
JITRbug

Integrity Test Rig for Hand-Held Mercury Monitors

March 2022



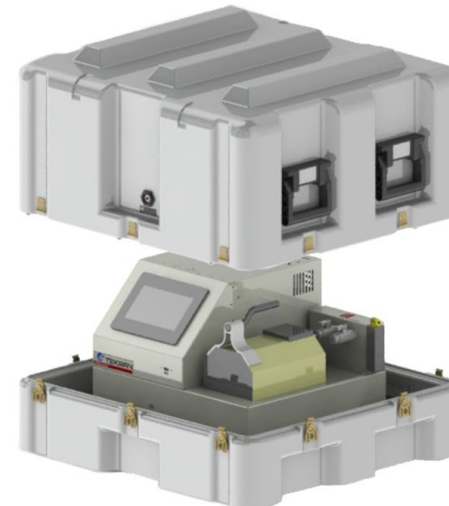
JITRbug – Mercury Test Gas Generator



JITRbug Front



JITRbug in use



JITRbug
Transport
Case



JITRbug Summary

- The JITRbug is a simple-to-operate continuous source of a precisely controlled mercury test gas of known concentration, traceable to a NIST standard. The mercury source flow and dilution air flow are precisely controlled by dual MFC's to generate Hg test gas at 0, 30, 50 and 100 $\mu\text{g}/\text{m}^3$.
- With the introduction of the Tekran JITRbug, accuracy and performance of hand-held mercury monitors can be accomplished in 5-minutes just prior to daily use, or before entering a potentially hazardous air space.
- Supervisors and industrial hygiene managers are now able to routinely document accuracy and performance, to make certain workers are fully protected from toxic levels of mercury in air.



JITRbug Justification and Purpose

- Users of hand-held mercury monitors, such as the Jerome® J405, must trust that the device will provide accurate results between factory calibration and certification. This may not always be the case.
- Jerome® offers a J405 Functional Test Kit that would be too laborious and time consuming to implement routinely or by a regular workforce. The J405 test method is very technique sensitive and should be done by a trained technician.
- Tekran and an interested customer, that routinely uses many J405 units, realized the need to develop a simple J405 functional test of accuracy that can be easily and quickly implemented and documented.
- A daily or weekly J405 functional test can remove malfunctioning or inaccurate instruments from being used for worker safety or other air mercury exposure monitoring.

