

# COFFING<sup>®</sup>

## HOISTS

## OPERATING & MAINTENANCE INSTRUCTIONS WITH PARTS LIST

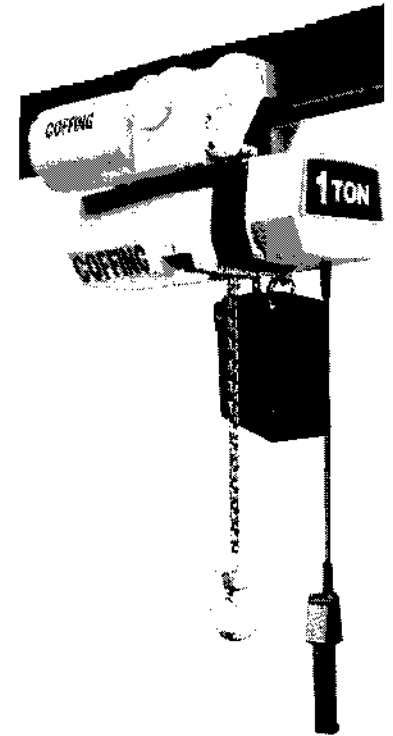
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## ECMT - MT Series Trolleys used with Electric Chain Hoist

*For Capacities:*

EC-1 Models - 1/4-3 Ton — Up to 1HP

EC-3 Models - 1-5 Ton — 2 & 3 HP



### IMPORTANT — CAUTION

To safeguard against the possibility of personal injury or property damage, follow the recommendations and instructions of this manual. This manual contains important information for the correct installation, operation, and maintenance of this equipment. All persons involved in the installation, operation, and maintenance of this equipment should be thoroughly familiar with the contents of this manual. Keep this manual for reference and further use.

### **⚠ WARNING**

To prevent personal injury, do not use the equipment shown in this manual to lift, support, or otherwise transport people, or to suspend unattended loads over people.

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## SECTION I

### INTRODUCTION

#### 1-1. General Information

This manual provides information for the installation and maintenance of Coffing® MT Series Motorized Trolleys furnished with EC Series Electric Chain Hoists. The Illustrated Parts List shows all trolley parts. For unillustrated hoist parts, refer to the Operating and Maintenance Instructions for the hoist.

#### 1-2. Safety Standards

Refer to the EC Hoist Operating and Maintenance Instructions for guidelines and applicable standards for safe hoist and trolley operation, as well as information on the proper application of this product.

#### 1-3. Warranty

Every hoist is thoroughly inspected and tested prior to shipment from the factory. Should any problems develop, return the complete hoist prepaid to your nearest Duff-Norton Authorized Warranty Repair Station. If inspection reveals that the problem is caused by defective workman-

ship or materials, repairs will be made without charge and the hoist will be returned, transportation prepaid.

This warranty does not apply where: (1) deterioration is caused by normal wear, abuse, improper or inadequate power supply, eccentric or side loading, overloading, chemical or abrasive actions, improper maintenance or excessive heat; (2) problems resulted from repairs, modifications or alterations made by persons other than factory or Duff-Norton Authorized Warranty Repair Station personnel; (3) the hoist has been abused or damaged as a result of an accident; (4) repair parts or accessories other than those supplied by Duff-Norton are used on the hoist. Equipment and accessories not of the seller's manufacture are warranted only to the extent that they are warranted by the manufacturer. EXCEPT AS STATED HEREIN, DUFF-NORTON MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

## SECTION II

### INSTALLATION

#### 2-1. Safety Notes

- Inspect the hoist and trolley for any evidence of shipping damage or loose parts.
- The beam and supporting structure should have a load rating at least equal to that of the hoist.
- All beams or tracks must have positive stops to prevent the trolley from running off the end.

#### 2-2. Trolley Mounting

- For the best possible wheel and beam life, Coffing® Motorized Trolleys use different wheels for American Standard I-beams, Wide (flat) Flange beams and patented monorail track. Check that the trolley wheels match the contour of the beam flange.
- Standard Motorized Trolleys are adjustable for the flange widths of 3.33 to 6.00 inches (4.0 inch minimum on 4 or 5 ton models). Adjustment for I-beam sizes and tolerances is accomplished by locating the spacer washers as shown in Figure 2-1. Normal placement of washers is given in Table 2-1.
- The load pin nuts for trolleys require a tightening torque of 100 ft.-lbs. Refer to Figure 2-1 for nut identification.

- Trolleys can be mounted on beam radii as small as 4 feet. Slightly increased spacing may be required when the trolley is mounted on curved beams to maintain freedom of movement.

**BEAM MANUFACTURING TOLERANCES ALLOW WIDE VARIATIONS FROM HANDBOOK FLANGE WIDTHS. SLIGHT CHANGES TO RECOMMENDED WASHER DISTRIBUTION MAY BE NECESSARY TO SUIT SPECIFIC INSTALLATIONS.**

The particular beam on which your hoist is to be installed should be measured and trolley spacer washers adjusted as required to achieve a wheel to beam flange clearance of  $\frac{3}{32}$ " to  $\frac{1}{8}$ ".

#### 2-3. Power Supply Connection

- Disconnect and lock out power before making connections.
- Follow procedures under "Power Supply Connection" in the hoist Operating and Maintenance Instructions.
- When used, current collectors should be installed per the recommendations of the collector manufacturer. A collector mounting arm is available from Duff-Norton

which accepts most brands of collectors. This arm is vertically adjustable to accommodate most collectors and beam sizes.

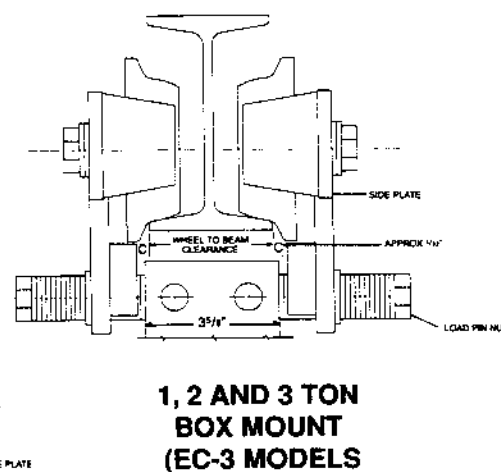
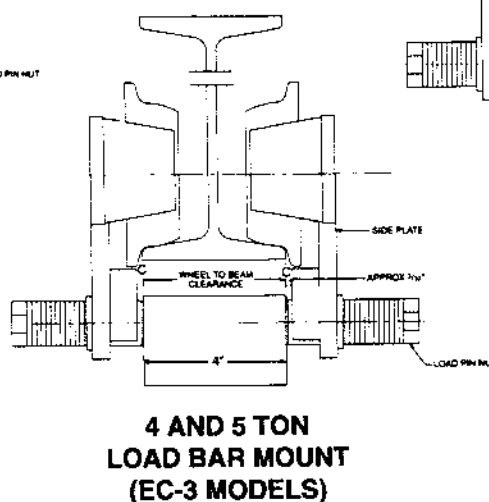
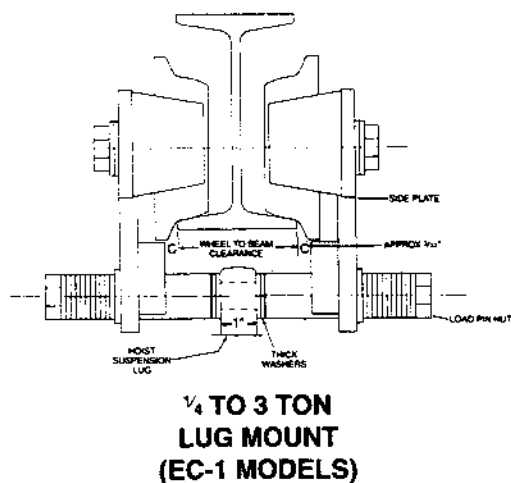
## 2-4. Initial Lubrication

Lubricate trolley wheel gears with NLGI-2 or heavier grease.

**TABLE 2-1. TROLLEY I-BEAM ADJUSTMENT DATA**

|                                                |       | "T" Beam Size |    |     |     |     |     |
|------------------------------------------------|-------|---------------|----|-----|-----|-----|-----|
|                                                |       | 6"            | 8" | 10" | 12" | 15" | 18" |
| <b>¼ to 3 Ton, Lug Mount (EC-1 Models)</b>     |       |               |    |     |     |     |     |
| Washers Between Hoist & Trolley                | Thick | 1             | 3  | 6   | 5   | 9   | 8   |
|                                                | Thin  | 0             | 1  | 0   | 4   | 0   | 5   |
| Washers Outside Trolley                        | Thick | 8             | 6  | 3   | 4   | 0   | 1   |
|                                                | Thin  | 5             | 4  | 5   | 1   | 5   | 0   |
| <b>1, 2 and 3 Ton, Box Mount (EC-3 Models)</b> |       |               |    |     |     |     |     |
| Washers Between Hoist & Trolley                | Thick | 0             | 3  | 1   | 4   | 7   | 6   |
|                                                | Thin  | 1             | 0  | 8   | 5   | 3   | 8   |
| Washers Outside Trolley                        | Thick | 7             | 4  | 6   | 3   | 0   | 1   |
|                                                | Thin  | 8             | 9  | 1   | 4   | 6   | 1   |
| <b>4 and 5 Ton (EC-3 Models)</b>               |       |               |    |     |     |     |     |
| Washers Between Hoist & Trolley                | Thick |               | 1  | 1   | 3   | 6   | 6   |
|                                                | Thin  |               | 0  | 4   | 3   | 1   | 4   |
| Washers Outside Trolley                        | Thick |               | 6  | 6   | 4   | 1   | 1   |
|                                                | Thin  |               | 5  | 1   | 2   | 4   | 1   |

Maintain approx.  $\frac{3}{32}$ " clearance at point "C"



**FIGURE 2-1. SPACER WASHER LOCATION: LUG MOUNTED HOISTS**

## SECTION III

### OPERATION

**3-1.** This section offers guidelines for the proper operation of Coffing Motorized Trolleys used with electric hoists. It is not intended to serve as a handbook on rigging. For information on the safe use of slings and similar gear, users are urged to consult a textbook on rigging.

#### 3-2. Safety Notes

- a. Inspect the trolley for any sign of loose, broken or malfunctioning parts. Any malfunctioning trolley should be tagged as “out of order” and removed from service until the defect is corrected.
- b. Be sure that beam end stops are in place.
- c. Before starting the trolley, the operator should be certain that all personnel are clear.
- d. Do not carry more than the rated load of the trolley.
- e. Avoid jogging controls or quick reversals of trolley.
- f. Do not carry people or loads over people.
- g. Do not leave a suspended load unattended.
- h. The operator should have a clear view of the load anytime it is moving and should be sure that the load

does not contact any obstructions.

- i. Read ANSI B30.16 Safety Standard for Overhead Hoists.

#### 3-3. Handling the Load

- a. Align hoist and trolley directly over the load. Avoid side pull or any action which causes trolley wheels to lift off one side of beam.
- b. Bring the hoist hook into engagement with the load and make sure it is well seated before proceeding to move the load.
- c. Lift the load just clear of its supports to check for proper brake operation, then proceed to lift the load to the height necessary to clear any objects over which the load must pass.
- d. Avoid letting load swing excessively while moving the trolley. Let the trolley coast to a stop instead of reverse plugging the trolley motor.
- e. Do not run the motorized trolley into beam end stops or other trolleys on the beam.

## SECTION IV

### INSPECTION

The trolley should be inspected for damage, loose parts, and excessive wheel wear at the same time as hoist inspection.

See the hoist Operating and Maintenance Instructions for inspection schedule guidelines.

## SECTION V

### MAINTENANCE AND REPAIR

**5-1.** No routine maintenance of the trolley is required other than wheel gear lubrication.

#### 5-2. Lubrication

- a. **Trolley Wheel Gears**—Lubricate at periodic inspection with an NLGI #2 or heavier grease.

- b. **Trolley Gearbox**—Periodic lubrication should not be necessary. If the gearbox is opened for repair, repack with an NLGI #1 grease.
- c. **Trolley Wheel Bearings**—Trolley wheel bearings are prelubricated and sealed. Bearings must be replaced if problems are indicated.

## SECTION VI

### WIRING

#### SAFETY NOTE

Disconnect power from unit before removing electrical covers.

#### 6-1. Voltage Conversion

Standard single speed units use dual voltage motors (230/460 volt, 3 phase; 115/230 volt, single phase). Motorized trolley units are factory wired for a specified voltage. Reconnection to the alternate voltage requires resplicing

of leads in both the trolley and the hoist. See the appropriate wiring diagram for splice connections.

#### 6-2. Wiring Diagrams

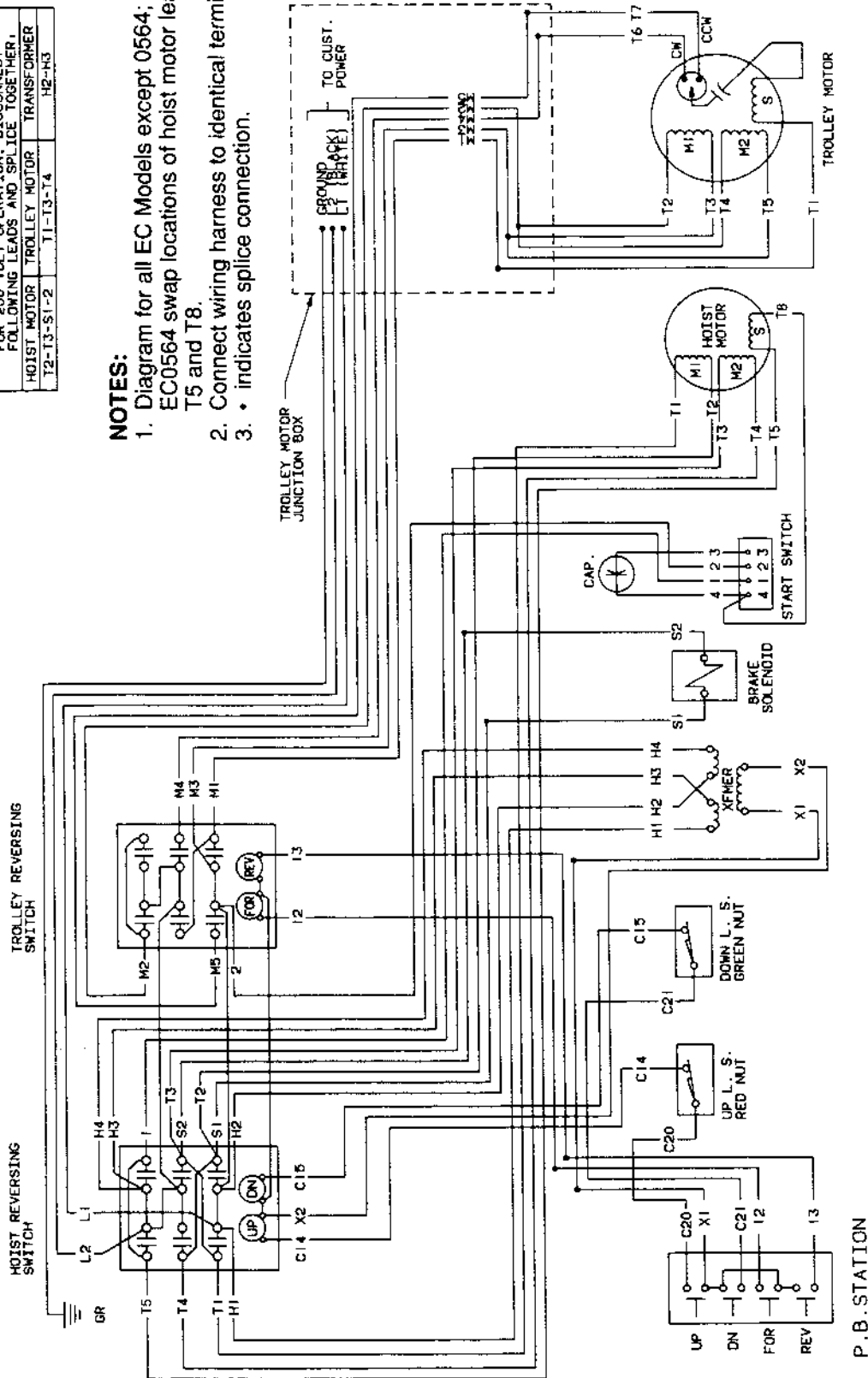
The wiring diagram for standard models are reproduced on the following pages. In addition, every hoist should have a wiring diagram located in either the trolley control box or the hoist long end cover.

SHOWN WIRED FOR 115 VOLTS.

| FOR 230 VOLT OPERATION, DISCONNECT FOLLOWING LEADS AND SPLICE TOGETHER. |               |             |
|-------------------------------------------------------------------------|---------------|-------------|
| HOIST MOTOR                                                             | TROLLEY MOTOR | TRANSFORMER |
| T2-T3-S1-2                                                              | T1-T3-T4      | H2-H3       |

**NOTES:**

1. Diagram for all EC Models except 0564; for EC0564 swap locations of hoist motor leads T5 and T8.
2. Connect wiring harness to identical terminals
3. • indicates splice connection.



WIRING DIAGRAM (115/230V)  
1 SPD HOIST 1 SPD TROLLEY

**FIGURE 6-1. 981ECMT30  
(SINGLE PHASE UNITS)**

SHOWN WIRED FOR 115 VOLTS.

|                                                                         |               |             |       |
|-------------------------------------------------------------------------|---------------|-------------|-------|
| FOR 230 VOLT OPERATION, DISCONNECT FOLLOWING LEADS AND SPLICE TOGETHER: |               |             |       |
| HOIST MOTOR                                                             | TROLLEY MOTOR | TRANSFORMER |       |
| T2-T3-S1-2                                                              | T2-T3-T8      |             | H2-H3 |

NOTES:

1. DIAGRAM FOR ALL EC MODELS EXCEPT 0564; FOR EC0564 AND ALL LR MODELS, SWAP LOCATIONS OF HOIST MOTOR LEADS T5 AND T8.
2. CONNECT WIRING HARNESS TO IDENTICAL TERMINALS.
3. • INDICATES SPLICE CONNECTION.

