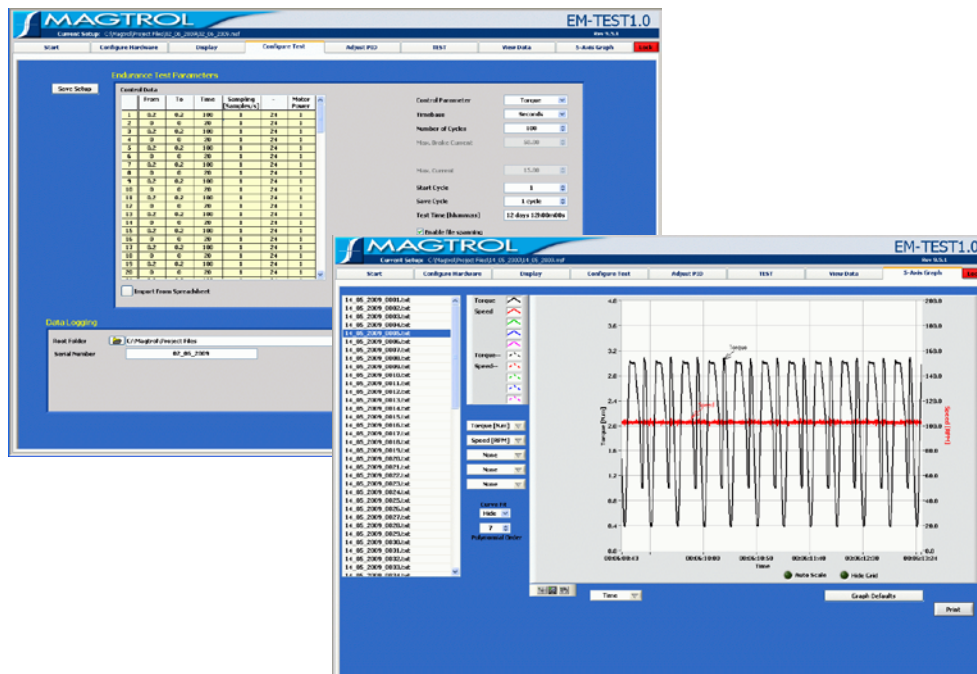


MAGTROL

EM-TEST 1.0

Endurance Motor Testing Software



User's Manual

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.

Pentium® and Celeron® are registered trademarks of Intel Corporation.

Safety Precautions



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.

TABLE OF REVISIONS

Date	Edition	Change	Section(s)
03/31/10	1 st Edition Rev. A	Timebase control added on table ENDURANCE TEST PARAMETERS	7.2
10/12/09	1 st Edition		

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Preface

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

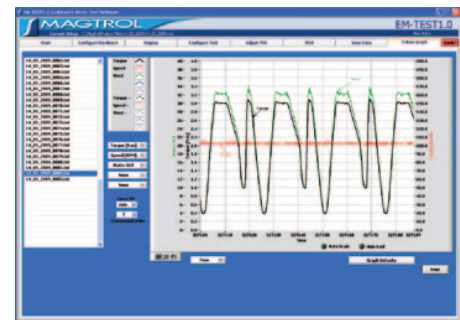
Endurance Motor Testing Software

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).



EM-TEST 1.0 Configuration Test



EM-TEST 1.0 Graphical Data Output

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.

Specifications

EM-TEST 1.0

STANDARD FEATURES

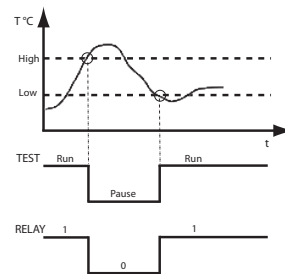
- **IEEE-488:** Computer interface with National Instruments™ PCI-GPIB.
- **Multiple Language Support:** Switch to/from English, French, German at any point during the program. Additional language dictionaries can be created/edited by the user.
- **Automatic Load Defaults Option:** Downloads testing 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 a (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.



RELAY CONTROL

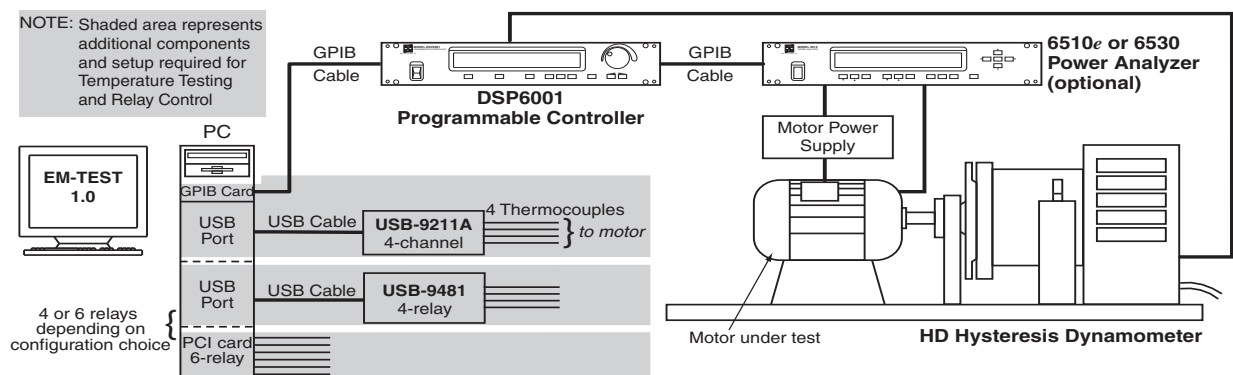
Up to 6 relays can be controlled during test. The state of each relay can be set for each step.

