

BURFORD CORP.®

SERVICE MANUAL

FOR YOUR

BURFORD ELECTRONIC SERVO TYER

MODEL 2000VTR or 2100VTR

MODEL #_____

SERIAL #_____

WIRING DIAGRAM #_____

DATE: February 13, 2013

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MANUAL PART No. C00261 rev "D"

DISCLAIMER

The descriptions and specifications contained in this Service Manual were in effect at the time this manual was approved for printing. Our policy is one of continuous improvement, and we do hereby reserve the right to discontinue models at any time, or to change specifications, prices, or designs 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 the removal of guards, or faulty wiring due to improper installation.

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1.0 SAFETY PRECAUTIONS

AS BURFORD CORP. STRIVES TO PROMOTE SAFETY IN THE MAINTENANCE AND OPERATION OF BURFORD EQUIPMENT, WE REQUEST THAT THE FOLLOWING SAFETY FEATURES BE FOLLOWED, ALONG WITH ANY ADDITIONAL SAFETY PROCEDURES SET BY THE CUSTOMER'S IN-PLANT SAFETY OFFICERS OR LOCAL CODES.

1. Read manual completely before attempting installation or operation of this unit.
2. Incoming electrical power must be properly shielded, routed, and grounded. All safety codes should be followed. Study wiring diagrams before attempting installation.
3. Disconnect power to equipment before removing any guards or covers. Replace guards or covers before resuming operation of the unit.
4. Loose clothing and long hair should be considered a safety hazard around mechanical equipment. Ensure that they will not be entangled in the equipment.
5. Do not bypass safety switches.
6. Do not attempt repairs while equipment is running.
7. Use only original equipment parts designed to safely operate in the equipment.
8. Only authorized personnel should be allowed to operate or perform maintenance on the unit.
9. The 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.

2.0 GENERAL INFORMATION

The Burford 2000VTR Series Electronic Servo Tyer is designed to close plastic bags with twist tie ribbon where product is presented with the bags in a vertical orientation. The tyer uses a microprocessor to control the motion of four servo motors, which perform the twist tying function. This machine has an optional stand alone rolling frame and may be interfaced into the existing control system to create a complete package closing system.

2.1 Specifications

Depending on conveyor speed and flight spacing, the Servo Tyer is capable of high operating speeds. The Servo Tyer operates on a nominal 110 Volts, 60 Hz, single-phase alternating current. 10 amp service is recommended. Terminals are available in the main enclosure for bagger interlock and safety circuits (see electrical diagram). A counter signal is also available, which can be used in conjunction with an external counter (not provided).

NOTE: Minimum size for a service transformer shall be 1.5KVA.

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 since the package spacing is not critical. All referenced measurements are in inches except as noted.

2.1.1 Bag Thickness Requirements

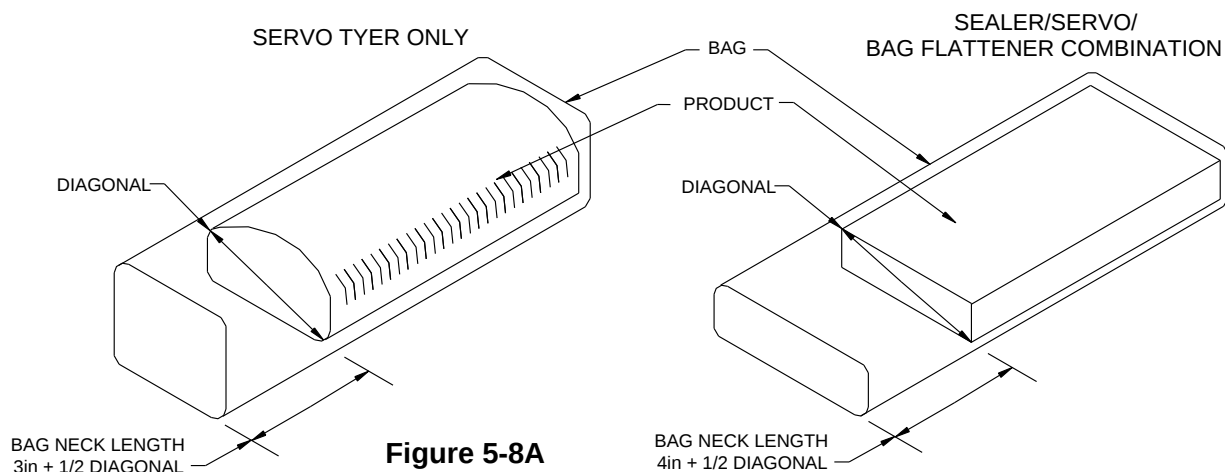
For optimal performance, a minimum bag thickness of 1.25 mil is recommended.

2.1.2 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 Corporation if we can be of assistance.

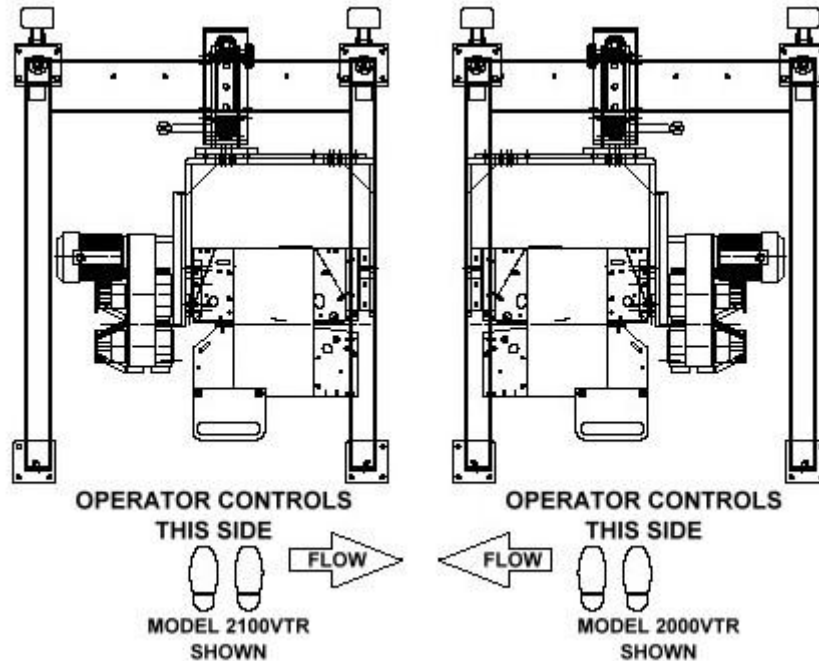
CAUTION: Short bag neck lengths can cause excessive ribbon drops and package jam-ups.



2.2 Model Numbers

MODEL 2000VTR (Right Hand) - mounts on right side of conveyor.

MODEL 2100VTR (Left Hand) - mounts on left side of conveyor.



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

3.0 INSTALLATION PROCEDURE

These instructions are for a typical bagger. If your specific installation requirements are different from what is described here, refer to section 3.3 on how to contact Burford Corporation for assistance.

3.1 Mechanical Installation

The unit should be positioned such that the following may be obtained:

1. The tyer assembly is properly positioned over the conveyor and aligned with the product flow.
2. The front panel of the control box and operator panel are easily accessible.

Once the unit has been correctly positioned, the castors may be locked in place to prevent inadvertent movement of the unit. Be sure to lock all castors so the unit will not move if bumped.

3.2 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 2000VTR Electronic Servo Tyer is nominally a 110 VAC machine. If required, minimum service transformer size shall be 1.5 KVA.

3.3 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

4.0 THEORY OF OPERATION

Before discussing the specifics of the Burford Model 2000VTR Electronic Servo Tyer, the overall operation of the tyer will be described to illustrate the principles of the tying cycle. The Model 2000VTR 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, if provided, that flatten and lift 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 depresses the bag switch, which readies the electronics for the start of the tie cycle. When the bag neck releases the bag switch, the Model 2000VTR 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.

A functional diagram for control of the tyer's servo motors is shown in Figure 4-2A.

FUNCTIONAL DIAGRAM FOR CONTROL OF MODEL 2000/2100 TYER SERVO MOTORS

This diagram is intended to show the function and relationship of the main components used in controlling the tyer's servo motors.
Not all wires or components are shown.

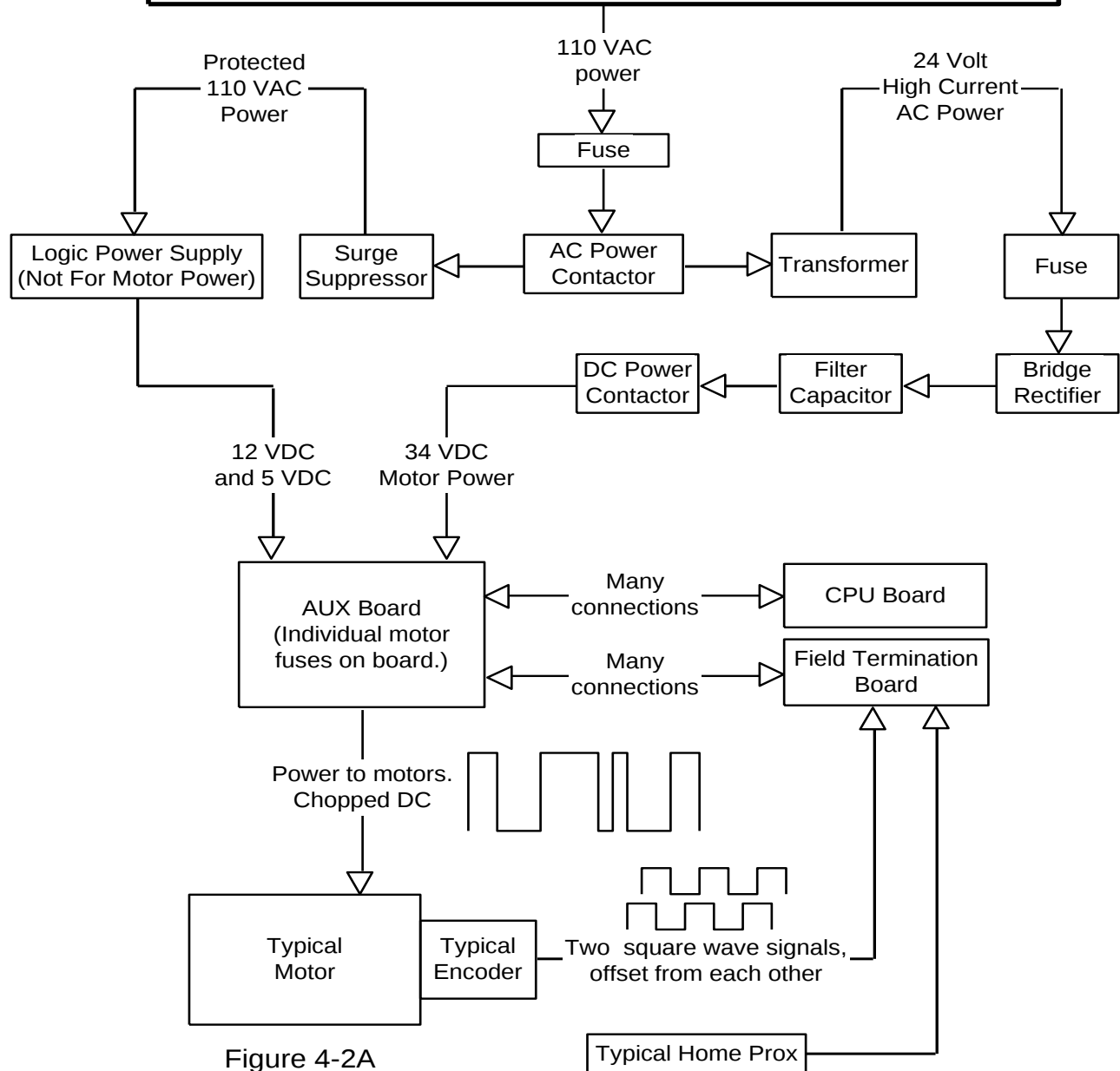


Figure 4-2A

4.1 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. This feature can be disabled with DIP SWITCHES 4 and 6 on the AUX board. See section 7.3 for details.

5.0 GENERAL OPERATION

The following is a discussion of the overall operation of the Model 2000VTR Electronic Servo Tyer. The Model 2000VTR 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 box. 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 push the master ON button on the front of the main enclosure. This will supply power to the Tyer's electronics, but does not supply power to the servo motors. Next, the operator must push the RUN button on the operator control box. 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.

5.1 Operator Controls

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 RUN button is pushed. Pushing the STOP button should not turn off the INITIALIZED light.

RUN 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 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.

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.

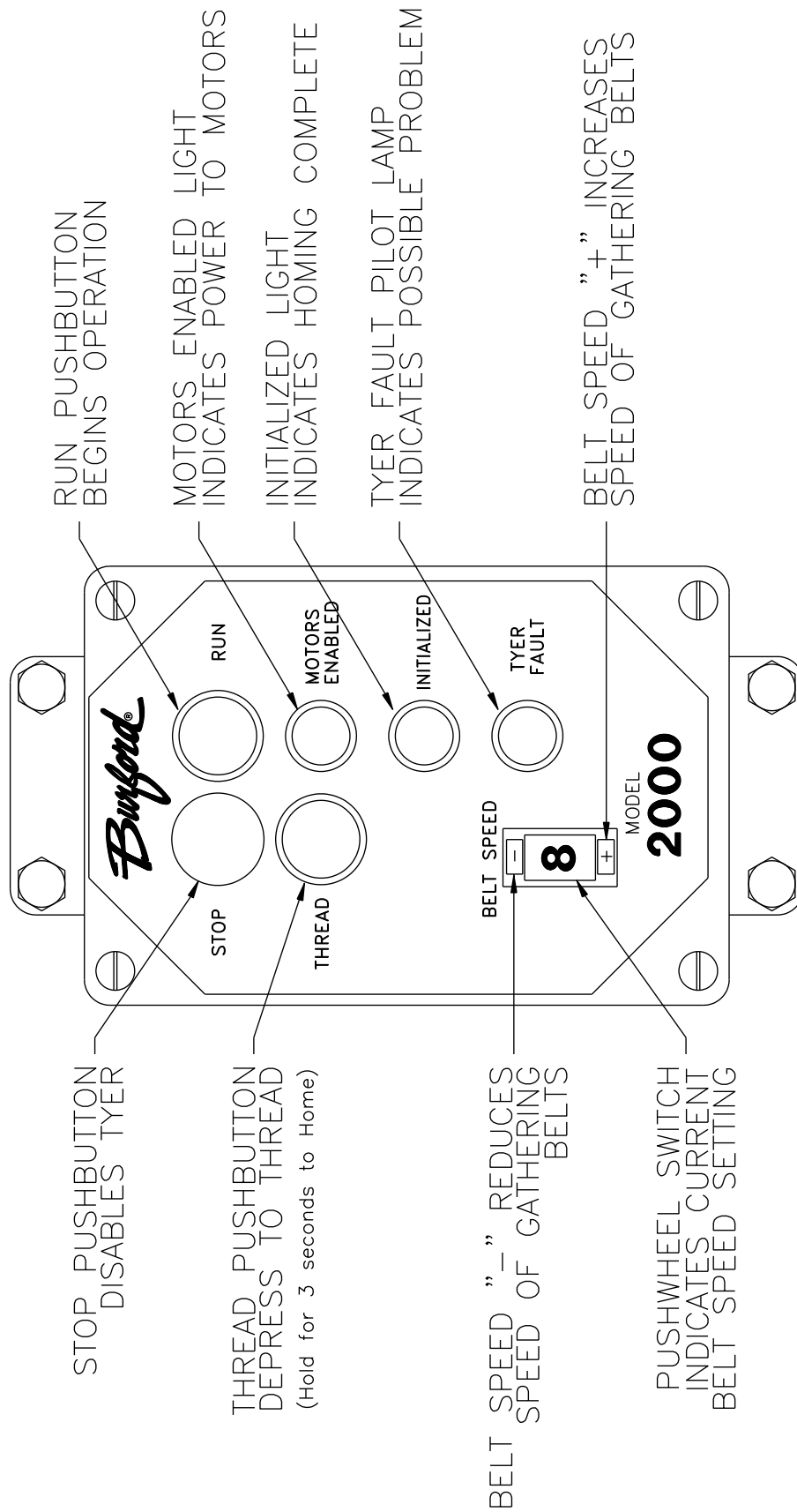


Figure 5-2A

5.1 Operator Controls, cont'd

TYER FAULT Light

This light will indicate problems with the Tyer. During normal operation, the light should be off. The light will turn on for any reason if the Tyer drops out of the run mode. For example, if the STOP button is pushed, or the front cover is opened. In addition, if a ribbon drop is detected the fault light will also turn on, but the Tyer will stay in the run mode.

In addition, this light is toggled on and off whenever the audible alarm is beeping. This is intended to help the operator identify which machine is indicating an alarm.

BELT SPEED Pushwheel 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 (see table below for approximate values). 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 7.8), this switch provides a fine adjustment for conveyor speed.

BCD Setting	Est. Belt FPM
1	18
2	22
3	27
4	33
5	40
6	48
7	58

BCD Setting	Est. Belt FPM
8	70
9	85
10	103
11	125
12	151
13	182
14	221
15	267

5.2 Main Enclosure Controls

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.

OFF Pushbutton

Drops out the master control relay. Removes power from the Tyer's electronics and the servo motors.

ON Pushbutton

Pulls in the master control relay contacts and supplies power to the Tyer's electronics. Does not supply power to the servo motors.

BRUSHES/BELTS, AUTO ON Selector Switch

This is a two 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.

5.2 Main Enclosure Controls, cont'd.

Audible Alarm

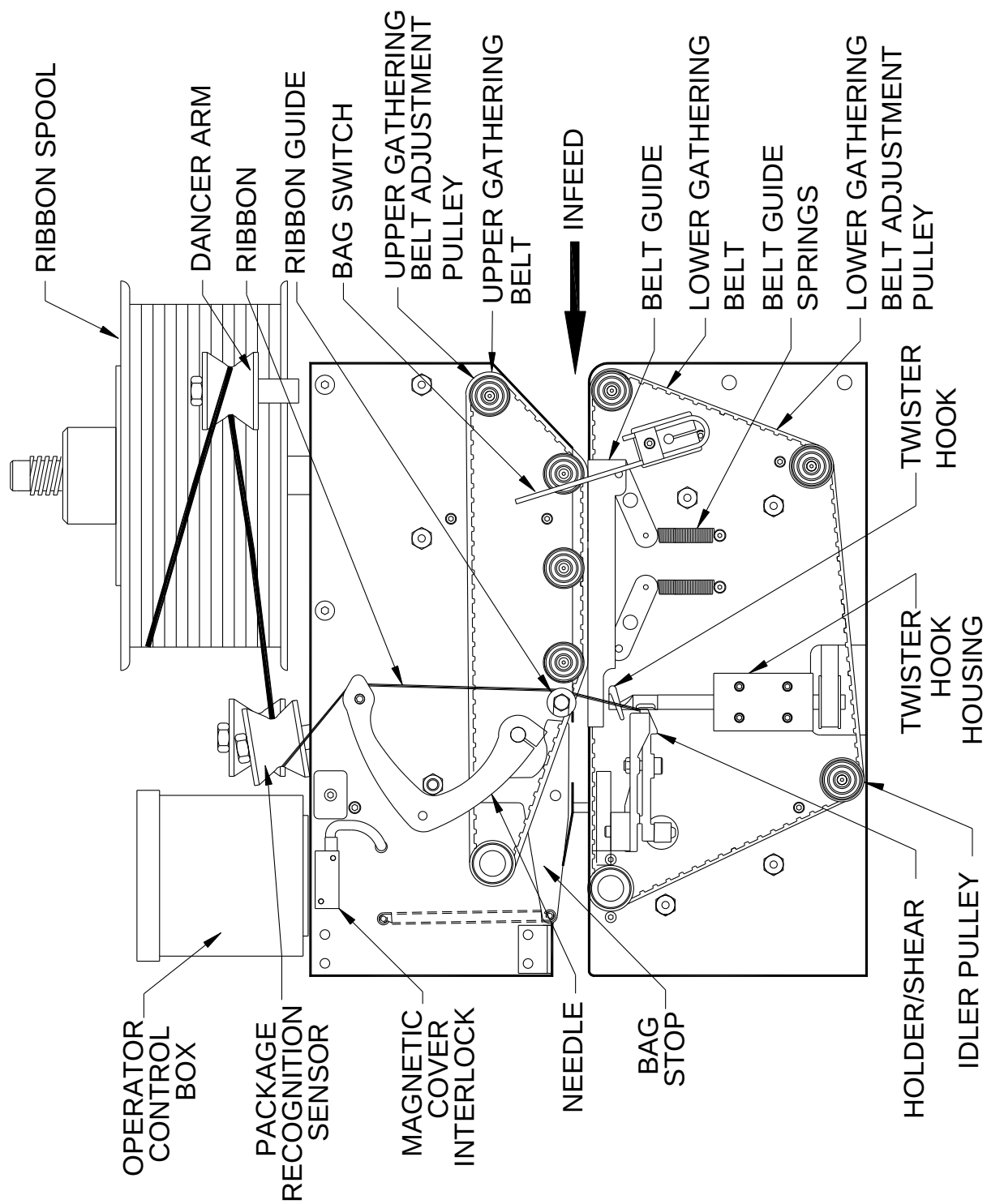
This gives the operator audible feedback as to the status of the Tyer. The following is a list of the audible alarm codes. A long beep is 1 second in duration. A short beep is 1/2 second in duration.

ALARM	CODE DISPLAYED	DESCRIPTION
1 Short	None	Power turned on, or home sequence successful.
2 Short	H006	Bag necks too close together (tried to start 2 nd cycle before 1 st 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.

5.3 Changing and Threading the Ribbon

For clarification on threading, refer to Figure 5-5A or the ribbon routing decal next to the ribbon spool on the front of 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. Refer to Figure 5-5B 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 next to the operator control box. Then, guide the ribbon toward the infeed end and over the top of the roller on the end of the dancer arm. Next, guide the ribbon back toward the discharge end and over the bottom roller next to the operator control box. 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.



NOTE: COVERS REMOVED FOR CLARITY
 BOTTOM VIEW
 Figure 5-5B

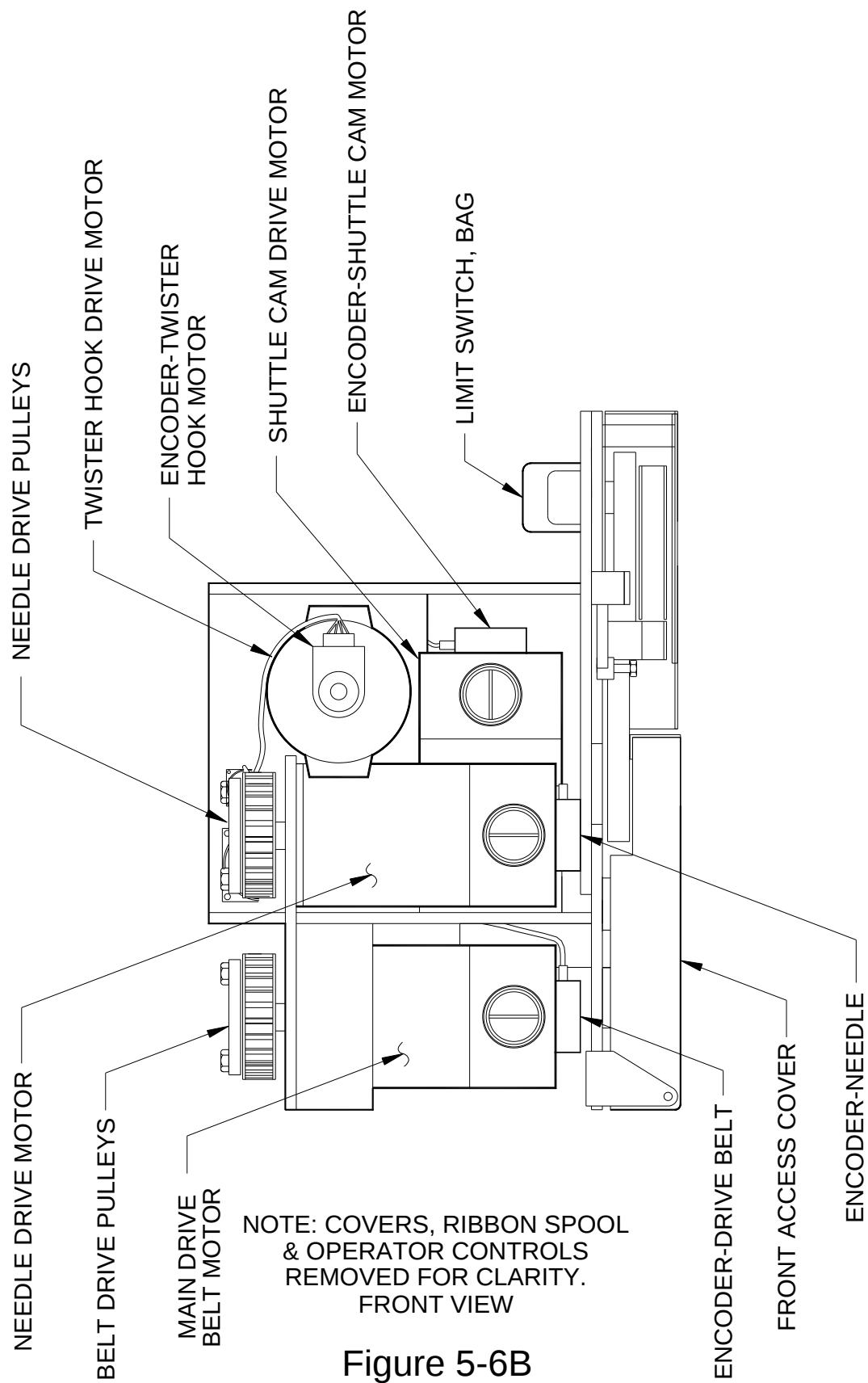
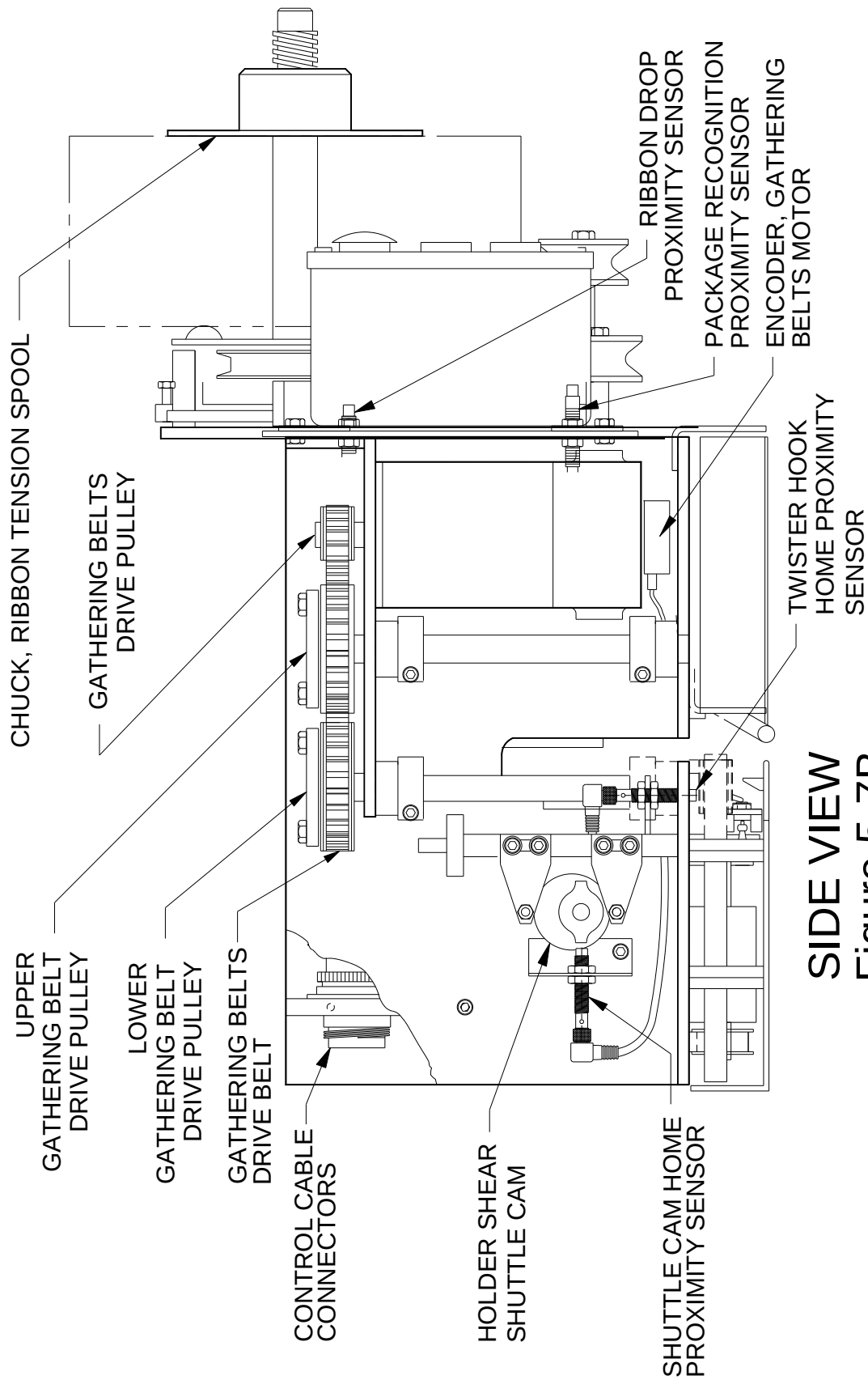


Figure 5-6B



SIDE VIEW
Figure 5-7B

6.0 SETTINGS AND ADJUSTMENTS

6.1 Timing

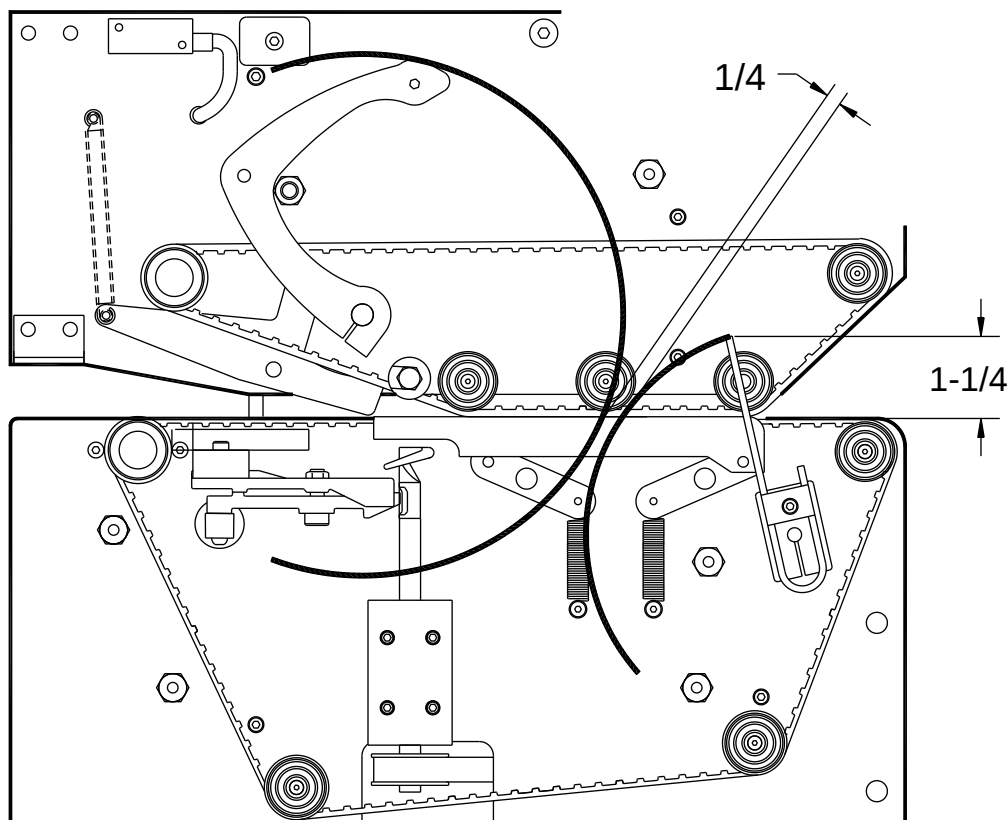
The design of the Model 2000VTR Electronic Servo Tye is based on precise computer control of servo motors. The electronic nature of the Servo Tye is unique in that it does not require any mechanical timing adjustments. The CPU contained in the proprietary electronics monitors each of the four motors 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.

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 tye is normally running at speed settings of 12 or more. When the tye runs at lower speeds, lubricating once every 3 months is sufficient.

6.3 Bag Switch Adjustment

The arm on the bag switch is adjustable in length and angle. It should be extended so that the end of the arm is about 1/4 inch away from the tip of the needle when the needle and arm are in their closest possible positions. See Figure 6-2A. In the normal position, the end of the arm should be 1-1/4 inches above the bag path. This assures that any package will activate the bag switch.



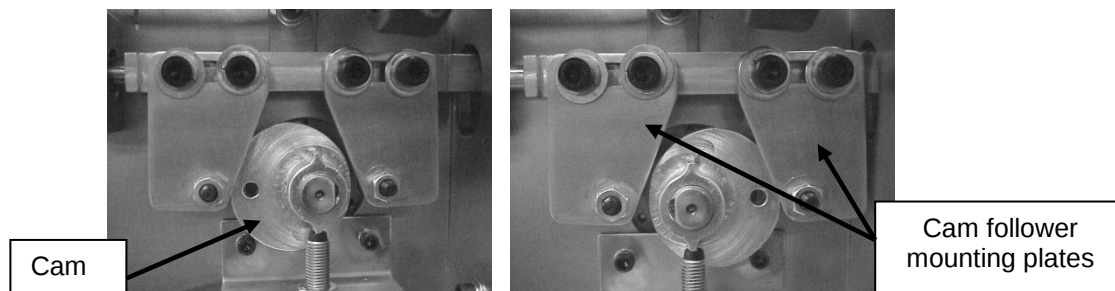
BAG SWITCH SETTING

Figure 6-2A

6.0 SETTINGS AND ADJUSTMENTS, cont'd.

6.4 Holder/Shear Adjustment

The force with which each side of the holder/shear holds the ribbon is adjustable. This adjustment is made simply by loosening and moving the cam follower mounting plates closer or farther away from the cam (with the cam turned towards the desired plate). Due to minor variations in castings, it is usually necessary to make these adjustments if the holder/shear is being replaced.

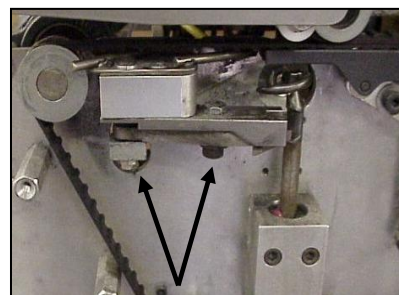
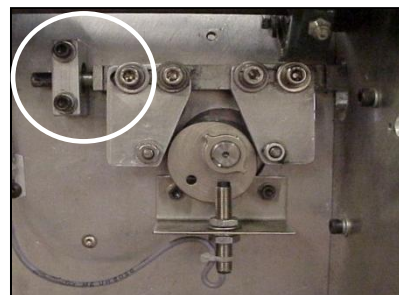


While it is important to have sufficient tension to hold the ribbon, it is also important not to have too much force on the cam followers. When there is no ribbon being held in the holder/shear, the cam should be able to be easily rotated by hand, all the way around. If binding is felt at either end of movement, then that side is adjusted too tightly and should be loosened. However, there should be no side-side movement.

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.

6.4.1 Shuttle Bar Alignment

1. Loosen the fasteners on the shuttle bearing block approximately $\frac{1}{4}$ turn.
2. Cycle the tyer 10-20 times by pressing the "THREAD" button located on the operator control box.
3. Retighten fasteners loosened in step 1 and run a few packages to determine if the issue has been resolved.
4. If the tyer is still experiencing ribbon drops, remove the front cover and loosen the two fasteners indicated at right approximately $\frac{1}{4}$ turn. Repeat step 2, then retighten the loosened fasteners and run a few packages to determine if the issue has been resolved.
5. Replace front cover and resume operation.



6.0 SETTINGS AND ADJUSTMENTS, cont'd.

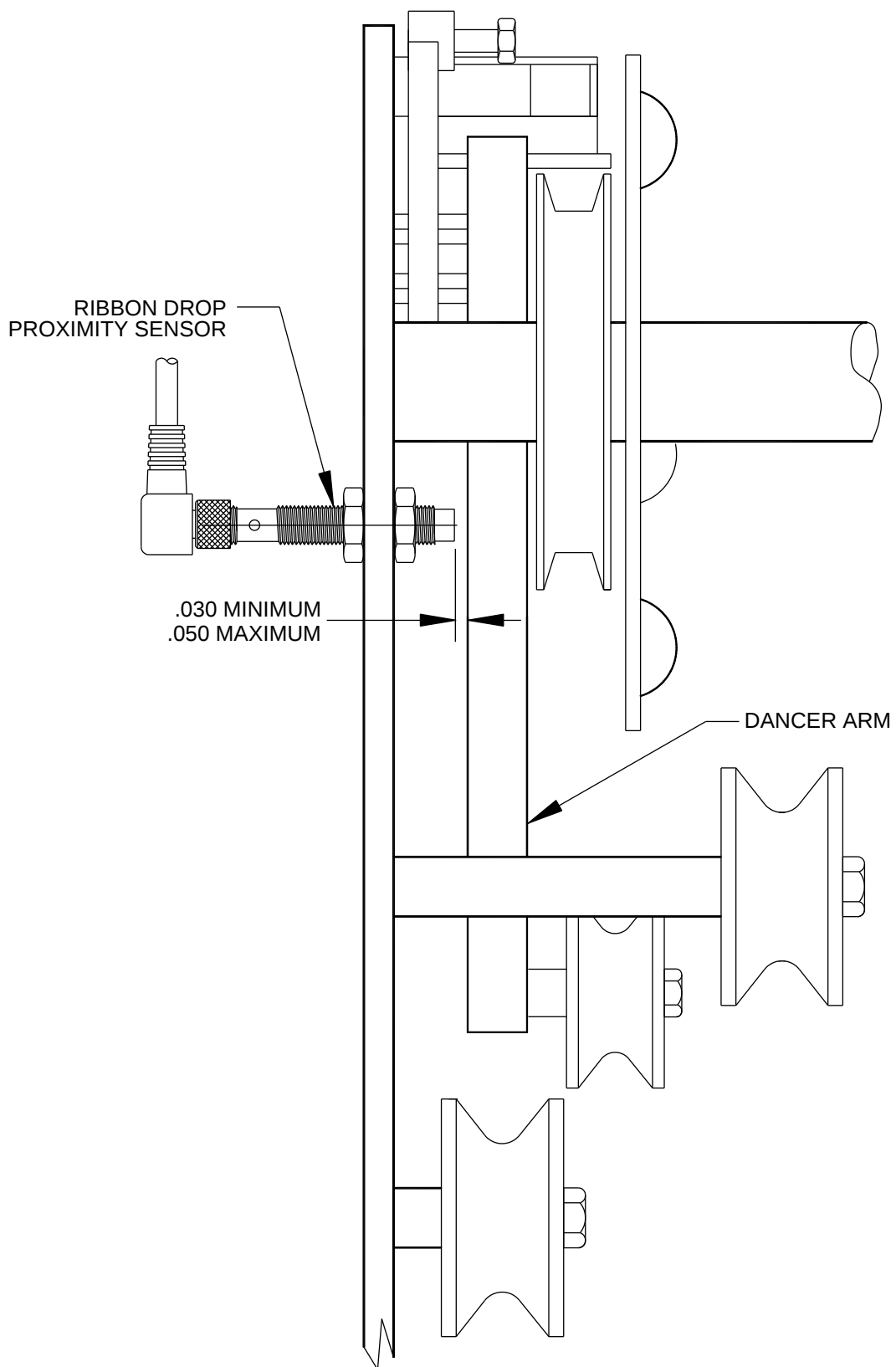
6.5 Gathering Belts, Tension Adjustment

The top and bottom gathering belts are tensioned by moving idler pulleys in slotted holes. These belts should not be run very tight because that would place excess load on the belt motor, resulting in a blown fuse on the Auxiliary board. Light fingerpressure of about 1 pound applied at mid-span of the upper belt should yield a deflection of about 3/8 inch. The lower belt should have a similar tension.

