KNIGHT
PROVEN INNOVATORS of Material Handling Systems

Servo Hoist
Technical Manual

THIS MANUAL CONTAINS IMPORTANT INFORMATION REGARDING INSTALLATION, SAFETY, MAINTENANCE, AND OPERATION OF KNIGHT INDUSTRIES SERVO HOIST AND SHOULD BE AVAILABLE TO ALL PERSONNEL RESPONSIBLE FOR USING THE SERVO HOIST.

Warranty

Knight Industries Inc. warrants the Servo Hoist to the original user to be free of defects in material and workmanship for a period of one year from the date of purchase. Knight Industries will repair, with cost, any Servo Hoist found to be defective, including parts and labor charges, or at its option, will replace such Servo Hoist or refund the purchase price less a reasonable allowance for depreciation, in exchange for the Servo Hoist. Repairs or replacements are warranted for the remainder of the original warranty period.

If the Servo Hoist proves defective within its original one year warranty period, contact Knight Industries or originating distributor for a return goods authorization.

This warranty is void if servo hoist is disassembled beyond recommendations in this manual.

This warranty does not apply to Servo Hoists which Knight Industries has determined to have been used in a caustic or severe environment, misused, abused or improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine Knight Industries parts. Knight makes no other warranty, and all implied warranties including any warranty of merchantability or fitness for a particular purpose are limited to the duration of the expressed warranty period as set forth above. Knight Industries liability is limited to the purchase price of the Servo Hoist and in no event shall Knight Industries be liable for any consequential, indirect, incidental, or special damages of any nature rising from the sale or use of the , whether based on contract, tort, or otherwise.

NOTE

Some states do not allow limitations on incidental or consequential damages or how long an implied warranty lasts. The above limitations may not apply in your state.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state. It is our policy to promote safe delivery of all orders. This shipment has been thoroughly checked, packed and inspected before leaving our plant and receipt for it in good condition has been received from the carrier. Any loss or damage which occurs to this shipment while in route is not due to any action or conduct of the manufacturer.

A. VISIBLE LOSS OR DAMAGE
If any of the goods called for on the bill of lading or express receipt are damaged, or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt.

B. CONCEALED LOSS OR DAMAGE
When a shipment has been delivered to you in an apparent good condition, but upon opening the crate or container, loss or damage has taken place while in transit, notify the transportation company immediately.

C. DAMAGE CLAIMS
You must file claims for damage with the carrier. It is the responsibility of the transportation company to reimburse you for repair or replacement or goods damaged in shipment. Claims for loss or damage in shipment must not be deducted from the Knight Industries invoice, nor should payment of Knight Industries invoice be withheld awaiting adjustment of such claims as the carrier guarantees safe delivery. Products damaged in shipment must be returned to us for repair, services will be charged to your account and these charges will form the basis for claim against the carrier.

Every effort has been made to provide complete and accurate product information in this manual. However, due to product improvements and changes, discrepancies and omissions may be present.
It is the responsibility of the end user to exercise common sense and judgement when performing the tasks described in this manual. If any procedure seems inaccurate, incomplete or unsafe please put the equipment in a safe condition and contact Knight Industries service department for assistance.

Printed December 2007

TABLE OF CONTENTS

TABLE OF CONTENTS

Safety

This manual provides important information for all personnel involved in the installation, operation and maintenance of the Knight Industries servo hoist.
Even if you feel that you are familiar with this or similar equipment, you should read and understand this manual before performing any of the tasks.

Knight Industries recognizes that most companies have a safety program in place at their facility. The Safety Section, Notes, Cautions and Warnings in this manual are intended to supplement and not supersede any existing plant or company safety guidelines or regulations.

Knight Industries cannot be aware of or provide for all the procedures by which the servo hoist operations or repairs may be conducted and the hazards which may result from each method. If operation or maintenance not specifically recommended by Knight Industries is conducted, it must be ensured that product or personnel safety is not endangered by these actions. If not sure of a operation or maintenance procedure or step, personnel should place the servo hoist in a safe condition and contact a supervisor and/or Knight Industries service department for technical support.

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

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

Electrical equipment described in this manual are designed and built in compliance with ANSI/NFPA 70, "National Electrical Code". It is the responsibility of the system designer, system manufacturer, crane or rail manufacturer, installer and user to ensure that the installation and associated wiring of the servo hoist and components is in compliance with ANSI/NFPA 70, and all applicable Federal, State and Local Codes.

Hazardous voltages are present in the servo hoist and components. Only properly trained and component personnel should perform inspections or repairs on the servo hoist or accessories.
Prior to performing any maintenance (mechanical or electrical) on the servo hoist de-energize (disconnect) the main switch supplying power to the servo hoist. Lock out the power supply following standard plant procedures.

Ensuring that the installation, inspection, testing maintenance and operation is compliance with ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations ANSI/NFPA 70, National Electric Code and ANSI/ASME B30 (if installed as part of an overhead crane system) is the responsibility of the owner/operator.
All personnel that will install, operate, inspect, test or maintain the hoist should read this manual and be familiar with all applicable portions of ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations ANSI/NFPA 70, "National Electric Code" and ANSI/ASME B30 (if installed as part of an overhead crane system).
If clarification of any information in this manual or additional information is required contact Knight Industries. Do not install, operate, inspect, test or maintain the hoist unless all information is understood.Ensuring that the installation, inspection, testing maintenance and operation is compliance with ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations ANSI/NFPA 70, National Electric Code and ANSI/ASME B30 (if installed as part of an overhead crane system) is the responsibility of the owner/operator.
All personnel that will install, operate, inspect, test or maintain the hoist should read this manual and be familiar with all applicable portions of ANSI/ASME B30.16, "Safety Standard for Overhead Hoists", OSHA Regulations ANSI/NFPA 70, "National Electric Code" and ANSI/ASME B30 (if installed as part of an overhead crane system).
If clarification of any information in this manual or additional information is required contact Knight Industries. Do not install, operate, inspect, test or maintain the hoist unless all information is understood.

Warning, Caution and Note

Throughout this manual there are steps and procedures that if not performed correctly can result in personal injury or equipment damage. The following signal words are used to identify the level of potential hazard:

⚠WARNING

Indicates a hazard which will cause severe injury, death or substantial equipment damage.

⚠CAUTION

Indicates a hazard which can or will cause injury or equipment damage.

NOTE

Notifies personnel of installation, operation or maintenance information which is important but not hazard related.

SAFETY

General Safety Precautions

Hazards to avoid and are not necessarily limited to the following list:

- Do not operate the servo hoist before reading this technical manual.
- Allow only personnel trained in safety and operation of this servo hoist to operate the servo hoist.
- If the servo hoist is locked out or a "DO NOT OPERATE" sign is on the servo hoist or controls do not operate the servo hoist until the lock or sign is removed by designated personnel.
- Do not use the servo hoist if hook latch has been sprung or broken.
- Ensure the hook latches are engaged before using.
- Before each shift or prior to use inspect the servo hoist in accordance with the procedures defined in the maintenance section of this manual.
- Never place your hand or fingers inside the throat area of a hook.
- Never operate a servo hoist with twisted, kinked or damaged chain.
- Only operate a servo hoist when the chain is centered over the hook. Do not "side pull" or "yard".
- Do not force the hook into place by hammering.
- Ensure the load is properly seated in the saddle of the hook.
- Never run the chain over a sharp edge.
- Pay attention to the load all times when operating the servo hoist.
- Ensure no personnel are in the path of the load.
- Do not lift the load over personnel.
- Never use a servo hoist for lifting or lowering people.
- Do not allow anyone to stand on a suspended load.
- Do not swing a suspended load.
- Never leave a suspended load unattended.
- Never cut or weld a suspended load.
- Do not operate a servo hoist if the chain is jumping, jamming, overloading or binding or if there is excessive noise.
- Avoid collisions or bumping of the servo hoist.
- Do not operate servo hoist when damaged or malfunctioning.
- Do not remove load or handling device until tension is released from the chain.

Fail Safe Brake

A fail safe braking system engages and holds the unit in place in the event of a power outage or when the run/stop button is pushed. The virtual limits and paths remain in tact.

Movement Interrupt Cycle

If the Servo System is moving in Auto-Mode, and an obstruction or operator is within its path, the Servo System will stop once contact is made.

Overload Capacity Protection

Protects the equipment and prevents the operator from lifting or moving more weight than the system is rated for. If load parameters exceed the programmed capacity, the hoist will not lift any further until the load is removed.

Run/Stop Push Button

If an operator needs to shutdown the system immediately, the operator pushes the Run/Stop button. The system will not function until it is reset.
To reset the system from the run/stop condition, the operator turns the button clockwise to release it from the down position. All virtual limits and programs remain intact.
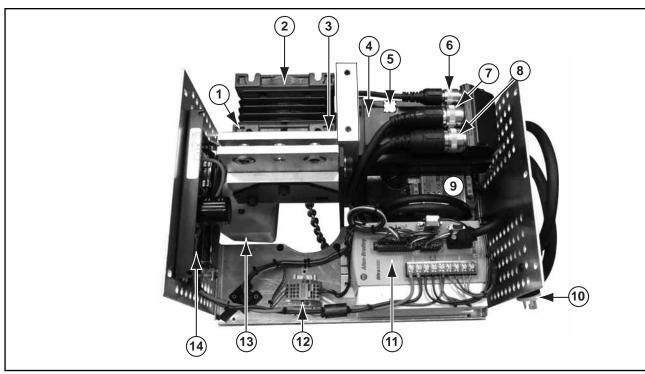
Figure 2-1

Introduction
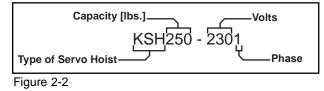
Servo Hoist Callouts

(Refer to Figure 2-1)

1. Gear Box Adapter
2. Gear Reducer
3. Chain Guide Mounting Plate
4. Servo Motor with Brake
5. Power Contractor (Underneath Servo Motor)
6. Motor Brake Cable
7. Motor Power Cable
8. Motor FB Cable
9. 24VDC Power Supply
10. 230 VAC Plug
11. Servo Drive
12. Terminals
13. Chain Bucket
14. Regen Board

Model Number

The servo hoist model number designates the Servo Hoist type and specifications. The letters indicate the Servo Hoist type, refer to table 2-1. The numbers preceding the servo hoist model letters reference the rated capacity. The next (3) three letters indicates the voltage and the last number indicates the phase.

Capacity [lbs.] — Volts

KSH250 - 2301

Type of Servo Hoist — Phase

Figure 2-2

Letters	Servo Hoist Type
KSH	Knight Servo Hoist Single Chain
KST	Knight Servo Tractor
KSHTC	Knight Servo Hoist Twin Chain
KSHTCDM	Knight Servo Hoist Twin Chain Dual Motor
KSHFA	Knight Servo Hoist Floor Mounted Articulating Arm
KSHCA	Knight Servo Hoist Overhead Carriage Articulating Arm
KSHEA	Knight Servo Hoist Extension Arm
KSHAEA	Knight Servo Hoist Articulating Extension Arm
KSHVA	Knight Servo Hoist Vertical Arm
KSHVAA	Knight Servo Hoist Vertical Articulating Arm
KSHXZ	Knight Servo Hoist and Tractor X and Z Movement
KSHXYZ	Knight Servo Hoist and Tractor X, Y, and, Z Movement

Servo Hoist Sizing

Servo Hoists are designed to float the weight, but can also be used as a hoist. The load should be 65 percent of the rated Servo Hoist capacity for optimal balance, refer to "Models and Specifications" page 2-2. Knight Industries recommends the total load weight be 75 percent or less than the Servo Hoist capacity for hoist applications.

Models and Specifications

INTRODUCTION

Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
Servo Hoist			
KSH250-1151 Single Chain	250 [113]	98.43′ fpm[30mpm]	115 / 1 Phase
KSH250-2301 Single Chain	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
KSH500-2301 Single Chain	500 [227]	98.43′ fpm [30mpm]	230 / 1 Phase
KSH750-2301 Single Chain	750 [340]	123.03′ fpm [37.5mpm]	230 / 1 Phase
KSH1000-2301 Single Chain	1000 [454]	82.02′ fpm [25mpm]	230 / 1 Phase
KSH2000-2301 Reeved Unit	2000 [908]	41.01′ fpm [12.5mpm]	230 / 1 Phase

Servo Hoist
Enables operator to precisely locate and/or float a load in the "Z" direction.

Servo Rack and Pinion Tractor			
Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
KST4000	4000 [1814]	174.53′ fpm [53.20mpm]	230 / 1 Phase

Servo Rack and Pinion Tractor
Accurately locates a load in the X and Y direction.

Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
Servo Hoist Twin Chain			
KSHTC250-2301	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
500lb, 750lb, and 1000lb arms are application dependent and considered a special order.			

■ Chain spreads 2ft [.6m] standard. Additional spreads determined per application.

Servo Hoist Twin Chain
Incorporates the benefits of a Servo System into a twin chain process. The twin chains help control/balance unwieldy or long parts.

Servo Hoist Twin Chain Dual Motor			
Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
KSHTCDM500-2301	500 [227]	196.85′ fpm [60mpm]	230 / 1 Phase
KSHTCDM1000-2301	1000 [454]	98.43′ fpm [30mpm]	230 / 1 Phase
KSHTCDM1500-2301	1500 [680]	123.03′ fpm [37.5mpm]	230 / 1 Phase
KSHTCDM2000-2301	2000 [908]	82.02′ fpm [25mpm]	230 / 1 Phase

■ Chain spreads 2ft [.6m] standard. Additional spreads determined per application.

Servo Hoist Twin Chain Dual Motor
Incorporates the benefits of a Servo System into a twin chain process. The twin chains control/balance unwieldy or long parts. The dual motor Servo Hoist is for heavier loads up to 1400lbs/635kg.

INTRODUCTION

Servo Hoist Articulating Arm On An Overhead Carriage			
Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
KSHCA500-2301	500 [227]	98.43′ fpm [30mpm]	230 / 1 Phase
KSHCA1000-2301	1000 [454]	82.02′ fpm [25mpm]	230 / 1 Phase

Servo Hoist Articulating Arm
"Overhead Carriage"
Servo Hoist mounted on an Articulating Arm. Allows for overhead extended reach within a work cell

Servo Hoist Articulating Arm Floor Mounted			
Model	Capacity lbs [kg]	Speed Max.	Voltage / Phase
KSHFA500-2301	500 [227]	98.43′ fpm [30mpm]	230 / 1 Phase
KSHFA1000-2301	1000 [454]	82.02′ fpm [25mpm]	230 / 1 Phase

Servo Hoist Articulating Arm
"Floor Mounted"
Servo Hoist mounted on an Articulating Arm. Allows for overhead extended reach within a work cell

Servo Hoist Extension Arm			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHEA250-2301	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
500lb, 750lb, and 1000lb arms are application dependent and considered a special order.			

Servo Hoist Extension Arm
"Overhead Mounted"
Incorporates a Servo Hoist within a boom. Enables the operator to reach outside the area directly below the rail.

Servo Hoist Articulating Extension Arm			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHAEA250-2301	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
KSHAEA500-2301	500 [227]	98.43′ fpm [30mpm]	230 / 1 Phase
KSHAEA750-2301	750 [340]	123.03′ fpm [37.5mpm]	230 / 1 Phase
KSHAEA1000-2301	1000 [454]	82.02′ fpm [25mpm]	230 / 1 Phase

Servo Hoist Articulating Extension Arm
"Floor Mounted"
Articulating Extension Arm attached to a Servo Hoist. Allows for overhead extended non-linear reach within a work cell. May be mounted to a single bridge, rotating carriage or floor mounted pedestal.

INTRODUCTION

Servo Hoist Vertical Arm			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHVA250-2301	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
500lb, 750lb, and 1000lb arms are application dependent and considered a special order.			

Servo Hoist Vertical Arm
"Overhead Mounted"
Servo Hoist mounted on a vertical aluminum mast creates a steady state condition. Eliminates the yarding of a cable or chain.

Servo Hoist Vertical Articulating Arm			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHVAA250-2301	250 [113]	196.85′ fpm [60mpm]	230 / 1 Phase
500lb, 750lb, and 1000lb arms are application dependent and considered a special order.			

Servo Hoist Vertical Articulating Arm
"Floor Mounted"
Servo Hoist mounted on a vertical aluminum mast. Creates a steady state condition, eliminating the yarding of a cable or chain. This hoist includes an articulating boom which enables the operator to reach underneath areas in a confined work cell.

Servo Tractor with "Z" Control			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHXZ1000	1000 [454]	174.53' fpm [53.20mpm]	230 / 1 Phase

Servo Tractor with "Z" Control
Combines X and Z movements in one handle.

Servo "X / Y" Tractor with "Z" Control			
Model	**Capacity lbs [kg]**	**Speed Max.**	**Voltage / Phase**
KSHXYZ1000	1000 [454]	174.53' fpm [53.20mpm]	230 / 1 Phase

Servo Tractor with "X, Y, and, Z" Control
Combines X ,Y and Z movements in one handle.

THIS PAGE IS INTENTIONALLY LEFT BLANK

Installation

Prior to installation visually inspect the servo hoist for signs of damage or missing parts.

⚠ CAUTION

Prior to installation, the chain must be lubed using a SAE 50 to 90 EP oil.

⚠ CAUTION

Prior to placing this unit into service the owners and user are advised to examine specific local and/or other regulations, including ANSI and OSHA regulations that may apply to the use of this product.

⚠ WARNING

A falling load can cause injury or death. Before installing this servo hoist read the "Safety" section of this manual.

Follow all procedures in this section for installation and set-up of the servo hoist .

Retain all product information supplied with the servo hoist for future reference.

Ensure that the supporting structure is able to support the weight of the system and load. The structure should be able to support 300 percent of the combined weight of the servo hoist and load. Do not use a supporting structure that tilts the servo hoist to one side or the other.

For safe and proper installation into a rail system, refer to the installation manual provided by the rail system manufacturer.

When installation is complete and prior to placing the servo hoist into operation, inspect the servo hoist following the "Periodic Inspection" procedure on page 5-2 of the "Maintenance" section.

Power Supply to Servo Hoist:

Prior to installation visually inspect the Servo Hoist for signs of damage or missing parts.

Power Requirements:
Standard 230V AC Single Phase / 60 hertz

1. The Servo System is operated by plug and cord power supply. Insert Servo Hoist plug into electrical receptacle.
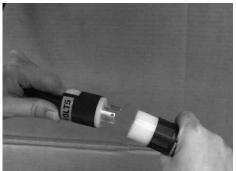
Figure 3-1

Servo Hoist Trolley Installation:

Prior to installation visually inspect the trolley for signs of damage or missing parts.

