BURFORD® CORP.

SERVICE MANUAL

FOR YOUR

BURFORD® ELECTRONIC SMART TYER

MODEL 2300M / 2200M

ORIGINAL INSTRUCTIONS

MODEL NUMBER_____
SERIAL NUMBER_____
WIRING DIAGRAM_____ISSUE___

Date: January, 2015

SAFETY PRECAUTIONS

As Burford® Corp. strives to promote safety in the maintenance and operation of Burford® equipment, we request that the following safety procedures be followed, along with any additional safety procedures set by the customer's in-plant safety officers or local codes.

1. Read the manual completely before attempting installation or operation of this unit.

2. This machine may contain programs that are password protected. Contact your supervisor or Burford® Corp. for password.

3. Incoming electrical power must be properly shielded, routed, and grounded. All safety codes should be followed. Study wiring diagrams before attempting installation.

4. Disconnect power to equipment before removing any guards or covers. Replace guards or covers before resuming operation of the unit.

5. Loose clothing, jewelry and long hair should be considered a safety hazard around mechanical equipment. Ensure that they will not be entangled in the equipment.

6. Keep clear of moving machine parts. Bodily harm and/or serious injury may result from contact with moving gears, sprockets, chains or pneumatically controlled machine components.

7. Do not bypass safety switches.

8. Do not attempt repairs while equipment is running.

9. Use only original equipment parts designed to safely operate in the equipment.

10. Only authorized personnel should be allowed to operate or perform maintenance on the unit.

11. This unit is not wash-down ready. Do not wash the unit or any of its electrical or mechanical components, with any form of high pressure or running liquids.

DISCLAIMER

The descriptions and specifications contained in this Service Manual were in effect when this manual was approved for printing. Our policy is one of continuous improvements, and we do hereby reserve the right to discontinue models at any time, or to change specifications, prices, or design without notice and without incurring obligations.

Burford® Corp. expressly disclaims any liability for damages and/or injuries caused as a result of negligence or misuse of its product. Such negligence or misuse includes, but is not limited to, software/program alteration, removal of guards, faulty wiring due to improper installation, subjecting the unit to washdown environments or any physical or mechanical changes made to a Burford® unit, by anyone other than a qualified Burford® Technician.

Burford® equipment should only be used for the purpose for which it was sold, and should not be modified in any way without notifying the General Manager of Burford® Corp. in writing of the modification.

The original language for this document is English. Translations to other languages may not be accurate.

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1.0 INTRODUCTION

1.1 General Information

The Burford® **2300M** Series Electronic Smart Tyer is designed to close plastic bags with twist tie ribbon in a wide variety of automatic packaging applications. The tyer uses a microprocessor to control and coordinate the motion of four servo motors, which perform the twist tying function. This machine is normally installed onto a bagger or conveyor and interfaced into the existing control system to create a complete package closing system.

1.1.1 Specifications

Depending on conveyor speed and flight spacing, the Smart Tyer is capable of operating speeds 100 plus packages per minute. The Smart Tyer operates on a nominal 110 Volts, 60 Hz, and single-phase alternating current. 15 amp service is recommended. Smart Tyer connections for bagger interlock and safety circuits are provided standard. A counter signal is provided which can be used in conjunction with an external counter (not provided).

Note:	Minimum size for a service transformer shall be 1.5 KVA

On flighted conveyors, any flight spacing may be used, but the tyer can have a higher production rate (packages per minute) with a small flight spacing, such as nine inches. This tyer can also be used on belted conveyors that provide consistent spacing. All referenced measurements are in inches except as noted.

1.1.2 Bag thickness requirements

For optimal performance, a minimum bag thickness of 1.25 mil is recommended.

1.0 INTRODUCTION, cont'd

1.1 General Information, cont'd

1.1.3 Bag neck length requirements

1. Measure the diagonal across the end of the product.

2. Take one-half of this diagonal measurement and (depending upon the machine combination) add three or four inches to determine the required length of the bag neck.

This formula is provided in case you are developing a new product package and need to calculate a bag neck length for an automatic tying operation. Please consult a reliable package manufacturer for your specific needs or contact Burford® Corp. if we can be of assistance.

CAUTION:	Short bag neck lengths can cause excessive ribbon drops and package jams.

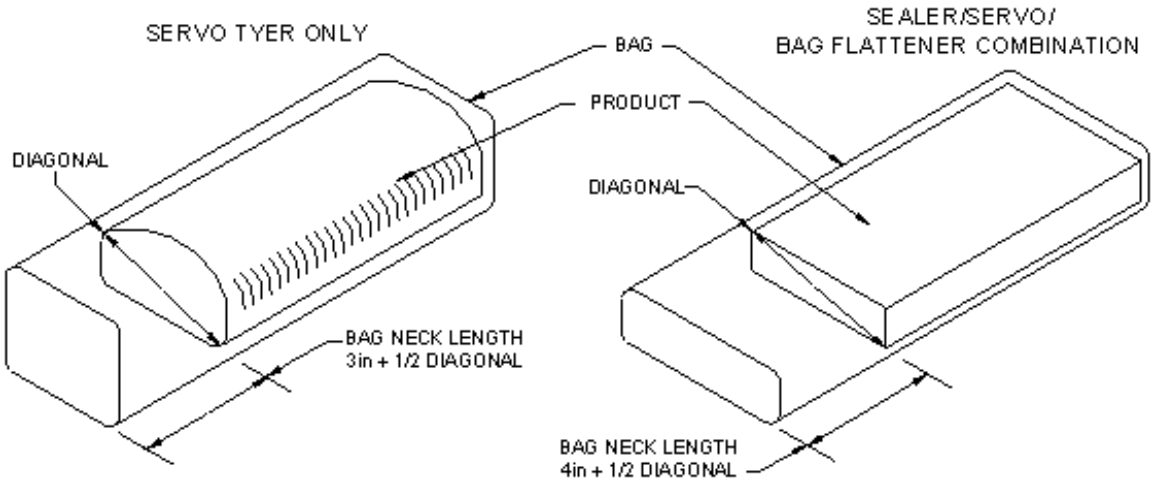


Fig. 1- Bag Neck Lengths

1.0 INTRODUCTION, cont'd

1.2 Model Numbers

MODEL **2200M** (Right Hand) - mounts on right side of conveyor.

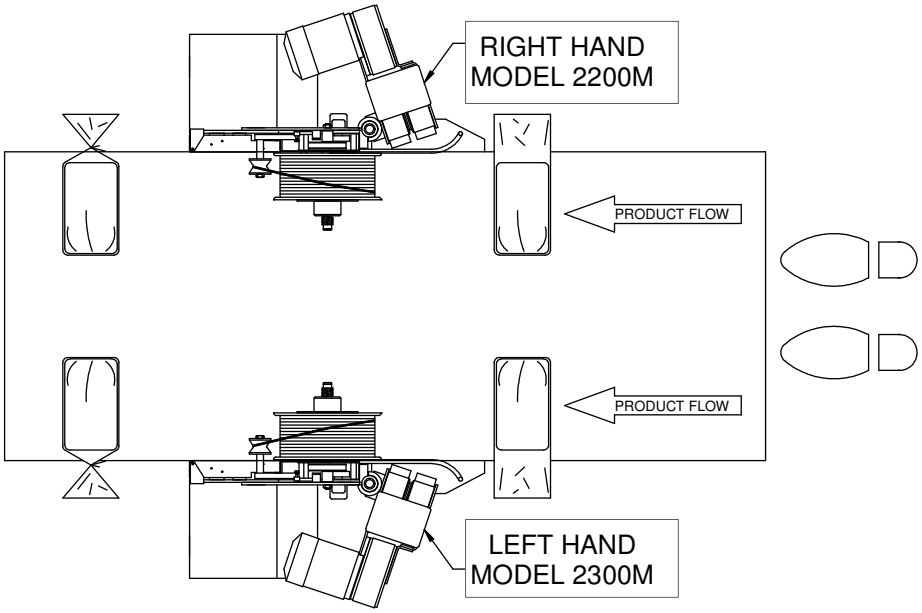


Fig. 1- Model Numbers

MODEL **2300M** (Left Hand) - mounts on left side of conveyor.

Note:	Referenced as looking with the direction of conveyor flow.

2.0 INSTALLATION PROCEDURES

These instructions are for a typical bagger. If your' specific installation requirements are different from what is described here. See Section 2.3 on how to contact Burford® Corp. for assistance.

2.1 Mechanical Installation

1. Locate the template drawing provided with your manual and review your application. Note that the template drawing is intended for use with standard bread packages. Depending upon your application, it may be necessary to raise or lower the mounting holes. Layout the bolt pattern as described on the drawing.

2. Center punch the hole locations' indicated. Drill 3/8" diameter mounting holes required for the standard unit (clearance holes for 5/16" bolts).

3. Position the Tyer Mounting Bracket (shown with dual ribbon system removed) and bolt this assembly onto the conveyor with 5/16" bolts and nylon insert nuts provided. Square bracket with conveyor and tighten securely.

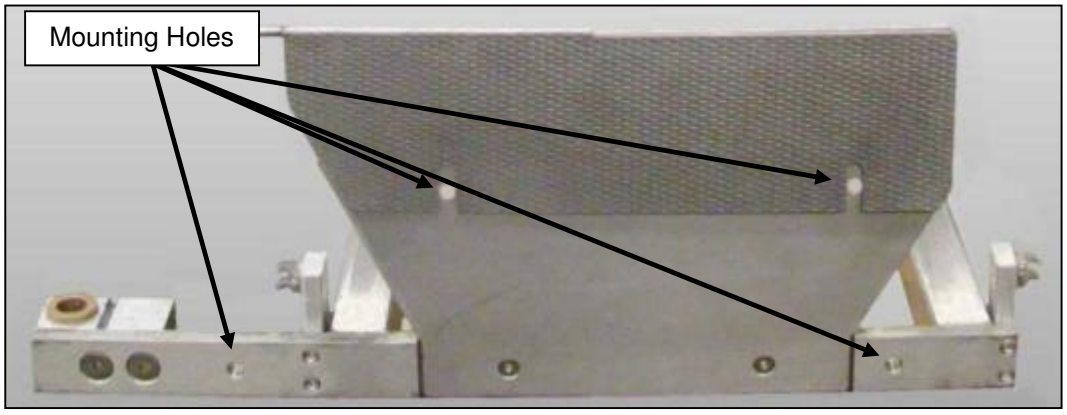


Fig. 2- Tyer Mounting Bracket

2.0 INSTALLATION PROCEDURES, cont'd

2.1 Mechanical Installation, cont'd

4. Remove the Tyer from the shipping crate and slide the unit onto the Tyer Mounting Bracket. Secure the tyer head using the clamps on the bracket. The centerline of the gathering belts should align with the center of the package. For instance, the belts should be 2 inches above the conveyor for a 4-inch tall package. If necessary, raise or lower the bracket to give the proper height.

5. Remove the brush assembly from the shipping crate and slide it onto the Tyer Mounting Bracket. See section 3.6.5 for proper adjustment.

6. For AMF/UBE bread bagger applications, position the product shelf plate inside the scoop channel. Line up the inlet plate slot with the two (2) studs on the side of the bagger conveyor. Secure with the flat washers and nuts provided.

Note:	Heel tab on Mark 50 baggers MUST be mounted on the operator side of the inlet plate to avoid bag damage.

7. Position the main electrical enclosure within six feet of the Tyer Head. Locate the four (4) pin power cable connector and thirty (30) pin main control cable connector attached to the main enclosure and connect it to the mating bulkhead connectors on the back of the Tyer. Locate the nineteen (19) pin operator control box connector (if equipped) attached to the main enclosure and connect it to the mating bulkhead connector on the back of the tyer. These connectors are polarized so that they cannot be plugged into the wrong receptacles. Locate the Brush Motor power twist-lock connector attached to the main enclosure and connect it to the mating connector attached to the Brush Motor.

2.0 INSTALLATION PROCEDURES, cont'd

2.2 Electrical Interconnections

To make specific wiring connections to your bagger or conveyor system please refer to the wiring diagram provided with this manual. The Model 2200M/2300M Electronic Smart Tyer is nominally a 110 VAC machine. If required, minimum service transformer size shall be 1.5 KVA. A flexible conduit is provided to route Line, Neutral, and Ground into the main enclosure. Included in this conduit are conductors for other bagger connections. The following is a description of the other possible connections.

2.2.1 Bagger enable circuit (safety interlock)

The Tyer provides a set of dry contacts that close when the Tyer is ready to tie packages. The Bagger Enable relay (CR2) is mounted in the Tyer's electrical enclosure. The contacts can be accessed using wires 58 and 59 in the flexible conduit. These contacts will open if a fault occurs in the Tyer or if a Tyer safety circuit is opened. These contacts should be wired in series with the bagger safety circuit to prevent the bagger from running if the Tyer is not threaded, the ribbon supply has been depleted, or the Tyer is not turned on.

2.2.2 Bagger-active circuit

This signal from the bagger to the tyer indicates the status of the bagger and it must be a 110 VAC type. This signal can be taken from across the coil of the clutch relay of most baggers. This signal drives the coil of a mechanical relay (CR1), which starts and stops the brush motor and gathering belts of the Tyer. This connection is used to prevent the Tyer's gathering belts and brushes from running while the bagger is stopped. This will prevent a package from being pulled forward over a conveyor flight. This will also reduce wear on the brushes and conserve energy during long breaks or periods of maintenance in other areas. This connection can be made using wires 40 and 43 in the flexible conduit coming from the main enclosure. Wire 40 should be connected to the Line side of the coil and wire 43 should be connected to the Neutral side of the coil. For setup and testing, the gathering belts and brushes can be made to run while the bagger is inactive by placing the switch on the front of the operator panel marked BELT/BRUSHES in the ON position.

Note: Wires 40 & 43 should be wired into the bagger so anytime the bagger is "CYCLING", 110 VAC is supplied to these wires.

2.0 INSTALLATION PROCEDURES, cont'd

2.2 Electrical Interconnections, cont'd

2.2.3 External counter output

If an external counter is desired, a set of dry contacts are supplied as an input to the customer's counter. The External Counter relay (CR3) is mounted in the Tyer's electrical enclosure. Connection can be made using wires 41 and 42 in the flexible conduit coming from the main enclosure. The contacts actuate for a period of about 1/4 second immediately after a successful tie has been completed. These contacts will not actuate if the tyer aborts its tie cycle or if the tyer determines that extra material is in the bag neck, such as a heel. The contacts can be configured to be normally open or normally closed by using DIP Switch 2 on the AMP board (see Section 3.9.1).

2.3 Installation Arrangements

A Burford® factory trained Installation Engineer may be hired for any installation. The arrangement can be made with the Service Manager:

Burford® Corp.
Maysville, Oklahoma
Phone: 1-877-BURFORD® or 405-867-4467
Fax: 405-867-4219

3.0 OPERATION PROCEDURES

3.1 Theory of Operation

Before discussing the specifics of the Burford® Model **2300M** Electronic Smart Tyer, the overall operation of the tyer will be described to illustrate the principles of the tying cycle. The Model **2300M** is designed to gather and securely close the neck of a plastic bag by twist tying it with a piece of reinforced ribbon.

The plastic bag first encounters a set of gathering brushes that flatten and straighten the bag neck. The brushes gently pull the bag neck and product against the inlet guide and main plate of the tyer. As the bag neck exits the brushes it is directed towards the gathering belts of the tyer. The gathering belts, which move at a selectable continuous rate of speed, transport the bag neck towards the tying position. As it approaches the tying position, the bag neck actuates the bag switch, which readies the electronics for the start of the tie cycle. When the bag neck releases the bag switch, the Model **2300M** controller waits for a short time before commencing the tie cycle. This delay allows the bag neck to gather against the ribbon for a more secure tie. Then the needle begins to move downward and allows the spring-loaded bag stop to engage, thereby restraining the end of the bag neck. The needle continues to rotate and wraps the ribbon around the neck of the bag. As the needle nears its full stroke, the twister hook begins rotating. The twister hook catches the end of the ribbon held in the holder/shear, and the part of the ribbon that is wrapped around the bag neck by the needle. As the hook twists the ribbon together, the holder/shear transfers to cut and hold the part of the ribbon held by the needle, and simultaneously releases the end of the twist tie. The twister hook completes its selectable four or five rotations while the needle returns to the home position, releasing the bag stop. After the twister hook has tightly secured the neck of the bag, it reverses rotation for one revolution to discharge the tie from the throat of the hook. The tied package is then carried away by the conveyor.

3.0 OPERATION PROCEDURES, cont'd

3.2 Package Recognition System

The Package Recognition System is an integral part of the Ribbon Tension assembly and the electronics. This system determines whether a bag neck has been properly presented in tying position. As the needle wraps the ribbon around the bag neck, the length of dispensed ribbon is measured. If the amount of ribbon dispensed is significantly less than that required by a normal package, the processor aborts the current tie cycle before the twister hook and holder/shear begin their motion. An audible alarm is sounded to alert the operator of a possible problem. This system detects inadvertent bag switch actuation caused by improperly packaged product or trash. By not allowing the holder/shear and twister to move, possible ribbon drops and jam-ups are avoided. If the length of dispensed ribbon is significantly more than normal, the tyer completes its tie, but the alarm is sounded to indicate that a heel may be contained in the tie. These features (heel detection and package recognition) can be disabled with DIP SWITCHES 4 and 6 on the AMP board (see section 3.9).

3.3 Dual Ribbon Spool System

As the ribbon pulls the dancer arm forward, a spring-loaded brake release arm is engaged, causing the "V" belt to be pushed up and away from the pulley, releasing the brake. The system provides an identical setup, which may be utilized by releasing the locking pin and rotating the assembly 180 degrees. This allows the next spool of ribbon to be staged for quick and effective ribbon changes.

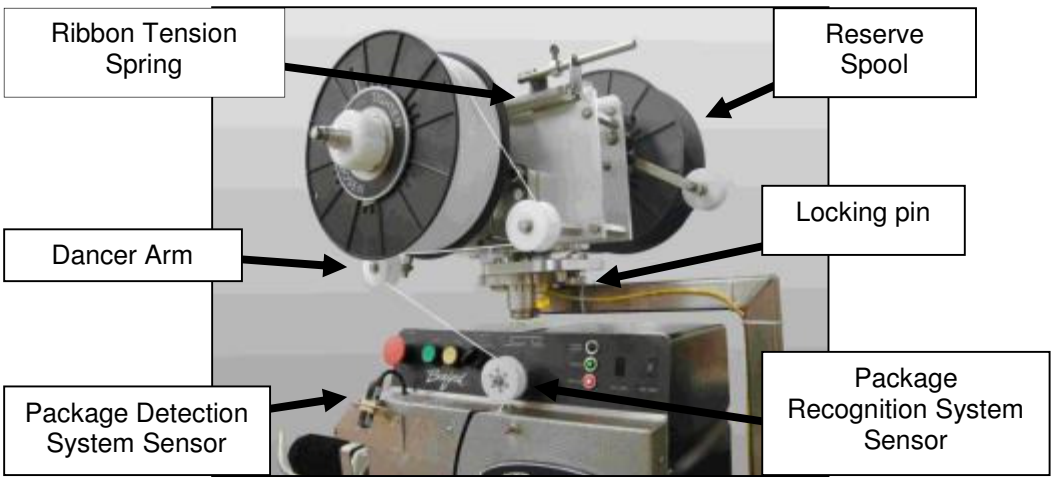


Fig. 3- Dual Ribbon Spool System

3.0 OPERATION PROCEDURES, cont'd

3.4 Package Detection System (PDS)

The Package Detection System monitors packages as they pass the Burford® Model **2200M/2300M** Servo Tyer and stops the bagger if a twist-tie is not applied. The system automatically resets after the next accepted package.

The PDS operates by monitoring the package sensor to determine when a package is in the operating area of the Servo-Tyer. Once a package is present, the system waits for the Servo-Tyer to actuate its counter contacts. If the Servo-Tyer has not counted the package as good before a preset time period has expired, the PDS will open the bagger safety circuit, stopping the bagger.

This feature can be disabled with DIP SWITCH 7 on the CPU board (see Section 3.9.2).

The Package Sensor is an advanced retro-reflective photo-proximity type. The sensor is factory preset to accommodate a large range of bag types and conveyor surfaces. However, for optimal operation, it is likely that some user adjustment may be required. Verify that the sensor does not detect the conveyor flights and does detect both the longest and shortest package that is run on the line.

Fig. 3- Product Sensor and Adjustments

If adjustments to the package sensor are required, turn the sensor gain and light / dark detect potentiometers until satisfactory operation is obtained. The sensor bracket may also be bent to extend or decrease the detection distance across the conveyor. Please note that bending the bracket will often require the sensitivity of the package sensor to be readjusted for optimal operation. See Figure 3-2 for the location of the adjustment potentiometers and operate LED.

3.0 OPERATION PROCEDURES, cont'd

3.5 General Operation

The following is a discussion of the overall operation of the Model **2200M/2300M** Electronic Smart Tyer. The Smart Tyer is designed so the operator has easy access to controls and adjustments from the front of the machine. The majority of the controls reside on the front of the operator control panel. The threading procedure has been simplified which reduces the time needed to change a ribbon spool.

An example of a normal start up procedure would be for the operator to first make sure the Tyer's main disconnect is turned on, and then insure the "STOP" button is in the "out" position. This will supply power to the Tyer's electronics, but does not supply power to the servo motors. Next, the operator must push the "START" button on the operator control panel. This will supply power to the servo motors and start the homing sequence. When the homing sequence is successfully completed, the Tyer is in the "RUN" mode. The operator should check the belt speed setting to ensure that it is correct for the current conveyor speed. If the ribbon is not threaded the operator should follow the procedure to thread the Tyer. The Tyer is now ready to automatically tie packages.

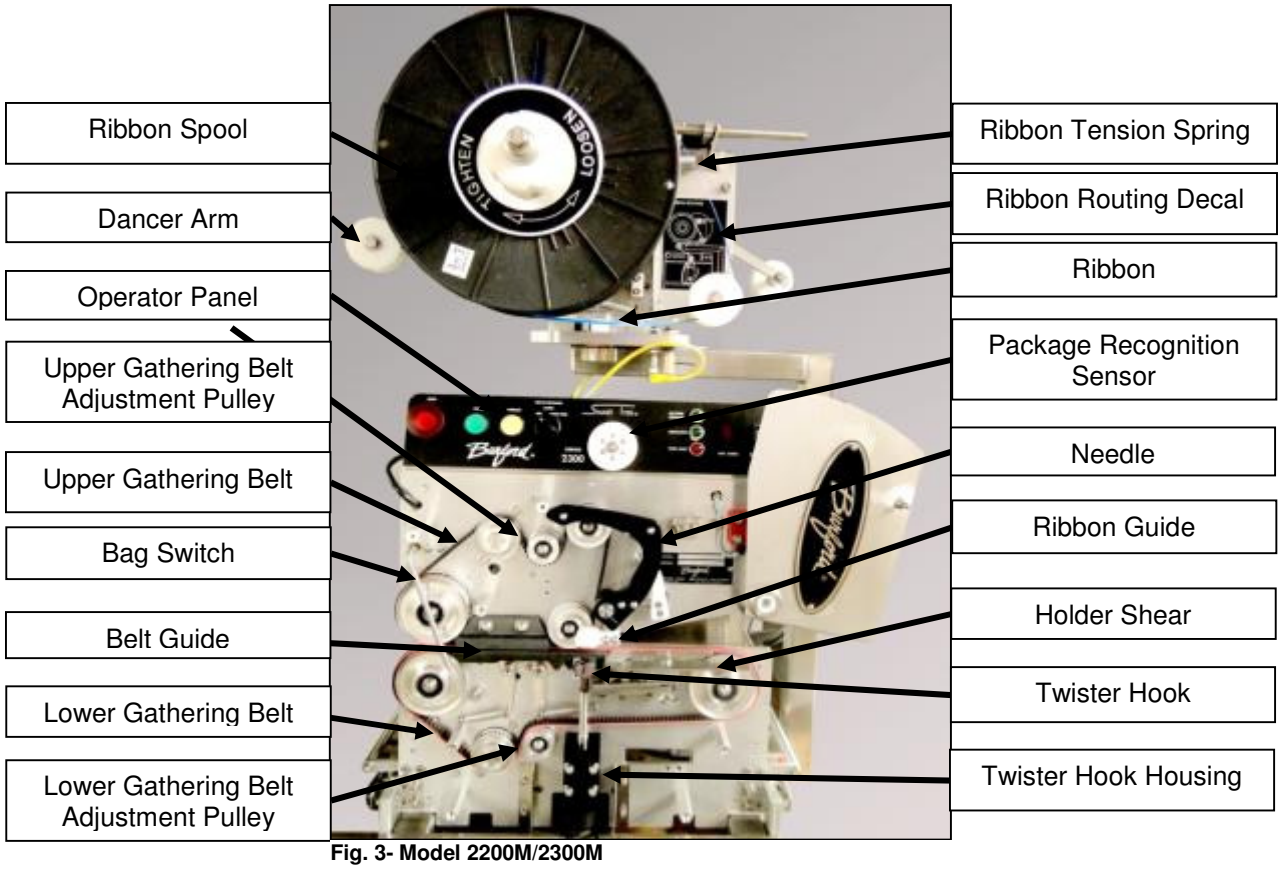


Fig. 3- Model 2200M/2300M

3.0 OPERATION PROCEDURES, cont'd

3.5 General Operation, cont'd

3.5.1 Operator controls

Fig. 3- Operator Controls

Item	Description
"STOP" Pushbutton	This button is used to disable the Tyer during operation. The "TYER FAULT" light will turn on and the "MOTORS ENABLED" light will turn off. If the "STOP" button is pushed or the front access cover is opened, servo motor power will be turned off. Power is removed from the servo motors until the "START" button is pushed. Pushing the "STOP" button should not turn off the "INITIALIZED" light.
"START" Pushbutton	The first time this button is pushed after power up, the homing sequence is initiated. This sequence locates the position of each axis relative to its home proximity sensor. Once the homing sequence is successfully completed, the "INITIALIZED" light should turn on and the belts may start running. If the brushes are turning and the belt speed is set to anything other than zero, the belts should run. Any other time the "RUN" button is pushed power will be applied to the servo motors without going through the homing sequence. The Tyer is now in the "RUN" mode.
"THREAD" Pushbutton	This button has two functions. The main function is to complete the threading procedure after being pushed and quickly released, which is described in Section 3.5.3. The second function is to force the Tyer to re-initiate the homing sequence. If for any reason, a previous homing sequence did not prove satisfactory, the Tyer can be re-homed by holding the "THREAD" button in for three seconds. For this button to function the Tyer must be in the "RUN" mode with the "MOTORS ENABLED" and "INITIALIZED" lights on.
"BELTS/BRUSHES, ON-AUTO-AUTO/PDS" Selector Switch	This is a three position maintained selector switch. During normal operation, it should be in the "AUTO" position. If the interlock signal from the bagger is connected properly, the brushes and belts will only run when the bagger is active. To override this interlock signal and run the brushes and belts continuously, move the switch to the "ON" position. To activate the Package Detection System move the switch to the "AUTO/PDS" position.
"MOTORS ENABLED" Light	This light indicates when the servo motors have power. It should turn on when the "RUN" button is pushed and stays on until the "STOP" button is pushed or the front cover is opened.
"INITIALIZED" Light	This light will be off when the Tyer is first powered up. It will turn on and stay on when homing sequence has been successfully completed. This light must be on before the Tyer can be threaded.
"TYER FAULT" Light	This light will indicate problems with the Tyer. During normal operation, the light should be "OFF". The light will turn "ON": • If the Tyer drops of out "RUN" mode. For example, if the "STOP" button is pushed or the front cover is opened. • If a ribbon drop is detected. However, the tyer will stay in "RUN" mode when this fault is detected. • The "TYER FAULT" light will toggle "ON" and "OFF when the audible alarm is beeping. This is intended to help the operator identify which machine is sounding the alarm.
"BELT SPEED" Push wheel Switch	In normal operation, this switch enables the operator to adjust the speed of the gathering belts. The belt speed can be adjusted from a setting of zero to fifteen. In normal operation, each speed setting is approx. 15 percent faster than the previous setting. Proper speed should pull the package 1"-2" ahead of the flight and finish tying as the flight catches up. If the tyer is setup so that the belt speed automatically adjusts to compensate for conveyor speed changes (see Section 3.12), this switch provides a fine adjustment for conveyor speed.

3.0 OPERATION PROCEDURES, cont'd

3.5 General Operation, cont'd

3.5.2 Main enclosure, controls

3.5.2.1 Main power disconnect

Disconnects the AC power coming to the Tyer controls. This does not disconnect any interlock connections coming from the bagger or conveyor.

3.5.2.2 Audible alarm

This gives the operator audible feedback as to the status of the Tyer. The following is a list of the audible alarm codes. A long beep is 1 second in duration. A short beep is 1/2 second in duration.

Alarm	Display Code	Description
1 Short	None	Power turned on, or home sequence successful.
2 Short	H006	Bag necks too close together (tried to start 2nd cycle before 1st cycle was completed).
1 Long	H007	Aborted tie cycle, not enough ribbon used.
2 Long	E116, E126, E136 or E146	One or more motors jammed or encoder faults.
3 Short	H008	Heel tied in package, too much ribbon used.

3.0 OPERATION PROCEDURES, cont'd

3.5 General Operation, cont'd

3.5.3 Changing and threading the ribbon

The Burford® Smart Tyer is equipped with a dual ribbon spool assembly. For clarification on threading, refer to ribbon routing decal next to the ribbon spool on the Tyer. To remove a ribbon spool from the spindle, turn the ribbon chuck in the loosen direction, as marked on the chuck, until the ribbon chuck comes off the spindle. Pull the ribbon spool off the spindle. The spool of ribbon must be placed on the spindle so that the ribbon leaves at the top of the spool.

Place the ribbon chuck on the spindle and turn the ribbon chuck in the tighten direction, as indicated on the chuck, until it is snug. Untie the ribbon from the spool and unwind about three feet. See Figure 3-5 for ribbon routing. As you route the ribbon around each spool, let the ribbon glide through your finger, do not hold the ribbon taught. First, route the ribbon over the top plastic roller labeled "#1". Then, guide the ribbon toward the infeed end and over the top of the roller on the end of the dancer arm "#2". Next, guide the ribbon back toward the discharge end and over the bottom roller labeled "#3". Then, slip the ribbon around the back of the access cover handle and thread it down the gap between the two front covers. Next, slip the ribbon along the bottom of the access cover towards the discharge end. While letting the dancer arm relax to its extended position, hold the ribbon firmly and press the THREAD button on the front of the operator control box. The ribbon will automatically be adjusted to the proper tension.

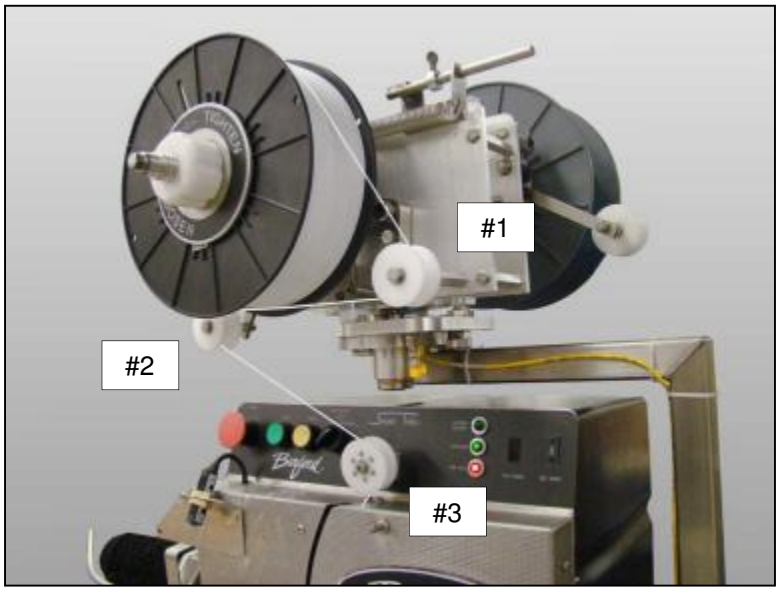


Fig. 3- Changing and Threading Ribbon

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments

3.6.1 Timing

The design of the Model **2300M** Electronic Smart Tyer is based on precise computer control of servo motors. The electronic nature of the Smart Tyer is unique in that it does not require any mechanical timing adjustments. The CPU contained in the proprietary electronics monitors each of the four motors, hundreds of times every second to verify their relative position. Corrections to motor position are made during the tie cycle to ensure the package is properly tied.

3.6.2 Lubrication

The two-flanged bearings supporting the needle shaft should be lubricated twice a year. The four bearings supporting the drive shafts for the gathering belts should be lubricated once a month when the tyer is normally running at speed settings of 12 or more. When the tyer runs at lower speeds, lubricating once every 3 months is sufficient.

3.6.3 Proximity sensor adjustment

The Smart Tyer has six proximity sensors; four are used to locate the relative position of the needle, holder/shear, and twister hook and bag switch. The fifth and sixth sensors are used to measure the amount of ribbon dispensed, and to detect ribbon drop. All six sensors are small 8 mm diameter inductive proximity sensors. Each sensor should be adjusted so it is 0.030 - 0.050 inch from its target.

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.4 Gathering belts tension adjustment

The upper and lower gathering belts are tensioned by moving idler pulleys in slotted holes. These belts should not be ran very tight because that would place excess load on the belt motor, resulting in a blown fuse on the Amplifier board.

3.6.4.1 Upper belt adjustment

1. Measure tension of upper gathering belt at area shown.

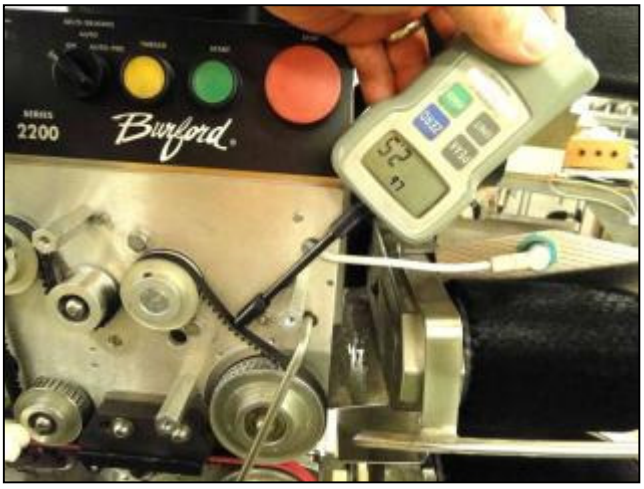


Fig. 3- Upper Belt Adjustment

2. With 2.5 pounds of pressure applied to belt the deflection should be approximately 3/8 of an inch.

3. To adjust: re-position upper idler pulley as necessary.

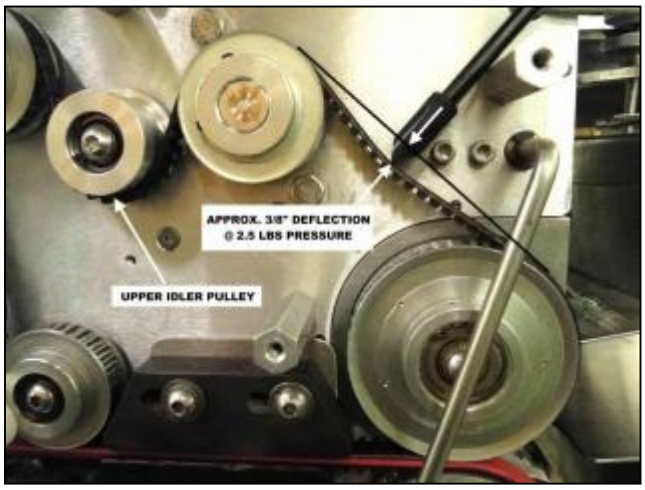


Fig. 3- Upper Idler Pulley

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.4 Gathering belts tension adjustment

3.6.4.2 Lower belt adjustment

1. Measure tension of lower gathering belt at area shown.

2. With 2.5 pounds of pressure applied to belt the deflection should be approximately 5/16 of an inch.

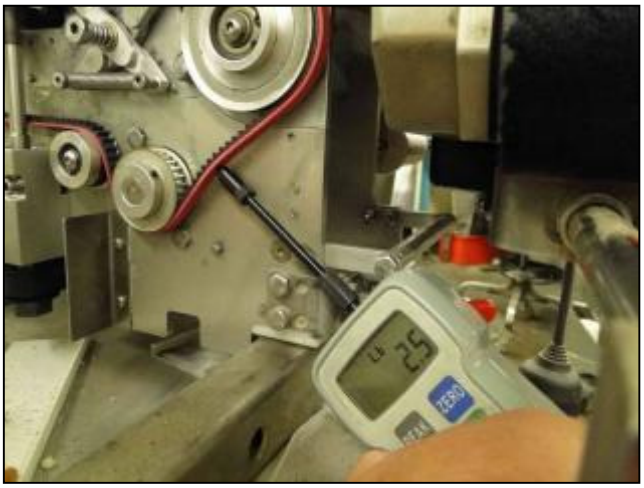


Fig. 3- Lower Belt Adjustment

3. To adjust: re-position lower idler pulley as necessary.

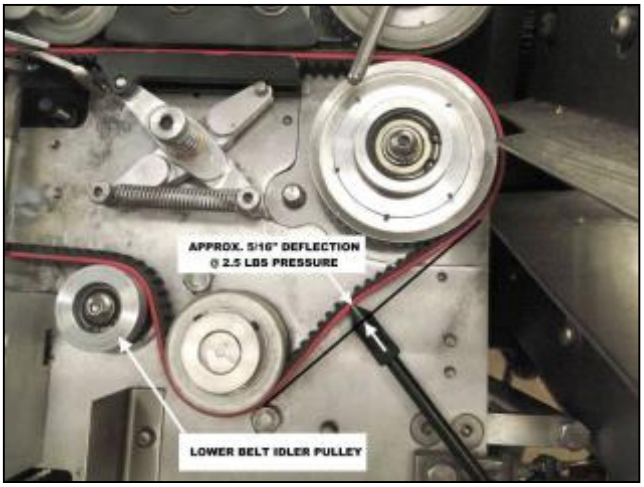


Fig. 3- Lower Idler Pulley

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

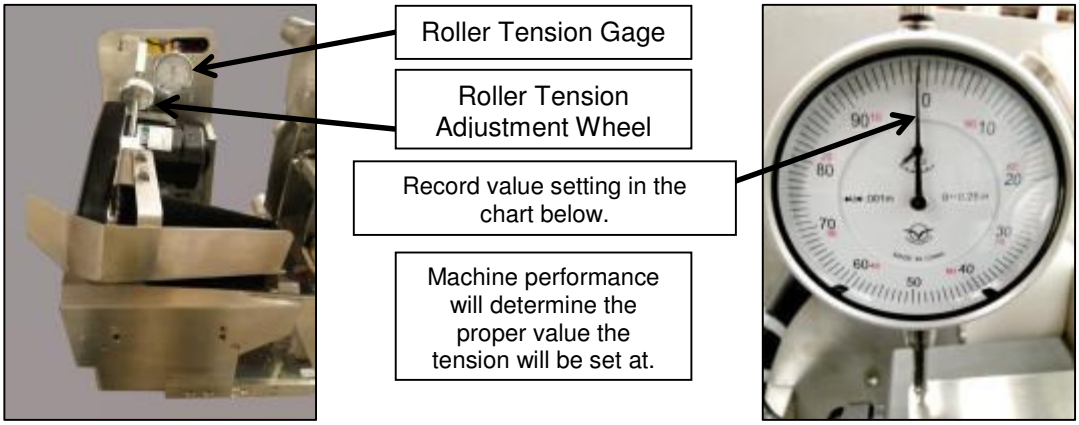
3.6.5 Gathering brush adjustment

3.6.5.1 Gathering brush tension adjustment

Fig. 3- Gathering Brush Adjustment

The tension of the gathering brushes can be varied by using the adjustment knob and tension gage provided on the top of the brush assembly. This knob limits the amount of mesh between the upper and lower brushes.

The amount of mesh between the brushes depends upon the application. On bread bags, the brushes are usually adjusted to give a gentle pull on the bag neck as the bag passes through the brushes. This takes slack out of the bag and gets the bag neck out straight to properly enter the tyer belts. On bun bags, it is usually not desired to pull on the bag with the brushes. Rather, the objective is merely to feed the bag neck smoothly into the tyer belts. In this case, the gathering brushes should have very little or no mesh. In all cases, the brush mesh must be limited so that the bag neck tension does not tend to pull the product through the guides and into the brushes.



ROLLER TENSION CHART					
Machine performance will determine the proper value the tension will be set at. Record this value in the space below each time the roller tension is recalibrated.					
Variety / Bag Type	Value	Value	Value	Value	Value

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.6 Gathering belts speed adjustment

In normal operation, this switch enables the operator to adjust the speed of the gathering belts. The belt speed can be adjusted from a setting of zero to fifteen. In normal operation, each speed setting is approximately 15 percent faster than the previous setting (see table below for approximate values). A proper speed setting should pull the product 1"-2" ahead of the flight and finish tying as the flight catches up with the product.

BCD Setting	EST. Belt FPM
1	18
2	22
3	27
4	33
5	40
6	48
7	58
8	70
9	85
10	103
11	125
12	151
13	182
14	221
15	267

In most installations, the belts will not normally run when the conveyor is stopped. For testing, you may make the belts run with the conveyor stopped by turning the selector switch on the operator panel to the "ON" position. Be sure to return the switch to the "AUTO" position after testing. To properly set the speed of the gathering belts, you must be running product at normal speed. The speed of the belts should be adjusted so that the end of the bag is pulled slightly forward from the flights. As soon as the tyer completes its tie of the package, the conveyor flight should be just catching up with the package. The flight then carries the tied package away from the tyer.

The belts should not be run any faster than necessary to ensure that the tie is completed just before the flight pushes the tied package out of the tyer. If the belts are running too fast, a bag may be pulled into the tying position before the previous package has been removed by its flight. This can cause two packages to be tied together or excess wear on the belts.

If the belts are running too slowly, the package will tend to drag back against its flight as it is being tied. In addition, it will appear as if the tyer is not keeping up with the needed production rate.

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.7 Ribbon dispenser adjustment

1. Release all spring tension from the ribbon assembly by loosening thumb screw and sliding the cantilevered spring stop to relieve spring tension.

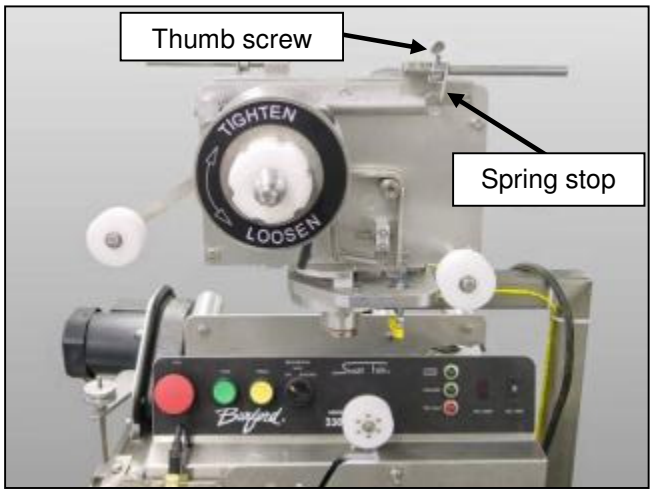
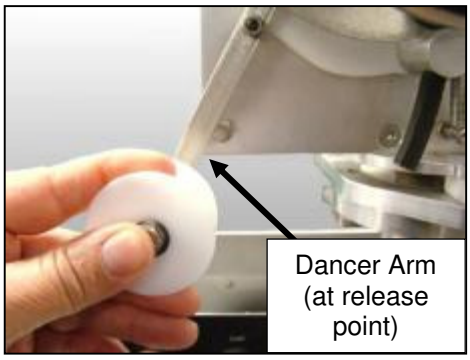


Fig. 3- Ribbon Dispenser Adjustment

2. Position dancer arm such that it is aligned with the corner of the main plate (as shown at right). Loosen "V" belt clamp, for ribbon spool assembly, and adjust "V" belt until the release point is as shown in the pictures below.



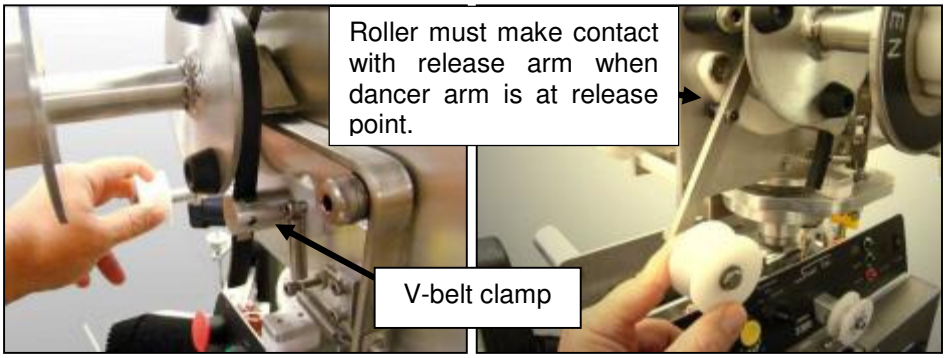


Fig. 3- Dancer Arm Positioning

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.7 Ribbon dispenser adjustment, cont'd

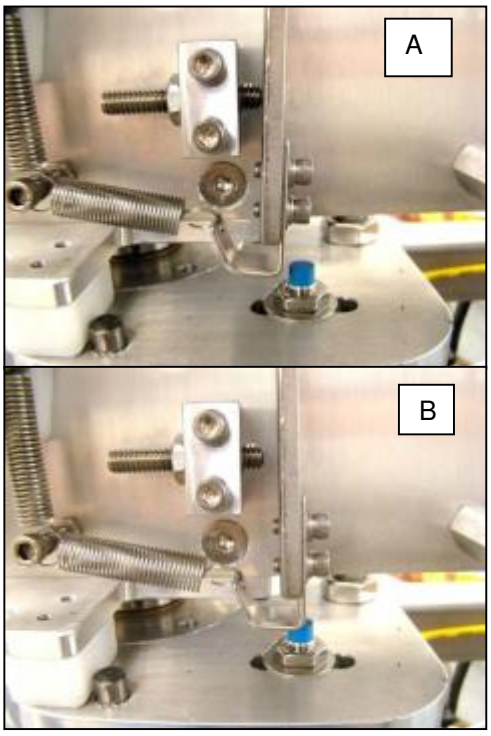
3. Mount spool of ribbon on spool holder.

4. Set brake tension to 1.5 lbs. by using a pull meter or similar method to measure force to pull ribbon from spool. To increase/decrease the brake tension slide the spring stop until correct tension is reached. Position thumb screw next to spring stop and securely tighten.

Fig. 3- Setting Brake Tension

5. Repeat for ribbon dispense on back side.

6. Verify the ribbon drop sensor operation. When the ribbon has not been threaded and brake tension is being applied to the dancer arm, the ribbon drop sensor should not be sensing the ribbon drop tab (see Figure 3-14 A). When the ribbon has been threaded and ready for production the ribbon drop sensor should be sensing the ribbon drop tab (see Figure 3-14 B).



7. Verify brake tension is at 1.5 lbs. using a pull meter or similar method.

8. Once the adjustments are satisfactory, run several test packages using both the upper and lower spools. The brake should hold firm when the tyer is idle and rotate freely when the tyer is pulling ribbon.

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.8 Spacing of twister hook shaft to tip of holder/shear

The proper spacing is 3/32" (see Figure 3-15). If these two items are too close, the ribbon will sometimes wrap around the shaft of the hook. The only adjustment available is the play in the mounting holes for the twister hook bearing tower and the holder/shear mounting.

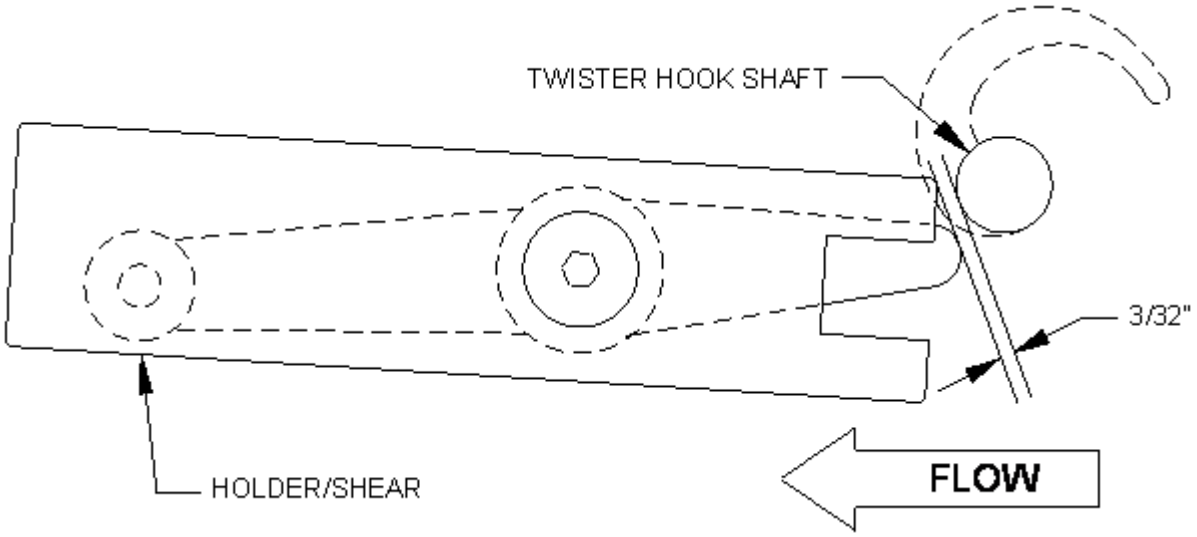


Fig. 3- Twister Hook Shaft

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.9 Holder/shear adjustment

The force with which each side of the holder/shear holds the ribbon is adjustable to provide the same holding force on each side of the holder/shear.

1. Verify electrical power has been removed from the tyer head. Follow lockout/tagout procedures for your facility.
2. Remove large back cover from rear of tyer head.
3. Loosen knob and open electrical panel.
4. Locate and remove (2) screws securing the bag tail tunnel bracket. Screws can be reached from the rear of the tyer head (see Figure 3-17).

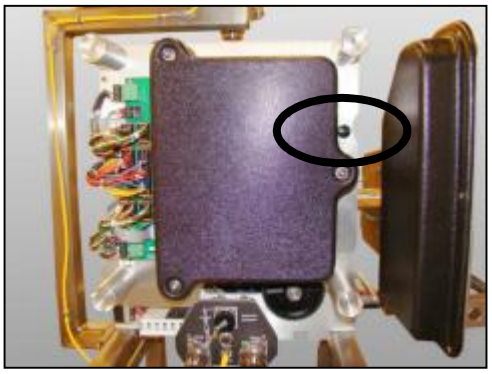


Fig. 3- Holder/Shear Adjustment

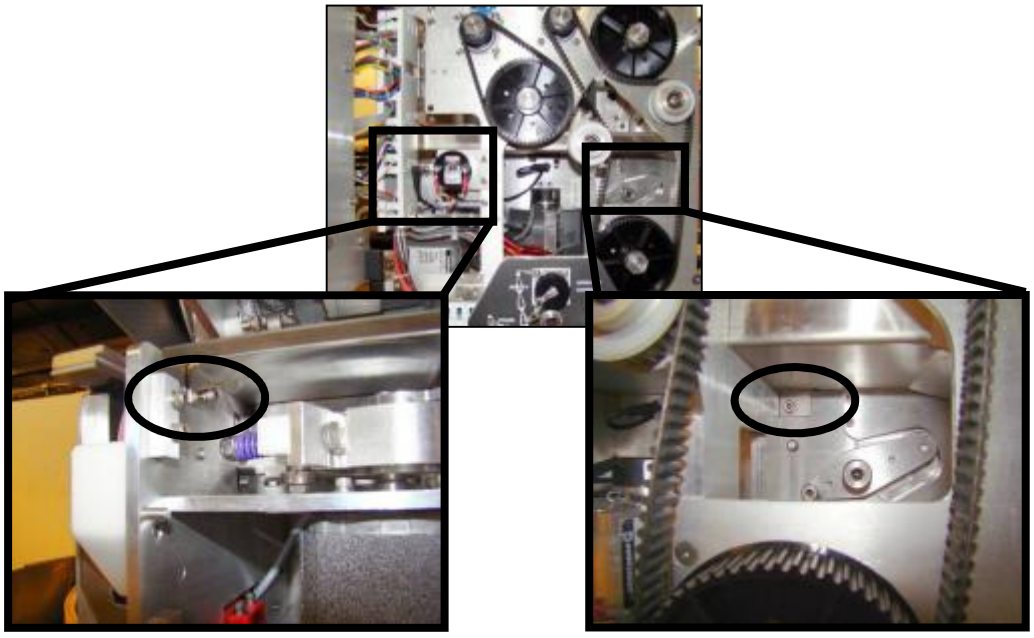


Fig. 3- Bag Tail Tunnel Bracket

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.9 Holder/shear adjustment, cont'd

5. Remove tunnel plate.
6. Locate holder/shear cam. Rotate holder/shear came a few times to obtain a "feel" for its operation.
7. Rotate holder/shear cam until the point where it begins to resist further rotation. Measure this distance to an arbitrary point (see Figure 3-19 A). Rotate the holder/shear cam 180 degrees and measure again to the same arbitrary point (see Figure 3-19 B). The desired result is for these distances to be equal.

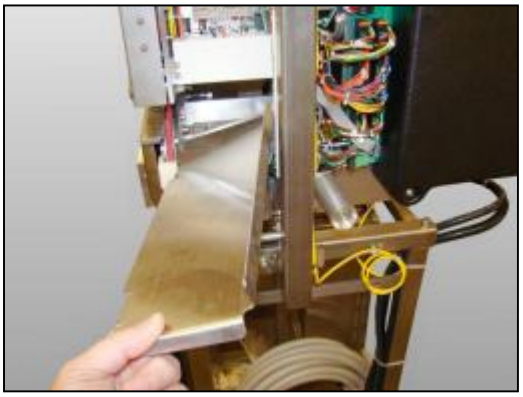


Fig. 3- Tunnel Plate

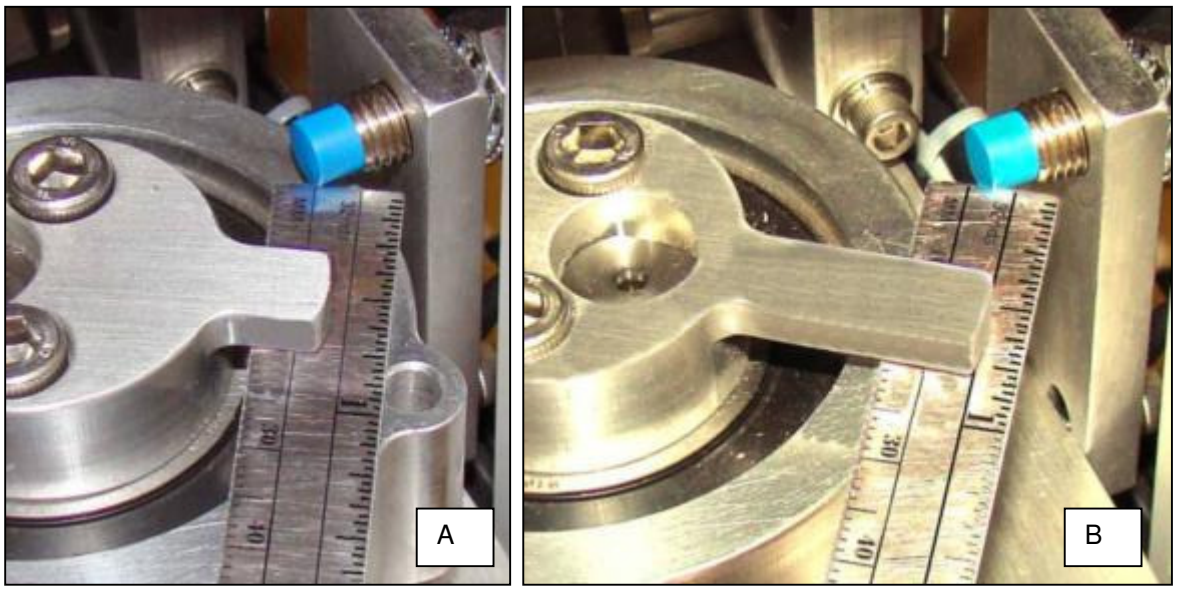


Fig. 3- Holder/Shear Cam

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.9 Holder/shear adjustment, cont'd

8. If not equal distances, then loosen shuttle bar bolts. Now when the cam is rotated the holder/shear mounting plate will slide in either direction along the shuttle bar. Rotate holder/shear cam and measure until distances are equal. This will require tightening and loosening the shuttle bar bolts after each attempt. Tighten the shuttle bar bolts securely once satisfied with adjustment. Adjust the black cam spring tension by setting the spring length to 3/4".

