Purchase Record

Please record all model numbers and serial numbers of your Magtrol equipment, along with the general purchase information. The model number and serial number can be found on either a silver identification plate or white label affixed to each unit. Refer to these numbers whenever you communicate with a Magtrol representative about this equipment.

Model Number: _____________________________
Serial Number: _____________________________
Purchase Date: _____________________________
Purchased From: _____________________________

While every precaution has been exercised in the compilation of this document to ensure the accuracy of its contents, Magtrol, Inc. assumes no responsibility for errors or omissions. Additionally, no liability is assumed for any damages that may result from the use of the information contained within this publication.

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Microsoft® and Windows® are registered trademarks of Microsoft Corporation.
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First Edition, October 2009
1. Make sure that all Magtrol dynamometers and electronic products are earth-grounded, to ensure personal safety and proper operation.
2. Check line voltage before operating electronic equipment.
3. Make sure that dynamometers and motors under test are equipped with appropriate safety guards.
Revisions To This Manual

The contents of this manual are subject to change without prior notice. Should revisions be necessary, updates to all Magtrol User’s Manuals can be found at Magtrol’s web site at www.magtrol.com/support/manuals.htm.

Please compare the date of this manual with the revision date on the web site, then refer to the manual’s Table of Revisions for any changes/updates that have been made since this edition.

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<td>Timebase control added on table ENDURANCE TEST PARAMETERS</td>
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PURPOSE OF THIS MANUAL

This manual contains information required for installation and general use of Magtrol Custom 4Q Dynamometer Software. To achieve maximum capability and ensure proper use, please read this manual in its entirety before operating. Keep the manual in a safe place for quick reference whenever a question should arise.

WHO SHOULD USE THIS MANUAL

This manual is intended for those operators in need of a software program to complement their Magtrol test equipment setup.

MANUAL ORGANIZATION

This section gives an overview of the structure of the manual and the information contained within it. Some information has been deliberately repeated in different sections of the document to minimize cross-referencing and to facilitate understanding through reiteration.

The structure of the manual is as follows:

Chapter 1:
Chapter 2:
Chapter 3:
Chapter 4:
Chapter 5:
Chapter 6:
Chapter 7:
Chapter 8:
Chapter 9:
Chapter 10:
Chapter 11:
CONVENTIONS USED IN THIS MANUAL

The following symbols and type styles may be used in this manual to highlight certain parts of the text:

Note: This is intended to draw the operator’s attention to complementary information or advice relating to the subject being treated. It introduces information enabling the correct and optimal functioning of the product to be obtained.

Caution: This is used to draw the operator’s attention to information, directives, procedures, etc. which, if ignored, may result in damage being caused to the material being used. The associated text describes the necessary precautions to take and the consequences that may arise if the precautions are ignored.

Warning! This introduces directives, procedures, precautionary measures, etc. which must be executed or followed with the utmost care and attention, otherwise the personal safety of the operator or third party may be put at risk. The reader must absolutely take note of the accompanying text, and act upon it, before proceeding further.
1. Introduction

1.1 ABOUT EM-TEST 1.0

Magtrol’s EM-TEST 1.0 is a state-of-the-art motor testing program designed for use with Windows® XP/VISTA 32 bit operating system for PC-based data acquisition. Used in conjunction with Magtrol’s Motor Testing Equipment, EM-TEST 1.0 is equipped with endurance testing capabilities to help determine the performance characteristics of a motor under test. The data generated can be stored, displayed and printed in tabular or graphic formats, and is easily imported into a spreadsheet. EM-TEST 1.0 is ideal for simulating loads for long term test. Magtrol can also make custom modifications to the software to meet your specific motor testing needs.

EM-TEST 1.0 is equipped to work in conjunction with any of the following Magtrol motor testing instruments:

- Dynamometer Controller (DSP6001)
- Hysteresis, Eddy-Current or Powder Dynamometer (HD, WB, PB)
- In-Line Torque Transducer (TM, TMB, TMHS)
- Power Analyzer (6530, 6510e, 6510)

Written in LabVIEW™, EM-TEST 1.0 has the flexibility to test a variety of motors in a multitude of configurations. If you have a specialized test that you wish to perform, contact Magtrol Technical Assistance at +41 (0)26 407 3000.

1.2 SYSTEM REQUIREMENTS

Recommended:

- Personal computer with Intel® Pentium® IV dual core or higher
- Microsoft® Windows® XP/VISTA 32 bit
- 2 GB of RAM (4 GB recommended)
- 1 GB of available hard drive space
- VGA color monitor with minimum screen resolution of 1280 × 900
- National Instruments™ PCI-GPIB card
- National Instruments™, USB-9211A hardware: Required only if temperature testing (sensor input) function will be used
- National Instruments™, USB-9481/PCI-652x hardware : required only if relay control function will be used
1.3 SOFTWARE FEATURES

1.3.1 FEATURES OF EM-TEST 1.0

- Tabbed pages for quick navigation.
- Front panel Lock and Unlock function to prevent any modification by an unauthorized operator.
- Global project management to see quickly all data under the project.
- Multiple Language Support: Switch to/from English, French, German at any point during the program. Additional language dictionaries can be created/edited by the user.
- Automatic GPIB/DAQmx Device/Address Detection: Displayed within program to easily check communication parameters.
- Temperature Measurement capabilities are included in standard program.
- Up to 6 Relays control are included in standard program.
- Rapid Graph Plotting: Change both the X- and Y-axis to display additional test curves, without having to exit the graph.
- Multiplot Graphical Display.
- Displays Tested and Calculated Parameters.
- Three-Phase Power Analyzer Data Acquisition.
- Torque Sign Indicator (+/-).
- IEEE-488 Interface.
- Automatically Loads Dynamometer Default Values.
- PID Adjustment Routines.
- Curve Fitting.
- Display the last cycle of the test.
- Continue current test after a crash machine.
- Temperature security function to prevent over-temp.
- Hysteresis temperature function with custom relay control can be set to break test when high temp is reach and continue test when low temp is reach.
1.4 DATA SHEET

EM-TEST 1.0
Endurance Motor Testing Software

SPECIFIC FEATURES

- **Global Project**: Manages Data and Setup of the current project.
- **Automatic GPIB and DAQmx Device/Address Detection**: Displayed within program to easily check communication parameters.
- **Lock / Unlock function**: Front Panel lock function prevents modification by an unauthorized operator.
- **Set-point table**: The set-point curve is defined in the data table. Sampling rate, voltage and relay state are also defined in this table.
- **Endurance Testing**: Tests speed, torque, amps, watts input, watts output and open loop parameters. Capable of adjusting sampling rate by step and using step or ramp from one load point to the next.
- **Relay Control**: Up to 6 customized relay controls.
- **Temperature Measurement**: Up to 8 thermocouple channels are included in the standard program.
- **Temperature Security**: Over-Temperature control and Hysteresis Temperature function.
- **Three-Phase Power Meter Data Acquisition**: Obtain data on each individual phase and/or the sum used in the chosen parameters (amps, volts, input watts and power factor).
- **Spanning file function**: Auto-Incrementation of filename depending on cycle, hours, days or file size.
- **Graph and display during test**: Displays previous files during test in tabular or graphic view.
- **Recovery Function**: Recovers test if the computer crashes (Windows® problem, power off).

