

TEC Optical Sensor Upgrade (TS3 and TS3/8)

FCO CA03931

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Creo Inc.
A subsidiary of Kodak
3700 Gilmore Way
Burnaby, BC
Canada V5G 4M1
(604) 451-2700

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Revision History

Revision	Date	Author	Comments
A	29Jun 2005	D Jeffery	Initial release
draft	28 Sep 2005	D Jeffery/J Waterman	Added photos and formatting
B	30 Sep 2005	C Galere	Added some more materials

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1. SCOPE

This procedure is for upgrading TEC sensors on TS3 and TS3/8 output devices (FCO CA03931). This FCO should be applied if there have been repeated failures of the TEC backbone lock, unlock, or magnet detect reed switches. It can also be applied on a TS3 and TS3/8 machine where FCO E120 (TEC microswitch) has been applied. Do not apply this FCO for an individual switch failure.

2. PARTS AND TOOLS REQUIRED

You will need an electric drill for this procedure. Drill bits required are included in the jig kit.

This procedure is for Trendsetter serial numbers S001 – Sxxx and Heidelberg-built Trendsetters S983631001 –S99363xxxx.

512-00123B Kit, Upgrade ECO CA03931, TS3 that includes:

Part Number	Quantity	Item Description
719-00264A	1	TEC Optical Sensor Upgrade Procedure (TS3)
500-01780A	1	TEC Optical Bar Assembly, MPE, TS3
50-2730B	1	TEC backbone Assembly, TSM
252-06091A	2	Rod end block TEC, TS3
58-0285A	2	Rod end block TEC TS
55-0757A	2	Fitting, Air choke 0.6mm 3-groove
18-3017	3	Cable ties black, 10 cm
18-3049	5	Cable ties black, 7.5 cm
518-01403	1	Jig kit for optical TEC backbone sensors

3. REMOVING THE BACKBONES

1. Turn off main air valve and power
2. Remove the air lines from the TEC lock/unlock cylinder.

   Do not lose the small brass speed control orifices in the end of the hoses. If the air is not turned off prior to taking these hoses off the fitting, the speed controls will pop out.
3. Cut the cable ties that hold the hoses to the TEC backbone.
4. Disconnect the cable harness from the home side and cut any cable ties that hold the cables in place.

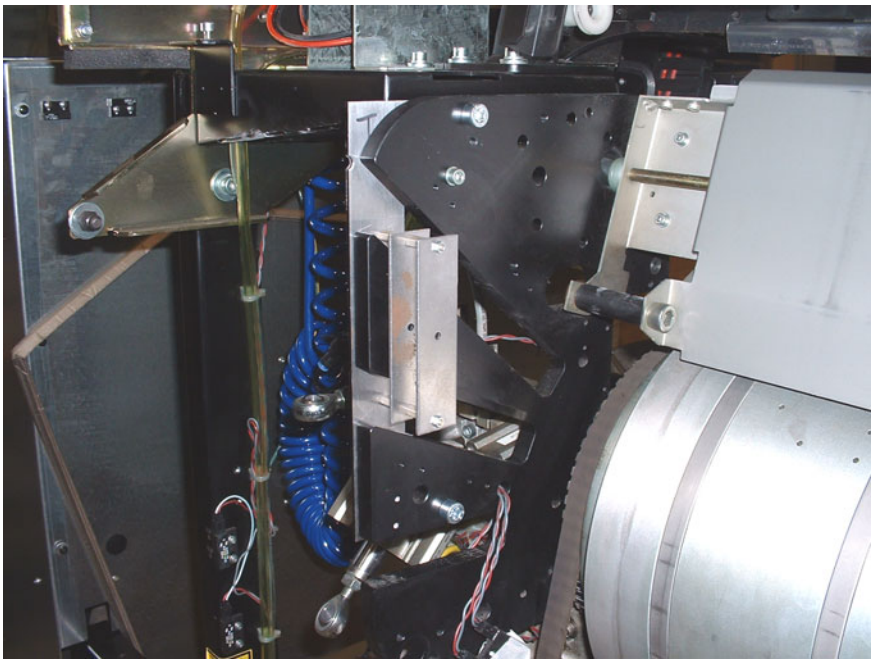
5. Remove the shoulder bolts that attach the TEC backbone to the rod end bearings on the pneumatic cylinders.
6. Keep the shoulder bolts and round spacers, as they will be used later in the procedure.
7. Remove the two reed switch magnets that trigger the TEC up/down reed switches from the backbone and install them on the new backbone (50-2730) that is in the FCO kit.
8. On the new backbone, remove the opened plastic tubing that holds the lock/unlock in the extend position for shipping protection.
9. On the new backbone, mark the lock and unlock sensor connector for easy reference later on.
10. Remove the LEC backbone and roller.
11. Save the old TEC backbone to be returned for rework.

