MultiPurpose TestWare® Software
Powerful, flexible and easy-to-use testing software

be certain.
As one of the most powerful testing software solutions available, MTS Multipurpose Testware Software delivers the accurate and actionable test data required to make appropriate and timely testing program decisions.
MTS MultiPurpose TestWare Software is known for its powerful test design capabilities. With several features that support standard and nonstandard test creation, MPT software gives you the ability to accommodate a wide range of test requirements.

Project organization simplifies testing
Your MPT software test procedures are associated with a Project. A Project stores test design files and resulting test data, and accesses system and controller information. You can configure Projects to organize data around specific tests, users, applications or station to suit your specific needs. A Project is your portal to the information flow of your test system.

Recovery features give you peace of mind
When you run a test, MPT software generates recovery files to counter unexpected or inadvertent test interruptions.

One type of recovery file allows you to restore the test procedure as it was run – even if it included unsaved changes. This way, if you modify and run your test, but forget to save your changes when you close the test, you can still restore the modifications the next time you run the test.

Another type of recovery file allows you to resume an interrupted test at the precise point of interruption. So if your test is interrupted before it completes (due to a power outage, interlock or accidental stop), you can resume the test from where it was interrupted rather than restarting from the beginning of the test.
MultiPurpose TestWare software is easy to use and requires very little time to learn. The bottom line is that you'll spend more time testing and less time learning and setting up the system.

With MPT software, you create test procedures by linking modular test activities (called processes) together. Each process represents a single test activity, such as a ramp or data acquisition, and is displayed as an icon on a palette. You use processes like building blocks to create test procedures.

The process palette and procedure table almost invite you to begin building your test. Simply drag the process icons you desire to the procedure table, define the parameters associated with each process, and define the test flow by selecting start and interrupt triggers.

Hover help, right-click menus, and common operations such as cut, copy and paste make working with test activity icons fast and easy. Once icons are placed on the procedure table, you can rearrange their order by simply dragging them up or down to the desired location.

Create tests faster with the enhanced Procedure Editor

The MPT Procedure Editor has been enhanced to facilitate test procedure design and editing.

The MPT Procedure Editor is now equipped with an integral navigation pane and a process parameters pane. The navigation pane displays a tree view of the processes in the procedure, which is useful for displaying nesting in group processes. The procedure table displays the processes in the active nesting level selected in the navigation pane. The process parameters pane displays the parameters of the currently selected process on either the navigation pane or procedure table.

Create nested levels with Group processes

A special type of process called a Group process extends the applications modular design. The group process allows you to put other processes inside it, creating a nested level. When selected, the group process displays its own table, which you can populate with processes in the same manner as the procedure table – including additional group processes.

Change controller calculations on-the-fly

Another process called the Set Controller Value process allows you to change calculation values in the underlying controller. You can use this powerful design capability to change calculated input equations used for control feedback, to change calculated output equations used to drive a valve, or even to change calculation variable values to create conditional calculations.

Direct test flow with confidence

By assigning triggers directly to every process (including group processes), you control the test flow with confidence. You use triggers to create serial and parallel branches in your test flow. You can also prematurely end active processes, group processes and the entire test procedure by assigning interrupt triggers.
Convenient right-click functionality makes working with processes on the procedure table quick and easy.

Start and interrupt triggers allow you to direct test flow with precision. To create parallel test branches, you simply assign the same triggers to two or more processes. To end an active process prematurely, you assign an interrupt trigger.
You run the test from the MPT software controls on the Station Manager application, as shown.

From this window you can apply hydraulics, set up the scope, select an MPT software specimen to store test data, and start the test.

Once the test is running, active processes are clearly displayed on the Procedure Editor so you know how the test is progressing, and can see serial and parallel activities in real-time.

The sequence counters pane displays current and target status information of individual processes. You enter counter labels for processes when you define process parameters.

