The Agilent Mobile Laboratory

Specifications

Introduction

The Agilent Mobile Laboratory is an integrated analytical platform that brings the full power of the traditional laboratory into the field. Equipped with state-of-the-art, customer-proven measurement systems, the mobile laboratory is configured to detect and confirm the presence of chemical and biological agents in air, water, soil, or food supplies, even at trace levels.

Developed in collaboration with Agilent's channel partners and the military, the unique design of this mobile laboratory allows trained personnel to conduct potentially hazardous analyses in safety, using separate and self-contained areas for sample preparation and sample analysis. See Figures 1 and 2.

The mobile laboratory is available for purchase from Government Scientific Source (GSS), an Agilent channel partner, on GSA Contract Number GS-24F-1181B, Part Number MLP28TK.

[1]Optional diesel engine is available.

Standard Van Specifications [1]

Vehicle - Ford E-550 Super Duty Chassis Cab

Polar white, Standard trim, bench seat

19,000 lb GVWR

V10 gasoline engine (6.8L Triton) 275 hp at 4250 rpm[1]

Automatic transmission 4R100 4-speed

Power steering

Tires 225/70R 19.5 BSW All-Season

4-wheel power disc brakes with ABS

Heavy-duty front springs

Heavy-duty service package

Transmission oil cooler

Engine oil cooler

Heavy-duty engine cooling

Dual electric horns

100 Amp alternator

AM/FM stereo radio

Air conditioning

Fuel capacity 55 gal

Body

- 18-ft. hi-cube van with over-the-cab compartment
- Construction with 0.063 pre-painted aluminum siding (white)
- Plywood floor with foam insulation and belly pan
- Heavy-duty, rear-step bumper, diamond plate
- Side and rear-entry doors with dual-pane windows
- Side fold-up stairs
- Windows in front compartment: dual-pane, tinted-sliding window with screen.
- Windows in rear compartment: fixed dual-pane beside pass-through door.

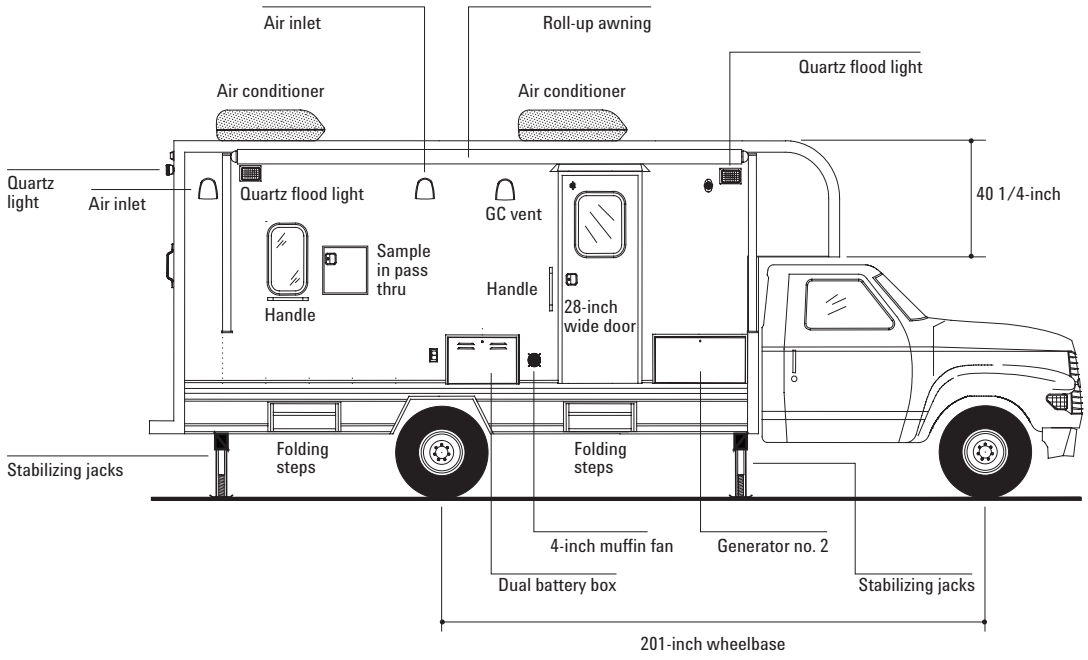


Figure 1. Exterior side view of van.

