

# **BIOMIC<sup>®</sup> V3**

## **CLINICAL MICROBIOLOGY SYSTEM**

### **Installation & Quick Reference Guide**

### **International Version**

**Note:** This document is designed as a quick reference guide to assist with the installation and basic operation of BIOMIC<sup>®</sup> V3. The complete Product Manual and Training Videos are located in the BIOMIC software and contain detailed, current information, and instructions on all system functions.

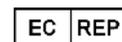
**Giles Scientific USA**

# Table of Contents

<b>1.</b>	<b>Intended Use and Function of BIOMIC® V3</b>	<b>2</b>
<b>1a.</b>	<b>Antibiotic Susceptibility Testing</b>	<b>2</b>
<b>1b.</b>	<b>Organism Identification Testing</b>	<b>2</b>
<b>2.</b>	<b>System Installation</b>	<b>3</b>
<b>2a.</b>	<b>Computer Requirements</b>	<b>3</b>
<b>2b.</b>	<b>Computer Monitor Installation</b>	<b>3</b>
<b>2c.</b>	<b>Software Installation</b>	<b>8</b>
<b>2d.</b>	<b>Reader Installation</b>	<b>12</b>
<b>2e.</b>	<b>Power Installation</b>	<b>13</b>
<b>2f.</b>	<b>Installation Troubleshooting</b>	<b>14</b>
<b>3.</b>	<b>Software Setup</b>	<b>17</b>
<b>4.</b>	<b>Performance Characteristics and Specifications</b>	<b>18</b>
<b>5.</b>	<b>Operating Instructions</b>	<b>19</b>
<b>5a.</b>	<b>Antibiotic Susceptibility Testing Procedure</b>	<b>19</b>
<b>5b.</b>	<b>Identification Panel Reading Procedure</b>	<b>22</b>
<b>5c.</b>	<b>Quality Control &amp; Inventory Management Procedure</b>	<b>24</b>
<b>6.</b>	<b>System Calibration</b>	<b>25</b>
<b>7.</b>	<b>Precautions, Limitations, Troubleshooting</b>	<b>28</b>
<b>8.</b>	<b>Service and Maintenance</b>	<b>29</b>
<b>8a.</b>	<b>Touch Screen and Drawer Cleaning</b>	<b>29</b>
<b>9.</b>	<b>References</b>	<b>30</b>

Giles Scientific recommends obtaining the latest guidelines from CLSI (Clinical Laboratory Standards Institute) and/or EUCAST (European Committee on Antimicrobial Susceptibility Testing) based on individual laboratory testing methods.

BIOMIC® is a registered trademark of Giles Scientific Inc.  
Copyright 1985-2022, Giles Scientific Inc,  
PO Box 4306, Santa Barbara, CA 93140 USA  
All Rights Reserved



Liofilchem® S.r.l.  
Via Scozia  
Roseto degli Abruzzi (Te), Italy



# 1. Intended Use & Function of BIOMIC® V3

## 1a. Antibiotic Susceptibility Testing

BIOMIC V3 is a personal computer based system providing complete data management for clinical microbiology laboratories, susceptibility testing, epidemiology, infection control, and antimicrobial agent research and development. It calculates antibiotic minimum inhibitory concentrations (MICs) from the standard disk diffusion continuous gradient by direct regression analysis (20). BIOMIC combines several features for accuracy and speed. An electronic caliper zone reader or video assisted plate reader system minimizes technologist variation. Zone measurements are automatically recorded in a computer, reducing reading and transcription errors. Test results are easily transferred to other computer programs or systems to display or further analyze.

BIOMIC V3 results help physicians to select the most active, least toxic and least costly drugs and enables labs using the disk diffusion method to provide quantitative results without dilution testing materials. BIOMIC V3 provides maximum flexibility to test different specimens and organisms from different clinics and locations that require different drugs to be tested. BIOMIC V3 includes most antimicrobial agents. The software is easily updated as new drugs or new guidelines become available.

Literature references are available at the end of this document and at [www.biomic.com](http://www.biomic.com)

## 1b. Organism Identification Testing

BIOMIC V3 is designed to automatically read various commercial brands of bacterial and yeast species identification (ID) panels. After insertion of an ID test panel in BIOMIC V3, an ID code number is displayed on-screen. The ID code number is based on automatic reading of the positive and negative test reactions contained in each panel and described in each commercial ID panel package insert. Depending on the panel type, the organism identification is shown on-screen or the code number is typed into the appropriate manufacturer's ID panel software, or looked up in their codebook to provide a species name.

## 2. System Installation

### 2a. Computer Requirements

- Windows 10 or 11
- All Microsoft Service Packs and Critical Updates must be applied
- Four available USB Ports
- Serial port for LIS connection (if in use)
- Internet Connection (recommended)
- Surge Protector

Note: Faster computer with additional memory will improve software speed and performance



**WARNING:** Do not connect the Power or USB cables to the back of the BIOMIC V3 Reader until after the BIOMIC software is installed.

Note: Image below is USB & Power Cable on the back of the BIOMIC V3 Reader



### 2b. Computer Monitor Installation

#### Step 1: Unpack BIOMIC V3 & Review Accessories



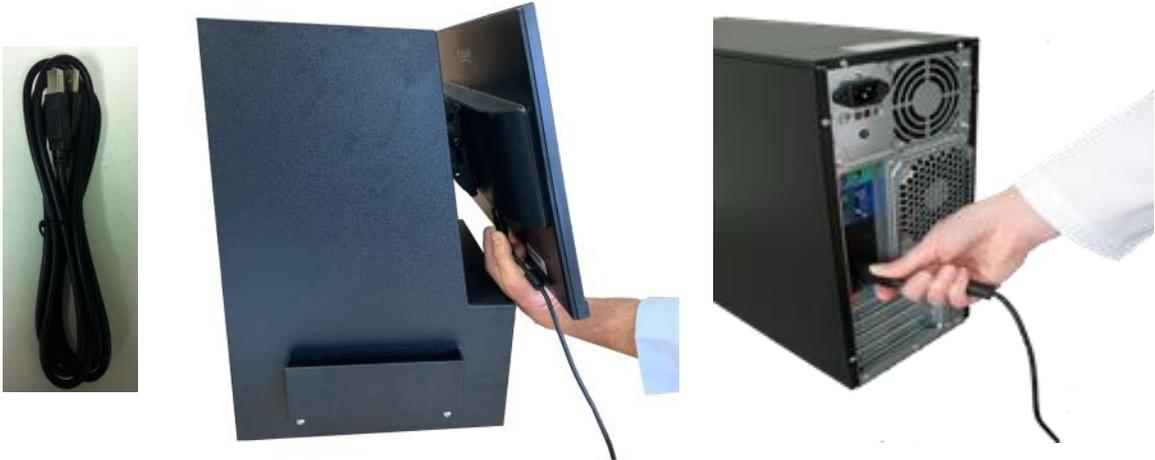
**STEP 2: Tilt monitor for access to cable connections**



Note: Image below is the view from bottom of monitor



**STEP 3: Connect Cable A (Monitor USB) to monitor & computer**



**STEP 4: Connect Cable B (Audio Cable) to monitor & computer**



**STEP 5\*: Connect either Cable C1 (Analog Monitor Cable - blue) or Cable C2 (Digital Monitor Cable) to monitor & computer**

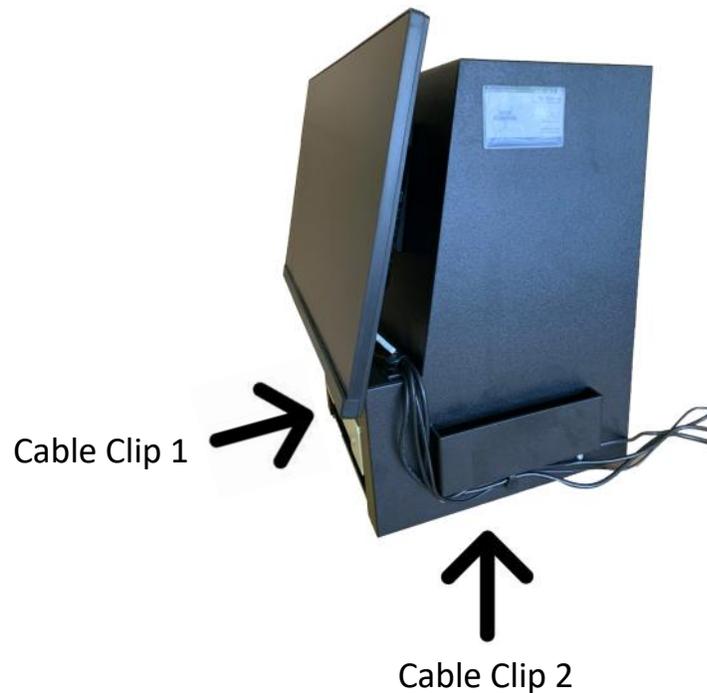


\*Note: Only one cable (C1 or C2) should be used depending on available computer connections

**STEP 6: Connect Cable D (Monitor Power Cable) to monitor & surge protector**



**STEP 7: Route all cables to the right side of the monitor and below the pocket on the side of BIOMIC V3. Secure cables using two cable clips.**