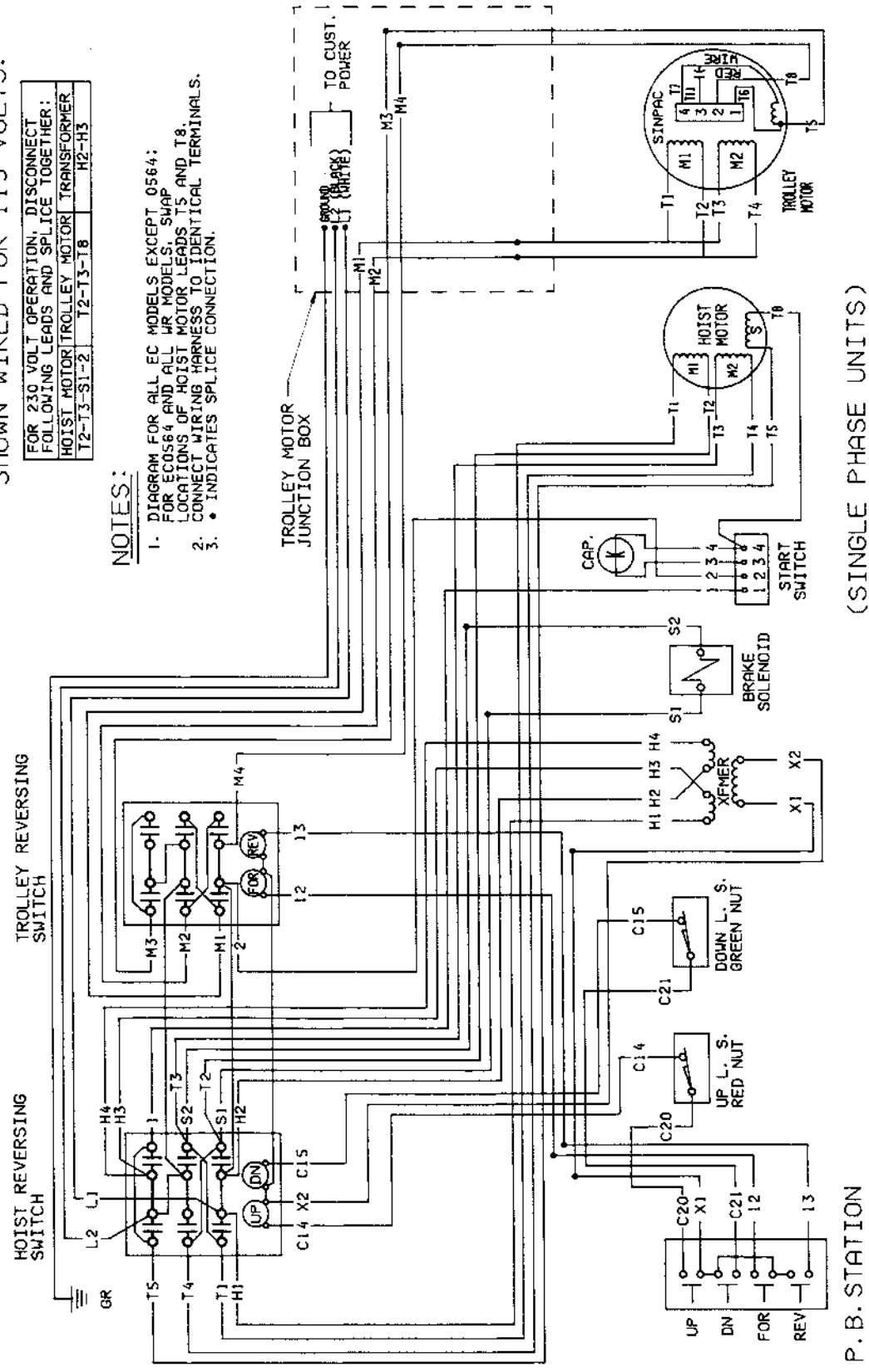
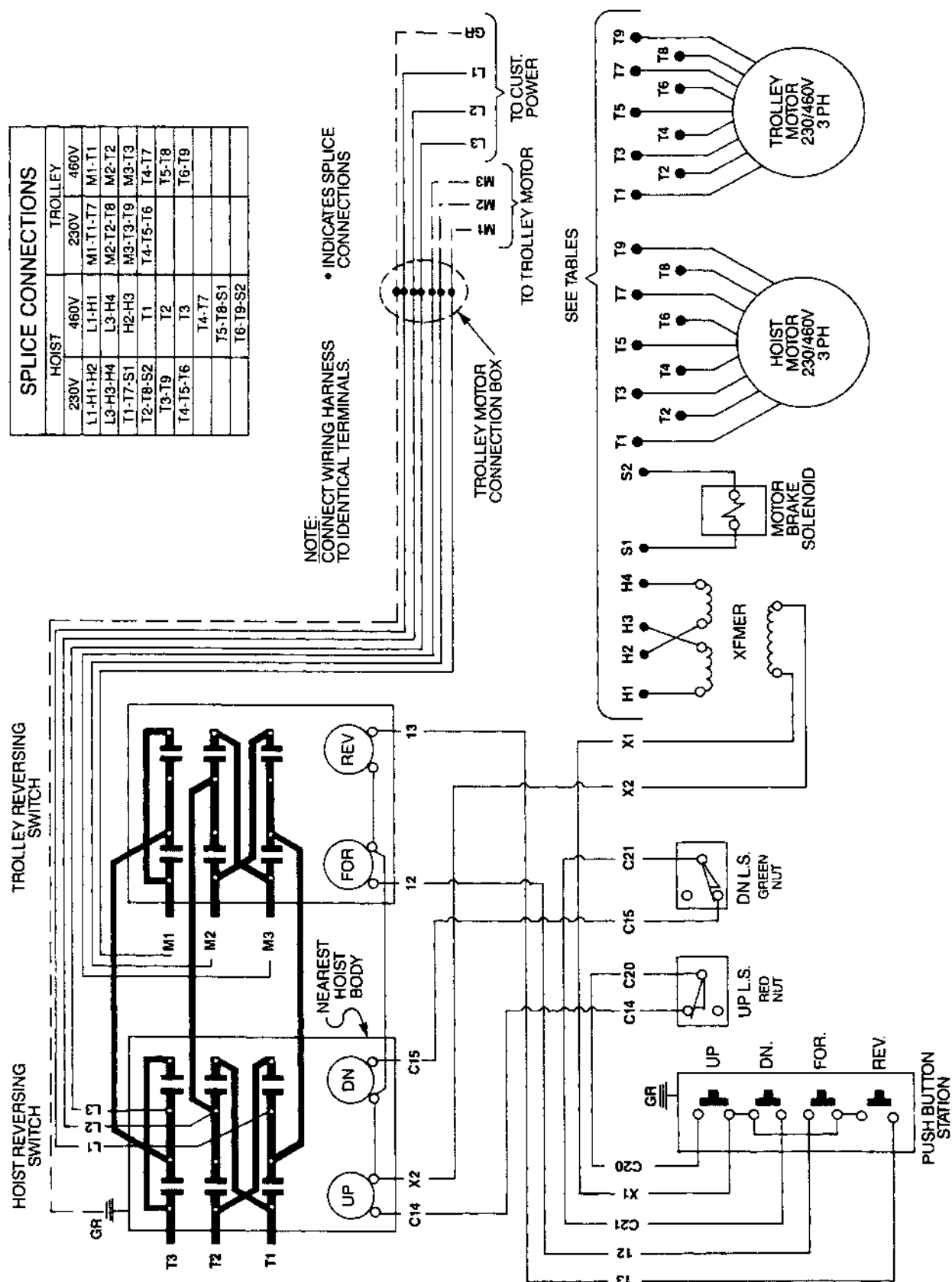
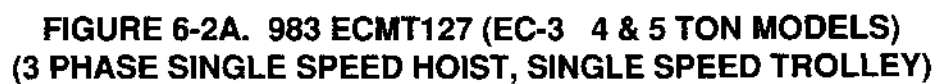
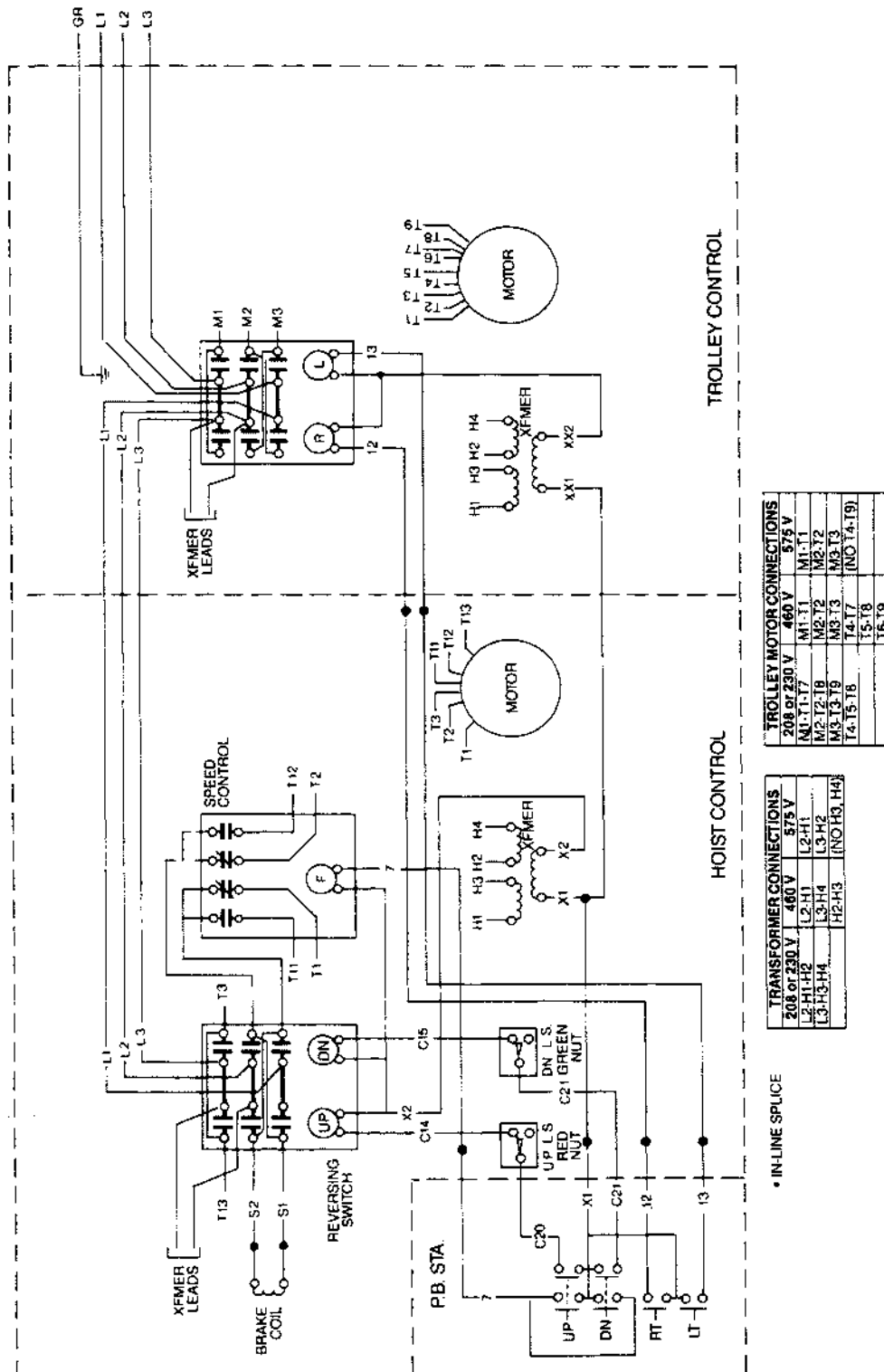


FIGURE 6-1A. 981 ECMT50 (SINGLE PHASE UNITS)

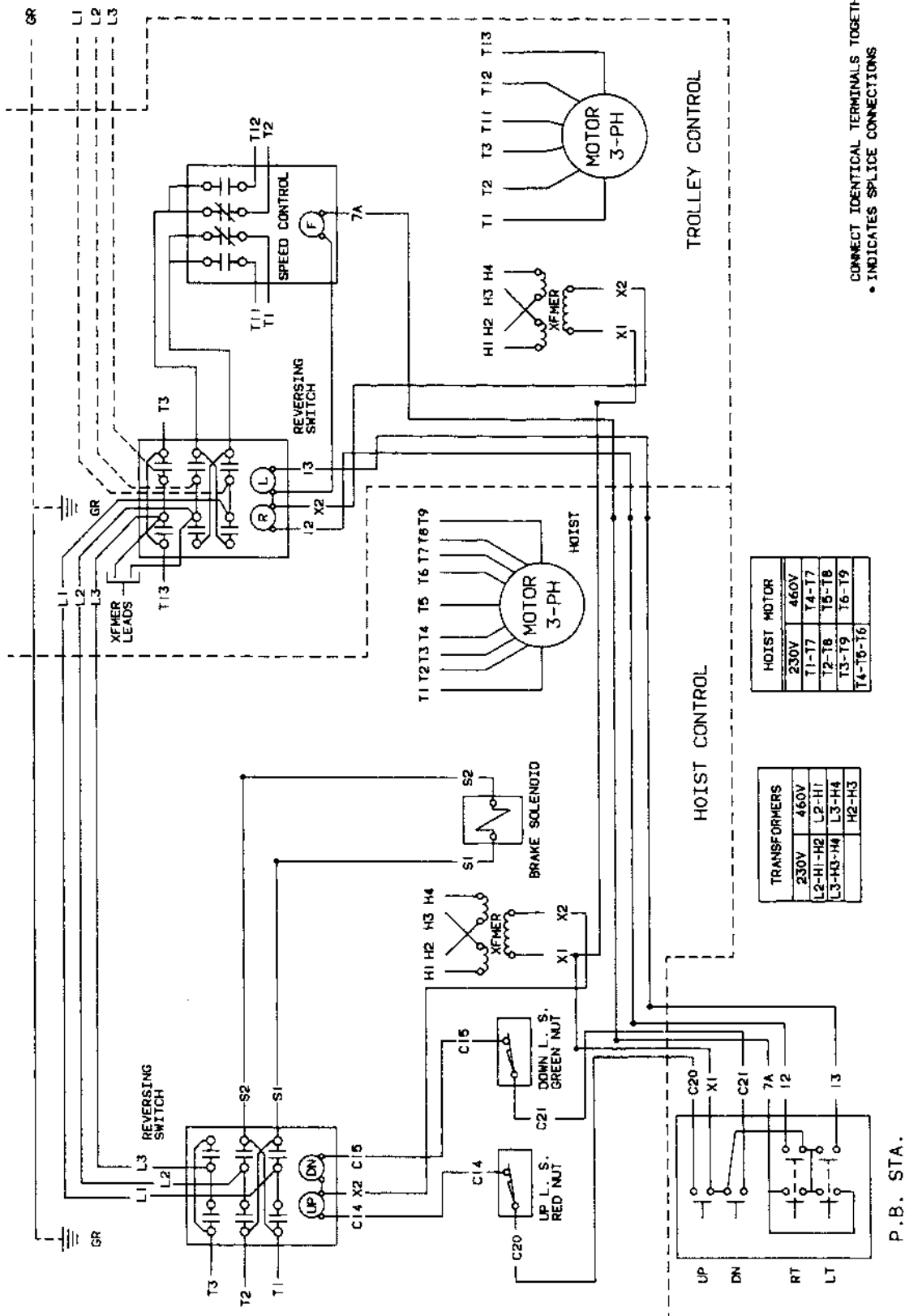


**FIGURE 6-2. 983ECMT1  
(3 PHASE SINGLE SPEED HOIST, SINGLE SPEED TROLLEY)**

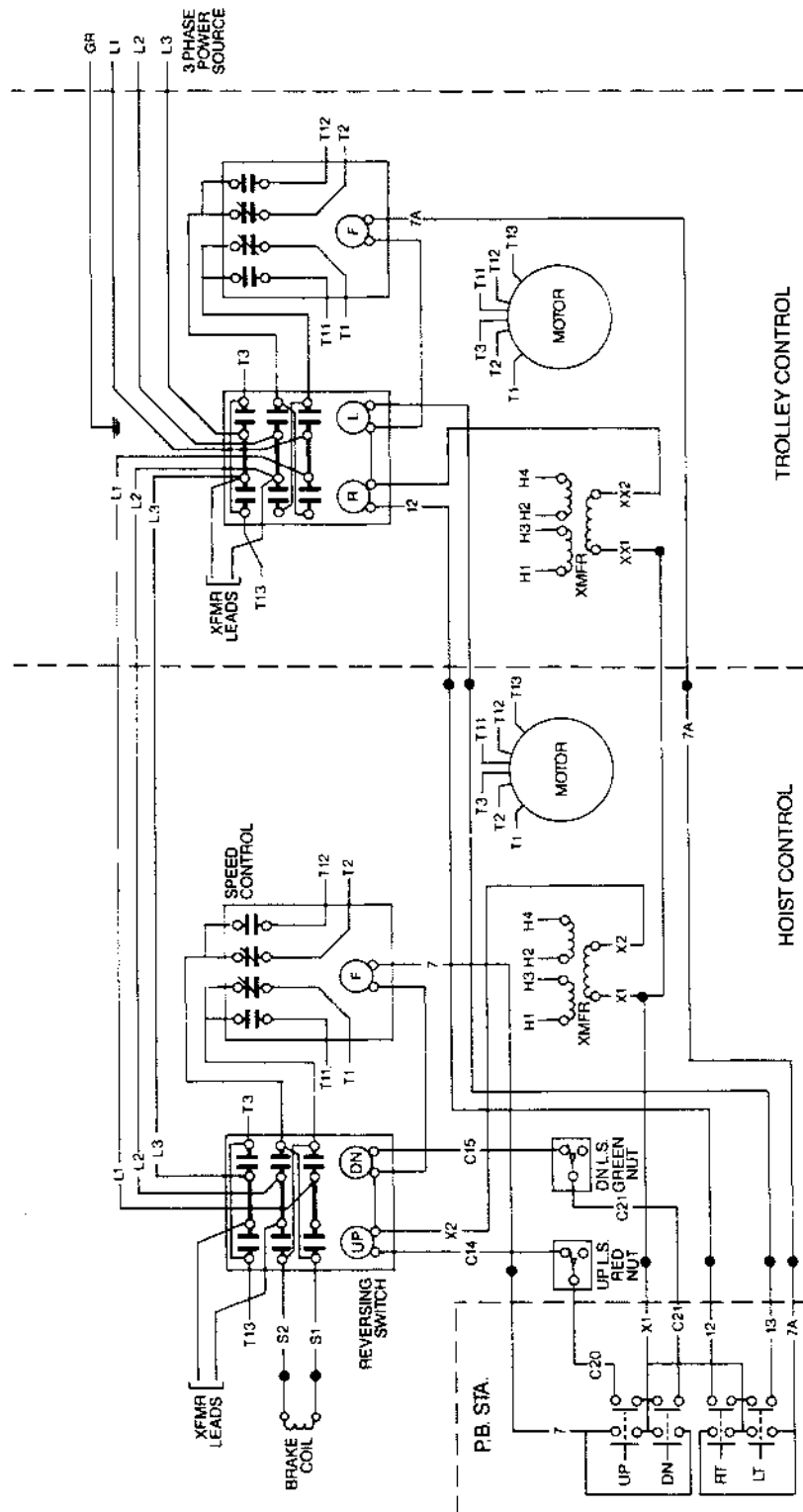




**FIGURE 6-3. 983ECMT268  
(2 SPEED HOIST, SINGLE SPEED TROLLEY)**



**FIGURE 6-4. 983ECMT269A  
(SINGLE SPEED HOIST, TWO SPEED TROLLEY)**



| TRANSFORMER CONNECTIONS |       |              |  |
|-------------------------|-------|--------------|--|
| 208 or 230 V            | 480 V | 575 V        |  |
| L2-H1-H2                | L2-H1 | L2-H1        |  |
| L3-H3-H4                | L3-H4 | L3-H2        |  |
|                         | H2-H3 | (NOT H3, H4) |  |

