087-055-00														
1-087-056-00														
1-087-061-00														
1-087-062-00														
1-087-065-00														
1-087-066-00														
1-087-081-00														
1-087-082-00														
1-087-086-00														

Table 2

Components for vertical modifications,
brass parts, and splined parts

Item	Description	Part number	1-087-011-00	1-087-012-00	1-087-016-00	1-087-021-00	1-087-022-00	1-087-025-00	1-087-028-00	1-087-031-00	1-087-035-00	1-087-036-00	1-087-041-00	1-087-042-00	1-087-045-00	1-087-046-00	1-087-051-00	1-087-052-00	1-087-055-00	1-087-056-00	1-087-061-00	1-087-062-00	1-087-065-00	1-087-066-00	1-087-081-00	1-087-082-00	1-087-086-00	
Vertical above modification*																												
CA	Pressure plate	8-005-702-04	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
GA	Endplate with pins (aluminum)	5-20-7001-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Endplate with pins (aluminum)	5-20-7002-00															1	1	1	1	1	1	1	1	1	1	1	
	Endplate with pins (aluminum)	5-20-7003-00																										
	Endplate & seal assembly w/pins (cast iron)	5-22-7002-00		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Endplate & seal assembly w/pins (cast iron)	5-22-7004-00																										
	Endplate & seal assembly w/pins (cast iron)	5-22-7006-00																										
H	Vertical above mounting pin kit (1-disc brake with cast iron endplate)	5-66-3371-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Vertical above mounting pin kit (2-disc brake with cast iron endplate)	5-66-3372-00															1	1	1	1	1	1	1	1	1	1	1	
	Vertical above mounting pin kit (3-disc brake with cast iron endplate)	5-66-3373-00																								1	1	1
	Vertical above mounting pins (1-disc brake with aluminum endplate)	8-061-717-01	3	3	3	3	3	3	3	3	3	3	3	3	3													
	Vertical above mounting pins (2-disc brake with aluminum endplate)	8-061-718-01															3	3	3	3	3	3	3	3				
	Vertical above mounting pins (3-disc brake with aluminum endplate)	8-061-719-01																								3	3	3
I	Vertical above spring and spacer kit	5-66-3171-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Housing and side release assembly	5-07-7036-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Support plate and bearing assembly	5-26-7007-05	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Support plate and bearing assembly	5-26-7008-05																										
Vertical below modification* (cast iron or aluminum endplate)																												
CB	Pressure plate - less pins (item J)	8-005-702-05															1	1	1	1	1	1	1	1	1	1	1	
J	Vertical mounting pin	8-061-716-00															3	3	3	3	3	3	3	3	3	3	3	
K	Vertical mounting pin	8-061-716-00																										
	Vertical below spring kit - green	5-66-3172-00															1	1	1	1	1	1	1	1	1	1	1	
	Vertical below spring kit - red	5-66-3173-00																										
Brass parts																												
C	Brass pressure plate (horizontal brake)	8-005-703-01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
E	Brass stationary disc (horizontal brake)	8-003-704-01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
Splined hub and friction disc																												
not shown	Friction disc kit - splined	5-66-8478-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	
not shown	Hub and set screw assembly	5-16-7107-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Hub and set screw assembly	5-16-7108-00															1	1	1	1	1	1	1	1	1	1	1	
not shown	Hub and set screw assembly	5-16-7109-00																										

*See item E (table 1) for stationary disc kit.



Solenoid and coil

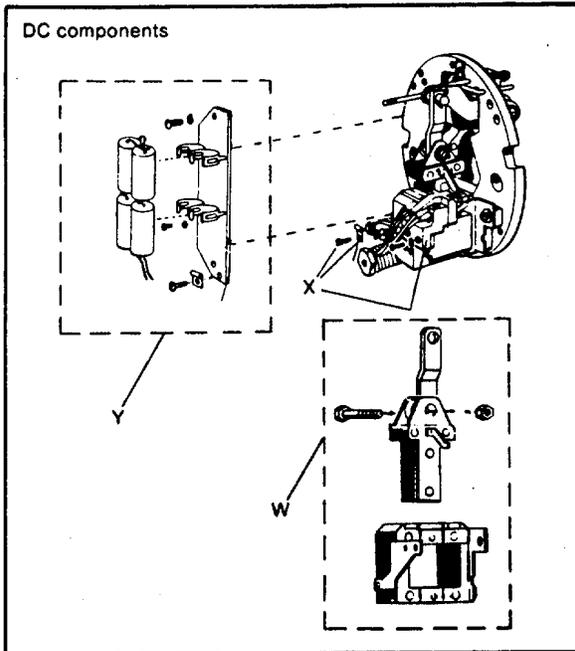
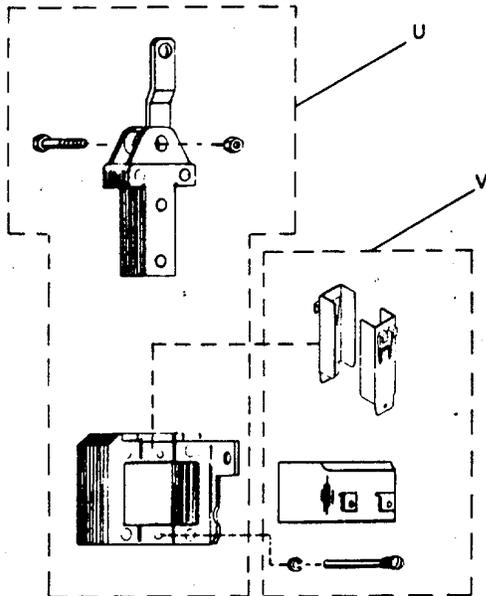


Table 3 Table 3
Components of support plate and coil assembly

Item	Description	Part number	
P*	Support plate and bearing assembly Support plate and bearing assembly	5-26-7007-0 5-26-7008-0	
Q	Solenoid lever and pinion kit	5-66-7371-0	
R	Lever arm kit	5-66-7271-0	
S	Pressure spring tube kit	5-66-7471-0	
T	Pressure spring kit - blue Pressure spring kit - yellow Pressure spring kit - red Pressure spring kit - green	5-66-3071-0 5-66-3073-0 5-66-3075-0 5-66-3077-0	
AC brakes			
U	No. 5 AC solenoid kit No. 6 AC solenoid kit No. 8 AC solenoid kit	5-66-5051-0 5-66-5061-0 5-66-5081-0	
V	No. 5 coil kit 60 Hz	115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6507-0 5-66-6509-0 5-66-6501-0 5-66-6502-0 5-66-6504-0 5-66-6505-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6607-0 5-66-6609-0 5-66-6601-0 5-66-6602-0 5-66-6604-0 5-66-6605-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
V	No. 6 coil kit 60 Hz	115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
V	No. 8 coil kit 60 Hz	115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
		115/230 Vac 230/460 Vac 115 Vac 230 Vac 460 Vac 575 Vac	5-66-6807-0 5-66-6809-0 5-66-6801-0 5-66-6802-0 5-66-6804-0 5-66-6805-0
DC brakes			
W	No. 5 DC solenoid assembly No. 8 DC solenoid assembly No. 8 DC solenoid assembly	5-12-5557-00 5-12-5567-00 5-12-5589-00	
V	No. 5 coil assembly	115 Vdc 230 Vdc	5-96-6516-00 5-96-6517-00
		115 Vdc 230 Vdc	5-96-6616-00 5-96-6617-00
		115 Vdc 230 Vdc	5-96-6816-00 5-96-6817-00
X	DC switch assembly	5-57-5501-00	
Y	Capacitor and mounting plate assembly (no. 5 and 6 solenoid) Capacitor and mounting plate assembly (no. 8 solenoid)	5-57-5706-00 5-57-5708-00	

*Consult factory for price and availability on complete support plate assembly.

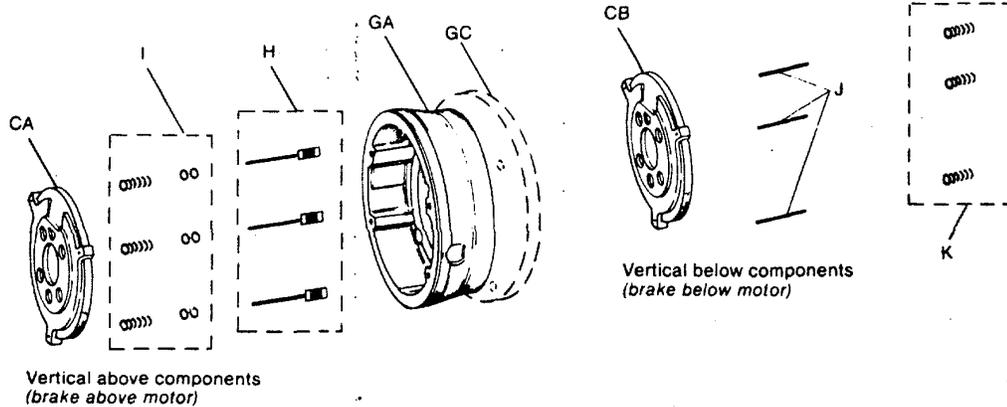
Table 4

For 284UC and 286UC or TC frame NEMA "C" flange

Suffix letter	Item number	Description	Part number
	2	Endplate	8-002-761-01
		Endplate	8-002-762-01
		Endplate and oil seal assembly	5-22-7027-00
		Endplate and oil seal assembly	5-22-7029-00
A	2*	Vertical mounting - above motor	
		Endplate	5-20-7022-00
		Endplate	5-20-7023-00
		Endplate and oil seal assembly	5-22-7028-00
		Endplate and oil seal assembly	5-22-7030-00

*Includes vertical mounting pins.

Note: Brakes with a no. 5 or no. 6 solenoid manufactured before June 17 (B-895488), or with a no. 8 solenoid manufactured before September 13, (B-787975) contained a cast iron support plate (126) and lever arm (17). C components have been changed to die cast aluminum. If either of the cast replaced, both must be replaced. However, in such a case, replacement C assembly (142) is recommended.



Vertical above components
(brake above motor)

Vertical below components
(brake below motor)

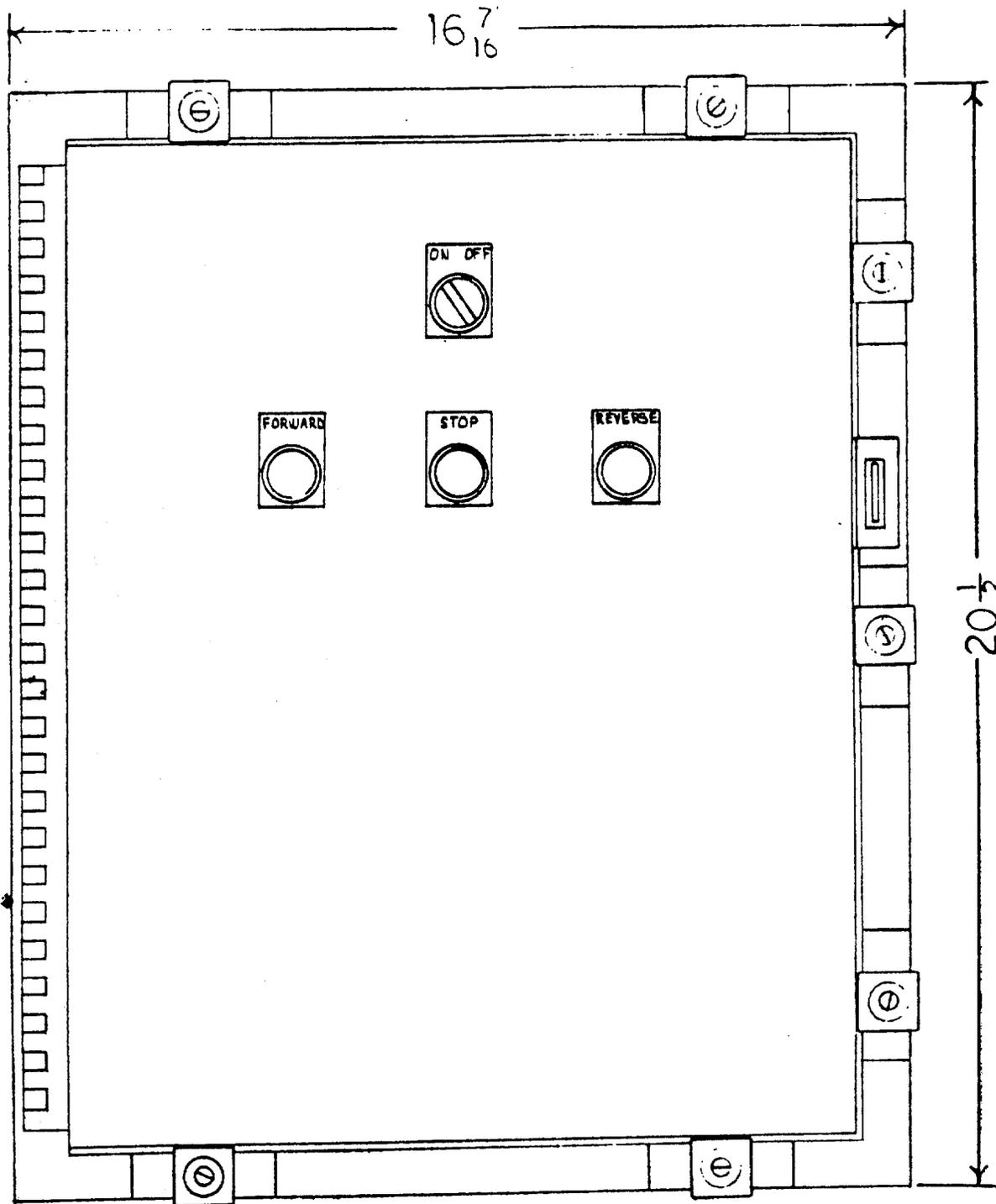
Table 2

Torque (lb-ft)	10		15		25		35		50		75		105														
	AC	DC																									
Enclosure	O	E	O	E	O	E	O	E	O	E	O	E	O	E													
Brake model number	1-087-911-00	1-087-912-00	1-087-915-00	1-087-918-00	1-087-921-00	1-087-922-00	1-087-925-00	1-087-926-00	1-087-931-00	1-087-932-00	1-087-935-00	1-087-936-00	1-087-941-00	1-087-942-00	1-087-945-00	1-087-951-00	1-087-952-00	1-087-955-00	1-087-956-00	1-087-961-00	1-087-962-00	1-087-965-00	1-087-966-00	1-087-981-00	1-087-982-00	1-087-985-00	1-087-986-00

