Kodak

Automatic Pallet Loader

Installation Setup and Alignment Procedures

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Revision History

Revision	Date	Author	Comments
1	13 July, 2007	A.Blignaut	Procedures extracted from the integration and setup document 708-00328A.
2	27 Nov, 2007	A.Blignaut/ V.Beyer	Additions and changes made as a result of past installations.
A	22 Jan 2008	A.Blignaut/ V.Beyer	More additions and changes made as a result of latest APL installation.
B	May, 2008	V Beyer	Additions for Series IV Machine.

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1. STARTUP

Before proceeding with the setup and alignment procedures, ensure that:

- The Magnus VLF has been upgraded to or is in the correct APL configuration.
- The assembly of the APL is complete and all shipping material has been removed.
- All tools gantry rails are removed from inside the APL.
- No pallets or pallet spacers have been loaded into the APL.
- The compressed air supply is connected to the APL and turned on.
- The power connector and ground cable is connected at the interface panel on the Magnus VLF.

2. RELATED DOCUMENTS

- APL Visual Installation Guides
  One segment (719-00828A)
  Two segment (719-00829A)
  Three segment (719-00830A)
- APL Operator Visual Reference Guide (732-00116A)
- APL Integration Procedures (708-00328A)

3. ENTERING NVS PARAMETERS

The NVS parameters for the APL must be manually entered into the customer's workstation. These parameters can be found in a text file generated during integration at the factory. The list of APL specific parameters are located in the following areas:

- `>>hwconfig`
- `>>set bay 1 to 6`
- `>>set apl`
- `>>option`

Enter the parameters for the slip sheet airjet. Do this for all defined media types <n>. The default parameters are:

- >>set mhmedia <n> SeparatorOnTime 50
- >>set mhmedia <n> SeparatorOnTimeP 100
- >>set mhmedia <n> SeparatorPulseDutyCycle 3

This will apply three pulses of air 50 ms long, with 100 ms between pulses. The NVS names are misleading because the names were recycled from the MCU airjets.

Tips:

- If the plates are sliding off the P-cups, reduce the number of pulses (more likely an issue for smaller plate sizes).
- If the slip sheets are being pushed off the plate stack during the plate push, increase the number of pulses and / or the duration of the pulse on time (more likely an issue with larger plate sizes of certain media types).
- If both small and large plate sizes are being used on the same machine, use two media slots for the same plate so that the pulse can be controlled independently for the two sizes via their respective *mhmedia* parameters. You must use different names for each media—for example **Kodak_Gold_Large** and **Kodak_Gold_Small**.

4. TESTING THE SAFETY LOOP

There are two scenarios when testing the APL safety loop:

- Testing without connecting the APL to the base device (use a dummy connector to terminate the cable connection from 220-01663A).
- Testing with the APL connected to the base device (connect APL cable 220-01663A to the Magnus VLF bulkhead connector 220-00325B).

1. Check that all locking Omron switches are in the **lock** position. If not, turn the little manual override dial from **unlock** to the **lock** position.
2. Close all the panels and doors. Make sure that they are all closed and properly aligned.
3. Ensure that the E-stop switches are released (not pressed down).
4. From Service Shell type:

```
>>door lock

>>apl lock
```

5. From Service Shell, check that the safety loop is completed. If the safety is not complete, determine which part of the loop is broken and fix it. You can also use a multimeter to check the continuity of the cable connection between Omron switches and the PDB board J30, J31, J39 or J40.
6. Press any E-stop switch and check that the message **APL Emergency Stop Switch: On** is reported. Also check that the emergency light lamps are ON.
7. Release the E-stop switch.
8. Repeat the previous two steps by pressing each E-stop switch to confirm that they are all functioning.

5. INITIALIZING THE APL

Ensure all tools and obstructions are removed from the APL and the Magnus VLF device. Initialize the APL by typing:

```
>>init
```

Note that this will initialize both the Magnus VLF and the APL.

One of the following errors may occur:

- **** Suspended: 47606 [MDHAPL:Gantry X position not found]
- **** Suspended: 47605 [MDHAPL:Cannot move Table Y-axis, Gantry detect sensor not in safe state]

For now, these errors can be ignored—type `>>release`. The APL will continue initializing. When the APL initialization is complete, the following is displayed:

```
Magnus VLF APL>> apl

APL Status:
Initialized
Idle
Online
Locked
*** Command Complete
```

During the initialization, there could be a number of problems that arise that prevents the APL from initializing. These problems should be worked through first before continuing on with this document, until a successful init is complete.

If this was an upgrade from an MCU device, type the following command to avoid firmware confusion:

```
>>set mds lastbay 1
```

5.1 Checking the Gantry Lock Alignment

This procedure needs to be done before setting up Gantry X's segposx values!!!

In this procedure you will check the table gantry to picker gantry lock alignment.

1. Use the gantry search command to check the gantry alignment. Type:
   `>>apl gantry search`

Note: This command will not engage the gantry locks at the end of the sequence.

2. Move the table Y into the safe zone for X movements. Type:
   `>>apl table y move 200`

3. Check the alignment of the pins to the holes. Make adjustments to the table X position to ensure they are perfectly aligned. Type:
   `>>apl table x jog <value>` where the value is an estimated distance in millimeters that the table gantry should move so that the pins and holes are perfectly aligned.