• IN-LINE SPLICE

FIGURE 6-5. 983ECMT271  
(TWO SPEED HOIST, TWO SPEED TROLLEY)

## SECTION VII

### ILLUSTRATED PARTS LIST

#### 7-1. General

The following exploded drawings provide a complete list of parts used in standard Motorized Trolleys used with EC hoist models. Since a number of different hoist and trolley models are covered by this manual, differences may be noted between the appearance of your part and the reference illustration. Where more than one part is shown for a reference number, sufficient information to pick the correct part should be included in the part description. For hoist parts not shown in this manual, refer to the hoist's Operating and Maintenance Instructions.

#### 7-2. How to Order Replacement Parts

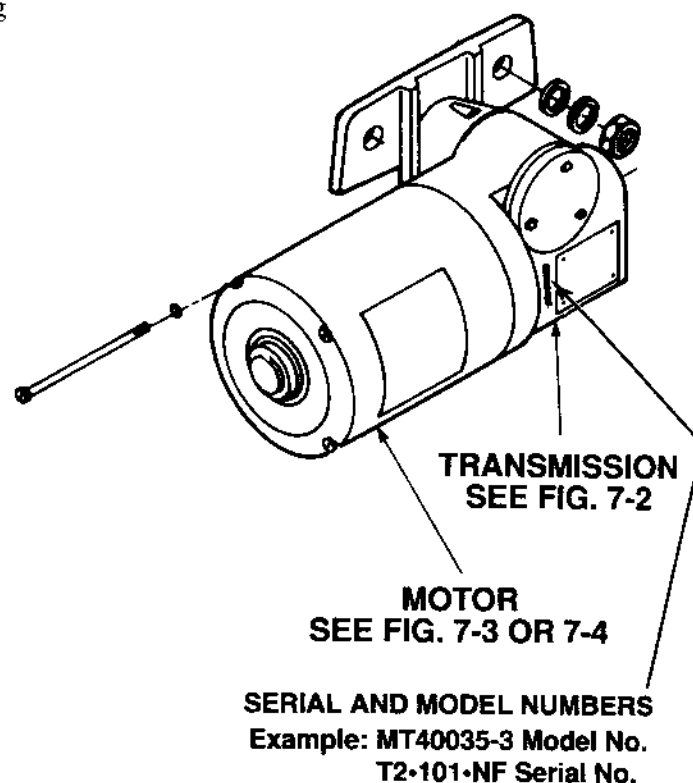
When ordering parts or requesting information concerning

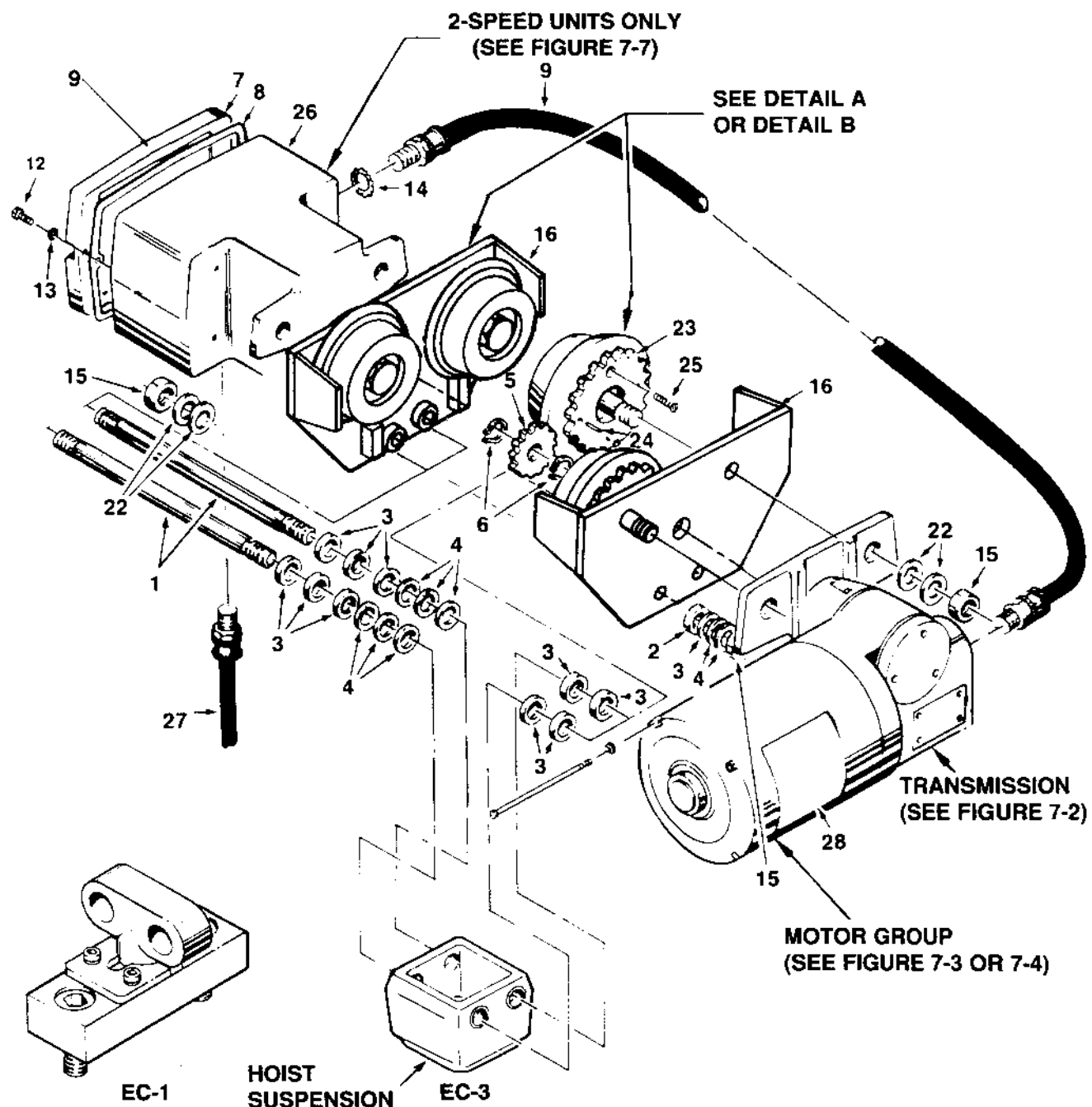
your trolley or hoist, always include the model and serial numbers of hoist and trolley. The hoist and trolley will each have its own numbers stamped into its housing.

When ordering motor parts, please provide complete motor nameplate data, including motor manufacturer name and motor "ref." number or model number.

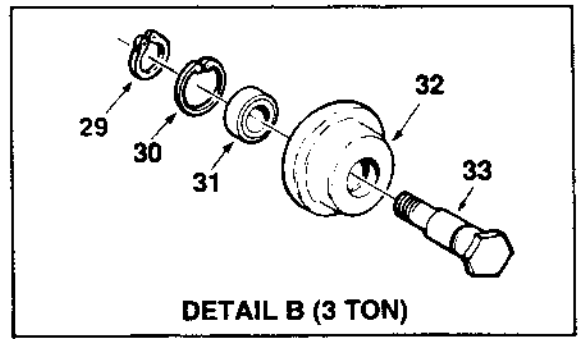
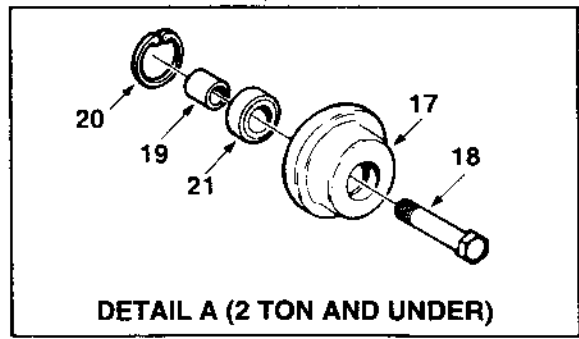
#### NOTE

Repair parts are available only from Coffing distributors or authorized repair facilities. It is recommended that repair part orders be directed to the authorized repair facility nearest you.





(PAGE 18, 19 SHOWS HOIST ATTACHED TO TROLLEY)



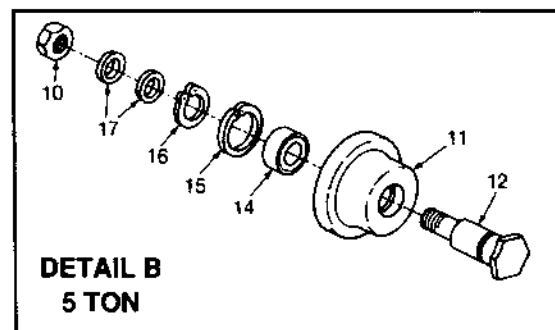
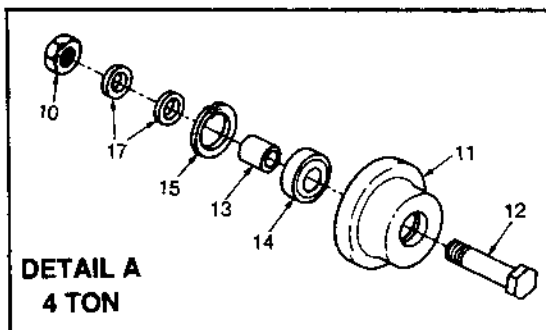
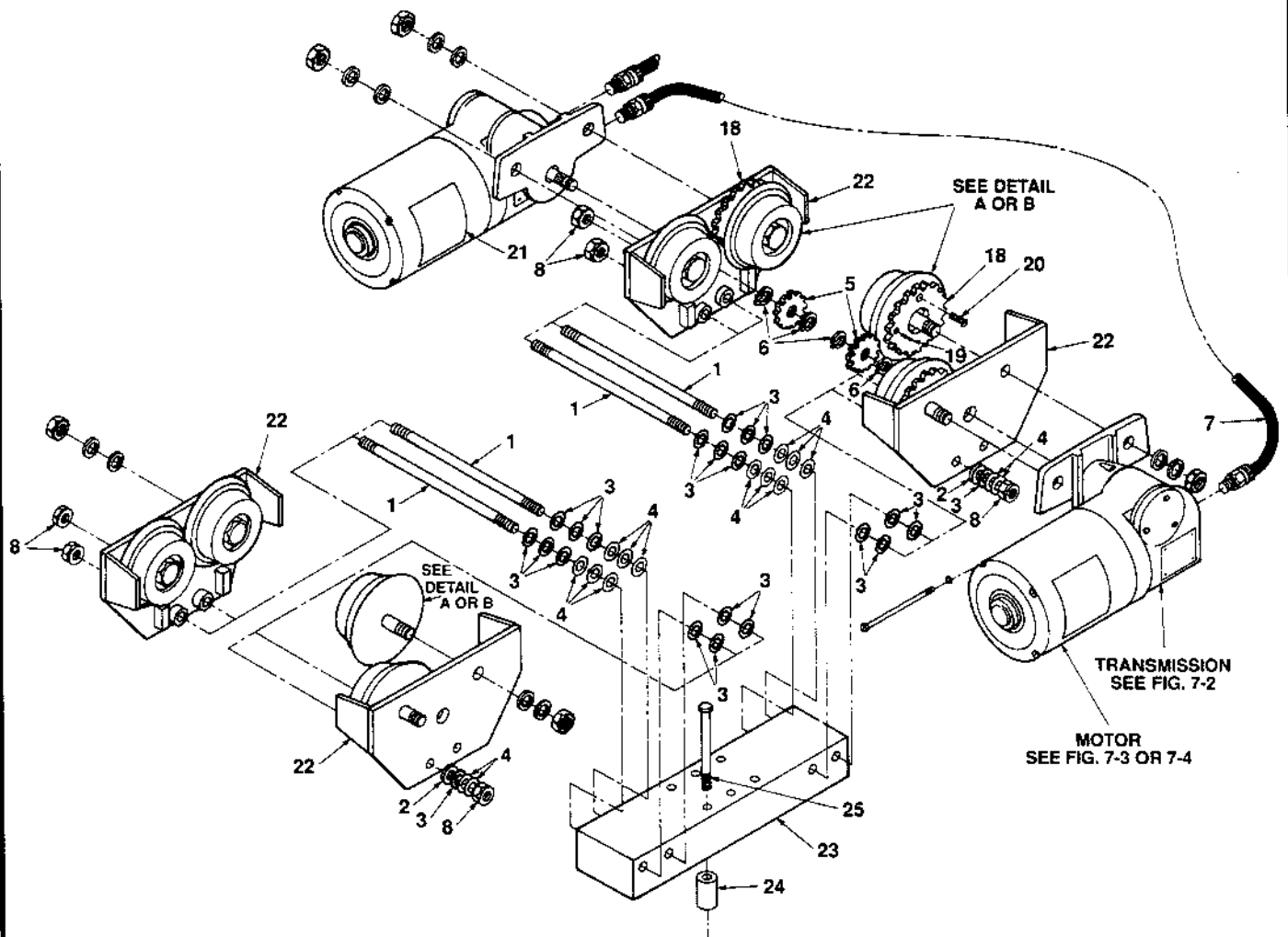
**FIGURE 7-1. TROLLEY GENERAL ASSEMBLY (3 TON & UNDER)**

| Index No. | Part Name                   | Part No. | Index No. | Part Name             | Part No. |
|-----------|-----------------------------|----------|-----------|-----------------------|----------|
| 1         | Load Pin                    | 103K1    | 17        | Wheel:                |          |
| 2         | Washer (1/8" Thick)         | H-4211   |           | Plain                 | 45K10    |
| 3         | Washer (.135 Thick)         | H-4209   |           | Drive                 | 45K1     |
| 4         | Washer (.075 Thick)         | H-4210   | 18        | Axle                  | 102K1    |
| 5         | Pinion                      | 420K1    | 19        | Spacer                | 200K1    |
| 6         | Retaining Ring              | H-5501   | 20        | Retaining Ring        | H-5528   |
| 7         | Cover, Control Box          | 36K3     | 21        | Bearing               | 500K4    |
| 8         | Gasket                      | 560K4    | 22        | Washer (1/8 Thick)    |          |
| 9         | Capacity Label:             |          |           | 2 Ton & Under         | H-4211   |
|           | 1/4 Ton                     | 675K18   |           | 3 Ton                 | H-4212   |
|           | 1/2 Ton                     | 675K19   | 23        | Gear                  | 420K2    |
|           | 1 Ton                       | 675K20   | 24        | Dowel Pin             | H-5331   |
|           | 2 Ton                       | 675K21   | 25        | Screw                 | H-2165   |
|           | 3 Ton                       | 675K22   | 26        | Control Box (If Used) |          |
| 10*       | Splice Cap                  | H-7519   |           | 2 Ton and under       | 36K1     |
| 11*       | Insulator, Splice Cap       | H-7520   |           | 3 Ton                 | 36K2     |
| 12        | Screw                       | S-44-4   | 28        | Decal                 | 692K1    |
| 13        | Lock Washer                 | H-4084-P | 29        | Retaining Ring        | H-5529   |
| 15        | Lock Washer                 |          | 30        | Retaining Ring        | H-5530   |
|           | 2 Ton & Under               | H-3945   | 31        | Bearing               | 500K5    |
|           | 3 Ton                       | H-3946   | 32        | Wheel:                |          |
| 16**      | Side Plate Weldment:        |          |           | Plain                 | 45K20    |
|           | 1 & 2 Ton (EC-3 Models)     | 5KG4     |           | Drive                 | 45K2     |
|           | 3 Ton (EC-3 Models)         | 5KG31    | 33        | Axle                  | 102K2    |
|           | 2 Ton & Under (EC-1 Models) | 5KG1     |           |                       |          |
|           | 3 Ton (EC-1 Models)         | 5KG2     |           |                       |          |

\* Not Illustrated

\*\* Identify hoist and trolley model as an EC-1 or EC-3.

