Special Instructions

When viewing this service manual, you will see references to the “Pro-Cut” part numbers. In order to correctly identify these parts in the “EquiServ” parts system the part numbers will require minor changes i.e. The part number will be preceded by a “PC” identifier and all dashes are removed.

Example Pro-Cut = 50-085
EquiServ = PC50085

JBC 520

Principles of operation

The JBC 520 aligns the axis of the lathe to the hub's axis. Instead of using a pair of runout screws to eliminate compensate for runout, it uses one screw. By precisely positioning that screw by spinning the ring, you can adjust for runout by only applying correction exactly where it is needed. This eliminates trying to get two screws in combination to eliminate the runout.

Background on Lateral Runout

Lateral run-out is caused by an angular misalignment between the vehicle hub and the lathe spindle. The motion this misalignment causes happens once per revolution of the lathe. This is the steady end to end sweep you see on a dial indicator. As the lathe and hub turn, the lateral runout starts at zero, goes up to its high point, back through zero, through its low point and back up to zero. This happens each time the spindle completes one revolution (360 degrees). This is shown in Figure 1.

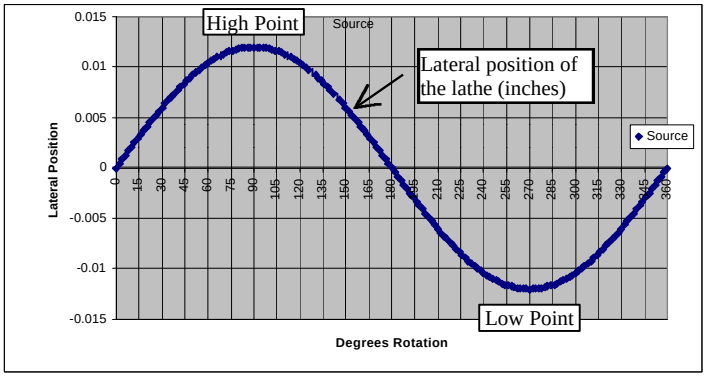


Figure 1: Lathe runout over 1 revolution

In order to eliminate lateral runout, we need to introduce a second source of lateral runout. We need to introduce lateral runout exactly equal to and opposite of the lateral runout that is present in the original hookup. With the standard runout screws we adjust two screws in combination until they exactly equal and opposite of the original lateral runout. A perfectly adjusted system would look like Figure 2. With the ring device, we place the single screw so that it is exactly opposite the high point of the original runout then turn the screw until the added runout exactly equals the original runout. This makes the total motion zero.

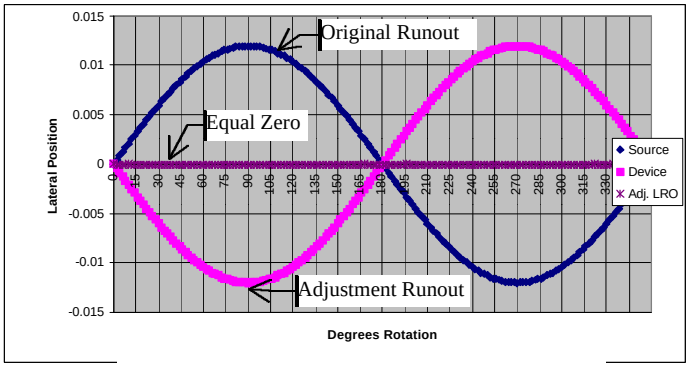
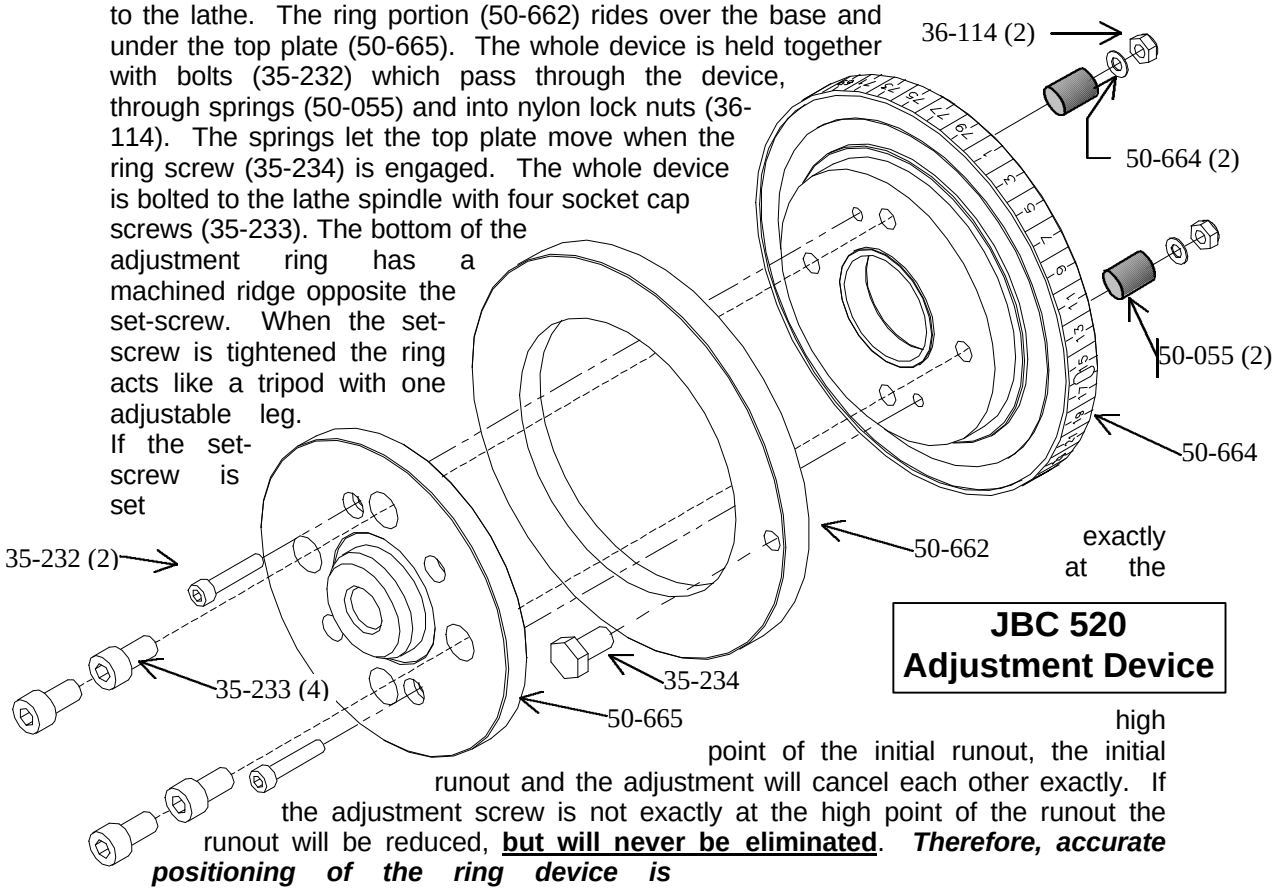


