About the Company

Jordan TOF Products, Inc. was orginally founded as R. M. Jordan Co., Inc. in 1973. Since its formation, the Company has focused on development of mass spectrometer components and systems, orginally providing quadrupole-based components.

In the late 1970's, the Company pioneered the development of components for Time-of-Flight systems, and later, reflectron Time-of-Flight systems, developing stable high voltage and pulsed electronics, and high performance TOF vacuum optics, including the first use of quadrupole ion traps as ion sources for Time-of-Flight systems.

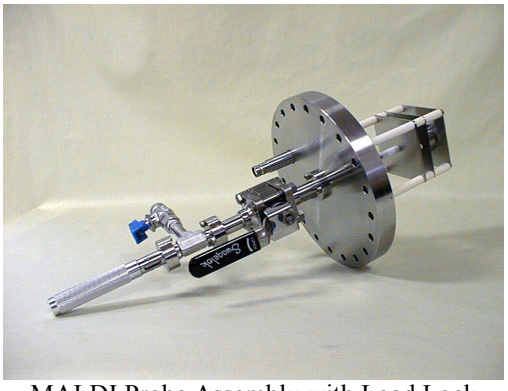
We have continued to innovate through the years, expanding our product line to include pulsed gas valves, long lifetime microchannel plate configurations, simultaneous positive and negative ion detection Time-of-Flight systems, and ZEKE systems, just to name a few.

One of the greatest strengths of our component designs is the fact that the various components can be mixed and matched into an infinite variety of configurations. More importantly, because of our history of maintaining backward compatibility, we can upgrade an existing system to new capabilities as our customers' research interests evolve.

We recognize that most every system we sell has some custom content, and take pride in the wide variety of custom systems that our components have helped enable for our hundreds of customers through the years.

Ion Trap Reflectron D-1450 System

A typical collection of Jordan TOF vacuum components which can be configured to build a system, including vacuum chamber, flight tube liner, reflectron, quadrupole ion trap with ion extraction optics, MCP detector, with an optional electron gun ionizer.

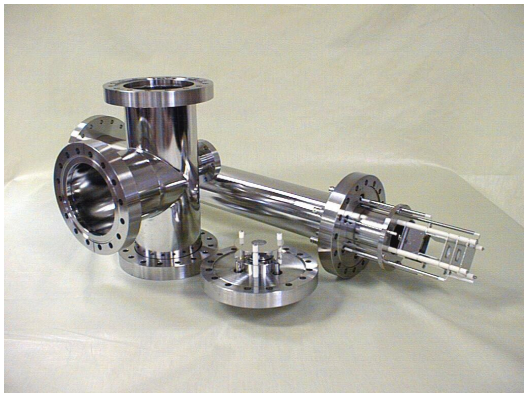


MALDI Probe Assembly with Load Lock

Ion Sampling Systems

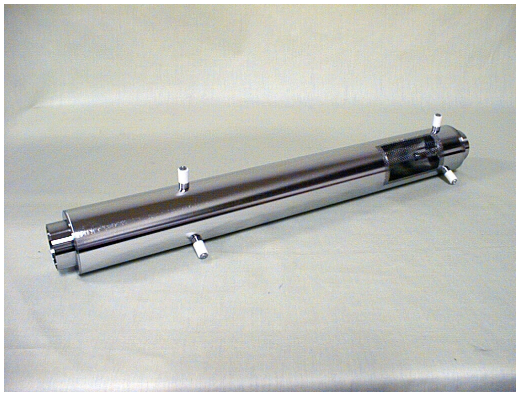
Jordan TOF Products provides a wide variety of ion sampling options, including:

- MALDI probes with load lock vacuum inlet and accessories, including laser windows.
- Quadrupole ion traps with RF control electronics.
- Orthogonal extraction electrodes which can be coupled to an external ion source such as Electrospray, or configured with a differentially pumped shroud and an electron gun to sample a supersonic molecular beam.



