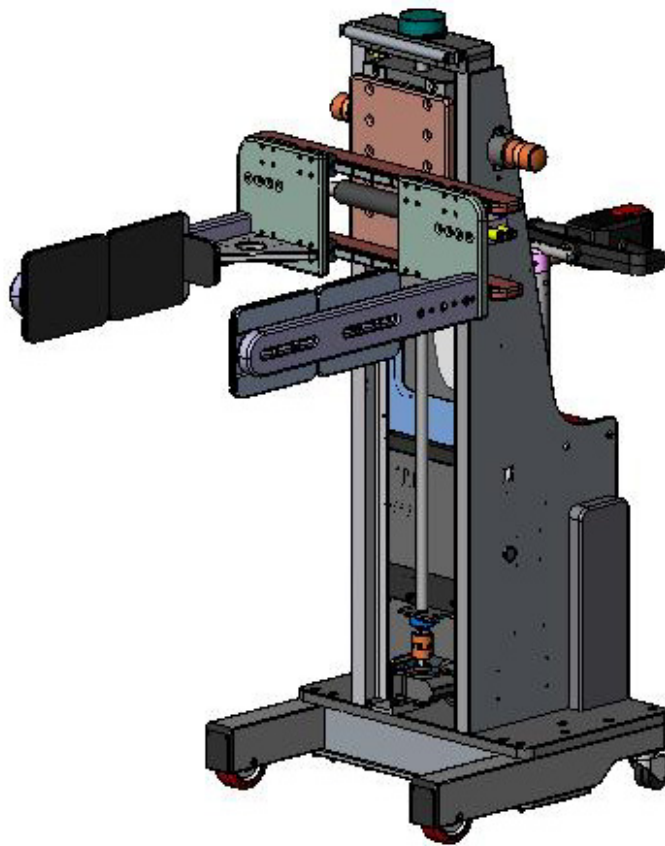


alum-a-lift

**Devices For:
Lifting, Lowering, Moving, Positioning, and Holding
Objects Too Heavy For the Unaided Human**



Lift Serial Number: _____

Model 5000 Owner's Manual

MODEL 5000 CASINO LIFT

Lift And End Effector Guide

NOTE: END-EFFECTORS TO BE USED IN ACCORDANCE WITH
ALUM-A-LIFT APPROVED PROCEDURES



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NOV 2006

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Setting Up Your Alum-A-Lift

NOTE: Read this section in its entirety before using your Alum-A-Lift.

Unpacking the Lift

The Alum-A-Lift is shipped to you on a wooden pallet. Larger lifts or those going overseas will be shipped inside a crate. Before unpacking the lift, check to see if there is any damage to the unit. If there is any damage, please contact the freight carrier, your traffic person, and our office at once. If it has been ascertained that the lift has not been damaged, carefully remove the wrapping and check the condition of the unit. Lifts are shipped completely assembled except for the installation of the battery which is shipped in a box fastened to the pallet. Some exceptions may apply in cases where the end-effector is removed due to shipping restrictions. In general, the lift will be secured with banding or boarding which can be removed with the appropriate tooling. Taped to the Alum-A-Lift is a manila envelope containing: an owner's manual, a tool set, "Good Stuff" ballscrew lubricant, and the final check list. The lift weight will vary according to the application; therefore care should be exercised in removing the lift from the pallet. It will usually require two people to do this safely.



Palletized Lift



Crated Lift

SETTING UP YOUR ALUM-A-LIFT

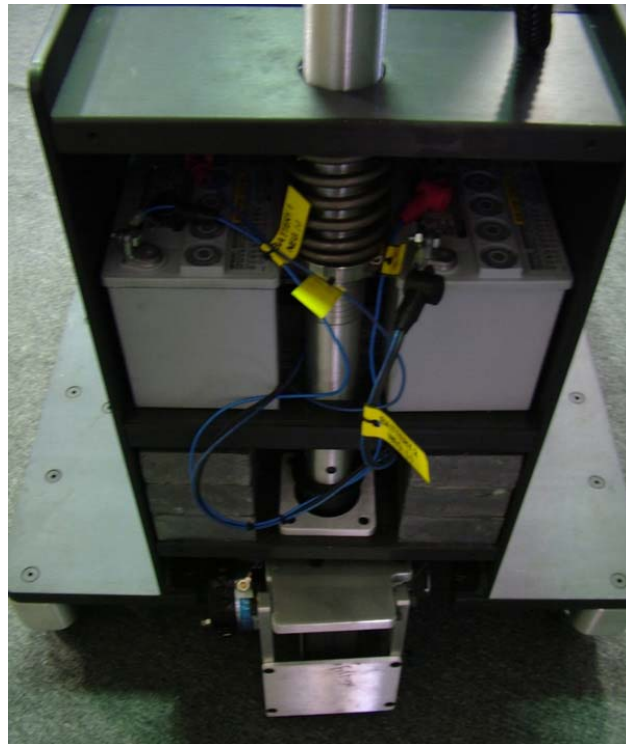
Providing Power to the Lift

The lift features a 24VDC battery operated system. This is accomplished by connecting two 12V, 31.5Ah gel cell batteries in series. The lift is shipped ready to use with the batteries already installed.

Changing the Batteries

Remove the back cover from the rear of the lift using a 5/32 allen wrench to loosen the captive fasteners. Inside the battery compartment you will find four leads with ring connectors. A battery strap is used to secure the batteries once they are in place. Loosen the strap to allow the batteries freedom to move. Each lead is labeled to aid connection and should be long enough to reach the ground. Remove the existing batteries and disconnect the leads.

