ELECTROM INSTRUMENTS

iTIG II MINI
Winding Analyzers

Instruction Manual

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 Page72*
On page 82: *(Return to Data Entry Methods Page13.)*

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

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.

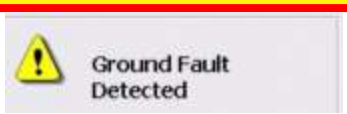
Safety Warnings and Cautions
Warnings, Cautions, Important statements and Notes are provided throughout this manual to protect personnel and equipment.
Read each message carefully before proceeding to the next step to avoid serious and potentially fatal injury from electric shocks.

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 devises 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

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).

Ground Fault
If the message below appears action must be taken. See Page 75.



- **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 MINI On & Off

Turn ON: Open the lid. Plug the power cord into the receptacle and into the power source.

Turn the power ON/OFF rocker switch by the receptacle to ON (**I**). The iTIG II MINI will start up, Windows will start and shortly after that the iTIG II software will start.

Turn OFF: Simply turn the ON/OFF switch to OFF (**0**) at any time and from any screen after a test is finished.

FRONT PANEL

The USB port is used for the following:

- To connect a printer (B-C models)
- To plug in a Memory Stick to transfer test data (B-C models)
- To plug inn a wireless adapter for transfer of data to a server.
- To connect a computer keyboard/mouse (not required to operate)
- Use with a Memory Stick for software & system updates & upgrades

NOTE: If the screen says "No signal" press the blue left monitor AV button once or twice.

Monitor buttons (blue) are ONLY for monitor adjustments of Volume (the ding dong sound), brightness and contrast with the Menu button. The Power button is ONLY for the monitor. If the green light is on and the screen is not on, press the blue Power button. Always keep the monitor power on.

Circular green light indicates power is on. It powers up the computer if Windows does not start when the main power is turned on.
NOTE: *Power should be turned on and off with the main power switch ONLY. DO NOT use the green ON light button for any purpose other than to turn on the computer if it does not start up automatically.*

Connector: This is used with the resistance Kelvin clamp lead set.

Optional Power Pack Connector: Used to connect to the Power Pack when this option is included.

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

Foot Switch receptacle: Used for the FS-12 foot switch (test Start/Stop).

DATA ENTRY METHODS

Model A: Go to Page 27

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 the USB port.
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 the USB port. *See Data Transfer* *Page72*

On Screen Keypads

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/Enter: The yellow circled keys on the top right are the backspace and clear/delete keys, and the one on the bottom right (blue) is the return or enter key.

Data Field Name: The keypad displays the name of the entry field next to the entry box (green box below, Motor ID in this case).

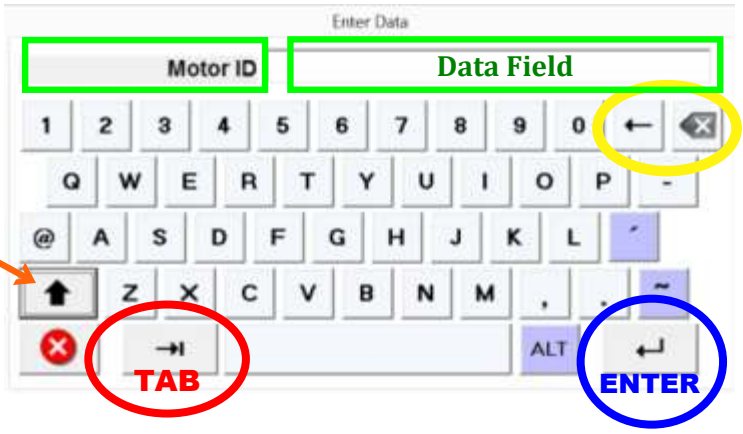
International Characters

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 (non English) characters.

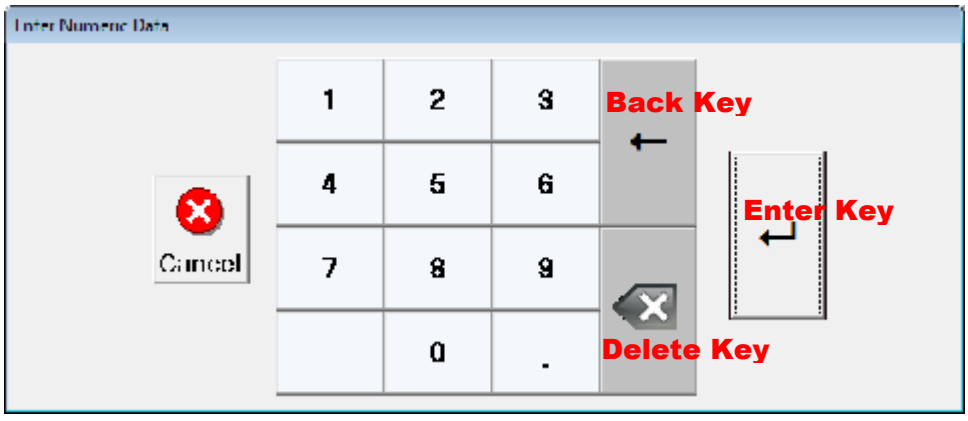
Alphanumeric Keypad

Cap key: Key shown will type a cap on the first letter only as on a smart phone.



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

Numeric Keypad



SYSTEM DATE/TIME AND INFORMATION SCREEN

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

Model B & C: 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.

Importance of Correct Date/Time

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. For the A Model go to the Info screen and "Exit to Windows".
Then 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 and select your preferences.

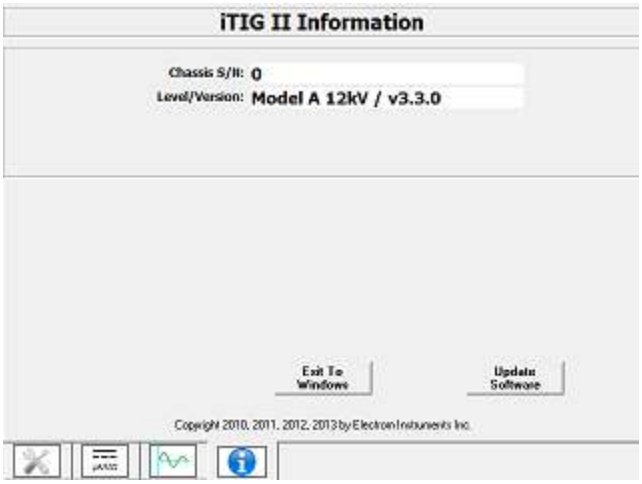
Decimal Point vs. Comma

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

Information Screen

The Information screen states what model the iTIG II is and which software revision level is running among other things. Click the "Info"tab 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.

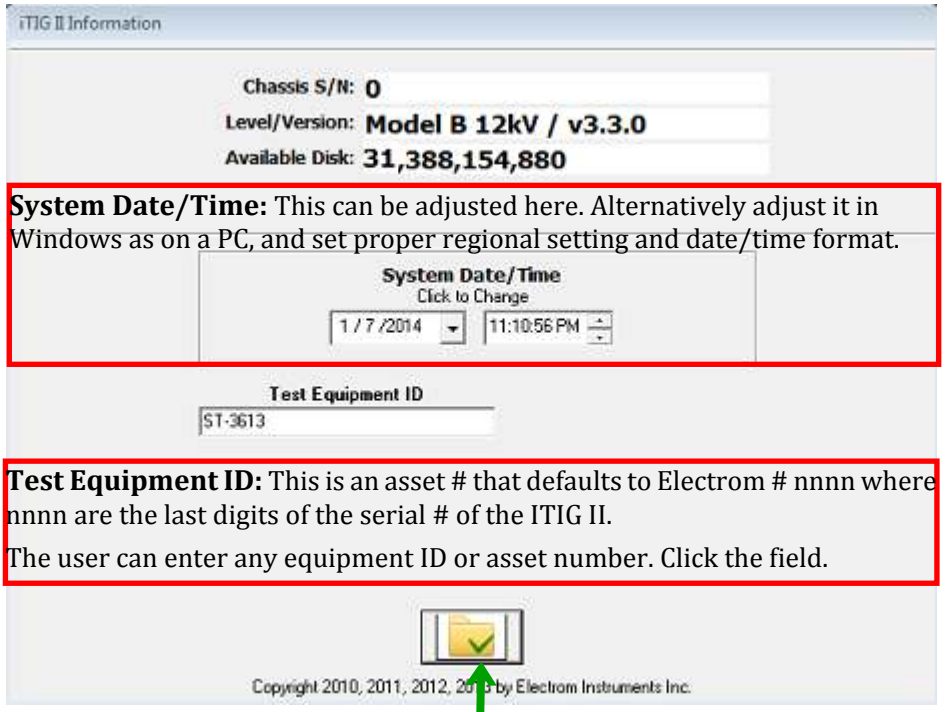
See Page 71 for updates and upgrades.

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.

Model B & C: The iTIG II disc is a Solid State Drive (SSD) with 30GB of storage or more. The available disc space is listed (31.4 GB in the picture 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.

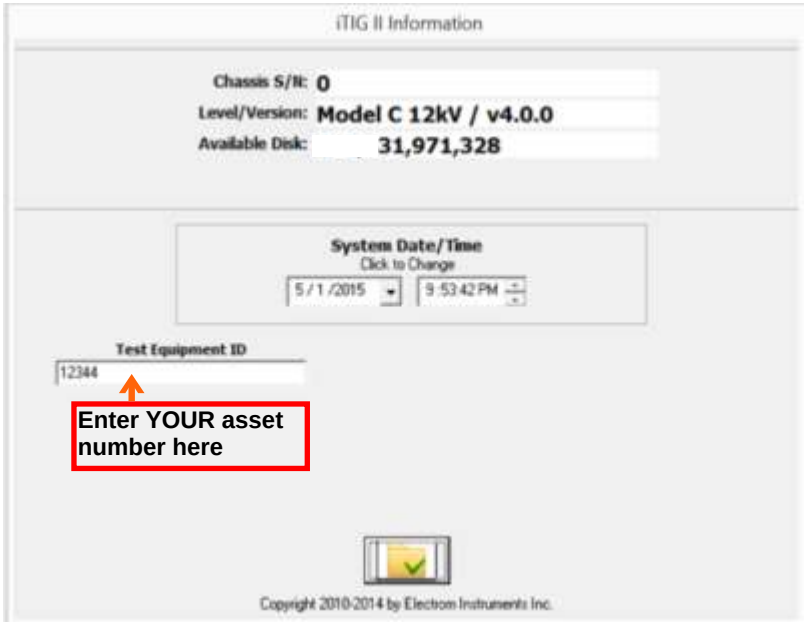
Test Equipment ID: This is an asset # that defaults to Electrom # nnnn where nnnn are the last digits of the serial # of the ITIG II.

The user can enter any equipment ID or asset number. Click the field.

The "Back" or "Exit Folder" or "Exit Test Mode" button takes you to the previous screen and exits test mode when on a test screen. Tests can be repeated and the old overwritten as long as you do not exit Test Mode.

Model C : The Test Equipment #, your asset number for the instrument, is automatically entered on the iTIG II "Test Summary" screen (see Page 25) and in the Test Description table in reports. It can be automatically entered on the Cover page of the test reports.

Model C 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.