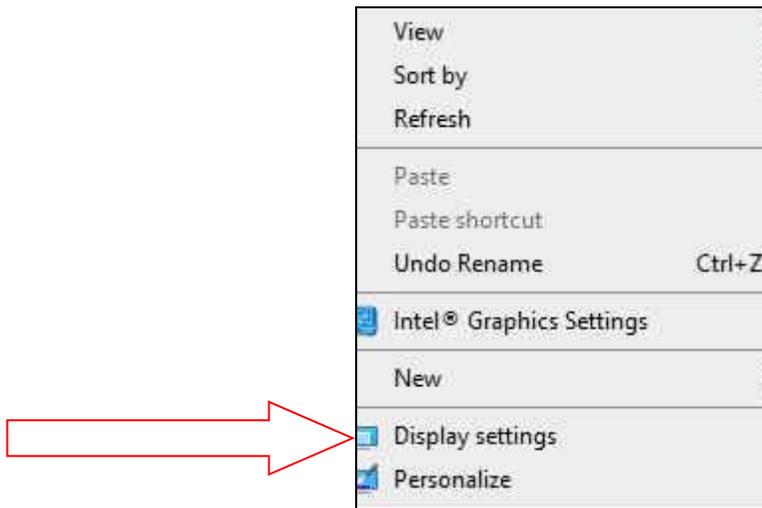


**STEP 8: Start computer and install drivers**

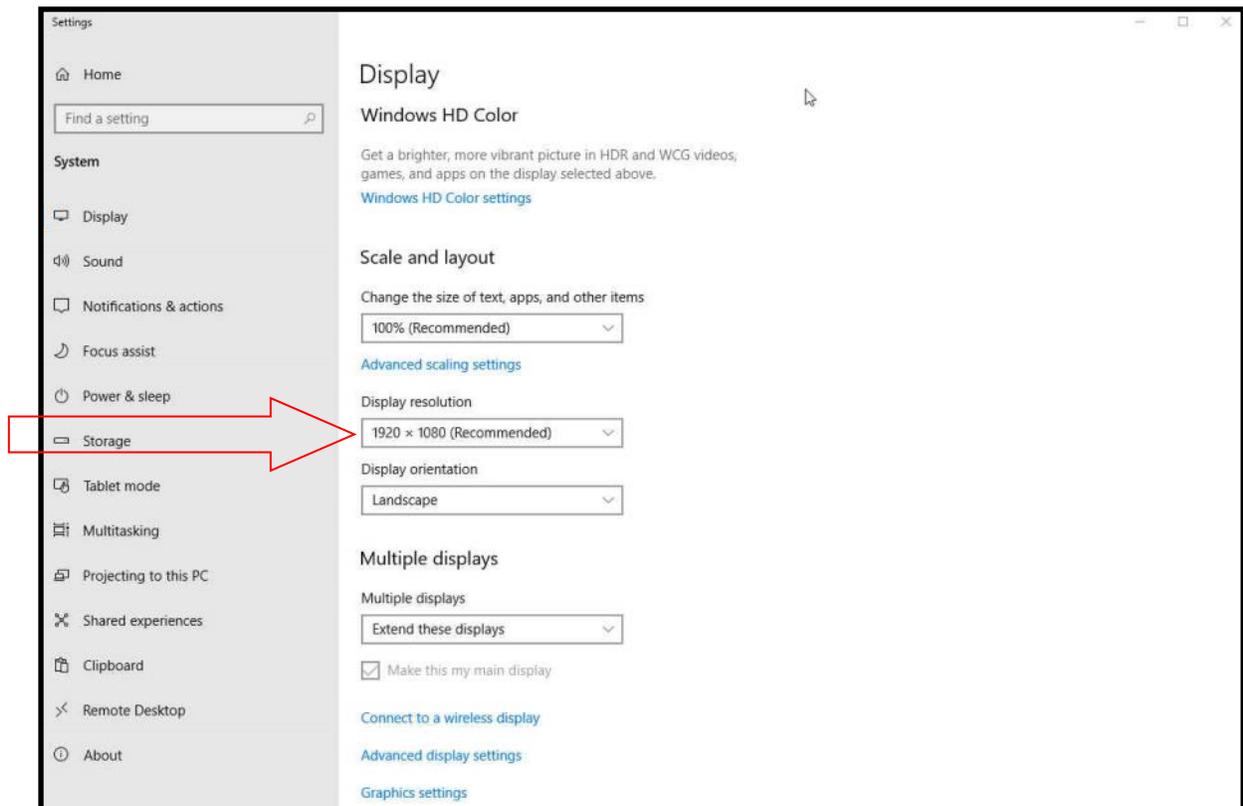


Windows will detect the monitor. A message may display asking which drives to install, or the driver may install automatically with no message on-screen. These variations depend on your Windows version.

## STEP 9: Confirm 1920 x 1080 screen resolution



Right mouse click on the computer desktop and select **Display Settings** from the popup menu.

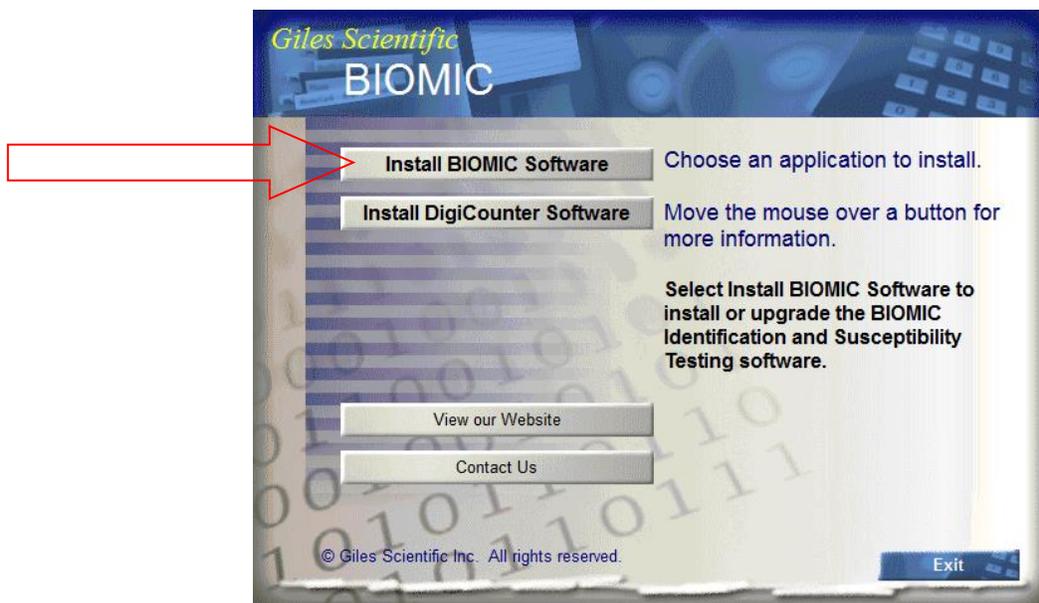


Select **Display Settings** and confirm 1920 x 1080 screen resolution.

## 2c. Software Installation

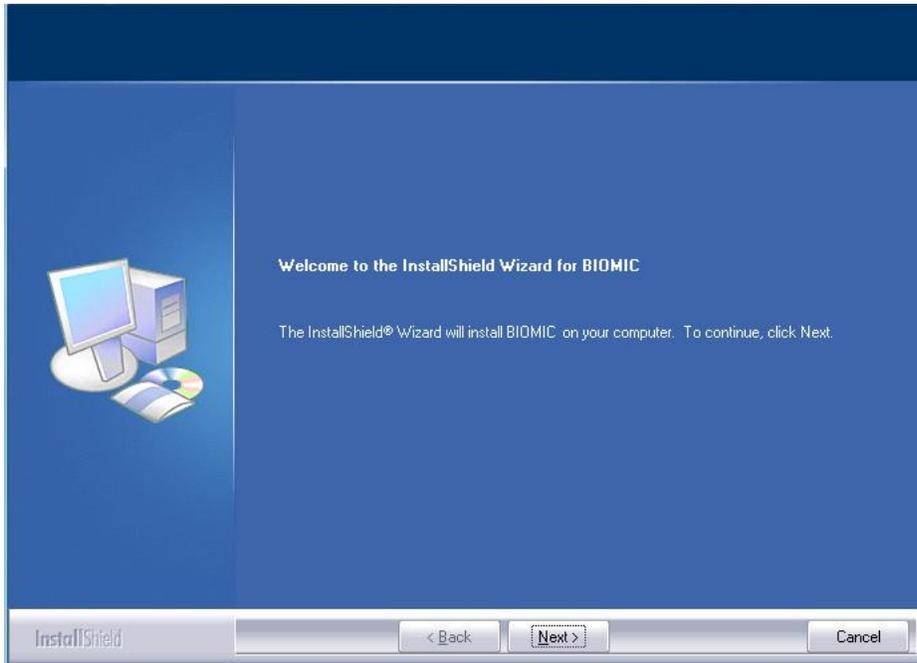


Insert BIOMIC CD in the computer or download the software installation from Giles Scientific.

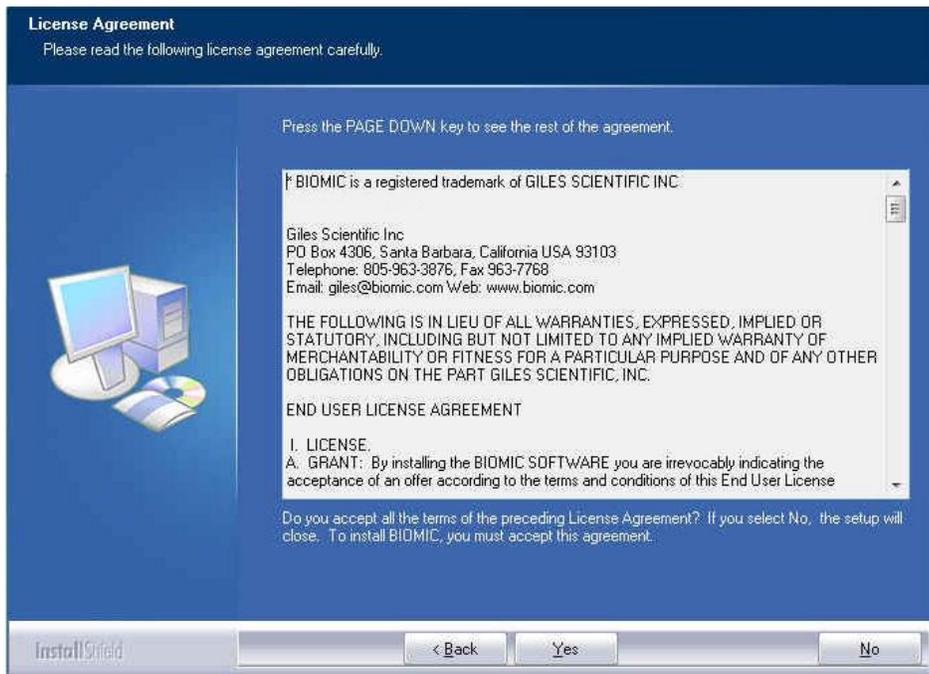


If using a CD to install, select **Install BIOMIC Software** from installation menu.

Note: If installation menu does not automatically display, locate the BIOMIC CD on your computer and run BIOMICInstall20xx.exe to start installation.

