

# Biomek<sup>®</sup> 2000 T<sup>3</sup> UPDATE

*A bi-monthly customer bulletin detailing new **Tips**, **Tricks** and **Techniques** to help keep your Biomek 2000 performing to it's fullest potential!*

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Welcome to the first issue of T<sup>3</sup> (T-Cubed) Update, a regular forum of information exchange for users of the Biomek<sup>®</sup> 2000 Laboratory Automation System. Our objective with T<sup>3</sup> is to provide Biomek<sup>®</sup> users with up-to-the-minute information about their systems. Tips, tricks, and techniques is designed to enable users to take full advantage of the many standard and advanced capabilities of the Biomek<sup>®</sup> 2000 system.

Our agenda will cover all aspects of automation with the Biomek<sup>®</sup> 2000, starting with BioWorks software, and extending into more advanced applications involving the use of BioScripts and integration of third-party hardware and software. We will focus our attention on providing solutions to common problems encountered with popular applications of robotics in (1) molecular biology, (2) immunoassays, (3) drug screening, and (4) sample library management. We expect this to be an open forum and welcome all suggestions and inputs from our users.

Please send any suggestions for T<sup>3</sup> to the address listed on the final page of this issue. We want to keep current with your applications to help us direct our topic catalog for the T<sup>3</sup> Update. There is a Biomek<sup>®</sup> 2000 User Questionnaire on the last page for this purpose. Finally, the T<sup>3</sup> Update will have a regular section answering questions you have about your Biomek<sup>®</sup> 2000. For more information regarding the information in this issue of T3, please contact your local Biomek Representative at 1-800-742-2345.

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**Please give us your opinions**

## I. HARDWARE INTEGRATION

The information contained in this section is in abstract form. The objective is to provide a quick look at hardware devices which have been successfully integrated into the Biomek/BioWorks working envelope. There are limitations to the utility and performance of the systems described in this section, we recommend that you contact the manufacturer for any specific information about the capabilities of the systems described here. For detailed information about the integrations you find in this section, please contact your local Beckman Biomek Representative.

- **Bio-Tek EL-404RB 96 well Plate Washer Integrated with the Side Loader**

Plate washing is an integral part of many automated assays. In some immunoassays, plate washing can represent 50% or more of the total assay. Typically, these washing steps are performed on a total plate basis, that is, the assay is configured such that washing takes place simultaneously on all wells of a 96-well microtiter plate. For these assays, plate/sample throughput can be improved by the use of a 96-well plate washing device. The BioTek™ EL-404RB is a 96-well plate washing system which fits within the physical and communication boundaries available in the Biomek®2000 system. The following information relates to the use of this device within the Biomek® 2000 working envelope.



The EL404RB Plate Washer is a 96 well automatic plate washer which has been integrated to the Biomek Side Loader. The Side Loader automatically delivers and retrieves plates from the device utilizing BioScript routines. Communication through one of the serial ports of the Biomek® workstation is utilized within a BioWorks method to automatically start plate washing methods using the “Device Send” function of BioWorks and/or by using the “SE” command of BioScript. Washing methods are pre-programmed into the EL404RB from the front panel. 10 different wash protocols can be programmed and started automatically. Dispense, aspirate, rinse, prime and maintenance routines can also be programmed from the EL404RB front panel and started automatically. The BioWorks “Device Wait” function is used to ensure proper sync with the EL404RB wash cycles.

## II. SOFTWARE INTEGRATION

This section will address the use of BioWorks software and the use third party software with the Biomek<sup>®</sup> 2000 system. The Biomek<sup>®</sup> user interface (BioWorks) is Windows-based and very easy to use. The Biomek<sup>®</sup> software control system enables the use of a cascade of control programs which can “drive” the system to locations within the spacial domain of the hardware. In this cascade, the user can access increasing levels of detail in control, and in programming complexity-literally controlling the motors which locate the function to be performed.

To perform Biomek<sup>®</sup> functions not possible in BioWorks, BioScript mat be used. Most of the software integration work described here will discuss the use of BioScript routines (BioScripts) and Tcl or Tool Command Language. Bioscript is a script driven programming language that directs specific motor-movement in the x,y,z and t axes of the Biomek<sup>®</sup> workstation. Moves can be made in absolute or relative steps from the current location of the system motors.