1. Slide trolley into trolley mounting plate on top of the servo hoist. Insert (2) two 1/2 x13x1/2 sockethead bolts and (2) two washers.

Figure 3-1

NOTE

Trolley should be mounted offset for load distribution. (Refer to Figure 3-1 for trolley plate alignment)

2. Secure the (2) two sockethead bolts.

(Refer to Safety Cable Installation on page 3-2)

INSTALLATION

Safety Cable Installation:

1. Slide thimbles together as shown (Figure 3-2).

Figure 3-2

2. Slide two (2) cable clamps onto cable.

3. Loop end of cable around thimble and run end through cable clamps as shown (See Figure 3-3). The cable saddle (forged part) rests on the "live" (longer) end of the cable. The U-bolt rests on the "dead" (shorter) end of the cable.
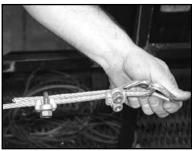
Figure 3-3

4. Tighten nuts on clamps, alternating sides.

5. Follow the steps below for trolley or top hook.

• Insert cable through center hole on trolley and bracket (fig.3-4) and place two crosby clamps on the cable.

• Secure the two crosby clamps snug to the thimble repeating step 3.

6. Install cable so that the servo hoist has a drop of not more than 1 in. [2.54 cm].

7. Trim excess cable and tape ends of cable to prevent fraying.

Figure 3-4

Figure 3-5

Figure 3-6

INSTALLATION

Operation

All operators should read and understand the instructions in this manual. Follow all instructions and warnings in this manual for safe and trouble free operation.

NOTE

> Due to the visual indicator (LED / Push Button Indicator) setup on the pendant control being configurable to customer specifications, the word "indicator" is used throughout these procedures to denote either a push button indicator or LED indicator.

Run-Stop

1. Press the RUN-STOP button, located on the pendant control handle.

    • Main power is removed and motion is disabled.

    • The RUN-STOP button will illuminate red.

Recovery:

1. Correct the situation that caused the run-stop.

2. Follow the Start Up procedure to restore power to the unit.

Shut Down

1. Press the RUN-STOP button, located on the pendant control handle.

2. Disconnect the power supply to the unit (if required).

Start Up

1. Connect the power supply to the unit (if required).

2. Reset the RUN-STOP button.

    • The unit defaults to No Mode.

    • GREEN indicator will flash

3. Move the handle upward (use lift or float mode) until the upper limit switch is made. The GREEN indicator will illuminate solid (Unit will switch to Lift Mode).

No Mode

If the servo hoist is inactive for 15 minutes the unit will shift to an energy saving sleep mode; the brake will engage and remove the load from the motor. When the unit is in No Mode, the GREEN and BLUE indicators will flash alternately.

To reactivate the unit, move the pendant handle upward or downward or press the GREEN or BLUE push button.

Lift Mode

Press the GREEN button to shift the servo hoist to Lift Mode.

> • The GREEN indicator will illuminate

In Line Pendant Handle

1. Slide the handle in the desired direction of travel (upward or downward). Travel speed is dependent on pressure applied to the handle by the operator.

Remote Mounted Pendant Handle

Press the UP or DOWN button to move the hoist in the desired direction. Travel speed is dependent on pressure applied to the button by the operator.

Float Mode

Press the BLUE button to shift the servo hoist to Float Mode.

> • The BLUE indicator will illuminate.

Use the fixture or part to move up and down. Do not use the handle to move the part.
To shift the servo hoist out of Float Mode use the pendant handle (inline or remote mount) to move the hoist upward or downward or press the GREEN push button and the unit will shift to Lift Mode.

NOTE

> Part must be picked up with the unit in Lift Mode and then shift the servo hoist to Float Mode.

NOTE

> If the servo hoist is inactive for 5 minutes while in Float mode the unit will shift to Lift Mode.

NOTE

> Pressing upward or downward on the pendant handle assembly will prevent the unit from changing to float mode.

OPERATION

Limit Stops

NOTE

During operation (normal or float mode) the hoist will ramp down in speed as the limit stops are approached.

Setting Upper Limit Stop

1. Move the handle to the desired location (Lift or Float mode).

2. Press and hold the GREEN push button until the GREEN and BLUE indicators begin to flash simultaneously (unit is in Program Mode).

3. Press the GREEN push button.

   • Upper limit is set.

   • GREEN and BLUE indicators will stop flashing.

   • GREEN indicator will remain illuminated.

Setting Lower Limit Stop

1. Move the handle to the desired location (Lift or Float mode).

2. Press and hold the GREEN push button until the GREEN and BLUE indicators begin to flash simultaneously (unit is in Program Mode).

3. Press the Blue Push Button.

   • The lower limit is set.

   • GREEN and BLUE indicators will stop flashing.

   • GREEN indicator will remain illuminated.

Clearing Limit Stops

1. Press and hold the GREEN push button.

   • The GREEN and BLUE indicators will begin to flash simultaneously.

   • When only the GREEN indicator is illuminated the limit stops are cleared from memory.

Fault Mode:

Red light will flash

1. Press the RUN-STOP button, located on the pendant control handle.

   • Main power is removed and motion is disabled.

   • The RUN-STOP button will illuminate red.

Recovery:

1. Correct the situation that caused the fault

2. Follow the Start Up procedure to restore power to the unit.

OPERATION

Preventive Maintenance

Inspection Overview

The inspection procedures and recommendations in this manual are based on ANSI/ASME B30.16. The following definitions and recommendations are from ANSI/ASME B30.16 and pertain to the recommended inspection procedures in this manual.

- Qualified Person- a person who, by possession of a recognized degree in an applicable field, 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 at work.

- Designated Person- a person selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

- Normal Service- service that 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 for electric hoists.

- Heavy Service- service that involves operation within the rated load limit, which exceeds normal service.

- Severe Service- service that involves normal or heavy service with abnormal operating conditions.

- Abnormal Operating Conditions- environmental conditions that are unfavorable, harmful, or detrimental to the operation of a hoist, such as excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust laden or moisture laden atmospheres, and hazardous locations.

Inspection Record Requirements

Duty Rating

Inspection frequency should be determined by a qualified person and is based on factors such as severity of environment, percentage of capacity lifts, cycle time and shock loading. Each servo hoist should be rated individually and inspections performed in accordance with rating.
Frequent inspections can be performed by the operator or designated personal.
Periodic inspections must to be performed by designated personal.

Frequency of Documentation

Frequent Inspection (Non Documented):
- Normal duty cycle - monthly.

- Heavy duty cycle- weekly.

- Severe duty cycle- daily.

Periodic Inspection (Documented):
- Normal duty cycle- annually.

- Heavy duty cycle- semi annually.

- Severe duty cycle- quarterly.

An inspection record which can be copied is located on the inside back cover of this manual.
Documentation should be made available to personnel for review.

Inspection

Frequent

If any of the conditions listed below are evident the servo hoist should be placed out of service and a detailed inspection and corrective action should be taken. Additionally, the operator should check the system continually during operation to ensure that no malfunctions are occurring.

Servo Hoist:
- Visually inspect the servo hoist, ensure that it is in good general working order. Repair or replace any broken or missing parts.

- Cycle the servo hoist and listen for any abnormal noises (grinding etc.). If any abnormal noises are evident a periodic inspection of the servo hoist must be performed.

- Inspect how the chain feeds through the servo hoist. If any binding is evident clean and lubricate the chain (see Chain Periodic Inspection). If the problem persists replace the chain.

- Cycle run stop.

MAINTENANCE

continued from previous page

MAINTENANCE

Load Chain

- Inspect each of the links for bending, cracks in weld area or shoulders, traverse nicks and gouges, weld splatter, corrosion pits, striation, general wear including bearing surfaces between chain links.

- The entire surface of the chain should have a light coating of lubricant and be free of dirt and grime. Clean and lubricate the chain as required refer to procedure on page 5-4.

- Inspect the chain for stretching. Measure the pitch across a five link section in several locations throughout the length of the chain (Refer to Figure 5-1). Additionally measure the wire diameter in several locations (Refer to Figure 5-1). Replace chain if the pitch is greater than the maximum value shown or if the wire diameter is less than the minimum value shown in Table 5-1.

Wire Diameter
Pitch
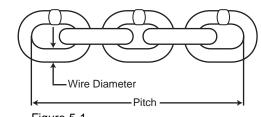
Figure 5-1

	Normal in. (mm)	Discard in. (mm)
Pitch Dimension	2.38 (60.5)	2.43 (61.7)
Wire Diameter	0.16 (4.0)	0.13 (3.3)

Table 5-1

Load Shackle:

- Check shackle for signs of wear, refer to manufacturer's documentation for wear limits.

- Ensure load shackle is not cracked, nicked or gouged. Replace the shackle as necessary.

- Refer to manufacturers literature for additional maintenance requirements.

- Refer to manufactures specifications for wear.

.

Periodic Inspection (Documented)

Perform the items listed in the Frequent Inspection section in addition to the items listed below. All findings from this inspection should be recorded. An inspection record, which can be copied, is located on the inside back cover of this manual.

If any of the conditions listed below are evident the servo hoist should be placed out of service and corrective actions can be taken.

Supporting Structure:

- Check for distortion, wear and continued ability to support the load. Refer to manufacturers' instructions for overhead rail systems.

Rail Trolley (if applicable):

- Ensure wheels and side rollers run smoothly and are not excessively worn. Replace the wheels and side rollers as necessary.

- Check all fasteners ensure they are intact and properly tightened.

- Visually check the nylon at the bearing and along the face of the wheel for cracks.

Fasteners:
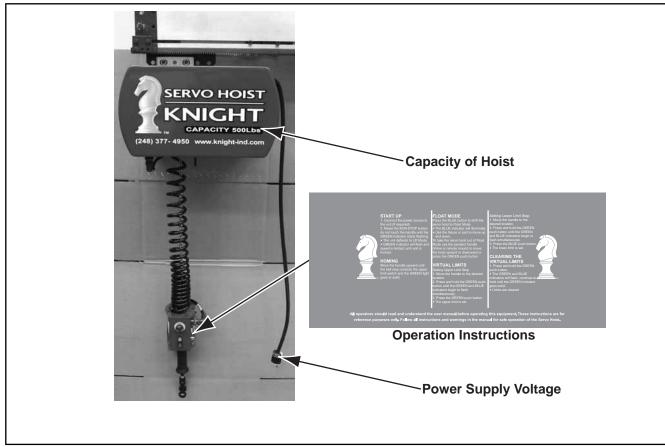
- Check all fasteners ensure they are not loose, missing or damaged .

Load Hook:

- Inspect for cracks, wear or damage.

- Inspect hook throat for spreading and proper safety latch engagement.

- Measure hook throat at wear points, greater than ten percent wear in any throat zone requires replacement. See manufacturer's instructions for wear zone information.

- Inspect hook eye or chain nest and sleeve for security.

- Inspect hook eye or chain nest and sleeve for free rotation without binding.

continued from previous page

Figure 5-2

Labels and Tags:
  • Ensure that all labels are intact and legible. Replace as necessary. (Refer to Figure 5-2)

Servo Hoist Not In Regular Use:
  • Idle for more than one month, but less than one year, perform the daily inspection on the servo hoist before placing it into service.

  • Idle for more than one year perform the detailed inspection before placing the servo hoist into service.

  • Stand-by servo hoist should have the daily inspection performed at regular intervals as conditions require.

⚠ WARNING

Failure to maintain clean and lubricated load chain will void the manufacture's warranty

⚠ CAUTION

Load Chain: Cleaning and Lubrication

Lubricate load chain weekly, or more frequently, depending on severity of service. In a corrosive environment, lubricate more frequently than normal.

Lubricate each link of the chain and apply new lubricate over existing layer. (Refer to Figure 5-3)

Lubricate hook and safety latch pivot points.

Cleaning:

Clean the load chain with an acid free cleaning solution.

Lubrication:
Apply a light coat of SAE 50 to 90 EP oil or equivalent machine/gear oil. Ensure that oil is applied to the bearing surfaces of the load chain links. Wipe off excess oil from the load chain surfaces. Substitute a dry lubricant for use in dusty environments.

MAINTENANCE

Figure 5-3

Chain Replacement **A**:

⚠️ **CAUTION**

The servo hoist must be powered up and operational during this procedure. Use extreme caution when working around moving parts.

⚠️ **CAUTION**

Use only replacement load chain from Knight Industries. Replacing the load chain with chain that is the incorrect size, grade or construction can cause injury to personnel or damage equipment and voids all warranties.

⚠️ **CAUTION**

Inspect the load sheave for wear when replacing the load chain, replace as necessary.

Figure 5-4

⚠️ **CAUTION**

Place Servo Hoist on workbench while performing chain replacement. Do not perform chain replacement while hoist is still in the air.

1. Lower the fixture onto a safe working surface to remove weight from hoist.

2. Depress Run/Stop button and remove power from Servo Hoist. Remove fixture from hoist.

3. Disconnect 9-Pin connector from bottom servo plate. (Refer to Figure 5-5)

Figure 5-5

4. Remove the (3) three bolts from the coiled cable clamps located on the bottom of the Servo Hoist.

NOTE

Keep coiled cable attached to handle and separate from chain.

Figure 5-6

5. Remove the chain retraining bolt from the control handle shackle. (Refer to Figure 5-6)

6. Remove the chain from the control handle shackle.

7. If needed, remove all chain components from the chain.

MAINTENANCE

continued from previous page

Figure 5-7

8. Remove side cover(s) and trolley from the servo hoist. (Refer to Figure 5-7)

9. Remove the top cover panel by unfastening (5) five machine screws from the front and back cover panels and (2) BHCS 8mm button head screws from the top cover panel. (Refer to Figure 5-8)

Figure 5-8

10. Remove the chain bin retaining bolt.   (Refer to Figure 5-9)

Figure 5-9

11. Remove the outer gearbox bearing plate by unfastening (3) three 8mm sockethead screws.(Refer to Figure 5-10)

Figure 5-10

12. Unfasten the (2) bolts that secures chain guide to the gearbox. (Refer to Figure 5-11)

NOTE

If necessary, remove chain guide shims. (Refer to Figure 5-12)
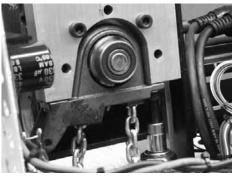
Figure 5-11

Figure 5-12

MAINTENANCE

continued from previous page
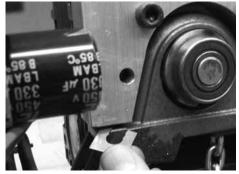
13. Remove sprocket from gearbox. If necessary, lightly tap sprocket from backside of gearbox. (Refer to Figure 5-13)

Figure 5-13

14. Remove remaining chain from chain guide by pulling chain through guide. (Refer to Figure 5-14)

Figure 5-14

15. At the end of the chain is a chain stop. Remove chain stop to allow chain to fully pass through chain guide. (Refer to Figure 5-15)

Figure 5-15

16. Install chain stop, which was removed in step 15, on new chain and place chain stop end into bucket.

17. Lubricate the new chain as it is placed into the chain bucket. Refer to Load Chain Cleaning and Lubrication section on page 5-4.

18. Insert new chain on bucket side of chain guide. Ensure that the chain welds on the chain links are on facing to the outside and top of the chain guide. (Refer to Figure 5-16)

Chain Link Welds

Figure 5-16

NOTE

Use the second and third chain links as reference for chain link welds. First chain link can rotate, causing the weld on the link to fluctuate to either side of chain.

19. Rotate sprocket until chain feeds through to the other side of chain guide. Pull chain through so that approximately 2 ft. of chain is through the chain guide. (Refer to Figure 5-17)

Figure 5-17

20. Insert sprocket back through gearbox assembly.

NOTE

Before inserting the sprocket, ensure that keyway is not damaged on the sprocket shaft.

21. If necessary, replace the bearing to the outer sprocket shaft.

22. Install the chain guide by fastening the (2) bolts to the gearbox.

NOTE

If necessary, replace chain guide shims.

MAINTENANCE

continued from previous page

23. Install the outer gearbox bearing plate by fastening (3) three 8mm sockethead screws.

24. Install chain bin by fastening chain bin retaining bolt.

25. Install trolley to servo hoist trolley mount.

26. Install chain to control handle shackle.

27. Install coil cable to handle and bottom of Servo Hoist.

28. Restore power to Servo Hoist.

29. Once power has been restored, payout chain and re-attach handle and fixture assembly.

NOTE

A laptop is required to payout chain and re-set the upper limit for hoist. Refer to Software section for instructions.

29. Cycle the servo hoist through an up / down sequence to ensure that the new chain does not bind.

30. Reinstall the side cover(s).

MAINTENANCE

Chain Replacement **B**:

> ⚠ **CAUTION**
>
> The servo hoist must be powered up and operational during this procedure. Use extreme caution when working around moving parts.

> ⚠ **CAUTION**
>
> Use only replacement load chain from Knight Industries. Replacing the load chain with chain that is the incorrect size, grade or construction can cause injury to personnel or damage equipment and voids all warranties.

> ⚠ **CAUTION**
>
> Inspect the load sheave for wear when replacing the load chain, replace as necessary.

Figure 5-4B

> ⚠ **CAUTION**
>
> Place Servo Hoist on workbench while performing chain replacement. Do not perform chain replacement while hoist is still in the air.

1. Lower the fixture onto a safe working surface to remove weight from hoist.

2. Depress Run/Stop button and remove power from Servo Hoist. Remove fixture from hoist.

3. Disconnect 9-Pin connector from bottom servo plate. (Refer to Figure 5-5B)

Figure 5-5B

4. Remove the (3) three bolts from the coiled cable clamps located on the bottom of the Servo Hoist.

> **NOTE**
>
> Keep coiled cable attached to handle and separate from chain.

Figure 5-6B

5. Remove the pin from the control handle shackle. (Refer to Figure 5-6B) Refer to page 5-12 for complete instructions for the chain keeper.