Figure 2: Corrected Lateral Runout

Ring Device

The ring device is composed of three main sections. The base section (50-664) is bolted to the lathe. The ring portion (50-662) rides over the base and under the top plate (50-665). The whole device is held together with bolts (35-232) which pass through the device, through springs (50-055) and into nylon lock nuts (36-114). The springs let the top plate move when the ring screw (35-234) is engaged. The whole device is bolted to the lathe spindle with four socket cap screws (35-233). The bottom of the adjustment ring has a machined ridge opposite the set-screw. When the set-screw is tightened the ring acts like a tripod with one adjustable leg. If the set-screw is set exactly at the high point of the initial runout, the initial runout and the adjustment will cancel each other exactly. If the adjustment screw is not exactly at the high point of the runout the runout will be reduced, **but will never be eliminated**. ***Therefore, accurate positioning of the ring device is necessary to compensate for runout.***



The ring device itself is purely mechanical. It can function with or without the electronics system. All that is required of the ring is that the high point is located accurately.

So what happens when the ring is not located accurately? The following illustrations show what happens to the total runout when the ring is incorrectly placed.

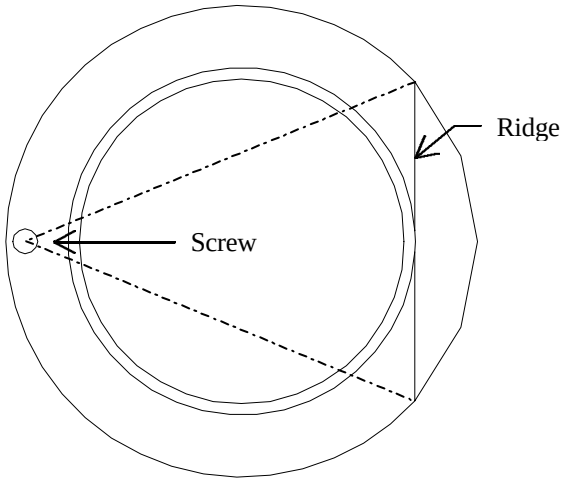
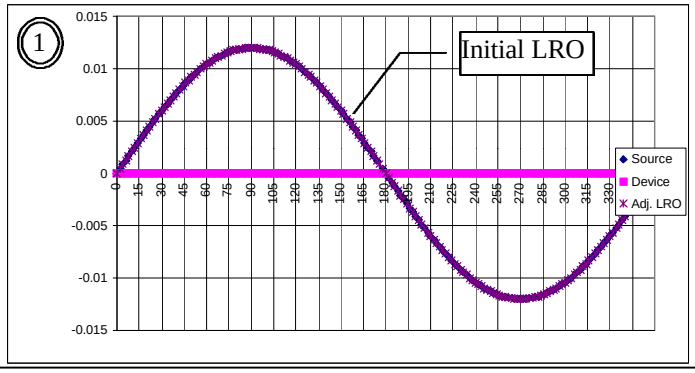
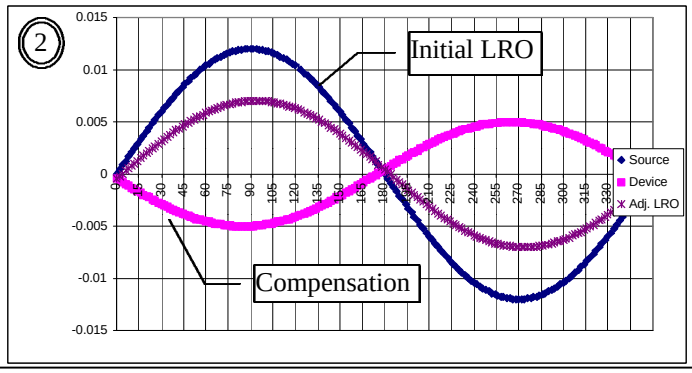


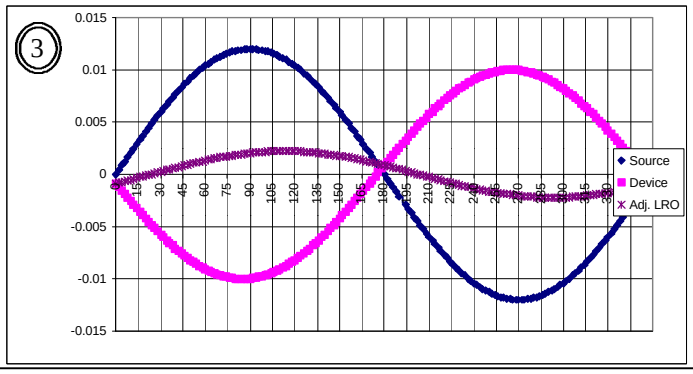
Figure 3 Bottom of Adjustment Ring



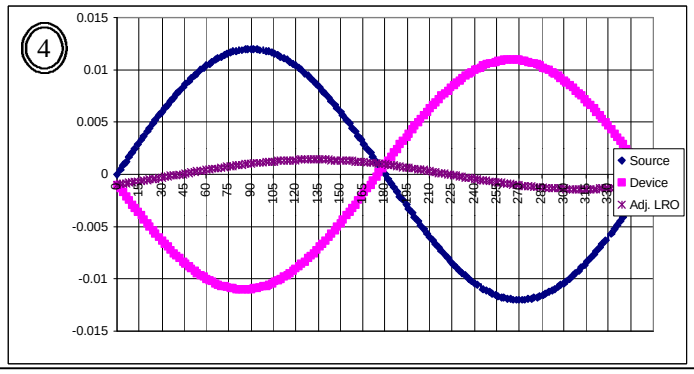
Initial LRO: 0.024” Total LRO: 0.024”
Compensation: 0.000” Total Peak Phase: 90°



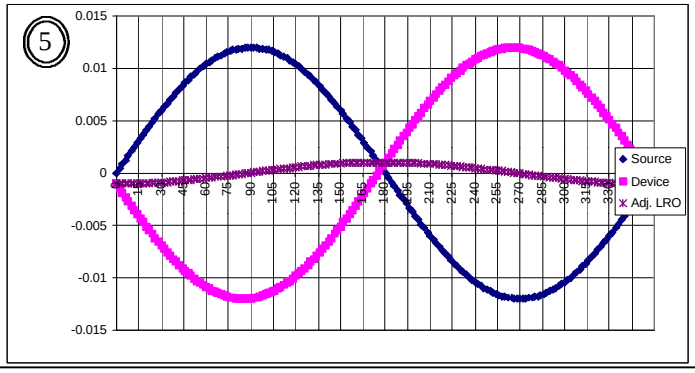
Initial LRO: 0.024” Total LRO: 0.014”
Compensation: 0.010” Total Peak Phase: 94°



