



2021 Training

Course Catalog

IMPROVE YOUR TESTING EFFICIENCY AND MAXIMIZE SYSTEM PERFORMANCE WITH **MTS TRAINING**. THESE EXPERTLY LED COURSES PROVIDE HANDS-ON LEARNING TO MAKE SURE YOU ARE THOROUGHLY FAMILIAR WITH YOUR TEST SYSTEMS AND KNOW HOW TO OPERATE THEM EFFECTIVELY. IN ADDITION TO A BROAD SELECTION OF STANDARD COURSES, MTS CAN CUSTOMIZE COURSES TO MEET YOUR SPECIFIC LAB NEEDS AND DELIVER THE TRAINING AT OUR TRAINING CENTER OR YOUR WORKPLACE.

Training Centers

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Course Selection

Overview

As your partner in successful testing, MTS provides in-depth, focused training on the operation of the products you have purchased. We offer classroom training in three Regional Training Centers, located in the USA, Korea, and Germany.

Training alternatives

MTS can provide onsite presentations of all course offerings. MTS also has the expert capability to develop custom courses on a broad range of test-related subjects not covered in the course schedule. (Please allow three months for onsite course scheduling.)

Test System Operation & Application Theory Courses

DESCRIPTION	AMERICAS TRAINING CENTER	ASIA TRAINING CENTER	EUROPE TRAINING CENTER	PAGE NUMBER	GROUND VEHICLES	BIOMEDICAL	GEO & CIVIL ENGINEERING	MATERIALS	AEROSPACE (STRUCTURAL & COMPONENT)	SERVICE PRODUCT CODE
Damper Test System Operation	√			5	√			√		TRDTSOC
Durability Testing Technology	√	√		6	√		√			TRDTTC
Elastomer Testing on Controllers with MTS Series 793 Software	√	√	√	7	√		√			TRETC793C
Test Rig Design	√			8	√	√	√	√	√	TRTRDC

Software Operation Courses

DESCRIPTION	AMERICAS TRAINING CENTER	ASIA TRAINING CENTER	EUROPE TRAINING CENTER	PAGE NUMBER	GROUND VEHICLES	BIOMEDICAL	GEO & CIVIL ENGINEERING	MATERIALS	AEROSPACE (STRUCTURAL & COMPONENT)	SERVICE PRODUCT CODE
MTS Hardware Concepts & Series 793 Software	√	√		9	√	√	√	√	√	TRCAHOMTWC
MTS Series 793 Advanced Software Operation			√	10	√	√	√	√	√	TR793ASOC
MTS Series 793 Software with MultiPurpose TestWare® (MPT™) Test Design	√	√	√	11	√	√	√	√	√	TRCAMTSC
MTS Series 793 Software with MTS TestSuite™ Elite (mpe) Test Design	√	√	√	12	√	√		√	√	TRCAMTSMSC
MTS TestSuite Multipurpose Elite (mpe) Software	√	√	√	13	√	√		√	√	TRMTSMSC
MTS TestSuite TW Software	√	√	√	15	√	√	√	√	√	TRTSTWEC
MTS TestSuite mpe Advanced			√	17	√	√	√	√	√	TTRTSMPEADVC
MTS Acumen Operation with MTS TestSuite Multipurpose Elite Software	√			18	√	√		√		TTRACUMTSMPE
AeroPro™ Software Operation*	√			19					√	TRAPOC
AeroPro Administrator*	√		√	19					√	TRAPAC
Fatigue & Fracture with MTS TestSuite Software*	√			20	√	√	√	√	√	TRFFSC
Component RPC Pro Software Operation	√	√	√	21	√		√			TRCFPSOC
RPC Pro® Software Operation	√	√	√	22	√		√			TRRPASOC
RPC Pro® Advanced Software Operation	√	√	√	23	√		√			TRRPASOC
RPC Pro® Fatigue Tools	√	√	√	24	√		√			TRBRPPFATADDC
RPC Pro® Fatigue Tools - (Advanced)	√	√	√	25	√		√			TRARPPFATADDC
RPC® Connect Advanced Software Operation	√	√	√	26	√		√			TRRPCCASOC
RPC® Connect Basic Software Operation	√	√	√	27	√		√			TRRPCCBSOC
RPC® Connect User Transition from RPC Pro	√	√	√	28	√		√			TRRPCCUTRANSC

Training/Consulting Package

DESCRIPTION	PAGE NUMBER	SERVICE PRODUCT CODE
MTS TestSuite MPE Training/Consulting Package <i>(Contact MTS Training for details)</i>	14	TTRTSMPETCP
MTS TestSuite TWE Training/Consulting Package <i>(2 days software training plus 2 days consulting on custom test methods)</i>	16	TTRTSTWETCP

RPC Pro® Software Training Course Comparison

Comparison Charts	32-33	
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* Not regularly scheduled, but available on request.

On-Line Training

DESCRIPTION	PAGE NUMBER	SERVICE PRODUCT CODE
RemoteTR - Series 793 Configuration	29	TTR793CONFIG
RemoteTR - Series 793 Operator Introduction	29	TTR793OPINTRO
RemoteTR - MultiPurpose TestWare Operator Introduction	30	TTR793MPTINTRO
RemoteTR - TestSuite mpe Operator Introduction	30	TTRTSMPEOPINTR
RemoteTR - TestSuite twe Operator Introduction	31	TTRTSTWEOPINTR
RemoteTR - TestSuite twe Test Design & Results	31	TTRTSTWEEXPDTA

Registration

To register for an MTS training course, call the appropriate Regional Training Center.

- » Americas Training Center
1-952-937-4000
- » Asia Training Center
+82-31-728-1600
- » Europe Training Center
+49-30-81002-222

Training course schedules are available online at www.mts.com.

Confirmation

MTS will send you a confirmation email of your course registration. Prices for standard courses include tuition, text materials, class supplies, classroom refreshments, and lunch. All other expenses are the responsibility of the student.

Software Support Plan (SSP) Training Package

If you are an SSP customer using RPC/cRPC or AeroPro software, you are entitled to 1 pass for up to 2 training courses per 12-month contract period. Reference your SSP Contract Number when registering for the courses to use each pass. Note this pass does not include travel or lodging costs, and is only for courses at MTS training facilities.

Cancellation policy

MTS reserves the right to cancel a class if there is not sufficient registration four weeks prior to the start date of the class. MTS will not reimburse any prearranged travel-related expenses if a class is cancelled.

If you cannot attend the course after you have registered, you must cancel your registration at least one week prior to the start of the course. Persons who do not attend a course and who do not cancel their reservations will be assessed a non-notification of cancellation fee.

Customized training

If you have specialized needs requiring custom training, MTS can help. MTS has a large staff of engineer trainers with a wide range of experience. In many cases, customized training may be combined with a solution to an issue you may be experiencing.

Please contact MTS for a quote for your custom training requirements.

Training at your facility can be more cost effective

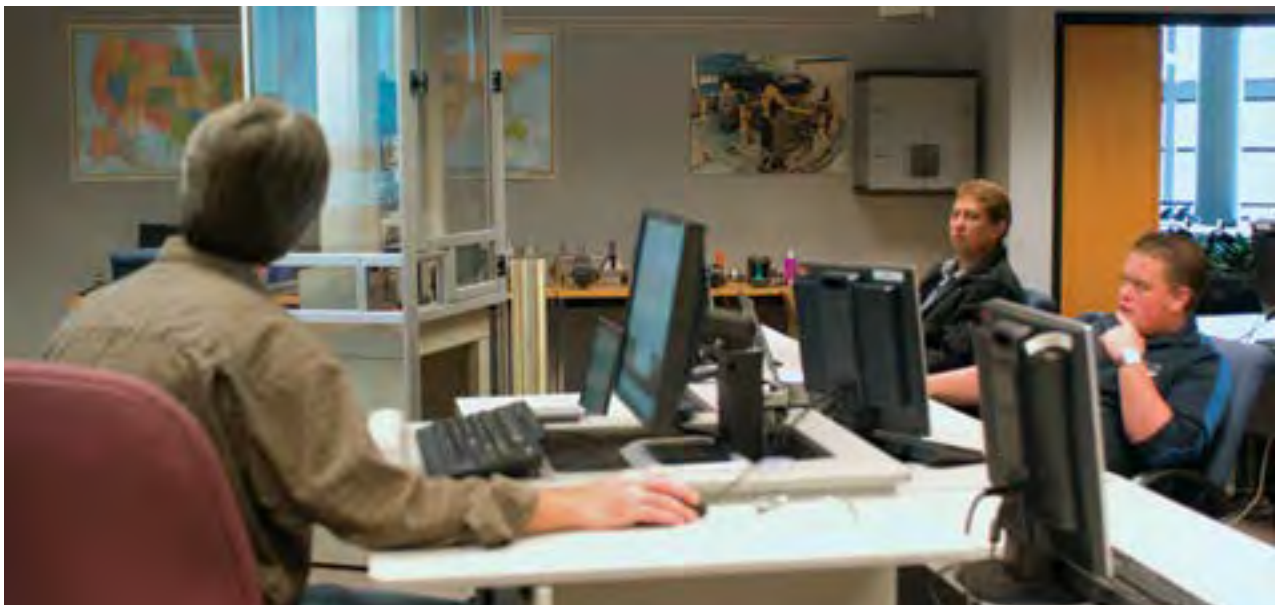
If you have a large group needing training, consider the cost effectiveness of having MTS provide training at your facility.