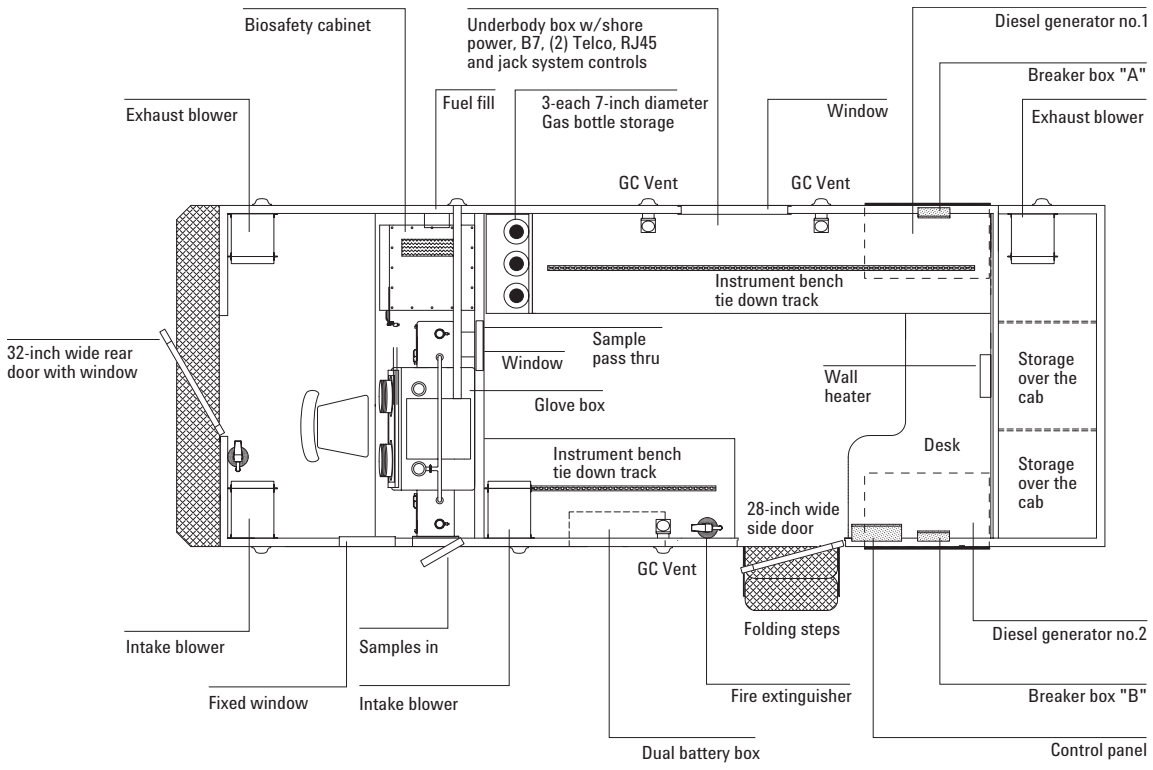


Figure 2. Interior top view of laboratory.

Basic Modifications

- Interior finish package, including no-wax vinyl floor, Marlite-covered wall and ceiling panels, rigid-foam insulation in walls. Sealed bulkhead separating rear "sample preparation" compartment from front "sample analysis" compartment. Pass-through door and observation window in bulkhead.
- Front compartment instrument bench, street side with Chem-Surf top. Aircraft-grade track and hold-down system secures all laboratory instrumentation. The track and hold-down system facilitates removal of the plate mounted instrumentation from the mobile platform, if required.
- Instrument bench, curb side with Chem-Surf top and track, and hold-down system.
- Data-system desk with cabinet above, curb side.
- Three overhead-storage cabinets, full width, above vehicle cab. Fresh-air inlet with high efficiency particulate air (HEPA) filter in cabinet, street side. Two positive/negative pressure blowers.
- Cabinets and drawers under all benches, plywood with laminate on all exposed surfaces. Drawers are stainless steel tubs.
- Positive latch, ¼-turn hardware on all doors.
- Rear-compartment bench for glovebox and biosafety cabinet across bulkhead, Chem-Surf top.
- Stabilizing jacks, front and rear, 12 VDC operation.
- Two air conditioner/heaters, roof-mounted, 13,500/5600 BTU.
- Pass-through door in curbside wall. Aligns with door on glovebox airlock for direct sample input to glovebox.