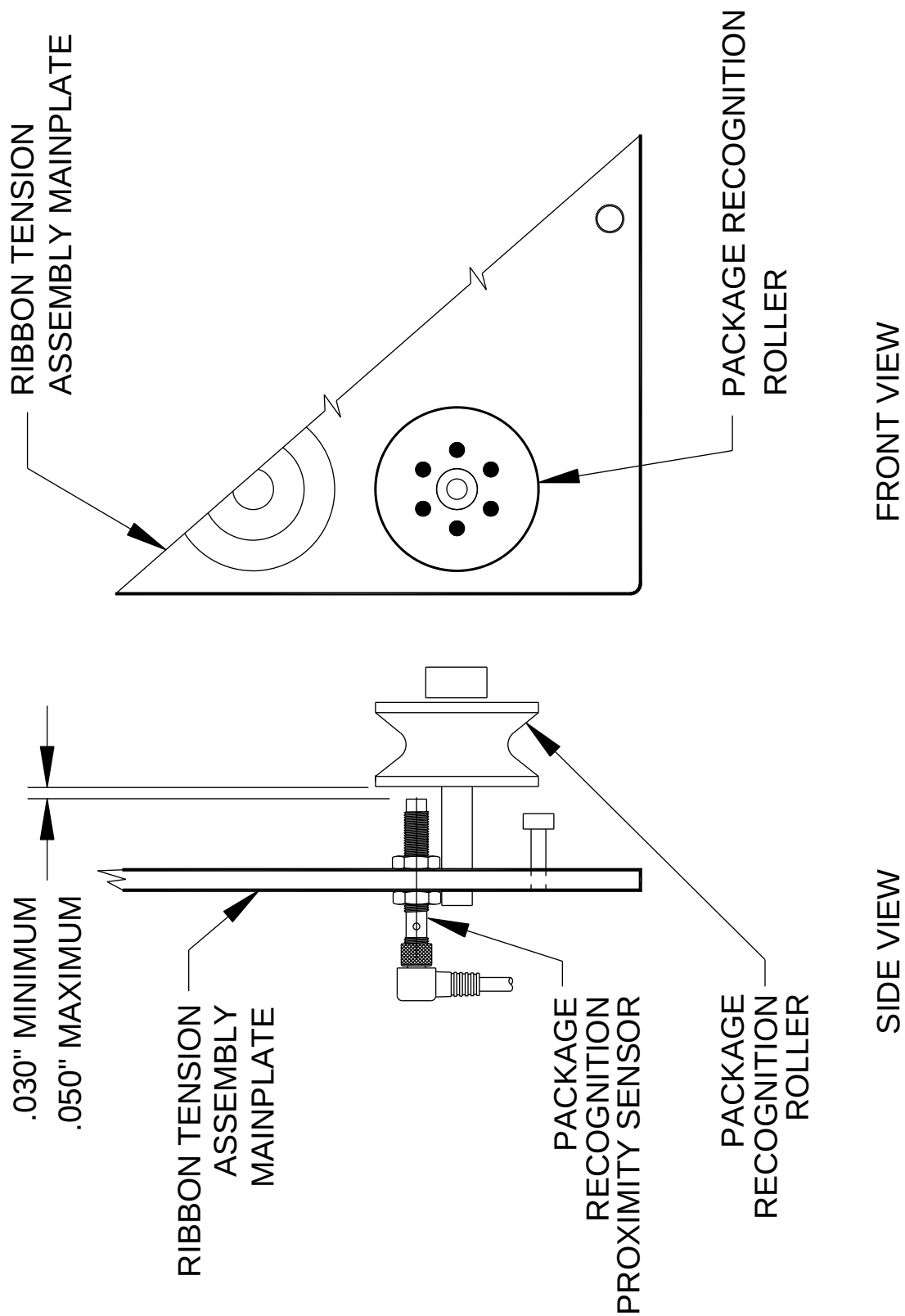
6.6 Proximity Sensor Adjustment

The Servo Tyer has five proximity sensors; three are used to locate the relative position of the needle, holder/shear, and twister hook. The fourth and fifth sensors are used to measure the amount of ribbon dispensed, and to detect ribbon drop. All five 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.

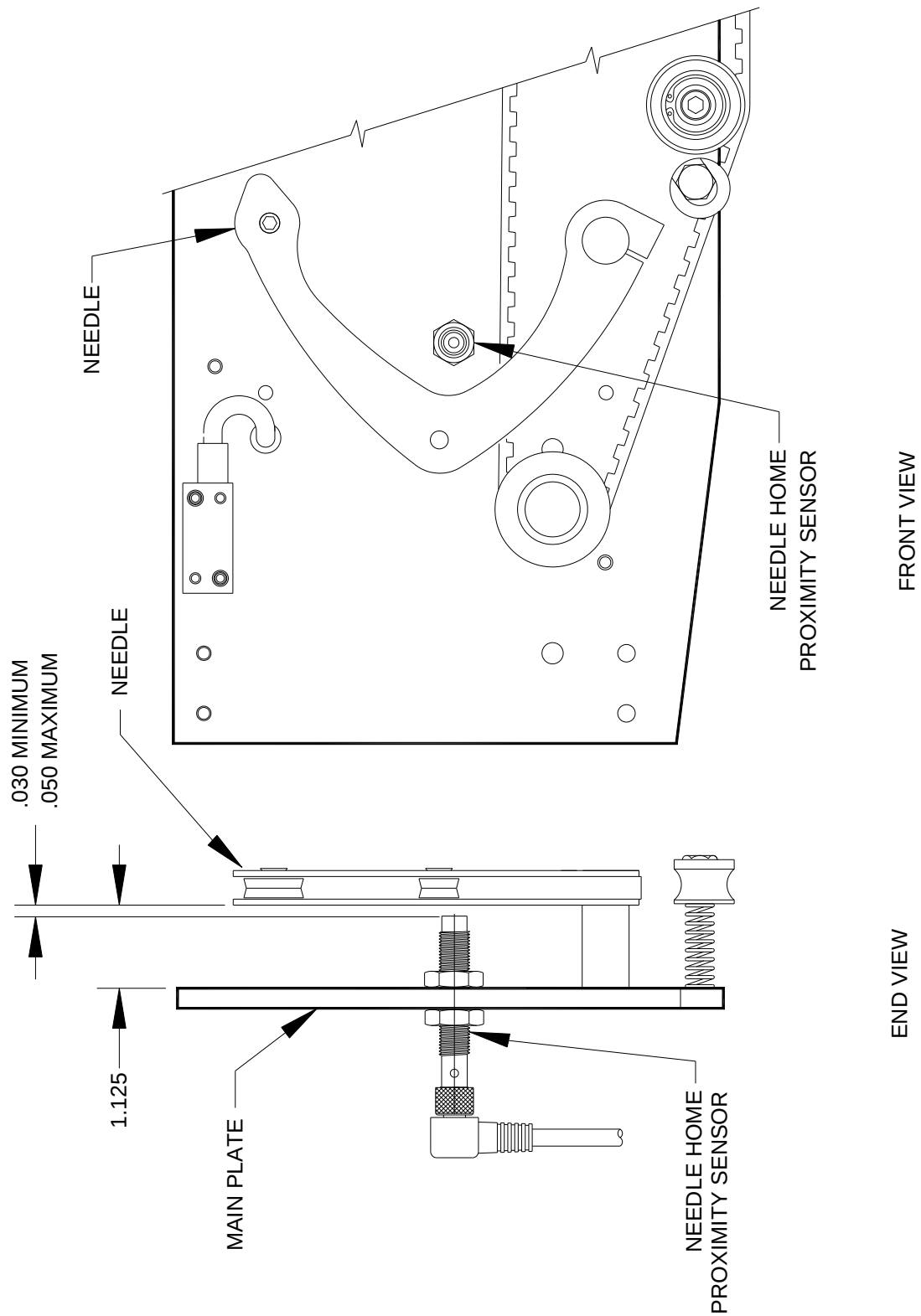
Refer to Figures 6-4 through Figure 6-8 for the specific geometry of each sensor.



RIBBON DROP PROXIMITY SENSOR ADJUSTMENT
Figure 6-5B

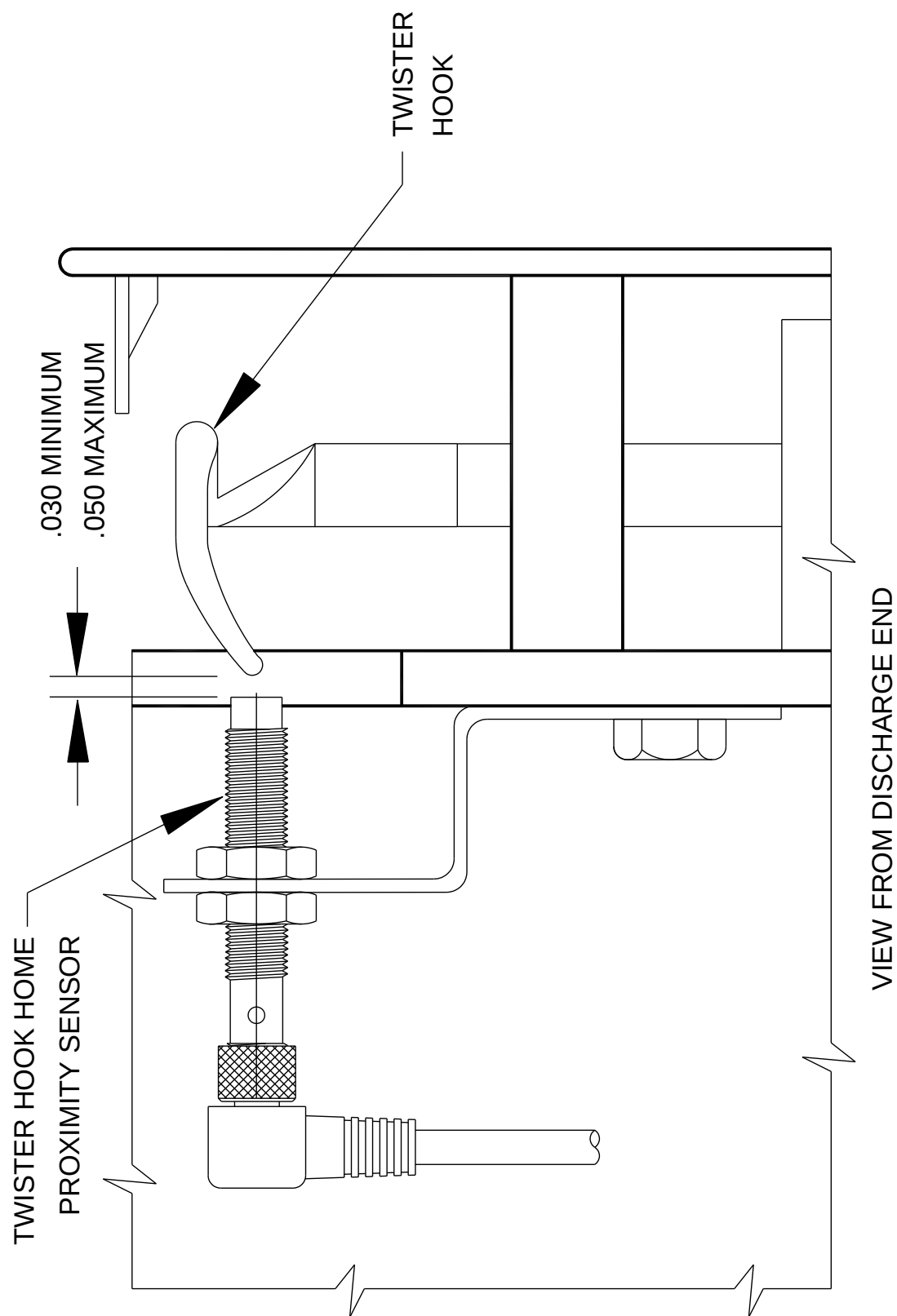


PACKAGE RECOGNITION PROXIMITY SENSOR
Figure 6-6B



NEEDLE HOME PROXIMITY SENSOR ADJUSTMENT

Figure 6-7B



TWISTER HOOK HOME PROXIMITY SENSOR ADJUSTMENT

Figure 6-8B

6.7 Gathering Brush Adjustment

6.7.1 Gathering Brush Tension Adjustment

The tension of the gathering brushes can be varied by using the adjustment knob provided on the front of the brush assembly. This knob limits the amount of mesh between the upper and lower brushes. However, the brushes are permitted to pivot away from each other to prevent a jam-up if product inadvertently is fed into the 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.

6.8 Gathering Belts, Speed Adjustment

The speed of the gathering belts is adjustable by using the pushwheel switch on the operator control box. The available speeds are 0 through 15. For more information see Section 5.1

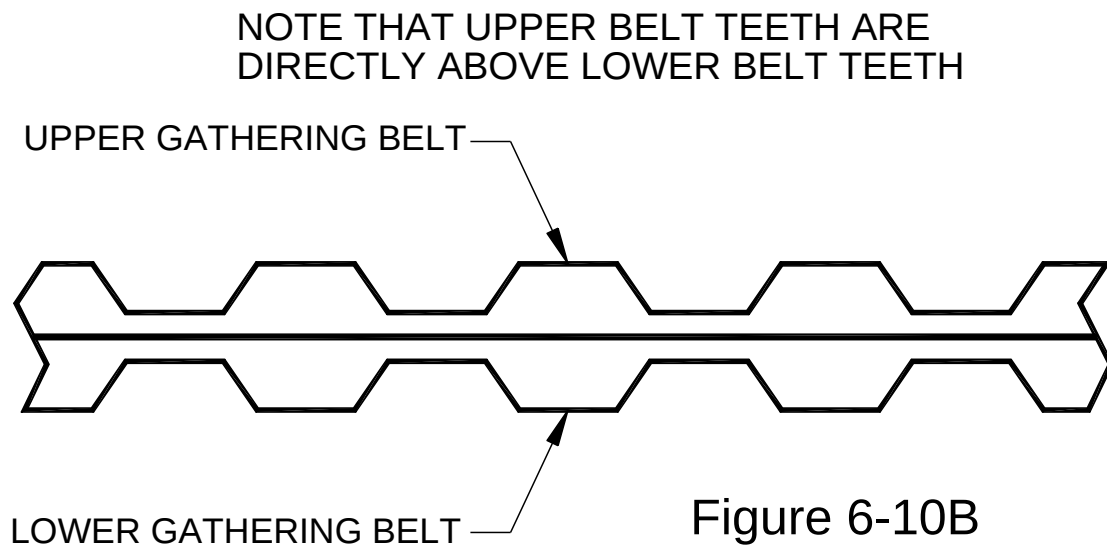
In most installations, the belts will not normally run when the conveyor is stopped. For testing, you may make the belts run with the conveyor stopped by turning the selector switch on the main electrical enclosure to the ON position. Be sure to return the switch to the AUTO position after testing. To 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.

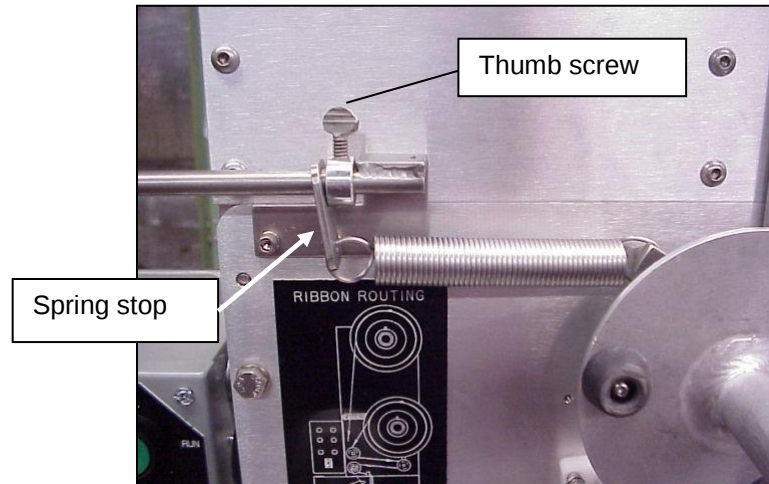
6.9 Gathering Belts, Teeth Mesh

As shown in Figure 6-10B, the gathering belts should be adjusted so that the teeth of the top belt are directly above the teeth of the lower belt. This arrangement minimizes the relative motion between the two belts and increases the lifetime of the upper rubber-coated belt.

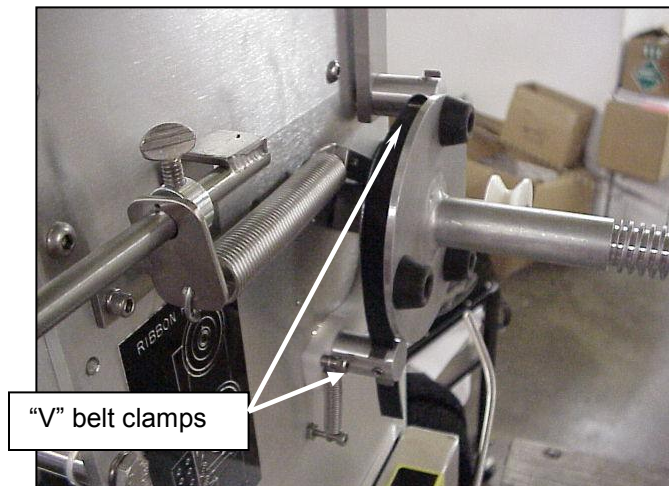


6.10 Ribbon Dispenser Adjustment

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

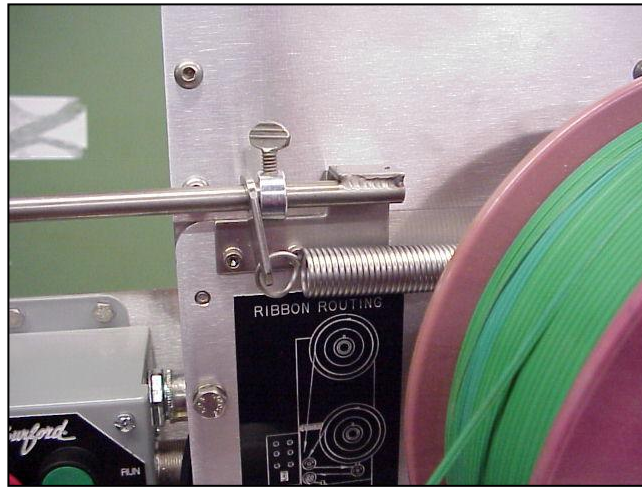


2. Mount spool of ribbon on lower spool holder.
3. Alternately loosen "V" belt clamps and adjust "V" belt until the ribbon brake releases when the dancer arm reaches the position as shown. When adjusted properly the spool will not turn easily without the brake being released.



6.10 Ribbon Dispenser Adjustment, cont'd.

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.



5. Move spool of ribbon to upper spool holder.
6. Verify the ribbon brake releases within 1" of lower ribbon brake release location.
7. Verify brake tension is at 1.5 lbs using a pull meter or similar method.
8. Re-check lower tension assembly.
9. 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.

6.11 Spacing of Twister Hook Shaft to Tip of Holder/Shear

The proper spacing is 3/32 as shown below. 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.

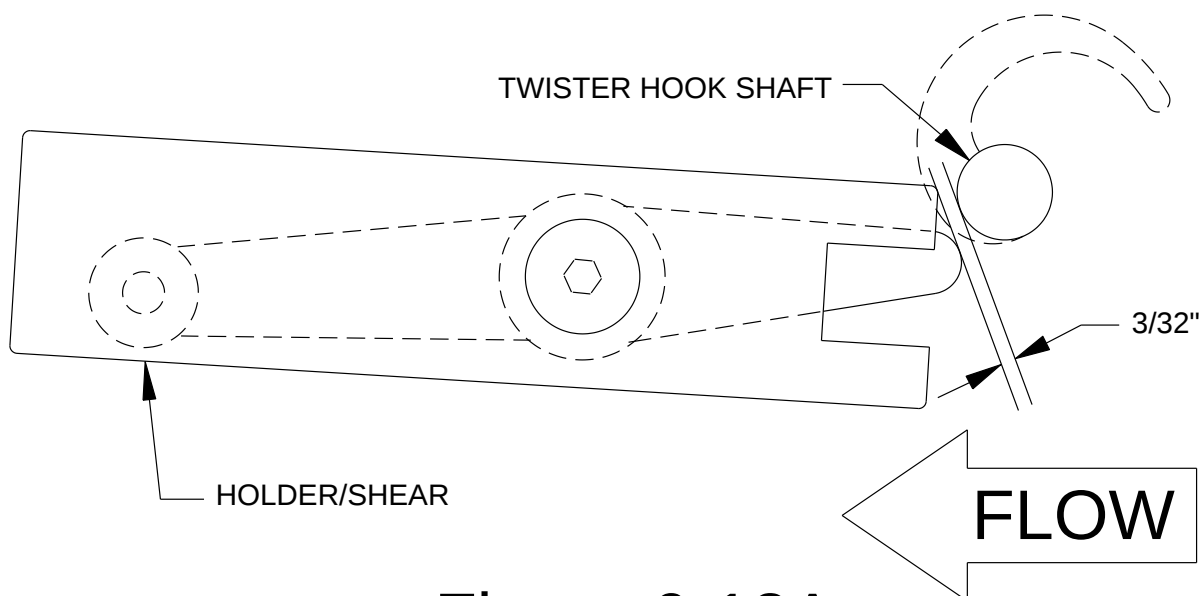


Figure 6-12A

6.12 Adjusting the Tie Tightness

There are two adjustments on the Model 2000VTR and 2100VTR Tyers to adjust the tie tightness. One adjustment is the eccentric ribbon guide and the other is the belt idler pulley.

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 window. The window is shaped like a sideways "V". The "V" opens up to the discharge end with the lower belt forming the horizontal, the ribbon wire forming the vertical, and the upper belt forming the diagonal (See Figure 6-13A). By increasing or decreasing the size of the 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 is so tight as to cause tears or holes in the bag neck the area of the window should be increased. The window may also need to be adjusted when changing bag size or thickness.

6.12 Adjusting the Tie Tightness, cont'd

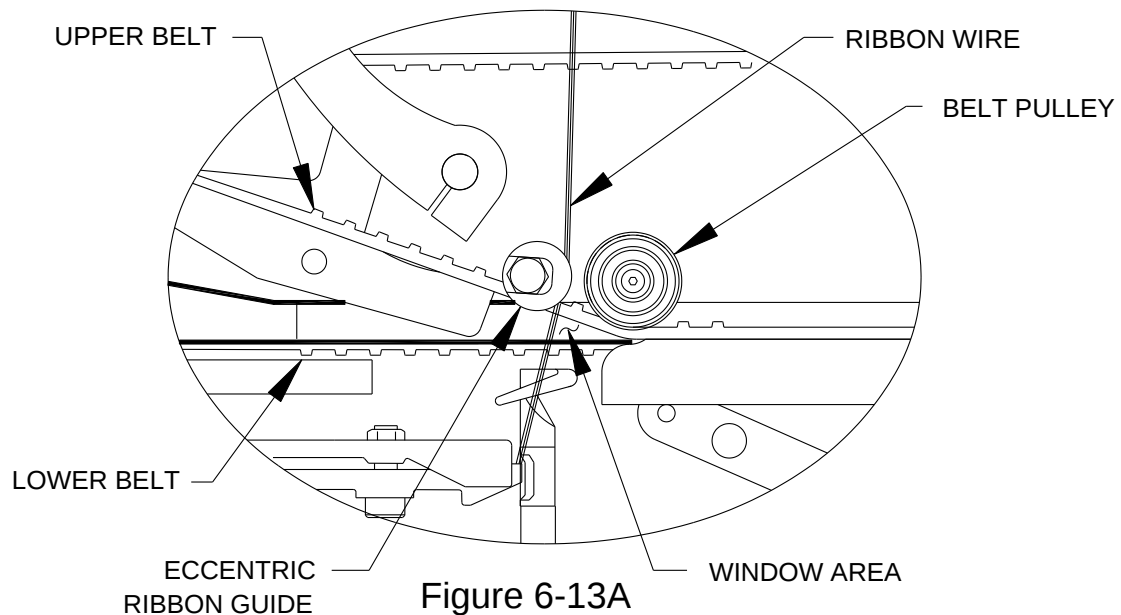


Figure 6-13A

6.12.1 Nominal Adjustment

Normally for a bag that is 1 to 1-3/4 mil thick the eccentric ribbon guide is positioned so the lobe is towards the infeed, with the belt pulley positioned so it almost touches the eccentric ribbon guide's support bolt.

6.12.2 Adjusting the Eccentric Ribbon Guide

The eccentric ribbon guide adjustment is for fine tuning the window area and can be adjusted by opening the front cover, pushing on the eccentric ribbon guide to disengage the guide from the hex bolt, and rotating the guide to change the position of the ribbon wire. Moving the ribbon downstream increases the window area and loosens the tie. Moving the ribbon wire upstream decreases the window area and makes a tighter tie. When you have found the proper position for the guide be sure it seats back into the flats of the hex bolt.

6.12.3 Adjusting the Belt Pulley

If after adjusting the eccentric ribbon guide the bag is still not tied with the proper tension, the belt pulley will need to be adjusted. First, it is essential that the guide not interfere with the rotation of the belt pulley. Disengage and rotate the eccentric ribbon guide to its closest position to the belt pulley. Next, loosen the mounting bolt and nut of the belt pulley. Slide the belt pulley downstream to decrease the area of the window and tighten the tie and upstream to increase the window area and reduce the tightness of the tie. When the pulley is in the proper position tighten the mounting bolt and nut. **CAUTION: Never allow the eccentric ribbon guide or mounting bolt to rub against the belt pulley or damage to the unit will occur.**

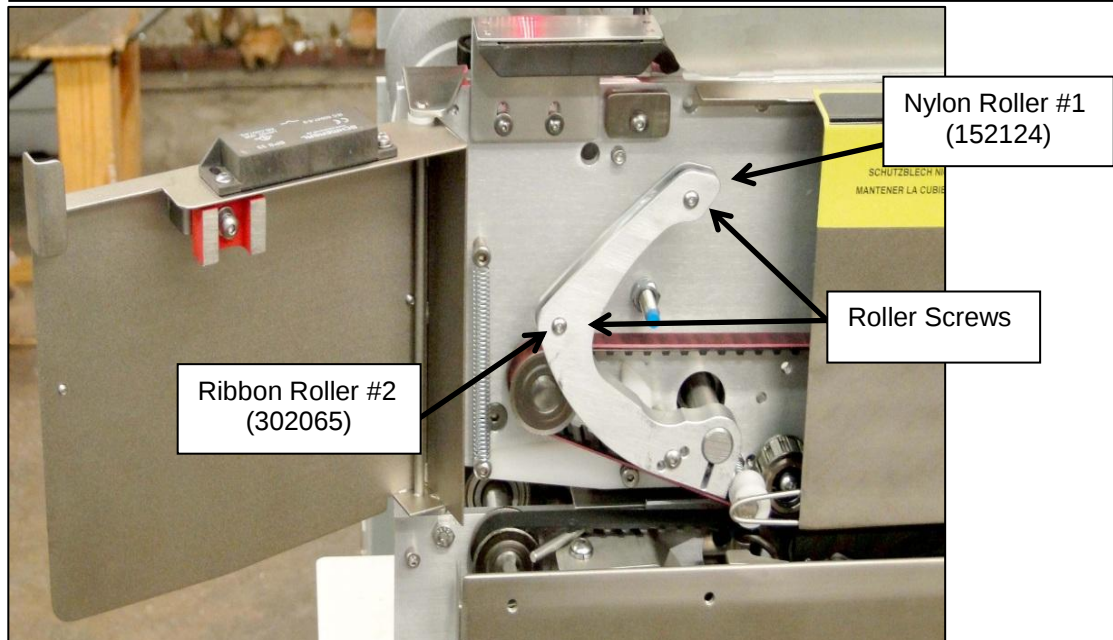
6.13 Needle Roller Replacement

To change the rollers, power down the machine and rotate machine to vertical position; open cover to expose needle assembly. Unthread the needle, then rotate needle to appropriate angle to access screws.

There are two rollers on the needle assembly (152124) and (302065). Each roller is attached to the assembly with a #8 Button Head Screw (986908) that uses a 3/32 Allen Head Wrench.

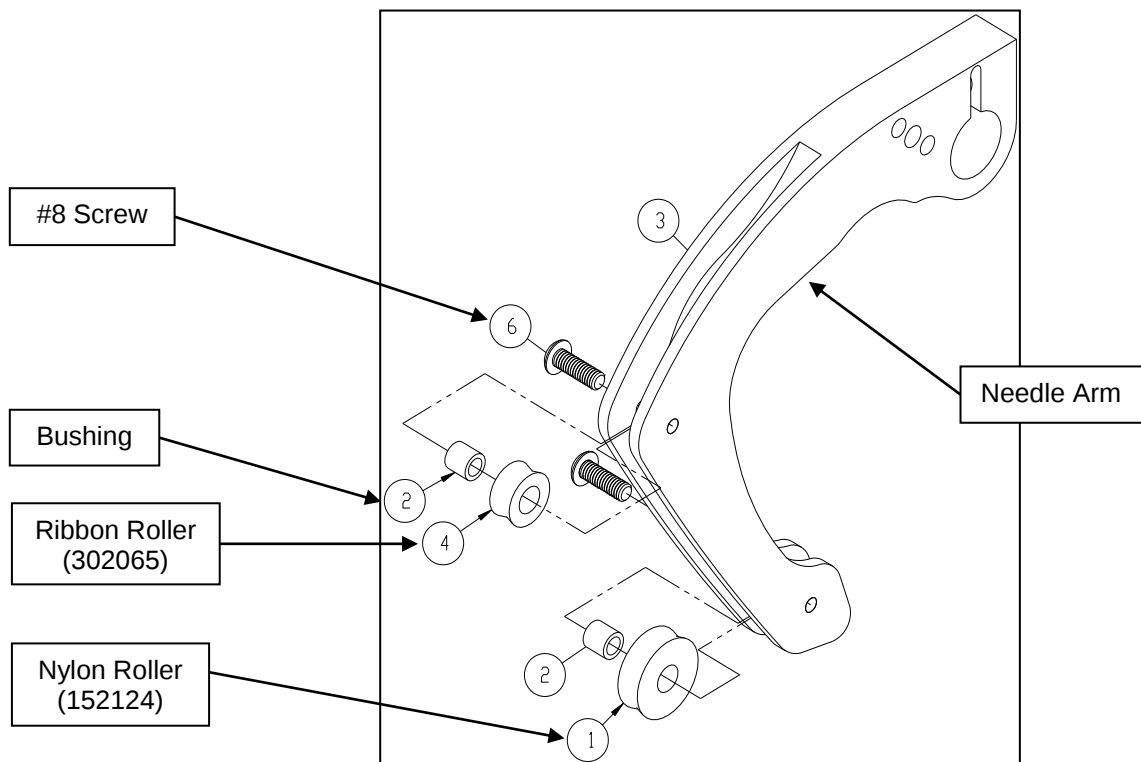
Each roller also has a bushing (152125) that fits in the middle of the roller over the screw between the needle arm.

NOTE: The rollers used in the needle assembly are different and have differing descriptions and part numbers as illustrated in the picture and drawing.



See illustration on page 6-16 for exploded view of assembly and steps on how to access rollers and bushings.

6.13 Needle Roller Replacement, cont'd



1. Carefully unloosen screw taking care not to round screw shoulders and remove roller and bushing.
2. Replace worn parts with careful observation of both the bushing and the roller with their respective part numbers and placement.
3. Apply Blue Loc Tight for reinsertion of screws.

6.14 Preventive Maintenance Program

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

DAILY

1. Clear bags from brush assembly.

WEEKLY

1. Check to insure cable connectors, located on the control panel and under the tyer, are tight.
2. Insure all ribbon rollers turn freely and the dancer arm releases ribbon in the proper position (reference section 6.11).
3. Insure all switches and lights function properly.

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 setting (reference section 6.3).
4. Lubricate gathering belt bearings.

SEMI-ANNUAL

1. Grease all bearings.
2. Check DIP switches for proper settings.
3. Check cooling fan for smooth operation.

7.0 ELECTRICAL

7.1 Circuit Board Descriptions

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 servo tyer and can communicate with a dumb terminal using the serial port connector on the front edge of the board. The CPU Board is attached to the Auxiliary 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 8.2 for specific details on this display. The CPU board is considered a replacement unit. The proprietary software used to control the Servo Tyer was developed by Burford and cannot be altered in the field.

7.1.2 Auxiliary (Aux.) Board, Part Number C01267

The Aux. Board is a six inch by eleven inch circuit board that is controlled by the CPU Board through the seventy-two pin connector J3. The Aux. 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 rest of the connections are made through the ninety-six pin connector J2 to the Field Termination Board. The Aux. board also contains two relays, which are described in section 7.3.

7.1.3 Field Termination Board (FTB), Part Number C01272

The FTB is a six inch by eight inch circuit board that is a point of mass termination for the main electrical enclosure. With the exception of the motors, all tyer signals are routed through the FTB to the Auxiliary board using the ninety-six pin connector J1. The FTB contains five control relays, which are described in section 7.3. In addition, there are twenty-eight status LED's that can be used for troubleshooting, these are described in section 8.1.

MAIN ENCLOSURE LAYOUT

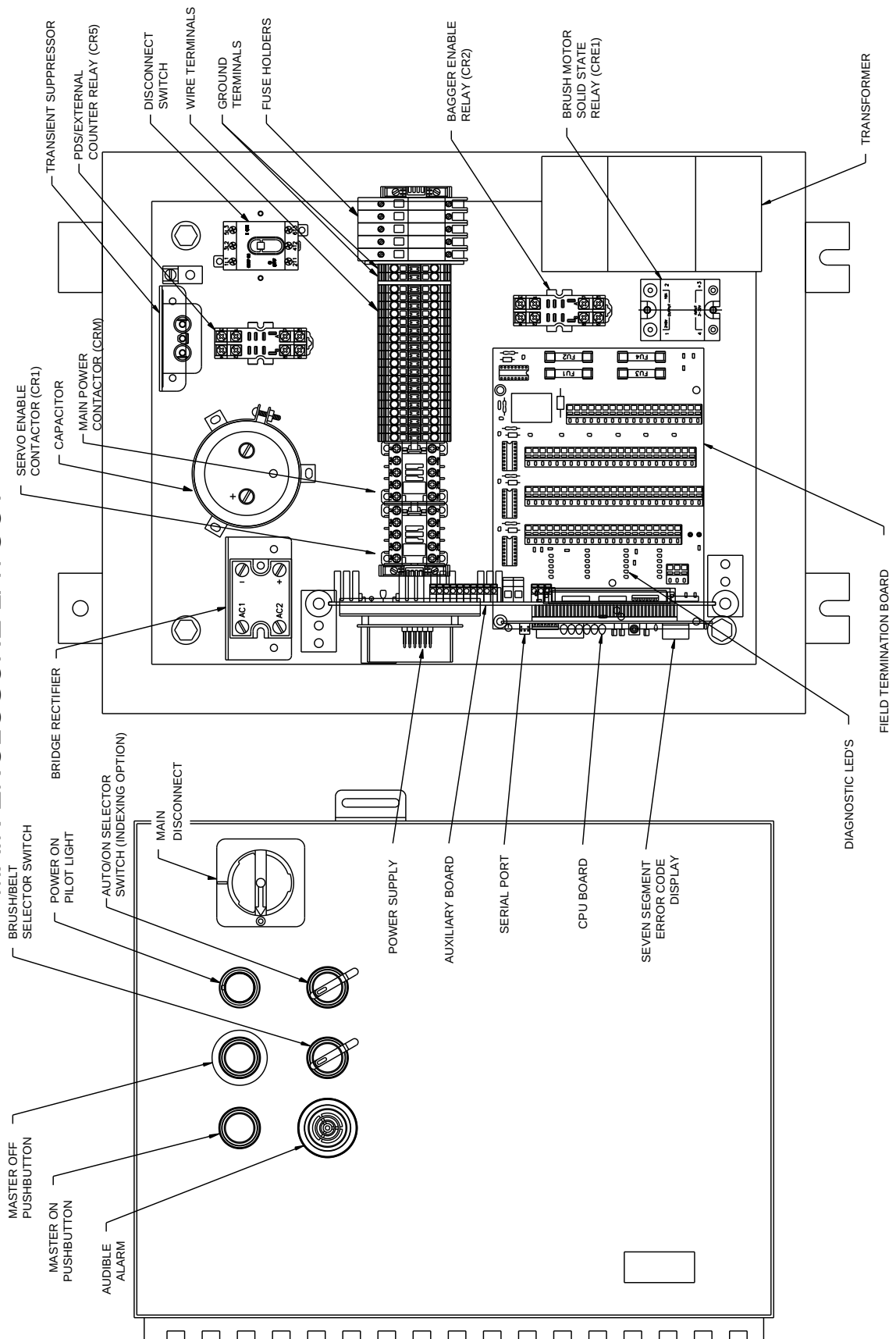


Figure 7-2A

7.2 Relay Descriptions

Panel Relays, Main Enclosure (See Figure 7-2A)

CRM, (C01021) - Latches in main power.
CR1, (C01021) - Connects 34VDC motor power to Aux. board.
CR2, (C01269-001) – Latches the bagger enable signal.
CR5, (C01269-003) – Package Detection System, external counter contacts.
CRE1, (C05138) – Latches in Brush Motor.

Field Termination Board Relays

CR1, (C01270) - Bagger Enable Relay, starts and stops bagger run circuit.
CR2, (C01270) - Servos Enabled Relay, energizes coil of CR1(panel relay).
CR3, (C01269) - Brush/Belt Relay, bagger energizes this relay to start and stop brushes and belts.
CR5, (C01270) - Horn Relay, controls audible alarm.
CR6, (C01270) - Counter Relay, controls external counter output.

Auxiliary Board Relays

CR1 - Run Circuit Relay, operator RUN button latches in this relay.
CR9 - CPU Status Relay, CPU energizes this relay if it is ready to control the motors.

7.3 DIP Switch Settings

The Auxiliary board, P/N C01267, has a group of eight DIP switches on the bottom left, labeled SW1, which are used to configure Tyler parameters. The following table identifies the switch functions.

Switch #	OFF Position	ON Position
1	Right hand machine, Model 2000VTR	Left hand machine, Model 2100VTR
2	Counter's contacts close to count	Counter's contacts open to count
3	Twister Hook Delay Inactive (standard)	Twister Hook Delay Active
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.