The scope trace shows the sample test output when the operator enters an initial frequency value of 1, an end-level 1 value of 1.2 mm, and end-level 2 value of -1.2 mm.

Note how the frequency of the second cyclic process automatically doubles and its amplitude automatically triples without the test having to be stopped and new values entered.

In this example, the amplitude of the second cyclic process graduates to its full amplitude because the selected waveform is a tapered sine wave shape, while the first cyclic process uses a conventional sine wave shape.
Setting up the controller and installing the specimen

To run a test procedure, begin by selecting the Station Manager application and using it to apply hydraulic pressure to the station, install the physical specimen, and set up and run the on-board scope in preparation for running the test.

Starting the test and monitoring progress

Press the run button on the Station Controls panel to start the test. When the test begins, a variety of visual indicators; including active process indicators, transient, fixed and sequence counters, and messages keep you informed of the test's progress.

Entering test data while the test is running

With the enhanced Operator Information process, you can design tests that prompt the operator to enter data at any point in the test.

SUPERIOR SERVOLoop CONTROL

With MPT software, you create test procedures which provide instructions to the controller, while the controller executes those instructions. The effectiveness of any test design, of course, is limited by the controller's ability to execute instructions while maintaining the control loop.

With the MTS Series 494 Controller, you can be assured of the most accurate control loop tracking possible. The controller's software allows you to employ a variety of control mode types and proprietary control compensation techniques to ensure the integrity of the control loop while your test designs are executed. This ensures that your specimen receives the inputs you intend, and that the data you acquire is repeatable and accurate.

MULTICHANNEL CONTROL

You can use MultiPurpose TestWare software to run both single-channel and multi-channel tests, making it a very powerful tool for multichannel or multiaxial testing.

Selecting an MPT software specimen

A specimen is a directory of information associated with a specific instance of running a test. The specimen will contain your test data, and is associated with your Project, which you selected before you created your test procedure.
When you design a test, you define the types of data acquisition needed, such as peak/valley, timed, max/min, or level-crossing.

While the sample test uses only timed data acquisition during the execution of the second cyclic process, you may define multiple data acquisition to run simultaneously.

As the test runs, data is automatically collected by the MTS controller. And, when a buffer of data is full, it is automatically stored in the data file you choose. The same data file can be directly opened by spreadsheet or word processing programs.

Data acquisition process configurational

Each MPT data acquisition process gives you control of the signals you wish to acquire, the buffer size and type, the destination of the data, and output units.

Flexibility in data format

For total flexibility in data analysis and report creation, MPT software saves data in several formats, including ANSI and ASCII formats. That way you can use your choice of analysis, plotting, and word processing programs, such as Microsoft Excel and Microsoft Word.

You can also choose to write your own analysis programs with a programming language. The multitasking capabilities of MTS operating systems software even makes it possible to have your spreadsheet read in a current data file at the same time that MultiPurpose TestWare software is running a test.

Exported data

Exported data is appropriately delimited so that columns of data in MultiPurpose TestWare software automatically appear in separate columns in your spreadsheet program.

Working with data acquired from the sample test

The facing page shows examples of how the data acquired during the sample test can be used in some well-known spreadsheets and word processing programs. These are only simple examples. You have complete flexibility to format your reports and analyze your data in any way you wish.

DATA DESTINATION CHOICES

Three choices are available:

- Specimen data file. A Specimen is a group of files related to the execution of a test. When you choose this option, your data is stored with this group of files.
- User-defined file. As the name implies, when you choose this option, you specify the file to which you want your data stored.
- Discard data. This selection causes the controller to send data to the linear buffer, but then discard it instead of sending it from the buffer to disk. You can use this capability to create an acquisition process that will run until the linear buffer is full, then trigger a signal which can be used to start another process.
Using a spreadsheet to analyze data and create charts and reports

You can open MultiPurpose TestWare software data from a spreadsheet just by selecting the data file. Using the spreadsheet’s plotting commands, you can create and annotate charts as desired.

