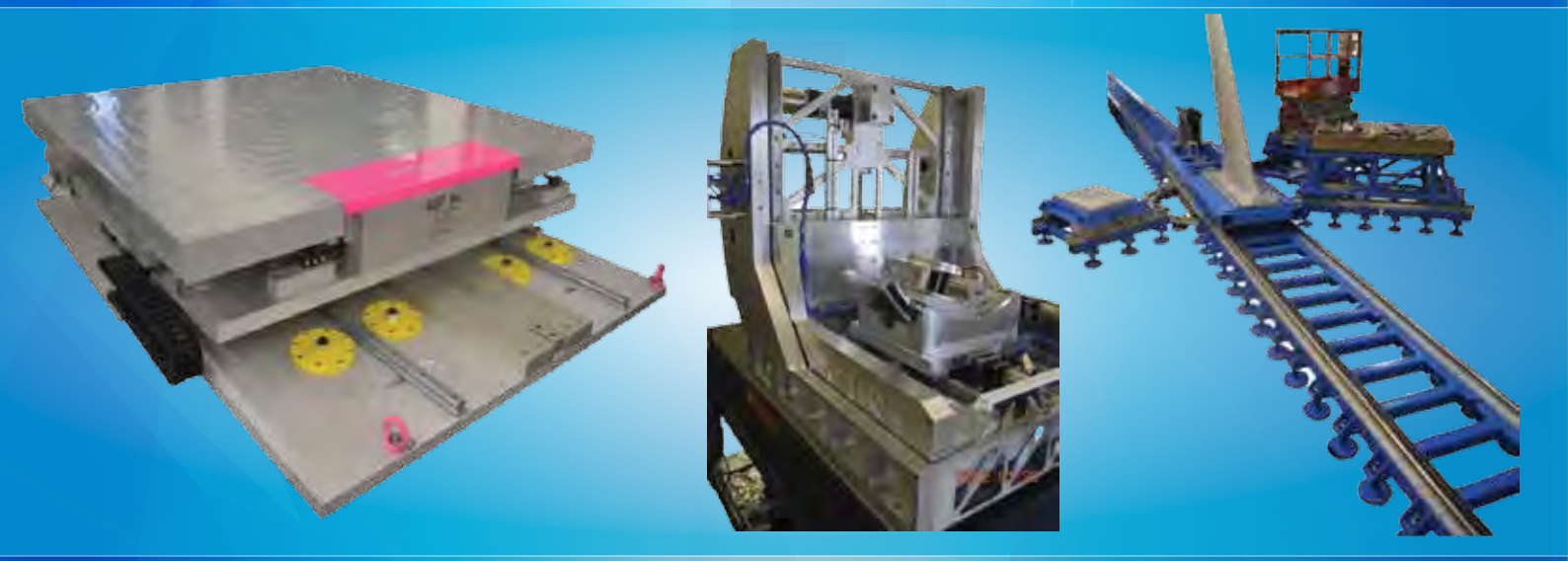
CUSTOM HIGH PRECISION SYSTEMS

High quality systems to the synchrotron, neutron, FEL, and high radiation scientific community



CERTIFIED ISO 9001:2008 COMPANY

Registered International Traffic in Arms Regulations ITAR

ADC

ISO 9001:2008 Certified

www.adc9001.com

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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

Custom High Precision Systems

ADC (ISO9001:2008 certified) has been a leading supplier of high quality systems to the synchrotron, neutron, FEL, and high radiation scientific community for over 18 years. Many of our instruments have been in operation nearly that long in facilities around the world. From slits to undulators, ADC has provided instruments both inside and outside the shield wall.
Our product portfolio is too broad to list, please see
http://www.adc9001.com/products/show_list/id/106 for more details.

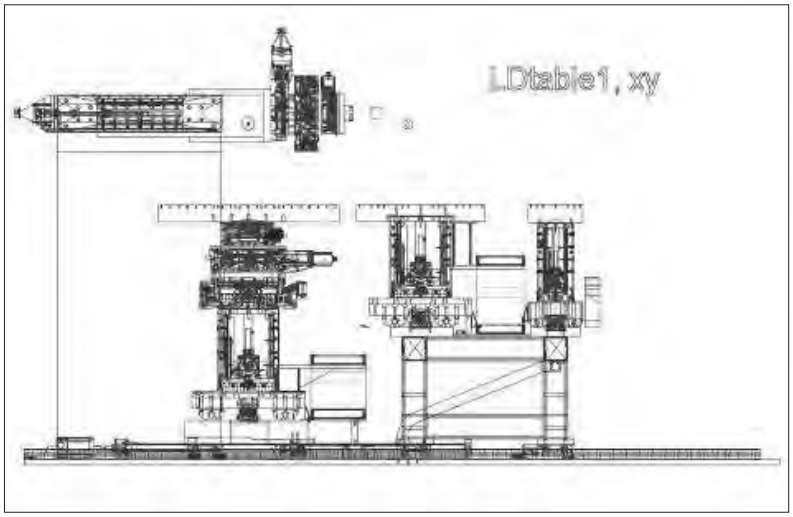
Our engineering design, and build staff are well acquainted with the special requirements of the synchrotron and FEL scientific community such as shielding, stability, precise motion, and UHV. ADC's engineering staff approaches each new application by thoroughly understanding the risks, challenges, and requirements. Our intimate knowledge of synchrotron operations gives us a solid basis for "filling in the blanks" in our customer's specifications. We have developed the art of project management to a high degree; thereby ensuring complex instruments are delivered on time.

Our engineers begin each project with a specification check-list and thorough research of prior designs both by ADC and others as well as input from our customers via the specification and direct communication. We then develop a project plan that is executed by the project manager. A solid 3D model is developed and reviewed with the customer. Calculations and FEAs are then performed for load capacity, deflections, thermal distortion, and application specific requirements. A stack up of tolerances analysis is performed. Motion profiles and motor sizing is also performed to meet specific needs. The design is reviewed at a Preliminary Design Review (PDR) typically at the ADC site and a Final Design Review (FDR) at the customer site where more customer personnel can be in attendance. The project is then detailed and passed to the ADC Operations Manager who develops the travelers for project. The travelers are then executed in ADC's extensive, State-of-the-Art, machine shop along with critical inspections. Our shop machining philosophy is to machine the parts to the best of our ability even if the tolerance requires less precision. The components are assembled and tested in ADC's various assembly areas according to requirements for clean room (UHV), vibrational stability, and special instrumentation. Each new device is tested according to a factory acceptance plan (FAT) that is developed in conjunction with the customer. The customer is welcomed and encouraged to visit ADC at any time but especially for FAT. The instrument is not shipped until the customer sign-off. ADC is also extensive experience crating sensitive instruments for shipment around the world with no damage. Site acceptance (SAT), installation, and commissioning options are available. ADC's service after the sale is impeccable.

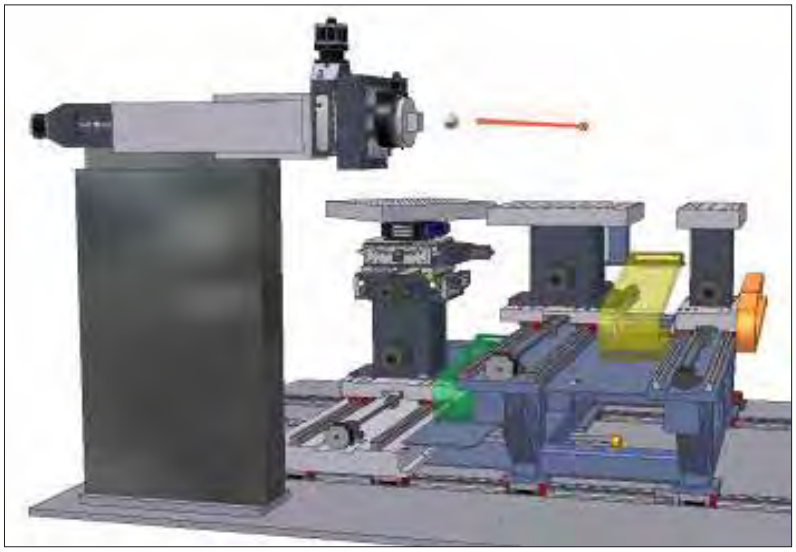
The attached catalog provides more information on our custom designed high precision systems along with specific applications and references. Additional details are provided for calculations, FEAs, frequency response, repeatability measurements, loading, testing, quality control, electronics instrumentation, and controls are available for each application on request. 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

HIGH PRECISION SYSTEMS

ADC's High Precision Systems such as Stages, Spectrometers, Diffractometers, Goniometers, and Optical Tables, are used for astronomy, synchrotron and neutron research applications. They are being used at many of the world class research facilities. This list includes: NASA, Los Alamos National Lab, Argonne, Brookhaven, SLAC, CHESS, CAMD, ELETTRA, BESSY, MAX Lab, CLS, Spring-8, DLS, DESY and many other facilities around the world. We typically design and build systems to customer engineered motion systems that are designed and built for system level performance for client application.These tables are used by physicists, chemists, biologists at Synchrotron and Neutron facilities, and mechanical and aerospace engineers.

Use the following link to view examples of ADC's High Precision Systems:
http://www.adc9001.com/products/show_list/id/106

Motion System for KB Mirror

VSANS Instrument for NIST

Cryostat Dilution Refrigerator

Radar Cross Section (RCS) Test Range

Interchangeable (Switchable) Beamline Design

Taiwan Spectrometer for Inelastic X-ray Measurements

Five-Axis Vacuum Compatible Positioning System

Four-Axis High Precision System for ANKA

SMARTS Translator

Twelve-Axis High Precision System

Fourteen-Axis High Precision System

Custom High Precision Motion System to Manipulate a 7 Ton Press

Four-Axis High Precision System

ANSTO 4-Axis Translation

(USANS) instrument

Monochromatic/analyzer

Small-Angle Neutron Scattering (SANS) Instrument

Compact Precision Translator

Selector Wheel Shutter Unit

Four-Axis Goniometer for the Canadian Neutron Beam Centre

Four-Axis Goniometer

High Precision Upright Cryostat Holder

Rotational Platform

Nine-Axis High Precision System

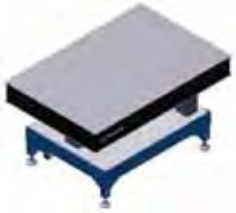
DLS Double Crystal Deflector

ANKA Fast Sample Exchange System

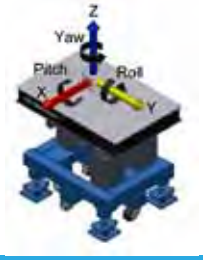
Kappa Six-Circle Goniometer for CHESS

MAX-Lab Precision Positioning System

Two-Axis High Precision System



Six-Axis High Precision System



Six-Axis High Precision System

Arecibo Observatory Upgrade

Colorado Gimbal System for MOBI Vacuum

HFIR Image Neutron Focusing System

High-resolution extreme-ultraviolet-light (EUV) microscope

Eleven Axis Custom Design Motion

Four Axis Custom Design Motion

XYZ & Multistage UHV Manipulators

Diffractometer Table, 2 Axis Motion System

Seven Axis High Load Precision Motion System

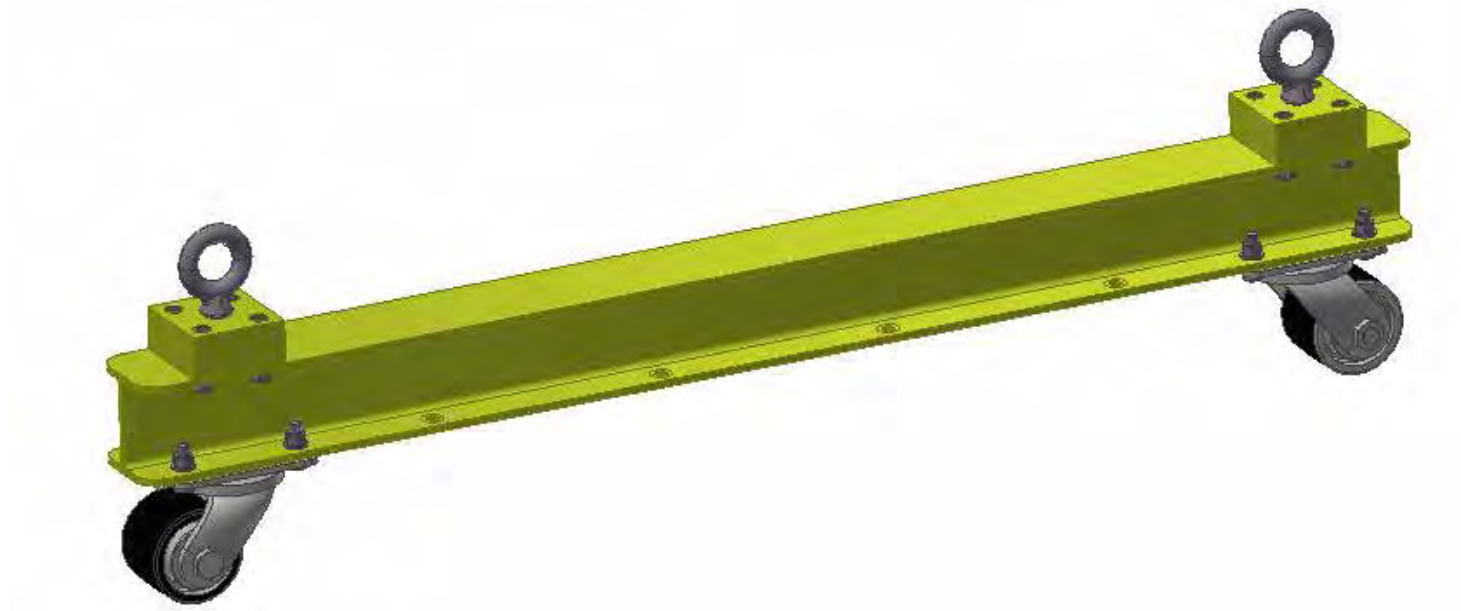
FLOOR MOUNTING

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).

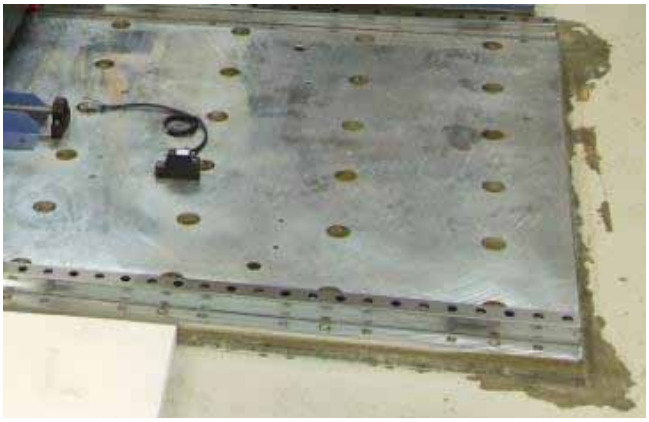
Adjustable feet can be used to align the Custom High Precision Systems height. ADC produces standard kinematic feet that provide height adjustment, transverse adjustment, and features for tie-down bolts. Bubble levels mounted to the system make it easy to dial in the system height. Using adjustable feet 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.

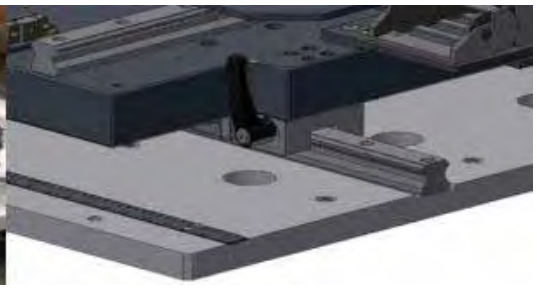
The table can also be supported by four casters which are mounted on two wide-flange I-Beams. The casters use 4" wheels and are each rated for 2860 kg. The I-Beam is made from steel according to industry standards for W4x13 beams. This beam has been selected to safety support the load of the table while 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 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.



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

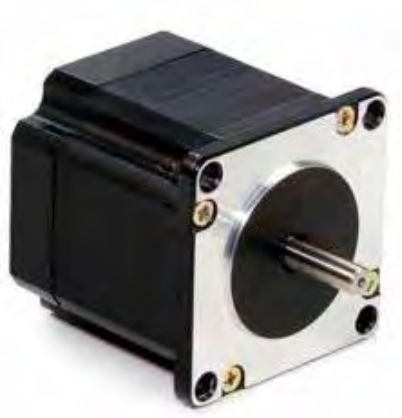
ADC uses typically uses the Newport's Research Grade Breadboard to provide rock-solid stability and rigidity to support demanding research applications. It is available in different thickness, and demonstrates an outstanding.

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.

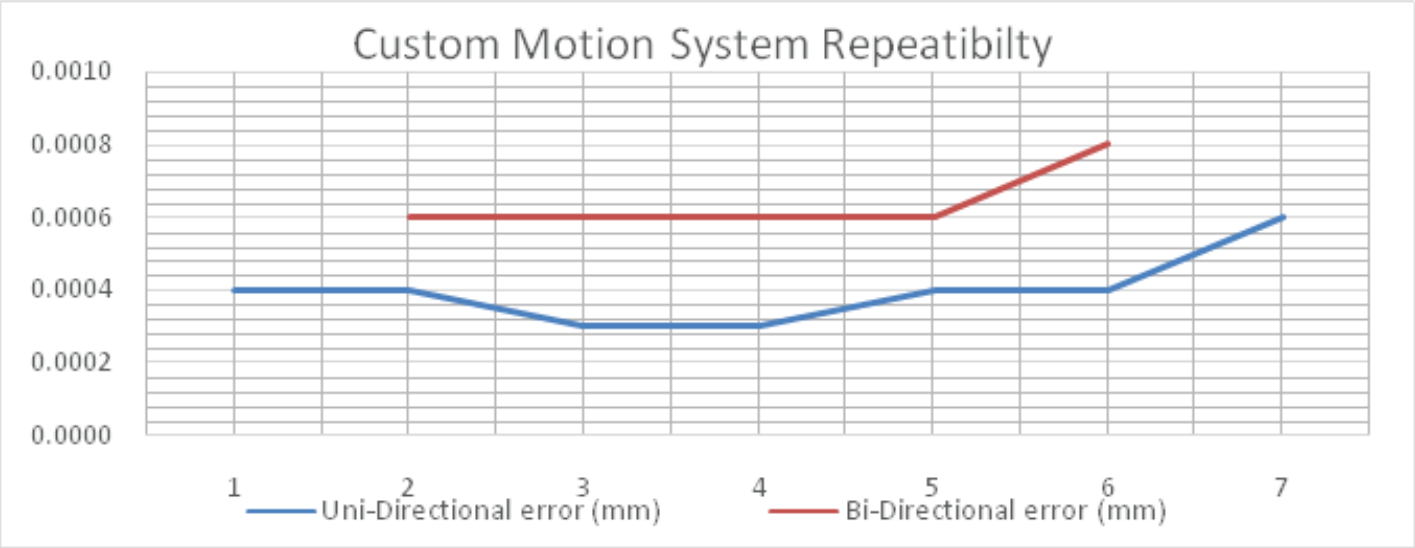
The connectors are firmly mounted on the overall equipment frame by the use of patch panels/bulkhead plates. This provides a safe and easy connection and disconnection of all field/control cables to the equipment. ADC provides a customized connector panel that exactly matches the type of connectors and 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

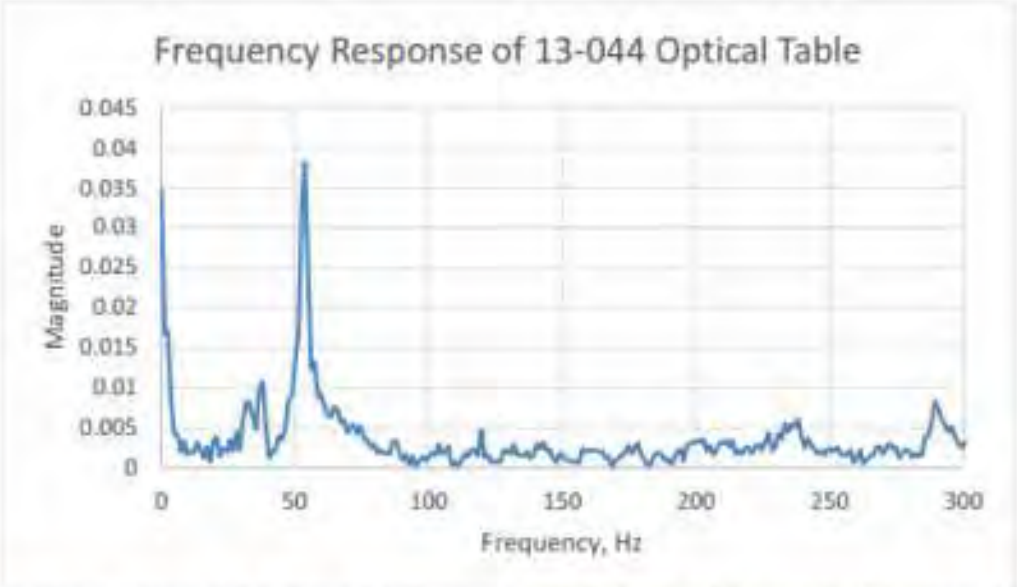
Testing

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:



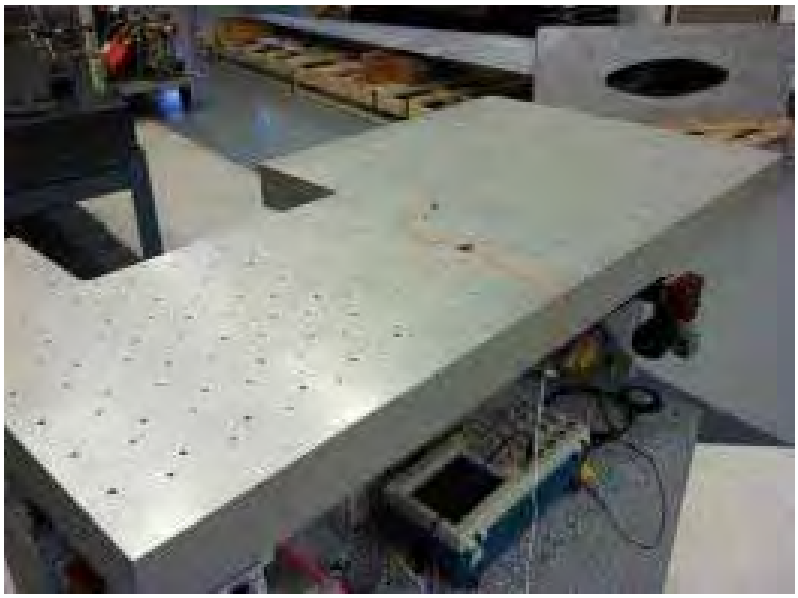
Frequency Response of Built Table

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.