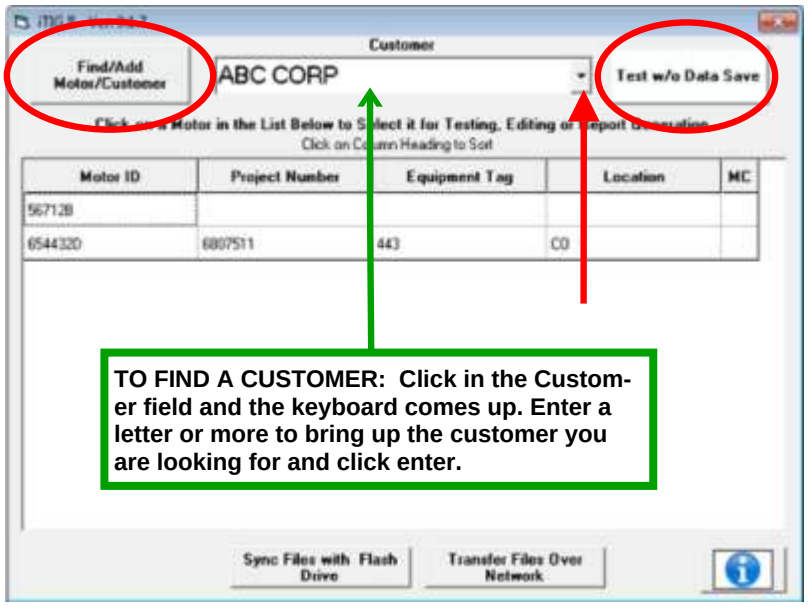
After turning the iTIG II on the Windows embedded operating software opens followed by the iTIG II software. Click the "Start" button.

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 Page27.**

MODEL B, & C MOTOR SELECTION SCREEN

Model B and C: On the Start screen, click "Start" and the "Motor Selection Screen", opens.



Motor Selection Screen

Model C Shown
See Model B on the next page

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, Page27, which automatically appears.

Select a different Customer: <u>See the green box in the picture.</u>
Alternatively, click the pull down menu (red arrow), 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.

STORE TEST DATA, EDIT AND REPORT

> **NOTE:** If the pull down menu is used, always click on a customer even if you decide to go back and use the keyboard. Clicking on the menu button again will disable the keyboard search and you have to click on something else first to be able to use the keyboard search.

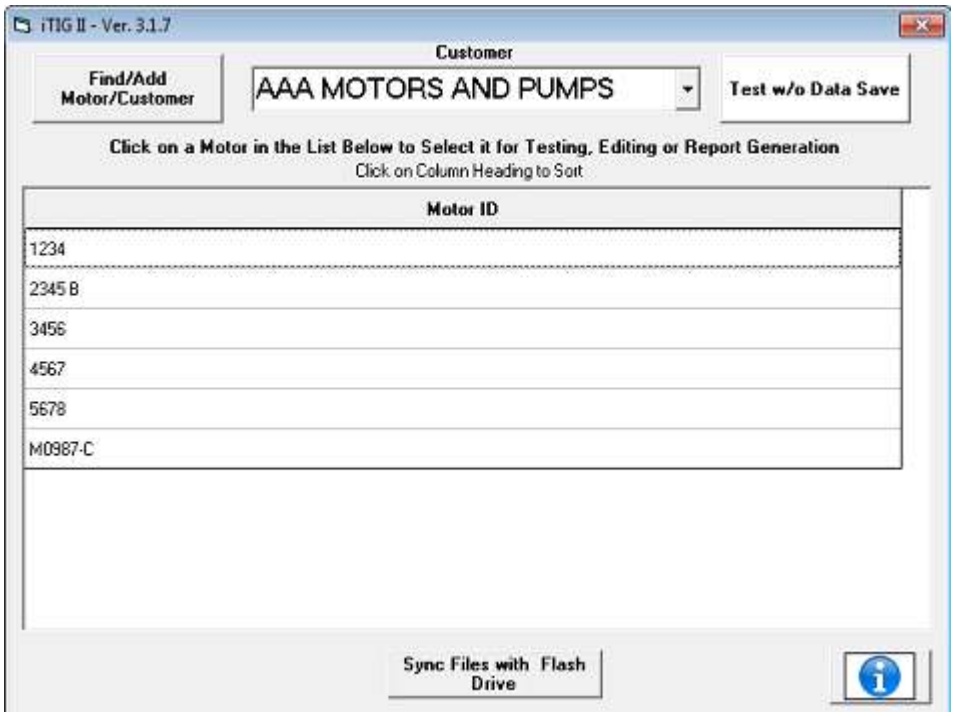
Add a motor or customer: Click on "Find/Add Motor/Customer" button.

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 Page72.*

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 #".



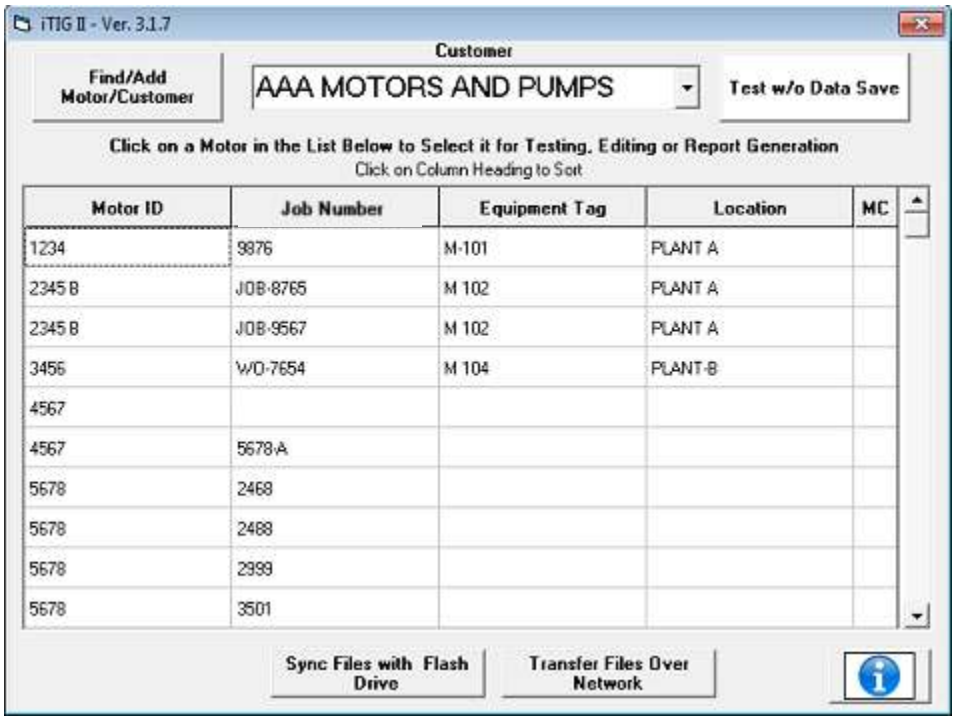
Motor Selection Screen, Model B

Model C

Model C: An ID Number and a Job # can be recorded. The ID# will be listed as many times as there are Job numbers. See ID# 5678 below. The Job numbers will be sorted when the iTIG II is started up, not necessarily after new Jobs are entered.

MC Column: Any test can be selected as a Master Coil or motor. See Page58

Sort: Click on column heading to sort, click again to sort in reverse order.



Motor Selection Screen, Model C

DATA STRUCTURE

Motor and test data are organized hierarchically as follows:

- Customer Name. Customers can also be plant sections or other groupings of tests or motors/generators.
  - Motor Serial or ID# (with an information block for each motor for C Models)
    - Test Files and Jobs. Each motor can have multiple project/job #'s.
      The Job #'s must be unique across all motors and customers."
      Job #'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: Customers\"Name of Customer"\"ID #"\"Test Files" and "Job #s"

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

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

Model C Job 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. All the tests with the same date/time stamp will be in the same report.

Test mode is entered when an ID # or Job # is clicked or selected on Screen 1 - the Motor Selection screen,. At that time 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, **or** just goes back to the Motor Information screen from any test screen, and then clicks "Test" again, a new date/time is set.

When Is Data Saved?

When is data saved? All individual tests are saved and 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.

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

SEARCH FOR A MOTOR, JOB, TAG # OR LOCATION, MODEL C

Model B:
Go to Page 23

By Motor: There are two methods to search for or find motors.

- Use the Motor Selection screen covered here,
- **Better:** Use the "Find Motor" button covered in the next section to search for specific Motor ID#s or Job Numbers.

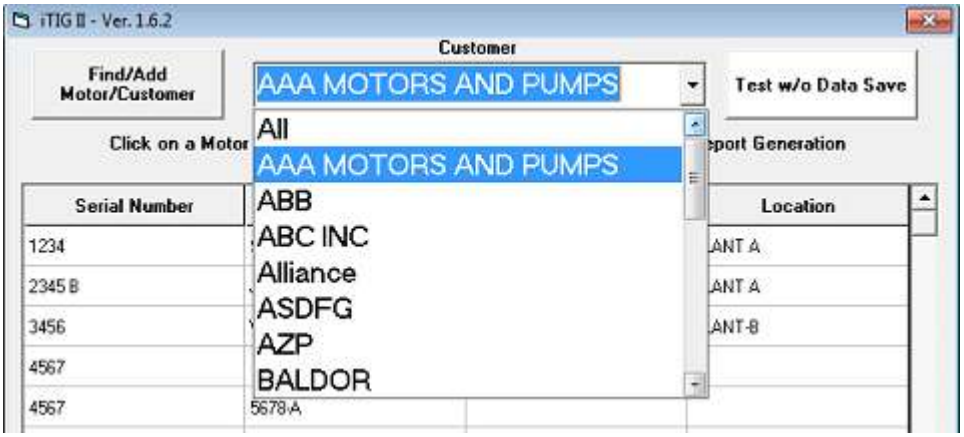
By Customer: On the "Motor Selection Screen" click the Customer field and enter the first letters of the customer you are searching for, then click Enter. Click on the column header you want to sort by for that customer, and scroll down until you find the motor.

Click header again to sort from last to first.

Search for a motor under 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 Job 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 the Job #, Tag # or motor Location .

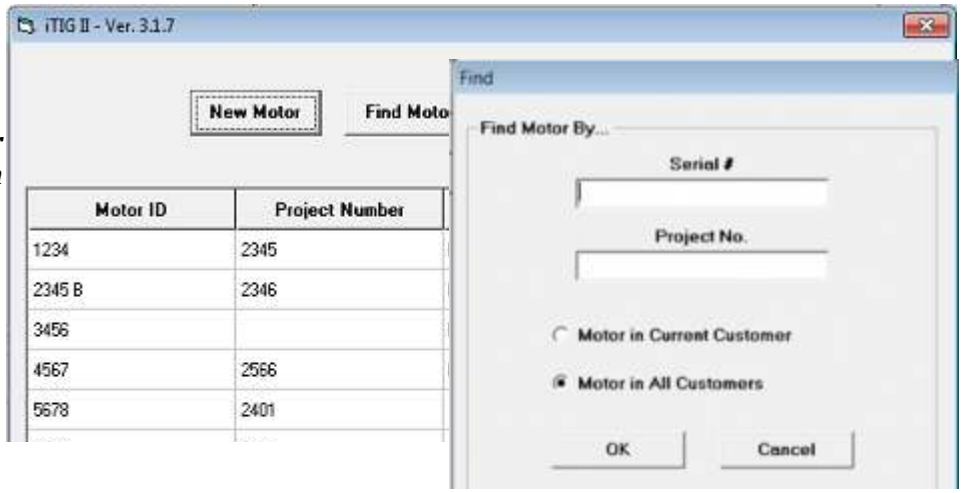
Motor Selection Screen



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 Job for any customer, click the "Find Motor" button, click one of the two fields on the "Find" screen and enter info. One or a few characters may be enough to find what you are looking for.



Find or Add a Motor or Customer Screen

Add a Motor and Enter Specs

New Motor Screen

Add motor: Click the "New Motor" button and get the New Motor 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: The screen above comes up.

Required fields MUST be entered: Customer, Motor ID, and Operating Volts.