In this example, data from an area of interest on the scope trace has been imported, analyzed, and plotted using Microsoft Excel®. The generated plot is then used in a report using Microsoft Word®.

As you can see, results can be calculated and formatted easily with a spreadsheet application. Using the macro capability of a spreadsheet, you can build complete analysis sequences that can analyze the data and provide results with just a few menu selections.

Phase 3 Results

Figure 1 displays the maximum amplitudes attained during test cycles 8 and 9 during Phase 3 trials. The phase difference between load and displacement is minimal.

This data varies from the results obtained in Phase 1 and 2 trials. For instance, the phase between load and displacement is minimal for all composite specimens.
Processes are modular test activities, such as command and data acquisition, and are represented by icons on the process palette. You create test procedure files by adding and linking process icons together on a procedure table according to your test requirements. MultiPurpose TestWare software is equipped with the following types of processes:

- Command processes, which send various types of command instructions to a servovalve or servomotor.
- Data acquisition processes, which acquire sensor data.
- Event processes, which monitor test signals to detect test conditions that you specify, or which generate a user event.
- External control processes, which issue signals to devices external to the servoloop control system.
- Other processes, which provide capabilities beyond the other category definitions. These include a program control process, for controlling test flow; group processes, which contain other processes and nest within the main test procedure; calculations process, which modifies variables by applying constants, operators, and mathematical operators; and an operator information process, which may require the operator to enter some type of information during the test.

**Command Processes**

- **SEGMENT COMMAND**
  This process generates a single control segment that starts at one level and ends at a different level. You can specify either absolute or relative values. For example, you could specify that the second level be exactly 10,000 Newtons, or you could specify that it be 10,000 Newtons higher than the starting level. You assign one of three segment shapes, a time to complete the segment and, for each channel, a control mode and an end level.

- **Dwell Command**
  This process maintains a static level for a time you specify in a selected control mode. When a dwell command begins, it reads the current level of the selected control mode and maintains that level for the specified duration.

- **Sweep Command**
  This process sweeps a command waveform between two frequency values in a linear or logarithmic progression at a constant amplitude.

- **Profile Command**
  This process applies a profile, which is a custom waveform consisting of a series of cyclic, dwell, and segment commands read from a profile file. You create profiles using a spreadsheet, text editor, or the MTS Model 793.11 Profile Editor application.

- **Cyclic Command**
  This process creates a waveform by assembling two single segments and repeating them continuously or for a specified number of cycles. You can specify either absolute or relative end-level values.
Data Acquisition Processes

**PEAK/VALLEY DATA ACQUISITION**
This process records data when the master channel signal detects a peak or valley. You can set the sensitivity to ignore peaks and valleys that fall below a certain range of amplitudes.

**MAX/MIN DATA ACQUISITION**
This process records data for the highest peak and lowest valley during a test. Each time a peak or valley is detected, it is compared to the peak or valley currently stored. If the new value exceeds the stored value, it replaces the stored value. If not, it is ignored.

**TIMED DATA ACQUISITION**
This process records data at specified, equal time intervals.

**CYCLIC DATA ACQUISITION**
This process records combinations of peak/valley, timed, and level crossing data in cyclic increments. Cycles can be defined arbitrarily or in linear or logarithmic progressions.

**LEVEL CROSSING DATA ACQUISITION**
This process records data when the master input channel signal changes a specific amount.

Event Processes

**DATA LIMIT DETECTOR**
This process waits for a specific event to occur, then issues a signal when it occurs. You typically sequence this process in parallel with a command process, to signal when the process should end and another should start. A data limit can be a number of segments, a length of time, or a sensor signal value. It can be specified as a relative value or an absolute value. Relative values are based on when the data limit detector process was started. Absolute values are based on a zero-point reference, such as the beginning point of the test.