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)



Ordering Information

EM-TEST 1.0

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 × 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

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

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**.

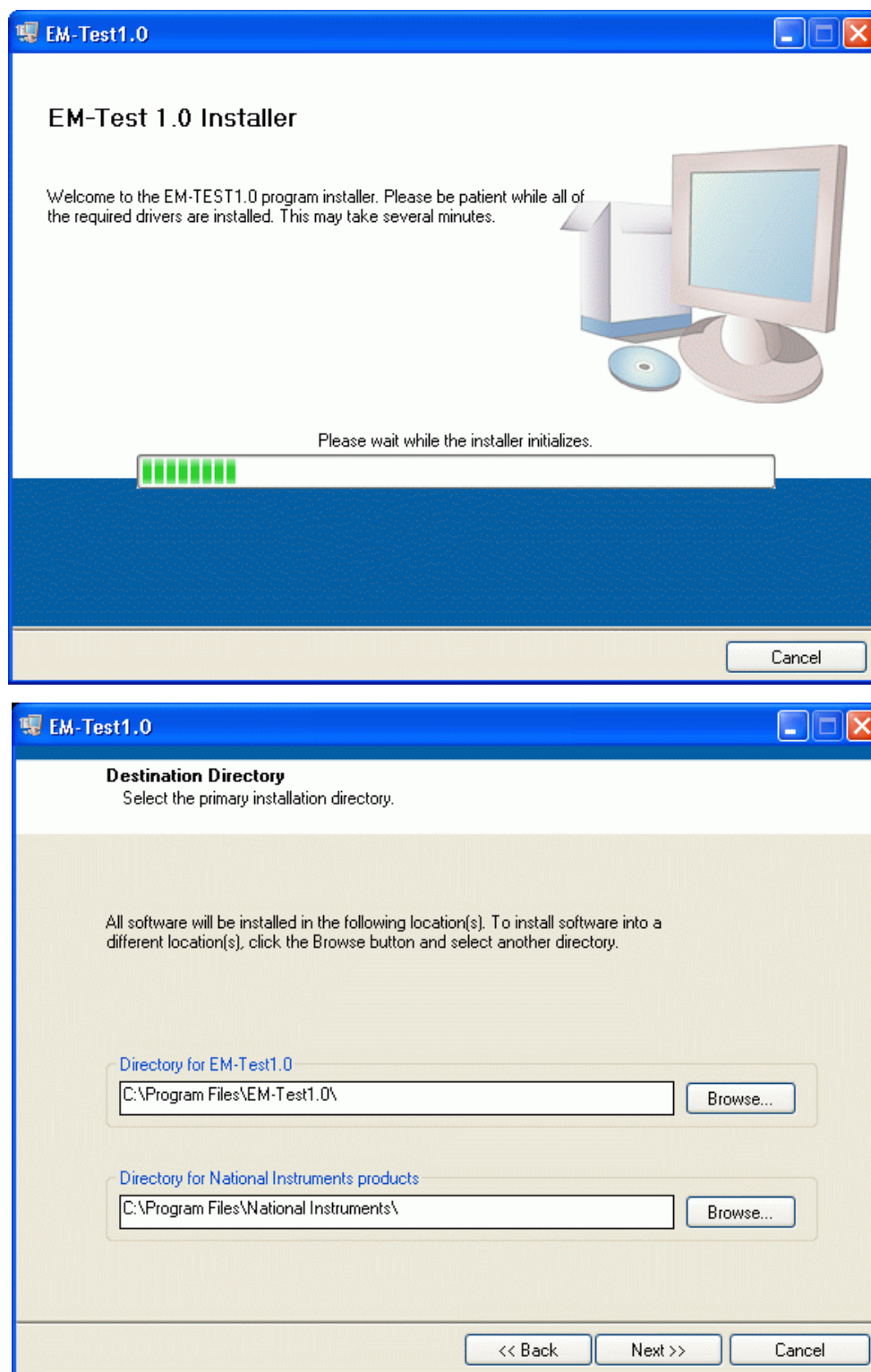


Figure 2–1 EM-TEST 1.0 Software Installation

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.