Table 2
Components for vertical modifications,
brass parts, and splined parts

Item	Description	Part number	1-087-911-00	1-087-912-00	1-087-915-00	1-087-918-00	1-087-921-00	1-087-922-00	1-087-925-00	1-087-926-00	1-087-931-00	1-087-932-00	1-087-935-00	1-087-936-00	1-087-941-00	1-087-942-00	1-087-945-00	1-087-951-00	1-087-952-00	1-087-955-00	1-087-956-00	1-087-961-00	1-087-962-00	1-087-965-00	1-087-966-00	1-087-981-00	1-087-982-00	1-087-985-00	1-087-986-00	
Vertical above modification*																														
CA	Pressure plate	8-005-702-04	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
GA	Endplate with pins (aluminum)	5-20-7001-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Endplate with pins (aluminum)	5-20-7002-00																												
	Endplate with pins (aluminum)	5-20-7003-00																												
	Endplate & seal assembly w/pins (cast iron)	5-22-7002-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Endplate & seal assembly w/pins (cast iron)	5-22-7004-00																												
H	Endplate & seal assembly w/pins (cast iron)	5-22-7006-00																												
	Vertical above mounting pin kit (1-disc brake with cast iron endplate)	5-66-3371-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Vertical above mounting pin kit (2-disc brake with cast iron endplate)	5-66-3372-00																	1	1	1	1	1	1	1	1	1	1	1	
	Vertical above mounting pin kit (3-disc brake with cast iron endplate)	5-66-3373-00																												
	Vertical above mounting pins (1-disc brake with aluminum endplate)	8-061-717-01	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3												
I	Vertical above mounting pins (2-disc brake with aluminum endplate)	8-061-718-01																	3	3	3	3	3	3	3	3	3	3	3	
	Vertical above mounting pins (3-disc brake with aluminum endplate)	8-061-719-01																												
	Vertical above spring and spacer kit	5-66-3171-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Housing and side release assembly	5-07-7036-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Support plate and bearing assembly	5-26-7007-05	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Support plate and bearing assembly	5-26-7008-05	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Vertical below modification* (cast iron or aluminum endplate)																														
CB	Pressure plate - less pins (item J)	8-005-702-05																	1	1	1	1	1	1	1	1	1	1	1	
J	Vertical mounting pin	8-061-715-00																	3	3	3	3	3	3	3	3	3	3	3	
K	Vertical mounting pin	8-061-716-00																												
	Vertical below spring kit - green	5-66-3172-00																												
	Vertical below spring kit - red	5-66-3173-00																	1	1	1	1	1	1	1	1	1	1	1	
Brass parts																														
C	Brass pressure plate (horizontal brake)	8-005-703-01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
E	Brass stationary disc (horizontal brake)	8-003-704-01																												
Splined hub and friction disc																														
not shown	Friction disc kit - splined	5-66-8478-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	
not shown	Hub and set screw assembly	5-16-7107-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Hub and set screw assembly	5-16-7108-00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
not shown	Hub and set screw assembly	5-16-7109-00																												

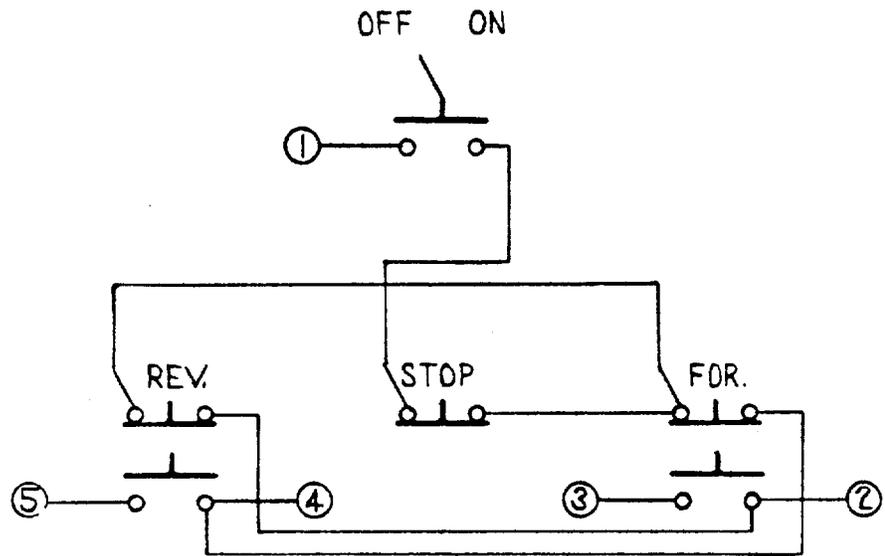
*See item c. (table 1) for stationary disc kit.



CONTROL BUTTON LAYOUT

W. W. PATTERSON CO.
 3 RIVERSEA ROADS
 PITTSBURGH, PA 15233

CARLON BOX ENCLOSURE



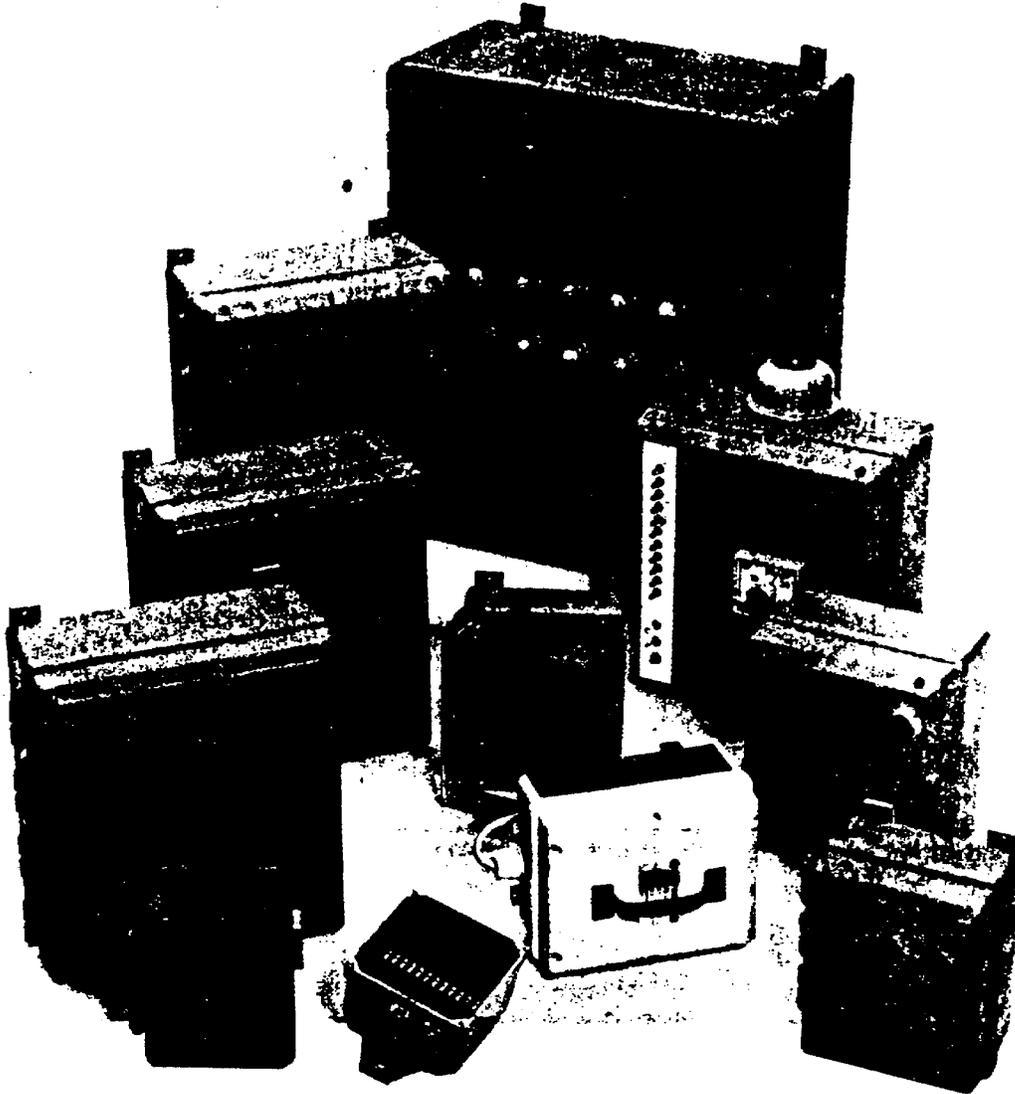
REAR VIEW OF DOOR

W. W. PATTERSON CO.
3 RIVERSEA ROADS
PITTSBURGH, PA 15203

WHY SPECIFY

CARLON CIRCUIT SAFE[®]

NON-METALLIC ELECTRICAL ENCLOSURES?



Carlton's unique foamed thermoplastic electrical enclosures combine mechanical, thermal, and electrical properties with exceptional chemical resistance, to provide an enclosure that's competitively priced with other non-metallic enclosures.

COMPARE...AND YOU BE THE JUDGE!

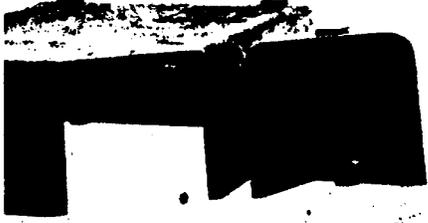
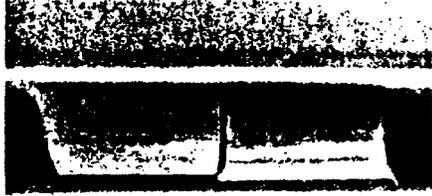


Carlton

Carlton Enclosures out-perform them all...

CARLON CIRCUIT SAFE®

HOFFMAN FIBERGLASS

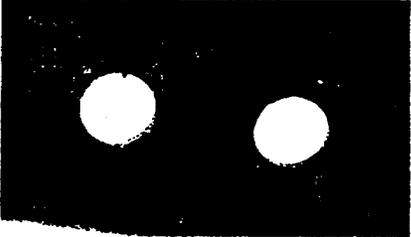
<p>Description</p>	<p>Injection molded from high temperature foamed Noryl.</p> 	<p>Molded and fabricated from fiberglass reinforced resin.</p> 
<p>Dimensions</p>	<p>Inside dimension larger to allow easier component installation.</p>	<p>Smaller than Carlton equal.</p>
<p>Price</p>	<p>Competitive with other non-metallic enclosures but offering larger inside dimensions.</p>	<p>Competitive with other non-metallic enclosures. Smaller inside dimensions than Carlton.</p>
<p>Fabrication Capability</p>	<p>Easy to cut or drill due to consistency of material. Hole saw makes smooth, even holes for watertight connections.</p> 	<p>Difficult to cut or drill smoothly without splintering. Difficult to accomplish watertight entries as a result.</p> 
<p>Internal Condensation</p>	<p>Structural foam Noryl doesn't respond to ambient temperature changes—no internal condensation.</p>	<p>Not equal to Carlton.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Other Features</p>	<p>Hinges</p> <p>Non-metallic, integral part of the mold. Hinge caps make cover captive. Hinge caps allow cover to be disconnected for field adjustments.</p> 	<p>Separate fabricated non-metallic hinges.</p> 
	<p>Wall Mounting</p> <p>Designed with separate mounting feet for proper installation. Mounting feet separate box from wall for cleaning access.</p>	<p>Mounted directly to the wall.</p>
	<p>Clear Cover</p> <p>Available on all JIC sizes—screw or hinged cover.</p>	<p>Available only with fabricated window.</p>
	<p>Fabrication Service</p> <p>Allows complete customization. Available to customer's specification on short notice at competitive prices.</p>	<p>Special order only.</p>

...see for yourself.