4. PREPARING THE SIDE PLATES

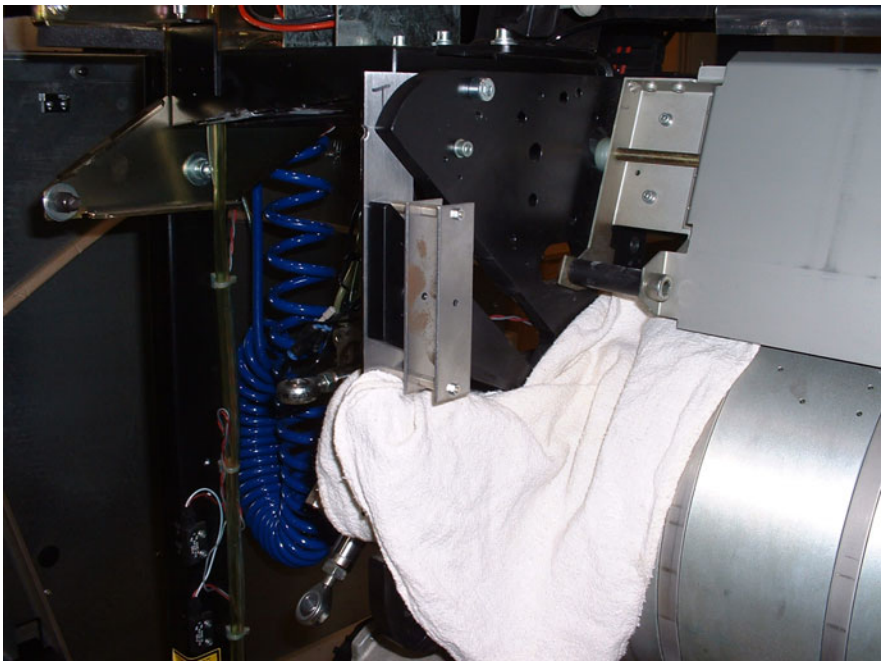
If you are upgrading an early TS3 Trendsetter or Heidelberg-built Trendsetter that does not have a hole suitable for mounting the TEC optical sensor bar, follow the steps in this section. Otherwise proceed to the next section of the procedure—*Installing the new trailing edge backbone*.

1. Remove any reed switches on the side plates that will interfere with mounting the drilling jig. Don't forget to mark the current position on the side plates and wiring orientation.
2. Assemble the drilling jig (518-01403):
   - Attach the drill jig backing plate (690-00229A) to the outside of the side plate using the two M8x25 cap screws (52-4773) provided. The notch on the back edge of the side plate should be located near the top of the jig. You will have to remove the tie wrap plastic holder that plugs the holes.
   - Attach two of the aluminum spacers (52-4332) to one of the alignment plates with a 5/32-in. diameter hole (690-00233A) using two M3 nuts (52-3025).
   - Attach the second alignment plate with a 5/32-in. (4-mm) hole to the assembly using two more aluminum spacers.
   - Use two M3x8 screws (52-4458) to attach the 5/32-in drill guide to the drill jig backing plate.

