HIGH PRECISION MOTORIZED OPTICAL TABLES

CERTIFIED ISO 9001:2008 COMPANY

Registered International Traffic in Arms Regulations ITAR

ADC

ISO 9001:2008 Certified

www.adc9001.com

Table of Contents

INTRODUCTION

ABOUT ADC

ADC an ISO9001 certified company

ADC an ISO9001 certified company, located near Cornell University in Ithaca, New York, is a leading developer and supplier of complex scientific components and instruments for large government laboratories and corporations around the world. Founded as a privately held company in 1995, ADC has grown into one of world's leading technology companies and has enjoyed 18 straight years of business growth and profitability with more than 500 customers located in over 26 countries. ADC's vision is to be a global leader in the development and manufacturing of innovative products for scientific and research markets.

For more information on "ADC" please go to:
http://www.adc9001.com

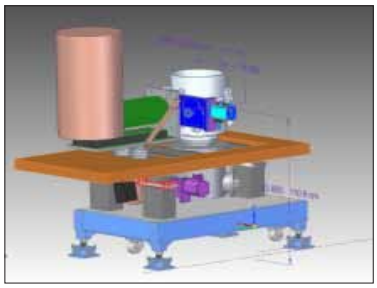
OVERVIEW

High Precision Motorized Optical Tables

ADC (ISO9001:2008 certified) has been a leading supplier of high quality optical tables to the synchrotron and neutron source scientific community as well as FELs and laser based experiments for over 18 years. Many of our optical tables have been in operation nearly that long in facilities around the world. Our tables are noted for stability as well as range of motion and load capacity. Options run from steel to granite base as well as size of the table and range of motion – please see http://www.adc9001.com/Custom-Optical-Tables . ADC has continuously improved our designs by supporting our customer's unique needs for improved space constraint, load capacity, vibrational stability, positional precision and stability, encoder position feedback, and base and frame requirements. ADC has developed a portfolio of optical table components such as base and frames, lifts and lateral stages, floor location and attachments, wheel and air bearing movement, breadboards, and controls. These components are customizable to meet your specific application. The attached catalog provides more information on our optical tables and custom designs along with specific applications and references. Additional details are provided on motors, limit switches, encoders, breadboards, cabling and connectors, frequency response, repeatability measurements, loading, testing and quality control, base supports and stands, floor mounting, and electronics instrumentation and controls. We hope you find our product line exceeds your needs and our friendly staff willing to satisfy your specific requirements. Please do not hesitate to contact ADC for further details.

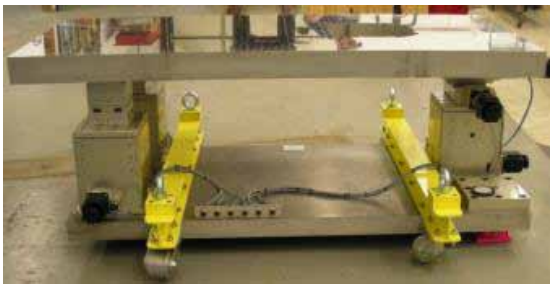
The Design Starts at ADC

ADC designs systems from ground up. This means we can build your system from just a simple idea. Our engineering staff has a large amount of experience designing and building systems from scratch. We have a large library of designs to help make a very modular system very much like one would use Legos. We can take your design from a preliminary design all the way to a final product.



PRELIMINARY DESIGN

FINAL DESIGN



FINISHED PRODUCT

GENERAL INFORMATION

The following section will highlight the common information shared between the high precision optical table systems. For more information please contact ADC or visit our website at: http://www.adc9001.com/Custom-Optical-Tables

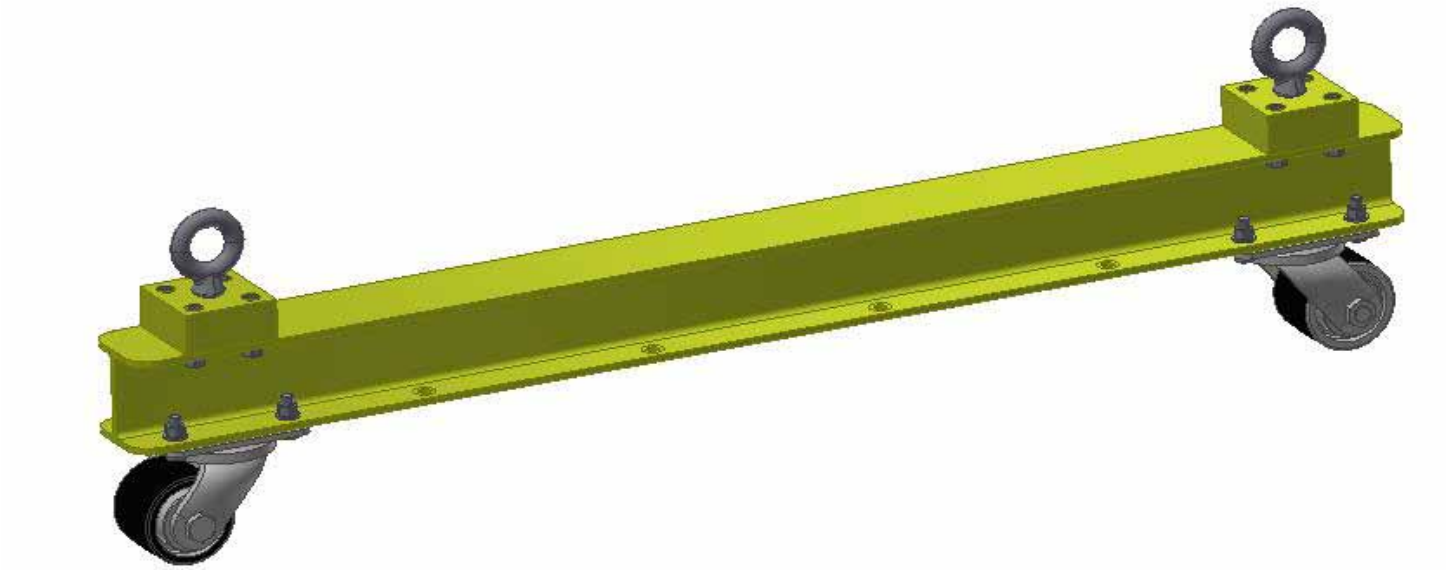
Floor Mounting

All of ADC's Custom High Precision Systems come with the ability to anchor to the floor and the ability to adjust and lock the parallelism of the Custom High Precision Systems with respect to the floor (pitch and roll).

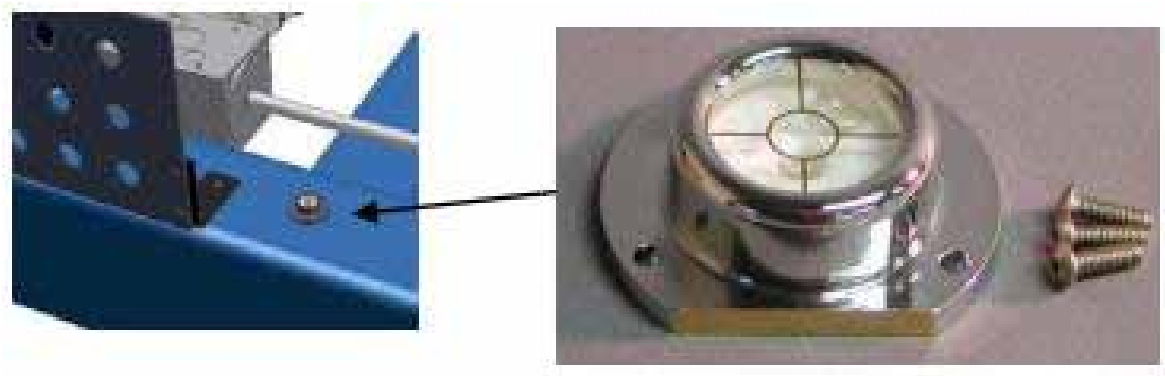
Adjustable feet can be used to align the Custom High Precision Systems height. ADC produces standard kinematic feet that provide height adjustment, transverse adjustment, and features for tie-down bolts. Bubble levels mounted to the system make it easy to dial in the system height. Using adjustable feet and casters allows for the Custom High Precision Systems to be easily moved into and out of the hutch or experimental area.

Air bearings mounted to the Custom High Precision Systems frame can be used instead of casters. The air bearings allow for the optical table to be moved into and around the hutch with zero resistance. A smooth surface is required for the air bearings to function properly. The figure to the right shows a Custom High Precision table provided with casters for moving into the hutch, and air bearings for manipulating the system within the hutch.

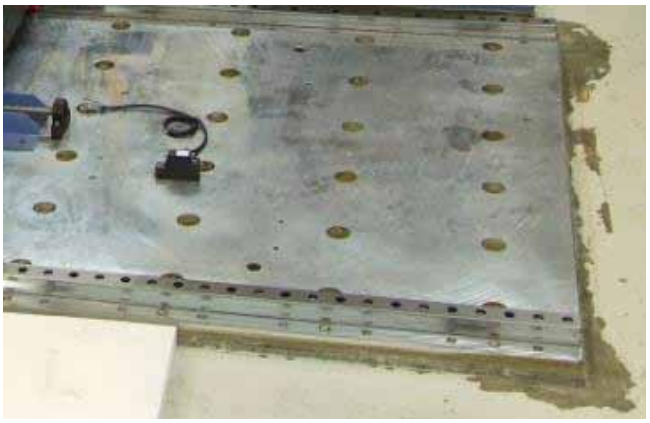
The table can also be supported by four casters which are mounted on two wide-flange I-Beams. The casters use 4" wheels and are each rated for 2860 kg. The I-Beam is made from steel according to industry standards for W4x13 beams. This beam has been selected to safety support the load of the table while maintaining a low profile in order to maximize the available space under the table. The caster assemblies also feature eye-bolts for picking up the table if needed.



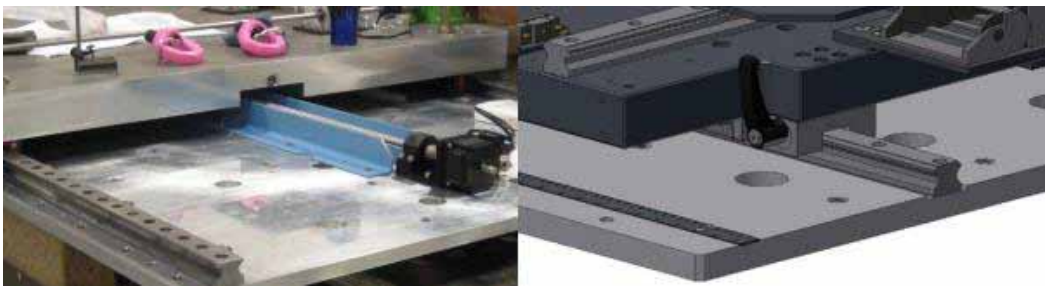
Leveling bubbles are installed on all custom devices. Though these bubble levels are not your thousand dollar high precision levels they are may to help the initial install of the device easier and less of a headache. See example below.

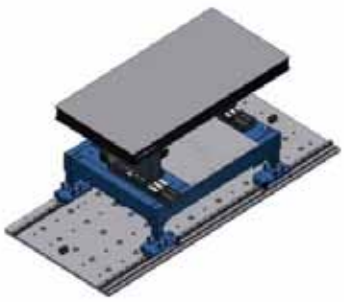


Permanent floor mounting options are also available with ADC Custom High Precision Systems. This is typically done by first grouting a precision flat plate to the facility floor. Before grout is poured, the plate is leveled and can be tied into the floor using threaded inserts. The grouted plate provides a permanent and extremely stable floor mount for the optical table.



A set of profile rails can be mounted to the grouted plate, allowing the Custom High Precision Systems to have an additional degree of freedom. Bearing blocks on the profile rails mount to the steel frame or granite base that supports the Custom High Precision Systems. Motion along the rails can be manual with hand brakes to lock the table into position or motorized with a ballscrew and motor assembly. Rail size and length can be designed to fit any number of lengths. The benefit of this setup is precision movement of the complete Custom High Precision Systems in one direction.





The figure to the right shows an example of a Custom High Precision System attached to linear rail guides. An aluminum floor plate is shown with features for leveling and grouting to the floor. This is example is moved manually and position is locked in using manual rail clamps. The four points of the welded frame bolt into bearing blocks and features for leveling the frame. This configuration can also be down with a granite slab instead of a welded frame. Motorized motion along the floor rails is easily incorporated as well.

BREADBOARD

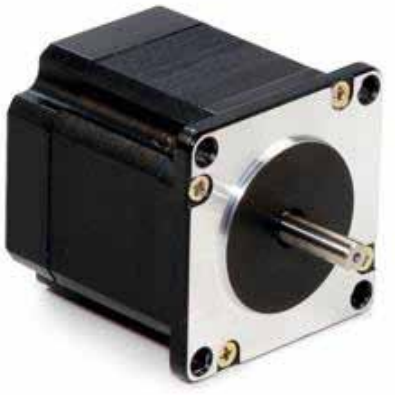
ADC uses typically uses the Newport's Research Grade Breadboard to provide rock-solid stability and rigidity to support demanding research applications. It is available in different thickness, and demonstrates an outstanding.

Specifications	
Working Surface	400 Series ferromagnetic stainless steel 3/16 in. (4.8 mm) thick with integrated damping layer
Thickness [in. (mm)]	2.4 (59); 4.4 (112)
Surface Flatness [in. (mm)]	±0.004 (±0.1), over 2 ft (600 mm) square
Core Design	Trussed honeycomb, vertically bonded closed cell construction, 0.010 in. (0.25 mm) Steel sheet materials, 0.030 in. (0.76 mm) triple core interface
Broadband Damping	Constrained layer dampers and Integrated Damping*
Mounting Hole Type	Cut (not rolled) threads with countersink 1/4-20 holes on 1 in. grid (M6-1.0 holes on 25 mm grid), 0.5 in. borders (12.5 mm borders)
Hole/Core Sealing	Easy clean conical cup 0.75 in. (19 mm) deep Non-corrosive high impact polymer material
Microlocks Option	
Number of Microlocks	4 for breadboards £3 ft^2 (0.27 m^2) 5 for breadboards >3 ft^2 (0.27 m^2)
Locations	W/6 from long side; L/6 from short side
Typical Performance Values	
Maximum Dynamic Deflection Coefficient	$<9.4 \times 10^{-4}$
Maximum Relative Motion Value [in. (mm)]	$<7.3 \times 10^{-7}$ ($<1.9 \times 10^{-5}$)
Deflection Under Load [in. (mm)]†	$<7.8 \times 10^{-5}$ ($<2.0 \times 10^{-3}$)

Note: All performance values are for 2 ft x 3 ft x 2.31 in. (600 x 900 x 59 mm) breadboards. †50 lb (22.7 kg) centered

*** Integrated Damping includes constrained layer core, damped working surface and composite edge finish**

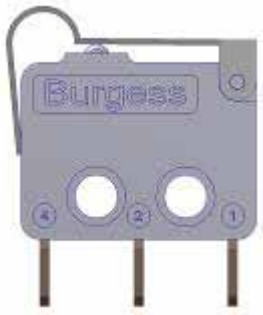
Motors



Custom High Precision Systems are provided with motors and limit switches for the equipment. ADC uses standard Lin Engineering NEMA bi-polar (2-phase) stepper motors with 200 steps/rev (1.8°/step). Depending upon the application and customer requirements, stepper motors of sizes NEMA 23 or 34 may be used. For more information please contact ADC.

These motors could be controlled with the majority of off the shelf controller/drivers on the market. Planetary gear boxes from CGI are provided on optical tables to achieve high resolution and load capacity. ADC also offers the option of using a 5 phase stepper motor or servo motor on the Custom High Precision Systems. All axis of motion are equipped with limit switches to prevent failure in case of a problem.

Limit Switches



All axes are fitted with mechanical limit switches. Depending on the size and scale of the system there will be a range of limit switches used. In smaller systems a Burgess PN: F4T7Y1 with a lever modification will be used. In larger systems a Honeywell BZ-2RQ18-A2 switch is used. All limit switches are calibrated and tested by ADC's engineers to ensure proper operation and travel. Limit switches are also mounted in slots so they can be adjusted if a different travel is required.

Home Switches

The SLT-310 and SLT-400 series have the option of a high precision Baumer MY-COM home switch. With a repeat accuracy of 1 micron, the My-Com® remains undisputedly the most accurate and most compact mechanical switch in the world. With its extremely compact design it can be placed in many arrangements.

Linear Incremental Encoders

Linear incremental encoders are available as an additional option for slits. ADC uses high resolution Renishaw TONiC series encoders. TONiC is Renishaw's new super-compact non-contact optical encoder that offers speeds up to 10 m/s and resolutions down to 1 nm for both linear and rotary applications. Offering significant enhancements to Renishaw's existing range of high speed non-contact optical encoders, TONiC also gives improved signal stability and long-term reliability, low cost of ownership and refreshing simplicity.

Linear Absolute Encoders

Linear absolute encoders are also available on most of the ADC's slits The Renishaw RESOLUTE is a true absolute, fine pitch optical encoder system that has excellent dirt immunity, and an impressive specification that breaks new ground in position feedback. It is the world's first absolute encoder capable of 1 nm resolution up to 100 m/s.

Cabling & Connectors

To ensure proper operation of the system, all cabling, wiring and connectors supplied comply with the EMC and NEC directive. To meet these criteria, all conductors and connectors used have sufficient and appropriate shielding capacity. The shielding efficiency is affected by a number of factors such as the overall cable installation and the components employed. Therefore, continuous and homogeneous shielding is done by the use of screened conductors.

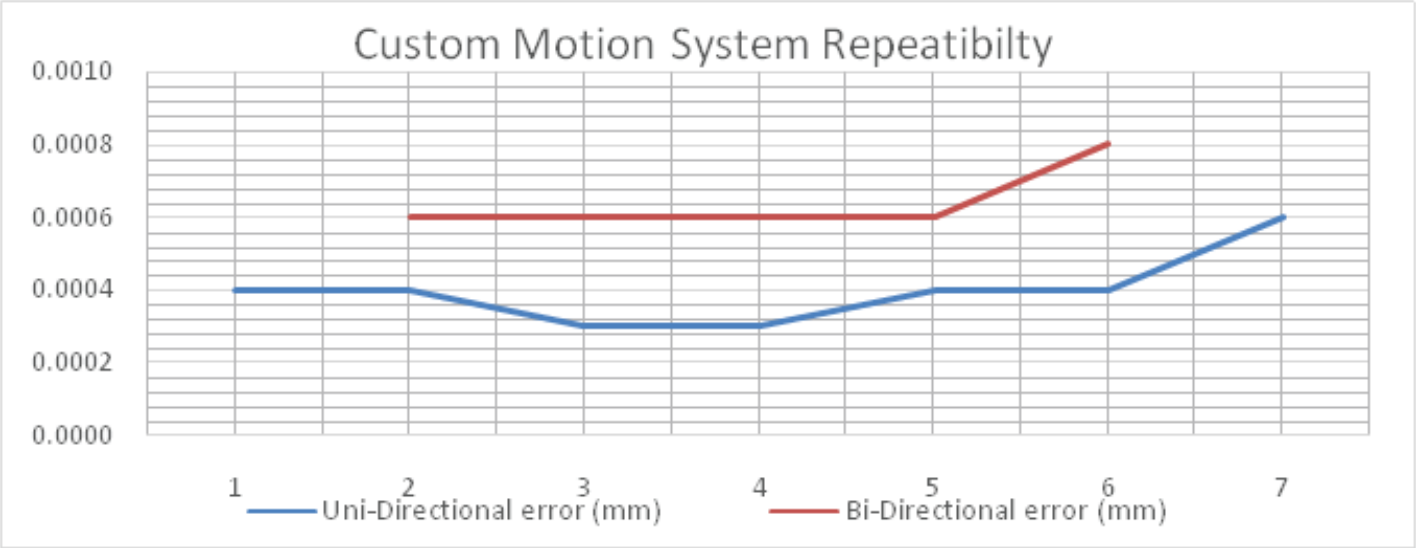
The connectors are firmly mounted on the overall equipment frame by the use of patch panels/bulkhead plates. This provides a safe and easy connection and disconnection of all field/control cables to the equipment. ADC provides a customized connector panel that exactly matches the type of connectors and wiring used at the customer's facility. This facilitates ease of installation and operation at a customer's site.

ADC provides a proper routing and grouping of cables installed. Consideration is given to the design of the cable management system, so practical assembly/disassembly of individual sub-assemblies is not affected during installation or maintenance.

All optical tables feature a control panel to allow for simple and organized electrical connections. The custom control panel below houses six Souriau 12-pin connectors which are each labeled to specify which motor they control

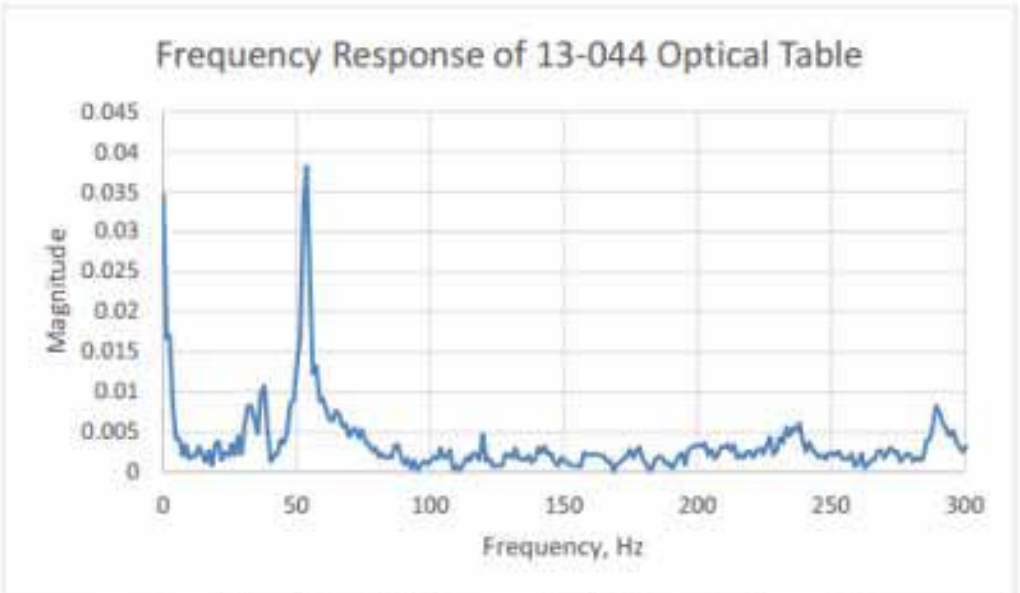
Testing

ADC's Custom High Precision Systems are typically designed, built and tested based upon customer specifications/requirements. Typical measurements include mechanical repeatability and frequency response measurements. ADC provides a detailed report with delivery of the equipment to customer. Below are examples of actual mechanical repeatability measurement tests performed on previous projects:



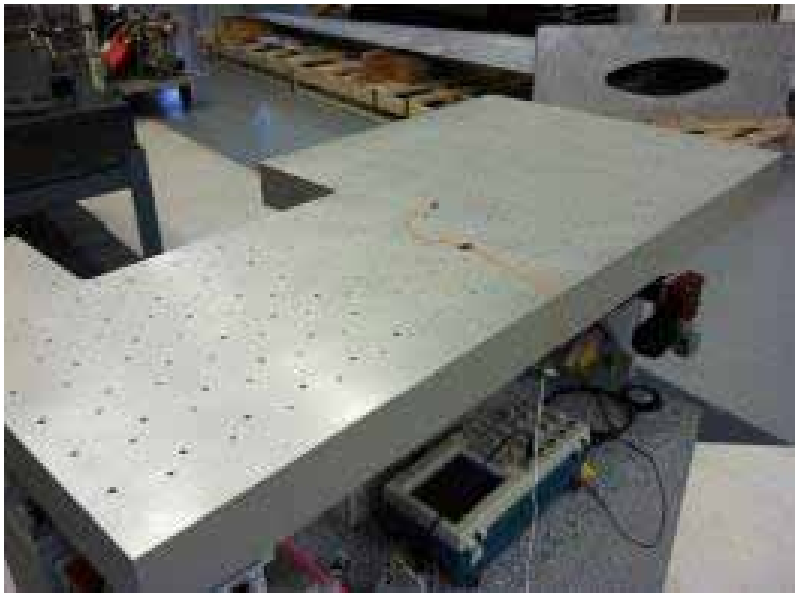
Frequency Response of Built Table

The vibrational response of a Custom High Precision System was measured using an accelerometer. Data was recorded on an oscilloscope and exported to Excel for further processing. Using a Fourier analysis, we are able to graph the frequency response. The table was excited using a dead-blow hammer. The oscilloscope took data at a rate of 2,500 samples/sec and sample size for the Fourier analysis was 2,048. Results showed a natural frequency at 54 Hz.



Measure frequency response of the optical table. These results indicate a fundamental frequency at about 54 Hz.

For this specific optical table design we suspect the source of these vibrations comes from the "spherical" joints at each support point of the table. These joints use c-flex bearings which have a very flexible rotation axis but are assumed to be rigid in all other axes. In reality, the bearings have flexibility about their other axes as well.

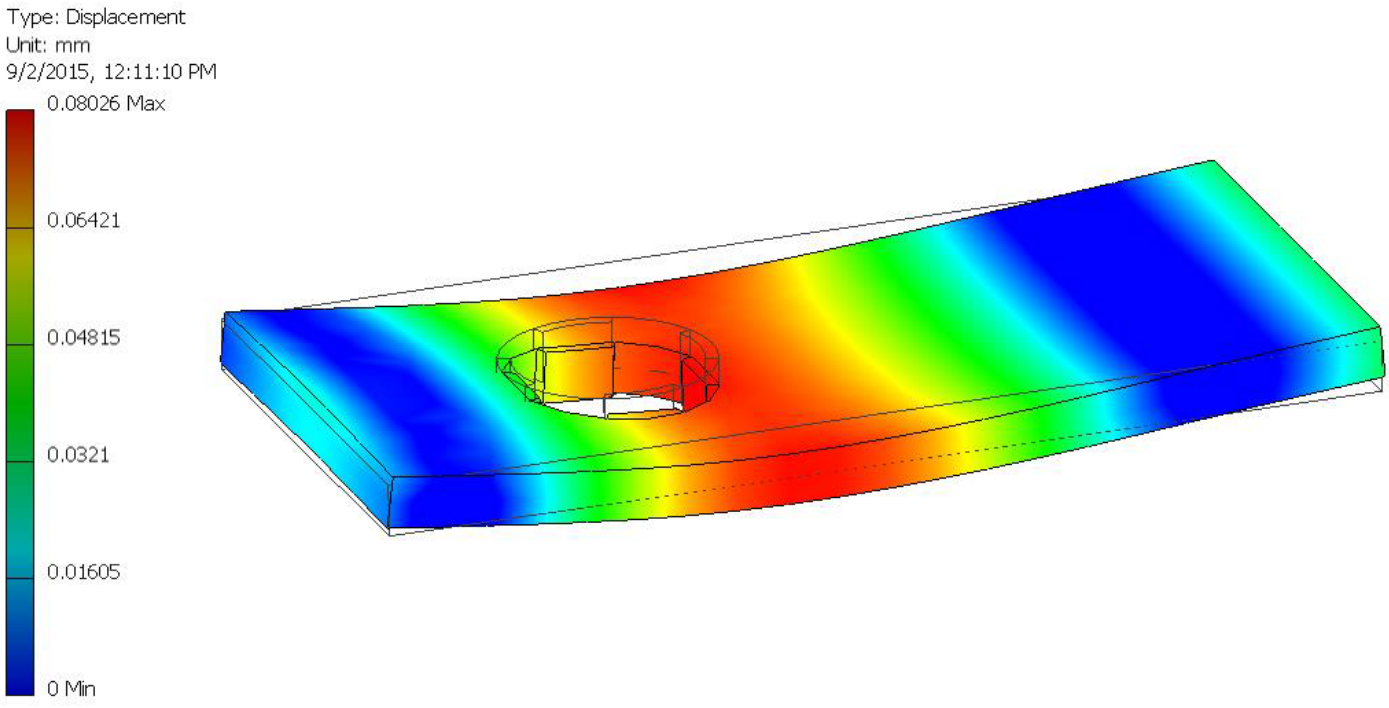


Analysis of Design

TADC has the ability to do design analysis on the custom designs. Finite Element Analysis (FEA) plays an important part of the design phase.

