

TEST CONTROLLER

MODULAR DESIGN WITH YOUR BOTTOM LINE IN MIND



Rev.B, May 2019

A RELIABLE, CONFIGURABLE PLATFORM
FOR PRECISE CONTROL OF YOUR TESTS



MOOG TEST CONTROLLER: CONFIGURABLE. RELIABLE. PRECISE.

Reliable Results.

At Moog, we pride ourselves in providing Test Controllers with the utmost reliability. Our experience speaks for itself: Over the last 20 years Moog has sold over 1,400 systems with over 14,000 channels.

Simple & User Friendly.

Time is money. We understand your need for operators to perform complex tasks faster and with minimal training. Our simplified feature-rich user interface allows you to do just that.

Unsurpassed Precision.

24 bit resolution and high signal quality allow you to visualize minute details for the variety of loops, resulting in unsurpassed precise control.

Universal Testing.

From simple fatigue tests to highly integrated full vehicle road vibration tests and more, you can rely on Moog Test Controllers for testing in a wide variety of applications.

Impressive Value.

The Moog Test Controller was designed with your bottom line in mind. The initial purchase, maintenance, and upgrade costs are all lower than the leading competition with direct comparisons.

Modular & Compact.

There's no job too big - or too small. Our modular design fits easily into any hydraulic or electric test system, large or small.

Easily Configurable.

The Moog Test Controller can be easily configured to fit your needs - because no two test labs are the same. 1 to 32 channels with thousands of I/O combinations from four modular building blocks allow for unmatched customization.

Expertise & Support.

We've seen it all. Moog expertise in test laboratories like yours ensures high value test results. With leadership and support in 26 countries, Moog delivers technology, innovation and service around the globe.

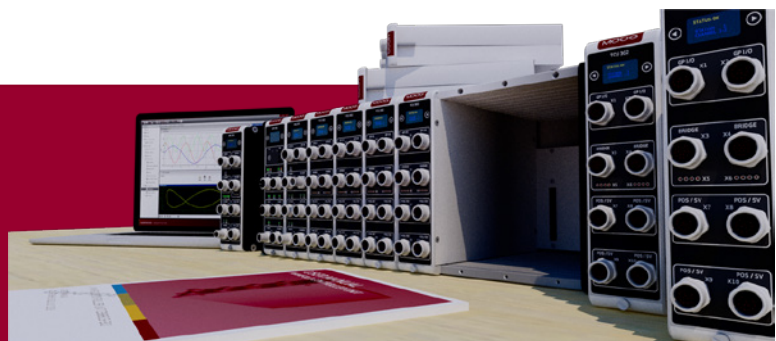
PRODUCT OVERVIEW

The Moog Test Controller is a 1 to 32 channel real-time modular control system that can control or collect data from any hydraulic or electric test system. The robust and compact modules have a wide range of transducer inputs and control outputs that can be easily configured for optimum use. The Moog test software allows the end user to control and record all of these signals in an easy to use format providing maximum value for many years of reliable usage.



| FEATURES | BENEFITS |
|--|---|
| Familiar feature-rich software: configurable hardware bindings, wizard for calibration, powerful control loops | No new training for current users; new users will appreciate the simplified interfaces that allow complex tasks with minimal training |
| Easier 1 piece modules | With less parts to manage, moving hardware between controllers is safer |
| Easier upgrades in future with CPU module and Manifold Control Unit | Modular design permits low cost upgrades to take advantage of rapidly improving technology or controller expansion |
| Higher density I/O per module | Lower cost per connection with more I/O packed into less space |
| Flexible I/O - Configurable Digital Input, Digital Output, Analog Input or Accelerometer (ICP) | One connection can be used to serve different functions giving you no added cost options as your test needs change |
| 1 to 32 channel expansion easier | Low cost controller expansion with space saving channel or data acquisition modules avoiding expensive racks with limited slots |
| Better 24-bit signal resolution | 32 times improvement in signal resolution over 19-bit, giving better precision to control or recorded data |

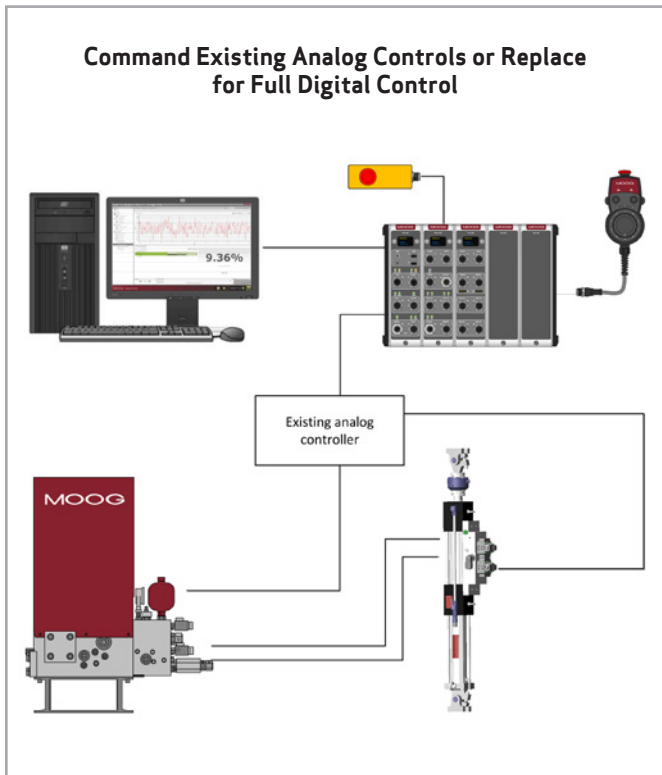
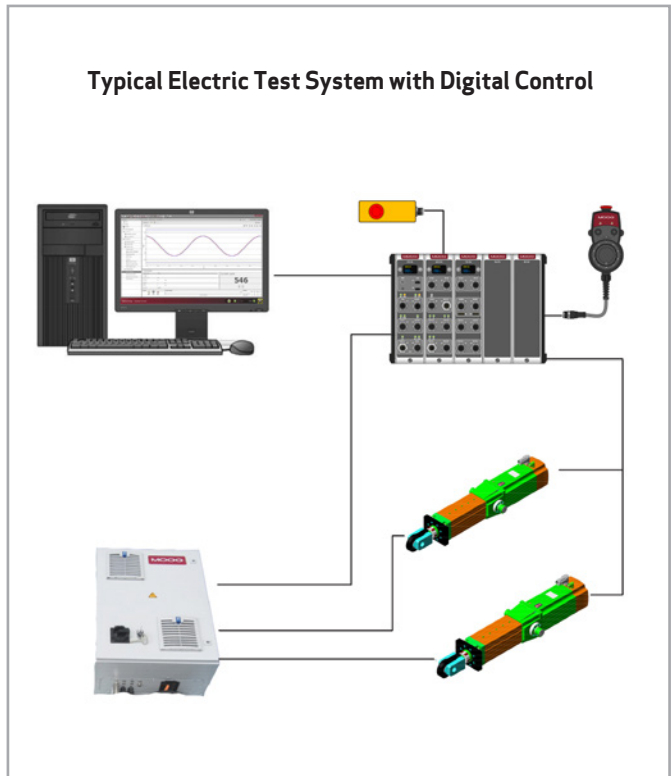
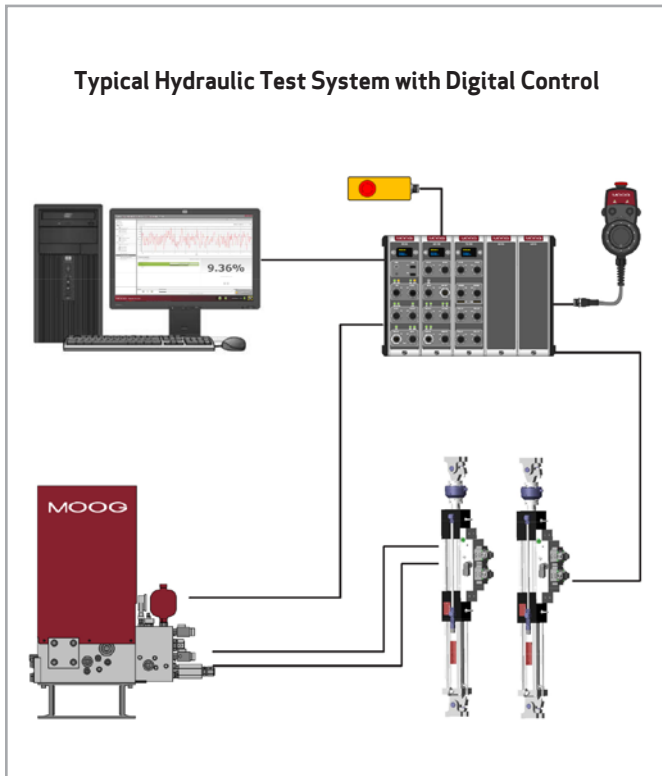
REDEFINING PERFORMANCE THROUGH ADAPTED SOLUTIONS