DESCRIPTION

Magtrol’s new EM-TEST 1.0 is an endurance motor testing Program for PC (Windows®XP/VISTA) based data acquisition. Combined with a Magtrol DSP6001 High Speed Programmable Controller, EM-TEST 1.0 works with any Magtrol dynamometer or in-line torque transducer to determine the performance characteristics of a motor under test. Up to 30 parameters are calculated and displayed utilizing EM-TEST 1.0’s unique testing and graphing capabilities.

An integral component of any Magtrol Endurance Motor Test System, EM-TEST 1.0 performs curve testing in a manner best suited to the overall efficiency of the test rig. Written in LabVIEW™, EM-TEST 1.0 has the flexibility to test a variety of motors in a multitude of configurations. The data generated from this user-friendly program can be stored, displayed and printed in tabular or graphical formats, and is easily imported into a spreadsheet.

Magtrol can also make custom modifications to the software to meet additional motor testing requirements.

APPLICATIONS

EM-TEST 1.0 is designed for long-term motor test cycling. It is ideal for developmental applications. It has the ability to duplicate tests and run them automatically. This versatile program is extremely valuable to anyone involved in motor testing. EM-TEST 1.0 can be used as stand alone software or in combination with M-TEST 5.0 Motor Testing Software.
Chapter 1 – Introduction

Specifications

STANDARD FEATURES

- **IEEE-488**: Computer interface with National Instruments™ PCI-GPIB.
- **Multiple Language Support**: Switch to/from English, French, German at any point during the program. Additional language dictionaries can be created/edited by the user.
- **Automatic Load Defaults Option**: Downloads testing instrument parameters based on model number.
- **PID Adjustment Routines**: Helps adjust the system for step functions.
- **Rapid Graph Plotting**: Change both the X- and Y-axis to display additional test curves, without having to exit the graph.
- **Displays 30 Tested and Calculated Parameters**: Torque, speed and auxiliary input are displayed from the DSP6001. Amps, volts and watts are displayed from (optional) power analyzer. Calculated values including horsepower, efficiency, power factor, output watts, cycle and time can also be displayed.
- **Curve Fitting**: A curve fitting routine can be applied to most motor test curves. Raw data and curve fit data can also be displayed simultaneously.
- **Context Help**: Hover over any field or parameter with the mouse to display a context help box.

TEMPERATURE SENSOR MEASUREMENT

Up to 4 thermocouples can be read and monitored during a motor test. Heat rise curves on the bearings, windings and housing of a motor can be performed.

EM-TEST 1.0, with its complete dynamometer control, allows for sensor measurement while performing load simulation for duty cycle and life testing.

**Hysteresis function**: If the temperature exceeds the high threshold, the test passes to Pause mode and a relay is disabled. When the temperature passes under the low threshold, the test passes to Run mode and a relay is enabled.

![Hysteresis Curve](image)

RELAY CONTROL

Up to 6 relays can be controlled during test. The state of each relay can be set for each step.

SYSTEM CONFIGURATION

A Magtrol Dynamometer provides motor loading with a Magtrol Programmable Controller acting as the interface between the PC running EM-TEST 1.0 and the dynamometer. If the motors’ electrical parameters are to be measured or used to determine load points, a Magtrol Power Analyzer is also required. The computer and electronic instrumentation interface through the National Instruments™ PCI-GPIB card.

EM-TEST 1.0 is equipped to work in conjunction with any of the following Magtrol motor testing instruments:

- High Speed Programmable Controller (DSP6001)
- Hysteresis, Eddy-Current or Powder Dynamometer (HD, WB, PB)
- In-Line Torque Transducer (TM, TMB, TMHS)
- Power Analyzer (6530, 6510e, 6510)

![System Configuration Diagram](image)
SYSTEM REQUIREMENTS

- Personal computer with Intel® Pentium® IV dual core 2Ghz or equivalent.
- Microsoft® Windows® XP / VISTA 32 bits.
- 2 GB of RAM or more.
- 1 GB of available hard drive space.
- VGA color monitor with minimum screen resolution of 1280 x 900.
- National Instruments™ PCI-GPIB card (available from Magtrol).
- National Instruments™ USB-9211A hardware: Required only if temperature sensor input function will be used.
- National Instruments™ USB-9481/PCI-652x hardware: required only if relay control function will be used.

SYSTEM OPTIONS AND ACCESSORIES

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<tr>
<th>CATEGORY</th>
<th>DESCRIPTION</th>
<th>MODEL / PART #</th>
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<td>TEMPERATURE TESTING HARDWARE</td>
<td>USB 4-Channel Isolated Input Module (USB-9211A) and USB Cable (1 m)</td>
<td>HW-TTEST-USBA</td>
</tr>
<tr>
<td>RELAYS CARDS</td>
<td>PCI card 6 relays 150V AC/DC 2A max. 60 W</td>
<td>HW-RLTEST-PCI</td>
</tr>
<tr>
<td></td>
<td>USB card 4 relays 30V DC 2A max. 60 W</td>
<td>HW-RLTEST-USB</td>
</tr>
<tr>
<td>CONTROLLERS</td>
<td>High Speed Programmable Controller</td>
<td>DSP6001</td>
</tr>
<tr>
<td>MOTOR TEST EQUIPMENT</td>
<td>Hysteresis Dynamometers</td>
<td>HD series</td>
</tr>
<tr>
<td></td>
<td>Eddy-Current Dynamometers</td>
<td>WB series</td>
</tr>
<tr>
<td></td>
<td>Powder Brake Dynamometers</td>
<td>PB series</td>
</tr>
<tr>
<td></td>
<td>In-Line Torque Transducers</td>
<td>TM/TMHS/TMB series</td>
</tr>
<tr>
<td>POWER ANALYZERS</td>
<td>High Speed Single-Phase Power Analyzer</td>
<td>6510c</td>
</tr>
<tr>
<td></td>
<td>High Speed Three-Phase Power Analyzer</td>
<td>6530</td>
</tr>
<tr>
<td>CARDS</td>
<td>GPIB Interface Card (PCI)</td>
<td>73-M023</td>
</tr>
<tr>
<td>CABLES</td>
<td>GPIB Cable, 1 meter</td>
<td>88M047</td>
</tr>
<tr>
<td></td>
<td>GPIB Cable, 2 meters</td>
<td>88M048</td>
</tr>
<tr>
<td></td>
<td>Torque Transducer Connector Cable</td>
<td>ER 113/01</td>
</tr>
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</table>
2. Installation

2.1 INSTALLATION PROCEDURE

The general installation order is as follows.

