QuickTrace® M-7600 Mercury Analyzer Pre-Installation Guide

1.1 Introduction

Thank you for purchasing a Teledyne Leeman Lab’s QuickTrace® M-7600 CVAA mercury analyzer. The purpose of this guide is to assist new users in the preparation of their laboratory prior to the installation of the Teledyne Leeman Lab’s QuickTrace® M-7600 CVAA mercury analyzer. If there is any doubt about the information provided, please contact your local Service Representative or Teledyne Leeman Labs using information in Section 1.16 "Contact Information”.

In preparation for the installation of your analyzer, please review this pre-installation guide to ensure that your laboratory is prepared. After the installation, please retain a copy of this guide for your records.

1.2 Receiving the Instrument

If your analyzer will be installed by a Teledyne Leeman Lab’s Service Engineer, please do not unpack any boxes without consulting the Teledyne Leeman Lab’s Customer Support Department (see Section 1.16 "Contact Information” if necessary).

The Service Engineer will be responsible for reviewing the shipment against the packing list. The Service Engineer cannot be responsible for this task, nor can Leeman Labs be responsible for any missing items, if boxes have been opened or removed before the arrival of the installation engineer.

The Service Engineer is a skilled professional who will install your equipment, verify that it is operating to specifications, and train your personnel in its basic operation. Your preparation enables you to use his/her visit to the best advantage.

NOTE

The connection of the QuickTrace® M-7600 CVAA mercury analyzer to your company’s internal communication network/server is not part of the normal installation process and is best left to a trained Information Technology (IT) professional.
1.3 Pre-Installation Requirements

This section summarizes the site requirements necessary for proper installation of the QuickTrace® M-7600 mercury analyzer. Specific details of these requirements are included in the sections which follow.

### Table 1-1 QuickTrace® M-7600 Site Requirements

<table>
<thead>
<tr>
<th>Dimensions(^{a,b})</th>
<th>Ventilation (for autosampler enclosure, if installed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (Base)</td>
<td>20 cm (8 in)</td>
</tr>
<tr>
<td>Depth (Base)</td>
<td>56 cm (22 in)</td>
</tr>
<tr>
<td>Height</td>
<td>46 cm (18 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>16 Kg (35 lbs)</td>
</tr>
</tbody>
</table>

**Electrical Requirements**

| Three Grounded Electrical Outlets | 100 - 240VAC ±10%, 50/60 Hz |

**Gas Supply**

<table>
<thead>
<tr>
<th>Type</th>
<th>Argon or Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purity</td>
<td>99.999% Purity Argon Ultra-High Purity, dry, Research Grade Nitrogen</td>
</tr>
</tbody>
</table>

**Inert Gas Regulator**

<table>
<thead>
<tr>
<th>Recommended Regulator Pressure Range</th>
<th>344 kPa - 1379 kPa (50 - 200 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection Size</td>
<td>3.175 mm (1/8 inch) OD</td>
</tr>
</tbody>
</table>

**Environmental Conditions**

- **Operating Temperature**: +5 °C to +40 °C (+41 °F to +104 °F)
- **Operating Altitude**: Up to 2,000 m (6,562 ft)
- **Relative Humidity**: 0% to 80% non-condensing for temperatures up to 31 °C, decreasing linearly to 50% at 40 °C
- **Pollution Degree**: Pollution Degree 2

Normally no pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Occasionally, however, a temporary conductivity caused by condensation may be expected.

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\(^{a}\) Refer to Table 1-4 “M-7600 Spacial Requirements” for typical installation spatial requirements.

\(^{b}\) The optional autosampler enclosure without elevating legs measures 64 cm (25") W x 69 cm (27") D x 69 cm (27") H. If the enclosure includes optional elevating legs, the enclosure measures 65 cm (26") W x 72 cm (28") D x 97 cm (38") H. Ideally, an unobstructed open island type of bench 36 inches deep will suffice.
1.4 Customer Supplied PC Requirements

A customer supplied PC must meet the requirements in Table 1-2 "Minimum PC Hardware/Software Requirements".

