Reformatting Procedures Employing a Quad-Z 215 with Disposable Tips

Application Note 202

Joan Stevens, PhD and Toni Hofhine (Gilson, Inc.)

Introduction

The Quad-Z 215 Liquid Handler with a 444 QuadDilutor is a cartesian robot with four independent shafts with variable horizontal spacing for access to a wide variety of sample vessels. With dimensions of 91.4 cm x 61.0 cm x 60.8 cm, it is a viable liquid handler for fume hoods or containment chambers. Although the Quad-Z 215 has proven its capabilities to transfer liquids throughout a wide range of volumes with fixed probes (non-disposable), it is imperative that the option be available to adapt the Quad-Z 215 with disposable tips.

Many current applications require the use of disposable tips (e.g., PCR preparation and protein crystallography). It is advantageous to have a single system that accommodates both disposable tips and non-disposable probes for the wide range of assays and experiments that are common to research groups. Therefore, the Quad-Z 215 with Disposable Tips is ideal for those researchers that need an automated liquid handler, but don't have the room or the need for a larger workstation.

Materials & Methods

Instruments and Accessories

Gilson Quad-Z 215 Liquid Handler, equipped with: 175-mm Z-arm and four independent shafts with interchangeable tips to accommodate 10-µL and 200-µL disposable tips (universal tip holder "A" accommodates 10-µL and 200-µL Gilson Diamond® Tips; tip holder "B" accommodates 10-µL Gilson Diamond Tips)

Gilson 444 QuadDilutor, equipped with: four independent syringe drives and 250-µL syringes

