PeelPlate® Colony Counter

Operator's Manual:
Peel Plate® Colony Counter

Introduction

Charm Peel Plate Colony Counter is used for counting bacterial colonies on developed Peel Plate tests. The counter should not be used with other types of microbial plates.

The 1mL Peel Plate tests: Aerobic Count (AC); Coliform Count (CC) and the cultured dairy form (CC-CD); *E. coli*/coliform (EC) and the cultured dairy form (EC-CD); Enterobacteriaceae (EB) and the cultured dairy form (EB-CD); Heterotrophic Count (HET); *Staphylococcus aureus* (SA) and Yeast and Mold (YM); are supported by the Colony Counter. All 5mL Peel Plate tests (CC, EC, EB, YM) are supported in upgraded Colony Counter model, Peel Plate Colony Counter II.

Plates are placed in plate nest; Peel Plate Type is selected from a drop down list of test types and associated test matrices. Count is initiated by pressing **Count Plate** button. An image of the test is displayed with the total count. When colony color is taken into account, as with Peel Plate EC, a blue and red count differentiates between coliforms and generic *E. coli*. The image may be enlarged and count edited and commented by the user. Count, and or edited count, is accepted when a new plate count is initiated or upon exiting the counting mode. Date, time, and optional information, such as dilution, operator, and notes are stored in memory. The screen is reviewable with associated image, and exportable as .CSV file.

Background images are used as a reference and can be preprogrammed for each Peel Plate type and matrix. These reference images can be added or updated by the administrator for plate counting accuracy.

The Peel Plate Colony Counter is programmed to identify larger colonies as spreaders and to alert a user to manually count a plate to verify result.

Software Version 6.0

TOUCH SCREEN Simple Menu Selection

POWER BUTTON Touch Screen Computer

PLATE NEST

TOGGLE SWITCH Lights Plate Nest and powers fan

USB PORT Insert USB or other External Storage Device to copy files and archive data.

USB PORT Real-time print or bar code scanner options.

ETHERNET Onboard Ethernet for real-time downloading of test results into SQL database.

BACKSIDE

WEBER SCIENTIFIC

Table of Contents

General Features

- The Peel Plate Colony Counter is an all-in-one camera and computer using Windows 10 operating system. When used in kiosk mode, users are provided access to the Peel Plate Colony Counter software program only. The unit is both touch screen and wireless touch pad/keyboard operated. On start-up the Colony Counter automatically loads the Peel Plate Colony Counter program.

Figure 1: <u>Count</u> screen seen at operator login
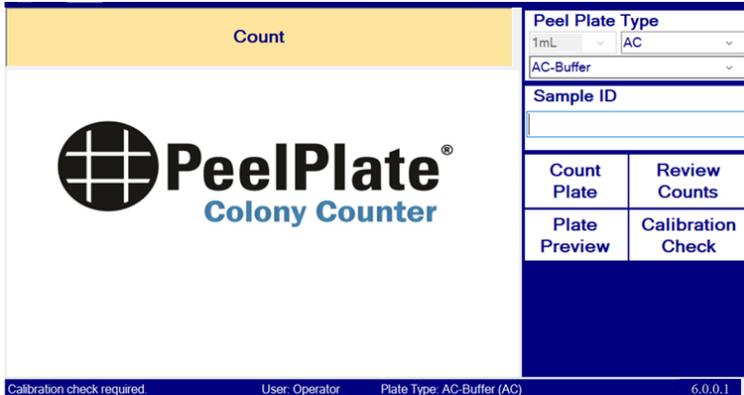
Figure 2: Administrator login level showing <u>Count</u> screen. <u>Config</u>, <u>Image</u>, <u>Colonies</u>, and <u>Admin</u> screen options appear to the right of the selected <u>Count</u> screen.

- Two login levels:
  - Operator (shows **Count** tab, Figure 1)
  - Administrator (shows **Count**, **Config**, **Image**, **Colonies** and **Admin** tabs, (Figure 2).
  - The user is shown in bottom tool bar and may be changed by mouse touch. (Figure 26)
- The specific tab opened at the Admin level has a dark blue background with light font while the other available tabs have a light background with dark font.

- Sample ID may be forced to be entered before a count is initiated. Sample ID may also be assigned a number that increments +1 each time. Sample ID may also be entered by bar code scan from a wand or automatically populated using a 2D QR-Code on the plate. Refer to **Admin Tab;** user customizations (p. 17)

- Data are stored as raw images, counted images and .CSV files. Counts may be reviewed by operators (page 15). Results with associated images appear on the screen. Counts and images can be exported by the administrator only unless otherwise enabled. See Output Location options on the **Config** tab. (p. 24)

- Calibration Check is required on power-up and daily thereafter. Calibration features include: a 24 hour lock out feature that can be password overridden, and a customizable feature that requires a calibration check after a specified number of samples.

- Peel Plate Types with matrix background images are factory loaded according to the user customizations when purchased. The administrator may add additional tests (Peel Plate Type- matrix) and create background images from rehydrated blank plates. Refer to **Create New Peel Plate Type** section and **Import New test Matrix**, (p 22)

- If the reader count average does not compare within 10% of visual count average, contact Charm Sciences. Additional precision adjustments and specific product set-ups are done with assistance of Charm representatives using Administrator access.

- Data files for copying, exporting and archiving are accessed at the administrator level from the **Review Counts** button, (p. 15), and the **Config tab**, (p. 21)

Initial Setup and Quick-Start Guide

The Colony Counter may be configured with user specified customizations at the time of purchase. These include user logins and passwords and specific test type and matrix calibrations.

Refer to Peel Plate Colony Counter QUICK START GUIDE to add new users, assign authorization levels, and to delete default administrator login. The guide also describes basic Counter operations.

Start-Up
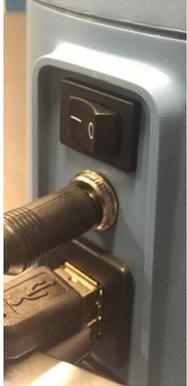
 Figure 3 **Figure 4** **Figure 5**	• Connect 19V power cord to low voltage supply connector and optional bar code scanner to USB hub in the back of the Counter. (Figure 3) • Toggle power switch on back of the Counter, (Figure 3), to power up light source, fan and screen display, which automatically launches program. • Power up wireless keyboard/track pad by switching Power button ON (Figure 4). Alternatively, a touch screen keyboard may be activated, see Administrator Access, **Admin** Tab.

Figure 6
	• Computer powers up and starts Peel Plate Colony Counter program.
	• Program prompts for **Username** and **Password,** (Figure 6). Press any button on keyboard to activate keyboard and then enter login information.
	• Following Quick-start guide, the default Administrator login is:
	    ○ **Username**: Admin
	    ○ **Password**: Charm (case sensitive)
	• Press OK
	• If the Login is cancelled, the Counter reverts to the log in window, (Figure 6)**.**
	• Default operator login is:
	    ○ **Username**: Operator
	    ○ **Password**: Charm (case sensitive)
	• The unit may contain custom logins if requested in advance.
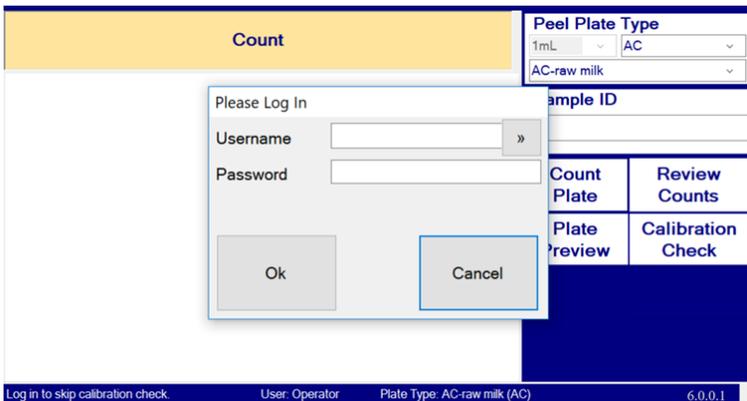
Power Down

Power down the screen by pressing the front blue power button before turning off toggle switch in back of the Counter.

- TURN OFF POWER TO THE KEYBOARD AND MOUSE (FIGURE 4).
- PRESS THE BLUE POWER BUTTON (FIGURE 5) ON FRONT OF UNIT.
- **WAIT FOR THE SCREEN TO POWER DOWN AND THE BLUE POWER LIGHT TO TURN OFF, THEN POWER OFF THE TOGGLE SWITCH** (FIGURE 3) IN BACK OF THE UNIT.

Calibration Check Window

Upon login, a pop-up window stating, "Calibration check required Check now?" appears, requiring a YES or NO response.

1. **Following Quick-start Guide**, an administrator, after login, may select "**No"** for the purpose of adding users and changing set up options on the **Admin** or **Config** tabs.
2. After initial set-up and in order to perform a count, a user, (administrator or operator), must select "**Yes"** and successfully complete a **Calibration Check**. The **Counter will not count plates without completing a successful calibration check.** This may be overridden for each test using Admin login.

Initial Set-up Continued

1. Click on **Admin Tab** (pictured below) to add users and change passwords and authorization level. Refer to page 18, Figure 28.

2. After adding users, click on the Admin user name and **change password**.
3. On completion of this set-up, either power down and restart, or click on User (middle of the bottom tool bar, (Figure 26 page 17) to change the operator, refer to "**Changing Between Operator and Administrator Level"**. Enter user and password. Press OK.
4. If Calibration window does not appear, press the "**Calibration Check"** button.
5. Daily Count Routine comprises the following manual sections:
   a. Daily Calibration Check (page 6)
   b. Count
      i. STEP 1- Select Peel Plate Type (page 8)
      ii. STEP 2- Enter Sample ID and Count Plate (page 9)
      iii. Processed Image (page 9)
      iv. STEP 3- Accept/Count (page 10)
   c. Image Check and Edit (page 12)
   d. Review Counts (page 15)

Calibration Check

Calibration Check is used to verify that Colony Counter is performing within specification. A successful Calibration Check consists of a **Valid** Low Calibration, and a **Valid** High Calibration test.