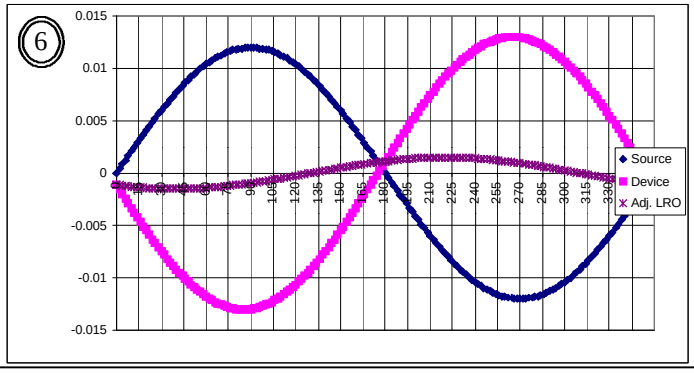
Initial LRO: 0.024” Total LRO: 0.005”
Compensation: 0.020” Total Peak Phase: 110°



Initial LRO: 0.024” Total LRO: 0.004”
Compensation: 0.022” Total Peak Phase: 135°



Initial LRO: 0.024” Total LRO: 0.003”
Compensation: 0.024” Total Peak Phase: 180°



Initial LRO: 0.024” Total LRO: 0.004”
Compensation: 0.026” Total Peak Phase: 225°

As you can see the total runout is minimized at 0.003” in step 5, but not entirely eliminated. Note the position (phase) of the high point when it is at its minimum. The high point is exactly between the initial LRO and the compensation (180°). If you keep tightening the screw, the phase shoots past 180° very quickly. ***The phase of the total LRO is how the computer determines whether the sign displayed to the technician is + or -.*** Note that the amount of total runout changes very little. This is why a technician can move the screw a small amount and have the sign on the electronics change from minus to plus (or vice versa) while the total number displayed changes very little. If you see this occurring, you know that you are at the minimum total runout that you can achieve with the ring at its current position.

Any error that leads to the computer calculating an ring position that is incorrect will lead to this 'hunting' back and forth around a particular value that keeps switching from + to –. This can be due to:

- A problem with the string sensor-sticky or rough action of the string or the string is not wrapped around the nylon pulley.
- The string is not straight. This leads the sensor to interpret RADIAL runout to be LATERAL runout. It cannot distinguish between the two. It only measures how far the string moves in and out. The string can be angled if the trolley handle is not tight and the lathe rotates when you start the motor.

A good workaround to unresolved 'hunting' is to remove the lathe from the adapter, spin the adapter 180° and hook back up. Check that the string is straight, hit the reset button and start again.

Electronics & Electromechanical Systems

The electronics & electromechanical systems are designed to assist the technician in determining where to place the ring and how much to turn the screw. *All runout values it displays are calculated for a nominal 10" diameter rotor.*

There are four major components in the electronics & electromechanical systems. They are: the electronics box, the string reel sensor unit, the tachometer and the wiring harness.

All four systems need to work, or else the electronics will malfunction.

Electronics Sub Systems

The Tachometer:

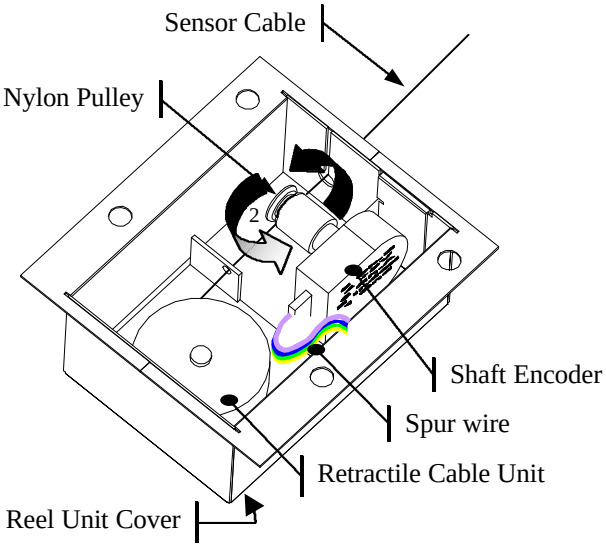
Located directly under the ring device is a small black sensor. It registers a pulse once each rotation. A slot cut into the base portion of the ring device creates this pulse. This is very similar to a gear tooth counter used in many automotive systems. This sensor is responsible for letting the control unit know that the lathe is running, and that it is running consistently and at the right speed.

Common problems with this part include:

- Loose or damaged connection at the junction to the main wire harness.
- The tach sensor is too far from the ring device. Proper distance is 1/8" or less.

The String Reel Unit:

This unit is mounted on the bottom of the bevel gear box (50-012). It consists of a retractile cable unit, the shaft encoder, nylon pulley and housing. There is also a short spur wire that runs between the outside of the housing and the encoder. This unit senses rotation of the encoder shaft and sends the data back to the controller. **The cable needs to wrap smoothly around the pulley <u>one time</u>. There can be no binding, catching or stiction. It must be wrapped as shown: under, around, under and out.** When in use, the sensor cable needs to come straight out of the cover.



Common problems include:

- Sensor cable frayed or broken
- Sensor cable no longer wrapped around the nylon pulley
- Sensor cable wrapped around the nylon pulley backwards
- Spur wire is disconnected from the shaft encoder or is connected backwards
- Sensor cable not connected to the vehicle or not straight
- Sensor cable not feeding in and out smoothly

Complaints that they technician cannot get past a yellow light most often point to a problem with the reel sensor unit. If the motion of the encoder shaft lags behind the actual motion of the machine the electronics will not report the correct ring position to the operator. If the ring is incorrectly positioned the LRO will get down to the lowest it can go, and then the electronics will just change the sign of the LRO, but not the amount.

Complaints that the **live mode counts up instead of down** are because the sensor cable is wrapped around the pulley backwards. The two ends of the sensor cable as they come off the nylon pulley should be parallel. The cable starts below the nylon pulley, is wrapped up and around the pulley one time, and then goes out the keyhole**. If the cable is wrapped the around the pulley in the wrong direction, the cable will come out of the small rectangular part of the keyhole slot. If the cable is wrapped the around the pulley in the *right* direction, the cable will come out *circular part of the keyhole*.**

Use needle-nose pliers to wrap and unwrap the cable around the nylon pulley. Be careful not to kink the sensor cable.