Electrical System

- Two Onan generators[2], 7.0 kW (120 VAC - 117 amps total service) with remote start/stop on control panel.
- Control panel for monitoring and controlling AC power and various DC circuits. Provision to select operation from one or both sources. Manual switchover from generator to shorepower via rotary switches.
- Complete 120 VAC wiring system throughout using armour BX.
- 120 VAC interior fluorescent-light fixtures.
- DC lighting, interior fluorescents and exterior floods.
- Auxiliary batteries, two at 105 amp deep-cycle.
- Automatic battery charger (40 APH, 220 VAC) dual-mode, with dual-charging circuits to maintain vehicle and auxiliary batteries.
- H.D. commercial power cables (2×25 ft.).
- Cellular phone antenna, roof-mounted cable to desk area.
- Commercial power inlets, two at 50 amp. 120 VAC, mounted in underbody ESP box.
- Two modular telephone-jack receptacles, mounted in underbody ESP box.

Lab Support Equipment

- Solvent-storage cabinet, sealed with fusible-link closure, 4-gallon capacity.
- Two refrigerators, 2.7 cu. ft., 12 VDC/120 VAC.
- Gas cylinder rack, three-bottle fixed design.
- Three stainless tubing gas distribution manifolds to bench area.
- First aid kit, two ABC fire extinguishers.
- Three GC vents with diverter for inside/outside discharge.
- Glovebox with two three-door airlocks, interlocks on doors and purge system, HEPA/carbon filtration on exhaust, all stainless steel construction, Class III Certification.
- Biological Safety Cabinet, internal blower with HEPA filtration. All stainless steel construction, Class II Certification.
- Fresh air/pressurization system, intake and exhaust modules with HEPA filter and variable speed blowers. All stainless steel construction. Digital differential pressure meter on exhaust module. Can create positive or negative pressure in either compartment.

Sample Handling and Analysis Systems

The standard van configuration comes equipped with a Class III glovebox and a Class II biological safety cabinet for the safe handling of hazardous or toxic materials. It also contains three Agilent measurement systems configured for the detection and confirmation of:

- Chemical weapons agents
- Biological weapons agents
- Toxic industrial compounds

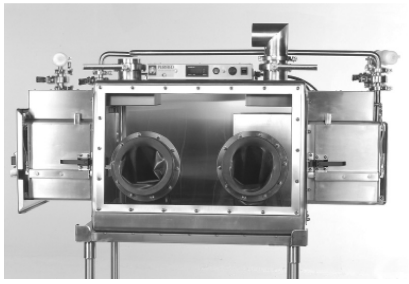
The van is designed to allow for the substitution or addition of other instruments and capabilities, if needed, such as liquid chromatography/mass spectrometry (LC/MS), inductively coupled plasma mass spectrometry (ICP-MS) or the BioAnalyzer.

These primary tools and instruments are listed below with their respective specifications. Note that some of these components

[2]Powered by gasoline or diesel engines. Choice is dictated by the van engine chosen.

are manufactured or supplied by Agilent Channel Partners. Please refer to the manufacturer's documentation referenced in each subsection for more detailed specifications on each of the individual system components.

The Biological and Chemical Glovebox/Filtration System [2]



This glovebox and filtration unit, located in the sample preparation area, provides the highest level of safety for work with hazardous biological and chemical materials in laboratories operating at all Biological Safety levels (BSL). It is manufactured by Purified microEnvironments, a division of Germfree laboratories, Inc., under license from the U.S. Army and is designed to be mobile and portable. *It meets the strictest definition of a Class III Biological Safety Cabinet when used in conjunction with the NBC (nuclear, biological, and chemical) Filtration Unit.* It is constructed of all-welded stainless steel and is helium leak tested.

The NBC Filtration unit is designed to work in conjunction with the Class III Glovebox but can be used with other containment equipment. It uses redundant HEPA and triethylene diamine (TEDA) -carbon filters with a carbon breakthrough monitor placed between the two TEDA-carbon filters.

The Class II Biological Safety Cabinet [2]

This cabinet, in the sample preparation compartment, allows for additional sample work-up in a clean laminar airflow environment. It incorporates an internal blower with TEDA- carbon and HEPA filtration. The biological safety cabinet can also accommodate an optional incubator.

Chemical Weapons Agent Detection and Confirmation System

This system is comprised of an air sampler to quantitatively collect chemical agents from air onto solid sorbent cartridges with subsequent transfer of the analytes to the Agilent 6890N gas chromatograph for separation, identification and measurement. (The system is also compatible with the Agilent 6850 GC.) The instrument configuration allows for the testing of samples from air (in either direct or remotely collected mode), liquid, or solids. A military checkout-sample mixture, composed of dimethyl methylphosphonate, triethyl phosphate, and 1,4-thioxane, in methanol, at two concentration levels, 1 and 30 ng/mL for each compound, is included with this system.

