MESO® QuickPlex SQ 120MM

User Guide

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1 Introduction

MSD develops, manufactures, and markets innovative and high-performance instruments, assays, and software for single and multiplex measurements of analytes within biological samples. For more details and information about MSD® products and applications, please visit the MSD website at www.mesoscale.com.

1.1 Intended Audience

This guide is for users of the MESO QuickPlex® SQ 120MM. Users should have an understanding of general computer and Microsoft Windows terminology and be familiar with standard laboratory practices.

This user guide describes how to operate the MESO QuickPlex SQ 120MM and acquire data using both SECTOR™ and QuickPlex® plates through the use of Methodical Mind™ software.

1.2 Safety Information

Information on the safe use of the MESO QuickPlex SQ 120MM is available in the *MSD Reader Safety Guide*. A copy of the Safety Guide is provided in printed format along with each shipment of a MESO QuickPlex SQ 120MM. It is also available electronically on the www.mesoscale.com® website, and in Methodical Mind via the MesoSphere™ Menu. The *MSD Reader Safety Guide* also contains supplemental information on proper software and instrument operation, regulatory information, and safety symbols and labels.

1.3 How to Use This User Guide

This user guide is organized by chapters containing main topics and subsections. Use the hyperlinked Table of Contents to find topics of interest quickly. The List of Figures and List of Tables hyperlink to images and tables that enhance the understanding of the written information in this user guide.

Caution Statements

Symbol ⚠️

Caution statements highlight procedures or information necessary to avoid damage to equipment, corruption of software, loss of data, or invalid test results.

Notes

Symbol ⓘ

Notes provide supplemental information on the proper use of the MESO QuickPlex SQ 120MM and Methodical Mind.

1.4 Formatting Information

This guide uses the following formatting conventions:

Internal hyperlinks are formatted bold/gray. Click to jump instantly to the referenced section or figure.

External hyperlinks are formatted underlined/blue. Click to create an e-mail message or open an external web page.

When referring to Methodical Mind-specific terms, the first letter in each word is capitalized—for example, "MesoSphere Menu."

When referring to software labels or controls as they appear in the software, which the user is instructed to view or select, these words are capitalized exactly as they are capitalized on-screen and they are italicized in the instruction text—for example, "Select *Lock UI* from the MesoSphere Menu."

2 Description

2.1 Intended Use

The MESO QuickPlex SQ 120MM is for research use only. It is not for use in diagnostic procedures.

2.2 Specifications Overview

The MESO QuickPlex SQ 120MM offers high sensitivity and a dynamic range that exceeds 5 logs. The MESO QuickPlex SQ 120MM is designed to read both SECTOR and QuickPlex plates. The MESO QuickPlex SQ 120MM reads SECTOR plates 4 wells at a time (24 sectors per plate). QuickPlex plates are read 1 well at a time.

The MESO QuickPlex SQ 120MM reads a SECTOR plate in approximately 1 minute, 30 seconds and a QUICKPLEX plate in 2 minutes, 45 seconds. The level of multiplexing does not affect the plate read time.

The MESO QuickPlex SQ 120MM distinguishes between SECTOR and QuickPlex plate types by reading the plate's barcode and will automatically read each plate accordingly.

For detailed specifications, see Section 5.1.

2.3 Plate Compatibility

The MESO QuickPlex SQ 120MM is compatible with all 96-well SECTOR and QuickPlex plates. Each sector in an MSD plate is designed to be read only once.

2.4 System Components

The following components come packaged together:

- ➢ The MESO QuickPlex SQ 120MM instrument
- ➢ Microsoft Windows-compatible laptop computer
- ➢ Laptop computer power supply and AC power cord
- ➢ MSD Reader Safety Guide (printed)*
- ➢ MESO QuickPlex SQ 120MM User Guide*
- ➢ Electronic test plate
- ➢ USB communication cable
- ➢ 24 V DC power supply and power cords
- ➢ Electrical noise filter and power cord
- ➢ Uninterruptible power supply (UPS)

* The latest versions of these documents are available through the Methodical Mind software. See Section 3.5.8 for additional information on accessing documents from within the software.

2.5   MESO QuickPlex SQ 120MM Components

FIGURE 2.1. The MESO QuickPlex SQ 120MM system.

2.5.1   CCD Camera and Telecentric Lens

The MESO QuickPlex SQ 120MM uses a very sensitive, high-resolution CCD camera and lens system to detect light emitted from MULTI-ARRAY® and MULTI-SPOT® plates. The custom-designed lens enables highly efficient and uniform collection of electrochemiluminescence (ECL) generated light.

2.5.2   Motion Control System

The MESO QuickPlex SQ 120MM uses a high-precision mechanism for transporting plates from the input stack, into the CCD camera's viewing area, and into the output stack. See Section 3—Installation and Operation for more information on reading a plate.

2.5.3 Plate Barcode Reader

The MESO QuickPlex SQ 120MM uses a single, internal barcode reader to identify the plate at the beginning of a plate read. The barcode information allows Methodical Mind to identify the plate type and to read and interpret the plate data correctly.

For certain applications, Users may be interested in applying their own barcode labels. Customer barcodes may be placed on the long sides of the plate next to the MSD barcode. Figure 2.2 illustrates where customer barcode labels may be placed. Customer barcodes must be either Code 39 or Code 128, with a minimum line width of 7 mils.
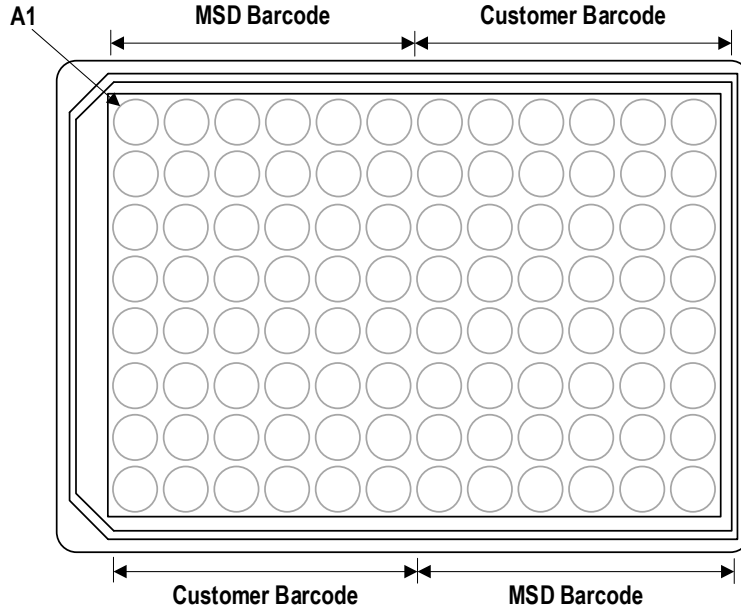
FIGURE 2.2. MSD Barcode and Customer Barcode label locations.

To enable customer barcode reading in Methodical Mind, see Section 3.6. For questions concerning the use of customer barcodes on MSD plates, please contact MSD Scientific Support.

2.5.4 Integrated Assay Plate Stacker

The MESO QuickPlex SQ 120MM includes an integrated assay plate stacker for loading and unloading plates. Up to five plates can be loaded on the input stacker at a time.

2.5.5   Status LEDs

The status LEDs indicate the operational mode of the MESO QuickPlex SQ 120MM (Figure 2.3).

- ➢ **Steady blue:** Standby mode
- ➢ **Blinking blue:** Processing a plate
- ➢ **Steady red:** Instrument not ready to process a plate

FIGURE 2.3. Status LEDs located on the side of the camera tower.

2.5.6 Power Switch and Input/Output (I/O) Panel

The on/off switch, power entry port, and a USB port for communication between the MESO QuickPlex SQ 120MM and laptop computer are located on the back of the instrument. Typically, the MESO QuickPlex SQ 120MM should be left powered-on to maintain camera temperature.

Power Entry Port (Pinout)

Socket 1 and 4:	+V(24 VDC)
Socket 2 and 5:	No Connection
Socket 3 and 6:	-V
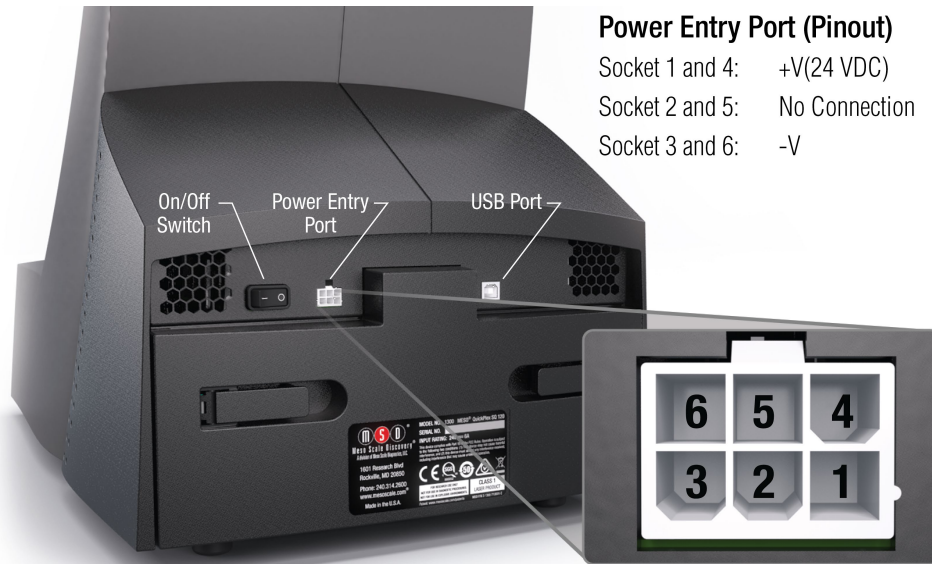
FIGURE 2.4. The power switch, power entry port, and USB port locations.

The power supply cannot be plugged directly into the instrument. The system is supplied with an electrical noise filter, which protects the system from electrical noise. Use the 6-pin power cord to connect the electrical noise filter to the power entry port on the back of the instrument (see Figure 2.4 above). Connect the 10-pin connector from the power supply into the electrical noise filter's power entry port (see Figure 2.5 below).

Power Entry Port (Pinout)

Socket 6, 7, 8, 9:	+V(24 VDC)
Socket 10:	No Connection
Socket 1, 2, 3, 4, 5:	-V

FIGURE 2.5. The electrical noise filter.

2.6 Microsoft Windows-Compatible Computer

A laptop computer is configured by MSD for use with the MESO QuickPlex SQ 120MM and comes preloaded with Methodical Mind. The laptop computer and its software are an integral part of the system and should only be modified by an MSD service engineer. The computer is connected to the MESO QuickPlex SQ 120MM by a single USB cable (Figure 2.6).

FIGURE 2.6. Laptop computer cable attachments (Ethernet, USB, and power).

2.7 Methodical Mind Software

Methodical Mind is a software solution composed of multiple locally installed and cloud-based software modules. The laptop computer supplied with the MESO QuickPlex SQ 120MM has the Reader Module and the Audit Trail Module pre-installed.

2.7.1 Methodical Mind Reader Module

The Reader Module supports the operation of MSD instruments, including controlling access to the instrument. The Reader Module provides access to the last 30 days of data. Plate data is also automatically exported to a customer-defined folder. MSD strongly recommends changing the default export location to a customer network location that is routinely backed up and does not allow deletion or modification of the exported files. See Section 3.6.2 for additional information on configuring the automatic data export.

2.7.2 Methodical Mind Audit Trail Module

The Audit Trail Module provides access to all recorded Audit Events that have been logged by the Methodical Mind Reader Module. This module allows Users to review and export the Audit Trail. For additional information on this feature, see Section 3.5.6.

2.7.3   Methodical Mind TeamLink™ Module

TeamLink is a website used to manage Methodical Mind Accounts. When a Methodical Mind enabled instrument is purchased or leased, a contact at the User's organization will be designated as the Primary Contact for Methodical Mind and assigned as a Methodical Mind Account Administrator to prepare the Account for use. Contact your Account Administrator to be provided access to a Methodical Mind Account.

For additional information on TeamLink, refer to the *Methodical Mind TeamLink User Guide*.

2.8   Reading Partial Plates

The MESO QuickPlex SQ 120MM can be set up to read partial plates. Users can specify the sectors (not the individual wells) that will be read for both SECTOR and QuickPlex plates. See Section 3.5.4 for more information on reading partial plates.

2.9   Electronic Test Plate

Each MESO QuickPlex SQ 120MM instrument is shipped with an electronic test plate (Figure 2.7). This test plate verifies operation of the instrument. This plate does not verify instrument performance. It should not be used for calibration or performance qualification.

The electronic test plate consists of an electronic circuit board housed in a plastic carrier in the shape of a standard assay plate. The circuit board for the electronic test plate simulates the structure of a QuickPlex plate.

FIGURE 2.7. The MESO QuickPlex Electronic Test Plate.

On the electronic test plate, wells A9, B10, C11, D12, E4, F3, G2, and H1 each contain an LED that simulates ECL-generated signal. The electronic plate can be used without any chemical reagents to check the functionality of the instrument at the start of each day or as a tool for demonstrating the MESO QuickPlex SQ 120MM and software to new Users.

Store the electronic plate in its case when not in use, and keep the electronic plate clean and free of dust and debris.

To use the electronic plate, place it in the input stack with the chamfered corners of the plate facing toward the instrument (Figure 3.13). See Section 3—Installation and Operation for more details on how to read a plate.

When using the electronic test plate, wells A9, B10, C11, D12, E4, F3, G2, and H1 should display numbers above 2,000. All other wells should display background signal. The Methodical Mind heat map will look similar to Figure 2.8.
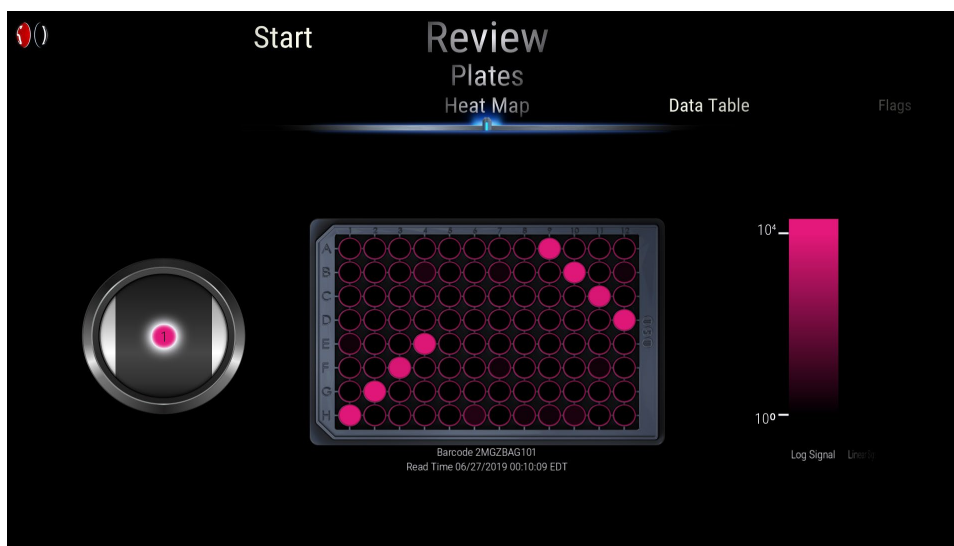
FIGURE 2.8. Electronic Test Plate Heat Map.