The Controller:

Mounted on the lathe trolley, the controller (computer) is responsible for gathering and interpreting the data from the tachometer and string reel unit. It then displays the high point phase (ring position) and lateral runout to the technician.

There are two buttons on the controller. The one on the left is the reset button. This erases any information in the controller and starts the program at the beginning. It can be pressed at any time to reset the unit. However, during normal operation, there should be no need to press this button. The right hand button switches the unit from the measuring mode to the live adjustment mode and makes the display act like a dial indicator.

The other features on the controller are the text display and the cable junctions. It is not possible to mis-wire the controller to the harness to the control unit.

Common problems include:

- Cable damage from tension on the wire harness. This is most often caused when flipping the lathe.
- Four black squares, and four blank spaces on the display. A jammed button most often causes this. Open the electronics box and be sure that the reset and live adjustment buttons are free to move up and down. Also be sure that either the sensor is not pressing the button on the backside of the circuit board or power wires.
- Works properly on one side but doesn't on a successive cut. The controller has a 5-minute time-out. It will reset itself after 5 minutes of not receiving a tachometer pulse. If you begin to do a second brake job less than 5 minutes after finishing the first, you will need to press RESET before you begin. Whenever you begin a brake job the controller should flash between READY and RELEASE SCREW.
- No power at the electronics box/no lights come on. Check AC connections and power at the wall outlet, inside the motor junction box and at the back of the electronics box.

- Electronics show 0.000” runout when there is obvious motion in the machine. This happens when one of the two channels from the shaft encoder is interrupted. Check the sensor connection at the back of the electronics box for damage or low pins, and the connections at the reel unit.

The Wiring Harness:

There are three main branches to the wiring harness and three small spurs.

The first brings AC power from the motor junction box to the control unit. This is a 120 (220V if used in Europe) AC line, so take normal precautions when servicing it. The wires in it are black (hot), white (neutral) and green (ground). It ends in a female 4-prong connector that is attached to the back of the control unit. Note that only three of the four connections are used. If this wire is damaged or disconnected you will get no lights whatsoever in the control unit.

The second and third branches of the wiring harness actually begin together at the eight-pin connector at the back of the controller. Three of these wires go to the tachometer (DC +, DC -, and ground). Four of these wires go to the string reel unit [1 DC (+), 2 DC (-) (channels A&B), 1 ground]. The eighth terminal is used to connect the cable shielding to ground. This protects against false electrical signals from strong fields, like those created by arc welders (or lathe motors starting up).

There are also three small spur wires that connect to the main harness. The first of these was mentioned when I described the string reel unit. It goes from the outside of the reel unit to the shaft encoder.

Please note that the connection to between the shaft encoder and the spur wire is the <u>only</u> connection that is possible to wire backwards. The purple wire should be attached at the top of the shaft encoder. The unused socket on the connector belongs at the ‘Index’ position. The back of the encoder has printing on it if you have any question as to which is the ‘Index’ position.

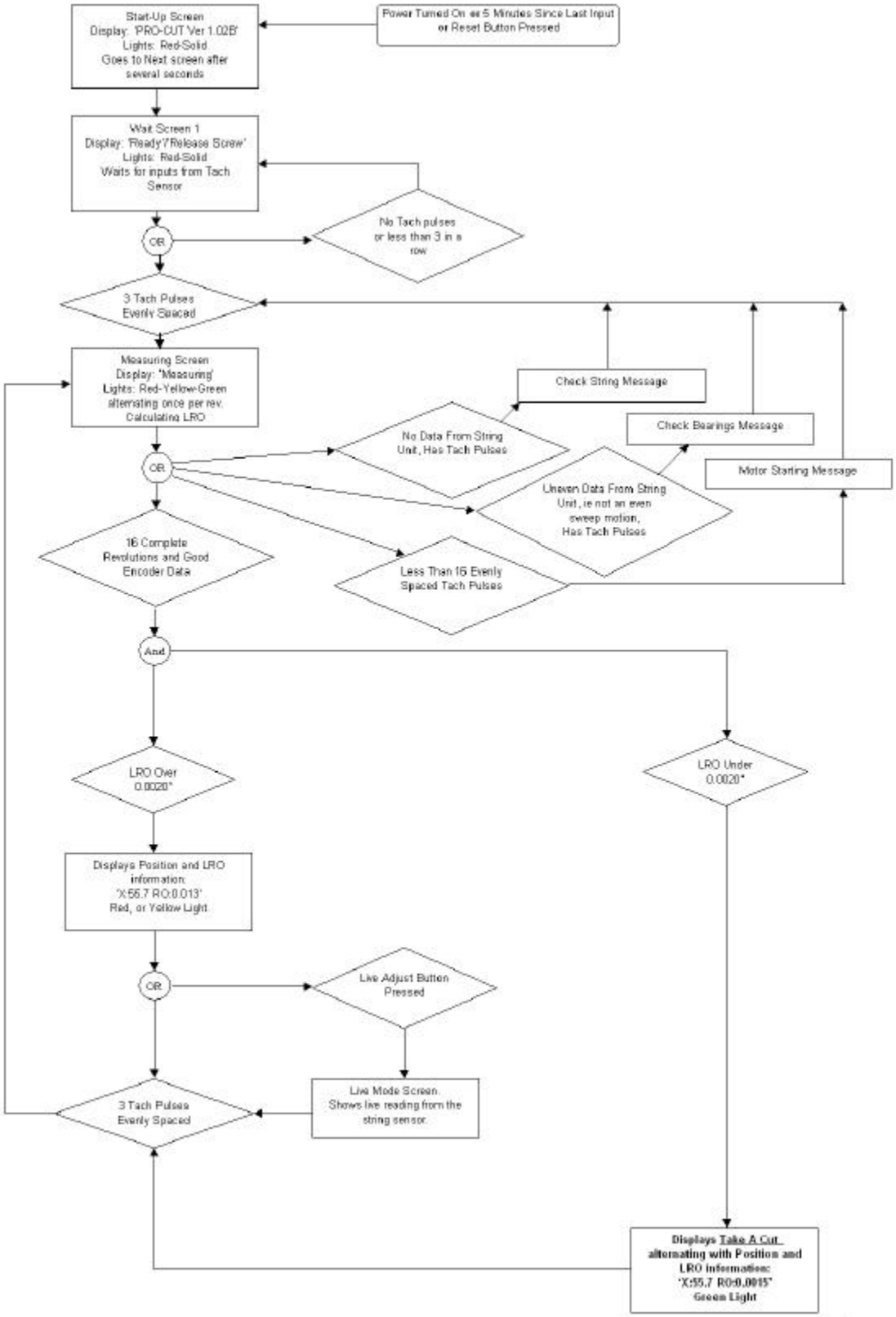
The other two spurs are inside the controller and go from the connectors on the back of the unit to the circuit board. One is for AC power and goes to a white three or five prong connector on the circuit board, and the other goes to a brown connector for the sensor data.