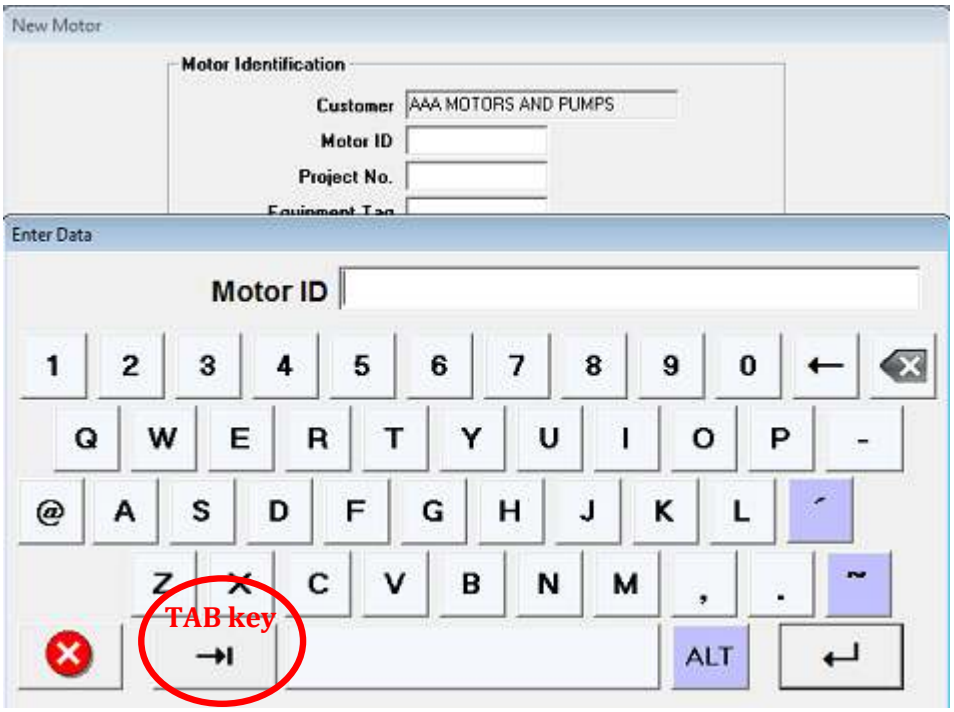
TIP: All other information is optional and can be added later in the iTIG II or in the report program on a PC.

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. **Job Number** is required if a Project, Job or Work Order # is to be used, ***NOTE:*** *Job 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 t**his 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).

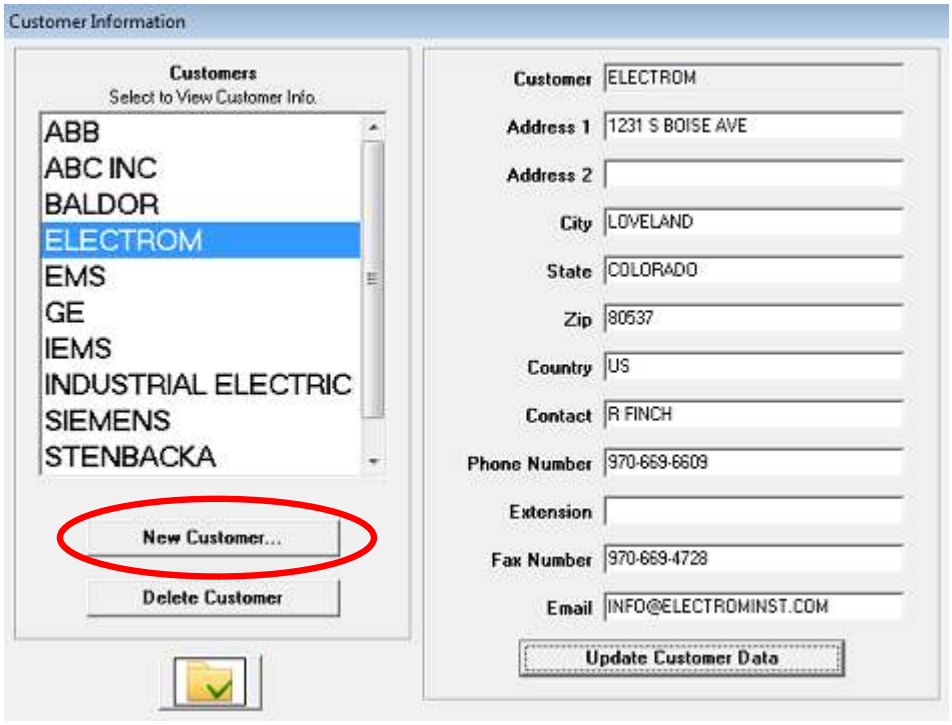
When finished with the data entry, click "OK" to save the information and return to Screen 1 where the motor can be selected to start a test.

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



Click the "New Customer" button to add a customer name. Click in the field that comes up to get the keyboard.

Customer Contact information on the right side of the screen is not included in reports and not used by the tester and is therefore not required.

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.

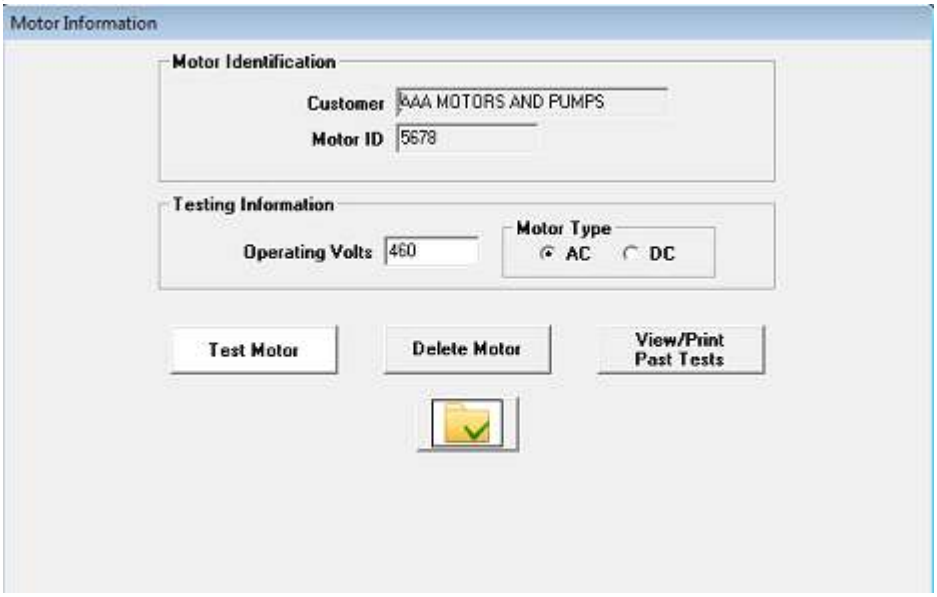
CHAPTER 4 Test Setup

Model A: Go to SETUP screen Page27. **Model C & D:** Go to the next page.

MOTOR INFORMATION MODEL B

Model B: To do a test and automatically store the test data, select the customer and click on the ID # you want to test. The screen below comes up.

Check accuracy of information on the motor to be tested.



Motor Information Screen Model B

Return to:
DC Motor Test *Page 62.*

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.*

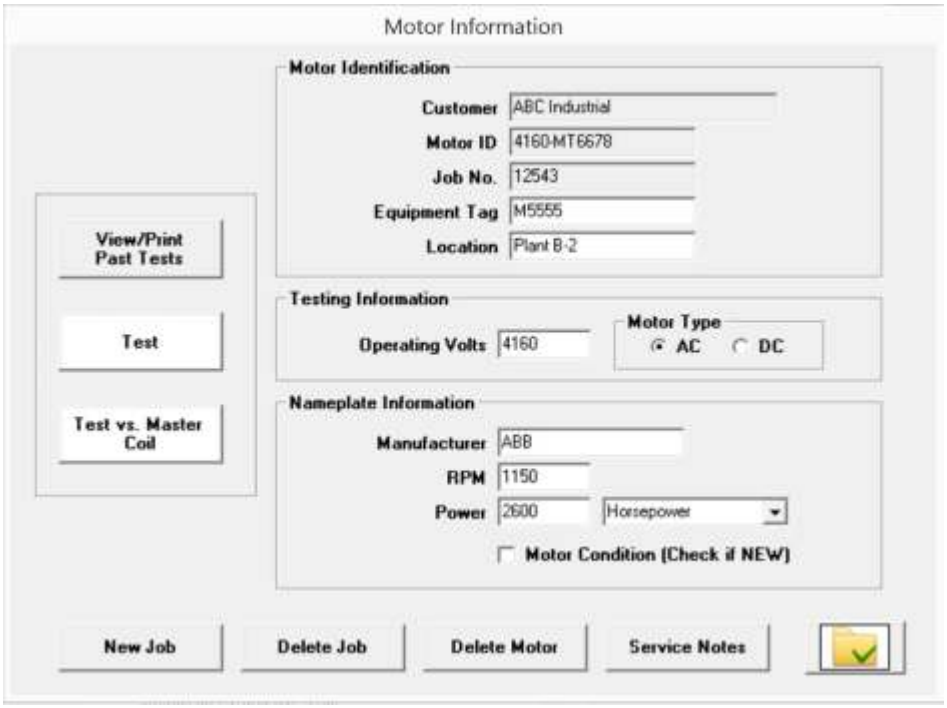
View and Print Past Tests button and reports are covered in the "View Previous Test & Set Pass/Fail Condition" chapter Page49.

Test Motor: Click the button to go to the Setup screen.
Next step: Go to the Setup screen Page27.

MOTOR INFORMATION MODEL C

To do a test and automatically store the test data, select the customer and click on the ID # or Job # 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

Return to:
Multi Coil Bar Graph *Page 61*
DC Motor Test *Page 62.*
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 Job #s under that ID#.

Customer name and motor ID# cannot be changed without deleting and re-entering the info in question. Job No: **See "New Job"** 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 Page50.

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 Page59.

New Project/Job Button

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

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.

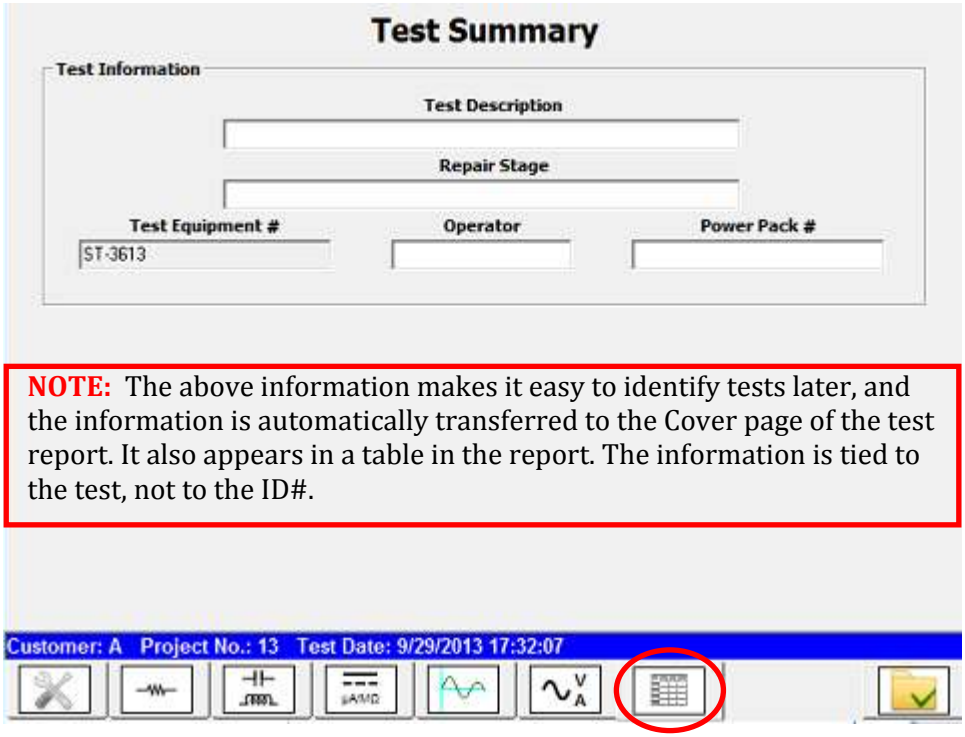
NOTE: *The notes are not part of any reports generated by the iTIG II or TRPro report software. The notes can be printed separately and added to a report by the user. An external keyboard is required to enter service notes.*

Add Test Information and Test Description for Model C

Model C: 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. It is optional, but very useful later. It is a highly recommended entry.