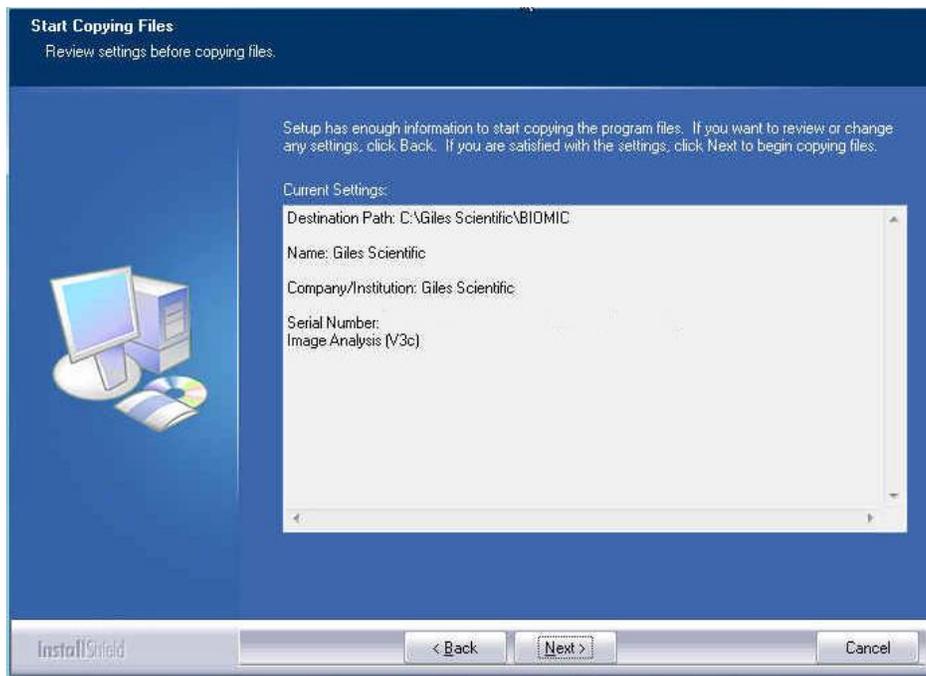


Select **Next** to continue



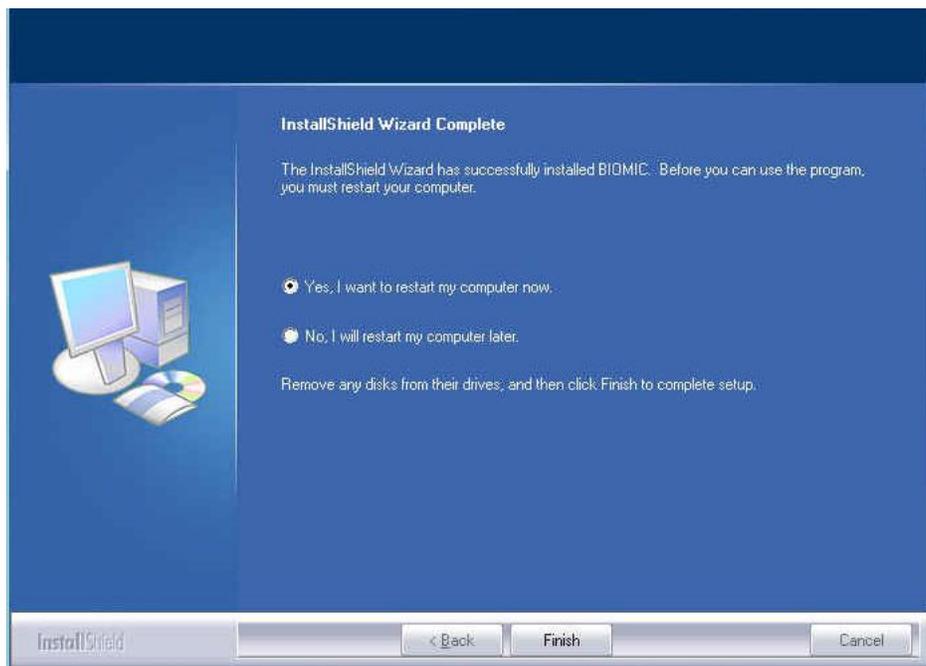
Select **Yes** to continue





Select **Next** to begin software installation. This may last 5-10 minutes.

If prompted to 'install the driver software', select **Install**.



When software installation is complete, restart your computer if requested.

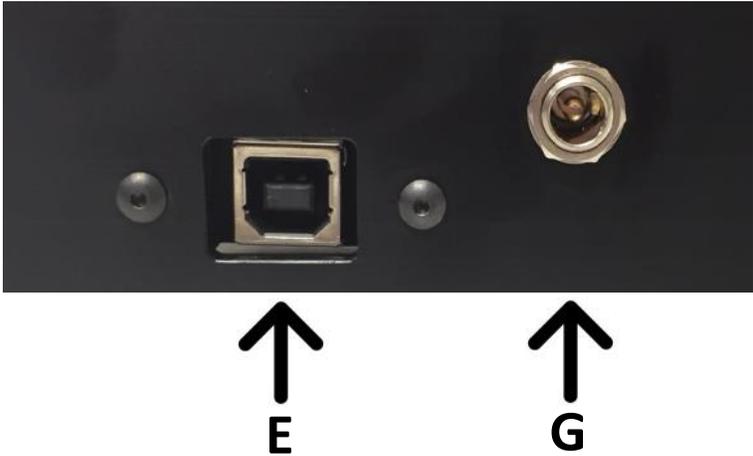
After restarting your computer, continue to reader installation.



**WARNING:** Security Permissions for the Giles Scientific directory must be set to **Full Control** for all User groups. This is critical for proper system function.

## 2d. Reader Installation

Note: Image below shows connections on the back of BIOMIC V3.



**Connect Cable E (Reader USB Cable) to the back of BIOMIC V3 and to any available USB port on the computer.**



When the Reader USB Cable is connected, the computer will automatically recognize the camera and install the drivers.

## 2e. Power Installation

**Connect Cable F (Reader Power Cable) to G (Reader Power Supply).**



**Connect G (Reader Power Supply) to the power inlet on the back of the Reader.**



**Connect F (Reader Power Cable) to the surge suppressor.**

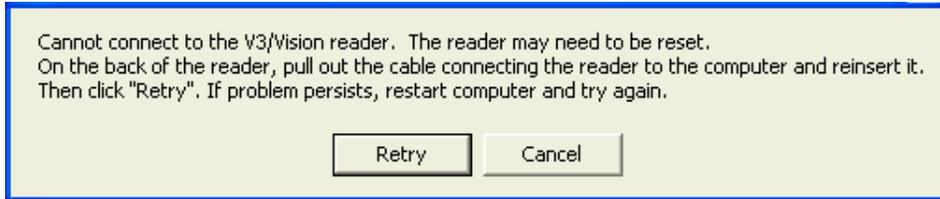


**Your BIOMIC® V3 System is now installed.**

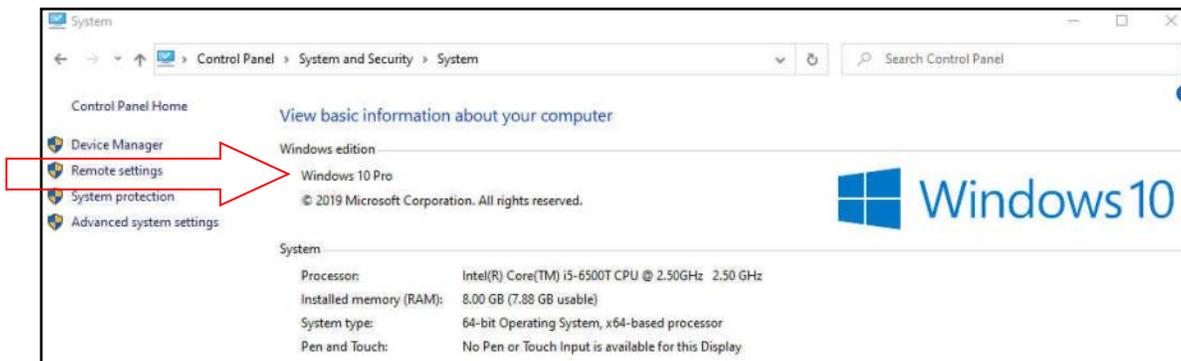
## 2f. Installation Troubleshooting

### Reader Connection Error

If you receive the following error message when starting BIOMIC V3:



1. Check all cable connections
2. Restart the computer and try running BIOMIC again
3. Confirm your computer is using Windows 10 or 11



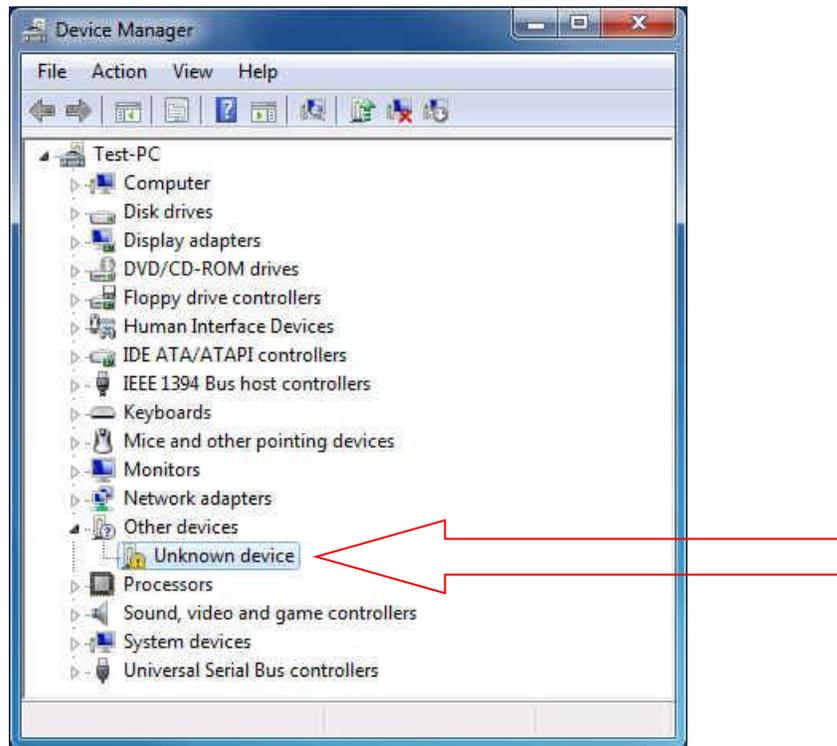
To check Windows version: **Windows Start Menu > Control Panel > System and Security > System**

Note: This path may vary based on your Windows version

## Reader Driver Reinstallation

If you connected the USB cable into the back of the Reader before installing the BIOMIC software, you probably received the 'Cannot Connect to Reader' error. Follow this instructions below to re-install the Reader Driver.

Go to: **Windows Start Menu > Control Panel > Hardware and Sound > Device Manager**



In the Other Devices category, select **Unknown device** then **Uninstall**.