FEA on the System Deflection When Loaded

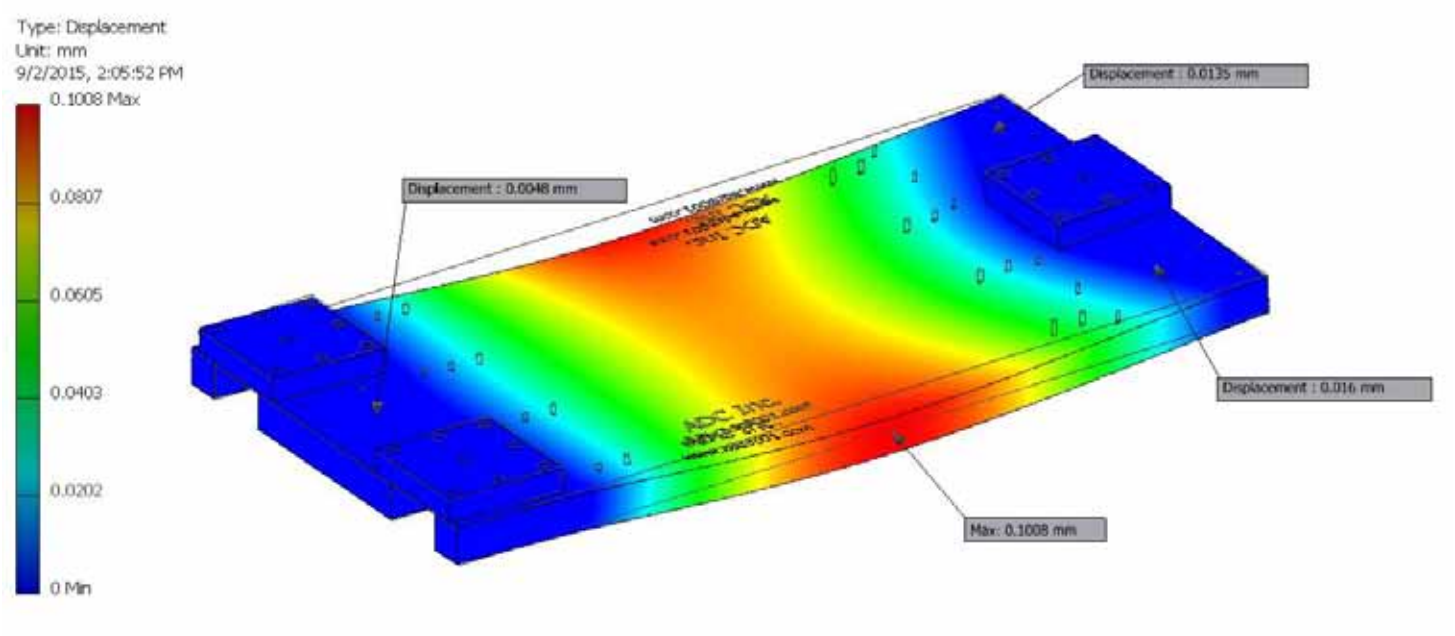
In order to maintain the accuracy of the system, it is important to minimize the deflections due to bending under loading. Although a 4" table is typically used, the possibility of using a different thicknesses can also be used. Below is an analysis to examine the effects of a deflection on a 4" thick table.



These results show that the deflection would more than double if a 3" thick table was used. Therefore, it was decided to use a 4" thick table unless it became absolutely necessary to use a thinner table in order to meet the overall height requirement.

FEA Support Plate Analysis - Displacement

The support/bottom plate of optical tables are also analyzed to help show the deflection under load. In the figure below it shows an example of a support plate the maximum deflection of the support plate is 0.1008 mm. However, this deflection occurs in the middle of the plate which is not important for operation as nothing is attached to the plate in this region. At the motion stack locations, the deflection is at most only 0.016 mm.

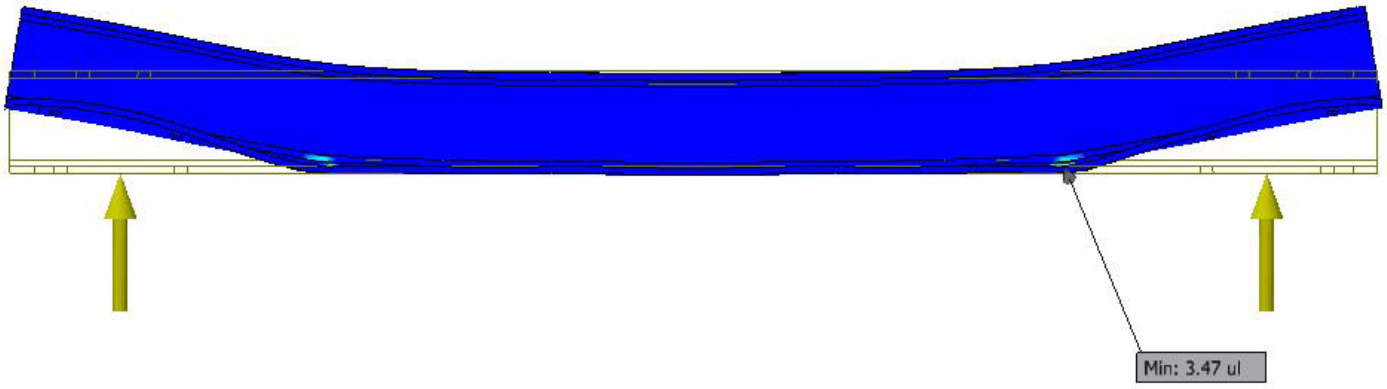


Frequency Response of Built Table

The vibrational response of a Custom High Precision System was measured using an accelerometer. Data was recorded on an oscilloscope and exported to Excel for further processing. Using a Fourier analysis, we are able to graph the frequency response. The table was excited using a dead-blow hammer. The oscilloscope took data at a rate of 2,500 samples/sec and sample size for the Fourier analysis was 2,048. Results showed a natural frequency at 54 Hz.

FEA on I-Beam Strength Analysis

Due to their strength and simplicity, an I-beams can be used to mount the removable casters onto the system. However, in order to maximize the available space underneath the table, it was desired to use as small of an I-beam as possible without compromising the structural integrity. Several standard size beams can be analyzed using hand calculations to find an I-beam with a safety factor around 4. Once a beam size was selected, a FEA analysis is done to verify the hand calculations and examine the effects of the bolts used to attach the I-Beam. An example of the results of this analysis are shown in the figure below which shows the minimum safety factor along the beam. The stress concentrations at the bolt locations resulted in a slightly lower safety factor than calculated by hand, however the minimum safety factor of 3.47 is still sufficient.



Electronics and Instrumentation

ADC has several electrical/software engineers and techs capable of providing custom circuit design and complete turn-key control systems. Some of our skills include integrated PLC design and programming, analog and digital circuit design, logic design (including PLA and FPGA programming), stepper and servo motor applications, microprocessor, RFID, serial and RF communications, and system controllers.

Our design tool set includes National Instruments (NI) MultiSim for schematic capture and NI UltiBoard for circuit board design, Xilinx ISE for FPGA design, ModelSim for simulation, and StateCad. Non-circuit board Schematics are drawn on various platforms with output to DXF. Microprocessor experience is broad but recent projects focus on the PIC Micro Family from MicroChip. ICE units and code simulation for the PIC microprocessors are in-house. Software skills and development platforms include Microsoft Visual C++, PERL, LabView, Visual Basic, CNC, and generic PLC (AB, NAIS, GE-Fanuc, Schneider, etc.) and Parker 6K and 9K (Accroloop).

Our standard motor controls and driver that we offer is the Aerotech Ensemble™ series controllers as described in this document. However, many of our customers have requirements for custom integration of these components into a functioning system, fully debugged, documented, and ready for operation.

We have provided mostly stepper motors but also servo motors on occasion. We have applied incremental and absolute linear and rotary encoders. A brake on all axes is standard. Limits consist of mechanical switches. For close repeatability at small gaps or near the beam pipe, ADC uses high repeatability (< 1 um) mechanical limit switches.

Software skills and development platforms include Microsoft Visual C++, LabView, EPICS, Visual Basic, CNC, and generic PLC (AB, NAIS, GE-Fanuc, Schneider, etc.) and Parker ACR and Accroloop. Our primary skill, however, is the integration of these components into a functioning system, fully debugged, documented, and ready for operation.

CUSTOM HIGH PRECISION OPTICAL TABLES

http://www.adc9001.com/Custom-Optical-Tables

ADC (ISO9001:2008 certified) has been a leading supplier of high quality optical tables to the synchrotron and neutron source scientific community as well as FELs and laser based experiments for over 18 years. Many of our optical tables have been in operation nearly that long in facilities around the world. Our tables are noted for stability as well as range of motion and load capacity. Options run from steel to granite base as well as size of the table and range of motion – please see http://www.adc9001.com/Custom-Optical-Tables .

SOLARIS 3

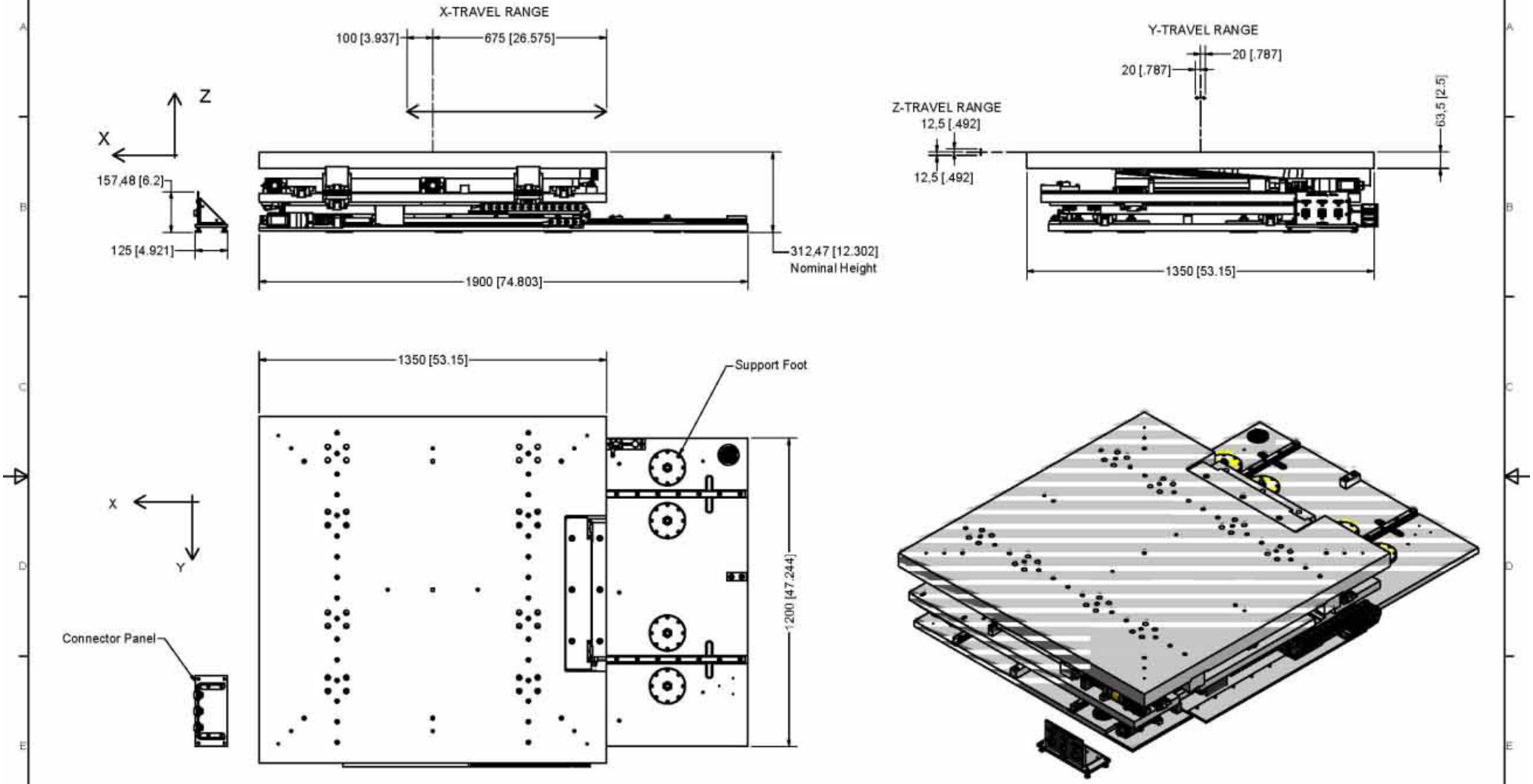
Axis Motorized Positioner High Load, Low Profile, High Precision Device

http://www.synchrotron.uj.edu.pl/en_GB/

The first Polish synchrotron radiation facility Solaris is being built at the Jagiellonian University III-rd Campus in Kraków. Synchrotron is a unique manmade source of electromagnetic radiation known as synchrotron radiation. This custom high load, high precision 3-Axis Motorized system was designed for SOLARIS Jagiellonian University, Krakow, Poland that allows for vertical axis positioning for a 1500kg load. All three motions are supported on THK rails and driven by a ball screw with a NEMA 23 stepper motor and planetary gearbox. All motions have adjustable limit switches to change the travel within the maximum range. The mechanics allow the three degree of freedom motion of the movable platform work surface. Vertical motion (Z direction) and horizontal transversal motions (Y & X direction) of the platform work surface are controlled and operated by means motorized stages. Limit-switches are of the type normally closed. Linear encoder plus zero marker position have to be provided for all three motions.

Key Specifications:

Description	X-Axis (horizontal)	Y-Axis (horizontal)	Z-Axis (vertical)
Range of Motion	+100mm/-675mm	+20mm/-20mm	+12.5mm/-12.5mm
Resolution (unit/step)	5 micron/full step	1.1 micron/full step	0.1 micron/full step
Minimum dynamic load capacity	1500 kg		
Estimated System Mass	993 kg		
Encoder Manuf.	Renishaw		



3-Axis Motorized Positioner
Load Capacity: 1500 kg
X-Axis
Travel Range: +100mm/-675mm
Resolution: 5 micron/full step
Y-Axis
Travel Range: +20mm/-20mm
Resolution: 1.1 micron/full step
Z-Axis
Travel Range: +12.5mm/-12.5mm
Resolution: 0.1 micron/full step
Support Foot:
Adjustment Range: +5mm/-5mm
Estimated System Mass: 993 kg

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference

Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994 | Date
Drawn by: F.Acome | 12/16/2014
Eng approval: Engineer
Mfg approval
Assy approval

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 0,38
0,25 A B C
0,25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 107
Lansing, NY 14882
Phone: 607.533.3533 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

3-Axis Positioner Assembly

Part Number | Revision: 0 | Size: A2 | Sheet

Purchased Part Modification | No

SLAC OPTICAL TABLE

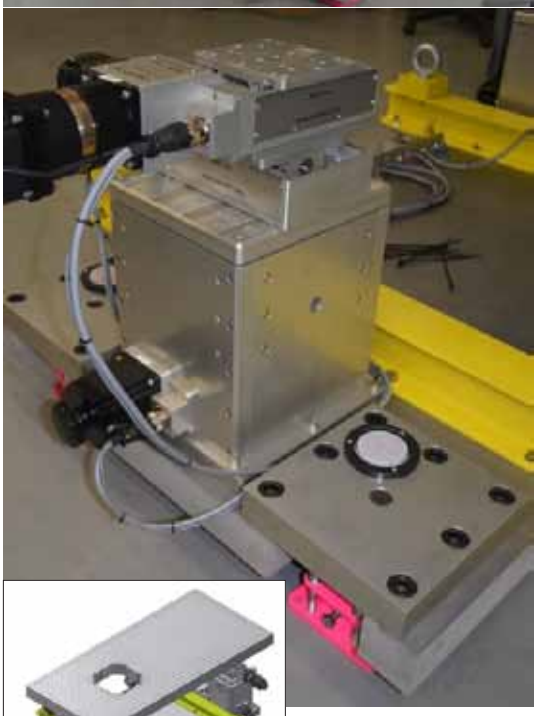
For more information please visit:
http://www-ssrl.slac.stanford.edu/
http://www.adc9001.com/products/view/693

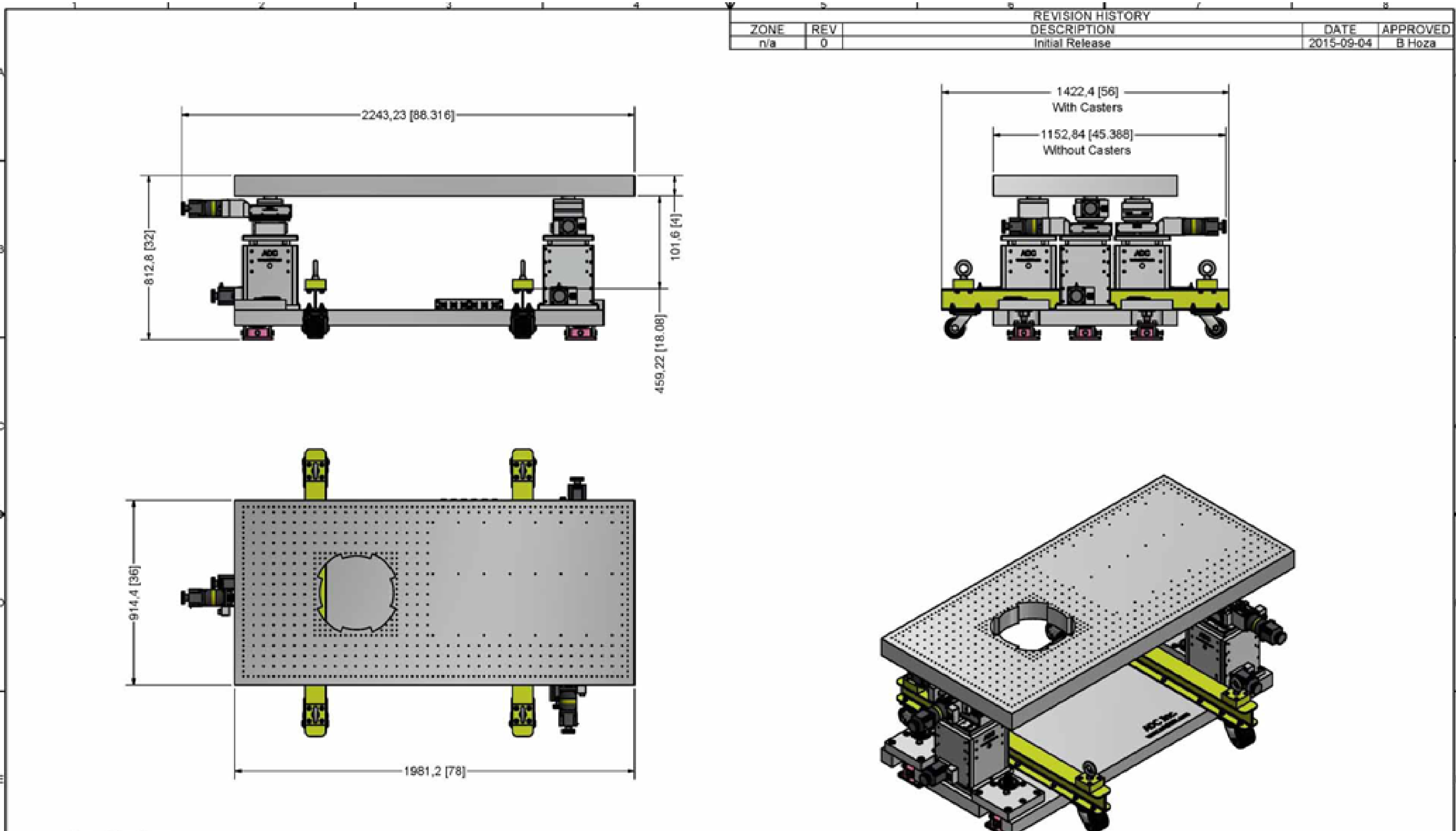
Summary

ADC has designed an optical table that will be used by SLAC National Accelerator Laboratory to both support and accurately position research equipment. The optical table has been designed to have 6 Degrees of Freedom with sufficient travel, resolution, and repeatability in each direction to meet all of SLAC's specifications. The overall dimensions of the table, as well as the features
machined into the surface of the table, have been custom designed to support SLAC's microscope, chambers, and related components. Additionally, the optical table has been engineered to support the load of the microscope and its related equipment without any significant deflections, helping to ensure the accuracy of the table.

Specification

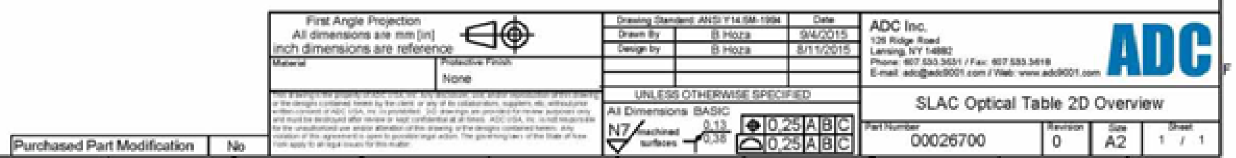
- 5 Degrees of Freedom: x, y, z, pitch, yaw
- Height of table at mid-travel: 32" from top of table to floor
- Dimensions of table in x-y plane: 78" x 36"
- Load: ~2,000 lbs. total weight
  - Microscope components: ~500 lbs.
  - Table: ~800 lbs.
  - All other components: ~700 lbs.
- Mounting: Adjustable feet and removable casters
- Movement:
  - Along Beam:
    - Travel – 1 in. (+/- ½ in.)
    - Resolution - 1um
    - Repeatability, 10um (prefer better)
  - Perpendicular to Beam:
    - Travel – 1 in. (+/- ½ in.)
    - Resolution – 1um
    - Repeatability - 10um (prefer better)
  - Vertically:
    - Travel: 2 in. (+/- 1 in.)
    - Resolution 1um
    - Repeatability 10um (prefer better)
- Equipment Mounting:
  - Center "Bayonet" hole as described in "ADC Plate 'bayonet' hole schematic PRELIM"
  - Hole pattern for attachment of microscope frame as shown in "ADC Plate 'bayonet' hole
  - schematic PRELIM"
  - Grid of ¼-20 holes based on previous hole pattern
  - Electrical Connectors: will be provided by SLAC





Specifications:

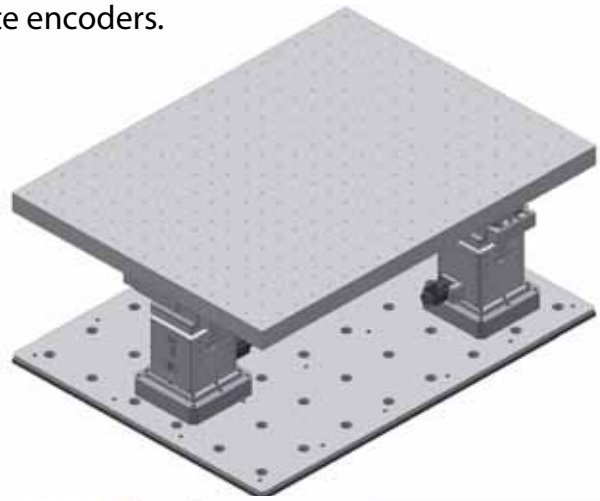
Degrees of Freedom: 6
Travel: +/- 25.4 [1] Vertically, +/- 37.5 [1.48] Horizontally
Resolution: 0.001 mm in each direction
Designed Load: 2,200 lbs. (1,000 lb table.)
Approximate Weight: 1185 kg [2612.5 lbs.]



PAUL SHERRER INSTIUTE (PSI) HIGH CAPACITY, 6 AXIS OPTICAL TABLE

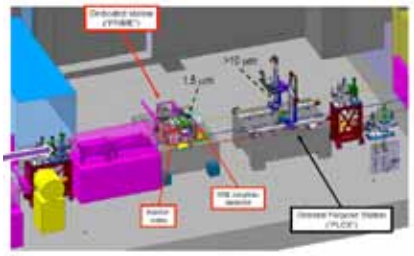
http://www.adc9001.com/products/view/694

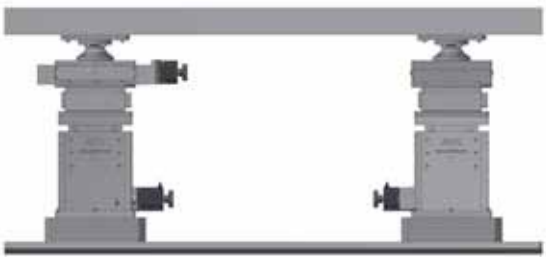
A pair of identical optical tables was designed for Paul ScherrerInstitut (PSI), to be installed in the Swiss Free Electron Laser (FEL) as large-scale manipulators for optical equipment. One of the two tables was topped with an additional horizontal axis to provide additional travel for the 2000 kg PRIME instrument and its surrounding vacuum chamber. From the crane capacity limitations in the hutch and the customer's desire for grouted foundations, it was decided to forgo the traditional base plate with casters and instead build the table in place, carting in each actuation stack separately and then placing the table atop the three stacks. All motions were driven by stepper motors through ball screws, and feedback was provided by absolute encoders.