6. Remove the chain from the control handle shackle.

7. If needed, remove all chain components from the chain.

MAINTENANCE

continued from previous page

Figure 5-7B

8. Remove side cover(s) and trolley from the servo hoist. (Refer to Figure 5-7B)

9. Remove the top cover panel by unfastening (5) five machine screws from the front and back cover panels and (2) BHCS 8mm button head screws from the top cover panel. (Refer to Figure 5-8B)

Figure 5-8B

10. Remove the chain bin retaining bolt. (Refer to Figure 5-9B and 5-10B)

Figure 5-9B

Figure 5-10B

11. Remove the outer gearbox bearing plate by unfastening (6) six 8mm sockethead screws.(Refer to Figure 5-11B)

Figure 5-11B

12. Remove the outer chain guide plate. (Refer to Figure 5-12B)

Figure 5-12B

13. Remove keeper from chain guide and inner chain guide plate. (Refer to Figure 5-13B)

Figure 5-13B

14. Remove sprocket from inner chain guide plate. (Refer to Figure 5-14B)

MAINTENANCE

continued from previous page

Figure 5-14B

15. At the end of the chain is a chain stop. Remove chain stop to allow chain to fully pass through chain guide. (Refer to Figure 5-15B)

Figure 5-15B

16. Install chain stop, which was removed in step 15, on new chain and place chain stop end into bucket.

17. Lubricate the new chain as it is placed into the chain bucket. Refer to Load Chain Cleaning and Lubrication section on page 5-4.

18. Insert new chain on bucket side of chain guide. Ensure that the chain welds on the chain links are on facing to the outside and top of the chain guide. (Refer to Figure 5-16)

Chain Link Welds
Figure 5-16B

Use the second and third chain links as reference for chain link welds. First chain link can rotate, causing the weld on the link to fluctuate to either side of chain.

19. Replace sprocket into inner chain guide plate. (Refer to Figure 5-14B)

20. Replace keeper into inner chain guide plate. (Refer to Figure 5-13B).

21. Replace the outer chain guide plate. (Refer to Figure 5-12B)

22. Install the outer gearbox bearing plate by fastening (6) six 8mm sockethead screws.

NOTE
Orientate the (6) six fasterners into the outer gearbox bearing. (Refer to Figure 5-17B)

Figure 5-17B

23. Install chain bin by fastening chain bin retaining bolt.

24. Install trolley to servo hoist trolley mount.

25. Install chain to control handle shackle. (Refer to Chain Keeper Installment section)

26. Install coil cable to handle and bottom of Servo Hoist.

27. Restore power to Servo Hoist.

28. Once power has been restored, payout chain and re-attach handle and fixture assembly.

NOTE
A laptop is required to payout chain and re-set the upper limit for hoist. Refer to Software section for instructions.

29. Cycle the servo hoist through an up / down sequence to ensure that the new chain does not bind.

30. Reinstall the side cover(s).

MAINTENANCE

Chain Keeper Installment:

1. Items needed (Refer to Figure 5-18)

   Chain, Chain Keeper, Roll Pin, Pin, and Snap Ring.

Figure 5-18

2. Place the chain into the chain keeper. (Refer to Figure 5-19)
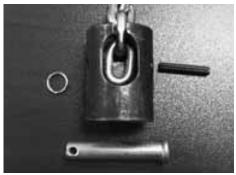
Figure 5-19

3. Insert roll pin thru chain keeper in front of chain link inside chain keeper. (Refer to Figure 5-20)

Figure 5-20

4. Place chain keeper assembly inside tube on top of handle or LMM unit. (Refer to Figure 5-21)

Figure 5-21

5. Align chain keeper assembly and tube thru holes. (Refer to Figure 5-22)
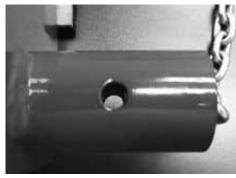
Figure 5-22

6. Insert pin thru tube and chain keeper assembly holes. (Refer to Figure 5-23)

Figure 5-23

MAINTENANCE

7. Prepare snap-ring to be inserted into the thru hole on pin. (Refer to Figure 5-24)

Figure 5-24

8. Spread snap-ring to be inserted into the thru hole on pin and insert. (Refer to Figure 5-25)
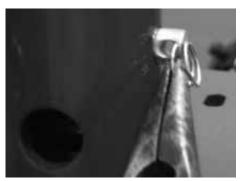
Figure 5-25

9. Completed installation of snap-ring thru pin. (Refer to Figure 5-26)

Figure 5-26

MAINTENANCE

Coiled Cable Replacement:

1. Remove power from Servo Hoist.

2. Remove cable guard from handle. (Refer to Figure 5-27).
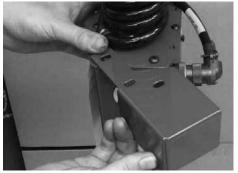
Figure 5-27

3. Remove 9-pin connector from handle.

4. Remove the chain retaining bolt from the control handle shackle. (Depending on Servo purchased, refer to Figure 5-28A or 5-28B)

Figure 5-28A
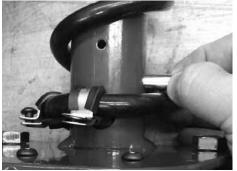
Figure 5-28B

5. Remove 9-pin connector from bottom of the servo hoist. (Refer to Figure 5-29)

Figure 5-29

6. Remove (3) screws from the coiled cable clamping assembly from the bottom of the servo hoist. (Refer to Figure 5-30)

Figure 5-30

7. Remove coiled cable from chain and replace with new cable. (Refer to Figure 5-31)

Figure 5-31

8. Secure (3) screws from the coiled cable clamping assembly from the bottom of the servo hoist.

9. Connect the 9-pin connector to the bottom of the servo hoist. (Refer to Figure 5-29)

MAINTENANCE

10. Seat the chain into the control handle shackle. Secure the retaining bolt through the control handle shackle. (Depending on Servo purchased, refer to Figure 5-32 or if chain keeper, refer to page 5-12)

Figure 5-32

11. Connect the 9-pin connector to the side of the handle.

12. Install cable guard to the handle. (Refer to Figure 5-18).

13. Restore power to Servo Hoist.

MAINTENANCE

THIS PAGE IS INTENTIONALLY LEFT BLANK

Troubleshooting

Problem	Cause	Solution
Hoist does not lift	Power loss	Check circuit breaker, switches, and connections of all power lines. Check run stop, reset if necessary.
	Incorrect voltage	Check supply voltage and frequency of power supply to ensure it is correct for the servo hoist.
	Hoist overload	Reduce load to within the rated capacity of the servo.
	Electrical fault	Secure power to the hoist; check all wiring and connections on the servo hoist.
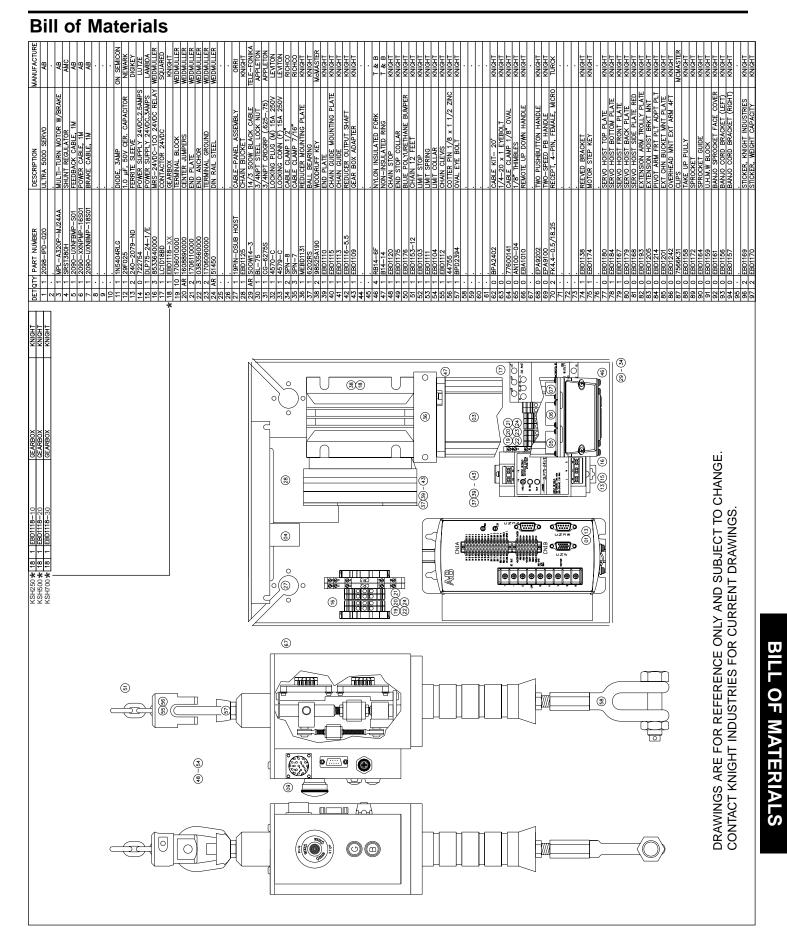
Problem	Cause	Solution
Servo Hoist lifts but does not lower	"Lower Limit Stop" set incorrectly	Clear limit stops. Refer to procedure on page 4-1.
	Open circuit	Check circuit for loose connections or broken conductors. Repair or replace as necessary.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
	Switch malfunctioning	Check continuity in switch and electrical connections. Repair or replace as needed.

Problem	Cause	Solution
Servo Hoist lowers but will not lift	"Upper Limit Stop" set too close to the over travel	Clear limit stops. Directions are located on the handle of the servo hoist. Refer to page 4-1 for further instructions.
	Open circuit	Check circuit for loose connections or broken conductors. Repair or replace as necessary.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
	Switch malfunctioning	Check continuity in switch and electrical connections. Repair or replace as needed.
	Hoist overloaded	Reduce the weight of the load to within the rated capacity of the servo hoist.
	Low voltage in power supply	Determine the cause of low voltage and restore voltage back to with in +/_10% of required voltage supply.
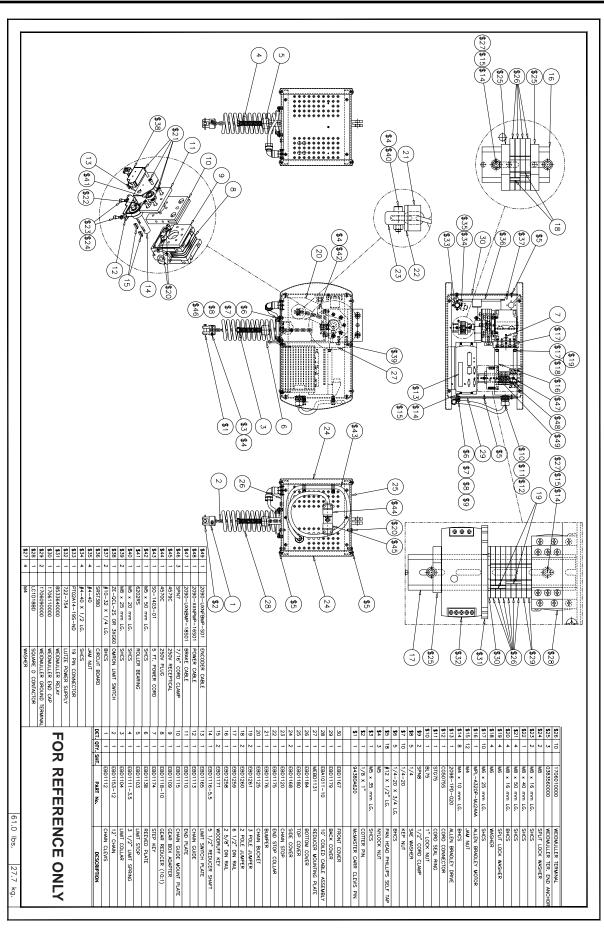
Problem	Cause	Solution
Servo Hoist does not lift at proper speed	Hoist overloaded	Reduce the weight of the load to within the rated capacity of the servo hoist.
	Low voltage in power supply	Determine the cause of low voltage and restore voltage back to with in +/_10% of required voltage supply.

TROUBLESHOOTING

Problem	Cause	Solution
Servo Hoist operates intermittently	Open circuit	Check circuit for loose connections or broken conductors. Repair or replace as necessary.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
	Damaged handle	Check each conductor in the pendant cable for continuity. Replace damaged conductors as required. Check connections and replace if necessary.

Problem	Cause	Solution
Actuation of limit switch does not stop hoist	Limit switch is defective	Repair or replace as necessary.
	Lever is bent, worn or does not move freely	Repair or replace as necessary.
	Missing ball stop	Replace.

TROUBLESHOOTING

Bill of Materials

DET	QTY	PART NUMBER	DESCRIPTION	MANUFACTURE
1	1	2098-IPD-020	ULTRA 5000 SERVO	AB
2	1			·
3	1	MPL-A320P-MJ24AA	MULTI-TURN MOTOR W/BRAKE	AB
4	1	SRST380H	SHUNT REGULATOR	AMC
5	1	2090-UXNFBMP-S01	FEEDBACK CABLE, 1M	AB
6	1	2090-XXNPMP-16S01	POWER CABLE, 1M	AB
7	1	2090-UXNBMP-18S01	BRAKE CABLE, 1M	AB
8	·	·	·	·
9	·	·	·	·
10	·	·	·	·
11	1	1N5404RLG	DIODE, 3AMP	ON SEMICON
12	1	29F025	1.0 uF, 50V CER. CAPACITOR	NEWARK
13	2	240-2079-ND	FERRITE SLEEVE	DIGIKEY
14	0	722754	POWER SUPPLY 24VDC,2.5AMPS	LUTZE
15	1	DLP75-24-1/E	POWER SUPPLY 24VDC,3AMPS	LAMBDA
16	3	8533640000	MRS-24VDC-1C0 24VDC RELAY	WEIDMULLER
17	1	LC1D18BD	CONTACTOR 24VDC	SQUARED
18	1	EBD1118-XX	GEARBOX	KNIGHT
19	10	1706010000	TERMINAL BLOCK	WEIDMULLER
20	1	1608890000	CENTER JUMPERS	WEIDMULLER
21	2	1706110000	END PLATE	WEIDMULLER
22	2	0383560000	END ANCHOR	WEIDMULLER
23	2	1706090000	TERMINAL GROUND	WEIDMULLER
24	AR	51450	DIN RAIL STEEL	WEIDMULLER
25	·	·	·	·
26	·	·	·	·
27	1	19PIN-DSUB HOIST	CABLE-PANEL ASSEMBLY	ORRI
28	1	EBD1125	CHAIN BUCKET	KNIGHT
29	AR	SOOW14-3	14/3 SOOW BLACK CABLE	TELE-FONIKA
30	1	BL-75	3/4 SS STEEL LOCK NUT	APPLETON
31	1	CG-6275S	3/4NPT CRDGRP (.625-.75)	APPLETON
32	1	4570-C	LOCKING PLUG (M) 15A 250V	LEVITON
33	1	4579-C	LOCKING CONN (F) 15A 250V	LEVITON
34	2	SPN-8	CABLE CLAMP 1/2"	RICHCO
35	3	SPN-7	CABLE CLAMP 7/16"	RICHCO
36	1	MEBD1131	REDUCER MOUNTING PLATE	KNIGHT
37	1	6202RS	BALL BEARING	KNIGHT
38	2	98525A190	WOODRUFF KEY	McMASTER
39	1	EBD1110	END PLATE	KNIGHT
40	1	EBD1115	CHAIN GUIDE MOUNTING PLATE	KNIGHT
41	1	EBD1113	CHAIN GUIDE	KNIGHT
42	1	EBD1116-5.5	REDUCER OUTPUT SHAFT	KNIGHT
43	1	EBD1109	GEAR BOX ADAPTER	KNIGHT
44	·	·	·	·
45	·	·	·	·
46	4	RB14-6F	NYLON INSULATED FORK	T & B
47	1	B14-14	NON-INSULATED RING	T & B
48	1	EBD1120	CHAIN STOP	KNIGHT
49	1	EBD1175	END STOP COLLAR	KNIGHT
50	1	EBD1176	BLUE POLYURETHANE BUMPER	KNIGHT
51	1	EBD1153-12	CHAIN 12 FEET	KNIGHT
52	1	EBD1103	LIMIT STOP	KNIGHT
53	1	EBD1111	LIMIT SPRING	KNIGHT
54	1	EBD1104	LIMIT COLLAR	KNIGHT
55	1	EBD1112	CHAIN CLEVIS	KNIGHT
56	1	44755	COTTER PIN 1/8 x 1 1/2 ZINC	KNIGHT
57	1	BPD2394	OVAL EYE BOLT	KNIGHT
58	·	·	·	·
59	·	·	·	·
60	·	·	·	·
61	1	BPA2402	CABLE KIT- 20'	KNIGHT
62	1	77600141	1/4-20 x 1 EYEBOLT	KNIGHT
63	1	AN100-04	CABLE CLAMP 1/8" OVAL	KNIGHT
64	1	EBA1010	1/8" THIMBLES	KNIGHT
65	0		REMOTE UP DOWN HANDLE	
66	·	·	·	·
67	1	EPA9202	TWO PUSHBUTTON HANDLE	KNIGHT
68	0	EPA9100	TWO-SPEED PB HANDLE	KNIGHT
69	0	FK4.4-0.5/18.25	RECEPT, 4-PIN, FEMALE, MICRO	TURCK
70	·	·	·	·
71	·	·	·	·
72	·	·	·	·
73	0	EBD1138	REEVED BRACKET	KNIGHT
74	0	EBD1174	MOTOR STEP KEY	KNIGHT
75	·	·	·	·
76	·	·	·	·
77	0	EBD1180	SERVO HOIST TOP PLATE	KNIGHT
78	1	EBD1184	SERVO HOIST BOTTOM PLATE	KNIGHT
79	0	EBD1167	SERVO HOIST FRONT PLATE	KNIGHT
80	0	EBD1179	SERVO HOIST BACK PLATE	KNIGHT
81	0	EBD1168	SERVO HOIST SIDE PLATE RED	KNIGHT
82	0	EBD1193	EXTENSION ARM TROLLY PLATE	KNIGHT
83	0	EBD1205	EXTENSION HOIST BRKT MNT	KNIGHT
84	0	EBD1214	PIVOT ARM FRT PLT ADPT PLT	KNIGHT
85	0	EBD1201	EXT CHN BUCKET MNT PLATE	KNIGHT
86	0	EBD1242	OVERHEAD MNT EXT ARM 4FT	KNIGHT
87	0	7566K31	CLIPS	McMASTER
88	0	EBD1158	TAKE UP PULLY	KNIGHT
89	0	EBD1172	SPROCKET	KNIGHT
90	0	EBD1164	SPROCKET GUIDE	KNIGHT
91	0	EBD1159	U.H.M.W BLOCK	KNIGHT
92	0	EBD1161	BANJO SPROCKET FACE COVER	KNIGHT
93	0	EBD1156	BANJO CORD BRACKET (LEFT)	KNIGHT
94	0	EBD1157	BANJO CORD BRACKET (RIGHT)	KNIGHT
95	·	·	·	·
96	2	EBD1169	STICKER, KNIGHT INDUSTRIES	KNIGHT
97	2	EBD1170	STICKER, WEIGHT CAPACITY	KNIGHT

Gearbox options (*):

Model	DET	QTY	PART NUMBER	DESCRIPTION	MANUFACTURE
KSH250 *	18	1	EBD1118-10	GEARBOX	KNIGHT
KSH500 *	18	1	EBD1118-20	GEARBOX	KNIGHT
KSH700 *	18	1	EBD1118-30	GEARBOX	KNIGHT

DRAWINGS ARE FOR REFERENCE ONLY AND SUBJECT TO CHANGE.
CONTACT KNIGHT INDUSTRIES FOR CURRENT DRAWINGS.