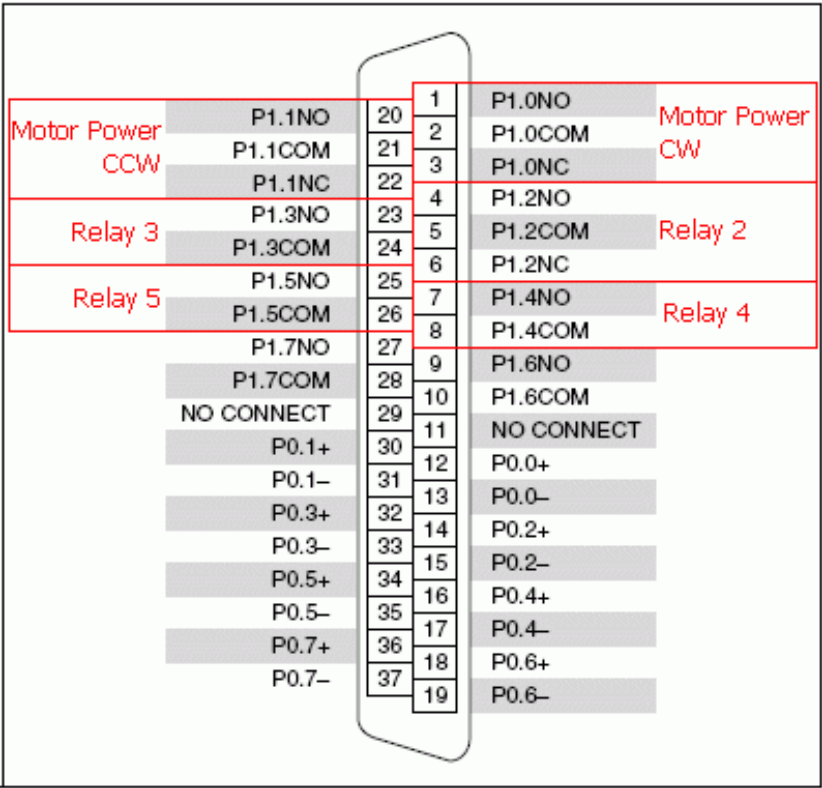


Figure 2–2 Pinout PCI 652x

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”

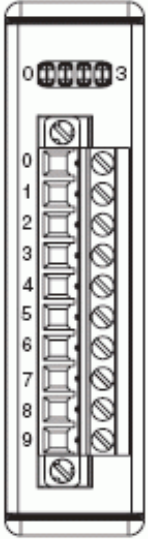
Module	Terminal	Signal
	0	Motor Power CW
	1	
	2	Motor Power CCW
	3	
	4	Relay 2
	5	
	6	Relay 3
	7	
	8	No connection
	9	No connection

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.

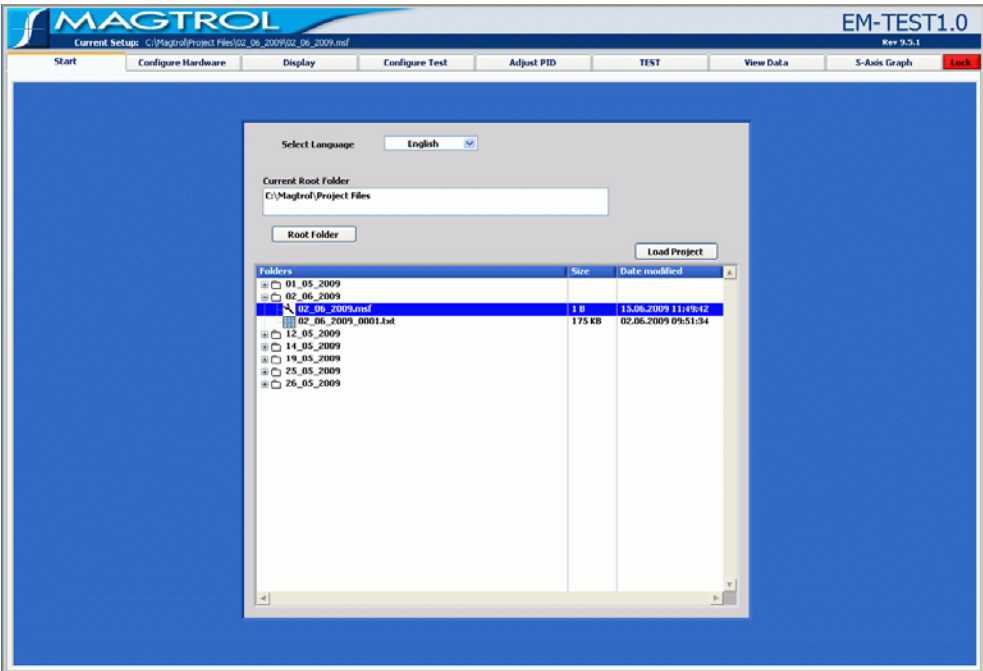


Figure 3–1 Start Window

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

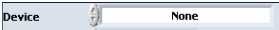
Navigate from window to window by clicking the tabs at the top of the screen.

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

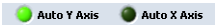
For text boxes requiring a numeric value, simply click inside the box and type the desired value. To overwrite an existing entry, click and drag the pointer across the field and then type the new value.



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).