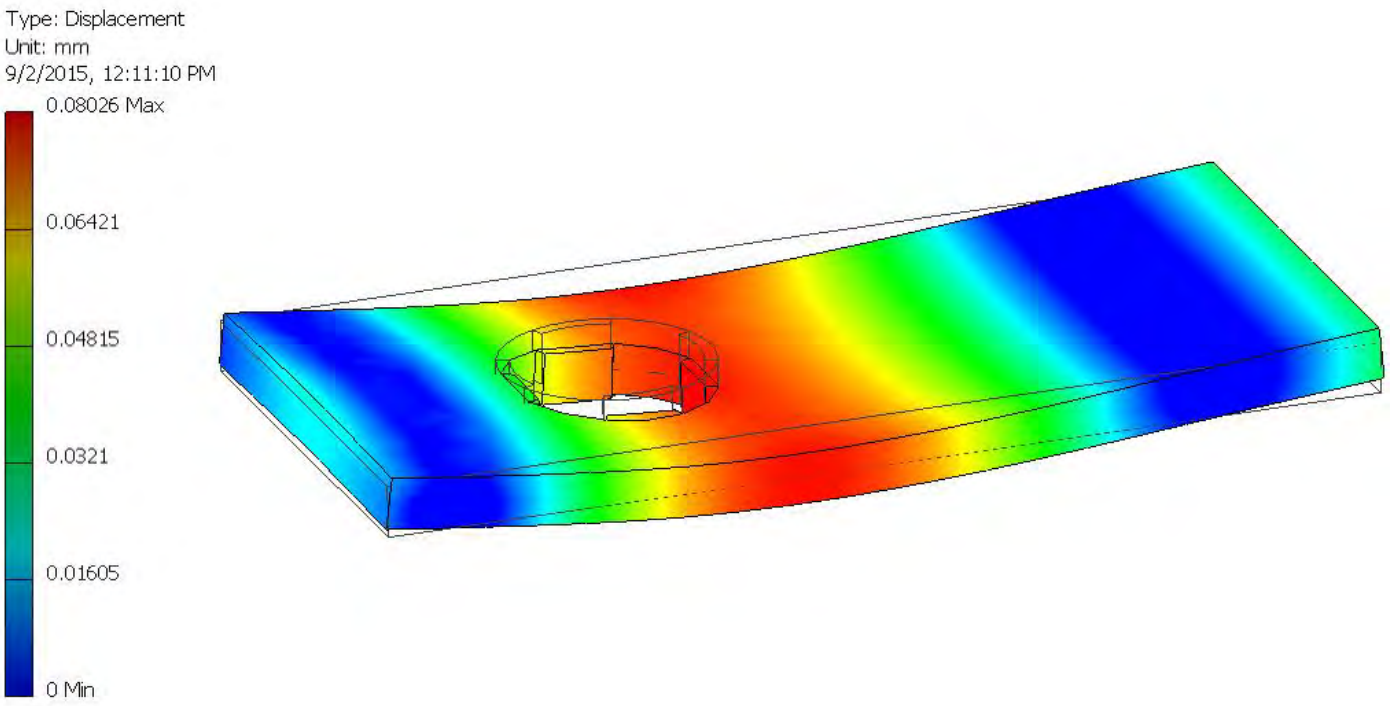


Analysis of Design

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

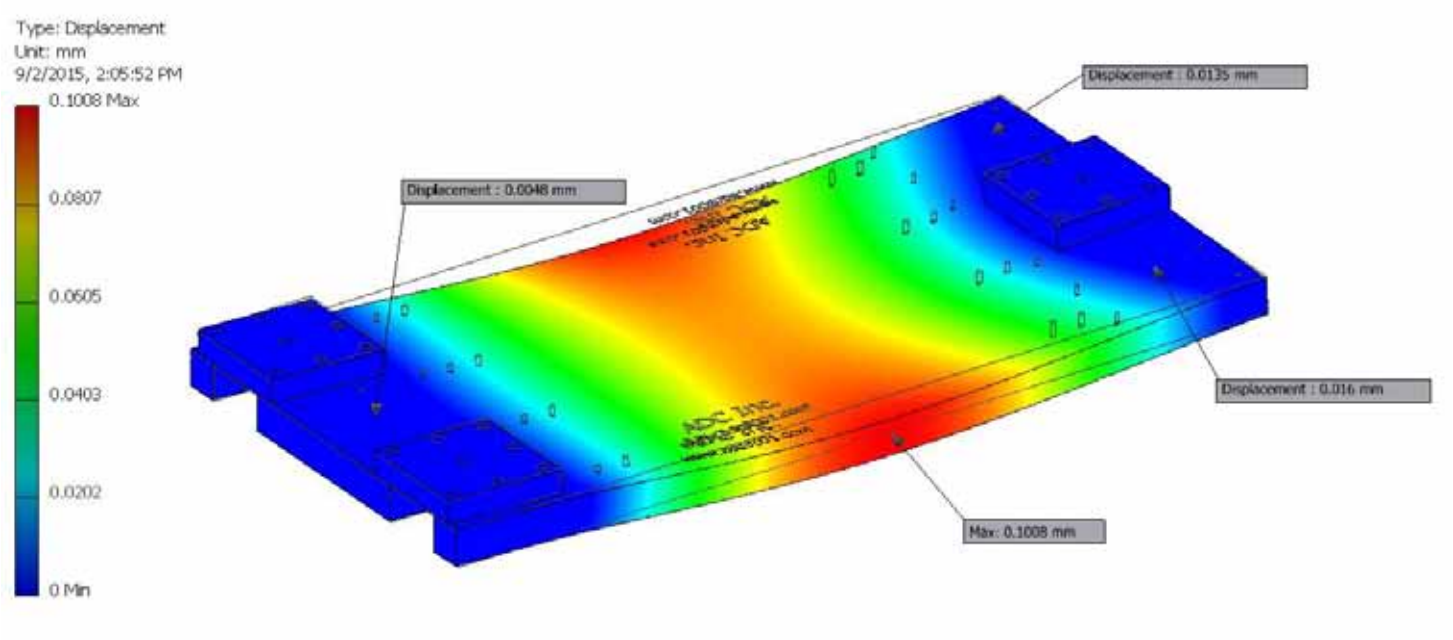
In order to maintain the accuracy of the system, it is important to minimize the deflections due to bending under loading. Although a 4" table is typically used, the possibility of using a different thicknesses can also be used. Below is an analysis to examine the effects of a deflection on a 4" thick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



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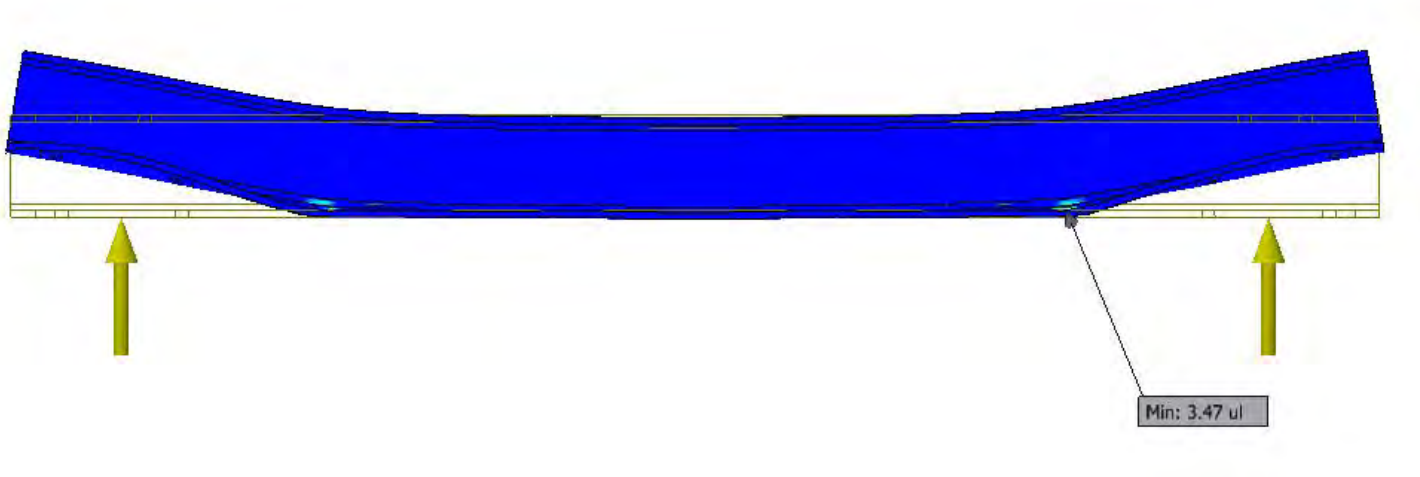
FEA on I-Beam Strength Analysis

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.

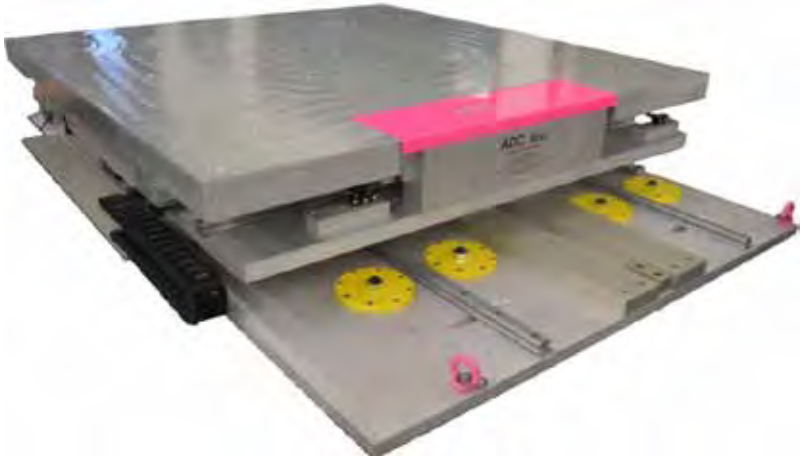
CUSTOM HIGH PRECISION SYSTEMS - AIR

Use the following link to view examples of ADC's High Precision Systems:
http://www.adc9001.com/products/show_list/id/106

SOLARIS 3-AXIS MOTORIZED POSITIONER

High Load, Low Profile, High Precision Device
http://www.synchrotron.uj.edu.pl/en_GB/

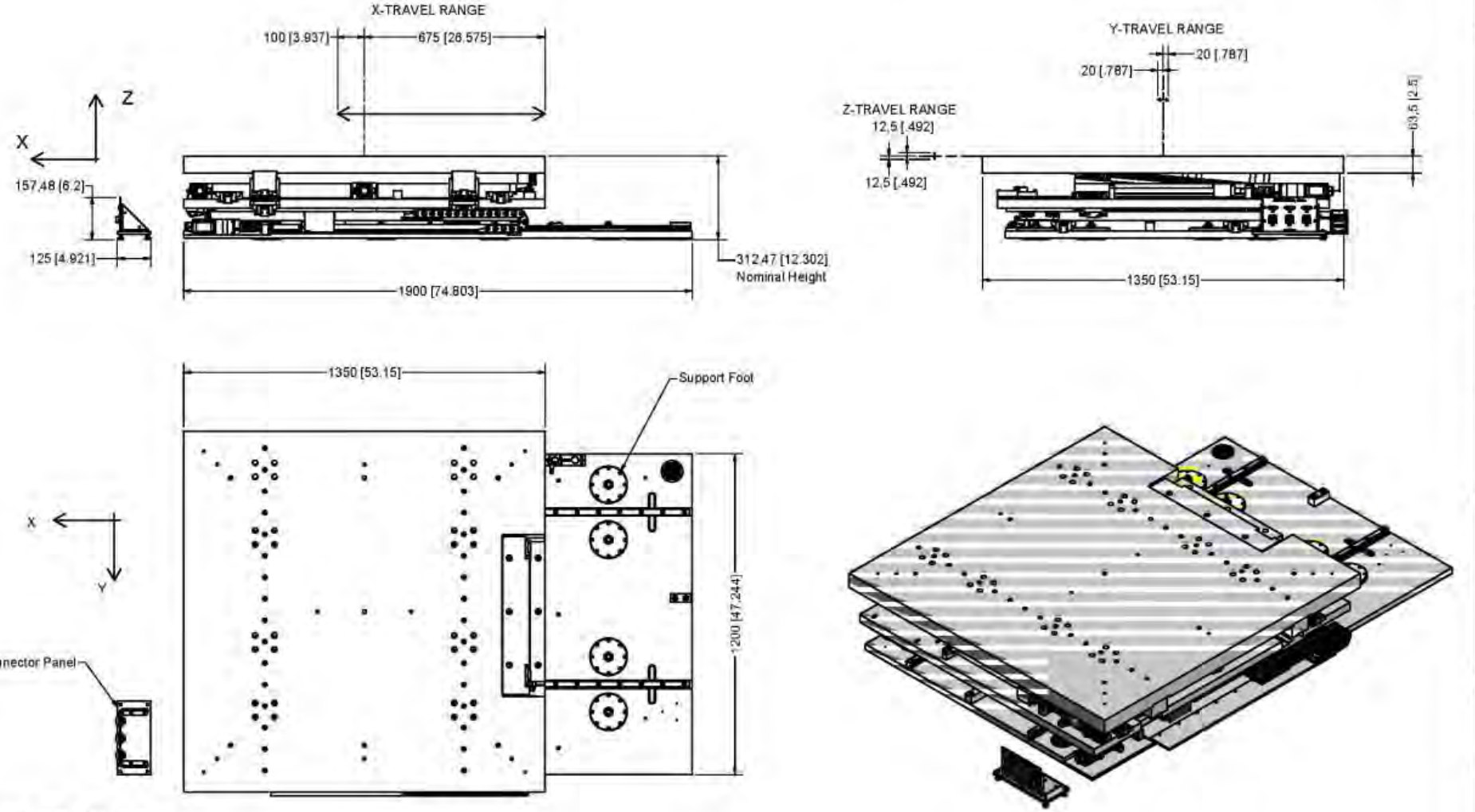
The first Polish synchrotron radiation facility Solaris is being built at the Jagiellonian University III-rd Campus in Kraków. Synchrotron is a unique manmade source of electromagnetic radiation known as synchrotron radiation. This custom high load, high precision 3-Axis Motorized system was designed 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.



SOLARIS
NATIONAL SYNCHROTRON RADIATION CENTRE

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

Drawn by: E.Acome
Engineer
Mfg approval
Assy approval
Date: 12/16/2013

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.

3-Axis Positioner Assembly

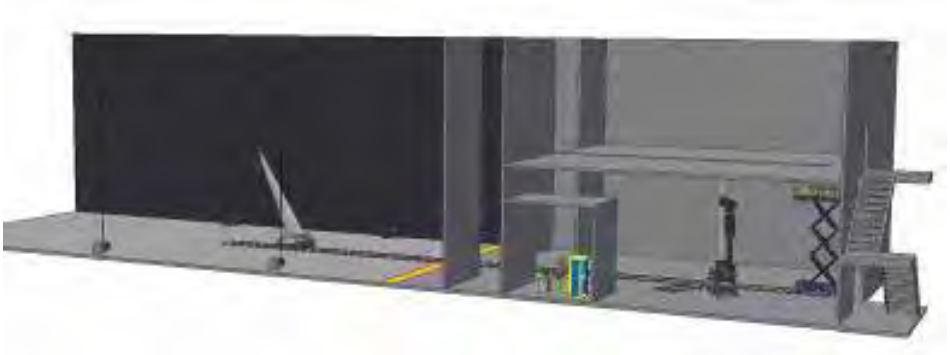
Part Number
Revision 0
Size A2
Sheet

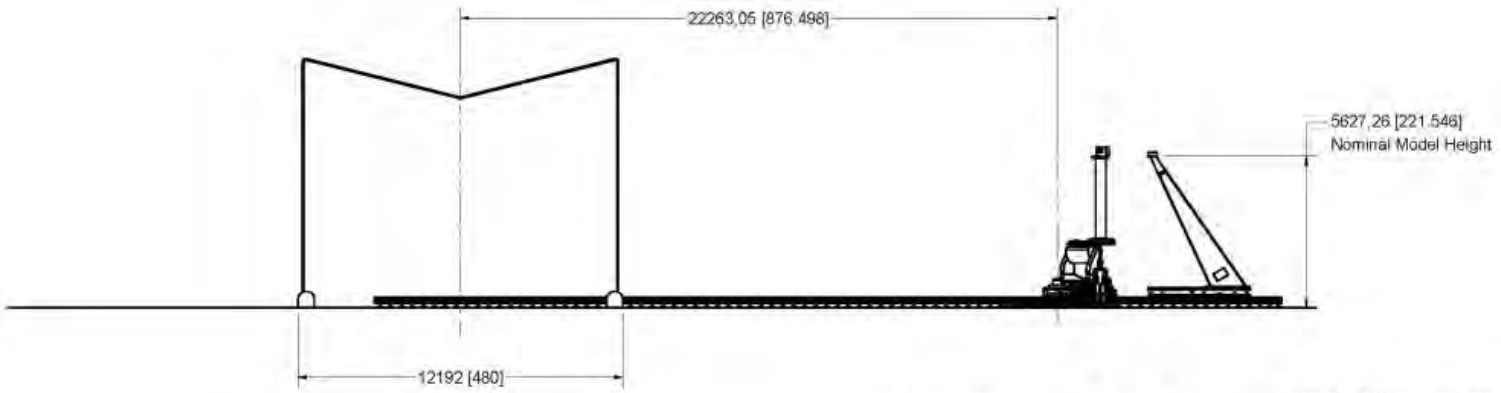
Purchased Part Modification | tap

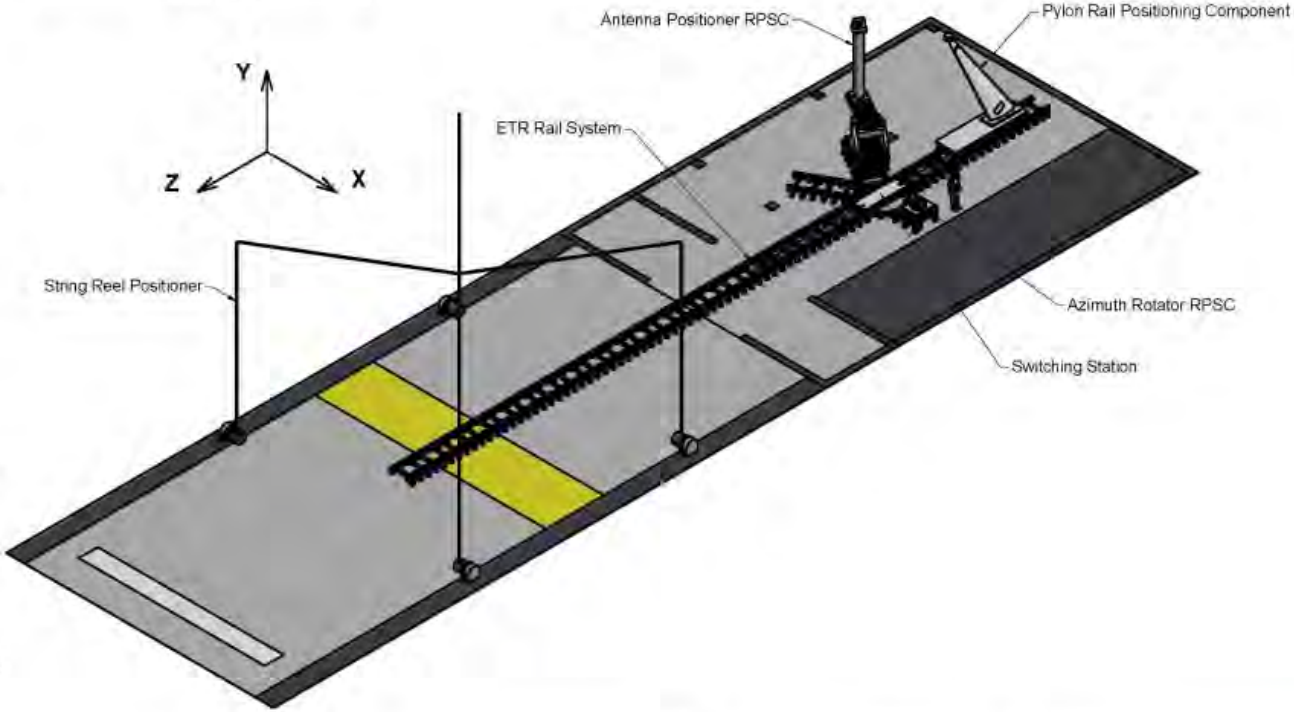
RADAR CROSS SECTION (RCS) TEST RANGE

For more information and video please visit:
http://www.adc9001.com/products/view/510
Or visit: http://www.nasa.gov/

ADC is in collaboration with NASA Langley Research Center is completing a turn-key design, build, and install major components for an updated indoor radar cross section and antenna measurement range. Modern radar systems, which include specialized active antennas, microwave circuits and devices, are governed by underlying electromagnetic physics. Designing sophisticated motion systems pushes the limits of engineering to solve ever-larger and more complex electromagnetic radiation and scattering problems. The RCS NASA Experimental Test Range consists of a rail positioning system and four rail positioning carriages: antenna measurement positioner, RCS pylon, azimuth rotator, and an electric manlfit. A switching station allows for rail positioning carriages to be quickly moved on and off of the rail system. Within the test chamber there is also a string reel positioning system capable of moving objects within a 40' x 40' x 25' volume.