Move the new batteries into close proximity and designate one battery as "A" and the other battery as "B". Connect each lead to the appropriate battery and secure using the hardware accompanying the batteries. Each battery weighs about 24 pounds. Note, use SEMI Type 4 protection when installing the batteries. Carefully lift the batteries onto the battery tray and secure using the battery strap. Replace the back cover. See the Electrical System section for more information.



Battery Compartment
(Battery Strap Not Shown)

SETTING UP YOUR ALUM-A-LIFT

Testing the Lift

Move the ON/OFF/CHARGE switch to the ON position. The voltmeter should now register 24 volts or more and a green LED by the switch should light up. The controls on the detachable black pendant box should now be active. Press the UP/DOWN controls on the lift pendant box and the carriage should raise and lower. Run the carriage up and down throughout the preset range. The motor and brake will make a clicking sound when the UP/DOWN button is initially depressed; this sound is normal. See the Operational/Controls Section for more detail regarding operation.

A second pendant box is used to control the end-effector. To clamp, press the green button. To unclamp, you must press both red buttons at the same time.

General Lift Information

Introduction

The lifting device described in this manual is designed to assist personnel in safely removing and installing equipment while complying with SEMI S2 safety guidelines. This manual describes the operation, maintenance and use of the lift.

Intended Use of the Lift

The lift is designed around various slot machines in a casino environment. It is intended to raise and lower loads and to act as a means of transportation where necessary. The lift may also be used to work in conjunction with a dolly system to provide a complete handling system. Call Alum-A-Lift for more details.

The Alum-A-Lift design features three integrated systems: electrical, static, and dynamic.

Electrical System

The electrical system provides power and control to the drive system and end effector. The system is comprised of:

- Batteries
- Limit Switches
- Voltmeter
- Rocker and Push Button Switches
- Speed Controller (where applicable)
- Circuit Breakers
- Relays
- Indicator Lights
- Low Voltage Indicator
- Battery Charger

The system operates on 24 volt DC power provided by a pair of 12 volt batteries connected in series. The lift contains a built in AC powered battery charger that can be plugged into an AC outlet through the use of the integrated AC power cord. A voltmeter located on the top cover helps to monitor the voltage of the batteries. As an additional feature, an audible alert will sound when the battery needs recharging. Ignoring this alert may result in discharging the batteries. The system should not be operated while the batteries are charging.

GENERAL LIFT INFORMATION

Static System

The static (framework) provides structure to which the electrical and drive systems are mounted. This system is comprised of:

- Welded Frame
- Base Assembly
- Leg Assembly
- Top Channel Assembly

The lift is comprised of numerous subsystems. The most basic framework involves the mounting of a frame assembly to a base assembly. Mounted to the base assembly are two leg assemblies. These subassemblies make up a very stable and mechanically strong system.

Dynamic System

The dynamic system (drive) provides motion and power in the form of upward and downward movements of the carriage. The carriage is designed to accommodate a variety of end-effectors. The dynamic system includes:

- Gear Motor
- Alignment Couple
- Ball Nut Assembly
- Carriage Assembly
- Brake
- Ball Screw
- Pillow Block Bearings

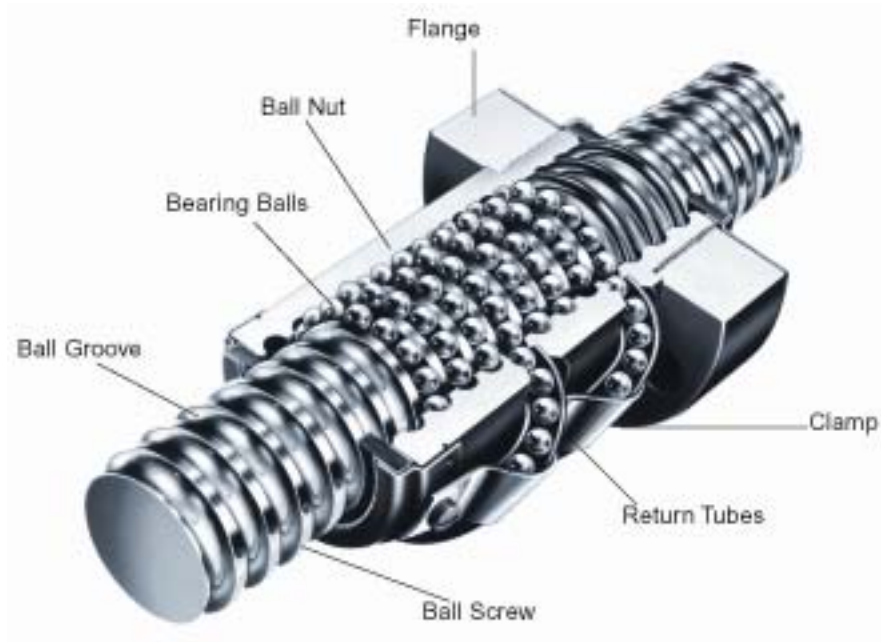
The lift's carriage is driven up and down by a DC gear motor driven ball screw that runs vertically along the inside of the structure.