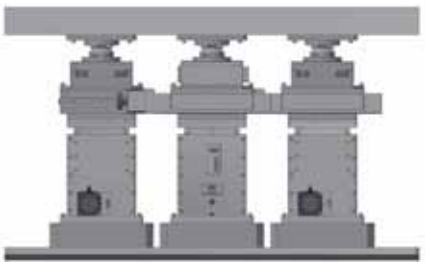


PAUL SCHERRER INSTITUT

PSI

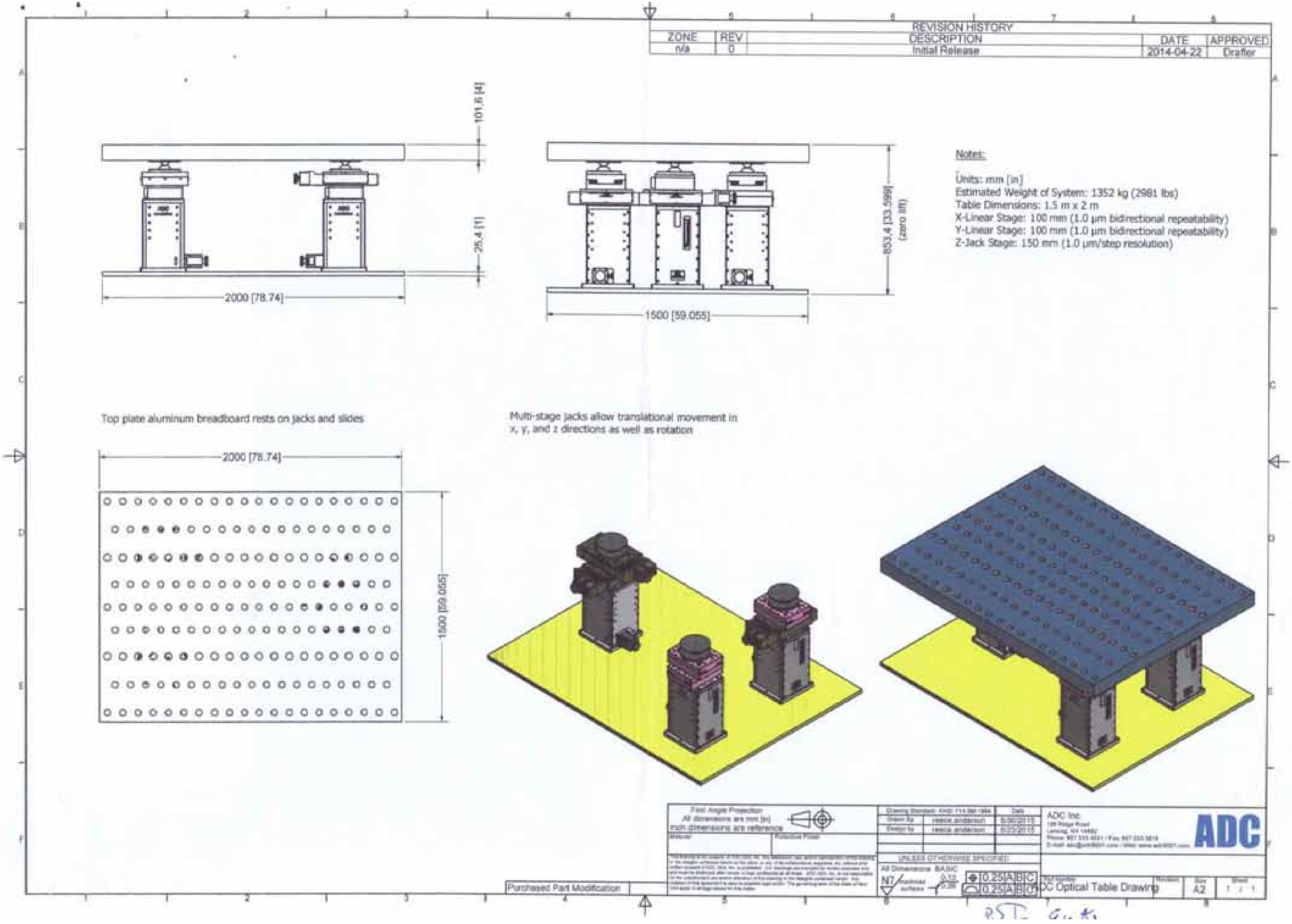






Key Specifications:

Description	Value	Units
Range of Motion (Linear)	+/- 50 [2] Horizontal +/- 25 [1] Vertical	mm [in.]
Additional Slide Range of Motion	+/- 300 [11.8]	mm [in.]
Range of Motion (Rotational)	+/- 0.034 [2]	rad. [degree]
Resolution (unit/step)	~ 0.025 Horizontal ~ 0.001 Vertical	mm/step
Table Size	2 x 1.5 [6' 6" x 4' 10.5"]	m [ft. & in.]
Table Height	914 [35.9]	mm [in.]
Minimum dynamic load capacity	20	kN
Weight	1525 [3355]	kg [lbs.]
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm

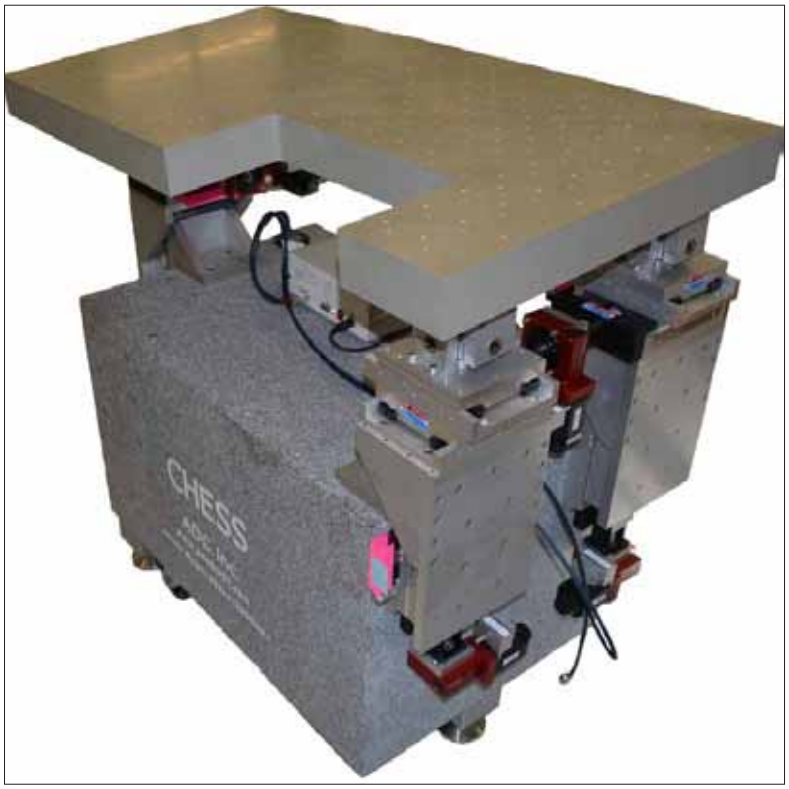

REVISION HISTORY
ZONE
REV
DESCRIPTION
DATE
APPROVED
n/a
0
Initial Release
2014-04-22
Drafter
101,6 [4]
25,4 [1]
2000 [78.74]
1500 [59.055]
853,4 [33.599]
(zero lift)
Notes:
Units: mm [in]
Estimated Weight of System: 1352 kg (2981 lbs)
Table Dimensions: 1.5 m x 2 m
X-Linear Stage: 100 mm (1.0 µm bidirectional repeatability)
Y-Linear Stage: 100 mm (1.0 µm bidirectional repeatability)
Z-Jack Stage: 150 mm (1.0 µm/step resolution)
Top plate aluminum breadboard rests on jacks and slides
2000 [78.74]
1500 [59.055]
Multi-stage jacks allow translational movement in x, y, and z directions as well as rotation
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
ADC Inc.
ADC
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
Purchased Part Modification
ADC Optical Table Drawing
A2

CORNELL HIGH ENERGY SYNCHROTRON SOURCE (CHESS)

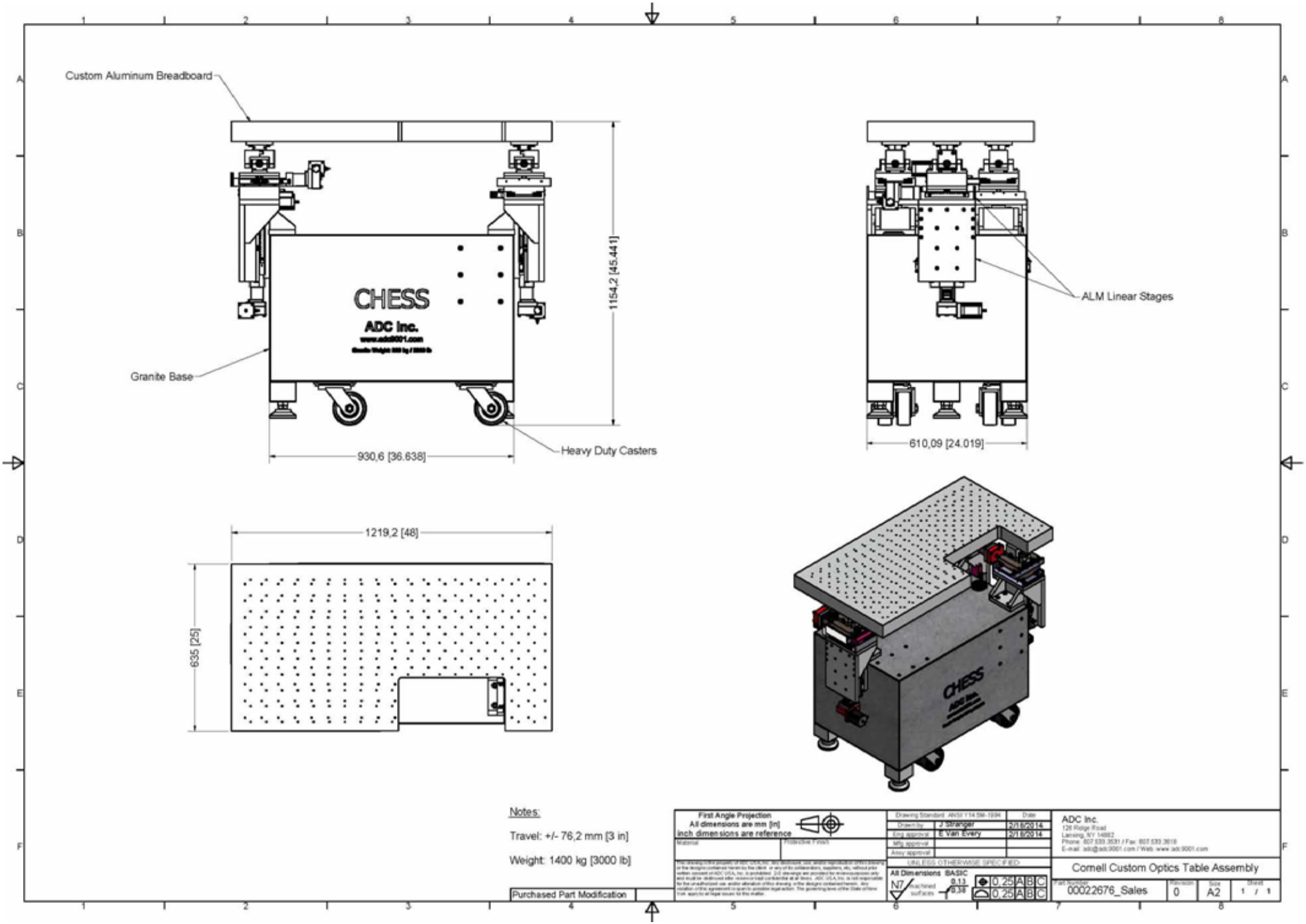
Custom Optics Table

http://www.adc9001.com/products/view/526

A system was designed for CHESS that contains three vertical stages and three horizontal stages. This allows for six degrees of freedom for the system. The vertical stages use a Lin Engineering NEMA 23 triple stack stepper motor with a 60:1 right angle gearbox. The horizontal stages use the same motor with a 20:1 right angle gearbox. The system also has a base made of granite that weighs around 9.6kN [2200lb]. The base has four heavy duty casters and three adjustable feet for positioning and leveling. The table top is a custom made aluminum breadboard with a custom hole pattern. The aluminum is 635mm [25in] wide, 1220mm [48in] long, and 76mm [3in] thick. To learn more about CHESS please go to: http://www.chess.cornell.edu/



CHESS


Custom Aluminum Breadboard
CHESS
ADC Inc.
Granite Base
1154,2 [45.441]
930,6 [36.638]
Heavy Duty Casters
ALM Linear Stages
610,09 [24.019]
1219,2 [48]
635 [25]
Notes:
Travel: +/- 76,2 mm [3 in]
Weight: 1400 kg [3000 lb]
Purchased Part Modification
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Drawing Standard: ANSI Y14.5M-1994
Drawn by: J Stranger 2/18/2014
Eng approval: E Van Every 2/18/2014
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
Cornell Custom Optics Table Assembly
Part Number: 00022676_Sales
Revision: 0
Size: A2
Sheet: 1 / 1

ONE DEGREE OF FREEDOM OPTICAL TABLE - BNL

http://www.adc9001.com/products/view/525

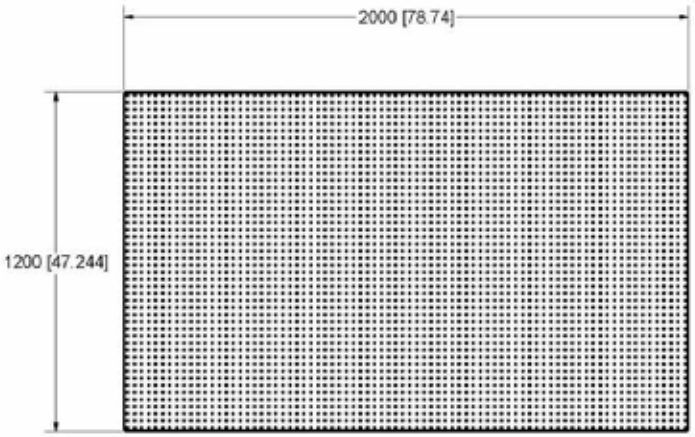
This optical table is a one axis motion system designed to lift a 3,500 lbs load and move +/- 50 mm vertically for Brookhaven National Lab. The vertical motion consists of 4 ADC DJ600-50 jacks that are driven by one Nema 34 motor and a 20:1 gear reduction, which is then coupled to a Tandler spiral bevel gear box which allows the jacks move simultaneously. The simultaneous motion is preferred to avoid potential binding of the jacks which is common with driving each jack individually. An 8 in thick Newport bread board is mounted on top of the jacks and will provide a stable base for mounting equipment as necessary. To learn more about BNL please go to: http://www.bnl.gov/ps/

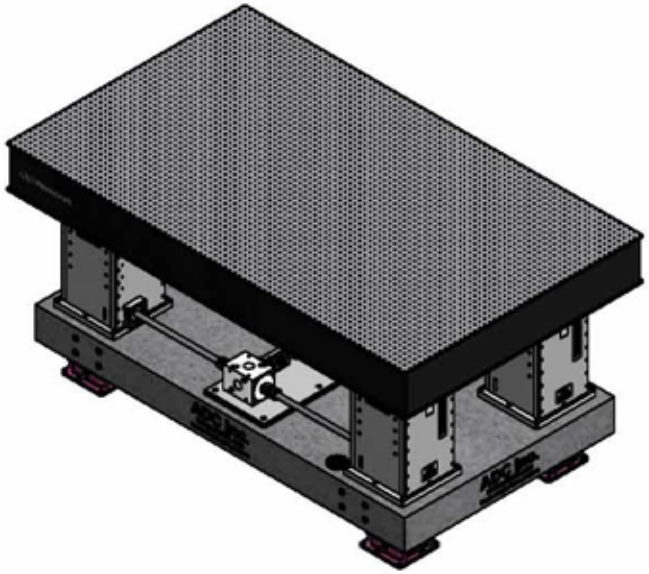
BROOKHAVEN NATIONAL LABORATORY

Motion	Product Description	Range of Motion	Resolution
Vertical Translation	Custom DJ600-50	+/- 50 mm	0.25µm

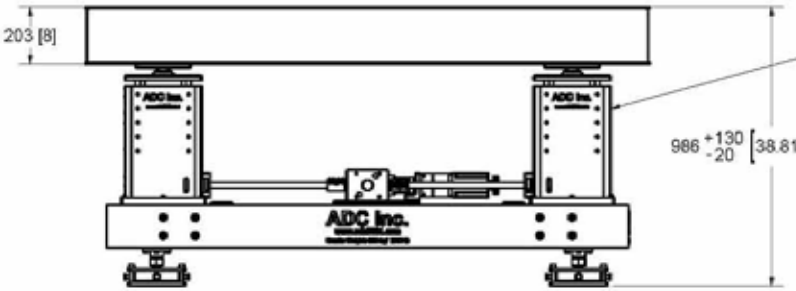
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2013-12-13	J Stranger
All	1	Updated drawing to match latest model	2014-02-07	J Stranger

Top View



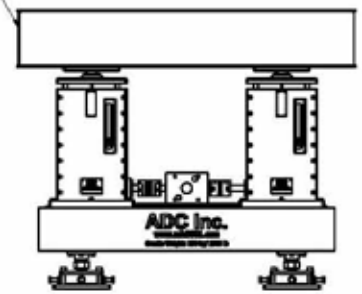


Front View



Newport Custom Optical Table with standard M6x1 mounting holes spaced 25mmx25mm (TYP.)

Side View



Notes:
Travel: 150 mm [5.905 in]
Weight: 1560 kg [3500 lbs]

Purchased Part Modification	No

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference

Material | Protective Finish

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by	J Stranger	12/13/2013
Eng approval	E Van Every	12/13/2013
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 Machined surfaces 0.13 / 0.38
0.25 A B C
0.25 A B C

ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3616
E-mail: adc@adc9001.com / Web: www.adc9001.com

Custom Optical Table Assembly

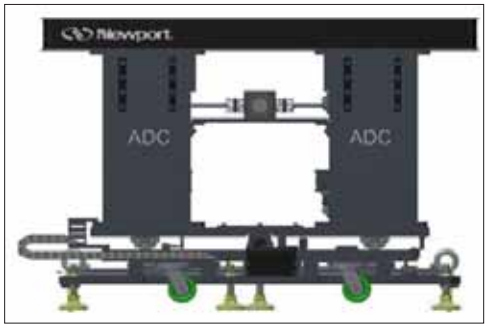
Part Number	Revision	Size	Sheet
	0	A2	1 / 1

THE AIR FORCE OFFICE OF SCIENTIFIC RESEARCH - AFOSR

3-Axis Optical Table

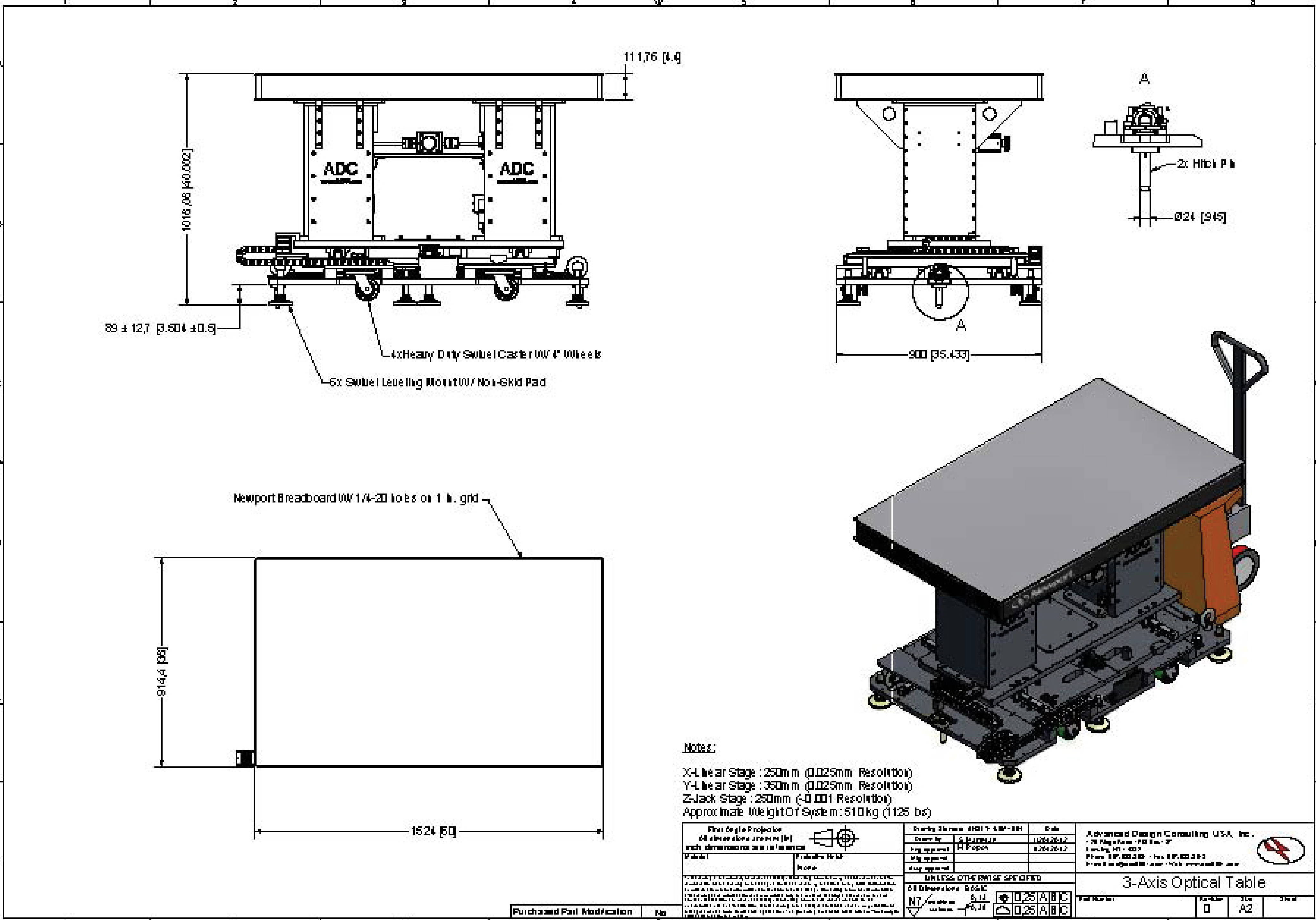
http://www.adc9001.com/products/view/522

3-Axis Optical Table built for The Air Force Research Laboratory (AFRL-Jacobs Tech) was designed for use in PIV experiments. The Newport optical breadboard provides a rigid surface for mounting and supporting measurement equipment. Utility Jacks each have a load capacity of 25kN. Each linear slide is actuated by precision ground ball screws and supported by caged ball linear guide rails. To learn more about AFRL-Jacobs Tech please go to:http://afrl.dodlive.mil/



Key Specifications:

Parameter	Value
Z-Jack Stage	250mm (9.8 in), ~0.001mm Resolution
X-Linear Stage	250mm (9.8 in), 0.025mm Resolution
Y-Linear Stage	350mm (13.8 in), 0.025mm Resolution
Nominal Height	1020mm (40.2in)
Weight	510kg (1125 lbs)


111,76 [4.4]
1016,06 [40.002]
ADC
ADC
89 ± 12,7 [3.504 ±0.5]
4x Heavy Duty Swivel Caster W/ 4" Wheels
6x Swivel Leveling Mount W/ Non-Skid Pad
A
2x Hitch Pin
Ø24 [.945]
A
900 [35.433]
Newport Breadboard W/ 1/4-20 holes on 1 in. grid
914,4 [36]
1524 [60]
Notes:
X-Linear Stage : 250mm (0.025mm Resolution)
Y-Linear Stage : 350mm (0.025mm Resolution)
Z-Jack Stage : 250mm (~0.001 Resolution)
Approximate Weight Of System : 510kg (1125 lbs)
Advanced Design Consulting USA, Inc.
3-Axis Optical Table
UNLESS OTHERWISE SPECIFIED
Purchased Part Modification
D
A2

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION - NASA

Custom Optics Table

http://www.adc9001.com/OPT-NASA

This NASA six degrees of freedom High Precision Motorized Optical Table used a 4" (100 mm) aluminum breadboard with a grid of mounting M6 holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about NASA please go to: http://www.nasa.gov/

Key Specifications:

Degrees of Freedom:	6
Table Size:	2.5' x 2.5' (762mm x 762mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Aluminum

*** Comes with large casters.**

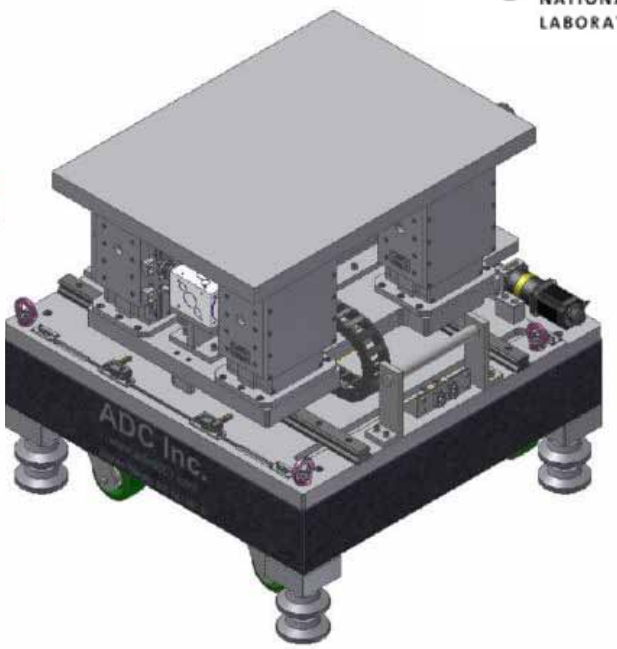
ADVANCES PHOTON SOURCE - APS

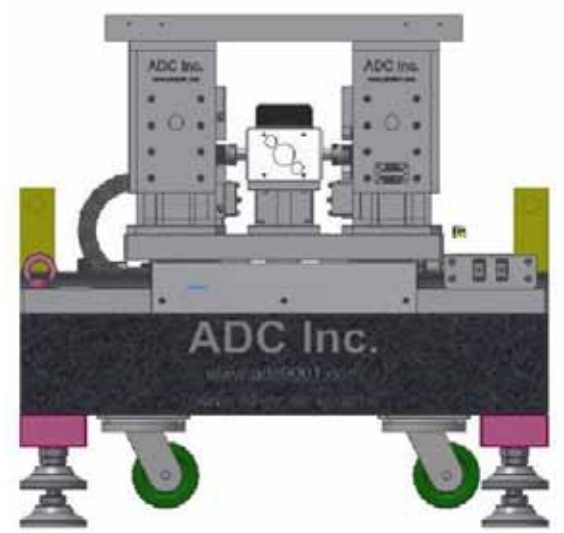
2 Degree of Freedom Optical Table

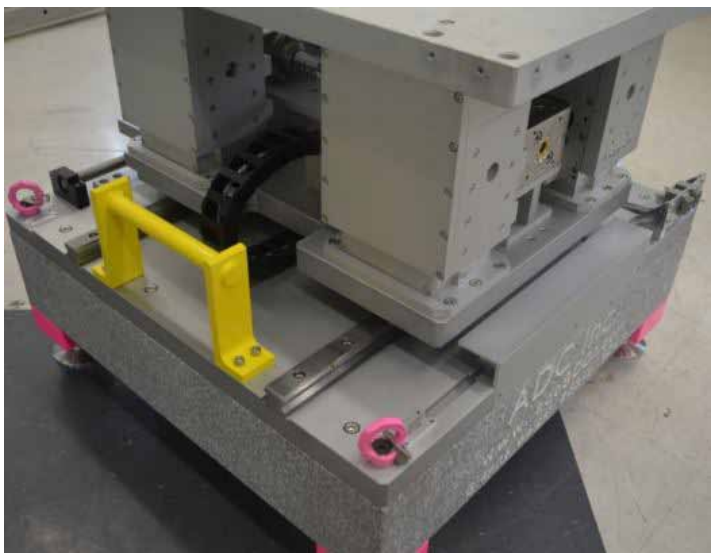
http://www.adc9001.com/products/view/530

This optical table for APS's facility has two degrees of driven motion, vertical and horizontal. The vertical motion is accomplished by four ADC 5 kN utility jacks driven by a single NEMA 34 stepper motor to prevent binding. The horizontal motion is supported on THK HSR35 rails and driven by a 20x5 mm ball screw from NSK with a NEMA 23 stepper motor and 10:1 planetary gearbox. All motions have adjustable limit switches to change the travel within the maximum range. Adjustable feet were used to meet the customer's height requirements, placing the table top at 725mm from the floor while sitting on the feet at mid vertical travel. The addition of handles to the system, in conjunction with large, durable casters, makes the system easy to move around the facility as needed. The table is designed to have a full range of horizontal travel without having the overall dimensions exceed 825mm in the direction of horizontal travel.