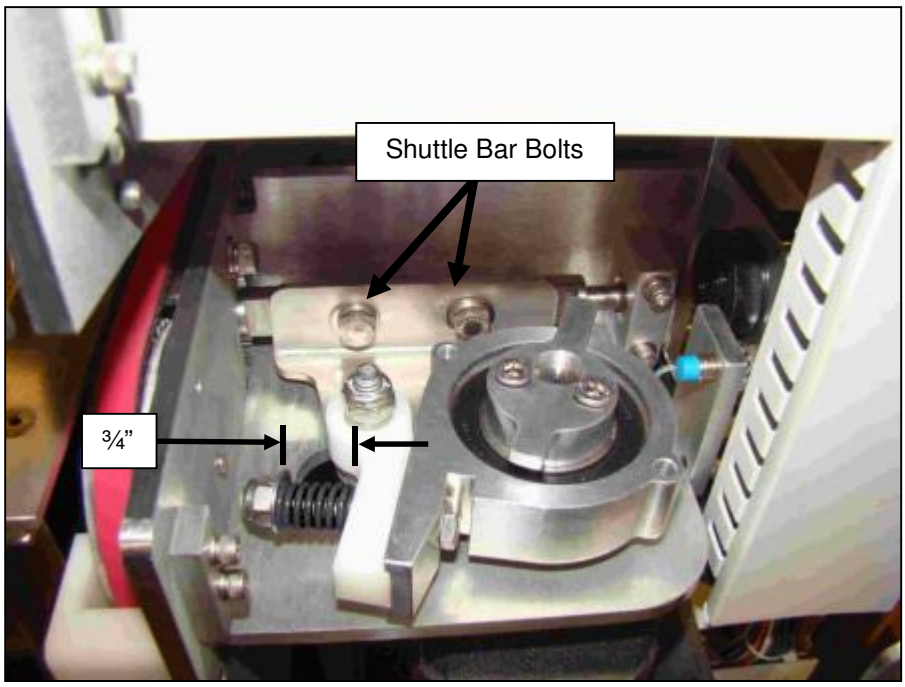


Fig. 3- Shuttle Bar Bolts

9. After adjusting the holder/shear, always verify that the ribbon is being held tightly enough on each side by threading the tyer and pulling on the ribbon by hand. Normally the ribbon will break before being pulled out of the holder/shear.

10. Install tunnel plate, close electrical panel and mount rear cover.

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.10 Adjusting the tie tightness

There are two adjustments on the Model **2200M/2300M** Tyers to adjust the tie tightness. One adjustment is the ribbon guide position and the other is the upper belt pulley position.

To correctly adjust these it is important to understand how this area of the Tyer works. The bag neck is gathered into an area called the "tie window". The tie window is shaped like a triangle. The triangle sides are outlined by the lower belt, upper belt and ribbon wire (see Figure 3-21). By increasing or decreasing the size of the tie window, the tension around the bag neck can be determined. If the tie around the bag neck is loose, the window area should be decreased. If the tie around the bag neck is so tight as to cause tears or holes in the bag neck, the window area should be increased. The window may also need to be adjusted when changing bag size or bag thickness.

Note:	Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.

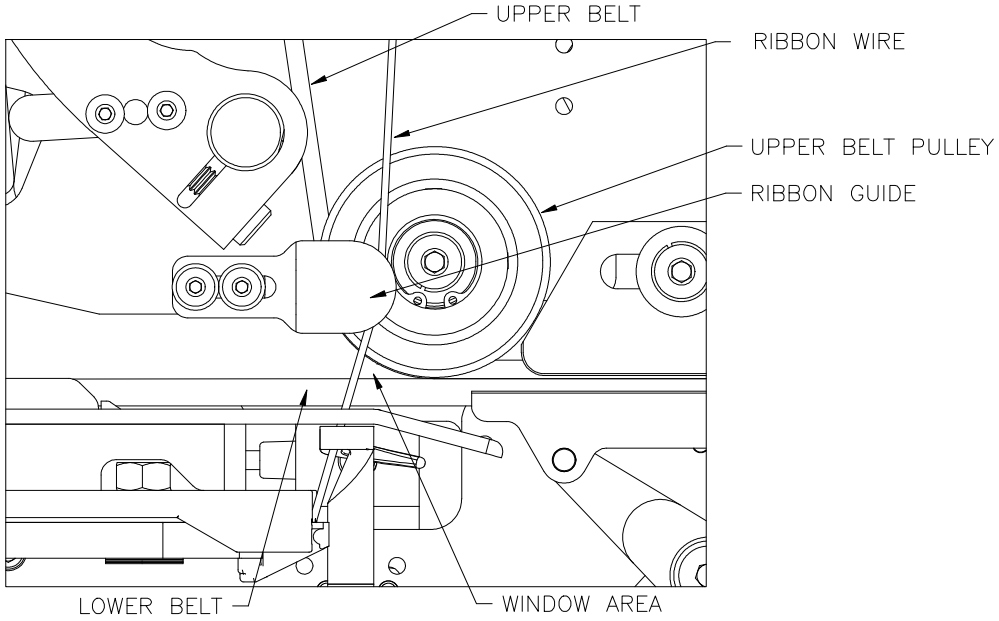


Fig. 3- Tie Tightness

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.10 Adjusting the tie tightness, cont'd

3.6.10.1 Factory setting

The ribbon guide is positioned so the downstream side of the lobe is flush with the mounting block, with the belt pulley positioned so the upper belt is approximately 1/8" from the needle shaft.

3.6.10.2 Adjusting the eccentric ribbon guide

The eccentric ribbon guide adjustment is for fine tuning the tie window area and can be adjusted by opening the front cover, loosening the ribbon guide, and sliding the guide to change the position of the ribbon wire. Moving the ribbon downstream increases the tie window area and loosens the tie. Moving the ribbon wire upstream decreases the tie window area and makes a tighter tie. When you have found the proper position for the guide be sure to tighten the mounting screws.

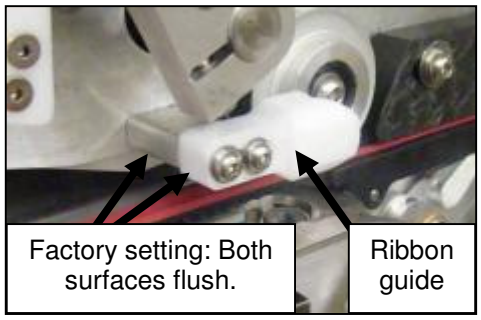


Fig. 3- Eccentric Ribbon Guide

3.6.10.3 Adjusting the belt pulley

If after adjusting the eccentric ribbon guide the bag is still not tied with the proper tension, the upper belt pulley may need to be adjusted. First, loosen the mounting bolt and nut of the upper belt pulley. Slide the upper belt pulley downstream to decrease the area of the tie window and increase the tightness of the tie or upstream to increase the tie window area and reduce the tightness of the tie. When the pulley is in the proper position tighten the mounting bolt and nut.

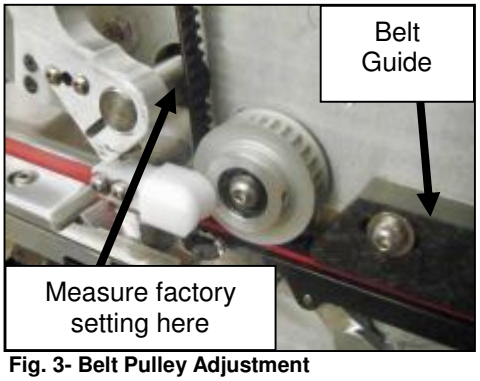


Fig. 3- Belt Pulley Adjustment

Note:	Factory setting results in a 1/8" gap between upper belt and needle shaft.

Note:	This procedure will require repositioning the belt guide as close to the belt pulley as possible <u>without</u> touching the belt pulley.

Note:	This procedure will require rechecking the upper belt tension (see Section 3.6.4.1).

3.0 OPERATION PROCEDURES, cont'd

3.6 Settings and Adjustments, cont'd

3.6.11 Adjusting the bag switch

1. With the bag switch rod centered on belts (use a thin scale), adjust sensor to 1/16" below surface of flag.

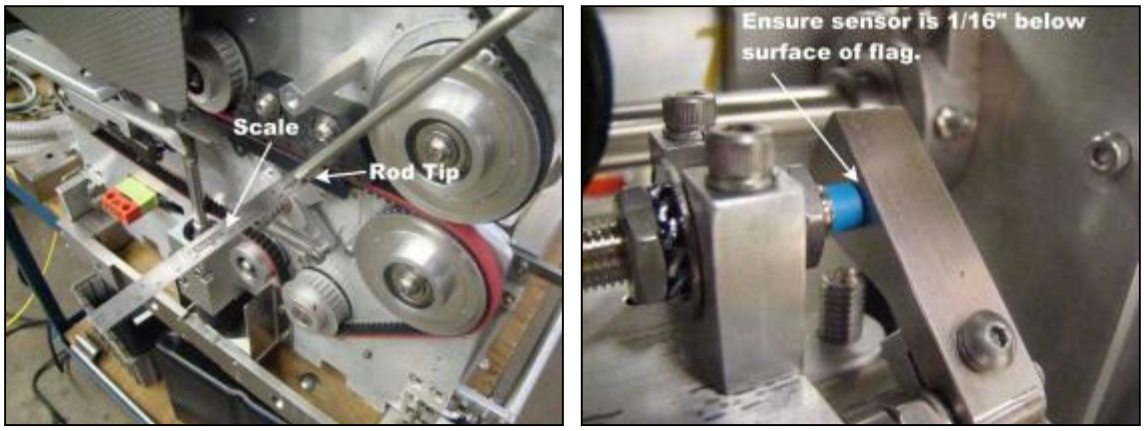


Fig. 3- Bag Switch Adjustment

2. Next, with bag switch rod resting on rod stop (located on front cover) adjust the 5/16-18 set screw to provide 1/16" gap between bottom of flag and top of the set screw.

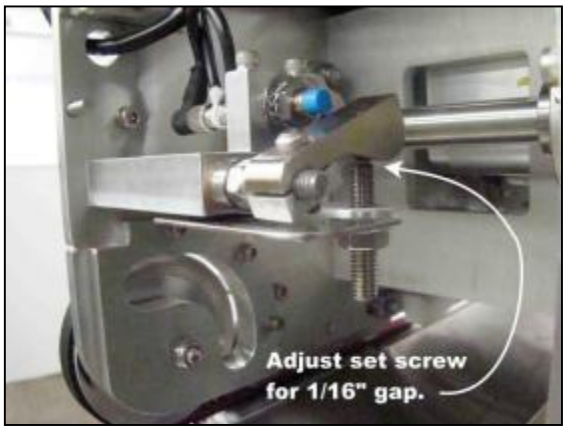


Fig. 3- Bag Switch Stop

Note:	All settings to be made with tyer unclamped and in the "maintenance" position.

3.0 OPERATION PROCEDURES, cont'd

3.7 Electrical

3.7.1 Circuit board descriptions

3.7.1.1 CPU board, part number C01410

The CPU Board is a six inch by six inch circuit board that contains the main processor and program memory. It has total control over the smart tyer and can communicate with an external terminal using the serial port connector on the front edge of the board. The CPU Board is attached to the Amplifier Board with four mounting screws. Signal connections between these two boards are made through the seventy-two pin connector J2. The CPU Board has a seven-segment LED display that can display machine status one character at a time. See Section 4.2 for specific details on this display. The CPU board is considered a replacement unit. The proprietary software used to control the Smart Tyer was developed by Burford® Corp. and cannot be altered in the field.

3.7.1.2 Amplifier board part number 611464

The AMP Board is a ten and one half inch by eleven inch circuit board that is controlled by the CPU Board through the seventy-two pin connector J1. The Amplifier Board contains the decoder electronics for the motor encoders as well as the pre-drivers and motor drivers for each of the four axes. This board converts sensor and encoder signals to five volt logic and relays them to the CPU board. Connections to motor power and the motors are made at the edge of this board. Each motor output is fused individually to protect the board from a shorted output. The AMP board also contains two relays, which are described in Section 3.9.1.

3.0 OPERATION PROCEDURES, cont'd

3.8 Relay Descriptions

3.8.1 Panel relays main enclosure

See Section 7.16 for more parts and wiring diagram.

SR1, (611508)	Latches in logic power (J4 connector on Amplifier board).
CR0 (611455)	Connects 48 VDC motor power to Amplifier board (T1 connector).
CR1 (610374)	Latches the bagger clutch signal.
CR2 (610404)	Latches the bagger enable signal.
CR3 (610404)	External counter contacts.
CR4 (610404)	Latches the servo enable signal.
CRE1 (C05138)	Latches in Brush Motor.

3.8.2 Amplifier board relays

CR1	Run Circuit Relay, operator START button latches in this relay.
CR2	CPU Status Relay, CPU energizes this relay when it is ready to control the motors.

3.0 OPERATION PROCEDURES, cont'd

3.9 DIP Switch Settings

3.9.1 Amplifier board part number 611464

The Amplifier board, P/N 611464, has a group of eight DIP switches (labeled SW1) and one jumper switch (labeled H1), which are used to configure Tyer parameters. The following table identifies the switch functions.

SW1 Settings		
Switch #	**OFF Position**	**ON Position**
1	Right hand machine, Model 2200M	Left hand machine, Model 2300M
2	Counter's contacts close to count	Counter's contacts open to count
3	Not used.	Not used.
4	Heel Detection Inactive	Heel Detection Active
5	Use data in battery backed RAM	Use data in PROM (default set-up)
6	Package Recognition cycle abort inactive	Package Recognition cycle abort active
7	Normal tie cycle speed	Maximum tie cycle speed
8	Four twists by twister hook.	Five twists by twister hook.
H1 Jumper Settings		
	LH position	**RH Position**
	For Model 2300M belt motor direction.	For Model 2200M belt motor direction.

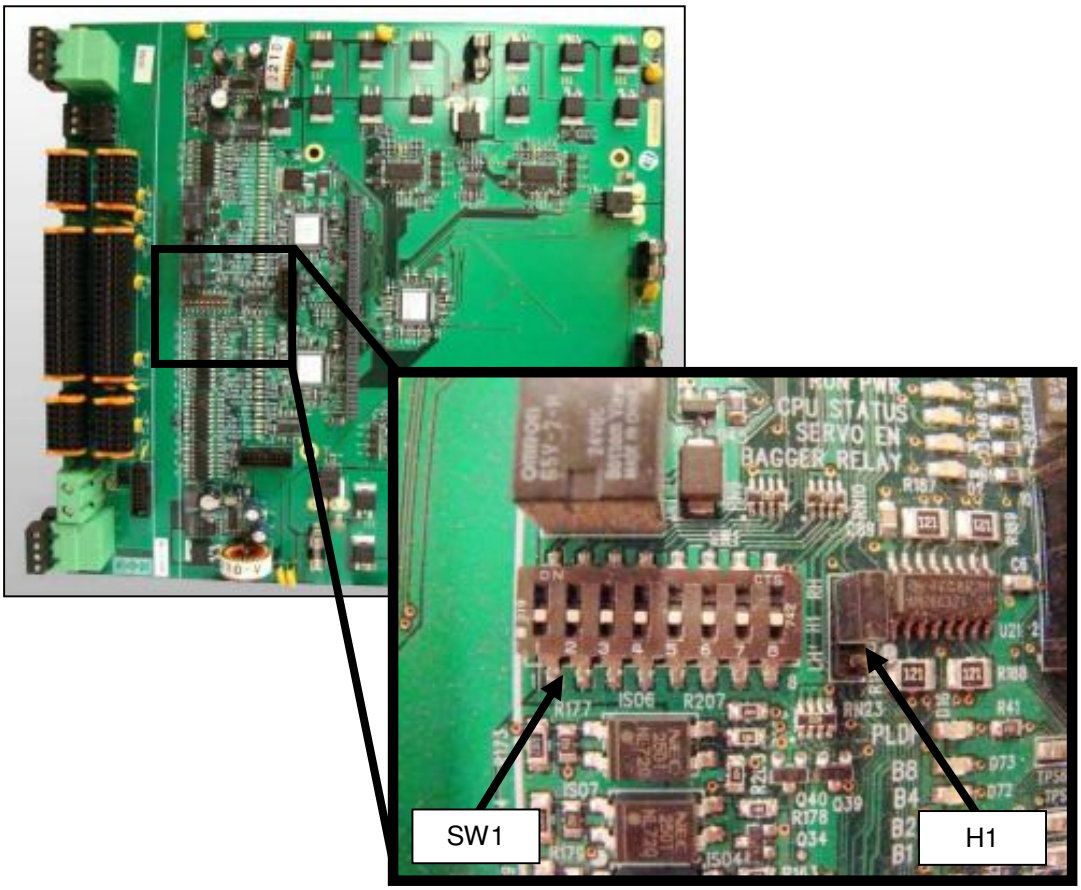


Fig. 3- AMP Board DIP Switches

3.0 OPERATION PROCEDURES, cont'd

3.9 DIP Switch Settings, cont'd

3.9.2 CPU board part number C01410

The CPU board, P/N C01410, has a group of eight DIP switches labeled S1. The following table identifies the switch functions.

Switch #	OFF Position	ON Position
1	Not Used.	Not Used.
2	Not Used.	Not Used.
3	Not Used.	Not Used.
4	Not Used.	Not Used.
5	Not Used.	Not Used.
6	Normal Motion.	Wireless Motion.
7	Normal PDS (stops conveyor)	PDS will not stop bagger (3 beep alarm)
8	Communicates with laptop.	Communicates with optional error display.

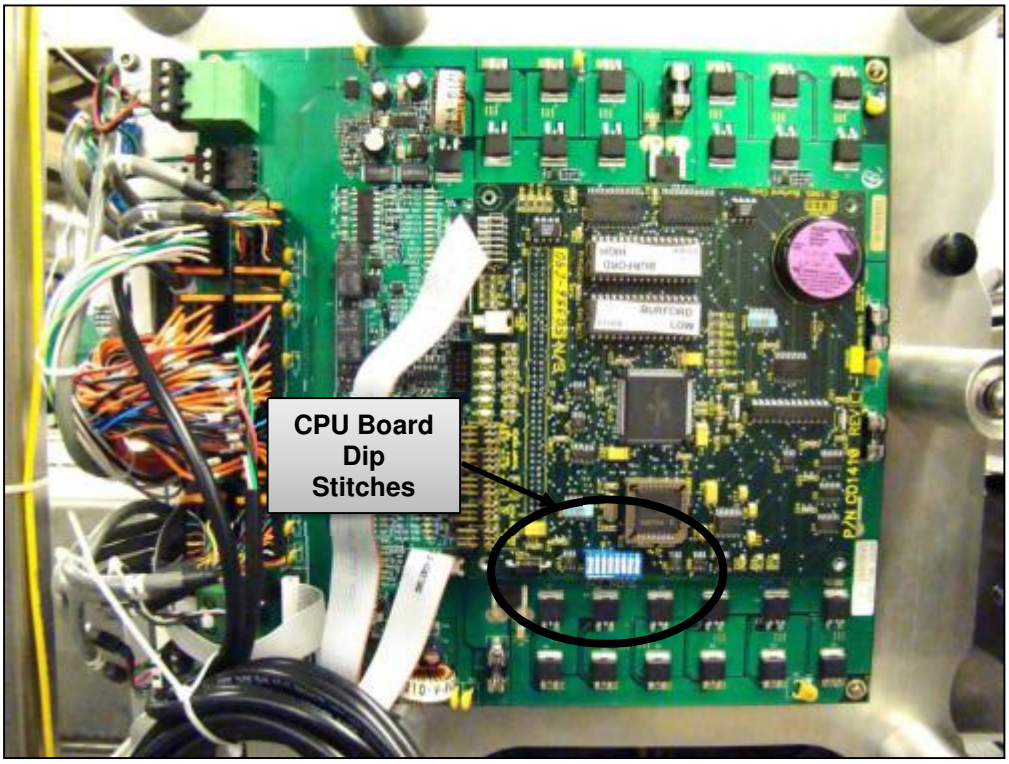


Fig. 3- CPU Board DIP Switches

3.0 OPERATION PROCEDURES, cont'd

3.10 Counter Output

The Smart Tyer comes standard with a relay (CR3), which toggles every time that a valid package is tied. This relay is normally used to drive a customer's external counter, but it can be adapted to serve other functions with external customer logic. This relay does not toggle if the tie cycle is aborted or if a heel is detected in the tie. These contacts can be configured to be normally open or normally closed using Dip Switch 2 of SW1, on the Amplifier board. See Section 3.9 for more detail. If the relay is configured to be normally open, the contacts will close for about 1/4 second when a valid tie cycle is completed.

3.11 PROM Replacement Procedure

The computer program for the Burford® Model **2300M** Electronic Smart Tyer resides in two PROMs, U6 and U9 on the CPU board. Each PROM contains half of the program. To upgrade the Smart Tyer to the latest program, the PROMs must be replaced with a new version. This is a simple process, which can be accomplished in 10 to 15 minutes. Before replacing the PROMs, note the positions of the Dip Switches on the Amplifier Board to ensure that they are not accidentally changed by handling the boards.

Caution:	The PROM's are sensitive to static electricity and care should be taken not to expose them to static.

Remove electrical power from the Tyer. Remove the cover from the tyer head. The PROM's are the two 32 pin chips in sockets in the middle of the CPU board. The program version is labeled on the top of each PROM. In general, you should use the PROM with the higher program version. For example, version 7.01 is newer than version 7.00. Each PROM will also be labeled either HIGH or LOW. Make sure that each is inserted in the socket with the same label.

Caution:	The pins on the PROM's are delicate and will break if bent repeatedly.

To remove a PROM from its socket, use a very small screwdriver to pry the PROM up from its socket. Never pull the PROM out by hand because one side will suddenly release before the other side and some of the pins will be bent.

3.0 OPERATION PROCEDURES, cont'd

3.11 PROM Replacement Procedure, cont'd

Slowly push the screwdriver under the PROM while twisting the blade. Work your way towards the back of the PROM. Do not pry the front of the PROM up too quickly or you will bend the pins in the back.

Carefully remove the PROM straight up from the socket being careful not to bend any pins. Note that the notch on the PROM is to the right. Be sure to orient the new PROM in the same direction.

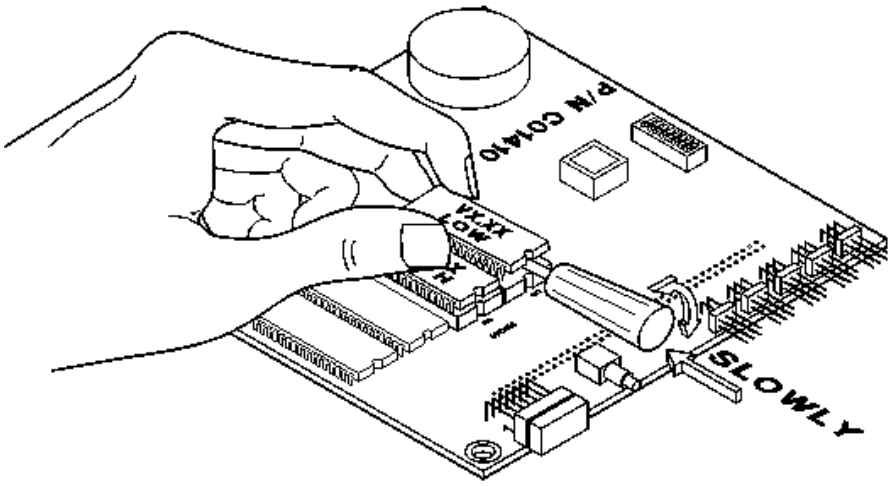


Fig. 3- PROM Replacement

Warning:	If a PROM is inserted with the notch towards the left, the PROM will be destroyed when power is turned on, and a replacement set would need to be ordered.

3.0 OPERATION PROCEDURES, cont'd

3.11 PROM Replacement Procedure, cont'd

With the notch on the PROM to the right, align it with the socket. Ensure each pin lines up with its receptacle. Usually the pins on new PROM's tend to be bent a little wider than the socket. If this is the case, lay the PROM on its side on a flat surface and bend the entire row of pins together to keep them all straight. Work the PROM into the socket by pressing it down little by little along its length. As you press, check that each pin is seating in the receptacle and not buckling.

After both PROM's have been replaced, verify that the Dip Switch settings have not changed. Apply power to the Tyer and push the "START" button on the operator panel. If the Tyer fails to perform its normal startup sequence, remove power, remove the board set, and check the PROM's for correct orientation, bent pins or unseated pins.

3.12 Speed Following Feature

The tyer has the ability to automatically adjust the speed of its gathering belts so that the belt speed changes as the conveyor speed changes. This minimizes the amount of operator input required to operate the tyer. However, it may be necessary for the operator to fine tune the belt speed, as explained later, to achieve the most desirable package.

Some baggers slowly ramp up to full speed when they are started. The Tyer's speed-following capability allows the speed of the belts to slowly ramp up to full speed as the speed of the bagger is increasing. This prevents damaging of bags by pulling them too far ahead of the flights as might occur if the conveyor started slowly and the belts started quickly.

In order for the tyer to use automatic speed following, the tyer requires an additional input signal to determine the conveyor speed. Normally, a proximity switch is used to monitor a sprocket that rotates with the conveyor. The proximity switch should provide one pulse for each 1/2 inch of conveyor travel. Consult wiring diagram for switch wiring.

If the proximity switch is not connected, or if the tyer senses that it is not getting any pulses from the proximity switch, the Tyer's controller will use only the settings of the BCD thumbwheel switch on the operator's control box to set the belt speed. If the proximity switch is connected and producing pulse signals, the tyer will automatically adjust the belt speed to follow the conveyor speed and the BCD thumbwheel switch can be used to fine tune the ratio between conveyor speed and tyer belt speed. The speed of the belts needs to be considerably faster than the conveyor speed, but the exact ratio of speeds depends upon the package being run.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating With the Controller

3.13.1 General

The Burford® Model **2200M/2300M** Twist Tyer has the ability to communicate with a terminal or a personal computer which is running a terminal emulation program. When the Tyer's controller detects an unusual situation or an error, the controller sends diagnostic information to the terminal through its serial port. In addition, the Tyer's controller maintains a record of problems that have occurred. This information can be called up later and displayed on screen. It is also possible to capture this information into a text file on the PC. This text file can be viewed or printed at a later time. For these reasons, it is sometimes desirable to communicate with the Tyer's controller.

This section is intended to provide the basic information needed to communicate with the tyer. It is assumed that you are using a PC and that you have experience with the basic operation of a PC. In addition to the PC, you need two other items.

1. A communications program to run on the PC.
2. A proper cable for connection between the PC's serial port and the Tyer's serial port on the CPU board.

3.13.2 Communications programs

Before a PC can communicate with the Tyer's controller, the PC must be running a terminal emulation program. Many different programs could be used, but this document will concentrate on two options, Burford® TERMINAL program and the Terminal program in Microsoft Windows. No matter what program is being used, it must be configured with the proper settings for the Burford® tyer. They are:

Baud Rate	4800 (9600 if using Burford® Tyer Prom Version 1.14 or earlier)
Parity	Even
Data Bits	8
Stop Bits	1
Com Port	Choose whichever serial port on the PC you will be using. This will usually be COM1

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.2 Communications program, cont'd

3.13.2.1 Burford® TERMINAL program

Burford® Corp. has developed a terminal emulation program specifically for use with the Model **2200M/2300M** Tyers. This program is simply called TERMINAL.EXE and it provides the simplest and easiest way of communicating with the Tyer's controller and capturing data to files. The program is already configured for 4800 Baud, Even Parity, 8 Data Bits and 1 Stop Bit. It is also configured to use the COM1 serial port of the PC, which usually has a male DB9 connector. Any of these settings can be changed as necessary. This TERMINAL program is available on high density 3-1/2 inch diskette from Burford® Corp. ask for Part Number C01287.

The Tyer's controller automatically sends information to the serial port, some of which is intended to be displayed on an optional Operator Display provided by Burford® Corp. The Burford® TERMINAL program has been written to recognize the format of these statements and it displays them in a box near the bottom of the screen, away from the other output. Any other terminal emulation program cannot distinguish these statements and they appear on the screen among all the other text.

The TERMINAL program can be run from a floppy drive or from the hard disk of the PC. To start the program with the default settings, simply change to the directory containing the TERMINAL.EXE file and type: TERMINAL

With the TERMINAL program running, you can press Alt-h for help on the proper command to use if you need to use a different baud rate or a different serial port. The help screen will show you, for instance, that to start the TERMINAL program with a setting of 9600 baud instead of the normal 4800 baud, type: TERMINAL B9600 at the DOS command prompt. You can exit the program at any time by pressing Alt-x.

You will not be able to see anything that you type on the screen until the tyer is running. This is because the Tyer's controller must echo your typed commands back to the PC before will be displayed.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.2 Communications program, cont'd

3.13.2.2 Terminal program in Microsoft Windows version 3.0 or 3.1

Most PC's sold today include a copy of Microsoft Windows. Included with Windows is a Terminal program, which can be used to communicate with the Burford® Model **2200M/2300M** tyer. This terminal program is not as easy to use with the Burford® tyer as Burford® Terminal program described above and it requires some time to configure the program. However, once it is configured, the configuration data can be saved for use later.

It is assumed that anyone using the Microsoft Windows Terminal program is familiar with this interface and systematic instructions for maneuvering in Windows are not necessary.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.2 Communications program, cont'd

3.13.2.3 Configuring the Microsoft Windows terminal program

Start the Windows program and open the Terminal program. It is usually located in the Accessories group of Program Manager. Under the Settings menu, choose Communications. Mark the appropriate boxes for the communication parameters listed earlier in Section 3.13.2. Due to a peculiarity in this program, it may be necessary to first choose 7 data bits; then choose 2 stop bits; then choose 1 stop bit. In the field entitled Flow Control, choose XON/XOFF. The boxes labeled Parity Check and Carrier Detect should be left empty. With all settings correct; choose OK to close this box.

Under the Settings menu, choose Terminal Emulation and select DEC VT-100 (ANSI).

Under the Settings menu, choose Terminal Preferences. Make sure that Local Echo is turned off.

When you have everything configured as listed above, save your configuration information by choosing the Save command under the File menu. This allows you to save this configuration data for later use. Assign a name to your configuration, such as TYER or BURFORD®. In the future, when you start this terminal program, you may use the Open command under the File menu to recall your configuration data.

You will not be able to see anything that you type on the screen until the tyer is running. This is because the tyer must echo your typed commands back to the PC before they will be displayed.

The Tyer's controller sends some information to the serial port which is intended to be displayed on the optional Operator Display provided by Burford® Corp. The Burford® TERMINAL program has been written to recognize the format of these statements and display them in a box near the bottom of the screen. Any other terminal emulation program (such as the terminal program in Microsoft Windows) cannot distinguish these statements from any other text and they appear on the screen among all the other text. This can be a little confusing.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.3 Cable between PC and tyer head

A cable like the one shown below is necessary to connect between the Tyer's serial port and the PC's serial port. The connection point is conveniently located at the rear of the tyer head and is labeled "COMM". This cable is available from Burford® Corp. Ask for Part Number 210672.

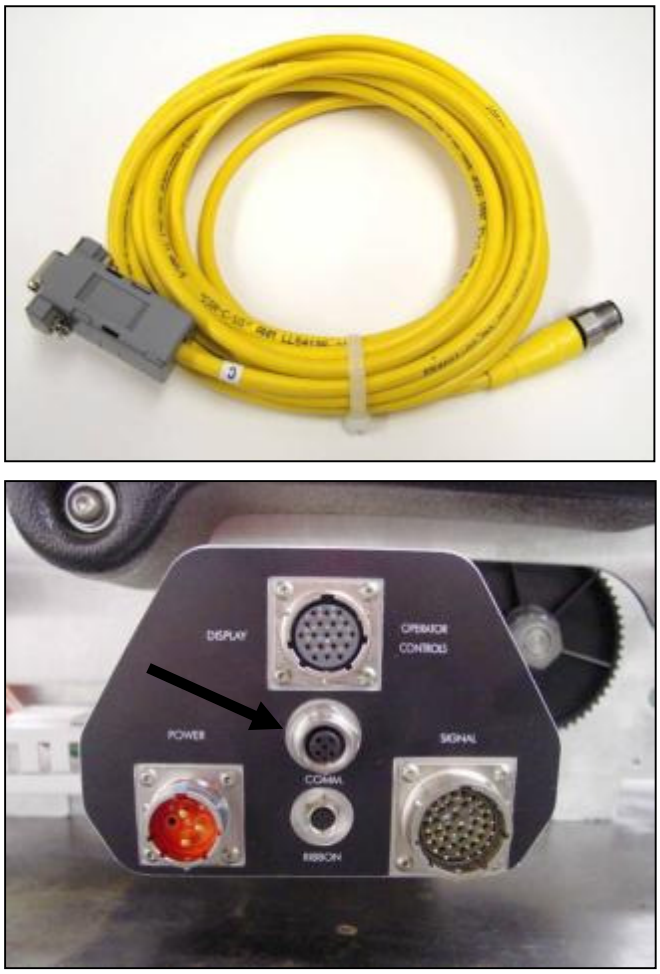


Fig. 3- Serial Port And Cable

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.4 Safety considerations

When working with the tyer, the following points should be observed:

1. This activity should only be conducted by qualified personnel. When troubleshooting a problem, it may be necessary to have the main electrical enclosure open in order to view the status lights or to make voltage checks while the machine is operating. Proper safety precautions should be taken.

2. Never place your hands in a position where you can be injured if a motor suddenly started running at high speed.

3. The Tyer's CPU board must be working properly for it to talk to the PC. If you are having a problem that prevents the CPU board from operating (such as a faulty power supply or a loose power connector), you cannot communicate with the Tyer's controller.

4. Communication with the Tyer's controller may be conducted while the tyer is operating and tying packages. In fact, operation of the tyer is often necessary to generate a situation of interest.

5. Any change in the tyer controller's settings made from the PC except TIME and DATE will be forgotten when power to the Tyer's controller is turned off, providing that Dip Switch 5 on the Amplifier Board of the Tyer is in the ON position.

6. At various times, you will see statements on the screen of the PC that refer to Motor 1, Motor 2, Motor 3 and Motor 4. These refer to the 4 servo motors being controlled. In all cases:

   Motor 1 refers to the motor that drives the needle.

   Motor 2 refers to the motor that drives the twister hook.

   Motor 3 refers to the motor that drives the holder/shear.

   Motor 4 refers to the motor that drives the bag gathering belts.

   The AC motor that drives the gathering brushes is not a servo motor and it is not under the command of the Tyer's controller.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands

Much of the time, it may not be necessary for you to issue any commands to the tyer because the Tyer's controller will automatically send statements to the screen regarding any problems it encounters as they occur. Often, this information is sufficient to identify a problem. However, if a previously encountered problem is not occurring now, it is sometimes desirable to command the Tyer's controller to output additional information, which may be helpful.

Not all of the possible tyer commands will be discussed in this document. Many of these are too technical to be helpful to anyone other than Burford® Service Personnel.

3.13.5.1 When you start the tyer

When power is first supplied to the Tyer's controller, it automatically sends out several lines of information, which look similar to the following.

TCR1 interval= 0.238 µsec

System Reset @ 10:35:47 on 03/06/95.

BURFORD® CORP.
Electronic Twist Tyer
Version 1.30 - TIE SPEED SUPPORT (Feb 22 1995 11:47:23)

The following caused the last microprocessor reset:
Power switched off.
10:35:47> Initializing.
10:35:47> Initialization complete.
10:35:47>
Interlock open.
Waiting for reset.

At this point, the controller is waiting for you to push the RUN button on the small operator's control box and you are prevented from typing in commands. After the run button is pressed, the tyer begins to perform its homing sequence for 3 of the motors. (The fourth servomotor drives the bag gathering belts and it does not have a home position.) While the tyer is homing, several lines of information are written to the screen about the progress of the homing sequence. When the tyer successfully completes the homing sequence, the following prompt will appear on the screen.

MOTOR 1>

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.5.1 When you start the tyer, cont'd

This indicates that the tyer is ready to receive commands and that any commands, which are motor-control commands, will be applied to Motor 1, the motor that drives the needle.

If, for any reason, the tyer does not successfully complete the homing sequence, this will be indicated on the screen. In that case, the MOTOR1> prompt will not appear and the controller will drop out power to all of the servomotors. The last two lines on the screen are:

Interlock open.
Waiting for reset.

At this point you will not be able to type commands. Based upon the information printed to the screen during the homing sequence, it may be possible to repair the tyer so that it will successfully home. If you need more information to determine the cause of a problem, see Section 3.13.5.9 for an explanation of the + command.

3.13.5.2 TIME and DATE commands

The Tyer's controller has a battery-powered real-time clock that it uses to record the time and date of special events. It is good practice to check the time and date before going on to other activities. If the time and date are not accurate, then the time and date information recorded will be incorrect.

To check the time, type TIME the time will be displayed on the screen. Be sure not to type TIME= this would set the time to 00:00. To set the time, you must use a 24 hour format. To set the time to 9:15 a.m., for example, type: TIME=9:15 to set the time to 9:15 p.m., for example, type: TIME=21:15.

You can check the date the same way. To set the date to March 10, 1995, for example, type: DATE=3-10-95

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.6 Tyer commands, cont'd

3.13.6.1 TROUBLE command

The Tyer's controller keeps a record of important events and problems that it encounters during operation. This record is stored in battery-backed memory on the CPU board. This record provides a valuable history of operation for this machine, which can be very helpful in diagnosing problems.

This Trouble buffer, when full, is 1000 lines long, about the equivalent of 17 printed pages. When this buffer gets full, the oldest information is discarded as new information is added. This ensures that this buffer contains the most up-to-date information possible. Depending upon the frequency of problems detected by this machine, this trouble buffer may contain information for a period of a few hours to several weeks. All the entries in the trouble buffer have their time and date recorded at the time of their occurrence.

To command the tyer to display the contents of the Trouble buffer, simply type TROUBLE or this can be abbreviated by (TR)

After a page of information has been displayed, you will be prompted to press any key to continue. Pressing any key besides the Escape key will cause the next page of information to be displayed. You will notice from the times and dates displayed that the most recent information is displayed first and the information gets progressively older. When the entire contents of the buffer have been displayed, the buffer will loop around to the beginning and the most recent information will be shown again. At this time, or any time you wish to leave the Trouble Report, you should press the Escape key to exit this command. You can look at this Trouble Report as many times as you like. If you wish to save or print this information, you should capture this data into a text file on your PC (see Section 3.13.6).

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.6.2 QUERY command

Whenever the needle motor, the twister hook motor, or the holder/shear motor is commanded to make a move, information is stored in a "QUERY" buffer about all the servomotor's position, speed, and motor commands during the move. This data can be displayed by using the "QUERY" command.

The information displayed by this command can be helpful in diagnosing certain complex problems. However, analyzing this data is very difficult for anyone not familiar with the inner workings of this machine. It is easy to draw incorrect conclusions from the data. Therefore, the most likely customer use for this command is to display data, which can be captured into a text file see Section 3.13.6 for information on capturing files. Then the customer would normally print the file and fax the data to Burford® Corp. for analysis. Contact the Service Manager at Burford® Corp. if you wish to do this.

The information in the QUERY buffer is automatically overwritten when the next move occurs, so this buffer always contains information about the most recent move. When the MOT>1 prompt is displayed, the data displayed is for the needle motor only. When the MOT>2 prompt is displayed, the data displayed is for the twister hook motor only. When the MOT>3 prompt is displayed, the data displayed is for the holder/shear motor only. When the MOT>4 prompt is displayed, the data displayed is for the gathering belts motor only. To change to a different motor, say the twister hook motor, simply type MOT=2. The MOT 2> prompt will then be displayed.

Type Q=0 to start at the beginning of the QUERY buffer. Then type Q each time you want to display another page of data. The QUERY buffer is 255 lines long. The exact format of the output depends upon the PROM version being run. However, the output from the QUERY command typically looks like the data below.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.5.4 QUERY command, cont'd

MOTOR 1>q=0
MOTOR 1>q

Step	Time Set	ACT	VEL	CMD	
0> 0.0	0	-2	-	-2.1	-2132.9
1> 5.2	4	-2	0	0.5	504.8
2> 10.5	17	-2	0	7.1	7122.3
3> 15.7	37	-1	1	13.6	13560.3
4> 21.0	66	3	4	21.4	21418
5> 26.2	103	13	10	28.2	28246.5
6> 31.5	149	33	20	34.1	34093.7
7> 36.7	202	68	35	35.9	35859.8
8> 42.0	264	121	53	36.1	36109
9> 47.2	335	188	67	37.7	37705
10> 52.5	413	271	83	36	35995.9
11> 57.7	500	369	98	34.7	34655.3
12> 63.0	595	480	111	32.7	32731.6
13> 68.2	698	599	119	32.9	32859
14> 73.5	803	723	124	30.7	30665.6
15> 78.7	908	854	131	24.9	24947.6
16> 84.0	1013	985	131	22	22016
17> 89.2	1118	1114	129	19.8	19765.6
18> 94.5	1223	1241	127	17.3	17271.8
19> 99.7	1328	1369	128	12.6	12639.2
20> 105.0	1433	1498	129	7.3	7301.5

If the last move caused a situation which resulted in the controller dropping out power to the servomotors (such as a motor jammed), the controller will not display the MOT 1> prompt and you will not be able to type the QUERY commands until you type the + command (see Section 3.13.5.9).

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd.

3.13.6.3 RESET command

This command causes the Tyer's controller to display the reason for the most recent controller reset. It does not cause the Tyer's controller to reset itself. The possible reasons for a reset are:

1. Power turned off. This is the most common cause of a reset and it is quite normal for this to occur. It occurs when the power is turned off for more than a couple of seconds.

2. External reset. This can be caused by a momentary loss of power such as might occur from a loose power connector. It also occurs if someone presses the reset button on the CPU board or if someone turns the power switch on within a second after the power has been turned off. All occurrences of external resets are also recorded in the Trouble buffer.

3. Watchdog reset. This indicates a software error. These are indicated in the trouble buffer.

4. Halt monitor reset. This indicates an internal processor fault. These are indicated in the trouble buffer.

To invoke the RESET command, simply type: RESET

3.13.6.4 DEBUG command

When Debug is turned on, the Tyer's controller will write a statement to the screen to indicate every time that the bag switch closes when the tyer is ready to tie. It also writes another statement every time that the bag switch opens during normal operation. This is sometimes helpful, if you are experiencing erratic triggering of the tyer. Normally, Debug is turned off.

To turn on Debug, type: DEBUG=1

To turn off Debug, type: DEBUG=0

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.6.5 HOME command

When the screen is displaying a prompt such as MOT>1, typing HOME causes the tyer to begin a homing sequence. This can also be accomplished by holding the thread button on the Operator's Control Box for 5 seconds.

3.13.6.6 DISPENSE command

Every time that the tyer is triggered, the Tyer's controller counts the number of pulses that it receives from the Bag Recognition System proximity switch. This pulse count indicates how much ribbon has been dispensed during the tie cycle. The controller compares the number of pulses for the latest package with the number of pulses for the previous 10 packages. The controller then decides whether it should:

1. Abort the tie cycle because too little ribbon has been dispensed to indicate a proper package, thereby preventing the tyer from dropping the ribbon.

Or

2. Complete the tie cycle

The controller also checks the count to determine if a heel (or anything else that would produce an exceptionally long tie) has been detected in the twist tie area. If so, the alarm is sounded three times and that package is not indicated by the Tyer's counter output.

If this system is not working correctly, it will cause the tyer to abort ties or enunciate heels incorrectly. You may see two packages tied together, because the tie was aborted on the first package. To see the number of the dispense counts on the most recent package, simply type: DISPENSE or this can be abbreviated to (DI)

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.5.8 DISPENSE command, cont'd

The exact format of the output depends upon which PROM Version you have. The output to the screen will look approximately like this.

> PASSED: RIBBON DISPENSER TIE COUNT at checkpoint was 19 > 17 - 3.
>
> PASSED: RIBBON DISPENSER HEEL COUNT at checkpoint was 20 < 18 +3.

In this example, the 19 in the first row means that the count was at 19 when the controller checked to see whether the most recent cycle should be aborted. The 17 represents the median value for the last 11 cycles. The -3 means that the tyer would abort any packages, which produce a count, which is 3 less than the median value.

In the second row, the 20 means that the count was 20 when the controller checked to determine whether there appears to be a heel (or other foreign matter) inside the twist tie. The 18 represents the median value for the last 11 cycles. The +3 means that we would enunciate any packages, which are 3 more than the median value.

It should be understood that the median values may change slightly depending upon what type of bag and product is being run.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.5 Tyer commands, cont'd

3.13.6.7 + Command

This command provides a "back door" way of getting access to the Tyer's controller if the tyer will not successfully home or if you wish not to home the tyer. This command causes the tyer to bypass the homing sequence that normally must successfully complete before you can type commands. In particular, this command permits you to perform inquiries (Such as the QUERY command) and to view the contents of the Trouble buffer described earlier in this document.

Never attempt to run the tyer servomotors while the tyer is in this mode. After completing your inquiries, you should always turn off power to the main electrical enclosure for a few seconds before continuing. This will reset the processor and assure safe operation.

To invoke this command, hold down the shift key and press the key with the + character. It is not necessary to press Enter. When the Motor 1> prompt appears, you will be able to enter other commands.

3.13.7 Capturing data into a text file on the PC

3.13.7.1 With the Burford® TERMINAL program

To begin capturing data, press Alt-F. A unique filename, based on the time and date, will be suggested in the dialog box in the center of the screen. You may use this filename or type in any other name permitted by DOS. If you choose your own file names, be sure to use a unique name each time so that you do not overwrite a previous file. A message will appear in the lower right-hand corner of the screen, which indicates that you are capturing data. Anything that is typed or written to the screen after you begin capturing will be saved into this file. As you are capturing a file, you can type in short notes to help in later understanding of what was happening. When you press ENTER, the display will show that you entered an invalid command, but your notes will be captured in the file. To stop capturing, press Alt-F again.

3.0 OPERATION PROCEDURES, cont'd

3.13 Communicating with The Controller, cont'd

3.13.6 Capturing data into a text file on the PC, cont'd

3.13.7.2 With Windows TERMINAL program

Be sure that you have the TERMINAL program properly configured as previously described. To begin capturing, select Transfers, then select Receive Text File. Enter a name for the file, being sure to type in the .txt file extension and return to the main screen. Anything that is typed or written to the screen after you begin receiving the text file will be captured to the file. As you are capturing a file, you can type in short notes to help in later understanding of what was happening. When you press ENTER, the display will show that you entered an invalid command, but your notes will be captured in the file. To stop capturing data, select the Stop button at the bottom of the screen.

3.13.7.3 After the files have been captured

Your captured files may be reviewed or printed using any text editor, such as the DOS text editor EDIT or the Windows text editor NOTEPAD. It is a good idea at that time to type in a quick summary of the tests you conducted at the top of the file for later reference. Control codes embedded in the text may cause the document to be printed with page breaks at strange locations. You can edit these out of the document if you wish.

3.0 OPERATION PROCEDURES, cont'd

3.14 Pass Thru Shelf

If a fault occurs during production and a tyer needs to be bypassed, the following procedure should be followed.

1. During conveyor down time, follow all local and in house lock out tag out procedures, turn "OFF" electrical power to tyer.

CAUTION:	Moving machinery may cause serious injuries and damage. Keep all objects and personnel away from moving machinery.

2. Unlatch securing latches on the sides of tyer.

3. Loosen set screws securing brush assembly to brush mount.

4. Slide both the tyer and the brush assembly away from conveyor side.

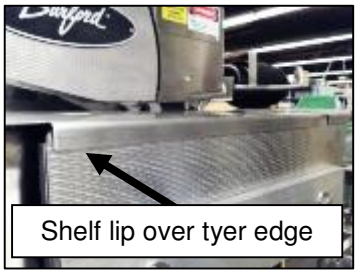
Fig. 3- Pass Thru Shelf

3.0 OPERATION PROCEDURES, cont'd

3.14 Pass Thru Shelf, cont'd

5. Remove bypass shelf from tyer currently being bypassed by lifting "UP" on bypass shelf using the slots on top of shelf.

6. Place bypass shelf in to position on tyer needing to be bypassed. Place the shelf lip over the top edge of the tyer.



7. Slide active tyer in to position against conveyor side and latch securely in to position.
8. Slide brush assembly into position and tighten securing screws.
9. Turn "ON" electrical power to tyer and begin production.

4.0 TROUBLESHOOTING

4.1 Diagnostic LED's

The specifications defined below apply to Amplifier Board P/N 611484. The Amplifier Board has forty-six LED's to assist in troubleshooting the Tyer.

D50, D51 NEEDLE Phase A and NEEDLE Phase B

Indicates input signals from the needle motor encoder. Each LED should blink on and off as the needle is moved back and forth. For further information on troubleshooting these encoder signals (see Section 4.6.1).

D52, D53 TWISTER Phase A and TWISTER Phase B

Indicates input signals from the twister hook motor encoder. Each LED should blink on and off as the twister hook is rotated back and forth. For further information on troubleshooting these encoder signals (see Section 4.6.1).

D63, D64 H/S Phase A and H/S Phase B

Indicates input signals from the holder/shear motor encoder. Each LED should blink on and off as the holder shear motor is rotated back and forth. For further information on troubleshooting these encoder signals (see Section 4.6.1).

D65, D66 BELT Phase A and BELT Phase B

Indicates input signals from the belt motor encoder. Each LED should blink on and off as the belt motor is rotated back and forth. For further information on troubleshooting these encoder signals (see Section 4.6.1).

D74 THREAD SWITCH

Indicates when the THREAD switch is pushed.

4.0 TROUBLESHOOTING, cont'd

4.1 Diagnostic LED's, cont'd

D83 RIBBON DISP

Indicates when one of the steel dowels in the ribbon dispenser spool is covering the ribbon dispense proximity sensor.

D62 BAG SWITCH

Indicates when the bag switch is depressed.

D78 H/S HOME

Indicates when the holder shear home proximity sensor is covered by the tabs on the holder shear shuttle cam.

D77 TWISTER HOME

Indicates when the tip of the twister hook is covering the twister hook home proximity sensor.

D76 NEEDLE HOME

Indicates when the needle is covering the needle home proximity sensor.

D2 BAGGER ENABLE RELAY

Indicates when the bagger enable relay, CR1 on the Amplifier Board, is energized.

D75 RIBBON DROP

Indicates when the dancer arm is actuating the ribbon drop proximity sensor.

D73/BCD 8, D72/BCD 4, D71/BCD 2, D70/BCD 1

Indicates the signals coming from the belt speed push wheel switch. The following table shows how the LED's should respond to each setting.

Setting	BCD 8	BCD 4	BCD 2	BCD 1
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

4.0 TROUBLESHOOTING, cont'd

4.1 Diagnostic LED's, cont'd

D3 SERVO ENABLED RELAY

Indicates when the servos enabled relay, CR2 on the Amplifier Board, is energized.

D57, D58, CPU0, CPU1

Indicates CPU activity.

D68 HORN

Indicates power is being sent to the horn.

D55, D56, PCS0, PCS1

Indicates CPU activity.

D69 COUNTER RELAY

Indicates when the counter relay, CR3 in the main enclosure, is energized.

D79, D80, D81 OPTIONAL I/O STATUS

Indicates optional input or output signal status.

D59, D60, D61 OPTIONAL INPUT STATUS

Indicates optional input signal status.

D49 RUN PWR

Indicates that the run circuit has been energized. The run circuit is made up of the START button, STOP button, mag-lock on the front cover, and the CPU status relay CR2 on the Amplifier board. All of these contacts must be closed for the run circuit to seal-in.

D46 CPU STATUS RELAY

Indicates the CPU is active and ready to control the motors. This LED must be on before the run circuit will seal-in.

4.0 TROUBLESHOOTING, cont'd

4.2 Seven Segment LED Error Codes

Mounted on the operator panel is the seven segment LED which can display all of the numbers and most of the alphabet, one character at a time. This device is used to display various codes that give the Tyer's status and may be helpful in troubleshooting. The codes are divided into three categories: counter, status and error. The CPU keeps a running count of the number of packages tied by the Tyer. During normal operation, the letter 'C' will be displayed followed by this count. Status codes begin with the letter 'H'. These codes give general information pertaining to the current Tyer status. Error codes begin with the letter 'E'. These codes will give information pertaining to a Tyer fault. For more information on how to use, the error codes to troubleshoot the Tyer (see Section 4.6).

Once an Error Code has been displayed, it will be repeated until a new code replaces it or power is turned off. Generally, you will have to home the Tyer or tie a package before the code will be removed. The following is a list of the codes and their description.

CODE	DESCRIPTION
H001	Main electric box power switched on
H002	External reset detected
H003	Tyer HOMING sequence aborted by operator
H004	Tyer not ready, close door and push START (see Section 4.6.7)
H005	Ribbon drop detected. Thread tyer.
H006	Two bags were too close together
H007	Tie cycle aborted, not enough ribbon used
H008	Heel detected, too much ribbon used
H011	Needle at end of forward travel
H012	Needle at end of backward travel
H021	Twister hook at end of forward travel
H022	Twister hook at end of backward travel
H031	Holder/shear at end of forward travel
H032	Holder/shear at end of backward travel
H051	Motor control loop ran out of time.
H052	Command table out of order.
H159	Loss of clock: push RUN
H160	Reset instruction: push RUN
H162	Test module reset: push RUN
E001	Tie cycle aborted: ribbon not threaded
E101	CPU detected a problem and stopped tyer
E102	HOMING sequence failed
E111	Unable to control needle while homing

4.0 TROUBLESHOOTING, cont'd

4.2 Seven Segment LED Error Codes, cont'd

CODE	DESCRIPTION
E112	Trailing edge of needle prox not found
E113	Leading edge of needle prox not found
E114	Can't move needle to home position
E115	Needle motor not moving
E116	Needle jammed or encoder fault
E117	Needle home prox. not detected.
E121	Unable to control hook while homing
E122	Trailing edge of hook prox not found
E123	Leading edge of hook prox not found
E124	Can't move hook to home position
E125	Twister hook motor not moving
E126	Twister hook jammed or encoder fault
E127	Twister hook home prox. not detected.
E131	Unable to control shear while homing
E132	Trailing edge of shear prox not found
E133	Leading edge of shear prox not found
E134	Can't move holder/shear to home position
E135	Holder/shear motor not moving
E136	Holder/shear jammed or encoder fault
E137	Holder/shear home prox. not detected.
E146	Gathering belts jammed or encoder fault
E151	Spurious interrupt detected by CPU
E152	General interrupt detected by CPU
E153	Bus error at 0x_____from 0x_____
E154	Address error at 0x_____from 0x_____
E155	Bad opcode at 0x_____
E156	Divide by zero at PC 0x_____
E157	Watchdog reset. Push run
E158	Halt monitor reset. Push run
E162	CPU detected IRQ 1
E163	CPU detected IRQ 2
E164	CPU detected IRQ 3
E165	CPU detected IRQ 4
E166	CPU detected IRQ 5
E167	CPU detected IRQ 6
E168	CPU detected IRQ 7
E169	Privileged instruction at 0x_____
E201	None of the three motors are moving
E300	Stack overflow error.

4.0 TROUBLESHOOTING, cont'd

4.3 Audible Alarm Codes

A long beep is 1 second in duration. A short beep is 1/2 second in duration.

Alarm	Display Code	Description
1 Short	None	Power turned on, or home sequence successful.
2 Short	H006	Bag necks too close together (tried to start 2nd cycle before 1st cycle was completed).
1 Long	H007	Aborted tie cycle, not enough ribbon used.
2 Long	E116, E126, E136 or E146	One or more motors jammed or encoder faults.
3 Short	H008	Heel tied in package, too much ribbon used.