Ball Screw Design Advantages ¹

"A ball bearing screw is well described by its name; it's a screw that runs on ball bearings. The balls provide the only physical contact between screw and nut, replacing the sliding friction of a conventional screw with a free and smooth rolling motion. In a ball bearing screw the return tubes carry the ball bearings from the end of their travel, over the screw and back to the start of the circuit to form a continuously recirculating path. A ball bearing screw is extremely energy efficient, about 90% – three times more efficient than conventional screws. The primary function of a ball bearing screw is to convert rotary motion to linear motion – or torque to thrust." In the case of the lift, this linear motion is accomplished by rotating the screw and having the nut travel up or down. A load locking spring is featured on the Alum-A-Lift. This spring is a coil turned into the inactive portion to the nut that conforms to the ball tract. During normal operation, the spring is inactive and not in contact with the screw. In the event the ball bearings are lost from the nut, the load locking spring will not allow the load carrying nut to free-fall down the screw.

1. (http://www.uslinear.com/config/BSHelp/Balscrew/Design_Advantages_of_Ball_Bearing_Screws.htm)

GENERAL LIFT INFORMATION

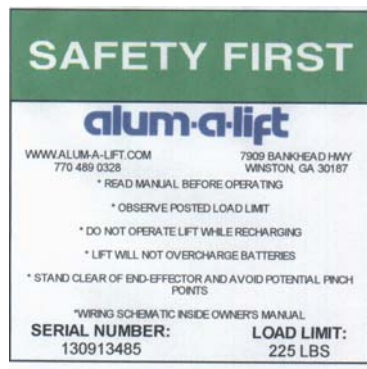


Ball Bearing Screw

(http://www.uslinear.com/config/BSHelp/Balscrew/Design_Advantages_of_Ball_Bearing_Screws.htm)

Nameplate

Located on the operator side of each lift, a nameplate or placard gives general information regarding the specifications for that specific lift. Notable items include serial number, vendor contact information, and load limit. A sample nameplate follows.



Lift Nameplate

Operation/Control System

Pendant Box

The Alum-A-Lift's vertical travel is controlled via a detachable pendant box. The pendant box allows for vertical adjustment of the lift's carriage. Up and Down push buttons are located on the front edge of the box. Only one button will function at a time. If equipped, a speed control knob located on the side of the pendant box allows for fine vertical adjustment of the lifting speed. The pendant box is attached to the lift by a flexible curly cord. This cord allows the user freedom of movement while operating the lift.

ON/OFF/CHARGE Button

The top cover contains an ON/OFF/CHARGE button. This button is a three-position toggle switch.

- The ON position gives power to the lift. The voltmeter shows the output voltage applied to the circuit. A green LED will light up to indicate the power is on.
- The OFF position turns the lift off.
- The CHARGE position switches input voltage via the charging cord to the built in charger. Do not run the lift while in charge mode.

Circuit Breakers

To protect the electrical system, circuit breakers located on the top cover serve as overload protection. The lift has four main circuits: a control circuit, an ac in circuit, a dc out circuit, and a lift main circuit. A fifth circuit will be present if the end-effector is powered. If the labeled amperage is exceeded, the circuit breaker will pop out and can be reset by pressing it back down. In the event a circuit breaker is tripped, the cause should be examined immediately.

Charger Status

A built in charger is included in every lift. The charger is CE approved and switchable between 110/220V as needed. Either charger is located in the battery compartment. A set of LEDs located on the top cover alert the operator as to the status of the battery. To charge the batteries, plug the charger cord (located on the lift's right side plate) into a standard

outlet and turn the ON/OFF/CHARGE switch to the CHARGE position. **The charger will not overcharge the batteries.**

Fixed Limits

The Alum-A-Lift is equipped with end-of-travel limit switches. These limit switches stop the movement of the carriage when depressed. The switches are fixed and initially set at the factory.

Operating Procedures

The basic operation of the lift is to move loads up and down. The following instructions summarize how to perform this operation. It is recommended that all lifting operations be conducted with fully charged batteries and that the battery charger is plugged in when the lift is not in use. See the Electrical System section for details on charging the batteries.

Lifting Load

- Switch the three-position ON/OFF/CHARGE switch to the ON position.
- Verify the keyed switch for the powered drive is turned on. Note the flashing amber lights.
- Move the lift into position using the powered drive system.
- Verify the clamp is open enough to allow the slot machine to fit between the clamp pads.
- Using the up or down buttons on the detachable pendant box, move the carriage up or down to the desired height.
- Clamp on the slot machine using the end-effector pendant box.
- Verify the slot is secure and lift off the cabinet.
- Use the powered drive to back away and lower load to a safe height before moving the lift.

Electrical System

Electrical Safety Concerns

SEMI S2 safety guidelines define electrical tasks as Type 1-5 based upon the level of electrical exposure involved.

Type 1 – Equipment is fully de-energized (electrically “cold”)

Type 2 – Equipment is energized. Live circuits are covered or insulated. Work is performed at a remove location to preclude accidental shock.

Type 3 – Equipment is energized. Live circuits are exposed and accidental contact is possible. Potential exposures are less than 30Vrms, 42.2 Vpeak, 240 volt-amps, and 20 Joules.

Type 4 – Equipment is energized. Live circuits are exposed and accidental contact is possible. Voltage potentials are greater than 30Vrms, 42.2 Vpeak, 240 volt-amps, 20 Joules, or radio frequency (rf) is present.

Type 5 – Equipment is energized and measurements and adjustments require physical entry into the equipment, or equipment configuration will not allow the use of clamp-on probes.