MTS will deliver any course at your facility. Please see price list for base rates that include tuition, text materials, and all other classroom supplies for the students.

You are responsible for providing all hands-on training equipment, classroom facilities, and training aids such as projectors.

BENEFITS OF ONSITE TRAINING

- » More economical for groups of four or more.
- » Often provides answers to the specific questions facing your company.
- » By using your equipment for the hands-on training, the students learn exactly how to use their testing system configuration.
- » Scheduling flexibility can resolve shift work and other group logistics issues often associated with larger groups.



Damper Test System Operation

3 day course

COURSE OUTLINE

- I. Introduction
- II. Damper Testing Principles & Issues
 - A. The damper test market
 - B. Damper test techniques
 - C. Current trends in damper testing
 - D. Damper test solutions
- III. Mechanical Aspects of a Damper Test Frame
 - A. Frame & actuator design
 - B. Performance test requirements vs. durability test requirements
 - C. Accumulator sizing
- IV. Damper Test Software Introduction
 - A. Damper software installation
 - B. PC requirements & controller platform requirements
- V. Laboratory Damper Testing
- VI. Damper Test System Software
 - A. Damper channel & signal configuration
 - B. Concepts of performance testing
 - C. Concepts of durability testing
 - D. Concepts of temperature sweep testing
 - E. Concepts of sine sweep testing
 - F. Gas & seal friction testing
 - G. Concepts of NVH testing
- VII. Damper Test Analysis
 - A. Creating a test workbook
 - B. Opening a test workbook
 - C. Data plotting & reporting
- VIII. Example Tests
 - A. Create & run a performance test
 - B. Create & run a durability test
 - C. Create & run a temperature sweep test
 - D. Create & run a sine sweep test
 - E. Create & run a NVH test

This course provides you with the fundamentals of damper testing and the use of the MTS Damper Software running on MTS Series 793 software to execute tests in your laboratory. Damper test setup, execution, and analysis are covered through classroom lectures and laboratory exercises. Both Performance and Durability testing are covered.

Who should attend

This course is targeted at damper system operators, test engineers, and laboratory managers. For more advanced topics that address your specific testing needs, contact MTS about consulting services.

Prerequisites

Students must have a thorough understanding of Series 793 software including PID tuning, signal offsets, and limit settings. For those who are new to the MTS controllers with Series 793 software, MTS strongly recommends attending either the *MTS Hardware Concepts and Series 793 Software* course or the *MTS Series 793 Software with MultiPurpose TestWare (MPT) Test Design* course prior to taking the Damper class.

Durability Testing Technology

2 day course

COURSE OUTLINE

- I. Introduction
 - A. Durability testing objectives
 - B. Durability testing in the vehicle development process
- II. Assessment of Service Conditions
 - A. In-service & proving ground loading
 - B. Road-load data acquisition
 - C. Transducer selection & vehicle instrumentation
 - D. Recording systems
 - E. Digitization of data
 - F. Time & frequency domain analysis
- III. Laboratory Reproduction of Service Conditions
 - A. Fixturing
 - B. Servohydraulic test systems & components
- IV. Programming of Test Systems
 - A. Test excitation
 - B. Servocontrollers
 - C. Servocontrol tuning & stabilization techniques
 - D. Command compensation methods
- V. Test Evaluation Metrics
 - A. Test correlation
 - B. Fatigue analysis methods (load-, stress-, & strain-life)
 - C. Cycle counting
 - D. Damage accumulation

In this course, your instructor presents the principles for fatigue-correlated durability testing of ground vehicles and their components using servohydraulic laboratory test equipment. You examine the choices required when designing a durability test, from vehicle instrumentation and data collection through test rig design and test excitation. The course includes an introduction to fatigue analysis methodologies applicable to durability test data editing, test correlation, and evaluation. Numerous test examples and problem-solution scenarios are included. Particular emphasis is given to the design of fatigue tests for ground vehicle structures and components subjected to variable amplitude loading. Test rig design is introduced in this course. A more rigorous, detailed approach to design is provided in another MTS course called Test Rig Design.

Who should attend

The course is excellent training for test or design engineers and technicians who require an understanding of modern simulation testing methods.

- » It should be especially useful for engineers who are planning new test facilities, or who must regularly request testing services from other departments.
- » It will be helpful for experienced test engineers and technicians who are looking to fill gaps in their understanding, and for lab managers and technicians who desire a broader understanding of test design.

Prerequisites

A technical degree or equivalent background in test applications is preferred.

Elastomer Testing on Controllers with MTS Series 793 Software

3 day course

COURSE OUTLINE

I. Day 1

- A. System Overview
- B. Elastomer Software Overview
- C. Typical Static Deflection Test
- D. Static Deflection Test Data
- E. Basic Elastomer Theory Part 1
- F. Static Deflection Test in Simulation
- G. Static Deflection Lab
- H. Static Deflection Macros

II. Day 2

- A. Basic Dynamic Characterization Test
- B. Dynamic Characterization Test Data
- C. Basic Elastomer Theory Part 2
- E. Dynamic Characterization Test in Simulation
- F. Dynamic Characterization Lab
- G. Dynamic Characterization Macros

III. Day 3

- A. Finish up Dynamic Characterization
- B. Basic Elastomer Theory Part 3
- C. Transmissibility
- D. Control Parameter Sets
- E. Process Settings
- F. Demo Mode
- G. Load Path Deflection Correction Set
- H. Conditioning Errors
- I. Acceleration Errors
- J. Tech Support

This is a basic course that covers the use of MTS Elastomer Test Systems using digital controllers with Series 793 Software. Training includes an overview of viscoelastic theory, test system setup, and operation with practical test examples and data analysis as it pertains to tests available with the **MTS Model 793.31 Dynamic Characterization** and **Model 793.33 Static Deflection software**. Test setup, execution, and analysis are covered through classroom lectures and laboratory exercises.

Note: This course does not include the ElastomerExpress™ Application.

Who should attend

This course is targeted for engineers new to elastomer testing using MTS controllers with Series 793 software, whether they are new to the test lab or they are just setting up a test system. For more advanced topics that address your specific testing needs, contact MTS about consulting services.

Prerequisites

Students must have a thorough understanding of Series 793 software including PID tuning, signal offsets, and limit settings. For those who are new to the MTS controllers with Series 793 software, MTS strongly recommends attending either the *MTS Hardware Concepts and Series 793 Software course* or the *MTS Series 793 Software with MultiPurpose TestWare (MPT) Test Design course* prior to taking the Elastomer Applications class. All prerequisites are the responsibilities of the student.

Test Rig Design

1.5 day course

COURSE OUTLINE

- I. Test Rig Concept Definition
- II. Design criteria
 - A. Stiffness
 - B. Mass
 - C. Strength/durability
 - D. Safety
- III. Component Selection
 - A. Bellcranks
 - B. Actuators
 - C. Servovalves
 - D. Hydraulic power supplies
 - E. Accumulators
 - F. Bearings
 - G. Bolted connections
 - H. Reaction bases

This course is available as a companion to the 3-day training course on Durability Testing Technology, or as a stand-alone course. The course focuses on the principles of test rig fixture design for testing vehicle components.

Important mechanical design issues are addressed, including:

- » Restraint
- » Fixture kinematics
- » Safety
- » Performance
- » Component sizing
- » Common test configurations

Who should attend

This course was developed for engineers and technicians who are new to the technology, whether they are new

employees of existing facilities or employees involved in setting up a new testing rig or laboratory. It will also be valuable for engineers and technicians who have experience with certain aspects of test technology and who desire expanded knowledge of test rigs and fixtures.

Prerequisites

A technical degree or equivalent background in test applications is preferred.