Tcl is a low-level programming language which can be used to direct the Biomek<sup>®</sup> workstation via BioScript. When using Tcl programs, the Biomek<sup>®</sup> uses a Tcl intepreter (embedded in the Biomek<sup>®</sup> Workstation CPU) to interface with Tcl program files. BioWorks version 1.4 has a built-in intepreter for Tcl version 7.3. By using the BioScript GF (get file) command, Tcl programs are activated within a BioScript routine. A particular advantage of using Tcl is

its' ability to loop function steps (a common action in low-level robotics programming functionality) such that the amount of code necessary to cause an action is minimized.

Since modifying variables (pipetting volumes, source/destination locations) in low-level programming languages like Tcl is not user-friendly, often times a better user interface is desirable. For this reason, many of the “software integrations” that we report will involve the use of a Visual Basic shell. By using a graphical user interface written in Visual Basic, the user can more easily modify variables within custom methods using Tcl programs. The Visual Basic “front page” links to the Tcl program, and finally, to BioScript and BioWorks. In this fashion, a user can use Visual Basic to edit variables for a custom maneuver, which then updates a Tcl file which is accessed by using the GF command in BioScript, which in turn is a method step within a standard BioWorks method.

For further information about the use of Tcl, BioScript and Visual Basic shells with BioWorks, please contact your local Biomek Representative.

**One word of warning** When using BioScript and Tcl, the user has complete control of the workstation motors. BioWorks collision avoidance cannot shield you from crashing the system when using BioScript. So be careful!

### III. LABWARE INTEGRATION

- **Creating New Labware in Bioworks**

Labware editing is one of the powerful tools of BioWorks software. It allows the user to bring new pieces of labware into the labware catalog of BioWorks, and store the labware in a database. In many cases, it is difficult to obtain precise dimensions and volumes for new labware. There are a few pointers to consider when installing new labware into BioWorks. Bob Coppock of the Biomek® Development Team has captured some of these essential considerations into a draft document. If you would like to receive a copy of this draft, please contact your local Biomek Representative.

- **0.65 ml Microfuge adapters**

0.65 ml Microcentrifuge tubes can now be used in a Beckman 24-Place Rack. We now have .65 ml adapters that fit into the 11mm white inserts. The 0.65 ml Microcentrifuge tubes can then be fit into the outer adapter. These adapters have been

tested with QuickSeal™ 0.65 Polypropylene Microcentrifuge tubes. For information on how to order these adapters, contact your local Biomek® Representative. Following is the Edit Labware screen for these tubes.

#### **Low tech cooling of reservoirs**

Some of our customers have come up with “low tech” innovations to keep reagents cool inside reservoirs on the worksurface.

- Fill the drip tray on a side module with dry ice. A reservoir placed on this side module will be kept cool until the dry ice evaporates. When the dry ice evaporates, there should not be any residue in the drip tray.
- Fill half of a quarter reservoir (divided by length) with water and freeze it. Use it in the same reservoir holder that contains a modular reservoir with the reagent you wish to keep cool.

Zone	Volume (µl)	Height (mm)
Zone 1	500.00	18.00
Zone 2	145.00	10.00
Zone 3	5.00	

## IV. ANNOUNCEMENTS

### **Bioworks Version 1.4**

Following is a list of the features added and the problems fixed in Release 1.4. This software release is a mandatory upgrade for all Biomek® 2000 systems.