Description:

Experimental Test Range (ETR) designed for NASA Langley Research Center to perform radar testing of aircraft models and antenna models.

Major Components

Rail System
- Total Length of Travel: 33.9 m [111']
- Test Zone: +/- 3.05 m [10']
- Position Repeatability within Test Zone. 1.27 mm [0.050"]

Rail Positioning System Components (RPSCs)

Antenna Positioner:
- Azimuth over Elevation Positioner
- Manual Offset Slide w/ 1.22m [4'] Travel
- Model Tower Mast, Aluminum Construction
- Polarization Positioner with DC-18 GHz Rotary Joint and 24 Conductor Slip-Ring
- Maximum Payload: 450 kg [1,000 lb]

RCS Ogive Pylon:
- 4:1 Ogival Ratio
- Spline Drive Rotator w/ Digital Encoder Feedback
- Suface Roughness: 65 micro-inch RMS
- Edge Sharpness: 0.004-0.008"
- Design Payload: 680 kg [1,500 lb]

Manlift Positioner:
- Carriage to Mount and Secure Electric Manlift w/ Up to 20' Vertical Height

Azimuth Rotator:
- Universal Carriage for 3x Azimuth Rotators

String Reel Positioning System
- Positioning Area: 40' x 40' x 25'
- Maximum Payload: 680 kg [1,500 lb]

Purchased Part Modification

First Angle Projection
All dimensions are mm (in)
inch dimensions are reference

Drawn by	E Acome	11/14/2013
Eng approval	M Popov	11/14/2013
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC

ADC USA, Inc.

Experimental Test Range

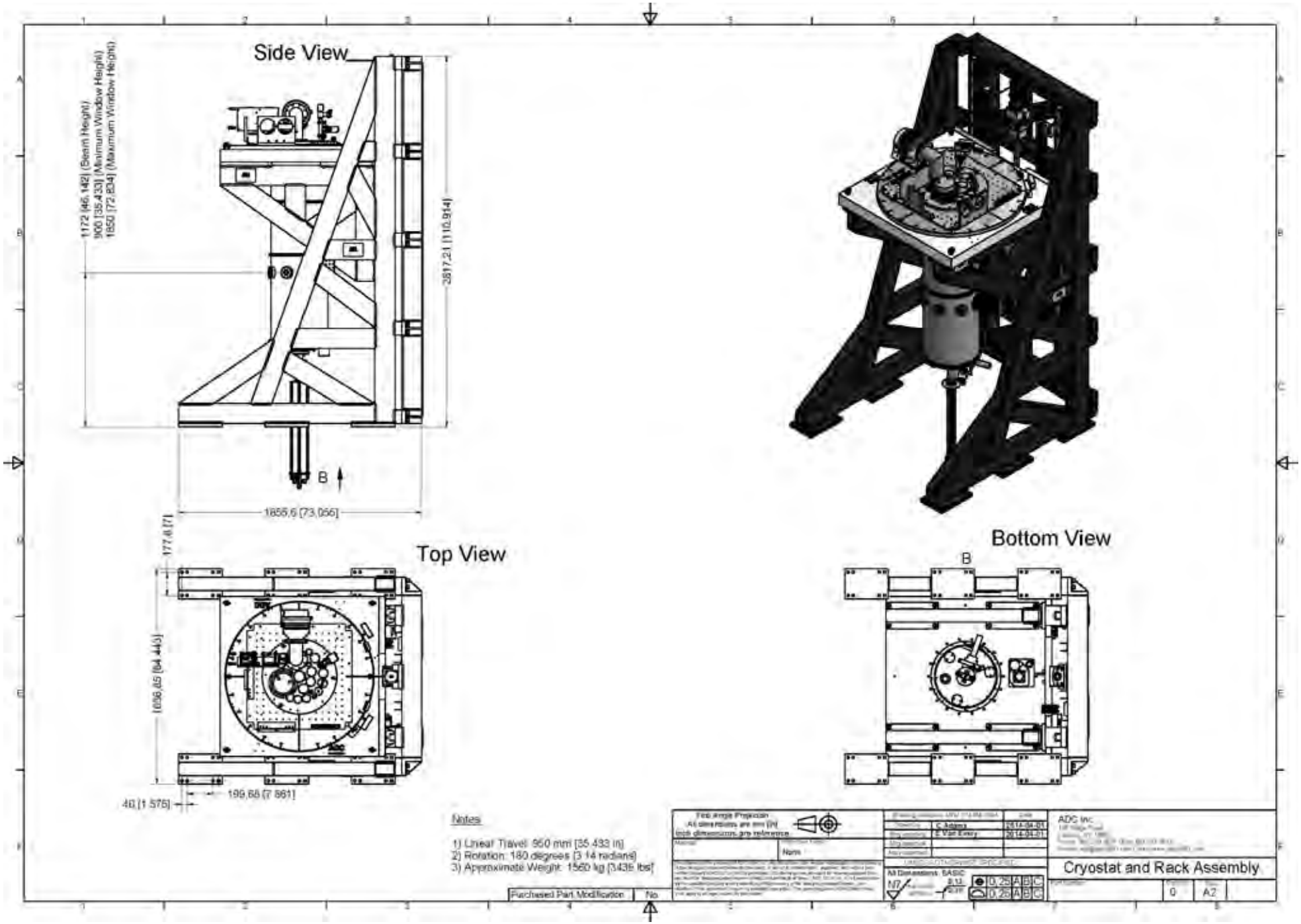
Size: A2 | Sheet: 1 / 1

CRYOSTAT DILUTION REFRIGERATOR

Manipulation of Dilution Refrigerator from Oxford Instruments
For more information please visit:
http://www.adc9001.com/products/view/512

A system was custom designed for the Free Electron Laser for Infrared eXperiments (FELIX) in Netherlands http://www.ru.nl/felix/ that provides both vertical (z) axis positioning and rotation about the z-axis of a Cryo-Free dilution refrigerator from Oxford Instruments (Kelvinox). http://www.oxford-instruments.com/

The refrigerator has a vertical travel of 950mm using linear bearings and a 40mm ball screw driven by a triple stack NEMA 34 stepper motor and a planetary inline gearbox. With a 10:1 gear ratio on the 200 steps/rev motor the resolution is approximately 5µm. 180 degrees of rotation is achieved through the use of a large bearing driven by a double stack NEMA 34 stepper motor and a planetary inline gearbox. With a 3:1 gear ratio on the 200 steps/rev motor the rotation has a resolution of approximately 0.07 degrees. The Aluminum frame (Non-Magnetic) is bolted to the floor using M16 Screws to provide ultimate stability.


Side View
1172 [46.142] (Beam Height)
900 [35.433] (Minimum Window Height)
1850 [72.834] (Maximum Window Height)
2817.21 [110.914]
B
1856.6 [73.056]
Top View
177.8 [7]
1696.85 [64.443]
199.68 [7.861]
40 [1.575]
Bottom View
B
Notes
1) Linear Travel: 950 mm [35.433 in]
2) Rotation: 180 degrees [3.14 radians]
3) Approximate Weight: 1560 kg [3436 lbs]
Third Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
Material
Finish
Norm
C. Adams
2014-04-01
E Van Every
2014-04-01
All Dimensions: BASIC
N7
0.25 A B C
0.25 A B C
Purchased Part Modification
No
ADC Inc.
Cryostat and Rack Assembly
0
A2

SPECTROMETER

for Inelastic X-ray Measurements at Spring-8 (Japan)

For more information, please visit:
http://www.adc9001.com/Spectrometer-for-Inelastic-X-ray-Measurements-at-SPring-8

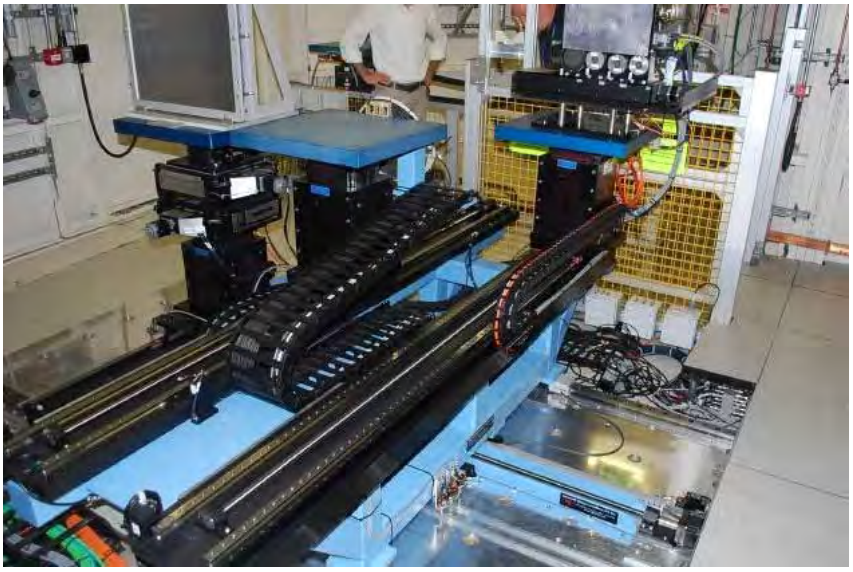
This spectrometer is operating at the Spring-8 synchrotron in Japan as part of a dedicated inelastic beamline (BL12XU). The system is used for investigating electronic excitations with milli-electron volt resolution; therefore many of the specifications require high precision, and accuracy on the micron level. The 3-meter analyzer arm on the spectrometer needed to have an angular stability measured in arc seconds over a long range of travel, under vacuum conditions. The spectrometer was designed for several types of inelastic X-ray measurements, such as performing non-resonant inelastic X-ray scattering, which directly measures the dynamical structure factor of the sample. The scientific focus is to study the single-particle and collective electronic excitations in many-body systems. The incident table allows for diagnostics, attenuation of the highly monochromatic beam, and reduction of parasitic scattering. In addition to the standard capability of orienting the sample, the spectrometer is used with large magnets, furnaces, or a specially designed cryostat with a fine-positioning carrier, for measurement of samples in extreme environments. In the initial phase, the spectrometer has a one-, two-, or three- meter radius spherically bent silicon analyzing crystal, allowing for a range of energy resolutions of around 100 meV to 1 eV. The spectrometer has the custom designed versatile capability of positioning a shielded detector in the backscattering geometry for use with various sample chambers, which allows for optimizing the energy resolution. The second purpose of the spectrometer is for Resonant Raman scattering, to capitalize on the large resonant enhancement of the inelastic scattering cross sections. The incident X-ray energy is widely tunable to excite core electron absorption edges of samples ranging from the copper to vanadium.

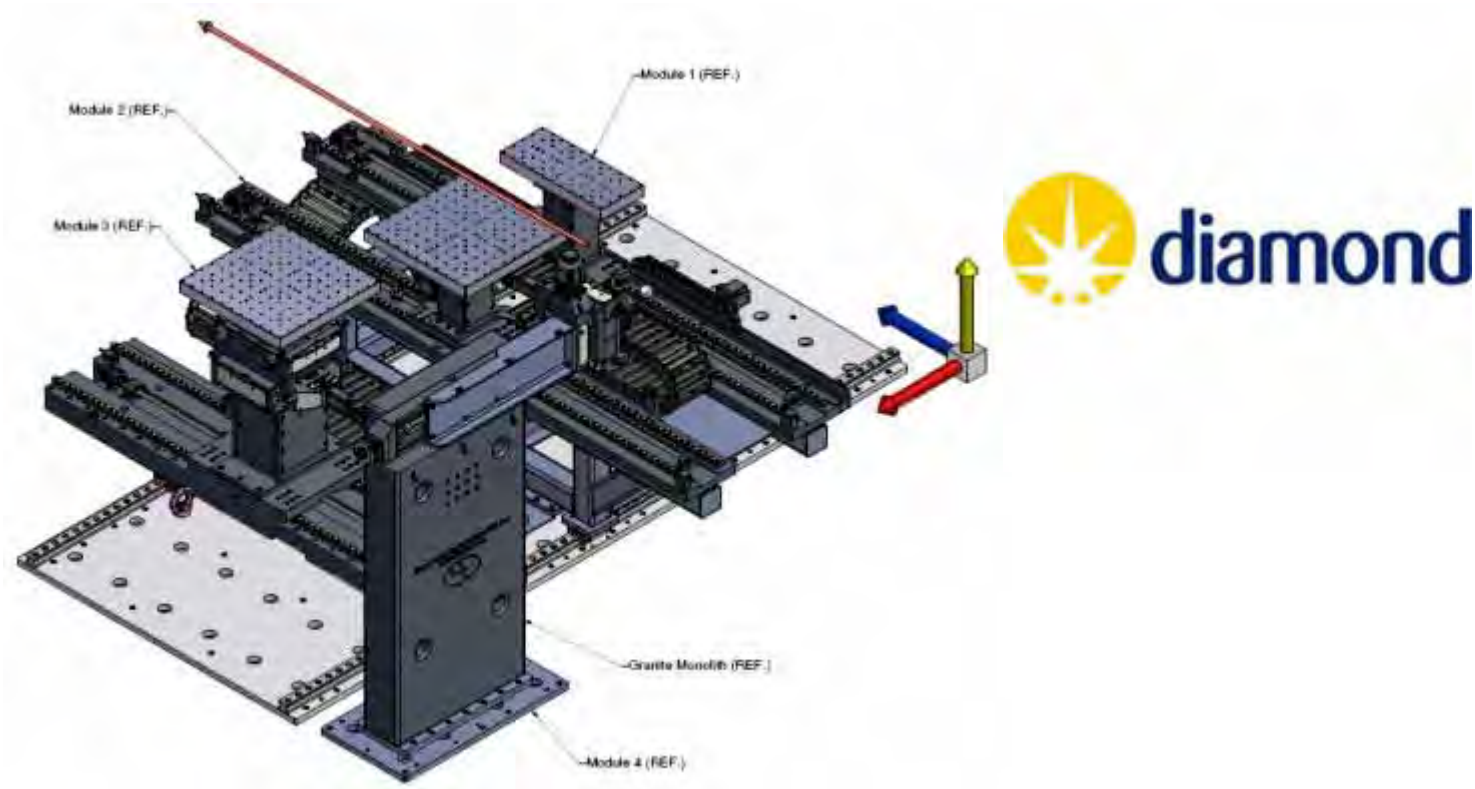
FOURTEEN AXIS HIGH PRECISION SYSTEM

for Diamond Light Source (UK)

For more information please visit:
http://www.adc9001.com/Fourteen-Axis-High-Precision-System-for-DLS

ADC, Inc. designed, manufactured, and installed six high precision systems for sample positioning stages to be used in an x-ray diffraction, x-ray scattering, x-ray imaging and tomography experiments for Diamond Light Source. The stages were designed to position, with micron accuracy, a variety of samples and sample test chambers. Stage motions include orthogonal motions in x, y, and z, tilt motions and rotation motions. In operation, the stages will be used to position and translate samples and test chambers for x-ray diffraction, x-ray scattering, x-ray imaging and tomography experiments. The motion systems used for the experimental tables were based on our standard products and proven in our optical tables





Parts List

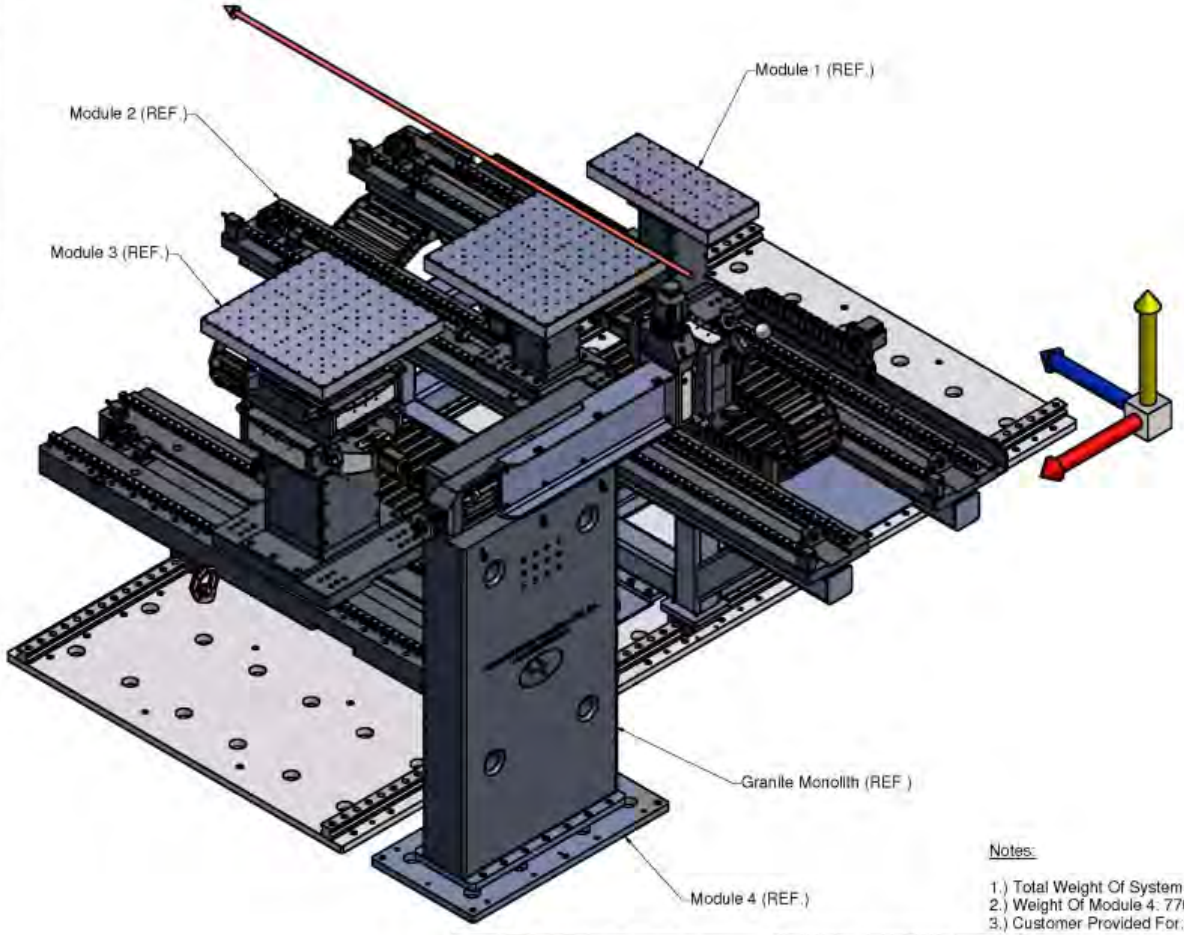
ITEM	QTY	PART #	REV	DESCRIPTION	MATERIAL	MOD	VENDOR
1	1	00014228	0	LDT1 Module 1 Assembly		No	ADC
2	1	00014229	0	LDT1 Module 2 Assembly		No	ADC
3	1	00014230	0	LDT1 Module 3 Assembly		No	ADC
4	1	00014824	0	LDT1 Module 4 Assembly		No	ADC
5	1	00015431	0	LDT Floor Plate Assembly		No	ADC
6	1	00016300	0	LDT1 Module Table Assembly		No	ADC

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	10/3/2009	S Hartman
sht 3	1	Added Travel Chart (sht 1) & Sheet 3	1/22/2010	S Hartman

Module	Travel Direction	Travel Distance
Common (Modules 1,2,&3)	"X" Axis	1300mm
Module 1	"Z" Axis	2000mm
Module 1 (DJ400-100)	"Y" Axis	100mm
Module 2	"Z" Axis	2000mm
Module 2 (DJ400-100)	"Z" Axis	100mm
Module 3	"Z" Axis	1500mm
Module 3 (DJ500-50)	"Y" Axis	100mm
Module 3 (TS-410)	About "X" Axis	+/- 4°
Module 3 (TS-310)	About "Z" Axis	+/- 5°
Module 3 (RS-200)	About "Y" Axis	360°
Module 4 (DS400-200)	"X" Axis	300mm
Module 4 (DS400-50)	"Y" Axis	75mm
Module 4 (TS-300)	About "Y" Axis	+/- 5°
Module 4 (RS-100)	About "X" Axis	360°

"X" Axis = Red Arrow
"Y" Axis = Yellow Arrow
"Z" Axis = Blue Arrow



Notes:

1.) Total Weight Of System: 2,885 kg (6,360 lbs)
2.) Weight Of Module 4: 770.15 kg (1,700 lbs)
3.) Customer Provided For: Diamond Light Source