2.10 Uninterruptible Power Supply

The MESO QuickPlex SQ 120MM should be operated with an uninterruptible power supply (UPS) to ensure the integrity of data in the event of power line transients.

The UPS required will depend on the standard operating voltage at your laboratory's location. Please ensure that the proper UPS is employed for the power conditions in your country and local area.

3   Installation and Operation

3.1   Instrument Installation

A qualified MSD service engineer must install and configure the MESO QuickPlex SQ 120MM before use. Installation includes setup, connection of the instrument to its computer, and verification that the system is functioning properly. Only the computer provided with the instrument and preconfigured by MSD should be used to operate the instrument.

MSD Instrument Service should be consulted prior to moving the instrument.

3.2   Methodical Mind Setup

Customers should start by setting up Teams and Users in their Methodical Mind Account. Account setup is performed by Users who have been defined in TeamLink as Account Administrators. Account Administration is possible using the Methodical Mind TeamLink web console, which can be accessed via the https://msd.methodicalmind.com/ website. See the Methodical Mind TeamLink User Guide for instructions on configuring your Methodical Mind Account.

When Users are configured and authorized in TeamLink, each User will receive an email to set his/her password. The email address where the email was sent is the username that should be used for logging in to Methodical Mind. After setting a password, Users will be able to use their username and password to log into the Methodical Mind Reader module as shown in Section 3.4.6.

3.3   The Methodical Mind User Interface

Methodical Mind provides a consistent user experience across all its software modules. The Horizontal Dial at the top of the screen shows which Step in the workflow the User is on and provides links to progress forward or backward in the workflow. The Status Bar, shown directly below the Horizontal Dial, indicates the status of the instrument. Available actions the User can take on a given workflow Step are displayed in the Active View area, located below the Status Bar. Additional, less frequently used functionality is available by tapping on the MesoSphere, located in the upper left corner of the screen.
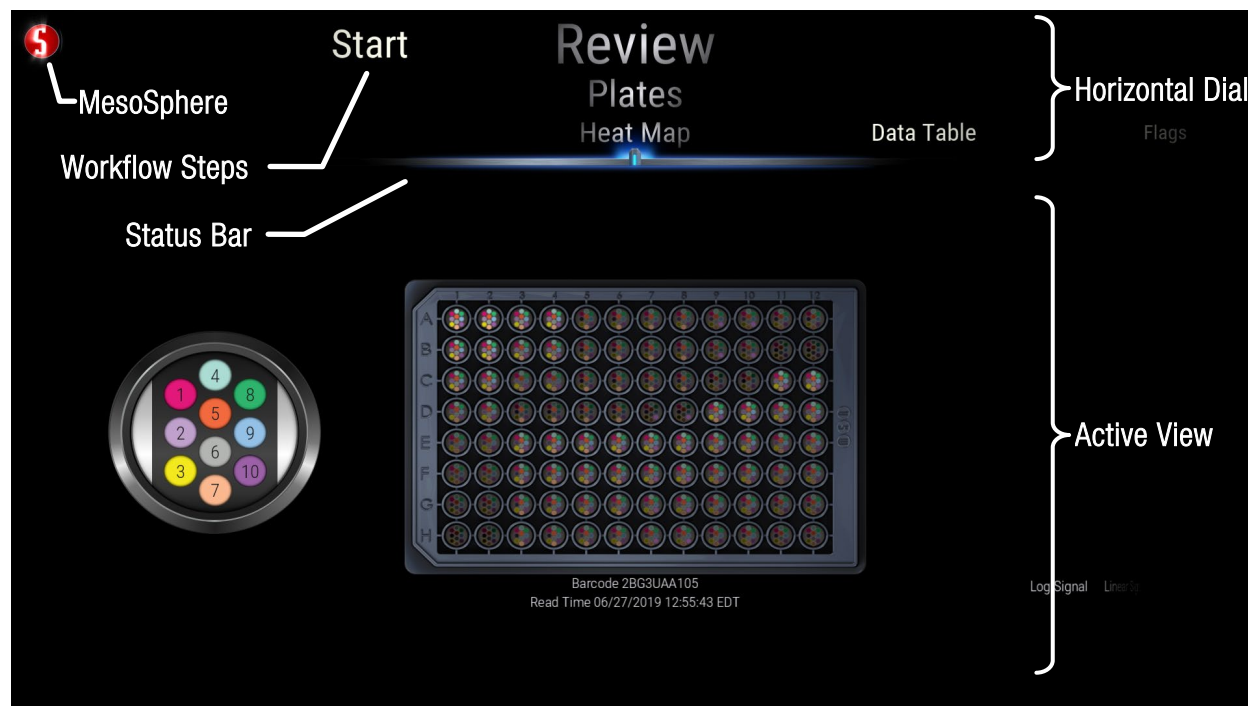
FIGURE 3.1. Methodical Mind user interface components.

As the User selects options displayed in the center of the screen, the Horizontal Dial will update to display the Step in the workflow the User is on (Figure 3.2). The User will also see previous and upcoming Steps in the Horizontal Dial. The User can select Steps shown in white to navigate forward or backward through the workflow. Steps that are dimmed (gray) cannot be selected. Navigating forward and backward through the Module's workflow displays the most commonly used features and Steps used in the Module.
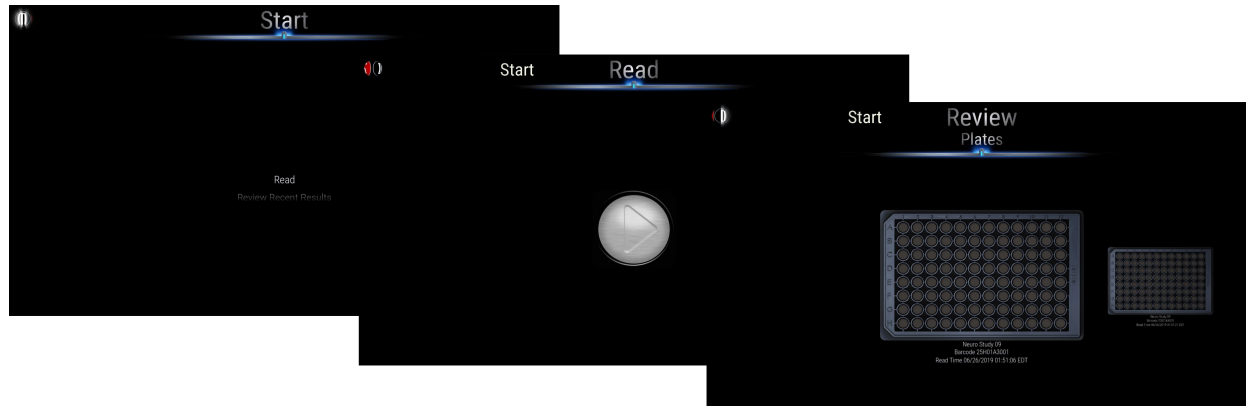
FIGURE 3.2. Horizontal Dial updating during workflow progression.

Additional functionality is accessible in all modules by selecting the MesoSphere (Figure 3.1). Selecting the MesoSphere displays the MesoSphere Menu, which provides menu options for the following functions as labeled in Figure 3.3.

1. Advanced functions associated with the current Active View (the top divided portion of the menu)
2. Switching to other active Methodical Mind Modules (the middle divided portion of the menu)
3. Performing various supplemental system-level functions (the bottom divided portion of the menu)
4. Error messages (shown at the very bottom as they occur)
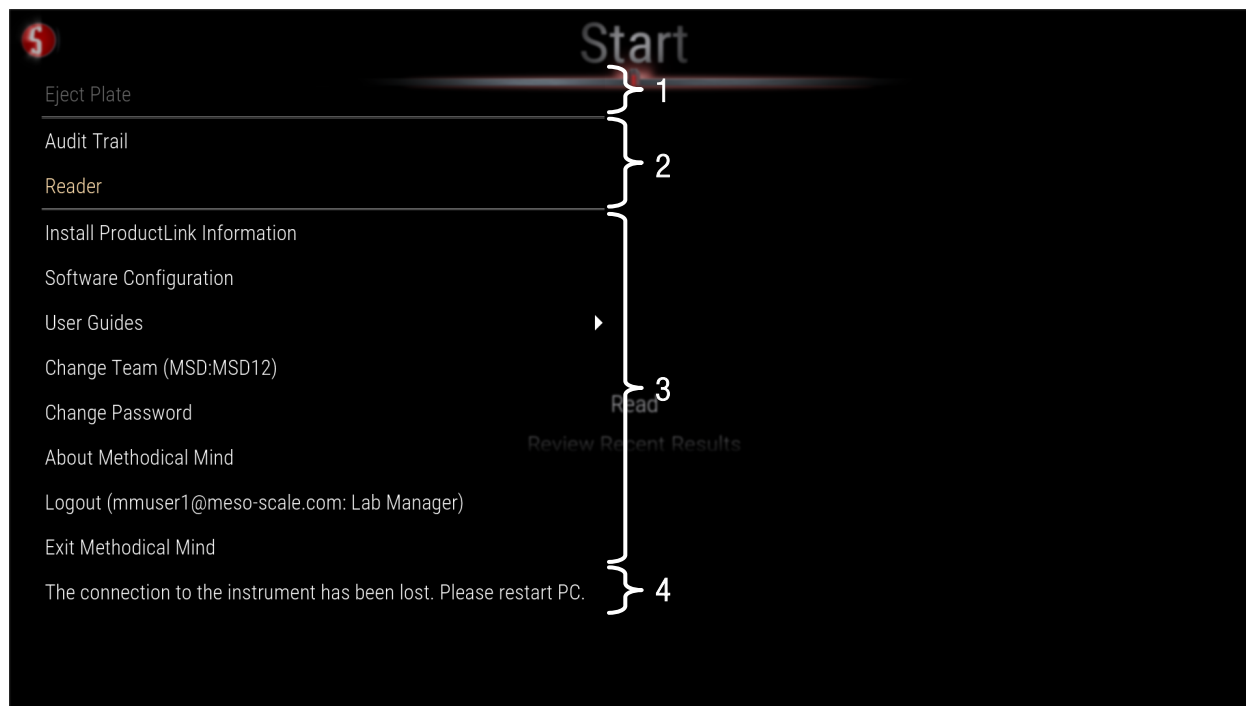
FIGURE 3.3. MesoSphere Menu from the Start Step.

3.4   Getting Started

This section serves as a quick start guide for getting started with Methodical Mind and the MESO QuickPlex SQ 120MM instrument. Use the MESO QuickPlex Electronic Test Plate to generate example data while following the steps in this section. MSD includes the electronic test plate in the instrument package.

⚠ CAUTION: Carefully read and understand all information in the *MSD Reader Safety Guide* before using the instrument. Failure to read, understand, and follow the instructions in the *MSD Reader Safety Guide* may result in damage to the product, injury to operating personnel, or poor instrument performance. See Section 1.2 for information on how to access this document.

3.4.1   Logging in to Windows

Power on the MESO QuickPlex SQ 120MM instrument and then power on the laptop computer.

If this is the first time you are logging in to the Windows operating system, use the default Windows User Credentials shipped with the instrument:

Username: *Administrator*

Password: *MsdAdmin*

ⓘ NOTE: For security reasons this password should be changed to a new password. To ensure accessibility to the system, other Windows users should be added or created. Consult with your IT department to join the computer to the organization's domain. After joining this computer to the domain, this default *Administrator* account may no longer be usable.

3.4.2   Network Configuration

It is important for your IT department to connect the laptop computer to your network and to enable a connection to the internet. Joining the operating system to the organization's domain server is recommended as it allows Users to export data to shared network locations.

Methodical Mind software requires internet connectivity to the methodicalmind.com™ and amazonaws.com websites through your organization's firewall by enabling the *.methodicalmind.com and *.amazonaws.com domains through TCP port 443.

ⓘ NOTE: The entire domains for methodicalmind.com and amazonaws.com must be enabled. The asterisks denote wildcard characters. Some firewall devices may require a different format to enable the entire domain.

3.4.3   Windows Updates

The operating system installed on this computer is Windows 10 IoT Enterprise LTSC. After connecting this computer to the network and joining it to your organization's domain, Windows Update rules will match the domain policies. Windows 10 LTSC is designed to provide a long-term stable and secure operating environment, which is desirable for computers that are controlling instrumentation. To provide this stable operating environment, feature updates are blocked by Windows 10 LTSC; however, security updates can be installed. Security updates will download and install according to the Windows Update rules set on the computer. For example, if a new build of Windows 10 becomes available, it will not automatically install, even if allowed by the domain policies. Attempting to download and install feature updates outside of Windows Update will result in an error.

3.4.4 Starting Methodical Mind

After logging in to Windows, Methodical Mind should automatically start. Methodical Mind can also be opened using the shortcut on the Windows desktop.

FIGURE 3.4. Desktop shortcut

When the software is first launched, you may be required to read and accept an end user license agreement (EULA) in order to proceed.

3.4.5 Logging in to Methodical Mind

Users can log in to Methodical Mind with either Methodical Mind or Windows Credentials. MSD strongly recommends using Methodical Mind Credentials. Logging in with Methodical Mind Credentials connects the instrument to the Methodical Mind Cloud and enforces User roles and permissions defined in TeamLink. Logging in with Windows Credentials limits the software's capabilities as follows:

➢ Methodical Mind does not connect to TeamLink.

➢ The *System / Login/Logout* configuration options are not accessible.

➢ The *System / Database Management* options are not accessible.

The first time Methodical Mind is launched, the Methodical Mind username field is displayed. See Section 3.4.6 for information on logging in with Methodical Mind Credentials. See Section 3.4.8 for information on logging in with Windows Credentials.

If other Users have logged in previously, their usernames will be displayed in the username wheel. Scroll to the bottom of the list of usernames to display the username field. After entering your username, the password field will be displayed. Enter the corresponding password and press Enter.

