First Ten Ångstroms

FTA2000 Autosampler Carousel Setup Service Bulletin

April 22, 2005

The FTA2000 includes a rotating autosampler to facilitate flexible liquid dispense algorithms. For a general discussion and photos of the FTA2000, see the FTA website and the following link: http://www.firsttenangstroms.com/faq/IntroductionToTheFta2000.html.

The autosampler carries a large body of control wires between its rotating carousel and the base of the instrument. To keep these from winding up tight, the rotation is restricted by software to ±180° from a central point.

The autosampler can become misaligned by any of the following:

- improper Driver Setup software constants
- mechanical collision or drag
- operator performing an emergency *Stop All* and then restarting motion without *Home All*

Software Realignment

The simple case is when the software has lost track of where the autosampler carousel is and has wound tight, but there is no mechanical problem. In this case, we may use the *Carousel rescue move*. This move is executed without regard to the rules of how much carousel rotation is allowed or where vials are located. It is arbitrary and absolute. We will use the rescue move to unwind and properly position the carousel for future, normal moves.

- The carousel winds tight by continued motion in the counter (anti) clockwise direction when viewed from above. It is true it would also wind tight if we turned *far* enough in the clockwise direction, but that would involve reversing the direction of the wires within the cable tray and we never want to do that. The cable is wound in the tray in such a fashion that the tray can turn at least four turns clockwise from the full-tight counter-clockwise position before the cable reverses direction.

- To make a rescue move, enter the desired rotation in the text box in the Driver Setup. The illustration on the following page shows its location. For example, you might enter +30 for a 30 degree motion clockwise. Then click either *Move Carousel* button on the tab. The carousel will move and then reset the rescue text box value to 0. As long as the value is 0, *Move Carousel* does an ordinary move to vial or video position move.
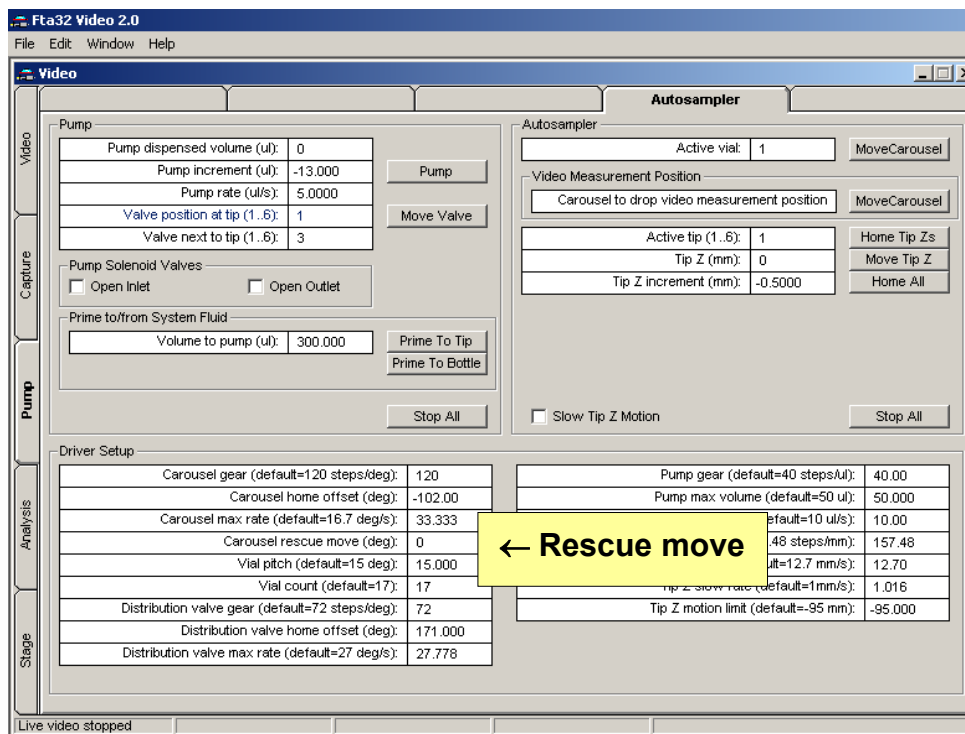
Autosampler Tab in Program

- If the carousel is wound tight counter-clockwise, we want to back it up two full turns, or +720°. This will be the starting point for *Home All* and normal operation. Rather than make the move in one long turn, try a short move (say, 30°) to make sure the direction is right.