The wiring harness is the part most susceptible to damage by the operator. When servicing a machine look for loose or damaged wires, especially at the back of the control box and where the wires terminate at the sensors.

<u>The Program:</u>

Understanding the controller’s program can go a long way in helping you diagnose problems with the JBC 520. How far you get in the program can tell you if one or the other of the sensors is or is not working, and can hint at which area to inspect.

The flow chart on the following page shows the steps that the program cycles through. The rectangles indicate displays and the diamonds actions, such as sensor inputs. The circles represent possible outcomes.



A note about the 'Live Mode'. When the live mode is pressed, the computer takes the last calculated LRO measurement out of memory and begins to add or subtract counts from the encoder to it. It has no idea what the position of the ring device actually is. If the ring device is 90° from the line between the string and the lathe spindle, you can tighten the screw forever with virtually no change in the sensor reading.

Trouble Shooting

JBC 520 won't give a green light	Wire sensor not straight	Straighten wire and begin again. If there is a lot of radial runout, try extending more string.
	Gooseneck not tight	Tighten gooseneck and begin again.
	Adapter not properly centered.	Check that all nuts sit squarely in their countersinks or that all guide plates are lined up evenly. Begin again.
	Ring Device needs cleaning	Remove ring device from lathe, disassemble and clean. See appendix for diagram. Any wobbling between plates will cause problems when removing runout.
	Nylon Pulley has come off sensor shaft	Remove reel units cover and put the nylon pulley back on. If it fits loosely, score the brass sensor shaft until the fit is snug.
	Sensor Cable no longer goes around pulley.	Remove reel units cover and check the that the Sensor Cable goes around the pulley. It can come off if the technician 'snaps' the cable back into the unit. Use needlenose pliers to wrap the cable around the pulley one time. The two ends should be parallel when you're done.
	Sensor Pulley loose on the shaft.	Slide pulley over and score the brass shaft so that there is a tighter fit between the nylon pulley and the shaft.
Black boxes take up half the display, other half-blank.	One of the buttons is jammed in the down position.	Open electronics box and check that buttons are not cocked or jammed and also that the power or data wires are not pressing on the button on the backside of the circuit board.
JBC 520 display is blank and lathe is plugged in.	Power connector is disconnected	Re-connect power cable to the back of the electronics unit, or check connections in the motor junction box.
JBC 520 will not enter live mode	Circuit board has come loose from the box.	Open box and tighten/replace the standoff screws that hold the circuit board to the front of the electronics box.
JBC 520 does not begin measuring	Sensor cable not attached to the electronics unit	Re-connect the sensor cable to the back of the electronics unit
JBC 520 says, "Take a cut" but there is still obvious motion.	Wire sensor not attached to gooseneck	Attach sensor wire and begin again.
	One of the two channels from the reel unit sensor is disconnected	Check all pins and connections between the sensor inside the reel unit and the electronics box.
JBC 520 adjustment works on one side, but fails to eliminate runout on the subsequent cut	Unit not reset between cuts.	Unit resets automatically after 5 minutes. If less than 5 minutes have elapsed since the last cut, the RESET button needs to be pressed before beginning the next brake disc.