3.4.6 Logging in with a Methodical Mind username and password

If Methodical Mind shows *Windows Username* and *Windows Password* under *Login* (Figure 3.8), the login type must be switched. To log in with Methodical Mind Credentials, select *Use Methodical Mind Login* from the MesoSphere Menu. This will switch the Steps in the Horizontal Dial to *Username* and *Password* as shown in Figure 3.5.
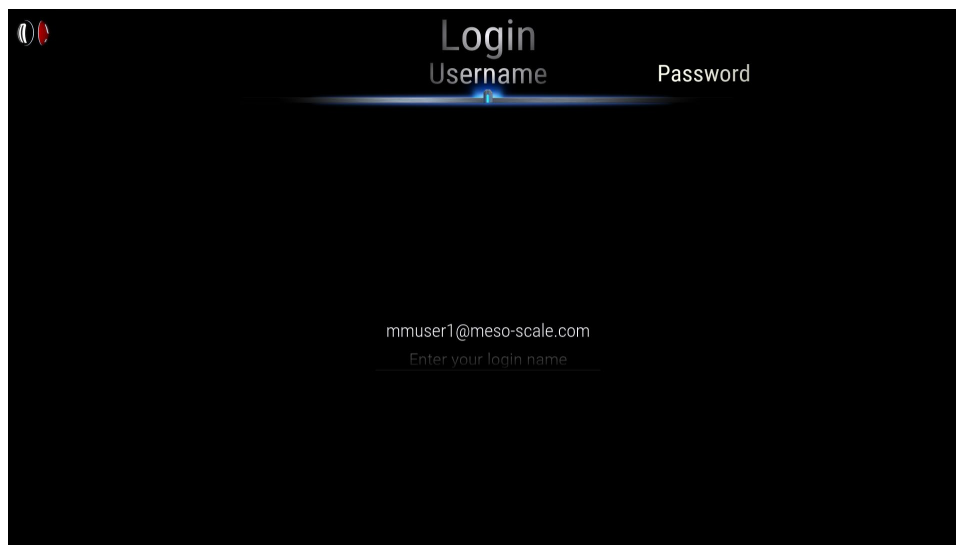
FIGURE 3.5. Methodical Mind Login screen for using Methodical Mind Credentials.

If the logged-in Methodical Mind User is a member of more than one Methodical Mind Account, a list of Accounts is displayed. Select the appropriate Account.

If the logged-in Methodical Mind User is a member of more than one Methodical Mind Team, a list of Teams is displayed. Select the appropriate Team.

If a Methodical Mind User does not have permission to access the Reader Module, an error message will be displayed. Contact your Account Administrator to add a User to a Team on an Account and assign permissions to allow access to the Reader Module. See the Methodical Mind TeamLink User Guide for information on how to set up Methodical Mind Teams and Users.

Alternatively, local Windows User Credentials can be used to log in. See Section 3.4.8 for information on logging in with Windows Credentials.

3.4.7 Logging in with Two-Factor Authentication

Some organizations may choose to enable an additional layer of login security in Methodical Mind, called two-factor authentication (2FA). See Section 3.6.6 for information on enabling 2FA. If 2FA is enabled, the first time a user logs in with their Methodical Mind Account, he/she will be prompted to enter a unique 2FA key into the *Google Authenticator* application installed on the User's smart phone or tablet (Figure 3.6).
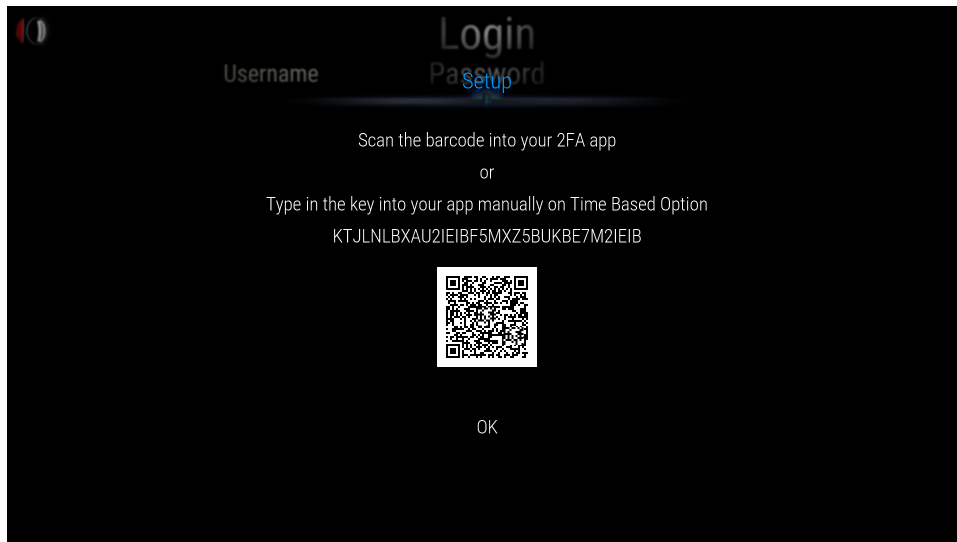
FIGURE 3.6. Two-Factor Authentication (2FA) Setup.

Open the *Google Authenticator* application, select the *Scan barcode* or *Manual entry* option, and scan in the barcode or enter the 2FA key manually. After the key has been successfully entered into *Google Authenticator*, this application will display a 2FA code that must be entered into Methodical Mind. The key from Methodical Mind will not need to be entered again unless 2FA is reset. The *Google Authenticator* application will reset the 2FA code every 30 seconds. Enter this code into Methodical Mind and select *OK* to complete the login process (Figure 3.7).
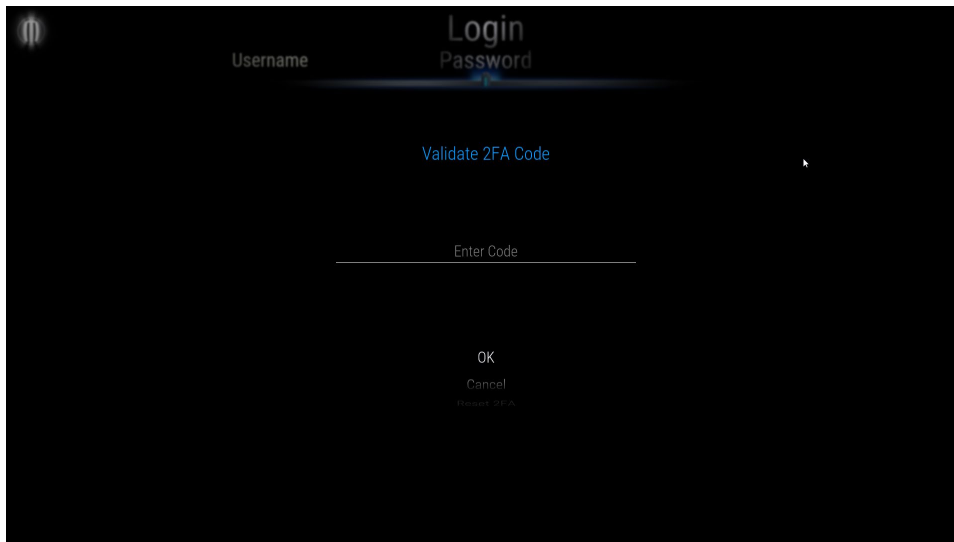
FIGURE 3.7. Entering the 2FA code from the Authenticator Application.

If the User's phone is lost or replaced, or if the 2FA key needs to be reset for any other security reason, scroll up on the vertical wheel and select *Reset 2FA*. *Reset 2FA* is below *Cancel*. Selecting this option will invalidate the previous key linked to the User's Methodical Mind username. An email will be sent to the Methodical Mind User with a new key.

3.4.8   Logging in with a Windows username and password

Windows Credentials can be used if you cannot log in using Methodical Mind Credentials, for instance due to a network disruption. To use local Windows or domain login credentials, select *Use Windows Login* from the MesoSphere Menu. This will switch the Steps in the Horizontal Dial to *Windows Username* and *Windows Password* (Figure 3.8). If this is the first time the instrument computer is being used, and it has not been joined to the organization's domain, use the default Windows Administrator credentials (Section 3.4.1). The *Windows Login* option can be disabled through the Software Configuration feature. See Section 3.6.4 for information.

FIGURE 3.8. Methodical Mind Login screen for using Windows Credentials.

3.4.9   The Start Screen

After logging in to Methodical Mind, the software will bring the User to the Start screen. *Start* is the first Step of any Methodical Mind module workflow. As shown in Figure 3.9, after logging in to the Reader Module, the software displays *Start* in the Horizontal Dial. After selecting Read or Review Recent Results, select *Start* from the Horizontal Dial to navigate back to this screen in order to access different workflows and features within the software. In addition to Workflows in the center of the Start screen, utilize the MesoSphere Menu (Figure 3.3) to access additional information and less frequently used feaures.
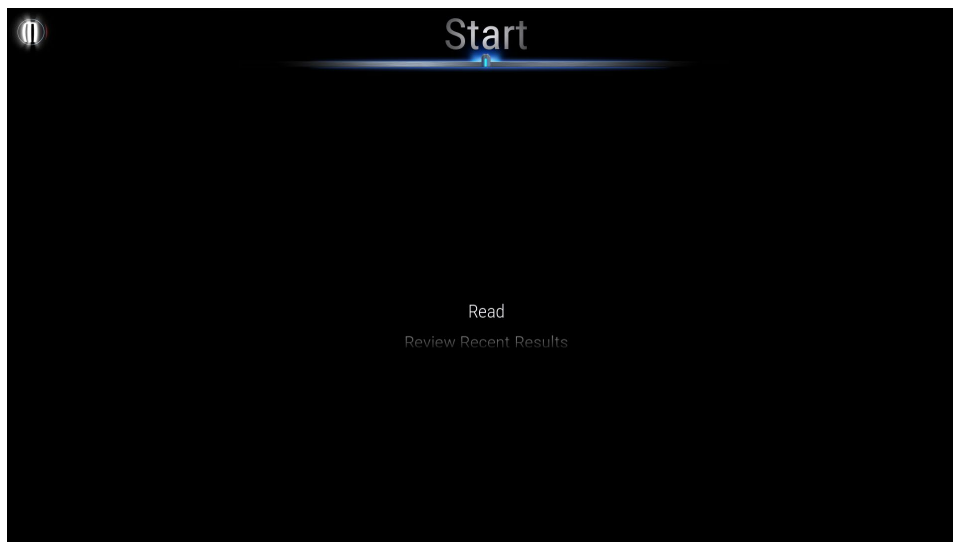
FIGURE 3.9. Methodical Mind Start.

3.4.10 Instrument Start-Up and Camera Cool-Down

After logging in, Methodical Mind will connect to the instrument and will immediately check that the camera is at its proper operating temperature. If the CCD camera has reached the proper operating temperature, and no error conditions have been detected, the Methodical Mind Status Bar (see Figure 3.1) and the instrument's status LEDs will be blue. If the Status Bar and the status LEDs are red, click on the MesoSphere for additional information, as shown in Figure 3.10 below. The reason for the red Status Bar will be shown at the bottom of the MesoSphere Menu.
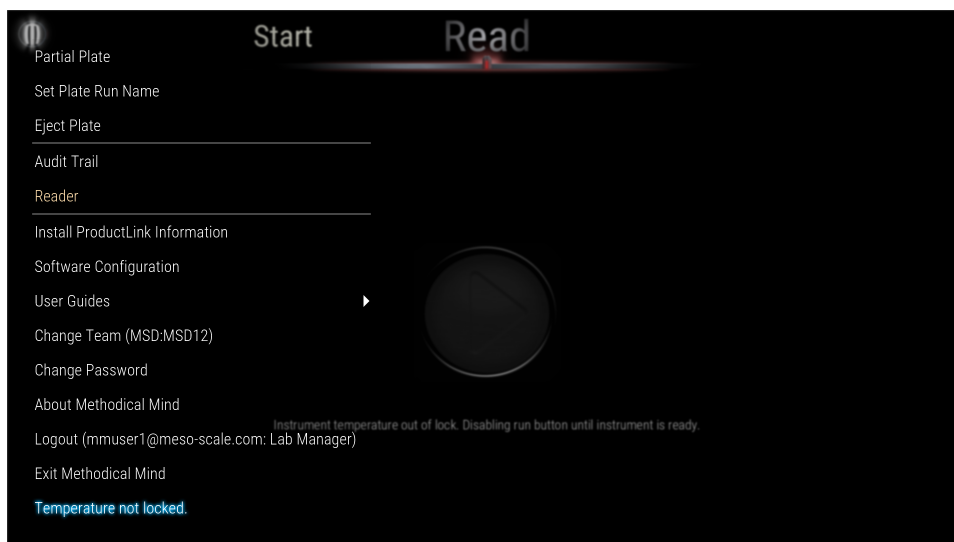
FIGURE 3.10. MesoSphere Menu showing the *Temperature not locked* message.

The MESO QuickPlex SQ 120MM has a cooled CCD camera that needs to be brought to its operating temperature before plates are read. The camera can take up to 25 minutes to cool down. The instrument must be powered on before opening Methodical Mind in order for the software to connect to the instrument and set the camera temperature. After the proper operating temperature is reached, the instrument will maintain the temperature at the appropriate set point.

ⓘ NOTE: If Methodical Mind is closed and the instrument is left powered on, the camera will remain at the proper operating temperature and the instrument will be ready to run assay plates at any time.