**FIGURE 7-1. TROLLEY GENERAL ASSEMBLY (3 TON & UNDER)**



**FIGURE 7-1A. TROLLEY GENERAL ASSEMBLY (EC-3 4 & 5 TON ONLY)**

| Index No. | Part Name                                                                    | Part No. |
|-----------|------------------------------------------------------------------------------|----------|
| 1         | Load Pin (up to 6" Flange Width)                                             | 103K1    |
| 2         | Washer (1/8" Thick)                                                          | H4211    |
| 3         | Washer (.135 Thick)                                                          | H4209    |
| 4         | Washer (.025 Thick)                                                          | H4210    |
| 5         | Pinion                                                                       | 420K1    |
| 6         | Retainer Ring                                                                | H-5501   |
| 7         | Tie Cable Assembly                                                           |          |
|           | Single Speed                                                                 | 955KG-6  |
|           | Two Speed                                                                    | 955KG9   |
| 8         | Nut (Load Pin)                                                               | H-3945   |
| 9         | Wheel Assembly (For S-shaped I-Beam Only): (Consist of Index No. 10 Thru 17) |          |
|           | 4 Ton:                                                                       |          |
|           | Geared Wheel Assembly                                                        | 45KG2    |
|           | Plain Wheel Assembly                                                         | 45KG1    |
|           | 5 Ton:                                                                       |          |
|           | Geared Wheel Assembly                                                        | 45KG4    |
|           | Plain Wheel Assembly                                                         | 45KG3    |
| 10        | Nut Axle:                                                                    |          |
|           | 4 Ton                                                                        | H-3945   |
|           | 5 Ton                                                                        | H-3946   |
| 11        | Wheel (For S-Shape I Beam Only):                                             |          |
|           | 4 Ton:                                                                       |          |
|           | Geared Wheel (Gear Not Included)                                             | 45K1     |
|           | Plain Wheel                                                                  | 45K10    |
|           | 5 Ton:                                                                       |          |
|           | Geared Wheel (Gear Not included)                                             | 45K2     |
|           | Plain Wheel                                                                  | 45K20    |
| 12        | Axle:                                                                        |          |
|           | 4 Ton                                                                        | 102K1    |
|           | 5 Ton                                                                        | 102K2    |

| Index No. | Part Name                   | Part No. |
|-----------|-----------------------------|----------|
| 13        | Spacer (4 Ton Only)         | 200K1    |
| 14        | Bearing:                    |          |
|           | 4 Ton                       | 500K4    |
|           | 5 Ton                       | 500K5    |
| 15        | Retainer Ring:              |          |
|           | 4 Ton                       | H-5528   |
|           | 5 Ton                       | H-5530   |
| 16        | Retaining Ring (5 Ton Only) | H-5529   |
| 17        | Washer:                     |          |
|           | 4 Ton                       | H-4211   |
|           | 5 Ton                       | H-4212   |
| 18        | Gear                        | 420K2    |
| 19        | Pin                         | H-5331   |
| 20        | Screw                       | H-2165   |
| 21        | Decal:                      | 677J7    |
| 22        | Side Plate                  |          |
|           | 4 Ton                       | 5KG4     |
|           | 5 Ton                       | 5KG31    |
| 23        | Load Bar:                   |          |
|           | 4 Ton                       | 50K52    |
|           | 5 Ton                       | 50K51    |
| 24        | Spacer                      | *127J9   |
|           |                             | **127J7  |
| 25        | Bolt                        | *H-2451  |
|           |                             | **H-2438 |

\* Motorized Trolley Models (4 & 5 Ton)

\*\* Plain and Geared Trolley Models (4 & 5 tons)

**FIGURE 7-1A. TROLLEY GENERAL ASSEMBLY (4 & 5 TON ONLY)**

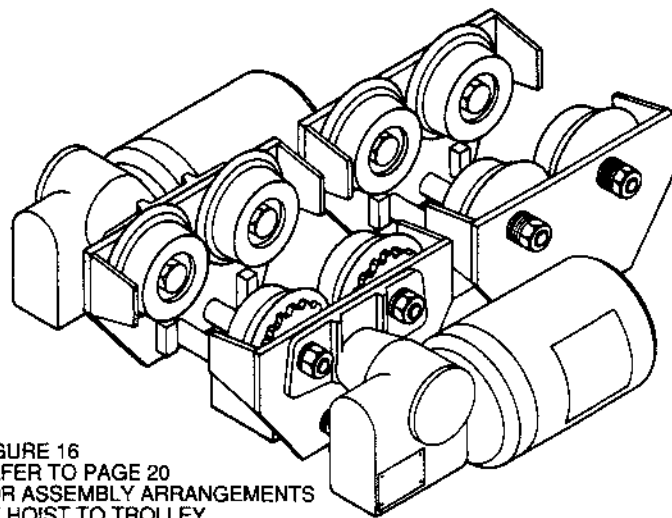
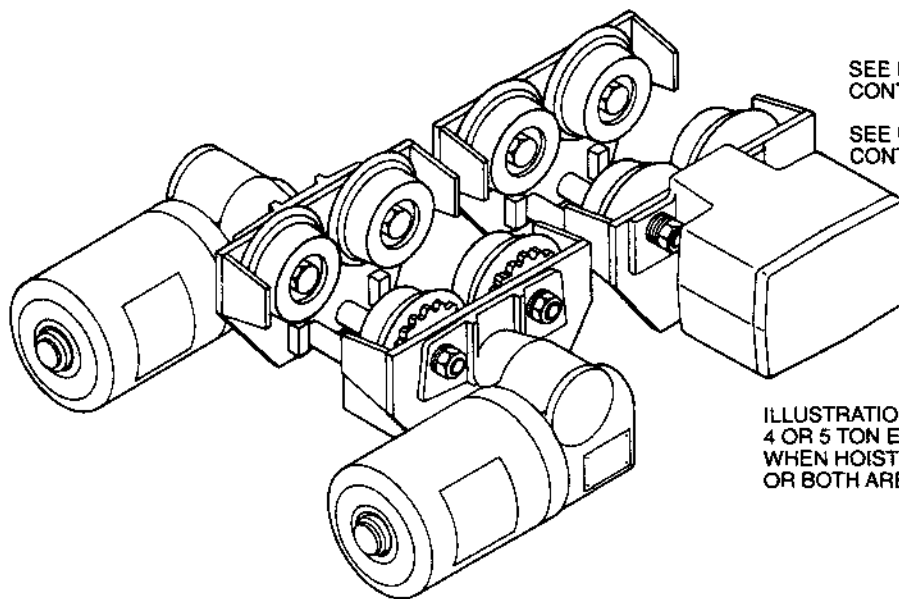


FIGURE 16  
REFER TO PAGE 20  
FOR ASSEMBLY ARRANGEMENTS  
OF HOIST TO TROLLEY

ILLUSTRATION FOR  
4 OR 5 TON ECMT  
WHEN BOTH HOIST AND  
TROLLEY ARE SINGLE SPEED  
SEE FIG. 7-5 FOR TROLLEY CONTROLS

NOTE POSITION OF TROLLEY  
MOTORS AND TROLLEY CONTROL BOX  
IN EACH VIEW.

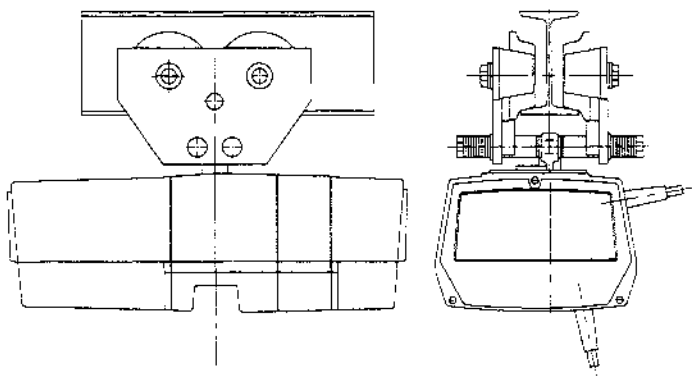


SEE FIG. 7-6 SINGLE SPEED TROLLEY  
CONTROL BOX ASSY.

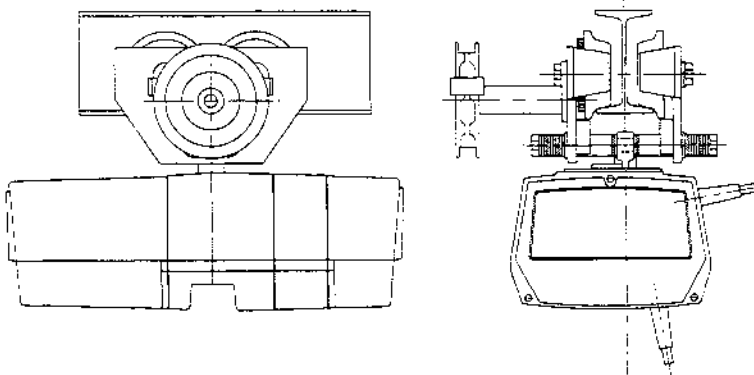
SEE FIG. 7-7 TWO SPEED TROLLEY  
CONTROL BOX ASSY.

ILLUSTRATION FOR  
4 OR 5 TON ECMT  
WHEN HOIST OR TROLLEY  
OR BOTH ARE TWO SPEED

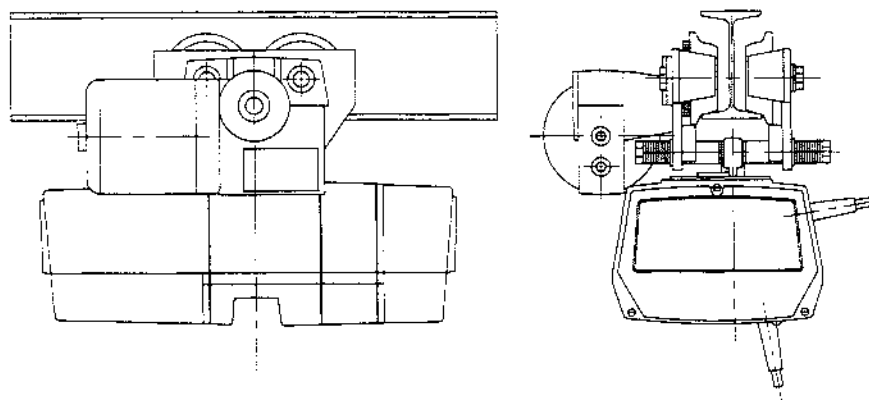
FIGURE 16



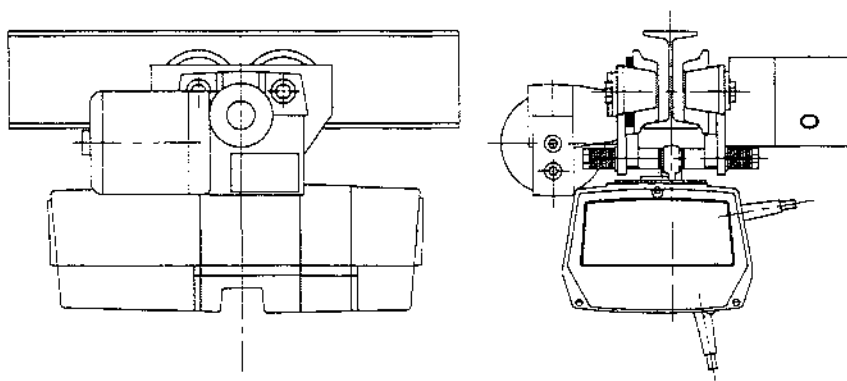
**EC-1  
PLAIN TROLLEY  
MOUNTED HOIST  
(PARALLEL MOUNTED)**



**EC-1  
GEARED TROLLEY  
MOUNTED HOIST  
(PARALLEL MOUNTED)**

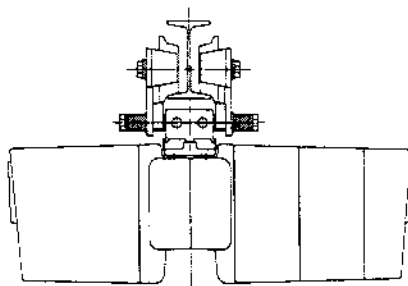
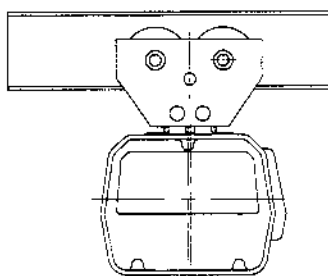


**EC-1  
MOTORIZED TROLLEY  
MOUNTED HOIST  
SINGLE SPEED  
HOIST AND TROLLEY  
(PARALLEL MOUNTED)**



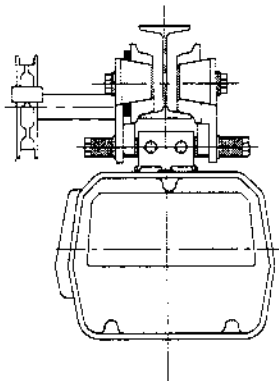
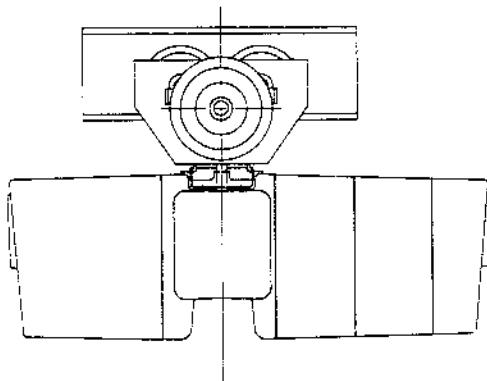
**EC-1  
MOTORIZED TROLLEY  
MOUNTED HOIST  
ANY 2 SPEED  
COMBINATIONS  
(PARALLEL MOUNTED)**

**ARRANGEMENT DRAWING — REFERENCE FOR EC-1 HOIST FIG. 1C**



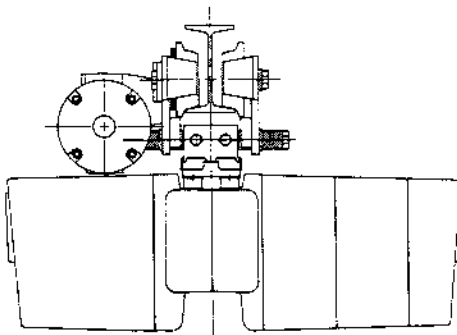
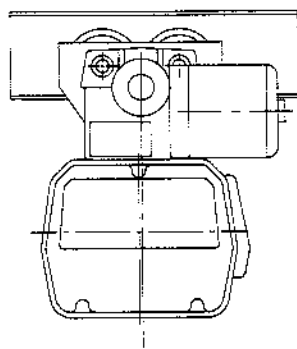
**EC-3  
PLAIN TROLLEY  
MOUNTED HOIST  
(CROSS MOUNTED)**

**1, 2, 3 TON**



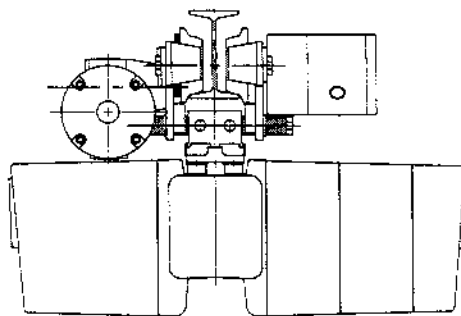
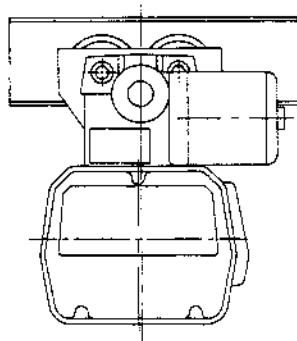
**EC-3  
GEARED TROLLEY  
MOUNTED HOIST  
(PARALLEL MOUNTED)**

**1, 2, 3 TON**



**EC-3  
MOTORIZED TROLLEY  
MOUNTED HOIST  
SINGLE SPEED  
HOIST AND TROLLEY  
(CROSS MOUNTED)**

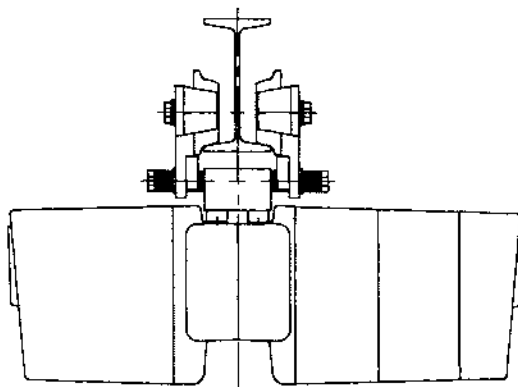
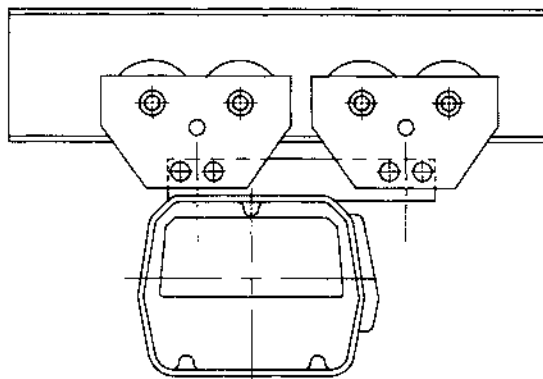
**1, 2, 3 TON**



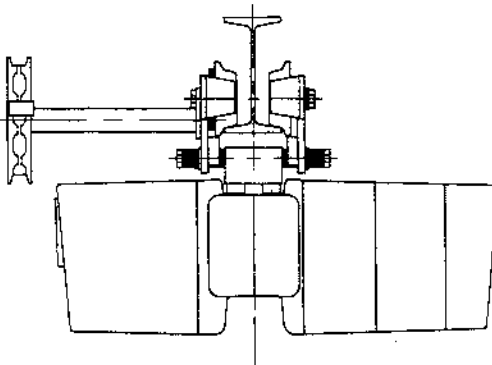
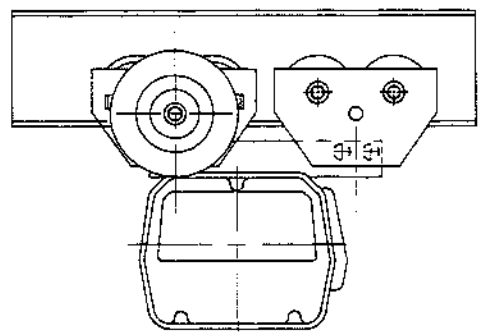
**EC-3  
MOTORIZED TROLLEY  
MOUNTED HOIST  
ANY 2 SPEED  
COMBINATIONS  
(CROSS MOUNTED)**