4. Adjust the parameter `>>set apl TableGantryJogX` by the same amount of jog required in the previous step.

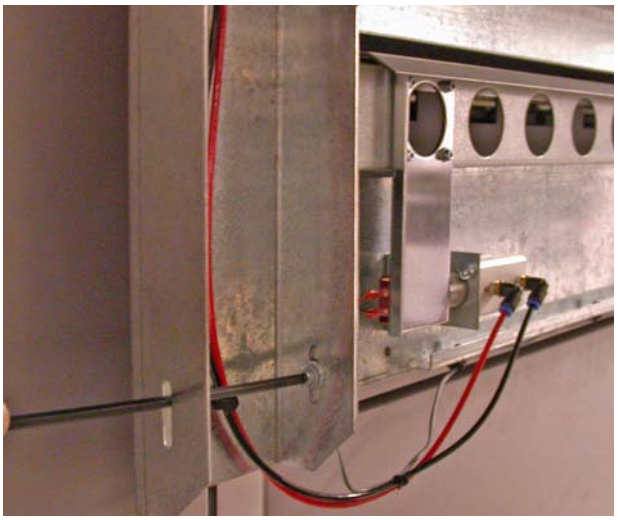
5. In this step you will actuate the gantry locks to engage the gantries. Watch closely for any X motion of either gantry when the locks engage. Type:
   `>> apl gantry lock`

6. If there is a small motion, adjust TableGantryJogX as required to eliminate any movement by repeating steps 1 to 3 until the lock to hole alignment is perfect.

The shutter alignment procedure is the same for both shutters (Pre-Series IV and Series IV). The mechanical adjustment mechanisms are slightly different as follows:

Pre-Series IV: The shutter is secured to the frame with 4 screws in slotted holes. When the screws are loosened, the shutter is free to move in the X and Z directions (see photo on left below).

Series IV: The shutter is secured to the frame with 4 screws via a nut plate. The 2 nuts on the nut plate are secured first to fix the shutter in the X direction (see photo on the right below).





Note: The shutter alignment is easier with two people.

In this procedure you will align the shutter relative to the fetcher on the Magnus VLF device.

1. Move the fetcher home. Type:

   `>>fetcher home`

2. Loosen the shutter mounting screws and nuts.

3. Manually adjust the shutter in the X direction (towards the Magnus VLF device) until it is approximately 5 mm from the fetcher in the home position. The gap can be larger than 5 mm if the end of travel is reached on the adjustment slots, but not less than 5 mm.

4. On the Series IV design, tighten only the nuts to lock-in the X alignment. On the Series III design, lightly tighten the 4 mounting bolts and mark the X alignment position for later reference when adjusting in the Z direction.

5. Move the fetcher to the safe-home position. Type:
```
>>fetcher home
>>fetcher move 50
```

6. Verify that the safe home sensor is TRUE. Type:
```
>>fetcher
```

7. Move the fetcher deck up. Type:
```
>>fetcher up
```

8. Close the APL's shutter (up position). Type:
```
>>apl shutter up
```

9. Manually adjust the height of the shutter so the shutter's top deck is above the fetcher's deck by around 10mm —the APL to Magnus VLF alignment jigs come in handy for this to extend the surface of the shutter. Ensure that the shutter deck is level across the length of the shutter by checking with the jig on both sides of the shutter.

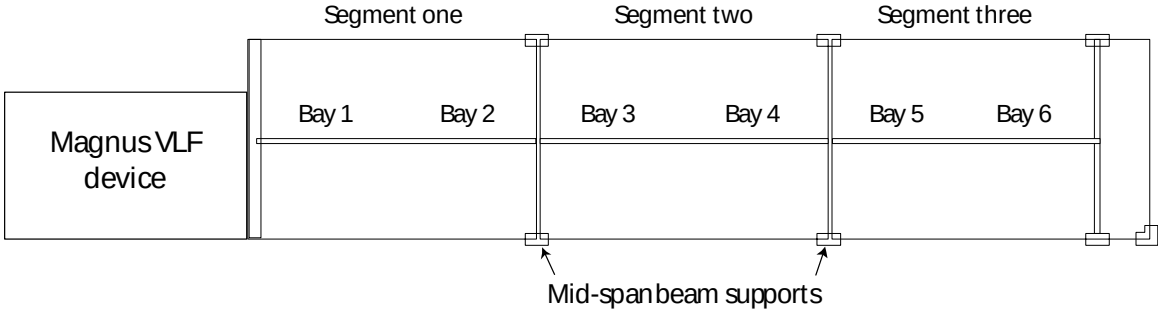


10. Tighten the four shutter mounting screws.

6. CHECKING THE BAY COORDINATES

Each APL segment contains two bays. For example, a three segment APL will have six bays, a two segment APL will have four bays, and a single segment APL has two bays. The bays are numbered sequentially with bay 1 closest to the Magnus VLF device.

In this procedure you will check the position of the picker gantry for each bay.



6.1 Checking the Bay X Coordinates

1. Verify the total number of bays in the APL. Type:

   `>>set apl InstalledBays <# of bays>`

2. Lock the picker gantry to the table gantry. Type:

   `>>apl gantry lock .`

3. Ensure the Picker towers are in the home positions:

   a. X home position. Type `>>apl picker x home`.

   b. Y home position. Type `>>apl picker y home`.

   c. Z home position. Type `>>apl picker z home`.

4. Raise and extend the float bar. Type:

   `>>apl float move 1000` (this will move the float bar to the away position)

   `>>apl float ext`

5. Move to bay 1 location. Type:

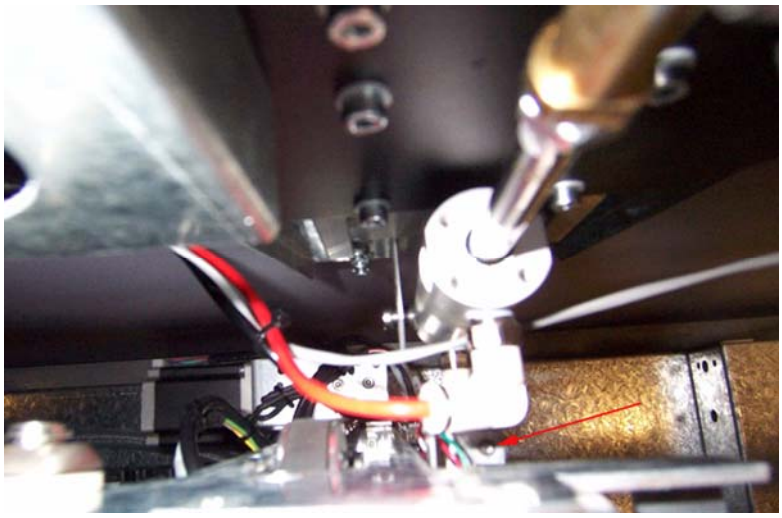
   `>>apl table x move <SegmentPosX value under set bay 1>`