- When the carousel motor winds tight and the carousel can no longer turn, the motor will continue to run (make noise) but will stall. Operation in this mode is not recommended but normally does no harm.

Cable Tray

The cable tray is a circular aluminum tray which holds the wiring up against the bottom of the autosampler carousel. The following photo shows the tray after it has been lowered. Remove four M3 socket head screws spaced around its upper edge that hold it up against the autosampler. You can see the wiring cable wound around in circles.

The cable tray must be carefully positioned so it is centered on the autosampler carousel, else it will rub against the center support post when the carousel turns. The proper way to do this is to first lightly fasten the M3 screws, loose enough that the tray can slide sideways with a little finger pressure. Turn the carousel back and forth and the tray will center itself on the post. Tighten the M3 screws a bit a repeat the carousel back and forth motion. The tray will find its centered position and can be tightened in place so that it does not rub on the post.
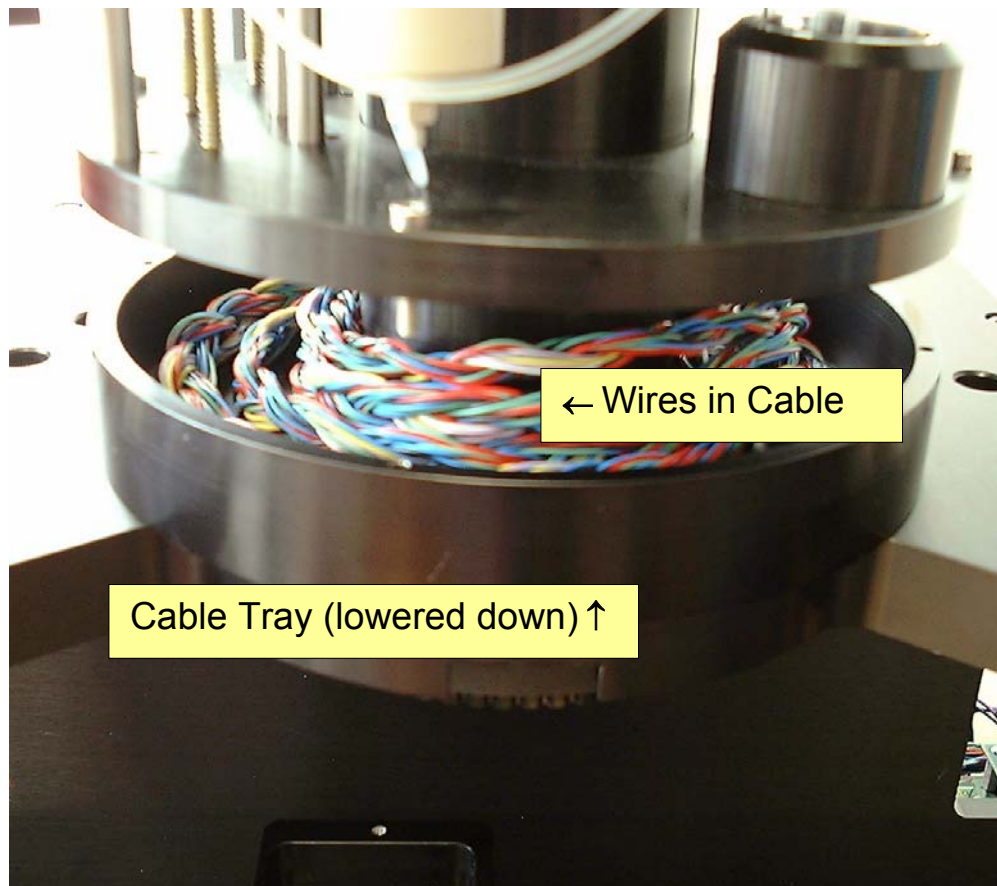
Tray lowered to expose wiring cable.

