INSTRUCTION MANUAL

EVA-MT-02-01
EVOM™ Auto Automated TEER Measurement System

Serial No._____

CONTENTS

ABOUT THIS MANUAL

The following symbols are used in this guide:

This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.

This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.

Fig. 1—The EVOM™ Auto with 96 high throughput screening (HTS) electrode array simplifies transepithelial electrical resistance (TEER) measurement in 96-well HTS plates from MatTek, Corning, and Millipore multiwell plates.

The EVOM™ Auto automates measurements of TEER in epithelial or endothelial monolayers cultured on 96-well high throughput screening (HTS) plates utilizing our innovative EVOM technology, qualitatively measuring cell monolayer health and quantitatively measuring cellular confluence by reaching an increase or a plateau in tissue resistance.

Automated measurement of tissue resistance in cell culture microplates provides the advantages of speed and precision, minimizes the chances of contamination, and ensures the rapid availability of measured resistance data. EVOM™ Auto applies a 12.5 Hz square wave current with switching polarity, which mitigates the chances of charging the sample and nullifies the chances of measurement technique having any adverse effects on the sample. Therefore, it is considered non-invasive measurement. EVOM™ Auto is designed for the non-destructive, high throughput screening of epithelial monolayer confluence and barrier function studies in cell cultures.

INTRODUCTION

The EVOM™ Auto automates TEER measurements. The instrument is controlled through a web browser, and the measurements are stored in the instrument and downloaded to your computer through the web browser. At present, the instrument supports MatTek , Corning, and Millipore 96 well plates. EVOM™ Auto is controlled wirelessly via Wi-Fi connectivity using an iPad (included with the system) or any other device with Wi-Fi connectivity.

Features

Features	Advantages	Benefits
Electrodes available for 96-well HTS plates	Measure 96-wells, a column at a time	Save time by automating your process and move through a plate quickly
Automate your measurements	Streamline your workflow	Minimize human errors
Three rinse locations	You may rinse your electrodes multiple times during a measuring sequence	Take control of your protocol and define the sequence you need and minimize the chance of cross-contamination
Crash protection	System automatically detects a misalignment and pauses measurements to prevent equipment damage	Minimize electrode damage
Auto-detection of electrode head	System automatically detects your electrode and configures its position for your plate	Hardware setup is easy and requires no configuration
Intuitive touchscreen user interface	Programming your sequences is simple with the informative application, allowing you to save programs and protocols	Easy-to-navigate system saves time when configuring sequences or loading saved sequences
Confirm or create a custom plate profile in Expert software mode	You can adjust the programmed coordinates	With complete control of the system, you can fine tune the programming as desired
Store all your data or export to Excel	You can analyze your data in a manner suitable to your workflow	Flexibility to manage your data with time and date stamps and saved information about protocols or parameters used to collect datasets

Notes and Warnings:

⚠ **CAUTION:** Never set anything (especially liquids) on top of the autosampler.

⊘ **CAUTION:** When you move or relocate the instrument, remove the front cover/lid, which can fall off. For example, you may move the system in and out of a cell culture hood. Always remove the EVOM™ Auto's front cover anytime the system is lifted and moved from one location in the lab to another, and reinstall the cover after the system has been placed at a new location.

TIP: Before you begin experimenting, verify the time zone setting is set correctly on your iPad control tablet. For instructions, visit the *support.apple.com page*.

Parts List

After unpacking, verify that there is no visible damage to the equipment. Verify that all items are included:

(1) Autosampler* with plate alignment option for MatTek, Corning or Millipore plates

(1) 96 HTS Electrode Array

(1) iPad Generation 9 Control Tablet

(1) Interface Unit

(1) Interface Unit Cable

(1) Power Supply Unit

(2) Wi-Fi Adaptor

(3) Plate Alignment Tools (for MatTek, Corning 96 and Millipore)

(1) Instruction Manual is available online at *www.wpiinc.com/manuals.*

* The autosampler is adjusted for MatTek, Corning or Millipore plate by WPI, as requested by the end user. The system may be adjusted to use with other plate types in the Expert mode by users. (Refer to the Install Guide for instructions.)

Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 38 of this manual. Please contact WPI Customer Service if any parts are missing at (941) 371-1003 or wpirms@wpiinc.com.

Returns: Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 38 of this manual.

INSTRUMENT DESCRIPTION

EVOM™ Auto System

Fig. 2—The EVOM™ Auto System, includes the iPad, the autosampler, the Interface Unit and the Power Supply (not shown).

The EVOM™ Auto consists of these major components:

- **Autosampler** – The robot contains the electrodes, a 3-compartment rinse stations, and a well plate area. The autosampler may be placed inside an incubator for long term studies, if desired. It may also be used inside a cell culture laminar hood.

- **Interface Unit** – This unit connects through a cable to the autosampler. This unit is a Wi-Fi access point to which the tablet connects to interface with the instrument.

- **Power Supply** – The power supply provides power to the autosampler and the interface unit. The cable plugs into the interface unit power supply port and a standard wall outlet.

- **iPad** – The tablet with Wi-Fi capabilities runs a web browser to communicate with the system.

- **Wi-Fi Adapter** – The Wi-Fi adapter plugs into one of the four USB ports on the right side of the interface unit. It has a range of at least 7 m (25 ft.), and it allows the iPad to communicate with the interface unit.
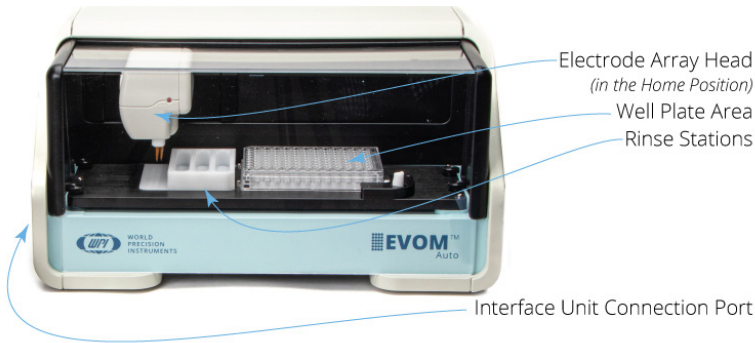
Autosampler

Fig. 3—The autosampler takes the TEER measurements of the HTS well plate.

Here are the primary components of the autosampler.

Electrode Array Head – The electrode array rests in the Home position (shown in Fig. 3), just to the right of the rinse stations. The LED on the electrode array will:
- Flash green when good measurements are being made.
- Be a steady red on power up. This shows the unit has power but is not yet in communication with the interface unit.
- Blink red when a bad measurement is made. (See "Resistance Value Display" on page 7.)
- Be a steady blue when it is in communication with the interface unit.

Well Plate Area – The HTS well plates are positioned in the well plate area.

Rinse Stations – Three rinse stations are located on the left side of the autosampler. These may be used for stabilizing, cleaning or chloridizing.

Interface Unit Connection Port – One end of the autosampler cable connects here and the other end connects to the interface unit. The autosampler power and communications travel through this cable.

Looking at the autosampler measurement plate from the top, you can see the:
- 4 Base Positioning Knobs used when you need to reposition the well plate when you are changing plate manufacturers
- Rinse Station Pocket where the rinse station slides into place
- 4 Well Plate Pins used for positioning the well plate precisely
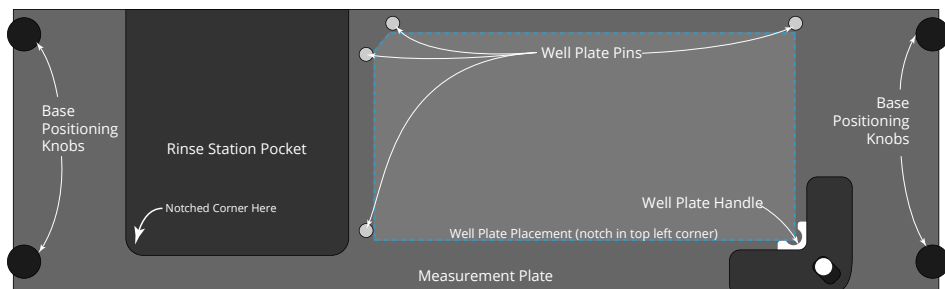- Spring loaded Well Plate Handle used to hold the well plate in place.