6. Verify the picker gantry coordinates of bay 1:

   a) Verify the clearance between the picker gantry and APL frame. This may be at the gantry drive belt/frame or at the float bar/shutter. Allow approximately 5 mm clearance.



Gantry belt close to frame



Float bar drive belt close to shutter cylinder

b) Jog the picker gantry closer or futher away from the frame as required to get 5mm of clearance.

c) If picker gantry position needs adjustment, type `>>set bay 1 SegmentPosX <value>` where the new value was set in step b).

7. Retract and lower the float bar. Type:

```
>>apl float ret

>>apl float move 0
```

8. Enter the picker gantry position of the last bay (bay 2 for a single segment APL, bay 4 for a two segment APL, and bay 6 for a three segment APL. Move the picker toward the rear of the APL. Type `>>apl picker y jog 1800` .

a. Move the gantries to segment pos x value. Type `>>apl table x move <value>` .



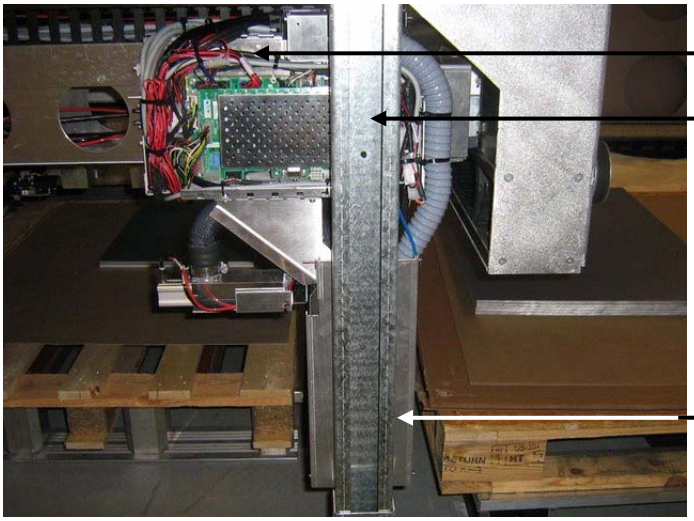
b. Verify the clearance from the picker blower box to the APL power box—it should be around 10 mm. Jog the picker gantry as required to achieve this.

c. If an adjustment was required, update the NVS value.
Type `>>set bay <n> SegmentPosX <value>` where the value was determined in step b.

9. For two and three segment APLs, verify the picker gantry position for bay 2 and bay 3:

a. Move the gantries so that they are located in SegementPosX value for bay 2:
Type `>>apl table x move <value>`.

b. Verify that the picker tower's crash sensor plate is centered on the mid-span beam support between segment one and segment two. For a left eject APL, the picker's right tower will be centered on the beam support for setting up bay 2. If required, jog the picker gantry to achieve this.



c. If an adjustment is required, update the NVS value, type `>>set bay <n> SegmentPosX <value>`, where the value was determined in the previous step.

d. Repeat steps a. to c. for bay 3.

10. For three segment APLs, verify the picker gantry position for bay 4 and bay 5:

a) Move the gantries so that they are located in SegementPosX value for bay 4:
Type `>>apl table x move <value>`.

b) Verify that the picker tower's crash sensor plate is centered on the mid-span beam support between segment one and segment two. For a left eject APL, the picker's right tower will be centered on the beam support for setting up bay 4. If required, jog the picker gantry to achieve this.

c) If an adjustment is required, update the NVS value, type `>>set bay <n> SegmentPosX <value>`, where the value was determined in the previous step.

d) Repeat steps a. to c. for bay 5.

6.2 Checking the Bay Z Coordinates

The APL can automatically estimate the plate count in a stack. In order to do this, the distance to the floor must be measured for each bay location and entered into firmware.

1. Move the picker gantry to the appropriate bay location. Type:

   `>>init`

   `>>apl gantry lock`

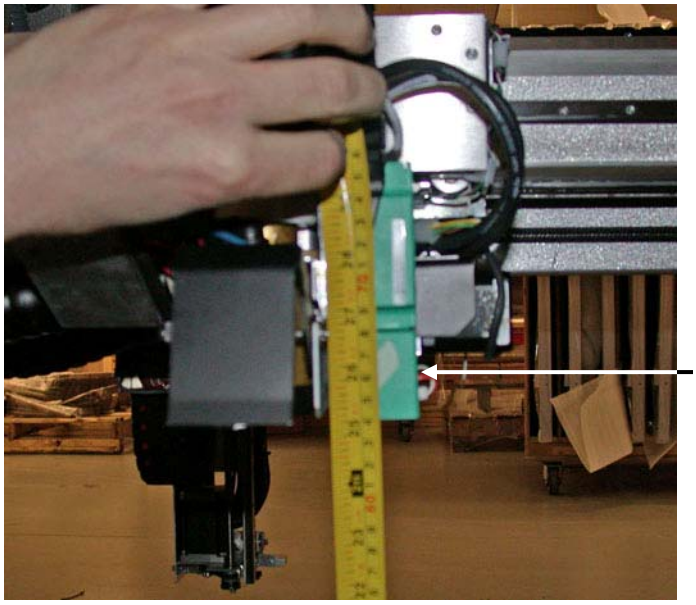
   `>>apl table x move <SegmentPosX Value>` where the SegmentPosX value is the value entered while setting up the Bay X gantry positions for each bay

2. Ensure the pusher is at the Z home position and extend (lower) the pusher vacuum. Type:

   `>>apl pusher Z home`

   `>>apl pusher vac dn`

3. Using a tape measure, measure the distance from the bottom face of the inductive sensor on each picker gantry tower straight down to the floor. Calculate the average of the two readings.