All electrical tasks described in this manual are Type 4 or less. The Type 4 assignment is required because of the presence of power levels greater than 240 volt-amps associated with the batteries. The batteries cannot be turned off and personnel will be exposed to them when they lockout DC power and/or change the batteries. The presence of the energy from the batteries could result in an accidental electrical short circuit resulting in hazardous arcs or flashes. Arcs and flashes may create high intensity flashes of bright light and discharge sparks or molten material that could injure personnel and/or damage equipment.

Lockout Instructions

The system has two power circuits, AC and DC. To properly achieve a lockout condition, both of these circuits must be locked out.

AC Power

- Remove the AC plug from the power outlet.

ELECTRICAL SYSTEM

- Replace the plug into the receptacle on the side of the lift.

DC Power

- Put eye protection on (Type 4 task).
- From the back of the lift, remove the back cover to expose the battery.
- Remove the negative wire from the terminals of the battery. Be careful not to short circuit the positive and negative terminals of the battery, as this could generate hazardous arcs and flashes.

Battery Basics

A 12-volt battery is not a 12-volt battery. Twelve volts is just a nominal, convenient term used to distinguish one battery from another. A fully-charged 12-volt battery, allowed to "rest" for a few hours (or days) with no load being drawn from it (or charge going to it), will balance out its charge and measure about 12.6 volts between terminals.

When a battery reads only 12 volts under the above conditions, it's almost fully depleted. Actually, if a battery's resting voltage is only 12.0 to 12.1 it means only 20 to 25% of its useful energy remains. It's either dead or it has been deep cycled, and a battery can only be deep-cycled a limited number of times before it is indeed dead.

Batteries should be charged if the open circuit voltage drops below 12.4 volts.

Twelve volt batteries supply useful energy only through a limited range -- from over 14 volts (when fully charged) down to 10.5 volts in use/under load.

| % Charge | Lead Acid | Gel Cell |
|----------|-----------|-------------|
| 100 | 12.7-12.6 | 12.95-12.85 |
| 75 | 12.4 | 12.65 |
| 50 | 12.2 | 12.35 |
| 25 | 12.00 | 12.00 |
| 0 | 11.8 | 11.8 |

Charging the Battery

- Switch the three-position ON/OFF/CHARGE switch to the OFF position.
- Insert the AC plug on the lift into a compatible AC outlet.
- Switch the three-position ON/OFF/CHARGE switch to the CHARGE position. The Charging LED will turn on and the battery will begin to charge.
- The charge is complete when the Charge Complete LED turns on.
- In the event that the batteries do not charge following an extended charging cycle, the batteries will likely need to be replaced.

ELECTRICAL SYSTEM

Battery Specs



The batteries accompanying the lift are valve-regulated, gelled-electrolyte batteries designed to offer reliable, maintenance-free power, for renewable energy applications where frequent deep cycles are required and minimum maintenance is desirable.

- 12 volts nominal, 31.5 Ah
- Weighs 24 pounds
- Element, post = Threaded stud of “flag” terminal, forged bushing
- Charge voltage = Cycle 2.30 to 2.35; Float 2.25 to 2.30
- Gelled-Electrolyte
- Rated non-spillable by ICAO, IATA, and DOT

FAQ

I Ordered an A800 But The Load Limit Sticker Says 300 Pounds. Did I Get the Wrong Lift?

It is common for the lift to be rated at a load less than the lift model. Each lift is rated based on the load being 18" off the front of the carriage. Exceeding this distance usually requires a higher rated lift. The weight of the end-effector and stability of the lift also have to be considered.

I Turn the Lift On, But the Light Doesn't Come On. What's Wrong?

The LED may be blown or simply disconnected. Check to make sure the lift is responsive to the pendant box controls. If so, the LED is the problem and will need to be replaced.

I Turn the Lift On, I press the Up / Down Buttons and Nothing Happens. What's Wrong?

As simple as this sounds, first check to make sure the On/Off/Charge switch is actually in the on position. A green LED should light up. If not, check to make sure the leads are correctly connected to the battery. Push the up and down buttons, check to see if the relays are clicking. You should be able to audibly tell.

The Lift Vibrates and / or Makes Noises When Going Up / Down. What's Wrong?

This is likely the result of misalignment between the lift motor and the ballscrew. Check the motor couple located at the front of the lift to see if the couple is misaligned.

The Lift is Making a High Pitched Noise. Is There Something Wrong?

The noise is likely coming from the Low Voltage Indicator (LVI). This audible alarm is to alert the operator that the batteries need to be charged.

Why is the Lift Tripping the 3A AC Circuit Breaker?

When batteries are excessively low, the charger will pull more amps in an attempt to charge the batteries. This will trip the breaker. First try removing the batteries and charging them with an offline charger. You can also try replacing the circuit breaker, it may be bad. If the problem persists, the charger may be defective and will need to be replaced.

Why is the Lift Tripping the 10A Circuit Breaker?

When batteries are excessively low, the charger will pull more amps in an attempt to charge the batteries. This will trip the breaker. First try removing the batteries and charging them with an offline charger. You can also try replacing the circuit breaker, it may be bad. If the problem persists, the charger may be defective and will need to be replaced.

Why is the Lift Tripping the 25A Circuit Breaker?

In general, the 25A breaker will trip if the motor begins to draw an excessive amount of amperage. This can be for several reasons. The most common cause is that the motor brake is not releasing, thus the motor is fighting the brake. Reset the breaker and remove the back cover so that you can see the brake, which is mounted to the rear of the motor. You should be able to see the brake move slightly as you press the up or down buttons. If not, check your brake connections. If the motor is shorted or you are lifting too heavy a load the breaker will trip as well. Also check to see if the lift's carriage seems to be binding or hitting an obstacle causing extra strain on the motor.