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

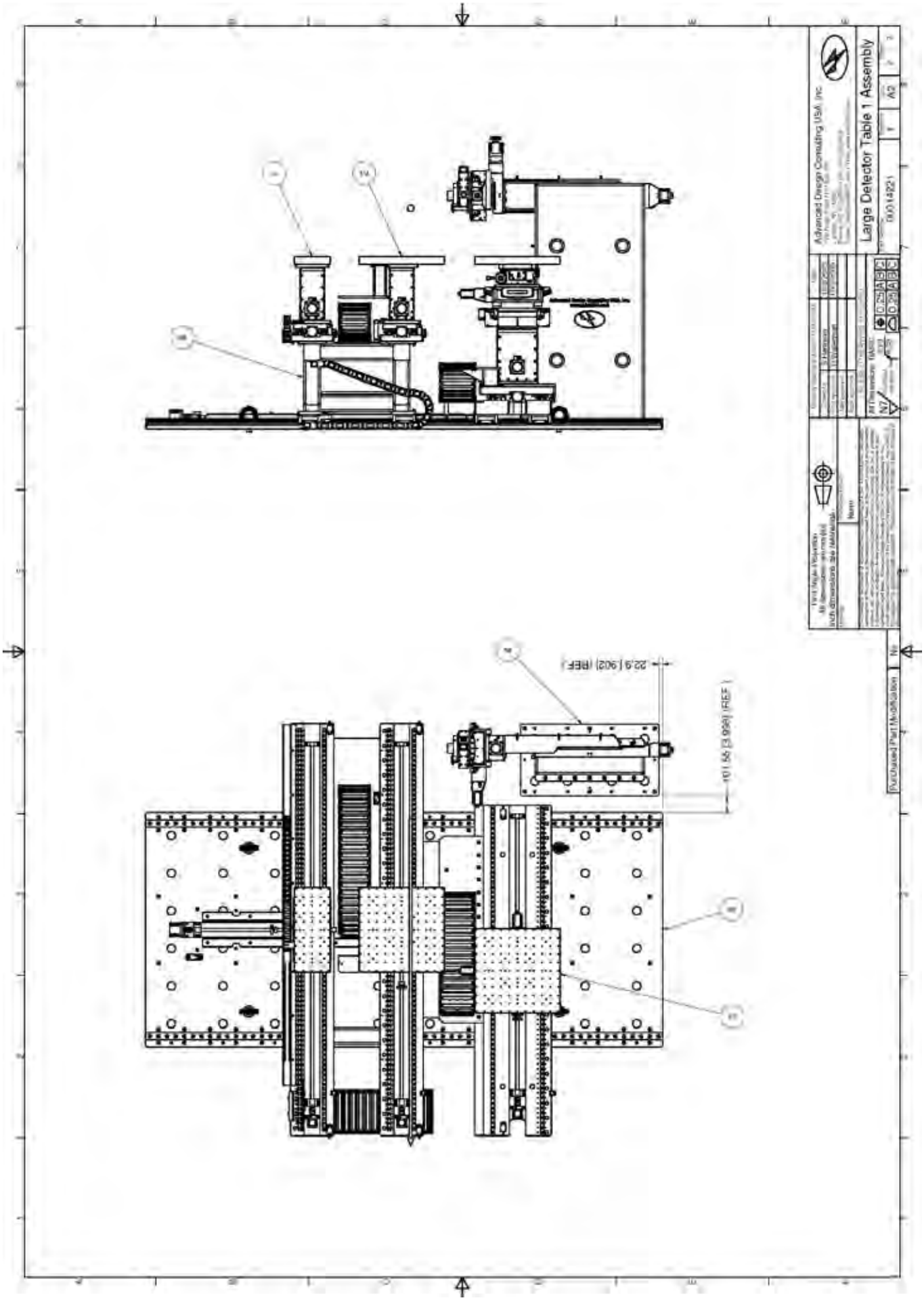
		Date
Drawn by:	S Hartman	10/3/2009
Eng approval:	D Waterman	10/3/2009
Mfg approval:		
Assy approval:		

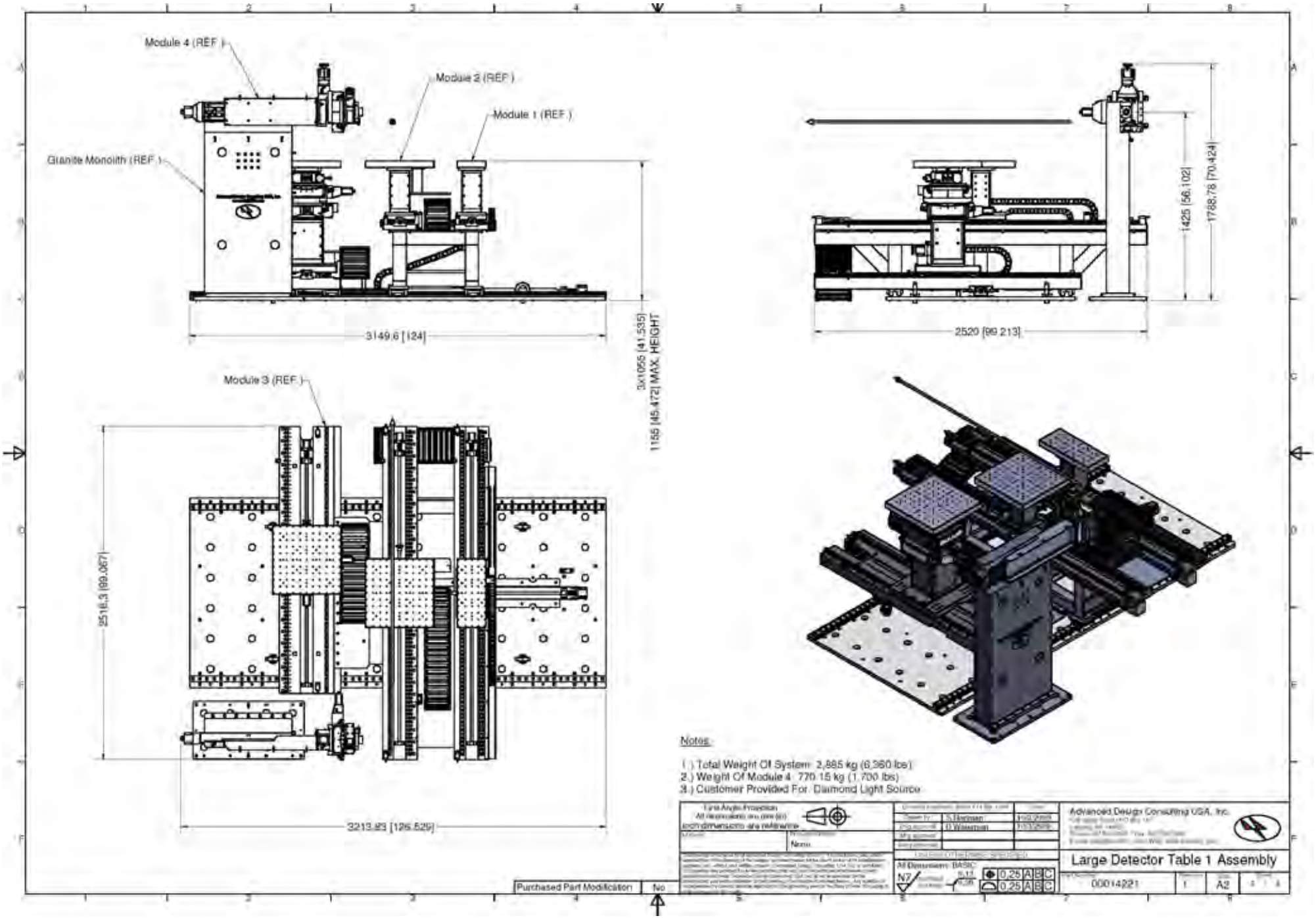
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 Machined surfaces 0.13 / 0.38
0.25 A B C
0.25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road | PO Box 167
Lansing, NY 14882
Phone 607.533.3501 / Fax 607.533.3509
E-mail: adc@adc3501.com / Web: www.adc3501.com

Large Detector Table 1 Assembly

Part Number	Revision	Size	Sheet
00014221	1	A2	1 / 3


Advanced Design Consulting USA, Inc
Large Detector Table 1 Assembly
A2
22.9 [.902] (REF.)
101.56 [3.999] (REF.)


Module 4 (REF.)
Module 2 (REF.)
Module 1 (REF.)
Granite Monolith (REF.)
3149.6 [124]
1155 [45.472] MAX. HEIGHT
1425 [56.102]
1768.78 [70.424]
2520 [99.213]
Module 3 (REF.)
2516.3 [99.067]
3213.93 [126.529]
Notes:
1.) Total Weight Of System: 2,885 kg (6,360 lbs)
2.) Weight Of Module 4: 770.15 kg (1,700 lbs)
3.) Customer Provided For Diamond Light Source
Purchased Part Modification
No
Advanced Design Consulting USA, Inc.
Large Detector Table 1 Assembly
00014221
A2

ELEVEN AXIS CUSTOM DESIGN MOTION

for a Press and a Detector System (APS - USA)

For more Information please visit:
http://www.adc9001.com/products/view/430

A system was designed for University of Chicago (Advanced Photon Source – USA) that allows for the positioning of a large press that is aligned with the beam and a detector, located downstream. Since the press and detector need to move independently, two sub-systems were designed. One sub-system controls the motion of the 600lb press, while the second sub-system supports a detector assembly and provides motion in several directions. Both sub-systems share a set of guide rails which are mounted to a large base plate. This plate is designed to be grouted to the hutch floor, providing a permanent and stable base for the entire system. The sub-systems can be manually moved back and forth on the guide rails and secured using manual rail clamps.

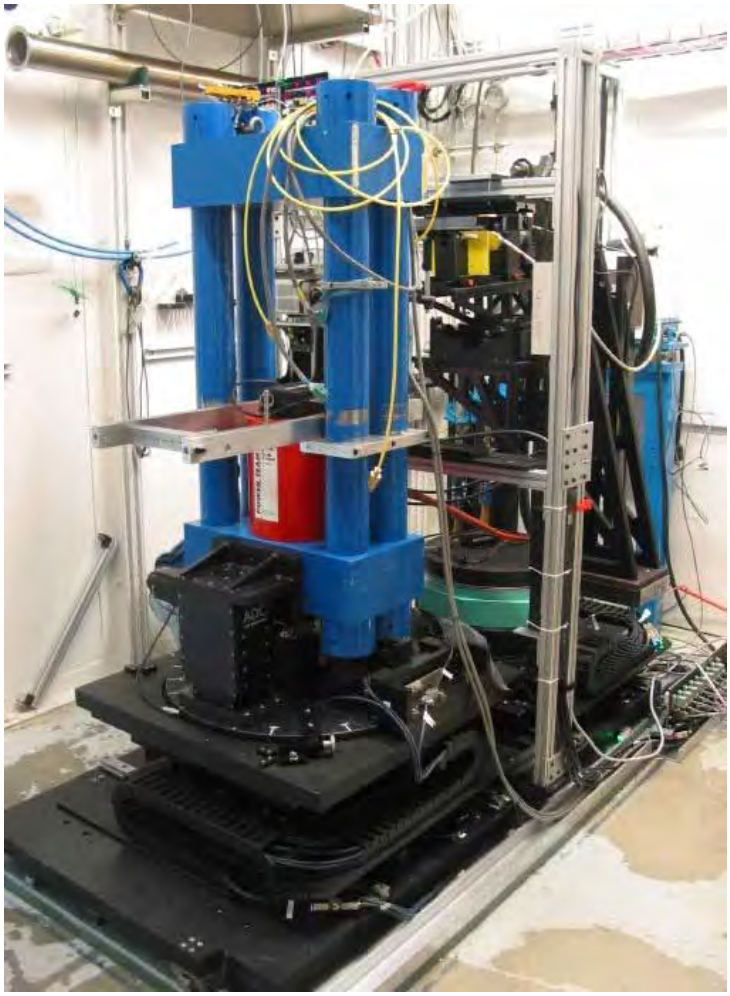
Argonne NATIONAL LABORATORY

Motion	ADC Product Description	Range of Motion	Resolution (unit/step)
Vertical Translation	DJ400-100 Crossed Roller Jacks	+/- 50mm	0.182 µm
Transverse to Beam	Custom Linear Slide	+/- 50mm	0.455 µm
Beam Direction	Custom Linear Slide	+/- 50 mm	0.455 µm
Yaw About Vertical Axis	Motorized Attachment for Rotation	+/-3°	0.03 degrees

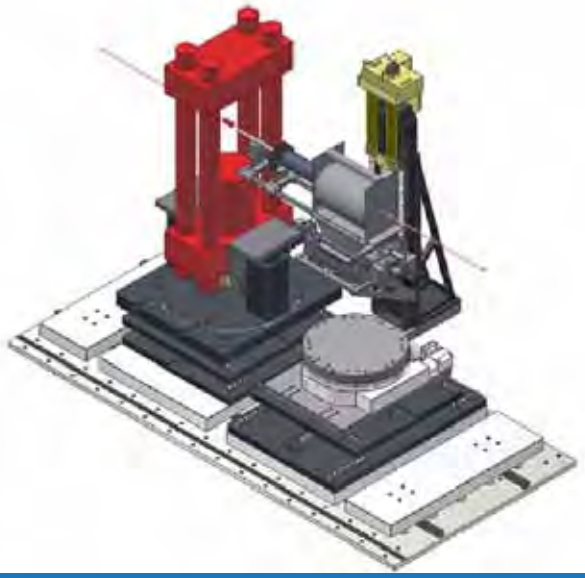
Table 1 Summary of motion specifications for the press sub-system

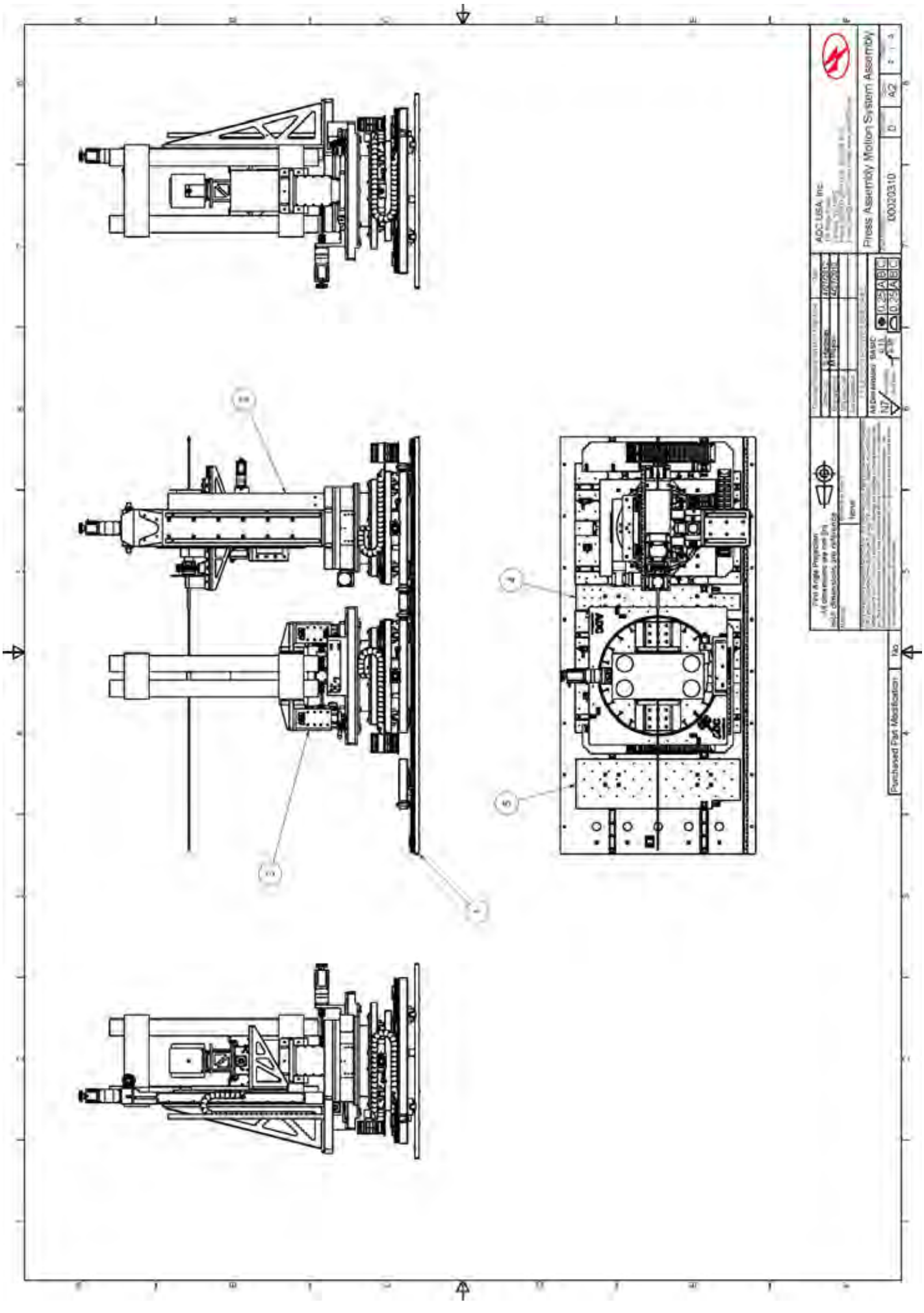
Motion	ADC Product Description	Range of Motion	Resolution (unit/step)
Vertical Translation	DS500-200 with Constant Force Spring	+/- 200mm	0.455 µm
Transverse to Beam	Custom Linear Slide	+/- 200 mm	0.455 µm
Beam Direction	Custom Linear Slide	+/- 50 mm	0.455 µm
Rotation In Vertical Plane	TSW300-20 Tilt Stage	+/-18°	0.00278 deg.

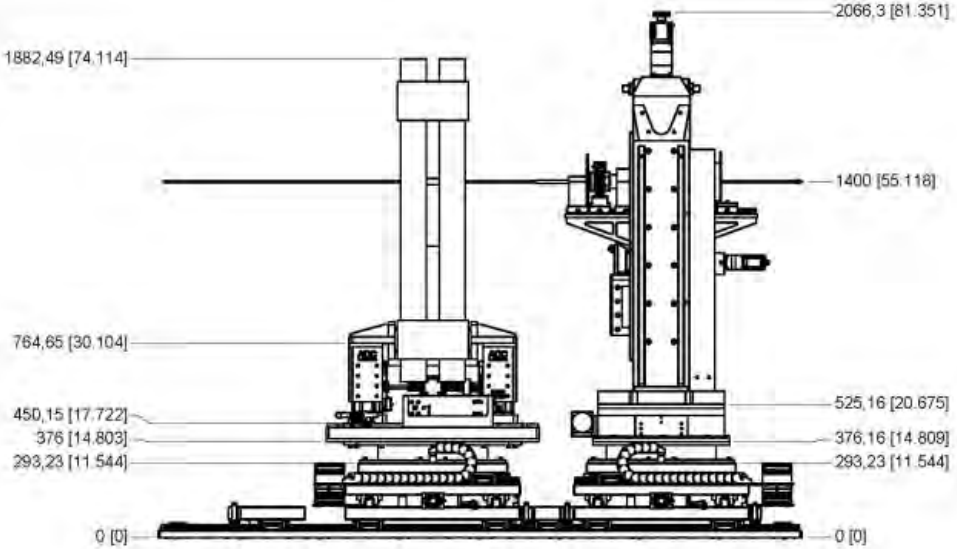
Table 2 Summary of motion specifications for the detector sub-system

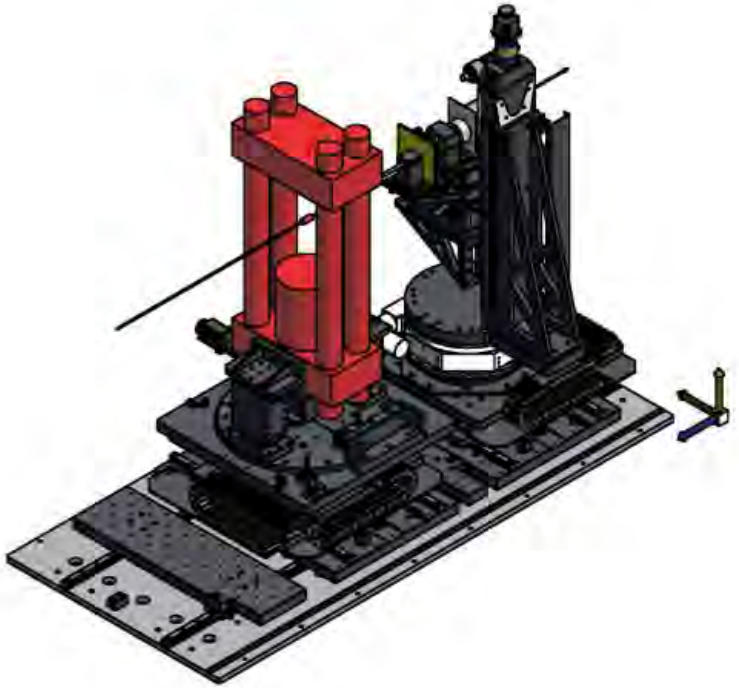


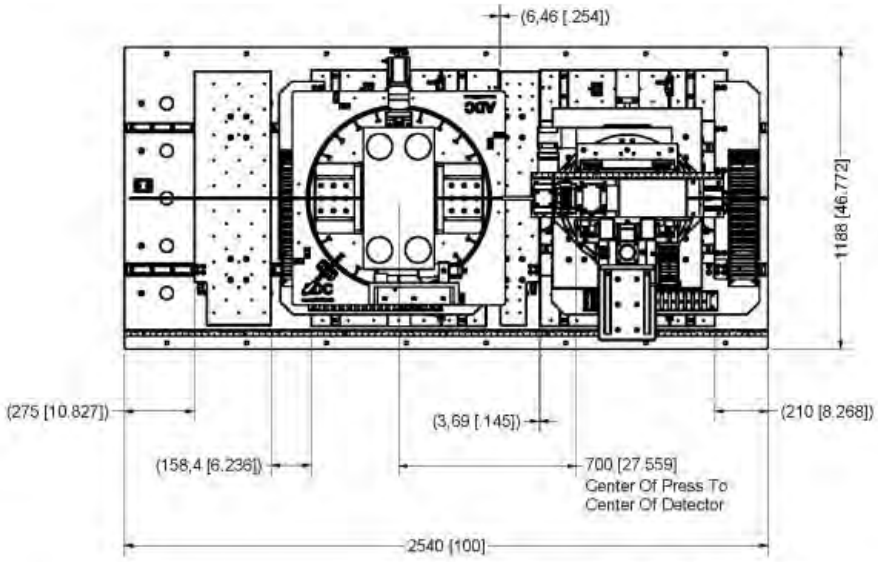

POWER TEAM




ADC USA, Inc.
Press Assembly Motion System Assembly
100020310
D
A2
Purchased Part Modification
No