1. Each time Peel Plate Colony Counter is powered on, a **Calibration Check** is required
2. Every 24 hours a **Calibration Check** is required
3. A **Calibration Check** can be programmed to be required after a predetermined number of tests. This number is factory set at 100 tests, however it can be changed on the **Config** tab. See Cal Check limit. (p. 21)

Calibration Plates

Calibration plates are plastic plates used for calibration only. They should be kept clean; (free from dirt and product samples), and stored in their original container in a safe location near the counter. Calibration Plates should only be used in the calibration mode to verify the Counter camera and light settings. During a Calibration Check no settings adjustments are made. Calibration plates are interchangeable between Counters. The Low calibrator must read 4 or less colonies and High Calibrator must read the average value ± 5%.
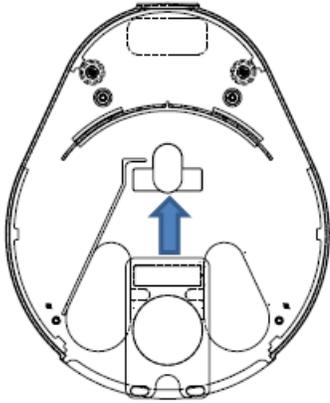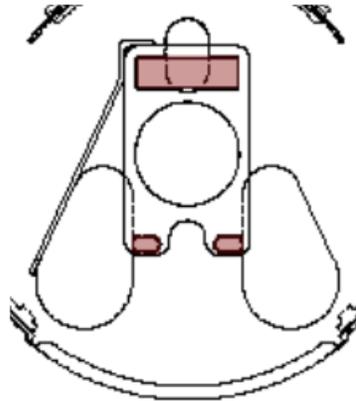
Figure 7:	**Figure 8:**	**Daily Calibration Check** • Upon start-up or upon pressing the calibration check button, reply **Yes** to the calibration window. • As prompted, place the Low Calibrator in the plate nest. • Slide the Calibrator plate into position, Figure 7, gridded side up, with the rectangle in front. • Seat Calibrator in the recessed notches called the Plate Nest. (Figure 8) • Press **OK** to start the low calibrator analysis. • If **VALID**, remove the Low Calibrator Plate and replace with the High Calibrator plate and press OK. (Figure 9)

Figure 7:

Figure 8:

Daily Calibration Check

- Upon start-up or upon pressing the calibration check button, reply **Yes** to the calibration window.
- As prompted, place the Low Calibrator in the plate nest.
- Slide the Calibrator plate into position, Figure 7, gridded side up, with the rectangle in front.
- Seat Calibrator in the recessed notches called the Plate Nest. (Figure 8)
- Press **OK** to start the low calibrator analysis.
- If **VALID**, remove the Low Calibrator Plate and replace with the High Calibrator plate and press OK. (Figure 9)

Count

Calibration Check

Place high 1mL calibration plate in plate nest.

Low Calibration Check: **VALID**

Maximum Limit: 4
Actual Count: 0

OK

Peel Plate Type
1mL — CAL
Calibrate
Sample ID
Low Calibrator 1mL

Accept / Count	Review Counts
Plate Preview	Calibration Check

Low Calibrator 1mL

Calibrate

0

Calibration check in progress.   User: Operator   Plate Type: Calibrate (CAL)   6.0.0.1

Figure 9

If the Low calibrator plate count is 4 or less, the Colony Counter accepts the count as **VALID**. If the count is above 4, the Low Calibration Plate is **INVALID.** Clean the Low Calibrator Plate with a dry cloth. Place it back in position in the plate nest and repeat the Calibration Check. If still **INVALID** contact Charm Sciences.

*Note that Figure 9 has only the **Count** tab appearing at top of screen because the logged in User is an Operator. If logged in as an administrator, **Count**, **Config**, **Image**, **Colonies**, and **Admin** tabs will appear at the top of screen and the open tab appears with a dark blue shaded background.
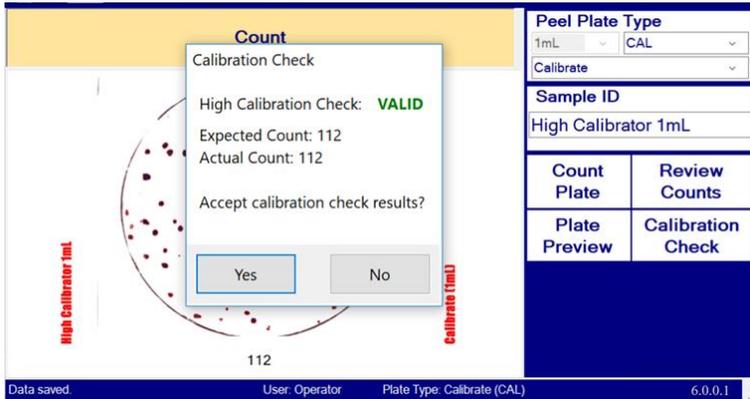
Figure 10

- With a **VALID** Low Calibration count, insert the High Calibration plate into the plate nest, then press OK to count the plate.

- An image of the High Calibrator plate and count appears, (Figure 10). If the count is within 5% of the count listed on the plate, the Colony Counter accepts the count as **VALID** and user is prompted to accept the count.

- Press **Yes** to accept result and return to **Count** tab. Press **No** to cancel calibration check routine. Results are stored in memory. A valid calibration check must be completed and accepted before counting test plates.

  Note: if Yes button is pressed hard, the screen could advance to the plate preview screen, Figure 20. Press Exit Zoom button to go back to count screen.

If the count is outside the acceptable range, the Colony Counter shows the High Calibrator **INVALID.** Clean High Calibrator Plate to remove any dust with a dry cloth. Repeat **Calibration Check**. If still **INVALID** contact Charm Sciences.

Count (Operator Level Access)

After pressing "**YES"** to a successful calibration check, the counter returns to the last Peel Plate Type-matrix used at last shut down. An optional pop-up menu may appear prompting Peel Plate Type Lot# and Expiration. (Figure 11). This is an option controlled by the administrator and may be opted out, see **Admin Tab User Customizations** (p. 17).

Change Settings?

These are the current Lot Number and Expiration Date settings for AC plates.
To change these settings, enter new values, and press OK.
To keep current settings, press Cancel.

Lot Number
`01B-058`

Expiration Date (DDMMMYYYY)
`01APR2017`

OK

Cancel

Figure 11

Update information and press **OK**. The **Count** Tab is now active for use. A user at the Operator Level has access to the **Count** tab only. This allows the user to select from a drop down menu of pre-programmed Peel Plate Types and matrices. Operators may also edit counts before storing, reviewing counts, and printing results. Creating a new Peel Plate Type and matrix requires administrative level access. (p. 22-23)
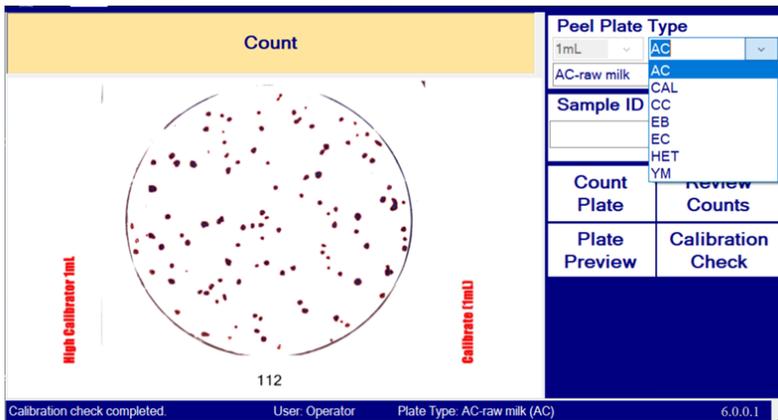
Figure 12A
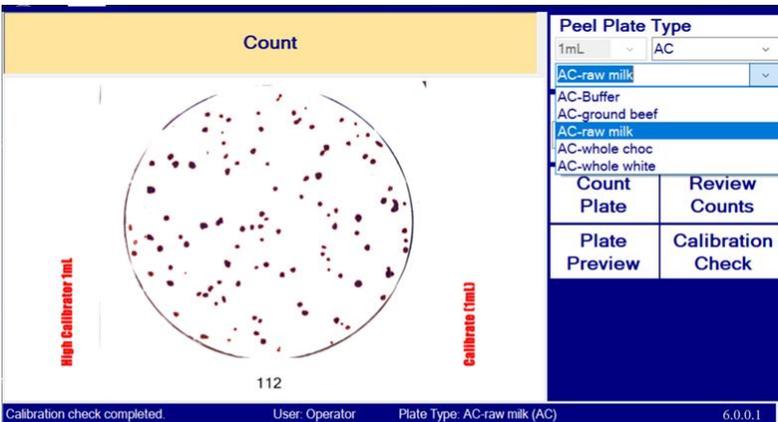
Figure 12B

STEP 1– Select Peel Plate Type

- Peel Plate Type is a selection of the test type and matrix for counting. The default test shown is the one last performed before shut down, start up, or calibration check.

- To change the **Peel Plate Type** press one of the three drop down boxes in the Peel Plate Type Window.

Peel Plate Type

1mL AC

AC-raw milk

1. The 1mL window with grey font indicates the window is inactive and that the counter is for 1mL Peel Plates and does not support the 5mL Peel Plate types.
2. Selecting the arrow in the top right box provides a list of available plate types. (Figure 12A)
3. Selecting the arrow in the bottom box provides a list of calibrated sample matrices available within the Peel Plate type selection see (Figure 12B)
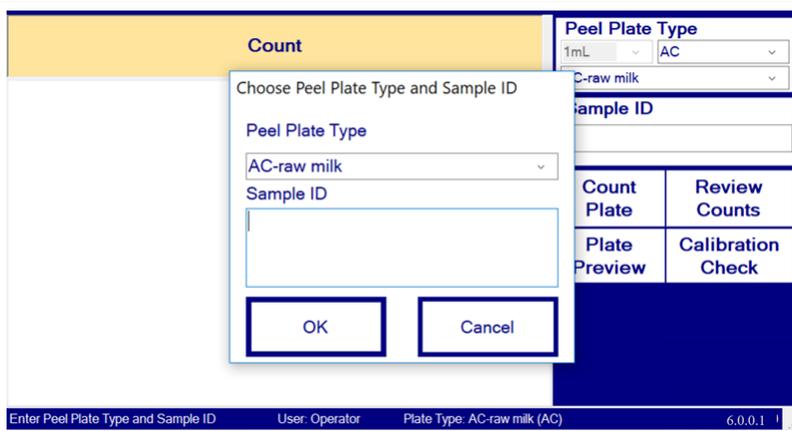
Figure 13

STEP 2- Enter Sample ID

- Place the test plate clear side up into plate nest.
- Enter **Sample ID*** or scan barcode ID.

Press **Count Plate** button to begin count.