How Long Does It Take to Recharge My Battery?

A specific time is difficult to determine because of many variables:

- Temperature
- Degree of discharge
- Charger
- Age and condition of battery

It will take about 60% of the charging time to bring a battery from 0% charged (10.5V) to 90% charged. It will take the remaining 40% of the total charging time to add the last 10% of charge to the battery. In general we recommend that a good overnight charge should be sufficient.

Will The Charger Overcharge My Battery?

No. We recommend that, when possible, you leave the lift's charger cord plugged into an outlet and the switch in the charge position until you next need the lift for use. Once the charging cycle is complete the charger switches to a constant voltage float/standby mode (trickle charge), nominally at 2.3 Volts per cell. At this voltage, the battery will not out gas so any electrolyte loss is minimal. The charge current drops exponentially to a very low level, sufficient to maintain a fully charged battery. This will actually tend to equalize charge imbalance between the battery cells over time, which can extend battery life. By leaving the charger switched on, you will actually prevent any risk of battery damage from sulphation which results from allowing a battery to remain in a discharged state.

My Charger Isn't Charging the Battery. Do I Need A New Charger?

Probably not. The chargers feature short circuit and reverse polarity shutdown, so they don't produce any output voltage unless they are actually connected to a battery. This is a safety measure to keep an operator from being shocked if they are holding the leads. If the battery is excessively discharged then the battery may not start because it can't detect that the battery is there. Try putting the battery on an offline charger until it has been charged to around 11 volts. At this time, it can be placed back in the lift and the onboard charger can take over.

F A Q

Why Won't My Battery Hold A Charge?

If the battery won't hold a charge it is likely due to a damaged battery. This usually is the result of a damaged cell resulting from the discharge of the battery. If a battery is well maintained, it will generally last 2-3 years before replacement is needed.

Preventative Maintenance

| | Schedule | Comments |
|----------------|---|---|
| Ball Screw | Lubricate the ball screw every 2 months or 500 hours of operation . | Use only Lithium or Teflon grease to lubricate the ball screw and linear guides. NO OIL . A supply of "Good Stuff" lubricant is supplied with the lift and free replacement bottles are available by contacting Alum-A-Lift. Manually apply grease up and down the screw and run the lift up and down to help spread the lubricant over the length of the screw. |
| Casters | Check the caster fastener for tightness every 2 months . | Verify that caster is not loose. Refer to tightening specifications for torque settings. |
| Limit Switches | Check limit switches every month . | While jogging the lift up or down, check to see that the limit switches stop travel or perform the intended function. Be careful not to "crash" the carriage at the extremes of travel. See the Operational/Controls System Section. |
| Battery | Charge often, at least once a week . | The charger will not over charge the battery. The battery should always be fully charged when the lift is not in use. |
| Set Screws | Check set screws in bearings, couple, and motor brake every 6 months . | Use appropriate tightening torque (see appendix) and removable grade thread locking compound. |
| Lift Cleaning | Frequently | Dirty or dusty environments may require a more frequent cleaning schedule. |
| Fasteners | Every 12 months | Inspect for damaged or loose fasteners. Tighten fasteners according to recommended torque settings. |

RECOMMENDED TORQUE SETTINGS

Alloy Steel Fasteners [in-lb]

| Size | Set Screw | SHCS | BHSCS | FHSCS |
|---------|-----------|------|-------|-------|
| #6-32 | 10 | 34 | 15 | 17 |
| #8-32 | 20 | 59 | 30 | 31 |
| #10-32 | 36 | 77 | 40 | 45 |
| 1/4-20 | 87 | 200 | 100 | 100 |
| 5/16-18 | 165 | 425 | 200 | |
| 3/8-16 | 290 | 750 | 350 | |
| 1/2-13 | 620 | 1850 | 850 | 83 |

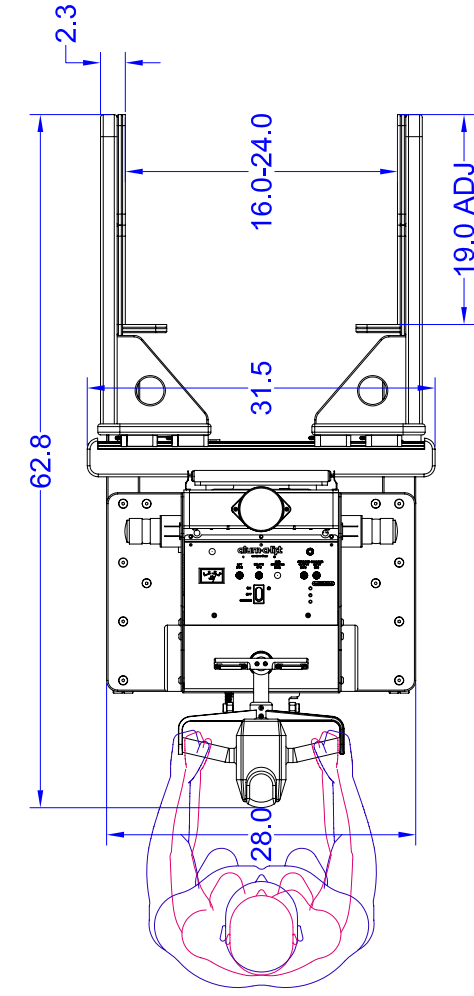
Stainless Steel Fasteners [in-lb]

| Size | Set Screw | SHCS | BHSCS | FHSCS |
|---------|-----------|------|-------|-------|
| #6-32 | 7 | 15 | 11 | 11 |
| #8-32 | 16 | 28 | 20 | 20 |
| #10-32 | 26 | 40 | 30 | 30 |
| 1/4-20 | 70 | 95 | 71 | 71 |
| 5/16-18 | 130 | 170 | 123 | 123 |
| 3/8-16 | 230 | 300 | 218 | 218 |
| 1/2-13 | 500 | 750 | 532 | 532 |

