

ELECTROM INSTRUMENTS

iTIG II Series Winding Analyzers

Instruction Manual



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IMPORTANT NOTES



THE INFORMATION IN THIS MANUAL MAY NOT COVER THE LATEST HARDWARE AND SOFTWARE VERSIONS and the Manufacturer assumes no liability for its use.

NOTE: Pictures do not necessarily represent the latest versions of hardware or software when used to point out specific features and functions.

Software updates are free, contact us if you have fewer standard features than what is described in this manual.



CAUTION



This manual must be read before operating the iTIG II. Both for personnel and equipment safety, and for optimum product performance, make sure you thoroughly understand the contents before using the instrument. Failure to follow instructions may result in electric shock and serious injury.

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CHAPTER 1 Introduction

USING THIS MANUAL

NOTE: When viewing this manual as a PDF file, click the bookmarks listed to the left to go directly to a chapter or sub-heading.

There are **Cross References** in the manual listed as underlined Page numbers in blue italic. **Click the page number to go to the reference.** References may have a “Return to.....” at the end of the section or on the left page side.

Example:

Page 14: See Data Transfer [Page82](#)

On page 82: (Return to Data Entry Methods [Page14.](#))

Model A and B: Look for **Page links** to the next subject for these models. When there are no links, go to the next subject heading on the left side of the page or to the next page.

SAFETY AND WARNINGS



This documentation must be studied before operating the iTIG II for the first time. Special attention must be paid to safety to avoid serious injury or damage to equipment.

This product is a Safety Class 1 instrument.

Safety Warnings and Cautions

Warnings, Cautions, Important statements and Notes are provided throughout this manual to protect personnel and equipment.

Read each message carefully before proceeding to the next step to avoid serious and potentially fatal injury from electric shocks.

Summary of key safety warnings:

- **Never touch** the output lead clips or object tested or anything connected to it during any test and while a voltage is present during and after testing.
- **Always discharge the potential** of the item under test and anything in contact with it such as test fixtures before handling it or disconnecting the output leads.
Hot stick probes and other shorting devices can be used to ground the windings and discharge any residual capacitance/potential in the item after the test.
- **Use safety gloves** if there is any chance of touching surfaces with any elevated voltage potential.
- **Never perform** a Megohm, Hipot or Surge test on energized

Ground Fault
If the message below appears action must be taken. See [Page 85](#).



circuitry or equipment. Make sure what is being tested is completely disconnected from power and other equipment such as capacitors, surge arrestors, current transformers, starters and VFDs (Variable Frequency Drives).

- **Earth Ground:** The Power source and iTIG II MUST be properly earth grounded and wired to avoid electric shock. If using a portable generator, make sure it is earth grounded. **If no earth ground is available such as for applications on-board ships, contact Electrom Instruments.**
- **If an internal failure occurs** such as “Loss of HV Sense”, “Inter board communication error” or other failures indicated on the screen, the iTIG II will not measure the potential in the windings. If such a failure happens during or after a Meg or Hipot type test, make sure the winding(s) are discharged before handling the equipment being tested.
- **In case of other problems** turn off the high voltage first, or shut off power to the unit.
- **Never** do a Surge test without connecting the iTIG II leads to a load (winding) as instructed.
- **Maintain a safe, clean and organized test area** away from high traffic.
- **Do not perform any tests in a combustible atmosphere** or in any area where combustible materials are present.
- **Moisture:** The iTIG II is not protected against harmful ingress of moisture. If used outside it must be protected from rain and any harmful contaminants.

PACKAGING - RETURNS

Save the Shipping Box!

Check the instrument for damage to the case such as dents or cracks before use.

The iTIG II is shipped in a specially designed box. When shipping the iTIG II always use this box with all inserts, or use something better.

NOTE: *The Electrom shipping box only protects the iTIG II if all original inserts are included.*

Never ship the iTIG II without a properly padded and well protected box. No damage during shipping is covered by the warranty.

CHAPTER 2 General Information

HOW TO GET STARTED

Turn the iTIG II On & Off

Open the front lid. Note that the lid will not support the weight of the instrument. Place a support under the front of the instrument, for example the lid itself.

The lid can be taken off the hinges. Push **the hinge stop** on the right hinge back and slide the lid sideways to the left.

Turn ON: Plug the power cord into the back of the iTIG II and into the power source.

Turn the power ON/OFF rocker switch in the back to ON (I). The iTIG II will start up, Windows XPe or W7 will start and shortly after that the iTIG II software will start.

Turn OFF: To turn the unit off, simply turn the ON/OFF switch in the back to OFF (O) at any time and from any screen after a test is finished.



The hinge stop

FRONT PANEL HARDWARE

NOTE: HO type testers have a different front panel layout:



20-pin connector is used for the ABT, Power Pack, and external warning light.

BNC connectors: The upper left corner has two plus a circular multi-pin connector. These are used when a Power Pack is connected to the iTIG II.

USB connectors are used for the following:

- Connecting a printer (B-D models)
- Plugging in a Memory Stick to transfer test data (B-D models)
- Connecting a computer keyboard and mouse (not required to operate the iTIG II)
- Use with a Memory Stick for software & system updates & upgrades

Monitor buttons below the monitor are only for monitor adjustments and should be left alone unless there is a problem with the settings.

Circular green light indicates power is on. Powers on computer if Windows was shut down with system power on.

NOTE: Power should be shut off with the main power switch in the back for both the system and the computer. Do not use the green ON light button.

Connector and fuses on the bottom right of the monitor are for the low resistance measurement for B-D models. Note that the D model uses the output leads (7 vs 4) for this measurements and does not come with a separate lead set for low resistance measurements like the B & C model.

Red button is the test Start/Stop button. The silver **“Voltage Control”** knob below it increases/decreases the voltage when tests are done manually.

Plug in the top right corner is used for the foot switch (test Start/Stop).

DATA ENTRY METHODS

**Model A: Go to
Page 28**

On Screen Keypads

International Characters

Data is entered and changed in the iTIG II in several different ways:

1. With on-screen keypads using the touch screen
2. With a computer keyboard (not included) plugged into one of the USB ports
3. With a radio or Bluetooth mini keyboard (not included) when its receiver is plugged into one of the USB ports
4. Through a transfer of data from a PC using a Memory Stick plugged into one of the USB ports. See *Data Transfer* [Page 82](#)

Tab Key: The alphanumeric keypad has a TAB key (red circled bottom left) which is used to move from one data field to the next.

After data for a field is entered, press the TAB key and the system will store the data and advance to the next field for further entry.

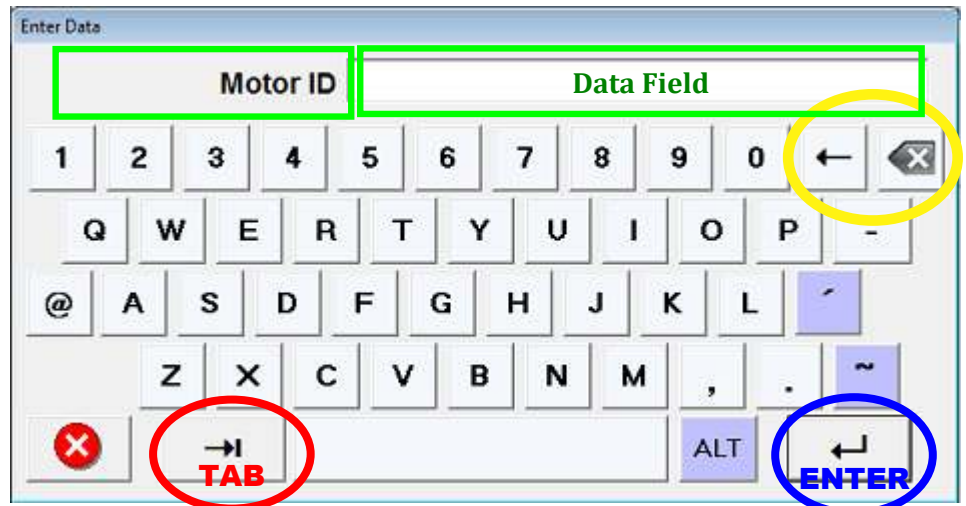
Backspace: The yellow circled keys on the top right are the backspace key and clear key, and the one on the bottom right is the return or enter key.

Data Field Name: The keypad displays the name next to the entry box (green box).

International Characters: The 3 keys with a blue-gray background are for typing international characters. The accent and tilde keys are “dead keys”. They cause the next key to be accented or tilded.

The ALT key presents a set of alternate characters that can be entered.

Alphanumeric Keypad



The numeric keypad comes up when only numbers are to be entered.

Numeric Keypad



SYSTEM DATE/TIME AND INFORMATION SCREEN

Importance of Correct Date/Time

Decimal Point vs. Comma

Information Screen

Model A does not store data, and therefore no date/time settings are necessary.

Model B, C & D: Before doing any tests, check that the **System Year, Date and Time** are correct, and also if they are configured correctly for your country. Access the Information screen with the Info (i) button on the main motor selection screen, bottom right corner. See pictures below.

IMPORTANT: If the date and time is set incorrectly, data may seem to be missing when the problem is an incorrect System date/time. The System date/time can be changed on the Information screen below **or** in Windows.

Date/time in the iTIG II can be configured for the country of use, for example to be DD: MM: YYYY (or YYYY:MM:DD) instead of the US standard of MM: DD : YYYY and a 24 Hr clock instead of 12 Hr. This must be done in Windows:

Go to the Motor Selection screen and click the X box in the top right corner. Go to Windows Control Panel or double click the Date/Time in the lower right corner. Click Change Date and Time settings and Calendar Settings settings and select your preferences.

The numbers displayed on the machine use only the U.S. format (decimal point instead of comma.) Thousands separators are not used.

The Information screen states what model the iTIG II is and which software revision level is running among other things. Click the “Info” tab or button on the bottom of the screen to open the screen.



Model A: The following Information screen will come up:

In the example the iTIG II is a Model A and has a maximum output of 12 kV.

The software version is v3.3.0

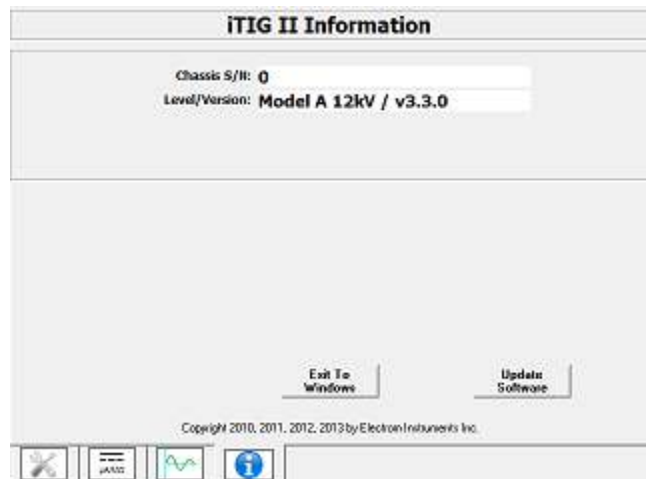
To update software to a higher version number use the “Update Software” button.

To upgrade an A model to a higher level model use the same button.

See [Page 81](#) for updates and upgrades.

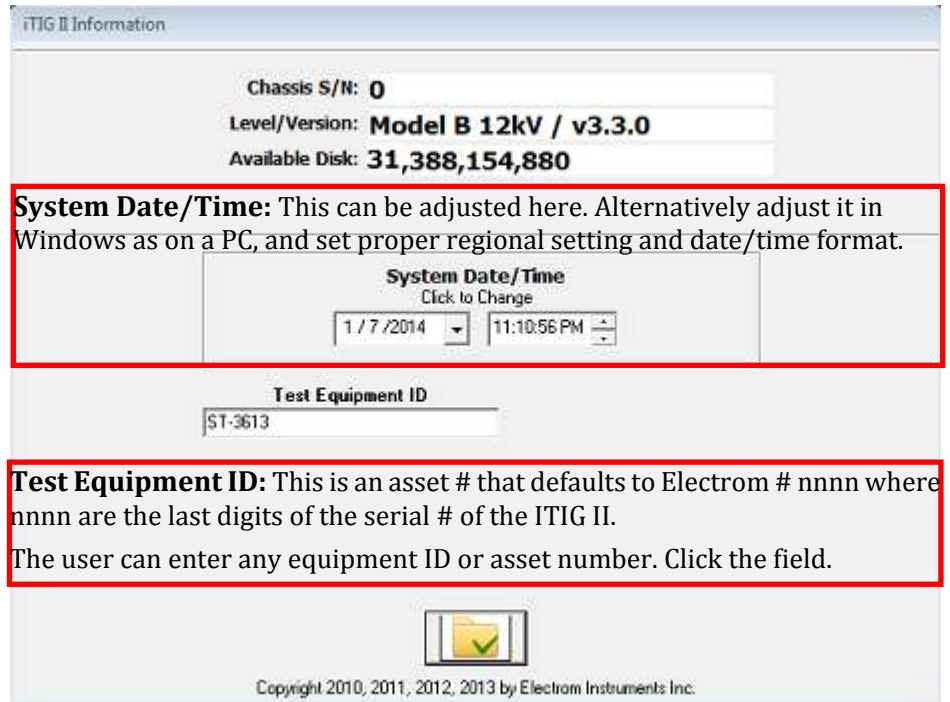
Click one of the other tabs to exit the Information screen.

To close the iTIG II software and go to the Windows screen, click the “Exit to Windows” button. To return to the iTIG II screens double click the iTIG II icon on the Windows screen or do a power cycle with the power switch in the back.



Model B, C and D: The iTIG II disc is a Solid State Drive with about 30 GB of storage or more. The available disc space is listed (31.4 GB in the pix below)

*Model B & C
Info screen*



System Date/Time: This can be adjusted here. Alternatively adjust it in Windows as on a PC, and set proper regional setting and date/time format.

Test Equipment ID: This is an asset # that defaults to Electrom # nnnn where nnnn are the last digits of the serial # of the iTIG II. The user can enter any equipment ID or asset number. Click the field.

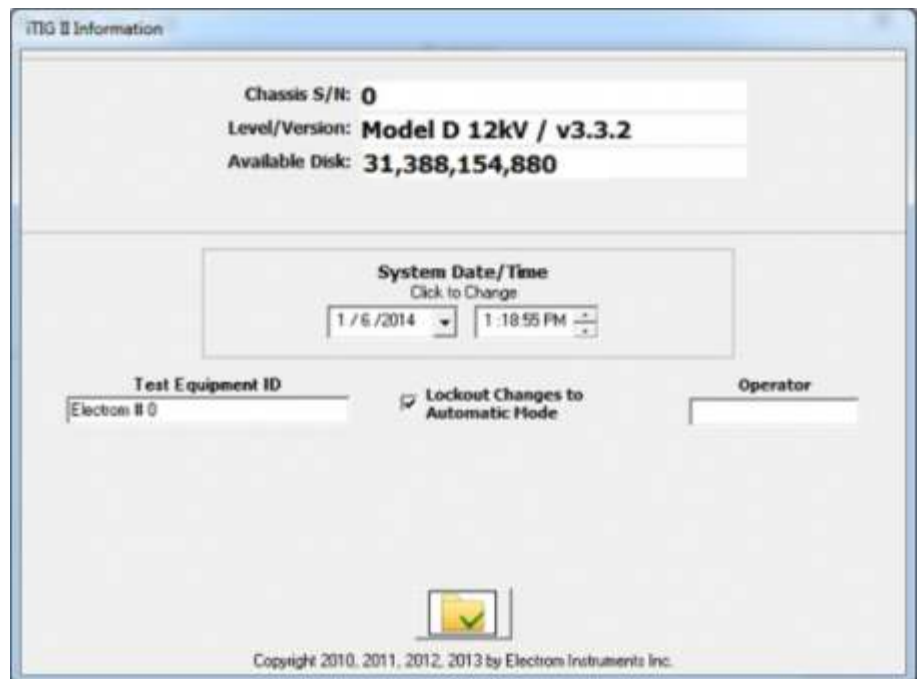
Models C & D: The Test Equipment # is automatically entered on the iTIG II “Test Summary” screen (see [Page 26](#)) and in the Test Description table in reports. It can be automatically entered on the Cover page of the test reports.

Model D:

Auto Mode Change Lockout: Tick the “Lockout Changes to Automatic Mode” box to prevent Auto Mode setup parameters, the Test Volts formula and the Overcurrent tripout level from being accidentally changed.

Operator: If a name is entered here, it is automatically inserted on the Test Summary screen.

*Model D
Info screen*



CHAPTER 3 Prepare for a Test

NOTE: Motors, generators, transformers, windings, coils and cables can be tested with the iTIG II. They are all referred to as “motors” in this manual.

After turning the iTIG II on with the switch in the back of the unit, Windows XPe opens followed by the iTIG II software. Click the “Start” button.

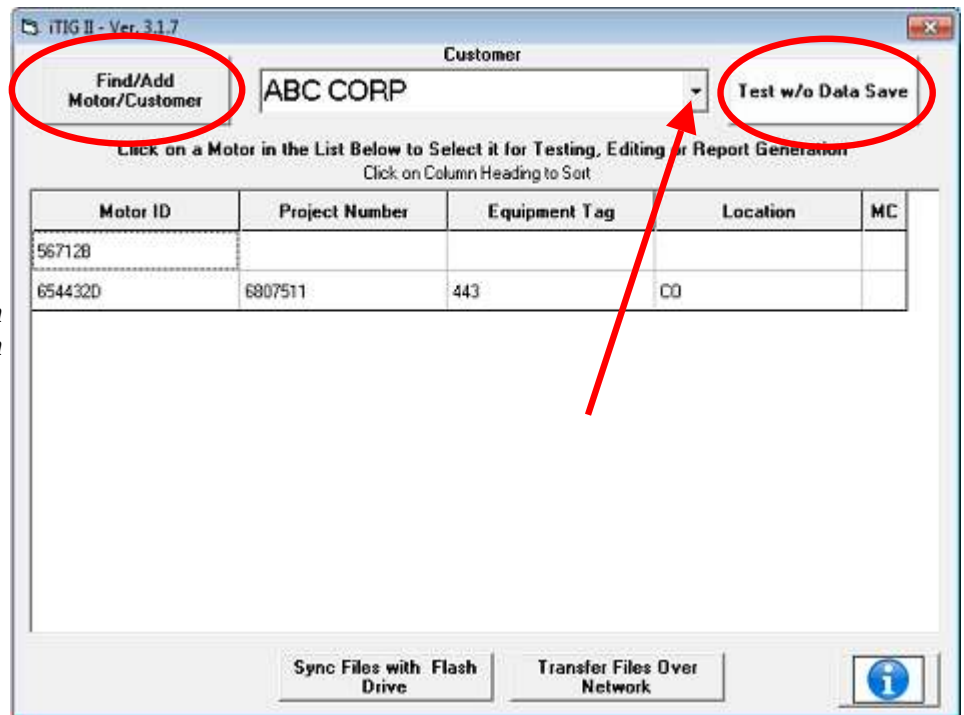
MODEL A

Model A: Does not store tests. The Setup Screen is the first screen after the start screen for the A Model. **Go to “Setup Screen” on [Page28](#).**

MODEL B, C & D MOTOR SELECTION SCREEN

Model B, D and D: On the Start screen, click “Start” and the “Motor Selection Screen”, opens.

Motor Selection Screen



If no Test Data Needs to Be Stored

If no test data needs to be stored, click the “Test w/o Data Save” button top right. Proceed with the Setup screen, [Page28](#), which automatically appears.

STORE TEST DATA, EDIT AND REPORT

Select a different Customer: Click the pull down menu on the right side of the Customer field, scroll down if necessary and click on the desired customer. The customers will be in alphabetical order after the iTIG II is turned on or power recycled. New entries will be added at the bottom of the list.

Note: with version 4.x.y software click in the Customers field and start entering letters on the keyboard that comes up

Tip: If an external keyboard is connected, click in the customer name field, the first letter of the customer name and click the pull down menu.

Add a motor or customer: Click on “Find/Add Motor/Customer” button.

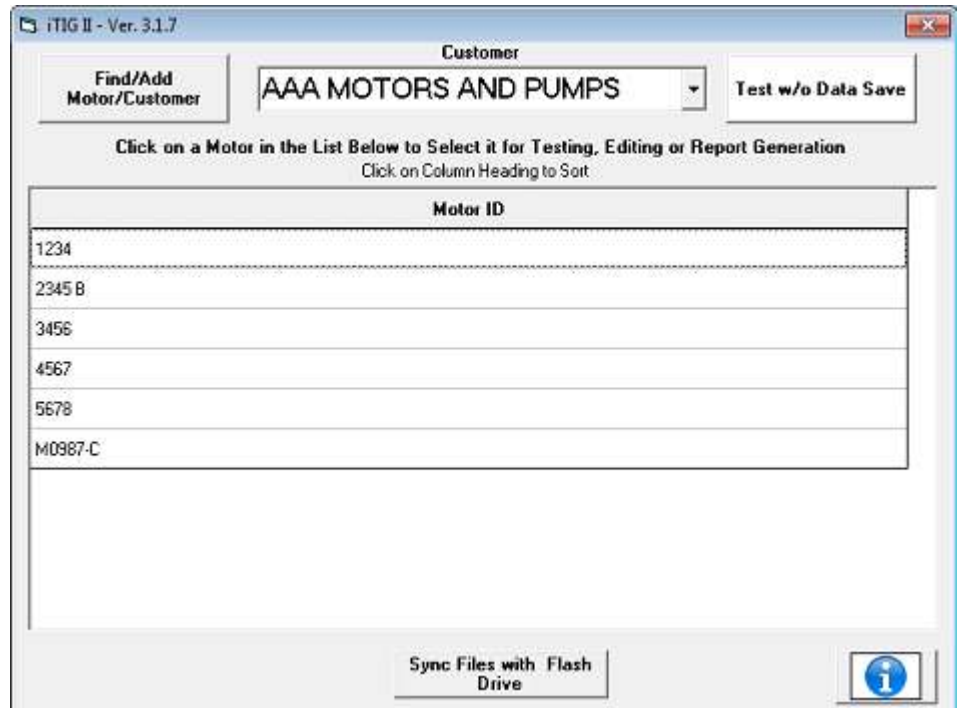
To do a test, edit information, or to make a report for any of the motors displayed: Click on the motor ID in the list.

Transfer Data: The button(s) on the bottom of the screen is used for transferring data so data can be backed up, and reports created and printed on a PC. See [Data Transfer Page82](#).

Model B

Model B records an ID Number for each motor. This can instead be a Job # or Work Order # or Project #. The report created by TRPro will label it as "ID/Job #".

Motor Selection Screen, Model B



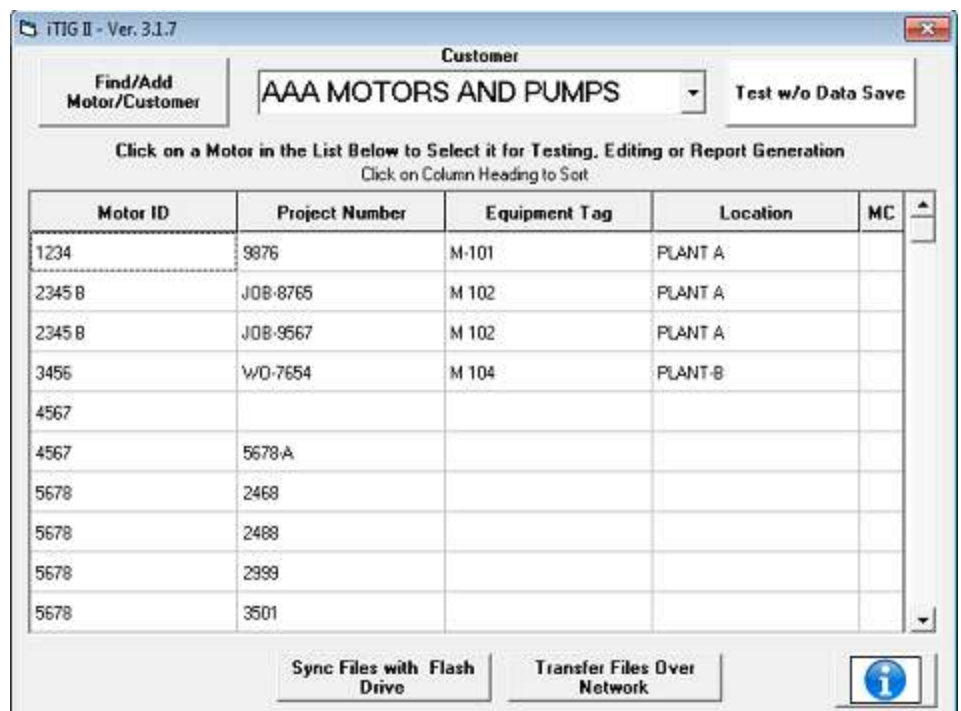
Model C & D

Model C&D: An ID Number will be listed as many times as there are Project numbers. See ID# 5678 below. The Project numbers will be sorted when the iTIG II is started up, not necessarily after new Projects are entered.

MC Column: Any test can be selected as a Master Coil. See [Page65](#)

Sort: Click on column heading to sort, click again to sort in reverse order. Columns are sorted chronologically and then alphabetically after power up.

Motor Selection Screen, Model C&D



DATA STRUCTURE

Motor and test data are organized hierarchically as follows:

- Customer Name (includes an information block for each customer for C&D Models)
 - Motor Serial or ID# (with an information block for each motor for C&D Models)
 - Test Files and Projects. Each motor can have multiple project/job #'s.
The project #'s must be unique across all motors & customers."
Project #'s can contain only alphanumeric symbols or hyphens.

“Customers” is a directory holding all information and test data in the hierarchy above. Each directory can virtually have an unlimited number of entries and files.

The structure by model is as follows:

Model B: Customers\“Name of Customer”\“ID #”\“Test Files”

The ID # can be a Serial #, Model #, Job #, Work Order #, etc..

Model C & D: Customers\“Name of Customer”\“ID #”\“Test Files” and “Project #s”

C&D Example: Customers\ABC CORP\M12345-LS5\Test Files & project numbers.

NOTE C & D: Motor ID can be a Serial #, it **cannot** be a Project, Job or WO number.

Model D: The ID # is used to group tests when reports are to be compared over time. Also, with the D Model, multiple tests taken at different times such as PI and Step Voltage tests can be combined in one graph.

C & D Project Numbers: Can be JOB numbers, WORK ORDER numbers etc..

Test Sets Printed in a Report: The various tests (Meg, Hipot, Surge etc.) are aggregated into a test set based on the system date/time when test mode was entered.

Test mode is entered when an ID # or Project # is clicked or selected on Screen 1 - the Motor Selection screen, and a date/time stamp is stored.

New Date/Time: When the user goes back to Screen 1 - Motor Selection, and then re-enters test mode, a new date/time is set. This is also true when the same motor and Project is re-selected.

When Is Data Saved?

When is data saved? All individual tests are written to the SSD immediately upon the termination of the test, not upon exit from test mode. This means no intermediate results can be lost due to a system or power failure.

IMPORTANT: If a test is redone, a warning appears. If you click YES the previous test is over-written.

To save multiple consecutive tests of the same type for the same motor, exit test mode and click the “Test” button on the Motor Information screen to do another test.

D Model: Do multiple tests of coils without exiting by using the NEXT COIL button.