Fig. 4—Top view of the measurement plate on the autosampler
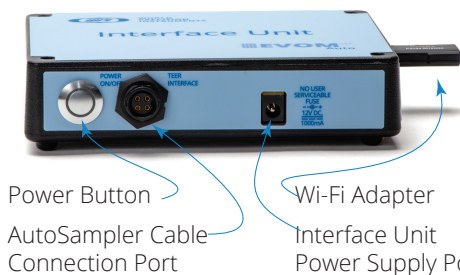
Interface Unit

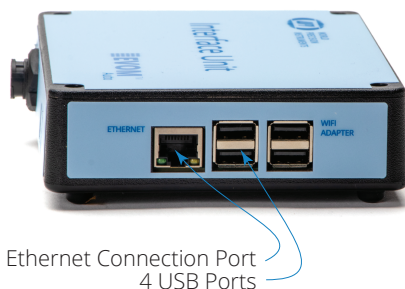*Fig. 5—(Left) Front view of the interface unit.*
Fig. 6—(Right) Side view of the interface unit.

Power Button – Press the power button to turn on the interface unit and the autosampler. When it is powered on, a blue ring illuminates the button.

Autosampler Cable –This cable plugs into the autosampler cable connector on the interface unit and the interface unit connection port on the left side of the autosampler.

Interface Unit Power Supply Port – Plug the power supply cable into this port.

Ethernet Connection Port – This port may be used to connect to your local area network through a standard ethernet cable. Using this option requires interfacing with your local network and observing all your IT policies.

USB Ports (4) – Use one of these ports to connect the Wi-Fi adapter.

Software

The EVOM™ Auto software runs in a web browser, and is not tied to any particular operating system or device. An pre-configured iPad is provided with the system.
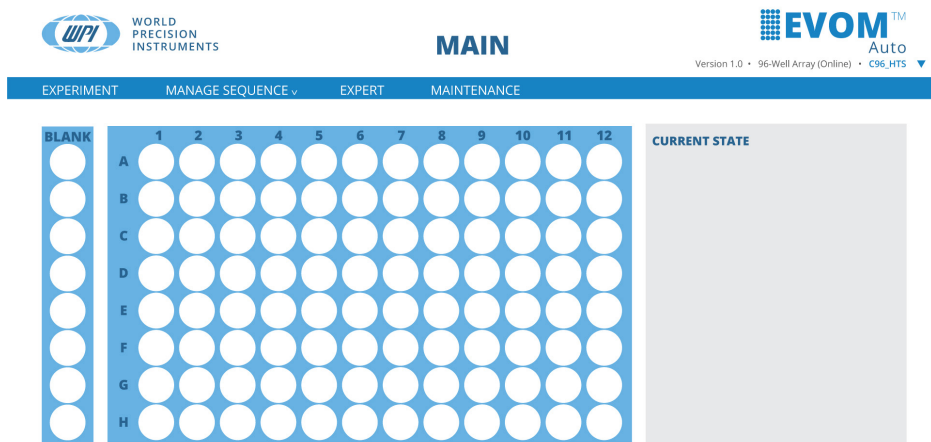
Fig. 7—The Main screen gives you access to all the main menu items and an overview of the selected plate.

Resistance Value Display

The resistance values will always be displayed in ohms. There are three possible outcomes when displaying a measurement:

- Resistance values are within the set range.
  Example: 78568 = 78.568 KOhms

- Resistance values are higher than the selected range. This is considered an Overflow measurement and displays as OVF in the file and on screen.

- Resistance values are bad measurements and are displayed as a series of four dashes (————). This indicates that a proper current could not be injected to accomplish a measurement. This is the case when there is no solution, or insufficient levels of fluid in the well being measured.

Emergency Stop

On any window where the electrode array can move, you can access the *Emergency Stop* button. It is the red stop icon located in the bottom right corner of the window. 🛑
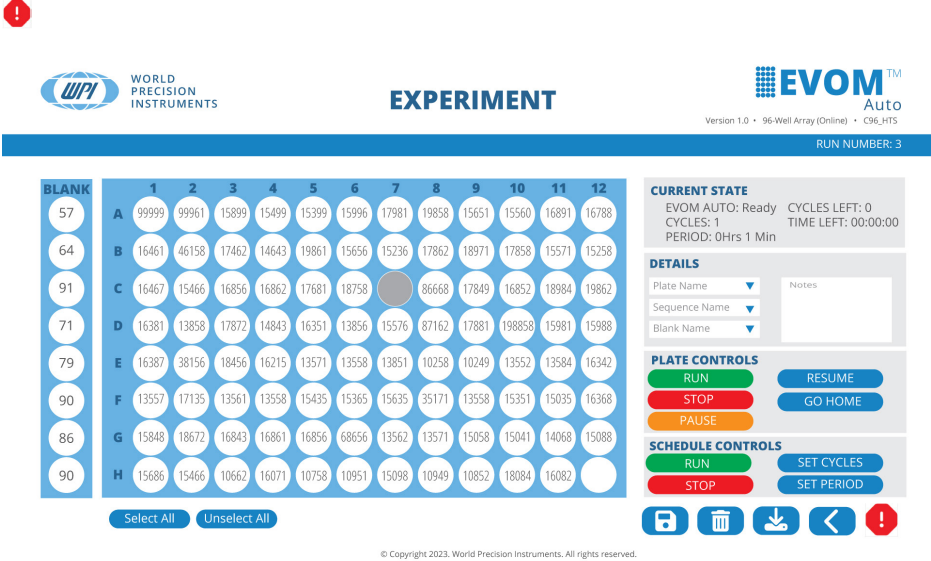
Fig. 8—The emergency stop button is located in the bottom right corner of any window where the electrode array can move.

Press this button 🛑 to disable the autosampler motors and stop movement immediately. The only valid option after this is *Go Home*. The autosampler needs to find the home position again to regain the reference to all movement. When you press the button, a message appears. Click the *Go Home* button to return to the home position.

Fig. 9—After pressing the emergency stop button, the message appears.

SETUP

Refer to the Install Guide for the hardware setup instructions.

1. Once all the components are properly connected, press the *Power* button on the interface unit to turn on the system. The blue ring around the button illuminates.

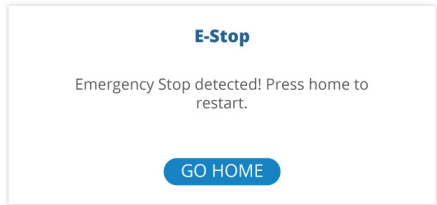2. Allow the system to boot up. On the iPad, navigate to the Setting area and select WiFi. Select your EVOM system when it appears as an available network on the list of Wi-Fi networks. (This may take up to 5 minutes). The network will be named **EVOM_AUTO_X** where **X** is unique to the system (serial number). The password is **rems2rems2**.

3. If you are using the provided iPad tablet, open the Safari browser and navigate to *https://192.168.54.1:5000*.

    NOTE: If you are using more than one EVOM™ Auto simultaneously, you may need to go to the Wi-Fi settings and select the appropriate device.

Fig. 10—Safari icon located on the iPad's desktop.

    NOTE: You may use a computer browser to access the software. Once you are connected, open your browser and enter the URL *192.168.54.1:5000*.

    TIP: Create an icon on your iPad home screen so you can easily connect to your system. Refer to the EVOM™ Auto Install Guide for instructions.

4. The Initializing window displays (Fig. 11) showing the progress. The window briefly displays a Machine Ready message when the initialization is complete (Fig. 12). Then, the *Main* window appears (Fig. 13).
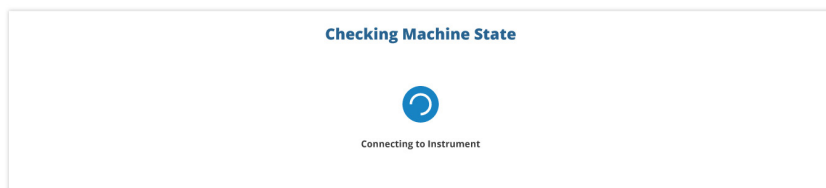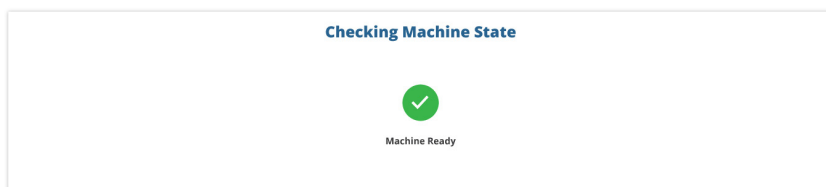

Fig. 11—Initialization screen.

