



Western Water Constructors, Inc.
Submittal Cover

Job no. 16-05



CONTRACT NAME: Manteca WQCF Digester Improvements
SPEC SECTION: 14650 Jib Crane
SUBMITTAL TITLE: Jib Crane - O&M
FILE NAME: 136-R2_14650-02_Jib Crane-OM

SUB #: 136
REV #: 2
CODE: 14650-02
DATE: 12/15/2017

WWC REVIEW/COMMENTS: [X] NO EXCEPTIONS [] EXCEPTIONS / DEVIATIONS AS NOTED

REVIEWED BY: ST SIGNED: [Signature]

WWC HAS REVIEWED THIS SUBMITTAL FOR CONFORMANCE WITH THE PROJECT PLANS & SPECIFICATIONS.

OWNER REVIEW:

Table with columns: ITEM, DESCRIPTION, REVIEW STATUS (A, B, C, D, E). Rows include Jib Crane O&M, Trolley O&M, Hoist O&M, and empty rows.

LEGEND: A = No Exceptions Taken B = Make Correction Noted C = Correct & Resubmit
D = Rejected E = Accepted for Record

OWNER COMMENTS:

REVIEWER'S NAME: _____

REVIEWER'S SIGNATURE: _____ DATE: _____

Manteca WQCF

Wastewater Treatment Plant

½ Ton Jib Crane O&M Manuals

11/15/2017

EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM NER005LD JIB CRANE AT FOG RECEIVING AREA
2. MANUFACTURER Harrington
3. EQUIPMENT IDENTIFICATION NUMBER(S) 00232819 FOG-CRN-07-746
(maps equipment number)
4. LOCATION OF EQUIPMENT Manteca WQCF Facility
5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) Hoist weight 73.4lbs

6. NAMEPLATE DATA - Horsepower 0.75 HP
Amperage 1.8 AMPS
Voltage 460volts
Service Factor (S.F.) H4 service factor
Speed 2.5 – 15 FPM
ENC Type NA
Capacity 1/2 Ton
Other NA
7. MANUFACTURER'S LOCAL REPRESENTATIVE
Name Carpenter Crane Hoist
Address 112 Bagley Street, Vallejo CA, 94592
Telephone
Number (707)562-3543
8. MAINTENANCE REQUIREMENTS Refer to Owners Manual

9. LUBRICANT LIST Refer to Owners Manual

10. SPARE PARTS (recommendations) NA

11. COMMENTS NA

EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM FS300-12-W8 JIB CRANE AT FOG RECEIVING AREA
2. MANUFACTURER Gorbel
3. EQUIPMENT IDENTIFICATION NUMBER(S) FS300-12-W8 FOG-CRN-07-746
(maps equipment number)
4. LOCATION OF EQUIPMENT Manteca WQCF Facility
5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) Jib crane weight 1050lbs

6. NAMEPLATE DATA - Horsepower NA
 Amperage NA
 Voltage NA
 Service Factor (S.F.) NA
 Speed NA
 ENC Type NA
 Capacity 1/2 Ton
 Other NA
7. MANUFACTURER'S LOCAL REPRESENTATIVE
 Name Carpenter Crane Hoist
 Address 112 Bagley Street, Vallejo CA, 94592
 Telephone
 Number (707)562-3543
8. MAINTENANCE REQUIREMENTS Refer to Owners Manual

9. LUBRICANT LIST NA

10. SPARE PARTS (recommendations) NA

11. COMMENTS NA

EQUIPMENT SUMMARY FORM

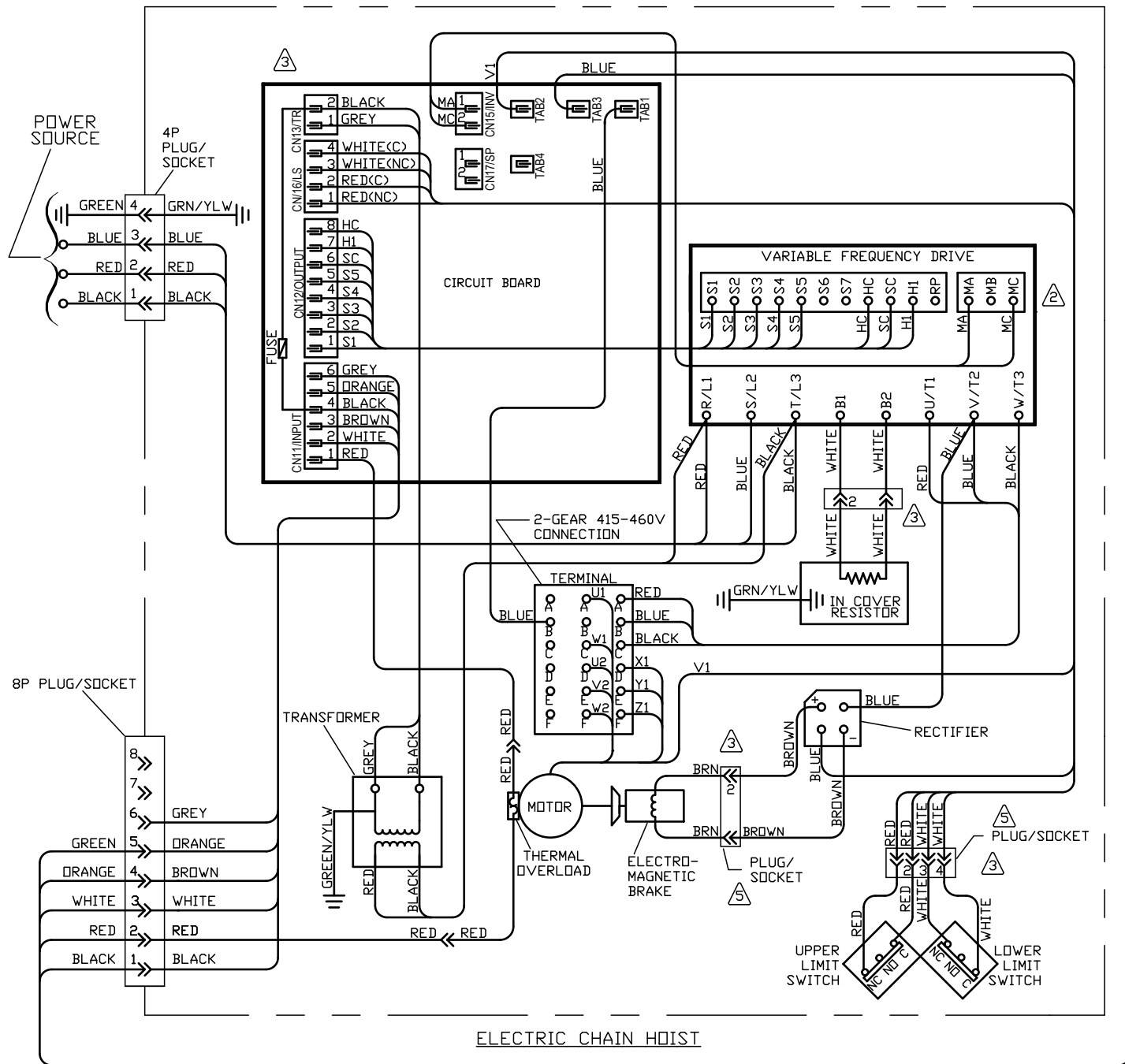
1. EQUIPMENT ITEM PT2005-26395 Hoist Trolley JIB CRANE AT FOG RECEIVING AREA
2. MANUFACTURER Harrington
3. EQUIPMENT IDENTIFICATION NUMBER(S) 000004 FOG-CRN-07-746
(maps equipment number)
4. LOCATION OF EQUIPMENT Manteca WQCF Facility
5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) Trolley Weight 9lbs.

6. NAMEPLATE DATA - Horsepower NA
Amperage NA
Voltage NA
Service Factor (S.F.) NA
Speed NA
ENC Type NA
Capacity 1/2 Ton
Other NA
7. MANUFACTURER'S LOCAL REPRESENTATIVE
Name Carpenter Crane Hoist
Address 112 Bagley Street, Vallejo CA, 94592
Telephone
Number (707)562-3543
8. MAINTENANCE REQUIREMENTS Refer to Owners Manual

9. LUBRICANT LIST NA

10. SPARE PARTS (recommendations) NA

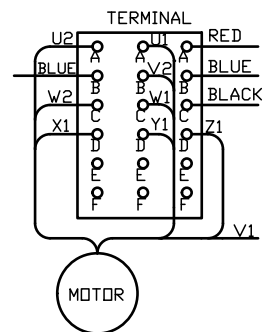
11. COMMENTS NA



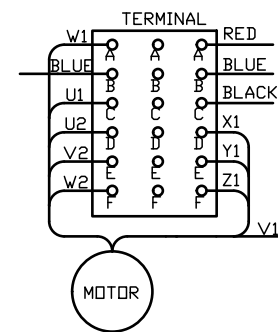
ELECTRIC CHAIN HOIST

MODEL: ER2A & NER2A
 FOR: 1/8 TO 5 TON DUAL SPEED HOIST.
 VOLTAGE: 208-230/460-3-60
 NOTES: 1) WRAP RED TAPE ON GREEN CONDUCTOR WHICH IS NOT USED FOR GROUNDING PURPOSES.

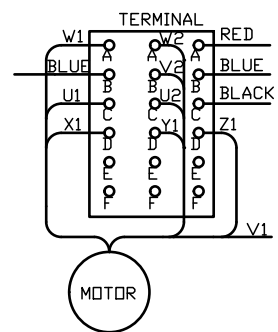
2) ALTHOUGH 208-230V, AND 415-460V CONNECTIONS ARE SHOWN, VOLTAGE CAN NOT BE CHANGED IN THE FIELD, DUE TO ELECTRICAL COMPONENTS BEING VOLTAGE SPECIFIC.



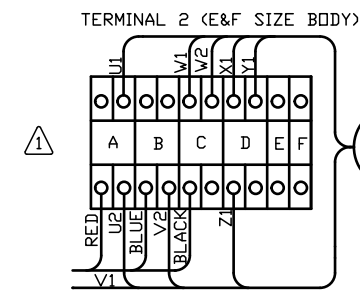
2 GEAR HOIST MOTOR AT 208-230V



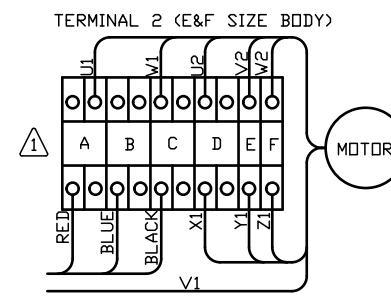
3 GEAR HOIST MOTOR AT 415-460V



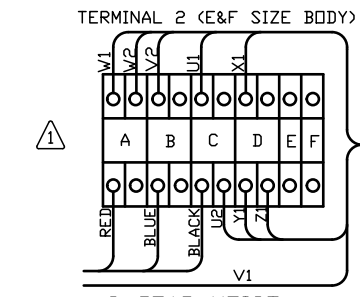
3 GEAR HOIST MOTOR AT 208-230V



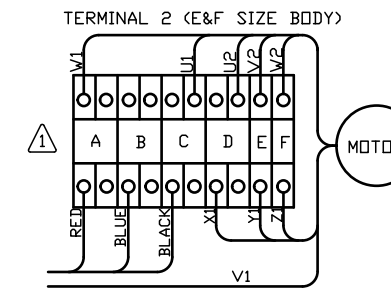
2 GEAR HOIST MOTOR AT 208-230V



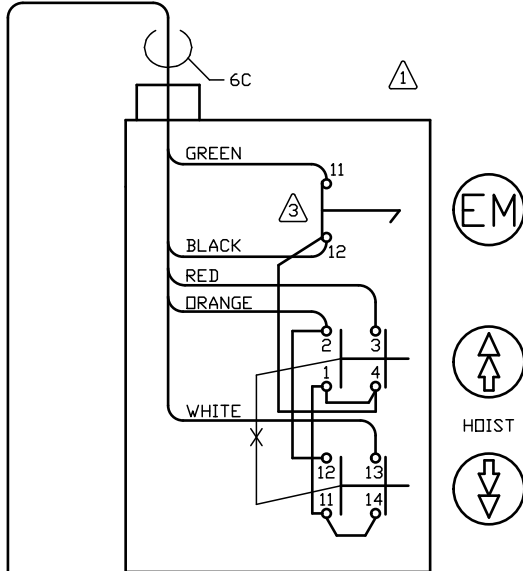
2 GEAR HOIST MOTOR AT 415-460V



3 GEAR HOIST MOTOR AT 208-230V



3 GEAR HOIST MOTOR AT 415-460V



2 BUTTON PENDANT W/E-STOP

NER AND ER UNITS LISTED WITH CAPACITY, PRODUCT CODE(SINGLE SPD/DUAL SPD), BODY SIZE AND NO. OF REDUCTION GEARS

CAPACITY (TONS)	PRODUCT CODE	BODY SIZE	REDUCTION GEAR #
1/8	(N)ER2001H/HD	B	2
1/4	(N)ER2003S/SD	B	2
1/4	(N)ER2003H/HD	C	2
1/4	NER2003L/LD-FG	C	2
1/2	ER2005L/LD	C	3
1/2	NER2005L/LD-FG	C	2
1/2	NER2005L/LD	C	2
1/2	(N)ER2005S/SD	C	2
1	NER2010L/LD-FG	D	3
1	(N)ER2010L/LD	D	3
1	(N)ER2010S/SD	D	2
1-1/2	(N)ER2015S/SD	E	3
2	(N)ER2020C/CD	D	3
2	NER2020L/LD-FG	E	3
2	(N)ER2020L/LD	E	3
2	(N)ER2020S/SD	E	2
2-1/2	(N)ER2025S/SD	F	3
3	(N)ER2030C/CD	E	2
5	(N)ER2050L/LD	F	3

NOTE: (N)ER REPRESENTS BOTH NER & ER HOISTS

NO.	REVISION DESCRIPTION	DRAWN BY	DATE	CHECKED BY	DATE
6	ADDED FOOD GRADE MODELS TO CHART	KPN	7/16/14	NLP	7/16/14
5	ECN 466	TDT	1/12/09	RI	1/21/09
4	REVISED NOTE 2	TDT	12/11/08	RI	12/11/08
3	ECN 465	TDT	12/02/08	RI	12/02/08
2	REMOVED WIRE FROM MB LOCATION	TDT	11/18/08	RI	11/18/08
1	ADDED E&F BODY TERMINAL 2, MOVED THE 12 TO 4 JUMPER FOR CLARIFICATION, MODIFIED EM BUTTON	TDT	10/10/08	BAO	10/10/08

TOLERANCES (EXCEPT AS NOTED)	WIRING DIAGRAM			
DECIMAL: +/-	HARRINGTON HOISTS AND CRANES			
FRACTIONAL: +/-	DRAWN BY: TDT	SCALE: FIT	DRAWING NO: 71001	REV. NO: 6
ANGULAR: +/-	CHK'D BY: JPB	DATE: 10/06/08		

3.6 VFD Setup (Dual Speed Only)

- 3.6.1 **⚠ DANGER** To avoid a shock hazard, **DO NOT** perform **ANY** mechanical or electrical maintenance on the dual speed (VFD control) trolley or hoist within 5 minutes of de-energizing (disconnecting) the trolley or hoist. This time allows the internal VFD capacitor to safely discharge.
- 3.6.2 **⚠ WARNING** Do Not remove power to the dual speed (VFD control) hoist or trolley during operation.
- 3.6.3 All dual speed hoists are equipped with a VFD. The VFD is used to control the high and low lifting speeds. The speeds come preset from the factory (Table 3-6). Speed (frequency) can be customized. Refer to Section 3.6.10 for hoist specific speed ranges and instructions.
- 3.6.4 The VFD is controlled by a Keypad/Display Interface. Refer to Figure 3-8 for Keypad/Display Interface functions and descriptions.

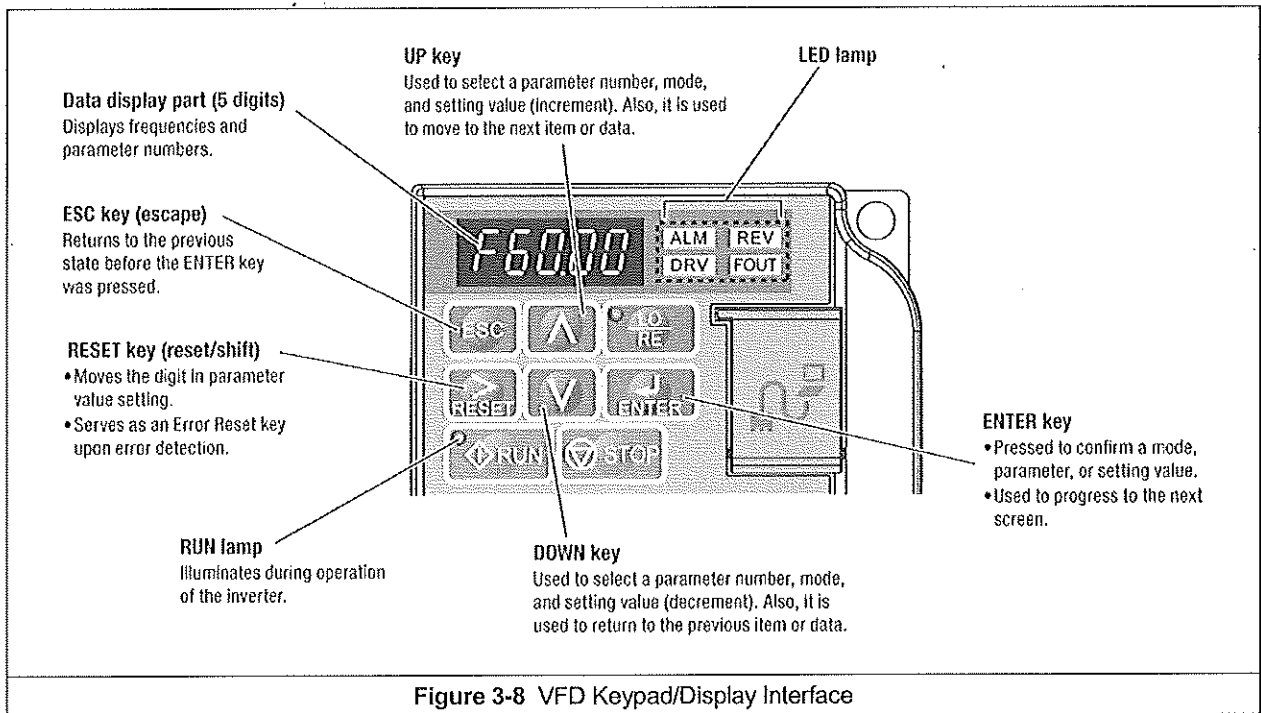




Figure 3-8 VFD Keypad/Display Interface

3.6.5 When power is supplied to the hoist the VFD LED operator display will illuminate as shown Table 3-2.

Table 3-2 LED Operator Display

No	Name	Description
Normal		The frequency command monitor is displayed in the data display part. DRV illuminates.
Error	 Example: Main circuit low voltage	The display varies depending on the error. ALM and DRV illuminate.

3.6.6 During operation the data display will exhibit illuminating or blinking data as shown in Figure 3-9.

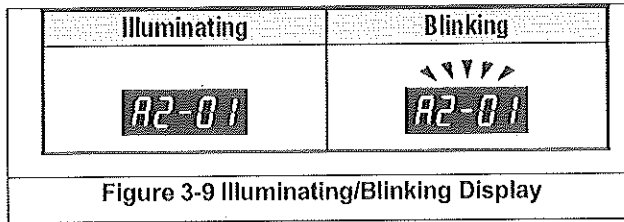


Figure 3-9 Illuminating/Blinking Display






3.6.7 The digital display uses a seven segment character to form the specific characters used in the display. Table 3-3 shows the corresponding digital characters to its English equivalent.

Character	Digital Display	Character	Digital Display	Character	Digital Display	Character	Digital Display
0	0	9	9	I	l	R	ρ
1	1	A	A	J	9	S	Σ
2	2	B	β	K	τ	T	Γ
3	3	C	X	L	Λ	U	Υ
4	4	D	δ	M	∩∩	V	ω
5	5	E	E	N	N	W	ωω
6	6	F	Φ	O	o	X	No Display
7	7	G	Γ	P	Π	Y	Ψ
8	8	H	H	Q	θ	Z	No Display

3.6.8 The LED Lamp display provides hoist status. Table 3-4 shows some of the status displays.

Lamp	Illuminating	Blinking	Off
ALM	Upon error detection	<ul style="list-style-type: none"> • Upon detection of minor failure • Upon detection of an OPE (operation error) 	Normal
REV	Inputting a reverse rotation command	-	Inputting a forward rotation command
DRV	In the drive mode	-	In the program mode
FOUT	Displaying output frequency (Hz)	-	-
Description in this document			

3.6.9 The Run Lamp display provides hoist "RUN" status. Table 3-5 shows the various "RUN" displays.

Lamp	Illuminating	Blinking	Short blinking	Off
	During operation	<ul style="list-style-type: none"> • During deceleration/ stop • Inputting a driving command with the frequency command 0 	<ul style="list-style-type: none"> • During deceleration due to an emergency stop • During deceleration • During a stop due to driving interlock operation 	During a stop
Description in this document				

3.6.10 All of the hoists have speed/frequency ranges that can be customized to a specific application. Refer to Table 3-6 for specific hoist speed/frequency ranges. To set custom speeds for an application, follow the procedure listed in Table 3-7.

Product Code	Hoist Speed (ft/min)			VFD Frequency (Hz)							
	Range*	Low	High	NER2				ER2			
				Low (d1-01)		High (d1-02)		Low (d1-01)		High (d1-02)	
				230V	460V	230V	460V	230V	460V	230V	460V
(N)ER2001HD	Low	4.5	55	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	9.0	55	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2003SD	Low	3.0	36	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	6.0	36	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2003HD	Low	4.3	53	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	9.0	53	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2005LD	Low	1.2	15	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	2.5	15	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2005SD	Low	2.3	29	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	5.0	29	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2010LD	Low	1.1	14	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	2.5	14	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2010SD	Low	2.2	28	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	4.5	28	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2015SD	Low	1.4	18	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	3.0	18	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2020CD	Low	0.5	7.0	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	1.0	7.0	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2020LD	Low	1.0	14.0	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	2.5	14.0	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2020SD	Low	2.2	28	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	4.5	28	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2025SD	Low	1.8	22	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	3.5	22	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2030LD	Low	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Std	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(N)ER2030CD	Low	1.4	17	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	3.0	17	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2050LD	Low	0.9	11	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	2	11	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0

*Low = The minimum and maximum speed/frequency range (12:1 ratio).
 Std = The factory standard minimum and maximum speed/frequency range (6:1 ratio).

Table 3-7 Dual Speed Hoist (w/VFD) Speed/Frequency Change Procedure

▲ CAUTION

- Each dual speed hoist model has a range of available speeds/frequencies (upper and lower limits). Any value outside the range listed in Table 3-6 for your specific hoist is strictly prohibited.
- Speeds must be set such as Low [d1-01] and High [d1-02].
- After parameters are changed, a "no load" operational check must be performed.





























Operational Step	VFD Display
1. Energize the hoist.	
2. Press  until the "Setup Mode" screen is displayed (blinking).	
3. Press  to display the parameter setting screen (blinking).	
4. Press  or  until the desired parameter is displayed (blinking). (Low Speed: d1-01, High Speed: d1-02)	
5. When you press  , the current setting value is displayed (digit selected blinks). (Example Value: 9 Hz)	
6. Press  to move the blinking digit to the desired digit. (Example Value: 9 blinks)	
7. Press  or  until the desired setting is displayed and press  .	
8. Press  to confirm the new setting.	
9. The display will automatically return to the parameter screen (blinking). (As in Step 4.)	
10. Press  until the display returns to the initial screen. (As in Step 1.)	

Table 3-8 Hoist VFD 2-Step/3-Step Infinitely Variable Parameter Setup Procedure

CAUTION

- Each VFD controlled hoist model has a range of available speeds/frequencies (upper and lower limits). Refer to Table 3-6 for a list of acceptable speeds/frequencies.
- Any value outside the range listed in Table 3-6 for your specific hoist is strictly prohibited.
- Speeds must be set such as Low [d1-01] and High [d1-02].
- After parameters are changed, a “no load” operational check must be performed.

Operational Step		VFD Display
Change Mode to 2 Step or 3 Step.		
1. Press  or  until the “Setup Mode” screen is displayed (blinking).		
2. Press  to display “d1-01”.		
3. Table 3-6 lists the values that may be changed.		
Title	Parameter	Description
Min. Frequency (Hz) – Low Speed	d1-01	Default setting, dependant upon hoist. (Refer to Table 3-7)
Max. frequency (Hz) – High Speed	d1-02	Default setting, dependant upon hoist. (Refer to Table 3-7)
Mode	S1-25	1. Standard 2 Speed (default)
		2. 2 Step Infinitely Variable
		3. 3 Step Infinitely Variable (Requires optional hardware)
Acceleration Time (sec.) (0 to 120 Hz) in 2 or 3 Step Mode.	S1-26	Apply for frequency range between d1-01 and d1-02.
Deceleration Time (sec.) (0 to 120 Hz) in 3 Step Mode.	S1-27	Apply for frequency range between d1-01 and d1-02.
4. Press  several times.		

3.6.11 “Hbb” will appear on the dual speed unit's VFD display when the Emergency Stop Button is depressed. Turn the Emergency Stop Button clockwise to unlock the controls and allow hoist operation.

3.7 Preoperational Checks and Trial Operation

- 3.7.1 **⚠WARNING** Confirm the adequacy of the rated capacity for all slings, chains, wire ropes and all other lifting attachments before use. Inspect all load suspension members for damage prior to use and replace or repair all damaged parts.
- 3.7.2 **⚠WARNING** Verify and correct all chain irregularities prior to operating the hoist. Refer to Section 3.2.
- 3.7.3 Measure and record the "k" dimension of all hooks on hoist. See Table 5-4 under Section 5, "Inspection".
- 3.7.4 Record the hoist's Code, Lot and Serial Number (from the name plate on the hoist; see Section 10) in the space provided on the cover of this manual.
- 3.7.5 Ensure that the hoist is properly installed to either a fixed point, or trolley, whichever applies.
- 3.7.6 If hoist is installed on a trolley, ensure that
- trolley is properly installed on the beam, and
 - stops for the trolley are correctly positioned and securely installed on the beam.
- 3.7.7 Ensure that all nuts, bolts and split pins (cotter pins) are sufficiently fastened.
- 3.7.8 Pull down on the Pendant and ensure that the Cord Strain Relief Cable takes the force, not the Pendant Cord.
- 3.7.9 **⚠CAUTION** Check supply voltage before everyday use. If the voltage varies more than 10% of the rated value, electrical devices may not function normally.
- 3.7.10 Confirm proper operation.
- Before operating read and become familiar with Section 4 - Operation.
 - Before operating ensure that the hoist (and trolley) meets the Inspection, Testing and Maintenance requirements of ANSI/ASME B30.16.
 - Before operating ensure that nothing will interfere with the full range of the hoist's (and trolley's) operation.
- 3.7.11 **⚠WARNING** The hoist must be connected to the power source such that its direction of operation corresponds to the up-and-down commands issued from the pendant control; i.e. pushing the UP button must cause the hoist to lift the load chain and hook. If the hoist does not operate correctly, shut off and lockout /tagout the main power source to the hoist. Disconnect and switch any two of the three input power leads at the power source to correct the hoist's motor phasing.

Section 1

Jib Crane Start-Up Procedures



CARPENTER CRANE/HOIST

Offices

222 Napoleon Street
San Francisco, California
415-285-1954
415-285-0176 (fax)

Manufacturing

112 Bagley St.
Vallejo, California
707-562-3543
707-562-3548(fax)

Carpenter Crane Hoist ½ Ton Jib Crane Start-up Checklist

Crane Serial No:

Project No:

Customer:

A. Instructional Manual

1. Does the customer have the crane O&M manuals? Yes No

B. Crane mounting surface

1. What type of surface is the crane mounted to? _____

2. Is the crane bolted down? Yes No

3. Are the anchor bolts tight, and the lock washers fully compressed? Yes No

4. Has the grout under the base been applied and cured properly? Yes No

C. Boom and Mast

1. Has the mast been set plumb? Yes No

2. Have all the bolts been installed in the boom section? Yes No

3. Does the boom rotate smooth without any interference? Yes No

4. Are the boom end stops installed on both ends of the boom? Yes No

5. Has the power cable tagline been installed? Yes No

- | | | | |
|----|---|-----|----|
| 6. | Is the tagline cable tight and secured properly? | Yes | No |
| 7. | Are the cable trolleys installed on the tagline? | Yes | No |
| 8. | Is the hoist tow arm attached and secured properly? | Yes | No |

D. Hoist and Trolley

- | | | | |
|----|--|-----|----|
| 1. | What is the incoming hoist voltage? _____ | | |
| 2. | What voltage is the hoist wired for? _____ | | |
| 3. | Is the hoists incoming power wired correctly? | Yes | No |
| 4. | Does the hoist operation correspond with direction arrows? | Yes | No |
| 5. | Does the hoist trolley travel freely? | Yes | No |
| 6. | Do the trolley bumpers contact the end stops correctly? | Yes | No |
| 7. | Do the tagline trolleys travel freely? | Yes | No |
| 8. | Is the hoist wired to a mainline disconnect? | Yes | No |
| 9. | Does the mainline disconnect operate correctly? | Yes | No |

E. Training

- | | | | |
|----|--|-----|----|
| 1. | Customer personnel fully trained in function & operation of jib crane? | Yes | No |
|----|--|-----|----|

Name of Trainees

_____	Date _____
_____	Date _____
_____	Date _____
_____	Date _____

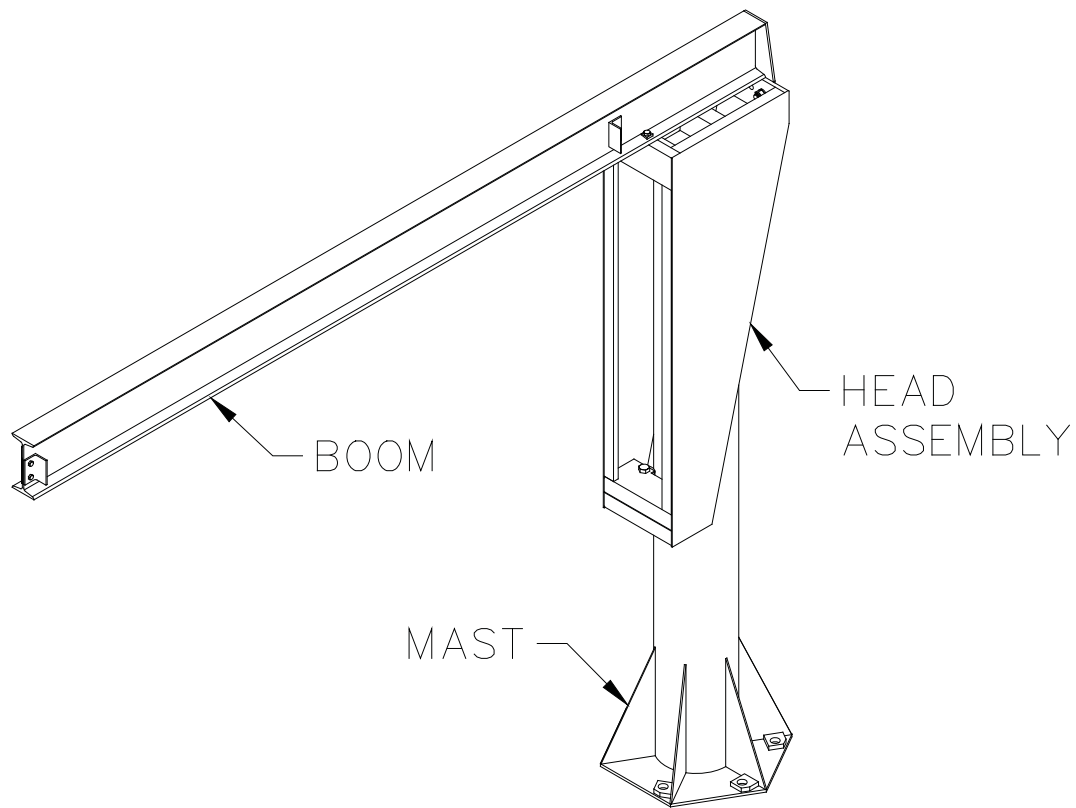
Start-up Performed By: _____

Customer Signature: _____

Section 2

Jib Crane Equipment Summary & O&M Manuals

Installation, Operation, & Maintenance Manual



**IMPORTANT!
DO NOT DESTROY**

Free Standing Jib Crane

Gorbel® Customer Order No. / Serial No. _____

Gorbel® Dealer _____

Date _____
Month _____ Year _____

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Questions? Concerns? Comments? Please call (800) 821-0086 (US and Canada) or (585) 924-6262 (outside US).

INTRODUCTION

Thank you for choosing a Gorbel® Free Standing Jib Crane to solve your material handling needs. The innovative design and heavy duty construction of a Gorbel® Free Standing Jib Crane will provide a superior quality product that will offer years of long term value. All Gorbel® cranes are pre-engineered for powered hoist operation. The hoist weight allowance is 15% of the crane capacity (for example, a crane rated for 1000 pounds allows for a 1000-pound live load plus 150 pounds for the weight of the hoist). There is also an allowance of 25% of the crane capacity for impact caused by hoist use. Gorbel® Free Standing Jib Cranes will provide many years of dependable service by following the installation and maintenance procedures described herein.

Dimensions contained in this installation manual are for reference only and may differ for your particular application. Please refer to the enclosed General Arrangement Drawing for actual dimensions.

Normal safety precautions: These include, but are not limited to:

- Checking for obstructions in crane rotation
- Checking that all bolts are tight and have lockwashers
- Making sure that endstop is in place
- Making sure that festooning cannot be snagged or pinched

For additional safety precautions see page 16.

WARNING

Only competent erection personnel familiar with standard fabrication practices should be employed to assemble these cranes because of the necessity of properly interpreting these instructions. Gorbel is not responsible for the quality of workmanship employed in the installation of a crane according to these instructions. Contact Gorbel, Inc., at 600 Fishers Run, P.O. Box 593, Fishers, New York 14453-0593, 1-585-924-6262, for additional information if necessary.

WARNING

Equipment described herein is not designed for, and should not be used for, lifting, supporting or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury and/or property damage. Check State and Local regulations for any additional requirements.

WARNING

Consult a qualified structural engineer to determine if your support structure is adequate to support the loads generated by anchor bolt force, overturning moment, or axial load of your crane.

WARNING

Crane cannot be utilized as a ground: A separate ground wire is required. For example, systems with 3 phase power require 3 conductors plus one ground wire.

WARNING

Reference American Institute of Steel Construction (AISC) Manual of Steel Construction (9th edition), Part 5, Specification for Structural Joints using ASTM A325 or A490 Bolts (section 8.d.2) for proper procedures to follow when using any torque tightening method.

WARNING

Do not field modify crane in any way. Any modifications without the written consent of Gorbel, Inc. will void warranty.

INSTALLATION

STEP 1 - PRE-ASSEMBLY

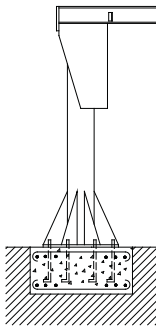
➔ **TIP:** Packing list can be found in plastic pocket attached to hardware box.
 General Arrangement Drawing can be found inserted in this installation manual.

- 1.1 Read entire manual **before** installing the crane.
- 1.2 Check packing list to ensure no parts have been lost prior to initiating assembly of crane.
- 1.3 Tools and materials (by others) typically needed to assemble crane:
 - Torque wrench
 - Ladders/man lifts
 - Hand tools
 - Leveling tools (plumb bob, plumb fixture-pg. 10)
 - Allen wrenches
 - Lifting device to lift heavy masts and booms
 - Steel shims
 - Grout (Non-Shrink Precision Grout)
 - Base Plate Template
 - Anchor Bolts (by others, grade 5 or better)
- 1.4 Identify crane type:

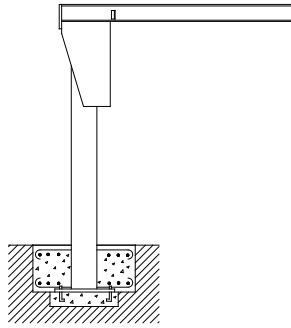
WARNING

Consult a qualified structural engineer to determine that your support structure is adequate to support the loads generated by anchor bolt force, overturning moment, or axial load of your crane.

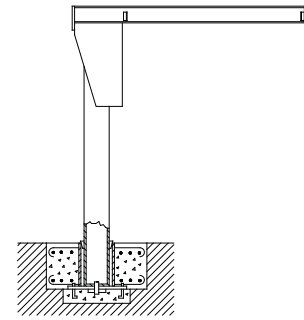
If your crane looks like:



Go to page 3.



Go to page 5.



Go to page 7.

Bolt Dia.	Torque
1/4"-20	6 ft.-lbs.
3/8"-16	20 ft.-lbs.
1/2"-13	50 ft.-lbs.
5/8"-11	95 ft.-lbs.
3/4"-10	175 ft.-lbs.
7/8"-9	300 ft.-lbs.

Chart 1A. Torque Chart.

STANDARD BOOM DATA		
Boom Height (W)	Beam Size	Flange Width (in)
6"	S6@12.5#/ft.	3-3/8"
8"	W8@18.4#/ft.	5-1/4"
10"	S10@25.4#/ft.	4-5/8"
12"	S12@31.8#/ft.	5"
16"	W16@45#/ft.	7"
18"	W18@50#/ft.	7-1/2"
21"	W21@62#/ft.	8-1/4"
24"	W24@84#/ft.	9"

Chart 1B. Boom data.

E	BEARING PART NUMBERS			
	Top Pivot		Trunnion Roller	
	Cup	Cone	Cup	Cone
8	08251	08250	03260A	03260A
12	08251	08250	08248	08249
14	08253	08252	08248	08249
16	08253	08252	08248	08249
18	08255	08254	08248	08249
20	08255	08254	08248	08249
24	08265	08264	08248	08249
30	08265	08264	08248	08249

Chart 1C. Bearing Part Numbers.

STEP 2A - FS300 (FREE STANDING)

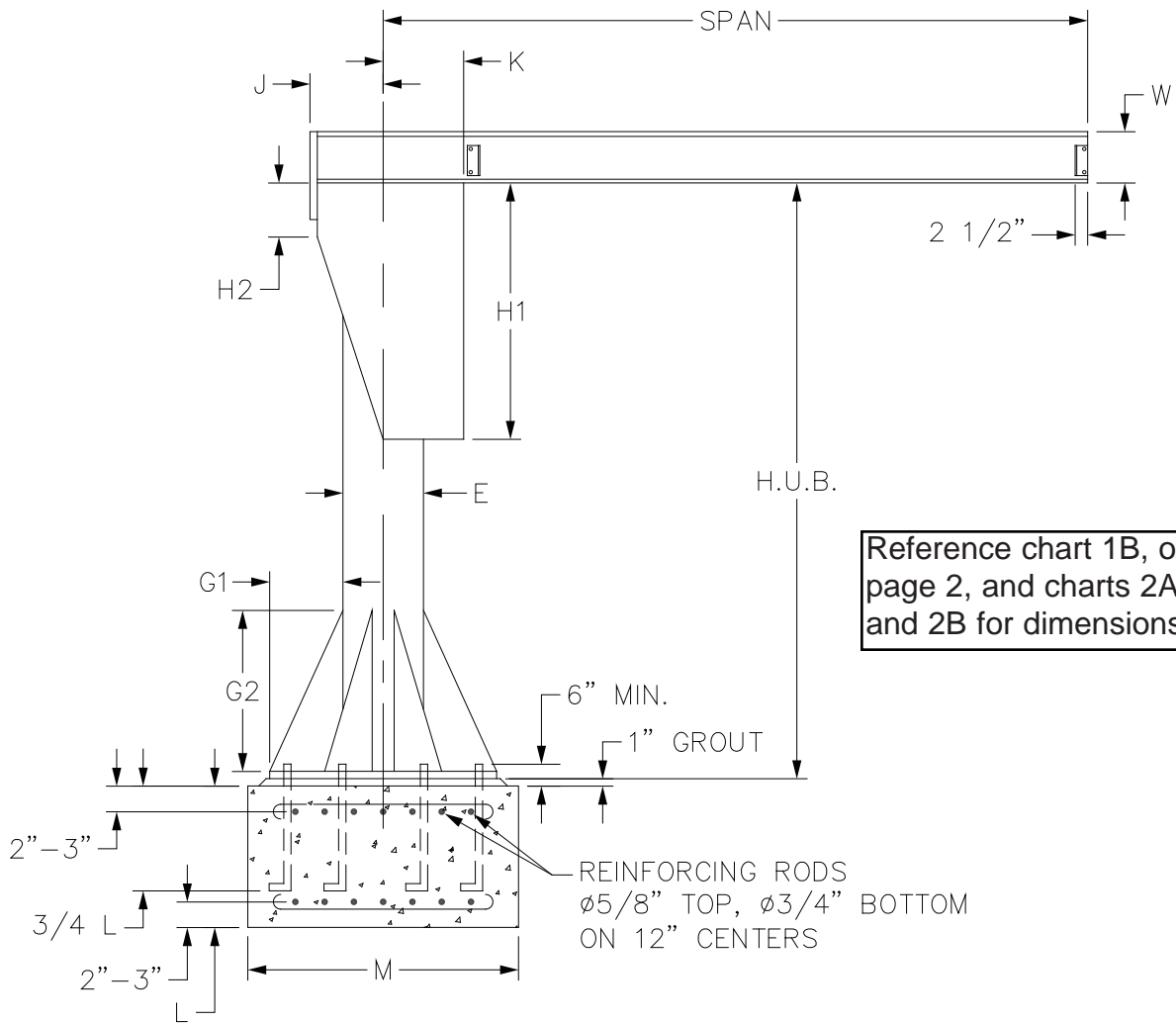


Diagram 2A. FS300

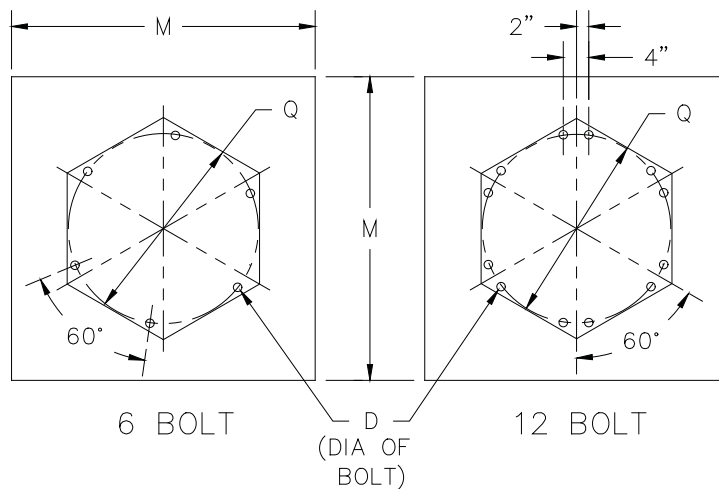


Diagram 2B. Base Bolt Pattern

STEP 2A - FS300 (FREE STANDING) (CONTINUED)

FS300 BASE PLATE MOUNTED

2.1 Pour the footing, according to the footing dimensions in **diagrams 2A and 2B**, page 3, and **charts 2A and 2B**, with the anchor bolts (J-bolts) in place. There should be between 4" and 6" of anchor bolt exposed above the floor level.

PIPE SIZE	DIMENSIONS (IN.)						ANCHOR BOLT PATTERN		
	E	G1	G2	J	K	H1	H2	QTY.	D
8	10	20	10-3/8	10	46-3/4	4	6	1.00	24
12	8-1/2	20	12-7/8	12-1/2	71-3/4	6	6	1.25	24
14	11	22	15-3/8	15	72	8	6	1.25	30
16	13	26	17-3/8	17	72	8	12	1.25	36
18	15	30	17-3/8	17	72	9	12	1.25	42
20	17	34	17-7/8	17-1/2	72	10	12	1.25	48
24	18	36	22-7/8	22-1/2	77	12	12	1.25	54
30	18	36	25-3/8	25	84	12	12	1.25	60

Note: Jib crane foundation requirements are based on a soil pressure of 2500 lbs. per square foot. Concrete recommended for jib crane foundation is 3000 lbs. per square inch of compressive force.

Chart 2A. Crane Dimensions

Note: Foundation/concrete must cure 7 days prior to mast installation. Foundation/concrete must cure 28 days prior to using crane to full capacity.

2.2 Once the concrete has cured, cover the base plate area with one (1") inch of grout.

Note: Grout is required to ensure the jib base plate has full contact support to the floor/footing. Shimming/leveling nuts under the base plate are acceptable methods that would aid plumbing of the mast assembly prior to setting the jib mast on the grout bed (shimming/leveling nuts by others). Grout must be a non-shrink, high compressive machinery type grout.

2.3 Set the mast into place and make sure the base plate is completely seated in the grout.

2.4 Plumb mast following the plumbing procedure in Step 3, page 10.

2.5 Once mast is plumb and grout has cured, tighten anchor bolts per manufacturer's specifications.

Note: If Gorbel is the supplier of the anchor bolts, tighten to full compression of the lockwasher.

2.6 Proceed to Step 4, page 11.

STANDARD FOOTING REQUIREMENTS			
Capacity Tons	Span (ft.)	Depth (ft.)	
		M	L
1/4	8-13	4	3
	14-20	4	4
1/2	8-12	4	4
	13-20	5	4
1	8-10	5	4
	11-15	6	4
	16-20	7	4
1-1/2	8-12	6	4
	13-15	7	4
	16-20	8	4
2	8-11	6	4
	12-15	7	4
	16-20	8	4
3	8-16	8	4
	17-20	9	4
4	8-13	8	4
	14-20	10	4
5	8-14	9	4
	15-18	10	4
	19-20	10	5

Chart 2B. Foundation Depth

STEP 2B - FS350 (INSERT MOUNTED)

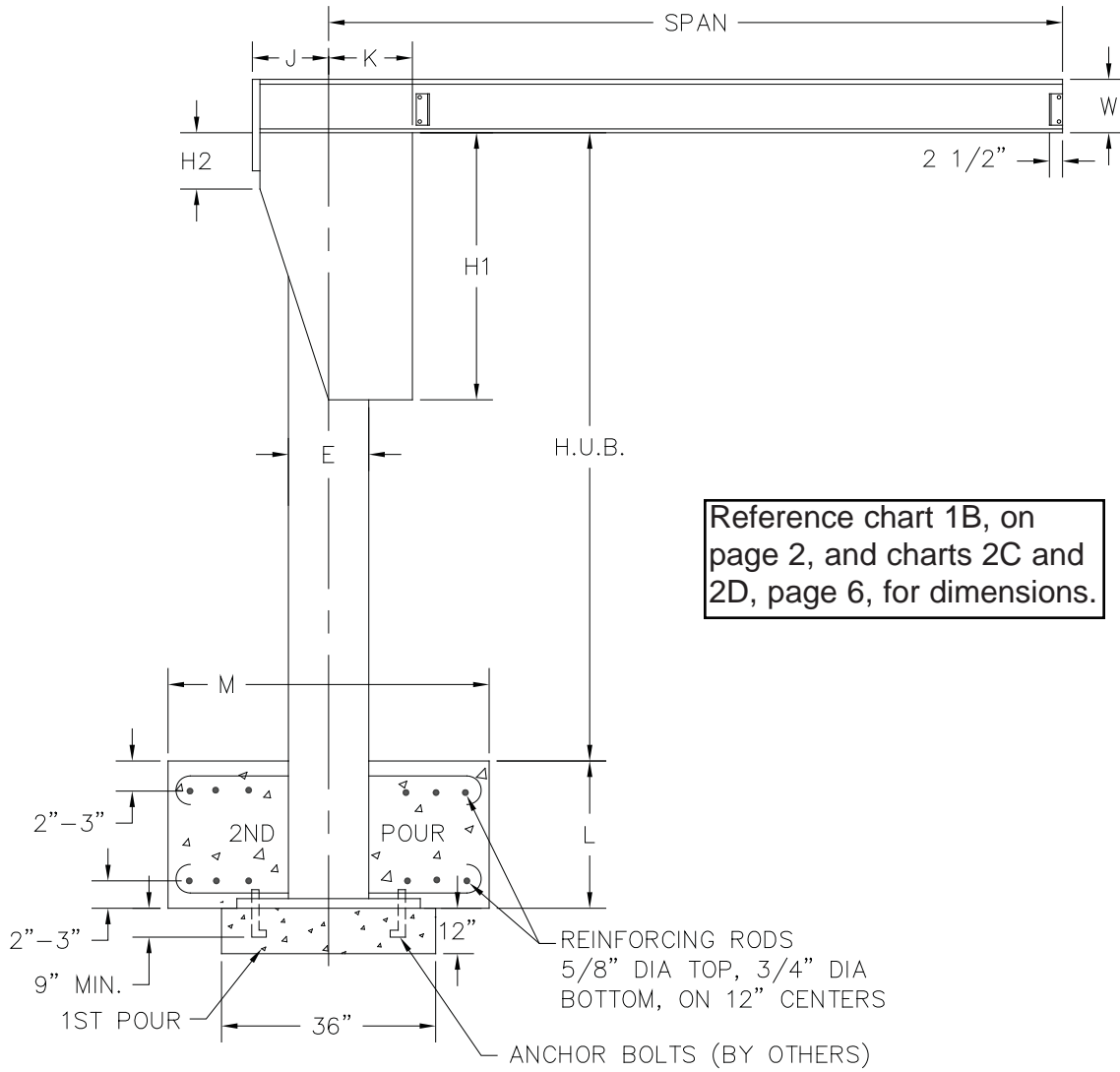


Diagram 2C. FS350

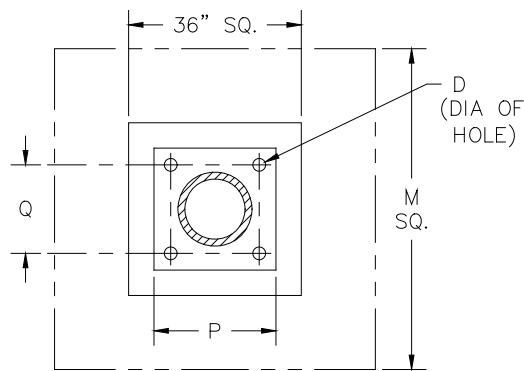


Diagram 2D. Base Bolt Pattern

STEP 2B - FS350 (INSERT MOUNTED) (CONTINUED)

FS350 INSERT MOUNTED

2.7 Pour the first footing, according to the footing dimensions in **diagrams 2C and 2D**, page 5, and **charts 2C and 2D**, with the anchor bolts (J-bolts) (by others) in place.

Note: Jib crane foundation requirements are based on a soil pressure of 2500 lbs. per square foot. Concrete recommended for jib crane foundation is 3000 lbs. per square inch of compressive force.

Note: Foundation/concrete must cure 7 days prior to mast installation. Foundation/concrete must cure 28 days prior to using crane to full capacity.

2.8 Once the concrete has cured, set the mast into place.

2.9 Plumb mast following the plumbing procedure in Step 3, page 10. Use grout and/or shims according to installer's recommendations.

2.10 Once mast is plumb, tighten anchor bolts per manufacturer's specifications.

2.11 Make the second pour according to the footing dimensions in **diagram 2C**, page 5, and chart 2D.

2.12 Proceed to Step 4, page 11.

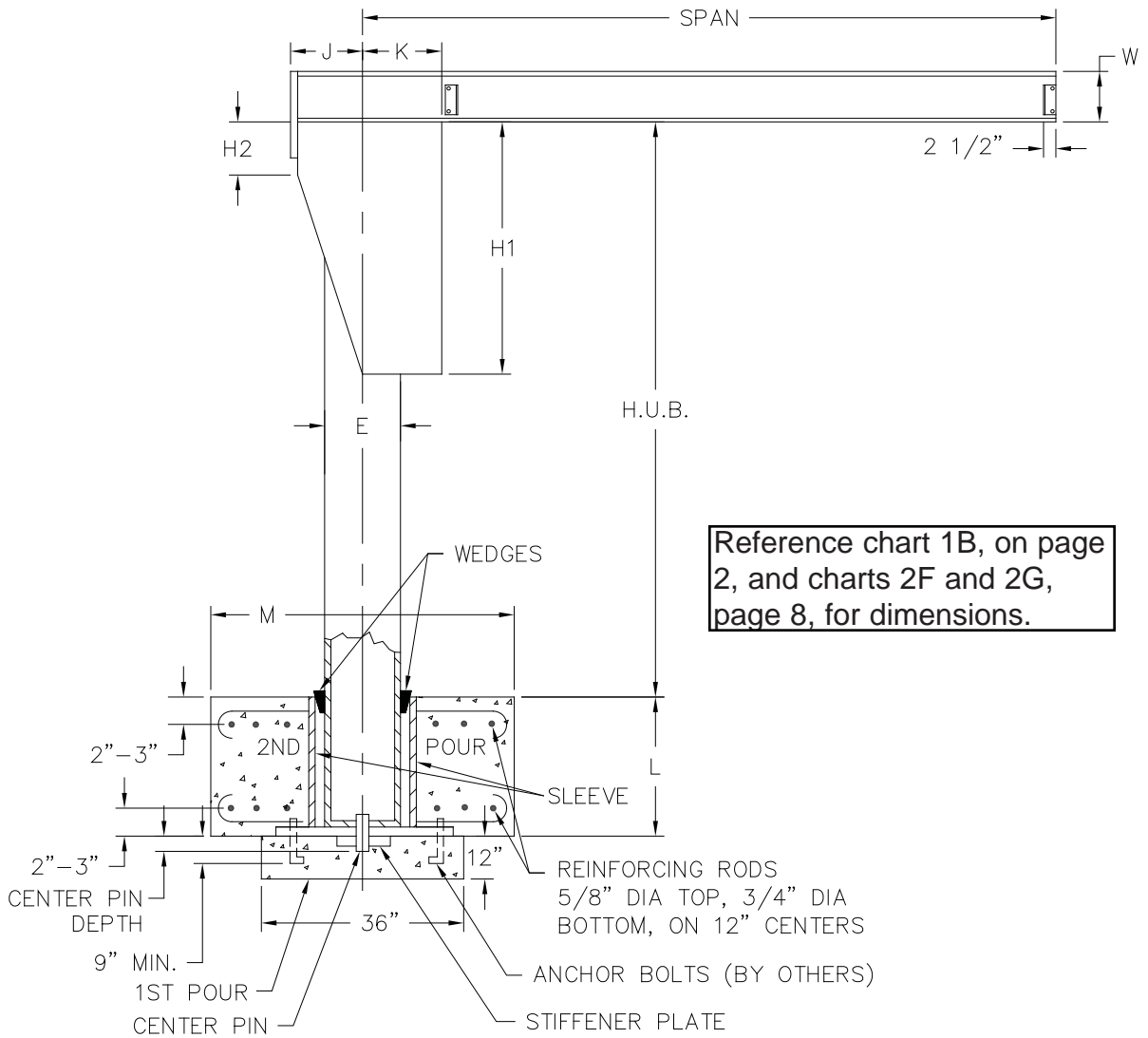
PIPE SIZE	DIMENSIONS (IN.)				ANCHOR BOLT PATTERN		
	E	J	K	H1	H2	D	P
8	10-3/8	10	46-3/4	4	13/16	11	8
12	12-7/8	12-1/2	71-3/4	6	13/16	15	12
14	15-3/8	15	72	8	13/16	17	14
16	17-3/8	17	72	8	13/16	19	16
18	17-3/8	17	72	9	13/16	21	18
20	17-7/8	17-1/2	72	10	13/16	23	20
24	22-7/8	22-1/2	77	12	13/16	27	24
30	25-3/8	25	84	12	13/16	33	30

Chart 2C. Crane Dimensions

STANDARD FOOTING REQUIREMENTS			
Capacity Tons	Span (ft.)	Width (ft.)	
		M	L
1/4	8-13	4	3
	14-20	4	4
1/2	8-12	4	4
	13-20	5	4
1	8-10	5	4
	11-15	6	4
	16-20	7	4
1-1/2	8-12	6	4
	13-15	7	4
	16-20	8	4
2	8-11	6	4
	12-15	7	4
	16-20	8	4
3	8-16	8	4
	17-20	9	4
4	8-13	8	4
	14-20	10	4
5	8-14	9	4
	15-18	10	4
	19-20	10	5

Chart 2D. Foundation Depth

STEP 2C - FS350S (SLEEVE MOUNTED)



Reference chart 1B, on page 2, and charts 2F and 2G, page 8, for dimensions.

Diagram 2E. FS350S

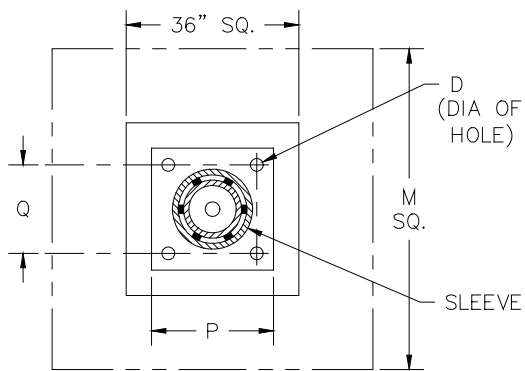


Diagram 2F. Base Bolt Pattern

Pipe Size (E)	Footing Depth (L)	Stiffener Plate Size (in. sq.)	Center Pin Depth (in.)
8	36	6	15/16
8	48	6	15/16
12	36	6	15/16
12	48	6	15/16
14	48	6	15/16
16	48	6	15/16
18	48	6	15/16
20	48	6	15/16
24	48	8	1-3/16
30	48	8	1-3/16
30	60	8	1-3/16

Chart 2E. Stiffener Plate and Center Pin Cut-Out Requirements

STEP 2C - FS350S (SLEEVE MOUNTED) (CONTINUED)

FS350S SLEEVE INSERT MOUNTED

2.13 Pour the first footing, according to the footing dimensions in **diagrams 2E and 2F**, page 7, and **charts 2F and 2G**, with the anchor bolts (J-bolts) (by others) in place. See **chart 2E** to calculate stiffener plate and center pin cut-out requirements.

Note: Jib crane foundation requirements are based on a soil pressure of 2500 lbs. per square foot.

Concrete recommended for jib crane foundation is 3000 lbs. per square inch of compressive force.

Note: Foundation/concrete must cure 7 days prior to mast installation. Foundation/concrete must cure 28 days prior to using crane to full capacity.

2.14 Once the concrete has set, set the sleeve in place (confirm sleeve size prior to setting) and tighten the anchor bolts, making sure the sleeve is plumb.

2.15 Make the second pour according to the footing dimensions in **diagram 2F**, page 7, and **chart 2G**.

2.16 When the second pour has cured, insert the mast inside the sleeve. Ensure that the center pin is fully inserted in the centering hole in the mast.

2.17 Using steel wedges (included) every 60°, plumb mast following the plumbing procedure in Step 3, page 10.

2.18 Once the mast is plumb, weld the steel wedges to the mast and sleeve to prevent any shifting of the mast.

PIPE SIZE	DIMENSIONS (IN.)				ANCHOR BOLT PATTERN		
	E	J	K	H1	H2	D	P
8	10-3/8	10	46-3/4	4	1	13	10
12	12-7/8	12-1/2	71-3/4	6	1	17	14
14	15-3/8	15	72	8	1	19	16
16	17-3/8	17	72	8	1	21	18
18	17-3/8	17	72	9	1	23	20
20	17-7/8	17-1/2	72	10	1	25	22
24	22-7/8	22-1/2	77	12	1	29	26
30	25-3/8	25	84	12	1	35	32

Chart 2F. Crane Dimensions

STANDARD FOOTING REQUIREMENTS			
Capacity Tons	Span (ft.)	Width (ft.)	
		M	L
1/4	8-13	4	3
	14-20	4	4
1/2	8-12	4	4
	13-20	5	4
1	8-10	5	4
	11-15	6	4
	16-20	7	4
1-1/2	8-12	6	4
	13-15	7	4
	16-20	8	4
2	8-11	6	4
	12-15	7	4
	16-20	8	4
3	8-16	8	4
	17-20	9	4
4	8-13	8	4
	14-20	10	4
5	8-14	9	4
	15-18	10	4
	19-20	10	5

Chart 2G. Foundation Depth

WARNING

All welds must meet American Welding Society (AWS) specification D1.1 using E70xx electrodes.

2.19 Proceed to Step 4, page 11.

STEP 2D - FS300NP6 (FREE STANDING FOUNDATIONLESS)

Hexagonal Base Plates for Foundationless Jibs

For jib cranes that can be mounted on a 6" foundation that is free from cracks, seams, expansion joints, and walls (**chart 2H**).

WARNING

Consult a qualified structural engineer if you deviate from the recommended dimensions provided in this manual. Gorbel Inc. is not responsible for any deviation from these foundation requirements.

2.20 A) Anchor bolts (by others) for **hexagonal** base plates must:

- be 1" in diameter (**diagram 2H**).

Note: Jib cranes that have an NP6 designation have a special design that is different than standard Free Standing Jib Cranes for poured foundations. The NP6 base plate stiffener allows for a 1" diameter anchor bolt as opposed to the standard base plate stiffener that allows for a 1-1/4" diameter anchor bolt. If you have a standard design FS Jib for a poured foundation refer to Step 2A. Contact Gorbel® Customer Service if you are unsure what style (NP6 or Standard) Free Standing Jib Crane you have.

- be embedded at least 4" into the floor, not to exceed 3/4 of foundation depth.

Note: A minimum 6" thick reinforced concrete floor is required.

- have **minimum** of two threads above nut after installation.

Note: Jib crane foundation requirements are based on soil pressure of 2500# per square foot. Concrete pressure recommended for jib crane foundation is 3000# per square inch of compressive force.

Note: Foundationless Free Standing Jib Cranes should be mounted to a shallow foundation, centered on a square foot area that is free from cracks, seams and walls mounted with chemical anchor bolts to withstand a minimum of 3470# of pull out force.

Note: Chemical (epoxy) anchor bolts are recommended because of their ability to withstand the vibrating loads caused by the hoist stopping and starting under load.

B) Drill holes in concrete floor using pre-drilled holes in base plate or **diagram 2H** as a guide (use drill bit size recommended by anchor bolt manufacturer).

C) Install anchor bolts (Grade 5 or better) and hardware (by others) according to the manufacturer's installation directions and requirements.

2.21 Set the mast into place and make sure the base plate is completely seated in the grout.

2.22 Plumb mast following the plumbing procedure in Step 3, page 10.

2.23 Once mast is plumb and grout has cured, tighten anchor bolts per manufacturer's specifications. Note: If Gorbel is the supplier of the anchor bolts, tighten to full compression of the lockwasher.

2.24 Proceed to Step 4, page 11.

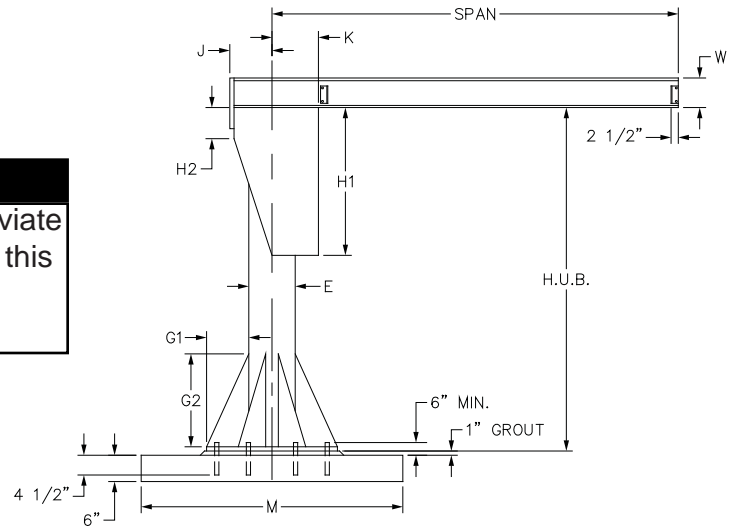


Diagram 2G. FS300NP6

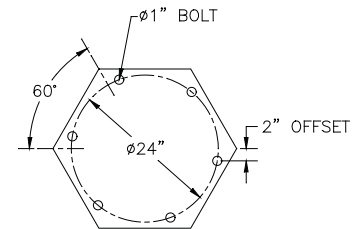


Diagram 2H. Base bolt pattern.

Capacity	Span	Foundation Size (sq. ft.)
1/4 ton	8' - 9'	5 x 5
	10' - 13'	6 x 6
1/2 ton	8' - 9'	6 x 6

Chart 2H. Distance of jib from cracks, seams, walls.

STEP 3 - PLUMBING MAST

WARNING

Mast must be plumb to prevent boom from drifting.

PLUMBING MAST

- 3.1 Drop plumb line (not included) from top of mast, using fixture (not included) or equivalent (*diagram 3A*).
 - 3.2 At point "A", one (1") inch below the top mast plate, set plumb line a distance of three (3") inches from the surface of the mast pipe (*diagram 3B*).
 - 3.3 At point "B", five (5') feet below point "A" (approximately where rollers will contact mast pipe), the distance between plumb line and the surface of the mast pipe should also be three (3") inches.
 - 3.4 Repeat steps 3.1 through 3.3 every 60° around mast to ensure mast is plumb throughout.
- Note:** Be sure to fasten plumb line securely to plumb fixture so that it will not move. Movement will result in an inaccurate plumb measurement.
- 3.5 Once mast is plumb and grout (FS300) has cured, fully tighten anchor bolt hardware.
 - 3.6 Verify mast is still plumb.

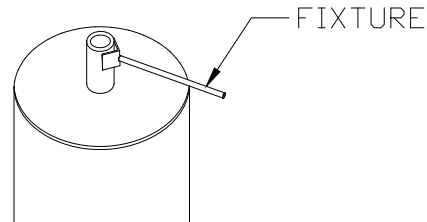


Diagram 3A. Plumbing fixture.

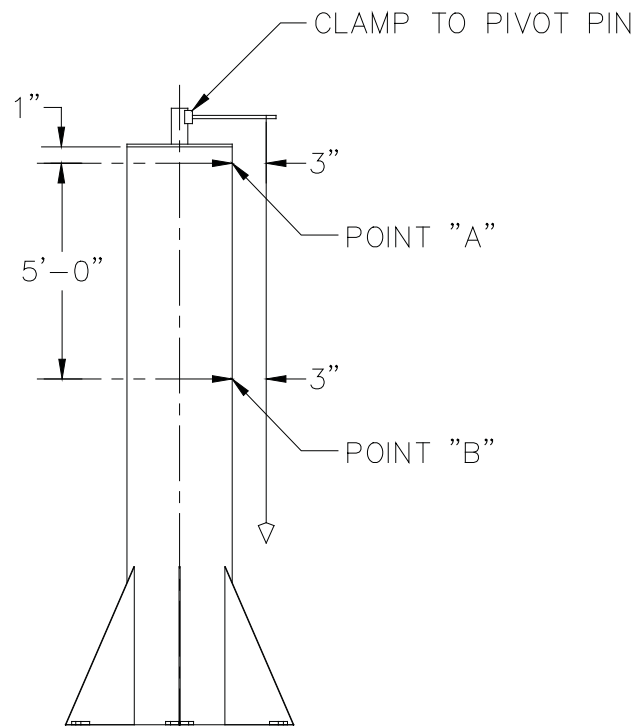
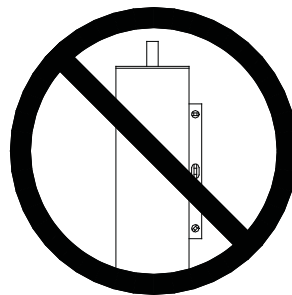


Diagram 3B. Plumbing the Mast

**DO NOT USE A
LEVEL TO
PLUMB MAST.**



STEP 4 - HEAD INSTALLATION

➔ **TIP:** Trunnion rollers should have full face contact with mast pipe when properly installed.

- 4.1 Wipe protective grease coating off and/or remove tape from pivot pin.
- 4.2 Place and orient tapered roller bearing inner race (cone) on the mast pivot pin (*diagram 4A*).
- 4.3 Remove safety channel from head assembly if it is bolted into place.
- 4.4 Place the head on the mast. Install V-ring seal (shipped loose) over mast pivot pin and press against weight bearing frame. Secure head by

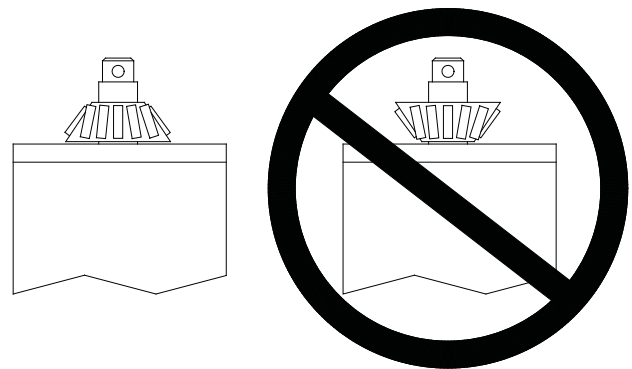


Diagram 4A. Bearing Orientation.

inserting the safety retaining pin into the hole located in the mast pivot pin. Ensure that the safety retaining pin is centered to within 1/16" inside of the mast pivot pin. Place 2 hose clamps (one on either side) over each end of the safety retaining pin and slide them inward until they come in contact with the mast pivot pin (*diagram 4B*). Tighten both hose clamps such that the safety retaining pin is locked into place without the ability to slide sideways. Also ensure that both hose clamps are identically oriented on the pin and, once tightened, ensure the clamp screws are facing downward.

Note: It is imperative that the safety retaining pin is installed in the "centered" position to avoid a possible interference with the threaded stud welded to the weight bearing frame.

- 4.5 Reinstall the safety channel into the head if removed in step 4.3.

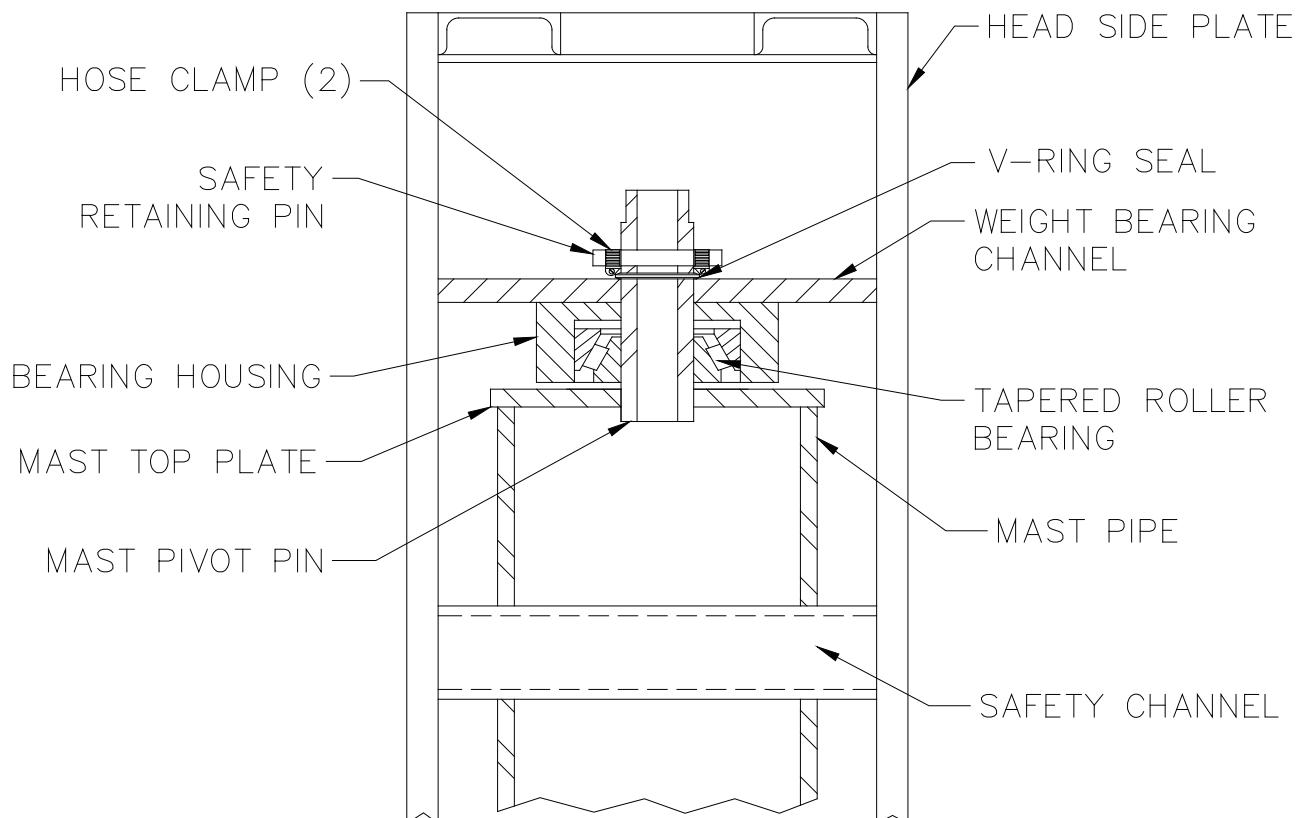


Diagram 4B. Head Assembly Installation.

STEP 5 - BOOM INSTALLATION

➡ **TIP:** If you have a bottom entry collector, install it prior to Step 5. See page 14.

5.1 Set the boom on the head and attach to the head using the hardware provided. Two (2) bolts are required in the front (under boom hardware) and all holes in the back of boom plate require bolts (*diagram 5A*).

5.2 Adjust the boom to a point of $L/300$ (length of span in inches divided by 300) above level at tip of span. Leveling is done by adding shims (by others) under the boom at the front of the head (when the pipe diameter (E) is 8", 12", 14", 16", 18" or 20") (*diagram 5B*), or by evenly adjusting the hexnuts on the threaded rod on the trunnion roller assembly (when the pipe diameter (E) is 24" or 30") (*diagram 5C*).

5.3 Torque the back of boom mounting hardware and the under boom hardware per *chart 1A*, page 2.

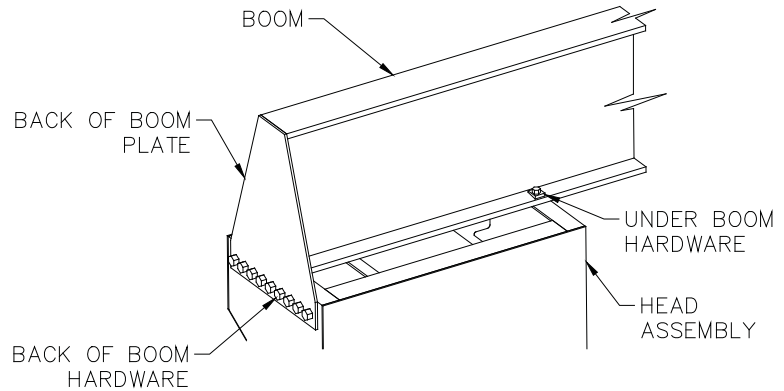


Diagram 5A. Boom Installation.