*With **Forced Sample Entry** option enabled from **Admin** tab, see page 18, if no Sample ID is entered and **Count Plate** button is pressed, a pop up window appears. (Figure 13). Sample ID may be entered by keyboard or scanned using an external USB bar code scanner, see Bar Code Options. (p. 19) Alternatively, place a 2D barcode type QR-Code in specified corners of Peel Plate to auto-populate Sample ID by pressing **Count Plate** button; refer to Bar Code Reading (p. 19)
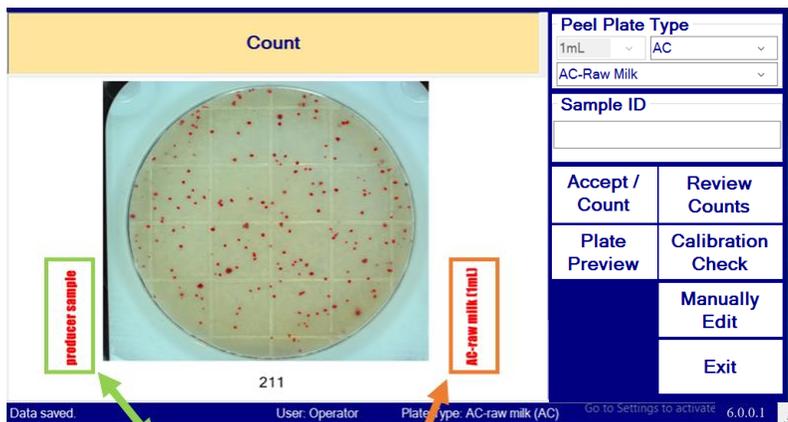
Sample ID associated with the image after the count

Peel Plate type and matrix associated with image

Figure 14

Processed Image

- Processed image of the Plate appears on successful count. (Figure 14)

  Note: Sample ID appears in red font on the lower left of the image (green text box) and Peel Plate Type appears in red font on lower right side of image (orange text box).

Figure 15A

Figure 15B

- When 'Allow Results Override' is selected on the Admin tab, the table of information to the right of the image is editable. (Figure 15A) If this feature is not enabled tap the image and the menu will appear.
- Dilution factor can be changed from a drop-down list or selected and overwritten, see Figure 15A
- The Peel Plate lot number and expiration date can be documented or edited if necessary. Notes can be typed, or default notes added using the customizable drop down list. Contact Charm Sciences to customize the pre-written notes.
- Press **Accept Edits** to finalize changes and enter results into memory.
- If no changes are needed, press **No Edits** and the edit table to right of photo closes.

Note: After selecting No Edits (Figure 15A), the Manual Edit button (Figure 15B) appears on the screen and can call up the edit table shown (Figure 15A),if edits become necessary after selecting No Edits.
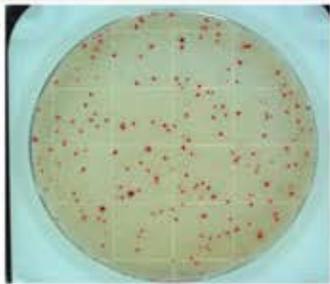
STEP 3- Accept / Count

- If the count is correct, place a new test plate in the plate nest.
- Enter new **Sample ID** and select the **Peel Plate Type** if different from the prior plate. Press **Accept/Count** (Figure 15B).
- Image and result of the previously counted plate is permanently stored in the memory while the count of the next plate begins. No edits to the previous test can occur after pressing the **Accept/Count** button.
- The count, the number of spreaders, (if applicable), and CFU/mL-g based on previous dilution entry, are automatically populated with each count. These may be edited only <u>before</u> the **Accept/Count** button is pressed.

Counts with an E preceding the count, counting convention and rounding.

If count is above or below the test type maximum count (countable range*), an E (for Estimate) appears in front of count to indicate that the count is considered an approximation. (Figure 16A) The count ranges that trigger the E are determined by microbial convention and are programmed in the "Maximum Count" field on the **Config** tab under the Admin account login. (Figure 16B)
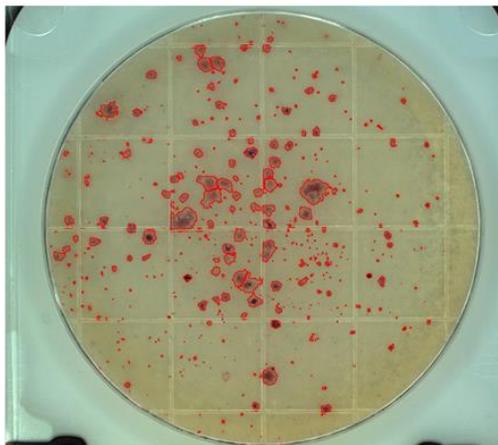
Figure 16A

Figure 16B

If the count exceeds this programmable number, a pop-up message appears "Count exceeds maximum allowable count". Press OK. For best results, the user should insert a plate of the next lower dilution, or a plate with a number of colonies within the countable range. If the counter can discriminate colonies higher than the maximum count, it appears as an estimate preceded by an E.

If zero colonies are detected, the counter displays the result as <1.   If a dilution is selected for that test, the count is multiplied by the dilution in the CFU/g-mL calculation. For example, a <1 coliform count with a dilution factor of 10 is calculated as <10 CFU/g-mL.

If colonies are detected as larger than the maximum allowable size, they are scored as spreader colonies. When spreader colonies are detected the counter prompts for a manual count and scores the count as MC. The user must manually count the plate and overwrite the MC with the actual plate count.

If plates are overgrown with colonies, or contain spreader colonies, or the counter cannot distinguish colonies, the plate is considered TNTC (Too Numerous To Count).   The "Count exceeds maximum allowable count" message appears with a "> (Maximum count result)"; for example, the maximum allowable count for coliform (according to the test plate Operator Manual) is 154, so the results are reported as >154. For AC tests using dairy products, the maximum allowable count (per FDA 2400 and the test plate Operator Manual) is 250, so the result is reported as >250.

FDA microbial count reporting requires rounding CFU/plate to 2 significant figures. When the count is above 100 and the third digit is a 5, the second digit will round up when the number is even. Under the same circumstances, the second digit will round down when the number is odd. For example, a count of 135 is reported as 130. A count of 185 is reported as 190. Rounding is activated on the **Admin** tab, see **Admin** section (p. 18). With this feature activated, manual count entries are also rounded.

*While the reader is accurate to visual counts higher than 1000, the countable range refers to FDA-BAM microbiological convention: 25 to 250 aerobic cfu/plate for dairy, 30 to 300 for meat, and 1 to 154 coliform cfu/plate. When outside these ranges, the next serial dilution is recommended for quantifying bacteria.
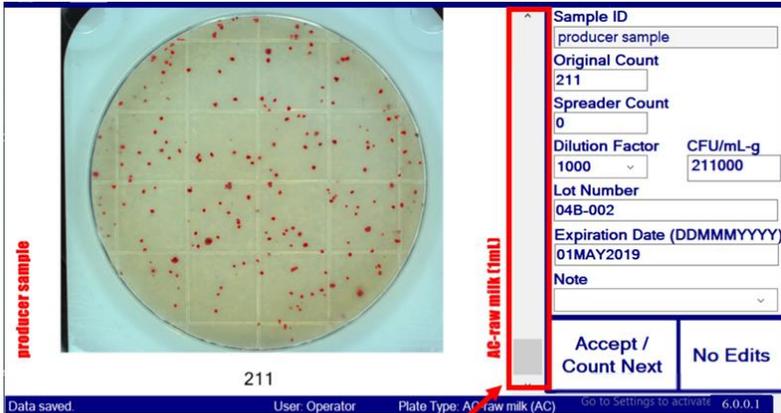
Figure 17A Sample information table as it appears with **Accept/Count Next** button when forced sample ID is checked. If forced sample ID is not checked the button appears as **Accept Edits** as shown in Figure 15 see **Admin**-Tab User Customizations.
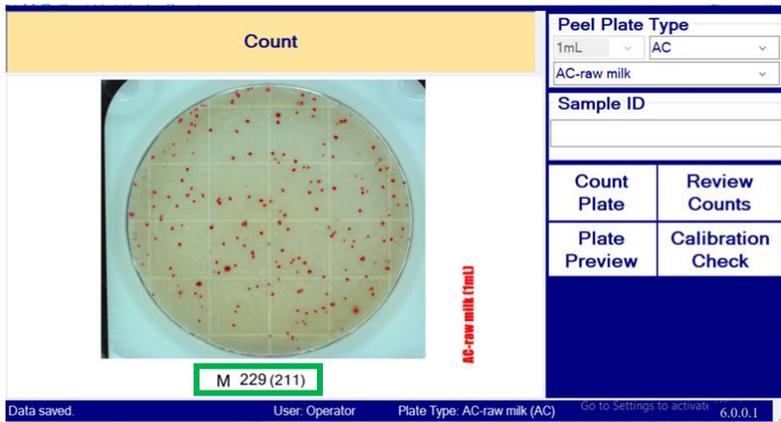
Figure 17B

Image Check and Edit

- To visually check colonies and edit sample information after a count, touch or mouse click the counted image to pull up manual edit table (Figure 15). A zoom bar to the right of the image is displayed. (Figure 17A)
- The Magnification bar to right of the image, shown in red box, can be used to magnify the image. Touch the magnification bar, or use the mouse, and drag bar upward and release to enlarge the image.
- When the image is enlarged beyond screen boundaries, <u>double</u> click the mouse on a colony to center that region or drag and release the mouse, or drag and release touch screen, to move image position.
- Images show counted colonies circled with a fine red line, while *E. coli*/coliform counted colonies are circled with a fine red (coliform) or blue (*E. coli*) line.
- The Count, Spreader Count, Dilution Factor, Peel Plate Lot#, Expiration, and notes can be overwritten. (CFU/mL-g is auto-calculated (count x dilution)). Press **Accept Edits** to save the changes permanently. For example, the original count is 211 (Figure 17A), then overwritten with count of 229, (Figure 17B), when **Accept Edits** is pressed. The count appears on the screen and in record as M 229 (211) with CFU/mL-g recalculated. When "Allow Results Override" is enabled, and **Accept/Count Next** is pressed, the data cannot be edited and a new count is initiated without showing Figure 17B.
- Press "**No Edits**," if there are no changes, and to exit screen and return to **Count** Tab. The **Manually Edit** button appears in the **Count** Tab (Figure 15B), which still allows editing before pressing "**Accept/Count Next**."
- Manually entered counts appear with an M in front of the count followed by original Colony Counter count in parentheses. (Figure 17B)
- For EC counts, if blue or red colonies are edited, the total count automatically adjusts. If total count is edited, and red or blue are not adjusted appropriately, the counter prompts that the sum of red and blue are not equal, and to make the adjustment.