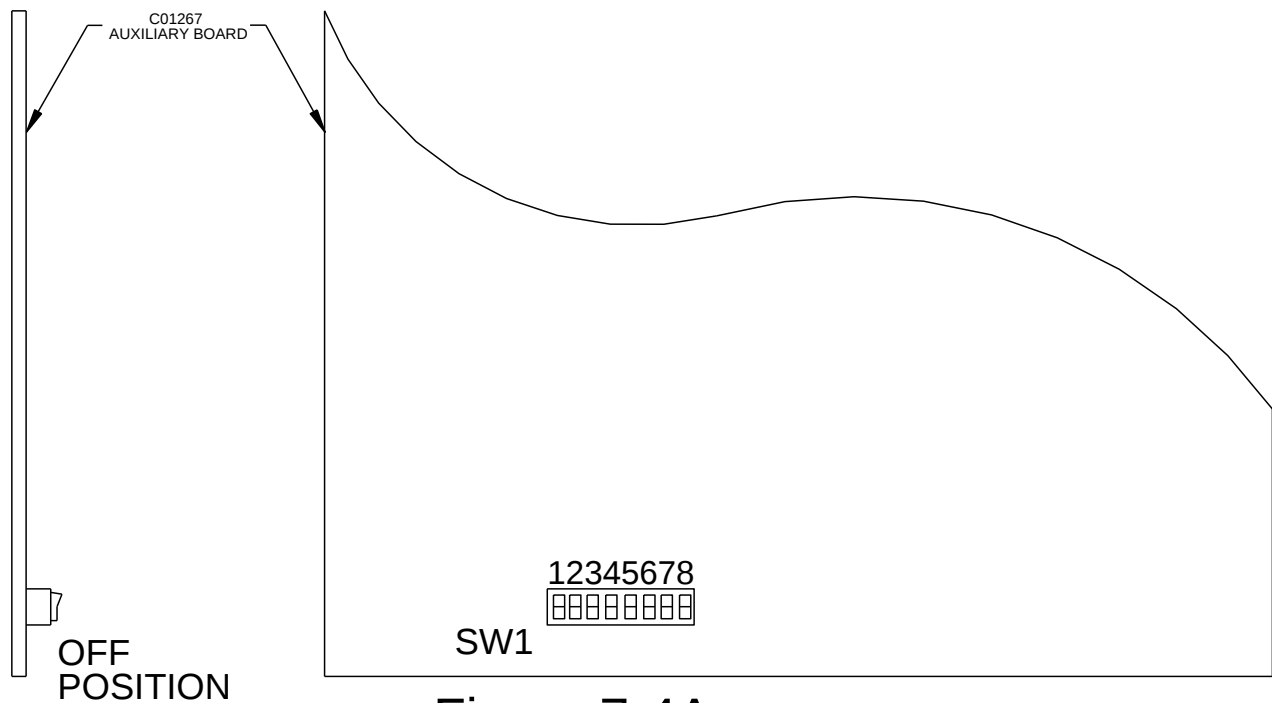
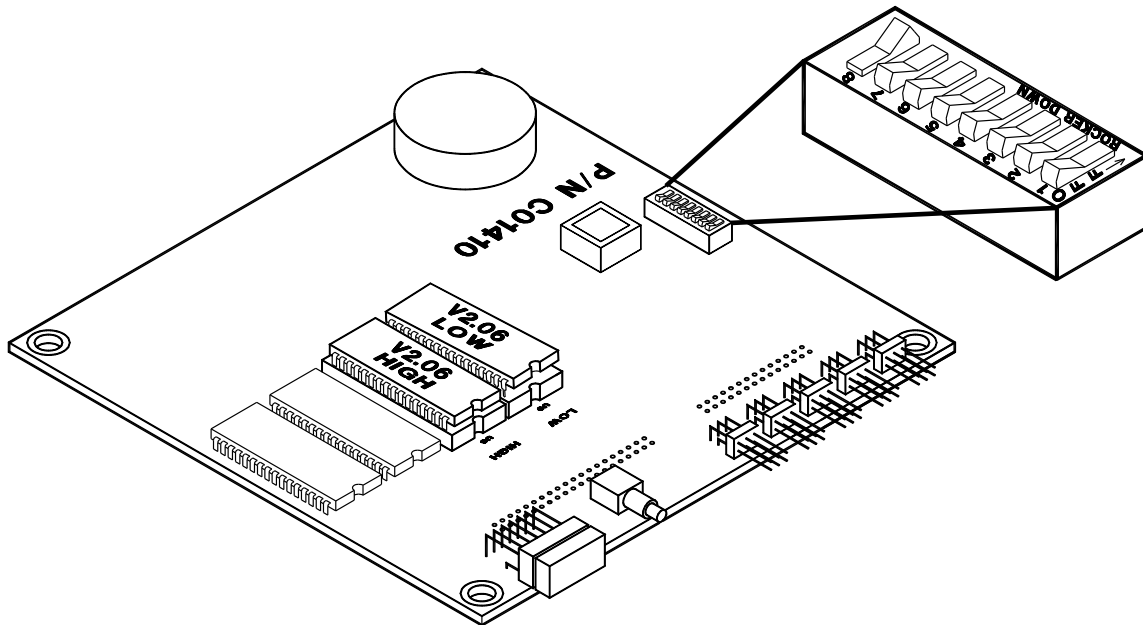


Figure 7-4A

7.3 DIP Switch Settings, cont'd

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	Not Used.	Not Used.
7	Not Used.	Not Used.
8	Communicates with laptop.	Communicates with optional display (as shown).



7.4 Circuit Protection List

There are eleven fuses and three circuit breakers in the main electrical enclosure. See Figure 7-6A. Four fuses reside on the Aux. board, three are mounted on a DIN rail below the disconnect, and four are located on the Field Termination Board. Three circuit breakers are also mounted on the DIN rail below the disconnect. *Note: Older Field Termination Boards do not have any fuses on the board. The fuses are located beside the Field Termination Board on the panel.*

MAIN PANEL CIRCUIT PROTECTION		
REFERENCE #	TYPE	DESCRIPTION
F1	10 Amp, FNQ-R	Main Power
F2	10 Amp, FNQ-R	Main Power
F3	20 Amp, LPCC	Transformer secondary
CB3	6 Amp, Circuit Breaker	Brush Motor
CB4	6 Amp, Circuit Breaker	Transformer secondary
CB5	2 Amp, Circuit Breaker	Blower (if equipped)

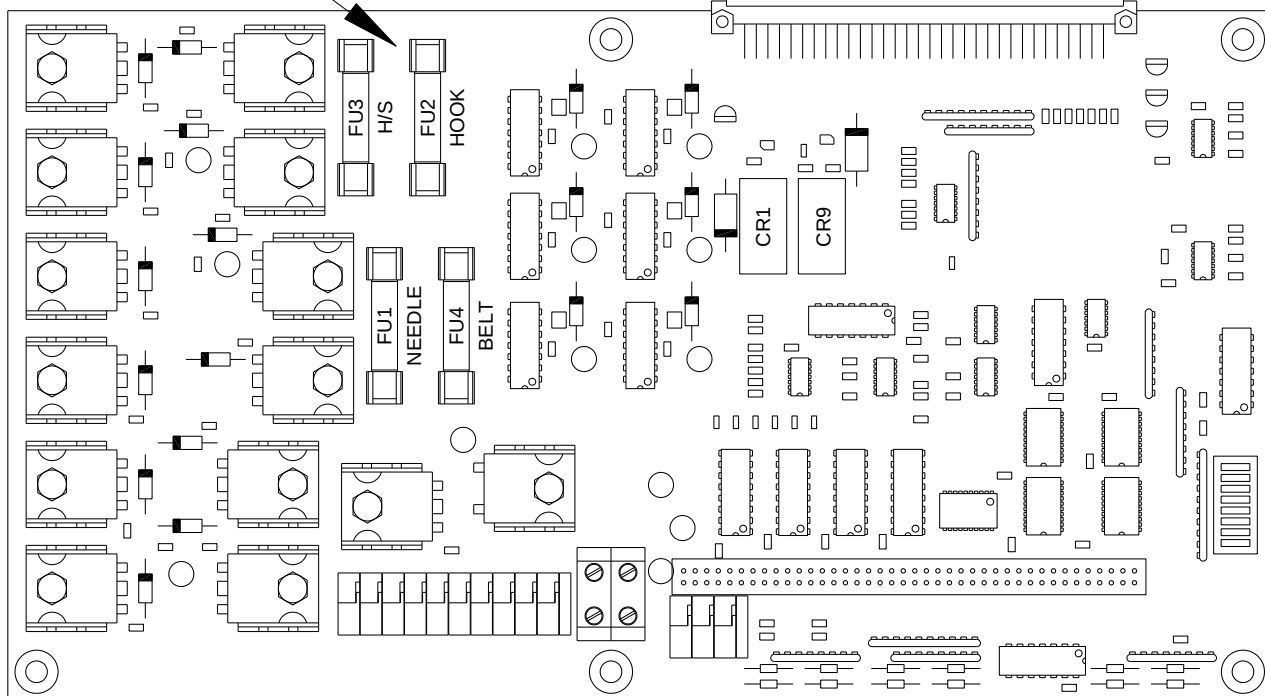
AUXILIARY BOARD FUSES		
REFERENCE #	TYPE	DESCRIPTION
F1	10 Amp, MDA	Needle Motor Output
F2	10 Amp, MDA	Twister Hook Motor Output
F3	5 Amp, MDA	Holder/Shear Motor Output
F4	5 Amp, MDA	Gathering Belt Motor Output

FIELD TERMINATION BOARD FUSES		
REFERENCE #	TYPE	DESCRIPTION
F1	3 Amp, GLD	Horn Relay
F2	3 Amp, GLD	Bagger Enable Circuit
F3	3 Amp, GLD	Servo Enable (DC contactor)
F4	3 Amp, GLD	Counter Relay

CAUTION: Be careful when removing fuses from any of the circuit boards. Never use a metal screwdriver to pry out the fuses because this damages the traces on the board below the fuse holders.

CIRCUIT PROTECTION SIZES AND LOCATIONS

AUXILIARY BOARD



MAIN PANEL

SYMBOL	SIZE	PART NO.
FU1	10 amp	C06543
FU2	10 amp	C06543
FU3	20 amp	C07062
CB3	6 amp	C07649-006
CB4	6 amp	C07649-006
CB5	2 amp	C07649-002

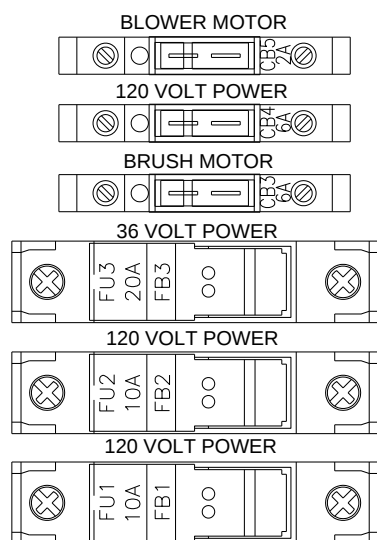
AUXILIARY BOARD

SYMBOL	SIZE	PART NO.
FU1	MDA-10	C07036
FU2	MDA-10	C07036
FU3	MDA-5	C01268
FU4	MDA-5	C01268

FIELD TERMINATION BOARD

SYMBOL	SIZE	PART NO.
FU1	GLD-3	C06585
FU2	GLD-3	C06585
FU3	GLD-3	C06585
FU4	GLD-3	C06585

MAIN PANEL



FIELD TERMINATION BOARD

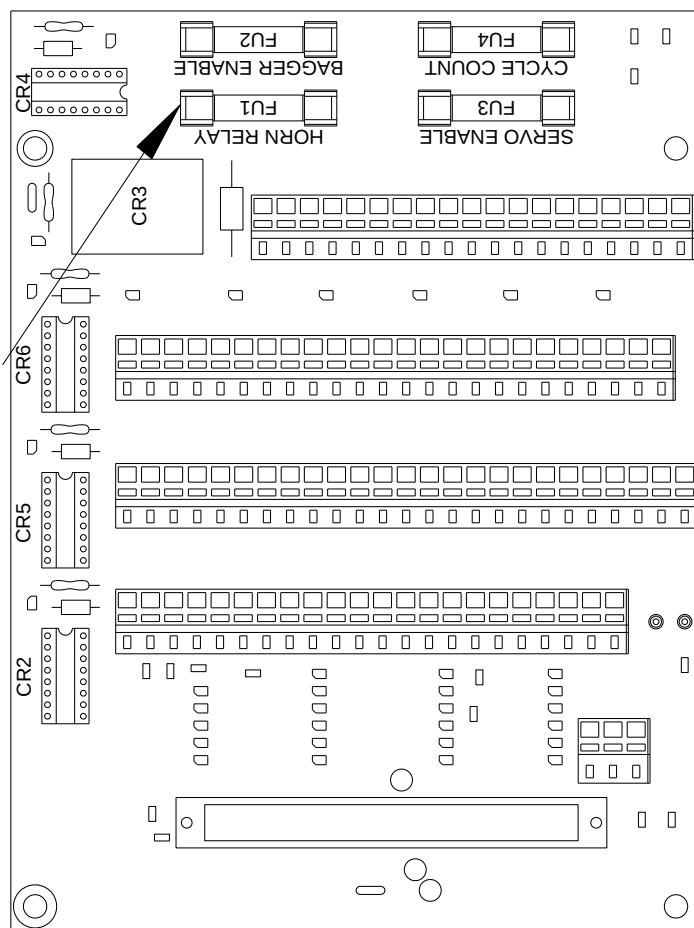


FIGURE 7-6B

7.5 Counter Output

The Servo Tyer comes standard with a relay, 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 Aux. board. See section 7.3 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.

7.6 Prom Replacement Procedure

The computer program for the Burford Model 2000VTR Electronic Servo Tyer resides in two PROMs, U6 and U9 on the CPU board. Each PROM contains half of the program. To upgrade the Servo 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 lower left of the Auxiliary 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 power from the Tyer and disconnect the Auxiliary board's 5V/12V connector from the power supply. Carefully pull the board set from the Field Termination Board. There should be enough slack in the motor cable to allow the board set to rotate out to the right without disconnecting the leads. The CPU board should now be facing out with the single character LED display on the bottom right of the board. 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 2.06 is newer than version 2.03. 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.

7.6 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.

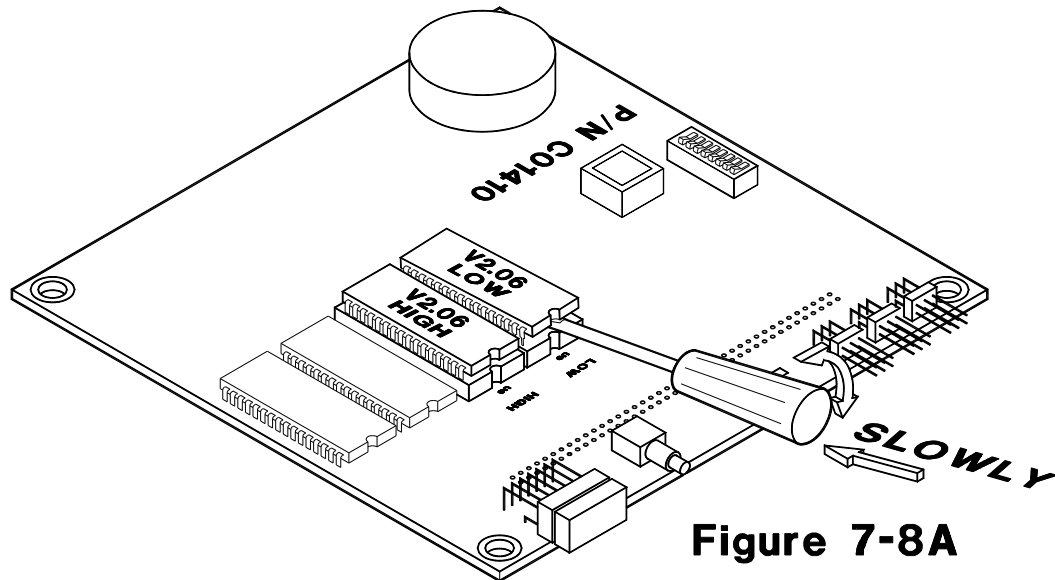


Figure 7-8A

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.

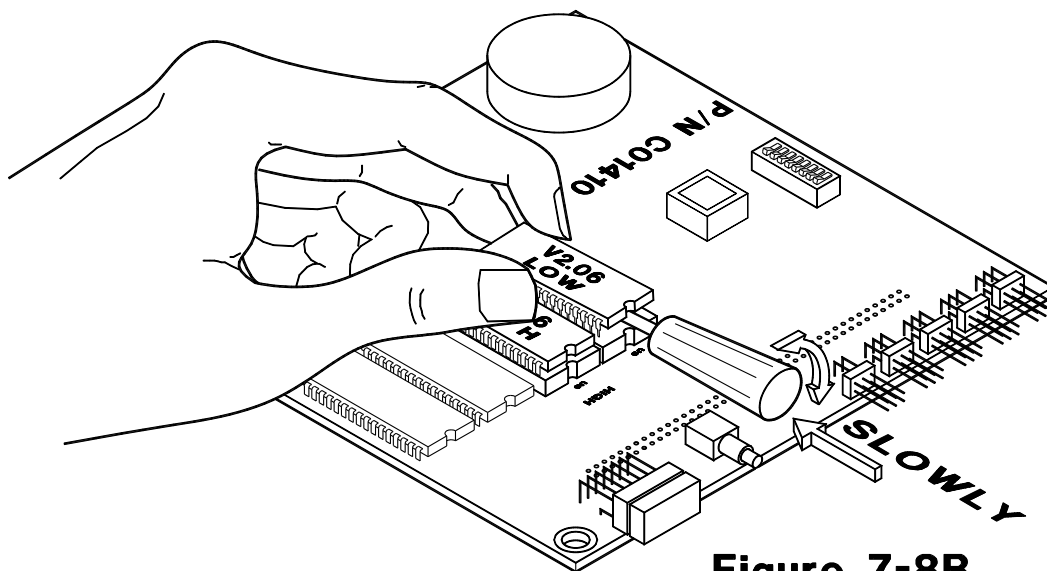


Figure 7-8B

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.

7.6 Prom Replacement Procedure, cont'd

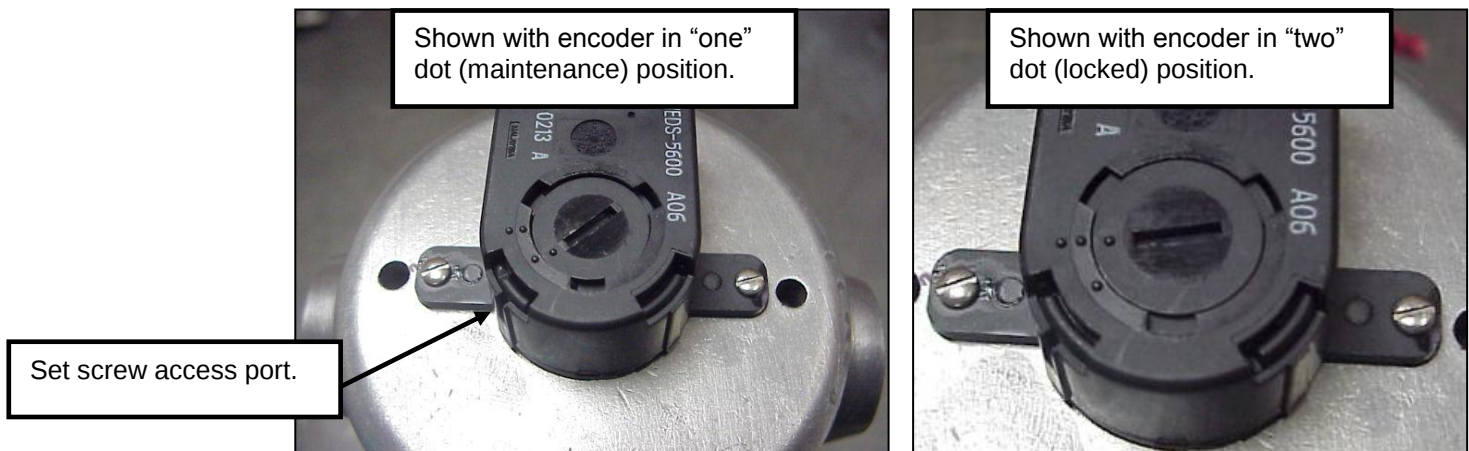
With the notch on the PROM to the right, align it with the socket. Ensure each pin lines up with its receptacle. Usually the pins on new PROM's tend to be bent a little wider than the socket. If this is the case, lay the PROM on its side on a flat surface and bend the entire row of pins together to keep 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, insert the board set into the card guides and press it firmly into place. Verify that the Dip Switch settings have not changed. Reconnect the 5V/12V connector to the power supply. Apply power to the Tyler and push the main enclosure ON button. If the Tyler 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.

7.7 Encoder Replacement Procedure

Following are procedures for replacing servo motor encoders on the Tyler.

1. Disconnect incoming electrical power and follow applicable lockout/tagout procedures.
2. Using a flat blade screwdriver turn the encoder to the "one" dot position. This allows access to hub set screw. Disconnect electrical connector from encoder.



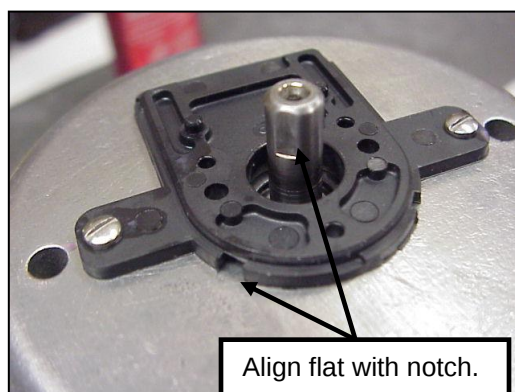
3. Insert hex wrench (supplied with new encoder) into access port and turn motor until set screw is located. Loosen set screw.
4. Remove (2) mounting screws securing encoder base plate to motor. Use care to NOT lose these screws, they will be used to mount the new encoder.
5. Slide encoder off motor shaft and discard.

7.7 Encoder Replacement Procedure, cont'd.

6. Mount new encoder base plate to motor using mounting screws removed in step 4. Use a low strength thread locking compound (Loc-Tite #222MS) when mounting these screws. Verify flat side of encoder mounting base and motor power wires are aligned.



7. Align motor shaft with baseplate as shown. This will ensure the flat on the motor shaft will be positioned correctly for tightening the hub set screw.



8. Align encoder body with baseplate and securely snap encoder body onto baseplate. Verify all four locking tabs are correctly positioned.
9. Apply a light downward force (this sets the code wheel gap by levering the code wheel hub to its upper position) on the hex wrench. Securely tighten hub set screw against flat on motor shaft while continuing with downward force. The hub set screw attaches the code wheel to the motor shaft.
10. Remove hex wrench and lock the encoder by turning the encoder to the "two" dot position.



11. Connect electrical connector to encoder (removed in step 2) and mount vinyl encoder cover.
12. Resume operation.

7.8 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. The proximity switch should be connected to I/O 3 of the tyer's Field Termination Board. **Note:** Use I/O 4 of older Field Termination Boards, which do not have the fuses, mounted directly on the Field Termination Board.

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. For further information see Section 6.8 on Setting Belt Speed.

8.0 TROUBLESHOOTING

8.1 Diagnostic LED's

The specifications defined below apply to Field Termination Board P/N C01272. If you have the earlier version (P/N C01211) use the specifications described in the manual, you received with your Tyer. Most designations are the same on both boards

The Field Termination Board has thirty-four LED's to assist in troubleshooting the Tyer. Twenty-three of these are on the left side of the FTB and indicate that the AUX board has received the signal. In addition, each relay and optional I/O connections on the FTB has a status LED mounted next to it. The Auxiliary Board has two status LED's that may also be helpful in troubleshooting. These are located next to CR1 and CR9 just below the middle of the AUX board.

FTB - D1, D2: 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 8.8.1.

FTB - D3, D4: 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 8.8.1.

FTB - D5, D6: 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 8.8.1.

FTB - D7, D8: 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 8.8.1.

FTB - D9: THREAD SWITCH

Indicates when the THREAD switch is pushed.

8.1 Diagnostic LED's, cont'd

FTB - D10: RIBBON DISP

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

FTB - D11: BAG SWITCH

Indicates when the bag switch is depressed.

FTB - D12: H/S HOME

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

FTB - D13: TWISTER HOME

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

FTB - D14: NEEDLE HOME

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

FTB - D15: BAGGER ENABLE RELAY

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

FTB - D16: RIBBON DROP

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

FTB - D18/BCD 8, D20/BCD 4, D22/BCD 2, and D23/BCD 1:

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

<u>SETTING</u>	<u>BCD 8</u>	<u>BCD 4</u>	<u>BCD 2</u>	<u>BCD 1</u>
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

8.1 Diagnostic LED's, cont'd

FTB - D19: SERVO ENABLED RELAY

Indicates when the servos enabled relay, CR2 on the FTB, is energized. Also, implies that CR7 on the main panel should be energized and there should be power to the servo motors.

FTB - D24, D27: CPU 2 and CPU1

Indicates CPU activity.

FTB - D25: HORN RELAY

Indicates when the horn relay, CR5 on the FTB, is energized.

FTB - D28: BRUSH/BELT RELAY

Indicates when the brush/belt relay, CR4 on the FTB, is energized.

FTB - D29, D31: PCS1 and PCS0

Indicates CPU activity.

FTB - D30: COUNTER RELAY

Indicates when the counter relay, CR6 on the FTB, is energized.

FTB - D33, D34, and D35: OPTIONAL I/O STATUS

Indicates optional input or output signal status.

FTB - D36, D37, and D38: OPTIONAL INPUT STATUS

Indicates optional input signal status.

AUX - D1: RUN RELAY

Indicates that the run circuit has been energized. The run circuit is made up of the RUN button, STOP button, mag-lock on the front cover, and the CPU status relay CR9 on the AUX board. All of these contacts must be closed for the run circuit to seal-in.

AUX - D6: 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.

8.2 Seven Segment LED, Error Codes

Mounted on the edge of the CPU board inside the main electrical enclosure 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 refer to Section 8.6.

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.

<u>CODE</u>	<u>DESCRIPTION</u>
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
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

8.2 Seven Segment LED, Error Codes, cont'd

<u>CODE</u>	<u>DESCRIPTION</u>
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.

See section 8.6 for more information.

8.3 Audible Alarm Codes

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

ALARM	CODE DISPLAYED	DESCRIPTION
1 Short	None	Power turned on, or home sequence successful.
2 Short	H006	Bag necks too close together (tried to start 2 nd cycle before 1 st 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.

8.4 Operating Voltages

The following voltages should be referenced from DC common, wire 22.

NAME	WIRE NUMBER	VOLTAGE
5 VDC	15	4.7 – 5.3 VDC
12 VDC	23	11.5 – 12.5 VDC
36 VDC	24	32.0 – 36.0 VDC
36 RET	20	0.0 – 0.2 VDC

8.5 Terminal Option

The Servo 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; refer to section 9.3 for wiring requirements. Using the terminal, the Servo Tyer can be queried as to its status and controlled manually for troubleshooting. This terminal is not required for normal operation.

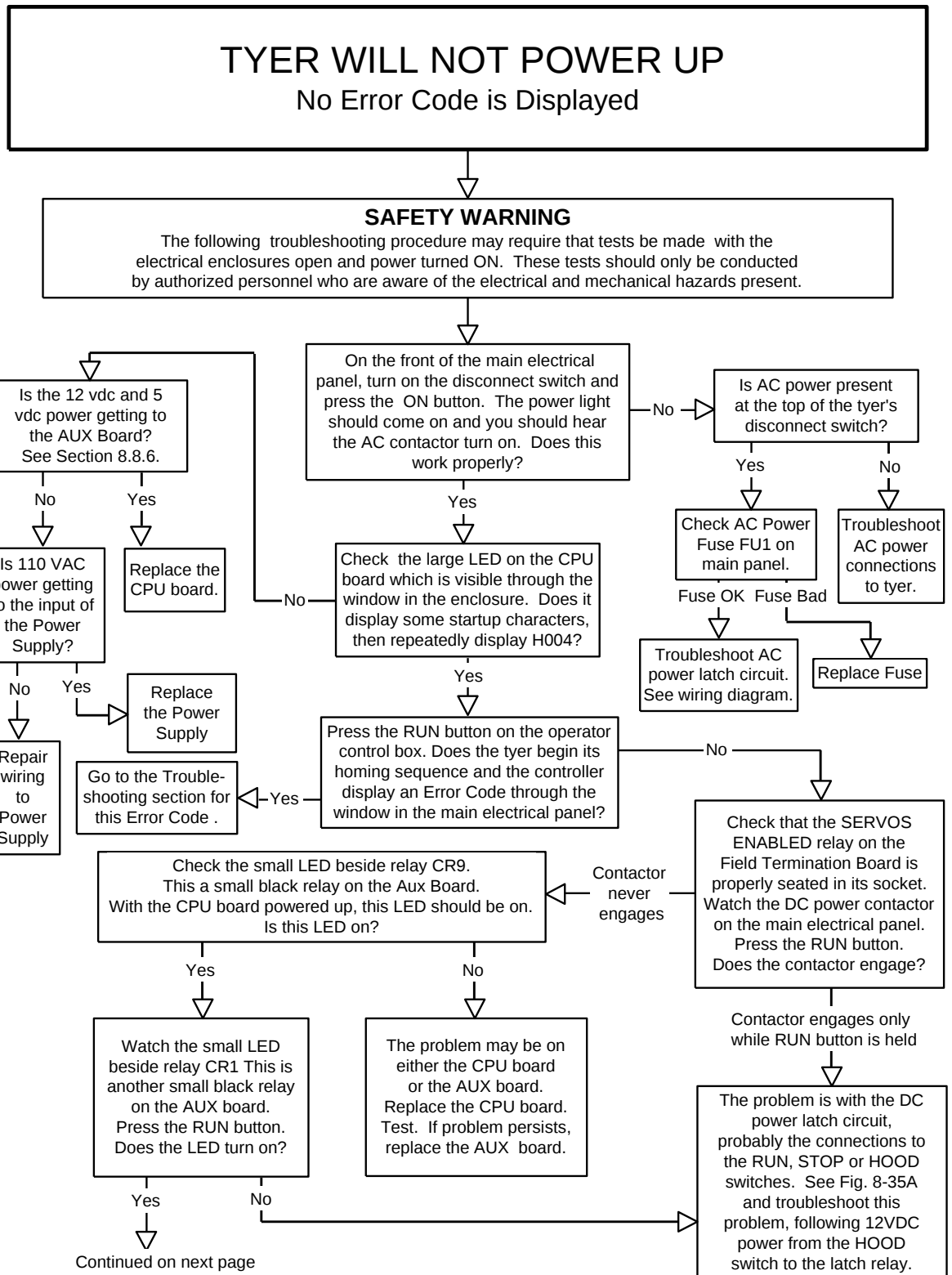
8.6 Troubleshooting Flow Charts

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 8.7 and 8.8 that aid in the troubleshooting.

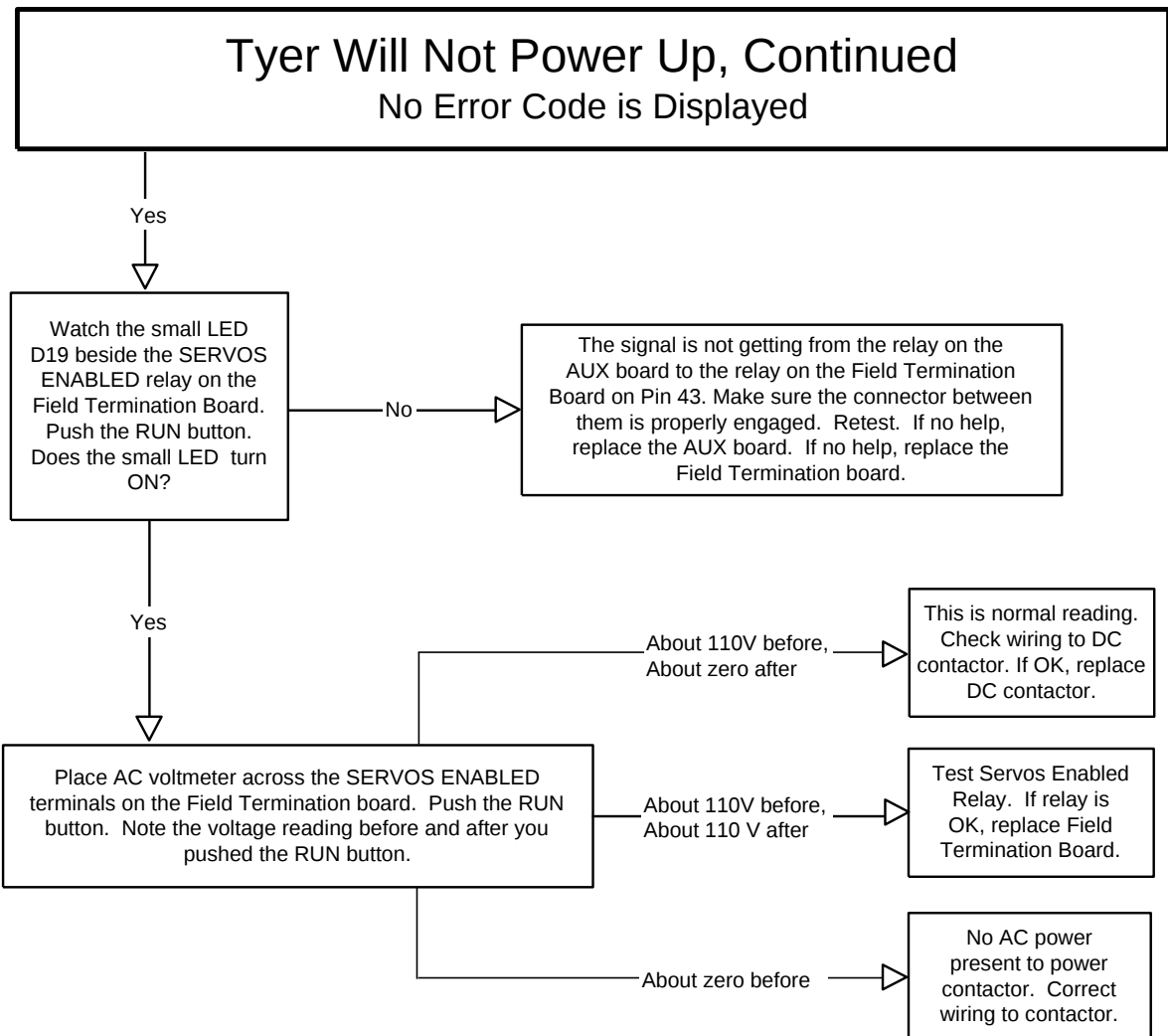
The first 4 troubleshooting flow charts deal with electrical problems that do not result in an Error Code being displayed in the viewing window.

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

8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.

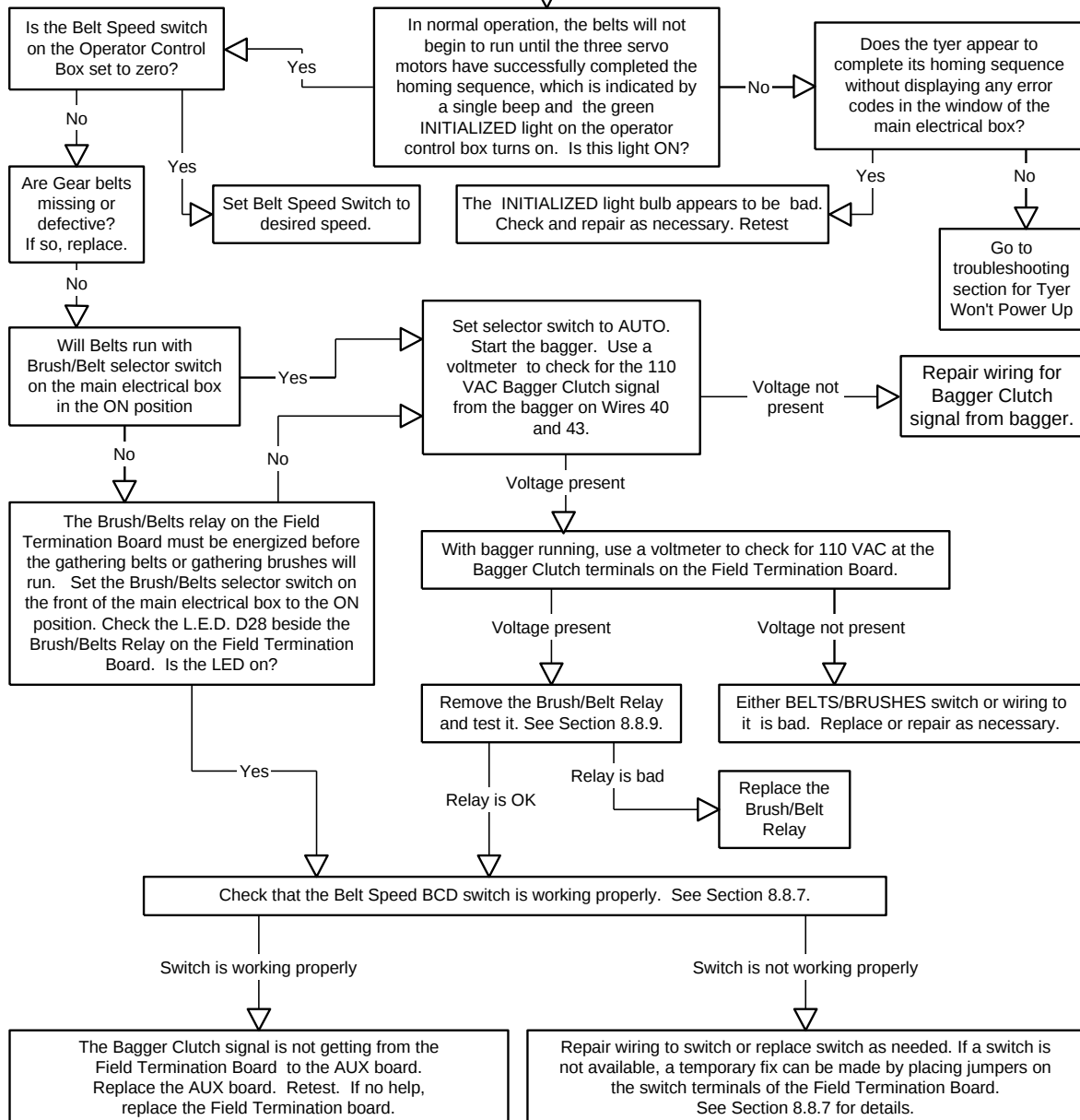


GATHERING BELTS WON'T RUN

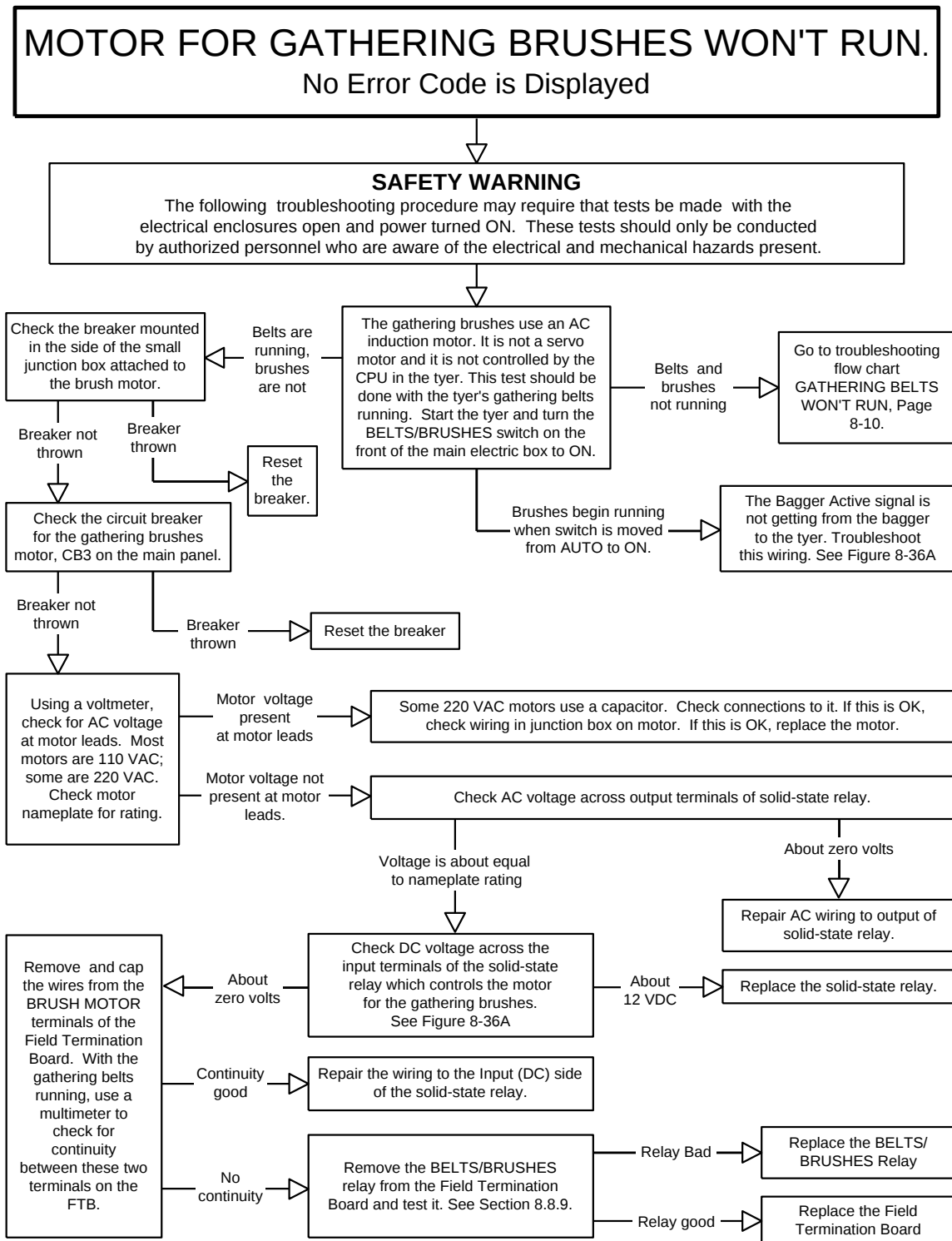
No Error Code Is Displayed

SAFETY WARNING

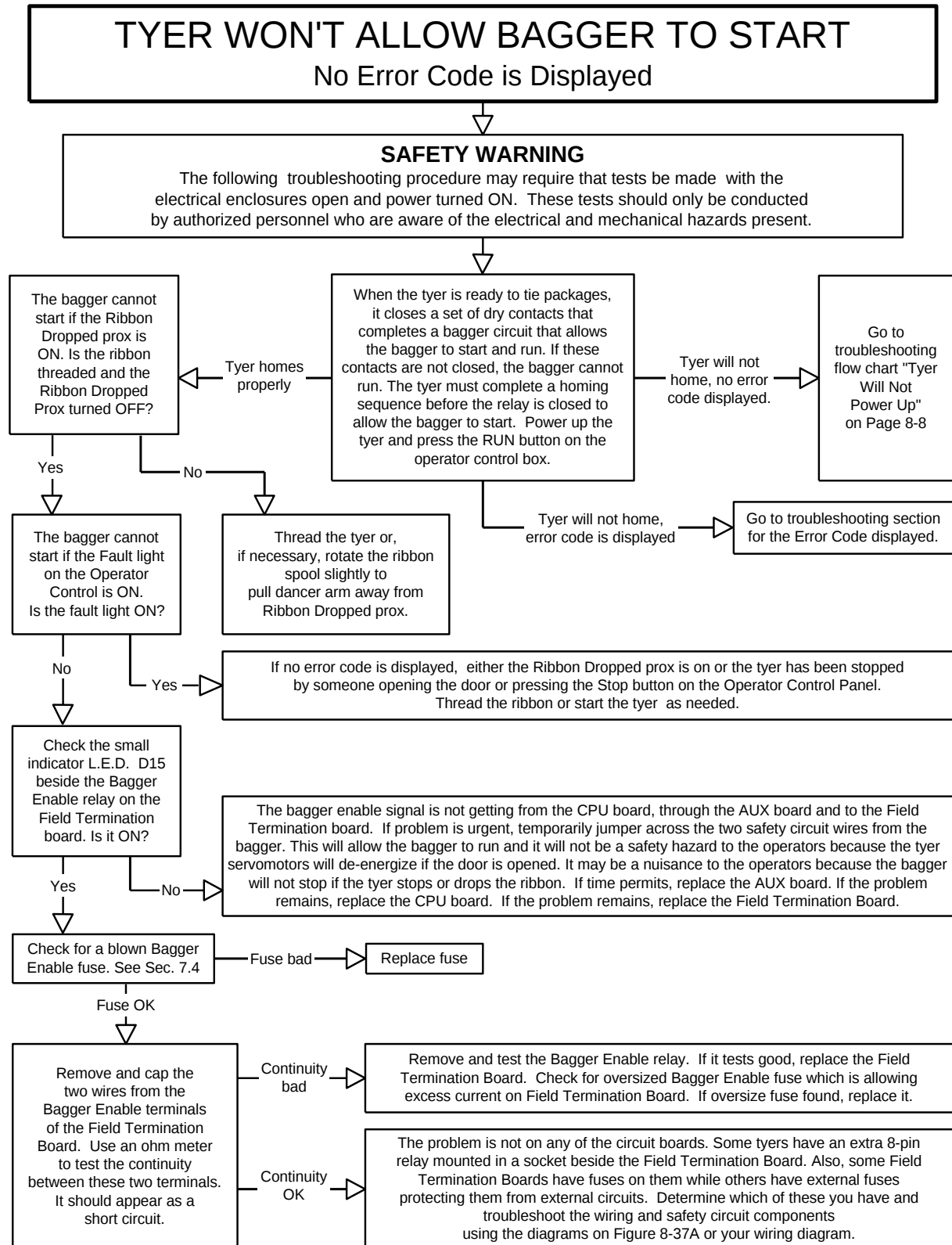
The following troubleshooting procedure may require that tests be made with the electrical enclosures open and power turned ON. These tests should only be conducted by authorized personnel who are aware of the electrical and mechanical hazards present.