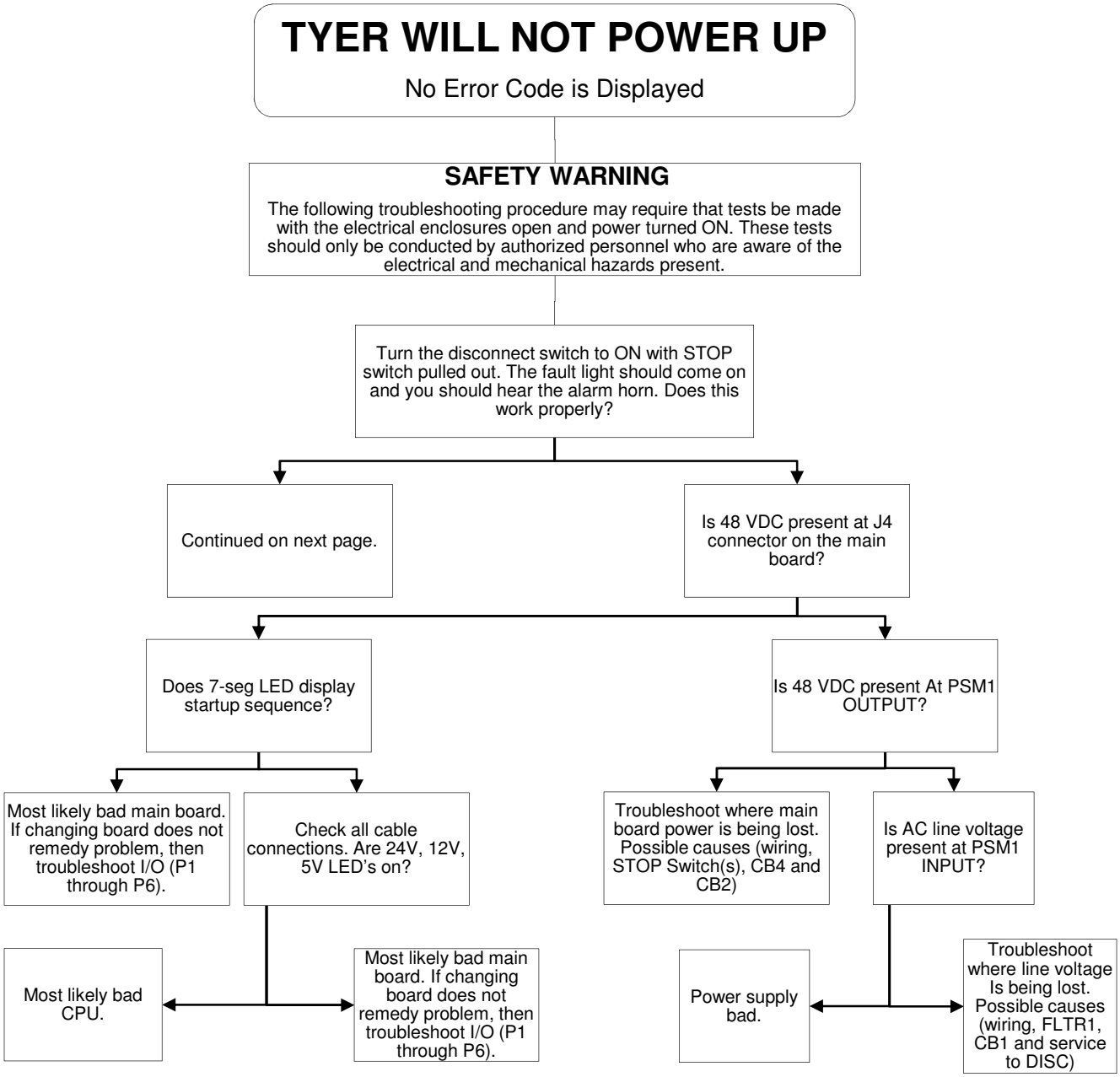
4.4 Terminal Option

The Smart Tyer is capable of communicating with a terminal over the serial port located on the edge of the CPU board. The terminal must be connected to the CPU using a serial cable (see Section 3.13.3). Using the terminal, the Smart Tyer can be queried as to its status and controlled manually for troubleshooting. This terminal is not required for normal operation.

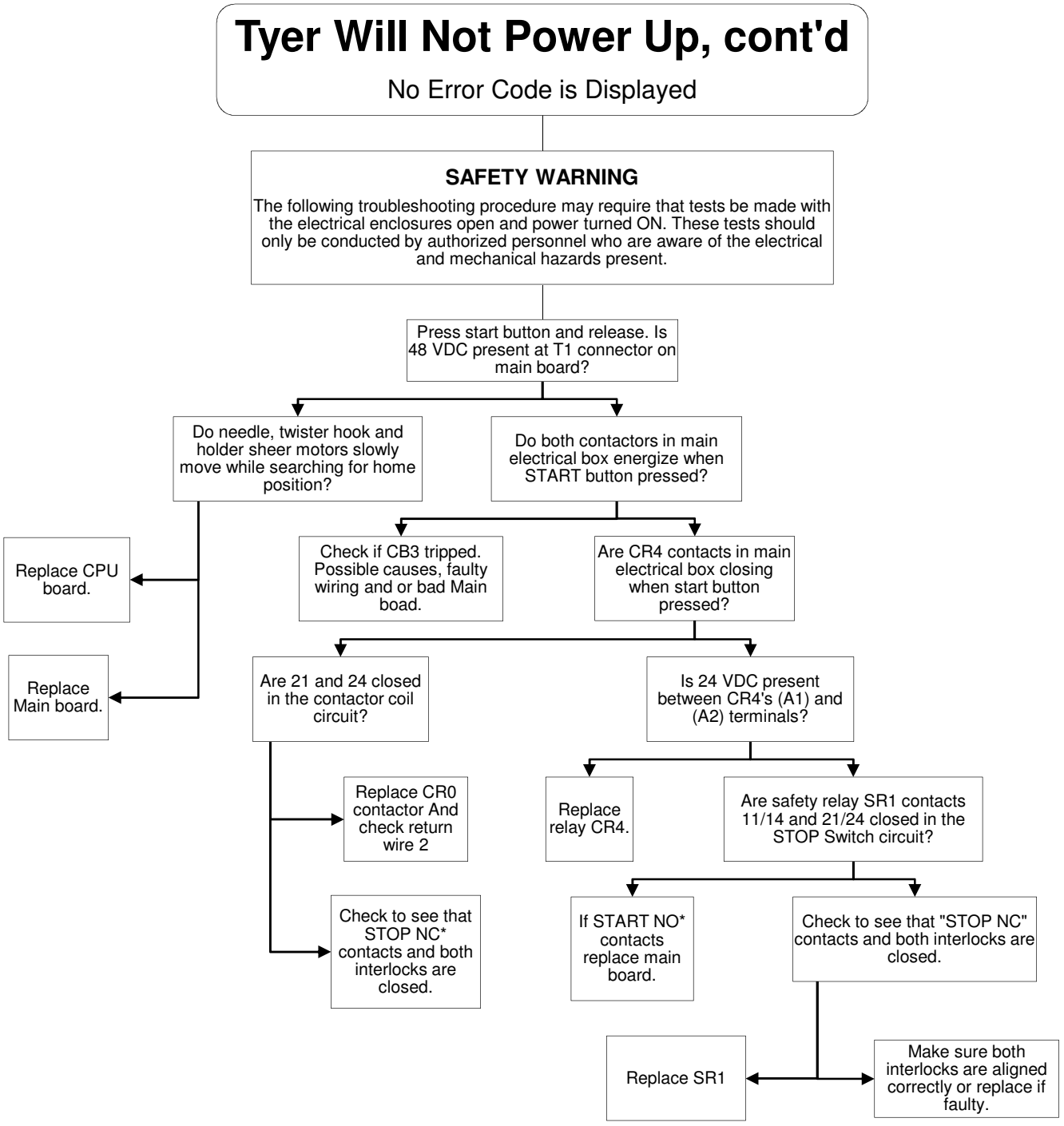
4.5 Troubleshooting Flow Charts

The troubleshooting flow charts on the following pages are intended to allow a serviceman to repair a problem and get the tyer running again as quickly as possible. These flow charts refer to several other diagrams and test procedures in Sections 4.6 and 4.7 that aid in the troubleshooting.

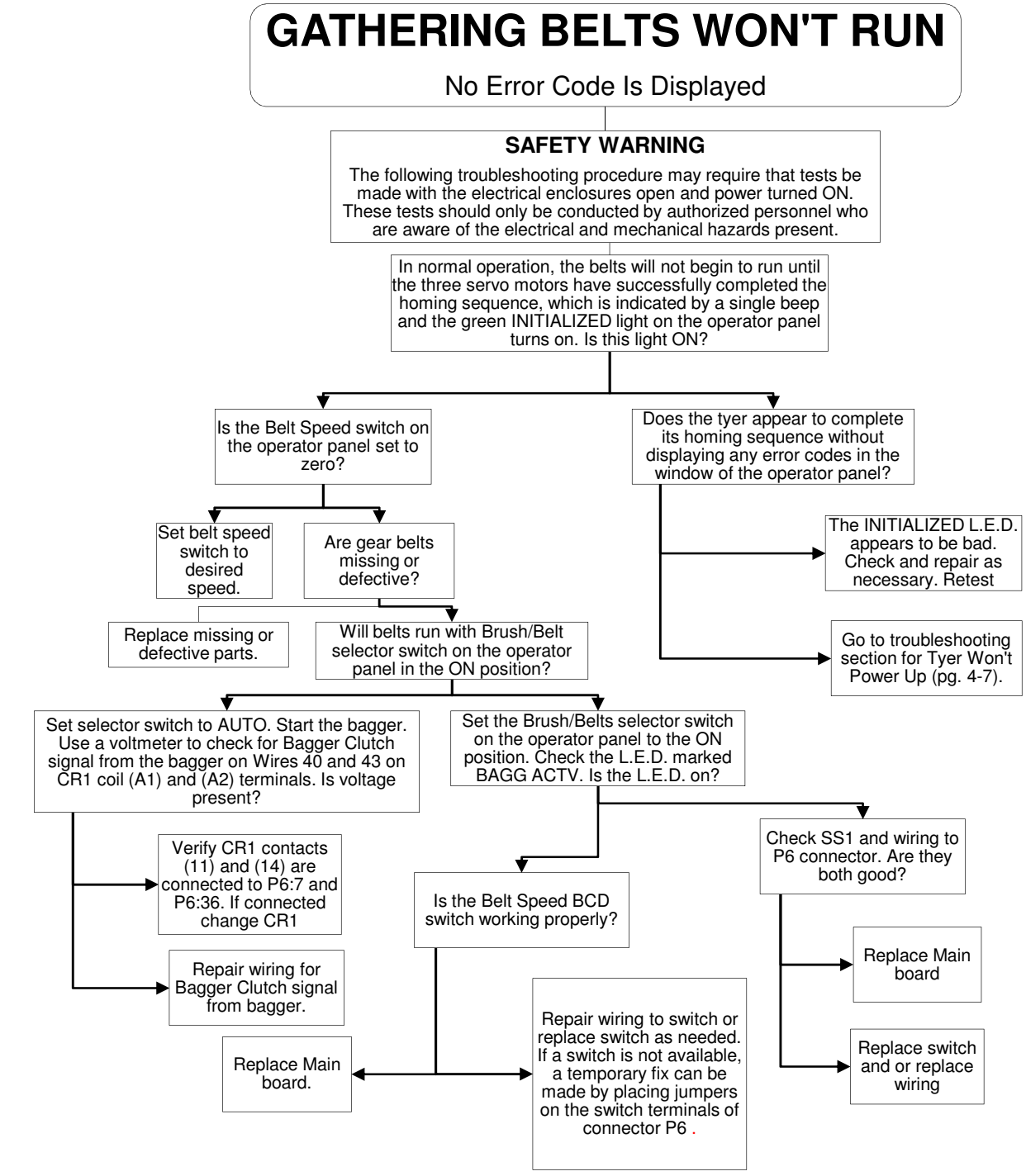
The troubleshooting flow charts deal with electrical problems that result in an Error Code being displayed in the viewing window. Only those Error Codes that are displayed in this viewing window are discussed.



Flow Chart 4- Tyer Will Not Power Up



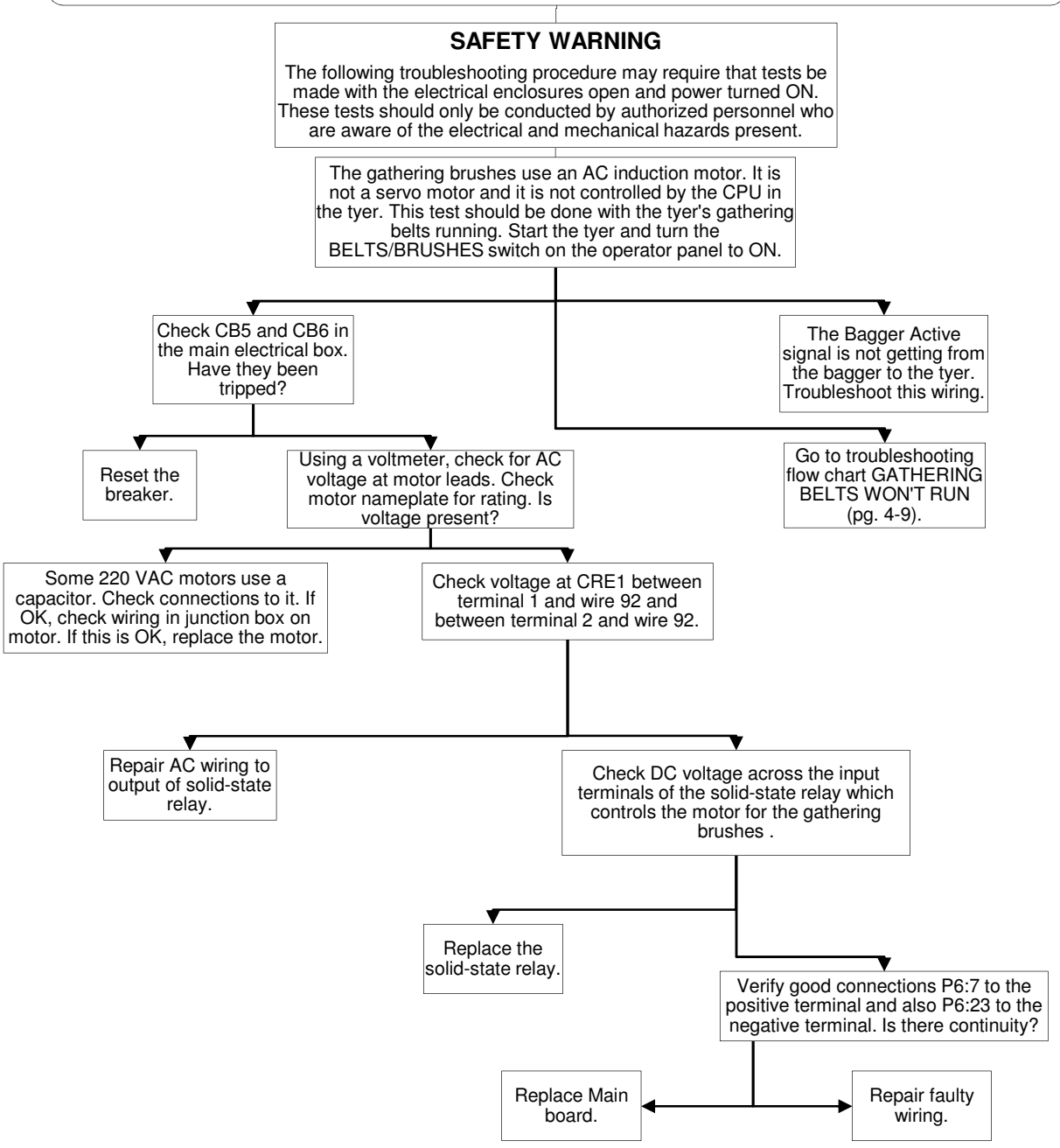
Flow Chart 4- Tyer Will Not Power Up, cont'd



Flow Chart 4- Gathering Belts Won't Run

MOTOR FOR GATHERING BRUSHES WON'T RUN

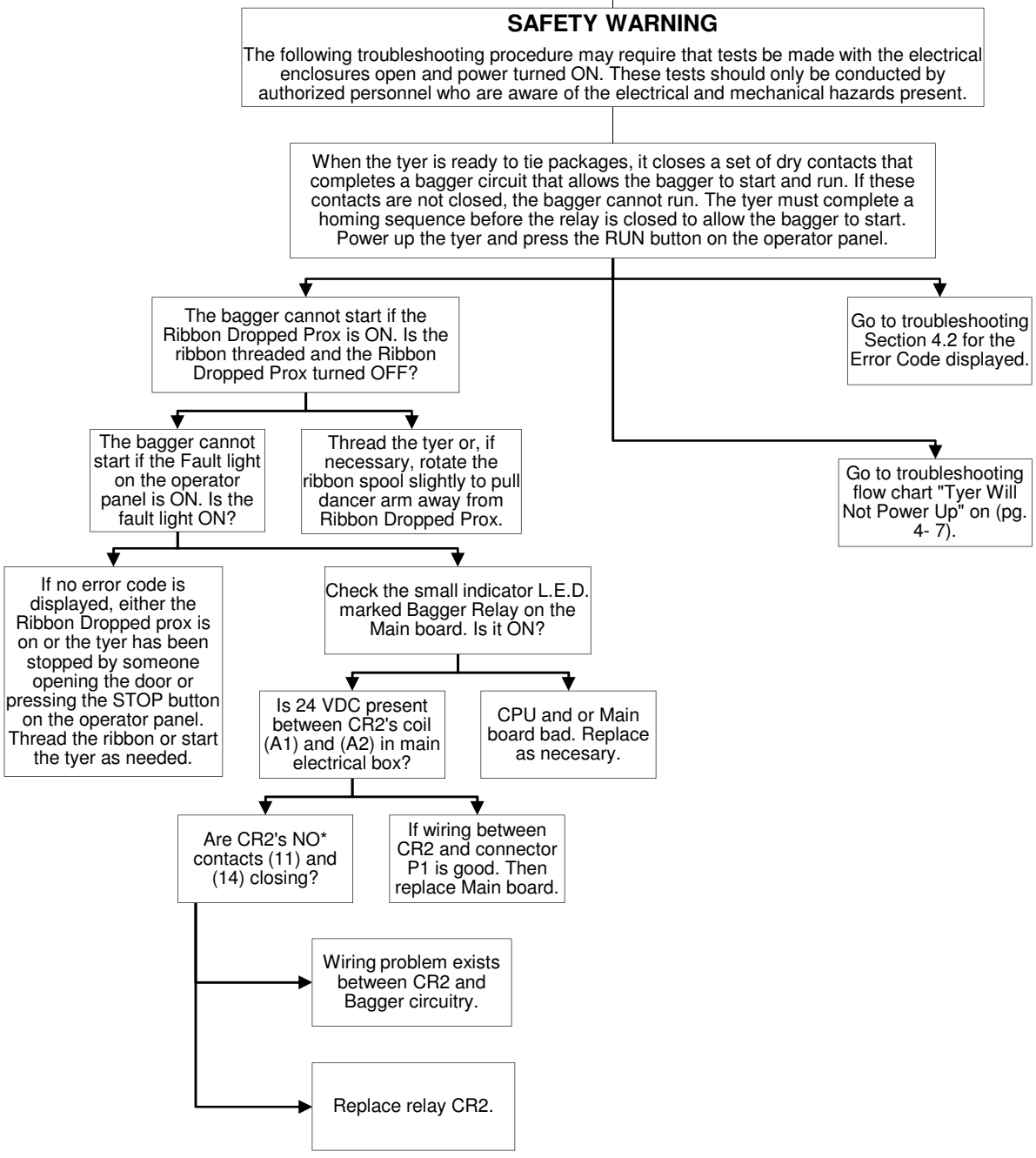
No Error Code is Displayed



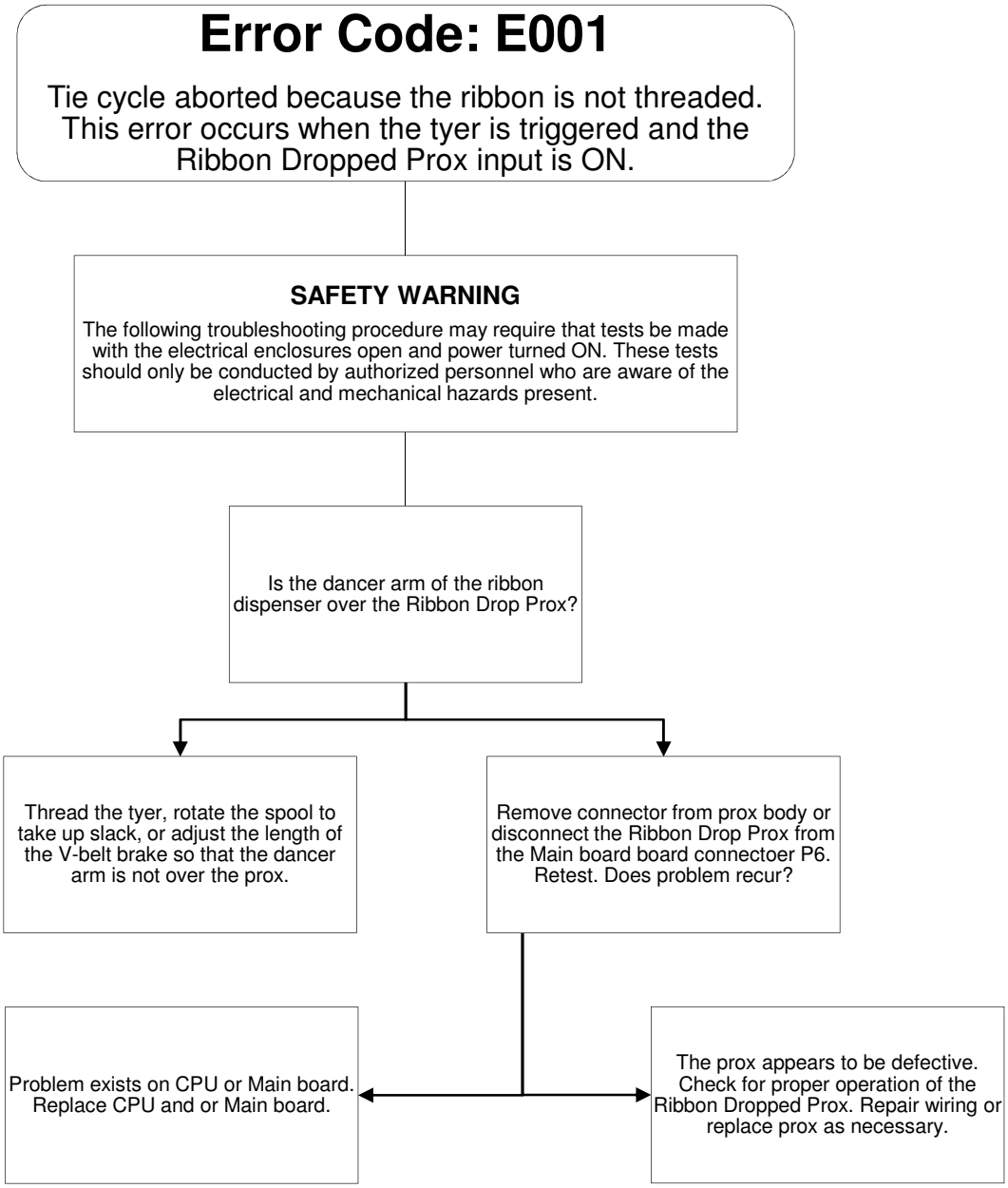
Flow Chart 4- Gathering Brushes Won't Run

TYER WON'T ALLOW BAGGER TO START

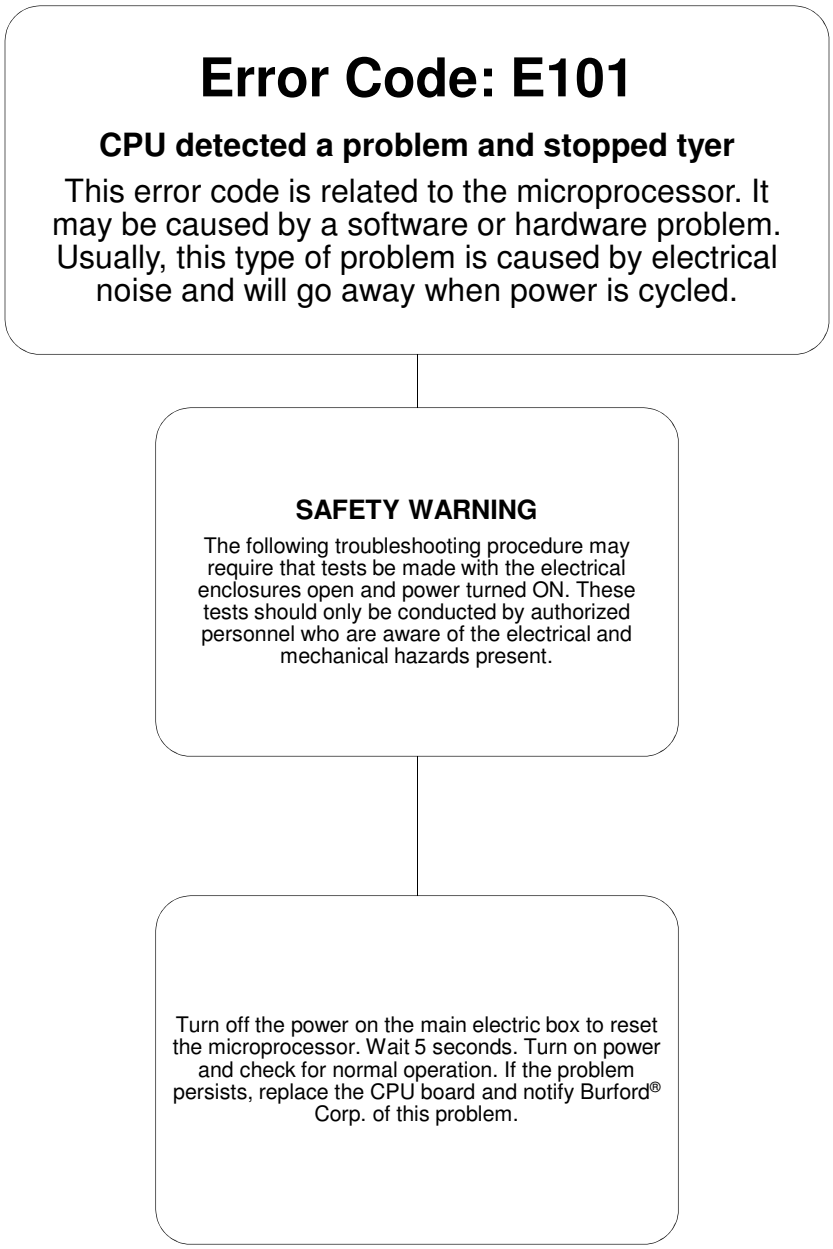
No Error Code is Displayed



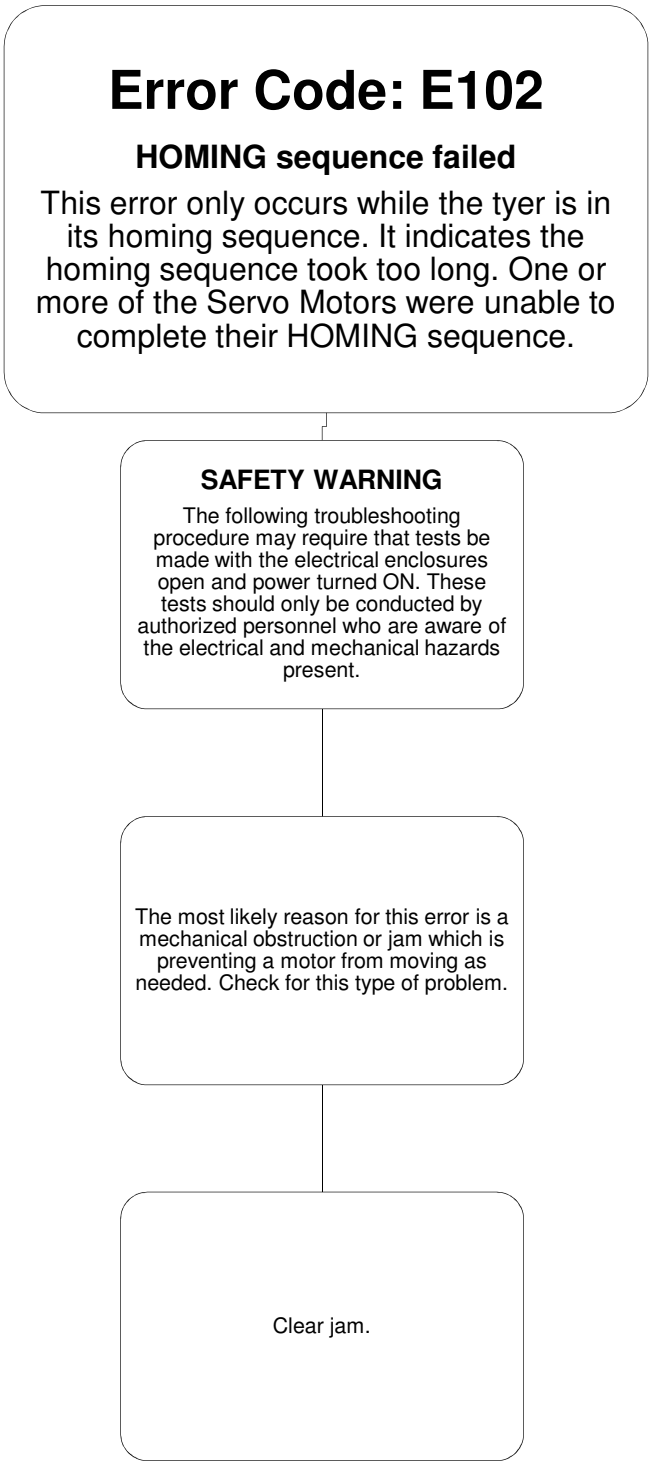
Flow Chart 4- Tyer Won't Allow Bagger to Start



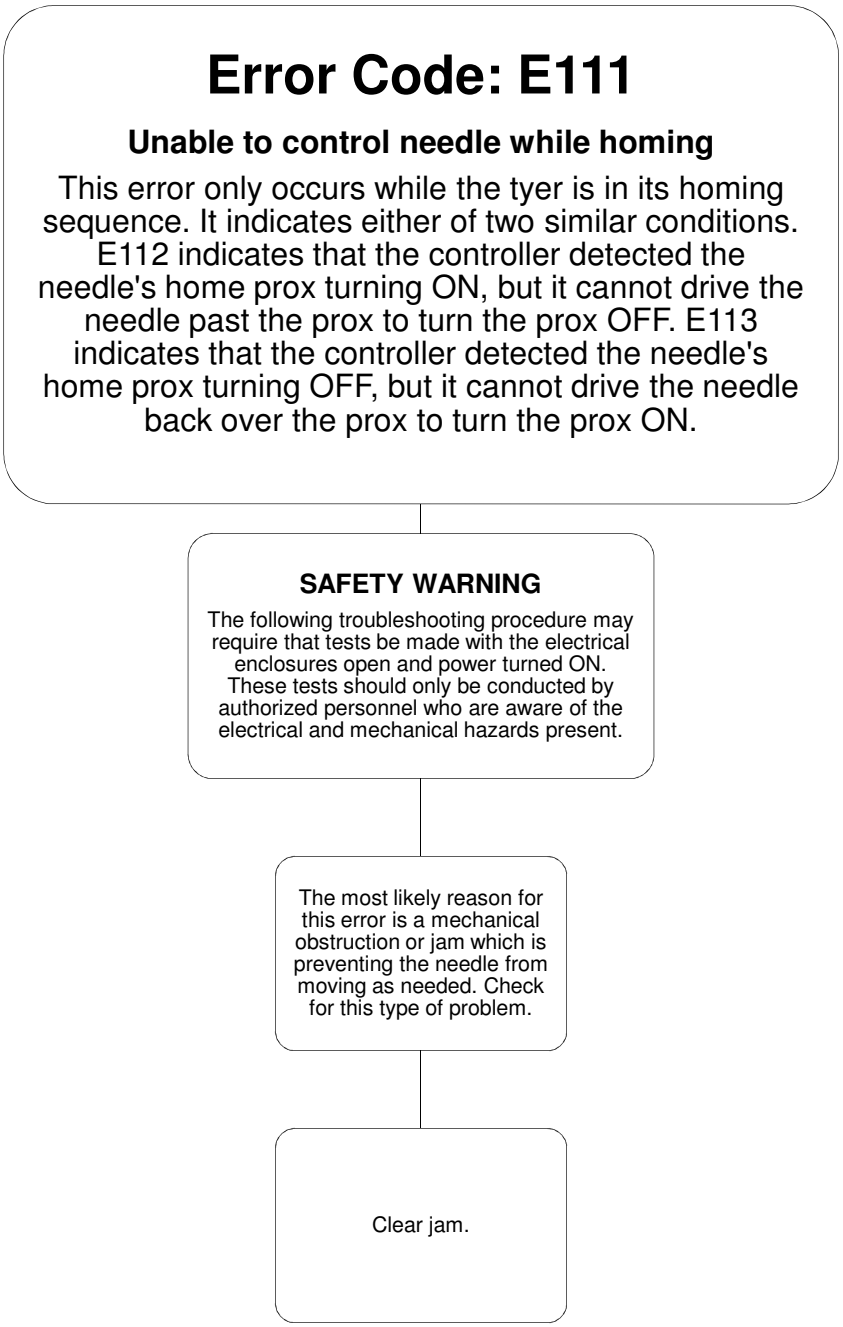
Flow Chart 4- Error Code: E001



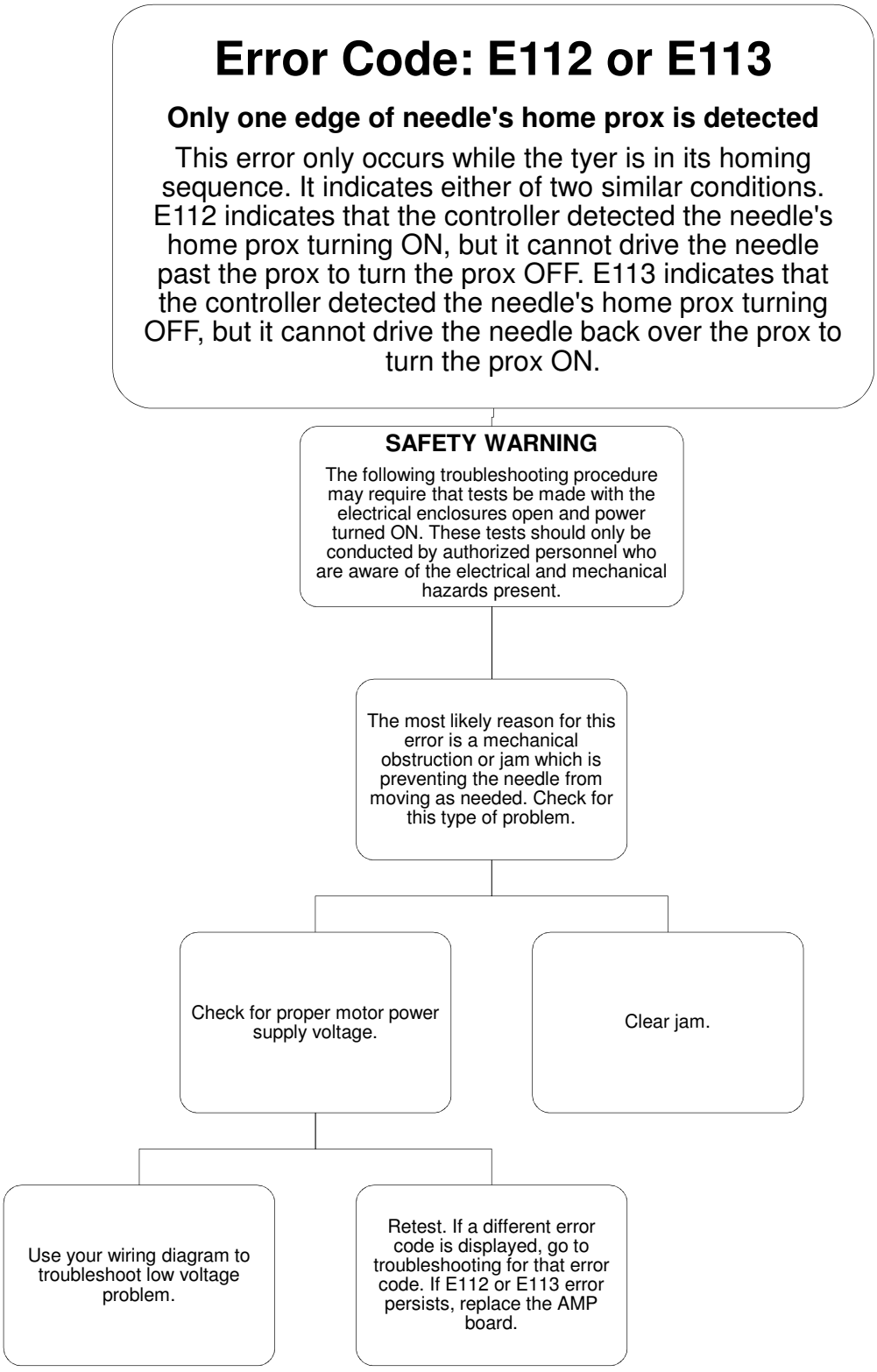
Flow Chart 4- Error Code: E101



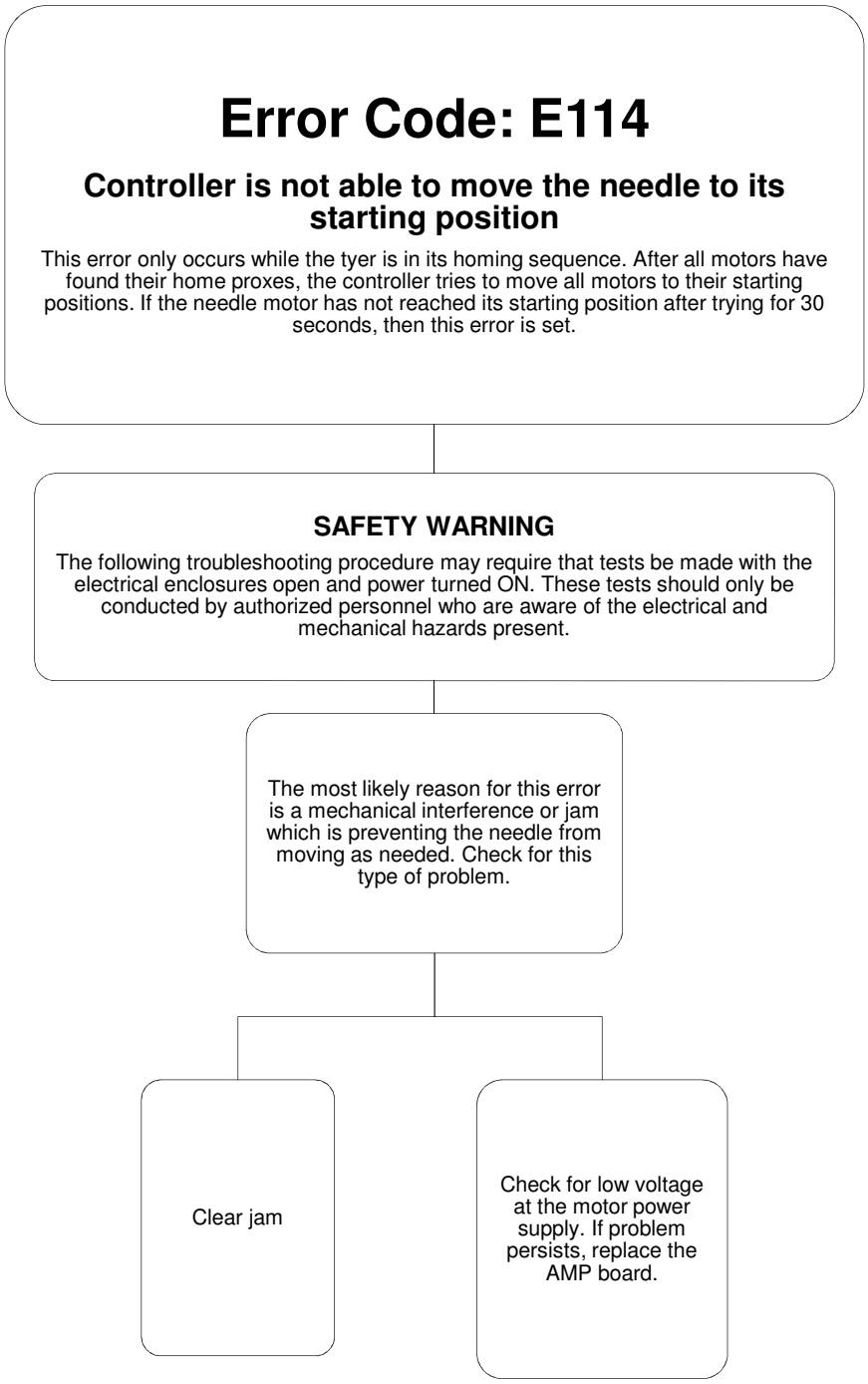
Flow Chart 4- Error Code: E102



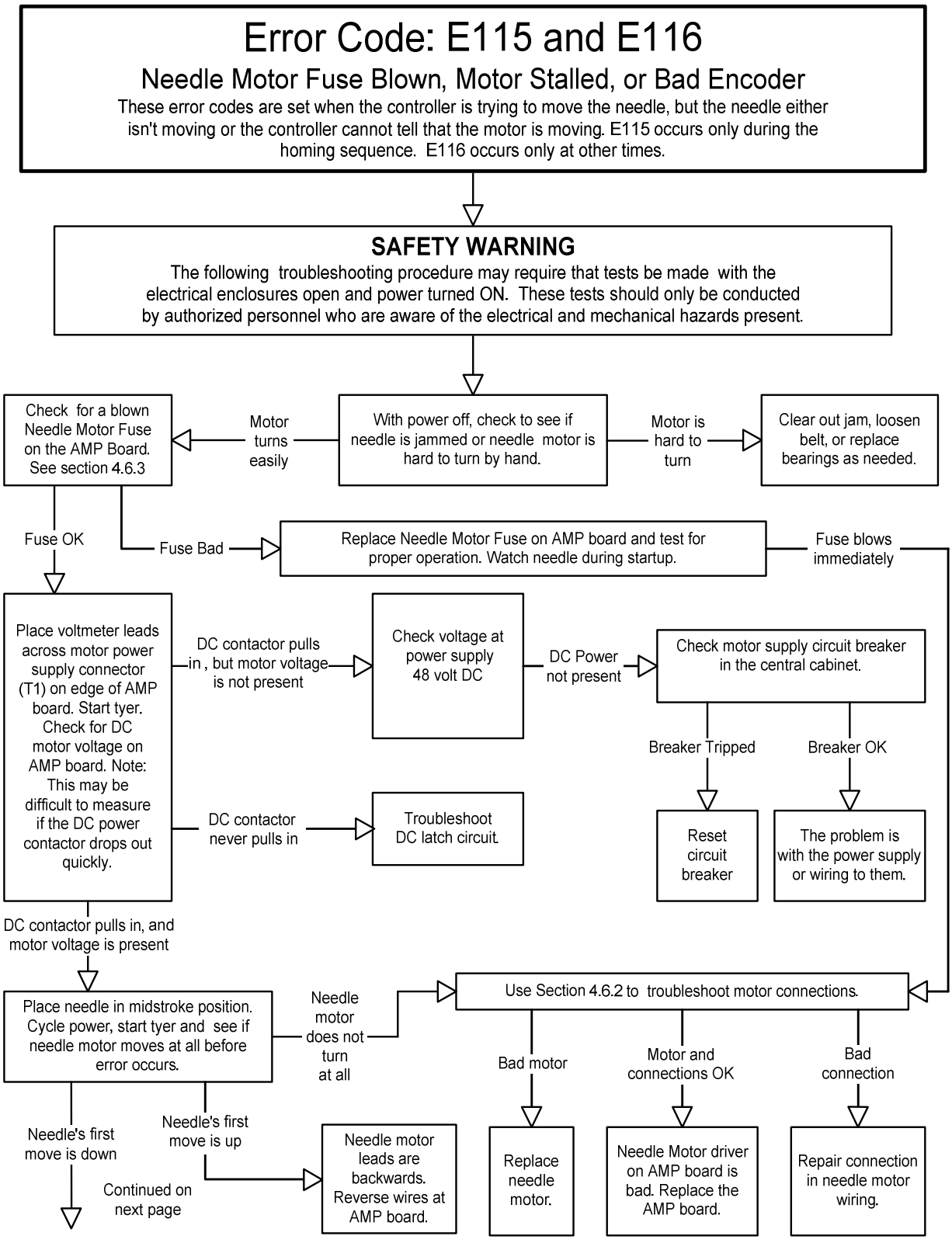
Flow Chart 4- Error Code: E111



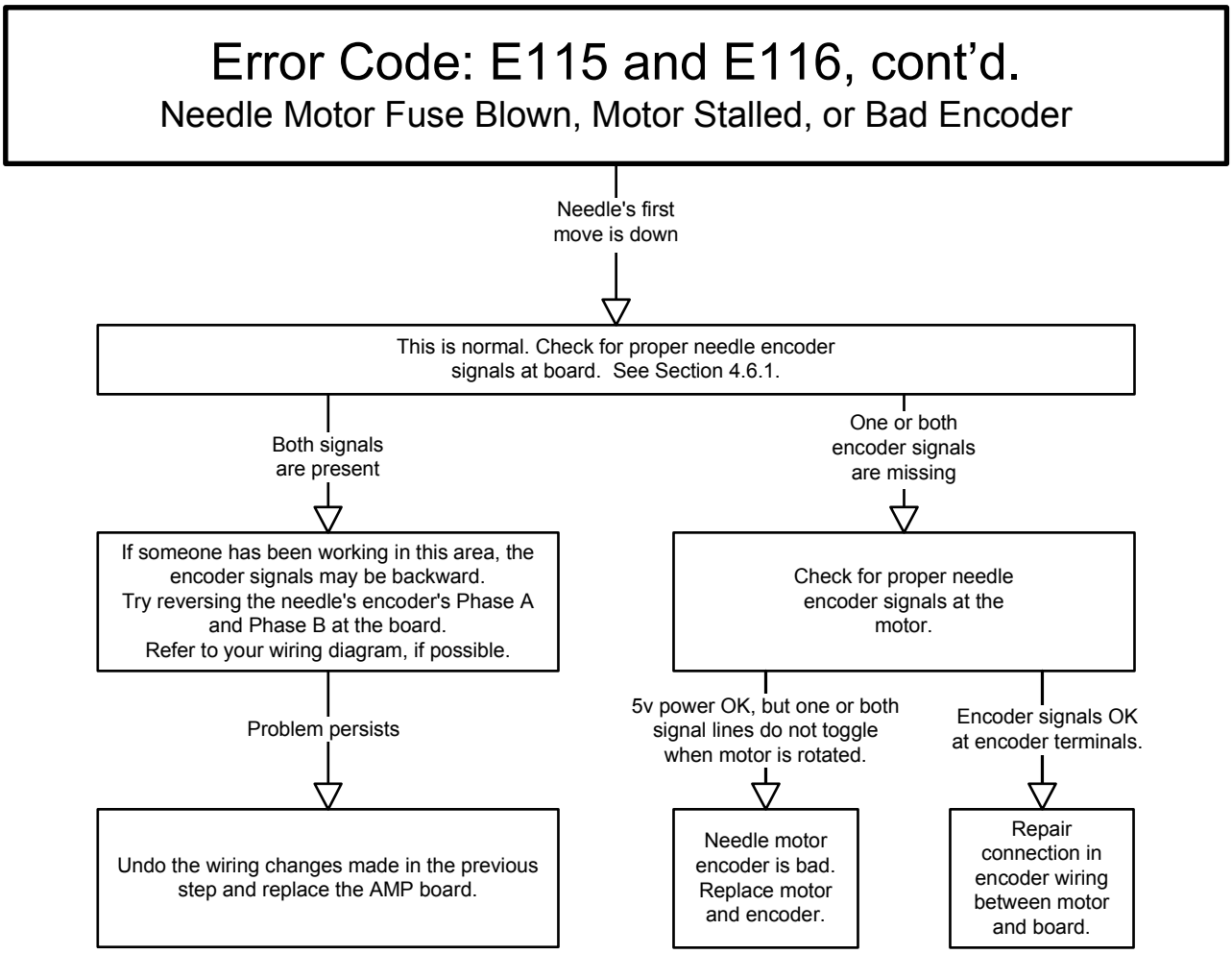
Flow Chart 4- Error Code: E112 or E113



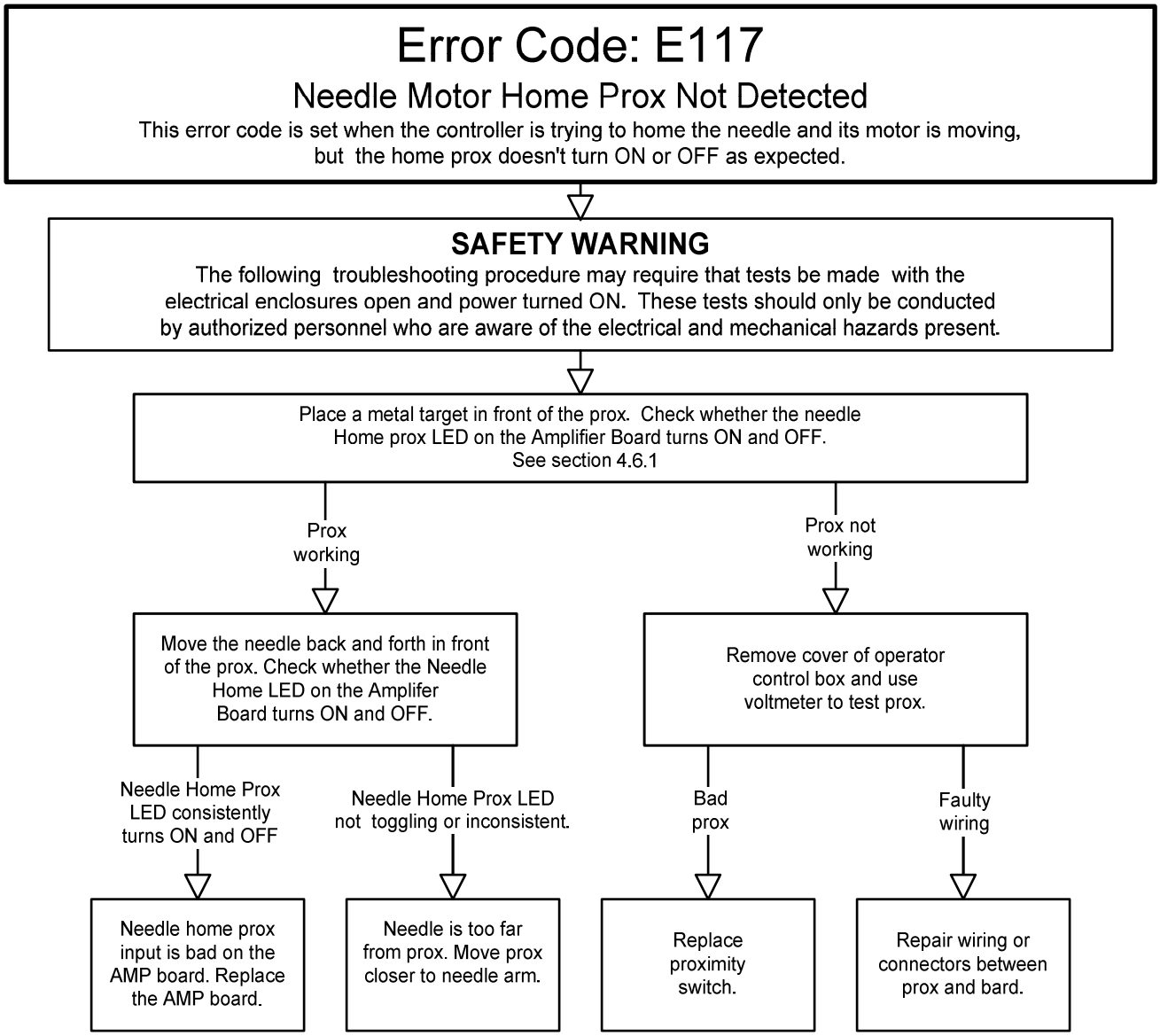
Flow Chart 4- Error Code: E114



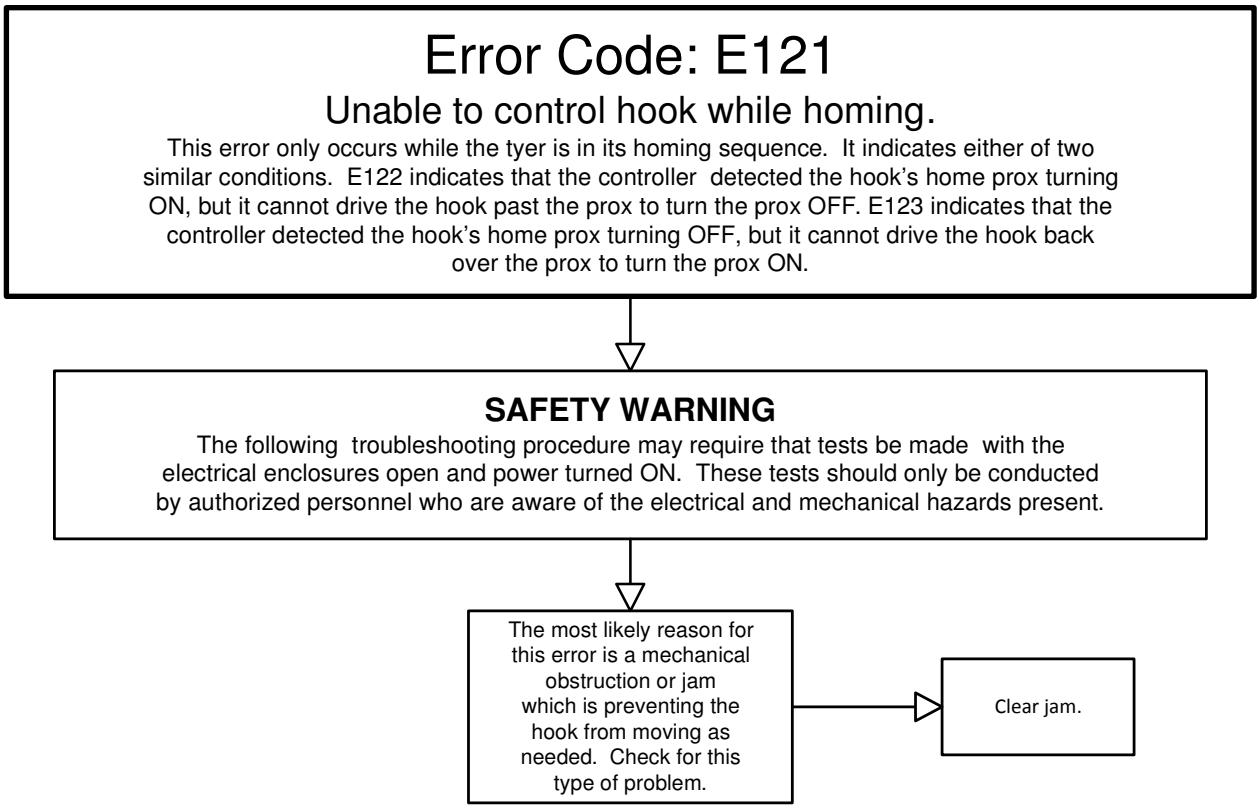
Flow Chart 4- Error Code: E115 and E116



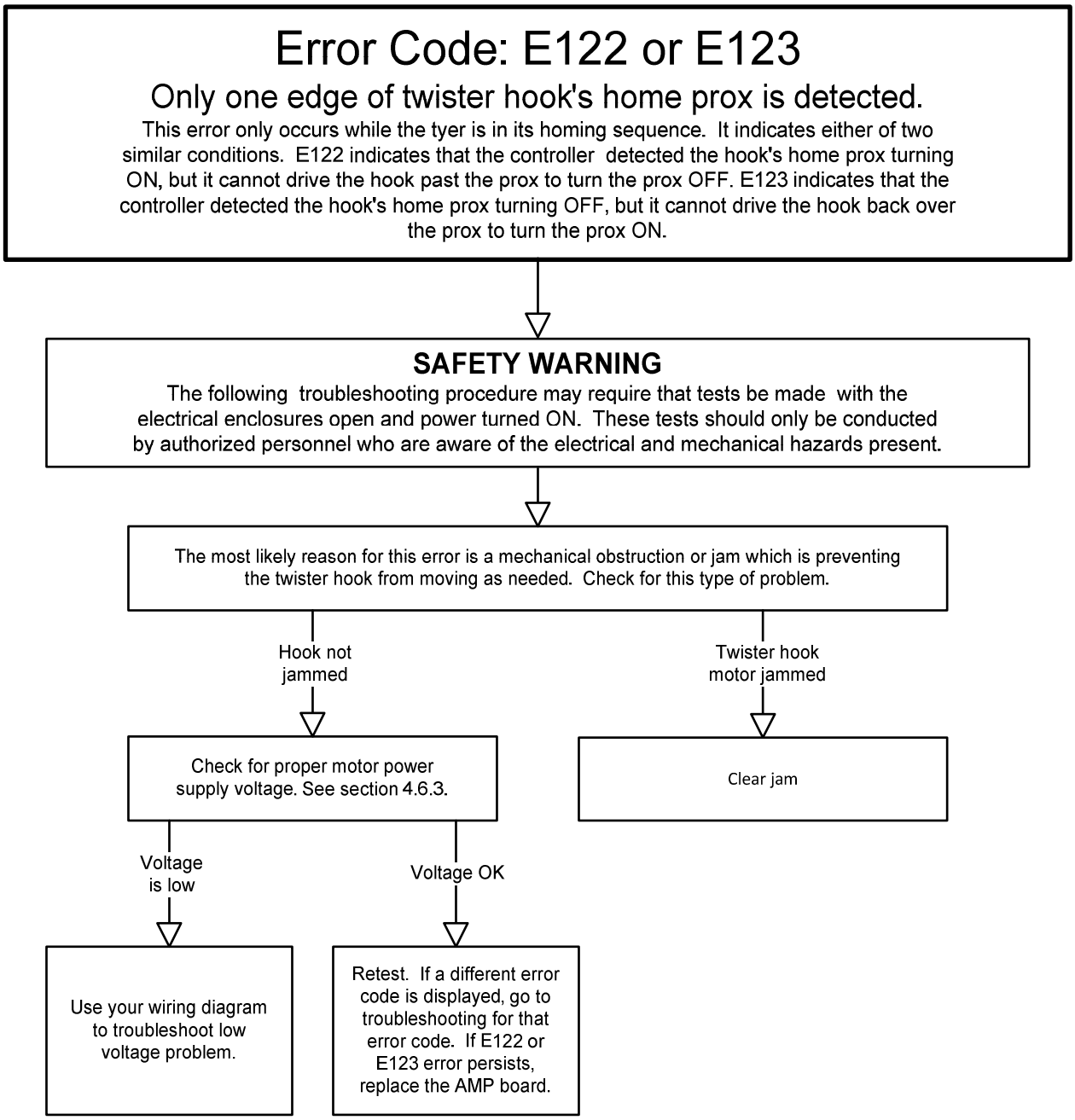
Flow Chart 4- Error Code: E115 and E116, cont'd.