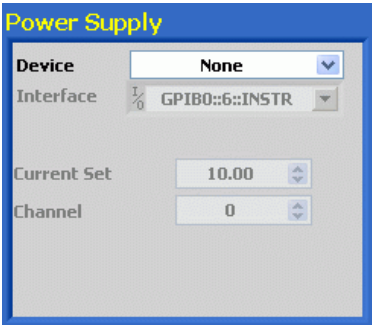


Figure 3–2 Inaccessible Controls Example

4. Start

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

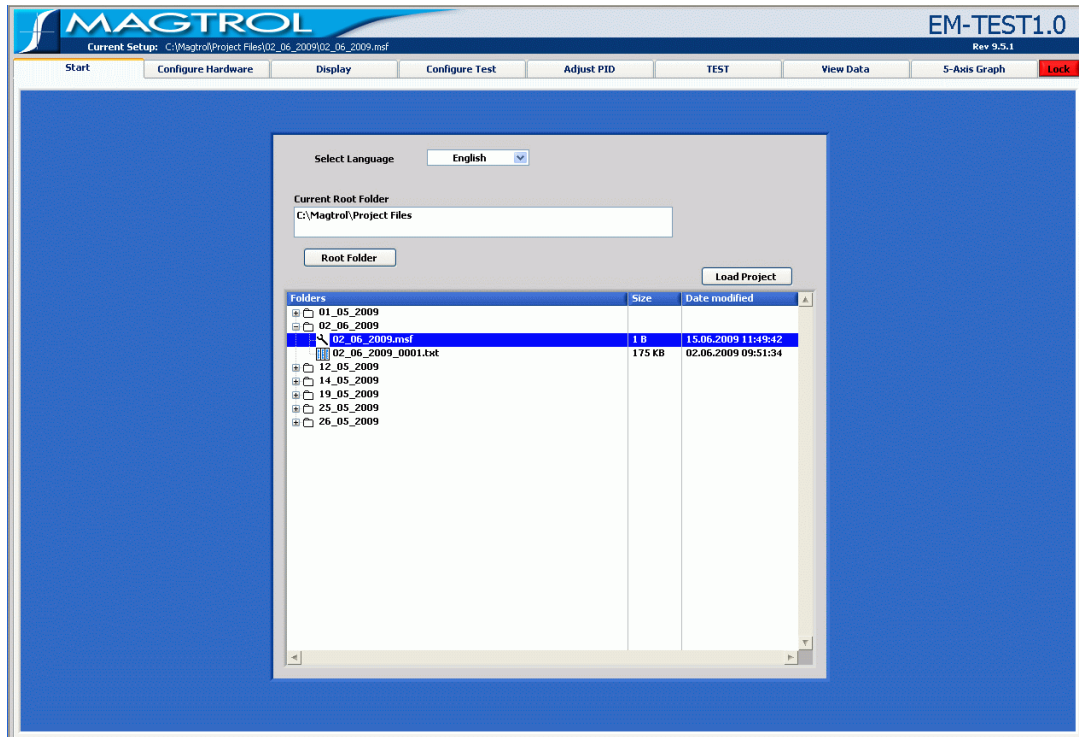


Figure 4–1 Start Window

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

5. Configure Hardware

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.



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.

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

5.2.1 ALARMS

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



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 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.

Control	Function	Options/Values
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

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

5.3 POWER MEASUREMENT

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

CONTROL	FUNCTION	OPTIONS/VALUES
Device	Selects the device used to read power data.	<ul style="list-style-type: none">• None• 6510• 6510_e• 6530:<ul style="list-style-type: none">1 ph. 2 w. 1 ph. 3 w.3 ph. 3 w. 3 ph. 4 w.3 ph. 3 v. 3 a.
GPIB Address	Selects the corresponding GPIB address for the power measurement device.	1 to 32 NOTE: Click Find Devices to display the device's GPIB address in the Device/Address table located in the upper left corner of the Configure Hardware window. See <i>Section 5.1–GPIB Device/Address Detection</i> .
External Shunt	Enables the external shunt(s) connected to the power analyzer (if applicable).	Yes and No
Shunt 1 Scaling	Sets the scaling constant for the external shunt on phase 1.	0.0001 to 99999 NOTE: The constant is determined by dividing the full scale amps of the shunt by 50 mV
Shunt 2 Scaling	Sets the scaling constant for the external shunt on phase 2.	0.0001 to 99999 NOTE: The constant is determined by dividing the full scale amps of the shunt by 50 mV

CONTROL	FUNCTION	OPTIONS/VALUES
Shunt 3 Scaling	Sets the scaling constant for the external shunt on phase 3.	0.0001 to 99999 NOTE: The constant is determined by dividing the full scale amps of the shunt by 50 mV

Examples for shunt scalings :

- 1) 50A / 50 mV
 1A / 1mV ==> scaling = 1.000
- 2) 100A / 50mV
 2A / 1mV ==> scaling = 2.000

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

Control	Function	Options/Values
Device	Selects the type of power supply being used. 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.	<ul style="list-style-type: none"> • None • AC Regulated (Staco MPA2) • EMI • HP603xA • HP66xxA • Lambda Genesys • Power Ten • Sorensen DCS • Sorensen DHP • Xantrex XFR • Xantrex XDC • Xantrex XMP
GPIB Address	Sets the GPIB address for the DC power supply.	1 to 32 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 <i>Section 5.1–GPIB Device/Address Detection</i>
Current Set	Sets to the maximum current that the DC power supply needs to deliver.	Any

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

Control	Function	Options/Values
Device	Selects the sensor input module.	<ul style="list-style-type: none"> • None • USB-9211

5.5.2 USB-9211A

5.6 RELAY CONTROL

Control	Function	Options/Values
Thermocouple Type	Selects type of thermocouple.	J, K, N, R, S, T, B and E
Units	Selects desired temperature unit for acquired/ displayed values.	<ul style="list-style-type: none"> • 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**.