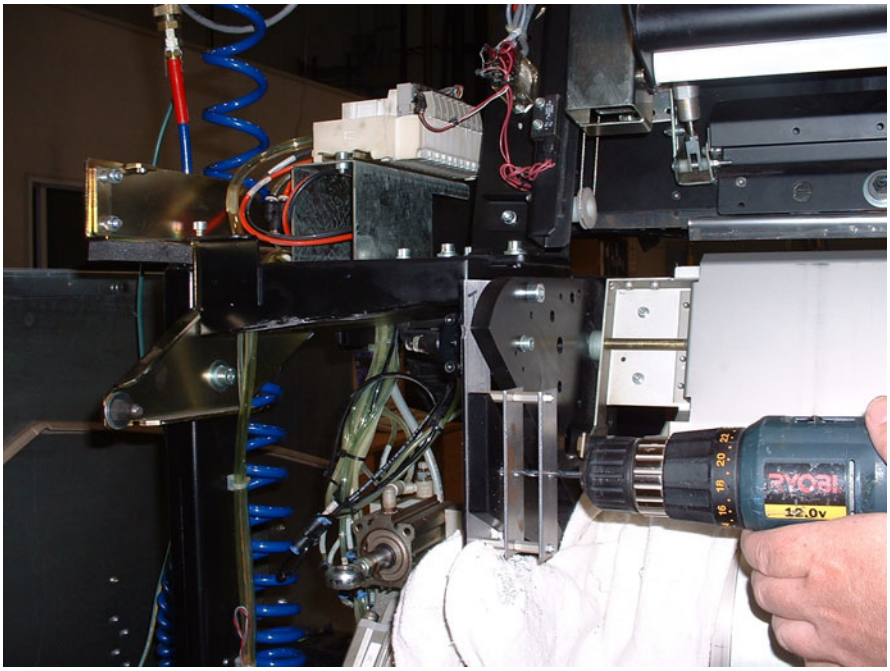
- See the photo below to confirm correct installation of jig.



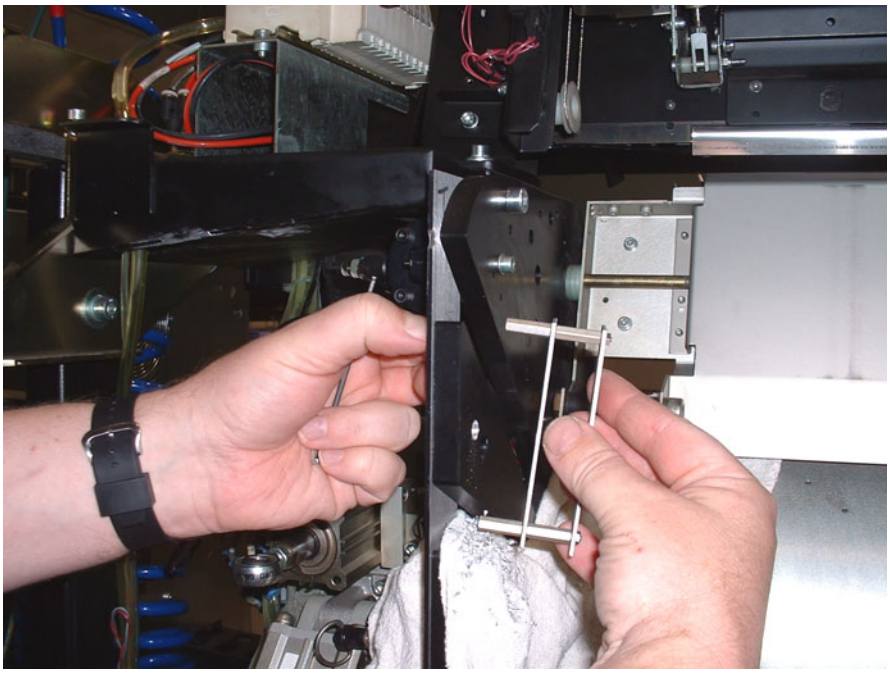
3. Cover the drum and engine casting with a drop cloth to collect the drill shavings.



