Brandt®
King Cobra Shaker

Installation, Operation and Maintenance Manual

REFERENCE	REFERENCE DESCRIPTION

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NATIONAL OILWELL VARCO

Customer Survey

Please take a few minutes to let us know your level of satisfaction with the NOV Brandt® equipment you have recently purchased. Your comments will help identify potential areas of improvement. Please send this completed form to:

NOV
Attn.: Global Marketing
2800 N. Frazier St.
Conroe, TX 77303
Phone: 936-523-2600
Fax: 936-788-7367
E-mail: brandt@nov.com

See Chapter 8, titled "Worldwide Locations" for your nearest representative.

Equipment

This survey is for the following equipment:

Type: _____

Model: _____

Serial number: _____

- ❑ Original equipment order
- ❑ Parts order

Comments on this equipment:

_____

_____

_____

Manual

Comments on the manual for this equipment:

_____

_____

_____

Purchasing experience

My purchasing experience for this equipment was:

_____

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Service experience

My service experience for this equipment was:

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General Information

This manual contains installation, operation, maintenance and parts information. Information in this manual should enable qualified personnel to install, operate and troubleshoot this system. Every effort has been made to ensure the accuracy of the information contained herein. NOV will not be held liable for errors in this material, or for consequences arising from misuse of this material.

Conventions

Notes, Cautions, and Warnings

Notes, cautions, and warnings provide readers with additional information and advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They may also inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these advisories.

Note: The note symbol indicates that additional information is provided about the current topics.

Caution: *The caution symbol indicates that potential damage to equipment or injury to personnel exists. Follow instructions explicitly. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.*

Warning: **The warning symbol indicates a definite risk of equipment damage or danger to personnel. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel, significant property loss, or significant equipment damage.**

ESD Warning: **The ESD (Electrostatic Discharge) warning symbol indicates that static control precautions are needed.**

Illustrations

Illustrations (figures) provide a graphical representation of equipment components or screen snapshots for use in identifying parts or establishing nomenclature, and may or may not be drawn to scale.

For component information specific to your application, see the technical drawings included with your documentation.

Safety Requirements

This equipment is installed and operated in a controlled drilling rig environment involving hazardous situations. Proper maintenance is important for safe and reliable operation. Procedures outlined in these manuals are the recommended methods of performing operations and maintenance.

To avoid injury to personnel or equipment damage, carefully observe requirements outlined in this section.

Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or those in the vicinity of the equipment, should be trained on rig safety, tool operation, and maintenance to ensure their safety.

Personnel should wear protective gear during installation, maintenance, and certain operations.

Recommended Tools

Service operations may require the use of tools designed specifically for the purpose described. It is recommended that only those tools specified be used when stated. Ensure that personnel and equipment safety are not jeopardized when following service procedures or using tools not specifically recommended.

General System Safety Practices

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.

Read and follow the guidelines below before installing equipment or performing maintenance to avoid endangering exposed persons or damaging equipment.

- Isolate energy sources before beginning work.
- Avoid performing maintenance or repairs while the equipment is in operation.
- Wear proper protective equipment during equipment installation, maintenance, or repair.
- Always utilize properly rated, certified lifting equipment when installing or servicing unit.
- Never energize the equipment with any guard or cover unsecured.
- Keep hands, loose clothing and hair away from equipment when in operation.
- Always observe warning signs posted on the equipment.
- If an abnormality occurs during the operation, turn off the main power immediately and check the equipment. If the problem still exists, contact your nearest representative.
- Wear hearing protection if exposed to loud equipment for an extended period of time.

Replacing Components

- Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installment.
- Replace failed or damaged components with genuine factory parts. Failure to do so could result in equipment damage or injury to personnel.

Routine Maintenance

Equipment must be maintained on a routine basis. See the service manual for maintenance recommendations.

Failure to conduct routine maintenance could result in equipment damage or injury to personnel.

Proper Use of Equipment

This equipment is designed for specific functions and applications, and should be used only for its intended purpose.

Warranty

NOV warrants that, for a period of one year from the date of delivery equipment of manufacture, the Equipment shall be free of defects in materials and workmanship under normal use and service, and provided the Equipment is used and maintained in accordance with instructions supplied. This is the sole and exclusive warranty. If a defect in the Equipment appears within one year from the date of shipment, and Purchaser has given written notice of such defect within thirty days from the discovery thereof, we will repair or replace the part, at our option, by shipping a similar part FOB shipping point or, at our option, refund an equitable portion of the purchase price. We may require the return, to a designated location, of the defective part, transportation prepaid to establish Purchaser's claim.

No allowance will be made for repairs undertaken without our written consent or approval.

This warranty applies only to equipment manufactured by NOV Brandt®. Warranties on equipment manufactured by others, if any, are assigned to Purchaser (without recourse) at time of delivery. Any description of Equipment, drawings, specifications, and any samples, models, bulletins, or similar material, used in connection with this sale are for the sole purpose of identifying the Equipment and are not to be construed as an express warranty that the Equipment will conform to such description. Any field advisory or installation support is advisory only. The foregoing warranties are in lieu of all other warranties, whether oral, written, express, implied or statutory. Implied warranties or merchantability and fitness for a particular purpose will not apply. Our warranty obligations and purchaser's remedies thereunder are solely and exclusively as stated herein. Purchaser's sole and exclusive remedy, whether based upon warranty, contract or tort, including negligence, will be to proceed under this warranty.

All liability shall terminate one year from the date of delivery of the Equipment.

Product Information

Introduction

The Role of a King Cobra™ Shaker

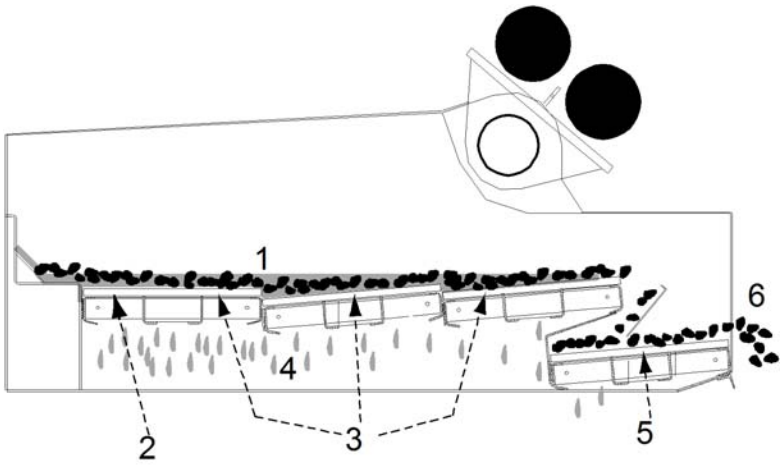
The NOV Brandt® King Cobra Shaker is a fine screen shaker with several motor/starter options producing linear, tuned elliptical or Variable G motion. The shaker is almost always located at the flow line unless it is preceded by a “scalping” or gumbo shaker. The King Cobra Shaker removes a large percentage of drill cuttings before the mud is circulated through the surface mud system leading to improved performance of downstream solids control equipment.

The King Cobra Shaker is designed to do two primary jobs:

- separate drilled solids from the mud
- transport the solids rapidly and efficiently off the screens

How the King Cobra Shaker Works

The three features key to the operation of the King Cobra Shaker are the basket and angle adjustment system, the vibrator system, and the screen retention system. These systems work with the uniquely designed shaker basket to give the highest fluid throughput and driest solids in a compact and reliable shaker.



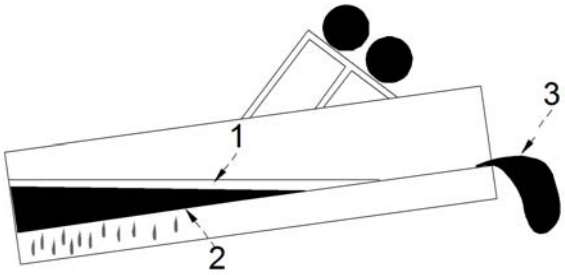
1 Liquid pool
2 Fine screen decks
3 Primary screening surfaces
4 Screened fluid
5 Drying screen
6 Discharged solids

Figure 2-1. King Cobra Shaker under normal operating conditions

King Cobra Basket and Pivot System

The basket’s patented screen configuration is a major advance over previously available shakers. During normal operation, with the basket in the neutral position, the first screen is evenly flooded with 1 to 2 in. (25 to 51 mm) of mud. The pool of mud creates an even hydrostatic head on the screen surface that increases the amount of mud that can pass through the first three screens. (See Figure 2-1.)

In traditional shakers, with all screens in the same plane, the operator must raise the basket to create a liquid pool. The resulting pool is wedge shaped and can cause a slow-moving solids bed to form. (See Figure 2-2.) The material in the slow-moving solids bed is very slow to convey and is ground into fine solids, which negatively affects the mud system. Screen life is also jeopardized due to slow-moving solids bed formation. Because the first screen of the King Cobra Shaker is flooded more evenly and shallowly, a slow-moving solids bed does not form, thus increasing screen life and optimizing shaker performance.



1 Liquid pool
2 Slow-moving solids bed
3 Discharged solids

Figure 2-2. Typical linear shaker angled upward showing a slow-moving solids bed

The design of the King Cobra basket also includes a drying screen. During normal operation, the liquid pool extends to the end of the third screen and the fourth screen is used to remove all excess liquid from the screened particles (dry the cuttings). During flow surges or changes in flow conditions, liquid can run off the end of the third screen and onto the fourth screen. Fluid on the fourth screen flows back to the baffle plate and builds up a second pool, preventing the loss of any whole mud off the end of the shaker. (See Figure 2-3.)

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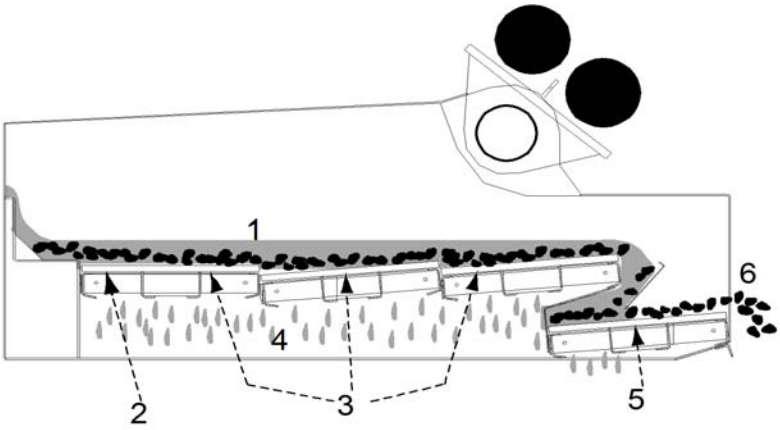


1 Liquid pool
2 Fine screen decks
3 Primary screening surfaces
4 Screened fluid
5 Drying screen
6 Discharged solids

Figure 2-3. King Cobra Shaker under upset operating conditions

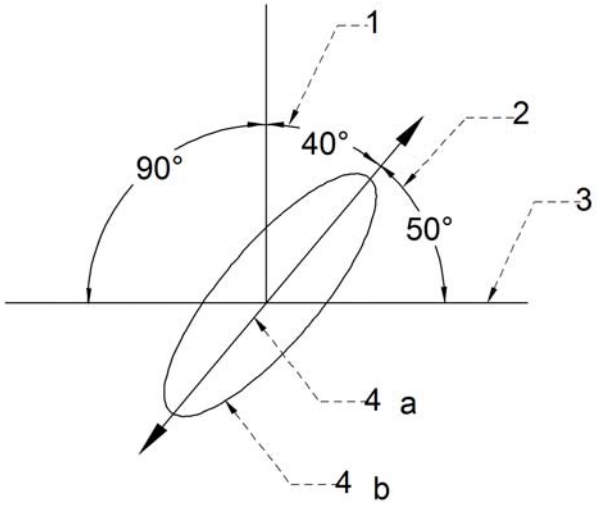
The King Cobra Shaker has a manually operated basket angle adjustment system. The angle adjustment system allows the basket to be tilted upward by as much as 3° and downward by as much as 5°. During unusually heavy flow conditions the basket can be pivoted upward to increase the depth of the pool. This deeper pool allows the shaker to handle the unusual flow conditions without a loss of whole mud off the end of the shaker.

Sticky clays and gumbo often do not convey upward and may not convey horizontally with a linear motion shaker. When sticky clays or gumbo are encountered, the basket can be tilted downward to make sure that the material conveys. The operator can adjust the basket angle while the unit is running by using the hand wheels located on each side of the basket. An angle adjustment plate and safety pendant near the back of the basket show the basket angle and take the load off the jacking system during normal operating conditions.

Vibrator System

The vibrator system includes the two canister type vibrator motors, a motor mounting motion tube and a plate. Each vibrator motor contains eccentric weights that generate a circular shaking force when rotated. During operation the two motors rotate in opposite directions, creating either a net linear or a net elliptical shaking force on the basket. This shaking force is directed through the center of mass of the basket, resulting in equal motion along the entire length of the screening surface. The motion conveys the solids along the screen, even upward, and off the discharge end of the shaker. The basket motion has been carefully designed to give the unit optimum performance over a wide range of drilling conditions.

The angle of the basket's vibratory motion relative to a line perpendicular to the screen surface is called the angle of attack (conveyance angle). The angle of the basket's motion relative to a line parallel to the screen surface is called the conductance angle. The King Cobra Shaker uses a 40° conveyance angle and a 50° conductance angle. See Figure 2-4 for a diagram of these angles.



1 Conveyance angle
2 Conductance angle
3 Screen
4 a Vibrator action line (linear)
b Vibrator action line (elliptical)

Figure 2-4. Motion diagram

Electrical Options

The King Cobra Shaker has several electrical options available for standard voltages and frequencies. These options can be grouped into three catagories:

- Standard electrical option
- Dual Motion electrical option
- Variable G electrical option

Standard Electrical Option

The standard King Cobra Shaker electrical system just has a START and STOP button on the front of an electrical enclosure.

Dual Motion Electrical Option

The Dual Motion electrical option has a selector switch to change from linear to tuned elliptical motion. You may find that switching from linear motion to tuned elliptical motion results in improved conveyance of sticky clays and gumbo.

Variable G Electrical Option

The Variable G electrical option has a selector switch that gives the operator three choices when operating the shaker:

- NORM 90 % = 6.1 g (60 Hz)
- HIGH 100 % = 6.7 g (63 Hz)
- MAX 110 % = 7.3 g (66 Hz)

Each setting changes the frequency at which the motor operates, changing the g-force generated on the basket. When drilling the top hole section with fast penetration rates (maximum screen loading), the MAX setting should be selected to efficiently remove solids from the drilling fluid. In the intermediate hole section, the HIGH setting should be employed, while in the slow drilling, the NORM setting should be utilized.

When sticky clays or gumbo are encountered, a higher setting can be used to make sure that the material conveys in conjunction with the basket angle. Settings may be adjusted while the shaker is in operation, thus giving the user the flexibility to adapt to changing drilling conditions.

A VFD (Variable Frequency Drive) is used to change the g-force and is programmed at the factory. If it becomes necessary to reset the parameters in the VFD, see the section titled "Parameters" on page 79. Special training is required to change the parameters.

Screen Retention System

The King Cobra Shaker is equipped with the screen wedge system, a simple screen hold-down mechanism. Tighten the screen wedge by using a non-sparking hammer or by prying the wedge into place. (See Figure 2-5.) The screen wedges used with pre-tensioned screens eliminates the need for a screen-tensioning system. Two different screen wedges are available; a black wedge for BHX screens and a yellow wedge for VNM screens. If both types of screen are to be used, complete sets of both wedges are required.

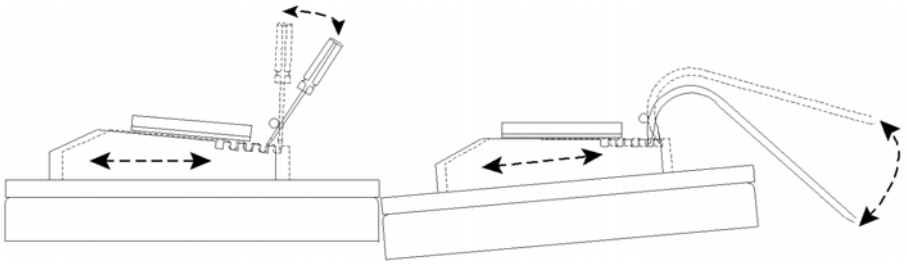


Figure 2-5. Screen wedge system

Specifications

Physical

Unit	Weight	Length	Width	Overall Height	Weir Height
King Cobra 12 in. skid	5300 lb (2404 kg)	120 1/4 in. (3054 mm)	66 3/4 in. (1695 mm)	65 5/8 in. (1667 mm)	41 3/16 in. (1046 mm)
King Cobra 8 in. skid	4400 lb (1996 kg)	120 1/4 in. (3054 mm)	66 3/4 in. (1695 mm)	61 5/8 in. (1565 mm)	37 3/16 in. (945 mm)
King Cobra Canada	4400 lb (1996 kg)	120 1/4 in. (3054 mm)	66 3/4 in. (1695 mm)	61 in. (1549 mm)	34 in. (864 mm)

Average Operating Noise Level

dB	Distance
75	3 m
80	1 m

Vibration Level (no load)

State	Motion
NORM	6.1 g
HIGH	6.7 g
MAX	7.3 g

Electrical

Motors	
Manufacturer	Italvibras
Type	Three Phase Induction Motor
Frame	70 VMX18-8300
Type	TENV
UL Rating	Class I, Groups C and D, Class II, Groups E, F, and G
ATEX Approved	Zone 1, 2, 21 and 22: II 2 G Exd IIB

Electrical options

Frequency Hz	Power hp	Speed (synchronous) rpm	Volts	Amps
60	2.50	1800	330/575/600	4.8/2.8
60	2.50	1800	220-240/440-480	7.0/3.5
50	2.50	1500	220-240/380-415	6.9/4.0
50	2.50	1500	690	2.2

Installation

Inspection

Prior to setting up and operating a new King Cobra Shaker, inspect the goods as received from the shipping company. A claim for damage or loss should be reported immediately to the carrier and to NOV. Either eight BHX screen wedges, 24 screen crown rubbers, a lubrication kit and a wedge installation/removal tool or eight VNM screen wedges, a lubrication kit and a wedge installation/ removal tool ship in a separate box located in the backtank of the unit. Check the bill of lading for any separately shipped items, including manuals and CDs.

VNM screens do not require the use of crown rubbers.

Once it is confirmed the order has been received complete in undamaged condition, installation of the King Cobra may begin.

Lifting and Handling Procedure

Shale Shaker Assembly

The King Cobra Shaker can be lifted with the use of a properly rated forklift, or by utilizing the four designated lift points on the skid. These lift points can be fitted with properly rated lifting shackles and slings in order to safely handle the unit.

Never attempt to lift a King Cobra Shaker by attaching shackles or slings to anything other than the designated lift points.

Lifting equipment needs to be rated to handle the dead weight of the shaker, 5300 lb (2404 kg), plus a safety factor. Always utilize certified lifting equipment and follow manufacturers' recommended practices.

Basket Assembly

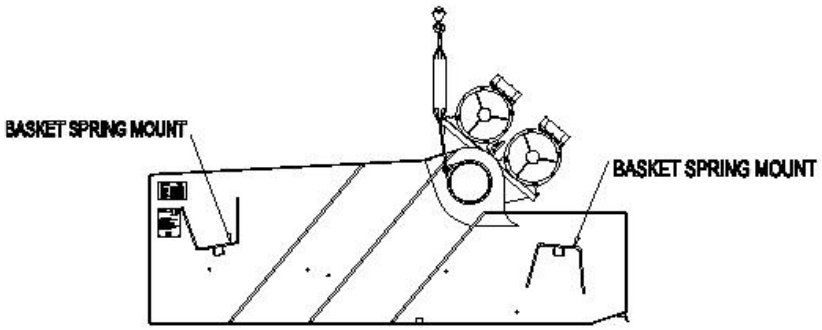


Figure 3-1. Lifting points

The King Cobra basket assembly, consisting of the basket and drive motors, can be lifted by either wrapping soft slings around the motor tube, below the motor base plate; or by connecting properly rated lifting eyebolts and slings to the four basket spring mounts.

The former method is only recommended for short, close proximity lifts in which a guide line is used to continuously control the load; for example when installing a basket into a skid or support structure. Always utilize the latter four-point method for major lifting operations.

Unit Preparation

Read these instructions carefully and completely before beginning. Failure to do so may result in personal injury or damage to the unit.