After logging in to Methodical Mind and advancing to *Read*, if the camera is not yet at temperature, the software will provide a message and the Run button will not be active (see Figure 3.11 below). The top screen shows the *Read* Step when the camera is not at the proper operating temperature. The bottom screen shows the *Read* Step when the instrument is ready to run.
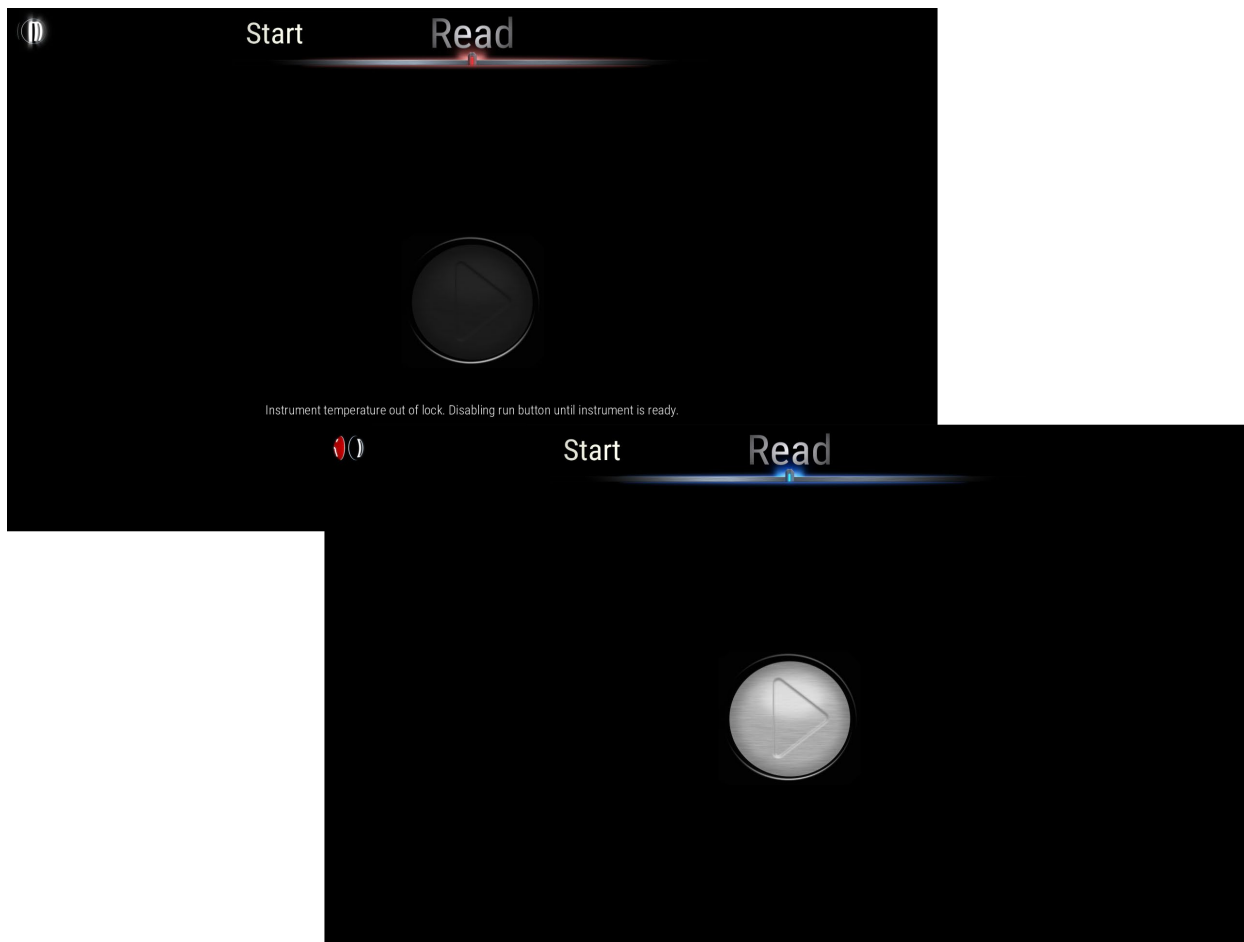
FIGURE 3.11. Read Step showing the camera state.

3.4.11 Reading a Plate

After logging in, the two primary functions are *Read* and *Review Recent Results* (see Figure 3.9). Select *Read* to proceed to the Read Step, which displays the Run button (see Figure 3.12). See Section 3.5 and Section 3.6 for information on options that can be configured prior to starting a run.
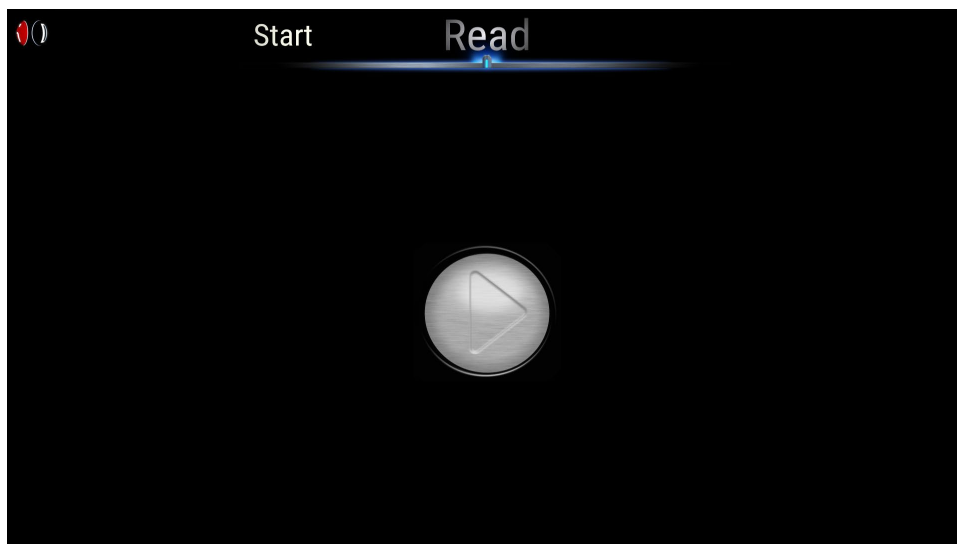
FIGURE 3.12. Methodical Mind Read Step showing the Run button.

Place the plate on the input stack as shown in Figure 3.13. The plate must be on the input stack prior to selecting the Run button to begin the read process.
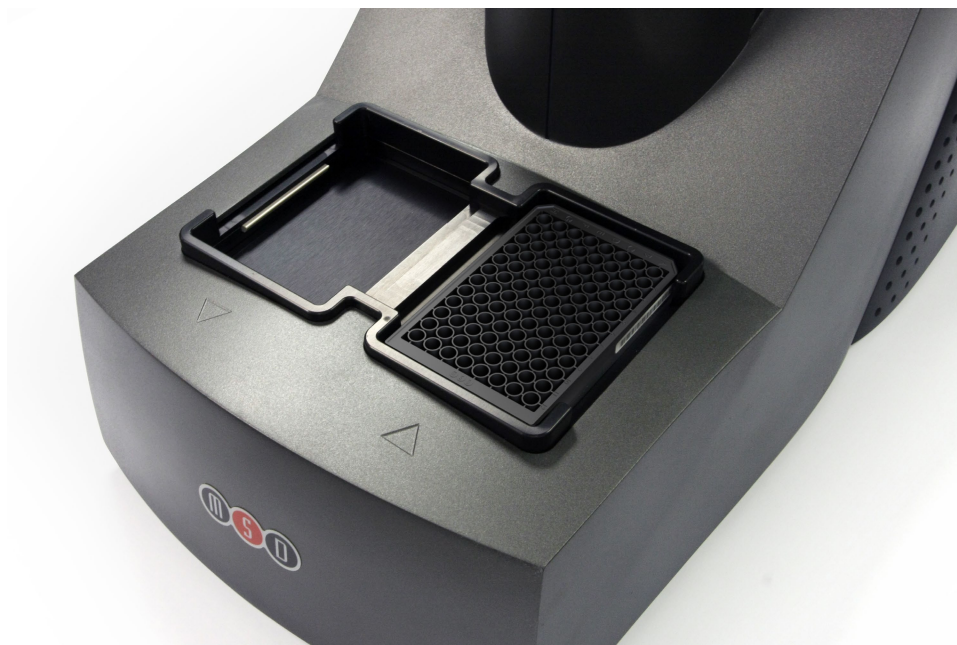
FIGURE 3.13. MESO QuickPlex SQ 120MM instrument with a plate loaded on the input stack.

The instrument will load and read each plate from the input stack. The instrument will unload each plate to the output stack. As Methodical Mind processes each plate, an animation (Figure 3.14) will show the progress with each plate. Tap on the animation to switch between views.
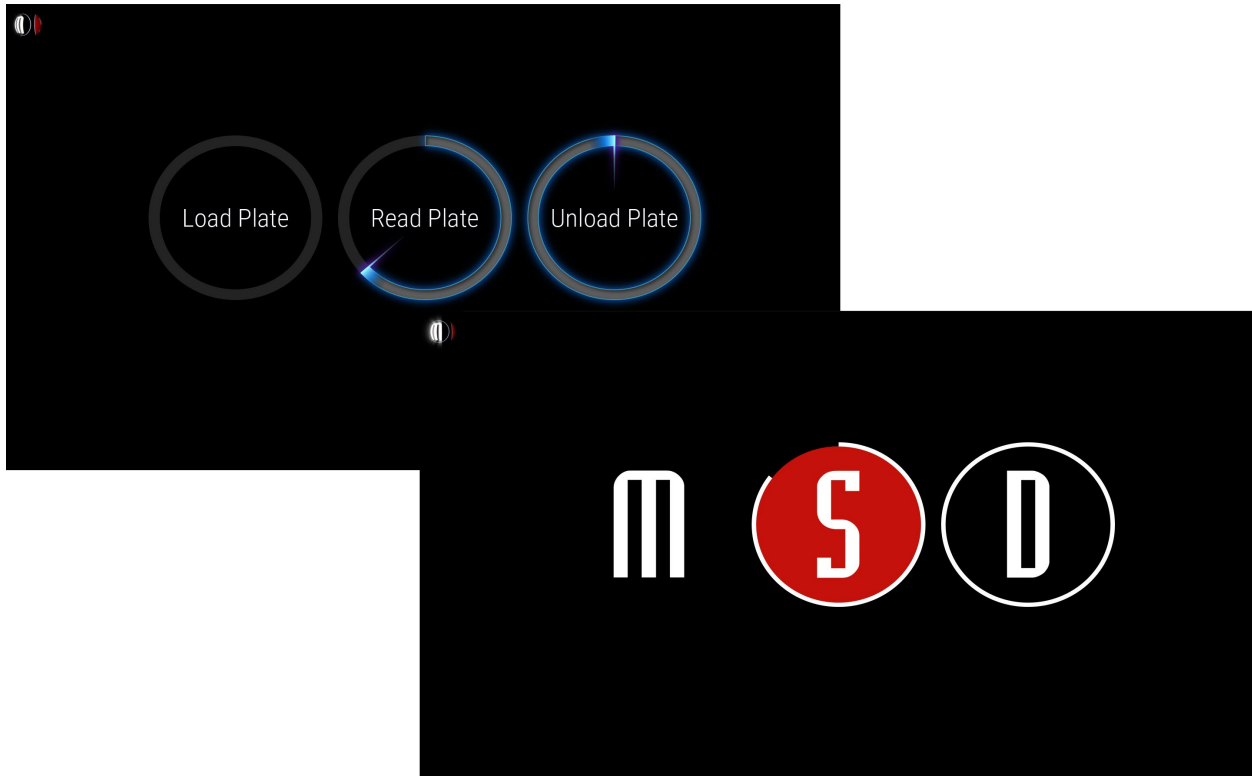
FIGURE 3.14. Methodical Mind plate read progress animation.

To prevent someone from canceling the run while plates are being read, the user interface can be locked by selecting *Lock UI* from the MesoSphere Menu. While the user interface is locked, additional plates can still be loaded. Methodical Mind will prompt the User to end the run or load more plates when the current stack of plates has been read.

If the instrument is unable to read the plate barcode, the software will halt the read process and prompt the User (Figure 3.15) to select from the following options:

➢ *Enter Plate Barcode*: If the plate barcode is readily available, enter the alphanumeric text string located below the barcode in the center of the plate pouch.

➢ *Skip Plate*: This option allows the User to use the second barcode on the plate and is the preferred option if the first barcode is unreadable. Selecting this option will immediately eject the plate to the output stack. The instrument will continue reading additional plates that are on the input stack. Rotate the skipped plate 180 degrees and place back on the input stack. This will use the barcode on the other side of the plate.

➢ *Select Plate Type*: If the plate barcode is not available, and you are certain of the plate type, select this option and then scroll down and select the correct plate type. You will be prompted to enter a barcode after the run is complete in order to view the data for this run.

ⓘ NOTE: Selecting the wrong plate type will produce invalid plate data. This option should be used as a last resort only.

➢ *Cancel Run*: Selecting this option will immediately eject the plate to the output stack and abort the remainder of the run. Plate data for any plates that were read prior to selecting this option will be available for review after canceling the run.
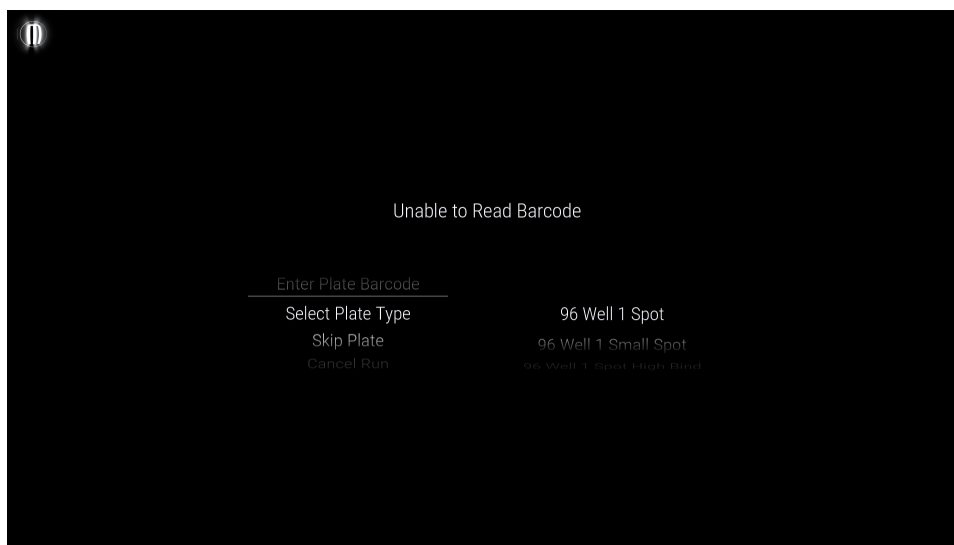
FIGURE 3.15. Methodical Mind options when unable to read the plate barcode.

After a plate has been read, Methodical Mind automatically checks for another plate on the input stack. If Methodical Mind does not find a plate on the input stack, it prompts the User to choose whether to end or continue the run. Up to five plates can be placed on the input stack at one time. If more than five plates need to be included in the same run, additional plates may be added to the input stack as long as the total number of plates on the input stack or the output stack does not exceed five plates. Select *Continue Run* to read the additional plates.
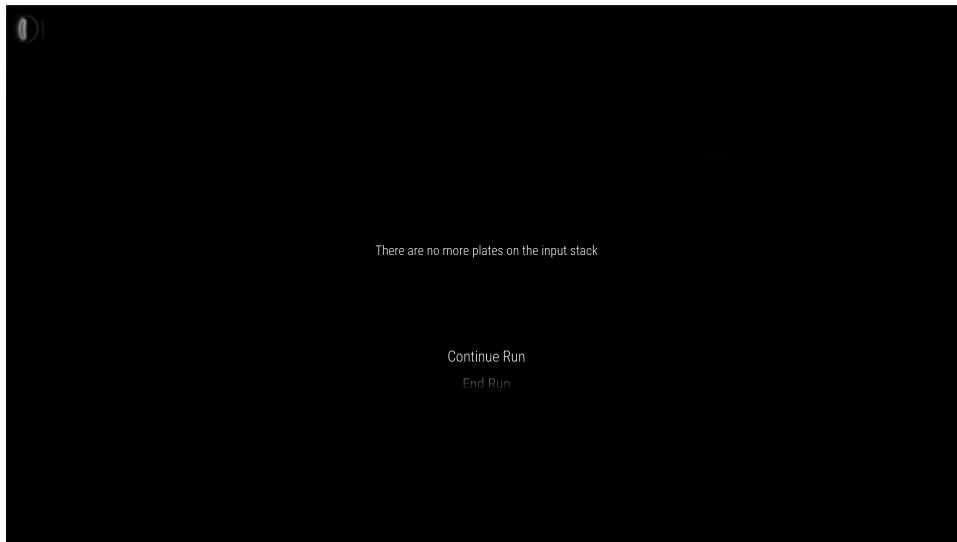
FIGURE 3.16. Methodical Mind options when the input stack is empty.