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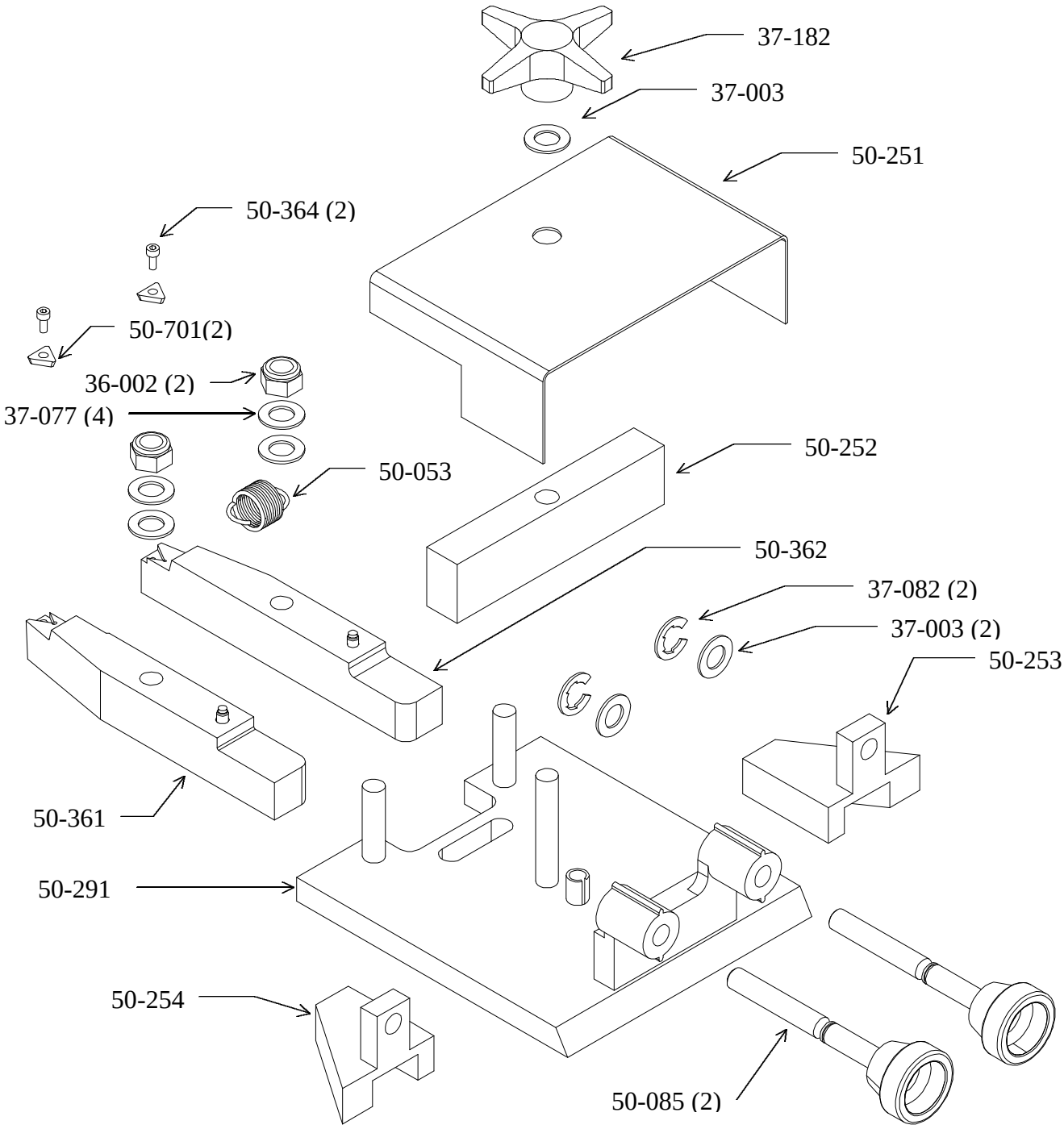
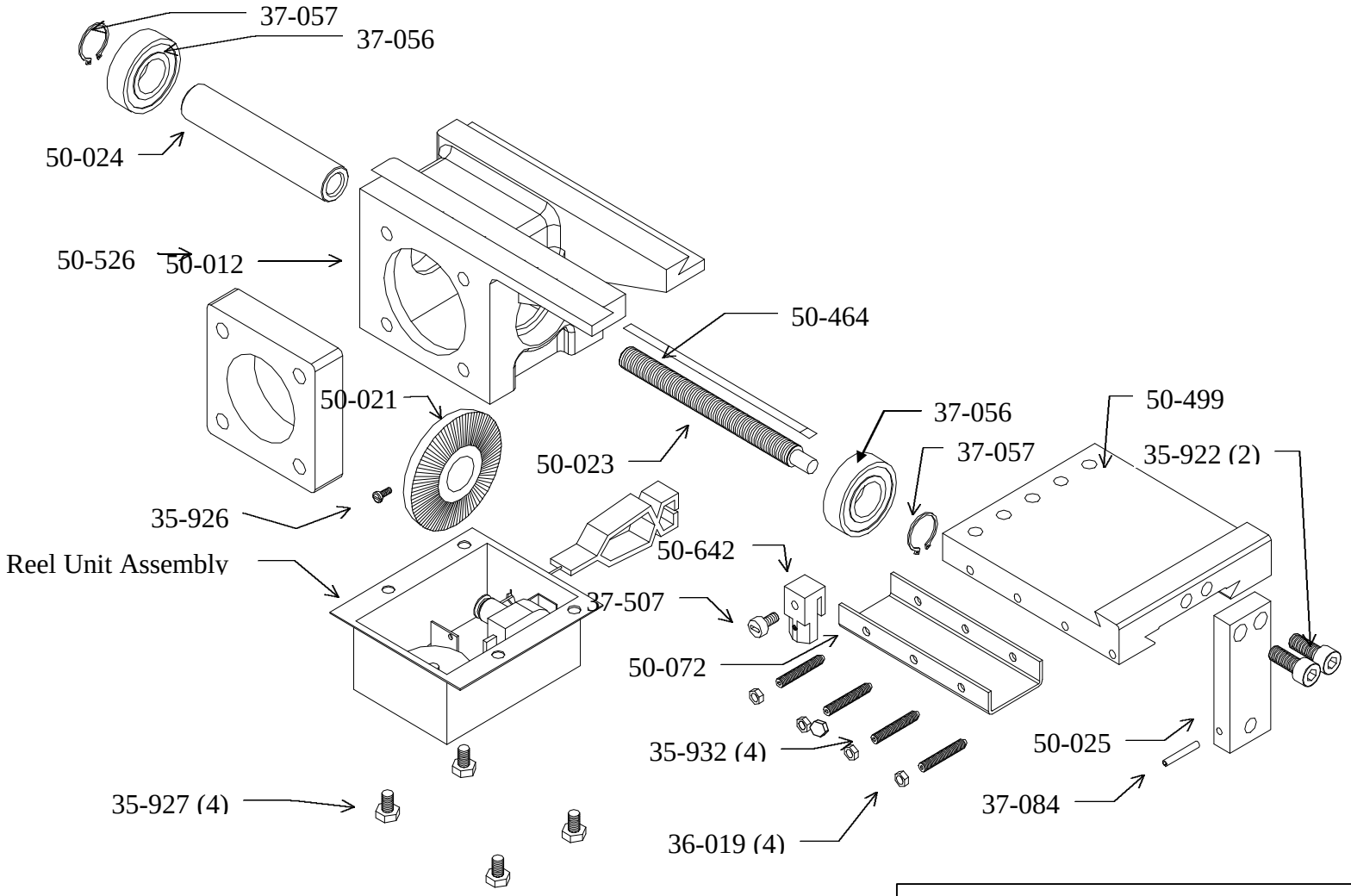
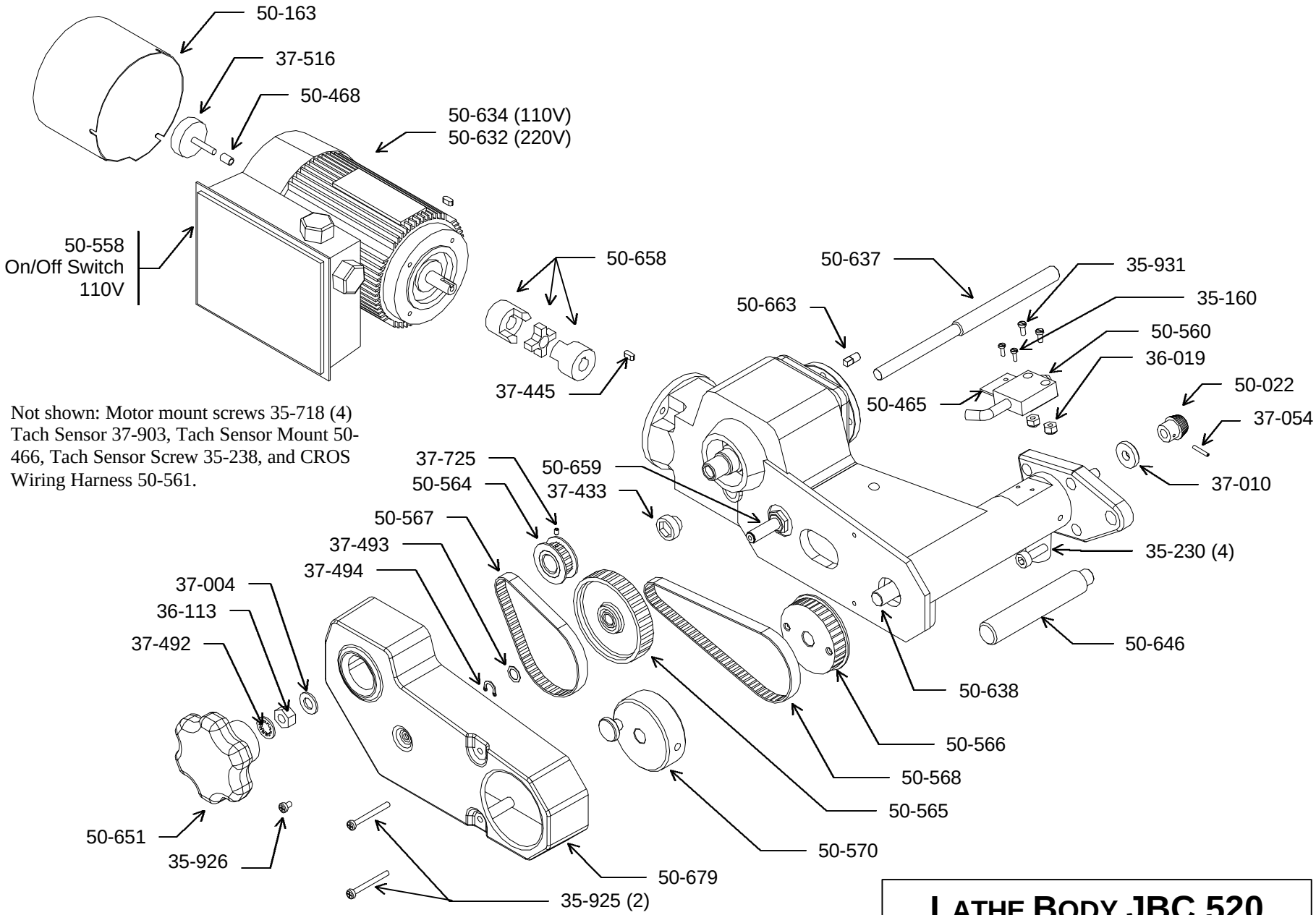
EquiServ = PC50085