BILL OF MATERIALS

DRAWINGS ARE FOR REFERENCE ONLY AND SUBJECT TO CHANGE. CONTACT KNIGHT INDUSTRIES FOR CURRENT DRAWINGS.

FOR REFERENCE ONLY

61.0 lbs.   27.7 kg.

DET.	QTY.	SHT.	PART No.	DESCRIPTION
30	1		EB01167	FRONT COVER
29	1		EB01179	BACK COVER
28	1		EB01125	END PLATE
27	1		EBA1011-10	10' COILED CABLE ASSEMBLY
26	1		MEB01131	REDUCER MOUNTING PLATE
25	2		EB01184	BOTTOM COVER
24	2		EB01180	TOP COVER
23	1		EB01168	SIDE COVER
22	1		EB01120	CHAIN STOP
21	1		EB01175	END STOP COLLAR
20	1		EB01176	BUMPER
19	2		EB01261	3 POLE JUMPER
18	2		EB01260	2 POLE JUMPER
17	1		EB01259	6 1/2" DIN RAIL
16	1		EB01258	2 5/8" DIN RAIL
15	2		EB01171	WOODRUFF KEY
14	1		EB01116-5.5	5 1/2" REDUCER SHAFT
13	1		EB01165	LIMIT SWITCH PLATE
12	1		EB01113	CHAIN GUIDE
11	1		EB01110	END PLATE
10	1		EB01115	CHAIN GUIDE MOUNT PLATE
9	1		EB01109	GEAR BOX ADAPTER
8	1		EB01118-10	GEAR REDUCER (10:1)
7	1		EB01174	STEP KEY
6	1		EB01138	REEVED PLATE
5	1		EB01103	LIMIT STOP
4	1		EB01111-3.5	3 1/2" LIMIT SPRING
3	1		EB01104	LIMIT COLLAR
2	1		EB01153-12	12' CHAIN
1	1		EB01112	CHAIN CLEVIS
$1	1		94380A620	McMASTER CARR CLEVIS PIN
$2	1	1/8 x 1"		COTTER PIN
$3	1	M5 x 35 mm LG.		SHCS
$4	3	M5		NYLOCK NUT
$5	18	#12 x 1/2" LG.		PAN HEAD PHILLIPS SELF TAP
$6	5	1/4-20 x 3/4 LG.		BHCS
$7	10	1/4-20		KEP NUT
$8	5	1/4		SAE WASHER
$9	2	SPN8		1/2" CORD CLAMP
$10	1	BL75		1" LOCK NUT
$11	1	STG75		CORD SEAL RING
$12	18	CG50755		CORD CONNECTOR
$13	1	2090-1PD-020		ALLEN BRADLEY DRIVE
$14	8	M4 x 10 mm LG.		BHCS
$15	12	M4		JAM NUT
$16	1	MPL-A320P-MJ24AA		ALLEN BRADLEY MOTOR
$17	10	M6 x 25 mm LG.		SHCS
$18	4	M6		WASHER
$19	4	M6		SPLIT LOCK WASHER
$20	4	M8 x 16 mm LG.		BHCS
$21	4	M8 x 50 mm LG.		SHCS
$22	2	M8 x 40 mm LG.		SHCS
$23	2	M8 x 16 mm LG.		SHCS
$24	2	M8		SHCS
$25	3	0385560000		WEIDMULLER TER. END ANCHOR
$26	10	1706010000		WEIDMULLER TERMINAL
$27	4			WASHER
$28	1	M4	LC1018BD	SQUARE D CONTACTOR
$29	2		1706090000	WEIDMULLER GROUND TERMINAL
$30	1		1706110000	WEIDMULLER END CAP
$31	1		853364000	WEIDMULLER RELAY
$32	2		722-754	LUTZE POWER SUPPLY
$33	1		PT02A14-19S-ND	19 PIN CONNECTOR
$34	4		#4-40 x 1/2 LG.	SHCS
$35	4		#4-40	JAM NUT
$36	1		SRST380	CIRCUIT BOARD
$37	2		#10-32 x 1/4 LG.	BHCS
$38	1		ZE-QCL-2S OR 3KG60	OMRON LIMIT SWITCH
$39	2		M8 x 25 mm LG.	SHCS
$40	1		M5 x 20 mm LG.	SHCS
$41	1		6202RS	ROLLER BEARING
$42	4		SHCS	SHCS
$43	1		SO-1403-01	5 FT. POWER CORD
$44	1		4570C	250V PLUG
$45	4		4579C	250V RECEPTICAL
$46	1		SPN7	7/16" CORD CLAMP
$47	3		2090-UXNBMP-18S01	BRAKE CABLE
$48	1		2090-XXNBMP-16S01	POWER CABLE
$49	1		2090-UXNFBMP-S01	ENCODER CABLE

BILL OF MATERIALS

KSH250-2301: Schematic

BILL OF MATERIALS

BILL OF MATERIALS

DRAWINGS ARE FOR REFERENCE ONLY AND SUBJECT TO CHANGE. CONTACT KNIGHT INDUSTRIES FOR CURRENT DRAWINGS.

NOTES:

- CUSTOMER:
- CITY, STATE:
- W/O NUMBER:
- END USER:
- APPLICATION:
- FIXTURE WEIGHT: _____ LBS.
- PART WEIGHT: _____ LBS.
- QUANTITY:
- RAIL TYPE:
- OTHER RAIL TYPE:
- RAIL HEIGHT:
- RAIL LENGTH:
- TROLLEY TYPE:
- FESTOON COUNT:
- PWR CABLE LENGTH:
- DROP-OFF HEIGHT:
- SERVO HOIST: □250LB □500LB □700LB
- CHAIN LENGTH: □12FT □20FT
- COIL CABLE: □ 3FT □ 4FT □ 6FT □ 8FT □10FT
- STRAIGHT CABLE: □ 3FT □ 6FT □ 8FT
- □ 10FT □ 12FT □ 15FT □ N/A
- PLANT POWER:
- SERVO VAC: □ 120/1 □ 230/1
- DISCON / TRANS:

I
B
E
A
M

C
O
L
U
M
N

TROLLEY TYPES:

- FESTOON TROLLEY
- FITS: 4100 SERIES / 7500 SERIES
- ETA-8 RAIL EBA1045
- ZRS2 RAIL EBA1044
- 7500 SERIES EBA1030
- 4100 SERIES EBA1020

INLINE HANDLES:

	FLOAT LOAD CELL	LIFT & FLOAT LOAD CELL	SHACKLE ONLY
500LBS. SERVO	EBA1048	EBA1051-500	
500LBS. SERVO	EBA1048-500	EBA1051-700	
700LBS. SERVO	EBA1007-500		
700LBS. SERVO	EBA1007-700		

EBA1000-500 EBA1048-700
EBA1000-700 EBA1048-700

NOTES: TAKE INTO CONSIDERATION RUNWAY CABLE LENGTH AND FESTOON TROLLEY COUNT

NOTE: "COIL CABLE STACK UP" + "HANDLE STACK UP" = TOTAL STACK UP FROM THE BOTTOM OF THE RAILING

NOTE: COIL CABLE STACK UP APPLIES TO INLINE HANDLES

6.5"
14.6"
21.38"
20"
21.25"
15.38"

EBA1003
480/230 STEPDOWN TRANSFORMER DISCONNECT
INPUT PWR: 480 VAC, 1PH., 60HZ
OUTPUT PWR: 230 VAC, 1PH., 60HZ

EBA1053
FUSIBLE DISCONNECT
30 AMP

7500 SERIES RAIL

KNIGHT

4100 SERIES RAIL

CHAIN:
	LENGTH:
EBD1153-12	12
EBD1153-20	20

OPTIONAL:
□ PNEUMATICS BOX
□ PNEUMATICS PLATE

COIL CABLE STACK UP:
	CABLE:	HEIGHT:
EBA1007	3	7"
EBA1007	6	22"
EBA1048	8	25"
EBA1051	10'	27"
EBA1000	15'	32"

HANDLE STACK UP:
9	1/2"
9 1/2"	14"
18"	

CLEVIS TYPE:

SHACKLE EBD1350	QUICK CONNECT EBA1008	HOOK BPA2031	EXT LOAD CELL EBA1052

WIRELESS OPTIONAL:
EBA1054

CABLE TYPES:

PENDANT ONLY
ASSEMBLY PART #	LENGTH
EBA1009-3	3FT
EBA1009-4	4FT
EBA1009-6	6FT
EBA1009-8	8FT
EBA1009-10	10FT
EBA1009-12	12FT
EBA1009-15	15FT

ASSEMBLY PART #	LENGTH
EBA1011-3	3FT
EBA1011-6	6FT
EBA1011-8	8FT
EBA1011-10	10FT
EBA1011-15	15FT

REMOTE HANDLES:

MEBA1010	EPA9202 1 SPEED	EBA9100 2 SPEED	MEPA9300 3 LEVER

*REMOTE HANDLES ARE USED WITH INLINE HANDLES

HOIST CONFIGURATIONS:

A KNIGHT	B KNIGHT
C KNIGHT	D KNIGHT
E KNIGHT	F KNIGHT
G KNIGHT	H KNIGHT
I WIRELESS	J WIRELESS
WIRELESS	WIRELESS

SERVO HOIST P/N:

DESCRIPTION	PART No.
250LBS. SERVO	KSH250
500LBS. SERVO	KSH500
700LBS. SERVO	KSH700

| DET | QTY | SH# | PART No. | DESCRIPTION |

KNIGHT INDUSTRIES
11860 CENTRE ROAD
AUBURN HILLS, MI 48326
TEL (248) 377-4950
FAX (248) 377-9316

DESCRIPTION: SERVO HOIST APPLICATION DRAWING
CUSTOMER: KNIGHT STANDARD

DESIGNED BY: STORT2 07/25/07
DRAWN BY: STORT2 07/25/07
APPROVED BY:
REV: A
SCALE: FULL
SHT. 1 OF 1 SHTS

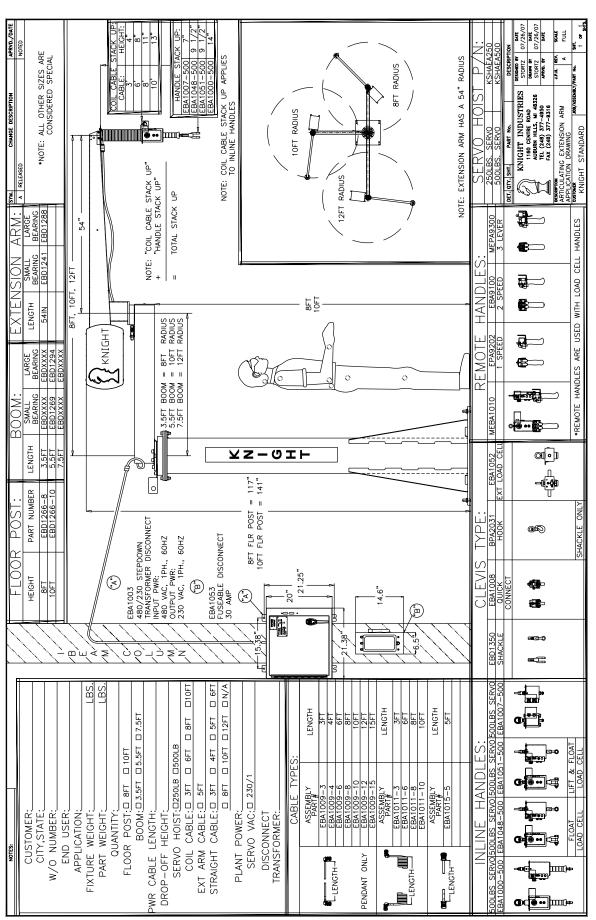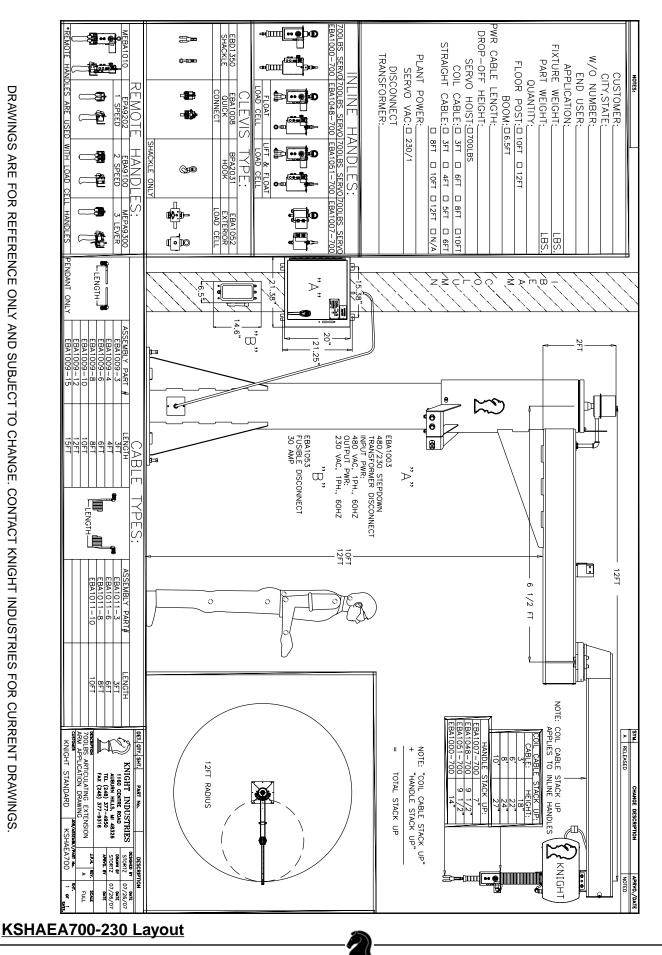| SYM	CHANGE DESCRIPTION	APPD./DATE
A	RELEASED	NOTED

KSH250-230 Layout

KSHEA250-230 Layout

DRAWINGS ARE FOR REFERENCE ONLY AND SUBJECT TO CHANGE. CONTACT KNIGHT INDUSTRIES FOR CURRENT DRAWINGS.

BILL OF MATERIALS

*NOTE: ALL OTHER SIZES ARE CONSIDERED SPECIAL

COIL CABLE STACK UP:	
CABLE:	HEIGHT:
3'	4"
6'	8"
8'	11"
10'	13"

HANDLE STACK UP:	
EBA1007-500	7"
EBA1048-500	9 1/2"
EBA1051-500	9 1/2"
EBA1000-500	14"

NOTE: "COIL CABLE STACK UP"
+ "HANDLE STACK UP"
= TOTAL STACK UP

NOTE: COIL CABLE STACK UP APPLIES TO INLINE HANDLES

NOTE: EXTENSION ARM HAS A 54" RADIUS

EXTENSION ARM:

LENGTH	SMALL BEARING	LARGE BEARING
54IN	EBD1241	EBD1288

BOOM:

LENGTH	SMALL BEARING	LARGE BEARING
3.5FT	EBDXXXX	EBDXXXX
5.5FT	EBD1269	EBD1294
7.5FT	EBDXXXX	EBDXXXX

FLOOR POST:

HEIGHT	PART NUMBER
8FT	EBD1266-8
10FT	EBD1266-10

3.5FT BOOM = 8FT RADIUS
5.5FT BOOM = 10FT RADIUS
7.5FT BOOM = 12FT RADIUS

8FT FLR POST = 117"
10FT FLR POST = 141"

EBA1003 480/230 STEPDOWN TRANSFORMER DISCONNECT
INPUT PWR: 480 VAC, 1PH., 60HZ
OUTPUT PWR: 230 VAC, 1PH., 60HZ

EBA1053 FUSEABLE DISCONNECT 30 AMP

SERVO HOIST P/N:

250LBS. SERVO	KSHEA250
500LBS. SERVO	KSHEA500

KNIGHT INDUSTRIES
1160 CENTRE ROAD
AUBURN HILLS, MI 48326
TEL (248) 377-4950
FAX (248) 377-8316

DESCRIPTION: ARTICULATING EXTENSION ARM APPLICATION DRAWING
CUSTOMER: KNIGHT STANDARD

	DATE
DESIGNED BY STORIZ	07/26/07
DRAWN BY STORIZ	07/26/07
APPD. BY	DATE

SCALE: FULL
DESCRIPTION
SHT. 1 OF SHTS.

SYM. A RELEASED — CHANGE DESCRIPTION — APRVD./DATE NOTED

REMOTE HANDLES:

MEBA1010	EPA9202 1 SPEED	EBA9100 2 SPEED	MEPA9300 3 LEVER

*REMOTE HANDLES ARE USED WITH LOAD CELL HANDLES

CLEVIS TYPE:

EBD1350 SHACKLE	EBA1008 QUICK CONNECT	BPA2031 HOOK	EBA1052 EXT LOAD CELL

SHACKLE ONLY

INLINE HANDLES:

CABLE TYPES:

ASSEMBLY PART#	LENGTH
EBA1009-3	3FT
EBA1009-4	4FT
EBA1009-6	6FT
EBA1009-8	8FT
EBA1009-10	10FT
EBA1009-12	12FT
EBA1009-15	15FT

ASSEMBLY PART#	LENGTH
EBA1011-3	3FT
EBA1011-6	6FT
EBA1011-8	8FT
EBA1011-10	10FT

ASSEMBLY PART#	LENGTH
EBA1015-5	5FT

NOTES:

CUSTOMER:
CITY, STATE:
W/O NUMBER:
END USER:
APPLICATION:
FIXTURE WEIGHT: ___ LBS.
PART WEIGHT: ___ LBS.
QUANTITY:
FLOOR POST: ☐ 8FT ☐ 10FT
BOOM: ☐ 3.5FT ☐ 5.5FT ☐ 7.5FT
PWR CABLE LENGTH:
DROP-OFF HEIGHT:
SERVO HOIST: ☐ 250LB ☐ 500LB
COIL CABLE: ☐ 3FT ☐ 6FT ☐ 8FT ☐ 10FT
EXT ARM CABLE: ☐ 5FT
STRAIGHT CABLE: ☐ 3FT ☐ 4FT ☐ 5FT ☐ 6FT
☐ 8FT ☐ 10FT ☐ 12FT ☐ N/A
PLANT POWER:
SERVO VAC: ☐ 230/1
DISCONNECT
TRANSFORMER:

PENDANT ONLY

FLOAT LOAD CELL · LIFT & FLOAT LOAD CELL · FLOAT LOAD CELL

8FT RADIUS · 10FT RADIUS · 12FT RADIUS

8FT 10FT

KNIGHT

K N I G H T

DRAWINGS ARE FOR REFERENCE ONLY AND SUBJECT TO CHANGE. CONTACT KNIGHT INDUSTRIES FOR CURRENT DRAWINGS.