4. Using the 5/32-in. drill bit (690-00231), drill a hole in the side plate.
   The holes in the jig will determine the position of this hole. This small hole (5/32 in.) is a pilot to make sure the position of the larger hole is correct.

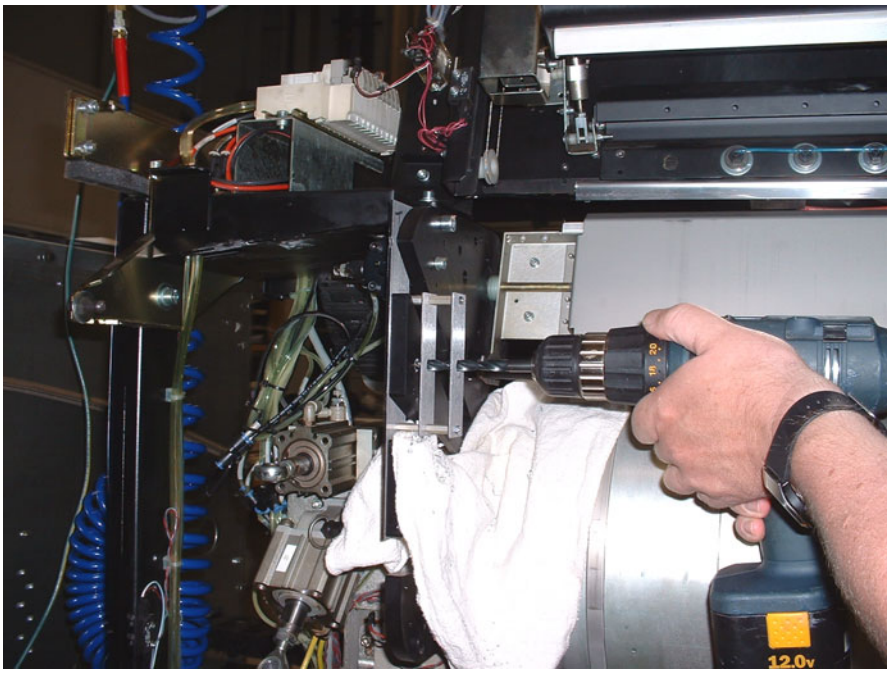


5. Remove the small hole alignment plates by removing the two M3x8 screws.



6. Replace the small hole alignment plates with the large hole alignment jigs (690-00234A) and attach to the drill jig backing plate using the two M3x8 screws.

7. Using the 21/64-in. drill bit (690-00230), drill a hole in the side plate. The holes in the jig will determine the position of this hole.