6. Display

Click the **Display** tab to open the Display Setup window.



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.

6.1 DISPLAY SETUP

6.1.1 MOTOR PARAMETERS

Torque	Amps 1	Volts 1	Input Watts 1	Power Factor 1	Output Watts
Speed	Amps 2	Volts 2	Input Watts 2	Power Factor 2	Output Kilowatts
Time	Amps 3	Volts 3	Input Watts 3	Power Factor 3	Horsepower
Auxiliary Input	Amps 4	Volts 4	Input Watts 4	Power Factor 4	Efficiency
Frequency	Amps Sum	Volts Sum	Input Watts Sum	Power Factor Sum	Cycle

Depending of 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”.

6.1.2 NAVIGATION

Move parameters between the Available and Selected columns by either using drag and drop function.

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.

	From	To	Time	Sampling Samples/s	Motor Power
1	0.2	0.2	100	1	24
2	0	0	20	1	24
3	0.2	0.2	100	1	24
4	0	0	20	1	24
5	0.2	0.2	100	1	24
6	0	0	20	1	24
7	0.2	0.2	100	1	24
8	0	0	20	1	24
9	0.2	0.2	100	1	24
10	0	0	20	1	24
11	0.2	0.2	100	1	24
12	0	0	20	1	24
13	0.2	0.2	100	1	24
14	0	0	20	1	24
15	0.2	0.2	100	1	24
16	0	0	20	1	24
17	0.2	0.2	100	1	24
18	0	0	20	1	24
19	0.2	0.2	100	1	24
20	0	0	20	1	24

Figure 7-1 Configure Test Window

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.

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

7.1.1 DETAIL OF STRUCTURE



7.2 ENDURANCE TEST PARAMETERS

Control	Function	Options/Values
Control Parameter	<p>Selects the desired parameter to be used as the control.</p> <p>NOTE: When controlling by Speed or Torque, the controller uses its internal circuitry to close the loop on the desired set point.</p> <p>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.</p> <p>This means that the control loop will probably not be as tight as the Speed or Torque modes.</p> <p>The only system tuning control available is proportional gain.</p>	<p>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.</p> <p>NOTE: Torque will be in the units previously selected in the Display Torque text box under Dynamometer Controller in the Configure Hardware window. For Amps and Input Watts control, the number refers to the phase of a three-phase system. If using a single-phase source, select an option with a "1".</p>
Start Cycle	Sets the cycle number at which the test must begin. NOTE: this option is use to continue a previous test..	1 to Number of Cycles
Save each	Sets the number to save data each x Cycle. Example: Put 10 to save data each 10 cycles.	1 to Number of Cycles
Test Time	Indicator of a complete test duration.	Days:hh:mm:ss
Number of Cycles	Selects the number of times to repeat the load cycle	1 to 2 ³²
Enable File ⁽¹⁾ Spanning	Enable/Disable File Spanning function	Enable (Select check box) and Disabled (clear check box)
Spanning Mode	Select the mode of spanning file	Cycle, Hours, Days, File size
Spanning size	Sets the size when span the file	1 to 2 ³²
Timebase	This sets the timebase for all the Time values in the control data table.	Seconds/Minutes

⁽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

Control	Function	Options/Values
Maximum Temperature	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.	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.
Temp Security	Enable /Disable Temperature Security function..	Enabled (Select check box) and Disabled (clear check box)
Temperature Channel	Select the channel of temperature it will be use to monitor and switch test in Pause mode if temp is higher a threshold.	Available temperature channel depending of the Configure Hardware selection.
High Temperature	Sets the high threshold temperature.	Low Temp to Max Temp
Low Temperature	Sets the low threshold temperature	0 to High Temp
Relay Control	Select the relay channel which is use to switch of when the test go to Pause mode	Relay Power, Relay 1, Relay 2, Relay 3, Relay 4

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.

Sequence	From	To	Time	Sampling	Volts	Motor Power	Description
1	0	0	2	0	24	1	This will load the motor with zero torque for 2 second. No save data, power supply at 24V and energize the relay Motor Power
2	0	10	5	50	24	1	This will ramp the load from 0 to 10 torque units in 5 second with 50 samples per sec.
3	10	10	2	10	24	1	This will dwell at 10 torque units for 2 second with 10 samples per sec.
4	10	0	5	50	24	1	This will ramp the unload from 10 to 0 torque units in 5 second with 50 samples per sec
5	0	0	2	0	24	0	Switch of the motor, No save data.

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.