**1, 2, 3 TON**

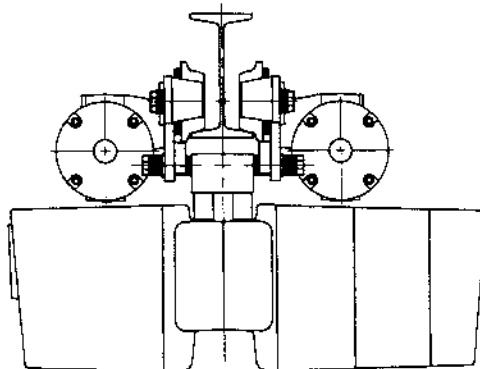
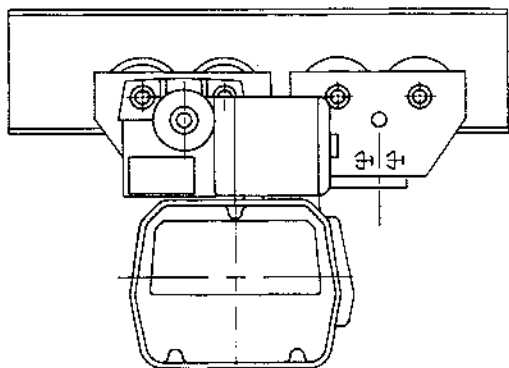
**ARRANGEMENT DRAWING — REFERENCE FOR EC-3, 1, 2, 3 TON FIG. 1D**



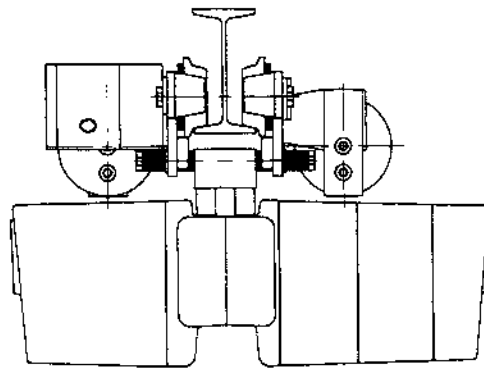
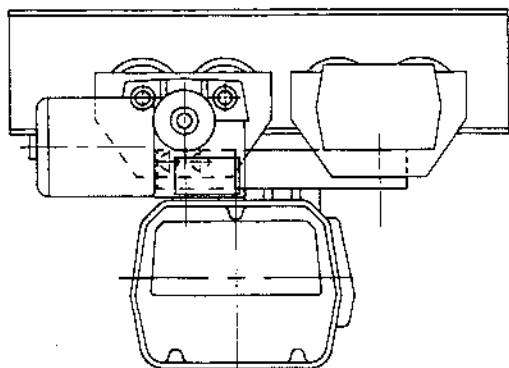
**EC-3 (4 & 5 TON)  
PLAIN TROLLEY  
MOUNTED HOIST  
(CROSS MOUNTED)**



**EC-3 (4 & 5 TON)  
GEARED TROLLEY  
MOUNTED HOIST  
(CROSS MOUNTED)**

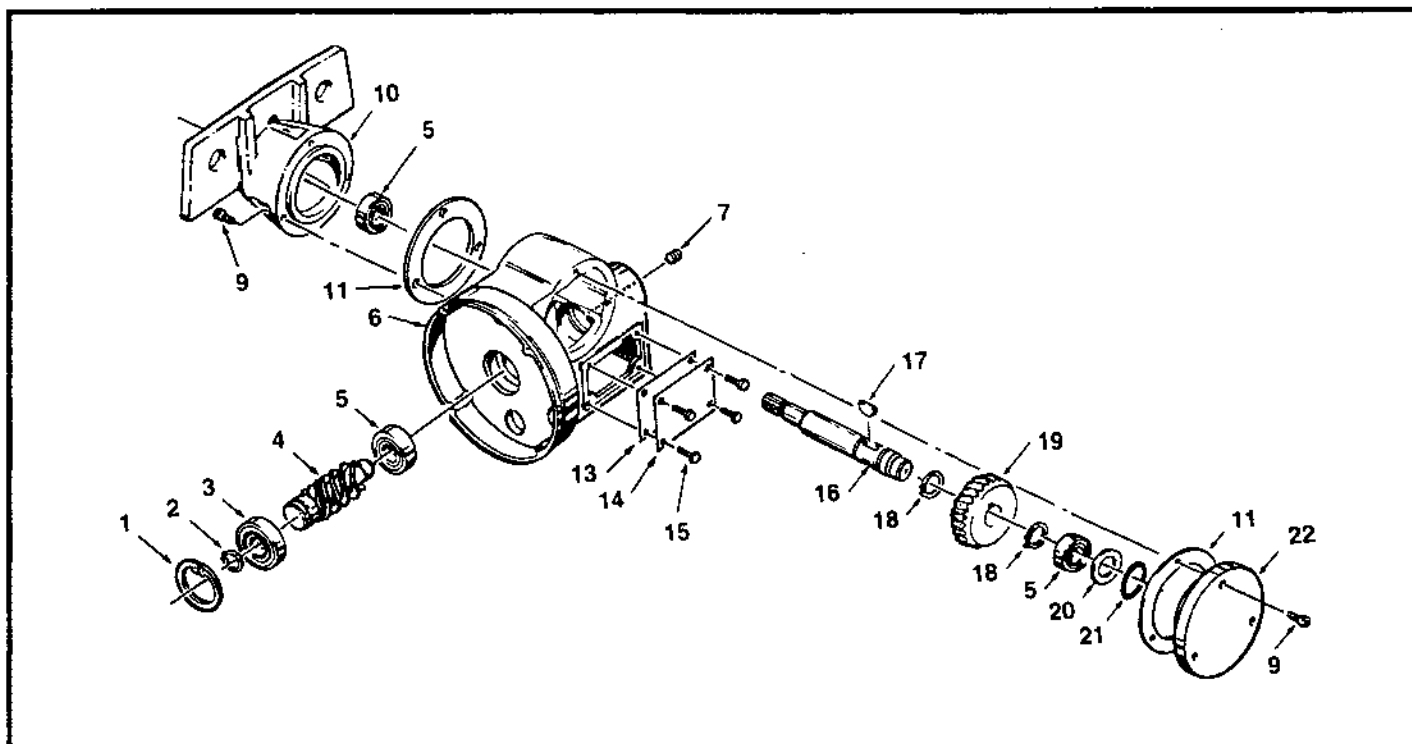


**EC-3 (4 & 5 TON)  
MOTORIZED TROLLEY  
MOUNTED HOIST  
SINGLE SPEED  
HOIST AND TROLLEY  
(CROSS MOUNTED)**



**EC-3 (4 & 5 TON)  
MOTORIZED TROLLEY  
MOUNTED HOIST  
ANY 2 SPEED  
COMBINATION  
(CROSS MOUNTED)**

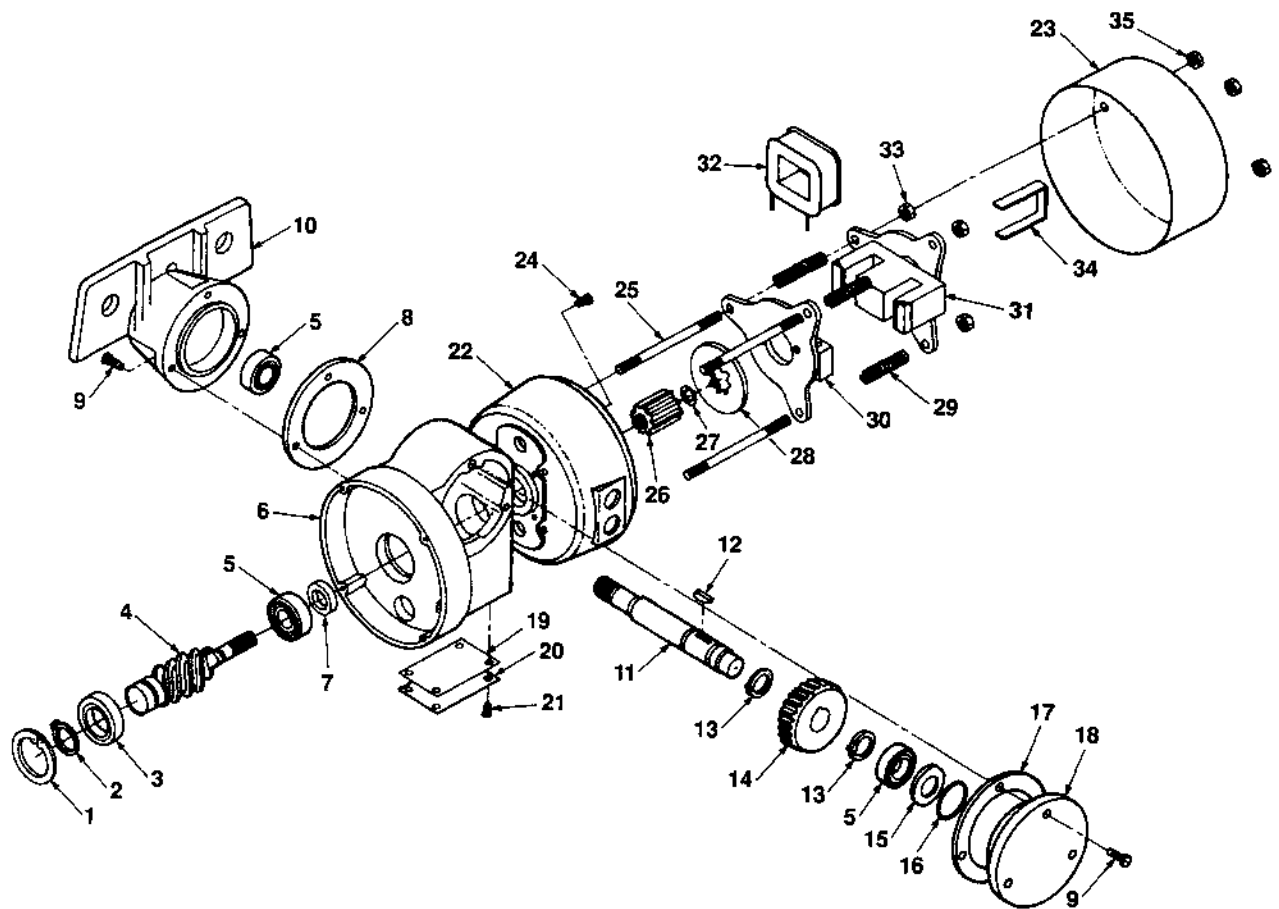
**ARRANGEMENT DRAWING — REFERENCE FOR 4 AND 5 TON EC-3 CHAIN HOIST FIG. 1F**



| Index No. | Part Name           | Part No. |
|-----------|---------------------|----------|
| 1         | Retaining Ring      | SK2658-6 |
| 2         | Retaining Ring      | H-5549   |
| 3         | Bearing             | JF-504-2 |
| 4         | Worm:               |          |
|           | 35 FPM              | 485K21   |
|           | 75 FPM              | 485K22   |
| 5         | Bearing             | 500K3    |
| 6         | Gear Housing        | 39K22    |
| 7         | Plug                | S-25-13  |
| 9         | Screw               | H-2215   |
| 10        | Adapter Housing:    |          |
|           | All Except 3, 5 Ton | 38K60A   |
|           | 3 and 5 Ton Only    | 38K61A   |

| Index No. | Part Name      | Part No. |
|-----------|----------------|----------|
| 11        | Gasket         | 560K2    |
| 13        | Gasket         | 560K3    |
| 14        | Splice Plate   | 295K1    |
| 15        | Screw          | H-1009-P |
| 16        | Shaft          | 100K12   |
| 17        | Woodruff Key   | S-23-15  |
| 18        | Retaining Ring | H-5527   |
| 19        | Worm Gear:     |          |
|           | 35 FPM         | 487K4    |
|           | 75 FPM         | 487K3    |
| 20        | Shim Washer    | 202K1    |
| 21        | "O" Ring       | H-5609   |
| 22        | End Cap        | 32K3     |

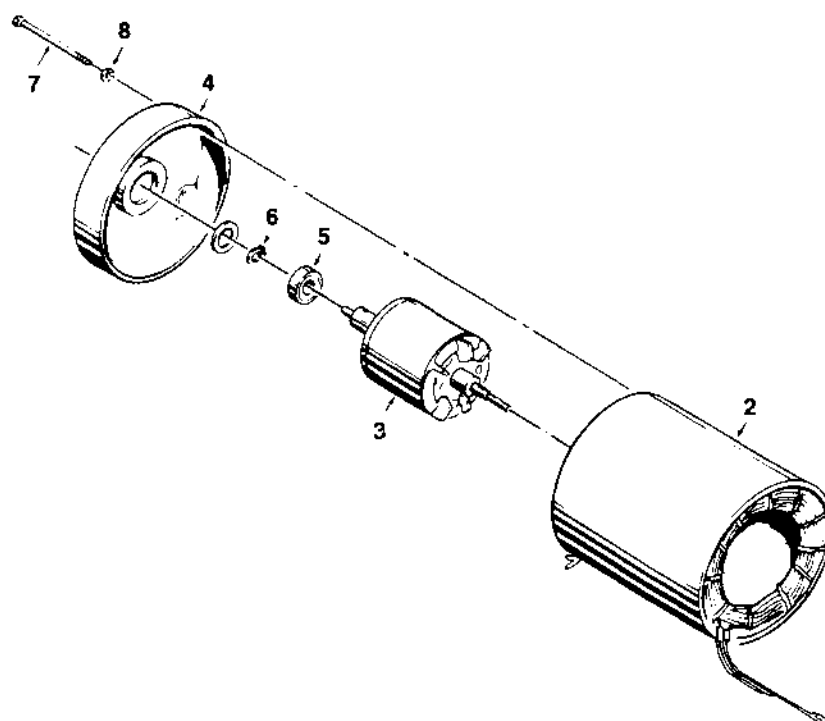
FIGURE 7-2. TROLLEY TRANSMISSION



| Index No. | Part Name       | Part No.                                                          |
|-----------|-----------------|-------------------------------------------------------------------|
| 1         | Retaining Ring  | SK2658-6                                                          |
| 2         | Retaining Ring  | H5549                                                             |
| 3         | Bearing         | JF504-2                                                           |
| 4         | Worm            | 485K25 35FPM<br>485K26 75 FPM<br>485K27 100 FPM<br>485K28 150 FPM |
| 5         | Bearing         | 500K3                                                             |
| 6         | Gear Housing    | 39K23                                                             |
| 7         | Oil Seal        | 561K2                                                             |
| 8         | Gasket          | 560K2                                                             |
| 9         | Screw           | H2215                                                             |
| 10        | Adapter Housing | 38K60A All Except<br>3, 5 Ton<br>38K61A 3, 5 Ton Only             |
| 11        | Shaft           | 100K12                                                            |
| 12        | Woodruff Key    | S23-15                                                            |
| 13        | Retaining Ring  | H5527                                                             |
| 14        | Worm Gear       | 487K4 35 FPM<br>487K3 75 FPM<br>487K2 100 FPM<br>487K1 150 FPM    |
| 15        | Shim Washer     | 202K1                                                             |
| 16        | "O" Ring        | H5609                                                             |

| Index No. | Part Name           | Part No.                                                                     |
|-----------|---------------------|------------------------------------------------------------------------------|
| 17        | Gasket              | 560K2                                                                        |
| 18        | End Cap             | 32K3                                                                         |
| 19        | Gasket              | 560K3                                                                        |
| 20        | Splice Plate        | 295K1                                                                        |
| 21        | Screw               | H1842P                                                                       |
| 22        | Brake Housing       | 37J11                                                                        |
| 23        | Brake Cover         | 36J10                                                                        |
| 24        | Screw (Socket Head) | S49-12                                                                       |
| 25        | Stud                | 141J12                                                                       |
| 26        | Brake Adapter       | JL142                                                                        |
| 27        | Retaining Ring      | H5501                                                                        |
| 28        | Brake Disc          | 581J1A                                                                       |
| 29        | Spring              | 344J6                                                                        |
| 30        | Plate & Armature    | JF858                                                                        |
| 31        | Plate & "E" Frame   | JF857                                                                        |
| 32        | Brake Coil          | JF853-1 115V<br>JF853-2 230V<br>JF853-3 460V<br>JF853-4 575V<br>JF853-5 208V |
| 33        | Nut                 | H3978                                                                        |
| 34        | Retainer            | JF710                                                                        |
| 35        | Nut                 | H3978                                                                        |