1. Install EM-TEST 1.0 product software and drivers.
2. Install National Instruments™ NI-DAQmx Data Acquisition Software.
3. Install PCI-GPIB interface board.
4. Install National Instruments™ USB-9211A if using temperature measurement/sensor input function.
5. Install (optional) National Instruments™ NI 6521 or USB-9481 relay actuator card to control motor power via EM-TEST 1.0.

2.2 INSTALLING EM-TEST 1.0 PRODUCT SOFTWARE AND DRIVERS

1. Exit all other programs before installing EM-TEST 1.0.
2. Insert the EM-TEST 1.0 CD in your CD-ROM drive. The EM-TEST 1.0 Installation Wizard will begin automatically.

Note: If AutoRun is disabled on your computer, the installation process must be started manually. On the taskbar, click the Start button, and then click Run. Click Browse to locate the CD-Rom drive where the EM-TEST 1.0 installation CD is inserted. From the EM-TEST CD root directory, select setup.exe then click Open.
3. Click Next.

Figure 2–1 EM-TEST 1.0 Software Installation
4. Select the Destination Folder then click **Next**. The default is C:\Program Files\EM-TEST 1.0. To install into a different folder, click the Browse button and select another folder.

5. Follow the instructions displayed at the screen to finish the installation.

### 2.3 TEMPERATURE MEASUREMENT

EM-TEST 1.0 allows the user to perform temperature measurement testing. The feature provides complete dynamometer control, allowing for temperature measurement while performing load simulation for duty cycle and life testing. The options, which may be purchased from either Magtrol or National Instruments, include:

- National Instruments™ USB-9211A

#### 2.3.1 National Instruments™ USB-9211A

**Features:**

- 4 thermocouple inputs
- Built-in isolation on all channels
- Connects to computer through USB port

##### 2.3.1.1 Installing Hardware

1. Plug in USB cable

2. Windows will detect the device and display the following message: “Found new Hardware”.

### 2.4 National Instruments NI 652X Relay Actuator Card or USB 9481

As an option, Magtrol offers the National Instruments™ NI 652X relay actuator card or USB 9481 for controlling motor power via EM-TEST 1.0. The relay actuator, used in conjunction with a contactor, serves as an ON/OFF switch for supplying power to the motor under test.

---

**CAUTION!**

*The National Instruments NI-652X Relay Actuator Card is rated up to 150 V AC/DC, 2 A, 60 W max.* Please refer to the included manufacturer’s specifications for additional ratings.
2.4.1 Installing the NI 652X Relay Card

1. Shut down your computer.
2. Install the National Instruments NI 652X card in an available PCI expansion slot according to National Instruments’ user documentation.
3. Turn on your computer. If installation was successful, Windows will detect the device and display the Found New Hardware message.
4. Connect the motor contactor to relay 0 (R0) of the NI 652X connector, following the pin diagram in the user documentation.

![Figure 2–2 Pinout PCI 652x](image)
2.4.2 Installing the USB-9481 Relay Card

1. Plug the USB cable
2. Windows will detect the device and display the following message: “Found new Hardware”

<table>
<thead>
<tr>
<th>Module</th>
<th>Terminal</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Motor Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CW</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Motor Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CCW</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Relay 2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Relay 3</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>No connection</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>No connection</td>
</tr>
</tbody>
</table>

Figure 2–3 Pinout USB-9481 Relay Card

Caution! The National Instruments USB-9481 relay actuator card is rated up to 30Vdc or 60Vdc / 1A. Please refer to the included manufacturer’s specifications for additional ratings.
3. EM-TEST 1.0 Interface

3.1 STARTING EM-TEST 1.0

From the taskbar, click Start, point to Programs >> EM-Test 1.0, then click EM-Test. From your desktop, double-click the desktop icon and the program will automatically start. The Start window will appear.

![Start Window](image)

*Figure 3–1 Start Window*

3.2 EM-TEST WINDOWS

The following outline is a representation of how EM-TEST 1.0 is organized and shows, at a quick glance, where all the main features are located within the program. The 8 navigation tabs displayed at the top of the EM-TEST 1.0 screen are purposely in the same order (sequentially from left to right) as a standard motor test procedure. Following is a brief description of the functions of each area.

Note: For detailed explanations of every button and control of each window (program area), please refer that window’s corresponding chapter in this manual.
3.2.1  **START**
- Select language from English, French, German or user-created dictionary.
- Select Root folder.
- Load Project.

3.2.2  **CONFIGURE HARDWARE**
- Search for and display GPIB/DAQmx addresses of devices communicating with EM-TEST 1.0.
- Configure the system for all connected hardware including: dynamometer controller, power analyzer, power supply, temperature input device and relay control card.
- Load default testing instrument parameters based on model number.

3.2.3  **DISPLAY**
- Select parameters to be tested and displayed.

3.2.4  **CONFIGURE TEST**
- Set up test parameters.
- Set up data logging to automatically store acquired data.
- Set up temperature parameters option.

3.2.5  **ADJUST PID**
- Adjust PID (proportional gain, integrative and derivative) settings and scaling on the DSP6001 Controller.

3.2.6  **TEST**
- Run test.
- Graphically display live test data.

3.2.7  **VIEW DATA**
- Display test data in a tabular (spreadsheet) format with option to print.

3.2.8  **5-AXIS GRAPH**
- Display up to five different test parameters on the same graph.

3.3  **NAVIGATING EM-TEST 1.0**
The following details will assist in navigating through EM-TEST 1.0.

3.3.1  **HELP**
For help with any item, right-click the control (button, text box, indicator, list, etc.). A drop-down menu will appear. Click **Description and Tip** and a message box will appear with useful information about the item in question. Enable or disable Context help with combination key “Ctrl+H”
3.3.2 **Tabs**

Navigate from window to window by clicking the tabs at the top of the screen.

*Note:* When test running tabs are disabled.

3.3.3 **Text Boxes**

For text boxes, there are two ways to make a selection:

1. Click inside the box and scroll down to the item of choice.
2. Click the up and down arrows to the left of the box until the desired option is reached.

3.3.3.1 Numeric Entries

For text boxes requiring a numeric value, simply click inside the box and type the desired value. To overwrite an existing entry, click and drag the pointer across the field and then type the new value.

**WARNING:** WHEN USING THE UP AND DOWN ARROWS, THE PROGRAM WILL NOT ALLOW THE NUMBERS TO LEAVE THE SPECIFIED RANGE. IF TYPING A VALUE, ANY NUMBER CAN BE USED BUT THOSE OUT OF RANGE WILL BE IGNORED.

3.3.4 **Indicators**

When an indicator is illuminated in green, that function is enabled. If the indicator is dimmed (dark gray), the corresponding function is disabled.

3.3.5 **Inaccessible Controls**

Controls (buttons, text boxes, etc.) will be available as needed. If there is no selection needed for a specific item, the control will be dimmed and no access may be gained to that control.