**STAYLASTIC
STAHLIN FIBERGLASS**

STAINLESS STEEL

STEEL

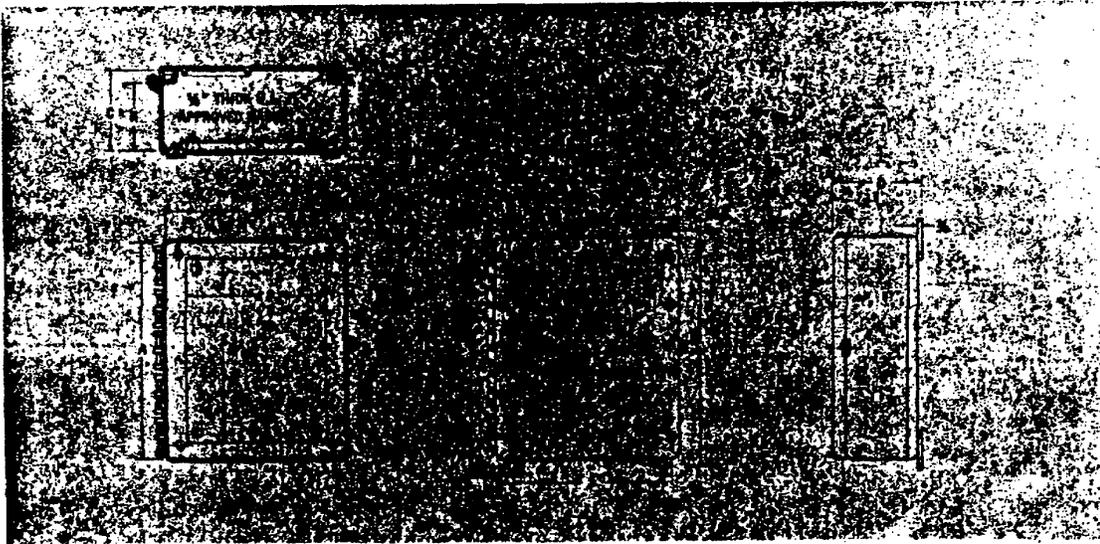
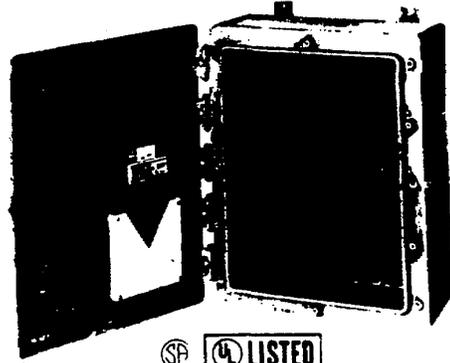
<p>Molded and fabricated from a special polyester material reinforced with fiberglass.</p> 	<p>Fabricated from stainless steel.</p>	<p>Manufactured from steel and painted, galvanized or epoxy coated.</p>
<p>Smaller than Carlton equal</p>	<p>Smaller than Carlton equal or made to order.</p>	<p>Smaller than Carlton equal.</p>
<p>Competitive with other non-metallic enclosures. Smaller inside dimensions than Carlton.</p>	<p>Too costly to be practical in most applications.</p>	<p>Painted enclosures about 25% less than non-metallic, galvanized 16% less, epoxy coated 25-50% more.</p>
<p>Difficult to cut or drill smoothly without splintering. Difficult to accomplish watertight entries as a result.</p> 	<p>Costly to fabricate.</p>	<p>Costly to fabricate.</p>
<p>Not equal to Carlton.</p>	<p>Not equal to Carlton.</p>	<p>Not equal to Carlton.</p>
<p>Separate stainless steel piano hinges. Riveted to enclosure.</p> 	<p>Separate stainless steel spot welded hinges.</p> 	<p>Separate steel spot welded piano hinges.</p>
<p>Mounted directly to the wall.</p>	<p>Mounted directly to the wall.</p>	<p>Mounted directly to the wall.</p>
<p>Available only with fabricated window.</p>	<p>Available only with fabricated window.</p>	<p>Available only with fabricated window.</p>
<p>Special order only.</p>	<p>Special order only.</p>	<p>Special order only.</p>

CIRCUIT SAFE®

NEMA 4-4X SCREW FASTENED ENCLOSURE WITH NON-METALLIC HINGES

UL 508 Listed
for Industrial Control Panels

Structural foam molded thermoplastic material provides high impact strength, chemical resistance, high dielectric strength, excellent weathering capabilities. For indoor/outdoor industrial, MRO, and OEM applications. Hinges are non-metallic and an integral part of the mold. Hinge caps make cover captive, and allow cover to be removed for field adjustments.



Catalog Number	Inside Box Size AxBxC	Box Opening ExF	Panel Part No. and Size Steel/PVC	Mounting LxJ	Overall Outside Incl. Mounting Bracket HxWxD	K	M	N	Cover Insert Size	Number Hinges	Pcs./Package	Weight Lbs./Unit
N2016A4	20x16x7½	13¼x17¼	NP2016/NP2016P 17x13	21¼x10	22x17¼x9½	6¼	6½	1	#10	5	1	13.2
N2016B4	20x16x9½			21¼x10	22x17¼x10½	8¼	8½	1	#10	5	1	14.8
N2016C4	20x16x11½			21¼x10	22x17¼x12½	10¼	10½	1	#10	5	1	15.8
N2420A4	24x20x7½	17¼x20¼	NP2420/NP2420P 21x17	25¼x14	26x21¼x9½	6¼	6½	1	#10	6	1	17.7
N2420B4	24x20x9½			25¼x14	26x21¼x10½	8¼	8½	1	#10	6	1	18.3
N2420C4	24x20x11½			25¼x14	26x21¼x12½	10¼	10½	1	#10	6	1	20.4
N3024A4	30x24x7½	21¼x27¼	NP3024/NP3024P 27x21	31¼x18	32x25¼x9½	6¼	6½	1	#10	8	1	23.0
N3024B4	30x24x9½			31¼x18	32x25¼x10½	8¼	8½	1	#10	8	1	25.2
N3024C4	30x24x11½			31¼x18	32x25¼x12½	10¼	10½	1	#10	8	1	26.5

All above units are supplied with nitrile rubber cellulose fiber gasket, 18-8 stainless steel screws (10-32 / ¼"), metal inserts (hd and panel mounts), external mounting brackets and screws.
Quotations for special fabrication available upon request.

FILE

Full Voltage Non-Reversing — 600 Volt Max.

DESCRIPTION

Three phase, full voltage magnetic starters connect motor directly across the line permitting it to draw inrush current during start up. This type of starter is most commonly used to control polyphase squirrel cage motors. The starters consist of a magnetically actuated contactor to make and break the motor power circuit, and an overload relay to provide running over current protection.

Starters listed in the selection table on the following page are supplied with:

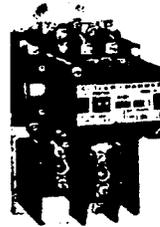
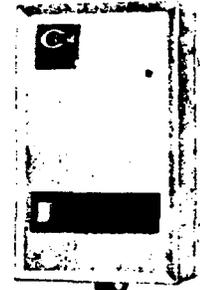
- Reset button in cover. Other cover control options, such as Start-Stop pushbuttons, are available for most listed starters either in Kit form for field installation, or as a factory installed option. For enclosures only, see FILE C799.
- Three coil eutectic alloy overload relay protection. Most listed starters are also available with Bimetal overload relays (manual reset convertible to automatic reset). Both overload relay types provide protection for NEMA Class A and B motors.
- Magnet coil wired for Separate control in starters with magnet coil voltages of 120 volts or lower. For magnet coil voltages over 120 volts, starters are wired for Common control.
- One NO (normally open) holding circuit interlock (auxiliary contact). Open type A10 Size 0 thru 5 starters have an early opening, normally closed auxiliary contact (NCI) for reversing electrical interlock protection—no other contacts should be used for this protection.
- An overload relay auxiliary contact, either NO or NC, can be field installed on all listed starters.

DESIGN CHARACTERISTICS

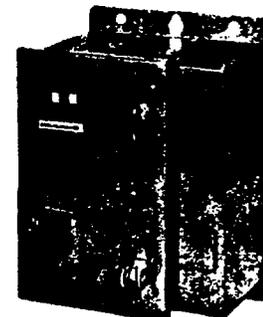
- Screw type power terminals with self-lifting saddle clamps on Size 00, 0 and 1 — solderless lugs on Sizes 2 through 8. Control terminals are self-lifting saddle clamp type.
- Straight through wiring — line lugs at top, load lugs at bottom.
- Plug-in molded epoxy resin magnet coil. Color coded and permanently marked with voltage, frequency and part number (Size 0 - 5).
- Horizontal or vertical three point mounting on upright panel (Size 00 - 5).
- Butt mounting capability — Open type Size 00 - 5 starters can be mounted side by side without extra spacing (Sizes 0 - 5 auxiliary contacts mounted on left side of starter only).
- Heater coil rating adjustable within 6% of full load motor current.

WHEN ORDERING SPECIFY

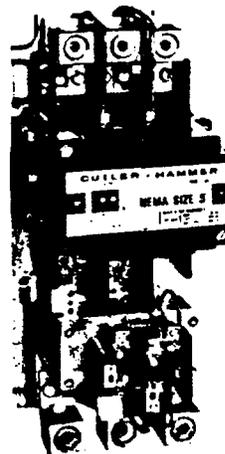
- Catalog Number
- Heater coil number or full load current

Size 1
Open TypeSize 1 NEMA 1 With
Reset Button Only
In Cover

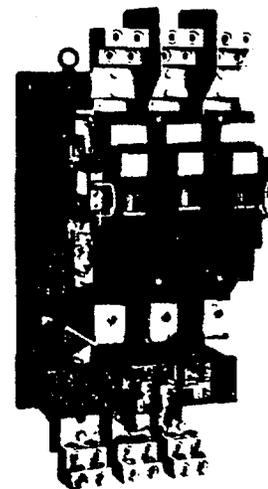
Size 1 NEMA 7C0-9EFG



Size 1, NEMA 3R



Size 5 Open Type



Size 8 Open Type

CUTLER-HAMMER 3 PHASE STARTERS — MAGNETIC

7/15/83

FILE

Full Voltage Non-Reversing — 600 Volt Max.®

RESET ONLY — 3 COIL EUTECTIC ALLOY OVERLOAD RELAY

Motor Volt. ●	Max. HP	Magnet Coil Voltage (60 Hz.)	NEMA Size	OPEN TYPE		NEMA 1 General Purpose		NEMA 3R Rainproof		NEMA 4 Watertight & Dusttight (Stain. Steel Thru Size 5)		NEMA 12 Dusttight Industrial External Reset (NEMA 3 & 3R)●		NEMA 7C-D-9EFG Hazardous Gp	
				Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price
●		120V.													
200 230 460 575	1½ 1½ 2 2	208V. 240V. 480V. 600V.	00	A10ANOAB A10ANOE A10ANOE A10ANOE A10ANOE	\$ 108.	A10AROE A10AROE A10AROE A10AROE A10AROE	\$ 116.								
●		120V.													
200 230 460 575	3 3 5 5	208V. 240V. 480V. 600V.	0	A10BNOA A10BNOE A10BNOE A10BNOE A10BNOE	136.	A10BROA A10BROE A10BROE A10BROE A10BROE	144.	A10BROA A10BROE A10BROE A10BROE A10BROE	\$ 192.	A10BWOA A10BWOE A10BWOE A10BWOE A10BWOE	\$ 284.	A10BDOA A10BDOE A10BDOE A10BDOE A10BDOE	\$ 192.	A10BEOA A10BEOE A10BEOE A10BEOE A10BEOE	\$ 548.
●		120V.													
200 230 460 575	7½ 7½ 10 10	208V. 240V. 480V. 600V.	1	A10CNOA A10CNOE A10CNOE A10CNOE A10CNOE	156.	A10CROA A10CROE A10CROE A10CROE A10CROE	164.	A10CROA A10CROE A10CROE A10CROE A10CROE	212.	A10CWOA A10CWOE A10CWOE A10CWOE A10CWOE	308.	A10CDOA A10CDOE A10CDOE A10CDOE A10CDOE	212.	A10CEOA A10CEOE A10CEOE A10CEOE A10CEOE	572.
●		120V.													
200 230 460 575	10 15 25 25	208V. 240V. 480V. 600V.	2	A10DNOA A10DNOE A10DNOE A10DNOE A10DNOE	284.	A10DROA A10DROE A10DROE A10DROE A10DROE	324.	A10DROA A10DROE A10DROE A10DROE A10DROE	412.	A10DWOA A10DWOE A10DWOE A10DWOE A10DWOE	612.	A10DDOA A10DDOE A10DDOE A10DDOE A10DDOE	412.	A10DEOA A10DEOE A10DEOE A10DEOE A10DEOE	824.
●		120V.													
200 230 460 575	25 30 50 50	208V. 240V. 480V. 600V.	3	A10ENOAB A10ENOE A10ENOE A10ENOE A10ENOE	460.	A10EROE A10EROE A10EROE A10EROE A10EROE	540.	A10EROE A10EROE A10EROE A10EROE A10EROE	644.	A10EWOA A10EWOE A10EWOE A10EWOE A10EWOE	948.	A10EDOA A10EDOE A10EDOE A10EDOE A10EDOE	644.	A10EEOA A10EEOE A10EEOE A10EEOE A10EEOE	1338.
●		120V.													
200 230 460 575	40 50 100 100	208V. 240V. 480V. 600V.	4	A10FNOAB A10FNOE A10FNOE A10FNOE A10FNOE	1052.	A10FROE A10FROE A10FROE A10FROE A10FROE	1220.	A10FROE A10FROE A10FROE A10FROE A10FROE	1564.	A10FWOA A10FWOE A10FWOE A10FWOE A10FWOE	1916.	A10FDOA A10FDOE A10FDOE A10FDOE A10FDOE	1564.	A10FEOA A10FEOE A10FEOE A10FEOE A10FEOE	
●		120V.													
200 230 460 575	75 100 200 200	208V. 240V. 480V. 600V.	6	A10GNOA A10GNOE A10GNOE A10GNOE A10GNOE	2570.	A10GROA A10GROE A10GROE A10GROE A10GROE	2878.	A10GROA A10GROE A10GROE A10GROE A10GROE	3318.	A10GWOA A10GWOE A10GWOE A10GWOE A10GWOE	3758.	A10GDOA A10GD OE A10GD OE A10GD OE A10GD OE	3318.	A10GEOA A10GEOE A10GEOE A10GEOE A10GEOE	5214.
200 230 460 575	150 200 400 400	120V. Sep. Control	6	A10JNDOE A10JNDOE A10JNDOE A10JNDOE A10JNDOE	6110.	A10JROE A10JROE A10JROE A10JROE A10JROE	8110.	A10JROE A10JROE A10JROE A10JROE A10JROE	9190.	A10JWOE A10JWOE A10JWOE A10JWOE A10JWOE	10110.	A10JDOE A10JDOE A10JDOE A10JDOE A10JDOE	9190.	A10JEOE A10JEOE A10JEOE A10JEOE A10JEOE	15302.
200 230 460 575	150 200 400 400	208V. 240V. 480V. 600V.	6	A10JNOE A10JNOE A10JNOE A10JNOE A10JNOE		A10JROE A10JROE A10JROE A10JROE A10JROE		A10JROE A10JROE A10JROE A10JROE A10JROE		A10JWOE A10JWOE A10JWOE A10JWOE A10JWOE		A10JDOE A10JDOE A10JDOE A10JDOE A10JDOE		A10JEOE A10JEOE A10JEOE A10JEOE A10JEOE	
230 460 575	300 600 600	120V. Sep. Control	7	A10KNDDE A10KNDDE A10KNDDE A10KNDDE A10KNDDE	9058.	A10KROE A10KROE A10KROE A10KROE A10KROE	11058.	A10KROE A10KROE A10KROE A10KROE A10KROE	12138.	A10KWOE A10KWOE A10KWOE A10KWOE A10KWOE	13058.	A10KDOE A10KDOE A10KDOE A10KDOE A10KDOE	12138.	A10KEOE A10KEOE A10KEOE A10KEOE A10KEOE	18342.
230 460 575	300 600 600	240V. 480V. 600V.	7	A10KNDE A10KNDE A10KNDE A10KNDE A10KNDE		A10KROE A10KROE A10KROE A10KROE A10KROE		A10KROE A10KROE A10KROE A10KROE A10KROE		A10KWOE A10KWOE A10KWOE A10KWOE A10KWOE		A10KDOE A10KDOE A10KDOE A10KDOE A10KDOE		A10KEOE A10KEOE A10KEOE A10KEOE A10KEOE	
230 460 575	450 900 900	120V. Sep. Control	8	A10LNDDE A10LNDDE A10LNDDE A10LNDDE A10LNDDE	13550.	A10LROE A10LROE A10LROE A10LROE A10LROE	15550.	A10LROE A10LROE A10LROE A10LROE A10LROE	16630.	A10LWOE A10LWOE A10LWOE A10LWOE A10LWOE	17550.	A10LDOE A10LDOE A10LDOE A10LDOE A10LDOE	16630.		
230 460 575	450 900 900	240V. 480V. 600V.	8	A10LNDE A10LNDE A10LNDE A10LNDE A10LNDE		A10LROE A10LROE A10LROE A10LROE A10LROE		A10LROE A10LROE A10LROE A10LROE A10LROE		A10LWOE A10LWOE A10LWOE A10LWOE A10LWOE		A10LDOE A10LDOE A10LDOE A10LDOE A10LDOE			