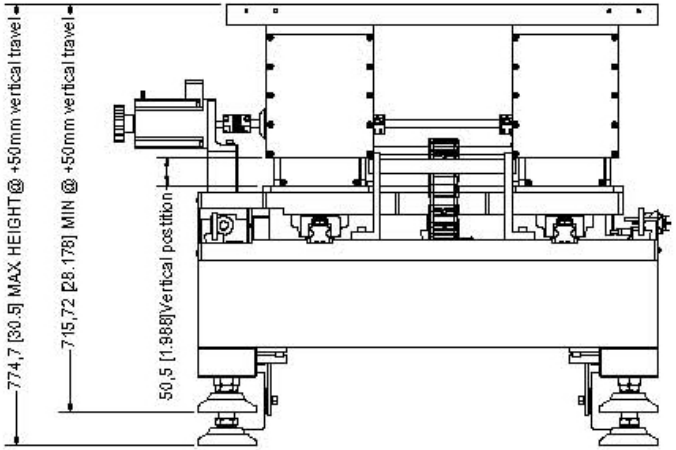
Argonne NATIONAL LABORATORY

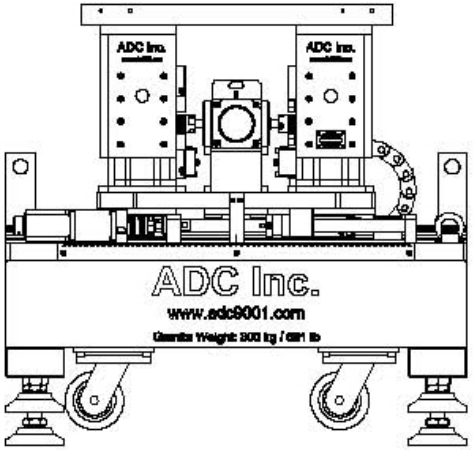


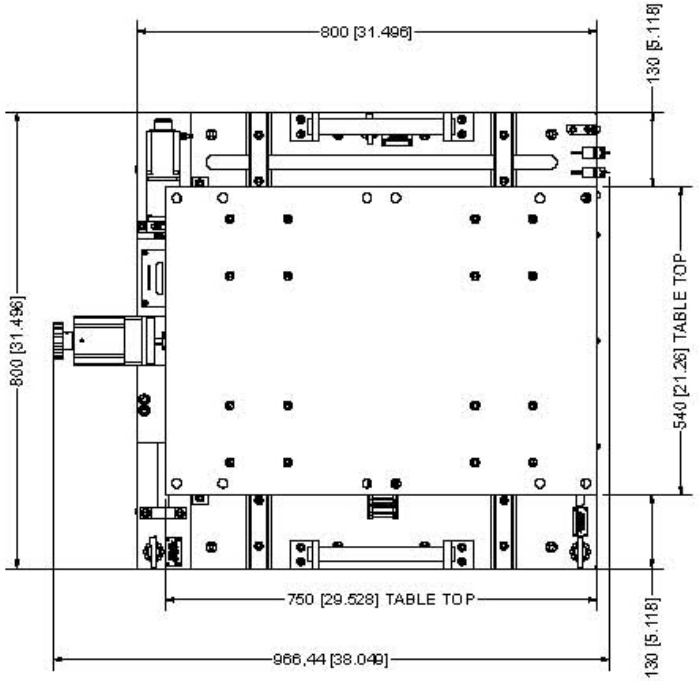


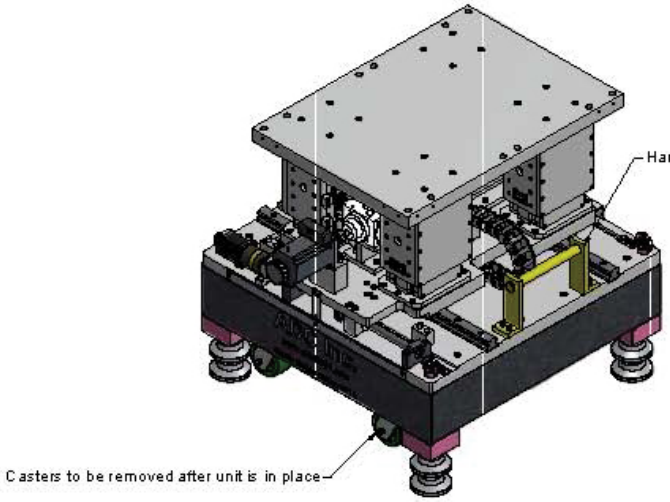


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Approval Drawing	2014-12-12	K McAfee









Note:
Table height at center of vertical travel, Max: 775mm Min: 716mm
Table length at end of travel: 800mm either direction
Approximate weight: 577kg [1272 lbs]

First Angle Protection All dimensions are mm [in] Inch dimensions are reference		Drawing Standard: ANSI Y 14.5M-1994	Date
Material	Protective Finish None	Drawn by: K McAfee	2014-11-21
		Design by: K McAfee	2014-11-21
		UNLESS OTHERWISE SPECIFIED	
		All Dimensions BASIC	
		N7 machined surfaces 0,13 0,38	⌖ 0,25 A B C ⏥ 0,25 A B C

ADC Inc.
128 Ridge Road
Lansing, NY 14882
Phone: 607 533 3581 | Fax: 607 533 3583
E-mail: adc@adc9001.com | Web: www.adc9001.com

CIW Optical Table Assembly

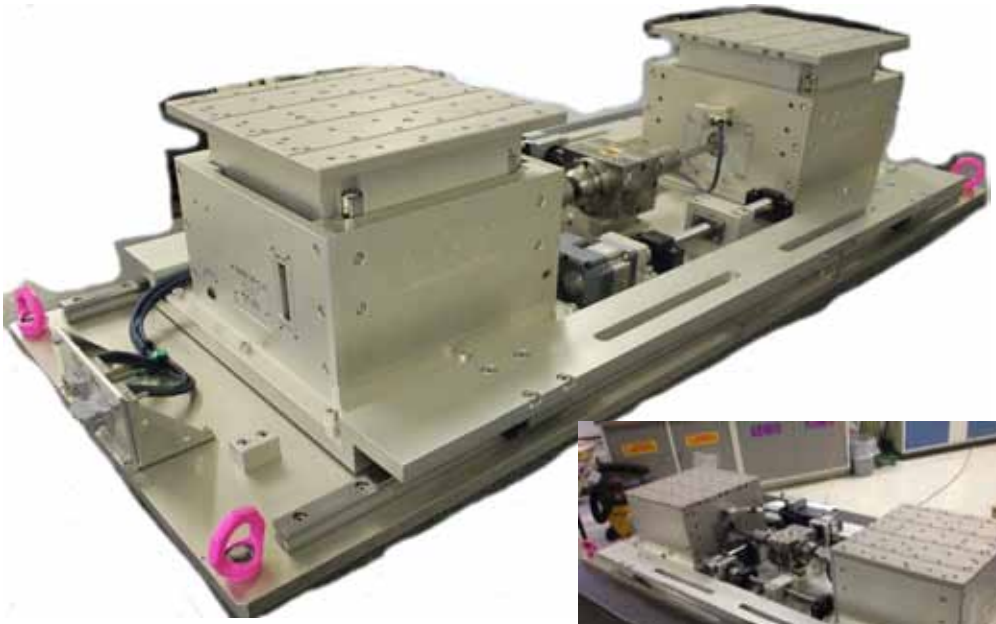
Part Number	Revision	Size	Sheet
00024920_2Doverview	0	A2	1 / 1

Purchased Part Modification	No

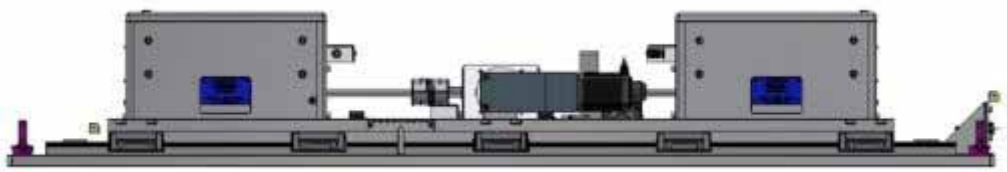
2 DEGREE OF FREEDOM OPTICAL TABLE - ANL

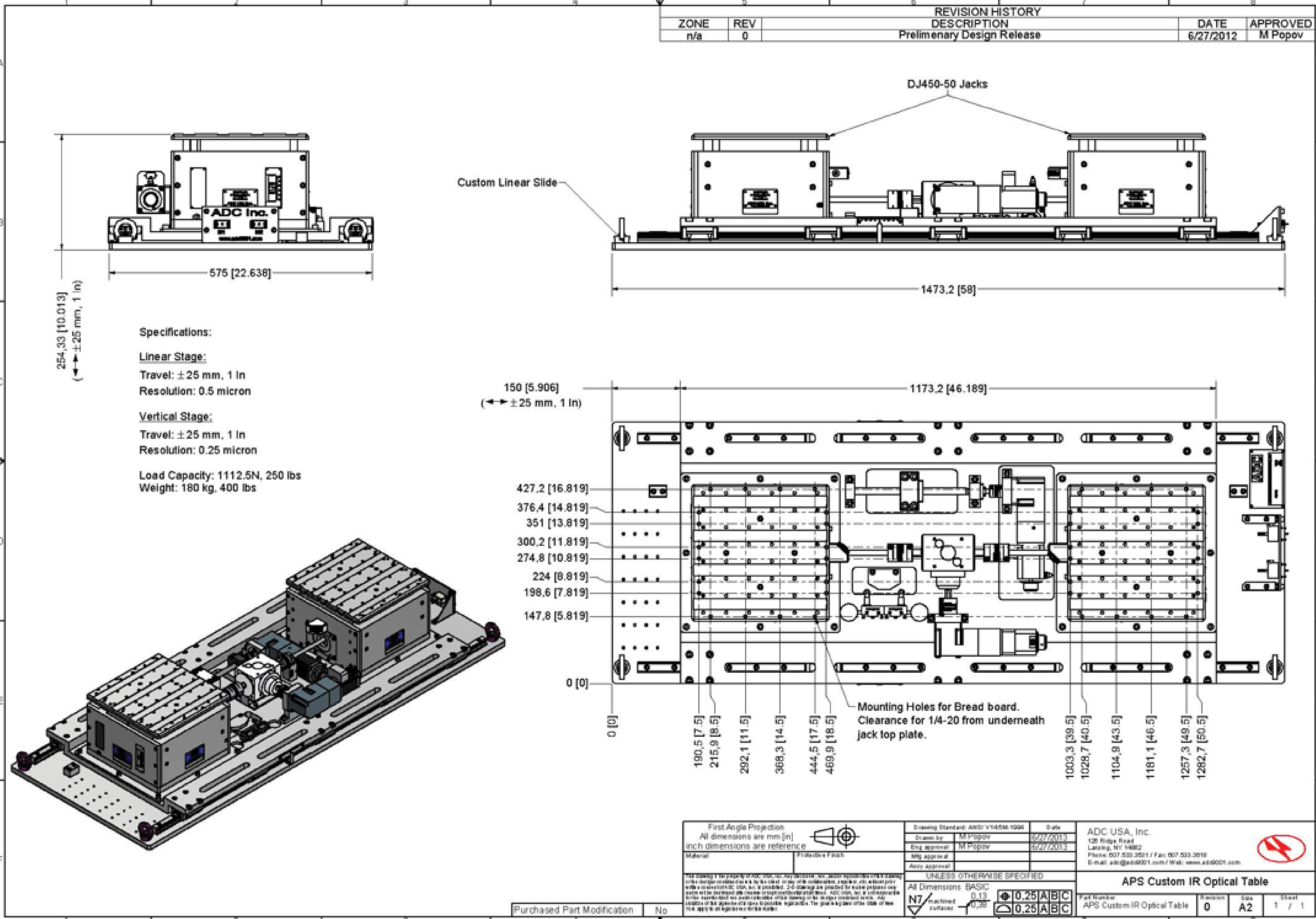
http://www.adc9001.com/products/view/519

This optical table is a 2 axis motion system designed to lift a 250 lb load and move +/- 25 mm both horizontally and vertically for Argonne National Lab. The horizontal motion is based on a linear slide design that ADC has continually improved in the past few years to meet the high demands of the industry. The linear motion is supported by THK HSR25 guide rails and bearings. A preloaded 16x2 mm ball screw coupled to a NEMA 23 motor and a 20:1 gear reduction allows the unit to have a 0.5 µm resolution. The vertical motion consists of 2 ADC DJ450-50 jacks that are driven by one Nema 23 motor and a 20:1 gear reduction, which is then coupled to a Tandler spiral bevel gear box which allows the jacks move simultaneously. The simultaneous motion is preferred to avoid potential binding of the jacks which is common with driving each jack individually. NB SVS 6100 crossed roller bearings provide a on top of the jacks, by the customer, and will provide a stable base for mounting equipment as necessary. To learn more about APS please go to: http://www.aps.anl.gov/



Motion	Product Description	Range of Motion	Resolution
Horizontal Translation	Custom Linear Slide	+/- 25 mm	0.5 um
Vertical Translation	Custom DJ450-50	+/- 25 mm	0.25 um

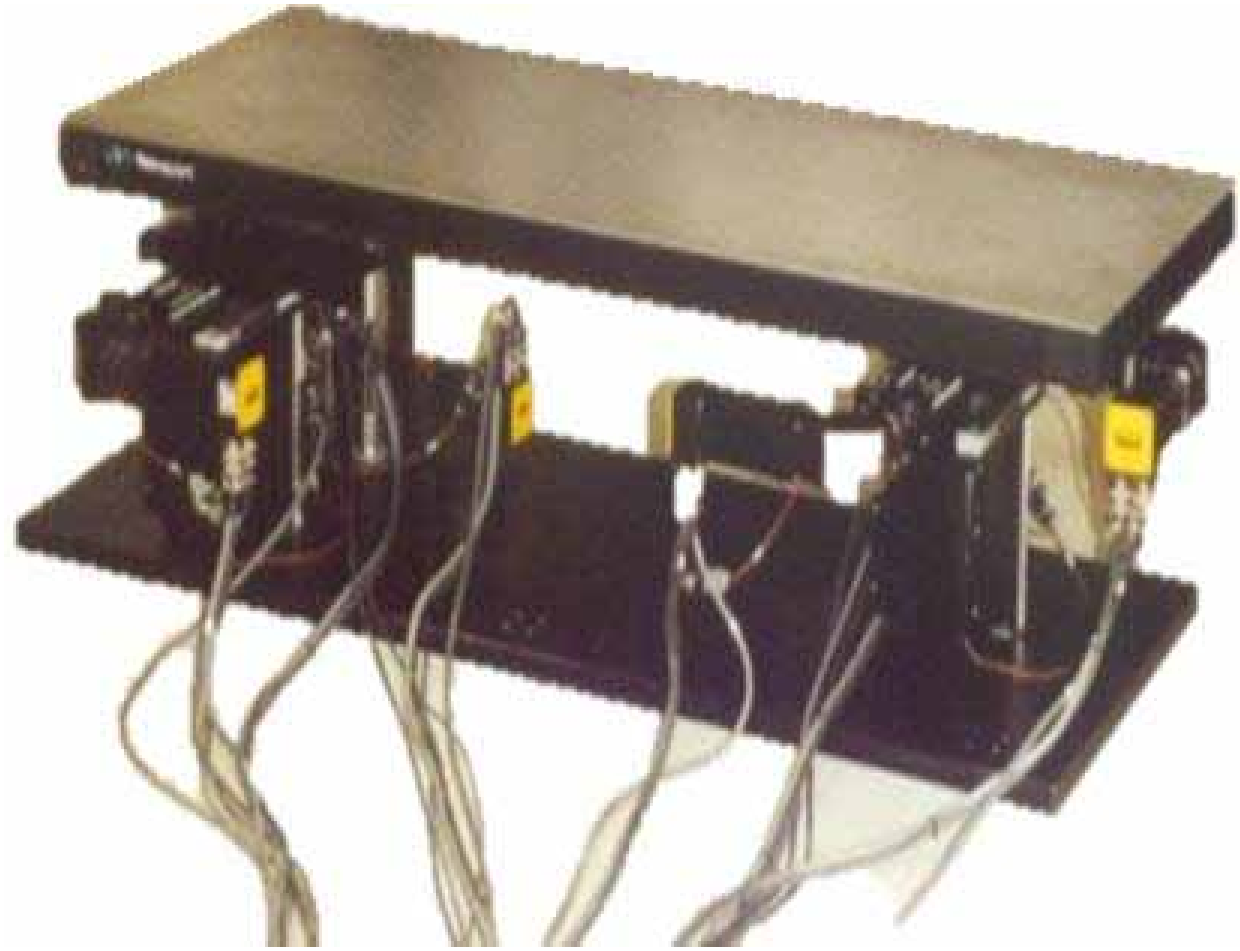



REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Prelimenary Design Release | 6/27/2012 | M Popov
DJ450-50 Jacks
Custom Linear Slide
575 [22.638]
254,33 [10.013]
(←→±25 mm, 1 in)
1473,2 [58]
Specifications:
Linear Stage:
Travel: ±25 mm, 1 in
Resolution: 0.5 micron
Vertical Stage:
Travel: ±25 mm, 1 in
Resolution: 0.25 micron
Load Capacity: 1112.5N, 250 lbs
Weight: 180 kg, 400 lbs
150 [5.906]
(←→±25 mm, 1 in)
1173,2 [46.189]
427,2 [16.819]
376,4 [14.819]
351 [13.819]
300,2 [11.819]
274,8 [10.819]
224 [8.819]
198,6 [7.819]
147,8 [5.819]
0 [0]
0 [0]
190,5 [7.5]
215,9 [8.5]
292,1 [11.5]
368,3 [14.5]
444,5 [17.5]
469,9 [18.5]
Mounting Holes for Bread board.
Clearance for 1/4-20 from underneath
jack top plate.
1003,3 [39.5]
1028,7 [40.5]
1104,9 [43.5]
1181,1 [46.5]
1257,3 [49.5]
1282,7 [50.5]
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
Purchased Part Modification
No
Drawn by M Popov 6/27/2013
Eng approval M Popov 6/27/2013
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
0,25 A B C
0,25 A B C
ADC USA, Inc.
APS Custom IR Optical Table
Part Number APS Custom IR Optical Table
Revision 0
Size A2
Sheet 1 / 1

MAX IV LABORATORY CUSTOM OPTICS TABLE

http://www.adc9001.com/OPT-MAX-LAB

This MAX Lab six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system was a turn-key system, the controller/driver was based on Parker 6K controller. The 6K is a multi-axis motion controller capable of solving basic to complex motion control applications including: pick-and-place, packaging, following, cam profiling and hundreds of others. The 6K utilizes Ethernet communications to allow high speed connections to many different products such as PLCs, HMIs, I/O modules and vision systems.



MAX-lab

Key Specifications:

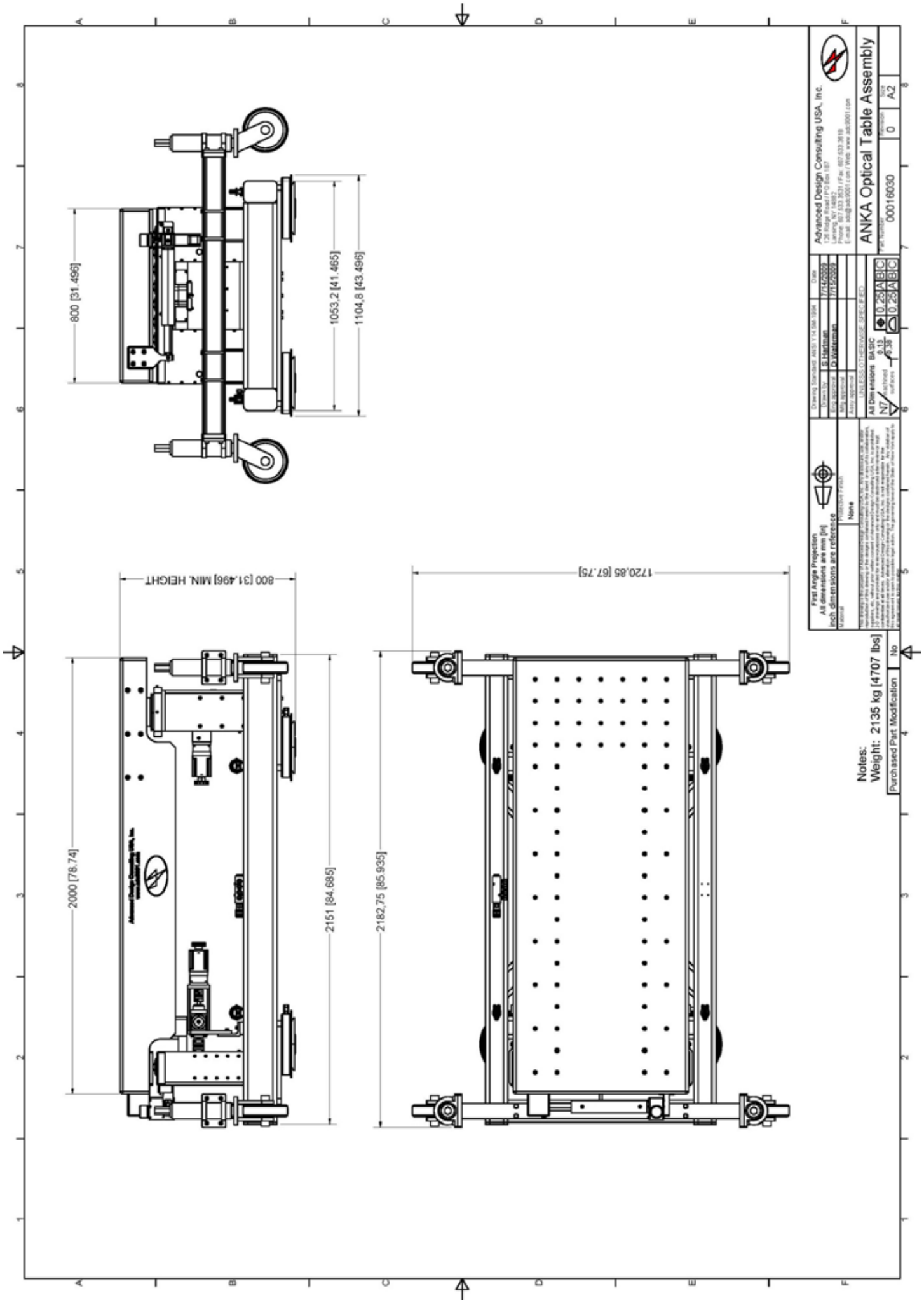
Degrees of Freedom:	6
Table Size:	2' x 4' (609mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	50 mm Newport

ANKA- THE SYNCHROTRON RADIATION FACILITY AT KIT

3 Axis Table

http://www.adc9001.com/OPT-ANKA-2

This high precision table consists of a large, black granite top, with working surface measuring 2000 mm by 800 mm, flat within .1 mm, and containing a grid of M6 holes for mounting required items. The granite is 254 mm thick and weighs 1200 kg, thus providing a highly stable platform for sample stages, detector, 205 kg detector translation system, and the fast sample exchange system. Total loading on the table is 1500 kg. It remains stable within 1µm for up to 3 hours. Removable jacking casters are provided for transporting the system from receiving areas to test and acceptance areas and then to the final destination. Within the hutch, the table will be periodically moved off line when other kinds of experiments are scheduled. For this purpose, air bearing supports are provided under the frame for ease of movement on the smooth marble floor. In order to avoid the need to survey the table back in parallel to the beam when it is returned to operation, motorized yaw adjustment of +/- 3 degrees is provided. The yaw motion is centered on the nominal sample position. Transverse location of the sample is accomplished within the stack of sample stages. Additional requirements for table movements to accommodate various experiments include motorized vertical movement of 200 mm with a resolution of 0.01 mm, and 2 degrees of pitch movement with a resolution of 0.005 degrees. The center of pitch rotation is directly below the sample. Under the sample is a single jack with capacity of 25 kN and interfacing the table with a spherical plain bearing. At the downstream end there are two jacks with capacity of 10 kN each and tied together with a common drive motor. The interface to the table consists of a line of ball transfer units, ensuring that the table is level transverse the beam. To learn more about ANKA please go to: http://www.anka.kit.edu/28.php


800 [31.496]
1053,2 [41.465]
1104,8 [43.496]
800 [31.496] MIN. HEIGHT
2000 [78.74]
2151 [84.685]
1720,85 [67.75]
2182,75 [85.935]
Notes:
Weight: 2135 kg [4707 lbs]
Purchased Part Modification
No
ANKA Optical Table Assembly
00016030
0
A2
Advanced Design Consulting USA, Inc.
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
None
All Dimensions BASIC
N7
0.25 A B C
0.25 A B C