<table>
<thead>
<tr>
<th>Table 1-2 Minimum PC Hardware/Software Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating System</strong></td>
</tr>
<tr>
<td><strong>Random Access Memory (RAM)</strong></td>
</tr>
<tr>
<td><strong>Video Processing</strong></td>
</tr>
<tr>
<td><strong>Processor</strong></td>
</tr>
<tr>
<td><strong>Networking Communication Ports</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Additional Hardware</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Internet Browser</strong></td>
</tr>
</tbody>
</table>

a. A Network Interface Card (NIC) is included in the M-7600 Completion Kit.

NOTE

Also refer to the Teledyne Leeman Labs Supplied Computer Specifications document for PC specifications best suited to the M-7600 mercury analyzer.

1.5 Required Network Connections

Anticipating the appropriate network connections is of particular importance to a successful installation of the QuickTrace® M-7600 mercury analyzer. To simplify the installation process and avoid a network conflict, Teledyne Leeman Labs requests that customers review the information in this section.

NOTE

The connection of the QuickTrace® M-7600 to your company’s internal communication network/server is not part of the normal installation process and is best left to a trained IT professional. If additional networking resources are required, refer to the QuickTrace® M-7600 Mercury Analyzer PC Setup Guide included with the mercury analyzer and the QuickTrace® M-7600 Mercury Analyzer Operator’s Manual on the QuickTrace® software installation disc.
1.5.1 Mini Tower or Small Form Desktop PC Installation

**NOTE**

If you wish to use a laptop computer refer to "Section 1.5.2 "Laptop PC Installation".

The Teledyne Leeman Labs QuickTrace® M-7600 mercury analyzer is controlled by a PC using an Ethernet connection. Teledyne Leeman Labs recommends that this PC be equipped with two Network Interface Cards (NIC). One card will be used for communication with your laboratory network or the Internet, and the other card will be used exclusively for communication with the M-7600 mercury analyzer.

**NOTE**

PCs supplied by Teledyne Leeman Labs will include two Network Interface Cards (NIC). One NIC will be installed in the PC and one will be supplied as an add-on card included in the Completion Kit of the analyzer. One of the two network connections will be dedicated for M-7600 control. It is strongly recommend to use the installed NIC and supplied Ethernet cable to communicate with the M-7600.

By default the network adapter of the Teledyne Leeman Lab’s supplied PC will have an IP address of 192.168.0.100. The M-7600 will have a default IP address of 192.168.0.149. Typical settings for a computer with two NICs are shown in Table 1-3 "NIC Connections".

<table>
<thead>
<tr>
<th>Table 1-3 NIC Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary NIC</strong></td>
</tr>
<tr>
<td>Connects to</td>
</tr>
<tr>
<td>Interface Metric</td>
</tr>
<tr>
<td>Default IP Address</td>
</tr>
</tbody>
</table>

**NOTE**

If this default configuration conflicts with your network settings, refer to the QuickTrace® M-7600 Mercury Analyzer PC Setup Guide included with the mercury analyzer and the QuickTrace® M-7600 Mercury Analyzer Operator’s Manual on the QuickTrace® software installation disc.
1.5.2 Laptop PC Installation

The Teledyne Leeman Labs QuickTrace® M-7600 mercury analyzer is controlled by a PC using an Ethernet connection. For communication to a network (or Internet) and the M-7600 mercury analyzer, a desktop PC would typically be equipped with that Ethernet connection and a secondary Network Interface Card (NIC). In the case of a laptop computer, a secondary NIC often cannot be installed. Customers wishing to use a laptop computer have three configuration options:

1. Use a USB to TCP/IP Converter

   The easiest solution is to use a USB to Ethernet Adapter (TCP/IP or USB LAN adapter). This adapter will behave just like a secondary NIC.