NOTES:

CUSTOMER:
CITY,STATE:
W/O NUMBER:
END USER:
APPLICATION:
FIXTURE WEIGHT: _____ LBS
PART WEIGHT: _____ LBS.
QUANTITY:
FLOOR POST: ☐ 10FT ☐ 12FT
BOOM: ☐ 6.5FT
PWR CABLE LENGTH:
DROP-OFF HEIGHT:
SERVO HOIST: ☐700LBS
COIL CABLE: ☐ 3FT ☐ 4FT ☐ 6FT ☐ 8FT ☐10FT
STRAIGHT CABLE: ☐ 3FT ☐ 4FT ☐ 5FT ☐ 6FT
PLANT POWER:
SERVO VAC: ☐ 230/1
DISCONNECT
TRANSFORMER:

I _____
B _____
E _____
A _____
M _____
C _____
O _____
L _____
M _____
N _____

INLINE HANDLES:

700LBS SERVO	700LBS SERVO	700LBS SERVO	700LBS SERVO
EBA1000-700	EBA1048-700	EBA1051-700	EBA1007-700

REMOTE HANDLES:

MEBA1010	EPA9202	EBA9100	MEPA9300
	1 SPEED	2 SPEED	3 LEVER

*REMOTE HANDLES ARE USED WITH LOAD CELL HANDLES

CLEVIS TYPE:

FLOAT LOAD CELL	LIFT & FLOAT LOAD CELL
EBD1350 SHACKLE	EBA1008 QUICK CONNECT
	BPA2031 HOOK
	EBA1052 EXTERIOR LOAD CELL

SHACKLE ONLY

CABLE TYPES:

ASSEMBLY PART #	LENGTH
EBA1009-3	3FT
EBA1009-4	4FT
EBA1009-6	6FT
EBA1009-8	8FT
EBA1009-10	10FT
EBA1009-12	12FT
EBA1009-15	15FT

PENDANT ONLY
LENGTH

ASSEMBLY PART #	LENGTH
EBA1011-3	3FT
EBA1011-6	6FT
EBA1011-8	8FT
EBA1011-10	10FT

LENGTH

"A"
21.38"
14.6"
"B"
6.5"
15.38"
20"
21.25"

EBA1003 STEPDOWN TRANSFORMER DISCONNECT
INPUT PWR:
480 VAC, 1PH., 60HZ
OUTPUT PWR:
230 VAC, 1PH., 60HZ

EBA1053 FUSIBLE DISCONNECT 30 AMP

"A"
"B"

10FT
12FT

2FT

6 1/2 FT

12FT

12FT RADIUS

NOTE: COIL CABLE STACK UP APPLIES TO INLINE HANDLES

COIL CABLE:	HEIGHT:
3"	18"
6"	22"
8"	24"
10"	27"

HANDLE STACK UP:	HEIGHT:
EBA1007-700	7"
EBA1048-700	9 1/2"
EBA1051-700	9 1/2"
EBA1000-700	14"

NOTE: "COIL CABLE STACK UP"
+ "HANDLE STACK UP"
= TOTAL STACK UP

KNIGHT

SYM.	CHANGE DESCRIPTION	APPRO./DATE
A	RELEASED	NOTED

KNIGHT INDUSTRIES
1160 CENTRE ROAD
AUBURN HILLS, MI 48326
TEL (248) 377-4950
FAX (248) 377-4316

DESCRIPTION	700LBS ARTICULATING EXTENSION ARM APPLICATION DRAWING
CUSTOMER	KNIGHT STANDARD
JOB/ASSEMBLY/PART No.	KSHAEA700

DET.	QTY.	SHT.	PART No.	DESCRIPTION

DESIGNED BY	STORZ
DATE	07/26/07
DRAWN BY	STORZ
DATE	07/26/07
APPRO. BY	
DATE	
J.P.K. REV.	A
SCALE	FULL
SHT. 1 OF 1 SHTS.	

BILL OF MATERIALS

Software

Serial Communications Settings

Connecting to a Servo Hoist

Options to initiate a connection between a computer and the Ultra 5000 Drive:

1. Double click on the Ultraware software (SW) icon on the desktop. The software will automatically poll for drives that are connected to the serial port.

OR

2. Select Tools and then Rescan inside of the Ultraware (SW). (Figure 8-1).
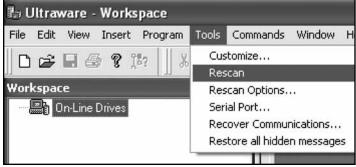
Figure 8-1

3. Ultraware Program is attaching to the drive. (Figure 8-2).
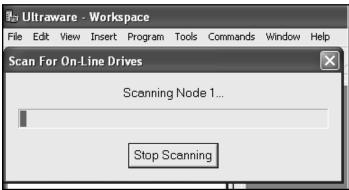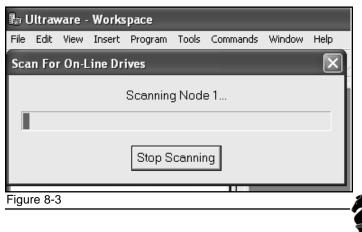
Figure 8-2

4. Software is uploaded and listed under On-Line Drives. (Figure 8-3).

Figure 8-3

Options to initiate a connection between a computer and the Ultra 5000 Drive:

1. Connect a female-to-female 9-pin null modem serial cable from serial port on the laptop to the 9-pin connector on the Servo Hoist handle. Some servo systems will need a female to male 9-pin null modem serial cable.

2. Select Tools and then Serial Port. (Figure 8-4)
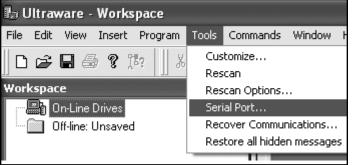
Figure 8-4

3. Confirm the Communication Parameters (Figure 8-5).

- Serial Port should be the com port where the serial cable is connected.
- Baud Rate is always 38400.
- Format is always 8 Data Bits, No Parity.

Figure 8-5

4. Click OK to accept the settings.

SOFTWARE

Scan for correct nodes on the network.

1. Select **Tools** and then **Rescan Options**. (Figure 8-6)

Figure 8-6

2. Set node values in Rescan Option Window.

1. Verify the Ultraware 5000 box is checked.

2. Set "From Node-To Node" values.

3. From Node: = 1

4. To Node: = 10

5. Knight Standard Hoist Systems are all Node 1.

6. Tractor Systems may be Nodes 1-4.

NOTE

If experiencing problems connecting to the drive, set scan options from Nodes 0 to 100. This will verify the node address. (Figure 8-7)

Figure 8-7
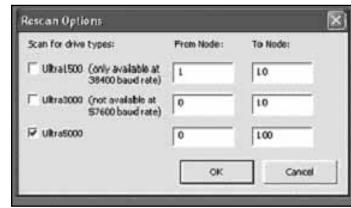
Save Uploaded File

Uploading and saving the drive parameters from an online drive.

1. Verify that the system is online with the drive

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Select the + next to Programs. This will expand to show one program Main.exe. (A red horizontal line will sweep from the top of the graphic to the bottom of the graphic when the program is running.)

4. Right click on Main.exe and select Stop from the menu to stop the program from running.

5. Once the program is stopped, click **File** and then **Save.** (Figure 8-8)

Figure 8-8

1. A confirmation window will pop up. (Figure 8-9)

2. Click YES to upload information from the drive to the computer (process takes approximately 2 minutes).

3. A "Save As" dialog box will appear and prompt for a file name and folder location to save the .udb file. Select folder on hard drive and enter desired file name. Press "Save" button to save to hard drive.

4. The saved drive is now visible in the "Off-line" folder of the Workspace Window. (Figure 8-10)

SOFTWARE

Figure 8-9

Figure 8-10

SOFTWARE

Reload New Drive with Existing Software

Uploading and saving the drive parameters from an online drive.

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Select the + next to Programs. This will expand to show one program Main.exe. (A red horizontal line will sweep from the top of the graphic to the bottom of the graphic when the program is running.)

4. Right click on Main.exe and select Stop from the menu to stop the program from running.

5. Drag offline drive file to the online drive file. (Figure 8-11)
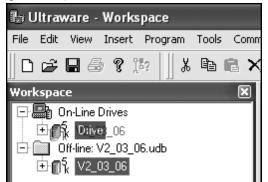
Figure 8-11

6. When prompt asks if you want to replace the drive, click "Yes".

7. Drive will be copied. (Process will take approximately 2 minutes).

8. When download is complete the program will not be running.

9. Expand Programs folder (located under Workspace On-Line Drives).

10. Highlight Main.exe

11. Start program by one of the following methods

    a. Right click on Main.exe and select "Run."

    b. Cycle power to the system and the program will restart upon power-up.
      - If the system has the small servo then you can press the run stop and wait 10-20 seconds for the servo to completely power down before turning it back on.
      - If the system has the large servo then you must unplug or completely disconnect the power and wait 10-20 seconds for the servo to completely power down before plugging back in.

Change Max Load Limit

If maximum load limit is reached, the hoist will no longer move in an upward direction. The system will however, allow the operator to set the load down. In order to reset the load limits:

1. Go to On-Line drive and double click on Global Variables.

2. Double click on the F8 file and scroll down to parameter F8:53 -Max Load (this value is the maximum weight that the hoist will pick up). (Figure 8-12)

Parameter	Value	Description
15	0	
16	0	
17	0	
18	0	
19	0	
20	0	
21	300	Max Load (lb) (Inc Fixture) UP STOP
22	-5	Min Load (lb) (Exc Fixture) DOWN STOP
23	1	Lift Mode Timeout (min) (0 = no timeout)
24	40	Lift Speed Limit (in/sec)
25	0	
26	0	Remote Pendant Gain (ips/V)
27	0	Remote Pendant Deadband (V)
28	0	
29	0	
30	2	Handle Sense (lb)
31	1	Lift Force Deadband (lb)

Figure 8-12

NOTE

Physics and Force = Mass x Acceleration. If limits are set at 250lbs and operator attempts to pick up 240lbs, the 250lb threshold will be crossed when accelerating upward. Refer to load capacity ratings (listed on Servo Unit) when setting limits. For optimal, safe performance, DO NOT exceed rated capacity.

SOFTWARE

Modify Chain Payout

To prevent chain payout, a minimum load weight is programmed into the software. For example if the fixture weight is 40lbs and the minimum load weight is set to 10lbs, then the servo system will allow the hoist to lower until 10lbs of the fixture is placed on the floor. The remaining 30lbs will be supported by the hoist. This allows the operator to set down the fixture without paying out chain. If the minimum load weight is set to -50lbs, then the servo system will allow the hoist to lower until the entire weight of the 40lb fixture is placed on the floor. If the down command is maintained then the chain will payout onto the fixture until it reaches the lower limit.

To Modify Settings:

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Open Global Variable F8L1 and scroll to F8L1:22 (Parameter-Min Load) (Figure 8-13)

4. Change value to allow or stop chain payout.

Parameter	Value	Description
15	0	
16	0	
17	0	
18	0	
19	0	
20	0	
21	300	Max Load (lb) (Inc Fixture) UP STOP
22	-5	Min Load (lb) (Exc Fixture) DOWN STOP
23	1	Lift Mode Timeout (min) (0 = no timeout)
24	40	Lift Speed Limit (in/sec)
25	0	
26	0	Remote Pendant Gain (ips/V)
27	0	Remote Pendant Deadband (V)
28	0	
29	0	
30	2	Handle Sense (lb)
31	1	Lift Force Deadband (lb)

Figure 8-13

NOTE

Larger values stop chain payout; smaller values allow chain payout.

Balance the Analog Handle

The analog handle is controlled from a load cell that senses any additional force to the handle. A force-up creates a command up; a force-down creates a command down. If the static weight of the handle changes, the analog signal needs to be balanced.

To Verify Settings:

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Open Global Variable fSTS and scroll to fSTS: 3. This is the current command on the analog handle in pounds. Add this number to the number in F8L1:8. This is the Handle Weight, used to offset the lift load cell. (Figures 8-14)

NOTE

Move curser off value cell to update new value and save setting.

When looking at values online the update rate is fairly slow, so you should wait 10-15 seconds to make sure the values that you are looking at are correct.

An easy way to verify that you are working in a parameter table that is in the online drive is to see if the tab at the bottom of the window is green. Green means online and gray means offline.

4. Return to fSTS and look to make sure that fSTS:3 is close to zero. This variable is an actual filtered value that represents the pounds of force on the lift load cell. It should display 0 when no force is applied to the handle. (Figure 8-15)

SOFTWARE

continued from previous page

Figure 8-14

Figure 8-15

Adjust the Fixture Weight

If a fixture is hanging without a load, review fSTS:17. This variable is the current part weight. This value should read approximately zero (0). (Figure 8-16)

13	0	Float LC Adj, Zeroed, Filtered
14	0	Total Weight, Adjusted for Acc
15	0	Total Weight, Adj, Filtered
16	0	Floating Weight (Float Mode Sn
17	0	Part Weight (lb) (Floating Wt - F

Figure 8-16

To Reset Variable fSTS: 17 (Part Weight) to Zero:

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Open Global Variable fSTS to fSTS:17. This is the current part weight on the float load cell in pounds. Add this number to the number in F8L1:9. This is the fixture weight, used to offset the float load cell.

4. After the change, return to fSTS:17 to make sure it is close to zero with no part on the fixture. This variable is an actual filtered value that represents the pounds of force on the float load cell.

NOTE

Fixture must be hanging without a load present to set correct fixture weight.

SOFTWARE

Enabling Float, Lift, Digital, or Analog Mode

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Open Global Variable F8L2. (Figure 8-17).

4. To enable the functionality, input (1) in the value columns.

5. To disable the functionality, input (0) in the value columns.

6. F8L2:20 Enable Lift Mode.

7. F8L2:40 Enable Float Mode.

8. F8L2:30 Enable Analog Handle.

9. F8L2:38 Enable Digital Handle.

NOTE

The above enable bits should only be set with the aid of a Knight Representative.

Parameter	Value	Description
20	0	Enable Lift Mode
21	300	Max Load (lb) (Inc Fixture) U
22	2	Up Stop Resume Bandwidth (
23	10	Down Stop Resume Bandwidth
24	1	Up/Down Stop Resume Time
25	1	Lift Max Speed "Fudge Factor
26	0	
27	1	Enable Impulse Limiting (Lift M
28	12	Impulse Limit Max Speed Afte
29	0.1	Impulse Limit Time To Limit Me
30	1	Enable Analog Handle
31	8	Handle Filter Bandwidth
32	0	
33	100	Lift Mode Prop Accel (in/sec2
34	150	Lift Mode Prop Decel (in/sec2
35	100	Lift Command Limit (lb)
36	0.9	Lift Force Cancellation Gain
37	0	
38	0	Enable Digital Handle
39	0	
40	0	Enable Float Mode

Figure 8-17

Adjust the Speeds of a Digital Handle

To Change Speed of the Handle:

1. Verify that your computer has an online connection with the drive.

2. Select the + next to the drive name under the On-Line Drives folder. This will expand and give more choices inside the drive.

3. Open Global Variable F8L1 and scroll down to F8L1:36 (high speed digital value in in/sec.) and F8L1:37 (low speed digital value in in/sec.) (Figure 8-18)

To Adjust the Rate of Acceleration and Deceleration of a Digital Handle:

1. Open Global Variable F8L1 and scroll down to F8L1:38 (digital acceleration value in in/sec2) and F8L1:39 (digital deceleration value in in/sec2). (Figure 8-18)

Figure 8-18

SOFTWARE
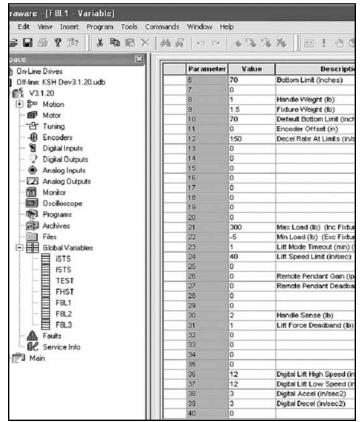
Encoder Offset Setup Procedure
(Zero Position Adjustment)

This procedure is to be performed after the servo motor, gearbox or chain have been modified or replaced. It will "teach" the system the encoder position that equates to the zero or fully raised position of the hoist. Zero position is when the hoist is fully raised. The bottom limit is when the hoist is fully lowered. To setup the encoder offset the encoder position that equates to the hoist zero position must be determined. This is the encoder offset.

1. Connect to Servo Hoist by following the "Connecting to a Servo Hoist" procedure.

2. Record original values of encoder related variables from the On-Line drive.

   a. Variable F8L1:5 _____ "Top Limit Inches"

   b. Variable F8L1:6 _____ "Bottom Limit Inches"

   c. Variable F8L1:11 _____ "Encoder offset Inches"

3. The current position of the hoist is displayed in variable fSTS:30 "Real Word Position". This is the position that the hoist thinks that it is at. This may be incorrect due to the due to the replaced motor, gearbox or chain. It may be a positive or negative value.

   a. Record current value of fSTS:30 _____ "Real Word Position".

4. Now that we know were the servo thinks that it is at, we can temporarily adjust the top limit to allow the hoist to move up to the physical top limit position (zero position).

   a. Adjust F8L1:5 "Top Limit Inches" a few inches less than fSTS:30 "Real Word Position"

   b. Use lift control to raise hoist a few inches.

   c. fSTS:30 "Real Word Position" will now display the new position.

   d. Re-adjust F8L1:5 "Top Limit Inches" a few inches less than fSTS:30 until it allows you to completely raise the arm to home position. Raise hoist to the point that the coil cable is almost fully compressed, but not to the point that the hoist is forcing the cable into the hoist enclosure. This is the proper zero position.