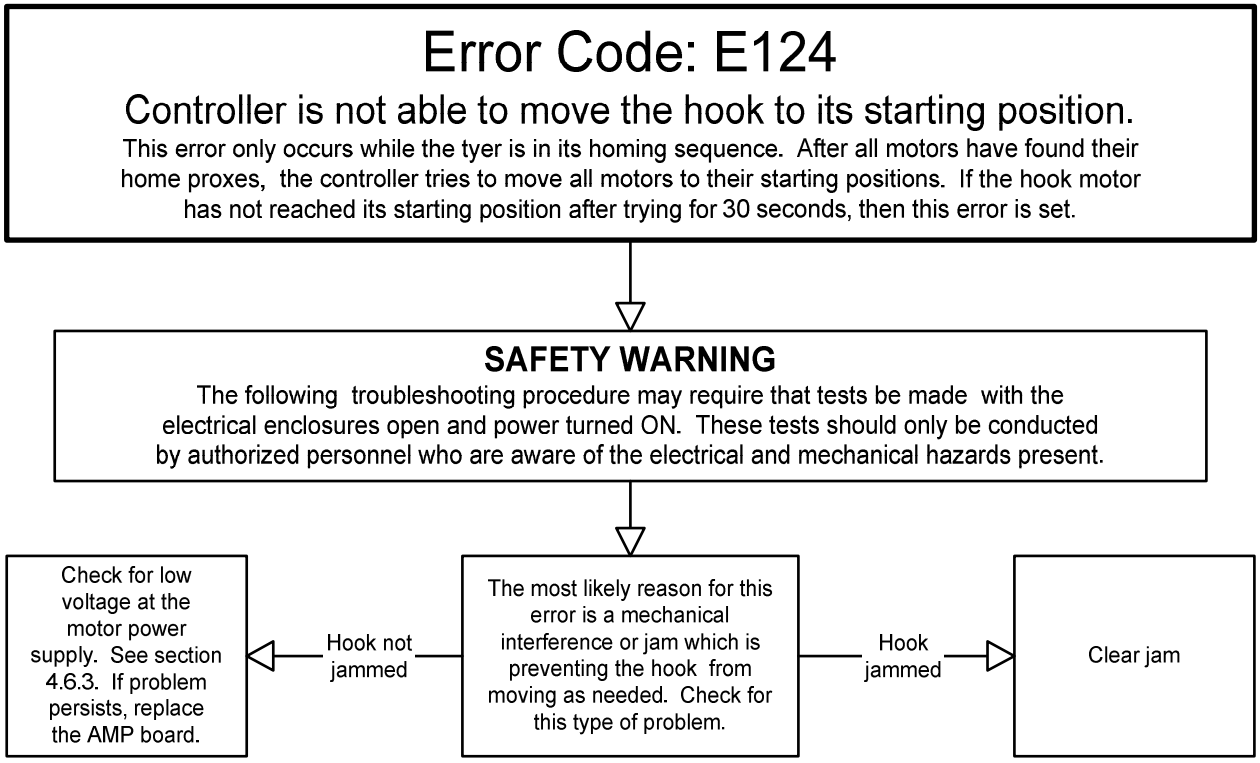
Flow Chart 4- Error Code: E117



Flow Chart 4- Error Code: E121



Flow Chart 4- Error Code: E122 or E123



Flow Chart 4- Error Code: E124

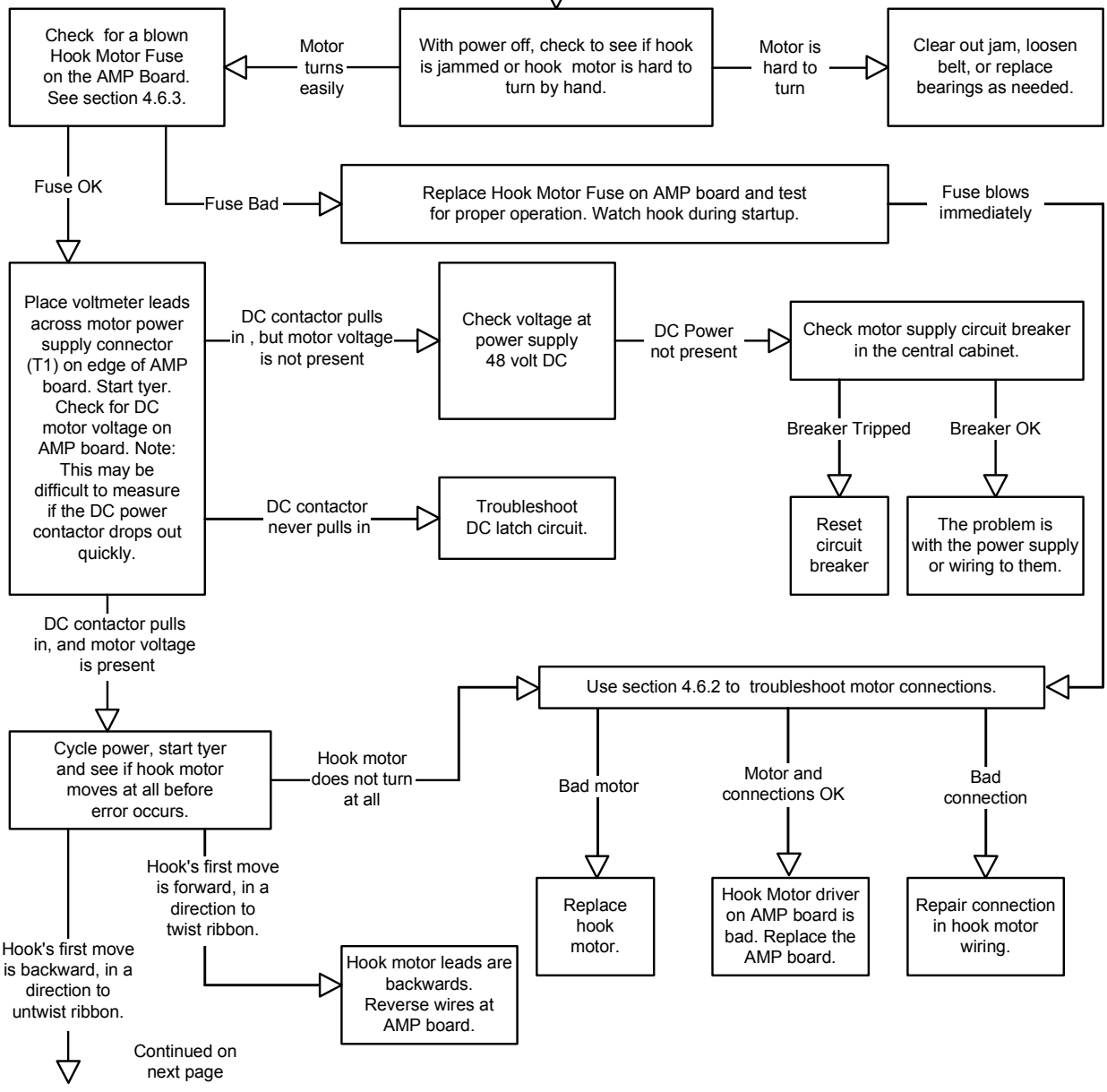
Error Code: E125 and E126

Hook Motor Fuse Blown, Motor Stalled, or Bad Encoder

These error codes are set when the controller is trying to move the hook, but the hook either isn't moving or the controller cannot tell that the motor is moving. E125 occurs only during the homing sequence. E126 occurs only at other times.

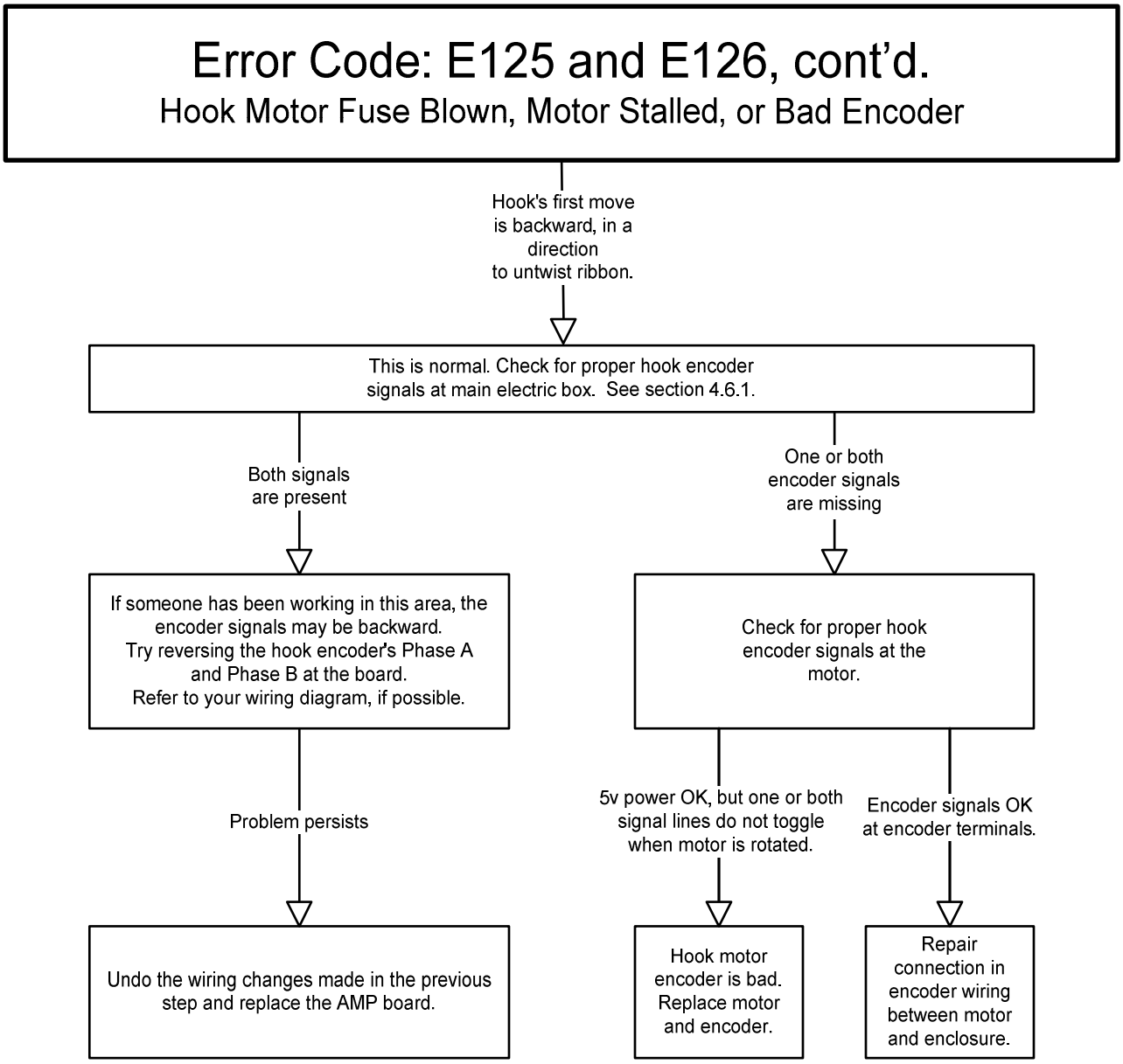
SAFETY WARNING

The following troubleshooting procedure may require that tests be made with the electrical enclosures open and power turned ON. These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

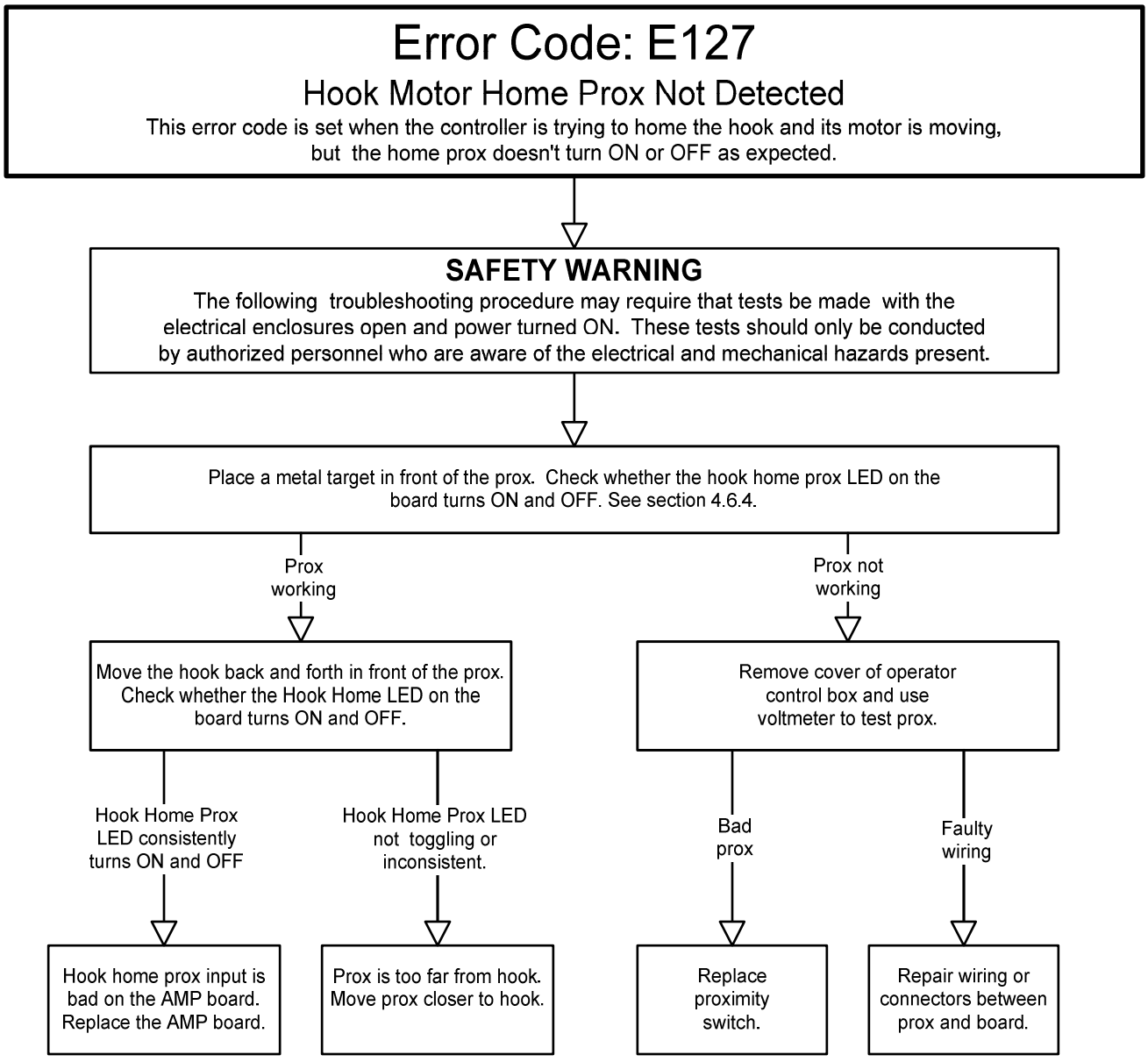


Continued on next page

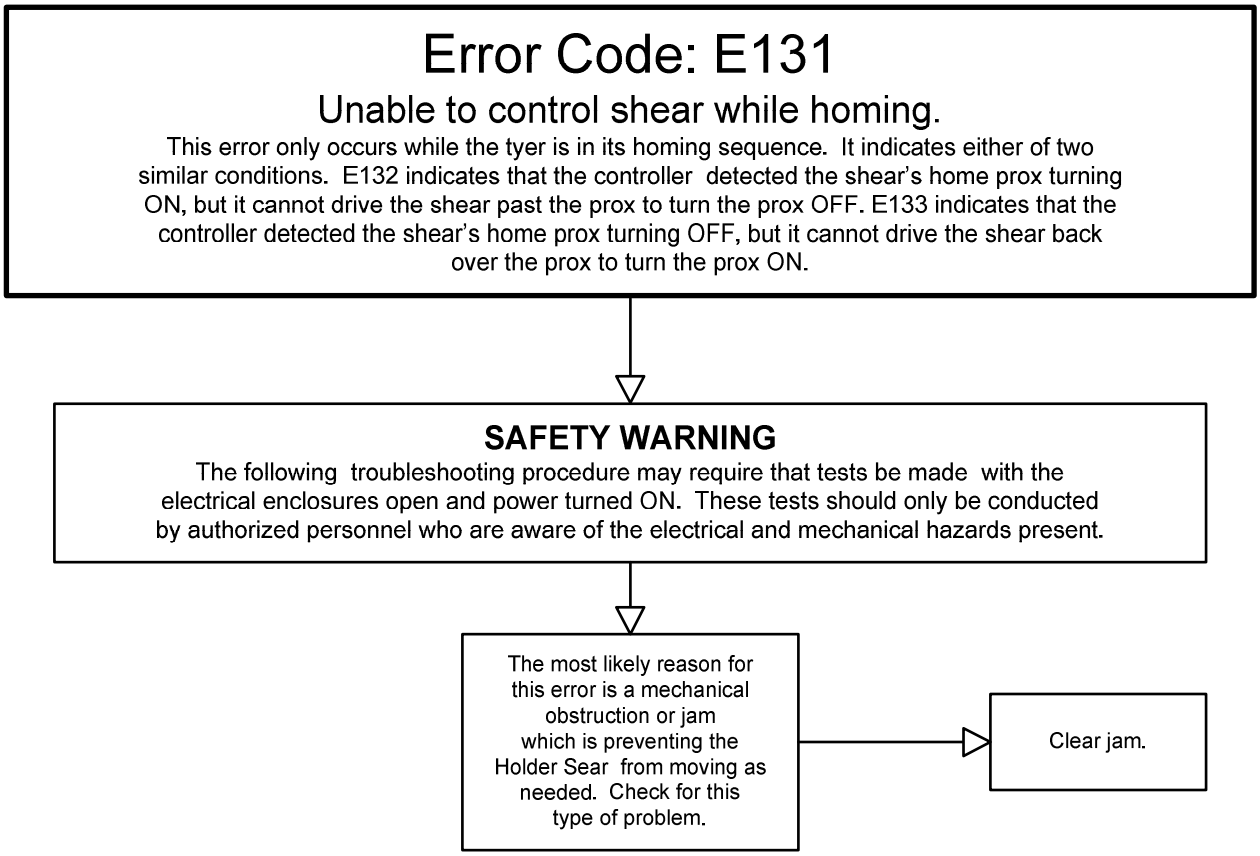
Flow Chart 4- Error Code: E125 and E126



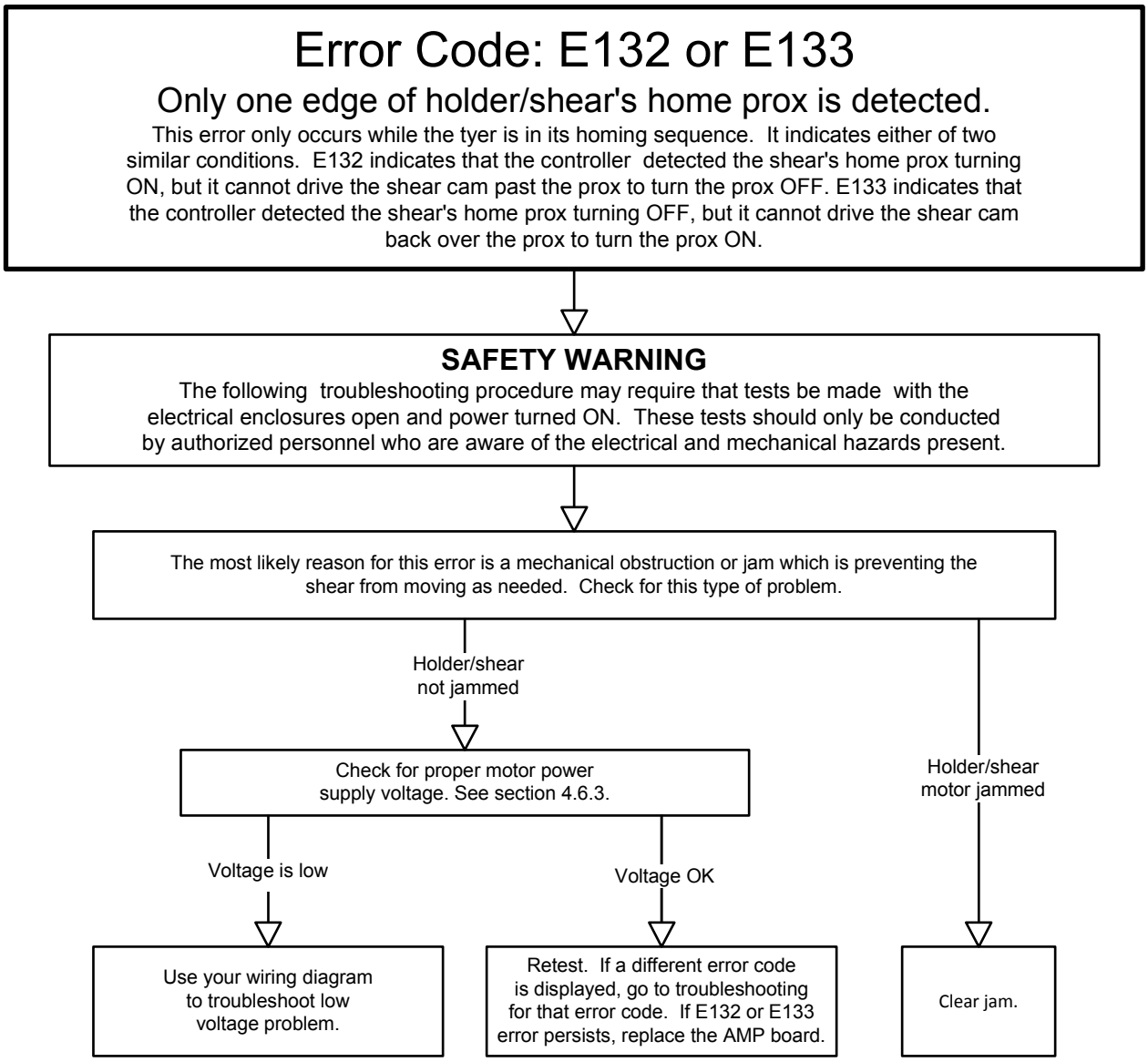
Flow Chart 4- Error Code: E125 and E126, cont'd.



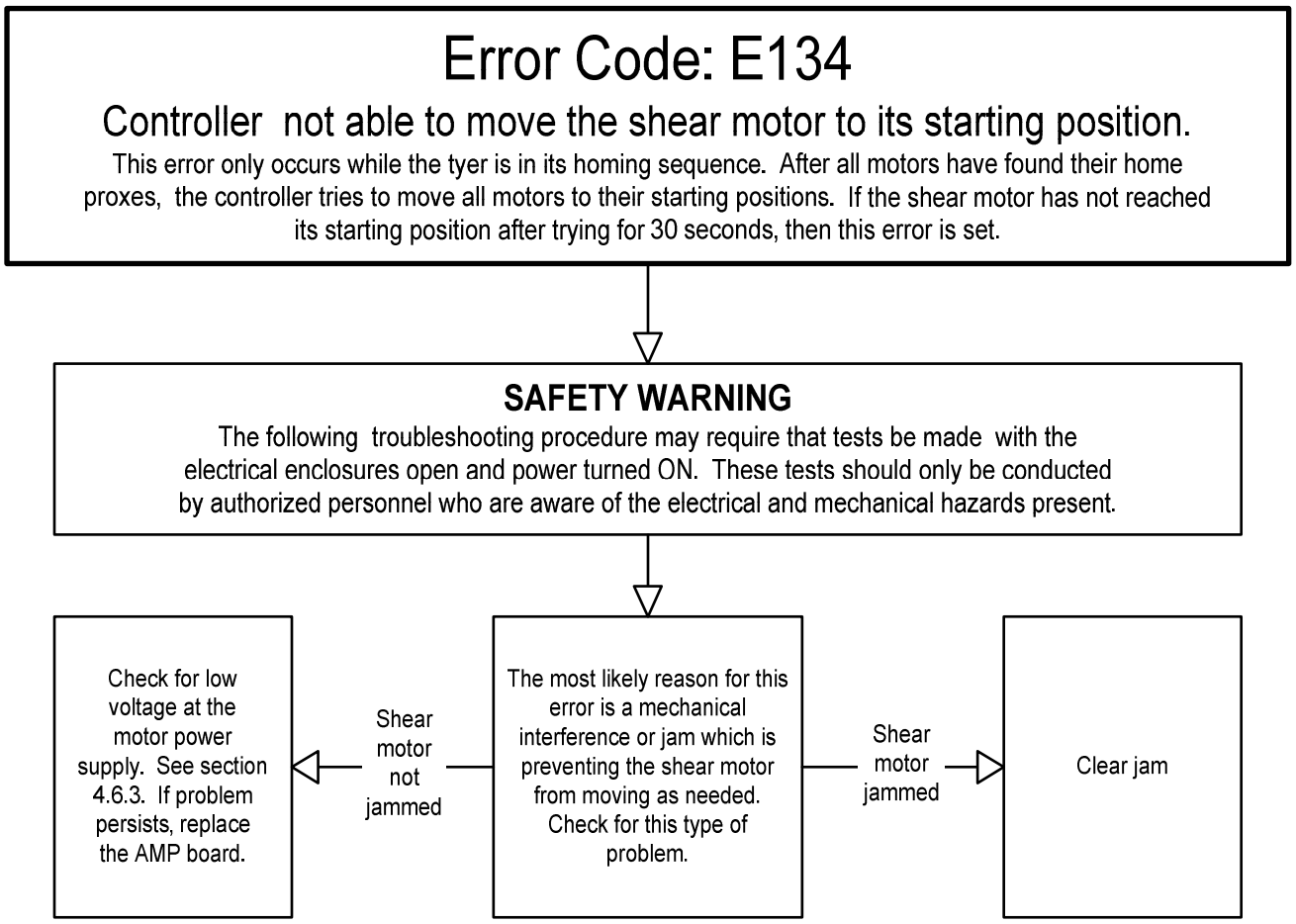
Flow Chart 4- Error Code: E127



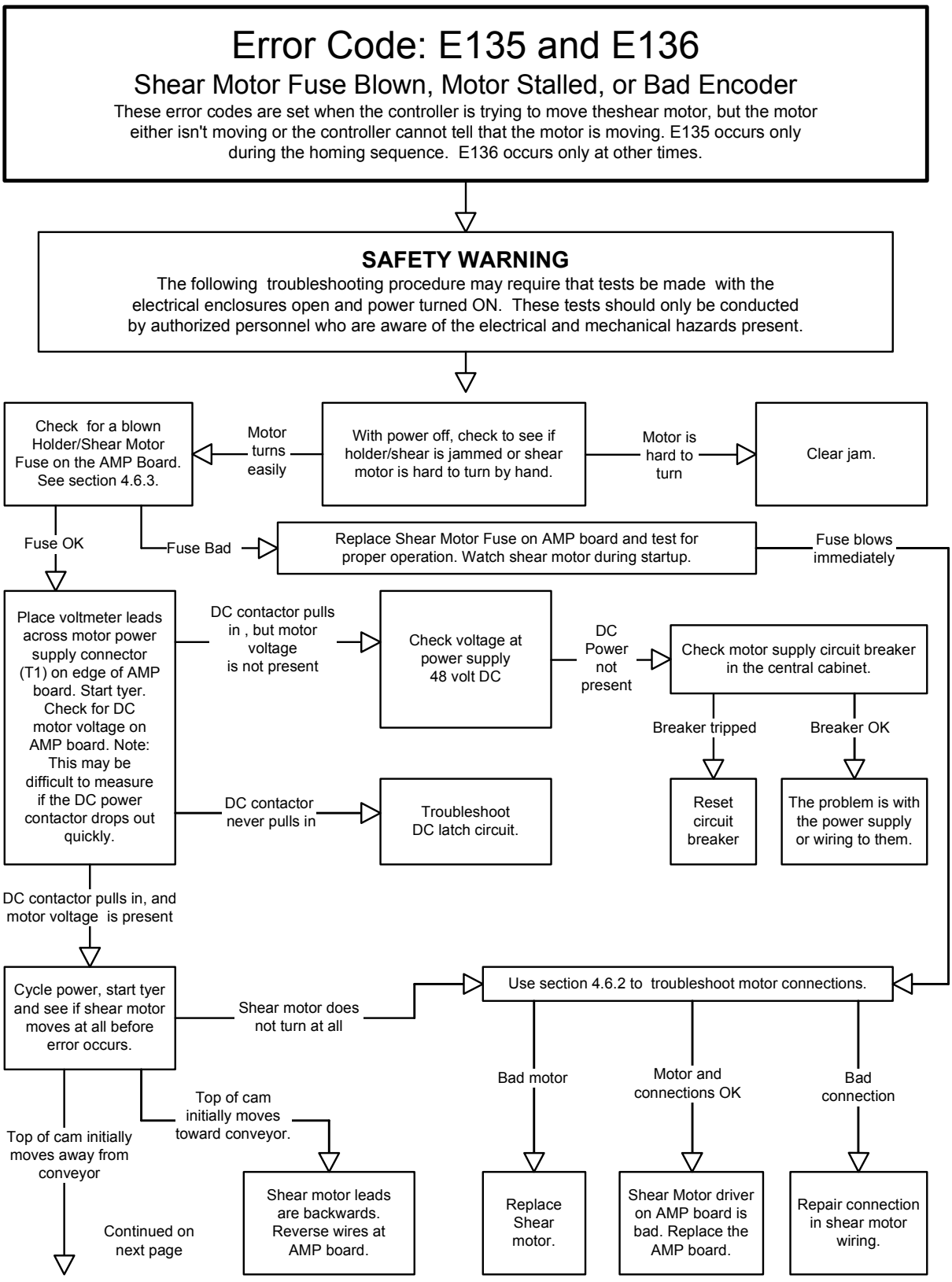
Flow Chart 4- Error Code: E131



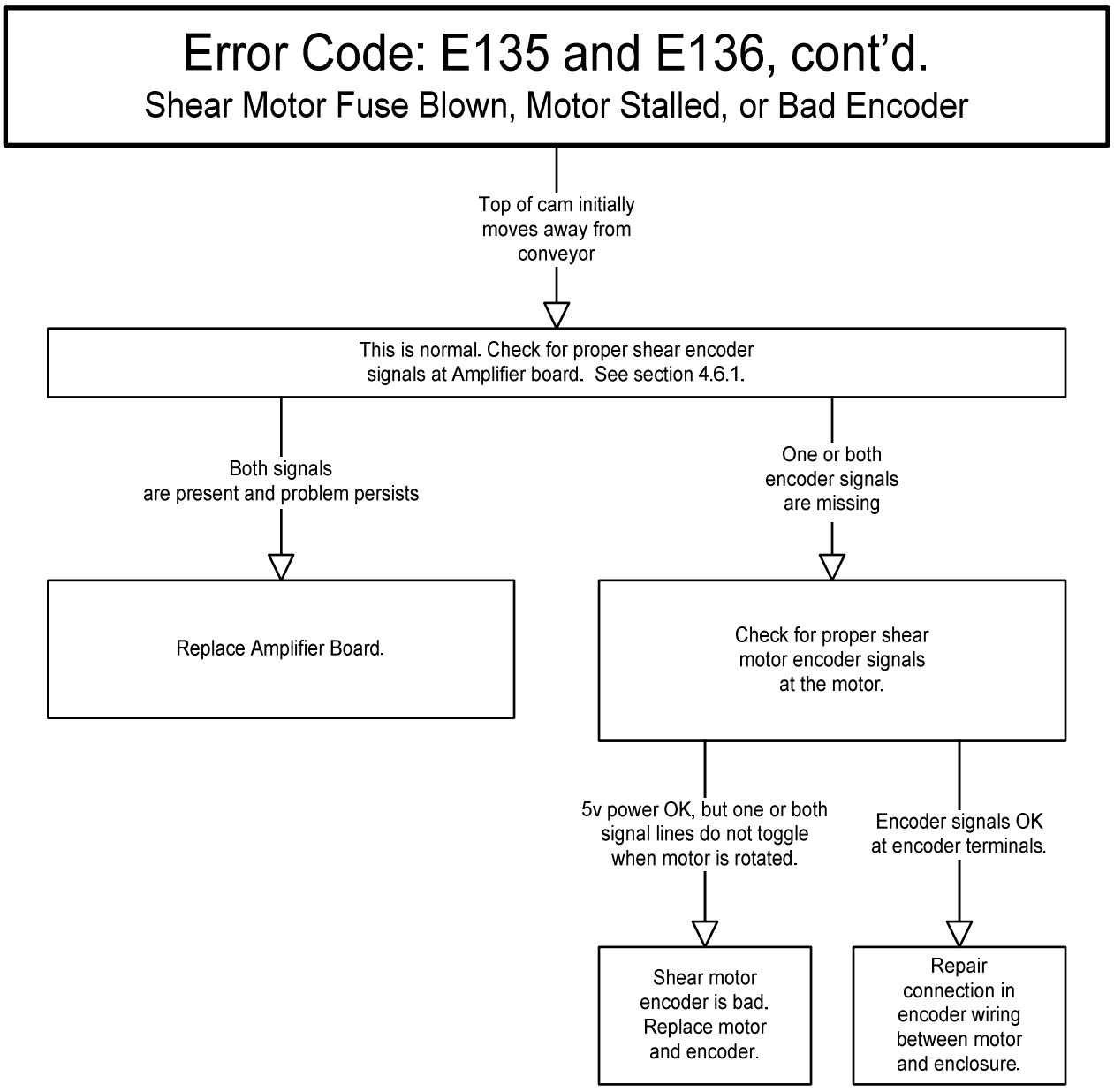
Flow Chart 4- Error Code: E132 or E133



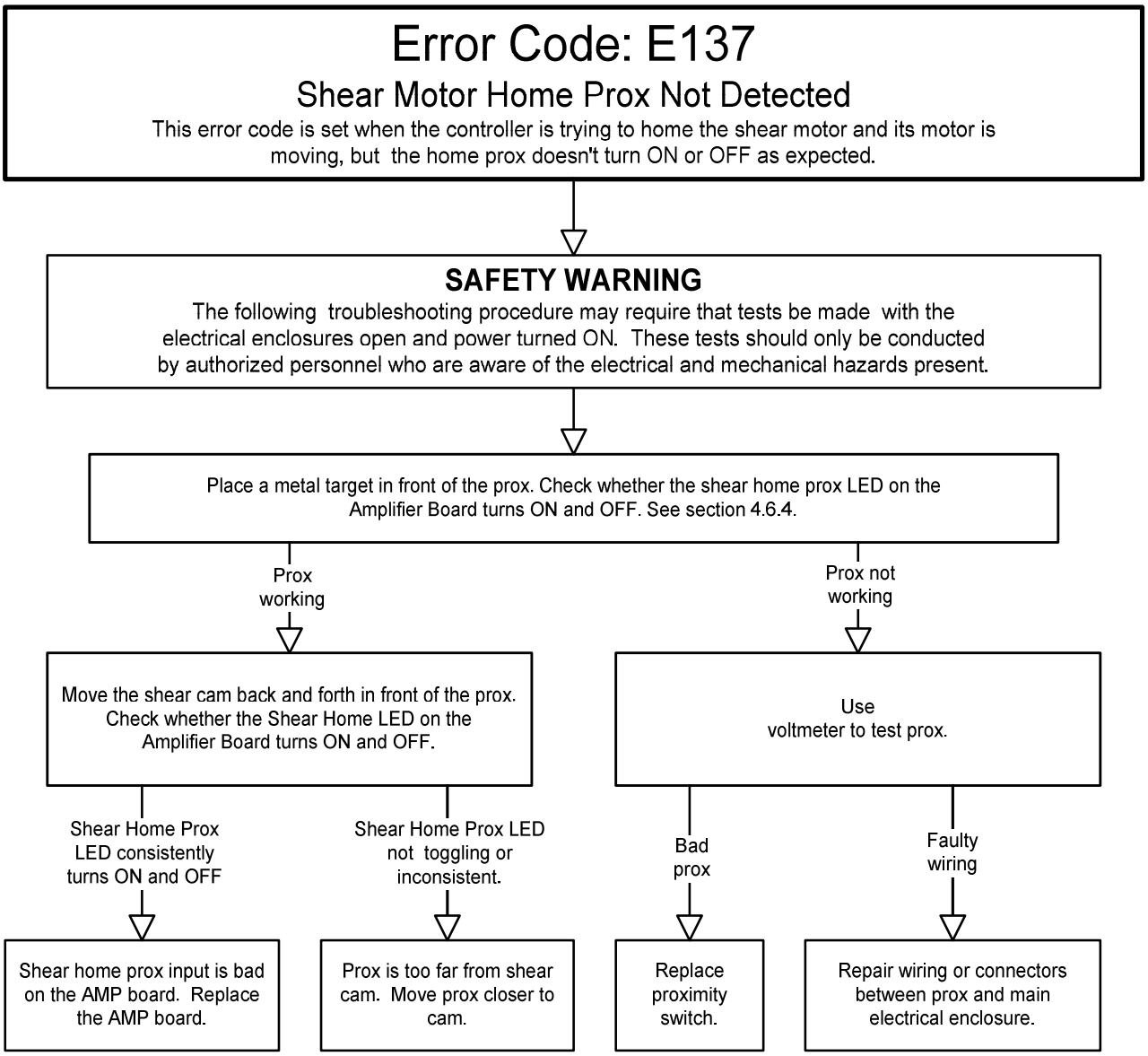
Flow Chart 4- Error Code: E134



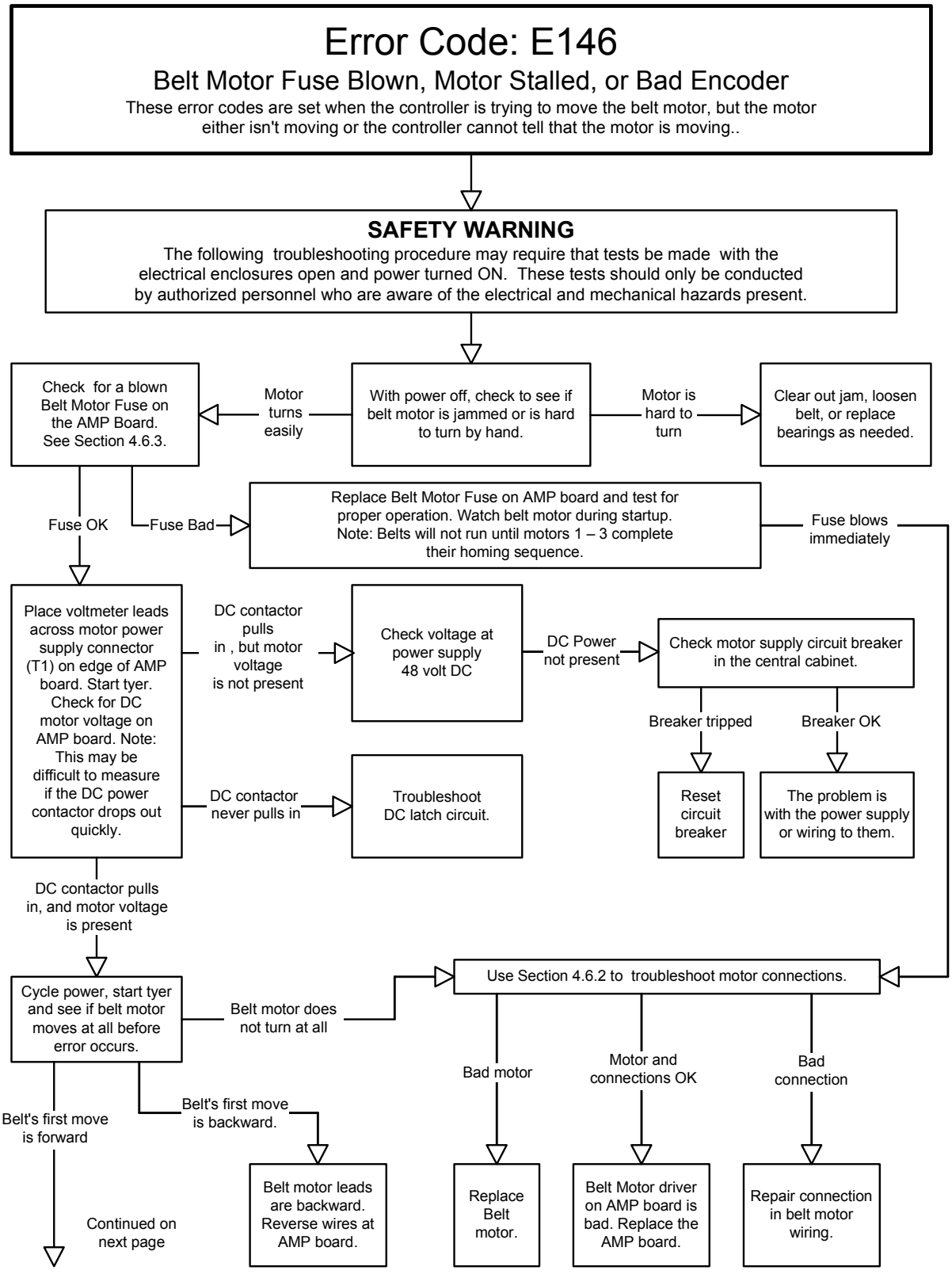
Flow Chart 4- Error Code: E135 and E136



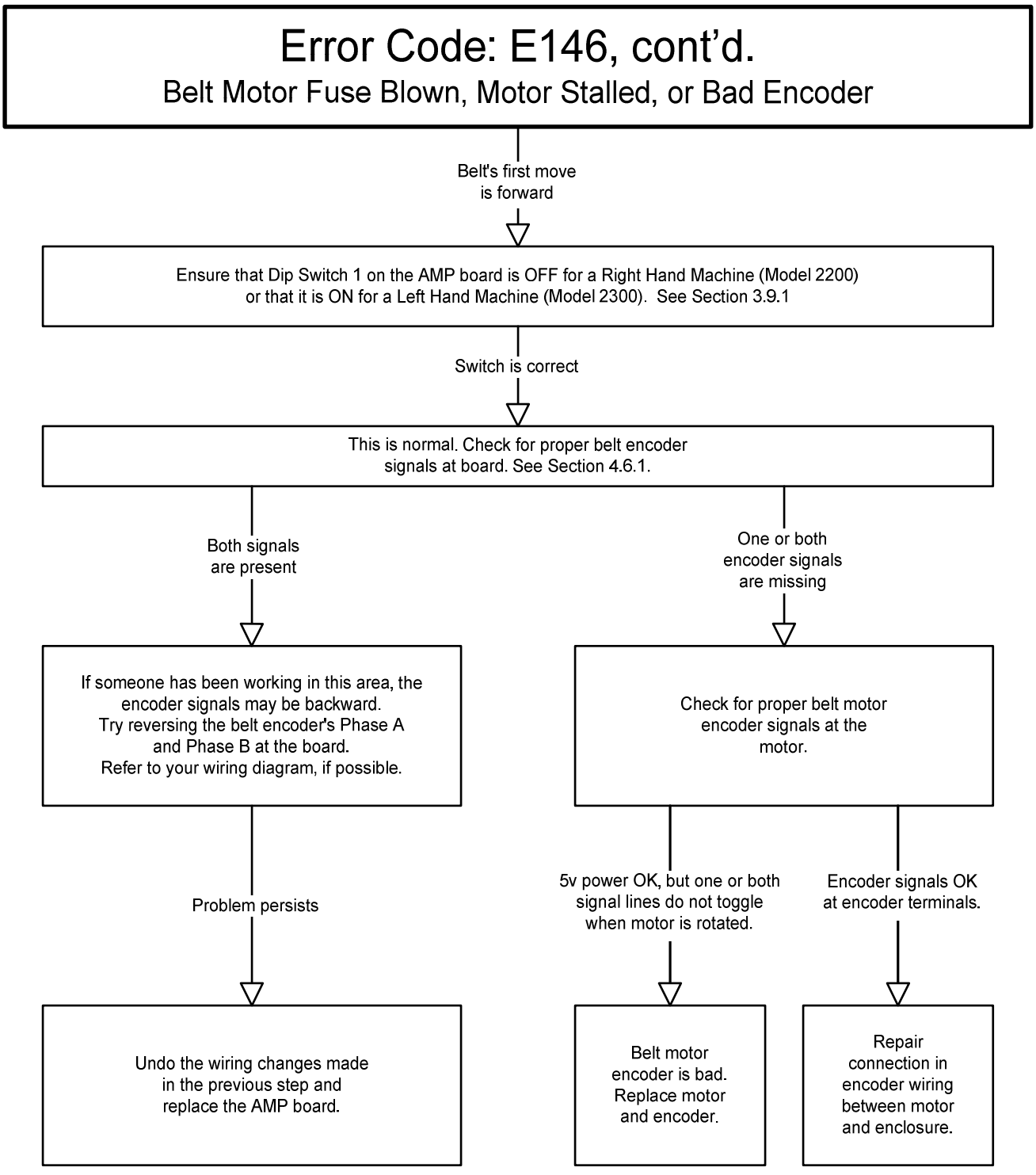
Flow Chart 4- Error Code: E135 and E136, cont'd.



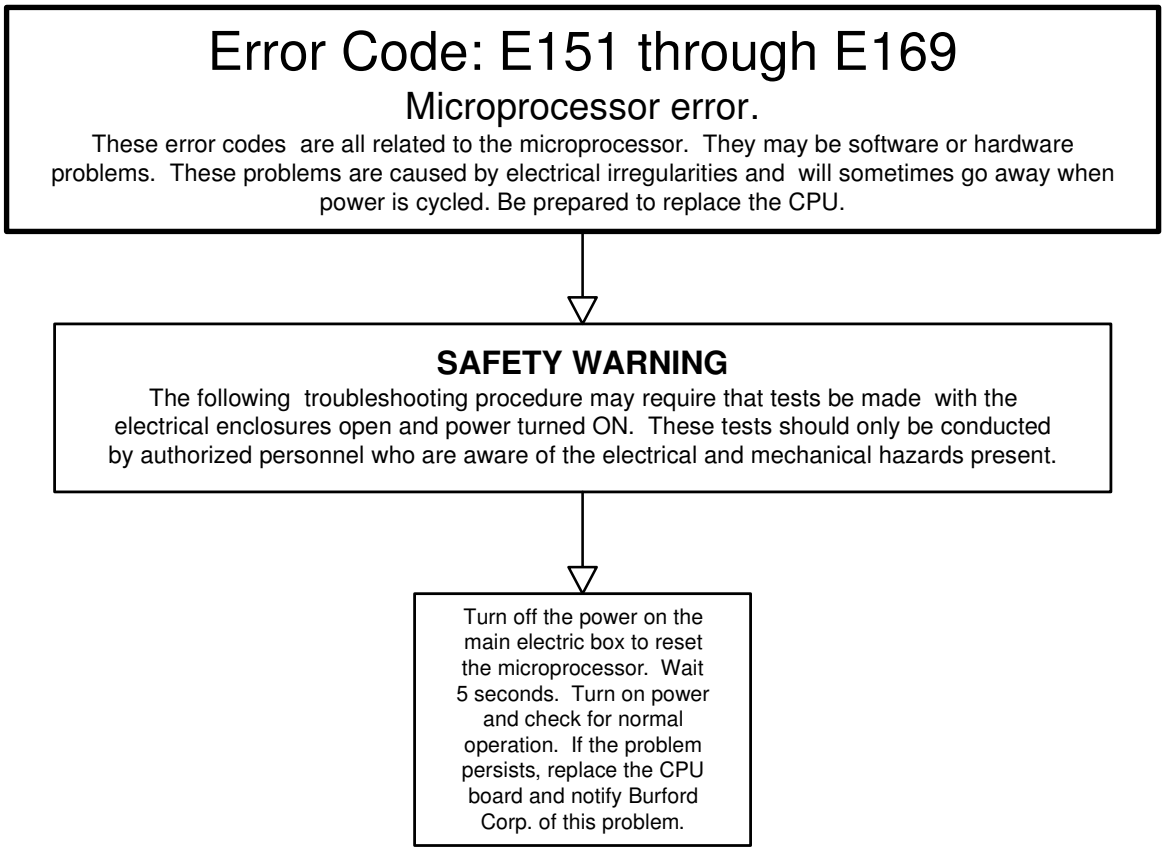
Flow Chart 4- Error Code: E137



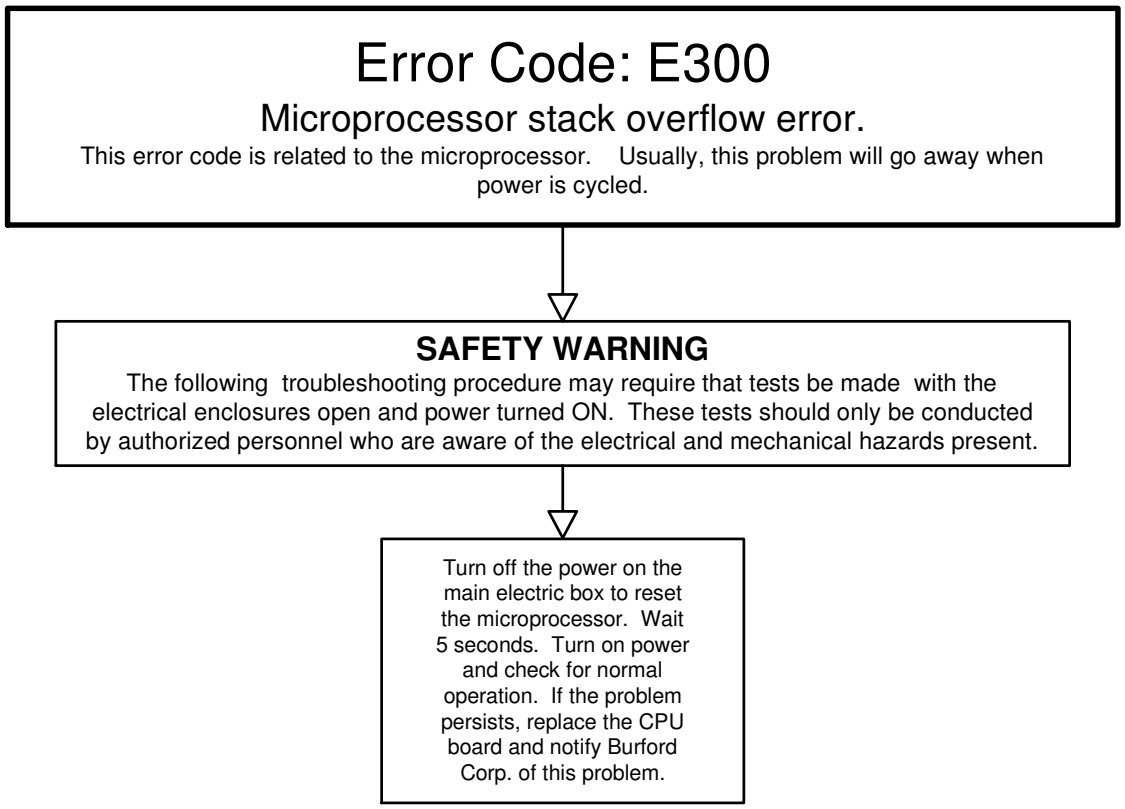
Flow Chart 4- Error Code: E146



Flow Chart 4- Error Code: E146, cont'd.



Flow Chart 4- Error Code: E151 through E169



Flow Chart 4- Error Code: E300

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures

4.6.1 Test procedure for motor encoders

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

An encoder can be checked for proper operation by following these steps.

1. Open the main electrical enclosure.
2. Turn the disconnect switch on.
3. Push the "ON" button located on the door to engage power.
4. While turning the shaft of the motor very slowly, observe the LEDs (Light Emitting Diodes) on the Amplifier Board. The 8 encoder LEDs are labeled BELT Phase A, BELT Phase B, H/S Phase A, H/S Phase B, NEEDLE Phase A, NEEDLE Phase B, TWISTER Phase A, and TWISTER Phase B. As you turn a motor, its encoder LEDs should be turning "ON" and "OFF". Only one of the LED's should toggle at any given time. However, the motor must be turned very slowly in order to observe this sequence because each LED turns "ON" and "OFF" 500 times per motor revolution. Note: If an encoder lead is broken or disconnected that LED will be "ON" all the time.

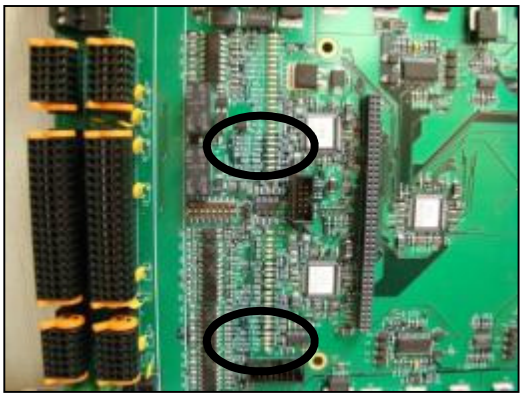


Fig. 4- Motor Encoder Test

5. If both encoder LED's are blinking as you rotate the motor and they do not always blink at the same time, you can be well assured that the encoder is working properly.