Hydraulic and Electric Simulation Tables
 Four Post/Tire Coupled Simulation Systems
 Performance or Buzz, Squeak and Rattle Vibration Test Systems

Electric Multi-Axis Test Systems
 Hydraulic Multi-Axis Test Systems
 Structural Static and Fatigue Test Systems

SYSTEM OVERVIEW



SYSTEM SPECIFICATIONS

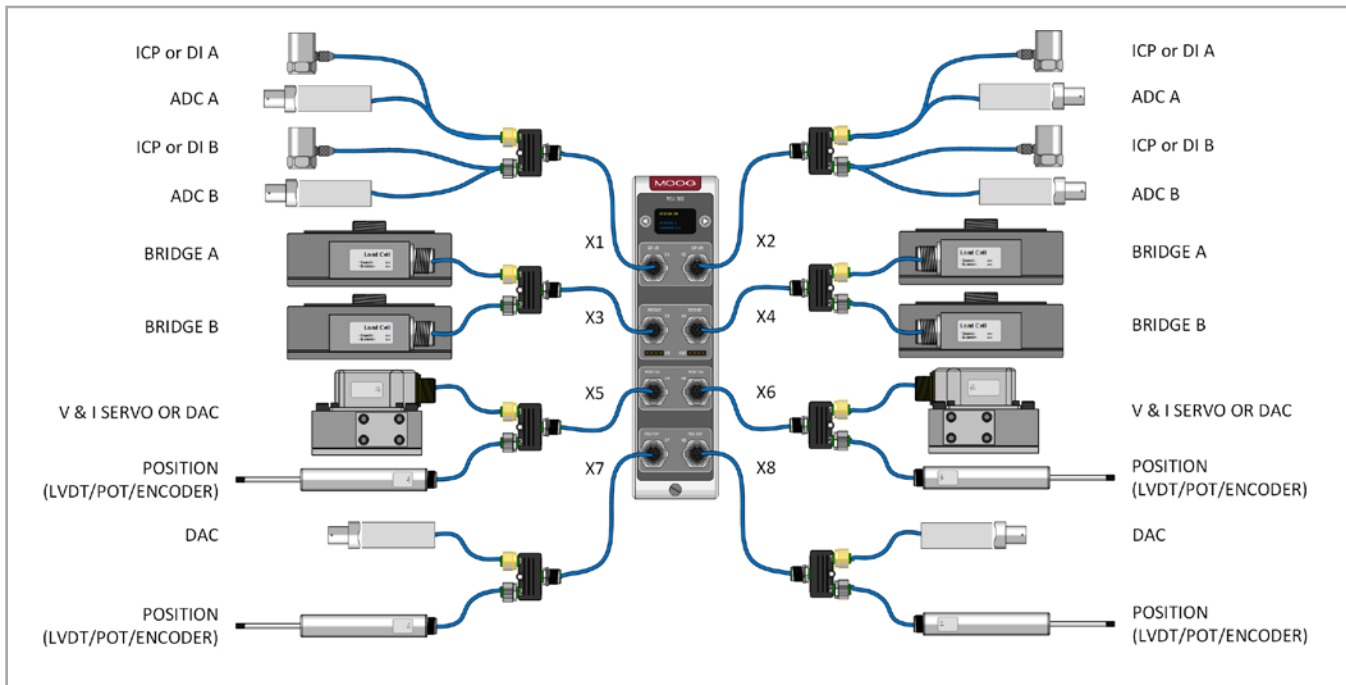
| | Five Slot Subtrack w/ CPU, MCU & TCU's | Nine Slot Subtrack w/ CPU, MCU & TCU's |
|---|---|---|
| Dimensions (DxHxW) | 280 x 190 x 260mm | 280 x 190 x 450mm |
| Weight | 8kg | 16kg |
| Power Consumption | Max 250W | Max 500W |
| Ambient Operating Temperature | 0 - 40°C | |
| Operating Relative Humidity | 10-95% non-condensing | |
| Protection Category IP to IEC 60 529 | IP 40 | |

TEST CONTROLLER UNIT (TCU)

The TCU is a dual channel digital servo controller which can be used in the Moog Test Controller. This unit has a high connection density to control hydraulic servo valves, read a wide variety of transducer signals and output analog test signals. It is a highly advanced controller which has a proven history of more than 14,000 units placed over 20 years worldwide.

| FEATURES | BENEFITS |
|---------------------------------------|--|
| Fully enclosed | ESD protection, easy to swap and service |
| Ruggedized | Full aluminum enclosure which protects electronics from harsh environments |
| Small form factor | Reduction of >50% in cabinet space, more I/O fits into less space |
| Modular | Fits easily into a small single channel or large multi channel test system |
| Easy to install | No tooling required |
| Safety line integrated in fieldbus | No hard to configure safety chain between components |
| Integrated display/module | Immediate status and diagnostics feedback |
| Onboard control loop | Results in higher achievable control loop frequencies/channel |
| Dual EtherCAT and Ethernet interface | Control through real-time EtherCAT; DAQ through Ethernet |
| 24 Bits on all inputs | Higher input accuracy |
| Input Bandwidth on all inputs 100 kHz | Simultaneous sampling |
| M12 Industrial standard connectors | High density, world wide availability |
| Integrated transducer power supply | Supply power directly from the unit, this reduces system complexity and cost |
| Wide range DC power input | Lower power consumption |

The Test Controller Unit is equipped with a large amount of I/O to interface to various equipment such as servo valves and transducers. The I/O is divided across 8 different connectors located on the front of the module.