After completing the run, Methodical Mind automatically transitions to the Review Step, showing the plates in the run. Swipe left or right to scroll through the plates and tap a plate to view. If ten or more plates have been read during the run, page numbers will appear below the plates. Select the page numbers to browse additional plates.
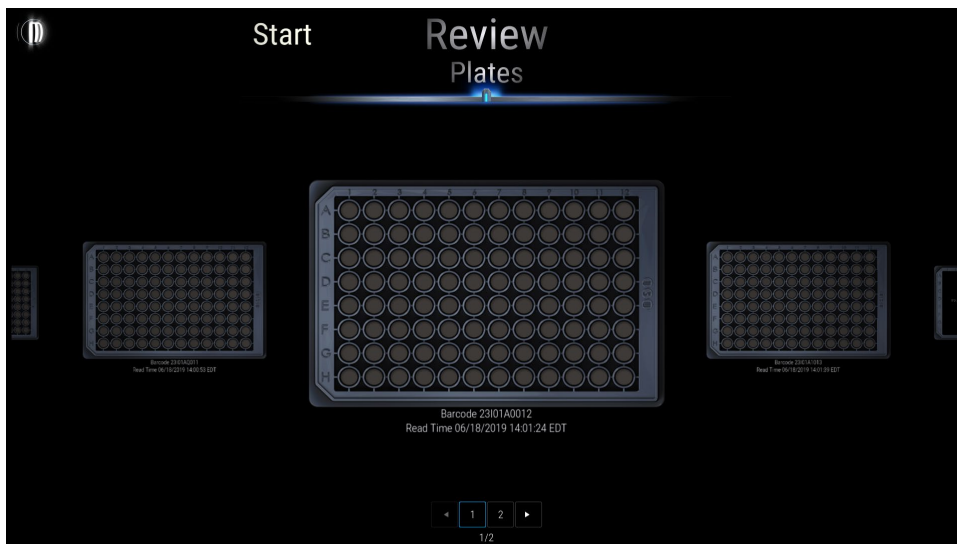
FIGURE 3.17. Methodical Mind review plate data.

3.4.12 Data Storage and Review

Data from plate runs are automatically exported to a text file. By default, the exported text files are saved to the C:\ECLResults\ directory in a format that is compatible with version 4.0 of the DISCOVERY WORKBENCH® software. The export location and file format can be changed. See Section 3.6.2 for additional information on configuring the automatic data export.

ⓘ **NOTE:** MSD strongly recommends changing the default export location to a customer network location that is routinely backed up and does not allow deletion or modification of the exported files.

ⓘ **NOTE:** Methodical Mind does not export the plate data if the plate is marked as "Unconfirmed." A plate will be marked as "Unconfirmed" if the wells have been read more than one time, or if the system is disconnected from the network and Methodical Mind has not downloaded ProductLink™ information that matches the plate barcode. See Section 3.5.2 for additional information.

Tapping on one of the plate images in the plate review selection screen (Figure 3.17) opens a dynamic plate review screen for the selected plate, showing a heat map representation of the ECL data (Figure 3.18).
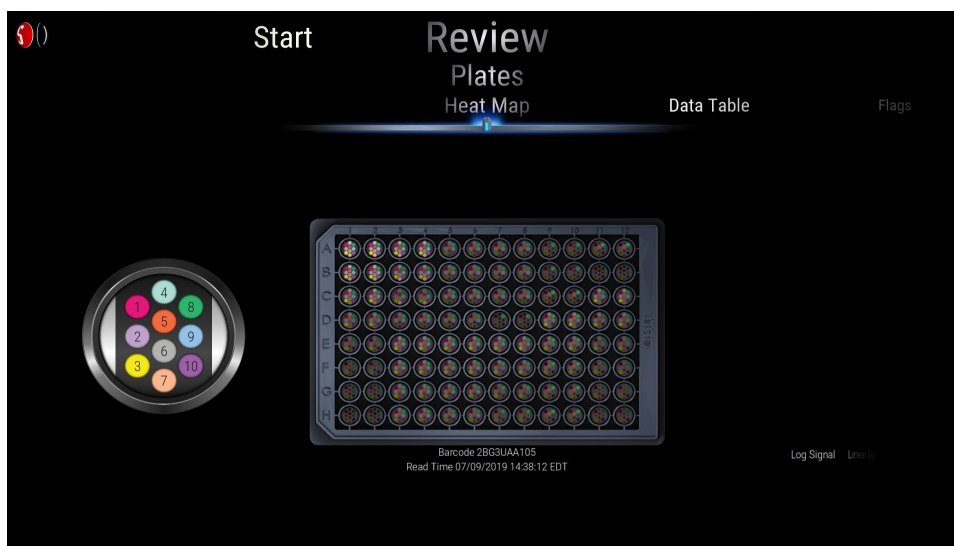
FIGURE 3.18. Methodical Mind plate review heat map.

Tapping on the spot in the well image, as shown in Figure 3.19, selects that spot for a view of ECL data across all wells in the plate and simultaneously displays an ECL scale of the highest to lowest ECL values for the selected spot. The scale can be switched between linear and log scales by sliding the label below the scale left and right.
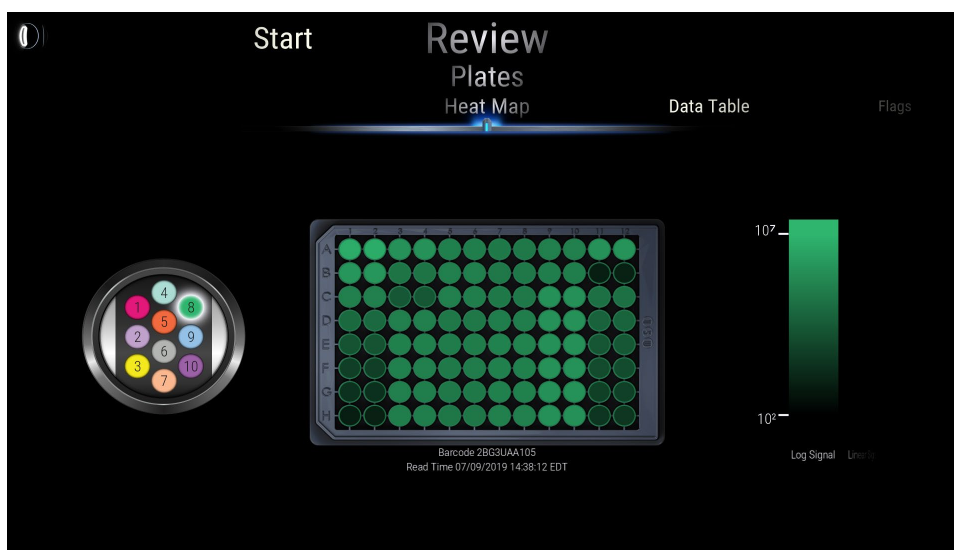
FIGURE 3.19. Methodical Mind plate review heat map for a selected spot.

Tapping on a well in the plate, as shown in Figure 3.20, displays the ECL value for the selected spot to the right of the scale.
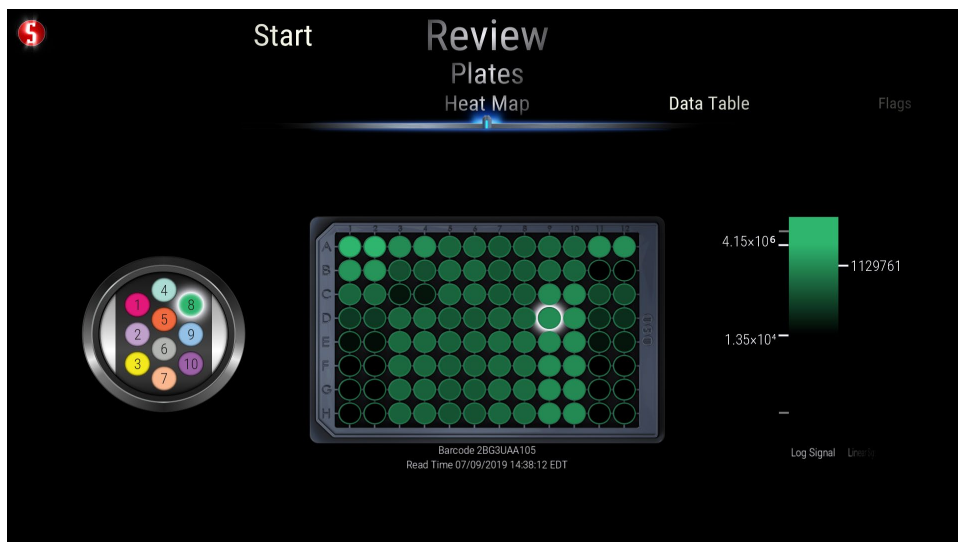
FIGURE 3.20. Methodical Mind plate review heat map with a single spot and well selected.

The ECL data for the selected plate can also be viewed in a tabular format (see Figure 3.21) by selecting *Data Table* in the Horizontal Dial. Plate data are automatically exported according to how the export settings have been configured. See Section 3.5.4 for instructions on configuring the automated export feature.
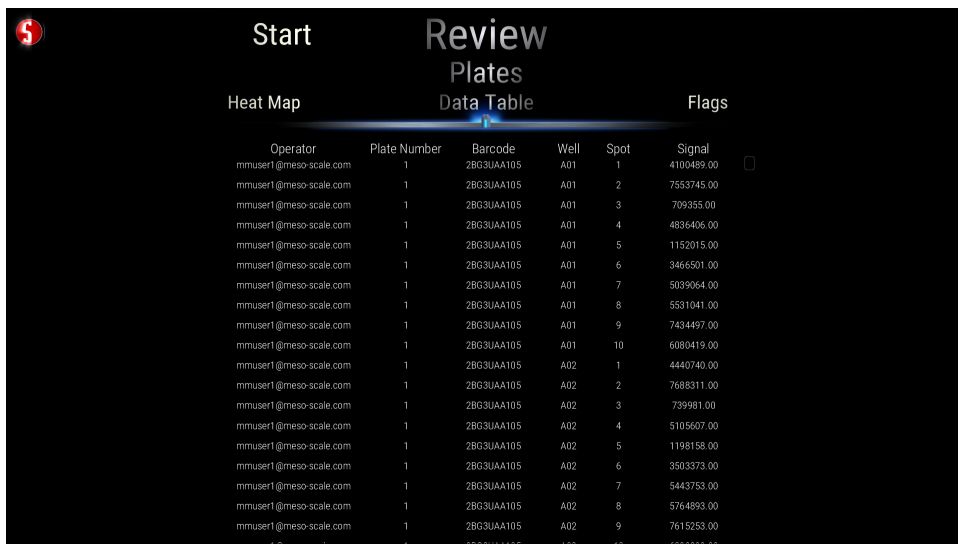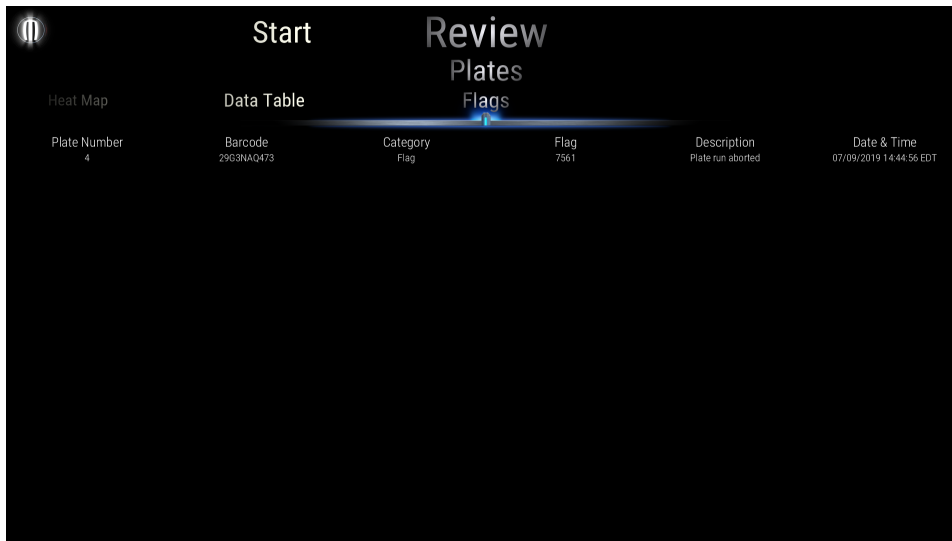
FIGURE 3.21. Methodical Mind plate review data table.

3.4.13 Reviewing and Exporting Run Flags

If issues are detected during the run, run flags are recorded and displayed when reviewing plate data. If flags are present when reviewing plate data, an additional table will be available to the right of the Data Table. Select *Flags* to display this table (Figure 3.22). This information can be exported by selecting *Export Run Flags* from the MesoSphere Menu.

FIGURE 3.22. Methodical Mind plate review flag table.

The reason for the quarantine or error will be displayed when a plate is flagged. Below are potential causes of run flags.

➢ If the plate has expired prior to reading the plate.
➢ If the read was aborted while the read was in process.
➢ If the plate has been quarantined and marked as "Unconfirmed."
➢ If an error occurred during a plate read.

3.5   Additional Software Functions

This section covers additional features and functions available within the Methodical Mind Reader Module, which have not been previously covered.