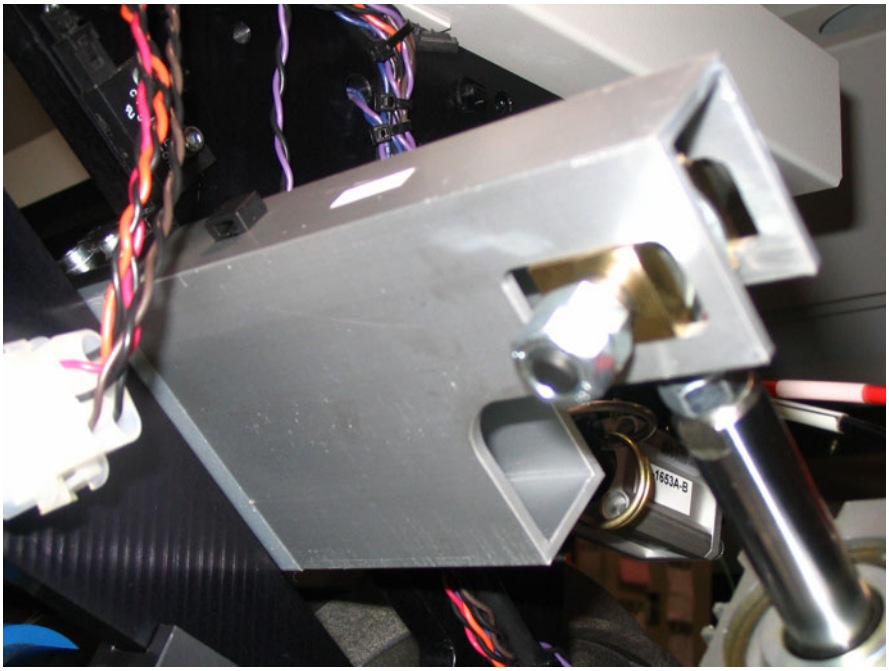


8. Remove the M8x20 bolts from the drill jig backing plate.
9. Repeat this procedure for the other side plate.
10. Clean up any loose drill shavings with your vacuum.
11. Reinstall the LEC backbone and roller.
12. Reseat the reed switches that were moved to allow clearance for the jigs.

5. INSTALLING THE NEW TRAILING EDGE BACKBONE

1. Place the new TEC backbone (50-2730) into the TEC slots in the side plate.
2. On the away side, use the shoulder bolt and spacer that you removed earlier (Removing the backbones) to attach the backbone to the rod end bearing on the air cylinder.
3. On the home side, insert the two new brass rectangular spacers into the rectangular slots on the **inside** of the backbone and place the rod end bearing between the brass spacers.
    - Use 252-06091A for TS3 machines and 58-0285A for TS3/8.

4. Insert the shoulder bolt through the brass spacers and the rod end bearing.

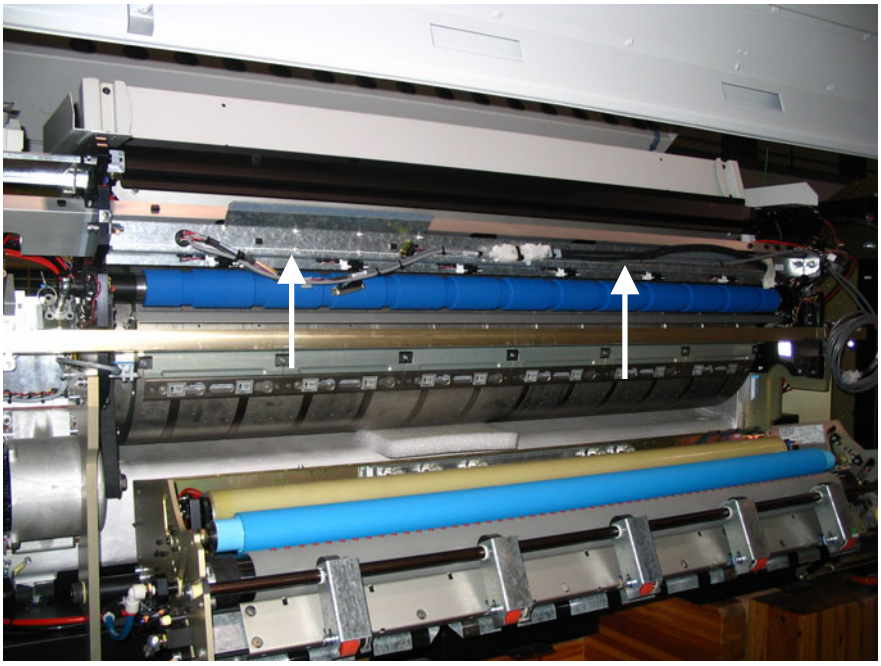


5. Install and tighten the nuts on each of the shoulder bolts.
6. Install the two extra M8 nuts (52-4102) on each shoulder bolt .
7. Insert the lock and unlock hoses back into the lock/unlock cylinder fittings.
8. Ensure that the speed control orifices (55-0757A) are inserted into the ends of each hose.