Tips for Centering Cable Tray

1. The tray may not be absolutely circular, due to normal manufacturing tolerances. If it seems to rub the center post at one particular rotation position, try rotating the tray with respect to the carousel 90 or 180º (in both directions) to see if there is alignment. This will fix almost all cases where the tray rubs at one particular point during its rotation.

2. It is important not to tighten the four M3 screws excessively, because this can warp (twist) the tray and make the rubbing problem worse. If it doubt, use a M3 spring washer with each screw holding the tray. Tighten the screw down just to the point where the washer flattens out, and no more. In extreme cases, use only two of the four screws – choose a diameter and place them opposite one another, separated by 180º.

Hardware Realignment

It is possible to perform almost all maintenance and realignment by dropping the cable tray so you cab see the wiring and using carousel rescue moves to turn the autosampler. However, if you want complete freedom, you can remove the drive belt so the carousel turns freely (within the constraints placed by the wiring cable).

The drive belt is shown in the photos on the next page. It can be removed, and replaced, in one of two ways:

- The belt can be slipped down and off the carousel pulley from the front by using strong finger pressure. It can be replaced by reversing the procedure. This is the easier and recommended method.

- If the belt seems tight, and you can not move it by hand, you can remove the main rear cover panel and loosen the drive motor and that will loosen the belt. This requires removing the Bosch frame from the back of the enclosure so you can remove the long rear cover which extends across the width of the instrument. This cover is held on by four M5 screws through the main bottom plate, two M5 screws against the vial plate, four M3 screws into the enclosure end plates (the lower two on each side are tricky and need to remain inside the plate, loose, while back cover is being removed or replaced, and six M3 screws from the two lower top covers.
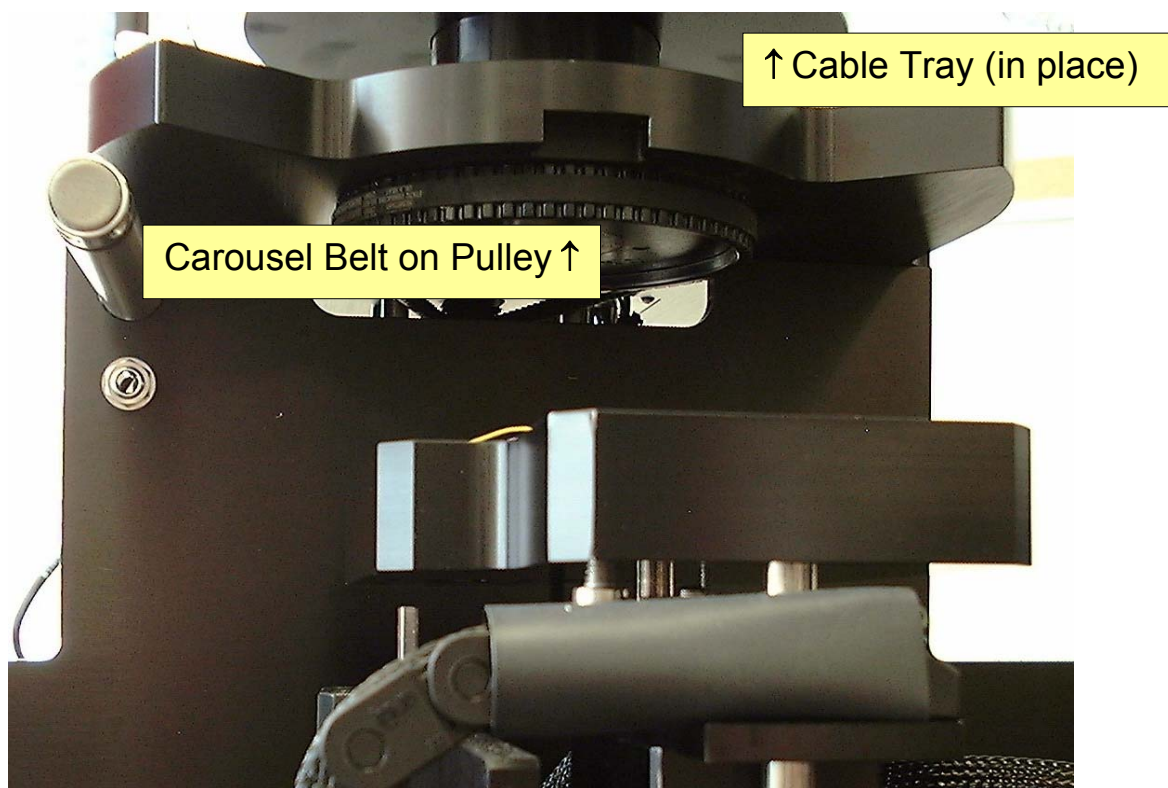
Carousel belt and pulley.