**PEAK/VALLEY CHANGE DETECTOR**
This process lets you monitor an input signal for changes in the peaks and valleys. The process begins by detecting a peak and valley, which become the reference levels for the tolerance range. When a peak or valley exceeds a tolerance range, the process triggers. If the process is set for continuous triggers, it detects new reference levels for the tolerance setting and continues the process.

**PROGRAM EVENT DETECTOR**
This process lets you trigger other processes in response to a change in test state. This process begins by letting you select which program events to monitor, such as program run, hold, or stop.

**PERIODIC TIME EVENT**
This process allows you to schedule arbitrary and repetitive times at which the process will produce a trigger or a series of triggers. This process is used to start other processes at specified times or intervals.

**OPERATOR EVENT**
This process lets you design operator interaction into test procedures. You can use it to have up to four buttons (one per operator event process) and associated text appear on the bottom of the MPT Control Panel during a test. The buttons and text appear when the process is triggered. When the buttons are pressed, the flow of the test is affected. You can use Operator Event processes to prompt the operator before the test begins, trigger the beginning of a data acquisition process, manually trigger the end of a command process, manually set a digital output channel, and hold a test indefinitely.

**DIGITAL INPUT DETECTOR**
This process monitors digital inputs from external sources, and can be used to start or end other processes. This process can detect the high or low status of any channel (including any type of signal transition). Logic signals or switch contact signals up to +24 volts can be detected.
External Control Processes

**DIGITAL OUTPUT**
This process outputs voltage signals to one or more external devices. Each output can be set independently. For example, this process can be used to trigger a remote device used with the test system.

**TEMPERATURE CONTROL**
This process sends a temperature setting or set point to an external temperature controller via an RS-485 interface. The temperature controller returns the current temperature to the process so it can ensure that the temperature setting is maintained.

Other Processes

**PROGRAM CONTROL**
This process is used to control test flow. Use it to stop a test before it is complete. Or, use it in conjunction with an event detector that triggers the program control process. Sample uses: display a message in the Control Panel status bar, suspend the test until the Run button is pressed, pause the program until a program resume action occurs, resume tests stopped by the program pause action, stop the test.

**START APPLICATION**
This process launches another application when triggered. For example, suppose you want to remind yourself of the steps required to run a specific test. This process can launch Notepad to remind you what to do next. You can also use this process to display your data files after the test is complete or to launch analysis directly from MPT software.

**OPERATOR INFORMATION**
This process lets you create a custom window that prompts the operator for input. It is useful for including test-related information in the data file. You can have the window appear at any time during a test.

**SEND MAIL**
This process allows you to send e-mail with a predefined message and a specimen log attachment. You can use this process to automatically inform others about the test’s progress.

**GROUP**
This process allows you to combine and sequence other processes, then nest it within a test procedure. Group processes can be set to run sequentially with other processes or in parallel with them, and are best suited for modularizing long or complex tests.

**AUTO OFFSET**
This process allows you to zero input signals that are not being used for the active control mode.

**DATA DISPLAY**
This process displays selected signals while a test is in progress. Multiple signals of the same dimension may be viewed together. Over the course of a long-term test you can select which data are acquired and displayed on the plot. You can choose whether to display every other point as the buffer fills or to discard older points as the buffer fills.

**SET CONTROLLER VALUE**
This process allows you to change calculation parameter and calculation variable values defined in the underlying station configuration. You may enter fixed values or assign variables (requires the Model 793.23 MPT Variables option).
You can purchase optional processes and applications that enhance the standard processes included with MultiPurpose TestWare software. These features are available as keyed options on the standard Series 793 System Software installation CD.
These applications are not available as keyed options on the standard Series 793 System Software installation CD; they are distributed on separate media. The following are just a few examples of optional Series 793 applications (contact MTS for a complete list).