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.2 Test procedure for motor continuity

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

The motor leads are attached to corresponding connectors on the edge of the Amplifier Board. A motor can be tested for continuity by following these steps.

1. Remove electrical power from the unit. Remove main cover.
2. Use the table below and Figure 4-2 to determine location of motor connector for the motor to be tested. Disconnect the motor connector from the amplifier board.

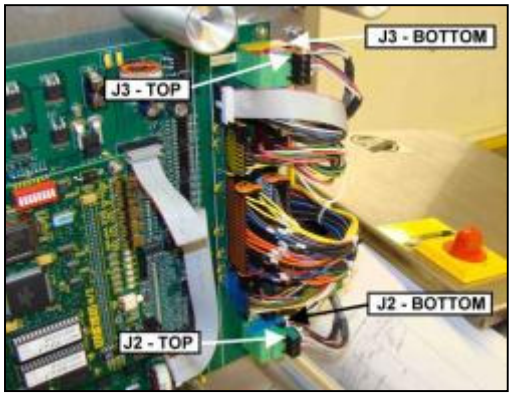


Fig. 4- Motor Connector Location

3. Measure motor resistance at motor wires (red-black, red-white, black-white). The ohmmeter readings should be 1 ohm or less. If not, motor may need to be replaced.

Fig. 4- Motor Resistance

Motor	Position	Color	Connector
1	Needle	Green	J2-TOP, P2
2	Twister	Blue	J2-BOTTOM,
3	Holder/She	Red	J3-TOP, P4
4	Belts	Yellow	J3-BOTTOM,

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.3 Test procedure for servo motor fuses

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

As shown in Figure 4-4, the fuses for the four servo motors are located on the amplifier board. The motor fuses can be checked by following these steps.

1. Remove electrical power from unit.
2. Locate the Amplifier board on the back of the Tyer Head.
3. Remove the desired fuse from the amplifier board. The amplifier board is labeled for fuse identification. This should be done carefully so as not to damage the traces under the fuses. Never use a metal screwdriver.
4. With the fuse removed, check it with an ohmmeter. The resistance of any of these fuses should be less than 1 ohm.

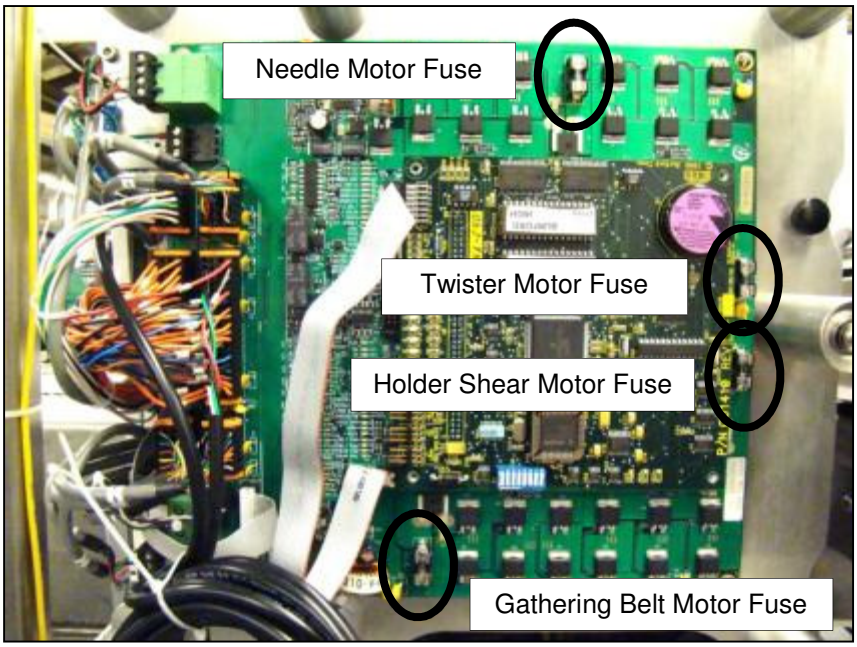


Fig. 4- Servo Motor Fuses Test

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.4 Test procedure for checking the proximity switch LED's

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

A proximity sensor can be checked for proper operation by following these steps.

1. Open the main electrical enclosure.
2. Turn the disconnect switch "ON".
3. Push the "ON" button located on the door to engage main power.
4. The 5 proximity LEDs are labeled NEEDLE HOME, TWISTER HOME, H/S HOME, RIBBON DROP and RIBBON DISP as shown below.
5. While triggering the proximity switch with a piece of metal, observe the LED on the Amplifier Board. The LED corresponding to the proximity switch being triggered should come on when the proximity switch is triggered.

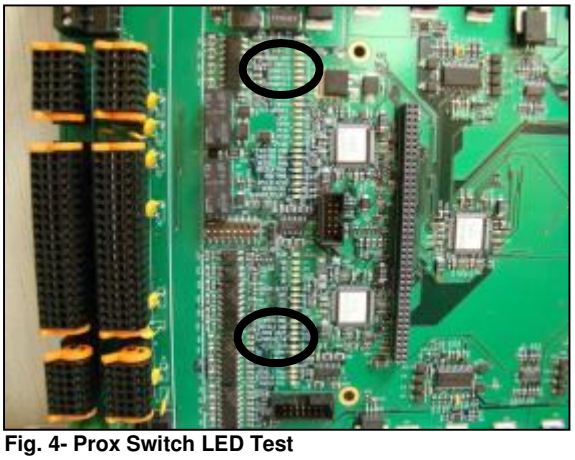


Fig. 4- Prox Switch LED Test

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.5 Test procedure for the BCD switch

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

The BCD switch controls the speed of the gathering belts. It can be checked for proper operation by following these steps.

1. Open the main electrical enclosure.
2. Turn the disconnect switch "ON".
3. Push the "ON" button located on the door to engage power.
4. Locate the BCD LEDs (Light Emitting Diode) on the Amplifier Board. The 4 BCD LEDs are labeled (BCD 1, BCD 2, BCD 4, and BCD 8).
5. Observe the LEDs while changing the setting of the BCD switch, located on the operator control box. The LEDs should display in binary whatever is set on the switch. For example if the switch is set at 11 the LEDs labeled BCD 1, BCD 2, and BCD 8 should be on. All the BCD LEDs should be on at the setting of 15, and they all should be off at the setting of 0.
6. If switch is not working, you can temporarily place jumpers between the BCD lines and ground. For instance, to get a speed of 10, place a jumper from BCD8 to ground and another from BCD2 to ground.

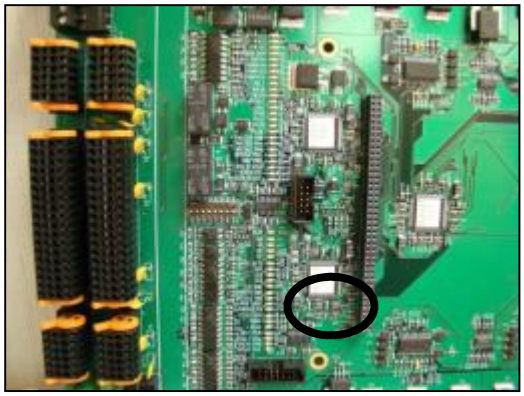


Fig. 4- BCD Switch Test

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.6 Test procedure for the bag switch

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

The bag switch can be checked for proper operation by following these steps.

1. Open the main electrical enclosure.

2. Turn the disconnect switch "ON".

3. Push the "ON" button located on the door to engage power.

4. Locate the bag switch LED (Light Emitting Diode) on the amplifier board. The bag switch LED is labeled (BAG SWITCH).

5. Observe the LED while pressing the wand of the bag switch down. The LED should light up when the wand is pushed down.

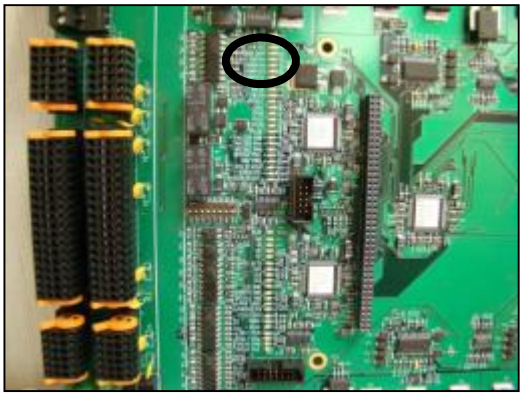


Fig. 4- Bag Switch Test

4.0 TROUBLESHOOTING, cont'd

4.6 Test Procedures, cont'd

4.6.7 Test procedure for enclosure/head compatibility

Safety Warning:	The following troubleshooting procedure may require that tests are made with the electrical enclosures open and power turned "ON". These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.

For electrical enclosures built with wiring diagram ED0650C or earlier to be compatible with tyer heads built with wiring diagram ED0650D or later; a jumper must be added by following these steps. Incompatible enclosure/tyer head combinations without the jumper, result in error code H004.

1. Open the main electrical enclosure.
2. Locate terminal strip (TB1).
3. If wire P1:34 is present, then jumper (Burford® P/N C06369) must be inserted to connect wires P1:33 and P1:34.

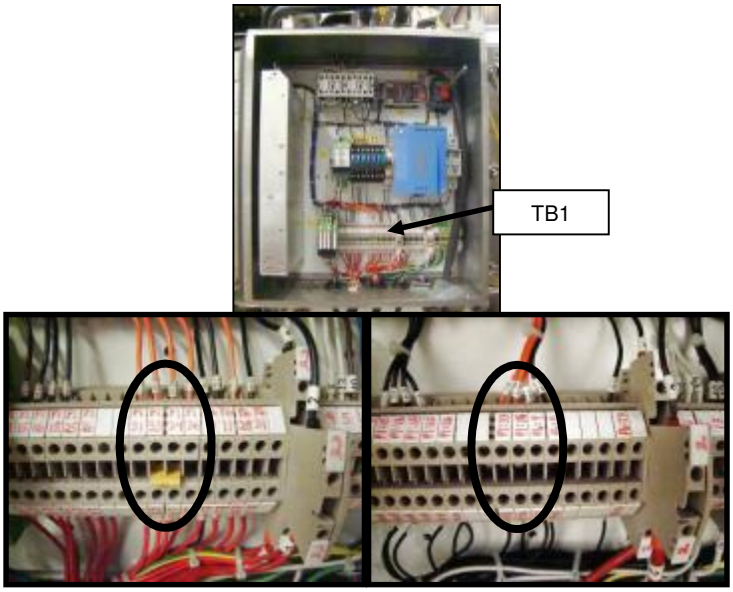


Fig. 4- Interlock Switch Jumper

Note: If wire P1:34 is not present, then no action is required.

4.0 TROUBLESHOOTING, cont'd

4.7 Mechanical Troubleshooting

Problem Description	Probable Cause	Recommended Action
Excessive ribbon drops	1. Excessive ribbon tension.	1a. Check that ribbon dispenser is working freely.
		1b. Check that ribbon on spool is not wrapped over itself, preventing ribbon from unspooling correctly.
		1c. Reduce ribbon tension by moving end of tension spring on adjustment rod.
	2. Trash going through tyer.	2. Clear trash and change the bagger setup to correct problem.
	3. Package recognition system not active.	3. Be sure that DIP switch 6, on AMP board, is set to the ON position (see Section 3.9).
	4. Bag neck is too short.	4. Increase bag length.
	5. Brushes at incorrect angle causing drag back of bag.	5. Correct brush angle (see Section 3.6.5).
	6. Poor bag tail presentation.	6. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Needle punches a hole through the bag neck.	1. Bag switch arm is set too low, allowing false indication of bag trailing edge.	1. Raise the end of the bag switch arm (see Section 3.6.11).
	2. Poor bag tail presentation.	2. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Bags drag back hard against the flight after being tied.	1. Brushes at improper angle, and not feeding bag neck into tyer correctly.	1. Adjust angle of brushes (see Section 3.6.5).
	2. Gathering belts running too slow.	2. Increase belt speed using push wheel switch on operator box.
Tyer aborts tie cycle of apparently good package	1. Ribbon dispense prox not properly adjusted.	1. Adjust prox closer to ribbon roller. Be sure that the prox can detect all of the steel dowels in the roller.
	2. Ribbon dispense prox not working.	2. Check wiring and power to prox. Replace if necessary. You may disable the Package Recognition system with DIP switch 6 on the AMP board (see Section 3.9).
	3. Ribbon has jumped out of the needle.	3. Open front cover and place ribbon into roller of needle.
	4. Ribbon has jumped out of ribbon roller above needle.	4. Place ribbon properly into ribbon roller.
	5. Poor bag tail presentation.	5. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.

4.0 TROUBLESHOOTING, cont'd

4.7 Mechanical troubleshooting, cont'd

Problem Description	Probable Cause	Recommended Action
Twist tie ribbon breaks during tying operation.	1. Excessive ribbon tension.	1. See Section 3.6.7 for proper tension adjustment.
	2. Poor quality ribbon.	2. Replace ribbon.
	3. Poor bag tail presentation.	3. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Ribbon wraps around twister hook shaft.	1. Twister hook shaft is too close to holder shear.	1. Move hook shaft to proper spacing.
	2. Poor bag tail presentation.	2. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Twist tie ribbon breaks during tying operation.	1. Excessive ribbon tension.	1. See Section 3.6.7 for proper tension adjustment.
	2. Poor quality ribbon.	2. Replace ribbon.
	3. Poor bag tail presentation.	3. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Excessive Belt Motor fuse failures on AMP board.	1. Excessive belt tension.	1. Check tension of all three belts driven by belt motor. Correct as necessary.
	2. Foreign material jammed in tyer.	2. Clear foreign material.
Ties are not centered on product.	1. Bag tucked into itself caused by excessive air jet blowing bag away from scoops on Mark 50 type bagger.	1. Reduce strength of air jet.
	2. Tyer is too high or too low from product.	2. Raise or lower tyer as necessary.
	3. Poor bag tail presentation.	3. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Two packages tied together with one ribbon.	1. Ribbon not dispensing properly, causing package recognition system to abort on first package.	1a. Check that ribbon is wound correctly on spool.
		1b. Check that ribbon dispenser is working smoothly.
	2. Package recognition system ribbon roller is not free to rotate.	2. Check roller and repair as necessary.
	3. Ribbon dispense proximity is not working.	3. Check proximity and connections. Repair as necessary.
	4. Poor bag tail presentation.	4. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.

4.0 TROUBLESHOOTING, cont'd

4.7 Mechanical troubleshooting, cont'd

Problem Description	Probable Cause	Recommended Action
Holes being formed in the bag.	1. Too much ribbon tension.	1. See Section 3.6.7.
	2. Too many twists.	2. See Section 3.9.
	3. Upper & lower covers have a. layer of residue built up on one or both.	3. Clean upper & lower covers with emery cloth to remove residue.
	4. Worn lower cover.	4. Replace cover.
	5. Belts tearing holes in bags.	5. Smooth sharp edges on belts
	6. Poor bag tail presentation.	6. Bag tail presentation from the exit of the bagger must be flat and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
Excessive wear on gathering belts.	1. Belts running at excessive speed.	1. Set belt speed to minimum required speed.
	2. Belts running for long periods with no bags going through tyer.	2. Turn off tyer when it is not in use.
	3. Belts teeth not aligned above each other.	3. Align teeth (see Section 3.6.6)

5.0 MAINTENANCE

Warning:	Do NOT use any form of high pressure cleaning systems on this unit.

5.1 Preventive Maintenance

Burford® Corp. recommends the following preventive maintenance schedule to insure proper performance of your Burford® Electronic Smart Tyer.

5.1.1 Daily

1. Clear bags from brush assembly.

5.1.2 Weekly

1. Check to insure cable connectors, located on the back of the tyer head, are tight.
2. Insure all ribbon rollers turn freely and the dancer arm releases ribbon in the proper position.
3. Insure all switches and lights function properly.

5.1.3 Monthly

1. Check all belts for wear and proper tension.
2. Check to insure belt guide moves freely.
3. Check bag switch arm for proper operation.
4. Lubricate gathering belt bearings.

5.1.4 Semi-Annual

1. Grease all bearings.
2. Check DIP switches for proper settings.

6.0 RECOMMENDED SPARE PARTS LIST

In order to prevent valuable down time, Burford® Corp. recommends the following parts be kept in stock.

Please have the following machine information on hand before calling Burford®.

- Machine Voltage
- Model Number
- Serial Number

RH Part #	LH Part #	QTY	DESCRIPTION
210724	210723	1	ASSEMBLY, NEEDLE, 2200/2300, LOW
210722	210721	1	ASSEMBLY, TWISTER HOOK, TYER
210620	210620	1	ASSEMBLY, ENCODER/MOTOR, 2200/2300
210612	210612	1	ASSEMBLY, ADVANCED HOLDER/SHEAR
611152	611152	1	GEARBELT, 710 MM X 9 MM, 5HTD
611153	611153	1	GEARBELT, 680 MM X 9 MM, 5HTD
611876	611876	1	POWER SUPPLY, 110/220-48 VDC 21A
611452	611452	1	GEARBELT, 295 MM X 15 MM, 5HTD
611453	611453	1	GEARBELT, DBL, 835 MM X 15 MM, 5HTD
611454	611454	1	GEARBELT, 405 MM X 15 MM, 5HTD
611455	611455	1	RELAY, CONTACTOR, 48V
611456	611456	1	GEARBELT, 925 MM X 9 MM, 5HTD, RED
611464	611464	1	BOARD, 2200/2300 AMPLIFIER
*712616	*712616	1	MOTOR, BRUSH ASSEMBLY, 110 VAC
*712615	*712615	1	MOTOR, BRUSH ASSEMBLY, 220 VAC
714076	714076	1	ARM, PRESSURE
C01410	C01410	1	BOARD, CPU, 2200/2300 SMART TYER VERSION 18
C07625	C07625	1	SENSOR, PROX, 8 MM, 10-30 VDC, NPN, NO, QC
C07678	C07678	1	SENSOR, INTERLOCK, CODED MAGNETIC SAFETY
C07679	C07679	1	SENSOR, INTERLOCK, ACTUATOR MAGNET
C07698-007	C07698-007	1	FUSE, 2AGSB, 7A, 125V, TIME DELAY

Contents

Drawings & Parts

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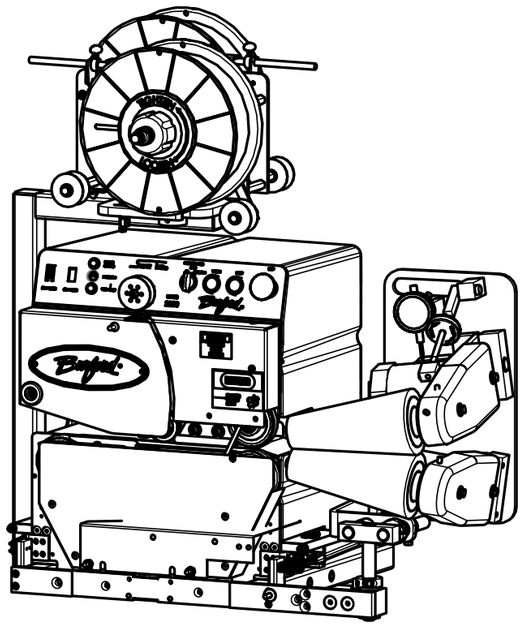
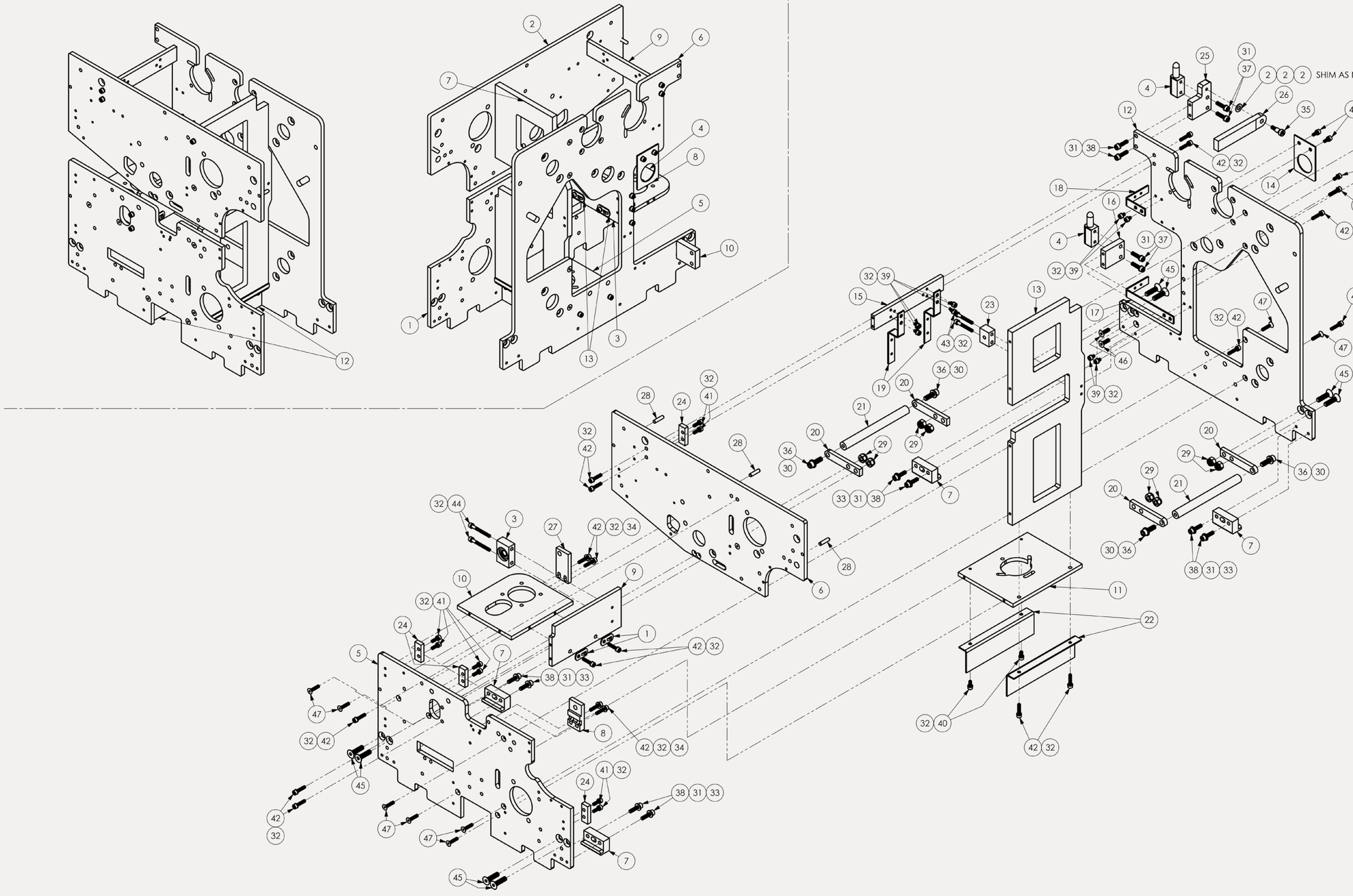


Smart Servo (2200M / 2300M)

2200M Frame Assembly
211102-01 RH Rev A
211101-01 LH Rev A

QTY.	ITEM #	PART#	DESCRIPTION
2	1	174248	MOUNT, CABLE
3	2	302021	BUSHING, MACH, ¼ X ½ X .010
1	3	302279	ASSY, SHUTTLE BLOCK
2	4	611306	HINGE, LIFT OFF (ZINC)
1	5	714000	PLATE, FRONT MAIN, SERVO
1	6	714001	PLATE, UPPER TYER, SERVO
4	7	714012	BLOCK, SLIDE
1	8	714013	PLATE,T/H,PROX MNT
1	9	714014	PLATE, HOL-SH MOUNT, TYER
1	10	714015	PLATE, TYER, H/S MOTOR MNT.
1	11	714017	PLATE, TWISTER HOOK MNT.
1	12	714025	PLATE, REAR MAIN, SERVO
1	13	714026	PLATE, INNER BRACE, SERVO
1	14	714036	PLATE, HORN MNT, SERVO
1	15	714040	PLATE, CROSS SUPPORT
1	16	714041	BLOCK, PIVOT
1	17	714043	BRACKET, HORIZ. PANDUIT SUPPORT
1	18	714044	BRACKET, TOP HORIZ. PANDUIT SUPPORT
2	19	714045	BRACKET, VERTICAL PANDUIT SUPPORT
4	20	714047	BAR, STANDOFF SUPPORT
2	21	714048	SHAFT, SERVO TYER HANDLE
2	22	714049	BRACKET, TWISTER HOOK DRIVE COVER
1	23	714053	BLOCK, IDLER MNT.
4	24	714063	BLOCK, LOWER COVER SUPPORT
1	25	714064	BLOCK, PIVOT STOP SUPPORT
1	26	714065	BAR, PIVOT STOP
1	27	714151	PLATE, H/S PROX. MNT.
3	28	954712	PIN DOWEL, 3/16 DIA X 3/4 SST
8	29	955661	NUT HEX NYLOC 1/4-20 UNC SST
4	30	955940	WASHER LOCK 1/4" SST
14	31	955941	WASHER LOCK #10 SST
44	32	955942	WASHER LOCK #8 SST
8	33	955978	WASHER FLAT #10 SST
4	34	955979	WASHER FLAT #8 SST
1	35	974906	SCREW SHLDR 1/4 X 3/8, #10-24 SST
4	36	978312	SCREW SOC HD CAP 1/4-20 X 3/4 SST
4	37	978812	SCREW SOC HD CAP #10-32 UNF X 3/4 SST
10	38	978912	SCREW SOC HD CAP #10-24 UNC X 3/4 SST
8	39	979504	SCREW SOC HD CAP #8-32 UNC X 1/4 SST
5	40	979506	SCREW SOC HD CAP #8-32 UNC X 3/8 SST
8	41	979508	SCREW SOC HD CAP #8-32 UNC X 1/2 SST
19	42	979512	SCREW SOC HD CAP #8-32 UNC X 3/4 SST
2	43	979520	SCREW SOC HD CAP #8-32 UNC X 1 1/4 SST
2	44	979524	SCREW SOC HD CAP #8-32 UNC X 1 1/2 SST
8	45	981716	SCREW FLT HD SOC 1/4-20 X 1 SST
2	46	982310	SCREW FLT HD SOC #10-24 X 5/8 SST
11	47	982912	SCREW FLT HD SOC #8-32 X 3/4 SST

FRAME ASSEMBLY 2200M (211102-01)



Right Hand Shown

Frame Assembly 2200M
Drawing 211102-01 Rev A

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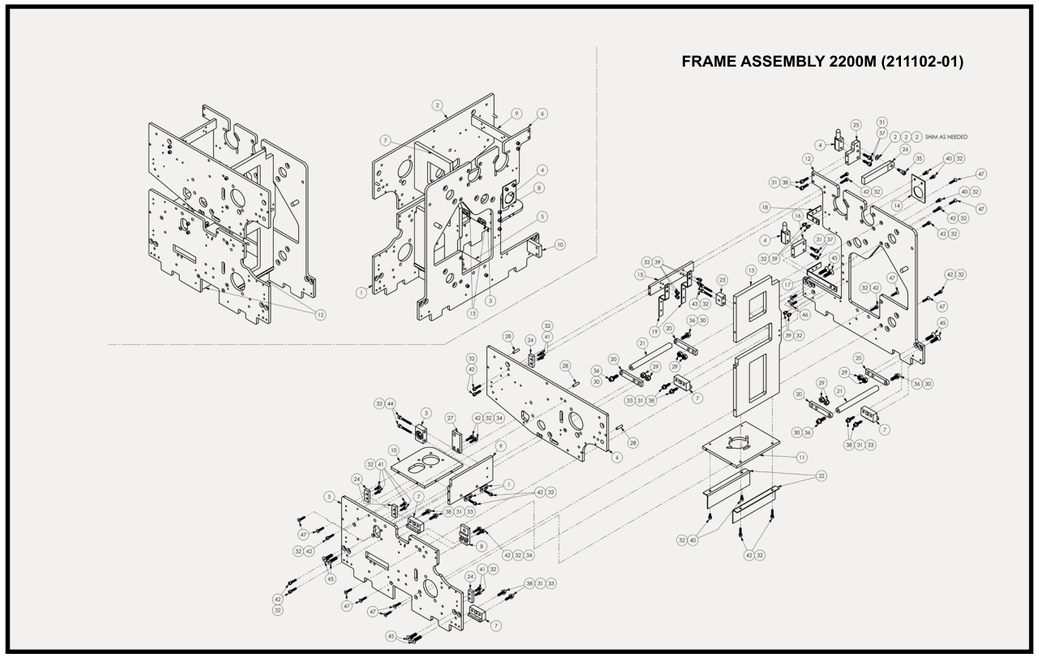


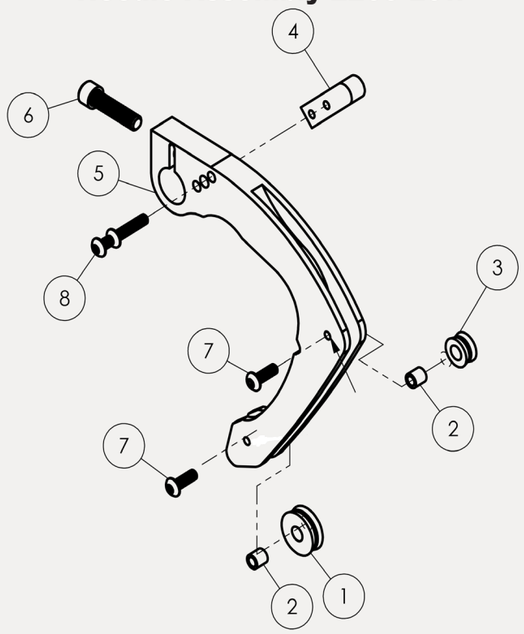
Shaft Bearing Assembly
211102-02 Rev A RH
211101-02 Rev A LH

QTY.	ITEM #	PART#	DESCRIPTION
1	1	210724	ASSY, NEEDLE, 2200,LOW (RIGHT HAND)
		210723	ASSY, NEEDLE, 2300,LOW (LEFT HAND)
6	2	611238	BEARING, 5/8, 2 BOLT FLANGE, SST
1	3	714006	SHAFT, NEEDLE, SERVO
2	4	714020	SPACER, .56 OD x .257 ID x .5 L
2	5	714037	SHAFT, MAIN DRIVE, SERVO
12	6	955661	NUT HEX NYLOC 1/4-20 UNC SST
6	7	981716	SCREW FLT HD SOC 1/4-20 X 1 SST
1	8	981724	SCREW FLT HD SOC 1/4-20 X 1 1/2 SST
4	9	989916	SCREW FIN HEX 1/4-20 X 1 SST
1	10	989924	SCREW FIN HEX 1/4-20 X 1 1/2 SST
1	11	C07625	SENSOR,PROX,8MM,10-30VDC,NPN,NO,QC

Frame Assembly 2200M

Drawing 211102-02 Rev A

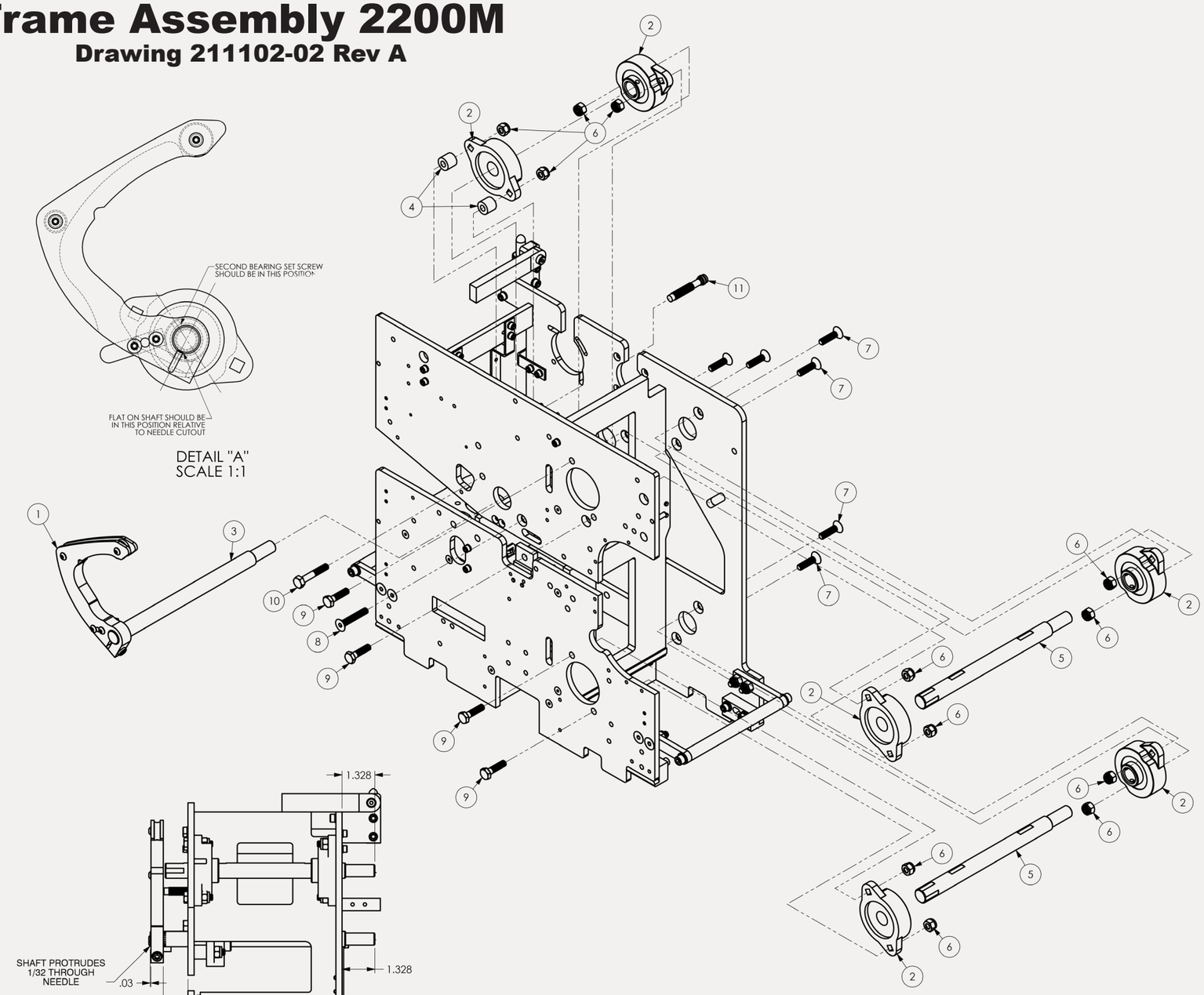
Needle Assembly 2200 Low

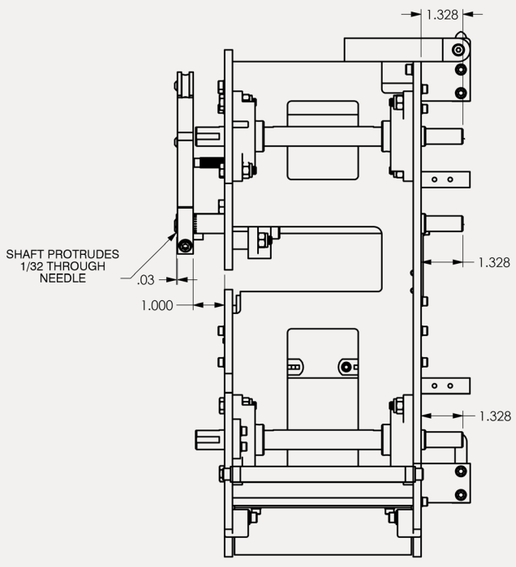


Right Hand Shown

QTY.	ITEM #	PART#	DESCRIPTION
2	8	986912	SCREW BUTT HD SOC #8-32 X 3/4 SST
2	7	986908	SCREW BUTT HD SOC #8-32 X 1/2 SST
1	6	978316	SCREW SOC HD CAP 1/4-20 X 1 SST
1	5	715509	NEEDLE, MACHINE, 2200/2300, LOW
1	4	714083	BAR, BAG STOP ACTUATOR
1	3	302065	RIBBON ROLLER
2	2	152125	BUSH, SST, .166 ID X 1/4 OD X 1/4 L
1	1	152124	ROLLER, NYLON

DETAIL "A"
SCALE 1:1





Right Hand Shown

Shaft Bearing Assembly 2200M
Drawing 211102-02 Rev A

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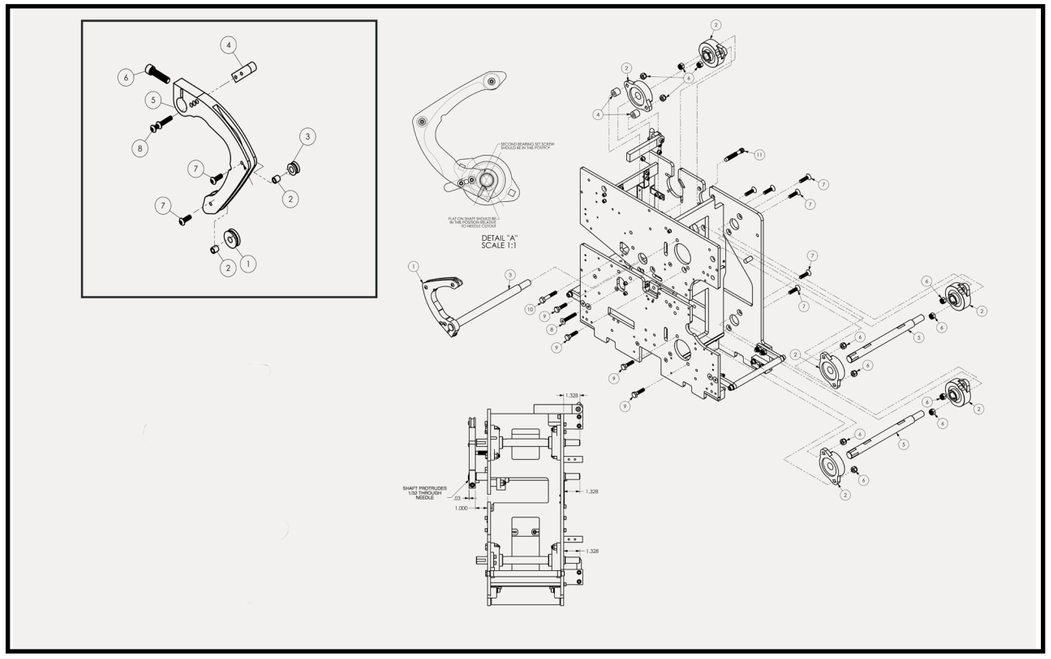
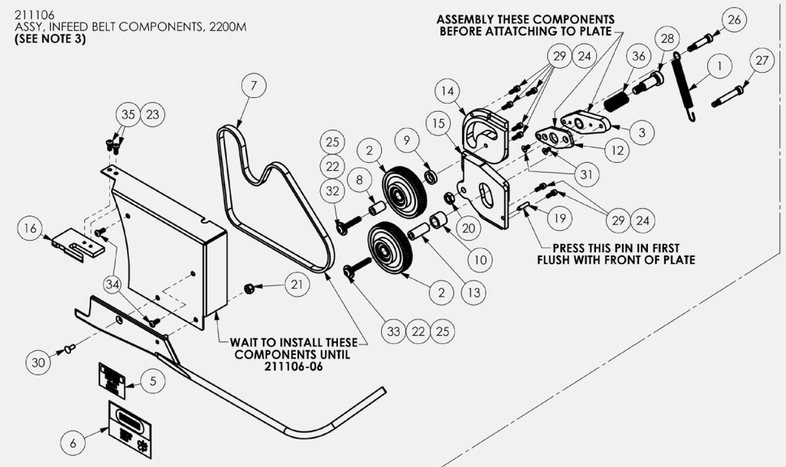
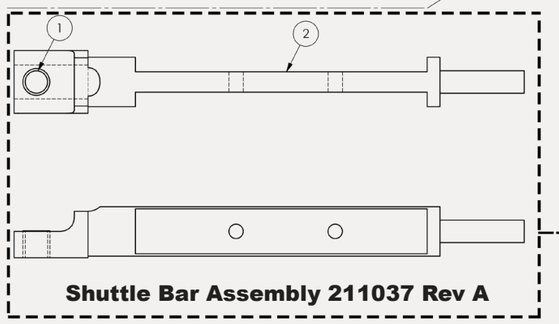


Front Lower Plate Assembly
211102-03 RH Rev A
211101-03 LH Rev A

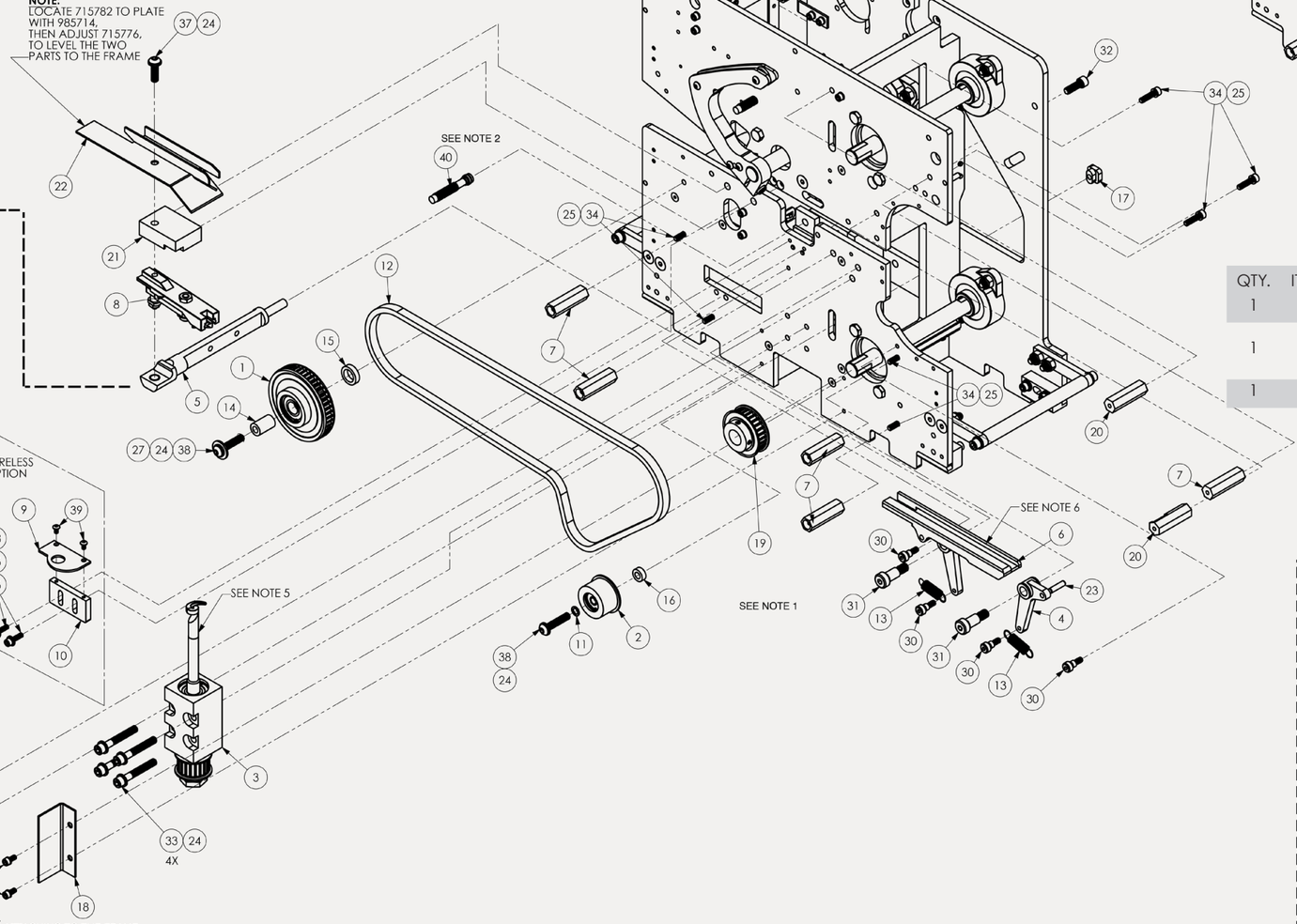
QTY.	ITEM #	PART#	DESCRIPTION
1	1	210607	ASSY., MAIN IDLER
1	2	210609	ASSY, BACKSIDE IDLER
1	3	210722	ASSY, TWISTER HOOK, 2200, LOW (RIGHT HAND)
		210721	ASSY, TWISTER HOOK, 2300, LOW (LEFT HAND)
1	4	211036	ASSY, LOWER GUIDE ARM
1	5	211037	ASSY, SHUTTLE BAR, LOW
1	6	211038	ASSY, LOWER GUIDE/ARM (RIGHT HAND)
		211039	ASSY, LOWER GUIDE/ARM (LEFT HAND)
5	7	302096	STANDOFF, FRONT
1	8	302526	ASSY, ADVANCED HOLDER/SHEAR
REF	9	303190	BRACKET,RIBBON DEFLECTION
REF	10	303191	BLOCK, RIBBON DEFLECTION
1	11	401351	BUSH MACH 3/8OD X 1/4ID X .031
1	12	611456	BELT, LOWER RED
2	13	611514	SPRING, EXTENSION, .375 OD X .026 MW X 1.75
1	14	714002	SHAFT, IDLER MOUNT
1	15	714003	SPACER, .75 OD X .515 ID X .195 L
1	16	714004	SPACER, .5 OD X .266ID X .195 L
1	17	714034	NUT, PULLEY ADJUSTMENT
2	18	714050	BRACKET, INSIDE TWISTER HOOK DRIVE COVER
1	19	714149	RWK, PULLEY, 5MM X 9MM X 28T, 2 FLANGES
2	20	715771	STANDOFF, FRONT, LOW
1	21	715776	H/S MOUNT, 2200 LOW (RIGHT HAND)
		715777	H/S MOUNT, 2300 LOW (LEFT HAND)
1	22	715782	A/W, RIBBON GUIDE (RIGHT HAND)
		715783	A/W, RIBBON GUIDE (LEFT HAND)
1	23	954712	PIN DOWEL, 3/16 DIA X 3/4 SST
9	24	955940	WASHER LOCK 1/4" SST
8	25	955941	WASHER LOCK #10 SST
4	26	955942	WASHER LOCK #8 SST
1	27	955977	WASHER FLAT 1/4" SST
REF.	28	955979	WASHER FLAT #8 SST
2	29	971804	SCREW SET SOC #10-24 UNC X 1/4 SST
4	30	974904	SCREW SHLDR 1/4 X 1/4, #10-24 SST
2	31	975110	SCREW, SHLDR 5/16 X 1 1/2, 1/4-20
3	32	978312	SCREW SOC HD CAP 1/4-20 X 3/4 SST
4	33	978328	SCREW SOC HD CAP 1/4-20 X 1 3/4 SST
7	34	978912	SCREW SOC HD CAP #10-24 UNC X 3/4 SST
4	35	979506	SCREW SOC HD CAP #8-32 UNC X 3/8 SST
REF.	36	979510	SCREW SOC HD CAP #8-32 X 5/8 SST
1	37	985714	SCREW BUTT HD SOC 1/4-20 X 7/8 SST
2	38	985720	SCREW BUTT HD SOC 1/4-20 X 1 1/4 SST
REF	39	987504	SCREW BUTT HD SOC #6-32 X 1/4 SST
1	40	C07625	SENSOR,PROX,8MM,10-30VDC,NPN,NO,QC

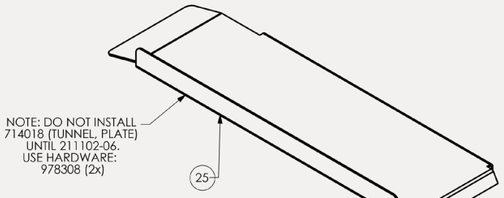
FRONT LOWER PLATE ASSEMBLY
211102-03 REV A

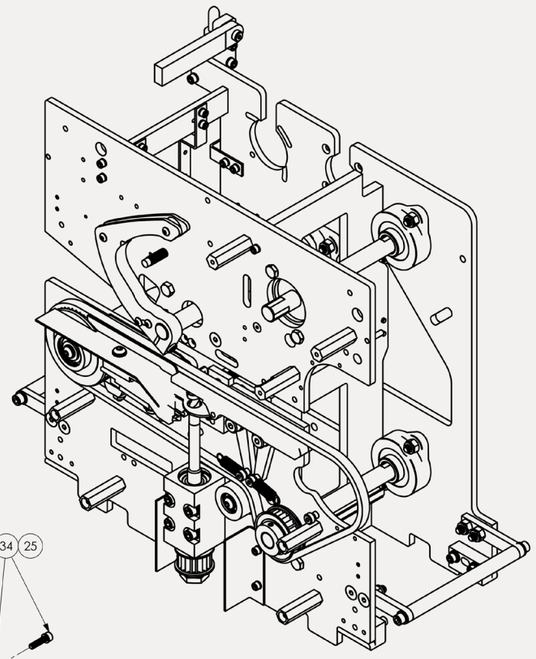




QTY.	ITEM #	PART#	DESCRIPTION
1	1	302146	OIL FILLED BUSHING
1	2	715788	SHUTTLE BAR

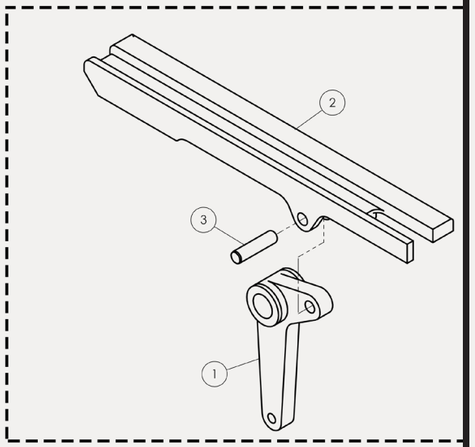






QTY.	ITEM #	PART#	DESCRIPTION
1	1	211036	ASSY, LOWER GUIDE ARM
1	2	715792	GUIDE, LOWER BELT (RIGHT HAND)
		715793	GUIDE, LOWER BELT (LEFT HAND)
1	3	954712	PIN DOWEL, 3/16 DIA X 3/4 SST

Lower Guide Assembly
211038 Rev A RH
211039 Rev A LH



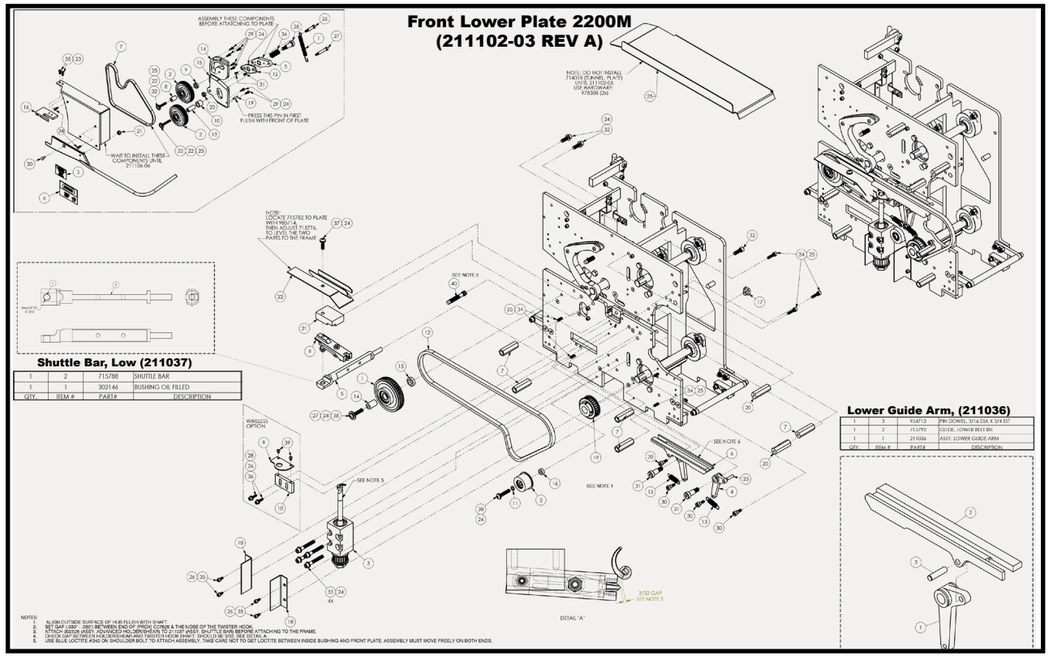
NOTES:
1. ALIGN OUTSIDE SURFACE OF HUB FLUSH WITH SHAFT.
2. SET GAP (.030" - .050") BETWEEN END OF (PROX) C07625 & THE NOSE OF THE TWISTER HOOK.
3. ATTACH 302526 (ASSY, ADVANCED HOLDER/SHEAR) TO 211037 (ASSY, SHUTTLE BAR) BEFORE ATTACHING TO THE FRAME.
4. CHECK GAP BETWEEN HOLDER/SHEAR AND TWISTER HOOK SHAFT. SHOULD BE 3/32. SEE DETAIL A.
5. USE BLUE LOCTITE #242 ON SHOULDER BOLT TO ATTACH ASSEMBLY. TAKE CARE NOT TO GET LOCTITE BETWEEN INSIDE BUSHING AND FRONT PLATE. ASSEMBLY MUST MOVE FREELY ON BOTH ENDS.