Removing or Replacing Belt
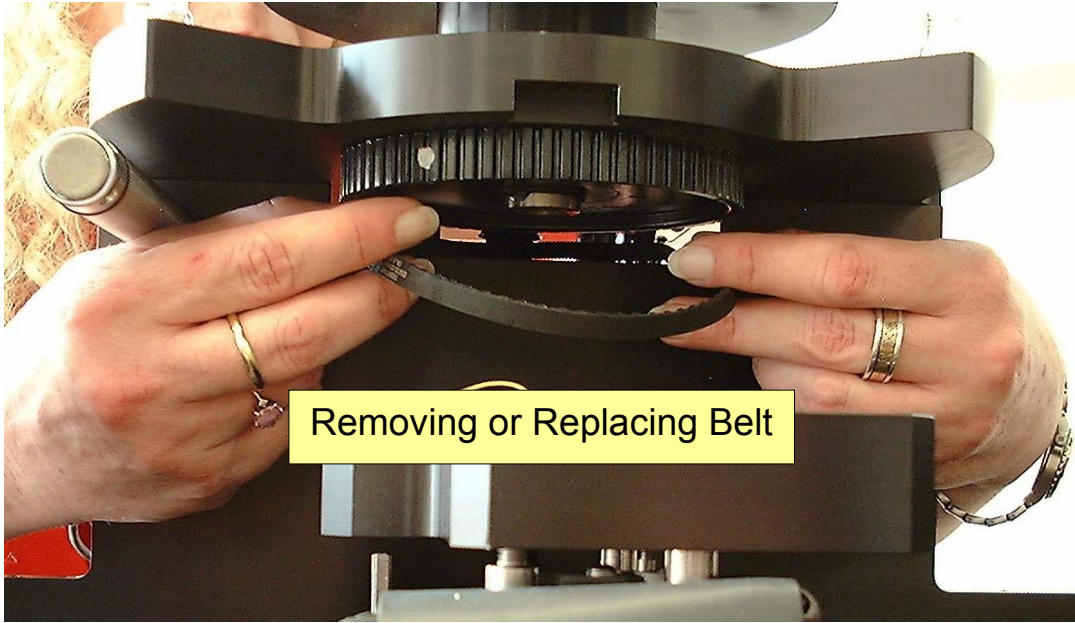
Pulling belt off pulley.
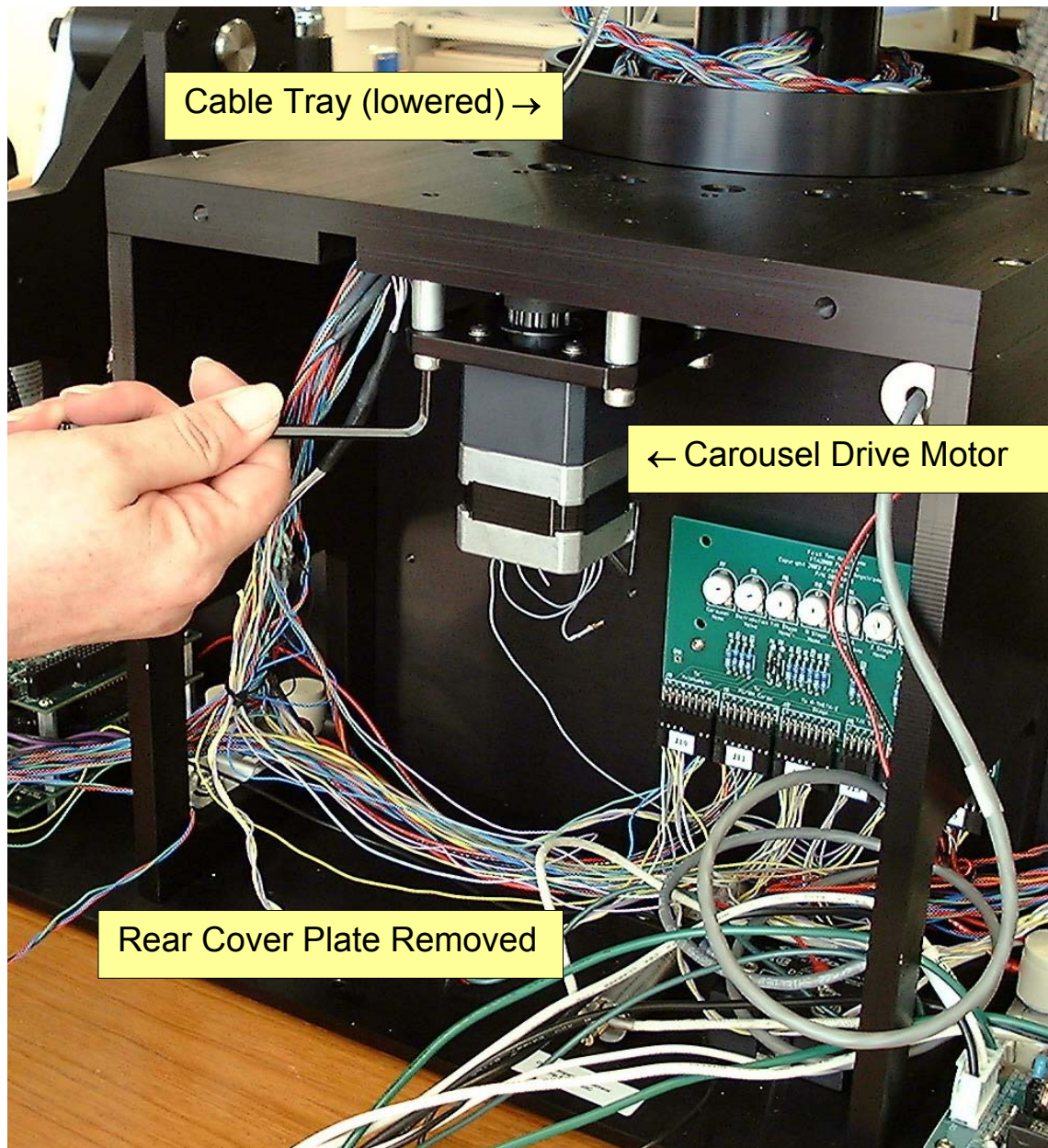
Rear of instrument with back cover removed.

The above photo illustrates access to the carousel drive motor when the main rear cover plate is removed. The drive motor should be adjusted so the drive belt can be depressed about 5mm by moderate finger pressure. Test this along its span from the motor to the carousel pulley.

Placing The Autosampler Back in Service

1. Ensure there are two turns of slack in the cable, either by using the carousel rescue move or by manually positioning the carousel with the belt removed.

2. Mark the portion of the carousel facing the front of the instrument. You want to record how much this moves during the following operations.

3. Execute a *Home All*. The carousel should never turn more than 360° from its starting position during its home move. This means the cable in the tray will never be *tighter* than 1 turn of slack and never *looser* than three turns of slack. Subsequent carousel moves will stay within these bounds by choosing to go in the opposite direction if the proposed move would exceed the bounds. Clearly any position can be reached by less than 360° of movement if the optimum direction is chosen.

4. Ensure the cable tray is tight and not rubbing on the center support post.

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