SEARCH FOR A MOTOR, PROJECT, TAG # OR LOCATION, MODEL C & D

Model B:
[Go to Page 24](#)

There are two methods to search for or find motors.

- Use the Motor Selection screen covered here,
- Use the “Find Motor” button covered in the next section. With “Find Motor” one can search for specific ID#s or Project Numbers.

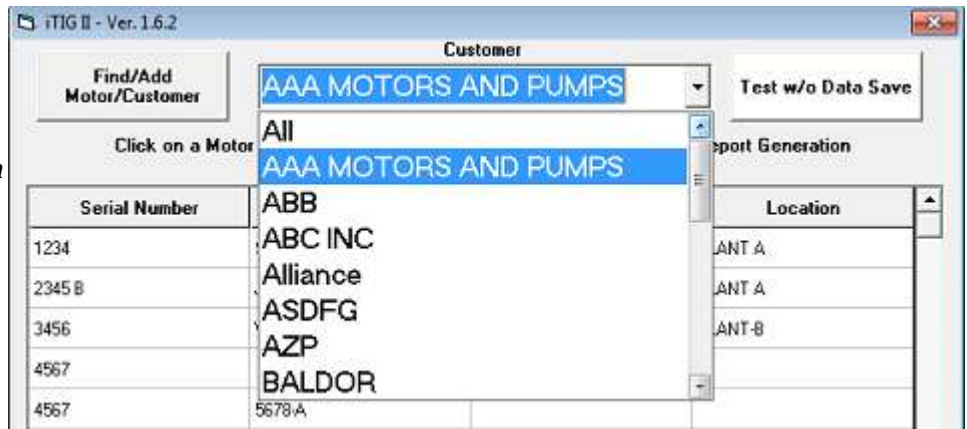
By Customer: On the “Motor Selection Screen” click the Customer pull down menu and select the customer name. Click on the column header you want to sort and scroll down until you find the motor.

Click header again to sort from last to first.

For All Customers: If the customer is unknown or you want to search based on the column headers only regardless of who the customer is:

1. Click on the Customer pull down menu. The first customer will be shown on top of the list.
2. Move the slider up and “All” will appear as shown in the picture below.
3. Click “All” and every ID# and Project number will be listed for all customers.
4. Click the column header to be sorted and scroll down the list until the ID# is found, or for Model C & D the Project #, Tag # or motor Location .

Motor Selection Screen

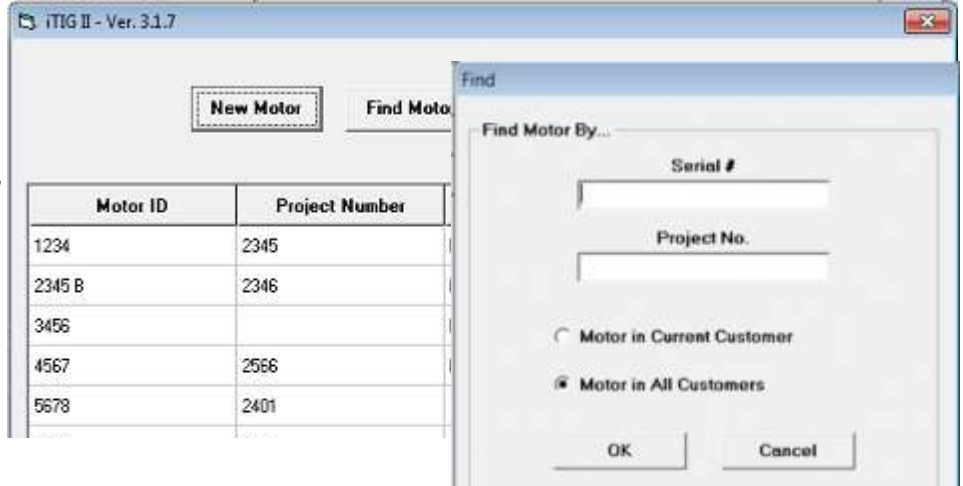


FIND OR ADD A MOTOR OR CUSTOMER

After clicking on the “Find/Add Motor or Customer” button the Screen below appears (the table only has ID#s for the Model B).

“**Find Motor**”: To find any motor or project for any customer, click the “Find Motor” button, click one of the two fields on the “Find” screen and enter info.

Find or Add a Motor or Customer Screen



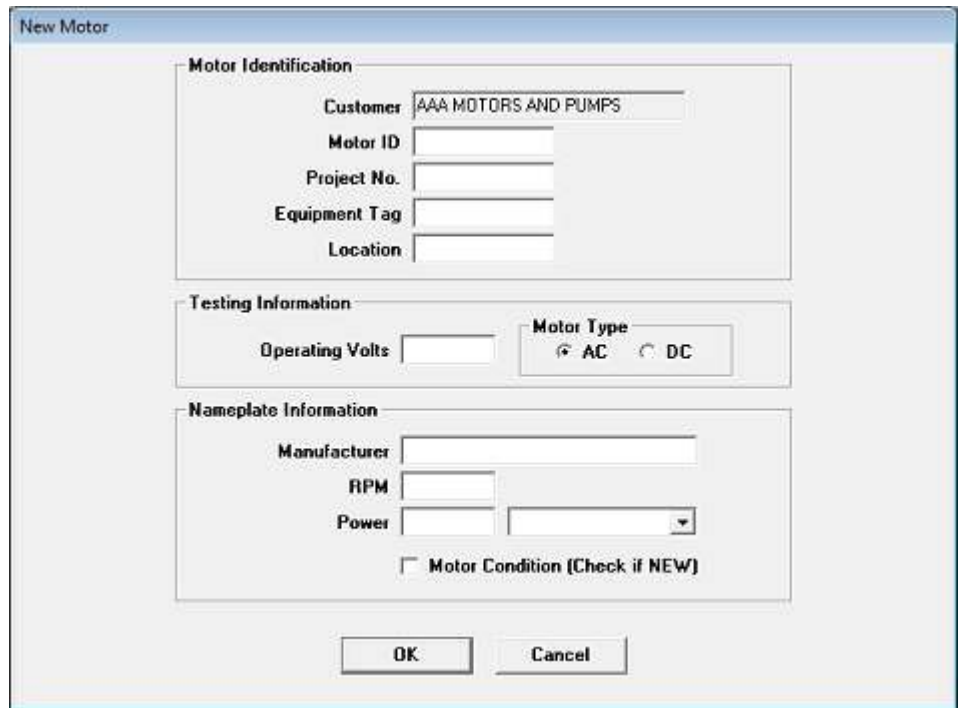
Add a Motor and Enter Specs

Add motor: Click the “New Motor” button and get the next screen:

Model B: On the screen that appears click the ID # field and enter S/N or Job# etc.. Then enter the motor’s Operating Volts. If a DC motor , click DC. See next page for more info on Operating Volts and AC/DC.

Model C & D: The screen below comes up

New Motor Screen



Some of the fields **MUST** be entered. See next page.

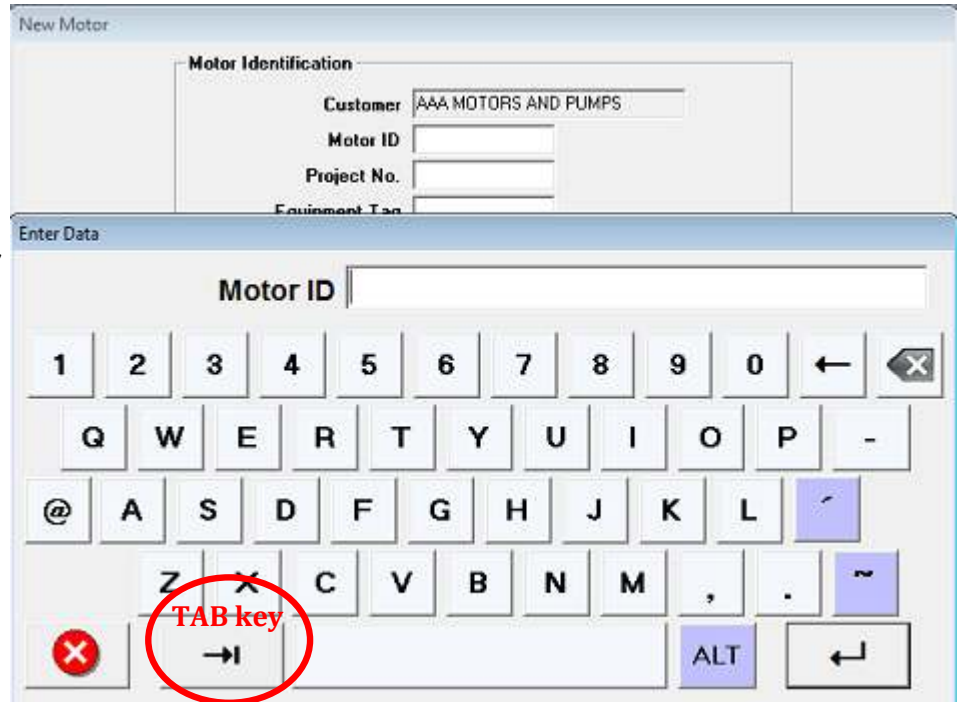
TIP: All other information is optional and can be added later in the iTIG II or in the report program on a PC.

Enter New Motor Data

By clicking in any of the fields, the keyboard below comes up.

TIP: This is true for any data field on any screen where information can be entered.

New Motor Data Entry Screen



Required Motor Information

1. **Serial # or ID number.** Enter and click the “Tab (Forward)” key to the right of the red X button to go to:
2. **Project Number** is required if a Project, Job or Work Order # is to be used,
NOTE: Project numbers must be entered in this field, never in other fields. Click the Tab or “Forward” key to go to the next field or keep clicking it until the next required field:
3. **Operating Volts. For AC motors** this is required for reports and calculation of recommended test voltage also called Design Test Voltage. Click “Tab” to enter more info or click the “Enter/Return” key in the lower right hand corner to make the last required selection.
4. **AC or DC:** In the middle of the New Motor screen select AC or DC motor. The default is AC. The screens and reports for AC and DC motors are different so this selection is important when testing DC motors.

NOTE: When “Power” is entered (such as 150 or 1500) and the “Forward” key is clicked, the keyboard disappears. The type of power units MUST now be selected on the drop down menu next to the “Power”. Units available are HP, kW and kVA. With an external keyboard, type the first letter(s) in the field.

Used or New Motor, AC or DC Motor Selections

Used or New Motor AC Motors: On the New Motor screen there is a selection for the Motor Condition at the bottom of the screen. If the condition of the motor is new and unused, click the box and the formula calculating the recommended test voltage will be multiplied by 1.7 (See setup screen).

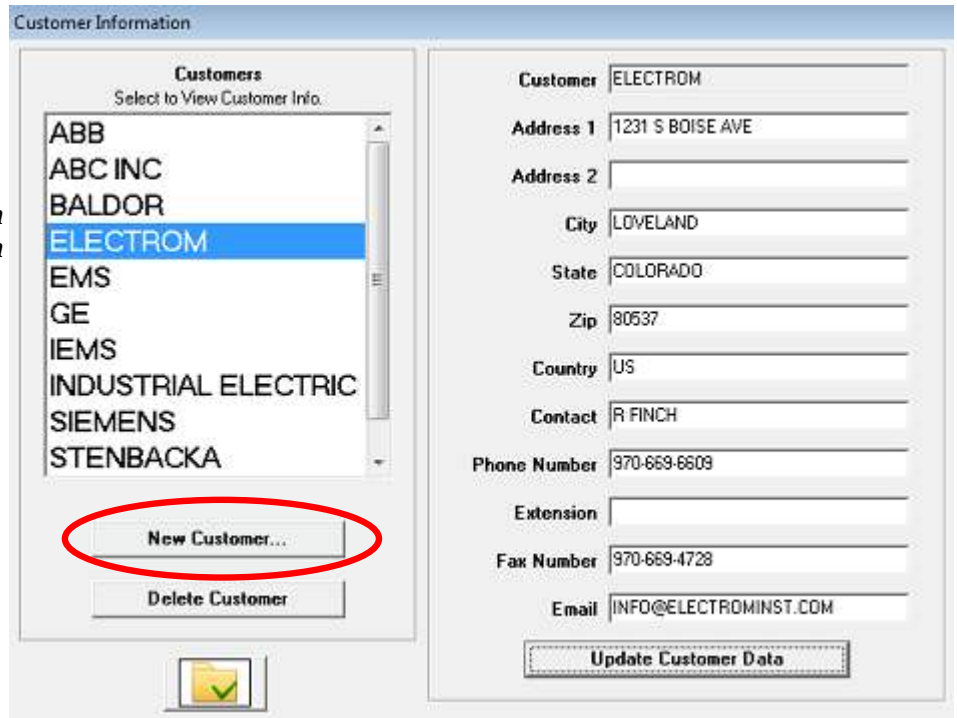
When finished with the data entry, click “OK” to save the information and return to Screen 1 where the motor can be selected to start a test.

Add a New Customer

To add a new customer click the “Customer” button on the “Find or Add a Motor or Customer” Screen. The screen below will appear for C & D Models.

For Model B it is similar without the contact information fields.

*Customer Information
Screen*



The screenshot shows a software interface titled "Customer Information". On the left, there is a list of customer names under the heading "Customers" with the instruction "Select to View Customer Info.". The list includes: ABB, ABC INC, BALDOR, ELECTROM (highlighted in blue), EMS, GE, IEMS, INDUSTRIAL ELECTRIC, SIEMENS, and STENBACKA. Below the list are two buttons: "New Customer..." (circled in red) and "Delete Customer". At the bottom of the list area is a folder icon with a green checkmark. On the right side, there is a form for entering contact information for the selected customer, "ELECTROM". The fields are: Address 1 (1231 S BOISE AVE), Address 2 (empty), City (LOVELAND), State (COLORADO), Zip (80537), Country (US), Contact (R FINCH), Phone Number (970-669-6609), Extension (empty), Fax Number (970-669-4728), and Email (INFO@ELECTROMINST.COM). An "Update Customer Data" button is located at the bottom of the form.

Click the “New Customer” button to add a customer name.

Click any of the fields on the right side of the screen to enter contact information. This information is not included in reports. It is only for ease of accessing the information.

All customer contact information is optional. Use the “TAB” key on the keyboard to move through the fields.

Contact Information can be added later or when reports are created on a PC.

To add Motor Information:

1. Click the Exit button (folder) to return to the Motor Selection screen.
2. Click “Find or Add a Motor or Customer”.
3. Click “New Motor” and enter information.

CHAPTER 4 Test Setup

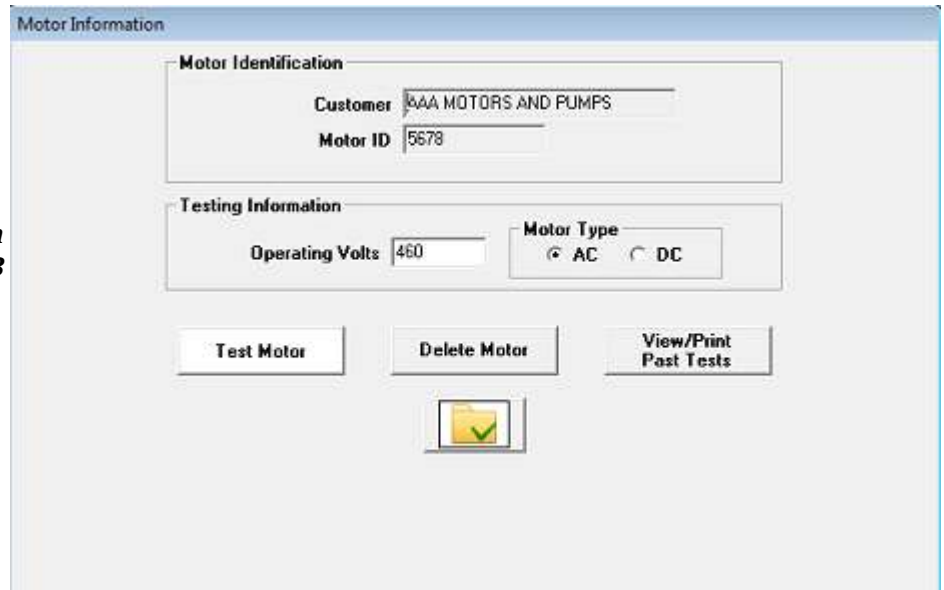
MOTOR INFORMATION MODEL B

Model A: Go to SETUP screen [Page28](#). **Model C & D:** Go to the next page.

Model B: To do a test and automatically store the test data, go to Screen 1 - Motor Selection, select the customer and click on the ID # you want to test.

The screen below comes up.

*Motor Information Screen
Model B*



Return to:
DC Motor Test [Page 69](#).

Check accuracy of information on the motor to be tested.

Testing information and Motor Type can be changed or added by clicking in the field.

Customer name and motor ID# cannot be changed without deleting and re-entering the info in question. It can be changed in Windows. Contact Electrom for information.

NOTE: If you click "Delete Motor", all data contained in that ID# directory will be lost. If useful data exists consider adding a new ID# instead of deleting.

View and Print Past Tests button and reports are covered in the "View Previous Test & Set Pass/Fail Condition" chapter [Page56](#).

Test Motor: Click the button to go to the Setup screen.

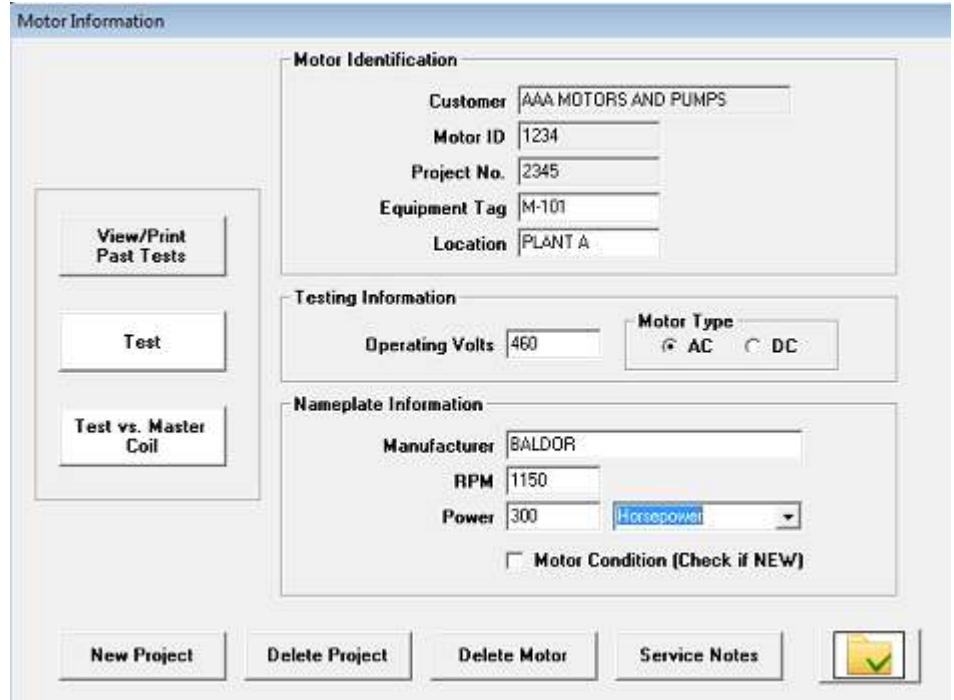
Next step: Go to the Setup screen [Page28](#).

MOTOR INFORMATION MODEL C & D

To do a test and automatically store the test data, go to the Motor Selection Screen, select the customer and click on the ID # or Project # you want to test (or anywhere in the ID# row). The screen below comes up.

Check accuracy of information on the motor to be tested.

*Motor Information Screen
Model C & D*



The screenshot shows the 'Motor Information' window with the following sections:

- Motor Identification:** Customer (AAA MOTORS AND PUMPS), Motor ID (1234), Project No. (2345), Equipment Tag (M-101), Location (PLANT A).
- Testing Information:** Operating Volts (460), Motor Type (radio buttons for AC and DC).
- Nameplate Information:** Manufacturer (BALDOR), RPM (1150), Power (300), a dropdown menu for 'Horsepower', and a checkbox for 'Motor Condition (Check if NEW)'.

On the left side of the window, there are three buttons: 'View/Print Past Tests', 'Test', and 'Test vs. Master Coil'. At the bottom, there are buttons for 'New Project', 'Delete Project', 'Delete Motor', 'Service Notes', and a green checkmark icon.

Return to:
Multi Coil Bar Graph
[Page 68](#)
DC Motor Test [Page 69.](#)
Form Coil Test [Page 46](#)

Motor information can be changed or added by clicking in a field. If motor information is changed, it is changed for all Project #s under that ID#.

Customer name and motor ID# cannot be changed without deleting and re-entering the info in question. Project No: **See "New Project"** below.

Motor Info Screen Buttons

NOTE: If you click "Delete Motor", all data contained in that ID# directory will be lost. If useful data exists consider adding a new ID# instead of deleting.

View /Print Past Tests and reports are covered in the "View Previous Test & Set Pass/Fail Condition" chapter. See [Page57.](#)

Test Buttons

Test: Click the button to do a test. The Test Summary screen comes up where test related info is entered.

Test vs. Master Coil: This function is used when testing a series of identical coils or windings such as form coils. See [{Ref}](#)

New Project/Job Button

New Project: To test a motor that has been tested before click a previous Project No on Screen 1-Motor Selection. Then click the "New Project" button on this screen. Enter the Project/Job # and click enter/return.

Service Notes Button

Service Notes can be entered before and after a test. Click the button. A PC keyboard or remote radio or Bluetooth keyboard must be used.

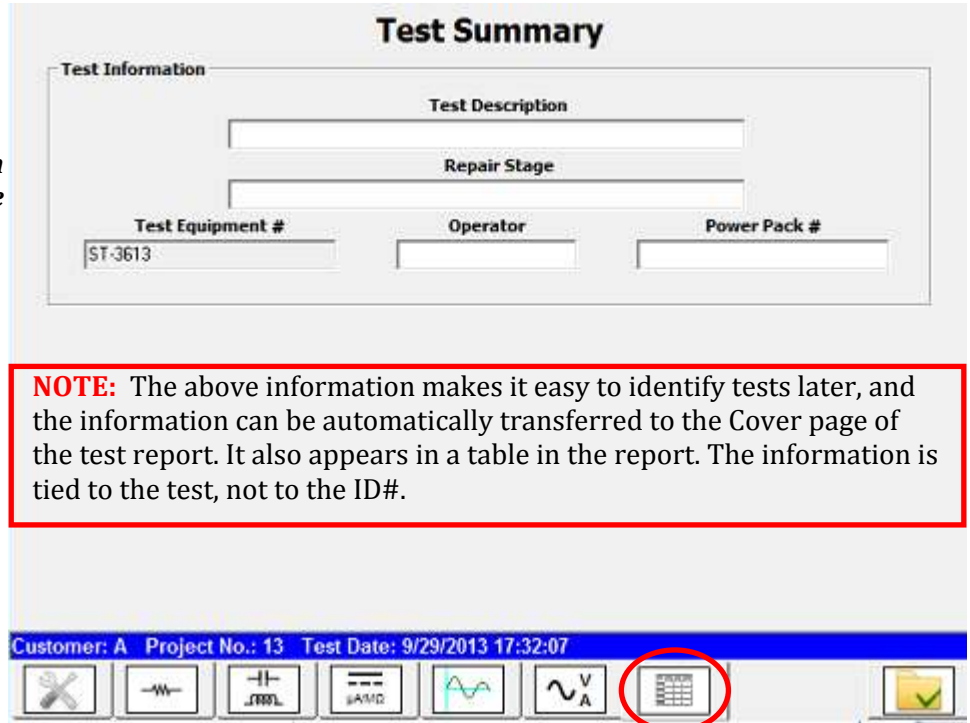
NOTE: The notes are not part of any reports generated by the iTIG II or TRPro report software. The notes can be printed separately and added to a report by the user.

Add Test Information and Test Description for Model C & D

Model C & D: When the “Test” button is clicked on the Motor Information screen, the Test Summary screen below comes up.

The information entered is specific to the test about to be done and only stored for that test.

*Test Summary Screen
- No Tests Done*



NOTE: The above information makes it easy to identify tests later, and the information can be automatically transferred to the Cover page of the test report. It also appears in a table in the report. The information is tied to the test, not to the ID#.

Return to:
Information screen
[Page 15](#)
Set Pass/Fail [Page 53](#)
to [Page 55](#).

Test Description: Enter information such as Stator, Assembled Motor, Rotor Coil or anything that helps identify **what** is being tested.

Repair Stage: Enter the condition the motor is in or reason for test such as Maintenance etc., etc., Field Test, Spare before installation, Incoming or Initial test, After cleaning, Pre dip and bake, Final test, etc.

Operator: Enter test operator name or initials.

Power Pack #: If a Power Pack is being used, enter the asset or ID#.

NOTE: The tester remembers the last 30 entries for each field and will auto fill the field when the first one or several letters are entered.

Test Equipment #: This is the asset number for the tester. The default number is “Electrom + last digits of the S/N”. Change the number by clicking the Info button on the main Motor Selection Screen, and enter your number under “Test Equipment ID”. See or return to [Page 15](#).

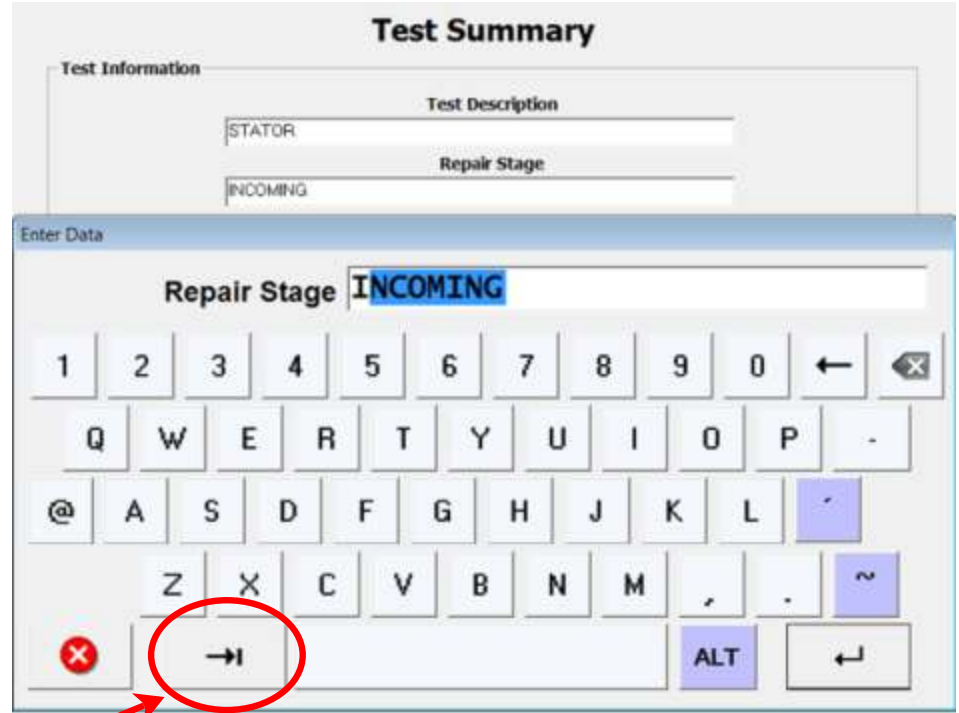


Access: The Test Summary screen can be accessed at any time by clicking the Tab circled in the picture above.