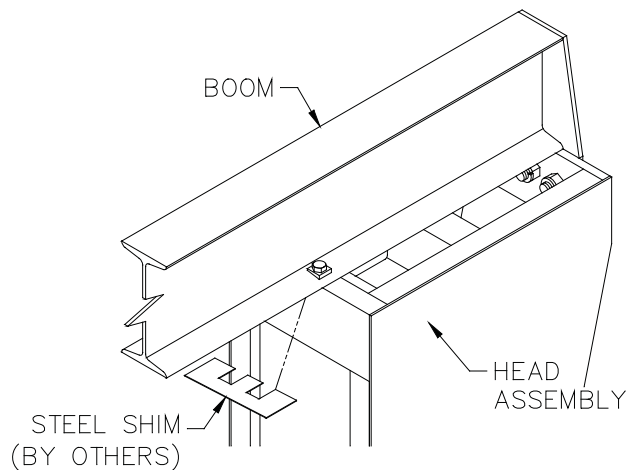


Diagram 5B. Shimming boom.

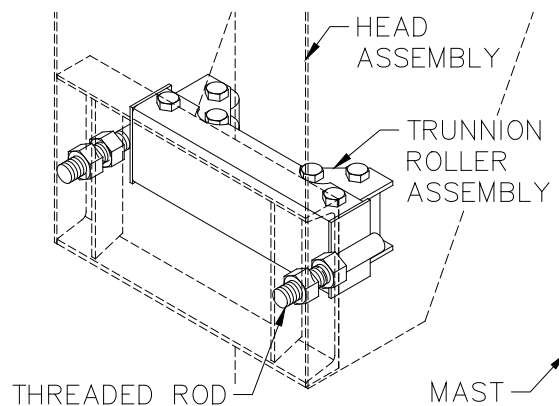


Diagram 5C. Adjusting trunnion roller assembly.

STEP 6 - ENDSTOP/TAGLINE INSTALLATION

➔ **TIP:** If you have tagline go to Step 6.2, otherwise go to Step 6.1.

6.1 Endstop Installation (*diagram 6A*)

- A) Bolt endstops to end of boom closest to the mast. Torque nuts (refer to **chart 1A**, page 2, for proper torque rating).
- B) Roll hoist/hoist trolley (by others) into place.
- C) Immediately bolt remaining endstops into place at the front of boom. Torque nuts (refer to **chart 1A**, page 2, for proper torque rating).

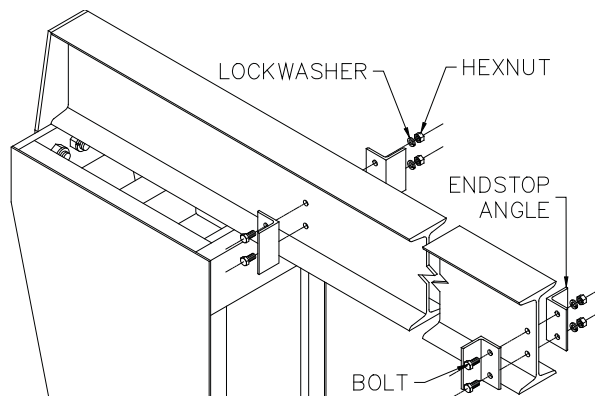


Diagram 6A. Endstop installation.

6.2 Tagline Festoon Installation (*diagram 6B*)

- A) Bolt tagline bracket and an endstop to end of boom closest to the mast. Torque nuts (refer to **chart 1A**, page 2, for proper torque rating).
- B) Roll hoist/hoist trolley (by others) into place.
- C) Immediately bolt remaining tagline bracket and endstop into place at the front of boom. Torque nuts (refer to **chart 1A**, page 2, for proper torque rating).

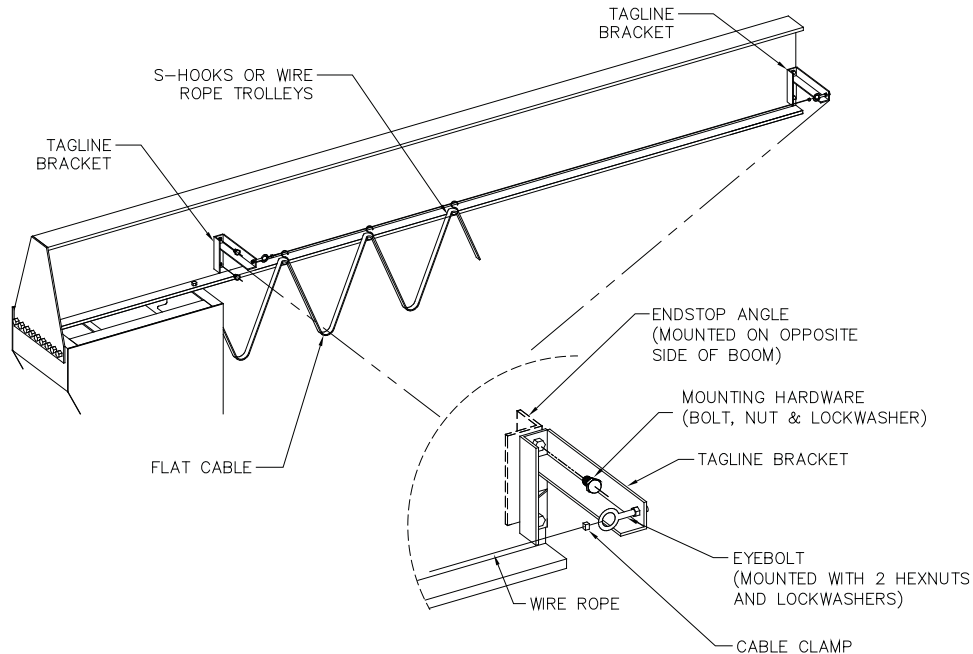


Diagram 6B. Tagline festoon installation.

- D) Bolt eyebolts to tagline brackets using two hexnuts per eyebolt.
- E) Loop the wire rope through one of the eyebolts and clamp the loop using cable clamps. Repeat this step at the other eyebolt while removing any slack from the wire rope.
- F) Adjust the eyebolts to achieve the desired cable tension and lock the eyebolts in place by tightening the hexnuts.
- G) Run the festoon cable through the S-hooks or wire rope trolleys (squeeze bottom of S-hooks to grip cable or hose).
- H) Wire the hoist per manufacturers (SIC) instructions.

STEP 7 - OPTIONAL ACCESSORIES

Electrical Bottom Entry Collector (*diagram 7A*)

- A) Remove the collector cover. Remove hose clamps and safety retaining pin if crane requires an adaptor pin (see packing list).
- B) Install the collector adaptor pin (if applicable) being sure wires from mast come up through the center.
- C) Reinstall the safety retaining pin and hose clamps if previously removed.
- D) Connect wires protruding from mast pin to the inside of the collector.
- E) Place the bottom entry collector on top of pivot pin (or adaptor pin) and secure with the set screws. Make sure wires are pushed down inside mast.
- F) Connect collector to the bolt mounted in the weight bearing channel using connecting link and hardware provided.
- G) Add appropriate size hole in the collector cover or front of weight bearing channel to allow installation of hoist power cable to collector.
- H) Wire from collector to hoist.
- I) Attach collector cover with hardware provided.

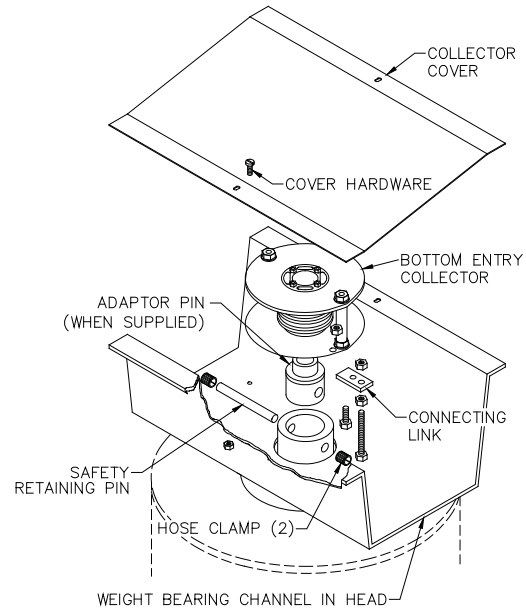


Diagram 7A. *Installing bottom entry collector.*

Electrical Top Entry Collector (*diagram 7B*)

- A) Position the collector over the mounting hole pattern on top of the mounting plate.
- B) Bolt collector assembly to the mounting plate with the hardware provided.
- C) Bring power down from overhead source and wire into pivot arm of the collector assembly with conduit.
- D) Wire from the collector assembly to the hoist.

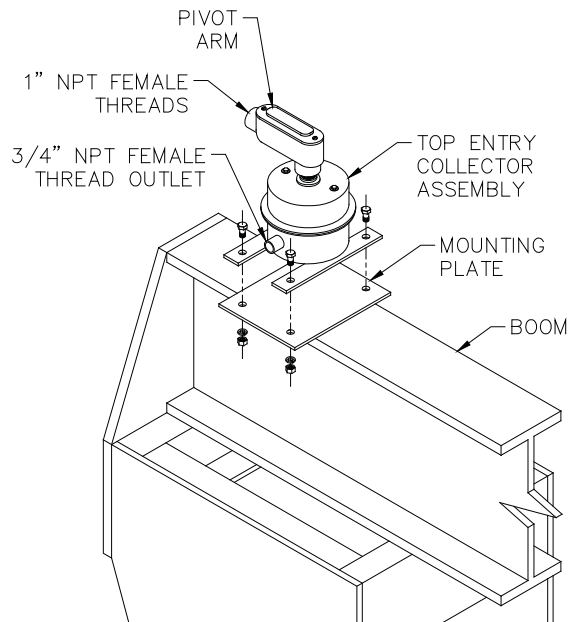


Diagram 7B. *Installing top entry collector.*

STEP 7 - OPTIONAL ACCESSORIES (CONTINUED)

WARNING

Welds must meet American Welding Society (AWS) specification D1.1 using E70xx electrodes.

Mechanical Rotation Stops (*diagram 7C*)

E	8	12	14	16	18	20	24	30
A	2-1/2"	2-3/4"	16-1/2"	16-1/2"	16-1/2"	16-1/2"	17-1/2"	17-1/2"

- A) Weld stationary stop blocks to mast.
- B) Weld rotation stop block to center of safety channel. Leave 1/4" gap between mast and rotation stop block.

Multi-Position or Single Position Locking Device (*diagram 7D*)

- A) Bolt mounting channels to head assembly.
- B) Bolt vertical channel assembly to the mounting channels.
- C) Move the lock clamp handle until the locking block falls into the slot in the position lock ring.
- D) Rotate the crane to the desired locking position. Unless otherwise specified, the slots on the lock ring are on 30° offset.

Note: Multi-position or single position locking ring can either be factory mounted or field mounted.

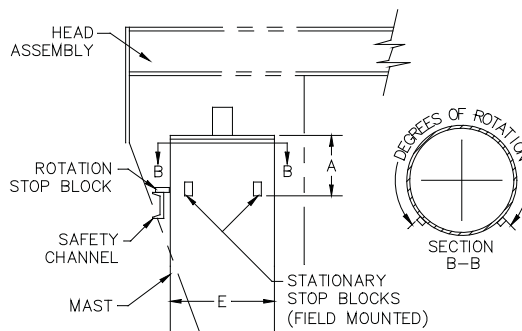


Diagram 7C. Installing rotation stops.

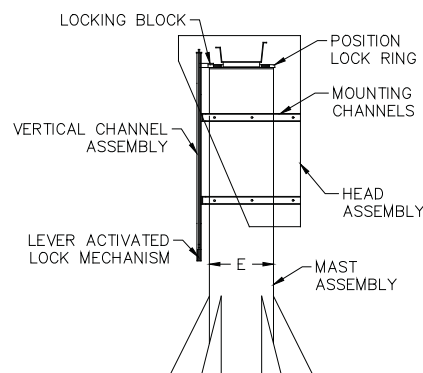


Diagram 7D. Installing locking device.

WARNING

Locking device not to be used for side loading, it is strictly used to prevent rotation of head and boom when lifting and lowering load directly below beam. Not to be used as a wind lock.

Other Options Available from Gorbel (Consult Gorbel® Representative)

- Anchor Bolts
- Bottom Entry Air Swivel
- Powered Rotation
- Base Plate Template
- Top Entry Air Swivel
- Fusible Disconnect Switch
- Flat or Round Conductor Cable
- Wire Rope Trolleys for Flat or Round Cable

STEP 8 - FINAL STEPS

➡ **TIP:** Do not throw away this manual: maintenance schedule is on back cover.

- 8.1 Check to make sure all bolts are tight and lockwashers are compressed.
- 8.2 If necessary, touch up with paint provided.
- 8.3 Keep Packing List, Installation Manual, General Arrangement Drawing and any other inserts together in a safe place.

CRANE OPERATOR INSTRUCTIONS

Overhead cranes and jib cranes generally handle materials over working areas where there are personnel. Therefore, it is important for the Crane Operator to be instructed in the use of the crane and to understand the severe consequences of careless operation.

It is not intended that these suggestions take precedence over existing plant safety rules and regulations or OSHA regulations. However, a thorough study of the following information should provide a better understanding of safe operation and afford a greater margin of safety for people and machinery on the plant floor.

It must be recognized that these are suggestions for the Crane Operator's use. It is the responsibility of the owner to make personnel aware of all federal, state and local rules and codes, and to make certain operators are properly trained.

Qualifications

Crane operation, to be safe and efficient, requires skill: the exercise of extreme care and good judgment, alertness and concentration, and rigid adherence to proven safety rules and practices as outlined in applicable and current ANSI and OSHA safety standards. In general practice, no person should be permitted to operate a crane:

- Who cannot speak the appropriate language or read and understand the printed instructions.
- Who is not of legal age to operate this type of equipment.
- Whose hearing or eyesight is impaired (unless suitably corrected with good depth perception).
- Who may be suffering from heart or other ailments which might interfere with the operator's safe performance.
- Unless the operator has carefully read and studied this operation manual.
- Unless the operator has been properly instructed.
- Unless the operator has demonstrated his instructions through practical operation.
- Unless the operator is familiar with hitching equipment and safe hitching equipment practices.

Handling the Jib Boom Motion

Before using the boom of the jib crane, the operator should be sure the hook is high enough to clear any obstruction. Before a load is handled by the crane, the jib boom should be brought into position so that it is directly over the load. Start the jib boom slowly and bring it up to speed gradually. Approaching the place where it is desired to stop the jib, reduce the boom speed.

Handling the Trolley Motion

Before a load is handled, the hoist should be positioned directly over the load that is to be handled. When the slack is taken out of the slings, if the hoist is not directly over the load, bring it directly over the load before hoisting is continued. Failure to center the hoist over the load may cause the load to swing upon lifting. Always start the trolley motion slowly and reduce the trolley speed gradually.

Handling the Hoist Motion

Refer to the lifting (hoist) equipment's operating instructions.

GENERAL SUGGESTIONS

Know Your Crane

Crane operators should be familiar with the principal parts of a crane and have a thorough knowledge of crane control functions and movements. The crane operator should be required to know the location and proper operation of the main conductor disconnecting means for all power to the attachments on the crane.

Responsibility

Each crane operator should be held directly responsible for the safe operation of the crane. Whenever there is any doubt as to SAFETY, the crane operator should stop the crane and refuse to handle loads until: (1) safety has been assured or (2) the operator has been ordered to proceed by the supervisor, who then assumes all responsibility for the SAFETY of the lift.

Do not permit **ANYONE** to ride on the hook or a load.

Inspection

Test the crane movement and any attachments on the crane at the beginning of each shift. Whenever the operator finds anything wrong or apparently wrong, the problem should be reported immediately to the proper supervisor and appropriate corrective action taken.

Operating Suggestions

One measure of a good crane operator is the smoothness of the crane operation. The good crane operator should know and follow these proven suggestions for safe, efficient crane handling.

1. The crane should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the sling and hoisting ropes before the load is lifted.
2. Center the crane over the load before starting the hoist to avoid swinging the load as the lift is started. Loads should not be swung by the crane to reach areas not under the crane.
3. Crane-hoisting ropes should be kept vertical. Cranes shall not be used for side pulls.
4. Be sure everyone in the immediate area is clear of the load and aware that a load is being moved.
5. Do not make lifts beyond the rated load capacity of the crane, sling chains, rope slings, etc.
6. Make certain that before moving the load, load slings, load chains, or other lifting devices are fully seated in the saddle of the hook with hook latch closed (if equipped with hook latch).
7. Check to be sure that the load and/or bottom block is lifted high enough to clear all obstructions when moving boom or trolley.
8. At no time should a load be left suspended from the crane unless the operator has the push button with the power on, and under this condition keep the load as close as possible to the floor to minimize the possibility of an injury if the load should drop. When the crane is holding a load, the crane operator should remain at the push button.
9. Do not lift loads with sling hooks hanging loose. If all sling hooks are not needed, they should be properly stored, or use a different sling.
10. All slings or cables should be removed from the crane hooks when not in use (dangling cables or hooks hung in sling rings can inadvertently snag other objects when the crane is moving).
11. Operators shall not carry loads and/or empty bottom blocks over personnel. Particular additional caution should be practiced when using magnet or vacuum devices. Loads, or parts of loads, held magnetically could drop. Failure to power magnets or vacuum devices can result in dropping the load. Extra precaution should be exercised when handling molten metal in the proximity of personnel.
12. Whenever the operator leaves the crane the following procedure should be followed:
 - Raise all hooks to an intermediate position.
 - Spot the crane at an approved designated location.
 - Place all controls in the "off" position.
 - Open the main switch to the "off" position.
 - Make visual check before leaving the crane.
13. In case of emergency or during inspection, repairing, cleaning or lubrication, a warning sign or signal should be displayed and the main switch should be locked in the "off" position. This should be done whether the work is being done by the crane operator or by others.
14. Contact with rotation stops or trolley end stops shall be made with extreme caution. The operator should do so with particular care for the safety of persons below the crane, and only after making certain that any persons on the other cranes are aware of what is being done.
15. **ANY SAFETY FEATURES AND MECHANISMS BUILT-IN OR OTHERWISE PROVIDED WITH THE CRANE BY GORBEL ARE REQUIRED FOR THE SAFE OPERATION OF THE CRANE. DO NOT, UNDER ANY CIRCUMSTANCES, REMOVE OR OTHERWISE IMPAIR OR DISABLE THE PROPER FUNCTIONING OF ANY CRANE SAFETY MECHANISMS OR FEATURES BUILT-IN OR OTHERWISE PROVIDED BY GORBEL FOR SAFE OPERATION OF THE CRANE. ANY REMOVAL, IMPAIRMENT OR DISABLING OF ANY SUCH SAFETY MECHANISMS OR FEATURES OR OTHER USE OR OPERATION OF THE CRANE WITHOUT THE COMPLETE AND PROPER FUNCTIONING OF ANY SUCH SAFETY MECHANISMS OR FEATURES AUTOMATICALLY AND IMMEDIATELY VOIDS ANY AND ALL EXPRESS AND IMPLIED WARRANTIES OF ANY KIND OR NATURE.**

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel Incorporated ("Gorbel") warrants the manual push-pull Work Station Cranes, Jib Crane, and Gantry Crane products to be free from defects in material or workmanship for a period of ten years or 20,000 hours use from date of shipment. Gorbel warrants the Motorized Work Station Cranes and Jib Crane products to be free from defects in material or workmanship for a period of two years or 4,000 hours use from the date of shipment. Gorbel warrants the G-Force® and Easy Arm™ products to be free from defects in material or workmanship for a period of one year or 2,000 hours use from the date of shipment. This warranty does not cover Gantry Crane wheels. This warranty shall not cover failure or defective operation caused by operation in excess of recommended capacities, misuses, negligence or accident, and alteration or repair not authorized by Gorbel. No system shall be field modified after manufacture without the written authorization of Gorbel, Inc. Any field modification made to the system without the written authorization of Gorbel, Inc. shall void Gorbel's warranty obligation. OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESS WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, ARE MADE BY GORBEL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. GORBEL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. Gorbel's obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Gorbel's products at the factory, or at the discretion of Gorbel, at a location designated by Gorbel. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Gorbel hereunder. Gorbel will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind resulting from failure or defective operation of any materials or equipment furnished hereunder. Components and accessories not manufactured by Gorbel are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Gorbel is limited to and determined by the terms and conditions of the warranty provided by the respective manufacturers of such components and accessories.

A) DISCLAIMER OF IMPLIED WARRANTY OF MERCHANTABILITY

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

B) DISCLAIMER OF IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE

Gorbel and Purchaser agree that the implied warranty of fitness for particular purpose is excluded from this transaction and shall not apply to the goods involved in this transaction.

C) DISCLAIMER OF EXPRESS WARRANTY

Gorbel's agents, or dealer's agents, or distributor's agents may have made oral statements about the machinery and equipment described in this transaction. Such statements do not constitute warranties, and Purchaser agrees not to rely on such statements. Purchaser also agrees that such statements are not part of this transaction.

D) DISCLAIMER OF SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Gorbel and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Gorbel's agent in any respect for any reason. Gorbel and Purchaser also agree that Purchaser has been put on notice that dealer or distributor is not authorized to incur any obligations or to make any representations or warranties on Gorbel's behalf other than those specifically set forth in Gorbel's warranty provided in connection with its product.

F) MERGER

This warranty agreement constitutes a final and complete written expression of all the terms and conditions of this warranty and is a complete and exclusive statement of those terms.

G) PAINTING

Every crane (excluding components) receives a quality paint job before leaving the factory. Unfortunately, no paint will protect against the abuses received during the transportation process via common carrier. We have included at least one (1) twelve ounce spray can for touchup with each crane ordered (unless special paint was specified). If additional paint is required, contact a Gorbel® Customer Service Representative at 1-800-821-0086 or 1-585-924-6262.

Title and Ownership:

Title to the machinery and equipment described in the foregoing proposal shall remain with Gorbel and shall not pass to the Purchaser until the full amount herein agreed to be paid has been fully paid in cash.

Claims and Damages:

Unless expressly stated in writing, goods and equipment shall be at Purchaser's risk on and after Seller's delivery in good shipping order to the Carrier. Gorbel shall in no event be held responsible for materials furnished or work performed by any person other than it or its authorized representative or agent.

Cancellations:

If it becomes necessary for the purchaser to cancel this order wholly or in part, he shall at once so advise Gorbel in writing. Upon receipt of such written notice all work will stop immediately. If the order entails only stock items, a flat restocking charge of 15% of the purchase price will become due and payable by Purchaser to Gorbel. Items purchased specifically for the canceled order shall be charged for in accordance with the cancellation charges of our supplier plus 15% for handling in our factory. The cost of material and/or labor expended in general fabrication for the order shall be charged for on the basis of total costs to Gorbel up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Gorbel without express permission in writing to do so.

Extra Charge Delay: If Purchaser delays or interrupts progress of Seller's performance, or causes changes to be made, Purchaser agrees to reimburse Gorbel for expense, if any, incident to such delay.

Changes and Alterations:

Gorbel reserves the right to make changes in the details of construction of the equipment, as in its judgment, will be in the interest of the Purchaser; will make any changes in or additions to the equipment which may be agreed upon in writing by the Purchaser; and Gorbel is not obligated to make such changes in products previously sold any customer.

Third Party Action:

Should Gorbel have to resort to third party action to collect any amount due after thirty (30) days from date of invoice, the Purchaser agrees to pay collection costs, reasonable attorney's fees, court costs and legal interest.

OSHA Responsibilities:

Gorbel agrees to fully cooperate with Purchaser in the design, manufacture or procurement of safety features or devices that comply with OSHA regulations. In the event additional equipment or labor shall be furnished by Gorbel, it will be at prices and standard rates then in effect, or as may be mutually agreed upon at the time of the additional installation.

Equal Employment Opportunity:

Gorbel agrees to take affirmative action to ensure equal employment opportunity for all job applicants and employees without regard to race, color, age, religion, sex, national origin, handicap, veteran, or marital status. Gorbel agrees to maintain non-segregated work facilities and comply with rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

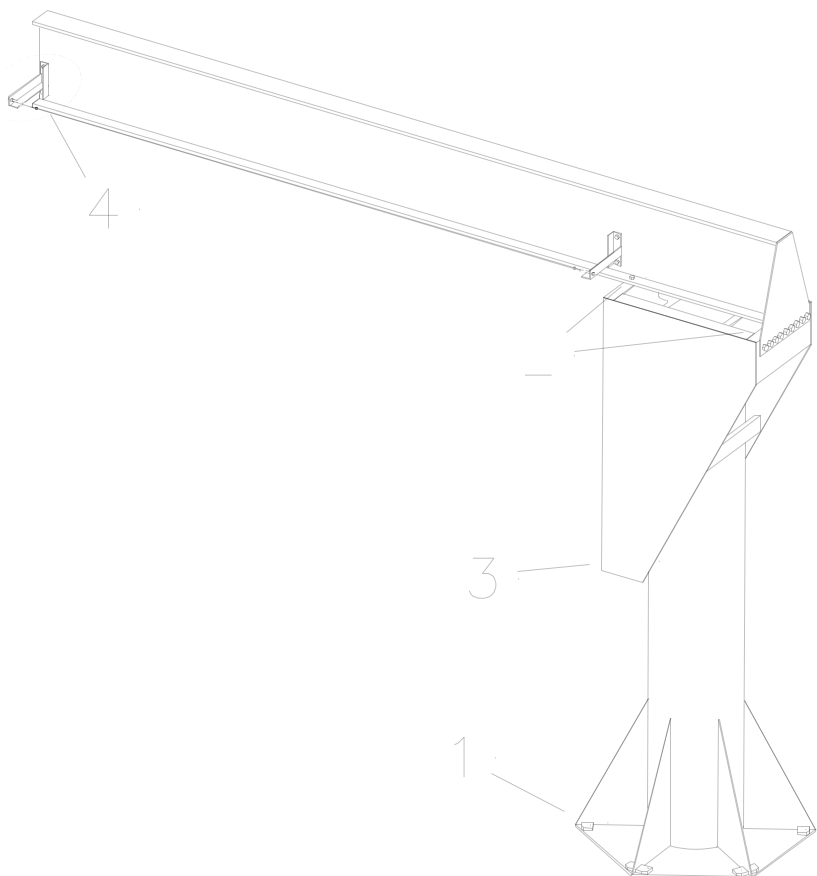
INSPECTION AND MAINTENANCE SCHEDULE

GORBEL® FREE STANDING JIB CRANE INSPECTION AND MAINTENANCE SCHEDULE			
ITEM	COMPONENT	MAINTENANCE	FREQUENCY*
1	Anchor Bolts	Check that lockwashers are compressed and nuts tightened to manufacturer's specifications.	Every 500 hours or 3 months
2	Boom Attachment Hardware	Check that lockwashers are compressed and bolts are tightened to torque specifications (chart 1A, page 2).	Every 500 hours or 3 months
3	Trunnion Rollers	Check to make sure both rollers have full face contact with mast pipe and that lockwashers are compressed.	Every 1000 hours or 6 months
4	Endstop/Tagline Assemblies	Check that lockwashers are compressed and bolts are tightened to torque specifications (chart 1A, page 2).	Every 500 hours or 3 months
5	Level of Boom	Verify end of boom is at a point of L/300 above level. Reference page 11, Boom Installation.	Every 1000 hours or 6 months
6	Accessory Items	Conduct a general inspection of all accessory items.	Every 1000 hours or 6 months
7	Gorbel® Crane	Conduct a visual inspection of crane overall.	Every 1000 hours or 6 months

* Federal, state and local codes may require inspection and maintenance checks more often. Please check the federal, state and local code manuals in your area.

WARNING

Any changes in rolling effort, rotation effort or unusual noises must be immediately identified and corrected.



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Section 3

Harrington ER2 Hoist Owner Manual

OWNER'S MANUAL

ELECTRIC CHAIN HOIST ER2 and NER2 SERIES

1/8 Ton through 5 Ton Capacity

Code, Lot and Serial Number

⚠ WARNING

This equipment should not be installed, operated, or maintained by any person who has not read and understood all the contents of this manual. Failure to read and comply with the contents of this manual can result in serious bodily injury or death, and/or property damage.

HARRINGTON
A KITO GROUP COMPANY

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1.0 Important Information and Warnings

1.1 Terms and Summary

This manual provides important information for personnel involved with the installation, operation and maintenance of this product. Although you may be familiar with this or similar equipment, it is strongly recommended that you read this manual before installing, operating or maintaining the product.

Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures that can present hazardous situations. The following signal words are used to identify the degree or level of hazard seriousness.

⚠ DANGER Danger indicates an imminently hazardous situation which, if not avoided, **will** result in **death or serious injury**, and property damage.

⚠ WARNING Warning indicates an imminently hazardous situation which, if not avoided, **could** result in **death or serious injury**, and property damage.

⚠ CAUTION Caution indicates a potentially hazardous situation which, if not avoided, **may** result **minor or moderate injury** or property damage.

NOTICE Notice is used to notify people of installation, operation, or maintenance information which is important but not directly hazard-related.

⚠ CAUTION

These general instructions deal with the normal installation, operation, and maintenance situations encountered with the equipment described herein. The instructions should not be interpreted to anticipate every possible contingency or to anticipate the final system, crane, or configuration that uses this equipment. For systems using the equipment covered by this manual, the supplier and owner of the system are responsible for the system's compliance with all applicable industry standards, and with all applicable federal, state and local regulations/codes.

This manual includes instructions and parts information for a variety of hoist types. Therefore, all instructions and parts information may not apply to any one type or size of specific hoist. Disregard those portions of the instructions that do not apply.

Record your hoist's Code, Lot and Serial Number (see section 10) on the front cover of this manual for identification and future reference to avoid referring to the wrong manual for information or instructions on installation, operation, inspection, maintenance, or parts.

Use only Harrington authorized replacement parts in the service and maintenance of this hoist.

WARNING

Equipment described herein is not designed for and **MUST NOT** be used for lifting, supporting, or transporting people, or for lifting or supporting loads over people.

Equipment described herein should not be used in conjunction with other equipment unless necessary and/or required safety devices applicable to the system, crane, or application are installed by the system designer, system manufacturer, crane manufacturer, installer, or user.

Modifications to upgrade, rerate, or otherwise alter this equipment shall be authorized only by the original equipment manufacturer.

Equipment described herein may be used in the design and manufacture of cranes or monorails. Additional equipment or devices may be required for the crane and monorail to comply with applicable crane design and safety standards. The crane designer, crane manufacturer, or user is responsible to furnish these additional items for compliance. Refer to ANSI/ASME B30.17, "Safety Standard for Top-Running Single Girder Cranes"; ANSI/ASME B30.2 "Safety Standard for Top-Running Double-Girder Cranes"; and ANSI/ASME B30.11 "Safety Standard for Underhung Cranes and Monorails".

If a below-the-hook lifting device or sling is used with a hoist, refer to ANSI/ASME B30.9, "Safety Standard for Slings" or ANSI/ASME B30.20, "Safety Standard for Below-the-Hook Lifting Devices".

Hoists and cranes, used to handle hot molten material may require additional equipment or devices. Refer to ANSI Z241.2, "Safety Requirements for Melting and Pouring of Metals in the Metal Casting Industry".

Electrical equipment described herein is designed and built in compliance with Harrington's interpretation of ANSI/NFPA 70, "National Electrical Code". The system designer, system manufacturer, crane designer, crane manufacturer, installer, or user is responsible to assure that the installation and associated wiring of these electrical components is in compliance with ANSI/NFPA 70, and all applicable Federal, State and Local Codes.

Failure to read and comply with any one of the limitations noted herein can result in serious bodily injury or death, and/or property damage.

DANGER

HAZARDOUS VOLTAGES ARE PRESENT IN THE CONTROL BOX, OTHER ELECTRICAL COMPONENTS, AND CONNECTIONS BETWEEN THESE COMPONENTS.

Before performing ANY mechanical or electrical maintenance on the equipment, de-energize (disconnect) the main switch supplying power to the equipment; as well as lock and tag the main switch in the de-energized position. Refer to ANSI Z244.1, "Personnel Protection – Lockout/Tagout of Energy Sources".

Dual speed units incorporate a VFD as well as a Capacitor. Therefore, DO NOT perform ANY mechanical or electrical maintenance within 5 minutes of powering down to allow time for the capacitor inside the VFD to discharge. DO NOT perform any voltage or insulation resistance tests with a meg ohmmeter when the VFD is connected to the electrical circuit.

Only trained and competent personnel should inspect and repair this equipment.

NOTICE

It is the responsibility of the owner/user to install, inspect, test, maintain, and operate a hoist in accordance with ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations and ANSI/NFPA 70, National Electric Code. If the hoist is installed as part of a total lifting system, such as an overhead crane or monorail, it is also the responsibility of the owner/user to comply with the applicable ANSI/ASME B30 volume that addresses that type of equipment.

It is the responsibility of the owner/user to have all personnel that will install, inspect, test, maintain, and operate a hoist read the contents of this manual and applicable portions of ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations and ANSI/NFPA 70, "National Electric Code". If the hoist is installed as part of a total lifting system, such as an overhead crane, the applicable ANSI/ASME B30 volume that addresses that type of equipment must also be read by all personnel.

If the hoist owner/user requires additional information, or if any information in the manual is not clear, contact Harrington or the distributor of the hoist. Do not install, inspect, test, maintain, or operate this hoist unless this information is fully understood.

A regular schedule of inspection of the hoist in accordance with the requirements of ANSI/ASME B30.16 should be established and records maintained.

1.2 Warning Tags and Labels

The warning tag illustrated below in Figure 1-1 is supplied with each hoist shipped from the factory. If the tag is not attached to your hoist's pendant cord, order a tag from your dealer and install it. Read and obey all warnings attached to this hoist. Tag is not shown actual size.

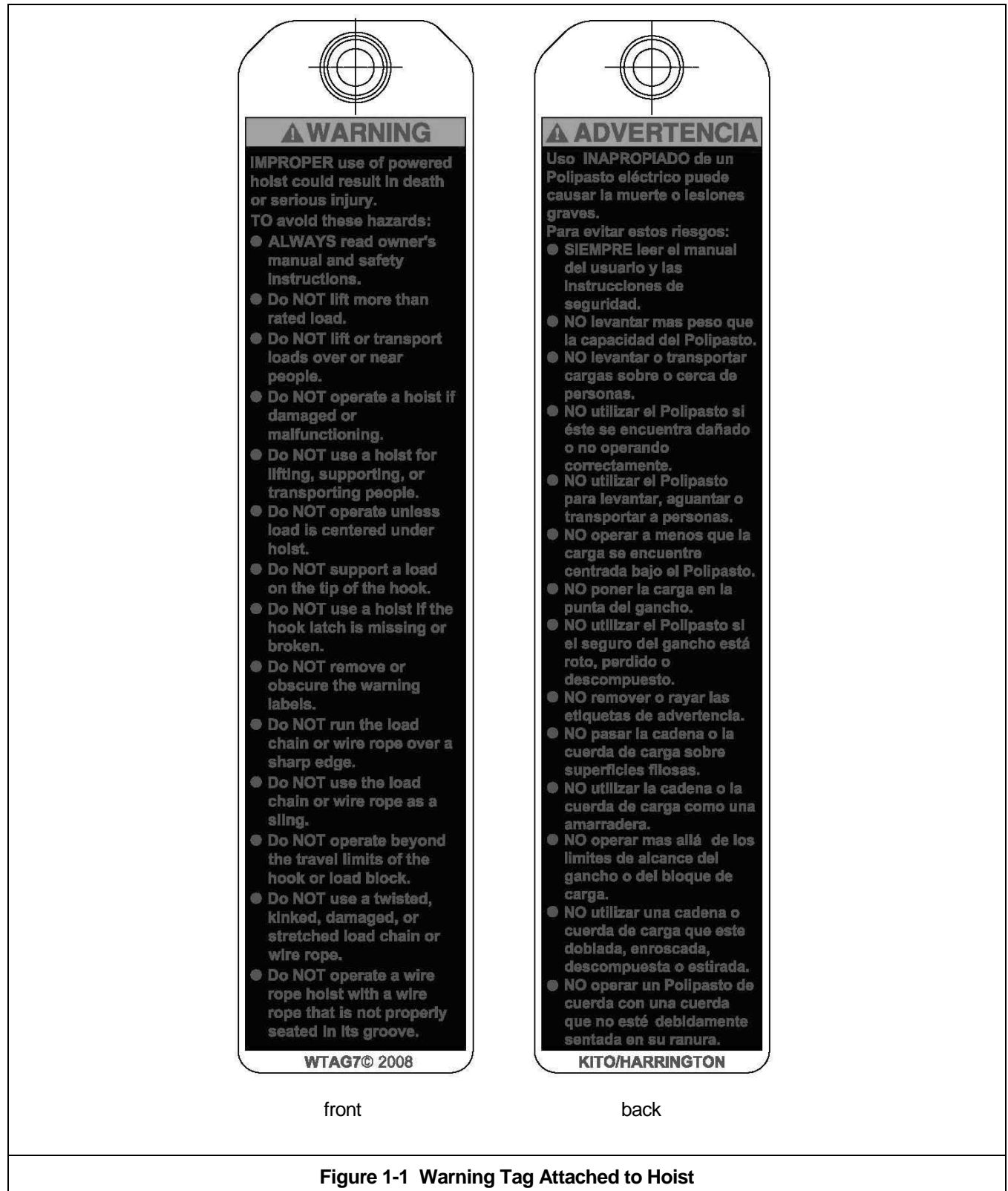


Figure 1-1 Warning Tag Attached to Hoist

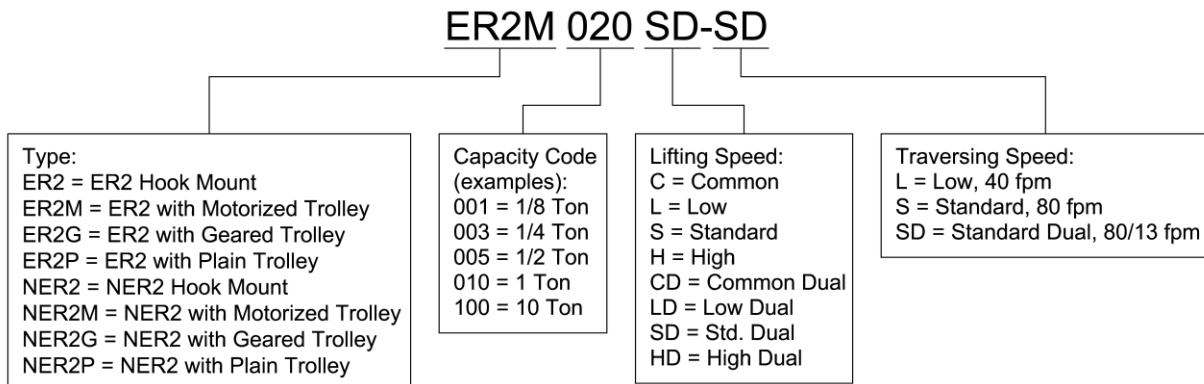
2.0 Technical Information

2.1 Specifications

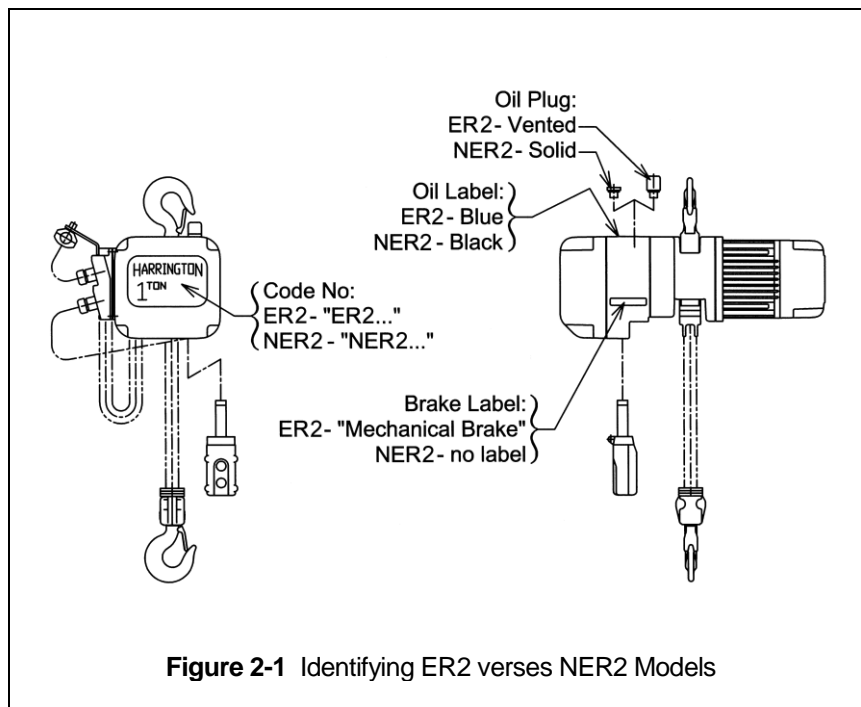
Note: This Owners Manual is for the *Enhanced Features Model* ER and NER. This *Enhanced Features Model* is referred to as the ER2 and NER2 in this Owners Manual.

Pendants are shown with optional *Emergency Stop* button.

2.1.1 Product Code



2.1.2 ER2 and NER2 Models - Harrington ER2 series hoists are available in two versions, the ER2 and NER2. These two versions differ with the presence of a mechanical load brake as standard equipment. The ER2 has a mechanical load brake/friction clutch combination while the NER2 has a friction clutch mechanism that provides over winding protection. Refer to Figure 2-1 for the visual differences between the ER2 and NER2.



2.1.3 Operating Conditions and Environment

Temperature range: -4° to +104°F (-20° to +40°C)
 Humidity: 85% or less
 Noise Level: 85 dB or less (A scale: measured 1 meter away from electric chain hoist)
 Enclosure Rating: Hoist Meets IP55, Pendant Meets IP65
 Supply Voltage: Single Speed Standard: Reconnectable 208/230 & 460V-3-60
 Single Speed Optional: 575V-3-60 or Special Voltages/Frequencies Available
 Dual Speed Standard: 208/230V-3-60 or 460V-3-60
 Dual Speed Optional: 575V-3-60 or Voltages/Frequencies Voltages Available

	Single Speed	Dual Speed
Hoist Duty Rating:	ISO M4/M5/M6; ASME H4	
Intermittent Duty Rating:	60% ED 360 starts per hour	40/20% ED 120/240 starts per hour
Short Time Duty Rating:	60 min.	30/10 min.

Table 2-1 Hoist Specifications

Capacity (Ton)	Product Code	Lifting Speed (ft/min)	Motor			Load Chain Wire Diameter (mm) x Chain Fall Lines	Load Sheave Pockets	Net Weight (lbs)		Weight for One Addnl. FT. of Lift (lbs)	
			Output (Hp)	Current Draw (amps)				NER	ER		
				208V or 230V	460V						
SINGLE SPEED	1/8	(N)ER2001H	55	0.75	3.4	1.7	4.3 x 1	6	60	62	0.28
	1/4	(N)ER2003S	36	0.75	3.4	1.7	4.3 x 1	6	60	62	0.28
	1/4	(N)ER2003H	53	1.2	4.8	2.5	6.0 x 1	5	79	82	0.54
	1/2	(N)ER2005L	15	0.75	3.4	1.7	6.0 x 1	5	71	79	0.54
	1/2	(N)ER2005S	29	1.2	4.8	2.5	6.0 x 1	5	79	82	0.54
	1	(N)ER2010L	14	1.2	4.8	2.5	7.7 x 1	5	104	110	0.89
	1	(N)ER2010S	28	2.4	8.6	4.2	7.7 x 1	5	119	119	0.89
	1 1/2	(N)ER2015S	18	2.4	8.6	4.2	10.2 x 1	5	159	170	1.6
	2	(N)ER2020C	7	1.2	4.8	2.5	7.7 x 2	5	130	134	1.8
	2	(N)ER2020L	14	2.4	8.6	4.2	10.2 x 1	5	161	174	1.6
	2	(N)ER2020S	28	4.7	16.4	7.9	10.2 x 1	5	201	198	1.6
	2 1/2	(N)ER2025S	22	4.7	16.4	7.9	11.2 x 1	5	227	225	1.9
	3	(N)ER2030C	17	4.7	16.4	7.9	10.2 x 2	5	234	234	3.2
	5	(N)ER2050L	11	4.7	16.4	7.9	11.2 x 2	5	289	284	3.8
DUAL SPEED	1/8	(N)ER2001HD	55/9	0.75	3.6	1.8	4.3 x 1	6	60	64	0.28
	1/4	(N)ER2003SD	36/6	0.75	3.6	1.8	4.3 x 1	6	60	64	0.28
	1/4	(N)ER2003HD	53/9	1.2	5.1	2.7	6.0 x 1	5	77	82	0.54
	1/2	(N)ER2005LD	15/2.5	0.75	3.6	1.8	6.0 x 1	5	68	79	0.54
	1/2	(N)ER2005SD	29/5	1.2	5.1	2.7	6.0 x 1	5	77	82	0.54
	1	(N)ER2010LD	14/2.5	1.2	5.1	2.7	7.7 x 1	5	99	108	0.89
	1	(N)ER2010SD	28/4.5	2.4	9.1	4.5	7.7 x 1	5	115	117	0.89
	1 1/2	(N)ER2015SD	18/3	2.4	9.1	4.5	10.2 x 1	5	159	172	1.6
	2	(N)ER2020CD	7/1	1.2	5.1	2.7	7.7 x 2	5	123	132	1.8
	2	(N)ER2020LD	14/2.5	2.4	9.1	4.5	10.2 x 1	5	161	174	1.6
	2	(N)ER2020SD	28/4.5	4.7	17.3	8.3	10.2 x 1	5	196	203	1.6
	2 1/2	(N)ER2025SD	22/3.5	4.7	17.3	8.3	11.2 x 1	5	218	231	1.9
	3	(N)ER2030CD	17/3	4.7	17.3	8.3	10.2 x 2	5	229	238	3.2
	5	(N)ER2050LD	11/2	4.7	17.3	8.3	11.2 x 2	5	280	293	3.8

2.2 Dimensions

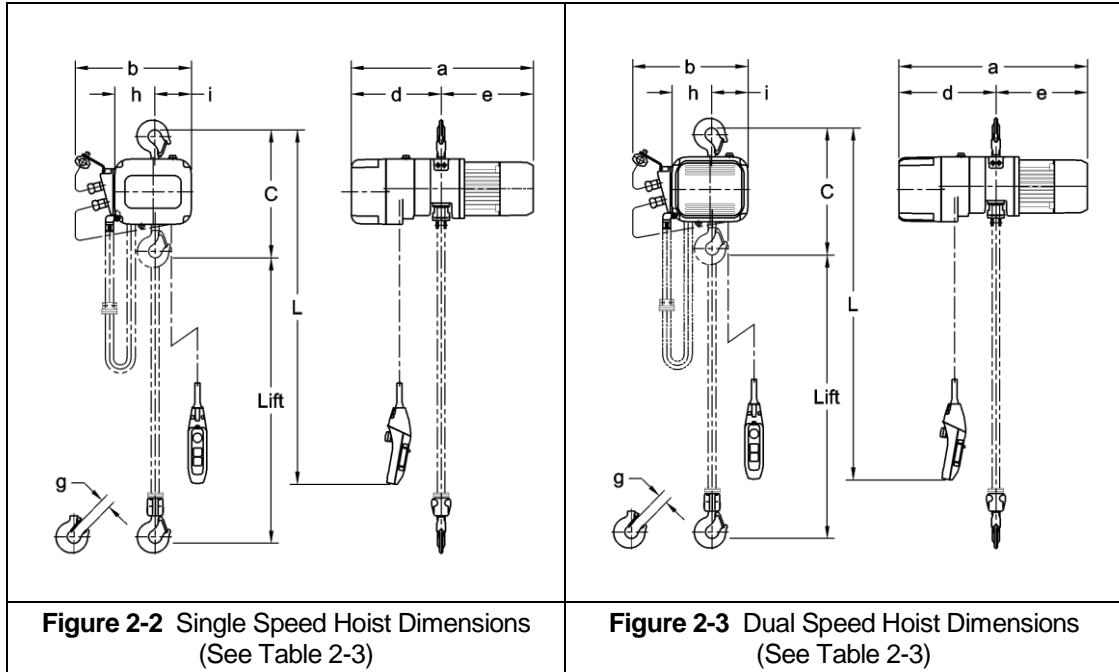


Table 2-2 Hook Dimension*							
<p>T = Top Hook B = Bottom Hook Units = inch</p>							
Capacity Code	Hook	a	b	c	d	e	g
001H, 003S, 003H, 005L, 005S	T & B	1.1	0.7	0.9	0.7	1.4	1.1
001HCC, 003SCC	T	1.1	0.7	0.9	0.7	1.4	1.1
	B	0.8	0.5	0.7	0.5	1.4	1.1
010L, 010S	T & B	1.5	0.9	1.2	0.9	1.7	1.2
020C	T & B	1.9	1.1	1.6	1.1	2.0	1.5
015S	T	2.0	1.3	1.7	1.3	2.1	1.5
	B	1.7	1.1	1.5	1.1	1.9	1.4
020L, 020S	T & B	2.0	1.3	1.7	1.3	2.1	1.6
025S	T	2.0	1.3	1.7	1.3	2.4	1.7
	B	2.0	1.3	1.7	1.3	2.1	1.6
030L, 030C	T & B	2.2	1.4	1.9	1.4	2.4	1.8
050L	T & B	2.6	1.7	2.2	1.7	2.5	1.9

*Refer to Section 5.7 for inspection dimensions and limits.

Table 2-3 Hoist Dimensions

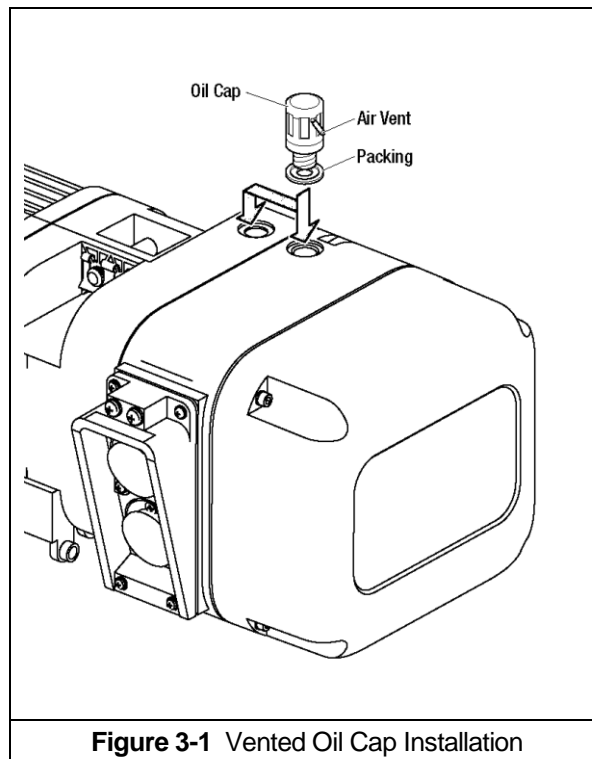
	Product Code	Minimum Headroom C (in)	L* (ft)	a (in)		b (in)		d (in)		e (in)		g (in)	h (in)	i (in)	
				NER	ER	NER	ER	NER	ER	NER	ER			NER	ER
SINGLE SPEED	(N)ER2001H	13.8	8.2	18.8	22.2	12.6	13.6	8.6	12.0	10.2	10.2	1.1	3.9	3.7	4.6
	(N)ER2003S	13.8	8.2	18.8	22.2	12.6	13.6	8.6	12.0	10.2	10.2	1.1	3.9	3.7	4.6
	(N)ER2003H	14.6	8.2	20.0	23.3	13.7	13.7	9.5	12.8	10.5	10.5	1.1	4.4	4.2	4.2
	(N)ER2005L	14.6	8.2	20.2	23.5	13.7	13.7	9.5	12.8	10.6	10.7	1.1	4.4	4.2	4.2
	(N)ER2005S	14.6	8.2	20.0	23.3	13.7	13.7	9.5	12.8	10.5	10.5	1.1	4.4	4.2	4.2
	(N)ER2010L	16.9	8.2	23.2	24.9	14.8	14.8	11.4	13.1	11.7	11.8	1.2	5.1	4.6	4.6
	(N)ER2010S	16.9	8.2	23.5	25.2	14.8	14.8	11.4	13.1	12.1	12.1	1.2	5.1	4.6	4.6
	(N)ER2015S	20.1	8.2	25.4	29.0	16.8	16.8	12.1	15.6	13.3	13.4	1.4	6.3	5.4	5.4
	(N)ER2020C	27.8	8.2	23.2	24.9	14.8	14.8	11.4	13.1	11.7	11.8	1.5	7.0	2.7	2.7
	(N)ER2020L	22.6	8.2	25.4	29.0	16.8	16.8	12.1	15.6	13.3	13.4	1.6	6.3	5.4	5.4
	(N)ER2020S	23.2	8.2	27.6	30.8	16.8	16.8	13.6	16.8	14.0	14.0	1.6	6.3	5.4	5.4
	(N)ER2025S	24.6	8.2	28.9	32.5	17.5	17.5	13.2	16.8	15.7	15.7	1.6	6.9	5.6	5.6
	(N)ER2030C	32.9	9.2	27.6	30.8	16.8	16.8	13.6	16.8	14.0	14.0	1.8	8.5	3.2	3.2
(N)ER2050L	33.5	9.2	28.9	32.5	17.5	17.5	13.2	16.8	15.7	15.7	1.9	9.1	3.3	3.3	
DUAL SPEED	(N)ER2001HD	13.8	8.2	21.0	22.2	13.6	13.6	10.8	12.0	10.2	10.2	1.1	3.9	4.6	4.6
	(N)ER2003SD	13.8	8.2	21.0	22.2	13.6	13.6	10.8	12.0	10.2	10.2	1.1	3.9	4.6	4.6
	(N)ER2003HD	14.6	8.2	22.3	23.3	13.7	13.7	11.8	12.8	10.5	10.5	1.1	4.4	4.2	4.2
	(N)ER2005LD	14.6	8.2	22.4	23.5	13.7	13.7	11.8	12.8	10.6	10.7	1.1	4.4	4.2	4.2
	(N)ER2005SD	14.6	8.2	22.3	23.3	13.7	13.7	11.8	12.8	10.5	10.5	1.1	4.4	4.2	4.2
	(N)ER2010LD	16.9	8.2	24.1	24.9	14.8	14.8	12.4	13.1	11.7	11.8	1.2	5.1	4.6	4.6
	(N)ER2010SD	16.9	8.2	24.5	25.2	14.8	14.8	12.4	13.1	12.1	12.1	1.2	5.1	4.6	4.6
	(N)ER2015SD	20.1	8.2	27.9	29.0	16.8	16.8	14.6	15.6	13.3	13.4	1.4	6.3	5.4	5.4
	(N)ER2020CD	27.8	8.2	24.1	24.9	14.8	14.8	12.4	13.1	11.7	11.8	1.5	7.0	2.7	2.7
	(N)ER2020LD	22.6	8.2	27.9	29.0	16.8	16.8	14.6	15.6	13.3	13.4	1.6	6.3	5.4	5.4
	(N)ER2020SD	23.2	8.2	30.2	30.8	16.8	16.8	16.2	16.8	14.0	14.0	1.6	6.3	5.4	5.4
	(N)ER2025SD	24.6	8.2	31.5	32.5	17.5	17.5	15.8	16.8	15.7	15.7	1.6	6.8	5.6	5.6
	(N)ER2030LD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(N)ER2030CD	32.9	9.2	30.2	30.8	16.8	16.8	16.2	16.8	14.0	14.0	1.8	8.5	3.2	3.2	
(N)ER2050LD	33.5	9.2	31.5	32.5	17.5	17.5	15.8	16.8	15.7	15.7	1.9	9.1	3.4	3.4	

*The "L" dimensions are based on the standard lift of 10 feet.

3.0 Preoperational Procedures

3.1 Gearbox

- 3.1.1 The gearbox is filled with the correct amount of oil at the time of shipment. The oil level must be verified prior to operation. The ER2 and NER2 hoists have different checking procedures. Refer to Section 6.3 for specific checking procedures.
- 3.1.2 Refer to Section 6.3 when replacing the gear oil.
- 3.1.3 All ER2, mechanical load brake equipped hoists, are shipped with a separate air vented oil cap. This vented oil cap must be installed prior to use. To install, remove an existing oil plug and replace with the vented oil cap (refer to Figure 3-1).
- 3.1.4 There are two oil fill holes located in the top of the gear case on the ER2 hoist. For ER2 coupled to MR2 trolley, there are some flange widths that make it necessary to relocate the oil cap assembly to the other oil fill hole. This will prevent interference with trolley side plate. Refer to Figure 3-1.



3.2 Chain

- 3.2.1 The quantity and location of the chain components including cushion rubbers, chain springs, and striker plates depend on the hoist model, capacity, and limits switches. Never operate the hoist with incorrect, missing, or damaged chain components. Refer to the hoist's nameplate, Table 3-1, as well as Figures 3-2, 3-3. Ensure that all chain components are in the correct location and properly installed.
- 3.2.2 When the hoist is used without a chain container, the free end of the chain is attached to the hoist body as shown in Figure 3-4. Connect the no load end of the chain to Chain Guide A with the End Suspender provided. For 5 ton hoist, connect the no load end of the chain directly to Chain Guide A if Chain Guide A is notched to accept the chain. Make sure the chain remains free of twists and the chain Stopper is installed on the correct link. Refer to Table 3-1 for proper placement of Stopper.

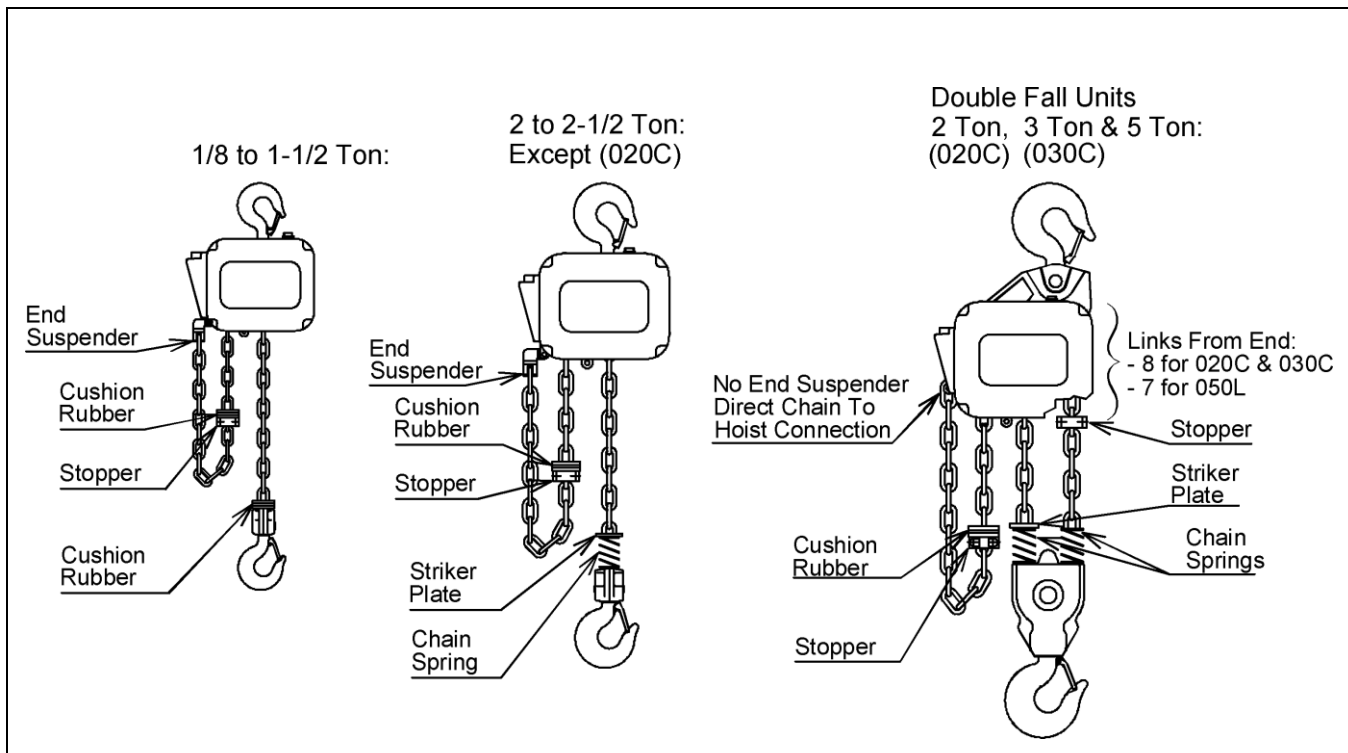


Figure 3-2 Chain Component Arrangement for Single Fall and Double Fall Hoists.

Table 3-1 Chain Stopper Placement		
Capacity Code	Without Chain Container	With Chain Container
001H & 003S	21 st link from the free end	3 rd link from the free end
003H, 005L, 005S, 010L, 010S, 015S, 020C, 020L, 020S, 025S, 030L, 030C, 050L	15 th link from the free end	3 rd link from the free end

*Tightening torque for the Stopper Bolt: 10 N-m (7 lb-ft)

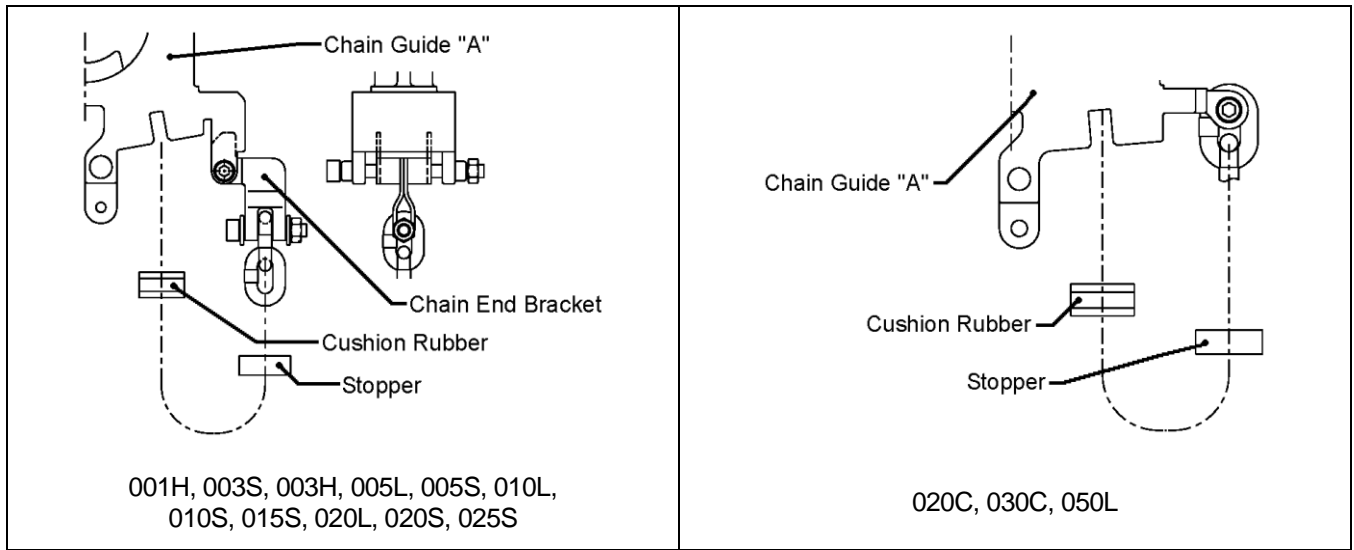


Figure 3-3 Attachment of Chain to Hoist Body – No Chain Container

3.2.3 **Optional Canvas or Plastic Chain Container** - When the optional canvas chain container is selected, fully unfold and install it on the hoist body as shown in Figure 3-4. When installing the optional plastic chain container, pass the socket bolt through the holes in this order: the chain container, the bucket spring, the chain guide A, the bucket spring, and the chain container. Be sure to mount the bucket spring in correct direction as shown in Figure 3-4. The free end of the chain is not attached to the hoist body and the chain stopper is installed on the third link from the free end. To place the chain into the chain container, feed the free end of the chain into the container. Take care to avoid twisting or tangling the chain. NEVER put all the chain into the container at once. Lumped or twisted chain may activate the down limit switch and stop the hoist during lowering.

3.2.4 **CAUTION** Each chain container indicates the maximum length of the load chain that can be stored in the container. The amount of chain the container must hold is equal to the lift on the hoist. DO NOT use a chain container with a storage capacity less than the lift length on the hoist. If all of the chain cannot be stored in the container, the limit switch will not operate properly.

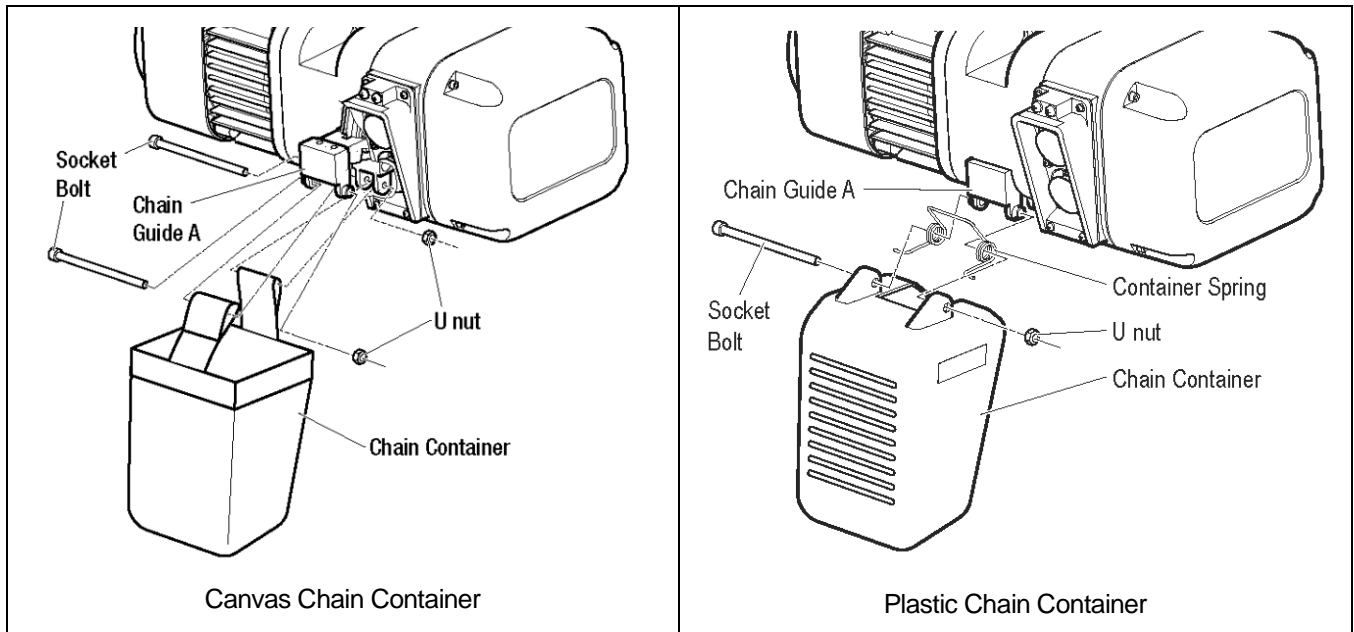


Figure 3-4 Attachment of Chain Container to Hoist Body

3.2.5 When using an optional steel chain container, refer to the assembly drawing and instructions provided with the container for correct assembly and attachment.

3.2.6 **⚠️WARNING** Verify that the load chain is not twisted or tangled prior to operating the hoist. Make sure the bottom hook on 2, 3 and 5 Ton double fall models is not capsized. See Figures 3-5 and 3-6. Correct all chain irregularities before conducting the first hoist operation.

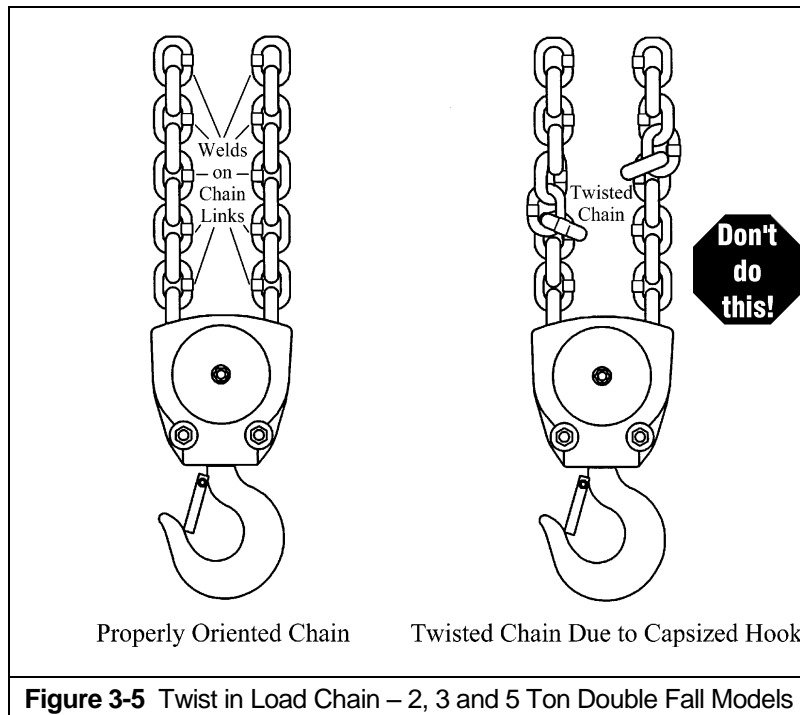


Figure 3-5 Twist in Load Chain – 2, 3 and 5 Ton Double Fall Models

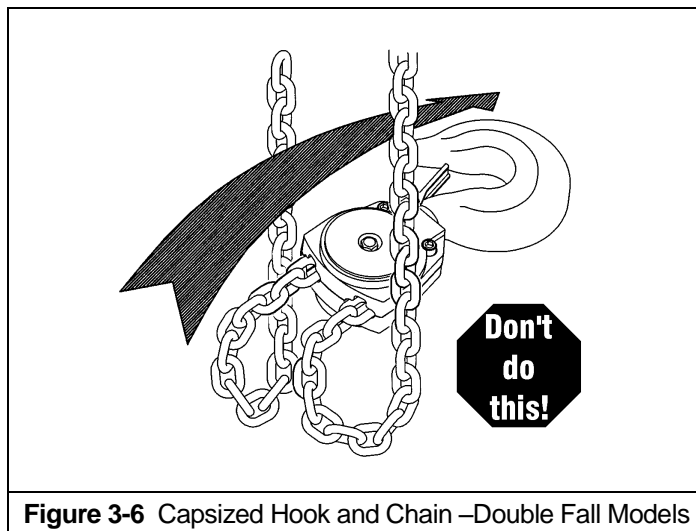


Figure 3-6 Capsized Hook and Chain –Double Fall Models

3.3 Mounting Location

3.3.1 **⚠️WARNING** Prior to mounting the hoist ensure that the suspension and the supporting structure are adequate to support the hoist and its loads. If necessary consult a professional that is qualified to evaluate the adequacy of the suspension location and its supporting structure.

3.3.2 **NOTICE** See Section 6.8 for outdoor installation considerations.

3.4 Mounting the Hoist

- 3.4.1 Manual Trolley - Follow instructions in Owner's Manual provided with the trolley.
- 3.4.2 Motorized Trolley - Follow instructions in Owner's Manual provided with the trolley.
- 3.4.3 Hook Mounted to a Fixed Location - Attach the hoist's top hook to the fixed suspension point.
- 3.4.4 **⚠ WARNING** Ensure that the fixed suspension point rests on the center of the hook's saddle and that the hook's latch is engaged.

3.5 Electrical Connections

- 3.5.1 **⚠ CAUTION** Ensure that the voltage of the electric power supply is proper for the hoist or trolley.
- 3.5.2 **⚠ CAUTION** Do NOT apply electronic soft-start control or voltage varying controls to the ER2 or NER2 hoist. Use of such devices may cause the motor brake and other electrical components to malfunction. Variable frequency drives MAY be used with the single speed ER2/NER2 hoists, contact Harrington Hoists, Inc. for more information.
- 3.5.3 **⚠ DANGER** Before proceeding, ensure that the electrical supply for the hoist or trolley has been de-energized (disconnected). Lock out and tag out in accordance with ANSI Z244.1 "Personnel Protection -Lockout/Tagout of Energy Sources".
- 3.5.4 **⚠ DANGER** To avoid a shock hazard, **DO NOT** perform **ANY** mechanical or electrical maintenance on the dual speed (VFD control) trolley or hoist within 5 minutes of de-energizing (disconnecting) the trolley or hoist. This time allows the internal VFD capacitor to safely discharge.
- 3.5.5 **⚠ DANGER** Do NOT remove power to the dual speed (VFD control) hoist or trolley during operation.
- 3.5.6 **⚠ CAUTION** All dual speed hoists are equipped with a VFD. The VFD is used to control the high and low lifting speeds. The speeds come preset from the factory (See Table 3-6). Speed (frequency) can be customized. Refer to Section 3.6.10 for hoist specific speed ranges and instructions.
- 3.5.7 The following instructions apply when the hoist is hook mounted to a fixed suspension point or installed on a manual trolley. The hoist is controlled by a pendant with two push buttons – one for raising and one for lowering. Refer to the appropriate trolley Owner's Manual if the hoist is installed on a motorized trolley. Special wiring considerations must be taken if the trolley is used with a trolley other than an MR2 model.

Pendant Cord

The Pendant Cord connects to the hoist via an 8-pin (8P) Plug and Socket. Make this connection as follows:

- Refer to Figure 3-7.
- Insert the 8P Plug into the 8P Socket on the hoist and hand-tighten the Lock Ring.
- Attach the Cord Strain Relief Cable to the Cord Support on the bottom of the hoist.

Power Supply Cable - Hoist Connection

The Power Supply Cable connects to the hoist via a 4-pin (4P) Plug and Socket. Make this connection as follows:

- Refer to Figure 3-7.
- Insert the 4P plug of the Power Supply Cable into the 4P Socket on the hoist and hand-tighten the Lock Ring.
- Install the Cable Support Arm (pre-installed on the Power Supply Cable) on to the Socket Holder using the pre-installed Machine Screws and Lock Washers.
- Use care to avoid twisting or kinking the Power Supply Cable.

Power Supply Cable - Installation

If the hoist is hook mounted to a fixed support ensure that the Power Supply Cable is properly installed and supported between the hoist and the electrical power supply.

If the hoist is installed on a manual trolley, then the Power Supply Cable must be installed along the beam that the trolley runs on. For curved beams a special cable suspension system will be needed, and this instruction does not apply. For straight beams install the Power Supply Cable as follows:

- Install a guide wire system parallel to the beam.
- For a manual trolley the guide wire should be positioned slightly outside the hoist's Cable Support as shown in Figure 3-7.
- Use the Cable Trolleys supplied with the hoist to suspend the Power Supply Cable from the guide wire. Space the Cable Trolleys every 5 feet.