  * Sample edit table can also be displayed on every count by an administrator selecting **Allow Results Override** button on **Admin** tab. See **Admin** tab-User Customizations section. (p. 18)
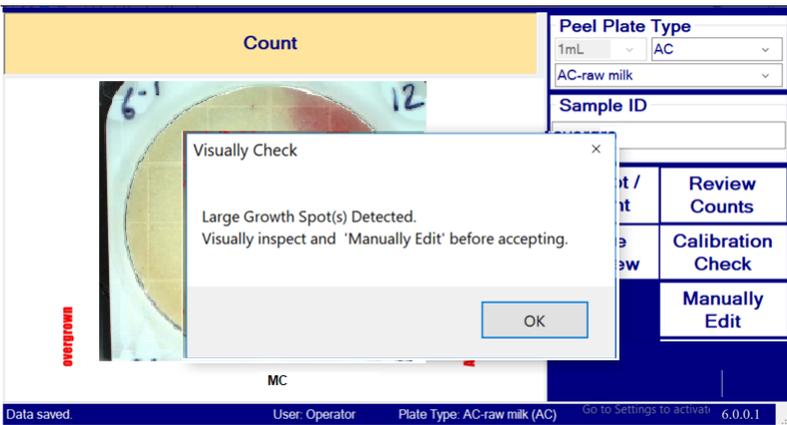
Figure 18
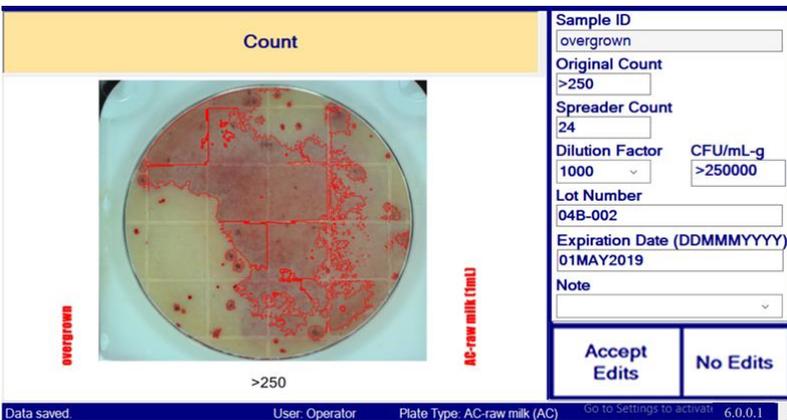
Figure 19

Large Growth Spot Detected

- Large Growth Spots are caused by spreader organisms, or overgrown plates with colonies merging together. This triggers an alert to visually inspect, and to manually edit the plate count. (Figure 18).

- The number of colonies that exceed the programmed channel maximum size automatically populates in the Spreader Count in "Edit Table"

- The Counter is alerting the user that it could be misinterpreting edges of a spreader as multiple colonies, or missing multiple colonies inside of a spreader colony.

- The pop-up alert is requiring user's visual assessment and the count appears as MC (manual count).

- In the following situations the counter displays the Large Growth Spot Detected message, and assigns a greater than channel maximum count, for example >250 for an AC dairy channel; When the plate is overgrown with poor colony distinction, TNTC*, the counter has difficulty distinguishing colonies, or plate is very dark.

- Click **OK** to close the message.

- The table shown in Figure 19 appears when manual edits is enabled, or a counted image is selected. Make any desired edits and click the **Accept Edits** button to finalize edits. In case of TNTC, >max count x dilution =CFU/mL-g.

*TNTC by microbial convention means Too Numerous to Count. In this case, TNTC means that the counter could not count the plate and a maximum count has been assigned. This may mean that the plate has many small colonies, but it could also be because of large spreading colonies, or a dark background. A visual determination of the plate must be performed to confirm if it is greater than max count or if there is another reason plate is uncountable. Regardless of number of colonies, if the counter detects and discriminates colonies without large colony spreaders, the counter will estimate a count, even if greater than maximum, and display the count with an E in front of the number.

Stability of Developed plates

The Peel Plate Colony Counter is optimized to read plate results at the completion of the recommended incubation time for each test. 24 hours for EC, EB, and CC tests, 24-48 hours for SA test, 48 hours for AC test, 3-5 days for YM test, and 5-7 days for HET test. Plates may be stored frozen after incubating and are stable for 1 week or longer. CC tests and EC test colonies darken over time. This darkening can potentially cause erroneous readings as plates age.
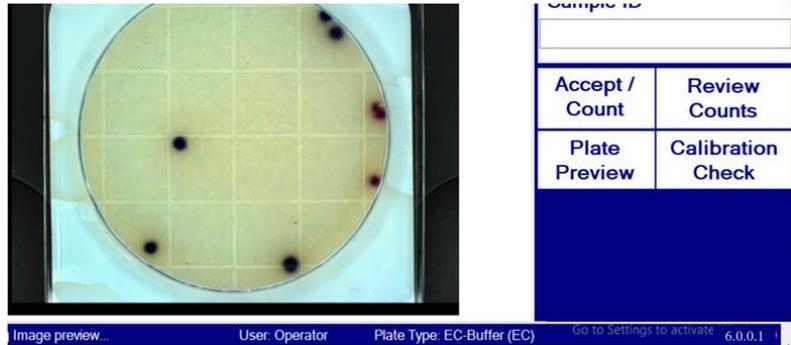
Figure 20
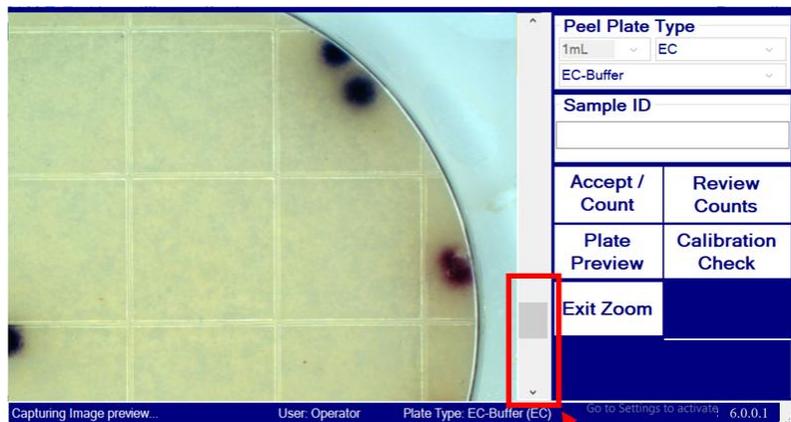
Figure 21

Plate Preview

- Pressing the **Plate Preview** button shows an image of plate without performing a count. (Figure 20)

- Touching, or mouse clicking, on plate preview image of Figure 20, generates a zoom (amplifying) bar. (Figure 21)

  Note: If force sample entry option is checked a sample ID must be entered to zoom.

- Zoom bar may be slid up or down to enlarge section of the image. The mouse or touch screen may center different areas of the picture. Drag and release to move the image or double click on colonies to center that portion of image.

- Press **Exit Zoom** button to return to **Count** tab.

Review Counts

Results are reviewable by an operator and administrator on a daily, weekly, and monthly basis by pressing **Review Counts** button. The operator may review results on screen, while administrator may also copy records to an external memory device after password prompt.

Figure 22

- From count screen press **Review Counts** button. (Figure 20)
- Review Record screen, (Figure 22) allows the user (operator or administrator) to view previous data.
- The counted image of most recent test appears on the screen in a spreadsheet with date, Peel Plate Type, sample ID, count, dilution, and CFU/g-mL appearing in the scrolling table.
- Selecting a data point (row) in spreadsheet displays image of that plate count. For example, image shown in Figure 22 is from the data shown and selected in blue shaded row. This shows a spreader colony triggered a MC from the counter and the operator entering a 35 as the manual count.
- The results can be filtered using **DAY, WEEK, MONTH,** and **ALL** buttons.
- **PREV** and **NEXT** buttons move to next or previous interval, i.e. day, week, or month.
- **ALL** button displays a preview of all data in memory
- Scroll bars in grey on bottom and right of data, if table screen is full, allow viewing of complete data set.
- The **Print Current** button will send the specific sample information in the table to a printer (if enabled and connected) or the **Print All** button sends the filtered sample set, **Day**, **Week, Month** or **All,** to an external printer.
- Press **Exit** to return to previous tab.

Figure 23

Copying Results

- The counter default settings are programmed such that only an administrator may copy files to a memory device. When **Copy Files to Output*** is pressed, (Figure 22) user is prompted to enter administrator username and password. (Figure 23)
- Pressing Cancel reverts to previous username or may require the user to re-log in.

*Note: USB memory device only with administrator password is the default setting of the Counter. Counter may be configured for operators to copy files or, with assistance of company IT, for unit to operate as a domain user and to send this information to a network drive with or without the administrator password and with the option of sending photos. See Archive and Output Location, (p. 23, 24)

Figure 24

- Enter an administrator login and password and press **OK** button to begin copy process to external memory device.
- A task bar appears to show files saving and the level of completion.
- Depending on number of results, copying files may take 20 minutes or longer, (Figure 24)
- If no memory drive is detected or memory capacity or write-to folder permission are insufficient, a message appears **Copy Failed. No memory device detected or not enough memory available in device**.

Figure 25

- When data are successfully copied to external storage device a message indicating name of folder and successful transfer appears. (Figure 25)
- Press **OK** to return to Review records screen.
- Press **Exit** button to return to Count Screen.

Successfully copied files include log.txt, .CSV containing data and links to JPG images associated with each test, and individual .jpg images. For each result a raw image and a processed counted image are copied. All test results are exported as one .csv file and copied onto external storage device. See Archiving for info on creating a new .csv file.

The exported .CSV file contains data and hyperlinks to raw and processed images. The file may be edited and saved as an .xlsx Excel file type to maintain image hyperlinks. Click on hyperlink to open stored images.