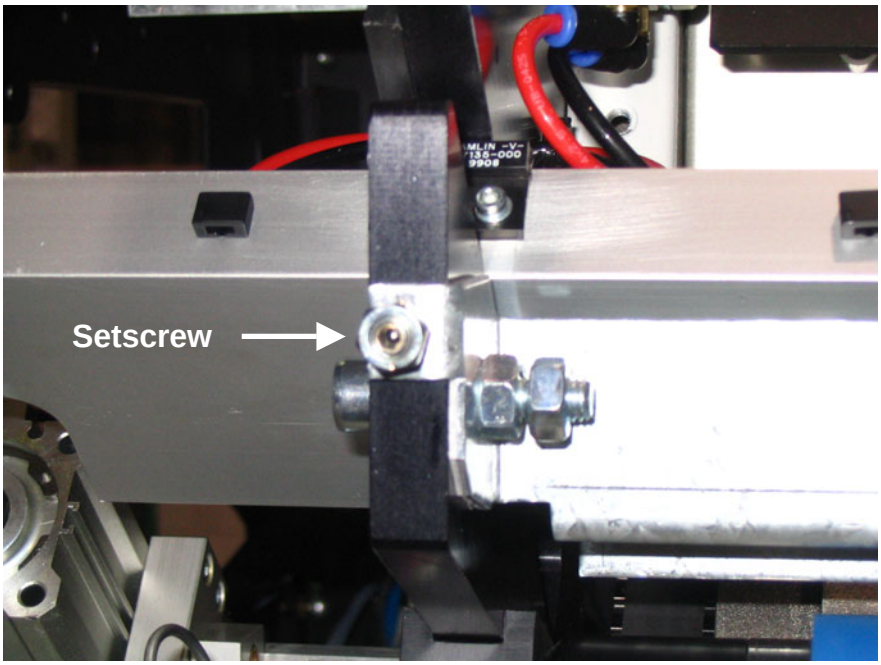
   If the air is turned on with these hoses disconnected, the orifices will blow out and will be difficult to find due to their small size.

6. INSTALLING THE TEC SENSOR BAR

1. Mount the sensor bar as shown in the photo below:



- Use an M8 bolt, nut and washer to attach the bar to the home side of the engine side plate.
- On the away side, use an M8 bolt, washers and two M8 nuts.



- Tighten the first nut onto the bolt finger tight.
- Install the second nut as a jam nut for the first.

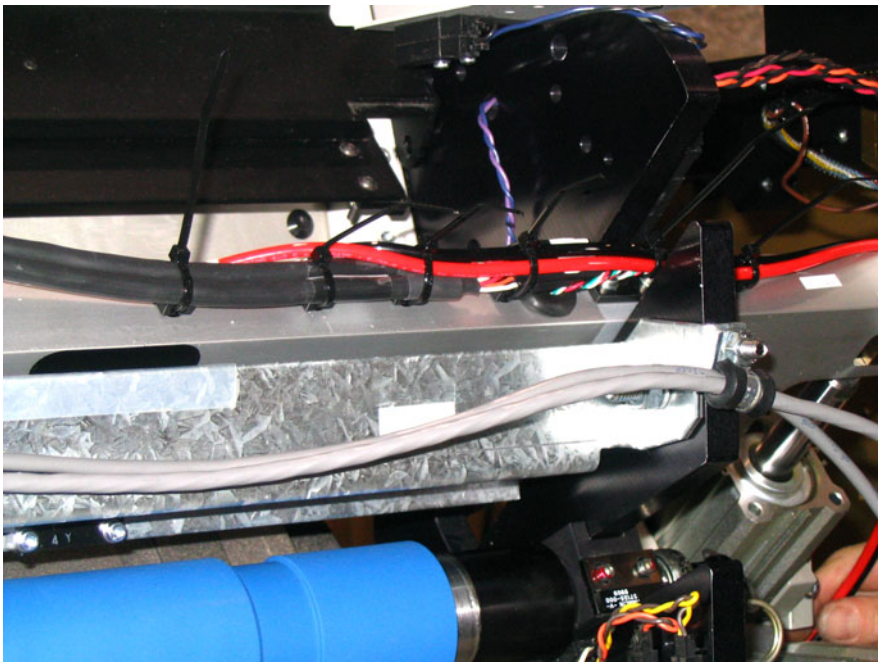
  The optical sensor bar should move with light resistance using finger pressure.

