



Mobile Climate Control
Test Facility



Test Facility Capabilities

Mobile Climate Control Test Facility, Toronto

Technology and expertise at your side, when you need it!



A new dimension in testing

Since 1975 MCC has been involved in the testing and validation of HVAC products and systems for transit, off-road, utility, military, and specialty applications. With our sophisticated and flexible test chambers and analysis equipment, we are able to quantify performance, robustness, and reliability of all types of equipment, in all types of conditions. MCC has invested significantly in equipment, but MCC's greatest asset is its' people.

State of the art test facilities

MCC's research & development testing facilities include extensive equipment for testing the performance of HVAC systems as well as components within the systems. Our custom-built climate chamber, the core of our test facility, enables MCC to provide a chamber with a large internal volume capable of accepting large articles.



Advanced software developed in-house provides fast accurate data which accelerates product validation.

Exceeding every expectation

MCC has extensive experience working on the global market within the bus industry. Our products have consistently met or exceeded the specifications, expectations and demands from our clients. In Europe our HVAC systems can be found on vehicles manufactured by EvoBus, Irisbus, Irizar, MAN, Scania, Solaris, Van Hool, Volvo and many more. In North America the HVAC systems can be found on vehicles manufactured by among others Blue Bird, El-Dorado, Gillig, Motor Coach Industries, New Flyer, Nova Bus and Orion.

Something all of these vehicles have in common is an HVAC system designed and manufactured for function, reliability and longevity. We welcome the challenge and we surpass every expectation.



Transit bus in Large Chamber ready for A/C system test.

In our climate chamber, we are able simulate the most severe environmental conditions and put client vehicles or HVAC systems through the most demanding tests. In addition to the specifications of the state of the art test facility, the IP-cameras in the drive in chamber can be accessed from anywhere, improving the ability to remotely & securely, view ongoing tests.

Flexible testing

MCC Vaughan's test facility meets the demanding expectations of being a sophisticated and flexible engineering tool. This enables us to develop and tailor test processes and configurations for each client. Our engineering staff have extensive experience with a broad spectrum of test standards and procedures such as: SAE, ISO, MIL, and ASHRAE.. With these in mind as a baseline, we can work to provide the best possible technical and economical solutions in each case. We are not satisfied until you are satisfied!



Proven methods, accurate results

Our mission as a state of the art test facility is to validate air conditioning system performance and components, optimize system performance, obtain accurate test results, and provide our customers with our analysis. Our Large Environmental Drive-In Chamber enables us to test vehicles with large dimensions and demanding systems. In the Large Chamber there is a Make-Up-Air and Engine Exhaust system to allow the vehicles to operate during testing while maintaining conditions.

Control and Data Acquisition

This state-of-the-art Climate Chamber contains the latest measurement equipment to provide accurate measurements during the various conditions possible.

Multiple DAQ system are available, each having +300 channels of I/O for use with pressure transducers, thermocouples, humidity sensors, mass flowmeters, tachometers, etc. Every measurement is viewed in real-time in the Central Control Room using customizable software developed in-house. We can quickly provide custom software to meet your needs.

Data & Reports

Our test team have many years of experience providing raw data, summarized data, data analysis, images, thermal images, summary reports, and comprehensive reports. The specific needs of each test normally dictate the quantity of information required post-test. We can provide examples of what you can expect as the final output and data package.



Technicians in Control Room monitoring a test.

Control and Data Acquisition

Testing in the Large Environmental Drive-In Chamber and the Calorimeter are controlled from the Central Control Room. To improve personnel safety, cameras and hazardous gas detectors are installed in the chamber. 300+ channels of I/O are available for measurement acquisition. Common instruments are available and onsite DAQ software customization is available for custom tests.



Air flow test cell

Airflow testing

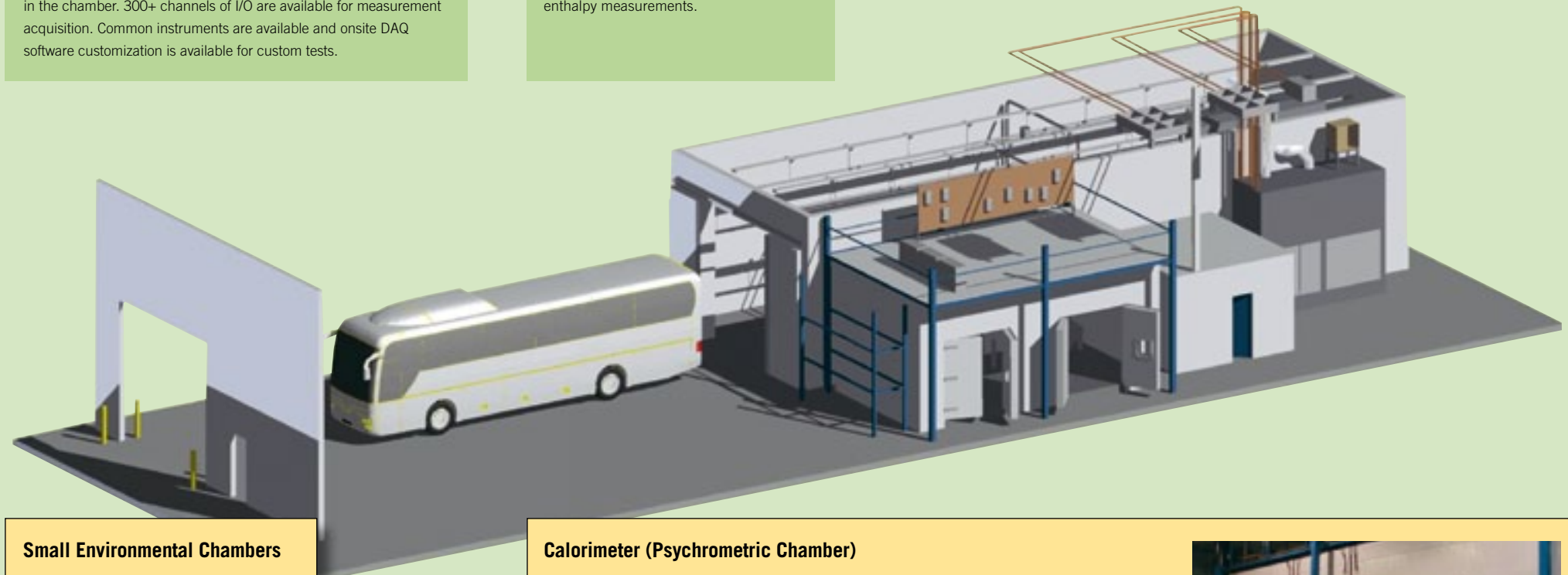
Individual blowers as well as complete evaporator assemblies can be mounted to a suitable wind tunnel for airflow and/or air enthalpy measurements.