For example, when “None” is selected as the Device in the Power Measurement section of the Configure Hardware window, there is no further input needed. Therefore, the remainder of the controls in that section are inaccessible to the user (as seen in the figure below).

![Figure 3–2 Inaccessible Controls Example](image)
4. Start

The Start window is the first window that appears when EM-TEST 1.0 is launched.

![Start Window](image)

Figure 4–1  Start Window

4.1 SELECT LANGUAGE

Select the language you would like to work with while using EM-TEST 1.0. Click inside the **Select Language** box, then click on the desired language. Standard options include: English, French, and German.

Note: The language can be changed at any time while running the program by simply returning to the Start window and selecting a new language.

4.1.1 ADDITIONAL LANGUAGES

Additional language dictionaries can be created by the user by editing the Language File.csv file (located in the EM-TEST 1.0 program folder) in any spreadsheet program. To add a new language, simply add a new column to the spreadsheet and manually enter translations for every term, using the English column (column B) as a template.
4.2 **ROOT FOLDER**

Select the root folder to display in the Tree below (see Figure 4–1) the list of tests sorted by serial number folder.

4.3 **TREE NAVIGATION**

Select the Folder by Serial Number name. Under each folder, a Setup file (.msf) and if tests has already done a list of test files (.txt).

4.4 **LOAD PROJECT**

When click on a Setup (.msf) file, a button Load Project appears.

Press this button to load a previously project.
Before beginning any test, the connected motor test equipment must first be set up within EM-TEST 1.0. Click the **Configure Hardware** tab to open the Configure Hardware window.

![Configure Hardware Window](image)

*Figure 5–1  Configure Hardware Window*

The Configure Hardware window is where testing instrument, dynamometer controller, power analyzer, power supply temperature and relay control device settings into the program.

**Note:** For specific instructions on how to enter information into EM-TEST 1.0, see Section 3.3–Navigating EM-TEST 1.0.

### 5.1 GPIB/DAQmx DEVICE/ADDRESS DETECTION

To search for GPIB/DAQmx devices connected to the motor test system, and available to EM-TEST 1.0, click **Find Devices**. The GPIB address of each device will be displayed in the table located in the upper left corner of the Configure Hardware window. This eliminates the need to open a separate program in order to view communication settings.
## 5.2 DYNAMOMETER CONTROLLER

Used with a Magtrol DSP6001 Programmable Dynamometer Controller, EM-TEST 1.0 provides the control of any Magtrol Dynamometer or Torque Transducer and runs test sequences in a manner best suited to the overall accuracy and efficiency of the Magtrol Endurance Motor Test System.

In this section, specifications for each testing instrument are set up for each channel. Alarms are also enabled or disabled at this time.

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Selects the controller model being used.</td>
<td>The DSP6001 is compatible with Magtrol Hysteresis, Eddy-Current, and Powder Brake Dynamometers, Magtrol In-Line Torque Transducers and auxiliary instrumentation.</td>
</tr>
<tr>
<td>Display Torque</td>
<td>Selects the torque units.</td>
<td>oz.in, oz.ft, lb.in, lb.ft, g.cm, kg.cm, mN.m, cN.m and N.m</td>
</tr>
<tr>
<td>Interface</td>
<td>Selects the method of interfacing between the controller and the computer.</td>
<td>GPIB</td>
</tr>
<tr>
<td>Acquire Aux/</td>
<td>If using the auxiliary input on the DSP6001 to read an additional</td>
<td>Yes and No</td>
</tr>
<tr>
<td>TSC2</td>
<td>parameter, set this control to “Yes” to have the data displayed and stored with other acquired data.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: Proper scaling must be set up from the front panel AUX SETUP menu on the DSP controller.</td>
<td></td>
</tr>
<tr>
<td>Active Channel</td>
<td>Selects the channel on which the control loop is closed when using a DSP6001.</td>
<td>Channel 1 or Channel 2. NOTE: Certain load device/dynamometer combinations will not permit changing channels. See Section 5.2.3–Channels.</td>
</tr>
</tbody>
</table>
Chapter 5 – Configure Hardware

5.2.1 **Alarms**

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airflow Alarm</td>
<td>Enables the airflow alarm function for (HD) Hysteresis Dynamometers, indicating a lack of air flow.</td>
<td>Enable and Disable</td>
</tr>
<tr>
<td>Waterflow Alarm</td>
<td>Enables the waterflow alarm function for (WB) Eddy-current and (PB) Powder Brake dynamometers, indicating a lack of water flow.</td>
<td>Enable and Disable</td>
</tr>
<tr>
<td>External Alarm</td>
<td>Enables the external alarm function for any dynamometer, indicating a problem based on additional user input.</td>
<td>Enable and Disable</td>
</tr>
</tbody>
</table>

Note: For more information on Alarms, see Chapter 6 – Alarm System in the DSP6001 Dynamometer Controller User’s Manual.

5.2.2 **Load Defaults**

- Loads default values for all parameters from the M-TEST Defaults.txt file after the type and model of testing instrument(s) has been selected.
- Click **Load Defaults** and the values will automatically update.

Note: This step must be completed for the testing instrument torque units to be programmed properly into the controller. If necessary, once the defaults are set, they can be adjusted.

5.2.2.1 Updated M-TEST Defaults File

The M-TEST Defaults file is subject to change as ratings on Magtrol’s Motor Test Equipment change. If you have purchased any Magtrol Dynamometers or Torque Transducers since initially installing EM-TEST 1.0, visit [www.magtrol.com/support/downloads.htm](http://www.magtrol.com/support/downloads.htm) on Magtrol’s Web site to ensure that you have the most recent M-TEST Defaults.txt file available. Simply click the link to connect you directly or type the Web address into your browser. Please feel free to contact our sales department at +41264073000, if you should have any questions or concerns.

5.2.3 **Channels**

EM-TEST 1.0 channels are used for multiple testing instrument connections. If using a DSP6001 Dynamometer Controller, there can be up to 2 testing instrument connections. Any Magtrol dynamometer or brake can be connected to Channel 1 (TSC1). Channel 2 (TSC2) can only support a Magtrol Eddy-Current (WB) or Powder Brake (PB) Dynamometer; Magtrol In-Line Torque Transducer (TM); a Magtrol Free-Run Speed Sensor (FR 10); or auxiliary instrumentation.
### TEST SETUP