Test Summary Screen - No Tests Done



NOTE: The above information makes it easy to identify tests later, and the information is 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 14

Set Pass/Fail Page 47

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, Pre-VPI, 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.*

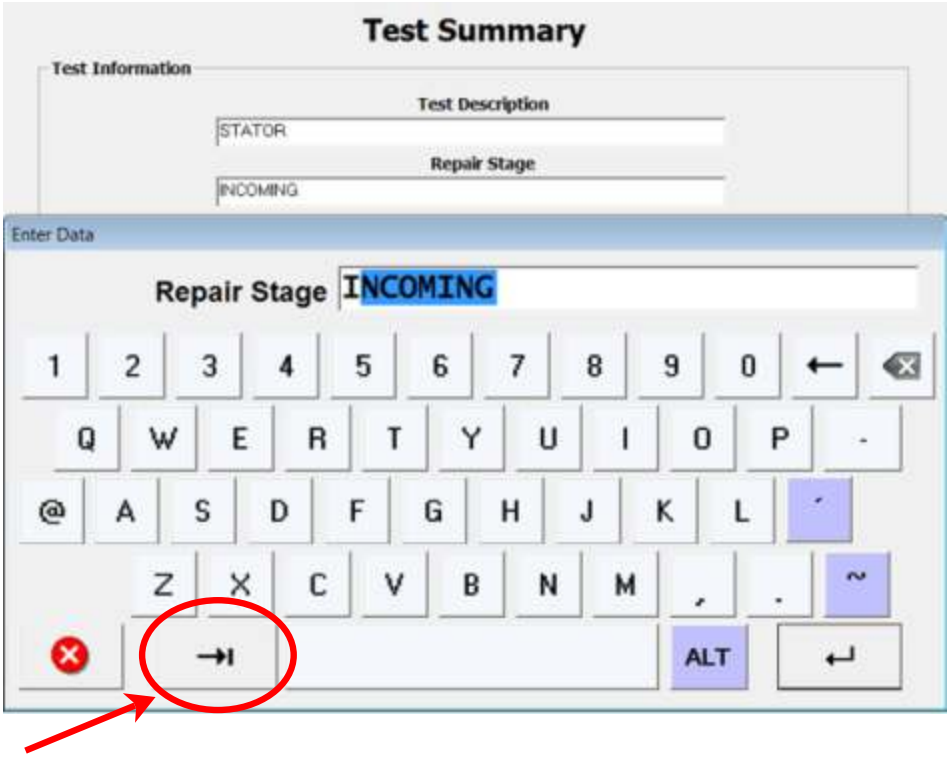
Test Equipment #: This is the asset number for the tester. The default number is "Electrom + last digits of the S/N". Change the number by clicking the Info button on the main Motor Selection Screen, and enter your number under "Test Equipment ID". See or return to Page 14.

Access to the Test Summary screen: 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.

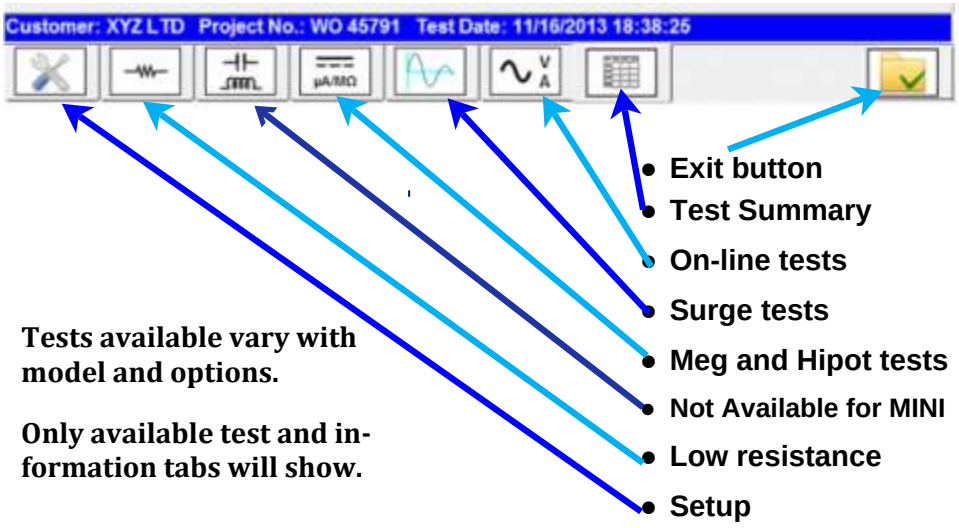


TAB: If you do not want to enter anything in a field or move to the next field, click the TAB button.

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



SETUP SCREEN ALL MODELS - AC

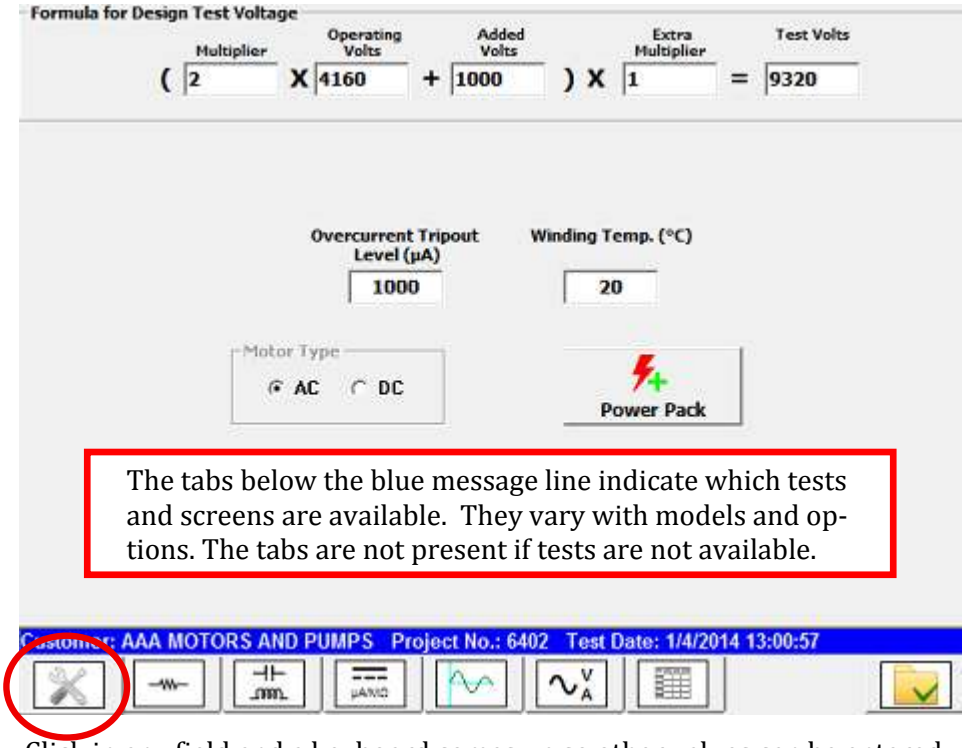
For DC motor setup screen go to *Page 63*

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.

Recommended Test Voltage or Design Test Volts

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,**

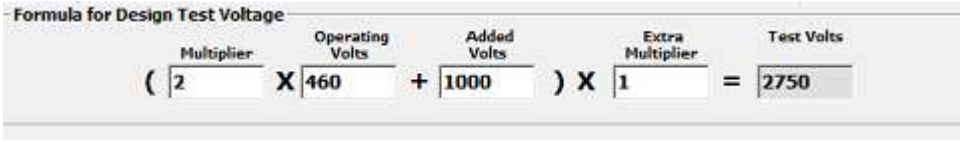


Click in any field and a keyboard comes up so other values can be entered.

Return to:
Prepare for Test, click Page16.
Test Setup Mod B Page 23.
Failure Limits Page 29.
Perform Hipot and Step Voltage Test Page 39.
Surge Test Page 41.
Pass/Fail Model B Page 49.
DC test Setup Page 63.

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 29

Winding Temperature needs to be entered if data is to be compared to data taken in the future. This is because winding and insulation resistance changes with temperature.
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. (Can be changed, contact Electrom)
- Insulation Resistance - 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 will be used as the actual temperature unless it is changed by the user.

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 Connected to MINI:

The iTIG II MINI can be ordered with an option to connect it to and operate a Power Pack with a maximum output of 24kV or 30kV. Both hardware and software is required.

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

Model B and C: Go to Page 23

See the separate Power Pack Manual for instructions.

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	Tests Using the Limits
Over-current (Limit: µA)	X	X	X	Meg/DAR/PI Hipot/Step Voltage
Arc to Ground Detection (fixed detection)	X	X	X	Meg/DAR/PI Hipot/Step Voltage
IR (Limit: megohms)			X	Meg/DAR/PI
ROC (Limit: factor)			X	Step Voltage
Delta R % (Limit: %)			*	Low Winding Resistance
% Wave Difference (Limit: %)			*	Surge

Note*:
Fixed limits will come with future software update

Failure Limits Types

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.*

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 27. The default is 1000 µA (or 1 mA). This may be too high in some cases. Set the limit higher than the inrush current one gets when the test is started.

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 for a Meg test (not checked during a Hipot test). Default = 5 megohms for used equipment, a number used in IEEE and EASA standards. NOTE that the limit is the resistance at 40°C. For motors with operating voltages over 1000 V the limit is normally 100 megohms. The numbers are too low for new and rebuilt motors, and can be too high for certain types of used equipment such as submersible pumps. For the C model that can set this limit it is checked upon completion of a measurement.

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

Return to:
Step Voltage Test *Page 40.*
View Previous Tests and Set Pass/Fail Conditions
Page 49

ROC Factor; Additional Information: ROC is calculated as the ratio of the most recent step (in µA) over the previous step. If the leakage current accelerates as the voltage increases, an "arc to ground" condition may be imminent. Example: step 2-3 µA 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.

DAR and PI Failure Limits: The iTIG II does not set limits for the DAR and PI values. But these tests are Megohm tests, and the leakage current limit, arc detection and megohm IR limit are active.

Good motors may have DAR/PI 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. See IEEE 42 for good information.

Surge Wave Difference: 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.

A gray area exists around 10% where operators must take all conditions into account and make a judgement about wether the result is a Pass or Fail. Concentric wound and assembled motors that are good will often have a higher %WD. For these motors the P-P Surge test should be used (model B & C).

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.

Auto Failure Limits model C

Return to:
Hipot and Step Voltage test Page 40

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 36, and the ROC limit is set on the Hipot "Auto Mode" screen Page40.

The low resistance Delta R and Wave Difference (%WD) have no failure limits at this time. Failures must be noted visually and the condition set on the Test Summary screen manually.
(May 2015: a future software update will include fixed limits for Delta R and Surge for the C model. Fixed limits for Surge tests means the PASS/FAIL flag on the Test Summary screen may have to be changed when the limit does not suit or is not applicable for the test performed).

FAILURE MESSAGES DISPLAYED BY THE ITIG II

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

- **"IR Fail":** Either an Arc is detected, or Over-current limit or IR limit is 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 IR.

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

* Note, May 2015: Fixed limits will come in a future software update.

- **"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 flashover or arc-over may be imminent.) It is set automatically for C & D models.

NOTE: *When any of the above failure flags are set, the overall "Off-line Motor Rating" is automatically set to FAIL.*

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.