The Air Sampler - Dynatherm Model IACEM 980 Thermal Desorber [3]

Dual collection tubes operating in alternating cycles provide continuous, uninterrupted, sample concentration. An integral mass flow controller controls sample collection, max 2.5 L/min. In the standard configuration, electronic pueumatic control (EPC) modules control column flow. There are two 1/8-inch switching valves with electric actuators connecting sample-transport tubing of stainless steel, silanized glass or deactivated fused silica. One heated GC transfer line, 36-inch long with fused silica liner is also standard. For timed events there are five sequence positions, adjustable from 0–99.9 minutes in 0.1 min increments. Heated zone temperatures are typically 99 °C (Sample Tube Idle), 350 °C (Sample Tube Desorb), and 375 °C (Focusing Trap Desorb). Maximum heating rate is 1000 °C/min and 900 °C/min for the Sample Tube and Focusing Trap, respectively. Dimensions are 300 mm wide (12 inches) × 340 mm high (13.5 inches) × 500 mm deep (20 inches). Weight is 19 kg (42 lbs). The air sampler is manufactured by Dynatherm and distributed by CDS (Oxford, PA).

Agilent 6890N Gas Chromatograph [4]

For this application, the Agilent 6890N GC comes equipped with a split/splitless capillary injector, EPC, and a dual wavelength Flame Photometric Detector (FPD). Optimally, it is combined with a 5973N mass selective detector (MSD) to provide compound structural information

and/or confirmatory measurements. Many additional detectors are available for specialized needs; for example flame ionization detector (FID), thermal conductivity detector (TCD), electron capture detector (ECD), and nitrogen-phosphorus detector (NPD).

Agilent 5973 Network MSD [5]

The 5973N MSD has a mass range of 1.6 to 800 atomic mass units (amu). Mass axis stability is extremely stable; 0.15 amu over a 12-hour period. This unit is equipped with an Electron Impact (EI) Source and turbo molecular pump. The MSD is compact, requires no cooling water or compressed air, and operates on 120 VAC or 200–240 VAC.

This unit produces classical EI spectra, allowing it to harness the immense volume of available EI library data for compound identification. The software includes the NIST02 mass spectral library, which includes >145,000 spectra and structures.

Biological Weapons Agent Detection and Confirmation System

The Biological Weapons Agent Detection and Confirmation System, which is based upon the measurement of an organism's unique fatty acid fingerprint, is comprised of an Agilent Technologies 6850 GC equipped with an FID, an Agilent 6850 Autosampler, and the MIDI Sherlock® Microbial Identification System (MIS) software.

Alternatively, for laboratories requiring DNA based measurements, Agilent Technologies offers the Agilent 2100 BioAnalyzer which uses microfluidic lab-on-a-chip technology to provide qualitative and quantitative information on DNA, RNA, and proteins in biological samples.

Agilent 6850 Automatic Liquid Sampler (ALS) [6]

The Agilent 6850 ALS, which can hold up to 27–2 mL vials, can be installed or removed without tools. Power and communications are integrated with the 6850 GC. It provides a wide range of injection capabilities including syringe sizes from 5 to 100 µL and injection volume selections from 2% to 50% of syringe volume.

Agilent 6850 Gas Chromatograph [7]

The Agilent 6850 gas chromatograph (GC) is a single-channel instrument. The six-button, two-line local interface provides run control and status information. A removable handheld control module is one of several options available for setpoint entry and diagnostics.

Oven dimensions are 202 mm high × 200 mm wide × 105 mm deep. Oven operating temperature is from 5 °C above ambient to 350 °C. There are six temperature program ramps with seven plateaus. Instrument control and data handling is accomplished with an included software driver and ChemStation software. Overall GC dimensions are 283 mm wide (11 inches) × 605 mm high (24 inches) × 568 mm deep (23 inches)

MIDI Sherlock® MIS Bacterial Identification System [8]

The Sherlock® Microbial Identification System is a fully automated gas chromatographic system, which identifies bacteria, based on their unique fatty acid profiles. See Figure 3.