Notes:

1.) Total Weight Of System (W/O Customer Supplied Press): 1,500kg (3,310 lbs)
2.) Customer Provided For: University Of Chicago

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI-Y14.5M-1982	Date	ADC USA, Inc. 120 Ridge Road Lansing, NY 14882 Phone: 607.533.3691 / Fax: 607.533.3618 E-mail: adc@adc3691.com / Web: www.adcusa.com
	Drawn by: S. Hartman	4/27/2012	
	Eng approval: M Popov	4/27/2012	
	Mfg approval:		
Material:	Quality Assur approval:		
Protective Finish: None	UNLESS OTHERWISE SPECIFIED:		Press Assembly Motion System Assembly
	All Dimensions: BASIC		
	N7 / 0.13 / 0.38	0.25 A B C / 0.25 A B C	Part Number: 00020310 / Revision: 0 / Size: A2 / Sheet: 3 / 3

Purchased Part Modification: No

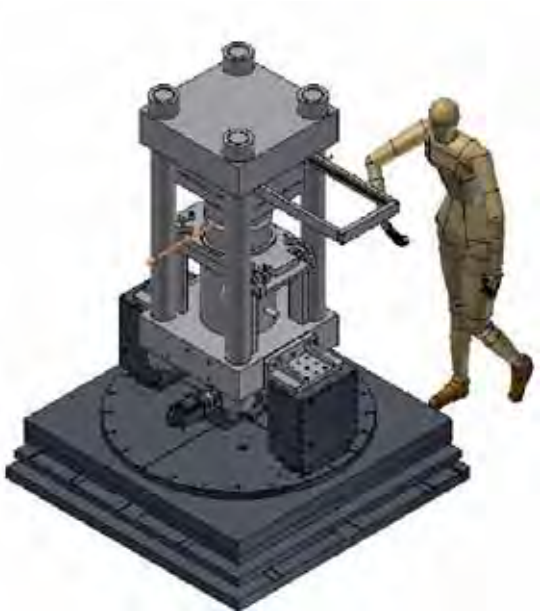
FOUR AXIS CUSTOM DESIGN MOTION

for a Press Manipulation System

For more information please visit:
http://www.adc9001.com/products/view/431

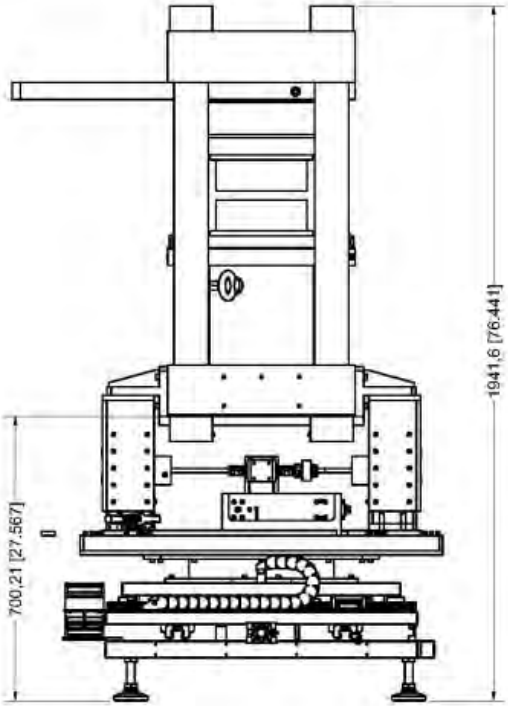
Australian Synchrotron

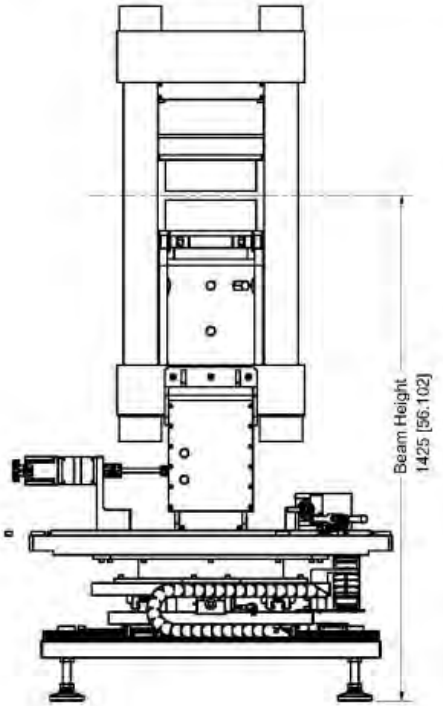
A system was designed for Macquarie University – Australian Synchrotron, which allows for multi-axis positioning for a 3,200 lb. press. There are four degrees of freedom for the press motion system. Vertical motion is provided by two ADC utility jacks, each having a load capacity of 25 kN (5,620 lbs.). The two jacks are driven simultaneously using a bevel gearbox. Custom linear slides provide motion transverse to the beam and in the beam direction. Linear travel is supported by THK HSR35 guide rails and bearings. A high-load-capacity manual rotation stage allows for rough positioning of the press and sample alignment. Vertical and linear motions are equipped with encoders to provide closed-loop precision motion. The table below provides the product description, range of motion, and resolution for each degree of freedom on the press manipulation system.

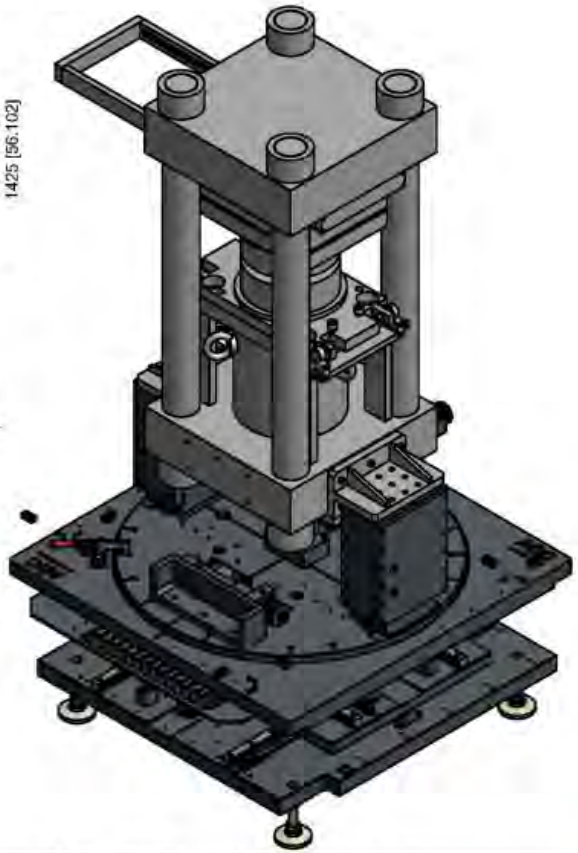


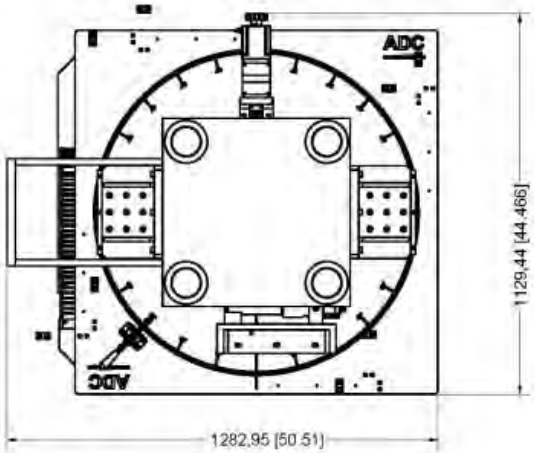
Motion	ADC Product Description	Range of Motion	Resolution (unit/step)
Vertical Translation	UJ-25kN-100-C Utility Jack	+/- 50mm	1.04 µm
Transverse to Beam	Custom Linear Slide	+/- 200mm	0.455 µm
Beam Direction	Custom Linear Slide	+/- 50 mm	0.455 µm
Yaw About Vertical Axis	Manual Rotation Stage	+/-180°	-

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Concept Drawing	9/6/2012	M Popov









Note: Jacks are shown at mid travel of 50 mm

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1982	Date:	ADC USA, Inc 135 Ridge Road Lansing, NY 14882 Phone: (607) 533-3631 / Fax: (607) 533-3619 E-mail: adc@adc3631.com / Web: www.adc3631.com
Material:	Drawn by: M Popov	9/6/2012	
Protective Finish: None	Engineering: M Popov		
	MS approval:		
	Assy approval:		
	UNLESS OTHERWISE SPECIFIED:		Press Manipulation Assembly
	All Dimensions BASIC N7 Machined surfaces 0,13 / 0,38 0.25 A B C 0.25 A B C		Part Number: Macquarie_Press_System Revision: 0 Size: A2 Sheet: 1 / 1

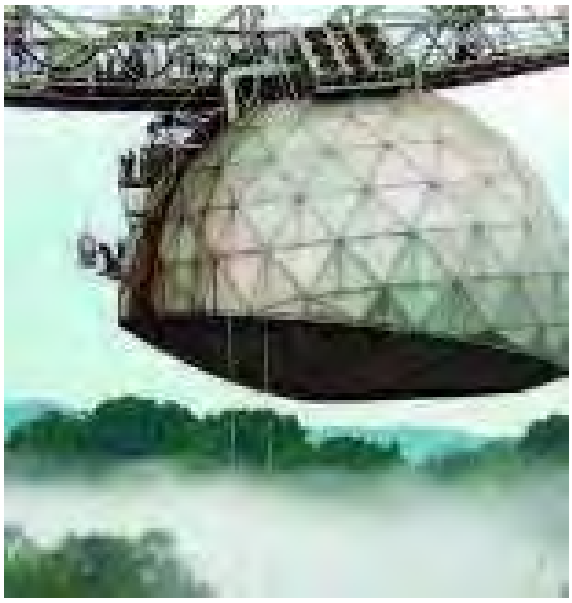
Purchased Part Modification	No

ARECIBO OBSERVATORY UPGRADE

for a Press Manipulation System

For more information please visit:
http://www.adc9001.com/Arecibo-Observatory-Upgrade

The Arecibo Observatory telescope in Arecibo, Puerto Rico, the largest and most sensitive single dish radio telescope in the world, got a good deal more sensitive. Thanks to ADC! In April 2004 the telescope got a new "eye on the sky" that helped turn the huge dish, operated by Cornell for the National Science Foundation, into the equivalent of a seven-pixel radio camera. The complex new addition to the Arecibo telescope was hauled 150 meters (492 feet) above the telescope's 1,000-footdiameter (305 meters) reflector dish starting in the early morning hours. The device, the size of a washing machine, took 30 minutes to reach a platform inside the suspended Gregorian dome, where ultimately it was cooled and then connected to a fiber optic transmission system leading to ultra-high speed digital signal processors. ADC's part included designing a large turntable, capable of positioning the receiver heads to within .5 mm (taking into consideration the weight budget and achieving the required velocity). ADC also designed the positioning systems for the tertiary sub reflector and the eight new receiver heads. This project was part of a $25 million upgrade to the Arecibo facility. A Gregorian reflector system now hangs from the main detector area 137 meters (450 feet) above the main reflector dish. The Gregorian dome contains two reflector dishes, a radar transmitter, and microwave receivers. The secondary and tertiary reflectors channel the signal from the main reflector into the receivers. The CH and Gregorian drive systems met their tracking specifications with no problems, and in fact the carriage house exceeded its specifications by a large factor. More information about the observatory and its facilities is available at http://www.astro.cornell.edu/facilities/arecibo.shtml.

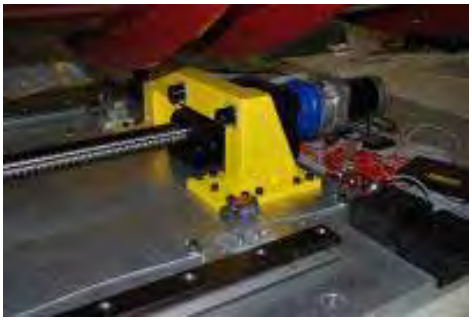


SMALL-ANGLE NEUTRON SCATTERING

(SANS) Instrument

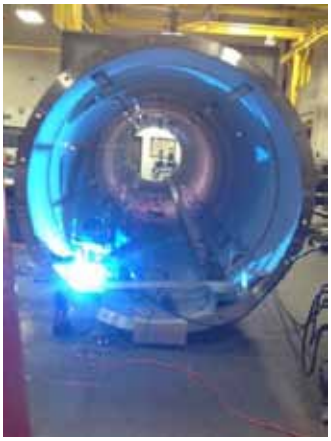
http://www.adc9001.com/products/view/461

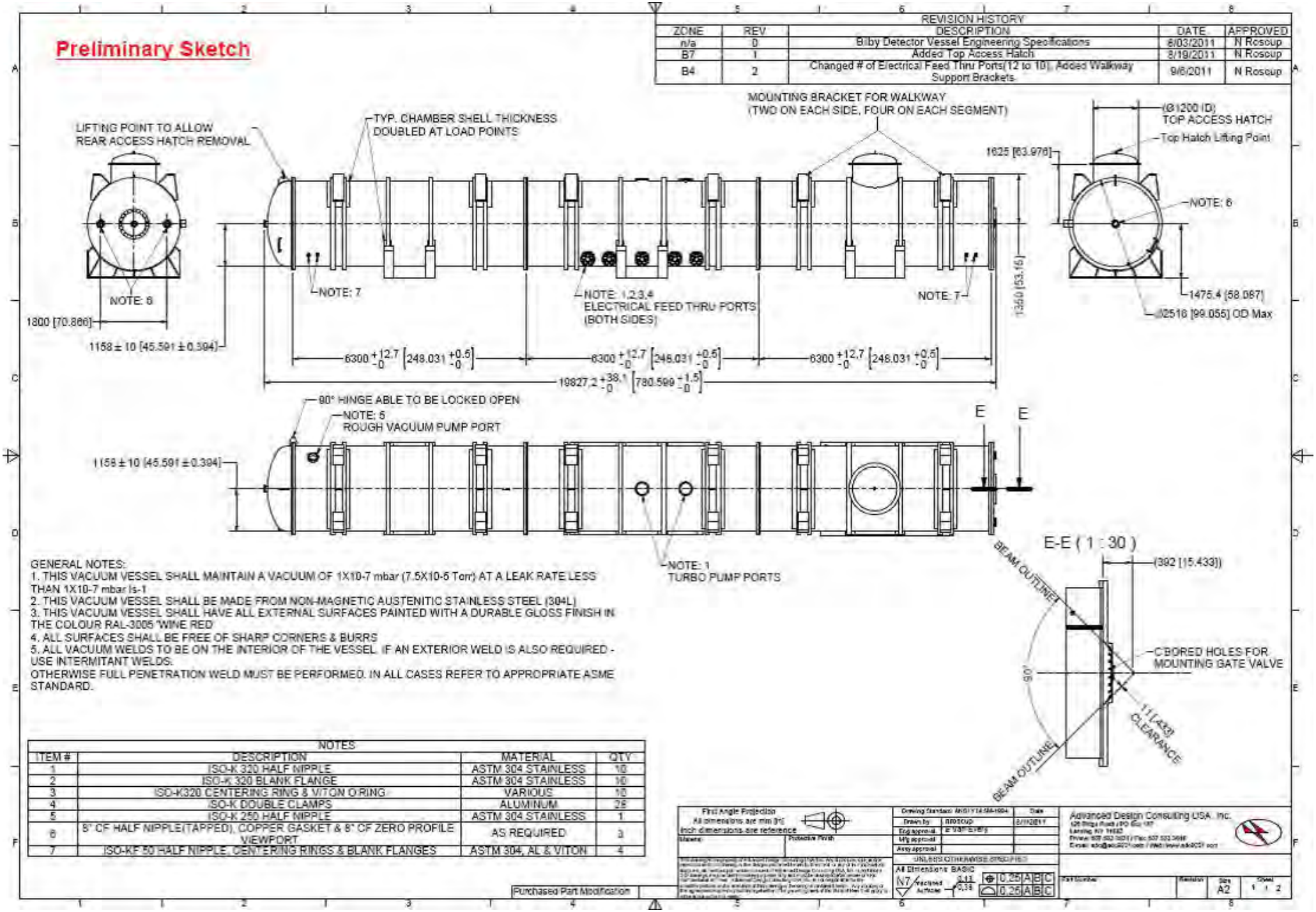
The Time-of-Flight Small Angle Neutron Scattering (ToF SANS) instrument is being built at reactor source, at ANSTO, Australia. SANS is complex machine. One of key parts of it is large detector vessel. ADC has taken the overall concept for the vessel developed by ANSTO designers, and provided final engineering design and then built the detector vessel as imaged below. In addition the entire vessel can be accurately moved 1.5 meters using external rails and a ball screw. The front end consists of a sample window and 630 mm gate valve. The rear of the vessel has a hatch with an articulated hinge. There is a central man-way hatch on the top and 17 ports for vacuum pumps, electrical, feed through, and sensors. The vessel was designed in compliance with ASME BPVC, Section VIII, Division 1, 2011 Revision, with exceptions for good vacuum practice and approved by the Australian Work Cover Authority.









Preliminary Sketch
REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Bilby Detector Vessel Engineering Specifications | 8/03/2011 | N Roscup
B7 | 1 | Added Top Access Hatch | 8/19/2011 | N Roscup
B4 | 2 | Changed # of Electrical Feed Thru Ports(12 to 10), Added Walkway Support Brackets | 9/6/2011 | N Roscup
LIFTING POINT TO ALLOW REAR ACCESS HATCH REMOVAL
TYP. CHAMBER SHELL THICKNESS DOUBLED AT LOAD POINTS
MOUNTING BRACKET FOR WALKWAY (TWO ON EACH SIDE, FOUR ON EACH SEGMENT)
(Ø1200 ID) TOP ACCESS HATCH
Top Hatch Lifting Point
1625 [63.976]
NOTE: 6
1475.4 [58.087]
Ø2516 [99.055] OD Max
NOTE: 8
1800 [70.866]
1158 ± 10 [45.591 ± 0.394]
NOTE: 7
NOTE: 1,2,3,4 ELECTRICAL FEED THRU PORTS (BOTH SIDES)
NOTE: 7
1360 [53.15]
6300 +12.7 -0 [248.031 +0.5 -0]
6300 +12.7 -0 [248.031 +0.5 -0]
6300 +12.7 -0 [248.031 +0.5 -0]
19827.2 +38.1 -0 [780.599 +1.5 -0]
90° HINGE ABLE TO BE LOCKED OPEN
NOTE: 5 ROUGH VACUUM PUMP PORT
1158 ± 10 [45.591 ± 0.394]
E
E
NOTE: 1 TURBO PUMP PORTS
E-E (1 : 30)
(392 [15.433])
BEAM OUTLINE
C'BORED HOLES FOR MOUNTING GATE VALVE
90°
111 [4.33] CLEARANCE
BEAM OUTLINE
GENERAL NOTES:
1. THIS VACUUM VESSEL SHALL MAINTAIN A VACUUM OF 1X10-7 mbar (7.5X10-5 Torr) AT A LEAK RATE LESS THAN 1X10-7 mbar ls-1
2. THIS VACUUM VESSEL SHALL BE MADE FROM NON-MAGNETIC AUSTENITIC STAINLESS STEEL (304L)
3. THIS VACUUM VESSEL SHALL HAVE ALL EXTERNAL SURFACES PAINTED WITH A DURABLE GLOSS FINISH IN THE COLOUR RAL-3005 "WINE RED"
4. ALL SURFACES SHALL BE FREE OF SHARP CORNERS & BURRS
5. ALL VACUUM WELDS TO BE ON THE INTERIOR OF THE VESSEL. IF AN EXTERIOR WELD IS ALSO REQUIRED - USE INTERMITANT WELDS.
OTHERWISE FULL PENETRATION WELD MUST BE PERFORMED. IN ALL CASES REFER TO APPROPRIATE ASME STANDARD.
NOTES
ITEM # | DESCRIPTION | MATERIAL | QTY
1 | ISO-K 320 HALF NIPPLE | ASTM 304 STAINLESS | 10
2 | ISO-K 320 BLANK FLANGE | ASTM 304 STAINLESS | 10
3 | ISO-K320 CENTERING RING & VITON O'RING | VARIOUS | 10
4 | ISO-K DOUBLE CLAMPS | ALUMINUM | 28
5 | ISO-K 250 HALF NIPPLE | ASTM 304 STAINLESS | 1
6 | 8" CF HALF NIPPLE(TAPPED), COPPER GASKET & 8" CF ZERO PROFILE VIEWPORT | AS REQUIRED | 3
7 | ISO-KF 50 HALF NIPPLE, CENTERING RINGS & BLANK FLANGES | ASTM 304, AL & VITON | 4
First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
Drawing Standard: ANSI Y14.5M-1994
Drawn by: NROSCUP
Eng approval:
Mfg approval:
Assy approval:
Date: 8/19/2011
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N7
0.25 A B C
0.25 A B C
Purchased Part Modification
Advanced Design Consulting USA, Inc.
Size: A2
Sheet: 1 of 2

SELECTOR WHEEL SYSTEM

for SANS Instrument

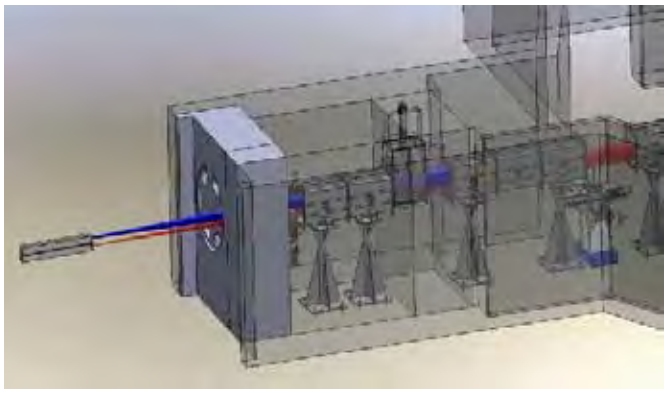
For more information, please visit:
http://www.adc9001.com/products/view/481

This system is for the Bragg Institute, a division of ANSTO, to provide a selector wheel shutter unit for their Radiography Instrument.
This new state-of-the-art instrument is to support the area of neutron imaging research (neutron radiography/tomography). It provides university, government and industry-based users of the new ANSTO research reactor OPAL a new world-class powerful tool for nondestructive real space testing and evaluation, with properties complementary to x-rays and synchrotron methods. The instrument covers a large area of scientific research from medical applications, biology and environmental science, geology and engineering science as well industrial application, which are key areas for future technology and industrial developments in Australia.