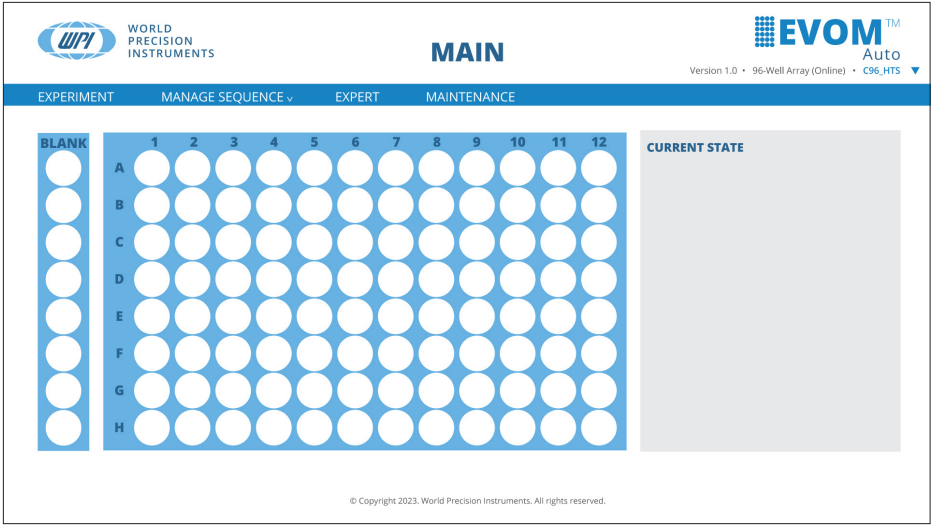*Fig. 12—Machine ready message displays briefly.*

Fig. 13—Home screen.

OPERATING INSTRUCTIONS

After your system is set up and configured, you may use the browser on the iPad to control the autosampler.

It is important to note that the Plate Name ties the elements together in the EVOM™ Auto software. The measurement options and date are attached to the Plate Name. Sequences are attached to a plate to define the measurement options and parameters. For example, parameters include number of rinses, each well measurement time, etc. Sequences may be used on multiple plates.

Full Screen Mode

The software is easier to operate when it runs in full screen mode. On the iPad, place your finger on the title bar at the top of the screen, and slide it up to minimize the title bar. To view the title bar again, just tap on the frame at the top of the screen.

TIP: On a Windows compatible browser, simply tap on the *Main* headline in the center of the header at the top of the page to enter full screen mode. To exit full screen mode, press the *Main* headline again.

TIP: Pressing the WPI logo or the EVOM logo in the header will take you to the Main window.

TIP: Avoid using the browser forward and back buttons to navigate the web page. Use the icons on the bottom right of the various screens. This ensures that the web page and the instrument are always synchronized.

Re-initializing the Instrument

If it becomes necessary to re-initialize the instrument because it becomes non-responsive, close the active web page and use the bookmark to navigate to the initial web page. This will re-establish communications with the instrument and re-initialize it. If relaunching the software does not reestablish proper connectivity between controlling device and the autosampler, turn OFF the power button of the interface unit, and power it ON again by pressing the power button.

The autosampler will finish its run and store the data for the plate it was reading, even if the connection between the web browser and the autosampler was lost. If you relaunch the software web browser, it will not be able to re-establish the connection until the previous plate reading finishes. Allow the last plate or experiment to finish. Then, launch the software to establish the connection again.

Selecting a Plate Brand

The electrode array is configured to support 96-well plates. Three different brands of plates are supported:

- **MT96_HTC** – MatTek 96 Well Plate
- **C96_HTC** – Corning 96 Well Plate
- **M96_HTC** – Millipore 96 Well Plate

To select the desired brand, click on the brand name under the EVOM™ Auto logo in the upper right corner of the Main window (Fig. 14).

NOTE: On the *Expert* window, you may also select the brand from the displayed drop-down list.

Fig. 14—Click on the brand in the upper right corner under the EVOM™ Auto logo to change the plate type.

The brand updates in the upper right corner of the browser window. Selecting a brand loads the geographical coordinates for the specific plate in use.

Online Status Definition and Use

The online status is displayed next to the electrode array type in the header under the EVOM™ Auto logo. The system automatically displays the head type. This field is not editable (Fig. 15). The system can only use the autosampler and collect data when it is in the *Online* state.

Fig. 15—The online/offline state of the system displays next to the electrode array type in the header on the right side of the window.

Creating a Plate File and Setting up Measurements

When the system starts, the *Home* window displays.
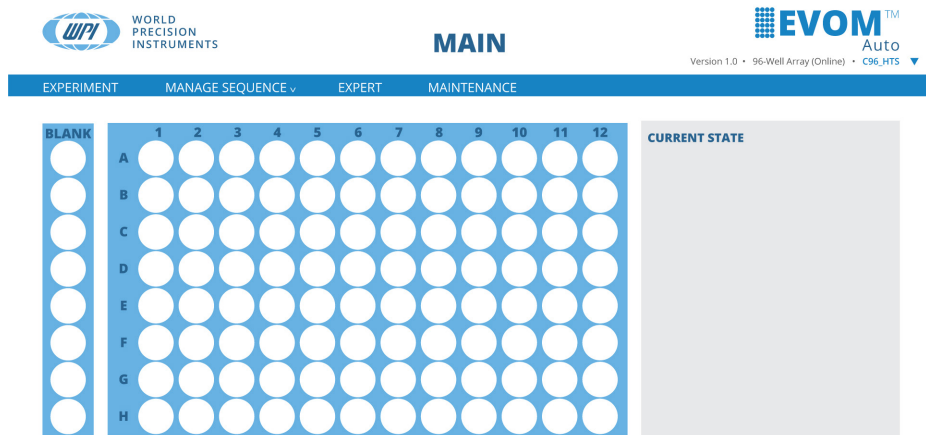
Fig. 16—The Main Window appears.

1. To create a measurement sequence, select the *Manage Sequence* menu. A list of the existing sequences displays (Fig. 17), and you may open and edit any existing sequence or select *New Sequence* to create a new one.
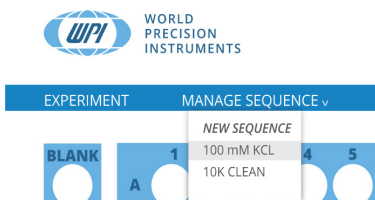
Fig. 17—The Manage Sequence menu lists the existing sequences.

If you select *New Sequence*, a popup allows you to name the sequence (Fig. 18). Enter a name and press *Save* to continue or *Cancel* to return to the main window without saving. The *Sequence* window appears (Fig. 19). The new sequence name is displayed on top of the window.

Fig. 18—Use this popup to name your sequence.

Fig. 19—The Sequence window lets you define a sequence.