When Info Can Be Entered: The information can be entered before, during or after a test is done. During: click the Test Summary Tab. After: Click “View Past Tests”, select the test, click “Display Test” and enter new data in the Test Summary.

Any time during testing, click on the Test Summary tab to see the progress, and maybe to see where you are in the test sequence after a break.

Information entered before will auto populate the field as in the picture below. The letter "I" was typed and "INCOMING" pops up. If this is what you want click the "Next Field" or TAB button circled and the Operator field pops up.



TAB: If you do not want to enter anything in a field or move to the next field, click the TAB button.

Next Step: When information entry is finished, click on the SETUP tab to review the setup or to start an Auto Test sequence with a Model D.

Alternatively click on any test tab at the bottom of the screen to start any individual test. The normal sequence of tests is from left to right.

Tabs at the Bottom of Screens



- Exit button
- Test Summary
- On-line tests
- Surge tests
- Meg and Hipot tests
- CLZ measurements
- Low resistance
- Setup

Tests available vary with model and options.

Only available test and information tabs will show.

**SETUP SCREEN
ALL MODELS - AC**

For DC motor setup screen go to [Page 70](#)

Recommended Test Voltage or Design Test Volts

Model A: Setup is the first screen that comes up with A models after the start screen. Model A does not have an AC/DC selection and no winding Temperature. Both AC and DC motors can be tested.

Model B: After clicking on the “Test” button on the Motor Information screen, the following AC motor setup screen comes up.

All Models: The formula determines what voltage the motor is tested to in Hipot and Surge. Hipot voltage is increased manually for A and B models. **Surge tests are automatic for all models,**

Return to:

Prepare for Test, click [Page 17](#).

Test Setup Mod B [Page 24](#).

Failure Limits [Page 33](#).

Perform Hipot and Step Voltage Test [Page 43](#).

Surge Test [Page 46](#).

Pass/Fail Model B [Page 56](#).

DC test Setup [Page 70](#).

Click in any field and a keyboard comes up so other values can be entered.

Enter Any Test Volts Number Directly

Test Volts Field: You can click in the Test Volts field in the formula to override the formula and enter any number.

NOTE: The background color of the field turns gray when the Test Volts does not match the formula as shown below.

Leakage Current Limit

Current limit or Overcurrent Tripout Level for leakage current in Megohm and Hipot tests are set on this screen in micro A (µA). The default from the factory is 1 mA (1000 µA).

AC/DC Motor Type (B-D models) is an indicator. To change the type click the Exit button (folder) and change the type on the Motor Information screen. If tests have already been stored, all tests for that ID# will change type if AC/DC is changed.

NOTE: If testing in NO DATA SAVE mode, change the AC/DC type any time.

Winding Temperature B to D Models

**Model A: Go to
Page 33**

Winding Temperature needs to be entered if data is to be compared to data taken in the future when ambient and winding temperatures are different. Winding Resistance and Megohm measurements are recalculated to a standard temperature used by international standards.

The measurements are standardized to the following fixed temperatures:

- Winding Resistance: 20°C.
- Megohm measurement: 40°C.

Temperature Impact:

- The winding resistance increases with temperature
- The megohm resistance of the insulation to the frame (ground) decreases with temperature.

Therefore, if the current winding temperature is measured to 50°C, the standardized winding resistance will be a lower number (at 20°C), and the megohm insulation resistance will be higher (at 40°C) than what is actually measured at an actual temperature of 50°C.

ITIG II Default Temperature: 20°C.

How to Measure Winding Temperature: It can be measured with an infrared temperature gun pointed at the windings or at some accessible part of the equipment that will be closest to the winding temperature.

If a temperature measuring device is not available, ambient temperature may be a crude approximation. If the motor has just been powered down, if it is exposed directly to the sun or inclement weather conditions, or if the motor has recently been baked, the winding temperature can be very different from the ambient temperature.

Power Pack

Power Pack: Click this button if a Power Pack is connected to the iTIG II and the Power Pack is used for the test. This will disconnect the high voltage section and output leads of the iTIG II. Information displayed on the screen will come from the Power Pack (PP).

After clicking the PP button the Zero Volts Lockout checkboxes appears.

Zero Volts Lockout (energize lock): Prevents the PP from energizing without returning the Output Voltage Knob on the PP to zero.

CAUTION: By un-checking this box the PP energizes at whatever voltage the PP is set at in Hipot and Surge.

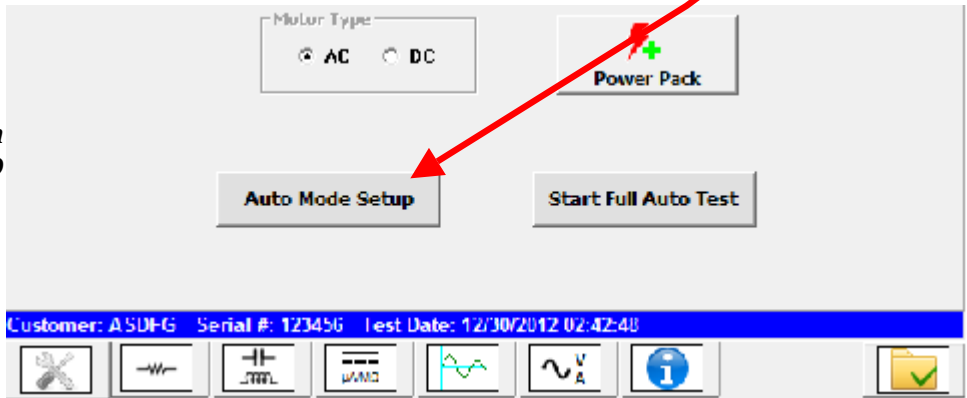
See the separate Power Pack Manual for instructions.

**Model B and C:
Go to Page 24**

ADDITIONAL MODEL D SETUP FEATURES

Model D can be operated in fully automatic mode for AC motors. This may require additional setup. On the Setup screen click "Auto Mode Setup".

*Setup Screen
Model D*



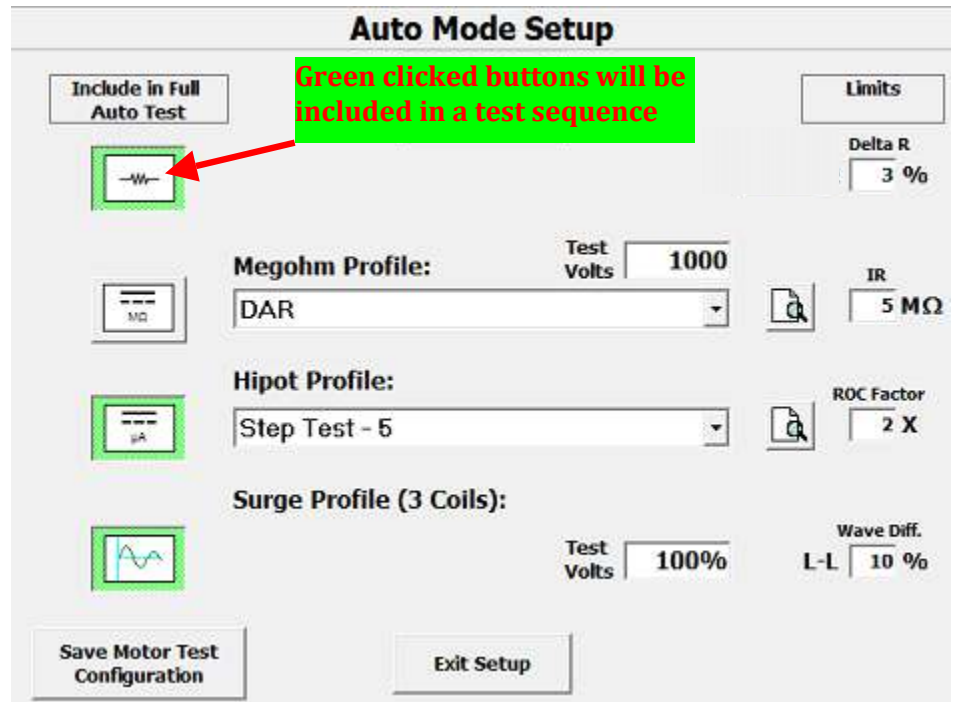
The screen below comes up.

NOTE: All tests including low resistance are done through the same 7 leads, all lead switching is done automatically by the iTIG II D.

Select Tests to Include in Auto Test Sequence

1. Select the tests to be included in the auto test sequence. If pressed (green) the test will be included. In the example below the megohm test will not be included. Low Resistance, Hipot and Surge will.
2. Check that the correct test profiles are selected. If not change the profile. See next pages.
3. Check that the failure limits for each test are appropriate. If a limit is exceeded the test sequence will be aborted automatically. Click in the box to change the limit.

*Auto Mode Setup Screen
Model D*



Return to:
[Auto Failure Limits
Page 34](#)
[Automatic Megohm Test
Page 41](#)
[Step Voltage Auto Mode:
Model C Page 44](#)
[Model D Page 45](#)

Once everything is set, click "Exit Setup" to use the settings for this test only. If the settings were changed, the iTIG II will go back to the default settings for the following test. See "Default Setup" on the next page.

Default Setup

System Default Settings: This is the set of settings on the Auto Mode Setup screen that first comes up both after a new ID# has been entered and when a test is done in “No Data Save Mode”. This mode is entered after clicking the “Test w/o Data Save” button on the Motor Selection screen.

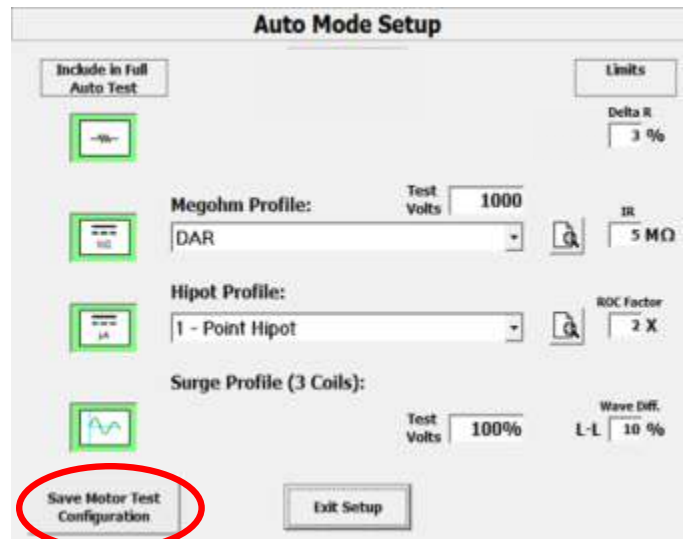


Set System Default: Click the “Test without Data Save” button on the Motor Selection screen. Proceed to the Auto Mode Setup screen, adjust the tests to be included, test profiles, Megohm Test Voltage, and failure limits as necessary. See next page. Then click the “Save Defaults” button. The “Save Motor Test Configuration” button on the Auto Mode Setup screen changes to “Save Defaults” in No Data Save Mode.

Test without Data Save Defaults: If this button is pressed on the Motor Selection screen no data will be stored. By clicking “Save Defaults” on the Auto Mode Setup screen the settings become the new System Default and will remain the default until changed and saved with the “Save Default” button again.

ID# Defaults: When data is to be saved an ID# is selected on the Motor Selection screen. When clicking Auto Mode Setup on the Setup screen (see previous page) the System Defaults will be on the Auto Mode Setup screen if no ID# defaults have been set previously.

To set ID# defaults adjust settings as necessary (see next page) and click the “Save Motor Test Configuration” button to save the settings for this ID#. Then click “Exit Setup” to proceed.

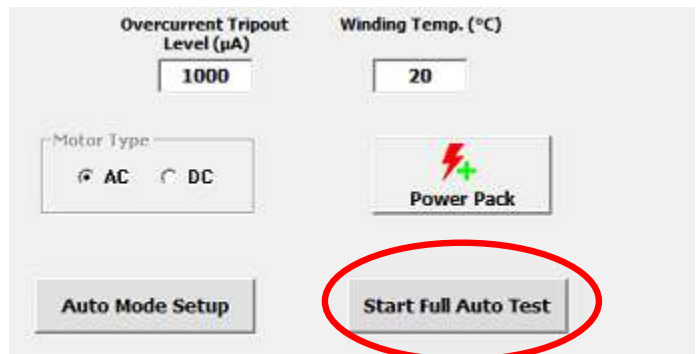


If the next test can use the same default settings you do not have to go to this screen during setup. However, it is good practice to check the settings.

The next time this ID# (motor or coil) is tested in the future, this test configuration setup will be used for the test.

Start test: Click “Start Full Auto Test” on the Setup screen and then the red Start/Stop button on the front panel. All tests selected above will be done automatically with no operator intervention.

To manually stop a test sequence, press the red Start/Stop button on the front panel.



Change Auto Test Profiles

To change profiles:

Megohm: Click in the Test Volts field (**burgundy box**) to change the voltage a megohm, DAR or PI test will go to.

The tester comes with pre-programmed profile options for Megohm and Hipot. Other profiles can be added by the users. See below.

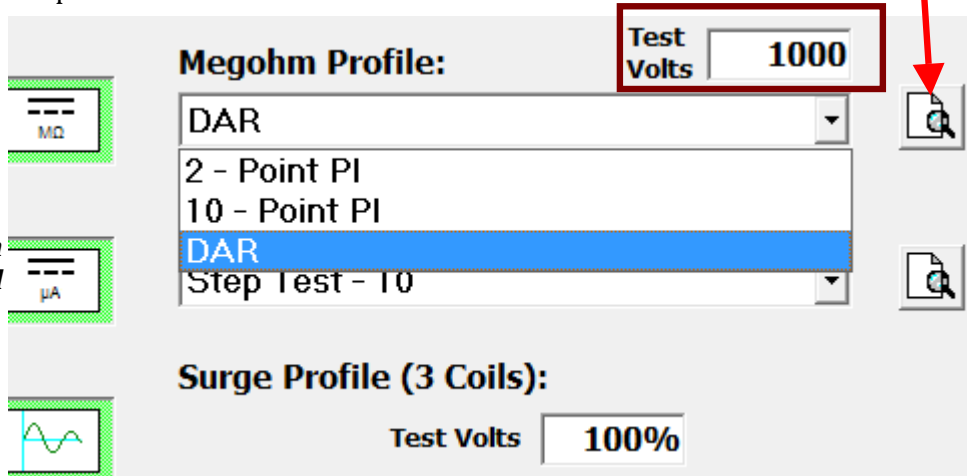
Choose a profile: Click the pull down menu to the right of the field. In the picture below the Megohm pull down menu has been clicked. Click on the profile you want, in the picture DAR, meg test with 30 and 60 sec data points.

Profiles are programmable: Test voltages, voltage ramp speed, the amount of time to hold each voltage, the number of steps and the times to record data can be programmed by the user. *Contact Electrom for instructions.*

View Auto Test Profile Details

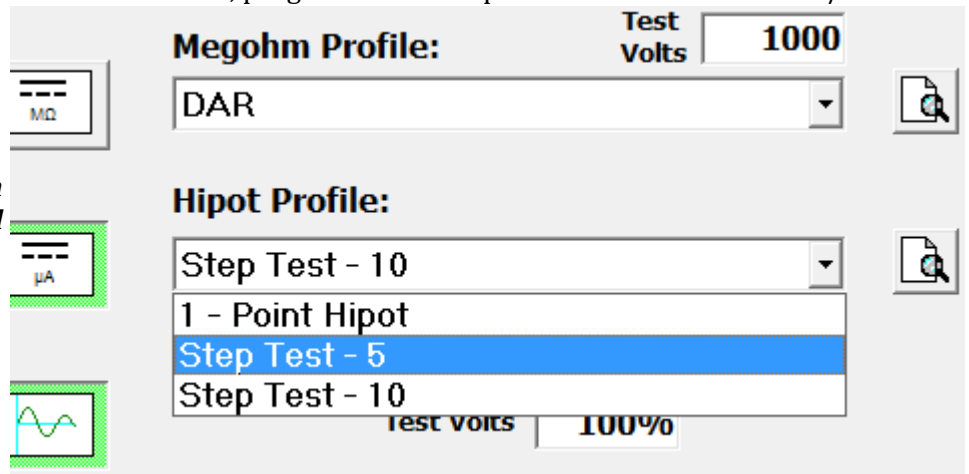
Profile Details: Click the button to the right of the field on the right side of the picture below.

Auto Mode Setup Screen
Megohm Auto Profile Detail



Hipot: This can be a one shot Hipot test or a Step Voltage Test. The end voltage for the test is determined by the Design Test Voltage formula on the main setup screen. The voltage ramp rate is programmable. If low inrush current is desired, program a low ramp rate. The default is 1000V/sec.

Auto Mode Setup Screen
Hipot Auto Profile Detail



Surge: The surge voltage is also determined by the Design Test Voltage (DTV) formula. One can modify this surge voltage two ways:

1. Set a % of the DTV in the Surge Test Volts field. For example 75%.
 2. Enter a number instead of a %. The number will be the test voltage.
- NOTE:** Never set a number as a System Default. This will cause under or over voltage tests of motors with different operating voltages.

CHAPTER 5 Failure Limits & Automatic Shut-off

FAILURE LIMITS, ALL MODELS

Failure limits for all tests must be established by the user both for manual and automatic models of the iTIG II. They are usually based on IEEE, EASA and other standards, as well as on company policies and experience.

Following is a table with the limits that are built into the iTIG II by model. These limits will cause the test to shut down if exceeded.

Failure Limits by Model	A	B	C	D	Tests Using the Limits
Over-current (Limit: μ A)	X	X	X	X	Meg/DAR/PI Hipot/Step Voltage
Arc to Ground Detection (fixed detection)	X	X	X	X	Meg/DAR/PI Hipot/Step Voltage
IR (Limit: megohms)			X	X	Meg/DAR/PI
ROC (Limit: factor)			X	X	Step Voltage
Delta R % (Limit: %)				X	Low Winding Resistance
% Wave Difference (Limit: %)				X	Surge

IMPORTANT: If a failure limit cannot be set in the iTIG II for automatic shut-off and recording of a fault, you must review the test results visually and determine if the test has passed or failed based on your company's policy or your own experience.

Failure Limits Types

Over-current Tripout Limit: The leakage current from the windings to ground is measured in all meg and hipot type tests. If the leakage current is higher than the limit, the test is automatically terminated (all models). Set the limit on the main Setup screen, [Page 28](#). The default is 1000 μ A (or 1 mA). This may be too high in some cases.

Arc Detection Tripout: If an arc to ground/frame during a Megohm or Hipot test is detected, the iTIG II terminates the test. There is no limit setting for this fault with any model.

Insulation Resistance (IR) Limit: The minimum Megohm value allowed during a Meg test (not checked during a Hipot test). Default = 5 megohms, a number used in some standards. It is too low for new and rebuilt motors, and can be too high for certain types of used equipment such as submersible pumps. For models that can set this limit (C&D) it is checked on sample point boundaries (i.e. after a measurement has settled.)

ROC Factor: Maximum Rate-Of-Change (ROC) or acceleration allowed for Hipot leakage current in a Step Voltage test. With C&D models it is checked for step tests of 3 or more points. It is NOT checked for leakage currents \leq 10 μ A. Default = 2x. See next page for more info.

Delta R %, Low Resistance Limit: The maximum % deviation from the average of the three measurements between leads for a 3 phase motor. Delta R is calculated after all 3 lead sets have been measured. Default = 2%.

Return to:

Step Voltage Test [Page 44](#).
View Previous Tests and Set Pass/Fail Conditions [Page 56](#)

Surge Wave Difference % Limit: The % WD is calculated by all models as the RMS difference between a given pair of surge waves divided by the mean RMS amplitude between the 2 waves.

For the D model, if any wave pair in a set exceeds a %WD limit, the limit error is flagged. Default = 10%. This % is too low for certain conditions. A gray area exists around 10% where operators must take all conditions into account and make a judgement about whether the result is a Pass or Fail.

DAR and PI Failure Limits: The iTIG II does not set limits for these tests. Good motors may have results that by the numbers alone might be considered bad. The result of modern insulation is low levels of polarization in the insulation, and leakage currents that settle in a very short time. This can make pass/fail determinations difficult. Use DAR and PI results as an additional piece of information to the other tests. Multipoint PI tests can be useful when compared over time.

ROC Factor; Additional Information: ROC is calculated as the ratio of the most recent sample (in μA) over the previous sample (in μA).

If the leakage current accelerates as the voltage increases, a tripout condition may be imminent (step 2-3 delta is higher than step 1-2 delta by some factor). The test is automatically terminated if the acceleration or Rate of Change exceeds the Limit Factor.

With the default setting of 2, the rate of leakage current increase would have to double before the test is terminated by the iTIG II, and the leakage current would have to be a minimum of 20 μA . Leakage numbers below 10 μA are ignored for ROC limit calculations. If the current goes above 10 μA in the next step, 10 μA is used as a plug for the previous step in the calculation.

Any number with up to two decimals can be entered as the ROC factor limit.

Return to:
Hipot and Step Voltage test [Page 44](#)

Auto Failure Limits model C

Model C: This model has automatic Meg/DAR/PI/Hipot and Step Voltage tests, and therefore has IR and ROC limits set by the user to automatically shut off a test (in addition to over-current tripout). The IR limit is set on the Meg/DAR/PI "Auto Mode" screen [Page 40](#), and the ROC limit is set on the Hipot "Auto Mode" screen [Page 44](#).

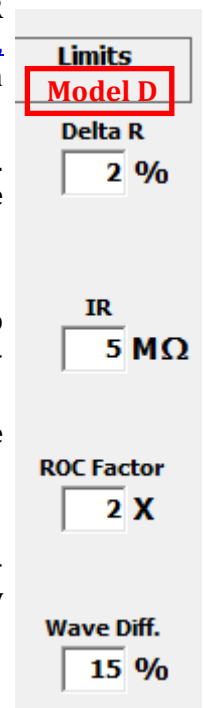
Delta R and Wave Difference, %WD, have no failure limits. Failures must be noted visually and the condition set on the Test Summary screen manually.

Auto failure Limits Model D

Model D: The Limits picture is a section of the Model D Auto Mode Setup screen. See [Page 30](#). In addition it has an over-current tripout limit set on the main Setup screen.

If any limit is exceeded in an Auto Mode test sequence, the test sequence will be terminated.

Any model: When failure limits set in the iTIG II are exceeded, the iTIG II will display a failure message with yellow background at the bottom of the screen.





FAILURE MESSAGES DISPLAYED BY THE ITIG II

Following is a list of Test Failure Messages displayed by the iTIG:

- **“IR Fail”**: Either an Arc Detection, Over-current limit or IR limit exceeded. This failure is latched for the test run and can only be changed manually on the Test Summary screen. This is a serious condition and typically not caused by limits set too tight with the exception of the IR limit.

Failure Limits by Model	A	B	C	D	Tests Using the Limits	Test Failure Message
Over-current (Limit: μ A)	X	X	X	X	Meg/DAR/PI Hipot/Step Voltage	IR Fail
Arc to Ground Detection (fixed detection)	X	X	X	X	Meg/DAR/PI Hipot/Step Voltage	IR Fail
IR (Limit: megohms)			X	X	Meg/DAR/PI	IR Fail
ROC (Limit: factor)			X	X	Step Voltage	Step Fail
Delta R % (Limit: %)				X	Low Winding Re- sistance	Delta R Fail
% Wave Difference (Limit: %)				X	Surge	Surge Fail

- **“Delta R Fail”**: The Max Delta R limit for resistance is exceeded. B & C models can set this failure manually on the Test Summary screen. It is set automatically with the D model.
- **“Step Fail”**: The Step Voltage leakage current Rate of Change (ROC) limit is exceeded. (If the leakage current accelerates rather than increases linearly as the voltage goes up, the insulation to ground is weak and a flash-over or arc-over may be imminent.) It is set automatically for C & D models.


WARNING


If an internal failure occurs such as “Loss of HV Sense”, “Inter board communication error” or other failures, the iTIG II will not measure the potential in the windings. If such a failure happens during or after a Meg or Hipot type test, make sure the winding(s) are discharged before handling the equipment being tested.

- **“Surge Fail”**: The % WD (wave difference) limit is exceeded. This failure will only stop the test for a D model in full auto test mode, e.g. an automatic test sequence of tests or a set of 3 surge comparison tests.

When any of the above failure flags are set, the overall “Off-line Motor Rating” is automatically set to FAIL.

TIP: Sometimes a failure may occur because a limit is set too tight. Review the limit, adjust if appropriate and retest.

IMPORTANT: If there is a dead short to ground and any type of Meg, Hipot or Step test is attempted, there will be a message on the screen saying “Test Failure - Windings Shorted to Ground”. Measure the resistance to the frame before proceeding.

CHAPTER 6 Perform Tests of AC Motors

TYPICAL MEASUREMENT AND TEST SEQUENCE

Measurements and tests should be done in the following order:

1. Low resistance coil/winding measurement (Model B, C & D)
2. Megohm measurement (can be DAR or PI)
3. Hipot or Step Voltage test
4. Surge Comparison test

For the CLZ option (Capacitance, Inductance, Impedance etc.) go to {Ref} These measurements are typically done before or after the low resistance measurement.

Model A does not have low resistance measurement. Go to [Page 38](#) Megohm.

Model B & C: Connect the Kelvin clamp lead set to the circular connector (R/CLZ, center front panel) . Then connect the 3 Kelvin clamps to each of the 3 leads of a 3 phase motor.

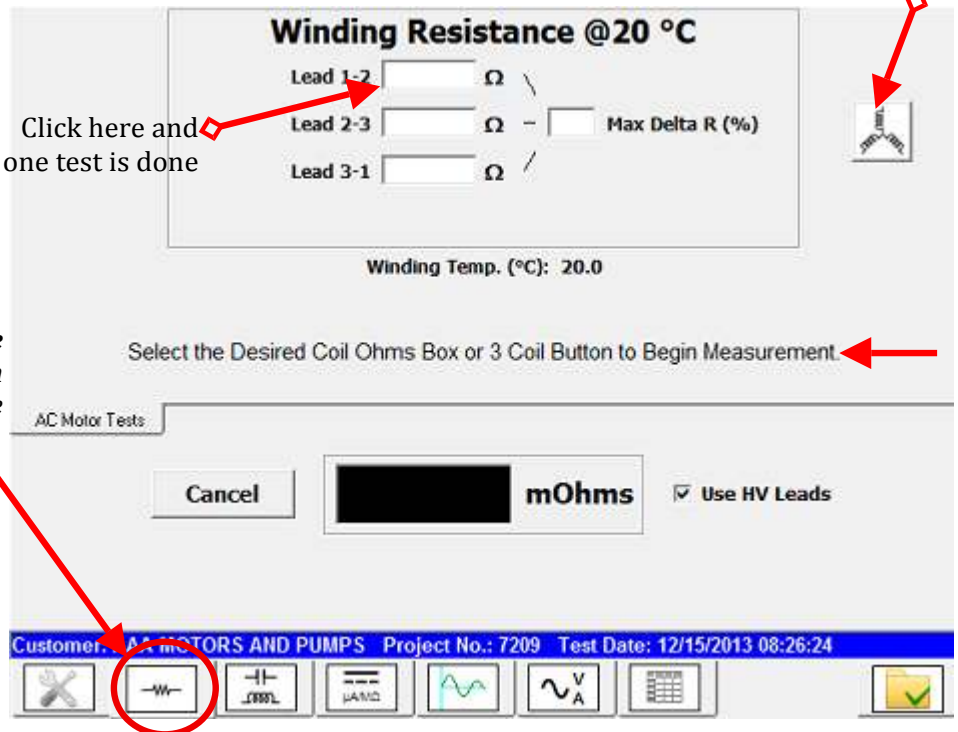
Model D: Use the 7 high voltage Kelvin clamp lead set for all tests.