4. Enter the sensor height into firmware. Type:

   `>>set bay <n> SensorHeightZ <value>` where the value is the distance in mm from the previous step.

5. Repeat steps 1 to 4 for all bays.

7. APL TABLE TRANSFER HEIGHT CALIBRATION PROCEDURE

When a plate is transferred from the table to the fetcher, **the height of the plate on the table must be the same as the deck of the APL shutter.** Note the shutter height must first be aligned to the fetcher as described in the previous section.

7.1 Pre Series IV APL's Only

The height of the table is adjusted by an NVS parameter. Here is how to set this parameter:

1. Ensure Shutter height alignment to fetcher is complete.
2. Initialize the APL. Type:

   ```
   >>init
   ```

3. Record the current table height value that is in NVS. Type
   `>>set apl TableTransferPosZ` (for example, this could be 120)
4. Close the shutter. Type
   ```
   >>apl shutter up
   ```
5. In this step you will move the APL table into position for the fetcher transfer. Follow the specific order of commands to avoid the firmware's safety checks at the command line level. Type:

   ```
   >>apl gantry unlock

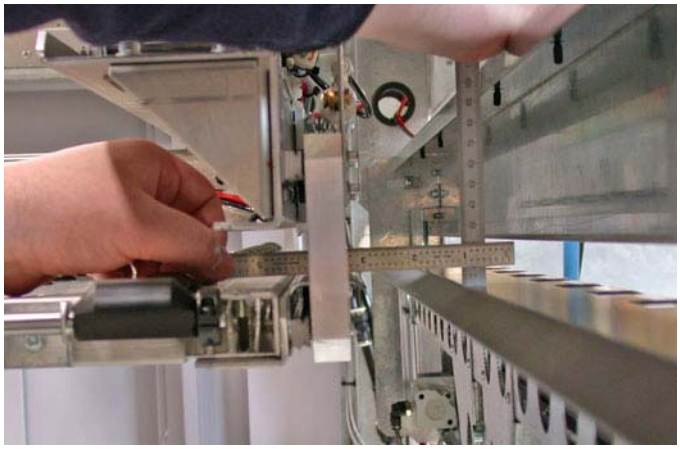
   >>apl table z move <TableTransferPosZ Value>
   ```
   (the value from step 2)

   ```
   >>apl table y move 300

   >>apl table x move 0

   >>apl table dn
   ```

6. Measure the difference in height in mm between the APL table's transfer deck and the shutter's deck. In the photo below a straight edge along the table deck and a steel ruler were used to make the measurement.



If the table height is the same as the shutter height, then no further actions are required. If they are not, continue to the next step (the example above shows that the table is 10 mm higher than the shutter).

7. Adjust the table height as follows:

   a) If the table is higher than the shutter, then **add** the measurement taken in step 5 to the current NVS value recorded in step 2. Using the examples given, that would be 120+10=130.
   If the table is lower, then **subtract** the measurement taken in step 5 from the current NVS value.

   b) Type:

   ```
   >>apl table up

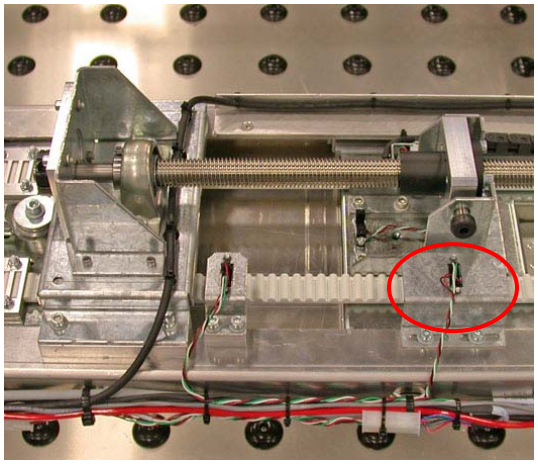
   >>apl table z move <value from step a>

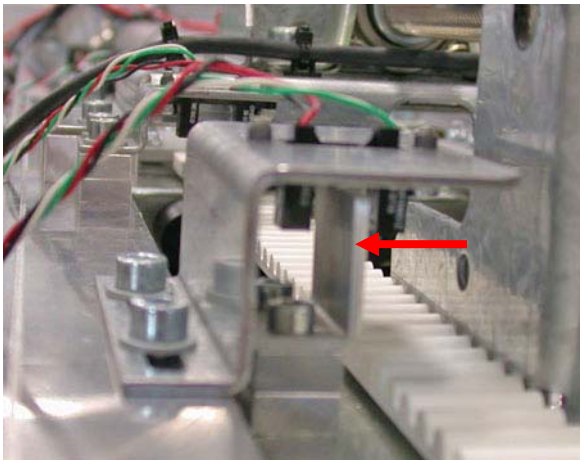
   >>apl table dn
   ```

8. Repeat steps 5&6 as required to fine tune the table height.

9. When the table height is the same as the shutter height, update the NVS parameter with the new value. Type `>>set apl TableTransferPosZ <value>` (this value would be 130 from the examples used).

10. Adjust the table eject height sensor to the middle of the sensor tab by loosening the two screws that secure the sensor bracket and sliding the bracket in the slots provided. Tighten the screws once the adjustment is made.