Right Hand Shown

Shaft Bearing Assembly 2200M /2300M

Drawing 211102-03 Rev A

FOLD OUT TO VIEW DRAWING

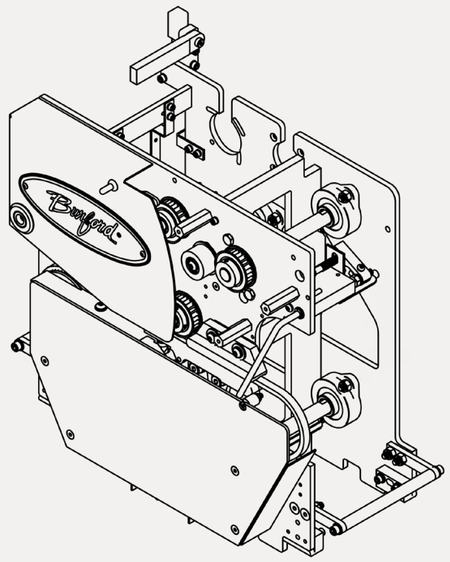


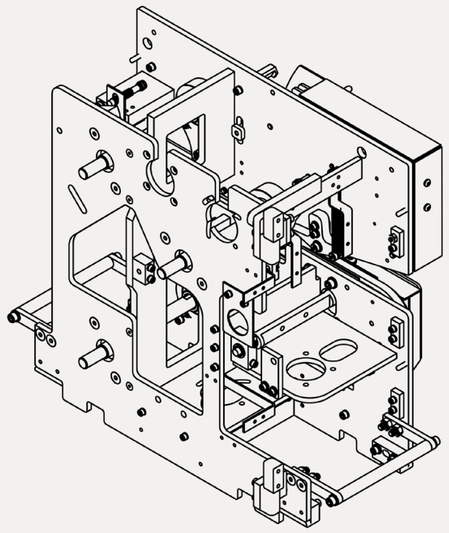
Front Upper Plate Assembly
211102-04 Rev D RH
211101-04 Rev D LH

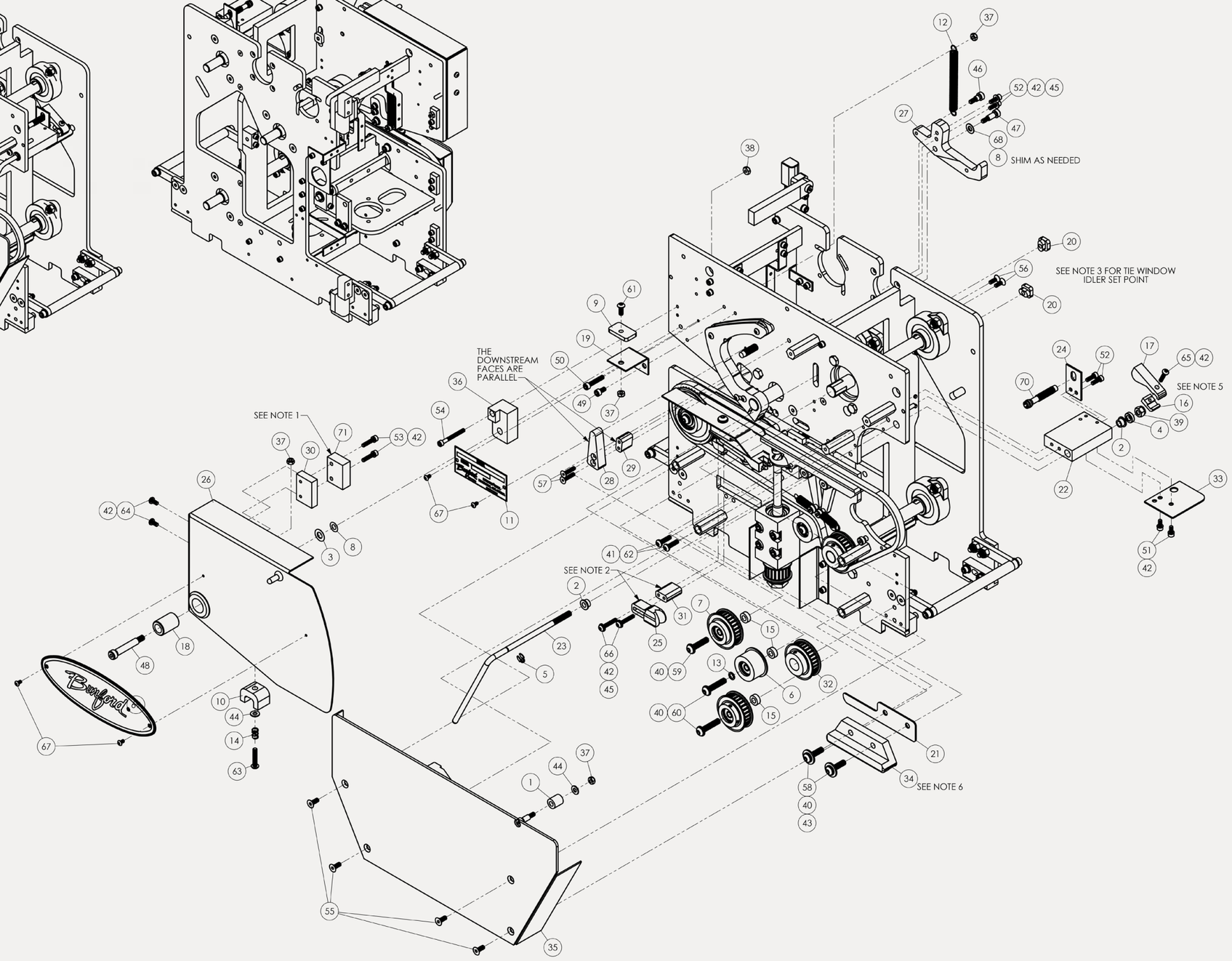
QTY.	ITEM #	PART#	DESCRIPTION
.05'	1	103878	HOSE, AIR 1/4" DIA NEOPRENE
2	2	110479	BUSH,BRZ,FLG,1/4ID 3/8OD X1/4L
1	3	113646	WASHER BELLEVILLE SPRING
1	4	115168	SPACER, IDLER
1	5	174024	RETAINING RING,EXT.,E-STYLE,1/4
1	6	210609	ASSY, BACKSIDE IDLER
2	7	210610	ASSY, WINDOW TIE IDLER
2	8	302022	BUSHING, MACH, 1/4 X 1/2 X .005
1	9	302111	MAGNET RECEIVER
1	10	302116	MAGNET HORSHOE
1	11	302299	PLATE SERIAL,SERVO TYER
1	12	302874	SPRING-EXTENSION 3/8 OD 2" L .031
2	13	401351	BUSH MACH 3/8OD X 1/4ID X .031
1	14	610469	SPRING, COMP, .30 OD x .44L x .02WD
3	15	714004	SPACER, .5 OD X .266ID X .195 L
1	16	714023	ARM, BAG TAIL SWITCH LOWER, SERVO
1	17	714024	ARM, TOP BAG TAIL SWITCH, SERVO
1	18	714029	SLEEVE, UPPER TYER DOOR PIVOT
1	19	714030	BRACKET, MAGNET MNT.
2	20	714034	NUT, PULLEY ADJUSTMENT
1	21	714051	PLATE, PULLEY GUARD
1	22	714056	BLOCK, BAG SWITCH SUPPORT
1	23	714057	ROD, BAG TAIL SWITCH
1	24	714058	PLATE, BAG SWITCH PROX.
1	25	714060	GUIDE, RIBBON SUPPORT
1	26	714068	A/W, UPPER DOOR, 2200 TYER (RIGHT HAND)
		714118	A/W, UPPER DOOR, 2300 TYER (LEFT HAND)
1	27	714095	ARM, BAG STOP
1	28	714096	BLOCK, BAG STOP ACTUATOR
1	29	714097	BLOCK, BAG STOP SUPPORT
1	30	714100	BLOCK, INTERLOCK MAGNET MNT.
1	31	714103	BLOCK, RIBBON GUIDE SUPPORT
1	32	714149	RWK, PULLEY, 5MM X 9MM X 28T, 2 FLANGES
1	33	714183	PLATE, TRIGGER GUARD
1	34	715778	BLOCK, UPPER BELT GUIDE
1	35	716214	A/W, LOWER GUARD FLUSH, 2200M
		716213	A/W, LOWER GUARD FLUSH, 2300M
1	36	716234	BLOCK, SPACER DOOR STOP 2200M
		716235	BLOCK, SPACER DOOR STOP 2300M
4	37	955621	NUT HEX NYLOC #10-24 UNC SST
1	38	955625	NUT HEX NYLOC #8-32 UNC SST
1	39	955661	NUT HEX NYLOC 1/4-20 UNC SST

QTY	ITEM#	PART#	DESCRIPTION
5	40	955940	WASHER LOCK 1/4" SST
2	41	955941	WASHER LOCK #10 SST
11	42	955942	WASHER LOCK #8 SST
2	43	955977	WASHER FLAT 1/4" SST
2	44	955978	WASHER FLAT #10 SST
4	45	955979	WASHER FLAT #8 SST
1	46	974904	SCREW SHLDR 1/4 X 1/4, #10-24 SST
1	47	974908	SCREW SHLDR 1/4 X 1/2, #10-24 SST
1	48	975024	SCREW, SHLDR 5/16 X 1 1/2, 1/4-20
1	49	978906	SCREW SOC HD CAP #10-24 X 3/8 SST
1	50	978916	SCREW SOC HD CAP #10-24 X 1" SST
2	51	979506	SCREW SOC HD CAP #8-32 UNC X 3/8 SST
4	52	979508	SCREW SOC HD CAP #8-32 UNC X 1/2 SST
2	53	979512	SCREW SOC HD CAP #8-32 UNC X 3/4 SST
1	54	979524	SCREW SOC HD CAP #8-32 UNC X 1 1/2 SST
4	55	982308	SCREW FLT HD SOC #10-24 X 1/2 SST
2	56	982908	SCREW FLT HD SOC #8-32 X 1/2 SST
2	57	982912	SCREW FLT HD SOC #8-32 X 3/4 SST
2	58	985716	SCREW BUTT HD SOC 1/4-20 X 1 SST
1	59	985718	SCREW BUTT HD SOC 1/4-20 X 1 1/8 SST
2	60	985720	SCREW BUTT HD SOC 1/4-20 X 1 1/4 SST
1	61	986208	SCREW BUTT HD SOC #10-32 X 1/2 SST
2	62	986312	SCREW BUTT HD SOC #10-24 X 3/4 SST
1	63	986316	SCREW BUTT HD SOC #10-24 X 1 SST
2	64	986906	SCREW BUTT HD SOC #8-32 X 3/8 SST
1	65	986912	SCREW BUTT HD SOC #8-32 X 3/4 SST
2	66	986916	SCREW BUTT HD SOC #8-32 X 1" SST
4	67	987504	SCREW BUTT HD SOC #6-32 X 1/4 SST
1	68	A02390	BUSH, MACH, 1/4 ID X 1/2 OD X .018
1	69	A08049	NAMEPLATE,BURFORD LOGO,LARGE
1	70	C07625	SENSOR,PROX,8MM,10-30VDC,NPN,NO,QC
REF	71	C07679	SENSOR,INTERLOCK,ACTUATOR MAGNET

Front Upper Plate 2200M
(211102-04 REV D)





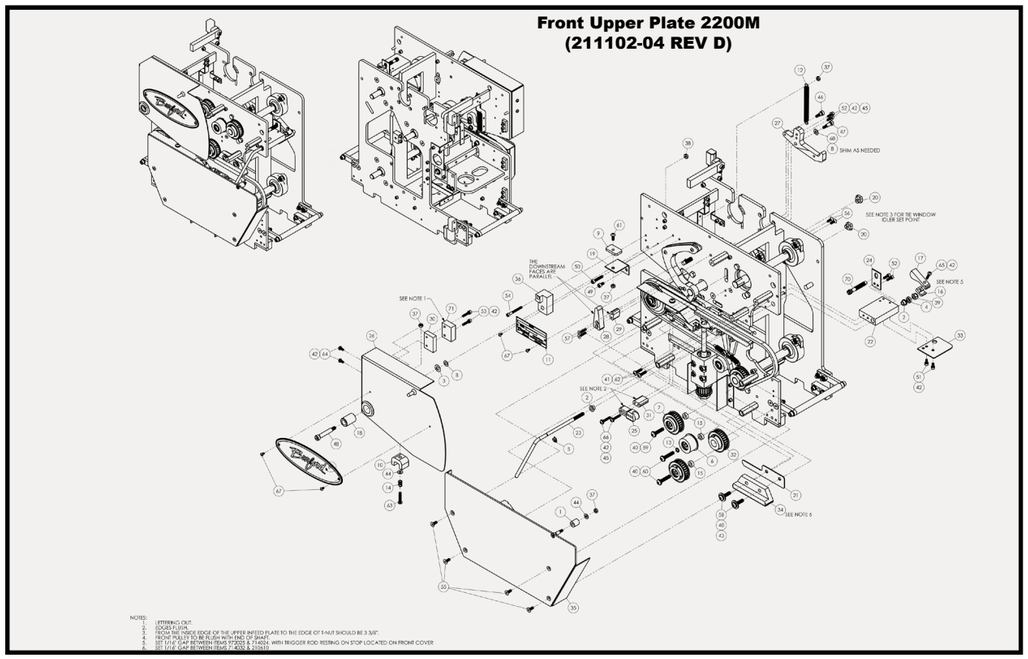


NOTES:
1. LETTERING OUT.
2. EDGES FLUSH.
3. FROM THE INSIDE EDGE OF THE UPPER INFEED PLATE TO THE EDGE OT T-NUT SHOULD BE 3 3/8".
4. FRONT PULLEY TO BE FLUSH WITH END OF SHAFT.
5. SET 1/16" GAP BETWEEN ITEMS 972025 & 714024. WITH TRIGGER ROD RESTING ON STOP LOCATED ON FRONT COVER
6. SET 1/16" GAP BETWEEN ITEMS 714032 & 210610

Right Hand Shown

Front Upper Plate 2200M
Drawing 211102-04 Rev D

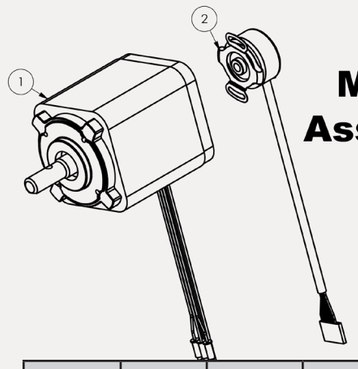
FOLD OUT TO VIEW DRAWING



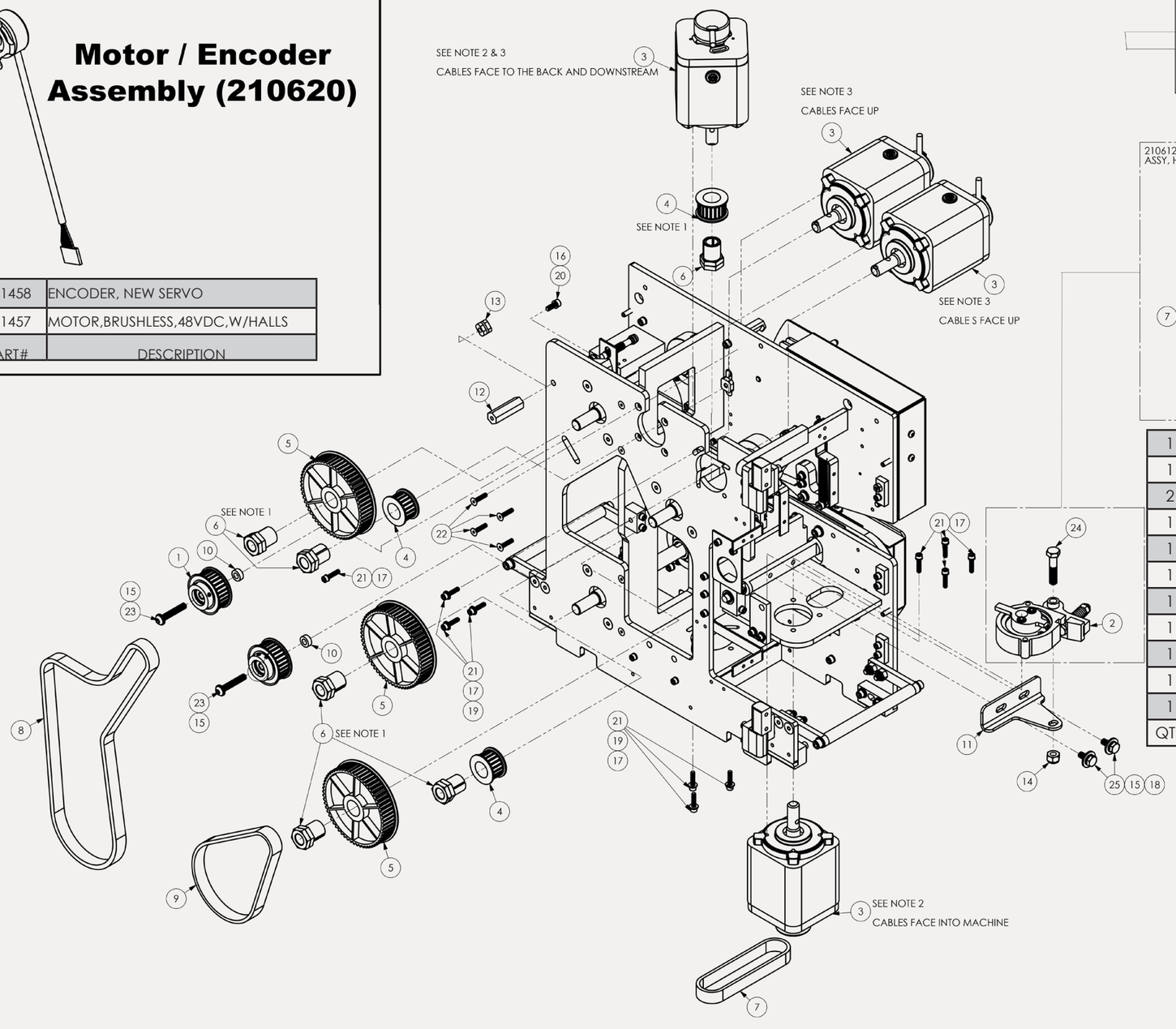
Drive Components Assembly
211102-05 Rev A RH
211101-05 REV A LH

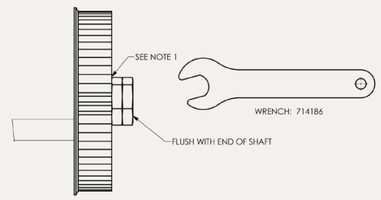
QTY	ITEM #	PART#	DESCRIPTION
2	1	210611	ASSY., REAR MAIN BELT
1	2	210612	KIT, HOLDER - SHEAR CAM
4	3	210620	ASSY, ENCODER / MOTOR, 2200/2300
3	4	611449	PULLEY, SHAFTLOC, 20T X 15MM X 5HTD
3	5	611450	PULLEY, 60T X .75 ID, SHAFTLOC
6	6	611451	SHAFTLOC, SINGLE
1	7	611452	BELT, TWISTER HOOK
1	8	611453	BELT, REAR DRIVE
1	9	611454	BELT, TWISTER HOOK
2	10	714004	SPACER, .5 OD X .266ID X .195 L
1	11	714007	BRACKET, HOL-SHEAR SHUTTLE, 2200M
		714126	BRACKET, HOL-SHEAR SHUTTLE, 2300M
1	12	714011	STANDOFF, PIVOT PLATE
1	13	714034	NUT, PULLEY ADJUSTMENT
1	14	955619	NUT HEX NYLOC 5/16-18 UNC SST
4	15	955940	WASHER LOCK 1/4" SST
1	16	955941	WASHER LOCK #10 SST
12	17	955942	WASHER LOCK #8 SST
2	18	955977	WASHER FLAT 1/4" SST
6	19	955979	WASHER FLAT #8 SST
1	20	978808	SCREW SOC HD CAP #10-32 UNF X 1/2 SST
12	21	979512	SCREW SOC HD CAP #8-32 UNC X 3/4 SST
4	22	982912	SCREW FLT HD SOC #8-32 X 3/4 SST
2	23	985724	SCREW BUTT HD SOC 1/4-20 X 1 1/2 SST
1	24	989724	SCREW FIN HEX 5/16-18 X 1 1/2 SST
2	25	989910	SCREW FIN HEX 1/4-20 X 5/8" SST

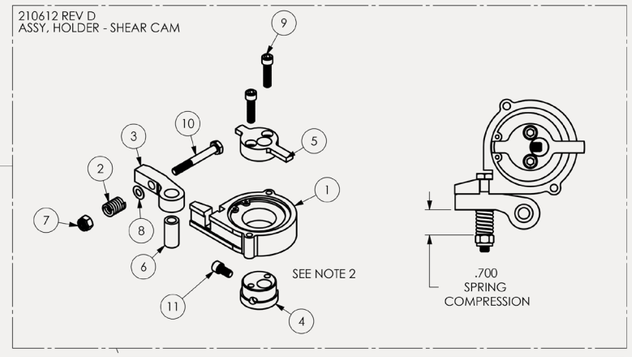
Motor / Encoder Assembly (210620)



QTY.	ITEM #	PART#	DESCRIPTION
1	2	611458	ENCODER, NEW SERVO
1	1	611457	MOTOR,BRUSHLESS,48VDC,W/HALLS







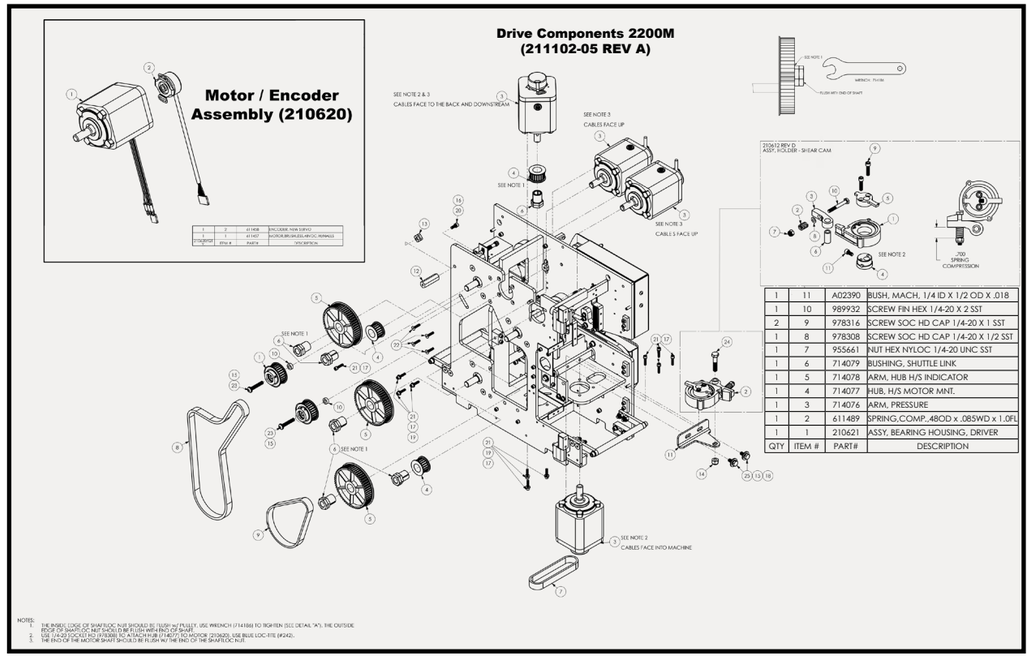
QTY	ITEM #	PART#	DESCRIPTION
1	11	A02390	BUSH, MACH, 1/4 ID X 1/2 OD X .018
1	10	989932	SCREW FIN HEX 1/4-20 X 2 SST
2	9	978316	SCREW SOC HD CAP 1/4-20 X 1 SST
1	8	978308	SCREW SOC HD CAP 1/4-20 X 1/2 SST
1	7	955661	NUT HEX NYLOC 1/4-20 UNC SST
1	6	714079	BUSHING, SHUTTLE LINK
1	5	714078	ARM, HUB H/S INDICATOR
1	4	714077	HUB, H/S MOTOR MNT.
1	3	714076	ARM, PRESSURE
1	2	611489	SPRING,COMP.,48OD x .085WD x 1.0FL
1	1	210621	ASSY, BEARING HOUSING, DRIVER

NOTES:
1. THE INSIDE EDGE OF SHAFTLOC NUT SHOULD BE FLUSH w/ PULLEY, USE WRENCH (714186) TO TIGHTEN (SEE DETAIL "A"). THE OUTSIDE EDGE OF SHAFTLOC NUT SHOULD BE FLUSH WITH END OF SHAFT.
2. USE 1/4-20 SOCKET HD (978308) TO ATTACH HUB (714077) TO MOTOR (210620). USE BLUE LOC-TITE (#242).
3. THE END OF THE MOTOR SHAFT SHOULD BE FLUSH W/ THE END OF THE SHAFTLOC NUT.

Right Hand Shown

Drive Components 2200M
Drawing 211102-05 Rev A

FOLD OUT TO VIEW DRAWING



QTY	ITEM #	PART#	DESCRIPTION
1	11	A02390	BUSH, MACH, 1/4 ID X 1/2 OD X .018
1	10	989932	SCREW FIN HEX 1/4-20 X 2 SST
2	9	978316	SCREW SOC HD CAP 1/4-20 X 1 SST
1	8	978308	SCREW SOC HD CAP 1/4-20 X 1/2 SST
1	7	955661	NUT HEX NYLOC 1/4-20 UNC SST
1	6	714079	BUSHING, SHUTTLE LINK
1	5	714078	ARM, HUB H/S INDICATOR
1	4	714077	HUB, H/S MOTOR MNT.
1	3	714076	ARM, PRESSURE
1	2	611489	SPRING,COMP..480D x .085WD x 1.0FL
1	1	210621	ASSY, BEARING HOUSING, DRIVER

Electrical Components Assembly
211102-06 Rev C
211101-06 Rev C

QTY.	ITEM #	PART#	DESCRIPTION
1	1	112643	SERIAL PLATE
2	2	122222	BUSHING 1/2X3/4X.074 MACH
1	3	210616	ASSY, BOARD MNT, 2200 ENCLOSURE RH
		210615	ASSY, BOARD MNT, 2300 ENCLOSURE LH
1	4	210618	ASSY, OPERATOR CONTROLS, 2200 RH
		210619	ASSY, OPERATOR CONTROLS, 2300 LH
1	5	210625	ASSY, CONNECTOR PLATE
1	6	302021	BUSHING, MACH, ¼ X ½ X .010
1	7	302166	ASSY, RIBBON ROLLER RH
		302167	ASSY, RIBBON ROLLER LH
4"	8	610360	TERMINAL, DIN RAIL, MINI
16	9	610361	TERMINAL, BLOCK, MINI
1	10	610362	TERMINAL,END COVER,MINI
2	11	610363	TERMINAL,ANCHOR,END CLAMP,MINI
3	12	610532	TERMINAL,JUMPER,2 POLE, MINI
1	13	611447	COVER, SERVO MAIN
2	14	611478	CONNCTOR,WEIDMULLER,36 POSITON
1	15	611481	CONNECTOR,3 POSITION FEMALE
19.25"	16	611485	PANDUIT, 2.25W X 1.12H
19.25"	17	611486	PANDUIT, COVER, 2.25W X 1.12H
REF.	18	714018	BRACKET,BAG TAIL TUNNEL,2200
1	19	714046	BRACKET, BOTTOM HORIZ. PANDUIT SUPPORT
1	20	714061	BRACKET, LOWER BACK GUARD
2	21	714062	BLOCK, UPPER COVER STOP
1	22	714098	BLOCK, RIBBON ROLLER/PROX. MNT.
4	23	955624	NUT HEX NYLOC #6-32 UNC SST
9	24	955940	WASHER LOCK 1/4" SST

QTY.	ITEM #	PART#	DESCRIPTION
2	25	955941	WASHER LOCK #10 SST
16	26	955942	WASHER LOCK #8 SST
4	27	955972	WASHER FLAT #6 SST
4	28	955977	WASHER FLAT 1/4" SST
2	29	955978	WASHER FLAT #10 SST
10	30	955979	WASHER FLAT #8 SST
1	31	974914	SCREW, SHLDR 5/16 X 1 1/2, 1/4-20
1	32	978306	SCREW SOC HD CAP 1/4-20 X 3/8 SST
2	33	978308	SCREW SOC HD CAP 1/4-20 X 1/2 SST
2	34	978310	SCREW, SOC HD CAP 1/4-20 X 5/8 SST
2	35	978908	SCREW SOC HD CAP #10-24 UNC X 1/2 SST
2	36	979506	SCREW SOC HD CAP #8-32 UNC X 3/8 SST
2	37	979508	SCREW SOC HD CAP #8-32 UNC X 1/2 SST
2	38	979516	SCREW SOC HD CAP #8-32 UNC X 1 SST
4	39	985708	SCREW BUTT HD SOC 1/4-20 X 1/2 SST
12	40	986904	SCREW BUTT HD SOC #8-32 X 1/4 SST
2	41	987506	SCREW BUTT HD SOC #6-32 X 3/8 SST
2	42	987508	SCREW BUTT HD SOC #6-32 X 1/2 SST
2	43	989912	SCREW FIN HEX 1/4-20 X 3/4" SST
1	44	A02349	SENSOR,CABLE,M8,3WIRE,F,QC,STR.
1	45	A02390	BUSH, MACH, 1/4 ID X 1/2 OD X .018
1	46	A08049	NAMEPLATE,BURFORD LOGO,LARGE
1	47	C07214	ALARM, SONALERT, 6 TO 28VDC
2	48	C07625	SENSOR,PROX,8MM,10-30VDC,NPN,NO,QC
4	49	C07626	SENSOR,CABLE,M8,3WIRE,F,QC,90
1	50	C07678	SENSOR,INTLK,CODED MAGNETIC SAFETY

9	24	955936	WASHER LOCK #6 SST
*8	23	C07698-007	FUSE,2AGSB,7A,125V,SLO-BLO
REF.	22	C01410	BOARD,CPU,SERVO TYER
4	21	978806	SCREW SOC HD CAP #10-32 UNF X 3/8 SST
11	20	978308	SCREW SOC HD CAP 1/4-20 X 1/2 SST
9	19	976908	SCREW SOC HD CAP #6-32 X 1/2 SST
9	18	976906	SCREW SOC HD CAP #6-32 X 3/8 SST
3	17	955977	WASHER FLAT 1/4" SST
9	16	955972	WASHER FLAT #6 SST
4	15	955941	WASHER LOCK #10 SST
11	14	955940	WASHER LOCK 1/4" SST
1	13	714169	RWK,KNOB,PLASTIC,THREADED 10-32 NF
1	12	714090	SHAFT, PANEL STOP, SERVO
4	11	714089	STANDOFF, MAIN COVER
3	10	714088	STANDOFF,INNER COVER
1	9	714087	PLATE, BOARD MNT/PIVOT
*1	8	611515	JUMPER,SHUNT,SOLDER CONT
4	7	611506	STANDOFF,#6-32 X 3/4 ,ALUM,HEX M x F
1	6	611464	BOARD, 2200 AMPLIFIER
1	5	611448	COVER, SERVO BOARD
REF.	4	611306	HINGE, LIFT OFF (ZINC)
*1	3	175081-001	CABLE,ASSY,DIP TYPE TIP2 (NEW)
5	2	174819	STANDOFF,#6-32 X 3/4,ALUM,HEX
4	1	174069	STANDOFF,#6-32 X 1/2,ALUM,HEX
QTY.	ITEM #	PART#	DESCRIPTION

See Pg. 16

ASSEMBLE 714090 FIRST

210616 REF. B.O.M ONLY
* ITEMS NOT SHOWN

210616 REV B
ASSY, BOARD MNT,2200 ENCLOSURE

2	15	981712	SCREW FLT HD SOC 1/4-20 X 3/4 SST
12	14	976004	SCREW SOC HD CAP #4-40 X 1/4 SST
3	13	955971	WASHER FLAT #4 SST
12	12	955935	WASHER LOCK #4 SST
2	11	714039	STANDOFF, DISCONNECT PLATE
1	10	714009	PLATE, CONNECTOR MNT., 5 CONN.
1*	9	611503	SENSOR,CAP,SHELL 18
1*	8	611502	SENSOR,CAP,SHELL 14
1	7	611494	SENSOR,BULKHD,M8,M8-0.5,3WR,F
1	6	611484	LABEL, CONNECTOR PLATE
1*	5	610174	SENSOR, CAP, BULKHEAD, M12, Q/C
1	4	210678	ASSY,BULKHD,2200,PCB-SIGNAL
1	3	210677	ASSY,BULKHD,2200,PCB-POWER
1	2	210676	ASSY,BULKHD,2200,COMPUTER INTERFACE
1	1	113763	PLUG,HOLE,CHROME 7/8" DIA
QTY.	ITEM #	PART#	DESCRIPTION

210625 REF. B.O.M ONLY

210625 REV B
ASSY, CONNECTOR PLATE

USE BLUE LOCTITE #242

See Pg. 16

SEE NOTE 3

SEE NOTE 1

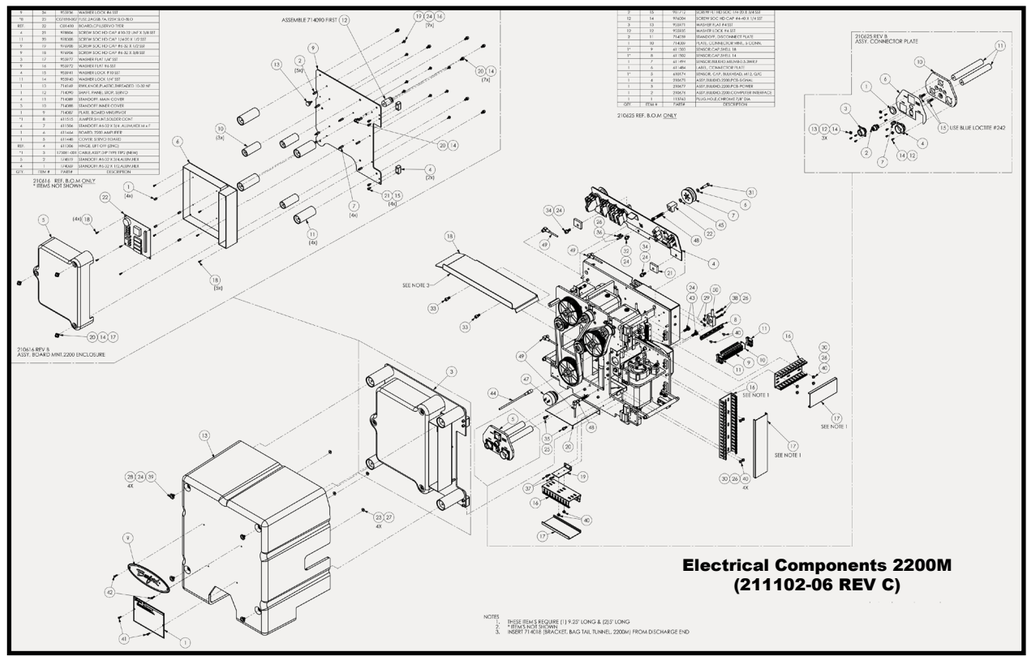
Electrical Components 2200M
(211102-06 REV C)

Right Hand Shown

NOTES
1. THESE ITEM'S REQUIRE (1) 9.25" LONG & (2)5" LONG
2. * ITEM'S NOT SHOWN
3. INSERT 714018 (BRACKET, BAG TAIL TUNNEL, 2200M) FROM DISCHARGE END

Electrical Components 2200M
Drawing 211102-06 Rev C

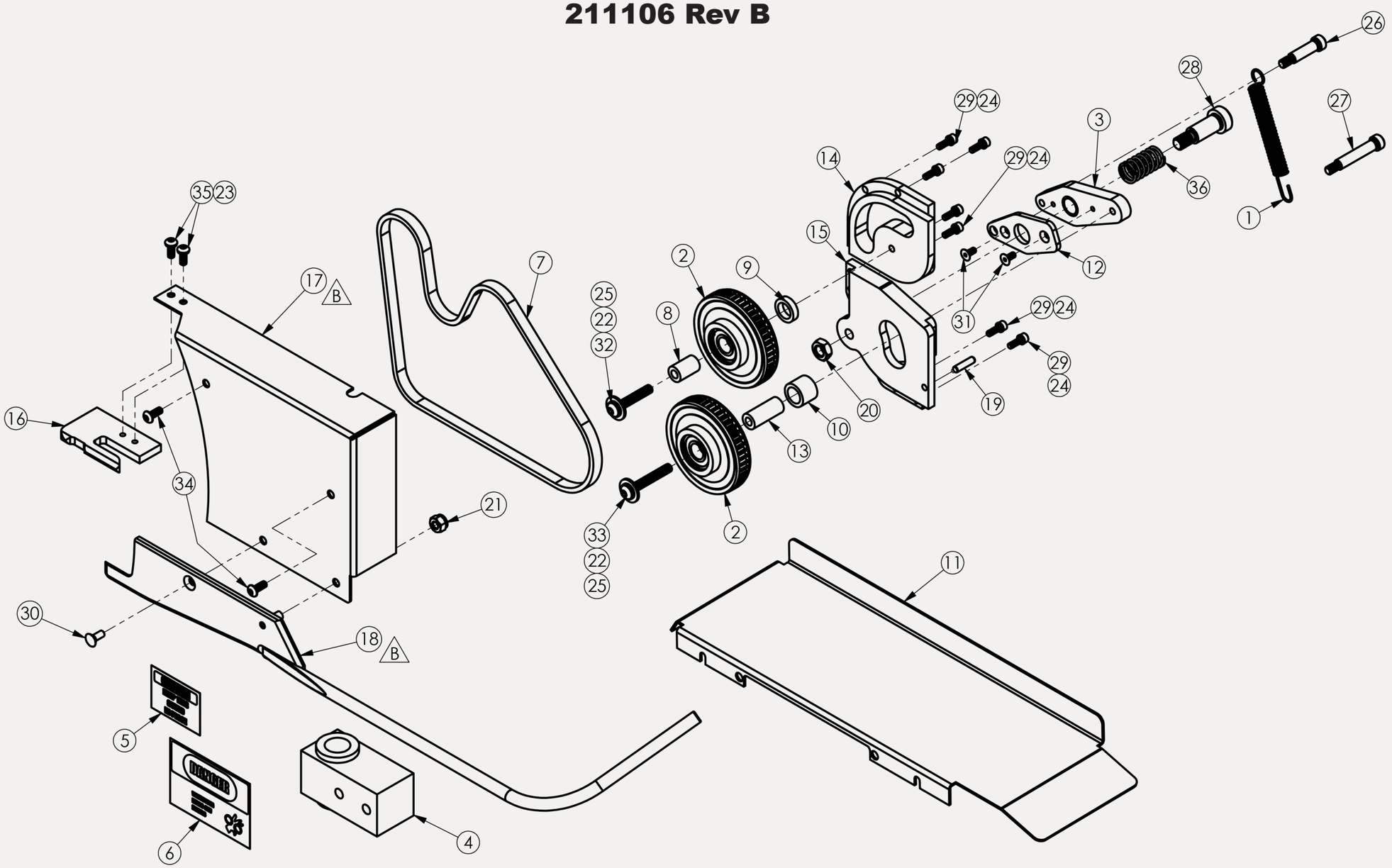
FOLD OUT TO VIEW DRAWING



Infeed Belt Components
211106 Rev B RH
211105 Rev B LH

QTY.	ITEM #	PART#	DESCRIPTION
1	1	152193	SPRING EXTENSION
2	2	210607	ASSY., MAIN IDLER
1	3	210608	ASSY., IDLER ARM
1	4	210624	ASSY., BUSHING BLOCK, BRUSH MNT.
1	5	302361	DECAL, SMALL, KEEP GUARD IN PLACE
1	6	302801	DECAL SMALL HAND DANGER
1	7	611152	GEARBELT, 710MM X 9MM, 5HTD
1	8	714002	SHAFT, IDLER MOUNT
1	9	714003	SPACER, .75 OD X .515 ID X .195 L
1	10	714005	SPACER, .75 OD X .515 ID X .59 L
1	11	714018	BRACKET,BAG TAIL TUNNEL,2200 RH
		714113	BRACKET,BAG TAIL TUNNEL,2300 LH
1	12	714033	STANDOFF, BELT IDLER ARM
1	13	714042	STANDOFF, PIVOTING IDLER
1	14	714054	PLATE, REMOVEABLE, UPP. INFEED PULLEY, 2200 RH
		714117	PLATE, REMOVEABLE, UPP. INFEED PULLEY, 2300 LH
1	15	714055	PLATE, REMOVEABLE INF. ROLLER, 2200 RH
		714114	PLATE, REMOVEABLE INF. ROLLER, 2300 LH
1	16	714099	PLATE, RIBBON GUIDE
1	17	715672	BRACKET, UPPER COVER, 2200 RH
		715671	BRACKET, UPPER COVER, 2300 LH
1	18	715810	A/W. INFEED COVER ROD 2200 RH
		715809	A/W. INFEED COVER ROD 2300 LH
1	19	954712	PIN DOWEL, 3/16 DIA X 3/4 SST
1	20	955405	NUT HEX JAM 3/8-16 UNC SST
1	21	955661	NUT HEX NYLOC 1/4-20 UNC SST
2	22	955940	WASHER LOCK 1/4" SST
2	23	955941	WASHER LOCK #10 SST
7	24	955942	WASHER LOCK #8 SST
2	25	955977	WASHER FLAT 1/4" SST
1	26	975016	SCREW SHLDR 5/16 X 1, 1/4-20 SST
1	27	975024	SCREW, SHLDR 5/16 X 1 1/2, 1/4-20
1	28	975216	SCREW SHLDR 1/2 X 1, 3/8-16 SST
7	29	979508	SCREW SOC HD CAP #8-32 UNC X 1/2 SST
1	30	982308	SCREW FLT HD SOC #10-24 X 1/2 SST
2	31	982906	SCREW FLT HD SOC #8-32 X 3/8 SST
1	32	985724	SCREW BUTT HD SOC 1/4-20 X 1 1/2 SST
1	33	985728	SCREW BUTT HD SOC 1/4-20 X 1 3/4 SST
2	34	986306	SCREW BUTT HD SOC #10-24 X 3/8 SST
2	35	986308	SCREW BUTT HD SOC #10-24 X 1/2 SST
1	36	C00817	SPRING, COMPRESSION .660 0D X .516 ID X .071W

Infeed Belt Components
211106 Rev B

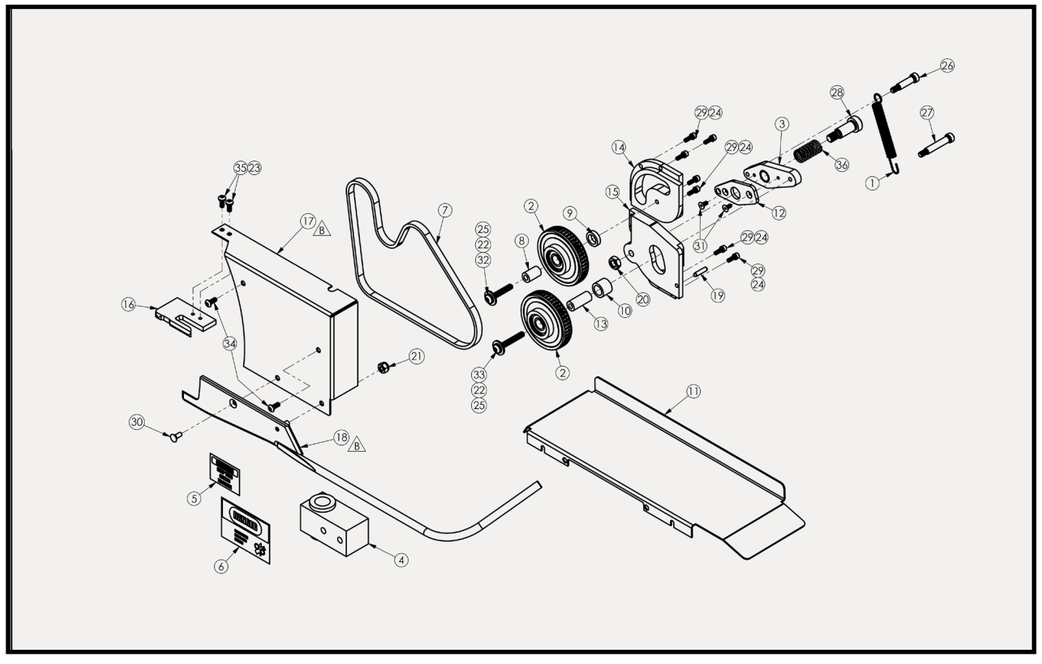


Right Hand Shown

Infeed Belt Components 2200M

Drawing 211106 Rev B

FOLD OUT TO VIEW DRAWING



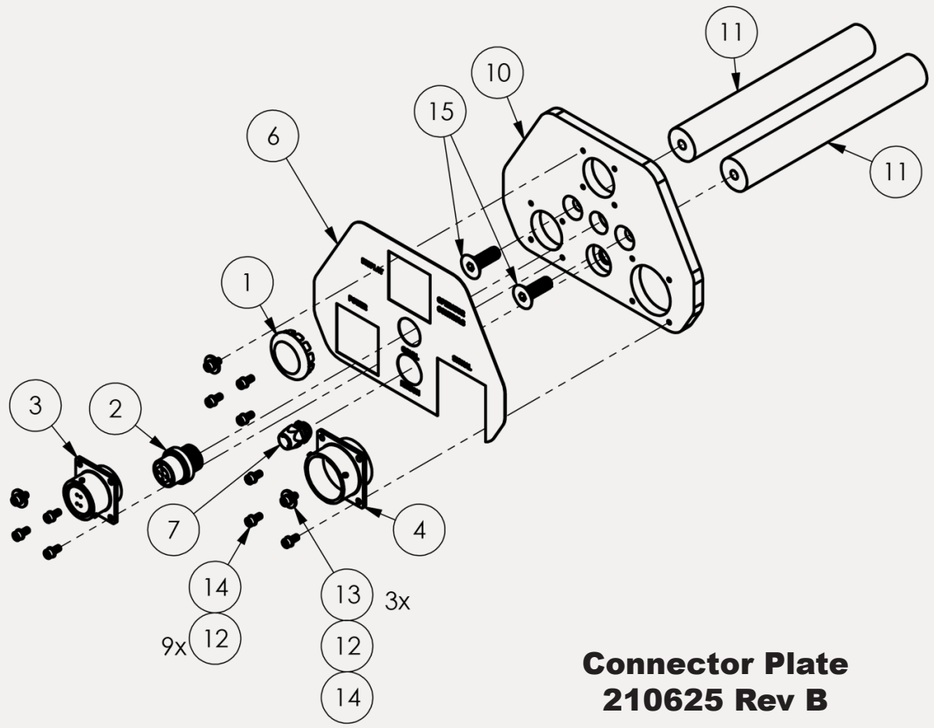
Board Mount Assembly 2200M

210616 Rev B RH
210615 Rev B LH

QTY.	ITEM #	PART#	DESCRIPTION
4	1	174069	STANDOFF,#6-32 X 1/2,ALUM,HEX
5	2	174819	STANDOFF,#6-32 X 3/4,ALUM,HEX
1	3	175081-001	CABLE ASSY, DIP TYPE, TTP2 (NEW)
REF.	4	611306	HINGE, LIFT OFF (ZINC)
1	5	611448	COVER, SERVO BOARD
1	6	611464	BOARD, 2200 AMPLIFIER
4	7	611506	STANDOFF,#6-32 X 3/4 ,ALUM,HEX M x F
1	8	714087	PLATE, BOARD MNT/PIVOT
3	9	714088	STANDOFF,INNER COVER
4	10	714089	STANDOFF, MAIN COVER
1	11	714090	SHAFT, PANEL STOP, SERVO
9	12	955936	WASHER LOCK #6 SST
11	13	955940	WASHER LOCK 1/4" SST
4	14	955941	WASHER LOCK #10 SST
9	15	955972	WASHER FLAT #6 SST
3	16	955977	WASHER FLAT 1/4" SST
9	17	976906	SCREW SOC HD CAP #6-32 X 3/8 SST
9	18	976908	SCREW SOC HD CAP #6-32 X 1/2 SST
11	19	978308	SCREW SOC HD CAP 1/4-20 X 1/2 SST
4	20	978806	SCREW SOC HD CAP #10-32 UNF X 3/8 SST
REF.	21	C01410	BOARD,CPU,SERVO TYER
1	22	714169	RWK,KNOB,PLASTIC,THREADED 10-32 NF

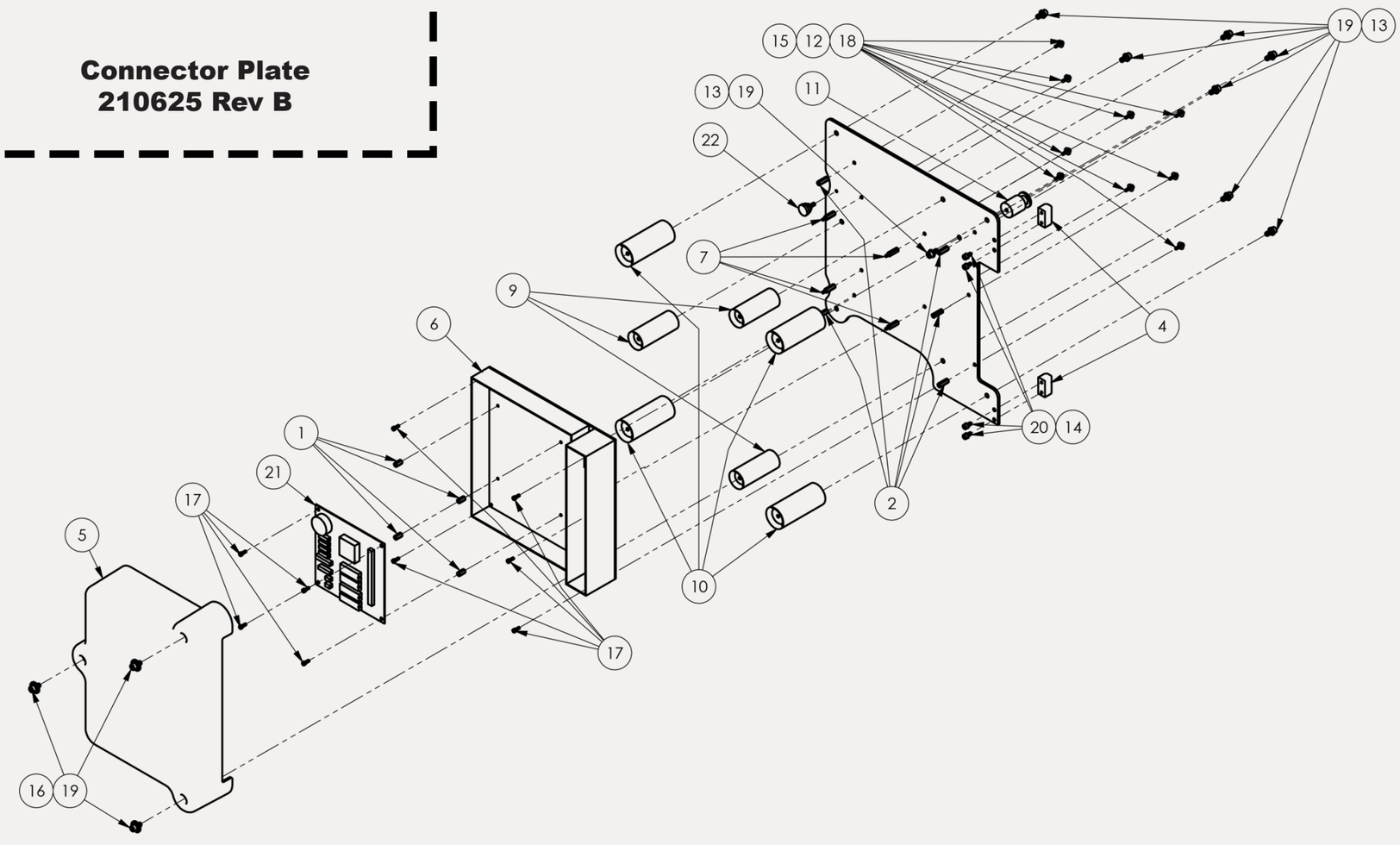
Connector Plate
210625 Rev B

QTY.	ITEM #	PART#	DESCRIPTION
1	1	113763	PLUG,HOLE,CHROME 7/8" DIA
1	2	210676	ASSY,BULKHD,2200,COMPUTER INTERFACE
1	3	210677	ASSY,BULKHD,2200,PCB-POWER
1	4	210678	ASSY,BULKHD,2200,PCB-SIGNAL
*1	5	610174	SENSOR,CAP,BULKHEAD,M12,Q/C
1	6	611484	LABEL, CONNECTOR PLATE
1	7	611494	SENSOR,BULKHD,M8,M8-0.5,3WR,F
*1	8	611502	SENSOR,CAP,SHELL 14
*1	9	611503	SENSOR,CAP,SHELL 18
1	10	714009	PLATE, CONNECTOR MNT., 5 CONN.
2	11	714039	STANDOFF, DISCONNECT PLATE
12	12	955935	WASHER LOCK #4 SST
3	13	955971	WASHER FLAT #4 SST
12	14	976004	SCREW SOC HD CAP #4-40 X 1/4 SST
2	15	981712	SCREW FLT HD SOC 1/4-20 X 3/4 SST



Connector Plate
210625 Rev B

Board Mount Assembly
210616 Rev B RH



Right Hand Shown

*** Not Shown**

Board Mount Assembly

Drawing 210615 Rev B RH
Drawing 210616 Rev B LH

Connector Plate

Drawing 210625 Rev B

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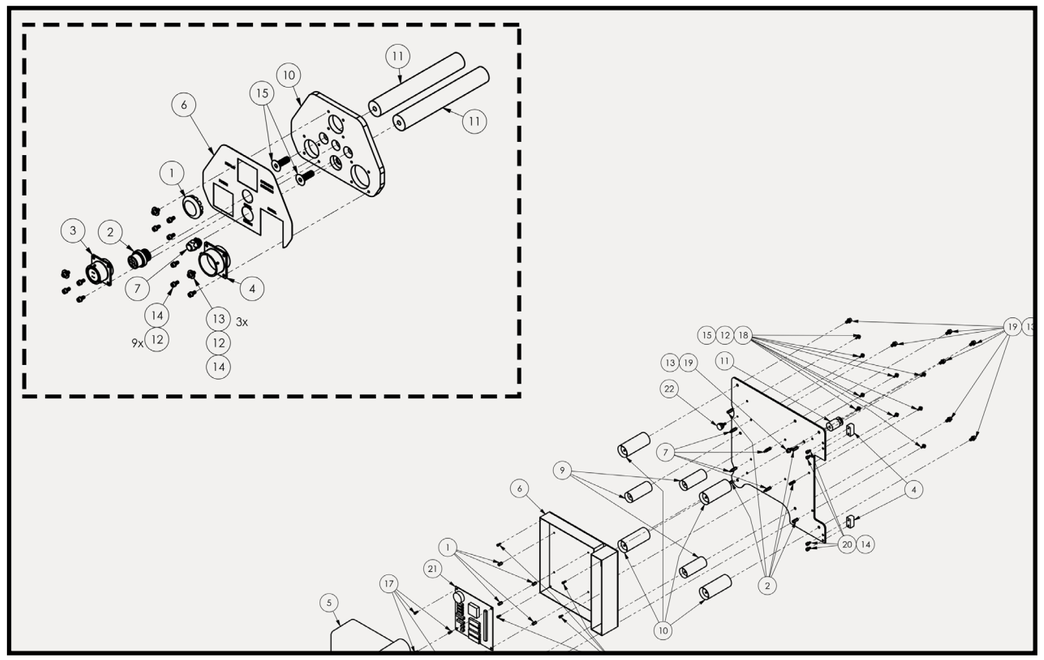
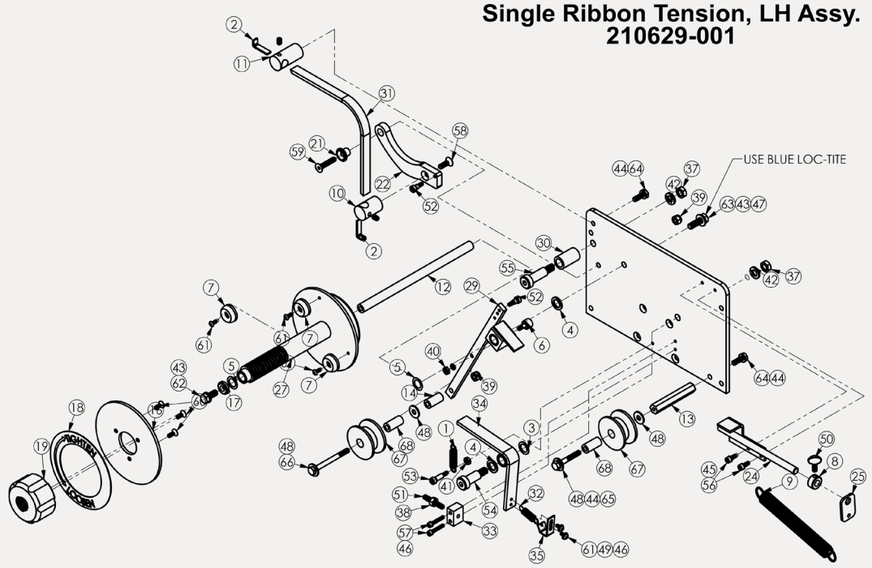