The selector wheel shutter unit combines two different functions in one item. The first function is to work as an instrument shutter and the second one is to work as a selector wheel.

The selector wheel assembly component as suggested in its name provides selective aperture options for high resolution or phase contrast imaging and separate the two beams coming from the in-pile collimator. One beam is blocked and the other passes the selector wheel insert is used for an imaging experiment. A positioning accuracy of 0.01° step width is achieved.

The selector wheel was designed with a stepped housing to mate with the inserts and prevent direct shine from the beam.



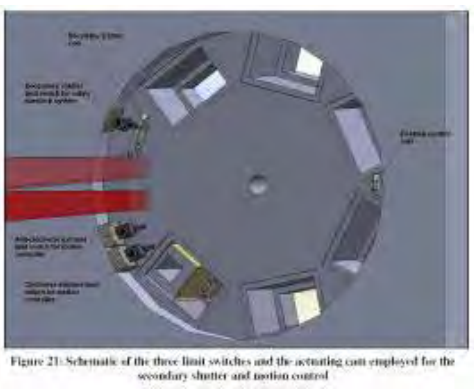
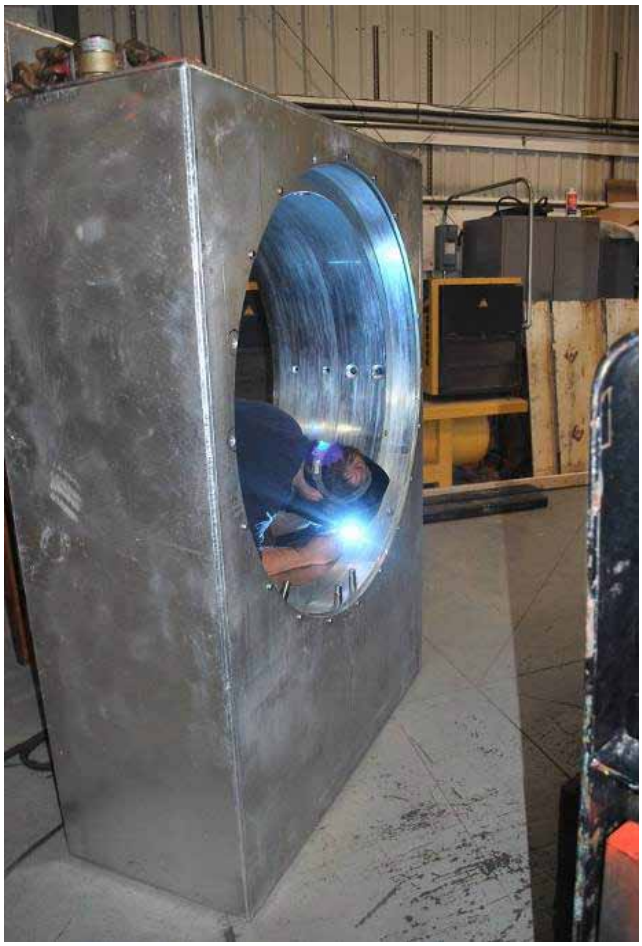
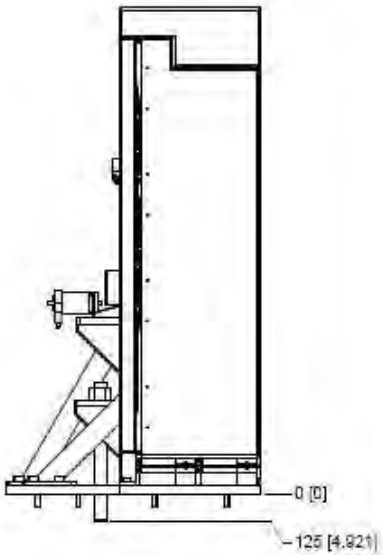
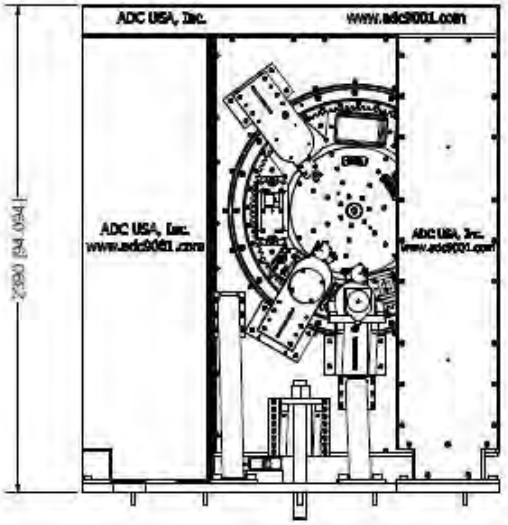


Figure 21: Schematic of the three limit switches and the actuating cam employed for the secondary shutter and motion control


ADC
SHARP

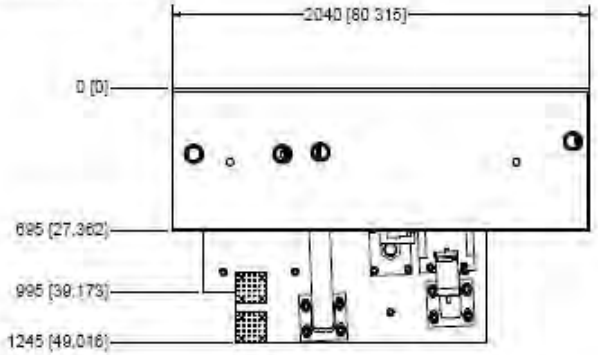






SPECS:

Total Weight: 144214.5 kg [31,800 lbs]
Rotational Speed:1.4 RPM
Minimum Shielding Thickness: 400 mm
6 Unique inserts with unique tapers allow the beam to be collimated



First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994		Date	ADC USA, Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3610 E-mail: adc@adc9001.com / Web: www.adc9001.com
Material	Protective Finish	Drawn by	M.Popov	4/21/2012	
	None	Eng approval	M.Popov	4/21/2012	
		Mfg approval			
		Appr approval			
UNLESS OTHERWISE SPECIFIED:					ANSTO Selector Wheel Top Level Assembly
All Dimensions BASIC					
N7 machined surface	0.13 / 3.38	⌖ 0.25 A B C ⏥ 0.25 A B C			Part Number: 00020556 | Revision: 0 | Size: A2 | Sheet:
Purchased Part Modification: No					

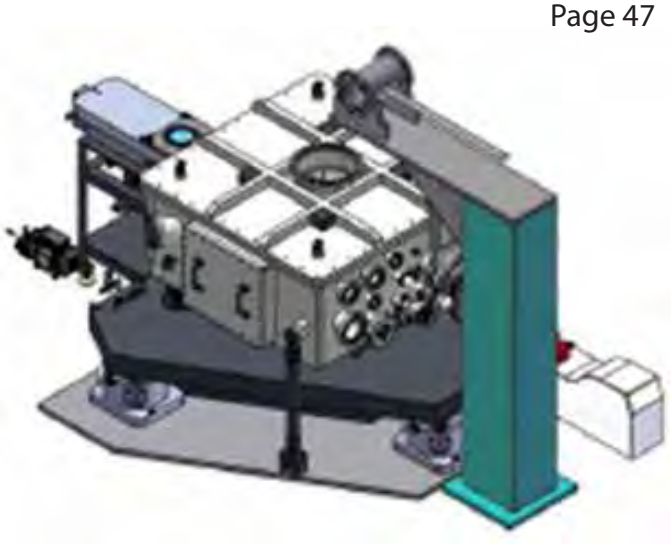
CUSTOM HIGH PRECISION SYSTEMS –VACUUM

Use the following link to view examples of ADC's High Precision Systems:
http://www.adc9001.com/products/show_list/id/106

Page 45

Double Crystal Deflector (DLS)

Page 47



High-resolution extreme-ultraviolet-light (EUV) microscope

Page 50

Colorado Gimbal System for MOBI Vacuum

Page 52

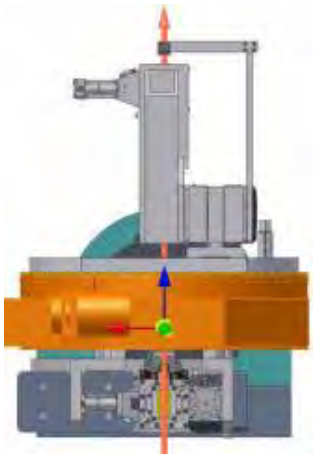
XYZ & Multistage Manipulators

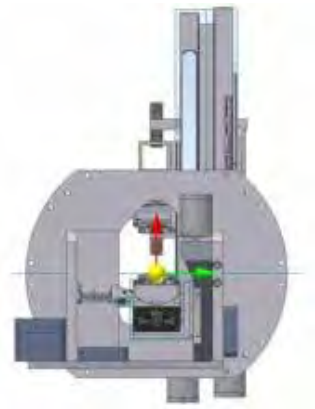
HIGH VACUUM DOUBLE CRYSTAL DEFLECTOR ASSEMBLY

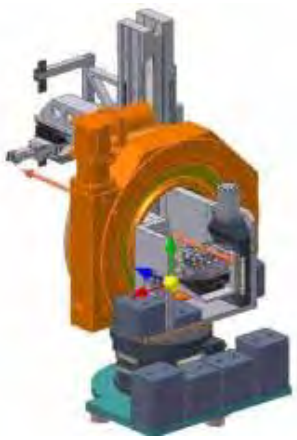
for Diamond Light Source

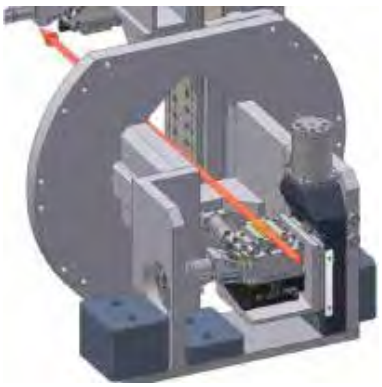
For more information please visit:
http://www.adc9001.com/DLS-Double-Crystal-Deflector

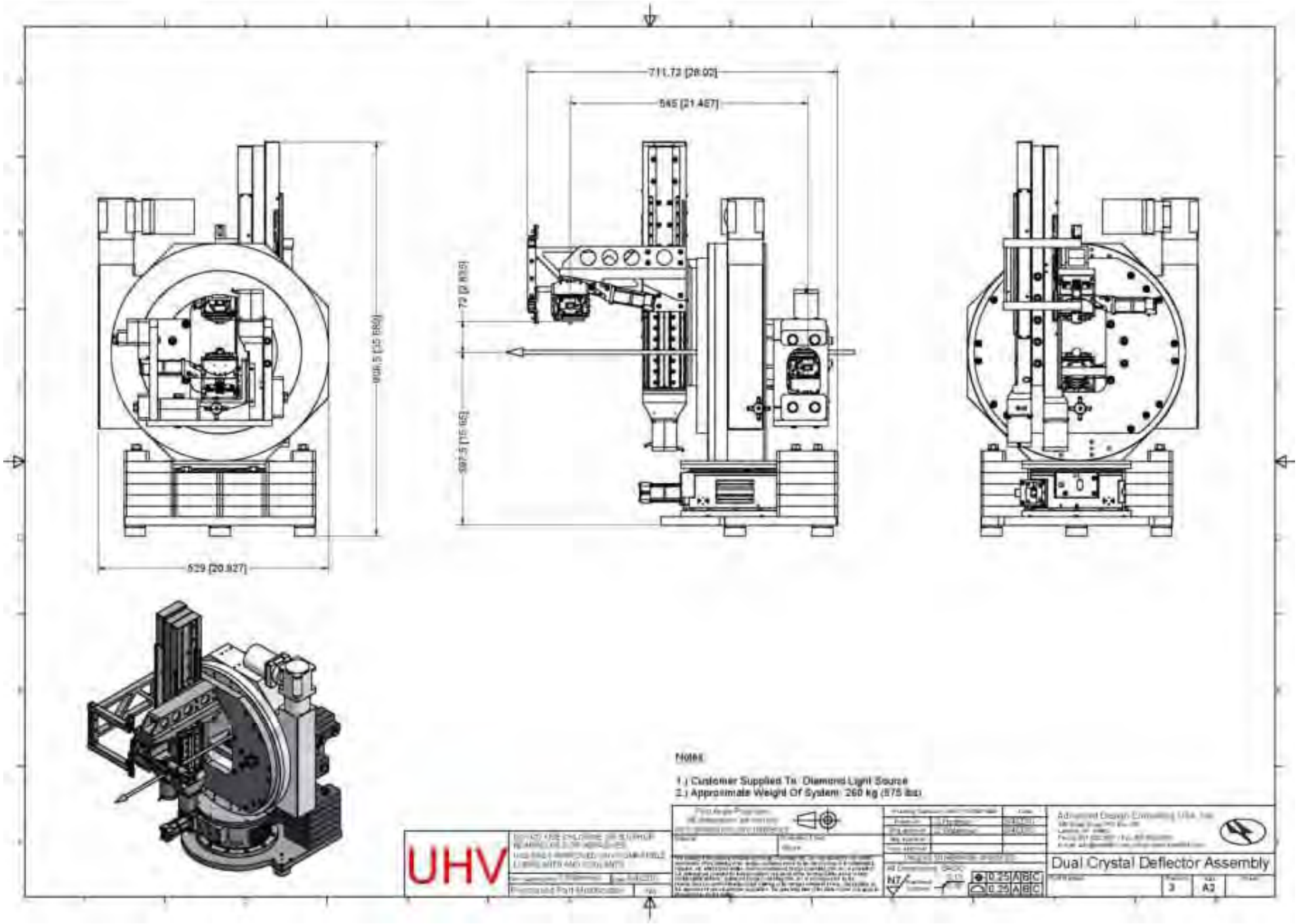
This is a custom double crystal reflector system. The two crystals reflections being used to deflect the beam are Si(111) and Si(220). These crystals are mounted on a stage that allows for adjustable alignment within the beamline, and for their rotation around the beam axis. The radial separation of the second crystal is variable. The optics stage is adjustable in the horizontal and vertical planes and for alignment in pitch and yaw to allow the center of rotation to be adjusted










711.72 [28.02]
545 [21.457]
72 [2.835]
397.5 [15.65]
529 [20.827]
UHV
Notes
1.) Customer Supplied To: Diamond Light Source
2.) Approximate Weight Of System: 260 kg (575 lbs)
Dual Crystal Deflector Assembly
3
A2

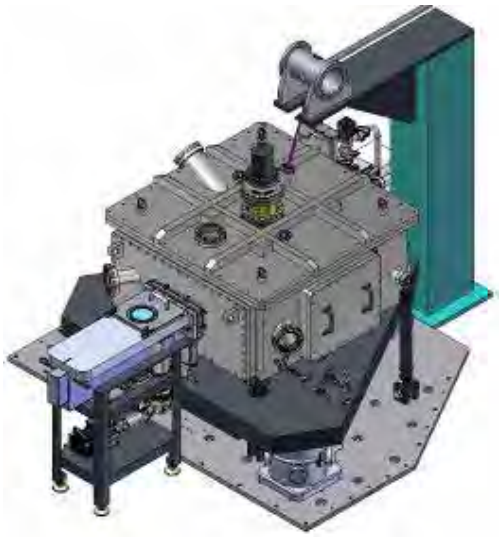
EUV MASK MICROSCOPE

for Lithography Generations Reaching 8 nm

For more information please visit:
http://www.adc9001.com/products/view/666

Lawrence Berkeley National Laboratory

ADC designed, built and installed SHARP (the SEMATECH High-NA Actinic Reticle review Project) an actinic, synchrotron-based microscope dedicated to extreme ultraviolet (EUV) photomask research for Lawrence Berkeley National Laboratory. The system demonstrated the addition of complementary imaging modes to the SHARP EUV mask microscope, in an effort to extract additional information from actinic photomask imaging, improve navigation and enhance defect detection.



ADC USA, Inc. is introducing a state-of-the-art high-resolution extreme-ultraviolet-light (EUV) microscope. This system contains a state-of-the-art high-resolution extreme-ultraviolet-light (EUV) microscope for imaging of EUV photomasks. These photomasks are critical components in photolithography—the process used to mass-produce semiconductor electronic devices. Major components of the system include: a large vacuum chamber to house the experimental area; active vibration control system; 3 axis in-vacuum motion stages; and an automated loadlock for inserting the EUV photomasks. The system is designed for nm-scale stability, light exclusion (internal darkness), and ease of maintenance. It operates near ultra-high vacuum (UHV) conditions, requiring a base pressure of 1e-7 Torr, and therefore has a high degree of cleanliness and the exclusive use of compatible materials and components that do not outgas. Owing to the high resolution of the microscope (down to 30-nm), the system is designed for nm-scale relative stability of the critical mask and (zone plate) lens over exposure time periods up to one minute. It is designed so internal components do not radiate light into the chamber, or "glow" from internal heat generation. A mask-transfer system enables masks to be loaded and unloaded from the system chamber. The mask transfer system gently, cleanly, and safely handles the mask loading, installation, unloading and removal. The Mask XYZ stage is the heart of the system and the primary navigation tool in the system. Specifications for the XYZ stages are as follows:

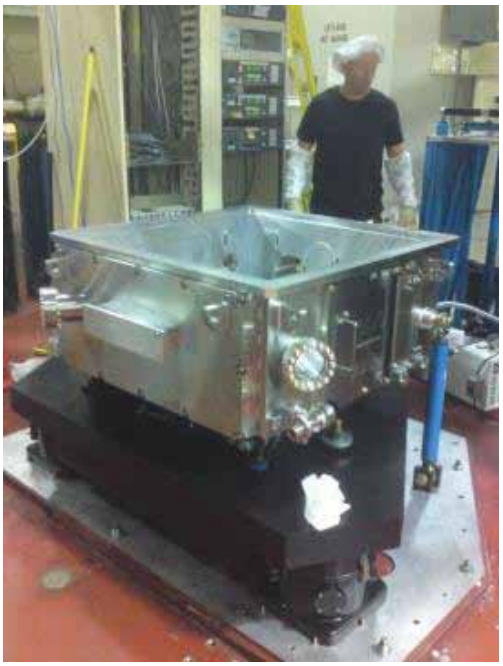
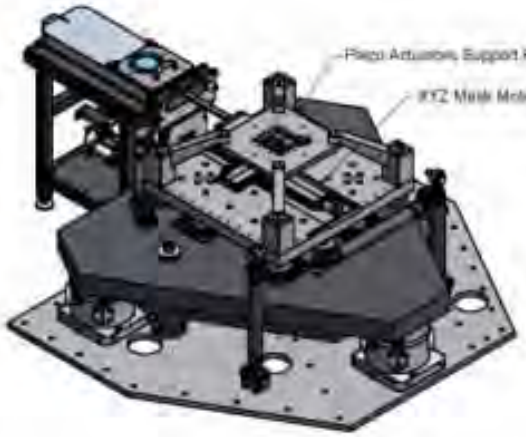


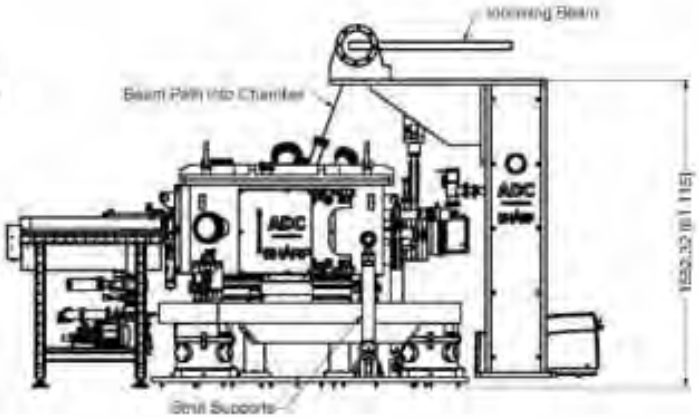
Table 1. Mask stage specifications. Axis	Travel (mm)	Resolution (nm)	Repeatability (µm)
X	250.00	< 100	±0.50
Y	250.00	< 100	±0.50
Z	5.00	< 50	±0.50

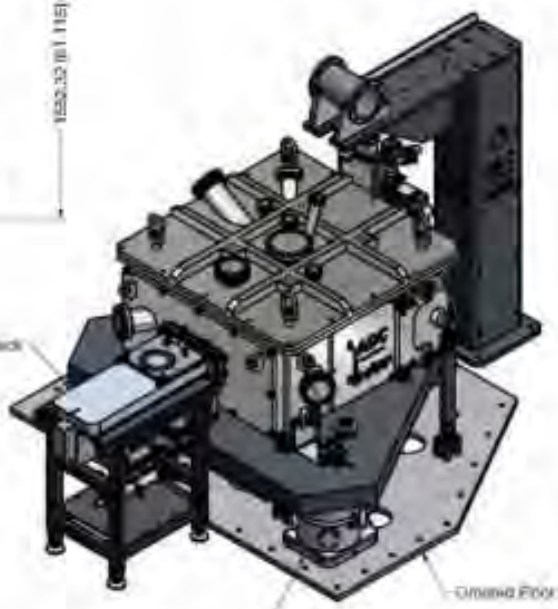

ADC
SHARP

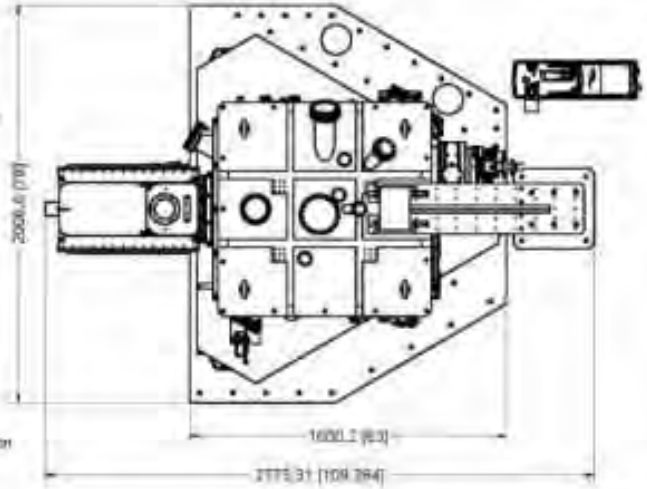

ADC
SHARP



Internal View







Notes

The SHARP instrument is designed for the inspection of EUV photolithography masks. Key features of the system include low particle generation, nm-scale stability and ease of maintenance. Due to long exposure times of up to 1 minute, relative stability and resolution of the mask and lens components are critical.

