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Motor Drive Service Guide

Motor Drive Instructions (Ser. No 391 and higher.)

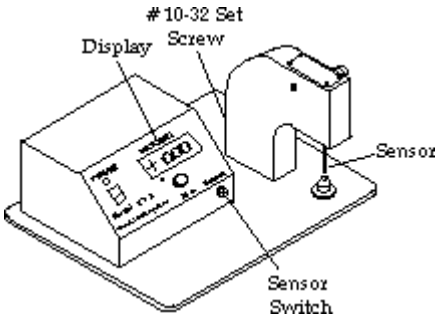
Motor Speed:

The motor speed should be set so that a stable reading (+000) appears on the display in approximately 2.25 to 2.50 seconds after the sensor switch is depressed. Mechanical changes within the motor or gear head may eventually create conditions that change theoutput speed. If changes occur beyond the 2.0 to 3.0 second range, the motor speed should be adjusted.

Tools Needed:

- Small straight screw driver ~ 2 mm wide.
- 3/32" hex key
- A means of accurately counting seconds.

Adjustment:



- Remove the # 10-32 set screw from the rear of the frame to access the motorspeed potentiometer (Pot).
- Engage the adjusting screw in the Pot with the small screw driver.
- Facing the rear of the frame, rotate the Pot screw clockwise to increase the speed and vice versa. This is a sensitive adjustment. Slight rotation of the screwwill provide significant changes to the speed.

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- Adjust the screw until you obtain the proper speed. Apply a small amount of sealant (light grease or Vaseline) to the # 10-32 screwprior to replacing it. This will help keep saline from getting into the frame.

Motor Drive Trouble Shooting:

Make sure that the voltage selector at the rear of the ET-3 is set to the proper line voltage at your laboratory. Refer to the Operating Instructions if the voltage needs to be changed. If you change the voltage make sure that the proper fuse is installed.

Sensor Does Not Fall:

There are four possibilities why the sensor does not fall when the sensor switch is pressed. These are: improper sensor force adjustment, mechanical binding, motor failure,or motor drive circuit failure.

1. If the sensor comes most of the way down then stops before it gets to the anvilthen the counterbalance may need to be adjusted. See the "Sensor Force Adjustment".
2. If the sensor does not come down at all, or very little, gently try to pull the sensor down by hand. (It may have gotten stuck at the top during shipping.) This should only take a gentle pull. Do Not force it to come down. If it does not come down with the first try, briefly press the sensor switch and try again. If it comes down and then cycles up and down properly with successive switching, the problem is solved. If it comes down, then goes up with the next press of the switch but won't come down again, something is binding. If it will not come downat all after a few tries there may be an electronic failure or mechanical binding.
3. Remove the cover plate (lid) on top of the frame.
4. Press the "sensor" switch and observe the push rod (rod) at the extreme rear ofthe frame cavity. The rod should go up with one push of the switch and down with the next.
5. If the rod does not go down, try gently pushing it down. If it still doesn't godown push the sensor switch one more time and try pushing it down again.
6. If you can push the rod down, and then it returns to the top with the next push of the switch the electronics are functioning properly and something is binding. If you are not able to push the rod down then there may be somethingwrong with the motor or motor drive circuits.
7. To test the electronics:

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a. Remove the cover plate from beneath the base plate.

b. Unplug the small connector.

c. Connect the minus (-) side of your volt meter to the black and plus (+)side to the green wires of the small female connector. There are slots in the connector where you can make contact. There should be -12 volts across these two wires.

d. Connect the volt meter to the black (-) and violet (+) wires of the smallfemale connector. There should be a +12 volt signal that goes to zero for

   i. 0.7 seconds when the sensor switch is pressed.

   ii. If these signals are not present the main motor drive circuit has failed andwill need to be replaced. If these signals are present then the main motor drive circuit is functioning properly and the next step will be to test the motor board.

8. Reattach the small connector and perform test 7c. and 7d. above. If the proper signals are still present continue to step 9. If the signals are not present record thevoltage readings and send this information to Rehder Development Co. Please include all the information you have discovered during these tests.

9. Unplug the large and small connectors and remove the two 1/4-20 socket screws that secure the frame to the base and remove the frame. Be careful of thewires and connectors as they are pulled through the hole in the base plate.

   a. Reattach the small connector.

   b. Find the motor board (small circuit board) in the cavity at the bottom of the frame. Connect the volt meter to the red (+) and black (-) wires marked"Motor" at the end of the board.

   c. When the sensor switch is pressed there should be a signal between 4 to6 volts for 2 or 3 seconds. If this signal exists the motor board is functioning properly and the cam on the end of the motor shaft should rotate 180 degrees each time the sensor switch is pressed. If this signal does not exist the motor board has failed and will need to be replaced. If this signal exists and the cam does not rotate 180 degrees when the switchis pressed, the motor has failed and will need to be replaced.

10. If the electronics and motor are functioning properly the problem is probably mechanical binding.

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If Something is Binding:

1. Remove the counterbalance assembly from the top cavity. (One screw through the left side of the frame- 5/32" hex key.) The counterbalance should freely swingas you hold the pivot pin with very little side play.