Gilson 735 Sampler Software, version 5.2

Intel® Pentium® 4 Processor; 2 GHz, 512 MB RAM, 80 GB hard drive

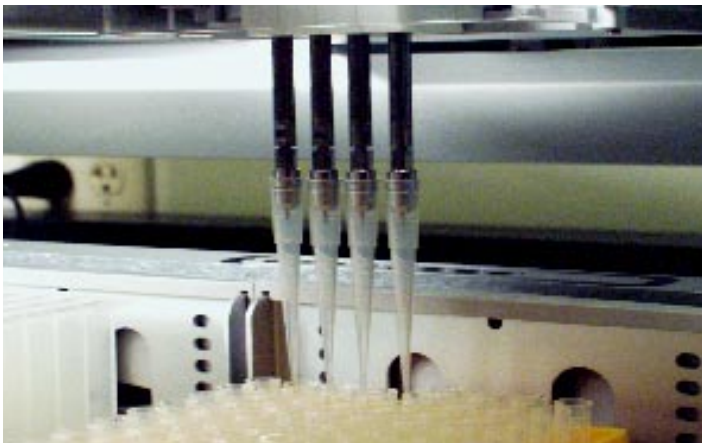


Photo 1: Quad-Z 215 with 200-µL Disposable Tips

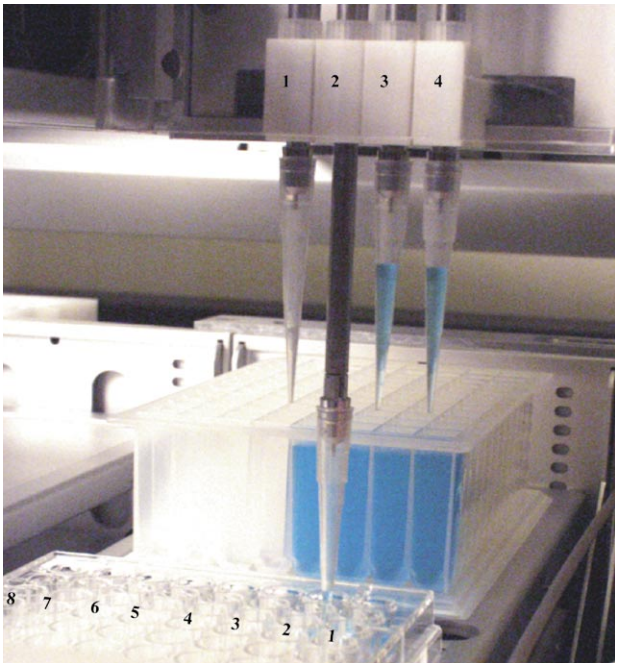


Photo 2: Quad-Z 215 with Disposable Tips Dispensing into a 96-well Plate

Numbering patterns within a zone are defined by the user. The system will complete the task in the most efficient mode. The default is a 1-to-1 correspondence between the tips and the numbering pattern within a zone, unless a random-to-random transfer is chosen.

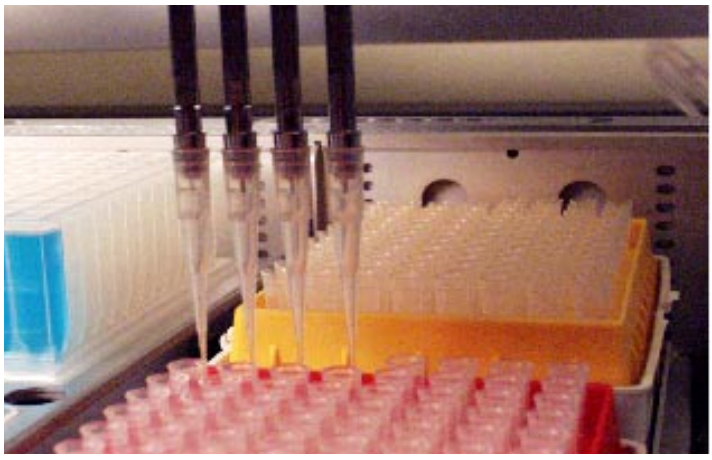


Photo 3: Quad-Z 215 with 10-µL Disposable Tips

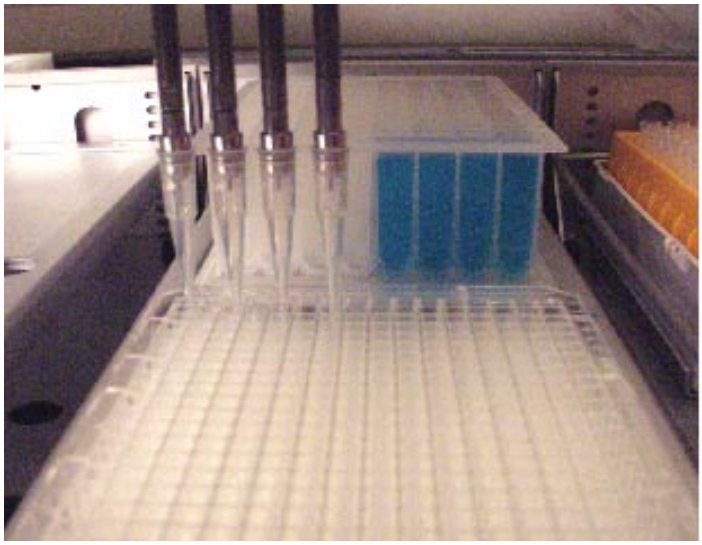


Photo 4: Dispensing with the Quad-Z 215

The Quad-Z 215 is shown dispensing with 10-µL disposable tips into a 384-well microplate. The time to dispense 5 µL into each 384 well without a tip change was 23 minutes.

System Controller

The Quad-Z 215 with Disposable Tips is controlled via 735 Sampler Software. 735 is a user-friendly, drag-and-drop software package that allows for modifications in the method, racks, and trays on the fly. A simulation mode is available, which allows the user to review the method prior to its actual running so that adjustments can be made, if necessary. Customization of many aspects of the software is available to accommodate unique plates, racks, vials, and bottles on the instrument bed. This also includes the actions or tasks of the instrument.