MTS Hardware Concepts & Series 793 Software

5 day course

COURSE OUTLINE

- I. Introduction
 - A. Test system definitions and overview
 - B. Lab demonstration
- II. Hardware
 - A. Hydraulic power supplies
 - B. Hydraulic service manifolds
 - C. Accumulators
 - D. Servovalves
 - 1. 2-stage servovalve
 - 2. 3-stage servovalve
 - E. Actuators
 - F. Mechanical components
- III. Project Manager
 - A. Project basics
 - B. Default projects
- IV. Station Builder
 - A. Hardware/closed-loop fundamentals
 - B. Resource identification
 - C. Configuration
 - D. Channel/control mode/hydraulic design/
Channel Limited Channel (CLC)
 - E. Inputs - internal/external/calculated
 - F. Outputs
 - G. Digital I/O
- V. Station Manager
 - A. Setup/Initial arrangement
 - B. Windows/menus
 - C. Display options
 - D. Command options
 - E. Detectors and actions
 - F. Input offset/zero
 - G. Calibration file management
(not calibration procedures)
 - H. Scopes and meters
 - I. Digital inputs/outputs usage
 - J. Parameter set management
 - K. Tuning principles
- VI. Basic TestWare (BTW)
 - A. Data acquisition setup
 - B. Data file buffers training
 - C. Peak valley change detector training
- VII. MTS MultiPurpose TestWare Fundamentals
 - A. Window navigation and definitions
 - B. Executing procedures
- VIII. MTS TestSuite Fundamentals
 - A. Window navigation and definitions
 - B. Executing test runs

The MTS Hardware Concepts and Series 793 Software* class will introduce and familiarize the students with the correct set-up and operation of MTS material, simulation, and component test systems. The course content is designed for individuals new to servohydraulic testing. The instructor will discuss major system components and present the principles of closed-loop servo control. The course also introduces the students to basic operating principles of a digitally controlled servohydraulic test system. Students are provided with a hands-on approach to learn the operation of the controller and its related system electronic, hydraulic, and mechanical components. The five-day course will cover opening and running a test in both MultiPurpose TestWare (MPT) and MTS TestSuite (mpe) Software. The course does not cover designing tests in these applications. Sessions consist of a combination of classroom and laboratory exercises using the Series 793 software.

Who should attend

This five-day course is geared toward users who are new to servohydraulics or have limited experience using them. They need to learn the basics of the hardware and be able to operate the digital controller software. The pace of the class is designed to ensure all students have the opportunity and time to engage all topics and concepts presented.

Learning outcome

The students will have a functional understanding of the hydraulic power unit (HPU), hydraulic service manifold (HSM), servovalve, fluid care, closed loop control, actuators and load frames, limit functions, tuning. They will have an understanding of the relationship of software adjustments to the hardware.

The students will be able to launch the application, open the proper configuration/parameter set, properly control the hydraulics, manually command the control channel, install specimens safely in their fixturing, manually tune control modes, set limits, offset inputs. The students will be able to open and run a test in MultiPurpose TestWare (MPT) and MTS TestSuite Multipurpose (mpe) software.

Prerequisites

Students should have some operator experience with their system prior to attending. For assistance in determining which class would appropriate for you, please contact the MTS Training department. All prerequisites are the students' responsibility.

* Series 793 Software operates the FlexTest and TestStar controllers.

MTS Series 793 Advanced Software Operation

3 day course

COURSE OUTLINE

- I. Introduction
- II. User-Defined Actions
- III. Advanced control modes
 - A. Channel-limited-channel
 - B. Dual Mode compensation
 - C. Cascade Control
- IV. Advanced Adaptive Compensation
 - A. ALC
- V. Calculations
 - A. Calculated inputs and outputs
 - B. Calculated channels
 - C. MPT variables
- VI. Advanced Tools
 - A. HWI Editor
 - B. Systems Options Editor
 - C. Project Manager
- VII. Calibration (on request)

The Series 793 Software operates the FlexTest SE, FlexTest 40, FlexTest 60, FlexTest 100 and FlexTest 200 controllers. The MTS Series 793 Software Advanced Operation class addresses options and tools of the Series 793 software that require in-depth knowledge of the system, such as advanced control modes, calculations and hardware configurations.

Who should attend

This course is designed for students who have a good working knowledge of their testing system and its operation. They desire instruction on the advanced system capabilities.

Prerequisites

Students should be familiar with Series 793 Software. Several of the subjects in the Series 793 Advanced Software Operation class require software options that may not be installed on all systems. All prerequisites are the responsibility of the student.



MTS Series 793 Software with MultiPurpose TestWare (MPT) Test Design

4 day course

The MTS Series 793 Software* with MultiPurpose TestWare Test Design class introduces you to basic operating principles of a digitally controlled servohydraulic test system. Students are provided with a hands-on approach to learn the operation of

the controller and its related system electronic, hydraulic, and mechanical components. Sessions consist of a combination of classroom and laboratory exercises. Students will set up and run monotonic and cyclic tests using the concepts they have learned.

COURSE OUTLINE

- | | |
|--|--|
| I. Introduction | I. Auxiliary inputs configuration |
| II. Overview 793 Application Set | J. Output configuration |
| A. Application functions | K. Scopes and meters creation, edit and adjustment |
| B. Hierarchy | L. Digital inputs/outputs usage |
| III. Project Manager | M. Parameter set management |
| A. Project basics | N. Tuning principles & control mode considerations |
| B. Define/create/Edit Projects | O. Control compensation adjustment and configuration |
| C. Default projects | P. Calculation and formula definitions |
| D. Project management | Q. Utilities tools and options |
| IV. Station Builder | VI. MultiPurpose TestWare (MPT) |
| A. Hardware/closed-loop fundamentals | A. Introduction/overview |
| B. Resource identification | B. Procedures |
| C. Configuration | C. Processes |
| D. Channel/control mode/hydraulic design/Channel Limited Channel (CLC) | D. Specimens |
| E. Inputs - internal/external/calculated | E. Sequencing |
| F. Outputs | F. Command processes |
| G. Digital I/O | G. Data acquisition processes |
| H. Calculation/options | H. Event processes |
| V. Station Manager | I. Special processes |
| A. Setup/initial arrangement | J. Grouping processes |
| B. Windows/menus | K. Monitoring capabilities |
| C. Display options | L. Executing tests |
| D. Command options | M. Procedure options |
| E. Detectors and actions edit and adjustment | N. Create/edit/modify MPT procedures |
| F. Custom detector usage and creation | O. Create/edit/modify specimen folders |
| G. Input offset/zero edit and adjustment | P. Test design considerations |
| H. Calibration file management (not calibration procedures) | |

Who should attend

This 4-day course is designed for students who have a practical working knowledge of a closed loop servohydraulic testing system and have experience operating their own test system. They desire instruction on adjusting the servohydraulic system and designing tests. The class pace assumes the students have a fundamental understanding of their MTS servohydraulic testing system.

Learning outcome

The students will be able to open the proper configuration/parameter set and manually command the control channel. They will have an understanding of the interaction of specimen installation, offset inputs, and limit actions. The students will create inputs and control modes. They will be able to monitor test inputs and control in real time and understand effects of tuning and specimen characteristics. The students will create both monotonic and cyclic test procedures using MultiPurpose TestWare (MPT) procedures that will feature both advanced test flow concepts and data collection.

Prerequisites

Students should have operator experience with their system prior to attending the course. Students must have a full understanding of basic closed loop control concepts and fundamental testing knowledge. Students should also have a working knowledge of the operating system and its graphical user interface. For students new to servohydraulic test systems, we strongly recommend attending the MTS Hardware Concepts and Series 793 Software course. For assistance in determining which class would be appropriate for you, please contact the MTS Training department. All prerequisites are the students' responsibility.

* Series 793 Software operates the FlexTest and TestStar controllers.

MTS Series 793 Software with MTS TestSuite Elite (mpe) Test Design

4 day course

The MTS Series 793 Software* with MTS TestSuite Test Design class introduces the basic operating principles of a digitally controlled servohydraulic test system. Students are provided with a hands-on approach to learn the operation of the controller and its related system electronic, hydraulic, and mechanical components. Sessions consist of a combination of classroom and laboratory exercises. Students will set up and run monotonic and cyclic tests using concepts learned.