2. Remove the lift arm assembly. (One screw through the right side of the frame-5/32" hex key.) The lift arm should freely swing as you hold the pivot pin with very little side play.

3. (Applicable to newer models) Do not loosen the two screws in the top of thewhite offset lifting block. These are used for adjusting the vertical position of theblock and do not secure it to the rod. Pull the lift block from the push rod.

4. (Applicable to older models only) Loosen the screw at the side that secures the white offset lifting block to the top of the push rod. (.050 inch hex key.) This is difficult to access because it is down in the recess at the rear of the cavity. Use a hex key that has the short end shortened a little and hold the long end with a pinvice. Use the hex key to lift the block off the push rod.

5. The 1/4" dia. white lift plunger (plunger) will come out at the same time with the lift block.

6. (Applicable to older models only) Drill out the hole in the white plunger to a#49, (.073"), (1.85mm).

7. Try the motor again without the lift block. If it now functions properly the problem is at the lift plunger. With the push rod at the lowered position, you should be able to easily lift the push rod and it should drop back down without any friction or binding. If there is friction or binding proceed to the next step (6.).If there is not any friction or binding with the push rod proceed to step (16.).

8. Unplug the connectors between the electronics chassis and the frame and setthe chassis and base plate aside.

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9. The Red-Yellow-White-Black wire bundle (wire bundle) must now be loosenedfrom the motor board (these wires are not soldered to the motor board). The wire bundle is held in place with a small dab of hot glue. You can melt the glue with the tip of a soldering iron while gently working the wires to free them. Be very careful not to burn the wires.

10. Remove the motor mount and push rod assembly (bottom cavity) with the circuit board attached. (Two screws through two access holes in the circuit board - 5/32" hex key.)

11. Properly align and reconnect the small connector. Push the sensor switch whileobserving the motor and cam. It should rotate 180 degrees with each push of the switch. If it does not rotate then the motor or motor drive circuit has a problem.

12. (Older models only) If the motor functions properly, remove the two whiteDelrin rod guides (.050 inch hex key), and drill out the holes nearest the outer radius (push rod holes), with a # 40 drill, (.098"), (2.50mm).

13. (Older models only) Drill out the two mounting holes in the base of the motormount with a #30, (.128"), (3.25mm). Be very careful not to damage the circuit board.

14. Replace the push rod and two Delrin rod guides. The lower guide should be about 1/4" from the motor mount. The top guide should be near the top of the support rod. The guides should be aligned with their flat sides parallel to the sideof the motor mount. This is easily done by laying the assembly on a flat surface. The Cam protrudes from the side of the motor mount so it needs to hang over theedge of the flat surface.

15. Make sure that the push rod is free to float up and down without any binding.

16. Reinstall the motor mount and push rod assembly in the frame, running thewire bundle along the flat side of the rod guides.

17. Make sure that the plunger moves freely in it's hole and then reattach the wire bundle to the motor board so they will not interfere with the operation of the camor push rod in the bottom cavity or lify arm or counterbalance in the top cavity.

18. Try the sensor switch to make sure all is functioning properly and then attachthe lift block to the top of the push rod. The lift block pin engages the hole in thewhite plunger and the plunger is inserted into its hole at the same time the lift block is

positioned on the push rod.

19. Try the switch to see that the push rod now travels up and down. If all is working properly, reinstall the frame onto the base plate. The sensor shaft shouldbe centered over the apex of the anvil then tighten the 1/4" screws.

20. Reinstall the lift arm assembly, make sure that the push rod is in the upper position and adjust the position of the lift block on the push rod. When properlyadjusted, the plunger should push the lift arm up so that the highest point of thelift arm will clear the inside of the lid by about 1/2 to 3/4 mm.

21. Engage the lift pin on the sensor shaft with the slot of the lift arm. You cangently spring the lift arm to the side to do this. Do not pry any more than necessary.

22. Adjust the vertical position of the sensor shaft lift pin collar (.050" hex key).When properly adjusted you can observe the following:

    a. With the push rod in the lowered position, and the lift arm held in position so it does not rise, the sensor is then gently lifted by hand until thelift pin hits the top of the slot in the lift arm. At this point the display should read approximately +1550 microns.

    b. When the sensor is held down on the anvil, it should be possible to liftthe lift arm approximately 0.5 mm or so of at the lift pin.

    c. Observe closely! As the sensor is lowered with the motor drive, observethe bottom tip of the sensor shaft. The rapid travel should stop and start moving slowy about 1.5 mm before it contacts the anvil.

23. Replace the counterbalance assembly (do not pinch the wires). Replace the lidand the bottom cover plate. Apply a small layer of petroleum jelly around the inside edge of the lid to help keep out saline that may accidentally be spilled on the frame.

24. Apply silicone sealant around the base of the frame, base of the electronicschassis and bottom cover plate to prevent saline contamination.

None of the above operations will have any effect on the instrument's calibration. Removing and replacing the frame from the base may have a small effect on the centering of the Zero

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knob. There should be plenty of range within the Zero adjustment tocompensate for this.

If the Zero position needs to be adjusted, please see those instructions.

If there is a conflict or problem, please call Createch Rehder Development Co at 1-833-833-1994 or email a.snow@createchrehder.com for further instructions.