NOTE: The two sides of a Kelvin clip jaw should not touch each other, only the lead conductors.

Click on the resistance tab at the bottom of the screen.

One measurement can be done at a time by clicking in the appropriate lead ohms field/box, or all three can be done automatically by clicking on the 3 coil

LOW RESISTANCE MEASUREMENT, MODEL B, C & D



Winding Resistance Screen
Click here

star button on the right side of the screen. See instructions on the screen.

Max Delta R %

Max Delta R % is used for 3-phase measurements. It is calculated after all 3 lead sets (phases) are measured. Delta-R % is recalculated when a lead pair is re-measured.

The Max Delta % is the largest percentage delta from the average of the 3 measurements.

More Details on Coil Resistance Measurements

Error Messages

Coil resistance can be measured individually, or in AC mode all 3 coils can be measured by clicking the 3 coil star button.

In DC mode each coil is always measured using Leads 1 & 2.

Errors: If a measurement error comes up saying the test was unstable, check the Kelvin clip connections. Make sure the connections are good and that each is done the same way. The upper and lower jaws of a clip should not touch each other. Also, if connecting to lugs, make sure they are clean. Brush them if necessary.

IMPORTANT: *If there is significant leakage to ground from the windings, the measurement may be unstable.*

NOTE: *There can be no varnish, paint, grease, oil or dirt etc. where the clips connect.*

Model D:

IMPORTANT: *the OHMS-FAIL flag (or failure message) is only set when lead set 3-1 is measured. Therefor the user should always measure leads 3-1 last in the series if operating in manual mode. In auto mode the series is always done in the right order.*

This is to allow a 3 pair or Full Auto sequence (i.e. resistance, Megohm, Hipot, Surge etc) re-measurement to be done without terminating early.

Termination could be due to a false imbalance that may have occurred due to an incomplete measurement of the full lead set.

An example of this would be when a Full Auto or 3 coil test is run with a clip improperly connected. The test will terminate with a Delta R% error after the full lead set has been measured.

The user will adjust the clip and want to re-run the full auto test from the start without using the previous data in the Delta R calculations.

Coil Temperature Compensation Model B, C & D

Coil temperature (B, C & D models) is entered on the setup screen.

IMPORTANT: *This must be done before the Test Mode is exited. It changes the results accordingly. The temperature can be added any time before, during or right after the measurement is done, but NOT once you go back to the Motor Information screen or main Motor Selection screen, i.e. out of the Test Mode and back to do another test or select another ID # (motor) to test.*

The default setting for temperature is 20°C.

MEGOHM, DAR AND PI TESTS ALL MODELS

Megohm Measurement is the measurement of the insulation resistance to ground. It is typically done at 1,000 V, but can also be done at a lower or higher voltage. The measurement is often taken after one minute or when the leakage current is stable.

Dielectric Absorption Ratio or DAR is the megohms measured at 60 seconds divided by the megohms at 30 seconds.

Polarization Index ratio or PI is the megohms measured at 10 minutes divided by the megohms at 1 minute. The tests will terminate if the leakage current limit is exceeded or if there is a flash-over.

Failure: A test has failed if the iTIG II trips out because of a ground fault or if the megohms are lower than a certain number determined by the user. Standards such as EASA and IEEE make recommendations.

Click the “ $\mu\text{A}/\text{M}\Omega$ ” tab at the bottom of the screen to get the Megohm screen.

Output Lead Connections

Connect red output leads 1, 2 & 3 to each phase of a 3 phase motor, and the black ground lead to an unpainted part of the motor’s frame. The same connections will be used for all Hipot and Surge tests for A to D models.

The D model’s output lead set should already be connected correctly if a resistance test was done first.



IMPORTANT: *With B and C models, disconnect the low resistance leads from the motor before doing a Meg, Hipot or Surge test.*

Start Megohm Measurement

Any Model: Press and release the red Start/Stop button and raise the voltage to the desired level with the voltage control knob.

To finish the measurement, press the red button again.

IMPORTANT: *If there is a dead short to ground and any type of Meg, Hipot or Step test is attempted, there will be a message on the screen saying “Test Failure - Windings Shorted to Ground”. Measure the resistance to the frame before proceeding.*

WARNING

Wait for the windings to discharge completely before touching the motor frame, windings or clips. The iTIG II indicates when the voltage in the windings is near zero, but this is not a guarantee that it is. Higher PI requires a long discharge time. Residual polarization may elevate the voltage in the windings after leads are disconnected.

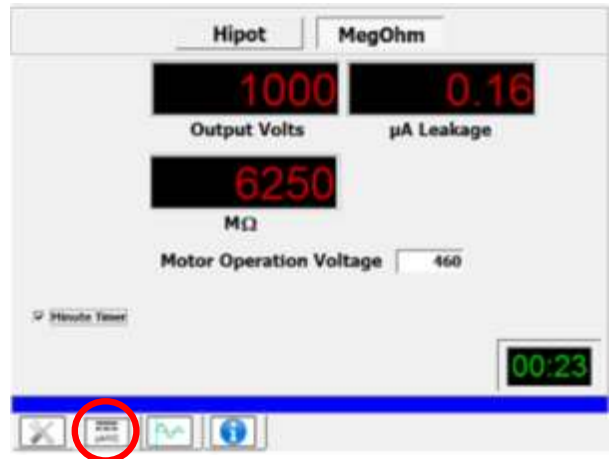
EXERCISE EXTREME CAUTION when handling equipment after a Megohm, Hipot or Step Voltage test to avoid electric shock.

Model A

Model A: For a 1 minute test tick the “Minute Timer” box, press the Start/Stop button, a timer appears in the lower right corner. Stop the test with the Start/Stop button after one minute is reached.

DAR and PI tests are done manually. Record the Megohm results at the times described above and calculate the ratio.

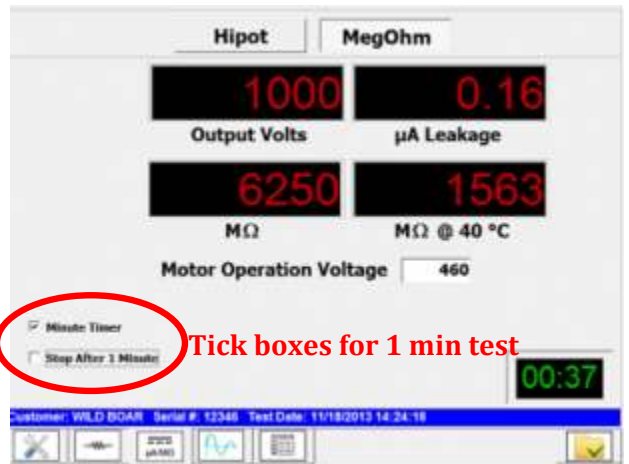
Model A: Go to Page 43



Model B

Model B: For a 1 minute test tick the “Minute Timer” box and the “Stop After 1 Minute” box, press the Start/Stop button, a timer appears in the lower right corner. The test will automatically end after 1 minute.

Stop the test at any time with the Start/Stop button.



Tick boxes for 1 min test

Temperature Standardization

If temperature is entered on the Setup screen, megohms will be calculated for 40 °C.

IMPORTANT: Megohms standardized to 40 °C should be used when measurements are to be compared over time so differences in the measurements due to temperature are eliminated.

DAR and PI Tests

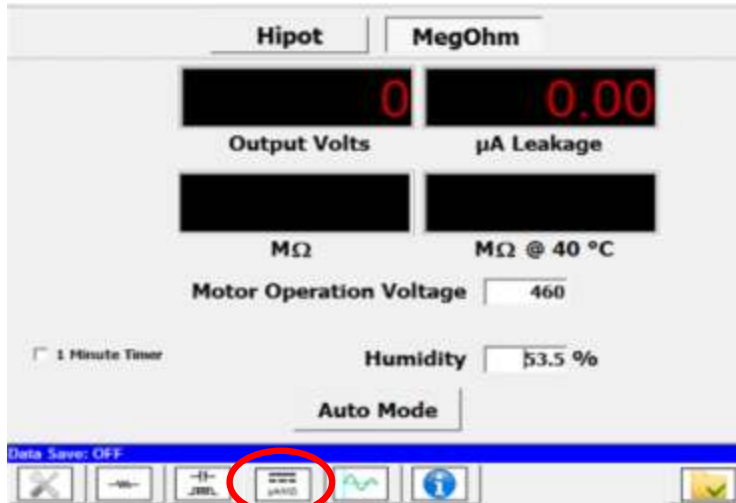
In Megohm mode, 2 points can be recorded in the iTIG II B to calculate DAR or PI.

Procedure:

1. With the Minute Timer ticked, press the red start button and manually increase the voltage to the megohm test level (often 1000 V).
2. When the timer reaches 30 sec for a DAR test or 1 min for a PI test, click the down arrow button on the screen. The first Data Point is stored.
3. When the timer reaches 60 sec for DAR or 10 min for PI, press the red Start/Stop button to terminate the test and store the data.
4. In order for DAR or PI calculations to occur automatically, the sample points must be taken within +/-3 seconds of the time points in step 2 and 3.
5. The DAR or PI ratio is calculated, displayed and stored.

Model B: Go to Page 43

Model C - Automatic Tests



Humidity: For the record and reports only. No formula exists that calculates the impact on Megohms, but the MΩs tend to drop with humidity.

Temperature: If it is entered on the Setup screen, megohms will be calculated for 40 °C.

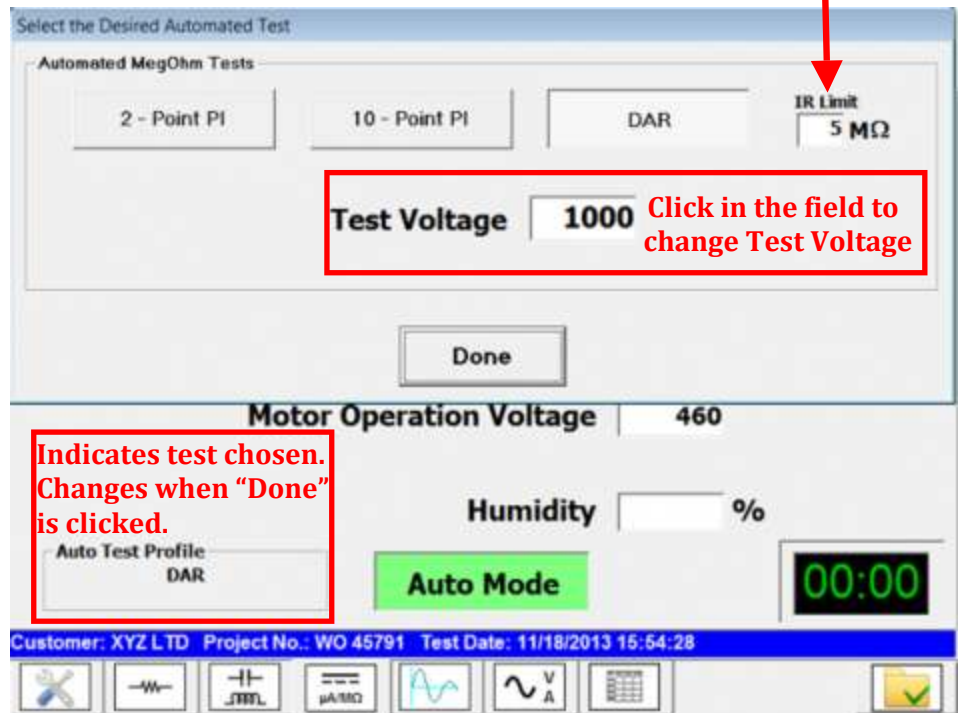
IMPORTANT: Megohms standardized to 40 °C should be used when measurements are to be compared over time so differences in the measurements due to temperature are eliminated.

Automatic Meg, DAR and PI Tests

Click “Auto Mode” button (green when pressed) and one of the 3 test buttons at the top of the screen. **For a standard 1 minute Meg test, use DAR.**

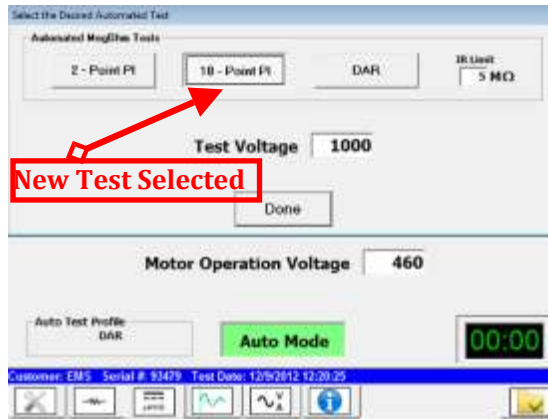
Adjust the IR Limit: Click in the box and enter another value. The measurement will terminate if the MΩs are lower than the limit. It will also terminate if there is a sudden flash-over.

Return to:
Auto Mode Failure
Limits [Page 34](#)



When the setup is complete, click “Done” to return to the Megohm screen.

*DAR/PI Auto Mode
Setup Screen
Model C*



“Auto Mode” Button: Remains green after “Done” is clicked to indicate that Auto Mode is ON, and the test selected is noted to the left of the button.

Press the Red Start/Stop button and wait for the test to finish. Data is automatically stored (unless the “Test w/o Data Save” button was clicked). The DAR or PI ratio is calculated, displayed and stored along with other data.

10 Point PI Test and Graph

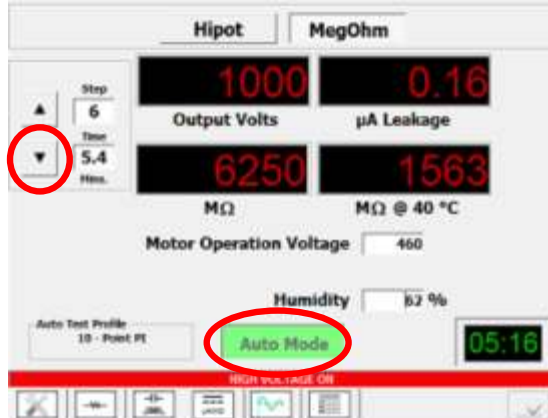
10 Point PI: Data is stored every minute and a graph is created. Click on the graph button to view the graph (the down arrow turns into a graph button). See example of a graph on the next page under Model D. The C Model does not have the “Trend” button on the graph screen, otherwise they are the same.

NOTE: The Megohm value is always recorded at the end of any Meg, DAR or PI test and included in reports. The report also produces a table with megohm values by minute.

Model D - Automatic Tests

Model D: To do a manual test, press the Start/Stop button and dial up the voltage. Click Start/Stop to end the test.

*Return to:
Auto failure Limits Model C
[Page 34.](#)*



Humidity: For the record and reports only. No formula exists that calculates the impact on Megohms, but the MΩs tend to drop with humidity.

Temperature: If it is entered on the Setup screen, megohms will be corrected to 40 °C.

IMPORTANT: Megohms standardized to 40 °C should be used when measurements are to be compared over time so differences in the measurements due to temperature are eliminated.

Automatic Meg, DAR or PI test only (without multi test sequence): From the Megohm screen, click the “Auto Mode” button, it turns green.

The test already selected on the Auto Mode screen ([Page 30.](#)), accessed from the Setup screen, will appear to the left of the Auto Mode button.

To change the test profile, for example from DAR to PI or to any other test the D model user has programmed (profiles are programmable), click on the main Setup screen tab (tools tab) on the bottom left of the page and then on the “Auto Mode Setup” button. See [Page 30.](#)

Change the profile. Exit setup, click on the Megohm tab to return to the Megohm screen and click the Auto Mode. The test just selected will appear to the left of the button.

Start the test by pressing the Start/Stop button and wait for the test to finish. The test will be automatically terminated if failure limits are exceeded.

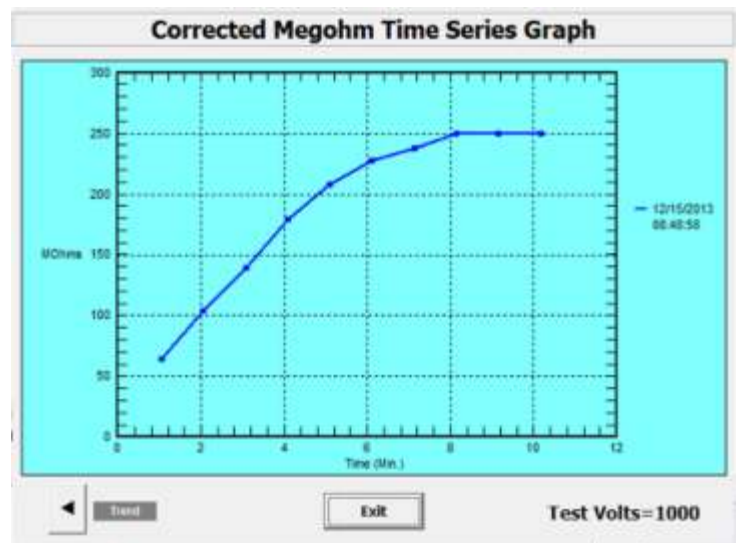
**DAR/PI Auto Mode Setup
Model D**

To view graphs: Tests with more than 2 points produces a graph button (circled in red). Click the graph button after the tests is finished. Below is an example of a 10 point PI graph.

Click the up arrow to see the other points displayed in the meters.

Optional: Add Humidity at this point if this is not already done.

The screenshot shows the iTIG II control interface. At the top, there are two tabs: "Hipot" and "MegOhm". Below the tabs, there are several digital displays: "Output Volts" showing 1000, "µA Leakage" showing 0.16, "MΩ" showing 6250, and "MΩ @ 40 °C" showing 1563. There is also a "Motor Operation Voltage" display showing 4160 and a "Humidity" display showing 45.8 %. A "PI" display shows 3.9. On the left side, there are controls for "10 Steps", "Step" (10), "Time" (10.2 Mins.), and a "Minute Timer" checkbox. A graph button, which is a small icon of a graph, is circled in red. At the bottom, there is an "Auto Mode" button and a status bar with the text "Customer: AAA MOTORS AND PUMPS Project No.: 1089 Test Date: 12/15/2013 08:48:58".



WARNING

Wait for the windings to discharge completely before touching the motor frame, windings or clips. The iTIG II indicates when the voltage in the windings is near zero, but this is not a guarantee that it is. Higher PI requires a long discharge time. Residual polarization may elevate the voltage in the windings after leads are disconnected. EXERCISE EXTREME CAUTION when handling equipment after a Megohm, Hipot or Step Voltage test to avoid electric shock.

HIPOT AND STEP VOLTAGE TESTS

Manual Hipot Test All Models

Minute Timer

On the Megohm screen, **click the “Hipot” button** on top of the screen to get to the Hipot screen below.

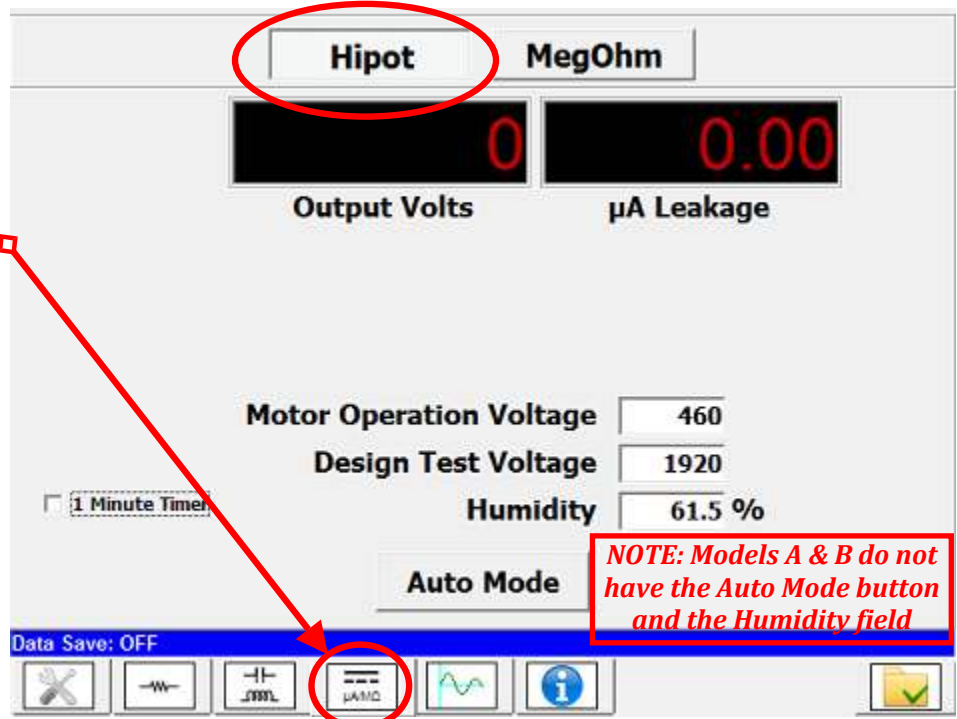
Hipot tests can be done manually. Leads are connected as in Megohm. Press the red Start/Stop button and increase the voltage with the voltage control knob to the Design test Voltage listed on the screen, or to the desired voltage level. Press the Start/Stop button again to stop the test.

IMPORTANT: Pressing the Start/Stop button any time during a manual or automatic test will terminate the test.

The Design Test Voltage is calculated by the formula on the Setup Screen. See Page [Page 28](#).

For a 1 minute test: Tick the “Minute Timer” box, press the Start/Stop button and raise the voltage. At 1 minute stop the test with the Start/Stop but-

*Hipot Test Screen
Varies by Model
Click here*



WARNING

Wait for the windings to discharge completely before touching the motor frame, clips or motor leads. Although the iTIG II indicates when the voltage in the windings is near zero, this is **not** a guarantee that it is. **EXERCISE EXTREME CAUTION** when handling equipment after a Hipot or Step Voltage test to avoid electric shock.

Motor Discharging

ton. The data is recorded when the Start/Stop button is pressed.

IMPORTANT: If there is a dead short to ground and any type of Meg, Hipot or Step test is attempted, there will be a message on the screen saying “Test Failure - Windings Shorted to Ground”. Measure the resistance to the frame before proceeding.

Discharging the Motor After Meg and Hipot Tests: The iTIG II will measure the discharge down to about 30V. This means there can still be a charge in the windings, and with certain windings the charge can build back up. SEE WARNING.

B model: Tick the “Stop After 1 Min” box and the test will automatically be turned off.

C & D models: Use “Auto Mode” tests for automatic shut off. See next page.

Humidity, C & D Models: Enter data obtained from another device by clicking in the box. The humidity will be added to reports for information only.

Step Voltage Test and Automatic Hipot Test

Auto Mode for Model C

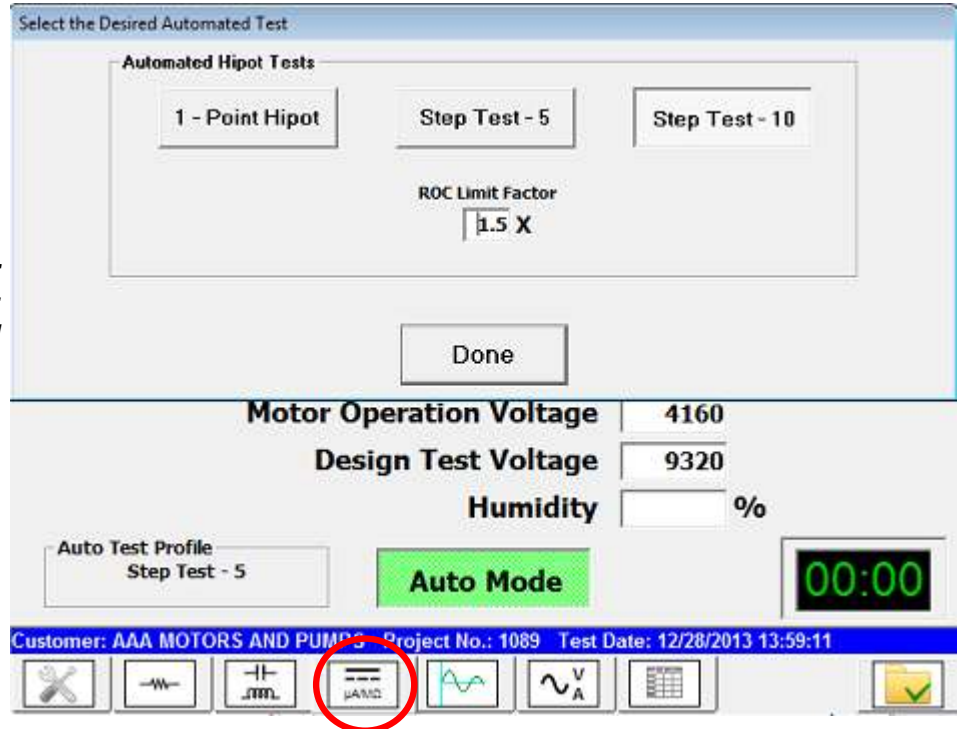
ROC Limit Factor

Model A & B: Step Voltage test is done by manually increasing the voltage in steps and manually writing down the voltage, leakage current and time for each step. **Continue on [Page 46](#).**

Model C: On the Hipot Test screen, click Auto Mode. The screen below comes up. Click the 1- Point Hipot (1 step), 5 step or 10 step test. Each step is held for one minute before the voltage is raised to the next level.

The ROC Limit Factor can be adjusted by clicking in the box and entering a new number. The test is automatically terminated if the acceleration or Rate of Change exceeds the Limit Factor. See *Auto Failure Limits* [Page 34](#).

Hipot Screen after Auto Mode button is pressed



Return to:

Auto failure Limits Model C
[Page 34](#).

Pass/Fail Model C [Page 54](#)

When the setup is complete, click “Done” to return to the Hipot screen.

The “Auto Mode” button remains green to indicate that Auto Mode is ON, and the test selected is noted to the left of the button.

Press the red Start/Stop button and wait for the test to finish. Data is automatically stored.

Graphs: For a 5 or 10 point Step Voltage test a graph is produced. See pictures on the next page. The C and D models are the same except the C model displays one test graph at a time.

Individual Step Results: Click the up and down arrows to see the μA leakage for each voltage step in the displays.

! **WARNING** !

Wait for the windings to discharge completely before touching the motor frame, clips or motor leads. Although the iTIG II indicates when the voltage in the windings is near zero, this is not a guarantee that it is.

EXERCISE EXTREME CAUTION when handling equipment after a Hipot or Step Voltage test to avoid electric shock.