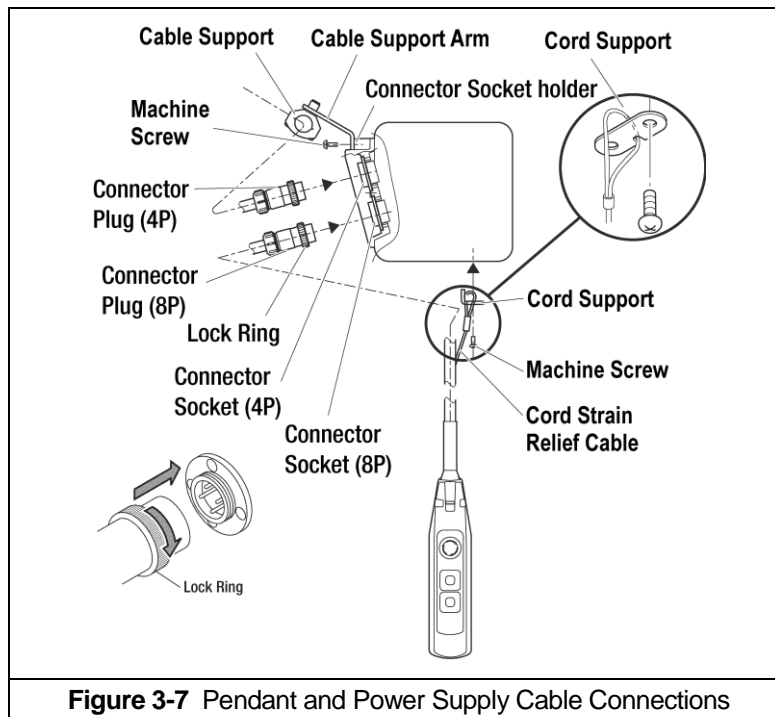


Figure 3-7 Pendant and Power Supply Cable Connections

- 3.5.8 Connection to Electrical Power Source - The red, blue and black wires of the Power Supply Cable should be connected to an Electric Power Disconnect Switch or Circuit Breaker. This connection should be made so that the hoist is phased properly. Refer to Section 3.7.11 for instructions on how to check for correct power supply phase connection.
- 3.5.9 Fuse/Breaker Capacity -The hoist's power supply should be equipped with current overload protection such as fuses, which should be selected for 110% to 120% of total listed full load amperage, and should be dual element time-delay fuses. Refer to the motor nameplate for the full load amperage draw.
- 3.5.10 **⚠ DANGER** Grounding - An improper or insufficient ground connection creates an electrical shock hazard when touching any part of the hoist or trolley. In the Power Supply Cable the ground wire will be either Green with Yellow stripe or solid Green. It should always be connected to a suitable ground connection. Do not paint the trolley wheel running surfaces of the beam as this can affect grounding.

3.6 VFD Setup (Dual Speed Only)

- 3.6.1 **⚠ DANGER** To avoid a shock hazard, **DO NOT** perform **ANY** mechanical or electrical maintenance on the dual speed (VFD control) trolley or hoist within 5 minutes of de-energizing (disconnecting) the trolley or hoist. This time allows the internal VFD capacitor to safely discharge.
- 3.6.2 **⚠ WARNING** Do Not remove power to the dual speed (VFD control) hoist or trolley during operation.
- 3.6.3 All dual speed hoists are equipped with a VFD. The VFD is used to control the high and low lifting speeds. The speeds come preset from the factory (Table 3-6). Speed (frequency) can be customized. Refer to Section 3.6.10 for hoist specific speed ranges and instructions.
- 3.6.4 The VFD is controlled by a Keypad/Display Interface. Refer to Figure 3-8 for Keypad/Display Interface functions and descriptions.

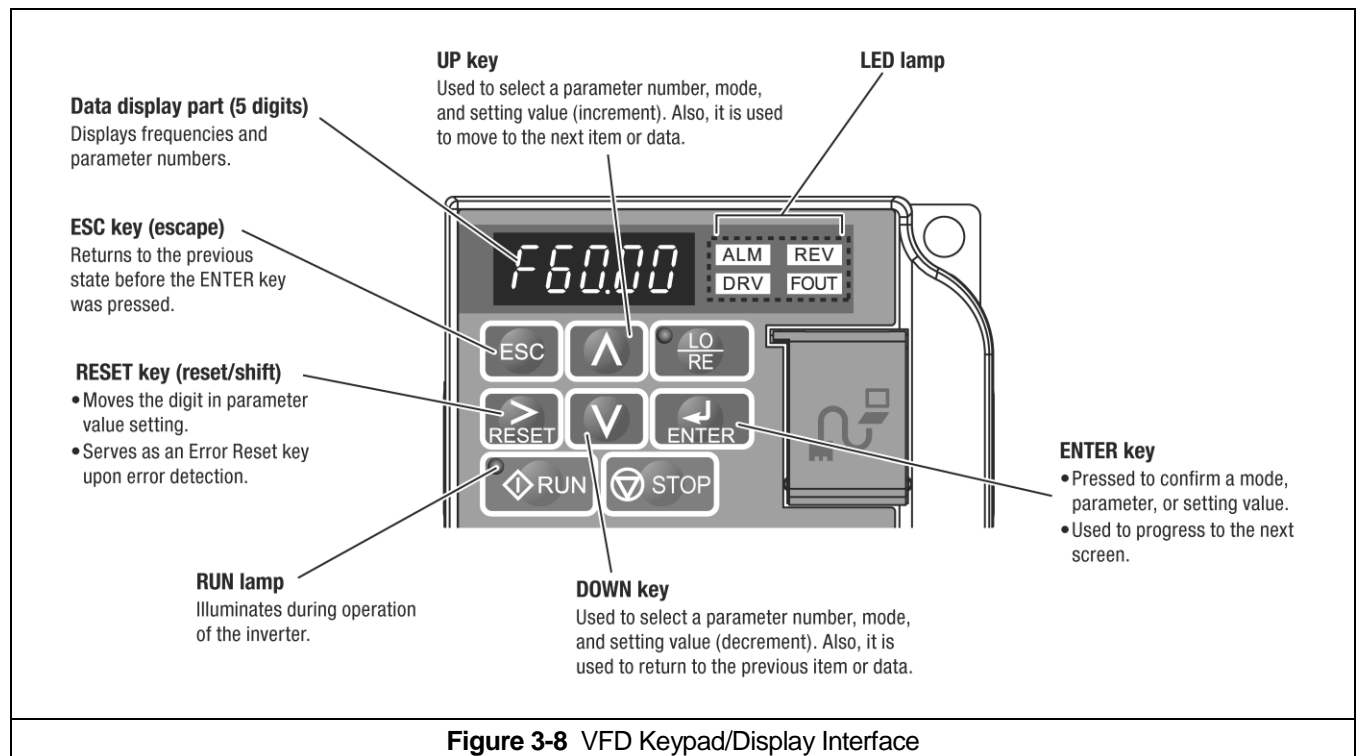

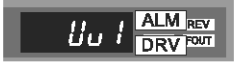


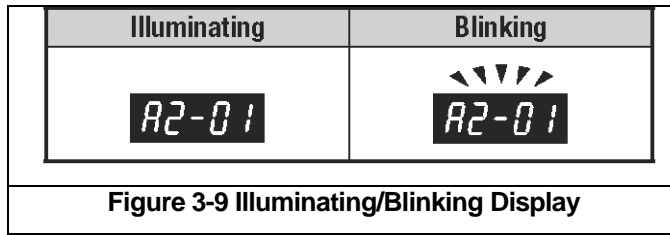
Figure 3-8 VFD Keypad/Display Interface

3.6.5 When power is supplied to the hoist the VFD LED operator display will illuminate as shown Table 3-2.

Table 3-2 LED Operator Display

No	Name	Description
Normal		The frequency command monitor is displayed in the data display part. DRV illuminates.
Error	 Example: Main circuit low voltage	The display varies depending on the error. ALM and DRV illuminate.

3.6.6 During operation the data display will exhibit illuminating or blinking data as shown in Figure 3-9.








3.6.7 The digital display uses a seven segment character to form the specific characters used in the display. Table 3-3 shows the corresponding digital characters to its English equivalent.

Character	Digital Display	Character	Digital Display	Character	Digital Display	Character	Digital Display
0	0	9	9	I	l	R	ρ
1	1	A	A	J	9	S	Σ
2	2	B	β	K	τ	T	Γ
3	3	C	X	L	Λ	U	Υ
4	4	D	δ	M	∩	V	ω
5	5	E	E	N	N	W	∪
6	6	F	Φ	O	o	X	No Display
7	7	G	∩	P	Π	Y	Ψ
8	8	H	H	Q	θ	Z	No Display

3.6.8 The LED Lamp display provides hoist status. Table 3-4 shows some of the status displays.

Lamp	Illuminating	Blinking	Off
ALM	Upon error detection	<ul style="list-style-type: none"> Upon detection of minor failure Upon detection of an OPE (operation error) 	Normal
REV	Inputting a reverse rotation command	-	Inputting a forward rotation command
DRV	In the drive mode	-	In the program mode
FOUT	Displaying output frequency (Hz)	-	-
Description in this document			

3.6.9 The Run Lamp display provides hoist “RUN” status. Table 3-5 shows the various “RUN” displays.

Lamp	Illuminating	Blinking	Short blinking	Off
	During operation	<ul style="list-style-type: none"> • During deceleration/ stop • Inputting a driving command with the frequency command 0 	<ul style="list-style-type: none"> • During deceleration due to an emergency stop • During deceleration • During a stop due to driving interlock operation 	During a stop
Description in this document				

3.6.10 All of the hoists have speed/frequency ranges that can be customized to a specific application. Refer to Table 3-6 for specific hoist speed/frequency ranges. To set custom speeds for an application, follow the procedure listed in Table 3-7.

Product Code	Hoist Speed (ft/min)			VFD Frequency (Hz)							
	Range*	Low	High	NER2				ER2			
				Low (d1-01)		High (d1-02)		Low (d1-01)		High (d1-02)	
				230V	460V	230V	460V	230V	460V	230V	460V
(N)ER2001HD	Low	4.5	55	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	9.0	55	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2003SD	Low	3.0	36	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	6.0	36	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2003HD	Low	4.3	53	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	9.0	53	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2005LD	Low	1.2	15	3.2	3.3	57.0	57.0	4.9	3.3	57.5	57.0
	Std	2.5	15	8.3	8.2	57.0	57.0	9.7	7.8	57.5	57.0
(N)ER2005SD	Low	2.3	29	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	5.0	29	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2010LD	Low	1.1	14	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	2.5	14	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2010SD	Low	2.2	28	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	4.5	28	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2015SD	Low	1.4	18	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	3.0	18	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2020CD	Low	0.5	7.0	2.6	2.5	53.5	54.0	2.8	2.5	55.0	54.0
	Std	1.0	7.0	7.3	7.3	53.5	54.0	8.0	7.2	55.0	54.0
(N)ER2020LD	Low	1.0	14.0	2.3	2.1	53.0	53.5	2.7	3.0	53.0	53.5
	Std	2.5	14.0	7.3	7.0	53.0	53.5	8.2	7.5	53.0	53.5
(N)ER2020SD	Low	2.2	28	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	4.5	28	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2025SD	Low	1.8	22	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	3.5	22	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2030LD	Low	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Std	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
(N)ER2030CD	Low	1.4	17	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	3.0	17	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0
(N)ER2050LD	Low	0.9	11	2.6	3.0	54.0	55.0	2.8	3.0	52.0	55.0
	Std	2	11	7.9	7.7	54.0	55.0	8.0	7.7	52.0	55.0

*Low = The minimum and maximum speed/frequency range (12:1 ratio).
 Std = The factory standard minimum and maximum speed/frequency range (6:1 ratio).

Table 3-7 Dual Speed Hoist (w/VFD) Speed/Frequency Change Procedure

⚠ CAUTION

- Each dual speed hoist model has a range of available speeds/frequencies (upper and lower limits). Any value outside the range listed in Table 3-6 for your specific hoist is strictly prohibited.
- Speeds must be set such as Low [d1-01] and High [d1-02].
- After parameters are changed, a “no load” operational check must be performed.





























Operational Step	VFD Display
1. Energize the hoist.	
2. Press  until the “Setup Mode” screen is displayed (blinking).	
3. Press  to display the parameter setting screen (blinking).	
4. Press  or  until the desired parameter is displayed (blinking). (Low Speed: d1-01, High Speed: d1-02)	
5. When you press  , the current setting value is displayed (digit selected blinks). (Example Value: 9 Hz)	
6. Press  to move the blinking digit to the desired digit. (Example Value: 9 blinks)	
7. Press  or  until the desired setting is displayed and press  .	
8. Press  to confirm the new setting.	
9. The display will automatically return to the parameter screen (blinking). (As in Step 4.)	
10. Press  until the display returns to the initial screen. (As in Step 1.)	

Table 3-8 Hoist VFD 2-Step/3-Step Infinitely Variable Parameter Setup Procedure

⚠ CAUTION

- Each VFD controlled hoist model has a range of available speeds/frequencies (upper and lower limits). Refer to Table 3-6 for a list of acceptable speeds/frequencies.
- Any value outside the range listed in Table 3-6 for your specific hoist is strictly prohibited.
- Speeds must be set such as Low [d1-01] and High [d1-02].
- After parameters are changed, a “no load” operational check must be performed.

Operational Step		VFD Display
Change Mode to 2 Step or 3 Step.		
1. Press  or  until the “Setup Mode” screen is displayed (blinking).		
2. Press  to display “d1-01”.		
3. Table 3-6 lists the values that may be changed.		
Title	Parameter	Description
Min. Frequency (Hz) – Low Speed	d1-01	Default setting, dependant upon hoist. (Refer to Table 3-7)
Max. frequency (Hz) – High Speed	d1-02	Default setting, dependant upon hoist. (Refer to Table 3-7)
Mode	S1-25	1. Standard 2 Speed (default)
		2. 2 Step Infinitely Variable
		3. 3 Step Infinitely Variable (Requires optional hardware)
Acceleration Time (sec.) (0 to 120 Hz) in 2 or 3 Step Mode.	S1-26	Apply for frequency range between d1-01 and d1-02.
Deceleration Time (sec.) (0 to 120 Hz) in 3 Step Mode.	S1-27	Apply for frequency range between d1-01 and d1-02.
4. Press  several times.		

3.6.11 “Hbb” will appear on the dual speed unit’s VFD display when the Emergency Stop Button is depressed. Turn the Emergency Stop Button clockwise to unlock the controls and allow hoist operation.

3.7 Preoperational Checks and Trial Operation

- 3.7.1 **⚠️ WARNING** Confirm the adequacy of the rated capacity for all slings, chains, wire ropes and all other lifting attachments before use. Inspect all load suspension members for damage prior to use and replace or repair all damaged parts.
- 3.7.2 **⚠️ WARNING** Verify and correct all chain irregularities prior to operating the hoist. Refer to Section 3.2.
- 3.7.3 Measure and record the “k” dimension of all hooks on hoist. See Table 5-4 under Section 5, “Inspection”.
- 3.7.4 Record the hoist’s Code, Lot and Serial Number (from the name plate on the hoist; see Section 10) in the space provided on the cover of this manual.
- 3.7.5 Ensure that the hoist is properly installed to either a fixed point, or trolley, whichever applies.
- 3.7.6 If hoist is installed on a trolley, ensure that
- trolley is properly installed on the beam, and
 - stops for the trolley are correctly positioned and securely installed on the beam.
- 3.7.7 Ensure that all nuts, bolts and split pins (cotter pins) are sufficiently fastened.
- 3.7.8 Pull down on the Pendant and ensure that the Cord Strain Relief Cable takes the force, not the Pendant Cord.
- 3.7.9 **⚠️ CAUTION** Check supply voltage before everyday use. If the voltage varies more than 10% of the rated value, electrical devices may not function normally.
- 3.7.10 Confirm proper operation.
- Before operating read and become familiar with Section 4 - Operation.
 - Before operating ensure that the hoist (and trolley) meets the Inspection, Testing and Maintenance requirements of ANSI/ASME B30.16.
 - Before operating ensure that nothing will interfere with the full range of the hoist’s (and trolley’s) operation.
- 3.7.11 **⚠️ WARNING** The hoist must be connected to the power source such that its direction of operation corresponds to the up-and-down commands issued from the pendant control; i.e. pushing the UP button must cause the hoist to lift the load chain and hook. If the hoist does not operate correctly, shut off and lockout /tagout the main power source to the hoist. Disconnect and switch any two of the three input power leads at the power source to correct the hoist’s motor phasing.

4.0 Operation

4.1 Introduction

DANGER

DO **NOT** WALK UNDER A SUSPENDED LOAD

WARNING

HOIST OPERATORS SHALL BE REQUIRED TO READ THE OPERATION SECTION OF THIS MANUAL, THE WARNINGS CONTAINED IN THIS MANUAL, INSTRUCTION AND WARNING LABELS ON THE HOIST OR LIFTING SYSTEM, AND THE OPERATION SECTIONS OF ANSI/ASME B30.16 and ANSI/ASME B30.10. THE OPERATOR SHALL ALSO BE REQUIRED TO BE FAMILIAR WITH THE HOIST AND HOIST CONTROLS BEFORE BEING AUTHORIZED TO OPERATE THE HOIST OR LIFTING SYSTEM.

HOIST OPERATORS SHOULD BE TRAINED IN PROPER RIGGING PROCEDURES FOR THE ATTACHMENT OF LOADS TO THE HOIST HOOK.

HOIST OPERATORS SHOULD BE TRAINED TO BE AWARE OF POTENTIAL MALFUNCTIONS OF THE EQUIPMENT THAT REQUIRE ADJUSTMENT OR REPAIR, AND TO BE INSTRUCTED TO STOP OPERATION IF SUCH MALFUNCTIONS OCCUR, AND TO IMMEDIATELY ADVISE THEIR SUPERVISOR SO CORRECTIVE ACTION CAN BE TAKEN.

HOIST OPERATORS SHOULD HAVE NORMAL DEPTH PERCEPTION, FIELD OF VISION, REACTION TIME, MANUAL DEXTERITY, AND COORDINATION.

HOIST OPERATORS SHOULD **NOT** HAVE A HISTORY OF OR BE PRONE TO SEIZURES, LOSS OF PHYSICAL CONTROL, PHYSICAL DEFECTS, OR EMOTIONAL INSTABILITY THAT COULD RESULT IN ACTIONS OF THE OPERATOR BEING A HAZARD TO THE OPERATOR OR TO OTHERS.

HOIST OPERATORS SHOULD **NOT** OPERATE A HOIST OR LIFTING SYSTEM WHEN UNDER THE INFLUENCE OF ALCOHOL, DRUGS, OR MEDICATION.

OVERHEAD HOISTS ARE INTENDED ONLY FOR VERTICAL LIFTING SERVICE OF FREELY SUSPENDED UNGUIDED LOADS. DO **NOT** USE HOIST FOR LOADS THAT ARE NOT LIFTED VERTICALLY, LOADS THAT ARE NOT FREELY SUSPENDED, OR LOADS THAT ARE GUIDED.

NOTICE

- Read ANSI/ASME B30.16 and ANSI/ASME B30.10.
- Read the hoist manufacturer's Operating and Maintenance Instructions.
- Read all labels attached to equipment.

The operation of an overhead hoist involves more than activating the hoist's controls. Per the ANSI/ASME B30 standards, the use of an overhead hoist is subject to certain hazards that cannot be mitigated by engineered features, but only by the exercise of intelligence, care, common sense, and experience in anticipating the effects and results of activating the hoist's controls. Use this guidance in conjunction with other warnings, cautions, and notices in this manual to govern the operation and use of your overhead hoist.

4.2 Shall's and Shall Not's for Operation

WARNING

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in death or serious injury, and substantial property damage. To avoid such a potentially hazardous situation **THE OPERATOR SHALL:**

- **NOT** operate a damaged, malfunctioning or unusually performing hoist.
- **NOT** operate a hoist until you have thoroughly read and understood Manufacturer's Operating and Maintenance Instructions or Manuals.
- Be familiar with operating controls, procedures, and warnings.
- **NOT** operate a hoist that has been modified without the manufacturer's approval or without certification that it is in conformity with ANSI/ASME B30 volumes.
- **NOT** lift more than rated load for the hoist.
- **NOT** use hoist with twisted, kinked, damaged, or worn load chain.
- **NOT** use the hoist to lift, support, or transport people.
- **NOT** lift loads over people.
- **NOT** operate a hoist unless all persons are and remain clear of the supported load.
- **NOT** operate unless load is centered under hoist.
- **NOT** attempt to lengthen the load chain or repair damaged load chain.
- Protect the hoist's load chain from weld splatter or other damaging contaminants.
- **NOT** operate hoist when it is restricted from forming a straight line from hook to support in the direction of loading.
- **NOT** use load chain as a sling or wrap load chain around load.
- **NOT** apply the load to the tip of the hook or to the hook latch.
- **NOT** apply load unless the load chain is properly seated in its grooves.
- **NOT** apply load if bearing prevents equal loading on all load-supporting chain.
- **NOT** operate beyond the limits of the load chain travel.
- **NOT** leave load supported by the hoist unattended unless specific precautions have been taken.
- **NOT** allow the load chain or hook to be used as an electrical or welding ground.
- **NOT** allow the load chain or hook to be touched by a live welding electrode.
- **NOT** remove or obscure the warnings on the hoist.
- **NOT** operate a hoist on which the safety placards or decals are missing or illegible
- **NOT** operate a hoist unless it has been securely attached to a suitable support.
- **NOT** operate a hoist unless load slings or other approved single attachments are properly sized, and seated in the hook saddle.
- **NOT** use the hoist in such a way that could result in shock or impact loads being applied to the hoist.
- Take up slack carefully – make sure load is balanced and load-holding action is secure before continuing.
- Shut down a hoist that malfunctions or performs unusually and report such malfunction.
- Make sure hoist limit switches function properly.
- Warn personnel before lifting or moving a load.
- Warn personnel of an approaching load.

CAUTION

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage. To avoid such a potentially hazardous situation **THE OPERATOR SHALL:**

- Maintain a firm footing or be otherwise secured when operating the hoist.
- Check brake function by tensioning the hoist prior to each lift operation.
- Use hook latches. Latches are to retain slings, chains, etc. under slack conditions only.
- Make sure the hook latches are closed and not supporting any parts of the load.
- Make sure the load is free to move and will clear all obstructions.
- Avoid swinging the load or hook.
- Make sure hook travel is in the same direction as shown on controls.
- Inspect the hoist regularly, replace damaged or worn parts, and keep appropriate records of maintenance.
- Use the hoist manufacturer's recommended parts when repairing the unit.
- Lubricate load chain per hoist manufacturer's recommendations.
- **NOT** use the hoist load limiting or warning device to measure load.
- **NOT** use limit switches as routine operating stops. They are emergency devices only.
- **NOT** allow your attention to be diverted from operating the hoist.
- **NOT** allow the hoist to be subjected to sharp contact with other hoists, structures, or objects through misuse.
- **NOT** adjust or repair the hoist unless qualified to perform such adjustments or repairs.

4.3 Hoist Controls

- 4.3.1 For hoists mounted to motorized trolleys follow the control instruction included in the trolley's Owner's Manual.
- 4.3.2 Emergency Stop Button – Press the Emergency Stop Button to perform an emergency stop and lock-out of hoist motion controls or to reset the VFD as shown in Figure 4-1. Turn the Emergency Stop Button clockwise to unlock the controls and allow hoist operation. “Hbb” will appear on the dual speed unit's VFD display when the Emergency Stop Button is depressed.
- 4.3.3 Single Speed Pendant Control – When using the pendant control depress the UP button to raise the hoist load chain/hook or the DOWN button to lower the hoist load chain/hook as shown in Figure 4-1. To stop motion release the buttons.
- 4.3.4 Dual Speed Pendant Control – Pendant controls supplied with dual speed hoists have two step control buttons. For low speed depress the button to the first step and for high speed depress the button fully to the second step. Use the UP button to raise the hoist load chain/hook or the DOWN button to lower the hoist load chain/hook as shown in Figure 4-1. To stop motion release the buttons.
- 4.3.5 **⚠ CAUTION** Make sure the motor completely stops before reversing direction.

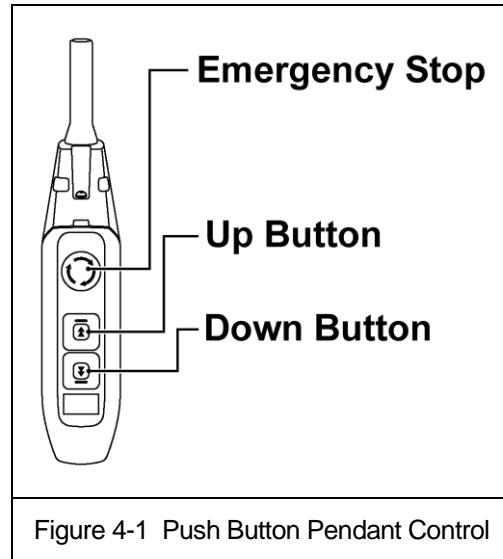


Figure 4-1 Push Button Pendant Control

5.0 Inspection

5.1 General

- 5.1.1 The inspection procedure herein is based on ANSI/ASME B30.16. The following definitions are from ANSI/ASME B30.16 and pertain to the inspection procedure below.
- **Designated Person** – a person selected or assigned as being competent to perform the specific duties to which he/she is assigned.
 - **Qualified Person** – a person who, by possession of a recognized degree or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.
 - **Normal Service** – that distributed service which involves operation with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load for not more than 25% of the time.
 - **Heavy Service** – that service which involves operation within the rated load limit which exceeds normal service.
 - **Severe Service** – that service which involves normal or heavy service with abnormal operating conditions.

5.2 Inspection Classification

- 5.2.1 Initial Inspection – prior to initial use, all new, altered, or modified hoists shall be inspected by a designated person to ensure compliance with the applicable provisions of this manual.
- 5.2.2 Inspection Classification – the inspection procedure for hoists in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the hoist and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as FREQUENT and PERIODIC, with respective intervals between inspections as defined below.
- 5.2.3 FREQUENT Inspection – visual examinations by the operator or other designated personnel with intervals per the following criteria:
- Normal service – monthly
 - Heavy service – weekly to monthly
 - Severe service – daily to weekly
 - Special or infrequent service – as recommended by a qualified person before and after each occurrence.
- 5.2.4 PERIODIC Inspection – visual inspection by a designated person with intervals per the following criteria:
- Normal service – yearly
 - Heavy service – semiannually
 - Severe service – quarterly
 - Special or infrequent service – as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.

5.3 Frequent Inspection

- 5.3.1 Inspections should be made on a FREQUENT basis in accordance with Table 5-1, "Frequent Inspection." Included in these FREQUENT Inspections are observations made during operation for any defects or damage that might appear between Periodic Inspections. Evaluation and resolution of the results of FREQUENT Inspections shall be made by a designated person such that the hoist is maintained in safe working condition.

Table 5-1 Frequent Inspection
All functional operating mechanisms for maladjustment and unusual sounds.
Operation of limit switch and associated components
Hoist braking system for proper operation
Hooks in accordance with ANSI/ASME B30.10
Hook latch operation
Load chain in accordance with Section 5.7
Load chain reeving for compliance with Section 3.2 and 6.5

5.4 Periodic Inspection

- 5.4.1 Inspections should be made on a PERIODIC basis in accordance with Table 5-2, "Periodic Inspection." Evaluation and resolution of the results of PERIODIC Inspections shall be made by a designated person such that the hoist is maintained in safe working condition.
- 5.4.2 For inspections where load suspension parts of the hoist are disassembled, a load test per ANSI/ASME B30.16 must be performed on the hoist after it is re-assembled and prior to its return to service.

Table 5-2 Periodic Inspection
Requirements of frequent inspection.
Evidence of loose bolts, nuts, or rivets.
Evidence of worn, corroded, cracked, or distorted parts such as load blocks, suspension housing, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins and rollers.
Evidence of damage to hook retaining nuts or collars and pins, and welds or rivets used to secure the retaining members.
Evidence of damage or excessive wear of load and idler sheaves.
Evidence of excessive wear on motor or load brake.
Electrical apparatus for signs of pitting or any deterioration of visible controller contacts.
Evidence of damage of supporting structure or trolley, if used.
Function labels on pendant control stations for legibility.
Warning label properly attached to the hoist and legible (see Section 1.2).
End connections of load chain.

5.5 Occasionally Used Hoists

5.5.1 Hoists that are used infrequently shall be inspected as follows prior to placing in service:

- Hoist Idle More Than 1 Month, Less Than 1 Year: Inspect per FREQUENT Inspection criteria in Section 5.3.
- Hoist Idle More Than 1 Year: Inspect per PERIODIC Inspection criteria in Section 5.4.

5.6 Inspection Records

5.6.1 Dated inspection reports and records should be maintained at time intervals corresponding to those that apply for the hoist's PERIODIC interval per Section 5.2.4. These records should be stored where they are available to personnel involved with the inspection, maintenance, or operation of the hoist.

5.6.2 A long range chain inspection program should be established and should include records of examination of chains removed from service so a relationship can be established between visual observation and actual condition of the chain.

5.7 Inspection Methods and Criteria

5.7.1 This section covers the inspection of specific items. The list of items in this section is based on those listed in ANSI/ASME B30.16 for the Frequent and Periodic Inspection. In accordance with ANSI/ASME B30.16, these inspections are not intended to involve disassembly of the hoist. Rather, disassembly for further inspection would be required if frequent or periodic inspection results so indicate. Such disassembly and further inspection should only be performed by a qualified person trained in the disassembly and re-assembly of the hoist.

Item	Method	Criteria	Action
Functional operating mechanisms.	Visual, Auditory	Mechanisms should be properly adjusted and should not produce unusual sounds when operated.	Repair or replace as required.
Limit Switches (upper and lower)	Function	Proper operation. Actuation of limit switch should stop hoist.	Repair or replace as required.
Limit Lever Assembly	Visual, Function	Lever should not be bent or significantly worn and should be able to move freely.	Replace.
Braking System Operation	Function	Braking distance with rated capacity should not exceed 3% of the lifting speed (approximately two chain links).	Repair or replace as required.
Hooks - Surface Condition	Visual	Should be free of significant rust, weld splatter, deep nicks, or gouges.	Replace.
Hooks - Fretting wear	Measure	The "u" and "t" dimensions should not be less than discard value listed in Table 5-4 .	Replace.
Hooks - Stretch	Measure	The "k" dimension should not be greater than 1.05 times that measured and recorded at the time of purchase (See Section 3.7). If recorded "k" values are not available for hooks when new, use nominal "k" values from Table 5-4 .	Replace.
Hooks - Bent Shank or Neck	Visual	Shank and neck portions of hook should be free of deformations.	Replace.

Table 5-3 Hoist Inspection Methods and Criteria

Item	Method	Criteria	Action
Hooks - Swivel Bearing	Visual, Function	Bearing parts and surfaces should not show significant wear, and should be free of dirt, grime and deformations. Hook should rotate freely with no roughness.	Clean/lubricate, or replace as required.
Hooks - Yoke Assembly	Visual	Should be free of significant rust, weld splatter, nicks, and gouges. Holes should not be elongated. The difference between dimensions "a" (vertical) and "b" (horizontal) must be within .020" (0.5mm), refer to Figure 5-1 . Fasteners should not be loose, and there should be no gap between mating parts.	Measure, tighten, or replace as required.
Hooks – Top Shaft Retainer Clip	Visual	Should not have any deformation, abrasion, or damage. Refer to Figure 5-2 .	Replace.
Hooks - Idle Sheave and Axle (Bottom Hook on Double Fall Hoist)	Visual, Function	Pockets of Idle Sheave should be free of significant wear. Idle Sheave surfaces should be free of nicks, gouges, dirt, and grime. Bearing parts and surfaces of Idle Sheave and Axle should not show significant wear. Idle Sheave should rotate freely with no roughness or significant free play.	Clean/lubricate, or replace as required.
Hooks - Hook Latches	Visual, Function	Latch should not be deformed. Attachment of latch to hook should not be loose. Latch spring should not be missing and should not be weak. Latch movement should not be stiff - when depressed and released latch should snap smartly to its closed position.	Replace.
Load Chain - Surface Condition	Visual	Should be free of rust, nicks, gouges, dents and weld splatter. Links should not be deformed, and should not show signs of abrasion. Surfaces where links bear on one another should be free of significant wear.	Replace.
Load Chain - Pitch and Wire Diameter	Measure	The "P" dimension should not be greater than maximum value listed in Table 5-5 . The "d" dimension should not be less than minimum value listed in Table 5-5 .	Replace. Inspect Load Sheave (and Idle Sheave for double fall hoist).
Load Chain - Lubrication	Visual, Auditory	Entire surface of each chain link should be coated with lubricant and should be free of dirt and grime. Chain should not emit cracking noise when hoisting a load.	Clean/lubricate (see Section 6.0).
Load Chain - Reeving	Visual	Chain should be reeved properly through Load Sheave (and Idle Sheave for double fall hoist) - refer to Section 6.5 . Chain, Chain Springs, Cushion Rubbers, Striker Plates, and Stoppers should be installed properly - refer to Section 3.2 .	Reeve/Install chain properly.

Table 5-3 Hoist Inspection Methods and Criteria			
Item	Method	Criteria	Action
Load Chain – Connection Yoke Chain Pin (Double Reeved Hoists Only)	Measure	The Connection Yoke Chain Pin should not have and apparent deformation. The “d” dimension should not be less than the discard value listed in Table 5-6 .	Replace.
Cushion Rubber	Visual	Should be free of significant deformation.	Replace.
Chain Springs	Visual	Chain springs should not be deformed or compressed. Refer to Table 5-9 for Chain Spring dimensions.	Replace.
Chain Guide	Visual	Chain Guide should be free of significant wear. Chain Guide surfaces should be free of deformation by nicks, gouges, and abrasion. Refer to Figure 5-3 .	Replace.
Chain Container (optional)	Visual	Container should not be damaged. Brackets should not be deformed or missing.	Replace.
Housing and Mechanical Components	Visual, Auditory, Vibration, Function	Hoist components including load blocks, suspension housing, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins and rollers should be free of cracks, distortion, significant wear and corrosion. Evidence of same can be detected visually or via detection of unusual sounds or vibration during operation.	Replace.
Bolts, Nuts and Rivets	Visual, Check with Proper Tool	Bolts, nuts and rivets should not be loose.	Tighten or replace as required.
Electromagnetic Brake Assembly	Measure, Visual	The electromagnetic motor brake gap is directly related to brake disk wear. As the disk wears, the brake gap will increase. The brake gap/wear dimension should not be more than discard value listed in Table 5-7 . Bolts and screws should not be loose.	Tighten bolts and screws as required or replace Brake Assembly. Note: DO NOT attempt to adjust or dis-assemble the Brake Assembly.
Hub Joint	Visual	Hub Joint should have no apparent deformation and abrasion. Must be fully seated. Refer to Figure 5-4 .	Replace. Note: Electromagnetic Brake Assembly may also need to be replaced.
V Ring	Visual	The V Ring should not be worn or show any abnormality. It should be well lubricated. Refer to Figure 5-5 and Section 6.1.7 .	Clean/lubricate or replace as required.
Contactor Contacts	Visual	Contacts should be free of significant pitting or deterioration. On hoists equipped with Count/Hour Meter check the contactor cycles – refer to Section 6.1 .	Replace.
VFD (Dual Speed only)	Visual, Function	There should be no fault codes (Reference Section 3.6 .)	Replace as needed.

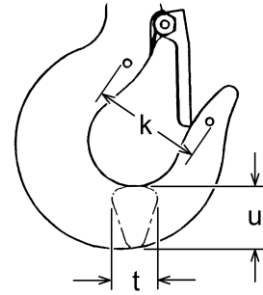
Load Sheave	Visual	Pockets of Load Sheave should be free of significant wear. Refer to Table 5-8 for Load Sheave wear dimensions.	Replace.
Pendant - Housing	Visual	Pendant housing should be free of cracks and mating surfaces of parts should seal without gaps.	Replace.
Pendant - Wiring	Visual	Wire connections to switches in pendant should not be loose or damaged.	Tighten or repair
Pendant - Switches	Function	Depressing and releasing push-buttons should make and break contacts in switch contact block and result in corresponding electrical continuity or open circuit. Push-buttons should be interlocked either mechanically or electrically to prevent simultaneous energization of circuits for opposing motions (e.g. up and down).	Repair or replace as necessary.
Pendant - Cord	Visual, Electrical Continuity	Surface of cord should be free from nicks, gouges, and abrasions. Each conductor in cord should have 100% electrical continuity even when cord is flexed back-and-forth. Pendant Cord Strain Relief Cable should absorb the entire load associated with forces applied to the pendant.	Replace.
Pendant - Labels	Visual	Labels denoting functions should be legible.	Replace.
Warning Labels	Visual	Warning Labels should be affixed to the hoist (see Section 1.2) and they should be legible.	Replace.
Hoist Capacity Label	Visual	The label that indicates the capacity of the hoist should be legible and securely attached to the hoist.	Replace.
Nameplates	Visual	The nameplates that indicate the hoist model, speed and motor data should be legible and securely attached to the hoist.	Replace.

Table 5-4 Top Hook & Bottom Hook Dimensions

"k" Measured When New:

Top: _____

Bottom: _____



Capacity Code	Nominal "k" Dimension* inch (mm)	"u" Dimension inch (mm)		"t" Dimension inch (mm)	
		Standard	Discard	Standard	Discard
001H, 003S, 003H, 005L, 005S	1.77 (45.0)	0.93 (23.5)	0.88 (22.3)	0.69 (17.5)	0.65 (16.6)
010L, 010M, 010S	1.97 (50.0)	1.22 (31.0)	1.16 (29.5)	0.89 (22.5)	0.84 (21.4)
015S	2.36 (60.0)	1.44 (36.5)	1.37 (34.7)	1.04 (26.5)	0.99 (25.2)
020C	2.46 (62.5)	1.57 (40.0)	1.42 (36.0)	1.14 (29.0)	1.02 (26.0)
020L, 020M, 020S, 025S	2.72 (69.0)	1.71 (43.5)	1.63 (41.3)	1.24 (31.5)	1.18 (29.9)
030L, 030C	2.87 (73.0)	1.87 (47.5)	1.78 (45.1)	1.36 (34.5)	1.29 (32.8)
050L	3.27 (83.0)	2.20 (56.0)	2.09 (53.2)	1.67 (42.5)	1.59 (40.4)

*These values are nominal since the dimension is not controlled to a tolerance. The "k" dimension should be measured when the hook is new - this becomes a reference measurement. Subsequent measurements are compared to this reference measurement in order to determine hook deformation/stretch. See Table 5-3, "Hooks - Stretch".

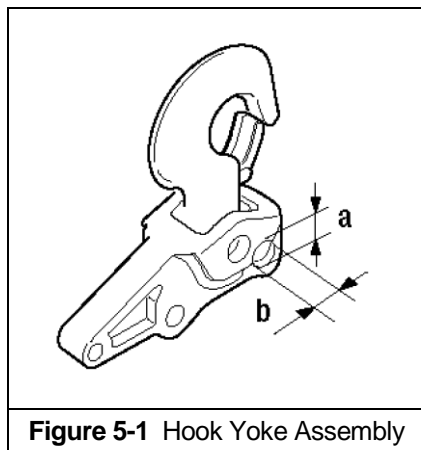


Figure 5-1 Hook Yoke Assembly

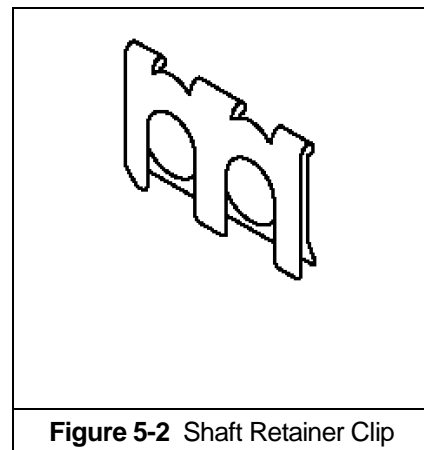


Figure 5-2 Shaft Retainer Clip

Table 5-5 Chain Wear Dimensions				
Capacity Code	"P" Dimension inch (mm)		"d" Dimension inch (mm)	
	Standard	Discard	Standard	Discard
001H, 003S	2.38 (60.5)	2.46 (62.5)	0.17 (4.3)	0.15 (3.9)
003H, 005L, 005S	3.31 (84.0)	3.41 (86.5)	0.24 (6.0)	0.21 (5.4)
010L, 010S, 020C	4.25 (108.0)	4.38 (111.2)	0.30 (7.7)	0.27 (6.9)
015S, 020L, 020S, 030C	5.63 (143.0)	5.80 (147.2)	0.40 (10.2)	0.36 (9.2)
025S, 030L, 050L	6.18 (157.0)	6.37 (161.7)	0.44 (11.2)	0.40 (10.1)

Table 5-6 Chain Pin Wear Dimensions		
Capacity Code	"d" - inch (mm)	
	Standard	Discard
020C	0.31 (8.0)	.30 (7.6)
030C	0.43 (10.8)	0.41 (10.3)
050L	0.51 (12.9)	0.48 (12.3)

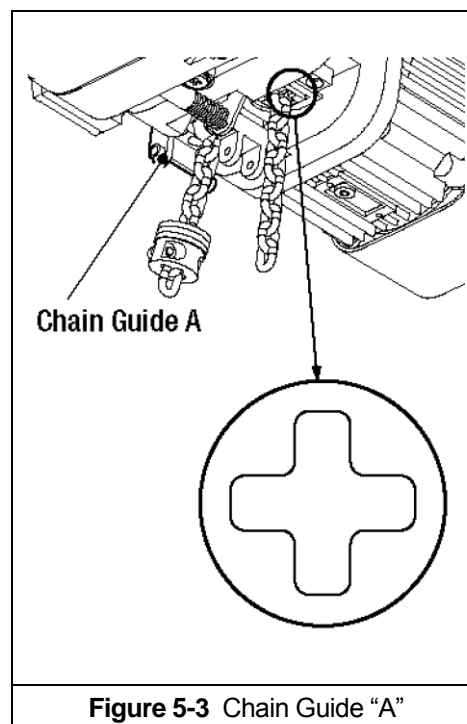
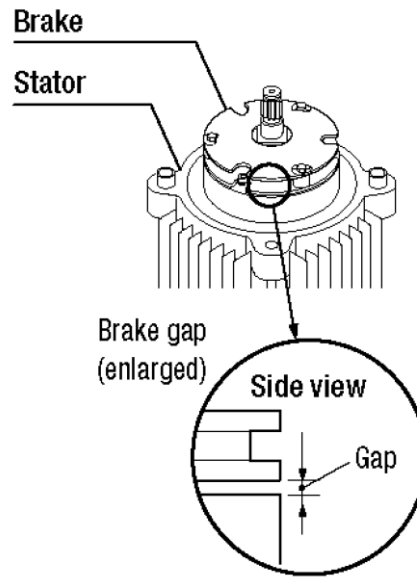


Table 5-7 Motor Brake Wear/Gap Dimensions



Hoist Speed	Capacity Code	"Gap" Dimension - inch (mm)
		Discard
Single	001H to 020L	0.030 (0.75)
	020S to 050L	0.043 (1.10)
Dual	001HD, 003SD, 005LD	0.024 (0.60)
	003HD, 005SD to 020LD	0.016 (0.40)
	020SD to 050LD	0.020 (0.50)

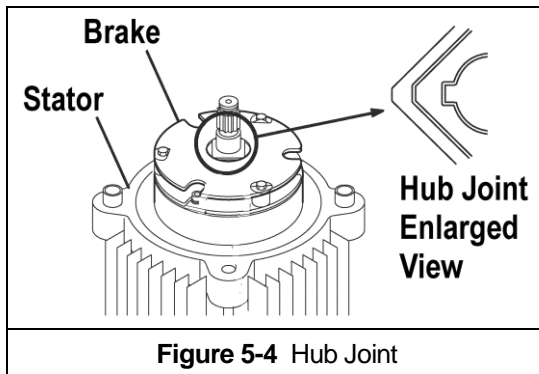


Figure 5-4 Hub Joint

Note: Hub Joint shown for 0.75HP motor. All other motors use splined Hub Joint.

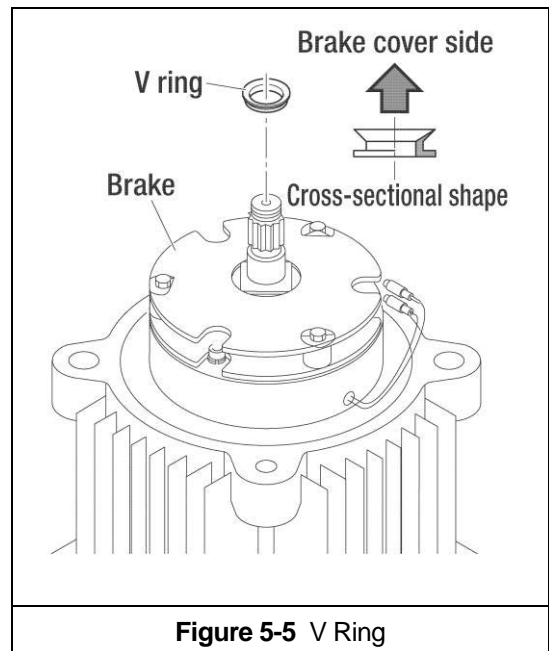
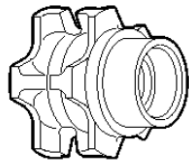
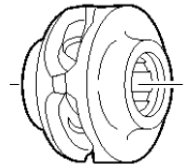


Figure 5-5 V Ring

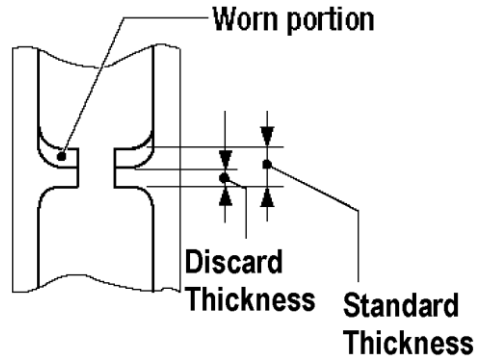
Table 5-8 Load and Idle Sheave Wear Dimensions



Load Sheave

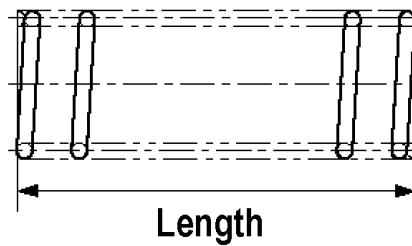


Idle Sheave



Capacity Code	"Thickness" - inch (mm)	
	Standard	Discard
001H, 003S, 003H	0.06 (1.5)	0.04 (1.0)
005L, 005S	0.12 (3.0)	0.08 (2.0)
010L, 010S, 020C	0.18 (4.5)	0.12 (3.0)
015S, 020L, 020S, 030C	0.26 (6.5)	0.17 (4.3)
025S, 030L, 050L	0.29 (7.3)	0.19 (4.9)

Table 5-9 Chain Spring Length Dimensions



Capacity Code	"Length" - inch (mm)	
	Standard	Discard
020C	3.94 (100)	3.74 (95)
020L	2.76 (70)	2.64 (67)
020S	3.35 (85)	3.19 (81)
025S	2.95 (75)	2.83 (72)
030L	TBD	TBD
030C	3.35 (85)	3.19 (81)
050L	2.95 (75)	2.83 (72)

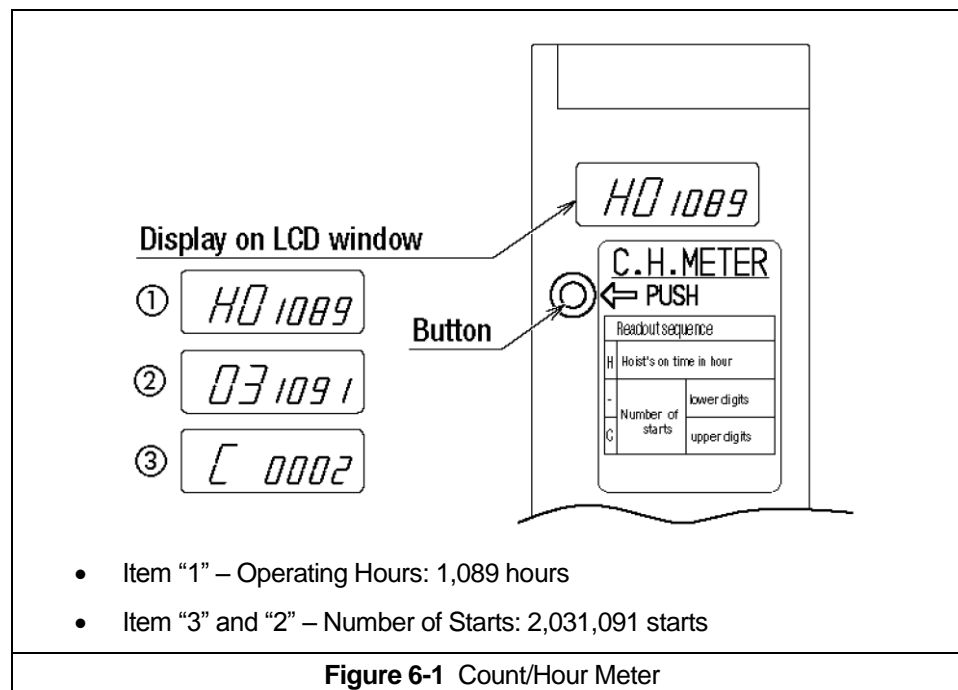
6.0 Maintenance and Handling

6.1 Count/Hour Meter

A count/hour function is included in all NER2/ER2 hoists. A Count/Hour Meter is included in the single speed hoists and a count/hour function is one of the VFD parameters in the dual speed hoists.

6.1.1 Single Speed – The Count/Hour (C/H) Meter located on the electrical control panel records the hoist's "ON" time and number of starts. To view these values, press the button on the C/H Meter one time. The display will then show a total of 3 values. The first value will show an "H" and a 5 digit number which is the hoist's total "ON" time (up and down) in hours (item "1" in Figure 6-1). After 3 seconds, the display will automatically change to a 6 digit number which is the number of starts of the hoists "DOWN" contactor, through 999,999 starts (item "2" in Figure 6-1). After 3 seconds, the display will automatically change to a 4 digit number prefaced by a "C". This is the number of hoist starts through 9,999,000,000 (item "3" in Figure 6-1).

The example in Figure 6-1 is as follows:



6.1.2 Contactor – The C/H Meter can be used in conjunction with the amount of jogging to estimate when the contactor(s) should be replaced. Jogging is when the pendant control buttons are pressed quickly and repetitively to move the hook in small increments. Refer to Table 6-1.

Table 6-1 Criteria for Recommended Contactor Replacement		
Jogging During Normal Operation		Change Contactor After: (starts)
Rating	Approximate Jogging Frequency	
Low	Jogging is rare.	1,000,000
Medium	During 25% of operations/lifts.	500,000
High	During 50% or more of operations/lifts.	200,000

6.1.3 Dual Speed – On dual speed models, the VFD has Count/Hour functions built into the parameters. Refer to Table 6-2 for parameter identification. Refer to Table 6-3 for Count/Hour access procedure.

Table 6-2 VFD Count/Hour Parameter Identification		
Parameter	Name	Description
U7-01	Number of Starts (Higher Order)	The number of starts in the down direction x 1,000. Up to 10,000 units are displayed. Display of "1" = 1,000 starts. Display of "10,000" = 10,000,000 starts
U7-02	Number of Starts (Lower Order)	The number of starts in the down direction under 1,000 starts (1 to 999). One start will register a "1" in the display. When 1,000 starts are reached, the value of U7-01 is incremented by 1 and the value of U7-02 is reset to 0.
U7-03	Hours of Operation	The number of hours of operation in both the up and down directions. One hour will register a "1" in the display. Up to 65535 hours are displayed.

The example using Table 6-2:

- U7-01 displays "81", U7-02 displays "567", U7-03 displays "122"
- Number of Starts (down) = 81,567
- Number of Operated Hours = 122

Table 6-3 VFD Count/Hour Access Procedure	
Operational Step	VFD Display
1. Energize the hoist.	
2. Press until the "Monitor" screen is displayed (blinking).	
3. Press to display the parameter setting screen and then press to move from "01" to "U1".	
4. Press or until the display reads "U7" (left value blinking).	
5. Press and or to select the specific "Monitor" parameter (right value blinking). (Example: U7-03 –Hours of Operation)	
6. Press to display the current parameter value. (Example: 75 Hours)	
7. Press until the display returns to the initial screen. (As in Step 1.)	

- 6.1.4 Gear Oil – The C/H Meter can be used in conjunction with the average load lifted by the hoist to estimate when the gear oil should be changed. Refer to Table 6-4.

Table 6-4 Criteria for Recommended Gear Oil Replacement		
Loading During Normal Operation		Change Gear Oil After: (hours)
Rating	Average % of Rated Capacity	
Light	0 to 33%	360
Medium	33 to 67%	240
Heavy	67 to 100%	120

- 6.1.5 Electromagnetic Brake – The C/H Meter can be used to determine when the Electromagnetic Brake should be monitored or replaced. Refer to **Table 6-5**.

- When 1 Million starts have been achieved, inspect brake gap referring to Table 6.5 criteria.
- When 2 Million starts have been achieved, replace brake assembly regardless of brake gap.

Table 6-5 Criteria for Electromagnetic Brake Replacement	
Condition of Electromagnetic Brake Gap (Ref. Table 5-7 for Gap Wear Dimension)	Action
Brake gap is less than 50% of the limit.	Check the Brake at every 200,000 starts.
Brake gap reaches 50 to 100% of the limit.	Check the Brake at every 100,000 starts until the brake gap reaches at the limit gap.
Brake gap reaches the limit.	Replace whole Brake

- 6.1.6 Hook and Yoke – The C/H Meter can be used to determine when the Top/Bottom Hook and Yoke should be replaced. Refer to **Table 6-6**.

Table 6-6 Criteria for Top/Bottom Hook and Yoke Replacement	
Rate of Loading	Number of Starts to replace Hook and Yoke
Light - The hoist is mostly used with a light load. Rated capacity rarely applied.	Every 2 million starts.
Medium – The hoist is mostly used with a medium load. Rated capacity frequently applied.	Every 1.5 million starts.
Heavy – The hoist is mostly used with a heavy load. Rated capacity frequently applied.	Every 1 million starts.
Ultra-Heavy – Rated capacity constantly applied.	Every 1 million starts.

- 6.1.7 V Ring – The C/H Meter can be used to determine when the V Ring should be lubricated. Several grams of MOLITHERM No. 2 grease should be applied to the V Ring every 200 hours of operation.

- 6.1.8 You are encouraged to use the Count/Hour Meter in conjunction with your experience with the hoist's application and usage to develop a history upon which to gage and fine tune your maintenance program for the hoist.

6.2 Lubrication – Load Chain, Hooks and Suspension

6.2.1 Load Chain

- For longer life, the load chain should be lubricated.
- The load chain lubrication should be accomplished after cleaning the load chain with an acid free cleaning solution.

- Apply Harrington Hoist, Inc. lubricating grease (Part No. ER2CS1951) or an equivalent to industrial general lithium grease, NLGI No. 0, to the bearing surfaces of the load chain links as indicated by the shaded areas in Figure 6-2. Also apply the grease to the areas of the load chain (shaded areas in Figure 6-2) that contact the load sheave. Insure that the grease is applied to the contact areas in the load sheave pockets.
- Machine or gear oil (grade ISO VG 46 or 68 oil or equivalent) may be used as an alternative lubricant but must be applied more frequently.

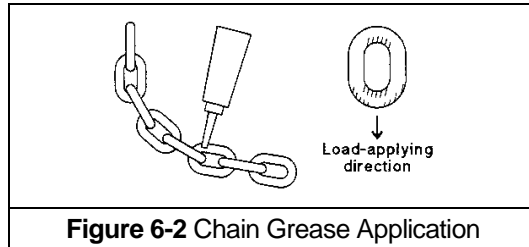


Figure 6-2 Chain Grease Application

- The chain should be lubricated every 3 months (more frequently for heavier usage or severe conditions).
- For dusty environments, it is acceptable to substitute a dry lubricant.

6.2.2 Hooks and Suspension Components:

- Hooks - Bearings should be cleaned and lubricated at least once per year for normal usage. Clean and lubricate more frequently for heavier usage or severe conditions.
- Suspension Pins - Lubricate at least twice per year for normal usage; more frequently for heavier usage or severe conditions.

6.3 Lubrication - Gearbox

6.3.1 **CAUTION** The ER2 (with mechanical load brake/friction clutch) uses different gear oil than the NER2 (with friction clutch). DO NOT use any oil or quantity other than that listed below. New hoists are prefilled with the correct type and amount of oil.

6.3.2 **DETERMINING OIL LIFE** - Refer to Section 6.1.3 when estimating gear oil life based on operations.

6.3.3 **NER2 OIL LEVEL** – For hoists equipped with a Friction Clutch, the oil level is checked by removing the oil plug on the side of the hoist as shown in Figure 6-3 for NER2 hoists. The oil level should be just below the hole when the hoist is level.

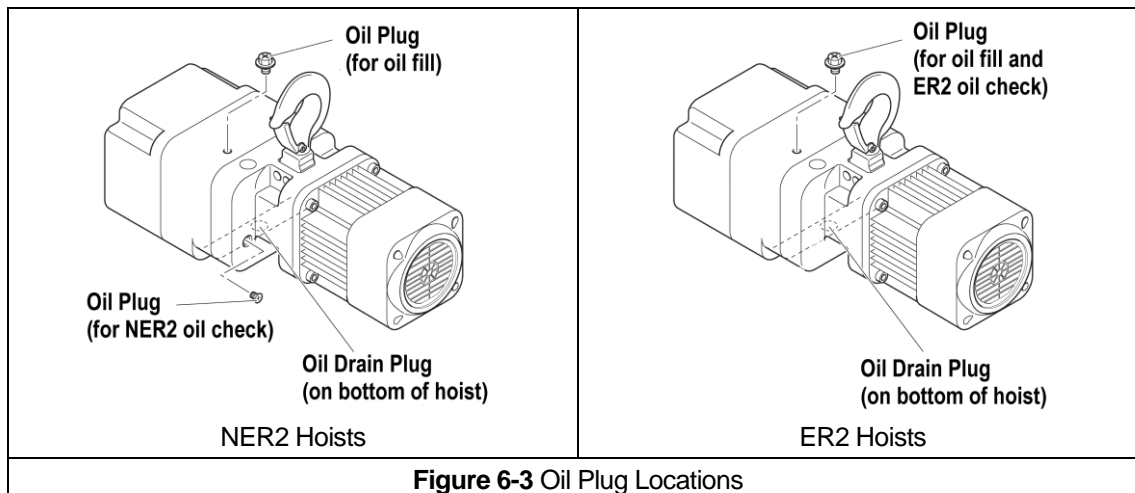


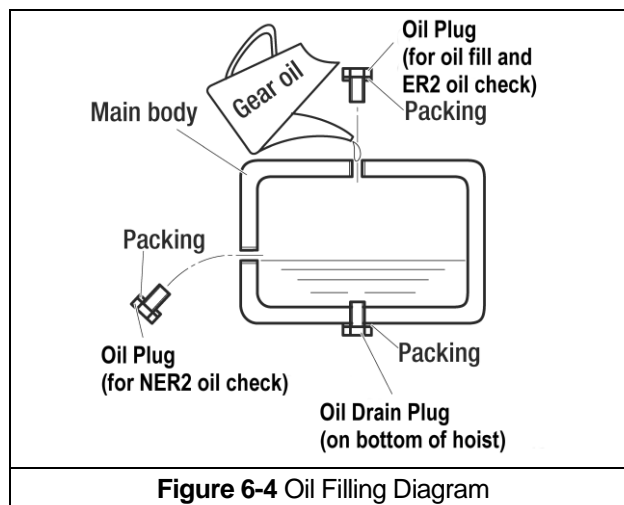
Figure 6-3 Oil Plug Locations

6.3.4 **ER2 OIL LEVEL** – For hoists equipped with a Mechanical Load Brake/Friction Clutch, the oil level is checked through the oil check hole at the top of the hoist. **DO NOT** remove the oil plug exposing the oil level check hole on the side of the hoist. The oil level will be above the hole and will leak out. A dip stick should be used to check the oil level through the top hole as shown in the in Figure 6-3 for ER2 hoists. Reference Table 6-7 for check distances from the top of the hoist body.

Table 6-7 ER (Mechanical Load brake Equipped) Gear Oil Check Distances		
Capacity Code	Check Distance (inches)	Check Distance (millimeters)
001H, 003S	2.95	75
003H, 005L, 005S	3.94	100
010L, 010S, 020C	3.94	100
015S, 020L, 020S, 030C	4.72	120
025S, 030L, 050L	5.12	130

6.3.5 **REPLACING OIL** – Change gear oil at least once every 5 years. The oil should be changed more frequently depending on the hoist's usage and operating environment. Refer to Section 6.1.3. Follow the procedure below for replacing the gearbox oil for your hoist:

- To drain the current oil from the hoist remove “Oil Plug” on top of the hoist and the “Oil Drain plug” on the bottom of the hoist. Allow the old oil to drain completely. Refer to Figure 6-4 for oil plug locations.
- **NOTICE** Dispose of the used oil in accordance with local regulations.



- Ensure that the oil plugs for the oil level check holes and the drain hole are reinstalled and secured into the hoist body.
- Refill the gear case with the correct quantity and type of new oil or until the oil level is within the range shown in Table 6-7. Refer to Figure 6-4. Note that the NER2 & ER2 models have different oil quantity requirements.

Capacity Code	Quarts		Liters	
	NER2	ER2	NER2	ER2
001H, 003S	0.55	0.72	0.52	0.68
005L	0.57	0.87	0.54	0.82
003H, 005S	0.57	0.95	0.54	0.90
010L, 020C	0.66	1.11	0.62	1.05
010S	0.72	1.16	0.68	1.10
015S, 020L	1.37	2.11	1.30	2.00
020S, 030C	2.01	2.64	1.90	2.50
025S, 030L, 050L	2.01	2.85	1.90	2.70

- ⚠ WARNING** Using an incorrect type/grade of gearbox oil or the wrong quantity of oil may prevent the friction clutch from working properly and may affect the ability of the hoist to hold the load. Refer to the following for correct types/grades of gearbox oil:

NER2 Gear Oil:

- Harrington standard: Bonnoc M260 (NIPPON OIL); Harrington Part Numbers:
 - ER1BS1855 – 1 Quart
 - ER1CS1855 – 2 ½ Gallons
- Acceptable equivalent: Meropa 320 (TEXACO)
- Acceptable equivalent: Meropa 320 (CALTEX)

ER2 Gear Oil:

- Harrington standard: Farm Gear B (NIPPON OIL); Harrington Part Numbers:
 - 7019801 – 1 Quart
 - 7019802 – 2 ½ Gallons

6.4 Motor Brake

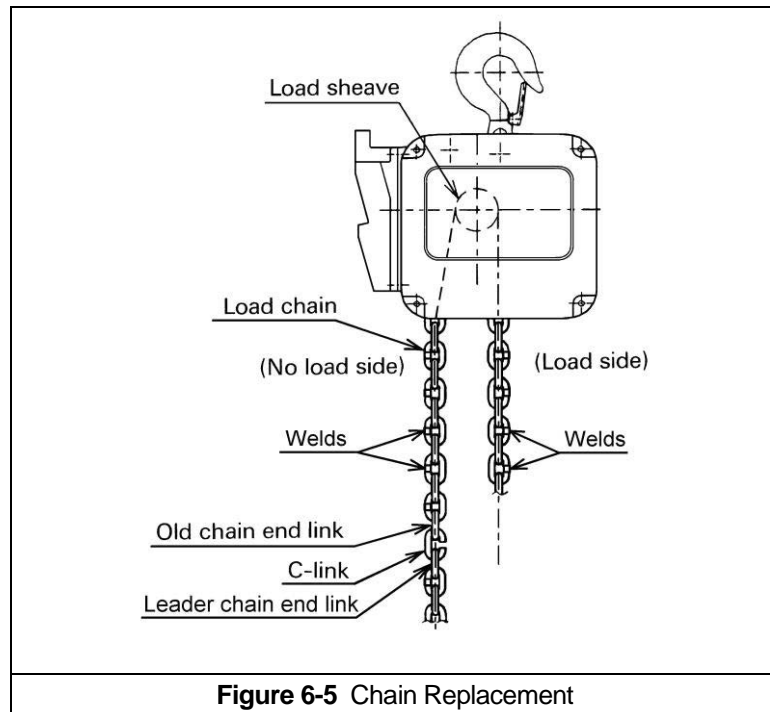
- 6.4.1 The motor brake on the NER2/ER2 hoist is not adjustable.
- 6.4.2 Refer to Section 5.7 and Table 5-7 for Brake Gap/Wear criteria.

6.5 Load Chain

- 6.5.1 Lubrication and Cleaning – refer to Section 6.2.
- 6.5.2 Load Chain Replacement:

- ⚠ CAUTION** The hoist must be properly powered and operational in order to perform the following procedures.
- ⚠ WARNING** Be certain that the replacement chain is obtained from Harrington Hoists, Inc. and is the exact size, grade and construction as the original chain. The new load chain must have an odd number of links so that both its end links have the same orientation. If the load chain is being replaced due to damage or wear out, destroy the old chain to prevent its reuse.
- ⚠ CAUTION** When replacing load chain, check for wear on mating parts, i.e. Load Sheave, Chain Guides and Idle Sheaves, and replace parts if necessary.

- 4) Remove all chain components including the Bottom Hook Set Assembly, Stoppers, Cushion Rubbers, Chain Springs, Striker Plates, Chain Pin and End Wire (or End Suspender) from the chain for reuse on new chain. Inspect and replace any damaged or worn parts.
- 5) Using a C-link, attach the new chain to the end link of the old chain on the no-load side. The end link of the new load chain should be connected so that the welded portions of the load chain's standing links are oriented to the outside as they pass over the sheave. Refer to Figure 6-5.
- 6) Operate the hoist down to move the chain through the hoist body. Stop when a sufficient amount of new chain is accumulated on the load side.
- 7) Single fall hoists - Attach the chain components (step 4 above) to the chain. Refer to Section 3.2 for the proper locations.
- 8) Double falls (020C, 030C, 050L) - Feed the end link on the load side of the new chain through the required chain components (step 4 above) and the bottom hook's Idle Sheave. Attach the remaining chain components to the chain referring to Section 3.2 for the proper locations. Connect the end link to the top connection yoke with the chain pin, slotted nut, and cotter pin. Ensure that chain remains free of twists. Refer to Section 3.2.6.
- 9) **⚠️WARNING** Make sure Stoppers, Cushion Rubbers, Chain Springs and Striker Plates are properly installed. Refer to Section 3.2.
- 10) After installation has been completed, perform steps outlined in Section 3.7, "Preoperational Checks and Trial Operation".



6.6 Friction Clutch and Mechanical Load Brake with Friction Clutch

- 6.6.1 Friction Clutch (NER2 Models) – If abnormal operation or slippage occurs do NOT attempt to disassemble or adjust the Friction Clutch. Replace the worn or malfunctioning Friction Clutch as an assembly with a new, factory adjusted part.

- 6.6.2 Mechanical Load Brake with Friction Clutch (ER2 Models) – If abnormal operation or slippage occurs do NOT attempt to disassemble or adjust the Mechanical Load Brake with Friction Clutch. Replace the worn or malfunctioning Mechanical Load Brake with Friction Clutch as an assembly with a new, factory adjusted part.

6.7 Storage

- 6.7.1 ER2 models with vented oil cap assemblies should be stored with the cap oriented up to prevent oil leakage.
- 6.7.2 The storage location should be clean and dry.

6.8 Outdoor Installation

- 6.8.1 For hoist installations that are outdoors, the hoist MUST BE covered and protected from the weather at all times.
- 6.8.2 Possibility of corrosion on components of the hoist increases for installations where salt air and high humidity are present. The hoist may require more frequent lubrication. Make frequent and regular inspections of the unit's condition and operation.
- 6.8.3 For hoist installations where temperature variations introduce condensation into the hoist additional inspection and more frequent lubrication may be required.
- 6.8.4 Refer to Section 2.1.3 for allowable environmental conditions.

6.9 Operational Environment

- 6.9.1 Non-conforming environment

A non-conforming environment is defined as one with any or all of the following.

- Explosive gases or vapor.
- Organic solvents or volatile powder
- Excessive amounts of powder and dust of general substances
- Excessive amount of acids or salts.

7.0 Troubleshooting

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE HOIST AND IN CONNECTIONS BETWEEN COMPONENTS.

Before performing ANY maintenance on the equipment, de-energize the supply of electricity to the equipment, and lock and tag the supply device in the de-energized position. Refer to ANSI Z244.1, "Personnel Protection – Lockout/Tagout of Energy Sources."

To avoid a shock hazard, **DO NOT** perform **ANY** mechanical or electrical maintenance on the dual speed (or VFD control) hoist within 5 minutes of de-energizing (disconnecting) the trolley or hoist. This time allows the internal VFD capacitor to safely discharge.

Only trained and competent personnel should inspect and repair this equipment.

NOTICE

Do Not perform "withstand voltage" test or "insulation resistance" measurement (megger) with the VFD connected.

Do Not remove power to the hoist or trolley during operation.

Do Not connect power to the output of the VFD.

When handling VFD provide ESD protection.

Table 7-1 Troubleshooting Guide

Symptom	Cause	Remedy
Hoist moving in wrong direction	Power supply reversed phased	Switch 2 of the 3 power supply cord wires at the power source. (Refer to Section 3.7.11 for instructions on how to check for correct power supply phase connection.)
	Improper electrical connections	Refer to wiring diagram and check all connections.
Hoist will not operate	Loss of power	Check circuit breakers, switches, fuses, and connections on power lines/cable.
	Wrong voltage or frequency	Check voltage and frequency of power supply against the rating on the nameplate of the motor.
	Hoist overloaded	Reduce load to within rated capacity of hoist.
	Motor overheated and thermal overload protector has tripped	See Trouble Shooting Problem "Motor or brake overheating".
	Improper, loose, or broken wire in hoist electrical system	Shut off power supply, check wiring connections on hoist control panel and inside push-button pendant.
Brake does not release	Check motor brake coil for continuity. Replace brake if needed.	

Table 7-1 Troubleshooting Guide

Symptom	Cause	Remedy
Hoist will not operate (continued)	Faulty magnetic contactor	Check coil for open or short circuit. Check all connections in the control circuit. Check for open contactors. Replace as needed.
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing the Emergency Stop Button on pendant. Replace as needed.
	Faulty Interface Board	Replace Interface Board.
	Emergency Stop Depressed on Push Button Pendant Control	“Hbb” will appear on the dual speed unit’s VFD display when the Emergency Stop Button is depressed. Turn the Emergency Stop Button clockwise to unlock the controls and allow hoist operation.
	Defect in control transformer	Check transformer coil for signs of overheating. Disconnect transformer and check for open winding.
	Motor burned out	Replace motor frame/stator, shaft/rotor, and any other damaged parts.
Hoist lifts but will not lower	Down circuit open	Check circuit for loose connections. Check down side of limit switch for malfunction.
	Broken conductor in pendant cord	Check the continuity for each conductor in the cable. If one is broken, replace entire cable.
	Faulty magnetic contactors	Check coils for open or short circuit. Check all connections on motor circuit. Check for burned contacts. Replace as needed.
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing Emergency Stop Button on pendant. Replace as needed.
	Faulty switch in pendant	Check electrical continuity. Check electrical connections. Replace or repair as needed.
Hoist lowers but will not lift	Hoist overloaded	Reduce load to within rated capacity of hoist.
	Low voltage in hoist’s power supply	Determine cause of low voltage and bring to within plus or minus 10% of the voltage specified on the motor nameplate. The voltage should be measured at the hoist contactor.
	Up circuit open	Check circuit for loose connections. Check up side of limit switch for malfunction.
	Broken conductor in pendant cord	Check the continuity of each conductor in the cable. If one is broken, replace entire cable.
	Faulty magnetic contactor	Check coils for open or short circuit. Check all connections on motor circuit. Check for burned contacts. Replace as needed.
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing Emergency Stop Button on pendant. Replace as needed.
	Faulty switch in pendant	Check electrical continuity. Check electrical connections. Replace or repair as needed.
Faulty friction clutch	Replace.	

Table 7-1 Troubleshooting Guide

Symptom	Cause	Remedy
Hoist will not lift rated load or does not have the proper lifting speed	Hoist overloaded	Reduce load to within rated capacity.
	Low voltage in hoist's power supply	Determine cause of low voltage and bring to within plus or minus 10% of voltage specified on the motor nameplate. The voltage should be measured at the hoist contactor.
	Brake drags/chatters	Check VFD for fault codes. Replace VFD or Interface Board if needed.
	Faulty friction clutch	Replace.
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing Emergency Stop Button on pendant. Replace as needed.
Load drifts excessively when hoist is stopped	Motor brake not holding	Check brake for proper "Brake Gap" dimension. (Reference Table 5-7). Replace if needed.
	Mechanical Load brake not holding (ER2 only)	Replace as needed. (ER2 only, NER2 has no load brake.)
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing Emergency Stop Button on pendant. Replace as needed.
Motor or brake overheating	Excessive load	Reduce load to within rated capacity of hoist.
	Excessive duty cycle	Reduce frequency of lifts.
	Wrong voltage or frequency	Check voltage and frequency of power supply against the rating on the nameplate on the motor.
	Brake drags/chatters	Check VFD for fault codes. Replace VFD or Interface Board if needed.
	Extreme external heating	Above an ambient temperature of 140°F, the frequency of hoist operation must be reduced to avoid overheating of the motor. Special provisions should be made to ventilate the hoist or otherwise shield it from the heat.
Hoist operates intermittently	Collectors making poor contact	Check movement of spring loaded arm, weak spring, connections, and shoe. Replace as needed.
	Contactor contacts arcing	Check for burned contacts. Replace as needed.
	Loose connection in circuit	Check all wires and terminals for bad connections. Replace as needed.
	Broken conductor in Pendant Cord	Check for intermittent continuity in each conductor the Pendant Cord. Replace entire Pendant Cord if continuity is not constant.
	Faulty VFD (dual speed only)	Check fault codes (Reference Section 3.6). Reset VFD by pressing Emergency Stop Button on pendant. Replace as needed.

8.0 Warranty

All products sold by Harrington Hoists, Inc. are warranted to be free from defects in material and workmanship from date of shipment by Harrington for the following periods:

- 1 year – Electric and Air Powered Hoists (excluding (N)ER2 Enhanced Features Models), Powered Trolleys, Powered Tiger Track Jibs and Gantries, Crane Components, Below the Hook Devices, Spare / Replacement Parts**
- 2 years – Manual Hoists & Trolleys, Beam Clamps**
- 3 years – (N)ER2 Enhanced Features Model Hoists**
- 5 years – Manual Tiger Track Jibs and Gantries, TNER Pull - Rotor Motor Brake**
- 10 years – (N)ER2 “The Guardian” Smart Brake**

The product must be used in accordance with manufacturer’s recommendations and must not have been subject to abuse, lack of maintenance, misuse, negligence, or unauthorized repairs or alterations.

Should any defect in material or workmanship occur during the above time period in any product, as determined by Harrington Hoist’s inspection of the product, Harrington Hoists, Inc. agrees, at its discretion, either to replace (not including installation) or repair the part or product free of charge and deliver said item F.O.B. Harrington Hoists, Inc. place of business to customer.

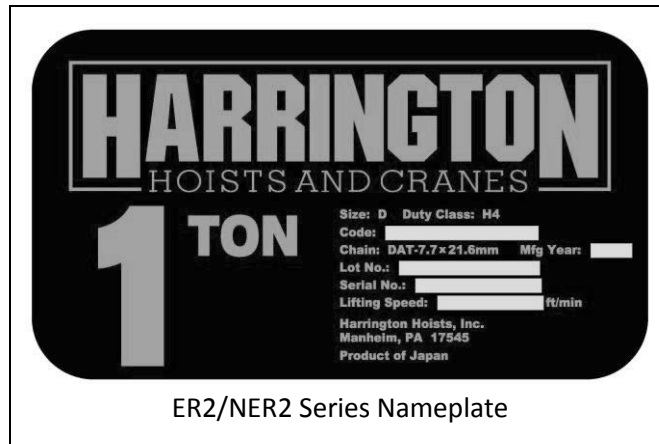
Customer must obtain a Return Goods Authorization as directed by Harrington or Harrington’s published repair center prior to shipping product for warranty evaluation. An explanation of the complaint must accompany the product. Product must be returned freight prepaid. Upon repair, the product will be covered for the remainder of the original warranty period. Replacement parts installed after the original warranty period will only be eligible for replacement (not including installation) for a period of one year from the installation date. If it is determined there is no defect, or that the defect resulted from causes not within the scope of Harrington’s warranty, the customer will be responsible for the costs of returning the product.