1. Remove the four shipping bolts and spacers (see Figure 3-2) and store in a safe place for reuse.

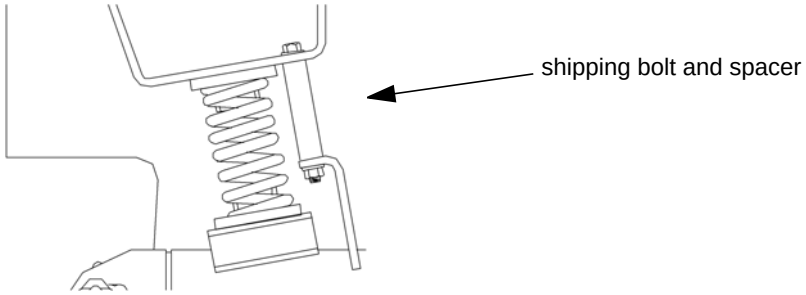


Figure 3-2. King Cobra shipping bolt and spacer

2. Position the sump discharge gate(s) on the sides of the shakers as needed for mud return to the sand trap or the degasser suction compartment or mud ditch.
3. Check that all the nuts, bolts and fasteners on the shaker are secure.
4. Check to ensure the basket incline safety pins are properly inserted and in the same setting on both sides. (See Figure 4-1 on page 21.)
5. Connect power to the starter enclosure. (See the section titled "Electrical Connections" on page 15.)
6. Install the crown rubbers. (See the section titled "To replace crown rubbers:" on page 28.)

VNM screens do not require the use of crown rubbers.

7. Install the screens. (See Figure 3-3.)

Installation

The following information provides the proper installation procedures for efficient and safe operation. Please follow the recommendations closely. As always, adequate working space, walkways and handrails should be considered.

Throughout this manual, the “back” of the King Cobra is the feed tank end and the “front” is the end where the dried solids fall off. Left and right are determined by looking at the unit from the front.

Location and Support

The King Cobra is shipped assembled on a box type skid with an integral sump and backtank. Although most of the basket vibration will not be transmitted through the coil spring and into the skid, it is recommended to skip weld or bolt the skid to the support structure on which it is placed. The support structure must be designed to support the shaker's dead weight of 5300 lb (2404 kg), plus a fluid load of 3000 lb (1361 kg) for a total of 8300 lb (3765 kg) per unit.

Ensure the skid is grounded before welding. Failure to do so can result in electrical system damage.

The operator needs access to both sides of the unit to change the screens. Allow at least 24 in. (0.6 m) of free space around the unit. Catwalks or walkways around the entire unit are very important, because they permit access to the shaker to provide proper maintenance.

Minimum access distance recommended is sufficient for maintenance and operation of the unit. User should check local regulations to ensure that additional space is not required.

Surfaces of the equipment are slippery. Use caution when working on or around to avoid falling.

Additional guidelines for locating and installing the shaker include:

- The unit(s) must be level in both directions to ensure even fluid distribution.
- Do not weld or attach discharge troughs to the vibrating basket.
- Do not install the solids slide above the bottom of the front shaker skid cutout.

Flow Line Connection

The flow line should connect near the bottom and center of the backtank. This minimizes settling of solids. "Over the top" connection of the flow line to the backtank is discouraged. If necessary, the pipe must be inserted at least two-thirds to the bottom of the backtank to prevent solids buildup. Solids buildup in the backtank results in an undesired reduction in the volume of the backtank and blockage of the dump valve. The drop or slope of the flow line should be a minimum of 1:12, or one foot (or meter) of drop for each twelve feet (or meters) of the flow line.

The preferred hookup between multiple shakers, if not utilizing an I.D.S. (Integrated Distribution System), is to use "Y" or "T" connections between the shakers. Use valves to regulate flow to each shaker. This way, one shaker can still function while repairing or changing a screen on the other shaker. For controlling flow, knife gate valves are preferred over butterfly valves.

Screen Installation

Screen installation requires minimal time or effort. However, if you do not follow these basic steps, the result may be poor screen life and solids bypassing into the active system.

1. If mud is circulating, open the backtank bypass valve or divert mud to the other shaker.
2. Wash down the screens while the shaker is running.
3. Shut down the shaker.

4. Remove the screen wedge on each side of the basket for the screen being removed. Each pre-tensioned screen on the King Cobra may be removed individually without removing the others.
5. Place the screen wedges outside the basket in a safe place so they cannot fall into the sump of the shaker or into the mud tanks.
6. Remove the screen panel.

Wash down the screen support area prior to installing a new screen.

7. Replace worn or missing screen seals, screen supports and crown rubbers. Screen seals must be replaced in pairs and crown rubbers in sets.

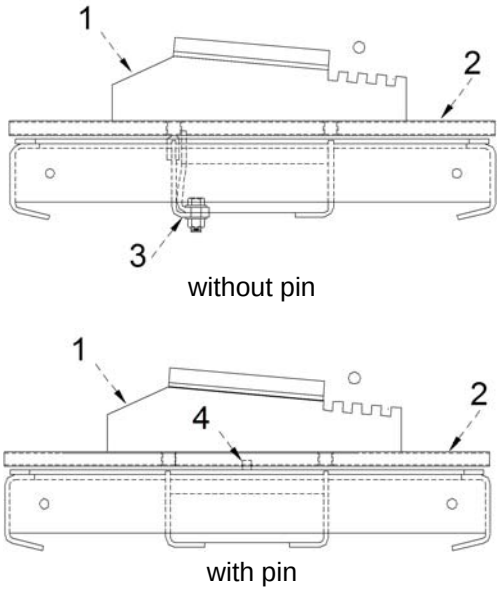
Do not operate the unit without all screen seals and crown rubbers in place. See the section titled "Replacing Seal Strips and Crown Rubbers" on page 28.

VNM screens do not require the use of crown rubbers.

8. Carefully lay in the new pre-tensioned screen panel.
9. Install the screen wedges in the designated slots on each side of the basket.
10. Check to see that the screen is straight across the basket and is engaging the retainer pins (current configuration) or is behind the retainer plate (obsolete configuration).

If your screens do not have holes to accommodate the retainer pins, contact your representative for assistance in retrofitting your screens. To locate the office nearest you, see Chapter 8, titled "Worldwide Locations".

11. Tighten the screen wedges using a non-sparking hammer or pry bar.
12. Check that the screen wedges are tightly secured.



1 Wedge
2 Screen
3 Retainer plate (obsolete)
4 Retainer pin (current)

Figure 3-3. Correct installation of screens

Electrical Options

Several electrical options available for the King Cobra Shaker are listed in the table below. The list of parts in the kits and the wiring diagrams are shown in Chapter 7.

Description	Kit P/N	Starter/Wiring diagram
380 V 50 Hz Std	99ACE	C10440
460 V 60 Hz Std	99ACD	C10441
575 V 60 Hz Std	99ACF	C10442
230 V 60 Hz Std	99AJF	C11411
460 V 60 Hz w/ J-box	99AED	C10441
460 V 60 Hz Std Elliptical motion	99GCM	C10441
690 V 50 Hz Std	99GAP	C14278
460 V 60 Hz Dual motion	99GBE	C16659
380 V 50 Hz J-box Industrial	99GBQ	60SU
460 V 60 Hz J-box Industrial	99GEJ	60SU
460 V 60 Hz Std Variable G	99GCN	C20190
380 V 50 Hz Std Variable G	99GCQ	C20190

Electrical Connections

Carefully proceed through this list to assure proper and safe operation of the unit(s). As with any electrical equipment, all electrical work should be performed by a qualified electrician.

Follow all LOCKOUT/TAGOUT procedures when making electrical connections.

1. Determine the rig voltage supplied to the unit. Ensure that the motor operating voltage matches.
2. LOCKOUT/TAGOUT power from the power supply cable that will be connected to the unit.
3. Install the power supply cable to the motor starter as indicated in the appropriate wiring diagram listed in the table above.

   Generally the procedure is to connect the incoming power to L1, L2 and L3 of the contactor and connect the incoming ground to a grounding post inside the enclosure.

   For the Variable G unit, the incoming power is connected to a fuse holder.

4. Check for proper voltage (labeled on the starter enclosure) and make sure all connections are tight. The motor junction boxes are pre-wired for the correct voltage at the factory.

Wires in the motor junction box must not be allowed to touch the inside of the junction box. Use the foam cushions supplied with the motor to protect the wires.

5. Set the two overload relays to the full load amperage listed on the motor nameplate.
6. Remove the weight covers from one side of the vibrator motors.
7. Turn on the power supply to the unit.
8. Check the motor rotation direction.
   - If the enclosure only has START and STOP buttons, proceed as follows:
     a. Bump start the motors to check motor rotation. To bump start the motors, push the START button and then quickly push the STOP button.
     b. Motors must rotate in opposite directions away from each other relative to the top of the motors. Follow the arrows on the motors. If the motors turn in the same direction, switch any two wires on one of the motors in the motor starter enclosure to reverse its direction.

Operation with both motors turning in the same direction results in very poor shaker performance.

   - If the enclosure has a selector switch for elliptical motion, proceed as follows:
     a. Turn the motion selector switch to Elliptical.
     b. Bump start the motors by pushing the START button and quickly pushing the STOP button. Make sure both weights follow the rotation arrows and the top motor is rotating toward the front (discharge) end of the shaker. If so, go to step 9.
     c. If both motors are rotating incorrectly, switch the positions of any two of the wires L1, L2 and L3. Bump start the motors again to confirm correct rotation direction and go to step 9.
     d. If one motor is rotating correctly and the other motor is rotating incorrectly, switch the positions of any two of the wires T1, T2 or T3 at the overload relay for the motor with the incorrect rotation. Bump start the motors again to confirm correct rotation direction.
   - If the enclosure has a selector switch for Variable G operation, procedeed as follows:
     a. Bump start the motors to check motor rotation. To bump start the motors, push the START button and then quickly push the STOP button.
     b. Motors may rotate in either direction but ensure that the motors turn opposite to each other or follow the arrows on the motors. If the motors turn in the same direction, switch any two wires on one of the motors in the motor starter enclosure to reverse its direction.
9. Replace the motor weight covers. Bolt down the motor junction box covers and the starter enclosure cover.
10. Start the unit and check for proper vibration.

There should not be any side-to-side motion of the basket. Check side-to-side motion by placing a thumb and forefinger on either side of the upper basket rail. The motion of the basket should cause the rail to slip between the thumb and fingers without touching the fingers.

If side-to-side motion does occur:

1. Check that the shaker is level.
2. Check that the counter weights are identical.

Storage

Store the King Cobra in a cool, dry place with the ability to test the unit for three hours once a month.

During Storage

If the King Cobra is to be stored after receipt instead of being immediately installed and operated, the following steps should be taken to ensure the unit does not degrade during storage.

When stored in a cool, dry location with adequate power:

1. Keep the shipping bolts on the shaker at all times while in storage, if movement is possible. The only exception is when the shaker is tested once a month. After the test or before shipment, replace the shipping bolts. (See Figure 3-2 on page 12.)
2. Test the operation of the shaker once a month. This requires connecting power to the shaker, removing the shipping bolts, and running the shaker for three hours.
3. Open the starter enclosure cover and spray the components with a water displacing solvent (for example, WD-40®). Allow the solvent to dry, and then close the starter cover tightly. Keep all other connections intact. Use desiccant bags in the starter and junction box to minimize moisture buildup.
4. Replace the cable with a water-resistant material or short piece of cable if the power source cable is removed from the starter enclosure coupling. The starter enclosure must be sealed at all times. Unused cable entries should be plugged to prevent moisture buildup.

When stored outside or with inadequate power:

1. Cover the shaker with a protective tarp if possible.
2. Keep the shipping bolts on the shaker at all times while in storage.
3. Replace the cable with a water-resistant material or short piece of cable if the power source cable is removed from the starter enclosure coupling. The starter enclosure must be sealed at all times.
4. Open the starter enclosure cover and spray the components with a water displacing solvent (for example, WD-40®) once a month. Allow the solvent to dry then put the starter cover back on tightly. Keep all other connections intact. Use desiccant bags in the starter and junction box to minimize moisture buildup.

Returning to Service

Before returning the shaker to service after three or more months of storage, complete the following steps:

1. Remove the motor covers and rotate the shafts by hand.

2. Continue to rotate the motor shaft while installing 5.7 grams (4 shots from a 400 gram grease gun) of Kluber Isoflex® Topas NB52 or NB152 grease into each bearing.
3. Remove the shipping bolts and connect power to the unit.
4. Turn on the power supply to the unit.
5. Bump start the motors to check motor rotation. To bump start the motors, push the START button and then quickly push the STOP button. See the section titled "Electrical Connections" on page 15 for more information.
6. Run shaker for three hours and monitor motor bearing temperatures. At startup the motors can run hot, but after approximately three hours they should stabilize between 160^{o}F (71^{o}C) and 180^{o}F (82^{o}C).
7. Disconnect the power. Replace the motor covers and shipping bolts.

General Recommendations

- Use the same mesh screen on all four panel sections. The cut point is normally determined by the coarsest mesh screen. If a coarser mesh screen is installed for any reason, it should be installed at the discharge end.
- Use finer mesh screens, rather than coarse mesh screens, where gumbo or sticky clays are encountered. Finer mesh screens provide a much smoother and wetter surface than coarse mesh. Gumbo and clay tend to convey better on smoother wetter surfaces and using finer screens often provides an immediate solution to conveying problems.
- Experiment with the basket angle to determine the best setting because conveyance rates vary with drilling rates and hole conditions.
- Use the weir diverter plates in the backtank to balance the flow between two or more shakers hooked to a common flow line. The weir diverter plates can also be used to change the flow of the liquid onto the screen surface. Adjust the weir plates to get a less curved horseshoe to improve overall shaker performance.
- If the solids being discarded are channeling to one side of the end screen, the shaker may be out of level. Correct this situation by shimming the corners of the shaker skid until it is level.
- Close the backtank bypass valve during normal operation. After opening and closing the valve, check to make sure that the valve is fully seated. Gravel or hard cuttings may prevent the bypass valve from providing a positive seal.
- Add replacement or makeup water while drilling as required. Adding the water to the feed tank generally reduces the mud viscosity and allows more efficient screening.
- Operate the King Cobra screens wet. Running with dry screens may result in premature screen failure. Lower the basket angle or install finer mesh screens to extend the liquid pool. The end of the pool should be on the third screen.
- Do not allow substantial amounts of mud to build up inside the vibrating basket. This may affect the unit's performance. A buildup of solids on or around the motors may cause overheating.
- Check basket springs for bottoming-out. Worn or weak springs may allow the vibrating basket to fully collapse the springs under heavy mud loads. This causes unusual vibration patterns and damage to the unit. Replace springs in pairs, front or rear pair, or all four springs immediately. Slow bouncing or rocking movements on the basket may indicate spring problems.
- Inspect and replace worn or missing wear strips and crown rubbers. The wear strips provide a positive seal around the screen panel. Worn or missing seals result in solids bypassing into the active system. Worn crown rubbers reduce screen panel support, causing poor conveyance throughout.
- Wash down screens before shutting down the unit for any length of time or before storing the screens.
- Do not walk or lay tools on the screens.

Operation

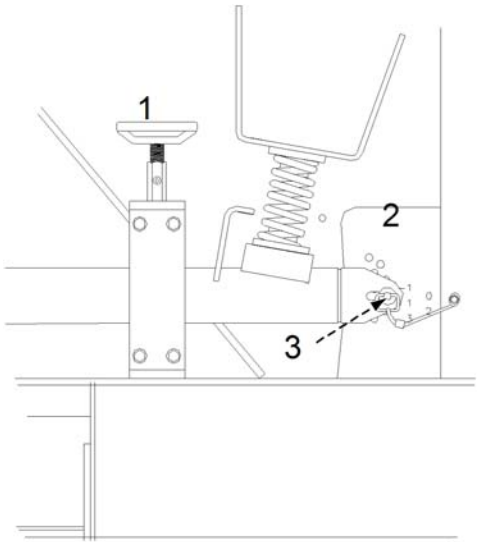
Start Up and Operation

The following sections provide instructions for normal operation. Before operating the unit(s) make sure that you performed all steps in Chapter 3, titled "Installation". The unit is factory set to provide a g-force suitable for most drilling applications. Once the unit has been installed, the only changes or adjustments that should be made are screen mesh and basket angle. Screen selection depends upon your specified drilling parameters, such as circulating volume, mud viscosity, penetration rate, etc.

Basket movement is higher during start up and shut down than under normal running conditions. Keep body parts away from basket and spring pinch points during these periods.

Basket Angle

The pivoting system is used to change the angle of the screening surfaces relative to the neutral position. The angle adjustment plates and safety pins are used to hold the shaker at the desired angle. (See Figure 4-1.)



1 Hand wheel
2 Adjustment plate
3 Safety pins

Figure 4-1. Angle adjustment plates and angle-indicating safety pins

It is not necessary to shut down the shaker before changing the basket angle.

To change the basket angle:

1. Remove the safety pins from the angle adjustment plates.

Be sure to remove the pins from both sides.

2. Use the hand wheel on one side of the King Cobra Shaker to adjust the basket angle.
3. Adjust the opposite side to the same angle.
4. Replace the safety pins when the desired screen angle has been reached. Make sure the pins are in the same hole on both sides of the shaker.
5. Tighten both hand wheels.

For normal drilling conditions the unit should be operated with the basket tilted between 2° upward and 2° downward so the end of the liquid pool is near the discharge end of the third screen. Additional upward incline can be used to handle an increased surge from bottoms up or an increased rate of penetration. Increasing the basket angle moves the end of the liquid pool toward the back of the basket, and allows the shaker to handle higher flow rates and/or produce drier cuttings. The disadvantage of running the basket steeply upward is the reduced conveyance and a thicker solids bed. A thicker solids bed causes solids to be ground into smaller pieces, wears out screens faster, and may increase the amount of fine solids returned to the active mud system.

Cuttings are generally dry enough for most applications when the end of the liquid pool is near the end of the third screen.

When gumbo or sticky clays are encountered it may be necessary to lower the basket angle to get the solids to convey properly. Although some baskets can be lowered to as much as 5° downward, running the shaker at a lower angle than necessary requires use of coarser screens to prevent excess drilling fluid loss.

Screen Blinding

If the screen's openings plug (blind) with sand, there are several methods by which the screen may be unplugged. If the screens are in the unit, rub the screens in a circular motion with a cloth rag or cloth gloves. Or, with the screen removed, you may try blowing out the solids with high-pressure air or water from the bottom.

Never use a wire or stiff fiber brush on the screens.

Changing to a finer mesh screen may cause the near size sand that is blinding the screens to be removed and discarded. Changing to a larger mesh screen may solve the blinding problem, but increases the amount of solids returned to the active system.

Often it is necessary to experiment with several mesh sizes to minimize blinding while drilling through unconsolidated sand formations. As a general rule, try finer screens first.

Salt-water muds sometimes cause calcium deposits to coat the wires in the screen. As the layer of calcium increases in thickness around the wires, the openings become plugged off. This usually results in flooding. Steam cleaning usually removes the calcium deposits.

Troubleshooting

Troubleshooting

Symptom	Probable cause	Solution
Motors start but shaker operation is very loud.	Shipping bolt(s) not removed.	Remove the shipping bolt(s).
	Motor bearing has failed. Loud squalling noise is emitted.	Replace the motor.
Motors do not start (no sound).	Power supply interrupted.	Reconnect the power.
	Power cable failure.	Repair or replace the cable.
	Overload relay has tripped.	Wait for automatic reset, then restart.
Motor does not start, but hums for a short period until the overload trips.	Motor is wired for the incorrect voltage.	Make sure the motor is wired for the correct voltage.
	Single phasing.	Make sure all three phases are at full voltage.
Motors run but trip off.	Overload relay has tripped the contactor.	Make sure both overload relays are set to the same amperage as listed on motor nameplate.
		Check for an overload condition.
	Incorrect motor rotation.	Make sure both motors are running and running in opposite directions.
Only one motor running.	Power cable failure.	Repair or replace the cable.
	Motor failure.	Replace the motor.

Variable G Electrical Option

Refer to the Yaskawa VFD manual for troubleshooting the VFD.

If the shaker stops during operations and there is a fault in the drive, press the RESET button and resume operations.

If there is not a fault in the drive and the shaker does not start, check the overload relays. Make sure the current setting on each overload relay matches the full load amps on the motor nameplate.

Check if the grounding wires are all connected to the same grounding stud.

If there is no power applied to the VFD, check the incoming power to the fuses and the output of the fuses.