5. Now that the hoist is at zero position we can determine the encoder position that equates to this zero position.

   a. Record current value of fSTS:29 "Encoder Position" _____.

   b. Copy value of fSTS:29 "Encoder Position" to F8L1:11 "Encoder Offset inches".

   c. Return values of variables F8L1:5 "Top Limit Inches" and F8L1:6 "Bottom Limit Inches" to the original values recorded in step 1.

   d. Verify that fSTS:30 "Real World Position" now displays a number close to zero.

6. Verify that encoder offset is correct by raising the host and checking that it stops automatically at the top limit before the coil cable is fully compressed.

7. Lower the hoist and verify that it stops automatically at the bottom limit before the hoist physically runs out of travel.

SOFTWARE

Troubleshooting Guide

Problem: Red light on the Run Stop button is flashing.

Action: Log onto the On-Line Ultraware Drive and open Global Variable fSTS:06. If the fault number is less than 100 then the fault is in the servo drive. Open the Fault screen to see the fault that is present. A yellow indicator (in the value column) will be on next to the fault description. (Figure 8-19)

Figure 8-19

If the fault number is greater than 99 then the fault is a software fault that can be looked up in table TBL8-1 on the following column:

Fault#	Description	Possible Solution
101	Run Stop input is not on to the drive.	Check input to determine why the drive is not getting the run stop input.
102	Failed to allocate memory for Global Variables.	Reduce the number of Global Variables in code.
103	Frame Failed.	Reduce the amount of code in the frame that is overloaded.
104	Velocity Following Error	Possible bad encoder cable.
105	Home Limit Switch Error	Home Limit switch has been made after the system has already been homed. Check to see why limit switch has moved.
106	Axis Enable Failed	Axis enable did not enable after one second.
107	Float Load Cell not connected	The float load cell has been disconnected. Look at the physicalconnection to see why the input is not on.
108	Lift Load Cell not connected	The lift load cell has been disconnected. Look at the physicalconnection to see why the input is not on.
150	Heartbeat Fault	The heartbeat from the PLC has been lost.
152	Encoder Position Fault	The tractors absolute encoder does not match the motors encoder position.
201	Lift Load Cell Faulted	The lift load cell has seen more than the Lift Load Cell Command Limit, F8L2:35.
202	Test Parameter Fault	One of the Test Parameters is outside the top or bottom limits, or max speed limits.
203	Air Pressure Switch Not Ok	The air pressure is below that allowable limit to operate the system.

TBL 8-1

SOFTWARE

Problem: Not sure if an Input or Output is coming on?

Action: Log onto the On-Line Ultraware Drive and open the Digital Input or Digital Output screen. Verify if the specific Input or Output is ON (the lower half of the window has the current status of the Input or Output). The value column will be yellow if it is ON. (Figure 8-20)
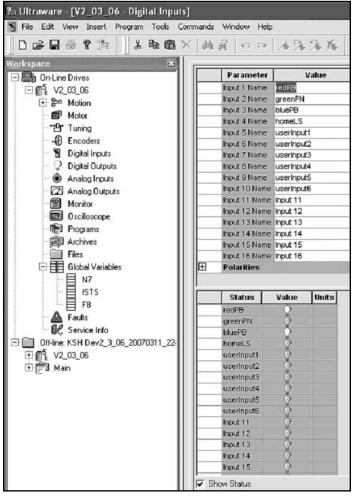
Figure 8-20

TROUBLESHOOTING

Variable Descriptions

iSTS Global Variable Array
This complete array is reserved for internal use.

fSTS Global Variable Array

This Global Array is used as a status file to see what is going on inside the program. The values are updated from the drive over the serial communication. This means that they may not update very fast. The less parameters on the screen, the faster it will update. You can use the Windows restore down button in the upper right hand corner of the window and shrink the window to reduce the number of parameters showing. Also, if you click on the workspace the update rate will increase.

fSTS: 00 - Analog Input 2 (Lift LC) Raw
Variable Units: Volts

Description: This parameter displays the current reading of the lift load cell input in volts.

**fSTS: 01 - Lift LC Unbiased
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 02 - Lift LC, Adjusted for Inertial Accel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

fSTS: 03 - Lift Lift LC Adj, Zeroed, Filtered
Variable Units: Pounds

Description: This parameter displays the current reading of the lift load cell input in pounds.

fSTS: 06 - Fault # (1-99 Drive, 100+ Software)
Variable Units: Fault #

Description: This parameter displays the current drive fault if one exists. If the number is between 1 and 99 then it is a drive fault and can be looked at on the Ultraware fault screen or in the Ultra5000 manual. If the fault number is 100 or greater then it is a software servo fault and can be looked up in the back of this manual.

**fSTS: 07 - AI2 Source
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

fSTS: 08 - Operating Mode
Variable Units: Choice (1=Lift, 2=Float, 3=Test)

Description: This parameter displays the current mode of the hoist.

VARIABLE DESCRIPTIONS

fSTS: 10 - Analog Input 1 (Float LC) Raw
Variable Units: Volts

Description: This parameter displays the current reading of the float load cell input in volts.

**fSTS: 11 - Float LC Unbiased (lb)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 12 - Float LC, Adjusted for Inertial Accel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 13 - Float LC Adj, Zeroed, Filtered
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 14 - Total Weight, Adjusted for Accel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 15 - Total Weight, Adj, Filtered
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 16 - Floating Weight (Float Mode Snapshot)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

fSTS: 17 - Part Weight (lb) (Floating Wt - Fixture)
Variable Units: Pounds

Description: This parameter displays the current reading of the float load cell input in pounds. This reading already has the fixture weight subtracted.

**fSTS: 20 - Motion Timer (sec)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 21 - Main Loop Core Time (ms)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 22 - Main Loop Total Time (ms)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 23 - Main Loop Core Time, 100 scan avg (ms)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 24 - Main Loop Total Time, 100 scan avg (ms)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 25 - Logic Run Timer (days)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 26 - Total Distance Counter (inches)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 27 - Lift Mode Distance Counter (in)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 28 - Float Mode Distance Counter (in)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

fSTS: 29 - Encoder Position (in)
Variable Units: Inches

Description: This parameter displays the actual encoder counts converted to inches.

fSTS: 30 - Real World Position (in)
Variable Units: Inches

Description: This parameter displays the actual encoder counts converted to inches with the absolute encoder offset.

fSTS: 32 - Feedback Velocity (in/s)
Variable Units: Inches per second

Description: This parameter displays the actual velocity of the servo hoist.

VARIABLE DESCRIPTIONS

fSTS: 33 - Feedback Acceleration (in/s2)
Variable Units: Inches per second2

Description: This parameter displays the actual rate of acceleration of the servo hoist.

**fSTS: 35 - PGain (Vel Loop Tuning)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 36 - IGain (Vel Loop Tuning)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 37 - FGain (Vel Loop Tuning)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 38 - Kp (Pos Loop Tuning)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 39 - Kff (Pos Loop Tuning)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 40 - Stress Relief Mode
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 41 - Stress Relief Active
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 42 - Jog Vel Squared Filter
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 43 - Command Current (Amps)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**fSTS: 44 - Equivalent Force (lbs) (Up = negative)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

TEST Global Variable Array

This Global Array is used to configure and initiate the test mode auto cycle. The mode is used to cycle the hoist during the break-in period and for performance verification prior to shipping each system. This mode is for use by Knight representatives only and is disabled prior to shipping.

TEST: 00 - START TEST MODE
Variable Units: Boolean 1 = ON, 0 = OFF

Description: This parameter is used as a switch to turn on test mode. The controller will not respond to inputs and follows a set path based on the parameters set below.

TEST: 01 - Position 1
Variable Units: Inches

Description: This parameter sets the upper position limit for the controller while in test mode.

TEST: 02 - Position 2
Variable Units: Inches

Description: This parameter sets the lower position limit for the controller while in test mode.

TEST: 03 - Velocity
Variable Units: Inches per second

Description: This parameter sets the velocity for test mode.

TEST: 04 - Accel
Variable Units: Inches per second2

Description: This parameter sets the acceleration while in test mode.

TEST: 05 - Decel
Variable Units: Inches per second2

Description: This parameter sets the deceleration while in test mode.

TEST: 06 - Delay
Variable Units: Seconds

Description: This parameter sets the time delay between cycles in test mode.

VARIABLE DESCRIPTIONS

TEST: 07 - Max Moves
Variable Units: Number of moves

Description: This parameter sets the number of test cycle moves. When the test cycle counter reaches this number, the test cycle will stop. If set to zero it will never stop on its own.

TEST: 10 - Move Count
Variable Units: Cycle Count

Description: This parameter displays the number of cycles completed by the hoist in test mode.

TEST: 13 - Est. Weight (lb) - Based On Mtr Current
Variable Units: Pounds

Description: This parameter displays the estimated weight that the hoist is moving in test mode. This weight value is calculated from the motor current sampled during the motion.

TEST: 14 - Est. Efficiency - Based On Mtr Current
Variable Units: Percent

Description: This parameter displays the estimated efficiency of the drive system. This is based on data collected during motion in test mode.

TEST: 15 - Motor Amp Avg 2nd Last Move
Variable Units: Amp

Description: Displays the average current draw of the servo motor during the 2nd to last motion in test mode.

TEST: 16 - Motor Amp Avg Last Move
Variable Units: Amp

Description: Displays the average current draw of the servo motor during the last motion in test mode.

NOTE

Variables marked with a "**" should NOT be manipulated inside the F8 and N7 Global Variable Arrays, as it may have unintended consequences

FHST Global Variable Array

This variable array stores the history of system faults. It is used for system diagnostic and troubleshooting.

FHST: 00 - Fault History Index

Variable Units: Integer

Description: This variable displays the current index number of the revolving fault history array. If the fault history index is 1 then the number of the last fault is located in FHST:1 and the time of the last fault is located in FHST:2. If the fault history index is 10, then the number of the last fault is located in FHST:20 and the time of the last fault is located in FHST:21.

-- Location of last fault number =
(Fault History Index x 2)

-- Location of last fault time =
(Fault History Index x 2) + 1

FHST: 01, 03, 05 … - Fault Number

Variable Units: Integer

Description: This variable displays the fault number for each fault number / fault time pair. If the number is between 1 and 99 then it is a drive fault and can be looked at on the Ultraware fault screen or in the Ultra5000 manual. If the fault number is 100 or greater then it is a software servo fault and can be looked up in the back of this manual. Note: Parameter fSTS:06 "Fault #" displays the current active fault.

FHST: 02, 04, 06 … - Fault Time (Sec)

Variable Units: Seconds

Description: This variable displays the fault time for each fault number / fault time pair. The time is displayed in seconds from the global run timer.

NOTE

 Variables marked with a "**" should NOT be manipulated without the aid of a Knight representative, as it may have unintended consequences.

F8L1 Global Variable Array

This variable array stores parameters that are most frequently adjusted by the end user. This list contains parameters used to fine tune the system performance. It also contains configuration parameters that must be adjusted after maintenance to the servo, motor or gearbox or after adjustment of the fixture or lift handle.

F8L1: 05 - Top Limit
Variable Units: Inches

Description: This sets the upper travel limit for the hoist. This may also be set through program mode on the handle (See instructional text on handle). This value should be set to a number greater than or equal to zero. The home position is set at zero. When setting the limits through program mode on the handle the limits must be 12 inches apart to prevent setting limits at the same point, which would prevent any movement.

Additional Reference: Section 4 "Limit Stop" instructions.

F8L1: 06 - Bottom Limit
Variable Units: Inches

Description: This sets the lower travel limit for the hoist. This may also be set through program mode on the handle (See instructional text on handle). This value should be set to a number greater than the Top Limit. The home position is set at zero. When setting the limits through program mode on the handle the limits must be 12 inches apart to prevent setting limits at the same point, which would prevent any movement.

Additional Reference: Section 4 "Limit Stop" instructions.

F8L1: 08 - Handle Weight
Variable Units: Pounds

Description: This configuration parameter is for the entry of the static weight of everything on the operator's side of the lift load cell. This must be adjusted if the lift handle is modified or replaced. Additional Reference: Section 8 "Balance the Analog Handle" procedure.

F8L1: 09 - Fixture Weight
Variable Units: Pounds

Description: This configuration parameter is for the entry of the static weight of the fixture, hook or shackle hanging below the float load cell. This must be adjusted if the fixture is modified or replaced.

Additional Reference: Section 8 "Adjust the Fixture Weight" procedure.

F8L1: 10 - Default Bottom Limit
Variable Units: Inches

Description: This sets the default value for the bottom position limit. This value is used when the operator programmed limits are reset by holding the green button for more than six seconds.

Additional Reference: Section 4 "Limit Stop" instructions.

F8L1: 11 -Encoder Offset
Variable Units: Inches

Description: This sets the offset that the hoist uses to compute the home position. It offsets the absolute encoders zero position so the hoists zero position becomes the position at the physical upper limit of travel. A zero indicates a non-absolute incremental motor and is for compatibility with legacy systems.

This parameter must be adjusted when the motor, gearbox or chain are replaced.

F8L1: 12 - Decel Rate At Limits
Variable Units: Inches per second2

Description: This sets the rate of deceleration at the top and bottom limits.

F8L1: 21 - Max Load (lb) (Including Fixture)
Variable Units: Pounds

Description: This sets the maximum load that the Servo Hoist will lift, including the weight of the fixture.

Note: Parameter "F8L2:21 - Max Load (lb)" also restricts the maximum load. F8L1:21 must be set to a value less than or equal to the value of F8L2:21.

Additional Reference: Section 8 "Change Max Load Limit" procedure.

F8L1: 22 - Min Load (lb) (Excluding Fixture)
Variable Units: Pounds

Description: This sets the minimum load that the Servo Hoist will release. This means that once it gets below this amount of weight the Servo Hoist will not pay out any more chain. This is typically set to a value that allows the hoist to lower most of the fixture weight on to the floor without paying out additional chain once the fixture is on the floor.

Additional Reference: Section 8 "Modify Chain Payout" procedure.

F8L1: 23 - Lift Mode Timeout (min) (0 = no timeout)
Variable Units: Minutes

Description: This sets the length of time that the controller will stay in lift mode unattended. When idle for longer than the specified time the controller will

disable and revert to off mode. If this variable is set to zero, the hoist will never go into off mode.

F8L1: 24 - Lift Speed Limit
Variable Units: Inches per second

Description: This sets the maximum lift velocity for the Servo Hoist. The parameter is limited to the absolute maximum velocity of the system.

**F8L1: 26 - Remote Pendant Gain
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L1: 27 - Remote Pendant Deadband
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L1: 30 - Handle Sense
Variable Units: Pounds

Description: This sets the amount of force that is required on the lift handle before it changes from off mode to lift mode or from float mode to lift mode.

Note: Applies to systems with in-line or fixture style handles only.

F8L1: 31 - Lift Force Deadband
Variable Units: Pounds

Description: This sets the amount of input force that is required on the lift handle to start motion.

Note: Applies to systems with in-line or fixture style handles only.

F8L1: 36 - Digital Lift High Speed
Variable Units: Inches per second

Description: This sets the high speed for hoists with discrete up/down controls.

Note: Applies to systems with up/down pendants or wireless transmitters only.

F8L1: 37 - Digital Lift Low Speed
Variable Units: Inches per second

Description: This sets the low speed for hoists with discrete up/down controls.

Note: Applies to systems with up/down pendants or wireless transmitters only.

F8L1: 38 - Digital Accel
Variable Units: Inches per second2

Description: This sets the acceleration for hoists with discrete up/down controls.

Note: Applies to systems with up/down pendants or wireless transmitters only.

F8L1: 39 - Digital Decel
Variable Units: Inches per second2

Description: This sets the deceleration when for hoists with discrete up/down controls.

Note: Applies to systems with up/down pendants or wireless transmitters only.

F8L1: 41 - Float Top Limit
Variable Units: Inches

Description: This sets the upper travel limit for the hoist when in float mode.

F8L1: 42 - Float Bottom Limit
Variable Units: Inches

Description: This sets the lower travel limit for the hoist when in float mode.

F8L1: 43 - Float Mode Timeout (min) (0 = no timeout)
Variable Units: Minutes

Description: This sets the length of time that the controller will stay in float mode unattended. When idle for longer than the specified time the controller will disable and revert to off mode. If this variable is set to zero, the hoist will never go into off mode.

F8L1: 44 - Float Speed Limit
Variable Units: Inches per second

Description: This sets the maximum velocity of the Servo Hoist in float mode.

F8L1: 45 - Float Force Deadband
Variable Units: Pounds

Description: This sets the amount of input force that is required on the object hanging from the hoist to start motion in float mode.

** Parameters 71 - 75 are application specific **

F8L1: 71 - User Param 1
Variable Units: Application Specific

Description: Application Specific

F8L1: 72 - User Param 2
Variable Units: Application Specific

Description: Application Specific

F8L1: 73 - User Param 3
Variable Units: **Application Specific**

Description: **Application Specific**

F8L1: 74 - User Param 4
Variable Units: Application Specific

Description: Refer Application Specific

VARIABLE DESCRIPTIONS

F8L1: 75 - User Param 5
Variable Units: Refer Application Specific

Description: Application Specific

F8L1: 78 - Down Slow
Variable Units: Choice (0=off, 1=dn, 2-up, 3=up/dn)

Description: The configures the mode of the slow down feature. This parameter works with the variables F8L1:79 to F8L1:84 to configure the slow down feature.

0 = Slow down feature is disabled.

1 = Hoist will slow the system when moving down only.

2 = Hoist will slow the system when moving up only.

3 = Hoist will slow the system when moving up and down.

F8L1: 79 - Down Slow Part Loaded Weight
Variable Units: Pounds

Description: This sets the number of pounds that the hoist needs to see to indicate that a part loaded on the fixture. This is specific to the Down Slow feature.

F8L1: 80 - Down Slow Height Loaded
Variable Units: Inches

Description: This sets the height that the hoist will start to run at a reduced speed when the part loaded is turned on. The home position with the hoist completely raised is zero and this parameter is the number of inches down from home position.

F8L1: 81 - Down Slow Speed Loaded
Variable Units: Inches per second

Description: This sets the slow speed that the hoist runs when the part loaded is turned on and it is below the down slow height loaded parameter.

F8L1: 82 - Down Slow Height Unloaded
Variable Units: Inches

Description: This sets the height that the hoist will start to run at a reduced speed when the part loaded is turned off. The home position with the hoist completely raised is zero and this parameter is the number of inches down from home position.