Prices of starters do not include heater coils. Select 3 coils at \$6.00 per coil. Heater coil selection, page 223.

STARTERS WITH BIMETAL OR SLOW TRIP EUTECTIC ALLOY OVERLOAD RELAYS

For starter with Bimetal O.L. Relay (convertible manual to auto. reset), or Slow Trip Eutectic Alloy O.L. Relay, substitute A11 or A13 respectively for A10 Cat. No. Same ratings and Prices. EXAMPLE: A11ANOAB instead of A10ANOAB.

- If branch circuit protective device is 45 amperes or greater, C320FBR1 fuse kit(s) may be required for control circuit protection per NEC 430-72.
- Sizes 0 thru 4 are suitable for outdoor application when properly installed — See Page 8 for details.
- For 380V, 50 Hz, see page 13, footnote 1.
- Wired for separate 120V control circuit. For maximum Hp at listed motor voltages, use the rating of other starters of same NEMA size.

DISCOUNT SCHEDULE 1CD (HEATER COILS 1CD-13)

SPECIAL MODIFICATIONS, pages 73-74

E.T.N. Electrical Electronic Control

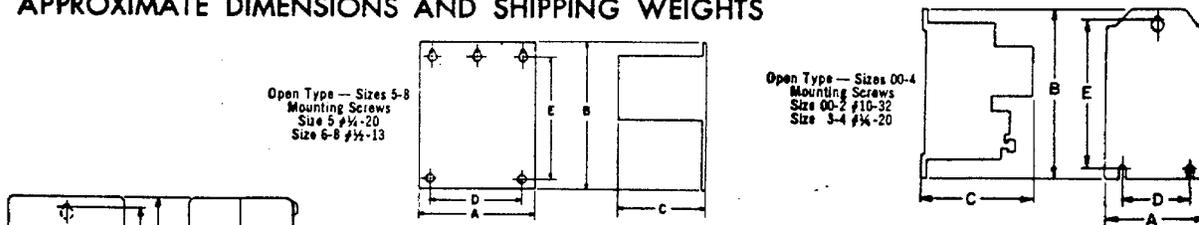
CUTLER-HAMMER 3 PHASE STARTERS — MAGNETIC

7/15/83

FILE

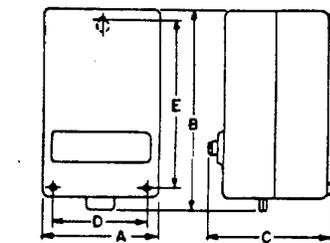
Full Voltage Non-Reversing — 600 Volt Max.

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS

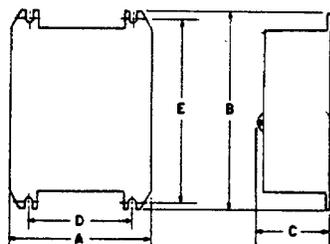


NEMA Size	Dimensions in Inches			Mounting	Ship. Wt. Lbs.
	Wide	High	Deep		

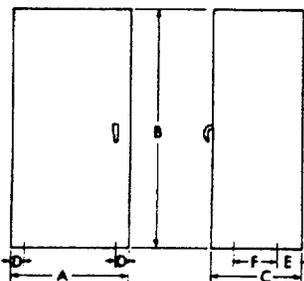
OPEN TYPE						NEMA TYPE 4② — WITHOUT TRANSFORMER						
00	3 1/4	5 1/4	3 1/4	5 1/4	14	00-1	8 1/4	11 1/4	5 1/4	5 1/4	10 1/4	14
0 & 1	3 1/4	5 1/4	3 1/4	5 1/4	23	0-1	8 1/4	15 1/4	7 1/4	5 1/4	15 1/4	23
0-1	3 1/4	5 1/4	3 1/4	5 1/4	56	0-2 Pole	12 1/4	24 1/4	9	9 1/4	23 1/4	56
0-2 Pole	3 1/4	5 1/4	3 1/4	5 1/4	58	0-2	12 1/4	24 1/4	9	9 1/4	23 1/4	58
0-2	3 1/4	5 1/4	3 1/4	5 1/4	116	0-3 Pole	17 1/4	36 1/4	11 1/4	14 1/4	36 1/4	116
0-3 Pole	3 1/4	5 1/4	3 1/4	5 1/4		0-3	17 1/4	36 1/4	11 1/4	14 1/4	36 1/4	160



NEMA TYPE 1 — WITHOUT TRANSFORMER						NEMA TYPE 12 — WITHOUT TRANSFORMER						
00	3 1/4	5 1/4	3 1/4	5 1/4	12	00-1	8 1/4	11 1/4	5 1/4	5 1/4	10 1/4	12
0-1	3 1/4	5 1/4	3 1/4	5 1/4	22	0-1	8 1/4	15 1/4	7 1/4	5 1/4	15 1/4	22
0-2	3 1/4	5 1/4	3 1/4	5 1/4	58	0-2	12 1/4	24 1/4	9	9 1/4	23 1/4	58
0-3	3 1/4	5 1/4	3 1/4	5 1/4	112	0-3	17 1/4	36 1/4	11 1/4	14 1/4	36 1/4	112
0-4	3 1/4	5 1/4	3 1/4	5 1/4		0-4	25 1/4	72 1/4	16	1	4	465
0-5	3 1/4	5 1/4	3 1/4	5 1/4		0-5	25 1/4	72 1/4	16	1	4	490
0-6	3 1/4	5 1/4	3 1/4	5 1/4		0-6	25 1/4	72 1/4	20	1	4	675



NEMA TYPE 1 — WITH TRANSFORMER						NEMA TYPE 12 — WITH TRANSFORMER						
00	3 1/4	5 1/4	3 1/4	5 1/4	15	00-1	8 1/4	11 1/4	5 1/4	5 1/4	10 1/4	15
0-1	3 1/4	5 1/4	3 1/4	5 1/4	32	0-1	13 1/4	15 1/4	7 1/4	10 1/4	15 1/4	32
0-2	3 1/4	5 1/4	3 1/4	5 1/4	62	0-2	17 1/4	24 1/4	9	14	23 1/4	62
0-3	3 1/4	5 1/4	3 1/4	5 1/4	66	0-3	17 1/4	24 1/4	9	14	23 1/4	66
0-4	3 1/4	5 1/4	3 1/4	5 1/4	165	0-4	25 1/4	36 1/4	11 1/4	23 1/4	36 1/4	165
0-5	3 1/4	5 1/4	3 1/4	5 1/4		0-5	25 1/4	72 1/4	16	1	4	470
0-6	3 1/4	5 1/4	3 1/4	5 1/4		0-6	25 1/4	72 1/4	16	1	4	495
0-7	3 1/4	5 1/4	3 1/4	5 1/4		0-7	30 1/4	72 1/4	20	1	4	680



NEMA TYPE 3R② — WITHOUT TRANSFORMER						NEMA Type 7CD-9EFG WITHOUT TRANSFORMER						
00	3 1/4	5 1/4	3 1/4	5 1/4	23	00-1	9 1/4	11 1/4	8 1/4	8	9 1/4	23
0-1	3 1/4	5 1/4	3 1/4	5 1/4	43	0-1	12 1/4	15 1/4	9 1/4	10 1/4	13 1/4	43
0-2	3 1/4	5 1/4	3 1/4	5 1/4	95	0-2	17 1/4	24 1/4	10 1/4	14	23 1/4	95
0-3	3 1/4	5 1/4	3 1/4	5 1/4		0-3	17 1/4	24 1/4	10 1/4	14	23 1/4	95
0-4	3 1/4	5 1/4	3 1/4	5 1/4		0-4	25 1/4	36 1/4	11 1/4	23 1/4	36 1/4	165
0-5	3 1/4	5 1/4	3 1/4	5 1/4		0-5	25 1/4	72 1/4	16	1	4	470
0-6	3 1/4	5 1/4	3 1/4	5 1/4		0-6	25 1/4	72 1/4	16	1	4	495
0-7	3 1/4	5 1/4	3 1/4	5 1/4		0-7	30 1/4	72 1/4	20	1	4	680

② Top entry requires interchangeable hubs.
③ Enclosures have conduit hubs for line, load and control conduits.

E.T.N. Electrical Electronic Control

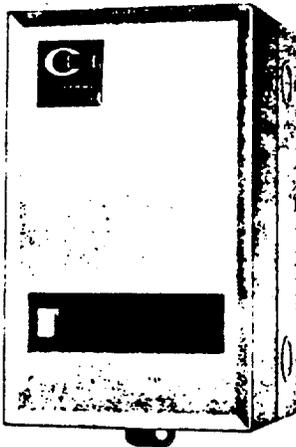
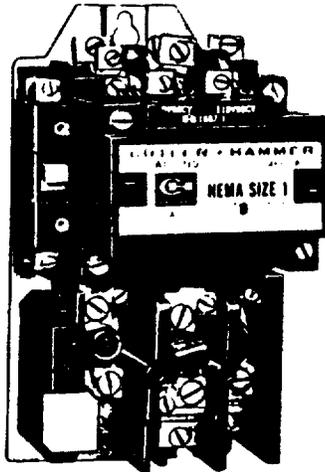


9/15/70

A-C FULL VOLTAGE MAGNETIC

Three Phase Non-Reversing Starters Size 0 thru 4

TECHNICAL
INFORMATION
PUBLIC/
A10,
A13



DESIGN CHARACTERISTICS

Overload Relays - Three overload relays available:
 A10, type ST, standard trip, eutectic alloy;
 A11, type BNC, bimetal;
 A13, type LT, slow trip, eutectic alloy.

Magnet - CI non-wearing with permanent air gap, totally enclosed.

Coil - Dual wound. Molded epoxy resin. Plug-in. Color coded.

Contacts - Dust safe vertical contacts. Twin break, silver cadmium oxide alloy, non-welding.

Terminals - Sizes 0 and 1, back-out saddle clamp. Sizes 2, 3, and 4, solderless lugs.

Holding Circuit Interlock - N.O.-N.C. standard on open starter; N.O. on NEMA 1 enclosed starter.

Wiring - Straight thru circuitry. Line lugs at top, load lugs at bottom.

Mounting - Horizontal or vertical, 3 point mounting.

Electrical Clearances - Butt mounting, side by side without extra spacing with auxiliary contacts mounted on left side of starter.

Overload Protection - Starters will accept two or three heater coils as desired without affecting power and control wiring, panel area, or heater coil selection.

Heater Coil Rating - Adjustable in 6% steps full load motor current.

Enclosure - Open or NEMA 1 enclosed.

Maintenance - Full view contact inspection and replacement without disturbing wiring. Plug-in power pack unit contains all moving parts. Front accessibility to all parts.

OPTIONAL FEATURES

Auxiliary Contacts - N.O., N.C., and N.O.-N.C. auxiliary contacts. Up to a total of 8 contacts including a holding circuit.

Mechanical Interlock Kit - For mechanically interlocking starters and/or contactors for reversing applications.

Terminal Board - Three point terminal board which mounts on auxiliary contact block.

NEMA 1 Cover Control - Five cover control options, factory installed or in kits for field conversion.

Control Transformer - For pilot light with NEMA 1 enclosures only. Single and dual voltage transformers.

For additional details on the components that make up the A10 starters, refer to the following TIP sheets:

C300-C303	} Overload Relays
C301	
C10	





**Three Phase Non-Reversing Starters
 Size 0 thru 4**

Electrical Data

NEMA Size	Volts	Maximum Horsepower Rating - Nonplugging and Nonjogging Duty		① Horsepower Rating - Plugging or Jogging Duty		Continuous Current Rating, Amperes - 600 Volts Max.	② Service-Limit Current Rating, Amperes
		Single Phase	Poly-Phase	Single Phase	Poly-Phase		
0	115	1	2	1 1/2	1	18	21
	230	2	3	1	1 1/2	18	21
	460	-	5	-	2	18	21
	575	-	5	-	2	18	21
1	115	2	3	1	2	27	32
	230	3	7 1/2	2	3	27	32
	460	-	10	-	5	27	32
	575	-	10	-	5	27	32
2	230	7 1/2	15	5	10	45	52
	460	-	25	-	15	45	52
	575	-	25	-	15	45	52
3	230	15	30	-	20	90	104
	460	-	50	-	30	90	104
	575	-	50	-	30	90	104
4	230	-	50	-	30	135	156
	460	-	100	-	60	135	156
	575	-	100	-	60	135	156

Table and footnotes are taken from NEMA Standards Publication No. ICS-1970 Section 2, Part ICS 2-321B Page 1 and 2.