System Support Features
- Grouted Floor Plate
- TMC Stacis 2100 Active Vibration Isolator Pads to Support Internal Motions
- Rigid 6 Strut Support System for Vacuum Chamber

Vacuum Chamber
- Base Pressure 10E-7 Torr
- 5x Viewports for Tracking the Mask and Optics Location
- Pumping System: Pfeiffer 600M Turbo-Pump, ACP 28 Roughing Pump
- Venting System: Swagelok Bellows Valves, High Purity PALL Filter

Internal Vacuum Assembly
- Large, Rigid Support Structure for XYZ Motion System
- Upper Platform for Piezo Stages that Manipulate Optical Equipment

XYZ Mask Motors
- X-Axis (Beam Direction): Micos LS-110 500mm Travel, 0.1 micron Resolution
- Y-Axis (Transverse to Beam): Micos LS-110 500mm Travel, 0.1 micron Resolution
- Z-Axis (Vertical): Micos UPL-120 10mm Travel, 0.1 micron Resolution

Mask Transfer
- TEAM-Mate Automatic Load Lock for Positioning Mask in the Chamber

Approximate Weight: 3238kg [7081lb]

Purchased Part Modification: No

Advanced Design Consulting USA, Inc.

SHARP Instrument Assembly

LASP GIMBAL SYSTEM

MOBI High Vacuum

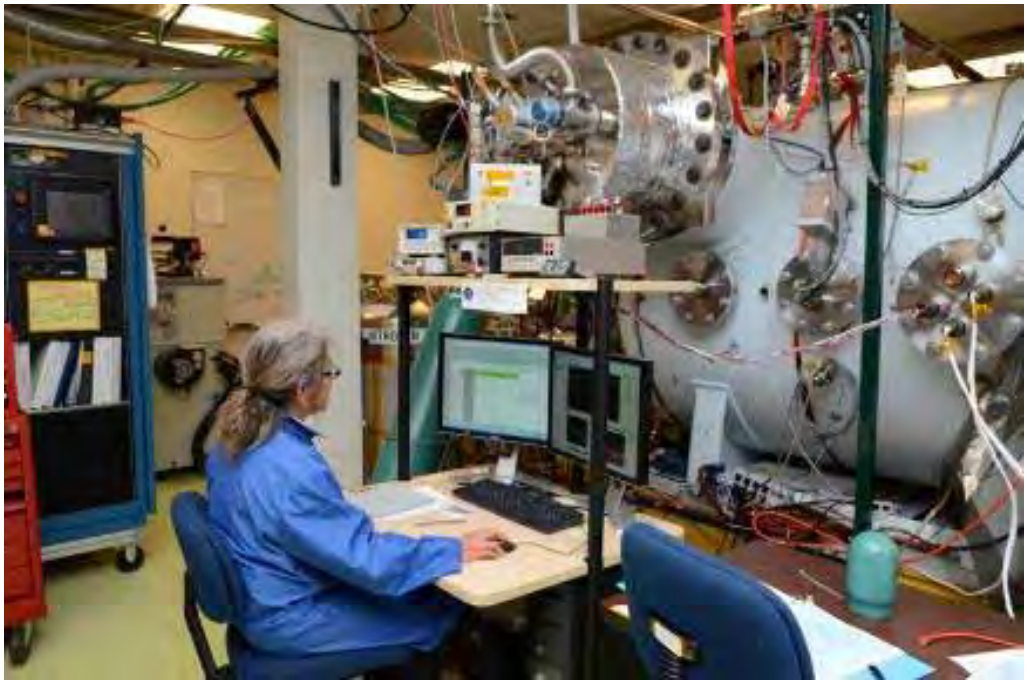
For more information please visit:
http://www.adc9001.com/products/view/464

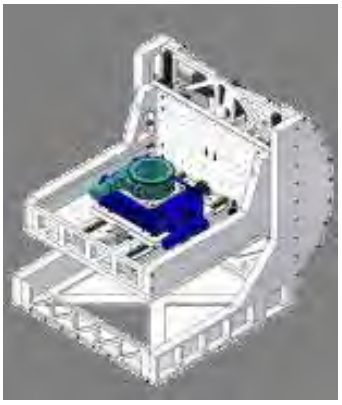
A high precision motion system was required to operate in the MOBI Vacuum Chamber at a High Vacuum level for Laboratory for Atmospheric and Space Physics (LASP). The motion system consists of: 1 custom high precision linear slide used for vertical travel; 1 custom high precision linear slide used for horizontal travel; 1 high precision rotation stage that provides yaw motion; and 1 high precision tilt stage that provides pitch motion. Key specifications: vacuum 1 x 10 -8 torr; vertical slide 362 mm; horizontal slide 368 mm; tilt ±18; rotation full 360º.

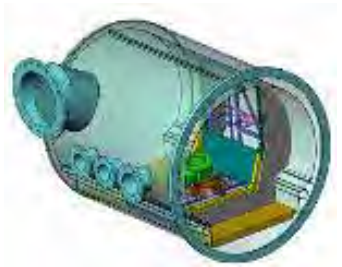
PC control architecture:

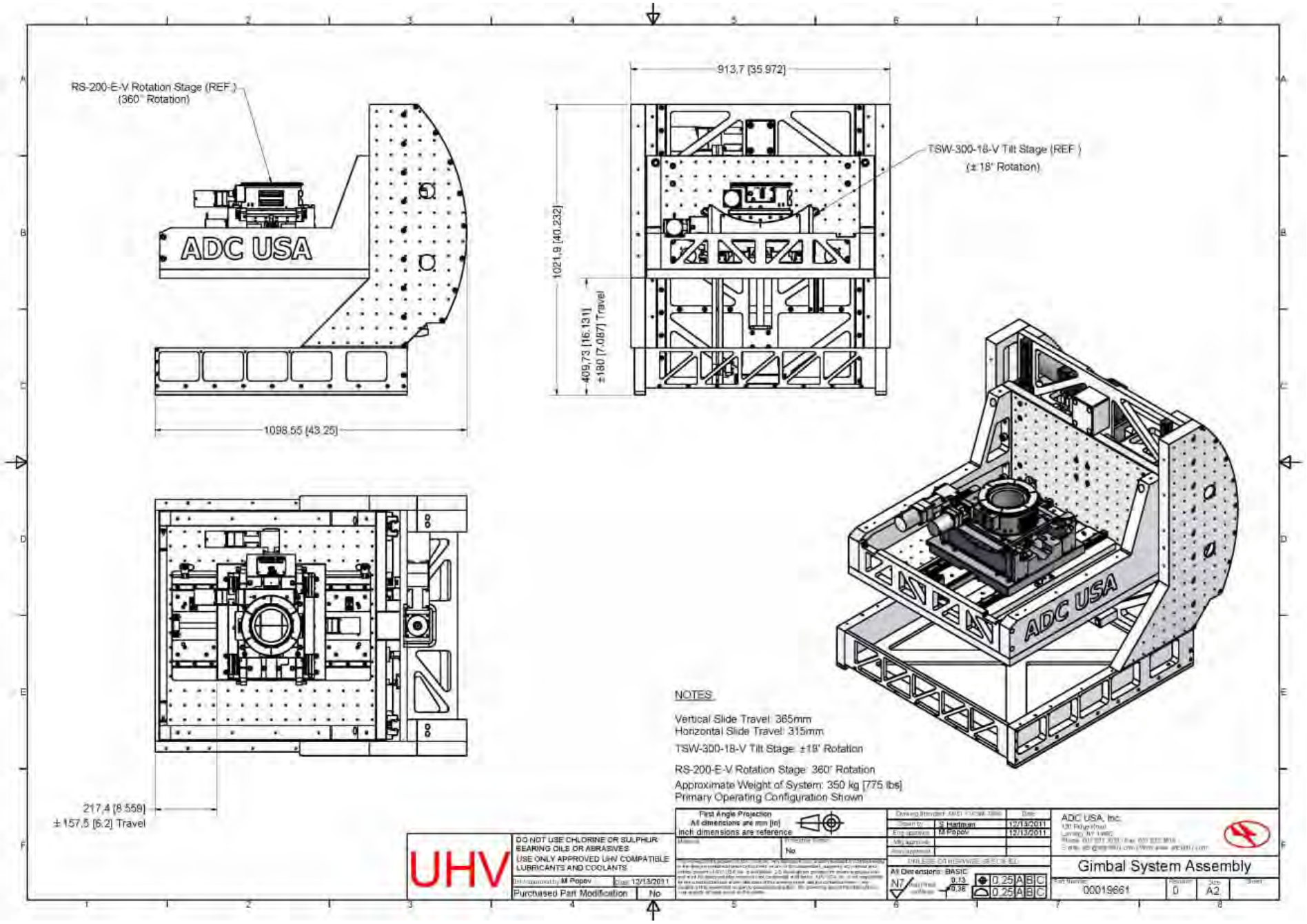
- LabView Software
- Galil DMC-40x0 motion controller
- Dell PC
- All 2-phase stepper motors

ADC wrote the control software and operator interface to debug and test the MOBI system for factory acceptance.








RS-200-E-V Rotation Stage (REF.)
(360° Rotation)
ADC USA
1098.55 [43.25]
913,7 [35.972]
1021,9 [40.232]
409,73 [16.131]
±180 [7.087] Travel
TSW-300-18-V Tilt Stage (REF.)
(±18° Rotation)
217,4 [8.559]
±157,5 [6.2] Travel
NOTES
Vertical Slide Travel: 365mm
Horizontal Slide Travel: 315mm
TSW-300-18-V Tilt Stage: ±18° Rotation
RS-200-E-V Rotation Stage: 360° Rotation
Approximate Weight of System: 350 kg [775 lbs]
Primary Operating Configuration Shown
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
No
First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
ADC USA, Inc.
Gimbal System Assembly
00019661
0
A2

XYZ & O MULTISTAGE

UHV Manipulators

For more information please visit:
http://www.adc9001.com/products/view/518

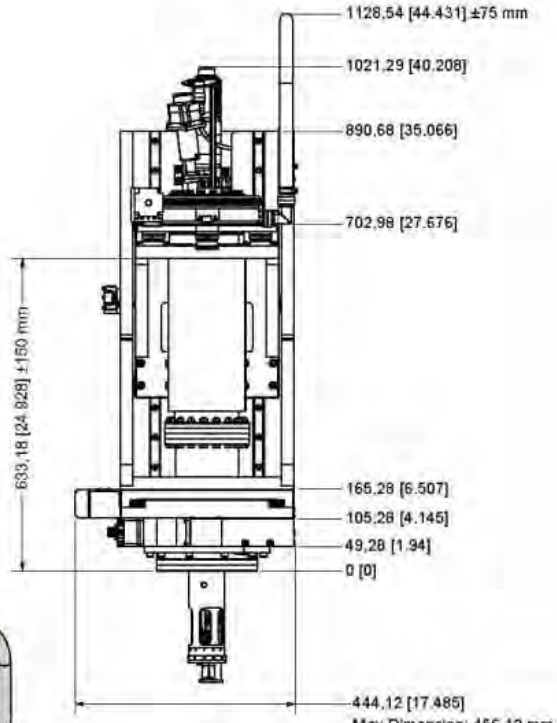
A high precision motion system was required to operate in the The UHV XYZ Stages is a 4 axis motion system consisting of two horizontal linear stages, one vertical linear stage and a rotation stage. The XYZ stages can reach a UHV vacuum level of 1x10-9 Torr, while the rotary stage can be differentially pumped with a vacuum level of 1x10-2 Torr. Edge welded bellows with a 300 mm stroke provide a movable connection between the rotary feed through and the DN150 CF flange that is used for mounting the system. The differentially pumped rotary feed through has a kinematic base which allows for adjustment of the users equipment to the appropriate orientation with respect to the beam.

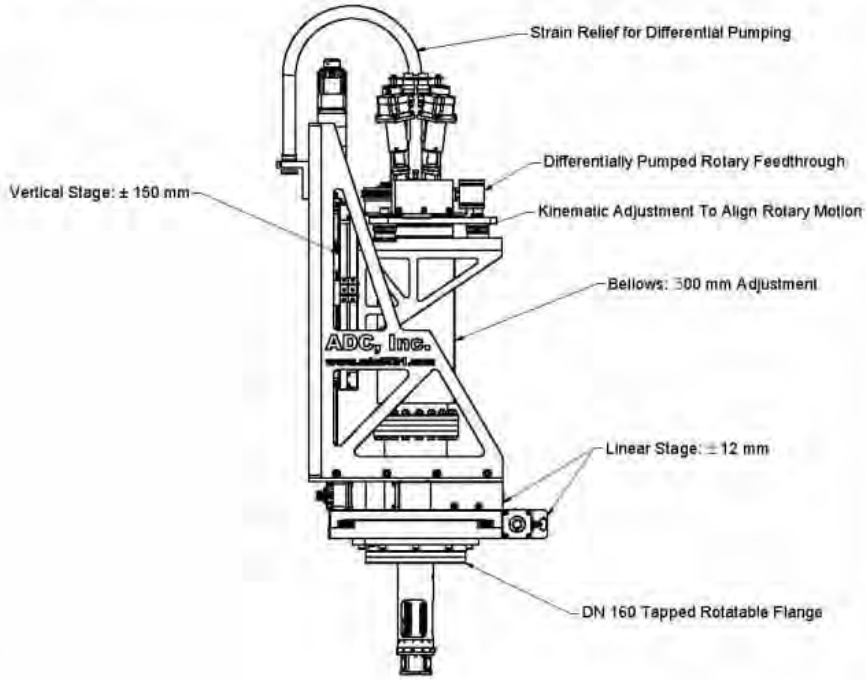
The Vertical Stage has a total travel of 300 mm (±150 mm) and consists of a NEMA 34 motor coupled to a 55:1 gear box, a preloaded 20x5 mm ballscrew and preloaded linear guide rails which allows for smooth operation of the vertical stage. The combination of the gearbox and ballscrew allows the vertical stage to have a resolution of 0.455 µm per step. The motor was sized to provide the vertical motion to be able to travel at a max speed of 1.81 mm/sec. The vertical stage is also equipped with fully adjustable limit switches and closed loop feedback is provided by a Renishaw Tonic Encoder with a resolution of 0.1µm.

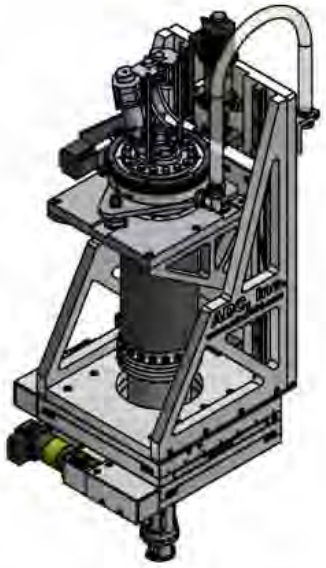
Key Specifications:

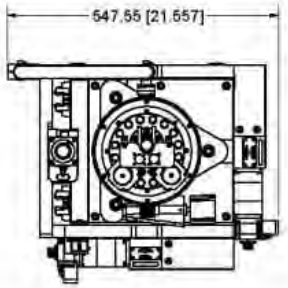
Parameter	Value
Vertical Travel Range	±150 mm
Horizontal Travel Range (X and Y Directions)	±12 mm
Rotary Feed Through Travel Range	Full 360°
Vacuum Level	1x10-9 Torr

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Approval Drawing	3/19/2013	M Popov









Specs:

Vertical Travel: ±150 mm
Horizontal Travel: ±12 mm (X and Y)
Rotation: Full 360°
Vacuum Level: 1x10-9 Torr
Differential Pumping Vacuum Level: 1x10-2 Torr
Weight: 115 kg

First Angle Projection
All dimensions are mm (in)
inch dimensions are reference

Material: Stainless Steel

Purchased Part Modification: No

Drawing Standard: ANSI Y14.5M-1994 | Date: 3/19/2013
Drawn by: M Popov | Eng approval: M Popov | Mfg approval: | Quality approval:

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

ADC USA, Inc.
120 Ridge Road
Lansing, NY 14882
Phone: 607.533.3533 | Fax: 607.533.3513
E-mail: adc@adc001.com | Web: www.adc001.com

UHV_XYZ_Stages

Part Number	Revision	Size	Sheet
UHV_XYZ_Stages	0	A2	1 of 1

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

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.

SOLARIS 3-Axis Motorized Positioner High Precision Device

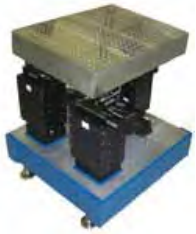
One Degree of Freedom Optical Table (Brookhaven National Lab)

Cornell Custom Optics Table

The Air Force 3-Axis Optical Table

ANKA - the Synchrotron Radiation Facility at KIT 3 Axis Table

Cornell Custom Optics Table



NASA Custom Optics Table

3 Degree of Freedom Optical Table (CHESS, Cornell University)

Diamond Light Source (DLS) Custom Optics Table

Advanced Photon Source (APS) Custom Optics Table

Advanced Photon Source (APS) Custom Optics Table

2 Degree of Freedom Optical Table (Argonne National Lab)

ANKA - the Synchrotron Radiation Facility at KIT 6 Axis Table

MAX IV Laboratory Custom Optics Table

Diamond Light Source (DLS) 2 Degree of Freedom Custom Optics Table

DeutschesElektronen-Synchrotron (DESY) Custom Optics Table

ElettraSincrotrone Trieste Custom Optics Table

Center for Advanced Microstructures and Devices (CAMD) Custom Optics Table

Michigan State University (MSU) Custom Optics Table

Six Degree of Freedom Optical Table (Brookhaven National Lab)

SLAC National Accelerator Laboratory Six Degree of Freedom Optical Table

Low Profile Diffractometer Table (LPDT-100)

DeutschesElektronen-Synchrotron (DESY-2) Custom Optics Table

Two Degree of Freedom Optical Table (Brookhaven National Lab)

Advanced Photon Source (APS) Custom Optics Table

Canadian Light Source (CLS) Custom Optics Table

OPT-1000-3-X-X

Six Degree of Freedom Optical Table (Brookhaven National Lab)

For detailed information regarding ADC's Optical Tables please refer to our 2016 Optical Table Catalog or visit the following website:

http://www.adc9001.com/ABOUT-US/Catalogs

OVERALL CAPABILITIES

Design

Fabrication

Assembly

Installation

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.

ADC offers a large assortment of synchrotron equipment including; High Precision Slits, Optical Tables, Custom Complex Motion Systems, Micro and Split Two Axis Ion Chambers, Mirror Systems, Spectrometers, and Insertion Devices.

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.

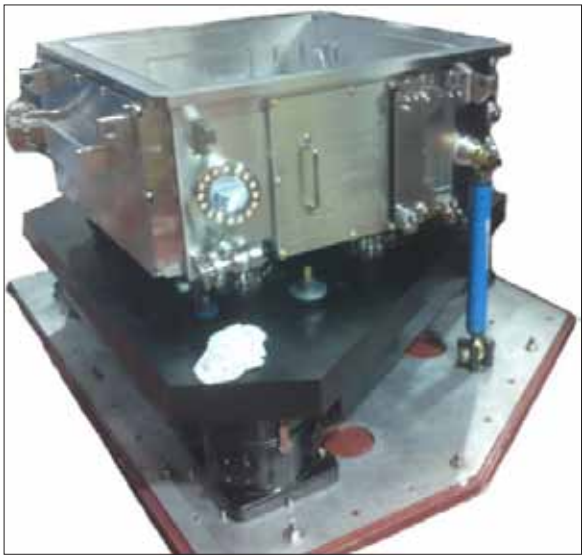
ADC has 23 years of combined experience as a welding shop and high attention to detail required ensuring that our welding shop provides the best welds and custom metal fabrication products every time.