Maintenance & Repair

Maintenance

The King Cobra Shaker requires very little maintenance. However, there are several maintenance checks that, if done on a regular basis, provide extended service and performance.

Lubrication

Motor

Lubricate each bearing on the motors once every operating month (750 hours) per the following instructions. Use only Kluber Isoflex® Topas NB52 grease (P/N 46AS) for operation in cold ambient temperatures of -20°F to +50°F (-29°C to +10°C). You may use either NB52 or NB152 for ambient temperatures of 50°F to 100°F (10°C to 38°C). For hot ambient temperatures above 100°F (38°C), you must use Isoflex Topas NB152 grease (P/N 46AY).

Using any grease other than Kluber Isoflex® Topas will void the motor warranty.
Do not mix Isoflex grease with any other grease.

1. Clean the vibrator case around the grease plug with a clean shop towel.
2. Remove the grease plug from the vibrator housing.
3. Install 1/8 in. NPT grease fitting (P/N 33B) into the vibrator housing. Always use a new grease fitting. Even small amounts of another grease may cause a negative reaction with the Isoflex grease.
4. Install 5.7 grams (0.2 oz) of grease with a grease gun into each grease fitting. 5.7 grams equals 4 shots from a 400 gram grease gun.
5. Replace the grease fitting with the grease plug.

Do not leave the grease fitting(s) in the vibrator housing.

6. Do not lubricate for another operating month. Too much grease will ruin the motor and void the warranty.

If the motor has been running and has not been lubricated for more than three months, put 20 shots in each bearing and then four additional shots each month per the above instructions.

Basket Angle Adjustment Wheels and Bypass Valve

Grease threads once per week with any lithium or lithium complex grease.

Ordering Lubrication Kits

Follow the guidelines below to ensure that you order the proper lubrication kit.

Plastic laminated lubrication instructions are available free of charge for attachment to each shaker. Request drawing PI7208.

For Normal Temperature Conditions

Lubrication kit P/N 7221
Two 1/8 in. NPT grease fittings P/N 33B.
One 400 gram tube of Isoflex Topas grease P/N 46AS. (One tube can lubricate 35 motors.)
One set of lubrication instructions PI7208.
One grease gun P/N 46AU. (4 shots equals 5.7 grams / bearing.)

For High Ambient Temperature Conditions

Lubrication kit P/N 7221H
Two 1/8 in. NPT grease fittings P/N 33B.
One 400 gram tube of Isoflex Topas grease P/N 46AY. (One tube can lubricate 35 motors.)
One set of lubrication instructions PI7208.
One grease gun P/N 46AU. (4 shots equals 5.7 grams / bearing.)

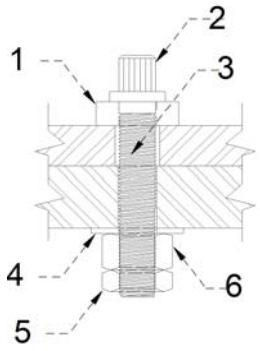
Maintenance Checks

Component	Tasks	Frequency
Screen wedge(s)	Check to make sure all eight are in good condition.	During Screen Change
Bypass valve	Check after opening and closing for a positive seal. Gravel or hard cuttings lodged in the valve seat area may prevent a positive seal and allow mud bypassing.	After Every Operation
Basket angle indicating safety pins	Pins should be inserted in proper holes on each side to provide a level basket. Tighten the handwheels against the pins to prevent rattling.	During Basket Angle Adjustment
Skid compartment	Clean out any solids buildup that may cause the vibrating basket to bottom out or interfere with screening.	Weekly
Screens	Check for torn screens. Repair or replace if necessary.	Every 4 hours
Screen cushions and seals	Check crown rubbers and flat seals for damage or wear. Replace as needed.	Monthly
Nuts, bolts, fasteners	Ensure all nuts, bolts, and lock washers are in place and tight, particularly on the motors.	Monthly
General operation	Listen for any loud or unusual noise particularly bearing squeal or any metal-to-metal contact. The basket should run quietly.	Daily

Repair

Replacing a Motor

If your bolt configuration does not match the design in Figure 6-1, see section titled "Alternate Bolt Configurations" on page 80.



		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4 10UNC x 4 1/2″	22BCJ
3	LOCTITE Product 243 (heavy coat)	18N
4	Washer	36AR
5	Heavy hex jam nut	35EA
6	Heavy hex nut, torqued to 275 ft-lb (373 N.m)	35FJ

Figure 6-1. Standard bolt design

To replace a motor:

1. Turn off and LOCKOUT/TAGOUT the power supply.
2. Disconnect the electrical wiring from the motor to be replaced.
3. Use a sling or cable through the motor lifting eyes to support the weight of the motor before the mounting nuts or bolts are loosened.
4. Remove the six motor mount bolts and heavy washers.
5. Remove the motor from the motor mount plate.
6. Remove all rust from the mounting plate.
7. Note the location of the motor junction box cable through-hole before picking up the replacement motor.
8. Mount the motor on the motor mount plate, bottom motor – hole up; top motor – hole down.

The Elliptical and Dual Motion units use two different motors. Make sure the correct motor is installed in the correct location as listed on the electrical drawing for the unit.

9. Use the new bolts provided and the existing thick washers to attach the new motor. Coat the threads on the new bolts with Loctite Product 243. Torque the bolts to 275 ft-lb (373 N.m) tightening the center bolts first.

Never re-use old bolts.

10. Wait at least 30 minutes after applying the Loctite and torquing the bolts before operating the shaker.

If the bolts are tightened or loosened after the Loctite has dried, the bolts must be removed, cleaned, re-applied with Loctite and re-torqued.

11. Reconnect the electrical wiring to the motor.
12. Remove both weight covers from both motors. Check that all the counterweights are marked the same (ex: 60 Hz, 90 %).
13. Bump start the motors to check motor rotation. To bump start the motors, push the START button and then quickly push the STOP button. See the section titled "Electrical Connections" on page 15 for more information.
14. Reinstall the motor weight covers.
15. Return the shaker to service.

Replacing Seal Strips and Crown Rubbers

To replace long wear strips:

1. Remove the old fasteners with a screwdriver and back-up wrench and remove the seal.
2. Clean all mating surfaces thoroughly.
3. New seals should be formed prior to installation. When received from the factory, they are straight, but should be bent upward at each bolt hole.
4. Tighten the seal from the center outward, alternating from side to side. Overtightening the seal causes deformation and forms a gap between the frame and the seal, which can lead to screw installation problems or leakage.

To replace side pinned wear strips and side wear strip (obsolete):

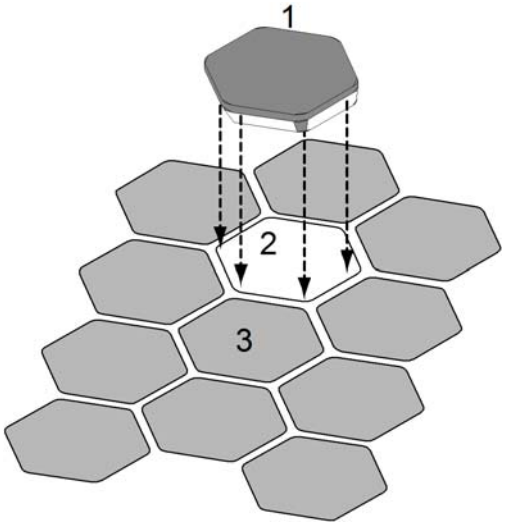
1. Remove the hardware and seal.
2. Clean all mating surfaces thoroughly.
3. Insert the new short wear strips with new fasteners, but do not tighten. Note that the pin is located off center. The clean strip must be mounted with the pin closest to the basket wall.
4. An alignment pin tool (P/N 13182) is required to set the pin spacing.
5. Place the alignment tool over the pins on both wear strips with the butt of the extended end against the basket wall. The other end does not touch the basket wall.
6. With the alignment tool still in place, tighten the hardware on one strip and then the other. The alignment tool may then be removed.
7. Proper installation of the screens is now possible.

To replace crown rubbers:

1. Remove the crown rubbers.
2. Clean the metal support thoroughly.
3. Replace with new crown rubbers.

Repairing or Patching Screens

You can extend the life of your shaker screens and save money by patching torn panels.



1 Rubber hex plug
2 Damaged hex opening (with mesh removed)
3 Intact hex openings

Figure 6-2. Screen repair

To repair a BHX™ or VNM panel using a screen plug:

1. Stop flow to the shaker basket with the torn screen using the bypass valve or shut-off valve.
2. Wash the screens.
3. Turn off the shaker.
4. Cut out all the wire mesh remaining in the hex opening.
5. Insert the rubber hex plug.
6. Check the screen wedges for tightness.
7. Start the shaker.
8. Return flow to the shaker.

To repair a BHX™ or VNM panel using silicone, epoxy, or liquid steel:

1. Stop flow to the shaker basket with the torn screen using the bypass valve or shut-off valve.
2. Wash the screens.
3. Turn off the shaker.
4. Dry off the screen as much as possible. The backing cloth must not be torn.
5. Apply a thick layer of the repair material to the torn panel and work into the backing cloth.

Do not use silicone with diesel-based mud.

6. Allow to dry for at least 30 minutes.
7. Check the screen wedges for tightness.
8. Start the shaker.
9. Return flow to the shaker.

Parts and Drawings

Recommended Spare Parts

The following table lists the spare parts recommended for the King Cobra Shaker operating under typical conditions. Contact your nearest representative for spare parts for other conditions.

1 year	2 years	Description	Part #
1	2	Screen wedge kit BHX	99AHP
8	16	Screen wedge VNM	26EZV
0	8	Spring spool	LF3C10426
16	48	Long wear strip	9745
8	24	Hi-temp long wear strip	17085-1
0	8	Short wear strip	
		Side pinned wear strip	13178
		Side wear strip (obsolete)	9800
24	72	Screen cushion crown rubber red	26CL
		Screen cushion crown rubber yellow	26CK
		Hi-temp screen cushion crown rubber	26FI
2	4	Lock pin assembly	LM3S00103
5	10	Cable clamp	01-1902
1	1	Shroud electrical	01-1903
1	1	Gland electrical BICC	01-1904
0	1	Overload relay option	
		Overload relay for 380V, 460 V and 575 V	24XP
		Overload relay for 230 V	24QR
0	1	Linear Vibra motor option	
		60 Hz 230/460 V	01-2054-KC
		50 Hz 220/380 V	01-2054-1KC
		60 Hz 575 V	01-2054-2KC
		Tuned elliptical motor option	
		60 Hz 230/460 V 110 %	1WU-KC
		60 Hz 460 V 80 %	1WV-KC
		50 Hz 220/380 V 110 %	1XC-KC
		50 Hz 220/380 V 80 %	1XD-KC
0	1	Jack screw subassembly	9738
0	1	Bypass valve subassembly	9719
50	100	Screen plugs	11EU
3	6	Fuse ATMR10 (Variable G only)	60AAI

VNM screens do not require the use of crown rubbers.

Electrical Kits

99ACE 380 V 50 Hz Std

Qty.	Description	Part #
2	Motor Vibra. 220-240/380-415 V, 50 Hz	01-2054-1
1	Starter Encl 380 V 50 Hz 4-6 FLA	10440
1	Plug EL .750 NPT Recessed Head Plg2	01-1354

99ACD 460 V 60 Hz Std

Qty.	Description	Part #
2	Motor Vibra. 220-240/440-480 V 60 Hz EXP	01-2054
1	Starter Assy 460 V 60 Hz 2.4-4 FLA	10441
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99ACF 575 V 60 Hz Std

Qty.	Description	Part #
2	Motor Vibra. 575/600 V 60 Hz	01-2054-2
1	Starter Encl 575/600 V 60 Hz 4-6 FLA	10442
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99AJF 230 V 60 Hz Std

Qty.	Description	Part #
2	Motor Vibra. 220-240/380-415 V, 50 Hz	01-2054
1	Starter Encl 230 V 60 Hz 6-10 FLA	11411
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99AED 460 V 60 Hz w/ J-box

Qty.	Description	Part #
2	Motor Vibra. 220-240/440-480 V 60 Hz EXP	01-2054
1	Starter Assy 460 V 60 Hz 2.4-4 FLA	10441
1	Enclosure NEMA 4 P/N:Adalet XCE-060804	2CH
5	Plug SQ HD .750 NPT	42AD
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99GCM 460 V 60 Hz Std Elliptical motion

Qty.	Description	Part #
1	Motor Vibra. 220-240/440-480 V	1UX
1	Motor Vibra. 220-240/440-480 V 60 Hz 70 FR	1ZW
1	Starter ASSY 460 V 60 Hz 2.4-4 FLA	10441
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99GAP 690 V 50 Hz Std

Qty.	Description	Part #
2	Motor Vibra. 690 V 50 Hz	1WJ
1	Starter ENCL 690 V 50 Hz	14278
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99GBE 460 V 60 Hz Dual motion

Qty.	Description	Part #
1	Motor Vibra VMX 18-8300 110/90 70 FRAME	1WU
1	Motor Vibra VMX 18-8300 90/80 70 FRAME	1WV
1	Starter ENCL Reversing FOR 2-2.5 hp MTRS	16659
1	Plug EL .750 NPT Recessed Head PLG2	01-1354

99GBQ 380 V 50 Hz J-box Industrial

Qty.	Description	Part #
2	Motor Vibra. 220-240/380-415 V, 50 Hz	01-2054-1
2	Adaptor ELECT M20 Male X .750 FNPT	60HW
1	Enclosure 250MM X 255MM X 120MM ABT-9373	60SU
2	Plug 20MM SKT HD Brass Flameproof	42AH
2	Plug EL .750 NPT Recessed Head PLG2	01-1354

99GEJ 460 V 60 Hz J-box Industrial

Qty.	Description	Part #
2	Motor Vibra. 220-240/440-480 V 60 Hz EXP	01-2054
2	Adaptor ELECT M20 Male X .750 FNPT	60HW
1	Enclosure 250MM X 255MM X 120MM ABT-9373	60SU
2	Plug 20MM SKT HD Brass Flameproof	42AH
2	Plug EL .750 NPT Recessed Head PLG2	01-1354

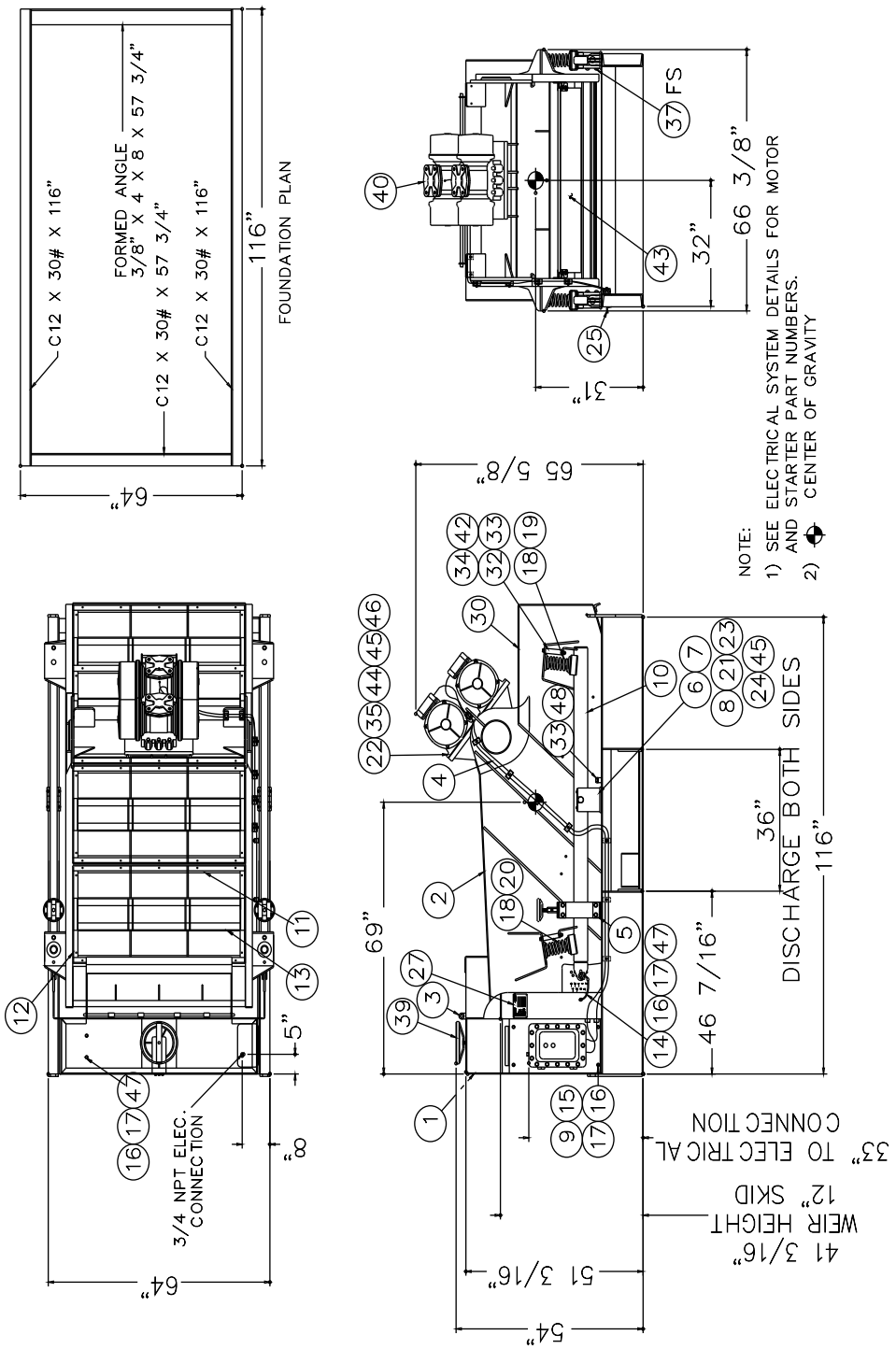
99GCN 460 V 60 Hz Std Variable G

Qty.	Description	Part #
2	Motor VIBRA. 220-240/440-480 V 60 Hz EXP	01-2054
1	Starter ENCL W/VFD F/KC Shaker Linear	20190

99GCQ 380 V 50 Hz Std Variable G

Qty.	Description	Part #
2	Motor VIBRA. 220-240/380-415 V, 50 Hz	01-2054-1
1	Starter ENCL W/VFD F/KC Shaker Linear	20190