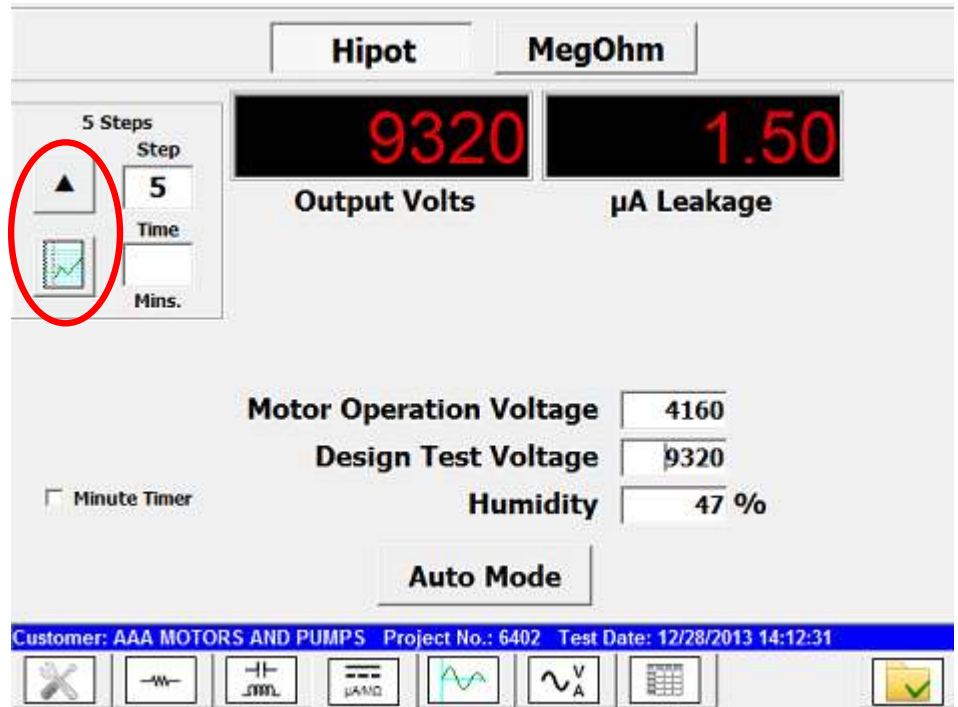
Model D Auto Mode

Model D: To change Auto Test Profile for Step Voltage click on the main Set-up tab (tools) and then on the “Auto Mode Setup” button.

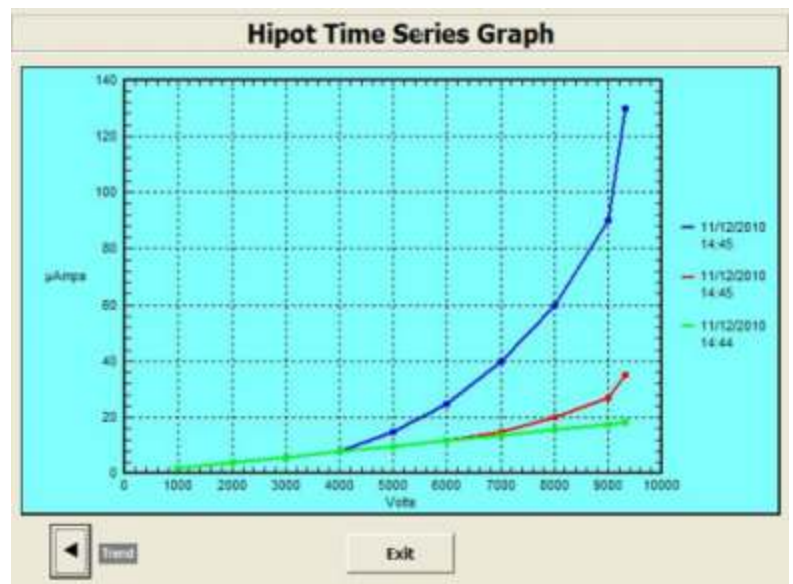
Change the profile. Exit and return to the Hipot screen. *See Page 30.* Click “Auto Mode” button and start the test with the Start/Stop button.

Once the test is done, click the graph button to see the result of the test.

See the individual data points by clicking on the Up/Down arrow buttons.



With the D model one can click the Trend button (lower left side on the graph screen below) and see current and previous tests for this motor in the same graph. C models will display the current test.

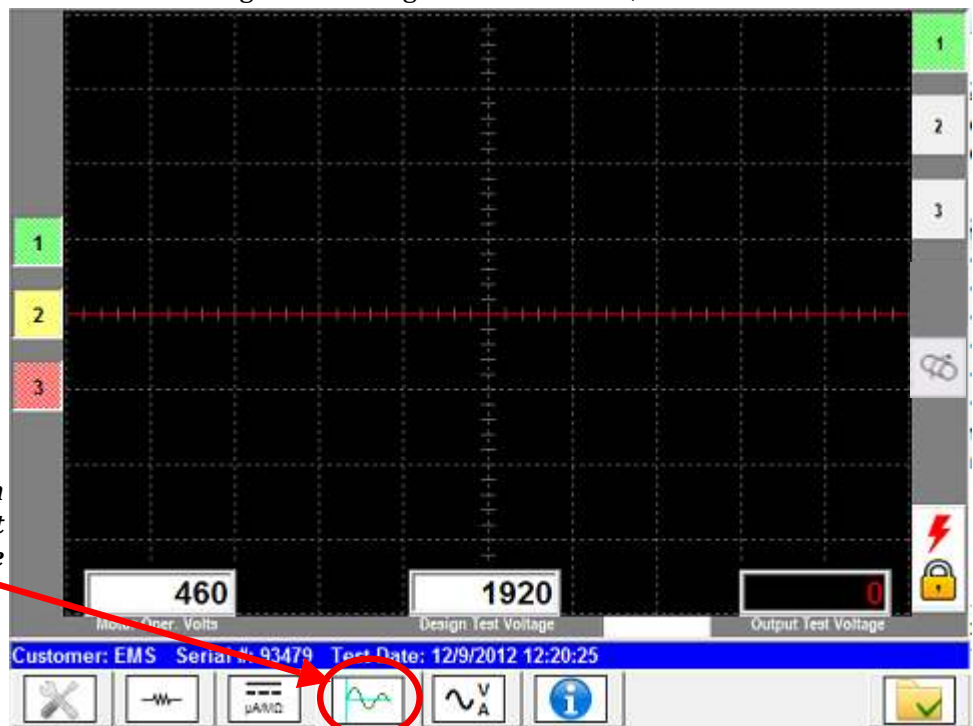


AUTOMATIC SURGE COMPARISON TEST, ALL MODELS

Surge Comparison tests are done automatically by all iTIG II models. Click the Surge tab on the bottom of the screen to get the screen below:

- The test voltage is determined by the Design Test Voltage formula on the Setup screen. See [Page 28](#).
- One phase in a 3 phase motor is energized at a time, the test result is stored on the screen and compared to tests of the other phases.
For DC motors see [Page 72](#).
- The buttons on the right side of the screen select the lead to be energized. The buttons turn green when they are activated.
- The buttons on the left select which tests are visible. See next page.
- A test set MUST start with lead 1. The iTIG II will determine the sweep and voltage range to use while at a low voltage, and then increase the voltage to the Design Test Voltage. Subsequent waves in the data set are then locked to the same settings.
- Once the Design Test Voltage level is reached, the test will be shut off.

Surge Test Screen
- Before a Test
Click here



Start and Perform Surge Tests

To start and perform Surge tests:

- Connect the output leads as in Megohm, one lead to each phase and the ground lead to an unpainted part of the frame.
- Button 1 on the top right of the screen must be green (default setting), otherwise click it.
- Click the red lightening bolt “unlock” button on the bottom right of the screen to unlock and enable Surge. The button turns green and unlocked.
- Press the red Start/Stop button.
- When the test is completed, click button 2 on the right side of the screen, click “Unlock” and press Start/Stop.
- Repeat again after clicking button 3 on the right side.

**Model A: Go to
[Page 49](#)**

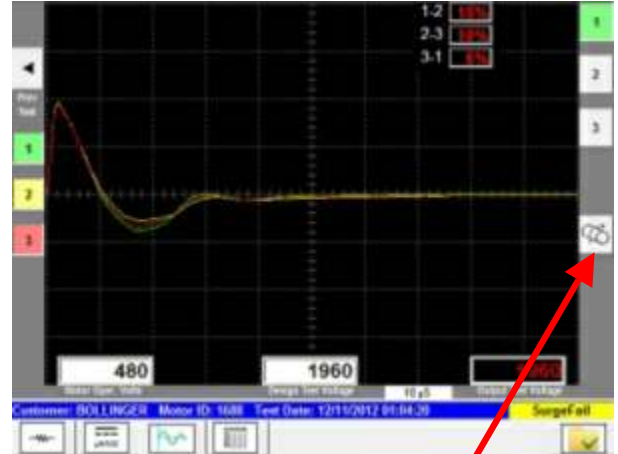
Assembled AC Motor Test

Model B, C & D: The picture shows typical waveforms from a small assembled AC motor (with rotor installed). Larger motors will have more peaks and valleys (ringing).

The waves indicate a problem since the frequencies are different in the 3 waves. However, because of transformer action between the stator and rotor, the inductance changes from phase to phase depending on the position of the rotor.

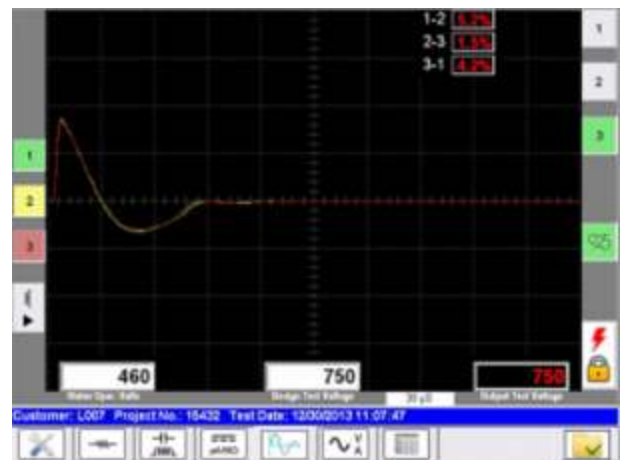
This is most apparent in 2 pole motors, is usually seen in 4 pole motors, and may not be seen at all in motors with 6 poles or more.

In order to check if the waves line up, it may be necessary to turn the rotor. Following is one of several possible procedures for for this process:



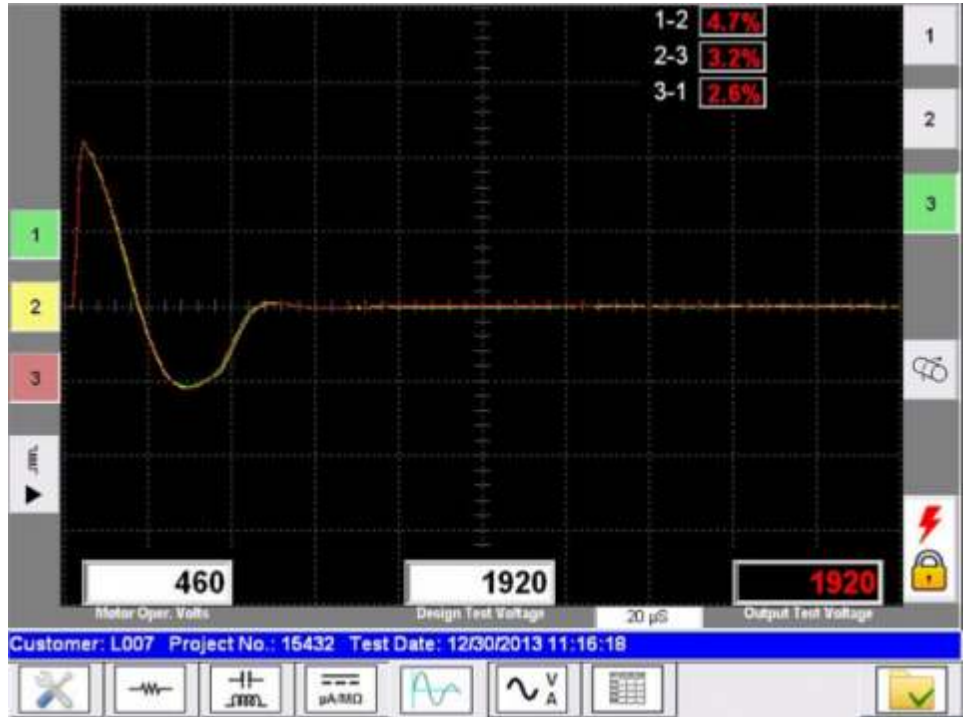
1. With all leads connected, click the Rotor button on the right side of the surge screen. The button turns green.
2. Energize surge on lead 1 (click unlock and then press Start/Stop). The surge voltage will go to a lower voltage than the Design test Voltage and remain on for up to 2 minutes to allow the operator to turn the rotor before surge is turned off.
 - 2.1 Turn the rotor until the wave moves to the position farthest to the left (has the highest frequency), then press the red Start/Stop button to stop the test (any position of the shaft on the first test is okay, but the above position is easy to find on the next two tests and tends to produce the best wave). Mark the position on the shaft/rotor as No. 1 with a marker against a mark on on the frame so the position can be repeated.

- 2.2 Click test lead 2 on the right side of the surge screen and energize. Rotate the shaft until the yellow wave 2 lines up with surge wave 1 (green) and stop the test. Mark the position of the shaft as No. 2.



- 2.3 Click test lead 3 and repeat the process lining up the wave with the previous two.

3. Click the Rotor button to turn the low voltage surge OFF and do a full design test voltage surge test set.
 - 3.1 Rotate the shaft to position No. 1, click lead 1 and energize surge.
 - 3.2 Rotate the shaft to position No. 2, click lead 2 and energize surge.
 - 3.3 Rotate the shaft to position No. 3, click lead 3 and energize surge.



4. The 3 waves on the screen should now overlap almost perfectly.
 - 4.1 Use the %WD numbers to gauge the difference. If all 3 waves will not line up during the low voltage test there is a short or serious weakness in the windings and no further testing is required.
 - 4.2 If they do not line up in the high voltage test there is a weakness in the windings that show up at higher voltages and the test has failed.
 - 4.3 **There is a “gray” area around 10% WD** where a motor can have a failure or not. Results from the other tests, retesting, and operator experience may be required to make a Pass/Fail judgement. See next page.
5. The default failure limit for %WD is set at 10% for Model D. Adjust this percentage on the Auto Mode setup screen (click “Auto Mode” button on the setup screen- tools tab).

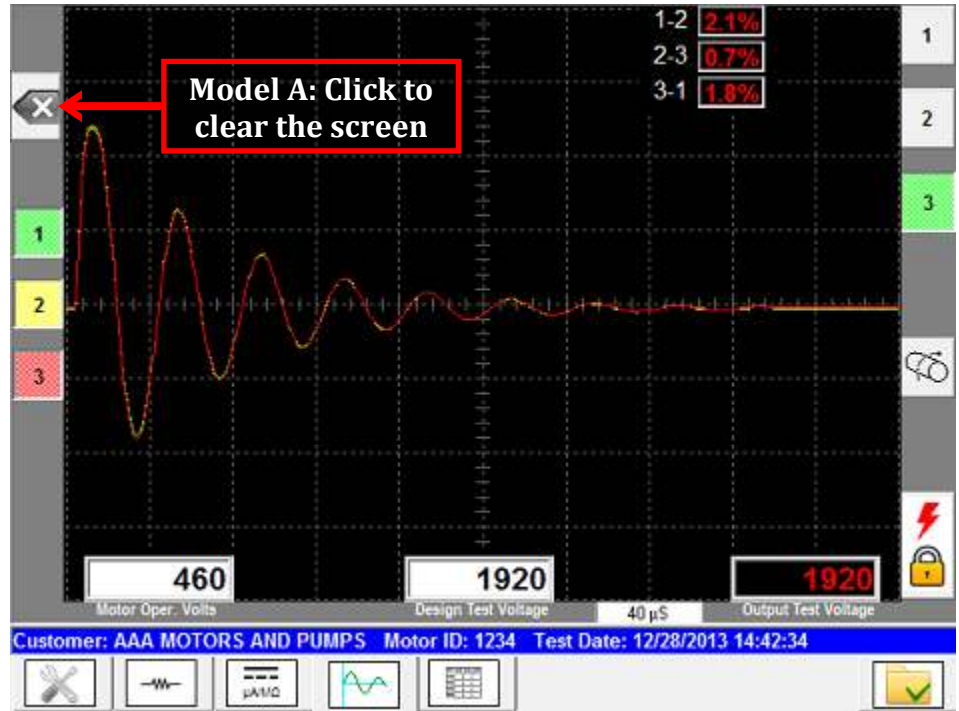
Review Surge Results

When the 3 phases are tested, all 3 waveforms (green, yellow and red) are displayed on the screen as shown below. The waves are on top of each other and it is a good result.

Wave Differences, % WD

The difference between the waves, the Wave Difference %, or %WD, is displayed in the top right corner. A % less than 10-15% is typically good, but different motors have different characteristics so the %WD is only a guide.

*Surge Test Screen
- All 3 Waves Shown*

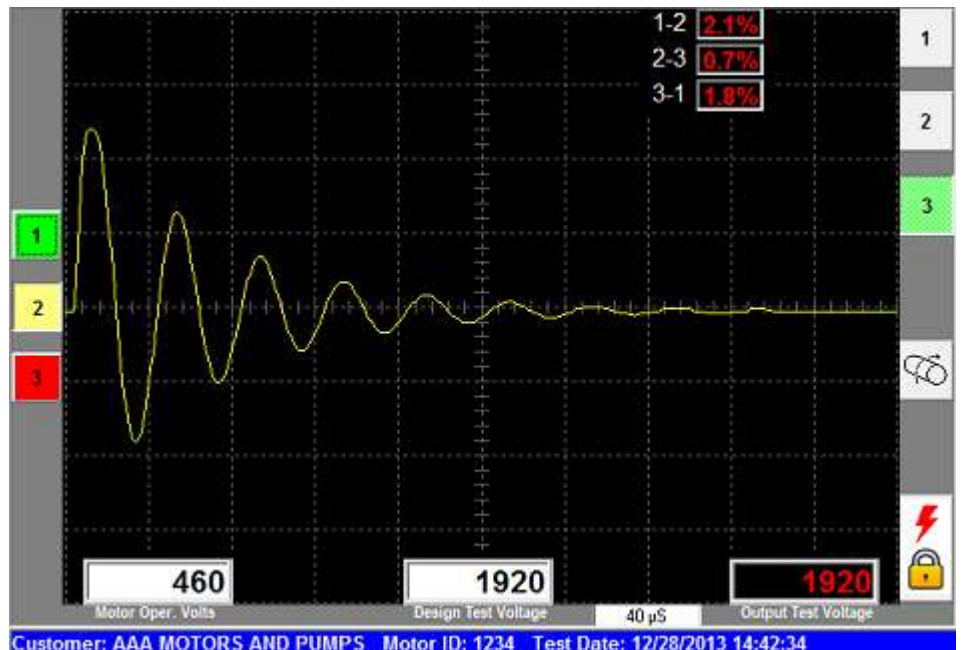


View Individual Waves

To see just one pair of waves or one wave, click one or more of the green, yellow and red buttons marked 1, 2 and 3 on the left side of the screen.

NOTE: The buttons must be pressed (ON) for the waves to be visible. If a button is OFF the wave will NOT be visible. In the picture below only the yellow wave 2 is displayed.

*Surge Test Screen
- Only Wave 2 Shown*



Return to:

[View Previous Tests](#)

[Page 56](#)

[View Mod. D Surge Test](#)

[Page 59](#)

Points to Note

Re-test: Over-writing Test Data

To re-do a test, or to test a different coil on the same lead, and not over-write the last test data, you must exit test mode and go back to the main Motor Selection screen and start a new test. This can be done as many times as you like.

This is the same for all types of tests, not only Surge.

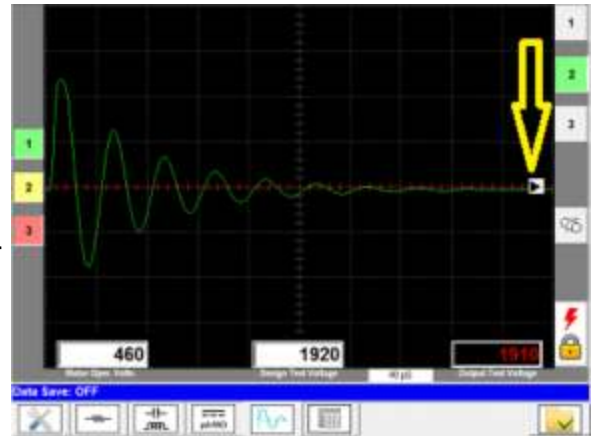
To use a different setting such as “No Data Save”, you must also go back to the Motor Selection Screen.

Stretch and Compress a Wave on the Screen

If a wave that has just been captured is too compressed or too stretched, tap the right or left side of the screen to stretch/compress the wave.

NOTE: *Stretching and compressing a wave can be done while surge is energized on lead 1.*

If the screen is tapped after a test is done on lead 1 a small arrow will appear on the side of the screen as shown in the picture to indicate that the next test will be done with a stretched (or compressed, if the arrow is on the left side) sweep.



Stretched means the width of the screen represents a shorter time period, therefore you may only see the first oscillations of the wave if stretched too much).

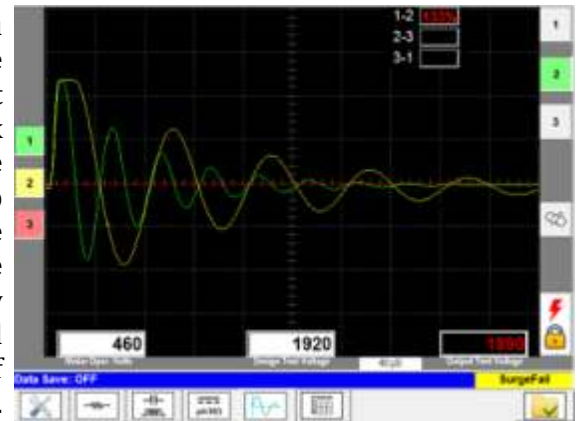
Repeat the surge test to get the stretched/compressed wave.

To cancel the stretch/compress function (the arrow), tap the opposite side of the screen before the wave is captured.

A good wave should be a flat line on the very right side of the screen.

Mismatched Waves

Missing a Button Push: If you tap any of the buttons in the left or right gray frame, miss it and instead touch the black wave part of the screen, the arrow indicating a sweep change appears. If you do the test the result is shown in the picture to the right, the yellow wave 2 is stretched compared to wave 1. Click the left side of the screen and redo wave 2. Alternatively redo wave 1.



Surge Test Voltage not Reached

Occasionally, a surge wave may not reach the desired test voltage. This may be due to a number of factors:

- The coil has very low impedance and is being driven by the maximum iTIG II voltage.
- A noise spike was encountered that caused early termination. In this case a re-run of the test will usually be successful.
- For the D model the Surge Profile in Auto Mode Setup is set at less than 100% or at a number less than the Design Test Voltage calculated by the formula on the Setup screen.
- The motor is too large. This can be because the HP/kW is too high and/or there are too many poles.
 - ❑ More poles (slower RPM) increases the load for a surge tester.
 - ❑ If the load is too large the maximum energy the tester can produce at 12 kV may not be enough to produce the desired test voltage in the motor.
Contact Electrom for options and more information.
- Note that the voltage reached may not be exactly the Design test Voltage

Review Test Set Just Performed

Before exiting test mode and going back to the main Motor Selection screen, you can review the test just done by clicking on the test tabs at the bottom of the screen.

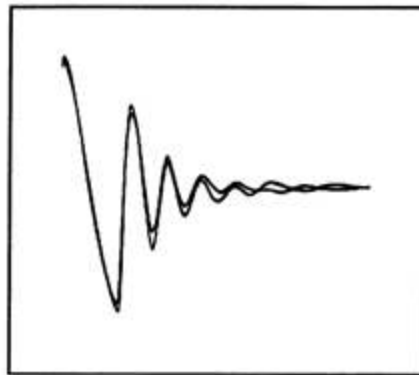
You can also review old tests. This is covered in the “View Previous Tests” chapter on [Page 56](#).



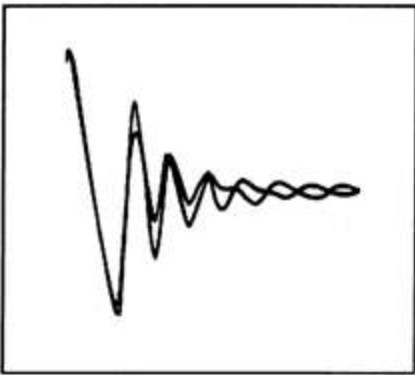
Longmont, Colorado, USA
+1 720-491-3580 info@electrominst.com
www.electrominst.com



Balanced Coils



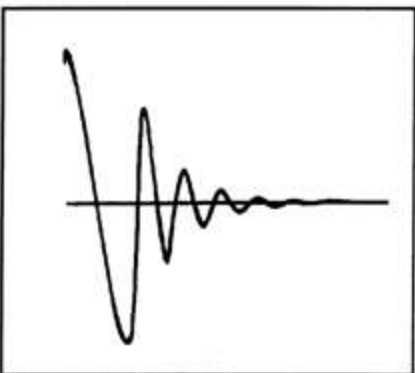
Shorted Turns



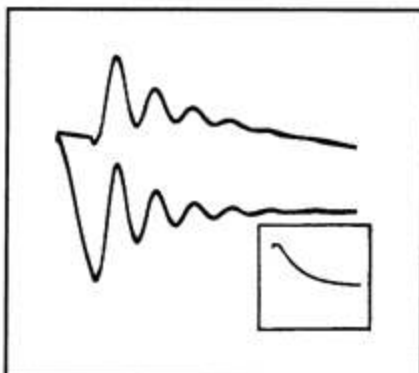
Shorted Coils



Shorted Phases



Short to Ground



Open Winding

CHAPTER 7 Set Pass/Fail Ratings for Tests

Model A: This model does not store data or produce reports. Therefore it has no Pass/Fail ratings. *Go to {Ref}*.

TEST SUMMARY SCREEN MODEL B, C & D

Test Summary: Click circled Tab. This screen has Pass/Fail ratings, and for C & D models additional information about the test, see [Page 26](#).

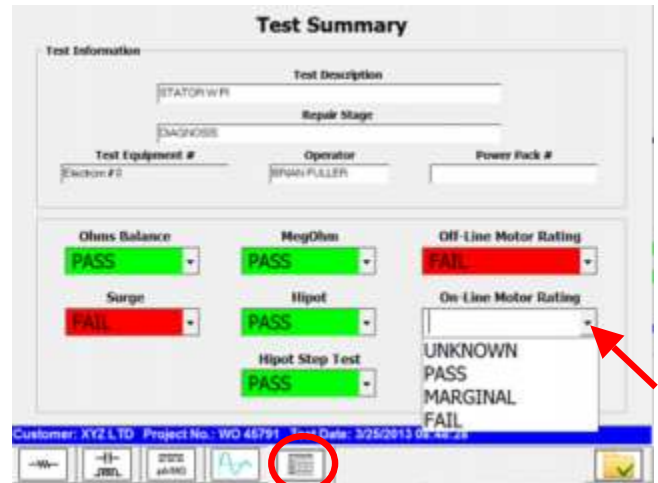
The Pass/Fail ratings appear only after the first test in a set is run.

The ratings are blank for tests that have not been run.