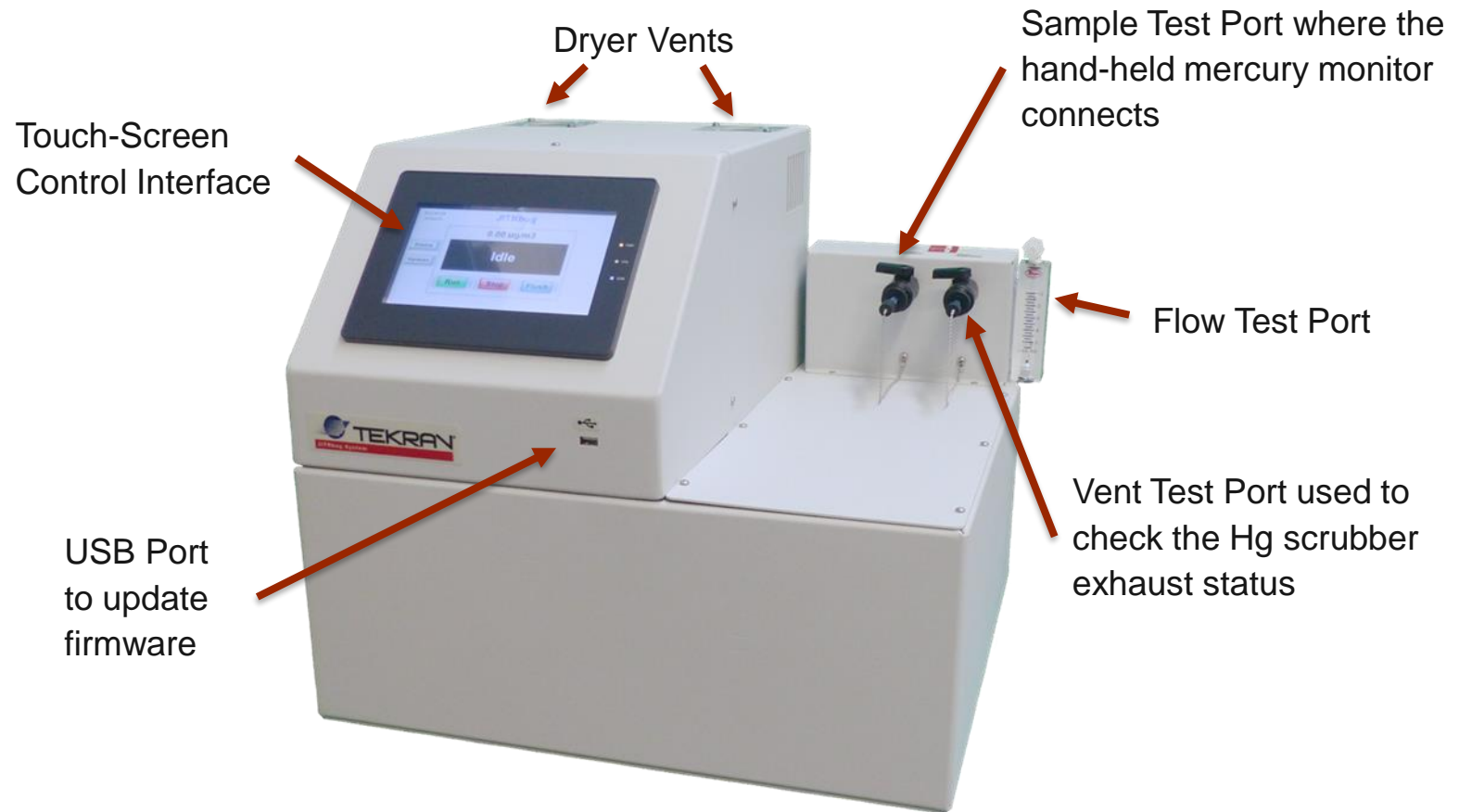


JITRbug Potential Customers

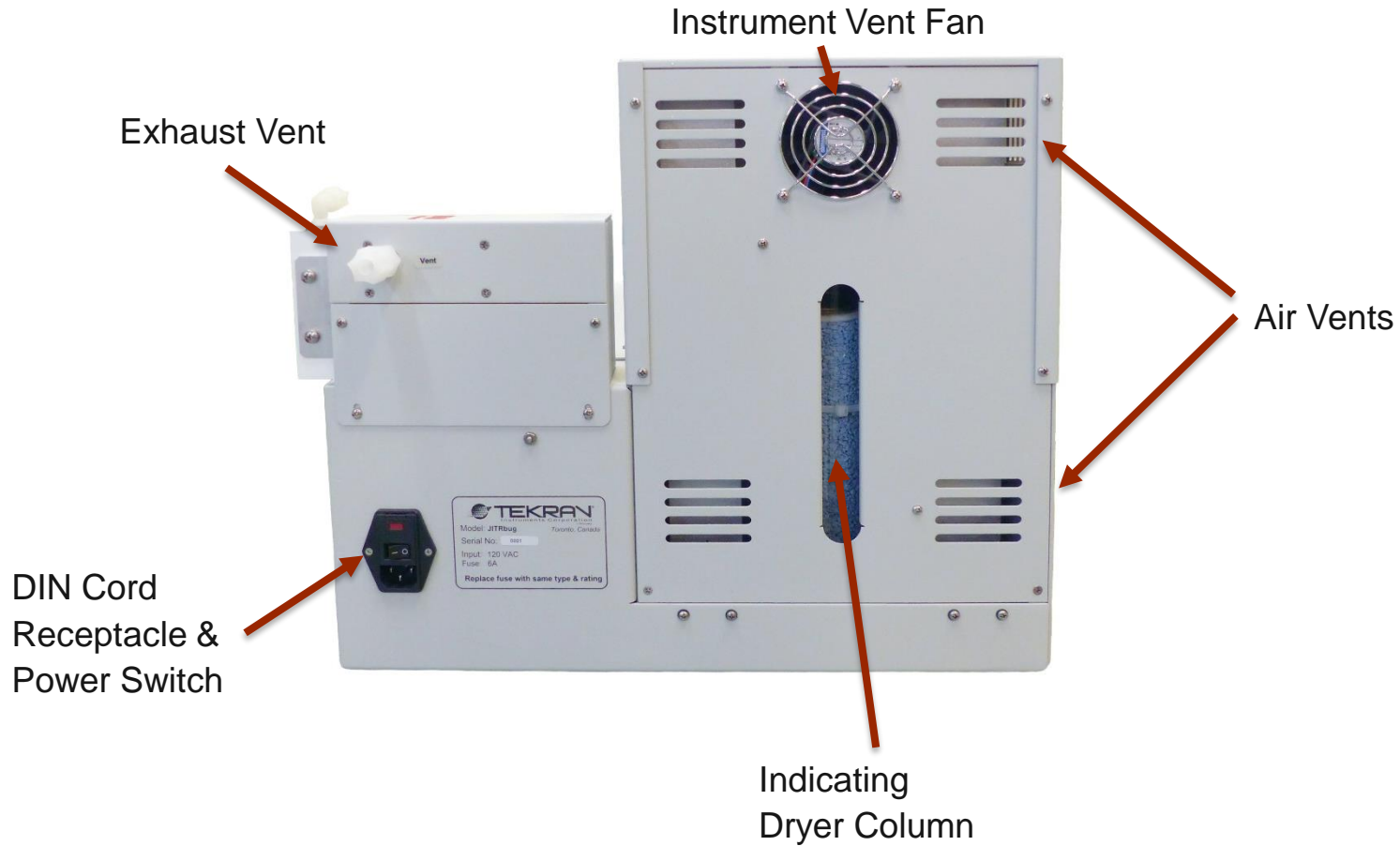
- Typical customer would likely have >5 hand-held mercury monitors for industrial health and safety monitoring such as:
 - National Labs with legacy mercury issues
 - Chlor-alkali plants (active and cleanup sites)
 - Hand-held mercury monitor rental companies
 - Industrial gold and bauxite refineries
 - State or national emergency response teams
 - Oil/Gas production facilities, including contractors that do decommissioning and pipeline cleanup
 - Legacy mercury remediation projects (e.g. EPA Superfund Sites)