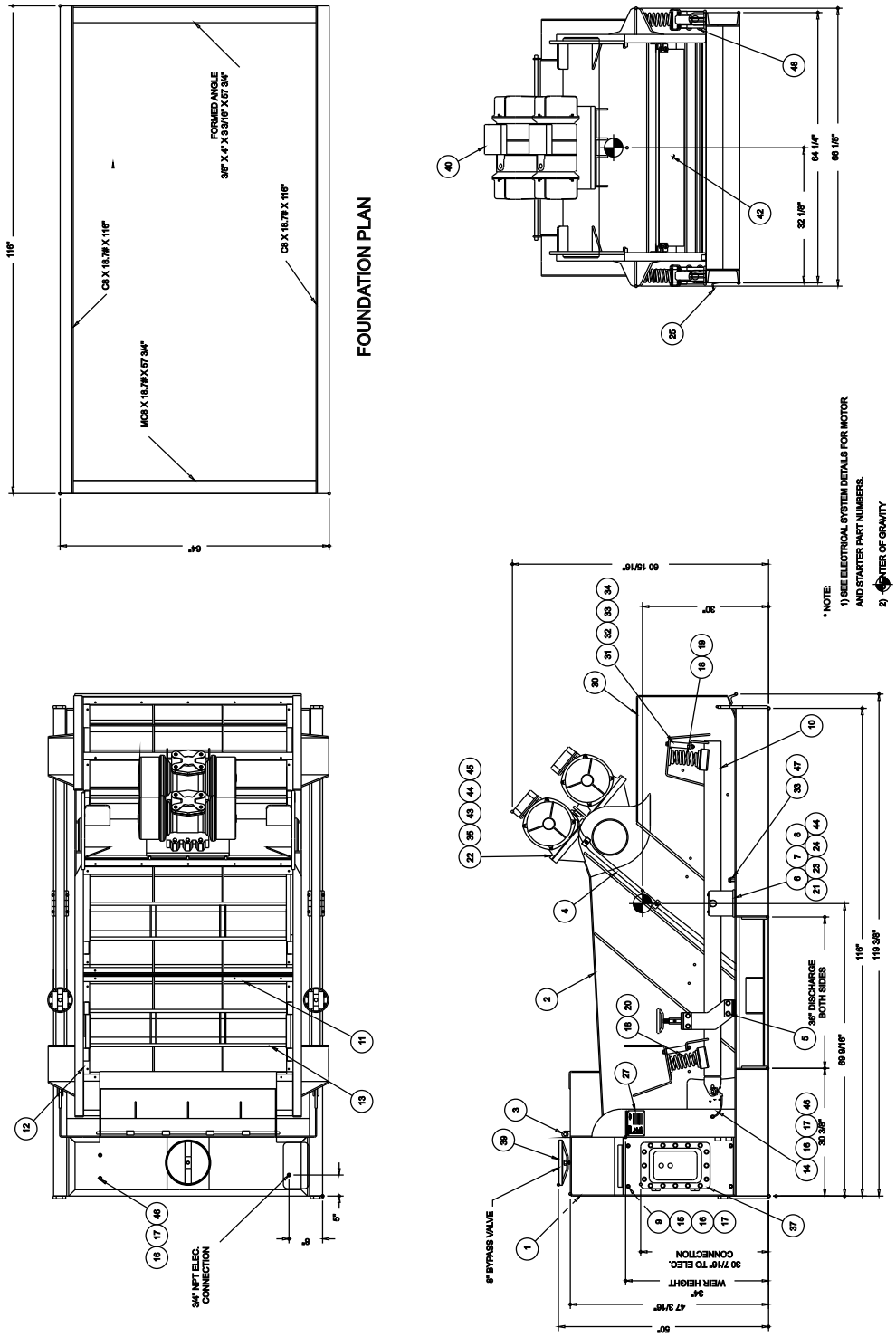
King Cobra Assembly A10995 rev. 14



Parts List for A10995

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SKID & BACKTANK WELDMENT 12"	10971
		SKID & BACKTANK WELDMENT 8"	11534
2	1	BASKET WELDMENT	10966
3	1	WEIR GATE SUB-ASSEMBLY	9714
4	1	ELECTRICAL SYSTEM LEFT HAND	11095
	1	ELECTRICAL SYSTEM RIGHT HAND	11094
5	2	JACK SUB-ASSEMBLY	9738
6	2	PIVOT STAND	9862
7	4	PIVOT STAND PLATE	9483-4
8	8	HHCS 3/8" 16UNC X 3/4"	22JN
9	1	STARTER PLATE	9490-7
10	2	ROCKERARM WELDMENT	10972
11	8	LONG WEAR STRIP	9745
12		SIDE WEAR STRIP (OLD)	9800
	8	SIDE PINNED WEAR STRIP (NEW)	13178
13	1	WEDGE/CROWN RUBBER OPTION	-
14	2	SAFTEY PENDANT	LM3S00103
15	4	HHCS 3/8" 16UNC X 1 1/2"	22PY
16	16	WASHER FLAT 3/8"	36BL
17	8	NUT HEX LOCK 3/8"	35CD
18	8	SPOOL SPRING	LF3C10426
19	2	FRONT SPRING	LF3B00936
20	2	REAR SPRING	LM3B13614
21	4	HHCS 3/4" 10UNC X 3"	22NC
22	12	SCREW 3/4-10 UNC X 4 1/2" XYLAN	22BCJ
23	4	WASHER BEVEL 3/4"	36AD
24	4	NUT HEX LOCK 3/4"	35AV
25	1	DISCHARGE GATE	9445-9
26	-	-	-
27	1	NAME PLATE	63L
28	1	STICKER 24"	76CN
29	1	CHECK-OFF LIST	PI9878
30	1	SERIAL NUMBER PLATE	63I
31			
32	4	HHCS 1/2" 13UNC X 6"	22AU
33	10	WASHER FLAT 1/2"	36CG
34	4	NUT HEX LOCK 1/2" 13UNC	35CR
35	12	MOTOR MOUNTING WASHER	LC2A14014
36		SCREEN STOP PLATE (OLD)	9443-6
37	2	PLUG HEX HD 3/4" NPT	42CD
38			
39	1	BYPASS VALVE SUBASSEMBLY	9719
40	1	380V MOTOR OPTION	99ACE
		460V MOTOR OPTION	99ACD
		575V MOTOR OPTION	99ACF
41			
42	4	SHIPPING BRACKET SPACER	20AF
43	1	SOLIDS DEFLECTOR PLATE	11546
44	12	NUT HEX 3/4-10 UNC JAM NUT	35EA
45	20	WASHER FLAT 3/4"	36AR
46	12	NUT HEX 3/4-10 UNC HEAVY HEX XYLAN	35FJ
47	4	HHCS 3/8"-16 UNC X 1 1/4"	22OS
48	2	HHCS 1/2"-13 UNC X 3/4"	22NB

King Cobra Canada 8” Skid 34” Weir
A11150 rev. 11



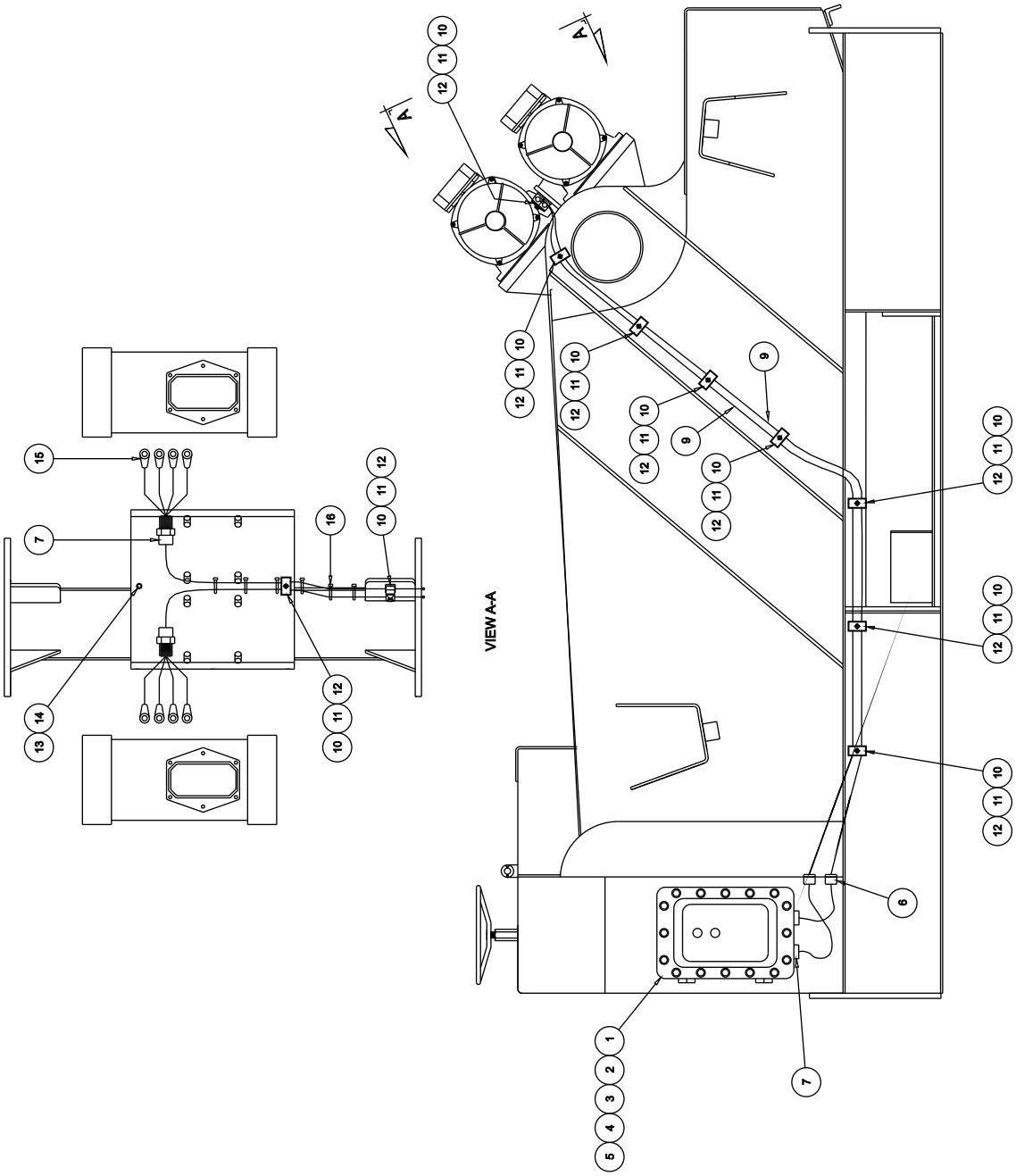
Parts List for A11150

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SKID & BACKTANK WELDMENT	11148
2	1	BASKET WELDMENT	10966
3	1	WIER GATE SUB-ASSEMBLY	11556
4	1	ELECTRICAL SYSTEM LEFT HAND	11225
	1	ELECTRICAL SYSTEM RIGHT HAND	11224
5	2	JACK SUB-ASSEMBLY	20814
6	2	PIVOT STAND	11153
7	4	PIVOT STAND PLATE	9483-4
8	8	HHCS 3/8" 16UNC X 3/4"	22JN
9	1	STARTER PLATE	9490-7
10	2	ROCKERARM WELDMENT	10972
11	8	LONG WEAR STRIP	9745
12	8	SIDE PINNED WEAR STRIP (NEW)	13178
		SIDE WEAR STRIP (OLD)	9800
13	1	WEDGE/CROWN RUBBER OPTION	-
14	2	SAFTEY PENDANT	LM3S00103
15	4	HHCS 3/8" 16UNC X 1 1/2"	22PY
16	16	WASHER FLAT 3/8"	36BL
17	8	NUT HEX LOCK 3/8"	35CD
18	8	SPOOL SPRING	LF3C10426
19	2	FRONT SPRING	LF3B00936
20	2	REAR SPRING	LM3B13614
21	2	HHCS 3/4" 10UNC X 3"	22NC
22	12	SCREW 3/4" 10UNC X 4 1/2" BLACK XYLAN	22BCJ
23	2	WASHER BEVEL 3/4"	36AD
24	2	NUT HEX LOCK 3/4"	35AV

Parts List for A11150 (Continued)

ITEM	QTY	DESCRIPTION	PART NUMBER
25	1	DISCHARGE GATE	11146-3
26	-	-	-
27	1	NAME PLATE	63L
28	1	STICKER 24"	76CN
29	1	CHECK-OFF LIST	PI9878
30	1	SERIAL NUMBER PLATE	63I
31	4	SHIPPING BRACKET SPACER	20AF
32	4	HHCS 1/2" 13UNC X 6"	22AU
33	10	WASHER FLAT 1/2"	36CG
34	4	NUT HEX LOCK 1/2" 13UNC	35CR
35	12	MOTOR MOUNT WASHER	LC2A14014
36	-	SCREEN STOP PLATE (OLD)	9443-6
37	2	PLUG HEX HD 3/4" NPT	42CD
38	-	-	-
39	1	BYPASS VALVE SUBASSEMBLY	9719
40	1	380V MOTOR OPTION	99ACE
		460V MOTOR OPTION	99ACD
		575V MOTOR OPTION	99ACF
41	-	-	-
42	1	SOLIDS DEFLECTOR PLATE	11546
43	12	NUT HEX 3/4-10 UNC JAM NUT	35EA
44	14	WASHER FLAT 3/4"	36AR
45	12	NUT HEX 3/4-10 UNC HEAVY HEX BLACK XYLAN	35FJ
46	4	HHCS 3/8-16 UNC X 1 1/4"	22OS
47	2	HHCS 1/2-13 UNC X 3/4"	22NB
48	2	PLUG 3/4" NPT	01-1354

King Cobra Left Hand Electrical System
C11095 rev. 8

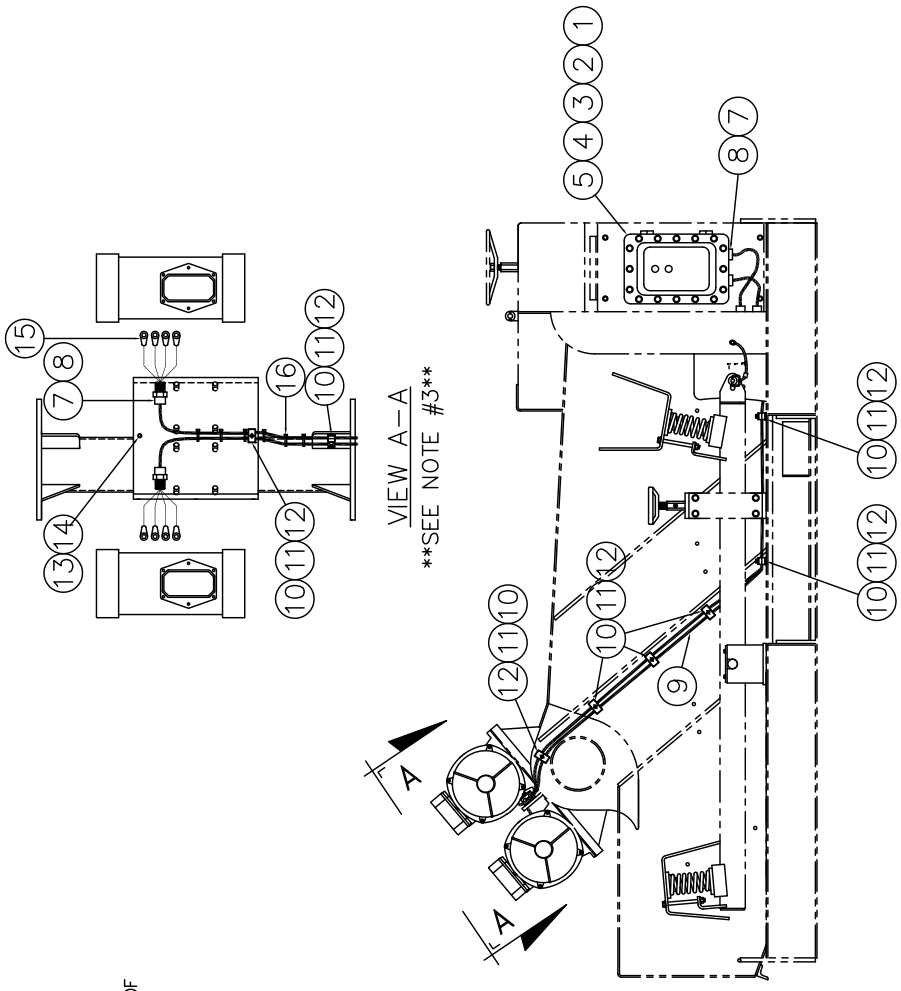


Parts List for C11095

ITEM	QTY	DESCRIPTION	PART NUMBER
1		STARTER OPTION	-
		460V 60HZ MOTOR	01-2054
		380V 50HZ MOTOR	01-2054-1
		575V 60HZ MOTOR	01-2054-2
		380V 50HZ STARTER	10440
		460V 60HZ STARTER	10441
		575V 60HZ STARTER	10442
2	1	DECAL LOCKOUT TAG OUT	76CU
3	4	HHCS 3/8 16UNC X 1 3/4 SST	220H
4	8	WASHER FLAT 3/8	36AT
5	4	NUT HEX 3/8 16UNC SST	35CD
6	2	CORD GRIP	41F
7	4	GLAND 3/4 NPT	01-1904
8	-	-	-
9	2/16 FT	CABLE 14 GAUGE 4 CONDUCTOR	01-1688
10	9	CLAMP, DUAL STAUFF, BODY	1480668
11	9	CLAMP, DUAL STAUFF, COVER	1480670
12	9	CLAMP, DUAL STAUFF, BOLT	1480671
13	1	WASHER FLAT 1/4" SST	36AZ
14	1	HHCS 1/4 20UNC X 3/4	22FV
15	8	TERMINAL RING 14 GA TO 1/4"	01-2046
16	6	WIRE TIES	60HX
17			

The right hand and left hand electrical systems use the same components.

King Cobra Canada Right Hand Electrical System C11224 rev. 7



NOTES:

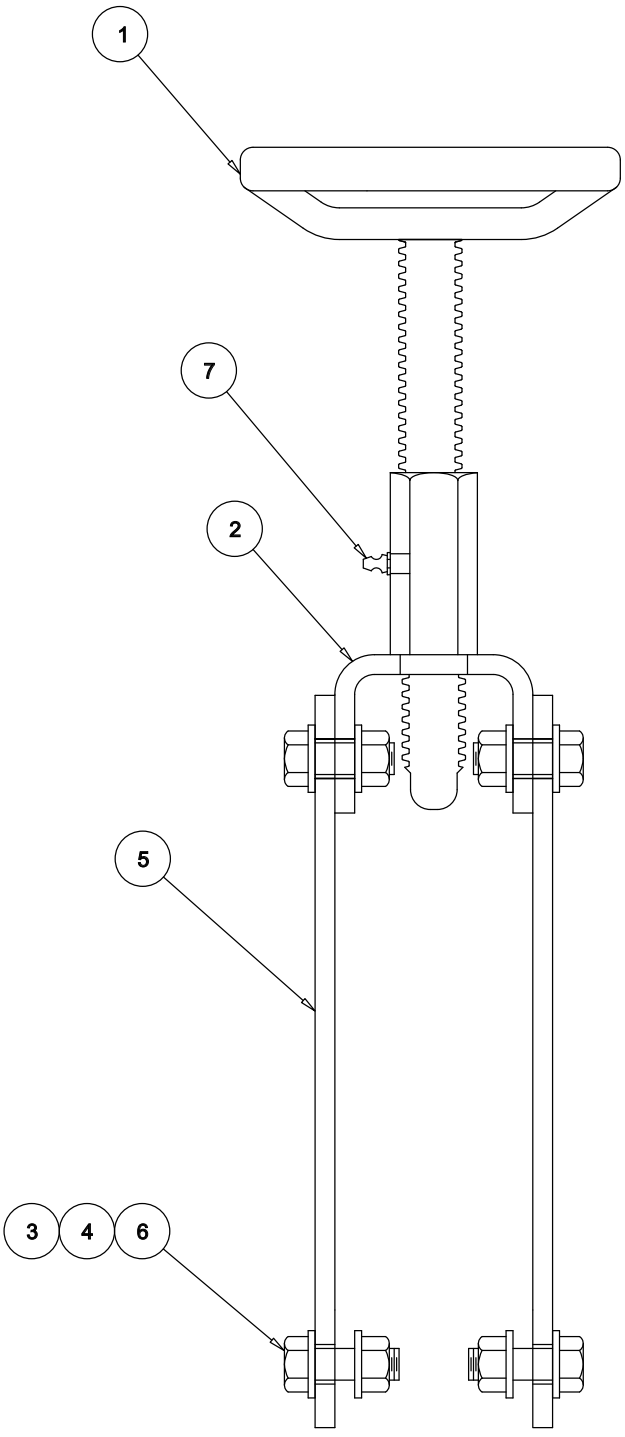
1. LEAVE APPROX. 6 1/2" OF LOOSE WIRE AT THE END OF EACH CABLE AND STRIP LAST 3/8" AND ATTACH ITEM 15.
2. LEAVE APPROX. 16" OF WIRE LOOSE ON THE END OF EACH CABLE AND STRIP 1/2".
3. CABLE ARE TO COME OUT OF BICC ON MOTOR AND GO STAIGHT TO WIRE CLIP MOUNTED ON MOTOR MOUNT PLATE. DO NOT RUN CABLE THROUGH LIFTING LUGS OF MOTOR.

Parts List for C11224

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	STARTER OPTION	10095
		460V 60HZ MOTOR	01-2054
		380V 50HZ MOTOR	01-2054-1
		575V 60HZ MOTOR	01-2054-2
		380V 50HZ STARTER	10440
		460V 60HZ STARTER	10441
		575V 60HZ STARTER	10442
2	1	DECAL LOCKOUT TAG OUT	76CU
3	4	HHCS 3/8 16UNC X 1 3/4 SST	220H
4	8	WASHER FLAT 3/8	36BL
5	4	NUT HEX 3/8 16UNC SST	35CD
6	2	CORD GRIP	41F
7	4	GLAND 3/4 NPT	01-1904
8	4	SHROUD	01-1903
9	2/16 FT	CABLE 14 GAUGE 4 CONDUCTOR	01-1688
10	8	CLAMP, DUAL STAUFF, BODY	1480668
11	8	CLAMP, DUAL STAUFF, COVER	1480670
12	8	CLAMP, DUAL STAUFF, BOLT	1480671
13	1	WASHER FLAT 1/4" SST	36AZ
14	1	HHCS 1/4 20UNC X 3/4	22FV
15	8	TERMINAL RING 14 GA TO 1/4"	01-2046
16	6	WIRE TIES	60HX
17	1	TOOL TRAY	11222-1

The right hand and left hand electrical systems use the same components.