For Failures Types, Limits & Settings see chapter on failures [Page 33](#).

Off-Line Motor Rating:

This is the composite overall rating for the tests done with the iTIG II when the test object is disconnected from power, i.e. off-line. It is automatically set based on the results of the tests that have automatic failure detection. This varies by model and is explained below.



- **Off-Line Fail:** If any test is listed as failed, the Off-Line rating will be FAIL.
- **Off-Line Default:** Off-Line defaults to PASS unless a test failure is set to FAIL automatically or manually.
- **Off-Line Override:** *If you override the OFF-LINE rating it does NOT change even as other ratings change. The only way to change an Off-line rating after an override is with another override.*
- **Off-Line Overall Rating Options:** Unknown, Pass, Fail, or Marginal
The Marginal rating must be set manually on all models. It can for example be used when the resistance Ohms balance is a bit high, a meg test has a lower number of megohms than the operator likes, a hipot test has a high leakage, a step voltage test has a “knee” in the leakage current graph but passed the test without arcing out, or a surge test is in the “gray” zone for the WD%. “Unknown” is only used for On-Line ratings.

On-line Motor Rating, Model C & D: The on-line measurements are done with a multi-meter or other instrument when the test object is connected to power and running, i.e. On-line. Enter the results to include them in reports. The rating is always set manually. The rating options are the same as the Off-Line options above. “Unknown” can be used to indicate it was not done.

All other Ratings: Options are Pass or Fail. If the result is Marginal for any individual test(s), this is indicated by setting the Off-line rating to Marginal.

NOTE: *Only the tests performed will have Test Tabs along the bottom of the screen in View mode. In Test mode all will show. Click the tabs to see the tests. On the Meg/Hipot screen click Hipot to see Hipot results.*

Change Rating: To change a rating click the pull down menu and then the option you want. This can be done at any time during or after a test set.

It can also be done in TRPro, the test report software running on a separate PC. See pull down menu (red arrow) in the picture on the previous page.

Pass/Fail Override

Override of Individual Test Ratings: The user can override any ratings by clicking on the pull down menu and selecting a different rating. If you override a rating and then re-run the test with a different failure limit, the override is replaced and the last result is reflected.

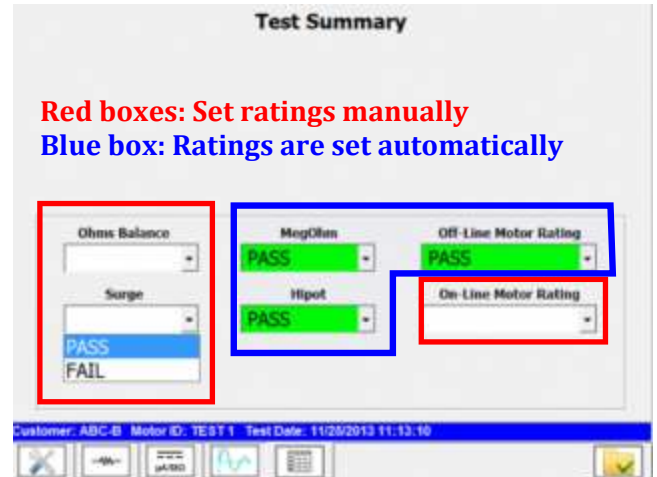
Exception: See **Override** for the On-Line rating on the previous page. If overridden once, the On-line rating will only change if you override it again.

DC Coils: The OHMS BALANCE rating becomes COIL RESISTANCE and is only set manually.

PASS/FAIL SETTINGS MODEL B

Model B: Ohms Balance and Surge ratings **MUST** be set manually since there is no failure limit. If these are not set manually, the tester assumes they passed.

If for example a surge test failed, set the Surge rating to FAIL to cause the Off-Line rating to change to FAIL



PASS/FAIL SETTINGS MODEL C

Model C: See Model B above, the Ohms Balance and Surge ratings **MUST** be set manually.

In addition the C model has a Pass/Fail rating for Hipot Step Voltage Tests which is set automatically based on the ROC failure limit. See [Page 44](#).



Return to:
[View Past Tests Page 57](#)

The C model has Test Information in addition to the ratings. If not entered, enter it now. See [Page 26](#).

The TEST DESCRIPTION, REPAIR STAGE and PROJECT # fields will be displayed in the test selection grid after the "View/Print Past Tests" is clicked to make it easy to find the test you are looking for.

The PROJECT/JOB #, TEST DESCRIPTION, REPAIR STAGE and OPERATOR fields are printed on the cover page of the report as a default. This can easily be changed if required.

PASS/FAIL SETTINGS MODEL D

Model D: All Pass/Fail ratings are set automatically by the iTIG II except for the On-Line rating. The rules listed at the beginning of this chapter including changing and overriding the ratings apply.

The D model has Test Information in addition to the ratings. If not entered, enter it now. See [Page 26](#).

The TEST DESCRIPTION, REPAIR STAGE and PROJECT # fields will be displayed in the test selection grid after the "View/Print Past Tests" is clicked to make it easy to find the test you are looking for.

The PROJECT/JOB #, TEST DESCRIPTION, REPAIR STAGE and OPERATOR fields are printed on the cover page of the report as a default. This can easily be changed if required.

Return to:

View Past Tests [Page 57](#)

CHAPTER 8 View, Print & Delete Previous Tests

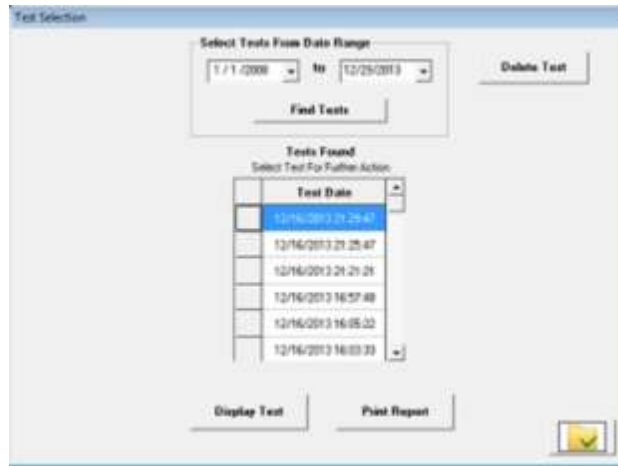
All Models: Click on any tab to see the previous test.

See [Page 49](#) for pictures and more information on reviewing surge tests.

VIEW PAST TESTS MODEL B

Model B: From the main Motor Selection screen select a customer and click on a motor ID. On the Motor Information screen click the “View/Print Past Tests” button. The Test Selection screen below comes up.

*Test Selection Screen
Model B*



Click the date you want to view, then “Display Test”. Tests done in the date range at the top of the screen will be listed in the “Tests Found” field in reverse order, the last test first. See picture.

To narrow or expand the date range enter new dates or click on the pull down menu to get a calendar. Click in the calendar, or click on the month to

get a list of months, or click on the year to increment or decrement the year. Then click the “Find Tests” button.

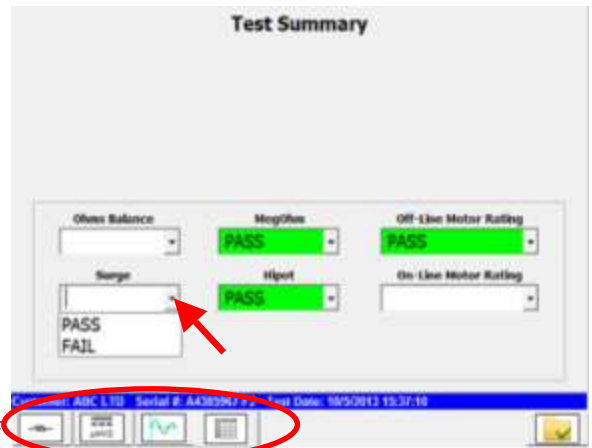
Test Set: Each date listed is a time stamp for a set of tests (meg, hipot, surge etc.) started at that time.

Test Summary Screen

After selecting a test and clicking “Display Test”, the Test Summary screen comes up.

See information on Pass/Fail ratings in the previous chapter.

NOTE: If a Surge failure or low resistance Ohms Balance failure occurred the Surge /Ohms Balance **must** be set to FAIL manually to change the Off line rating to FAIL.



Return to:

Motor Information
[Page 24.](#)

Review Tests Just Done
[Page 51](#)

Master Coil Mode
{Ref}

Model B:
Go to [Page 62](#)

To view tests click on any test Tab at the bottom of the screen (circled in the picture above).

To see Hipot tests click the Meg/Hipot Tab and then click the Hipot button on the top of the screen.

For more information on viewing surge tests go to [Page 49](#).

Make changes to the ratings as necessary.

To print a test to paper click the Exit button (folder button) and then click “Print Report”. For instructions see PRINT REPORTS later in this chapter.

VIEW PAST TESTS MODEL C & D

From the Motor Selection screen click an ID#. On the Motor Information screen click the “View/Print Past Tests” button. The Test Selection screen below comes up.

Tests done in the date range shown will be listed in the “Tests Found” field in reverse order, the last test first. Click the test you want to view.

Narrow or Expand the Date Range: Enter new dates or click on the pull down menu to get a calendar. Click in the calendar, or click on the month to get a list of months, or click on the year to increment or decrement the year. Then click the “Find Tests” button.

Each date/test listed is a test set started at the time listed. Click on the test set you want. You can click on any field in a row. Clicking the left column without a header will highlight the whole row. This will preserve the blue highlight for the row when you return to this screen from viewing tests.

Sort Table: Click on a column heading. Click again to reverse the order. For the D model the left hand column without a heading is used for coil numbers

*Return to:
Motor Information
[Page 25.](#)*

	Test Date	Test Description	Repair Stage	Project No.
	9/29/2013 22:51:55	ASSEMBLED MOTOR	FINAL TEST	wo 45791
	9/29/2013 22:46:53			wo 45791
	9/25/2013 10:00:27	STATOR	DIAGNOSIS W-PI	wo 45791
	9/25/2013 09:25:09	STATOR	FINAL TEST W-PI	wo 45791
	3/25/2013 08:48:28	STATOR W-PI	DIAGNOSIS	wo 45791
	3/25/2013 08:32:38	2ND TEST	DIAGNOSIS	wo 45791

when a series of coils is tested. This can also be sorted.

NOTE: The Test Selection field in the picture only shows the tests for the selected Project (Job or Work Order). If the “Include All Projects” check box is selected, all test sets for all Projects for that motor ID Number are shown.

Click the “Display Test” button to view tests. The first screen displayed is the Test Summary screen. See [Page 53](#) to [Page 55](#).

Tabs: Click any tab along the bottom of the Test Summary screen to review tests.



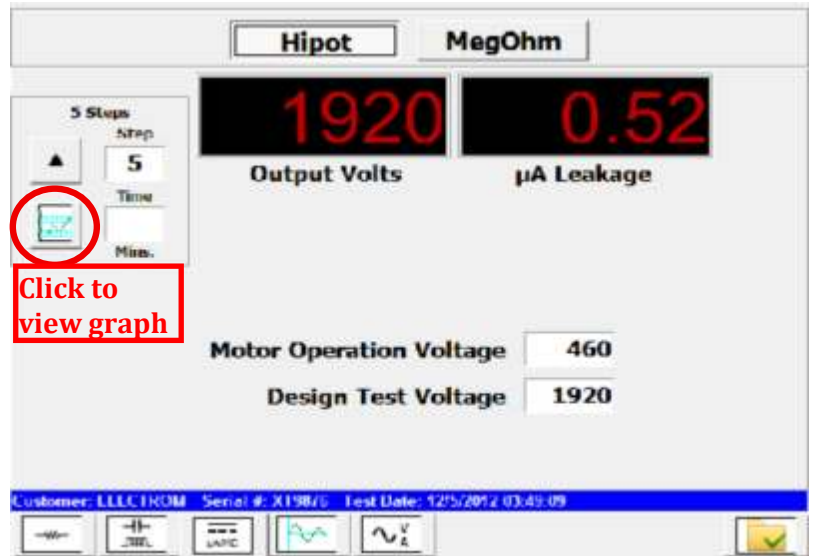
Bar Graph Icon Button: Used for multi-coil tests. Displays a bar graph of surge %WD for each coil selected. See [Page 68](#). If clicked, the graph will be included in reports. See [Page 59](#).

View PI & Step Voltage Time Series Graphs Model C & D

When a Hipot or Megohm time series of more than 2 points has been captured, a graph of the series can be displayed by clicking on the graph icon that is displayed in place of the down-arrow or up-arrow when the last or first point is shown in the meters.

Examples of multipoint time series would be a 10 point PI and a 3 point Step Voltage test.

For tests with 2 or more data points, click the up and down arrows on the left to see each individual data point.

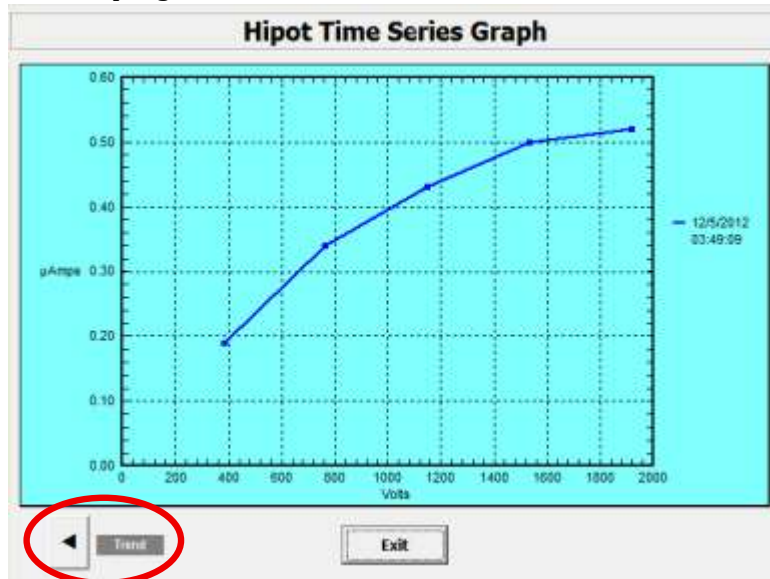


Trend Graphs, Model D

Model D graphs contain a back arrow button. Each time this back arrow is clicked the previous Hipot/Megohm test for this ID# is added to the graph (provided the test contains at least 3 points). The graphs are available for both multi point Meg (PI) and Hipot (Step Voltage) tests.

The system will continue to step back in time with each button click until a maximum of 5 curves are displayed.

This comparison of tests done over time can be valuable in predictive maintenance programs.



Model D View Surge Tests

Model D has an arrow button in the left side gray frame of the screen. Click the arrow and the immediately previous test will be shown if a test was done. Keep clicking until there are no more tests stored for this motor. To review again, go back one screen, click “Display Test” and start over.



See [Page 49](#) for pictures and more information on reviewing surge tests.

PRINT REPORT MODEL B, C & D

Print Test Report: Reports can be printed from the iTIG II or from a PC.

It may be more convenient to print reports from a PC using TRPro report software included. It can print to PDF so reports can be emailed as well as stored in a finished form. For how to transfer data to a PC see [Page 82](#).

To print a test report to paper directly from the iTIG II, install the proper printer driver first. The printer must be connected.

IMPORTANT: Make sure **only** the driver is installed, **NOT** any of the other programs printer companies want you to install in addition. These programs can cause testing problems. Contact Electrom with any questions.

On the Test Selection screen covered earlier in this chapter, select a test. The print screen shown below comes up.

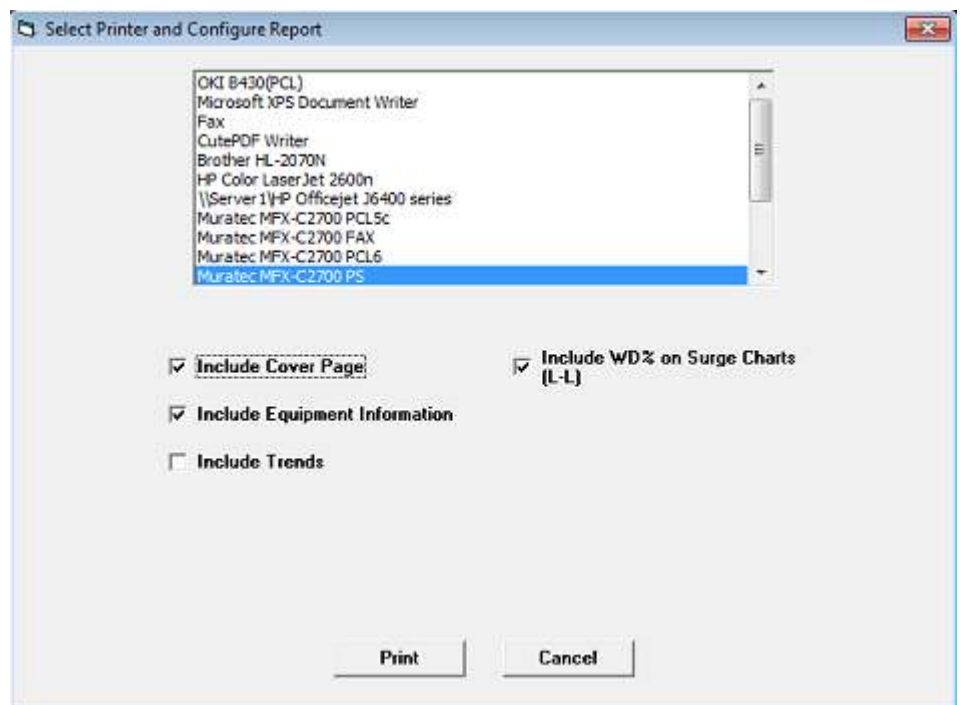
Select the printer to be used. The picture shows a list on a PC, the iTIG II may only have one printer available.

Model B : Choose to include the WD % or not. The other options are not available. With the printer connected click the “Print” button.

Model C and D: Make the selections. The cover page template must be generated in TRPro and copied to the iTIG II. See the TRPro manual.

Trends will generate a table of past Megohm results if a range of tests are highlighted on the Test Selection screen.

Click the “Print Report” button. See picture below.



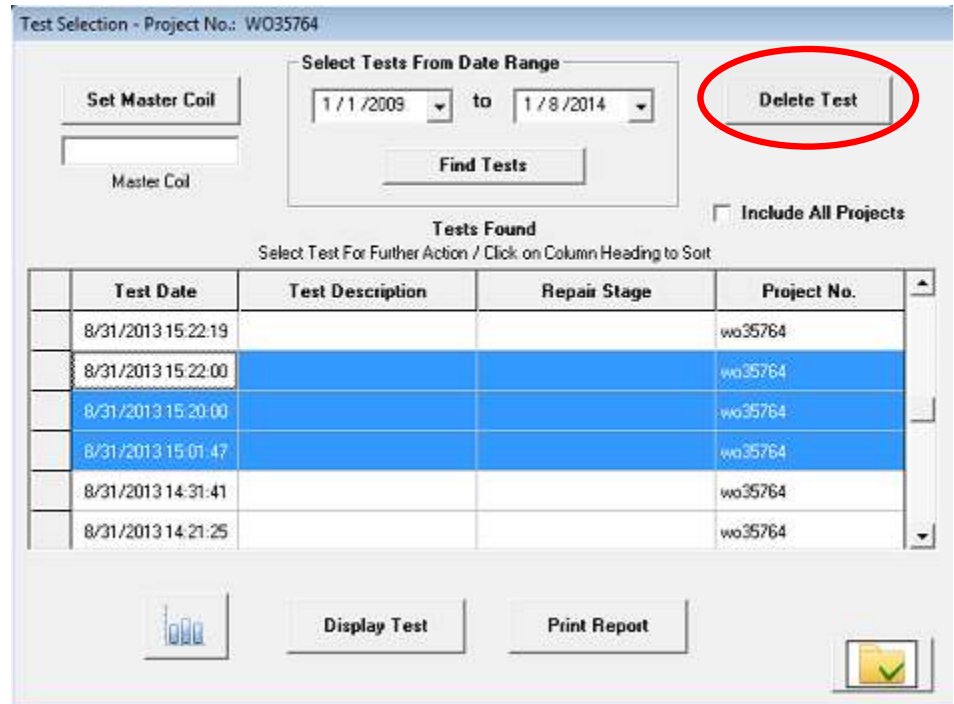
DELETE STORED TESTS

All entries can be deleted. Some deletions take 3 steps:

- To delete entries in the iTIG II click the Delete button on the screen listed in the table below:

Entry	Where	How Many	Comments
Customers	Customer Information entry screen	One at a time	All associated ID#s and tests will be deleted if a customer is deleted
ID#s	Motor Information screen	One at a time	All projects and tests under that ID# will be deleted if the ID# is deleted
Projects Mod C & D	Motor Information screen	One at a time	All tests under that Project or Job # will be deleted
Test Sets	Test Selection screen	Multiple	Click View Past Tests on the Motor Info screen

To delete multiple tests click (or tap) and hold in the left column of the first test to be deleted and drag down. All rows (tests) highlighted will be deleted when the “Delete Test” button in the upper right corner is clicked.



Test Date	Test Description	Repair Stage	Project No.
8/31/2013 15:22:19			wo35764
8/31/2013 15:22:00			wo35764
8/31/2013 15:20:00			wo35764
8/31/2013 15:01:47			wo35764
8/31/2013 14:31:41			wo35764
8/31/2013 14:21:25			wo35764

- If tests deleted in 1. above have been transferred to a USB Flash Drive (FD), they MUST be deleted from the FD. An alternative is to just delete (on the FD) all customer name directories where tests were deleted on the iTIG II, or all ID#s for tests deleted, and then Synchronize the FD with the iTIG II in order to put Customers, ID#s, Projects and/or tests that were not deleted in the iTIG II back on the FD. Another alternative is to start over with a new or clean FD.

3. If the tests or entries were transferred to TRPro on a PC or server, they MUST also be deleted in TRPro. Otherwise they will be put back on the FD and the iTIG II during synchronization.

One can use the same method described in 2. and delete more than what was deleted on the iTIG II or FD. Synchronizing after deleting more than what was deleted on the FD (or in the iTIG II if a network transfer is used) will put the directories and files that should not have been deleted back on the PC/Server.

The delete sequence can be done in reverse order:

1. Delete files or directories in TRPro,
2. Delete files on the FD. You can delete more than what was deleted in TRPro and then synchronize the FD with TRPro to put directories and/or files that should not have been deleted back on the FD.
3. Delete directories and/or files in the iTIG II. You can delete more than what was deleted on the FD/TRPro and then synchronize the iTIG II with the FD to add back directories and/or files that should not have been deleted.

NOTE: With network transfers data only goes from the iTIG II to the server to lower the risk of virus attacks on the iTIG II. Use a FD to synchronize from the Server back to the iTIG II.

CHAPTER 9 Multi Coil & Master Coil Tests

MULTI COIL TESTS ALL MODELS

To test multiple coils and **not store** any information do the following:

1. Go to step 2 for Model A. Click "Test w/o Data Save" for B - D models.
2. On the setup screen enter the test voltage in the Test Volts field.
3. Click on the Surge Tab and test the first coil on lead 1 (button 1 on top right side of the surge screen should be green - the default when you start a surge test).
 - 3.1 Connect lead 1 to one side of the coil and lead 3 (ground) to the other side.
 - 3.2 Lead 2 is grounded and does not have to be used.
 - 3.3 Connect the black ground lead to the stator or housing if it exists. If not the black ground lead does not have to be connected for a surge test.
4. For the second coil click lead 2 button, connect lead 2 to the same coil end or side lead 1 was connected and connect lead 3 (ground) to the other side as before. Compare the yellow lead 2 wave to the green lead 1 wave on the screen.
5. For every next coil use lead 2 and 3 as in point 4 above and compare them to the first coil, the green wave on 1. Lead 1 and the black lead are not used except as in point 3.3.

TIP: Two or more coils can be connected in series. Make sure that the connections and setup are identical to the Master coil setup.

Return to:

Motor Information

Screen [Page 25](#).

Test Coil against First

Coil - Mod D [Page 64](#).

Foot Switch with Coil Test

[Page 67](#)

DC Tests [Page 69](#) and DC

Surge [Page 72](#).

Store Data, Model B & C Multi Coil Test

Model A: Go to
[Page 69](#)

Model C Surge Test against Master Coil

NOTES:

1) The energized leads, 1 & 2 in the process above, should be connected to the same side of each coil. For coils that are not totally symmetrical test results can be different when testing from different sides of a coil.

2) Coils should not be stacked or lay right next to each other during testing unless they are all connected. Transformer action may change the surge waves.

3) Place coils on a wooden or non-conducting surface. Transformer action from the coils can cause ground currents to run in a metal table and change the surge waves.

Model B and C: Up to 3 coil waves can be stored and compared to each other using the normal AC test. To store the tests use a Customer name (or coil name) and an ID# as normal. For C models other information can be added as normal.

The test process is the same as above. The third saved coil is stored using lead 3 as the energized lead and either lead 1 or 2 as the grounded return lead.

As multiple coils are tested with the same energized lead the tester will put up a message saying "This test has already been performed. Do you want to overwrite the previous test?" Click yes to continue testing.

Model C: Any coil test can be selected as a Master Coil under any Customer name. One can also create a new Customer called "Master Coils", and store tests of the master coils under that customer name. This makes it easy to find master coils.

Designate a Master Coil

Model B:
Go to [Page 69](#)

Test Using a Master Coil Model C

How to Designate a Master Coil (MC) - see System vs ID# MC [Page67](#) :

1. Choose the Customer name on the Motor Selection screen and click on the ID# you want to make a master (assumes master is tested).
2. Click the "View Past Tests" button and find the test you want in the test list. With more than one test, the use of test descriptions is very helpful.
3. Select/Highlight (blue) the test if it is not already highlighted and click the "Set Master Coil" button. The field below the button should be populated with the test Date/Time highlighted. It has now been designated as a Master Coil. See Master Coil Recommendation [Page67](#) .
See pictures on [Page 65](#). C and D model screens are the same.
4. Click the Exit button twice to get back to the Motor Selection screen.

Test Against a Master Coil (MC):

1. If the coil ID# to be tested is also a MC, make sure there is no System MC, and go to step 3.
If not, choose a MC to test against by clicking the X in the MC column on the Motor Selection Screen to set a System MC. A MC is an ID#. If there are several Project #s, all rows with the same ID# will have a green X.
2. Select the Customer and ID#, maybe also Project number for the test.
3. On the Motor Information screen click the "Test vs. Master Coil" button.
4. The Test Summary screen comes up. Enter appropriate information.