Linear TOF components

Reflectron Assembly



Electrically Isolated Liner for Flight Tube

TOF Flight Tubes

There are a variety of different TOF Flight Tube options available from Jordan TOF Products, including linear TOFs as well as different flight length reflectron systems.

The simplest TOF configuration is a linear TOF, with a Microchannel Plate (MCP) Detector situated at the other end of a flight tube from the ion sampling optics. Such a configuration is elegant in its simplicity, but is limited to a mass resolution of a few hundred.

More common in modern TOF instruments is a reflectron configuration, which utilizes a grid reflector at the end of the flight tube to reflect the ions back in the direction of the ion source. Such a configuration uses Wiley-McLaren focusing to re-correlate ions of a given mass, which may have started at different initial positions along the flight axis. The reflectron corrects this and allows these ions of varying initial positions to arrive at the detector at the same time improving mass resolution into the thousands.

Such a reflectron configuration often requires the ions to have an initial velocity vector just off parallel (by a few degrees) of the flight tube axis to carry the ions to the plane of the detector. Jordan TOF Products offers an electrode configuration which allows the ions to fly through an assymmetric field on their way to the flight tube to induce this ~4^{o} included angle into the ion trajectory.

A key consideration for a given proposed configuration is recognition of the effective birth potential of the ions and its impact on ion flight time. For MALDI systems, the ions are typically extracted from a sample holder to which a very large bias potential has been applied (tens of thousands of volts). In such a case, a ground referenced flight tube (i.e. the vacuum chamber) will suffice to maintain good accelleration with reasonable flight times.

In contrast, when extracting ions from a ground or near-ground referenced ion source (i.e. from an ion trap, a molecular beam ionizer, or from electrospray), the vacuum chamber requires an isolated liner to allow the flight tube to be biased to allow thousands of eV ion energy for reasonable flight times.

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MCP Detector Assemblies

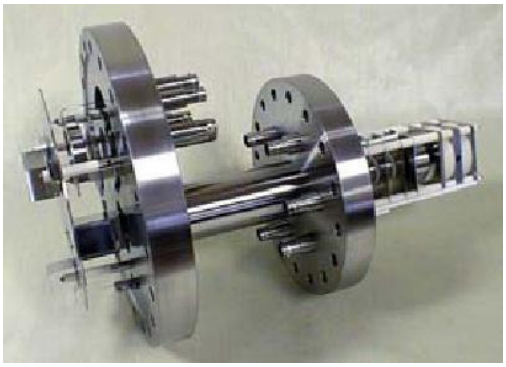
Jordan TOF Products offers a variety of detector optics, from traditional dual chevron microchannel plates with 18, 25 and 40 mm areas, to our higher performance Z-gap series detector, which allows for higher accelleration potentials for improved high mass detection efficiency, while at the same time dramatically improving detector lifetime.

As an option, a detector assembly can be mounted behind the reflectron grids to allow a reflectron TOF to be used in linear mode. In such a system, the two distinct detectors are typically powered using one set of electronics, with the cable connections moved between the two flanges.