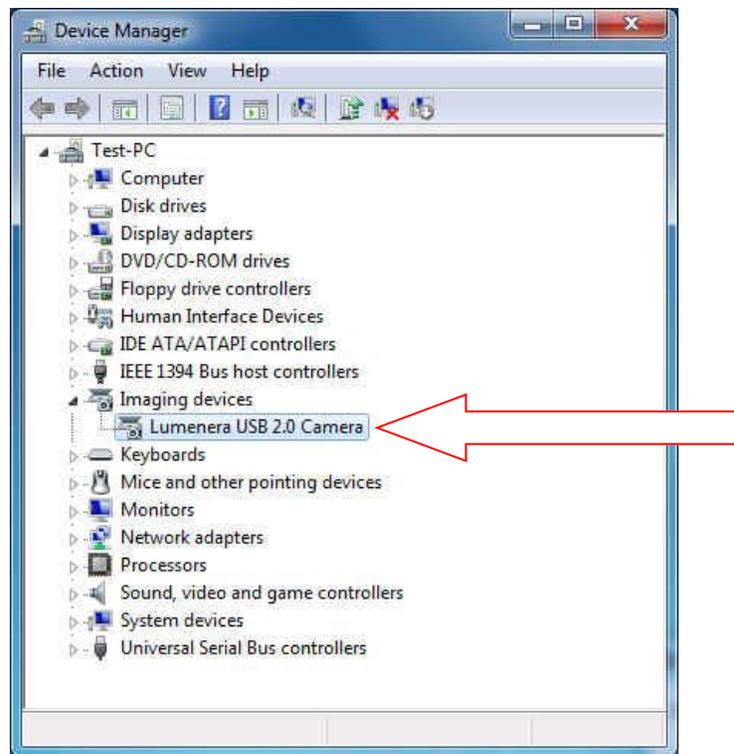


Next, unplug the USB Cable from the back of BIOMIC V3 and plug it in again. Windows should load the correct driver automatically.

## Reader Driver Reinstallation (Continued)



Select **Install** to continue



The correct device name under **Imaging Devices** should be **Lumenera USB 2.0 Camera**

# 3. Software Setup

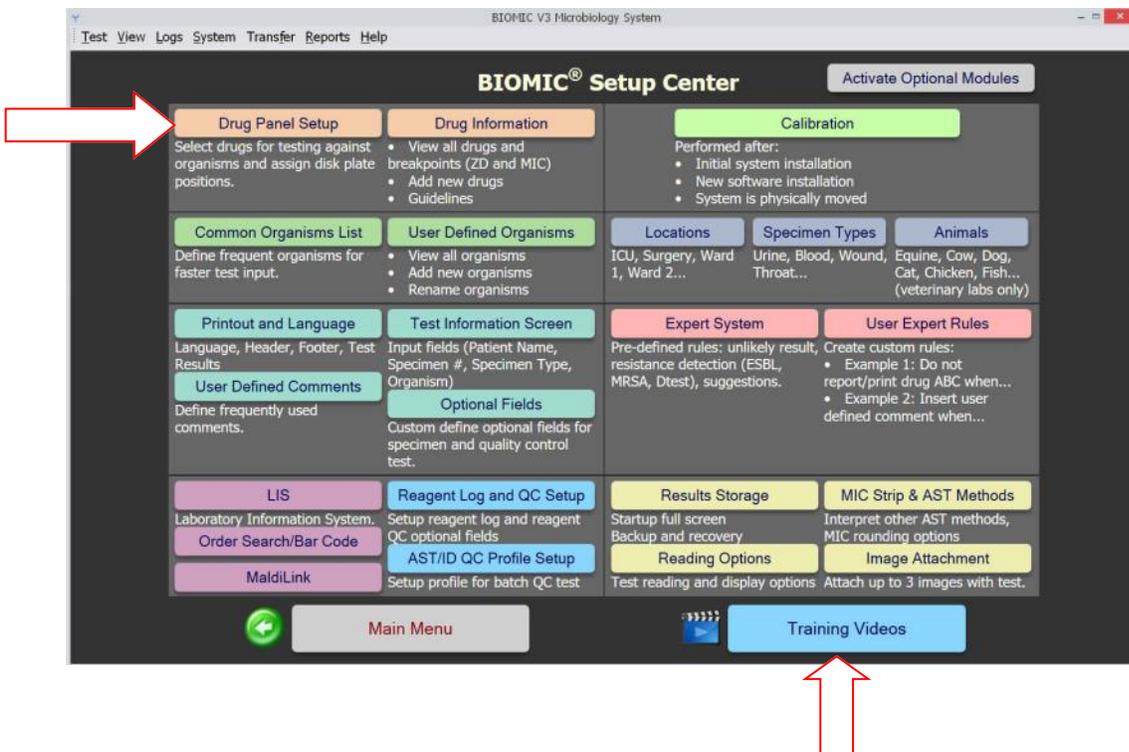
**STEP 1: Select the BIOMIC icon on your Windows desktop**



**STEP 2: Calibration**

The first time BIOMIC software is open, calibration will automatically begin. Refer to on-screen calibration procedures or the Calibration section in this document for detailed instructions. Successful calibration is required to read plates with BIOMIC V3.

**STEP 3: Main Menu > Setup Center > Drug Panel Setup**



Select **Training Videos** for detailed Drug Panel Setup instructions.

Drug Panel Setup is required to confirm antibiotics used in Disk Diffusion & Broth Microdilution testing.

## 4. Performance Characteristics & Specifications

**The accuracy and precision of disk versus dilution method MIC results** is shown in the correlation coefficients between zone diameters produced by disk diffusion method and MICs by dilution method. These are published for most antimicrobics early in development. Coefficients clearly demonstrate the direct correlation between the diffusion method and the dilution method performed without large gaps between dilutions. D'Amato and Thornsberry 1985 showed a 96% correlation between BIOMIC and microdilution MICs. However, microdilution panels often make room for more drugs by reducing the number of concentrations tested, creating broad gaps in dilutions; the quality of panel results is difficult to control in the laboratory. Broth media often does not support fastidious organism growth as well as agar; this may result in trailing end-points that are difficult to read and highly variable. While dilution methods measure susceptibility on a discontinuous scale, interrupted by dilution intervals, the disk method measures susceptibility precisely on a continuous gradient scale to millimeters of growth inhibition, much like the Etest® method.

**MICs reported by the BIOMIC System** are calculated by direct regression analysis based on concentration of antimicrobial agent associated with each quantitative millimeter measurement. These regression lines are very carefully determined by comparative studies correlating dilution MIC results with agar diffusion results. A major factor in the accuracy of these results is that organisms with relatively common growth rates need to be grouped together in regression analysis, (note: CLSI drug-organisms groupings on published interpretive charts) because zone formation in all agar diffusion assays is time dependent. Agar diffusion test results, as all quantitative methods, must be measured quantitatively and quality controlled regularly in order to produce accurate quantitative MIC test results.

**Reproducibility of the disk diffusion method** was shown in one study of 2,181 bacterial-antibiotic combinations re-tested by the CLSI disk diffusion method with interpretive agreement to be 94.5%. Most changes (4.6% or 101/2181) were minor disagreements (R-I, I-S). Of the 19 remaining changes, 0.5% or 10 were from R to S and 0.4% or 9 were S to R. Those changes that occurred tended to be with combinations near interpretive breakpoints and the magnitude of differences between zone diameters on re-testing was small, a mean of only 1.3 mm.

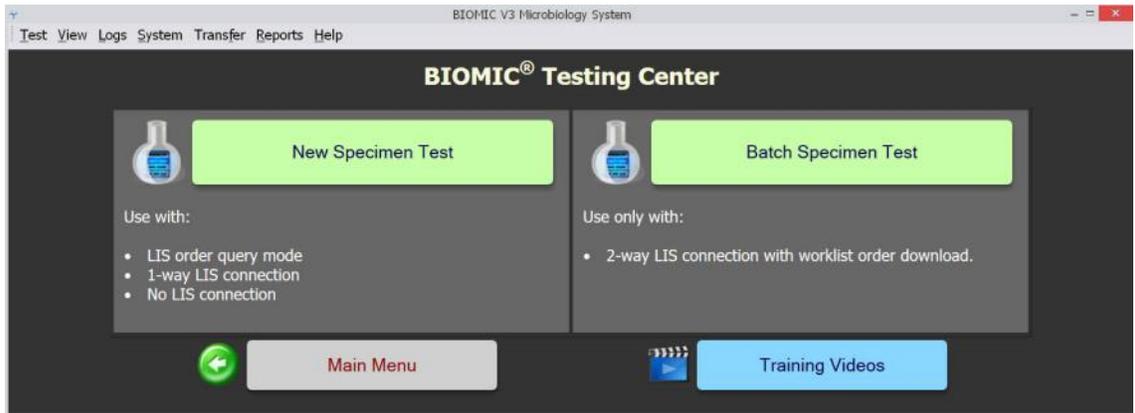
Data from College of American Pathologists (CAP) surveys indicate that overall disk diffusion test acceptable performance is over 95%. Reproducibility and accuracy of the disk diffusion method is well established. Measurements using the BIOMIC System and computer analysis further enhance standardization and quality of antimicrobial susceptibility test results.

Literature references are available at the end of this document or at [www.biomic.com](http://www.biomic.com)

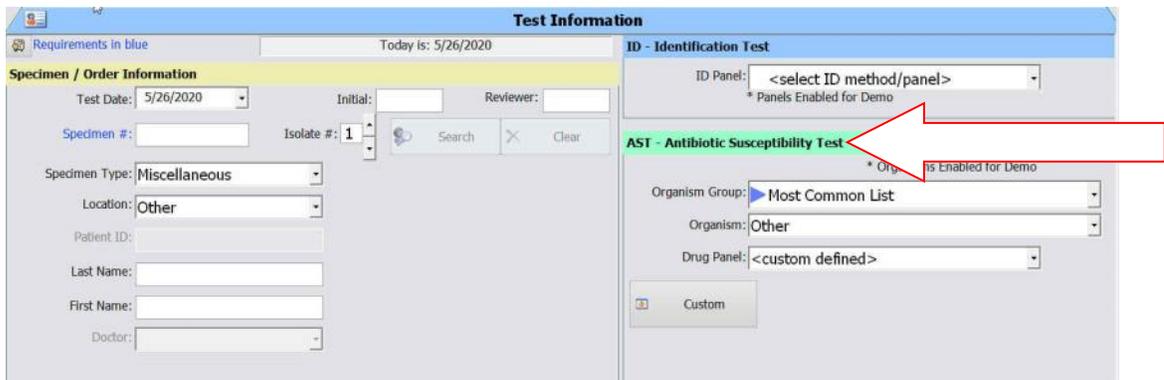
# 5. Operating Instructions

## 5a. Antibiotic Susceptibility Testing Procedure

**STEP 1: Main Menu > Testing Center > New Specimen Test**

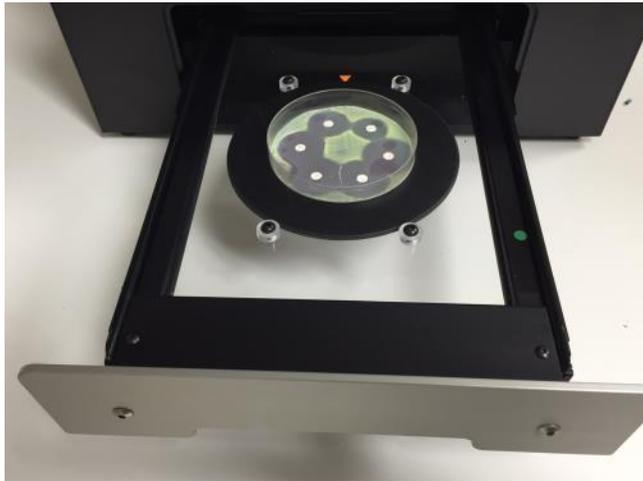


**STEP 2: Enter AST test information**



Screen layout can be customized at Main Menu > Setup Center > Test Information Screen