NOTE:

- 1)** *There can be mismatches between test voltages for the MC and current Coil since coil test voltages may not use the Test Volts Formula. Therefore a coil test voltage is usually entered in the Test Volts field for a MC. Click OK if a mismatch warning comes up.*
- 2)** *After a warning: The test voltage always defaults to the MC test voltage regardless of what is entered as Test Volts for the coil.*
- 3)** *Recommended Test Voltage listed in reports is what is entered for the coil. This will be wrong unless it is set to the MC test voltage.*
- 4)** *If the ID# for a coil to be tested is used for the complete motor or for tests other than individual coils, do not change the Test Volts. Only one set of Test Volts is remembered for each ID#, and it is the last one entered.*
5. Click on the Setup Tab (bottom left) and check other settings.
6. Click the Surge test Tab. The Master Coil wave (green) will be on the screen, the MC is listed on top of the screen, and the Lead 2 selector button on the right side of the screen is green.
7. Connect Lead 2 to the coil to be tested, and Lead 3 to the other side of the coil. Lead 1 is not used. **See 3.3 plus notes on the previous page.**
8. Click the "Unlock" button (red lightening bolt) and then the red Start/Stop button on the front panel to start the test.
9. If you want to save the test result for each coil click the "Exit" button (folder) to go back to the Motor Selection screen. Click on the same ID#, or if a Project # is used click on the same Project #. The next coil test will get a new date/time stamp and be recorded separately.
10. Click on "Test Coil vs. Master Coil", click on the Surge tab, and start the next test. Repeat the process for each coil.
11. Alternatively, overwrite tests and just save a few. See "Model B&C Multi Coil Test" on the previous page.

MODEL D MULTI COIL TEST

Test Coils against the First Coil


Return to:
Model D, Armature
Test [Page 75](#).
DC Surge Test [Page 72](#)

Model D:

There are three ways to test multiple coils and store all the data.

1. Test all the coils against the first coil tested.
2. Test the coils against a Master Coil (MC).
3. Use the Manufacturing Line/Assembly Line software package. This option is covered in a separate manual.

To save the data create a new or use an existing Customer and ID#. Add a Project number and other test descriptions as normal. With the test voltage set on the Setup screen, go to the Surge test screen and do the following:

1. Test the first coil on lead 1 (button 1 on top right side of the surge screen should be green - the default when you start a surge test).
 - 1.1 Connect lead 1 to one side of the coil and lead 3 (grounded) to the other side.
 - 1.2 Lead 2 is grounded and does not have to be used.
 - 1.3 Connect the black ground lead to the stator or housing if it exists. If not the black ground lead does not have to be connected for a surge test.
2. For the second coil connect lead 2 to the same coil side lead 1 was connected on the first coil and connect lead 3 (ground) to the other side as before. Repeat 1.3.
3. Click the "Next Coil" button in the lower left corner.  Note that coil number 2 appears below the button. Also note that lead 2 is automatically selected, button 2 is green.
4. Start the test (unlock and press Start) and compare the yellow lead 2 wave to the green lead 1 wave on the screen.
5. If the wave difference is more than the %WD set on the Auto Mode screen, the test will be flagged as failed and a yellow Surge Failed message appears in the message line at the bottom of the wave screen.

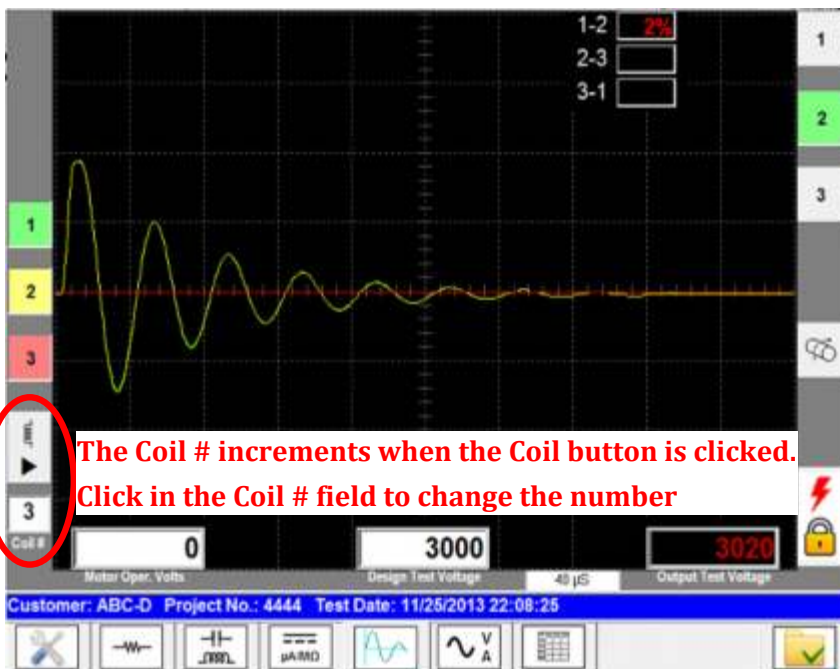
6. For every next coil use lead 2 and 3 as in point 2 above. Click the "Next Coil" button, unlock and start the test. Compare all the tests to the first coil, the green wave on 1. Lead 1 and the black lead are not used except as in point 1.3.

Foot Switch: If the FS-01 is used to energize the tests, the coil number increments automatically with each test, and the unlock button is disabled. Both the Next Coil and the Unlock button have to be pressed one time on lead 2 to get started.

IMPORTANT-CAUTION: The tester will energize and quickly go to full test voltage any time the Foot Switch is pressed.

USE EXTREME CAUTION TO AVOID ELECTRIC SHOCK. A foot switch symbol appears in the right side frame when the FS-01 is used.

See NOTES {Ref}



Test Coils Using a Master Coil - Model D

Any coil test can be selected as a Master Coil. One can also create a new Customer called "Master Coils", and store tests of master coils under that name. This makes it easy to find master coils.

How to Designate a Master Coil (MC):

1. Choose the Customer name, and click on the ID# you want to make a master (for example Master Coils and Master 3 in the picture below).

Customer: MASTER COILS

Motor ID	Project Number	Equipment Tag	Location	MC
MASTER 1		MODEL C345-K		X
MASTER 2		FC 5729		X
MASTER 3		AB-2486		

Click a box in the MC column that has an X to choose the Master Coil, GREEN = active master.

2. The Test Info screen comes up. Click the "View/Print Past Tests" button and find the test you want, see picture below (with a new ID # or Project/Job # there is just one). Additional information can be entered in the Test Description and Repair Stage fields to make this even easier.
3. Select/Highlight (blue) the test if it is not already highlighted and click the "Set Master Coil" button. The field below it populates with the test Date/Time you selected. It has now been designated as a Master Coil.

Return to:
Motor Selection screen [Page 18](#)
Model C Master Coil Test [Page 63](#).

Test Selection - Project No.:

Set Master Coil (circled in red)

11/25/2013 23:59:55
Master Coil

Select Tests From Date Range: 1/1/2008 to 11/27/2013

Find Tests

Tests Found

Test Date	Test Description	Repair Stage	Project No.
11/25/2013 23:59:55	DOWN GOOD	PROOF DATE 11-29-2013	
11/25/2013 23:59:16			

Click in this column to highlight row. Clicking in other columns also works but does not highlight the row.

Display Test | Print Report

4. Click the Exit (folder) button twice to get back to the Motor Selection screen. The MC column for the test will now have an X in a green box indicating it is the active MC. Change the active MC as necessary.

Test Against a Master Coil

To Start a Test: If a MC is used as the ID# for a test, make sure no System MC is set, otherwise the System MC will be used. Go to step 3.

If not, choose a MC to test against by clicking the X in the MC column on the Motor Selection Screen to set a System MC. A MC is an ID#.

If there are several Project #s, all rows with the same ID# will have a green X as each Project used the same MC.

1. Select or set up the Customer and ID# for the coils to be tested, maybe also a Project number for the test.
2. On the Motor Information screen click the “Test vs. Master Coil” button.
3. The Test Summary screen comes up. Enter appropriate information.

NOTE:

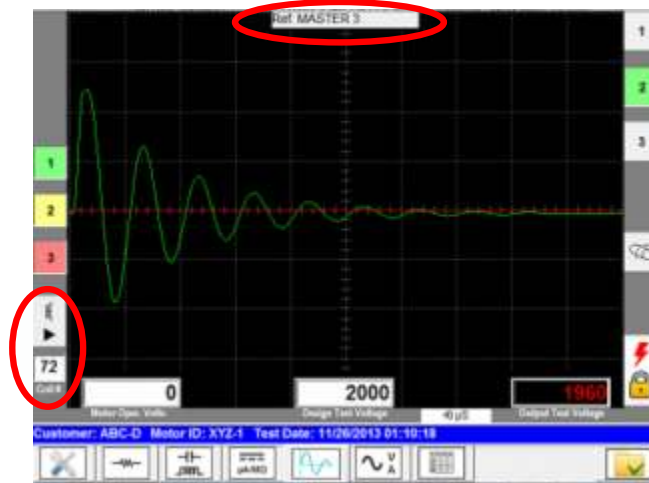
1) There can be mismatches between test voltages for the MC and current Coil since coil test voltages may not use the Test Volts Formula. Therefore a coil test voltage is usually entered in the Test Volts field for a MC. Click OK if a mismatch warning comes up.

2) After a warning: The test voltage always defaults to the MC test voltage regardless of what is entered as Test Volts for the coil.

3) Recommended Test Voltage listed in reports is what is entered for the coil. This will be wrong unless it is set to the MC test voltage.

4) If the ID# for a coil to be tested is used for the complete motor or for tests other than individual coils, do not change the Test Volts. Only one set of Test Volts is remembered for each ID#, and it is the last one entered.

4. Click on the Setup Tab (bottom left) and check other settings.
5. Click the Surge test tab at the bottom of the screen. The Master Coil wave (green) is on the screen, the MC name is listed on top of the screen, and the Lead 2 selector button on the right side of the screen is green.
6. Connect Lead 2 to the coil to be tested, and Lead 3 to the other side of the coil. Lead 1 is grounded and not used. The black ground lead is connected to the frame if there is one. If not, it is not used.



7. Click the “Next Coil” button in the lower left corner. Coil number 2 appears below the button, this is the coil to be tested. Coil 1 is the MC.

8. Start the test (unlock and press Start) and compare the yellow lead 2 to the green lead 1 wave.

9. If the wave difference is more than the %WD limit set on the Auto Mode screen, the test will

be flagged as failed and a yellow Surge Failed message appears in the message line at the bottom of the wave screen. Change the %WD limit if necessary.

10. For every next coil use leads 2 and 3 as in point 6 above. Click the “Next Coil” button, unlock and start the test. Compare all to the Master Coil.

11. The previous yellow wave is taken off the screen when the Coil button is clicked. The green lead 1 Master Coil wave remains on the screen. See picture.

Use of Foot Switch with Coil Testing

Foot Switch: If the FS-01 is connected to the iTIG II, a black foot switch icon appears in the right side frame of the surge screen above the lock/unlock button.



Click the "Next Coil" button. The number 1 will appear under the button. This is the MC coil #. Click "Unlock" and press the FS. Hold it down until the test has finished. Releasing the FS stops the test immediately.

The coil number increments automatically with each test. The first comparison test will be # 2. Both the Next Coil and the Unlock button are now disabled. They only have to be pressed one time after the FS is plugged in and after a new test set is started.

IMPORTANT-CAUTION: The tester will energize and quickly go to full test voltage any time the Foot Switch is pressed.

USE EXTREME CAUTION TO AVOID ELECTRIC SHOCK. A foot switch symbol appears in the right side frame when the FS-01 is used.

System MC vs. ID# MC and Other Tips MODEL C & D

System Master Coil: To set a System MC click on an X in the MC column on the Motor/ID Selection screen. The box turns green. Any time the "Test vs. Master Coil" button is clicked the selected MC will be used.

ID# Master Coil: If no System MC is chosen (no green MC box anywhere), and "Test vs. Master Coil" is clicked, the iTIG II will use the MC for this ID number as the Master.

If there is no MC for this ID# a message will come up saying there is "No Master Coil Selected for this Motor"

System Master Coil Reset: A System MC stays the MC until

1. Another MC is chosen on the Motor/ID Selection screen
2. A blank MC box is clicked
3. A new MC is set for a new ID#
4. Power is turned off on the iTIG II

Return to:
[MC Model C Page63](#)

Find the System Master Coil: To find what is chosen as the System MC, go to the Motor/ID Selection screen, click "All" in the Customer pull down menu, and scroll down the ID# list until you find the MC that is set (green MC box).

Master Coil Setup Recommendation

If a Master Coil is used repeatedly we strongly recommend it be stored under a customer name called MASTER COIL.

The ID# can be descriptive so it is easily recognized by the test operator. The Equipment Tag and Location fields can be used for further descriptions. They are attached to the ID# for the Master, not to the ID# or the motor or coils that are tested.

The MASTER COIL "customer" directory can have an unlimited number of MC ID#s stored in it. Again, using the Equipment Tag and Location fields for additional information on the Master Coil may help to quickly identify which Master Coil to set as the System Master Coil for the test to be done.

Multi Coil Bar Graph Model D

To view multi coil %WD test results in a bar graph when the “Next Coil” button has been used (the coils must have been numbered), click “View Past Tests” on the Motor Information screen. (See [Page 25.](#)) The Test Selection screen below appears. There will be a column next to the Test Date column with the coil number.

Press and drag the highest coil number down to the lowest number to highlight all rows. One can also use the standard Shift+Click Windows command to choose a range of coils with a keyboard.

Test Selection - Project No.: 4444

Set Master Coil [] Master Coil []

Select Tests From Date Range: 1/1/2008 to 12/1/2013

Find Tests [] Delete Test []

Include All Projects

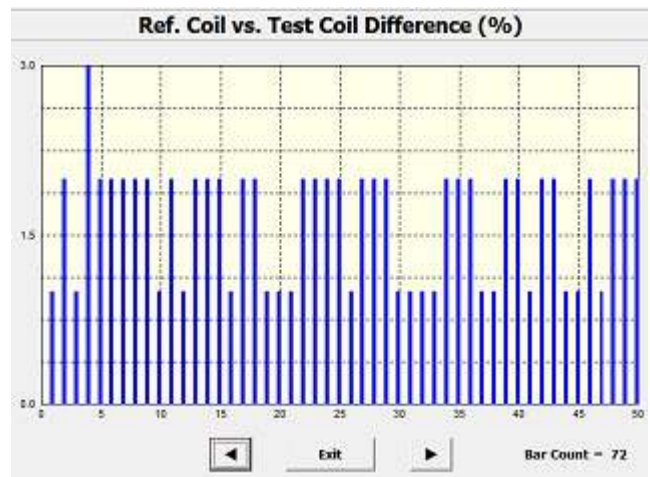
Tests Found: Select Test For Further Action / Click on Column Heading to Sort

	Test Date	Test Description	Repair Stage	Project No.
72	11/30/2013 12:22:14	FC-1234	FOR M-ABC-1234	4444
71	11/30/2013 12:22:12	FC-1234	FOR M-ABC-1234	4444
70	11/30/2013 12:22:11	FC-1234	FOR M-ABC-1234	4444
69	11/30/2013 12:22:10	FC-1234	FOR M-ABC-1234	4444
68	11/30/2013 12:22:09	FC-1234	FOR M-ABC-1234	4444
67	11/30/2013 12:22:07	FC-1234	FOR M-ABC-1234	4444

Bar Graph [] Display Test [] Print Report []

Click the “Bar Graph” button.

Click the right arrow below the bar graph to see more bars if there are more than 50 coil numbers.



Return to:
View Past Tests [Page 57](#)
DC Surge Test [Page 72](#)

Each coil has its own bar and is compared to the Master Coil. Click a coil number on the Test Selection screen above, then click on the Surge Tab on the Test Summary screen that comes up.

Click the Previous Test button and the previous test is shown. Keep going back until all tests are seen.

To review again, go back one screen by clicking the “Folder” button, click “Display Test” and start over.



CHAPTER 10 DC Motor Tests

Read the chapters on performing AC motor tests before reading this chapter.

Model A uses the AC motor and multi coil processes to test DC motors. See [Page 36](#) to Page 51. **Continue with the “Megohm and Hipot” paragraph below.**

DC SCREEN BUTTONS

Model B, C & D: When testing DC motors make sure “DC” is selected on the “New Motor” information screen, *B model* [Page 24](#), *C & D model* [Page 25](#). If not, change the selection on the “Motor Information” screen before the test is performed.



In DC mode many screens are different than in AC mode.

The setup screen has buttons for MOD (Module or Stator), ARM (Armature), SER (Series Fields), SHNT (Shunt) and INT (Interpole) so test data for each type can be stored individually. The selected coil type button turns green when clicked.

NOTE: *The coil type selected with any of these buttons will automatically be entered in the Description field on the Test Summary screen, BUT ONLY if the field is empty. To change coil type in the Test Summary description field re-enter the coil type directly in the field, and make sure it matches the selected button on the Setup screen.*

The Field coils are referred to as SER, “Series”. This is because the fields, shunts and interpoles may be tested as one instead of individually. In this case choose “Series” as the location to store the test data.

TESTS & MEASUREMENTS

Resistance: Follow instructions on the screen. Click in the DC Coil Ω field and measure resistance between leads 1 & 2 in each case. For information on Armature Bar to Bar resistance measurements, see [Page 72](#).

CLZ: If this option is included select the type of coil and then click one of the two measurement buttons. Capacitance is always measured with leads 1 & 2 between the winding and the frame or shaft.

Megohm and Hipot: As in AC mode, DAR, PI and Step Voltage tests can be done. Each one is automatic with Model C & D. The screens are the same as in AC mode for all models and the tests are done the same way.

Surge: Only leads 1 & 2 are used. DC coil tests use the same process as Multi Coil tests in AC mode. The main difference is that the coil type (MOD, ARM, SER etc) can be chosen for B-D models.

DC TEST SETUP

Model A: The Setup screen is the same in AC and DC mode. See [Page 28](#). Enter the test voltage for Surge tests into the Test Volts field in the formula. For the other tests dial the voltage up to the appropriate voltage as in AC mode.

Meg and Hipot tests are done the same way AC motors are tested. **Go to [Page 71 DC Module/Stator Test](#).**

Model B: Choose the coil type to be tested with the buttons on the right side. Then enter the Surge and Hipot test voltages. There is no standard formula for DC test voltages, use company policy. Armature Span Test Surge voltage calculations are covered later in this chapter ([Page 74](#)).

Adjust Overcurrent Tripout if necessary and enter Winding Temperature to automatically have the iTIG II calculate standardized resistance for both winding resistance and insulation resistance (megohms).

DC Motor Setup Screen Model B & C.

The screenshot shows the DC Motor Setup screen with the following data:

Field	Value
Surge Volts	1800
Hipot Volts	2500
Overcurrent Tripout Level (µA)	500
Winding Temp. (°C)	29
Motor Type	DC

Customer: A Motor ID: 16356 Test Date: 12/1/2013 12:46:33

Model C: When clicking the “Test” button on the Motor information screen the Test Summary screen comes up. Enter in the information and click the Setup screen (lower left Tab). See picture above.

Clicking on the coil type automatically populates the Test Description field on the Test Summary screen, BUT ONLY if it has not already been filled. See NOTE on the previous page.

Enter the Surge and Hipot test voltages. There is no standard formula for DC test voltages, use company policy. Armature Span Test Surge voltage calculations are covered later in this chapter ([Page 74](#)).

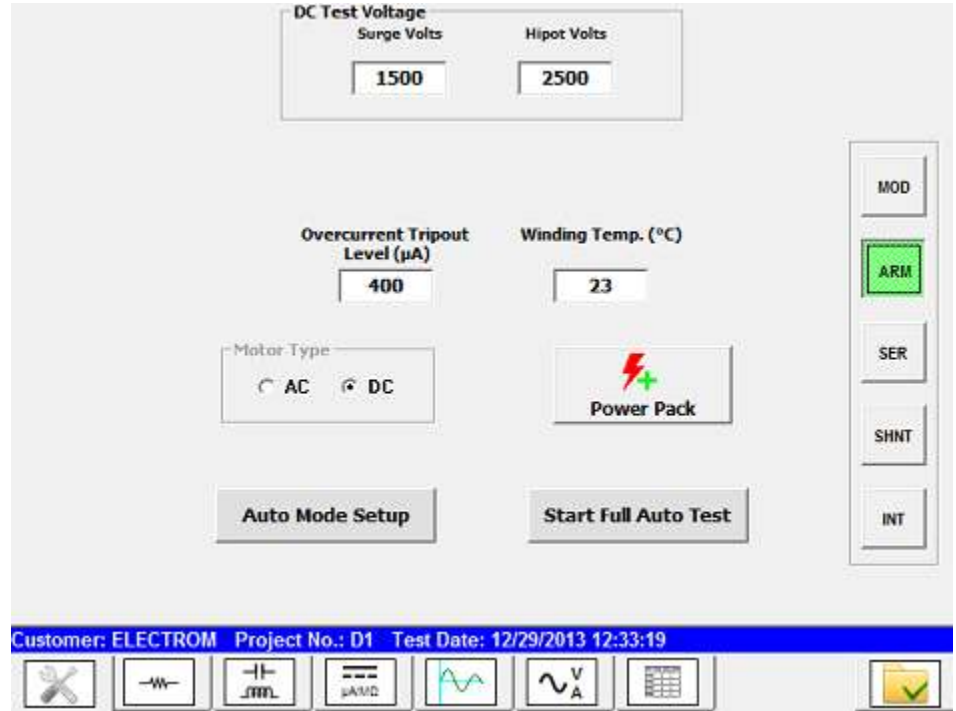
Adjust Overcurrent Tripout if necessary and enter Winding Temperature to automatically have the iTIG II calculate standardized resistance for both winding resistance and insulation resistance (megohms).

Model D: When clicking the “Test” button on the Motor information screen the Test Summary screen comes up. Enter in the information and click the Setup screen (lower left Tab). See picture.

Clicking on the coil type automatically populates the Test Description field on the Test Summary screen, BUT ONLY if it has not already been filled in. See NOTE on the first page of this chapter ([Page 69](#)).

Enter the Surge and Hipot test voltages. There is no standard formula for DC test voltages, use company policy. Armature Span Test Surge voltage calculations are covered later in this chapter ([Page 74](#)).

DC Motor Setup Screen Model D.



Auto Mode Setup: Use it to choose test profiles as in AC mode.

Start Full Auto Test: The iTIG II output leads must be moved during the tests, so there is no fully automatic sequence of tests although individual tests can be done automatically from the Test Tabs.

DC MODULE/STATOR TESTS

Resistance, Meg & Hipot

Module/Stator Coil Tests, with Armature Removed:

DC motors may have several different Module/Stator coils, for example Series Fields, Shunts and Interpoles. They can be tested together in Meg, Hipot and Surge. If a fault is found, the coils will have to be tested in groups or individually to find the problem coil (disconnected from other coils) unless one can see or hear a spark location.

Resistance, Meg and Hipot:

Connect output lead 1 to the coils (for resistance also lead 2 to the other side of the coil) and the black ground lead to the frame. Make sure there is a good ground connection on unpainted metal.

Select the motor to be tested and click “Test Motor” button.

On the Setup screen check that test voltages are correct. Click on the Resis-

tance or on the Meg/Hipot test tab at the bottom and proceed with any of the tests in manual or automatic as in AC mode.

Surge Comparison

Return to AC Motor Surge Test [Page 46](#).

Surge Comparison of DC Module/Stator Coils:

Model A does not store any data. When surge testing DC motors use a similar procedure as for AC motor Surge tests.

Stators: Separately test each coil type in the group (e.g. compare interpoles to each other). Test the first coil or group with Lead 1 (lead 2 connected to the other side of the coil, lead 3 is grounded and does not need to be connected).

Then move the leads and test each additional coil with Lead 2 (leads 1 connected to the other side of the coil). Compare the new tests to the first test done with Lead 1.

If the first coil appears to be bad, put a different coil on Lead 1 and retest.

If there is only one coil test it from both sides and compare the results.

Model B -D: Test and compare each coil type in the group separately (e.g. compare interpoles to each other, field coils to each other etc.). With C and D models the whole module can be tested if a Master Coil exists for the motor.

1. Connect Lead 1 to one side of a coil (or group of coils that can , Leads 3 to the other side. Lead 2 is grounded and not used.
2. The test voltage will be determined by the Test Voltage entered on the Setup screen (see previous page).
3. Click “Unlock” and start the test with the red Start/Stop button.
4. Click the 2 selector button on the right side of the screen.
5. Move lead 2 to a new coil, and lead 3 to the other side of the new coil. Lead 2 should be on the same side of the coil as lead 1 was on the first coil test. Lead 1 is now grounded and not connected. Click “Unlock” and start the test.
6. Repeat step 5 for the next coils. Click “Yes” to over-write the previous test. Wave 1 and the last wave (test) on 2 will be stored and be part of a report.

Model C & D: All the coil tests can be stored if the Multi Coil or Master Coil test process is used. The process is the same as in AC mode. See instructions starting on [{Ref}](#) for Model C, and for D models Page 59 and [Page 64](#) to 65.

ARMATURE TESTS

Bar-to-Bar Resistance Model D (Requires version F hardware)

Armature Tests and ATF (Armature Test Fixture)

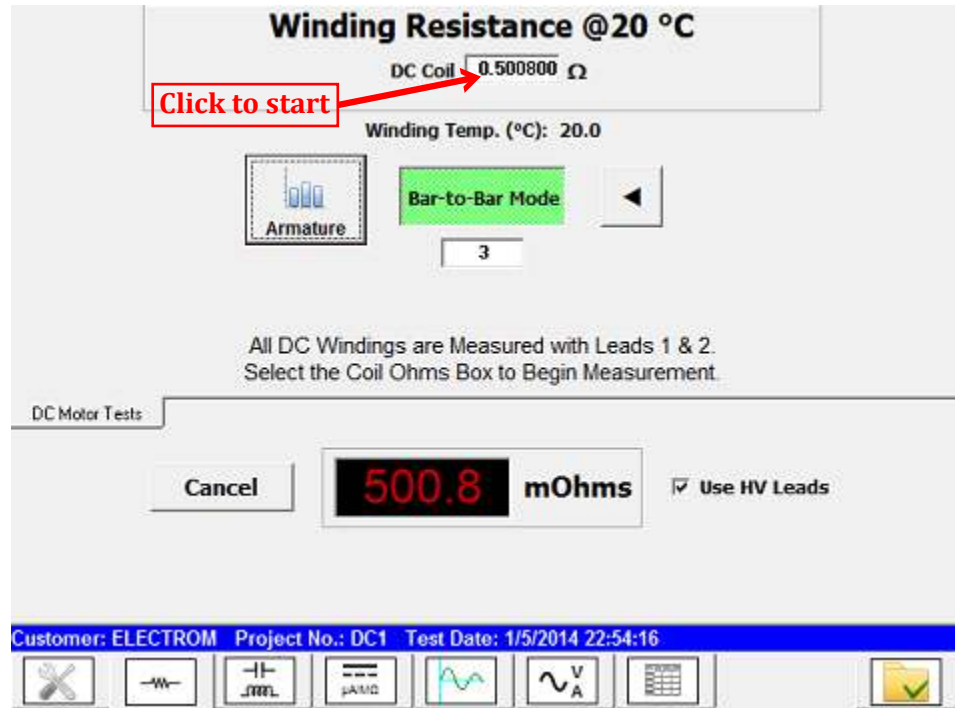
When tests are done on an armature, it can sit on the floor or on an insulated bench with the commutator up unless fixtures are required to hold it.

Model D: Bar to Bar Resistance Measurement

Click on the resistance measurement tab and then on the “Bar-to-Bar Mode” button.

1. Connect probes to leads 1 and 2 and press them against adjacent bars.
2. Click in the Armature Ω field to start.
3. The bar count is automatically advanced after the measurement is done. If the measurement needs to be repeated, click on the left arrow to decrement the count (can only decrement once). See next page.

4. Move the probes to the next bars and click the Armature Ω field to start the next measurement. Go all the way around the armature if necessary.