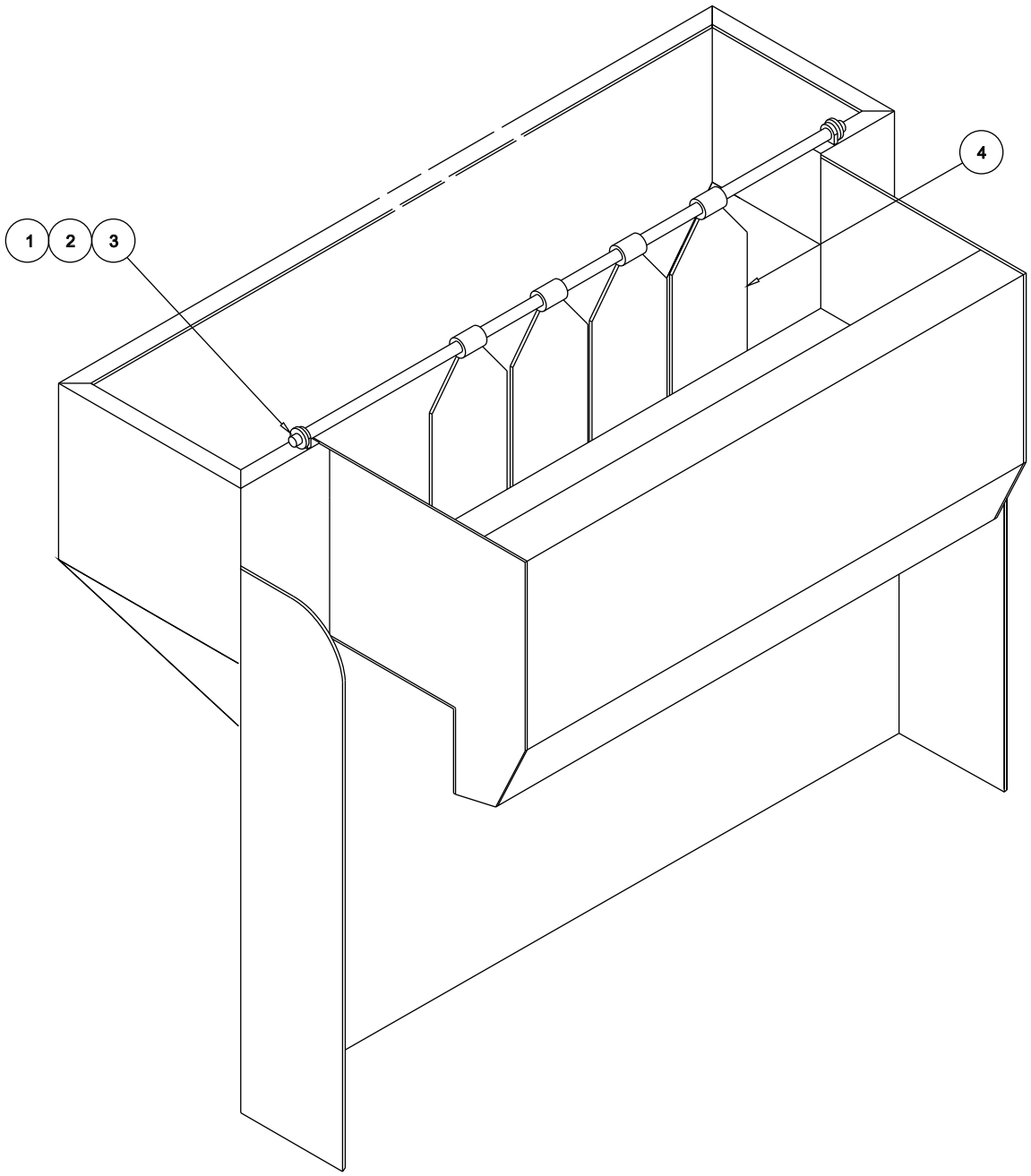
King Cobra Jacking System
SA9738 rev. 1



Parts List for SA9738

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	JACK SCREW WELDMENT	9856
2	1	JACK WELDMENT	9702
3	8	HHCS 1/2 13UNC X 1 1/2	22NP
4	16	WASHER FLAT 1/2	36CG
5	2	ITEM-1	9733-1
6	8	NUT HEX 1/2 13UNC	35CR
7	1	GREASE FITTING	33B

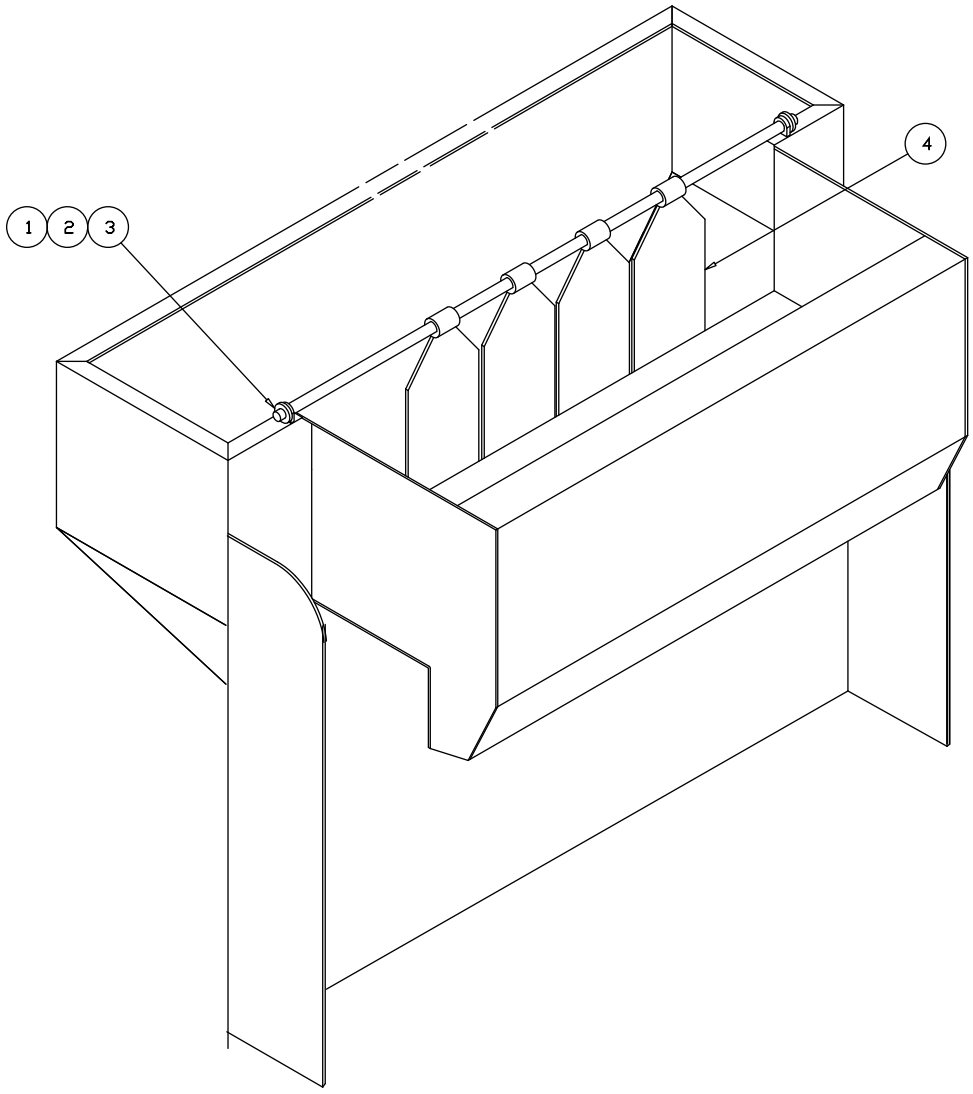
Weir Gate Subassembly SA9714 rev. 3



Parts List for SA9714

ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	HAIR PIN	22RT
2	2	WASHER FLAT 3/4"	36BK
3	1	WEIR GATE BAR	9490-8
4	4	WEIR PLATE	LCMC14073

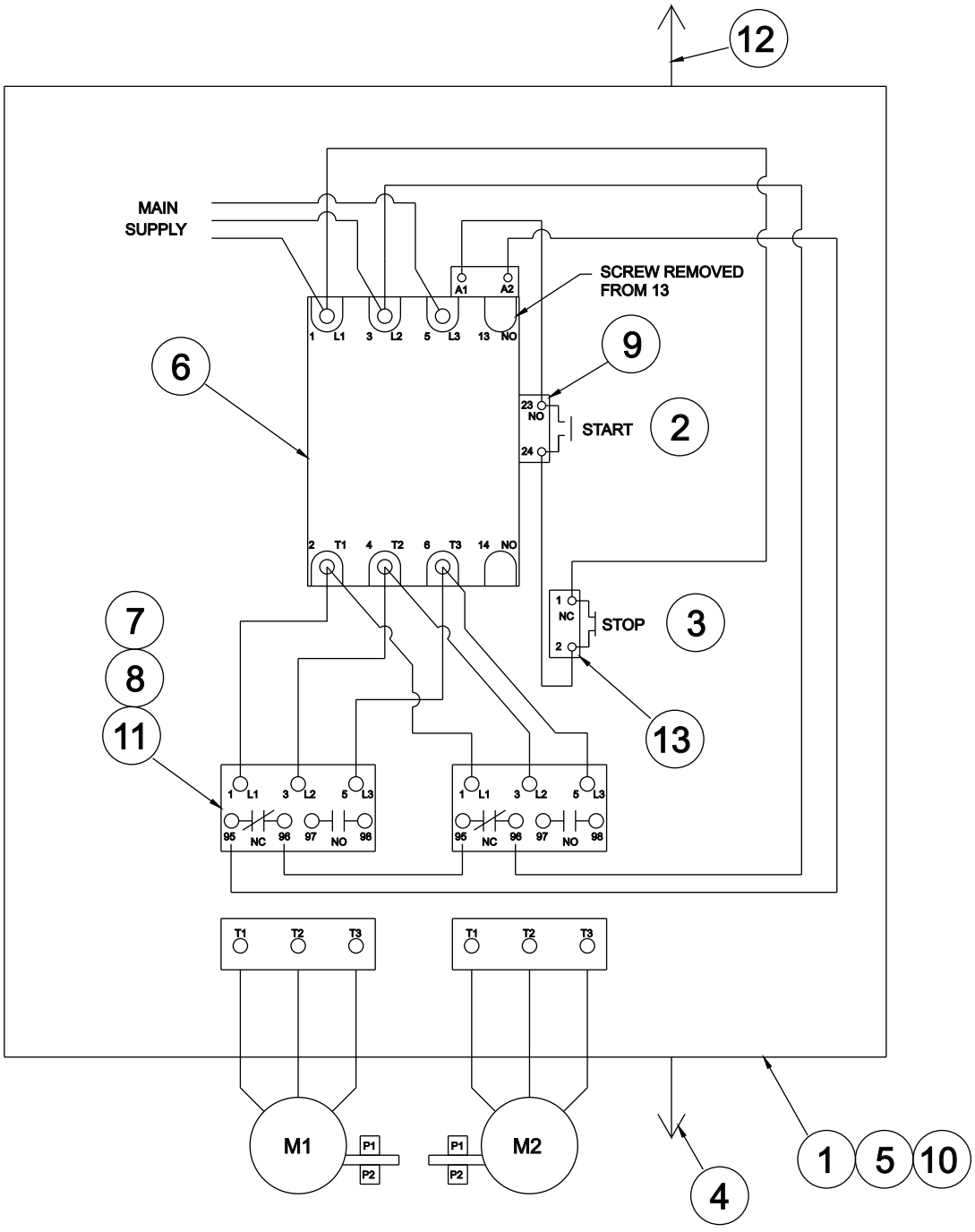
King Cobra 34” Weir Backtank
Subassembly SA11556 rev. 1



Parts List for SA11556

ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	HAIR PIN	22RT
2	2	WASHER FLAT 3/4"	36BK
3	1	WEIR GATE BAR	9490-8
4	4	WEIR PLATE	10762

Wiring Diagram C10440 sheet 1 rev. 8



Parts List for C10440-1

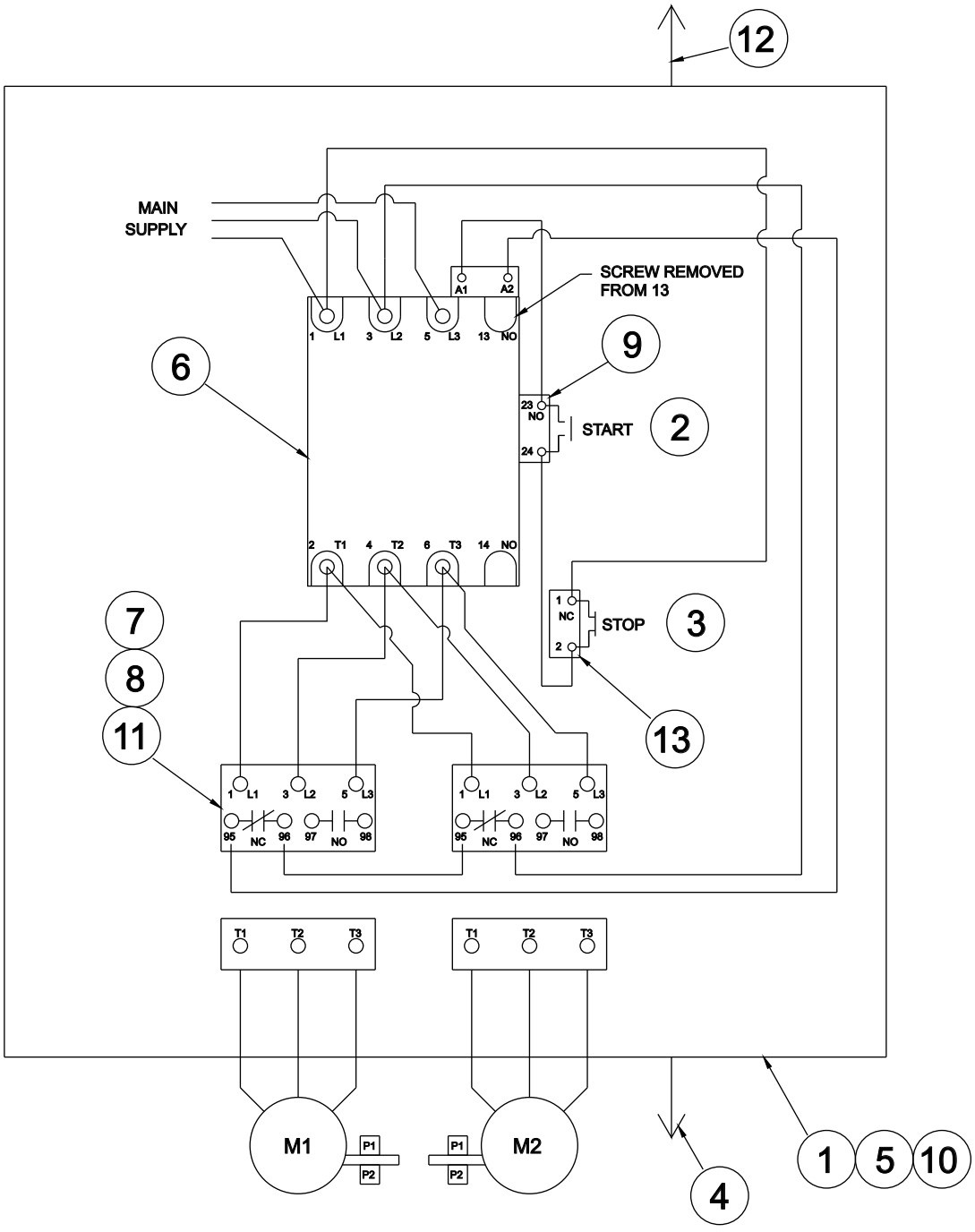
	ITEM	QTY	DESCRIPTION	BRANDT #
	1	1	ENCLOSURE CURLEE MANUFACTURING	-
			HINGE ON LEFT SIDE, WITH (2) 3/4"	
			NPT HOLE TOP & BOTTOM,(1) 1/2"	
			NPT HOLES ON BOTTOM. (2) THREADED	
			HOLES ON COVER FOR START & STOP	
			BUTTONS COMBINED W/QUICK RELEASE	
			SS BOLTS. PROVIDE GREEN GROUNDING LUG.	
	2	1	START BUTTON W/GREEN BOOT	24LN
	3	1	STOP BUTTON W/ RED BOOT	24LO
	4	1	1/2" NPT BREATHER/DRAIN	01-935
	5	1	BACK PAN 12 GA (GALVANIZED)	-
*	6	1	A-B CONTACTOR 380V	24QL
	7	2	A-B IEC BIMETALLIC OVERLOAD	24NU
			A-B IEC BIMETALLIC OVERLOAD 4-6A	24NW
			A-B IEC BIMETALLIC OVERLOAD 3.5-4.8A	24XR
	8	2	A-B OVERLOAD MOUNTING ADAPTERS (OLD)	24NT
			A-B OVERLOAD MOUNTING ADAPTERS	24NY
*	9	1	A-B START INTERLOCK	24QH
	10	1	GROUND LUG & GREEN SCREW &	-
			GROUND LABEL	
	11	2	SHIELD, TAMPER	24NS
	12	1	3/4" NPT PIPE PLUG TOP	
*	13	1	AB STOP CONTACT	24QJ
*	14	1	MICO CONTACT ASSEMBLY (STOP)	24QK

* PURCHASED IN A KIT - 24MP

NOTE:

1. SET OVERLOAD AT LOWEST AMP SETTING AT FACTORY
2. LEAVE TAMPER SHIELDS LOOSE
3. SET OVERLOAD FOR AUTO TRIP
4. COMPLETE INTERNALS WIRED
   ON BACK PAN IS P/N 10440-01
5. COAT COVER & BOX FACE WITH UL APPROVED LUBRICANT
6. SPRAY ALL TERMINAL SCREWS, HEADS, START/STOP LOCKNUT,
   AND ALL CORROSION EFFECTED COMPONETS WITH LPS-3.
7. PLUG THE THREE OPEN HOLES WITH SHIPPING CAPS.
8. USE DIN RAIL TO INSTALL RELAYS.

Wiring Diagram C10440 sheet 2 rev. 8



Parts List for C10440-2

	ITEM	QTY	DESCRIPTION	BRANDT #
	1	1	ENCLOSURE CURLEE MANUFACTURING	-
			HINGE ON LEFT SIDE, WITH (2) 3/4"	
			NPT HOLE TOP & BOTTOM,(1) 1/2"	
			NPT HOLES ON BOTTOM. (2) THREADED	
			HOLES ON COVER FOR START & STOP	
			BUTTONS COMBINED W/QUICK RELEASE	
			SS BOLTS. PROVIDE GREEN GROUNDING LUG.	
	2	1	START BUTTON W/GREEN BOOT	24LN
	3	1	STOP BUTTON W/ RED BOOT	24LO
	4	1	1/2" NPT BREATHER/ DRAIN	01-935
	5	1	BACK PAN 12 GA (GALVANIZED)	-
*	6	1	A-B CONTACTOR 380V	24QL
	7	2	A-B IEC BIMETALLIC OVERLOAD	24NU
			A-B IEC BIMETALLIC OVERLOAD 2.4-4A	24NV
			A-B IEC BIMETALLIC OVERLOAD 2.9-4A	24XP
	8	2	A-B OVERLOAD MOUNTING ADAPTERS (OLD)	24NT
			A-B OVERLOAD MOUNTING ADAPTERS	24NY
*	9	1	A-B START INTERLOCK	24QH
	10	1	GROUND LUG & GREEN SCREW &	-
			GROUND LABEL	
	11	2	SHIELD, TAMPER	24NS
	12	1	3/4" NPT PIPE PLUG TOP	
*	13	1	AB STOP CONTACT	24QJ
*	14	1	MICO CONTACT ASSEMBLY (STOP)	24QK

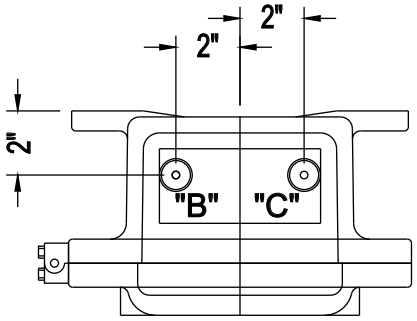
* PURCHASED IN A KIT - 24MP

NOTE:

1. SET OVERLOAD AT LOWEST AMP SETTING AT FACTORY
2. LEAVE TAMPER SHIELDS LOOSE
3. SET OVERLOAD FOR AUTO TRIP
4. COMPLETE INTERNALS WIRED
   ON BACK PAN IS P/N 10440-01
5. COAT COVER & BOX FACE WITH UL APPROVED LUBRICANT
6. SPRAY ALL TERMINAL SCREWS, HEADS, START/STOP LOCKNUT, AND ALL CORROSION EFFECTED COMPONETS WITH LPS-3.
7. PLUG THE THREE OPEN HOLES WITH SHIPPING CAPS.
8. USE DIN RAIL TO INSTALL RELAYS.