**FIGURE 7-3. TROLLEY TRANSMISSION WITH BRAKE**

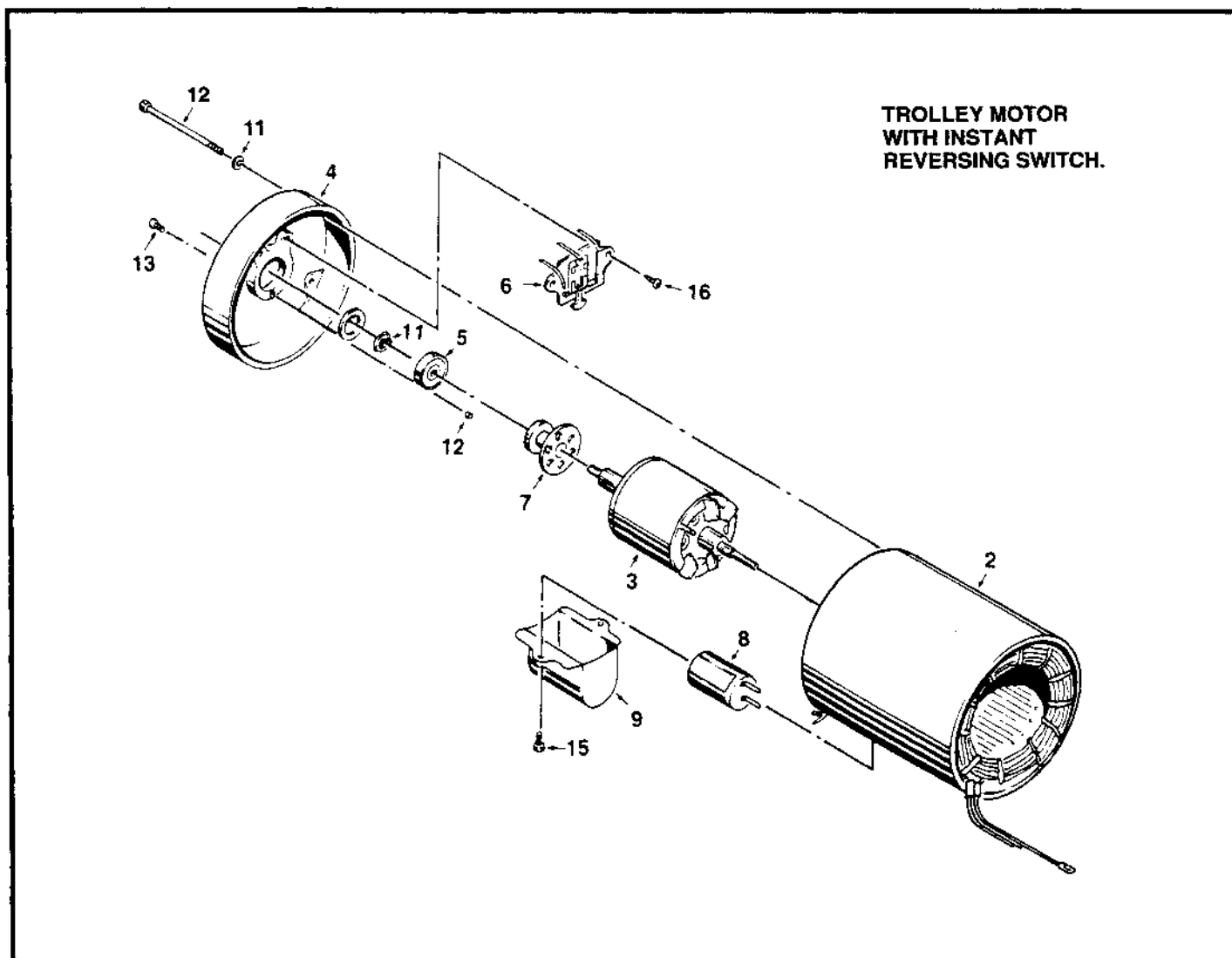


| Index No. | Part Name                    | Part No.  |
|-----------|------------------------------|-----------|
| 1         | Motor Complete, 3 Ph, 60 Hz: |           |
|           | Single Speed;                |           |
|           | 208-230/460V.                |           |
|           | 1/4 HP                       | JL-863-1M |
|           | 1/2 HP                       | JL-863-2  |
|           | 575V.                        |           |
|           | 1/4 HP                       | JL-863-5M |
|           | 1/2 HP                       | JL-863-6  |
|           | Two Speed;                   |           |
|           | 208-230V.                    |           |
|           | 1/4 HP                       | JL-873-1M |
|           | 1/2 HP                       | JL-873-2M |
|           | 460V.                        |           |
|           | 1/4 HP                       | JL-873-5M |
|           | 1/2 HP                       | JL-873-6M |

| Index No.    | Part Name                         | Part No.   |
|--------------|-----------------------------------|------------|
| 1<br>(Cont.) | Two Speed (Cont.);                |            |
|              | 575V.                             |            |
|              | 1/4 HP                            | JL-873-9M  |
|              | 1/2 HP                            | JL-873-10M |
| 2            | Stator (Not Available Separately) | *          |
| 3            | Rotor & Shaft                     | *          |
| 4            | End Shield                        | *          |
| 5            | Bearing, Front                    | 500K3      |
| 6            | Ring, Retaining                   | *          |
| 7            | Screw, Motor Mount                | *          |
| 8            | Lock Washer                       | *          |

\*For individual motor parts, contact your Duff-Norton Distributor and supply complete motor nameplate data.

**FIGURE 7-4. TROLLEY MOTOR PARTS  
(3 PHASE)**



| Index No. | Part Name                                                    | Part No.                |
|-----------|--------------------------------------------------------------|-------------------------|
| 1         | Motor Complete,<br>115/230V, 1-PH, 60Hz:<br>1/4 HP<br>1/2 HP | JL-861-11M<br>JL-861-12 |
| 2         | Stator (Not Available<br>Separately)                         | *                       |
| 3         | Rotor & Shaft                                                | *                       |
| 4         | End Shield                                                   | *                       |
| 5         | Bearing                                                      | 500K3                   |

| Index No. | Part Name          | Part No. |
|-----------|--------------------|----------|
| 6         | Shim Wheel         | *        |
| 7         | Start Switch       | 839J2    |
| 8         | Capacitor          | *        |
| 9         | Cover, Capacitor   | *        |
| 10        | Start Switch cover | *        |
| 11        | Lockwasher         | *        |
| 12        | Screw, Motor Mount | *        |
| 13        | Screw              | *        |
| 14        | Screw              | *        |

\*For individual motor parts, contact your Duff-Norton Distributor and supply complete motor nameplate data.

**FIGURE 7-4A. TROLLEY MOTOR PARTS  
(SINGLE PHASE)**

| Index No. | Part Name | Part No.                                                                    |
|-----------|-----------|-----------------------------------------------------------------------------|
| 31        | JL-861-12 | Motor, Complete:<br>1/2 HP, 115/230V, 60 Hz                                 |
| 31        | JL-861-14 | Motor, Complete:<br>1 HP, 115/230V, 60 Hz                                   |
| 32        | ---       | Stator & Housing Assembly<br>Not Available Separately                       |
| 33        | *         | Rotor & Shaft Assembly:<br>1/2 HP, 115/230V, 60 Hz<br>1 HP, 115/230V, 60 Hz |
| 34        | *         | End Shield                                                                  |
| 35        | 500K3     | Front Bearing                                                               |
| 38        | *         | Capacitor:<br>1/2 HP                                                        |
| 38        | *         | 1 HP                                                                        |

| Index No. | Part Name | Part No.        |
|-----------|-----------|-----------------|
| 39        | *         | Capacitor Cover |
| 40        | *         | Screw           |
| 42        | 732012    | Rear Bearing    |
| 43        | *         | Nut Flange      |
| 44        | *         | Screw           |
| 45        | H-4062-P  | Lock Washer     |
| 46        | *         | Screw           |
| 48        | *         | Shim Washer     |
| 49        | 839J2     | SINPAC® Switch  |
| 50        | *         | Cover           |
| 51        | *         | Screw           |

\* Contact factory with complete electric motor nameplate data.

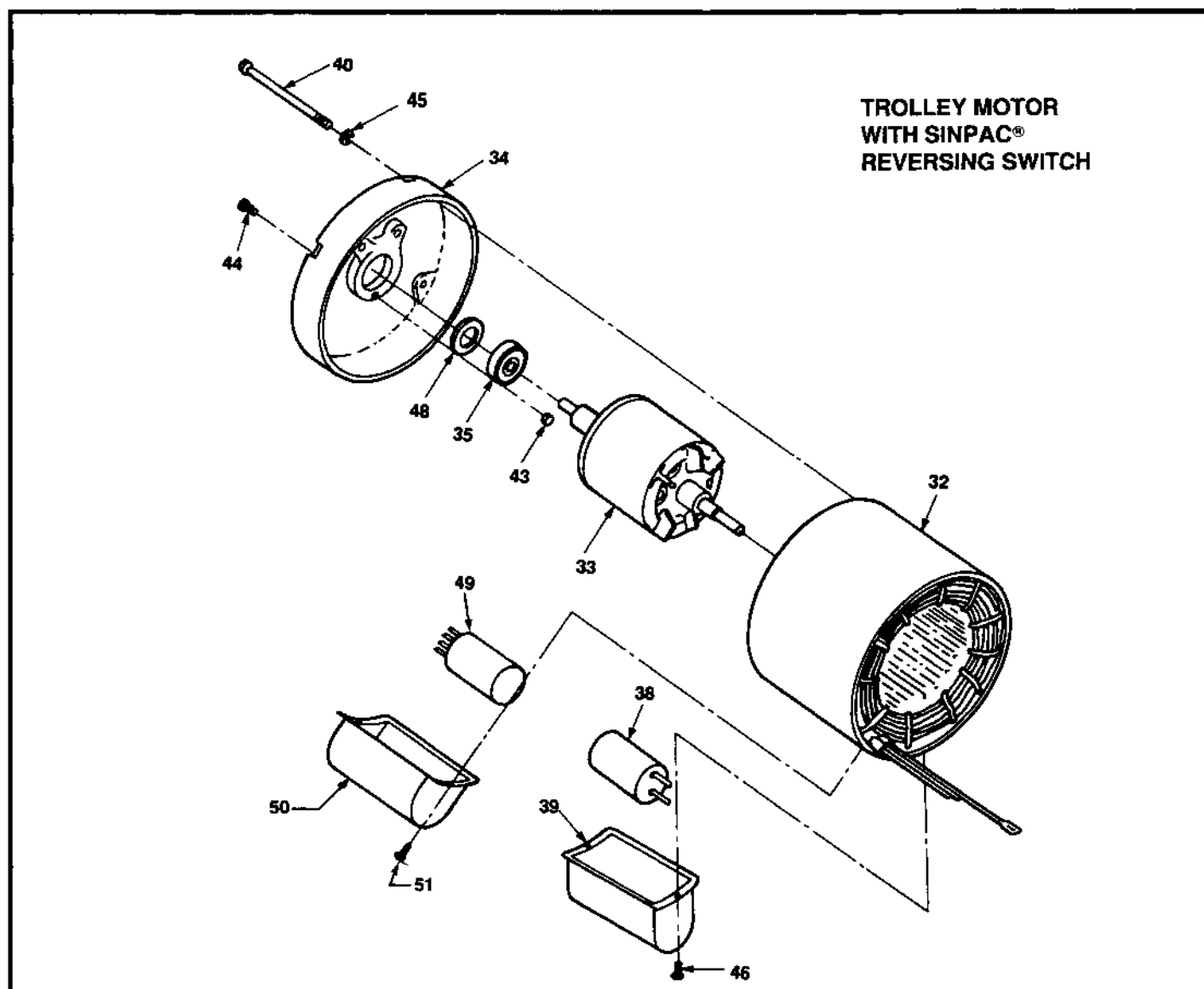
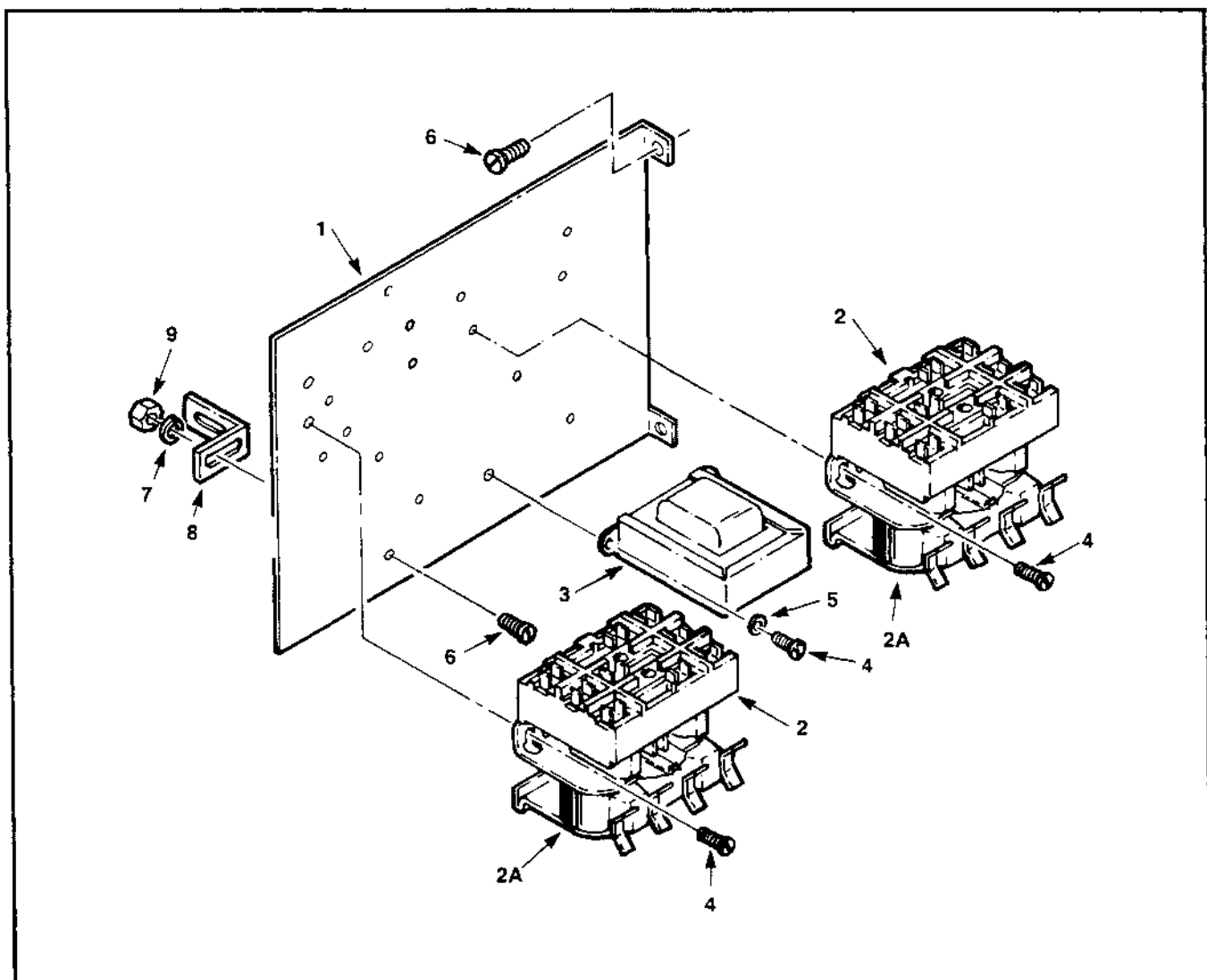


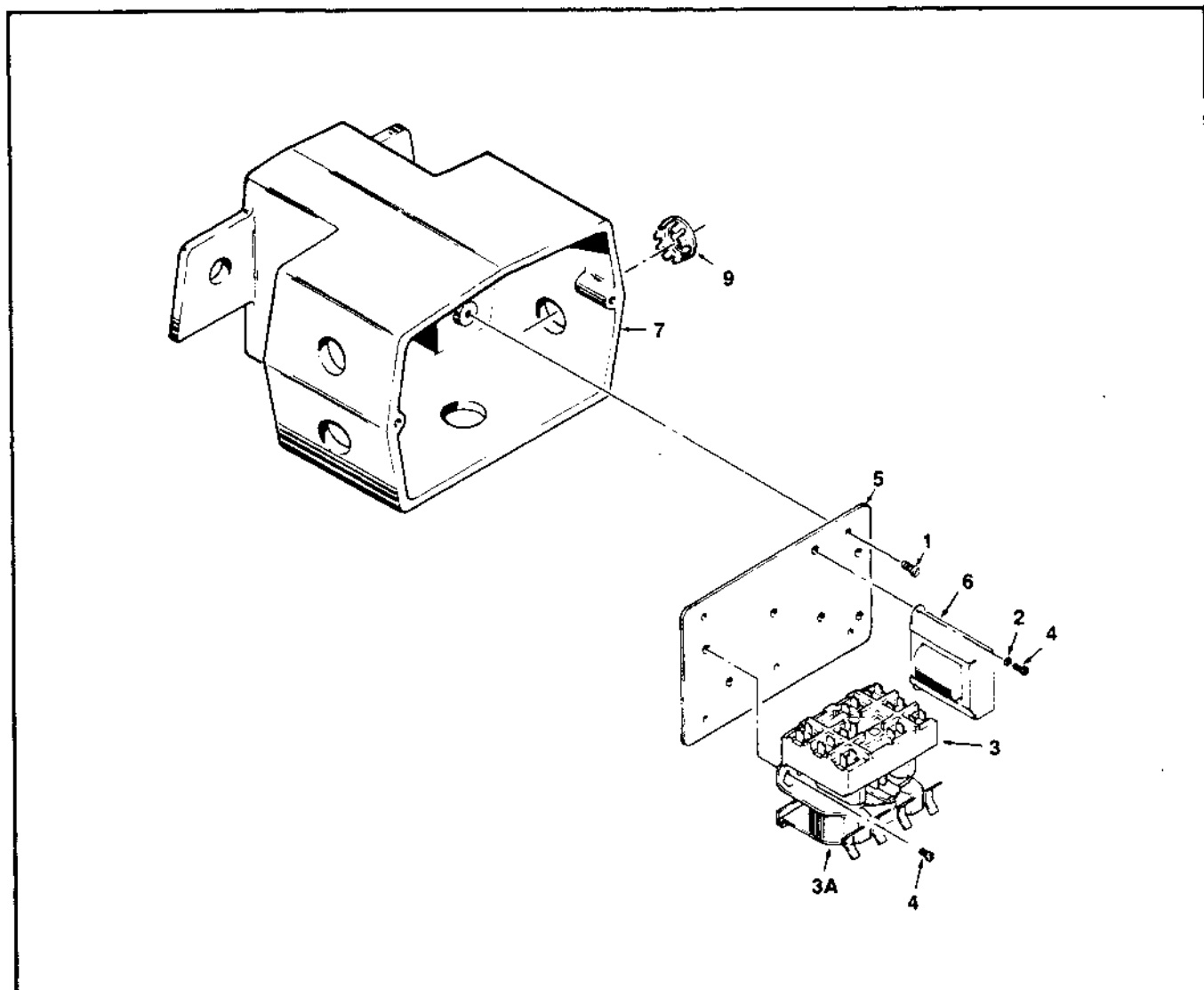
FIGURE 7-4B. TROLLEY MOTOR PARTS  
(1 PHASE, SINGLE SPEED)



| Index No. | Part Name                                                                                                                 | Part No.  | Index No. | Part Name                                         | Part No.  |
|-----------|---------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------------------------------------------------|-----------|
| 1         | Control Panel                                                                                                             | 257J1A    |           | Pri. 208, 230/460V, 208V,<br>Sec. 115V, 50/60 Hz. | JF-821-17 |
| 2         | Magnetic Reversing Switch                                                                                                 | 820K2     |           | Pri. 575V, Sec. 24V,<br>50/60 Hz                  | JF-821-16 |
| 2A        | Coil (24V)                                                                                                                | 820K317   |           | Pri. 575V, Sec. 115V,<br>50/60 Hz                 | JF-821-20 |
| 2A        | Coil (115V)                                                                                                               | 820K301   |           |                                                   |           |
| 2B*       | Replacement Contact Kit<br>(Includes stationary &<br>movable contacts and<br>spring for one magnetic<br>reversing switch) | 820K302   | 4         | Screw                                             | H2751     |
|           |                                                                                                                           |           | 5         | Lock Washer                                       | H-4158    |
|           |                                                                                                                           |           | 6         | Screw                                             | H-2981-P  |
|           |                                                                                                                           |           | 7         | Lock Washer                                       | H-4802-P  |
|           |                                                                                                                           |           | 8         | Retainer                                          | 285J7     |
| 3         | Transformer: (20 VA.)<br>Pri. 208, 230/460V, 208V,<br>Sec. 24V, 50/60 Hz.                                                 | 820K300   | 9         | Nut (Retainer)                                    | H-3862    |
|           |                                                                                                                           | JF-821-15 | 10*       | Splice Connector                                  | H-5757    |