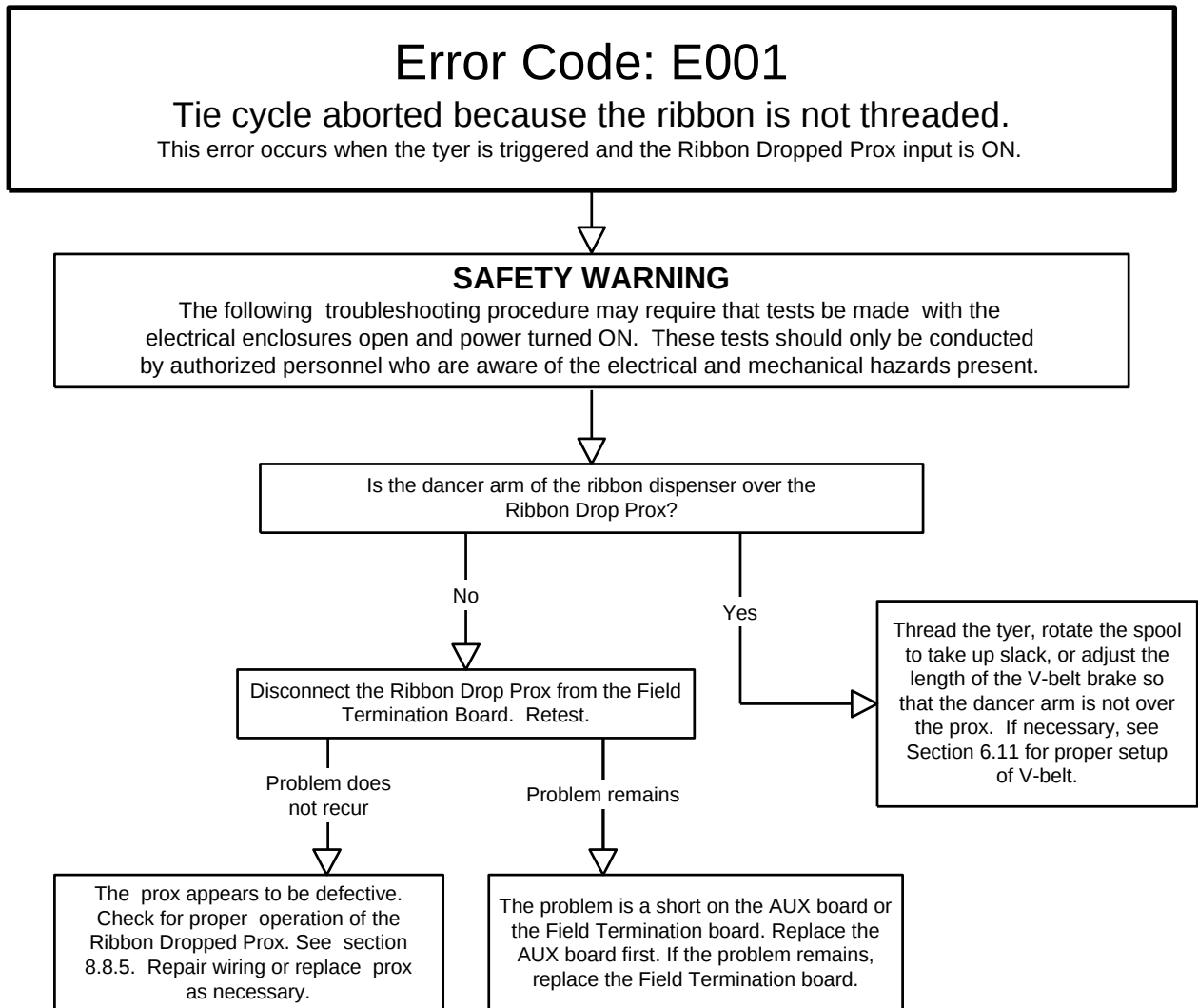
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



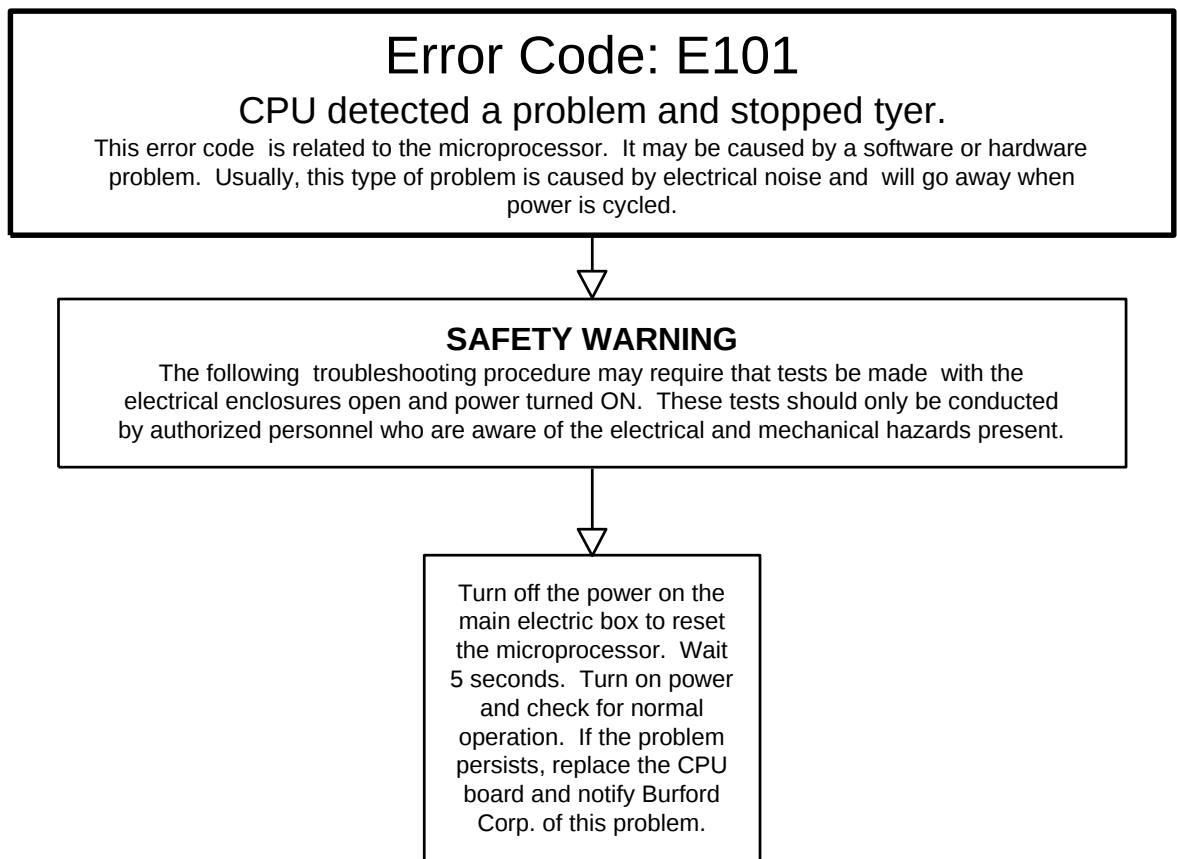
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



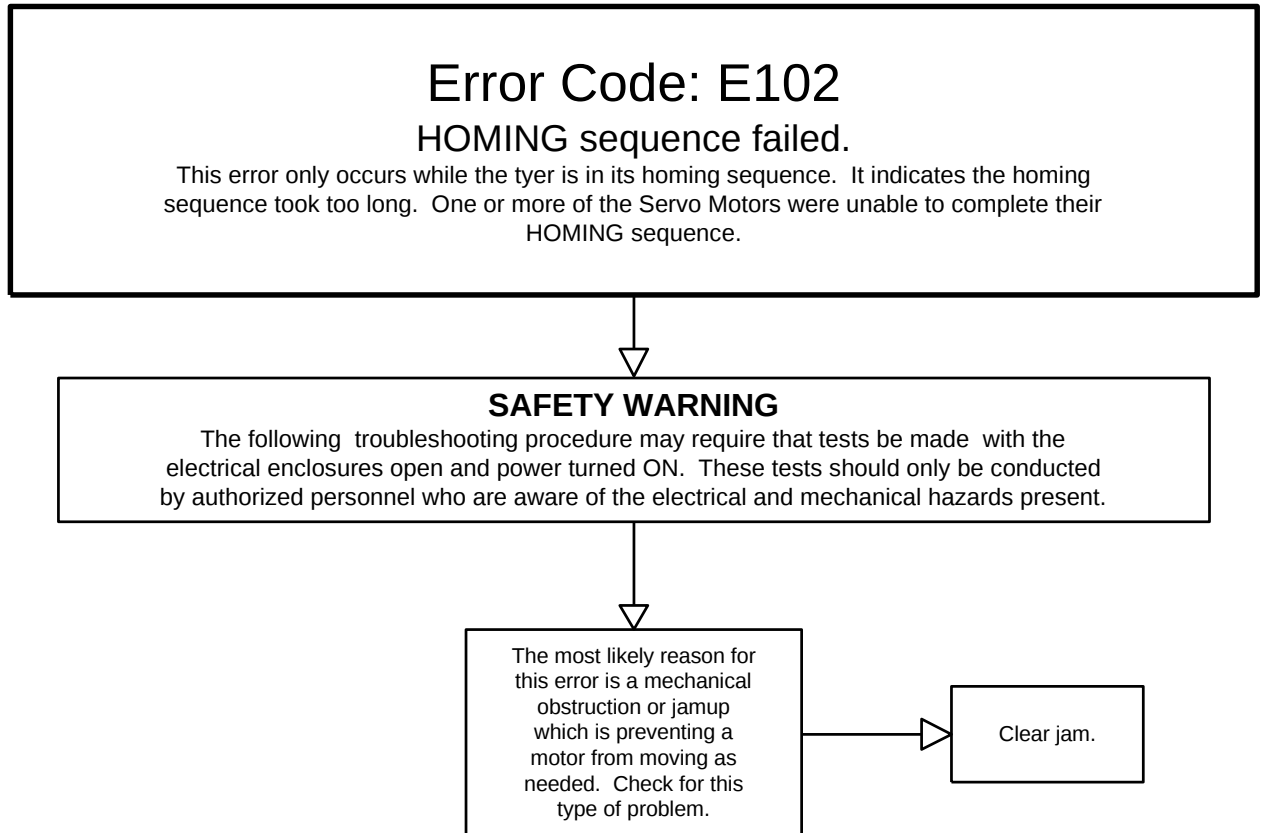
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



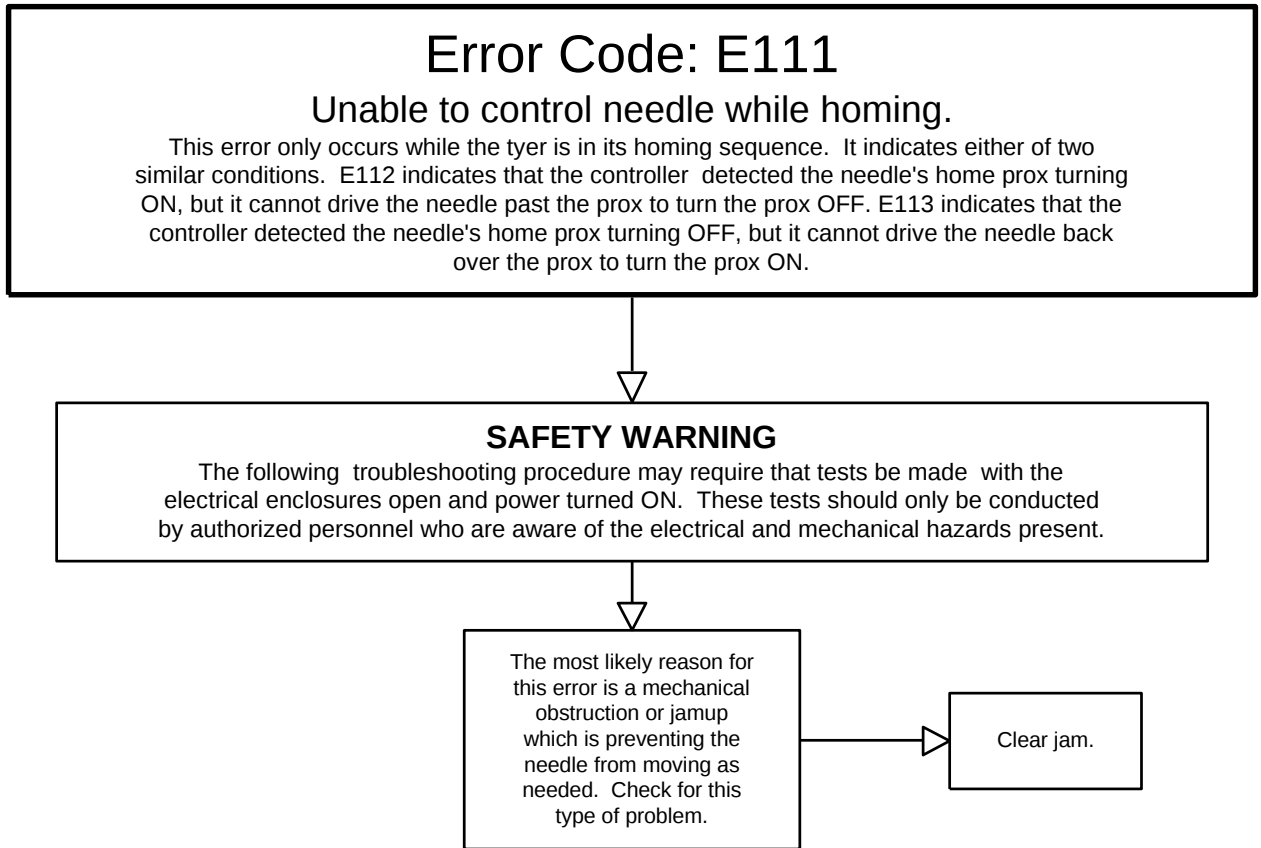
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd



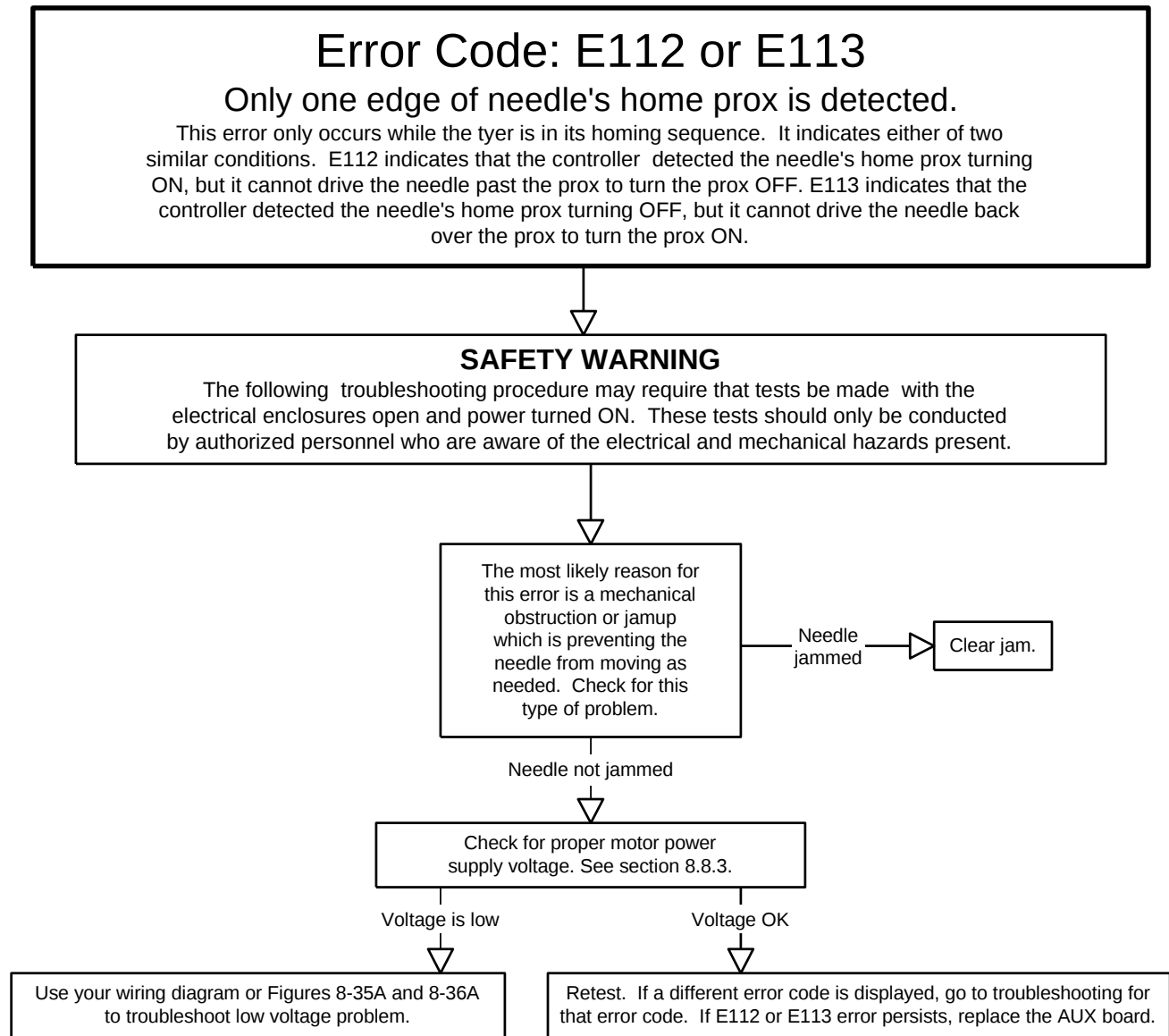
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd



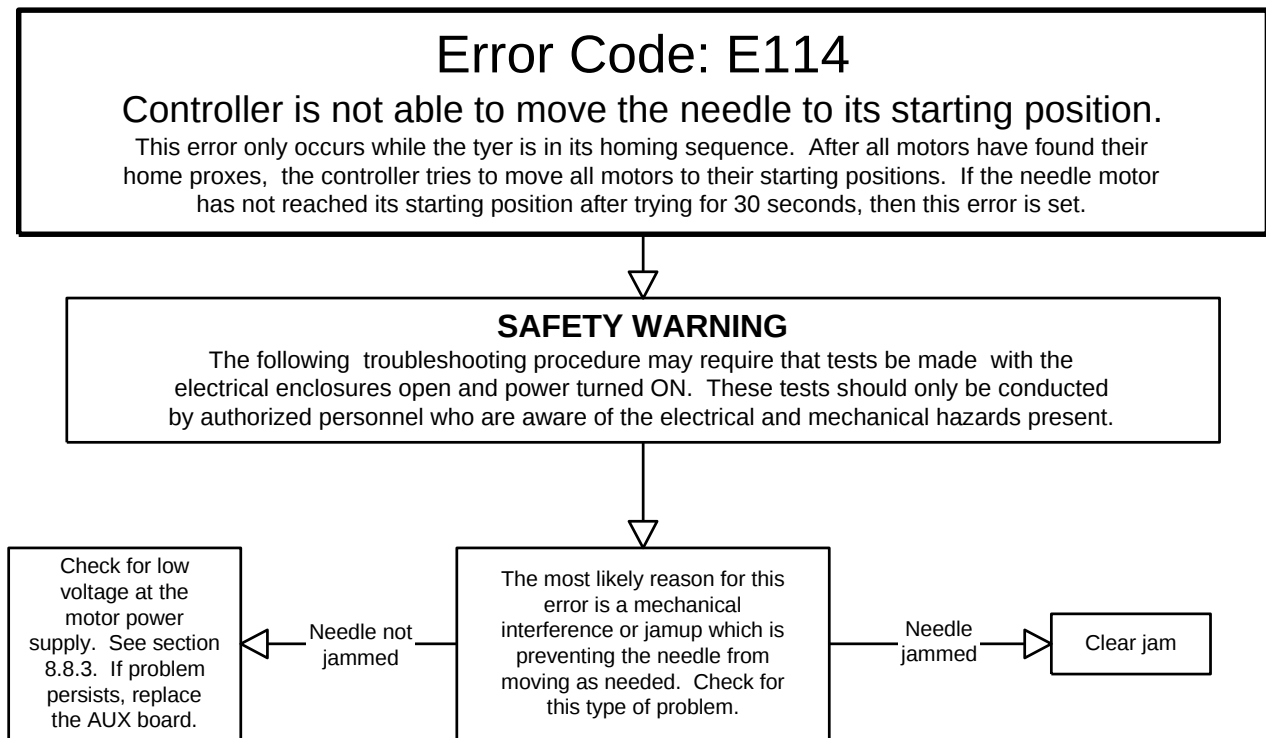
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd



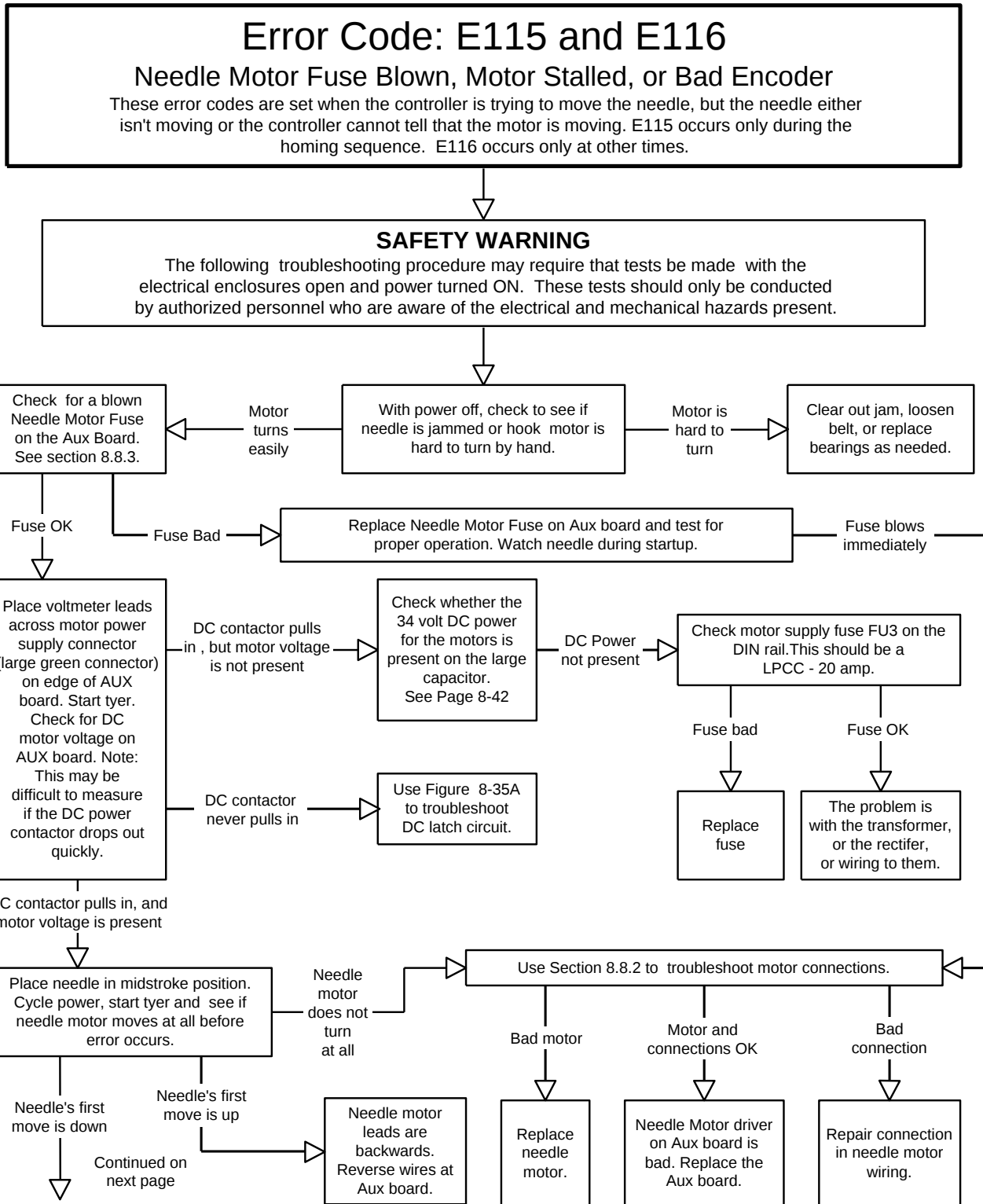
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



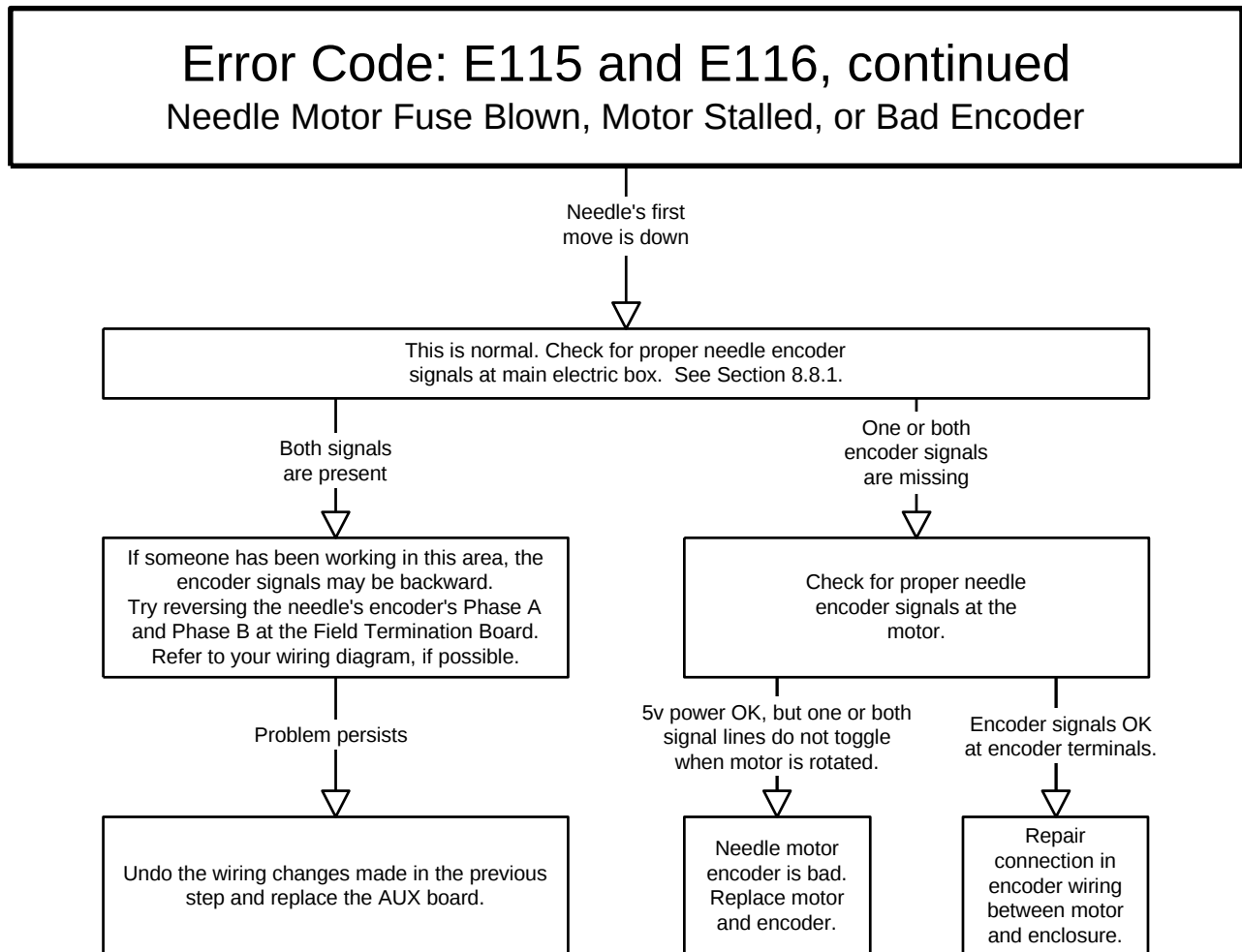
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



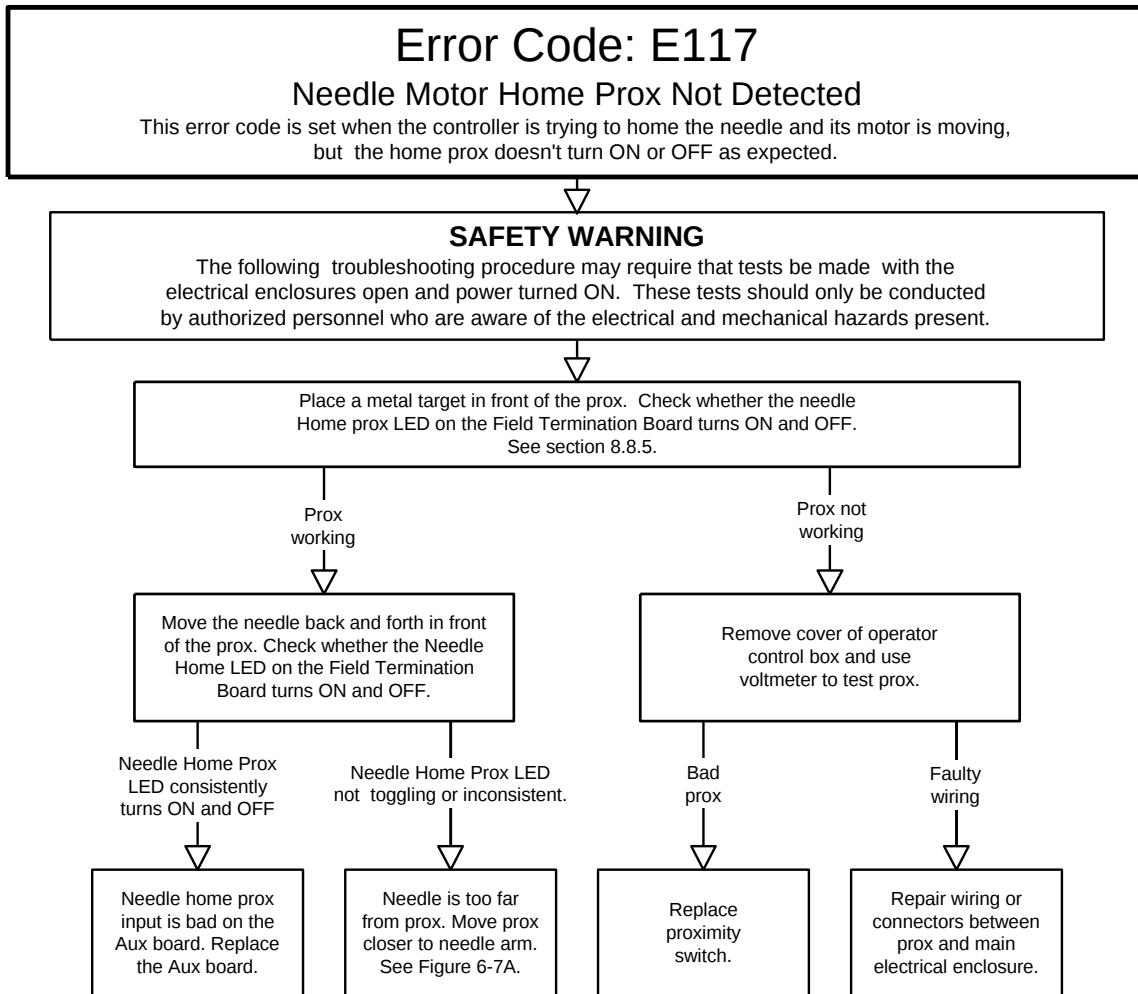
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



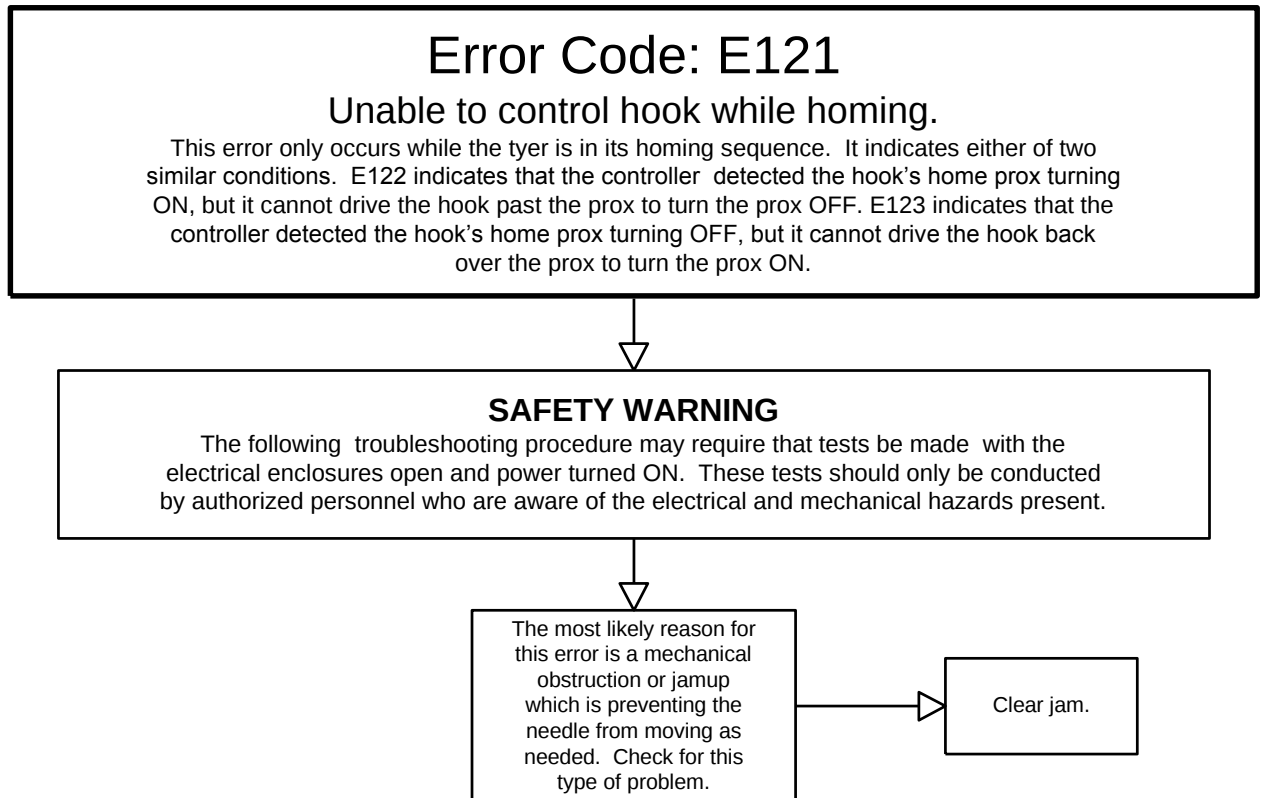
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



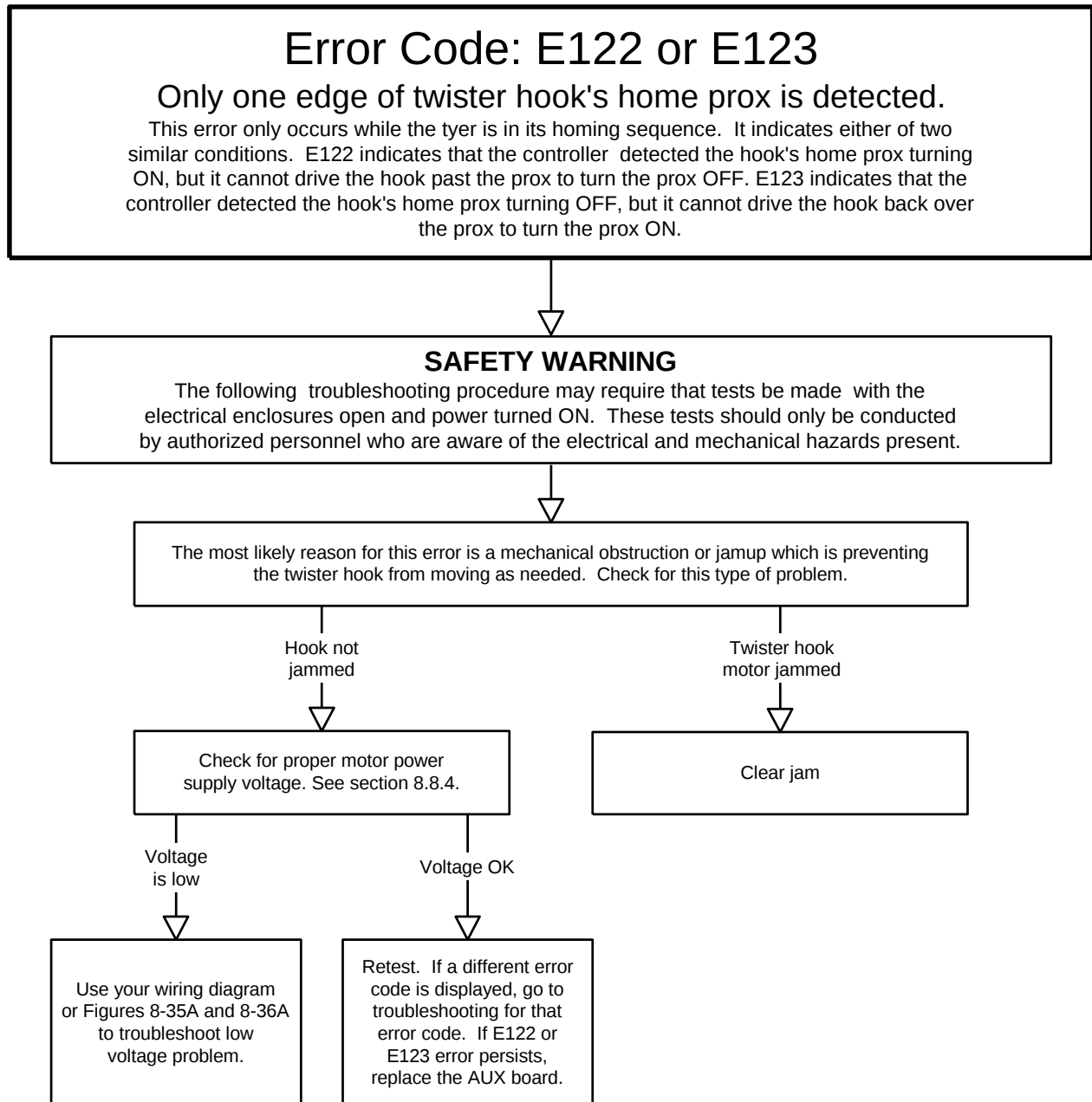
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