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
</table>
| Instrument Type  | Selects the type of loading device or dynamometer connected to the channel(s) (TSC1 and TSC2) of the controller. | For Channel 1 (TSC1): Hysteresis Dynamometer (HD)  
Eddy-Current Dynamometer (WB)  
Powder Brake Dynamometer (PB)  
Brake  
For Channel 2 (TSC2):  
Auxiliary  
Eddy-Current Dynamometer (WB)  
Powder Brake Dynamometer (PB)  
In-Line Torque Transducer (TM)  
Free-Run Speed Sensor (FR 10) |
| Brake Type       | If using a brake and Magtrol In-Line Torque Transducer in a cross loop function, selects the type of brake connected to the Brake Output or Supply 1 of the controller. Applies to TSC1 only. | HB  
Hysteresis Brake  
WB  
Eddy-current Brake  
PB  
Powder Brake |
| Model            | Selects the specific model number of the testing instrument.  
NOTE: Once the model is selected, click Load Defaults at the bottom of the window to update the parameters for that model. This step must be performed for the testing instrument torque units to be programmed properly in the controller. If it is necessary, once the defaults are set, they can be adjusted. | The available model numbers will be listed, depending upon the Instrument Type selected. |
| Tandem           | If a tandem dynamometer is being used, this function must be enabled. | Enable and Disable |
| Encoder          | Selects the encoder type being used.  
NOTE: Some models may have dual encoders for normal and low speed operation. In this situation, select the encoder currently in use. | 1, 2, 6, 20, 30, 60, 600 and 6000-bit |
| Quadrature Input | If the dynamometer has a low speed quadrature encoder installed, the speed signal may be smoothed substantially by enabling this feature.  
NOTE: This applies only to 600- and 6000-bit encoders that have both channels wired to the DSP6001 controller. | Enable or Disable |
| Torque Filter    | Applies digital filtering to the torque signal input. | 3, 10, 25 and 50 Hz cutoff frequencies  
Select Off to disable filtering. |
| Nominal Speed    | For WB and PB dynamometers, this is the maximum speed at rated torque.  
NOTE: Exceeding the nominal speed will cause the dissipated power to be greater than the dynamometer’s rating. | 0 to 99,999 |
| Max Speed        | Maximum no-load speed at which the dynamometer can be run without physical damage. | 0 to 99,999 |
| Max Speed Excited| Maximum speed that may be used under any load condition. | 0 to 10,000 |
5.3 POWER MEASUREMENT

To read amps, volts, watts, power factor and system efficiency data, a separate device is needed

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Power</td>
<td>Maximum rated power (in kilowatts) that the dynamometer can dissipate without causing physical damage.</td>
<td>0 to 99,999</td>
</tr>
<tr>
<td>Max Torque</td>
<td>Maximum torque rating of the dynamometer.</td>
<td>0 to 10,000</td>
</tr>
<tr>
<td>Torque/Aux Scale Factor</td>
<td>This is the torque value at 5 volts output for WB &amp; PB dynamometers and TM transducers; and the scale factor for the auxiliary input.</td>
<td>0 to 99,999</td>
</tr>
<tr>
<td>Scale Factor</td>
<td>This is the torque value at 5 volts output for WB and PB dynamometers.</td>
<td>0 to 99,999</td>
</tr>
<tr>
<td>Gearbox Ratio</td>
<td>If using a motor with a gearbox attached, the gearbox ratio may be entered here to give the true motor speed and torque. Otherwise, the dynamometer speed and torque will be displayed. NOTE: All parameters throughout the program will reflect the motor performance only.</td>
<td>The value should be entered as the ratio from the motor shaft to the gearbox output shaft (in an x:1 ratio). For example: If the motor shaft spins at 3600 rpm and the gearbox output shaft spins at 2 rpm, the ratio entered should be 1800.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>Selects the device used to read power data.</td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 6510</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 6510ε</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 6530:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ph. 2 w.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ph. 3 w.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 ph. 3 w.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 ph. 4 w.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 ph. 3 v. 3 a.</td>
</tr>
<tr>
<td>GPIB Address</td>
<td>Selects the corresponding GPIB address for the power measurement device.</td>
<td>1 to 32</td>
</tr>
<tr>
<td>External Shunt</td>
<td>Enables the external shunt(s) connected to the power analyzer (if applicable).</td>
<td>Yes and No</td>
</tr>
<tr>
<td>Shunt 1 Scaling</td>
<td>Sets the scaling constant for the external shunt on phase 1.</td>
<td>0.0001 to 99999</td>
</tr>
<tr>
<td>Shunt 2 Scaling</td>
<td>Sets the scaling constant for the external shunt on phase 2.</td>
<td>0.0001 to 99999</td>
</tr>
</tbody>
</table>
### 5.4 POWER SUPPLY

Tells the system which DC power source is being used and sets the corresponding attributes.

**Note:** “None” is defined as any AC or DC external power source not controlled by the system. “DC” is defined as a DC power source that is controlled by the system.

### 5.5 TEMPERATURE SENSOR

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>Selects the type of power supply being used.</td>
<td>• None&lt;br&gt; • AC Regulated (Staco MPA2)&lt;br&gt; • EMI&lt;br&gt; • HP603xA&lt;br&gt; • HP66xA&lt;br&gt; • Lambda Genesys&lt;br&gt; • Power Ten&lt;br&gt; • Sorensen DCS&lt;br&gt; • Sorensen DHP&lt;br&gt; • Xantrex XFR&lt;br&gt; • Xantrex XDC&lt;br&gt; • Xantrex XMP</td>
</tr>
<tr>
<td></td>
<td>NOTE: If running from AC lines, select “None” as your power supply. If using one of the mentioned DC power supplies, be sure that its GPIB address corresponds to what you have set in the GPIB Address control.</td>
<td></td>
</tr>
<tr>
<td>GPIB Address</td>
<td>Sets the GPIB address for the DC power supply.</td>
<td>1 to 32&lt;br&gt; NOTE: Click Find Devices to display the power supply’s GPIB address in the Device/Address table located in the upper left corner of the Configure Hardware window. See Section 5.1—GPIB Device/Address Detection</td>
</tr>
<tr>
<td>Current Set</td>
<td>Sets to the maximum current that the DC power supply needs to deliver.</td>
<td>Any</td>
</tr>
</tbody>
</table>
Up to 4 thermocouples or can be read and monitored during a motor test. Heat rise curves on the bearings, windings and housing of a motor can be performed. EM-TEST 1.0, with its complete dynamometer control, even allows for temperature measurement while performing load simulation for duty cycle or life testing.

5.5.1 **DEVICE SELECTION**

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
</table>
| Device  | Selects the sensor input module. | • None  
• USB-9211 |

5.5.2 **USB-9211A**

5.6 **RELAY CONTROL**

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
</table>
| Units | Selects desired temperature unit for acquired/displayed values. | • Deg C  
• Deg F  
• Kelvins  
• Deg R  
• From Custom Scale |
| TC0 – TC3 | Assigns a specific name/label to each thermocouple channel being used (TC0, TC1, TC2, TC3). | Select checkbox next to each thermocouple channel being used. Type desired label (any string of alphanumeric characters, without spaces) in box to right. |

Up to 6 relays can be switched during a motor test. Motor Power cw, Motor Power ccw and 4 others relays in case of use PCI-652x card, 2 others relays in case of use USB-9481. Each relay can be set for every steps.

---

**CAUTION!**

The National Instruments NI- 652X relay actuator card is rated up to 150 V AC/DC, **2 A, 60 W max.** Please refer to the included manufacturer’s specifications for additional ratings.
5.7 SAVING THE HARDWARE CONFIGURATION

5.7.1 APPLY SETTINGS

When finished configuring the hardware, click Apply Settings.