COURSE OUTLINE

- I. Introduction
- II. Overview 793 Application Set
 - A. Application functions
 - B. Hierarchy
- III. Project Manager
 - A. Project basics
 - B. Define/create/edit projects
 - C. Default projects
 - D. Project management
- IV. Station Builder
 - A. Hardware/closed-loop fundamentals
 - B. Resource identification
 - C. Configuration
 - D. Channel/control mode/hydraulic Design/Channel Limited Channel (CLC)
 - E. Inputs - internal/external/calculated
 - F. Outputs
 - G. Digital I/O
 - H. Calculation/options
- V. Station Manager
 - A. Setup/initial arrangement
 - B. Windows/menus
 - C. Display options
 - D. Command options
 - E. Detectors and actions edit and adjustment
 - F. Custom detector usage and creation
 - G. Input offset/zero edit and adjustment
 - H. Calibration file management (not calibration procedures)
- I. Auxiliary inputs configuration
- J. Output configuration
- K. Scopes and meters creation, edit and adjustment
- L. Digital inputs/outputs usage
- M. Parameter set management
- N. Tuning principles & control mode considerations
- O. Control compensation adjustment and configuration
- P. Calculation and formula definitions
- Q. Utilities tools and options
- VI. Multipurpose
 - A. Introduction/overview
 - B. Windows/menus
 - C. Projects, tests and test runs
 - D. Specimens
 - E. Test execution and management
 - F. Procedure creation, modification and editing
 - G. Command processes
 - H. Data acquisition processes
 - I. Other processes
 - J. Runtime displays
 - K. Executing tests
 - L. Procedure options
 - M. Create/edit/modify procedures
 - N. Reports
 - O. Test design considerations

Who should attend

This 4-day course is designed for students who have a practical working knowledge of a closed loop servohydraulic testing system and have experience operating their own test system. They desire instruction on adjusting the servohydraulic system and designing tests. The class' pace assumes students have a fundamental understanding of their MTS servohydraulic testing system.

Learning outcome

The students will be able to open the proper configuration/parameter set and manually command the control channel. They will have an understanding of the interaction of specimen installation, offset inputs, and limit actions. The students will create inputs and control modes. They will be able to monitor test inputs and control in real time and understand effects of tuning and specimen characteristics. The students will create both monotonic and cyclic test procedures using TestSuite Multipurpose (mpe) software. Test procedures will feature both advanced test flow concepts and data collection.

Prerequisites

Students should have operator experience with their system prior to attending the course. Students must have a full understanding of basic closed loop control concepts and fundamental testing knowledge. Students should also have a working knowledge of the operating system and its graphical user interface. For students new to servohydraulic test systems, we strongly recommend attending the MTS Hardware Concepts and Series 793 Software course. For assistance in determining which class would be appropriate for you, please contact the MTS Training department. All prerequisites are the students' responsibility.

* Series 793 Software operates the FlexTest and TestStar controllers.

MTS TestSuite Multipurpose Elite (mpe) Software

2 day course

COURSE OUTLINE

- I. Introduction
 - A. Overview
 - B. Elite/Express
 - C. User interface
 - D. Menus
 - D. Users
- II. Projects/Tests
 - A. Managing projects/tests
 - B. Templates/tests
 - C. Procedures
 - D. Activities
- III. Specimens
 - A. Creation
 - B. Properties
- IV. Test Runs
 - A. Test resources
 - B. Test runs
- V. Scopes and Runtime Displays
 - A. Message log
 - B. Runtime scope
 - C. General runtime properties
 - D. Cycle and signal views
 - E. General views
- VI. Reports
 - A. Report layouts
 - B. Report templates
- VII. Test Execution
 - A. Control panel
 - B. Hydraulic control
 - C. Implementing a test
- VIII. Variables
 - A. Overview
 - B. Creation, editing, modifying and managing
 - C. Calculations and functions

The MTS TestSuite Multipurpose Elite Software class explores the more complex features of the application including File Playback with focus on activities beyond command and data acquisition. Students are provided with instruction consisting of a combination of classroom and laboratory exercises. Students will create their own procedures covering a variety of different testing scenarios utilizing the concepts they have learned.

Who should attend

This course is designed for experienced users of Series 793 software who would like further instruction on developing tests.

Learning outcome

The students will be able to create and configure optional software adjustments. They will set up, monitor, and incorporate analog/digital inputs, outputs, control modes, and detectors. This would also include data acquisition techniques such as type, file sampling, file size, and output format. The students will associate Project Folders, Configurations, Procedures, MP Test Runs and Specimen Files appropriately for their testing needs. Upon completion of the course the user will be able to create, edit, and modify Multipurpose tests.

Prerequisites

Students should have significant and detailed operator experience with their test system prior to attending the course. Students should also have a working knowledge of the operating system and its graphical user interface. For students with limited experience, it is strongly recommended that they attend the MTS Hardware Concepts & Series 793 Software course prior to attending this class. All prerequisites are the responsibility of the student.



MTS TestSuite MPE Training/Consulting Package

4 day course

COURSE OUTLINE

- I. Introduction
 - A. Overview
 - B. Elite/Express
 - C. User interface
 - D. Menus
 - E. Users
- II. Projects/Tests
 - A. Managing projects/tests
 - B. Templates/tests
 - C. Procedures
 - D. Activities
- III. Specimens
 - A. Creation
 - B. Properties
- IV. Test Runs
 - A. Test resources
 - B. Test runs
- V. Scopes and Runtime Displays
 - A. Message log
 - B. Runtime scope
 - C. General runtime properties
 - D. Cycle and signal views
 - E. General views
- VI. Reports
 - A. Report layouts
 - B. Report templates
- VII. Test Execution
 - A. Control panel
 - B. Hydraulic control
 - C. Implementing a test
- VIII. Variables
 - A. Overview
 - B. Creation, editing, modifying and managing
 - C. Calculations and functions

For customers who are converting from 793 Multipurpose TestWare (MPT) to TestSuite Multipurpose Elite (mpe) or customers who are new to the MTS TestSuite mpe software, MTS offers a package that combines product training and test consulting. This is an excellent option to quickly bring your staff up to speed on the new software and to develop your test methods so you can continue testing with minimal interruption.

Training helps ensure that your staff understands the software and is familiar with setting up and editing tests and reports. Once your staff is comfortable with the software, the test consultant works with you to design or convert your test methods to your specific requirements.

The training is done at your location using your conference room facilities and your computers. Each student receives a 30-day license to run TestSuite mpe in simulation mode. This enables them to actively participate during the class and apply their new skills after it. Consulting can take place in the classroom and in your lab with your systems testing your products.

The benefits to this approach are twofold

1. It can reduce the time required to transition your lab to MTS TestSuite mpe software.
2. As your testing needs change, your staff will have the skills required to modify and develop test templates.

Who should attend

This training is designed for test engineers who need to create or modify tests using MTS TestSuite mpe software. No prior experience with MTS TestSuite mpe is needed, **however a familiarity with material testing and servo-hydraulic test systems is required.** Detailed knowledge of the tests that need to be conducted will maximize the benefits of the course.

Training – 2 days (8 hours each)

Training on the MTS TestSuite mpe product gives you a foundation for creating and maintaining the tests and reports you need now and into the future.

- » Training is conducted at the customer site in a conference room environment.
- » Class size is limited to eight students.
- » Hands-on training is provided for each student using the software's simulation mode.
- » Training includes an MTS TestSuite mpe 30-day simulation mode license for each student.
- » Customer provides student computers.

Consulting – 2 days (8 hours each)

Consulting services give you expert assistance with your choice of the following:

- » Converting 793 Multipurpose TestWare (MPT) procedures to TestSuite MP Elite (mpe) tests
- » Creating a new test from a written description
- » Optimizing test procedures

Advance planning session

A planning session conducted on-line or by phone with the customer, trainer and consultant is included prior to the course in order to make the course time most effective.

Options

To further customize the package you can add:

An additional day of consulting at the package price. Custom test templates, written in advance by MTS so they are sure to be ready when you need them.

MTS TestSuite TW Software

3 day course

COURSE OUTLINE

- I. Introduction
- II. Material Testing Terms and Definitions
 - A. Stress/strain
 - B. Modulus/yield
 - C. Testing standards
- III. Load Frame Safety and Operation
- IV. TWE Terminology
 - A. Template/tests/test runs
 - B. Test procedures/activities
 - C. Report templates
- V. TWE Software Overview
 - A. Test procedures
 - B. Configuration menu
 - C. Define tab
 - D. Monitor tab
- VI. Test Procedures
 - A. Opening tests
 - B. Test resources
 - C. Test runs
- VII. Review Tab
 - A. Configure statistics
 - B. Tag test runs
 - C. Format charts/move markers
 - D. Edit and recalculate data
- VIII. Variables
 - A. Creating, editing, and managing variables
 - B. Calculated variables
 - C. Data acquisition
- IX. Modifying Tests
 - A. Test flow basics
 - B. Test activities basics
- X. Creating Report Templates

This is a basic course on MTS TestSuite TW Elite (twe) software. The course starts with test terminology, frame operation and test-run fundamentals, and then covers other subjects such as modifying tests and customizing the test workflow. Classroom and lab exercises are performed on Electro-Mechanical (EM) software simulators and EM frames.