\*Not Illustrated

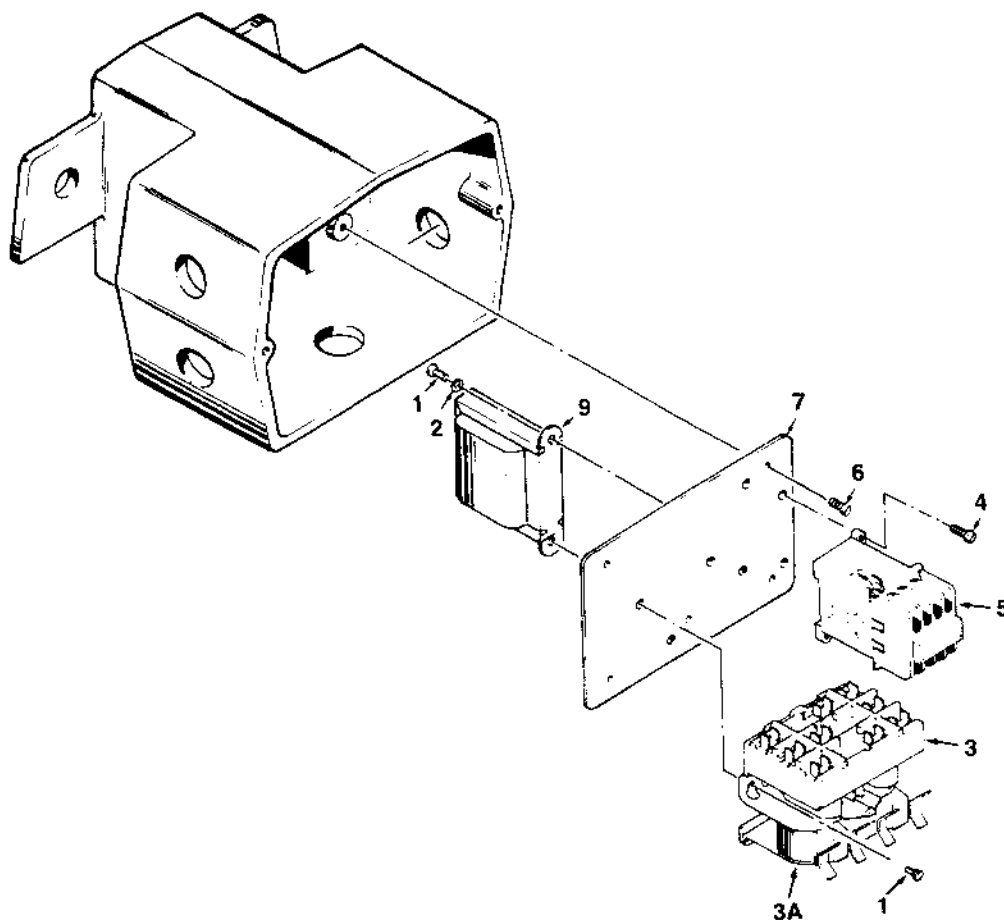
**FIGURE 7-5. CONTROLLER AREA (3 PHASE)  
(SINGLE SPEED HOIST, SINGLE SPEED TROLLEY)**



| Index No. | Part Name                  | Part No. | Index No. | Part Name            | Part No. |
|-----------|----------------------------|----------|-----------|----------------------|----------|
| 1         | Screw                      | H-1005-P | 6         | Transformer: (10 VA) |          |
| 2         | Lock Washer                | H-4158   |           | Pri. 208, 230/460V,  |          |
| 3         | Magnetic Reversing Switch: |          |           | Sec. 24V, 50/60 Hz   | JF-821-3 |
|           | 24V Control                | 820K2    |           | Pri. 208, 230/460V,  |          |
|           | 115V Control               | 820K317  |           | Sec. 115V, 50/60 Hz  | JF-821   |
| 3A        | Coil:                      |          |           | Pri. 575V,           |          |
|           | 24V                        | 820K301  |           | Sec. 24V, 50/60 Hz   | JF-821-9 |
|           | 115V                       | 820K302  |           | Pri. 575V,           |          |
| 3B*       | Replacement Contact Kit    |          |           | Sec. 115V, 50/60 Hz  | JF-821-2 |
|           | (Includes stationary and   |          | 7         | Control Box:         |          |
|           | movable contacts and       |          |           | 1; 2-Ton             | 36K1     |
|           | springs for one magnetic   |          |           | 3-Ton                | 36K2     |
|           | reversing switch)          | 820K300  |           | Jumper Wire          | JF-940-7 |
| 4         | Screw                      | H-2751   | 8*        |                      |          |
| 5         | Panel Plate                | 257K267  | 9         | Hole Plug            | H-6286   |

\*Not Illustrated

**FIGURE 7-6. TROLLEY CONTROL, SINGLE SPEED  
(SINGLE SPEED TROLLEY, TWO SPEED HOIST)**

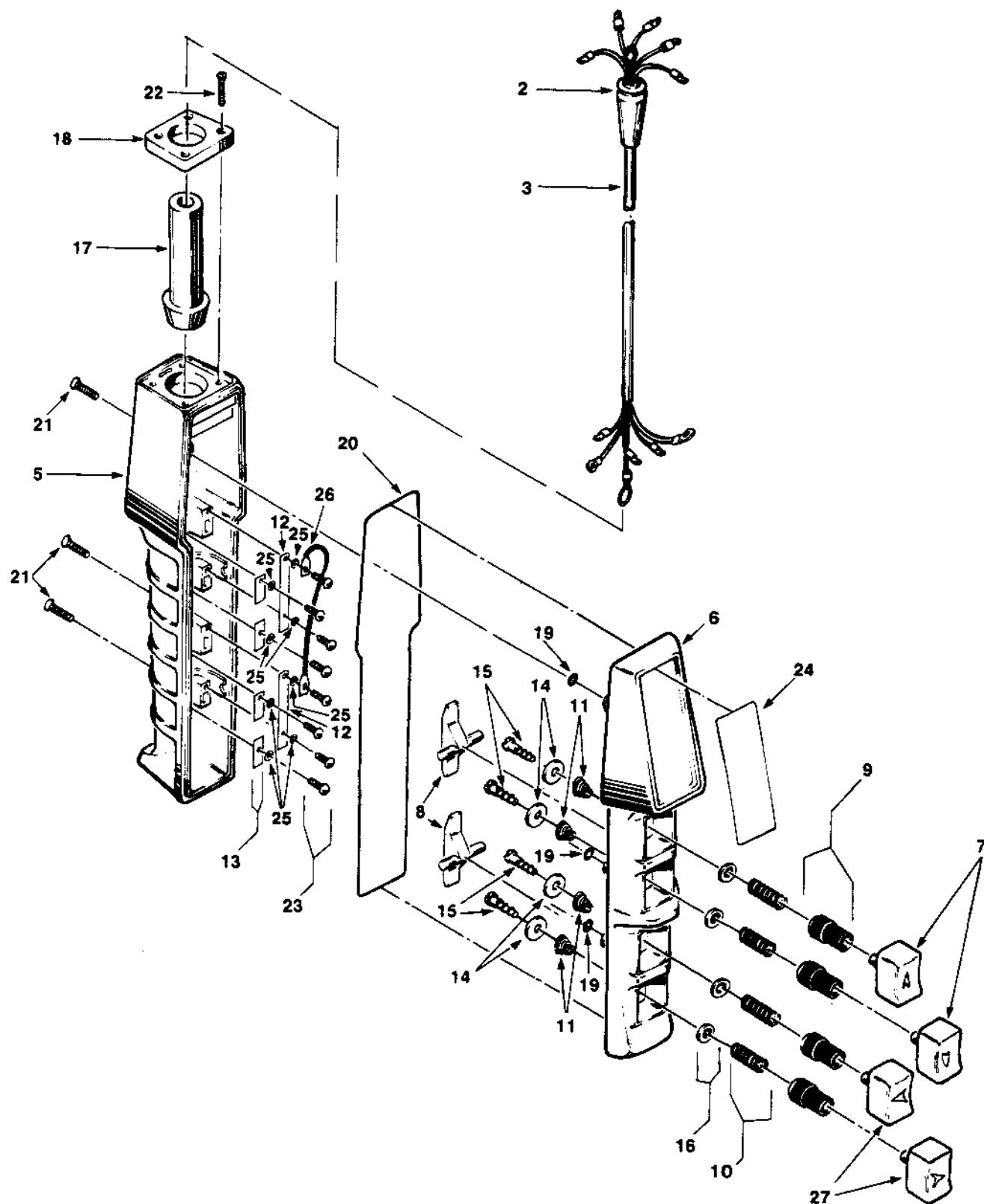


| Index No. | Part Name                                                                                                                    | Part No.           |
|-----------|------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 1         | Screw                                                                                                                        | H-2751             |
| 2         | Lock Washer                                                                                                                  | H-4158             |
| 3         | Magnetic Reversing Switch:<br>24V Control<br>115V Control                                                                    | 820K2<br>820K317   |
| 3A        | Coil:<br>24V<br>115V                                                                                                         | 820K301<br>820K302 |
| 3B        | Replacement Contact Kit<br>(Includes stationary and<br>movable contacts and<br>springs for one magnetic<br>reversing switch) | 820K300            |

| Index No. | Part Name                                                                                                                    | Part No.                                         |
|-----------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 4         | Screw                                                                                                                        | H-1901                                           |
| 5         | Speed Control Relay:<br>24V Control<br>115V Control                                                                          | 820J3<br>820J4                                   |
| 6         | Screw                                                                                                                        | H-1005-P                                         |
| 7         | Panel Plate                                                                                                                  | 257K267                                          |
| 8*        | Jumper Wire                                                                                                                  | JF-940-7                                         |
| 9         | Transformer:<br>Pri. 208, 230/460V, Sec. 24V<br>Pri. 208, 230/460V, Sec. 115V<br>Pri. 575V, Sec. 24V<br>Pri. 575V, Sec. 115V | JF-821-15<br>JF-821-17<br>JF-821-16<br>JF-821-20 |

\*Not illustrated.

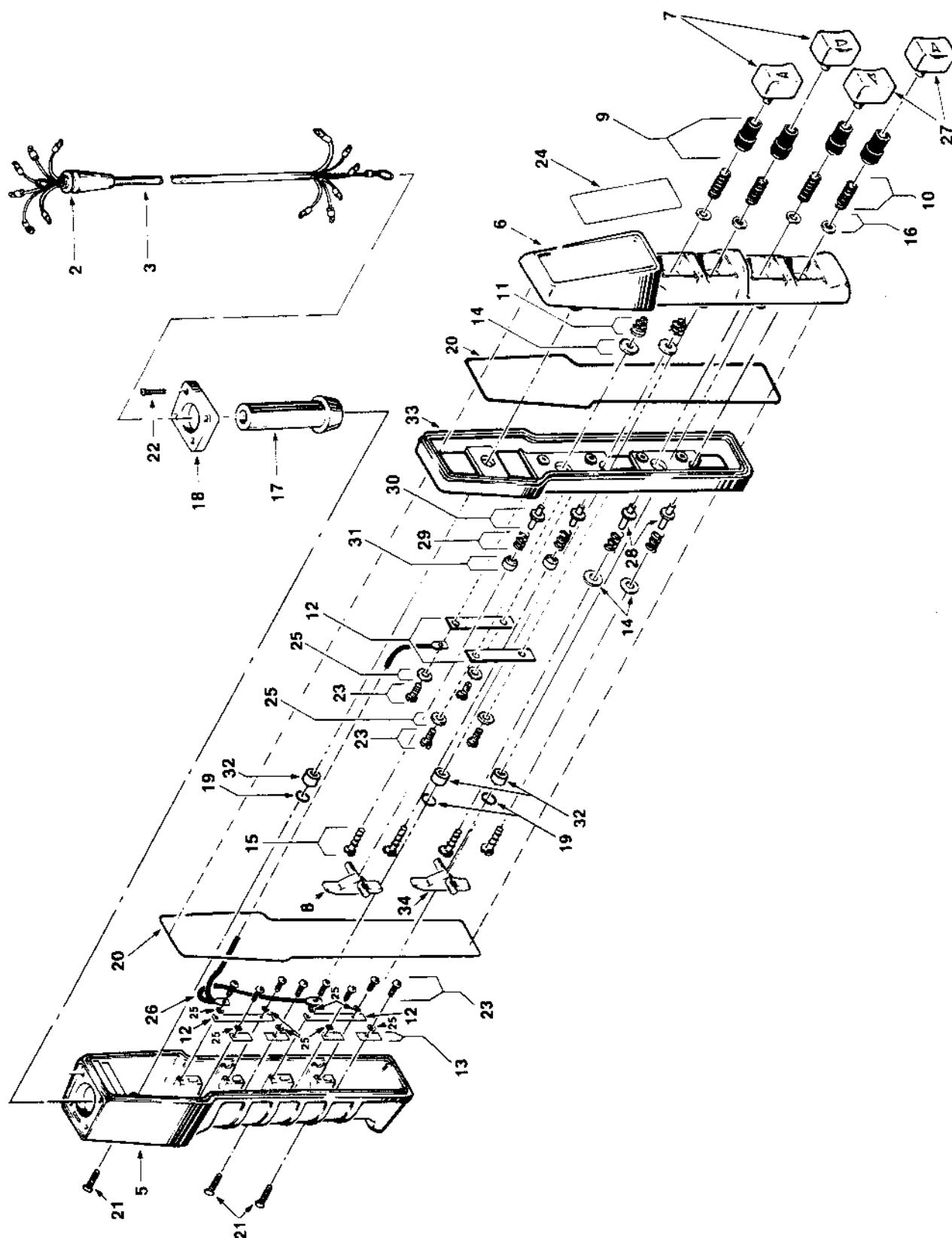
**FIGURE 7-7. TROLLEY CONTROL, TWO SPEED**



**FIGURE 7-8. PUSHBUTTON  
(SINGLE SPEED HOIST, SINGLE SPEED TROLLEY)**

| Index No. | Part Name                                                        | Part No.   |
|-----------|------------------------------------------------------------------|------------|
| 1         | Push Button & Cable Assembly (Consists of Index Nos. 2 thru 27): |            |
|           | 6' Drop                                                          | PB-300-6A  |
|           | 11' Drop                                                         | PB-300-11A |
|           | 16' Drop                                                         | PB-300-16A |
|           | 21' Drop                                                         | PB-300-21A |
|           | Special Lift (*Equal to P.B. Drop)                               | PB-300-*A  |
| 2         | Rubber Grommet                                                   | JF-761     |
| 3         | Push Button Cable Assembly:                                      |            |
|           | 6' Drop                                                          | PB-300-6   |
|           | 11' Drop                                                         | PB-300-11  |
|           | 16' Drop                                                         | PB-300-16  |
|           | 21' Drop                                                         | PB-300-21  |
|           | Special Lift (*Equal to P.B. Drop)                               | PB-300-*   |
| 4         | Push Button Assembly (Consists of Index Nos. 5 thru 27)          | 534K98     |
| 5         | Enclosure                                                        | PB-282-4   |
| 6         | Cover                                                            | PB-283     |
| 7         | Push Button (Hoist)                                              | PB-284-2   |
| 8         | Interlock (Single-Speed, Red)                                    | PB-285     |
| 9         | Boot                                                             | PB-286     |
| 10        | Spring, Compression                                              | PB-287     |
| 11        | Spring, Conical                                                  | PB-288     |
| 12        | Contact Plate, Common                                            | PB-290     |
| 13        | Contact Plate                                                    | PB-289     |
| 14        | Washer, Contact                                                  | PB-291     |
| 15        | Screw                                                            | PB-301     |
| 16        | Washer, Boot                                                     | PB-293     |
| 17        | Grommet                                                          | PB-294-2   |
| 18        | Cap Enclosure                                                    | PB-295     |
| 19        | "O" Ring                                                         | X6477-1    |
| 20        | Seal                                                             | H-7851     |
| 21        | Screw                                                            | H-2991     |
| 22        | Screw                                                            | H-2992     |
| 23        | Screw                                                            | H-2993     |
| 24        | Warning Tag                                                      | PB-296     |
| 25        | Lock Washer                                                      | H-4160     |
| 26        | Jumper (Common)                                                  | JF-940-42  |
| 27        | Push Button (Trolley)                                            | PB-284-1   |