***TIP*:** Sometimes a failure may occur because a limit is set too tight. Review the limit, adjust if appropriate and retest. Alternatively change the PASS/FAIL setting on the Test Summary screen for the C Model.

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)
   NOTE: *Never do this test after a Meg/Hipot test, damage may result.*
2. IR Megohm measurement (can be DAR or PI)
3. Hipot or Step Voltage test
4. Surge Comparison test

LOW RESISTANCE MEASUREMENT, MODEL B, C & D

Model A does not have low resistance measurement. **Go to** Page 34 Megohm.

Model B & C: Connect the Kelvin clamp lead set to the circular connector (R front panel). Then connect the 2 Kelvin clamps to two of the phases of a 3 phase motor or to each end of a coil.

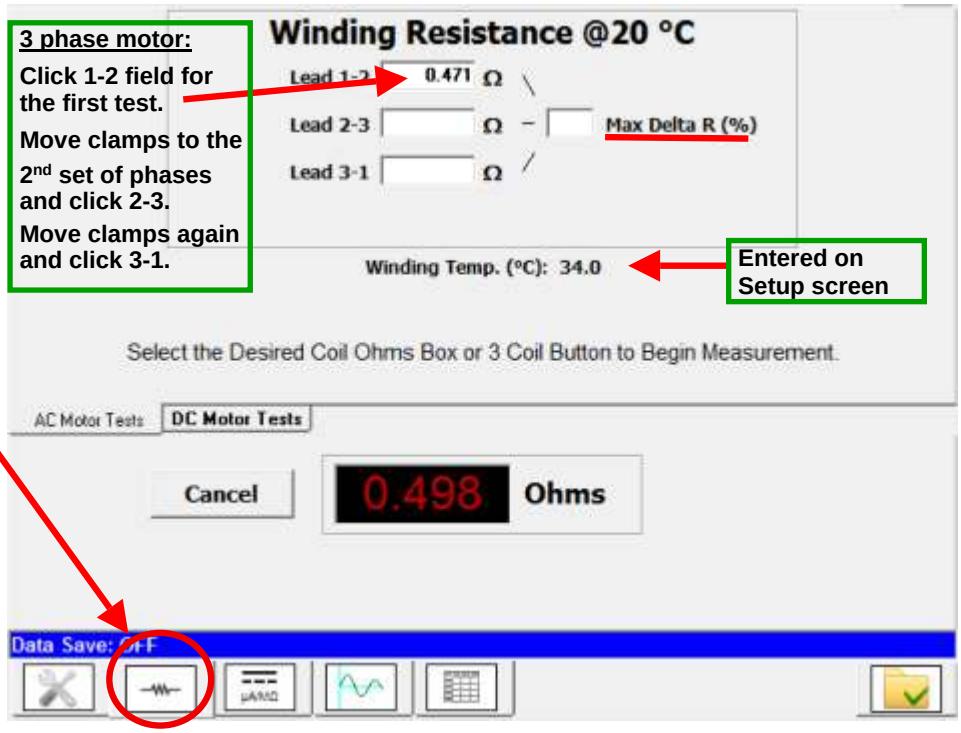
NOTE: *The two sides of a Kelvin clip jaw should not touch each other, only the lead conductors. Make sure there is a clean and good connection.*

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. On a 3 phase motor measure between phases or one phase at a time.

Max Delta R %, the largest percentage delta from the average, is used for 3-phase measurements. It is calculated after 3 pairs of phases are measured. Delta-R % is recalculated when a lead pair is re-measured.

Winding Resistance Screen
Click here



NOTE: *The Ohms in the large display with red numbers is the actual measurement taken. The Ohms in the Lead 1-2 box has been adjusted for temperature to 20°C. Winding resistance goes down with temperature.*

More Details on Coil Resistance Measurements

Error Messages

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

Errors: If a measurement error comes up saying the test was unstable or out of range, check the Kelvin clip connections. Make sure the connections are good. The upper and lower jaws of a clip should not touch each other. Also, if connecting to spade lugs, make sure they are clean. Brush them if necessary. Make sure the clamps do not touch the insulation of the motor leads.

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.*

Coil Temperature Compensation Model B & C

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

IMPORTANT: *Coil temperature must be entered before the Test Mode is exited. 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 Test Mode.*

The default setting for winding temperature is 20°C.

CAUTION:
Never do a low resistance measurement after a megohm or hipot test. The instrument can be damaged from residual potential in the windings.

Residual potential may take a long time to discharge and can build back up after leads are disconnected due to de-polarization.

Never have the low resistance leads connected to the motor when a high voltage test is done. The instrument will be damaged.

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. See IEEE 43-2013 standard for recommendations.

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 Megohm, DAR and PI tests will terminate if the leakage current limit is exceeded or if there is an arc to ground.

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 43 make recommendations.

Click the "μA/MΩ" tab at the bottom of the screen to get the Megohm screen.

Output Lead Connections

Red lead: Always the hot lead for all megohm, hipot and surge tests.

Black leads: Always ground.

Connect the red output lead to one phase of a 3 phase motor or to all 3 together, and connect one black ground lead to an unpainted part of the motor's frame. The second black ground lead can be connected to the frame or not be used.

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 below 30V, but this is not a guarantee that it is. Short the windings to ground with a jumper or the second ground lead.

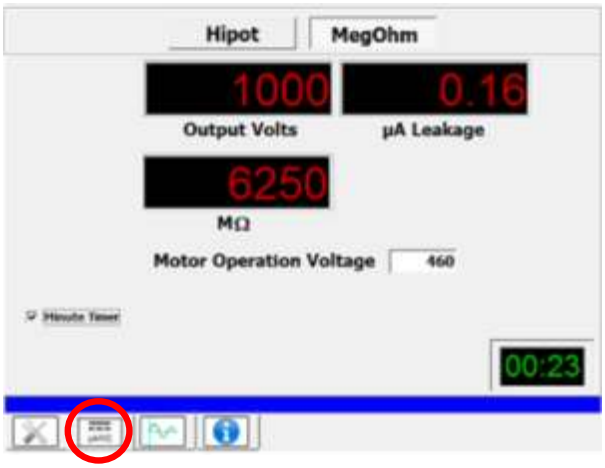
Higher PI requires a long discharge time. Residual polarization may elevate the voltage in the windings after leads are disconnected.

USE 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 on the previous page and calculate the ratio.

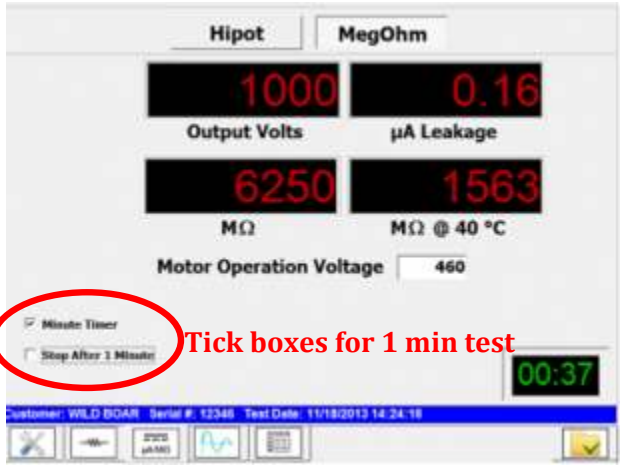


Model A: Go to Page 39

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.



Temperature Standardization

The temperature entered on the Setup screen is used to calculated the megohms at 40 °C. Otherwise the default temperature of 20°C will be used and the calculation may not reflect the right result.

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. IEEE 43 limits are megohms at 40°C.*

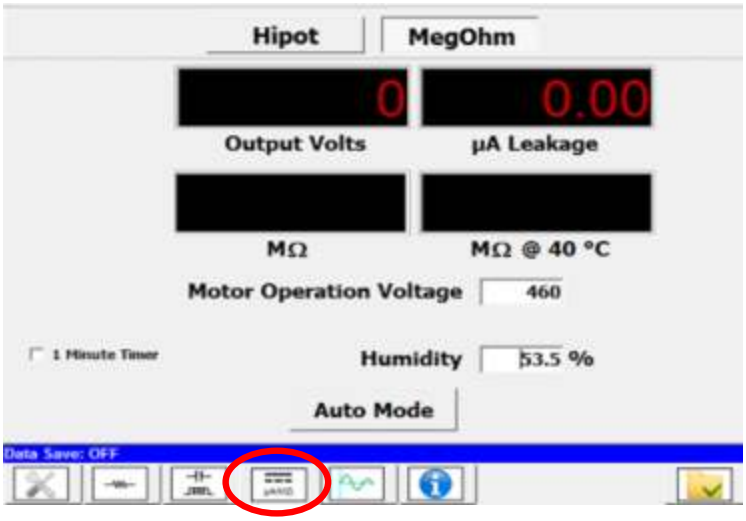
DAR and PI Tests

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 39

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.

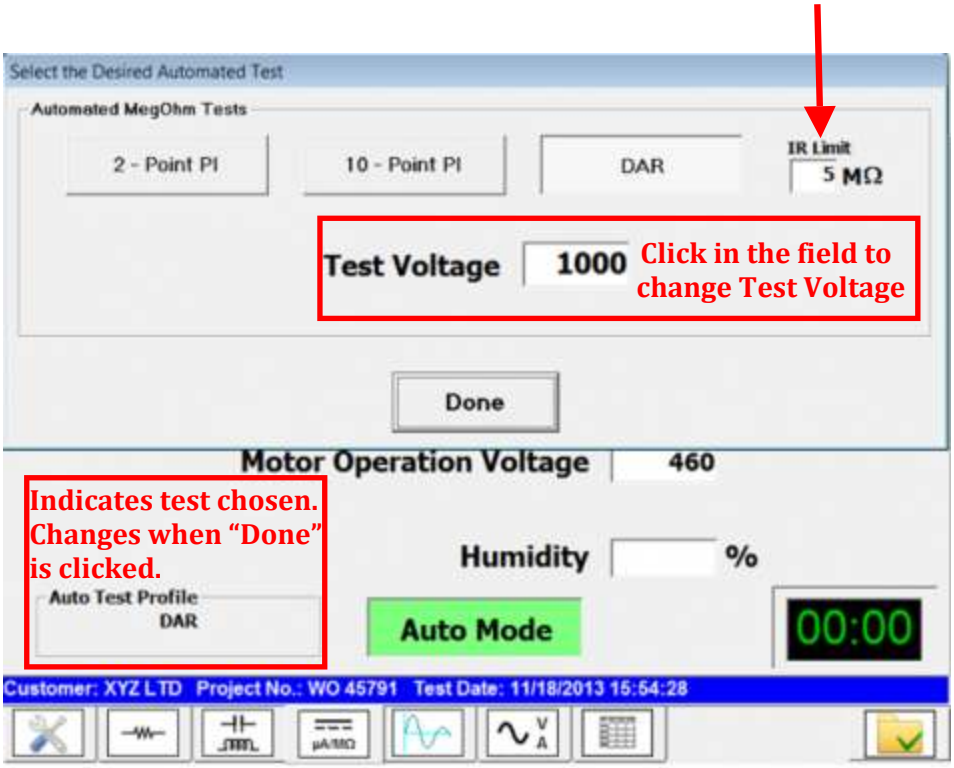
Temperature: The temp entered on the Setup screen, will be used to calculate megohms at 40°C. Otherwise the 20°C default will be used and the calculation may not reflect the right result.