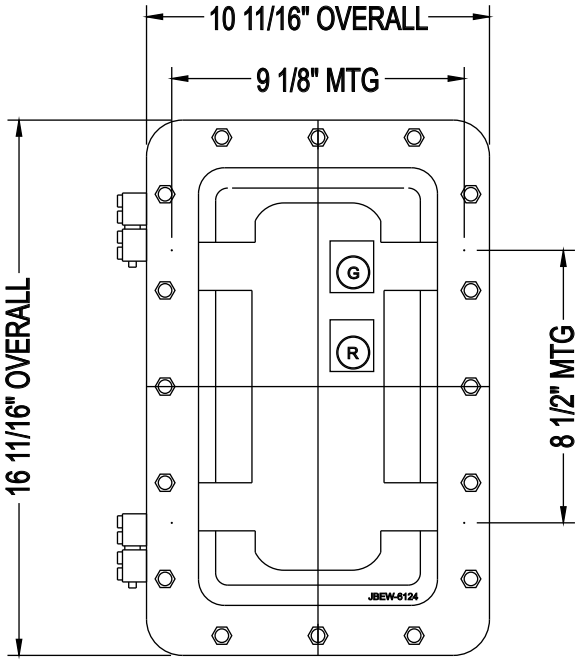
FOR COBRA ONLY

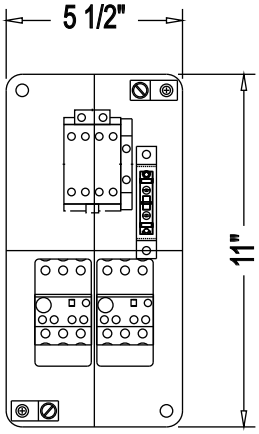
Starter C10440 sheet 3 rev. 8

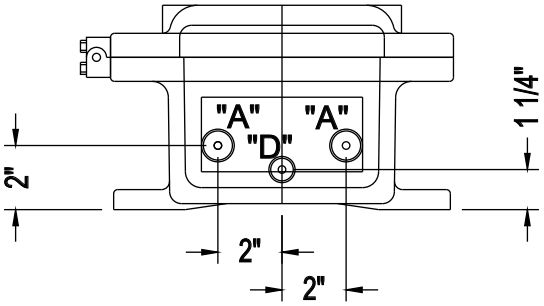


HOLE SCHEDULE

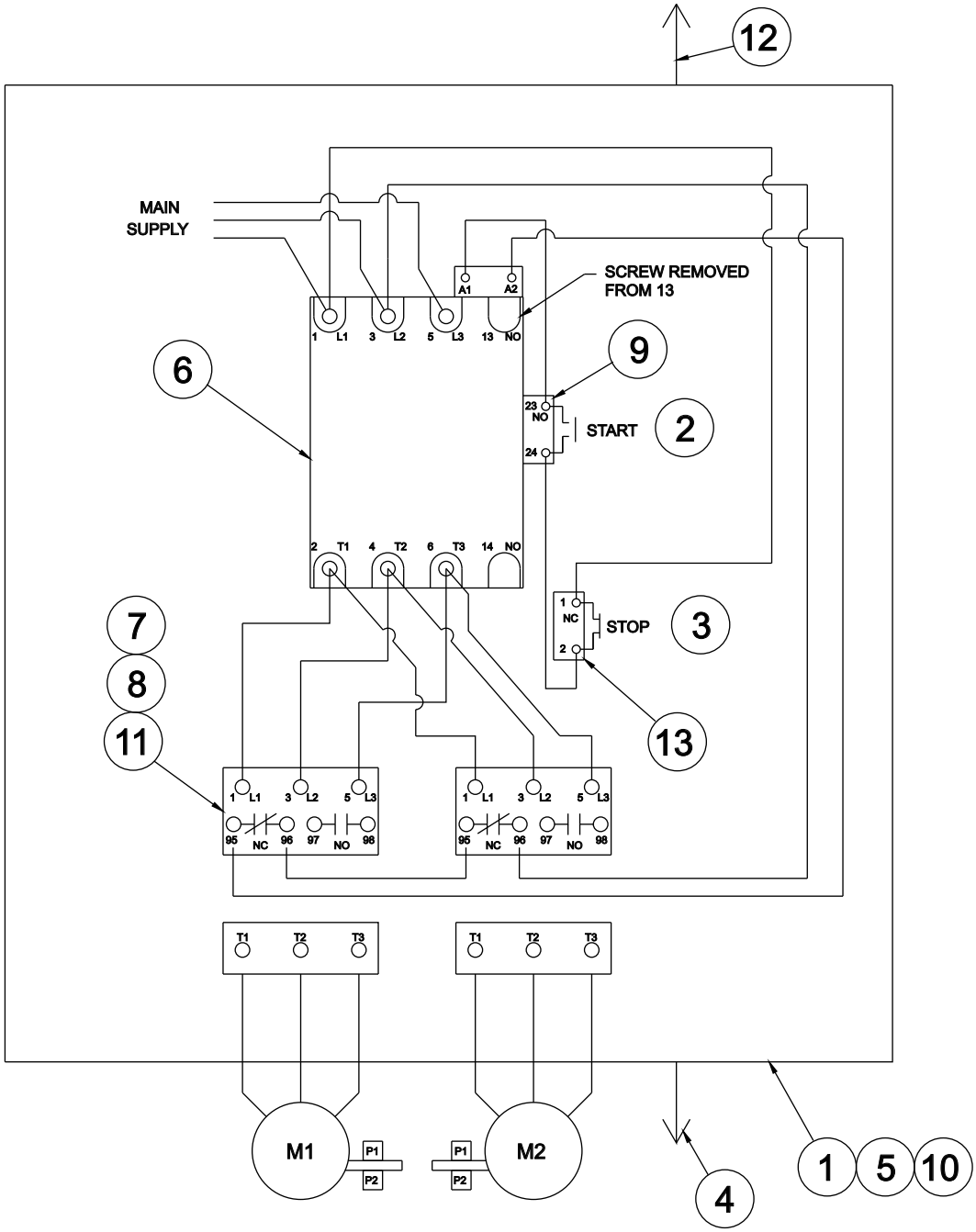
"A" = 3/4" NPT, INSTALL SHIPPING PLUG (TYP.2)
"B" = 3/4" NPT, INSTALL SQ. HD. PLUG (TYP. 1)
"C" = 3/4" NPT, INSTALL SOC. HD. PLUG (TYP. 1)
"D" = 1/2" NPT, INSTALL BREATHER/DRAIN (TYP. 1)







Wiring Diagram C10441 sheet 1 rev. 7



Parts List for C10441-1

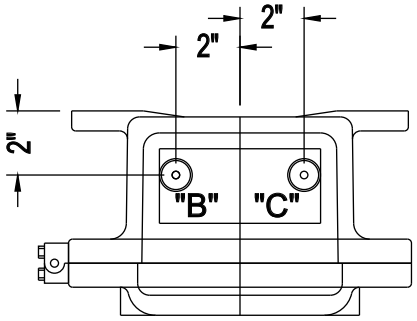
	ITEM	QTY	DESCRIPTION	BRANDT #
	1	1	ENCLOSURE CURLEE MANUFACTURING	-
			HINGE ON LEFT SIDE, WITH (2) 3/4"	
			NPT HOLE TOP & BOTTOM,(1) 1/2"	
			NPT HOLES ON BOTTOM. (2) THREADED	
			HOLES ON COVER FOR START & STOP	
			BUTTONS COMBINED W/QUICK RELEASE	
			SS BOLTS. PROVIDE GREEN GROUNDING LUG.	
	2	1	START BUTTON W/GREEN BOOT	24LN
	3	1	STOP BUTTON W/ RED BOOT	24LO
	4	1	1/2" NPT BREATHER/DRAIN	01-935
	5	1	BACK PAN 12 GA (GALVANIZED)	-
*	6	1	A-B CONTACTOR 460V	24QM
	7	2	A-B IEC BIMETALIC OVERLOAD	24NU
			A-B IEC BIMETALIC OVERLOAD 2.4-4A	24NV
			A-B IEC BIMETALIC OVERLOAD 2.9-4A	24XP
	8	2	A-B OVERLOAD MOUNTING ADAPTERS (OLD)	24NT
			A-B OVERLOAD MOUNTING ADAPTERS	24NY
*	9	1	A-B START INTERLOCK	24QH
	10	1	GROUND LUG & GREEN SCREW &	-
			GROUND LABEL	
	11	2	SHIELD, TAMPER	24NS
	12	1	3/4" NPT PIPE PLUG	
*	13	1	A-B STOP CONTACT	24QJ
*	14	1	MICO CONTACT ASSEMBLY (STOP)	24QK

* PURCHASED IN A KIT - 24MQ

NOTE:

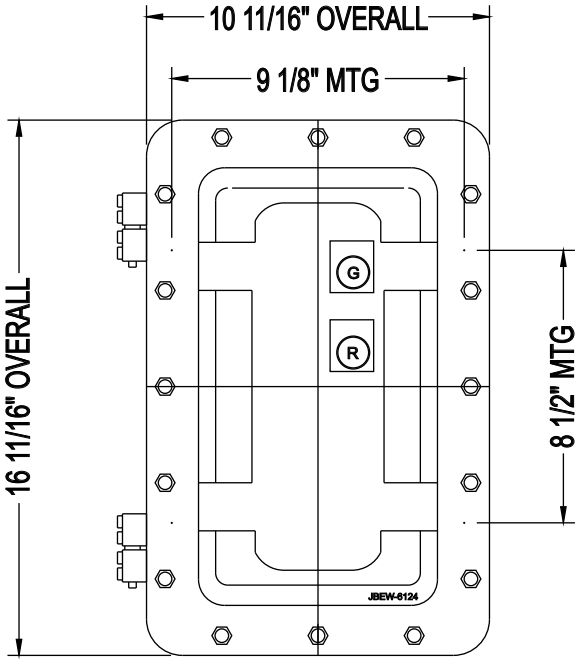
1. SET OVERLOAD AT LOWEST AMP SETTING AT FACTORY
2. LEAVE TAMPER SHIELDS LOOSE
3. SET OVERLOAD FOR AUTO TRIP
4. COMPLETE INTERNALS WIRED
   ON BACK PAN IS P/N 10441-01
5. COAT COVER & BOX FACE WITH UL APPROVED LUBRICANT
6. SPRAY ALL TERMINAL SCREWS, HEADS, START/STOP LOCKNUT,
   AND ALL CORROSION EFFECTED COMPONETS WITH LPS-3.
7. PLUG THE THREE OPEN HOLES WITH SHIPPING CAPS.
8. USE DIN RAIL TO INSTALL RELAYS.

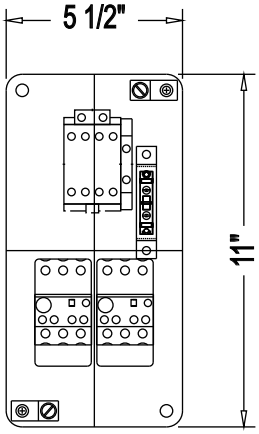
Starter C10441 sheet 2 rev. 7

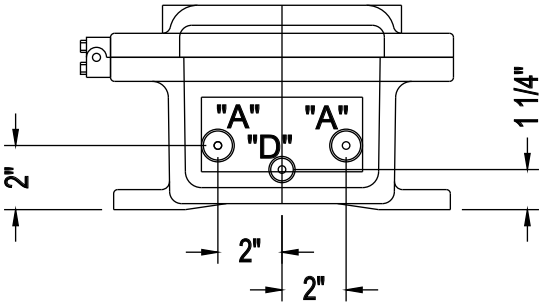


HOLE SCHEDULE

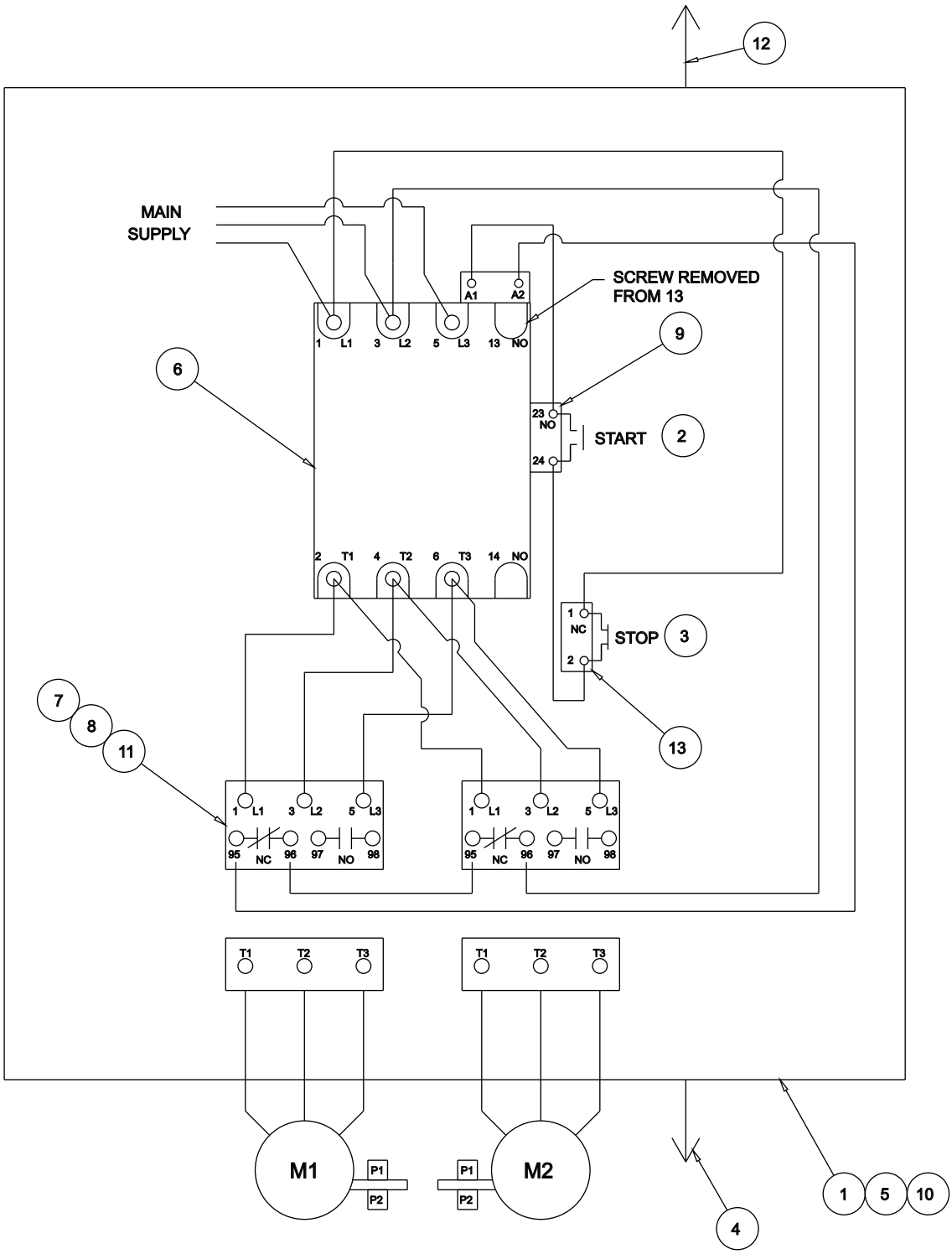
"A" = 3/4" NPT, INSTALL SHIPPING PLUG (TYP.2)
"B" = 3/4" NPT, INSTALL SQ. HD. PLUG (TYP. 1)
"C" = 3/4" NPT, INSTALL SOC. HD. PLUG (TYP. 1)
"D" = 1/2" NPT, INSTALL BREATHER/DRAIN (TYP. 1)







Wiring Diagram C10442 sheet 1 rev. 6

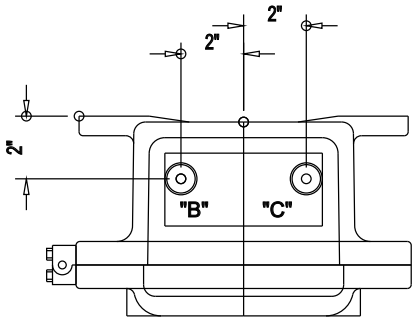


Parts List for C10442-1

	ITEM	QTY	DESCRIPTION	PART NUMBER
	1	1	ENCLOSURE CURLEE MANUFACTURING	-
			HINGE ON LEFT SIDE, WITH (2) 3/4"	
			NPT HOLE TOP & BOTTOM,(1) 1/2"	
			NPT HOLES ON BOTTOM. (2) THREADED	
			HOLES ON COVER FOR START & STOP	
			BUTTONS COMBINED W/QUICK RELEASE	
			SS BOLTS. PROVIDE GREEN GROUNDING LUG.	
	2	1	START BUTTON W/GREEN BOOT	24LN
	3	1	STOP BUTTON W/ RED BOOT	24LO
	4	1	1/2" NPT BREATHER/DRAIN	01-935
	5	1	BACK PAN 12 GA (GALVANIZED)	-
*	6	1	A-B CONTACTOR 575V	24QN
	7	2	A-B IEC BIMETALIC OVERLOAD (OLD)	24NR
		2	A-B IEC BIMETALIC OVERLOAD	24NV
	8	2	A-B OVERLOAD MOUNTING ADAPTERS (OLD)	24NT
		2	A-B OVERLOAD MOUNTING ADAPTERS	24NY
*	9	1	A-B START INTERLOCK	24QH
	10	1	GROUND LUG & GREEN SCREW &	-
			GROUND LABEL	
	11	2	SHIELD TAMPER	24NS
	12	1	3/4" NPT PIPE PLUG (RIGHT SIDE-TOP)	
*	13	1	AB STOP CONTACT	24QJ
*	14	1	MICO CONTACT ASSEMBLY (STOP)	24QK

