Forensic Biology Section

Operation of the Maxwell RSC48 extraction robot

1. Scope

1.1. The Maxwell Rapid Sample Concentrator 48 (Maxwell RSC 48) is an automated DNA purification instrument for a variety of sample types. The Maxwell RSC 48 Instrument starts with manually pre-treated and lysed samples and binds the nucleic acids to paramagnetic particles as the primary separation principle. Up to 48 samples can be prepared in a single run that takes 22 minutes to complete.

1.2. After samples are pre-treated with an extraction buffer master mix and lysis buffer, the automated purification Maxwell RSC 48 purifies the pre-treated extracts by:

- Binding any nucleic acids to paramagnetic particles which are then transferred by magnetic rods.
- The bound nucleic acids are transferred through a series of washes to remove cellular debris.
- The purified nucleic acids are eluted into 0.5 ml tubes in 50 ul volumes (or up to 250 ul).

1.3. A Tablet PC attached on top of the Maxwell RSC 48 acts as the instrument's interface, recording the sample identifiers, controls the methods used, and creates reports on sample tracking and run data. A bar code reader can select methods to run as well as record kit lot numbers. Reports can be printed and exported to a USB drive for transfer to a network drive for archival storage.

2. Safety:

2.1. Use alcohol to clean up any spills. DO NOT use bleach (bleach may react with Thioglycerol).

2.2. Do not discard liquid waste down sink drains. Transfer any liquid waste to a designated collection bottle in the Extraction Lab for chemical waste disposal.

3. Reagents

- Casework Extraction Kit [Cat. # DC6745] (Promega)
- Maxwell FSC DNA IQ Casework Kit [Cat. # AS1550] (Promega)
- Casework Spin Baskets [Cat. # AS8101] (Promega)
- Casework Microfuge Tubes [Cat. # AS8201] (Promega)

4. Instrumentation

- Maxwell Rapid Sample Concentrator 48 (Maxwell RSC 48) (Promega)
- Windows Tablet (Promega)

5. Quality Assurance

5.1. A UV sanitization procedure is run when the instrument is turned on, before each run, and when the deck trays are stored in the instrument after a run.

5.2. The deck trays and the inside surfaces of the instrument should be cleaned with kimwipes wetted with alcohol (do not use bleach).

5.3. A vendor will perform regular maintenance on the Maxwell and tablet during the contracted annual preventative maintenance service. If the annual preventative maintenance cannot be performed within 18 months of the previous maintenance, extracting and profiling the NIST SRM 2391d Component D and accompanying reagent blanks can serve as the annual performance check (expected yield of DNA from samples, appropriate profile from Component D, and clean reagent blanks should all be obtained).

6. Procedural Notes

6.1. Running known reference samples and forensic unknowns within the same run is not permitted, even if they are on separate deck trays in the same run. Extraction of known references and unknown samples must be run on separate runs (separated by time).

6.2. Batches of samples from multiple cases may be run on the same run, separated by accompanying reagent blanks.

7. Preparing a Sample Run

7.1. Turn on power to Maxwell instrument (on right side of instrument) and tablet (on top left of tablet).

7.2. Double tap the "**Maxwell RSC 48**" icon on the desktop. The Maxwell will run a 1-minute self-test.

7.3. A prompt to run a 5-minute UV sanitization will appear. Press "**Start**" and a 5-minute countdown will appear in the corner (if canceled, the instrument will prompt again when a method is chosen).

7.4. Press the large "**START**" button. A list of methods appears with "DNA IQ Casework" at the top.

7.5. **Scan the barcode** on the side of the Maxwell FSC DNA IQ Casework box's label to choose the method and automatically enter the Catalog #, Lot #, and Expiration Date of the kit into the run log.

7.6. Press the "**Proceed**" button and the 'Cartridge Setup' screen will appear.

7.7. Choose the "**Front**" or "**Back**" deck tray button.

7.8. Press the cartridge's tall **Rectangle** to select a position, then press that cartridge's **Number** to open the name editor. Type in the Case # and Item # of the sample for the cartridge in that deck tray position.