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. IEEE 43 limits are megohms at 40°C.*

Automatic Meg, DAR and PI Tests

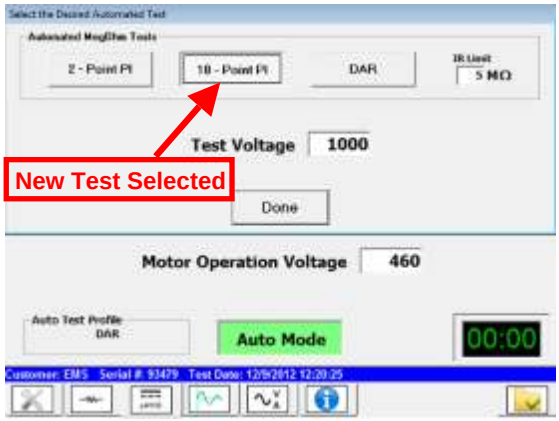
Click "Auto Mode" button (green when pressed) and one of the 3 test buttons at the top of the screen. **For a standard 1 minute Meg test, use DAR**.

Adjust the IR Limit: Click in the box and enter another value. The IR Failure message will appear if the MΩs are lower than the limit. A sudden flash-over will terminate the test.



Return to:
Auto Mode Failure Limits Page 30

DAR/PI Auto Mode Setup Screen Model C



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

"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).

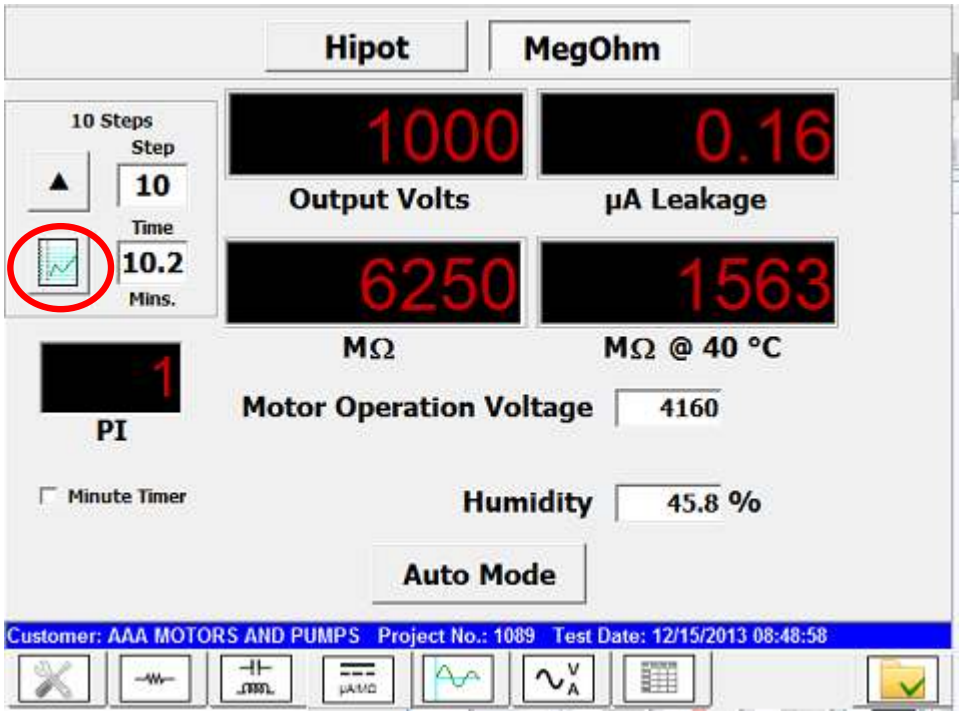
The DAR or PI ratio is calculated, displayed and stored along with other data.

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.

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.*

Return to:
Auto failure Limits Model C
Page 30.

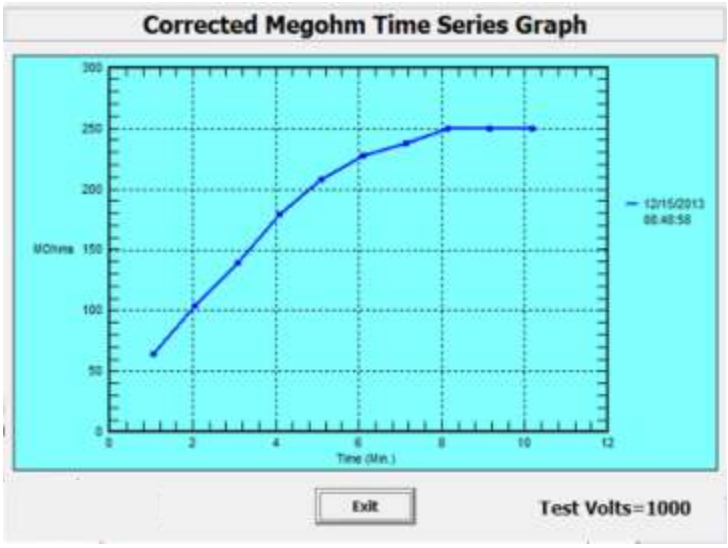


To view graphs: Tests with more than 2 points produces a graph button (circled in red). Click the graph button after the tests is finished.

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

PI Graph Model C

Below is an example of a 10 point PI graph.
Click the up arrow to see the other points displayed in the meters.



WARNING

Wait for the windings to discharge completely before touching the motor frame, windings or clips. The iTIG II MINI indicates when the voltage in the windings is below 30V, but this is not a guarantee that it is.

Short the windings to ground with a jumper cable or one of the black ground leads.

Higher PI requires a long discharge time. Residual polarization may elevate the voltage in the windings after leads are disconnected.

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

HIPOT AND STEP VOLTAGE TESTS

Manual Hipot Test All Models

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.

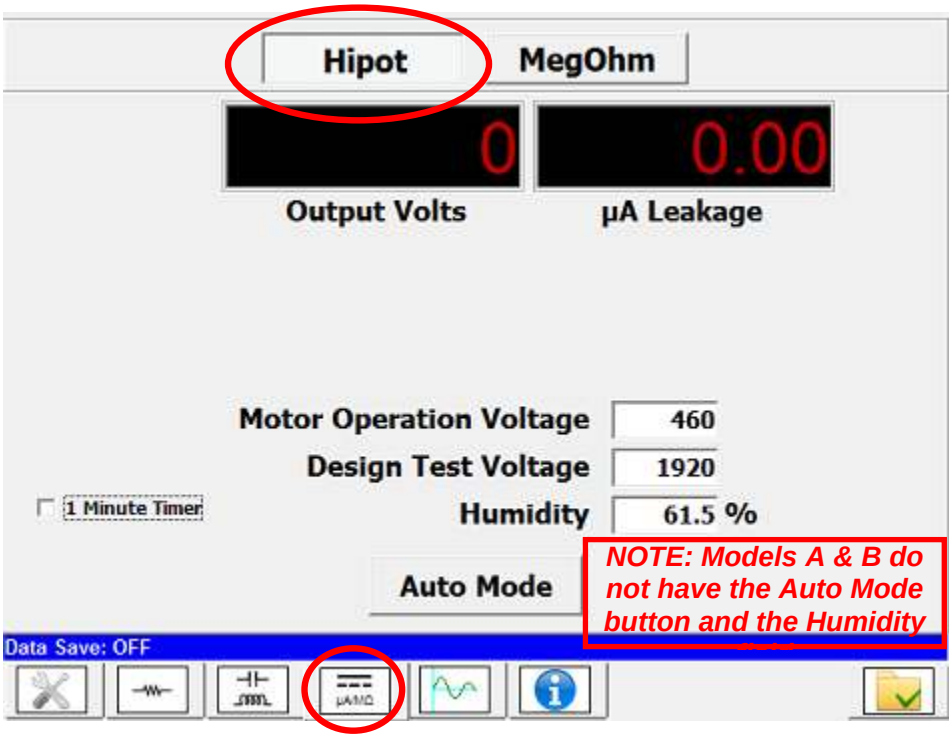
IMPORTANT: *Pressing the Start/Stop button any time during a manual or automatic test will terminate the test.*

The Design Test Voltage is calculated by the formula on the Setup Screen. *See Page* *Page 27.*

Minute Timer

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

Hipot Test Screen Varies by Model



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 below 30V, this is not a guarantee that it is.
USE EXTREME CAUTION when handling equipment after a Hipot or Step Voltage test to avoid electric shock.

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.*

Motor Discharging

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 model: Use "Auto Mode" tests for automatic shut off. See next page.

Humidity, C Model: 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

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 41** .

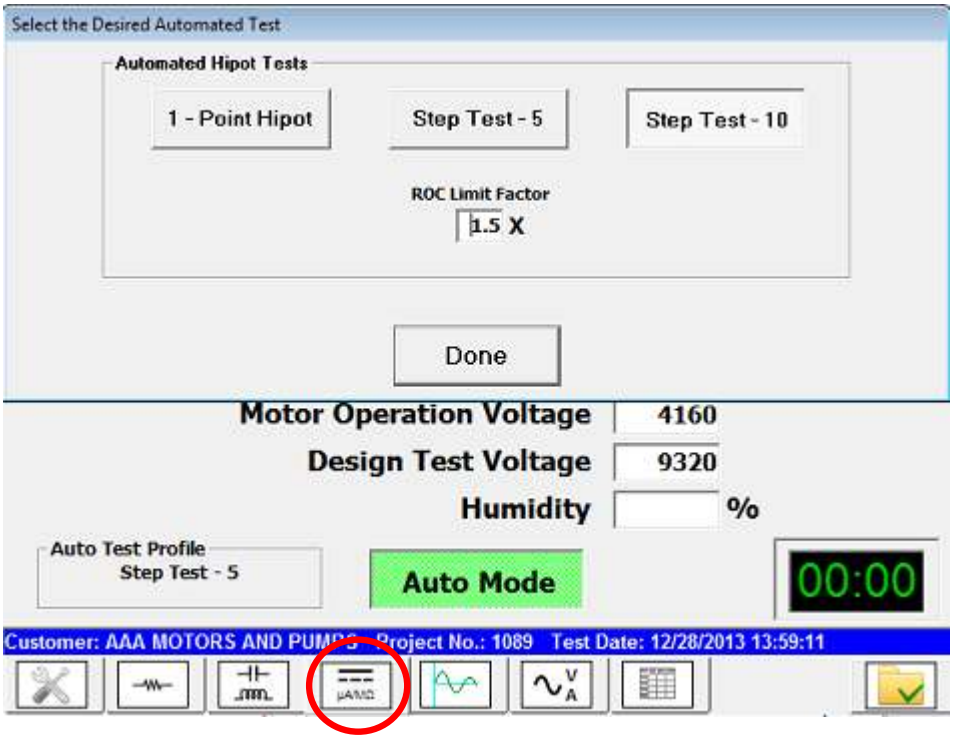
Auto Mode for Model C

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.

ROC Limit Factor

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.

Hipot Screen after Auto Mode button is pressed



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. Click the "Graph" button so see it. For details see PI Test and Graph in the previous section under Megohm.