PERFORMANCE SPECIFICATIONS - TEST CONTROLLER UNIT

| DESCRIPTION | SPECIFICATION |
|--|--|
| Supported Servo Channels | 2 |
| Max. Control Loop Speed/channel | Up to 6144 Hz |
| Power Supply | Wide range 20 V to 50 VDC |
| Bus System | EtherCAT slave/master 100 Mbps; Ethernet 1000 Mbps |
| Accelerometer or Digital Input | |
| Supported Type | IEPE/ICP Accelerometer |
| Digital Input Type | Source/Sink |
| Digital Input Range | 0 - 28 VDC |
| Analog Input | |
| Input Signal Range | Voltage: ± 10 VDC Current: ± 20 mA (activated through internal shunt resistor) |
| Input Resolution | 24 bits simultaneous sampling |
| Bridge Input/output | |
| Input Accuracy | <0.1% full scale |
| Input Resolution | 24 bits simultaneous sampling |
| Supported Bridge Types | Full |
| Supported Number of Bridge Wires | 4-wire, 6-wire, 7-wire, 8-wire (physical 7-wire interface; internal/external shunt +/- possible) |
| Excitation Voltage | 10 VDC +/- 1mV |
| Excitation Current | 100 mA max |
| Load Cell Support/Excitation Drive | 120 to 1000 Ω |
| Excitation Drift | 10 ppm / $^{\circ}$ C |
| Internal Shunt Resistor | 100 k Ω |
| External Shunt Resistor | 1 connection/interface (4 total) |
| LVDT/Potentiometer/Encoder (Position) Input | |
| Input Accuracy | <0.1% full scale |
| Input Temperature Drift | <0.23% full scale; <0.25% at highest gain |
| Excitation Signal Range | Potentiometer up to +/- 5 V (<+/- 4 mV) max, +/- 50 mA LVDT +/- 2.0 Vrms or +/- 3.5 Vrms (<=1 mVrms) max at +/- 50 mA |
| Excitation Frequency | 2.5 kHz or 5 kHz (+/- 5 Hz) |
| Wire Type Support | 3-wire, 4-wire, 5-wire |
| Encoder Supported Types | SSI, relative (quadrature), Endat 2.2 |
| Servo and DAC Output | |
| Servo Current Output Signal Range | +/- 100 mA |
| Servo Current Output Load | Between 0 and 100 Ω |
| DAC Voltage Output Signal Range | Up to +/- 10 V; +/- 25 mA |
| DAC Voltage Output Resolution | 16 bits |



I/O SPECIFICATIONS - TEST CONTROLLER UNIT

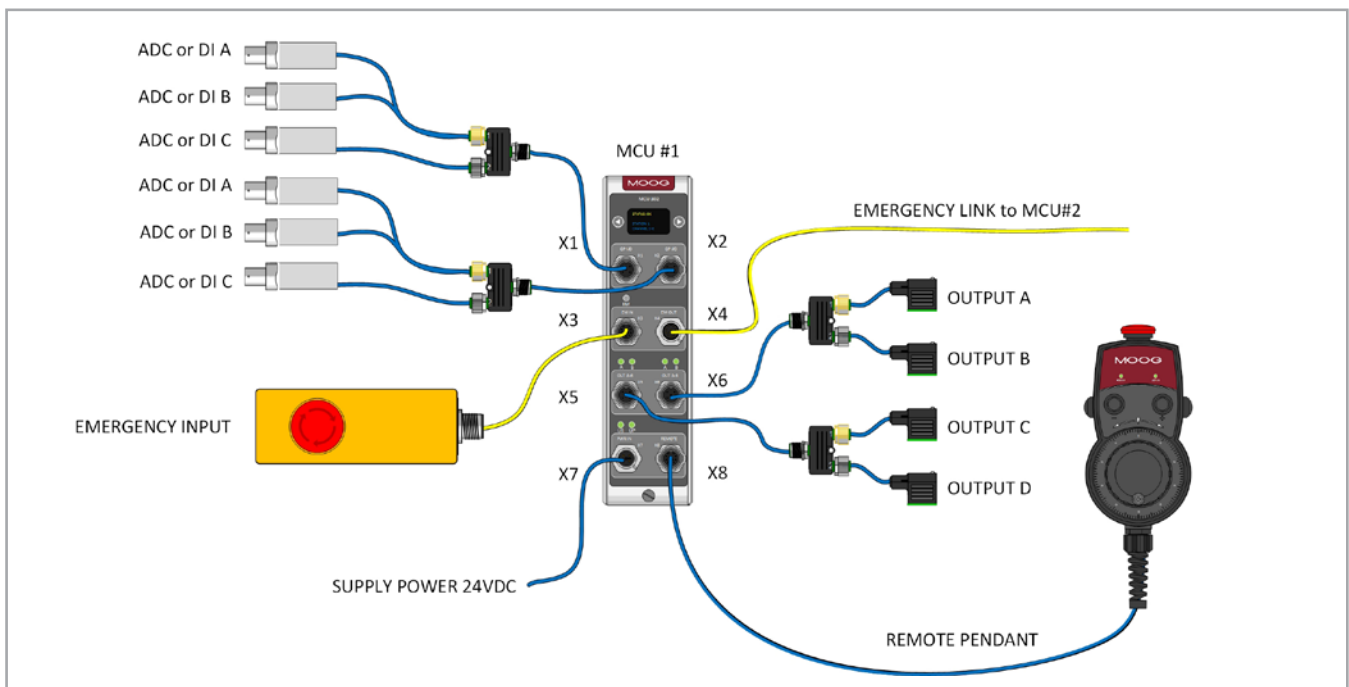
| TCU | CONNECTOR | # OF INTERFACES | TYPE | COMMENTS |
|---|----------------|-----------------|---|---|
| Accelerometer (ICP) or Digital Input (DI) | X1 and X2 | 4x | Input- Individually configurable | ICP = Current Source Supply DI = Voltage input (Sink/Source) |
| Analog Input (ADC) | X1 and X2 | 4x | Input | Voltage or Current type input |
| Bridge Input | X3 and X4 | 4x | Excitation output Excitation Sense input Signal input | Voltage type input |
| LVDT or Potentiometer or Encoder (Position) | X5, X6, X7, X8 | 4x | Excitation output Signal input | Voltage type input |
| Servo or DAC | X5 and X6 | 2x | Servo current/voltage output Servo current read back DAC output | Voltage and current type output |
| DAC | X7 and X8 | 2x | DAC output | Voltage output |

MANIFOLD CONTROL UNIT (MCU)

The MCU is a single test station manifold controller with two independent outputs providing off/low/high voltage to hydraulic service manifold (HSM) solenoids. The high current output allows up to 4 total off/low/high outputs in parallel. The emergency stop button has a dedicated connection and turns off all HSM outputs.

| FEATURES | BENEFITS |
|---|--|
| Fully enclosed | ESD protection, easy to swap and service |
| Ruggedized | Full aluminum enclosure protects electronics from harsh environments |
| Small form factor | Reduction of >50% in cabinet space, more I/O fits into less space |
| Modular | Fits easily into small single channel or large multi channel test system |
| Easy to install | No tooling required |
| Safety line integrated in fieldbus | No hard-to-configure safety chain between components |
| Integrated display/module | Immediate status & diagnostics feedback |
| Control of a 1 to 4 stage manifold with a single unit | No need for additional power source or digital logic connections |
| 18 Bits on all inputs | Higher input accuracy |
| Input bandwidth on all inputs 10 kHz | Simultaneous sampling |
| M12 industrial standard connectors | High density, world-wide availability |
| Integrated transducer power supply | Supply power directly from unit, reducing system complexity and cost |
| Wide range DC power input | Low power consumption |
| Emergency stop with internal safety relay | Safe shutdown in conformance with international safety standards |

The MCU includes general purpose inputs that can be flexibly configured as analog or digital inputs. A Pendant is connected to the MCU for the station, which gives actuator jogging control to the user during specimen installation. If no pendant is used, then six additional digital inputs or outputs are available. The I/O is divided across eight different connectors located on the front of the module. Additional MCUs can be added to the Moog Test Controller for each test station.