7.9. After all the samples have been typed in, press the "**Proceed**" button and the Maxwell door will open and present the deck trays.

8. When the Run is Complete

8.1. Press the "**Open Door**" button, close each Elution tube's cap, remove the deck trays from the Maxwell instrument, and transfer the Elution tubes containing the DNA extracts to storage racks.

8.2. A '**Report**' view with information from the run should be saved to a USB and copied to the "Maxwell Runs" folder on the H-Drive (H:\Crimelab\DNA\MAXWELL Runs).

8.3. Remove and discard the cartridges and plungers from the deck trays, wipe the surfaces inside the instrument and surface of the decks with alcohol (not bleach), and place the deck trays back into the Maxwell instrument.

8.4. The Maxwell instrument will automatically perform a UV cleaning cycle after the door closes.

9. Using USB Flash Drives

9.1. Do not insert or remove a USB flash drive while a method is running. Insert a USB flash drive before running the method and remove it when the method is finished.

9.2. If a USB flash drive is not detected after a few seconds or if you encounter issues with the USB flash drive, shut down and restart the tablet and the instrument, or try a different brand of USB flash drive.

9.3. If the tablet controller becomes unresponsive after inserting a USB flash drive, shut down and restart the tablet and the instrument.

10. Errors and Aborted Runs

10.1. If a method is aborted by the user, the 'Protocol Running' screen will indicate that the method has been aborted. After a method is aborted, the Current Step will be listed as Aborted by user. After aborting the method, press the "**Open-Door**" button. The Vision System will determine whether plungers have been unloaded successfully, and if not, will attempt to unload them. Otherwise, the 'Clean Up' screen will be displayed.

10.2. The 'Clean Up' screen requests the user check if plungers are still attached to either the front or back plunger bar. If all the plungers are off the plunger bars, remove the deck trays from the instrument and touch the "**Skip Clean Up**" button and the extraction report will be displayed.

10.3. If any of the plungers are still on either plunger bar, perform the following steps to remove the plungers:

10.3.1. Remove any cartridges containing ejected plungers from the deck trays.

10.3.2. Reinsert the deck trays with the cartridges that were missing plungers.

10.3.3. Touch the "**Start Clean Up**" button to eject the remaining plungers.

10.4. If the plungers are successfully removed, press the "**Open Door**" button, and remove the deck trays.

10.5. If there are plungers still on the plunger bars, contact Promega Technical Services for assistance.

11. Instrument and Computer Maintenance

11.1. A vendor will perform annual preventative maintenance service on the Maxwell RSC48.

11.2. The Maxwell will be performance checked annually and after any repairs or service.

11.3. If the computer reacts slowly or gives error messages, restart the tablet and/or the Maxwell.

12. Cleaning the Maxwell RSC48

12.1. Wipe up any spills immediately using kimwipes or a cloth dampened with 70% ethanol.

12.2. If plungers are omitted during a run, the Maxwell may go through a run with the magnetic rods unprotected. If this happens, the magnetic rod assemblies need to be cleaned. See the "Cleaning the Hardware" section in the manufacturer's Instrument Operating Manual for directions to clean the magnetic rods.

13. Performance Check Test

13.1. Extract at least one sample (e.g., known bloodstain punch) and one reagent blank in the Maxwell, and then quantitate (preferably in triplicate) the amount of DNA in the extracts.

13.2. The reagent blank should be free of detectable DNA and the sample should produce the amount of DNA consistent with previous extractions of that type of sample.

13.3. If the reagent blank is not free of detectable DNA or the sample does not produce the expected amount of DNA, repeat the test. If the test fails repeatedly, investigate possible sources of error in the lab. Place a service request if necessary.

14. References

14.1. Maxwell RSC 48 Instrument Operating Manual.