F8L1: 83 - Down Slow Speed Unloaded
Variable Units: Inches per second

Description: This sets the slow speed that the hoist runs when the part loaded is turned off and it is below the down slow height unloaded parameter.

F8L1: 84 - Down Slow Max Decel
Variable Units: Inches per second2

Description: This sets the deceleration when transitioning from the current speed to the down slow speed.

NOTE

Variables marked with a "**" should NOT be manipulated without the aid of a Knight representative, as it may have unintended consequences.

VARIABLE DESCRIPTIONS

F8L2 Global Variable Array

This variable array stores advanced parameters that affect the performance of the hoist. These parameters should only be adjusted with the aid of a Knight representative.

F8L2: 00 - Nominal Capacity
Variable Units: Pounds

Description: This displays the rated capacity of the hoist. It is purely text and will not change anything in the program.

**F8L2: 02 - Payout Mode
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 05 - Gear Ratio
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 06 - Max Motor RPM
Variable Units: RPM

Description:This configuration parameter sets the maximum motor rpm. The motor has a physical maximum of RPM of 5000.

**F8L2: 07 - Lift LC Gain
Variable Units: **Reserved for Internal Use Only**

Description:**Reserved for Internal Use Only**

**F8L2: 08 - Float LC Gain
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 09 - Lift Load Cell Bias
Variable Units: **Reserved for Internal Use Only**

Description:**Reserved for Internal Use Only**

**F8L2: 10 - Float Load Cell Bias
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 11 - Reverse Motor Direction
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 12 - Absolute Encoder
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used as a switch in the code determining the encoder type which is either an absolute or incremental. If the system has an absolute encoder then the motor will remember its counts even after loosing power. If it is incremental it will power up with a new set of counts thus needing to be re-homed. To re-home with an incremental just raise the hoist until the ball stop triggers the limit switch up inside the hoist enclosure.

**F8L2: 13 - Max Velocity Following Error
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 14 - Chain Pitch
Variable Units:**Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 15 - Sprocket Size
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 16 - Decel Rate on Fault
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 17 - Allow Down Full Speed Lift
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 18 - Allow Down Full Speed Float
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 20 - Enable Lift Mode
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to enable or disable lift mode.

F8L2: 21 - Max Load (lb)(Including Fixture)
Variable Units: Pounds

Description: This sets the maximum load that the Servo Hoist will lift, including the weight of the fixture.

Note: Parameter "F8L1:21 - Max Load (lb)" also restricts the maximum load. F8L1:21 must be set to a value less than or equal to the value of F8L2:21.

Additional Reference: Section 8 "Change Max Load Limit" procedure.

**F8L2: 22 - Up Stop Resume Bandwidth
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 23 - Down Stop Resume Bandwidth
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 24 - Up/Down Stop Resume Time
Variable Units: **Reserved for Internal Use Only**

VARIABLE DESCRIPTIONS

Description: **Reserved for Internal Use Only**

F8L2: 25 - Lift Max Speed Fudge Factor
Variable Units: Factor

Description: This factor is multiplied by the lift max speed limit. A value of one is normal. Any value above one will increase the max speed and any value below one will reduce the max speed.

F8L2: 27 - Enable Impulse Limiting
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to enable the impulse limiting code. When this code is enabled the hoist will sense an impulse in the load cell and slow the hoist to reduce the impact on the system. This prevents the sharp motion that would occur if a load is snagged while the lift is in motion. Instead of jerking the load off the ground, the hoist sense the impulse and slow to a controlled speed.

F8L2: 28 - Impulse Limit Max Speed after Impulse
Variable Units: Inches per second

Description: This sets the speed that the hoist will slow to when impulse limiting is enabled and an impulse is detected.

F8L2: 29 - Impulse Limit Time to Limit Max Speed
Variable Units: Seconds

Description: This sets the time that the slow speed will be active when impulse limiting is enabled and an impulse is detected.

F8L2: 30 - Enable Analog Handle
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to enable the analog handle. The parameter is enabled for systems that have an inline or fixture handle.

**F8L2: 31 - Handle Filter Bandwidth
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 33 - Lift Mode Prop Accel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 34 - Lift Mode Prop Decel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 35 - Lift Command Limit
Variable Units: Pounds

Description: This sets the maximum lift command that can be given to an analog handle without a fault. For example, if this parameter is set to 100lbs and a force of more than 100lbs is applied to the lift handle

then the hoist will fault. A force of 100lbs would indicate the handle may be hung-up a fixed structure or damaged.

**F8L2: 36 - Lift Force Cancellation Gain
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 38 - Enable Digital Handle
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to enable the digital handle. This parameter is enabled for systems that have a single speed or two speed pushbutton handle or a wireless transmitter pendant.

F8L2: 40 - Enable Float Mode
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to enable or disable float mode.

F8L2: 41 - Float PB Dwell Time
Variable Units: Seconds

Description: This sets that amount of time that the blue button needs to be pressed before the hoist enters float mode.

F8L2: 45 - Float Max Speed Fudge Factor
Variable Units: Factor

Description: This factor is multiplied by the float max speed limit. A value of one is normal. Any value above one will increase the max speed and any value below one will reduce the max speed.

**F8L2: 53 - Float Mode Prop Accel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 54 - Float Mode Prop Decel
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 55 - Float Command Limit
Variable Units: Pounds

Description: This sets the maximum float command that can be given to a load without a fault.

**F8L2: 60 - Float Prop Gain Fudge Factor
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 61 - Float Input Filter Fudge Factor
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

VARIABLE DESCRIPTIONS

**F8L2: 62 - Float Output Filter Fudge Factor
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 63 - Float Force Filter Limiting Scale Factor
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 64 - Max Vel for Jerk Limitation
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 65 - Disable "Gear Unlock" code
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 67 - Acmtr Enable
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 68 - Acmtr g's per Volt
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

F8L2: 70 - Disable Program Limits
Variable Units: Boolean (1 = ON, 0 = OFF)

Description: This configuration parameter is used to disable the programming of the top and bottom limits from the green and blue pushbuttons. This feature may be disabled to prevent accidental programming of limits.
1 = Limit programming is disabled

0 = Limit programming is enabled

**F8L2: 71 - Enable Stress Relief Logic
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 80 - Load Touch Bandwidth
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 81 - True Weight Filter Constant (2-pole)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 85 - Active Damping Normal Filter Constant
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 86 - Active Damping Gain (Sensitive)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 87 - High Freq Active Damping Gain
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 90 - Active Damping Min Gain - Lift
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 91 - Active Damping Min Gain - Float
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 92 - Active Damping Always On
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 93 - AD Ramp Down - Start Position (in)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 94 - AD Ramp Down - Min Gain Position (in)
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

**F8L2: 95 - AD Ramp Down - Min Gain
Variable Units: **Reserved for Internal Use Only**

Description: **Reserved for Internal Use Only**

NOTE

Variables marked with a "**" should NOT be manipulated without the aid of a Knight representative, as it may have unintended consequences.

VARIABLE DESCRIPTIONS

F8L3 Global Variable Array

This complete array is reserved for internal use.

THIS PAGE IS INTENTIONALLY LEFT BLANK

 Allen-Bradley MP-Series Small Frame Brushless Servo Motor Installation Guide

 Allen-Bradley MP-Series Small Frame Brushless Servo Motor Installation Guide

MP-Series Small Frame Brushless Servo Motor

(Catalog Number MPL-A310, -A320, -A330, -A420, -A430, -A4520, -A4530, -A4540, -A4560, -A520, -A540, -A560, -A580, -B310, -B320, -B330, -B420, -B430, -B4520, -B4530, -B4540, -B4560, -B520, -B540, -B560, and -B580)

These *Installation Instructions* describe how to install the MP-Series motors with a frame size of 165mm or smaller. Use this document if you are responsible for installing these Allen-Bradley® MP-Series motor products. Please read all instructions before installing this motor.

Receiving and Storage

The customer is responsible for inspecting the equipment before accepting the shipment from the freight company. Check the item(s) you receive against your purchase order. Notify the carrier of any shipping damage or missing items immediately.

You may store your motor in a clean and dry location within the following environmental conditions:

- storage temperature: -30° to 70° C (-22° to 158° F)
- relative humidity: 5% to 95% non-condensing
- atmosphere: non-corrosive

Environmental Ratings

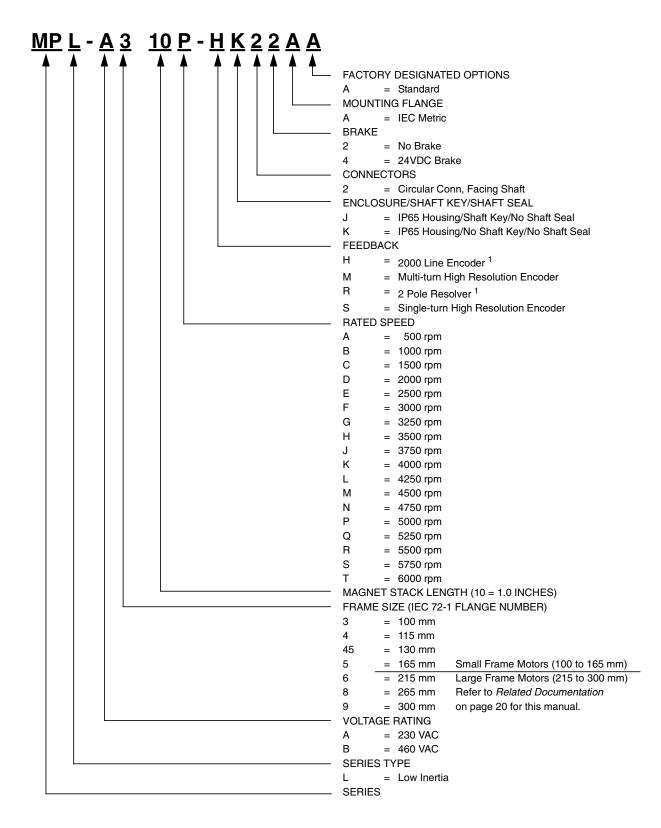The International Protection Code or IP Rating for environmental protection is:

- with a shaft seal: IP66   dust tight, heavy jet spray

The IP66 rating is roughly equivalent to a NEMA 35 (dust tight, drip tight).

Operational temperature range is:

- operating temperature: 0° to 40° C (32° to 104° F)

Motor Catalog Number Identification

MP L - A 3 10 P - H K 2 2 A A

FACTORY DESIGNATED OPTIONS
A = Standard

MOUNTING FLANGE
A = IEC Metric

BRAKE
2 = No Brake
4 = 24VDC Brake

CONNECTORS
2 = Circular Conn, Facing Shaft

ENCLOSURE/SHAFT KEY/SHAFT SEAL
J = IP65 Housing/Shaft Key/No Shaft Seal
K = IP65 Housing/No Shaft Key/No Shaft Seal

FEEDBACK
H = 2000 Line Encoder [1]
M = Multi-turn High Resolution Encoder
R = 2 Pole Resolver [1]
S = Single-turn High Resolution Encoder

RATED SPEED
A = 500 rpm
B = 1000 rpm
C = 1500 rpm
D = 2000 rpm
E = 2500 rpm
F = 3000 rpm
G = 3250 rpm
H = 3500 rpm
J = 3750 rpm
K = 4000 rpm
L = 4250 rpm
M = 4500 rpm
N = 4750 rpm
P = 5000 rpm
Q = 5250 rpm
R = 5500 rpm
S = 5750 rpm
T = 6000 rpm

MAGNET STACK LENGTH (10 = 1.0 INCHES)

FRAME SIZE (IEC 72-1 FLANGE NUMBER)
3 = 100 mm
4 = 115 mm
45 = 130 mm
5 = 165 mm   Small Frame Motors (100 to 165 mm)
6 = 215 mm   Large Frame Motors (215 to 300 mm)
8 = 265 mm   Refer to *Related Documentation*
9 = 300 mm   on page 20 for this manual.

VOLTAGE RATING
A = 230 VAC
B = 460 VAC

SERIES TYPE
L = Low Inertia

SERIES

1 Not available on MPL-x5xx or larger (>165mm Frame Sizes)

Before You Install the Motor

1. Remove the motor carefully from its shipping container.

2. Visually inspect the motor for any damage.

3. Examine the motor frame, front output shaft, and mounting pilot for any defects.

4. Notify the carrier of any shipping damage immediately.

ATTENTION	Do not attempt to open and modify the motor beyond changing the connector orientation as described on page 9.
⚠	Only a qualified Allen-Bradley employee can service this type of motor.
	Failure to observe these safety procedures could result in personal injury or damage to equipment.

Using Shaft Seals

An additional seal is required on the motor shaft near the motor front bearing, if the shaft is exposed to fluids or significant amounts of fine dust. This includes lubricating oil from a gearbox. An IP66 rating for the motor requires use of a shaft seal and environmentally sealed connectors/ cables. The additional seal is not recommended in applications where the motor shaft area is free of liquids or fine dust and a lower rating will suffice.

• Refer to *Environmental Ratings* on page 2 for a brief description of MP-Series motor IP rating.

• Refer to *Shaft Seal Kits* on page 16 to find the catalog numbers of seal kits available for your motor.

• Refer to *Motion Control Selection Guide* on page 20 to find environmentally sealed connectors and cables compatible with the MP-Series motors.

Using Couplings and Pulleys

Mechanical connections to the motor shaft, such as couplings and pulleys, require a torsionally rigid coupling or a reinforced timing belt. The high dynamic performance of servo motors can cause couplings, pulleys or belts to loosen or slip over time. A loose or slipping connection will cause system instability and may damage the motor shaft. All connections between the system and the servo motor shaft must be rigid to achieve acceptable response from the system. Periodically inspect connections to verify their rigidity.

When mounting couplings or pulleys to the motor shaft, ensure that the connections are properly aligned and that axial and radial loads are within the specifications of the motor. Refer to *Motor Load Force Ratings* on page 18 for guidelines to achieve 20,000 hours of motor bearing life.

ATTENTION ⚠	Damage may occur to the motor bearings and the feedback device if sharp impact to the shaft is applied during installation of couplings and pulleys. Damage to the feedback device may result by applying leverage from the motor mounting face to remove devices mounted on the motor shaft.
	Do not strike the shaft, couplings, or pulleys with tools during installation or removal. Use a wheel puller applying pressure from the user end of the shaft to remove any friction fit or stuck device from the motor shaft.
	Failure to observe these safety procedures could result in damage to the motor and its components.

Preventing Electrical Noise

ElectroMagnetic Interference (EMI), commonly called noise, may adversely impact motor performance by inducing stray signals. Effective techniques to counter EMI include filtering the AC power, shielding and separating signal carrying lines, and practicing good grounding techniques.

Effective AC power filtering can be achieved by using isolated AC power transformers or properly installed AC line filters.

To help avoid EMI:

1. Physically separate signal lines from motor cabling and power wiring. Do not route signal wires with motor and power wires, or over the vent openings of servo drives.

2. Ground all equipment using a single-point parallel ground system that employs ground bus bars or large straps. If necessary, use additional electrical noise reduction techniques to reduce EMI in noisy environments.

Refer to *System Design for Control of Electrical Noise Reference Manual* on page 20 for additional information on reducing the effects of EMI by improving the system level electromagnetic compatibility (EMC).

Building and Installing Cables

Knowledgeable cable routing and careful cable construction improves system electromagnetic compatibility (EMC).

To build and install cables, perform the following steps:

1. Keep wire lengths as short as physically possible.

2. Route signal cables (encoder, serial, analog) away from motor and power wiring.

3. Separate cables by 0.3 m (1 ft) minimum for every 9 m (30 ft) of parallel run.

4. Ground both ends of the encoder cable shield and twist the signal wire pairs to prevent electromagnetic interference (EMI) from other equipment.

ATTENTION	High voltage can be present on the shield of a power cable, if the shield is not grounded.
⚠	Ensure there is a connection to ground for any power cable shield.
	Failure to observe these safety procedures could result in personal injury or damage to equipment.

Installing Your Motor

All motors include a mounting pilot for aligning the motor on a machine. Preferred fasteners are stainless steel. The installation must comply with all local regulations and use of equipment and installation practices that promote electromagnetic compatibility and safety.

ATTENTION	Unmounted motors, disconnected mechanical couplings, loose shaft keys, and disconnected cables are dangerous if power is applied.
	Disassembled equipment should be appropriately identified (tagged-out) and access to electrical power restricted (locked-out).
	Before applying power to the motor, remove the shaft key and other mechanical couplings which could be thrown from the shaft.
	Failure to observe these safety procedures could result in personal injury.

ATTENTION	Ensure that cables are installed and restrained to prevent uneven tension or flexing at the cable connectors.
	Excessive and uneven lateral force at the cable connectors may result in the connector's environmental seal opening and closing as the cable flexes.
	Failure to observe these safety procedures could result in damage to the motor and its components.

Changing Connector Orientation

The connector housing can be rotated to face down when the motor is installed in a vertical application, or rearward if connector access is restricted in a horizontal application. To rotate the connector housing:

1. Remove the three connector housing screws from the motor.

2. Rotate connector housing 180 degrees. If binding of the wire bundles prevents rotation of the connector, you can gain access to the internal motor wiring by:

  A. Remove the four screws from the rear cover of the motor.

  B. Carefully reposition the wires around the perimeter of the motor feedback device located under the rear cover.

  C. Ensure that wires are not close to any rotating parts.

ATTENTION	Do not loosen or remove the motor feedback device (encoder) mounting screws while repositioning the connector wires.
⚠	Encoder alignment is a critical adjustment that can only be performed in the factory. Misadjustment can render the motor inoperable or degrade motor performance, and voids the motor warranty.
	Failure to observe this safety precaution could result in personal injury or damage to equipment.

3. Re-install the connector housing and torque the three screws to 0.8–1.0 Nm (7–9 in.-lbs) after verifying that gaskets are properly positioned, and that no wires are pinched under the connector housing.

ATTENTION	Exercise caution to prevent damaging the screw holes when reinserting the self-tapping screws holding the connector housing and rear cover.
	Excessive force may strip the threads within the screw holes and prevent proper sealing of the motor. Ensure that the specified torque values are not exceeded.
	Failure to observe these safety procedures could result in damage to the motor and its components.

4. Re-install the four rear cover screws and torque them to 0.8–1.0 Nm (7–9 in.-lbs) after ensuring that the rear cover O-ring is properly positioned onto the rear cover circular pilot surface.

Guidelines for Installation

Observe the following guidelines when installing the motor.