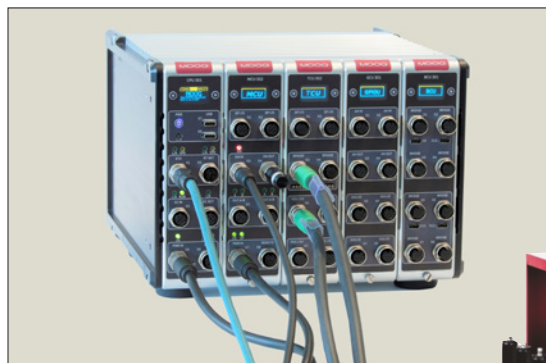


PERFORMANCE SPECIFICATIONS - MANIFOLD CONTROL UNIT

| DESCRIPTION | SPECIFICATION |
|---|---|
| Analog or Digital Input | |
| Input Signal Range | Voltage: ± 10 VDC Current: ± 25 mA (activated through internal shunt resistor) |
| Input Resolution | 18 bits simultaneous sampling |
| Digital Input Type | Source/Sink |
| Digital Input Range | 0 - 28 VDC |
| Digital Input Threshold | Low ≤ 3 VDC, High ≥ 8 VDC |
| High Power Output | |
| Output Current | 24 VDC @ Max 2.5 A/output |
| Proportional Definition | PWM Mode: 0 to 100%, Solenoid Mode: auto PWM |
| Digital Inputs or Outputs (when not connected to a Pendant) | |
| Digital Input Signal Range | 0-30 VDC |
| Digital Output Signal Range | 0-30 VDC (non-isolated) |
| Digital Output Current | Max 500 mA |

I/O SPECIFICATIONS - MANIFOLD CONTROL UNIT

| MCU | CONNECTOR | # OF INTERFACES | TYPE | COMMENTS |
|---|--------------------|-----------------|--------------|-------------------------|
| General Purpose Input (Analog or Digital) | X1 and X2 (GP-I/O) | 6x | Input | Analog I or V, Digital |
| Emergency Input for E-Stop | X3 (EM-IN) | 1x | Input | Analog I or V, Digital |
| Emergency Output | X4 (EM-OUT) | 1x | Output | To link Multi MCUs |
| High Power Outputs | X5 & X6 (OUT 2x) | 4x | Output | Voltage |
| Manifold Power | X7 (PWR-IN) | 1x | Input | - |
| Digital Input/Output | X8 (REMOTE) | 6x | Input/Output | Or to Connected Pendant |



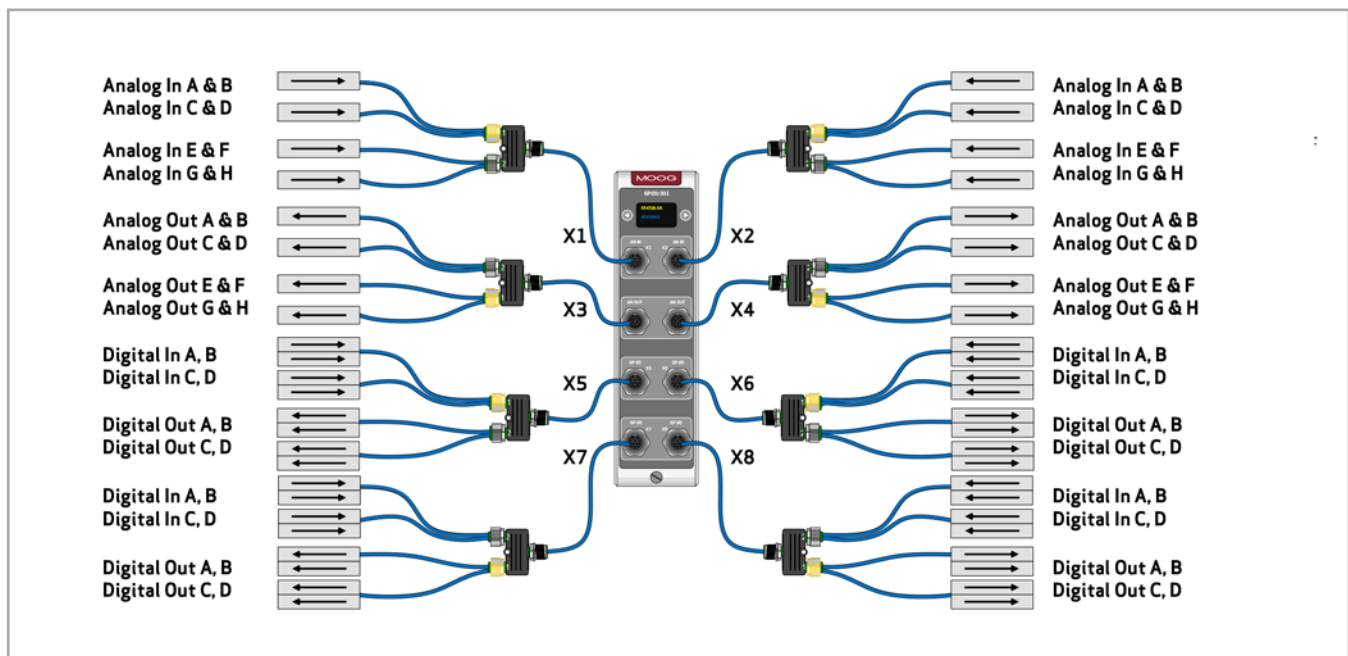
GENERAL PURPOSE INPUT/OUTPUT UNIT - (GPIOU)

The General Purpose Input/Output Unit (GPIOU) is a flexible module that provides 8 differential analog input and analog output channels (16 channel single ended) as well as 16 digital input and digital outputs all in one configurable module. This high channel density gives a cost effective tool to complement the other available control units for additional control or recording of data signals.

Its full aluminum enclosure makes it ruggedized and easy to handle. It's equipped with a display for immediate status and diagnostics feedback.

Communication with the module is achieved through EtherCAT and Ethernet interfaces, along with control power through the back of the module. The internal ZYNQ processor module provides power to run multiple control loops that can control external equipment or internal processes.

| FEATURES | BENEFITS |
|---|--|
| Fully enclosed | ESD protection, easy to swap and service |
| Ruggedized | Full aluminum enclosure protects electronics from harsh environments |
| Small form factor | Reduction of >50% in cabinet space, more I/O fits into less space |
| Modular | Fits easily into small single channel or large multi channel test system |
| Easy to install | No tooling required |
| Integrated OLED display/module | Immediate status & diagnostics feedback |
| Dual EtherCAT and Ethernet Interface | Control through real-time EtherCAT; DAQ through Ethernet |
| Record or control 4 different types of transducers on a single unit | Configurable connections giving flexible value as test needs change |
| 24 Bits on all inputs | Higher input accuracy |
| Input bandwidth on all inputs 50 kHz | Simultaneous sampling |
| M12 industrial standard connectors | High density, world-wide availability |
| Integrated transducer power supply | Supply power directly from unit, reducing system complexity and cost |
| Wide range DC power input | Low power consumption |



PERFORMANCE SPECIFICATIONS - GENERAL PURPOSE INPUT/OUTPUT UNIT

| DESCRIPTION | SPECIFICATION |
|-----------------------------|--|
| Analog Input | |
| Connections | 8x Differential (16x Single Ended) |
| Input Signal Range | Voltage: +/- 10 VDC Current: +/- 10 mA Diff, +/- 20 mA S.E. (activated through internal shunt resistor) |
| Input sample rate | Up to 100 kHz |
| Input resolution | 24 bits simultaneous sampling |
| Analog Output | |
| Connections | 8x Differential (16x Single Ended) |
| Voltage output signal range | Up to +/- 10 V; +/- 25 mA |
| Voltage output resolution | 16 bits |
| Digital Input | |
| Connections | 16x with common ground |
| Digital Input type | Source/Sink |
| Digital Input range | 0-50 VDC |
| Digital Input Threshold | Low <= 3 VDC, High >= 4.5 VDC |
| Digital Output | |
| Connections | 16x |
| Digital Output Signal Range | 12 - 28 VDC (common ground) |
| Digital Output current | Max 1A per channel, 4A total for 16 channels |
| Digital Input Threshold | Low <= 3 VDC, High >= 4.5 VDC |