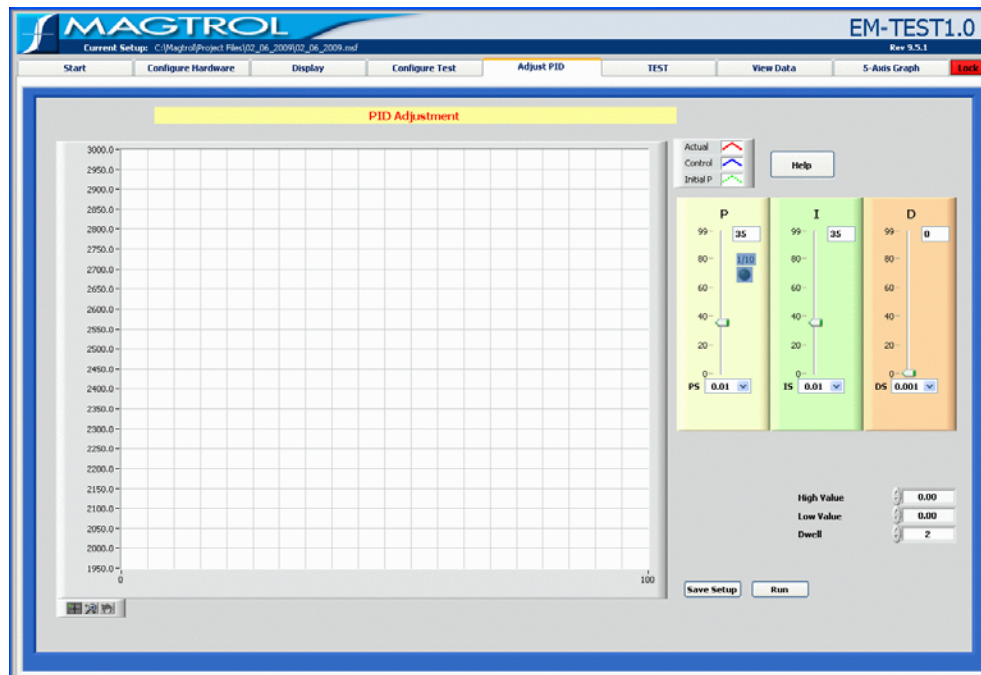


Figure 8–1 Adjust PID Window

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.

8.1 PID PARAMETERS

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

Control	Function	Options/Values
Actual	Indicates the plot in the graph that displays the actual system response to a test run.	N/A
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.	
DS (Derivative Scaling)	Adjusts the derivative scaling on the DSP6001.	
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

Control	Function	Options/Values
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 <i>Section 4.3.1–Save Setup</i> .	N/A

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

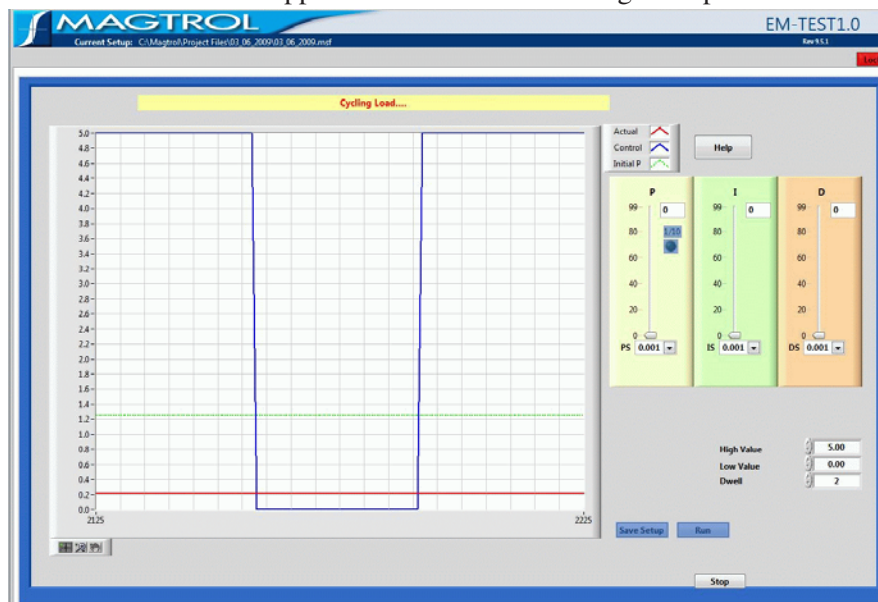


Figure 8–2 Curve (no I or D)

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%)

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.