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

Return to:
Auto failure Limits Model C *Page 30.*
Pass/Fail Model C *Page 48*

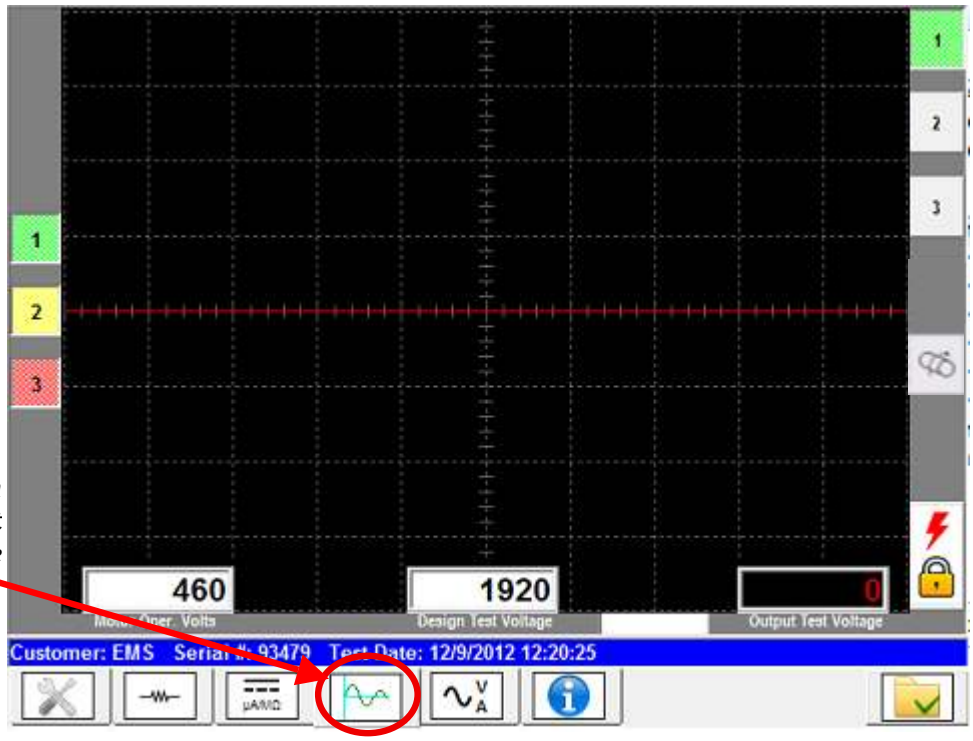
WARNING

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 below 30V, this is not a guarantee that it is.
USE EXTREME CAUTION when handling equipment after a Hipot or Step Voltage test to avoid electric shock.

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 27.*
- 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 66.*
- The buttons on the right side of the screen select the channel the test results are stored under, one for each phase of a 3-phase machine. 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 red output lead to phase 1, one black ground lead to phase 3 and the second ground lead to an unpainted part of the frame.
- Button 1 on the top right of the screen must be green (default setting).
- Click the red lightening bolt "unlock" button on the bottom right of the screen to unlock and enable Surge. The button turns green and unlocks.
- Press the red Start/Stop button.
- When the test is completed, click button 2 on the right side of the screen, move the red lead to phase 2, click "Unlock" and press Start/Stop.
- Repeat again, move the black lead to phase 1 or 2, and the red lead to phase 3. Click button 3 on the right side, Unlock and Start.

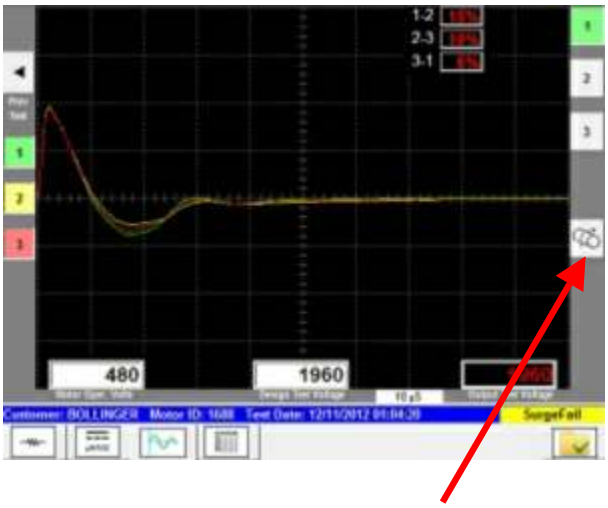
CAUTION: *The loose motor lead from the phase not connected will be* ***HOT*** *during the test. Make sure it is insulated from ground.*

Model A: Go to Page 44

Assembled AC Motor Test

All Models: The picture shows typical waveforms from a small assembled AC motor (with rotor installed). Larger motors will have more peaks and valleys (ringing).

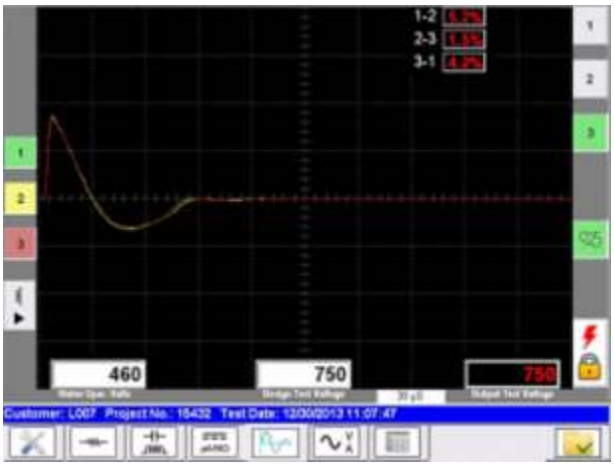
The waves indicate a problem since the frequencies are different in the 3 waves. However, because of transformer action between the stator and rotor, the inductance changes from phase to phase depending on the position of the rotor.



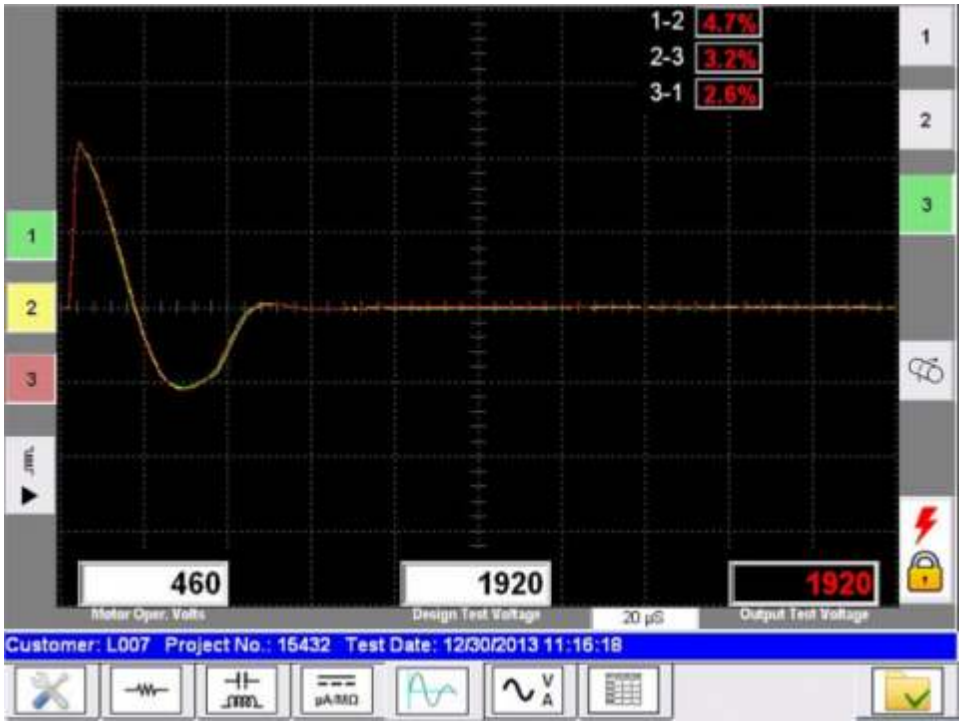
This is most apparent in 2 pole motors, is usually seen in 4 pole motors , and may not be seen at all in motors with 6 poles or more.

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. Click the Rotor button on the right side of the surge screen. The button turns green.
2. Energize surge on phase1 (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 Move the red lead to phase 2, click 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 Move the red lead to phase 3 and the black to phase 2, click 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, move the red lead to phase 1 and the black to 3, click button 1, unlock & start surge.
   3.2 Rotate the shaft to position No. 2, move the red lead to phase 2, click button 2, unlock & start surge..
   3.3 Rotate the shaft to position No. 3, move the red lead to 3 and the black to 2, click button 3, unlock & start surge.



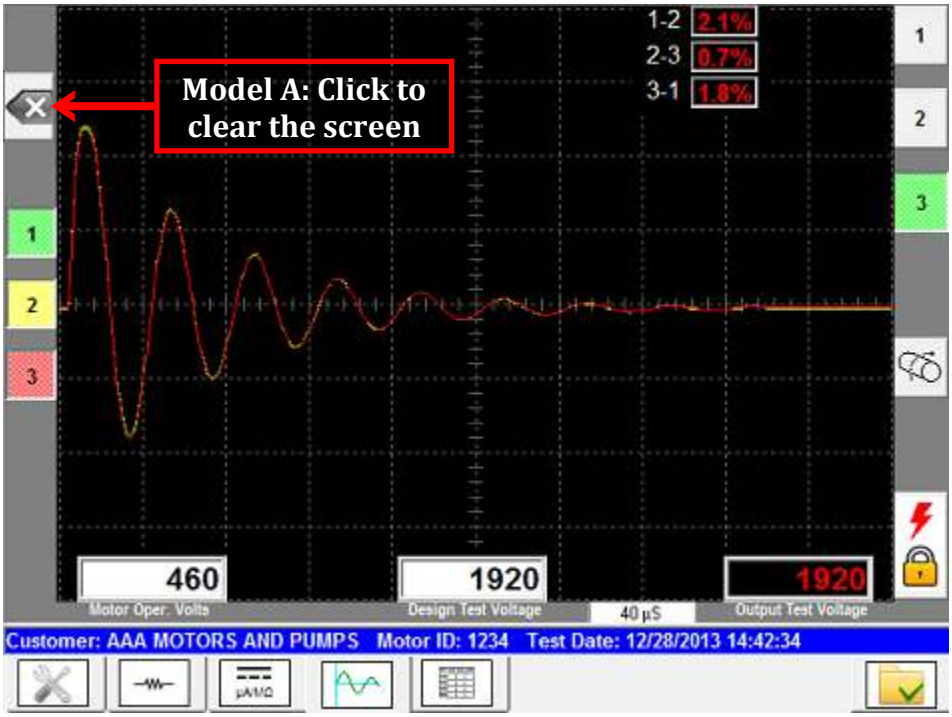
4. The 3 waves on the screen should now overlap almost perfectly.
   4.1 Use the %WD numbers to gauge the difference. If all 3 waves will not line up during the low voltage test there is a short or serious weakness in the windings and no further testing is required.
   4.2 If they do not line up in the 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. With Model B and C the P-P surge test is also available and not require the rotor to be turned.

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.

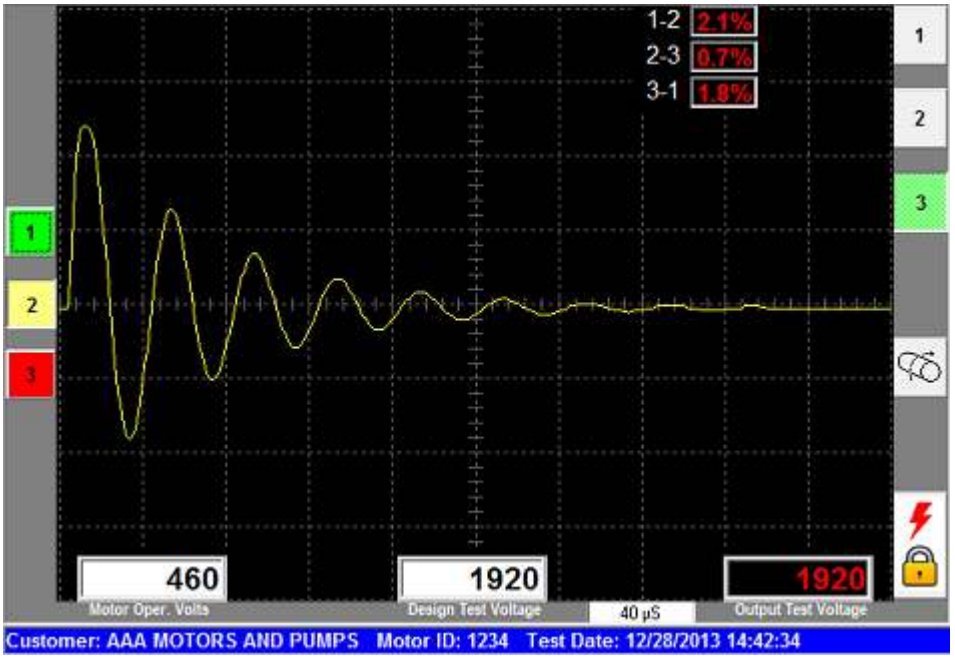


Surge Test Screen – All 3 Waves Shown

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 49
View Mod. D Surge Test
Page 52

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 start a new test. This can be done as many times as you like.