I/O SPECIFICATIONS - GENERAL PURPOSE INPUT/OUTPUT UNIT

| MCU | CONNECTOR | # OF INTERFACES | TYPE | COMMENTS |
|---------------------|----------------|--|--------------------------------------|--|
| Analog Input (AI) | X1 and X2 | 8x Differential or 16x Single Ended | Input- individually configurable | Voltage or current type, software configurable |
| Analog Output (AO) | X3 and X4 | 8x Differential or 16x Single Ended | Output- individually configurable | Voltage type, software configurable |
| Digital Input (DI) | X5, X6, X7, X8 | 16x | Input | Source/Sink |
| Digital Output (DO) | X5, X6, X7, X8 | 16x | Output | Required external power supply (24 VDC) Insulated High Side Driver |

BRIDGE CONDITIONER UNIT - (BCU)

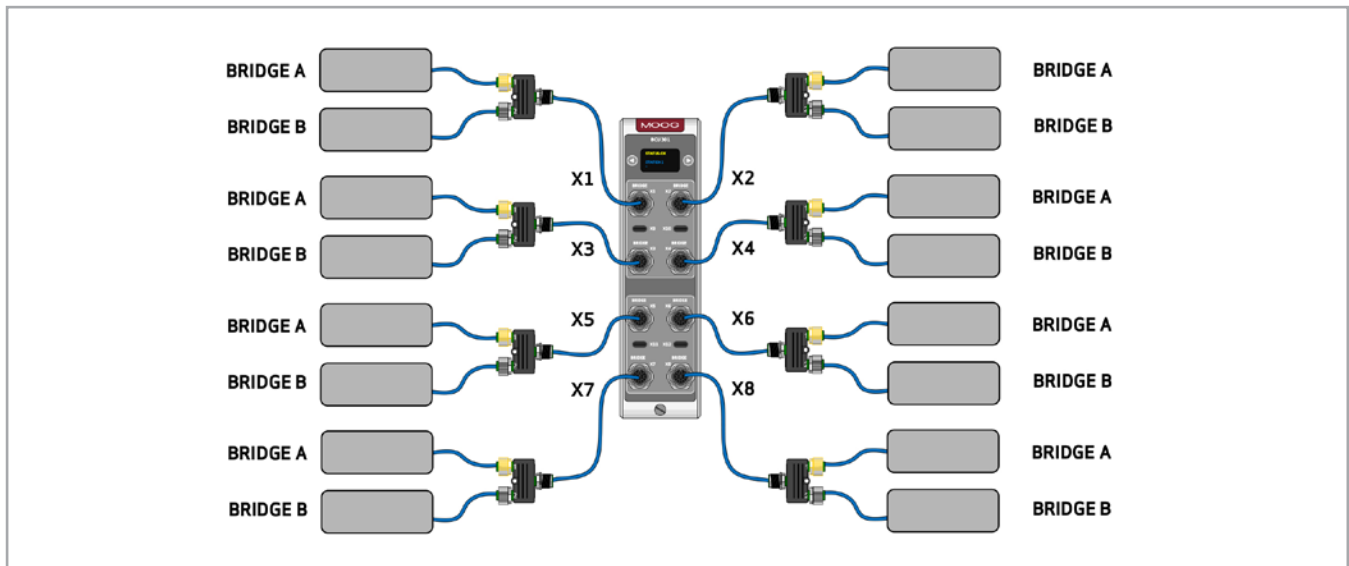
The Bridge Conditioner Unit is a flexible module that provides signal conditioning for up to 16 channels. It is designed primarily for Wheatstone bridge style sensors, but can be used on any high level signal-based sensor using 10 VDC excitation and output like a potentiometer or accelerometer. The strain gage-based sensors are compatible when wired in quarter, half or full bridge configuration. Each bridge type input is equipped with one internal shunt, one external shunt connection, and a connection for matched external completion resistors. This high channel density gives a cost effective tool to complement the other available control units for additional control or recording of data signals.

Its full aluminum enclosure makes it ruggedized and easy to handle. It's equipped with a display for immediate status and diagnostics feedback.

Communication with the module is achieved through EtherCAT and Ethernet interfaces, along with control power through the back of the module. The internal ZYNQ processor module provides power to run multiple control loops that can control external equipment or internal processes.

| FEATURES | BENEFITS |
|--------------------------------------|--|
| Fully enclosed | ESD protection, easy to swap and service |
| Ruggedized | Full aluminum enclosure protects electronics from harsh environments |
| Small form factor | Reduction of >50% in cabinet space, more I/O fits into less space |
| Modular | Fits easily into small single channel or large multi channel test system |
| Easy to install | No tooling required |
| Integrated OLED display/module | Immediate status & diagnostics feedback |
| Dual EtherCAT and Ethernet Interface | Control through real-time EtherCAT; DAQ through Ethernet |
| 24 Bits on all inputs | Higher input accuracy |
| Input bandwidth on all inputs 40 kHz | Simultaneous sampling |
| M12 industrial standard connectors | High density, world-wide availability |
| Integrated transducer power supply | Supply power directly from unit, reducing system complexity and cost |
| Wide range DC power input | Low power consumption |

Cable design and manufacturing is critical to measure these small signals and isolate electrical noise from the outside environment. Moog has already designed and manufactured a wide variety of cost effective cabling options to meet your specific needs. Talk to one of our experts who will make sure all the equipment runs with the best performance.



PERFORMANCE SPECIFICATIONS - BRIDGE CONDITIONER UNIT

| DESCRIPTION | SPECIFICATION |
|------------------------------------|--|
| Number of Interfaces | 16 |
| Input Type | Differential |
| Input signal range | ±16V AC or DC |
| Input programmable gain | 1/8 to 176 in 22 software selectable combinations |
| Input sample rate | Up to 100 kHz |
| Input resolution | 24 Bits simultaneous sampling |
| Supported bridge type | Full/Half/Quarter (quarter bridge is supported making use of the completion resistor connector for external bridge completion) |
| Supported number of bridge wires | 4-wire, 6-wire, 7-wire, 8-wire* (*physical 7-wire interface; internal/external shunt ± possible) |
| Broken wire detection | Yes (all wires) |
| Excitation voltage | Programmable; max ±10 V (±1 mV) |
| Excitation current | 100 mA max. |
| Load cell support/excitation drive | 120 to 1000 Ω |
| Internal shunt resistor | 1 pcs; 100 kΩ (<10 Ω internal multiplex resistor) |
| External shunt resistor | 1 connection/interface (total 4); (<10 Ω internal multiplex resistor) |

I/O SPECIFICATIONS - BRIDGE CONDITIONER UNIT

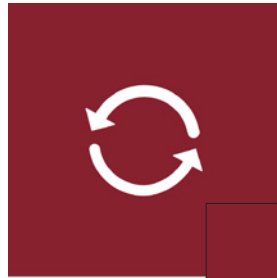
| DESCRIPTION | # OF INTERFACES | TYPE | COMMENTS |
|---|-----------------|---|--|
| Bridge type inputs Full, half or quarter | 16x | Input Individually configurable per in/output | Including -internal/external shunt -External shunt bridge completion |

SOFTWARE TO MEET YOUR NEEDS

The Moog Test Controller includes the Moog Integrated Test Suite as the core to operating complex tasks in easy-to-use ways. Complementing the Integrated Test Suite software are several optional application packages to expand control, capability and test performance.