Note: This does not permanently save the current test configuration. See Section 5.7.2–Save Setup

5.7.2 SAVE SETUP

The current test configuration is saved, overriding the current setup file that is loaded. If you do not wish to override the current setup file (after pressing Save Setup), click Cancel when prompted and read the note below.

Note: To save current test configuration as a new setup file (project), click Apply Settings then go to Configure Test. Change the serial number and press Save Setup.
Click the **Display** tab to open the Display Setup window.

![Display Setup Window](image)

*Figure 6–1  Display Setup Window*

The Display Setup window is used to select the parameters that will be measured, displayed and graphed during a test.

## 6. Display

### 6.1 DISPLAY SETUP

#### 6.1.1 Motor Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Amplitude 1</th>
<th>Volts 1</th>
<th>Input Watts 1</th>
<th>Power Factor 1</th>
<th>Output Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>Amplitude 2</td>
<td>Volts 2</td>
<td>Input Watts 2</td>
<td>Power Factor 2</td>
<td>Output Kilowatts</td>
</tr>
<tr>
<td>Time</td>
<td>Amplitude 3</td>
<td>Volts 3</td>
<td>Input Watts 3</td>
<td>Power Factor 3</td>
<td>Horsepower</td>
</tr>
<tr>
<td>Auxiliary Input</td>
<td>Amplitude 4</td>
<td>Volts 4</td>
<td>Input Watts 4</td>
<td>Power Factor 4</td>
<td>Efficiency</td>
</tr>
</tbody>
</table>

**Note:** Depending on the hardware, temperature label can be displayed in the available list above.

- **Note:** The numbers refer to the phase of a three-phase system. If using a single-phase source, select an option with a “1”.

---

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6.2 **SAVE SETUP**

The current test/display parameters are saved, overriding the current setup file that is loaded. If you do not wish to override the current setup file (after clicking *Save Setup*), click *Cancel* when prompted and read the note below.

---

**Note:** To save current test configuration as a new setup file (project), click *Apply Settings* then go to *Configure Test*. Change the serial number and press *Save Setup.*
7. Configure Test

Once the hardware configuration is complete and the test parameters have been selected, the actual test must now be set up. Click the **Configure Test** tab to open the Configure Test window.

![Figure 7–1 Configure Test Window](image)

The Configure Software window is where the software is programmed for the type of test to be performed.

Note: For specific instructions on how to enter information into EM-TEST 1.0, see Section 3.3–Navigating EM-TEST 1.0.
7.1 **DATA LOGGING**

Data Logging allows EM-TEST 1.0 to automatically store acquired data.

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Folder</td>
<td>Specifies the drive and directory for test data files.</td>
<td>Click Root Folder to access Save As dialog box. Open the desired folder and click <strong>Select Cur Dir</strong>.</td>
</tr>
<tr>
<td></td>
<td>NOTE: File names are automatically generated from the serial number and saved with an .txt file extension.</td>
<td></td>
</tr>
<tr>
<td>Serial Number</td>
<td>Records the serial number for generating data log files.</td>
<td>Enter the serial number for the first motor being tested.</td>
</tr>
</tbody>
</table>

### 7.1.1 **DETAIL OF STRUCTURE**

![Folder Structure Diagram](image.png)
### 7.2 ENDURANCE TEST PARAMETERS

<table>
<thead>
<tr>
<th>Control Parameter</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Selects the desired parameter to be used as the control.</td>
<td>Amps 1, Amps 2, Amps 3, Amps 4, Amps Sum, Input Watts 1, Input Watts 2, Input Watts 3, Input Watts 4, Input Watts Sum, Speed, Torque, Output Watts and Open Loop.</td>
</tr>
<tr>
<td></td>
<td>NOTE: When controlling by Speed or Torque, the controller uses its internal circuitry to close the loop on the desired set point. The PID controls are fully active for system response tuning. However, when using Amps, Input Watts, or Output Watts control, the controller operates in an open loop mode and the loop is closed through the M-TEST 5.0 program. This means that the control loop will probably not be as tight as the Speed or Torque modes. The only system tuning control available is proportional gain.</td>
<td></td>
</tr>
<tr>
<td>Start Cycle</td>
<td>Sets the cycle number at which the test must begin. NOTE: this option is use to continue a previous test.</td>
<td>1 to Number of Cycles</td>
</tr>
<tr>
<td>Save each</td>
<td>Sets the number to save data each x Cycle. Example: Put 10 to save data each 10 cycles.</td>
<td>1 to Number of Cycles</td>
</tr>
<tr>
<td>Test Time</td>
<td>Indicator of a complete test duration. Days:hh:mm:ss</td>
<td></td>
</tr>
<tr>
<td>Number of Cycles</td>
<td>Selects the number of times to repeat the load cycle</td>
<td>1 to $2^{32}$</td>
</tr>
<tr>
<td>Enable File (1) Spanning</td>
<td>Enable/Disable File Spanning function</td>
<td>Enable (Select check box) and Disabled (clear check box)</td>
</tr>
<tr>
<td>Spanning Mode</td>
<td>Select the mode of spanning file</td>
<td>Cycle, Hours, Days, File size</td>
</tr>
<tr>
<td>Spanning size</td>
<td>Sets the size when span the file</td>
<td>1 to $2^{32}$</td>
</tr>
<tr>
<td>Timebase</td>
<td>This sets the timebase for all the Time values in the control data table.</td>
<td>Seconds/Minutes</td>
</tr>
</tbody>
</table>

(1) The file spanning function allows the acquired data to be split into separate files of a specified size. Decreasing the file size in turn reduces the risk of a computer malfunction (crash). File size should be limited to 10 Mo.
7.3 TEMPERATURE PARAMETERS

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Temperature</td>
<td>Allows a maximum value to be set for temperature when using temperature acquisition hardware. NOTE: If any thermocouple exceeds the Maximum Temperature value, the test in progress will abort.</td>
<td>Any NOTE: The temperature units are the same as what was selected in the hardware setup. Units are set up in the Configure Hardware window.</td>
</tr>
<tr>
<td>Temp Security</td>
<td>Enable/Disable Temperature Security function.</td>
<td>Enabled (Select check box) and Disabled (clear check box).</td>
</tr>
<tr>
<td>Temperature Channel</td>
<td>Select the channel of temperature to monitor and switch test in Pause mode if temp is higher a threshold.</td>
<td>Available temperature channel depending on the Configure Hardware selection.</td>
</tr>
<tr>
<td>High Temperature</td>
<td>Sets the high threshold temperature.</td>
<td>Low Temp to Max Temp</td>
</tr>
<tr>
<td>Low Temperature</td>
<td>Sets the low threshold temperature</td>
<td>0 to High Temp</td>
</tr>
<tr>
<td>Relay Control</td>
<td>Select the relay channel which is used to switch of when the test go to Pause mode</td>
<td>Relay Power, Relay 1, Relay 2, Relay 3, Relay 4</td>
</tr>
</tbody>
</table>

7.4 CONTROL DATA TABLE

- Used for entering a load profile.
- Table includes the following items:
  - **From**: The starting load value.
  - **To**: The ending load value.
  - **Time**: The number of seconds or minutes to achieve the series.
  - **Sampling**: The number of acquisition per second (0-100)
  - **Volts**: Sets the voltage for each step when using a DC or regulated AC power supply. The power supply will be programmed to the voltage desired at the beginning of each step.