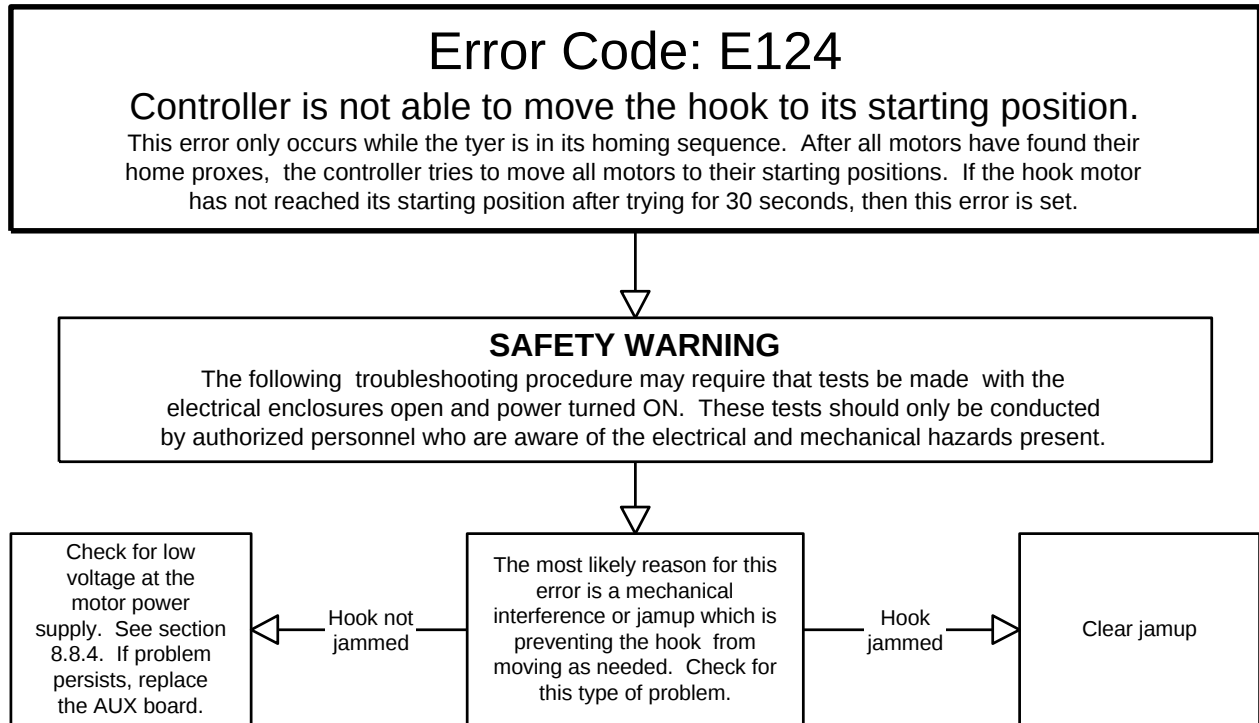
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd



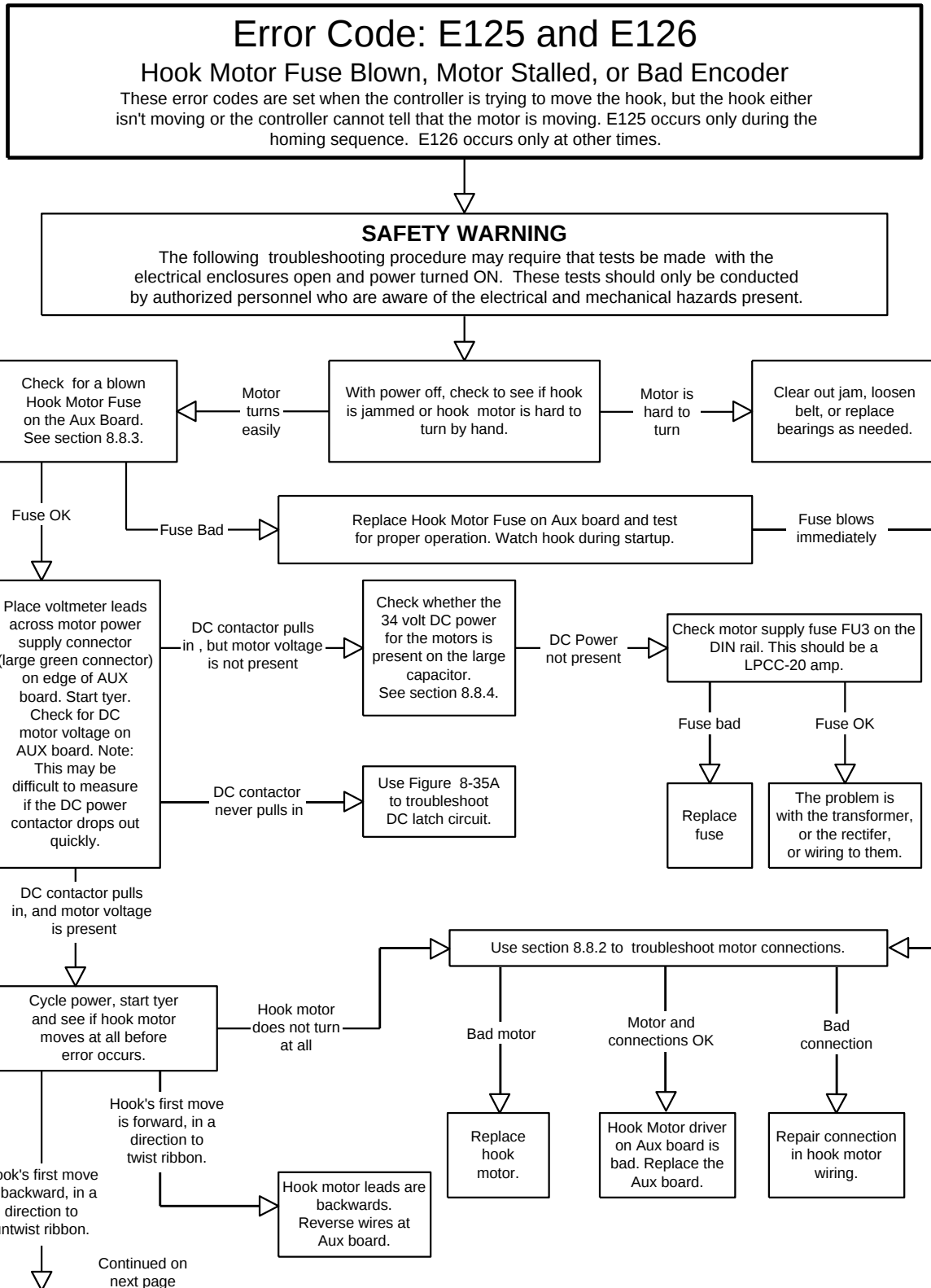
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



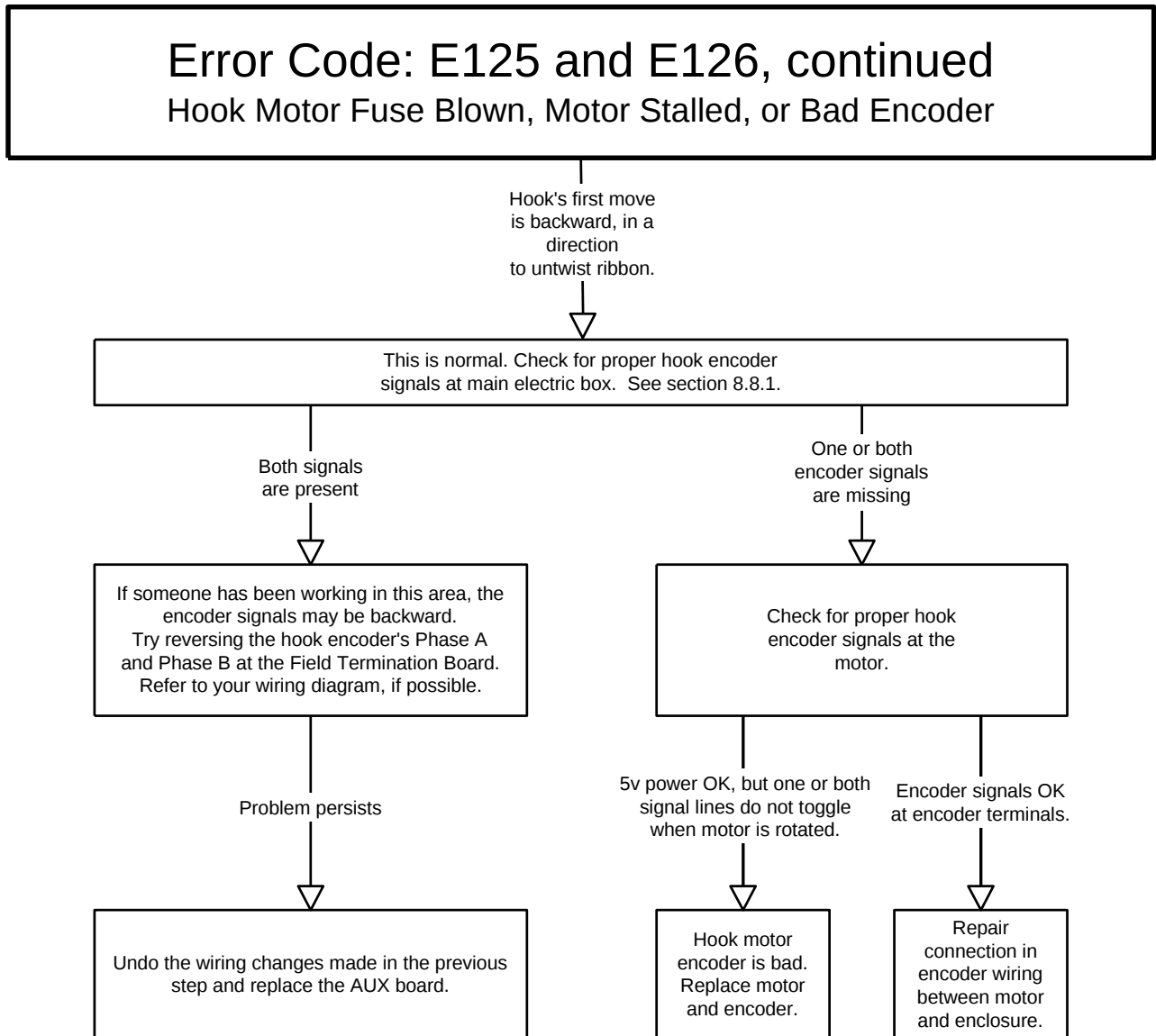
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



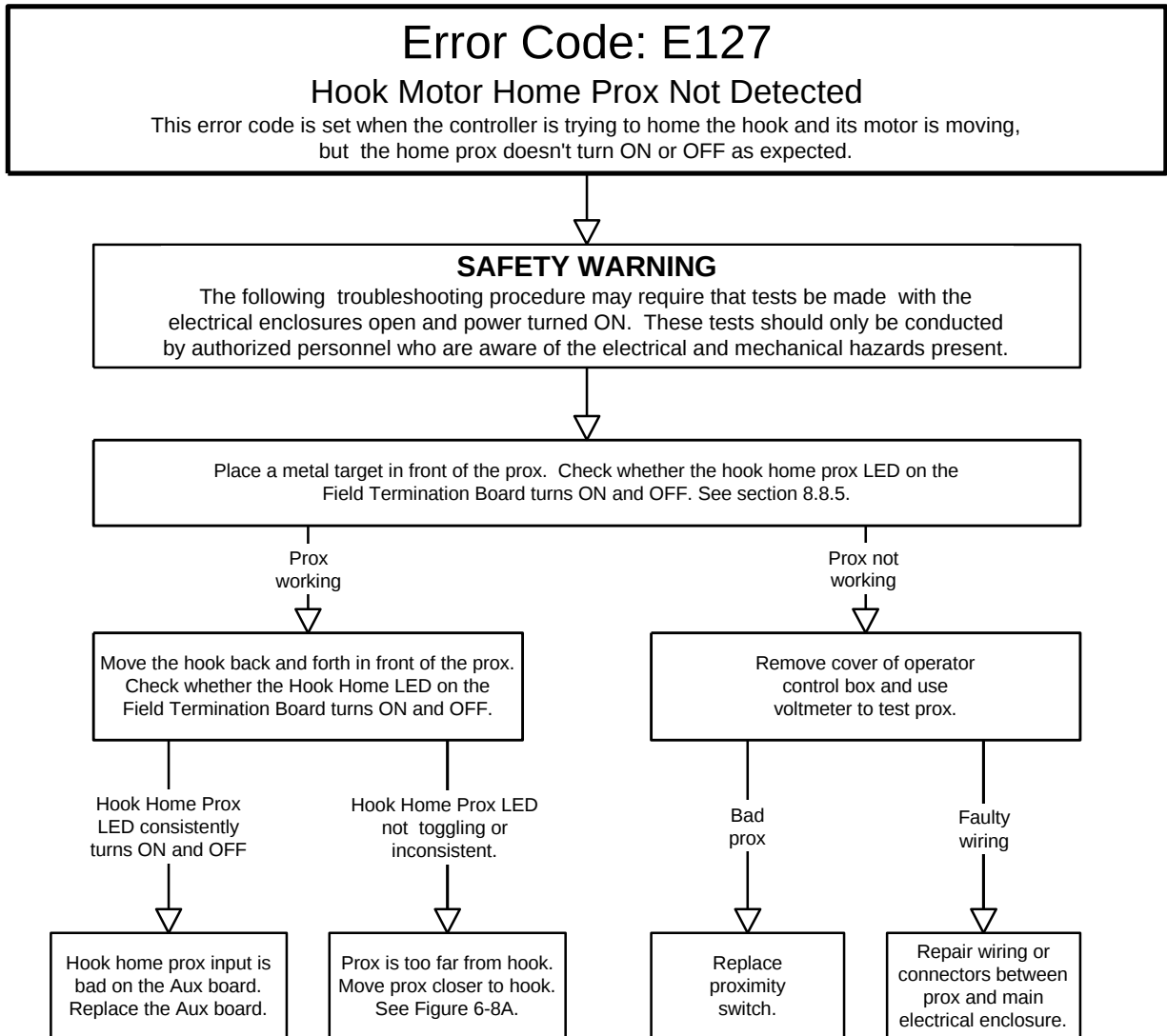
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



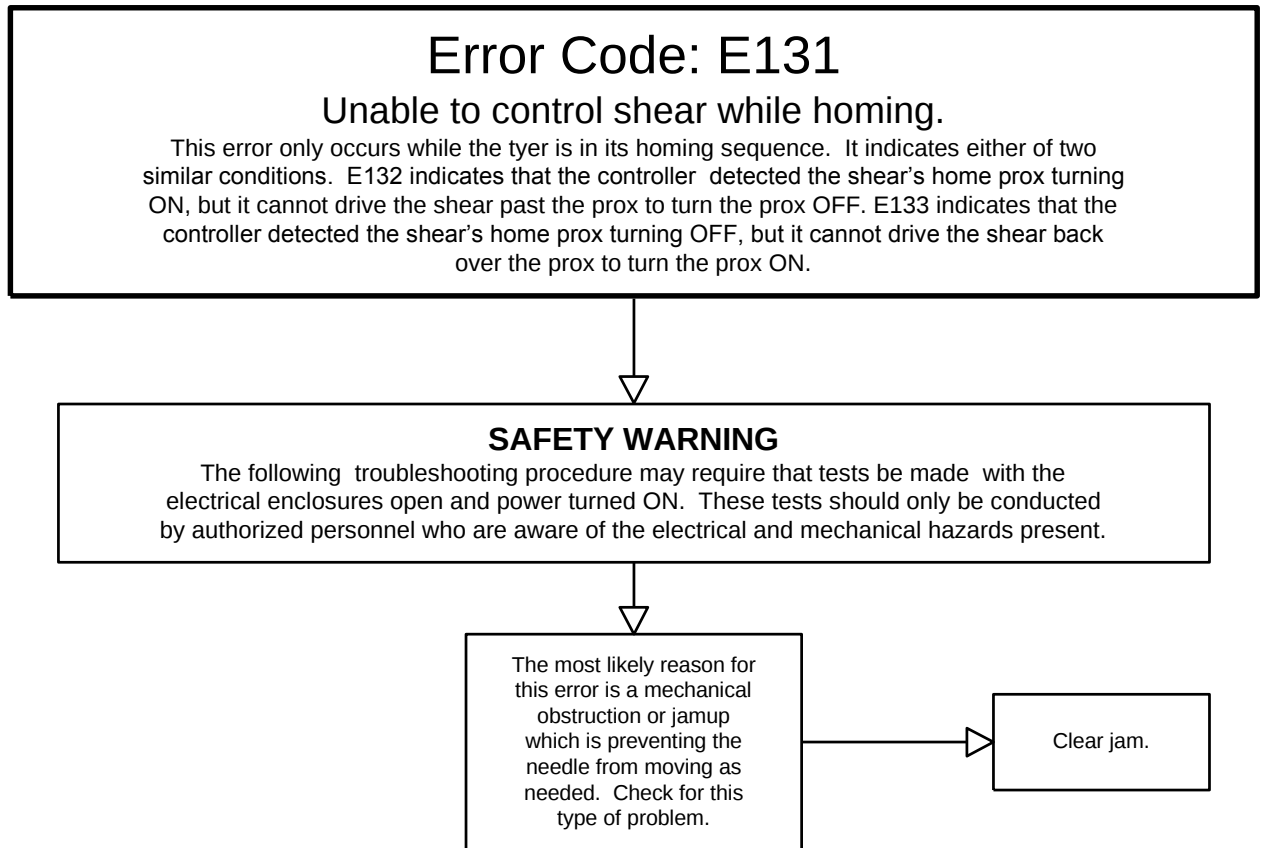
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



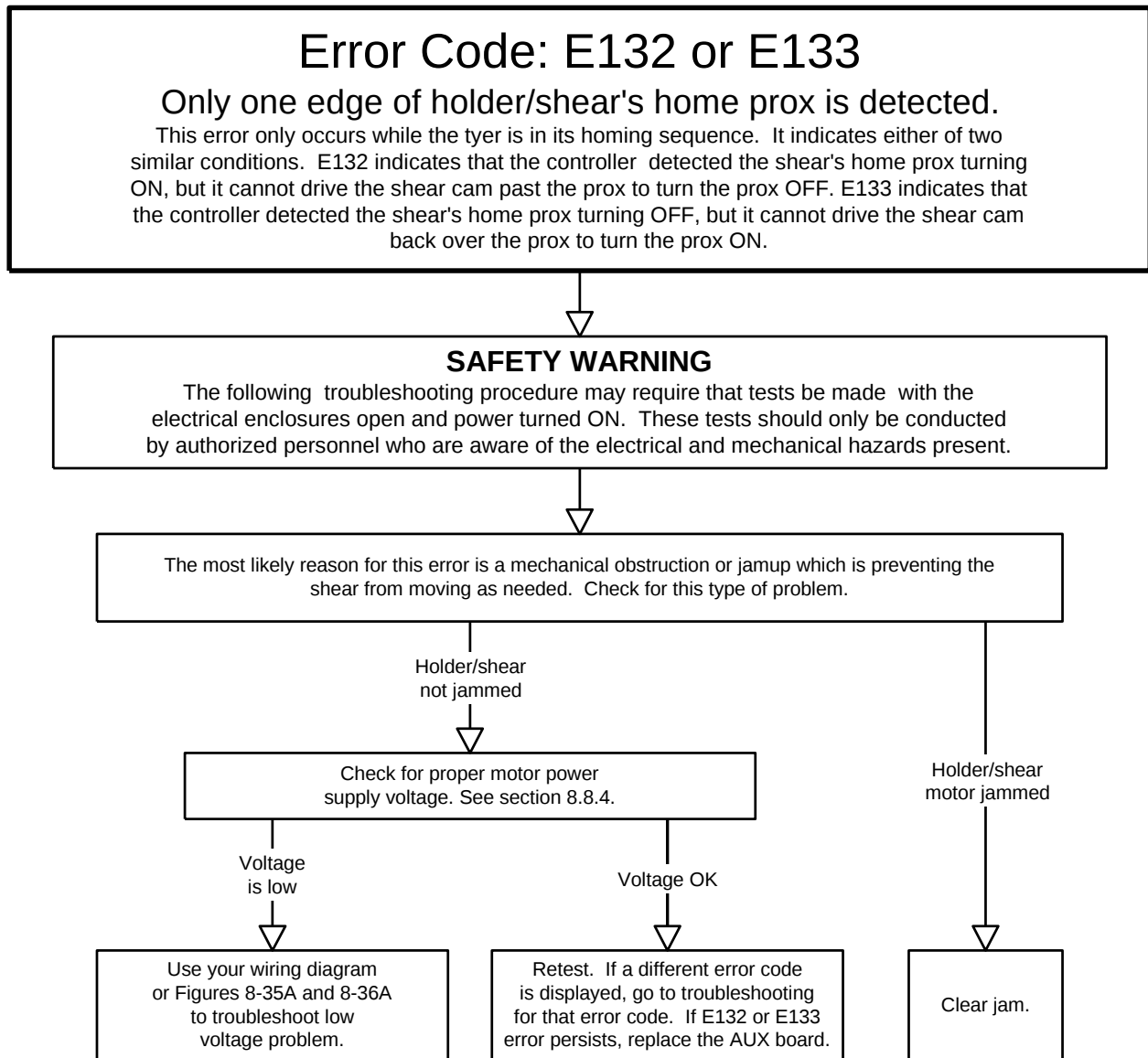
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



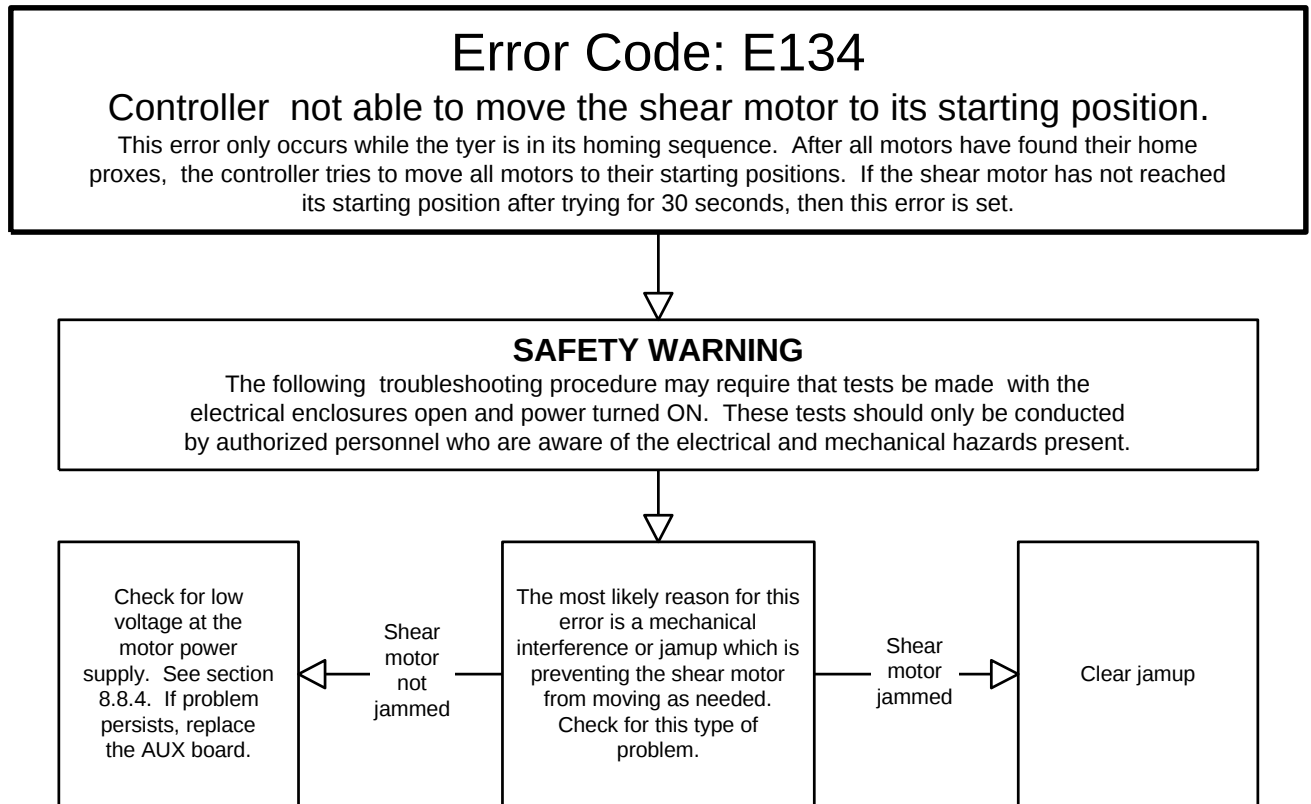
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd



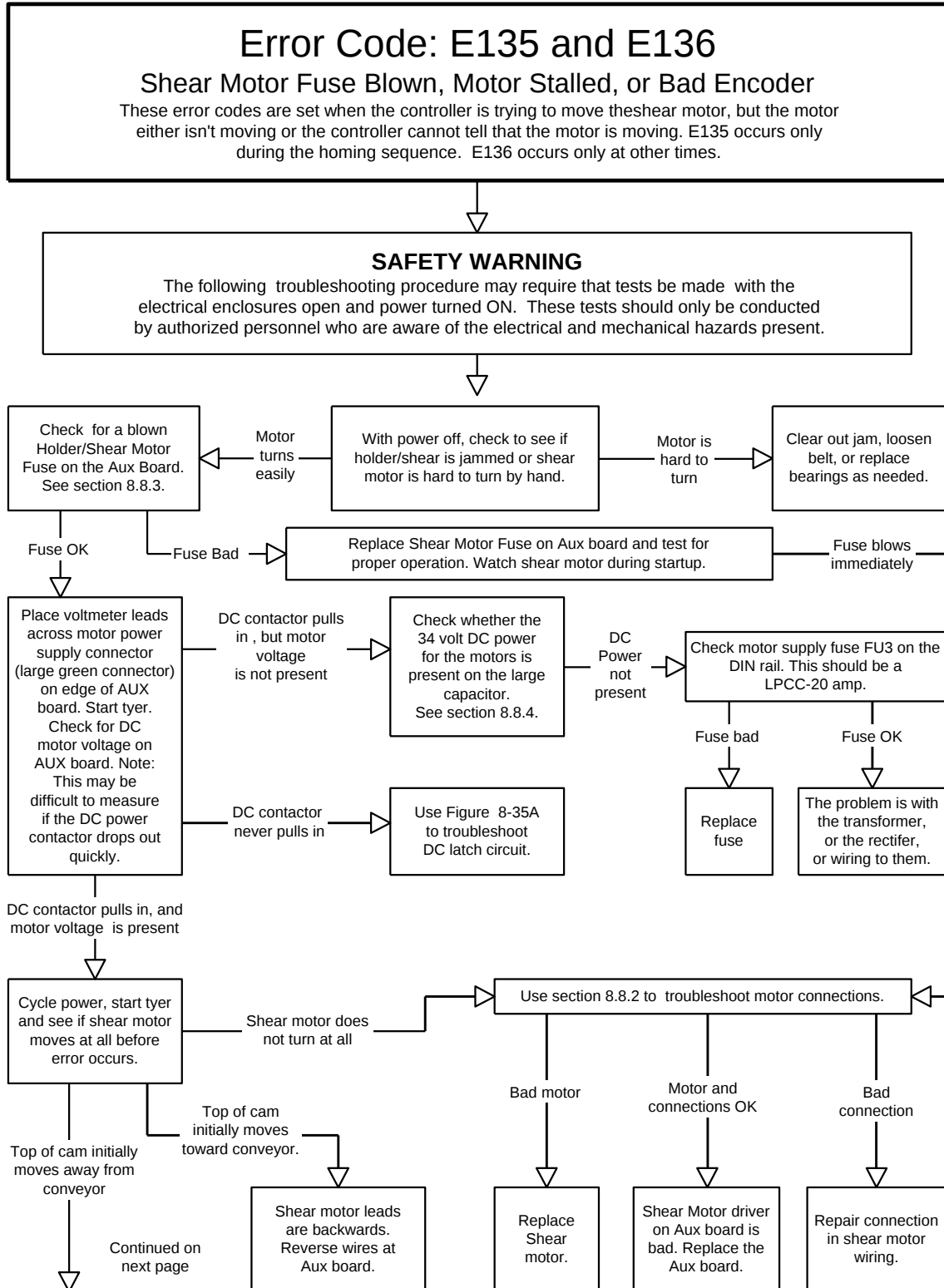
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