MOOG REPLICATION

Replicate time history files using state-of-the-art algorithms in an easy yet powerful way



MOOG RUNNER

Build complex, nested durability tests through simple instructions. Run and monitor the progress of the durability test and specimen

MOOG SINESWEEP

Measure the resonant frequencies of your test specimen. Run sine sweep durability tests



MOOG VIBRATION

Run real-time closed loop control to defined random vibration frequency spectra (PSDs)

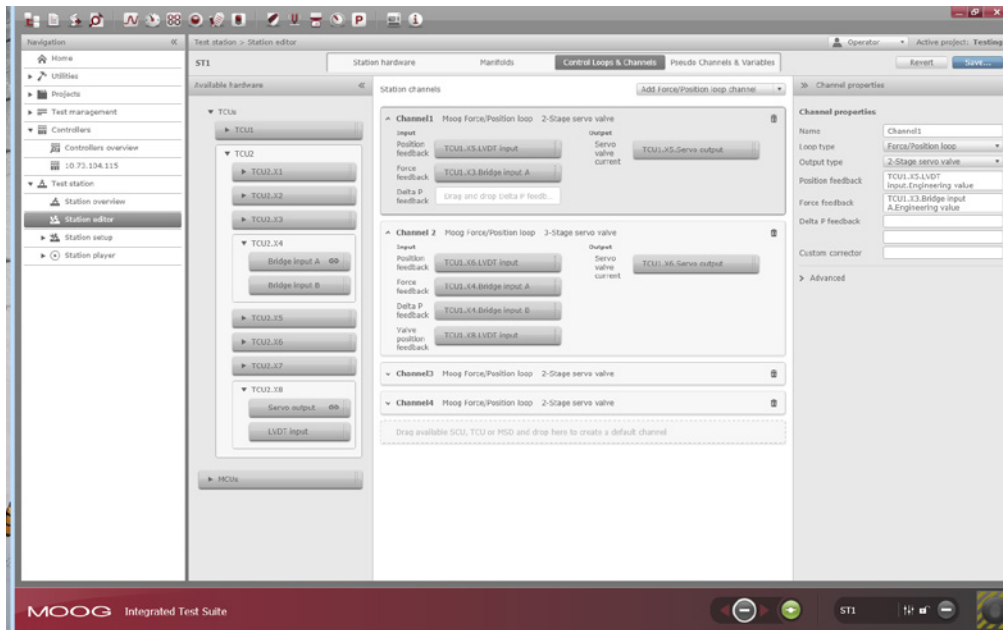
CONTROL YOUR TEST WITH THE MOOG INTEGRATED TEST SUITE

Configure, calibrate and tune equipment with easy-to-use setup screens and then build and play simple to complex test sequences for durability tests.

| Key Features | User Benefits |
|--|---|
| Supports multiple test systems <ul style="list-style-type: none"> Single and multi-axis hydraulic or electric test systems, Hydraulic Simulation Tables, Electric Simulation Tables, Tire Coupled Simulation Systems | One controller platform for many uses <ul style="list-style-type: none"> User interface includes configuration, calibration, tuning and test players for strength, fatigue or vibration tests |
| Integrated suite <ul style="list-style-type: none"> Utilize a variety of functions for simple or complex tasks | User friendly and intuitive <ul style="list-style-type: none"> One learning curve for operating different test rigs Supports less experienced operators or total control for advanced users High value software without hidden extras Additional capability with optional application software |
| Real time motion control <ul style="list-style-type: none"> Multiple control loops, amplitude and phase matching, bumpless control switching, data acquisition | Test accuracy and efficiency <ul style="list-style-type: none"> Optimal control and data recording across all channels minimizes setup and run time |
| Maximum access to configurable hardware <ul style="list-style-type: none"> Bind the high density I/O needed to the test station, easily calibrate sensors | Cost effective hardware and software combination <ul style="list-style-type: none"> High utilization of available I/O Quick setup leads to more testing uptime |
| Customize your user interface <ul style="list-style-type: none"> Multi-language support (9 languages including English, German, and Chinese) Save/load user interface layouts (scopes/meters) User authentication (levels of access) | Efficient localization <ul style="list-style-type: none"> Preferred language Time saving monitor sets Control access to key information |
| Several players built-in to run your test <ul style="list-style-type: none"> Cycle player- multi-axis phased operation with target matching and recording Sequence player- create custom tests with ramp, cycle, drive file instructions, recordings and/or triggered actions | One software package to run simple or advanced tests <ul style="list-style-type: none"> One user interface to run and monitor simple fatigue tests, or monitor complex tests with nested instructions, data recording, and dozens of triggered actions |

CONTROL YOUR TEST WITH THE MOOG INTEGRATED TEST SUITE

STATION EDITOR

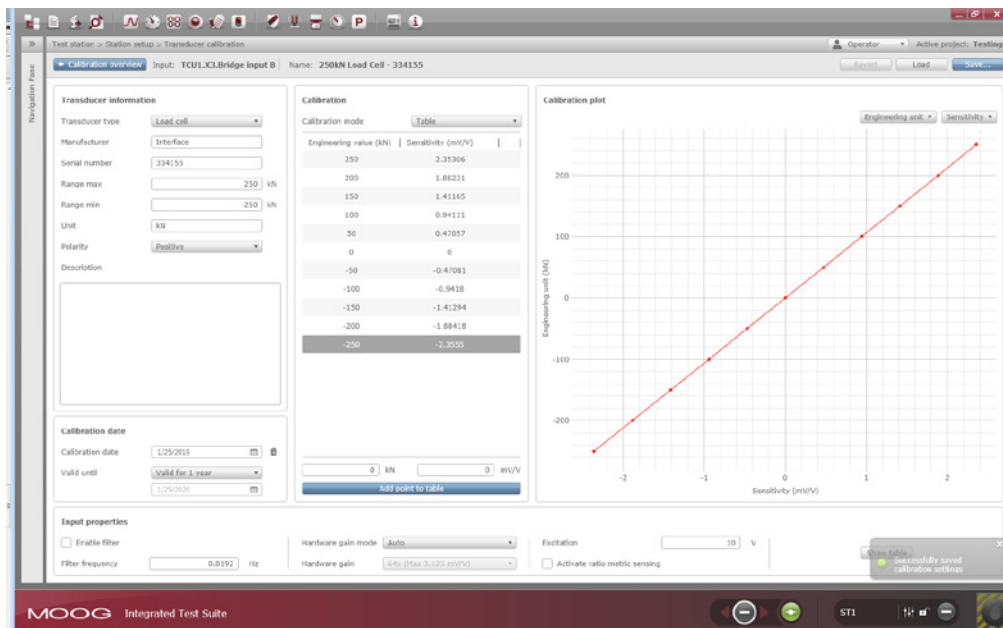


This is the central place to configure the station hardware and software. The user adds specific hardware I/O, creates logical channels and desired control loops, and can add pseudo channels for calculations.

This flexible configuration tool allows the user to select from the available high density I/O and simply drag and drop the connections into the stations. These settings can be saved and later loaded to minimize manual steps.



TRANSDUCER CALIBRATION



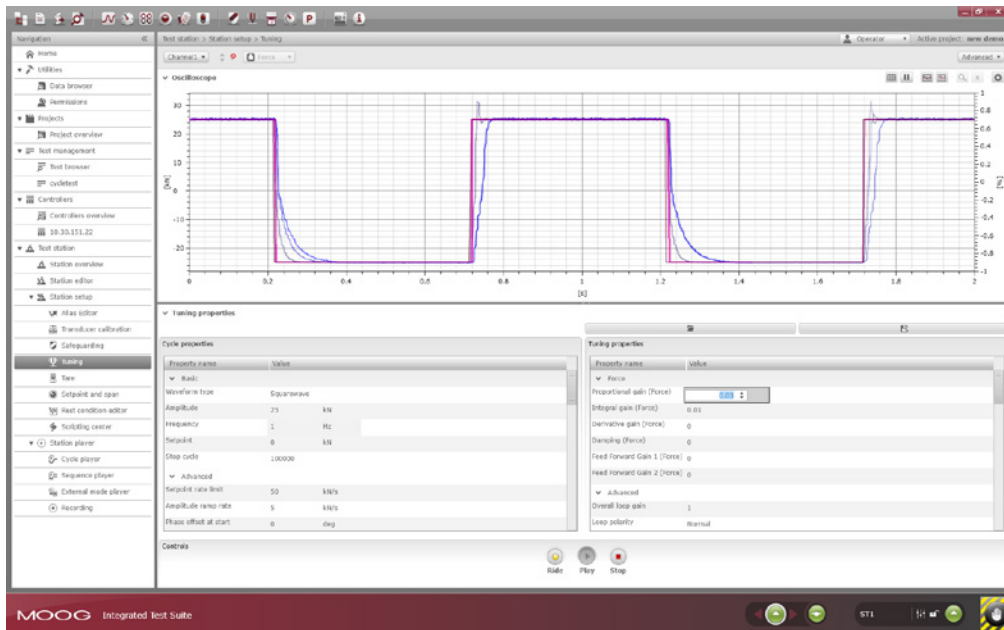
This area allows the user to convert sensor signals (voltages) into desired engineering units. A calibration wizard guides the user through the process in a simple way. Sensor sensitivity can be directly entered or calculated from up to 99 points for precise linearity.