Note: For more advanced training that addresses your specific testing needs, MTS recommends the MTS TestSuite TWE Training/Consulting Package that combines two days of TWE training with two days of consulting. See the course description for the TWE Training/Consulting Package on page 19 for details.

Who should attend

This course is designed for those who use MTS TestSuite TWE software to run tests, create/edit report templates, and modify work flow in existing tests.

Learning outcome

The students will become familiar with using TestSuite TWE software to select and run a test, tag and recalculate data, add and configure meters, and run test reports. The students will also learn how to modify a test procedure, edit test parameters, create variables and calculated variables, define user roles, create report templates, and manage hardware resources.

Prerequisites

Students must have some hands-on experience with their system, and have a good working knowledge of computers prior to attending. All prerequisites are the responsibility of the student.

Note: For customers that are running TWE software on servo-hydraulic frames, MTS recommends attending either the MTS Hardware Concepts and Series 793 Software course or the MTS Series 793 Software with MultiPurpose TestWare (MPT) Test Design course. These courses cover using Series 793 software to set up basic PID tuning, signal offsets, and limit settings.

MTS TestSuite TWE Training/Consulting Package

4 day course

COURSE OUTLINE

Training concentrates on essential core concepts and best practices. Some content can be customized, based on your requirements.

- I. Workflow Basics
 - A. Running tests
 - B. Setting up projects
- II. TW Elite Software Setup
 - A. Configuration menu
 - B. User management
 - C. Review tab results, statistics, tagging, charts/markers
- III. Variables
 - A. Creating, editing, and managing
 - B. Calculated variables and functions
- IV. Modifying Tests
 - A. Test flow and test activities
 - B. Extracting data
 - C. Data acquisition
- V. Creating Report Templates with Optional Reporter Add-in
 - A. Test run and test report templates
 - B. Report generation options

For customers who are converting from TestWorks 4 to TestSuite TWE or customers who are new to the MTS TestSuite TWE software, MTS offers a package that combines product training and test consulting. This is an excellent option to quickly bring your staff up to speed on the new software and to develop your test methods so you can continue testing with minimal interruption.

Training helps ensure that your staff understands the software and is familiar with setting up and editing tests and reports. Once your staff is comfortable with the software, the test consultant works with you to design or convert your test methods to your specific requirements.

The training is done at your location using your conference room facilities and your computers. Each student receives a 30-day license to run TestSuite TWE in simulation mode. This enables them to actively participate during the class and apply their new skills after it. Consulting can take place in the classroom and in your lab with your systems testing your products.

The benefits to this approach are twofold

1. It can reduce the time required to transition your lab to MTS TestSuite TWE software.
2. As your testing needs change, your staff will have the skills required to modify and develop test templates.

Who should attend

This training is designed for test engineers who need to create or modify tests using MTS TestSuite TWE software. No prior experience with MTS TestSuite TWE is required, but a familiarity with material testing and test systems is desirable. Detailed knowledge of the tests that need to be conducted will maximize the benefits of the course.

Training – 2 days (8 hours each)

Training on the MTS TestSuite TWE product gives you a foundation for creating and maintaining the tests and reports you need now and into the future.

- » Training is conducted at the customer site in a conference room environment.
- » Class size is limited to four students.
- » Hands-on training is provided for each student using the software's simulation mode.
- » Training includes an MTS TestSuite TWE 30-day simulation mode license for each student.
- » Customer provides student computers.

Consulting – 2 days (8 hours each)

Consulting services give you expert assistance with your choice of the following:

- » Converting TestWorks 4 methods to TestSuite TW templates
- » Creating a new test from a written description
- » Optimizing test procedures
- » Connecting with external devices
- » Communicating with LIMS and other software

Advance planning session

A planning session conducted on-line or by phone with the customer, trainer and consultant is included prior to the course in order to make the course time most effective.

Options

To further customize the package you can add:

- » An additional day of consulting at the package price.
- » Custom test templates, written in advance by MTS so they are sure to be ready when you need them.

MTS TestSuite mpe Advanced

2 day course

COURSE OUTLINE

- I. Calculations
 - A. Calculated signals in station manager - overview
 - B. Control calculations from TestSuite
 - C. Functions in TestSuite
 - D. Python – overview and examples
- II. Data Acquisition Options
 - A. Synchronized and stand-alone acquisition
 - B. Array and single value variables
 - C. Data reduction
- III. Activities
 - A. Custom waveform
 - B. Interfacing with the procedure
 - C. Tools for cyclic tests
 - D. Other activities
- IV. Specimen Geometry
 - A. Specimen variables and functions

This course addresses advanced functions and tools of MTS TestSuite mpe. Subjects covered contain calculations, data acquisition options, complex activities, specimen geometry and an overview of the programming language Python.

Who should attend

This course is designed for students who already have experience running their test system and wish to know more about advanced system functions.

Learning outcome

The students will learn how to use advanced system functions and tools. Samples and exercises are used to develop practical solutions for common problems. Custom problems can also be used for demonstration.

Prerequisites

Students should be familiar with the subjects covered in **MTS 793 Software with MTS TestSuite mpe Test Design** or **MTS TestSuite mpe for MPT Users**. Some subjects of the MTS TestSuite mpe Advanced class require specific licenses that may not be installed on all systems. All prerequisites are the students responsibility.

MTS Acumen Operation with MTS TestSuite Multipurpose Elite Software

3 day course

COURSE OUTLINE

- I. Introduction
 - A. Overview of Acumen load frame
 - B. Overview of 793 Software and MTS TestSuite (mpe) Software
- II. Operation
 - A. Characteristics of electrodynamic test system
 - B. Acumen control mode behavior and response
 - C. Using MTS TestSuite (mpe) application software to run the system
- III. Navigating the Situational Awareness Panel
 - A. Observe signals
 - B. Check for sensor zero
 - C. Fixture limits and Specimen limits
 - D. Limit actions and resetting limits
- IV. Guided Testing
 - A. Install a specimen
 - B. Auto-tuning
 - C. Actuator command and control mode selection
- V. Designing and Running Tests
 - A. Procedure command, sequence logic, and data acquisition
 - B. Test run and specimen file creation
 - C. Scopes and runtime display
 - D. Variables and Calculations
 - E. Reports

This course will teach the students the correct set-up and operation of their MTS Acumen system. The class involves optimizing the system for specific test requirements including low force testing, delicate specimens, higher frequency, and static testing. Instruction will include test design using MTS TestSuite Multipurpose Elite software. Students are provided with instruction consisting of a combination of classroom and hands-on exercises.

Who should attend

This course is designed for those who use MTS TestSuite mpe Software to run and modify tests, create/edit test report templates, and modify work flow on Acumen load frames.

Prerequisites

Students must have some hands-on experience with their system and have a good working knowledge of computers prior to attending. All prerequisites are the responsibility of the student.



AeroPro Software Operation

4 day course

COURSE OUTLINE

- I. AeroPro Software
 - A. Software layout
 - B. Sensor object
 - C. Hardware object
- II. Setting Up for a Simple Test
 - A. Configure sensors
 - B. Configure a test
 - C. Calibrate
 - D. Create a load table
 - E. Create profiles
 - F. Create sequences
 - G. Define event actions
 - H. Set limits
 - I. Tune the test
 - J. Retrieve data
 - K. Review data

This course provides introductory training on AeroPro™ Software. It is intended for system operators needing hands-on experience setting up and running structural tests using AeroPro, and for new users of the AeroPro software. The course incorporates extensive hands-on time to allow attendees to practice the skills learned.

Who should attend

This course is designed for technologists and engineers who set up and run structural tests using AeroPro Software on a day-to-day basis. It will be useful for operators new to the system.

Prerequisites

A technical degree or equivalent test background is required. Specific experience in structural testing is not mandatory; however, familiarity with servohydraulic test systems is required.

Scheduling policy

Course dates will be scheduled once sufficient interest for this course has been received.

AeroPro Administrator

4 day course

COURSE OUTLINE

- I. Hardware
 - A. Controller hardware
 - B. Data acquisition hardware
- II. AeroPro Control Troubleshooting
 - A. Hardware troubleshooting
 - 1. Troubleshooting skills
 - 2. Board failures
 - 3. Cable failures
 - B. Test troubleshooting
 - 1. Test setup
 - 2. Test configuration
- III. Advanced AeroPro Control Operation
 - A. Tuning techniques and theories
 - B. Control and data acquisition linking

This course will provide advanced AeroPro training. The class will expand on the AeroPro operator training to include different hardware configurations and their benefits.