Date	Time	PeelPlateType	SampleID	PlateType	Count	RedCount	BlueCount	User	Note	Error	CountImage	RawImage	LotNumber	xpirationDa	CFUPermL	erialNumb	ilutionFacto
1/31/2017	12:48:00	EB-Rinse	chicken 3 neat	EB	86	0	0	Charm			chicken 3 neat Count 2017-01-31 12.48.00.jpg	iicken 3 neat Raw 2017-01-31 12.48.00.jp	9	31-Jan-18	86	PPCC-	1
1/31/2017	12:46:11	EB-Rinse	chicken 3	EB	12	0	0	Charm			chicken 3 Count 2017-01-31 12.46.11.jpg	chicken 3 Raw 2017-01-31 12.46.11.jpg	9	31-Jan-18	120	PPCC-	10

Administrator Access

Administrator access allows lot number and expiration date entry of Peel Plate types, date and time change, new Peel Plate Type and matrix creation, data archive, creation of new usernames and passwords, change of access levels, and feature/message customization. The default administrator login is:

Username: Admin

Password: Charm (case sensitive).

On first time login, a new administrator name and password should be created and default Username: **Admin password should be changed for security purposes**.

Changing Between Operator and Administrator Level
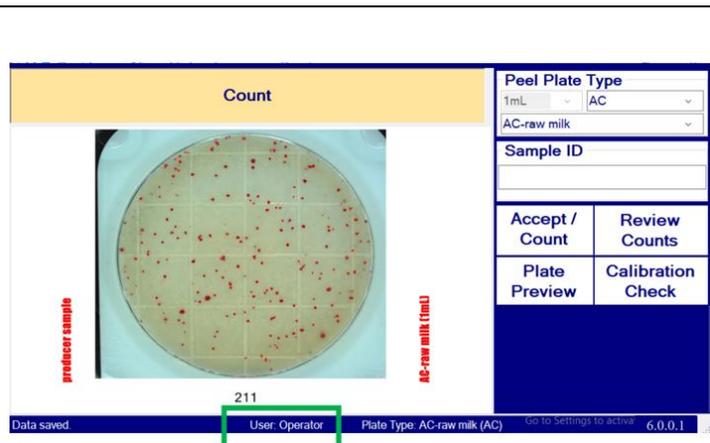
Figure 26

- To change operators or change to administrator, mouse click or tap on User: text in the center of the lower status bar noted by the green box of Figure 26.

The Log In pop up window prompts for new username and password. See above for details on logging in as an administrator. On successful Admin login, Five tabs are presented to the user:

Admin Tab-User Customizations
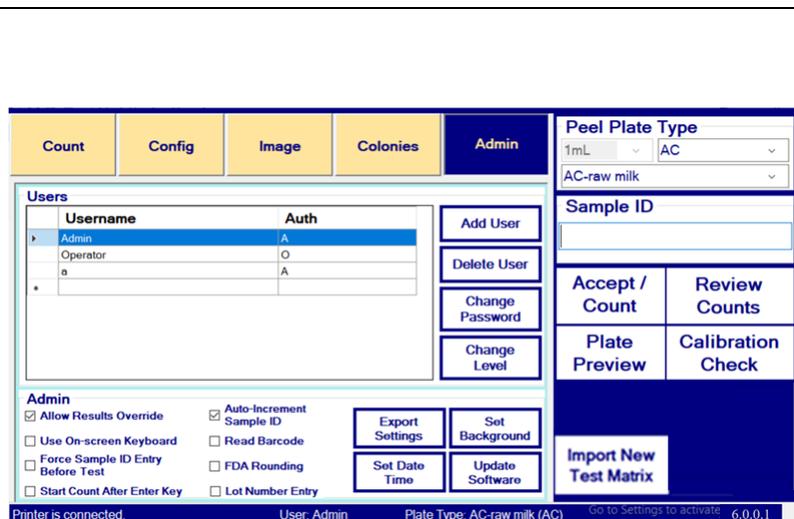
Figure 27

Click on **Admin** Tab, Figure 27:

- From the right side of the **Admin** tab, administrator may perform the same functions as operators from **Count** Tab, e.g. **Count Plate**, **Review Counts**, **Plate Preview**, and **Calibration Check**.

- Additionally, the Administrator sees a new button, **Import New Test Matrix**, that allows additions of new Peel Plate matrix channels supplied by Charm Sciences Inc. via USB memory stick.

- On the left side are the various admin-accessible tabs on the top (Admin tab is selected). From the Admin tab, the user can create and edit user accounts and select customization and performance preferences.
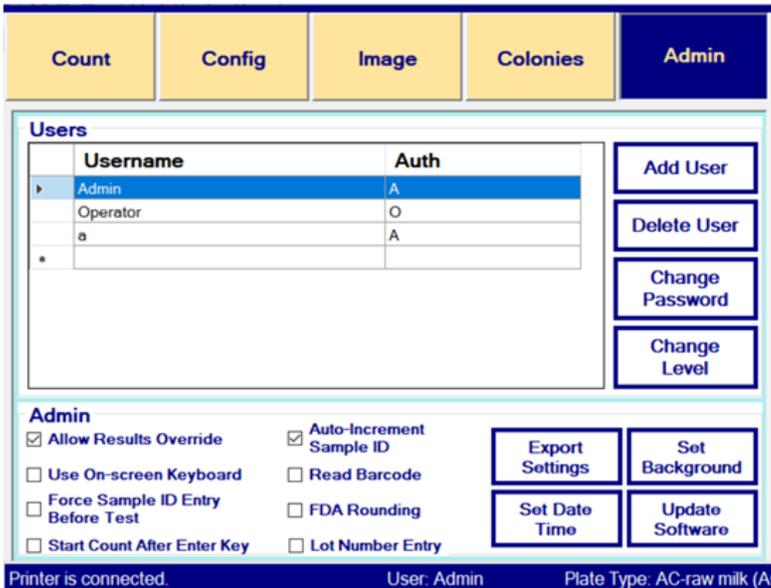
Figure 28

The left side of the **Admin** tab, (Figure 28), allows maintenance and customization functions:

Operator creation and maintenance.

- Press **Add User** to create new **Username** and **Password**.

- Highlight **Username** and press **Delete User**, **Change Password**, or **Change Level** (authorization level **O**=operator and **A**=administrator) to maintain users.

- Check **Allow Results Override** button to populate the edit table, (Figure 15A), with each count. Count, dilution, spreaders, and notes may be edited by overwriting the information in the table. Upon overwriting count or dilution, the CFU/mL-g information updates.

  Note: Making this selection requires the user to press **Accept Edits** button with each count or alternatively with **Force Sample ID** checked the button becomes an **Accept/Next Count** button and initiates Sample ID pop up.

- On-screen keyboard may be used by checking **Use On-screen Keyboard**. An external USB mouse or touchpad on keyboard is used with this item unchecked.

- **Force Sample ID Entry Before Test** requires a sample ID entry to count.

- **Start Count After Enter Key** checked, initiates a count with Enter key press on keyboard. Customization is required to use this feature with bar code scanning.

- Check **Auto-Increment Sample ID** to have the Colony Counter increment a numeric Sample ID after each count.

- **Read Barcode** checked, enables QD barcode reading from the plate.

- **FDA Rounding** checked, activates rounding feature described on page 11.

- **Lot Number Entry** checked requires lot and expiration date entry on starting a test type.

- **Set Date Time** allows the user to adjust the date and time settings on the unit while in Kiosk mode.

- Press **Set Background** button to create a blank image for a new Peel Plate Type-matrix name. A pop up window requires an administrator username and password to set the new background. See **Create a New Peel Plate Type**.

- A software update supplied by Charm on a USB stick is integrated upon pressing **Update Software** button.

- **Export Settings** button provides output of unit customizations and channel settings.

Admin Tab Change Time and Date
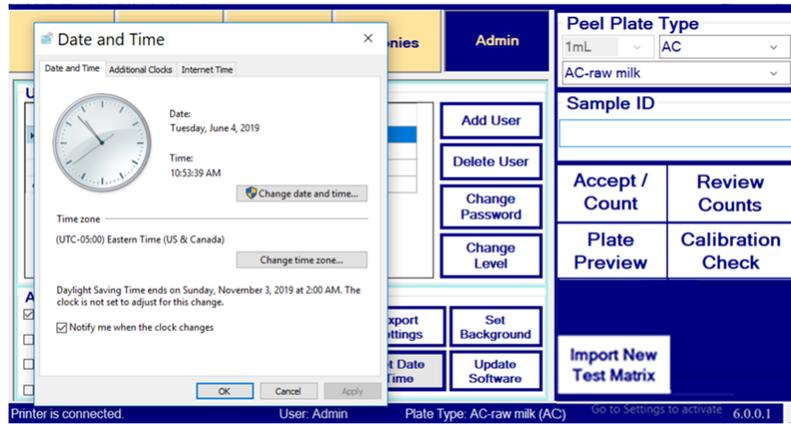
Figure 29

Change Time and Date:

Click on the **Admin** tab

- Press **Set Date Time** button
- The Windows Set System Date/Time window appears, (Figure 29). Press **Change date and time...** button and follow prompts to adjust day, month, date, year and time or press **Change Time Zone..** button to make zone adjustments. Day light savings and standard times must be adjusted manually using this button and is not adjusted by the counter automatically.

Press the **OK** button to save changes or **Exit** button to leave settings as they are.

Bar Code Reading

1. Any USB bar code wand may be connected to one of the counter's USB ports, (Figure 3). It may beep on power up.
2. Place sample bar code on plate or plate adhesive cover. A larger size Peel Plate cover is available for bar code labels as large as 1"x 3", see Figure 30. These Peel Plates have a different order code with BC in the code, for example a 100 kit of aerobic count with bar code cover is PP-AC-BC-100K. Peel Plates with bar code covers fit into the plate nest but must use an external bar code scanner to read the sample information from the bar code label.
3. Before counting plate, scan sample bar code. The scanner may beep on successful bar code read.
4. Bar code populates in Sample ID box.
5. Place plate into counter nest and press **Count** or **Accept/Count Next**.
6. When using an external bar code scanner, leave **Start Count After Enter Key** unchecked, unless otherwise configured by Charm Assistance.