- ① Plugging or Jogging Duty. Ratings shown are for applications requiring repeated interruption of stalled motor current or repeated closing of high transient currents encountered in rapid motor reversal, involving more than five openings per minute, e.g., plug-stop, plug-reverse or jogging duty. Ratings apply to single speed and multi-speed controllers.
- ② Per NEMA Standards paragraph ICS 2-321A.20. The service-limit current represents the maximum rms current, in amperes, which the controller may be expected to carry for protracted periods in normal service. At service-limit current ratings, temperature rises may exceed those obtained by testing the controller at its continuous current rating. The ultimate trip current of over-current (overload) relays or other motor protective devices shall not exceed the service limit current ratings of the controller.

DESCRIPTION

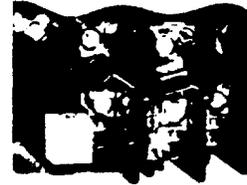
General

The three types of starters covered in this TIP sheet are similar except for the type of overload relay.

A10, TYPE ST, STANDARD TRIP, EUTECTIC ALLOY OVERLOAD RELAY

The A10 starter has a type ST eutectic melting alloy, standard trip, overload relay. This starter is used for most industrial and commercial motor control applications. The locked rotor trip time of the A10 is designed to protect the new class B motors, while still allowing sufficient start up time for most class A motor applications.

A new high temperature eutectic alloy used in the overcurrent sensing element eliminates nuisance tripping problems normally associated with high



C300-C303 OVERLOAD RELAY

ambient temperature conditions at the control location. It allows a heater coil to be selected, however, which allows the motor to work to its maximum safe capacity.



UNTRIPPED TRIPPED
 TRIP INDICATOR

A trip indicator is readily visible from the front of the overload relay. When the overload relay has tripped, a metal indicator appears in a window located above the reset button shaft.

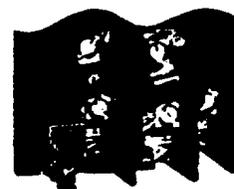
The type ST overload relay is always manually reset, and is designed so that pressing the reset button will not stop the motor or have any affect unless the overload relay has tripped.

The standard A10 starter has one N.C. contact mounted on the overload relay. Also available is an additional N.O. contact which closes simultaneously with the opening of the N.C. contact. This feature is used for signaling an overload condition, or for interlocking purposes.

The A10 starter is identified by the overload relay having a white button with the designation "TYPE ST" stamped on the button. For complete details on the overload relay of this starter refer to TIP C300-C303.

A11, TYPE BNC, BIMETAL OVERLOAD RELAY

The A11 starter has a type BNC bimetal overload relay. The overload relay uses the same line of heater coils used on the A10 starter.



C301 OVERLOAD RELAY



9/15/70

A-C FULL VOLTAGE MAGNETIC

Three Phase Non-Reversing Starters Size 0 thru 4

TECHNICAL
INFORMATION
PART NUMBER
A11, A13

DESCRIPTION (Continued)

The sensing element and trip mechanism utilize a principle previously unique to eutectic overload relays: The sensing element acts as a trigger and does no work. The tripping force is supplied by the reset spring instead.

Like the overload relay of the A10 starter, the new higher tripping temperature eliminates nuisance tripping in high ambient temperature conditions.

NOTE: The bimetal overload relay is not available with a N.O. signaling circuit and has no trip indicator.

The principal use of the A11 starter is in applications where conversion to automatic reset is desired.

The A11 starter is identified by the overload relay having a gray reset button with the designation "TYPE BNC" stamped on it. For complete details on the overload relay of this starter, refer to TIP C301.

A13, TYPE LT, SLOW TRIP, EUTECTIC ALLOY OVERLOAD RELAY

The A13 starter has a type LT eutectic thermal alloy, slow trip, overload relay. It is similar to the A10 starter, except that the trip time on starting is longer. It provides protection for class A insulated motor designs, and motors designed for high inertia equipment.

The A13 starter is used to start motors with high inertia loads or to start machines which must start under load. The protection afforded under full load condition is the same as that of the A10 starter.

The A13 starter is identified by the overload relay having a black reset button with the designation "TYPE LT" stamped on it. For further information on the overload relay of this starter, refer to TIP C300-C303.

Contactor

The contactor used in these starters has a horizontal stroke magnet with the magnet assembly out front and the contacts behind for front accessibility of all parts: terminals, contacts, coil, and auxiliary contact mounting.

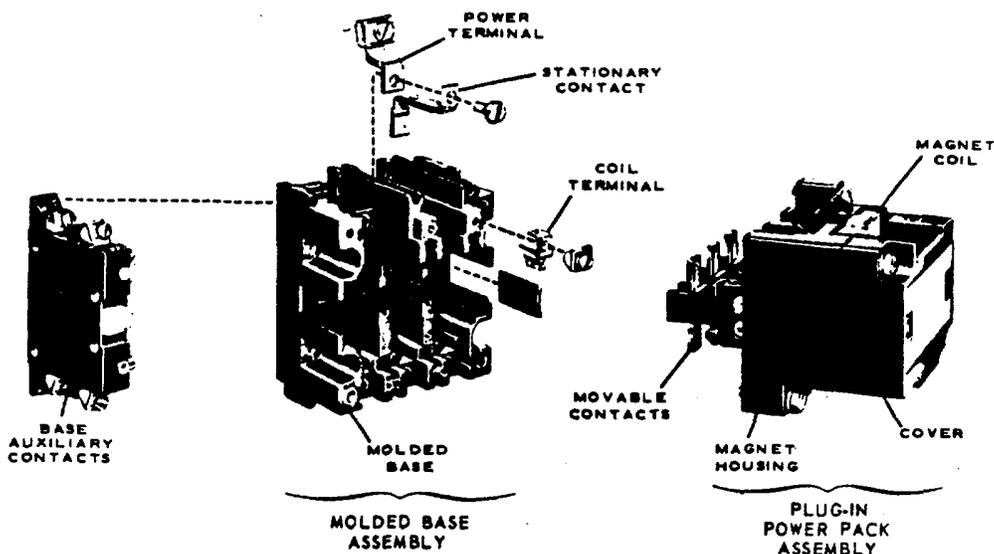
The contactor consists of two basic units: the molded base and the power pack unit.

The molded base is essentially a terminal board to which all power and control wiring is connected. It houses the stationary contacts, and mounts the power, control, and coil terminals, and the auxiliary contact assemblies.

The power pack is a separate plug-in assembly which is independent of all wiring. It consists of the magnet housing which houses the magnet assembly, coil, and movable contact assembly. The plug-in power pack unit is secured to the molded base with two hex head screws.

Magnet Assembly

The magnet is a double pole CI type. The C member is stationary and the I member is the movable armature. The horizontal stroke assembly has throw-out springs, independent of gravity.



CONTACTOR ASSEMBLY

CUTLER-HAMMER



**Three Phase Non-Reversing Starters
 Size 0 thru 4**

DESCRIPTION (Continued)

The magnet assembly is cushioned on pickup and dropout by stainless steel springs for maximum performance and quiet operation. The air gap of the C member is permanent and non-wearing. The two shading coils are permanently bonded in place with epoxy.

The magnet assembly is completely enclosed within the magnet housing and armature operation is totally protected from external interference. Operation is visually indicated from the front of the contactor by two square indicators which appear in windows in the front cover. When the contactor is de-energized, the indicators recede into the housing about 1/4".

Magnet Coil

The magnet coil is of the double coil type, bobbin wound, and molded in epoxy. The coil terminations are plug-in, male stabs, molded into the epoxy. These male stabs mate with female connectors mounted in the molded base.

The coil is identified by color coding and by white stamped markings of voltage, frequency, and part number on the front of the coil. These markings are clearly visible from the front of the contactor.

The coil is removed in three steps, requiring the use of only a screwdriver.

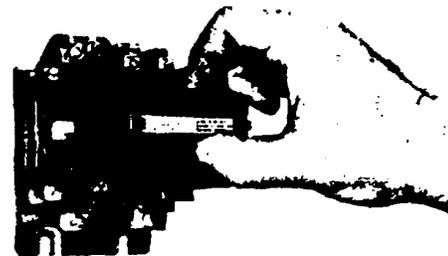
1. Remove the plug-in power unit's cover.
2. Remove the armature and spring plate.
3. Unplug the coil from its mounting.

Since the plug-in coil is connected to the terminals by stab connectors, no coil wiring need be removed to change the coil.

Three magnet coil sizes cover all contactors, size 0 thru 4. The coils for size 0 and 1 are common, and the coils for size 3 and 4 are common. The magnet coils are suitable for use on either 60 or 50 Hertz distribution systems at the voltages listed in the following table.

MAGNET COIL DATA

Size	Inrush		Sealed	
	Watts	VA	Watts	VA
0 and 1	65	104	7	20
2	116	391	13	55
3	198	1034	14	85
4	198	1034	14	85



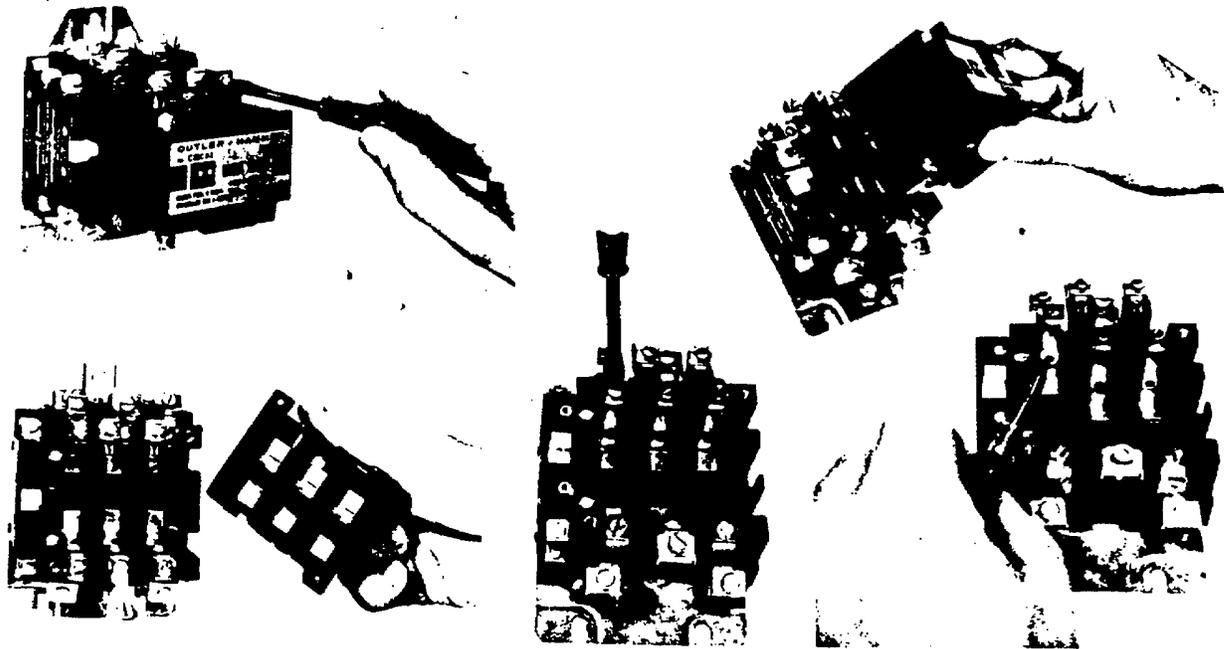
COIL REMOVAL

MAGNET COIL IDENTIFICATION

Volts/Hertz	Starter Size and Coil Part number		
	0 & 1	2	3 & 4
120/60 or 110/50	9-1887-1	9-1889-1	9-1891-1
240/60 or 220/50	9-1887-2	9-1889-2	9-1891-2
480/60 or 440/50	9-1887-3	9-1889-3	9-1891-3
600/60 or 550/50	9-1887-4	9-1889-4	9-1891-4
120/240/60 or 110/220/50	9-1888-1	9-1890-1	9-1892-1
240/480/60 or 220/440/50	9-1888-2	9-1890-2	9-1892-2
208/60	9-1887-5	9-1889-13	9-1891-13
380/50	9-1887-8	9-1889-14	9-1891-14
24/60	9-1887-7	9-1889-20	9-1891-15



9/15/70

A-C FULL VOLTAGE MAGNETIC**Three Phase Non-Reversing Starters
Size 0 thru 4****T**ECHNICAL**I**NFORMATION**P**UBLICATION:**A10, A11
A13**

STATIONARY CONTACT REMOVAL

DESCRIPTION (Continued)**Movable Contacts**

The movable contacts are mounted on the plug-in power unit, and are completely enclosed within the contactor when the power unit is mounted on the molded base. The contacts can be inspected by removing the power unit without removing any wiring.

The contacts are double break, silver cadmium oxide and are vertical, dust-free. For maximum performance, the contacts are guided by stainless steel metal guide plates, with optimized contact pressure being maintained by a stainless steel spring. Each contact is stamped with the part number, and all contacts within a contactor size are common and interchangeable.

Stationary Contacts

The stationary contacts are mounted on the molded base and are inspected by removing the plug-in power unit.

A stationary contact and a power terminal are attached to the molded base with one common screw. Stationary contacts can be removed without removing the power or control circuit wiring.

Terminals

All power and control terminals are assembled to the base unit, providing full front accessibility for inspection and maintenance of the device without disconnecting the line, load, or control connections.