  **Note**: Volts are only applicable when using a DC or regulated AC power supply and will not be visible to the user during line AC operation.

  **Motor Power**: Sets the state of the Motor Power relay for each step.

  **Relay 1-4**: Sets the state of each relay for each step.

  To set, type values in the table and use the TAB key or mouse to move from cell to cell. The time units are set by the Timebase control to the right and are applied to all time values in the table. Any values entered in the “From” and “To” columns will be in the units specified by the Control Parameter. To clear the table, right-click inside of it and select **Empty Table**.

  **Note**: If a certain profile is repetitive, enter the basic sequence in the table once and use the Number of Cycles control on the right to repeat that sequence any number of times.
The following is an example of using the Control Data while running a torque curve with a line AC power supply and Motor Power relay Control.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>From</th>
<th>To</th>
<th>Time</th>
<th>Sampling</th>
<th>Volts</th>
<th>Motor Power</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>24</td>
<td>1</td>
<td>This will load the motor with zero torque for 2 second. No save data. Power supply at 24V and energize the relay Motor Power.</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td>24</td>
<td>1</td>
<td>This will ramp the load from 0 to 10 torque units in 5 second with 50 samples per sec.</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>10</td>
<td>24</td>
<td>1</td>
<td>This will dwell at 10 torque units for 2 second with 10 samples per sec.</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>0</td>
<td>5</td>
<td>50</td>
<td>24</td>
<td>1</td>
<td>This will ramp the unload from 10 to 0 torque units in 5 second with 50 samples per sec.</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>Switch of the motor, No save data.</td>
</tr>
</tbody>
</table>
8. Adjust PID

The PID can be adjusted either prior to a test being run or afterwards if the test results are unacceptable. Click the **Adjust PID** tab to open the Adjust PID window.

![Adjust PID Window](image)

*Figure 8–1 Adjust PID Window*

The Adjust PID window is where PID setup routines are provided.

Note: For specific instructions on how to enter information into EM-TEST 1.0, see Section (3.3)–Navigating EM-TEST 1.0.

A step function is sent to the controller and the system response is plotted against it. Adjust PID values on the fly until desired response is obtained.

Adjustments made to the PID values during test are automatically transferred to the controller when the test is executed.
Chapter 8 – Adjust PID

8.1 PID PARAMETERS

The following parameters may be used when adjusting the DSP6001 Dynamometer Controller.

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>Indicates the plot in the graph that displays the actual system response to a test run.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| Ideal                    | Indicates the plot in the graph that displays the optimum result of a test run.  
                          | NOTE: This plot is only displayed during a ramp test.                        | N/A                         |
| Control                  | Indicates the plot in the graph that displays the value and dwell settings.  
                          | NOTE: This plot is only displayed during a curve test.                       | N/A                         |
| P (Proportional Gain)    | Adjusts the proportional gain setting on the DSP6000/6001.                 | 0 to 99                     |
| I (Integral)             | Adjusts the integral setting on the DSP6000/6001.                          | 0 to 99                     |
| D (Derivative)           | Adjusts the derivative setting on the DSP6000/6001.                        | 0 to 99                     |
| PS (Proportional Gain Scaling) | Adjusts the proportional gain scaling on the DSP6001.                     | 0.001; 0.005; 0.01; 0.05; 0.1; 0.5; 1; 5; 10 (*) |
| IS (Integral Scaling)    | Adjusts the integral scaling on the DSP6001.                              | Any                         |
| DS (Derivative Scaling)  | Adjusts the derivative scaling on the DSP6001.                            | Any                         |
| High Value               | Sets the maximum value for the desired system response adjustment. The program will cycle between the low value and this value. | Any                         |
| Low Value                | Sets the minimum value for the desired system response adjustment. The program will cycle between this value and the high value. | Any                         |
| Dwell                    | When performing curve tests, this control sets the dwell time at no-load and at load for the adjustment procedure. The time is in seconds. | 0 to 32767                  |
| Motor voltage            | Sets the motor voltage if using a power supply controlled by EM-TEST 1.0   | Any                         |

(*) A=0.001; B=0.005; C=0.01; D=0.05; E=0.1; F=0.5; G=1; H=5; I=10
### TEST SETUP

<table>
<thead>
<tr>
<th>Control</th>
<th>Function</th>
<th>Options/Values</th>
</tr>
</thead>
</table>
| Run         | When the controls are configured, click **Run** to begin the adjustment procedure.  
NOTE: Curve tests allow adjustment of the PID values on the fly. After the ramp test has run once, the settings may be changed and then the test may be repeated. | N/A            |
| Save Setup  | The current PID settings are saved, overriding the current setup file that is loaded. If you do not wish to override the current setup file (after pressing Save Setup), click **Cancel** when prompted and read the note below.  
NOTE: To save current PID settings in a new setup file, first return to the Start window. Create a new setup file by clicking Save Setup under Current Setup Filename. See Section 4.3.1–Save Setup. | N/A            |

* A=0,001; B=0,005; C=0,01; D=0,05; E=0,1; F=0,5; G=1; H=5; l=10

### 8.2 ADJUSTING THE CONTROLLER FOR AN ENDURANCE TEST

**Note:** When amps, input watts, output watts or output kW endurance tests are being performed, only the proportional gain (P) can be adjusted.

1. Set P to **35**.
2. Set I and D to **0**.
3. Set PS, IS and DS to **0,001 (A)**.
4. Set High Value to the highest load used on the motor during testing.
5. Set Low Value to the lowest load used on the motor during testing.
6. Set Dwell to **2** or **3** seconds.
7. Set Motor Voltage to appropriate value if a motor power supply was selected in the Configure Hardware window.
8. Click **Run**. The result will appear similar to the following example.

![Figure 8–2 Curve (no I or D)](image)

9. Increase PS until actual value is approximately 25% of ideal value. Use the P slider for finer adjustment. When optimal setting is reached, the result will appear similar to the following example.

![Figure 8–3 Curve (P at 25%)](image)
10. Set I to 35.
11. Increase IS until actual value reaches ideal value. Use the I slider for finer adjustment. When optimal setting is reached, the result will appear similar to the following example.

![Figure 8–4 Curve (with P and I)](image)

12. Set D to 35.
13. Increase DS until the actual curve matches, or is as close to, the ideal curve as possible. Use the D slider for finer adjustment. The final result will appear similar to the following example.