Large Environmental Drive-in Chamber

- Internal: 21m x 7.3m x 5.5 m
- Door: 3.6m x 4.4m
- -40°C to +60°C
- Humidity up to 95 %RH
- Solar load up to 1250 W/m²
- Engine exhaust up to 600 cfm
- Cooling Capacity: 260 kBtu/hr
- Glycol loop: 154Kbtu/hr @ 10gpm



Fire truck ready for A/C system test



Small Environmental Chambers

- | | |
|------------------------------|----------------------------|
| Heat/Cool | Heat only |
| • Cooling: -76F (-60°C) | • Heating: 572°F (300°C) |
| • Heating: 250°F (121°C) | • Volume: 4ft ² |
| • Humidity: n/a | |
| • Volume: 4.6ft ² | |

Calorimeter (Psychrometric Chamber)

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|--|--|
| Outdoor Room Capabilities | Indoor Room Capabilities |
| • 3m x 4.2m x 3.6m | • 3m x 4.2m x 3.6m |
| • Temperature range: ambient to -54°C | • Temperature range: 15°C to + 60°C |
| • Temperature control ±0.2°C | • Temperature control: ±0.2°C |
| • Heat rejection capacity: 160,000 Btu/hr @ 100°F (38°C) | • Humidity control: ±2%RH |
| | • Steam humidifier capacity: 33 lbs/hr |
| | • Thermal load: 102 kBtu/hr (30kW) |



Two-room Calorimeter Test Cell.

Qualified, Certified, Reliable.

We are ready when you are.



Providing you with the right environment

Windscreen Defrost Testing

With our chamber temperature range, we have the ability to perform defroster tests which meet the strict requirements of Canadian Motor Vehicle Safety Standard (CMVSS) & Federal Motor Vehicle Safety Standard (FMVSS).



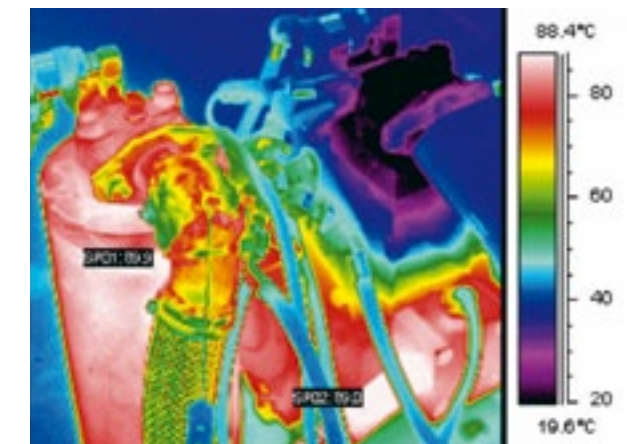
Layer of frost applied to windscreen for Defrosting Test.

Refrigerant charge optimization

For an A/C system to function properly throughout its design range, we conduct charge optimization tests to identify how much refrigerant is required to ensure that it will operate properly at all intended operating conditions.

Thermal Imaging

MCC has a high resolution thermal imaging system which provides accurate analysis of dynamic systems. Thermal imaging is the ideal tool for heat exchanger analysis, development, and trouble-shooting. This tool is a critical tool used by our engineers, test personnel, and customers.



Thermal image of transit compressor during operation.

Solar Simulator (Solar Load)

For analysis of the effects of cabin heating by the sun, the large environmental climate chamber is equipped with a solar simulator attached to sliding rails inside the chamber. The Solar Load provides a solar radiation intensity of up to 1250 W/m² with closely replicated solar spectral distribution. To allow reproduction of any irradiation angle and sun position at any time of the day, the solar array is mounted on easily adjustable frames.

Every customer deserves high performance. We make sure they get it.

MCC provides exceptional performance in mobile climate comfort. Our value add is:

- Customer optimized system solutions through exceptional product performance and custom engineering based on extensive competence and resources.
 - Verified solutions through simulation and testing.
- Short lead times and competitive prices through simulation and testing.
 - Rapid industrialization through agile production processes.
- Perseverance and credibility through strong financial performance.