**793.17 Dynamic Properties Monitor**
This application calculates and displays the dynamic properties of materials by sampling user-specified force, length, and phase relationships of input signals. The dynamic characteristics are displayed on a graphical run-time window to monitor desired properties vs. time or cycle count. You can define limit values to terminate cycling when preset property limits are reached. Like the trend monitoring feature, you run this software in parallel with a cyclic command process. Dynamic property windows can be displayed throughout the test, or the operator can select which window to display at any time.

**793.33 Static Deflection**
This process allows you to characterize the static deflection properties of elastomeric materials and components. You load the specimen between predefined load or displacement end levels and acquire subsequent timed data. Then this software calculates the stiffness of the sample as a cord or tangent modulus during the loading or unloading portion of the test, or as an average of the two. Finally, the process compares the calculated stiffness to predefined limits. It can also compare individual load and displacement data pairs to predefined envelopes for quality control applications.

**793.37 Resonance Search**
This application characterizes the dynamic behavior of elastomeric materials and components in the free-end resonant mode. The Resonance Elastomer software includes two processes:
- The Resonance Search process performs a frequency sweep to determine the resonant frequency and plots run-time data.
- The Resonance Fatigue process performs a frequency sweep to determine the resonant frequency, maximum amplification or maximum phase difference. Once the frequency sweep identifies the required parameter, a series of cycle blocks are applied to the specimen while maintaining the desired resonance relationship.

**793.38 High-Speed Timed Data Acquisition**
This process allows you to acquire data at very high speeds (up to 49 KHz for 1-2 channels for Series 493 controllers and up to 61 KHz for 1-2 channels for Series 494 controllers) for short bursts. This process extends the timed data acquisition beyond the system rate.

**793.39 Sine-on-Sine (SOS)**
The Model 793.39 Elastomer Command Processes include two command processes for use with the Model 793.10 MultiPurpose TestWare (MPT) software test design application.
- The sine-on-sine process combines two sinusoidal waveforms to produce one unique waveform.
- The pulse process produces a mixed mode pulse that allows one control mode for an offset and a different control mode to produce the pulse.

**793.35 Production QC**
This application extends the capability of Model 793.31 Dynamic Characterization and Model 793.33 Static Deflection processes. Designed for the QC/QA environment, this software has a simplified user interface as well as a pass/fail test criteria determination. With it you can predefine upper and lower limits for any of the parameters measured by the Dynamic and Static deflection processes. Based on the established pass/fail criteria, the application displays test results and prompts the operator to insert new specimens.

**793.30 Advanced Dynamic Characterization (ADC)**
Building upon the Model 793.31 Dynamic Characterization process, this process allows you to characterize the dynamic properties of materials and components excited with either sine-on-sine or pulse wave forms. Using the sine-on-sine wave shape, ADC performs characterizations as a function of fundamental mean level, fundamental and harmonic frequency, and fundamental and harmonic amplitude. Using the pulse wave shape, ADC performs characterizations as a function of fundamental base level, fundamental and pulse frequency, and pulse amplitude. ADC provides limited control of additional static channels, including temperature control and monitor channels.
The TMF toolkit facilitates Thermo Mechanical Fatigue (TMF) testing. You use MPT software to run the specialized templates that come with the toolkit. This feature requires the calculated signals option to calculate the real-time signals required in the TMF test. The TMF toolkit uses capabilities to create TMF-oriented solutions.

The TMF toolkit includes a variety of MPT software test templates. These templates represent the TMF test methodology suggested by MTS. The TMF toolkit includes an enhanced MPT plotting process. The enhanced plotting process provides Peak/Valley vs. cycle plots for any selected signal.

The TMF toolkit also includes a Thermal Strain Calculator that can be automatically launched from within MPT software. The Thermal strain calculator: 1) reads the MPT software data file, 2) calculates polynomial coefficients relating Strain (thermal strain) to temperature, and 3) copies the coefficients into appropriately named calculation constants in the Station Manager application, which automates the laborious calculations typically required to define the thermal strain calibration.
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