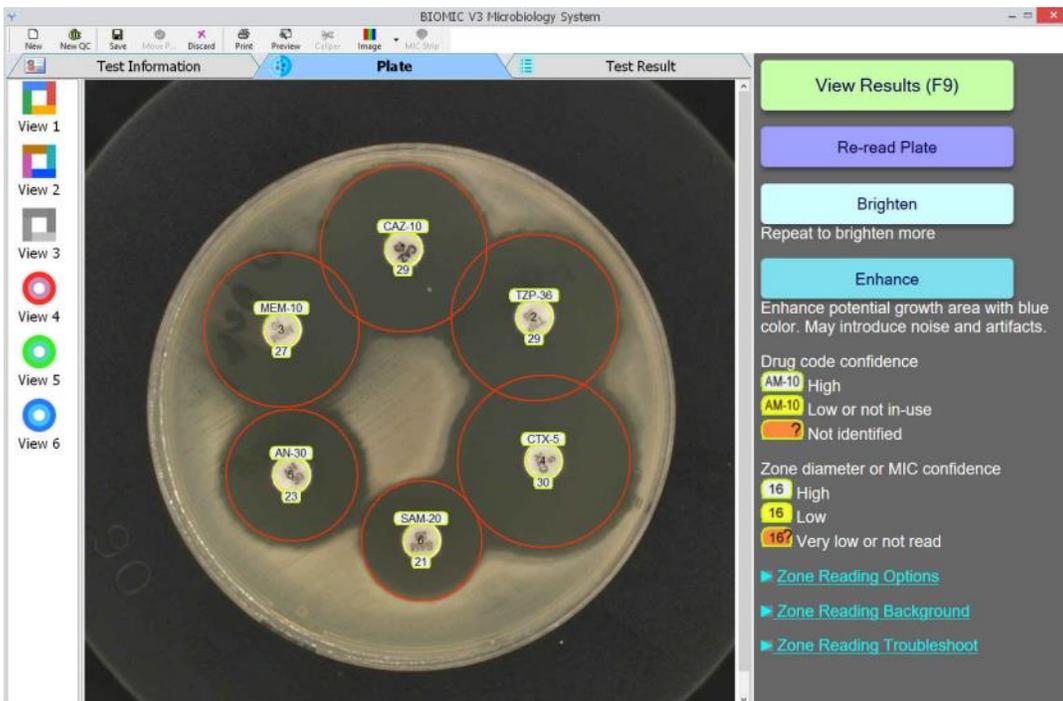
**STEP 3: Open drawer and insert plate as instructed on-screen.**  
**Note: For 90 mm plates, insert the black adapter ring first as displayed below.**



**STEP 4: Close drawer and select Read AST Plate**

Read AST Plate (F10)

**STEP 5: Review plate image on-screen**



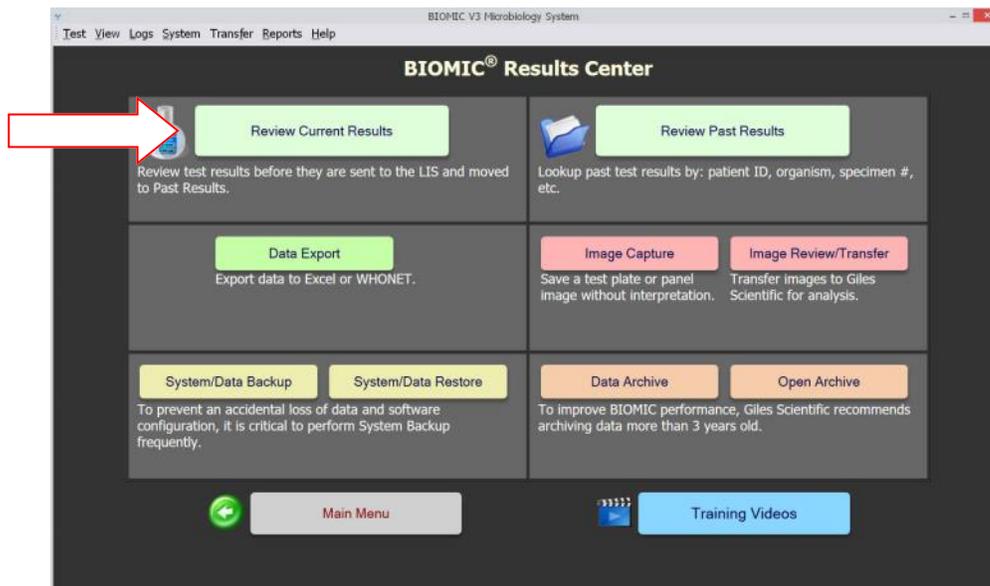
This example is a 90mm antibiotic disk diffusion plate. Confirm or adjust red zone diameters.

## STEP 6: Select View Results

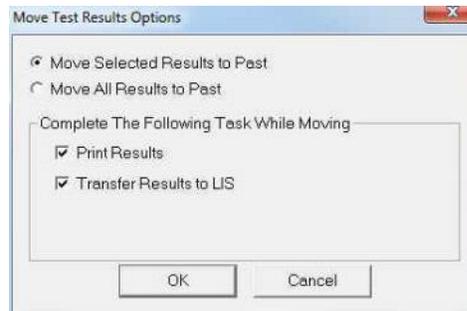
		Drug Name	ZD(mm)	Raw	SIR	Expert
1	Disk	Tetracycline	27		S	
2	Disk	Penicillin	32		N/A	
3	Disk	Trimethoprim-sulfamethoxazole	23		S	
4	Disk	Erythromycin	25		S	
5	Disk	Vancomycin 5ug	20		S	
6	Disk	Oxacillin	21		S	

View Disk Diffusion **Training Videos** for detailed instructions on how to adjust zone sizes, confirm disk codes, select CLSI/EUCAST guidelines, and more.

## STEP 7: Review Results, Move to Past Batch, Print, or LIS Transfer



Current Batch		Past	QC
Show All			
Specimen #	Isolate	Date	LIS
<input type="checkbox"/> 4	1	5/26/2020	
<input type="checkbox"/> 564	1	5/26/2020	
<input type="checkbox"/> 654	1	4/22/2020	
<input type="checkbox"/> 654	1	4/22/2020	
<input type="checkbox"/> 456	1	4/22/2020	
<input type="checkbox"/> 654	1	4/20/2020	

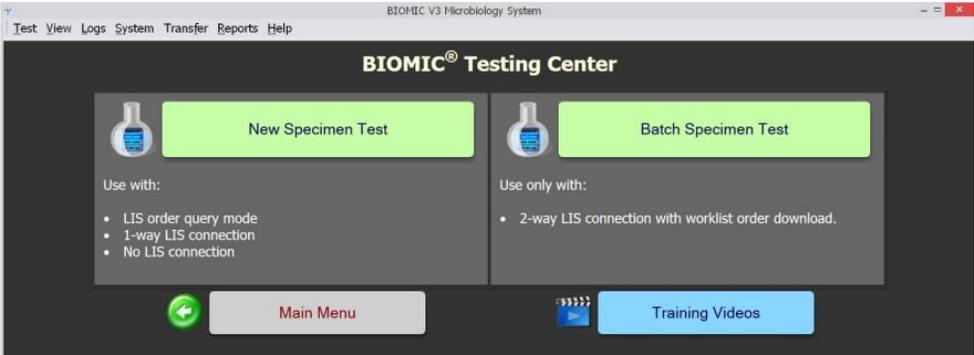


Completed test results are stored in the Current Batch and can be reviewed or edited. Move Current Batch tests to the Past when you have completed testing and reporting.

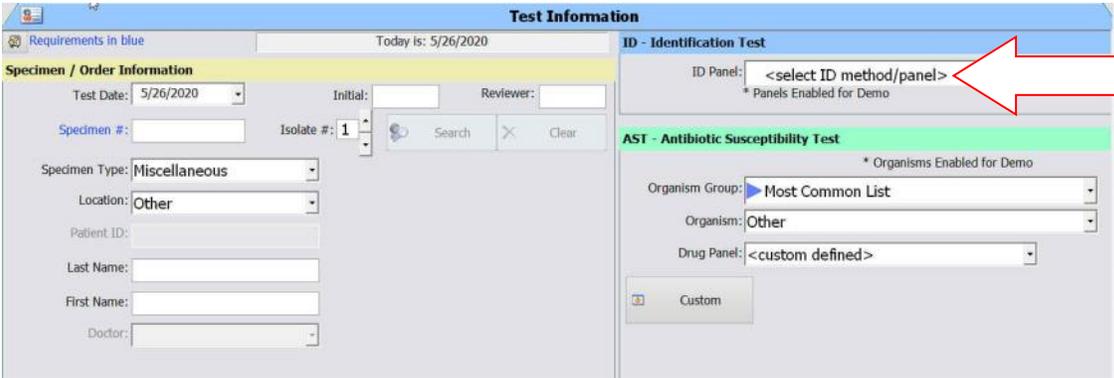
View Results Center **Training Videos** for detailed instructions.

# 5b. Identification Panel Reading Procedure

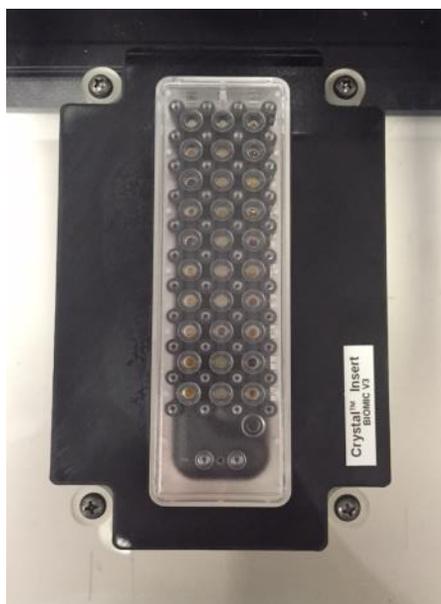
**STEP 1: Main Menu > Testing Center > New Specimen Test**



**STEP 2: Enter ID test information including ID Panel**



### STEP 3: Open drawer and insert ID panel following on-screen instructions



Note: Many ID panels require a plastic insert. Place the plastic insert into the drawer before loading ID panel. Inserts can be stored in the pocket on the side of BIOMIC V3.