Figure 30

Figure 31
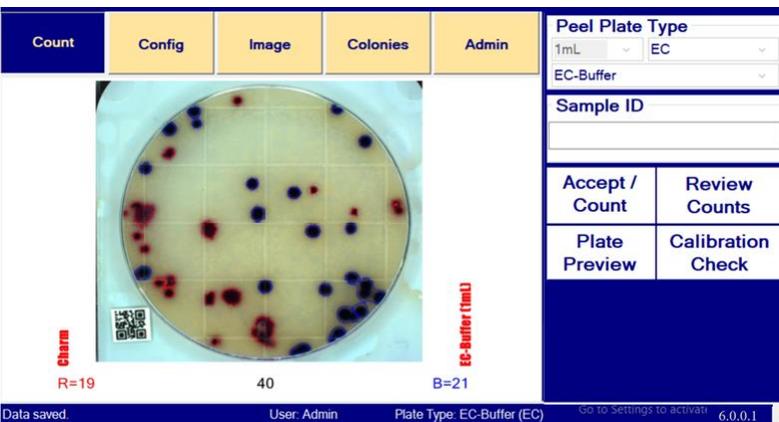
Figure 32

Automatic QR-Code Read Feature:

Peel Plate Colony Counter can automatically read specific QR-Code, two dimensional barcodes, that are between 4 and 6 mm^2 and placed in any of four corners surrounding the Plate development area, (Figure 31)

- On **Admin** Tab, check **Read Barcode** to enable automatic reading of 2D barcode.

- Place QR-Code of sample ID in one of four corners of the plate, close to 47 mm diameter growth area, as shown in Figure 31. These can be placed in any orientation if they do not extend beyond the sides of the plate and are not out of bounds of camera view lines.

- From **Count** tab, select appropriate **Peel Plate Type** and with the plate in the plate nest, press **Count Plate**.

- Sample ID populates with the barcode information. Select **Accept/Count** or press the Enter key on the keyboard to proceed with count. The Sample ID appears on the left side of the image and the Sample ID entry box clears, (Figure 32)

- This feature is specific to QR-Code of 4-6 mm^2 size placed in any orientation in the field of view of the image.

- If barcode is not read sample ID remains blank. When **Force Sample ID Entry Before Test** option is active, count does not occur and a pop-up screen requiring the sample ID populates.

Software Update

Peel Plate Colony Counter software may be updated by customers with the assistance of Charm Technical support.

- Charm supplies USB memory stick with updated firmware version.

- User logs in as an administrator, places USB into back of unit USB port.

- From the Admin tab, press **Update Software** button. Do not press any keys or power down counter while the installation process occurs. User may be prompted to restart the Counter at the end of installation.

- With new program installed, user logs in as an administrator. Keep USB device in the back of the Counter. Go to Admin tab and press **Export Settings** button. Export setting will copy an update file (.UPD) to the USB port.

- Remove USB and copy the .UPD file to an email and send to Charm Technical support.

- Charm Technical support may then send a new update file (.UPD) by email or sends a new USB with a new .UPD file to the user, if necessary.

- Copy .UPD file to a USB, or insert USB with the .UPD file into the Counter with the unit turned off.

- Start-up counter. Update completed when confirmation message is displayed.

Config Tab

Figure 33

Select **Config** tab, (Figure 33), to:

- Activate or turn off specific Peel Plate Type.
- Create new Peel Plate Type
- Set limit for number of counted plates before calibration check is required.
- Archive data to maintain colony counter memory
- Designate Path (Output Location) to copy and archive files and select if pictures will copy/transfer on copy/archive. Network configured by Charm Representative and Company IT personnel
- Activate a print out of results
- Enter default dilution factor for a specific Peel Plate Type
- Enter lot numbers and expiration dates for specific Peel Plate type
- Set the maximum count level that will cause a message that maximum count is exceeded

To change default dilution factor, or change maximum count triggering a windows message, overwrite the information, (Figure 33), or use the drop-down arrow for a drop down list of dilutions with each **Peel Plate Type**.

- Select the Peel Plate Type to populate the field with the selected Peel Plate type – matrix. The 5mL checkbox on this version Colony Counter is grey and inactive.
- The number of plates counted to require a calibration check is programmed in the **Cal Check Limit** window. This is a global setting that is not unique to the **Peel Plate Type** or matrix and counts the total number of counted plates to trigger a calibration check.
- **Files to Keep** (weeks) indicates the number of weeks of data to remain on the unit when archiving. This data will not be transferred to an external memory device and will remain on the unit. To archive all data from unit, set # weeks to 0.
- Enter default **Dilution Factor**. For example, most liquid milk tests for coliform may be neat or dilution 10 while aerobic for milk may be a 100 or 1000 dilution.
- Lot Number and Expiration date are specific to **Plate Type** and are changed on the **Config** tab or alternatively changed from an optional pop up window that is activated (with Lot Number Entry checked on Admin tab) on selecting peel plate type, (Figure 12B)
- Lot, expiration and dilution information can also be changed in the sample information table that is populated with the **Allow Results Override** check box on the **Admin** tab or that is populated from the **Count** tab on touch of a counted image.
- Select **Maximum Count** to activate the pop-up screen indicating maximum count is exceeded.
- Press **Save** button.
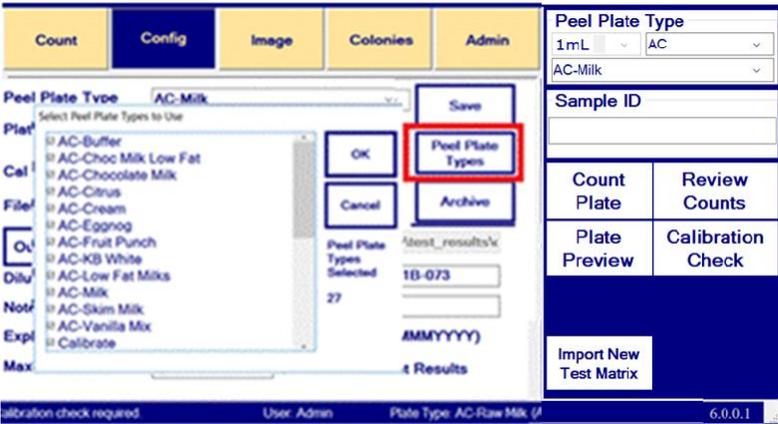
Figure 34

Selecting Peel Plate Types-Matrix

Pressing the **Peel Plate Types** button, shown in red box of (Figure 34), presents a pop up box of programmed Peel Plate Types.

- Check the box to make Peel Plate Type available to drop down menu in Peel Plate Type on **Count** tab or uncheck to remove that from the drop down list.

  Press OK to accept changes. Checking/enabling new Peel Plate Types that were not factory installed will require to set a background from **Admin** tab, see next page.

Create New Peel Plate Type and Set Background
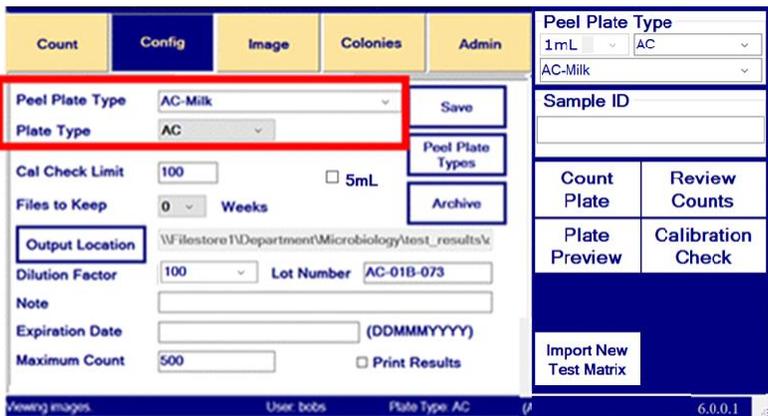
Figure 35

There are two options for creating new calibrations for Peel Plate type matrices: 1) Import from USB stick supplied by Charm, using the **Import New Test Matrix** button or 2) copy and rename an existing channel. To import, insert USB stick containing new channel settings provided by Charm, press **Import New Test Matrix** button and follow prompts, refer to **Charm Assisted Access** (P. 26) To copy and rename a channel, on **Config** Tab, there are two boxes of information shown in the red box (Figure 35). **Peel Plate Type** is a matrix specific name for the **Plate Type** which is fixed as AC, EC, CC, EB, HET, SA, or YM.

- When creating a new matrix specific selection that is not in the **Peel Plate Type** drop list, use drop box arrow to select Peel Plate Type-matrix similar to the new matrix. For example, choose EC-Meat for an EC-chicken matrix.

- Overwrite matrix part of name with new desired matrix. For example, overwrite the existing AC-Milk name with the new name AC-raw milk. **Do not leave a blank entry.**

- The **Plate Type** drop-down box will populate the type of plate: AC, CC, EC, EB, HET, SA, or YM. Select the appropriate test type.

- Press **Save** button. A new **Peel Plate Type-**matrix name is created. The original copied channel name, e.g. AC-Milk, is not erased.
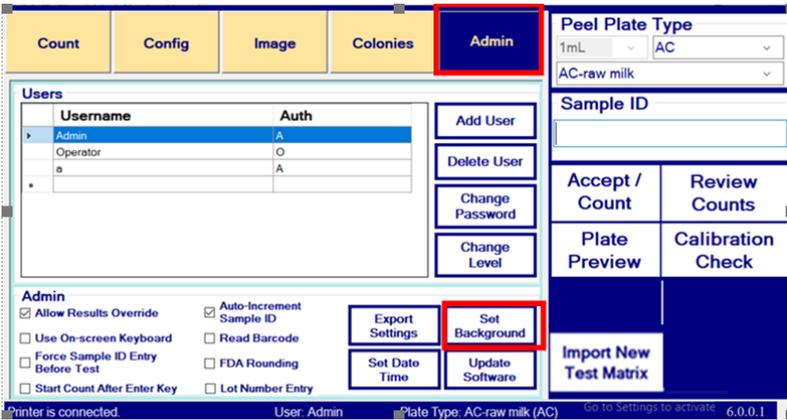
Figure 36

Set background of a created Peel Plate type from **Peel Plate Type-**matrix drop list on **Admin** Tab.

- Rehydrate an appropriate Peel Plate type, e.g. AC, EC, CC, etc. with matrix.
- Place the un-incubated plate in nest.
  - For best results, use an incubated plate with no growth.
- Verify the new name Peel Plate Type – selected or created appears in Peel Plate Type box (Figure 36), e.g. AC-raw milk. If not, then use drop arrow to select it.
- Press **Set Background** button,(Figure 36), with the blank plate in plate nest.
- Follow **Set Background** prompts including administrator log in.
- Verify new Peel Plate Type matrix is operating correctly by counting the blank plate as a 0-count sample.
- After setting up, verify Peel Plate Type performance by doing a visual count on plates and confirming results are within ±10%. Contact Charm Sciences if counts are outside these expected ranges.

Removing Peel Plate Type from Active Test List

On **Config** tab, select Peel Plate Type drop down box and uncheck the box next to Peel Plate Type-matrix to be removed from Peel Plate Type active list (right hand side of screen). Select **Save**.