11. Verify that the eject height sensor is detected by firmware. Type

    `>>apl table` The eject height should be **TRUE**.

7.2 Series IV and Later APL's Only

The height of the table is adjusted by an adjustable hard stop. Here is how to mechanically align this hard stop:

1. Ensure Shutter height alignment to fetcher is complete.

2. Initialize the APL. Type: `>>init`

3. Close the shutter. Type
   `>>apl shutter up`

4. In this step you will move the APL table into position for the fetcher transfer. Follow the specific order of commands to avoid the firmware's safety checks at the command line level. Type:

   `>>apl gantry unlock`

   `>>apl table y move 300`

   `>>apl table x move 0`

   `>>apl table gate open` (note this also raises the table stop)

   `>>apl table dn`

5. Measure the difference in height in mm between the APL table's transfer deck and the shutter's deck. See the photo in the previous section.

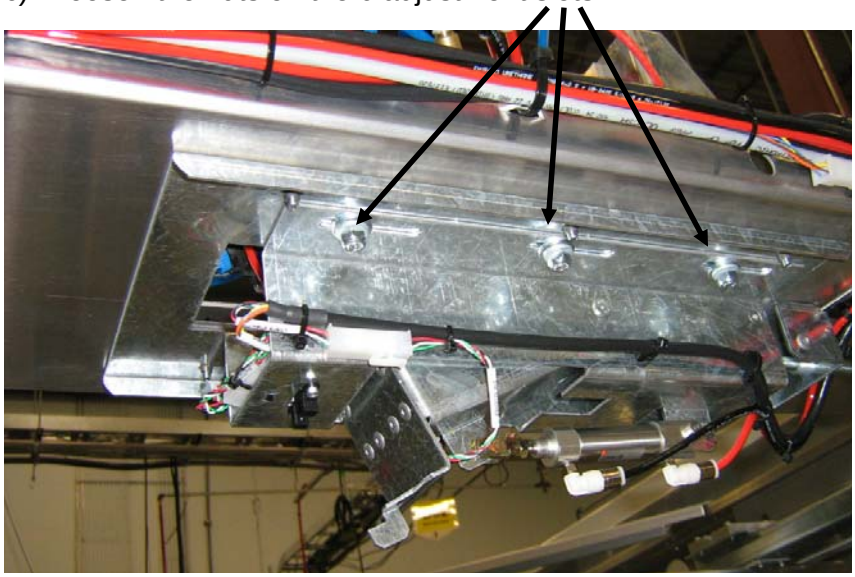
   If the table height is the same as the shutter height, then no further actions are required. If they are not, measure the height difference and continue to the next step (the example in the photo shows that the table is 10 mm higher than the shutter).

6. Adjust the table height as follows:

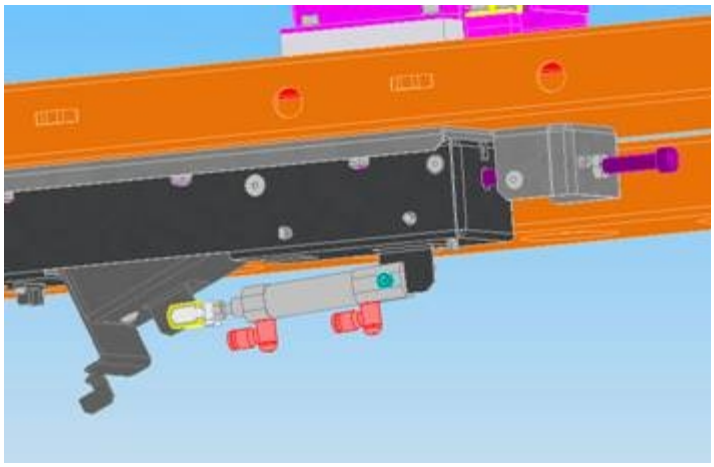
   a) Raise the table, type:
   `>>apl table gate close`

   b) Mark the current position of the Table Z Stop Assembly as a reference.

   c) Loosen the nuts on the 6 adjustment slots.



   d) Use the adjustment screw (shown below) and your reference marks to move the stop by the amount of misalignment measured in step 5. Move the stop towards the big table Z lifting cylinder to raise the Table Transfer position and vice versa. In the example above, the stop should be moved 10mm away from the table Z cylinder.



e) Tighten the nuts on the adjustment slots.

f) Lower the table to verify the adjustment. Type:

```
>>apl table gate open
>>apl table dn
```

7. Repeat steps 5&6 as required to fine tune the table height.

8. ALIGNING THE TABLE SHIFTER WITH THE MAB

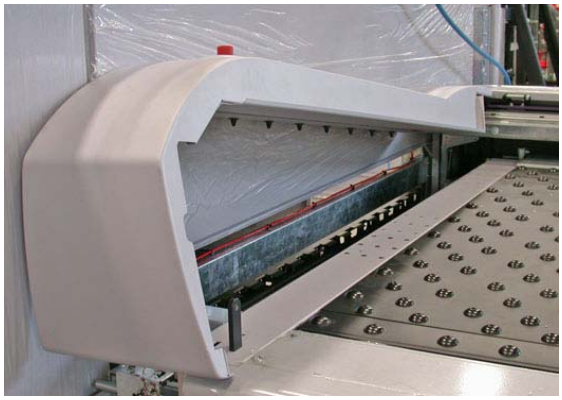
In this procedure you will adjust the table shifter so that it is parallel to the Magnus VLFs MABs. You will need the two special magnetic alignment tools and a large plate.