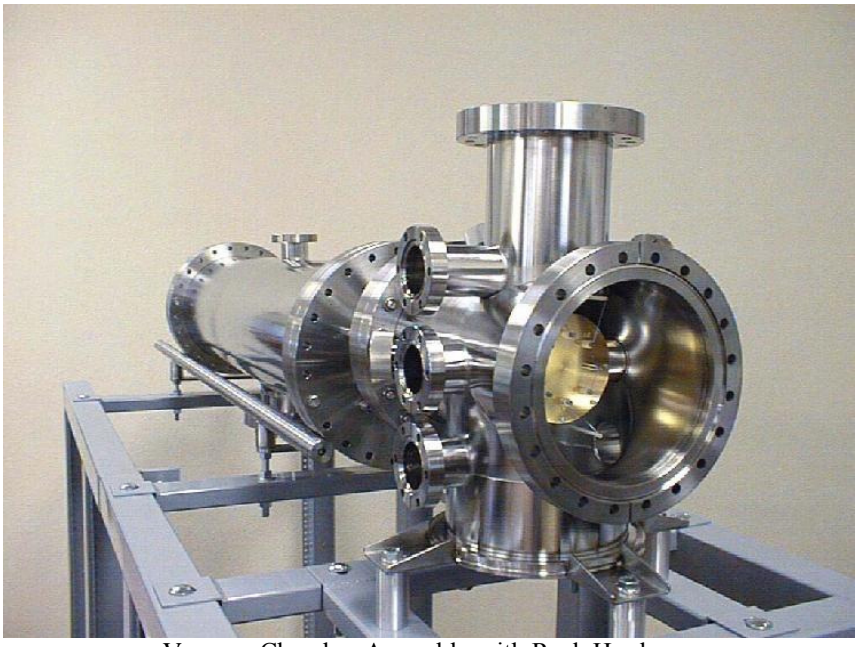
Jordan TOF Products uses an offset adapter configuration in our reflectron TOF design to separate the detector physically in space from the ion extraction optics, allowing adequate room for the detector and its feedthroughs.

A wide range of voltage divider electronics assemblies are available to simplify the high voltage connections to bias the various parts of the MCP assembly.

40 mm Dual Chevron MCP Assembly



Offset Adapter Assembly with MCP (left) and quadrupole ion trap extraction optics (right)



Vacuum Chamber Assembly with Rack Hardware

Chambers and Frames

Jordan TOF Products has a broad range of vacuum chamber designs, with pre-engineered racking solutions to support our wide variety of system configurations.

One innovative configuration is our Dual Polarity design, which has a second flight tube mounted 180 degrees opposite the first flight tube, allowing for pulsed extraction of positive ions to a TOF mass spectrometer in one direction with simultaneous extaction of negative ions in the opposite direction to a separate TOF mass spectrometer.

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Pulse Control Electronics

The beginning of an ion's journey into a TOF flight tube is most influenced by the quality of the electronics which pulse the ions from the extraction region.

Jordan TOF Products offers two different Pulsed Power Supply options, one an isolated pulser supply that can swing up to 400 volts between states, with both states biasable up to 5,000 volts from ground (10 ns rise time), and the other a ground referenced dual pulser with each channel having a voltage swing up to 950 from ground, for a total of 1900 volts differential.

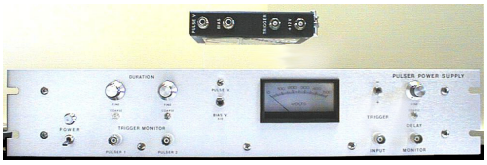
The biased Pulser is useful where the ions can be formed in situ in the pulsed extraction region via an electron gun or photoionization, and allows for thousands of volts potential difference between the ion source and the grounded flight tube chamber.

When it is not convenient to bias the extraction plates, for example when coupling to an electrospray ion source, and the extraction plates are ground referenced, increased resolution is possible by using a dual pulser, although a single pulser will work just fine.

The downside to having ground refererenced extraction grids is that the flight tube then requires an isolated liner to allow for a few thousand volt bias of the flight tube to maintain high energy ion trajectories. Such liners are available for all of our configurations, but must be specified at the time of order, as it is more difficult, but not impossible to upgrade this feature after the fact.

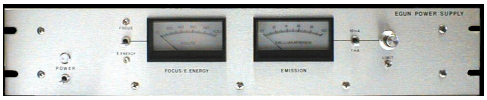
Our Electron Gun is compatible with our Pulser, to allow pulsed generation of ions by electron impact ionization (EI), with suitable vacuum hardware available for a variety of custom configurations.