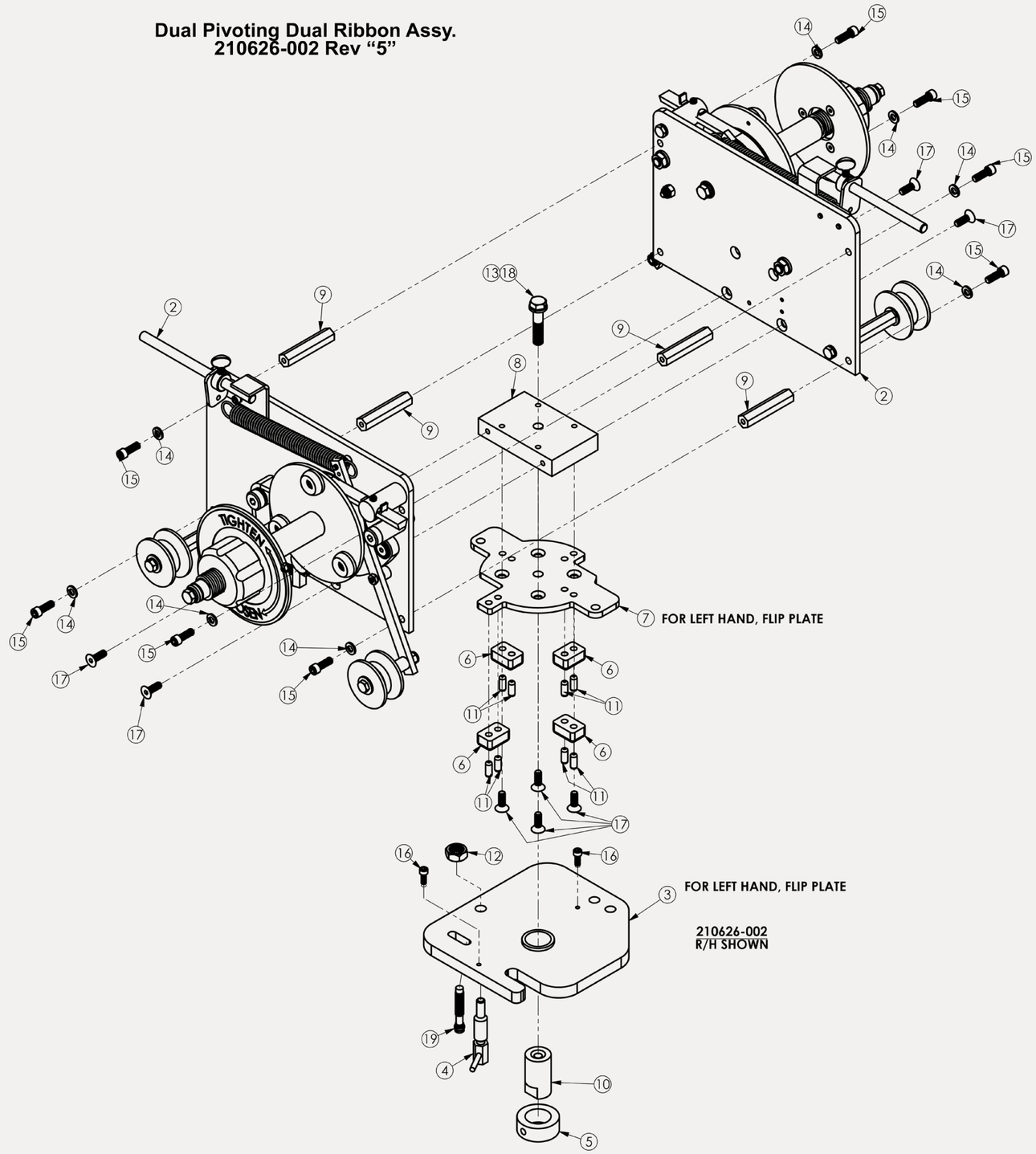
Ribbon Assembly
210626-002 Rev “5”

-	2	1	210629-001	ASSY, SINGLE RIBBON TENSION
2	-	2	210629-002	ASSY, SINGLE RIBBON TENSION
1	1	3	210635	ASSY, RIBBON HUB/BUSHING
1	1	4	611550	PLUNGER,DETENT SST 1/2-13, L-HANDLE
1	1	5	711757	COLLAR, SET, 1" SST
4	4	6	714171	BLOCK, RIBBON PIVOT STOP
1	1	7	714172	PLATE, RIBBON ASSY. PIVOT MNT
1	1	8	714173	PLATE, RIBBON ASSEMBLY HUB
4	4	9	714174	STANDOFF, RIBBON ASSEMBLY SUPPORT
1	1	10	714212	SHAFT, RIBBON PIVOT
8	8	11	954610	PIN DOWEL 1/4" X 5/8"
1	1	12	955401	NUT HEX JAM 1/2-13 UNC SST
1	1	13	955938	WASHER LOCK 3/8"
8	8	14	955940	WASHER LOCK 1/4" SST
8	8	15	978312	SCREW SOC HD CAP 1/4-20 X 3/4 SST
2	2	16	978908	SCREW SOC HD CAP #10-24 UNC X 1/2 SST
8	8	17	981712	SCREW FLT HD SOC 1/4-20 X 3/4 SST
1	1	18	988928	SCREW FIN HEX 3/8-16 X 1 3/4 SST
1	1	19	C07625	SENSOR,PROX,8MM,10-30VDC,NPN,NO,QC
-2	-1	ITEM #	PART#	DESCRIPTION

Single Ribbon Tension, LH Assy.
210629-001



Dual Pivoting Dual Ribbon Assy.
210626-002 Rev “5”



Ribbon Assembly 2200M

Drawing 210626-002 Rev “5”

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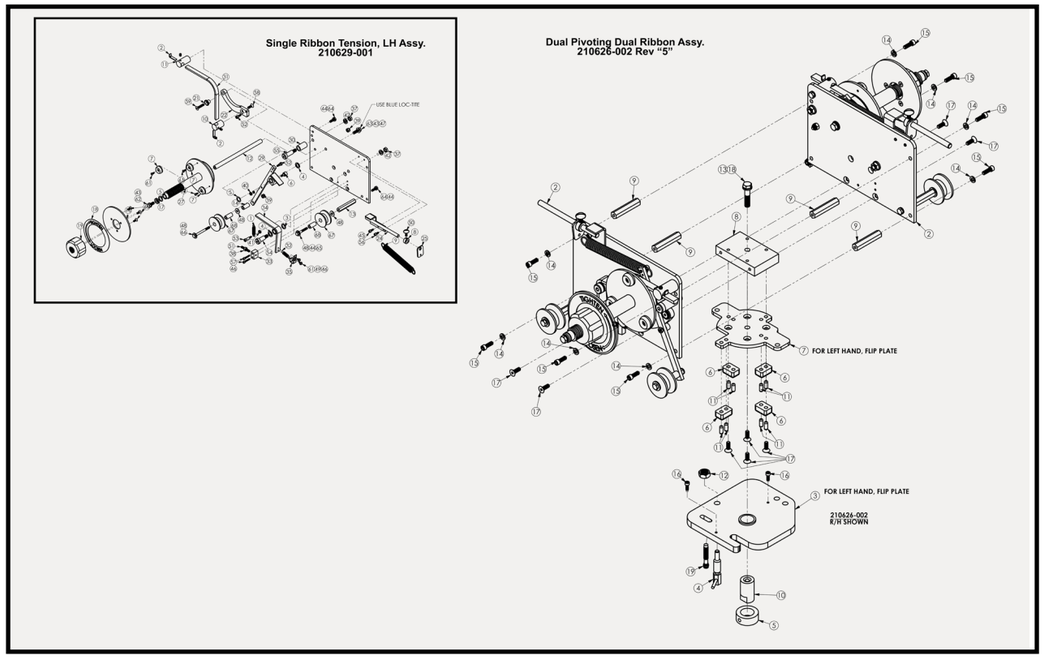


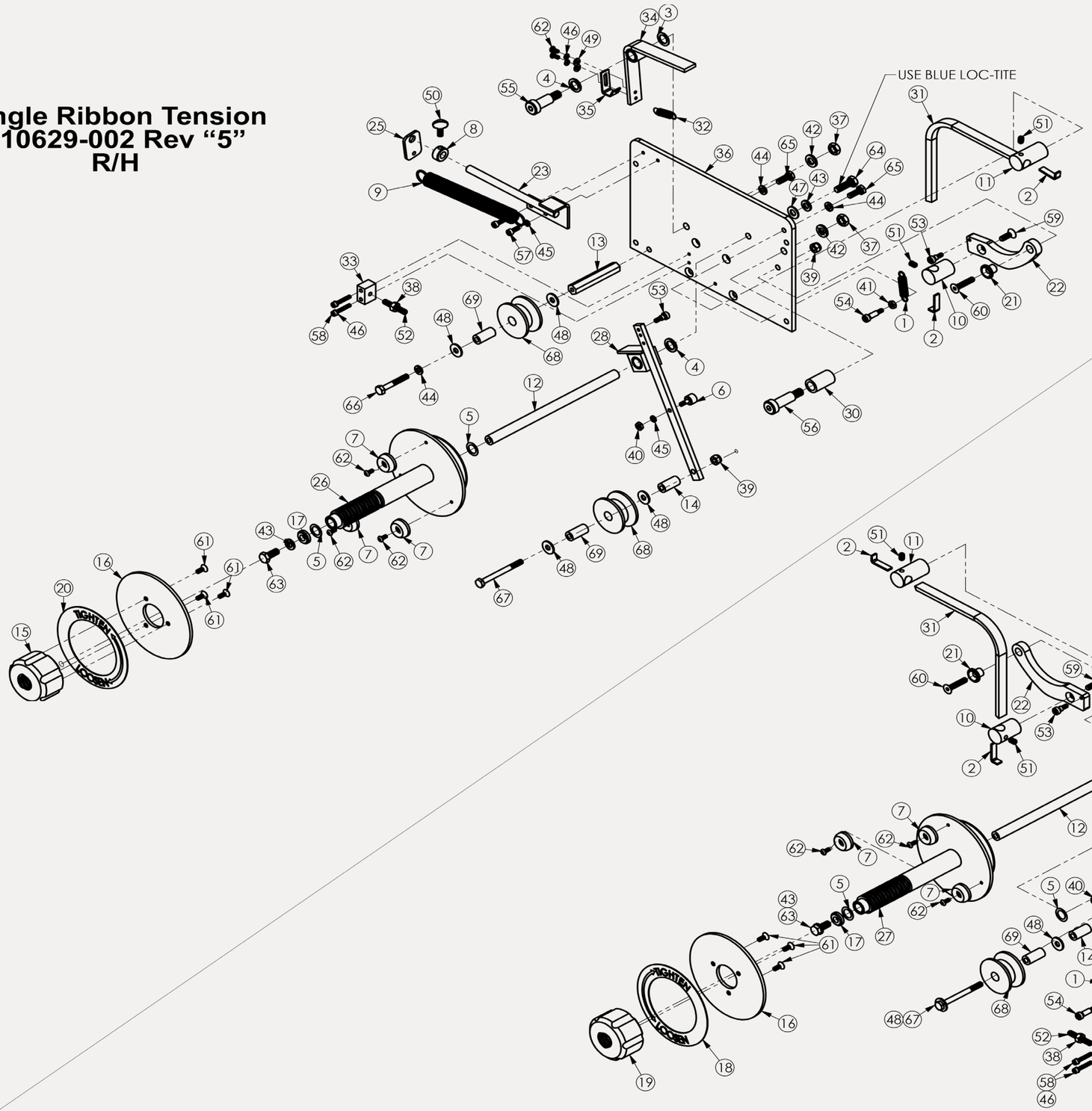
Ribbon Tension Assembly

210629-001 Rev “5”

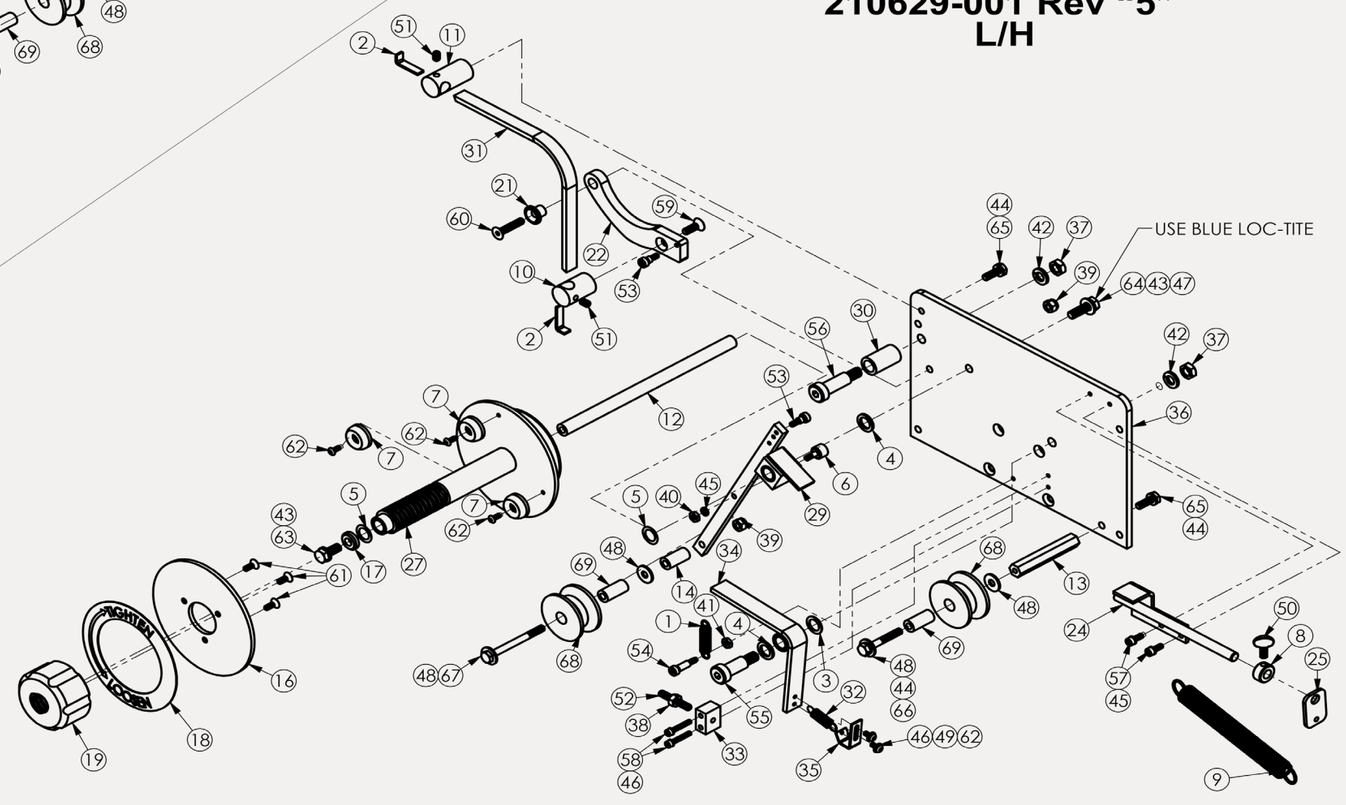
210629-002 Rev “5”

-002	-001	ITEM #	PART#	DESCRIPTION
1	1	1	103519	SPRING EXTENSION
2	2	2	104239	CLAMP RIBBON FEED BELT
1	1	3	122221	BUSHING, 1/2 X 3/4 X .036 MACH.
2	2	4	122222	BUSHING, 1/2 X 3/4 X .074 MACH.
2	2	5	122232	BUSHING 1/2 X 3/4 X .010 MACH
1	1	6	152076	BEARING, 1/2" CAM FOLLOWER
3	3	7	152148	MOLDED RECESS BUMPER
1	1	8	152151	COLLAR,3/8" SET,ZINC PLATED
1	1	9	302161	SPRING RIBBON TENSION
1	1	10	302162	ROD, BELT CLAMP BRAKE
1	1	11	302163	BLOCK, BELT CLAMP
1	1	12	302164	SHAFT, RIBBON TENSION
1	1	13	302168	SHAFT, RIBBON TENSION
1	1	14	302169	SHAFT, 2ND ROLLER
1	-	15	302171	NUT, RIBBON TENSION, R.H.
1	1	16	302174	PLATE, OUTER SPOOL
1	1	17	302178	RETAINER, RIBBON SPOOL
-	1	18	302183	NAMEPLATE, RIBBON SPOOL, 2100
-	1	19	302190	NUT RIBBON TENSION L.H.
1	-	20	302192	NAMEPLATE, RIBBON SPOOL, 2000
1	1	21	302243	SLEEVE, BRAKE ARM, RIBBON TENSION
1	1	22	302244	ARM, BRAKE RIBBON TENSION, SERVO
1	-	23	302248	A/W, MOUNT, R.H.
-	1	24	302249	A/W, MOUNT, LH
1	1	25	302252	SPRING ADJUSTER
1	-	26	302370	ASSY, INNER SPOOL, R.H.
-	1	27	302371	ASSY, INNER SPOOL, LH
1	-	28	302372	ASSY, DANCER ARM, R.H.
-	1	29	302373	ASSY, DANCER ARM, LH
1	1	30	302479	BUMPER, RIBBON TENSION ARM
1	1	31	504521	BELT, V 1/2 X 15"
1	1	32	611514	SPRING, EXTENSION, .375 OD X .026 MW X 1.75
1	1	33	714053	BLOCK, IDLER MNT.
1	1	34	714166	A/W, RIBBON DROP PIVOT
1	1	35	714167	BRACKET, RIBBON DROP PROX.
1	1	36	714168	PLATE, DUAL RIBBON ASSY.
2	2	37	955405	NUT HEX JAM 3/8-16 UNC SST
1	1	38	955409	NUT HEX JAM 1/4-20 UNC SST
2	2	39	955661	NUT HEX NYLOC 1/4-20 UNC SST
1	1	40	955822	NUT HEX MACH. #10-32 UNF SST
1	1	41	955823	NUT HEX MACH #10-24 NC SST
2	2	42	955938	WASHER LOCK 3/8"
2	2	43	955939	WASHER LOCK 5/16" SST
3	3	44	955940	WASHER LOCK 1/4" SST
3	3	45	955941	WASHER LOCK #10 SST
4	4	46	955942	WASHER LOCK #8 SST
1	1	47	955976	WASHER FLAT 5/16 SST
4	4	48	955977	WASHER FLAT 1/4" SST
2	2	49	955979	WASHER FLAT #8 SST
1	1	50	962508	SCREW THUMB 1/4-20 UNC X 1/2 SST
1	1	51	971224	SCREW SET SOC 1/4-20 UNC X 1 1/2 SST
2	2	52	974904	SCREW SHLDR 1/4 X 1/4, #10-24 SST
1	1	53	974910	SCREW, SHLDR 5/16 X 1 1/2, 1/4-20
1	1	54	975216	SCREW SHLDR 1/2 X 1, 3/8-16 SST
1	1	55	975220	SCREW SHLDR 1/2 X 1 1/4, 3/8-16 SST
2	2	56	978908	SCREW SOC HD CAP #10-24 UNC X 1/2 SST
2	2	57	979516	SCREW SOC HD CAP #8-32 UNC X 1 SST
1	1	58	981712	SCREW FLT HD SOC 1/4-20 X 3/4 SST
1	1	59	981720	SCREW FLT HD SOC 1/4-20 X 1 1/4 SST
3	3	60	982308	SCREW FLT HD SOC #10-24 X 1/2 SST
5	5	61	986906	SCREW BUTT HD SOC #8-32 X 3/8 SST
1	1	62	989712	SCREW FIN HEX 5/16-18 X 3/4 SST
1	1	63	989716	SCREW FIN HEX 5/16-18 X 1 SST
2	2	64	989912	SCREW FIN HEX 1/4-20 X 3/4" SST
1	1	65	989928	SCREW FIN HEX 1/4-20 X 1 3/4 SST
1	1	66	989944	SCREW FIN HEX 1/4-20 X 2 3/4 SST
2	2	67	A02359	RIBBON ROLLER
2	2	68	A02363	BUSHING, RIBBON ROLLER
2	2	69	971206	SCREW SET SOC 1/4-20 X 3/8 SST

Single Ribbon Tension
210629-002 Rev “5”
R/H



Single Ribbon Tension
210629-001 Rev “5”
L/H



Ribbon Tension Assembly
Drawing 210629 Rev “5”

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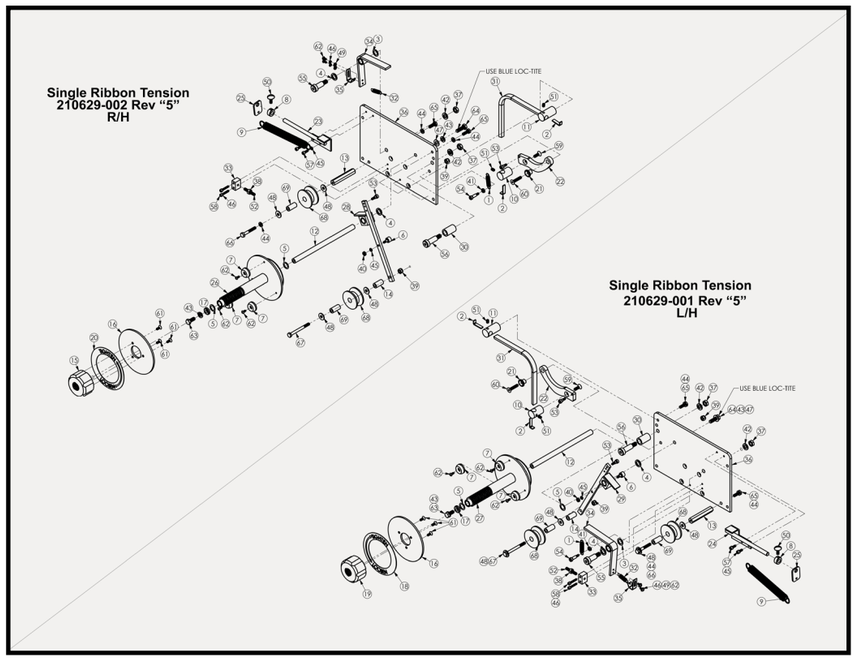
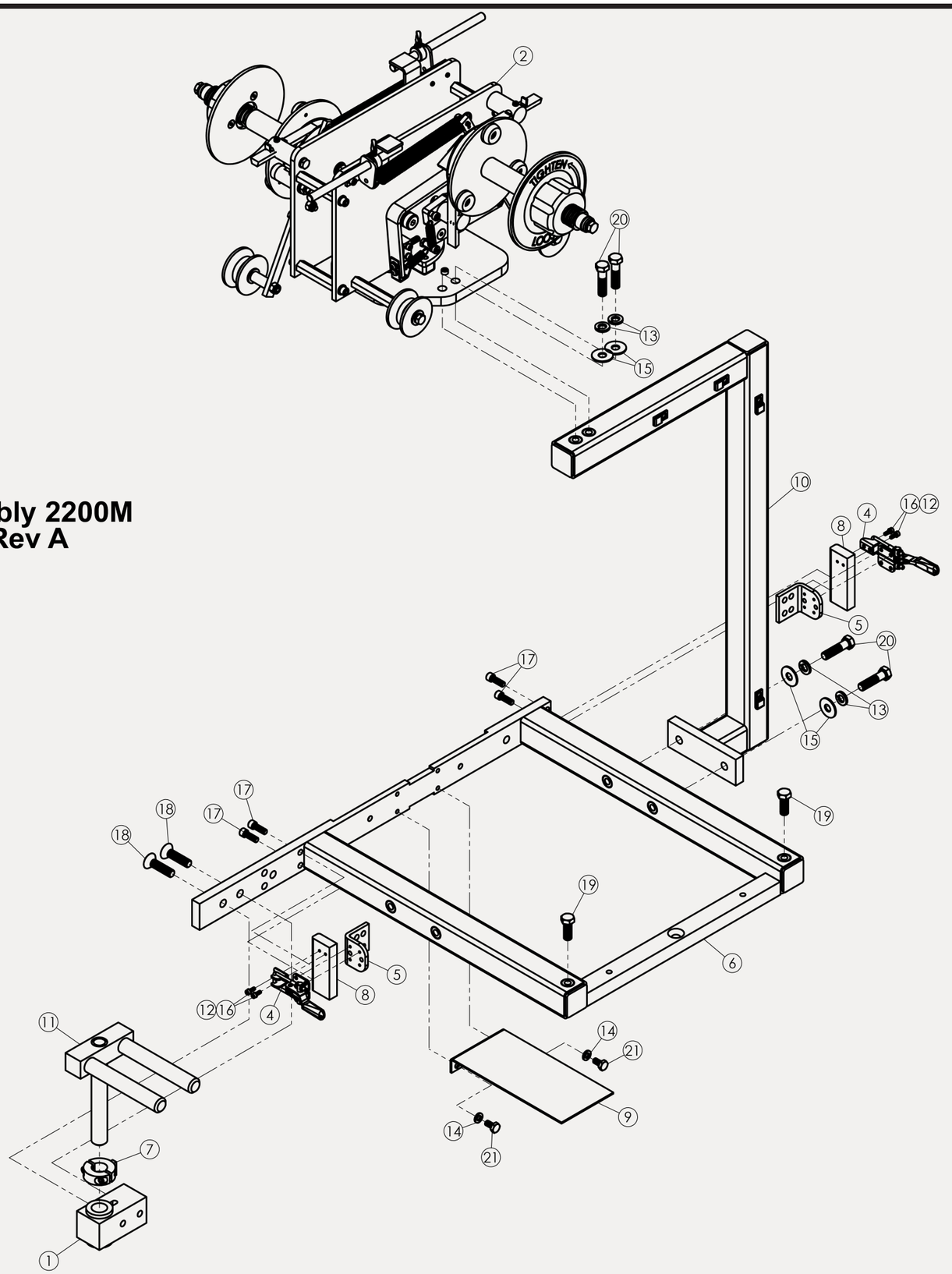


Ribbon Assembly Frame
211104 Rev A
211103 Rev A

QTY.	ITEM #	PART#	DESCRIPTION
REF.	1	210624	ASSY., BUSHING BLOCK, BRUSH MNT.
1	2	210626-002	ASSY, PIVOTING DUAL RIBBON 2200 RH
		210626-001	ASSY, PIVOTING DUAL RIBBON 2300 LH
4	3	610884	TY-RAP, MOUNTING HANGER
2	4	611477	CLAMP, PULL ACTION
2	5	714027	BRACKET, TYER CLAMP
1	6	714104	A/W, TYER FRAME MOUNT, 2200 RH
		714125	A/W, TYER FRAME MOUNT, 2300 LH
1	7	714110	A/W, LOCK COLLAR, BRUSH ASSY.
2	8	714111	BLOCK, MAIN FRAME CLAMP
1	9	714141	BRACKET, T/H LOWER COVER
REF.	10	714142	A/W, RIBBON TENSION UPRIGHT SIDE MNT
1	11	714161	A/W, PIVOTING BRUSH MNT.
4	12	955936	WASHER LOCK #6 SST
4	13	955938	WASHER LOCK 3/8"
2	14	955940	WASHER LOCK 1/4" SST
4	15	955975	WASHER FLAT 3/8" SST
4	16	976906	SCREW SOC HD CAP #6-32 X 3/8 SST
4	17	978312	SCREW SOC HD CAP 1/4-20 X 3/4 SST
2	18	980624	SCREW FLT HD SOC 3/8-16 UNC X 1 1/2 SST
2	19	988916	SCREW FIN HEX 3/8-16 X 1 SST
4	20	988924	SCREW FIN HEX 3/8-16 X 1 1/2 SST
2	21	989908	SCREW FIN HEX 1/4-20 X 1/2" SST

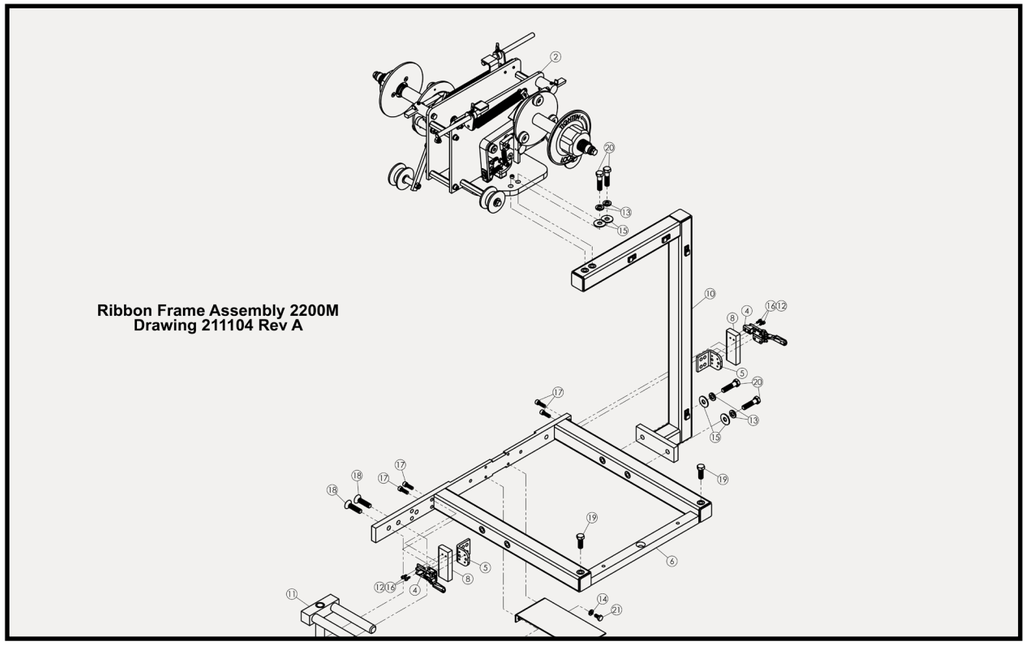
Ribbon Frame Assembly 2200M
Drawing 211104 Rev A



Right Hand Shown

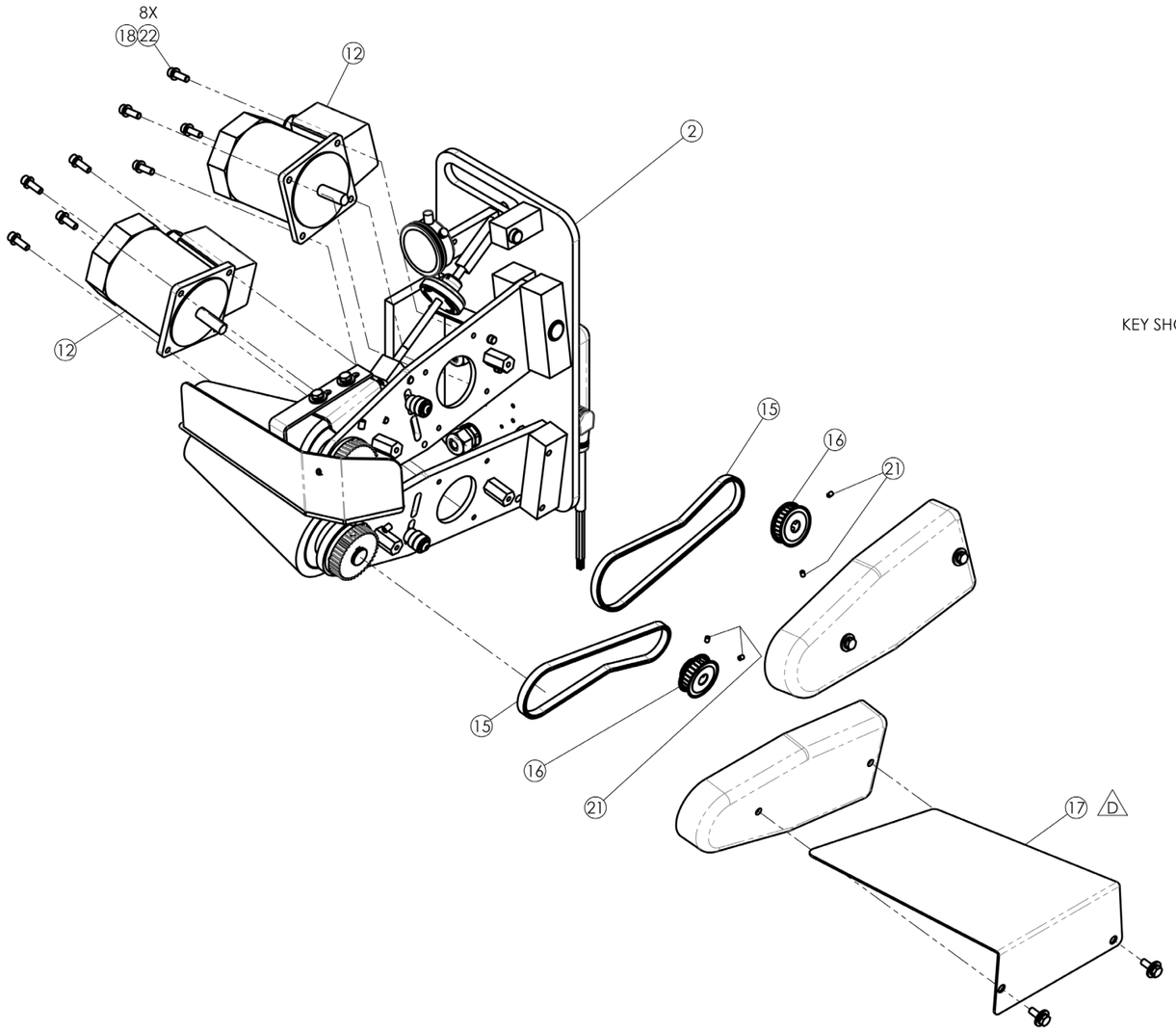
Ribbon Frame Assembly
Drawing 211104 Rev A

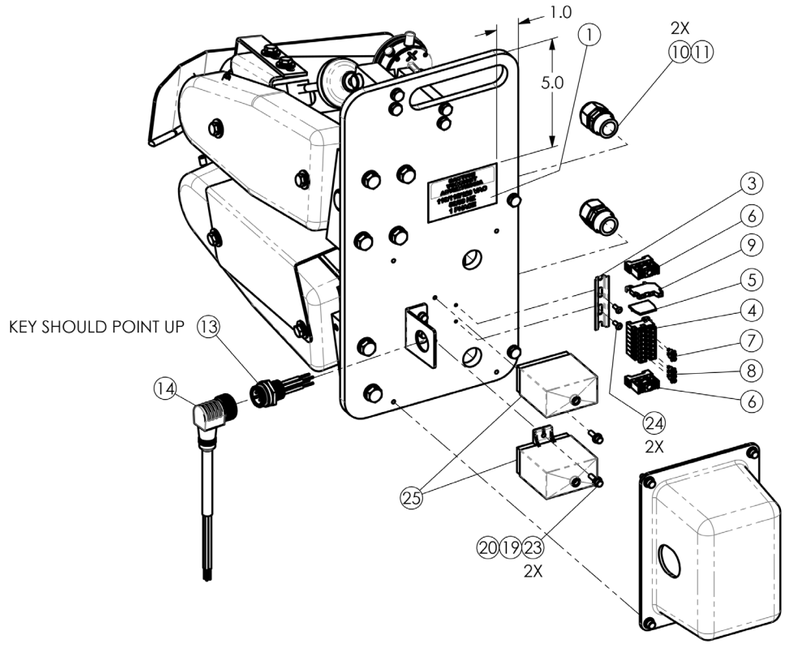
FOLD OUT TO VIEW DRAWING

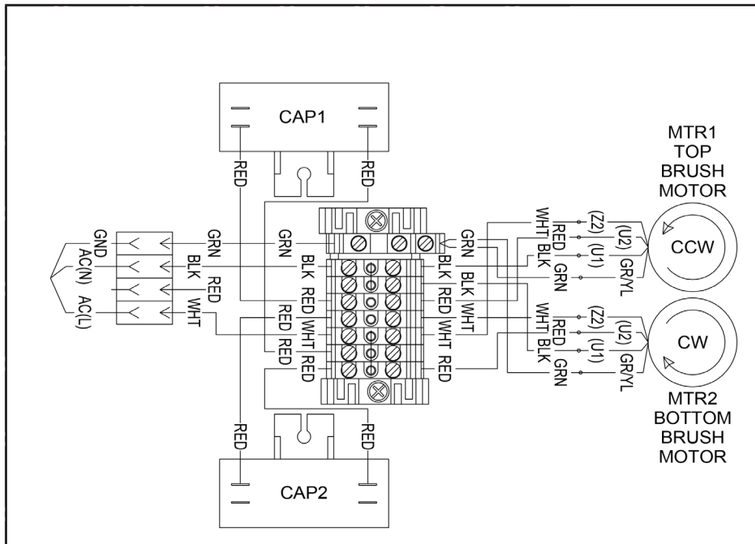


Tapered Brush Assembly
210999-002 Rev D RH
210999-001 Rev D LH

QTY.	ITEM #	PART#	DESCRIPTION
1	1	111177	DECAL,110/115/120 VOLTS,1 PHASE
1	2	210999-008	ASSY,TAPERED BRUSH RH
		210999-007	ASSY,TAPERED BRUSH LH
2.3"	3	610360	TERMINAL, DIN RAIL, MINI
7	4	610361	TERMINAL, BLOCK, MINI
1	5	610362	TERMINAL,END COVER,MINI
2	6	610363	TERMINAL,ANCHOR,END CLAMP,MINI
1	7	610532	JUMPER, TERMINAL, 2 POS, MINI
1	8	610533	JUMPER, TERMINAL, 3 POS, MINI
1	9	610534	TERMINAL,GROUNDING,MINI
2	10	610953	CONNECTOR, CORD, .20-.35, DOME, NYLON
2	11	610955	CONNECTOR,SEAL RING,1/2NPT,POLYETH
2	12	611158	MOTOR, 60W, 110V, 60Hz, 1450 RPM
1	13	611841	CABLE,POWERFAST,BULKHEAD,14-4,600V,15A
1	14	611842	CABLE,POWERFAST,14-4,600V,15A,5M,90°
2	15	611929	5MM HTD, 100 TEETH, 9MM WIDE SINGLE SIDED
2	16	715727	REWORK, 26T PULLEY, 12MM BORE
1	17	715772	ANGLE, BAG TAIL SHELF TAPERED RH
8	18	955940	WASHER LOCK 1/4" SST
2	19	955942	WASHER LOCK #8 SST
2	20	955979	WASHER FLAT #8 SST
4	21	972104	SCREW SET SOC #8-32 UNC X 1/4 SST
8	22	978312	SCREW SOC HD CAP 1/4-20 X 3/4 SST
2	23	979510	SCREW SOC HD CAP #8-32 UNC X 5/8 SST
2	24	987506	SCREW BUTT HD SOC #6-32 X 3/8 SST
2 REF.	25	C01294-002	CAPACITOR, 18uF, 250WVAC







Right Hand Shown

Tapered Brush Assembly RH

Drawing 210999-002 Rev D

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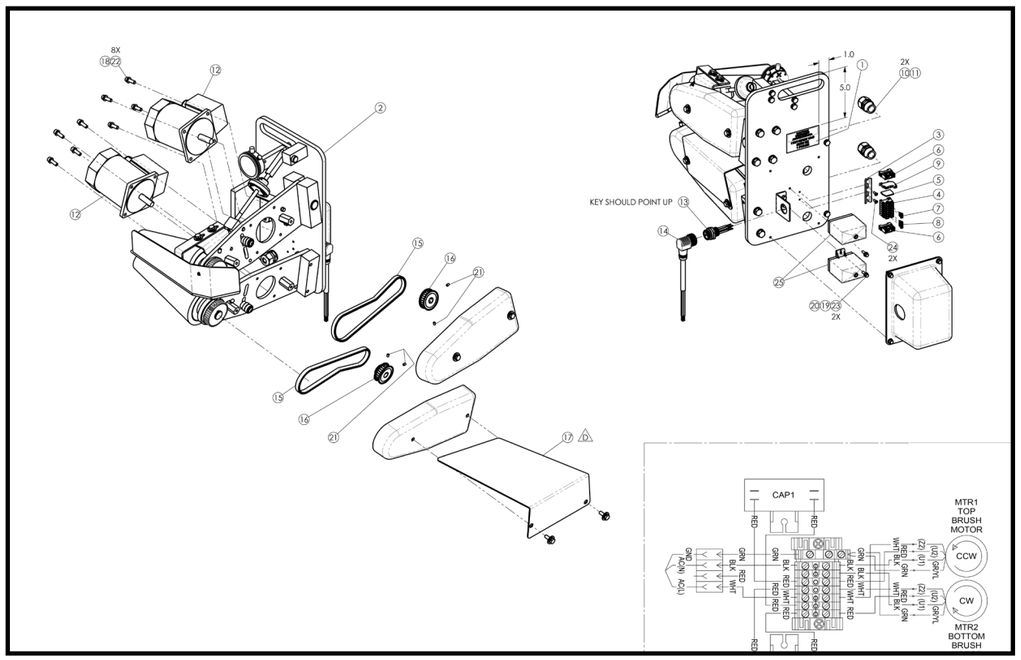
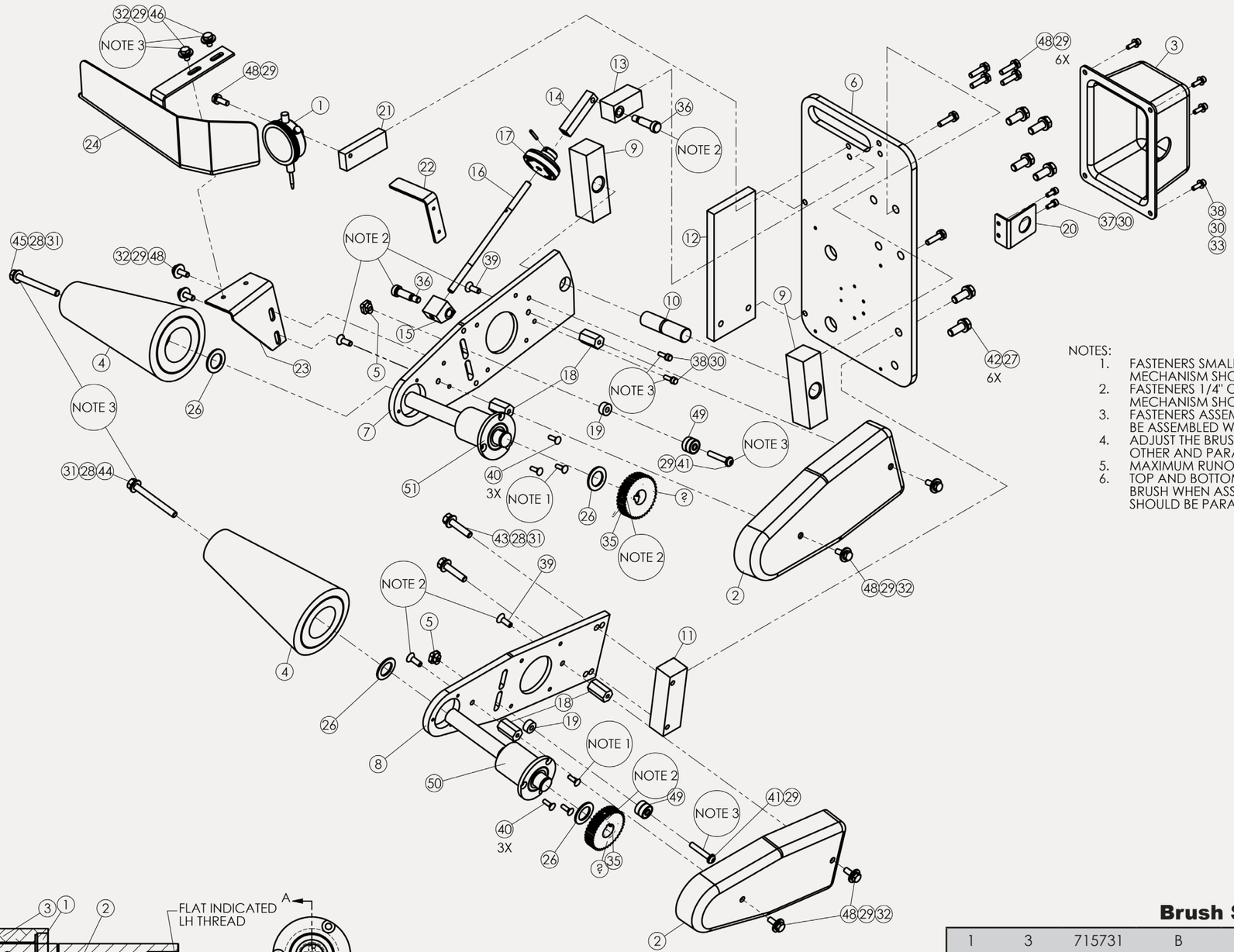


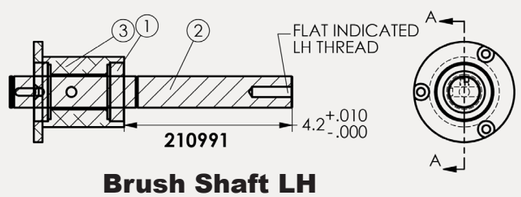
Tapered Brush Assembly Detail
210999-008 Rev F

QTY.	ITEM#	PART#	DESCRIPTION
1	1	611931	DIAL INDICATOR, 2-3/8 FACE, .25"
2	2	611932	COVER, TAPERED BRUSH ARM
1	3	611933	COVER, TAPERED BRUSH BACK
2	4	611934	BRUSH, TAPERED 4-2 OD X 7.63, .010
2	5	714034	NUT, PULLEY ADJUSTMENT
1	6	715700	PLATE, TAPERED BRUSHES MAIN
1	7	715701	PLATE, BRUSH ARM UPPER PIVOT
1	8	715702	PLATE, BRUSH ARM LOWER FIXED
2	9	715703	BLOCK, UPPER ARM PIVOT
1	10	715704	SHAFT, UPPER BRUSH ARM PIVOT
1	11	715705	BLOCK, LOWER ARM FIXED MOUNT
1	12	715706	BLOCK, T ARM MOUNT
1	13	715707	BLOCK, BRUSH ADJUST MAIN PLATE
1	14	715708	BLOCK, 5/16-18 ADJUST PIVOT
1	15	715709	BLOCK, 5/16-24 ADJUST PIVOT
1	16	715710	SHAFT, BRUSH ADJUSTMENT
1	17	715711	KNOB, BRUSH ADJUSTMENT
4	18	715712	SPACER, 5/8 HEX X 1-1/8L, 1/4-20
2	19	715713	SPACER, 5/8 OD X .257 ID X .3 L, AL
1	20	715714	BRACKET, TAPERED BRUSH PLUG MOUNT
1	21	715718	BAR, BRUSH INDICATOR MOUNT
1	22	715719	ANGLE, BRUSH INDICATOR STRIKE
1	23	715720	ANGLE, BRUSH GUIDE ROD MNT RH
1	24	715722	A/W, BRUSH GUIDE ROD RH
		715223	A/W, BRUSH GUIDE ROD LH
2	25	715732	PULLEY, TAPERED BRUSH DRIVE, 20MM

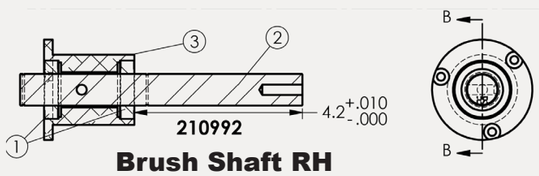
QTY.	ITEM #	PART#	DESCRIPTION
4	26	715733	BUSH,MACH
6	27	955938	WASHER, LOCK 3/8" SST
4	28	955939	WASHER, LOCK 5/16" SST
17	29	955940	WASHER LOCK 1/4" SST
8	30	955941	WASHER LOCK #10 SST
4	31	955976	WASHER FLAT 5/16 SST
8	32	955977	WASHER FLAT 1/4" SST
4	33	955978	WASHER FLAT #10 SST
1	34	958612	PIN ROLL, 1/8 DIA X 3/4 SST
4	35	971206	SCREW SET SOC 1/4-20 UNC X 3/8 SST
2	36	975116	SCREW SHLDR 3/8 X 1, 5/16-18 SST
2	37	978908	SCREW SOC HD CAP #10-24
6	38	978910	SCREW SOC HD CAP #10-24
4	39	981712	SCREW FLT HD SOC 1/4-20 X 3/4 SST
6	40	982310	SCREW FLT HD SOC #10-24 X 5/8 SST
2	41	985724	SCREW BUTT HD SOC 1/4-20 X 1 1/2
6	42	988916	SCREW FIN HEX 3/8-16 X 1 SST
2	43	989724	SCREW FIN HEX 5/16-18 X 1 1/2 SST
1	44	989748	SCREW FIN HEX 5/16-18 X 3 SST
1	45	989748L	SCREW FIN HEX 5/16-18LH X 3 SST
2	46	989908	SCREW FIN HEX 1/4-20 X 1/2 SST
6	48	989916	SCREW FIN HEX 1/4-20 X 1 SST
7	48	989912	SCREW FIN HEX 1/4-20 X 3/4 SST
4	49	C00111	BEARING, .75 OD X .25 ID X .28 W
1	50	210992	ASSY, TAPERED BRUSH SHAFT RH
1	51	210991	ASSY, TAPERED BRUSH SHAFT LF



NOTES:
1. FASTENERS SMALLER THAN 1/4" THAT DO NOT HAVE A LOCKING MECHANISM SHOULD BE ASSEMBLED WITH PURPLE LOCTITE 222MS
2. FASTENERS 1/4" OR LARGER THAT DO NOT HAVE A LOCKING MECHANISM SHOULD BE ASSEMBLED WITH BLUE LOCTITE 242
3. FASTENERS ASSEMBLED INTO STAINLESS STEEL OR SHAFTING SHOULD BE ASSEMBLED WITH FOOD GRADE ANTISEIZE CRC SL35905
4. ADJUST THE BRUSH ARMS SO THE BRUSHES MEET TANGENT TO EACH OTHER AND PARALLEL TO THE MAIN PLATE.
5. MAXIMUM RUNOUT ON END OF BRUSH HUB WHEN ASSEMBLED: .020"
6. TOP AND BOTTOM BRUSH SHOULD MEET EVENLY ACROSS LENGTH OI BRUSH WHEN ASSEMBLED. THE LINE OF INTERSECTION OF THE BRUSHE SHOULD BE PARALLEL WITH THE TOP SURFACE OF THE MAIN PLATE.