50-238 CUTTING HEAD

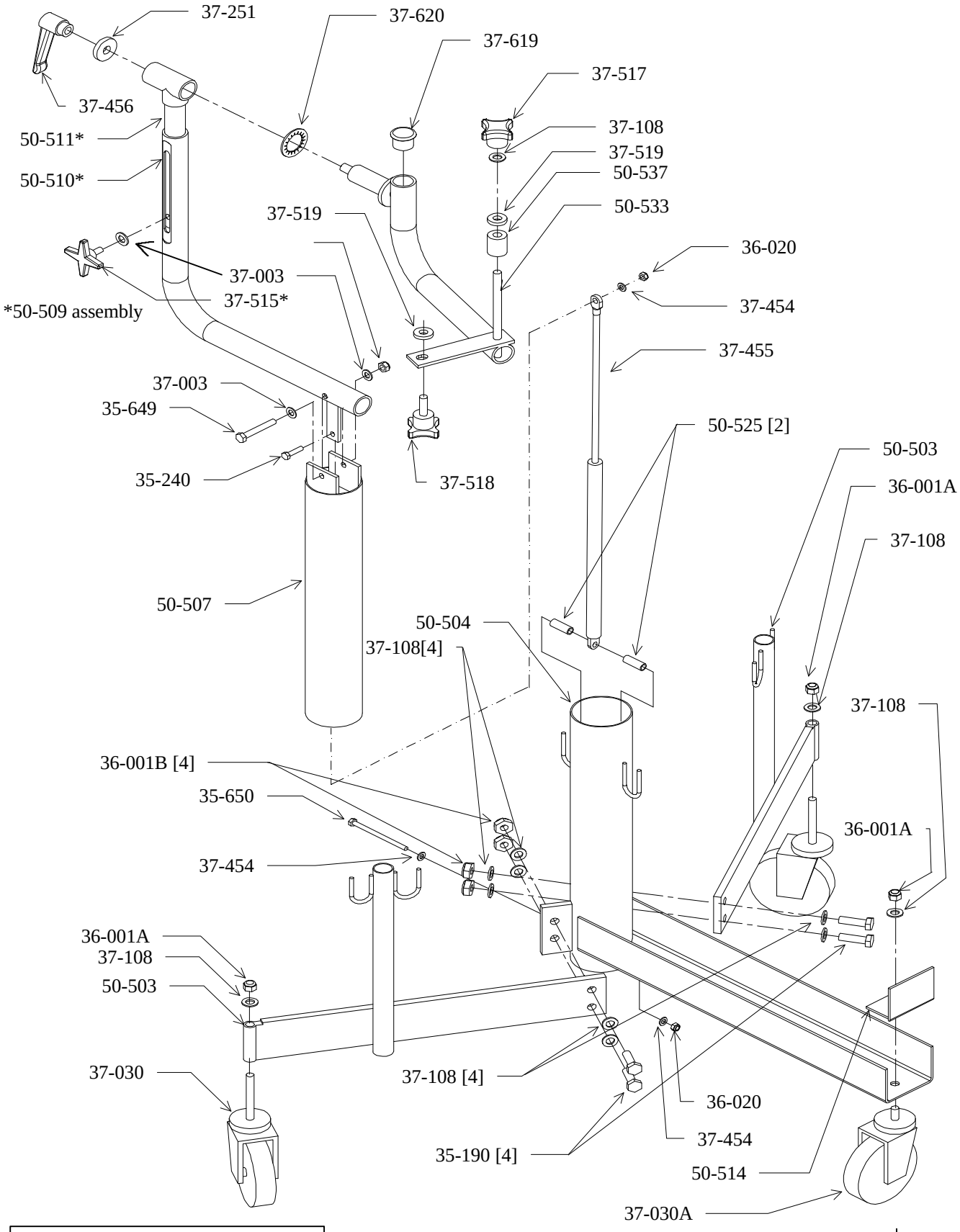


JBC 520 BEVEL GEAR

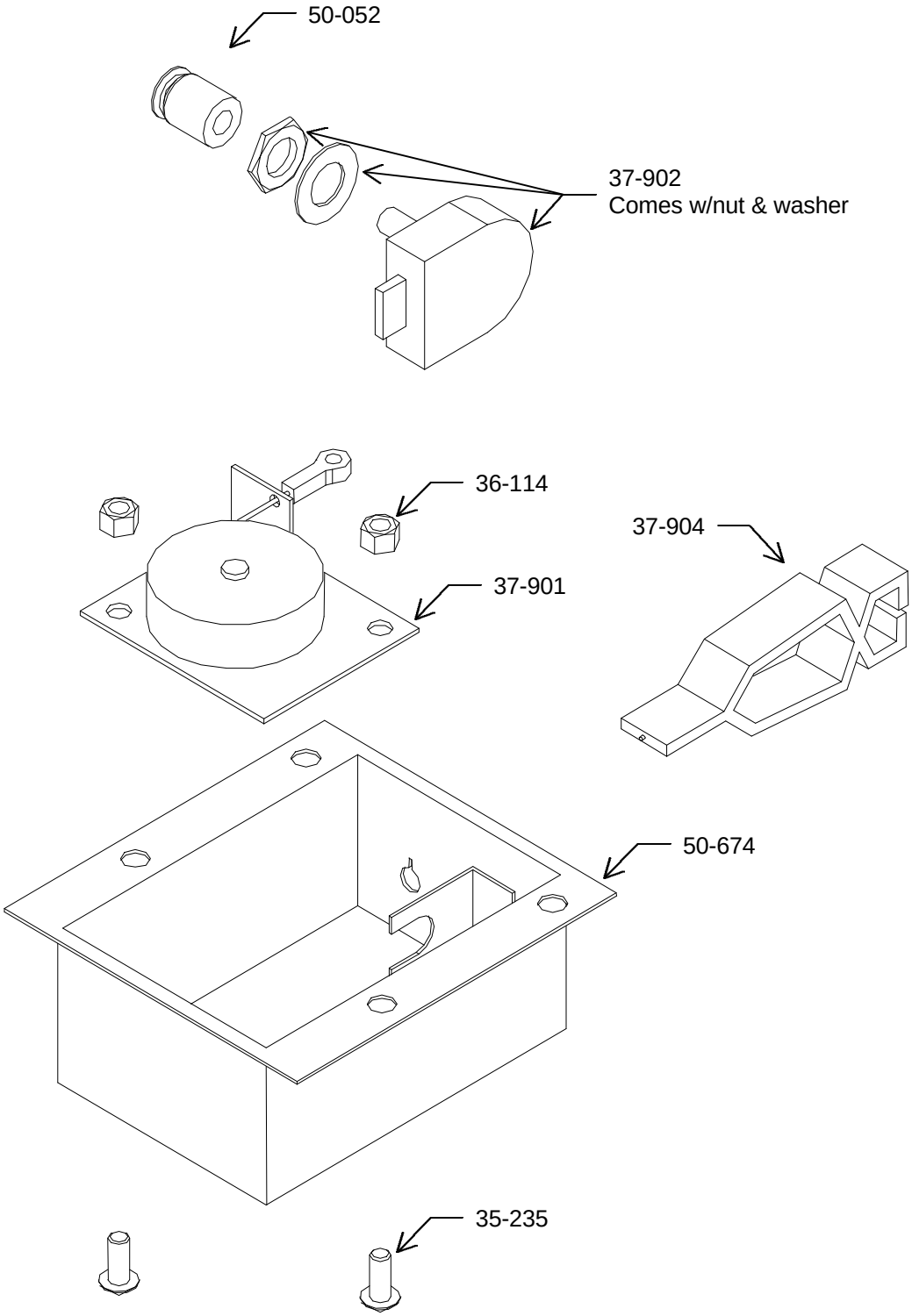


Not shown: Motor mount screws 35-718 (4) Tach Sensor 37-903, Tach Sensor Mount 