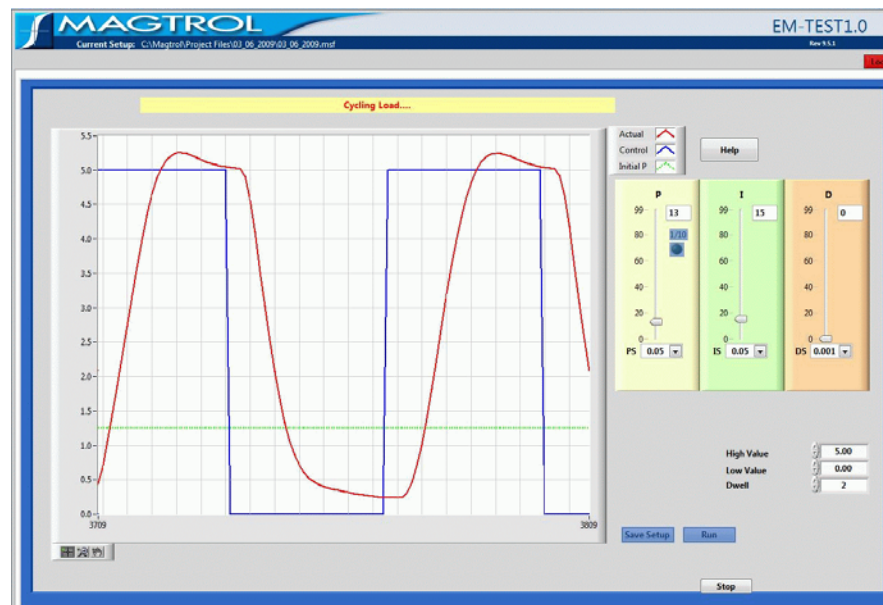


Figure 8–4 Curve (with P and I)

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.

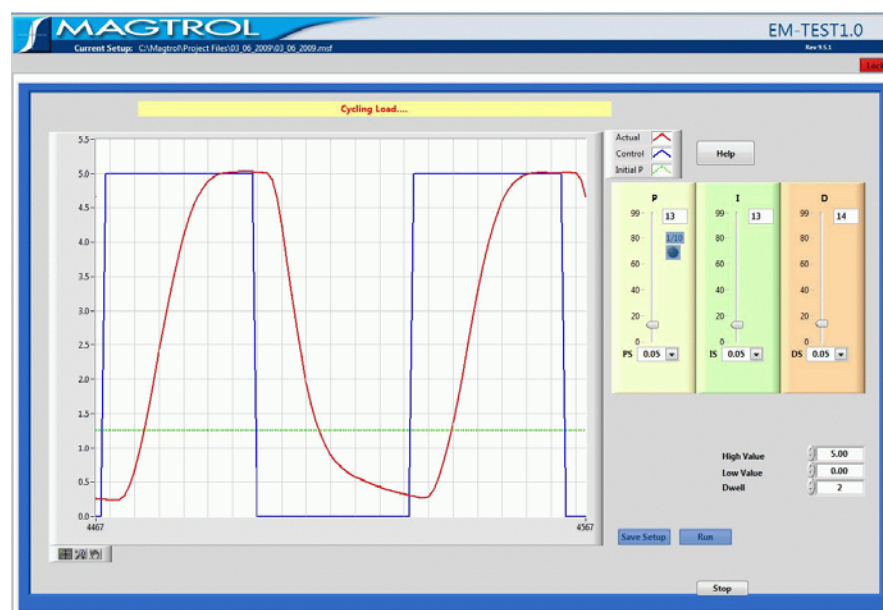


Figure 8–5 Matched Curve

9. Test

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 datas are saved each second. If windows problem occurs during the test and EM-TEST 1.0 is not closed properly, then at the next software START, the program ask 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 datas will be saved at next increment file.