   This installation uses one Ethernet Port and one USB port (via the USB to TCP/IP converter) to communicate to a local network (or the Internet) and the M-7600 mercury analyzer.

   **NOTE**

   If additional USB ports are required a USB hub can be used. Alternatively a Ethernet hub can also be used.

   The M-7600 mercury analyzer will have a default IP number of 192.168.0.149. If this default configuration conflicts with your network settings, refer to the QuickTrace® M-7600 Mercury Analyzer PC Setup Guide included with the mercury analyzer and the QuickTrace® M-7600 Mercury Analyzer Operator’s Manual on the QuickTrace® software installation disc.

2. Use an isolated network

   If you don’t need to connect the laptop to another network (including the laboratory network or the Internet), set up the network to communicate **only** with the M-7600 using the primary NIC.

3. Use an unallocated IP address on the network

   - If your network uses static IP addresses, allocate a new address for the M-7600.

   **NOTE**

   If your network is managed by a network administrator or Information Technology (IT) professional, it is strongly recommended to ask that person to assign the address.

   - If your network uses dynamic IP addresses (DHCP), it is usually possible to assign a static address to the M-7600 while the other devices on the network continue to use DHCP.
1.6 Choosing a Location

**NOTE**

Always position the equipment so that it is easy to disconnect the power cord.

1.6.1 Spacial Requirements According to Configuration

The typical QuickTrace® M-7600 Mercury Analyzer System includes the analyzer, PC (standard desk top mini tower) with monitor, reagent and rinse bottles, 10 L waste bottle (supplied), and an optional autosampler and autosampler enclosure.

**NOTE**

30 cm x 30 cm (1 ft²) of floor space is required for the liquid waste receptacle. The waste receptacle can be located directly below the analyzer or directly in front of the lab bench (in line with the analyzer’s peristaltic pump).

Approximate spacial requirements for each component/configuration are shown in Table 1-4 "M-7600 Spacial Requirements". Combine widths to estimate the total linear bench space required for your system configuration. Height and depth are determined by the greatest component requirement.

**NOTE**

Allow an additional 5 cm (2 in) behind the system for cable egress, ventilation, and access to power switches. If installing the optional autosampler enclosure, allow ~ 21 cm (8 in) behind the enclosure for ventilation (total minimum bench depth ≈ 32). If the bench does not provide enough depth for this additional clearance, a chase behind the bench can be used.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>M-7600</th>
<th>PC</th>
<th>ASX-280 Autosampler</th>
<th>ASX-560 Autosampler</th>
<th>Autosampler Enclosure</th>
<th>Autosampler Enclosure w/Elevating Legs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width(\text{a})</td>
<td>21 cm (8 in)</td>
<td>92 cm (36 in)</td>
<td>35.5 cm (14 in)</td>
<td>58 cm (22.5 in)</td>
<td>64 cm (25 in)</td>
<td>67 cm (26 in)</td>
</tr>
<tr>
<td>Depth(\text{b})</td>
<td>56 cm (22 in)</td>
<td>44 cm (17 in)</td>
<td>55 cm (21.6 in)</td>
<td>55 cm (21.6 in)</td>
<td>69 cm (27 in)</td>
<td>72 cm (28 in)</td>
</tr>
<tr>
<td>Height (Unobstructed Space Above)</td>
<td>46 cm (18 in)</td>
<td>41 cm (16 in)</td>
<td>62 cm (24.4 in) (Probe fully up)</td>
<td>62 cm (24.4 in) (Probe fully up)</td>
<td>69 cm (27 in)</td>
<td>97 cm (38 in)</td>
</tr>
</tbody>
</table>

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\(\text{a. PC width requirement can be reduced to 51 cm (20 in) by placing the mini tower of the PC behind the monitor.}\)

\(\text{b. The optional autosampler enclosure requires an additional 16 cm (6 in) behind the enclosure to allow for the exhaust chimney. Ideally, an unobstructed open island type of bench 36 inches deep will suffice.}\)

**NOTE**

Teledyne Leeman Labs highly recommends an autosampler enclosure for protection against sample contamination and removal of acid gases from the laboratory environment during analysis of sample batches.
1.6.2 Work Surface Requirements

The analyzer must be placed on a sturdy counter-top or table.