Return to:
DC Tests and Measurements [Page 69](#)

5. Click the Armature bar graph button to display a bar graph of the results for easy identification of potential problems. The bar graph can be seen in the TRPro reporting software and can be included in reports.

Meg and Hipot All Models

Meg and Hipot Tests:

These tests are best done with all the bars on the commutator shorted to each other. It is not strictly necessary. A bare wire or metal band wrapped around the commutator is often used.

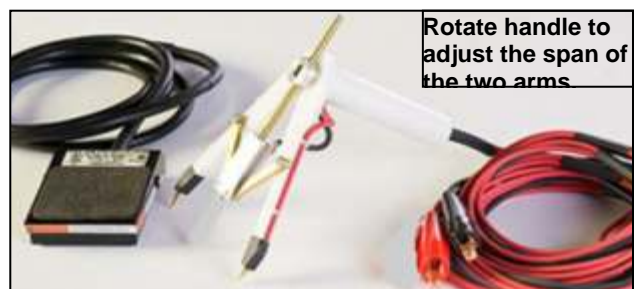
Connect output lead 1 to the commutator, and the black ground lead to the shaft. Make sure the ground connection is solid, otherwise faulty tests will result. If a bolt is screwed into the end of the shaft for the ground connection, make sure it is tight and not greased.

Surge Comparison All Models

Surge Comparison Span Test

Span Tests are done with the Armature Test Fixture (ATF-11) or other span fixtures. The Foot Switch (FS-01) can be used to turn the test on. To determine if there is a fault, only a few tests on the armature are normally required.

Connect output lead 1 to the red lead on the ATF, and output lead 2 to the black lead on the ATF. Lead 3 is grounded and not used.



Connect the black ground lead from the iTIG II to the shaft of the armature. Make sure the ground connection is solid, otherwise faulty tests may result.

Plug the Foot Switch into the iTIG II receptacle.

Loosen the arms of the ATF by turning the handle counter-clockwise. Open the arms to span an optional number of bars, and turn the handle clockwise to lock the arms in place.



The Number of Bars to Span is determined by 1) the inductance bar to bar (less means more bars must be spanned to get a good ringing wave), 2) the test voltage required per bar, 3) the maximum voltage used with the ATF (typically 2500V for safety reasons), and 4) the presence of shorting jumpers or equalizers.

Armature Test Voltage

Armature Test Voltage for a Span Test

Test voltage = (AOV/#Bars) x Factor x Span

- AOV = Armature Operating Voltage
- # Bars = Number of Bars between brushes
- Factor = Factor to multiply the voltage per Bar by. It should be a minimum of 2, usually much higher
- Span = Number of Bars spanned by the ATF

Example 1: Test Volts = (600V/20Bars) x 7 x 6 Bars Span = 1260V

There are conventions such as a fixed number of volts per bar (usually 500V or less). Multiply the volts per bar by the number of bars spanned to get the test voltage.

Example 2: Test Volts = 300 V x 6 =1800 V

NOTE: Limit the total voltage to a maximum of about 2,500V when using the ATF, and to equal or less than the hipot voltage.

Equalizers may force a change in the span if a single wave pattern cannot be repeated after a few tests. If so, change the span and start over. The same number of equalizers must be spanned in each test.

NOTE: If an equalizer is spanned, a dead short would be tested and no waves produced.

Different Wave Patterns: An armature may have two wave patterns that repeat around the commutator. For example a set of a few tests will be within 3% WD and another set within 9% WD. This is not a problem and is a result of how the armature is wound.

Tip: Especially with narrow bars, wrap the commutator with masking tape. Push the ATF brass pins through the tape. This will prevent the ATF from slipping as easily. Mark the positions of the ATF pins.

Return to:
DC Setup [Page 70](#)

Start Test: With the ATF held in place on the commutator, press the red Start/Stop button or the Foot Switch to start the Surge test.

Foot Switch: Press and hold the FS until the test is done.

IMPORTANT-CAUTION: *The tester will energize and quickly go to full test voltage any time the Foot Switch is pressed.*

USE EXTREME CAUTION TO AVOID ELECTRIC SHOCK. *A foot switch symbol appears in the right side frame when the FS-01 is used.*

Model B & C:

Move the ATF in either direction on the armature so that ATF arm 1 is placed where arm 2 was (or the other way around). See picture above.

Start another test. The 1st (green) and 2nd (yellow) waves should overlap. If not there is a fault or a different number of “good” equalizers involved. The %WD is calculated and displayed in the upper right hand corner.

Move the ATF again and do a 3rd test. The iTIG II will say: “This test has already been performed. Do you want to overwrite the previous test?” Click Yes. Repeat the process as many times as desired. Often only a few span tests are required to determine if an armature is good or bad.

The iTIG II stores the first and last tests performed. In order to store more tests a new test date/time is required. Go back to the Motor Selection screen and restart the test sequence to save more tests. The tests will be in separate reports, but can be combined using a PDF editor after they are printed to PDF.

Model D: To do a 3rd test (and more) and store the result, click the “Next Coil” button which is the arrow with a coil above it. The yellow wave will disappear, letting you know that the iTIG II is ready for the next test. The date/ time is automatically updated so both the previous and next tests are stored. The process is the same as for Multi Coil AC tests. Study this Chapter, see [Page 64](#).



Compare each wave to the green lead 1 wave first tested. You can store as many test waves as you want. If the armature is good, storing all waves may not be necessary. If the armature is bad storing a few good and a bad wave may be sufficient. Make sure a “bad” test is not a Wave Pattern issue as described on the previous page.

Foot Switch: Press and hold the FS until the test is done. If the “Next Coil” button has been pressed the coil number will automatically advance.

IMPORTANT-CAUTION: *The tester will energize and quickly go to full test voltage any time the Foot Switch is pressed.*

USE EXTREME CAUTION TO AVOID ELECTRIC SHOCK. *A foot switch symbol appears in the right side frame when the FS-01 is used.*

Surge Waveform Analysis

DC Armature Waveform Analysis

A frequency shift in the waveforms may be the result of shorted turns. Also see “Different Wave Patterns” on the previous page.

Make sure the commutator is clean. Carbon dust and metal particles left between the bars may cause shorting or arcing.

NOTE: Do not test an armature while it is lying on a bench made of metal or other conductive material. Some rubber pads may contain embedded conductive materials that can affect the test results.

The waveforms from separate span tests may exhibit some separation. Particularly on random wound armatures the coil turn lengths may vary due to coil overlap. This changes the capacitive and inductive characteristics of some of the coils slightly. Therefore, small separations in the peaks of the waveforms with a slight frequency shift are acceptable if the waves are stable and they appear very similar.

NOTE: To see what a fault looks like, randomly short two bars near the ATF and then between the arms of the ATF.

Finding Fault Location

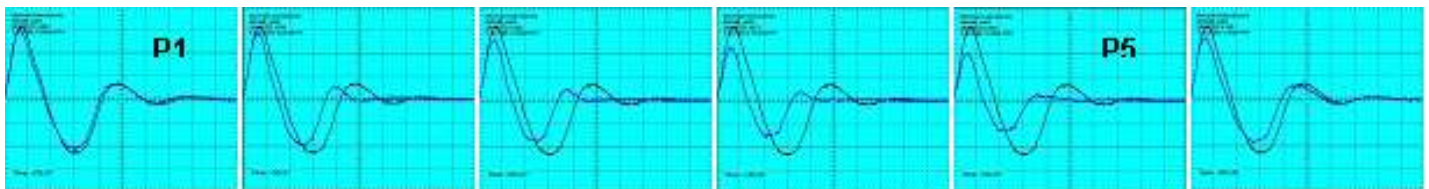
Finding a Fault Location with a Span Test

If a fault is detected and sparks or arcs are not visible to identify where the fault is located, first make sure the slots are clean and that there are no obvious issues with the risers such as shorts or cracks.

Next, follow the procedure below:

Continue to make tests moving the ATF in the same direction around the commutator. If there is a fault the shift and the %WD will become larger as the ATF approaches the fault location. If it gets smaller, move the ATF in the opposite direction so the shift becomes larger. This is the shortest way to the fault.

Picture below: P1: the 2nd wave is about equal to the first wave. As the ATF



is moved, the shift between the waves increases until P5 - the fault location. As the ATF is moved further, the shift decreases. Different wave shapes will be seen with different armatures, lap vs wave wound, no. of turns, equalizers etc.

When the ATF spans the fault, the wave may collapse. As the ATF moves away on the other side of the fault the shift and %WD will decrease.

To narrow down where the fault is located, reduce the ATF span to minimum and follow the procedure above starting with a new wave on lead 1.

Alternatively, use a bar to bar test fixture, or connect the iTIG II output leads to probes and use the probes to find the exact location after the span test has narrowed it down to a small area.

If the inductance in the coils is very low, it may be necessary to span a few bars to get a good wave.

ASSEMBLED DC MOTOR

Assembled DC Motor Tests

To test the stator coils, lift the brushes from the commutator to avoid interference from the armature windings.

To test the armature,

1. Connect leads 1 and 3 to adjacent brushes.
2. Make the first test on lead 1 as usual.
3. Rotate the armature so the brushes connect to the next bar.
 - 3.1 Click selector button 2 or with the D model click the "Next Coil" button.
 - 3.2 Test with lead 2 connected instead of lead 1.
4. Repeat 3 above around the commutator. It may not be necessary to test from every bar.

CHAPTER 11 CLZ Measurements

MODEL C & D OPTION: CAPACITANCE, INDUCTANCE, IMPEDANCE, PHASE ANGLE

Model A and B:
Go to [Page 81](#)

These measurements plus calculations of the Dissipation factor (D) and Quality factor (Q) are an option for the C & D models.

The measurements are used when additional analysis is required. They may be useful for predictive maintenance when data is compared over time.

Model C: Use the extra lead set, and plug it into the R/CLZ connector.

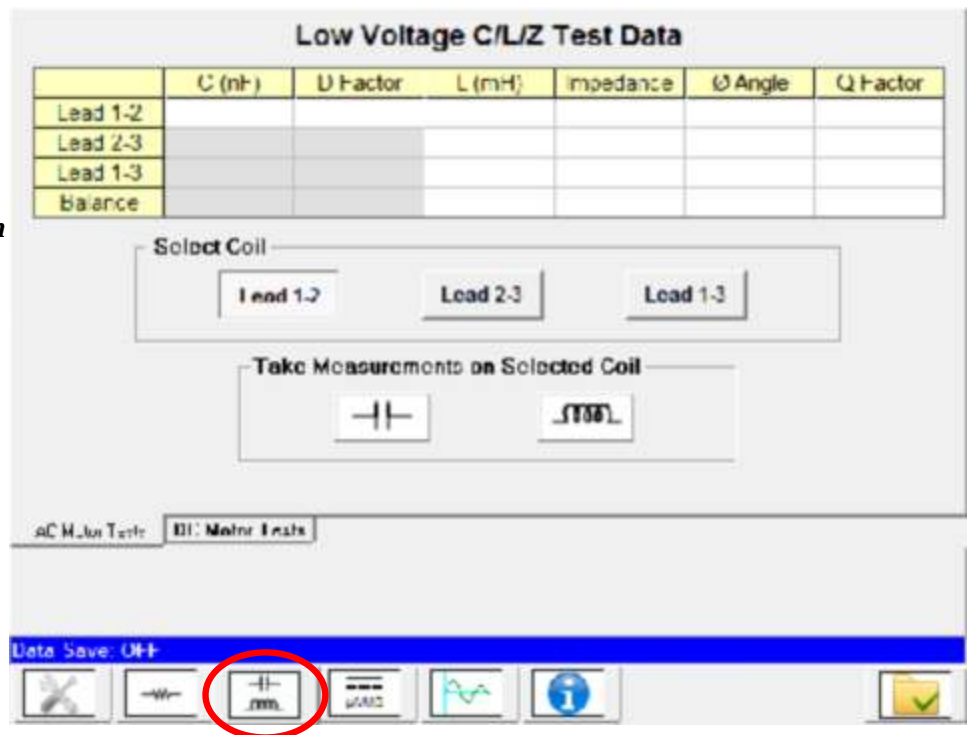
Model D: Use the high voltage leads.

The measurements are typically done before or after the coil resistance.

Inductance, Impedance and Phase Angle:

1. Connect the 3 Leads to the motor phases. If a resistance measurement was just done, leave the leads as is.
2. Click on the "Coil" button. An hour-glass cursor will appear until the measurement is finished, typically a few seconds. The measurements will appear in the CLZ table in the Lead 1-2 row when done.
A single measurement will produce the coil inductance, impedance (at f=1 kHz.), impedance phase angle, and Q (quality factor.)
3. Click the "Lead 2-3" button and then the "Coil" button and wait for the data to appear in the Lead 2-3 row in the table.
4. Repeat for Lead 1-3.

CLZ Screen



Return to:
Chapter 6, Perform
Tests [Page 36](#)

Capacitance: Measured between the winding and the frame of the motor. Always connect lead 1 to the winding and lead 2 to the frame for this measurement. Lead 3 is not used.

5. Click "Lead 1-2" button on the screen
6. Then click the "Capacitor" button.

7. An hour-glass cursor will appear until the measurement is finished, typically a few seconds.

The Balance index is calculated like the Max Delta R % for resistance. It is the the max delta for the quantity being measured (e.g. inductance, impedance etc.) as a % of the average of the three measurements.

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Chapter 6, Perform
Tests [Page 36](#)

As with the 3 phase resistance measurements, a Balance will be calculated after the Lead 1-3 measurement is made (Leads 1-2 & 2-3 must have been measured first).

CHAPTER 12 Online Measurements

AC & DC ONLINE MEASUREMENTS MODEL C & D

Online measurements are made with other instruments while the motor is running.

This screen is available so online data can be entered into the iTIG II and be part of a comprehensive report, especially for tests done in the field.

This may be important if it is found that the voltages and currents in a 3 phase AC motor are unbalanced, or the voltage and current in a DC motor are off spec.

Click in the fields and enter the data with the on screen keypad.

Online Screen AC
Click here.

AC Online

	Volts	Amps
Lead 1	<input type="text"/>	<input type="text"/>
Lead 2	<input type="text"/>	<input type="text"/>
Lead 3	<input type="text"/>	<input type="text"/>
RPM	<input type="text"/>	Efficiency % <input type="text"/>
Motor Rating <input type="text" value="UNKNOWN"/>		

AC Online Tests

Customer: LLLCTROM Project No.: JOB-3948 Test Date: 1/22/2013 05:14:30

✕
⚡
⚙
≡
📊
⚡ V A
ℹ
✅

Test Summary

Test Information

Test Description:

Repair Stage:

Test Equipment #: Operator: Power Pack #:

<p>Ohms Balance</p> <p><input type="text" value="PASS"/></p>	<p>MegOhm</p> <p><input type="text" value="PASS"/></p>	<p>Off-Line Motor Rating</p> <p><input type="text" value="PASS"/></p>
<p>Surge</p> <p><input type="text" value="PASS"/></p>	<p>Hipot</p> <p><input type="text" value="PASS"/></p>	<p>On-Line Motor Rating</p> <p><input type="text" value="UNKNOWN"/></p> <p>PASS</p> <p>MARGINAL</p> <p>FAIL</p>
<p>Hipot Step Test</p> <p><input type="text" value="PASS"/></p>		

Customer: XYZ LTD Project No.: WO 45791 Test Date: 9/29/2013 22:51:59

When the "Test Summary" Tab is clicked, the window to the left appears. Click the pull down menu and select one of the Online Motor Rating shown.

This rating will be included in the report. It can be changed when the report is generated in TRPro on a PC.

If not entered at the time of the test, it can be entered in TRPro later.

A similar screen is available when a DC motor is selected.

CHAPTER 13 Software Updates and Upgrades

SOFTWARE UPDATES

What: Software Updates are free updates to the iTIG II software that include software maintenance and bug fixes as well as new features that become standard features for the various models.

How to Get the Update: Electrom will notify you from time to time via email that an update is available. The software is sent via email in a compressed (zip) folder or downloaded using a link provided by Electrom.

Transfer Software Update from PC to iTIG II: The attached or downloaded folder should be opened, unzipped and extracted, and the contents (a single folder named "ITIG II - Software") should be copied to a USB Flash Drive (FD). It is easiest to use the FD that came with the instrument since it is already set up to perform updates.

How to Install: Insert the FD into one of the ITIG II USB ports.

Model A: Click the Info Tab on the Setup screen and click "Update Software".

Model B, C & D: Click the "Sync Files with Flash Drive" button on the bottom of the Motor Selection screen

The system automatically checks to see if the software on the FD is a newer revision than the software on the iTIG II. If yes, the user is asked if they want to perform the update. Click Yes and then click the check mark when done.

After the software update has been installed, turn off the power with the switch in the back of the iTIG II, wait a few seconds and restart the iTIG II. Check the new version number on top of the first screen to confirm the update.

NOTE: The software for the ITIG II is always stored in the "C:\Program Files\ITIG II - Software\" directory.

MODEL UPGRADE

Upgrades to Higher Level Models or Additional Options

All models can be upgraded to a higher level model with software, for example from Model A to Model D. Options can also be added with software. Some options and the change from 4 to 7 output leads with Model D require additional hardware and the iTIG II may have to be sent back to the factory for the upgrade.

Model level software upgrades are accomplished the same way as software updates.

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CHAPTER 14 Data Transfer for Reports

ITIG II TO PC / PC TO ITIG II

Transfer of data from the iTIG II to a PC, and from a PC running TRPro report software to the iTIG II, can be done by synchronizing the iTIG II and PC with a USB Memory Stick.

A button, “Sync Files with Flash Drive”, is displayed at the bottom of the Motor Selection screen in both the iTIG II and TRPro. With the USB Flash Drive plugged in, click the button to synchronize data.

The following data is transferred:

- Test Data: All new files are copied both ways.
- Customer and Motor Information: All new files and modified files are copied both ways.
- Report cover page, logo, templates (in ITIG II): PC to Flash to ITIG II only.
 - The cover page & logo always override files on the ITIG II even if the Flash Drive files are older.
- Auto Sequences files (in ITIG II D): PC to Flash to ITIG II D only. These files contain the default auto test profile options available on the Auto Mode Setup screen.

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If a new USB Flash Drive is used, add the following directories to it:

1. ITIG/Customer (Customers is under the iTIG directory).
2. ITIG II/Auto Sequences

The directories do not need any content. The ITIG and ITIG II directories must both be at the highest level on the FD. If there are many files stored in the iTIG II, the first transfer to a new FD can take some time,

Network Transfer of Data

Network Syncing

 **CAUTION** 

The iTIG II does not have virus protection software. When connected to a network it can be attacked by viruses even though the iTIG II is set up to only transfer data out to a server.

NOTE: Virus attack problems are not covered under warranty!

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A button (Transfer Files Over Network) is displayed on the main motor list screen when this option has been purchased. It comes as a standard with the Model D.

Data is transferred from the iTIG II to a server as follows:

- Test data: All new files copied to server (not server to iTIG II).
- Customer and motor information: All files copied to server (latest dated files only)

Transfers from a server to the iTIG II is not enabled for virus protection reasons.

Network Setup for the iTIG II:

In the iTIG II, the file "Net Connect Info.txt" must be created.

It is stored in the same directory as the ITIG II program: My Computer\C:\Program Files\ITIG II - Software.

The file contains the login information for the destination server.

When the network sync button ("Transfer Files Over Network") is clicked the system uses the information in this file to login to the server.

There are 3 required text lines in the file:

1. The Share path for the server (address)
2. The login User ID
3. The password

From the iTIG II you may need to use the "Map Network Drive" tool to set up the connection.

Using Remote PC/Server for TRPro Report Data (not your own PC)

How it works: When TRPro is started up on a PC it looks for the test data directory "ITIG\Customers" on the C: drive of the same PC. If it isn't found it looks for the file "TRPro Data Directory.txt" in the directory that contains the TRPro software program (this will usually be "c:\Program Files\ITIG II - Software").

If this file exists it must have a pointer to the remote PC that contains the ITIG\Customers directory which is used for storage of the test data and other information.

This pointer file must be 1 line of text which is the drive letter for the mapped network drive of the remote machine (for example T:).

Setup Process: To use a Server for storing the test data do the following:

1. YOUR PC: Remove the 'ITIG\Customers' directories from your PC. If it contains data files rename the ITIG directory to "ITIG Old" to save it, or make sure the directories/files are on a USB Flash Drive so they can be transferred to the server after setup.
2. Create the file on your PC that will tell TRPro where to find the data.
 - 2.1 Open Notepad or similar text program to create the "txt" file. The text file should only contain the drive letter where the TRPro test data will be stored followed by a colon, no additional spaces, for example X:
 - 2.2 Alternatively the test data can be stored in a different location on this drive, for example in a folder called Reports located under another folder called Tests. In this case the only content of the text file should be: X:\Tests\Reports

3. Save the text file as: TRPro Data Directory (must be a .txt file)
Save it to your PC in the TRPro software directory "C:\Program Files\ITIG II – Software".
4. A new drive can be created on the server (with a letter other than drive letters on your PC) by using the Map Network Drive windows command under Home Group/Tools, or access it from Computer/Map Network Drive.
5. SERVER: Create the following directories on the server under the address specified by the "TRPro Data Directory.txt" file you created on your PC (for example the X drive):
 - a. X:\Tests\Reports\ITIG\Customers
 - b. X:\Tests\Reports\ITIG II\Auto Sequences

NOTE: If the "ITIG\Customers" directories are not found on the local PC and a remote directory isn't specified, then TRPro will automatically create the ITIG\Customers directories on the local PC's "C:" drive.

NOTE: The directories can only be in one location, on one PC or on one Server. If they are on both a local and remote PC, files will only be synchronized with the local PC.

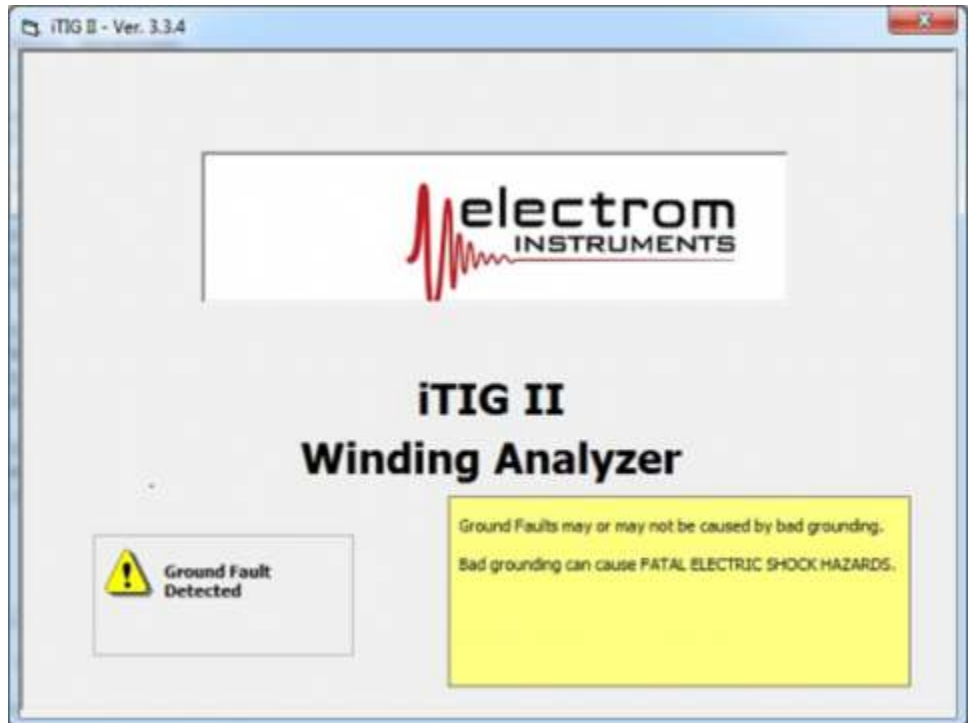
Synchronizing Files with a Server or Remote PC:

1. Ethernet:
Connect the Ethernet output in the back of the iTIG II to a network. Follow the instructions under Network Setup on [Page 82](#). Click the "Transfer Files Over Network" button on the Motor Selection screen.
2. Use a Flash Drive (FD) .
 - a. Plug the FD into the iTIG II and click the "Sync Files with Flash Drive" button at the bottom of the Motor selection screen.
 - b. Plug the FD into a local PC that has TRPro installed and that is set up to get its data from the server/remote PC. In TRPro click "Sync Files with Flash Drive" on the Motor Selection screen. The data will be transferred to the Server.
Requires software version 3.2.x or higher.
3. Use a Wireless connection. Contact Electrom Instruments for more information on how to set this up and what USB wireless adapter to use.

APPENDIX 1 Ground Fault Warning

The Ground Fault Detected message will show on the Start screen if one or both of the following conditions exist:

1. The power connected to the iTIG has a poor or missing ground.
2. The power has reversed polarity, i.e. line and neutral has been switched in the outlet the power cord is connected to.



CAUTION

A poor ground can cause the voltage potential of the tester to rise to dangerous levels during testing. DO NOT TOUCH THE TESTER UNDER SUCH CIRCUMSTANCES EXCEPT to TURN OFF POWER. FATAL ELECTRIC SHOCKS ARE POSSIBLE.

If the Start/Stop button is pressed: Nothing will happen, it is locked out, a test will not start.

REQUIRED ACTION: Find out where the fault is and fix it, or use a different power outlet. Note that the faults often are in extension cords and reels.

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NOTE: The iTIG II can be configured with an override so the tester can be used without a ground in special applications (upon customer request).

IMPORTANT: *Overriding the the lockout should only be done by well trained and knowledgeable personnel who know how to work and operate safely with high voltages when there is no ground present.*



Glossary of Terms

ATF	Armature Test Fixture	Used to surge test spans on a DC armature.
DAR	Dielectric Absorption Ratio	Meg Test, 1 minute divided by 30 second megohm values.
DTV	Design Test Voltage	The recommended maximum voltage to take a hipot or step voltage test to.
HIPOT TEST	High Potential or Dielectric Strength Test	Tests the strength of the insulation to ground (frame). Can be a DC or AC test done at an elevated voltage. The iTIG II does a DC Hipot test.
IR TEST or MEASUREMENT	Insulation Resistance in Megohms	Also called megohm or meg test
MEG TEST / MEASUREMENT	Megohm Test	Measures the resistance to ground (frame) in megohms, usually at 500 or 1000V DC, higher voltages for larger equipment.
PI TEST	Polarization Index Test	10 minute megohm divided by the 1 minute megohm results from a meg test. Due to modern insulation, this test is mostly done on form coil motors and motors built before polymer insulation was used.
ROC	Rate of Change Factor	Maximum rate-of-change (ROC) allowed in a Step Voltage Test.
STEP VOLTAGE TEST	DC Hipot test done in voltage steps to assess the strength of the ground insulation	The leakage current to ground (frame) is monitored. It should increase proportionally to the voltage. If the current accelerates as the voltage is increased, it indicates a breakdown of the insulation.
SURGE COMPARISON TEST	Test of the insulation strength phase-to-phase, coil-to-coil and turn-to-turn	Multiple Surge Tests are compared to each other. A surge test sends pulses into coils and windings at an elevated voltage, and uses the ringing waves resulting from each pulse to compare one test to another.

