



The Digital Revolution: Now Protecting Your Pipetting Data

A higher standard of reproducibility made possible with tools that track pipetting data

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INTRODUCTION

Connecting research tools to the Internet of Things (IoT) can help researchers track their protocols and data more reliably and completely. Detailing each step of an experiment is critical if researchers hope to reproduce their work, but it is a common problem.

Experimental notes may be fragmented across different notebooks, paper and computer documents. Pipetting data is easy to lose and difficult to retroactively compile. Inconsistent record keeping practices can lead to incomplete reporting on experimental protocols and jeopardize research.



Even carefully laid plans can run afoul. Simple protocols may have to be revised unexpectedly. A scientist may perform hundreds of steps, and even with careful notes, important details can be overlooked or forgotten. More complicated workflows that demand intricate pipetting sequences, like high-throughput, repetitive pipetting protocols for ELISAs, qPCR, next-generation sequencing, and

cell-based assay especially stand to benefit from an automatic record of pipetting data. When an experiment cannot be reproduced, it calls into question the validity of all past experimental results achieved. Moreover, when protocols and experimental results are stored in such a decentralized fashion, sharing those protocols and results become a monumental challenge as well. When the sharing of experimental results falls apart, crucial scientific collaboration breaks down.

THE ABSENCE OF PIPETTING DATA AFFECTS TODAY'S LAB

It is likely that most scientists have experienced at least one of the following situations, all of which can lead to errors in tracking pipetting data:

1. A researcher is performing a complicated protocol that will include six hours of closely-spaced, time-sensitive steps. The researcher must make a last-minute change in the middle of the protocol but does not have time to write the change down in their lab notebook. At the end of the protocol, the researcher wants to update the protocol, but cannot remember the exact change they made.
2. A reaction must be mixed in a specific order, but a new colleague is not aware of this and mixes the solution in the wrong order. Unfortunately, there is no pipetting data and the results confuse the entire lab.
3. A scientist develops an experimental protocol that produces exciting results, which are later published in a prestigious journal. After the scientist leaves the lab, another researcher

would like to apply the protocol to a new project. However, the notes on the protocol are incomplete. New researchers try to contact the scientist to no avail and cannot figure out how to replicate the results. Researchers cannot proceed with future experiments, and now question the validity of the original results.

DIGITIZATION IS THE SOLUTION

Automating record keeping takes the task of note-taking out of human hands. Lab tools that digitally record each step researchers make leave a consistent, traceable record that is centralized and organized. One such tool is Gilson's Bluetooth®-enabled laboratory instruments.

These instruments communicate through the PipettePilot™ application to bring a new kind of traceability to pipetting that solves the issues which may come with manual pipette recordkeeping. Gilson's **TRACKMAN® Connected** is a platform that includes a tablet preloaded with PipettePilot and other accessories that make repetitive pipetting in 96 and 384-well plates faster and more reliable. TRACKMAN Connected is designed to communicate with **PIPETMAN® M Connected**, a Bluetooth®-enabled smart electronic pipette. Using protocols created in the app, PipettePilot will configure the pipettes and highlight the pipetting location, allowing the scientist to be more organized and confident.

Additionally, because environmental conditions such as humidity and temperature can influence experimental results, TRACKMAN Connected monitors ambient conditions via a wireless sensor, generating time-stamped records for every experiment. All pipetting data and environmental records can be uploaded to most customers' systems, including **SciNote**. **SciNote**, a top-rated electronic lab notebook for researchers in academia or industry, enables users to manage a centralized repository of protocols. Each day's individual experiments can easily be referenced and shared within and between labs. Together, Gilson's connected laboratory products track and record pipetting data for each step of every experiment, enabling bench scientists to achieve a higher degree of traceability than has ever been possible with manual lab equipment.

PUTTING THE INTERNET OF THINGS INTO PRACTICE

These tools can often fit into researchers' existing workflows or even improve them. For example, researchers can create a protocol on the PipettePilot app. With PIPETMAN M Connected pipettes, the app will then guide users through the execution of that protocol.

The PipettePilot app automatically records the researcher's pipetting while providing detailed configuration and guidance through each step. At the end of the experiment, the researcher can upload pipetting data and environmental records to their electronic lab notebook hosted by SciNote. If, during the protocol, the researcher identifies an error, steps can be repeated, and comments can be added to the report to allow for further investigation. By having the ability to look back at a report of pipetting actions and timestamped environmental data, a scientist can improve the experiment's traceability and make it easier for others to replicate. The capability to go back and determine, with certainty, what changed during an experimental protocol saves time and resources.

Because the data is stored in a central location, sharing data and protocols is simple and reliable. When sharing pipetting data with lab mates and collaborators, a researcher can be confident they haven't missed anything, and their collaborators have everything they need. Finally, reports can be exported into portable formats or exported securely to SciNote's electronic lab notebook, making it easy to share with the wider scientific community as needed.

To learn more about TRACKMAN Connected and how it brings together the suite of Gilson Connect devices here: **TRACKMAN® Connected**

HOW DO I USE CONNECTED TOOLS AT THE BENCH?



1  CHECK the activity and calibration status of your device in PipetteScope™	2  REQUEST a pipette calibration/service if needed	3  OPEN the PipettePilot® app	4  LOAD your protocol from SciNote or your tablet	5  EDIT and save changes to your protocol
6  CONNECT your PIPETMAN® M Connected and environment sensor to the app	7  PLACE your plate support and microplate on the screen	8  FOLLOW the light on the app that shows where, when and how to pipette	9  REVIEW your automatically generated report and add comments	10  SAVE the report locally or send it to your ELN

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