### STEP 4: Close drawer and select Read ID Panel to view automated results

BIOMIC V3 Microbiology System

Test Information

BBL Crystal

Select any result to change, positive to negative or negative to positive.

Next Test (F10)

Main Menu (F12)

Positive

Negative

Questionable

Requires user input

Invalid well reaction or incorrect panel

Rare well reaction for current ID

Very rare well reaction for current ID

ID Panel Reading Tips

	A	B	C	D	E	F	G	H	I	J
4	+	+	+	+	+	+	+	+	+	+
2	-	+	+	-	+	+	+	+	-	+
1	+	+	-	+	-	+	+	+	+	+

ID Profile: 5765467555

**Positive identification.**

*Klebsiella pneumoniae ssp pneumoniae*

Biotype Typicality: 2 (Very Typical)

Probability: 99.8%

Messages: Positive identification.

- ID Profile Number, Organism Identification, Biotype Typicality, Probability are displayed.
- Select +, -, or ± to change the automated reading.
- Refer to Organism Identification **Training Videos** for detailed instructions.

## 5c. Quality Control & Inventory Management Procedure

### STEP 1: Main Menu > Quality Control Center > Disk QC



Disk QC reading procedures are the same as a specimen test.

Test Information			Plate			Test Result				
		Drug Name	ZD (mm)	ZD Limits (mm)	Quality	Comment	Manufacturer	Lot #	Expire Date	
1	Disk	Ampicillin	20	15 - 22	OK		BD	586554386895354	9 / 9 /2021	View Lot Information
2	Disk	Amoxicillin-clavulanate	22	18 - 24	OK		BD	56576566897908	3 / 9 /2022	View Lot Information
3	Disk	Cephalothin	18	15 - 21	OK		BD	76575673547899	3 /16/2022	View Lot Information
4	Disk	Gentamicin	22	19 - 26	OK		Oxoid	435868656345436547	5 /26/2022	View Lot Information
5	Disk	Norfloxacin	30	28 - 35	OK		Oxoid	54768564669768587	5 /26/2023	View Lot Information
6	Disk	Trimethoprim	27	21 - 28	OK		BD	326865636585654	6 /18/2021	View Lot Information

Disk QC Test results with Disk Inventory Management details including Manufacturer, Lot Number, Expiration Date.

View Quality Control & Inventory Management **Training Videos** for detailed instructions.

# 6. System Calibration

BIOMIC V3 calibration only needs to be performed after:

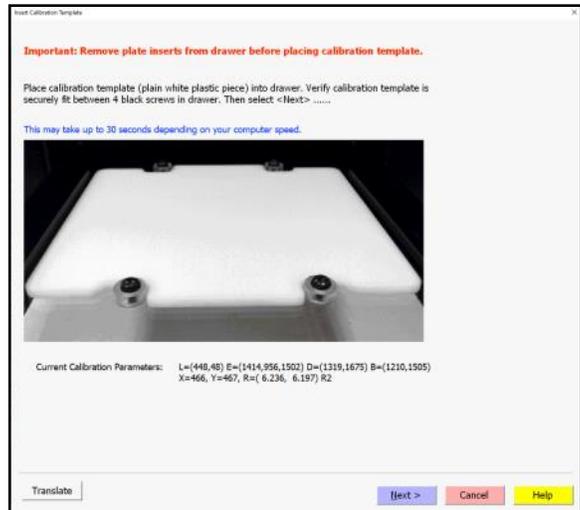
- Initial system installation
- New software installation
- System is physically moved

*Note: Additional calibration steps may be required based on your BIOMIC V3 model and software modules. Please follow instructions on screen.*

**STEP 1: Main Menu > Setup Center > Calibration**



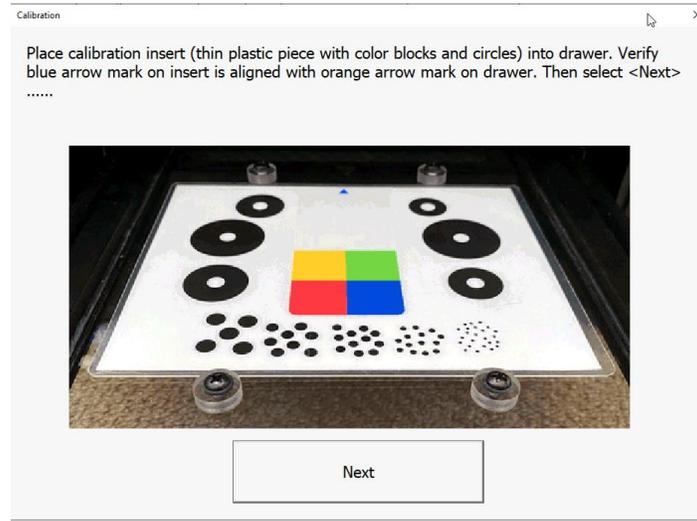
**STEP 2: Place calibration template (plain white plastic piece) into drawer. Verify template is securely fit between 4 black screws. Select Next.**



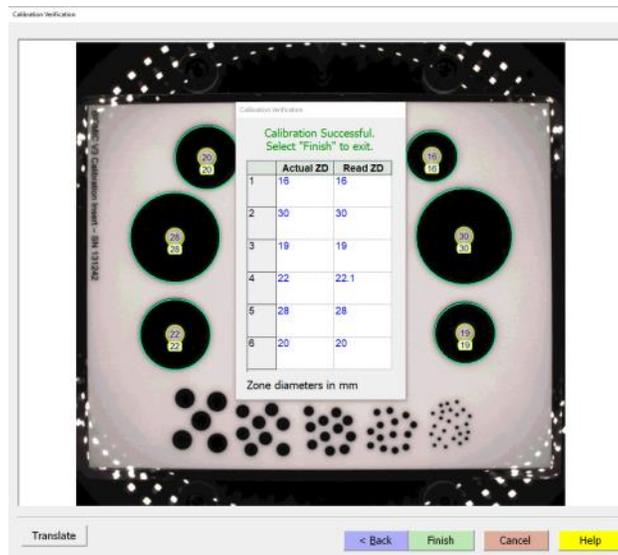
**STEP 3: Remove white calibration template from drawer. Leave drawer empty and close drawer. Select Next.**



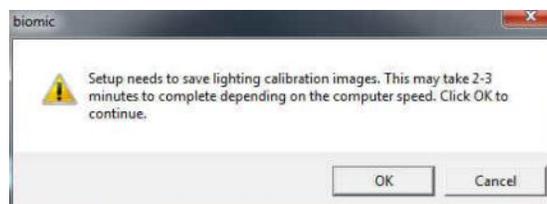
**STEP 4: Place calibration insert (plastic piece with color blocks and black circles) into drawer. Verify blue arrow mark on insert is aligned with drawer mark. Select Next.**



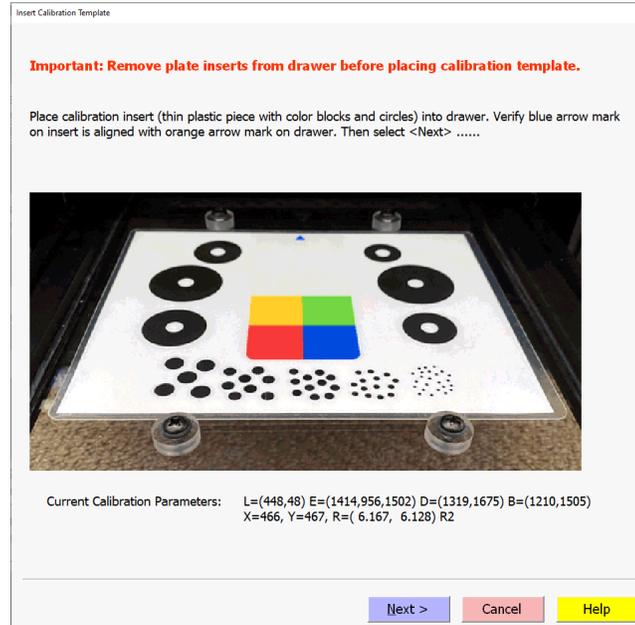
**STEP 5: Review automated zone diameter reading column (Read ZD) with actual zone diameter reading (Actual ZD). BIOMIC V3 automatically calibrates to measure zone diameters within acceptable range. Calibration may be repeated. Select Finish.**



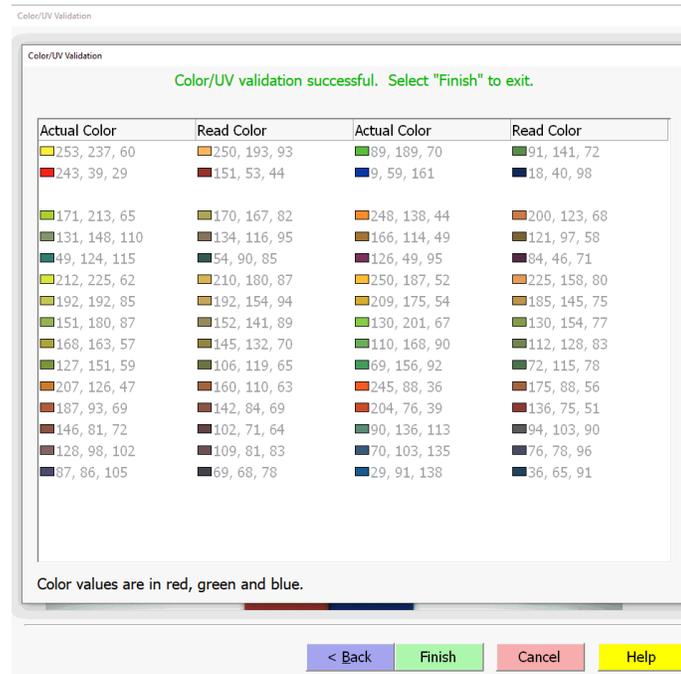
**STEP 6: Select OK to save lighting calibration images. This may last 2-3 minutes depending on your computer.**



**STEP 7: Keep the calibration insert in the drawer from the previous step.  
Select Next to continue with color verification.**



**STEP 8: Review color/UV verification results to confirm BIOMIC V3 is within manufacturer's acceptable specifications. Select Finish.**



**Your BIOMIC® V3 System is now calibrated.**

## 7. Precautions, Limitations, Troubleshooting

In Vitro results do not necessarily correlate with clinical response. Antimicrobial tissue levels vary among patients on the same dosage schedule, and many different dosage schedules are used. Site and severity of infections vary. MIC and S-I-R "breakpoints" and inhibitory quotients are numerical values that must by definition be based on certain assumptions and approximations, as these values are related to average peak human tissue levels of drug.