2. You may choose to display the measured resistance values or the TEER measurement. TEER is a calculated value based on the surface area of the well and the measured resistance. Select the *Mode* menu. Options include *Resistance and TEER*.
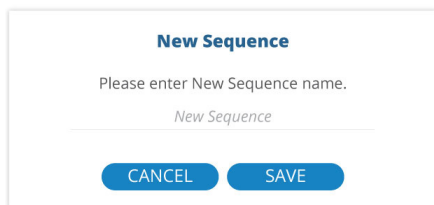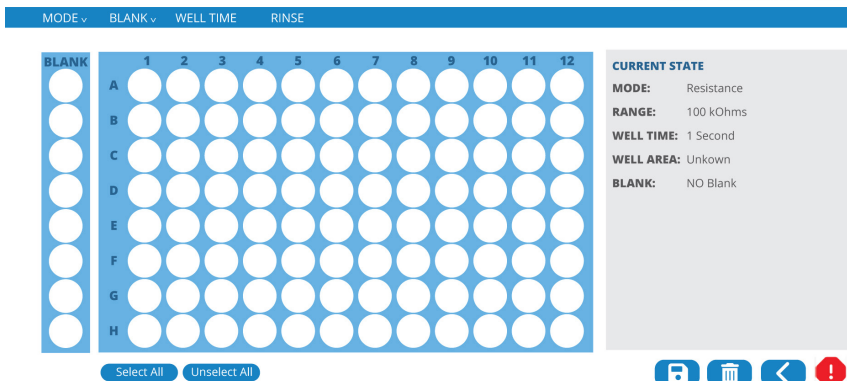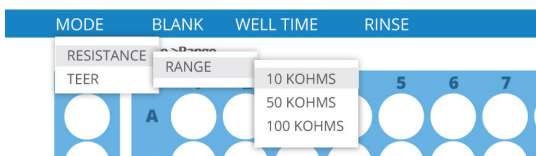

Fig. 20—The mode menu lets you select your options.

3. When you select the *Mode>Resistance>Range*, you can choose the resistance range for making measurements. Options include *10K Ohms*, *50K Ohms* and *100K Ohms*. The *Current State* area on the right side of the window updates accordingly.

   When you select *Mode>TEER*, you may choose the resistance range and the well area. The well area defines the surface area of a well on your plate. You may select the default surface area of the well or manually enter the value.

4. Select your blank option. This option measures the resistance of the first column (Wells A1, B1, C1... H1), and this value is used as a baseline for each row. Each value on the *Blank Value* table measures the resistance of the specific electrode pair used to measure each column on a well containing only buffer or media. (See the column highlighted in blue in Fig. 21.) These values (Value 1 ... Value 8) are subtracted from the measurements on the corresponding row (Red Rectangles) to obtain the change from the baseline well (the well with no cell growth).
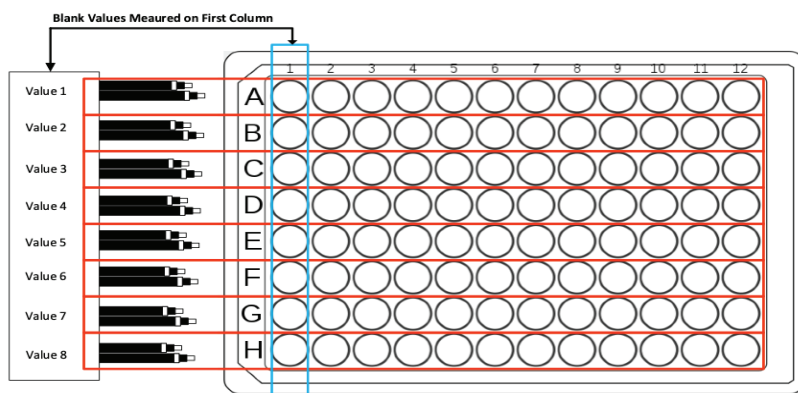
Fig. 21—The values of the blanks are measured to determine the baseline resistance without any cells.

To start the blank setup, select the *Blank* menu and choose *Load Blank*, and then *New Blank* (Fig. 22) to create a blank baseline data file. A popup asks for a name for your new blank file or data set (Fig. 23).

NOTE: You may select previously created blank data sets, which will load previously measured values for the first column.

Fig. 22—The blank menu lets you create a new blank or load a previous set of blanks.

Fig. 23—Enter the name of your new blank data set.

6. Enter a name and press *Save*, or press *Cancel* to abort the action. After the sequence is saved, the container is created with a default value of zero shown. The blank name is updated on the *Current State* area.

7. Load a well plate with media or buffer in the first column of wells and place it in the HTS Well Plate area on the autosampler.

8. To measure the blanks and load that information into the blank data set, select the *Blank* menu and choose *Populate Blank*. A message appears indicating that

the EVOM™ Auto is about to measure the resistance values of the first column and that a well plate with the desired level of buffer or media solution must be placed in the well plate area to be measured (Fig. 24). Press *Continue* to begin or *Cancel* to abort the action. A message displays briefly at the bottom of the screen to indicate the population of the blank will begin.

Populate Blank

The selected blank will be populated from Column 1. Make sure a well plate with buffer only is loaded.
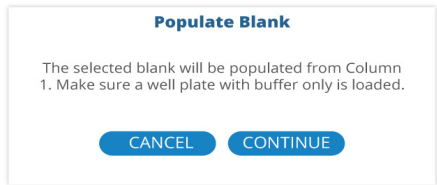
CANCEL   CONTINUE

Fig. 24—An informational message appears to make sure you have positioned your well plate on the autosampler and filled the first column of wells with media.

The autosampler moves the electrode array to Column 1 and measures all eight values consecutively. The values are shown in the *Blank* area on the window as they are populated.

9. After the measurement is completed, a message appears (Fig. 25). Press *OK* to complete the sequence. You may re-sample the blanks as many times as desired, now or in the future, by loading this data set and running the *Populate Blank* option again.

Populate Blank

Populating of blank completed. Do you want to save the collected data?

209,222,292,215,282,175,287,276

CANCEL   CONTINUE
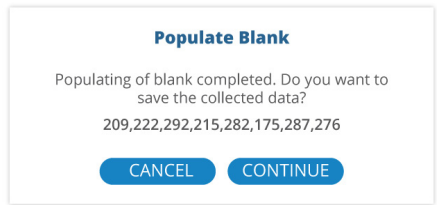
Fig. 25—The message indicates that the blank measurements have completed.

10. Setup the well time by selecting the *Well Time* menu. The well time is the number of seconds the electrodes are held immersed in a well before measurements are taken. The *Well Time* popup appears (Fig. 26). Enter the desired time in seconds and press *Save*. The updated value displays in the Current State area of the window.

Well Time

—   1 Second   +

CANCEL   SAVE
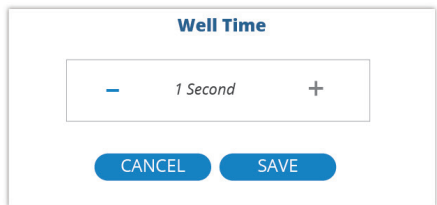
Fig. 26—Set the desired amount of time that the electrodes will be immersed in a well before taking measurements.

11. The three rinse stations may be used for rinsing, disinfecting, stabilizing or any other function desired. Configure the rinse schedule by selecting *Rinse* from the menu. The *Rinse Time* window appears (Fig. 27). You may set the rinse time and the wait time in each rinse station using the toggle controls on each field. Three toggle buttons in the *Rinse Options* section on the right side of the window let you set when the rinse and wait parameters are implemented. You may choose any combination of these options:
   - Between measurements
   - At the beginning of a sequence
   - At the end of a sequence.

   NOTE: If none of the check boxes are selected, measurement will be taken with no rinsing operations.

Fig. 27—The Rinse Time window lets you configure the rinse schedule.

   For example, the following rinse schedule will run as shown in Fig. 29.

Fig. 28—This is an example of a rinse schedule.
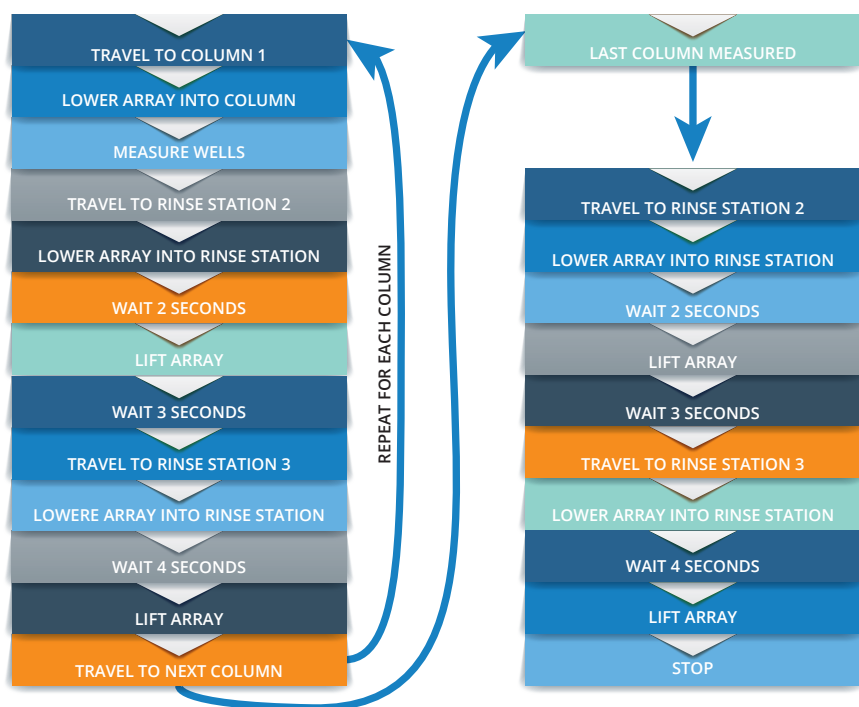
Fig. 29—This is the sequence of events that happens based on the example program above.