SHCS - Socket Head Cap Screw
 BHSCS - Ball Head Socket Cap Screw
 FHSCS - Flat Head Socket Cap Screw
 ref: Unbrako Engineering Guide, Form 5519 REV. A 20M 697
 SPS

Lift Drawings / Photos

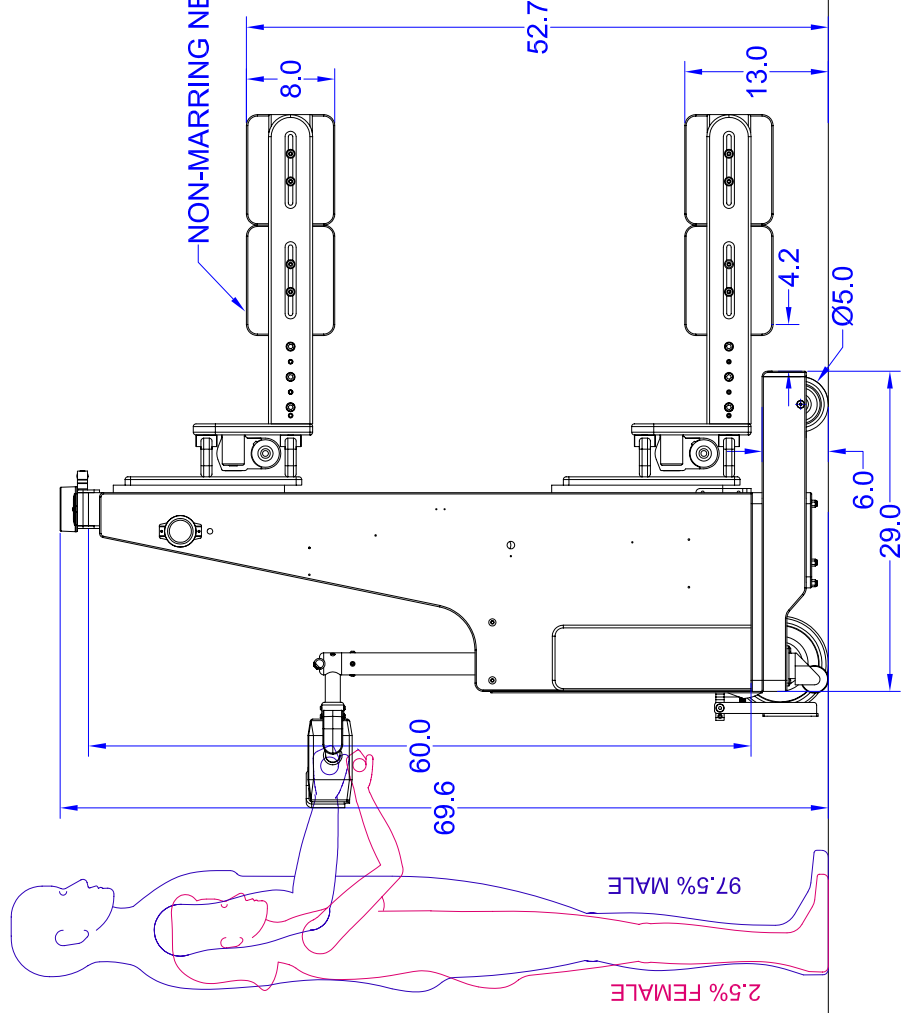
SHUTTLES +/- 2" AT 24.0" OPENING



alum-a-lift

MODEL A800CSPD-60 WITH
CASINO CLAMP
FOR HANDLING 300# SLOT MACHINES

OCTOBER 18, 2006



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Test Certification

Build Standards

Alum-A-Lifts are assessed against all available build standards in order to ensure a fully functional, yet safe and ergonomic solution to general lifting requirements. If it is desired that the lift be built to a certain specification this should be discussed during the quotation stage. Most assessments are done on a self certifying basis. Formal third part testing for each lift is available upon request.

Load Test and Tilt Test

Each lift is certified to ensure the stability and structural integrity of the lift in accordance with Machinery Directive 98/37/EC. This was done two ways. First, theoretical tilt diagrams were generated based on data collected from wire frame and solid models. Second, the theoretical data was verified through actual tilt tests when necessary.