Harrington Hoists, Inc. disclaims any and all other warranties of any kind expressed or implied as to the product’s merchantability or fitness for a particular application. Harrington will not be liable for death, injuries to persons or property or for incidental, contingent, special or consequential damages, loss or expense arising in connection with the use or inability whatever, regardless of whether damage, loss or expense results from any act or failure to act by Harrington, whether negligent or willful, or from any other reason.

9.0 Parts List

When ordering Parts, please provide the Hoist code number, lot number and serial number located on the Hoist nameplate (see fig. below).

Reminder: Per sections 1.1 and 3.7.4 to aid in ordering Parts and Product Support, record the Hoist code number, lot number and serial number in the space provided on the cover of this manual.



The parts list is arranged into the following sections:

Section	Page
9.1 Housing and Motor Parts.....	52
9.2 Gearing Parts.....	56
9.3 Hook and Chain Parts.....	60
9.4 Electric Parts (Single Speed).....	78
9.5 Electric Parts (Dual Speed).....	84
9.6 Power Supply and Pendant Parts.....	90

In the column "Parts Per Hoist" a designator is used for parts that apply only to a particular model or option. Refer to Section 2 for hoist model numbers and additional descriptions. The designators are:

S = Single Speed

D = Dual Speed

F = NER Models

M = ER Models

2V = 208/230 Volt Models

4V = 460 Volt Models

9.1 Housing and Motor Parts

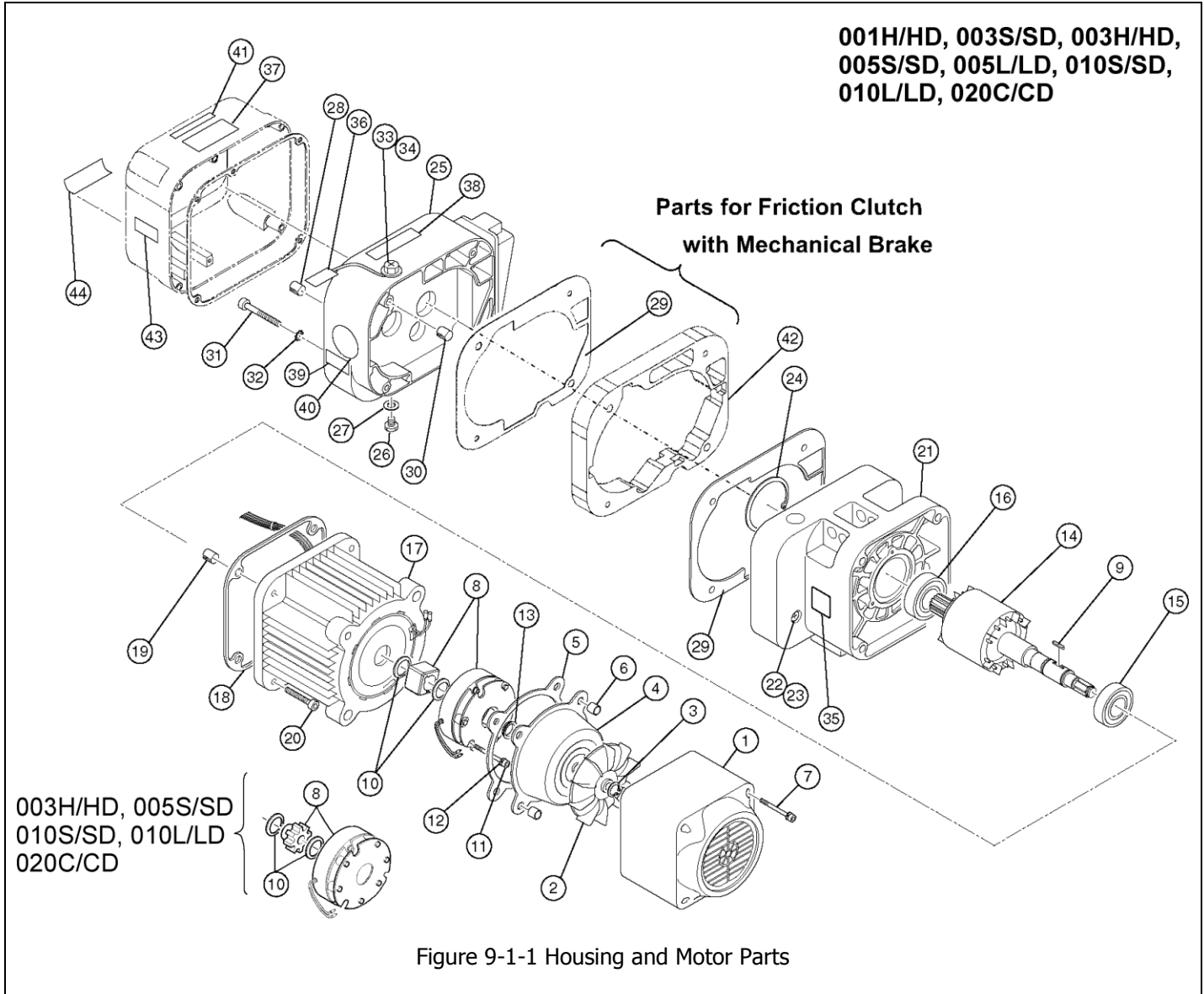


Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005S	005L	010S	010L	020C
1	Fan Cover	1	ER2BS9107		ER2CS9107		ER2CL9107	ER2DS9107		ER2CS9107
2	Fan	1	ER2BS9108		ER2CS9108		ER2CL9108	ER2DS9108		ER2CS9108
3	Snap Ring	1			9047113			9047116		9047113
4	Brake Cover	F	ER2BS9115	ER2CL9115	ER2CS9115	ER2CL9115	ER2CL9149	ER2DS9115		ER2CS9115
		M								ER2DL9149
5	Packing B	1	ER2BS9119		ER2CS9119		ER2CL9119	ER2DS9119		ER2CS9119
6	Set Pin S	2					ES120003			
7	Socket Bolt	4					9091234			
8	Electromagnetic Brake Assembly	1	MBABB0ENA		MBABB09NA		MBABB0ENA	MBABB18NA		MBABB09NA
9	Key B	1	ER2CL9360		ER2CS9360		ER2CL9360	ER2DS9360		ER2CS9360
10	Snap Ring	2	9047119		9047124		9047116		9047124	
11	Socket Bolt	3					9091254			
12	Spring Lock Washer	3					9012709			
13	V Ring	1			ER2CS9210			ER2DS9210		ER2CS9210

9.1 Housing and Motor Parts

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005S	005L	010S	010L	020C	
14	Motor Shaft With Rotor	1	ER2BS5502		ER2CS5502		ER2CL5502	ER2DS5502	ER2DL5502		
15	Ball Bearing	1	9000904		9000905		9000904	9000905			
16	Ball Bearing	1	9001003		9000904			9000922			
17	Motor Frame With Stator	1	ER2BKV03S5A1		ER2BKV05S5A1		ER2BKV05L5A1	ER2BKV10S5A1	ER2BKV10L5A1		
18	Packing M	1	ER2BS9118		ER2CS9118			ER2DS9118			
19	Set Pin S	2	ES120003		ES120010S			ER1DS9138			
20	Socket Bolt	4	9091252		9091275			9091296			
21	Body B Assembly* Lot No. ER2A-...	F	1	ER2BS6101		ER2CS6101			ER2DS6101*		
	Body B Assembly Lot No. ER2B-...	F	1						ER2DS6101R4		
	Body C Assembly* Lot No. ER2A-...	M	1	ER2BS6099		ER2CS6099			ER2DS6099*		
	Body C Assembly Lot No. ER2B-...	M	1						ER2DS6099R4		
16	Ball Bearing	1	9001003		9000904			9000922			
22	Oil Plug	1	E3S111003								
23	Plug Packing	1	E3S112003								
24	Snap Ring	1	9047255		9047262			9047268			
25	Gear Case	F, S	1	ER2BS6103		ER2CS6103			ER2DS6103		
		F, D	1	ER2BI6103							
		M	1	ER2BS6102		ER2CS6102			ER2DS6102		
26	Oil Plug	1	E3S111003								
27	Plug Packing	1	E3S112003								
28	Spring Pin	1	9148128		E3S129005S						
29	Packing G	F	1	ER2BS9116		ER2CS9116			ER2DS9116		
		M	2								
30	Set Pin S	F	2	ES120003							
		M	4								
31	Socket Bolt	F	4	9091256							
		M	4	9091262							
32	Toothed Lock Washer	4	9679709								
33	Oil Fill Plug	1	ER1BS9135								
34	Eyebolt Packing	1	ES127005S								
35	Name Plate Load Side E	1	ER1BS9960								
36	Oil Full Tag	1	ER1BS9953								
37	Warning Sticker E (Disconnect Power)	1	ER2CS9936								
38	Name Plate OF (Correct Oil Required)	F	1	ER2CS9845							
	Name Plate OM (Correct Oil Required)	M	1	ER2CS9846							
39	Name Plate AA (With Mechanical Brake)	M	1	ER1BS9893							
40	Name Plate AD (Speed Letter)	1	ER1BH9868	ER1BS9868	ER1BH9868	ER1BS9868	ER1BL9868	ER1BS9868	ER1BL9868	ER1DR9868	
41	Warning Sticker HW (Hot Surface)	D	1	ER2CI9806							
42	Spacer M	M	1	ER2BS9296		ER2CS9296			ER2DS9296		
43	Check Voltage Label	S,2V	1	ECP99NVVB							
		S,4V		ECP99NVVA							
		D,2V		ECP99NVWB							
		D,4V		ECP99NVWA							
44	Check Hook Movement Label (bottom front of cover)	S	1	ER1BS9957							

*010L, 010S and 020C Body B and C have been discontinued for lot ER2A. Replace with lot ER2B body B or C and ER2B Top Pins (see pages 63 and 67)

9.1 Housing and Motor Parts

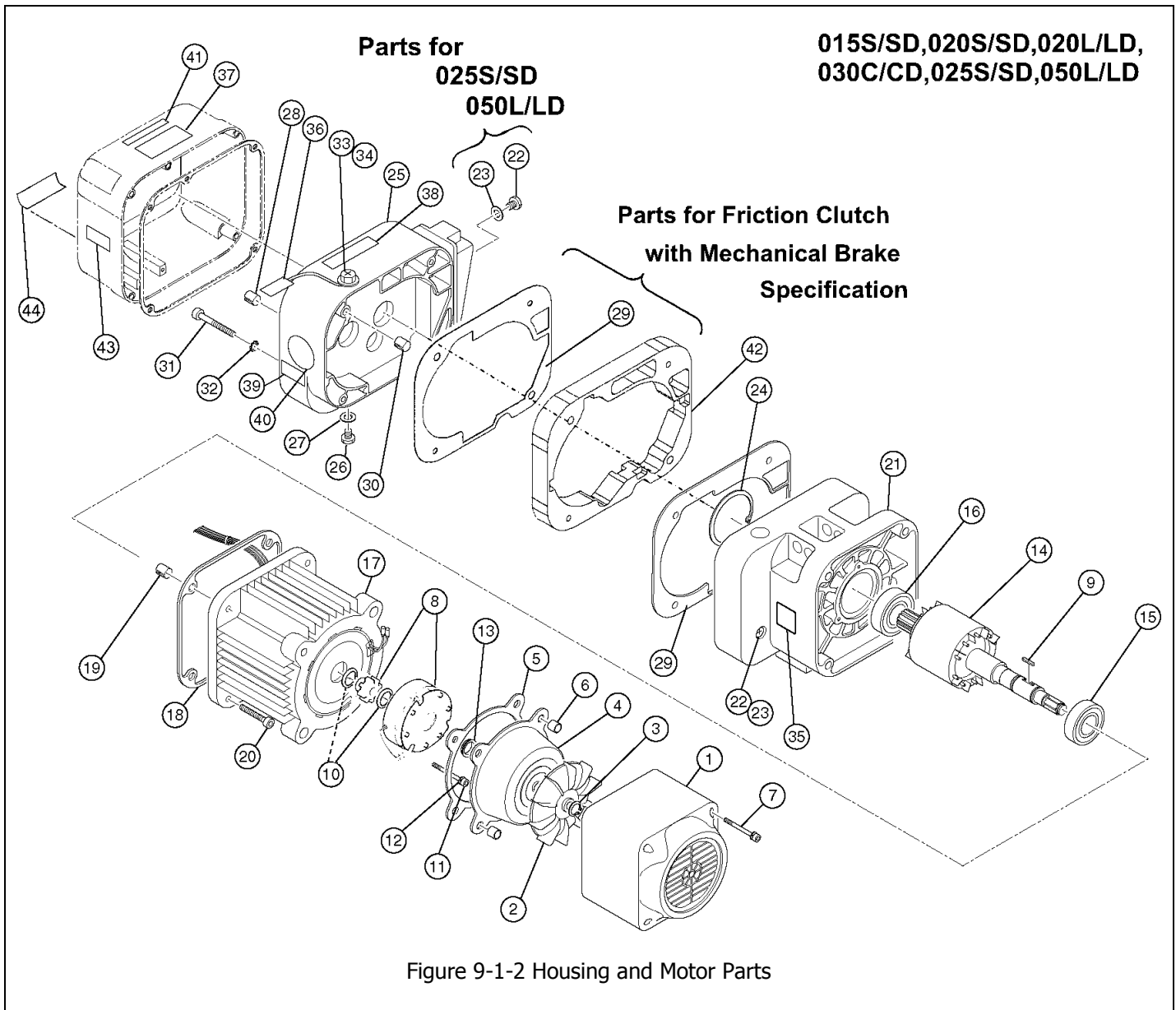


Figure No.	Part Name	Parts Per Hoist		015S	020L	020S	030C	025S	050L
1	Fan Cover		1	ER2DS9107				ER2ES9107	
2	Fan		1	ER2DS9108				ER2ES9108	
3	Snap Ring		1	9047116				9047122	
4	Brake Cover	F	1	ER2DS9115				ER2ES9115	
		M		ER2EL9149					
5	Packing B		1	ER2DS9119				ER2ES9119	
6	Set Pin S		2			ES120003			
7	Socket Bolt		4	9091234				9091255	
8	Electromagnetic Brake Assembly		1	MBABB18NA				MBABB35NA	
9	Key B		1	ER2DS9360				ER2ES9360	

9.1 Housing and Motor Parts

Figure No.	Part Name	Parts Per Hoist		015S	020L	020S	030C	025S	050L
10	Snap Ring		1				9047130		
			2	9047124					
11	Socket Bolt		3	9091254			9091278		
12	Spring Lock Washer		3	9012709			9012711		
13	V Ring		1	ER2DS9210			ER2ES9210		
14	Motor Shaft With Rotor		1	ER2EL5502			ER2ES5502		ER2FS5502
15	Ball Bearing		1	9000905			9000907		
16	Ball Bearing		1	9000906					
17	Motor Frame w/Stator		1	ER2BKV20L5A1		ER2BKV20S5A1		ER2BKV25S5A1	
18	Packing M		1	ER2ES9118				ER2FS9118	
19	Set Pin S		2	ER2ES9138					
20	Socket Bolt		4	90912116					
21	Body B Assembly	F	1	ER2ES6101				ER2FS6101	
	Body C Assembly	M		ER2EL6099		ER2ES6099		ER2FS6099	
16	Ball Bearing		1	9000906					
22	Oil Plug		1					E3S111003	
23	Plug Packing		1					E3S112003	
24	Snap Ring		1	9047280					
25	Gear Case	F	1	ER2EL6103		ER2ES6103		ER2FS6103	
		M		ER2EL6102		ER2ES6102		ER2FS6102	
26	Oil Plug		1	E3S111003					
27	Plug Packing		1	E3S112003					
28	Spring Pin		1	E3S129005S					
29	Packing G	F	1	ER2ES9116				ER2FS9116	
		M	2						
30	Set Pin S	F	2	ES120010S					
		M	4						
31	Socket Bolt	F	4 (5)	9091280	9091286	9091280	9091286		
		M	4 (5)	90912147				90912155	
32	Toothed Lock Washer		4 (5)	9679711					
33	Oil Fill Plug		1	ER1BS9135					
34	Eyebolt Packing		1	ES127005S					
35	Name Plate Load Side E		1	ER1BS9960					
36	Oil Full Tag		1	ER1BS9953					
37	Warning Sticker E (Disconnect Power)		1	ER2CS9936					
38	Name Plate OF (Correct Oil Required)	F	1	ER2CS9845					
	Name Plate OM (Correct Oil Required)	M		ER2CS9846					
39	Name Plate AA (With Mechanical Brake)	M	1	ER1BS9893					
40	Name Plate AD (Speed Letter)		1	ER1BS9868	ER1BL9868	ER1BS9868	ER1DR9868	ER1BS9868	ER1BL9868
41	Warning Sticker HW (Hot Surface)	D	1	ER2CI9806					
42	Spacer M	M	1	ER2EL9296		ER2ES9296		ER2FS9296	
43	Check Voltage Label	S,2V	1	ECP99NVVB					
		S,4V		ECP99NVVA					
		D,2V		ECP99NVWB					
		D,4V		ECP99NVWA					
44	Check Hook Movement Label (bottom front of cover)	S	1	ER1BS9557					

*Quantities in "()" are for 025 and 050 hoists.

9.2 Gearing Parts

001H/HD,003S/SD,003H/HD,
005S/SD, 005L/LD,010S/SD,
010L/LD, 020C/CD

Parts for Friction Clutch with Mechanical Brake Specification

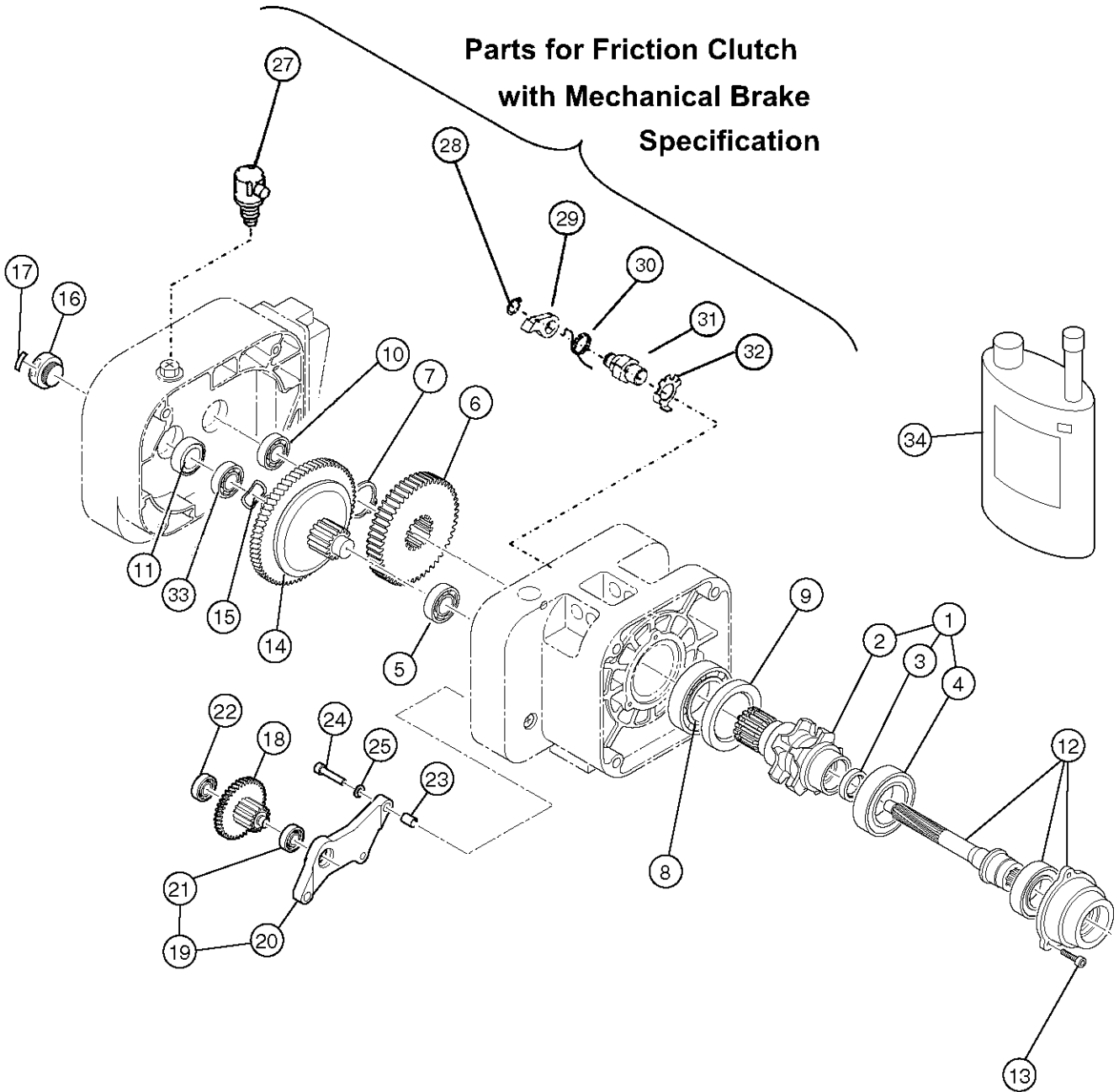


Figure 9-2-1 Gearing Parts

9.2 Gearing Parts

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005S	005L	010S	010L/020C
1	Load Sheave Assembly	1	ER2BS6241		ER2CS6241			ER2DS6241	
2	Load Sheave	1	ER2BS9241		ER2CS9241			ER2DS9241	
3	Oil Seal	1	ER2BS9221		ER2CS9221			ES221010S	
4	Ball Bearing	1	9000506		9000508			9000509	
5	Ball Bearing	1	9000202		9000104		9000302	9000104	9000304
6	Load Gear	F	ER2BH9240	ER2BS9240	ER2CH9240	ER2CS9240	ER2CL9240	ER2DS9240	
		M					ER2CS9240		
7	Snap Ring	1	9047130		9047135				
8	Ball Bearing	1	9000106		9000107			9000108	
9	Oil Seal	1	ER2BS9244		ES232005S			ES232010S	
10	Ball Bearing	1	9000200		9000201			9000301	
11	Oil Seal	F	E6F235003S						
12	Pinion Assembly	F	ER2BS5220		ER2CS5220			ER2DS5220	
		M	ER2BS5304		ER2CS5304			ER2DS5304	
13	Socket Bolt	3	90912149						
14	Friction Clutch Complete Assembly	F	ER2BH1223	ER2BS1223	ER2CH1223	ER2CS1223	ER2CL1223	ER2DS1223	ER2DL1223
	Friction Clutch With Mechanical Brake Complete Assembly	M	ER2BH1274	ER2BS1274	ER2CH1274	ER2CS1274	ER2CL1274	ER2DS1274	ER2DL1274
15	Wave Washer	F	E1DBX20S9311						
16	Nut Cover	F	ER1CS9235						
17	Name Plate FP (Adjustment Of Friction Clutch Prohibited)	F	ER1BS9892						
18	Gear B Assembly	F							ER2DL5262
		M							ER2DL5306
19	Gear Holder Plate Assembly	F							ER2DL6261
		M							
20	Gear Holder Plate	F							ER2DL9261
		M							
21	Ball Bearing	F							9000101
		M							
22	Ball Bearing	F							9000100
		M							
23	Set Pin S	F							ES120003
		M							
24	Socket Bolt	F							9091252
		M							
25	Spring Lock Washer	F							9012709
		M							
27	Vent Cap	M	ER1BS1175						
28	Snap Ring	M	9047111						
29	Pawl	M	L4155015						
30	Pawl Spring	M	ER1BS9290						
31	Pawl Shaft	M	ER2CS9289						
32	Pawl Shaft Washer	M	ER2CS9294						
33	Ball Bearing	M	9000300		9000202				
34*	NER2 Gear Oil 1qt	F				ER1BS1855*			
	NER2 Gear Oil 2.5 gal	F				ER1CS1855*			
	ER2 Gear Oil 1qt	M				7019801*			
	ER2 Gear Oil 2.5 gal	M				7019802*			

*Refer to Section 2.1.1 to for how to identify NER2 verse ER2. Refer to Section 6.3 for the amount of gear oil required and for the method to check the oil level.

9.2 Gearing Parts

**015S/SD, 020S/SD, 020L/LD,
030C/CD, 025S/SD, 050L/LD**

Parts for Friction Clutch with Mechanical Brake Specification

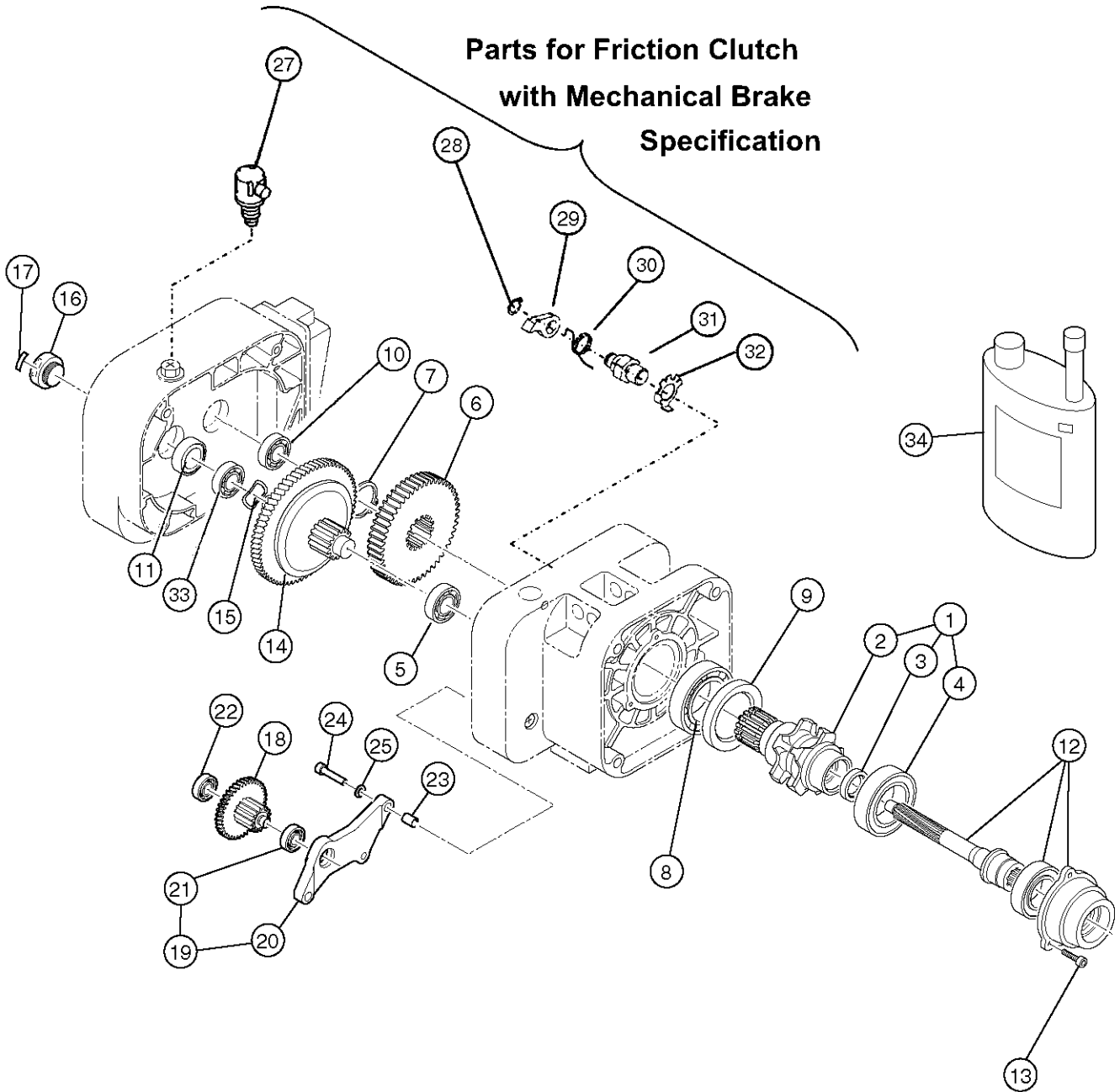


Figure 9-2-2 Gearing Parts

9.2 Gearing Parts

Figure No.	Part Name	Parts Per Hoist	015S	020L	020S	030C	025S	050L	
1	Load Sheave Assembly	1	ER2ES6241				ER2FS6241		
2	Load Sheave	1	ER2ES9241				ER2FS9241		
3	Oil Seal	1	ER2ES9221						
4	Ball Bearing	1	9000609				9000610		
5	Ball Bearing	1	9000405						
6	Load Gear	1	ER2EM9240	ER2EL9240	ER2ES9240	ER2ER9240	ER2FS9240		
7	Snap Ring	1	9047150						
8	Ball Bearing	1	9000110						
9	Oil Seal	1	ER2ES9244						
10	Ball Bearing	1	9000303						
11	Oil Seal 22	F 1	ER1DS9233						
12	Pinion Assembly	F 1	ER2EL5220		ER2ES5220		ER2FS5220		
		M 1	ER2EL5304		ER2ES5304		ER2FS5304		
13	Socket Bolt	3	90912149						
14	Friction Clutch Complete Assembly	F 1	ER2EM1223	ER2EL1223	ER2ES1223	ER2ER1223	ER2FS1223	ER2FR1223	
	Friction Clutch With Mechanical Brake Complete Assembly	M 1	ER2EM1274	ER2EL1274	ER2ES1274	ER2ER1274	ER2FS1274	ER2FR1274	
15	Wave Washer	F 1	ER1DS9234		ER2ES9234				
16	Nut Cover	F 1	ER1DS9235		ER2ES9235				
17	Name Plate FP (Adjustment Of Friction Clutch Prohibited)	F 1	ER1BS9892						
18	Gear B Assembly	F 1	ER2EM5262	ER2EL5262				ER2FS5262	
		M 1	ER2EM5306	ER2EL5306				ER2FS5306	
19	Gear Holder Plate Assembly	1	ER2EL6261					ER2FS6261	
20	Gear Holder Plate	1	ER2EL9261					ER2FS9261	
21	Ball Bearing	1	9000202					9000203	
22	Ball Bearing	1	9000201					9000202	
23	Set Pin S	2	ES120010S					ES120010S	
24	Socket Bolt	3	9091275					9091275	
25	Spring Lock Washer	3	9012711					9012711	
27	Vent Cap	M 1	ER1BS1175						
28	Snap Ring	M 1	9047116						
29	Pawl	M 1	ER2FS9288						
30	Pawl Spring	M 1	ER2FS9290						
31	Pawl Shaft	M 1	ER2FS9289						
32	Pawl Shaft Washer	M 1	ER2CS9294						
33	Ball Bearing	M 1	9000303			9000304			
34	NER2 Gear Oil 1qt	F 1	ER1BS1855*						
	NER2 Gear Oil 2.5 gal	F 1	ER1CS1855*						
	ER2 Gear Oil 1qt	M 1	7019801*						
	ER2 Gear Oil 2.5 gal	M 1	7019802*						

*Refer to Section 2.1.1 to for how to identify NER2 verse ER2. Refer to Section 6.3 for the amount of gear oil required and for the method to check the oil level.

9.3 Hook and Chain Parts

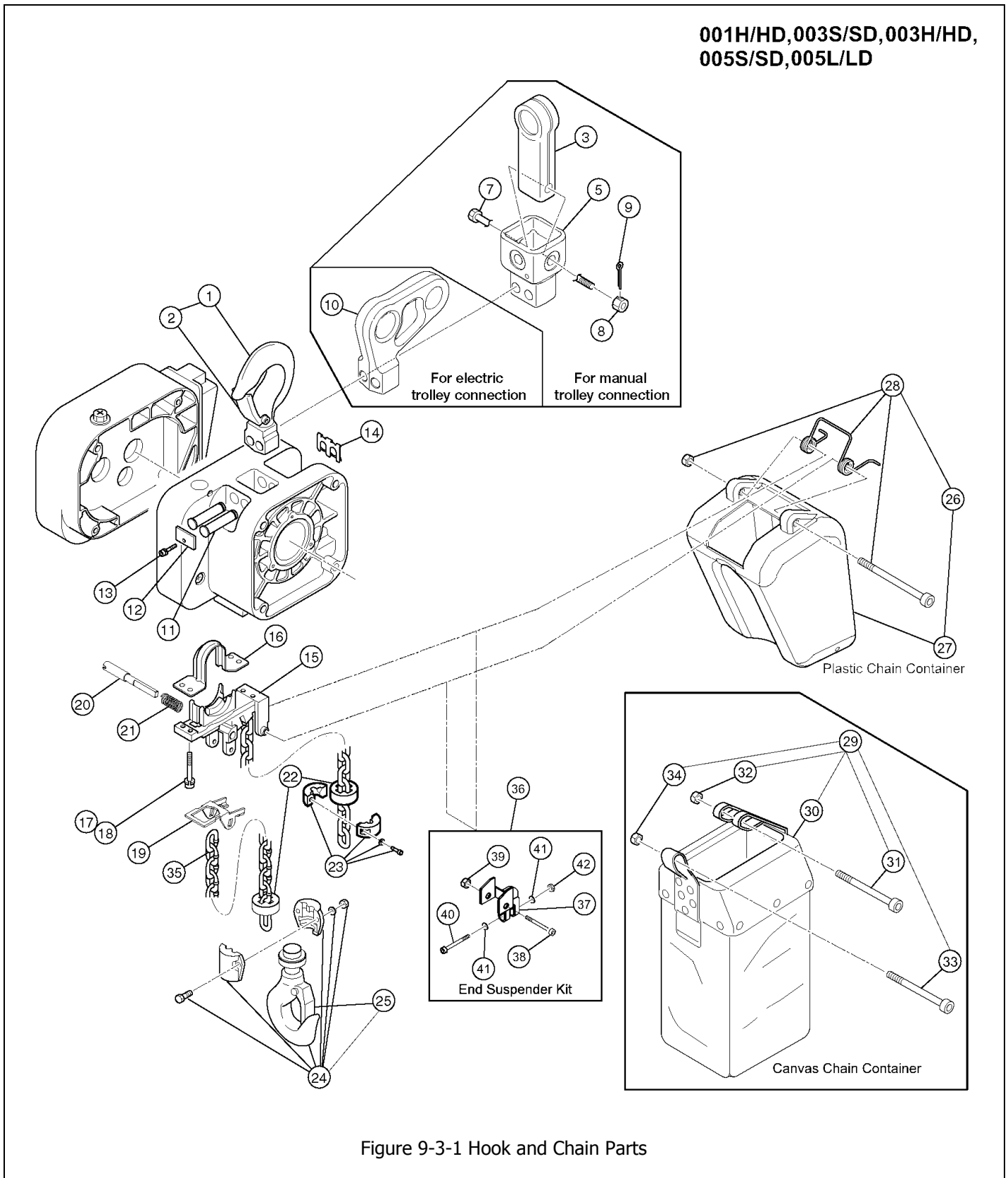


Figure 9-3-1 Hook and Chain Parts

9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005S	005L
1	Top Hook Assembly	1	ER2CS1001				
2	Hook Latch	1	ER2CS1002				
3	Suspender E (For Manual Trolley)	1	T7GB004010				
5	Connection Yoke PG* (For Manual Trolley)	1	ER2CS5027*				
7	Yoke Bolt	1	ER1CS9032				
8	Slotted Nut	1	L3183008				
9	Split Pin	1	9009414-5				
10	Suspender T (For Motorized Trolley)	1	ER2DS9031				
11	Top Pin	2	ER2CS9121				
12	Plate A	1	ER2CS9123				
13	Socket Bolt With Spring Washer	1	J1BG10601212				
14	Shaft Clip	1	ER2CS9186				
15	Chain Guide A	1	ER2BS9331		ER2CS9331		
16	Chain Guide B	1	ER2BS9332		ER2CS9332		
17	Socket Bolt	4	9091251				
18	Spring Lock Washer	4	9012709				
19	Limit Lever	1	ER2BS9337		ER2CS9337		
20	Limit Lever Pin	1	ER2BS9338		ER2CS9338		
21	Limit Lever Spring	1	ER2CS9357				
22	Cushion Rubber	2	ER2BS9053		ER1CS9053		
23	Stopper Assembly	1	ES1045003		ER2CS1041		
24	Bottom Hook Complete Assembly	1	ER2BH1011	ER2BS1011	ER2CH1011	ER2CS1011	
25	Hook Latch	1	ER2CS1002				
26	Plastic Chain Container Assembly (Max. Lifting Height 20ft)	1	PBK2-B		PBK2-C		
27	Plastic Chain Container	1	ER2BS1401		ER2CS1401		
28	Plastic Container Spring Assembly	1	ER2BS1416		ER2CS1416		
29	Canvas Chain Container Assembly (Max. Lift Height 50ft)	1	BK2C1		BK2C2		
30	Canvas Chain Container	1	ER2CS5403		ER2CS5405		
31	Socket Bolt	1	9091283				
32	Lever Nut	1	ES857005S				
33	Socket Bolt	1	ER419001				
34	Lever Nut	1	ES855003				
35	NP Load Chain	1	LCER2003NP		LCER2005NP		
36	End Suspender Kit	1	ENDS2B		ENDS2C		
37	End Suspender	1	ER2BS9408		ER2CS9408		
38	Socket Bolt	1	9091281		9091283		
39	Lever Nut	1	ES857005S				
40	Socket Bolt	1	90912150		90912151		
41	Flat Washer	2	9012510		9012511		
42	Lever Nut	1	E2D853125		ES855003		

*Connection Yoke PG replaces Connection Yoke P (ER2CS9027) and Connection Yoke G (ER2CS9029)

9.3 Hook and Chain Parts

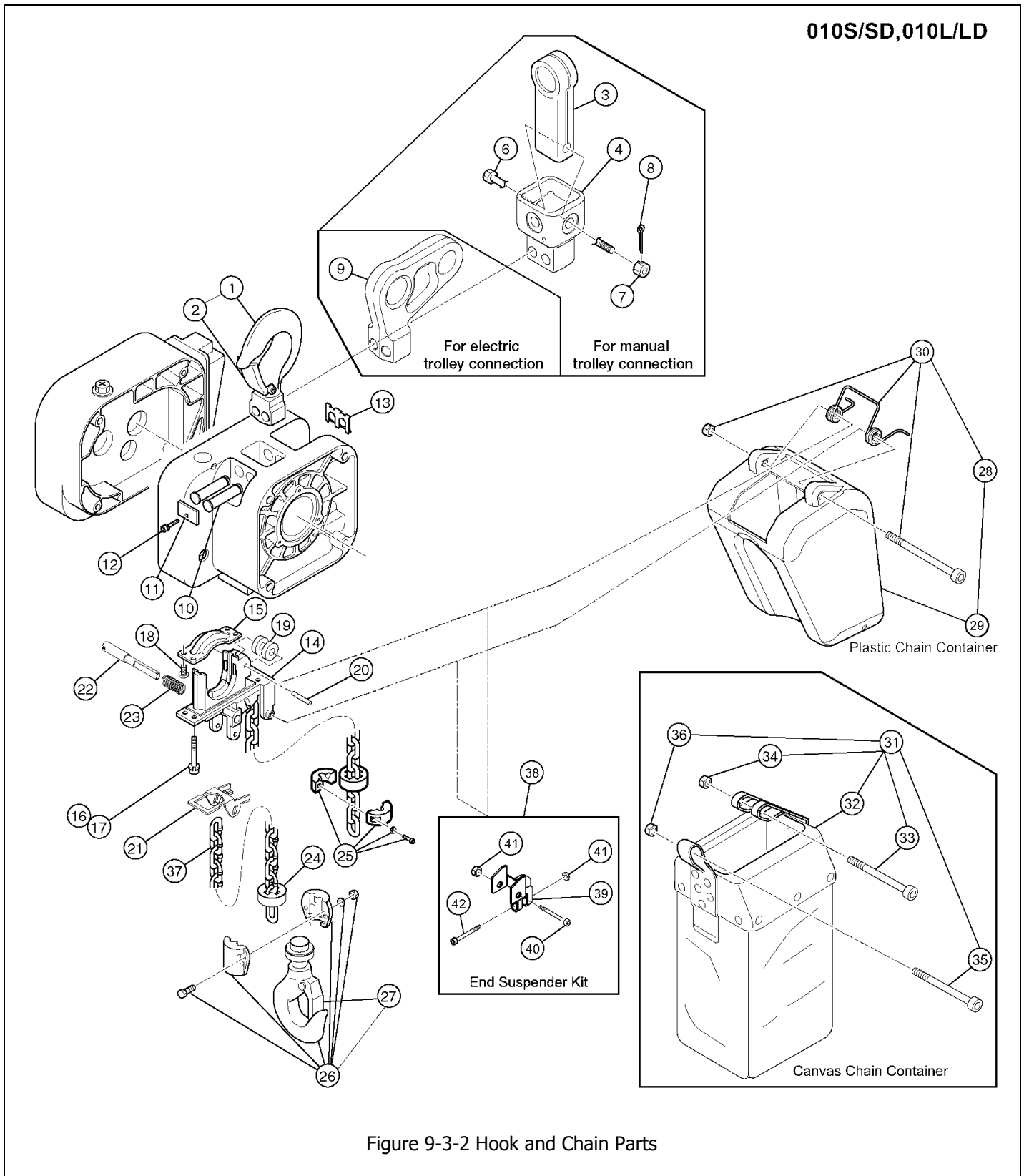


Figure 9-3-2 Hook and Chain Parts

9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	010S	010L
1	Top Hook Assembly	1	ER2DS1001	
2	Hook Latch	1	ER2DS1002	
3	Suspender E (For Manual Trolley)	1	T7GB004010	
4	Connection Yoke PG* (For Manual Trolley)	1	ER2CS5027*	
6	Yoke Bolt	1	ER1CS9032	
7	Slotted Nut	1	L3183008	
8	Split Pin	1	9009414-5	
9	Suspender T (For Motorized Trolley)	1	ER2DS9031	
10	Top Pin, Lot No. ER2A-..., 2.7in (69mm) Long	2	ER2CS9121	
	Top Pin, Lot No. ER2B-..., 3.7in (95mm) Long	2	ER2DS9121	
11	Plate A	1	ER2CS9123	
12	Socket Bolt With Spring Washer	1	J1BG10601212	
13	Shaft Clip	1	ER2CS9186	
14	Chain Guide A	1	ER2DS9331	
15	Chain Guide B	1	ER2DS9332	
16	Socket Bolt	4	9091274	
17	Spring Lock Washer	4	9012711	
18	Machine Screw With Spring Washer	4	M6F554010	
19	Guide Roller	1	ER2DS9333	
20	Roller Pin	1	ER1CS9334	
21	Limit Lever	1	ER2DS9337	
22	Limit Lever Pin	1	ER2DS9338	
23	Limit Lever Spring	1	ER2CS9357	
24	Cushion Rubber	2	ER1DS9053	
25	Stopper Assembly	1	ER1DS1041	
26	Bottom Hook Complete Assembly	1	ER2DS1011	
27	Hook Latch	1	ER2DS1002	
28	Plastic Chain Container Assembly (Max. Lifting Height 20ft)	1	PBK2-D	
29	Plastic Chain Container	1	ER2DS1401	
30	Plastic Container Spring Assembly	1	ER2DS1416	
31	Canvas Chain Container Assembly (Max. Lifting Height 50ft)	1	BK2D2	
32	Canvas Chain Container	1	ER2DS5405	
33	Socket Bolt	1	9091286	
34	Lever Nut	1	ES857005S	
35	Socket Bolt	1	ER419001	
36	Lever Nut	1	ES855003	
37	NP Load Chain	1	LCER2010NP	
38	End Suspender Kit	1	ENDS2D	
39	End Suspender	1	ER2CS9408	
40	Socket Bolt	1	90912153	
41	Lever Nut	2	ES857005S	
42	Socket Bolt	1	90912152	

*Connection Yoke PG replaces Connection Yoke P (ER2CS9027) and Connection Yoke G (ER2CS9029)

9.3 Hook and Chain Parts

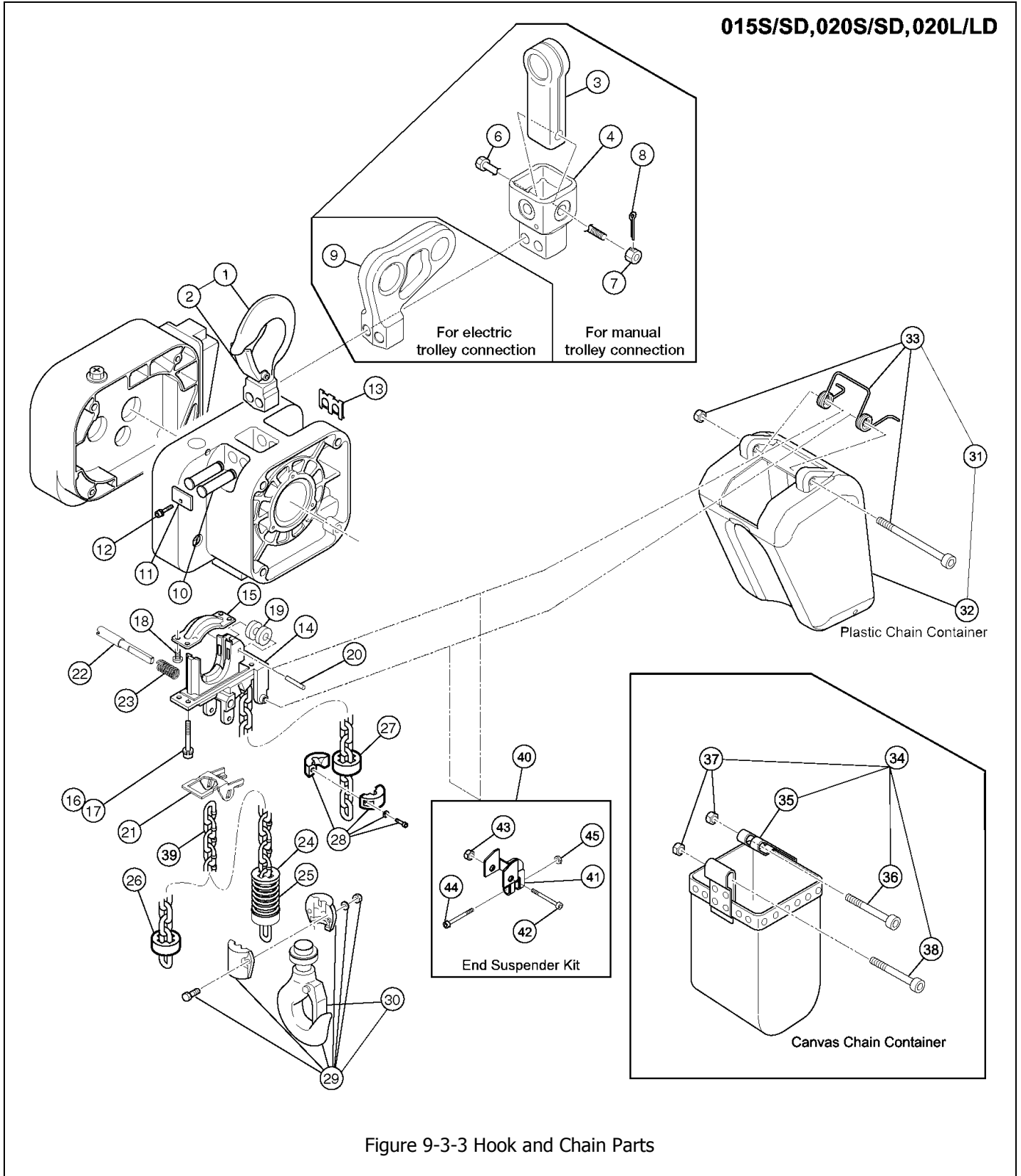


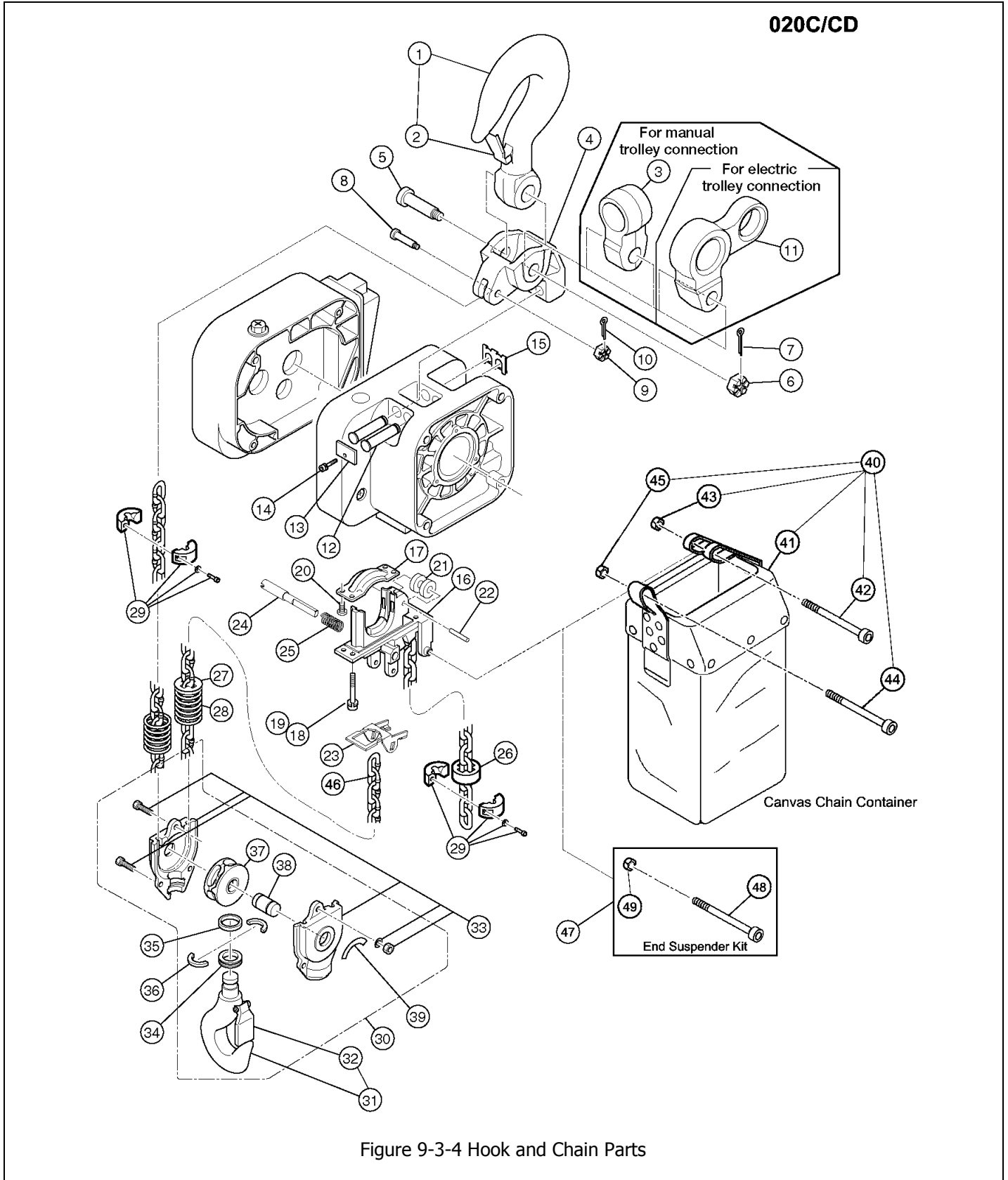
Figure 9-3-3 Hook and Chain Parts

9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	015S	020S	020L
1	Top Hook Assembly	1		ER2ES1001	
2	Hook Latch	1		ER2ES1002	
3	Suspender E (For Manual Trolley)	1		T7GB004020	
4	Connection Yoke PG* (For Manual Trolley)	1		ER2ES5027*	
6	Yoke Bolt	1		ER1ES9032	
7	Slotted Nut	1		ES088020L	
8	Split Pin	1		9009436	
9	Suspender T	1		ER2ES9031	
10	Top Pin	2		ER2ES9121	
11	Plate A	1		ER2ES9123	
12	Socket Bolt With Spring Washer	1		J1BG10601212	
13	Shaft Clip	1		ER2ES9186	
14	Chain Guide A	1		ER2ES9331	
15	Chain Guide B	1		ER2ES9332	
16	Socket Bolt	4		9091274	
17	Spring Lock Washer	4		9012711	
18	Machine Screw With Spring Washer	4		E6F151003	
19	Guide Roller	1		ER1DL9333	
20	Roller Pin	1		ER1DL9334	
21	Limit Lever	1		ER2ES9337	
22	Limit Lever Pin	1	ER2EL9338	ER2ES9338	ER2EL9338
23	Limit Lever Spring	1		ER2CS9357	
24	Limiting Plate	1		ER1ES9054	
25	Chain Spring	1		E7SS020S9047	ER1DL9051
26	Cushion Rubber	1	ER1ES9053		
27	Cushion Rubber	1		ER1ES9053	
28	Stopper Assembly	1		ER1ES1041	
29	Bottom Hook Complete Assembly	1	ER2EM1011	ER2ES1011	
30	Hook Latch	1	ER2EM1002	ER2ES1002	
31	Plastic Chain Container Assembly (Max. Lifting Height 13ft)	1		PBK2-E	
32	Plastic Chain Container	1		ER2ES1401	
33	Plastic Container Spring Assembly	1		ER2ES1416	
34	Canvas Chain Container Assembly (Max. Lifting Height 60ft)	1		BK2E2	
35	Canvas Chain Container	1		ER2ES5405	
36	Socket Bolt	1		90912107	
37	Lever Nut	2		ES066075	
38	Socket Bolt	1		90912104	
39	NP Load Chain	1		LCER2020NP	
40	End Suspender Kit	1		ENDS2E	
41	End Suspender	1		ER2ES9408	
42	Socket Bolt	1		90912107	
43	Lever Nut	1		ES066075	
44	Socket Bolt	1		90912152	
45	Lever Nut	1		ES857005S	

*Connection Yoke PG replaces Connection Yoke P (ER2ES9027) and Connection Yoke G (ER2ES9029)

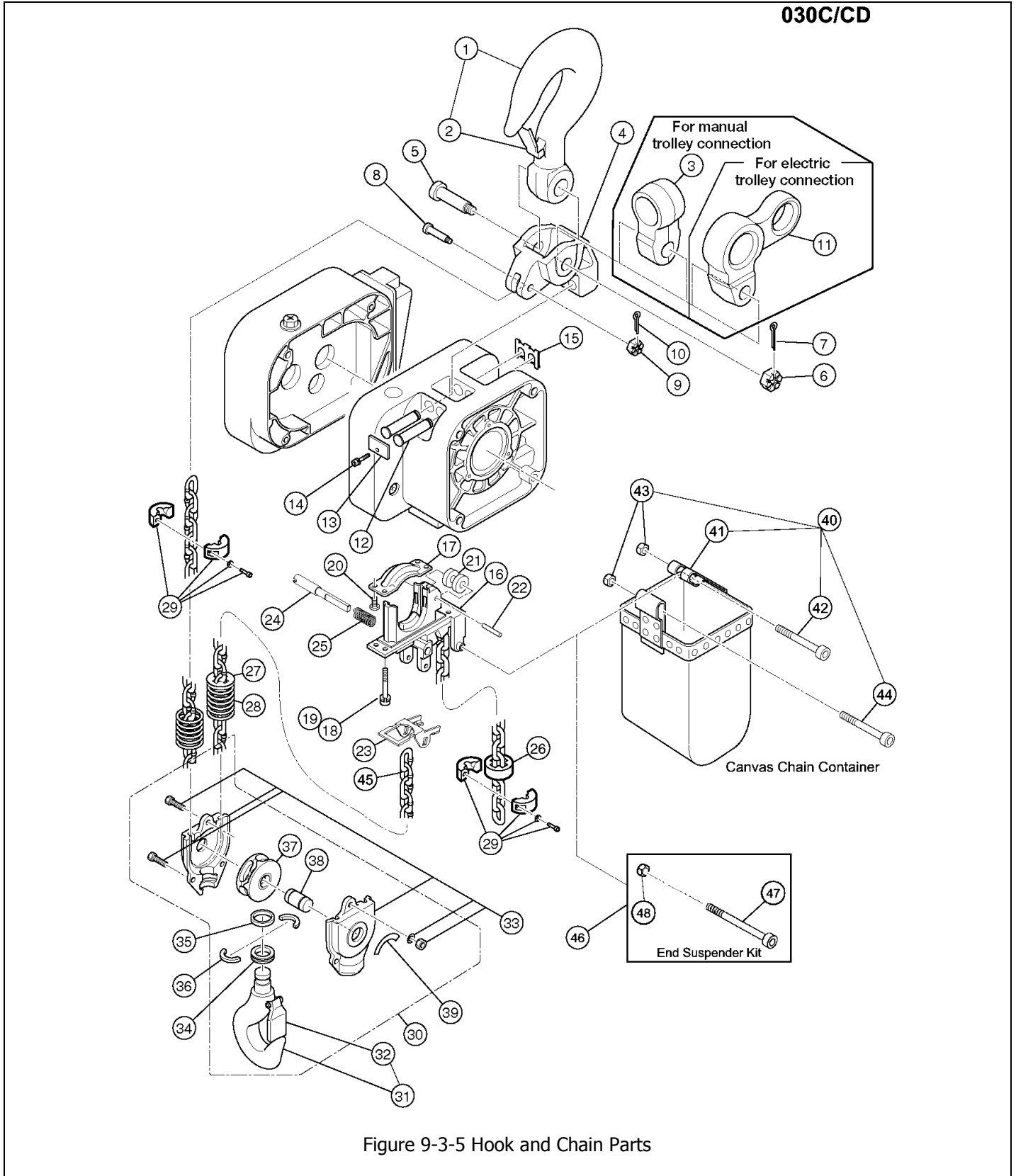
9.3 Hook and Chain Parts



9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	020C
1	Top Hook Assembly	1	ER2DR1001
2	Hook Latch	1	ER2DS1002
3	Suspender E (For Manual Trolley)	1	T7GB004020
4	Connection Yoke D	1	ER2DR9030
5	Yoke Bolt	1	ER1ES9032
6	Slotted Nut	1	ES088020L
7	Split Pin	1	9009436
8	Chain Pin	1	M2041010
9	Slotted Nut	1	M2049010
10	Split Pin	1	9009412
11	Suspender T (For Motorized Trolley)	1	ER2DR9031
12	Top Pin, Lot No. ER2A-..., 2.7in (69mm) Long	2	ER2CS9121
	Top Pin, Lot No. ER2B-..., 3.7in (95mm) Long	2	ER2DS9121
13	Plate A	1	ER2CS9123
14	Socket Bolt With Spring Washer	1	J1BG10601212
15	Shaft Clip	1	ER2CS9186
16	Chain Guide A	1	ER2DS9331
17	Chain Guide B	1	ER2DS9332
18	Socket Bolt	4	9091274
19	Spring Lock Washer	4	9012711
20	Machine Screw With Spring Washer	4	E6F151003
21	Guide Roller	1	ER1DS9333
22	Roller Pin	1	ER1DL9334
23	Limit Lever	1	ER2DS9337
24	Limit Lever Pin	1	ER2DS9338
25	Limit Lever Spring	1	ER2CS9357
26	Cushion Rubber	2	ER1DS9053
27	Limiting Plate	1	ER2DR9054
28	Chain Spring	2	ER1DS9051
29	Stopper Assembly	2	ER1DS1041
30	Bottom Hook Complete Assembly	1	ER2DR1011
31	Bottom Hook Assembly	1	ER2DR2011
32	Hook Latch	1	ER2DS1002
33	Bottom Yoke Assembly	1	ER2DR2015
34	Thrust Bearing	1	ES022015
35	Thrust Collar A	1	ES026015
36	Hook Stopper A	2	ES027015
37	Idle Sheave Assembly	1	ER2DR6021
38	Bottom Shaft Assembly	1	ER2DR6023
39	Name Plate C	1	80173
40	Canvas Chain Container Assembly (Max. Lifting Height 26ft)	1	BK2D2
41	Canvas Chain Container	1	ER2DS5405
42	Socket Bolt	1	9091286
43	Lever Nut	1	ES857005S
44	Socket Bolt	1	ER419001
45	Lever Nut	1	ES855003
46	NP Load Chain	1	LCER2010NP
47	End Suspender Kit	1	ENDS2D2
48	Socket Bolt	1	90912153
49	Lever Nut	1	ES857005S

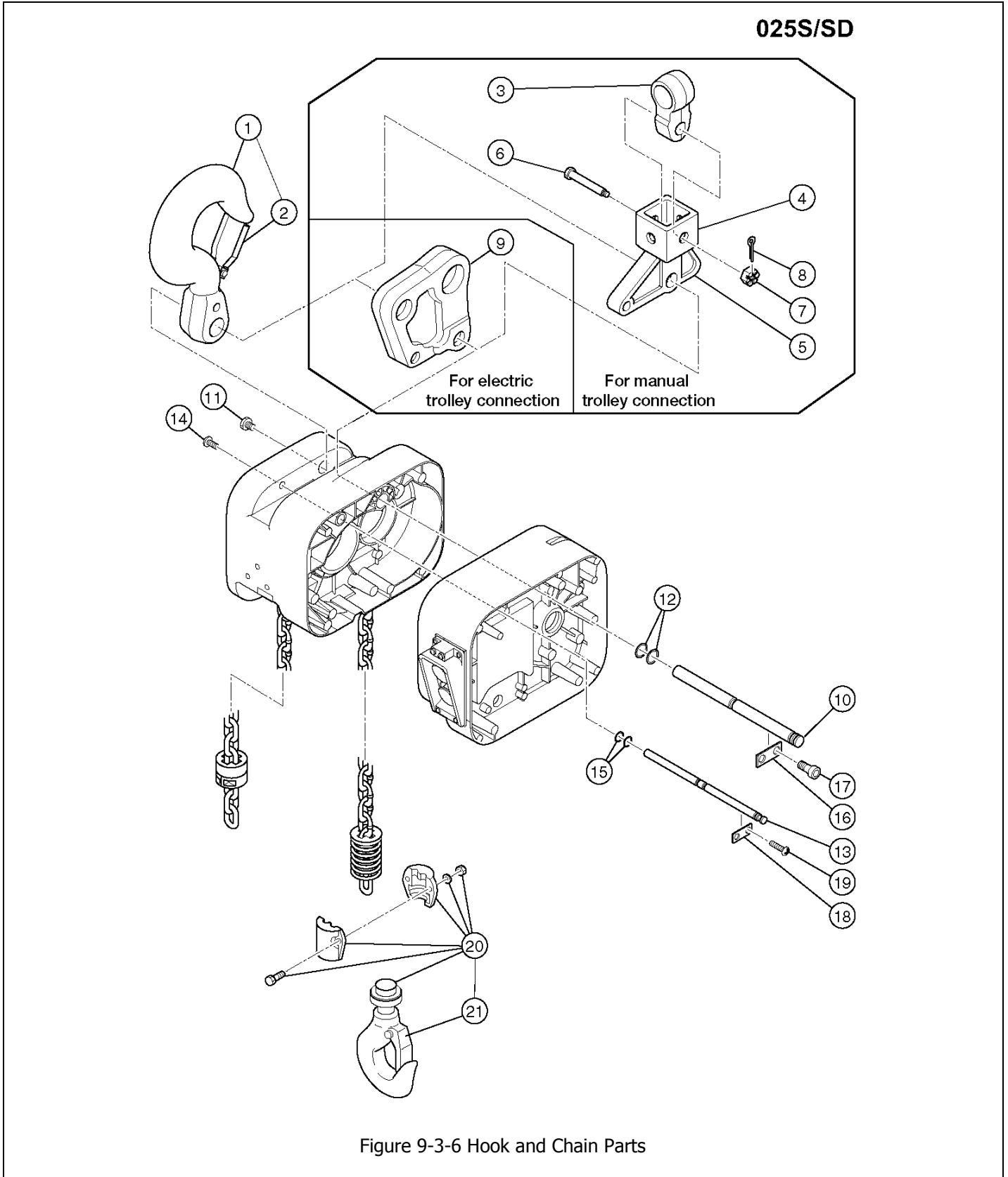
9.3 Hook and Chain Parts



9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	030C
1	Top Hook Assembly	1	ER2ER1001
2	Hook Latch	1	ER2ER1002
3	Suspender E (For Manual Trolley)	1	T7GB004030
4	Connection Yoke D	1	ER2ER9030
5	Yoke Bolt	1	ER1ES9032
6	Slotted Nut	1	L3183008
7	Split Pin	1	9009436
8	Chain Pin	1	ES041030
9	Slotted Nut	1	M2049020
10	Split Pin	1	9009416
11	Suspender T (For Motorized Trolley)	1	ER2ER9031
12	Top Pin	2	ER2ES9121
13	Plate A	1	ER2ES9123
14	Socket Bolt With Spring Washer	1	J1BG10601212
15	Shaft Clip	1	ER2ES9186
16	Chain Guide A	1	ER2ES9331
17	Chain Guide B	1	ER2ES9332
18	Socket Bolt	4	9091274
19	Spring Lock Washer	4	9012711
20	Machine Screw With Spring Washer	4	E6F151003
21	Guide Roller	1	ER1DL9333
22	Roller Pin	1	ER1DL9334
23	Limit Lever	1	ER2ES9337
24	Limit Lever Pin	1	ER2ES9338
25	Limit Lever Spring	1	ER2CS9357
26	Cushion Rubber	1	ER1EM9053
27	Limiting Plate	1	ER1ES9054
28	Chain Spring	2	ES047015
29	Stopper Assembly	2	ER1ES1041
30	Bottom Hook Complete Assembly	1	ER2ER1011
31	Bottom Hook Assembly	1	ER2ER2011
32	Hook Latch	1	ER2ER1002
33	Bottom Yoke Assembly	1	ER2ER2015
34	Thrust Bearing	1	ES022025
35	Thrust Collar A	1	ES026025
36	Hook Stopper A	2	ES027025
37	Idle Sheave Assembly	1	ER2ER6021
38	Bottom Shaft Assembly	1	ER2ER6023
39	Name Plate C	1	80173
40	Canvas Chain Container Assembly (Max. Lifting Height 20ft)	1	BK2E1
41	Canvas Chain Container	1	ER2ES5403
42	Socket Bolt	1	90912107
43	Lever Nut	2	ES066075
44	Socket Bolt	1	90912104
45	NP Load Chain	1	LCER2020NP
46	End Suspender Kit	1	ENDS2E2
47	Socket Bolt	1	90912107
48	Lever Nut	1	ES066075

9.3 Hook and Chain Parts

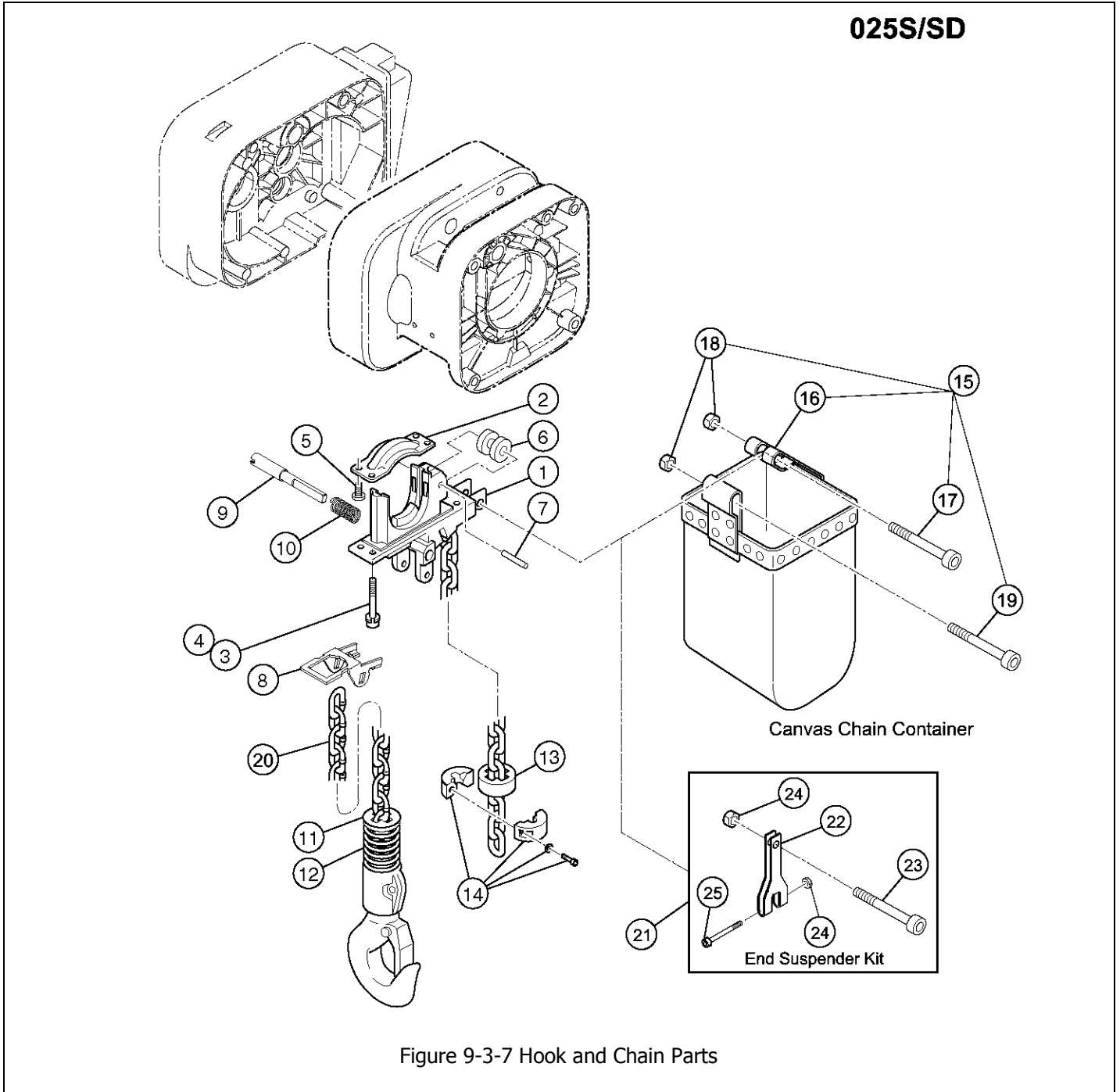


9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	025S
1	Top Hook Complete Assembly	1	ER2FS1001
2	Hook Latch	1	ER2FS1002
3	Suspender E (For Manual Trolley)	1	T7GB004030
4	Connection Yoke PG* (For Manual Trolley)	1	ER2FS5027*
6	Yoke Bolt	1	ER2FS9032
7	Slotted Nut	1	ES088020L
8	Split Pin	1	9009436
9	Suspender T (For Motorized Trolley)	1	ER2FS9031
10	Connection Shaft Assembly	1	ER2FS6121
11	Shaft Plug	1	ER2FS9128
12	O Ring	2	9013317
13	Fixing Shaft Assembly	1	ER2FS6122
14	Fixing Shaft Plug	1	ER2FS9131
15	O Ring	2	9013307
16	Connection Shaft Plate A	1	ER1ES9123
17	Socket Bolt With Spring Washer	2	J1BG10601616
18	Fixing Shaft Plate A	1	ER1BS9123
19	Machine Screw With Spring Washer	2	M6F554010
20	Bottom Hook Complete Assembly	1	ER2FS1011
21	Hook Latch	1	ER2ES1002

*Connection Yoke PG replaces Connection Yoke P (ER2FS9027) and Connection Yoke G (ER2FS9029)

9.3 Hook and Chain Parts



9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	025S
1	Chain Guide A	1	ER2FS9331
2	Chain Guide B	1	ER2FS9332
3	Socket Bolt	4	9091274
4	Spring Lock Washer	4	9012711
5	Machine Screw With Spring Washer	4	E6F151003
6	Guide Roller	1	ER1EM9333
7	Roller Pin	1	ER2FS9334
8	Limit Lever	1	ER2FS9337
9	Limit Lever Pin	1	ER2FS9338
10	Limit Lever Spring	1	ER2CS9357
11	Limiting Plate	1	ER1FH9054
12	Chain Spring	1	ER1EM9051
13	Cushion Rubber	1	ER1EM9053
14	Stopper Assembly	1	ER1ES1041
15	Canvas Chain Container Assembly (Max. Lifting Height 40ft)	1	BK2F2
16	Canvas Chain Container	1	ER2FS5405
17	Socket Bolt	1	90912140
18	Lever Nut	2	ES066075
19	Socket Bolt	1	90912104
20	NP Load Chain	1	LCER2025NP
21	End Suspender Kit	1	ENDS2F
22	End Suspender	1	ER1ES9408
23	Socket Bolt	1	90912101
24	Lever Nut	1	ES066075
25	Socket Bolt	1	90912140
26	Lever Nut	1	ES066075