**NOTE**

Do not place the analyzer on a wheeled cart or folding table.

The work surface should be at least 61 cm (24 in) deep.

*Figure 1-1  Work Surface Requirements*

If the analyzer is to be used in an earthquake zone, choose a location that allows you to secure the QuickTrace® M-7600 so that it will not fall and cause injury or damage during an earthquake.

1.7 General Requirements

- A clean and dedicated hood for standard and sample preparations.

**NOTE**

Due to the likelihood of accelerated damage from corrosion and dust, locating the analyzer or autosampler in a fume hood with stagnant air will automatically void the warranty.
1.8 Electrical Requirements

NOTE

Do not apply power to the power supply until ready to operate the analyzer.

Place the QuickTrace® M-7600 within 1.2 meters (4 feet) of a standard power outlet. The standard configuration requires three power outlets, one each for the QuickTrace® M-7600 Mercury Analyzer, computer, and monitor. The autosampler is powered by the M-7600’s AUX POWER output.

NOTE

An AC surge protected power strip with six outlets is strongly recommended.

The power cord set supplied with the QuickTrace® M-7600 and autosampler meets the requirements of the country where the instrument was purchased.

NOTE

If the instrument is to be used in a country other than the one specified at the time of ordering, obtain a new power cord set that meets the requirements of that country.

The QuickTrace® M-7600 mercury analyzer and autosampler use an auto-switching power supply that accepts AC input from 100-240 VAC ±10%, 50/60Hz. The specifications are shown in Table 1-5 “Voltage and Power Requirements,”.

<table>
<thead>
<tr>
<th>Table 1-5 Voltage and Power Requirementsa, b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M-7600 Mercury Analyzer</strong></td>
</tr>
<tr>
<td><strong>AC Input</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>DC Output</strong></td>
</tr>
</tbody>
</table>

a. Autosampler power supplied by the M-7600’s auxiliary DC output power supply.
b. Autosampler AC input values are for configurations in which the autosampler is not powered by the M-7600 Mercury Analyzer.

WARNING

This equipment is designed for connection to a grounded (earthed) outlet. The grounding type plug is an important safety feature. For continued protection against electrical shock or damage to the instrument, do not disable this feature.

The power requirements for the computer can be found on the label affixed to the bottom of the computer, or in the computer user’s manual.
1.9 Gas Supply Requirements

A source of Ultra-High Purity (UHP), dry, research grade N₂ or 99.999% purity Argon is required. The gas regulator must be an inert 2-stage design and provide 344 kPa - 1379 kPa (50 - 200 psi), with a coupling for either a cylinder or Dewar capable of delivering 827 kPa (120 psi). The M-7600 is supplied with 1.82 meters (6 feet) of 1/8 inch (3.175 mm) OD gas supply tubing. If the regulator is located more than 1.82 meters (6 feet) from the analyzer, additional tubing will be required.

1.10 Ventilation Requirements

1.10.1 Without Autosampler Enclosure

During operation, the QuickTrace® M-7600 internally contains trace amounts of mercury vapor. To prevent inhalation of the vapor, the QuickTrace® M-7600 uses a solid KMnO₄ absorbent trap located on the back of the instrument. This trap absorbs the mercury vapor prior to final exhaust, therefore no extra ventilation is required beyond that of a standard laboratory environment.

WARNING

Gases exhausting from the QuickTrace® M-7600 cabinet prior to the external Hg vapor trap (affixed to the rear cabinet panel) contain traces of mercury vapor and will cause injury if inhaled. Do not run the QuickTrace® M-7600 unless exhausted gas is properly “scrubbed” or removed. Fill, maintain, and use the provided KMnO₄ absorbent trap. It is the responsibility of the laboratory to supply the fill chemical and maintain the integrity of the mercury vapor trap. Alternatively a transfer line can be run to a fume hood.