Archiving Data
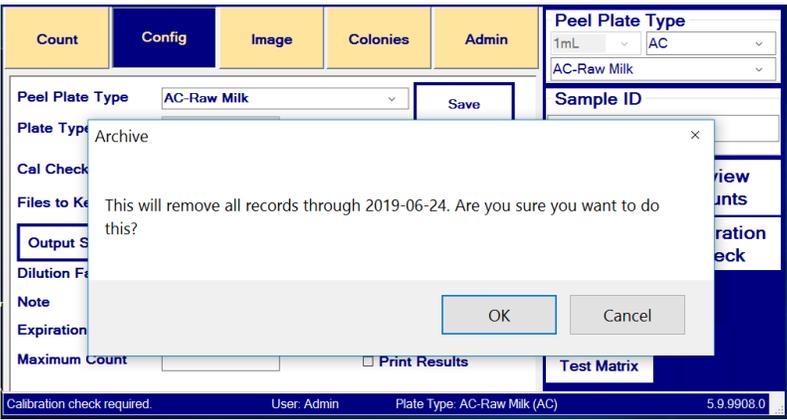
Figure 37

The **Archive** button on **Config** tab moves image files and data to external memory as memory management for the counter.

- **Files to Keep** is the number of weeks of image files that remains on counter hard disk after pressing the **Archive** button. Set this to the number of weeks desired for review. These files will not be moved to external memory.
- Click **Archive** button to move image files from the data folder to a memory device inserted into USB or the Network Output location as determined by the **Output Location**.
- If a memory device with enough available memory and correct permissions is detected, a window populates confirming the intent to permanently move data off the internal memory, (Figure 37). Press **OK** to proceed or **Cancel** to abort.
- A progress bar and then a window confirming successful transfer and name of the newly created archive folder appears. Press OK to complete task.
- This archived data and associated test images are now removed and are no longer accessible in **Review Records**.

Output Location

Figure 38

- Pressing **Output Location** button on the **Config** Tab allows the user to choose between a USB memory or Network Drive location, see Figure 38. A TCP server option is available for real time download to another computer using Charm Colony Counter Receiver. Choosing a Network Drive or TCP locations requires IT personnel to assign the Counter domain access and administrative rights and UNC address. Charm Assistance in accessing the Network communications of the Counter.
- Checking the **Require Admin Confirmation to Copy** box presents Operators with an administrator login screen to complete Copy commands.

Unchecking **Copy image files** box will not send pictures with data output which can save data and transfer time with remote network applications.

- From **Output Location**, a reminder to manually archive the reader can be configured on a specific day of the week or after a specified number of tests have been run. Once the reminder is triggered, it automatically resets to the next programmed interval. The pop-up reminder may be bypassed by the user by selecting OK. The user must navigate to the **Config** tab to perform the archive. Refer to **Archiving Data** on the previous page.

Printer Output Option

The Peel Plate Counter has drivers installed for a 32 column Citizen Printer and a USB serial adapter and is factory configured at time of purchase. Installation of different printer types and set up of a printer subsequent to the initial purchase, is done with the assistance of a Charm representative.

Figure 39

Figure 40 USP connections on Counter and on Printer
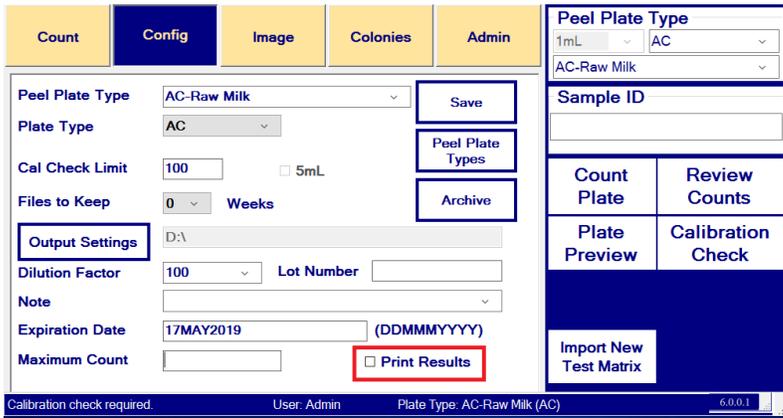
- Check **Print Results** box on **Config** tab, (Figure 39).
- Place USB adapter, supplied and configured by Charm, into the top USB port on the counter and the other end to the printer USB, (Figure 40).
- Connect printer to serial adapter and power up.
- Print output occurs on pressing **Accept/Count Next** button or on changing test type for next count or on exiting program. A picture of the print out is shown below. (Figure 41).


```
Date: 2016-12-22
Time: 10:18:28
User: bobs
Plate: EC-meat
ID: 15r33b
Count: M 46 (47)
Spreader: 0
Red: 14
Blue: M 32 (33)
Dilution: 10
CFU/mL-g: 460
Note:
```

Figure 41

Charm Assisted Access

Image and colony settings may be adjusted for channel and matrix optimization. These features are part of the admin login and should be done with the assistance of Charm Sciences representative.

Figure 42 Image Screen
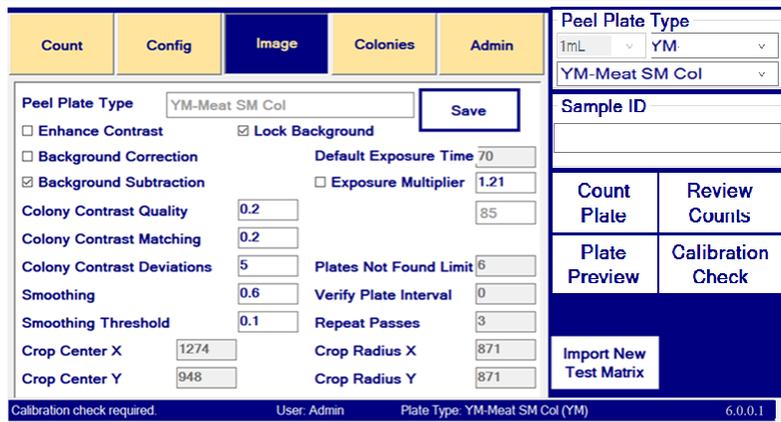
- Adjusting the Exposure Multiplier setting changes the brightness of the field, which alters colony contrast. This can help improve detection of small colonies.
- Adjusting the Smoothing and Smoothing Threshold settings can increase or decrease colony size, helping to distinguish spreaders.

Figure 43 Colony Screen
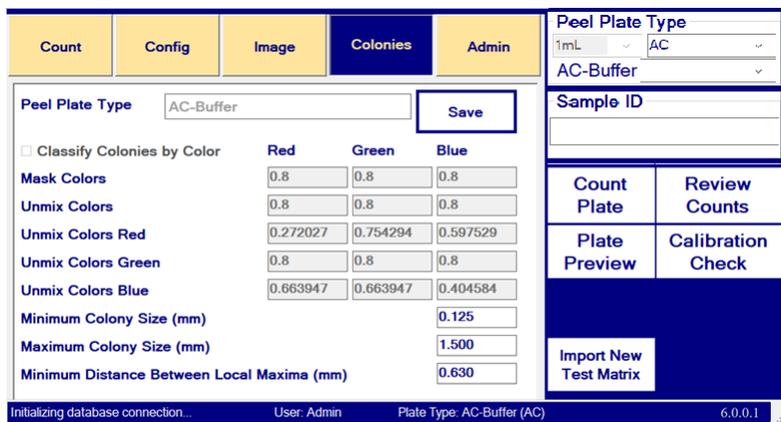
- The minimum and maximum colony size can be adjusted.
- The distance between colonies can be adjusted to manually calibrate the observed counts to manual counts.
- For EC plates, red and blue colors can be adjusted for optimal contrast between coliform and generic *E. coli.*

Customized features configured at time of purchase	- Printer options
	- Test types and products set with background pictures
	- Color differentiation of colonies
	- Network communications
Importing additional Peel Plate Type-matrixes can be done with assistance of a Charm Sciences, Inc. representative by sending a USB memory stick for channel import by selecting the Import New Test Matrix button, visible to the administrator only.	- Log in as Administrator, insert USB stick supplied by Charm, and press **Import New Test Matrix** button
	- Channels that are not already on the counter will appear in black font and may be imported one at a time.
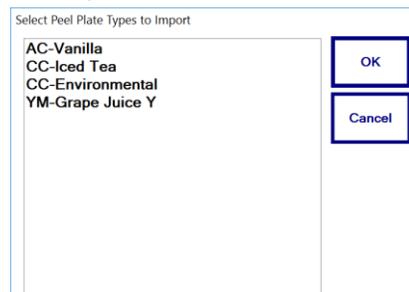
	• Select the channel to be imported and press OK. Message that import completed appears and selected channel drops off the available import list.
	Import Completed ✕ Import Completed. A new background image may be required for each imported matrix. OK
	• Import another channel or Cancel to end import.
	• Go to **Admin** Tab to load a new background for each of the newly imported channels. (p. 22)
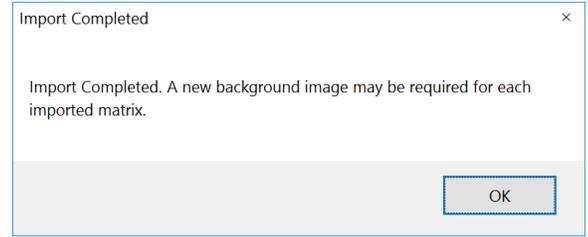
Count optimization of new Plate Plate Types may be needed to achieve count precision of +/-10% of visual count. This can be done in coordination with your Charm Representative. Please call 1-978-687-9200.

Network Communication and real time download using TCP is coordinated by company IT personnel and Charm Technical Representatives. Company IT needs to establish the counter as a domain user, following domain rules. This requires Charm Technical assistance to put counter into Windows mode and to map network drives. Network connections are customized according to user options as follows:

- Copying and archiving folders to network with or without Admin password protection
- Placing database table on network
- Placing images on network
- Sharing network database with multiple counters

Technical Information

Requirements for Ambient Conditions

Use in a well-lit, dust free and clean working area.

Dimensions / Weight

- Unit dimensions: 12.55" H, 9.00" W 11.00" L
- Screen Size: 6.75" measured diagonally
- Weight: 10lbs

Power

- Input DC Power: 19V, 4.74A

Network requirements

Generally, IT personnel assign the counter as a network user using network rules that could include an IP address, user registration, scheduled Windows updates and company required anti-virus software.