![Figure 8–5 Matched Curve](image)
This chapter includes step-by-step instructions for setting up and running a basic endurance test from beginning to end.

Follow these steps in order (sequentially from left to right) as the navigation tabs at the top of the EM-TEST 1.0 screen.

1. Configure Hardware
2. Configure Display
3. Configure and Run Test
4. View Test Results
   - Tabular display (View Data)
   - Graphical display
     - 5-Axis Graph

### 9.1 CONFIGURE HARDWARE

The following hardware configuration is common for each test. For a detailed procedure, refer to *Chapter 5 – Configure Hardware*.

1. Click **Configure Hardware** tab to open the Configure Hardware window.
2. Select Dynamometer Controller and corresponding settings.
3. Select Instrument Type and Model for Channel 1 (TSC1).
4. If applicable, select Instrument Type and Model for Channel 2 (TSC2).
5. Click **Load Defaults**.
6. Make any changes to default settings, if necessary.
7. Select Power Measurement device and corresponding settings.
8. Select Power Supply and corresponding settings.
9. Select temperature testing hardware and corresponding settings, if applicable.
10. Click **Apply Settings**.

### 9.2 CONFIGURE DISPLAY

The following display configuration applies to curve, manual and ramp tests. For a detailed procedure, refer to *Chapter 6 – Display*.

1. Click **Display** tab to open Display Setup window.
2. Select parameters to record and/or display during test.
9.3  CONFIGURE AND RUN TEST

9.3.1  CURVE TEST
Endurance testing simulating real life usage or to check a few specific data points.
1. Click the Configure Test tab to open the Configure Test window.
2. Select Control Parameter.
3. Enter values in control data table.
4. Click Test tab to open Test window.
5. Select which parameters will be plotted from the X and Y-axis drop-down lists located in the lower right corner of the Test window.
6. Click Start Test. The test data table to the left will appear based on the parameters selected in the Display window. The test graph will display the plot for the selected X and Y parameters.
7. Select Auto X/Y axis enable or disable.
8. During the test, click View DATA or View GRAPH to see data previously saved of the current test.

Note: Depending of the file size, this function can alterate the real-time test!

9. Press Pause button to pause the current test. Release it to continue test. The DSP6001 is resetted and Power relay is energized.
9. Press Set-Point table to see the Set-Point table red line indicate the current position of the current cycle.

To display additional test curves, simply change the X and Y-axis parameters and click Start Test again.

Note: If results are unacceptable, see Section 8.1–Adjusting the Controller.

9.4  VIEW TEST DATA
When the test run is complete, there are a few different options for viewing test results:

9.4.1  TABULAR DISPLAY
- View Data: Display test results in a data table with option to print. Refer to Chapter 11 – View Data for more information.

9.4.2  GRAPHICAL DISPLAY
- 5-Axis Graph: Display up to 5 test curves in a single graph with option to print. Refer to Chapter 11 – 5-Axis Graph for more information.
9.5 RECOVERY FUNCTION

During the test, the data are saved each second. If a windows problem occurs during the test and EM-TEST 1.0 is not closed properly, then at the next software START, the program asks to continue the previous test or generate a new test. If the option to continue the previous test is selected, the test will continue at the beginning of the current cycle. The data will be saved at the next increment file.
10. View Data

After the test has been completed, click View Data to see test results in a tabular format.

![Figure 10–1 View Data Window](image)

Use the scroll bars to the right and at the bottom of the table to view all the data. Select the file which will be displayed in the table. Press Ctrl and click on second file to add at displayed file.

Note: Depending of the file size, it can be take few minute to display datas.
11. 5-Axis Graph

After the test has been completed, click 5-Axis Graph tab to view test results in a multiplot graph.

![5-Axis Graph Window](image)

*Figure 11–1  5-Axis Graph Window*

Note: For detailed information on formatting and navigating graphs, refer to Appendix A – Graph Tools.

11.1 SELECT FILE

Select the file which will be displayed in the table. Press Ctrl and click on second file to add at displayed file.

11.2 SELECT PLOTTED PARAMETERS

Up to 5 (Y-axis) test parameters are plotted against one common X-axis parameter.

1. Select each Y-axis parameter from the drop-down lists located to the left of the graph.
2. Select the X-axis parameter from the drop-down list located below the graph.
11.3 SAVE DATA

If data logging is enabled, test data is automatically saved as a Microsoft® Excel file, using the motor’s serial number as the file name. Refer to Section 7.1–Data Logging for more information.

To save test data as a file that can be recalled later by EM-TEST 1.0, click Save Data. The Save As dialog box will open to prompt for a file name (with an .mdf file extension). The data is then saved as a tab-delimited file that can be imported into any spreadsheet program.
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RETURNING MAGTROL EQUIPMENT FOR REPAIR AND/OR CALIBRATION

Before returning equipment to Magtrol for repair and/or calibration, please visit Magtrol’s Web site at http://www.magtrol.com/support/rma.htm to begin the Return Material Authorization (RMA) process. Depending on where the equipment is located and which unit(s) will be returned, you will be directed to either ship your equipment back to Magtrol, Inc. in the United States or Magtrol SA in Switzerland.

Returning Equipment to Magtrol, Inc. (United States)

When returning equipment to Magtrol, Inc.’s factory in the United States for repair and/or calibration, a completed Return Material Authorization (RMA) form is required.

2. Complete the RMA form online and submit.
3. An RMA number will be issued to you via e-mail. Include this number on all return documentation.
4. Ship your equipment to:

   MAGTROL, INC.
   70 Gardenville Parkway
   Buffalo, NY 14224
   Attn: Repair Department

5. After Magtrol’s Repair Department receives and analyzes your equipment, a quotation listing all the necessary parts and labor costs, if any, will be faxed or e-mailed to you.
6. After receiving your repair estimate, provide Magtrol with a P.O. number as soon as possible. A purchase order confirming the cost quoted is required before your equipment can be returned.

Returning Equipment to Magtrol SA (Switzerland)

If you are directed to ship your equipment to Switzerland, no RMA form/number is required. Just send your equipment directly to Magtrol SA in Switzerland and follow these shipment instructions:

1. Ship your equipment to:

   MAGTROL SA
   After Sales Service
   Route de Montena 77
   1728 Rossens / Fribourg
   Switzerland
   VAT No: 485 572

2. Please use our forwarder: TNT • 1-800-558-5555 • Account No 154033
   Only ship ECONOMIC way (3 days max. within Europe)
3. Include the following documents with your equipment:
   • Delivery note with Magtrol SA’s address (as listed above)
   • Three pro forma invoices with:
     • Your VAT number
     • Description of returned goods
     • Noticed failures
     • Value - for customs purposes only
     • Origin of the goods (in general, Switzerland)
4. A cost estimate for repair will be sent to you as soon as the goods have been analyzed. If the repair charges do not exceed 25% the price of a new unit, the repair or calibration will be completed without requiring prior customer authorization.