9.3 Hook and Chain Parts

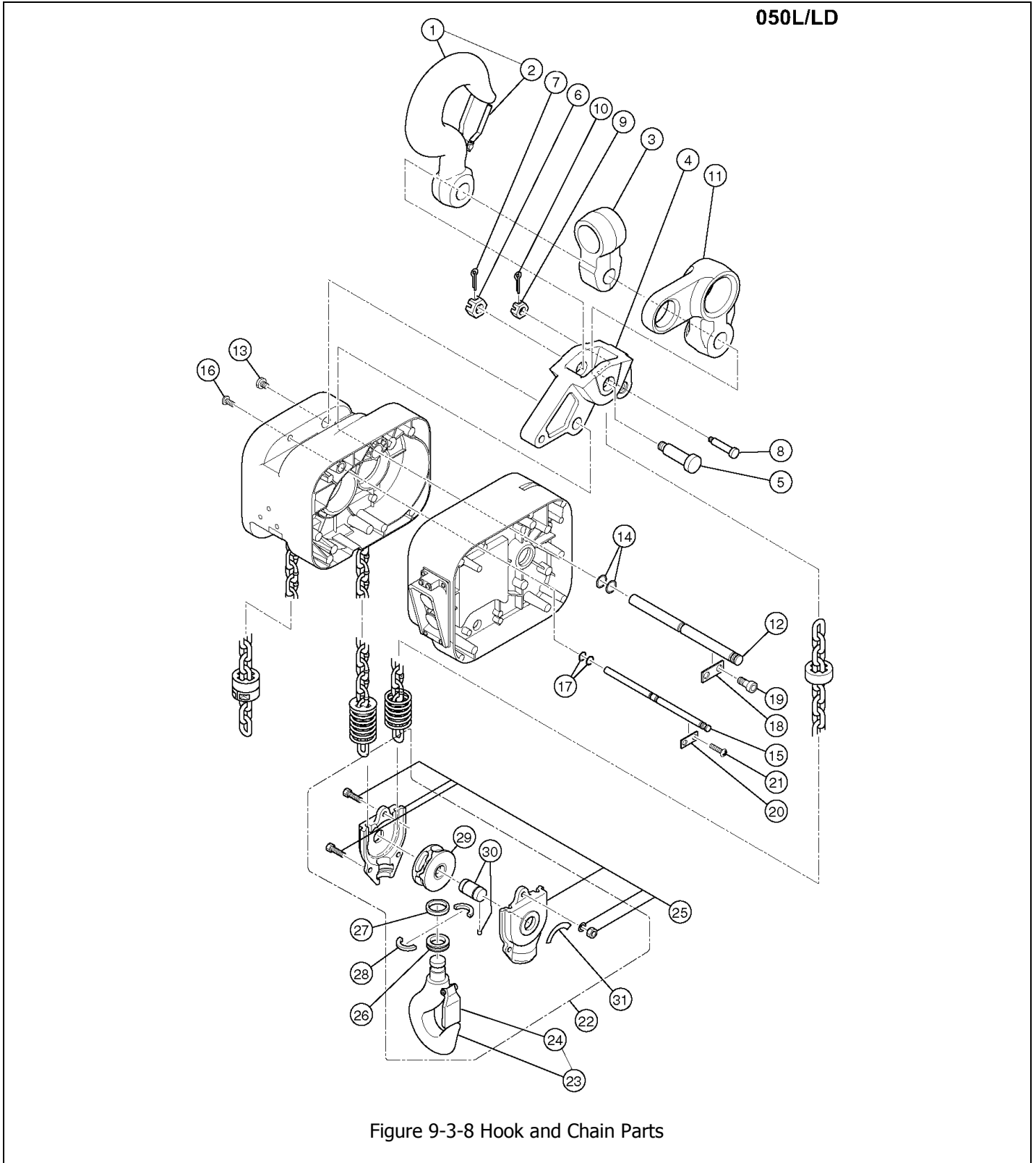
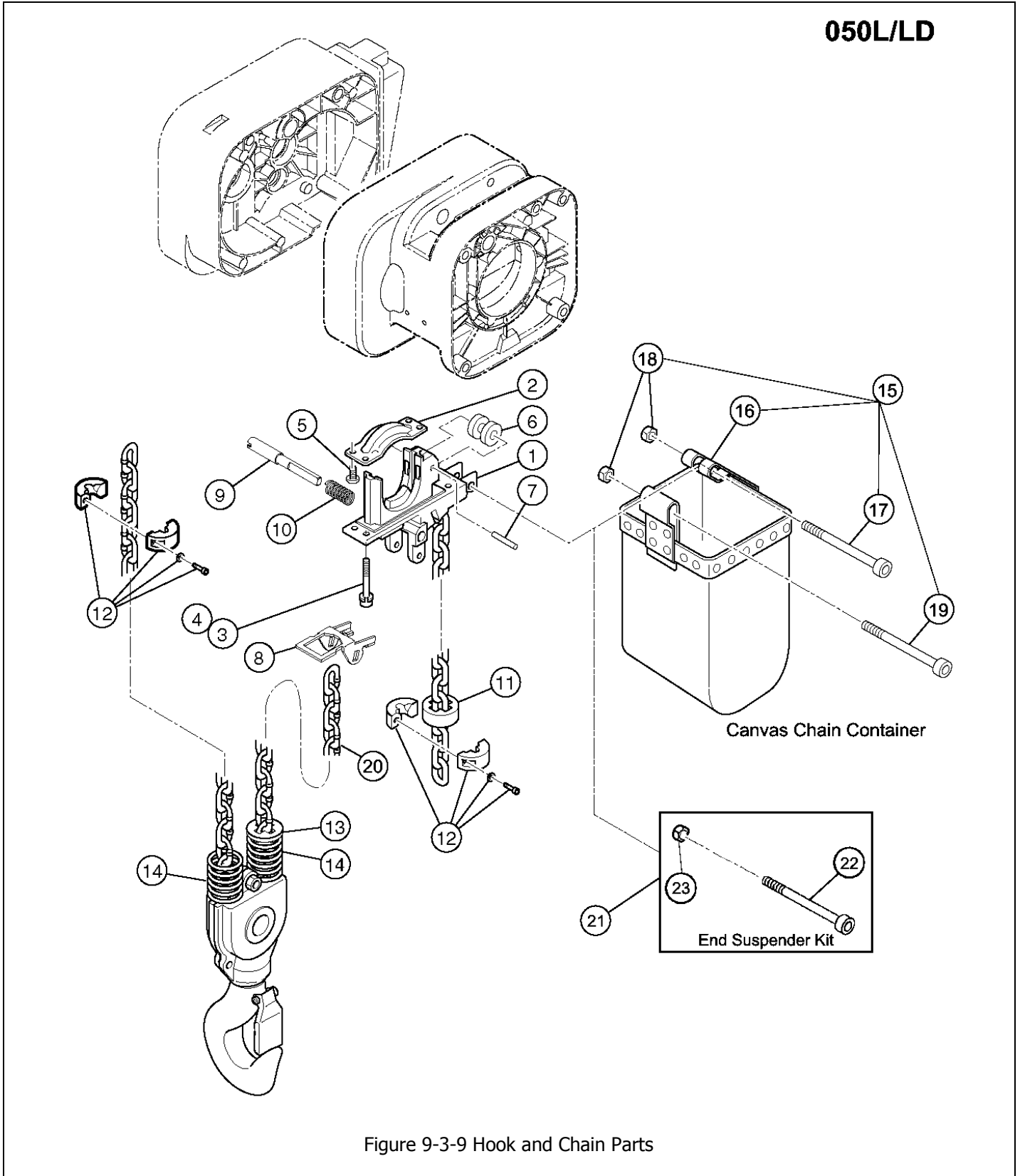


Figure 9-3-8 Hook and Chain Parts

9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	050L
1	Top Hook Assembly	1	ER2FR1001
2	Hook Latch	1	ER2FR9002
3	Suspender G (For Manual Trolley)	1	MR1GS9001
4	Connection Yoke D	1	ER2FR9030
5	Yoke Bolt	1	ES006050
6	Slotted Nut	1	J1NL00120200
7	Split Pin	1	9009437
8	Chain Pin	1	ES041050
9	Slotted Nut	1	M2049030
10	Split Pin	1	9009424
11	Suspender T (For Motorized Trolley)	1	ER1FR9031
12	Top Pin Assembly	1	ER2FS6121
13	Top Pin Plug Assembly	1	ER2FS6128
14	O Ring	2	9013317
15	Fixing Shaft Assembly	1	ER2FS6122
16	Fixing Shaft Plug Assembly	1	ER2FS6131
17	O Ring	2	9013307
18	Plate A	1	ER1ES9123
19	Socket Bolt With Spring Washer	2	J1BG10601616
20	Plate A	1	ER1BS9123
21	Machine Screw With Spring Washer	2	M6F554010
22	Bottom Hook Complete Assembly	1	ER2FR1011
23	Bottom Hook Assembly	1	ER2FR2011
24	Hook Latch	1	ER2FR9002
25	Bottom Yoke Assembly	1	ER2FR2015
26	Thrust Bearing	1	ES022050
27	Thrust Collar A	1	ES026050
28	Hook Stopper A	2	ES027050
29	Idle Sheave Assembly	1	ER2FR6021
30	Bottom Shaft Assembly	1	ES5054050
31	Name Plate C	1	80173

9.3 Hook and Chain Parts



9.3 Hook and Chain Parts

Figure No.	Part Name	Parts Per Hoist	050L
1	Chain Guide A	1	ER2FS9331
2	Chain Guide B	1	ER2FS9332
3	Socket Bolt	4	9091274
4	Spring Lock Washer	4	9012711
5	Machine Screw With Spring Washer	4	E6F151003
6	Guide Roller	1	ER1EM9333
7	Roller Pin	1	ER2FS9334
8	Limit Lever	1	ER2FS9337
9	Limit Lever Pin	1	ER2FS9338
10	Limit Lever Spring	1	ER2CS9357
11	Cushion Rubber	1	ER1EM9053
12	Stopper Assembly	2	ER1ES1041
13	Limiting Plate	1	ER1FH9054
14	Chain Spring	2	ER1EM9051
15	Canvas Chain Container Assembly (Max. Lifting Height 20ft)	1	BK2F2
16	Canvas Chain Container	1	ER2FS5405
17	Socket Bolt	1	90912140
18	Lever Nut	2	ES066075
19	Socket Bolt	1	90912104
20	NP Load Chain	1	LCER2025NP
21	End Suspender Kit	1	ENDS2F2
22	Socket Bolt	1	90912140
23	Lever Nut	1	ES066075

9.4 Electric Parts (Single Speed)

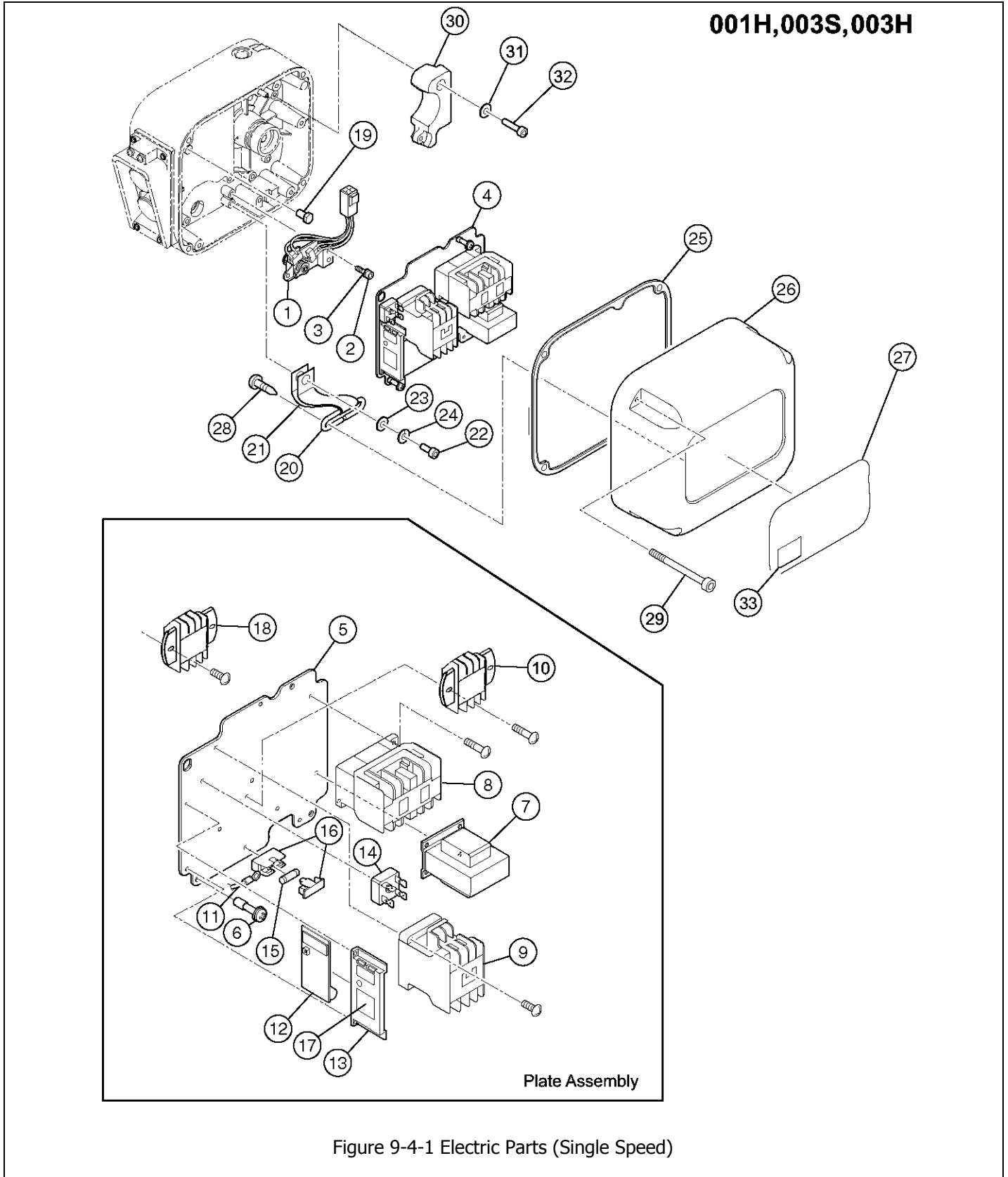


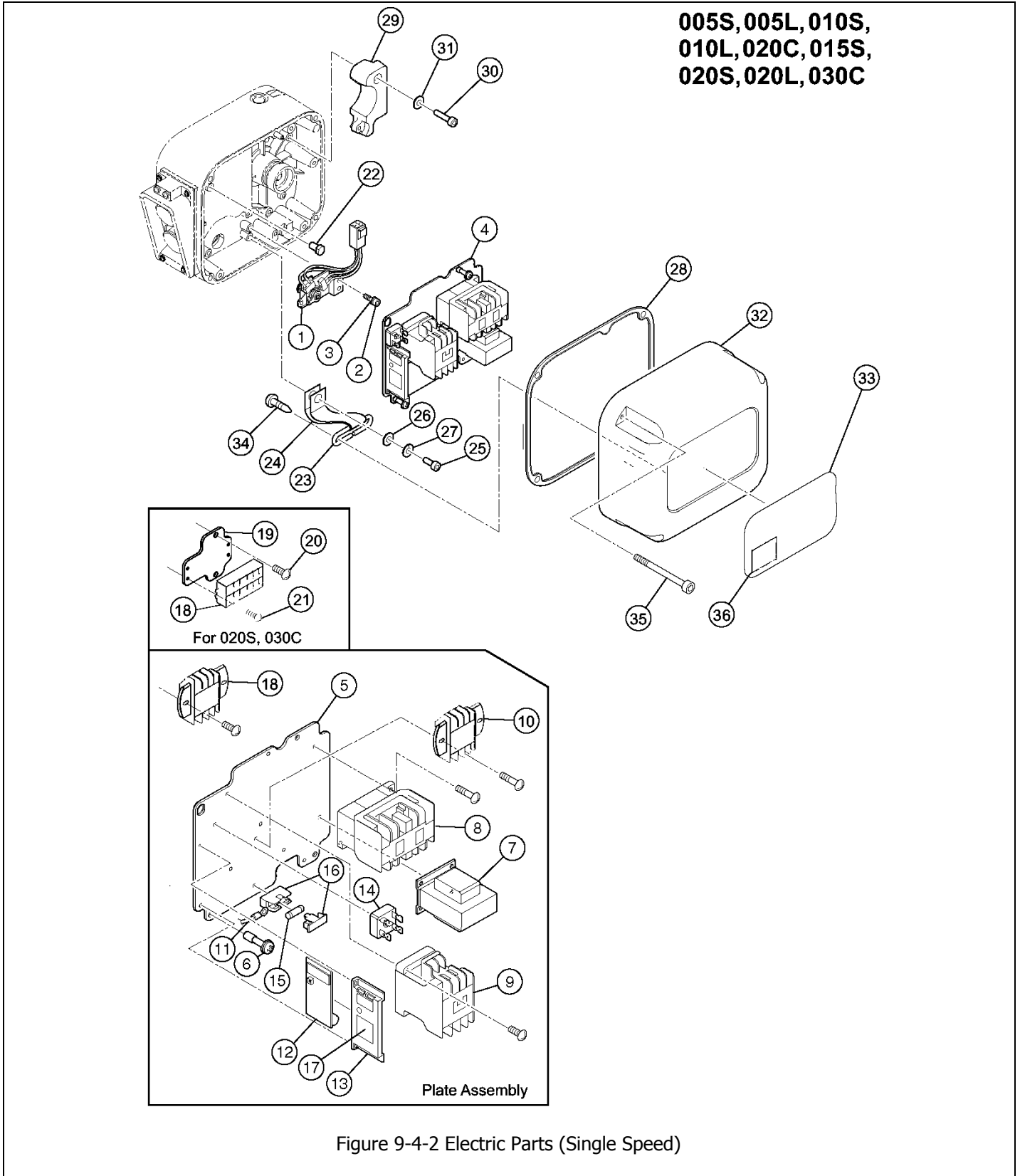
Figure 9-4-1 Electric Parts (Single Speed)

9.4 Electric Parts (Single Speed)

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H
1	Limit Switch Complete Assembly	1	ER2CI1060		
2	Socket Bolt	3	9091247		
3	Spring Lock Washer	3	9012709		
4	Plate Assembly	1	ER2GHM03S5A2	ER2GHM05S5A2	
5	Plate	1	ER2BS9441	ER2CS9441	
6	Plate Screw	3	ER1BS9445		
7	Transformer	1	TRF72V611	TRF73V611	
8	Electromagnetic Contactor	1	MGC23406C	MGC23406A	
9	E-Stop Contactor*	1	MGC13306F*		
			MGC14306C*		
10	Terminal Block 3P	1	ECP1303AB		
11	Lead Wire	1	ER2GHM03S9A2	ER2GHM05S9A2	
12	CH Meter	1	ECP91CHAF	ECP91CHAE	
13	CH Meter Support	1	ECP99BKBA		
14	Rectifier	1	ECP93DIAA		
15	Fuse	1	9006275		
16	Fuse Holder	1	ECP92FZAA		
17	Name Plate CH	1	ECP99CHAA		
18	Terminal Block 6P	1	ECP1306AD		
19	Fulcrum Pin	1	ER2CS9449		
20	Cover Suspender	1	ER2CS9456		
21	Cover Belt	1	ER2BI9457	ER2CS9457	
22	Socket Bolt	1	9091249		
23	Plain Washer	1	ER1BS9436		
24	Spring Lock Washer	1	9012709		
25	Packing C	F	ER2BS9117	ER2CS9117	
		M	ER2BI9117		
26	Controller Cover	F	ER2BS9104	ER2CS9104	
		M	ER2BS2302	ER2CS2302	
27	Name Plate B	1	ER2BHM03S9A5	ER2BHM05S9A5	
28	Pan Head Mach. Screw	2	9798534		
29	Socket Bolt With Spring Washer	4	J1BG10504022		
33	Name Plate D	1	ER2BHM01H9A6		ER2BHM03H9A6

*Refer to the alpha-numeric code on contactor. The Code "S-N11" corresponds to MGC13306H. The code "CLK-25J3" corresponds to MGC14306C.

9.4 Electric Parts (Single Speed)



9.4 Electric Parts (Single Speed)

Figure No.	Part Name	Parts Per Hoist	005S	005L	010S	010L/020C	015S	020L	020S	030C	
1	Limit Switch Complete Assembly	1	ER2CI1060								
2	Socket Bolt	3	9091247								
3	Spring Lock Washer	3	9012709								
4	Plate Assembly	1	ER2GHM05S 5A2	ER2GHM05L 5A2	ER2GHM10S5A2		ER2GHM20L5A2		ER2GHM20S5A2		
5	Plate	1	ER2CS9441		ER2DS9441		ER2ES9441				
6	Plate Screw	3	ER1BS9445								
7	Transformer	1	TRF73V611	TRF72V611	TRF73V611						
8	Electromagnetic Contactor	1	MGC23406A	MGC23406C	MGC23406A				MGC23406B		
9	E-Stop Contactor**	1	MGC13306F**						MGC13306H**		
10	Terminal Block 3P	1	ECP1303AB				ECP1303AB				
	Terminal Block 9P				ECP1309AB						
11	Lead Wire	1	ER2GHM05S 9A2	ER2GHM05L 9A2	ER2GHM05S9A2				ER2GHM20S9A2		
12	CH Meter	1	ECP91CHAE								
13	CH Meter Support	1	ECP99BKBA								
14	Rectifier	1	ECP93DIAA						ECP94DIAA		
15	Fuse	1	9006275								
16	Fuse Holder	1	ECP92FZAA								
17	Name Plate CH	1	ECP99CHAA								
18	Terminal Block 6P	1	ECP1306AD				ECP1306AD		ECP1306AF		
21	Machine Screw	2							9798512		
22	Fulcrum Pin	1	ER2CS9449								
23	Cover Suspender	1	ER2CS9456								
24	Cover Belt	1	ER2CS9457								
25	Socket Bolt	1	9091249								
26	Plain Washer	1	ER1BS9436								
27	Spring Lock Washer	1	9012709								
28	Packing C	1	ER2CS9117		ER2DS9117		ER2ES9117				
29	Balancer	F			ER2DS9109				ER2ES9109		
		M									
30	Socket Bolt	2	90912154		90912154						
		3							9091273		
31	Spring Lock Washer	2	9012709		9012709						
		3							9012711		
32	Controller Cover	F	ER2CS9104		ER2DS9104		ER2ES9104				
		M	ER2CS2302		ER2DS2302		ER2ES2302				
33	Name Plate B	1	ER2BHM05S9A5		ER2BHM10S9A5		ER2BHM20S9A5				
34	Pan Head Mach. Screw	2	9798534								
35	Socket Bolt With Spring Washer	4	J1BG10504022			J1BG10604024					
36	Name Plate D	1				ER2BHM20S9A6		ER2BHM15 M9A6		ER2BHM30 R9A6	

*Name Plate D for 020C ONLY

**Refer to the alpha-numeric code on contactor. The code "S-U12" corresponds to MGD13306F. The code "S-N11" corresponds to MGC13306H. The code "CLK-25J3" corresponds to MGC14306C.

9.4 Electric Parts (Single Speed)

Figure No.	Part Name	Parts Per Hoist		025S	050L
1	Limit Switch Complete Assembly		1	ER2CI1060	
2	Socket Bolt		3	9091247	
3	Spring Lock Washer		3	9012709	
4	Plate Assembly		1	ER2GHM20S5A2	
5	Plate		1	ER2ES9441	
6	Plate Screw		3	ER1BS9445	
7	Transformer		1	TRF73V611	
8	Electromagnetic Contactor		1	MGC23406B	
9	E-Stop Contactor*		1	MGC13306H* MGC14306C*	
10	Terminal Block 3P		1	ECP1303AB	
11	Lead Wire		1	ER2GHM020S9A2	
12	CH Meter		1	ECP91CHAE	
13	CH Meter Support		1	ECP99BKBA	
14	Rectifier		1	ECP94DIAA	
15	Fuse		1	9006275	
16	Fuse Holder		1	ECP92FZAA	
17	Name Plate CH		1	ECP99CHAA	
18	Terminal Block 6P		1	ECP1306AF	
21	Machine Screw		2	9798512	
22	Fulcrum Pin		1	ER2CS9449	
23	Cover Suspender		1	ER2CS9456	
24	Cover Belt		1	ER2CS9457	
25	Socket Bolt		1	9091249	
26	Plain Washer		1	ER1BS9436	
27	Spring Lock Washer		1	9012709	
28	Packing C		1	ER2FS9117	
29	Balancer		1	ER2FS9109	
30	Socket Bolt		3	9091273	
31	Spring Lock Washer		3	9012711	
32	Controller Cover	F	1	ER2FS9104	
		M		ER2FS2302	
33	Name Plate B		1	ER2BHM25S9A5	
34	Pan Head Mach. Screw		2	9798534	
35	Socket Bolt With Spring Washer		4	J1BG10604040	
36	Name Plate D		1		ER2BHM50R9A6

*Refer to the alpha-numeric code on contactor. The code "S-N11" corresponds to MGC13306H. The code "CLK-25J3" corresponds to MGC14306C.

9.5 Electric Parts (Dual Speed)

001HD, 003SD, 003HD

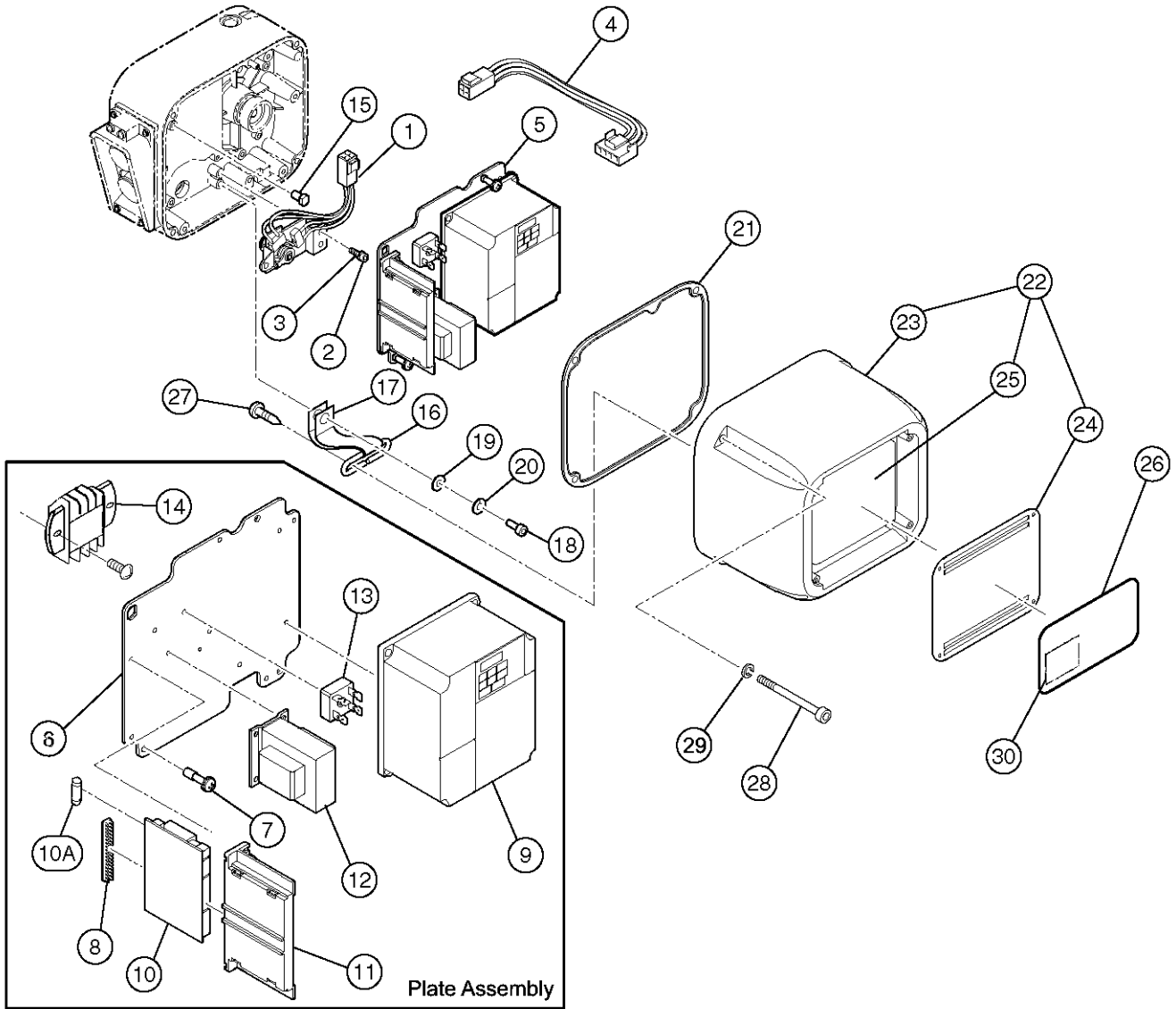


Figure 9-5-1 Electric Parts (Dual Speed)

9.5 Electric Parts (Dual Speed)

Figure No.	Part Name	Parts Per Hoist		001HD	003SD	003HD
1	Limit Switch Complete Assembly		1	ER2CI1060		
2	Socket Bolt		3	9091247		
3	Spring Lock Washer		3	9012709		
4	LS Harness		1	ER2CI9554		
5	Plate Assembly	M, 2V	1	ER2LHE03I5A2	ER2LHE05I5A2	
		F, 2V		ER2BHE03I5A2	ER2BHE05I5A2	
		M, 4V		ER2LHN03I5A2	ER2LHN05I5A2	
		F, 4V		ER2BHN03I5A2	ER2BHN05I5A2	
6	Plate		1	ER2BI9441	ER2CI9441	
7	Plate Screw		3	ER1BS9445		
8	Bushing		1	ECP99JBAC		
9	VFD Assembly	M, 2V	1	INV60FH24	INV615H24	
		F, 2V		INV60FH21	INV615H21	
		M, 4V		INV60FM24	INV615M24	
		F, 4V		INV60FM21	INV615M21	
10	Interface Board		1	ECP91KB02		
10A	Fuse		1	9006275		
11	Board Support		1	ECP99BKAA		
12	Transformer	2V	1	TRF32C612		
		4V		TRF32N612		
13	Rectifier		1	ECP93DIAA		
14	Terminal Block 6P		1	ECP1306AD		
15	Fulcrum Pin		1	ER2CS9449		
16	Cover Suspend		1	ER2CS9456		
17	Cover Belt		1	ER2CS9457		
18	Socket Bolt		1	9091249		
19	Plain Washer		1	ER1BS9436		
20	Spring Lock Washer		1	9012709		
21	Packing C	M	1	ER2BI9117	ER2CS9117	
22	Controller Cover Assembly	2V	1	ER2BI2104	ER2CI2104	
		4V		ER2BI1104	ER2CI1104	
23	Controller Cover		1	ER2BI9104	ER2CI9104	
24	Resistor Cover		1	ER2BI9185	ER2CI9185	
25	Braking Resistor	2V	1	INV70EE16	INV709E16	
		4V		INV70EY16	INV709Y16	
26	Name Plate B		1	ER2BHM03I9A5	ER2BHM05I9A5	
27	Pan Head Mach. Screw		2	9798534		
28	Socket Bolt		4	9091233		
29	Toothed Lock Washer		4	9679708		
30	Name Plate D		1	ER2BHM01H9A6		ER2BHM03H9A6

9.5 Electric Parts (Dual Speed)

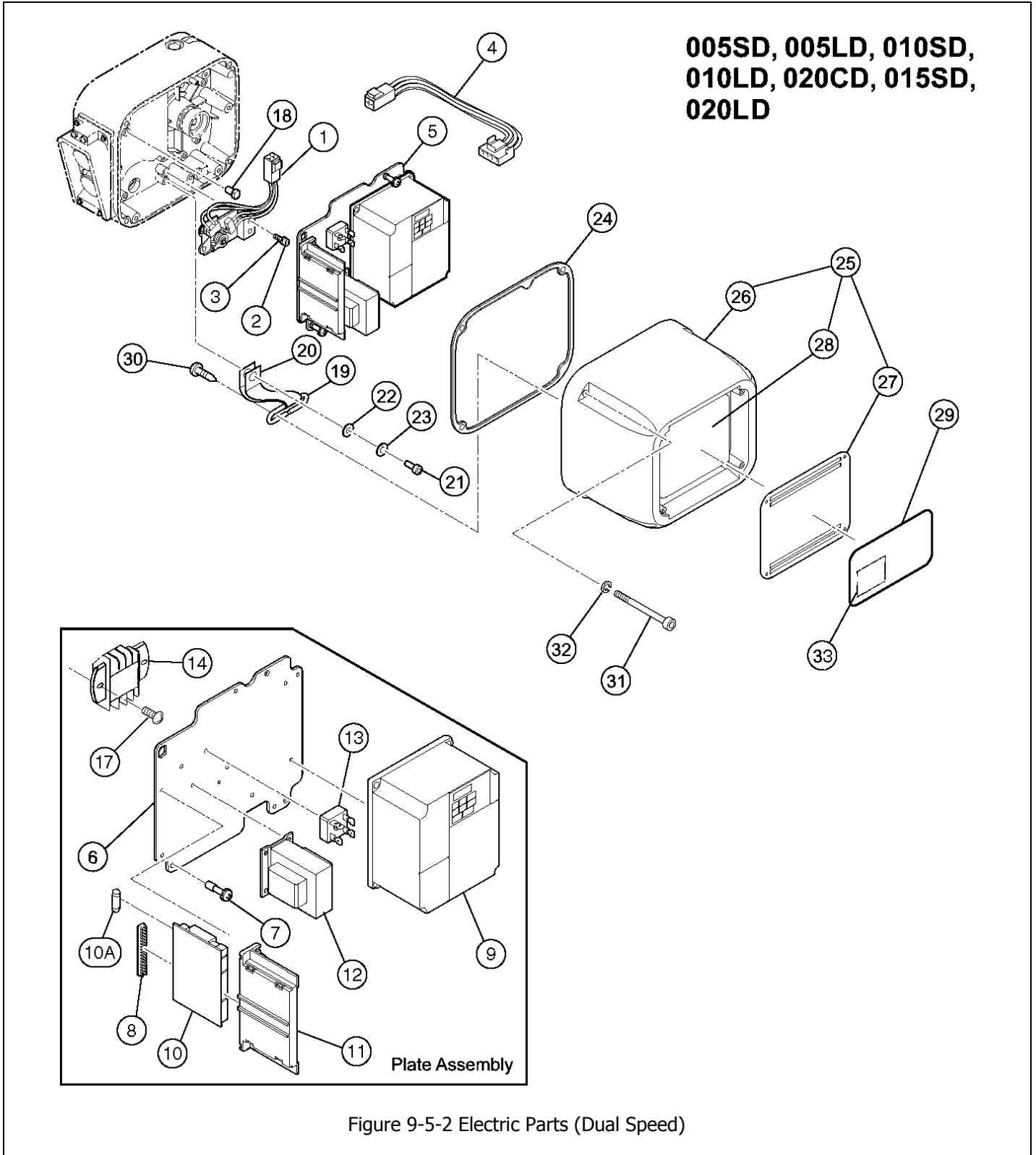


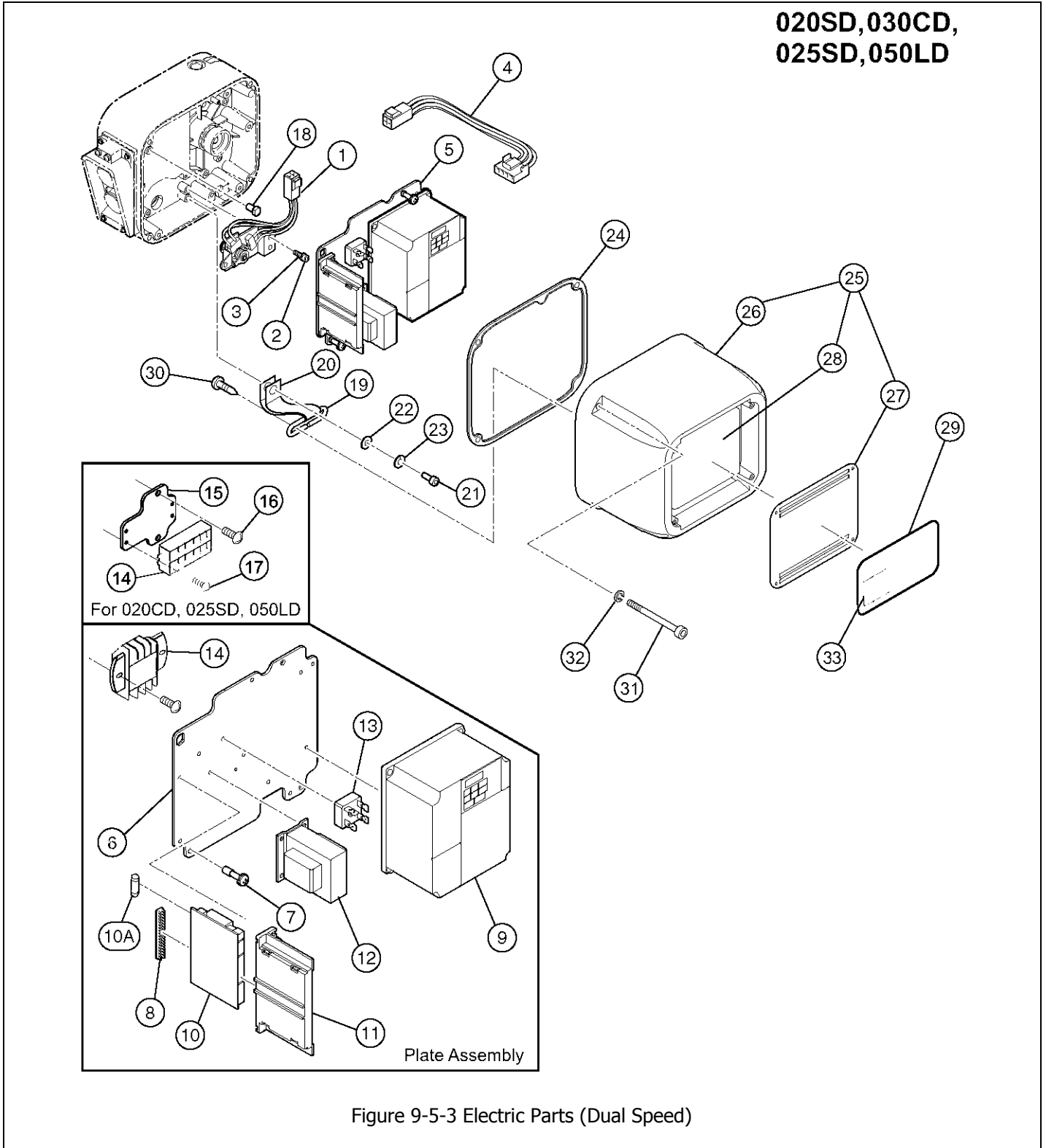
Figure 9-5-2 Electric Parts (Dual Speed)

9.5 Electric Parts (Dual Speed)

Figure No.	Part Name	Parts Per Hoist	005SD	005LD	010SD	010LD/020CD	015SD	020LD	
1	Limit Switch Complete Assembly	1	ER2CI1060						
2	Socket Bolt	3	9091247						
3	Spring Lock Washer	3	9012709						
4	LS Harness	1	ER2CI9554						
5	Plate Assembly	M, 2V	1	ER2LHE05I5A2	ER2LHE05J5A2	ER2LHE10I5A2	ER2LHE10J5A2	ER2LHE20J5A2	
		F, 2V	1	ER2BHE05I5A2	ER2BHE05J5A2	ER2BHE10I5A2	ER2BHE10J5A2	ER2BHE20J5A2	
		M, 4V	1	ER2LHN05I5A2	ER2LHN05J5A2	ER2LHN10I5A2	ER2LHN10J5A2	ER2LHN20J5A2	
		F, 4V	1	ER2BHN05I5A2	ER2BHN05J5A2	ER2BHN10I5A2	ER2BHN10J5A2	ER2BHN20J5A2	
6	Plate	1	ER2CI9441		ER2DI9441		ER2EI9441		
7	Plate Screw	3	ER1BS9445						
8	Bushing	1	ECP99JBAC						
9	Inverter Assembly	M, 2V	1	INV615H24	INV60FH24	INV622H24	INV615H24	INV622H24	
		F, 2V	1	INV615H21	INV60FH21	INV622H21	INV615H21	INV622H21	
		M, 4V	1	INV615M24	INV60FM24	INV622M24	INV615M24	INV622M24	
		F, 4V	1	INV615M21	INV60FM21	INV622M21	INV615M21	INV622M21	
10	Interface Board	1	ECP91KB02						
10A	Fuse	1	9006275						
11	Board Support	1	ECP99BKAA						
12	Transformer	2V	1	TRF32C612					
		4V	1	TRF32N612					
13	Rectifier	1	ECP93DIAA						
14	Terminal Block 6P	1	ECP1306AD						
17	Machine Screw	2	9798512						
18	Fulcrum Pin	1	ER2CS9449						
19	Cover Suspender	1	ER2CS9456						
20	Cover Belt	1	ER2CS9457						
21	Socket Bolt	1	9091249						
22	Plain Washer	1	ER1BS9436						
23	Spring Lock Washer	1	9012709						
24	Packing C	1	ER2CS9117		ER2DS9117		ER2ES9117		
25	Controller Cover Assembly	2V	1	ER2CI2104	ER2CJ2104	ER2DI2104	ER2DJ2104	ER2EJ2104	
		4V	1	ER2CI1104	ER2CJ1104	ER2DI1104	ER2DJ1104	ER2EJ1104	
26	Controller Cover	1	ER2CI9104		ER2DI9104		ER2EI9104		
27	Resistor Cover	1	ER2CI9185		ER2DI9185		ER2EI9185		
28	Braking Resistor	2V	1	INV709E16	INV70EE16	INV718E16	INV709E16	INV718E16	
		4V	1	INV709Y16	INV70EY16	INV718Y16	INV709Y16	INV718Y16	
29	Name Plate B	1	ER2BHM05I9A5		ER2BHM10I9A5		ER2BHM20I9A5		
30	Pan Head Machine Screw	2	9798534						
31	Socket Bolt	4	9091233			9091254			
32	Toothed Lock Washer	4	9679708			9679709			
33	Name Plate D	1				ER2BHM20S9A6*	ER2BHM15M9A6		

*Name Plate D for 020C ONLY

9.5 Electric Parts (Dual Speed)



9.5 Electric Parts (Dual Speed)

Figure No.	Part Name	Parts Per Hoist		020SD	030CD	025SD	050LD
1	Limit Switch Complete Assembly		1	ER2CI1060			
2	Socket Bolt		3	9091247			
3	Spring Lock Washer		3	9012709			
4	LS Harness		1	ER2CI9554			
5	Plate Assembly	M, 2V	1	ER2LHE20I5A2			
		F, 2V	1	ER2BHE20I5A2			
		M, 4V	1	ER2LHN20I5A2			
		F, 4V	1	ER2BHN20I5A2			
6	Plate		1	ER2EI9441			
7	Plate Screw		3	ER1BS9445			
8	Bushing		1	ECP99JBAC			
9	Inverter Assembly	M, 2V	1	INV637H24			
		F, 2V		INV637H21			
		M, 4V		INV637M24			
		F, 4V		INV637M21			
10	Interface Board		1	ECP91KB02			
10A	Fuse		1	9006275			
11	Board Support		1	ECP99BKAA			
12	Transformer	2V	1	TRF32C612			
		4V		TRF32N612			
13	Rectifier		1	ECP94DIAA	ECP94DIAA		
14	Terminal Block 6P		1	ECP1306AF	ECP1306AF		
17	Machine Screw		2	9798512			
18	Fulcrum Pin		1	ER2CS9449			
19	Cover Suspender		1	ER2CS9456			
20	Cover Belt		1	ER2CS9457			
21	Socket Bolt		1	9091249			
22	Plain Washer		1	ER1BS9436			
23	Spring Lock Washer		1	9012709			
24	Packing C		1	ER2ES9117	ER2FS9117		
25	Controller Cover Assembly	2V	1	ER2EI2104		ER2FI2104	
		4V		ER2EI1104		ER2FI1104	
26	Controller Cover		1	ER2EI9104		ER2FI9104	
27	Resistor Cover		1	ER2EI9185			
28	Braking Resistor	2V	1	INV735E16			
		4V		INV735Y16			
29	Name Plate B		1	ER2BHM20I9A5			
30	Pan Head Machine Screw		2	9798534			
31	Socket Bolt		4	9091254			
32	Toothed Lock Washer		4	9679709			
33	Name Plate D		1		ER2BHM30R9A6	ER2BHM25I9A6	ER2BHM50K9A6

9.6 Power Supply and Pendant Parts

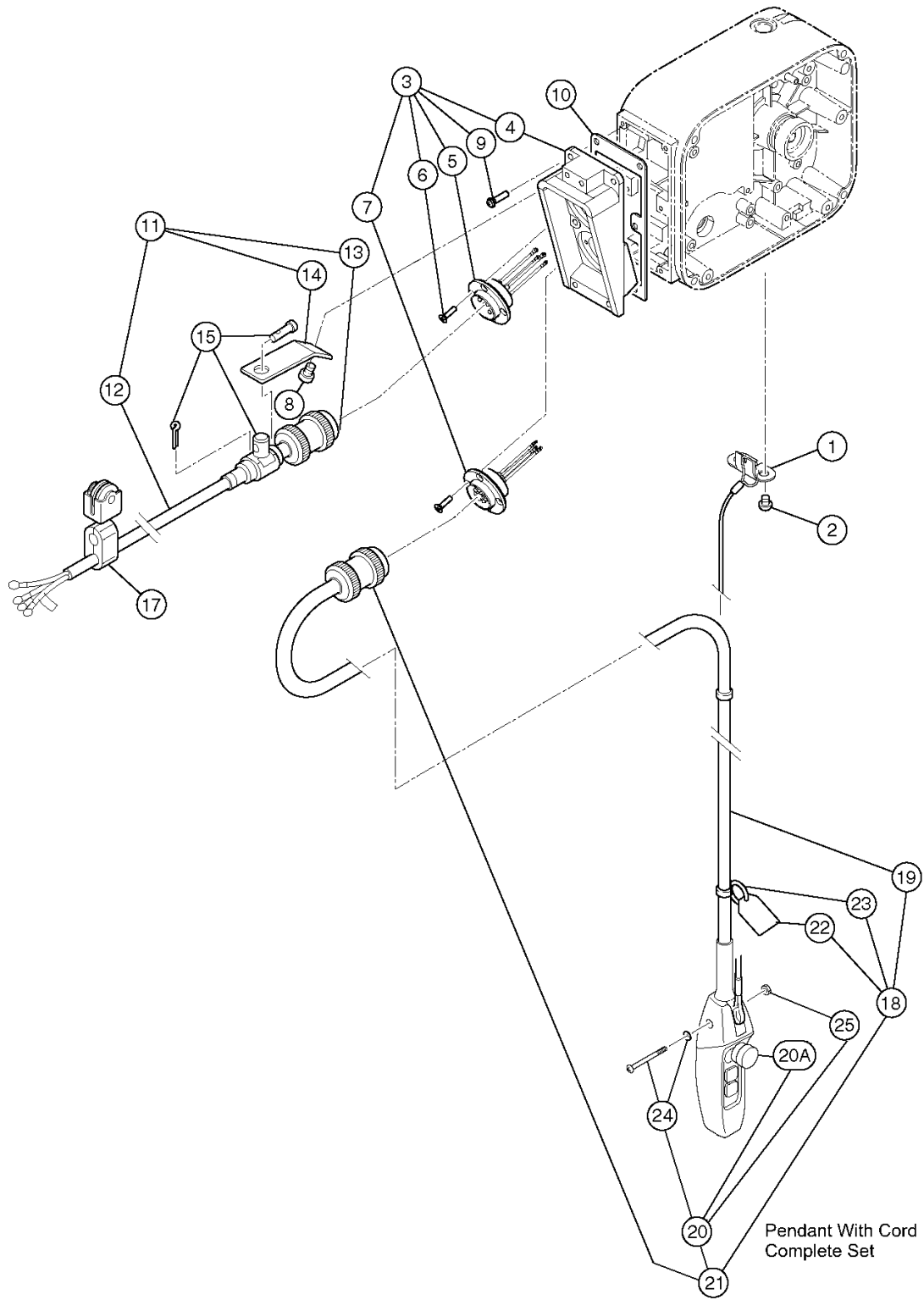


Figure 9-6-1 Power Supply and Pendant Parts (Plug Connection)

9.6 Power Supply and Pendant Parts

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005L	005S	010L/ 020C	010S	015S	020L	020S	030C	025S	050L
1	Cord Support (Wire Stop)		1	ER1BS9535											
2	Mach. Screw W/Spring Washer		2	M6F554010											
3	Socket Frame Complete Assembly	S	1	ER2CS4511						ER2ES4511					
		D		ER2CI4511			ER2DI4511			ER2EI4511					
4	Socket Frame		1	ER2CS9511											
5	Socket 4P Assembly	S	1	ER2CS2523						ER2ES2523					
		D		ER2CI2523			ER2CS2523			ER2EI2523					
6	Tapping Flat Head Mach. Screw		8	ES558003											
7	Socket 8P Assembly	S	1	ER2CS2564											
		D		ER2CI2564						ER2EI2564					
8	Mach. Screw W/Spring Washer		2	ES650005S											
9	Mach. Screw W/Spring Washer		6	MS561010											
10	Socket Frame Packing		1	ER2CS9512											
11	Power Supply Cable 4C Assembly		1	ZBZA12CH1000								ZBZA12AH1000			
12	Power Supply Cable 4C		ft	16/4								14/4			
13	Plug 4P		1	ECP2304AD								ECP2304AF			
14	Cable Support Arm		1	ER1BS9541											
15	Cable Support 12 Assembly		1	ES822003											
	Cable Support 14 Assembly											MS1724010			
17	Cable Hanger 14 Assembly		A/R	ES1527003											
18	Pendant W/Cord Complete Assembly	S	1	ZB10025H1000											
		D		ZB20025I1000											
19	Pendant Cord	S	ft	16/4P											
		D		16/6P											
20	Pendent Assembly	S	1	SWD1100AA											
		D		SWD2200AA											
20A	E-Stop Button and Switch Assembly		1	SWD9024AA											
21	Plug 8P	S	1	ECP2108AA											
		D		ECP2108AB											
22	Warning Tag PB		1	WTAG7											
23	Tag Holder		1	E3S787003											
24	Machine Screw w/Spring Washer		1	J1AP24002608											
25	Nut		1	9093414											

Note: A/R = As required, one every 5 ft. of Power Supply Cable.

9.6 Power Supply and Pendant Parts

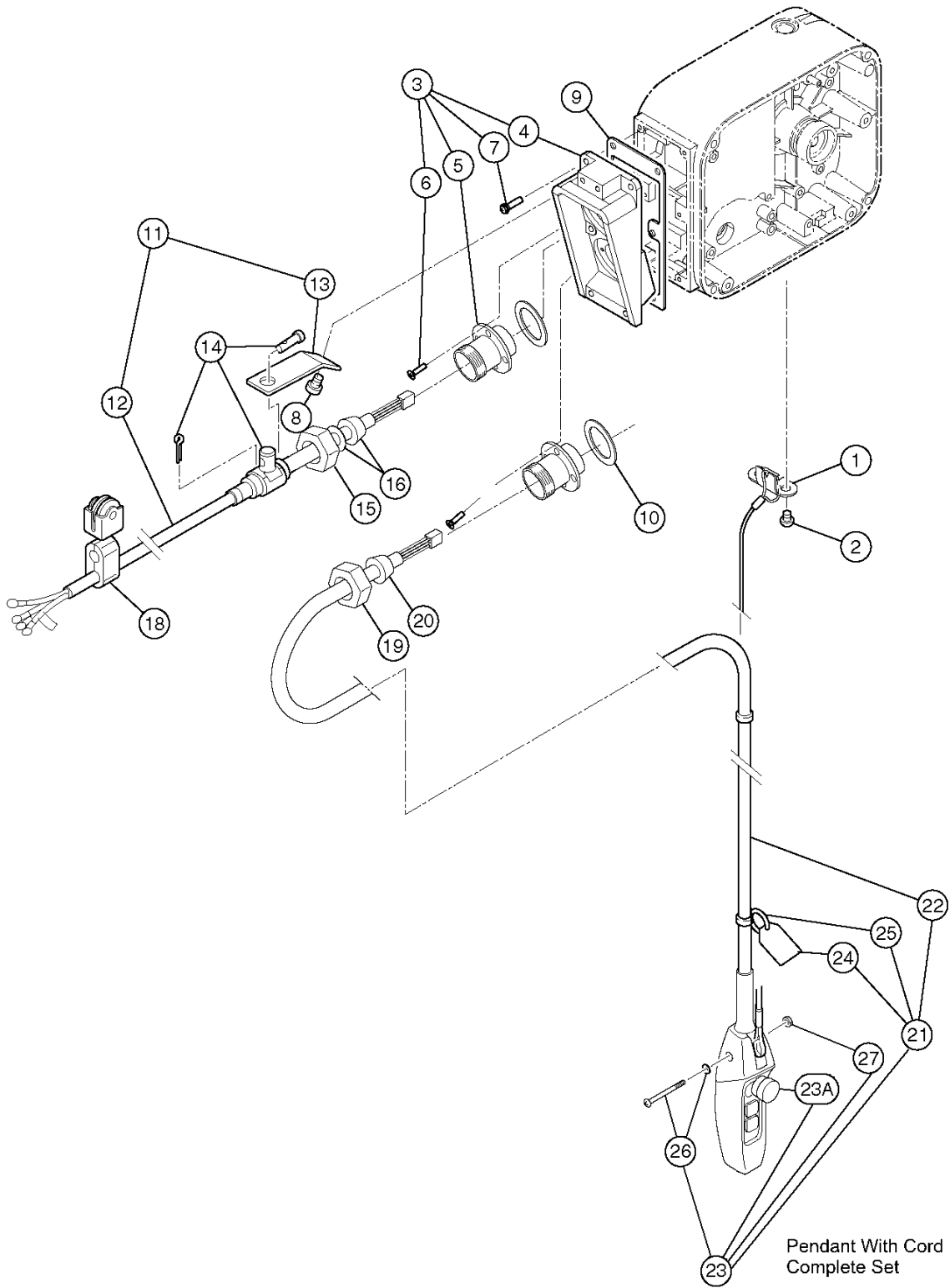


Figure 9-6-2 Power Supply and Pendant Parts (Direct Connection)

9.6 Power Supply and Pendant Parts

Figure No.	Part Name	Parts Per Hoist	001H	003S	003H	005L	005S	010L/ 020C	010S	015S	020L	020S	030S	025S	050L
1	Cord Support (Wire Stop)		1	ER1BS9535											
2	Mach. Screw W/Spring Washer		2	M6F554010											
3	Socket Frame Complete Assembly	S	1	ER2CS4511						ER2ES4511					
		D		ER2CI4511						ER2EI4511					
4	Socket Frame		1	ER2CS9511											
5	Holder C		2	ECP5924AL											
6	Tapping Mach. Screw		8	ER1BS9517											
7	Mach. Screw W/Spring Washer		6	MS561010											
8	Mach. Screw W/Spring Washer		2	ES650005S											
9	Socket Frame Packing		1	ER2CS9512											
10	Holder Packing		2	ECP5924AM											
11	Power Supply Cable 4C Assembly		1	ZBZA12CH1000								ZBZA12AH1000			
12	Power Supply Cable 4C		ft	16/4								14/4			
13	Cable Support Arm		1	ER1BS9541											
14	Cable Sup. 12 Assembly		1	ES822003											
	Cable Sup. 14 Assembly											MS1724010			
15	Holder A		1	ECP5924AA											
16	Cable Packing		1	ECP6912AA								ECP6914AA			
18	Cable Hanger 14 Assembly		A/R	ES1527003											
19	Holder A		1	ECP5924AA											
20	Cable Packing		1	ECP6912AA											
21	Pendant W/Cord Complete Assembly	S	1	ZB10025H1000DW											
		D		ZB20025I1000DW											
22	Pendant Cord	S	ft	16/4P											
		D		16/6p											
23	Pendant Assembly	S	1	SWD1100AA											
		D		SWD2200AA											
23A	E-Stop Button and Switch Assembly		1	SWD9024AA											
24	Warning Tag PB		1	WTAG7											
25	Tag Holder		1	E3S787003											
26	Machine Screw w/Spring Washer		1	J1AP24002608											
27	Nut		1	9093414											

Note: A/R = As required, one every 5 ft. of Power Supply Cable.

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ER20M-ENG

Section 4

Harrington Hoist Trolley Equipment Summary & O&M Manual

OWNER'S MANUAL

MANUAL TROLLEY TF2/TS2 SERIES

1/2 Ton through 20 Ton Capacity

Code, Lot and Serial Number

WARNING

This equipment should not be installed, operated or maintained by any person who has not read and understood all the contents of this manual. Failure to read and comply with the contents of this manual can result in serious bodily injury or death, and/or property damage.

HARRINGTON
A **KITO** GROUP COMPANY

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1.0 Important Information and Warnings

1.1 Terms and Summary

This manual provides important information for personnel involved with the installation, operation and maintenance of this product. Although you may be familiar with this or similar equipment, it is strongly recommended that you read this manual before installing, operating or maintaining the product.

Danger, Warning, Caution and Notice - Throughout this manual there are steps and procedures that can present hazardous situations. The following signal words are used to identify the degree or level of hazard seriousness.

⚠ DANGER Danger indicates an imminently hazardous situation which, if not avoided, **will** result in **death or serious injury**, and property damage.

⚠ WARNING Warning indicates an imminently hazardous situation which, if not avoided, **could** result in **death or serious injury**, and property damage.

⚠ CAUTION Caution indicates a potentially hazardous situation which, if not avoided, **may** result **minor or moderate injury** or property damage.

NOTICE Notice is used to notify people of installation, operation, or maintenance information which is important but not directly hazard-related.

⚠ CAUTION

These general instructions deal with the normal installation, operation, and maintenance situations encountered with the equipment described herein. The instructions should not be interpreted to anticipate every possible contingency or to anticipate the final system, crane, or configuration that uses this equipment. For systems using the equipment covered by this manual, the supplier and owner of the system are responsible for the system's compliance with all applicable industry standards, and with all applicable federal, state and local regulations/codes.

This manual includes instructions and parts information for a variety of trolley and hoist types. Therefore, all instructions and parts information may not apply to any one type or size of specific trolley or hoist. Disregard those portions of the instructions that do not apply.

Record your trolley's Code, Lot and Serial Number on the front cover of this manual for identification and future reference to avoid referring to the wrong manual for information or instructions on installation, operation, inspection, maintenance, or parts.

Use only Harrington authorized replacement parts in the service and maintenance of this trolley.

WARNING

Equipment described herein is not designed for and **MUST NOT** be used for lifting, supporting, or transporting people, or for lifting or supporting loads over people.

Equipment described herein should not be used in conjunction with other equipment unless necessary and/or required safety devices applicable to the system, crane, or application are installed by the system designer, system manufacturer, crane manufacturer, installer, or user.

Modifications to upgrade, rerate, or otherwise alter this equipment shall be authorized only by the original equipment manufacturer.

Equipment described herein may be used in the design and manufacture of cranes or monorails. Additional equipment or devices may be required for the crane and monorail to comply with applicable crane design and safety standards. The crane designer, crane manufacturer, or user is responsible to furnish these additional items for compliance. Refer to ANSI/ASME B30.17, "Safety Standard for Top-Running Single Girder Cranes"; ANSI/ASME B30.2 "Safety Standard for Top-Running Double-Girder Cranes"; and ANSI/ASME B30.11 "Safety Standard for Underhung Cranes and Monorails".

If a below-the-hook lifting device or sling is used with a hoist, refer to ANSI/ASME B30.9, "Safety Standard for Slings" or ANSI/ASME B30.20, "Safety Standard for Below-the-Hook Lifting Devices".

Hoists, trolleys and cranes, used to handle hot molten material may require additional equipment or devices. Refer to ANSI Z241.2, "Safety Requirements for Melting and Pouring of Metals in the Metalcasting Industry".

Electrical equipment described herein is designed and built in compliance with Harrington's interpretation of ANSI/NFPA 70, "National Electrical Code". The system designer, system manufacturer, crane designer, crane manufacturer, installer, or user is responsible to assure that the installation and associated wiring of these electrical components is in compliance with ANSI/NFPA 70, and all applicable Federal, State and Local Codes.

Failure to read and comply with any one of the limitations noted herein can result in serious bodily injury or death, and/or property damage.

DANGER

HAZARDOUS VOLTAGES ARE PRESENT IN THE HOIST CONTROL BOX, OTHER ELECTRICAL COMPONENTS, AND CONNECTIONS BETWEEN THESE COMPONENTS.

Before performing ANY mechanical or electrical maintenance on the equipment, de-energize (disconnect) the main switch supplying power to the equipment; and lock and tag the main switch in the de-energized position. Refer to ANSI Z244.1, "Personnel Protection – Lockout/Tagout of Energy Sources".

Only trained and competent personnel should inspect and repair this equipment.

NOTICE

It is the responsibility of the owner/user to install, inspect, test, maintain, and operate a trolley or hoist in accordance with ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations and ANSI/NFPA 70, "National Electric Code". If the trolley is installed as part of a total lifting system, such as an overhead crane or monorail, it is also the responsibility of the owner/user to comply with the applicable ANSI/ASME B30 volume that addresses that type of equipment.

It is the responsibility of the owner/user to have all personnel that will install, inspect, test, maintain, and operate a hoist read the contents of this manual and applicable portions of ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations and ANSI/NFPA 70, "National Electric Code". If the trolley is installed as part of a total lifting system, such as an overhead crane, the applicable ANSI/ASME B30 volume that addresses that type of equipment must also be read by all personnel.

If the trolley owner/user requires additional information, or if any information in the manual is not clear, contact Harrington or the distributor of the trolley. Do not install, inspect, test, maintain, or operate this trolley unless this information is fully understood.

A regular schedule of inspection of the trolley in accordance with the requirements of ANSI/ASME B30.16 should be established and records maintained.

1.2 Warning Tag and Labels

The warning tag illustrated below in Figure 1-1 is supplied with each trolley shipped from the factory. If the tag is not attached to the pendant cord for your hoist/trolley, order a tag from your dealer and install it. Read and obey all warnings attached to this trolley. Tag is not shown actual size.

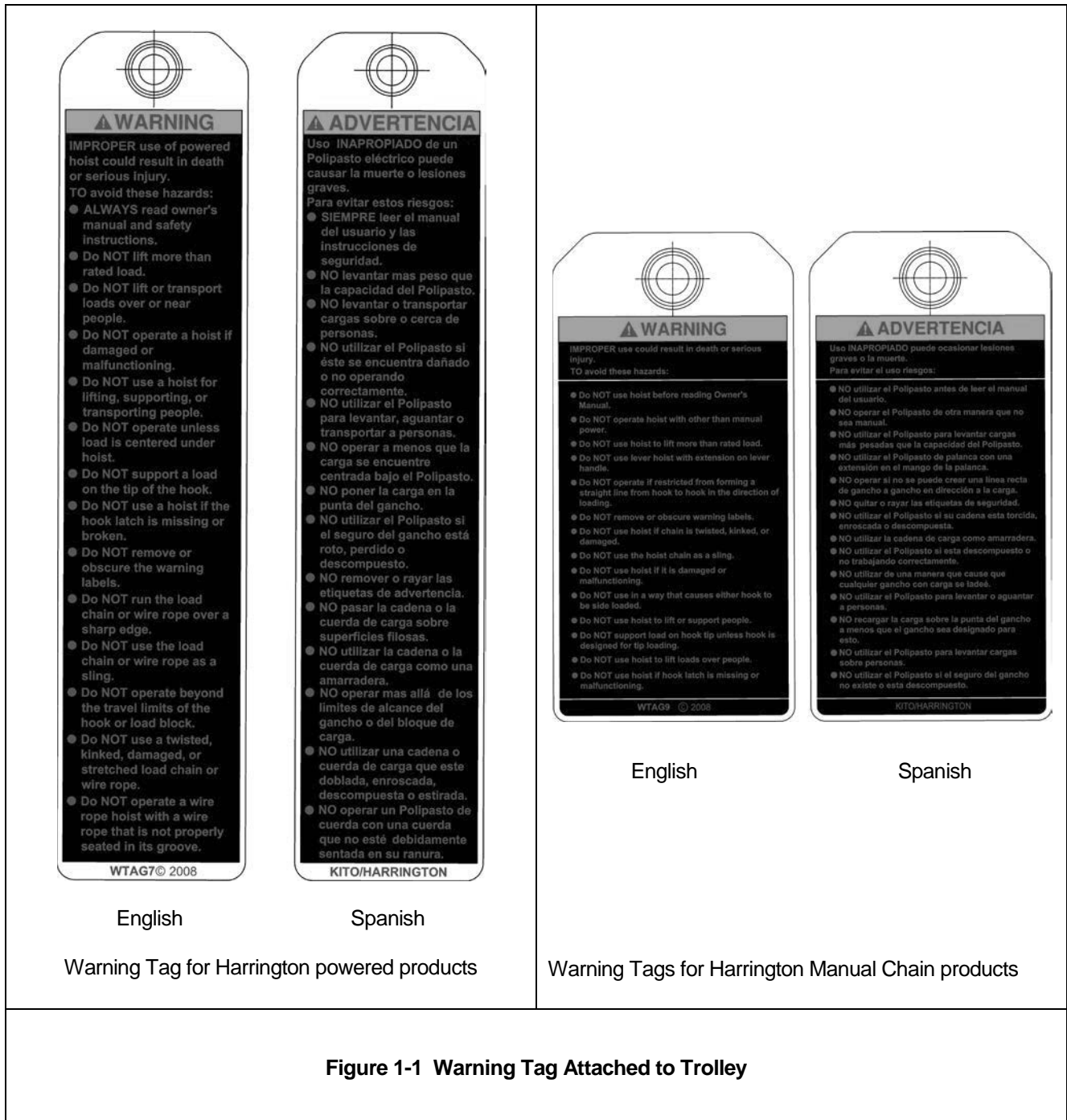
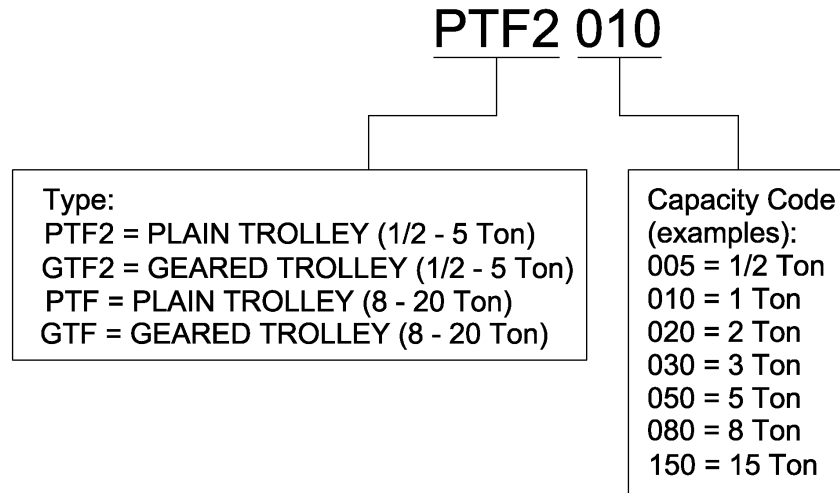


Figure 1-1 Warning Tag Attached to Trolley

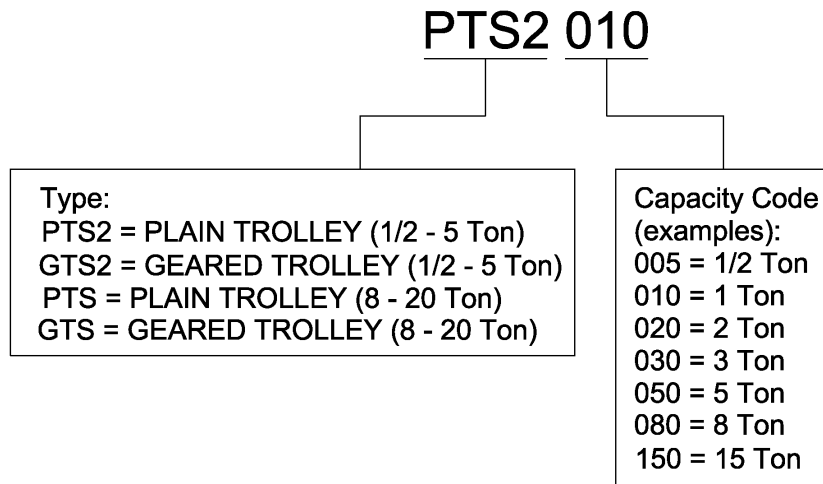
2.0 Technical Information

2.1 Specifications

2.1.1 Product Code for TF2 Trolley:



2.1.2 Product Code for TS2 Trolley:



2.1.3 Operating Conditions and Environment

Temperature Range: -4° to +104°F (-20° to +40°C)

Humidity: 85% or less

2.1.4 PTF2 Specifications

Table 2-1 PTF2 Trolley Specifications					
Cap. (Tons)	Product Code	Min. Radius for Curve (in)	Flange Width Adjustability B (in)		Approx. Net Weight (lbs)
			Standard	Option	
1/2	PTF2005	13.8	2.28 to 4.00	4.01 to 8.00 or 8.01 to 12.00	9
1	PTF2010	17.7	2.28 to 5.00	5.01 to 8.00 or 8.01 to 12.00	15
1 1/2-2	PTF2020	21.7	3.23 to 6.02	6.03 to 12.00	29
2 1/2-3	PTF2030	25.6			46
5	PTF2050	78.7	4.92 to 7.02	7.03 to 12.00	95
8	PTF080	118.1	5.50 to 8.66	8.67 to 12.00	212
10	PTF100				

2.1.5 PTS2 Specifications

Table 2-2 PTS2 Trolley Specifications					
Cap. (Tons)	Product Code	Min. Radius for Curve (in)	Flange Width Adjustability B (in)		Approx. Net Weight (lbs)
			Standard	Option	
1/2	PTS2005	43.3	2.28 to 4.00	4.01 to 8.00 or 8.01 to 12.00	10
1	PTS2010	51.2	2.28 to 5.00	5.01 to 8.00 or 8.01 to 12.00	18
1 1/2-2	PTS2020	59.1	3.23 to 6.02	6.03 to 12.00	31
2 1/2-3	PTS2030	66.9			51
5	PTS2050	90.6	3.94 to 7.02	7.03 to 12.00	110
8	PTS080	118.1	5.50 to 8.66	8.67 to 12.00	220
10	PTS100				

2.1.6 GTF2 Specifications

Table 2-3 GTF2 Trolley Specifications						
Cap. (Tons)	Product Code	Min. Radius for Curve (in)	Flange Width Adjustability B (in)		Approx. Net Weight (lbs)	
			Standard	Option	ER2	CB
1	GTF2010	17.7	2.28 to 5.00	5.01 to 8.00 or 8.01 to 12.00	24	
1 1/2-2	GTF2020	21.7	3.23 to 6.02	6.03 to 12.00	38	
2 1/2-3	GTF2030	25.6			55	
5	GTF2050	78.7	4.92 to 7.02	7.03 to 12.00	104	
8	GTF080	118.1	5.50 to 8.66	8.67 to 12.00	248	218
10	GTF100				490	534
15	GTF150	∞				
20	GTF200					

2.1.7 GTS2 Specifications

Table 2-4 GTS2 Trolley Specifications						
Cap. (Tons)	Product Code	Min. Radius for Curve (in)	Flange Width Adjustability B (in)		Approx. Net Weight (lbs)	
			Standard	Option	ER2	CB
1	GTS2010	51.2	2.28 to 5.00	5.01 to 8.00 or 8.01 to 12.00	27	
1 1/2-2	GTS2020	59.1	3.23 to 6.02	6.03 to 12.00	42	
2 1/2-3	GTS2030	66.9			60	
5	GTS2050	90.6	3.94 to 7.02	7.03 to 12.00	124	
8	GTS080	118.1	5.50 to 8.66	8.67 to 12.00	257	227
10	GTS100				510	553
15	GTS150	∞				
20	GTS200					

2.2 Dimensions

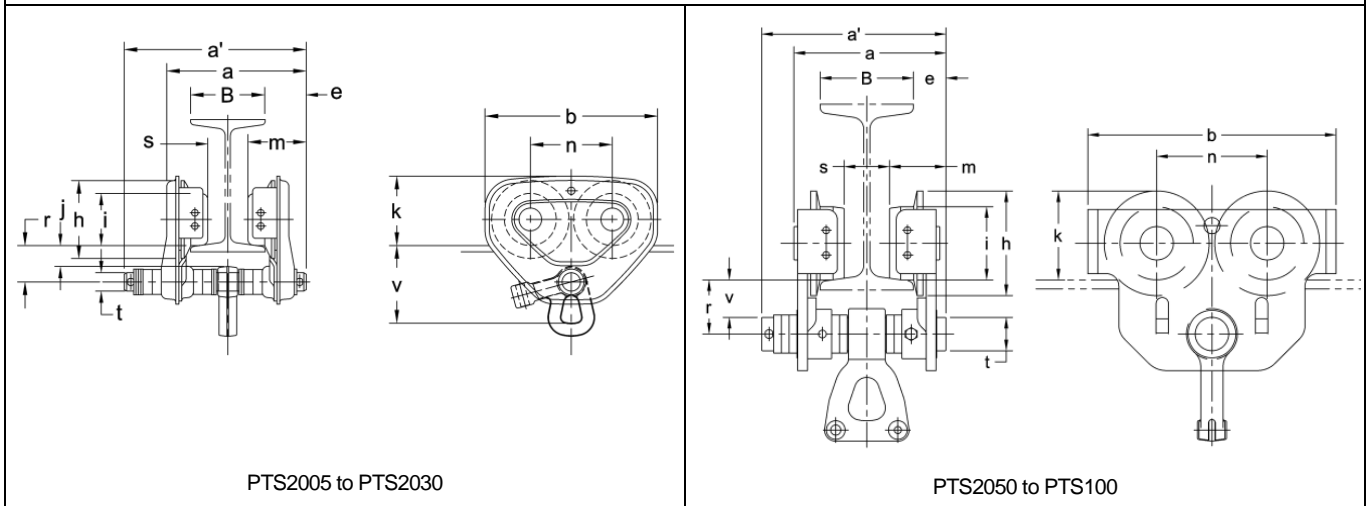
2.2.1 PTF2 Dimensions

Table 2-5 PTF2 Trolley Dimensions

Table 2-5 PTF2 Trolley Dimensions															
<p>PTF2005 to PTF2030</p>								<p>PTF2050 to PTF100</p>							
Cap. (Tons)	Product Code	a max (in)	a' (in)	b (in)	e (ft)	h (in)	i (in)	j (in)	k (in)	m (in)	n (in)	r (in)	s (in)	t (in)	v (in)
1/2	PTF2005	6.8	8.0	7.2	1.8	3.2	2.36	0.80	3.0	2.7	3.3	1.5	B-1.8	0.87	3.7
1	PTF2010	8.5	9.8	9.3	2.2	4.2	2.80	1.1	3.7	3.1	4.4	2.0	B-1.9	0.98	4.2
1 1/2-2	PTF2020	10.4	11.8	11.0	2.7	5.0	3.35	1.4	4.4	3.8	5.2	2.4	B-2.3	1.26	5.1
2 1/2-3	PTF2030	11.0	12.6	12.8	3.1	5.8	3.94		5.3	4.3	6.0	2.7	B-2.3	1.42	6.7
5	PTF2050	10.7	11.7	13.7	2.1	6.7	4.65	-	5.7	3.6	7.0	3.5	B-3.0	1.73	3.7
8	PTF080	14.4	19.2	18.9	4.1	7.3	6.10		6.7	5.9	7.7	6.0	B-3.6	2.76	4.7
10	PTF100														

2.2.2 PTS2 Dimensions

Table 2-6 PTS2 Trolley Dimensions



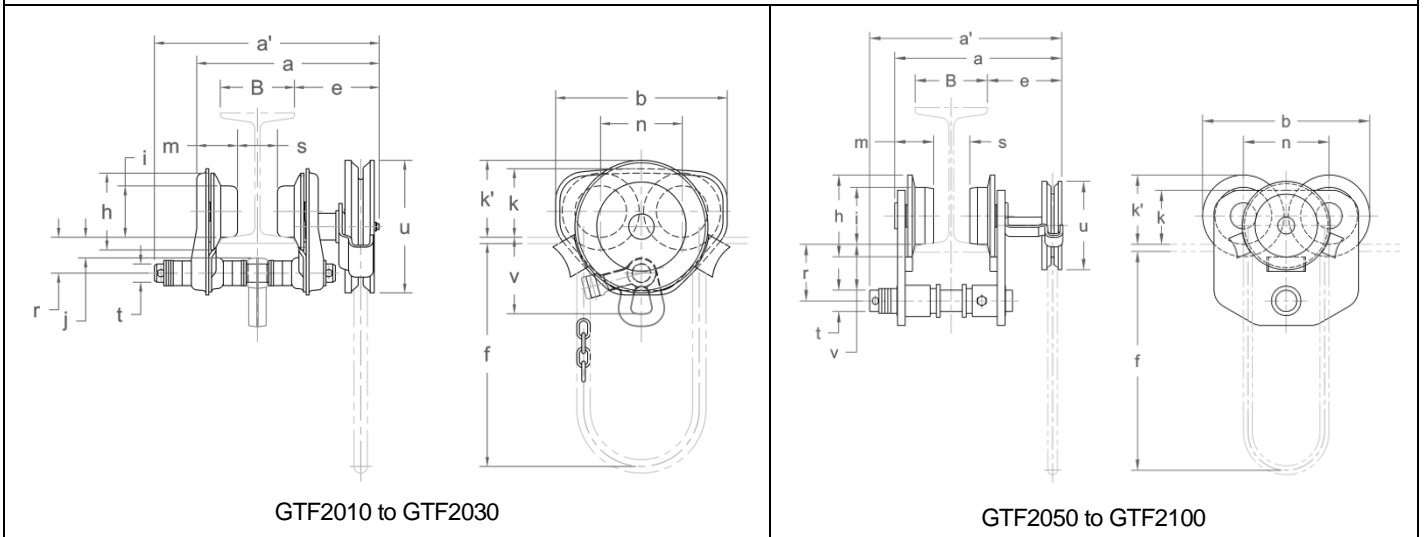
PTS2005 to PTS2030

PTS2050 to PTS100

Cap. (Tons)	Product Code	a max (in)	a' (in)	b (in)	e (ft)	h (in)	i (in)	j (in)	k (in)	m (in)	n (in)	r (in)	s (in)	t (in)	v (in)
1/2	PTS2005	6.8	8.0	7.2	1.8	3.2	2.36	0.7	3.0	2.7	3.3	1.5	B-1.8	0.87	3.7
1	PTS2010	8.5	9.8	9.3	2.2	4.2	2.80	1.1	3.7	3.1	4.4	2.0	B-1.9	0.98	4.2
1 1/2-2	PTS2020	10.4	11.8	11.0	2.7	5.0	3.35	1.3	4.4	3.8	5.2	2.4	B-2.3	1.26	5.1
2 1/2-3	PTS2030	11.0	12.6	12.8	3.1	5.8	3.94	1.4	5.3	4.3	6.0	2.7	B-2.3	1.42	6.7
5	PTS2050	10.7	11.7	15.7	2.1	6.7	4.65	1.8	5.7	3.2	7.0	3.5	B-3.0	2.13	3.7
8	PTS080	14.4	19.2	19.4	4.1	7.3	6.10	-	6.7	5.9	7.7	6.0	B-3.6	2.76	4.7
10	PTS100														

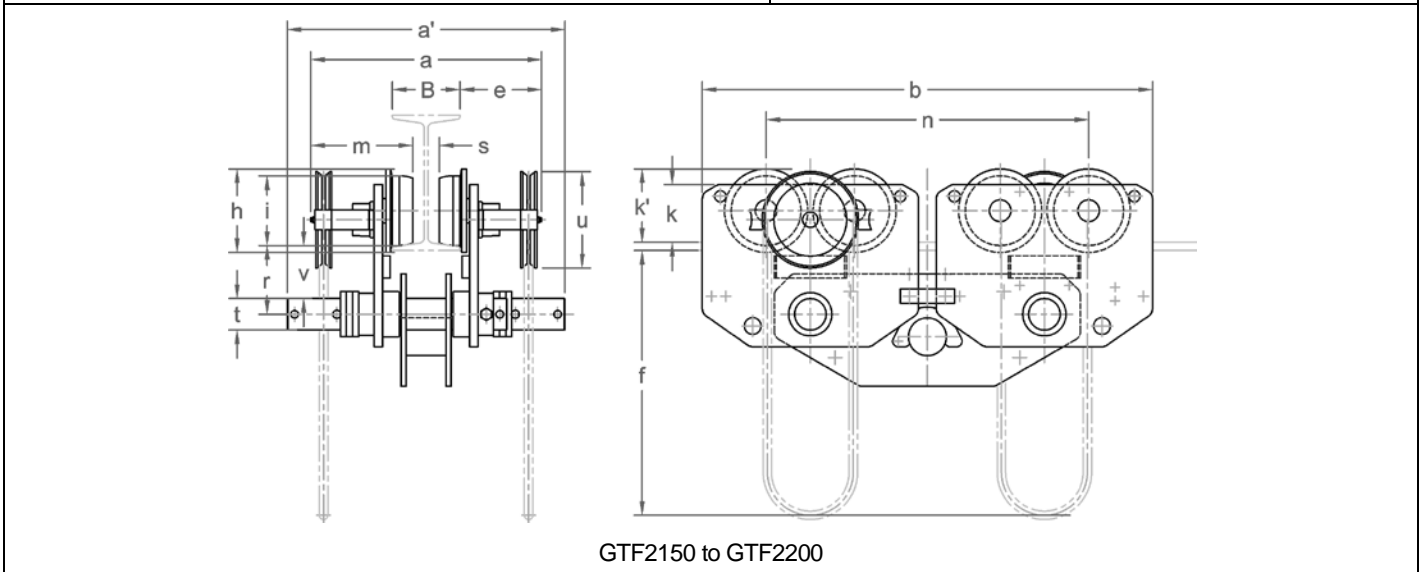
2.2.3 GTF2 Dimensions

Table 2-7 GTF2 Trolley Dimensions



GTF2010 to GTF2030

GTF2050 to GTF2100



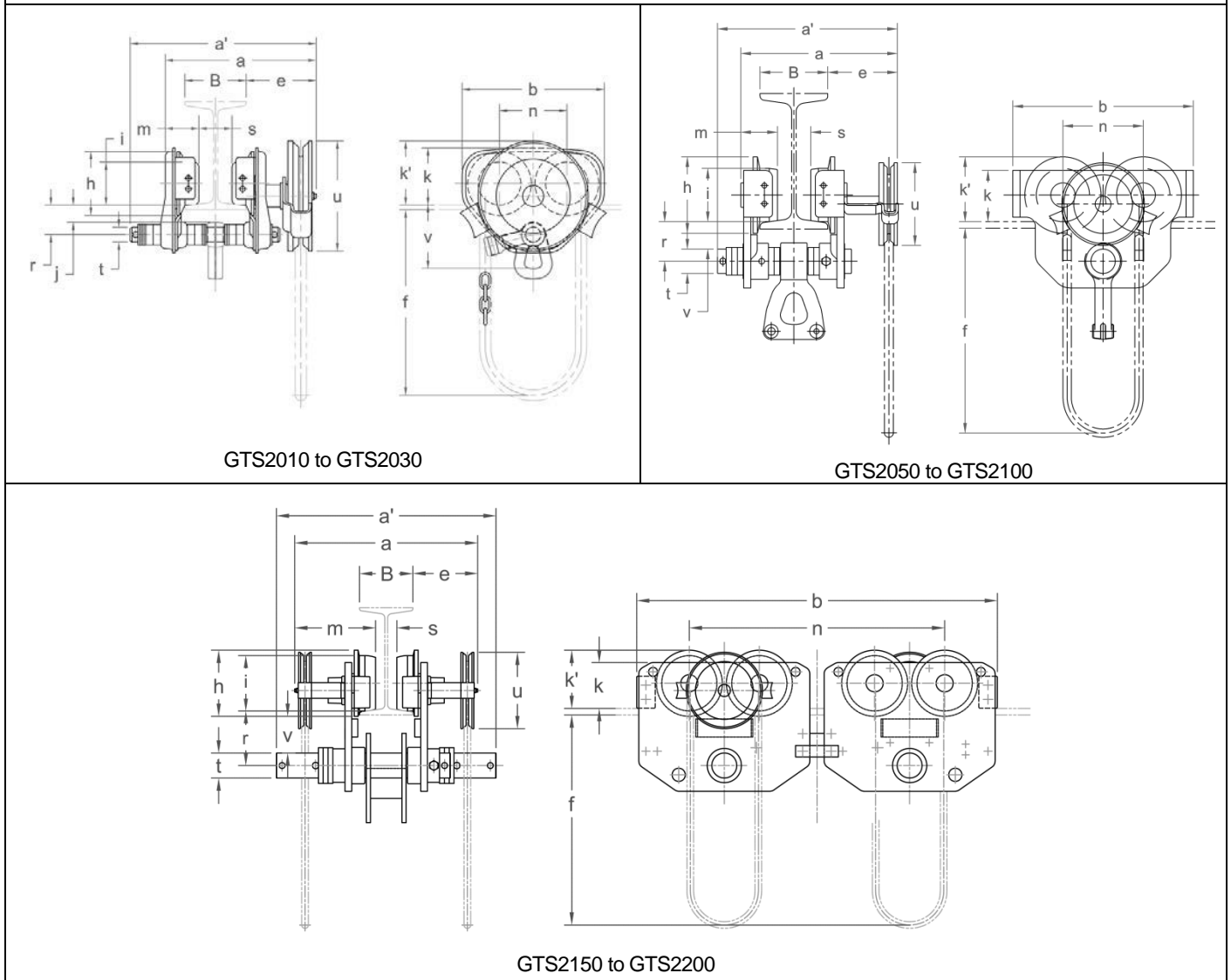
GTF2150 to GTF2200

Cap. (Tons)	Product Code	a max* (in)		a' max (in)		b (in)	e (in)		f (ft.)	h (in)	i (in)	j (in)	k (in)	k' (in)	m (in)		n (in)	r (in)	s (in)	t (in)	u (in)	v (in)
		ER2	CB	ER2	CB		ER2	CB							ER2	CB						
1/2-1	GTF2010	10.8		13.6		9.3	6.0		8	4.2	2.80	1.1	3.7	4.2	2.2	4.4	2.0	B-1.8	0.98	7.2	4.2	
1 1/2-2	GTF2020	13.7		15.2		11.0	6.1			5.0	3.35	1.3	4.4	4.3	2.8	5.2	2.4	B-1.9	1.26		5.1	
2 1/2-3	GTF2030	14.1		15.7		12.8	6.2			5.8	3.94	1.4	5.3	4.5	3.1	6.0	2.7	B-2.3	1.42		6.7	
5	GTF2050	14.8		15.8		13.7	6.1			6.7	4.65	-	5.7	5.2	3.2	7.0	3.5		1.73		3.7	
8	GTF080	26.4	17.4	31.3	22.2	18.9	16.2	7.2	12	7.3	6.10	-	5.4	6.7	3.4	7.7	6.0	B-3.6	2.76	8.4	4.6	
10	GTF100																					
15	GTF150	41.0	23.0	24.3	24.3	39.4									18.0	8.9	28.2	8.0				
20	GTF200																					

*This dimension is variable on 15/20 Ton model, therefore it is recorded at its maximum value for standard range.