Charm Sciences' Contact Information

Contact the Technical Services staff at Charm Sciences for any questions or concerns about the Peel Plate Colony Counter.

- Twenty-four-hour telephone support: **978-687-9200** or **1-800-343-2170**.
- E-mail Address: support@charm.com

Troubleshooting

System does not power on

- Verify power source.
- Verify power cord is plugged in properly.
    - If available, try another power cord.
- Verify toggle switch on back is powered up and light and fan powers up. Then press front blue switch to start program.

Light does not turn on from back toggle switch

- Turn toggle switch off and back on. Check that power cord is connected and that power is to outlet.
- Verify that the power cord is the 19V cord supplied with the counter. Other Charm 12V power cords used for ROSA equipment power-ups counter screen but not the lights.

Screen does not power-up

- Turn off front blue power button. Then turn off system power (toggle switch in back of counter).
- After 10 seconds, re-apply toggle switch power.
- If blue power button on front of unit does not illuminate:
    - Contact Charm Technical Support for assistance.
- If button illuminates and screen does not boot:
    - Wait 120 seconds, if screen has not powered, then press front power button to shut system down.
    - After front power button light turns off, wait 10 seconds.
    - Press front power button again to turn on the screen.

Touch Screen not operational

- Turn off front blue power button. Then re-start using toggle switch on the back of the unit.

Image is dark

- Verify light is on and operational.
- Verify correct Peel Plate Type is selected.
- Run calibration plates and confirm that they are in range.

Plate not found

- Only Peel Plates should be counted. Do not count other types of microbial plates or use license may terminate.
- Check position of plate and verify it is seated in plate nest.
- Verify that the correct Peel Plate Type and matrix are selected. If any doubt, do not continue with count by pressing **NO** to the pop-up window
- Once Peel Plate is properly positioned in nest and the correct plate type-matrix is selected, press **Yes** to continue count.
- If no plate is placed in the nest, the count will abort. Click OK to continue.
- If message continues, discontinue use of the specific Peel Plate Type matrix and contact Charm Technical Support.

Image is blurry

- Verify plate is properly set in nest and only one plate has been inserted at a time.

Background Image Does Not Exist

- Create a plate 100% rehydrated with the appropriate matrix and dilution.
- For best results, use an incubated plate of the correct matrix and dilution that contains no growth.
- Place rehydrated plate into the plate nest
- Select Peel Plate Type-matrix appropriate to the plate.
- From **Admin** tab press **Set Background** button. Follow prompts.

Keyboard/trackpad does not respond

- Verify keyboard is turned on by power switch in back edge of trackpad.
- Replace batteries.
- Cycle keyboard power.

Touch screen cursor positioning is inaccurate

- Contact Charm Technical Support for assistance.

Calibration Check routine fails

- Inspect calibration plates for damage (smudges, cracks, debris).
- Wipe calibration plates clean and repeat the **Calibration Count**.
- If issues persist, contact Charm Technical Support.

Camera not operational

- Shut down counter using blue front button.
- Turn off power to system using back toggle switch.
- Wait 30 seconds.
- Return power to system with back toggle switch.

Plate not centered in image

- Check that Peel Plate feet are properly seated in Plate nest.
- If plate is still not centered in image, contact Charm Technical Support.

Visible colonies not being counted, or plate edges counted as colonies

- Check that plate is properly seat in nest and recount.
- If camera is off center or light exposure has changed, contact Charm Technical Support for assistance with image settings.

Peel Plate Type Drop down box on configuration page is not updating the Peel Plate Type list of tests on the count tab.

A blank Peel Plate test type was created and needs to be deleted. Contact Charm Technical Support.

Error Messages

Counting Errors

• Plate out of position. Continue with count?	• Check that plate feet are nestled in plate nest. Press Yes once positioned correctly to continue count. Press No to cancel count.
• Dilution factor setting is not numeric. Cannot calculate count data.	• Verify Dilution Factor setting on **Config** tab is numeric
• Count exceeds maximum. Manually check.	• Number of colonies found is greater than programmed maximum setting
• Large growth spot(s) detected. Manually check.	• A colony or colonies are larger than the maximum colony size programmed for the Plate Type Matrix. These are recorded as "Spreader(s)" found on plate. The counter may not be properly interpreting the larger colony and is requesting a manual edit. After pressing OK to message, manually edit the count by tapping/clicking the counted image to view table of information including number of spreaders. Make any changes based on visual check of plates and press **Accept Edits** button to return to count screen.
• Unable to count plate.	• Program script failed to return valid count value • Retry count • Reboot from front power button
• Plate not found. • Plate out of position. Continue with count? • Plate misaligned. • Invalid plate. • No plate or plate upside down.	• Verify plate is present and aligned in nest • Verify plate is right-side up • Verify plate is a Charm Peel Plate • Verify that correct Plate Type-Matrix is selected for the count • Press **OK** and restart count. • If message continues, discontinue counting on that Peel Plate Type channel and contact Charm Technical Support.
• Background image does not exist. Please Set Background first.	• File specified by Background Image setting is not found. Prepare a Plate rehydrated with matrix, incubated with no growth. Use Set Background on **Admin Tab** to create image. Requires login as an administrator.
• Unhandled exception	• Reboot from front power button • Contact Charm Sciences, Inc. if message repeats.

Other Errors

Set Background denied. Must be logged in as admin to set new background.	• Invalid username or password entered upon attempting to set new background image • Enter valid Admin username and password
• Calibration check required.	• Perform Calibration Check process, or • Login as Admin to bypass Calibration Check
• Invalid Sample ID. Disallowed character(s).	• Invalid character included in entered sample ID. • Disallowed characters are as follows: • \ / : * ? " < > |
• Memory Stick Missing. Matrix import cancelled.	• This message appears if Import New Test Matrix button is pressed without a USB stick in place.

• Peel Plate Types to import – Blank Screen	• This message appears if Import New Test Matrix button is pressed with a USB stick in place, but there is no channel to import on the stick or channel(s) with the same name already exist. Press Cancel and call Charm Technical Support for assistance.
• Lighting too dark. Check connections and restart system. Call for technical assistance if problem persists.	• Inadequate lighting for counting plates • Verify light is on • Verify light is mounted properly
• Lighting too bright. Adjust lighting or lens aperture. Call for technical assistance if problem persists.	• Too much light for counting plates • Verify light is mounted properly
• File Save Error	• Call Charm Sciences Technical Support for assistance to check output file path hard disk attributes for read-only or hidden setting and to verify adequate hard disk space exists
• Less than 15% disk space remaining. Please archive files.	• Archive output images by moving files to external location (external hard disk, network drive, etc.) See **Config** Tab.
• Less than 1GB disk space remaining. Please archive files before continuing.	• Database not found. Drive paths can be case sensitive and should be in caps. Seek assistance with Charm Technical Support to access **Data** Tab.
• Image file (path) does not exist.	• Call Charm Sciences Technical Support to set path and filename.
• Error saving data to database.	• With assistance of Charm Technical Support, verify database settings on the **Data** Tab.
• Error opening connection to test settings database. Please check database settings on **Data** tab.	• With assistance of Charm Technical Support, verify database settings on the **Data** Tab.

Warranty Information

1. <u>WARRANTY; LIMITATION OF REMEDIES</u>: (a) Charm Sciences, Inc. ("<u>Charm</u>") warrants each equipment product to be free from defects in materials and workmanship and to be free from deviations from the specifications and descriptions of Charm's products appearing in Charm's product literature, based upon normal use. The warranty periods are, from the date of delivery:

Days from Date of Delivery	Warranty Coverage
1-30	New replacement unit, shipping
31-90	Parts and labor, shipping
91-180	Parts and labor
181-365	Parts only

Charm shall undertake to correct any such defects in material or workmanship that exist or appear during the warranty periods, provided, however, that Charm shall have no obligation or liability under this warranty unless Charm has been notified of such defect no later than thirty (30) days after such defect is first discovered and, in any case, no later than one year from the date the equipment is shipped to Buyer. Buyer will provide Charm with an opportunity to inspect and test the goods claimed to be defective. Remedial action under this warranty shall require only that Charm at Charm's option, repair or modify the equipment, or replace the same. (b) The foregoing provisions of this paragraph set forth and constitute Charm's sole obligation and liability and Buyer's exclusive remedy under this warranty. Charm's liability shall immediately cease if the seal is broken or the equipment is (i) subjected to accident, misuse, negligence, alteration, improper repair, servicing or maintenance, (ii) installed or used contrary to local, state or federal laws, codes or regulations, (iii) used contrary to Charm warnings, instructions or recommendations or contrary to the purpose or manner for which it was designed, or (iv) used with reagents other than those provided, sold or approved in writing by Charm. In addition, Charm will have no liability if the alleged breach of warranty is due to incomplete information supplied by Buyer or his representative to Charm or if the alleged breach of warranty is due to dirt, debris or other contamination of the equipment. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXCEPT TITLE, WHETHER STATUTORY, EXPRESS, IMPLIED (INCLUDING WARRANTIES FOR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE). Buyer represents that it alone has determined that the equipment purchased is suitable for and will meet the requirements of its intended use.

2. <u>LIMITATION OF LIABILITY; INDEMNIFICATION</u>: (a) Charm's liability on any claim of any kind, whether based in contract, warranty or tort (including negligence, failure to warn or strict liability) or otherwise, for any expense, injury, loss or damage arising out of, or connected with, or resulting from the design, manufacture, sale, delivery, resale, installation, inspection, repair, reconditioning, operation or use of any equipment, shall in no case exceed the contract price of that equipment. In no event shall Charm be liable for any special, indirect or consequential damages. (b) In the event the equipment is (i) subjected to abuse, misuse, alteration, improper repair, servicing or maintenance, (ii) installed or used contrary to local, state or federal laws, codes or regulations, (iii) used contrary to Charm's warnings, manuals or recommendations, or (iv) used with reagents other than those provided, sold or approved in writing by Charm, Buyer expressly agrees to defend, indemnify and hold Charm harmless from and against all claims, whether based in contract, warranty, or tort (including negligence, failure to warn, or strict liability), losses, expenses, damages, and liabilities which may arise out of the use or alleged use of the equipment to the extent caused by Buyer's negligence.

3. <u>AMENDMENTS</u>: The warranty provided herein may not be altered except by express written agreement signed by an officer of Charm. Representations, oral or written, which are inconsistent with this warranty are not authorized and if given, should not be relied upon.