Engineering unit entry allows the operator to change units as necessary without starting over, like from inches to mm and lbs to kN. All of the sensor calibration data can be stored for reuse.



MOOG INTEGRATED TEST SUITE

TUNING

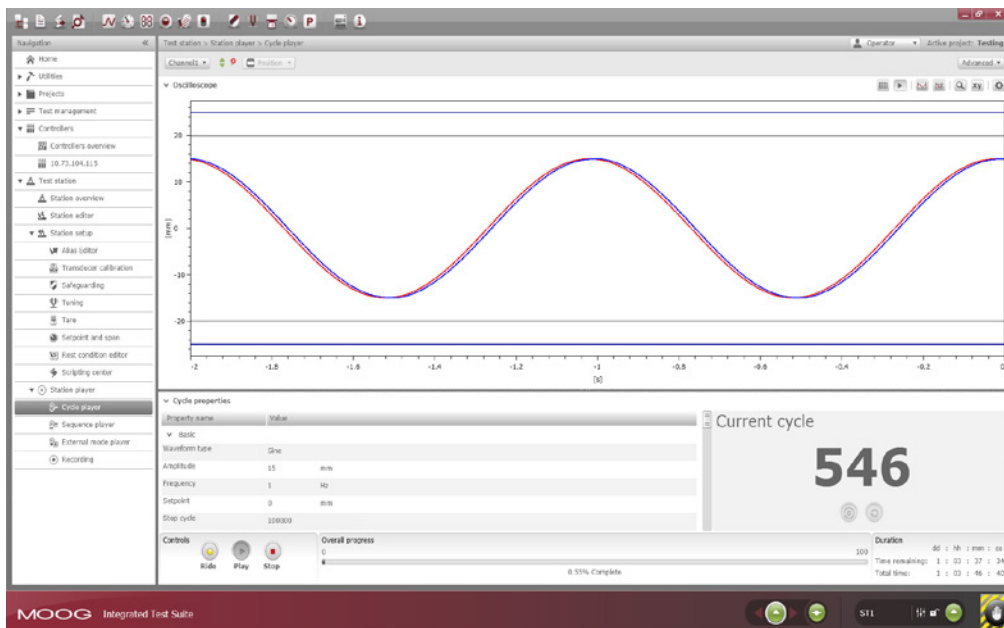


The Tuning screens in the Integrated Test Suite allow the user to set a command signal and view the response of the feedback signal in real time.

The user can easily adjust the gains to minimize the following error for the various control loops like the PID loop, Moog force/position loop, PVA loop or Trimode loop. These loops can operate with two or three stage servo valves, and include advanced tuning parameters like feed forward terms and loop shaping filters. Moog uniquely provides a damping term which improves stabilization of force loops.



CYCLE PLAYER



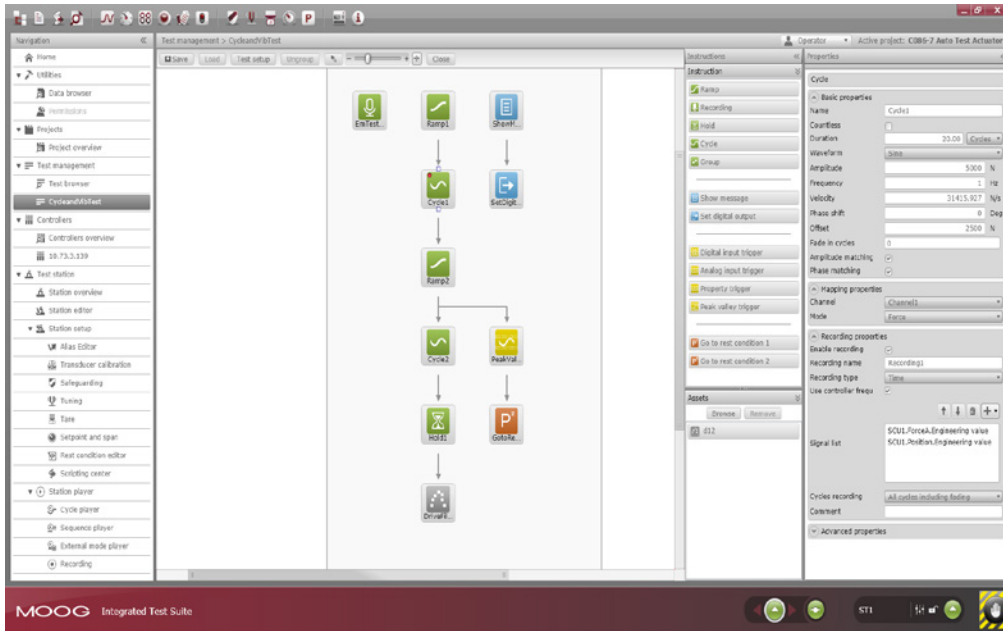
The Cycle Player puts all necessary information on one screen to command and monitor a cyclic test. Amplitude and phase matching controls automatically adjust the command signal to achieve targeted waveforms.

Monitoring of test progress is easy with a large cycle count display, a progress bar, and an oscilloscope. Recordings can be done at any time to store signal data for review or analysis.



MOOG INTEGRATED TEST SUITE

TEST BROWSER / TEST BUILDER

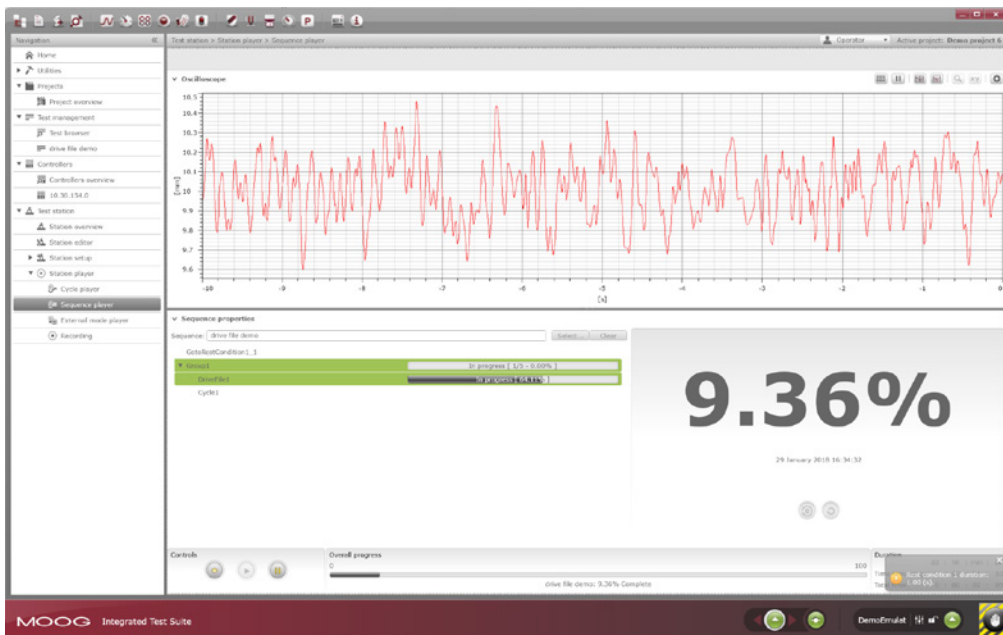


The Test Builder allows the user to quickly create and/or edit test definitions. Tests consist of instructions, actions, triggers, or assets like drive files. These instructions include items like ramp, recording, cycle, or grouping for nesting instructions.