2. Install the M6 setscrews (should be preassembled) into both the home and away part of the sensor bar.

3. You will install the M6 nuts used for locking the setscrews once the optimum position has been determined according to the Adjustment and testing section.

4. Route the power cable (220-00604A) and the control cable (220-00605A) from the sensor board toward the home end through the cable support strap.

   Loop the cables along the cable harness making sure that they are tied to the optical bar.



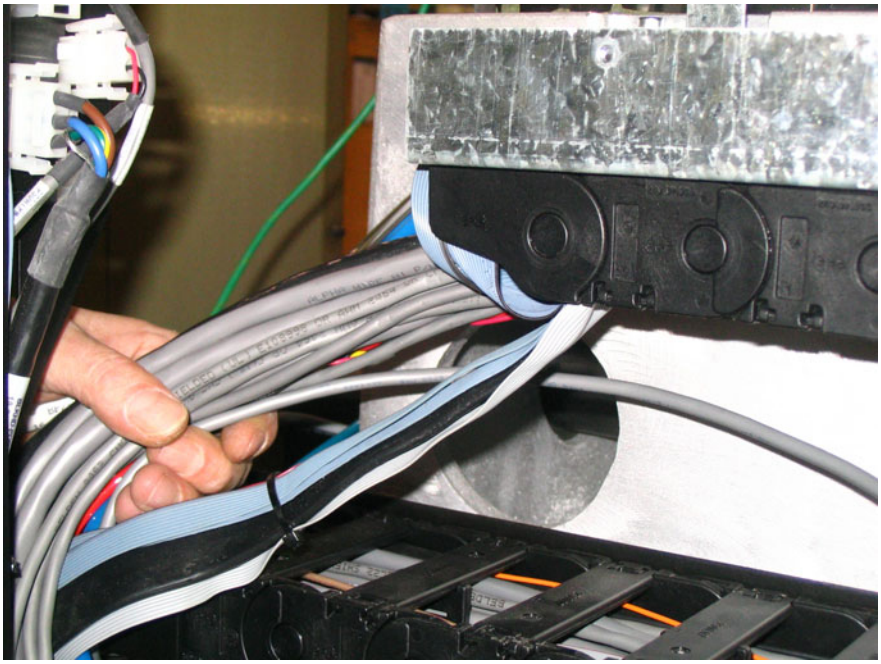
5. Connect cable 220-00605A to the control cable on the left side of the home side plate.

   Make sure that the cable is tied up in a loop so that it is out of the way of any moving parts.

6. Route the TEC power cable (220-00604A):

   - Route the cable along the same path used in the previous steps.
   - Continue to route the cable along the side plate, towards the TEE board, and down to the cable harness underneath the TEE board.
   - Use a cable tie to attach the cable to the existing wire bundle.
   - Continue routing this cable towards the back of the machine.
   - Remove the hose tray for easy access to the flex track.

- Pass the cable under the flex track that goes to the power box.
- Remove the cover of the flex track and install the new cable in such a way that the new cable runs parallel to the existing cables.



- The cable should now end in the power box.
- Close the flex track sections that were opened.

7. Connect the TEC power cable (220-00604A) to power supply 2 by connecting the red lead to **+24V** and connecting the black lead to **24V return**.

8. Use the eight M3 screws and washers provided to attach the TEC Optical Sensor I/O board (503-00050B) to the standoffs on the sensor bar.

Be sure to wear a static wrist strap when handling all electronic circuit boards.