3.5.1   Reviewing Recent Results

Plate data generated in the last 30 days can be reviewed in the Reader Module by selecting *Review Recent Results* from the Start Step (Figure 3.23). This will open the same plate review screen that is shown when a run completes.
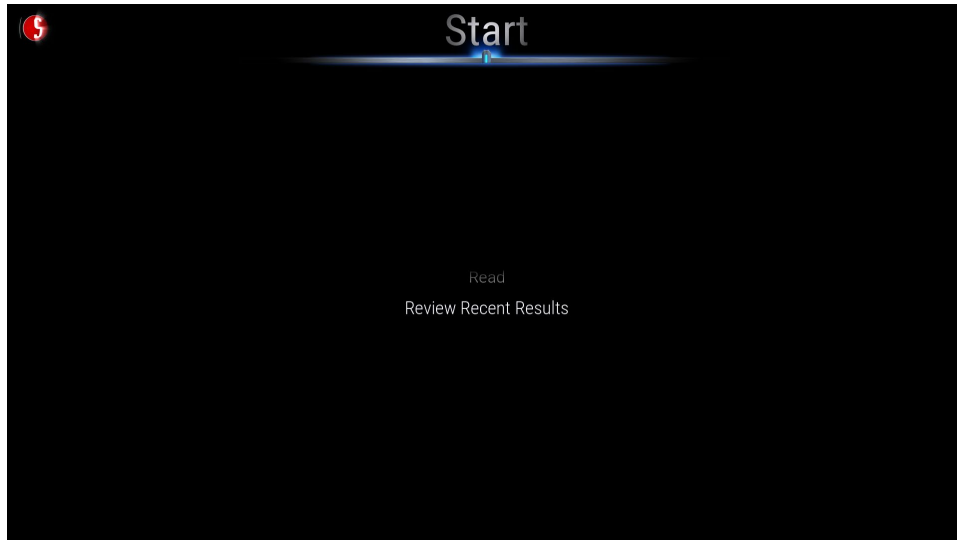
FIGURE 3.23. Methodical Mind Start Step showing Review Recent Results option.
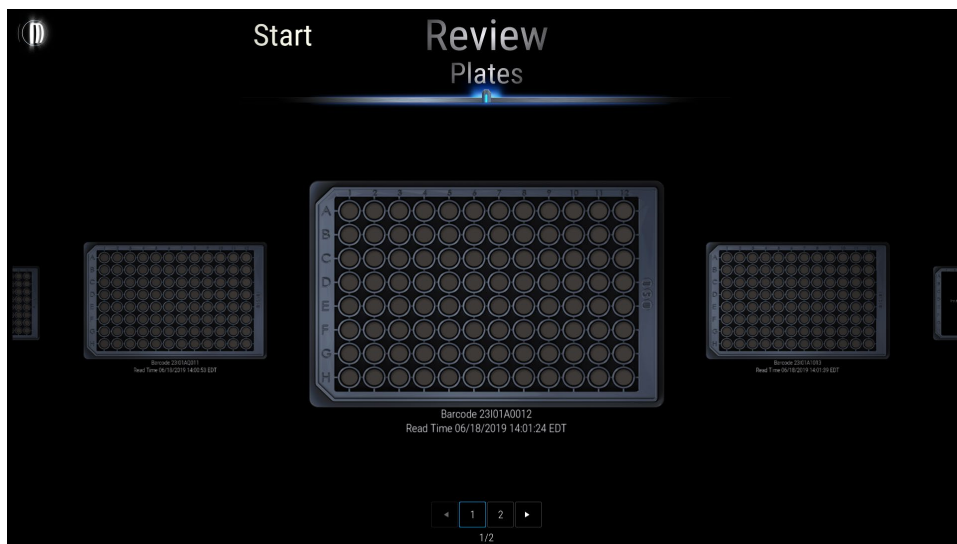
FIGURE 3.24. Methodical Mind review plate data.

3.5.2 Using Methodical Mind without an Internet Connection

Methodical Mind automatically downloads ProductLink information over the internet connection. If ProductLink information for a plate is not available, plate data will be stored, but the plate will be locked with a status of "Unconfirmed." ProductLink information will be downloaded once internet connectivity resumes. ProductLink information can also be downloaded by your Methodical Mind Account Administrator from TeamLink (https://msd.methodicalmind.com/).

To confirm a plate, select *Review Recent Results* and browse to the unconfirmed plate. Tap on the *Check* button shown in Figure 3.25 below, and Methodical Mind will unlock the plate. The plate data can then be reviewed and exported. If a plate cannot be confirmed, contact MSD Scientific Support.
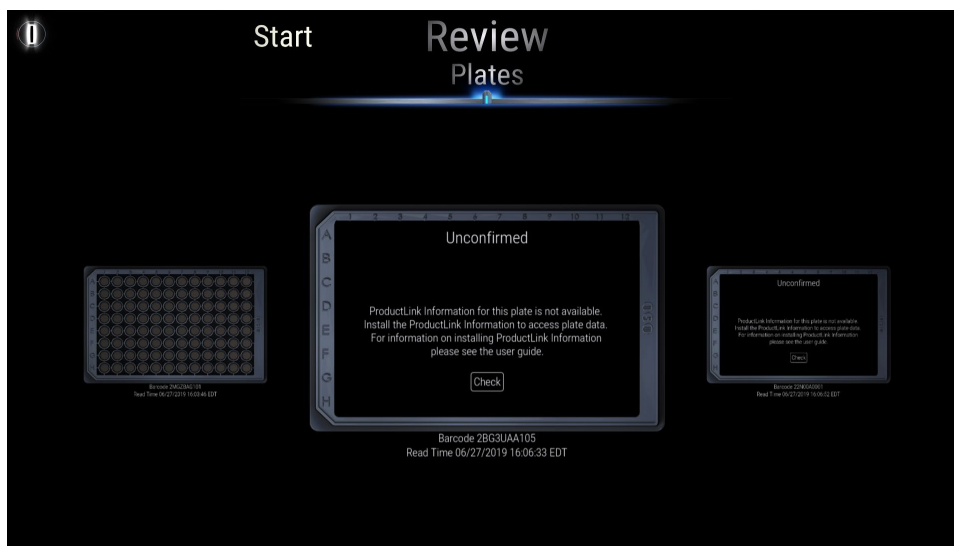
FIGURE 3.25. Review Plates Step showing an unconfirmed plate.

3.5.3 Naming Plate Runs

Plate Runs can be named prior to reading one or more plates to ease the process of finding plate data or plate export files. To name a plate run, select *Set Plate Run Name* in the MesoSphere Menu when on the *Read* Step.
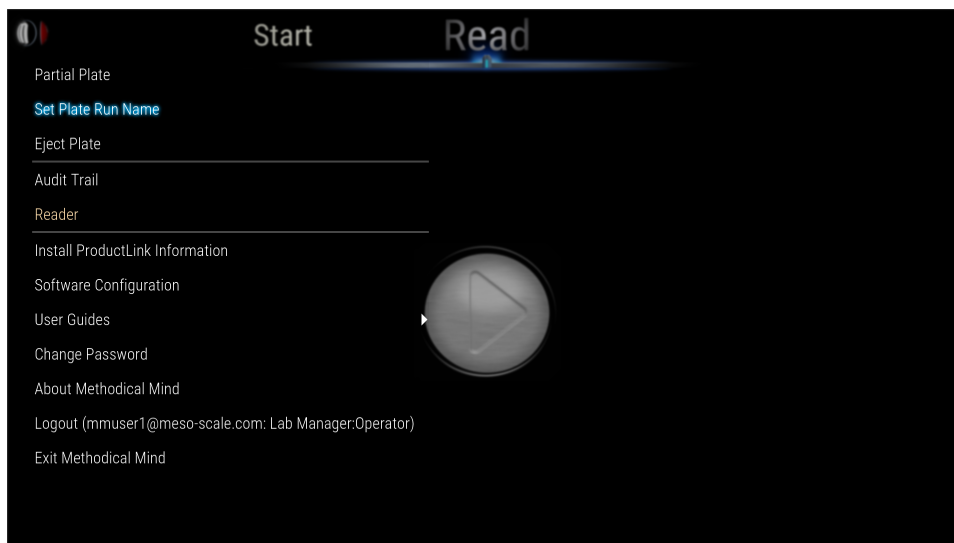
FIGURE 3.26. MesoSphere Menu showing the Set Plate Run Name menu item.

Enter the desired plate run name and tap *OK*.
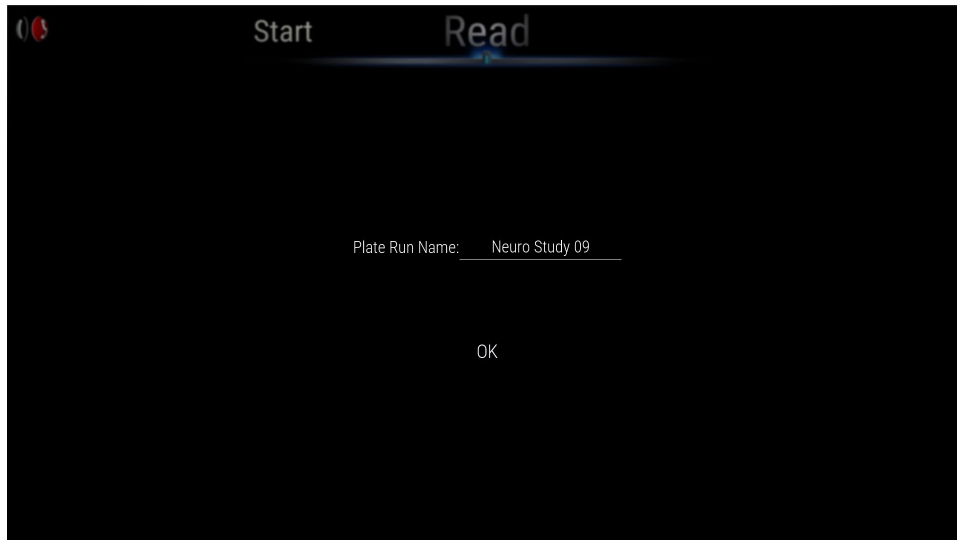
FIGURE 3.27. Plate Run Name field.

3.5.4   Configuring a Partial Plate

Methodical Mind supports reading a partial plate. This feature limits the next plate Read to a single plate; i.e., a User cannot read a stack of plates as Partial Plates. Partial Plate mode must be configured from the Read Step prior to reading the plate. The partial plate feature can be accessed by selecting *Partial Plate* from the MesoSphere Menu.
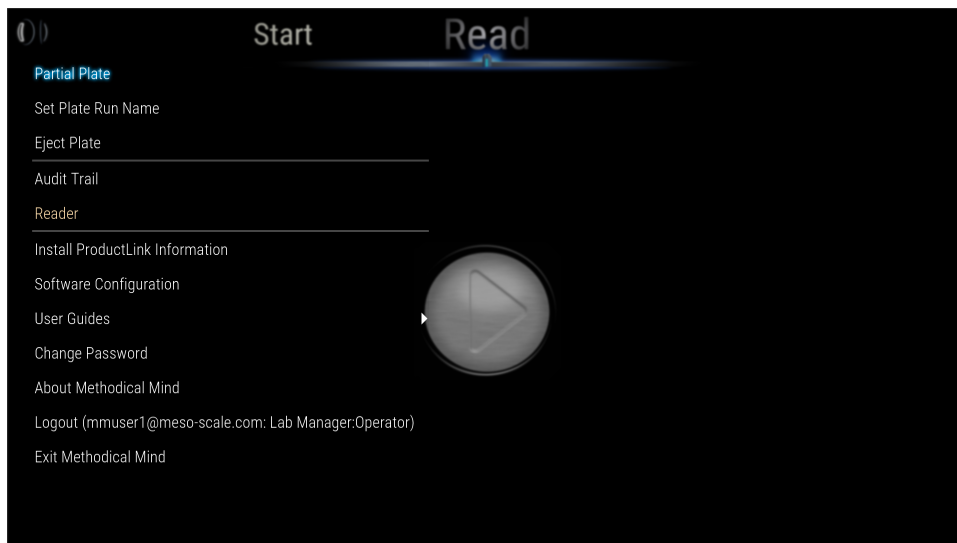
FIGURE 3.28. MesoSphere Menu showing Partial Plate menu item.

By default, all sectors for a given plate will be highlighted. A sector that is highlighted blue will be read, while sectors that are not highlighted will not be read and will be available for use at a later time (Figure 3.29). Tap on a sector to select and deselect it. If a partial plate is configured (i.e., at least one sector is not highlighted), Methodical Mind will set Partial Plate as active for the next plate that will be read.
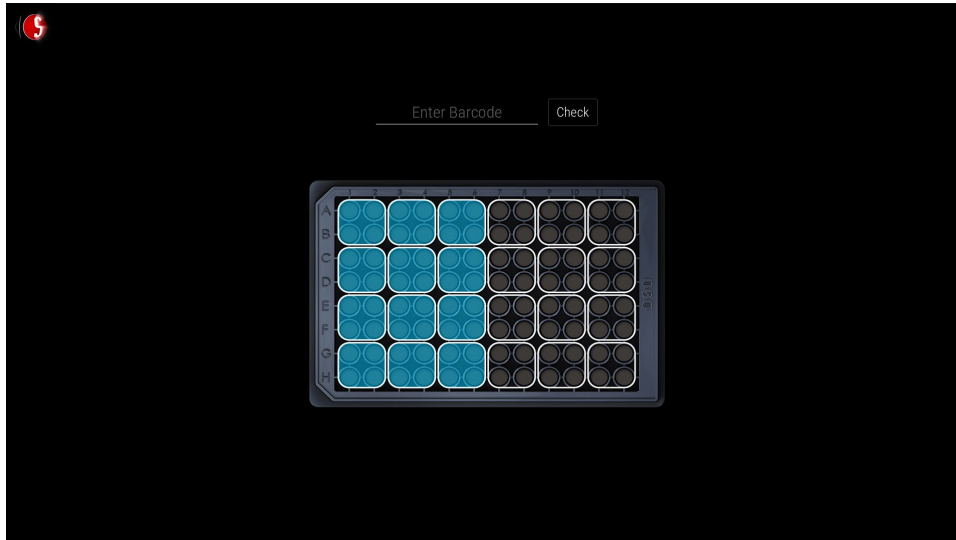
FIGURE 3.29. Partial Plate sector selection.

For plates that have previously been read as partial plates, enter the plate barcode in the field above the plate image in order to verify which sectors are still available to be used. When *Check* is selected, Methodical Mind will look up the plate barcode and update the plate image. As shown in Figure 3.30, sectors that are no longer available will be black.

ⓘ NOTE: Partial plate barcode check does not work across multiple instruments.
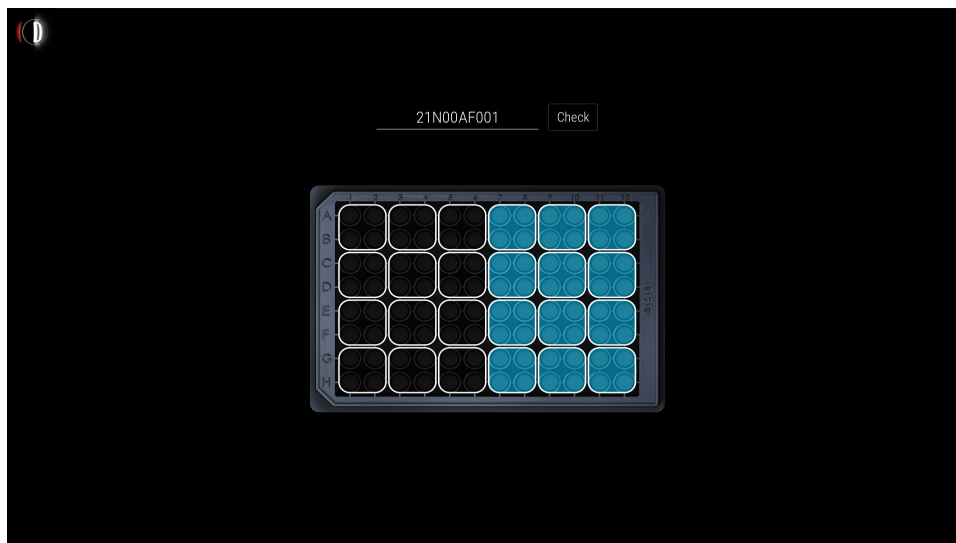
FIGURE 3.30. Partial Plate barcode check.