In view of the number of variables involved, by utilizing a continuous gradient of resistance and susceptibility rather than three categories, in more severe infections, the physician can more easily and accurately choose the relatively most active drug.

Remove moisture and labels and do not write on bottom of test plates except with a fine-point yellow, red, green, blue ink felt pen that will not interfere with image analysis. Put labels or black writing on side or plate lid, or under an unused/empty disk area on plate. Moisture, writing, or labels on bottom of the plate can interfere with plate reading. Wipe moisture from bottom of the plate before inserting into drawer.

The zone diameter circle should be just inside the edge of each zone. Manual adjustments of the BIOMIC V3 automated zone measurements should only be necessary if not near the zone edge. It is important to minimize overlapping zones by positioning the more active drugs next to less active drugs. When highly active drugs are placed together, accuracy of the zone reading is reduced and may require visual confirmation on-screen.

Always use a disk dispenser to drop disks on plates, or print a paper template to slide under the plates with positions marked. Giles Scientific recommends a maximum of 12 disks on 150mm plates, and a maximum of 6 disks on 90mm plates.

If you are not using automatic disk locator, you must assign each disk position. BIOMIC V3 has approximately 20mm tolerance and it will not find disks outside that range. When setting up your drug panels, put the most active drugs disks far apart to minimize overlapping of large zones.

If you are not using automatic disk locator, place plates in the drawer with antibiotic disk code prompted (from screen) in the 12 o'clock position. Line it up with the mark on the drawer to ensure disks are in the same position as during layout of that drug panel.

If bacterial growth is difficult to view on-screen, select the Enhance or Brighten features positioned to the right of the plate image. If it is still too difficult to read the plate manually, enter the measurements on-screen. Hemophilus and Neisseria may need more on-screen adjustments.

Note: Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.

## **8. Service and Maintenance**

No maintenance of BIOMIC V3 is required. It contains no motors or moving parts. BIOMIC V3 requires no adjustments or lubrication. Lights in the system do not require maintenance and are non-replaceable by the user.

Giles Scientific recommends performing routine maintenance on your computer with Windows. This includes standard system functions such as backup, defragmentation, and virus protection.

A surge protector is required to guard against power surges causing potential damage to the BIOMIC V3. Damage caused by power surges is not included in the system warranty.

### **8a. Touch Screen Monitor And Drawer Surface Cleaning Instructions**

Any standard glass cleaner can be used to clean the touch screen monitor and drawer surface. Standard hospital disinfectants can also be used including alcohol, iodine, and betadine. Disinfectants or glass cleaners should be applied to a cloth or towel and not sprayed directly on the screen or drawer surface.

# 9. References

## Evaluation & Study References

2014. Paul Levett, Tina Ash, David Gibbs, Andrew Wang, Nikolaus Thierjung. Study of BIOMIC V3 Automated versus Manual Reading of MicroScan ESBL Plus Panel Results. Canadian Journal of Infectious Diseases and Medical Microbiology Vol 25 No 2 March/April 2014. View Poster.
2013. Sam Cohen, Natali Baker, David Gibbs, Andrew Wang, Nikolaus Thierjung. Study of BIOMIC V3 Automated Well Reading versus Manual Reading of Sensititre YeastOne YO-9 Panel Results. Giles Scientific Inc.
2013. Robert C. Fader, Emily Weaver, Rhonda Fossett, Michele Toyras, John Vanderlaan, David Gibbs, Andrew Wang, Nikolaus Thierjung. Multilaboratory Study of the Biomic Automated Well-Reading Instrument versus MicroScan WalkAway for Reading MicroScan Antimicrobial Susceptibility and Identification Panels. Journal of Clinical Microbiology 51(5): 1548-1554.
2010. G.P. Turner, I. Dusich, R.B. Thomson, Jr. Comparative Cost of Antimicrobial Susceptibility Testing using BIOMIC Disk Diffusion vs. the BD Phoenix™ AP Automated Microbiology Systems. ASM Poster.
2010. H.M. Vinson, L.M. Piche, N.W. Dyer, D.F. Krogh, L.P. Schaan, P.S. Gibbs. Characterization of Multiple Morphologically Different Escherichia coli Colonies From Individual Diagnostic Cases. ASM Poster.
2010. P.S. Gibbs, M. Smith, E. Sackreiter, H.M. Vinson, and J.W. Grier. Genotypic and Antibigram Comparison of Salmonella spp. Isolates from Multiple Populations of Snakes in the Upper Midwest. ASM Poster.
2009. Nicole M. Broekema, Tam T. Van, Timothy A. Monson, Steven A. Marshall, and David M. Warshauer. Comparison of Cefoxitin and Oxacillin Disk Diffusion Methods for Detection of mecA-Mediated Resistance in Staphylococcus aureus in a Large-Scale Study J. Clin. Microbiol. 47: 217-219.
2008. E.J. Baron et. al. Evaluation of the BIOMIC V3 Microbiology System for Identification of Selected Species on BBL CHROMagar Orientation Agar and CHROMagar MRSA Medium. Journal of Clinical Microbiology 46 (10), 3488-3490. View Abstract
2003. C. Girmenia, G. Pizzarelli, D. D'Antonio, F. Cristini and P. Martino. In Vitro Susceptibility Testing of Geotrichum capitatum: Comparison of the E-Test, Disk Diffusion, and Sensititre Colorimetric Methods with the NCCLS M27-A2 Broth Microdilution Reference Method. Antimicrob Agents Chemother. December; 47(12): 3985–3988.
1998. M. Jacobs, H. Holoszyk et. al. Determination of Penicillin MICs of Streptococcus pneumoniae by using a Two- or Three-Disk Diffusion Procedure. Journal of Clinical Microbiology 36(1), 179-183.
1998. K. Korgenski and J. Daly. Evaluation of the BIOMIC System for Determining Interpretive Categories of Isolates on the Basis of Disk Diffusion Susceptibility Results. No very major or major errors and the BIOMIC is a reliable system for reading disk test zones. Journal of Clinical Microbiology 36(1) 302-304.
1997. M. Jacobs et. al., Comparison: BIOMIC vs Agar Dilution, Microdilution & E-Test: 183 isolates of strep pneumo vs penicillin; using penicillin, oxacillin & methicillin disks.
1996. I. Berke and P. Tierno. Comparison of Efficacy and Cost-Effectiveness of BIOMIC and Vitek Antimicrobial Susceptibility Test Systems for Use in the Clinical Microbiology Laboratory. Overall agreement of interpretation was 97%, of MICs 93% with 2948 organism-drug combinations on gram positive and gram negative bacteria. Journal of Clinical Microbiology 34(8), 1980-1984.
1995. D. Amsterdam and D. Hardy. Anaerobe Susceptibility Determinations in Two Continuous Agar Gradient Systems (BIOMIC & Etest). Complete agreement was shown in 79, 90 & 88% of Bacteroides, Clostridia & Fusobacteria. Abstract C366, American Society for Microbiology Annual Meeting.

1995. K. Korgenski and J. Daly. Evaluation of the BIOMIC Reader System. Abstract C337, American Society for Microbiology Annual Meeting.

1995. R. Sautter and D. DeWeese et. al. Comparison of two Gradient Diffusion Susceptibility Methods, BIOMIC and Etest, for the Determination of Susceptibility on Routine Clinical Isolates: 166 routine isolates, 7 species, and 4 drugs, 638 drug combinations. 94% agreement. Abstract C336, American Society for Microbiology Annual Meeting.

1994. J. McLaughlin et al. A Comparison of BIOMIC and Etest for Antibiotic Susceptibility Testing of Haemophilus influenzae. 852 H.influenzae - antibiotic combinations (6 drugs). 94% MIC-agreement within +/- 1 log dilution. Abstract, Poster C-308, American Society for Microbiology Annual Meeting.

1994. J. Daly et. al. Reliability two Unique Techniques, BIOMIC and Etest, for Detection of Antimicrobial Resistance of Streptococcus pneumoniae. Abstract C218, American Society for Microbiology Annual Meeting.

1993. J. Daly et. al. Evaluation of the BIOMIC System and Etest by Using Beto-Hemolytic Streptococci. 24 hour MICs on 10 antibiotics and 101 beta-hem-streptococci showed 99% agreement. Abstract C97, American Society for Microbiology Annual Meeting.

1993. P. Rohner and R. Auckenthaller. Evaluation of the BIOMIC Antimicrobial Susceptibility Test System with Staphylococci. 102 S aureus and 63 coag-neg Staph were tested S.aureus & 63 coag-neg Staph showed 99,98,98,96,95 & 90% MIC-agreement with dilution tests.. Abstract C112, American Society for Microbiology Annual Meeting.

1993. S. Hodowanec et. al. Comparative Study of BIOMIC and MicroScan Methods for the Determination of Quantitative Antibiotic Sensitivity Testing. 400 gram negative bacilli, 12,000 drug combinations. Abstract C183, American Society for Microbiology Annual Meeting.

1991. R. Morfin et. al. Correlation Between the BIOMIC Antimicrobial Susceptibility Test System and Microdilution MIC's. A comparison of MicroScan and BIOMIC MIC showed 92% agreement. Abstract C138, American Society for Microbiology Annual Meeting.

1991 R. L. Sautter et al. Comparison: BIOMIC & Panel Systems Antimicrobial Susceptibility Testing of Staphylococcus aureus. 93 S.aureus isolates were tested using MICs and S-R interpretation with 28 antibiotics (6831 combinations showed 90% agreement with MicroScan and 84% for MRSA. Reliability of MRSA MIC-panel results has been challenged. BIOMIC uses reliable disk-testing to detect MRSA and offers MICs. Abstract, American Society for Microbiology Annual Meeting.

1991. T. Lawrence and D. Amsterdam. Early and Overnight BIOMIC Observations for Determining MICs. 162 Enterobacteriaceae and 56 nonfermenters, were tested against 8 antibiotics. 1744 organism-drug combinations, showed 94% agreement. Early 6 hr readings showed 4.2% Vm and Ma disagreement. BIOMIC is an acceptable for determining MICs after 18hr, and for most gram-negatives after 6 hours. Abstract C137, American Society for Microbiology Annual Meeting.