Troubleshooting skills for AeroPro hardware and AeroPro tests will be a major part of the experience. Advanced test setup, as well as advanced tuning, will be addressed.

**The outline of this course may be adjusted to fit the specific needs of the class*

Who should attend

- » AeroPro Advanced Users
- » AeroPro System Administrators

Scheduling policy

Course dates will be scheduled once sufficient interest for this course has been received.

Prerequisites

- » AeroPro Operator Training
Or
- » Minimum of two years AeroPro experience

Fatigue & Fracture with MTS TestSuite Software

4 day course

COURSE OUTLINE

- I. Testing Fundamentals
 - A. Load, deformation, stress and strain
 - B. Stress-strain relations, material properties
 - C. Elastic-plastic deformation
 - D. Material strength: yield vs. fracture
- II. TestSuite Fundamentals
 - A. Introduction/overview
 - B. Windows/menus
 - C. Projects, tests and test runs
 - D. Specimens
 - E. Procedure creation, modification and editing
 - F. Command processes
 - G. Data acquisition processes and management
 - H. Other processes
 - I. Runtime displays
 - J. Executing tests
 - K. Reports
- III. Standard Tests
 - A. Tension
 - B. HCF/LCF
 - C. KIC fracture toughness
 - D. Fatigue crack growth
- IV. Fatigue and Fracture Fundamentals
 - A. Stress-life, strain-life, and linear elastic fracture mechanics
 - B. Cracks and crack propagation
 - C. Plane stress and plane strain
 - D. Stress intensity and fracture toughness
 - E. Crack length measurement: compliance
 - F. Fracture crack growth and damage tolerance design

This course provides you with the fundamentals of material testing and the use of MTS TestSuite Multipurpose Software for fatigue and fracture testing applications. Students will learn how to adjust and operate the software to run a material test as well as analyze data. The instructor will review the fundamentals of material testing as well as recent advancements including for Additive Manufacturing. Class days are divided into classroom training and laboratory training.

Who should attend

This course is targeted at material test system operators, test engineers, and laboratory managers who are using Fatigue and Fracture applications.

Learning outcome

At the completion of the course the students will have both a theoretical and practical knowledge of a wide range of material tests. Students will use MTS TestSuite software to run standard ASTM tests. These tests include fatigue, fracture toughness and fatigue crack growth. In addition, students will be able to process test data and generate reports.

Prerequisites

Students should have some experience prior to attending this course in servohydraulic testing and a working knowledge of the current Microsoft operating system. For assistance in determining which class would be appropriate for you, please contact the MTS Training department.

Component RPC Pro® Software Operation

2.5 day course

COURSE OUTLINE

- I. RPC Pro Fundamentals
 - A. What is RPC?
 - B. The six steps of RPC
 - C. Why RPC?
- II. Acquire Data (step 1)
 - A. Road data collection and digitization considerations
 - B. Data acquisition equipment and preparation
 - C. Getting started in RPC Pro
 - D. Data validation
- III. Data Preparation – Edit and Analyze (step 2)
 - A. Visual inspection
 - B. Frequency domain analysis
 - C. Graphical editing
 - D. Filtering
- IV. Channel Setup
 - A. Networking and configuring hardware
 - B. Drive, response, and calculated response
 - C. Event-action setup
- V. Measuring the System FRF (step 3)
 - A. Sequential random excitation
 - 1. Linearity and coherence
- VI. Invert and Prepare the FRF (step 4)
 - A. Control band selection
- VII. Iterate (step 5)
 - A. Iteration process
 - B. Convergence and divergence
 - C. Time, frequency, and amplitude analysis
- VIII. Run the Test (step 6)
 - A. Defining test sequences
 - B. Point by Point Monitoring

Optional Materials – The instructor may provide handouts for self-guided study or cover the following during class, as time and class interest permits.

» *Peak picking and peak slicing methods for block cycle testing*

» *Random vibration testing*

This course shares the same lecture materials as the RPC Pro Software Operation course. However, the training covers only essential basic simulation theory and devotes more time on cRPC Pro application training, following step-by-step procedures. PC-based hands-on exercises use simplified examples. The pace of the hands-on exercises is intentionally slower to ensure basic proficiency of all students. This class is not sufficient preparation for the RPC Pro advanced class.

Who should attend

Entry-level engineers or experienced technicians with some related experience. The course will provide the training necessary to allow simulation operators to understand simulation concepts and run cRPC Pro software.

Prerequisites

A technical or engineering degree and proficiency in the latest Windows operating systems.

RPC Pro® Software Operation

3 day course

COURSE OUTLINE

- I. RPC Pro Fundamentals
 - A. What is RPC?
 - B. The six steps of RPC
 - C. Why RPC?
- II. Acquire Data (step 1)
 - A. Road data collection and digitization considerations
 - B. Data acquisition equipment and preparation
 - C. Getting started in RPC Pro
 - D. Data validation
- III. Data Preparation – Edit and Analyze (step 2)
 - A. Visual inspection
 - B. Frequency domain analysis
 - C. Graphical editing
 - D. Filtering
- IV. Channel Setup
 - A. Networking and configuring hardware
 - B. Drive, response, and calculated response
 - C. Event-action setup
- V. Measuring the System FRF (step 3)
 - A. Sequential random excitation
 - B. Simultaneous random excitation
 - C. H1 and H2 FRF calculation
 - D. Linearity and coherence
- VI. Invert and Prepare the FRF (step 4)
 - A. FRF inversion
 - B. Inverse FRF evaluation
 - C. Control channel selection
 - D. Control band estimation
- VII. Iterate (step 5)
 - A. Iteration process
 - B. Convergence and divergence
 - C. Time, frequency, and amplitude analysis
 - D. Correlation assessment
 - E. System repeatability
 - F. Turbo iteration process
- VIII. Run the Test (step 6)
 - A. Defining test sequences
 - B. Monitoring correlation transducers
 - C. Resuming aborted tests
 - D. Modifying event-action sequences

This course shares the same lecture materials as the cRPC Pro Software Operation course. However, the training includes more in-depth simulation theory and devotes less time to RPC Pro application training. The training focus includes real-life simulation experiences on 4 Post and MAST systems. PC-based hands-on exercises reinforce concepts during each step of a typical simulation process. The pace of the hands-on exercises is intentionally faster to allow more complete coverage of simulation theory. This course is a pre-requisite for the RPC Pro Advanced course.

For an introduction to the cycle counting and fatigue damage calculation capabilities of RPC Pro, check out the RPC Pro Fatigue Tools add-on course.

Who should attend

Entry-level engineers or experienced technicians with some related experience. The course will provide the training necessary to allow simulation operators to understand simulation concepts and run RPC Pro software.

Prerequisites

A technical or engineering degree and proficiency in the latest Windows operating systems.

RPC Pro® Advanced Software Operation

3 day course

COURSE OUTLINE

- I. Using Process Manager to Build User Processes
 - A. Introduction to batch processor tool
 - B. Building user processes
- II. Channel Transformation, Differentiate, and Integrate
 - A. Using channel transformation
 - B. Vector transformation of X-Y wheel force data
- III. System Performance
- IV. FRF Analysis
 - A. H1 and H2 FRF
 - B. Inverse FRF evaluation
 - C. Coherence
 - D. Estimating control bands
- V. Inverse FRF
 - A. Inverse tool options
 - B. Scaling and partitioning
 - C. Multiple control bands for different channels
- VI. Singular Value Decomposition
 - A. Introduction to SVD
 - B. SVD tools
 - C. Control band estimation
 - D. Engineering Rank Inverse Tool
- VII. Turbo
 - A. Iterating with turbo
 - B. Response, drive, and dual turbo study
 - C. Review turbo-created files
- VIII. RPC Reporting Tools
 - A. Time history report tool
 - B. Model and simulate reports
- IX. Component Testing Tools
 - A. Block cycle generator
 - B. Peak slicing
- X. System Analysis
 - A. Servovalve analysis
 - B. Actuator friction analysis
 - C. Swivel analysis

Software training alone does not ensure successful simulation tests. This course is for the experienced RPC software user who needs to keep abreast of current simulation technology. Instructors take you through advanced techniques for setting up complex RPC tests utilizing the application of the various analytical tools in the RPC Pro Software.

For an introduction to the cycle counting and fatigue damage calculation capabilities of RPC Pro, with additional depth on algorithms, advanced features and more complex analysis methods, check out the RPC Pro Advanced Fatigue Tools add-on course.