The MIS libraries, which are comprised of >25,000 entries, are available for environmental aerobes, clinical aerobes, anaerobes, yeast, and biological warfare agents. The Sherlock bioterrorism library, developed in collaboration with the U.S. Army Medical Research Institute of Infectious Diseases, identifies the six major bacterial agents of bioterrorism plus another 15 closely related organisms. Combined with the Clinical Aerobe library, the Bioterrorism library contains entries for most known bioterrorism agents

Agilent 2100 Bioanalyzer Automated Analysis System [9]

The Agilent 2100 Bioanalyzer uses microfluidic lab-on-a-chip technology to provide qualitative and quantitative information on DNA, RNA, and proteins in biological samples. Sample-specific reagents and chips for a variety of cell assays are available.

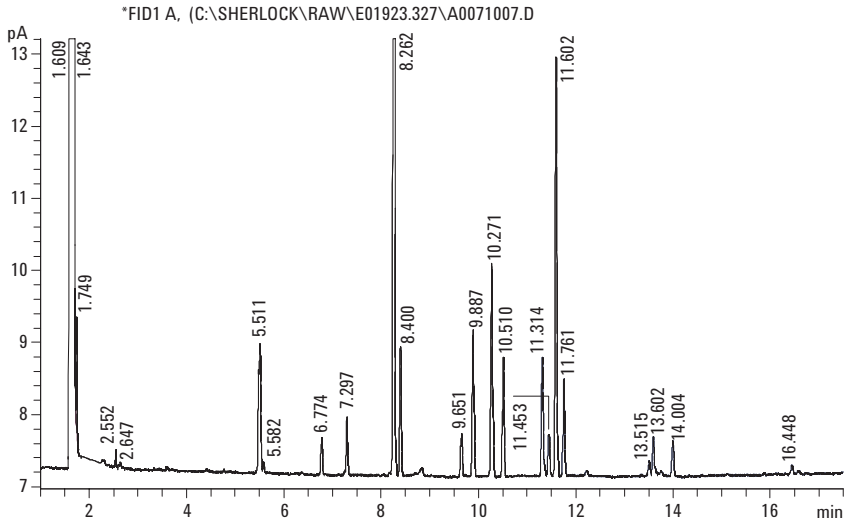


Figure 3. An example of a methylated cellular fatty acid chromatogram for *Bacillus anthracis*.

Biological pathogens are detected and identified after specific DNA sequences from the chosen pathogens are amplified by the polymerase chain reaction (PCR), using selective primers. Relative to other PCR based detection methods, such as real time PCR, the 2100 Bioanalyzer allows analysts to develop multiplex-detection assays that can simultaneously interrogate collected samples for many different types of bacteria and viruses. A multiplex assay enables a laboratory to run a single test rather than six or more different tests resulting in dramatically reduced operating costs as well as a more efficient workflow.

Toxic Industrial Compound Detection and Confirmation System

The Toxic Industrial Compound Detection and Confirmation System includes the Agilent 6850 or 6890N gas chromatograph with 5973N MSD, EPC, EI source, 6850 or 7683 ALS, and turbo molecular pumping.

In addition to the NIST02 MS library (>145 K spectra and structures), the system includes sophisticated search and deconvolution routines to help identify unknown compounds.

References

1. E-N-G Mobile systems, Inc. 2245 Via de Mercados, Concord, CA 94520 (925) 798-4060 (800) 662-4522
2. Biological and Chemical Glovebox/Filtration System-Purified microEnvironments, a div. of Germfree laboratories, Inc. 7435 N.W. 41st Street, Miami, FL, (800) 888-5357
3. CDS Analytical, Inc., 465 Limestone Road, P. O. Box 277, Oxford, PA 19363 (610) 932-3636
4. “Agilent 6890N Network Gas Chromatograph Specifications,” Agilent Technologies, publication 5988-5329EN www.agilent.com/chem
5. “Agilent 5973 Network Mass Selective Detector Specifications,” Agilent Technologies, publication (23) 5968-7358E www.agilent.com/chem
6. “Agilent 6850 Automatic Liquid Sampler Model Number G2880A Specifications,” Agilent Technologies, publication (23) 5980-1895E www.agilent.com/chem
7. “Agilent 6850A Gas Chromatograph Specifications,” Agilent Technologies, publication 5968-5111E www.agilent.com/chem
8. Sherlock 4.5 Microbial Identification System Specifications MIDI Inc., 125 Sandy Drive, Newark, DE 19713, (302) 737-4297 www.midi-inc.com
9. “Agilent 2100 Bioanalyzer Automated Analysis System,” Agilent Technologies, publication 5988-4265EN www.agilent.com/chem

For More Information

For more information on our products and services, visit our web site at www.agilent.com/chem.

Printed in the USA
January 24, 2003
5988-8341EN