12. After the schedule is set in the *Rinse Time* window, press *Save* to save the changes, and then return to the *Sequence* window. Press *Cancel* to abort without saving the changes.

13. Press the *Save* icon ⬛ in the bottom right corner of the *Sequence* window to save the sequence. A brief message displays indicating the sequence was saved.

   Now that we have defined the sequence, we can use it in a plate. Press the *Back*

   button ◀ to return to the *Main* window and select the *Experiment* menu to begin making measurements.

Running an Experiment

After you have defined a sequence, you can begin running an experiment. The *Experiment* window shows a representation of the plate on the left side of the window. On the right side of the window, you see these areas:
   • *Current State* region shows the status of the autosampler and remaining time. It also shows the schedule settings.

- *Details* area lets you set your plate name, choose a sequence, select your blank and make notes.
- *Plate Controls/Schedule Controls* areas have all the buttons for controlling an experiment or scheduling an experiment.
- *System Controls* area has the buttons to manage the data files and the emergency shut off for the autosampler.
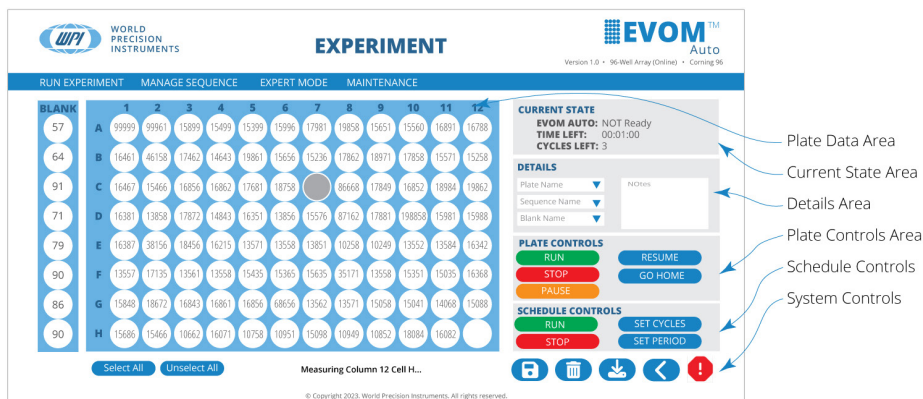
Fig. 30—The experiment window has several important areas.

The buttons in the *Plate Controls* Area function as follows:

Run – Starts the data acquisition sequence.

Stop – Finishes the data collection on the present column and lifts the electrode array out of the well plate. The data acquisition is halted. The data can be saved, or the sequence may be restarted.

Pause – Finishes the data collection on the active column and lifts the electrode array out of the well plate. Continue the data acquisition run by pressing the *Resume* button.

Resume – Restarts the data collection at the point it left off when you pressed the *Pause* button.

Go Home – This places the electrode array in the home position away from the well plate and rinse stations. This option is only available after pressing the Stop button.

The buttons in the *Schedule Controls* area function as follows:

Run – The *green* button starts the first scan. The time and cycle counters become active, counting down one by one until they reach zero, when the measurement stops. Every time a scan finishes, the data is saved, and the plate run number increments. When the scheduled operations are not being used, the counters are displayed in grey. When active, the buttons are green.

Stop – The *red* button stops the scheduler. The current scan will continue until you press the *Stop* button.

Set Cycles – Brings up a popup to set the number of scans to be performed according to the current sequence.

Set Period – Brings up a popup to set the length of time in between well plate scans.

In the *Plate Controls* area, available options are shown in color. If an option is not available, the button will be grey. For example, at the beginning of data acquisition, the *Run* and *Go Home* buttons will be the only valid options.

Fig. 31—(Left) Controls at the beginning of data acquisition.
Fig. 32—(Center) Controls when a sequence is running.
Fig. 33—(Right) Controls when a sequence is paused.

The *System Controls* area has five buttons as follows:

Save   Delete   Download   Back   STOP
Fig. 34—System Control buttons.

Save – Saves the current data file. This option is not valid during data acquisition.

Delete – Deletes the current data file. This option is not valid during data acquisition.

Download – Downloads the current data file. This option is not valid during data acquisition.

Back – Returns you to the previous window (*Main* page). If you press this during data acquisition, a popup asks if you wish to discard the collected data. Press *Yes* to discard the data and return to the previous window or *No* to all the data collection to finish normally.

Stop – This emergency stop button is always active. If you press this button, the autosampler will immediately stop, no matter where it is in a sequence. All measurement will be suspended.

To begin running an experiment:

1. Select *Experiment* from the main menu. The *Experiment* window appears (Fig. 35).
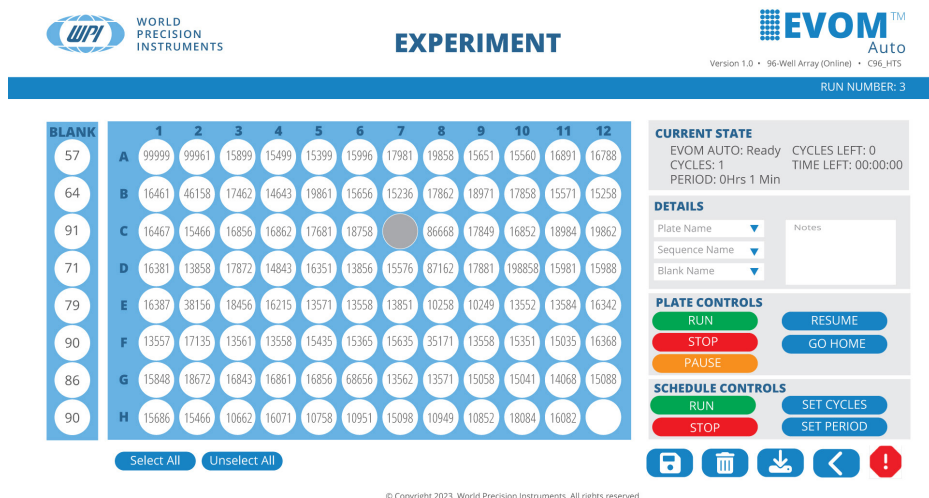
Fig. 35—The Experiment window appears.

2. Select the *Plate Name* drop-down in the *Details* area on the right side of the screen. Choose from the list of existing plates or select *New Plate* to define a new plate. A popup appears so you can enter a name for the plate (Fig. 36).

Fig. 36—Plate name popup.

3. Enter the name for the plate and press the *Save* button. A confirmation window appears indicating that the plate was successfully created (Fig. 37). This indicates that this is the first data set for this plate when measurements are taken. The run number displays in the menu bar and indicates the number of times you have run the plate sequence.

New Plate

The plate with the name [Example Plate] was successfully created!

OK

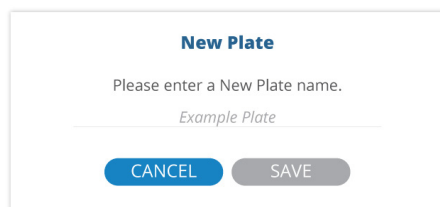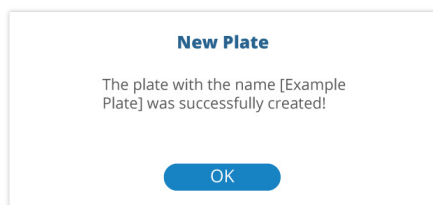*Fig. 37—Confirmation window.*

4. Select the *Sequence Name* drop-down in the *Details* area on the right side of the screen. A list of existing sequences appears. Select the appropriate sequence that you created earlier.