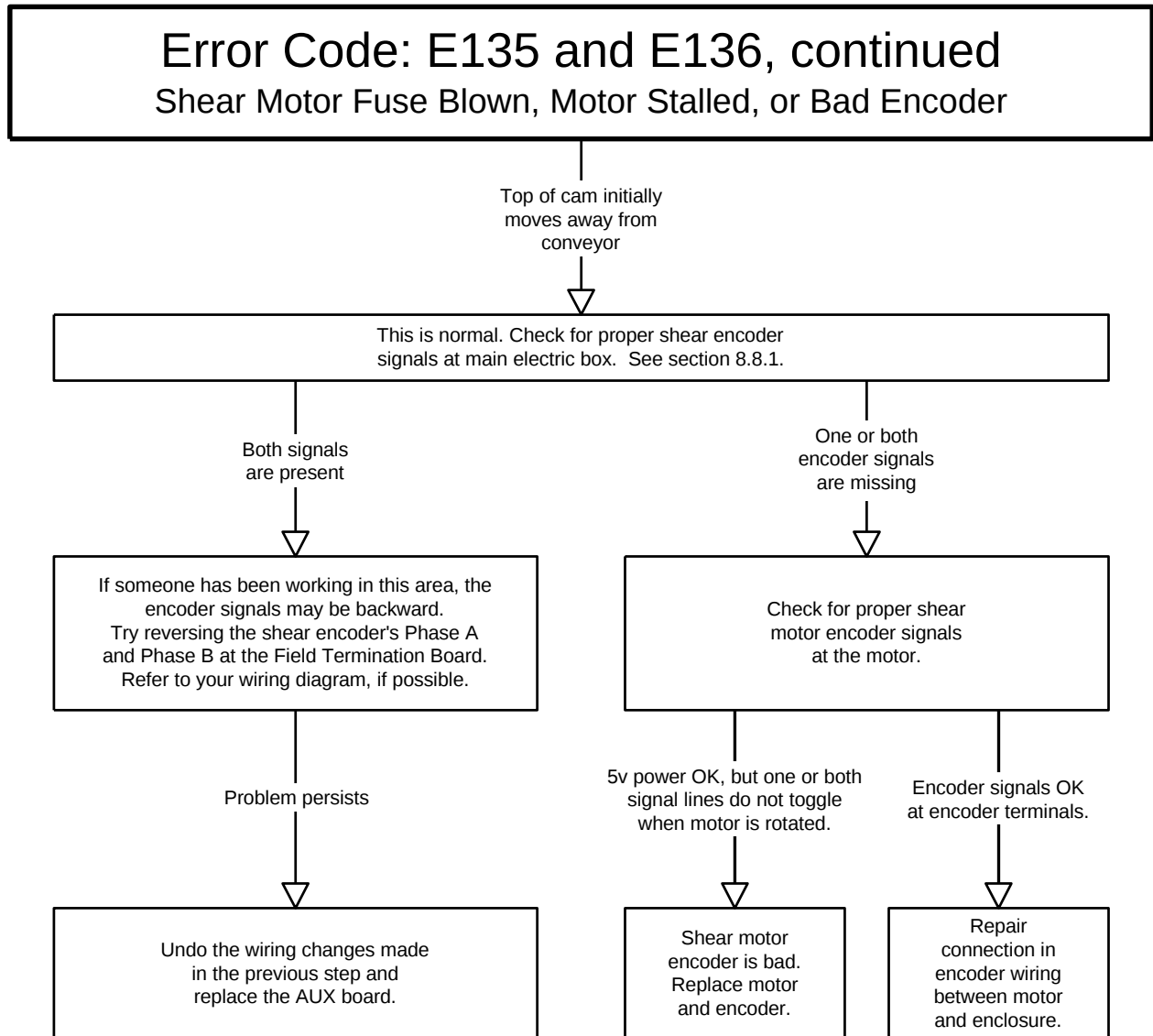
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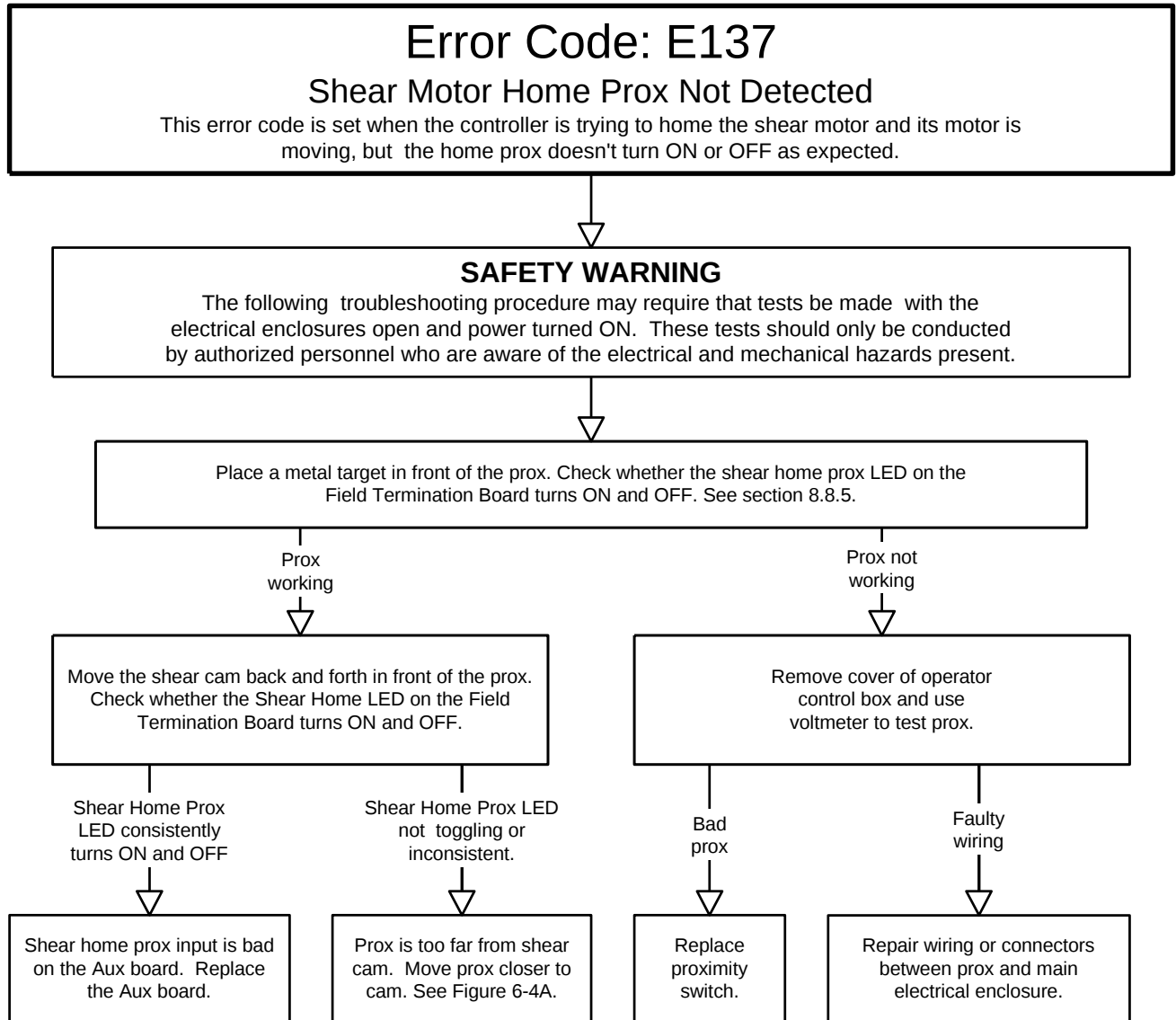
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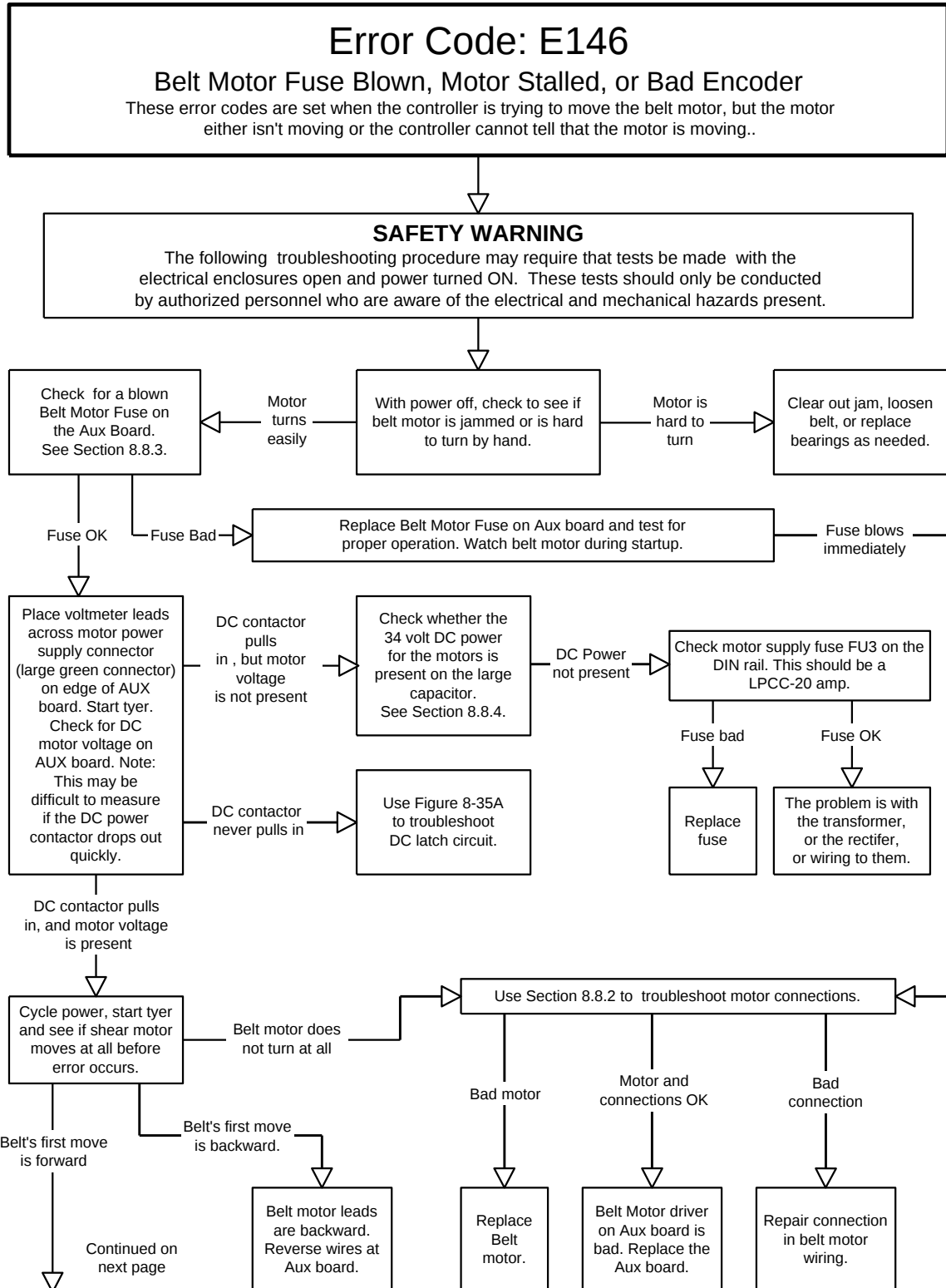
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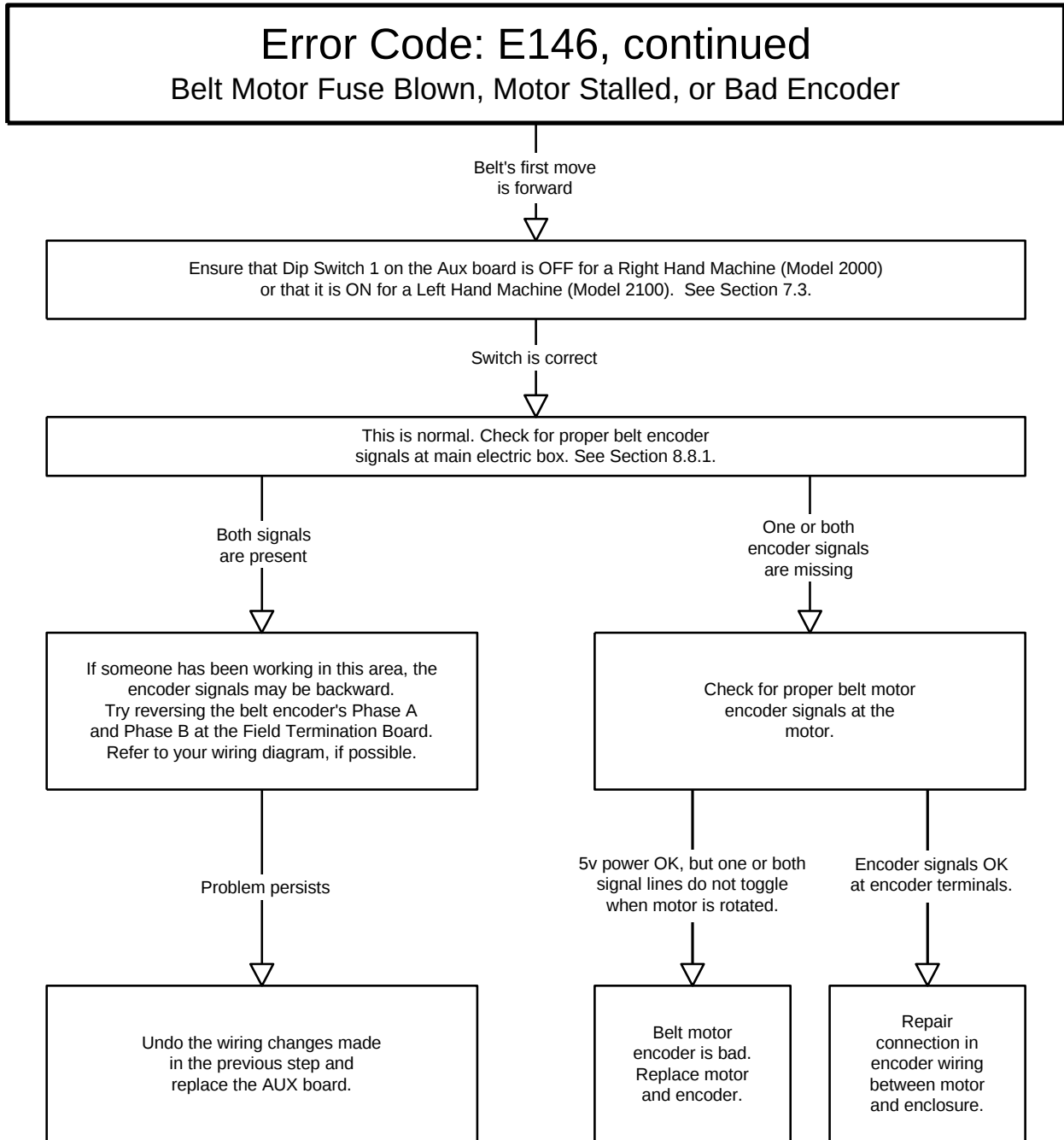
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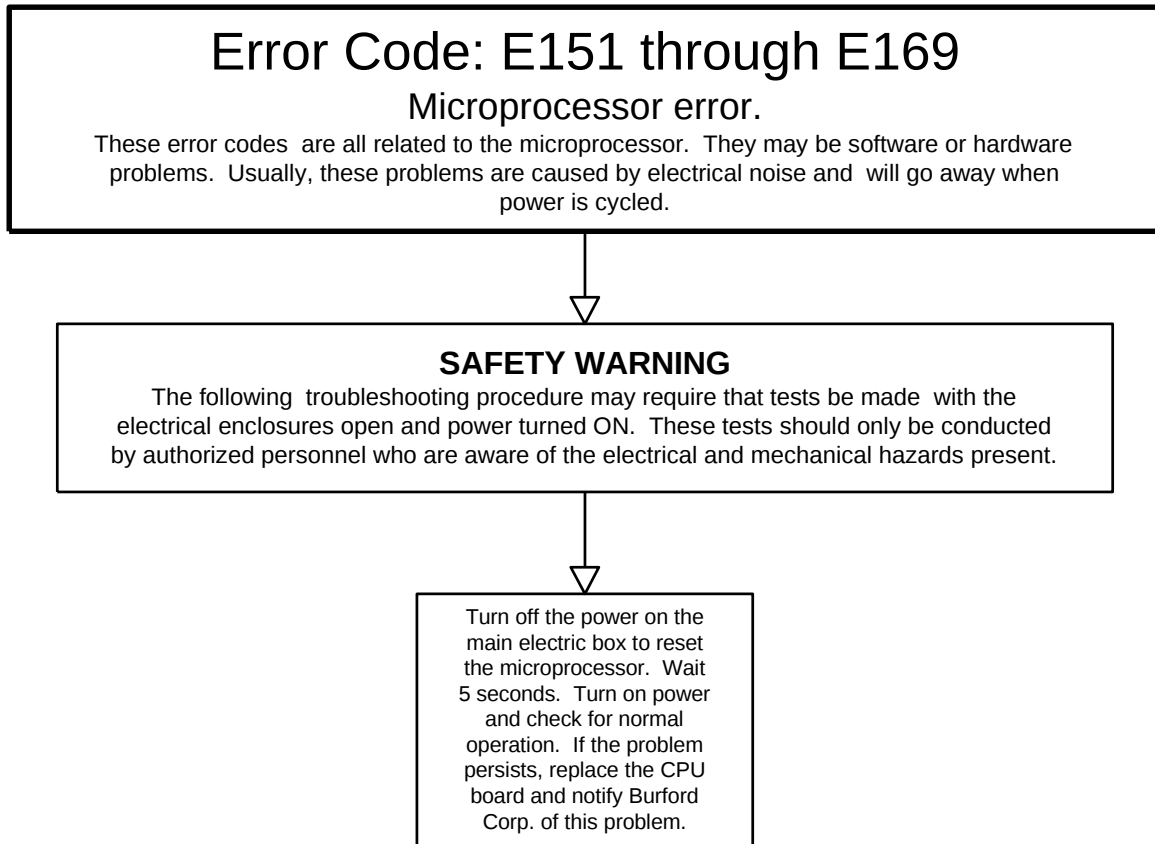
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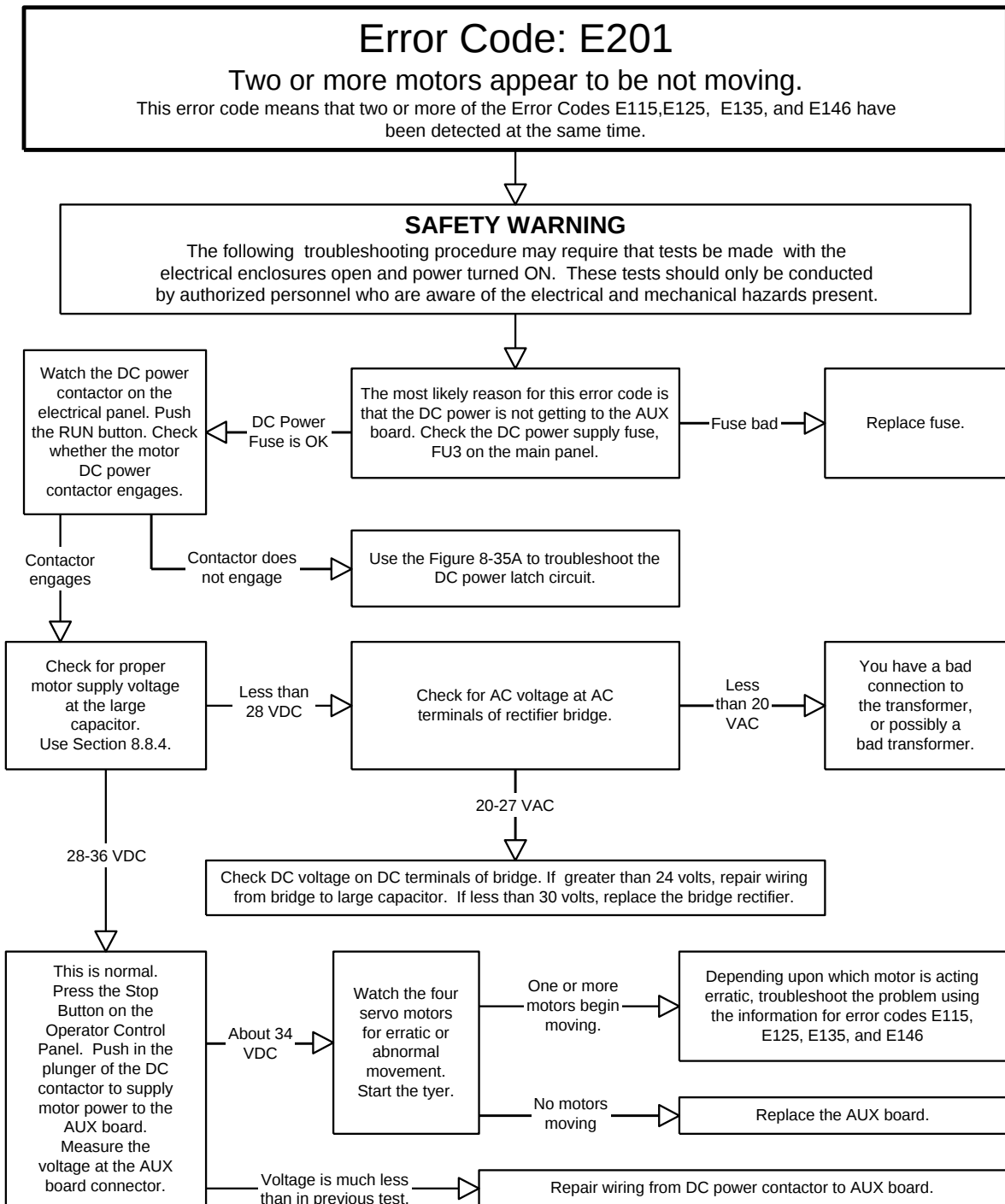
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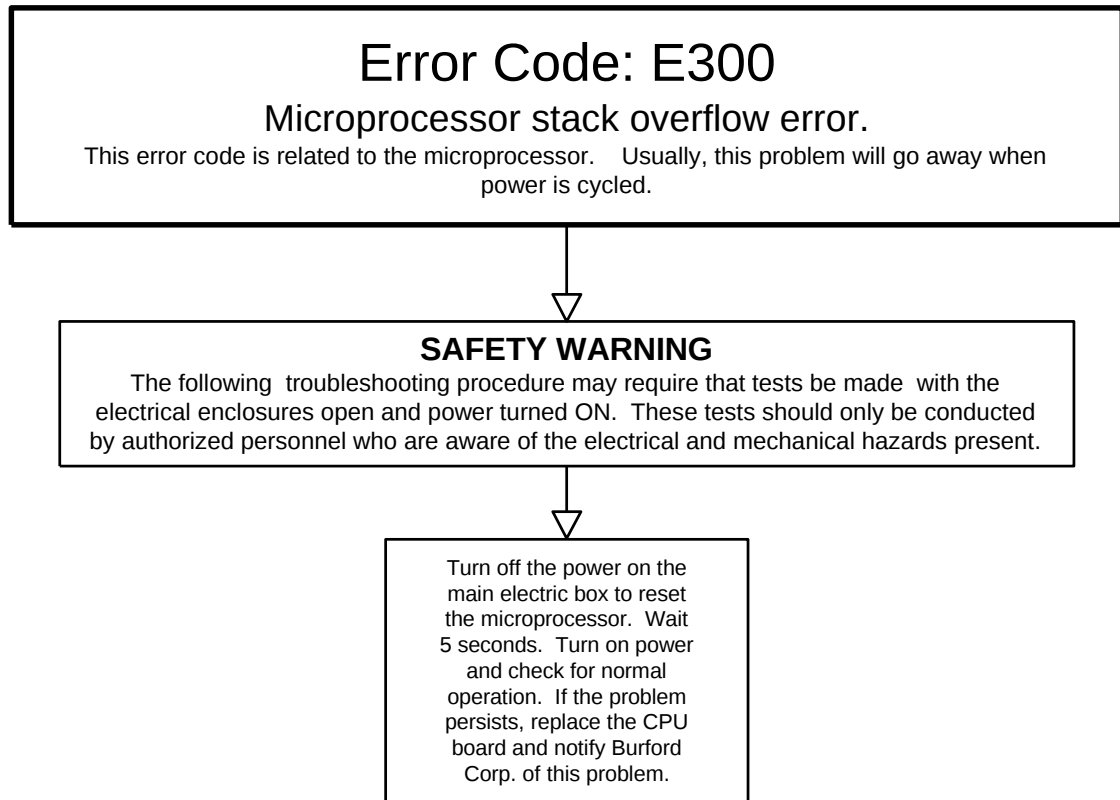
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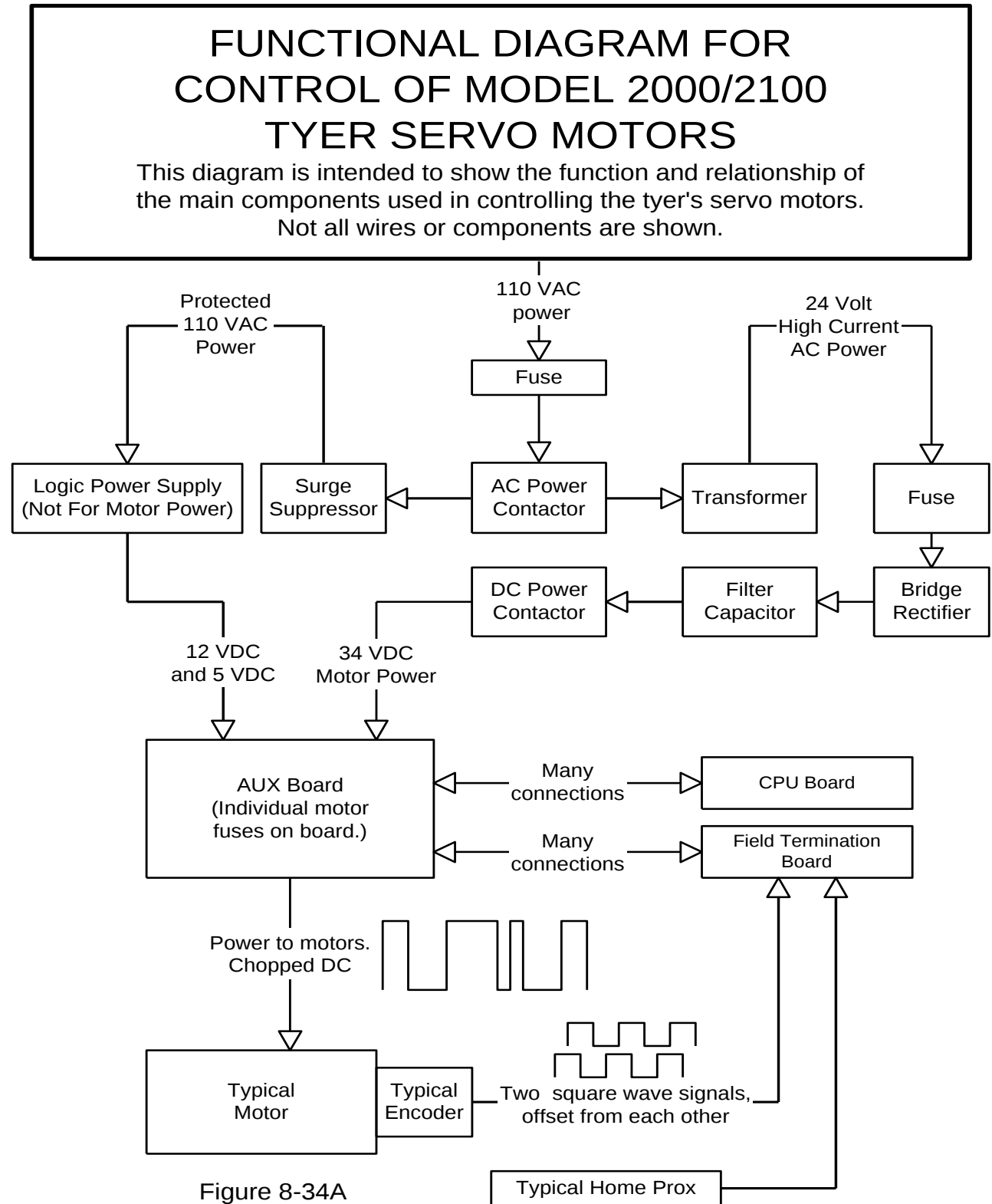
8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



8.6 TROUBLESHOOTING FLOW CHARTS, cont'd.



8.7 Operational Diagrams



8.7 OPERATIONAL DIAGRAMS, cont'd.

BURFORD 2000/2100 TYER DC POWER LATCH CIRCUIT

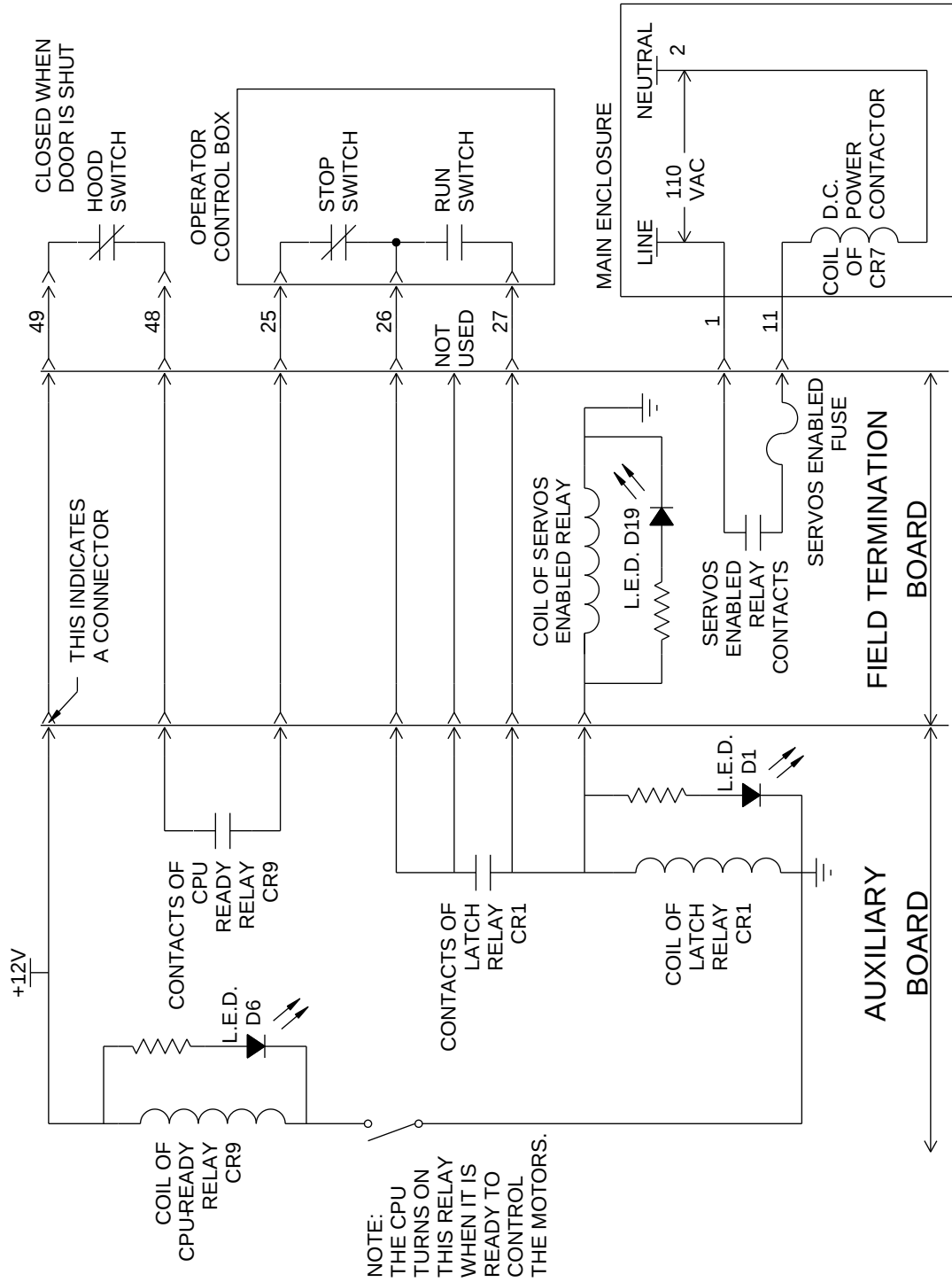


FIGURE 8-35A

BURFORD 2000/2100 TYER
CONTROL OF GATHERING BRUSHES MOTOR



8.7 OPERATIONAL DIAGRAMS, cont'd.

BURFORD 2000/2100 TYER BAGGER ENABLE (SAFETY CIRCUIT)

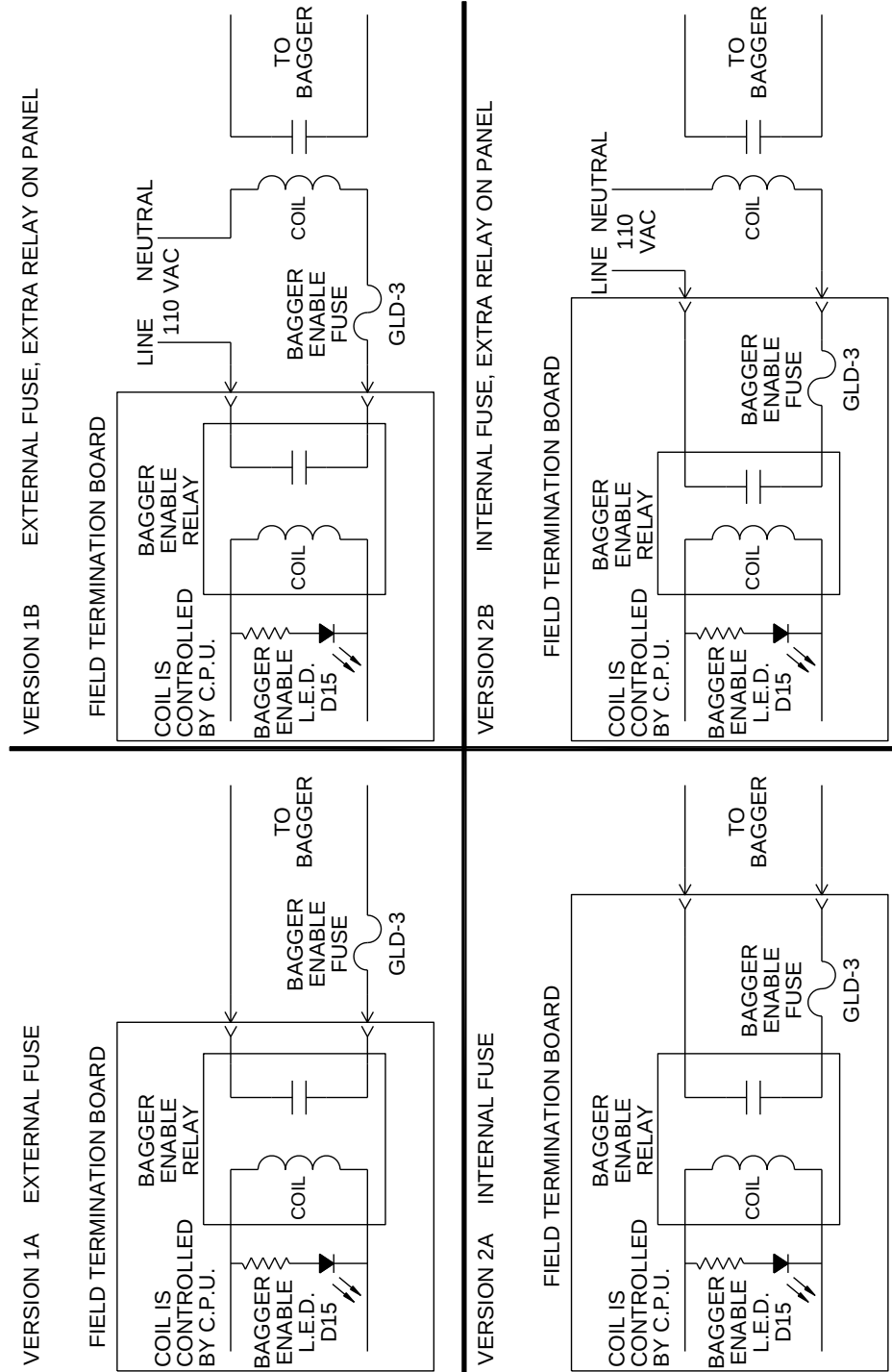


FIGURE 8-37A

8.8 Test Procedures

8.8.1 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 Field Termination 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.
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.

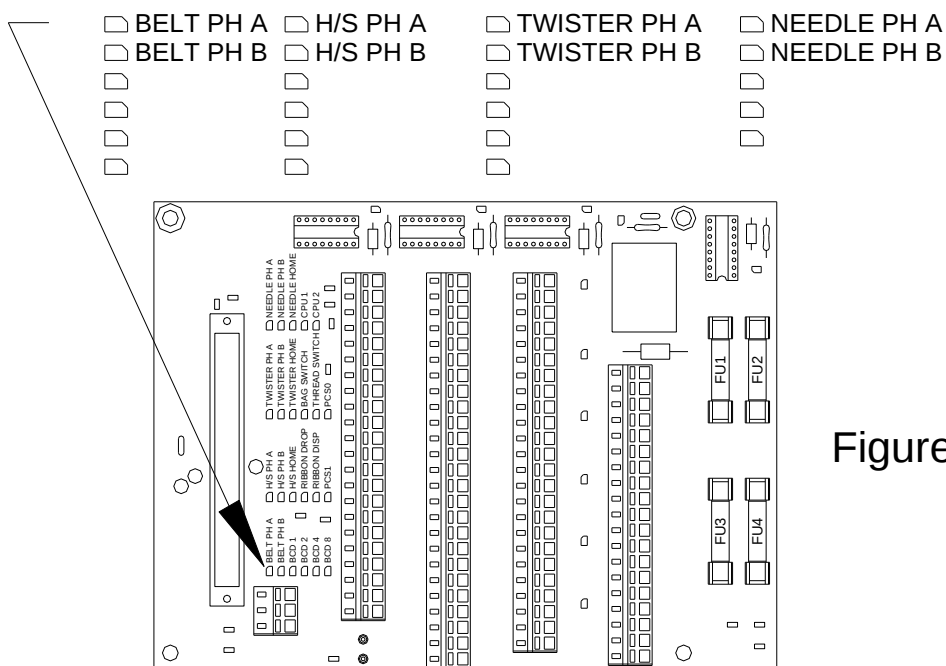


Figure 8-38A

8.7 TEST PROCEDURES, cont'd

8.8.2 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 servo-motor leads are attached to the connector on the edge of the Auxiliary Board. See Figure 7-2A. A motor can be tested for continuity by following these steps.

1. Remove electrical power from the enclosure.
2. Note the location and wire numbers of the motor to be tested. Disconnect the wires of the motor from the Auxiliary board.
3. Attach ohmmeter leads to the motor wires. The ohmmeter reading should be 1 ohm or less. If not, go to Step 5.
4. While continuing to measure the resistance, wiggle the motor connector that goes into the bottom of the tyer. If your meter reading changes drastically while you are wiggling the connector, disconnect the connector and check for motor pins that are arcing or not making good contact. Sometimes, the pins in the connector tend to get pushed out of the connector when it is connected.
5. If the test in Step 3 indicates an open circuit, disconnect the motor connector that goes into the bottom of the tyer and determine whether the break in continuity is in the cable or on the motor side of the connector. Check for motor pins that are arcing or not making good contact. Sometimes, the pins in the connector tend to get pushed out of the connector when it is connected.

8.8 TEST PROCEDURES, cont'd

8.8.3 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 below, the fuses for the four servo motor are located on the auxiliary board. The motor fuses can be checked by following these steps.

1. Remove power from enclosure.
2. Locate the auxiliary board on the electrical panel.
3. Remove the desired fuse from the auxiliary board. The auxiliary 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.

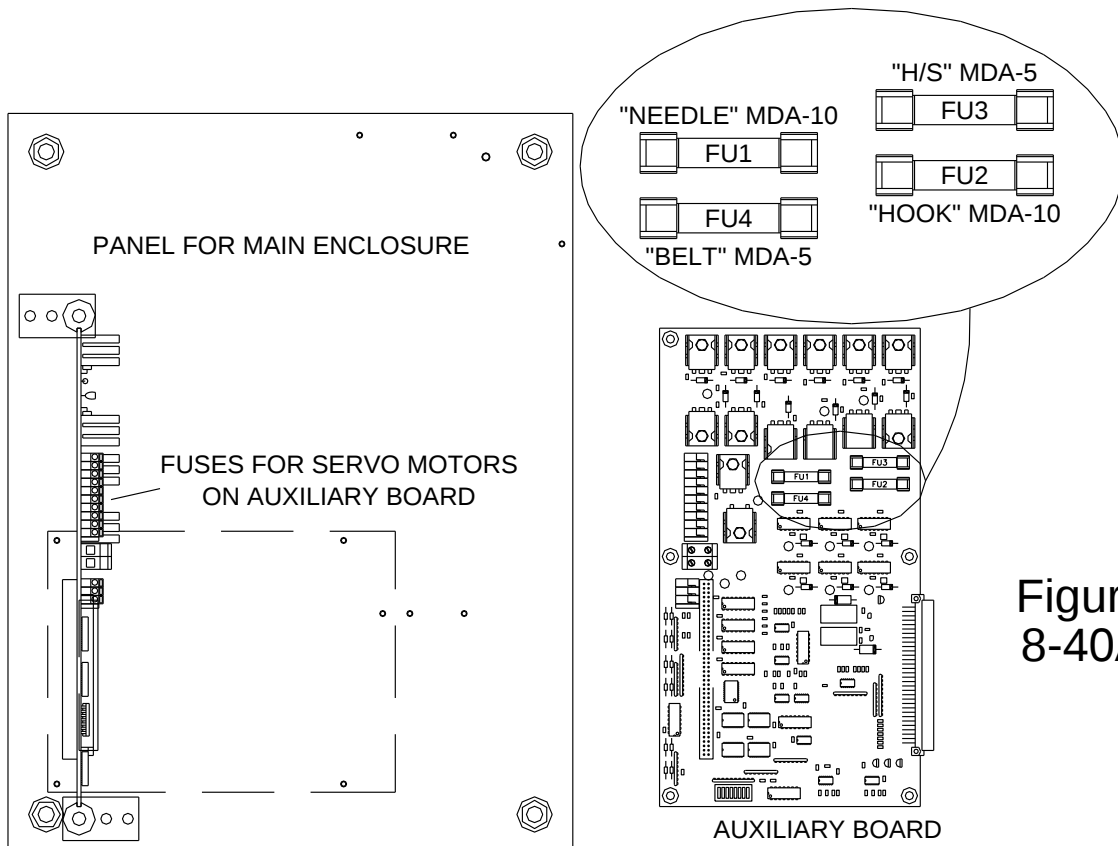


Figure
8-40A

8.8 TEST PROCEDURES, cont'd

8.8.4 Test Procedure For The 36 Volt DC Power For Motors

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 36 volt DC power can be checked 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. Using a DC voltmeter, measure the voltage across the terminals of the large capacitor. See Figure 7-2A to locate this capacitor. The voltage should be 32 to 36 VDC.

8.8 TEST PROCEDURES, cont'd

8.8.5 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 Field Termination Board. The LED corresponding to the proximity switch being triggered should come on when the proximity switch is triggered.

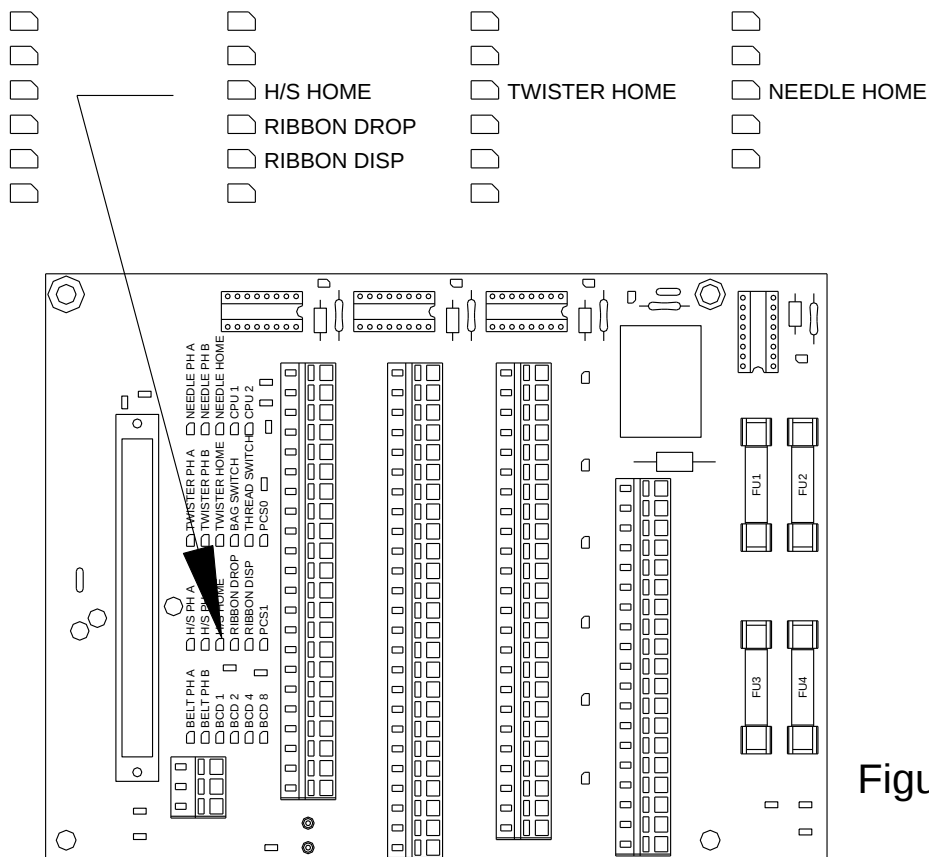


Figure 8-42A

8.8 TEST PROCEDURES, cont'd

8.8.6 Test Procedure For The 5 Volt & 12 Volt D.C. Power Supply

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 5 volt and 12 volt D.C. power supply 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. Locate the connectors on the auxiliary board where the +12VDC, +5VDC, and COM wires are connected.
5. Measure the voltage between the common and +5 terminals on the auxiliary board; this should read 4.9 to 5.1 volts DC. (Measurement can be made on the solder side of the auxiliary board.)
6. Measure the voltage between the common and +12 terminals on the auxiliary board; this should read 11.5 to 12.5 volts DC. (Measurement can be made on the solder side of the auxiliary board.)

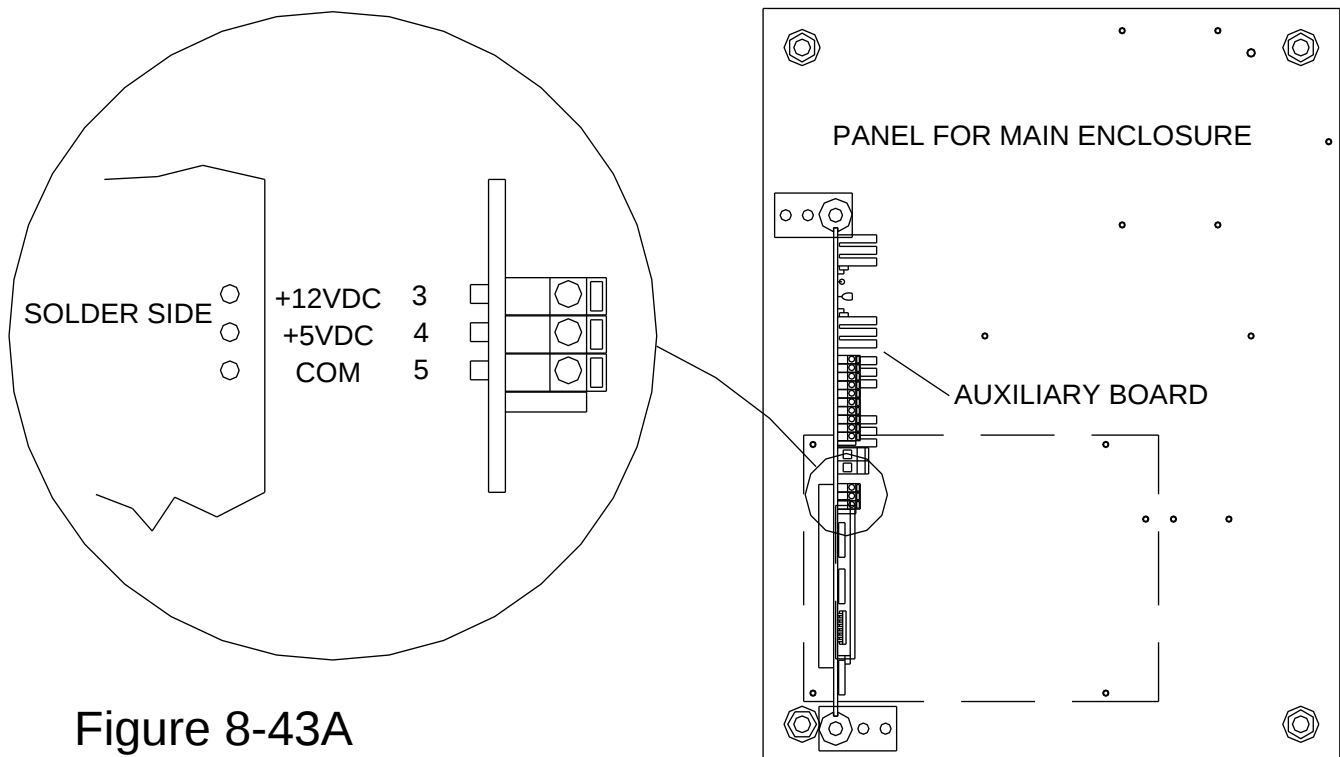


Figure 8-43A

8.8 TEST PROCEDURES, cont'd

8.8.7 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 field termination 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.

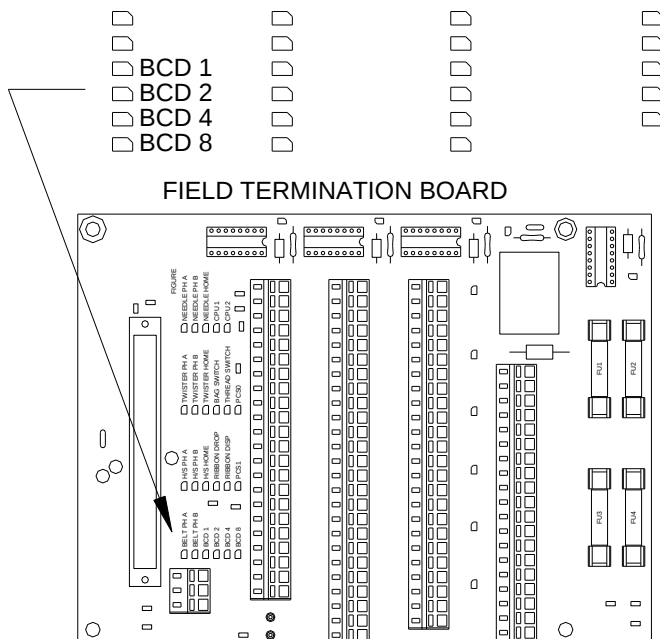


Figure 8-44A

8.8 TEST PROCEDURES, cont'd

8.8.8 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 field termination board. The bag switch LED is labeled (BAG SWITCH).
4. Observe the LED while pressing the wand of the bag switch down. The LED should light up when the wand is pushed down.