Learning outcome

The course combines theory with hands-on exercises to help make the RPC software user more effective in the following areas:

- » RPC control and correlation sensor choices
- » Test correlation analysis
- » Engineering and test methods decisions

Who should attend

Experienced RPC Pro operators who have simulation experience, but who want to further their RPC knowledge.

Prerequisites

- » Proficiency in the latest Windows operating systems
- » Experience with RPC Pro software

RPC Pro® Fatigue Tools

1 day course

COURSE OUTLINE

- I. **Data Classification**
 - A. Algorithms in Comparison
 - B. RPC Pro Tools
 - a. Level-Crossing, Rainflow, Range Pair
 - b. Histogram Plotter
 - c. Histogram Accumulation
- II. **Damage Calculation**
 - A. Damage Models – Stress Life
 - B. A–B Comparison
 - C. RPC Pro Tools
 - a. Material Editor – Stress Life
 - b. Project Options
- III. **Time History Based Damage**
 - A. RPC Pro Tools
 - a. Damage Cycle
 - b. Damage Time History
 - c. Time History Plotter / Editor
- IV. **Damage Based Editing**
 - A. Basics
 - a. Window Size
 - b. Tapering Options
 - B. RPC Pro Tools
 - a. Damage Time History
 - b. Statistical Region Selection
 - c. Region Combining
 - d. Cut
 - e. Auto Damage Editor
- V. **Damage from Histograms**
 - A. RPC Pro Tools
 - a. Damage Histogram
- VI. **Fatigue in Applications**
 - A. RPC Simulate Pro
 - a. Per-Iteration Damage
 - b. Project Options
 - B. RPC Test Pro
 - a. Per-Pass Damage (time history)
 - b. Per-Pass Damage (histogram)
 - c. Cumulative Damage (histogram)
 - d. Damage Limits
- VII. **Fatigue in Reports**
 - A. RPC Pro Tools
 - a. Time History Report
 - b. Correlation Report Templates

This course provides an introduction to the cycle counting and fatigue damage calculation capabilities of RPC Pro. The course is targeted at beginning users and focuses on the more basic analysis methods and the operation of fatigue analysis tools and features.

Who should attend

Test operators, technicians or engineers who have basic familiarity with RPC Pro and wish to begin to use the fatigue capabilities within the software for damage calculation and editing. Typically offered as an add-on to the RPC Pro Software Operation course.

Prerequisites

- » Basic understanding of fatigue concepts.
- » Basic proficiency in operating RPC Pro software (as acquired by attending the “RPC Pro Software Operation” course, or through equivalent experience).

RPC Pro® Fatigue Tools (Advanced)

1 day course

COURSE OUTLINE

- I. Data Classification
 - A. Algorithms & Comparisons
 - B. Project Level Defaults
 - C. Level-Crossing
 - D. Rainflow \leftrightarrow Range Pair
 - E. Probability Density
 - F. Histogram Textual Output
 - G. Histogram Plotter (advanced)
 - H. Histogram Accumulation
- II. Damage Calculation
 - A. Stress Life & Strain Life Models
 - B. Mean Stress Correction
 - C. Material Editor
 - D. Project Options
- III. Time History Based Damage
 - A. Project Level Defaults
 - B. Tool Report Options
 - C. Damage Cycle / Damage Time History
 - D. Time History Plotter / Editor
(advanced features)
- IV. Damage Based Editing
 - A. Window Size & Tapering Options
 - B. Auto Damage Editor
 - C. Damage Assessment
(road, edited & simulated)
- V. Damage from Histograms
 - A. Damage Histogram
 - B. Back Calculation
- VI. Signal Regeneration from Histograms
 - A. Rainflow Regeneration
 - B. Block Cycle Generator
- VII. Fatigue in Applications
 - A. RPC Simulate Pro
 - a. Per-Iteration Damage
 - b. Damage incurred during Iterations
 - c. Project Options
 - B. RPC Test Pro
 - a. Initial damage
 - b. Per-Pass & Cumulative Damage
 - c. Damage Limits
- VIII. Fatigue in Reports
 - A. Sequence Report
 - B. Time History Report
 - a. Custom Templates

This course builds on the concepts presented in the “RPC Pro Fatigue Tools (Basic)” course. The basic course focuses on familiarizing the beginning user with the operation of the cycle counting and fatigue damage calculation capabilities of RPC Pro. The advanced course provides additional depth on algorithms, advanced features and more complex analysis methods.

Who should attend

Test operators, technicians, or engineers who have familiarity with RPC Pro, including basic use of its fatigue tools, and who wish to understand more fully the application’s fatigue analysis capabilities. Typically offered as an add-on to the RPC Pro Advanced Software Operation course.

Prerequisites

- » Basic understanding of fatigue concepts.
- » Proficiency in operating RPC Pro software (as acquired by attending the “RPC Pro Software Operation” course, or equivalent experience).
- » Basic familiarity with RPC Pro fatigue tools and features – as acquired by attending course “RPC Pro Fatigue Tools” course, or equivalent experience)

RPC® Connect Advanced Software Operation

4 day course

COURSE OUTLINE

- I. System Analysis
- II. Advanced Data Analysis
 - A. Differentiate/integrate
 - B. Channel transformation
 - C. Degree of Freedom transformation
- III. Advanced Data Editing
- IV. FRF Diagnostic Tools
 - A. a. H1 and H2 FRF
 - B. Coherence
 - C. Estimating control bands and sensors
- V. Matrix Decomposition
 - A. Singular Value Decomposition introduction
 - B. SVD tools
 - C. Control band estimator
- VI. FRF Inverse and Analysis
- VII. Improving iteration results
- VIII. Component testing tools
- IX. Advanced Fatigue tools
 - A. Data classification methods
 - B. Damage Calculation models
 - C. Material editor
 - D. Damage based editing
 - E. Pseudo damage analysis
 - F. Fatigue in Applications
- X. Building processes

This course lays the foundation of using RPC Connect to its maximum capability. This course is for experienced RPC Connect users who are looking to expand their existing knowledge and ways to improve their lab efficiency. The Advanced simulation techniques for setting up complex RPC tests using various analytical tools will be discussed. The training also includes in-depth discussion of some of the advanced analysis methods for better system understanding and sound decision making capability.

This course also provides additional depth on fatigue damage calculation capabilities of RPC Connect. The course builds on the fatigue theory concepts introduced in RPC Connect Basic course and provides additional information on algorithms, advanced features and more complex fatigue analysis methods.

Who should attend

Experienced RPC Connect users who have simulation experience, but want to further expand their RPC Connect knowledge.

Prerequisites

Students should have some experience prior to attending this course in using the MTS 793 and RPC Pro applications along with a working knowledge of the current Microsoft operating system. All prerequisites are the students' responsibility.

RPC® Connect Basic Software Operation

4 day course

COURSE OUTLINE

- I. RPC Fundamentals
- II. Data Acquisition
 - A. How and what data to acquire?
 - B. Data acquisition equipment & preparation
- III. Getting started with RPC Connect
- IV. Data preparation – Analysis
 - A. Time, Spectral, and Statistical analysis
 - B. Import and data analysis tools in RPC
- V. Data preparation – Editing
 - A. Time and Frequency based editing
 - B. Data editing tools in Connect
- VI. Measure & Evaluate System Behavior (FRF)
- VII. Invert and Prepare FRF Inverse
- VIII. Iterate
 - A. Understanding iteration process
 - B. Evaluate iteration results
 - C. Perform automatic iterations
- IX. Run Durability Test
- X. Introduction to Fatigue

This course teaches the basics of the RPC Connect software package for data validation, analysis, lab simulations and durability test setup. This course also provides an introduction to cycle counting and the fatigue damage calculation capabilities of RPC Connect. Included will be discussion of RPC simulation theory as well as software application operation to provide comprehensive learning experience including hands-on lab practice. Advanced simulation techniques are covered in the RPC Connect Advanced course.

Who should attend

Entry-level engineers, test operators or experienced technicians with some related test experience. The course will provide the training necessary to allow simulation operators to understand simulation concepts and run RPC Connect software.

Prerequisites

Students should have some experience prior to attending this course in using the MTS 793 application and a working knowledge of the current Microsoft operating system. All prerequisites are the students' responsibility.