**FIGURE 7-8. PUSHBUTTON  
(SINGLE SPEED HOIST, SINGLE SPEED TROLLEY)**



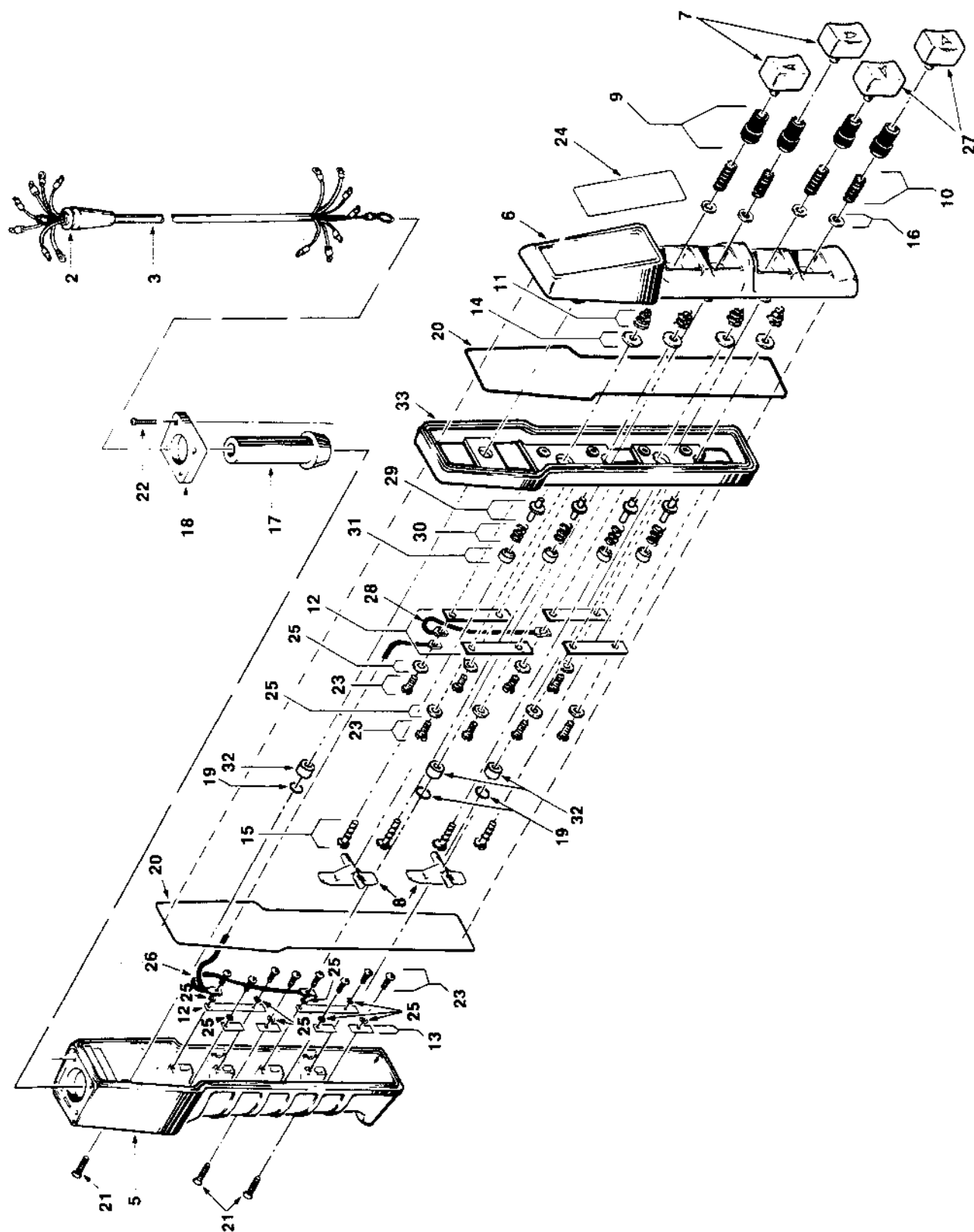
**FIGURE 7-9. PUSHBUTTON  
(TWO SPEED HOIST, SINGLE SPEED TROLLEY;  
SINGLE SPEED HOIST, TWO SPEED TROLLEY)**

| Index No. | Part Name                                                                                                                                                | Part No.             |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1         | Push Button & Cable Assembly (Consists of Index Nos. 2 thru 34):<br>Two Speed Hoist,<br>Single Speed Trolley<br>Single Speed Hoist,<br>Two Speed Trolley | 534JG5-*<br>534JG6-* |
| 2         | Rubber Grommet                                                                                                                                           | JF-761               |
| 3         | Push Button Cable Assembly                                                                                                                               | PBS-309-*            |
| 4         | Push Button Assembly (Consists of Index Nos. 5 thru 34)<br>Two Speed Hoist,<br>Single Speed Trolley<br>Single Speed Hoist,<br>Two Speed Trolley          | 534JG5<br>534JG6     |
| 5         | Enclosure                                                                                                                                                | PB-282-4             |
| 6         | Cover                                                                                                                                                    | PB-283               |
| 7         | Push Button (Hoist)                                                                                                                                      | PB-284-22            |
| 8         | Interlock (Two-Speed, Black)                                                                                                                             | PB-285-1             |
| 9         | Boot                                                                                                                                                     | PB-286               |
| 10        | Spring, Compression                                                                                                                                      | PB-287               |
| 11        | Spring, Conical                                                                                                                                          | PB-288               |

| Index No. | Part Name                     | Part No.   |
|-----------|-------------------------------|------------|
| 12        | Contact Plate, Common         | PB-290     |
| 13        | Contact Plate                 | PB-289     |
| 14        | Washer, Contact               | PB-291     |
| 15        | Screw                         | H-1852-P   |
| 16        | Washer, Boot                  | PB-293     |
| 17        | Grommet                       | PB-294-2   |
| 18        | Cap, Enclosure                | PB-295     |
| 19        | "O" Ring                      | X-6477-1   |
| 20        | Seal                          | H-7851     |
| 21        | Screw                         | H-2925     |
| 22        | Screw                         | H-2992     |
| 23        | Screw                         | H-2993     |
| 24        | Warning Tag                   | PB-296     |
| 25        | Lock Washer                   | H-4160     |
| 26        | Jumper                        | JF-940-111 |
| 27        | Push Button (Trolley)         | PB-284-21  |
| 28        | Spacer                        | 755J2      |
| 29        | Spring, Lower                 | 344J5      |
| 30        | Insulating Bushing            | 755J1      |
| 31        | Lower Contact                 | 201J1      |
| 32        | Bushing                       | 200J16     |
| 33        | 2-Speed Adapter               | PB-308     |
| 34        | Interlock (Single Speed, Red) | PB-285     |

\* Denotes pushbutton drop in feet. Standard lengths = 6, 11, 16 and 21 feet.

**FIGURE 7-9. PUSHBUTTON  
(TWO SPEED HOIST, SINGLE SPEED TROLLEY;  
SINGLE SPEED HOIST, TWO SPEED TROLLEY)**



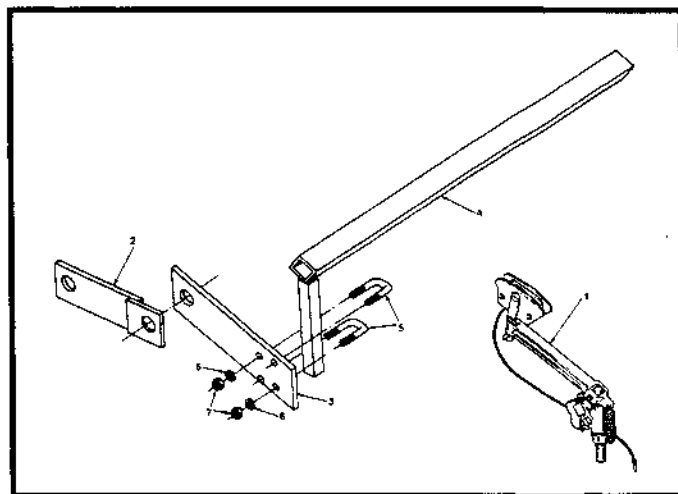
**FIGURE 7-10. PUSHBUTTON  
(TWO SPEED HOIST, TWO SPEED TROLLEY)**

| Index No. | Part Name                                                       | Part No.   |
|-----------|-----------------------------------------------------------------|------------|
| 1         | Push Button & Cable Assembly (Consists of Index Nos. 2 thru 33) | 534JG7-*   |
| 2         | Rubber Grommet                                                  | JF-761     |
| 3         | Push Button Cable Assembly                                      | PB-309-*   |
| 4         | Push Button Assembly (Consists of Index Nos. 5 thru 33)         | 534JG7     |
| 5         | Enclosure                                                       | PB-282-4   |
| 6         | Cover                                                           | PB-283     |
| 7         | Push Button (Hoist)                                             | PB-284-22  |
| 8         | Interlock (Two Speed, Black)                                    | PB-285-1   |
| 9         | Boot                                                            | PB-286     |
| 10        | Spring, Compression                                             | PB-287     |
| 11        | Spring, Conical                                                 | PB-288     |
| 12        | Contact Plate, Common                                           | PB-290     |
| 13        | Contact Plate                                                   | PB-289     |
| 14        | Washer, Contact                                                 | PB-291     |
| 15        | Screw                                                           | H-1852-P   |
| 16        | Washer, Boot                                                    | PB-293     |
| 17        | Grommet                                                         | PB-294-2   |
| 18        | Cap, Enclosure                                                  | PB-295     |
| 19        | "O" Ring                                                        | X-6477-1   |
| 20        | Seal                                                            | H-7851     |
| 21        | Screw                                                           | H-2925     |
| 22        | Screw                                                           | H-2992     |
| 23        | Screw                                                           | H-2993     |
| 24        | Warning Tag                                                     | PB-296     |
| 25        | Lock Washer                                                     | H-4160     |
| 26        | Jumper                                                          | JF-940-111 |
| 27        | Push Button (Trolley)                                           | PB-284-21  |
| 28        | Jumper (2-Speed Common)                                         | JF-940-42  |
| 29        | Insulating Bushing                                              | 755J1      |
| 30        | Spring, Lower                                                   | 344J5      |
| 31        | Lower Contact                                                   | 201J1      |
| 32        | Bushing                                                         | 200J16     |
| 33        | 2-Speed Adapter                                                 | PB-308     |

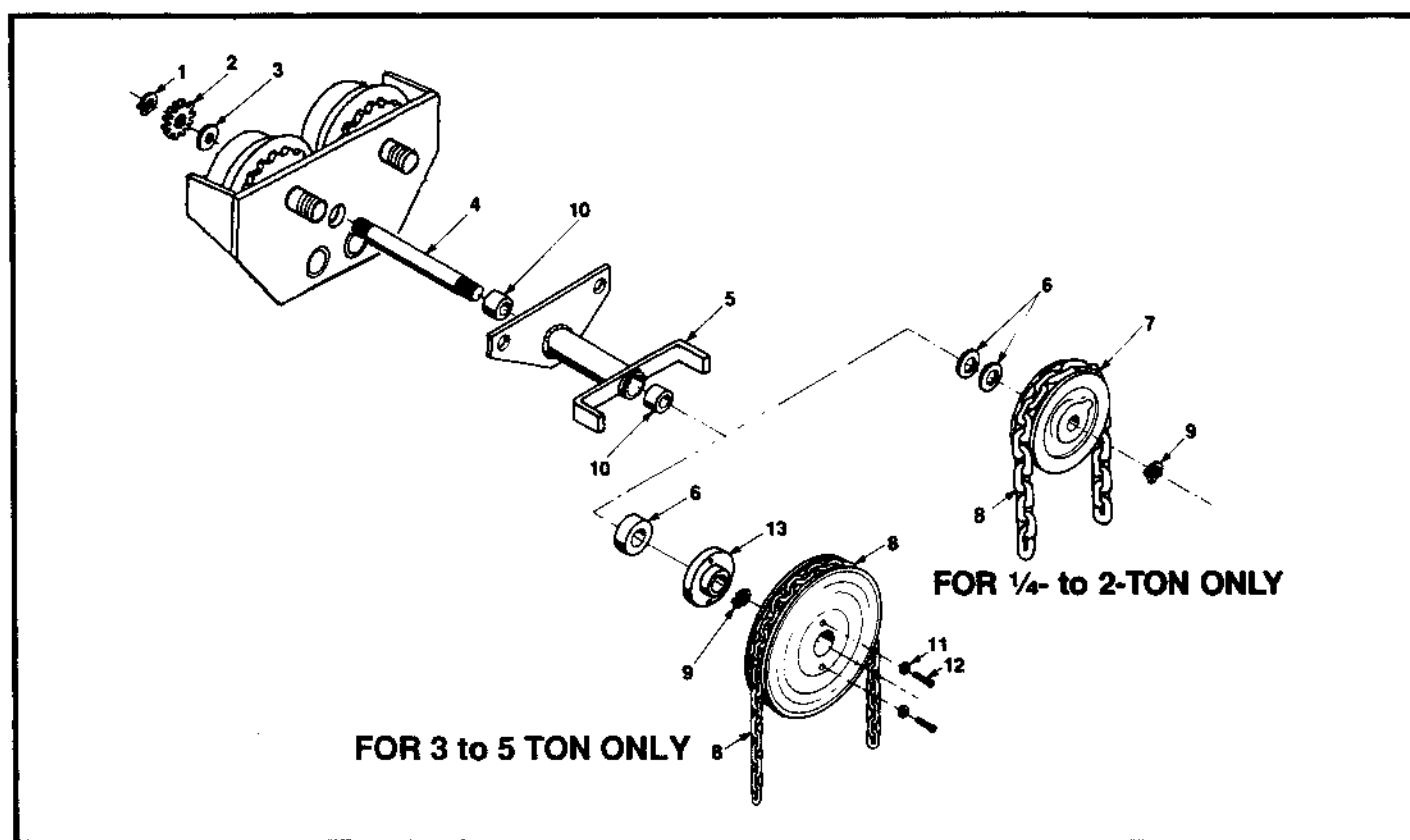
\* Denotes pushbutton drop in feet. Standard lengths = 6, 11, 16 and 21 feet.

**FIGURE 7-10. PUSHBUTTON  
(TWO SPEED HOIST, TWO SPEED TROLLEY)**

| Index No. | Part Name                                                                        | Part No.       |
|-----------|----------------------------------------------------------------------------------|----------------|
| 1         | Swivel Collector Assembly:<br>Insul-8 Type                                       | 804K1          |
| 2         | Collector Kit<br>(Includes Items 3-7)<br>All Except 3, 5 Ton<br>3 and 5 Ton Only | CCK2<br>CCK3   |
| 3         | Mounting Plate<br>All Except 3, 5 Ton<br>3 and 5 Ton Only                        | 802K1<br>802K2 |
| 4         | Arm, Mounting                                                                    | 803KG8         |
| 5         | Shackle, Mounting                                                                | 806K1          |
| 6         | Lock Washer                                                                      | H-4062-P       |
| 7         | Nut                                                                              | H-3561         |



**FIGURE 7-11. CURRENT COLLECTOR GROUP**



| Index No. | Part Name                                                               | Part No.       |
|-----------|-------------------------------------------------------------------------|----------------|
| 1         | Retaining Ring                                                          | H-5501         |
| 2         | Pinion                                                                  | 420K1          |
| 3         | Spacer Bearing (1/8 Thick)                                              | 525K2          |
| 4         | Gear Shaft                                                              | 100K6          |
| 5         | Sleeve and Adapter Assembly:<br>All Except 3, 5 Ton<br>3 and 5 Ton Only | 51KG1<br>51KG2 |
| 6         | Spacer Bearing (1/8 Thick)                                              | 525K1          |

| Index No. | Part Name                   | Part No. |
|-----------|-----------------------------|----------|
| 7         | Hand Chain Wheel            | 33K23    |
| 8         | Hand Chain (Specify Length) | 53A      |
| 9         | Retaining Ring              | H-5527   |
| 10        | Sleeve Bushing              | 530K6    |
| 11        | Lockwasher                  | H-4138   |
| 12        | Bolt                        | H-2304   |
| 13        | Adapter                     | 51K4     |

**FIGURE 7-12. GEARED TROLLEY**

# COFFING<sup>®</sup> HOISTS

## WARRANTY

**E**very hoist is thoroughly inspected and tested prior to shipment from the factory. Should any problem develop, return the complete hoist prepaid to your nearest Coffing Hoists Authorized Warranty Repair Station. If inspection reveals that the problem is caused by defective workmanship or material, repairs will be made without charge and the hoist will be returned, transportation prepaid. This warranty does not apply where: **(1)** deterioration is caused by normal wear, abuse, improper or inadequate power supply, eccentric or side loading, overloading, chemical or abrasive actions, improper maintenance, or excessive heat; **(2)** problems resulted from repairs,

modifications, or alterations made by persons other than factory or Coffing Authorized Warranty Repair Stations personnel; **(3)** the hoist has been abused or damaged as a result of an accident; **(4)** repair parts or accessories other than those supplied by Coffing Hoists are used on the hoist. Equipment and accessories not of the seller's manufacture are warranted by the manufacturer.

**Except as stated herein, Coffing Hoists makes no other warranties, express or implied, including warranties or merchantability and fitness for a particular purpose.**

## WARNING

### Overloading and Improper Use Can Result In Injury

#### To Avoid Injury:

- Do not exceed working load limit, load rating, or capacity.
- Do not use to lift people or loads over people.
- Use only alloy chain and attachments for overhead lifting.
- Read and follow all instructions.

**Coffing Hoists • Country Club Road • P.O. Box 779 • Wadesboro, NC 28170 USA**  
**Customer Service: Tel. (800) 477-5003 (704) 694-2156 • FAX (800) 374-6853 (704) 694-6829**