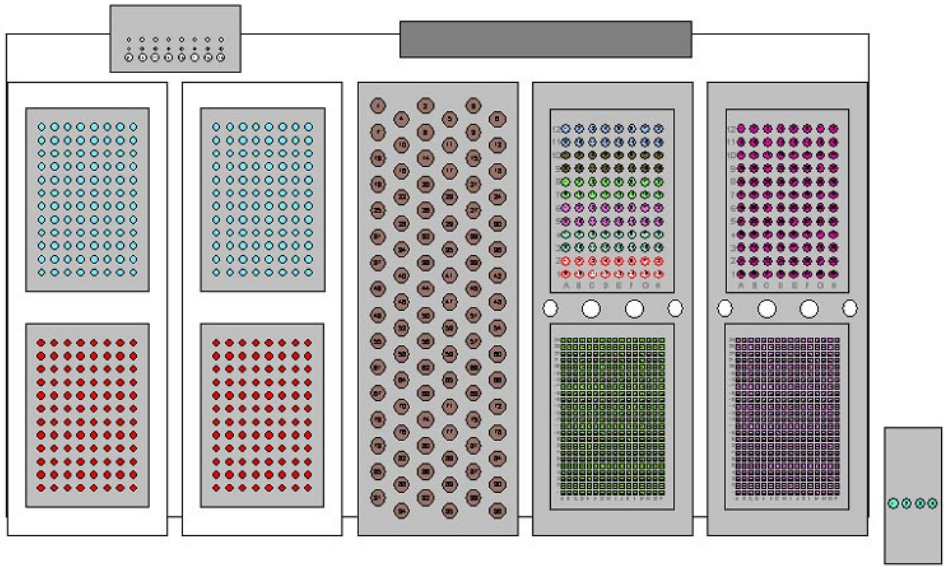
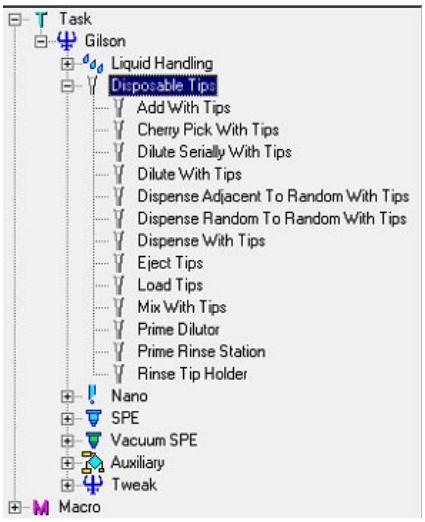
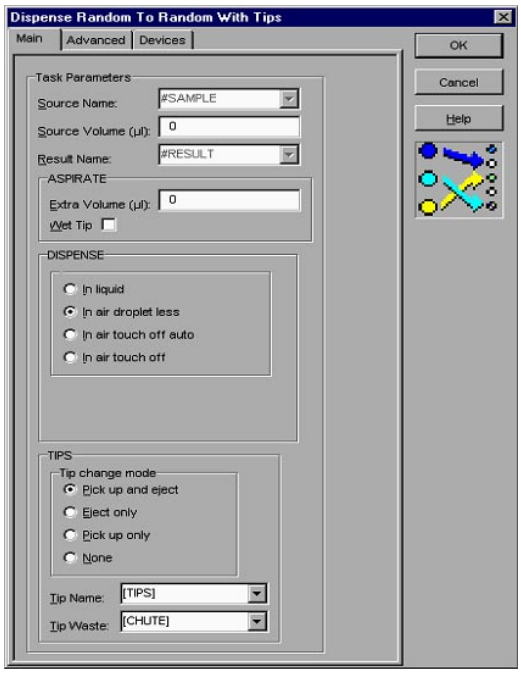


Figure 1: 735 Tray File for the Quad-Z 215 with Disposable Tips

The bed of the Quad-Z 215 with Disposable Tips can hold up to 5 different racks. Custom racks can also be included on the bed. Color-coded zones indicate multiple zones within a given plate or rack.