1.10.2 With Autosampler Enclosure

The autosampler enclosure is optional but is highly recommended for use with the M-7600.

The lab in which the M-7600 with autosampler enclosure is installed must be equipped with the following:

- A ventilation trunk 11 cm (4 in) in diameter for connecting to the enclosure exhaust chimney.
- The autosampler enclosure is rated for an exhaust flow with a maximum draw of 453 LPM (16 CFM) (recommended draw 283 LPM [10 CFM]).

NOTE

The autosampler enclosure includes a HEPA filter. The HEPA filter stops particulates from entering the enclosure as it draws room air to remove acid gas during the analysis of digested samples. Particulates can result in sample contamination and the biasing of results during ultra-trace analysis.
1.11 Environmental Conditions

The ambient temperature should be kept as stable as possible. Locating the QuickTrace® M-7600 directly in the path of an air conditioner or heater vent may cause baseline drift, and is not recommended.

1.12 Necessary Supplies

- UHP Nitrogen or Argon (Cylinder or Dewar)
  Ultra-High Purity (UHP), dry, research grade N₂ or 99.999% purity Argon
- Inert Gas Regulator
  Inert 2-stage, 344 kPa - 1379 kPa (50-200 psi) secondary pressure gauge, with a coupling for either a cylinder or Dewar capable of delivering 827 kPa (120 psi)

NOTE

The M-7600 is supplied with 1.82 meters (6 feet) of 1/8 inch (3.175 mm) OD gas supply tubing. If the regulator is located more than 1.82 meters (6 feet) from the analyzer, additional tubing will be required.

- AC Power Strip (surge protected) with six outlets (if sufficient wall outlets are not available)
- Certified Mercury Standard Solution
  100 or 1000 ppm
- Hydrochloric acid (Minimum grade: Trace Metal specification @ 37%)
  Recommended: Mallinckrodt/Macron, 6 each - 2.5 L, AR Select, Item # 5587-46
- Nitric acid, trace metal grade (68-70%)
  Recommended: Mallinckrodt/Macron, 2.5 L, AR (ACS), Item # 2704-46
- Stannous chloride (crystals, Di-hydrate)
  Recommended: Mallinckrodt/Macron, ACS 500 g, Item # 8176-04
- Potassium permanganate; solid, crystalline for the hg exhaust vapor trap or suitable for mercury analysis i.e., EPA 245.1
  Recommended: J.T. Baker 500 g bottle item number 3227-1
- 2-Propanol. High-purity, “spectrophotometric” grade
  2-propanol will be used for cleaning the optical cells and cell windows
- Additional Chemical Compounds

NOTE

The sample preparation procedures of the intended analytical method may require additional chemical compounds. Refer to published method specifications.
1.13 Recommended Supplies

- Volumetric Flasks 100 mL class A (TC) 12 each
- Volumetric Flasks 1000 mL class A (TC) 2 each
- Volumetric Flasks 2000 mL class A (TC) 1 each
- Precision adjustable air displacement pipettes, 10 to 100 µl (TD), 200 to 1000 µl (TD), 400 to 2000 µl (TD), 1000 to 5000 µl (TD), 2000 to 10000 µl (TD)
- Replacement Tips for micropipettes
- Disposable Plastic Pipette Droppers
- Graduated Cylinders, 10 and 100 mL
- Kimwipes®
- Polypropylene or Polyethylene Bottle with Cap, 1 L
- Weighing Balance, top loading (0.1 g - readability or better, capacity > 200 g)
- Laboratory Scoopula and Large Spatula
- Stopwatch (for measuring liquid uptake rates)
- Stirring Rod
- Powder Funnel, wide-bore stem, small overall size
- Wrenches, adjustable 12 in, 6 in and 4 in
- Screw Drivers:
  - 1 Small Phillips-Head
  - 1 Medium Phillips-Head
  - 1 Long-Shank Medium Flat-Head
  - 1 Small Thin Flat-Head
- Flow Meter, 0-1500 mL/min calibrated to user's choice of carrier gas with 1 mL readability
- Deionized Water
1.14 Installation Solution Preparations