To save the Partial Plate configuration and return to the *Read* Step, select *Save Partial Plate* from the MesoSphere Menu.
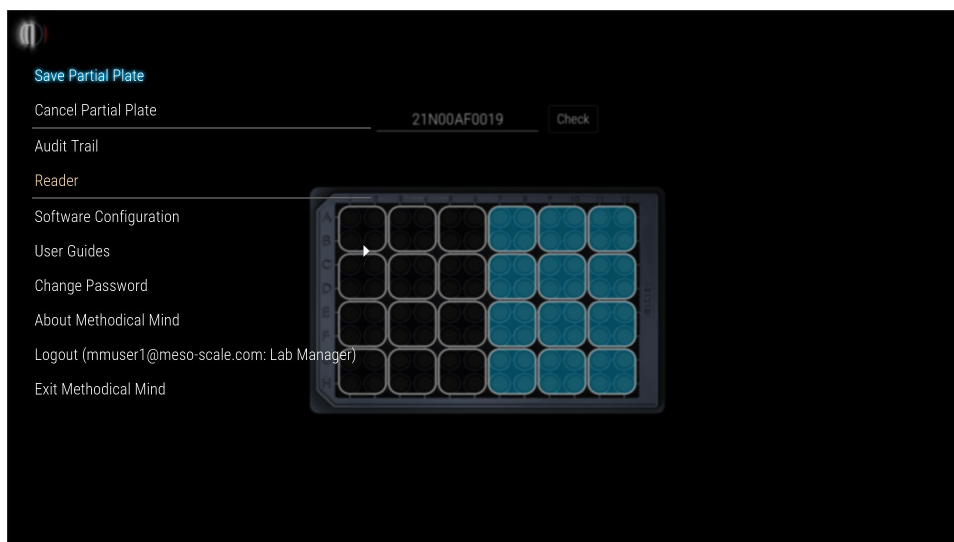
FIGURE 3.31. Exiting the Partial Plate configuration screen.

The Read Step will now be displayed with *Partial Plate Active* displayed above the read button. Tap on the Run button to read the plate.

FIGURE 3.32. Reading a Partial Plate.

ⓘ **NOTE:** Wells on an MSD assay plate cannot be read more than once. Doing so will generate data that should not be used. If a plate is read where sectors have been previously read, Methodical Mind will detect this and the plate will be marked as "Unconfirmed" (Figure 3.33). Contact MSD Scientific Support to unlock the plate in order to review the active sectors. Enter the barcode provided by Scientific Support into the Unlock field to access the data.
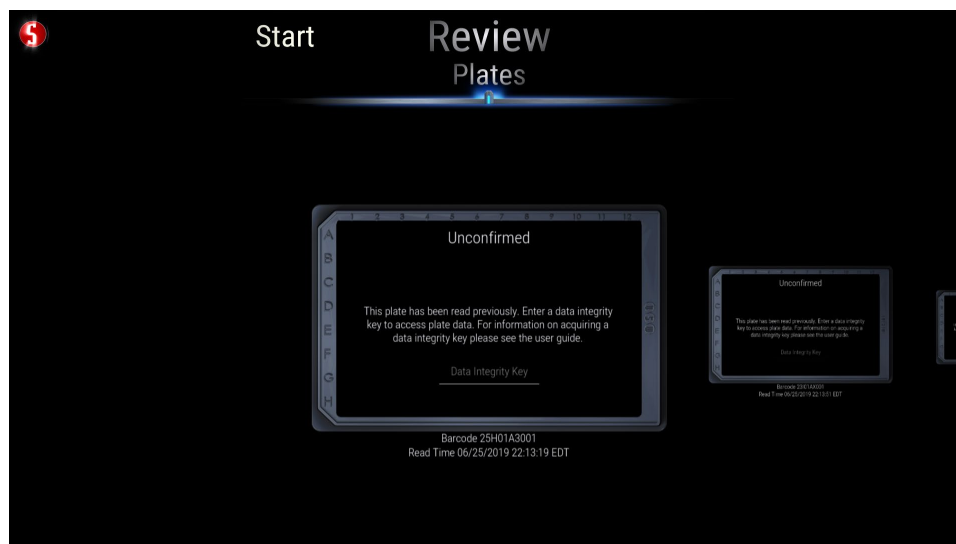
FIGURE 3.33. Unconfirmed Partial Plate.

3.5.5   Running a Stack of Plates

To read a stack of plates, load up to five plates on the input stack. After each plate has been read, Methodical Mind ejects the plate to the output stack and checks for another plate on the input stack. Additional plates can be added to the input stack and removed from the output stack, as long as the input stack or the output stack does not exceed five plates. When Methodical Mind does not find a plate on the input stack, it prompts the User to choose whether to end or continue the run. Load additional plates and select *Continue Run*. When all plates that need to be grouped in a single run have been read, select *End Run*.

3.5.6 Reviewing Audit Trail Events

To review the Audit Trail, select *Audit Trail* from the MesoSphere Menu.

FIGURE 3.34. Audit Trail Module highlighted in the MesoSphere Menu.

The Audit Trail Module shows audited events in a table of Instrument events. All audited events generated by a Methodical Mind instrument will be displayed. Long lists of audit events will be divided across multiple pages. Page number buttons at the bottom of the page allow access to additional pages of audit events.

ⓘ NOTE: Columns can be reordered by dragging them, column widths can be adjusted by dragging the double arrow that appears when hovering between columns, and column content can be sorted by tapping the column header.

FIGURE 3.35. Audit Trail Module showing an example audit log.

The entire audit trail can be exported as a comma-separated values (CSV) file by selecting *Export Audit Trail* from the MesoSphere Menu. Select a folder, enter a file name, and then select *Save*.

Portions of the audit trail can also be copied to the Windows clipboard by selecting *Copy to Clipboard* from the MesoSphere Menu. If rows of the audit trail are selected, only those rows will be copied to the clipboard. If no audit trail entries are selected, the entire visible page of audit events will be copied to the clipboard. This function copies the audit trail entries in a tab-separated format, which enables pasting directly into a spreadsheet.

3.5.7   Changing Teams

While logged in to Methodical Mind, a User who is a member of more than one Team may switch Teams by selecting *Change Team* under the MesoSphere Menu.

3.5.8   Accessing User Guides

Select *User Guides* from the MesoSphere Menu to access the most recent versions of the software and instrument documentation.

3.5.9   Logging Out and Exiting Methodical Mind

Select *Logout* from the MesoSphere Menu to log out of the software without shutting down Methodical Mind. Select *Exit Methodical Mind* to close and shut down Methodical Mind.

3.6   Software Configuration

Multiple configuration options are available in the Reader Module. To access these configuration options, select *Software Configuration* from the MesoSphere Menu (Figure 3.36). This menu option is available from the Start, Read, and Review Steps.

FIGURE 3.36. MesoSphere Menu showing the Software Configuration menu item.

Configuration options accessible in the Reader Module are divided into *Reader* and *System*. *Instrument Configuration*, *Export Configuration*, and *Database Configuration* are accessible under *Reader*. *Login/Logout* is available under *System*.

ⓘ **NOTE:** *System / Login/Logout* and *Reader / Database Configuration* are not visible when logged in with Windows Credentials.

ⓘ **NOTE:** The Methodical Mind User must be granted permission to access *Reader* and *System* settings under *Software Configuration*. If a Step is not visible, it is because the Methodical Mind User has not been granted permissions to modify settings within that feature. Contact your Methodical Mind Account Administrator to have the permissions enabled. Log out and log back in for the software to update accessible settings after permissions have been modified in TeamLink.

To exit Software Configuration and return to the Reader Module, select *Reader* from the MesoSphere Menu.

3.6.1   Enabling Customer Barcodes

If customer barcodes will be added to MSD assay plates, the Methodical Mind software must be configured to read these barcodes. The option to configure long side barcodes is available in *Reader / Instrument Configuration*. Select *Off*, to the right of *Long Side Customer Barcode*, to switch this feature to *On*. The instrument will now read barcodes placed next to the MSD barcodes on the long sides of the plate. See Figure 2.2 for additional information on barcode placement.
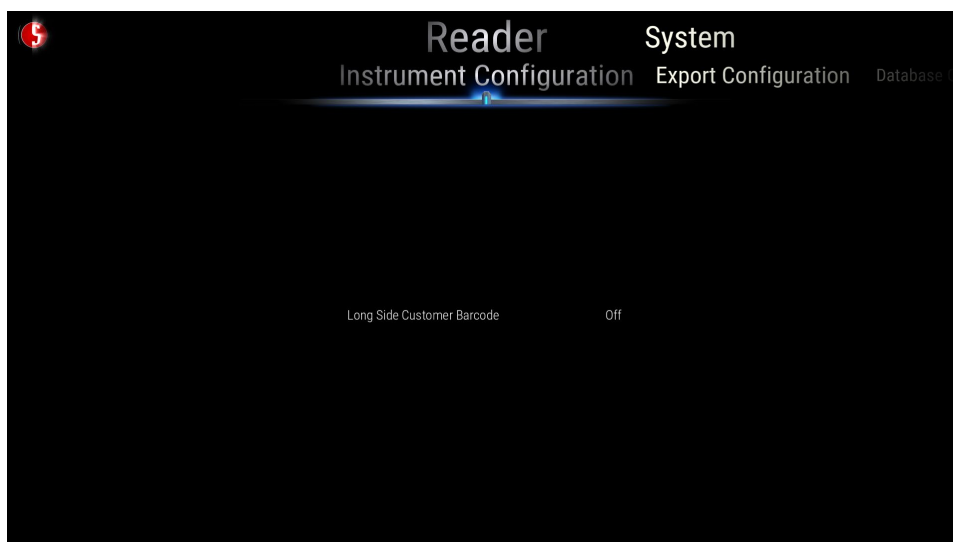
FIGURE 3.37. Instrument-Specific Configuration Options.

3.6.2   Automatic File Export Options

By default, the Methodical Mind Reader Module is configured to export a single standard format data file per run to the C:\ECLResults\ directory. Options to modify the export settings are available in *Reader / Export Configuration*. The export file will be named using the plate barcode and the date and time that the plate was read as follows: *Plate Barcode_Read Date and Time.txt*.
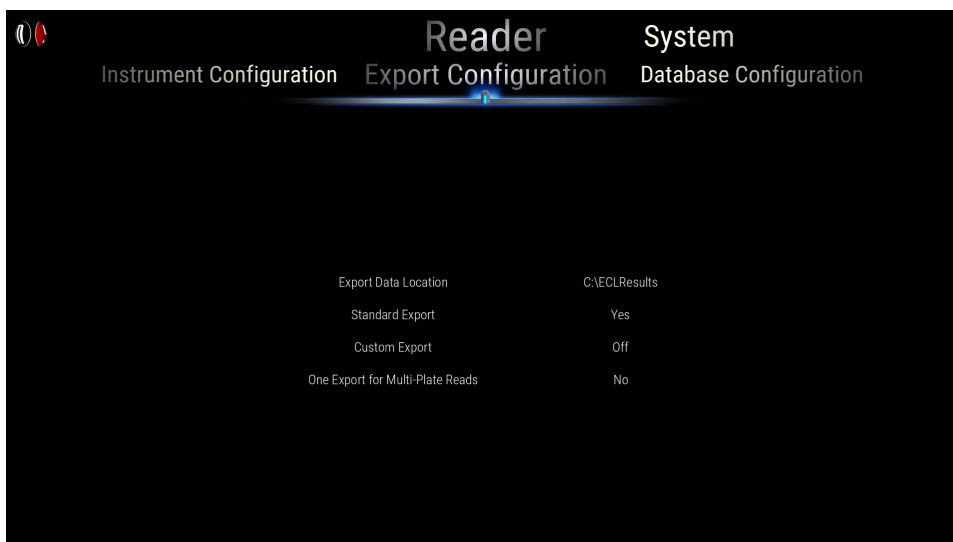
FIGURE 3.38. File Export Configuration.

The following options can be modified:

- ➢ *Export Data Location*: The Export Data Location can be changed to a different local or network directory using either the drive letter in the path or by using the Universal Naming Convention (UNC). Select the currently defined path and browse to the desired directory or enter the new path.

- ➢ *Standard Export*: The Standard Export format is compatible with DISCOVERY WORKBENCH 4.0 and can be imported into the DISCOVERY WORKBENCH 4.0 desktop application. To disable this feature, select *Yes* to switch it to *No*.

- ➢ *Custom Export*: To enable integration with systems using older DISCOVERY WORKBENCH file formats, Methodical Mind supports the DISCOVERY WORKBENCH 3.0 format. Select *Off* to the right of Custom Export and select MSD_3_0_format from the wheel of Custom Export options. Export files can be customized to match custom export files from DISCOVERY WORKBENCH by copying the CXF file from the DISCOVERY WORKBENCH system to the C:\Program Files (x86)\Methodical Mind\data\customexport\ directory.

- ➢ *One Export for Multi-Plate Reads*: By default, Methodical Mind creates one export file for each plate in a run. Alternatively, a file can be created for the entire run. To have the software create one file per run, change this option from *No* to *Yes*.

3.6.3 Database Configuration

Options to backup, restore, and erase the Methodical Mind Reader Module's database, stored on the local instrument computer system, are available in *Reader / Database Configuration*.
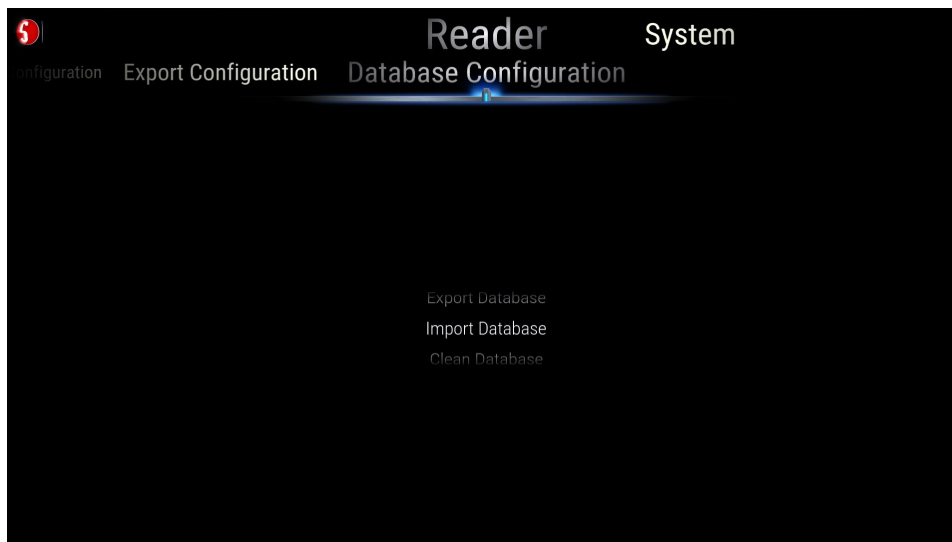
FIGURE 3.39. Database Configuration options.