RPC® Connect User Transition from RPC Pro

3 day course

COURSE OUTLINE

- I. Review RPC Fundamentals
- II. Getting Started with RPC Connect
 - A. RPC Connect advantages
 - B. New RPC Connect software handling features
 - C. New RPC Project Explorer
 - D. Working with new tools interface
- III. Connect Setup
- IV. Data Preparation – Analysis
 - A. Time, Spectral and Statistical analysis
 - B. Data analysis tools in RPC Connect
- V. Data Preparation – Editing
 - A. Time and Frequency based editing
 - B. Data editing tools in RPC Connect
- VI. Connect Model
- VII. Connect Simulate
- VIII. Connect Test
- IX. Miscellaneous Tools and Topics
 - A. Process manager
 - B. Batch processor
 - C. Frequently used tools

This course lays the foundation of how to use MTS new RPC Connect software package for data validation, analysis, lab simulations and durability test setup. The course is intended to help RPC Pro users to transition to using RPC Connect. The course discusses 6 steps of RPC testing using Connect along with some of the commonly used tools. Training devotes less time to simulation theory and more to Connect application training to help user make the seamless transition from Pro to Connect.

The course is geared towards users with some experience with Pro, and the difficulty level can be considered between the Basic and Advanced courses. It will cover some of the advanced topics commonly used, but a user should attend the RPC Connect Advanced course for learning much more complex testing methods.

Who should attend

Experienced engineers, test operators or technicians with some related RPC test experience. The course will provide the training necessary to allow simulation operators to understand simulation process in Connect and make the transition from Pro to Connect. New users with no past RPC experience are recommended to attend the RPC Connect Basic course.

Prerequisites

Students should have some experience prior to attending this course in using the MTS 793 and RPC Pro applications along with a working knowledge of the current Microsoft operating system. All prerequisites are the students' responsibility.

ONLINE TRAINING

Live, online classes that are led by an instructor give you the information you need to get started. Our online classes are conducted in two sessions, each two hours long.

Series 793 Operator Introduction

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » Station Manager and Station Setup navigation
- » Sensor feedback and Control mode behavior
- » Setting Limits and Actions
- » Manual command careful operation
- » P gain tuning
- » Calibration file assignment
- » Sensor Offset Zero

The Series 793 Operator Introduction class will familiarize the student with the hydraulic and control mode system. It will include an overview of Series 793 Station Manager sensors, command, and tuning. The class will allow the student to safely and confidently protect the specimen and monitor signals during start up and operation.

* *Series 793 Software operates the MTS FlexTest® and TestStar™ controllers.*

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

None

Tuition

Contact your service sales specialist for pricing details.

Series 793 Configuration

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » 793 File management
- » PID tuning
- » Station Builder Configuration modification
- » Adding Analog Inputs, Calculated Inputs, Digital I/O
- » Adjustments for added signals
- » Basic TestWare® data acquisition and fatigue detectors

The Series 793 Configuration class will provide instruction on how to modify 793 files to include external devices. Discussion of PID Tuning will go into further depth for dynamic and static performance. The student will acquire the skills for basic test set-up.

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

Strongly recommend taking the Series 793 Operator Introduction class or having equivalent experience.

Tuition

Contact your service sales specialist for pricing details.

MultiPurpose TestWare Operator Introduction

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » Procedure Creation
- » Standard Command Processes
- » Sequencing
- » Data Types
- » Modes
- » Effective Data Gathering and Techniques

The MultiPurpose TestWare® (MPT™) Operator Introduction class covers test procedure creation. It includes generating command, controlling test flow, and data acquisition. The student will acquire the basic skills to successfully create and design both a simple monotonic and cyclic test.

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

Students must have a fundamental understanding of the Series 793 Software, particularly Station Manager.

Tuition

Contact your service sales specialist for pricing details.

TestSuite mpe Operator Introduction

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » Fundamental concepts
- » Navigation
- » Command Generation and Practical Data Acquisition approaches
- » Test results

The MTS TestSuite™ Multipurpose Elite (MPE) Operator Introduction class covers test creation. It includes generating command, controlling test flow, and data acquisition. The student will acquire the basic skills to successfully create and design both a simple monotonic and cyclic test.

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

Students must have a fundamental understanding of the Series 793 Software, particularly Station Manager.

Tuition

Contact your service sales specialist for pricing details.

TestSuite twe Operator Introduction

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » Basic EM frame safety and use for new operators
- » Overview of TWE and TWX
- » Loading parts
- » Running tests
- » Reviewing results

The MTS TestSuite™ TWE Operator Introduction class will cover basic test operation. This class incorporates test execution with fundamental real-time operation. Beginning level review and configuration of results will be included.

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

None

Tuition

Contact your service sales specialist for pricing details.

TestSuite twe Test Design & Results

Duration: 4 hours divided into 2 sessions

COURSE TOPICS

- » Data collection
- » Test run display
- » Review page
- » Data export
- » Reports

The MTS TestSuite™ TWE Test Design & Results class will include data export and review. It will show the student how data is captured and reported along with optimizing the data acquisition process. The class will cover various ways to select and export data and results. Fundamental report creation and generation is included.

Technology Requirements

For this course, students will need an Internet connection of 10 Mbps or higher, the ability to listen to audio (headphones with a mic are recommended), and a recent version of an Internet browser.

Prerequisites

Strongly recommend taking the MTS TestSuite TWE Operator Introduction class or having equivalent experience.

Tuition

Contact your service sales specialist for pricing details.

RPC Pro® Software Training Course Comparison

Topic	Component RPC Pro Software Operation	RPC Pro Software Operation	RPC Pro Advanced Software Operation	RPC Pro Fatigue Tools	RPC Pro Fatigue Tools (Advanced)
RPC Theory	√	√			
RPC Pro Project Manager	√	√			
Getting started in RPC Pro	√	√			
Project -> workspace -> dataset	√	√			
Setup Pro – Channel Setup	√	√			
Networking & configuring hardware	—	√		—	—
Drive, response, & calculated response	√	√			
Event action setup	√	√			
Acquire Pro – Acquire Data	On request only	√			
Road data collection and digitization considerations		√			
Data acquisition equipment and preparation		√			
Importing data	On request only	√			
Data validation	On request only	√			
Analyze Pro – Data Preparation	√	√			
Visual data inspection	√	√			
Frequency domain analysis	√	√			
Graphical editing	√	√			
Regions	√	√			
Filtering	√	√		√	√
Fatigue theory					
Damage based editing					
Batch processing			√		
User-defined processes			√		
Channel transformation, differentiate, and integrate			√		
Model Pro – Measuring the System FRF	√	√			
Sequential random excitation	√	√			
Simultaneous random excitation		√			
H1 and H2 FRF calculation			√		
Linearity and coherence	√	√	√	√	√
Model Pro Report	√	√	√		
Model Pro – Invert and Prepare the FRF	√	√			
FRF inversion	—	√			
Inverse FRF evaluation	√	√	√		
Control channel selection	√	√			
Control band estimation	—	√	√		
Singular Value Decomposition			√		
Inverse tool options			√		
Scaling and partitioning			√		
Multiple control bands for different channels			√		

RPC Pro® Software Training Course Comparison (continued)

Topic	Component RPC Pro Software Operation	RPC Pro Software Operation	RPC Pro Advanced Software Operation	RPC Pro Fatigue Tools	RPC Pro Fatigue Tools (Advanced)
Simulate Pro – Iterate	√	√			
Iteration process	√	√			
Convergence and divergence	√	√			
Time, frequency, and amplitude analysis	√	√			
Correlation assessment	√	√			
System repeatability	—	√			
Turbo iteration process		√	√		
Turbo files			√	√	√
Per-iteration damage				√	√
Damage limits				√	√
Simulate Pro Report	√	√	√		
Test Pro – Run the test	√	√			
Defining test sequences	√	√			
Monitoring correlation transducers	√	√		√	√
Damage monitoring				√	√
Initial damage				√	√
Damage compensation					
Resuming aborted tests	√	√		√	√
Modifying event-action sequences	√	√		√	√
Histogramming Tools				—	√
Rainflow				—	√
Range Pair				—	√
Levelcross				—	√
Joint/Single Probability Density					√
Histogram Plotter				—	√
Histogram Accumulation				—	√
Data Reduction & Regeneration Tools				—	√
Rainflow Regeneration					√
Peak Picking – Peak Slicing			√		
Peak-Valley Regeneration			√		
Basic Fatigue Tools				—	√
Material Editor				—	√
Damage Cycle/Damage Time History				—	√
Damage Histogram				—	√
Back Calculation					√
Histogram Editor					
Advanced Fatigue Tools				—	√
Auto Damage Editor				—	√
Block Cycle Generator					√
Damage Assessment					√
Damage Frequency					
Equivalent Amplitude					
Time History Report			√	—	√

— Denotes topic briefly covered in class

√ Denotes topic covered in depth

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