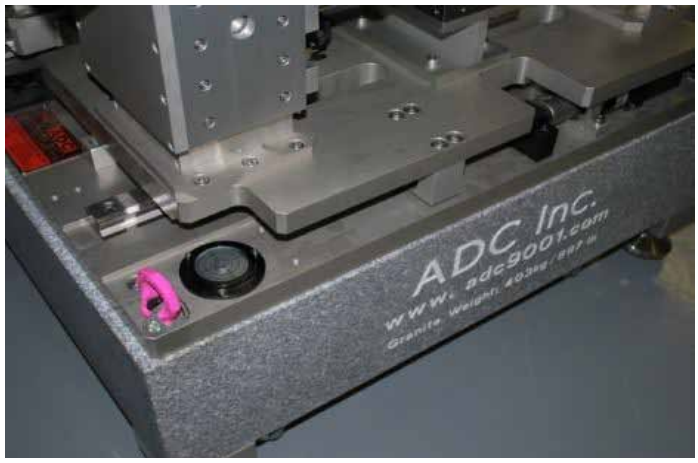
CORNELL HIGH ENERGY SYNCHROTRON SOURCE - CHESS

Custom Optics Table

http://www.adc9001.com/products/view/521

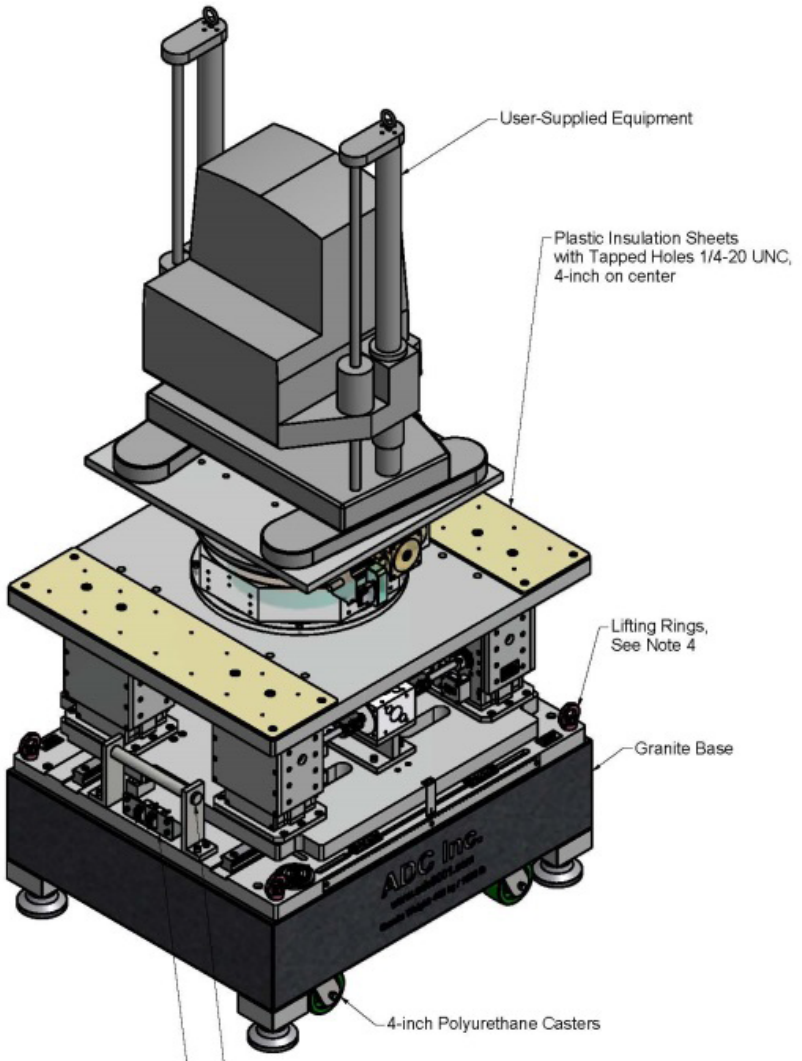
A new load frame / diffractometer has been commissioned at CHESS for X-ray diffraction experiments on engineering materials during in-situ mechanical testing. The system was designed with flexibility in mind, allowing for X-ray diffraction experiments to be combined with a wide suite of mechanical tests. Loads are applied to samples by a Bose 3330 testing system capable of applying a max 3000N at a frequency of 100hz for high-cycle fatigue testing. 250lbs (1112N) and 1000lbs (4448N) load cells are available for high and low load amplitude loading. Fixtures are available for tensile, compressive, and fully reversed loading. A furnace capable of heating samples to 1000°C during mechanical loading is also available. Samples can be rotated 360° about a vertical rotation axis during loading, while the incoming X-ray beam has an unimpeded path to the sample for 260°. Sample positioning accuracy is less than 1µm in the X, Y, and Z directions allowing for positioning of the incoming X-ray beam on to centroids of individual grains within a polycrystal. The diffractometer is available for use in both the A2 and F2 experimental stations. To learn more about CHESS please go to: http://www.chess.cornell.edu/

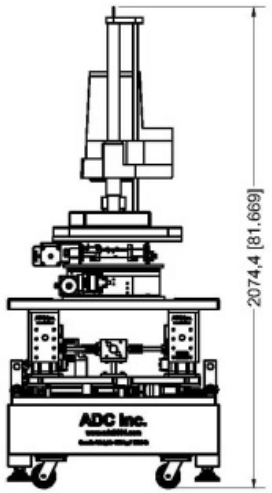
CHESS



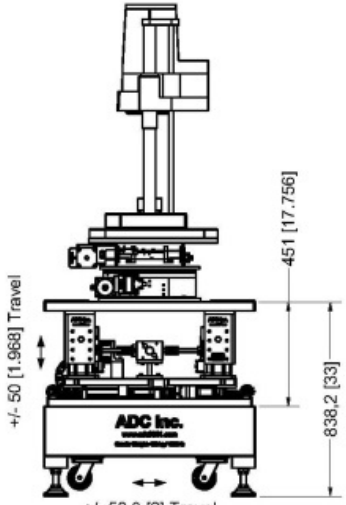
Key Specifications:

Motion	Product Description	Range of Motion	Resolution
Vertical	5 kN Utility Jacks (x4)	+/- 50 mm	1.25 µm/step
Horizontal	Custom Horizontal Slide	+/- 50.8 mm	2.5 µm/step

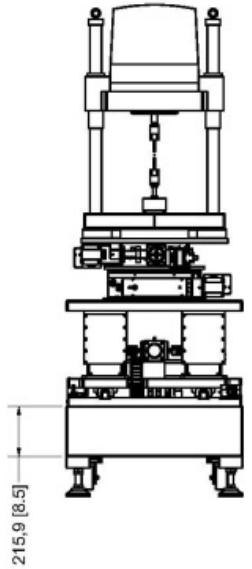


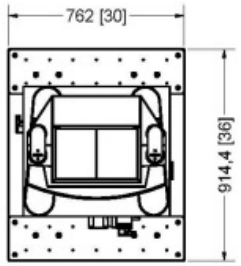


Transport Position



Experiment Position





Notes:

1. System shown with motions at mid-travel
   Horizontal Travel: +/- 50.8 mm (2 in.), 4 in. total
   Vertical Travel: +/- 50 mm (~2 in.), ~4 in. total
2. System Mass/Weight
   Mass/Weight of ADC System Only: 806 kg (~1780 lb)
   Weight with User Equipment: ~2380 lb
3. See Sheet 2 for height specifications
4. Lift from beneath granite with straps or forklift, using spreader bar to keep straps off table top. Only use lifting rings to lift aluminum table components.

Purchased Part Modification	No

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	T Shea	8/30/2013
Eng approval	M Popov	8/30/2013
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 / 0,38
0,25 A B C
0,25 A B C

ADC USA, Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

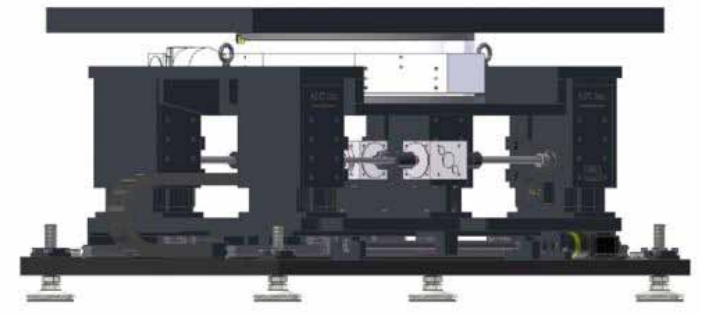
Custom Optical Table Assembly, Cornell

Part Number	Revision	Size	Sheet
00022107	0	A2	

3 DEGREE OF FREEDOM OPTICAL TABLE (CHESS)

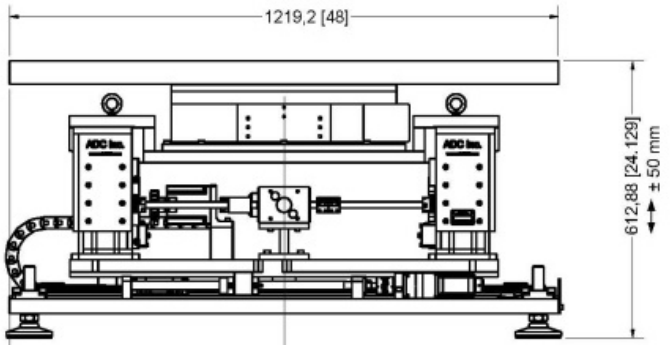
http://www.adc9001.com/products/view/520

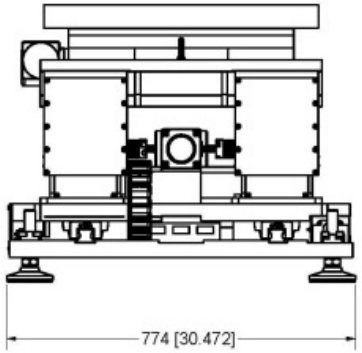
This optical table is a 3 axis motion system and was designed for G-Line at CHESS. The horizontal motion based on linear slide that ADC has continually improved in the past few years to meet the high demands of the industry. The linear motion is supported by THK HSR35 guide rails and bearings. A preloaded 20x5 mm ball screw coupled to a NEMA 23 motor and a 10:1 gear reduction allows the unit to have a 2.5 µm resolution. The vertical motion consists of 4 ADC 5kN Utility Jacks that are geared to be driven off of one motor. The one motor approach is preferred to avoid the potential binding of the jacks that is common with driving each jack individually. NB SVS 4160 crossed roller bearings provide a stable and smooth platform for the vertical motion. The rotary motion for this optical table provides a full 360º rotation, and is equipped with fully adjustable limit switches to set travel limits as necessary. A 2 in thick aluminum bread board is mounted on top of the rotary stage which provides a stable base for mounting equipment as necessary. To learn more about CHESS please go to:
http://www.chess.cornell.edu/

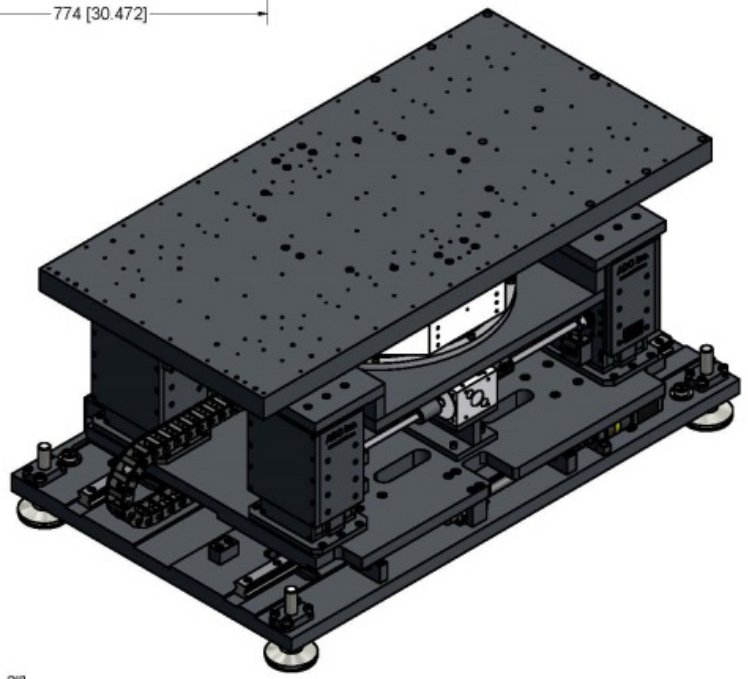


CHESS

Motion	Product Description	Range of Motion	Resolution
Horizontal Translation	Custom Linear Slide	+/- 115 mm	2.5 µm
Vertical Translation	UJ-5kN Jack	+/- 50 mm	1.25 µm
Yaw about Vertical Axis	Rotation Stage	Full 360º	0.005º







Specifications:

Vertical Travel: ±50 [± 2"]
Horizontal Travel: ±115mm [±4.53"]
Rotation: Huber 440

Approximate Weight of System: 600 kg (1325 lbs)

First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
Material	Protective Finish: None	Drawn by: S Hartman	2/3/2013
		Eng approval: M Popov	2/3/2013
		Mfg approval	
		Assy approval	

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 0,38
0,25 A B C
0,25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

Cornell Custom Optical Table Assembly

Part Number	Revision	Size	Sheet
OPT-1000-3-C	0	A2	

Purchased Part Modification	No

DLS CUSTOM OPTICS TABLE

http://www.adc9001.com/OPT-DLS

This DLS six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling.

diamond

Key Specifications:

Degrees of Freedom:	6
Table Size:	3' x 3' (914mm x 914mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

*** Comes with large casters.**

ADVANCED PHTON SOURCE - APS

Custom Optics Table

http://www.adc9001.com/products/view/422

This APS six degrees of freedom High Precision Motorized Optical Table was designed to hold a large detector system. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about APS please go to: http://www.aps.anl.gov

Argonne NATIONAL LABORATORY

Key Specifications:

Degrees of Freedom:	6
Table Size:	3' x 4' (914mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	N/A
Breadboard:	N/A

*** Comes with large casters.**

ADVANCED PHOTON SOURCE - APS

Custom Optics Table

http://www.adc9001.com/OPT-APS

This APS six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about APS please go to: http://www.aps.anl.gov/

Argonne NATIONAL LABORATORY

Key Specifications:

Degrees of Freedom:	6
Table Size:	6' x 4' (1828mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

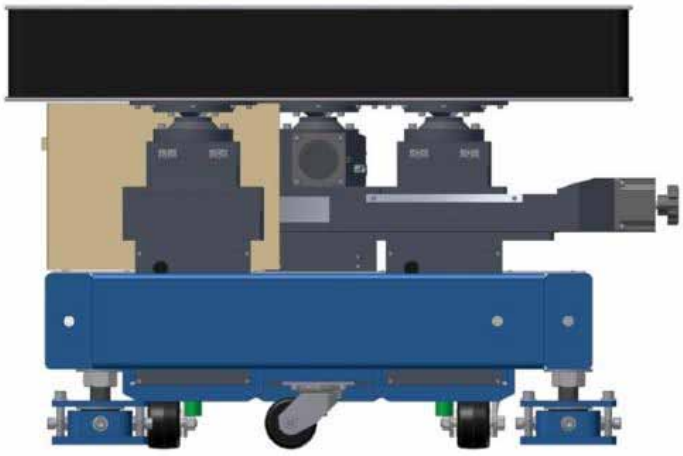
*** Comes with large casters.**

ANKA – THE SYNCHROTRON RADIATION FACILITY

at KIT 6 Axis Table

http://www.adc9001.com/OPT-ANKA

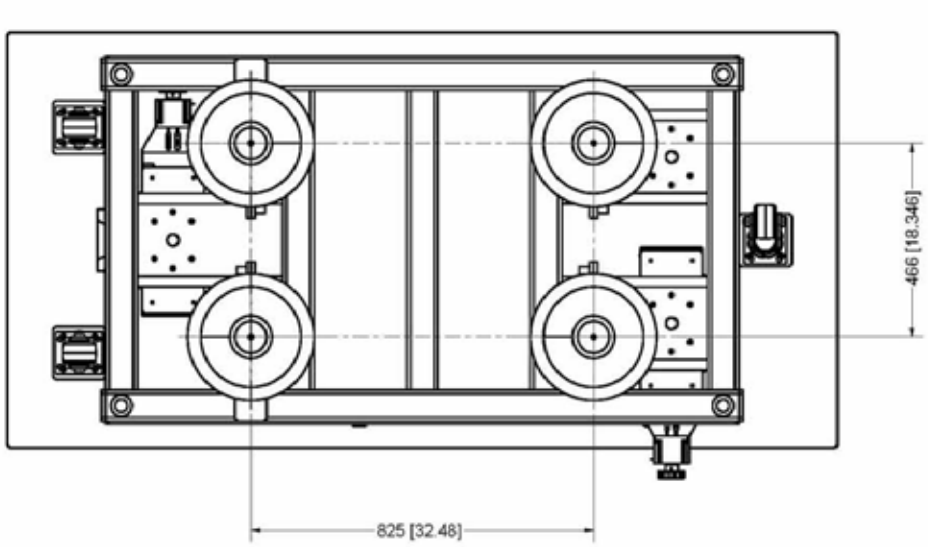
This ANKA six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. This table incorporated "air pads" for ease of table motion inside the hutch (experimental area). The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about ANKA please go to: http://www.anka.kit.edu/28.php

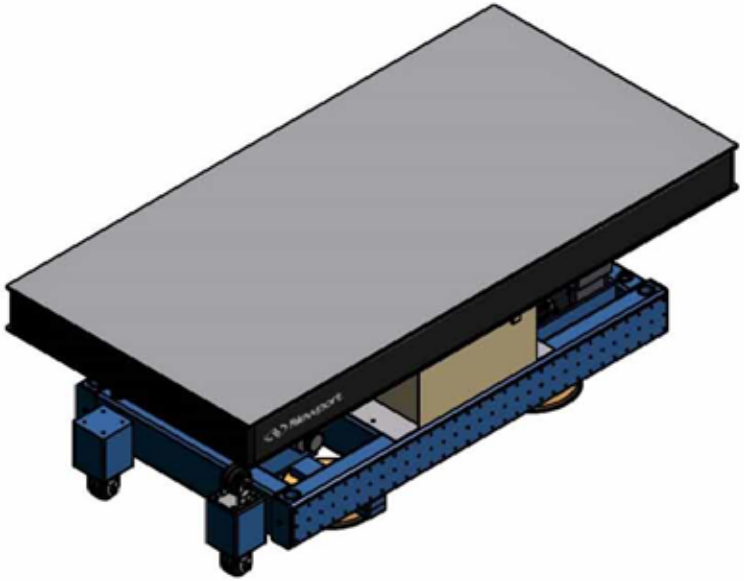


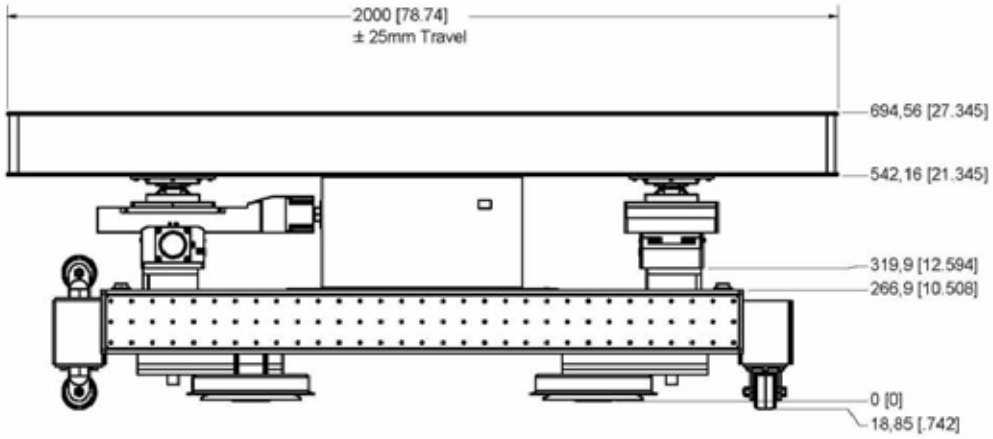
Key Specifications:

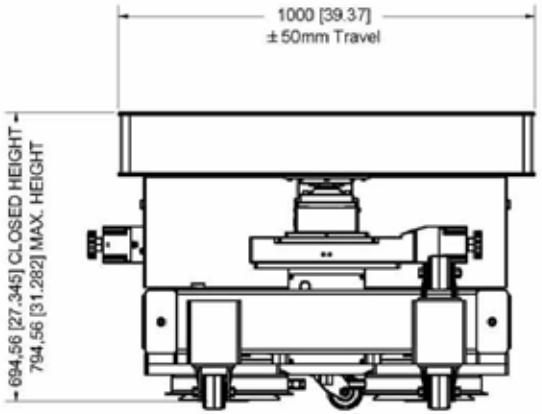
Degrees of Freedom:	6
Table Size:	6' x 4' (1828mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

*** Comes with large casters.**









Notes:

1.) Approximate Weight Of System (Without Sand): 640 kg (1410 lbs)
2.) Customer Provided For: ANKA

First Angle Projection	
All dimensions are mm [in]	
inch dimensions are reference	
Material	
Protective Finish	None
Drawing Standard: ANSI Y14.5M-1994	Date
Drawn by: S.Hartman	8/13/2010
Eng. approval: D.Waterman	8/13/2010
Mfg approval	
Assy approval	
UNLESS OTHERWISE SPECIFIED	
All Dimensions BASIC	
N7 machined surfaces	0.13 / 0.38
0.25 A B C	
0.25 A B C	
Purchased Part Modification	No

Advanced Design Consulting USA, Inc.
136 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

ANKA Optical Table Assembly

Part Number	Revision	Size
00017777	0	A2

DIAMOND LIGHT SOURCE 2 DEGREE OF FREEDOM

Custom Optics Table

http://www.adc9001.com/OPT-DLS-2

This DLS two degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling.

diamond

Key Specifications:

Degrees of Freedom:	2
Table Size:	3’ x 5’ (914mm x 1524mm)
Vertical Travel (X, Z):	4” (100 mm), 4” (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

*** Comes with large casters.**

DEUTSCHES ELEKTRONEN-SYNCHROTRON - DESY

Custom Optics Table

http://www.adc9001.com/OPT-DESY

TThis DESY six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. This table had a requirement for long Y axis travel. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about DESY please go to: http://www.desy.de/

Key Specifications:

Degrees of Freedom:	6
Table Size:	4’ x 6’ (1219mm x 1828mm)
Vertical Travel (X, Y, Z):	4” (100 mm), 10” (250 mm), 4” (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

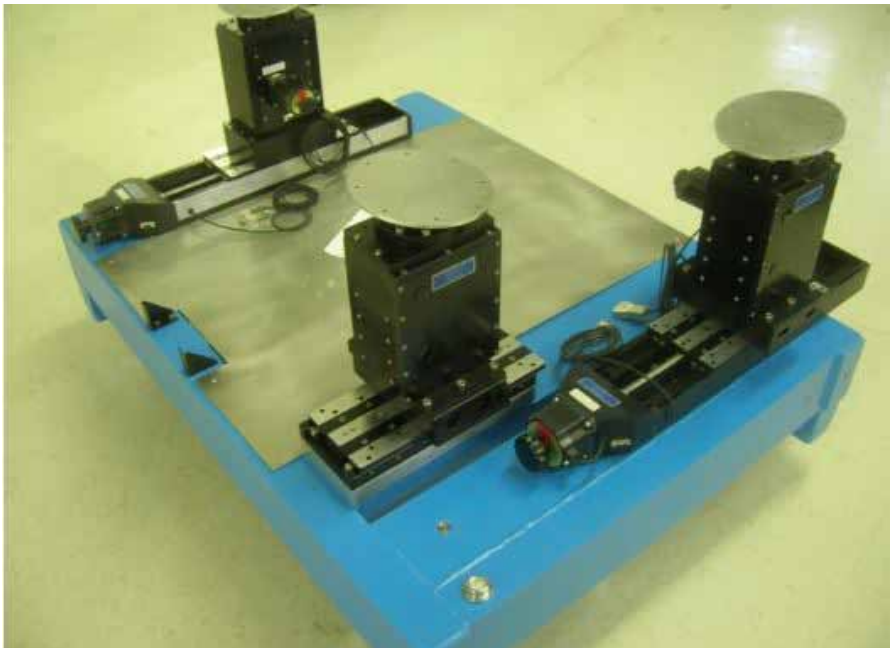
*** Comes with large casters.**

DEUTSCHES ELEKTRONEN-SYNCHROTRON - DESY-2

Custom Optics Table

http://www.adc9001.com/products/view/424

This DESY six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about DESY please go to: http://www.desy.de/



Key Specifications:

Degrees of Freedom:	6
Table Size:	4' x 6' (1219mm x 1828mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 10" (250 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

*** Comes with large casters.**

ELLETRA SINCROTRONE TRIESTE

Custom Optics Table

http://www.adc9001.com/OPT-Elettra

This Elettra six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about Elettra please go to: http://www.elettra.trieste.it/

Key Specifications:

Degrees of Freedom:	6
Table Size:	4' x 6' (1219mm x 1828mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 10" (250 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

*** Comes with large casters.**

CENTER FOR ADVANCED MICROSTRUCTURES AND DEVICES - CAMD

Custom Optics Table

http://www.adc9001.com/OPT-CAMD

This CAMD six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about CAMD please go to: http://www.camd.lsu.edu/

Key Specifications:

Degrees of Freedom:	6
Table Size:	3' x 3' (914mm x 914mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

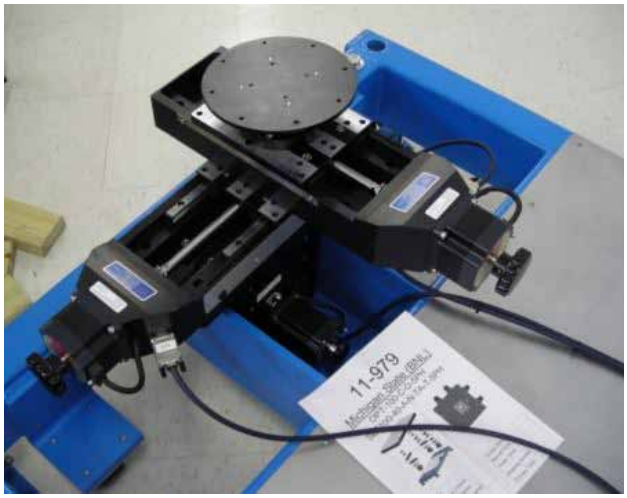
*** Comes with large casters.**

MICHIGAN STATE UNIVERSITY - MSU

Custom Optics Table

http://www.adc9001.com/OPT-MSU

This MSU six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about MSU please go to: https://www.msu.edu/



Key Specifications:

Degrees of Freedom:	6
Table Size:	4’ x 6’ (1219mm x 1828mm)
Vertical Travel (X, Y, Z):	4” (100 mm), 10” (250 mm), 4” (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	125 mm Newport