ATTENTION

⚠

Damage may occur to the motor bearings and the feedback device if sharp impact to the shaft is applied during installation of couplings and pulleys. Do not strike the shaft, couplings, or pulleys with tools during installation or removal.

Failure to observe these safety procedures could result in damage to the motor and its components.

---

1. Allow sufficient clearances in the area of the motor for it to stay within its specified operating temperature range. Refer to *Receiving and Storage* on page 2 for the operating range. Do not enclose the motor unless forced air is blown across the motor for cooling. A fan blowing air across the motor will improve its performance. Keep other heat producing devices away from the motor.

   To obtain the specified motor thermal rating, mount the motor on a surface with heat dissipation equivalent to a 12 x 12 x 0.5 inch aluminum heatsink.

2. Refer to *Motor Load Force Ratings* on page 18 to determine the radial and axial shaft load limitations of your motor.

3. Place the motor with the connector housing pointing downward.

4. Properly mount and align the motor. Electronic zero (Index pulse or Stegmann ABS = 0) occurs when the shaft key or dimple is aligned with the connectors. Refer to *Mounting Dimensions* on page 13 for a visual reference of this alignment.

5. Attach all power, feedback, and brake cables after the motor is mounted and use a drip loop in the cable to keep liquids flowing away from the connectors.

ATTENTION	Outer surfaces of motor can reach high temperatures, 125° C (275° F) during motor operation.
	Take precautions to prevent accidental contact with hot surfaces. Consider motor surface temperature when selecting motor mating connections and cables.
	Failure to observe these safety procedures could result in personal injury or damage to equipment.

Mounting Dimensions

Motors are designed to metric dimensions (mm), inch dimensions (in.) are conversions
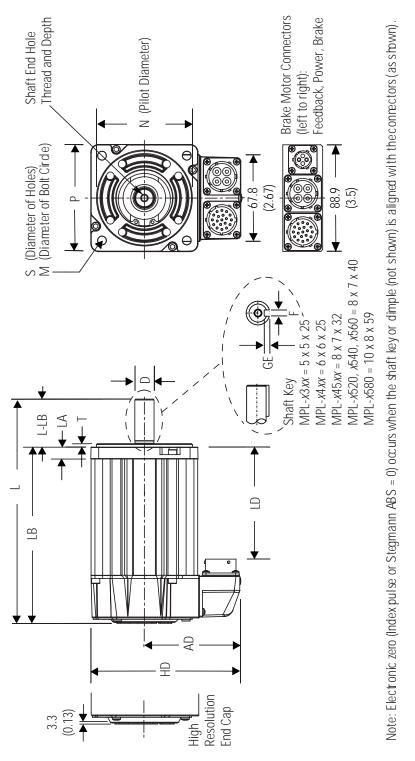
Figure 1   References for Motor Dimensions

Motor Series MPL-A or MPL-B	AD mm (in.)	D * mm (in.)	HD mm (in.)	L 1,2 mm (in.)	L-LB 3 mm (in.)	LA mm (in.)	LB 1,2 mm (in.)	LD 1 mm (in.)	M mm (in.)	N * mm (in.)	P mm (in.)	S 4 mm (in.)	T mm (in.)	F 5 mm (in.)	GE 6 mm (in.)	End of Shaft Thread and Depth of Hole
310	80.9 (3.19)	16.0 (0.629)	125.7 (4.95)	164.7 (6.49)	40.0 (1.58)	9.9 (0.39)	124.7 (4.91)	70.7 (2.78)	100.0 (3.937)	80.0 (3.15)	89.4 (3.52)	7.0 (0.28)	2.87 (0.113)	5.0 (0.20)	3.0 (0.12)	M5 x 0.8 x 12.5 (0.49)
320				190.1 (7.49)			150.1 (5.91)	96.1 (3.78)								
330				215.5 (8.49)			175.5 (6.91)	121.5 (4.78)								
420	83.9 (3.3)	19.0 (0.748)	132.8 (5.23)	186.5 (7.35)	40.0 (1.58)	10.2 (0.4)	146.5 (5.77)	92.5 (3.64)	115.0 (4.528)	95.0 (3.74)	98.3 (3.87)	10.0 (0.41)	2.87 (0.113)	6.0 (0.20)	3.5 (0.14)	M6 x 1.0 x 16 (0.63)
430				211.9 (8.35)			171.9 (6.77)	117.9 (4.64)								
4520	91.5 (3.6)	24.0 (0.945)	148.3 (5.84)	199.8 (7.87)	50.0 (1.97)	12.2 (0.48)	149.8 (5.90)	95.8 (3.77)	130.0 (5.118)	110.0 (4.331)	113.7 (4.48)	10.0 (0.41)	3.38 (0.133)	8.0 (0.31)	4.0 (0.158)	M8 x 1.25 x 19 (0.75)
4530				225.2 (8.87)			175.2 (6.90)	121.2 (4.77)								
4540				250.6 (9.87)			200.6 (7.90)	146.6 (5.77)								
4560				301.5 (11.87)			251.5 (9.90)	197.4 (7.77)								
520	106.2 (4.18)	28.0 (1.1)	178.1 (7.01)	233.7 (9.20)	60.0 (2.38)	13.97 (0.55)	173.7 (6.84)	115.8 (4.56)	165.0 (6.496)	130.0 (5.118)	143.5 (5.65)	12.0 (0.48)	3.38 (0.133)	8.0 (0.31)	4.1 (0.162)	M10 x 1.5-6H x 22 (0.87)
540				284.5 (11.20)			224.5 (8.84)	166.9 (6.57)								
560				335.3 (13.20)			275.3 (10.84)	217.7 (8.56)								
580		32.0 (1.26)		406.1 (15.99)	80.0 (3.15)		326.1 (12.84)	268.5 (10.57)						10.0 (0.39)	5.1 (0.20)	M12 x 1.75-6H x 28 (1.10)

1 Motors with brake, add this value to the dimension:
MPL-x310 through -x330: add 34.5 mm (1.36 in.) to L, LB, and LD.
MPL-x420 through -x4560: add 48.5 mm (1.91 in.) to L, LB, and LD.
MPL-x520 through -x580 add 51.6 mm (2.03 in.) to L and LB, and 45.6 mm (1.79 in.) to LD.

2 Motors with high-resolution feedback, add 3.3 mm (0.13 in.) to L and LB.

* Refer to Motion Control Selection Guide (referenced on page 20) for tolerances on these measurements.

3 Tolerance for this dimension is ±0.7 (±0.028).
4 Tolerance for this dimension is +0.36 (±0.007).
5 Tolerance for this dimension is -0.03 (-0.001).
6 Tolerance for this dimension is +0.1 (+0.004).
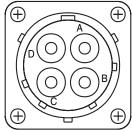
Connector Data

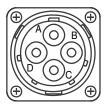The tables below list the signal descriptions for the feedback, power, and brake connector pins.

Feedback Connector

Pin	2000 Line Encoder	2 Pole Resolver	High Resolution Encoder for: MPL-A3xx through -A45xx	MPL-A5xx, and all MPL-B (460V)
A	A+	S2	Sin+	Sin+
B	A-	S4	Sin-	Sin-
C	B+	S1	Cos+	Cos+
D	B-	S3	Cos-	Cos-
E	I+	Reserved	Data+	Data+
F	I-		Data-	Data-
G	Ground	R1	Reserved	Reserved
H	ABS	R2		
J	Reserved	Reserved		
K	+5 VDC		+5 VDC	
L	Common		Common	
M	Reserved		Reserved	
N				+9 VDC
P				Common
R	TS+	TS+	TS+	TS+
S	TS-	TS-	TS-	TS-
T	S1	Reserved	Reserved	Reserved
U	S2			
V	S3			

ITT Cannon
TNM 16-19, 192993-0110

Power Connector

Pin	Signal
A	Phase U
B	Phase V
C	Phase W
D	Ground
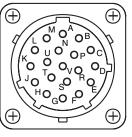
ITT Cannon
TNM 16-4, 192993-0106

Brake Connector

Pin	Signal
A	BR+
B	Reserved
C	BR-
D	Reserved

ITT Cannon
TNM 10-4, 192993-0116

Shaft Seal Kits

Catalog numbers and dimensions for Nitrile shaft seals are shown below.

Motor	Catalog Number [1]	Inside Diameter		Outside Diameter		Width	
		mm	(in.)	mm	(in.)	mm	(in.)
MPL-A310 and -B310	MPL-SSN-A3B3	17	(0.669)	47	(1.850)	7	(0.276)
MPL-A320 and -B320							
MPL-A330 and -B330							
MPL-A420 and -B420	MPL-SSN-A4B4	20	(0.787)	52	(2.047)	7	(0.276)
MPL-A430 and -B430							
MPL-A4520 and -B4520	MPL-SSN-A5B5	25	(0.984)	62	(2.441)	7	(0.276)
MPL-A4530 and -B4530							
MPL-A4540 and -B4540							
MPL-A4560 and -B4560							
MPL-A520, B520, A540, A560 and B560	MPL-SSN-F165	30	(1.181)	72	(2.835)	8	(0.315)
MPL-A580 or B580	MPL-SSN-F165-32MM	35	(1.378)	72	(2.835)	8	(0.315)

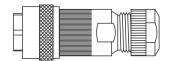[1] Nitrile shaft seals require a lubricant to reduce wear. Lubricant is provided with kit.
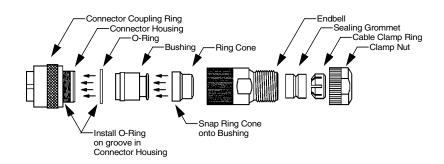
Cables and Connector Kits

Factory manufactured feedback and power cables are available in standard cable lengths. They can provide environmental sealing and shield termination. Contact your nearest Allen-Bradley sales office or refer to your drive's installation manual for a complete listing of available cables.

If you choose to build your own cables, the following connector kits are available for MP-Series Small Frame motors. These solder-type connectors mate with the motor-mounted connectors and provide environmental sealing with shield termination.

Each connector kit includes the requisite number and size of solder-type contact pins, a connector housing, and a connector backshell. As an example, finished and exploded views of the Brake Connector Kit are shown below.

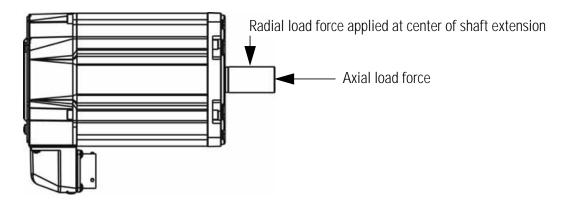| Catalog Number	Connector Type	Accepts Wire Gauge		Accepts Cable Diameter Gauge	
		mm^2	(AWG)	mm	(in.)
2090-MPPC-S	Power - Straight	2.5-4.0	(14-12)	7.9-12.4	(0.31-0.49)
2090-MPFC-S	Feedback - Straight	0.08-2.5	(28-14)		
2090-MPBC-S	Brake - Straight			4.3-7.4	(0.17-0.29)

Motor Load Force Ratings

Motors are capable of operating with a sustained shaft load. The radial and axial load force location is shown in the figure, and maximum values are in the tables.

Figure 2
Load Forces on Shaft

Radial load force applied at center of shaft extension

Axial load force

The following tables represent 20,000 hour L10 bearing fatigue life at various loads and speeds. This 20,000 hour life does not account for possible application-specific life reduction that may occur due to bearing grease contamination from external sources.

Radial Load Force Ratings

Motor	500 rpm		1000 rpm		2000 rpm		3000 rpm		3500 rpm		4000 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
MPL-A/B310	78	(171)	62	(136)	49	(108)	—	—	40	(89)	—	—	36	(79)
MPL-A/B320	87	(192)	69	(152)	55	(121)	—	—	45	(100)	—	—	40	(89)
MPL-A/B330	—	—	74	(163)	59	(129)	—	—	49	(107)	—	—	43	(95)
MPL-A/B420	—	—	78	(172)	62	(136)	—	—	51	(113)	—	—	45	(100)
MPL-A/B430	106	(234)	84	(186)	67	(148)	—	—	55	(122)	—	—	49	(109)
MPL-A/B4520	—	—	97	(213)	77	(169)	67	(147)	64	(140)	61	(134)	56	(124)
MPL-A/B4530	133	(292)	105	(232)	84	(184)	73	(161)	—	—	66	(146)	—	—
MPL-A/B4540	140	(309)	111	(245)	89	(195)	77	(170)	—	—	—	—	—	—
MPL-A/B4560	151	(332)	119	(263)	95	(209)	83	(183)	—	—	—	—	—	—
MPL-A/B520	—	—	127	(280)	100	(222)	88	(194)	—	—	80	(176)	—	—
MPL-A/B540	—	—	143	(316)	114	(251)	99	(219)	—	—	90	(199)	—	—
MPL-A/B560	—	—	153	(338)	121	(268)	106	(234)	—	—	—	—	—	—
MPL-A/B580	—	—	153	(338)	121	(268)	106	(234)	—	—	—	—	—	—

Axial Load Force Ratings (Maximum Radial Load)

Motor	500 rpm		1000 rpm		2000 rpm		3000 rpm		3500 rpm		4000 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
MPL-A/B310	30	(66)	23	(50)	16	(36)	—	—	13	(29)	—	—	11	(24)
MPL-A/B320	34	(74)	25	(56)	19	(41)	—	—	15	(32)	—	—	13	(28)
MPL-A/B330	—	—	27	(59)	20	(44)	—	—	16	(35)	—	—	13	(29)
MPL-A/B420	—	—	36	(80)	27	(59)	—	—	21	(47)	—	—	18	(39)
MPL-A/B430	52	(115)	39	(86)	29	(63)	—	—	22	(49)	—	—	19	(42)
MPL-A/B4520	—	—	31	(68)	23	(50)	19	(42)	18	(39)	17	(37)	15	(33)
MPL-A/B4530	45	(100)	34	(74)	25	(55)	21	(46)	—	—	19	(41)	—	—
MPL-A/B4540	49	(107)	36	(80)	27	(59)	22	(49)	—	—	—	—	—	—
MPL-A/B4560	53	(117)	40	(88)	30	(65)	24	(53)	—	—	—	—	—	—
MPL-A/B520	—	—	42	(94)	30	(68)	26	(58)	—	—	22	(50)	—	—
MPL-A/B540	—	—	48	(107)	35	(79)	30	(66)	—	—	26	(58)	—	—
MPL-A/B560	—	—	52	(115)	43	(95)	32	(71)	—	—	—	—	—	—
MPL-A/B580	—	—	52	(115)	43	(95)	32	(71)	—	—	—	—	—	—

Axial Load Force Ratings (Zero Radial Load)

Motor	500 rpm		1000 rpm		2000 rpm		3000 rpm		3500 rpm		4000 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
MPL-A/B310	49	(109)	36	(80)	27	(59)	—	—	21	(47)	—	—	18	(40)
MPL-A/B320	49	(109)	36	(80)	27	(59)	—	—	21	(47)	—	—	18	(40)
MPL-A/B330	—	—	36	(80)	27	(59)	—	—	21	(47)	—	—	18	(40)
MPL-A/B420	—	—	51	(112)	38	(83)	—	—	30	(65)	—	—	25	(55)
MPL-A/B430	69	(152)	51	(112)	38	(83)	—	—	30	(65)	—	—	25	(55)
MPL-A/B4520	—	—	51	(112)	38	(83)	31	(69)	30	(65)	28	(61)	25	(55)
MPL-A/B4530	69	(152)	51	(112)	38	(83)	31	(69)	—	—	28	(61)	—	—
MPL-A/B4540	69	(152)	51	(112)	38	(83)	31	(69)	—	—	—	—	—	—
MPL-A/B4560	69	(152)	51	(112)	38	(83)	31	(69)	—	—	—	—	—	—
MPL-A/B520	—	—	67	(149)	49	(109)	41	(92)	—	—	36	(81)	—	—
MPL-A/B540	—	—	67	(149)	49	(109)	41	(92)	—	—	36	(81)	—	—
MPL-A/B560	—	—	67	(149)	49	(109)	41	(92)	—	—	—	—	—	—
MPL-A/B580	—	—	67	(149)	49	(109)	41	(92)	—	—	—	—	—	—

Related Documentation

These publications provide additional information, and specifically about MP-Series motors and compatible drives.
To order printed copies, contact your Allen-Bradley Distributor or Rockwell Automation Sales Office. To view and download, go to Literature Library at **http://www.rockwellautomation.com/literature**.

For information about:	Read this document:	Publication Number
Installing large frame (≥215 mm) MP-Series low inertia motors	*MP-Series Brushless Servo Motor Installation Manual*	MP-IN002*x*-EN-P
Installing MP-Series integrated gear motors	*MP-Series Integrated Gear Motor Installation Manual*	MP-IN003*x*-EN-P
Connecting to an Ultra5000™ drive	*Ultra5000 IPD Install Manual*	2098-IN001*x*-EN-P
Connecting to an Ultra3000™ drive	*Ultra3000 DSD Install Manual*	2098-IN003*x*-EN-P
Connecting to an Kinetix™ 6000 drive	*Kinetix 6000 Multi-Axis Servo Drive Installation Manual*	2094-IN001x-EN-P
Connecting to an 1394 SERCOS™ drive	*1394 SERCOS Interface™ Installation Manual*	1394-IN002x-EN-P
A glossary of industrial automation terms and abbreviations	Allen-Bradley *Industrial Automation Glossary*	AG-7.1
How to minimize and control system-level noise.	*System Design for Control of Electrical Noise Reference Manual*	GMC-RM001x-EN-P
An overview of Allen-Bradley motion controls and systems, including information about MP-Series motors.	*Motion Control Selection Guide*	GMC-SG001*x*-EN-P or GMC-SG002*x*-EN-E

For more information refer to our web site: **www.ab.com/motion**
For Allen-Bradley Technical Support information refer to: **www.ab.com/support** or Tel: (1) 440.646.5800

Allen-Bradley is a registered trademark of Rockwell Automation, Inc.
Kinetix, Ultra3000 and Ultra5000 are trademarks of Rockwell Automation, Inc.

THIS PAGE IS INTENTIONALLY LEFT BLANK

THIS PAGE IS INTENTIONALLY LEFT BLANK

KNIGHT

PROVEN INNOVATORS of Material Handling Systems

KNIGHT INDUSTRIES & ASSOCIATES INC
1140 Centre Road
Auburn Hills, MI 48326
Phone 248-377-4950 Fax 248-377-2135
For additional copies\literature contact: sales@knight-ind.com
For service related requests contact: services@knight-ind.com
www.knight-ind.com