We offer two different RF power supply models for driving a quadrupole ion trap as a storage device for accummulating ions in front of a time-of-flight mass spectrometer. Model 1230 is our lower cost version, which is ground referenced, offering up to 2,500 Vpp RF voltage at 1 MHz, and rapid shut down of the RF voltage prior to pulsing the ion trap endcaps. Model 1203 is our higher performance version, allowing for pulsed bias voltages to 3,500 volts, and RF operation at 1 MHz to 4,000 Vpp. Model 1203 also incorporates the power supplies to support one of our D-1040 pulsers to drive the end cap electrodes.



Pulse Power Supply with 5,000 volt bias, 400 volt swing, with Pulser (above).

UHV Filament Assembly and Electron Gun (Model C-950)



Electron Gun Power Supply (Model D-903)

RF Power Supply for Ion Trap (Model 1230)

RF Power Supply for Ion Trap (Model 1203)

TOF Power Supply

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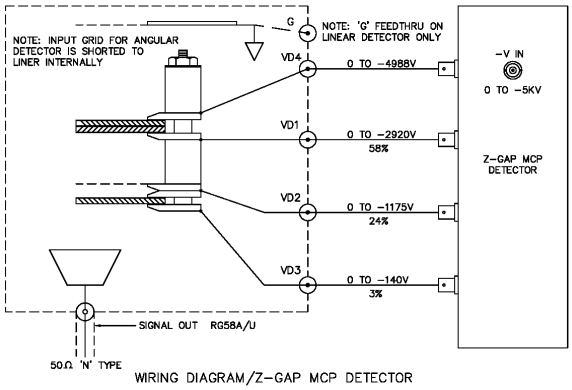
Time of Flight Power Supply (Model D-603)

Coupling Capacitor Assembly for Negative Ion , Electron, and High Voltage Positive Ion Detection

Voltage Distribution Network Assembly for use with Z-Gap MCP Detectors



WIRING DIAGRAM/Z-GAP MCP DETECTOR

Jordan TOF Products provides a Time of Flight Power Supply which contains seven DC power supplies that have among the lowest noise specifications available. Our versatile power supply platform can be customized to allow a variety of positive or negative unipolar 500 volt and 5,000 volt power supplies.

When switching between positive and negative ions, user's typically purchase two distinct power supplies, one configured for positive ions, and one configured for negative ions. If the budget is limited, a spare set of internal modules can be purchased, requiring the power supply cover to be removed, to substitute the internal high voltage modules to reverse polarity.

The various outputs from the TOF Power Supply can be mapped to different functions for different configurations.

For example, when using a Z-Gap detector configuration, one of the high voltage outputs can be connected to a voltage distribution network, which will derive the four different required bias voltages from the high voltage input.

The outputs of the TOF Power Supply are also used to provide the potentials for the different optics elements of the TOF system, including focusing plates, the deflector plates which can be used to instill a 4^{o} angle to the flight path, the reflectron, a flight tube liner (if present), and bias voltages for the pulser, in addition to providing the voltages for the MCP detector.

The figure to the left illustrates a schematic view of the Z-Gap detector design with the Voltage Distribution Network. The Voltage Distribution network derives the four required potentials from the -5 kV input.. What is unique about this design is the use of a large spacing between the second and third micro channel plates, and the integral suppression grid. These two features allow for a large accelleration potential into the front of the MCP detector (almost 5,000 volts) while still maintaining the anode at virtual ground, without excessive noise.