CONTROL TERMINALS

The magnet coil and control terminals are backout

saddle clamps. One or two, solid or stranded wire conductors ranging in size from #12 to #16 can be accommodated.

POWER TERMINALS

The power terminals for the size 0 and 1 starters are backout saddle clamps, and are suitable for use with one or two solid or stranded wire conductors. (A heavy body aluminum lug kit is available for the size 0 and 1 starters specifically for use with aluminum conductors.)

The size 2, 3, and 4 *open type* starters have a copper body pressure type solderless lug intended for use with copper conductors. The lug will accommodate a single conductor one size oversize for the maximum requirement of each device. The terminal plate accommodates an additional lug either for power cross connection or power take-off of either the pressure type solderless lug or crimp-on type lug.

The size 2, 3, and 4 *NEMA 1 enclosed* starters are provided with a heavy body aluminum lug suitable for use with either copper or aluminum conductors.

The table on the next page lists the range of wire sizes that can be accommodated by the power lugs on these devices.

In addition to the 3 phase power terminations, the L1 and L2 terminals have an auxiliary control terminal (backout saddle clamp type) either for connection of control circuit devices or to provide for control circuit power take-off.

**CUTLER-HAMMER**



Three Phase Non-Reversing Starters
 Size 0 thru 4

DESCRIPTION (Continued)

Wire Size and Type Capability for Power Terminals

Size	NEMA 1 Enclosed		
	Open Standard	Standard	Optional
0 and 1	#8-#14 Cu	#8-#14 Cu	#6-#14 Cu-Al
2	#4-#14 Cu	#4-#14 Cu-Al	-
3	1/0-#14 Cu	2/0-#14 Cu-Al	-
4	3/0-#8 Cu	4/0-#14 Cu-Al	-

Control Wiring

For control voltage of 120 volts or lower, starters are wired for separate control. For control voltage of 208 volts and above, starters are wired for common control.

Cover Control

The local cover controls listed below are available either factory installed or as on-the-job conversion kits: start-stop, 2-position selector switch, 3-position selector switch, start-stop with pilot, and reset only with pilot. The kits consist of a switch assembly complete with color coded leads for proper terminal connections. Optional cover control islands mount in place of the standard, reset only, island in the cover. There are no knockouts to remove or holes to drill.

Control Transformer

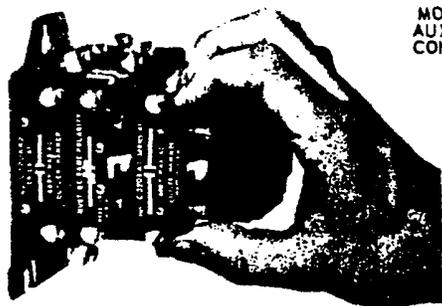
Control transformers are offered for local or remote pilot light applications. Available with NEMA 1 enclosed Starters size 0 thru 3.

Auxiliary Contacts

OPEN TYPE

The open type starter is supplied with N.O. - N.C.I. auxiliary contacts as standard (normally open holding circuit and normally closed early opening contact for electrical interlocking purposes). Six additional contacts can be added to obtain a total of eight auxiliary contacts (including a holding circuit). Six of the eight can then be N.O. or N.C., while the other two are N.C.I. contacts.

The addition of the first two auxiliaries (any combination of N.O. - N.C.) is accomplished by add-on auxiliary contacts. The add-on auxiliary contacts fit all starters, size 0 through 4. The addition of two auxiliary



MOUNTING
 AUXILIARY
 CONTACTS

contacts to the holding circuit block does not change either the dimensions or the electrical clearance requirements.

To add more than two auxiliary contact blocks requires that either a N.O. or N.C.I. base auxiliary be added to the right side of the starter. This adds approximately 1/2" to the width dimension. Two additional add-on auxiliaries can be added to this base unit.

NEMA 1

The NEMA 1 enclosed starter is supplied with a N.O. holding circuit as standard. Two N.O. or N.O.-N.C. auxiliary contacts can be added. Additional auxiliary contacts can be added to the right side of the starter, see table below.

Number of Auxiliary Contacts

Location	Open	NEMA 1
Standard		
Left Side	2 ①	1 ②
Right Side	0	0
Optional		
Left Side	2	2
Right Side	4	4 ③
TOTAL	8	7

① N.O. holding circuit and an auxiliary N.C. contact.

② N.O. holding circuit when specified.

③ Two only on the Size 0 and 1.

Terminal Block

An optional three point terminal block can be mounted on either the standard or add-on auxiliary contacts. It can be used for control circuit electrical tie points.

Mechanical Interlock

Mechanical interlock kits are available for field construction of reversing units, using standard non-reversing devices. The kit contains a mechanical interlock unit plus the power cross-wiring to provide a complete assembly. This kit provides the same reliability as a factory-assembled reversing unit.

The mechanical interlocking unit mounts directly to the contactor base assemblies, eliminating problems of tolerance in mounting of the unit or special panel drilling.

Three mechanical interlock kits are available to cover size 0 thru 4: one for the size 0 and 1, one for the size 2, and another for size 3 and 4.

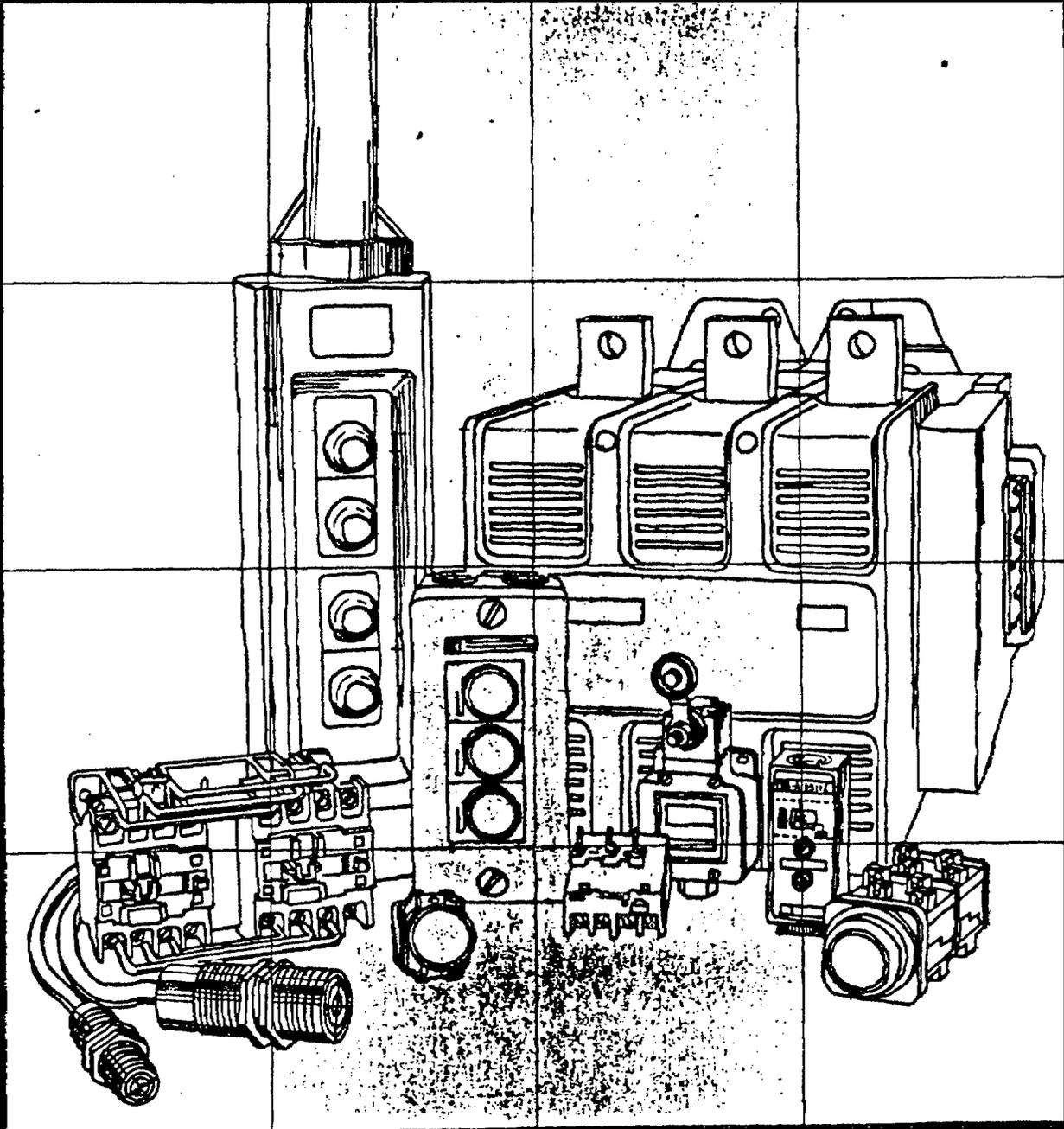
SUBMITTAL DATA

For your convenience, the wiring diagram and dimension pages of this TIP Sheet have been set up to provide complete data on the device for specification purposes either with or without certification. Additional copies are readily available from the factory.



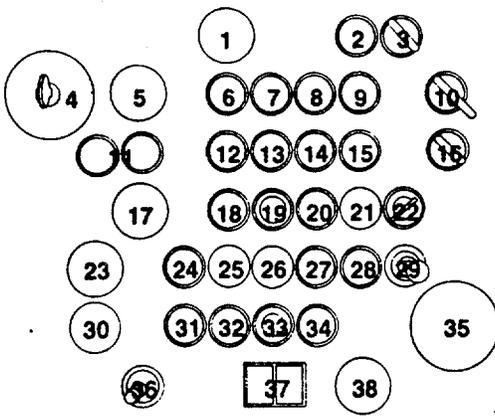
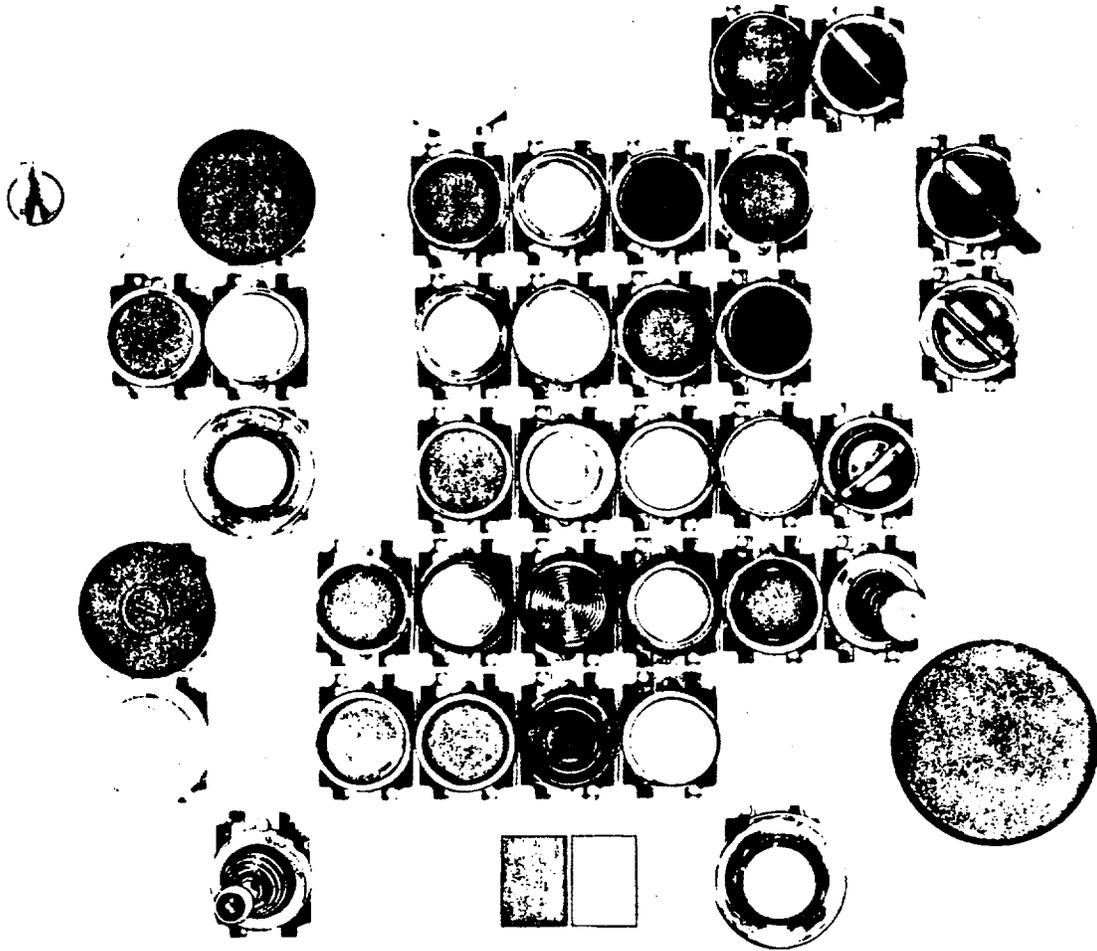
Telemecanique

1981-82 INDUSTRIAL CONTROL COMPONENTS CATALOG



INVENTIVE SOLUTIONS TO CONTROL PROBLEMS

We trimmed the size



- | | |
|---|---|
| <ol style="list-style-type: none"> 1. 1.6" RED TURN-TO-RELEASE MUSHROOM HEAD 2. BLUE PILOT 3. STANDARD LEVER SELECTOR 4. 2.4" RED KEY RELEASE MUSHROOM HEAD 5. 1.6" BLACK MUSHROOM HEAD 6. BLUE ILLUMINATED PUSH ON-PUSH OFF MAINTAINED EXTENDED HEAD 7. AMBER ILLUMINATED EXTENDED HEAD 8. BLACK METALLIC FLUSH HEAD 9. GREEN ILLUMINATED FLUSH HEAD 10. EXTENDED LEVER SELECTOR 11. FLUSH INTERLOCKED PUSHBUTTONS 12. CLEAR PUSH-TO-TEST PILOT 13. YELLOW FLUSH HEAD 14. GREEN PUSH ON-PUSH OFF EXTENDED HEAD 15. BLACK EXTENDED HEAD 16. RED ILLUMINATED STANDARD LEVER SELECTOR 17. ILLUMINATED RED 3 POSITION MUSHROOM HEAD 18. GREEN FLUSH HEAD | <ol style="list-style-type: none"> 19. RED BOOTED HEAD 20. AMBER TRANSPARENT FLUSH HEAD 21. SILICON BOOT, RED FLUSH HEAD 22. KEY SELECTOR 23. 1.6" BLACK PUSH-PULL MUSHROOM HEAD 24. BLUE ILLUMINATED EXTENDED HEAD 25. RED NEON LENS PILOT 26. GREEN NEON LENS PILOT 27. RED ILLUMINATED SILICON BOOTED HEAD 28. GREEN NEON LENS PILOT 29. RED WOBBLE STICK 30. 1.6" ILLUMINATED AMBER MOMENTARY MUSHROOM HEAD 31. GREEN GUARDED HEAD 32. GREEN TRANSPARENT FLUSH HEAD 33. BLACK BOOTED HEAD 34. YELLOW EXTENDED HEAD 35. 2.4" GREEN MUSHROOM HEAD 36. JOYSTICK 37. FLUSH 2 BUTTON RECTANGULAR HEAD 38. 1.6" RED ILLUMINATED 2 POSITION MAINTAINED MUSHROOM HEAD |
|---|---|

but kept the muscle

Thanks to TELEMECANIQUE innovative engineering, the pushbuttons you probably buy now are out of date.