2.2.4 GTS2 Dimensions

Table 2-8 GTS2 Trolley Dimensions



Cap. (Tons)	Product Code	a max* (in)		a' max (in)		b (in)	e (in)		f (ft.)	h (in)	i (in)	j (in)	k (in)	k' (in)	m (in)		n (in)	r (in)	s (in)	t (in)	u (in)	v (in)
		ER2	CB	ER2	CB		ER2	CB							ER2	CB						
1/2-1	GTS2010	10.8		13.6		9.3	6.0		10.5	4.2	2.80	1.1	3.7	4.2	2.2	4.4	2.0	B-1.8	0.98	7.2	4.2	
1 1/2-2	GTS2020	13.7		15.2		11.0	6.1			5.0	3.35	1.3	4.4	4.3	2.8	5.2	2.4	B-1.9	1.26		5.1	
2 1/2-3	GTS2030	14.1		15.7		12.8	6.2			11.0	5.8	3.94	1.4	5.3	4.5	3.1	6.0	2.7	B-2.3		1.42	6.7
5	GTS2050	14.8		15.8		15.8	6.1		11.4	6.7	4.65	1.8	5.7	5.2	3.2	7.0	3.5		2.13	3.7		
8	GTS080	26.4	17.4	31.3	22.2	19.4	16.2 7.2		12	7.3	6.10	-	5.4	6.7	3.4 7.7		6.0	B-3.6	2.76	8.4	4.6	
10	GTS100																					
15	GTS150	41.0	23.0	24.3	24.3	39.8								18.0 8.9		28.2	8.0					
20	GTS200																					

*This dimension is variable on 15/20 Ton model, therefore it is recorded at its maximum value for standard range.

2.3 Optional Equipment

2.3.1 Suspender C

Table 2-9 Suspender C Dimensions						
C (1/2 to 2 1/2 Ton)			C (3 to 5 Ton)			
Capacities (Tons)	a (in)	b (in)	c (in)	d (in)	e (in)	f (in)
1/2	1.0	1.3	0.6	0.87	2.1	2.6
1	1.1	1.5	0.7	0.99	2.2	2.7
2	1.3	1.6	0.9	1.27	2.7	3.2
2 1/2	1.4	1.7	1.0	1.43	3.0	3.6
3	1.6	1.9	1.2	1.43	4.0	4.5
5	2.4	2.8	1.4	2.13	5.5	6.1

2.3.2 Suspender H

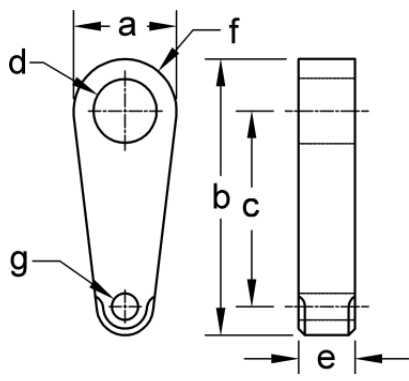
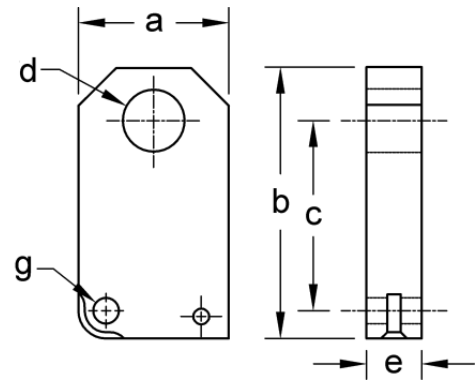
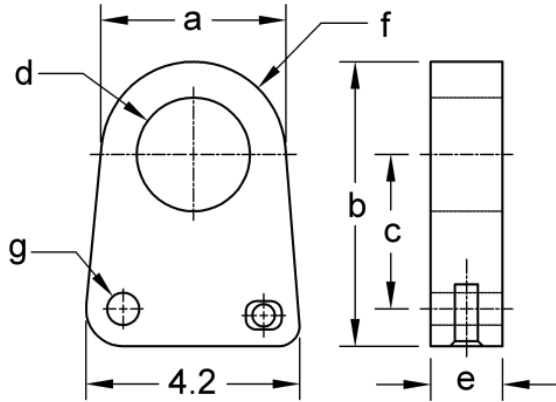
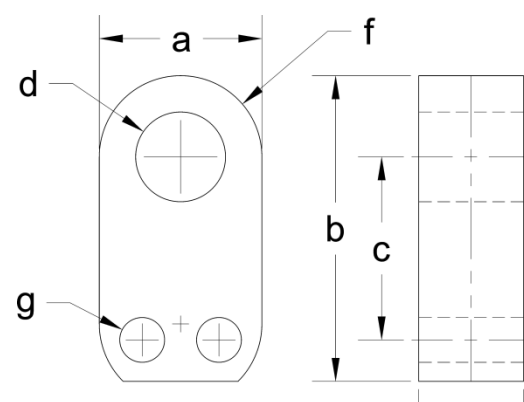
Table 2-10 Suspender H Dimensions					
H					
Capacities (Tons)	a (in)	b (in)	c (in)	d (in)	e (in)
1/4-1/2	1.0	1.3	0.4	0.91	2.3
1	1.1	1.5	0.5	1.02	2.6
1 1/2-2	1.4	1.8	0.7	1.30	3.3
2 1/2-3	1.7	2.1	0.9	1.46	3.9

2.3.3 Suspender E & G

Table 2-11 Suspender E & G Dimensions									
Suspender	Capacities (Ton)	d1	D	d2	B	P	L	T	W
E	1/8 to 1/2	0.874	1.46	0.480	1.30	2.36	3.60	1.06	0.94
	1	0.992	1.65	0.480	1.30	2.72	4.06	1.06	0.94
	1 1/2 to 2	1.268	2.13	0.795	1.73	2.99	4.84	1.54	1.42
	2 1/2 to 3	1.425	2.48	0.795	1.73	3.35	5.47	1.54	1.77
G	5	2.13	3.23	1.11	1.93	3.35	6.22	2.32	2.52

2.3.4 TCR Suspender (used for Air Hoist)

Table 2-12 TCR Suspender Dimensions

		TCR250, TCR500, TCR1000, TCR3000		TCR1000-2, TCR2000-2					
									
		TCR6000-2		TCR10000-2					
									
Model Hoist	Suspender P/N	Cap (Ton)	a (in)	b (in)	c (in)	d (in)	e (in)	f (in)	g (in)
TCR250 TCR500	6040204	¼ TO ½	2.00	5.33	3.78	.875	1.10	R 1.00	0.512
TCR1000	6040201	1	2.00	5.33	3.78	1.230	1.10	R 1.00	0.512
TCR1000-2	60403	1	3.00	5.38	3.78	1.230	1.10	--	0.512
TCR2000-2	6040403	2	3.25	5.56	3.54	1.703	1.10	--	0.512
TCR3000	TF26K531030S	3	2.44	4.80	2.83	1.42	1.77	R 1.22	0.795
TCR6000-2	60405	6	4.48	6.91	3.75	2.761	1.75	R 2.25	0.787
TCR10000-2	60926	10	5.00	9.41	5.64	2.764	3.22	R2.50	1.379

3.0 Pre-operational Procedures

3.1 Manual Hoist Adjustment for Trolley

- 3.1.1 For ½ - 5 Ton capacities, Harrington's Model CB Series chain hoist can be Hook mounted to the TF2/TS2 Trolley using suspender "C" as shown in **Figure 3-1** or Lug mounted to suspender "C" as shown in **Figure 3-2**

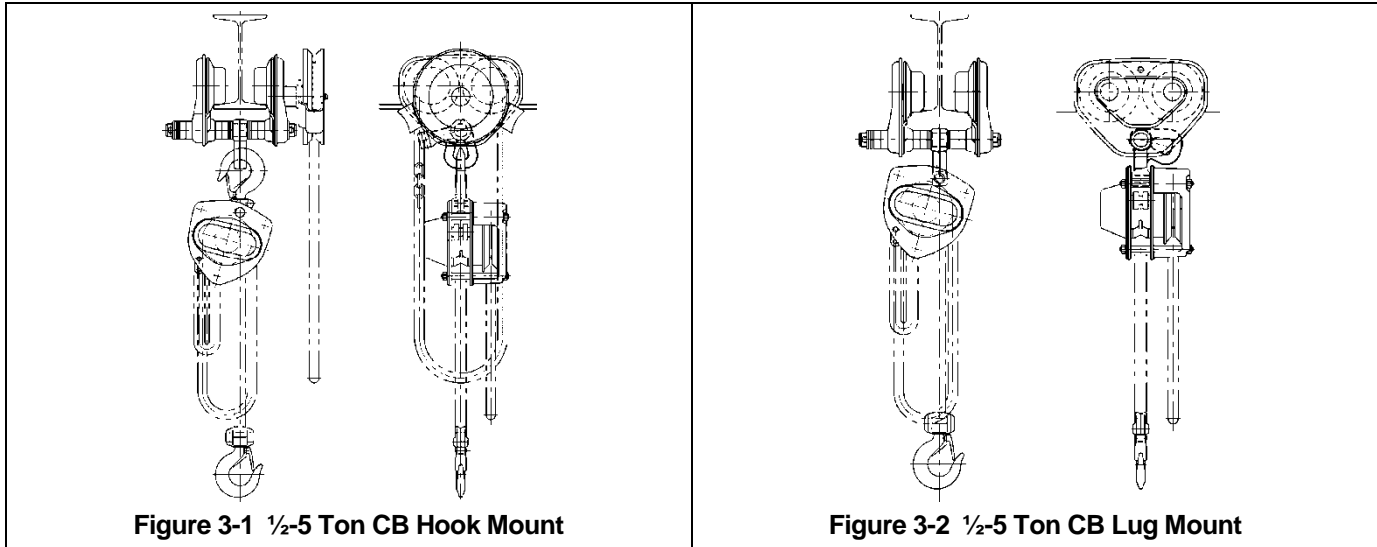


Figure 3-1 ½-5 Ton CB Hook Mount

Figure 3-2 ½-5 Ton CB Lug Mount

- 3.1.2 Direct coupling lug mounted method for CB Series.

- 1) For ½ to 2 ½ Ton capacity Refer to **Figure 3-3**.
- 2) Remove the wheel cover nuts and lock washers, then remove wheel cover.
- 3) Straighten and remove the spit pin in the top shaft pin and remove the top shaft pin, remove the top hook.
- 4) Mount suspender "C" (small) in place of the top hook, insert the top shaft pin and re-insert the split pin.
- 5) Replace the wheel cover.
- 6) Attach Hoist to Trolley.

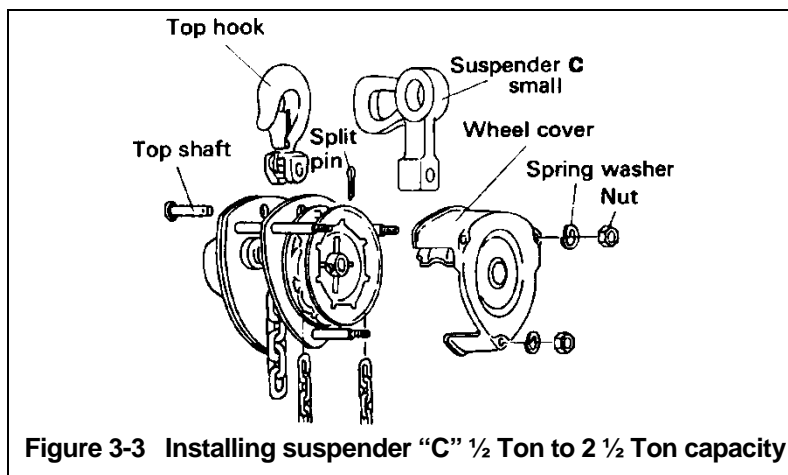
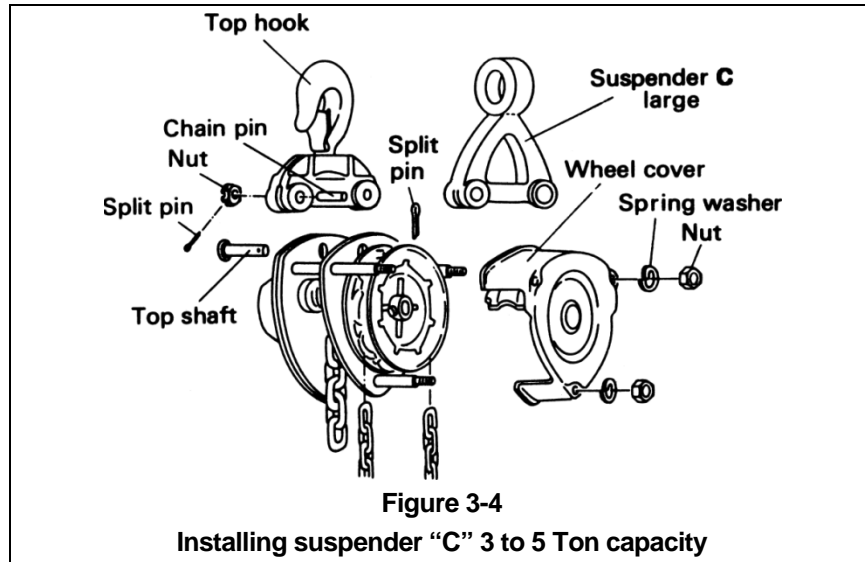


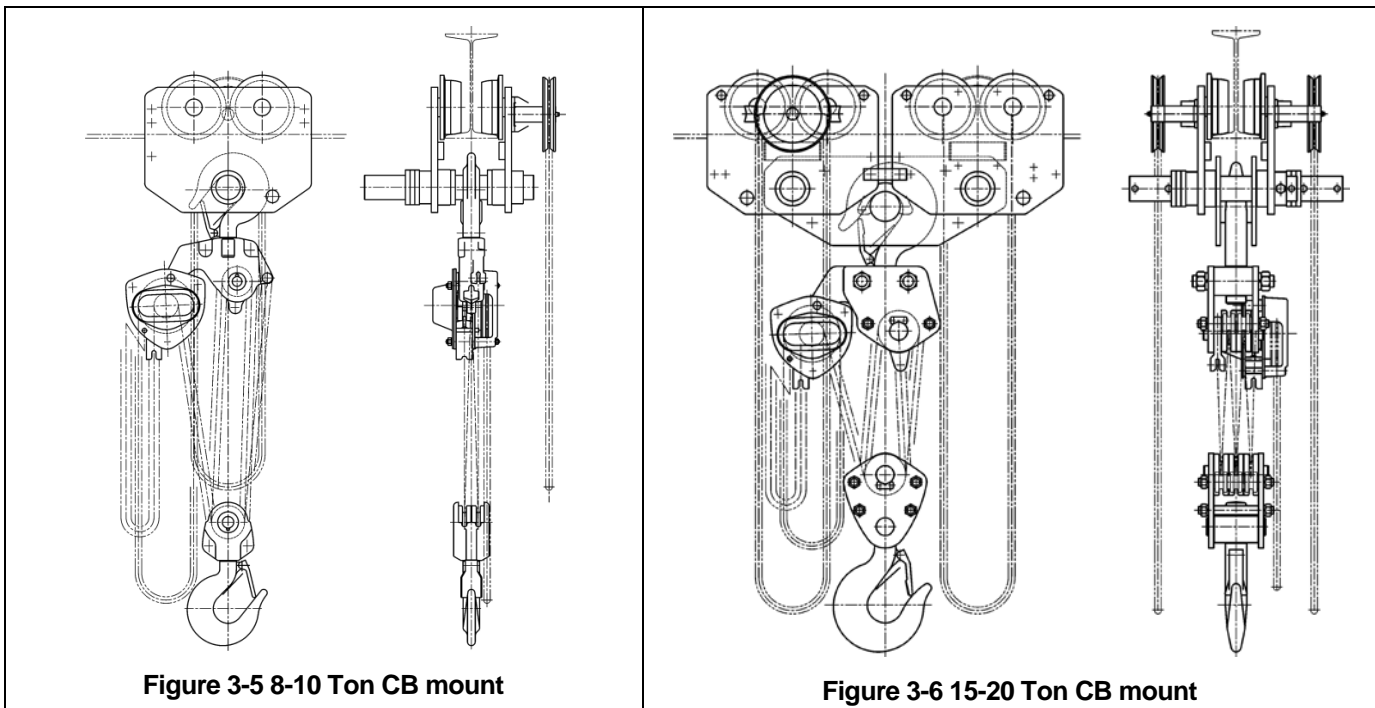
Figure 3-3 Installing suspender "C" ½ Ton to 2 ½ Ton capacity

- 7) For 3 to 5 Ton capacity Refer to **Figure 3-4**.
- 8) Remove the wheel cover nuts and lock washers, then remove wheel cover.

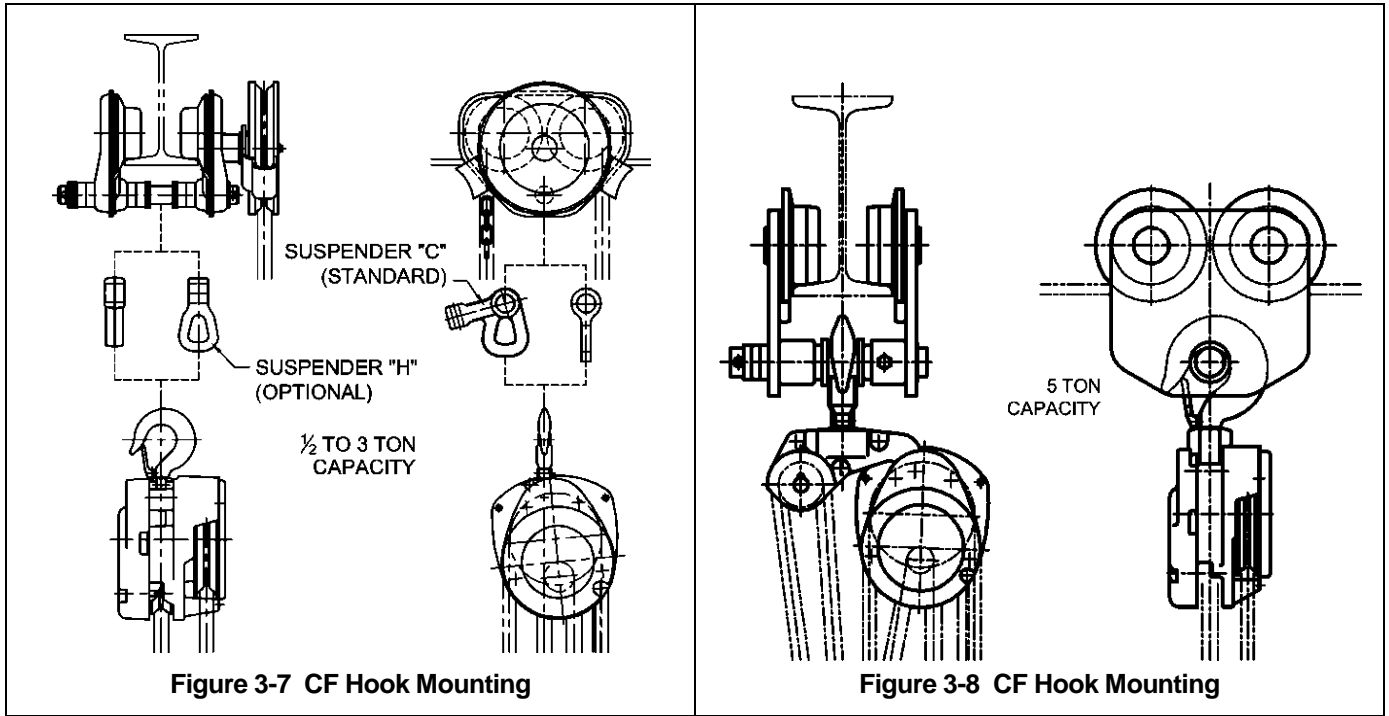
- 9) Straighten and remove the spit pin in the top shaft pin and remove the top shaft pin, remove the top hook.
- 10) Mount suspender "C" (large) in place of the top hook, insert the top shaft pin and re-insert the split pin.
- 11) Replace the wheel cover.
- 12) Attach Hoist to Trolley.



- 3.1.3 For 8 and 10 Ton capacities, Harrington's Model CB Series chain hoists is hook mounted directly to the suspension shaft of the TF/TS Trolley as shown in **Figure 3-5**. Since the hoist is directly hook mounted, no additional hoist preparation is necessary. See **Section 3.4** for more information on trolley assembly.
- 3.1.4 For 15 and 20 Ton capacities, Harrington's Model CB Series chain hoist is hook mounted to a suspension shaft which is connected to a pair of side plates. The side plates are mounted to the TF/TS trolley using two additional suspension shafts as shown in **Figure 3-6**. Since the hoist is directly hook mounted, no additional hoist preparation is necessary. See **Section 3.4** for more information on trolley assembly.



3.1.5 Harrington Model CF Series hoists can be hook mounted to the TF2 trolley using suspender "C" or optional suspender "H" ½ Ton to 3 Ton, as shown in **Figure 3-7**. 5 Ton models hook to the trolley shaft, as shown in **Figure 3-8**.




3.2 Electric Hoist Adjustment for Trolley

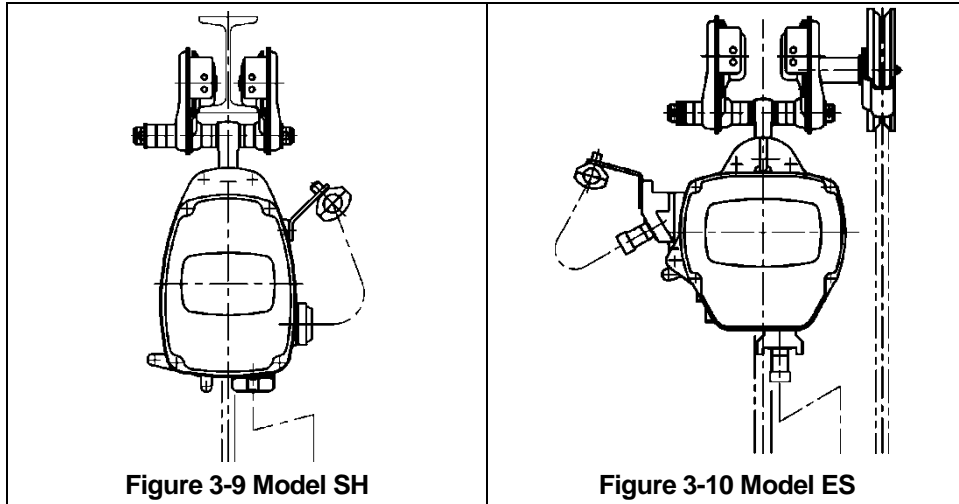
DANGER

HAZARDOUS VOLTAGES ARE PRESENT IN THE HOIST CONTROL BOX, IN THE SUPPLY OF ELECTRICAL POWER TO THE HOIST MOTOR.

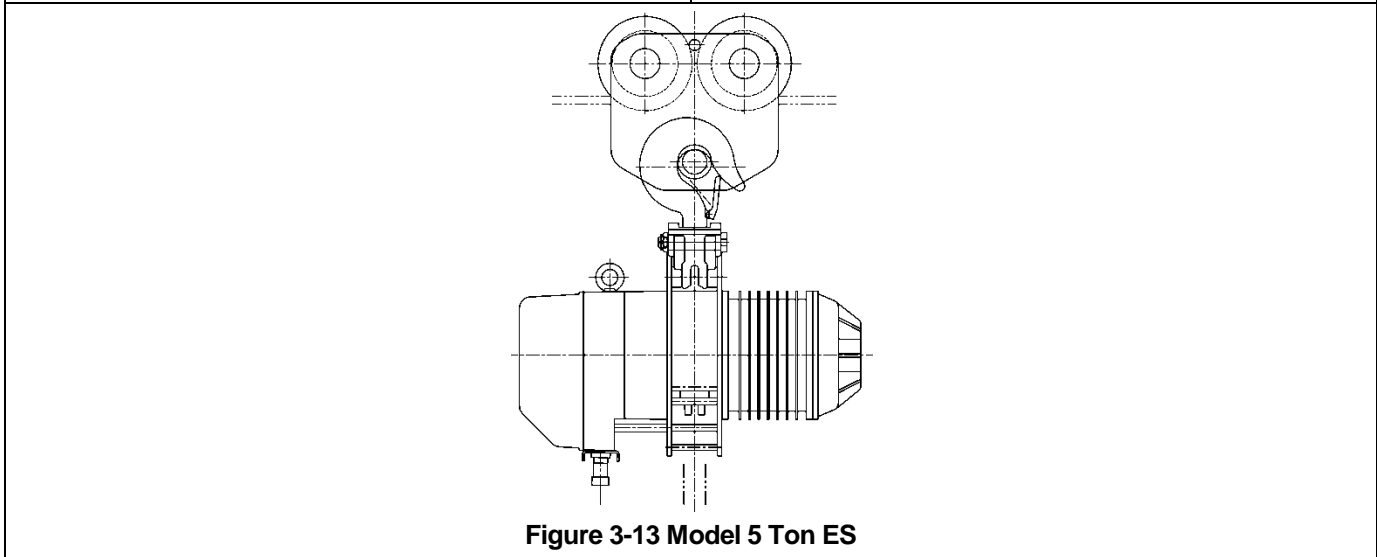
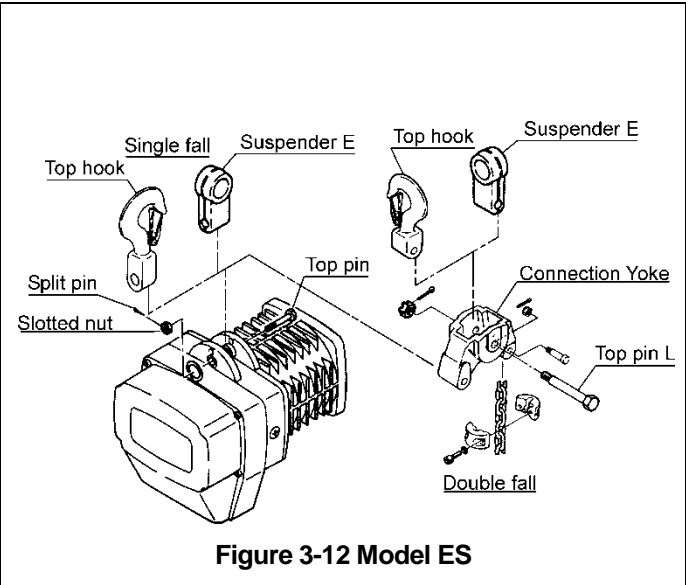
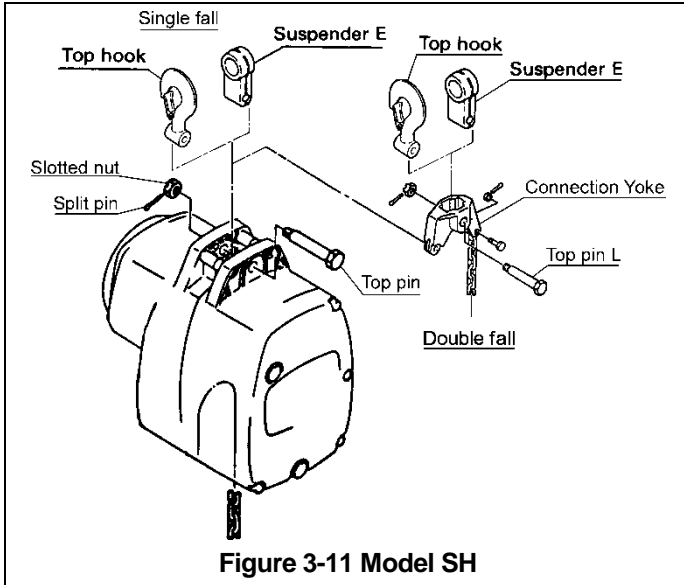
Before performing ANY mechanical or electrical maintenance on the equipment, de-energize (disconnect) the main switch supplying power to the equipment; and lock and tag the main switch in the de-energized position. Refer to ANSI Z244.1, "Personnel Protection – Lockout/Tagout of Energy Sources".

Only trained and competent personnel should inspect and repair this equipment.

- 3.2.1  **DANGER** Never attempt to hook mount an Electric chain hoist directly to the Suspension Shaft on trolleys up to and including 3 Ton. These trolleys are designed to be used with a suspender only and do not have the vertical clearance required for a hook to fit between the Suspension Shaft and trolley beam.
- 3.2.2 When the TS2 trolley is combined with a hoist, follow and complete all pre-operational procedures provided with the hoist. For Harrington SH, ES and NES model hoists, follow the pre-operational procedures in the SH, ES/NES Owner's Manual in conjunction with all information provided in this section for mounting and electrical connections.
- 3.2.3 In addition to the information and procedures provided in this section for the TS2 trolley, there are specific details for using SH, ES and NES hoists with TS2 trolleys. Special mounting and wiring considerations must be taken if the trolley is used with a hoist other than an SH, ES or NES model.
- 3.2.4 Preparing SH, ES and NER hoists for use with TS2 trolley.
- 1) These instructions pertain to the mechanical coupling of the hoist to the trolley. Refer to the hoists owner's manual for the Electrical connections.
 - 2) SH & ES Series Hoists couple directly to the trolley with suspender "E", as shown in **Figure 3-9** and **Figure 3-10**.



- 3) Refer to the appropriate product owner's manual parts list and associated diagrams for the hoist.
- 4) Single Fall Units – Remove the Top Hook assembly by removing the Split Pin from the Slotted Nut. Remove the Slotted Nut, pull out the Top Pin, and remove the Top Hook. Replace with Suspender E, replace Top Pin, Slotted Nut and Split Pin. Be sure to bend Split Pin ends of the Split Pin away from each other sufficiently so the Split Pin remains captive in the Top Pin. Refer to **Figure 3-11** or **Figure 3-12** for the appropriate product. Attach hoist to the trolley.
- 5) Double Fall Units (except 5 Ton ES) – Remove the Top Hook assembly by removing the Split Pin from the Slotted Nut. Remove the Slotted Nut, pull out the Top Pin L from the Connection Yoke, and remove Top Hook. Replace with Suspender E, replace Top Pin, Slotted Nut and Split Pin. Be sure to bend Split Pin ends of the Split Pin away from each other sufficiently so the Split Pin remains captive in the Top Pin. Refer to **Figure 3-11** or **Figure 3-12** for the appropriate product. Attach hoist to the trolley.
- 6) 5 Ton ES – This hoist couples to the trolley by hook mounting the hoist to the trolley's suspension shaft. As shown in **Figure 3-13**.



3.2.5 To Couple a 1/8-5 Ton Model ER Electric chain hoist to a TF2/TS2 trolley, access to the ER Electrical controls is required. Refer to **Figure 3-14** or **Figure 3-15**, proceed as follows.

▲ DANGER

HAZARDOUS VOLTAGES ARE PRESENT IN THE HOIST CONTROL BOX, IN THE SUPPLY OF ELECTRICAL POWER TO THE HOIST MOTOR.

Before performing ANY mechanical or electrical maintenance on the equipment, de-energize (disconnect) the main switch supplying power to the equipment; and lock and tag the main switch in the de-energized position. Refer to ANSI Z244.1, "Personnel Protection – Lockout/Tagout of Energy Sources".

Only trained and competent personnel should inspect and repair this equipment.

- 3.2.6 When the TF2/TS2 trolley is combined with a hoist, follow and complete all pre-operational procedures provided with the hoist. For Harrington's ER and NER model hoists, follow the pre-operational procedures in the ER/NER Owner's Manual in conjunction with all information provided in this section for mounting and electrical connections.
- 3.2.7 In addition to the information and procedures provided in this section for the TS2 trolley, there are specific details for using ER and NER hoists with TF2/TS2 trolleys. Special mounting and wiring considerations must be taken if the trolley is used with a hoist other than an ER or NER model.
- 3.2.8 Preparing ER and NER hoists for use with TF2/TS2 trolley.

1/8 to 3 Ton ER/NER (EXCEPT 030C) – Assuming the hoist has an existing Top hook.

- 1) Refer to **Figure 3-14**.
- 2) Remove the four Controller Cover socket head bolts and allow the cover to swing fully open.
- 3) Loosen the three or four captive screws holding the electrical component mounting Plate against the main body of the hoist and swing the plate out to access the required components.
- 4) Loosen one of two Machine Screws attaching Plate A and remove the second Machine Screw. Allow Plate A to rotate out from the retaining slot in the bottom side of the Connection Shaft. Pull out the Connection Shaft and remove the Top Hook Assembly.
- 5) Remove the Hoist Fixing Shaft.
- 6) Installing the Connection Yoke, place the Connection Yoke Rubber and Suspender E in the top of the Connection Yoke. Attach Suspender E to the Connection Yoke with the Yoke Bolt, Slotted Nut and Split Pin (cotter pin).
- 7) Place Connection Yoke with Suspender E on the top of the hoist. Line up the holes for the Connection Shaft and the Hoist Fixing Shaft and reinsert the shafts.
- 8) Reassemble the remaining hoist components in reverse order of disassembly.

3 Ton (030C) and 5 Ton ER/NER – The 3 Ton (030C) and 5 Ton ER/NER hoists (double fall) always use a Connection Yoke. Remove the Top Hook Assembly from the Connection Yoke and install the Suspender E shown in **Figure 3-15**.

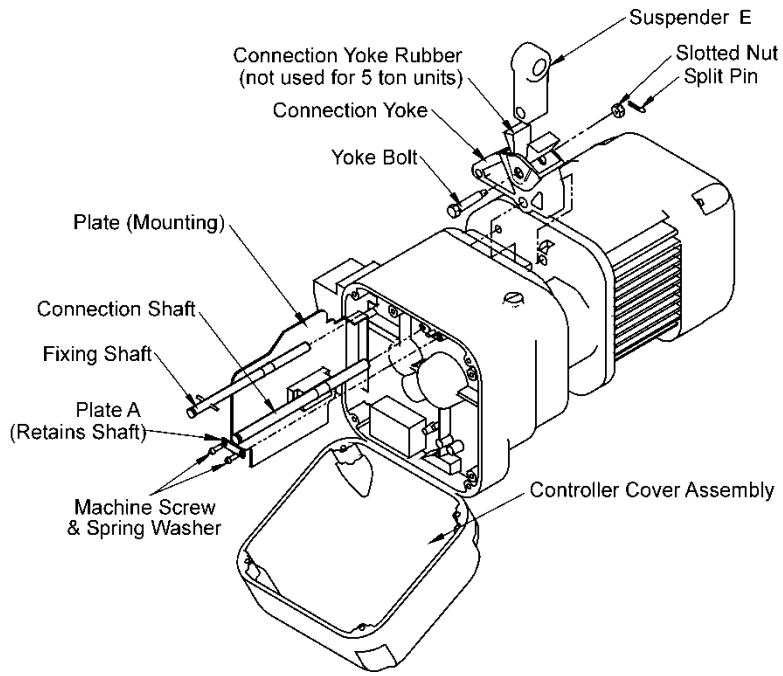
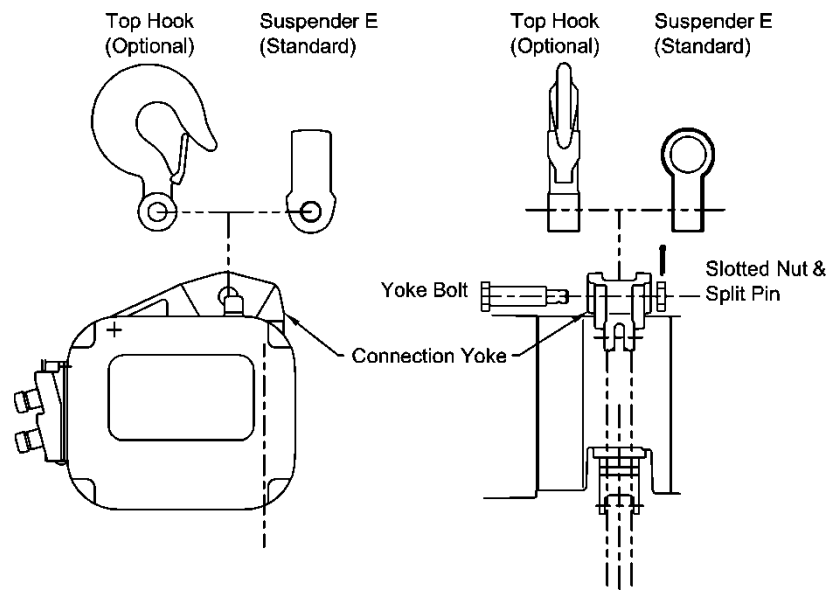


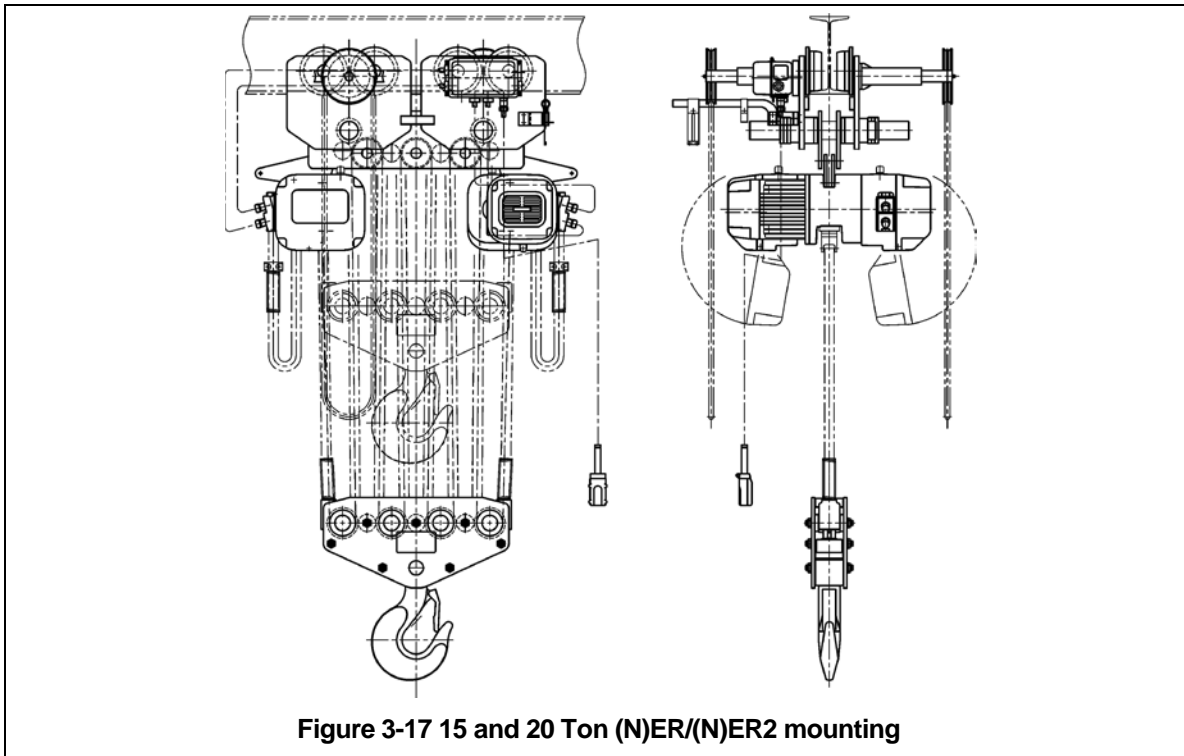
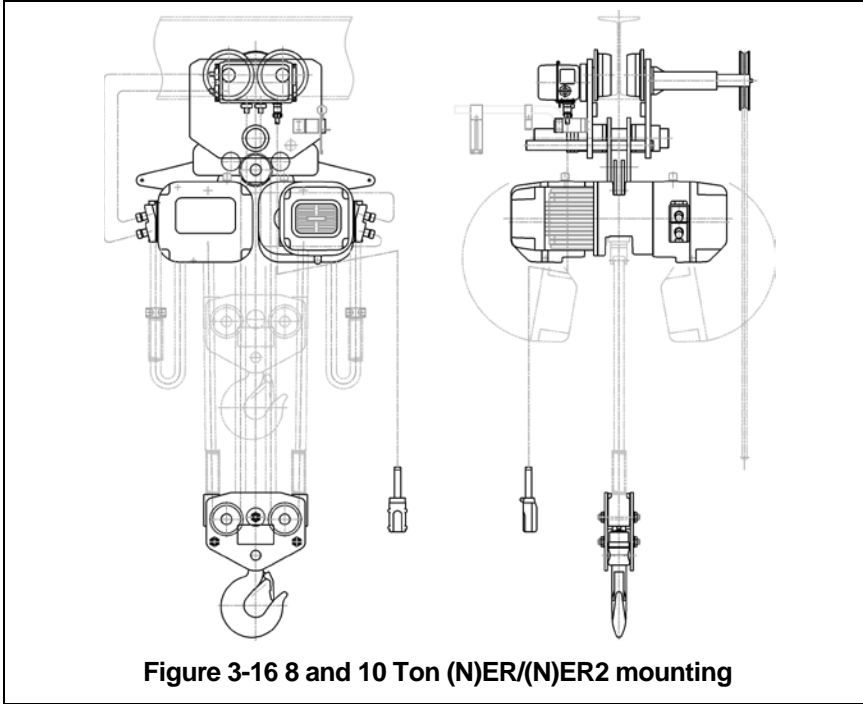
Figure 3-14 Installing Connection Yoke with Suspender E on ER Hoists – Connection Yoke standard on 030C & 050 models



Note: Unlike 3 Ton (Single Fall) and below (see Figure 3-12), Suspender G for 3 Ton (030C) and 5 Ton connects directly to the Connection Yoke without the Connection Yoke Rubber.

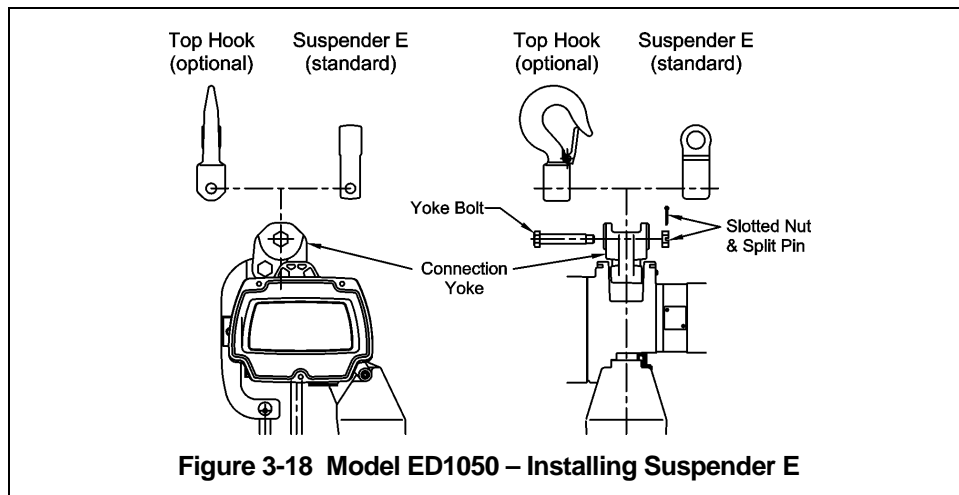
Figure 3-15 Installing Suspender E or G on 3 Ton (030C) and 5 Ton ER Hoists

8 to 20 Ton ER/NER – Since the trolley suspension shaft(s) passes through the hoist top plates, no additional hoist preparation is required to mount the (N)ER hoist to the trolley. Refer to **Figure 3-16** and **Figure 3-17**. See **Section 3.4** for more information on trolley assembly.



3.2.9 Preparing ED1050S/DS hoists for use with TS2 trolley.

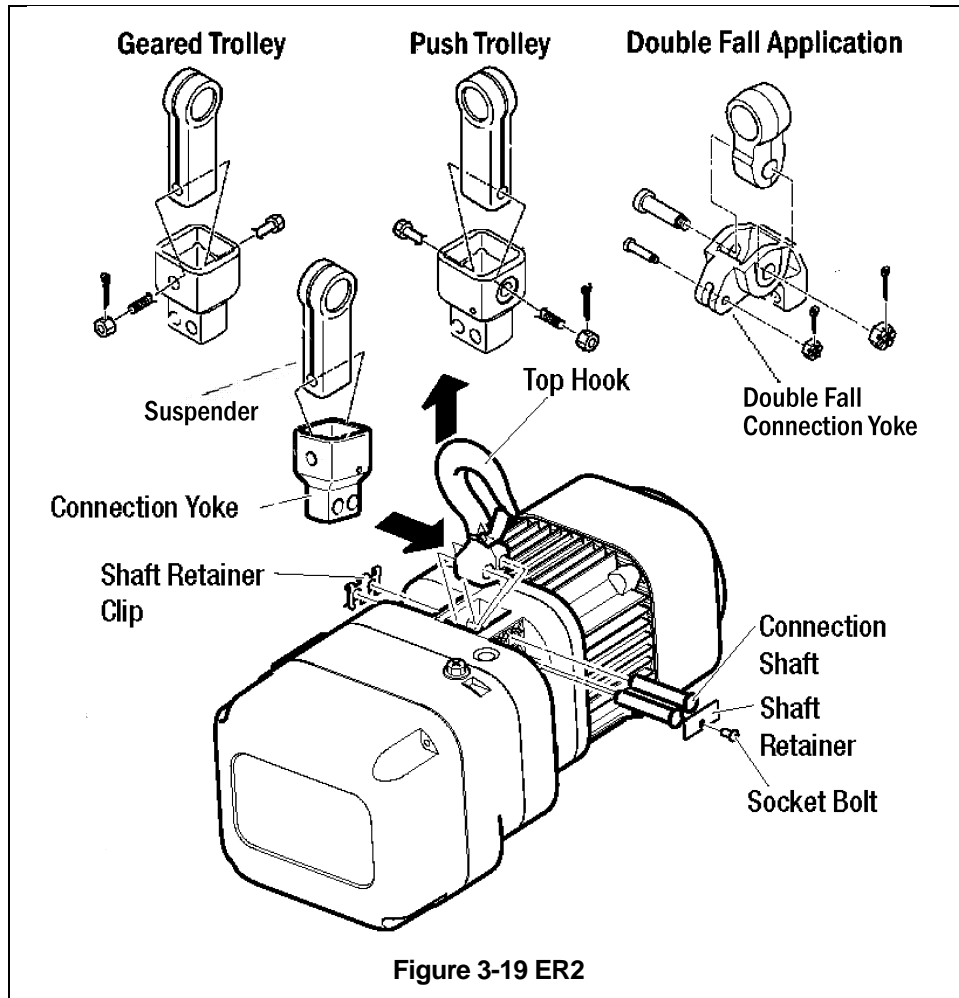
- 1) These instructions pertain to the mechanical coupling of the hoist to the trolley. Refer to the hoist's owner's manual for the electrical connections.
- 2) The standard configuration for ED1050S/DS hoists is to couple the hoist directly to the trolley with Suspender "E", as shown in **Figure 3-18**.
- 3) Refer to the appropriate product owner's manual parts list and associated diagrams for the hoist.
- 4) Refer to **Figure 3-18**. Remove the Top Hook assembly by removing the Split Pin from the Slotted Nut. Remove the Slotted Nut, pull out the Top Pin, and remove the Top Hook. Replace with Suspender E, replace Top Pin, Slotted Nut and Split Pin. Be sure to bend Split Pin ends of the Split Pin away from each other sufficiently so the Split Pin remains captive in the Top Pin. Attach hoist to the trolley.



3.2.10 Prepare the ER2 and NER2 hoists for use with TF2/TS2 trolley for the following hoists:

001H, 003S, 003H, 005L, 005S, 010L, 010S, 015S, 020C, 020L, 020C, 030C

- 1) Refer to **Figure 3-19**.
- 2) Remove the Shaft Retainer Clip from the two Connection Shafts.
- 3) Remove the Socket Bolt from the Shaft Retainer.
- 4) Remove the two Connection Shafts.
- 5) Remove the Top Hook and replace it with the Connection Yoke.
- 6) Re-insert the two Connection Shafts, so that both pass through the main body and the shaft holes of Connection Yoke.
- 7) Re-install the Shaft Retainer, Socket Bolt, and Shaft Retainer Clip.
- 8) Install the appropriate Suspender for the application, securing it to the Connection Yoke with the Yoke Bolt, Slotted Nut, and Split Pin. **Note: (See Figure 3-19) Double Fall applications require a Chain Pin, small Slotted Nut, and small Split Pin, in addition to the Yoke Bolt, Slotted Nut, and Split Pin.**



3.2.11 Prepare ER2 and NER2 hoists for use with TF2/TS2 trolley for the following hoists:

025S and 050L

- 1) Refer to **Figure 3-20**
- 2) Remove the four Socket Bolts that hold the Controller Cover to the hoist body. Now the Controller Cover can be lowered and left to hang by the cover belt.
- 3) Remove the four pan head screws and the two Shaft Retainers. This will allow the Bracing Shaft and the Connection Shaft to be removed by sliding them out of the hoist body.
- 4) With the Connection Shaft and Bracing Shaft removed, the Top Hook can be removed and replaced with the appropriate Connection Yoke.
- 5) Re-insert the Connection Shaft and Bracing Shaft ensuring both pass through the Connection Yoke flange.
- 6) Fix the Connection Shaft and Bracing Shaft with their respective Shaft Retainer and pan head screws.
- 7) Install appropriate Suspender for the application, securing it to the Connection Yoke with the Yoke Bolt, Slotted Nut, and Slit Pin. **Note: (See Figure 3-20) Double Fall applications require a Chain Pin, small Slotted Nut, and small Split Pin, in addition to the Yoke Bolt, Slotted Nut, and Split Pin.**
- 8) Re-install Controller Cover with the four Socket Bolts.

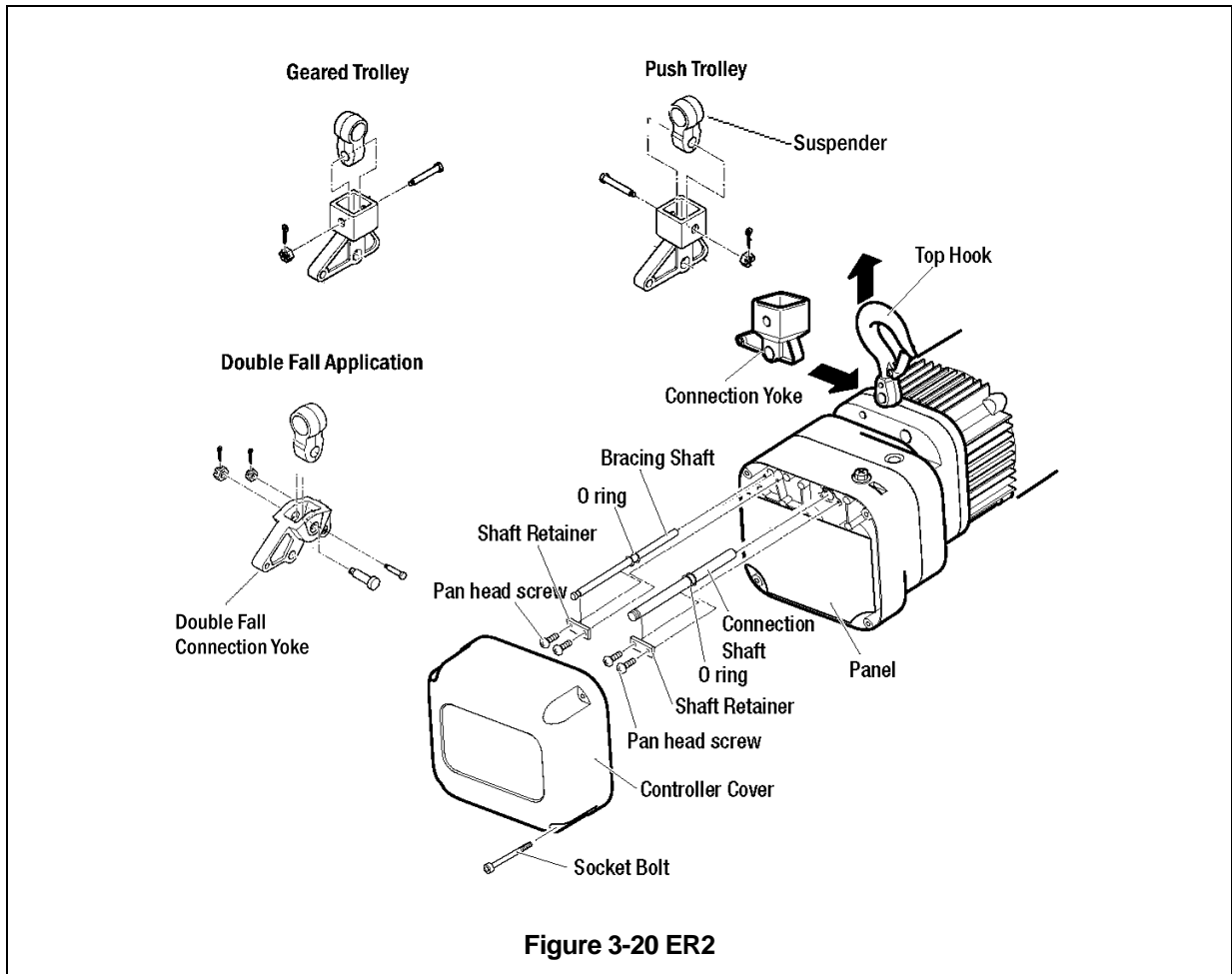


Figure 3-20 ER2

8 to 20 Ton ER2/NER2 – Since the trolley suspension shaft(s) passes through the hoist top plates, no additional hoist preparation is required to mount the (N)ER2 hoist to the trolley. Refer to **Figure 3-16** and **Figure 3-17** which apply to both (N)ER and (N)ER2. See **Section 3.4** for more information on trolley assembly.

3.3 Air Powered Hoist Adjustment for Trolley

3.3.1 Coupling a TCR Air Hoist to a TS2 Trolley.

3.3.2 When the TS2 trolley is combined with a hoist, follow and complete all pre-operational procedures provided with the hoist. For Harrington TCR model hoists, follow the pre-operational procedures in the TCR Owner's Manual in conjunction with all information provided in this section for mounting and air hose connections.

3.3.3 In addition to the information and procedures provided in this section for the TF2 trolley, there are specific details for using TCR hoists with TF2 trolleys. Special mounting and air hose considerations must be taken if the trolley is used with a hoist other than a TCR model.

3.3.4 Standard configuration for a TCR hoist is lug mounted to the trolley using a TCR Suspender. As shown in **Figure 3-21** or **Figure 3-22**. Optional configurations for 1/4 to 3Ton TCR hoist is, hook mount to suspender C as shown in **Figure 3-23**.

3.3.5 Preparing TCR hoists for use with TF2 trolley.

For Single fall hoists (*TCR250P, *500P, 1000P, 3000P) - Refer to **Figure 3-24**.

* TCR250 & 500 use a TF2010 trolley. Hoists WILL NOT FIT on TF2005 trolley.

Remove the Top Hook Assembly from the hoist and install the suspender as follows:

- 1) Remove the top pin, yoke and top hook.
- 2) To remove the top pin, yoke and top hook on the TCR1000P loosen and remove the 3 bolts holding the gear section onto the main body. Rotate the gear section clockwise to allow the top pin to be removed.
- 3) Place the suspender on the top of the hoist. Line up the holes for the hoist main body and suspender. Reinsert the top pin.
- 4) Reassemble the remaining hoist components in reverse order of disassembly.

For Double fall hoists (TCR1000P2, TCR2000P2, TCR6000P2) - Refer to **Figure 3-25**.

Remove the Top Hook Assembly and Load Chain from the hoist and install the suspender as follows:

- 1) Loosen and remove the bolt attaching the load chain to the top hook yoke.
- 2) Remove the load chain from the top hook yoke.
- 3) Remove the top pin, yoke and top hook.
- 4) To remove the top pin, yoke and top hook on the TCR2000P2 loosen and remove the 3 bolts holding the gear section onto the main body. Rotate the gear section clockwise to allow the top pin to be removed.
- 5) Place the suspender on the top of the hoist. Line up the holes for the hoist main body and suspender. Reinsert the top pin.
- 6) Reassemble the remaining hoist components in reverse order of disassembly
- 7) Reattach the no load side of the load chain to the load chain mounting hole in the suspender.

For Double fall hoist (TCR10000P2) - Refer to **Figure 3-26**

Remove the Top Hook Assembly from the hoist and install the suspender as follows:

- 1) Loosen and remove the two top pins that connect the top hook assembly to the hoist body.
- 2) Remove the top hook assembly.
- 3) Place the suspender on the top of the hoist and line up the holes with the main hoist body.
- 4) Reinstall the two top pins through the hoist body and suspender.

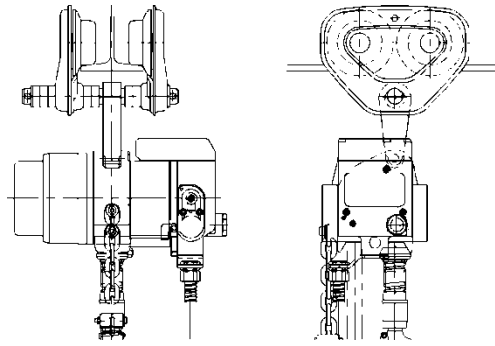


Figure 3-21 Lug mount on TF2

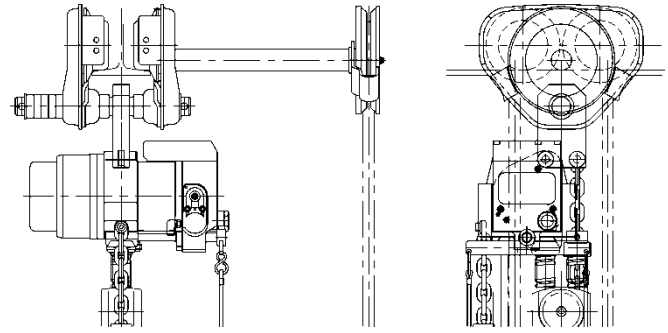


Figure 3-22 Lug mount on Geared TS2 Extended Hand Wheel

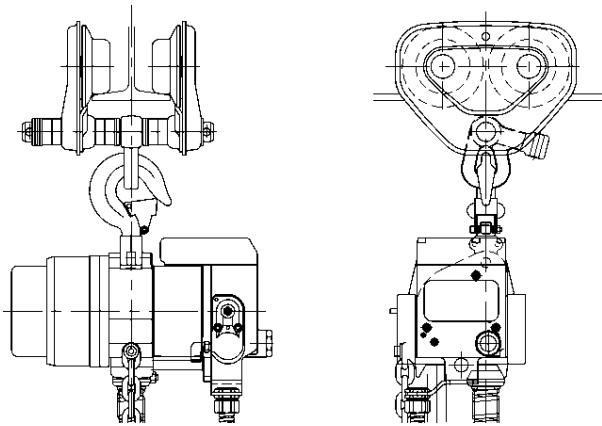


Figure 3-23 Hook mounted on Suspender C

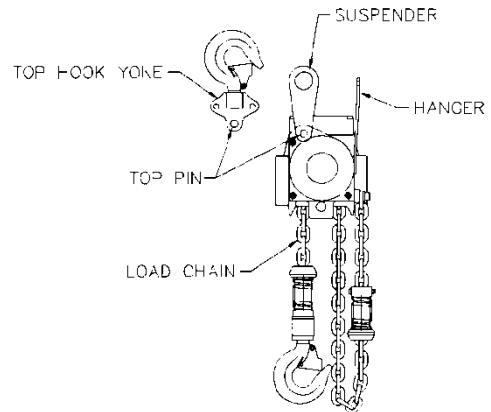


Figure 3-24 Installing Suspender on single fall hoists TCR250P, 500P and 300P

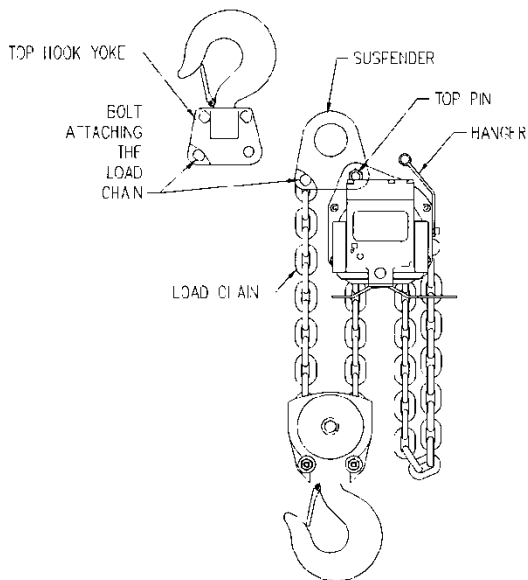


Figure 3-25 Installing Suspender on double fall hoists TCR1000P, TCR2000P2, TCR6000P2

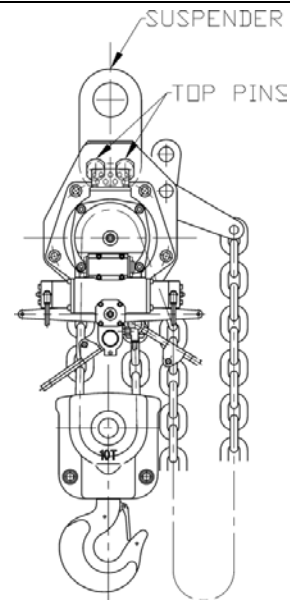


Figure 3-26 Installing Suspender on TCR10000P2

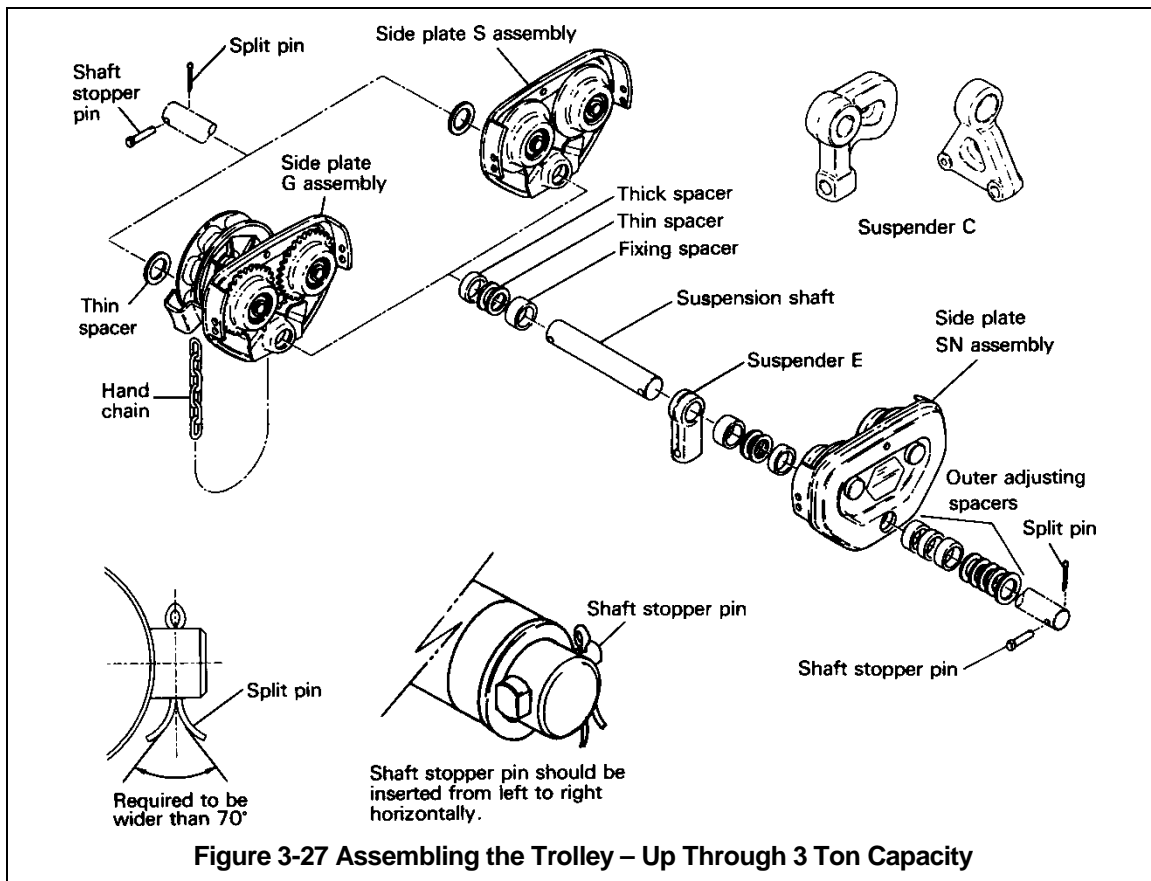
3.3.6 When using an optional steel chain container, refer to the assembly drawing and instructions provided with the container for correct assembly and attachment.