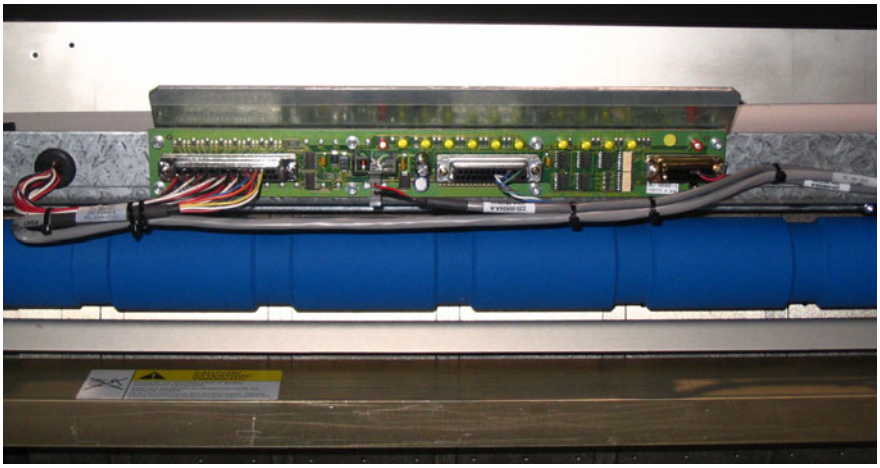
9. Attach cable 220-00590A to J1 on the I/O board. See photo

10. Attach cable 220-00514B to J2 and J3 on the I/O board.

11. Attach cable 220-00508A to J4 on the I/O board.

12. Use a cable tie to keep the cables together.

    Ensure that all conductors entering connectors are not stressed.



13. Connect the TEC optical lock and unlock sensors to the high flex cable.

    Use the labeling on the cable to identify lock and unlock.

14. Loop the cables from the sensor bar to the TEC backbone, and fasten them.

    Ensure that the loop is large enough so that the cables do not rub against the sensor bar as the backbone moves up and down.

    Note: The last cable mount is not used to hold down these cables, but serves to attach cables inside the sensor bar.

15. Ensure that the speed control orifices (55-0757A) are in place before connecting the red and black hoses to the hose fittings on the lock/unlock cylinder at the home end. The kit contains 2 extra orifices in case they are needed.

16. Use a cable tie to tie the hoses and the sensor connectors to the top of the TEC backbone.

    Ensure that they do not interfere with the up and down travel of the backbone.

17. Turn the power and main air valve back on.

7. ADJUSTMENT AND TESTING

There are six LEDs on the sensor board labeled **Sens1** to **Sens6**. Each LED corresponds to a TEC clamp on the backbone from left to right When the TEC clamps are attached to the TEC backbone, and the TEC backbone is in the extend (up) position, **Sens1** to **Sens6** LEDs on the board should all be on.

Firmware in the latest controlled release is required for this assembly to operate reliably.

1. Adjust the setscrew on the away side by turning it in a clockwise direction until you see all six LEDs on the board go on.

   Note: As you turn the setscrews, the sensor bar will move in an arc. While adjusting the setscrew, ensure that the end of the M6 setscrew is always touching the side plate.

2. Turn the away side setscrew another ½ turn and stop.
3. Tighten the lock nut on the away side, ensuring that the bar does not move, and the setscrew is continuously touching the side plate.
4. Turn the home side setscrew until the setscrew touches the side plate.
5. Turn the home side setscrew another ¼ turn and stop.
6. Tighten the lock nut on the home side, ensuring that the bar does not move, and the setscrew is continuously touching the side plate.
7. Tighten the M8 nuts on both the home and away side plates, ensuring that the bar does not move, and the setscrew is continuously touching the side plate.

   The LEDs should now go on and off simultaneously as the backbone extends and retracts.
8. Test the device by removing one clamp from the drum and making sure that the missing clamp is detected.
9. Confirm the function of the lock and unlock sensors:
   - Turn the drum to the park position (**`set al ppos`**) and hold it there.
   - Move the TEC backbone into the drum (**`tec on`**).
   - Unlock the TECs (**`tec unlock`**).
   - Query the TEC lock sensor (**`tec`**).
     The locked sensor should read false and the unlock sensor should read true.
   - Lock the TECs (**`tec lock`**).
   - Query the TEC lock sensor (**`tec`**).
     The locked sensor should read true and the unlock sensor should read false.
10. Test the device for loading and unloading plates.