The following database actions can be taken:

- ➢ *Export Database*: Selecting this option allows the User to create a database backup file. After selecting *Export Database*, select the location to create the database backup file. The file will be named with the name "Export" and the date and time.

- ➢ *Import Database*: Selecting this option allows the User to select a previously exported database and restore that database to the instrument computer.

- ➢ *Clean Database*: Selecting this option allows the User to erase the database on the instrument's computer.

ⓘ NOTE: Importing and cleaning a database overwrites the existing database. These actions require elevated administrator privileges. To run Methodical Mind with elevated privileges, log in to the Windows operating system as an administrator and then right-click on the Methodical Mind desktop icon and select *Run as Administrator*.

3.6.4 Login/Logout Options

Two options for configuring how Users log in to and out of Methodical Mind are available in *System* / *Login/Logout*.
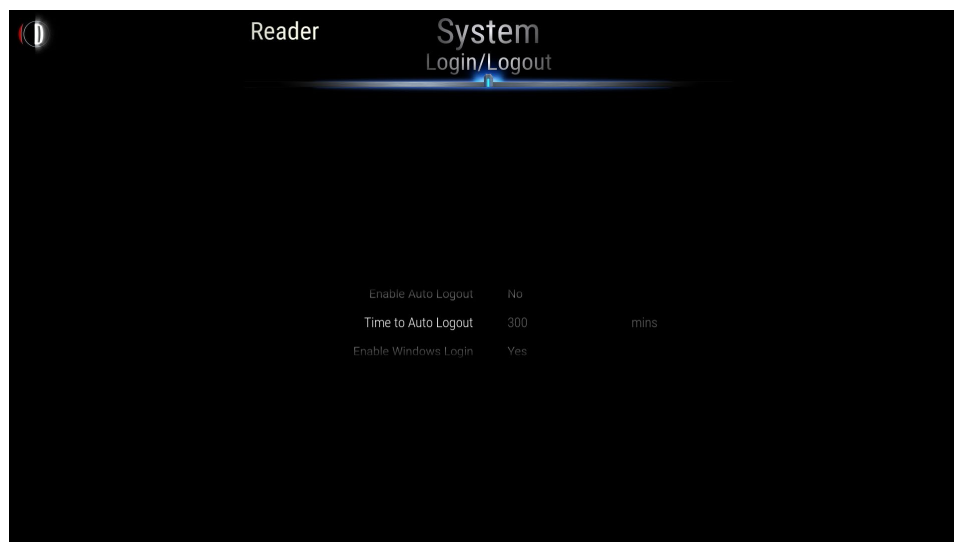
FIGURE 3.40. Login/Logout options.

➢ *Auto Logout*: By default, the option to automatically log the User out is disabled. When enabled, after the user-defined period of inactivity has passed, the User will be logged out and returned to Start. To enable the Auto Logout feature, select *No* and it will change to *Yes*. When set to *Yes*, the *Time to Auto Logout* option will be available. Select *Time to Auto Logout* and enter the period of inactivity that must occur before the User is automatically logged out of Methodical Mind.

ⓘ **NOTE:** Methodical Mind's *Auto Logout* feature operates independently of Windows settings. Windows settings lock the operating system and will not affect the behavior of the Methodical Mind *Auto Logout* feature.

➢ *Enable Windows Login*: By default, Users can log in with Windows or Methodical Mind Credentials. Disable Windows Login to ensure Users always log in with Methodical Mind Credentials. Select *Yes* and it will change to *No*.

3.6.5 Disabling the Virtual Keyboard

The Methodical Mind Reader module has a virtual keyboard for users who wish to use the touch screen to type in information. By default, the virtual keyboard is enabled. The virtual keyboard is displayed whenever a text entry field is selected. It can be temporarily disabled by tapping the hide key, located in the bottom left corner of this keyboard (Figure 3.41).

FIGURE 3.41. The built-in virtual keyboard displayed at the bottom of the screen.

The option for disabling the virtual keyboard is available in *System / Login/Logout*. To disable the virtual keyboard, change *Yes* to *No* for the *Show Virtual Keyboard* option (Figure 3.42).
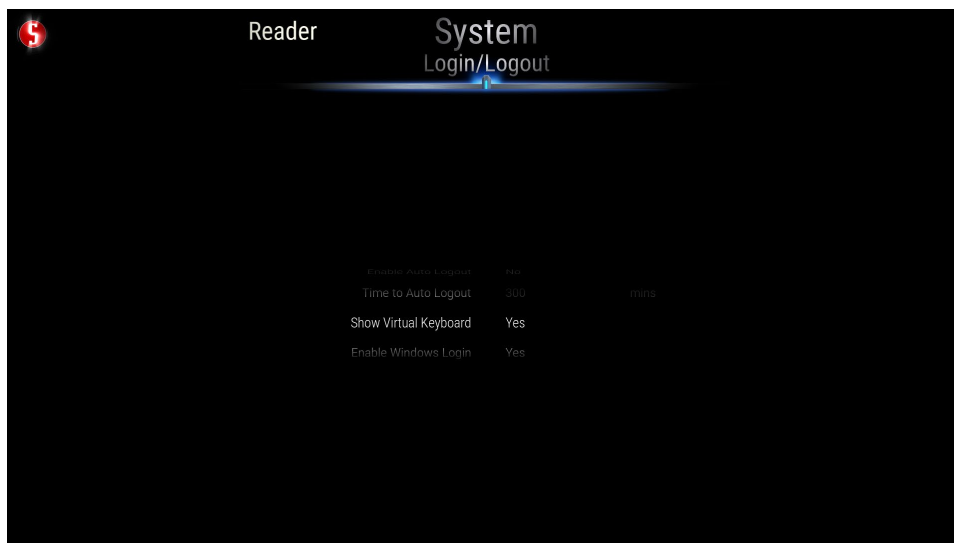

FIGURE 3.42. Show Virtual Keyboard option.

3.6.6 Enabling Two-Factor Authentication (2FA)

Two-factor authentication provides enhanced security by forcing Users to enter a unique code in addition to their Methodical Mind username and password. This unique code is generated by the *Google Authenticator* application on Users' smart phones or tablets. This ensures that even if an unauthorized person attempts to utilize the password of an authorized User, TeamLink and the Methodical Mind software cannot be used without access to the User's authentication code. For organizations that wish to force Methodical Mind Users to use two-factor authentication in the Methodical Mind Reader module, a Methodical Mind Account Administrator will need to log in to TeamLink (https://msd.methodicalmind.com/) and select *Configure 2FA* from TeamLink's MesoSphere Menu. TeamLink will prompt the Account Administrator to enter his/her password again before selecting 2FA options. First, select *Enforce 2FA on Login* and then select *Enforce 2FA on Instruments* (Figure 3.43). When *OK* is selected, an email will be sent to all Methodical Mind Users notifying them of the new login requirement.

ⓘ NOTE: If personal electronic devices, such as smart phones, are not permitted in the laboratory, select *Enforce 2FA on Login*, but leave *Enforce 2FA on Instruments* unchecked. Doing this will require 2FA for other Methodical Mind modules, but not for the Methodical Mind Reader module.
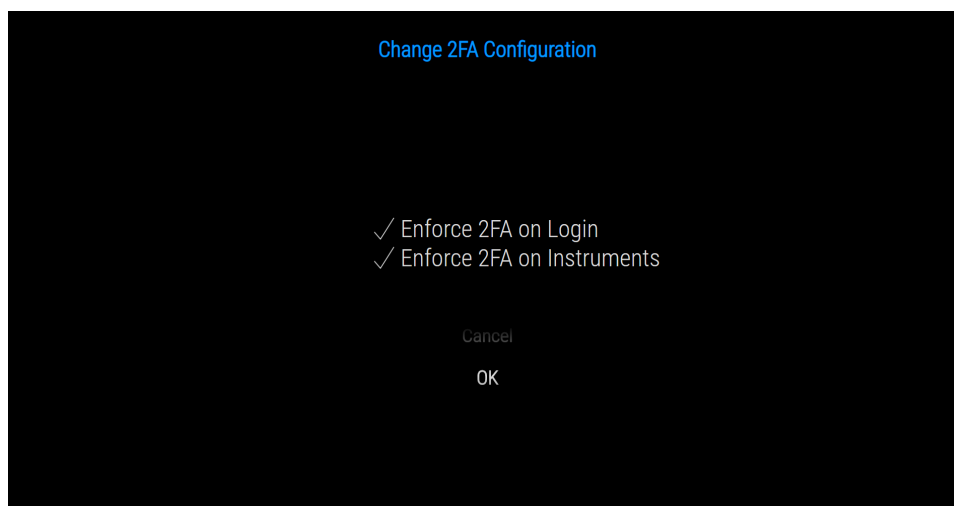

FIGURE 3.43. Enabling 2FA in TeamLink.

4   Maintenance

This chapter provides information on maintenance for the MESO QuickPlex SQ 120MM system. The MESO QuickPlex SQ 120MM has been designed to require minimal maintenance. A qualified MSD service engineer should perform all maintenance procedures that are not categorized as user maintenance items.

4.1   User Maintenance

User maintenance of the MESO QuickPlex SQ 120MM system is minimal and mainly consists of keeping the outside of the instrument clean along with basic maintenance of the MESO QuickPlex SQ 120MM computer.

Inspect the instrument before and after each use to ensure that there is no debris (liquid, dirt, plastic items, etc.) on or near the input and output stacks. Clean the instrument when needed as described below.

4.1.1   Computer Maintenance

Perform periodic maintenance on the computer when the instrument is not in use. This includes discarding unneeded files and ensuring that there is adequate disk space on the computer. Use the Windows built-in Disk Cleanup feature to remove unneeded files.

4.1.2   Performance Qualification

A Performance Qualification Kit—containing plates, reagents, and a protocol for verifying instrument performance—is available for purchase (MSD catalog number R31QQ-3). MSD Scientific Support can provide more details on the performance qualification kit.

4.1.3   Cleaning and Exterior Decontamination

Any outside surfaces of the MESO QuickPlex SQ 120MM instrument, accessible regions of the input and output stacks, and stacker elevator can be cleaned in the event of a fluid spill onto the instrument, or for general cleanliness. Power to the instrument must be disconnected before cleaning.

Acceptable cleaning solutions include water, 70% ethanol, 1% bleach in water, or a mild detergent. Choose a cleaning solvent that is appropriate for the nature of the spill. Lint-free cleaning wipes are recommended. Please follow all safety protocols for your facility.

If chemical reagents are spilled inside the light-tight enclosure, contact MSD Instrument Service for instructions.

4.2   Preventive Maintenance

MSD recommends preventive maintenance by an MSD instrument service engineer at least once per year for the MESO QuickPlex SQ 120MM. Only MSD instrument service engineers should perform standard preventive maintenance, which includes cleaning and lubricating all appropriate internal components. Service contracts are available through MSD.

5 Appendix

5.1 Specifications

5.1.1 MESO QuickPlex SQ 120MM Instrument Specifications

All performance information given below, including standard signal levels, detection limits, dynamic range, and instrument noise, is based on 150 µL read volumes in 96-well MULTI-ARRAY plates using standard plate read parameters.

TABLE 5.1. Instrument Specifications.

Scientific Performance	
Dynamic Range	$>10^5$
Electronic Noise	
Standard Deviation of Dark Noise (one spot plates)	0–16 counts
Read Times	
96-well SECTOR plate (singleplex and multiplex)	1 minute, 30 seconds per plate
96-well QuickPlex plate (singleplex and multiplex)	2 minutes, 45 seconds per plate
Read Volume	
96-well MULTI-ARRAY and MULTI-SPOT Plates	150 µL
Environmental Specifications	
Operational Temperature Range	20–26 °C (68–78.8 °F)
Operational Humidity Range	10%–80% relative humidity (non-condensing)
Storage Conditions	-18–50 °C (0–122 °F) at 85 % relative humidity (non-condensing)
Ambient Light	<2,000 lux with no exposure to direct sunlight
Altitude	<6,500 ft (2,000 m)
Power Requirements	
Voltage	100–240 V~ 50/60 Hz
Power Consumption (instrument)	155 W max.
Power Consumption (system)	350 W max. for the instrument, laptop, and UPS
Physical Dimensions	
Instrument Size (W x D x H)	13 in x 23 in x 21 in (33 cm x 58 cm x 53 cm)
System Size (W x D x H)	A minimum of 30 in x 30 in x 22 in (76 cm x 76 cm x 56 cm) should be available for the instrument, power supply, UPS, and laptop.
Instrument Weight	44.5 lb (20.2 kg)
System Weight	~67–82 lb (30–37 kg) depending upon UPS configuration
Customer Barcode Compatibility	
Code 39, Code 128	Minimum line width: 7 mils

5.1.2 MSD Plate Barcode Label Specification

MSD plate barcode labels conform to ISO/IEC 16388, Information technology – Automatic identification and data capture techniques – Code 39 bar code symbology specification.

6   Technical Support

MSD provides excellent and timely support for all authorized users of the MESO QuickPlex SQ 120MM. We welcome and carefully consider all bug reports and suggestions for improvements to future versions. We will work with you to resolve any problems you may encounter.

6.1   Bug Reports and Suggestions

Please send comments or feedback on the software, including bug reports, unresolved error codes, feature requests, or design change requests to MSD Scientific Support at scientificsupport@mesoscale.com.

6.2   How to Contact Us

Meso Scale Diagnostics, LLC. company headquarters is located at:

> 1601 Research Boulevard
> Rockville, Maryland 20850 USA
> +1 240-314-2600

Our website is www.mesoscale.com.

Customer Service	Scientific Support	Instrument Service
+1 240-314-2795	+1 240-314-2798	+1 301-947-2057
customerservice@mesoscale.com	scientificsupport@mesoscale.com	instrumentservice@mesoscale.com

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Hours of Operation: 5:00 AM to 8:00 PM, Monday – Friday, U.S. Eastern Time

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