1. Raise the Magnus VLFs shoulder panel closest to the APL.
2. Move the fetcher out of the way:

```
>>fetcher dn
>>fetcher move 1000
```

3. Remove the two black MAB skin panels (P52 and P53).



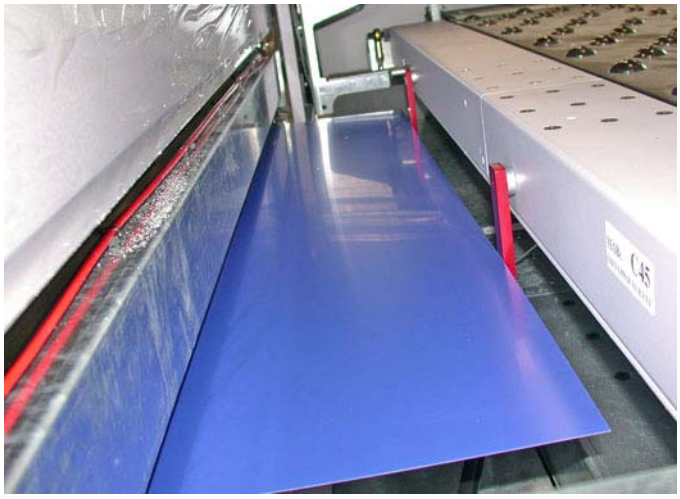
4. Attach the two magnetic alignment tools to the MABs approximately one meter apart and adjacent to the APL shutter opening. The two dowel pins on the tools rest on the bottom MAB with the single dowel pin facing the APL.



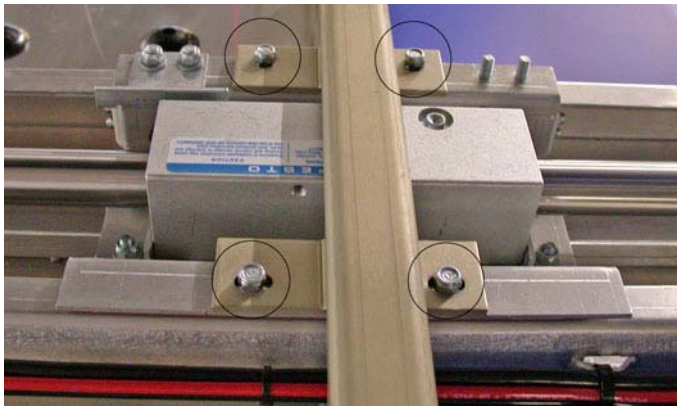
5. Move the APL table to the transfer position. Refer to the previous section on setting the Table Transfer Position for detailed procedure on how to do this.

6. Place a large plate on the APL table and slide it through the shutter opening so that it is tightly up against both alignment jigs.

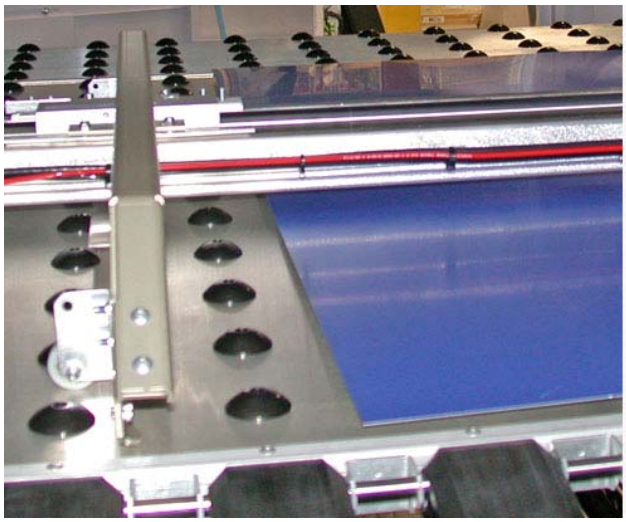
   TIP: Use a piece of foam to help support the plate to avoid it sagging in the area next to the red jigs.

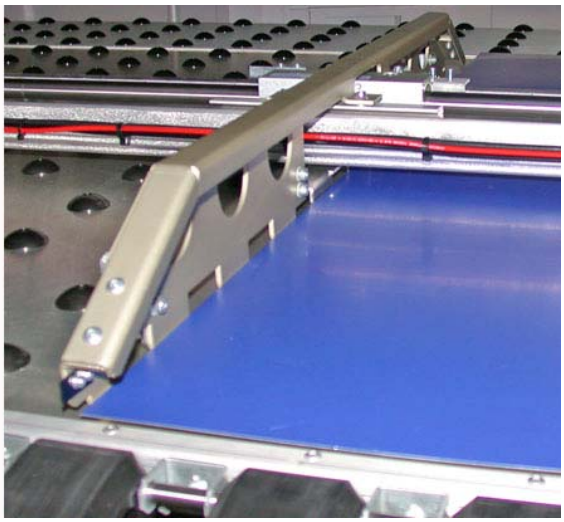


7. Using an 8mm socket, loosen the four M6 nylock nuts that secure the shifter in place. Two of the holes have adjustment slots in the X direction and the other two have adjustment holes in the Y direction.



8. Move the table shifter close to the edge of the plate on the table using the **apl tableshift ext slow/fast** solenoid on the table manifold—manually press the activate button on the solenoid. If the red hose (port B) on this solenoid is not powered, then the hose can be temporarily disconnected so that the shifter can be easily moved.





9. Move the shifter by hand so that the fingers are tightly up against the edge of the plate.

Note: Do not apply too much pressure that will cause the plate to buckle and no longer be square to the alignment jigs.

10. Tighten the four nylock nuts and check that the shifter is still tightly against the plate and the plate is still tightly against the alignment jigs.

11. Move the table shifter away from the plate and remove the plate from the table.

12. Remove the alignment jigs from the MABs, install the MAB skin panels, and secure the Magnus VLFs shoulder panel in place.

9. LOADING THE FIRST PALLET OF PLATES

In this procedure you will specify the 1st coordinates to advance the picker to the park position during system initialization (these are the 'Threading Coordinates').