50-466, Tach Sensor Screw 35-238, and CROS Wiring Harness 50-561.

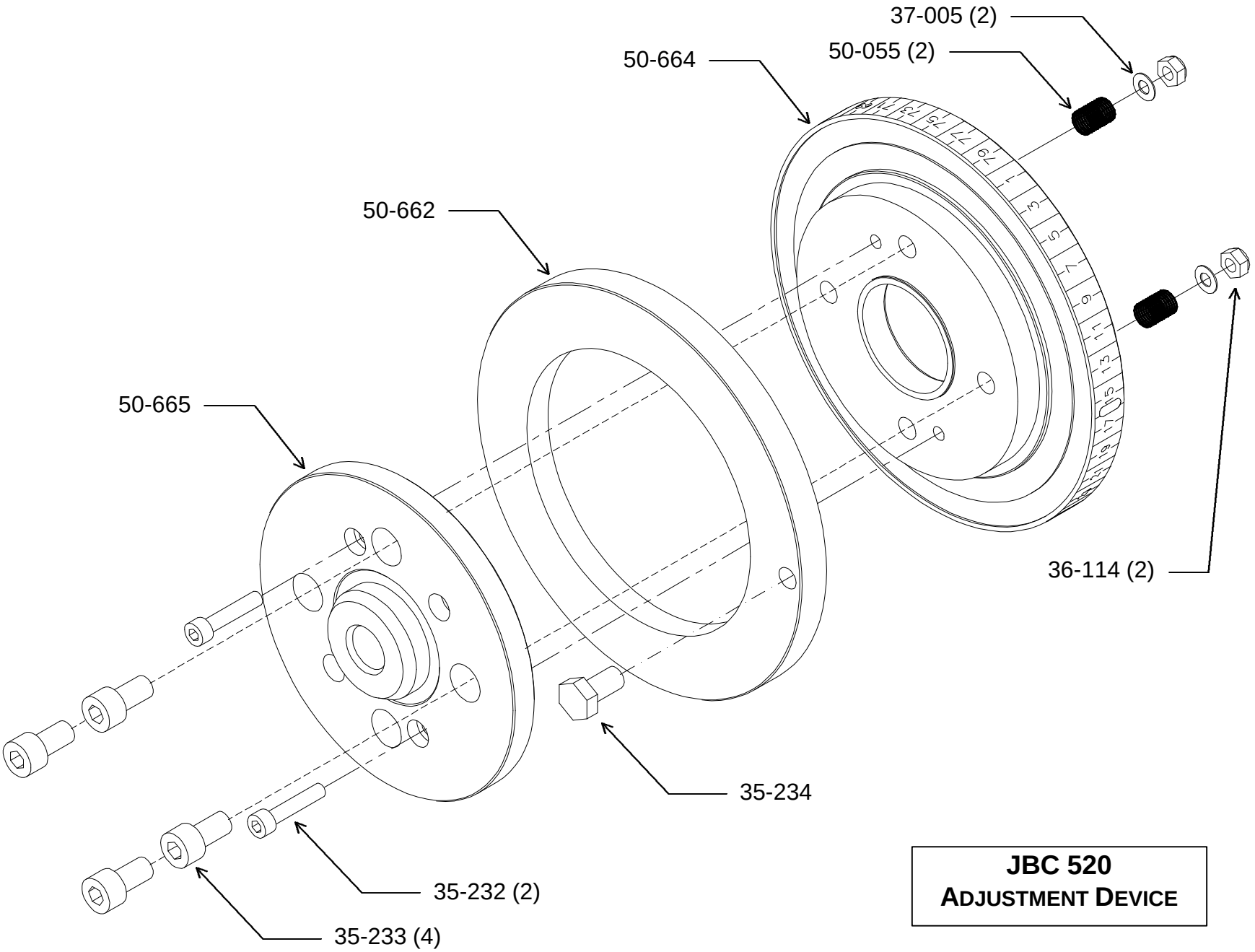
LATHE BODY JBC 520



LATHE TROLLEY



REEL UNIT ASSEMBLY JBC 520



JBC 520
ADJUSTMENT DEVICE