1987. R. Sautter and G. Denys. Evaluation of BIOMIC and Commercial Microdilution Antimicrobial Susceptibility Test Systems. BIOMIC automates & standardizes disk tests and reports MICs. BIOMIC eliminates maintaining MIC panels. BIOMIC/disk-diffusion is preferred for testing multiply-resistant staphylococci. Journal of Clinical Microbiology 25(2), 301-304.

1986. S. Nicol et. al. BIOMIC Disk and Microbroth Dilution Susceptibility Test Comparative Study. Abstract C200, American Society for Microbiology Annual Meeting.

1985. R. D'Amato and C. Thornsberry. Evaluation of the BIOMIC Antimicrobial Susceptibility System. MICs of 511 isolates of Enterobacteriaceae, nonfermenters, enterococci & staph, 10,085 organism-drug combinations. Journal of Clinical Microbiology 22(5), 793-798.

## Antimicrobial Surveillance & Yeast Disk Test References

2010. Pfaller MA, Diekema DJ, Gibbs DL, Newell VA, Ellis D, Tullio V, Rodloff A, Fu W, Ling TA; and the Global Antifungal Surveillance Group. Results from the ARTEMIS DISK Global Antifungal Surveillance Study, 1997 to 2007: a 10.5-year analysis of susceptibilities of *Candida* Species to fluconazole and voriconazole as determined by CLSI standardized disk diffusion. *Journal of Clinical Microbiology*. 48(4):1366-77. View Abstract
2009. N. Mandras, V. Tullio, V. Allizond, D. Scalas, G. Banche, J. Roana, F. Robbiano, G. Fucale, A. Malabaila, A.M. Cuffini, and N. Carlone. In Vitro Activities of Fluconazole and Voriconazole against Clinical Isolates of *Candida* spp. Determined by Disk Diffusion Testing in Turin, Italy. *Antimicrobial Agents and Chemotherapy*. 53(4): 1657–1659. View Abstract
2009. M. A. Pfaller, D. J. Diekema, D. L. Gibbs, V. A. Newell, H. Bijie, D. Dzierzanowska, N. N. Klimko, V. Letscher-Bru, M. Lisalova, K. Muehlethaler, C. Rennison, M. Zaidi and the Global Antifungal Surveillance Group. Results from the ARTEMIS DISK Global Antifungal Surveillance Study, 1997 to 2007: 10.5-Year Analysis of Susceptibilities of Noncandidal Yeast Species to Fluconazole and Voriconazole Determined by CLSI Standardized Disk Diffusion Testing. *Journal of Clinical Microbiology* 47(1) 117-123.
2008. M. A. Pfaller, D. J. Diekema, D. L. Gibbs, V. A. Newell, E. Nagy, S. Dobiasova, M. Rinaldi, R. Barton, A. Veselov and the Global Antifungal Surveillance Group. *Candida krusei*, a Multidrug Resistant Opportunistic Fungal Pathogen: Geographical and Temporal Trends from the ARTEMIS DISK Global Antifungal Surveillance Program, 2001-2005. *Journal of Clinical Microbiology* 46(2) 515-521.
2008. M.A. Pfaller, D.J. Diekema, D.L. Gibbs, V.A. Newell, K.P. Ng, A. Colombo, J. Finquelievich, R. Barnes, J. Wadula, and the Global Antifungal Surveillance Group. Geographic and Temporal Trends in Isolation and Antifungal Susceptibility of *Candida parapsilosis*: A Global Assessment from the ARTEMIS DISK Antifungal Surveillance Program, 2001 to 2005. *Journal of Clinical Microbiology* 46 (3) 842-849.
2007. A. Espinel-Ingroff, B. Arthington-Skaggs, N. Iqbal, D. Ellis, M.A. Pfaller, S. Messer, M. Rinaldi, A. Fothergill, D. L. Gibbs, A. Wang. A Multicenter Evaluation of a New Disk Agar Diffusion Method for Susceptibility Testing of Filamentous Fungi with Voriconazole, Posaconazole, Itraconazole, Amphotericin-B and Caspofungin. *Journal of Clinical Microbiology* 45(6), 1811-1820.
2007. M. A. Pfaller, D. J. Diekema, D. L. Gibbs, V. A. Newell, J. F. Meis, I. M. Gould, W. Fu, A. L. Colombo, E. Rodriguez-Noriega, and the Global Antifungal Surveillance Group. Results from the ARTEMIS DISK Global Antifungal Surveillance Study, 1997-2005: An 8.5-Year Analysis of Susceptibilities of *Candida* and Other Yeast Species to Fluconazole and Voriconazole by CLSI Standardized Disk Diffusion Testing. *Journal of Clinical Microbiology*. 45(6), 1735-1745.
2006. M. Pfaller, D. Diekema, A. Colombo, C. Kibbler, K. P. Ng, D. Gibbs, V. Newell and the Global Antifungal Surveillance Group. *Candida rugosa*, an Emerging Fungal Pathogen with Resistance to Azoles: Geographic and Temporal Trends from the ARTEMIS Disk Antifungal Surveillance Program. *Journal of Clinical Microbiology*.
2006. M. Pfaller, D. Diekema, M. Mendez, C. Kibbler, P. Erzsebet, S. Chang, D. Gibbs, V. Newell, and the Global Antifungal Surveillance Group. *Candida guilliermondii*, an Opportunistic Fungal Pathogen with Decreased Susceptibility to Fluconazole: Geographic and Temporal Trends from the ARTEMIS Disk Antifungal Surveillance Program. *Journal of Clinical Microbiology* 44, 3551-3556.
2006. Pfaller, M.& D. Diekema, D.Sheehan et al. Interpretive Breakpoints for Fluconazole and *Candida* Revisited: a Blueprint for the Future of Antifungal Susceptibility Testing. *Clinical Microbiology Review*. 19(2), 435-447.
2006. M. Pfaller, D. Diekema, et al. Correlation of MIC with Outcome for *Candida* Species Tested against Voriconazole: Analysis and Proposal for Interpretive Breakpoints. *Journal of Clinical Microbiology*, 44(3), 819-826.

2005. M. Pfaller, D. Diekema, M. Rinaldi, R. Barnes, B. Hu, A. Veselov, N. Tiraboschi, E. Nagy, D. Gibbs. Results for the ARTEMIS Disk Global Antifungal Surveillance Study: a 6.5-year Analysis of Susceptibilities of *Candida* and Other Yeast Species to Fluconazole and Voriconazole by Standard Disk Diffusion Testing. *Journal of Clinical Microbiology*. 43(2) 5848-5859.
2005. D. Sheehan and D. Gibbs. In Vitro Activity of Voriconazole and Fluconazole Against *Candida* Species; a Report from the ARTEMIS Global Surveillance Program. Abstract, European Congress of Clinical Microbiology and Infectious Disease (ECCMID).
2005. D. Gibbs and D. Sheehan. In Vitro Activity of Voriconazole and Fluconazole Versus > 8000 *Candida glabrata* Isolates. Abstract, European Congress of Clinical Microbiology and Infectious Disease ECCMID.
2004. Clinical and Laboratory Standards Institute. Method for Disk Diffusion Susceptibility Testing of Yeasts; Approved Guideline M44-A. CLSI Wayne, PA. [www.clsi.org](http://www.clsi.org)
2003. K. C. Hazen, E. J. Baron, A. Colombo, C. Girmenia, A. Sanchez-Sousa, A. del Palacio, C. de Bedout, D. L. Gibbs, and the Global Antifungal Surveillance Group. Comparison of the Susceptibilities of *Candida* spp to Fluconazole and Voriconazole in a 4-Year Global Evaluation Using Disk Diffusion. *Journal of Clinical Microbiology*, 41(12) 5623-5632.
2003. M. Pfaller et. al. Evaluation of the Etest and Disk Diffusion Methods for Determining Susceptibilities of 235 Bloodstream Isolates of *Candida glabrata* to Fluconazole and Voriconazole. *Journal of Clinical Microbiology* 41(5), 1875-1880.
2003. M. Pfaller et. al. Activities of Fluconazole and Voriconazole against 1,586 Recent Clinical Isolates of *Candida* Species Determined by Broth Microdilution, Disk Diffusion, and Etest Methods: Report from The ARTEMIS Global Antifungal Susceptibility Program, 2001. *Journal of Clinical Microbiology* 41(4), 1440-1446.
2003. M. A. Pfaller et. al. Activities of Fluconazole and Voriconazole against 1,586 Recent Clinical Isolates of *Candida* Species Determined by Broth Microdilution, Disk Diffusion, and Etest Methods: Report from The ARTEMIS Global Antifungal Susceptibility Program, 2001. *Journal of Clinical Microbiology* 41(4), 1440-1446.
2003. Y.C. Chen et al. Stable susceptibility of *Candida* blood isolates to fluconazole despite increasing use during the past 10 years. *Journal of Clinical Microbiology* 52, 71-77.
2001. L. Leibowitz et. al. A two year global evaluation of the susceptibility of *Candida* species to fluconazole by disk diffusion. *Diagnostic Microbiology and Infectious Disease* 04, 27-33.
2000. J. Meis et. al. A global evaluation of the susceptibility of *Candida* species to fluconazole by disk diffusion. *Diagnostic Microbiology and Infectious Disease* 36, 215-223.
1998. J. Bille. BIOMIC Vision Reading of Fluconazole Agar Disk Diffusion Susceptibility Testing of *Candida* Spp. Clinical Isolates Compared to CLSI Microbroth Dilution. Poster J-120, Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC).
1997. J. Bille, M. Glauser et. al: Evaluation of the Susceptibility of Pathogenic *Candida* Species to Fluconazole. *European Journal of Clinical Microbiology and Infectious Disease* 16(12), 924-928.
1997. J. Rex, M. Pfaller, J. Galgiani, M. Bartlett, A. Espinel-Ingroff, M. Ghannoum, M. Lancaster, F. Odds, M. Rinaldi, T. Walsh and A. Barry. Development of Interpretive Breakpoints for Antifungal Susceptibility Testing; Conceptual Framework and Analysis of In Vitro and In Vivo Correlation data for Fluconazole and Itraconazole and *Candida* Infections. *Clinical Infectious Diseases* 24, 235-247.
1996. A. Barry and S. Brown. Fluconazole Disk Diffusion Procedure for Determining Susceptibility of *Candida* Species. *Journal of Clinical Microbiology* 34, 2154-2157.

**Giles Scientific Inc.**

Santa Barbara, California, USA

Phone: 1-805-963-3876, Fax: 1-805-963-7768

Email: [support@biomic.com](mailto:support@biomic.com)

Website: [www.biomic.com](http://www.biomic.com)