10. View Data

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

File	Speed (RPM)	Torque (Nm)	Watts (W)	Cycle	Time	Amps 1	Volts 1	Watts IN 1	Efficiency
14_05_2009_0001.txt	106	0.506	5.617	001	20000.117	0.014	0.032	0.002	260966.077
14_05_2009_0002.txt	102	0.460	4.999	001	20000.219	0.014	0.00	0.002	232759.614
14_05_2009_0003.txt	102	0.436	4.657	001	20000.316	0.014	0.098	0.002	218378.615
14_05_2009_0004.txt	103	0.414	4.465	001	20000.421	0.014	0.112	0.002	207474.746
14_05_2009_0005.txt	103	0.403	4.347	001	20000.513	0.014	0.116	0.002	201962.132
14_05_2009_0006.txt	102	0.390	4.251	001	20000.623	0.014	0.110	0.002	197519.920
14_05_2009_0007.txt	102	0.398	4.251	001	20000.715	0.014	0.118	0.002	197519.920
14_05_2009_0008.txt	103	0.396	4.271	001	20000.815	0.014	0.115	0.002	198454.104
14_05_2009_0009.txt	101	0.39	4.125	001	20000.919	0.014	0.116	0.002	191652.132
14_05_2009_0010.txt	102	0.380	4.144	001	20001.022	0.014	0.117	0.002	192557.116
14_05_2009_0011.txt	103	0.388	4.266	001	20001.119	0.014	0.119	0.002	198270.56
14_05_2009_0012.txt	104	0.391	4.258	001	20001.222	0.014	0.117	0.002	197850.782
14_05_2009_0013.txt	103	0.393	4.239	001	20001.323	0.014	0.121	0.002	196950.664
14_05_2009_0014.txt	102	0.394	4.200	001	20001.424	0.02	0.423	0.01	41900.290
14_05_2009_0015.txt	101	0.399	4.22	001	20001.514	0.04	0.457	0.018	23528.919
14_05_2009_0016.txt	103	0.410	4.509	001	20001.616	0.048	0.503	0.021	21670.245
14_05_2009_0017.txt	101	0.446	4.717	001	20001.710	0.057	0.509	0.032	14943.460
14_05_2009_0018.txt	104	0.401	5.220	001	20001.822	0.066	0.610	0.043	12165.566
14_05_2009_0019.txt	103	0.517	5.376	001	20001.920	0.076	0.768	0.058	9396.004
14_05_2009_0020.txt	103	0.558	6.019	001	20002.023	0.086	0.856	0.074	8144.828
14_05_2009_0021.txt	101	0.596	6.304	001	20002.115	0.096	0.939	0.09	7025.191
14_05_2009_0022.txt	103	0.655	7.065	001	20002.225	0.100	1.046	0.115	6154.690
14_05_2009_0023.txt	104	0.71	7.723	001	20002.318	0.117	1.112	0.13	5954.122
14_05_2009_0024.txt	102	0.770	8.31	001	20002.420	0.120	1.205	0.155	5362.59
14_05_2009_0025.txt	103	0.844	9.103	001	20002.513	0.137	1.273	0.175	5200.422
14_05_2009_0026.txt	103	0.914	9.859	001	20002.615	0.140	1.355	0.203	4855.626
14_05_2009_0027.txt	102	1.006	10.745	001	20002.723	0.159	1.445	0.237	4622.754
14_05_2009_0028.txt	103	1.070	11.627	001	20002.818	0.160	1.506	0.255	4565.37
14_05_2009_0029.txt	103	1.172	12.641	001	20002.924	0.177	1.569	0.281	4506.461
14_05_2009_0030.txt	102	1.257	13.427	001	20003.010	0.185	1.622	0.302	4445.290
14_05_2009_0031.txt	101	1.346	14.236	001	20003.123	0.193	1.689	0.327	4351.603
14_05_2009_0032.txt	102	1.434	15.317	001	20003.226	0.201	1.738	0.352	4351.13
14_05_2009_0033.txt	103	1.51	16.287	001	20003.321	0.200	1.789	0.377	4324.166
14_05_2009_0034.txt	102	1.585	16.93	001	20003.413	0.214	1.835	0.397	4258.59
14_05_2009_0035.txt	103	1.677	18.088	001	20003.515	0.221	1.88	0.42	4202.497
14_05_2009_0036.txt	105	1.763	19.385	001	20003.621	0.228	1.92	0.441	4293.543
14_05_2009_0037.txt	102	1.837	19.622	001	20003.721	0.233	1.96	0.46	4266.767
14_05_2009_0038.txt	103	1.9	20.494	001	20003.814	0.230	1.991	0.476	4201.999
14_05_2009_0039.txt	102	1.967	21.01	001	20003.920	0.244	2.045	0.5	4201.647
14_05_2009_0040.txt	102	2.04	21.79	001	20004.017	0.25	2.084	0.522	4177.762

Figure 10–1 View Data Window

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 to 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.

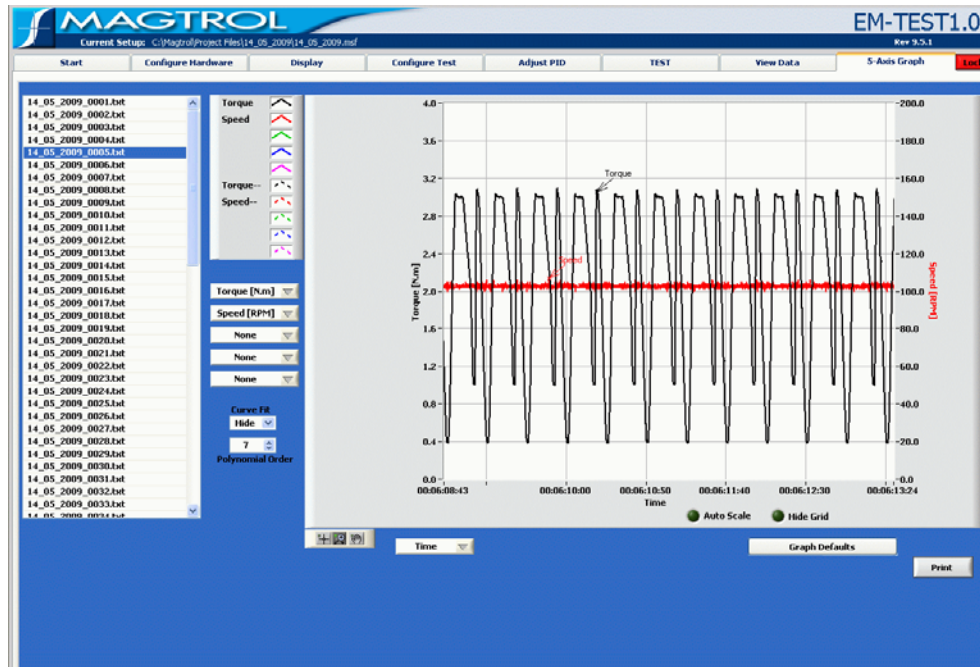


Figure 11-1 5-Axis Graph Window



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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Service Information

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.

1. Visit Magtrol's Web site at <http://www.magtrol.com/support/rma.htm> to begin the RMA process.
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.



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