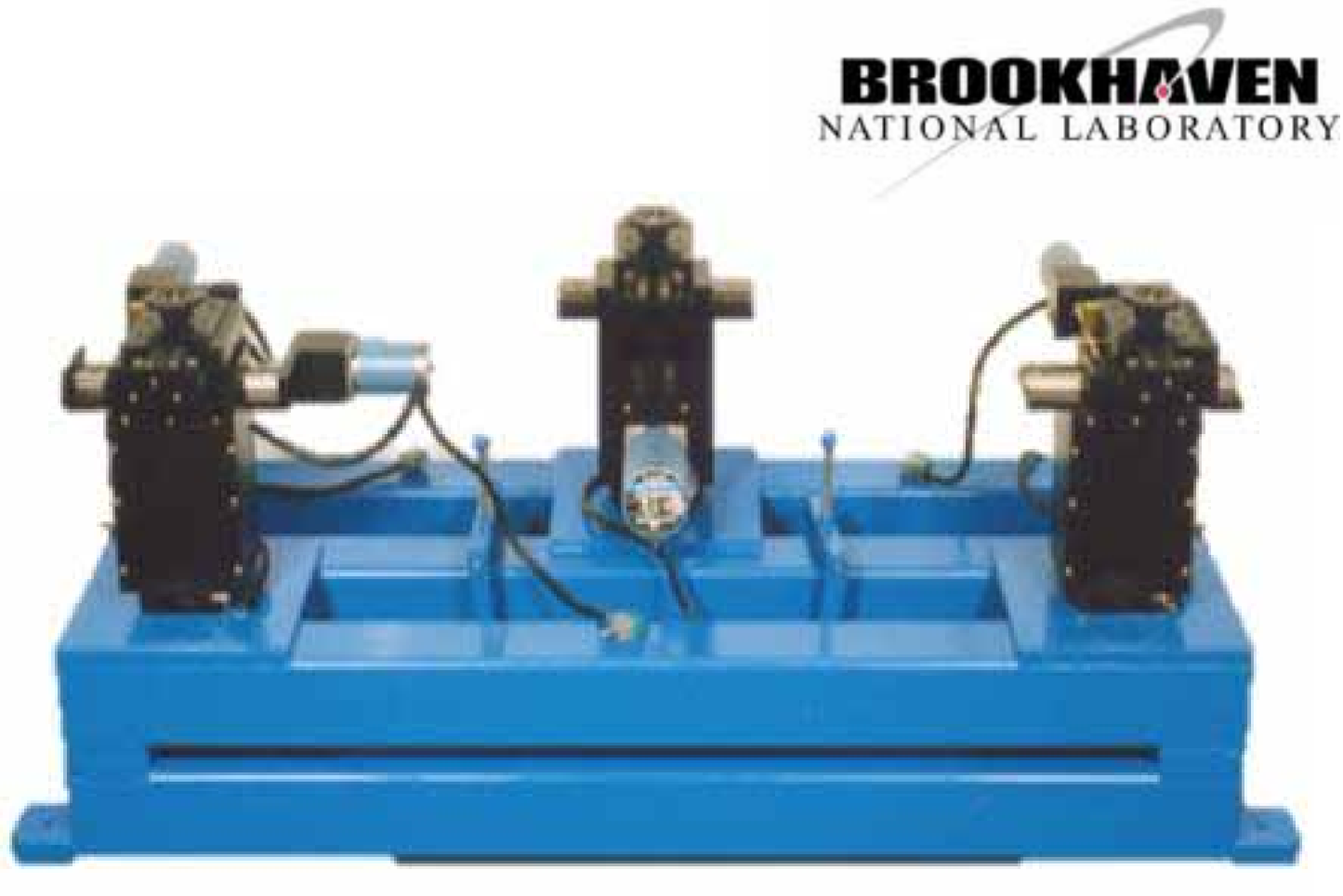
*** Comes with large casters.**

SIX DEGREE OF FREEDOM OPTICAL TABLE

Brookhaven National Lab

http://www.adc9001.com/OPT-BNL

This BNL six degrees of freedom High Precision Motorized Optical Table was designed to hold a large refractometer system. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about BNL please go to: http://www.bnl.gov/ps/



Key Specifications:

Degrees of Freedom:	6
Table Size:	3' x 5' (914mm x 1524mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	N/A
Breadboard:	N/A

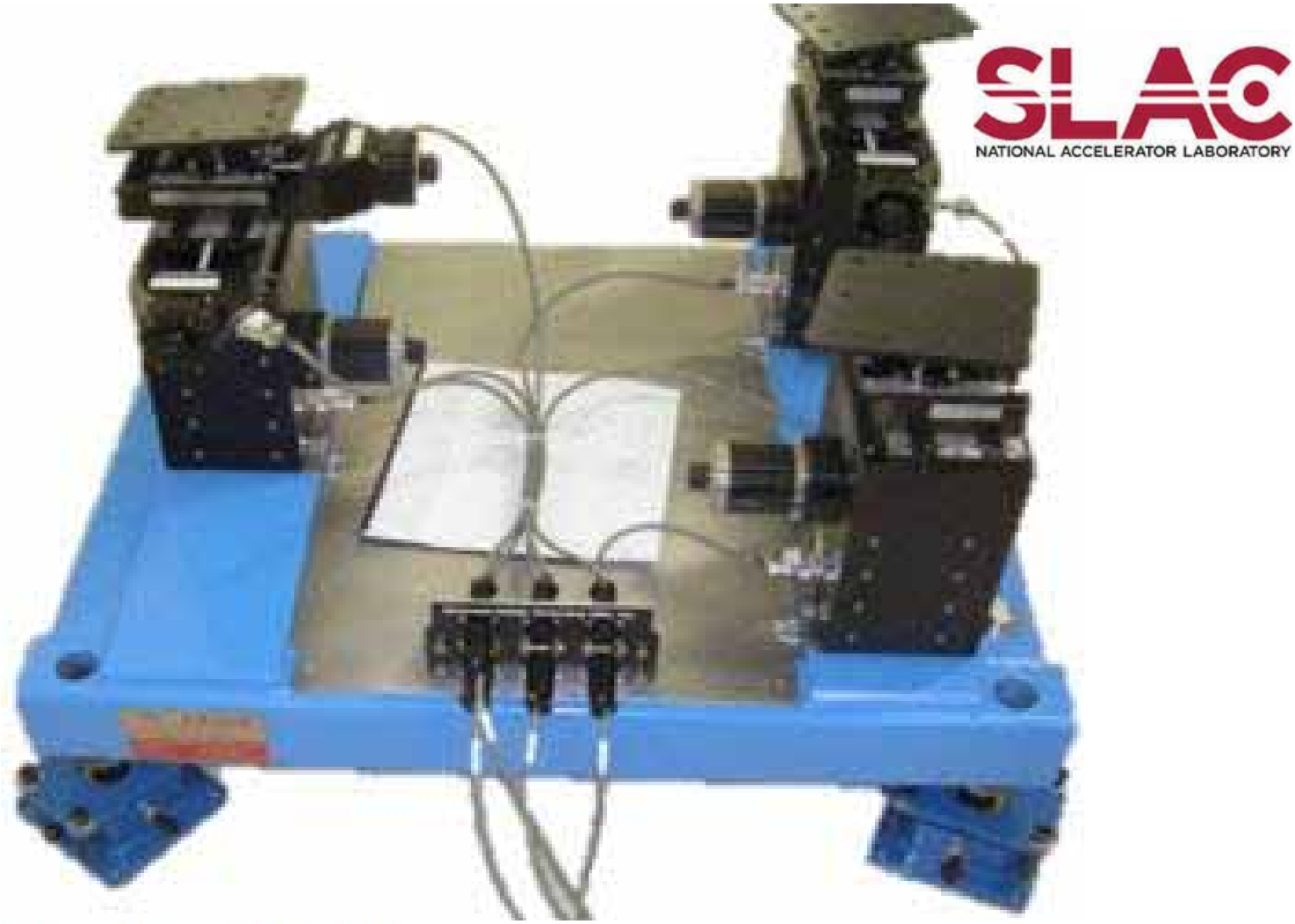
*** Comes with large casters.**

SLAC NATIONAL ACCELERATOR LABORATORY SIX DEGREE

Freedom Optical Table

http://www.adc9001.com/OPT-SLAC

This SLAC six degrees of freedom High Precision Motorized Optical Table was designed to hold a large refractometer system. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about SLAC please go to: https://www6.slac.stanford.edu/



Key Specifications:

Degrees of Freedom:	6
Table Size:	3' x 3' (914mm x 914mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	N/A
Breadboard:	N/A

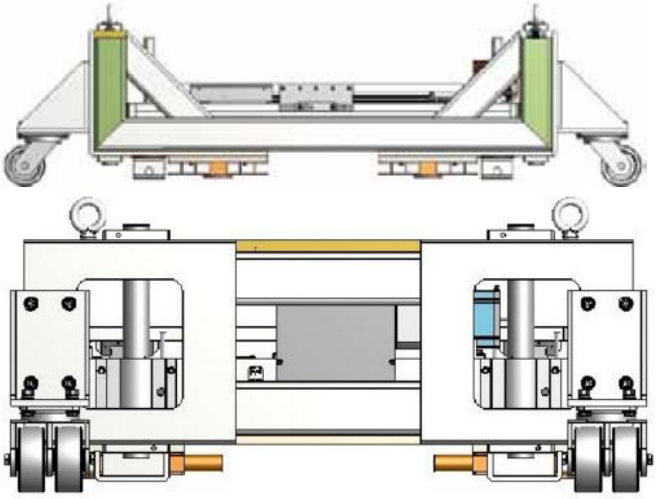
*** Comes with large casters.**

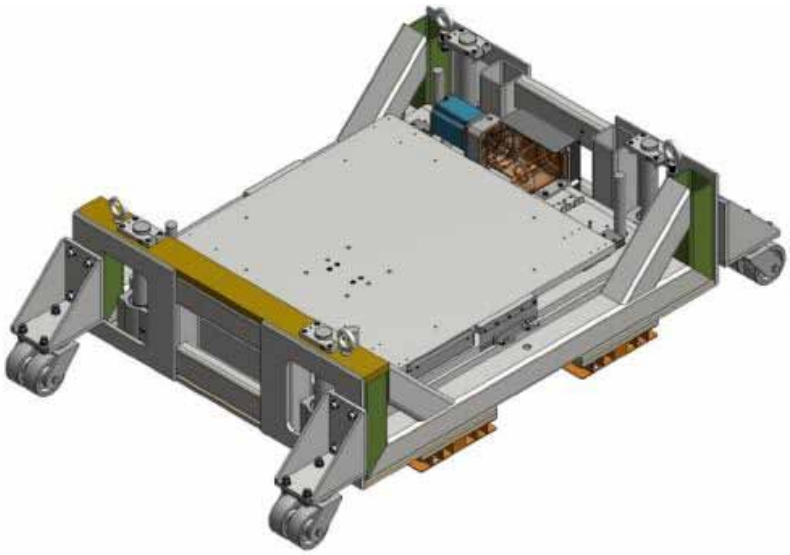
LOW PROFILE DIFFRACTOMETER TABLE

LPDT-100

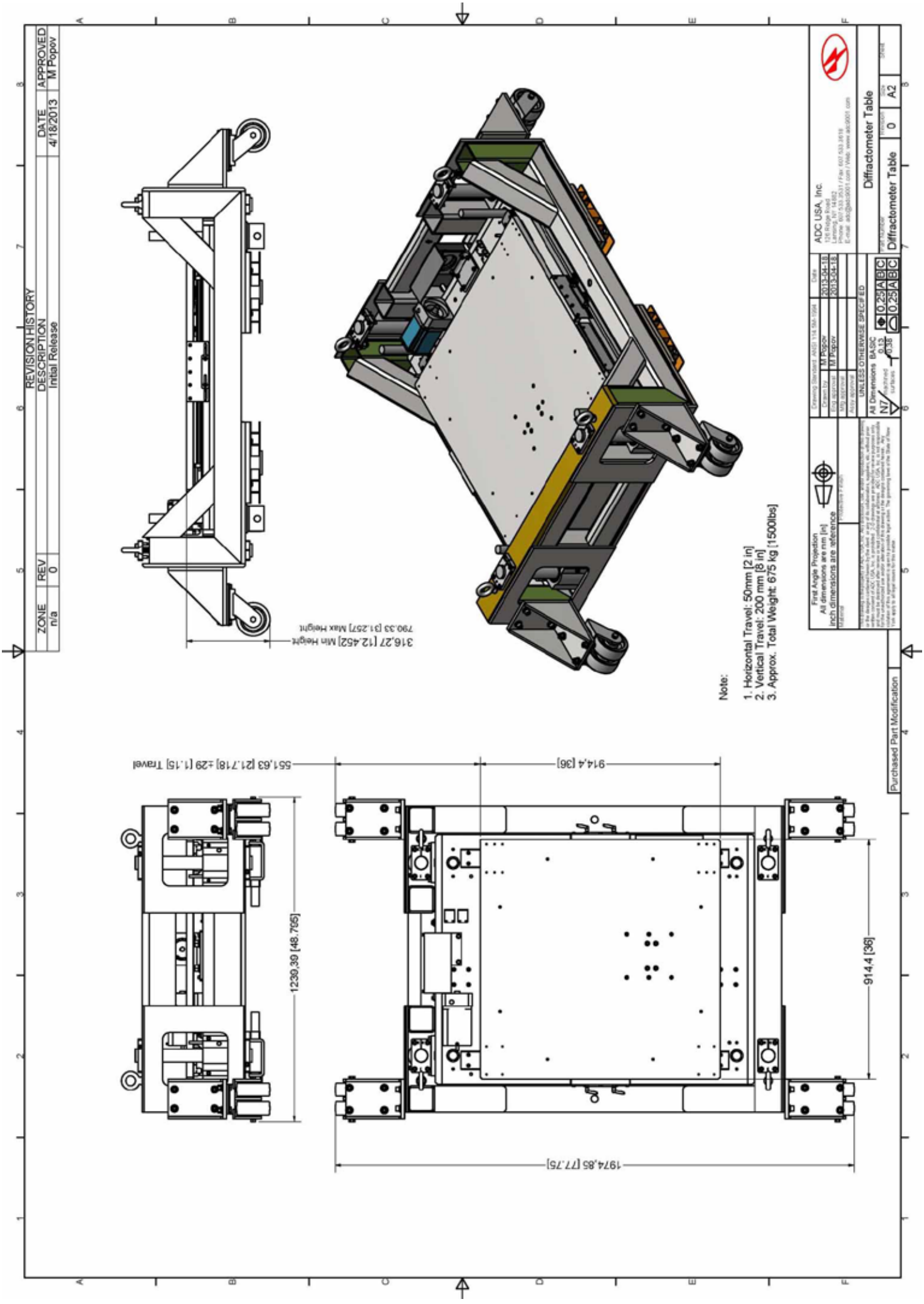
http://www.adc9001.com/products/view/423

The Diffractometer table is a low profile 2 axis motion system that allows generous travel while still fitting into tight spaces. The Diffractometer table can handle up to a 1 ton load, while still maintaining a fine resolution. The table is built to hold 4 caster wheels for easy movement into and out of the desired locations. Air bearings and small manual linear motion are provided underneath the table for a 3rd axis alignment of the system. The Vertical Stage is built around a welded steel frame and has 4 caster wheels for rolling the unit in and out of its desired location. Four Nook Ballscrew Jacks coupled together, are driven by one stepper motor and provide the vertical motion to the table. The vertical motion is guided by 4 two inch diameter Thompson Linear bearings, which allow smooth travel during operation. The Horizontal Stage sits on top of the vertical stage is driven by a 25x2 mm Nook Acme screw and coupled a stepper motor. This stage is guided by a set of Rexroth linear bearings which provide smooth travel during operation.





Axis	Travel	Resolution	Encoder	Load Capacity
Horizontal Stage	50 mm	0.1 µm	Renishaw	1 Ton 8900 N
Vertical Stage	200 mm	0.1 µm	Renishaw	1 Ton 8900 N

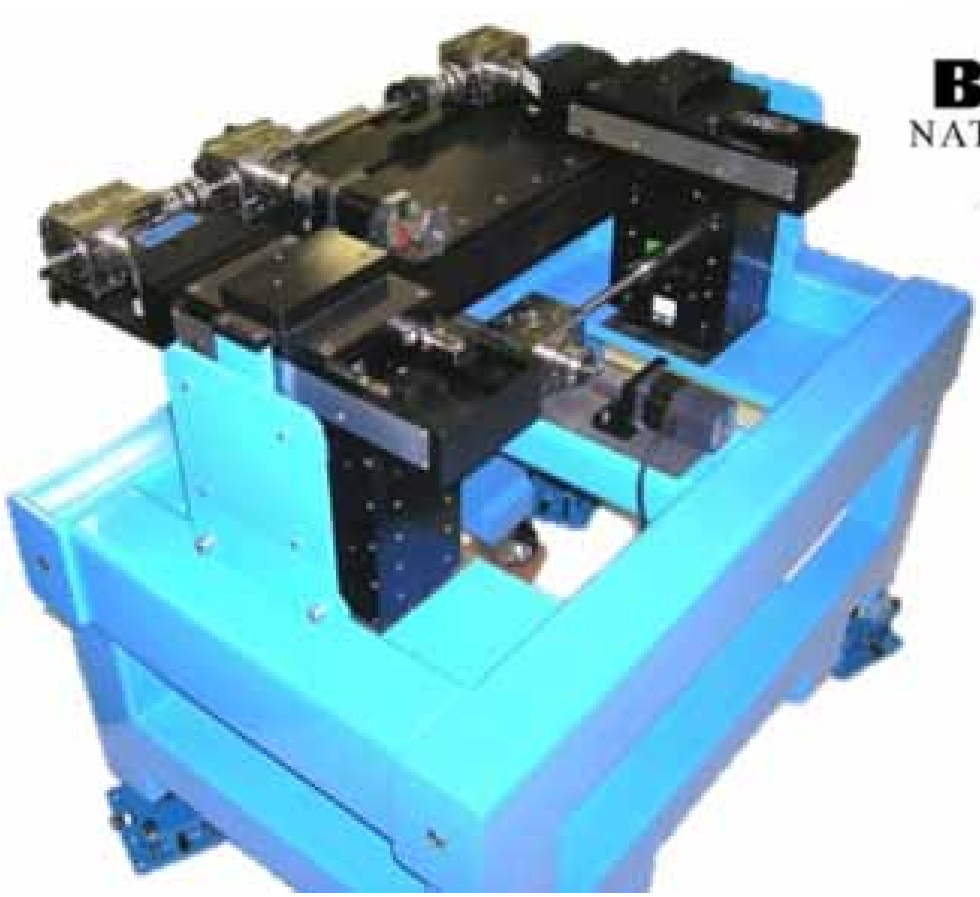

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 4/16/2013 | M Popov
316.27 [12.452] Min Height
790.33 [31.257] Max Height
Note:
1. Horizontal Travel: 50mm [2 in]
2. Vertical Travel: 200 mm [8 in]
3. Approx. Total Weight: 675 kg [1500lbs]
ADC USA, Inc.
Diffractometer Table
Purchased Part Modification
551.63 [21.718] ±29 [1.15] Travel
914.4 [36]
1239.39 [48.795]
1974.85 [77.75]
914.4 [36]

TWO DEGREE OF FREEDOM

Optical Table (BNL)

http://www.adc9001.com/products/view/425

This custom BNL two degrees of freedom High Precision Motorized Optical Table was designed to hold a scientific instrument. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about BNL please go to: http://www.bnl.gov/ps/

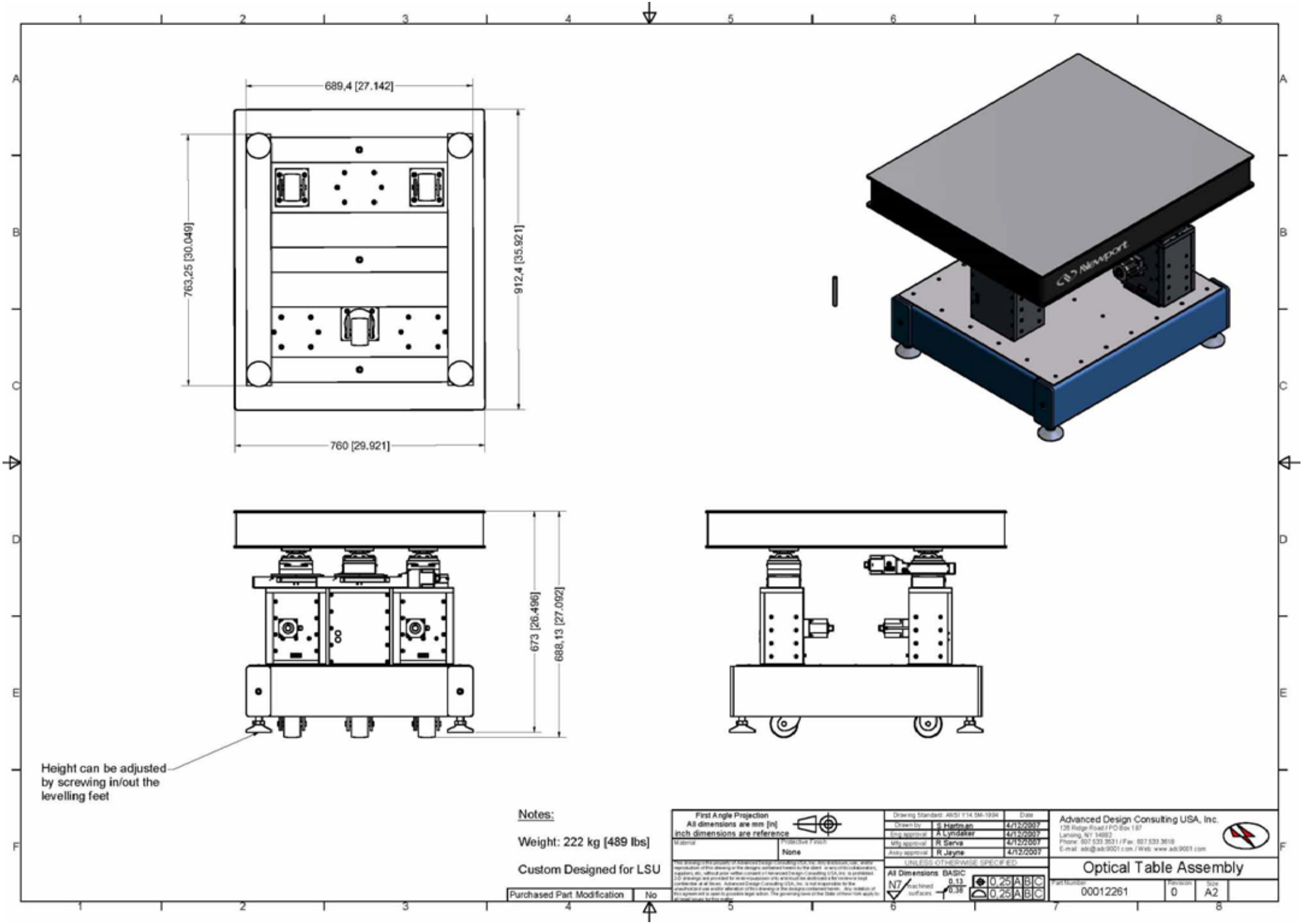


BROOKHAVEN NATIONAL LABORATORY

Key Specifications:

Degrees of Freedom:	2
Table Size:	3' x 5' (914mm x 1524mm)
Vertical Travel (X, Z):	4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	N/A
Breadboard:	N/A

*** Comes with large casters.**


689,4 [27.142]
763,25 [30.049]
912,4 [35.921]
760 [29.921]
673 [26.496]
688,13 [27.092]
Height can be adjusted by screwing in/out the levelling feet
Notes:
Weight: 222 kg [489 lbs]
Custom Designed for LSU
Purchased Part Modification
No
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Drawn by S.Hartman 4/12/2007
Eng approval A.Lyndaker 4/12/2007
Mfg approval R.Serva 4/12/2007
Assy approval R.Jayne 4/12/2007
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
Advanced Design Consulting USA, Inc.
Optical Table Assembly
Part Number 00012261
Revision 0
Size A2

ADVANCED PHOTON SOURCE - APS

Custom Optics Table

http://www.adc9001.com/products/view/426

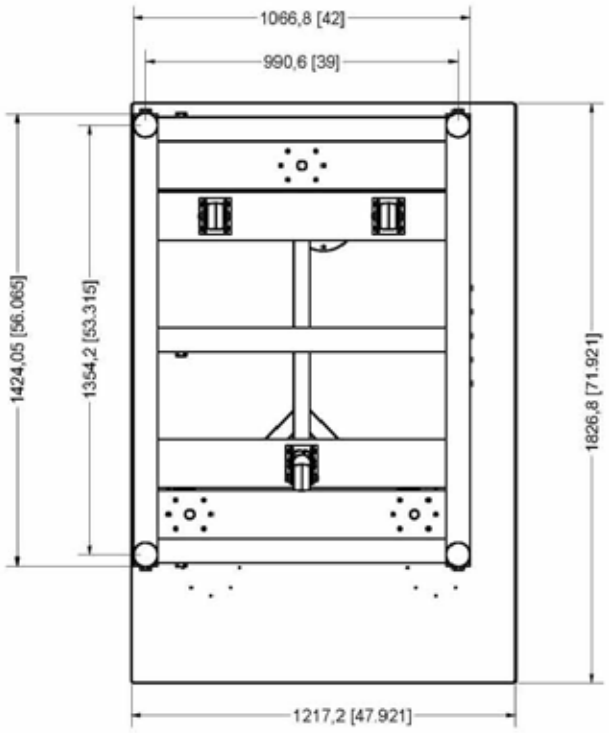
This APS six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about APS please go to: http://www.aps.anl.gov/

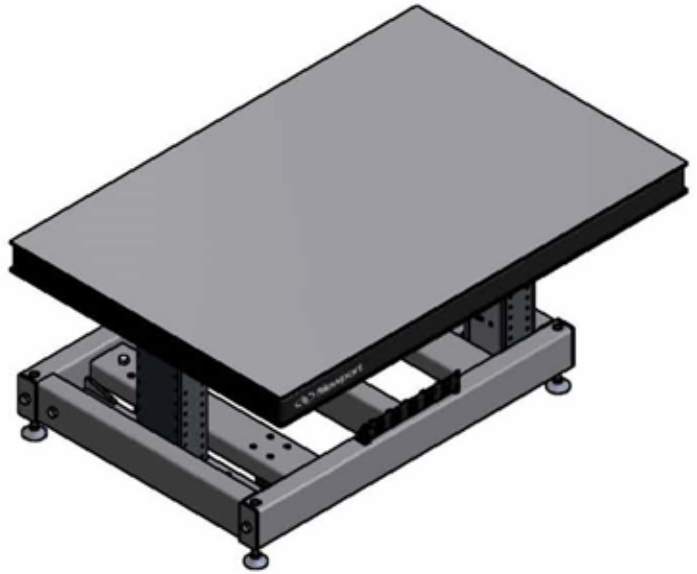
Argonne NATIONAL LABORATORY

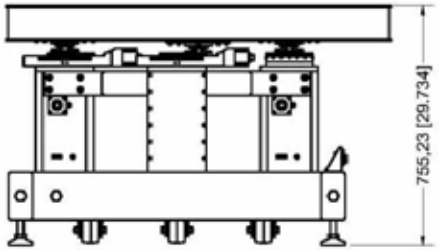
Key Specifications:

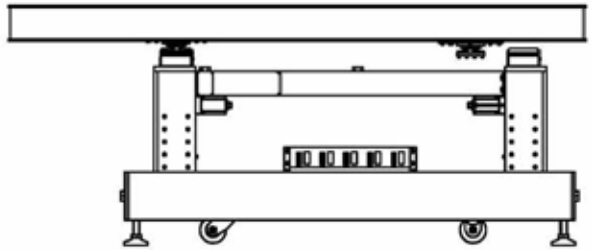
Degrees of Freedom:	6
Table Size:	6' x 4' (1828mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

*** Comes with large casters.**









Notes:

Weight: 531 kg [1170 lbs]

First Angle Projection
All dimensions are mm [in]

Material | Protective finish

Drawing Standard: ANSI Y14.5M-1994

		Date
Drawn by	SWH	6/14/2006
Eng approval	A.B.	6/14/2006
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N8 machined surfaces
0.13 / 0.38
0.25 A B C
0.25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 167
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

ANL Optical Table Assembly

Part Number	Revision	Size
00010313	1	A2

CANADIAN LIGHT SOURCE - CLS

Custom Optics Table

http://www.adc9001.com/OPT-CLS

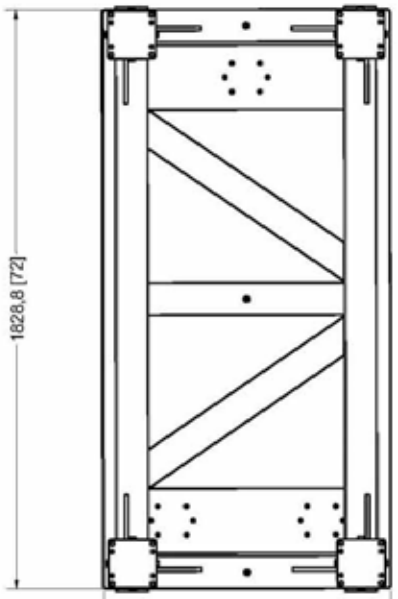
This CLS six degrees of freedom High Precision Motorized Optical Table used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about CLS please go to: http://www.lightsource.ca/

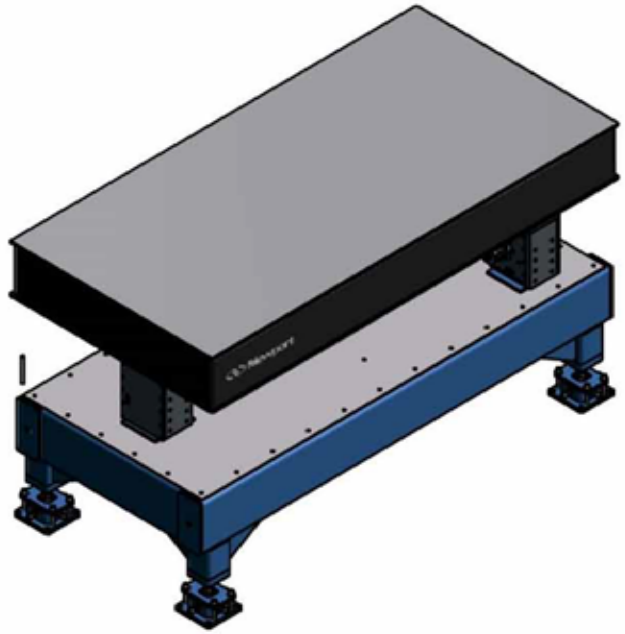
Canadian Light Source — Centre canadien de rayonnement synchrotron

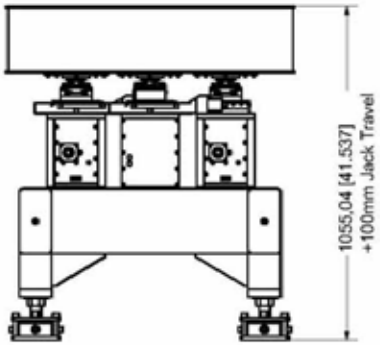
Key Specifications:

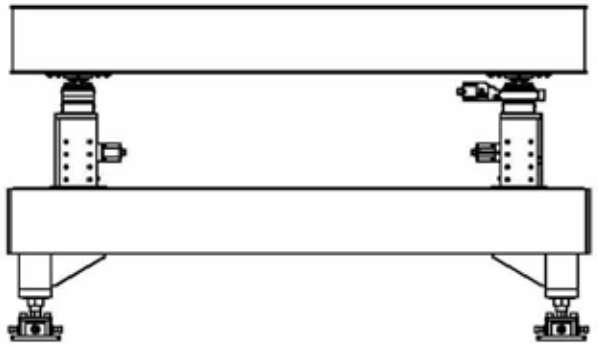
Degrees of Freedom:	6
Table Size:	6' x 4' (1828mm x 1219mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

*** Comes with large casters.**









Notes:

Weight: 561 kg [1237 lbs]

Purchased Part Modification	No

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference

Material	
Protective Finish	None

Drawing Standard: ANSI Y14.5M-1994

		Date
Drawn by:	S. Hartman	9/12/2007
Eng approval:	A. Lyndaker	9/12/2007
Mfg approval:	R. Serva	9/12/2007
Assy approval:	R. Jayne	9/12/2007

UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N7 machined surfaces
0.13 / 0.38
0.25 A B C
0.25 A B C

Advanced Design Consulting USA, Inc.
136 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3619
E-mail: adc@adc9001.com / Web: www.adc9001.com

CLS Custom Optical Table Assembly

Part Number	Revision	Size
00012966	0	A2

SIX DEGREES OF FREEDOM OPTICAL TABLE - BNL

http://www.adc9001.com/products/view/527

This BNL six degrees of freedom High Precision Motorized Optical Table was designed to hold a large Huber Six Circle Diffractrometer system. It was also design to move this system in and out of the beam over a 1000 mm distance. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling. To learn more about BNL please go to: http://www.bnl.gov/ps/

BROOKHAVEN NATIONAL LABORATORY

Key Specifications:

Degrees of Freedom:	7
Table Size:	3' x 5' (914mm x 1524mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Additional Horizontal Travel:	1000 mm
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	N/A
Breadboard:	N/A

*** Comes with large casters.**

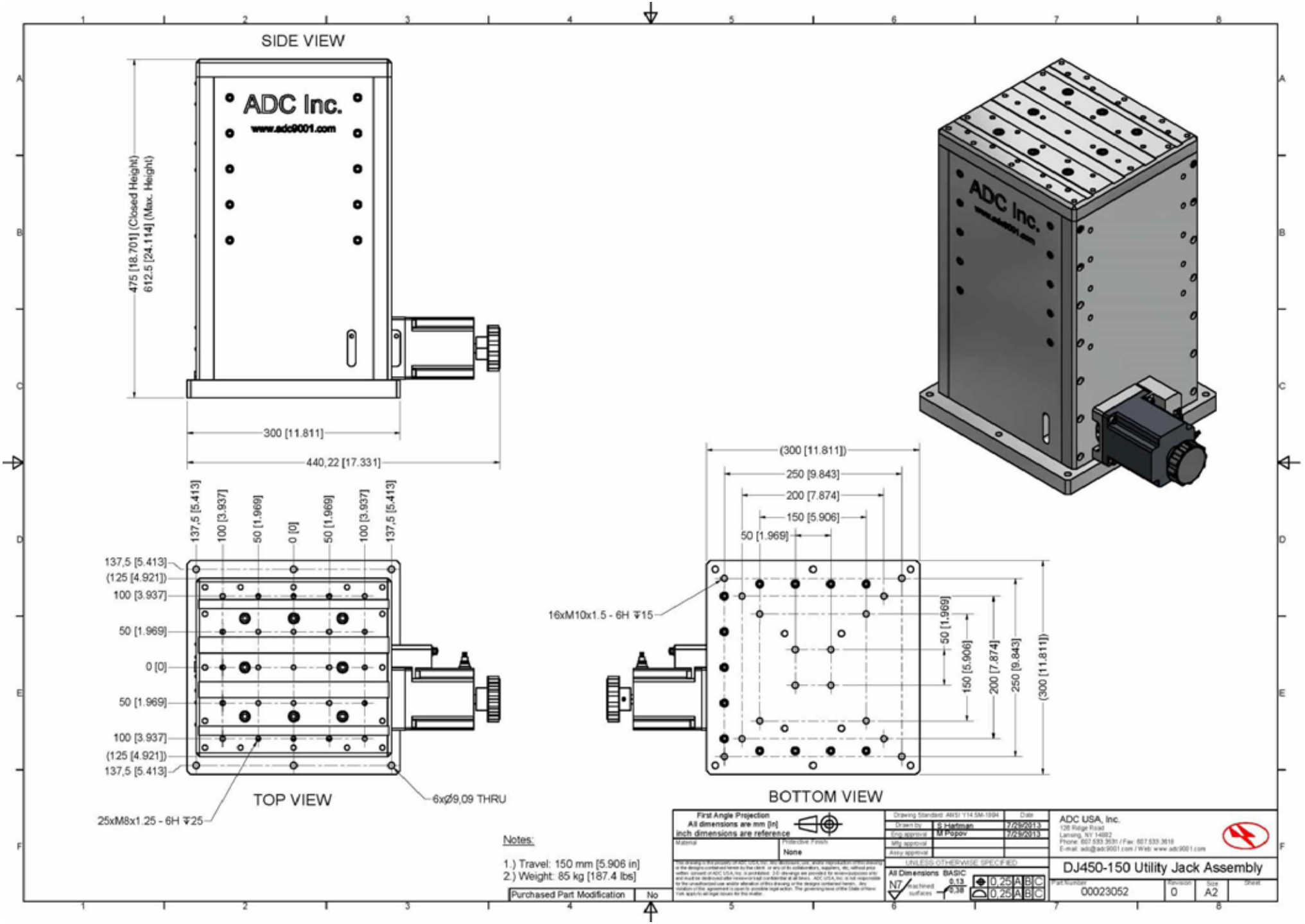
NIST HIGH LOAD, HIGH PRECISION VERTICAL JACK STAGE

http://www.adc9001.com/products/view/529

A system was designed for NIST that allows for vertical axis positioning for a 10kN [~2250 lbf] load. The jack is equipped four sets of cross roller bearing with a worm drive screw in the center. The vertical trajectory straightness is in the microns during its travel.

National Institute of Standards and Technology

Description	Value	Units
Range of Motion	150 [~6]	mm [“]
Resolution (unit/step)	~0.001041667	mm/step
Minimum dynamic load capacity	10	kN
Weight	85 [188]	Kg [lbs]
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm


SIDE VIEW
ADC Inc.
www.adc9001.com
475 [18.701] (Closed Height)
612.5 [24.114] (Max. Height)
300 [11.811]
440,22 [17.331]
137,5 [5.413]
100 [3.937]
50 [1.969]
0 [0]
50 [1.969]
100 [3.937]
137,5 [5.413]
137,5 [5.413]
(125 [4.921])
100 [3.937]
50 [1.969]
0 [0]
50 [1.969]
100 [3.937]
(125 [4.921])
137,5 [5.413]
25xM8x1.25 - 6H ↧25
6xØ9,09 THRU
TOP VIEW
(300 [11.811])
250 [9.843]
200 [7.874]
150 [5.906]
50 [1.969]
16xM10x1.5 - 6H ↧15
50 [1.969]
150 [5.906]
200 [7.874]
250 [9.843]
(300 [11.811])
BOTTOM VIEW
Notes:
1.) Travel: 150 mm [5.906 in]
2.) Weight: 85 kg [187.4 lbs]
Purchased Part Modification
No
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Date
Drawn by: S Hartman 7/23/2013
Eng. approval: M Popov 7/23/2013
Mfg. approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions: BASIC
N7
0.13
0.38
0.25 A B C
0.25 A B C
ADC USA, Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3516
E-mail: adc@adc9001.com / Web: www.adc9001.com
DJ450-150 Utility Jack Assembly
Part Number
00023052
Revision
0
Size
A2
Sheet

OVERALL CAPABILITIES

Design

Fabrication

MANUFACTURING CAPABILITIES

ADC USA, located near Cornell University in Ithaca, New York, is a leading developer and supplier of complex engineering components and instruments for large government laboratories and corporations around the world. Founded as a privately held company in 1995, ADC has grown into one of world's leading technology companies with more than 500 customers located in over 26 countries. ADC provides machining systems and products to our diverse customers from structural metal fabrication to turn key design products with complex control systems. ADC is fully equipped with a CNC precision machine shop; and over the past 4 years our unique ability to fabricate/provide parts for precision vacuum machining equipment has grown immensely. Our process begins with providing quotes, which we prepare, based on specific drawing requirements given to us by the customer.

Our customers say ADC is unique because we:

- Proactively solve manufacturing challenges
- Initiate cost savings for our customers
- Innovate – in the way we build and the equipment we use
- Integrate complex systems, efficiently
- Understand schedule
- Listen

Customers are the most valuable people for an organization. They are the resource upon which the success of our business depends. The relationships we build with our customers are based upon loyalty and satisfaction. Our purpose is to fulfill the needs of the customer and they in turn make achieving our business aims possible.

Equipment

We use precision equipment to verify each order and are committed to delivering precision machined parts. We are very proud of our shop and the capabilities we can offer because of our state-of-the-art precision CNC milling and CNC turning machines. Equipment used for inspections a Brown & Sharpe CMM, a Jones &Lamson Optical Comparator, and an extensive selection of gages. We ensure calibrations are performed and are traceable to meet your standards. Our inspection room is temperature controlled to enable the utmost accuracy and consistency in measurements. We can provide a Certificate of Conformance for all processes as required. These are stored electronically and attached to each job for future reference.

Process Flow

We pay strict attention to every detail of our operation. Our process includes having the machinists check parts throughout the process flow and inspect parts as they are run. First articles are performed on all new parts and at each operation. In addition, all parts also go through a final inspection on state-of-the-art measuring equipment. We are pleased our clients recognize and count on our quality capabilities so much so that we've even had customers come to us to help them inspect parts where there may be a discrepancy even though the parts were made by a different machine shop!

ADC's Manufacturing Material Stack
for Machining Projects

WELDING

At ADC, we offer full service custom metal fabrication which includes welding services for short and long production run jobs. Our extensive welding capabilities utilize both robotic welding and manual welding in MIG and TIG and mesh welding for wire products. We are experienced in welding aluminum, carbon steel, and stainless steel materials. We also have complete resistance welding, also known as spot welding capabilities. Our unique welding shop supports our custom metal fabrication process.

The welding services at ADC support our full service fabrication process with capabilities including:

- Resistance Welding / Spot Welding
- Gas Metal Arc Welding (GMAW) / Metal Inert Gas (MIG Welding) - This semi-automatic or automatic process uses a continuous wire feed.
- Gas Tungsten Arc Welding (GTAW) / Tungsten Inert Gas (TIG Welding) - A manual welding process that is extremely precise, especially useful for welding thin materials.
- Mesh Welding - electric flash butt welding where the two wires are pressed together and the electric current is activated

Benefits of TIG Welding

- Superior quality welds
- Welds can be made with or without filler metal
- Precise control of welding variables (heat)
- Free of spatter
- Low distortion

Benefits of MIG Welding

- All position capability
- Higher deposition rates than SMAW
- Less operator skill required
- Long welds can be made without starts and stops
- Minimal post weld cleaning is required

Benefits of Mesh Welding

- wires resist movement
- it is much faster than traditional welding
- it is a high quality low cost spot welding solution

Welding shop strength is our ability to engineer and fabricate complex, multiple part welded assemblies. We also design and build our own weld fixtures when needed.

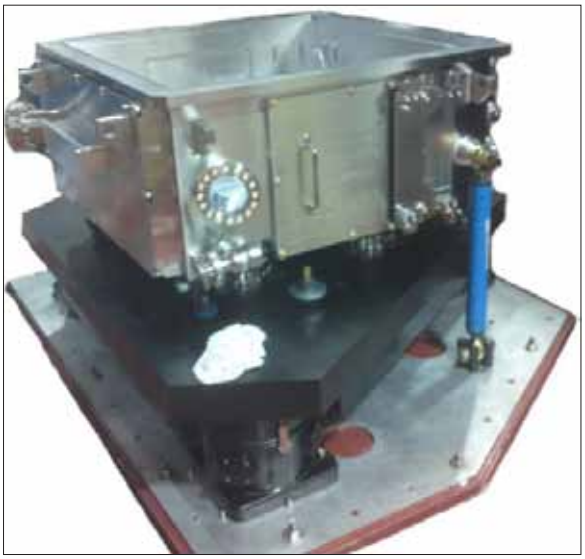
ADC has 23 years of combined experience as a welding shop and high attention to detail required ensuring that our welding shop provides the best welds and custom metal fabrication products every time.

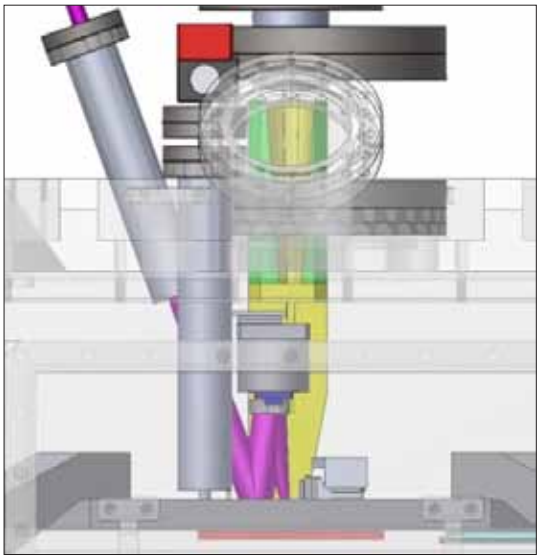
ADC welders are constantly trained and kept up-to-date on the latest welding techniques and have some of the most technologically advanced equipment available. That means customers enjoy a welding shop with knowledgeable craftsmen who give more attention to detail than other welding companies. Our goal is to complete every custom metal fabrication job in the most timely, professional, and mistake-free manner possible.

ENGINEERING DESIGN & ANALYSIS

The Engineering Design and Analysis group is a multi-disciplinary team of engineers with unique training and creativity, and dedication to meeting the needs of our customers. ADC uses the latest computational and graphics software and hardware to approach the most challenging problems in the Aerospace, Automotive, Nuclear, Turbomachinery, Automated Machinery, Electro-Optical Products, synchrotron, high energy physics, and neutron diffraction communities. Parametric solid models are created for all mechanical designs, using Autodesk Inventor 2014 Professional. Drawing on our extensive experience, we present practical, economical and safe designs. We stand apart by providing a multidisciplinary approach - in materials, modelling and manufacturing to the design process. We review design and fabrication requirements, scoping and detailed stress analysis, determining specification and regulatory constraints, and working to practical cost limitations.

These models are the basis for procurement, manufacturing and assembly, ensuring accurate and timely execution of the designs. Autodesk Inventor 2014 comes with a finite element package capable of many different types of simulations including stress analysis, modal analysis and thermal analysis. These simulations as well as ANSYS are used for providing numerical results that cannot be efficiently calculated by hand. With a dedication to customer satisfaction backed by over 18 years of experience in developing innovative designs, we are confident we can tackle and solve the most challenging problems; examples below.



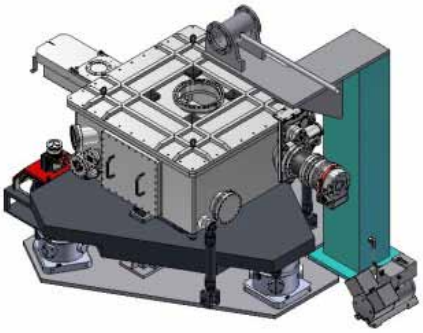


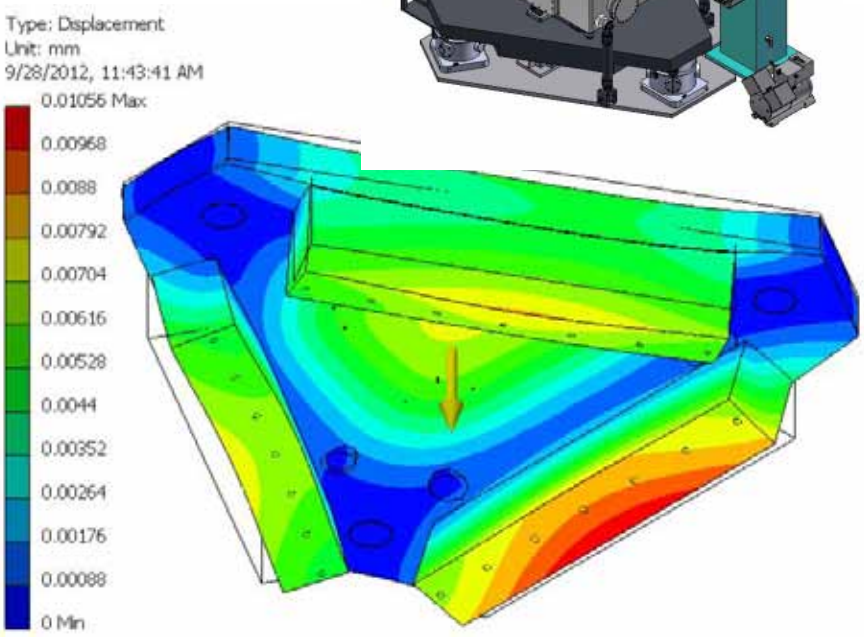
FINITE ELEMENT ANALYSIS

ADC Engineers perform structural design and analysis for the manufacturing, aerospace, Electro-Optical Products, synchrotron, high energy physics, and neutron diffraction communities. We perform finite element analysis (FEA) to accurately model products and processes to determine structural integrity, performance and reliability, as well as predict structural failures. ADC uses FEA for decreasing design cycles, keeping production costs low through design optimization, and uncovering potential sources of field failures. Analysis includes:

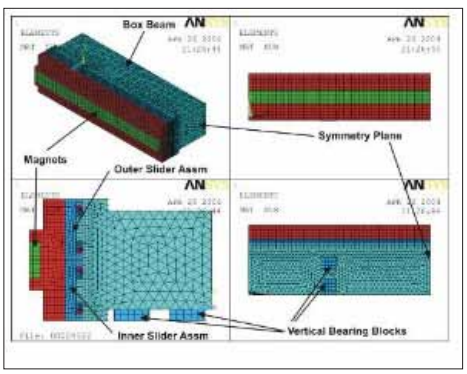
Structural Integrity

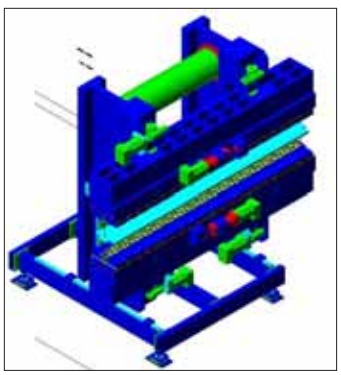
- Component Life Prediction
- Fatigue, Buckling, and Code Compliance
- Design Optimization
- Fabrication Process Evaluation
- Heat Transfer
- Thermal Cycling
- Creep Response & Ratcheting
- Shock, Vibration & Impact
- Flow-Induced Vibrations
- Fluid Flow Analyses
- Computational Fluid Mechanics
- 2D & 3D Finite Element Analysis
- Linear & Nonlinear
- Seismic & Vibration
- Thermal Analysis
- Elevated Temperature Applications

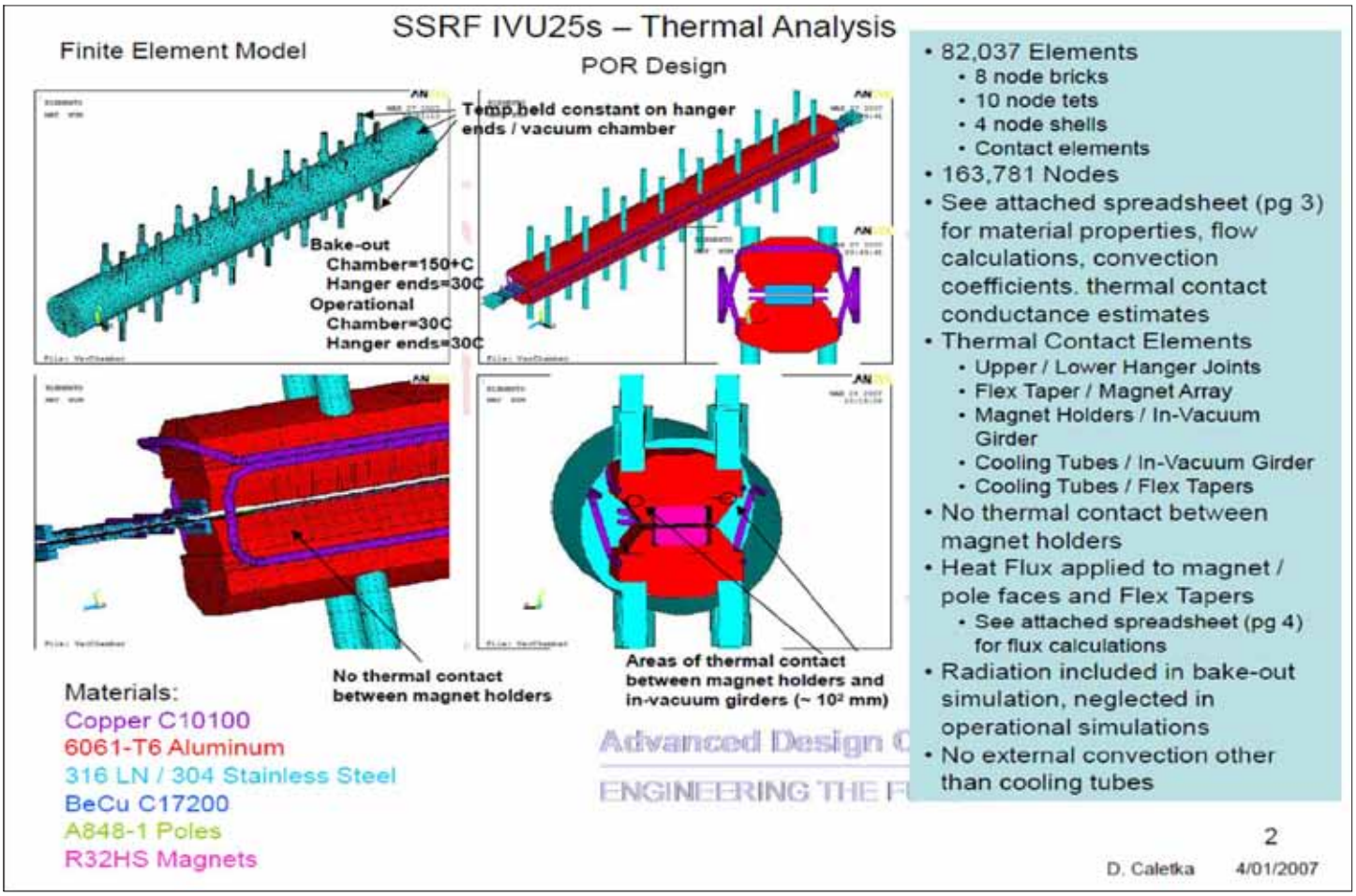




ADC uses Finite Element Analysis (FEA) to predict the deflections of complex and critical structures and to solve the most challenging product engineering problems. For example, when ADC's engineers design insertion devices, the magnet support structure behavior can be simulated in ANSYS by applying the anticipated magnetic forces, which are determined from a RADIA calculation. Solid models generated using Autodesk Inventor can be imported into ANSYS, greatly simplifying the interactive design process. Many aspects of the design, such as material selection, girder geometry, bearing size and preload, and magnet clamping are optimized using FEA. Below is a typical example of what you would expect to see from ADC, including a solid model, finished product and installed product.