1. Fixed communication lockup problems which did not allow user to STOP or QUIT method, even though communications status light was still green.
2. Workstation now completes a disconnection properly.
3. Plate Reader alignment at the left side position on the worksurface is maintained through a power-down.
4. Fixed bug - No longer have to press Stop then Continue to start a SL method.
5. GF in BioScript now waits for file download.
6. Fixed various collision and grip problems with Plate Readers and shelves.
7. Adjusted the height of tip ejection to avoid missing the tip disposal chute.
8. Adjusted the operation of liquid level sensing with small volumes in a large container, with prewet enabled.
9. Fixed workstation server log overflow problem.
10. Fixed problem with workstation running out of memory after 800 runs.
11. Updated Tcl version for BioScript to include For/Next loops, variables, and read/write files. Also fixed various TCL bugs.
12. Fixed problem which caused the computer to hang if Stop and Quit commands were issued during a Side Loader move.
13. The default backup volume of the Wash 1 tool was changed from 0.1  $\mu$ l to 5  $\mu$ l to eliminate leaks while dispensing liquid.
14. A message was added to the power down exception screen to remind the operator to remove the tool.
15. Fixed problem which caused the Side Loader to perform erratically after alignment at A6.
16. Fixed problem which caused the software to lock up during a dry run with liquid level sensing and no tip change (with dirty tip).
17. Fixed problem where the tool parameters were not set properly when a logical tool change happened between transfer functions. (If consecutive transfer functions used the same physical tool but different logical tool definitions, all transfers used the tool definition in the first transfer.)
18. The Plate Reader files naming scheme has been changed to eliminate the problem with files being overwritten after a power down.
19. Added the option to specify an Export Path to make exporting a method to diskette easier.
20. Fixed problem which occurred when using pattern/repeat same labware without including well A1 in the pattern. (When repeating the source plate, the tool visited A1 first, then went to wells in the pattern.)
21. Fixed problem with the P200L tool which occurred when running a dry run with the transfer function set for liquid level sensing.
22. The P1000 tip no longer drags across 12x75 tubes.

23. Fixed the error message displayed when attempting to copy a lab book to a diskette when the drive is empty.
24. The BioScript CV command now waits properly for a response from the Cavro unit.
25. Exception messages from multiple tasks are now allowed.
26. Destination delays for dispensing with the To Deliver option are now handled properly.
27. System performs properly after alignment at position 3D1. (Previously an error message was displayed erroneously.)
28. Fixed a problem where the Side Loader moved reservoirs at high speed if the first quarter location of the reservoir holder was not occupied.
29. Side Loader arm positioning was adjusted (1 millimeter) to alleviate collisions which occurred when moving a plate from the Plate Reader (at 1F) to the worksurface.
30. Fixed error which occurred when repeat dispense was combined with replicates, which caused the liquid level tool to aspirate air.
31. The number of repeat dispenses cannot exceed the replicate count.
32. Disabled the Cancel Button in Position Calibration in BioWorks Diagnostics. This avoids the problem of homing the machine with the warning light off when position calibration is complete.

- <http://www.beckman.com>

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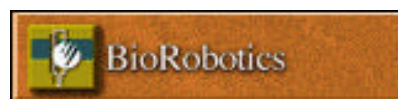
The product information section includes information on all Beckman products.



Protein application topic areas include: ***purification, purity checking, sequencing, quantitation, binding, molecular interactions, heterogeneity, and activity.***



DNA application topic areas include: ***synthesis, analysis, sequencing and mapping, and amplification.***



The Biorobotics section is still under construction at the time of this printing.

## V. FREQUENTLY ASKED QUESTIONS (FAQ)

This section addresses the most commonly asked questions we receive from users of the Biomek® 2000 system. These questions come into our product and technical support areas via our 800-number hotlines. We will continue to select the most pertinent (common) issues from these areas and address them here.

### **Q. Can I run more than one plate and use the same tip box?**

A. Yes. Choose the reset tip rack icon from the function palette and click on the tip rack you wish to re-use. Set the tip # to zero.

### **Q. I would like specification sheets for CVs and accuracy for my tools.**

A. We are very close to completion of official CV specifications for our certification service. This service requires CV specifications for all tools on the system. This service will be available in the third quarter 1996.

### **Q. How can I get to the bottom of a deep well titer plate and pipette volumes less than 5 uL?**

A. BioWorks software version 1.3c added the ability to use P250 tips with the P20 and MP20 tools and work in volumes down to 2 uL.

### **Q. How do I calibrate my tools?**

A. There is a calibration worksheet included in the ship kit of the Biomek® 2000. Use this sheet to correctly calibrate your tools.

### **Q. If a method crashes, can I start the method where it left off?**

A. Yes. To do this you must:

1. Edit the method by retaining the current initial configuration.
2. Delete the lines that have been completed.
3. Give the method a new name. (If the method crashed in the middle of a plate, the new method will begin at the beginning of the plate.)

### **Q. Can I cut and paste more than one method line at a time?**

A. No. BioWorks does not currently allow for this.

### **Q. Can I perform multiple aspirations prior to a single dispense?**

A. Yes, but not with BioWorks. This application requires the use of BioScript and Tcl. Beckman presented a poster at the recent ICAR meeting describing this capability with the Biomek®. If you would like a copy of this poster, please contact your local Biomek representative.