The old way was to buy big standard size pushbuttons when you needed heavy duty 600 volt 10 Ampere capacity. The large and bulky devices gave you the rating you needed, but you were in trouble when panel density was a consideration. The comparison below shows that the surface area of both units is the same (use a quarter for comparison), but the XB2-B line requires less space behind the panel.



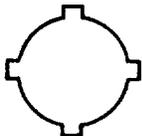
Competition



TELEMECANIQUE

The alternative was miniature pushbuttons, easy to crowd on a panel, but limited to 300 VAC rating. The XB2-B oiltight and watertight pushbuttons successfully combine the best features of both these earlier models.

The simple $\frac{7}{8}$ " one-step round mounting holes with no notching have eliminated the costly and time consuming notching method required for competitive lines. This feature reduces panel size and labor cost.



Competition



TELEMECANIQUE

The space savings of the smaller $\frac{7}{8}$ " mounting hole is enhanced by the feature of being able to mount contact blocks side by side and having no space lost between each unit. The reduced

height, width and depth of the contact blocks increases the panel density and reduces your panel size.

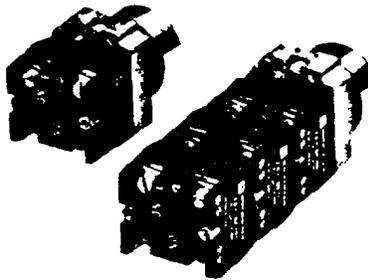


Competition



TELEMECANIQUE

As many as six contact blocks can be stacked behind an operator using a single captive screw in each block, further improving design flexibility. The devices have been designed to provide more wiring clearance for faster installation. The terminal screws are supplied in the raised position allowing you to directly insert wiring. No need to backout the screws.

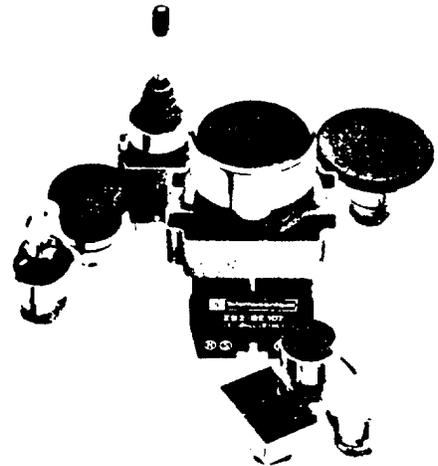


Operators and contact blocks are supplied as separate components. The bayonet base mounting of the operators and the use of 2 screws to tighten the unit to the panel eliminates the need for a torque wrench and reduces your installation time. Also this method grounds the device to the panel and provides a tamperproof mounting.

XB2-B is a complete line with illuminated and non-illuminated pushbuttons and selectors, key switches, joysticks, wobble sticks,

rectangular operators, pilot lights plus a full array of contact blocks, bases and accessories.

Pilot lights (standard and push to test) and illuminated pushbuttons are available with direct supply, resistor, transformer or flashing bases.

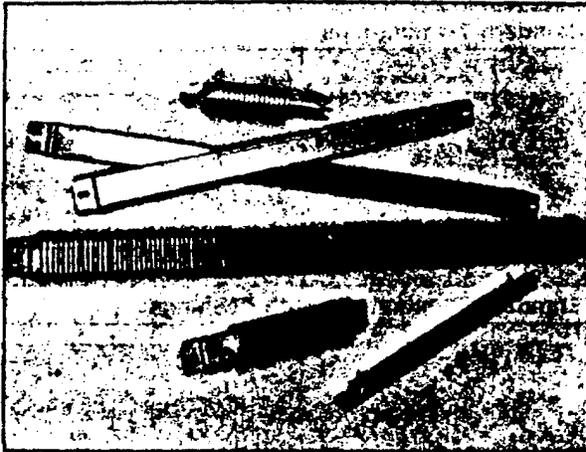


Oiltight TELEMECANIQUE pushbuttons and related products are respected and specified throughout the world for their quality, reliability and competitive prices.

XB2-B pushbuttons not only comply with UL and CSA standards, but meet such international standards as IEC, ASE, NEMKO, SEMCO, DEMCO, UTE, VDE, SF and many others, vital approvals if your products are to be exported. Standard units comply with NEMA 1, 2, 3, 4, 5, 12 and 13, are treated for use in harsh climatic conditions and are watertight even under pressure wash conditions.

The products are backed up by readily available technical back-up and after sales service. Prices for these state of the art devices will be a pleasant surprise to you.

Strip Heaters



With years of experience in the manufacture of metal sheathed strip heaters, Wellman has the application expertise to design a strip heater to serve most any need. Easy and economical installation, wide temperature range, rugged construction and dependability are some of the reasons Wellman™ Strip Heaters have such wide applications, including: **surface heating**—on platens, dies, molds, tanks, piping and more; **process air heating**—both strip and finned strip heaters in drying cabinets, ovens, baking ovens and vacuum dehydrating ovens and for moisture protection for motors, etc.; **resistors**—as dropping resistors for line applications in railroads and load banks; **winterizing**—on hoppers, conveyors, ducts, car heating, thawing; **original equipment**—air conditioning, laboratory equipment food packaging, ovens, presses and drying equipment. For more information regarding application, request Catalog WHB.

Construction

Wellman strip heaters are constructed of specially selected high quality materials, beginning with the high-temperature alloy resistance wire uniformly coiled and spaced over the width of the heated length of the strip heater. This controlled coil process and placement assures uniform heat distribution over the entire active surface of the heater. Special care is taken to secure the stud-type terminal to the high-temperature alloy resistance wire to prevent premature failure due to high resistance contact.

The coiled resistance wire is embedded in a special refractory material which possesses excellent heat transfer characteristics and superior insulation properties. The entire heater assembly is encased in either an aluminized or chrome steel sheath and is compressed under high pressure. The completed assembly is heated under controlled conditions to bake and semi-vitrify the refractory for a rigid, vibration-resistant, heavy-duty heating unit.

Strip Heaters—Normal Limits

Maximum Voltage	600 Volts
Maximum Amps	48 Amps
Overall Length Limit	42 1/4 Inch
Effective Length Limit	39 Inc
Finned Length Limit	38 Inc
Approx. Weight/Inch of Length	Std. Strip .08 lb/Inch Finned Strip .13 lb/Inch
Square Inches of Surface Area Per Inch of Design	3.75 Sq. Inches
Maximum Sheath Temperature	Aluminized Steel 1000°F Chrome Steel 1200°F Stainless Steel 1200°F Monel 1050°F
Minimum Lengthwise Bending Radius (Factory)	4 Inches

Standard Features

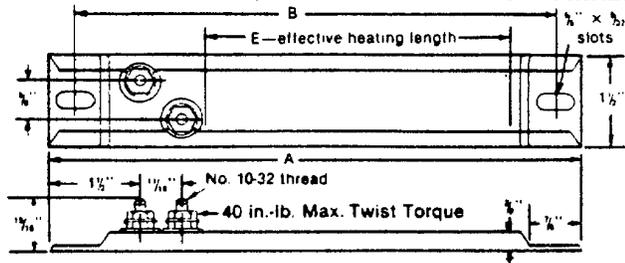
- Aluminized steel sheath—suitable for applications where the maximum sheath temperature does not exceed 1000° F.
- Chrome steel sheath—suitable for applications where the maximum sheath temperature does not exceed 1200° F.
- Slotted mounting tabs—provide for lineal expansion during initial heatup period.
- Flat surface—provides a suitable surface clamp-on applications and provides uniform distribution for broad surfaces.
- Factory tested—both electrically and mechanically to ensure compliance with rigid engineering specifications.
- Single-end offset terminals—Type SS strip and Type FS finned strip heaters have both terminals offset on one end to allow wiring access from the end or from either side.
- Terminals on both ends—Type SD heaters have terminals at each end for ease of parallel or series wiring configurations.
- Heavy wall construction—for strength and rigidity in the application and for long performance life.

Benefits

- Aluminized steel sheath provides both corrosion resistance and an attractive appearance.
- Chrome steel sheath combines additional corrosion protection and excellent appearance.
- Vibration resistant—the compacted semi-vitrified refractory and insulation and its integrity with the rigid sheathed construction enable Wellman strip heaters to withstand severe vibration conditions.
- Rugged construction for long life.
- Application versatility—easy to use in a wide variety of surface and air heating applications.

Strip Heaters Available From Stock

Type SS
Offset Terminals at one end



Dimensions (inches):				ALUMINIZED STEEL SHEATH Sheath temperatures up to 1000°F max.				CHROME STEEL SHEATH Sheath temperatures up to 1200°F max.			
A Overall Length	B Mounting Centers	E Heated Length	Approx. Net Wt Pounds	Watts	Volts	Watts per Sq. Inch	CATALOG NUMBER	Watts	Volts	Watts per Sq. Inch	CATALOG NUMBER
6	5%	2%	0.48	150	120	15.2	SS1011	300	120	30.5	SS2011
				150	240	15.2	SS1022	300	240	30.5	SS2022
8	7%	4	0.64	150	120	10.0	SS1061	250	120	16.7	SS2061
				150	240	10.0	SS1072	250	240	16.7	SS2072
				175	120	11.7	SS1081	400	120	26.7	SS2081
				175	240	11.7	SS1092	400	240	26.7	SS2092
11%	10%	7%	0.94	250	120	8.6	SS1141	350	120	12.0	SS2141
				250	240	8.6	SS1152	350	240	12.0	SS2152
				—	—	—	—	500	120	17.2	SS2161
				—	—	—	—	500	240	17.2	SS2172
15	14%	11	1.20	325	120	7.9	SS1201	500	120	12.1	SS2201
				325	240	7.9	SS1212	500	240	12.1	SS2212
17%	16%	13%	1.36	350	120	6.8	SS1221	500	120	8.3	SS2221
				350	240	6.8	SS1232	500	240	8.3	SS2232
				500	120	10.3	SS1241	750	120	10.3	SS2241
				500	240	10.3	SS1252	750	240	10.3	SS2252
19%	18%	15%	1.56	350	120	6.0	SS1301	500	120	8.6	SS2301
				350	240	6.0	SS1312	500	240	8.6	SS2312
				500	120	8.6	SS1321	1000	120	17.2	SS2321
				500	240	8.6	SS1332	1000	240	17.2	SS2332
21	20%	17%	1.88	500	120	6.8	SS1361	500	120	6.8	SS2361
				500	240	6.8	SS1372	500	240	6.8	SS2372
				500	277	6.8	SS1386	750	120	10.3	SS2381
				750	120	10.3	SS1391	750	240	10.3	SS2392
23%	22%	19%	1.88	750	240	10.3	SS1402	1000	120	13.7	SS2401
				—	—	—	—	1000	240	13.7	SS2412
				750	120	6.8	SS1421	750	120	9.3	SS2421
				750	240	6.8	SS1432	750	240	9.3	SS2432
25%	24%	21%	2.14	700	120	8.2	SS1461	1000	120	11.7	SS2461
				700	240	8.2	SS1472	1000	240	11.7	SS2472
				700	120	7.7	SS1481	750	120	10.3	SS2481
				700	240	7.7	SS1492	750	240	10.3	SS2492
30%	29%	26%	2.68	750	120	6.8	SS1511	750	120	6.8	SS2511
				750	240	6.8	SS1522	750	240	6.8	SS2522
33%	32%	29%	3.08	800	120	6.2	SS1561	1000	120	7.7	SS2561
				800	240	6.2	SS1572	1000	240	7.7	SS2572
				1000	120	7.7	SS1581	—	—	—	—
				1000	240	7.7	SS1592	—	—	—	—
42%	41%	38%	4.20	1000	120	8.7	SS1601	1000	120	8.7	SS2601
				1000	240	8.7	SS1612	1000	240	8.7	SS2612
				1000	120	10.6	SS1621	1000	120	10.6	SS2621
				1000	240	10.6	SS1632	1000	240	10.6	SS2632

W14 / Strip Heaters *These heaters have parallel (side-by-side), not offset terminals. **WELLMAN**

CUSTOMER:	VSE CORPORATION
ORDER NO:	TO: Norshipco
DATE OF ORDER:	PO 58515 S/O 2912
CONTRACT NO:	4-8-85
MODEL NO:	DAAK70-83-C-0108
WINCH SREIAL NO:	65-10-600I Elec. Anchor
DRESSER USED ELECTRA MOTOR:	Winches w/ Level-wind
FRAME NO:	053085-8-8
MODEL NO:	EBM 213 TV 500AY
STEARNS BRAKE:	3E 33173XE
MODEL NO:	1-087-082-00-053
SERIAL NO:	BZ-A00373

APPENDIX B

MANUFACTURERS' SERVICE MANUALS/INSTRUCTIONS

<u>Component</u>	<u>Document title</u>	<u>Manufacturer</u>
Anchor winches	Instruction Manual	W. W. Patterson Co. 830 Brocket St Pittsburgh, PA 15233 (412) 322-2012
Gear motor	Instruction Manual	Electric Motors Corporation Power Transmission Division Dresser Industries Anaheim, CA 92803 (714) 535-6061
Electric brake	Instructions	PT Components Incorporated Stearns Division 120 North Broadway Milwaukee, WI 53202 (414) 272-1100

B-1/(B-2 blank)

APPENDIX C

Preventive maintenance checks and services (PMCS) for the Anchor, Mooring and Towing System

C-1 Introduction to PMCS

NOTE

TM 55-193020914&P-19 contains PMCS for all systems ROWPU Barge. This appendix contains only PMCS for the Anchor, Mooring and Towing System

a. General.