**NOTE**

The reagent, rinse and standard solutions should be prepared during the unpacking and initial installation period. Teledyne Leeman Labs and customer owned polypropylene bottles and standard tubes should be used.

| Table 1-6 Installation Standards, Reagents and Rinse Solutions\(^a\) |
|--------------------------|------------------|
| **Solution**             | **Preparation**  |
| Stannous Chloride        | 1 L of 10% w/v stannous chloride in 7% v/v HCl |
| Calibration Blank        | 3% v/v HCl       |
| Autosampler Rinse Solution | 2 L of 5% HCl / 2% HNO\(_3\) v/v |
| Reagent Capillary Rinse Solution | 500 mL of 10% v/v HNO\(_3\) |
| Reagent Capillary Rinse Solution | 500 mL of DI water |
| Secondary Mercury Standard | 100 mL of 10,000 ng/L and 100 mL of 1000 μg/L |
| Working Mercury Standard  | 100 mL of 200 ng/L and 100 mL of 100 μg/L |
| Calibration Standards    | Trace to ultra-trace calibration range as listed in Table 1-7 "Trace Standard Concentrations". |

\(^a\) Teledyne Leeman Labs recommends preparing calibration training standards in the provided 50 mL polypropylene test tubes. All bottles and vessels need to be cleaned prior to use.

<table>
<thead>
<tr>
<th>Table 1-7 Trace Standard Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Concentration</strong></td>
</tr>
<tr>
<td>5 ng/L</td>
</tr>
<tr>
<td>10 ng/L</td>
</tr>
<tr>
<td>25 ng/L</td>
</tr>
<tr>
<td>50 ng/L</td>
</tr>
<tr>
<td>100 ng/L</td>
</tr>
</tbody>
</table>

1.15 Preparedness Statement

Failure to meet one or more of the pre-installation requirements may prevent your instrument from operating properly. During installation, if an installation engineer determines that one or more of the pre-installation requirements have not be met, the company reserves the right to delay installation until all requirements are satisfactorily met. Any time lost during installation, caused by failure to meet the pre-installation requirements, will be billed to your account. If you have any questions regarding these requirements, please contact Teledyne Leeman Labs using Section 1.16 "Contact Information".
1.16 Contact Information

Teledyne Leeman Labs encourages you to contact us for any questions or concerns regarding your installation, or to order accessories and consumables. Please use the appropriate means of contact listed below for the most efficient service.

1.16.1 Teledyne Leeman Labs

110 Lowell Road
Hudson, NH 03051 U.S.A
Main: 603-886-8400
Fax: 603-886-4322
www.teledyneleemanlabs.com

1.16.2 Sales

US and International: +1 800-634-9942 or +1 603-886-8400
US and International Fax: +1 603-886-4322
E-mail: salesinfo@teledyne.com

Visit our website at www.teledyneleemanlabs.com for a complete list of US and International Sales Representatives.

1.16.3 Technical Support

US: +1 800-533-6267 (1-800-Leemans)
International: +1 603-886-8400
E-mail: service@teledyne.com

1.16.4 Replacement Parts and Consumables

US and International: +1 800-533-6267
E-mail: service@teledyne.com
1.17 Your Installation is Our Highest Priority

Streamlining the installation of your new QuickTrace® M-7600 CVAA mercury analyzer system is our highest priority! Teledyne Leeman Labs would like to thank you in advance for the preparation of your laboratory. Your attention to detail will assist in the installation of your new instrument. If you have any questions or concerns we encourage you to contact us directly:

Jeff Forsberg  
Teledyne Leeman Labs  
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jeff.forsberg@teledyne.com  
(402) 733-2829

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