Brush Shaft LH



Brush Shaft RH

Right Hand Shown

Brush Shaft LH

QTY.	ITEM #	PART #	Revision	DESCRIPTION
1	3	715731	B	HUB, TAPERED BRUSH MNT, 20MM
1	2	715729	C	SHAFT, 20MM BRUSH, LH
2	1	611935	A	BEARING, 20MM ID X 37MM OD X 9MM

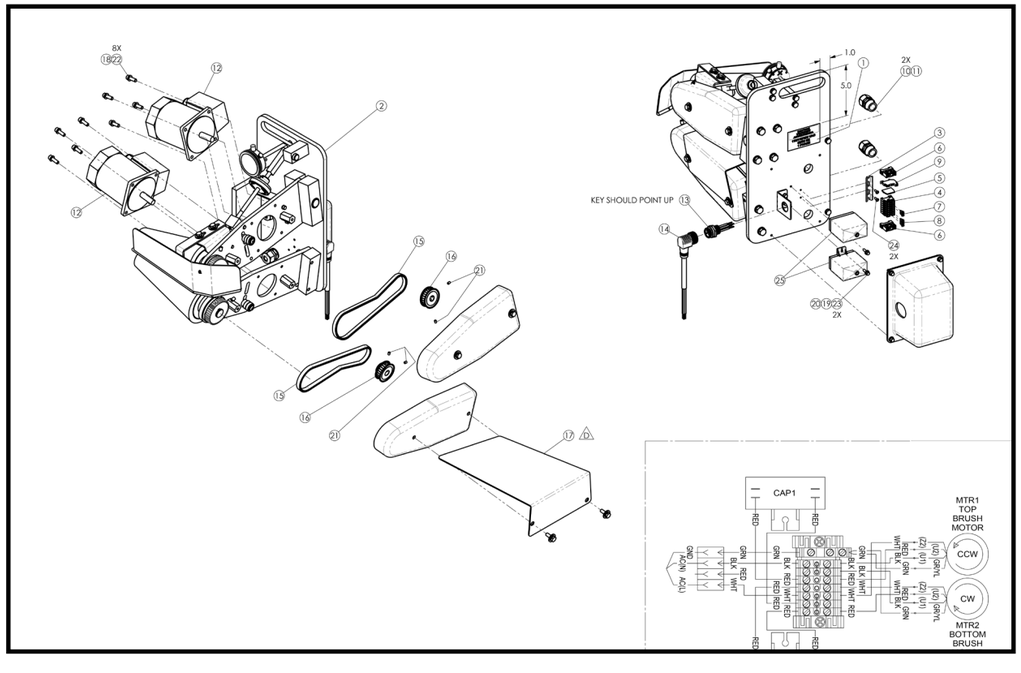
Brush Shaft RH

QTY.	ITEM #	PART #	Revision	DESCRIPTION
1	3	715731	B	HUB, TAPERED BRUSH MNT, 20MM
1	2	715730	C	SHAFT, 20 MM BRUSH, RH
2	1	611935	A	BEARING, 20MM ID X 37MM OD X 9MM

Tapered Brush Assembly Detail

Drawing 210999-008 Rev F

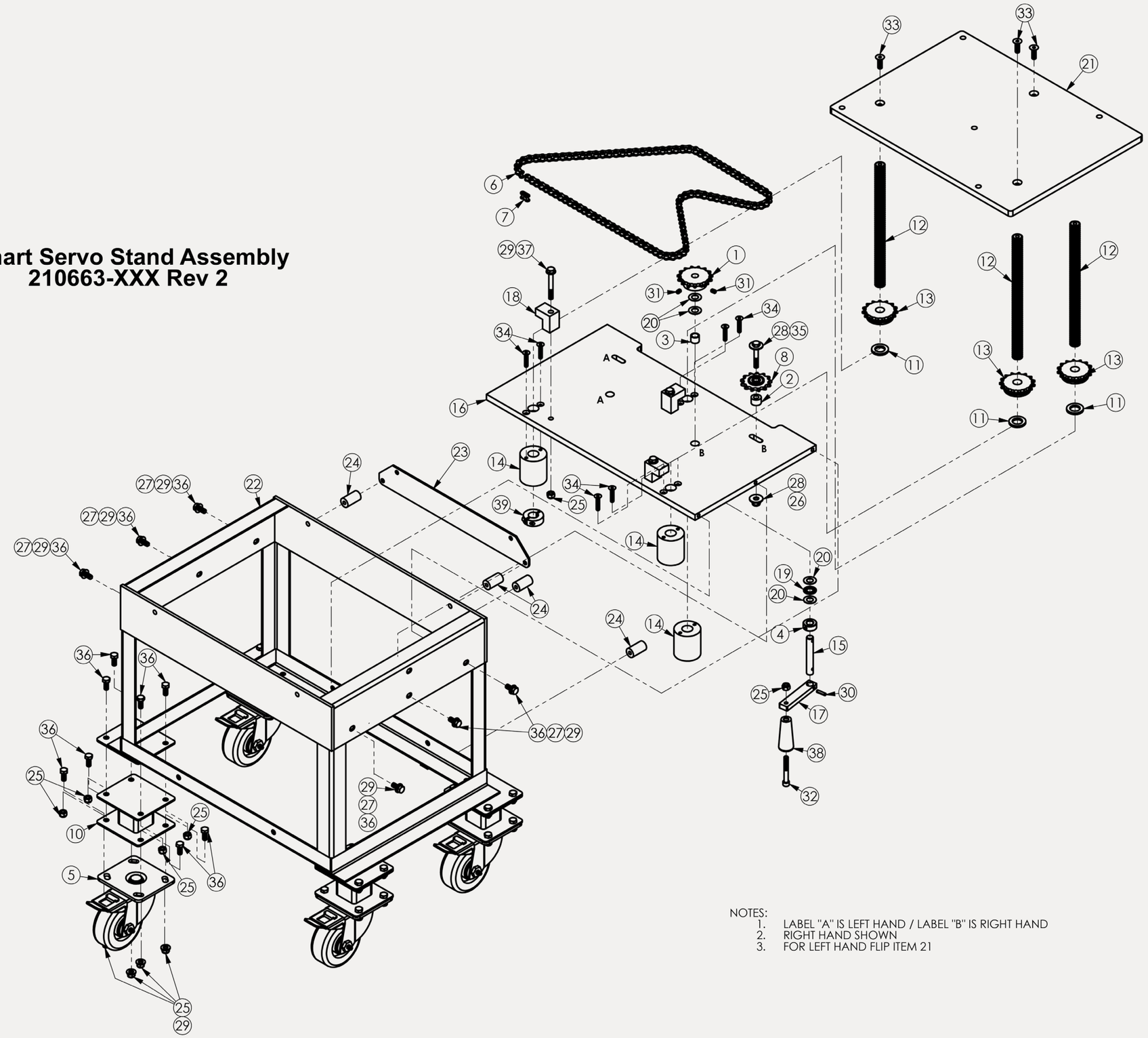
FOLD OUT TO VIEW DRAWING



Optional Stand
210633-XXX Rev 2

-001	-002	-003	ITEM #	PART#	DESCRIPTION
1	1	1	1	101127	SPROCKET, 41-B-15 1/2 BORE
1	1	1	2	101136	SPACER, .75 OD x .38 ID x .50 L
1	1	1	3	152102	BUSH,BRZ,1/2 ID X 5/8 OD X 1/2LG
1	1	1	4	152106	COLLAR,1/2" SET
4	4	4	5	152161	CASTER, 4" SWIVEL LOCKING
1	1	1	6	152170	CHAIN ROLL #41 NICKEL PLATED
1	1	1	7	152176	CHAIN LINK #41 CONNECTING N.P.
1	1	1	8	181167	SPROCKET, 41-A-13 IDLER
-	-	4	9	302856	A/W, RISER CASTER PAD 5"
-	4	-	10	302878	A/W, RISER CASTER PAD, 2.5"
3	3	3	11	304782	SPACER DELRIN LIFT
3	3	3	12	304`784	ALL THREAD 3/4-6 ACME STAND
3	3	3	13	304785	SPROCKET RWK 41B15 3/4 ACME
3	3	3	14	304787	GUIDE ALL THREAD STAND
1	1	1	15	304788	SHAFT, CRANK STAND
1	1	1	16	304790	PLATE, LOWER LIFT, STAND
1	1	1	17	304791	CRANK, ARM 3"
3	3	3	18	304792	PLATE, RETAINER SPROCKET
1	1	1	19	401598	BEARING,THRUST 1/2ID
4	4	4	20	401599	WASHER,THRUST 1/2ID X .030
1	1	1	21	714175	PLATE, STAND, 2200/2300
1	1	1	22	714181	A/W, ADJ. STAND, 2200/2300
1	1	1	23	714194	PLATE, ENCLOSURE ADAPTER, STAND
4	4	4	24	714197	SPACER, .75OD X .266ID X 1.38L
20	36	36	25	955619	NUT HEX NYLOC 5/16-18 UNC SST
1	1	1	26	955620	NUT HEX NYLOC 3/8-16 UNC SST
6	6	6	27	955939	WASHER LOCK 5/16" SST
2	2	2	28	955975	WASHER FLAT 3/8" SST
25	25	25	29	955976	WASHER FLAT 5/16 SST
1	1	1	30	958412	PIN ROLL 3/16 X 3/4 SST
2	2	2	31	971206	SCREW SET SOC 1/4-20 X 3/8 SST
1	1	1	32	977736	SCREW SOC HD CAP 5/16-18 X 2 1/4 SST
3	3	3	33	981616	SCREW FLT HD SOC 5/16-18 UNC X 1 SST
6	6	6	34	981720	SCREW FLT HD SOC 1/4-20 X 1 1/4 SST
1	1	1	35	989632	SCREW FIN HEX 5/16-24 X 2 SST
22	38	38	36	989712	SCREW FIN HEX 5/16-18 X 3/4 SST
3	3	3	37	989740	SCREW FIN HEX 5/16-18 X 2 1/2 SST
1	1	1	38	A04735	HANDLE
1	1	1	39	A05020	COLLAR,3/4" SPLIT,SST
REF.	REF.	REF.	40	C05736	STRAIGHT PLUG
REF.	REF.	REF.	41	C05739	CABLE CLAMP
REF.	REF.	REF.	42	C05740	RUBBER BUSHING 2.50 LG .438 ID
REF.	REF.	REF.	43	C07116	RECEPTACLE, FREE ANGING
REF.	REF.	REF.	44	C07131	INSERT, PLUG, 6 PIN, FEMALE
REF.	REF.	REF.	45	C07132	INSERT, 6 PIN, MALE
REF.	REF.	REF.	46	C07133	CABLE, 18AWG, 6 WIRE

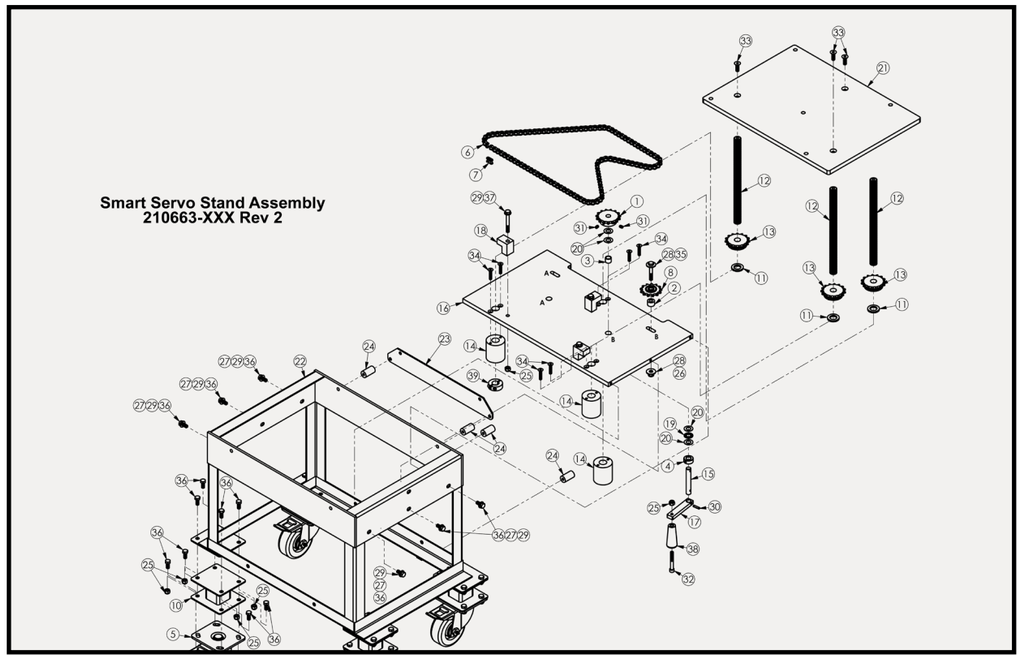
Smart Servo Stand Assembly
210663-XXX Rev 2



NOTES:
1. LABEL "A" IS LEFT HAND / LABEL "B" IS RIGHT HAND
2. RIGHT HAND SHOWN
3. FOR LEFT HAND FLIP ITEM 21

Smart Servo Stand
Drawing 210663-XXX Rev 2

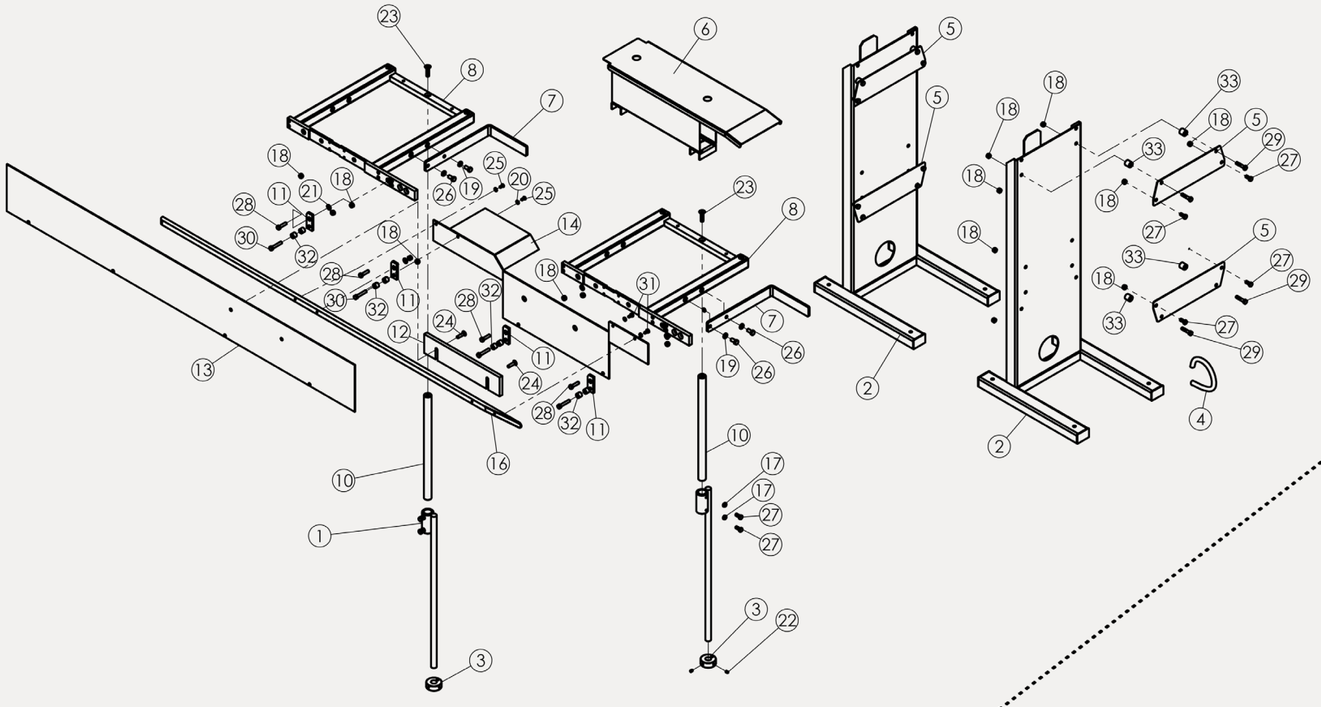
FOLD OUT TO VIEW DRAWING



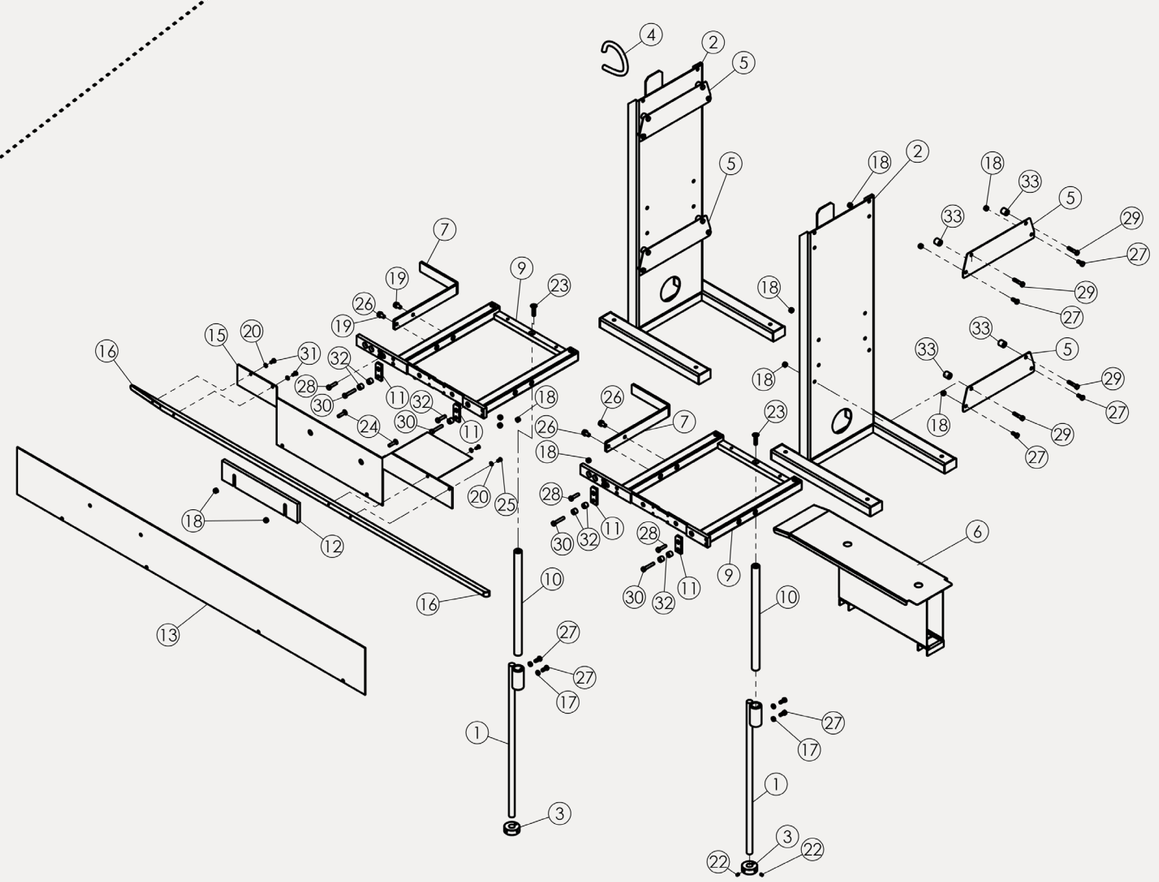
Pass Thru Kit
210998-XXX Rev 5

-1	-2	ITEM #	PART#	DESCRIPTION
2	2	1	302347	A/W, LEG SUPPORT
2	2	2	302360	A/W, STAND, ELEC. ENCLOSURE
2	2	3	302389	LEG, BASE
1	1	4	302458	CONDUIT ASS'Y 8 FT AMF M50
4	4	5	713667	ANGLE, EQUIPMENT BOX MOUNT
1	1	6	713985	A/W, TRANSFER SHELF DBL
2	2	7	713999	BRACKET SUPPORT EXT BRUSH
-	REF.	8	714104	A/W, TYER FRAME MOUNT, 2200
REF.	-	9	714125	A/W, TYER FRAME MOUNT, 2300
2	2	10	714162	SHAFT, TYER FRAME SUPPORT
4	4	11	714187	PLATE,LOWER FRAME SUPPORT,2200/2300
1	1	12	714188	PLATE, 2200/2300 BUN SPACER
1	1	13	715489	MOUNTING LAYOUT UBE DBL TYERS 36"
-	1	14	715680	MOUNT BUN GUIDES RH DUAL
1	-	15	715681	MOUNT BUN GUIDES LH
1	1	16	715696	BUN GUIDE, UBE 2200 DBL 36" FULL
4	4	17	955407	NUT HEX JAM 5/16-18 UNC SST
26	26	18	955619	NUT HEX NYLOC 5/16-18 UNC SST
4	4	19	955938	WASHER, LOCK 3/8" SST
6	6	20	955940	WASHER LOCK 1/4" SST
4	4	21	955976	WASHER FLAT 5/16 SST
4	4	22	971206	SCREW SET SOC 1/4-20 X 3/8 SST
2	2	23	980624	SCREW FLT HD SOC 3/8-16 UNC X 1 1/2 SST
2	2	24	981620	SCREW FLT HD SOC 5/16-18 UNC X 1 1/4 SST
4	4	25	985708	SCREW BUTT HD SOC 1/4-20 X 1/2 SST
4	4	26	988912	SCREW FIN HEX 3/8-16 X 3/4 SST
14	14	27	989712	SCREW FIN HEX 5/16-18 X 3/4 SST
10	10	28	989720	SCREW FIN HEX 5/16-18 X 1 1/4 SST
8	8	29	989724	SCREW FIN HEX 5/16-18 X 1 1/2 SST
4	4	30	989728	SCREW FIN HEX 5/16-18 X 1 3/4 SST
2	2	31	989908	SCREW FIN HEX 1/4-20 X 1/2 SST
8	8	32	A05483	SPACER BEARING PLATE
8	8	33	C03845	SPACER. .34 ID, .75 OD .75 L, SST

UBE Pass Thru Kit Dual RH
210998-XXX Rev 5

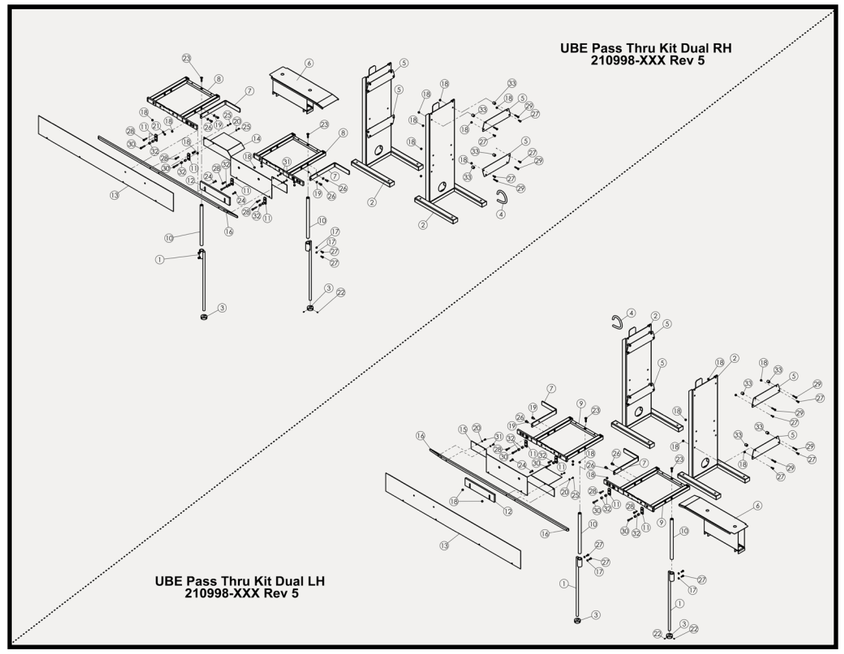


UBE Pass Thru Kit Dual LH
210998-XXX Rev 5



Pass Thru Kit Dual
Drawing 210998-XXX Rev 5

FOLD OUT TO VIEW DRAWING

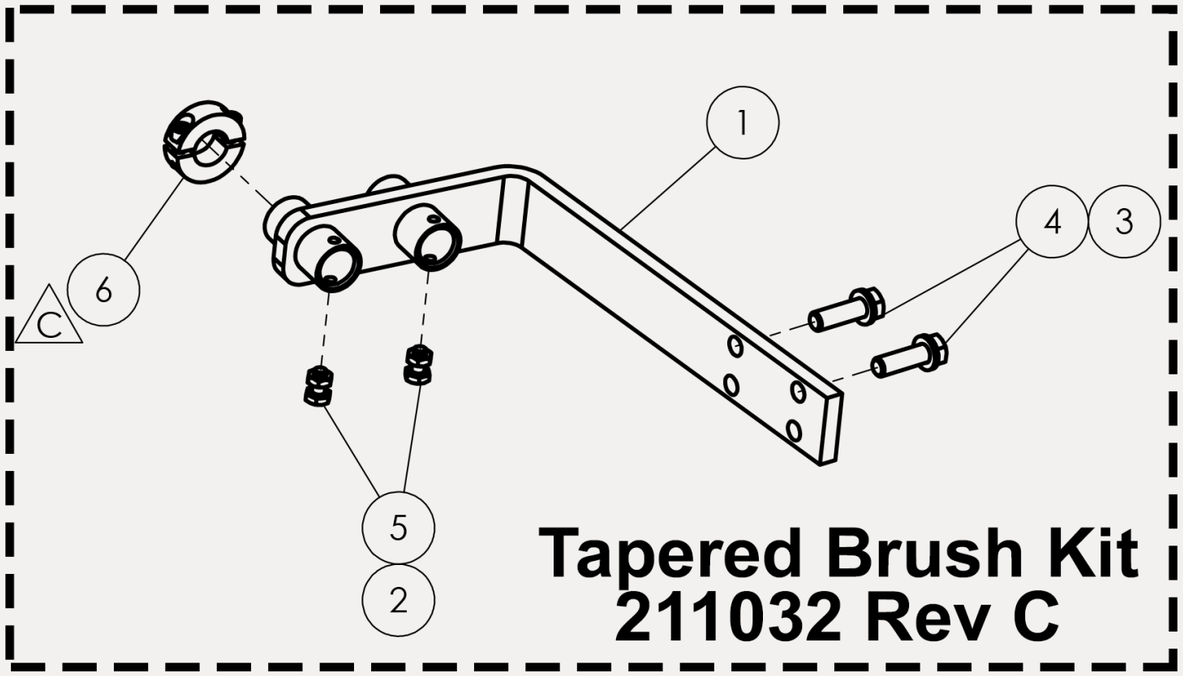


Taper Brush Bun Kit
211032 Rev C RH
211033 Rev C LH

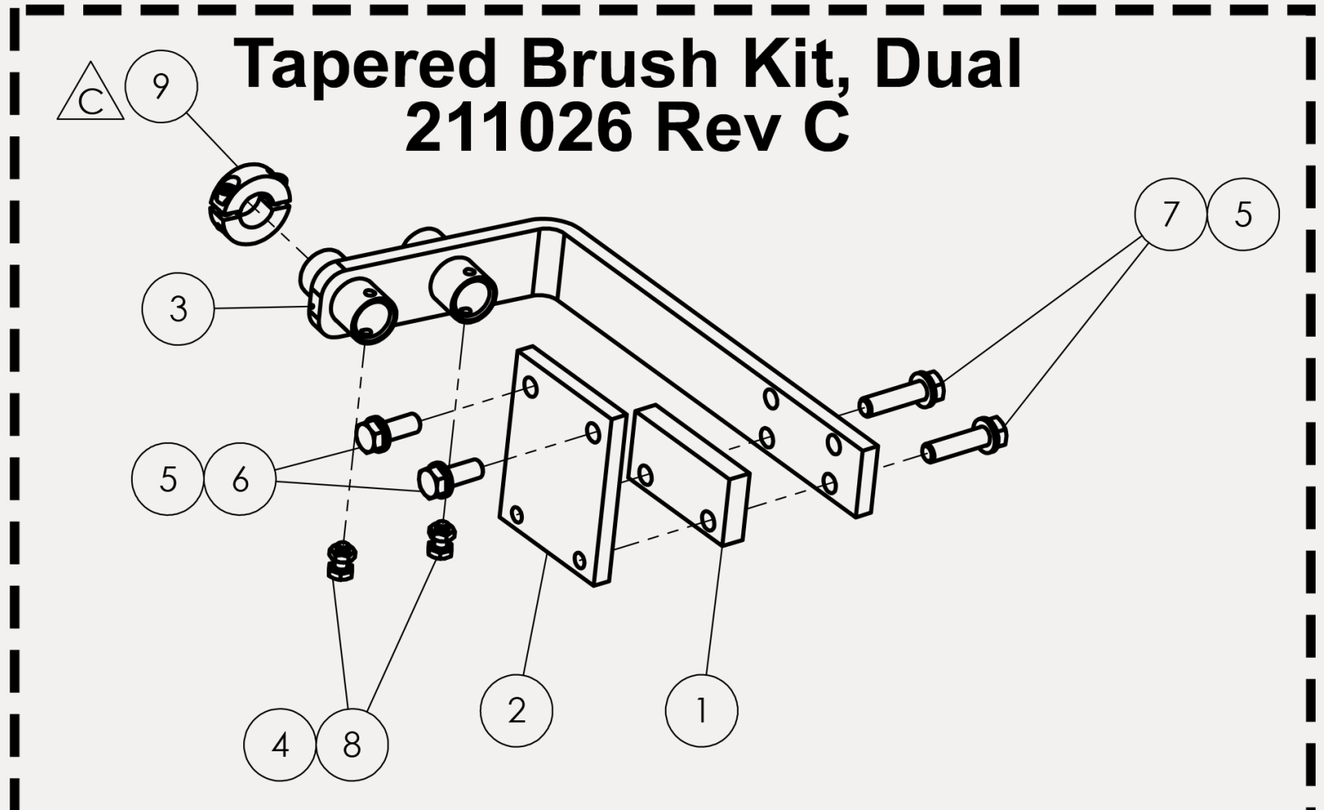
QTY.	ITEM #	PART#	DESCRIPTION
1	1	715769	A/W, 2200/2300 TAPERED BRUSH MNT
2	2	955409	NUT JAM 1/4-20 UNC
2	3	955938	WASHER, LOCK 3/8" SST
2	4	988920	SCREW FIN HEX 3/8-16 X 1 1/4 SST
2	5	989908	SCREW FIN HEX 1/4-20 X 1/2 SST
1	6	A05020	COLLAR,3/4" SPLIT,SST

Taper Brush Kit Dual
211026 Rev C RH
211027 Rev C LH

QTY.	ITEM #	PART#	DESCRIPTION
1	1	715309	BLOCK, DUAL TAPERED BRUSH SPACER
1	2	715544	PLATE, FISH TAPERED BRUSH MNT EXT
1	3	715769	A/W, 2200/2300 TAPERED BRUSH MNT
2	4	955409	NUT JAM 1/4-20 UNC
4	5	955938	WASHER, LOCK 3/8" SST
2	6	988916	SCREW FIN HEX 3/8-16 X 1 SST
2	7	988924	SCREW FIN HEX 3/8-16 X 1 1/2 SST
2	8	989908	SCREW FIN HEX 1/4-20 X 1/2 SST
1	9	A05020	COLLAR,3/4" SPLIT,SST

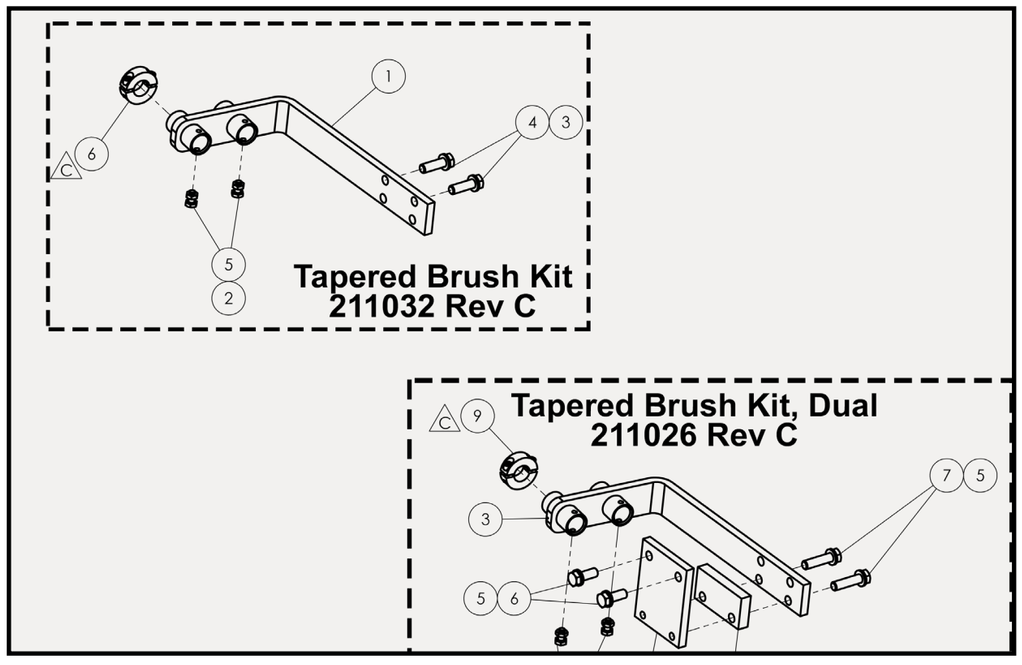


Tapered Brush Kit
211032 Rev C



Tapered Brush Kits
Drawing 211032 Rev C
Drawing 211026 Rev C

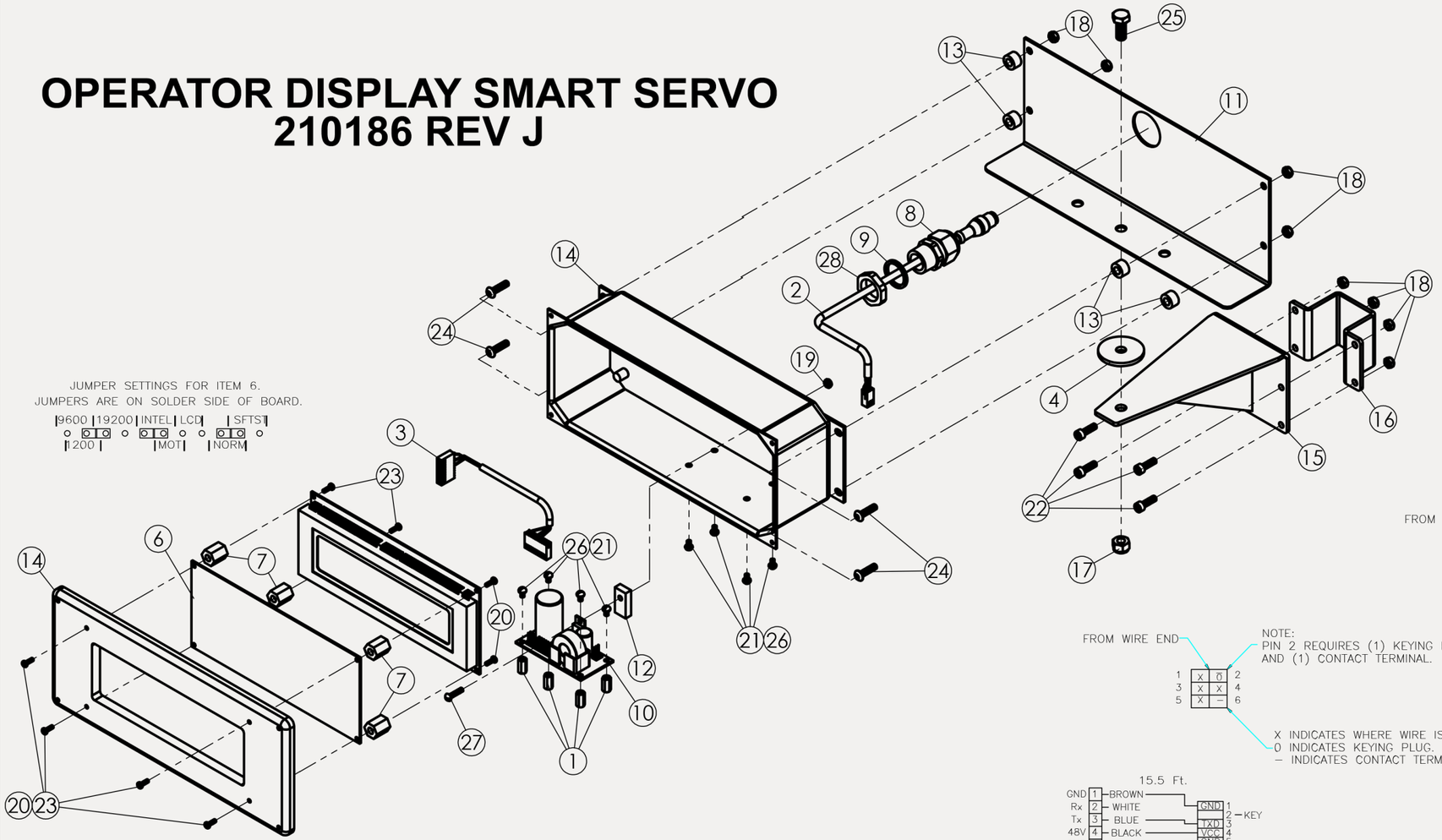
FOLD OUT TO VIEW DRAWING



Operator Display Smart Servo
210186 Rev J

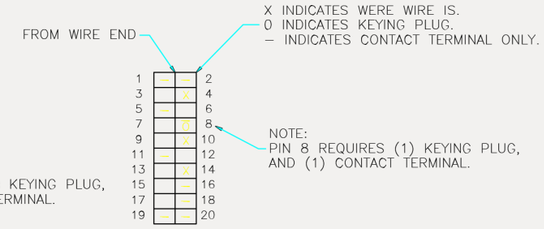
QTY.	ITEM #	PART#	DESCRIPTION
4	1	174069	STANDOFF,#6-32 X 1/2,ALUM,HEX
1	2	210203	ASSY,CABLE,COMM,ERROR DISP-2200
1	3	210204	ASSY,CABLE,PWR,DISPLAY-POWER SUPPLY
1	4	302450	WASHER, DISPLAY PIVOT
1	5	610000	DISPLAY, VFD (PRODUCTION)
1	6	610001	DISPLAY, FILTER (GREEN)
4	7	610004	STANDOFF, #4-40 UNC, .625 L.
1	8	610953	CONNECTOR, CORD, .20-.35, DOME, NYLON
1	9	610955	CONNECTOR,SEAL RING,1/2NPT,POLYETH
1	10	611566	PCBA, CONVERTER 12V TO 5V
1	11	710000	BRACKET, (VFD) DISPLAY BOX
1	12	710003	SPACER, HEAT SINK, MOUNT PCBA
4	13	710208	SPACER, 1/2OD X .257ID X .281L
1	14	714185	ENCLOSURE,REWORK,2200/2300 DISPLAY
1	15	714578	A/W, ERROR DISPLAY MNT.
1	16	714579	CHANNEL, ERROR DISPLAY MNT
1	17	955619	NUT HEX NYLOC 5/16-18 UNC SST
8	18	955621	NUT HEX NYLOC #10-24 UNC SST
1	19	955624	NUT HEX NYLOC #6-32 UNC SST
8	20	955935	WASHER LOCK #4 SST
8	21	955936	WASHER LOCK #6 SST
4	22	978910	SCREW SOC HD CAP #10-24 UNC X 5/8 SST
8	23	984806	SCREW,BUTT HD SOC. #4-40 X 3/8" SST
4	24	986312	SCREW BUTT HD SOC #10-24 X 3/4 SST
1	25	989712	SCREW FIN HEX 5/16-18 X 3/4 SST
8	26	999504	SCREW RD HD SLOT #6-32 X 1/4 SST
1	27	999510	SCREW RD HD SLOT #6-32 X 5/8 SST
1	28	C00174	LOCKING NUT, 1/2 NPT, NYLON

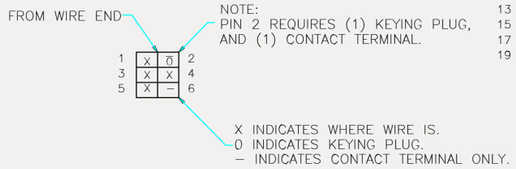
OPERATOR DISPLAY SMART SERVO
210186 REV J

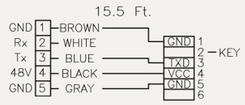


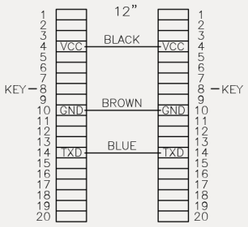
JUMPER SETTINGS FOR ITEM 6.
JUMPERS ARE ON SOLDER SIDE OF BOARD.

9600	19200	INTEL	LCD		SFTST
1200		MOT		NORM	









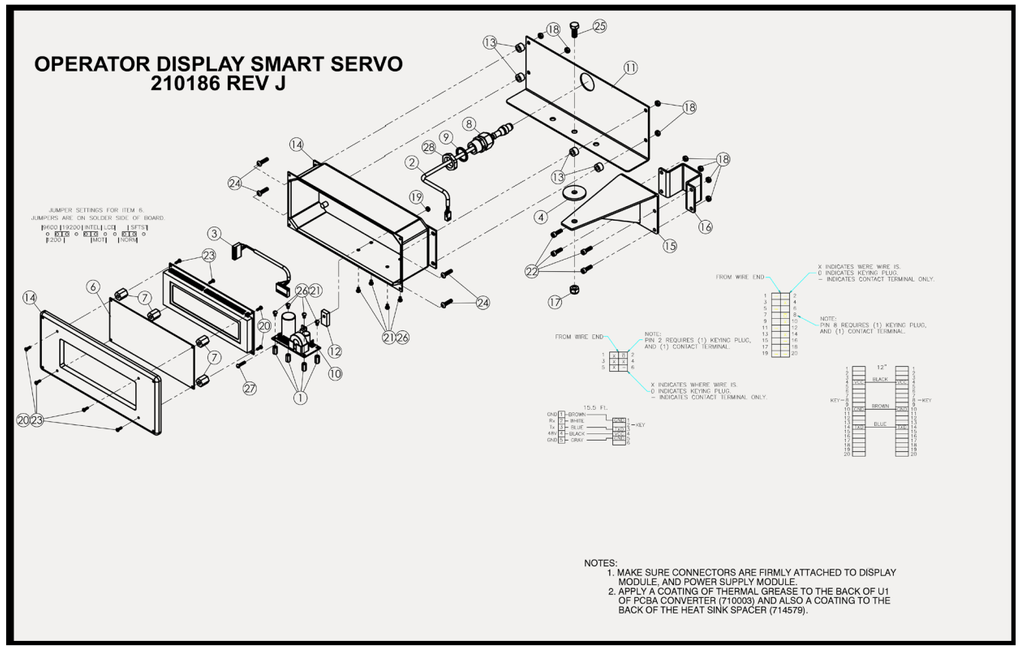
NOTES:

1. MAKE SURE CONNECTORS ARE FIRMLY ATTACHED TO DISPLAY MODULE, AND POWER SUPPLY MODULE.
2. APPLY A COATING OF THERMAL GREASE TO THE BACK OF U1 OF PCBA CONVERTER (710003) AND ALSO A COATING TO THE BACK OF THE HEAT SINK SPACER (714579).

Operator Display
Drawing 210186 Rev J

Electrical Schematics

FOLD OUT TO VIEW DRAWING



NOTES:
1. MAKE SURE CONNECTORS ARE FIRMLY ATTACHED TO DISPLAY MODULE, AND POWER SUPPLY MODULE.
2. APPLY A COATING OF THERMAL GREASE TO THE BACK OF U1 OF PCBA CONVERTER (710003) AND ALSO A COATING TO THE BACK OF THE HEAT SINK SPACER (714579).

SERVICE +/– 10%
110/220 VOLTS
50/60 HERTZ
1 PHASE
10 AMPS

DISC1 DISCONNECT

NOTE: WHEN MAIN POWER IS SINGLE PHASE THE CB1 BREAKER WILL BE REMOVED ON THE NEUTRAL LEG. ADD THE WIRE LABEL N.

EXCHANGE THE WHITE WIRE AND RED WIRE TO REVERSE ROTATION OF MOTOR

TOP BRUSH MOTOR — MTR5 CW — CAP1 — CAP2 — 18uF — MTR6 CCW — BOTTOM BRUSH MOTOR

BLOWER MOTOR — MTR7

GND PE

L1 L2 N

CB1 10A 2 pole — CB2 10A 1 pole — CB3 10A 1 pole — CB4 6A 1 pole — CB5 — CB6 2A 1 pole — CB7 — CB8 4A 1 pole

FLTR1 — (L) (G) (N) 100-240VAC@12A — PSM1 — (+V) 48VDC@2.1A (–V) — FAN

CR0 — CR1 — CR2 — CR3 — CR4 — SR1 — T1

OPERATOR BOX — E-STOP — PB1 — PB4 — INTLK1 INTLK2 DOOR TILT — CB4 — CB7 — J4

REMOTE OPERATOR BOX — PB5 START — MOTORS ENABLE L4 — TYER FAULT L6 — L5 — L3 — L2 — INITIALIZE

PB2 START — MOTORS ENABLE L1 — PB3 ON/AUTO/PDS — SS1 BRUSH/BELTS ON/AUTO/PDS

CR1 — PB6 THREAD — PB3 THREAD

BCD1 BELT SPEED SWITCH

P6

1	BCD SWITCH 2
2	BCD SWITCH 8
3	BCD SWITCH COM
4	RIBBON DROP SIGNAL IN
5	THREAD SWITCH IN
6	BAG SENSOR SIGNAL IN
7	BAGGER CLUTCH IN
8	FAULT LIGHT OUT
9	INITIALIZE LIGHT OUT
10	ALARM HORN OUT
11	COUNTER REALY OUT
12	OP IN4
13	COM
14	OP IN5
15	COM
16	OP IN6
17	RIBBON DISPENSE SIGNAL IN
18	COM
19	BCD SWITCH 1
20	BCD SWITCH 4
21	RIBBON DROP 24V
22	RIBBON DROP COM
23	THREAD SWITCH COM
24	BAG SENSOR COM
25	COM
26	FAULT LIGHT 24V
27	INITIALIZE LIGHT 24V
28	COUNTER RELAY 24V
29	ALARM HORN 24V
30	24V OP IN4
31	COM
32	24V OP IN5
33	24V OP IN6
34	RIBBON DISPENSE COM
35	RIBBON DISPENSE 24V
36	5V OP

PRS1 — PRS2 — PRS3 — PRS4 — PRS5 — PRS6 — PRS7 — PPS — SPEED FOLLOWING OPTION

P1

1	NEEDLE HOME SIGNAL IN
2	NEEDLE HOME SIGNAL OUT
3	TWISTER HOOK HOME SIGNAL IN
4	TWISTER HOOK HOME SIGNAL OUT
5	HOLDER SHEAR HOME SIGNAL IN
6	HOLDER SHEAR HOME SIGNAL OUT
7	I/O 3 IN
8	I/O 3 OUT
9	I/O 2 IN
10	I/O 2 OUT
11	I/O 1 IN
12	I/O 1 OUT
13	BAGGER ENABLE OUT
14	
15	SERVO ENABLE OUT
16	HOOD INTERLOCK
17	RUN SWITCH
18	STOP SWITCH
19	NEEDLE HOME 24V
20	NEEDLE HOME COM
21	TWISTER HOOK HOME 24V
22	TWISTER HOOK HOME COM
23	HOLDER SHEAR HOME 24V
24	HOLDER SHEAR HOME COM
25	I/O 3 24V
26	I/O 3 COM
27	I/O 2 24V
28	I/O 2 COM
29	I/O 1 24V
30	I/O 1 COM
31	COM
32	24V OP IN5
33	24V OP IN6
34	RIBBON DISPENSE COM
35	RIBBON DISPENSE 24V
36	5V OP

ENCO1 ENCODER — ENCO2 TWISTER HOOK ENCODER — ENCO3 HOLDER SHEAR ENCODER — ENCO4 BELTS MOTOR ENCODER

MTR1 NEEDLE MOTOR — MTR2 TWISTER HOOK MOTOR — MTR3 HOLDER SHEAR MOTOR — MTR4 BELTS MOTOR

INSIDE SENSORS: HALL MTR1 — HALL MTR2 — HALL MTR3 — HALL MTR4

J2 TOP — J3 BOTTOM — P2 — P3 — P4 — P5

J5 CPU BOARD — J6 LED DISPLAY — CBL6 — CBL7

J7 COMPUTER INTERFACE CBL4 BULKHD — CBL4 PLUG COMPUTER INTERFACE — DB9 FEMALE — CBL4 PLUG ERROR DISPLAY — ERROR DISPLAY — INSIDE ERROR DISPLAY

U3

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CB1,CB2,CB3	007649-010	4	CIRCUIT BREAKER,250V,10AMP
2	CB4	007649-006	1	CIRCUIT BREAKER,250V,6AMP
3	CB5	007649-008	1	CIRCUIT BREAKER,250V,8AMP
4	CB6	007649-002	1	CIRCUIT BREAKER,250V,2AMP
5	CB7,CB8	007649-004	2	CIRCUIT BREAKER,250V,4AMP
6	CB1,2,3,4,5,6,7,8	007649-100	9	CIRCUIT BREAKER,250V,BASE
7	CB2,3,4 P/O	007738-003	1	CIRCUIT BREAKER,BASE,JUMPER,3POS
8	CB5,6,7,8 P/O	007738-002	2	CIRCUIT BREAKER,BASE,JUMPER,2POS
9	CB11	210673	1	CABLE ASSY,220,PCB-POWER 15"
10	CB12	210674	1	CABLE ASSY,220,PCB-SIGNAL 15"
11	CB14	210672	REF.	CABLE ASSY,220,COMPUTER INTERFACE
12	CR0	611455	2	RELAY,CONTACTOR,48VDC
13	CR1	610374	1	RELAY,TERM-MTG,110VAC,SPDT,WHITE
		610375	1	RELAY,TERM-MTG,220VAC,SPDT,WHITE
14	CR1,2,3,4	610404	4	RELAY,TERM-MTG,24VDC,SPDT,WHITE
15	CR1 P/O	610387	2	RELAY,TERM-MTG,SEPARATION PLATE
16	CR11	605138	1	RELAY,SOLID STATE,DC TO AC
17	CR11 P/O	C00168	1	RELAY,SSR,COVER,FINGER SAFE
18	DISC1	A02345	1	DISCONNECT
19	DISC1 P/O	A02346	1	HANDLE,DISCONNECT
20	DISC1 P/O	610342-004	1	SHAFT,DISCONNECT
21	ENC1	714218	1	ENCLOSURE,REWORK,MAIN
22	ENC1 P/O	C03845	4	SPACER,9/32" X 3/4, 3/4 LG.
23	FAN1	611576	1	FAN,AXIAL,3.13",32CFM,48VDC
24	FAN1 P/O	611577	2	FAN,FILTER SCREEN,80MM
25	FAN1 P/O	611578	2	FAN,FINGER GUARD,80MM
26	FLTR1	C05818	1	SUPPRESSOR,LINE FILTER,120/240V,10AMP
27	GND	C06488	1	GROUND LUG
28	GND-STRP	C07155	1	GROUND STRAP,10"
29	PNL1	C06019	1	PANEL REWORKED,MAIN
30	PSM1	611443	1	POWER SUPPLY MODULE,110/220 TO 48VDC
31	PSM1 P/O	710714	1	BLOCK,MOUNT POWER SUPPLY
32	PSM1 P/O	992412	3	SCREW FIN HEX,M4X0.7X12mm
33	SR1	611508	2	RELAY,TERM-MTG,48VDC,6A,DPDT,WHITE
34	SR1 P/O	610443-001	.2	RELAY,TERM-MTG,JUMPER RED
35	SR1 P/O	610443-002	.2	RELAY,TERM-MTG,JUMPER BLUE
36	TB1,TB2 P/O	C05843	70	MARKER STRIP
37	TB1 P/O	C06369	1	JUMPER 2-POS.
38	TB1 P/O	C06461	32	TERMINAL BLOCK
39	TB1 P/O	C06462	3	END COVER
40	TB1,TB2,TB3 P/O	C06464	18"	RAIL,DIN
41	TB1,TB2,TB3 P/O	C06465	6	CLAMP,END ANCHOR
42	TB1 P/O	C06525	5	GROUNDING TERMINAL
43	TB1,TB2 P/O	C07117	5	TERMINAL BLOCK,DUAL
44	TB1,TB2 P/O	C07118	3	END COVER,DUAL

(210605-06/210606-06) SERVO TYER ASSY ELEC. COMP.

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	AH1	C07214	1	ALARM,SONALERT,6 TO 28VDC
2	CBL8	210670	1	CABLE ASSY 2200 MOTOR-ENCODER

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	AH1	C07214	1	ALARM,SONALERT,6 TO 28VDC
2	CBL8	210670	4	CABLE ASSY 2200 MOTOR-ENCODER
3	CBL9	210671	4	CABLE ASSY 2200 MOTOR POWER
4	CBL9 J2,J3	611480	4	PCB,CONNECTOR,4 POS.
5	GNDSTRP	C07155	1	GROUND STRAP 10"
6	INTLK1,INTLK2	C07678	2	INTERLOCK,CODED MAGNETIC SAFETY
7	MIR/ENC01,2,3,4	210620	4	ASSY,2200 MOTOR-ENCODER,CABLE
8	ENC01,2,3,4	611458	REF.	ENCODER,ACCU-5-28VDC,8WIRE,2FT CABLE
9	MIR1,2,3,4	611457	REF.	MOTOR,BRUSHLESS,48VDC,W/HALLS
10	PCB1 P1,P6	611478	2	PCB,CONNECTOR,36 POS.
11	PCB1 J4	611481	1	PCB,CONNECTOR,3 POS.
12	PRS1-5	C07625	5	SENSOR,PROX,8MM,10-30VDC,NPN,NO
13	PRS1,3,4,5 P/O	C07626	4	SENSOR,CABLE,M8,3WIRE,F,QC,90
14	PRS2 P/O	A02349	1	SENSOR,CABLE,M8,3WIRE,F,QC,STR
15	TB3 P/O	610360	4"	RAIL,DIN,MINI
16	TB3 P/O	610361	16	TERMINAL BLOCK,MINI
17	TB3 P/O	610362	1	END COVER,MINI
18	TB3 P/O	610363	2	CLAMP,END,ANCHOR,MINI
19	TB3 P/O	610352	3	TERMINAL JUMPER 2 POS,MINI
20	TB3 P/O	610353	5	TERMINAL JUMPER 3 POS,MINI

(210615/210616) ASSY,PCB MOUNTING COMP.

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CBL6	17508I-001	1	CABLE ASSY CPU-BOARD TO AUX-BOARD
2	FU1-FU4	C07698-007	4	FUSE,2ASB,7A,125V,SLO-BLO
3	PCB1	611464	1	PRINTED CIRCUIT BOARD,FIELD TERMINATION
4	PCB1 P/O	174819	5	PCB,STAND OFF,3/4 LG
5	PCB1 P/O	174069	4	PCB,STAND OFF,1/2 LG
6	PCB1 P/O	611506	4	PCB,STAND OFF,MALE/FEMALE 3/4 LG
7	PCB1 P/O	611515	1	PCB,JUMPER,SHUNT,SOLDER CONT
8	PCB2	C01410	1	PRINTED CIRCUIT BOARD,CPU

(210618/210619) ASSY,OPERATOR CONTROLS

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	BCD1	C01224	1	SWITCH,BDC PUSHWHEEL,1 DIGIT ASSY
2	BCD1 P/O	611487	1	SWITCH,BDC PUSHWHEEL,CONNECTOR
3	CBL7	611504	1	CABLE ASSY AUX-BOARD TO LED DISPLAY
4	LED1	611488	1	ASSY LED DISPLAY 2200
5	LT1,LT2	610330	2	SWITCH,LIGHT,LED,24VDC,GREEN
6	LT3	610328	1	SWITCH,LIGHT,LED,24VDC,RED
7	PB1	C07693	1	SWITCH,LIGHTED,PUSH/PULL,MUSHROOM,RED
8	PB1 P/O	C07694	1	SWITCH,LIGHT ASSEMBLY,48VDC,LED
9	PB1 P/O	C01221	1	SWITCH,CONTACT CARTRIDGE (2NC)
10	PB2	C01213	1	SWITCH,PUSHBUTTON,FLUSH,GREEN
11	PB3	C01246	1	SWITCH,PUSHBUTTON,FLUSH,YELLOW
12	PB1,2,3,SS1 P/O	C07102	5	SWITCH,CONTACT CARTRIDGE (1NO)
13	SS1	C07130	1	SWITCH,SELECTOR,3POS
14	LABEL	611483	1	LABEL OPERATOR CONTROL 2200
		611507	1	LABEL OPERATOR CONTROL 2300
15	A/W OPER-CONTROL	714154	1	A/W OPERATOR CONTROL PLATE 2200
		714153	1	A/W OPERATOR CONTROL PLATE 2300

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CAP1,CAP2	C01296	2	CAPACITOR,4UF,450VAC
2	CAP1,CAP2 P/O	710688	2	COVER,CAPACITOR,BRUSH DRIVE
3	ENC3	A08369	1	ENCLOSURE,6X4X4 SCREW COVER
4	MTR5,MTR6	611178	2	MOTOR,GEAR,230-50/60-1
5	PL8	611842	1	CABLE,POWERFAST,BULKHEAD,14-4,600V,15A,5M,90
6	PL8	611841	1	CABLE,POWERFAST,BULKHEAD,14-4,600V,15A
7	TB4 P/O	610360	2.3"	RAIL,DIN,MINI
8	TB4 P/O	610361	4	TERMINAL BLOCK,MINI
9	TB4 P/O	610362	1	END COVER,MINI
10	TB4 P/O	610363	2	CLAMP,END,ANCHOR,MINI
11	TB4 P/O	610352	1	TERMINAL JUMPER 2 POS,MINI
12	TB4 P/O	610353	1	TERMINAL JUMPER 3 POS,MINI
13	TB4 P/O	610534	1	TERMINAL,GROUNDING,MINI

(210628) ASSY,CONNECTOR PLATE

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CBL1	210677	1	BULKHEAD,ASSY,2200,PCB-POWER 15'
2	CBL2	210678	1	BULKHEAD,ASSY,2200,PCB-SIGNAL 15'
3	CBL4	210676	1	BULKHEAD,ASSY,2200,COMPUTER INTERFACE
4	CBL5	611494	1	CONNECTOR,BULKHEAD,FEMALE,3POLE,M8
5		113763	1	PLUG,HOLE,CHROME 7/8 DIA.

(210626-001/002) ASSY,PIVOT DUAL RIBBON

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CBL5 P/O	611495	1	CONNECTOR,PLUG,MALE/FEMALE,3POLE,M8
2	PRS6	C07625	1	SENSOR,PROX,8MM,10-30VDC,NPN,NO

(210999-001) ASSY,BRUSH DRIVE 110 VAC

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CAP1,CAP2	C01294-001	2	CAPACITOR,18UF,250VAC
2	CAP1,CAP2 P/O	710688	2	COVER,CAPACITOR,BRUSH DRIVE
3	ENC3	A08369	1	ENCLOSURE,6X4X4 SCREW COVER
4	MTR5,MTR6	611158	2	MOTOR,GEAR,115-50/60-1
5	PL8	611841	1	CABLE,POWERFAST,BULKHEAD,14-4,600V,15A
6	PL8	611842	1	CABLE,POWERFAST,14-4,600V,15A,5M,90
7	TB4 P/O	610360	2.3"	RAIL,DIN,MINI
8	TB4 P/O	610361	7	TERMINAL BLOCK,MINI
9	TB4 P/O	610362	1	END COVER,MINI
10	TB4 P/O	610363	2	CLAMP,END,ANCHOR,MINI
11	TB4 P/O	610352	1	TERMINAL JUMPER 2 POS,MINI
12	TB4 P/O	610353	1	TERMINAL JUMPER 3 POS,MINI
13	TB4 P/O	610534	1	TERMINAL,GROUNDING,MINI

(210999-002) ASSY,BRUSH DRIVE 220 VAC

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	CAP1,CAP2	C01296	2	CAPACITOR,4UF,450VAC
2	CAP1,CAP2 P/O	710688	2	COVER,CAPACITOR,BRUSH DRIVE
3	ENC3	A08369	1	ENCLOSURE,6X4X4 SCREW COVER
4	MTR5,MTR6	611178	2	MOTOR,GEAR,230-50/60-1
5	PL8	611842	1	CABLE,POWERFAST,14-4,600V,15A,5M,90
6	PL8	611841	1	CABLE,POWERFAST,BULKHEAD,14-4,600V,15A
7	TB4 P/O	610360	2.3"	RAIL,DIN,MINI
8	TB4 P/O	610361	4	TERMINAL BLOCK,MINI
9	TB4 P/O	610362	1	END COVER,MINI
10	TB4 P/O	610363	2	CLAMP,END,ANCHOR,MINI
11	TB4 P/O	610352	1	TERMINAL JUMPER 2 POS,MINI
12	TB4 P/O	610353	1	TERMINAL JUMPER 3 POS,MINI
13	TB4 P/O	610534	1	TERMINAL,GROUNDING,MINI

(142018) ASSY,BLOWER 110 VAC

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	MTR7	118471	1	BLOWER REWORKED 220V - 113941
2	PL10	A00509	1	CONNECTOR,TWISTLOCK,FEMALE,3POLE
3	PL10	A00510	1	CONNECTOR,TWISTLOCK,MALE,3POLE
4	PL10 P/O	C07638	1	COVER,WEATHER PROOF-A00509
5	PL10 P/O	C07639	1	COVER,WEATHER PROOF-A00510

(210978/210979) SPEED FOLLOWING ENCODER OPTION

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	ENC01	610021	1	ENCODER,EPC,5-28VDC,8PIN,M,QC
2	ENC01 P/O	610024-001	1	ENCODER,CABLE,8WIRE,F,QC,STR,6M

(302445) SPEED FOLLOWING PROXIMITY OPTION

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	PRS7	C07625	1	SENSOR,PROX,8MM,10-30VDC,NPN,NO
2	PRS7 P/O	C07626	1	SENSOR,CABLE,M8,3WIRE,F,QC,90

(210732/210733) PACKAGE DETECTION SENSOR KIT CIRCUIT

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	PRS8	C07159	1	SENSOR,PROX,18MM,10-30VDC,24IN RETRO
2	PRS8 P/O	714150	1	BRACKET,PROX MOUNT,PDS100 L/H
		714008	1	BRACKET,PROX MOUNT,PDS100 R/H

(210633-001,002,003) PORTABLE STAND

REF	SYMBOL	PART #	QUAN	DESCRIPTION
1	PL13 P/O	C07116	1	RECEPTACLE,FREE HANGING
2	PL13 P/O	C07131	1	INSERT,6 PIN,FEMALE
3	PL13 P/O	C05736	1	SHELL,PLUG
4	PL13 P/O	C07132	1	INSERT,6 PIN,MALE
5	PL13 P/O	C05740	2	RUBBER BUSHING SIZE 8
6	PL13 P/O	C05739	2	CLAMP,CABLE
7	PL13 P/O	C07133	15'	CABLE,18AWG,6 COND.
8		112009	1	CABLE,POWER CORD,14AWG,3 COND.

FOLD OUT TO VIEW DRAWING