   A blank data table with no data values displays in the window. At this point, select which wells you want to measure. Press the *Select All* button below the data table to select all the wells. The selected wells change color as you select them. You may also select or unselect wells by clicking on them directly. Selected wells are white, and unselected cells are grey.

   NOTE: The status line below the table indicates that the EVOM™ autosampler is ready.

5. Press the *Run* button located in the *Plate Controls* area on the right side of the window. The sequence is executed. A brief message in the lower left corner indicates that the experiment has started. If you defined the blank container, the data displayed represents the difference between the baseline and the actual value measured.

   NOTE: If the blank values have overflow values, the calculated values on the *Experiment* window are also invalid and will show a --- or *OVF*.

6. Once the sequence is completed, a confirmation message appears. Press *OK*. To stop the sequence and abort the run, press the *Stop* button in the *Plate Controls* area. To pause the sequence, press the *Pause* button. Press the *Resume* button to continue the sequence where you left off.

Experiment Data

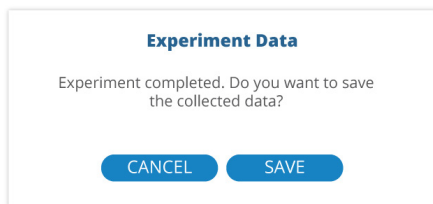Experiment completed. Do you want to save the collected data?

CANCEL   SAVE

Fig. 38—Select Save to store the data.

7. You may save the data or run the sequence again. To run the sequence again without saving, press *Cancel*. To save the data, press the *Save* button. A popup appears. When you press the *Run* button again, the run number on the right side of the menu bar increments by 1.

8. At any time, you may add comments for the data run being collected. Click inside the *Notes* text block in the *Details* section on the right side of the screen to attach notes to the plate run.

TIP: You may select the wells containing samples. Reading empty wells takes longer to finish reading the sample plate. Click any wells to disable it, and then read the sample plate.

Downloading the Data File

Once a data acquisition run is completed, the data can be exported. This process exports all the runs performed on a plate into a downloadable, comma-delimited (CSV) file which can be read by Microsoft® Excel. The downloaded file is immediately available.

1. To download a data file, press the *Download* button 🔽 in the *System Controls* area in the bottom right corner of the window. When the export is finished, it downloads to the tablet or computer in the configured directory. Usually, it exports to the *Downloads* directory.

Do you want to download "Run 48-10K Scale.csv"? ✕
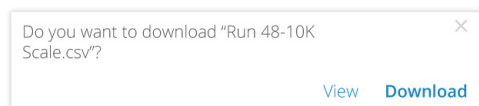
View **Download**

Fig. 39—A browser popup appears so you can download the file to the device.
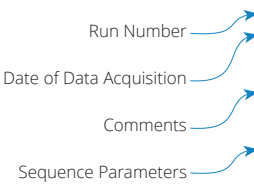
NOTE: In the Safari browser on the iPad, click on the downloads icon ⬇ in the upper right corner of the screen and select the file to view it. The Google Chrome browser shows the downloaded file in the bottom left corner of the window.

2. Open the file with Microsoft® Excel. The first line of the file indicates when the data was exported.

	A	B	C	D
1	Export Date:	October 11 2021 9:42AM		
2				

Fig. 40—The CSV file shows the export date of the file in the first line.

For each run there is a header section. The first run at the top of the file is the most recent. A sample file is shown in Fig. 41.

<table>
<tr><td></td><td>6</td><td>RUN 004</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Run Number</td><td>7</td><td>Run Date:</td><td>October 12 2021 12:45PM</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Date of Data Acquisition</td><td>9</td><td>Description :</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>This note goes with Run 004</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Comments</td><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>12</td><td>Sequence :</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>13</td><td>Mode</td><td>Range</td><td>WellArea</td><td>PD</td><td>Blank</td><td></td><td>WellTime</td></tr>
<tr><td>Sequence Parameters</td><td>14</td><td>Resistance</td><td>50</td><td>Corning 96</td><td>Do Not Zero</td><td>160 mM KCL Blank</td><td></td><td>2</td></tr>
<tr><td></td><td>15</td><td>Station 1 Rinse</td><td>Station 1 Wait</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>16</td><td>0</td><td>0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>17</td><td>Station 2 Rinse</td><td>Station 2 Wait</td><td></td><td></td><td></td><td></td><td></td></tr>
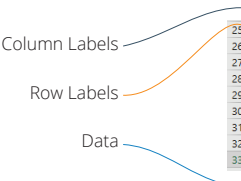<tr><td></td><td>18</td><td>0</td><td>0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>19</td><td>Station 3 Rinse</td><td>Station 3 Wait</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>20</td><td>0</td><td>0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>21</td><td>Rinse Between :</td><td>FALSE</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>22</td><td>Rinse Beginning :</td><td>FALSE</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>23</td><td>Rinse End :</td><td>FALSE</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Fig. 41—Sample data file.

Following the header is the data table. See Fig. 42.

		1	2	3	4	5	6	7	8	9	10	11	12
26	A	26	5	5	1	5	3	4	5	5	4	4	12
27	B	2	-6	-3	-3	-3	0	-3	-1	-3	-3	-1	-4
28	C	-6	0	3	-1	1	1	-1	0	1	-1	7	-3
29	D	0	0	2	-3	-5	-2	-1	-1	-1	-4	6	-2
30	E	-8	-3	-1	2	0	-2	-1	0	-1	-3	1	-1
31	F	-5	0	-2	-2	1	-2	-1	1	0	1	1	2
32	G	2	2	-1	2	2	0	1	0	1	2	-1	2
33	H	2	-2	0	-3	0	-1	-5	-1	-2	-2	-4	6

Column Labels, Row Labels, Data

Fig. 42—Sample data table in CSV format.

Plates files may be downloaded at any point after a data acquisition run is completed.

Deleting a Data File

Plates files may be deleted using the *Delete* button [trash icon] in the *System Controls* area in the bottom right corner of the window. When a plate is deleted, all data runs are deleted. The sequences are not deleted since other plates may be referencing the same sequences. If you choose to delete a file, a confirmation popup appears asking you to verify that you want to delete the selected plate file (Fig. 43). Select the *Delete* button to delete the file or the *Cancel* button to abort the deletion.
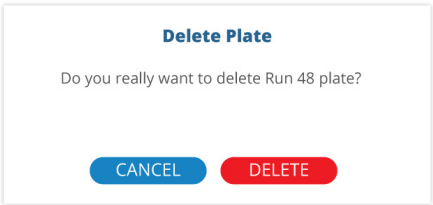
Delete Plate

Do you really want to delete Run 48 plate?

CANCEL   DELETE

Fig. 43—Confirmation popup to verify the deletion of a plate file.

Transferring Files Between iPad and Computer

There are multiple ways to move files on your iPad to your Mac or Windows PC, and vice versa.

- **Wirelessly** (email, messages, or AirDrop) – Refer to the iPad online User Guide topic *Transfer files wirelessly between your iPad and computer with email, messages, or AirDrop*.

- **iCloud Automatically Sync** – Refer to the iPad online User Guide Topic *Automatically keep your files up to date on your iPad and computer with iCloud.*

- **Cloud Storage** – With a cloud storage provider, you can store your files on a service like Box or Dropbox to make them available on both your iPad and computer.

- **External Storage Device** – You can copy files to an external device, such as a USB drive or SD card, connected to your iPad or computer. After disconnecting the storage device, you can connect it to your other device and copy the files to that device.

- **File Server**– By connecting to a file server from your iPad and your Mac or Windows PC, you can share files between them. Refer to the iPad online User Guide topic *Use a file server to share files between your iPad and computer*.

- **Finder** or **iTunes** – After you connect your iPad to your Mac or Windows PC with a cable, you can sync many types of data and can transfer many types of files.