Design process and project completion

Magnetic Design

The Engineering Design and Analysis group at ADC also perform magnetic designs. These are typically performed for an insertion device. ADC's scientists use B2E, SRW and RADIA (developed at the ESRF), along with Mathematica and ANSYS FEA in the design of insertion devices. An initial, parametric magnetic design is completed as part of each proposal to ensure that the customer's specifications can be met. From these specifications the magnetic materials are chosen to produce either a pure permanent magnet (PPM) or hybrid design (both SmCo and NdFeB magnets have been used in our designs).

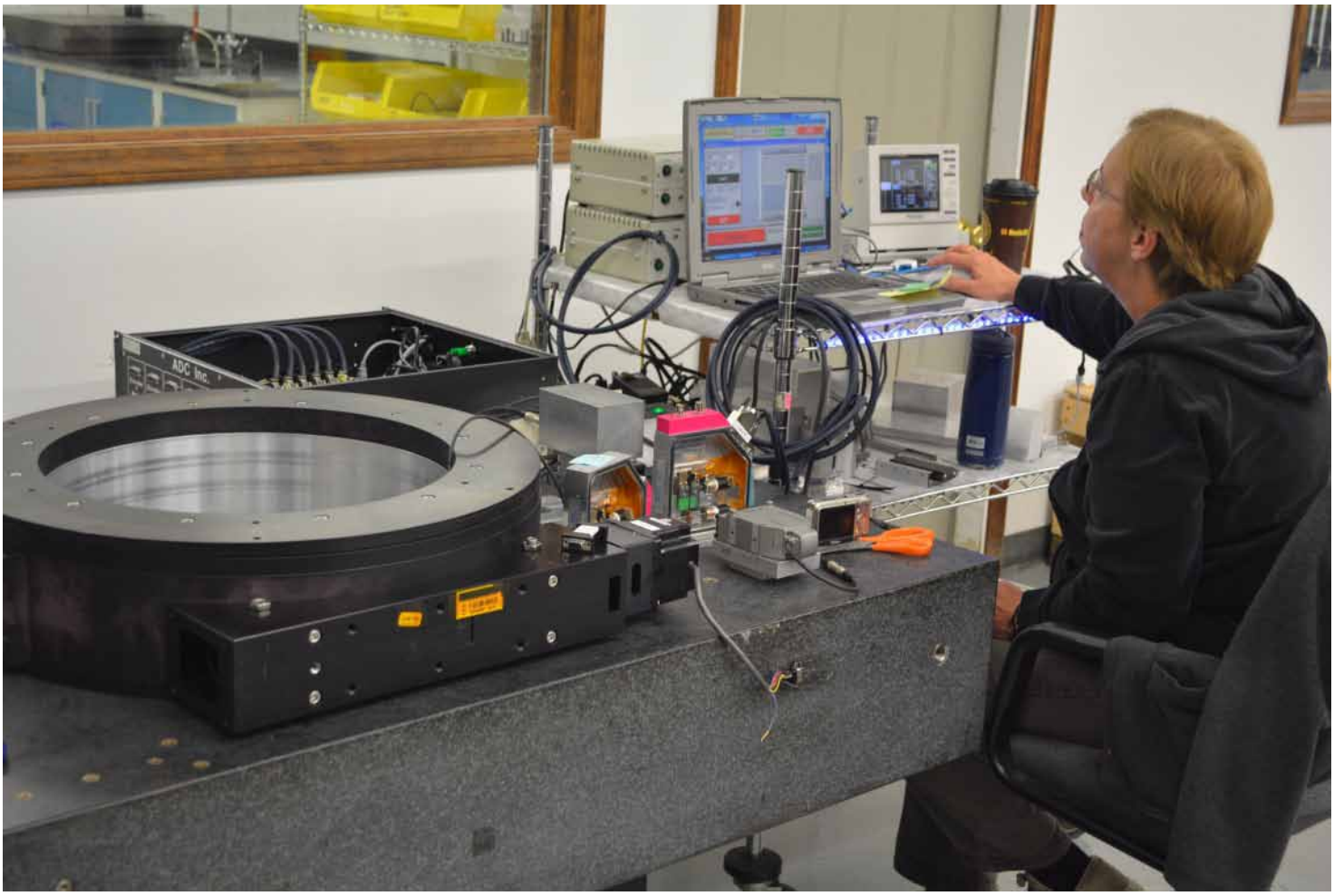
Using a model of the device, and a preliminary magnet design, the specifications are checked to ensure that the period, length, gap and flux density are sufficient to meet the desired range of photon energy.

Optics Design

ADC uses SHADOW a widely used program for the simulation of optical systems, more geared to the synchrotron radiation research. It is based on a geometrical ray-tracing approach, but also traces field amplitude with phase difference. This design tool is used by ADC in combination with ADC's High Accuracy Optical Mirror Metrology Profilometer.

ELECTRONICS AND INSTRUMENTATION

ADC has several electrical/software engineers and techs capable of providing custom circuit design and complete turn-key control systems. Some of our skills include integrated PLC design and programming, analog and digital circuit design, logic design (including PLA and FPGA programming), stepper and servo motor applications, microprocessor, RFID, serial and RF communications, and system controllers.



We have a suite of instrumentation tools for test and measurement of temperature, position, angular displacement, tolerance, acceleration, vacuum, magnetic fields, and motor controls with extensive stock components for prototyping and breadboard. Our electrical lab includes various precision DVMs, oscilloscopes, power supplies, and other tools.

Our design tool set includes National Instruments (NI) MultiSim for schematic capture and NI UltiBoard for circuit board design, Xilinx ISE for FPGA design, ModelSim for simulation, and StateCad. Non-circuit board Schematics are drawn on various platforms with output to DXF. Microprocessor experience is broad but recent projects focus on the PIC Micro Family from MicroChip. ICE units and code simulation for the PIC microprocessors are in-house. Software skills and development platforms include Microsoft Visual C++, PERL, LabView, Visual Basic, CNC, and generic PLC (AB, NAIS, GE-Fanuc, Schneider, etc.) and Parker 6K and 9K (Accroloop).

Our standard motor controls and driver that we offer is Galil as described in this document. However, many of our customers have requirements for custom integration of these components into a functioning system, fully debugged, documented, and ready for operation.

ADC's Standard Motor Controls and Driver
The DMC-40x0 motion controller is Galil's highest performance, stand-alone motion controller, at right. It belongs to Galil's latest generation motion controller family:

the Accelera Series, which accepts encoder inputs up to 22 MHz, provides servo update rates as high as 32 kHz, and processes commands as fast as 40 microseconds-10 times the speed of prior generation controllers.

ADC has supplied many customers turn-key slits system using the Ensemble® motion controller. This is a 4 multi-axis, stand-alone controller for high-performance applications with high-speed communication through 10/100 Base T Ethernet or USB interfaces. The Ensemble™ can control brushless, brush or stepper motors or stages in any combination, and both PWM and linear drives are available. It offers easy to use, affordable multi-axis (1-10 axes) motion programming for laboratory experimentation, production testing or advanced OEM automated manufacturing systems.

ADC Standard Motor Controls and Driver

Ensemble Series of Controllers by Aerotech

The Ensemble® motion controller is a next-generation, multi-axis, stand-alone controller for moderate- to high-performance applications with high-speed communication through 10/100 Base T Ethernet or USB interfaces. The Ensemble™ can control brushless, brush or stepper motors or stages in any combination, and both PWM and linear drives are available. It offers easy to use, affordable multi-axis (1-10 axes) motion programming for laboratory experimentation, production testing or advanced OEM automated manufacturing systems.

Like all Galil controllers, programming the DMC-40x0 is simplified with two-letter, intuitive commands and a full set of software tools such as GalilTools for servo tuning and analysis.

Computer Hardware

Dell- Personal Computer

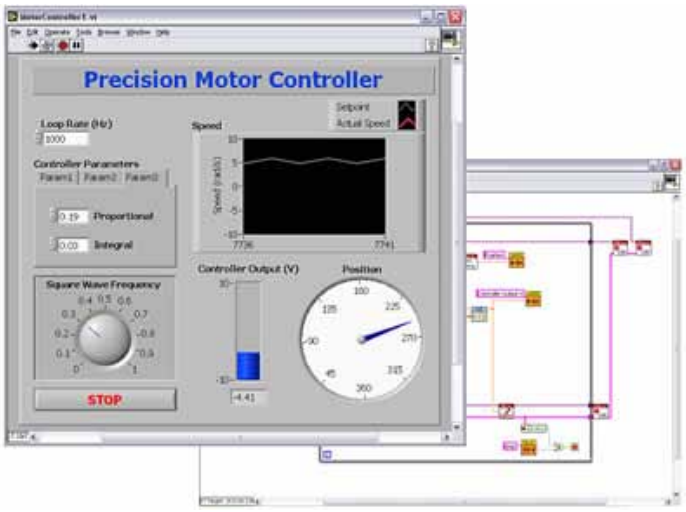
- Intel® Core™ i3-2100 processor (3MB Cache, 3.10GHz)
- 2GB Dual Channel DDR3 SDRAM at 1333MHz - 2 DIMMs
- 250GB Serial ATA Hard Drive (7200RPM) w/DataBurst Cache™
- Genuine Windows® 7 Professional SP1, 64bit
- Dell E Series E2011H 20"W Monitor, 20.0 Inch VIS, Widescreen, VGA/DVI

User / Software Interface

National Instruments- LabView

LabVIEW is a graphical programming environment used by millions of engineers and scientists to develop sophisticated measurement, test, and control systems using intuitive graphical icons and wires that resemble a flowchart. It offers unrivaled integration with thousands of hardware devices and provides hundreds of built-in libraries for advanced analysis and data visualization – all for creating virtual instrumentation. The LabVIEW platform is scalable across multiple targets and OSs, and, since its introduction in 1986, it has become an industry leader.

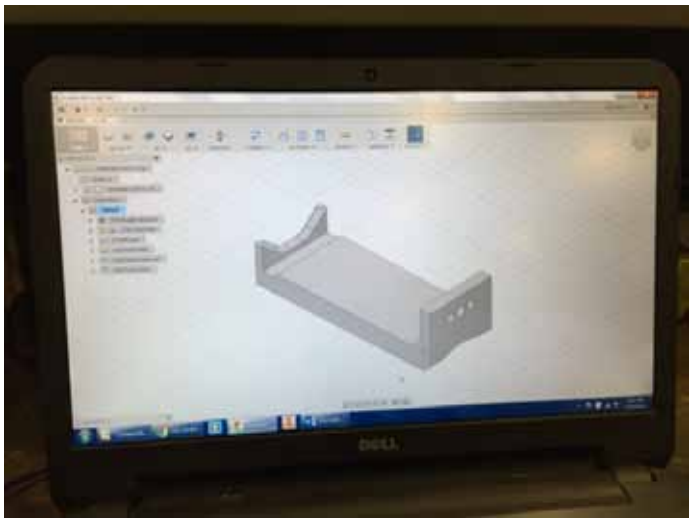
Graphical User interface for the motion control include:

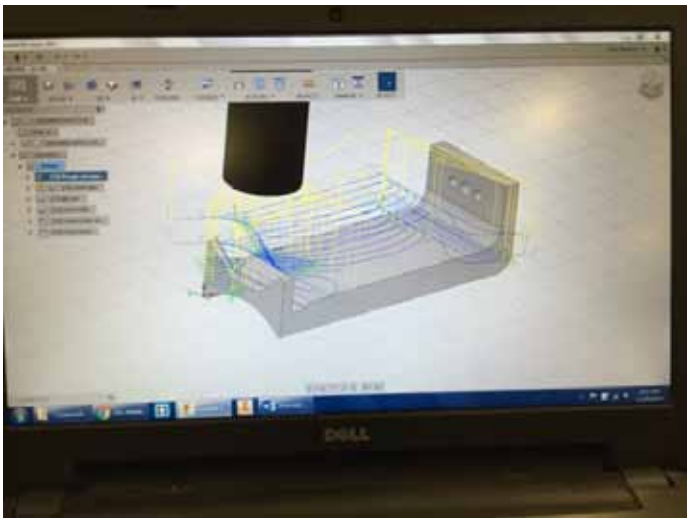


- Data Display;
- Ability to move individual axis;
- Absolute move of axis;
- Relative move of axis;
- Home individual axis;
- Encoder feedback;
- Limit switch detection, and;
- Easy install on a Windows OS platform.

CAM SOFTWARE

We have also set up a computer station with the appropriate program packages so that we can feed our CAD drawings directly into our machining centers. We have recently switched to new powerful CAM software called Fusion 360 from Autodesk. Fusion 360 is built off of the same kernel as HSMWorks and Inventor HSM giving it years of proven experience. Fusion 360 is the next generation of CAM software allowing the machinist to create a CNC program faster and more accurately than ever before. Using adaptive clearing strategies that maintain load on the tool cutting time is decreased by as much as 50% while also increasing tool life. Fusion 360 also includes extensive finishing strategies to allow machining of fine details. The part shown below was programmed and run in the CNC machine in less than 90 minutes while maintaining a small tolerance of one thousandth of an inch!!





ASSEMBLY & TESTING

Team Structure

Our team-based structure provides a distinctive advantage in the overall success of the organization. Common processes and integrated team based concepts allow for effective and efficient program management. We measure the performance of our teams through feedback channels that allow for continual improvement. This element is essential to the team's ability to meet and exceed their objectives. Through the team process, with a focus on our vision of being our customer's premier supplier, we provide the highest level of customer satisfaction possible.

Each month our Manufacturing, CFT, and Support teams hold a Workplace Meeting. This is a devoted time for each team to communicate important team-based and corporate information. Every team is empowered to hold other meetings as needed to ensure all customer specific requirements are met.
ADC's assembly and testing consists of different departments to make up the framework of our operations. This includes: Ultra-High Vacuum (UHV) Facility, Metrology Laboratory, Magnetic Measurement Facility (Undulator Testing Facility), and Electronics and Instrumentation. Each department plays an important role in the capabilities we offer to our customers. It is rare to find this myriad of capabilities in one company.

Temperature Control/Clean Room Assembly/Testing Facility

ADC has a temperature controlled class 10,000 clean room that is used for testing purposes (below). The room has a vibration-dampening vault (in the lower two photos) to isolate the testing area from building vibrations. This room is also isolated from the rest of the assembly area and can be closed off for temperature control.



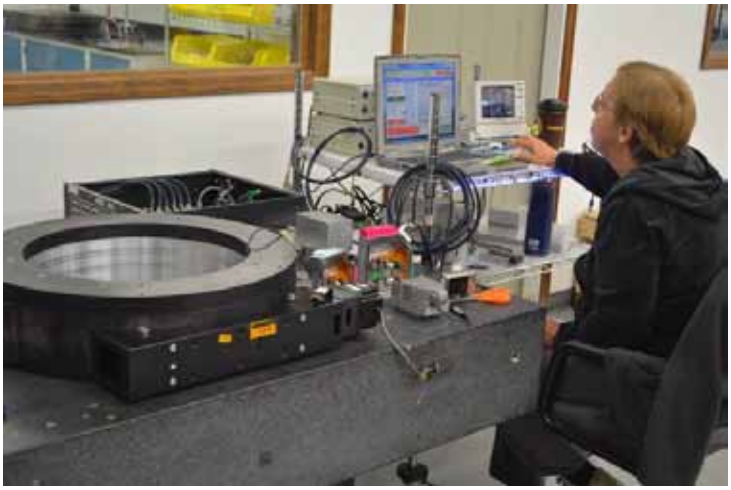

Vibration dampening vault

Dedicated Assembly Area

ADC's assembly department (below) is dedicated to providing quality assembly and technical support to our manufacturing department and customers. Assembly methods are guided by procedures developed in accordance with requirements of military standards, federal specifications, international standards, and customers' "in-house" specifications (photos below).

ADC has a large solid granite table, 8-foot (3.8 m) by 14-foot (6.6 m) polished to a flatness of one-micron accuracy over its entire length providing an excellent surface to assemble massive high precision systems as well as undulator back bones. It is isolated from external vibrations by a 0.75 meter thick concrete block that is supported on Unisorb™ anti-vibration padding.







QUALITY CONTROL

ADC has developed and implemented aquality management system in order to document the company' sbestbus inesspractices, better satisfy ther equirements and expectations of its customers and to improve the overall management of the company.

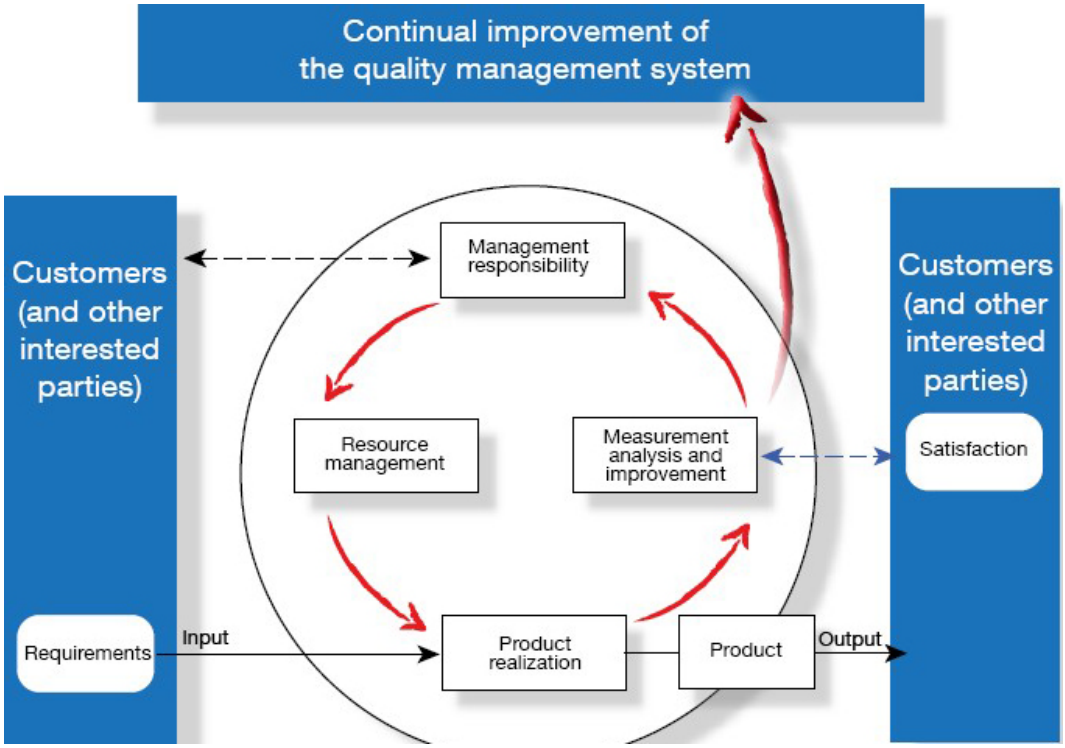
The uality management system of ADC meets ther equirements of the international standard ISO9001:2008. This system addresses the manufactur eandpr oduction of ADC's and its customers' products.

This manual describes the quality management system, delineates authorities, inter relationships and responsibilities of personnel responsible for performing within the system. The manual also provides procedures or references for all activities comprising the quality management systemt oensure compliance to the necessary requirements of the standard.

This manual is also used externally to introduce our quality management systemt our customer sand other external or ganizations or individuals. The manual is used of amiliarize the with the controls that have been implemented and to assure that the integrity of our quality management system is maintained and focused on customer satisfaction and continuous improvement.

ADC has its own quality management team which consists of three individuals. ADC President, who is responsible for finance, sales/marketing, public relations.Director of Operations, who is responsible for the day to dayoperations of ADC including the overseeing of the quality management system.Quality administrator, who is responsible for dealing with supplier issues before and after orders are placed, helps oversee the quality management systems, deals with the maintenance and ADC upkeep.

Quality Management System Process Approach
The model above illustrates that effectiveness and improvement can be represented as a cyclical process that uses components of the quality management system to analyze data and then direct changes and initiatives that ensure the system's continual improvement. This ensures aproactive approach to meet ingthequality management system objectives and customer requirements.



After Sale Support

Customer Satisfaction

Customer complaints, whether received in writing, verbally or electronically are immediately forwarded to the Manufacturing Manager for action.

Customer survey data along with other customer feedback, including written or verbal complaints and information collected via the customer feedback form arer eviewed by management who initiates appropriate corrective actions needed as required by Section 8.5.

Customer satisfaction is monitored in various ways:

- Product returns and warranty claims
- Repeat customers
- Analysis of customer complaints
- Levels of repeat business
- Recognition and awards
- On-time delivery

CorrectiveAction

Evidence of non-conformance, customer dissatisfaction or process weakness is used to drive our corrective action system. Since problems mayexist, they will require immediate correction and possible additional action a imedate liminating or reducing the like lihood of recurrence. Management with responsibility and authority for corrective action are notified promptly of product or process non-conformities. Investigating and eliminating the root cause of the sefailures is a critical part of our continual improvement process.

ADC take saction to eliminate the cause of non-conformities in order to prevent recurrence. Corrective actions are appropriate to the effects of the non-conformities encountered.
The documented Complaints, Corrective, and preventive Action Procedure (OP-85-02) defines the requirements for:

- Reviewing non-conformities (including customer complaints)
- Determining the causes of non-conformities
- Evaluating the need for action to ensure that non-conformities donotrecur
- Determining and implementing action needed
- Records of the results of action taken (seeSection 4.2.4)
- Reviewing corrective action taken

Follow-up audits are conducted in accordance with the internal audit process; Section 8.2.2, to ensure that effective corrective action is taken and that the action is appropriate to the impact and nature of the problem encountered. Inaddition, management summarizes and analyzes corrective action data to identify trends in order to assess the overall effectiveness of the corrective action system and to develop related recommendations for improvement.

The corrective actions are considered effective if the specific problem was corrected and data indicates that the same or similar problems have not recurred. Results of data analysis and subsequent recommendations are presented to management for review.

Preventative Action

ADC determines any necessary action to eliminate the causes of potential non-conformities in order to prevent their occurrence. Preventive actions are appropriate to the nature of a potential problem.
Data from internal audits, customer feedback, employee suggestions, and other appropriate data is collected and analyzed to identify the actions needed to eliminate the causes of potential. Investigating and eliminating the root cause of potential failuresisa critical part of our continual improvement process.

REFERENCES

The following is a list of the world class facilities that work with ADC creating cutting edge instrumentation. To see more information, follow the link to our reference page on our website.
http://www.adc9001.com/REFERENCES

National Aeronautics and Space Administration (NASA)	The Air Force Research Laboratory (AFRL)	ITER(International Thermonuclear Experimental Reactor)	The Advanced Light Source (ALS)
ANKA (abbreviation for „ Angströmquelle Karlsruhe“)	The Australian Nuclear Science and Technology Organisation (ANSTO)	The Australian Synchrotron (AS)	Diamond Light Source (DLS)
MAX IV Laboratory	CCLRC (Council for the Central Laboratory of the Research Councils)	Cornell High Energy Synchrotron Source (CHESS)	The Canadian Light Source (CLS)
Deutsches Elektronen-Synchrotron (DESY)	Department of Justice (DOJ)	Department of Transportation (DOT)	Brookhaven National Laboratory (BNL)
The European Synchrotron Radiation Facility (ESRF)	Free Electron Laser for Infrared eXperiments (FELIX)	High Flux Isotope Reactor (HFIR)	Hiroshima Synchrotron Radiation Center (HiSOR)
Raja Ramanna Centre for Advanced Technology, Indore (INDUS, RRCAT)	Science & Technology Facilities Council (ISIS)	ALBA (meaning "Sunrise" in Catalan and in Spanish)	IUC
Korea Atomic Energy Research Institute (KAERI)	Photon Factory (PF) at KEK	Los Alamos National Laboratory (LANL)	Laboratory for Atmospheric and Space Physics (LASP)

Michigan State University (MSU)

United States Navy (USN)

National Institute of Standards and Technology (NIST)

National Nuclear Security Administration (NNSA)

National Synchrotron Radiation Research Center (NSRRC)

Oak Ridge National Laboratory (ORNL)

Pohang Accelerator Laboratory (PAL)

Paul Scherrer Institute (PSI)

SLAC National Accelerator Laboratory

Spallation Neutron Source (SNS)

Special Operations Command (USSOCOM)

SOLARIS National Synchrotron Radiation Centre

Shanghai Synchrotron Radiation Facility (SSRF)

Mayo Clinic

Cornell University Department of Astronomy

Bar-Ilan University

The Advanced Photon Source (APS)

CAMD (LSU Lousiana State University

Canadian Institute for Neutron Scattering (CINS)

Elettra Sincrotrone Trieste

Institute of High Energy Physics, Chinese Academy of Sciences (IHEP)

Thomas Jefferson National Accelerator Facility (Jefferson Lab)

Brazilian Synchrotron Light Laboratory (LNLS)

National Oceanic and Atmospheric Administration (NOAA)

Shanghai Institute of Applied Physics (SINAP)

SPring-8
(Super Photon ring-8 GeV)

National Science Foundation

Design

Fabrication

Assembly

Installation

CERTIFIED ISO 9001:2008 COMPANY

Registered International Traffic in Arms Regulations ITAR

ADC

ISO 9001:2008 Certified

ADC USA, Inc.126 Ridge Rd., PO Box 187, Lansing, NY 14882
Telephone: (607) 533-3531 Fax: (607) 533-3618
Website: www.adc9001.com
Email: adc@adc9001.com