Figures 2 & 3: 735 Tasks for the Quad-Z 215 with Disposable Tips

Tasks for the Quad-Z 215 with Disposable Tips can be chosen from a drop-down menu, then dragged and dropped into a method. Variables can be used for volumes and zone areas. The open task window in figure 2 is an example of the options that are available per task. Each task can be customized for a given assay.

Results

Results for the Quad-Z 215 with Disposable Tips are shown in Tables 1–3. All dispenses were made into dry plates. Data in Table 1 were achieved using tip holder B, data in Tables 2 & 3 were achieved using tip holder A.

Photo 5: Tip Holder Styles for the Quad-Z 215 with Disposable Tips

Universal tip holder "A" accepts 10-µL and 200-µL tips; tip holder "B" accepts 10-µL tips and is ideal for volumes less than 10 µL.

Table 1: Quad-Z 215 with B-DL10 Disposable Tips (10 µL) Results

Visible Detection Method: no wet tip/in liquid/no extra volume (data represents the average of 3 microplates)

	Volume (µL)		
	1	5	10
CV (%)	6.1	1.8	1.6
STD (%)	0.8	1.0	1.6
Accuracy (%)	110	98	95

Table 2: Quad-Z 215 with A-D200 Disposable Tips (200 µL) Results

Visible Detection Method: wet tip/in liquid/2 µL extra volume (data represents the average of 2 microplates)

	Volume (µL)		
	10	20	50
CV (%)	3.4	3.2	1.9
STD (%)	0.4	0.6	1.0
Accuracy (%)	87	95	97

Table 3: Quad-Z 215 with A-D200 Disposable Tips (200 µL) Results

Visible Detection Method: no wet tip/in liquid/no extra volume (data represents the average of 2 microplates)

	Volume (µL)		
	100	150	200
CV (%)	1.0	0.8	0.7
STD (%)	1.0	1.3	1.4
Accuracy (%)	101	100	99

Summary of Results

The volumetric accuracy and precision across the volume ranges tested (1–200 µL) offers researchers the consistency required in all assays. The use of common plates (96- and 384-well) and tubes (e.g., microcentrifuge, scintillation, HPLC vials), along with the option of designing a custom rack, offers a high degree of versatility to accommodate variations in procedures.

Conclusion

The Quad-Z 215 with Disposable Tips is a versatile liquid handler that is operational with fixed probes as well as the disposable tip probes. This feature allows the researcher to minimize the cost and waste associated with disposable tips if the assay does not require their use. The time required to change between fixed probes and disposable tips takes less than 5 minutes. Automating liquid transfer steps in an assay offers a higher degree of precision and accuracy than manual pipetting, since human error is removed and a log file is generated in order to track all steps, volumes, timing sequences, and errors, if they occur.

735 Sampler Software that controls the Quad-Z 215 with Disposable Tips is a user-friendly interface that allows the methods to be optimized for the assay in regards to aspiration/dispensing rates, tip options (changing tips between steps, maintaining the same tip throughout the step) and modes for dispensing (in liquid, air touch off, in air droplet). Another advantage of the software is the use of variables for sample areas and rates. This allows a method to be implemented as a general protocol and modified on the fly if the viscosity of the liquids varies.

The smaller footprint of the Quad-Z 215 with Disposable Tips allows the instrument to be placed in most fume hoods while still offering robust automated liquid handling capabilities.

Gilson, Inc. World Headquarters
3000 W. Beltline Hwy., P.O. Box 620027, Middleton, WI 53562-0027 USA
Telephone: (1) 800-445-7661 or (1) 608-836-1551• Fax: (1) 608-831-4451

Gilson S.A.S.
19, avenue des Entrepreneurs, BP 145, F-95400 VILLIERS LE BEL France
Telephone: (33-1) 34 29 50 00 • Fax: (33-1) 34 29 50 20

GILSON® SOLUTIONS AT WORK FOR YOU
www.gilson.com
sales@gilson.com, service@gilson.com, training@gilson.com