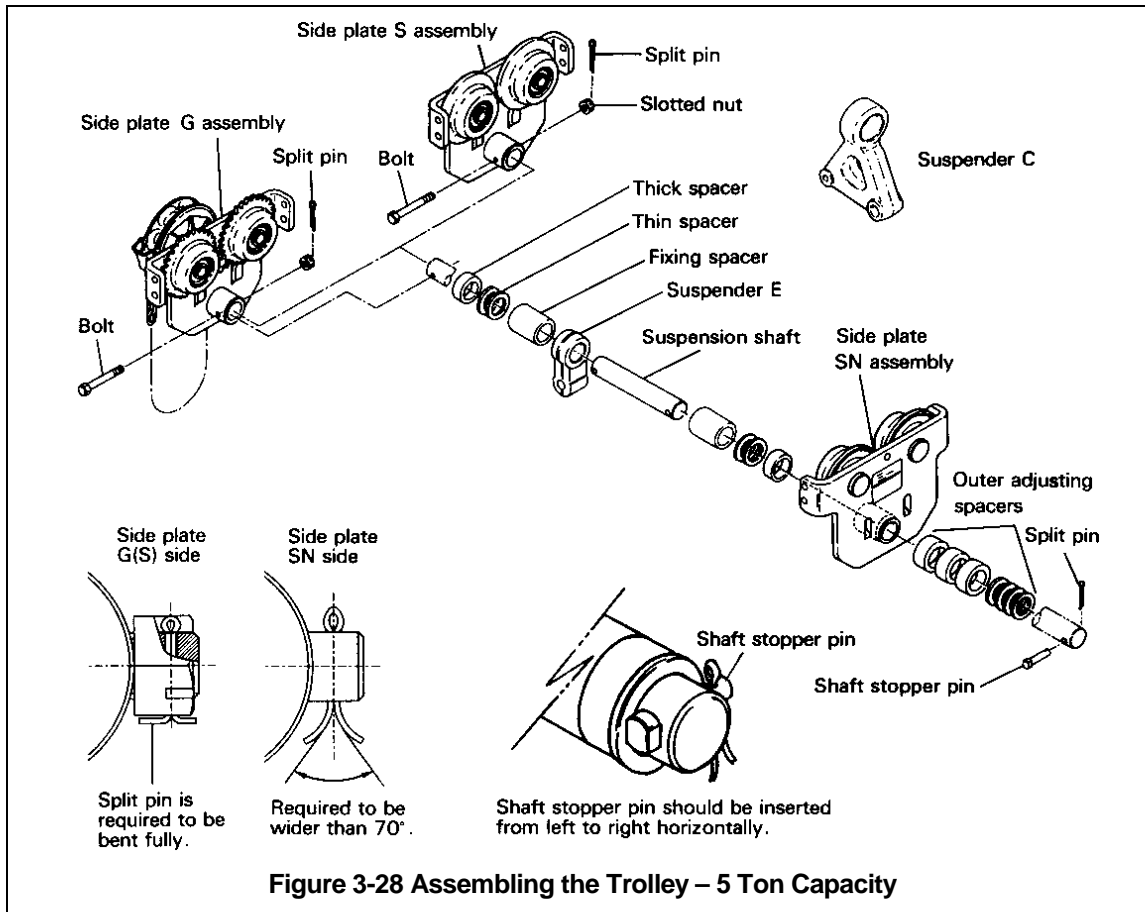
3.4 Trolley Assembly

Refer to **Figure 3-27** for ½ through 3 Ton.

Refer to **Figure 3-28** for 5 Ton.

- 1) Remove the Shaft Stopper Pin, Side Plate SN, and Spacers from the Suspension Shaft. For beam flanges that are wider than the standard range, different suspension shaft and/or spacer arrangements are provided. Refer to **Table 3-1**.
- 2) Insert the Suspension Shaft to Side Plate G or S and attach it with the Shaft Stopper Pin and Split Pin (cotter pin). Refer to **Figure 3-33** to ensure that the correct Suspension Shaft holes are used. Securely bend both branches of the Split Pin after insertion.
- 3) Referring to **Figure 3-35**, **Table 3-1** and **Table 3-2** install the inner adjusting Spacers and Suspender on the Suspension Shaft. Use all of the Spacers provided with the trolley. If the beam width is not listed in the Table, use the next size smaller and make adjustments in accordance with **Section 3.3.8**.
- 4) Place Side Plate SN into the Suspension Shaft.
- 5) Install the outer adjusting Spacers on the Suspension Shaft outside of Side Plate SN. Insert the Shaft Stopper Pin into Suspension Shaft. Temporarily install the split pin in the Shaft Stopper Pin and bend the split pin slightly to hold it in place. The split pin should be fully bent after checking and attaining the proper beam flange adjustment





Refer to **Figure 3-29** for 8 to 10 Ton coupled with Manual CB hoist

Refer to **Figure 3-29** for 6 and 10 Ton coupled with a TCR air hoist except the applicable TCR suspender will be used instead of the top hook (See Table 2-12 and Section 3.3 for TCR suspender information).

Refer to **Figure 3-30** for 8 to 10 Ton coupled with (N)ER/(N)ER2 hoist

- 1) Remove the Shaft Stopper Pin, Side Plate S, and Spacers from the Suspension Shaft. For beam flanges that are wider than the standard range, different suspension shaft and/or spacer arrangements are provided. Refer to **Table 3-1**.
- 2) Insert the Suspension Shaft to Side Plate G and attach it with the Suspension Shaft Bolt, Slotted Nut and Split Pin (cotter pin). Refer to **Figure 3-33** to ensure that correct Suspension Shaft holes are used. Securely bend both branches of the Split Pin after insertion.
- 3) Referring to **Figure 3-35** and **Table 3-3** install the inner adjusting Spacers and Suspender (for TCR) or Suspension Plates (for (N)ER/(N)ER2) on the Suspension Shaft. For CB hoist, the hook can be attached after assembly. Use all of the Spacers provided with the trolley. If the beam width is not listed in **Table 3-3**, use the next size smaller and make adjustments in accordance with **Section 3.3.8**.
- 4) Place Side Plate S onto the Suspension Shaft.
- 5) Install the outer adjusting Spacers on the Suspension Shaft outside of Side Plate S. Refer to **Figure 3-33** and insert the Shaft Stopper Pin into hole "A." Temporarily install the split pin in the Shaft Stopper Pin and bend the split pin slightly to hold it in place. The split pin should be fully bent after checking and attaining the proper beam flange adjustment.

- 6) For the (N)ER/(N)ER2 hoists – Insert the Trolley Fixing Shaft through Side Plate G, Suspension plates and Side Plate S. Refer to **Figure 3-30**. Secure it to side Plate G with two split pins. Securely bend both branches of the Split Pin after insertion.

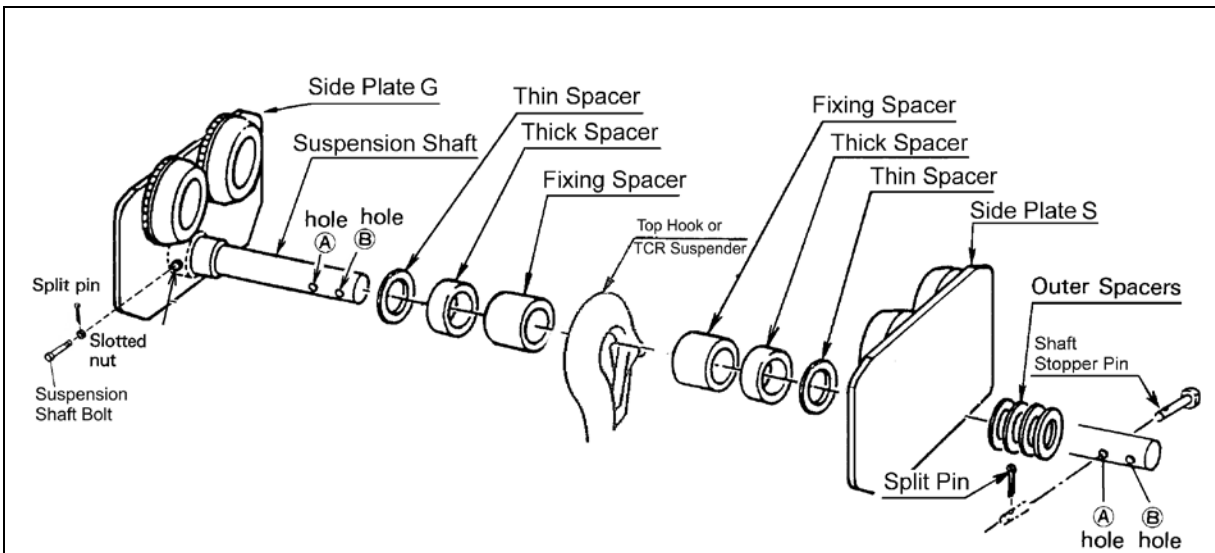
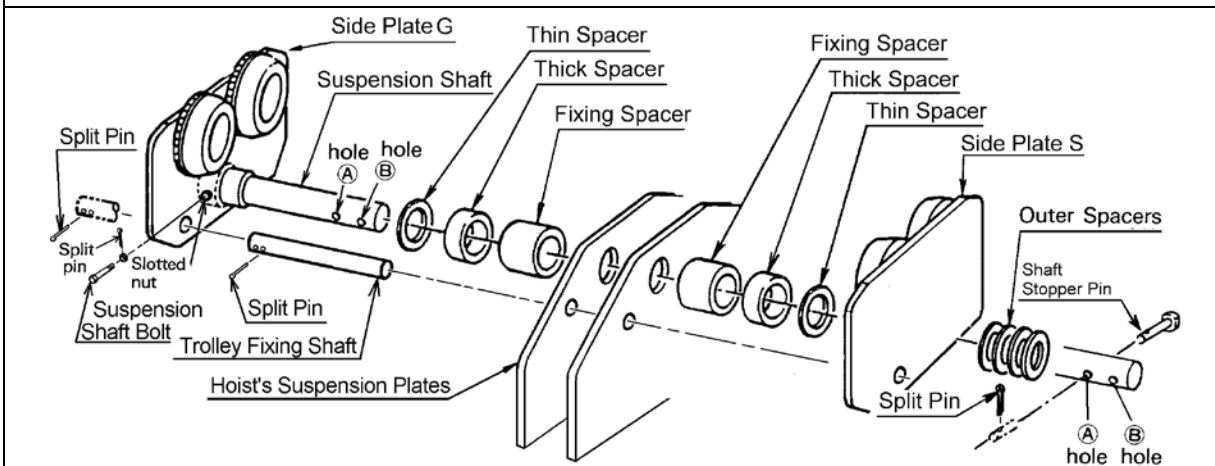


Figure 3-29 Assembling the Trolley - 8 Through 10 Ton Capacity, CB or TCR



Note: ■ Trolley Fixing Shaft is shown in front of Suspension Shaft for clarity. Actual location is behind the Suspension Shaft.

Figure 3-30 Assembling the Trolley - 8 Through 10 Ton Capacity, (N)ER/(N)ER2

Refer to **Figure 3-31** for 15-20 Ton coupled with Manual CB hoist

Refer to **Figure 3-32** for 15-20 Ton coupled with (N)ER/(N)ER2 hoist

- 1) Remove the Shaft Stopper Pin, Side Plate S, and Spacers from the Suspension Shaft. For beam flanges that are wider than the standard range, different suspension shaft and/or spacer arrangements are provided. Refer to **Table 3-1**.

- 2) Insert the Suspension Shaft to Side Plate G and attach it with the Suspension Shaft Bolt, Slotted Nut and Split Pin (cotter pin). Refer to **Figure 3-33** to ensure that correct Suspension Shaft holes are used. Securely bend both branches of the Split Pin after insertion.
- 3) Referring to **Figure 3-35** and **Table 3-3** install the inner adjusting Spacers, Suspension plates, and Side Plate S on the Suspension Shaft. Use all of the Spacers provided with the trolley. If the beam width is not listed in **Table 3-2**, use the next size smaller and make adjustments in accordance with Section 3.3.8.
- 4) Place Side Plate S onto the Suspension Shaft.
- 5) Install the outer adjusting Spacers on the Suspension Shaft outside of Side Plate S. Insert the Shaft Stopper Pin into Suspension Shaft. Temporarily install the split pin in the Shaft Stopper Pin and bend the split pin slightly to hold it in place. The split pin should be fully bent after checking and attaining the proper beam flange adjustment.

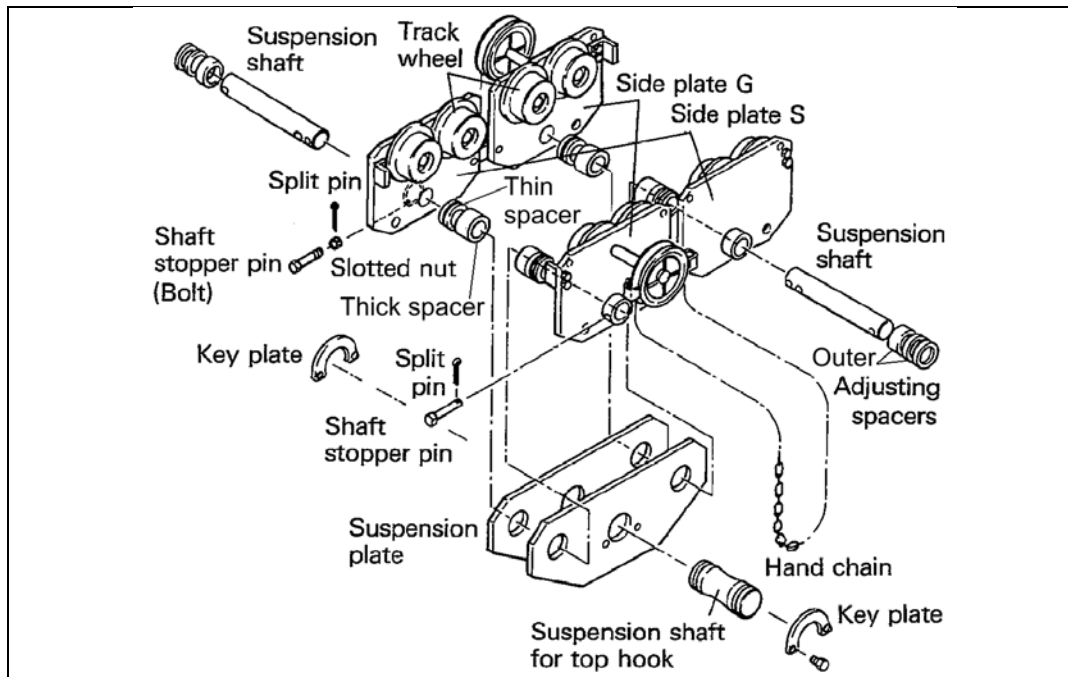


Figure 3-31 Assembling the Trolley – 15-20 Ton Capacity (Manual)

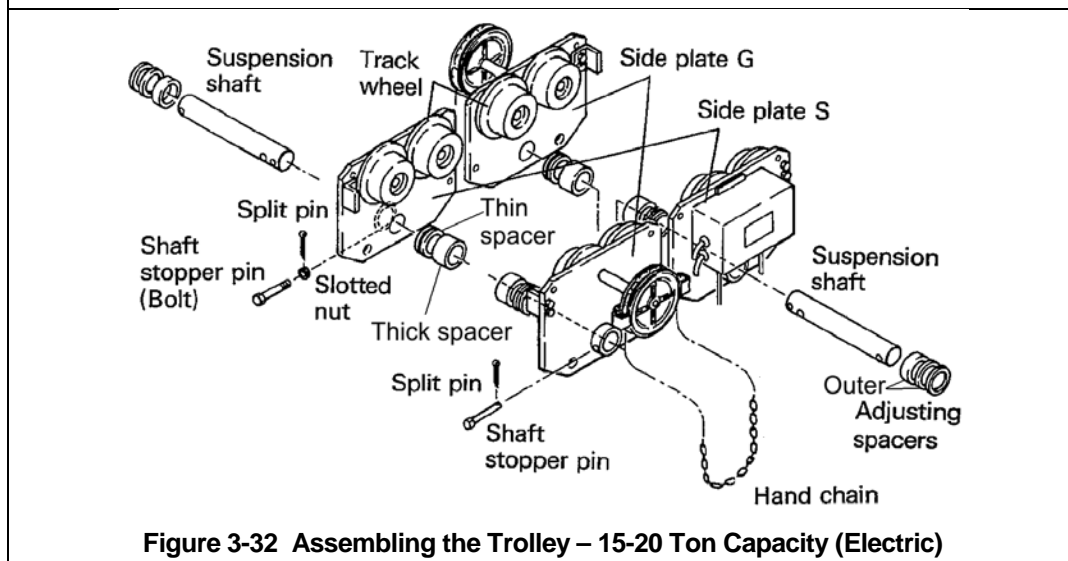


Figure 3-32 Assembling the Trolley – 15-20 Ton Capacity (Electric)

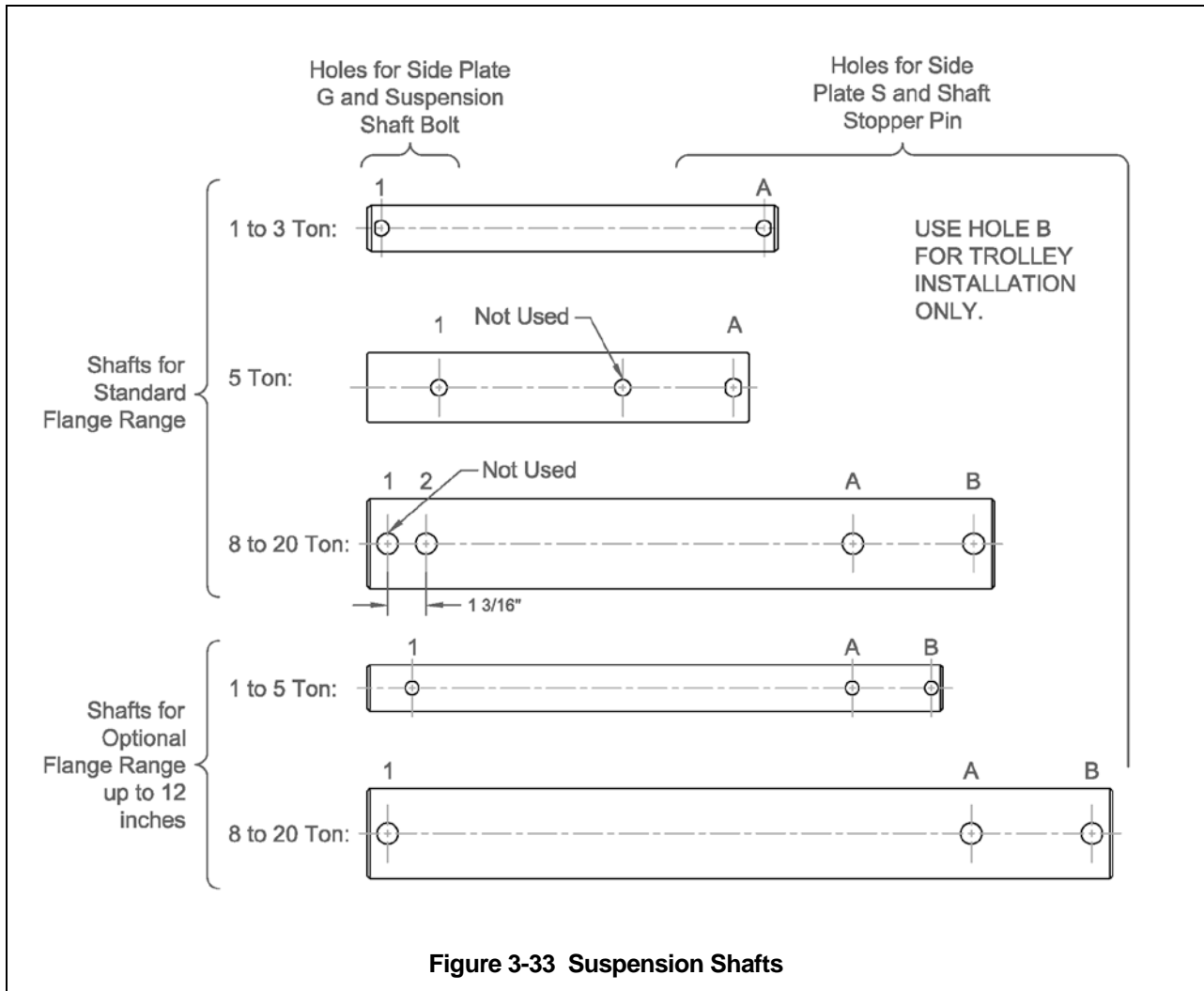


Figure 3-33 Suspension Shafts

3.4.1 Adjusting the trolley width – After assembling trolley per **Section 3.5**, check the adjustment as follows:

- 1) Refer to **Figure 3-34**.
- 2) Make sure both side plates are spread fully outward and measure dimension “A”. Compare dimension “A” with the following values:
 - For trolleys up through 5 Ton, “A” must be $\frac{3}{32}$ ” to $\frac{5}{32}$ ” greater than “B”.
 - For trolleys 8 Ton to 20 Ton, “A” must be $\frac{3}{16}$ ” to $\frac{1}{4}$ ” greater than “B”.
- 3) If “A” does not fall within the specified range, move spacers from inner to outer or from outer to inner as necessary to obtain the proper “A” dimension, irrespective of the numbers in **Table 3-2**.
- 4) After obtaining the proper adjustment, install the Shaft stopper Pin, insert the Split Pin into the Stopper Shaft Pin, and securely bend both branches of the Split Pin.
 - **⚠ WARNING** For trolleys 8 Ton to 20 Ton, make sure to insert Shaft Stopper Pin into Hole “A”. HOLE “B” IS FOR TROLLEY INSTALLATION ONLY.
- 5) Because two traversing units are combined in the 15 and 20 Ton trolley, ALWAYS adjust both units in the same way.

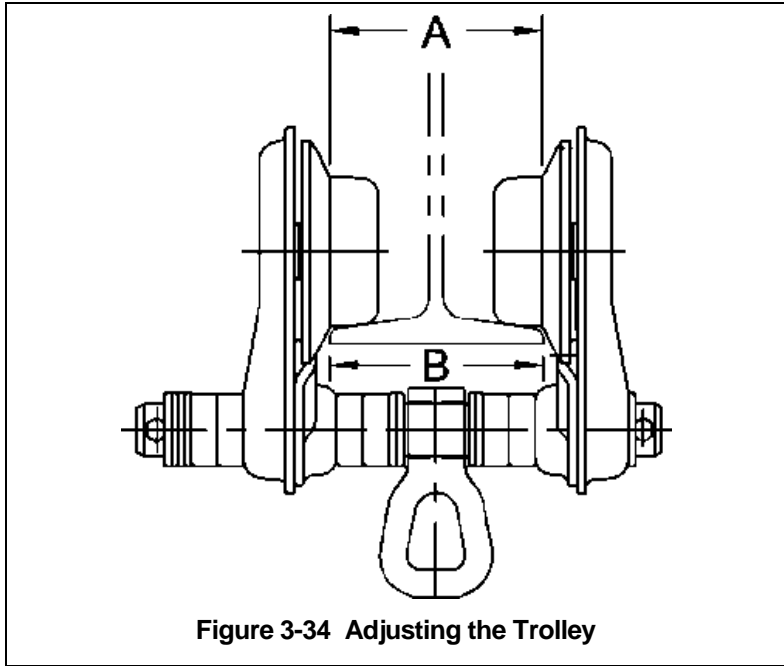
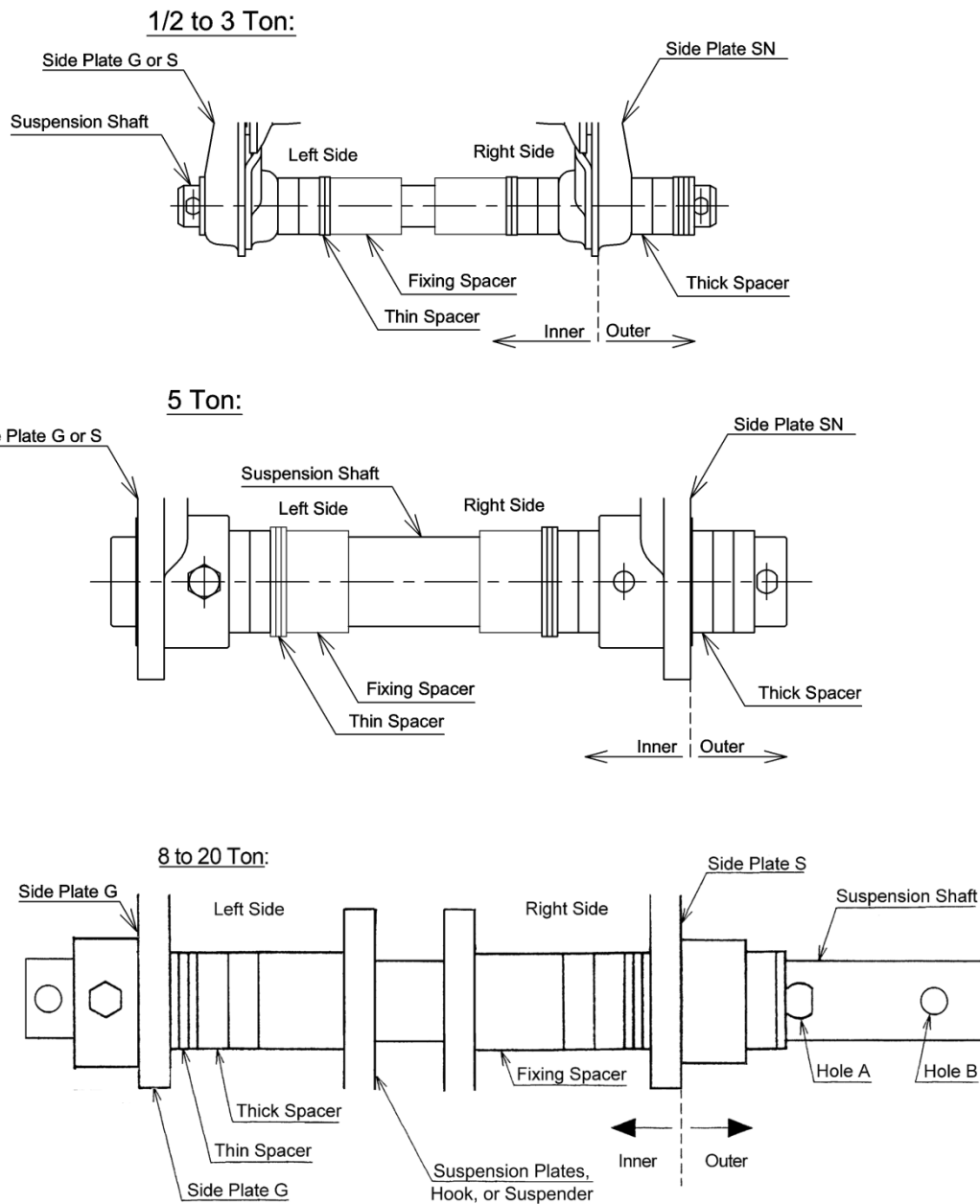


Figure 3-34 Adjusting the Trolley



Note: Inner Spacer rows on **Table 3-2** and **Table 3-3** list two numbers. The first number is the quantity of spacers located on the left side of the Suspender or Suspension Plates, the second number is the quantity on the right side.

Example: 1 + 2 ← Adjusting Spacers on the right side [Side Plate SN side (for 8 to 20 Ton, Side Plate S side)] ↑ Adjusting Spacers on the left side [Side Plate G or S side (for 8 to 20 Ton, Side plate G side)]

Figure 3-35 Spacers Arrangement

Table 3-1 Suspension Shaft Adjusting Spacers							
Capacity (Tons)	Flange Range (in)	Total Number of Spacers Supplied					
		Thin	Thick	Fixing	Thick L	Balancing Collar (5 Ton only)	
1/2	2.28 to 4.00	10	4	—	—	—	
	4.01 to 8.00	10	7	2	—	—	
	8.01 to 12.00	10	7	2	—	—	
1	2.28 to 5.00	9	6	—	—	—	
	5.01 to 8.00	10	5	2	—	—	
	8.01 to 12.00	10	7	2	—	—	
2	3.23 to 6.02	8	6	—	—	—	
	6.03 to 12.00	10	11	2	—	—	
3	3.23 to 6.02	11	9	—	—	—	
	6.03 to 12.00	10	11	2	—	—	
TF	5	3.94 to 7.02	8	3	—	2	—
		7.03 to 12.00	8	11	—	2	2
TS	5	3.94 to 7.02	8	5	—	—	—
		7.03 to 12.00	8	9	2	—	—
8	5.50 to 9.02	8	8	—	—	—	
	9.02 to 12.00	8	9	2	—	—	
10	5.50 to 9.02	8	8	—	—	—	
	9.02 to 12.00	8	9	2	—	—	
15*	5.50 to 9.02	10**	3	—	—	—	
	9.02 to 12.00	8	11	—	—	—	
20*	5.50 to 9.02	10**	3	—	—	—	
	9.02 to 12.00	8	11	—	—	—	

*Note: 15 and 20 Ton models have two suspension shafts. The number of spacers above reflects the quantities per suspension shaft.

**For flange widths between 5 1/2 to 5 5/16, three (3) additional thin spacers are required (for a total of 13 thin spacers).

Table 3-2 Number of Adjusting Spacers, ½ to 5 Ton

Beam Flange Width		(in)	2	2 ⁵ / ₁₆	2 ¹ / ₂	2 ⁷ / ₈	3	3 ¹ / ₄	3 ⁹ / ₁₆	3 ⁷ / ₈	3 ¹⁵ / ₁₆	4	4 ³ / ₁₆	4 ¹⁵ / ₁₆	4 ⁷ / ₁₆	4 ¹¹ / ₁₆	4 ¹⁵ / ₁₆	5	5 ³ / ₁₆	5 ⁵ / ₁₆	5 ³ / ₈	5 ¹ / ₂	5 ⁵ / ₈	5 ⁷ / ₈	6	6 ¹ / ₈	6 ⁵ / ₁₆	6 ⁷ / ₁₆
Cap (Ton)	Spacer Type	(mm)	50	58	64	73	75	82	90	98	100	102	106	110	113	119	125	127	131	135	137	140	143	149	153	155	160	163
					2 ⁵ / ₈	2 ¹⁵ / ₁₆			66	74	76					4 ³ / ₄								5 ¹⁵ / ₁₆				
1/2	Thin	Inner	2+3	3+4	0+1	1+2	2+2	3+3	0+1	1+2	2+2	2+3	1+1	1+2	2+2	3+3	0+0	0+1	1+1	1+2	2+2	2+3	3+3	0+0	0+1	1+1	1+2	2+2
		Outer	4	2	8	6	5	3	8	6	5	4	7	6	5	3	9	8	7	6	5	4	3	9	8	7	6	5
	Thick	Inner	0+0	0+0	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	0+0	0+0	0+0	0+0	1+1	1+1	1+1	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	2+2
Outer		4	4	2	2	2	2	0	0	0	0	7	7	7	7	5	5	5	5	5	5	5	3	3	3	3	3	
1	Thin	Inner		3+3	0+0	1+1	1+2	2+3	0+0	1+1	1+2	1+2	2+3	3+3	3+4	0+1	1+2	2+2	1+1	1+2	2+2	2+3	3+3	0+0	0+1	1+1	1+2	2+2
		Outer		2	8	6	5	3	8	6	5	4	3	2	1	7	5	4	7	6	5	4	3	9	8	7	6	5
	Thick	Inner		0+0	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	2+2	2+2	2+2	3+3	3+3	3+3	0+0	0+0	0+0	0+0	0+0	1+1	1+1	1+1	1+1	1+1
Outer			6	4	4	4	4	2	2	2	2	2	2	2	0	0	0	5	5	5	5	5	3	3	3	3	3	
2	Thin	Inner						2+2	3+4	6+1	1+1	1+2	2+2	2+3	3+3	0+0	1+1	1+2	2+2	2+3	3+3	3+4	0+0	1+1	1+2	1+1	1+2	2+2
		Outer						3	0	6	5	4	3	2	1	7	5	4	3	2	1	0	7	5	4	7	6	5
	Thick	Inner						0+0	0+0	1+1	1+1	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	2+2	2+2	2+2	3+3	3+3	3+3	0+0	0+0	0+0
Outer							6	6	4	4	4	4	4	4	2	2	2	2	2	2	2	0	0	0	11	11	11	
3	Thin	Inner						1+2	3+3	0+0	0+1	1+1	1+2	2+2	2+3	3+4	0+1	1+1	1+2	2+2	2+3	3+3	3+4	1+4	1+5	1+1	1+2	2+2
		Outer						7	4	10	9	8	7	6	5	3	9	8	7	6	5	4	3	5	4	7	6	5
	Thick	Inner						2+2	2+2	3+3	3+3	3+3	3+3	3+3	3+3	3+3	4+4	4+4	4+4	4+4	4+4	4+4	4+4	5+4	5+4	0+0	0+0	0+0
Outer							5	5	3	3	3	3	3	3	3	1	1	1	1	1	1	1	0	0	11	11	11	
5 (TF)	Thin L	Inner															1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1
		Outer															8	7	6	5	4	3	2	8	7	6	5	4
	Thick	Inner															0+0	0+0	0+0	0+0	0+0	0+0	1+1	1+1	1+1	1+1	1+1	
		Outer															3	3	3	3	3	3	3	1	1	1	1	1
Balancing Collar	Inner															-	-	-	-	-	-	-	-	-	-	-	-	
5 (TS)	Thin	Inner										0+0	0+1	1+1	1+2	2+2	3+3	0+0	0+1	1+1	1+2	2+2	3+3	0+0	0+1	1+1	1+2	2+2
		Outer										8	7	6	5	4	2	8	7	6	5	4	2	8	7	6	5	4
	Thick	Inner										0+0	0+0	0+0	0+0	0+0	0+0	1+1	1+1	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	
		Outer										5	5	5	5	5	5	3	3	3	3	3	3	1	1	1	1	1
Fixing Spacer	Inner																											

Table 3-2 Number of Adjusting Spacers, ½ to 5 Ton (continued)

Beam Flange Width		(in)	6 ¹¹ / ₁₆	6 ⁷ / ₈	7	7 ¹ / ₁₆	7 ¹ / ₄	7 ⁷ / ₈	8	8 ⁷ / ₈	8 ¹¹ / ₁₆	9	9 ¹ / ₈	9 ⁷ / ₈	10	10 ¹ / ₈	10 ¹ / ₄	10 ³ / ₈	10 ¹ / ₂	11	11 ¹ / ₈	11 ¹ / ₄	11 ³ / ₈	11 ⁵ / ₈	11 ³ / ₄	11 ¹³ / ₁₆	11 ⁷ / ₈	12	
Cap (Ton)	Spacer Type	(mm)	170	175	178	180	184	200	203	215	220	229	232	250	254	257	260	264	267	279	283	286	289	295	298	300	302	305	
			181	185																									
1/2	Thin	Inner	3+3	0+0	0+1	1+1	1+2	4+4	4+5	2+3	3+3	4+5	1+1	0+0	0+1	1+1	1+2	2+2	3+3	4+5	1+1	1+2	2+2	3+3	3+4	4+4	4+5	4+5	
		Outer	3	9	8	7	6	1	0	4	3	0	7	9	8	7	6	5	4	0	7	6	5	3	2	1	0	3	
	Thick	Inner	2+2	3+3	3+3	3+3	3+3	3+3	3+3	3+3	0+0	0+0	0+0	1+1	2+2	2+2	2+2	2+2	2+2	2+2	2+2	3+3	3+3	3+3	3+3	3+3	3+3	3+3	4+3
		Outer	3	1	1	1	1	1	1	7	7	7	5	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	0
Fixing	Inner	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+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	
1	Thin	Inner	3+3	0+0	0+1	1+1	1+2	4+4	4+5	2+3	3+3	4+5	1+1	0+0	0+1	1+1	1+2	2+2	2+3	4+5	1+1	1+2	2+2	3+3	3+4	4+4	4+5	1+5	
		Outer	3	9	8	7	6	1	0	4	3	0	7	9	8	7	6	5	4	0	7	6	5	3	2	1	0	3	
	Thick	Inner	1+1	2+2	2+2	2+2	2+2	2+2	2+2	0+0	0+0	0+0	1+1	2+2	2+2	2+2	2+2	2+2	2+2	2+2	3+3	3+3	3+3	3+3	3+3	3+3	3+3	3+3	4+3
		Outer	3	1	1	1	1	1	1	7	7	7	5	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	0
Fixing	Inner	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+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	
2	Thin	Inner	3+3	0+0	0+1	1+1	1+2	0+0	0+1	2+3	3+3	4+5	1+1	0+0	0+1	1+1	1+2	2+2	2+3	4+5	1+1	1+2	2+2	3+3	3+4	4+4	4+5	1+5	
		Outer	3	9	8	7	6	9	8	4	3	0	7	9	8	7	6	5	4	0	7	6	5	3	2	1	0	3	
	Thick	Inner	0+0	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	2+2	3+3	4+4	4+4	4+4	4+4	4+4	4+4	4+4	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+5	6+5
		Outer	11	9	9	9	9	7	7	7	7	7	5	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	0
Fixing	Inner	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+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	
3	Thin	Inner	3+3	0+0	0+0	1+1	1+2	0+0	0+1	2+3	3+3	4+5	1+1	0+0	0+1	1+1	1+2	2+2	2+3	4+5	1+1	1+2	2+2	3+3	3+4	4+4	4+5	1+5	
		Outer	3	9	8	7	6	9	8	4	3	0	7	9	8	7	6	5	4	0	7	6	5	3	2	1	0	3	
	Thick	Inner	0+0	1+1	1+1	1+1	1+1	2+2	2+2	2+2	2+2	2+2	3+3	4+4	4+4	4+4	4+4	4+4	4+4	4+4	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+6
		Outer	11	9	9	9	9	7	7	7	7	7	5	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	0
Fixing	Inner	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+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	

Table 3-2 Number of Adjusting Spacers, ½ to 5 Ton (continued)

Beam Flange Width		(in)	6 ¹¹ / ₁₆	6 ⁷ / ₈	7	7 ¹ / ₁₆	7 ¹ / ₄	7 ⁷ / ₈	8	8 ⁷ / ₈	8 ¹¹ / ₁₆	9	9 ¹ / ₈	9 ⁷ / ₈	10	10 ¹ / ₈	10 ¹ / ₄	10 ³ / ₈	10 ¹ / ₂	11	11 ¹ / ₈	11 ¹ / ₄	11 ³ / ₈	11 ⁵ / ₈	11 ³ / ₄	11 ¹³ / ₁₆	11 ⁷ / ₈	12	
Cap (Ton)	Spacer Type	(mm)	170	175	178	180	184	200	203	215	220	229	232	250	254	257	260	264	267	279	283	286	289	295	298	300	302	305	
						181	185																						
5- (TF)	Thin L	Inner	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+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
	Thin	Inner	3+3	0+4	1+4	1+1	1+2	0+0	0+1	2+3	3+3	0+1	1+1	0+0	0+1	1+1	1+2	2+2	2+3	0+1	1+1	1+2	2+2	3+3	3+4	4+4	1+4	1+5	
		Outer	2	4	3	6	5	8	7	3	2	7	6	8	7	6	5	4	3	7	6	5	4	2	1	0	3	2	
	Thick	Inner	1+1	2+1	2+1	0	0	1+1	1+1	1+1	1+1	2+2	2+2	4+4	4+4	4+4	4+4	4+4	4+4	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+5	6+5	6+5
		Outer	1	0	0	11	11	9	9	9	9	7	7	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	0
Balancing Collar	Inner	-	-	-	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+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1
5- (TS)	Thin	Inner	3+3	0+4	1+4	1+1	1+2	0+0	0+1	2+3	3+3	0+1	1+1	0+0	0+1	1+1	1+2	2+2	2+3	0+1	1+1	1+2	2+2	3+3	3+4	4+4	1+4	1+5	
		Outer	2	4	3	6	5	8	7	3	2	7	6	8	7	6	5	4	3	7	6	5	4	2	1	0	3	2	
	Thick	Inner	2+2	3+2	3+2	0+0	0+0	1+1	1+1	1+1	1+1	2+2	2+2	3+3	3+3	3+3	3+3	3+3	3+3	4+4	4+4	4+4	4+4	4+4	4+4	4+4	5+4	5+4	
		Outer	1	0	0	9	9	7	7	7	7	5	5	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	
	Fixing Spacer	Inner	-	-	-	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+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1

Table 3-3 Number of Adjusting Spacer, 8 to 20 Ton

Beam Flange Width		(in)	2	2 ⁵ / ₁₆	2 ¹ / ₂	2 ⁷ / ₈	3	3 ¹ / ₄	3 ⁹ / ₁₆	3 ⁷ / ₈	3 ¹⁵ / ₁₆	4	4 ³ / ₁₆	4 ¹⁵ / ₁₆	4 ⁷ / ₁₆	4 ¹¹ / ₁₆	4 ¹⁵ / ₁₆	5	5 ³ / ₁₆	5 ⁵ / ₁₆	5 ³ / ₈	5 ¹ / ₂	5 ⁵ / ₈	5 ⁷ / ₈	6	6 ¹ / ₈	6 ⁵ / ₁₆	6 ⁷ / ₁₆			
Cap (Ton)	Spacer Type	(mm)	50	58	64	73	75	82	90	98	100	102	106	110	113	119	125	127	131	135	137	140	143	149	153	155	160	163			
					2 ⁵ / ₈	2 ¹⁵ / ₁₆	76		91						4 ³ / ₄								5 ¹⁵ / ₁₆								
8	Thin	Inner																						3+4	4+4	1+1	1+2	1+2	2+3	3+3	
		Outer																							1	0	6	5	5	3	2
	Thick	Inner																							1+1	1+1	2+2	2+2	2+2	2+2	2+2
		Outer																								6	6	4	4	4	4
10	Thin	Inner																							3+4	4+4	1+1	1+2	1+2	2+3	3+3
		Outer																							1	0	6	5	5	3	2
	Thick	Inner																							1+1	1+1	2+2	2+2	2+2	2+2	2+2
		Outer																								6	6	4	4	4	4
15*	Thin	Inner																							0	0	0	1+0	1+1	1+2	2+2
		Outer																							13	13	10	9	8	7	6
	Thick	Inner																							0	0	0	0	0	0	0
		Outer																								3	3	3	3	3	3
20*	Thin	Inner																							0	0	0	1+0	1+1	1+2	2+2
		Outer																								13	13	10	9	8	7
	Thick	Inner																							0	0	0	0	0	0	0
		Outer																								3	3	3	3	3	3
Fixing	Inner																								-	-	-	-	-	-	-

*Note: 15 and 20 Ton models have two suspension shafts. The number of spacers above reflects the quantities per suspension shaft

Table 3-3 Number of Adjusting Spacer, 8 to 20 Ton (continued)

Beam Flange Width		(in)	6 ¹ / ₁₆	6 ⁷ / ₈	7	7 ¹ / ₁₆	7 ¹ / ₄	7 ⁷ / ₈	8	8 ⁷ / ₈	8 ¹¹ / ₁₆	9	9 ¹ / ₈	9 ⁷ / ₈	10	10 ¹ / ₈	10 ¹ / ₄	10 ³ / ₈	10 ¹ / ₂	11	11 ¹ / ₈	11 ¹ / ₄	11 ³ / ₈	11 ⁵ / ₈	11 ³ / ₄	11 ¹³ / ₁₆	11 ⁷ / ₈	12	
Cap (Ton)	Spacer Type	(mm)	170	175	178	180	184	200	203	215	220	229	232	250	254	257	260	264	267	279	283	286	289	295	298	300	302	305	
		181	185																										
8	Thin	Inner	4+4	1+1	1+2	2+2	2+3	1+1	1+2	3+3	4+4	1+1	1+2	4+4	1+1	5+1	5+2	2+3	3+3	1+1	1+2	2+2	2+3	3+0	4+0	4+0	4+1	5+1	
		Outer	0	6	5	4	3	6	5	2	0	6	5	0	6	2	1	3	2	6	5	4	3	5	4	4	3	2	
	Thick	Inner	2+2	3+3	3+3	3+3	3+3	4+4	4+4	4+4	4+4	2+2	2+2	2+2	3+3	2+3	2+3	3+3	3+3	4+4	4+4	4+4	4+4	4+5	4+5	4+5	4+5	4+5	
		Outer	4	2	2	2	2	0	0	0	0	5	5	5	3	4	4	3	3	1	1	1	1	0	0	0	0	0	
Fixing	Inner	Inner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Outer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	Thin	Inner	4+4	1+1	1+2	2+2	2+3	1+1	1+2	3+3	4+4	1+1	1+2	4+4	1+1	5+1	5+2	2+3	3+3	1+1	1+2	2+2	2+3	3+0	4+0	4+0	4+1	5+1	
		Outer	0	6	5	4	3	6	5	2	0	6	5	0	6	2	1	3	2	6	5	4	3	5	4	4	3	2	
	Thick	Inner	2+2	3+3	3+3	3+3	3+3	4+4	4+4	4+4	4+4	2+2	2+2	2+2	3+3	2+3	2+3	3+3	3+3	4+4	4+4	4+4	4+4	4+5	4+5	4+5	4+5	4+5	
		Outer	4	2	2	2	2	0	0	0	0	5	5	5	3	4	4	3	3	1	1	1	1	0	0	0	0	0	
Fixing	Inner	Inner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Outer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
15*	Thin	Inner	3+3	0	1+0	1+1	1+2	4+0	4+1	6+2	7+3	1+1	1+2	4+4	1+1	1+2	2+2	2+3	3+3	1+1	1+2	2+2	2+3	3+4	4+4	4+0	4+1	5+1	
		Outer	4	10	9	8	7	6	5	2	0	6	5	0	6	5	4	3	2	6	5	4	3	1	0	4	3	2	
	Thick	Inner	0	1+1	1+1	1+1	1+1	1+2	1+2	1+2	1+2	3+3	3+3	3+3	4+4	4+4	4+4	4+4	4+4	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+6	5+6	5+6
		Outer	3	1	1	1	1	0	0	0	0	5	5	5	3	3	3	3	3	1	1	1	1	1	1	0	0	0	
Fixing	Inner	Inner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Outer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20*	Thin	Inner	3+3	0	1+0	1+1	1+2	4+0	4+1	6+2	7+3	1+1	1+2	4+4	1+1	1+2	2+2	2+3	3+3	1+1	1+2	2+2	2+3	3+4	4+4	4+0	4+1	5+1	
		Outer	4	10	9	8	7	6	5	2	0	6	5	0	6	5	4	3	2	6	5	4	3	1	0	4	3	2	
	Thick	Inner	0	1+1	1+1	1+1	1+1	1+2	1+2	1+2	1+2	3+3	3+3	3+3	4+4	4+4	4+4	4+4	4+4	5+5	5+5	5+5	5+5	5+5	5+5	5+5	5+6	5+6	5+6
		Outer	3	1	1	1	1	0	0	0	0	5	5	5	3	3	3	3	3	1	1	1	1	1	1	0	0	0	
Fixing	Inner	Inner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Outer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Note: 15 and 20 Ton models have two suspension shafts. The number of spacers above reflects the quantities per suspension shaft

3.5 Mounting Location

3.5.1 **⚠ WARNING** Prior to mounting the trolley (and hoist) ensure that the trolley beam and its supporting structure are adequate to support the trolley, hoist and its loads. If necessary consult a professional that is qualified to evaluate the adequacy of the suspension location and its supporting structure.

3.5.2 **NOTICE** See **Section 6.3** for outdoor installation considerations.

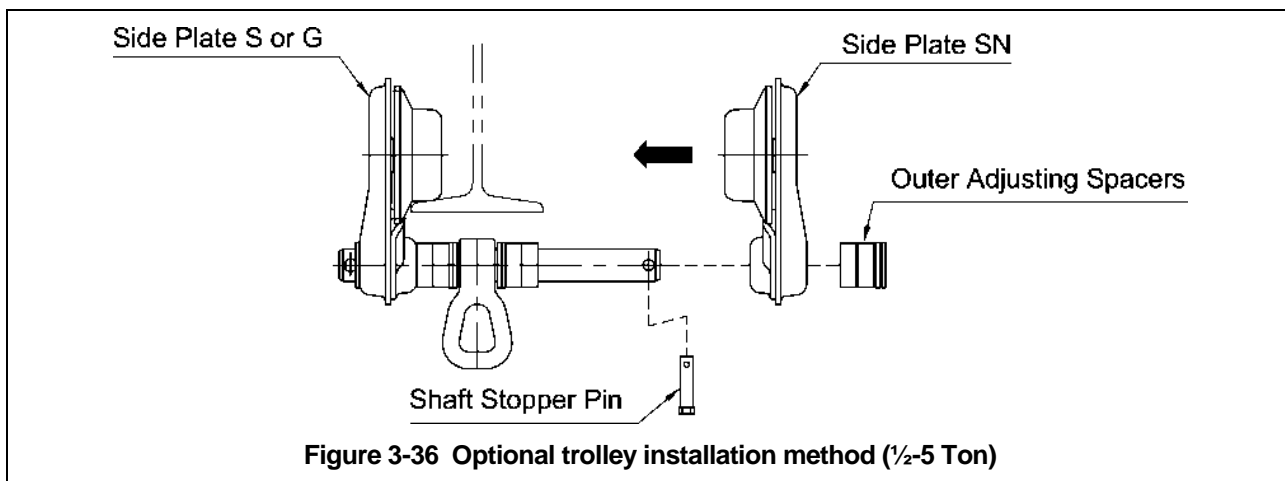
3.6 Installation of Trolley onto Beam

3.6.1 Assemble and adjust the trolley before attempting to install the trolley on the beam.

3.6.2 Preferred Method – Sliding the trolley connected with a hoist onto the traversing beam from the beam end is the most convenient and recommended method. If the trolley can be mounted from the end of the beam then: Remove the trolley end-stop from the beam and set the trolley on the beam from the end. Securely re-install the trolley end stop on the beam.

3.6.3 Optional Method for Trolleys up to 5 Ton – If the trolley cannot be mounted from the end of the beam, complete the installation as follows:

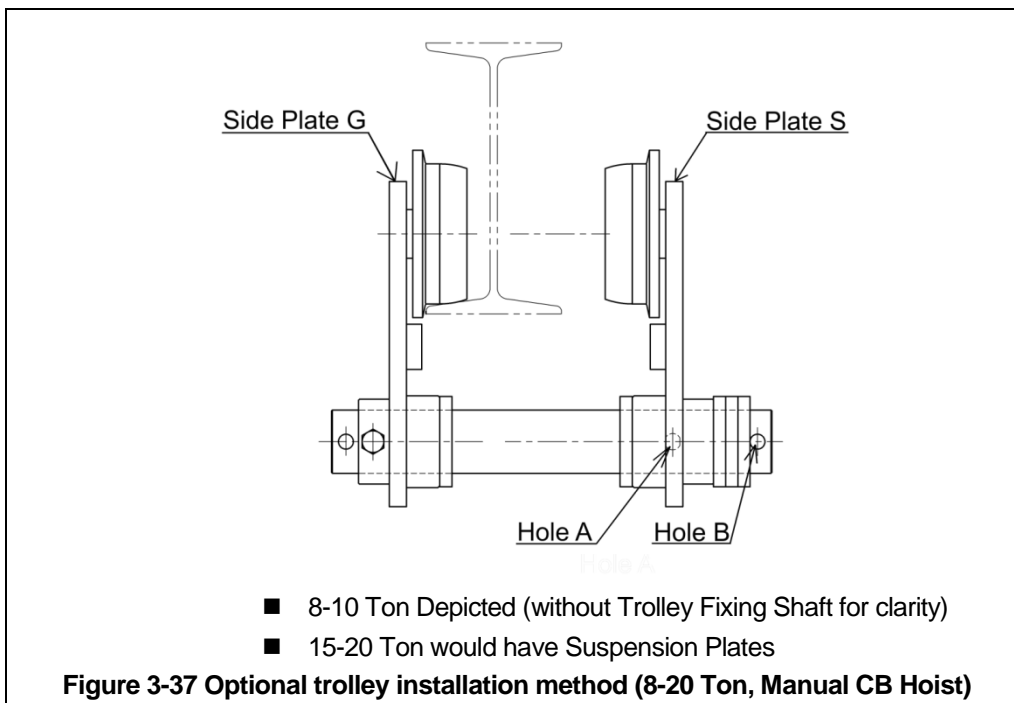
- 1) Assemble the trolley (refer to **Section 3.4**).
- 2) Remove the Shaft Stopper Pin from Suspension Shaft (See **Figure 3-36**).
- 3) Remove the outside Adjusting spacers and Reinsert the Shaft Stopper Pin. Spread the trolley side plates apart.
- 4) Lift the trolley onto the beam so that the trolley wheels of Side Plate S or G rests on the beam's flange.
- 5) Hold Side Plate S or G securely so that it does not come off the beam, then push the side plates together so that all four wheels rest on the beam's flange.
- 6) Replace the Outside Adjusting Spacers and the Shaft Stopper Pin. Insert Split Pin, Bend the Split Pin securely.



3.6.4 Optional Method for Trolleys 8 Ton to 20 Ton, coupled with Manual CB Hoist – refer to **Figure 3-37**. If the trolley cannot be mounted from the end of the beam, complete the installation as follows:

⚠ WARNING ALWAYS install the trolley onto the beam before installing the hoist to the trolley. Attempting to install a pre-assembled hoist and trolley onto the beam other than onto the the beam end (per **Section 3.6.2**) is dangerous and must not be attempted.

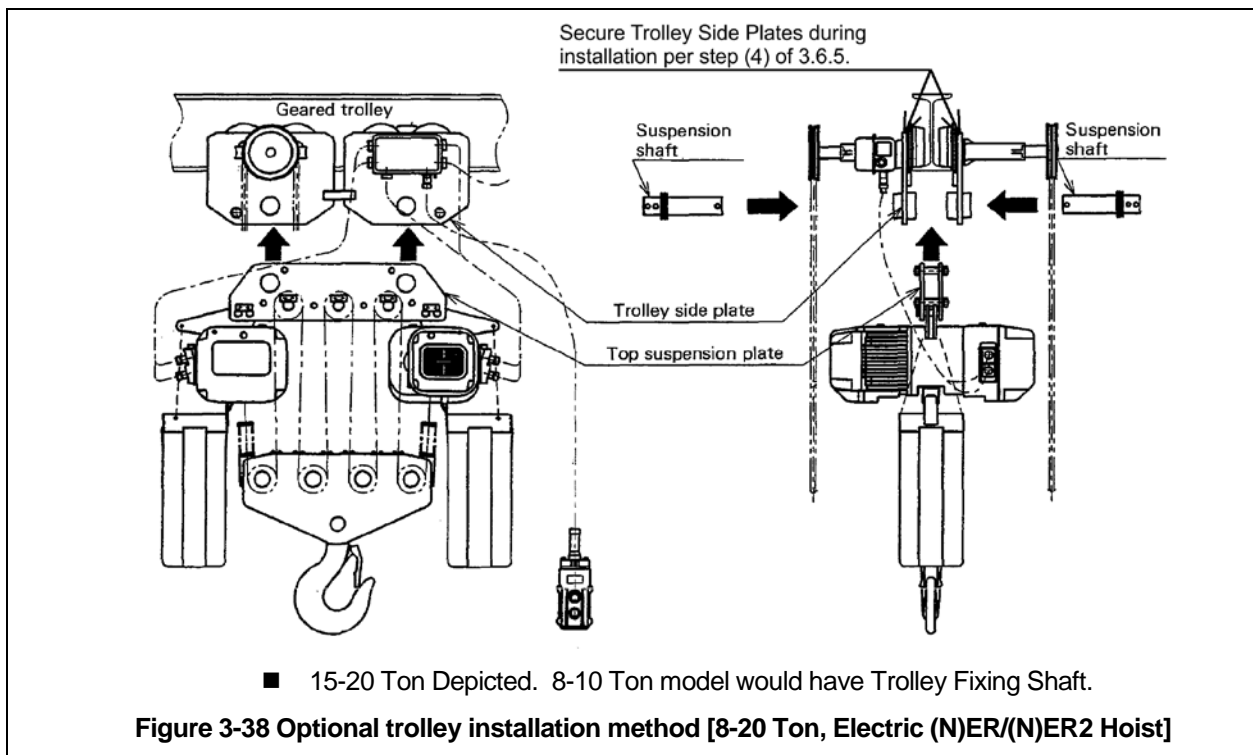
- 1) Separate the trolley from the hoist by removing the hoist's top hook assembly from its suspension shaft.
 - For the 8-10 Ton model, the top hook assembly's suspension shaft is connected directly to the trolley side plates
 - For the 15-20 Ton model the top hook assembly's suspension shaft goes through to a pair of suspension plates that are connected to the trolley side plates by two shafts (see **Figure 3-6**). Leave the suspension plates attached to the trolley side plates.
- 2) Assemble the trolley (refer to **Section 3.4**).
- 3) Move the Shaft Stopper Pin to Hole "B" (see **Figure 3-37**).
- 4) Spread the trolley side plates apart.
- 5) Lift the trolley onto the beam so that the trolley wheels of Side Plate S or G rests on the beam's flange.
- 6) Hold Side Plate S or G securely so that it does not come off the beam then push the side plates together so that all wheels rest on the beam's flange.
- 7) Remove the Shaft Stopper Pin from Hole "B" and re-install in Hole "A" (**Figure 3-35**). Bend the Split Pin securely. Never use trolley with Shaft Stopper Pin in Hole "B". Hole "B" is ONLY used when installing the trolley on the beam.
- 8) Because two traversing units are combined in the 15 and 20 Ton trolley, ALWAYS adjust both units in the same way.



3.6.5 Optional Method for Trolleys 8 Ton to 20 Ton, coupled with Electric (N)ER/(N)ER2 hoist – refer to **Figure 3-38**.
 3.6.6 If the trolley cannot be mounted from the end of the beam, complete the installation as follows:

⚠WARNING ALWAYS install the trolley onto the beam before installing the hoist to the trolley. Attempting to install a pre-assembled hoist and trolley onto the beam other than onto the the beam end (per **Section 3.6.2**) is dangerous and must not be attempted.

- 1) Separate the trolley from the hoist by removing the Suspension Shaft(s), Adjusting spacers, and Trolley Fixing Shaft (8 and 10 Ton only).
- 2) Reassemble the trolley without the hoist by reinstalling the suspension Shaft(s), Trolley Fixing Shaft (8 and 10 Ton only), and outside Adjusting Spacers (refer to **Section 3.4**). Place inner spacers aside until step (8).
- 3) Install the trolley on the beam by following steps (3) to (8) of **Section 3.6.4**.
- 4) Use safe and proper rigging practices to secure the trolley side plates so that they will remain firmly in place after the Suspension Shaft(s) and Trolley Fixing Shaft are removed (next step).
- 5) Remove the Suspension shaft(s), Trolley Fixing Shaft and outer Adjusting Spacers.
- 6) Move the hoist up into position between the trolley side plates and line up the trolley and hoist's Suspension Shaft holes.
- 7) Connect the hoist to the trolley by reinstalling the Suspension Shaft(s), Trolley Fixing Shaft, Adjusting Spacers, Suspension Shaft Bolts(s), and Shaft Stopper Pin(s).
- 8) Bend Split Pin(s) securely.
- 9) Ensure that:
 - Shaft Stopper Pin(s) is (are) in hole A of the Suspension Shaft(s)
 - Split Pins are installed properly.
 - Trolley is properly adjusted (refer to **Section 3.4.1**).



3.7 Electrical/Air Connections

3.7.1 This instruction applies to a Harrington Powered hoist attached to a Push or Geared Trolley. Refer to the appropriate hoist's owner's manual for the Electrical or Air connections.

3.7.2 **⚠ DANGER** Before proceeding, ensure that the electrical supply for the hoist has been de-energized (disconnected). Lock out and tag out in accordance with ANSI Z244.1 "Personnel Protection -Lockout/Tagout of Energy Sources".

3.7.3 **⚠ DANGER** Before proceeding, ensure that the air supply for the hoist has been de-energized (disconnected). Lock out and tag out in accordance with ANSI Z244.1 "Personnel Protection-Lockout of Energy Sources".

Power Supply Cable/Air Supply – Installation

Cable must be installed along the beam that the trolley runs on. For curved beams a special cable suspension system will be needed, and this instruction does not apply. For straight beams install the power supply cable as follows:

- Install a guide wire system parallel to the beam. (See Figure 3-39)
- The guide wire should be positioned slightly outside the hoist's Cable Support Arm.
- Use the Cable Trolleys supplied with the hoist to suspend the Power Supply Cable/Air Supply Hose from the guide wire. Space the Cable Trolleys every 5 feet.
- Make sure the Guide Wire is properly tensioned and the Power Supply Cable/Air Supply Hose is not twisted or kinked.
- Festoon Cable / Guide wire should not make any contact with any component of hoist or trolley.

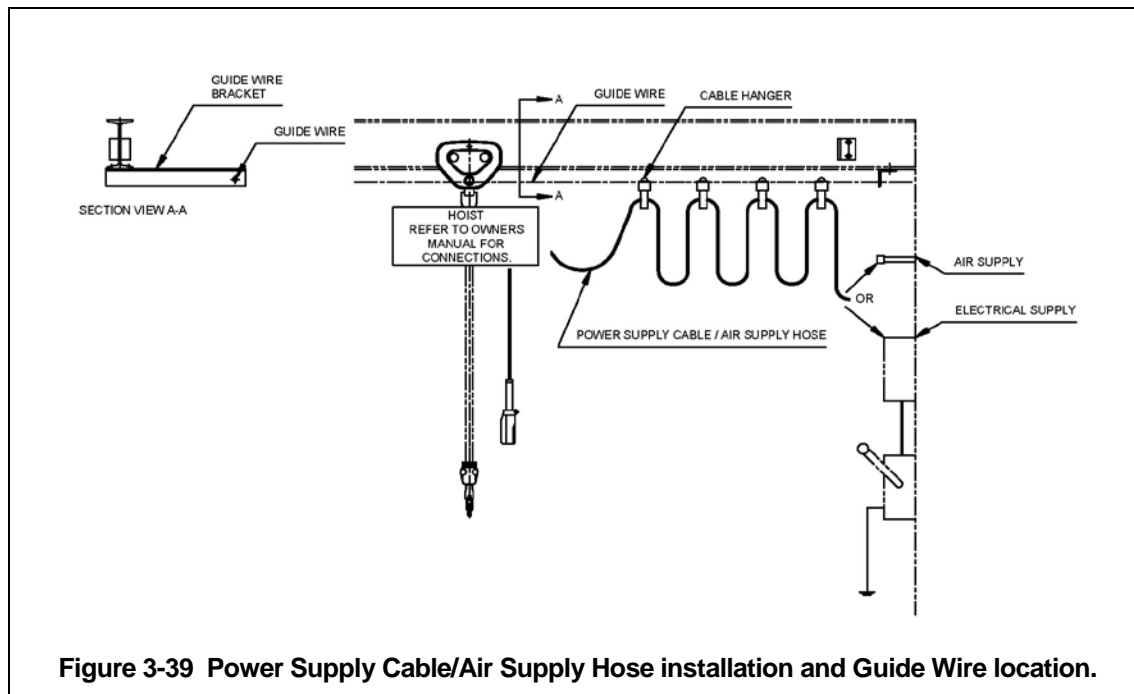


Figure 3-39 Power Supply Cable/Air Supply Hose installation and Guide Wire location.

3.8 Pre-operational Checks and Trial Operation

- 3.8.1 Refer to the trolley's Nameplate and record the Code, Lot and Serial Number in the space provided on the cover of this manual.
- 3.8.2 Refer to the hoist's owner's manual and perform all pre-operational checks for the hoist.
- 3.8.3 Perform pre-operational checks for the trolley:
- **⚠ WARNING** Confirm the adequacy of the rated capacity for all slings, chains, wire ropes and all other lifting attachments before use. Inspect all load suspension members for damage prior to use and replace or repair all damaged parts.
 - Ensure that trolley is properly installed on the beam, and stops for the trolley are correctly positioned and securely installed on the beam.
 - Ensure that all nuts, bolts and split pins (cotter pins) are sufficiently fastened.
- 3.8.4 Confirm proper operation.
- Before operating read and become familiar with Section 4 - Operation.
 - Before operating ensure that the hoist (and trolley) meets the Inspection, Testing and Maintenance requirements of ANSI/ASME B30.16.
 - Before operating ensure that nothing will interfere with the full range of the trolley's (and hoist's) operation.
- 3.8.5 Proceed with trial operation to confirm proper operation.
- Operate the trolley through its full range of motion. Make sure the trolley runs smoothly and does not bind. If applicable check the power/Air supply and festoon system for proper operation
 - Perform inspections per Section 5.3, "Frequent Inspections".

4.0 Operation

4.1 Introduction

DANGER

DO **NOT** WALK UNDER A SUSPENDED LOAD

WARNING

HOIST OPERATORS SHALL BE REQUIRED TO READ THE OPERATION SECTION OF THIS MANUAL, THE WARNINGS CONTAINED IN THIS MANUAL, INSTRUCTION AND WARNING LABELS ON THE HOIST OR LIFTING SYSTEM, AND THE OPERATION SECTIONS OF ANSI/ASME B30.16 and ANSI/ASME B30.10. THE OPERATOR SHALL ALSO BE REQUIRED TO BE FAMILIAR WITH THE HOIST AND HOIST CONTROLS BEFORE BEING AUTHORIZED TO OPERATE THE HOIST OR LIFTING SYSTEM.

HOIST OPERATORS SHOULD BE TRAINED IN PROPER RIGGING PROCEDURES FOR THE ATTACHMENT OF LOADS TO THE HOIST HOOK.

HOIST OPERATORS SHOULD BE TRAINED TO BE AWARE OF POTENTIAL MALFUNCTIONS OF THE EQUIPMENT THAT REQUIRE ADJUSTMENT OR REPAIR, AND TO BE INSTRUCTED TO STOP OPERATION IF SUCH MALFUNCTIONS OCCUR, AND TO IMMEDIATELY ADVISE THEIR SUPERVISOR SO CORRECTIVE ACTION CAN BE TAKEN.

HOIST OPERATORS SHOULD HAVE NORMAL DEPTH PERCEPTION, FIELD OF VISION, REACTION TIME, MANUAL DEXTERITY, AND COORDINATION.

HOIST OPERATORS SHOULD **NOT** HAVE A HISTORY OF OR BE PRONE TO SEIZURES, LOSS OF PHYSICAL CONTROL, PHYSICAL DEFECTS, OR EMOTIONAL INSTABILITY THAT COULD RESULT IN ACTIONS OF THE OPERATOR BEING A HAZARD TO THE OPERATOR OR TO OTHERS.

HOIST OPERATORS SHOULD **NOT** OPERATE A HOIST OR LIFTING SYSTEM WHEN UNDER THE INFLUENCE OF ALCOHOL, DRUGS, OR MEDICATION.

OVERHEAD HOISTS ARE INTENDED ONLY FOR VERTICAL LIFTING SERVICE OF FREELY SUSPENDED UNGUIDED LOADS. DO **NOT** USE HOIST FOR LOADS THAT ARE NOT LIFTED VERTICALLY, LOADS THAT ARE NOT FREELY SUSPENDED, OR LOADS THAT ARE GUIDED.

NOTICE

- Read ANSI/ASME B30.16 and ANSI/ASME B30.10.
- Read the hoist manufacturer's Operating and Maintenance Instructions.
- Read all labels attached to equipment.

The operation of an overhead hoist involves more than activating the hoist's controls. Per the ANSI/ASME B30 standards, the use of an overhead hoist is subject to certain hazards that cannot be mitigated by engineered features, but only by the exercise of intelligence, care, common sense, and experience in anticipating the effects and results of activating the hoist's controls. Use this guidance in conjunction with other warnings, cautions, and notices in this manual to govern the operation and use of your overhead hoist.

4.2 Shall's and Shall Not's for Operation

WARNING

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in death or serious injury, and substantial property damage. To avoid such a potentially hazardous situation **THE OPERATOR SHALL:**


- **NOT** lift more than rated load for the hoist.
- **NOT** operate unless load is centered under hoist.
- **NOT** use damaged hoist or hoist that is not working properly.
- **NOT** use hoist with twisted, kinked, damaged, or worn chain.
- **NOT** use hoist if the bottom hook is capsized (double fall hoists - see **Section 3.2**).
- **NOT** use the hoist to lift, support, or transport people.
- **NOT** lift loads over people.
- **NOT** apply load unless load chain is properly seated in the load sheave (and idle sheave for hoist with two chain falls).
- **NOT** use the hoist in such a way that could result in shock or impact loads being applied to the hoist.
- **NOT** attempt to lengthen the load chain or repair damaged load chain.
- **NOT** operate hoist when it is restricted from forming a straight line from hook to hook in the direction of loading.
- **NOT** use load chain as a sling or wrap load chain around load.
- **NOT** apply the load to the tip of the hook or to the hook latch.
- **NOT** apply load if binding prevents equal loading on all load-supporting chains.
- **NOT** operate beyond the limits of the load chain travel.
- **NOT** operate hoist with missing/damaged chain springs, cushion rubbers, stoppers or striker plates.
- **NOT** leave load supported by the hoist unattended unless specific precautions have been taken.
- **NOT** allow the chain, or hook to be used as an electrical or welding ground.
- **NOT** allow the chain, or hook to be touched by a live welding electrode.
- **NOT** remove or obscure the warnings on the hoist.
- **NOT** operate a hoist on which the safety placards or decals are missing or illegible.
- Be familiar with operating controls, procedures, and warnings.
- Make sure the unit is securely attached to a suitable support before applying load.
- Make sure load slings or other approved single attachments are properly sized, rigged, and seated in the hook saddle.
- Take up slack carefully - make sure load is balanced and load-holding action is secure before continuing.
- Make sure all persons stay clear of the supported load.
- Protect the hoist's load chain from weld splatter or other damaging contaminants.
- Report Malfunctions or unusual performances (including unusual noises) of the hoist and remove the hoist from service until the malfunction or unusual performance is resolved.
- Make sure hoist limit switches function properly.
- Warn personnel before lifting or moving a load.
- Warn personnel of an approaching load.

CAUTION

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage. To avoid such a potentially hazardous situation THE OPERATOR SHALL:

- Maintain a firm footing or be otherwise secured when operating the hoist.
- Check brake function by tensioning the hoist prior to each lift operation.
- Use hook latches. Latches are to retain slings, chains, etc. under slack conditions only.
- Make sure the hook latches are closed and not supporting any parts of the load.
- Make sure the load is free to move and will clear all obstructions.
- Avoid swinging the load or hook.
- Make sure hook travel is in the same direction as shown on controls.
- Inspect the hoist regularly, replace damaged or worn parts, and keep appropriate records of maintenance.
- Use the hoist manufacturer's recommended parts when repairing the unit.
- Lubricate load chain per hoist manufacturer's recommendations.
- **NOT** use the hoist load limiting or warning device to measure load.
- **NOT** use limit switches as routine operating stops. They are emergency devices only.
- **NOT** allow your attention to be diverted from operating the hoist.
- **NOT** allow the hoist to be subjected to sharp contact with other hoists, structures, or objects through misuse.
- **NOT** adjust or repair the hoist unless qualified to perform such adjustments or repairs.

4.3 Trolley Controls

- 4.3.1 For Plain Trolley, movement is controlled by pushing/pulling on the load or the hook of the attached hoist.
- 4.3.2 For Geared Trolley, when facing Trolley Hand Wheel:
- Pull down on the right side of Hand Chain (Clockwise Rotation) to move the Trolley left.
 - Pull down on the left side of Hand Chain (Counterclockwise Rotation) to move the Trolley right.
- 4.3.3  **CAUTION** Avoid collisions with the end stops or other Trolleys. Damage may result.

5.0 Inspection

5.1 General

- 5.1.1 The inspection procedure herein is based on ANSI/ASME B30.16. The following definitions are from ANSI/ASME B30.16 and pertain to the inspection procedure below.
- **Designated Person** - a person selected or assigned as being competent to perform the specific duties to which he/she is assigned.
 - **Qualified Person** - a person who, by possession of a recognized degree or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.
 - **Normal Service** - that distributed service which involves operation with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load for not more than 25% of the time.
 - **Heavy Service** - that service which involves operation within the rated load limit which exceeds normal service.
 - **Severe Service** - that service which involves normal or heavy service with abnormal operating conditions.

5.2 Inspection Classification

- 5.2.1 Initial Inspection - prior to initial use, all new, re-installed, altered, or modified trolleys shall be inspected by a designated person to ensure compliance with the applicable provisions of this manual.
- 5.2.2 Inspection Classification - the inspection procedure for trolleys in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the trolley and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as FREQUENT and PERIODIC, with respective intervals between inspections as defined below.
- 5.2.3 FREQUENT Inspection - visual examinations by the operator or other designated personnel with intervals per the following criteria:
- Normal service - monthly
 - Heavy service - weekly to monthly
 - Severe service - daily to weekly
 - Special or infrequent service - as recommended by a qualified person before and after each occurrence.
- 5.2.4 PERIODIC Inspection - visual inspection by a designated person with intervals per the following criteria:
- Normal service - yearly
 - Heavy service - semiannually
 - Severe service – quarterly
 - Special or infrequent service - as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.

5.3 Frequent Inspection

5.3.1 Inspections should be made on a FREQUENT basis in accordance with Table 5-1, "Frequent Inspection." Included in these FREQUENT Inspections are observations made during operation for any defects or damage that might appear between Periodic Inspections. Evaluation and resolution of the results of FREQUENT Inspections shall be made by a designated person such that the trolley is maintained in safe working condition.

Table 5-1 Frequent Inspection
All functional operating mechanisms for proper operation, proper adjustment, and unusual sounds.
Connection points between Hoist and Trolley in accordance with ANSI/ASME B30.16
Hook(s) and hook latches in accordance with ANSI/ASME B30.10
Hoist(s) attached to Trolley in accordance with ANSI/ASME B30.16

5.4 Periodic Inspection

5.4.1 Inspections should be made on a PERIODIC basis in accordance with Table 5-2, "Periodic Inspection." Evaluation and resolution of the results of PERIODIC Inspections shall be made by a designated person such that the trolley is maintained in safe working condition.

5.4.2 For inspections where load suspension parts of the trolley are disassembled, a load test per ANSI/ASME B30.16 must be performed on the trolley after it is re-assembled and prior to its return to service.

Table 5-2 Periodic Inspection
Requirements of frequent inspection.
Loose or missing bolts, nuts, pins or rivets.
Worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, yokes, and bumpers.
Function, instruction and warning labels for legibility and placement.

5.5 Occasionally Used Trolleys

5.5.1 Trolleys that are used infrequently shall be inspected as follows prior to placing in service:

- Trolley Idle More Than 1 Month, Less Than 1 Year: Inspect per FREQUENT Inspection criteria in Section 5.3.
- Trolley Idle More Than 1 Year: Inspect per PERIODIC Inspection criteria in Section 5.4

5.6 Inspection Records

5.6.1 Dated inspection reports and records should be maintained at time intervals corresponding to those that apply for the hoist's PERIODIC interval per Section 5.2.4. These records should be stored where they are available to personnel involved with the inspection, maintenance, or operation of the trolley.

5.7 Inspection Methods and Criteria

5.7.1 This section covers the inspection of specific items. The list of items in this section is based on those listed in ANSI/ASME B30.16 for Frequent and Periodic Inspection. In accordance with ANSI/ASME B30.16, these inspections are not intended to involve disassembly of the trolley. Rather, disassembly for further inspection would be required if frequent or periodic inspection results so indicate. Such disassembly and further inspection should only be performed by a qualified person trained in the disassembly and re-assembly of the trolley.

Item	Method	Criteria	Action
Functional operating mechanisms.	Visual, Auditory	Mechanisms should be properly adjusted and should not produce unusual sounds when operated.	Repair or replace as required.
Housing and Mechanical Components	Visual, Auditory, Vibration, Function	Trolley components including, suspension shafts, track wheels, track wheel axles, clevises, connection yokes, suspension bolts, shafts, gears, bearings, pins, rollers, and bumpers should be free of cracks, distortion, significant wear and corrosion. Evidence of same can be detected visually or via detection of unusual sounds or vibration during operation.	Replace.
Side Plates	Visual, Measure	Must be free of significant deformation. For 8-20 Ton trolley, the difference of dimension "A" and "B" should not exceed .0787 (2mm). See Figure 5-1	Replace.
Bolts, Nuts, Snap Rings, and Split Pins	Visual, Check with Proper Tool	Bolts, nuts, snap rings and split pins should not be loose.	Tighten or replace as required.
Track Wheel - Tread	Visual, Measure	Diameter of the inside and outside tread surface should not be less than the discard value shown in Table 5-4 .	Replace.
Track Wheel - Gear	Visual	Teeth should not be cracked, damaged, or excessively worn.	Replace.
Suspension Shaft	Visual, Measure	Suspension shaft should not be bent. Diameter should not be worn by 10% or more.	Replace.
Suspenders	Visual, Measure	Never use the suspender if its dimension of D2 – D1, d or h exceed the limits of Table 5-5 .	Replace.
Cable Hangers	Visual	Cable Hangers should not be damaged or significantly worn. Movement should be smooth and should not cause the Power Supply Cable to twist or kink.	Repair or replace as necessary.
Pendant - Labels	Visual	Labels denoting functions should be legible.	Replace.
Warning Labels	Visual	Warning Labels should be affixed to the pendant cord (see Section 1.2) and they should be legible.	Replace.
Trolley Capacity Label	Visual	The label that indicates the capacity of the trolley should be legible and securely attached to the trolley.	Replace.