- (1) Systematic (B) before, (D) during, (A) after, and scheduled periodic PMCS are essential to ensure that the Reverse Osmosis Water Purification Barge is in operational readiness at all times. The purpose of the PMCS program is to discover and correct deficiencies and malfunctions before they cause serious damage or failure of the barges and their support systems. An effective PMCS program requires that operators report all unusual conditions noticed before, during and after operation as well as while performing periodic PMCS. All deficiencies and malfunctions discovered during maintenance inspections must be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).
- (2) A schedule for preventive maintenance inspections and service should be established and adhered to. When operating under unusual conditions, such as extreme heat or cold, it may be necessary to perform PMCS more frequently.
- (3) The PMCS items have been arranged and numbered in a logical sequence to provide for greater efficiency and the least amount of downtime required for maintenance.

b. PMCS columnar entries.

- (1) Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- (2) Interval Column. The interval columns tell you when to do a certain check or service: before, during, or after operation. Sometimes a dot may be placed in more than one interval column which would mean you should do the check or service at each of those intervals.
- (3) Item to Be Inspected Column. This column lists the common name of the item to be inspected such as 'Air Filters.'
- (4) Procedures Column. This column tells you how to do the required checks and services. Carefully follow these instructions.
- (5) Equipment is Not Ready/Available if Column. This column tells you when and why your equipment cannot be used.

NOTE

The terms "Ready/Available" and "Mission Capable" refer to the same status: equipment is on hand and is able to perform its combat missions. (See DA PAM 738750).

(6) Increased Inspections. Perform weekly as well as Before Operations PMCS if:

(f) You are the assigned operator and have not operated the item since the last weekly PMCS.

(g) You are operating the item for the first time.

(7) Leakage definitions. In checking for fluid leaks, the following leakage definitions apply to all ROWPU barges and barge equipment, product water, and seawater leakage by class type.

(a) Class I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

(b) Class II - Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.

(c) Class III - Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). However, the fluid level or operating pressure of the item being checked/inspected must be considered. When in doubt, notify the shift leader or bargemaster.

When operating with Class I or Class II leaks, continue to check fluid levels as required by PMCS and operating instructions.

(8) The following fuel and hazardous material leakage procedures apply for any fuel, chemical, or bilge system.

WARNING

Class I, II or III leaks or seepage occurring in a fuel, chemical, or bilge container, tank, line, piping, or valve can cause fire or health hazards.

(a) If any leaks or seepage from a fuel, chemical, or bilge container, tank, or fluid line is detected, it must be immediately reported to the shift leader or bargemaster for corrective action.

(b) To prevent combustible or toxic fumes from collecting or contaminated material from spilling, exercise extreme caution after detecting leaks or seepage of flammable or hazardous material.

c. Continuous operation. When equipment must be kept in continuous operation for extended periods of time, check and service only those items that can be checked and serviced without disturbing operations. Perform complete checks and services when the equipment can be shut down.

d. Maintenance log. Always record the time and date of PMCS, any deficiencies noted, and corrective action taken in the PMCS log book.

C2 Major components. The anchor, mooring, and towing system consists of anchor winches, anchors, turnbuckles with jamnuts, fairleads, winch wire rope, winch electric gear motors, and ropes. The major components for this system are listed in Chapter 1. Also listed are basic functions and location on the barge for each component.

C-3 Anchor mooring and towing equipment system description. This system provides a four-point anchoring system to hold the barge in a fixed offshore position while processing water and for mooring the barge at pierside or to another vessel. When the seabottom provides firm anchor holding, this system is capable of holding the barge in an offshore position in a Sea State 3 condition in depths not exceeding 50 feet.

C-3.1 Anchoring system has four electrically powered winches, two on the bow and two on the stern, each with 600 feet of 1-inch wire rope (cable) hooked to a 1 000-pound Danforth type anchor. Winches have both manually and electrically operated brakes.

C-3.2 Each winch is powered by a 10 hp Dresser electric gear motor in a totally enclosed housing specifically designed for maritime use. For added protection against moisture and corrosion, the motor has an internally mounted 120 V, single phase electric space heater that will maintain internal temperature between 38 to 55 degrees F depending upon outside ambient temperature. This motor drives the winch through a drive chain and gears which are running in lubricant in a sealed housing on the side of the winch frame.

C-3.3 Within the motor housing is a Stearns 1 Osft-lbs self-adjusting electric disc brake. This brake is always on except when voltage applied to a solenoid depresses the spring and allows the disc and motor to turn freely. For anchor winch manual operation (without power), this solenoid operated electric brake is manually turned off. This brake has a 120 V, 25-watt space heater to minimize adverse effects of condensation. To work in a saltwater atmosphere, this brake has naval brass friction discs instead of the usual fiber discs.

C-3.4 Each winch is designed so reeling-in action pulls cable onto the drum underside (bottom-spooling) and is equipped with a heavy duty levelwind assembly to ensure proper spooling of cable. To assist in spooling cable onto the nongrooved drum, each winch uses only 'right-lay" cable (wire rope).

C-3.5 Each winch has electrical controls including an ON/OFF switch, an OUT button, an IN button, a STOP button, and a RESET button. Manual controls provide for engaging/disengaging levelwind mechanism, operating manual drum brake, and selecting either manual or electrical power for the winch.

C-3.6 The manual method of operating the winch, when selected, may be used to allow anchor to free-fall. This is not recommended. Anchor cannot be manually retrieved with this system. With two ship service generators providing electrical power, a manual backup system with full capability is not considered necessary.

C-3.7 Each winch cable passes through a fairleader before attaching to the anchor. This prevents the anchor cable from becoming entangled with other equipment on the weatherdeck.

C-3.8 Anchoring and mooring system components are listed in Chapter 1.

Table C-1. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment

B-Before

D-Daily

Q-Quarterly

D-During

W-Weekly

S-Semiannually

A-After

M-Monthly

A-Annually

Item No.	INTERVAL										Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted as Necessary	Equipment Is Not Ready/Available
	B	D	A	D	W	M	Q	S	A				
1	*			*		*					ANCHOR, MOORING, AND TOWING EQUIPMENT	<p style="text-align: center;">WARNING</p> <p>Be sure electrical power is OFF before performing maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed at the beginning of this manual and in manufacturers' manuals/instructions.</p> <p>a. Visually check each anchor, exposed cable and connections, fairleader, and anchor winch for damage (all items located on weatherdeck). If damaged, notify shift leader or bargemaster so repairs can be made. If not operational, modify anchoring procedures to adjust for nonfunctioning anchor winch.</p> <p>b. Use grease gun with extender to lubricate each winch and fairleader as follows:</p> <ol style="list-style-type: none"> 1) Eight grease fittings on fairleader (two on each of four rollers). 2) Eleven grease fittings on levelwind traveler (two on each of four rollers and three on top of Barge 1 traveler). On barges 2 and 3, traveler has four fittings on top. 3) One grease fitting on gear case (outboard) side. 4) Two grease fittings on brake (inboard) side (one on levelwind release mechanism, one on water end of cover on levelwind gears). 5) Three fittings on inside shaft behind the manual/power selector. 	Anchor, cables connections, fairleader and/or anchor winch damaged.
	*					*				Anchoring Components			

**Table C-1. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment
(Continued)**

Item No.	INTERVAL									Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted as Necessary	Equipment Is Not Ready/Available
	B	D	A	D	W	M	Q	S	A			
	*										6) Levelwind compound helix shaft and guide bars. c. Check oil level in gear motor reduction box as follows: <p style="text-align: center;">CAUTION</p> <p>If unit has been in storage, gear motor reduction box may be full of oil and must be drained to operating level prior to operation.</p> 1) Remove gearbox breather plug/oil filler plug near top of gearbox. 2) Remove gear oil check plug near top of gearbox end of unit. Oil should be level with bottom of check hole. 3) If overfull from storage requirements allow excess oil (about 3 qt.) to run out of check hole into a container. When oil stops flowing, replace plug. Dispose of excess oil into bilge system. 4) If oil level is lower than bottom of check hole, add oil through breather and oil filler plug on side of gearbox until oil flows out of check hole. Use nontoxic rust-inhibiting gear oil, AGMA No. 7. Replace both plugs. 5) Check gearbox breather plug/oil filler plug on side near top of gear motor reduction box. Screw inner portion of plug 'out' to uncover breather holes. Make sure breather holes are not covered with paint. d. Check oil level in gear case on outer side of winch as follows: 1) Unscrew oil level plug just below center line of gear case. Oil should be level with bottom of hole. 2) Remove gear lube access plate above oil level check hole.	
	*											

**Table C-1. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment
(Continued)**

Item No.	INTERVAL									Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted as Necessary	Equipment Is Not Ready/Available
	B	D	A	D	W	M	Q	S	A			
										*	3) Add 90 weight gear oil until it runs out of hole. 4) Replace oil level plug in hole. 5) Replace access plate. e. Change oil in gear lube on outer side of winch. 1) Gearcase oil should be warm but winch not in use. 2) Remove gear lube access plate and oil drain plug. Catch oil in container and empty into sludge tank. 3) Replace oil drain plug. 4) Remove oil level plug. 5) Fill with 90 weight gear oil until it runs out oil level hole. 6) Replace oil level plug. 7) Replace gear lube access plate. f. Change oil in gear motor reduction box. 1) Run motor a short time to warm gear motor oil. Turn off motor. 2) Remove gearbox breather plug/oil filler plug and gear oil drain plug. Catch oil in container. Dispose of oil into sludge tank. 3) Replace gear oil drain plug. 4) Remove gear oil check plug. 5) Add oil thru oil filler plug until it runs out of gear oil check plug hole. Use a nontoxic rust-inhibiting warm gear oil, AGMA NO. 7 compound, suitable for ambient temperatures of 50° to 1400 F. 6) Replace gear oil check plug and gear box breather plug/oil filler plug.	
										*		

**Table C-1. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment
(Continued)**

Item No.	INTERVAL									Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted as Necessary	Equipment Is Not Ready/Available
	B	D	A	D	W	M	Q	S	A			
	*		*									
		*									g. Apply multipurpose, water-resistant grease (MILG-24139) on anchor cable fairleader rollers, and all exposed, unpainted surfaces.	
											CAUTION	
											During anchor retrieval, if winch panel circuit breaker trips several times during operation, this may indicate a wrong recovery method. Continuing to operate winch under these conditions will damage winch motor.	
		*									h. Check condition of cable as it is pulled into drum. If cable is frayed, smashed, or cut, note location on drum and notify shift leader or bargemaster so repairs or replacement can be done.	Drum cable is frayed, smashed, or cut.
			*	*							i. Remove rust and corrosion. Clean and touchup all painted surfaces in accordance with TB 43-0144.	
		*									j. Make sure power panel 3 (120 Vac) circuit breaker 11P13 is closed (ON) to provide heat to electric motors and brakes to combat moisture and corrosion.	
				*							k. Visually check electric winch motors, motor controllers, and wiring for damage or malfunction. Report deficiencies to shift leader or bargemaster for corrective action.	Wiring is frayed or damaged.
											l. Check winch manual brakes to assure brake bank is properly fastened and not excessively worn.	Brake bank is excessively worn.
											m. Check and clean all electrical components and wiring.	

By Order of the Secretary of the Army:

Official:

MILTON H. HAMILTON
*Administrative Assistant to the
Secretary of the Army*
06927

GORDON R. SULLIVAN
*General, United States Army
Chief of Staff*

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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 = .15 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

Cubic Measure

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

Square measure

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

Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 metric ton = 10 quintals = 1.1 short tons

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce inches	newton-meters	.0070062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
sq. inches	sq. centimeters	6.451	kilometers	miles	.621
sq. feet	sq. meters	.093	sq. centimeters	sq. inches	.155
sq. yards	sq. meters	.836	sq. meters	sq. yards	10.764
sq. miles	sq. kilometers	2.590	sq. kilometers	sq. miles	1.196
acres	sq. hectometers	.405	sq. hectometers	acres	2.471
cubic feet	cubic meters	.028	cubic meters	cubic feet	35.315
cubic yards	cubic meters	.765	milliliters	fluid ounces	.034
fluid ounces	milliliters	29.573	liters	pints	2.113
pints	liters	.472	liters	quarts	1.057
quarts	liters	.946	grams	ounces	.035
gallons	liters	3.785	kilograms	pounds	2.205
ounces	grams	28.349	metric tons	short tons	1.102
pounds	kilograms	.454	pound-feet	newton-meters	1.356
short tons	metric tons	.907			
pound inches	newton-meters	.11296			

Temperature (Exact)

°F Fahrenheit temperature

5/9 (after subtracting 32)

Celsius Temperature °C