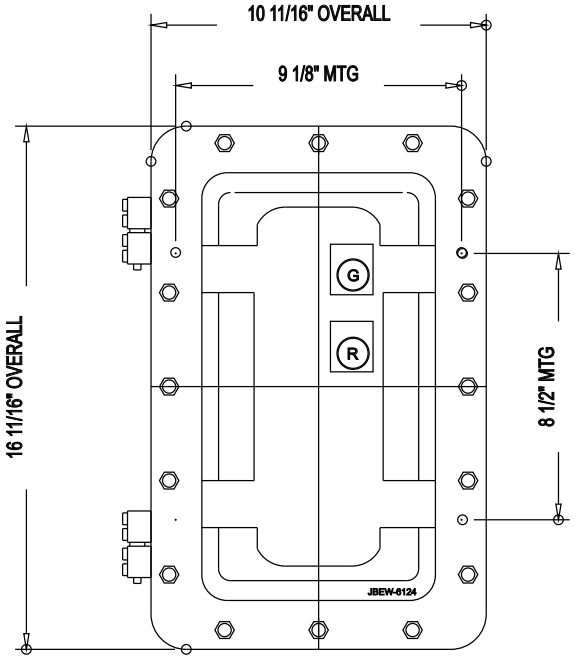
* PURCHASED IN A KIT - 24MV

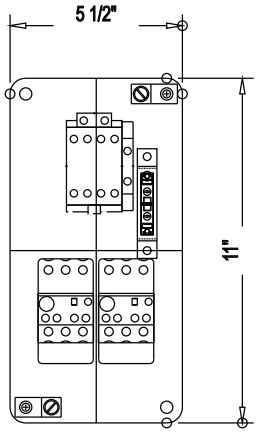
Starter C10442 sheet 2 rev. 6

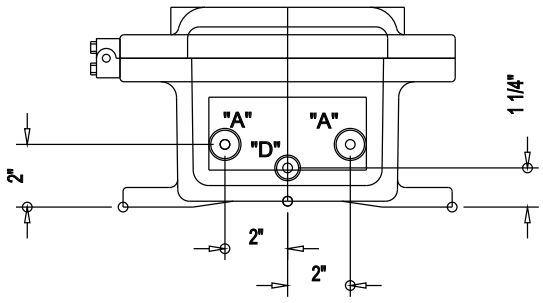


HOLE SCHEDULE

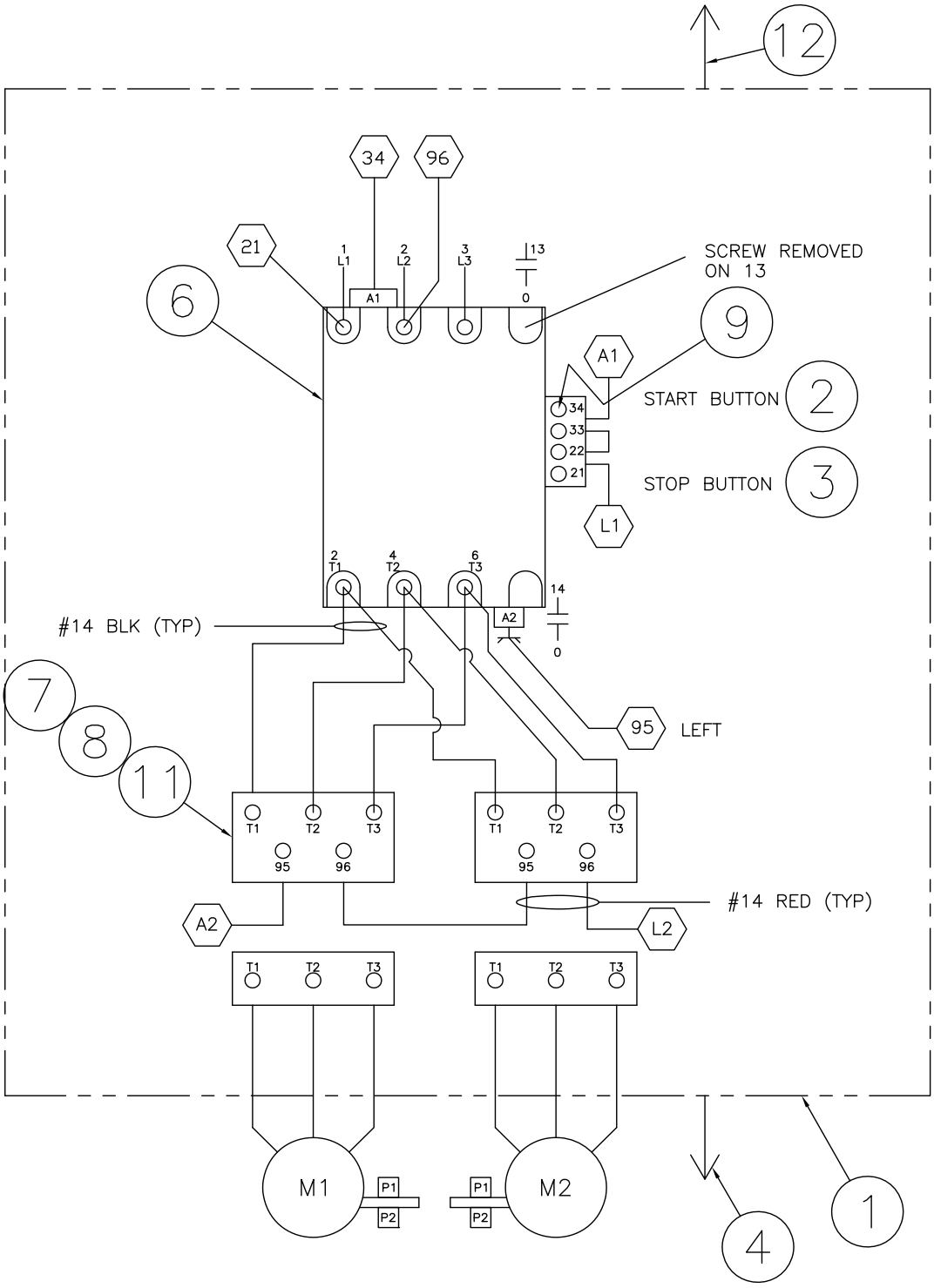
"A" = 3/4" NPT, INSTALL SHIPPING PLUG (TYP.2)
"B" = 3/4" NPT, INSTALL SQ. HD. PLUG (TYP. 1)
"C" = 3/4" NPT, INSTALL SOC. HD. PLUG (TYP. 1)
"D" = 1/2" NPT, INSTALL BREATHER/DRAIN (TYP. 1)







Wiring Diagram C11411 sheet 1 rev. 4



Parts List for C11411-1

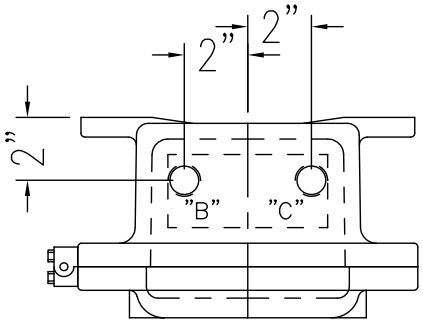
	ITEM	QTY	DESCRIPTION	PART NUMBER
	1	1	ENCLOSURE CURLEE MANUFACTURING	–
			HINGE ON LEFT SIDE, WITH (2) 3/4"	
			NPT HOLE TOP & BOTTOM,(1) 1/2"	
			NPT HOLES ON BOTTOM. (2) THREADED	
			HOLES ON COVER FOR START & STOP	
			BUTTONS COMBINED W/QUICK RELEASE	
			SS BOLTS. PROVIDE GREEN GROUNDING LUG.	
	2	1	START BUTTON W/GREEN BOOT	24LN
	3	1	STOP BUTTON W/ RED BOOT	24LO
	4	1	1/2" NPT BREATHER/DRAIN	01–935
	5	1	BACK PAN 12 GA (GALVANIZED)	–
*	6	1	A–B CONTACTOR 230V	24QS
* *	7a	2	A–B IEC BIMETALIC OVERLOAD (OLD)	24QR
	7b	2	A–B IEC BIMETALIC OVERLOAD	24XS
			W/A–B OVERLOAD MOUNTING ADAPTERS (NEW)	
* *	8	2	A–B OVERLOAD MOUNTING ADAPTERS (OLD)	24NY
*	9	1	A–B START INTERLOCK	24QH
	10	1	GROUND LUG & GREEN SCREW &	–
			GROUND LABEL	
	11	2	SHIELD, TAMPER	24NS
	12	1	3/4" NPT PIPE PLUG	
*	13	1	AB STOP CONTACT	24QJ
*	14	1	MICO CONTACT ASSEMBLY (STOP)	24QK

* PURCHASED IN A KIT – 24QT

NOTES:
1. SET OVERLOAD AT LOWEST AMP SETTING AT FACTORY.
2. LEAVE TAMPER SHIELDS LOOSE.
3. SET OVERLOAD FOR AUTO TRIP.
4. COMPLETE INTERNALS WIRED ON BACK PAN IS P/N 10441–01
5. COAT COVER & BOX FACE WITH UL APPROVED LUBRICANT.
6. SPRAY ALL TERMINAL SCREWS, HEADS, START/STOP LOCKNUT.
7. PLUG THE THREE OPEN HOLES WITH SHIPPING CAPS.
8. USE DIN RAIL TO INSTALL RELAYS.

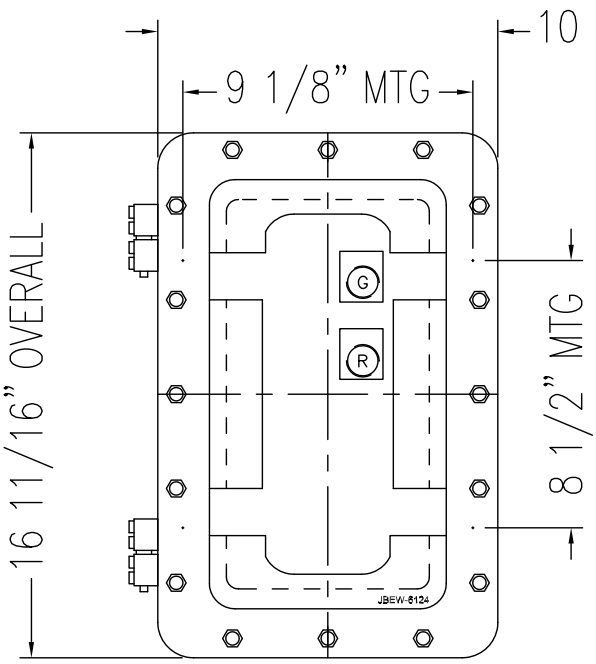
** 9. ITEM–8 IS USED WITH ITEM–7a.

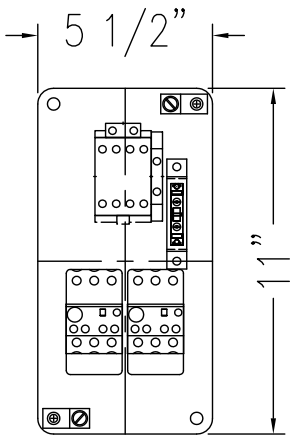
Starter C11411 sheet 2 rev. 4

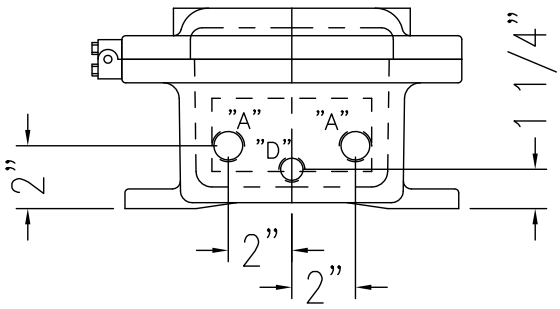


HOLE SCHEDULE

"A" = 3/4" NPT, INSTALL SHIPPING PLUG (TYP.2)
"B" = 3/4" NPT, INSTALL SQ. HD. PLUG (TYP. 1)
"C" = 3/4" NPT, INSTALL SOC. HD. PLUG (TYP. 1)
"D" = 1/2" NPT, INSTALL BREATHER/DRAIN (TYP. 1)



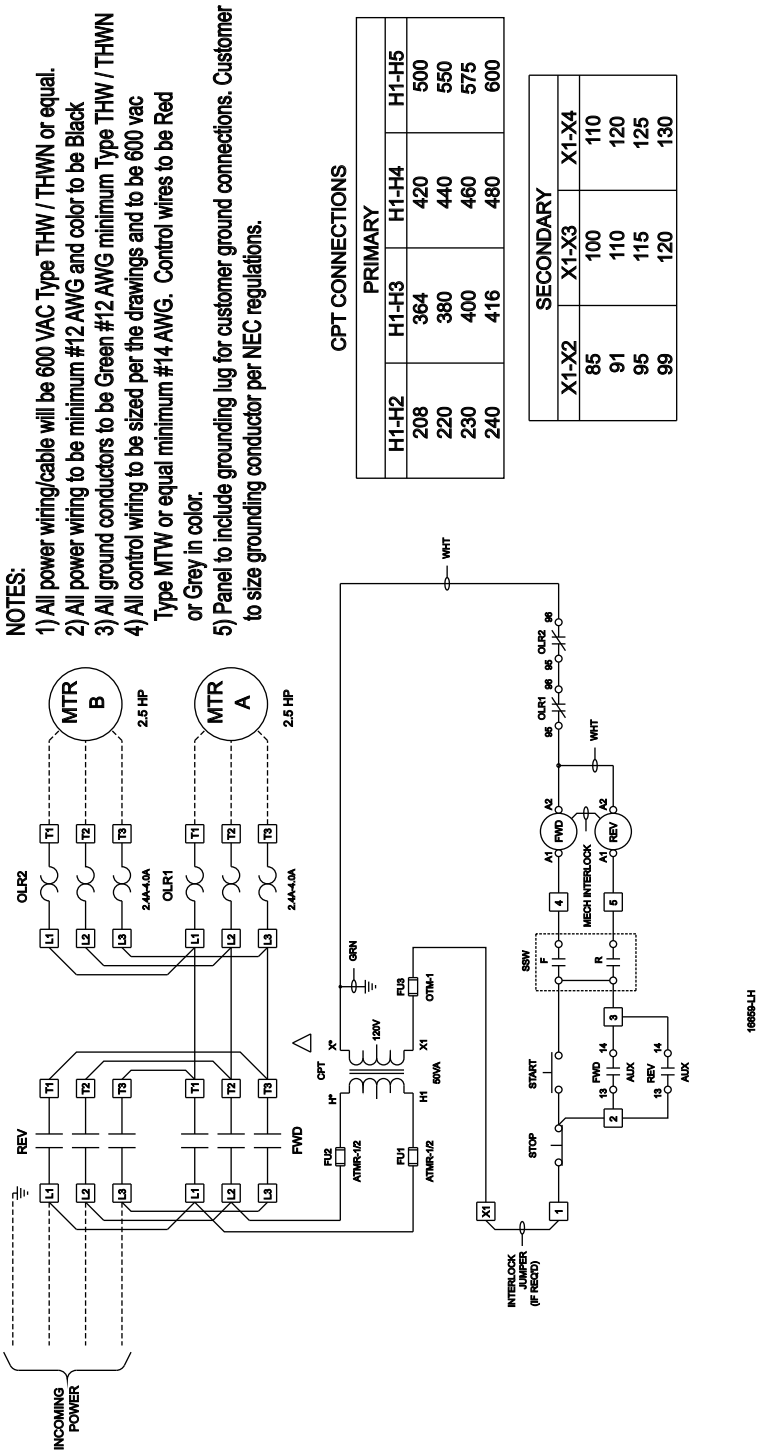




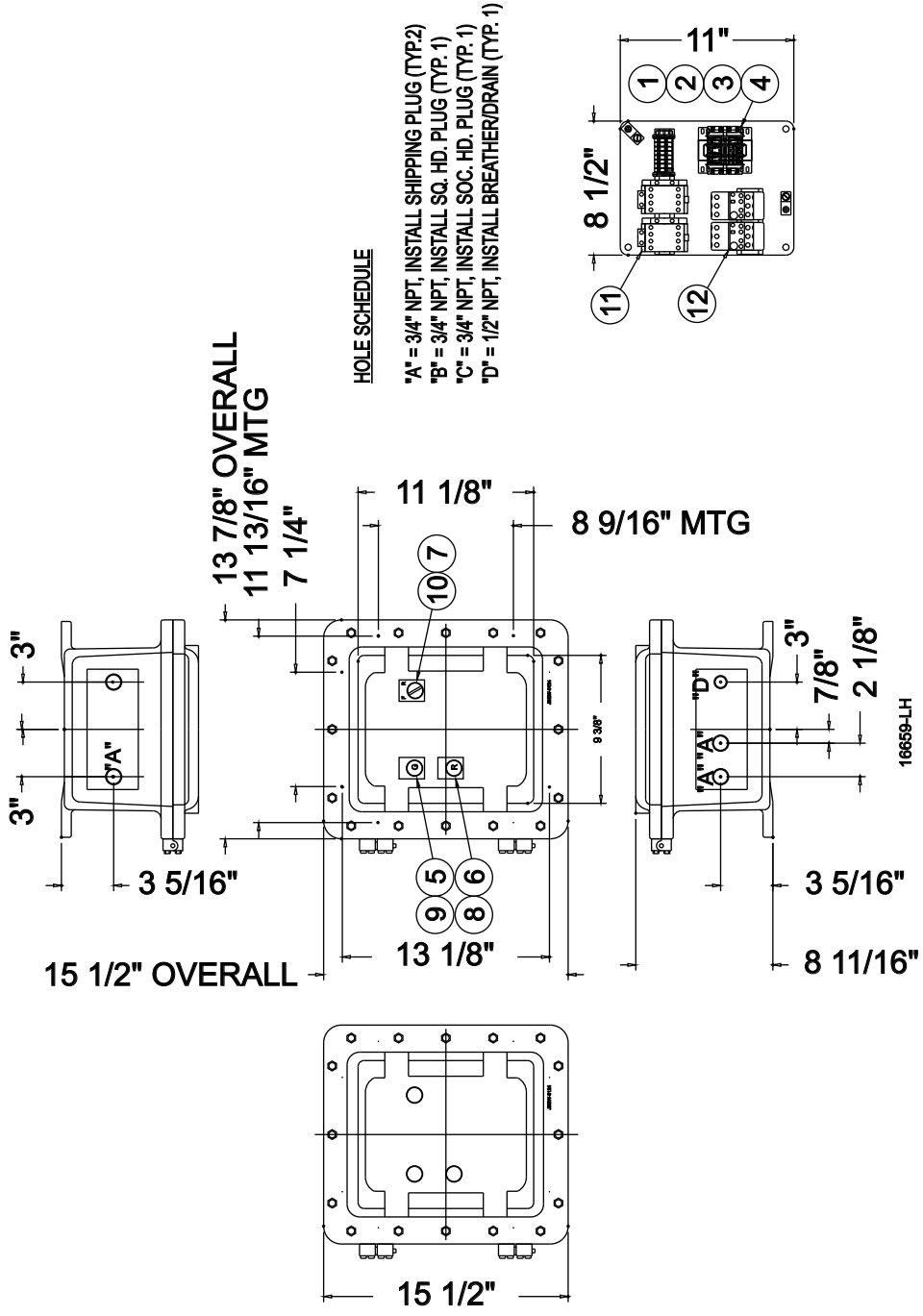
Wiring Diagram C14278

Not available

Wiring Diagram C16659 sheet 1 rev. 5



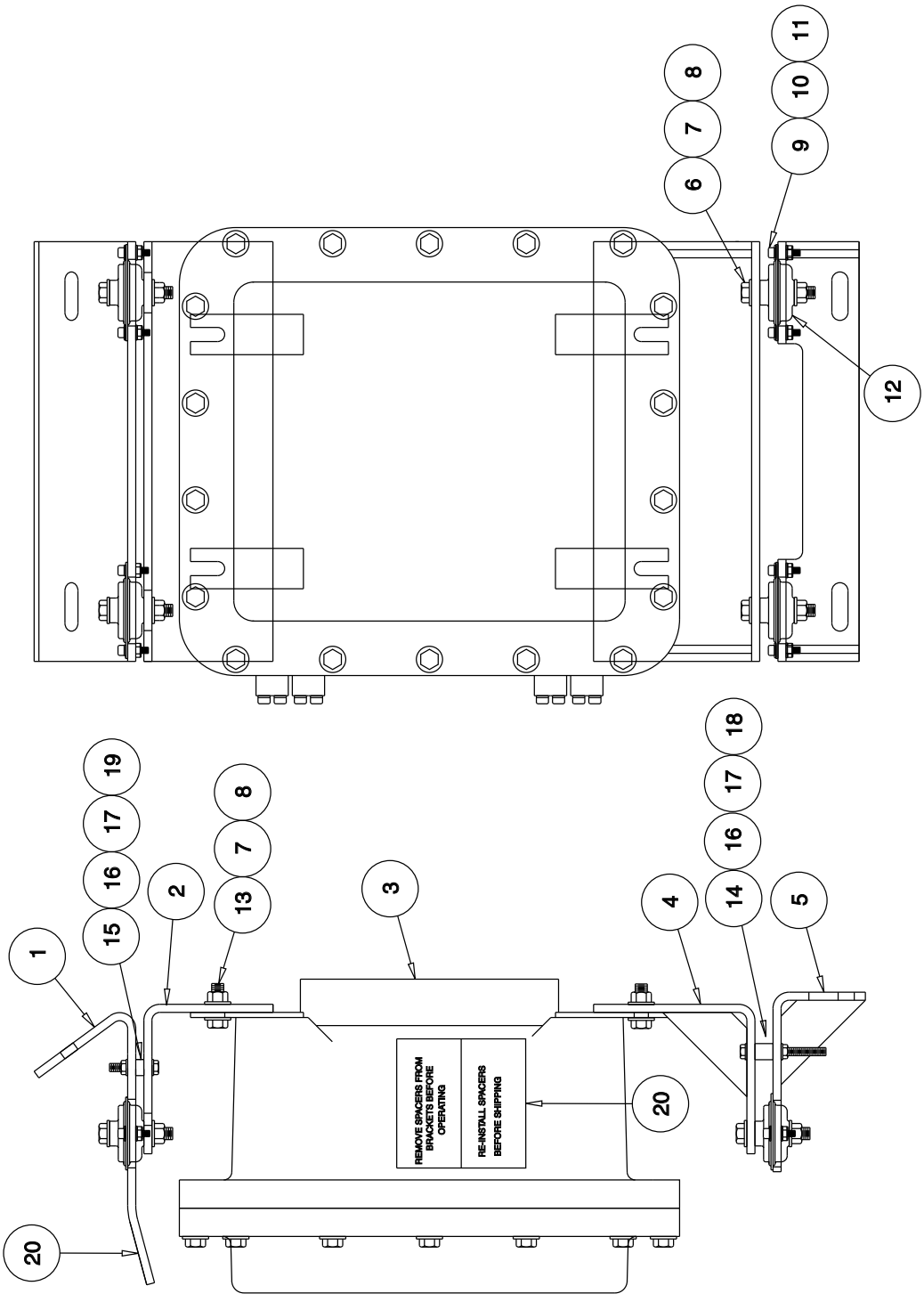
Starter C16659 sheet 2 rev. 5



Parts List for C16659-2

ITEM	QTY	DESCRIPTION	PART NUMBER
1	3	PRIMARY FUSE 1/2AMP 600V	60AAG
2	3	SECONDARY FUSE 1AMP 250V	60AAQ
3	1	CONTROL PWR TRANSFORMER 50VA	24UY
4	1	FUSE MOUNTING KIT	24OE
5	1	CONTACT BLOCK NO for PB	60TR
6	1	CONTACT BLOCK NC for PB	60TQ
7	1	3 POSITION, SELECTOR SWITCH	61AAZ
8	1	PB RED	24TT
9	1	PB GREEN	60TS
10	2	CONTACT BLOCK FOR SSW	60BBC
11	1	CONTACTOR(S) W/ 120 VAC COIL	60BBK
12	1	S/S Bi-METALIC OVERLOAD RELAY 2.4-4A	24NV
		S/S Bi-METALIC OVERLOAD RELAY 2.9-4A	24XP