CUSTOMER: _____ MODEL: A800CSPD-60
 FILE #: _____ S/N: _____
 DATE: _____

LIFT LOAD TEST:
 LIFT RATING (MODEL): 800 #
 TEST LOAD: 1200 #
(RATING x 1.50)
 TESTED BY: _____
 CHECKED BY (ENG): _____

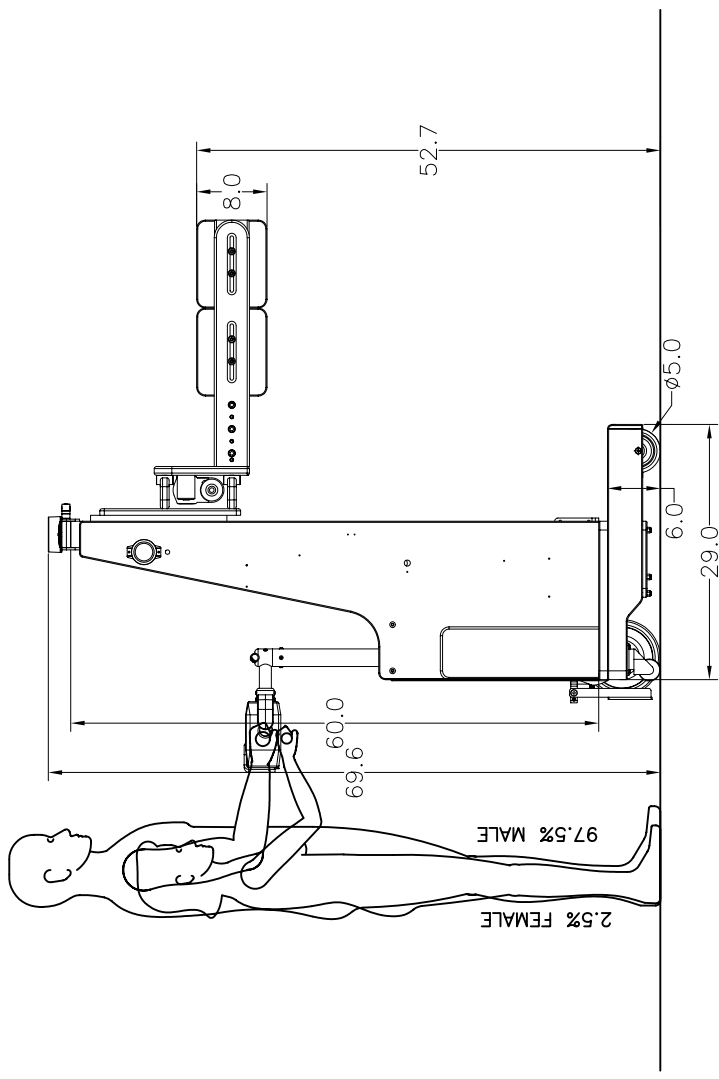
END-EFFECTOR LOAD TEST:
 NOMINAL LOAD = 300 #
 END-EFFECTOR RATING: 300 #

STATIC TESTING 375 #
(RATING x 1.25)
 TEST LIFT WITH END EFFECTOR
 UNDER LOAD CONDITIONS FOR 2 MINUTES
 OBJECT TO BE TESTED: LEAD
 TESTED BY: _____
 CHECKED BY: _____

CYCLIC TESTING 330 # @ 25 CYCLES
(RATING x 1.10)
 ONE CYCLE = PICK ROLL UP AND ROTATE
 TESTED BY: _____

10 DEGREE TILT TEST
 TESTED BY: _____ CHECKED BY: _____

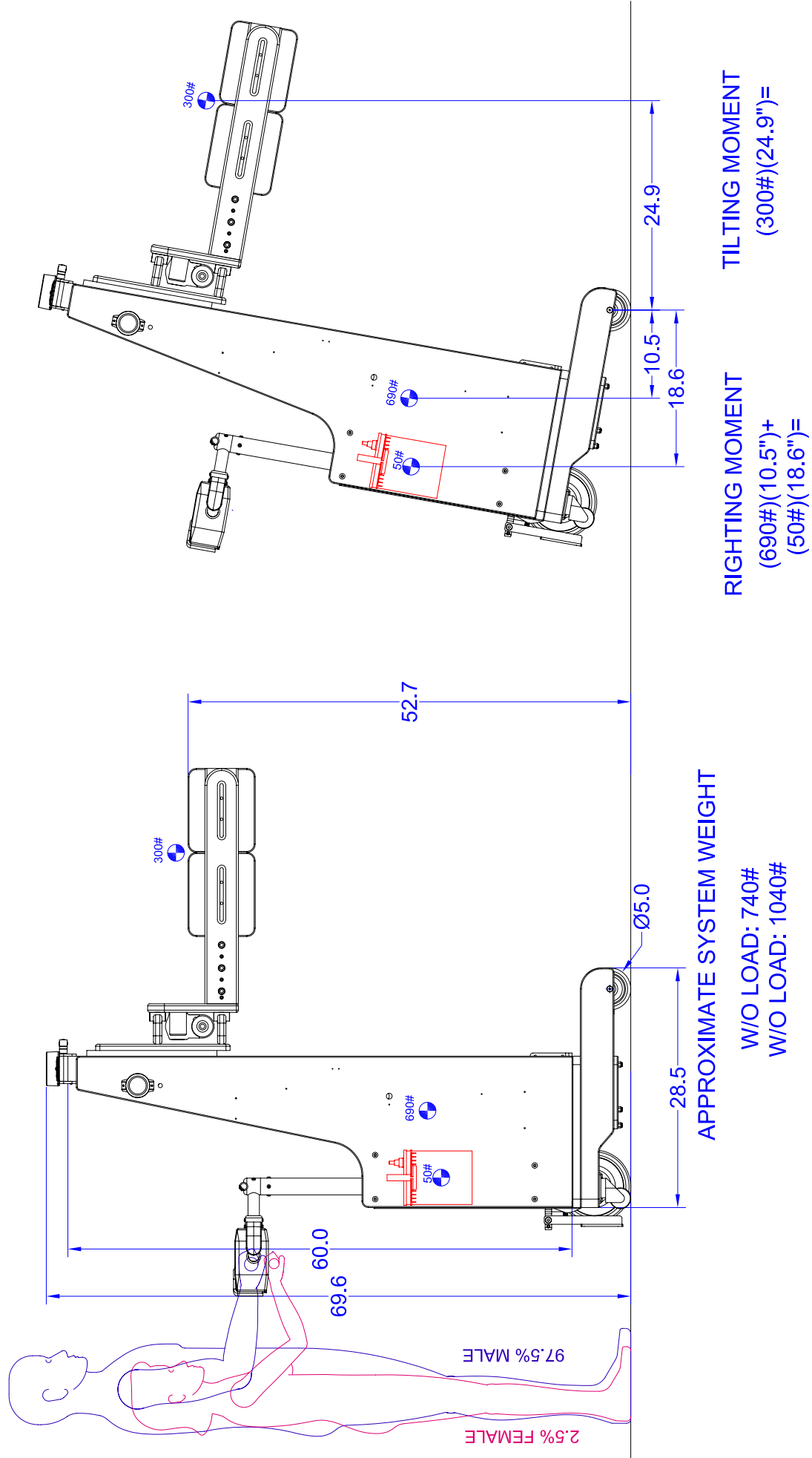
LOAD LIMIT STICKER:
 NOT TO EXCEED: 300 LBS.