NOTE: Each approach requires you to set up your computer to receive and send files, and each may have limitations on the items you want to transfer.

NOTE: You can also connect the EVOM™ Auto User Interface directly to your computer using the second Wi-Fi key provided. You need to disconnect the iPad from the EVOM™ Auto network and connect the iPad to your computer Wi-Fi network.

Scheduling Operations

The data acquisition functions of the EVOM™ Auto may be repeated at a defined time interval when multiple scans of a plate are needed. The scheduled operations are displayed on the right side of the *Experiment* window in the *Current State* area (Fig. 44). The control buttons for scheduling are in the *Schedule Controls* area on the right side of the window (Fig. 45).
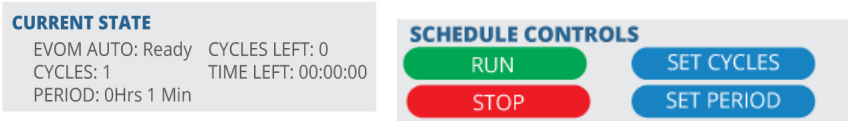
CURRENT STATE
EVOM AUTO: Ready   CYCLES LEFT: 0
CYCLES: 1   TIME LEFT: 00:00:00
PERIOD: 0Hrs 1 Min

SCHEDULE CONTROLS
RUN   SET CYCLES
STOP   SET PERIOD

Fig. 44—(Left) Current State area of the window when a schedule is running.
Fig. 45—(Right) Plate Controls area of the window for running a schedule.

Running a Scheduled Measurement Sequence

1. Press the *Set Period* button to set the length of time in between well plate scans. A popup displays (Fig. 46). Tap on the hours and minutes field to open another popup (Fig. 47). Tap the pencil icon to enter the hours and minutes in HH:MM format or use the spinner to select the hours and minutes. Then, press the *SAVE* button to save the changes.
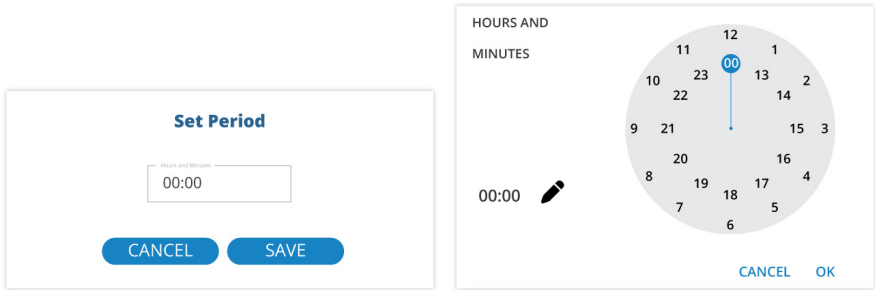
Set Period

Hours and Minutes
00:00

CANCEL   SAVE

HOURS AND
MINUTES

12
11   1
23   00   13
10   22   14   2
9   21   15   3
20   16
8   19   17   4
00:00   7   18   5
6

CANCEL   OK

Fig. 46—(Left) Tap the numbers in the hours and minutes field to set the period.
Fig. 47—(Right) Tap the pencil and enter and period or use the spinner to set the number of hours and minutes for which you want the schedule to run.

- If you click on the pencil, a popup appears (Fig. 48). enter a four-digit number (HHMM) to set the hours and minutes.
- If you use the spinner, you may select from 1 to 23 hours. The first 12 hours are on the outside of the spinner, and the inner spinner is used to set 13 – 23 hours. After you make that selection, the spinner displays minutes and you may use the dial to set the number of minutes in the period (Fig. 49).

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Fig. 48—(Left) If you select the pencil icon, you may use the keyboard to enter a four-digit number in the form of HHMM to set the period.
Fig. 49—(Right) If you used the spinner to set the hours of the period, then the display changes to allow you to set the minutes of the period.

2. Press the *Set Cycles* button to set the number of scans to be performed according to the current sequence. A popup displays (Fig. 50). Use the + and – buttons to increment or decrement the number of scans. Then, press the *OK* button to save the changes.

Fig. 50—Use the buttons to set the number of scans to be performed.

3. Press the *Run* button in the *Schedule Controls* area to start the first scan. After that scan, the *Time* and *Cycle* counters become active in the *Current State* area on the right side of the window (Fig. 51). They will continue counting down until they reach zero Then, measurements stop. When a scan is finished, the data is saved, and the plate number (run number) increments. When the scheduled operations are dormant, the counters display grey. When the schedule is active the counters turn green.

Fig. 51—The counters display with green text when the schedule is active, and it only appears when it is actually counting down.

Stopping a Running Scheduled Sequence

Press the *Stop* button in the *Schedule Controls* area to stop the schedule. The current scan will continue until it completes the cycle. The *Stop* and *Pause* buttons become active in the *Plate Controls* area. If you need to stop the scan, you must also press the *Plate Controls Stop* button. Measurements will continue until the scan reaches the end of the active column. When it stops a popup appears asking if you want to save the collected data. Saved data includes all the collected data, including the last active row scanned. Click *Save* to store the data or *Cancel* to abort.
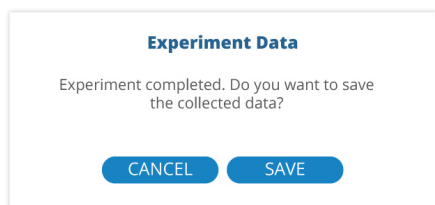

Fig. 52—After you stop the experiment, you have the option to save data collected..

MAINTENANCE

The electrodes require regular maintenance to keep them performing optimally.

Chloridizing – To replenish the chloride on the surface of the electrodes, the electrode tips need to be submerged in a bleach solution for at least 10 minutes, followed by a rinse with distilled water.

Stabilization – Once chloridized, the electrodes need to be stabilized by being submerged in buffer solution.

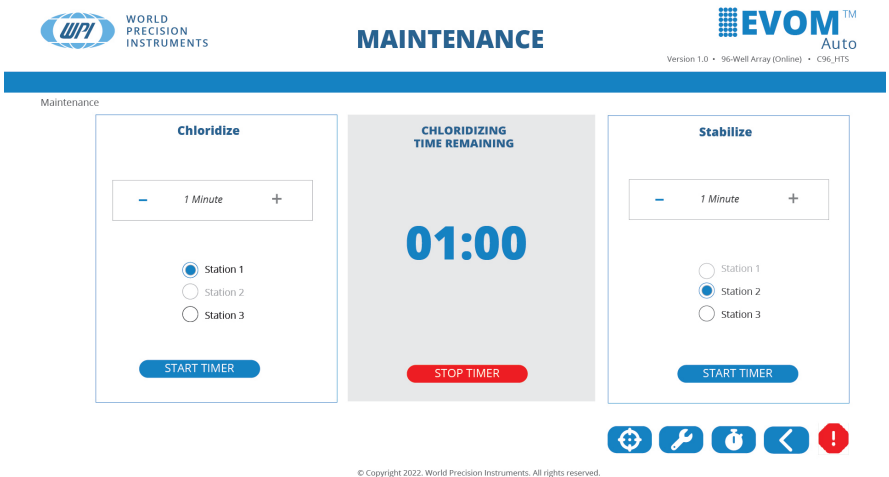The *Maintenance* window allows for a timed soaking for each operation.

Fig. 53—Maintenance window.

Four control buttons are located at the bottom of this window:

- - Go home button positions the electrode array in the home position.
- - Calibrate takes a few moments to calibrate the sensor head using the internal reference resistor. Nothing involving the motor movement happens. The icons show the animation until the process is completed.
- - Set/Read Time lets you adjust the time the electrode array will enter a station to chloridize or stabilize.
- - Back returns you to the previous window.

Chloriding the Electrode Array

1. Select *Maintenance* on the main menu. The *Maintenance* window appears.

2. To chloridize, press the + or – buttons to set the timer to the desired time in minutes in the *Chloridize* frame.

3. Select the radio button for the rinse station containing the chloridizing solution.

4. Fill the appropriate rinse station with a bleach solution.

5. Press the *Start Timer* button. The time interval displays on the counter in the center of the window. The title changes to *Chloriding Time Remaining*.