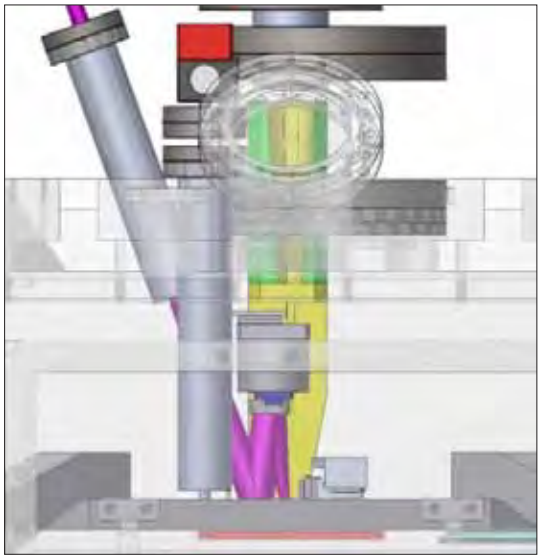
ADC welders are constantly trained and kept up-to-date on the latest welding techniques and have some of the most technologically advanced equipment available. That means customers enjoy a welding shop with knowledgeable craftsmen who give more attention to detail than other welding companies. Our goal 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.



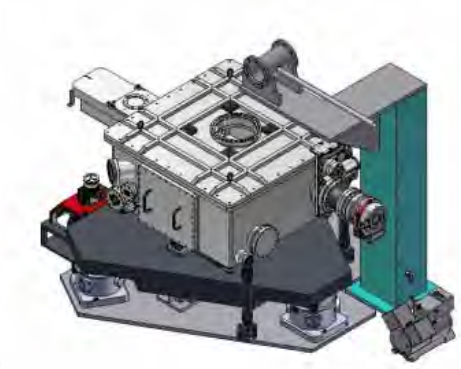


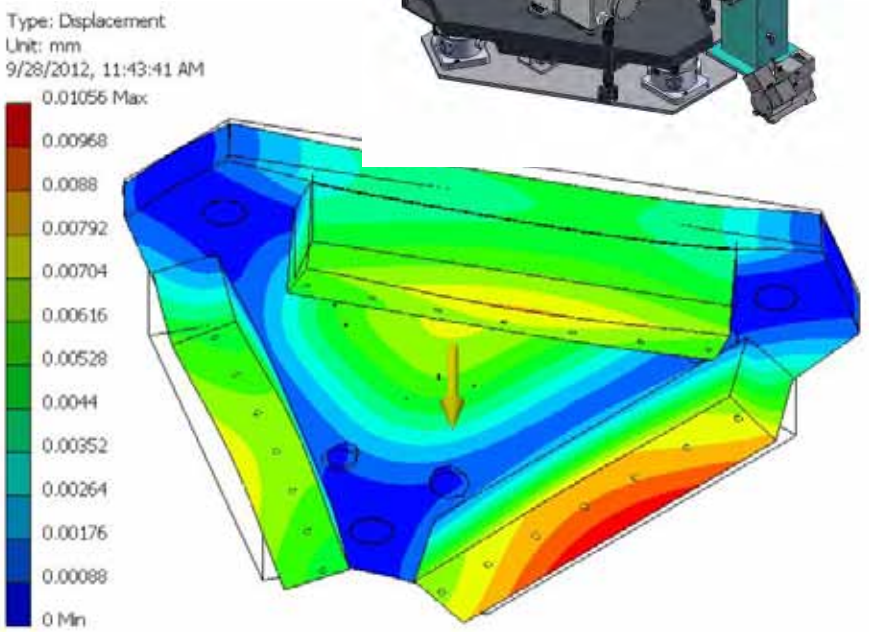
FINITE ELEMENT ANALYSIS

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:

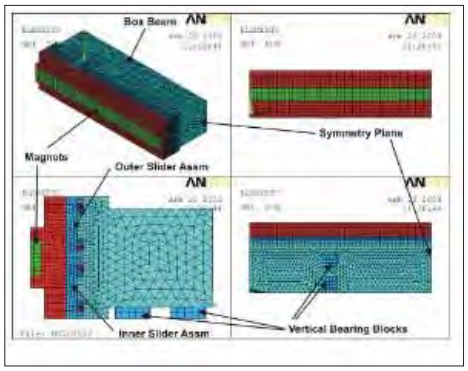
Structural Integrity

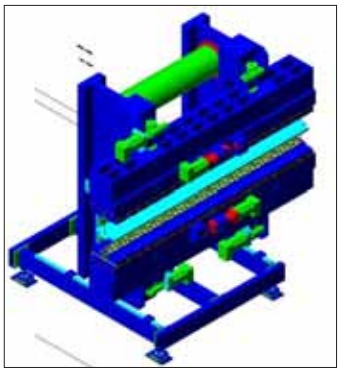
- Component Life Prediction
- Fatigue, Buckling, and Code Compliance
- Design Optimization
- Fabrication Process Evaluation
- Heat Transfer
- Thermal Cycling
- Creep Response & Ratcheting
- Shock, Vibration & Impact
- Flow-Induced Vibrations
- Fluid Flow Analyses
- Computational Fluid Mechanics
- 2D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

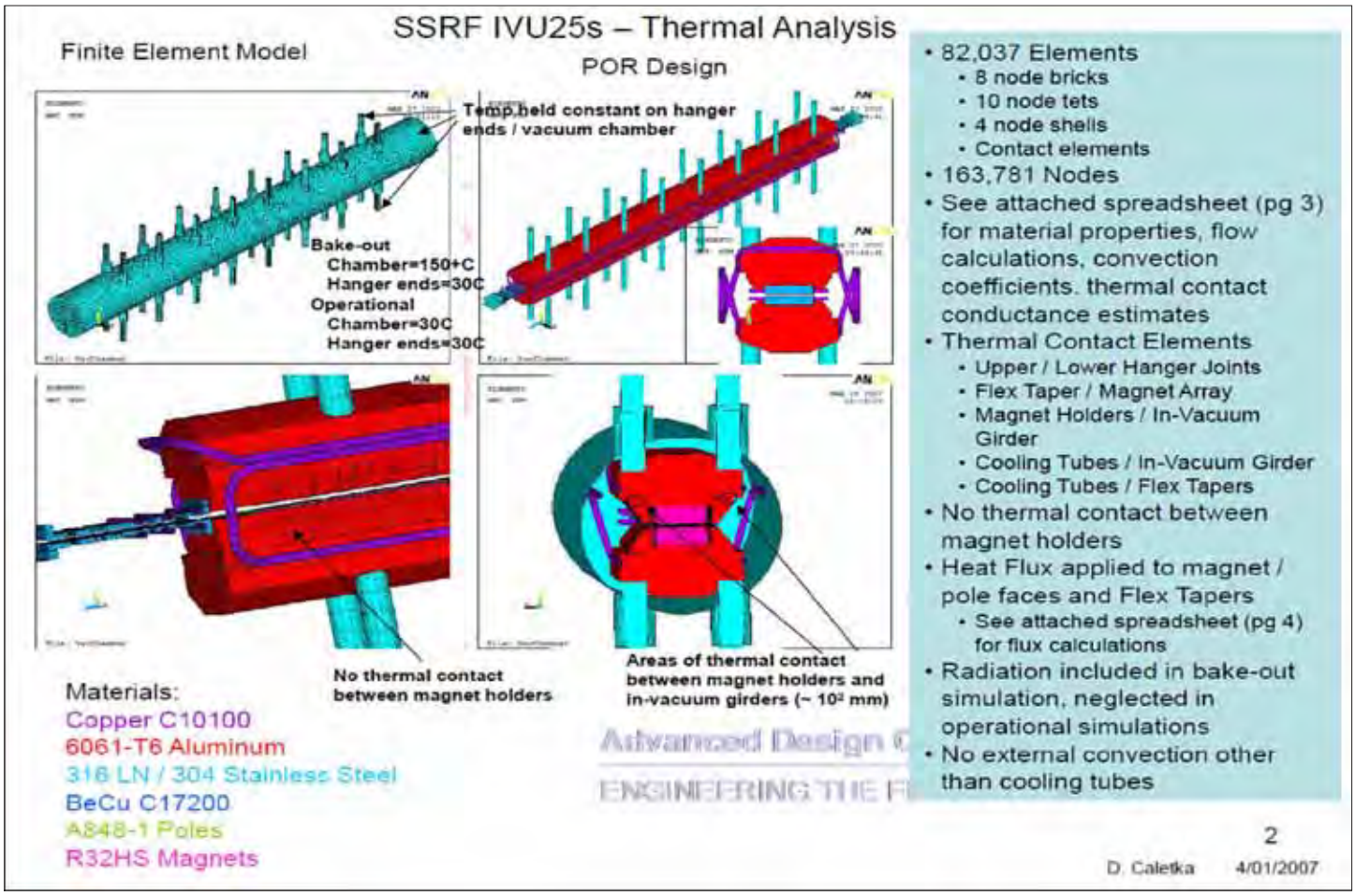




ADC uses Finite Element Analysis (FEA) to predict the deflections of complex and critical structures and to solve the most challenging product engineering problems. For example, when ADC's engineers design insertion devices, the magnet support structure behavior can be simulated in ANSYS by applying 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.

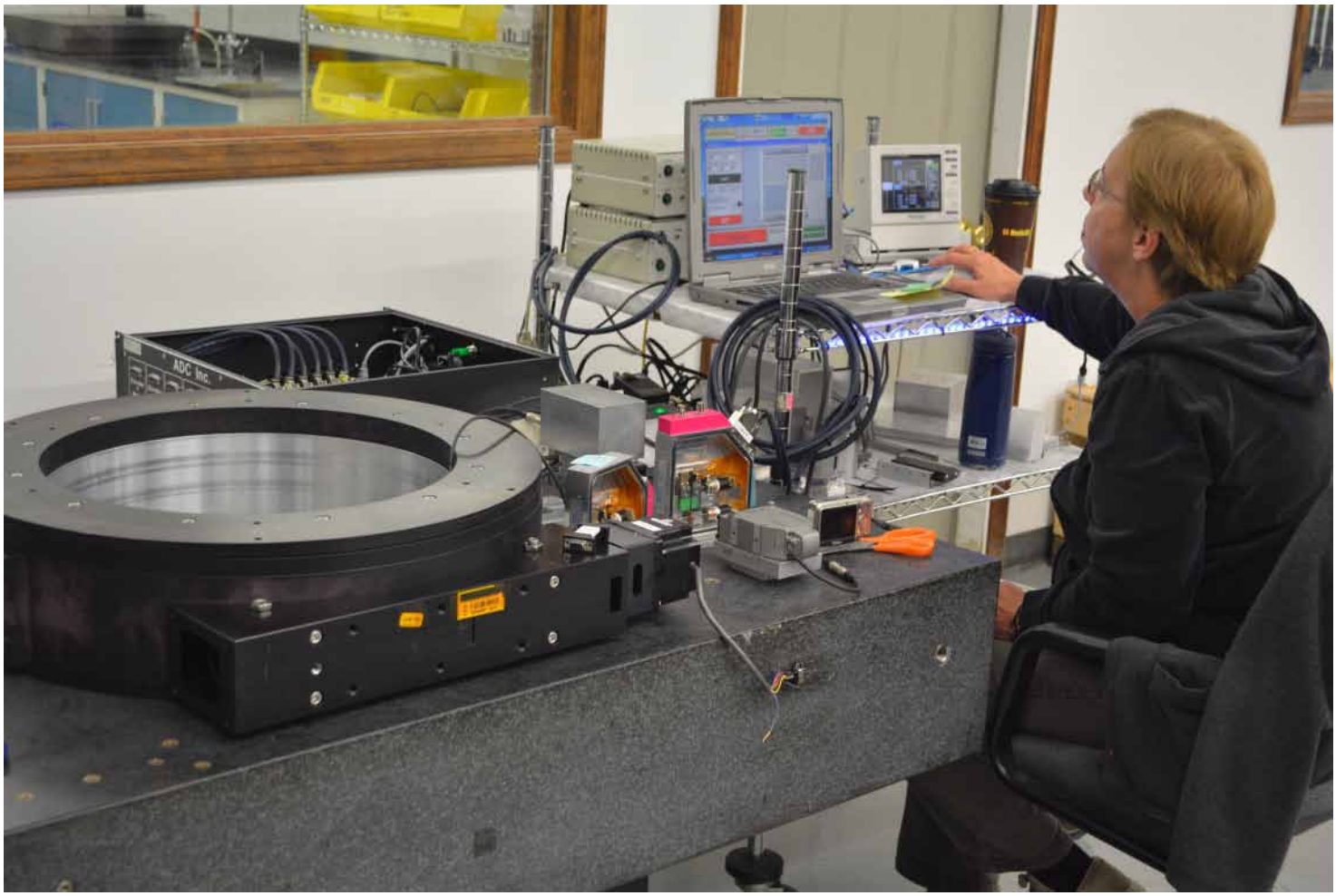
Optics Design

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

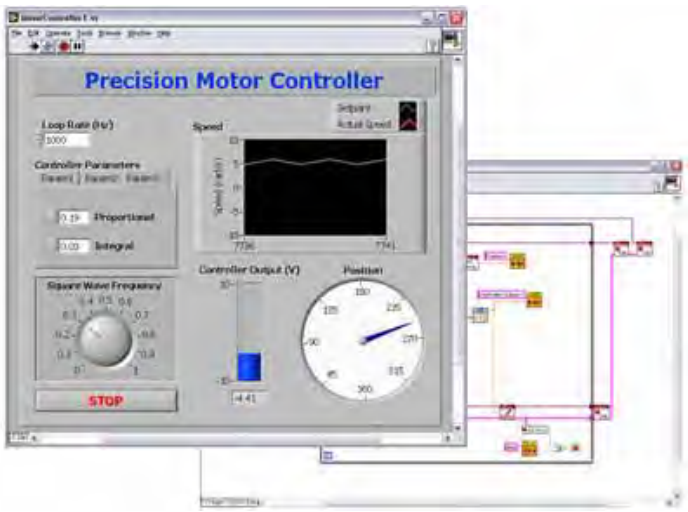
- Intel® Core™ i3-2100 processor (3MB Cache, 3.10GHz)
- 2GB Dual Channel DDR3 SDRAM at 1333MHz - 2 DIMMs
- 250GB Serial ATA Hard Drive (7200RPM) w/DataBurst Cache™
- Genuine Windows® 7 Professional SP1, 64bit
- Dell E Series E2011H 20"W Monitor, 20.0 Inch VIS, Widescreen, VGA/DVI

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.

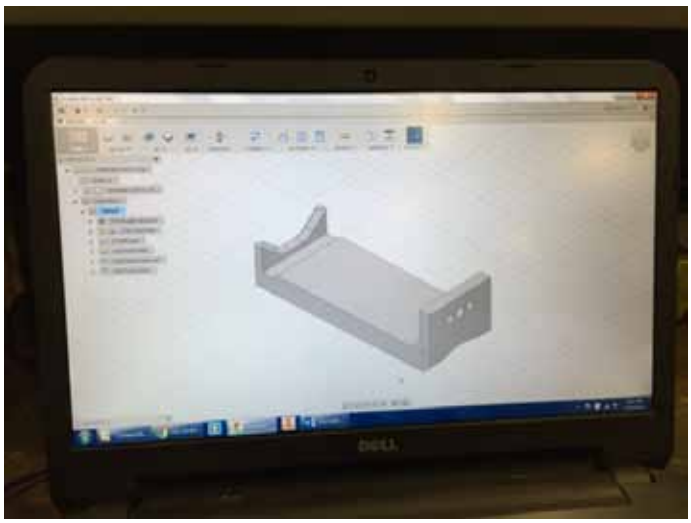
Graphical User interface for the motion control include:

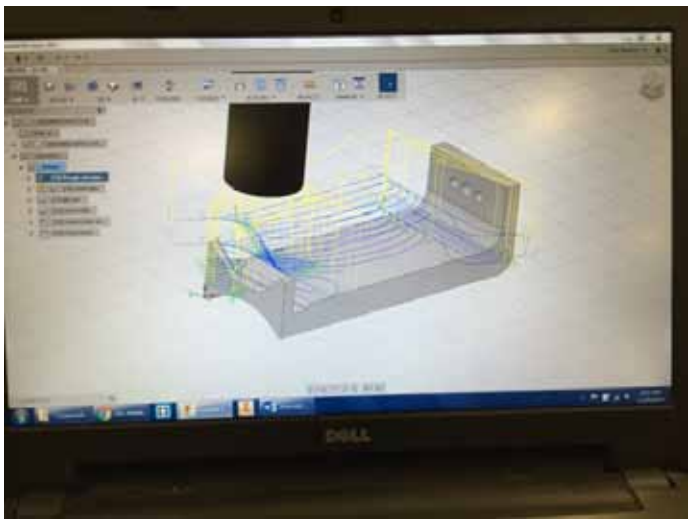


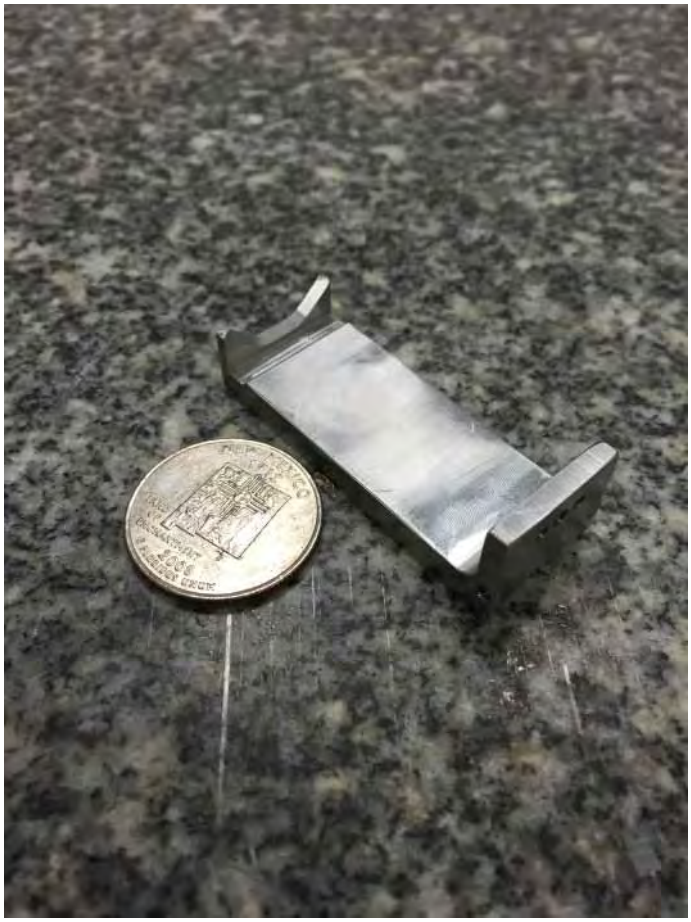
- Data Display;
- Ability to move individual axis;
- Absolute move of axis;
- Relative move of axis;
- Home individual axis;
- Encoder feedback;
- Limit switch detection, and;
- Easy install on a Windows OS platform.

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.

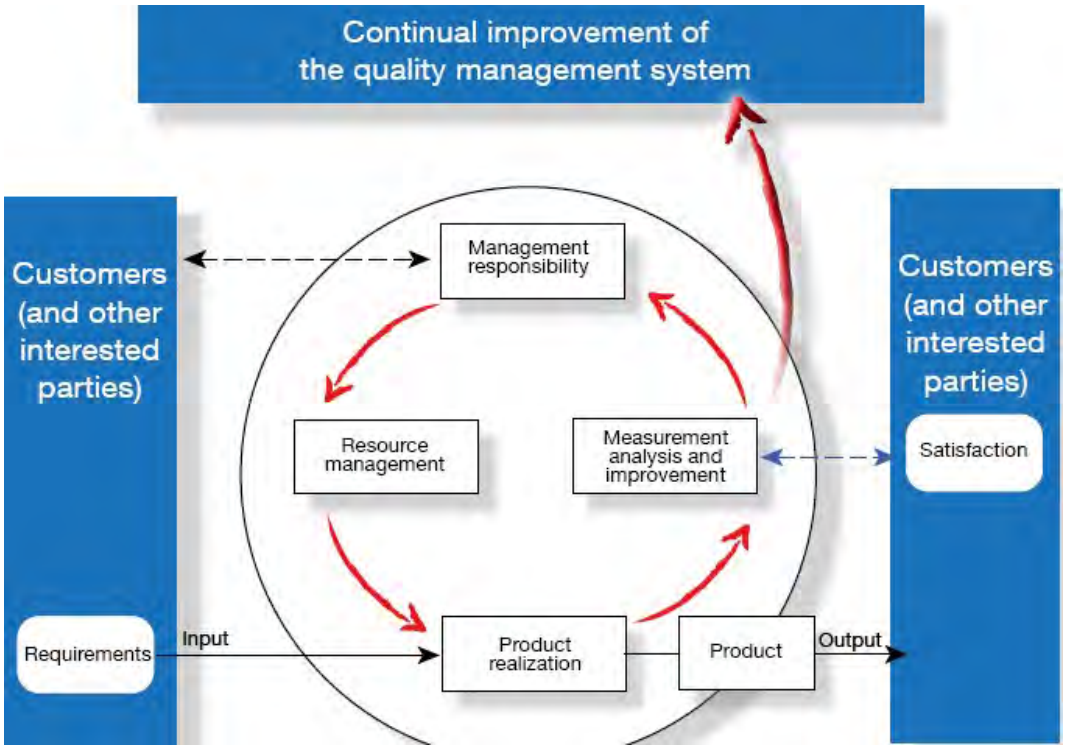
The uality management system of ADC meets ther equirements of the international standard ISO9001:2008. This system addresses the manufactur eandpr oduction of ADC's and its customers' products.

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

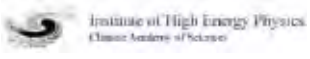
Bar-Ilan University

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

International Traffic in Arms Regulations Registered 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