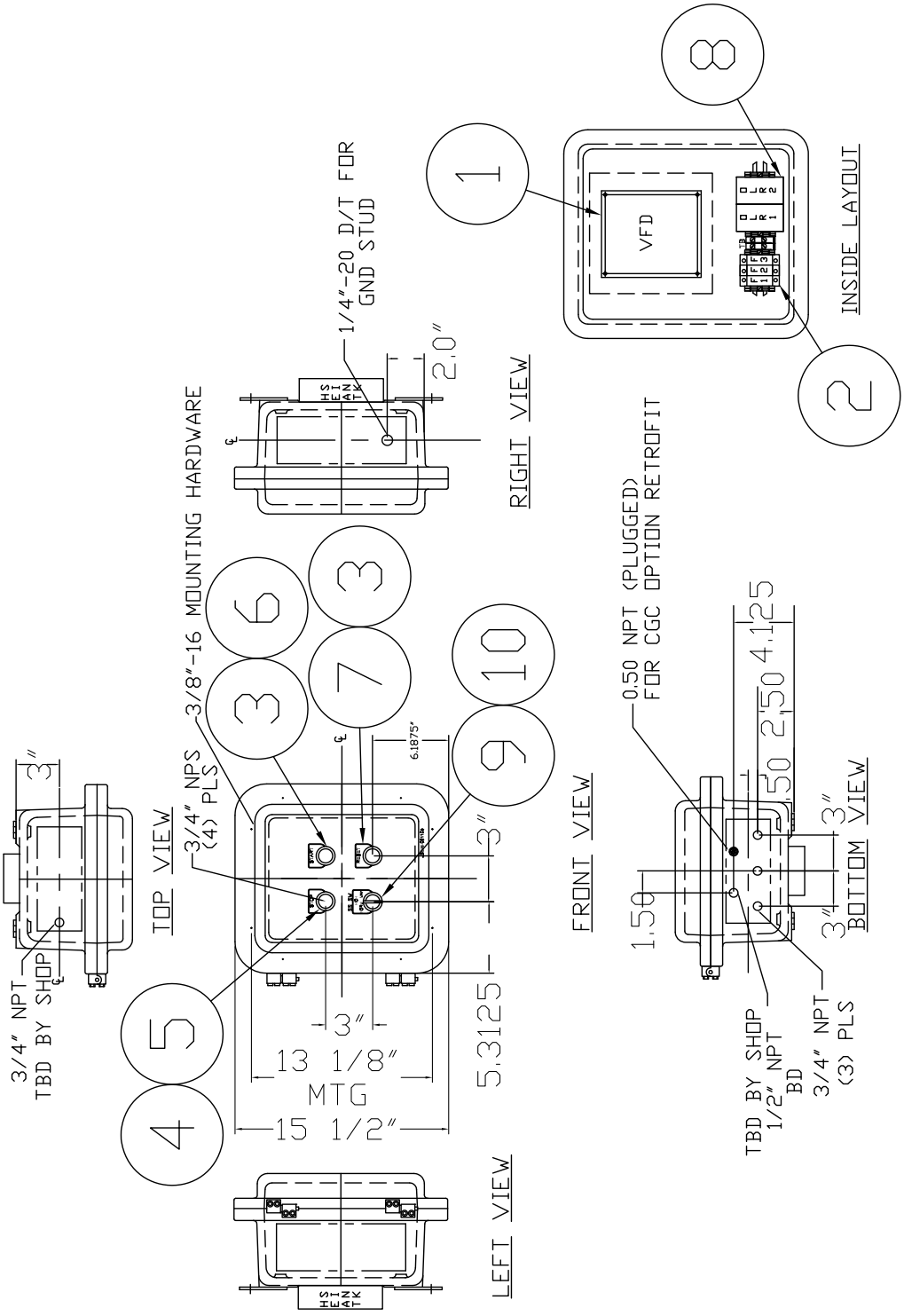
King Cobra VFD Shaker Starter
Subassembly SA20331 rev. 3



Parts list for SA20331

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SHAKER UPPER BRACKET	20288
2	1	STARTER UPPER BRACKET	20291
3	1	STARTER (20190)	-
4	1	STARTER LOWER MNTG. BRACKET WELDMENT	20372
5	1	SHAKER LOWER MNTG. BRACKET WELDMENT	20292
6	4	HHCS 3/8-16UNC X 2 18-8 SST	22LF
7	16	WASHER FLAT 3/8 SST	36BL
8	8	NUT HEX LOCK 3/8-16UNC NYL-INSR SST	35CD
9	8	SHCS #10-24UNC X 3/4 SST	22ACN
10	16	WASHER FLAT #10 SST	36AN
11	8	NUT HEX LOCK #10-24UNC NYL-INSR SST	35AR
12	4	SHOCK MOUNT NITRILE	5AD
13	4	HHCS 3/8-16UNC X 1-1/4 18-8 SST	22OS
14	2	9/16" SPACER	01-1683
15	2	1/4" SPACER	01-1684
16	2	HHCS .250 20UNC X 1.25	22AH
17	8	WASHER FLAT .250	36AZ
18	4	NUT HEX .250 20UNC	35AJ
19	2	HHCS .250 20UNC X 2.5	22AFI
20	2	STICKER	76BC

Starter Enclosure C20190-1 rev. 7

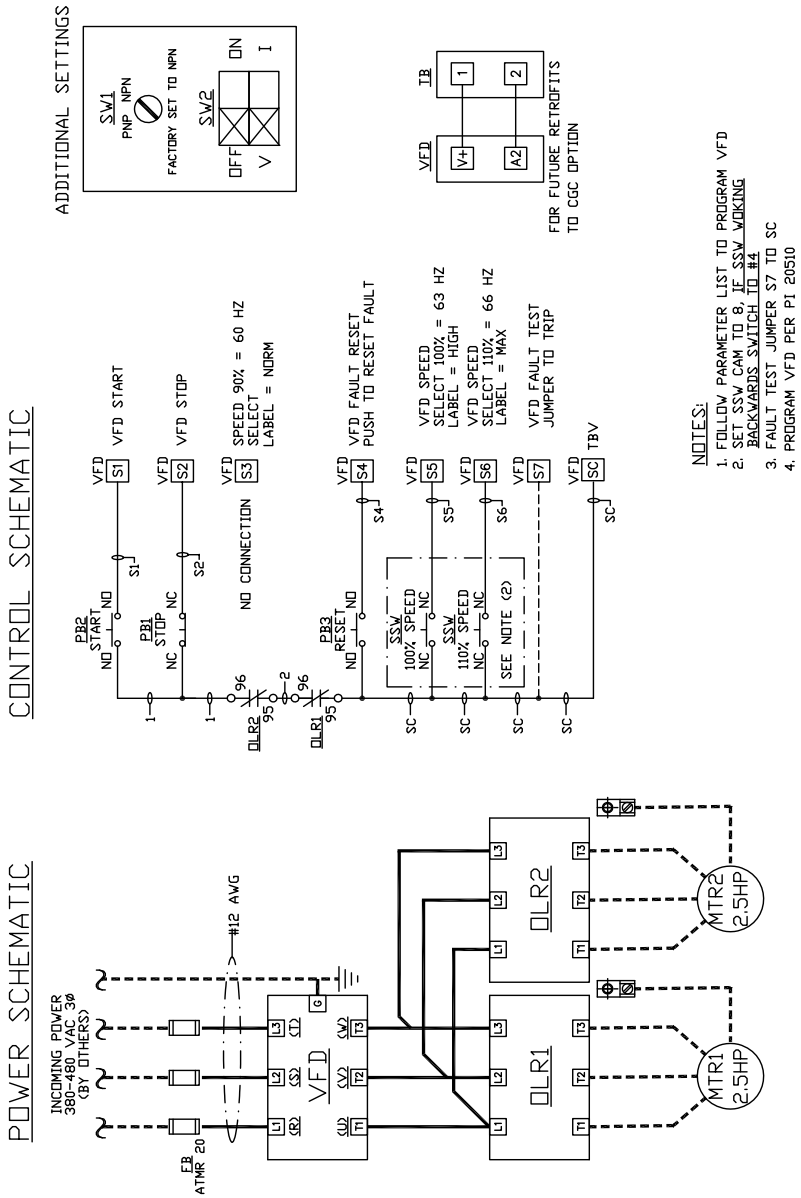


Parts List for C20190-1

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	VFD 5 HP	60TS
2	3	FUSES 20 AMP	60ADA
3	2	NO CONTACT	60TR
4	1	N.C CONTACT	60TQ
5	1	PB, RED	61DAB
6	1	PB, START	61DAD
7	1	PB, RESET	61DAC
8	2	OVERLOAD RELAY 2.4–4A	24NV
		OVERLOAD RELAY 2.9–4A	24XP
9	1	3–WAY SWITCH	60DAE
10	2	N.C CONTACT	60DAF

Wiring Diagram C20190-2 rev. 7

PARAMETER	SETTING
N001	4
N002	1
N004	1
N006	1
N008	1
N012	460
N019	5
N020	20
N021	5
N022	20
N024	60
N025	63
N026	66
N033	110
N034	0
N036	7
N041	5
N042	20
N050	1
N051	2
N052	0
N053	5
N054	6
N055	7
N106	12



Parameters

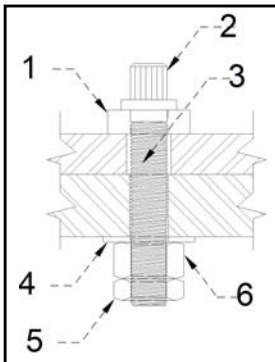
The parameters programmed into the V7 drive are listed below. Only a qualified technician should change the VFD parameters.

The parameters should be saved in a DRIVE WIZARD file and reloaded to the drive if necessary. The drive is shipped with these parameters installed and tested to insure proper operation.

Parameter	Setting	Name	Definition
n001	4	Parameter Selection	all parameters can be read and reset
n002	1	Control Method Selection	Open Loop Vector
n004	1	Reference Selection	Digital Operator
n006	1	Reverse Prohibit	Reverse Run Disabled
n008	1	Reference Selection-Digital Operator	Frequency Ref. from n0024
n012	460	Voltage Max	460 V
n019	5	Accel Time 1	5 Seconds
n020	20	Decel Time 1	20 Seconds
n021	5	Accel Time 2	5 Seconds
n022	20	Decel Time 2	20 Seconds
n024	60	Frequency Reference 1	60 Hz
n025	63	Frequency Reference 2	63 Hz
n026	66	Frequency Reference 3	66 Hz
n033	110	Frequency Reference Upper Limit	110 % ---> 66 Hz
n034	0	Frequency Reference lower Limit	0 % ---> 0 Hz
n036	7	Motor Rated Current	7 Amps (2 Motors X 3.5 Amps each)
n041	5	Accel Time 3	5 Seconds
n042	20	Decel Time 3	20 Seconds
n050	1	Multi-Function input S1	Forward Run/Start
n051	2	Multi-Function input S2	Stop
n052	0	Multi-Function input S3	3 Wire Control
n053	5	Multi-Function input S4	Fault Reset
n054	6	Multi-Function input S5	Speed 2
n055	7	Multi-Function input S6	Speed 3
n106	1.2	Motor Rated Slip	1.2 Hz

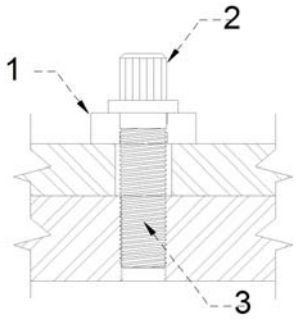
For 380 V, 50 Hz service, parameter n036 must be changed to the sum of the FLA of both motors. The setting of the overload relays inside the control panel must also be changed.

Alternate Bolt Configurations



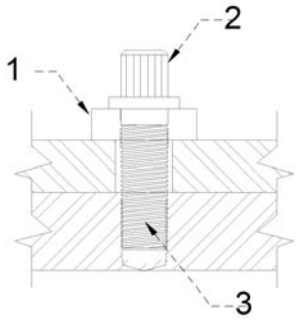
		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4” 10UNC x 4″	22XV
3	LOCTITE Product 243 (heavy coat)	18N
4	Washer	36AR
5	Heavy hex jam nut	35EA
6	Heavy hex nut, torqued to 380 ft.-lb. (515 N.m)	35DZ

Figure 7-1. Bolt design 1



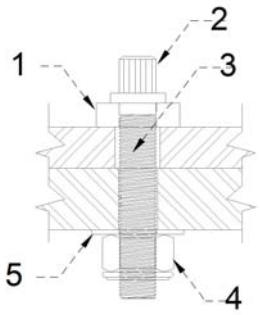
		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4″ UNRC x 2 1/2″ bolt, torqued to 275 ft.-lb. (373 N.m)	22XU
3	LOCTITE Product 243 (heavily coated)	18N

Figure 7-2. Bolt design 2



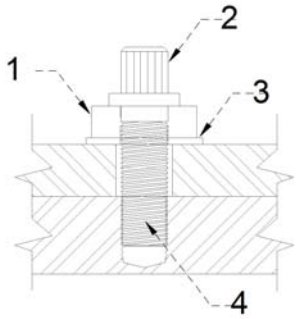
		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4″ UNRC x 2 1/2″ bolt, torqued to 275 ft.-lb. (373 N.m)	22XU
3	LOCTITE Product 243 (heavy coat)	18N

Figure 7-3. Bolt design 3



		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4” 10UNC x 4″	22XV
3	LOCTITE Product 243 (heavy coat)	18N
4	Heavy hex nylock nut, torqued to 380 ft.-lb. (515 N.m)	35DW
5	Washer	36AR

Figure 7-4. Bolt design 4



		Part #
1	Hardened thick washer	LC2A14014
2	12-point 3/4″ UNRC x 2 1/4″ bolt, torqued to 275 ft.-lb. (373 N.m)	22RO
3	Washer 1.87″ O.D. x 0.109″ thick	36BK
4	LOCTITE Product 243 (heavy coat)	18N

Figure 7-5. Bolt design 5

Bolt Torque Requirements

The bolt torque requirements for stainless steel, cadmium and zinc bolts presented in the following tables are obtained from Drawing PI5508. Note the following conditions:

- If torquing of a fastener is required, these values apply unless noted otherwise.
- Values should be obtained by turning the nut and holding the bolt whenever possible.
- Coefficient of 0.17 for cadmium and 0.22 for zinc and 70 % of the proof load.
- Preload does not include the use of a lock nut.

Stainless Steel Bolts

Description	Grade 304 Torque		Grade 316 Torque	
	lb-ft	Nm	lb-ft	Nm
1/4-20 UNC	6	8.1	7	9.5
1/4-28 UNF	6	8.1	8	10.9
3/8-16 UNC	19	25.8	20	27.1
3/8-24 UNF	21	28.5	22	29.9
1/2-13 UNC	43	58	45	61
1/2-20 UNF	45	61	47	64
5/8-11 UNC	92	125	96	130
5/8-18 UNF	103	140	108	146
3/4-10 UNC	127	172	131	178
3/4-18 UNF	124	168	129	175
7/8-9 UNC	194	263	202	274
7/8-14 UNF	193	262	201	273
1-8 UNC	283	384	300	407
1-14 UNF	258	350	270	366
1 1/4-7 UNC	413	560	432	586
1 1/4-12 UNF	390	529	408	553
1 1/2-6 UNC	888	1204	930	1261
1 1/2-12 UNF	703	1261	732	992

Cadmium bolts

Description	Grade 5				Grade 8			
	Torque		Preload		Torque		Preload	
	lb-ft	Nm	lb	kg	lb-ft	Nm	lb	kg
1/4-20 UNC	7	9.5	1892	858	10	13.6	2671	1212
1/4-28 UNF	8	10.8	2166	982	11	14.9	3058	1387
5/16-18 UNC	14	19.0	3118	1414	20	27.1	4402	1997
5/16-24 UNF	15	20.3	3451	1565	22	29.8	4872	2210
3/8-16 UNC	25	33.9	4611	2092	35	47.5	6510	2953
3/8-24 UNF	28	38.0	5224	2370	39	52.8	7375	3345
1/2-13 UNC	60	81	8449	3832	85	115	11,928	5410
1/2-20 UNF	67	91	9520	4318	95	128	13,440	6096
9/16-12 UNC	86	117	10,829	4912	122	165	15,288	6934
9/16-18 UNF	96	130	12,079	5479	136	184	17,052	7735
5/8-11 UNC	119	161	13,447	6099	168	228	18,984	8611
5/8-18 UNF	135	183	15,232	6909	190	258	21,504	9754
3/4-10 UNC	211	286	19,873	9014	298	404	28,056	12,726
3/4-16 UNF	236	320	22194	10,067	333	451	31,332	14,212
7/8-9 UNC	341	462	27,489	12,469	481	652	38,808	17,603
7/8-14 UNF	375	508	30,286	13,737	530	719	42,756	19,394
1-8 UNC	511	693	36,057	16,355	721	978	50,904	23090
1-12 UNF	573	777	40,460	18,352	809	1097	57,120	25909
1 1/8-7 UNC	630	854	39,523	17,927	1022	1386	64,092	29,071

Zinc bolts

Description	Grade 5				Grade 8			
	Torque		Preload		Torque		Preload	
	lb-ft	Nm	lb	kg	lb-ft	Nm	lb	kg
1/4-20 UNC	9	12.2	1892	858	12	16.3	2671	1212
1/4-28 UNF	10	13.6	2166	982	14	19.0	3058	1387
5/16-18 UNC	18	24.4	3118	1414	25	33.9	4402	1997
5/16-24 UNF	20	27.1	3451	1565	28	38.0	4872	2210
3/8-16 UNC	32	43.4	4611	2091	45	61	6510	2953
3/8-24 UNF	36	48.8	5224	2370	51	69	7375	3345
1/2-13 UNC	77	104	8449	3832	109	148	11,928	5410
1/2-20 UNF	87	118	9,520	4318	123	167	13,440	6096
9/16-12 UNC	112	152	10,829	4912	158	214	15,288	6934
9/16-18 UNF	125	169	12,079	5479	176	239	17,052	7735
5/8-11 UNC	154	209	13,447	6099	218	296	18,984	8611
5/8-18 UNF	175	237	15,232	6909	246	334	21,504	9754
3/4-10 UNC	273	370	19,873	9014	386	523	28,056	12,726
3/4-16 UNF	305	414	22,194	10,067	431	584	31,332	14,212
7/8-9 UNC	441	598	27,489	12,469	623	845	38,808	13,067
7/8-14 UNF	486	659	30,286	13,737	686	930	42,756	19,398
1-8 UNC	661	896	36,507	16,559	933	1265	50,904	23,090
1-12 UNF	742	1006	40,460	18,352	1047	1420	57,120	26,045
1 1/8-7 UNC	815	1105	39,523	17,927	1322	1792	64,092	29,071

Supporting Documents

Italvibras Motor Manual

PIB-01021 Overload Relay Replacement

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