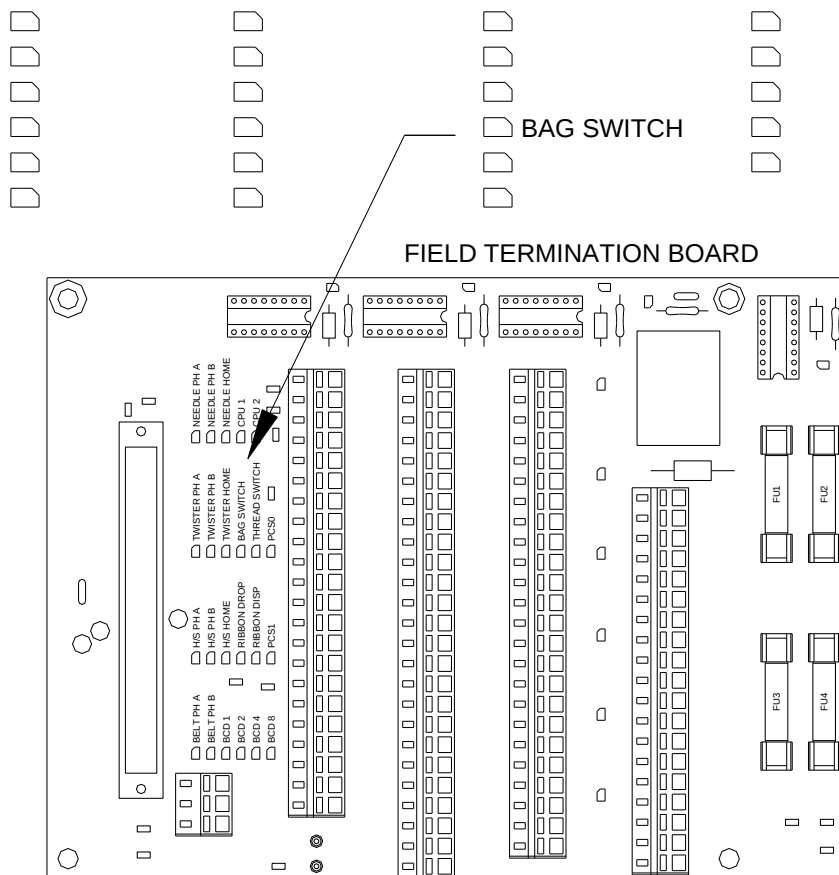


Figure 8-45A

8.8 TEST PROCEDURES, cont'd

8.8.9 Test Procedure For Field Termination Board Relays

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.

There are two different types of relays on the Field Termination Board. CR2, CR4, CR5, and CR6 (Burford P/N C01270) are 12 vdc relays and CR3 (Burford P/N C01269) is a Potter & Brumfield K10P-11A15-120 (K10) relay. The K10 is a 110 volt AC relay. The relays can be tested by following these steps. NOTE: All relays must be inserted correctly note pin out on circuit board silk screen.

1. Remove power from enclosure.
2. Remove the desired relay from the board. (make note of the position in which it is plugged in).
3. Using the diagram below to identify the pins for the coil of each relay. Check the coil of the relay with an ohmmeter. The resistance of the dc relay coils should be about 925 ohms. The resistance of the K10 relay coil should be about 4000 ohms.
4. Check the resistance of the NORMALLY CLOSED (NC) contacts. The resistance should be less than 1 ohm. Check the resistance of the NORMALLY OPEN (NO) contacts. The resistance should be infinite.
7. If possible, apply power to the coil of the relay. Use 12 volts DC for CR2, CR4, CR5 and CR6. Use 110 volts AC for the K10 relay.
5. Measure the resistance of the NORMALLY OPEN (NO) contacts while power is being applied to the coil of the relay. The reading should be less than 1 ohm. Measure the resistance of the NORMALLY CLOSED (NC) contacts while power is being applied to the coil of the relay. The resistance should be infinite.

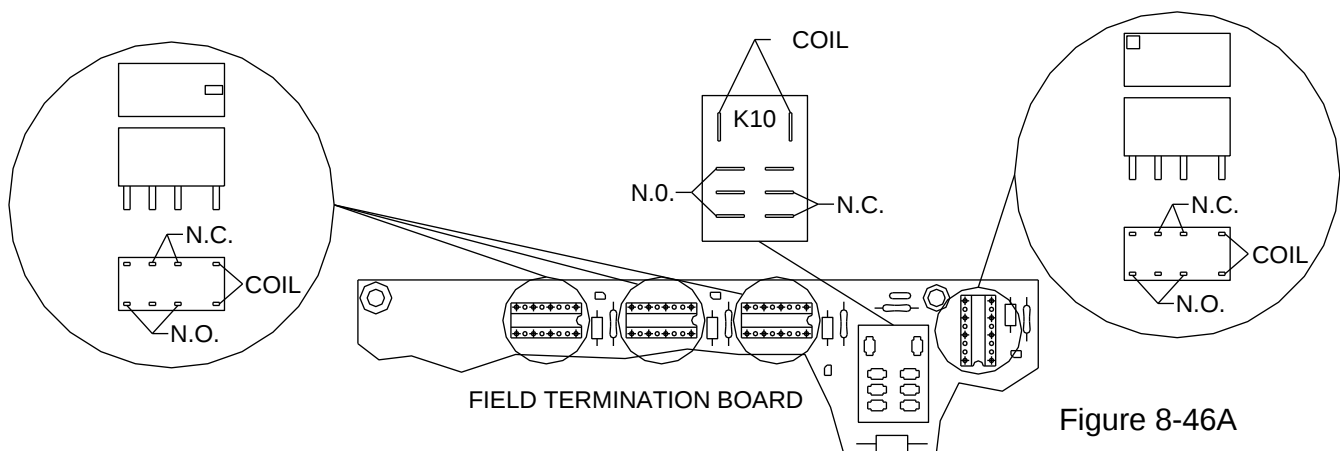


Figure 8-46A

8.9 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 7.3 for more detail.
	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 6.7 for proper adjustment.
Needle punches a hole through the bag neck.	6. Poor bag tail presentation.	6. Bag tail presentation from the exit of the bagger <u>must be flat</u> and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
	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 6.3 for proper adjustment.
Bags drag back hard against the flight after being tied.	2. Poor bag tail presentation.	2. Bag tail presentation from the exit of the bagger <u>must be flat</u> and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.
	1. Brushes at improper angle, and not feeding bag neck into tyer correctly.	1. Adjust angle of brushes. See section 6.7 for proper adjustment.
Tyer aborts tie cycle of apparently good package	2. Gathering belts running too slow.	2. Increase belt speed using pushwheel switch on operator box.
	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 7.3 for details.
	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 <u>must be flat</u> and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.

8.9 Mechanical Troubleshooting, cont'd.

Problem Description	Probable Cause	Recommended Action
Twist tie ribbon breaks during tying operation.	1. Excessive ribbon tension.	1. See section 6.8 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 <u>must be flat</u> 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 <u>must be flat</u> 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 6.8 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 <u>must be flat</u> 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 <u>must be flat</u> 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 <u>must be flat</u> and not folded over. If this is not achievable, contact your Bagger manufacturer for assistance.

8.9 Mechanical Troubleshooting, cont'd.

Problem Description	Probable Cause	Recommended Action
Holes being formed in the bag.	1. Too much ribbon tension.	1. See Section 6.8
	2. Too many twists.	2. See Section 7.3
	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 <u>must be flat</u> 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 6-9.

9.0 COMMUNICATING WITH THE CONTROLLER

9.1 General

The Burford Model 2000/2100 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.

9.2 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's 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

9.2 Communications Program, cont'd

Burford's TERMINAL program

Burford Corp. has developed a terminal emulation program specifically for use with the Model 2000/2100 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.

Terminal Program in Microsoft Windows Version 3.0 or 3.1

Most PC's being 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 2000/2100 tyer. This terminal program is not as easy to use with the Burford tyer as Burford's 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.

9.2 Communications Programs, cont'd

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

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 this document in the section entitled Communications Programs. *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.

9.3 Cable between PC and Tyer's Controller

A cable like the one shown below is necessary to connect between the tyer's serial port and the PC's serial port. This cable is available from Burford Corporation. Ask for Part Number C01286.

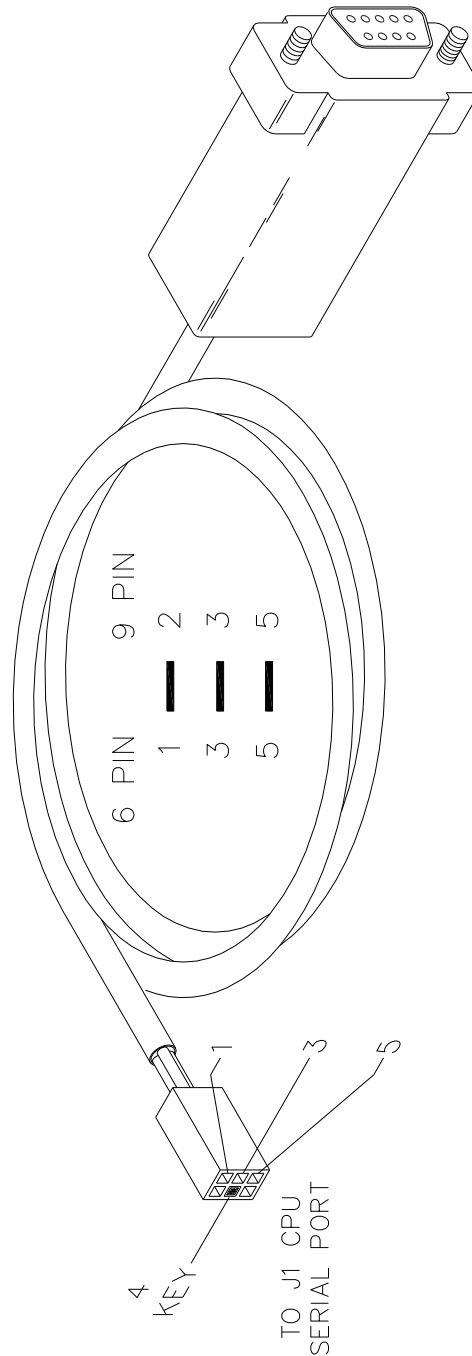


Figure 9-4A

9.4 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.

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

2. 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.
3. 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.
4. 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 Auxiliary Board of the Tyer is in the ON position.
5. 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.

9.5 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.

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 usec

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

BURFORD CORPORATION

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>

9.5 Tyer Commands, 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 the explanation for the + command later in this document.

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**

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.

9.5 Tyer Commands, cont'd

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 as described in a later section.

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 9.6 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.

9.5 Tyer Commands, cont'd

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.

```
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 21418.0
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 36109.0
9> 47.2 335 188 67 37.7 37705.0
10> 52.5 413 271 83 36.0 35995.9
MOTOR 1>q
STEP TIME SET ACT VEL CMD
10> 52.5 413 271 83 36.0 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 32859.0
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 22.0 22016.0
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
```

9.5 Tyer Commands, cont'd

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 the information and cautions on the + command later in this section.)

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**

9.5 Tyer Commands, cont'd

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**

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.

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.

9.5 Tyer Commands, cont'd

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**

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.

+ 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.

9.6 Capturing Data into a Text File on the PC

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.

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.

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.

10.0 RECOMMENDED SPARE PARTS LIST

Model 2000VT Part Number	Model 2100VT Part Number	Qty	DESCRIPTION
302526	302526	1	HOLDER/SHEAR ASSEMBLY
C01410	C01410	1	BOARD, CPU, SERVO TYER
C07170	C07170	1	POWER SUPPLY, 5V & 12V
C01230	C01230	1	BRIDGE, RECTIFIER, 600 V, 60 AMP
C01267	C01267	1	BOARD, CIRCUIT, AUXILIARY
C07625	C07625	1	SWITCH, PROXIMITY, 8MM, 10-30 VDC
103972	103972	1	SWITCH, LIMIT
302020	302020	1	BELT, 3/8" PITCH, 28.5" LONG, RED
302928	302929	1	ASSEMBLY, TWISTER HOOK, EXT
302132	302132	1	GEARBELT, 3/8 PITCH, 36.7" LONG
302133	302133	1	GEARBELT, 3/8 PITCH, 18.7" LONG, DOUBLE
302141	302141	1	GEARBELT, 1/5 PITCH, 19" LONG
302210	302210	1	MOTOR ASSEMBLY WITH ENCODER
302276	302276	1	BELT, NEEDLE DRIVE
302842	302842	1	BELT, V, BRUSH
302278	302278	1	BELT, DOUBLE BRUSH
C01203	C01203	1	CAPACITOR, 75 VDC, 33K mfd
C01269	C01269	1	RELAY, 120VAC, K10P-11A15-120
302204	302205	1	NEEDLE ASSEMBLY

C07512 "B"
OPPOSITE HAND C07513

11.0 PARTS LISTS

11.1 Frame Assembly

Ref No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
1	302342	302342	1	PULLEY, 30 TOOTH
2	302348	302348	1	BRACE, DISCHARGE
3	C00111	C00111	2	BEARING, ¾" OD X ¼" ID X .28" WIDE
4	C07625	C07625	5	SENSOR, PROXIMITY, 10-30 VDC
5	100380	100380	6	BEARING, FLANGE, 5/8"
6	152076	152076	2	CAM FOLLOWER, ½"
7	204450	204450	1	BUSHING, STRIPPER
8	302038	302038	1	CAM, SHUTTLE
9	302042	302042	1	PLATE, BELT MOTOR
10	302043	302043	REF	PLATE, UPRIGHT, SMALL
11	302044	302044	1	PLATE, UPRIGHT, LARGE
12	302045	302045	REF	PLATE, LOWER FRONT
13	302046	302046	REF	PLATE, UPPER FRONT
14	302049	302049	2	SHAFT, BELT DRIVE
15	302058	302058	1	BRACKET, HOLDER/SHEAR SENSOR
16	302066	302066	1	SPACER, HOOK GUARD
17	302067	302067	1	SPACER, HOOK GUARD
18	302073	302073	2	PULLEY, BELT MOTOR
19	710180	401251	REF	COVER, INFEED
20	302078	302079	1	A/W, DISCHARGE COVER
21	302319	302319	1	STAND-OFF, GUARD
22	302098	302098	2	CAM FOLLOWER
23	302102	302102	1	PULLEY, REWORKED
24	302103	302103	1	PULLEY, 24 TOOTH
25	302105	302105	3	BUSHING
26	302116	302116	1	MAGNET, HORSESHOE
27	302133	302133	1	BELT, DOUBLE GEAR, 18.7", 3/8 PITCH
28	301178	301178	1	PLATE, HOOK MOTOR
29	302139	302139	1	PULLEY, HOOK MOTOR
30	302141	302141	1	BELT, GEAR, 19", 1/5 PITCH
31	302147	302147	1	ANGLE, GUARD MOUNTING
32	302197	302197	1	A/W, HOOK BELT COVER
33	974904	974904	1	SCREW, SHOULDER, ¼" X ¼" X #10-24
34	302464	302464	1	BLOCK, HOOD PIN
35	C03535	C03535	2	SPACER
36	302210	302210	4	MOTOR, 24 VDC, REWORKED
37	302276	302276	1	BELT, NEEDLE DRIVE
38	302279	302279	1	ASSEMBLY, SHUTTLE BLOCK
39	302281	302281	REF	PLATE, LOWER TUNNEL
40	302285	302285	REF	PLATE, INNER GUIDE, TOP
41	302286	302286	1	GUIDE, HOLDER DISCHARGE, INNER
42	302295	302295	1	ASSEMBLY, SHUTTLE BAR w/BUSHING
43	302320	302320	1	SHAFT, NEEDLE

712950-1 "A"
Model 2100VT 712951-1

11.1 Frame Assembly, cont'd

Ref No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
44	302323	302324	REF	A/W, COVER GUARD
45	302326	302326	1	BAR, TRACK
46	302327	302327	REF	ANGLE, GUIDE TRACK, COVER
47	302801	302801	REF	DECAL, "SMALL HAND DANGER"
48	111174	111174	REF	DECAL, "KEEP THIS GUARD IN PLACE"
49	958510	958510	REF	PIN, ROLL, 1/4" X 5/8"
50	610469	610469	1	SPRING
51	955978	955978	9	WASHER, FLAT, #10
52	986316	986316	1	SCREW, BUTTON HEAD SOC, #10-24 X 1"
53	955621	955621	1	NUT, HEX NYLOC, #10-24 UNC
54	989936	989936	1	SCREW, FIN HEX, 1/4-20 X 2-1/4"
55	955661	955661	15	NUT, HEX NYLOC, 1/4-20 UNC
56	955822	955822	2	NUT, HEX, #10-32 UNF
57	955940	955940	14	WASHER, LOCK, 1/4"
58	955941	955941	13	WASHER, LOCK, #10
59	955942	955942	17	WASHER, LOCK, #8
60	955977	955977	4	WASHER, FLAT, 1/4"
61	955979	955979	12	WASHER, FLAT, #8
62	978310	978310	4	SCREW, SOC HEAD CAP, 1/4-20 X 5/8"
63	978906	978906	3	SCREW, SOC HEAD CAP, #10-24 X 3/8"
64	978908	978908	2	SCREW, SOC HEAD CAP, #10-24 X 1/2"
65	978910	978910	1	SCREW, SOC HEAD CAP, #10-24 X 5/8"
66	978912	978912	1	SCREW, SOC HEAD CAP, #10-24 X 3/4"
67	985716	985716	REF	SCREW, BUTTON HEAD SOC, #10-24 X 1"
68	978920	978920	2	SCREW, SOC HEAD CAP, #10-24 X 1-1/4"
69	979510	979510	1	SCREW, SOC HEAD CAP, #8-32 X 5/8"
70	979512	979512	16	SCREW, SOC HEAD CAP, #8-32 X 3/4"
71	989916	989916	6	SCREW, FIN HEX, 1/4-20 X 1"
72	981720	981720	1	SCREW, FLAT HEAD SOC, 1/4-20 X 1-1/4"
73	981728	981728	1	SCREW, FLAT HEAD SOC, 1/4-20 X 1-3/4"
74	989932	989932	1	SCREW, FIN HEX, 1/4-20 X 2"
75	985724	985724	1	SCREW, BUTTON HEAD SOC, 1/4-20 X 1-1/2"
76	986308	986308	6	SCREW, BUTTON HEAD SOC, #10-24 X 1/2"
77	986312	986312	2	SCREW, BUTTON HEAD SOC, #10-24 X 3/4"
78	987504	987504	2	SCREW, BUTTON HEAD SOC, #6-32 X 1/4"
79	989912	989912	2	SCREW, FIN HEX, 1/4-20 X 3/4"
80	C01369	C01369	1	ASSEMBLY, BULKHEAD, LOWER UNIT (NOT SHOWN)
81	C01370	C01370	1	ASSEMBLY, BULKHEAD, MOTOR (NOT SHOWN)
82	C07626	C07626	5	CABLE, SENSOR, M8, 3 WIRE (NOT SHOWN)
83	A08049	A08049	1	NAMEPLATE, LARGE BURFORD (NOT SHOWN)
84	302741	302741	1	PIN, ROLL, HEAVY DUTY, 3/16" X 5/8"

712950-1 "B"
Model 2100VT 712951-1

11.2 Belt Drive Assembly Advanced 2000VTR/2100VTR

Ref No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
1	103400	103400	2	SPACER
2	103519	103519	2	SPRING, EXTENSION
3	103972	103972	REF	SWITCH, LIMIT
4	111174	111174	1	DECAL, "KEEP THIS GUARD IN PLACE"
5	115290	115290	1	SPRING, COMPRESSION
6	302019	302019	2	PULLEY, BELT DRIVE
7	302020	302020	1	BELT, GEAR, 28.5", 3/8 PITCH, RED
8	302029	302029	1	BLOCK, RIBBON
9	302036	302037	1	PLATE, HOLDER/SHEAR MOUNTING
10	302046	302046	1	PLATE, UPPER FRONT
11	302106	302106	7	SPACER, IDLER
12	302110	302110	2	WASHER, COVER
13	302111	302111	1	RECEIVER, MAGNET
14	302128	302129	1	AW, TIE DEFLECTOR
15	302132	302132	1	BELT, GEAR, 36.7", 3/8 PITCH
16	302196	302196	REF	ARM, TRIGGER, REWORKED
17	302204	302205	1	ASSEMBLY, NEEDLE w/ROLLER
18	302206	302206	7	ASSEMBLY, IDLER PULLEY
19	302207	302207	2	ASSEMBLY, GUIDE SUPPORT BUSHING
20	302299	302299	1	PLATE, SERIAL
21	302434	302434	2	BUSHING, 3/8" X 5/8" X .047"
22	302435	302435	2	BUSHING, 3/8" X 5/8" X .062"
23	302452	302452	1	PLATE, BAG STOP SUPPORT
24	302456	302456	1	LEVER, BAG STOP
25	302457	302457	1	PIN, BAG STOP ACTUATION
26	302460	302460	2	BUSHING, 1/4" X 1/2" X 0.060"
27	302526	302526	1	ASSEMBLY, HOLDER/SHEAR
28	302873	302873	1	SPACER, BAG STOP SPRING
29	302874	302874	1	SPRING, EXTENSION, 3/8" DIA. X .03" WIRE
30	302928	302929	1	ASSEMBLY, TWISTER HOOK HOUSING, EXT
31	302930	302930	1	GUIDE, LOWER, REWORKED
32	302932	302932	1	SPACER, HOLDER SHEAR PLATE
33	302934	302934	1	PLATE, TWISTER HOOK SPACER
34	302940	302941	REF	AW, LOWER COVER
35	302947	302947	1	BRACKET, SENSOR MOUNTING
36	401351	401351	3	BUSHING, 1/4" X 3/8" X .031"
37	712965	712965	7	STAND-OFF, FRONT, RAISED HOOK
38	712794	712975	1	PLATE, COVER HINGE
39	712796	712977	1	PLATE, COVER HINGE
40	715457	715457	1	PLATE, LOWER FRONT, REWORKED
41	954712	954712	2	PIN, DOWEL, 3/16" X 3/4", SST
42	955409	955409	1	NUT, JAM, 1/4-20 UNC
43	955621	955621	2	NUT, HEX NYLOC, #10-24 UNC
44	955661	955661	6	NUT, HEX NYLOC, 1/4-20 UNC
45	955940	955940	3	WASHER, LOCK, 1/4"

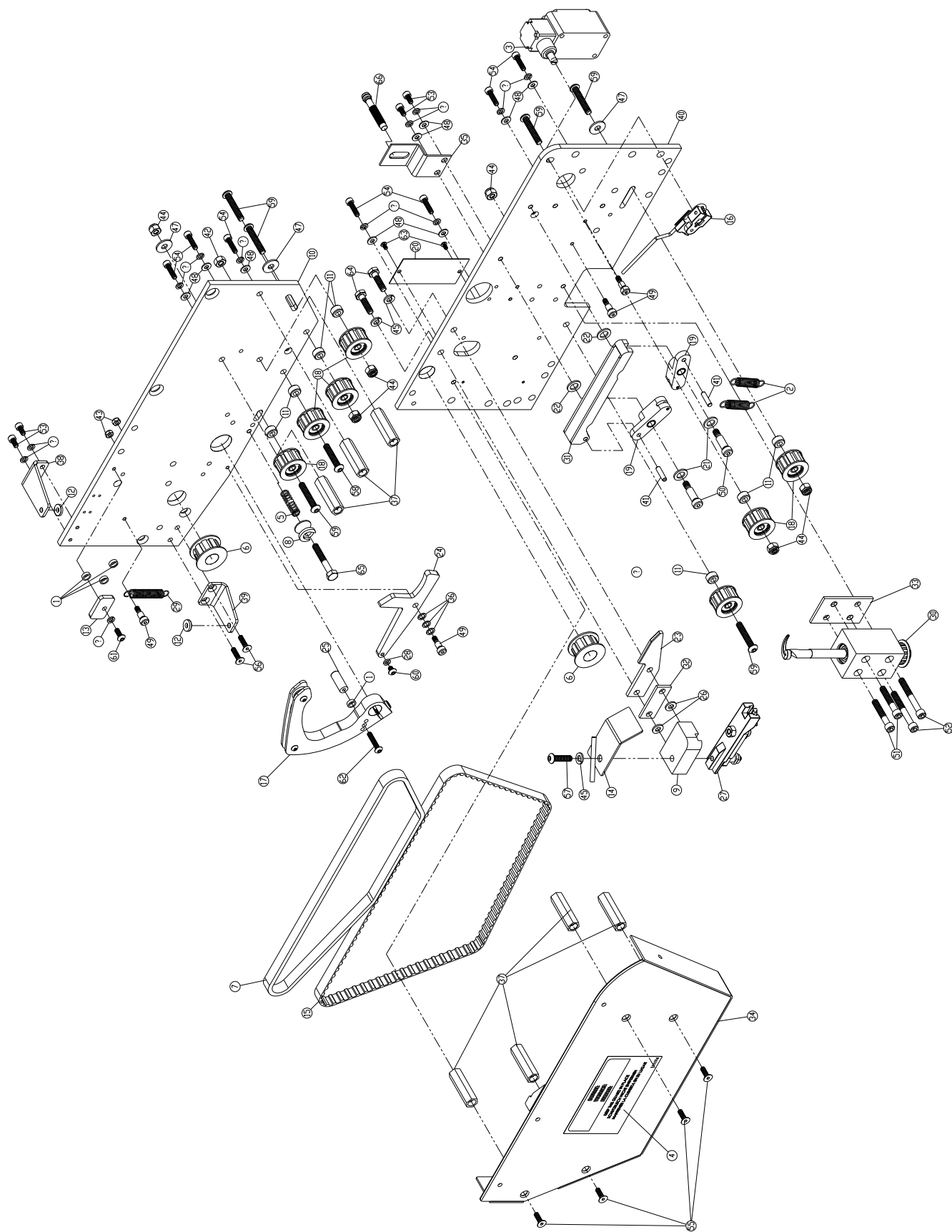
712950-2 "E"
Model 2100VTR 712951-2

11.2 Belt Drive Assembly Advanced 2000VTR/2100VTR, cont'd

Ref. No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
46	955941	955941	12	WASHER, LOCK, #10
47	955977	955977	3	WASHER, FLAT, 1/4"
48	955978	955978	9	WASHER, FLAT, #10
49	974906	974906	4	SCREW, SHOULDER, 1/4" X 3/8" X #10-24
50	975012	975012	2	SCREW, SHOULDER, 5/16" X 3/4" X 1/4-20
51	978324	978324	2	SCREW, SOC HEAD CAP, 1/4-20 X 1-1/2"
52	978332	978332	2	SCREW, SOC HEAD CAP, 1/4-20 X 2"
53	978906	978906	7	SCREW, SOC HEAD CAP, #10-24 X 3/8"
54	978912	978912	7	SCREW, SOC HEAD CAP, #10-24 X 3/4"
55	982310	982310	4	SCREW, FLAT HEAD SOC, #10-24 X 5/8"
56	982312	982312	2	SCREW, FLAT HEAD SOC, #10-24 X 3/4"
57	985716	985716	1	SCREW, BUTTON HEAD SOC, 1/4-20 X 1"
58	985722	985722	1	SCREW, BUTTON HEAD SOC, 1/4-20 X 1-3/8"
59	985724	985724	6	SCREW, BUTTON HEAD SOC, 1/4-20 X 1-1/2"
60	986304	986304	1	SCREW, BUTTON HEAD SOC, #10-24 X 1/4"
61	986308	986308	1	SCREW, BUTTON HEAD SOC, #10-24 X 1/2"
62	986316	986316	1	SCREW, BUTTON HEAD SOC, #10-24 X 1"
63	987504	987504	2	SCREW, BUTTON HEAD SOC, #6-32 X 1/4"
64	989916	989916	2	SCREW, FIN HEX, 1/4-20 X 1"
65	989928	989928	1	SCREW, FIN HEX, 1/4-20 X 1-3/4"
66	C07625	C07625	REF	SENSOR, PROXIMITY, 10-30 VDC, NPN, N.O.

712950-2 "E"

Model 2100VTR 712951-2



11.3 Ribbon Tension Assembly

Ref. No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
1	302150	302150	1	PLATE, RIBBON TENSION
2	302244	302244	1	ARM, BRAKE
3	302372	302373	1	ASSEMBLY, DANCER ARM
4	152076	152076	1	CAM FOLLOWER, 1/2"
5	103519	103519	1	SPRING, EXTENSION
6	302162	302162	1	CLAMP, BELT
7	971206	971206	2	SCREW, SET SOC, 1/4-20 X 3/8", SST
8	981712	981712	1	SCREW, FLAT HEAD SOC, 1/4-20 X 3/4", SST
9	C07625	C07625	REF	SENSOR, PROXIMITY, 10-30 VDC, NPN
10	302243	302243	1	SLEEVE, RIBBON TENSION BRAKE ARM
11	981720	981720	1	SCREW, FLAT HEAD SOC, 1/4-20 X 1-1/4", SST
12	302163	302163	1	BLOCK, BELT CLAMP
13	104239	104239	2	CLAMP, RIBBON FEED BELT
14	974904	974904	1	SCREW, SHOULDER, 1/4" X 1/4", #10-24, SST
15	302165	302184	1	NAMEPLATE, "RIBBON TENSION"
16	302170	302170	1	SPACER, RIBBON ROLLER
17	302164	302164	1	SHAFT, RIBBON TENSION
18	302166	302166	1	ASSEMBLY, RIBBON ROLLER
19	974914	974914	1	SCREW, SHOULDER, 1/4" X 7/8", #10-24, SST
20	504521	504521	1	BELT, RIBBON TENSION
21	112643	112643	1	PLATE, "BURFORD PATENT & SERIAL"
22	302169	302169	1	SHAFT, SECOND ROLLER
23	302370	302371	1	ASSEMBLY, INNER SPOOL
24	152148	152148	3	BUMPER, RUBBER
25	975220	975220	1	SCREW, SHOULDER, 1/2" X 1-1/4", 3/8-16, SST
26	302178	302178	1	RETAINER, RIBBON SPOOL
27	A02363	A02363	2	BUSHING, RIBBON ROLLER
28	A02359	A02359	2	ROLLER, RIBBON
29	302168	302168	1	SPACER, RIBBON ROLLER
30	955977	955977	4	WASHER, FLAT, 1/4", SST
31	989928	989928	1	SCREW, FIN HEX, 1/4-20 X 1-3/4", SST
32	302248	302249	1	AW, MOUNT
33	982308	982308	3	SCREW, FLAT HEAD SOC, #10-24 X 1/2", SST
34	302174	302174	1	PLATE, OUTER SPOOL
35	302171	302190	1	NUT, RIBBON TENSION
36	152151	152151	1	COLLAR, 3/8" SET
37	302192	302183	1	NAMEPLATE, "RIBBON SPOOL"
38	302252	302252	1	ADJUSTER, SPRING
39	302161	302161	1	SPRING, RIBBON TENSION

30200401 "I"
Model 2100VT 30200501

11.3 Ribbon Tension Assembly, cont'd

Ref. No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
40	978906	978906	2	SCREW, SOC HEAD CAP, #10-24 X 3/8", SST
41	986906	986906	3	SCREW, BUTTON HEAD SOC, #8-32 X 3/8", SST
42	989944	989944	1	SCREW, FIN HEX, 1/4-20 X 2-3/4", SST
43	302021	302021	1	BUSHING, 1/4" X 1/2" X .010"
44	955822	955822	1	NUT, HEX MACHINE, #10-32 UNF, SST
45	955661	955661	2	NUT, HEX NYLOC, 1/4-20 UNC, SST
46	302182	302182	REF	NAMEPLATE, ELECTRICAL BOX
47	302185	302185	REF	BOX, ELECTRICAL, REWORKED
48	302180	302180	REF	STAND-OFF, CONTROL BOX
49	302179	302179	1	PLATE, CONTROL BOX MOUNTING
50	987504	987504	2	SCREW, BUTTON HEAD SOC, #6-32 X 1/4", SST
51	122232	122232	3	BUSHING, 1/2" X 3/4" X .010"
52	978920	978920	1	SCREW, SOC HEAD CAP, #10-24 X 1-1/4", SST
53	962508	962508	1	SCREW, THUMB, 1/4-20 X 1/2", SST
54	955941	955941	5	WASHER, LOCK, #10, SST
55	955939	955939	6	WASHER, LOCK, 5/16", SST
56	989912	989912	2	SCREW, FIN HEX, 1/4-20 X 3/4", SST
57	955940	955940	3	WASHER, LOCK, 1/4", SST
58	302479	302479	1	SLEEVE, RUBBER
59	955938	955938	1	WASHER, LOCK, 3/8", SST
60	955405	955405	1	NUT, HEX JAM, 3/8-16 UNC, SST
61	302022	302022	1	BUSHING, 1/4" X 1/2" X .005"
62	955823	955823	2	NUT, HEX MACHINE, #10-24 UNC, SST
63	974906	974906	1	SCREW, SHOULDER, 1/4" X 3/8", #10-24, SST
64	174248	174248	2	CLIP, WIRE, ALUMINUM
65	989712	989712	6	SCREW, FIN HEX, 5/16-18 X 3/4", SST
66	978910	978910	1	SCREW, SOC HEAD CAP, #10-24 X 5/8", SST
67	710185	710184	REF	BRACKET, ENCODER MOUNTING
68	710190	710190	REF	HANDLE, VERTICAL TYER
69	710162	710162	REF	BRACKET, SPOOL SUPPORT
70	710169	710169	REF	BRACKET, SPOOL

30200401 "I"

Model 2100VT 30200501

ASSEMBLY NOTES:

1. SHIM AS REQUIRED TO .003 CLEARANCE USING ITEM #61 (302022) OR ITEM #43 (302021) MACHINE BUSHINGS

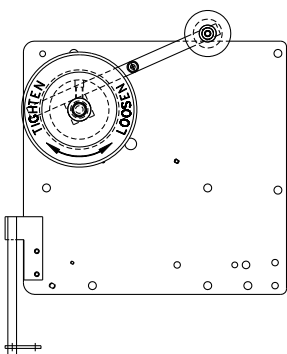
2. SEE DETAIL "A"

NOTES: USED ON 2000 ONLY

** USED ON 2000 VT ONLY

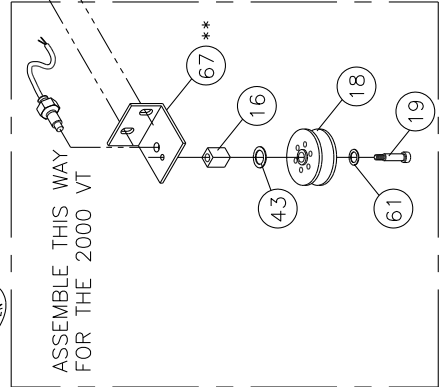
*** QTY. MAY VARY, SHIM AS NEEDED

PART #	DESCRIPTION	MACHINE	BUSHING	REFERENCE
A02390	BUSH, MACH 1/4 X 1/2 X .018			
302022	BUSH, MACH 1/4 X 1/2 X .005			
302021	BUSH, MACH 1/4 X 1/2 X .010			
122232	BUSH, MACH 1/2 X 3/4 X .010			
122231	BUSH, MACH 1/2 X 3/4 X .008			
122222	BUSH, MACH 1/2 X 3/4 X .074			
122221	BUSH, MACH 1/2 X 3/4 X .036			
122220	BUSH, MACH 1/2 X 3/4 X .031			

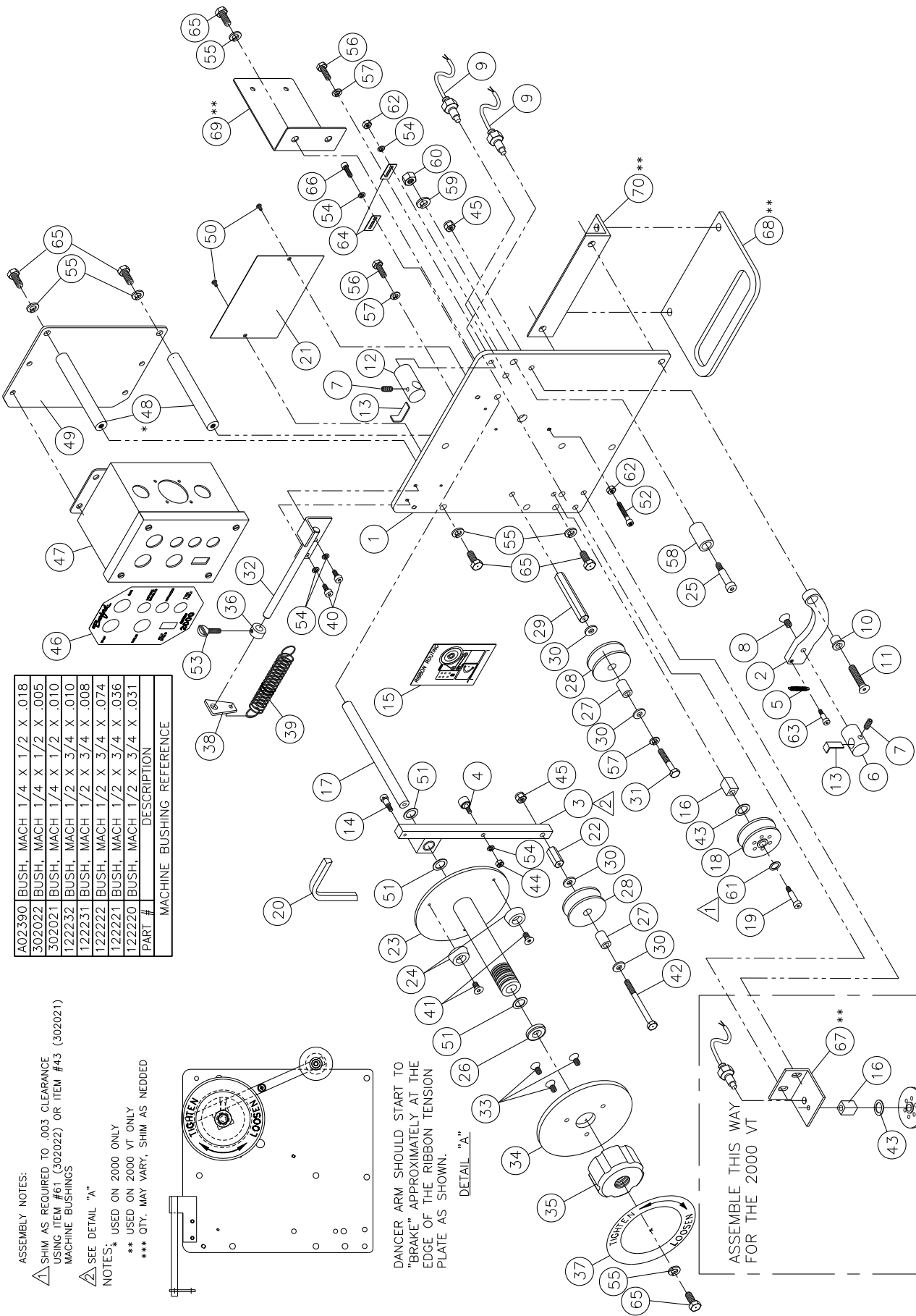


DANCER ARM SHOULD START TO "BRAKE" APPROXIMATELY AT THE EDGE OF THE RIBBON TENSION PLATE AS SHOWN.