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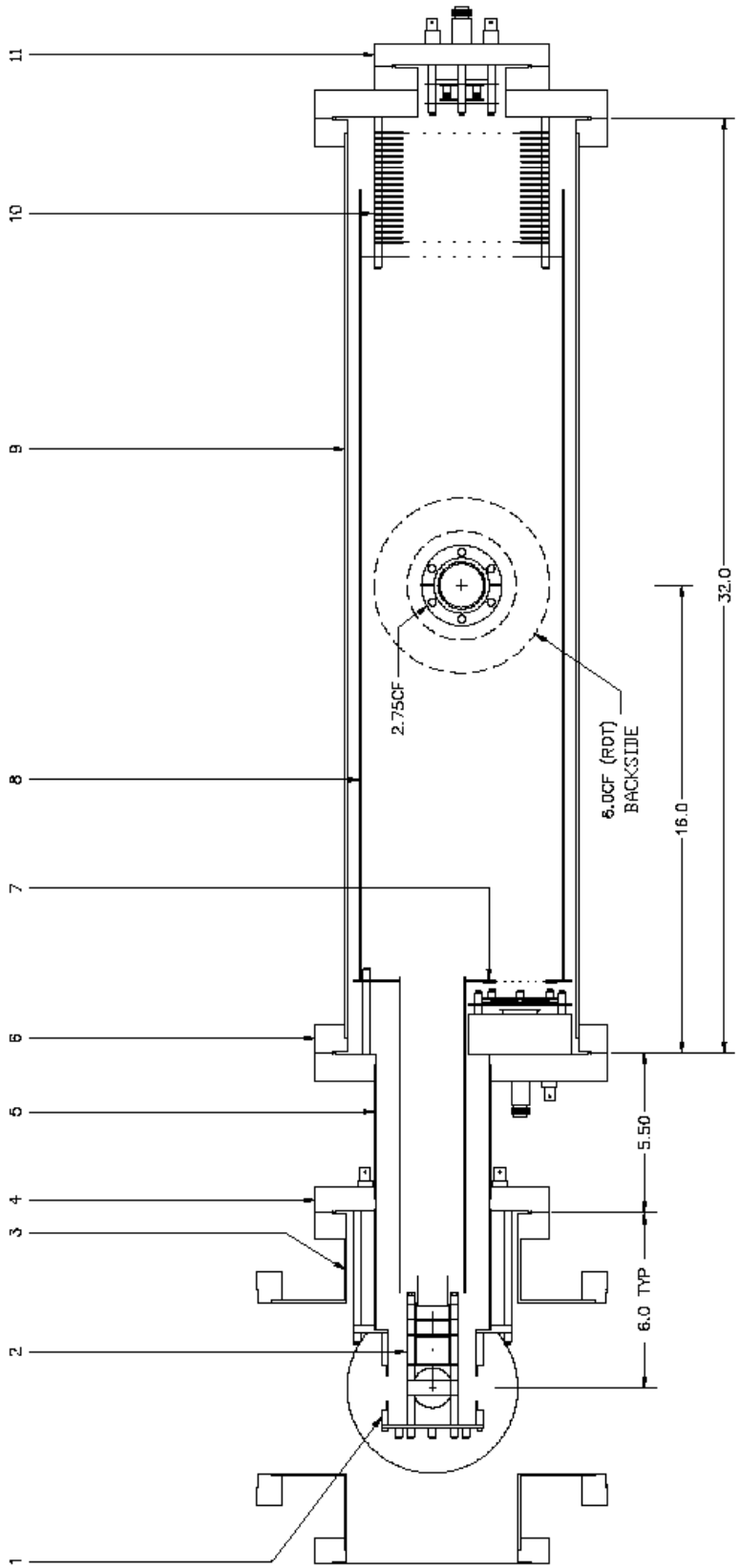

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REV 2/21/07

1. B0682 SHROUD/SKIMMER/DIFFERENTIAL PUMPING
2. C-870M ION SOURCE ASSY. (MODIFIED)
3. TEST CHAMBER (PER QUOTE)
4. 6.0CF (RDT) SOURCE MOUNTING FLANGE
5. C-854 OFFSET ADAPTOR
6. 10.0CF FLANGE
7. C-726 40MM MCP DETECTOR ASSY.
8. D-679 FLIGHT TUBE LINER
9. C-855 FLIGHT TUBE ASSY.
10. C-852 REFLECTOR ASSY.
11. C-701 18MM MCP DETECTOR ASSY.

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