JITRbug Description



JITRbug Description (back)



JITRbug Quick Start Guide

- Simple startup and use instructions provide a worker or technician with visual and verbal information to operate the system from start to finish
- The protocol to connect and remove a hand-held mercury monitor using the manual valves and tube caps, ensures the system is fully sealed.



Step 14: Cap Sample Test Port

After removal of the final instrument to be tested, replace the Sample Test Port Cap on the measurement port.



Figure 42 – Replace Port Cap

Step 15: Stop Test Gas Generation

When finished making measurements, press the Stop button. The instrument screen will then show Idle status. In Idle mode, the pump is off and the Hg source is securely closed. The instrument may be stopped immediately at any time during operation by simply hitting the Stop button. Remember to Flush the system after any abrupt halt – see Step 16.

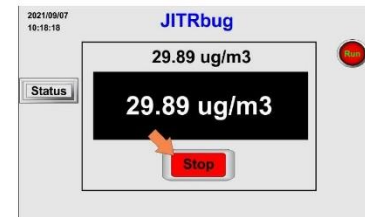


Figure 44 – Stop Run

Step 16: Power Down System

If no further measurements are to be made, the instrument may be powered down.



JITRbug Key Features and Specifications

Key Features:

- Turn-key system with quick setup time and NIST traceable Hg gas source
- Simple operation with touch-screen controller – advanced features password protected
- Rapid switching between output concentrations
- Dual front panel test ports for Hg test gas and scrubber vent exhaust
- System will halt and display a warning, if pressure, temperature or flow are out of range
- Easily adjustable to user-specified STP reporting conditions
- Separate rotameter to assess hand-held instrument flow accuracy
- Optional shipping and carrying case for portability and protection

Specifications:

Output Concentration:	0-30-50-100 ug/m ³ standard, others available
Flow Output:	1.25 L/min standard, 2 L/min maximum
Warm Up -Source:	30-60 Minutes
Warm Up – Air Dryer	120 hours recommended, shorter options available
W x H x D	19” x 17.25” x 17” (482 x 438 x 432 mm)



JITRbug NIST Traceability

- There are two options as a reference for accuracy of the JITRbug mercury concentration output.
 - The default setting is an unbroken chain of comparisons to a NIST Prime Elemental Mercury Generator (a Tekran Model 3310) which is based on the primary liquid standard, NIST 3133 (Ref 1).
 - The alternative option is using a table based on the NIST published saturated vapor pressure of mercury with temperature (Ref 2).
 - The gas concentration basis is 25 °C and 101.3 kPa, which can be adjusted by the end-user.
- 1. <https://doi.org/10.1016/j.apr.2019.12.012> Long et al., (2019) “Traceability of the Output Concentration of Mercury Vapor Generators”, *Atmos. Poll. Res.* 11:639.
- 2. Huber et al., (2006) “Correlation of the Vapor Pressure of Mercury”, *Ind. Eng. Chem. Res.* 45:7351.



JITRbug Conclusions

- A common worker can use the JITRbug to do a 5-minute functional test of accuracy on a hand-held mercury monitor prior to use in environments where there is a risk of mercury exposure.
- Multiple hand-held mercury monitors can be quickly checked for accuracy at the beginning of a work shift.
- The JITRbug offers 3 mercury concentration options at typical government set exposure levels for industrial workers.
- There is almost no maintenance work required, likely once per year.
- Advanced functionality, such as multipoint integrity checks and system status are available for the expert user (password protected)