DETAIL "A"



ASSEMBLE THIS WAY FOR THE 2000 VT



11.4 Brush Assembly

Ref. No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
1	103400	103400	1	SPACER, BEARING
2	610505	610505	3	FITTING, 1/4" NPT X 3/8" QUICK RELEASE
3	610955	610955	1	CONNECTOR, SEAL RING, 1/2" NPT, POLY
4	108331	108331	2'	CABLE, 18 AWG, 4 CONDUCTOR, BLACK
5	111174	111174	1	DECAL, "KEEP THIS GUARD IN PLACE"
6	C02199	C02199	2	GUIDE, SPRING
7	610953	610953	1	CONNECTOR, CORD, .20 - .35, NYLON
8	114803	114803	1	CIRCUIT BREAKER, 3 AMP, 250 VOLT
9	A06724	A06724	2	FITTING, ADAPTER, 1/8" NPTM X 1/4" NPTF
10	C07186	C07186	.25	TERMINAL STRIP, BREAK-A-PART
11	610710	610710	1	SPRING, .845" OD X .675" ID
12	C07641	C07641	1	COVER, WEATHERPROOF (C07066)
13	122222	122222	2	BUSHING, 1/2" X 3/4" X .074"
14	302206	302206	1	ASSEMBLY, IDLER
15	302220	302221	1	A/W, GUARD
16	302253	302253	4	SPACER, FRAME
17	302254	302254	1	PULLEY, REWORKED
18	302255	302255	2	ASSEMBLY, JACKSHAFT PULLEY
19	302257	302257	2	AXLE, JACKSHAFT
20	302259	302259	1	GUARD, BACK-BOTTOM
21	302278	302278	1	BELT, DOUBLE BRUSH
22	302546	302546	1	SPACER, 1/2" OD X .259" ID X .26" LONG, ALUMINUM
23	302317	302317	2	SPACER, JACKSHAFT
24	302332	302332	4	SPACER, PULLEY
25	302333	302333	3	MOUNT, BRUSH GUARD
26	302361	302361	1	DECAL, SMALL, "KEEP THIS GUARD IN PLACE"
27	302415	302415	2	WASHER, 5/16" X 3/4", SST
28	302427	302427	1	BOLT, REWORKED
29	302430	302430	2	KNOB, BRUSH ADJUSTING
30	302432	302433	1	BOX, JUNCTION, REWORKED
31	302815	302815	2	BRUSH, 5" DIAMETER X 7"
32	302816	302816	1	COVER, TOP
33	302817	302817	2	AXLE, BRUSH
34	302818	302818	1	ARM, UPPER HALF
35	302819	302819	1	ARM, UPPER HALF
36	302826	302826	2	GUARD, CENTER BRUSH, #1
37	302827	302827	1	COVER, BRUSH DRIVE
38	302824	302843	1	ARM, LOWER HALF
39	302829	302829	2	SPACER, .515" ID X .62" OD X 1.06 LONG
40	C00174	C00174	1	DRIVE-NUT, CONDUIT, 1/2"
41	302832	302832	2	A/W, MANIFOLD ADJUSTMENT ASSEMBLY
42	302833	302833	2	BLOCK, HEIGHT ADJUSTMENT
43	302835	302835	2	A/W, AIR TUBE ASSEMBLY
44	302836	302836	2	ARM, MANIFOLD ADJUSTMENT
45	302839	302839	1	GUARD, CENTER BELT

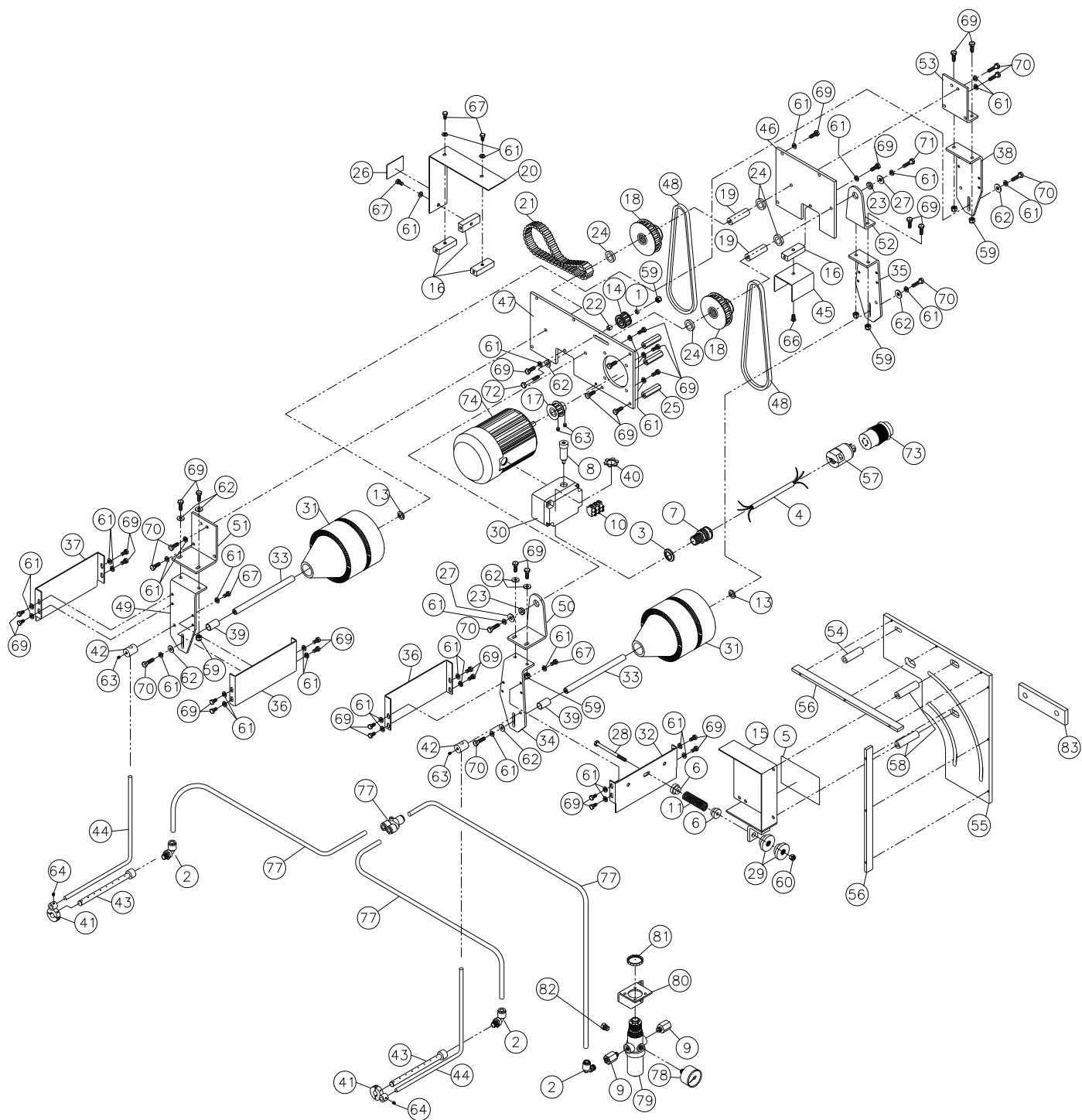
21010002 ISSUE "M"
Model 2100VTR 21009902

11.4 Brush Assembly, cont'd

Ref. No.	Model 2000VTR Part Number	Model 2100VTR Part Number	Qty	DESCRIPTION
46	302840	302840	1	PLATE, MAIN JACKSHAFT
47	302841	302841	1	PLATE, MAIN BRUSH MOTOR
48	302842	302842	2	V-BELT, 3L250
49	302843	302824	1	ARM, LOWER HALF
50	710155	710155	1	ARM, UPPER PIVOT
51	710157	710157	1	ARM, UPPER HALF
52	710159	710159	1	ARM, BACK, UPPER PIVOT
53	710160	710160	1	ARM, BACK, UPPER HALF
54	710163	710163	1	SPACER, .625" OD X .313" ID X 2.00" LONG
55	710172	710172	1	PLATE, MAIN BRUSH MOUNT
56	710173	710173	2	PLATE, MAIN BRACE
57	C07085	C07085	1	PLUG, MALE TWISTLOCK
58	710183	710183	2	SPACER, .625" OD X .313" ID X 2.375" LONG
59	955661	955661	11	NUT, HEX NYLOC, 1/4-20 UNC, SST
60	955659	955659	1	NUT, HUGLOCK, 1/4-20 UNC, SST
61	955940	955940	43	WASHER, LOCK, 1/4", SST
62	955977	955977	13	WASHER, FLAT, 1/4", SST
63	971206	971206	4	SCREW, SET SOC, 1/4-20 X 3/8", SST
64	971803	971803	2	SCREW, SET SOC, #10-24 X 3/16", SST
65	978910	978910	2	SCREW, SOC HEAD CAP, #10-24 X 5/8", SST
66	985708	985708	1	SCREW, BUTTON HEAD SOC, 1/4-20 X 1/2", SST
67	989908	989908	24	SCREW, FIN HEX, 1/4-20 X 1/2", SST
68	989910	989910	4	SCREW, FIN HEX, 1/4-20 X 5/8", SST
69	989912	989912	15	SCREW, FIN HEX, 1/4-20 X 3/4", SST
70	989916	989916	12	SCREW, FIN HEX, 1/4-20 X 1", SST
71	989920	989920	1	SCREW, FIN HEX, 1/4-20 X 1-1/4", SST
72	989928	989928	1	SCREW, FIN HEX, 1/4-20 X 1-3/4", SST
73	C07086	C07086	1	PLUG, FEMALE TWISTLOCK
74	C07084	C07084	1	MOTOR, 1/6 HP, 115-50/60-1
75	C07640	C07640	1	COVER, WEATHERPROOF (C07085)
76	610509	610509	1	FITTING, UNION, "Y", 3/8" X 3/8" QUICK RELEASE
77	610886-05	610886-05	15'	TUBING, 3/8" YELLOW
78	111419	111419	1	GAUGE, REGULATOR, 1/8" NPT, 0 – 60 PSI
79	A00644	A00644	1	FILTER-REGULATOR COMBO, 1/8" NPT
80	113439	113439	1	BRACKET, REGULATOR MOUNTING
81	A00643	A00643	1	NUT, FILTER-REGULATOR PANEL
82	C00916	C00916	1	PLUG, 1/8" NPT
83	715538	715538	1	SPACER, VT BRUSH MOUNT
84	C01294	C01294	1	CAPACITOR, NOT SHOWN

21010002 "M"

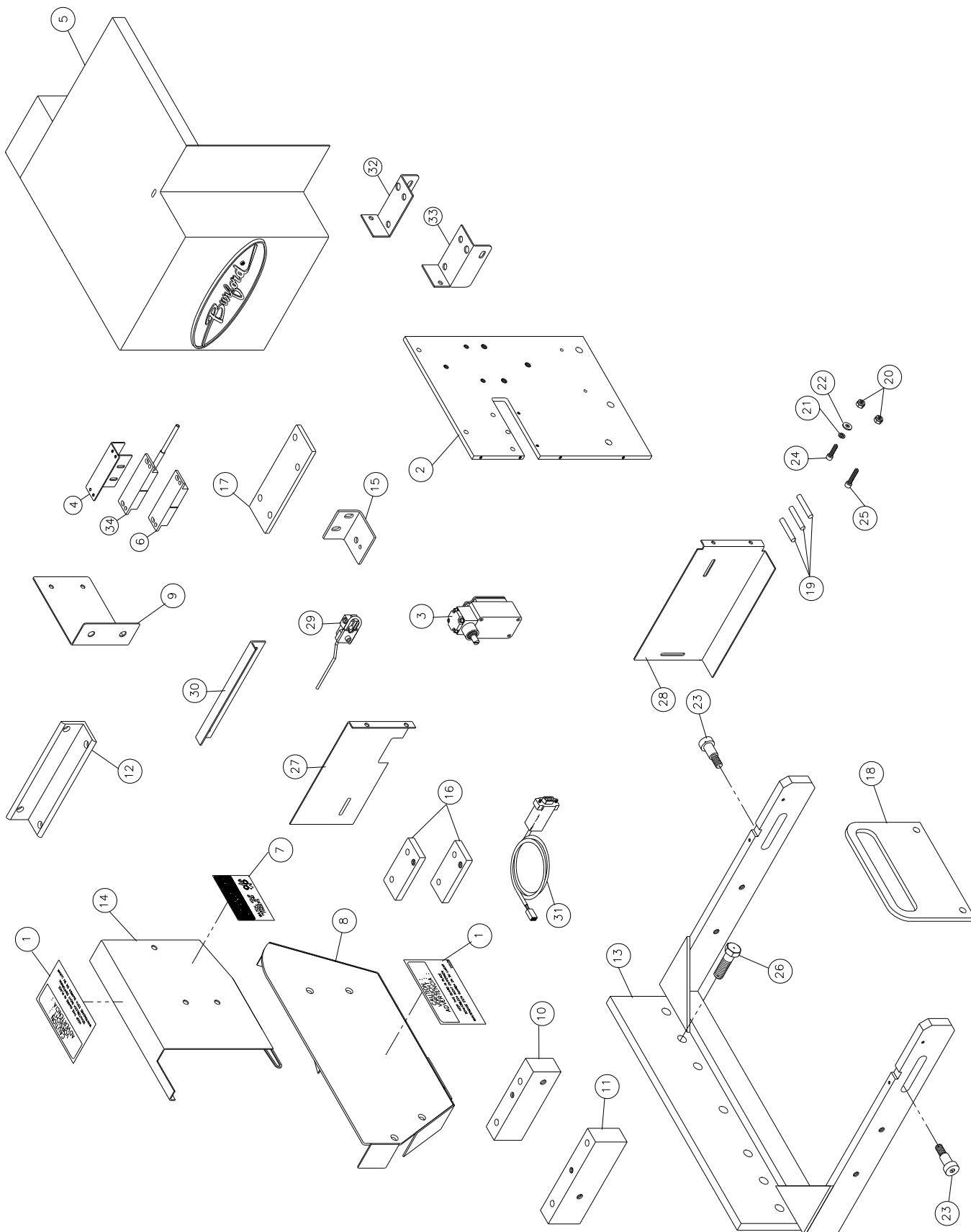
Model 2100VTR 21009902



11.5 Covers, 2000 VTR Tyer

ITEM #	MODEL 2000VTR PART #	MODEL 2100VTR PART #	QTY	DESCRIPTION
1	111174	111174	2	DECAL, "KEEP THIS GUARD IN PLACE"
2	302043	302043	1	PLATE, SMALL UPRIGHT
3	103972	103972	1	SWITCH, LIMIT
4	302388	302431	1	MOUNT, CE MAGLOCK
5	302323	302324	1	AW, GUARD
6	C07219	C07219	1	SENSOR, INTERLOCK MAGNET
7	302801	302801	1	DECAL, "SMALL HAND DANGER"
8	302940	302941	1	AW, LOWER GUARD
9	710162	710162	1	BRACKET, SPOOL SUPPORT
10	710164	710164	1	BLOCK, SERVO MOUNT, INFEED
11	710165	710165	1	BLOCK, SERVO MOUNT, DISCHARGE
12	710169	710169	1	L-BRACKET, SPOOL
13	710170	710170	1	AW, TYER MOUNT
14	710180	401251	1	AW, INFEED COVER
15	710185	710184	1	BRACKET, ENCODER
16	710186	710186	2	PLATE, VERTICAL TYER STOP
17	710187	710187	1	PLATE, SERVO MOUNT
18	710190	710190	1	HANDLE, VERTICAL TYER
19	958510	958510	3	PIN, ROLL, 1/4" DIAMETER X 5/8", SST
20	955621	955621	2	NUT, HEX NYLOC, #10-24 UNC, SST
21	955941	955941	1	WASHER, LOCK, #10, SST
22	955978	955978	1	WASHER, FLAT, #10, SST
23	975210	975210	2	SCREW, SHOULDER, 1/2" X 5/8", 3/8-16, SST
24	978912	978912	1	SCREW, SOC HEAD CAP, #10-24 X 3/4", SST
25	978916	978916	1	SCREW, SOC HEAD CAP, #10-24 X 1", SST
26	988328	988328	1	SCREW, FIN HEX, 1/2-13 X 1-3/4", SST
27	302284	302285	1	GUIDE, INNER TOP
28	302280	302281	1	PLATE, LOWER TUNNEL
29	302196	302203	1	ARM, TRIGGER, REWORKED
30	302327	302327	1	ANGLE, TRACK
31	C01286	C01286	1	ASSEMBLY, CABLE, PC TO TYER
32	711514	711514	1	AW, TYER STOP BRACKET
33	711515	711515	1	AW, TYER STOP BRACKET
34	C07220	C07220	1	ACTUATOR, INTERLOCK SENSOR

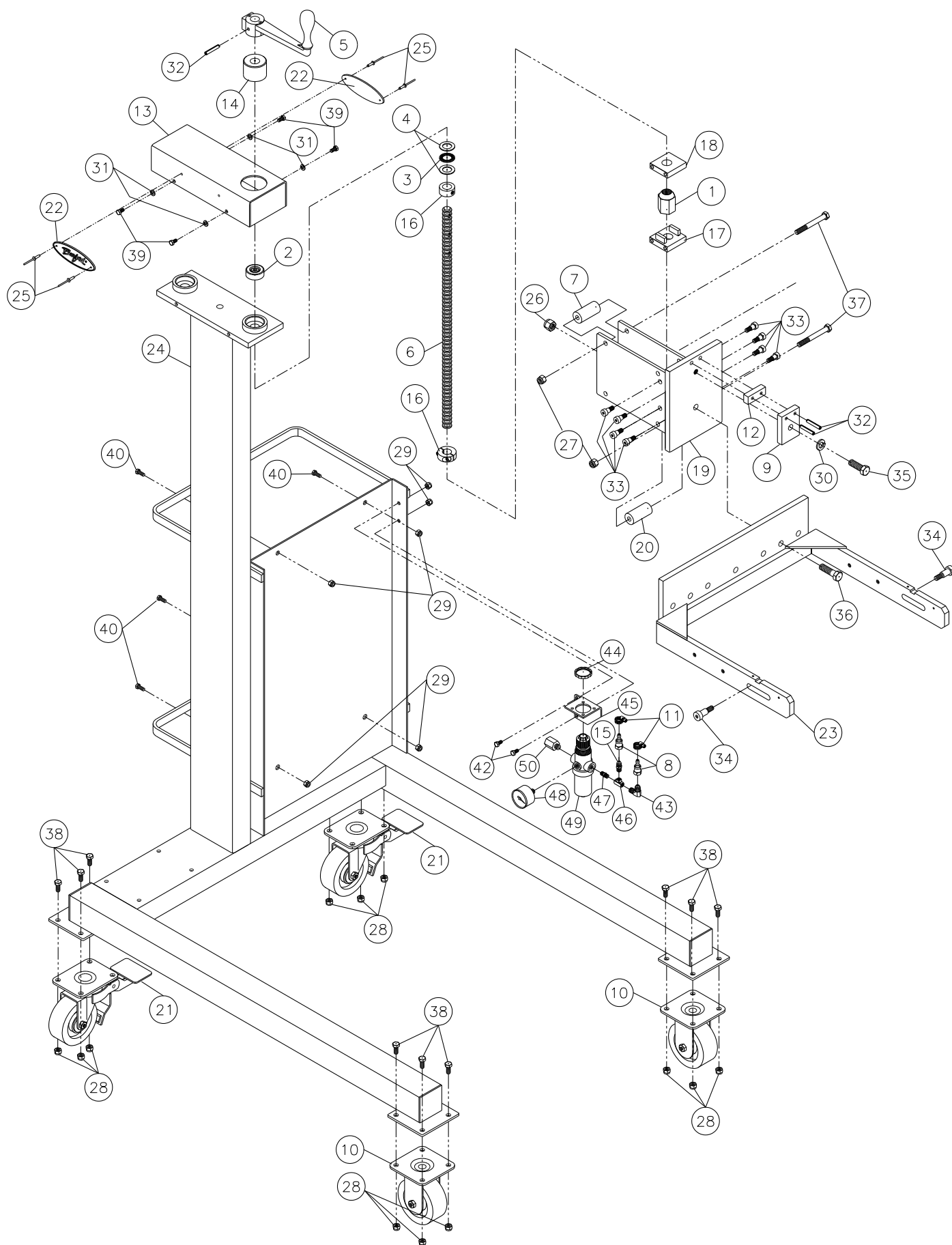
712954 ISSUE "E"
Model 2100VTR: 712955



11.6 Stand Assembly, Vertical Tyer

ITEM #	PART #	QTY	DESCRIPTION
1	103647	1	NUT
2	103664	1	BEARING, BALL THRUST
3	104107	1	BEARING, NEEDLE THRUST
4	104109	2	RACE, THRUST BEARING
5	104307	1	CRANK
6	104308	1	ROD, HEIGHT ADJUSTMENT
7	711658	1	ROLLER, DELRIN, 1-1/8" DIAMETER
8	C01915	REF	FITTING, 7/16-20 F FLAIR
9	104316	1	PLATE, CLAMP
10	104318	2	CASTER, 4" RIDGID NON-LOCKING
11	C00414	REF	CLAMP, 1/6" – 5/8", SST
12	104334	1	BAR, CLAMP
13	711660	1	A/W, CHAIN GUARD
14	114679	1	SPACER
15	118321	REF	FITTING, 1/8" MPT X 7/16-20, HOSE
16	A05020	2	COLLAR, SPLIT, 3/4", SST
17	711391	1	A/W, HEIGHT ADJUSTMENT NUT RETAINER
18	711433	1	PLATE, HEIGHT ADJUSTMENT PIVOT
19	710227	1	A/W, TYER SUPPORT
20	304516	1	ROLLER, DELRIN, 1" DIAMETER
21	152161	2	CASTER, 4" SWIVEL LOCKING
22	303000	2	NAMEPLATE, "BURFORD"
23	710170	REF	A/W, TYER MOUNT
24	710176	1	A/W, STAND, VERTICAL TYER
25	955541	4	RIVET, 5/32" X 3/8" POP
26	955618	1	NUT, HEX NYLOC, 1/2-13 UNC, SST
27	955620	4	NUT, HEX NYLOC, 3/8-16 UNC, SST
28	955619	14	NUT, HEX NYLOC, 5/16-18 UNC, SST
29	955661	6	NUT, HEX NYLOC, 1/4-20 UNC, SST
30	955937	1	WASHER, LOCK, 1/2", SST
31	955940	4	WASHER, LOCK, 1/4", SST
32	958524	3	PIN, ROLL, 1/4" DIAMETER X 1-1/2", SST
33	975106	8	SCREW, SHOULDER, 3/8" X 3/8", 5/16-18, SST
34	975112	REF	SCREW, SHOULDER, 1/2" X 3/4", 3/8-16, SST
35	988324	1	SCREW, FIN HEX, 1/2-13 X 1-1/2", SST
36	988328	REF	SCREW, FIN HEX, 1/2-13 X 1-3/4", SST
37	988968	2	SCREW, FIN HEX, 3/8-16 X 4-1/4", SST
38	989712	14	SCREW, FIN HEX, 5/16-18 X 3/4", SST
39	989908	4	SCREW, FIN HEX, 1/4-20 X 1/2", SST
40	989910	4	SCREW, FIN HEX, 1/4-20 X 5/8", SST
41	103878	REF	HOSE, AIR, 1/4" Ø NEOPRENE (NOT SHOWN)
42	989912	2	SCREW, FIN HEX, 1/4-20 X 3/4", SST
43	112030	REF	FITTING, ELBOW, 1/8" MPT X 7/16-20F
44	A00643	REF	NUT, REGULATOR-FILTER PANEL
45	113439	REF	BRACKET, REGULATOR MOUNTING
46	110401	REF	FITTING, TEE, 1/8"
47	110403	REF	FITTING, NIPPLE, 1/8"
48	111419	REF	GAUGE, REGULATOR, 1/8" NPTM, 0 – 60 PSI
49	A00644	REF	FILTER-REGULATOR COMBO
50	A06724	REF	FITTING, ADAPTER, 1/8" NPTM X 1/4" NPTF

210101 ISSUE "J"

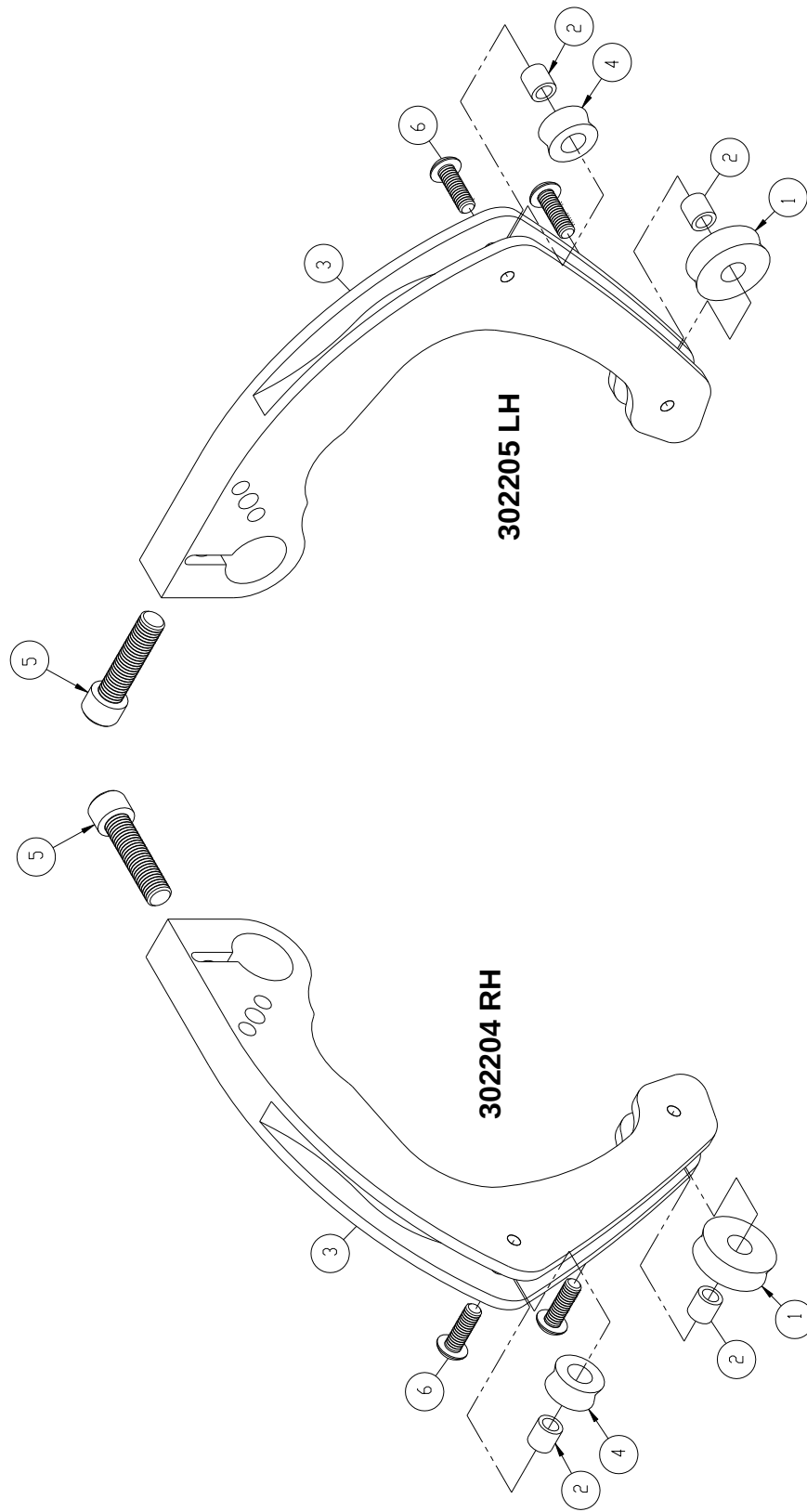


11.7 Needle Roller Assembly (302204/302205 "F")

ITEM #	PART #	QTY	DESCRIPTION
1	152124	1	ROLLER, NYLON
2	152125	2	BUSH, SST,.166 ID X OD X ¼ L
3	302060	1	NEEDLE MACHINE
4	302065	1	RIBBON ROLLER
5	978216	1	SCRW SOC HD CAP ¼-28 X 1 SST
6	986908	2	SCREW BUTT HD SOC #8-32 X ½ SST

302204 RH ISSUE "F"

302205 LH ISSUE "F"



**Needle Roller Assembly
302204/05 Issue "F"**

11.8 Wiring Diagram (ED0203K)

SERVO TYER MAIN ENCLOSURE				
REF	SYMBOL	PART #	QTY	DESCRIPTION
1	AH1	C07214	1	SONALERT, 12 VDC
2	CAP1	C01203	1	CAPACITOR, 33000 MFD, 75VDC
3	CAP1 P/O	C01204	1	BRACKET, MOUNT, CAPACITOR
4	CB3	C07649-006	1	CIRCUIT BREAKER, 250 V, 6 A
5	CB4	C07649-002	1	CIRCUIT BREAKER, 250 V, 2 A
6	CB3,CB4 P/O	C07649-100	2	BASE, 250 V CIRCUIT BREAKER
7	CBL1	C01360	1	CABLE ASSY, LOWER UNIT
8	CBL3	C01359	1	CABLE ASSY, OPERATOR BOX
9	CBL5	C01364	1	CABLE ASSY, SERVO MOTORS
10	CRM, CR1	C07245	2	CONTACTOR, 24 V, 10 A, 4 POLE
11	CR2,5	C01269-003	2	RELAY, DP/DT, K10 STYLE, 12VDC
12	CR3	C01269-002	1	RELAY, DP/DT, K10 STYLE, 24 VDC
		C01269		RELAY, DP/DT, K10 STYLE, 110 VAC
		C01269-004		RELAY, DP/DT, K10 STYLE, 220 VAC
13	CR2,3,5 P/O	C01295	3	BASE, RELAY, K10 STYLE
14	CRE1	C05138	1	RELAY, SOLID STATE, DC TO AC
15	CRE1 P/O	C00168	1	COVER, SOLID STATE RELAY
16	DISC1	A02345	1	DISCONNECT
17	DISC1 P/O	A02346	1	HANDLE, DISCONNECT
18	DISC1 P/O	610342-001	1	SHAFT, DISCONNECT ASSY
19	ENC1	C01231	1	ENCLOSURE, RWK, MAIN
20	ENC1 P/O	C01277	1	WINDOW, LEXAN, SERVO ENCLOSURE
21	FB1-3	C07076	3	HOLDER, FUSE, 600 V
22	FLTR1	C05818	1	FILTER, LINE, EMI, 10 A, 120-240VAC
23	FLTR1 P/O	C01362	1	BRACKET, MOUNT, LINE FILTER
24	FU1,2	C06543	2	FUSE, 10 A, 600 V
25	FU3	C07062	1	FUSE, 20 A, 600 V
26	GND	C06488	1	GROUND LUG
27	GND STRP	C07156	1	GROUND STRAP, DOOR
28	LT1	C01301	1	LIGHT, 24 VDC
29	LT1 P/O	C01218	1	LENS ASSY, GREEN
30	LT1 P/O	C01263	1	NAMEPLATE, POWER ON
31	PB1	C01214	1	SWITCH, PUSHBUTTON, MUSHROOM
32	PB1,SS1 P/O	C07101	2	CONTACT, SWITCH, N.C., RED

EDO203 ISSUE "K"

11.8 Wiring Diagram (ED0203K) cont'd.

SERVO TYER MAIN ENCLOSURE				
REF	SYMBOL	PART #	QTY	DESCRIPTION
33	PB1 P/O	C01265	1	NAMEPLATE, OFF
34	PB2	C01213	1	SWITCH, PUSHBUTTON, GREEN
35	PB2 SS1 P/O	C07102	2	CONTACT, SWITCH, N.C., RED
36	PB2 P/O	C01264	1	NAMEPLATE ON
37	PC1	C01299	1	PC BOARD, FIELD TERMINATION, 12VDC
38	PC1, CR3	C01269-003	1	RELAY, DP/DT, K10 STYLE, 12VDC
39	PC1, CR2,4-6	C01270	4	RELAY, PCB, 12 VDC, 2PDT, T85
40	PC1 FU1-4	C06585	4	FUSE, 3 A, 250 V, INDICATING
41	PC1 P/O	C06514	4	SPACER, NYLON, #8-32 X ½
42	PC2	C01267	1	BOARD, CIRCUIT, AUXILIARY
43	PC2, FU1,2	C07036	2	FUSE, 10 A, 250 V, TIME DELAY, TIME LAG
44	PC2 FU3,4	C01268	2	FUSE, 5 A, 250 V, TIME DELAY
45	PC2 P/O	C01235	2	CARD GUIDE, MOUNTING BLOCK
46	PC2 P/O	C01236	2	CARD GUIDE, SHAFT
47	PC2 P/O	302364	1	CARD RETAINER
48	PC3	C01410	1	BOARD, CIRCUIT, CPU-332
49	PC3 P/O	C01291	REF	EPROM LOW, VER 2.11
50	PC3 P/O	C01292	REF	EPROM HIGH, VER 2.11
51	PC3 P/O	174069	4	STANDOFF, PCB, HEX, #6-32 X ½
52	PNL1	C01232	1	PANEL, RWK MAIN
53	PSM1	C07170	1	POWER SUPPLY, +5V/+12V
54	PSM1 FU1	C07138	1	FUSE, 2 A, 250 VS, 5 X 22MM
55	PSM1 P/O	C01234	1	MOUNT PLATE, POWER SUPPLY
56	PSM1 P/O	174071	1	CONNECTOR, 3PIN HOUSING, .156CENTERS
57	PSM1 P/O	174073	1	CONNECTOR, 6PIN HOUSING, .156CENTERS
58	PSM1 P/O	A06661	4	STANDOFF, PUSH-IN, 3/8" LONG
59	REC1	C01230	1	BRIDGE RECTIFIER, 600 V
60	SS1	C01217	1	SWITCH, SELECTOR, 2 POSITION
61	SS1 P/O	C01266	1	NAMEPLATE, BRUSH/BELT AUTO/ON
62	SUP1	C07123	1	DIODE, SUPPRESSOR, TRANSIENT, 28V
63	T1	C01206	1	TXFMR, TORODIAL, 120/240VAC, 1.2 KVA
64	TB1 P/O	C05843	22	MARKER STRIP, BLANK
65	TB1 P/O	C06369	2	CENTER JUMPER 2 POLE
66	TB1 P/O	C06464	10	RAIL, DIN MOUNTING
67	TB1 P/O	C06465	2	CLAMP, END ANCHOR

EDO203 ISSUE "K"

11.8 Wiring Diagram (ED0203K) cont'd.

SERVO TYER MAIN ENCLOSURE				
REF	SYMBOL	PART #	QTY	DESCRIPTION
68	TB1 P/O	C06525	2	TERMINAL, GROUND
69	TB1 P/O	C07117	9	TERMINAL, DUAL
70	TB1 P/O	C07118	1	TERMINAL, END COVER, DUAL LEVEL
71	TB1 P/O	C07117-001	2	TERMINAL, BLOCK, DUAL LEVEL, A/B
72	TB1 P/O	C07118-001	1	TERMINAL, COVER, DUAL LEVEL, A/B
73	TB3 P/O	610360	7.75	RAIL, DIN, MINI
74	TB3 P/O	610361	32	TERMINAL BLOCK, MINI
75	TB3 P/O	610362	3	COVER, END PLATE, MINI
76	TB3 P/O	610363	2	CLA, END PLATE, MINI
77	TB3 P/O	610532	6	JUMPER, 2 POSITION, MINI
78	TB3 P/O	610533	1	JUMPER, 3 POSITION, MINI
79	TB3 P/O	610534	3	TERMINAL, GROUNDING, MINI
80	TB3 P/O	710829	1	BRACKET, MNTG, TERMINAL STRIP, MINI
81	REF	A08049	1	NAMEPLATE, BURFORD
82	REF	302299	1	SERIAL PLATE, SMALL
83	REF	118325	1	DECAL, CERTIFIED BY BISSC
SERVO TYER OPERATOR BOX (30200250)				
1	BCD1	C01224	1	B.C.D SWITCH ASSY
2	CBL4	C01368	1	BULKHEAD ASSY, OPERATOR BOX
3	ENC2	302185	1	ENCLOSURE, RWK, CONTROL BOX
4	ENC2 P/O	302182	1	NAMEPLATE, CONTROL BOX
5	LT2,3,4	610163	3	LA, SOCKET, 11/16" DIAMETER
6	LT2,3,4 P/O	C07099	3	LIGHT BULB, 12 V
7	LT2,3 P/O	C01258	2	LENS, DOME, GREEN
8	LT4 P/O	C01259	1	LENS, DOME, RED
9	PB3	C01213	1	SWITCH, PUSHBUTTON, GREEN
10	PB3,5 P/O	C07102	2	CONTACT, SWITCH, N. O.
11	PB4	C01214	1	SWITCH, PUSHBUTTON, MUSHROOM, RED
12	PB4 P/O	C07101	1	CONTACT, SWITCH, N. C.
13	PB5	C01246	1	SWITCH, PUSHBUTTON, YELLOW
14	PNL2	302298	1	PANEL, RWK, OPERATOR BOX
15	TB2	100774	1	TERMINAL STRIP, 12 POSITION
16	TB2 P/O	103532	5	JUMPER, TERMINAL STRIP

EDO203 ISSUE "K"

11.8 Wiring Diagram (ED0203K) cont'd.

BRUSH ASSEMBLY (2000/2100)				
REF	SYMBOL	PART #	QTY	DESCRIPTION
1	CAP2	C01294	1	CAPACITOR,RUN,MOTOR,15mFD,250V
2	CB6	114803	1	CIRCUIT BREAKER, 3 A
3	ENC4	302432	1	ENCLOSURE, RWK, MOTOR, RH
4		302433	1	ENCLOSURE, RWK, MOTOR, LH
5	ENC4 P/O	C07186	0.4	TERMINAL, MOTOR, CONNECTOR
6	MTR5	C07084	1	MOTOR, 1/6 HP, BRUSH
7	PL8	C07086	1	PLUG, TWISTLOCK, FEMALE, 4 POLE
8	PL8 P/O	C07085	1	PLUG, TWISTLOCK, MALE, 4 POLE
SPEED FOLLOWING KIT – SENSOR OPTION (302445)				
1	PRS6	C07625	1	SENSOR, PROX 8MM, QC
2	PRS6 P/O	C07626	1	CABLE, PROX 8MM, QC
SPEED FOLLOWING KIT – ENCODER OPTION (210988/210989)				
1	ENCO1	610021	1	ENCODER, EPC, 5-28 VDC, 8 PIN
2	ENCO P/O	610024-001	1	CABLE, ENCODER, 8 WIRE, FEMALE
BLOWER MOTOR ASSY				
1	MTR6	142018	1	BLOWER MOTOR ASSY, 110V
2	PL9	A00509	1	PLUG, TWISTLOCK, FEMALE, 3 POLE
3	PL9 P/O	A00510	1	PLUG, TWISTLOCK, MALE, 3 POLE
SERVO FRAME ASSEMBLY (302000-1 / 302001-1)				
1	CBL2	C01369	1	BULKHEAD ASSY LOWER UNIT
2	CBL6	C01370	1	BULKHEAD ASSY SERVO MOTORS
3	INTLK1	C07219	1	INTERLOCK, MAGNETIC,KEYED
4	INTLK1 P/O	C07220	1	ACTUATOR, MAGNET
5	MTR1-4	302210	4	MOTOR ASSY W/ ENCODER
6	PRS1-5	C07625	5	SENSOR PROX 8MM QC
7	PRS1-5 P/O	C07626	5	CABLE PROX 8MM QC
COVERS STANDARD SERVO (302844-RH, 302845-LH)				
1	LS1	103972	1	SENSOR, MICRO, LIMIT SWITCH
2	LS1 P/O	302196	1	TRIGGER ARM, RWK, RH
3		302203	1	TRIGGER ARM, RWK, LH

EDO203 ISSUE "K"

11.8 Wiring Diagram (ED0203G) cont'd.

COVERS SERVO WITH TEC100 (210096-RH, 210095-LH)				
REF	SYMBOL	PART #	QTY	DESCRIPTION
1	PRS7	C07625	1	SENSOR,PROX,8MM,QC
2	PRS7 P/O	C07626	1	CABLE, PROX, 8MM, QC
3	PRS7 P/O	210164	1	BAG SWITCH ARM ASSY, RH
4		210163		BAG SWITCH ARM ASSY, LH
EMERGENCY STOP CIRCUIT (302539)				
1	CRX	C01021	1	RELAT, CONNECTOR, 110 VAC
2	ENC3	A08369	1	ENCLOSURE 6X4 X4
3	PB6	C07213	1	SWITCH/PULL, MUSHROOM,RED
4	PB6 P/O	C07101	1	CONTACT CARTRIDGE (1N.C)
5	PB6 P/O	C07215	1	NAMEPLATE, EMERGENCY STOP
6	PNL3	A07388	1	PANEL, DISCONNECT BOX
7	TB4 P/O	C06464	6"	RAIL, DIN MOUNTING
8	TB4 P/O	C06465	2	ANCHOR, END CLA
9	TB4 P/O	C06525	1	TERMINAL, GROUNDING
ELECTRICAL COMPONENTS				
1	PL6 P/O	C07116	1	RECEPTACLE, FREE HANGING
2	PL6 P/O	C07131	1	INSERT, 6 PIN, FEMALE
3	PL6 P/O	C05736	1	SHELL, PLUG
4	PL6 P/O	C07132	1	INSERT, 6 PIN, MALE
5	PL6 P/O	C05740	2	RUBBER, BUSHING, SIZE 8
6	PL6 P/O	C05739	2	CLAMP, CABLE
7	PL6 P/O	C07133	15'	CABLE, 18 AWG, 6 CONDUCTOR
8	PL7 P/O	113393	1	CONNECTOR, TWISTLOCK, 3 POLE, MALE
9	PL7 P/O	A05379	1	CONNECTOR, TWISTLOCK, 3 POLE, FEMALE
10	PL7 P/O	C07644	1	COVER, WEATHER PROOF, 113393
11	PL7 P/O	C07645	1	COVER, WEATHER PROOF, A05379
12	PL7 P/O	142007	15'	CABLE, 16 AWG, 3 CONDUCTOR
13	T2	A06997	1	TRANSFORMER, 1.5 KVA, 190/480-50/60-1

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