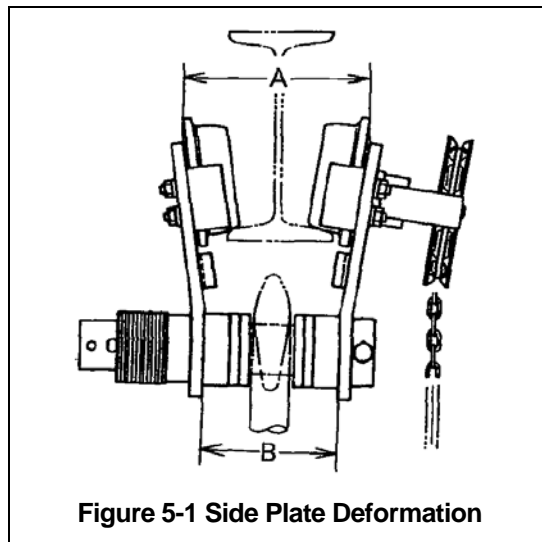


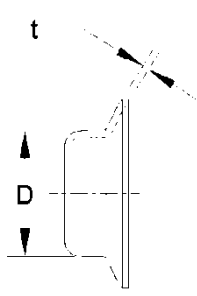
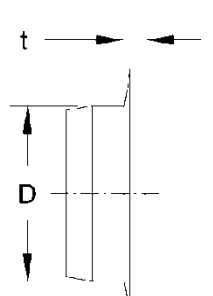
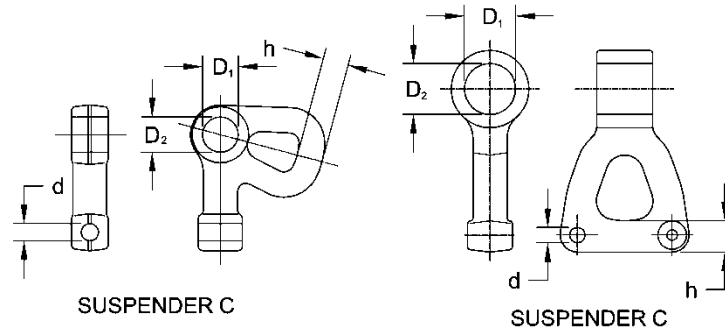
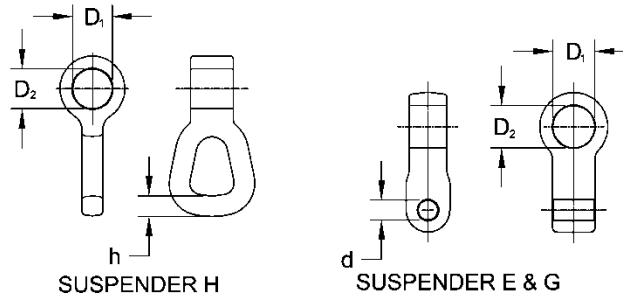
Table 5-4 Track Wheel Wear Dimensions					
		1 to 3 Ton:		5-20 Ton:	
					
Capacity (Ton)		“D” Dimension inch (mm)		“t” Dimension inch (mm)	
		Standard	Discard	Standard	Discard
1/2	Tapered	2.36 (60)	2.30 (58.5)	0.126 (3.2)	0.098 (2.5)
	Flat				
1	Tapered	2.80 (71)	2.74 (69.5)	0.157 (4.0)	0.130 (3.3)
	Flat				
2	Tapered	3.35 (85)	3.29 (83.5)	0.177 (4.5)	0.150 (3.8)
	Flat				
3	Tapered	3.94 (100)	3.88 (98.5)	0.197 (5.0)	0.169 (4.3)
	Flat				
5	Tapered	4.65 (118)	4.41 (112)	0.378 (9.6)	0.264 (6.7)
	Flat				
8	Tapered	6.10 (155)	5.83 (148)	0.512 (13)	0.354 (9)
10					
15					
20					

Table 5-5 Suspender Wear Measurements

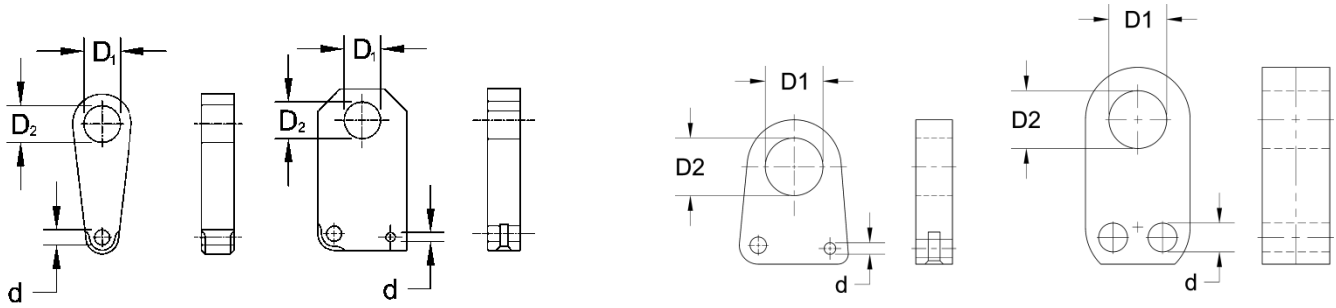


Hoist Type	Trolley Capacity	Hoist Applied Capacity	D ₁ — D ₂ Limit	d in. (mm)		h in. (mm)	
				Standard	Limit	Standard	Limit
CF or CB	1/2	1/2	0.04 (1)	0.48 (12.2)	0.512 (13.0)	0.551 (14.0)	0.492 (12.5)
	1	1/2, 1				0.709 (18.0)	0.63 (16.0)
	2	1 1/2, 2				0.866 (22.0)	0.787 (20.0)
	3	2 1/2	0.06 (1.5)	0.64 (16.2)	0.669 (17.0)	1.063 (27.0)	0.945 (24.0)
	5	3				0.945 (24.0)	0.846 (21.5)
	5	5				0.646 (16.4)	1.299 (33.0)



Trolley Capacity	D ₂ — D ₁ Limit	h		d	
		Standard in. (mm)	Limit in. (mm)	Standard in. (mm)	Limit in. (mm)
1/2	0.04 (1)	0.40 (10)	0.33 (8.5)	0.48 (12.2)	0.51 (13)
1		0.51 (13)	0.45 (11.5)	0.49 (12.5)	
2		0.75 (19)	0.67 (17)	0.80 (20.2)	
3	0.06 (1.5)	0.87 (22)	0.79 (20)		0.83 (21)
5		—	—	1.11 (28.2)	1.18 (30)

Table 5-5 (Continued) Suspender Wear Measurements



TCR SUSPENDERS

Trolley Capacity	D2 – D1 Limit	d	
		Standard in. (mm)	Limit in. (mm)
1/4	0.04 (1)	0.51 (13)	0.55 (13.9)
1/2 – 1			
2			
3	0.06 (1.5)	0.80 (20)	0.82 (20.8)
6	.08 (2)	0.55 (14)	0.57 (14.6)
10		1.38 (35)	1.43 (36.4)

6.0 Maintenance & Handling

6.1 Lubrication

- 6.1.1 Lubricate the following trolley components with NLGI (National Lubricating Grease Institute) #2 or equivalent grease.
- 6.1.2 Track Wheel Gear – Clean and re-grease the Track Wheel gears and Hand Wheel output pinion every three months (more frequently for heavier usage or severe conditions). Do not use an excessive amount of grease and avoid getting any grease on the running surfaces of the Track Wheels or the beam.
- 6.1.3 Trolley Wheel Bearings do not need to be lubricated and must be replaced if worn or damaged.
- 6.1.4 Suspension Pins, Bolts and Shafts – Grease at least twice per year for normal usage (more frequently for heavier usage or severe conditions).

6.2 Storage

- 6.2.1 The storage location should be clean and dry.

6.3 Outdoor Installation

- 6.3.1 For trolley and hoist installations that are outdoors, the trolley and hoist **MUST** be covered and protected from the weather when not in use.
- 6.3.2 Possibility of corrosion on components of the trolley increases for installations where salt air and high humidity are present. The trolley may require more frequent lubrication. Make frequent and regular inspections of the unit's condition and operation.

7.0 Warranty

All products sold by Harrington Hoists, Inc. are warranted to be free from defects in material and workmanship from date of shipment by Harrington for the following periods:

- 1 year – Electric and Air Powered Hoists (excluding (N)ER2 Enhanced Features Models), Powered Trolleys, Powered Tiger Track Jibs and Gantries, Crane Components, Below the Hook Devices, Spare / Replacement Parts**
- 2 years – Manual Hoists & Trolleys, Beam Clamps**
- 3 years – (N)ER2 Enhanced Features Model Hoists**
- 5 years – Manual Tiger Track Jibs and Gantries, TNER Pull - Rotor Motor Brake**
- 10 years – (N)ER2 “The Guardian” Smart Brake**

The product must be used in accordance with manufacturer’s recommendations and must not have been subject to abuse, lack of maintenance, misuse, negligence, or unauthorized repairs or alterations.

Should any defect in material or workmanship occur during the above time period in any product, as determined by Harrington Hoist’s inspection of the product, Harrington Hoists, Inc. agrees, at its discretion, either to replace (not including installation) or repair the part or product free of charge and deliver said item F.O.B. Harrington Hoists, Inc. place of business to customer.

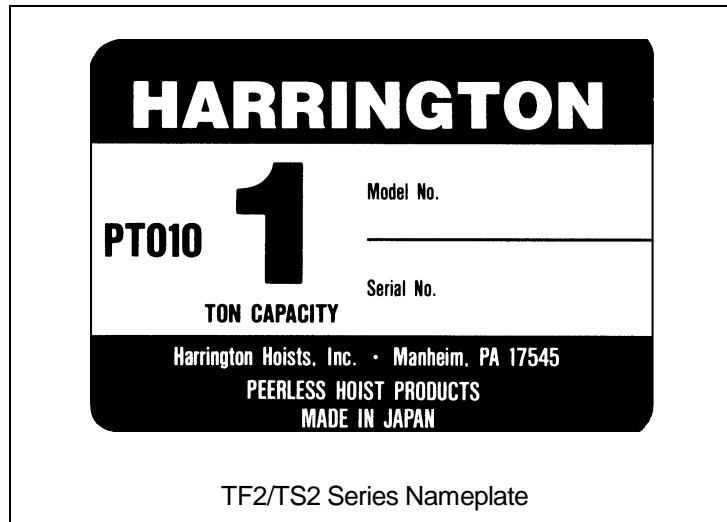
Customer must obtain a Return Goods Authorization as directed by Harrington or Harrington’s published repair center prior to shipping product for warranty evaluation. An explanation of the complaint must accompany the product. Product must be returned freight prepaid. Upon repair, the product will be covered for the remainder of the original warranty period. Replacement parts installed after the original warranty period will only be eligible for replacement (not including installation) for a period of one year from the installation date. If it is determined there is no defect, or that the defect resulted from causes not within the scope of Harrington’s warranty, the customer will be responsible for the costs of returning the product.

Harrington Hoists, Inc. disclaims any and all other warranties of any kind expressed or implied as to the product’s merchantability or fitness for a particular application. Harrington will not be liable for death, injuries to persons or property or for incidental, contingent, special or consequential damages, loss or expense arising in connection with the use or inability whatever, regardless of whether damage, loss or expense results from any act or failure to act by Harrington, whether negligent or willful, or from any other reason.

8.0 1/2 to 20 Ton Parts List

When ordering Parts, please provide the Hoist code number, lot number and serial number located on the Hoist nameplate (see fig. below).

Reminder: Per sections 1.1 and 3.5.1 to aid in ordering Parts and Product Support, record the Hoist code number, lot number and serial number in the space provided on the cover of this manual.



The parts list is arranged into the following sections:

Section ½ to 5 Ton	Page
8.1 TF2 Push Trolley Parts – 1/8 to 5 Ton	62
8.2 TF2 Geared Trolley Parts – 1/8 to 5 Ton.....	64
8.3 TS2 Push Trolley Parts – 1/8 to 5 Ton	66
8.4 TS2 Geared Trolley Parts – 1/8 to 5 Ton	68
 Section 8 to 20 Ton	
8.5 TF/TS Push/Geared Trolley Parts for CB Hoist – 8 to 10 Ton	70
8.6 TF/TS Push/Geared Trolley Parts for ER2 Hoist – 8 to 10 Ton	72
8.7 TF/TS Geared Trolley Parts for CB Hoist – 15 to 20 Ton	74
8.8 TF/TS Geared Trolley Parts for ER2 Hoist – 15 to 20 Ton	78

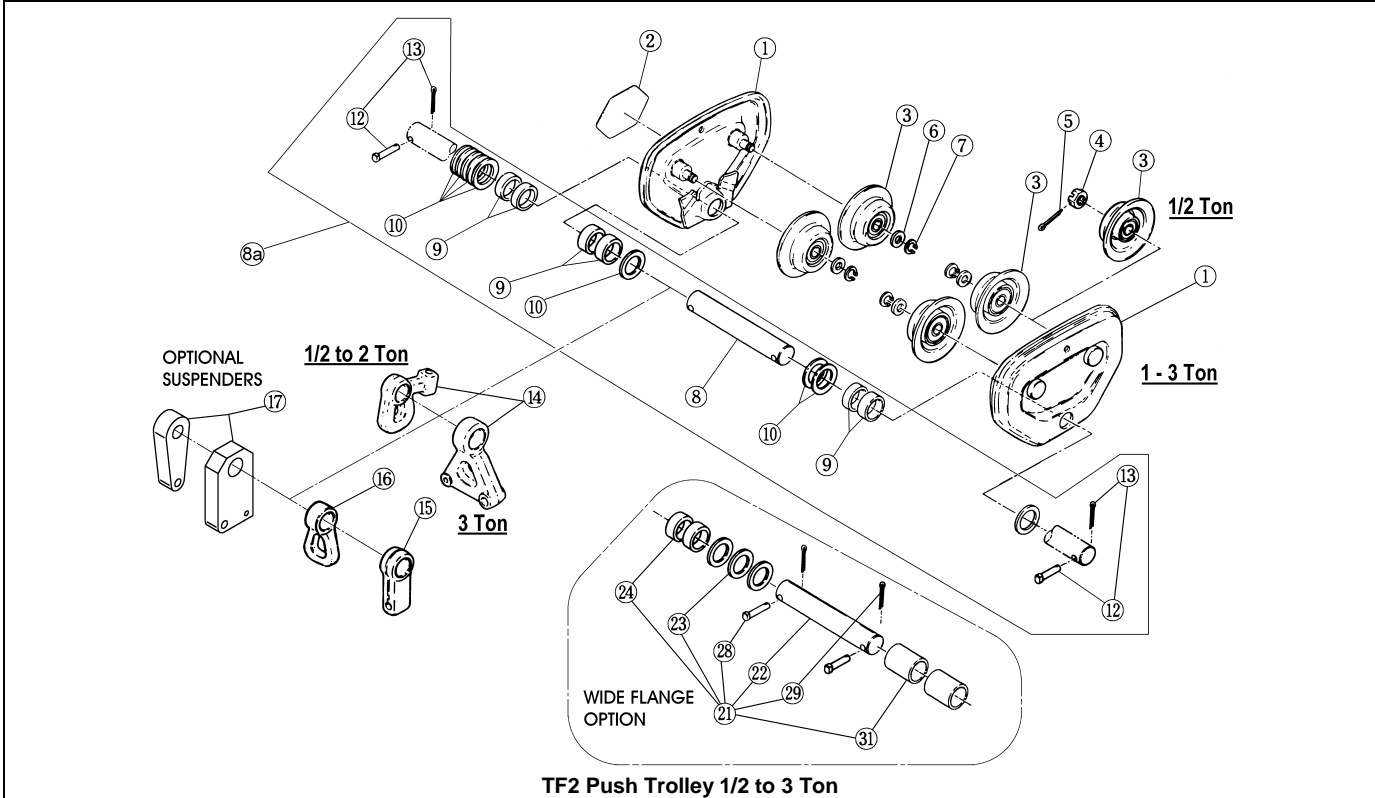
In the column "Parts Per Trolley" a designator is used for parts that apply only to a particular model or option.

Refer to Section 2 for TF2/TS2 Trolley model numbers and additional descriptions.

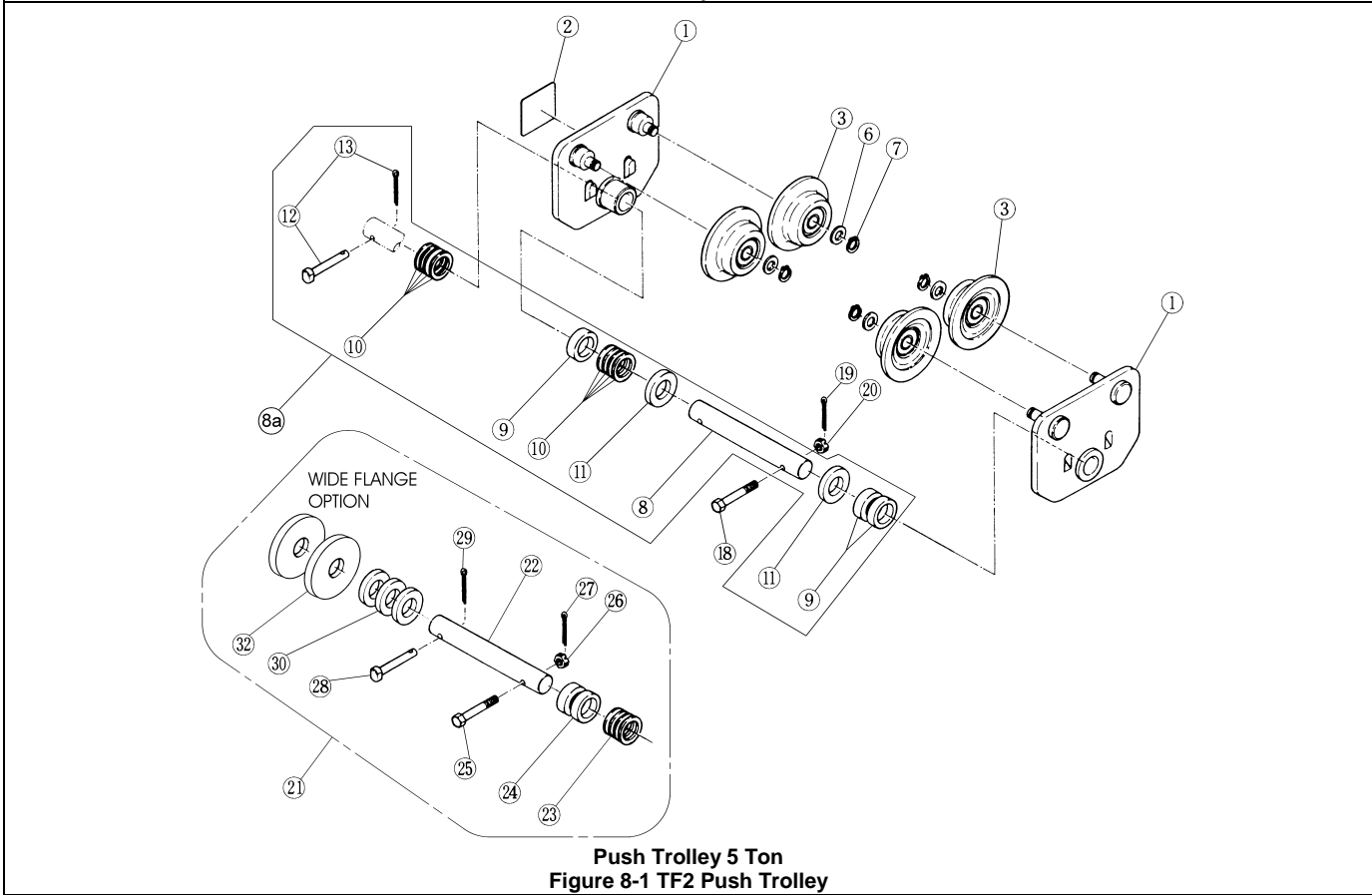
The designators are:

- Push = Push TF or TS model only
- Geared = Geared TF or TS model only
- Std. = Standard Flange Range
- Wide = Optional Wide Flange Range
- TS = TS model only

8.1 TF2 Push Trolley Parts – 1/8 to 5 Ton



TF2 Push Trolley 1/2 to 3 Ton



**Push Trolley 5 Ton
Figure 8-1 TF2 Push Trolley**

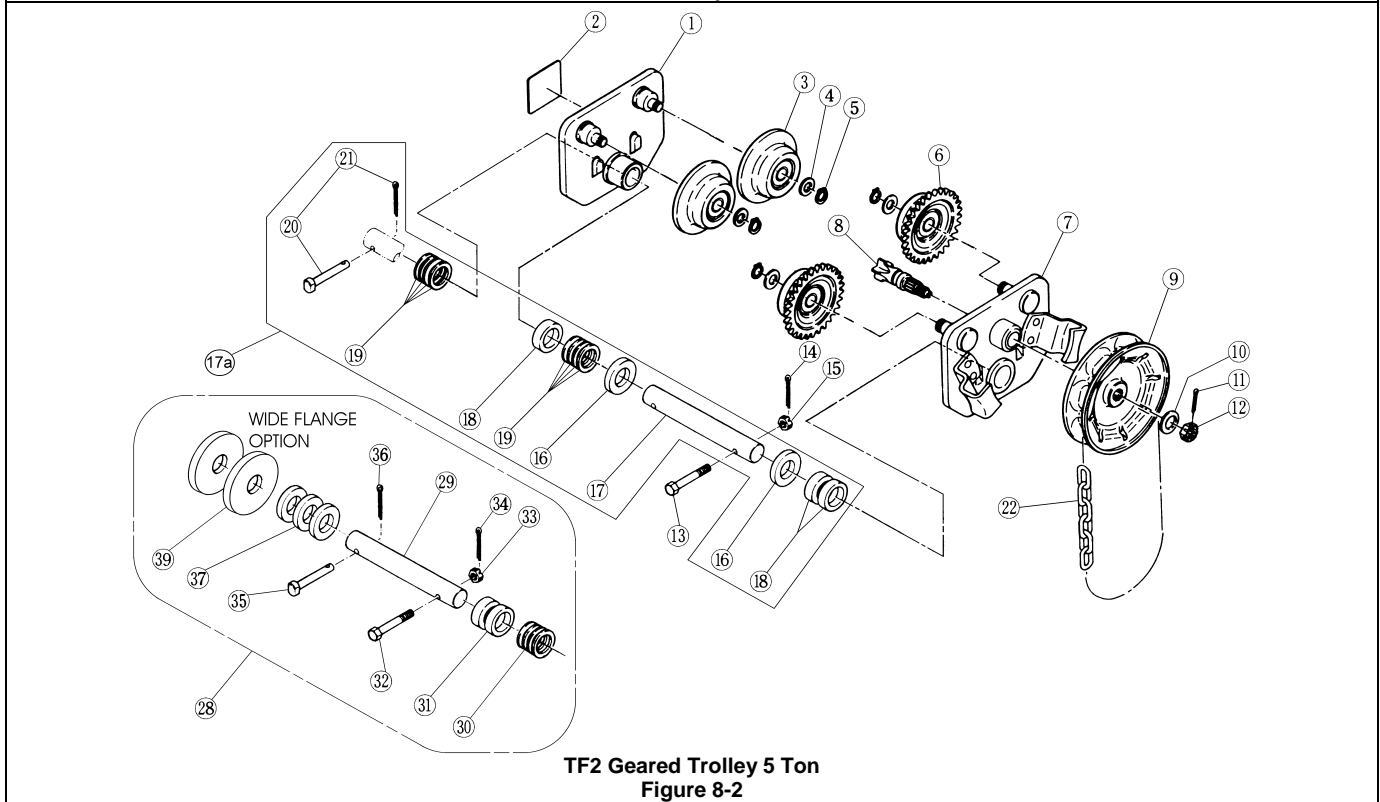
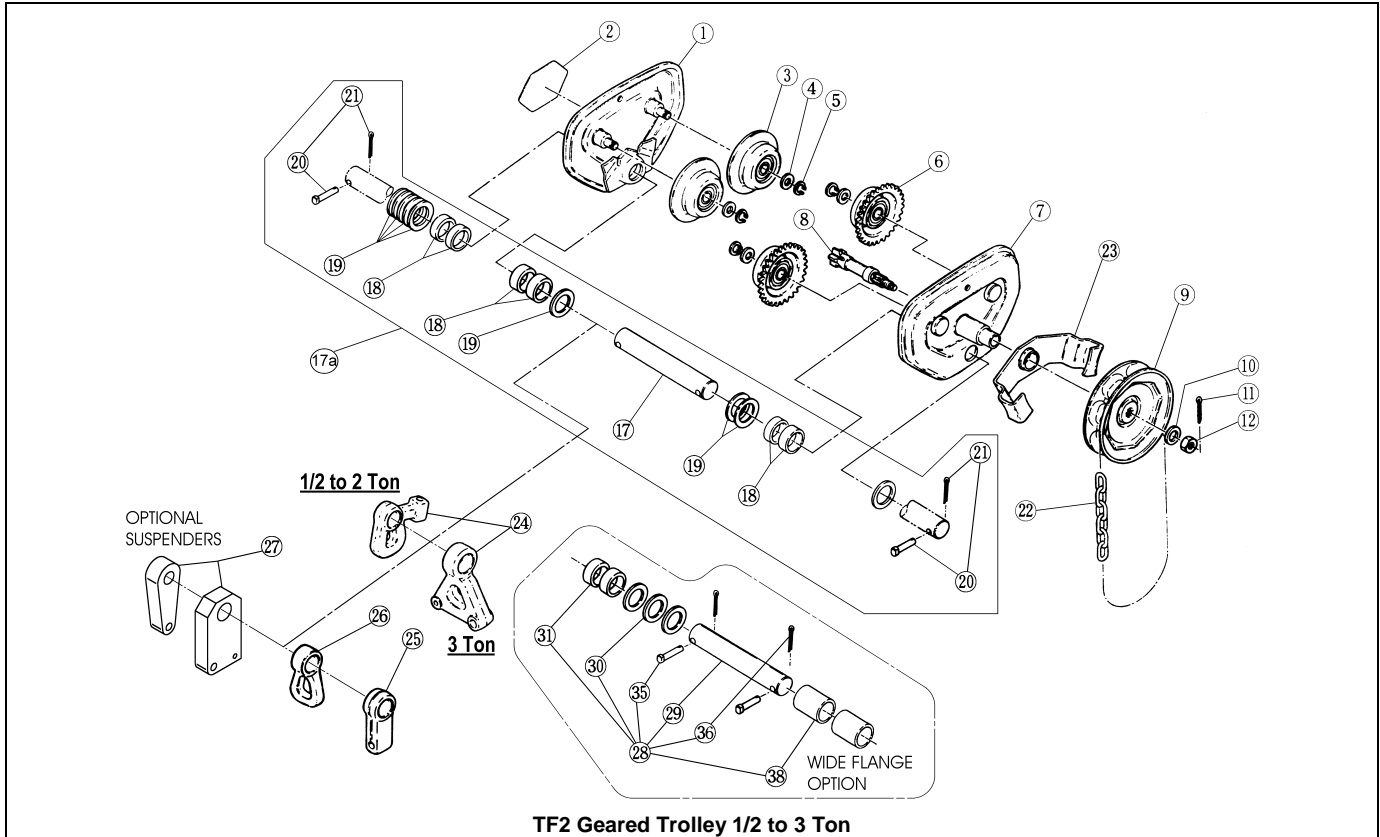
8.1 TF2 Push Trolley Parts – 1/8 to 5 Ton

Figure No.	Part Name	Parts Per Trolley	1/2 Ton	1 Ton	2 Ton	3 Ton	5 Ton
1	Side Plate S Assembly	2	T6G5112005	T6G5112010	T6G5112020	T6G5112030	T3P110050
2	Name plate B	1	T6G800005P	T6G800010P	T6G800020P	T6G800030P	T3P800050
3	Track wheel S Assembly	4	T6G5102005	T6G5102010	T6G5102020	T6G5102030	T3P1102050
4	Slotted nut	4	L3183008				
5	Split pin	4	9009413				
6	Track wheel washer	4		MS104010	MS104020	MS104030	MS104050
7	Snap ring	4		9047115	9047120	9047125	9047135
8a	Suspension shaft assembly Standard	1	T7G1115005	T7G1115010	T7G1115020	T7G1115030	T6G1115050
8	Suspension shaft	1	T7G115005	T7G115010	T7G115020	T7G115030	T6G115050
9	Thick spacer (qty)	X	T7G116005(4)	T7G116010(6)	T7G116020(6)	T7G116030(9)	MSF116050(3)
10	Thin spacer (qty)	X	T7G117005(10)	T7G117010(9)	T7G117020(8)	T7G117030(11)	T6G120050(8)
11	Thin Spacer L	2					T6G119050
12	Shaft stopper pin	2*	T6G156005	T6G156010	T6G156020	MS164020	MS164030
13	Split pin	2*	9009423			9009432	
14	Suspender C	1	T7GC004005	T7GC004010	T7GC004020	T7GC004030 (T7GCO04025)**	
15	Suspender E & G	1	T7GB004005	T7GB004010	T7GB004020	T7GB004030	
16	Suspender H	1	T6G019005	T6G019010	T6G019020	T6G019030	
17	TCR Suspender	1	6040204	6040201 (1 Fall Chain) 60403 (2 Fall Chain)	6040403	TF26K531030S	
18	Bolt Assembly	1					T3P153050
19	Split pin	1					9009423
20	Slotted nut	1					T3P154050
21	Suspension Shaft Assembly Extended	1	T7PD136005 {4.01 to 8.00"} T7PD181005 {8.01 to 12.00"}	T7GD136010 {5.01 to 8.00"} T7GD181010 {8.01 to 12.00"}	T7GD181020 {6.03 to 12.00"}	T7GD181030 {6.03 to 12.00"}	T6GD181050 {7.03 to 12.00"}
22	Suspension Shaft	1	T7PA0059136 {4.01 to 8.00"} T7PA0059181 {8.01 to 12.00"}	T7GA0109136 {5.01 to 8.00"} T7GA0109181 {8.01 to 12.00"}	T7GA0209181 {6.03 to 12.00"}	T7GA0309181 {6.03 to 12.00"}	T6GA0509181 {7.03 to 12.00"}
23	Thin Spacer	X	T7G117005 (10)	T7G117010 (10)	T7G117020 (10)	T7G117030 (10)	T6G120050 (8)
24	Thick Spacer	X	T7G116005 (7)	T7G116010 {5.01 to 8.00"}-(5) {8.01 to 12.00"}-(7)	T7G116020 (11)	T7G116030 (11)	MSF116050 (11)
25	Bolt Assembly	1					T3P153050
26	Slotted Nut	1					T3P154050
27	Split Pin	1					9009423
28	Shaft Stopper Pin	*2	T6G156005	T6G156010	T6G156020	MS164020	MS164030
29	Split pin	*2	9009423			9009432	
30	Thin Spacer L	2					T6G119050
31	Fixing spacer	2	T7PA0059137 {4.01 to 8.00"} T7PA0059182 {8.01 to 12.00"}	T7GA0109137 {5.01 to 8.00"} T7GA0109182 {8.01 to 12.00"}	T7GA0209182	T7GA0309182	
32	Balancing Collar	2					T3GA0509137

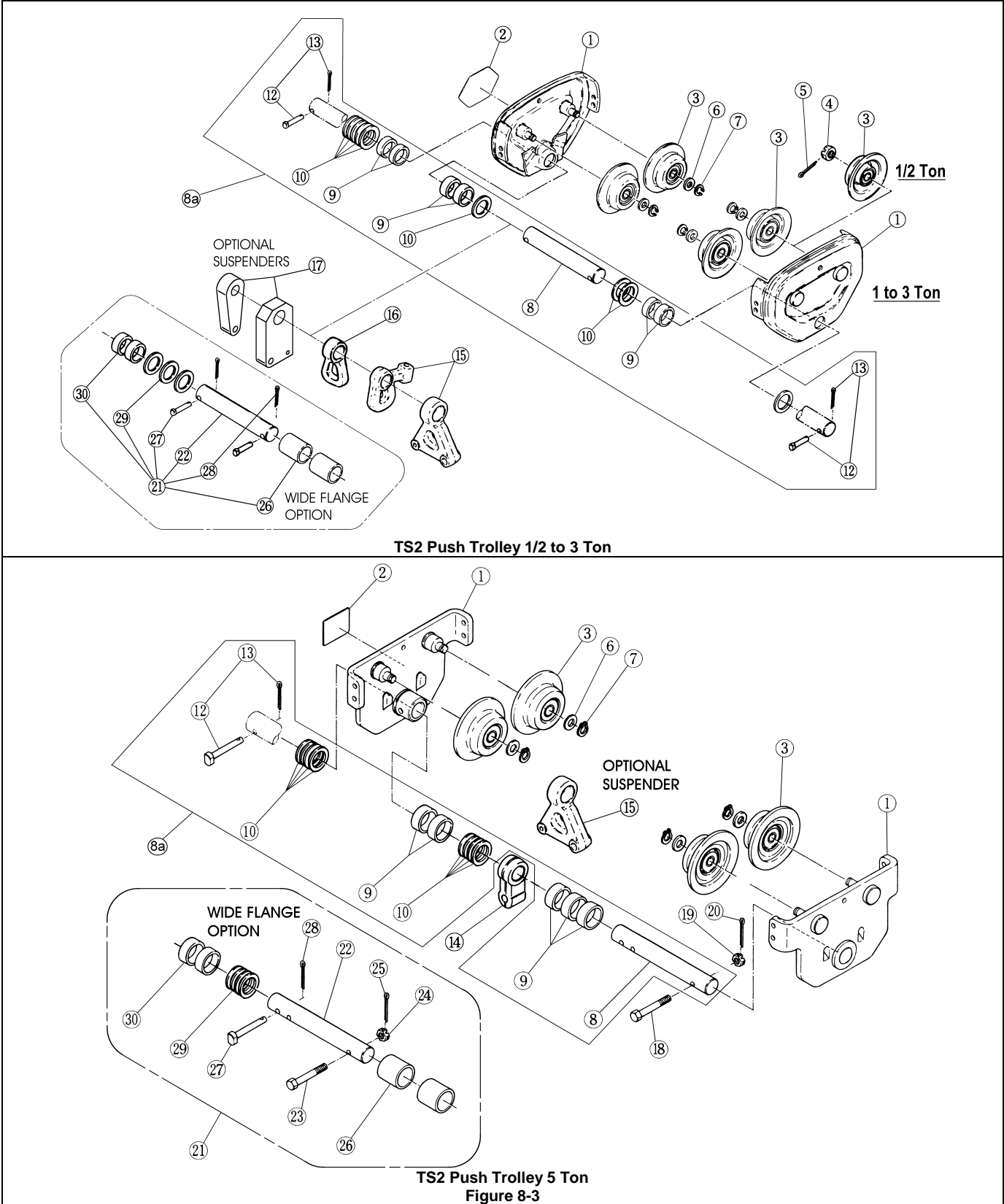
* Quantity is 1 for 5 Ton.

** Suspender for use with model CB025, 2 ½ Ton.

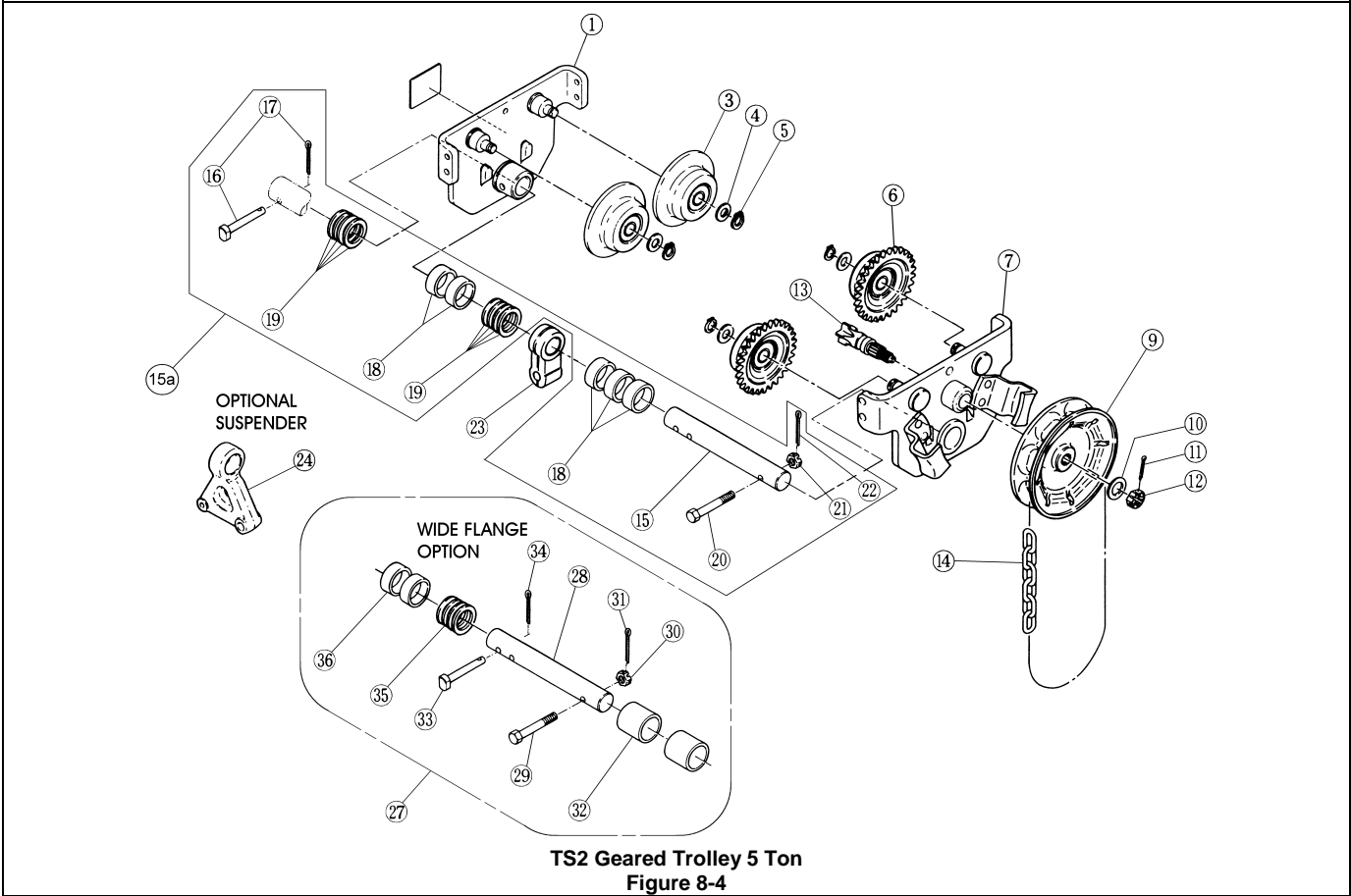
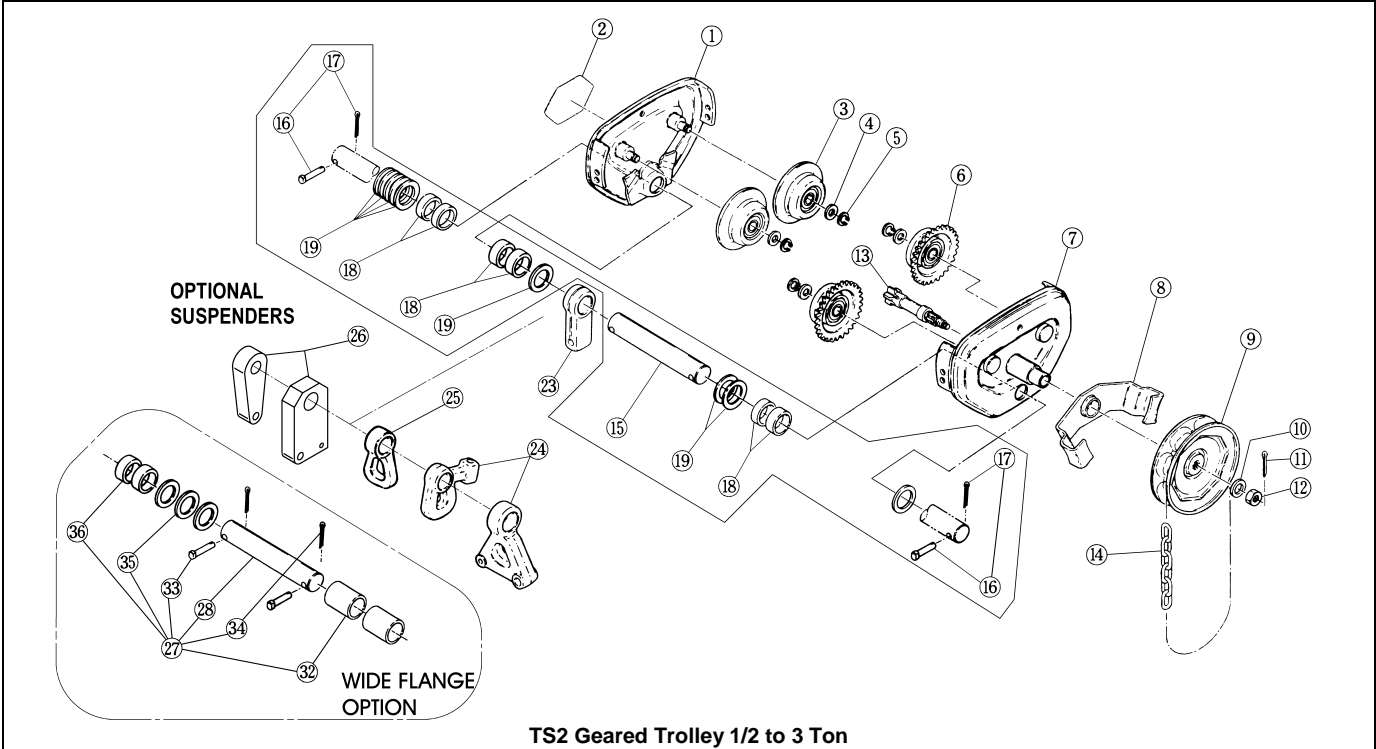
8.2 TF2 Geared Trolley Parts – 1/8 to 5 Ton



8.3 TS2 Push Trolley Parts – 1/8 to 5 Ton



8.4 TS2 Geared Trolley Parts – 1/8 to 5 Ton

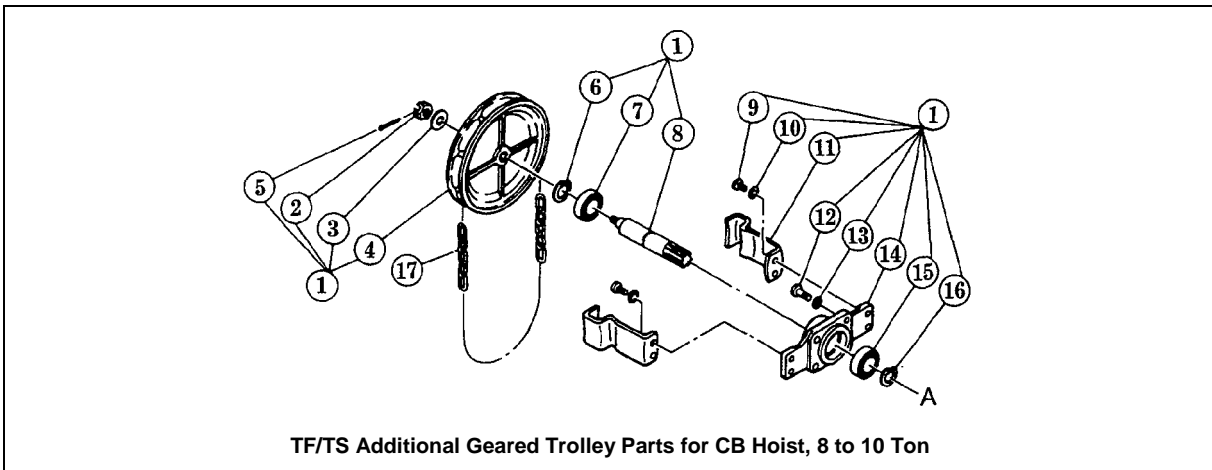
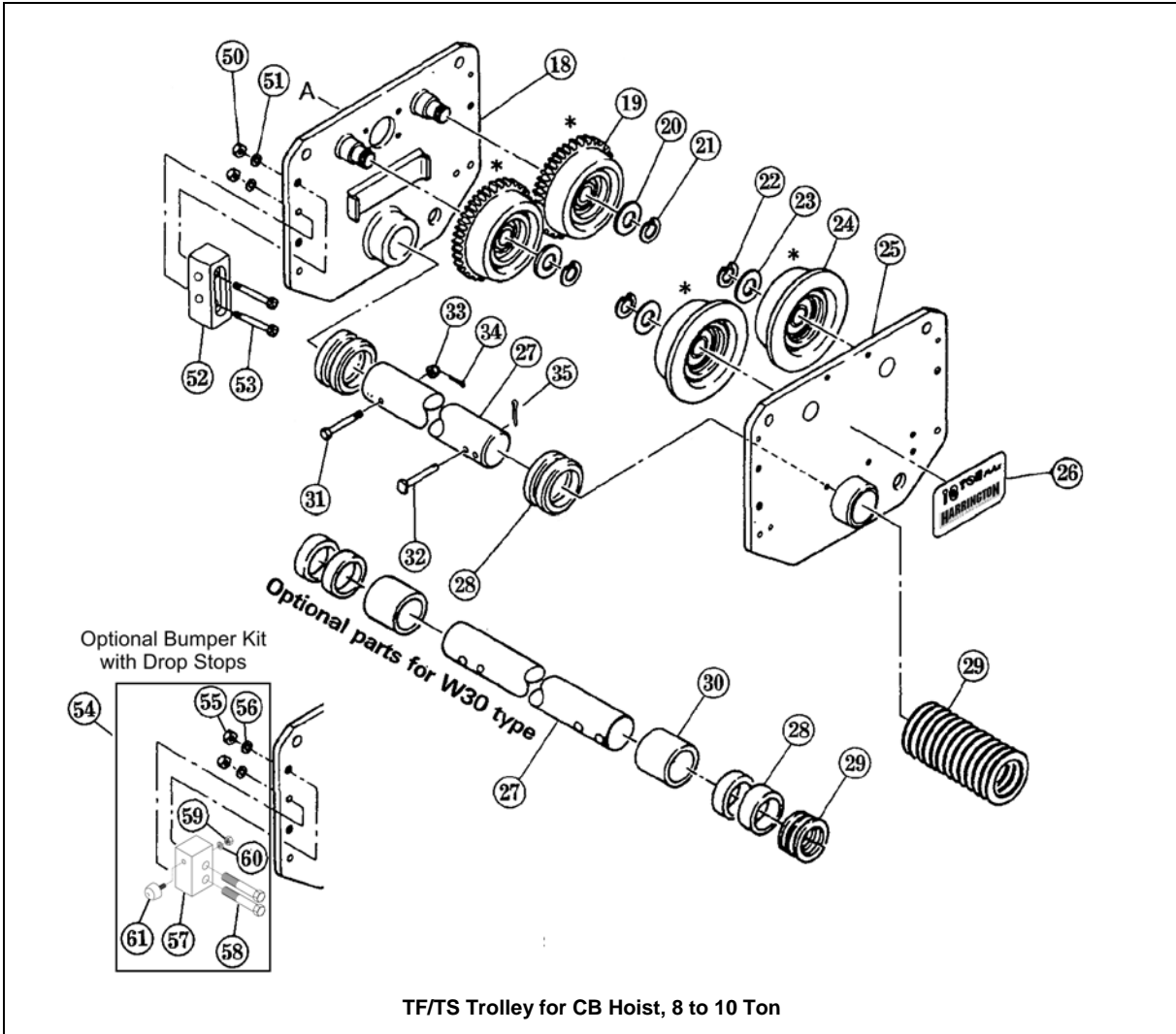


8.4 TS2 Geared Trolley Parts – 1/8 to 5 Ton

Figure No.	Part Name	Parts Per Trolley	1 Ton	2 Ton	3 Ton	5 Ton
1	Sideplate S Assembly	1	T7GA0105112	T7GA0205112	T7GA0305112	T5GA0505112
2	Name plate B	1	T6G800010G	T6G800020G	T6G800030G	T3G800050
3	Track wheel S Assembly	2	T6G5102010	T6G5102020	T6G5102030	T3P1102050
4	Track wheel washer	4	MS104010	MS104020	MS104030	MS104050
5	Snap ring	4	9047115	9047120	9047125	9047135
6	Track wheel G Assembly	2	T6G5101010	T6G5101020	T6G5101030	T3G1101050
7	Sideplate G Assembly	1	T7GB0105111	T7GA0205111	T7GA0305111	T5GA0505111
8	Hand chain guide Assembly	1	T6G5121010			
9	Hand wheel		T6G123010			T7GA0509123
10	Washer	1	9012515			
11	Split pin	1	9009423			
12	Lever nut	1	L4082090			T3P154050
13	Pinion	1	T7GC121010	T7GB121020		T4GB01091211
14	Hand chain	1	HCCF005			
15a	Suspension shaft assembly Standard	1	T7G1115010	T7G1115020	T7G1115030	T7G1115050
15	Suspension shaft	1	T7G115010	T7G115020	T7G115030	T7GA0509115
16	Shaft stopper pin	2	T6G156010	T6G156020	MS164020	MS164030
17	Split pin	2	9009423	9009432		
18	Thick spacer (qty)	X	T7G116010(6)	T7G116020(6)	T7G116030(9)	MSF116050(5)
19	Thin spacer (qty)	X	T7G117010(9)	T7G117020(8)	T7G117030(11)	MSF117050(8)
20	Bolt Assembly	1				T3P153050
21	Slotted nut	1				T3P154050
22	Split pin	1				9009423
23	Suspender E	1	T7GB004010	T7GB004020	T7GB004030	M7S004050
24	Suspender C	1	T7GC004010	T7GC004020	T7GC004030	M3004050
25	Suspender H	1	T6G019010	T6G019020	T6G019030	
26	TCR Suspender	1	6040201 (1 Fall Chain) 60403 (2 Fall Chain)	6040403	TF26K531030S	
27	Suspension Shaft Assembly Extended	1	T7GD136010 {5.01 to 8.00"} T7GD181010 {8.01 to 12.00"} T7GA0109136 {5.01 to 8.00"} T7GA0109181 {8.01 to 12.00"} T7GA0209181 {6.03 to 12.00"} T7GA0309181 {6.03 to 12.00"} T7GA0509181 {7.03 to 12.00"} T7GD181020 {6.03 to 12.00"} T7GD181030 {6.03 to 12.00"} T7GD181050 {7.03 to 12.00"} T7GA0109137 {5.01 to 8.00"} T7GA0109182 {8.01 to 12.00"} T7GA0209182 T7GA0309182 T7GA0509182			
28	Suspension Shaft	1				
29	Bolt	1				T3P153050
30	Nut	1				T3P154050
31	Split Pin	1				9009423
32	Fixing Spacer	2				
33	Shaft Stopper pin	*2	T6G156010	T6G156020	MS164020	MS164050
34	Split Pin	*2	9009423	9009432		
35	Thin Spacer	X	T7G117010 (10)	T7G117020 (10)	T7G117030 (10)	MSF117050 (8)
36	Thick Spacer	X	T7G116010 {5.01 to 8.00"}-(5) {8.01 to 12.00"}-(7)	T7G116020 (11)	T7G116030 (11)	MSF116050 (11)

* Quantity is 1 for 5 Ton.

8.5 TF/TS Push/Geared Trolley Parts for CB Hoist – 8 to 10 Ton

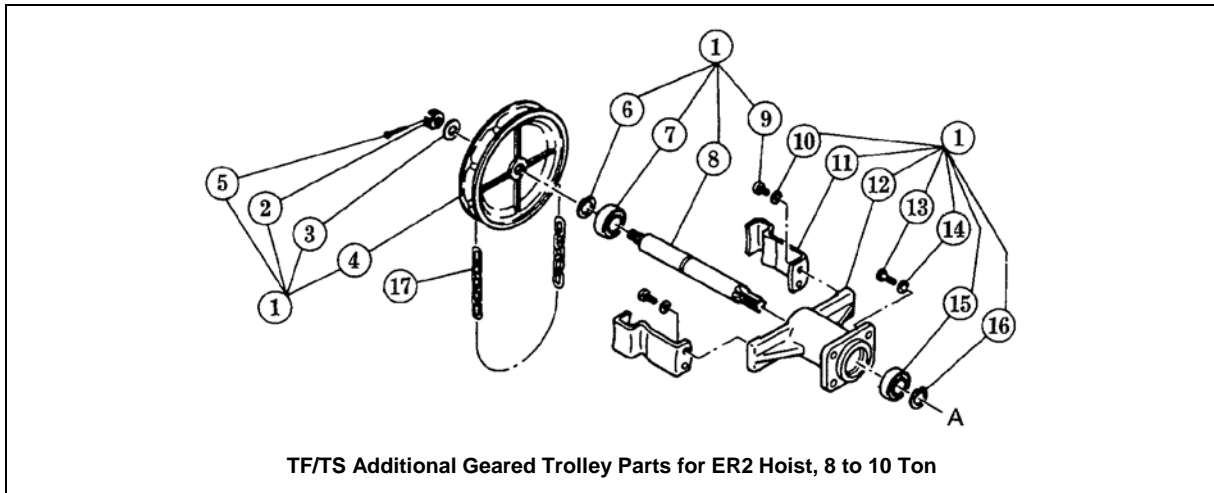
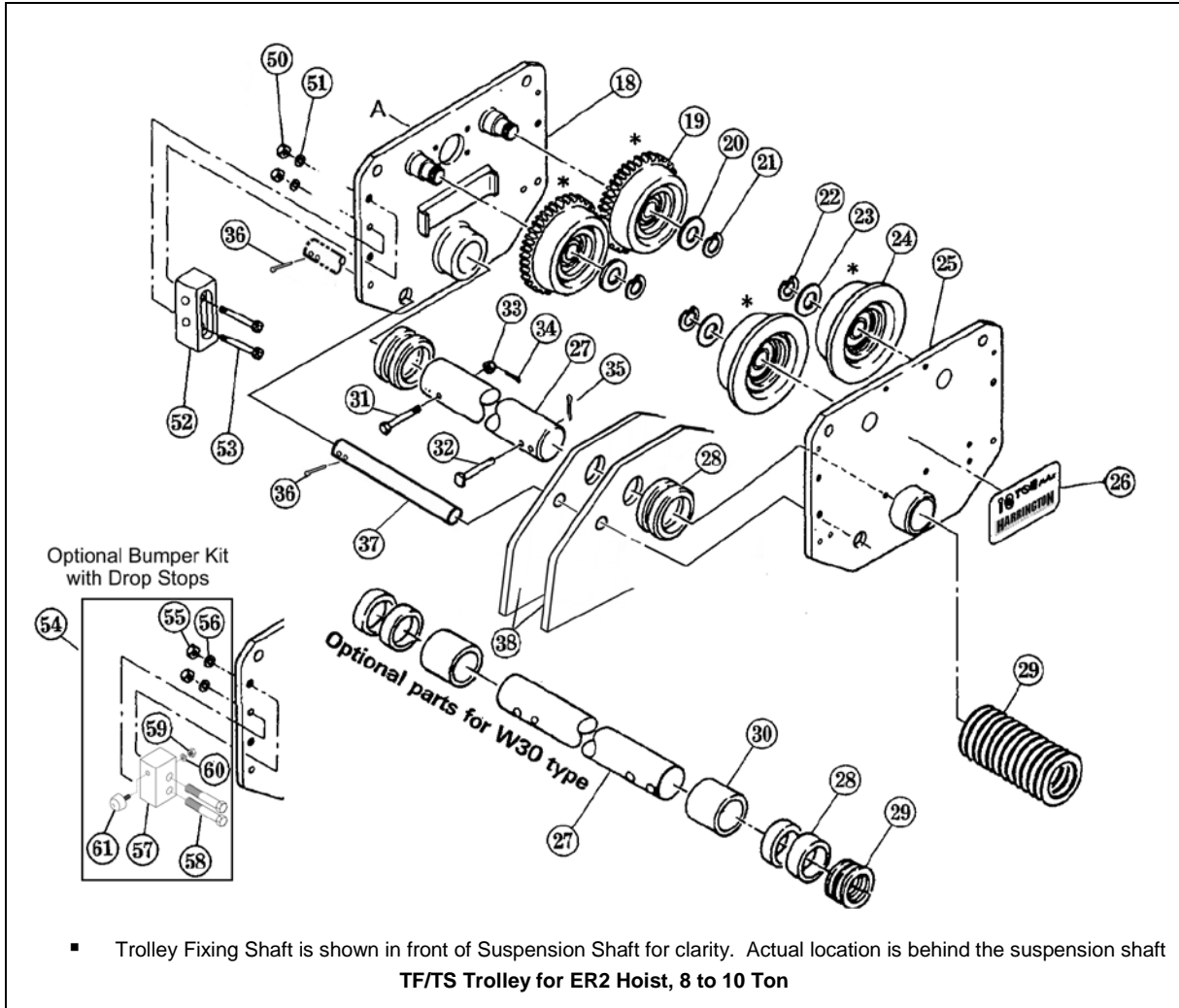


8.5 TF/TS Push/Geared Trolley Parts for CB Hoist – 8 to 10 Ton

Figure No.	Part Name	Parts Per Trolley		8 Ton	10 Ton
1	Hand wheel Assembly	Geared	1	T3G123AM075	
2	Slotted nut		1	T3P154050	
3	Washer		1	9012515	
4	Hand wheel		1	T3G123075	
5	Split Pin		1	9009423	
6	Snap ring		2	9047130	
7	Ball bearing		2	9000506	
8	Pinion		1	T3G127100	
9	Socket bolt		4	9091272	
10	Spring washer		4	9012711	
11	Hand chain guide		2	T3G125075	
12	Socket bolt		4	9091295	
13	Spring washer		4	9012712	
14	Pinion holder		1	T3G128100	
15	Ball bearing		2	9000506	
16	Snap ring		2	9047130	
17	Hand chain	1	HCCF005		
18	Side plate G Assembly	1	T3G5111075		
19	Track wheel G Assembly	2	T3G1101075		
20	Washer	4	MS104075		
21	Snap ring	4	9047140		
22	Snap ring	4	9047140		
23	Washer	4	MS104075		
24	Track wheel S assembly	2	T3G1102075		
25	Side plate S assembly	1	T3G5110075		
26	Name plate B	Push	1	T3P800080	T3P800100
		Geared		T3G800080	T3G801100
27	Suspension Shaft	Std.	1	MS115075	
		Wide		MSF181075	
28	Thick spacer*	8	MS117075		
29	Thin spacer*	Std.	8	MS116075	
		Wide	9		
30	Fixing spacer	Wide	2	M6SE100S9182	
31	Bolt	1	MS161100		
32	Shaft stopper pin	1	MS164075		
33	Slotted nut	1	T3G154075		
34	Split pin	1	9009436		
35	Split pin	1	9009436		
50	Nut	TS (Not compatible with bumpers)	8	9093439	
51	Spring washer		8	9012715	
52	Drop Stop		4	T5AB0759141	
53	Socket bolt		8	90912156	
54	Bumper Kit	Optional for TF or TS	4	6078501	
55	Nut		8	9093439	
56	Spring washer		8	9012715	
57	Drop Stop		4	60818	
58	Socket bolt		8	9093196	
59	Nut		4	9093424	
60	Spring washer		4	9012711	
61	Bumper	4	MR1FS9631		

*See owner's manual for placement of thick and thin spacers.

8.6 TF/TS Push/Geared Trolley Parts for ER2 Hoist – 8 to 10 Ton



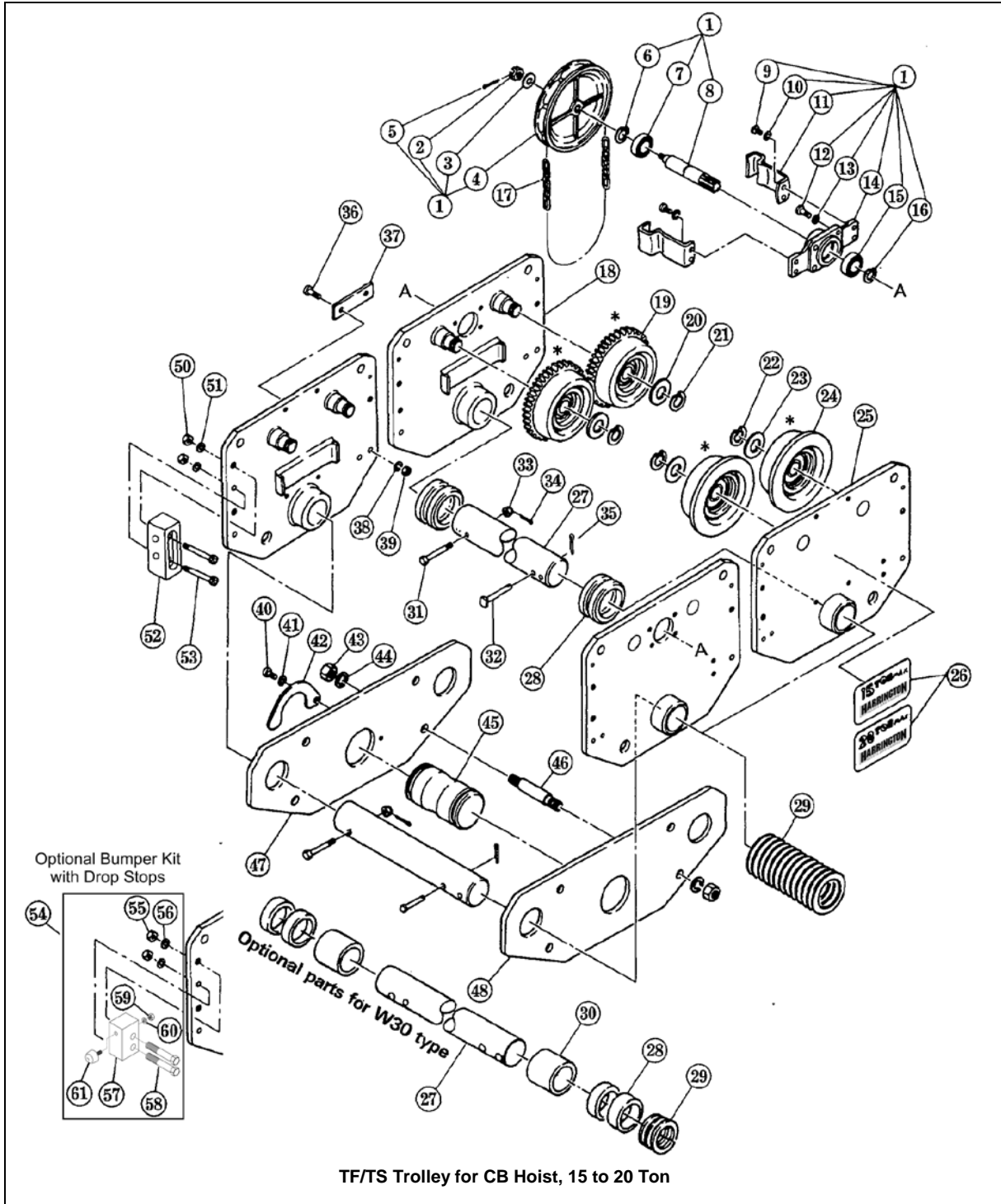
8.6 TF/TS Push/Geared Trolley Parts for ER2 Hoist – 8 to 10 Ton

Figure No.	Part Name	Parts Per Trolley		8 Ton	10 Ton
1	Hand wheel Assembly	Geared	1	T3G123ASM075	
	2		1	T3P154050	
	3		1	9012515	
	4		1	T3G123ASM075	
	5		1	9009423	
	6		2	9047130	
	7		2	9000506	
	8		1	T3GB1009121	
	9		4	9091272	
	10		4	9012711	
	11		2	T3G125075	
	12		4	9091295	
	13		4	9012712	
	14		1	T3B1009122	
	15		2	9000506	
			16	2	9047130
17	Hand chain	1	HCCF005		
18	Side plate G Assembly	1	T3G5111075		
19	Track wheel G Assembly	2	T3G1101075		
20	Washer	4	MS104075		
21	Snap ring	4	9047140		
22	Snap ring	4	9047140		
23	Washer	4	MS104075		
24	Track wheel S assembly	2	T3G1102075		
25	Side plate S assembly	1	T3G51110075		
26	Name plate B	Push	1	T3P800080	T3P800100
		Geared		T3G800080	T3G801100
27	Suspension Shaft	Std.	1	MS115075	
		Wide		MSF181075	
28	Thick spacer*	8	MS117075		
29	Thin spacer*	Std.	8	MS116075	
		Wide	9		
30	Fixing spacer	Wide	2	M6SE100S9182	
31	Bolt	1	MS161100		
32	Shaft stopper pin	1	MS164075		
33	Slotted nut	1	T3G154075		
34	Split pin	1	9009436		
35	Split pin	1	9009436		
36	Split pin, Trolley Fixing Shaft**	2			
37	Trolley Fixing Shaft**	1			
38	Hoist Suspension Plates**	2			
50	Nut	TS	8	9093439	
51	Spring washer	(Not compatible with bumpers)	8	9012715	
52	Drop Stop		4	T5AB0759141	
53	Socket bolt		8	90912156	
54	Bumper kit	Optional for TF or TS	4	6078501	
55	Nut		4	9093439	
56	Spring washer		8	9012715	
57	Drop Stop		8	60818	
58	Socket bolt		4	9093196	
59	Nut		8	9093424	
60	Spring washer		4	9012711	
61	Bumper		4	MR1FS9631	

*See owner's manual for placement of thick and thin spacers.

**These parts come with the hoist and are not included with the trolley

8.7 TF/TS Geared Trolley Parts for CB Hoist – 15 to 20 Ton



8.7 TF/TS Geared Trolley Parts for CB Hoist – 15 to 20 Ton

Figure No.	Part Name	Parts Per Trolley		15 Ton	20 Ton
1	Hand wheel Assembly	Geared	2	T3G123AM075	
	2		2	T3G154050	
	3		2	9012515	
	4		2	T3G123075	
	5		2	9009423	
	6		4	9047130	
	7		4	9000506	
	8		2	T3G127100	
	9		8	9091272	
	10		8	9012711	
	11		4	T3G125075	
	12		8	9091295	
	13		8	9012712	
	14		2	T3G128100	
	15		4	9000506	
	16		4	9047130	
17	Hand chain	2	HCCF005		
18	Side plate G Assembly	2	T3G5111075		
19	Track wheel G Assembly	4	T3G1101075		
20	Washer	8	MS104075		
21	Snap ring	8	9047140		
22	Snap ring	8	9047140		
23	Washer	8	MS104075		
24	Track wheel S assembly	4	T3G1102075		
25	Side plate S assembly	2	T3G5110075		
26	Name plate B	2	T3G801150	T3G801200	
27	Suspension Shaft	Std.	2	MS115075	
		Wide		MSF181075	
28	Thick spacer*	Std.	6	MS117075	
		Wide	22		
29	Thin spacer*	Std.	20**	MS116075	
		Wide	16		
31	Bolt	2	MS161100		
32	Shaft stopper pin	2	MS164075		
33	Slotted nut	2	T3G154075		
34	Split pin	2	9009436		
35	Split pin	2	9009436		

*See owner's manual for placement of thick and thin spacers.

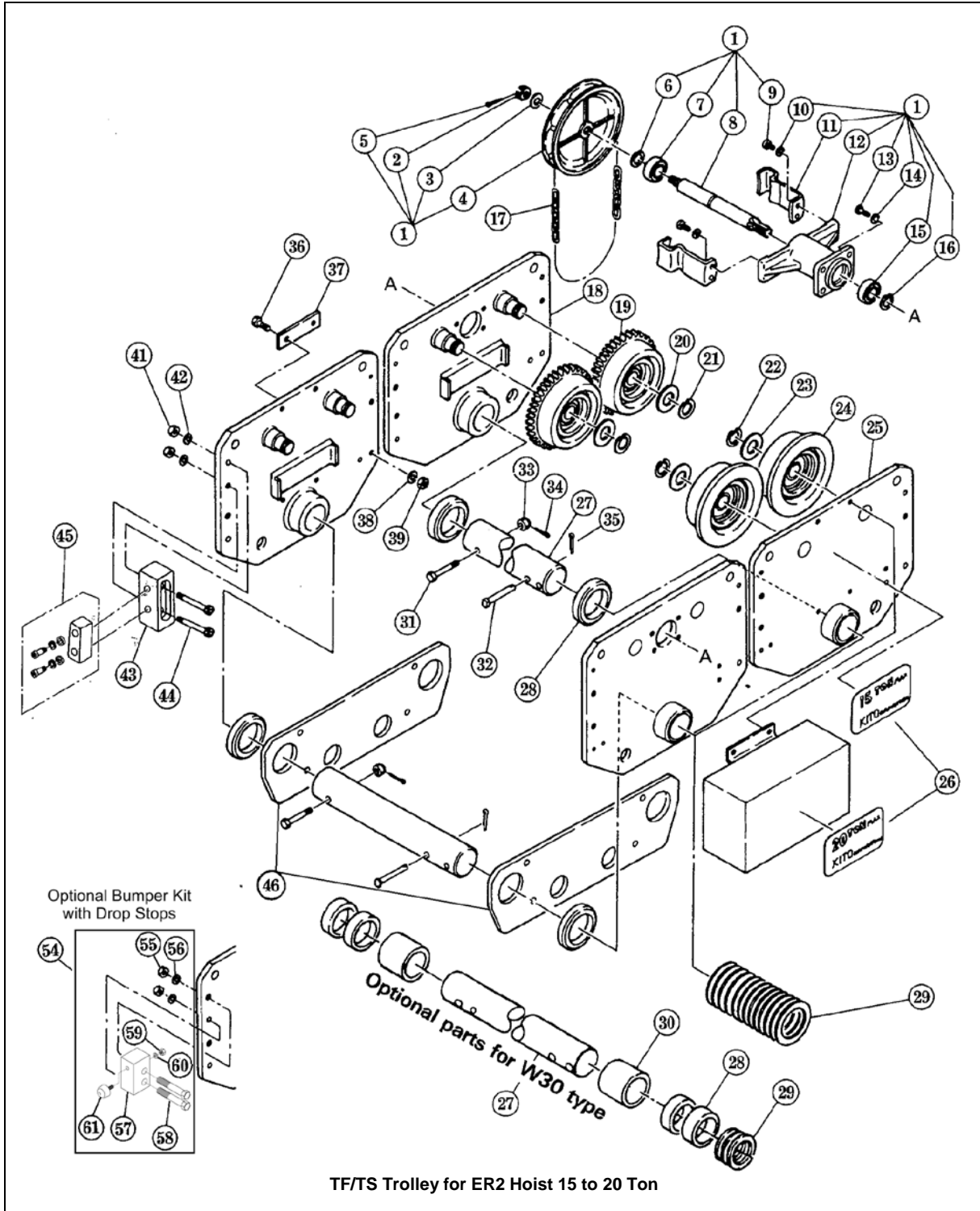
**For flange widths between 5 ½ to 5 ⅝ , six (6) additional thin spacers are required (for a total of 26 thin spacers).

8.7 TF/TS Geared Trolley Parts for CB Hoist – 15 to 20 Ton

Figure No.	Part Name	Parts Per Trolley	15 Ton	20 Ton
36	Bolt	4	MS106150	
37	Connection plate	2	MS105150	
38	Spring washer	4	9012713	
39	nut	4	9093433	
40	Bolt	1	9093327	
41	Spring washer	1	9012711	
42	Key plate	1	T3G145150	
43	Nut	8	9093445	
44	Spring washer	8	9012717	
45	Suspension shaft	1	T3G144150	
46	Stay bolt	4	T3G143150	
47	Suspension plate A	1	T3G141200	
48	Suspension plate B	1	T3G142150	
50	Nut	TS (Not compatible with bumpers)	8	9093439
51	Spring washer		8	9012715
52	Drop Stop		4	T5AB0759141
53	Socket bolt		8	90912156
54	Bumper Kit	Optional for TF or TS	4	6078501
55	Nut		4	9093439
56	Spring washer		4	9012715
57	Drop Stop		8	60818
58	Socket bolt		8	9093196
59	Nut		4	9093424
60	Spring washer		8	9012711
61	Bumper		4	MR1FS9631

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8.8 TF/TS Geared Trolley Parts for ER2 Hoist – 15 to 20 Ton



8.8 TF/TS Geared Trolley Parts for ER2 Hoist – 15 to 20 Ton

Figure No.	Part Name	Parts Per Trolley	15 Ton	20 Ton
1	Hand wheel Assembly	Geared	2	T3G123ASM075
	2 Slotted nut		2	T3G154050
	3 Washer		2	9012515
	4 Hand wheel		2	T3G123075
	5 Split Pin		2	9009423
	6 Snap ring		4	9047130
	7 Ball bearing		4	9000506
	8 Pinion		2	T3GB1009121
	9 Socket bolt		8	9091272
	10 Spring washer		8	9012711
	11 Hand chain guide		4	T3G125075
	12 Pinion holder		2	T3GB1009122
	13 Socket bolt		8	9091295
	14 Spring washer		8	9012712
	15 Ball bearing		4	9000506
	16 Snap ring		4	9047130
17	Hand chain	2	HCCF005	
18	Side plate G Assembly	2	T3G5111	
19	Track wheel G Assembly	4	T3G1101075	
20	Washer	8	MS104075	
21	Snap ring	8	9047140	
22	Snap ring	8	9047140	
23	Washer	8	MS104075	
24	Track wheel S assembly	4	T3G1102075	
25	Side plate S assembly	2	T3G5110075	
26	Name plate B	2	T3G801150	T3G801200
27	Suspension Shaft	Std.	2	MS115075
		Wide		MSF181075
28	Thick spacer*	Std.	6	MS117075
		Wide		
29	Thin spacer*	Std.	20**	MS116075
		Wide		
31	Bolt	2	MS161100	
32	Shaft stopper pin	2	MS164075	
33	Slotted nut	2	T3G154075	
34	Split pin	2	9009436	
35	Split pin	2	9009436	
36	Bolt	4	MS106150	
37	Connection plate	2	MS105150	
38	Spring washer	4	9012713	
39	Nut	4	9093433	
41	Nut	TS (Not compatible with bumpers)	8	9093439
42	Spring washer		8	9012715
43	Bumper		4	T5AB0759141
44	Socket bolt		8	90912156
46	Hoist Suspension Plates [†]			
54	Bumper Kit	Optional for TF or TS	4	6078501
	55 Nut		4	9093439
	56 Spring washer		4	9012715
	57 Drop Stop		8	60818
	58 Socket bolt		8	9093196
	59 Nut		4	9093424
	60 Spring washer		8	9012711
61	Bumper	4	MR1FS9631	

*See owner's manual for placement of thick and thin spacers.

**For flange widths between 5 ½ to 5 ⅝, six (6) additional thin spacers are required (for a total of 26 thin spacers).

[†]Hoist Suspension Plates come with the hoist and are not included with the trolley.



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