The user can also select a command time history (drive file) to command a real time instruction. The instructions can include nested recordings or the data can be recorded in parallel with one or more instructions.



SEQUENCE PLAYER



The Sequence Player puts all of the necessary information on one screen to run a sequence of instructions and monitor data.

Monitoring of test progress is easy with a large percent complete display, a progress bar, and an oscilloscope.



A VARIETY OF APPLICATIONS

Test labs need a variety of capabilities and flexibility to perform tests with many different requirements.

The Moog Integrated Test Suite and Application Software gives you capabilities to develop successful tests that match your changing priorities and protect the test specimen.

Our expert approach to achieving reliable testing results using better hardware and software with electric and

hydraulic technologies, ensures we can control the highest requirements and give you easy to use test equipment for the best value.

By understanding today's test trends and challenges, and listening closely to the needs of customers around the world, we provide the right tools and proactive expertise to make your test applications faster or perform farther than you ever thought possible.

ELECTRIC MULTI-AXIS TEST SYSTEMS



For design and production verification, Moog Electric Multi-Axis Test Systems are designed for efficient operation in a range of static or load/deflection tests to cyclic loading with test specimens like seat systems or door closures. These quiet systems are plug-in ready and have a lower total operating costs than equivalent hydraulic systems.

HYDRAULIC MULTI-AXIS TEST SYSTEMS



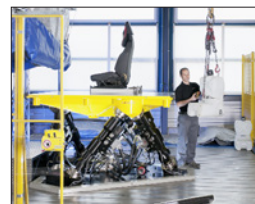
Hydraulic test systems are the foundation of high cycle structural durability fatigue tests on many test articles. Moog provides the necessary building blocks like test actuators, controllers and software that are built for years of reliable use. Most likely, you have been using our servo valve products on your test equipment for decades.

FOUR POSTER TEST SYSTEMS



Our Four Poster Test Systems include hydrostatic bearing test actuators for low friction, high velocity and high side load carrying capacity. Our systems are found in research labs where they are used for ride quality assessment and Noise, Vibration and Harshness (NVH) testing. They're used in durability test labs to validate selected body, chassis, and suspension designs. They are also used in production facilities to assess squeak and rattle concerns.

HYDRAULIC AND ELECTRIC SIMULATION TABLES



The Hydraulic Simulation Table provides acceleration or displacement inputs to reproduce time history data collected on proving grounds. Test samples generally include body mounted components or systems like EV batteries, engine mounting systems, cooling modules or cockpits.

The human rated Electric Simulation Table, with the small Stewart platform footprint, incorporates electric actuators to deliver 6 degree-of-freedom motion. The test controller plays vibration spectra or time histories to provide exact control for comfort evaluation.

TEST PRODUCTS

Moog engineers are always ready to meet your unique application needs with building blocks or complete turnkey systems that include hydraulic and electric test actuators, servo valves, hydraulic service manifolds, test controllers, software and more.

SERVO VALVES



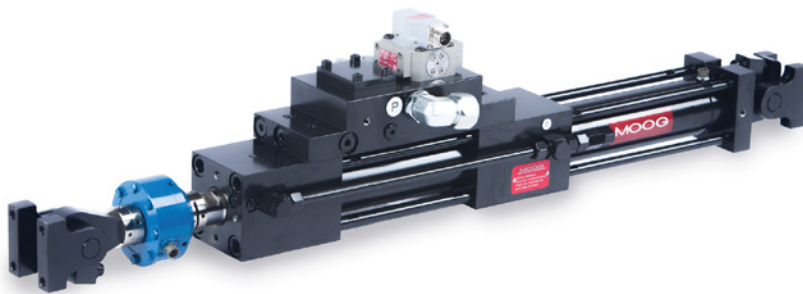
Because we design our renowned Moog Servo Valves, the world standard in performance and durability, you're assured of a system tailored to your exacting requirements.

HYDRAULIC SERVICE MANIFOLDS



The Moog Hydraulic Service Manifold (HSM) provides on/off hydraulic pressure with an adjustable transition from off to high pressure. Filters protect sensitive servo valves and accumulators provide instantaneous flow or pressure damping when needed. Several flow-rating sizes with 1 to 4 station options are available.

HYDRAULIC TEST ACTUATORS



Fatigue rated actuators are the heart of high performance test systems. For years, test engineers have been looking for actuators that deliver dependability, less maintenance and high performance, yet are available at an affordable price.

ELECTRIC TEST ACTUATORS WITH SERVO DRIVES



Moog provides electric actuators with appropriately sized servo drives to meet displacement, velocity and force requirements for each test application. These matched pairs are plug-in ready and connect to a test controller through only an EtherCAT network connection.

SERVICE AND SUPPORT

Five Point Inspection Process

Our number one goal is to eliminate downtime and make repairs that will deliver reliability and cost savings for years to come. When you send in your repair, it must work like new when you get it back. This is the Moog Global Support® promise.

- Incoming inspection will provide the customer details on the performance of the assembly. For actuators it could be leakage or response. For electronic modules it could be a non-functional connection. The inspection will also provide details to our technicians in regards to critical performance specs that need to be addressed.
- Technicians will then review engineering notes for any design improvements that may have been initiated since inception.
- Servo valves are removed and sent through the same rigorous evaluation, disassembly and test.
- Finally, the individual component or assembly will be tested to original specs to ensure the overhauled unit meets all design and performance criteria as if it were new.

Moog Engineering On Call For You

In today's competitive manufacturing environment, machine performance plays a significant role in determining your bottom line. Moog Global Support is key to achieving cost-effective machine operation, day in and day out.

We are committed to providing world-class motion control products and solutions, taking customer support far beyond the initial sale. Our dedicated approach solves your problems, addresses your machine challenges, and allows you to achieve maximum productivity on a daily basis.

Repair Capabilities

Moog Global Support® is designed to keep your critical machines up and running at peak performance with only 100% genuine Moog replacement parts. Only Moog replacement parts can deliver the reliability, versatility and long life that you would expect from a world leader in motion control solutions. Each Moog part delivers essential components with precise dimensions, close tolerances and specifications. Because we understand the key role our parts play in the overall operation of your machine, we carefully inspect and test each repair to identify only those components that need replacement.



The Moog Difference

It's time you worked with a partner who can offer both the world-class products you desire and collaborative expertise you need to reach the next level of performance. Contact us today to see the difference Moog can make.



THINKING ABOUT AN UPGRADE?

Our servo valve products include cleaning, repair and trade-in programs to keep you running or using the latest technology.

Our software maintenance agreements keep you up-to-date with the latest features, stabilizing updates, and ease-of-use improvements.

Our control hardware includes updates to processors, storage space, and multi-range conditioners as changes occur to add years of useful life to your initial purchase.

Do you have an analog test controller? Moog can provide a digital controller to provide commands to the existing controller as a transition to full digital or a drop-in replacement in one step. Why not take advantage of the many features digital controls can bring to your tests like advanced control loops and sequenced tests, built-in data acquisition, and settings that can be saved for future use. Contact Moog for more details!

TAKE A CLOSER LOOK.

Moog designs a range of products that complement the performance of those featured in this catalog. Visit our website for more information or contact the Moog facility nearest you.

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