PRELIMINARY LIFT STABILITY CALCULATION

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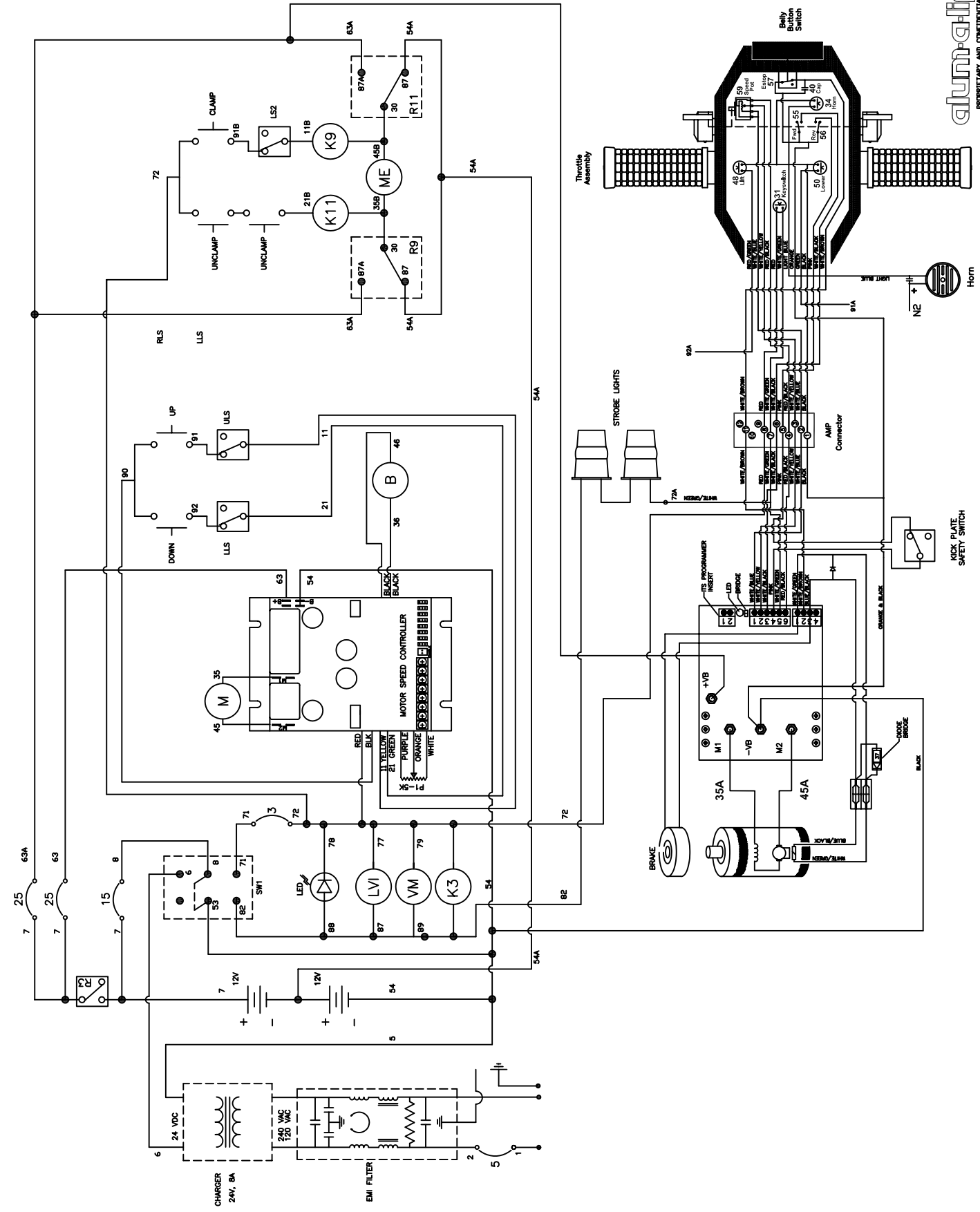
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8144" # >> 7214" #
NO COUNTER-MASS REQUIRED

Electrical Supplement

MODEL 5000 CASINO CLAMP



alumni
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