1. Ensure there are **no plates loaded** in the APL.

2. Enter the following settings into NVS:

```
>>set apl ThreadLeft 0

>>set apl ThreadRight 0

>>set apl ThreadGantry 300
```

3. Open the APL as follows:

```
>>bay all open

>>apl unlock
```

4. Load in a pallet of plates in bay 1 according to the instructions in the *APL Operator's Visual Reference Guide (APL VRG)*.

5. Verify that the pallet sensors are detecting the pallet spacer as follows:

```
>>apl pallet
      Bay  Detected
-------------
 1   TRUE
 2   FALSE
 3   N/A
 4   N/A
 5   N/A
 6   N/A
```

If they are not, it is possible that the stops of the left / right spacers were installed backwards. The angled face on the pallet stop should be facing outwards.

6. Manually enter the dimensions and bay information for the plate:

```
>>set bay 1 MediaMainscan <mscan size>

>>set bay 1 MediaSubscan <sscan size>

>>set bay 1 MediaThickness <thk>

>>set bay 1 MediaIndex <index>

>>set bay 1 PalletHeight <height>  (note, see APL VRG)

>>set bay 1 StaleFlag False
```

7. Close the APL as follows:

```
>>apl lock

>>bay all close
```

8. Measure this first pallet as follows:

```
>>bay 1 measure
```

10. ALIGNING THE PICKER SLIP SHEET / PLATE CONTRAST SENSOR

1. Align the picker to the pick position. To do this, start to load a plate and type abort after the plate is lifted by the pcups, but after the sensor array finishes finding the plate edges:

```
>>load bay 1

>>a       (must be timed correctly)

>>abort clear
```

2. Extend the picker shoes and turn on the picker plate contrast sensors as follows:

```
>>apl shoe ext

>>apl picker
```

3. Check that the red laser from the sensor is hitting the top of the plate stack. You should see three red dots on each side. If not, adjust the pointing of the sensor (see below) to obtain this. Note that the laser is on a timer and will turn off automatically after approximately one minute.

4. Query the sensor reading when shining both on a plate and a slip sheet. Type:

```
>>apl picker

APL Picker Status:
                Left      Right
                ----      -----
SS sensor   :    233        222
```

5. The left and right sensors should be reading within 10 units of each other on the plate measurement. If they are not, adjust the pointing of the laser sensor to achieve this goal (see below).

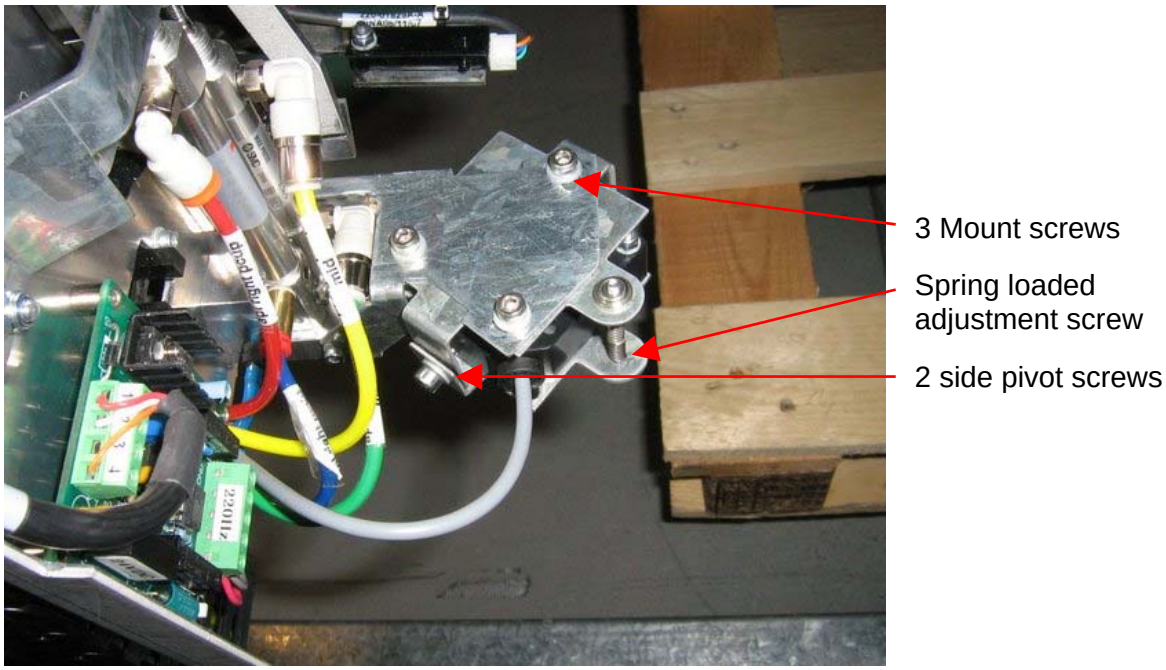
6. Set the NVS threshold by taking the average of the lower of the two slip sheet readings and the higher of the two plate readings for the appropriate media type.
   Threshold = (slipsheet_min + plate_max) / 2
   Type: `>>set mhmedia <n> PlenumSSSensorThresh <value>`

7. Repeat steps 1-6 for all media types.

10.1 Contrast Sensor Mechanical Adjustment

1. Loosen the two side pivot screws to adjust the up/down pointing of the sensor with the spring loaded adjustment screw. The laser should be entering into the mirror at the top end of the mirror.

2. Loosen the three mounting screws to adjust the side-to-side pointing of the sensor. The laser should be pointing towards the wider half of the mirror.



11. FETCHER UPGRADE INTEGRATION PROCEDURE

The new APL fetcher has less travel, so the following parameters must be updated to reflect this:

```
>> set mhauto FetcherAwayParkPos

>> set mhauto FetcherEngineCenterPos
```

There is very little latitude for error for these values for dual plate jobs. Symptom is that the fetcher will not clear the away side plate after dropping it on the load table, and hook it on the fetcher return travel home. There could also be edge detection problems with the camera edge detect if a plate is loaded too close to the home edge of the drum.