6. The electrode array moves to the selected rinse station, and the counters start counting down to zero.

7. When the count reaches zero, the electrode array retracts.

8. At any point, you may stop the counter by pressing the *Stop Timer* button. This resets the counter to zero and retracts the electrode array.

Stabilizing the Electrode Array

1. Select *Maintenance* on the main menu. The *Maintenance* window appears.

2. To stabilize, press the + or – buttons to set the timer to the desired time in minutes in the *Stabilize* frame.

3. Select the radio button for the rinse station containing the buffer solution.

4. Fill the appropriate rinse station with distilled water.

5. Press the *Start Timer* button. The time interval displays on the counter in the center of the window. The title changes to *Stabilizing Time Remaining*.

6. The electrode array moves to the selected rinse station, and the counter starts counting down to zero.

7. When the count reaches zero, the electrode array retracts.

8. At any point, you may stop the counter by pressing the *Stop Timer* button. This resets the counter to zero, and retract the electrode array.

9. In the third rinse station, you may perform another rinse in distilled water.

NOTE: The radio button selection requires different rinse stations to be used for chloriding and stabilizing.

ACCESSORIES

Part Number	Description
EVM-EL-xxxx	EVOM™ Auto Electrode Array
CCI96-PET-0.4	PermaCell Cell Culture Insert Plates, 96-Well, PET, 0.4µm, pkg of 1
CCI96-PET-0.4-5	PermaCell Cell Culture Insert Plates, 96-Well, PET, 0.4µm, pkg of 5

TROUBLESHOOTING

Issue	Possible Cause	Solution
Reading displays as dashes	You may not have adequate apical or basolateral liquid volumes.	Increase the liquid volumes.
	Readings may be out of range.	Make sure 100 KΩ maximum range is selected.
Software is not communicating with the autosampler or software connectivity is terminated	Other programs may interfere while the EVOM™ Auto software is running.	To prevent future occurrences, do not launch any other programs or software when EVOM™ Auto software is running.
		Close the browser and relaunch the software.
	Wi-Fi is not properly connected	Restart the interface unit by cycling power to it.

NOTE: If you have a problem/issue with that falls outside the definitions of this troubleshooting section, contact the WPI Technical Support team at (941) 371-1003 or wpirms@wpiinc.com.

SPECIFICATIONS

This unit conforms to the following specifications:

Autosampler Dimensions (W×D×H) ....16×10×8.4"
Autosampler Weight ....15.5 lbs.
Interface Unit Weight.. 1 lb.
CE Certified...Yes
Compatibility ....Wide variety of 96-well HTS Plates
Resistance Range.. 10KΩ, 50KΩ, 100KΩ
Number of Rinse Stations 3
Electrode Array for 96 HTS Plate ....Array of 8 pair of (1mm Φ) electrodes
Minimum Sample Reading Time ....1 Second
Device Connectivity .... Wi-Fi
Wi-Fi Range..25 ft./7 m
Software Type...Web browser
Control Device for Running Software ....Tablet, Laptop, Desktop with Wi-Fi adapter
Output Data ....CSV/Microsoft® Excel

APPENDIX A: UPDATING EVOM™ AUTO SOFTWARE

1. Before updating the software, verify that the system has Wi-Fi connectivity. Insert the Wi-Fi adapter into the Interface Unit and press the power button on the Interface Unit control box to power it on. (The blue LED is ON).

    NOTE: Do not plug in the USB drive (WPI#: 97255) with the software upgrade yet.

    Establish the connection between the iPad. If any connectivity issue exist, verify that the Wi-Fi adapter is properly connected to the EVOM™ AUTO and relaunch the software.

2. Note the software version in the upper right corner of the software. See Fig. 54.

Fig. 54—Note the software version in the top right corner of the software window.

3. Navigate on the iPad to *Settings* and choose *Wi-Fi*. If you see the WPI BYOD network, click *Forget WPI BYOD Network* to delete it. See Fig. 54, and Fig. 56.
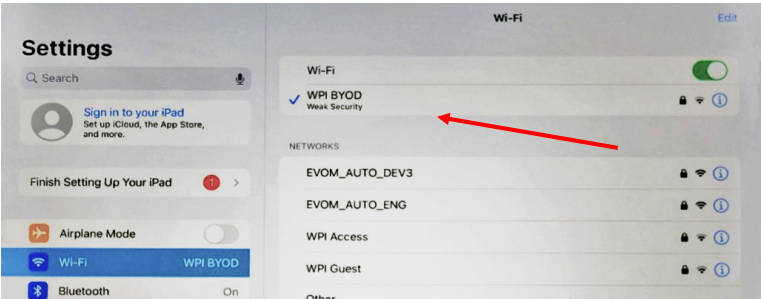
Fig. 55—Locate the WPI BYOD network.
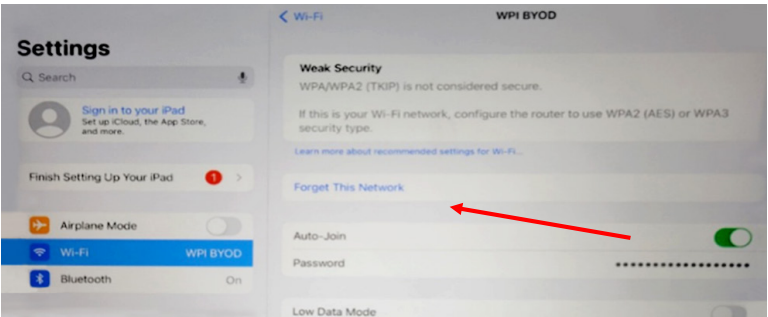
Fig. 56—Click Forget This Network.

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NOTE: The network may have already been deleted during the configuration of your iPad at WPI.

4. Now, power off the Interface Unit by pressing the power button. The blue LED turns off. Plug in the USB drive (WPI #: 97255) onto any available USB port. Keep the Wi-Fi adapter connected to the Interface Unit.

5. Power on the Interface Unit by pressing the power button. The blue LED turns on. Allow 5 minutes, and then make sure the Wi-Fi network is connected to EVOM Auto's Wi-Fi.

6. Launch the EVOM™ Auto software. Let the system establish the connection. If a connection does not appear to be established, open the Wi-Fi settings on the iPad to verify that the iPad is connected to the EVOM™ Auto network. See "Setup" on page 9.

7. The electrode array travels to the home position. Note the new version of the software in the upper right corner of the EVOM™ Auto Main Screen.

8. Power off the Interface Unit by pressing the blue power button. The blue LED turns off.

9. Remove the USB thumb drive with the software upgrade (WPI #: 97255).

⊘ **CAUTION:** This step is important to make sure the unit does not reapply the update.

10. Power on the Interface Unit by pressing the power button with Wi-Fi adapter connected. The blue LED turns on.

11. Wait 5 minutes. Let the Wi-Fi connect to EVOM™ Auto's network.

12. Launch the software page and note the new version of the software. The system is ready to be used with the latest software version.

INDEX

DECLARATION OF CONFORMITY

WORLD PRECISION INSTRUMENTS, LLC.

175 Sarasota Center Boulevard
Sarasota, FL 34240-9258 USA
Telephone: (941) 371-1003 Fax: (941) 377-5428
E-mail: wpi@wpiinc.com

DECLARATION OF CONFORMITY CE

We: World Precision Instruments
175 Sarasota Center Boulevard
Sarasota, FL 34240-9258 USA

As the **manufacture/distributor** of the apparatus listed, declare under sole responsibility that the product(s):
WPI PN: EVOM AUTO

To which this declaration relates is/are in conformity with the following standards or other normative documents:

Low Voltage:
EN 61010-1:2010+A1:2019
EMC:
EN 61326-2-3:2013, EN 61326-1:2013
EN IEC 61000-3-2:2019+A1:2021
EN61000-3-3:2013+A1:2019+A2:2021

And therefore conform(s) with the protection requirements of Council Directive 2014/30/EU relating to electromagnetic compatibility and Council Directive 2014/35/EU relating to safety requirements and Council Directive 2011/65/EU relating to hazardous substances:

	Issued on: **August 10, 2022**

_____
President of WPI

F-QC-006   Rev C

WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.