`FetcherAwayParkPos` is set to the fetcher position just before it triggers the away sensor. Simple home the fetcher and move it until it triggers the sensor. Give a couple mm's of clearance.

Setting `FetcherEngineCenterPos` requires a plate be centrally loaded onto the drum (on symmetric pins). Note the `gc DrumMidpoint` value and subscan plate size. Do an edge test and make sure the plate's edge is half the subscan size away from the drum midpoint. Adjust `FetcherEngineCenterPos` to force this.

12. SPECIAL SMALL PLATE ALIGNMENT CONSIDERATIONS

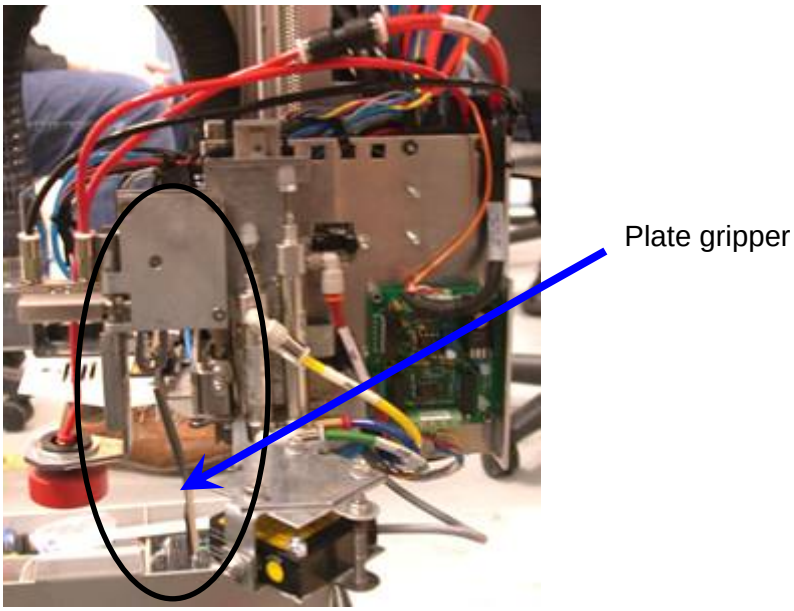
Follow the steps in this section if any plate size is below 750mm in either the main or subscan.

12.1 Plate Gripper Kit (Small Plate Upgrade)

For any plate size with one or both dimensions less than 750mm, the plate gripper kit is required for reliable plate picking. Information on upgrading and setup of the plate grippers is found on the Magnus VLF TechPlanet site.

The plate grippers are located on the pickers and will pinch the plate while it is held up with the P-cups, which prevents small and lightweight plates from sliding off the P-cups, the hardware is shown in the photo below.

Notes: when the plate grippers are installed, they are used for all plate sizes, not just small ones. There is no firmware configuration for this hardware option.



12.2 Disable slip sheet air jets

As mentioned at the beginning of this document, the slip sheet air jets should be turned off for small plates.

>>set mhmedia <n> SeparatorPulseDutyCycle 0

If both small and large plate sizes are being used on the same machine, use two media slots for the same plate so that the pulse can be controlled independently for the two sizes via their respective *mhmedia* parameters. You must use different names for each media—for example **Kodak_Gold_Large** and **Kodak_Gold_Small**.

12.3 Pusher To Table Z Calibration Procedure

This is a new feature to Controlled Release 5.0. When the plate is pushed onto the transfer table, the pusher Z will be adjusted to the height of the transfer table. There are 2 new NVS parameters to adjust the final height of the pusher relative to the table:

```
>>set apl PusherHookToTableOffsetZLeft
>>set apl PusherHookToTableOffsetZRight
```

The objective is to lower the hooks so they are barely below the plate when the transfer to the table is complete. Here is how to set these values:

1. Single step the pusher through the pick sequence (using `>> apl pusher step`) until the plate is pushed onto the transfer table.
2. Note that when single-stepping, the following motion sequence is followed that is normally done concurrently (you must step through the final Z adjustment):
    a. Pusher Y move to table handoff
    b. Pusher Hooks move to table handoff
    c. **Pusher Z move to align to Table**.
3. If the hooks are lifting the plate above it's flat rest position, measure how much the hooks need to be lowered. Measure both Left and Right sides. **TIP:** Manually take the

plate off the hooks so it lays flat on the table and measure the gap between the top of the hooks and the bottom of the plate.

4. Adjust the NVS parameters as required. Increasing the value will lower the Pusher Hooks towards the table.

5. Repeat steps 1-4 as require to verify the adjustment.

Notes on Adjustment Range:

If the Pusher is lowered too much, the Pusher mechanism will contact the plate on the table.

If the Pusher is too high, this is in general not a problem except for small plates. Small plates can be dragged back when the hooks are retracted. Tests show that some plates can be dragged back if the hooks are lifting the plate off the table by as little as 5mm.

13. FINAL TESTING AND TROUBLESHOOTING

Pick a sample of plates (say 5-10) to ensure the APL is working. It is strongly recommended to pick the final plate of a pallet AND the first plate of the tallest pallet that the customer will use.

Generally, the picker and pusher alignments are not required during a field installation. To troubleshoot picking problems, refer to the factory integration document (719-00328A) for detailed alignment procedures. These describe the alignments to set the various parameters located under `set apl`. These procedures include:

- Picker Z and P-cup height alignment,
- Pusher X and Z alignment to picker,
- Pusher hook Y alignment,
- Table transfer Z position alignment,
- Float bar z alignment,
- Plate on table verification alignment,
- Table Transfer Y alignment to shutter (and base machine opening).