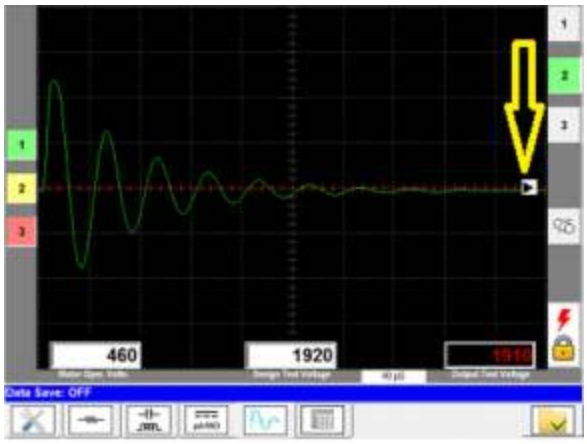
This is the same for all types of tests, not only Surge.

To use a different setting such as "No Data Save", you must 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).

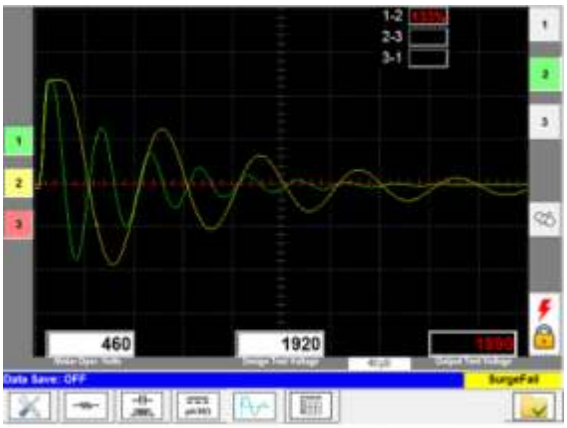
Repeat the surge test to get the stretched/compressed wave.

To cancel the stretch/compress function (the arrow), tap the opposite side of the screen before starting a test.

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.
- The motor is too large. This can be because the HP/kW is too high and/or there are too many poles, and/or the capacitance of the motor is too high.
  - ❑ More poles (slower RPM) increases the load for a surge tester.
  - ❑ If the load is too large the maximum energy the tester can produce 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 will usually not be exactly the Design test Voltage and can be off by a few %.

Surge Voltage Generated Internally - the Green Bar

NOTE: *It is easy to see if the motor is too large for the tester to get to the test voltage. There is a green bar that rises on the right side of the surge screen as the surge voltage rises. The bar indicates the voltage being generated internally in the tester. The top of the screen is the maximum voltage that can be generated internally, 4kV or 6kV, and the measured voltage is the highest voltage it can generate in the motor windings if the bar reaches the top.*

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 49.

CHAPTER 7 Set Pass/Fail Ratings for Tests

Model A: This model does not store data or produce reports. Therefor it has no Pass/Fail ratings. ***Go to Page 55 .***

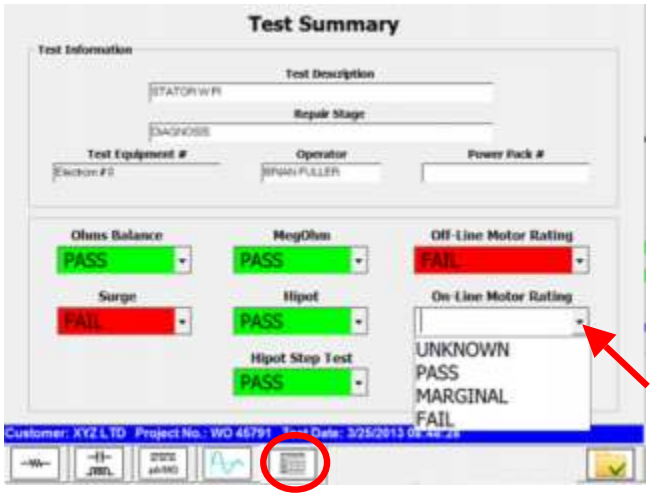
TEST SUMMARY SCREEN MODEL B & C

Test Summary: Click circled Tab. This screen has Pass/Fail ratings, and for the C models additional information about the test, see Page 25.

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 29.



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.

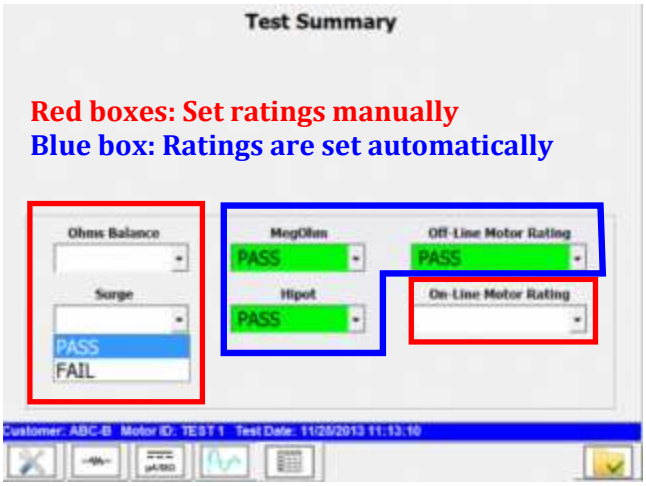
> ***Exception:*** See ***Override*** for the On-Line rating on the previous page. If overridden once, the On-line rating will only change if you override it again.

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 (automatic by 2015).

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 40.

The C model has Test Information in addition to the ratings. If not entered, enter it now. See Page 25 .

The TEST DESCRIPTION, REPAIR STAGE and Job # 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 50

CHAPTER 8 View, Print & Delete Previous Tests

All Models: Click on any tab to see the previous test.
See Page 44 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

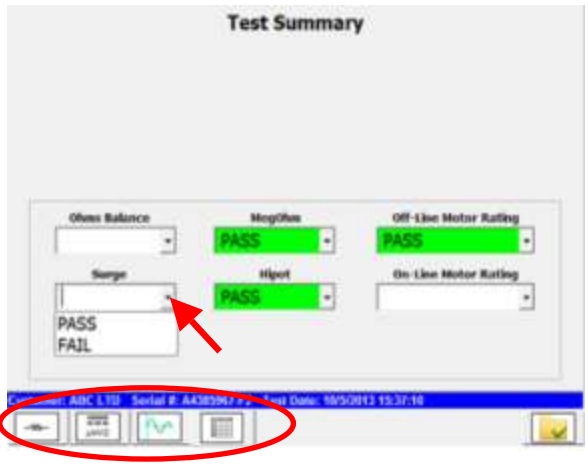
Click the date you want to view, then "Display Test". Tests done in the date range at the top of the screen will be listed in the "Tests Found" field in reverse order, the last test first. See picture.

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.*

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 44.

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.

Return to:
Motor Information *Page23.*
Review Tests Just Done *Page 46*
Master Coil Mode *Page 60.*

Model B:
Go to Page 55

VIEW PAST TESTS MODEL C

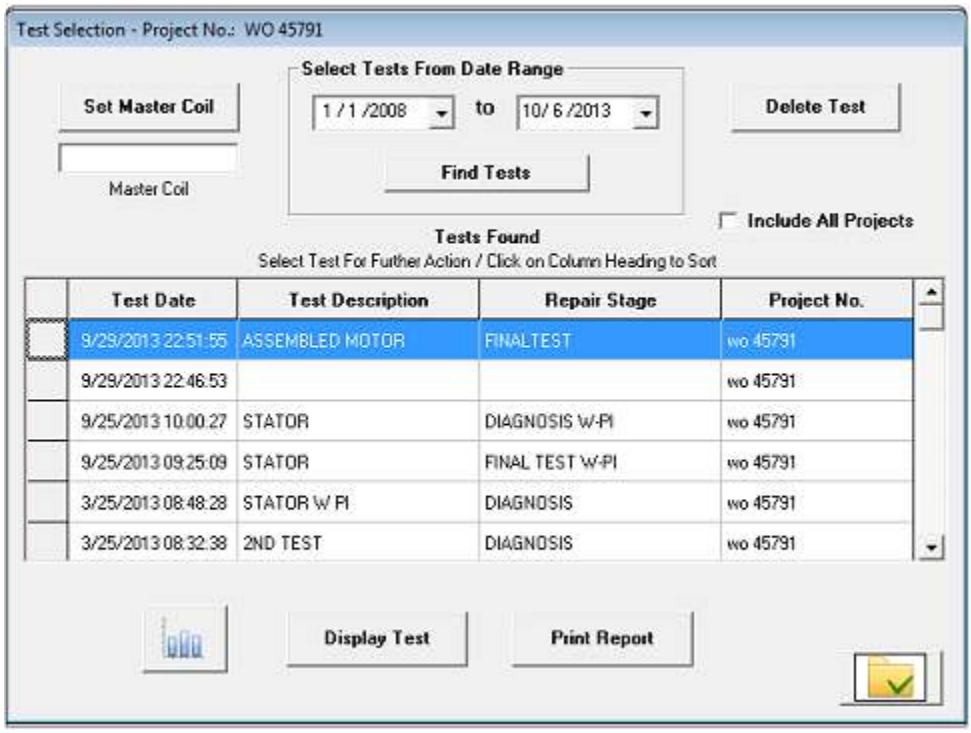
From the Motor Selection screen click an ID#. On the Motor Information screen click the "View/Print Past Tests" button. The Test Selection screen below comes up.

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 C+ model the left hand column without a heading is used for coil numbers



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 Job (or Work Order). If the "Include All Jobs" check box is selected, all test sets for all Jobs 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 47 to Page 48.

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

Bar Graph Icon Button, Model C+: Used for multi-coil tests. Displays a bar graph of surge %WD for each coil selected. See Page 61. If clicked, the graph will be included in reports. See Page 52.

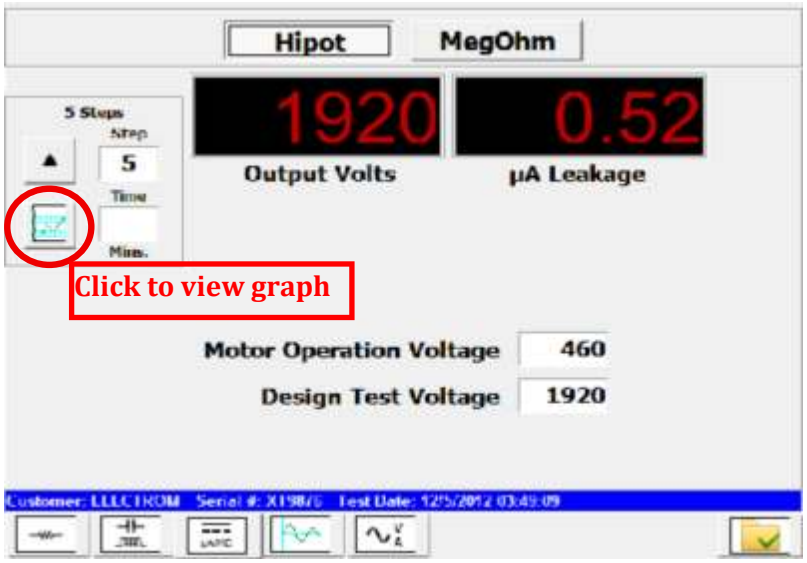
Return to:
Motor Information
Page24.

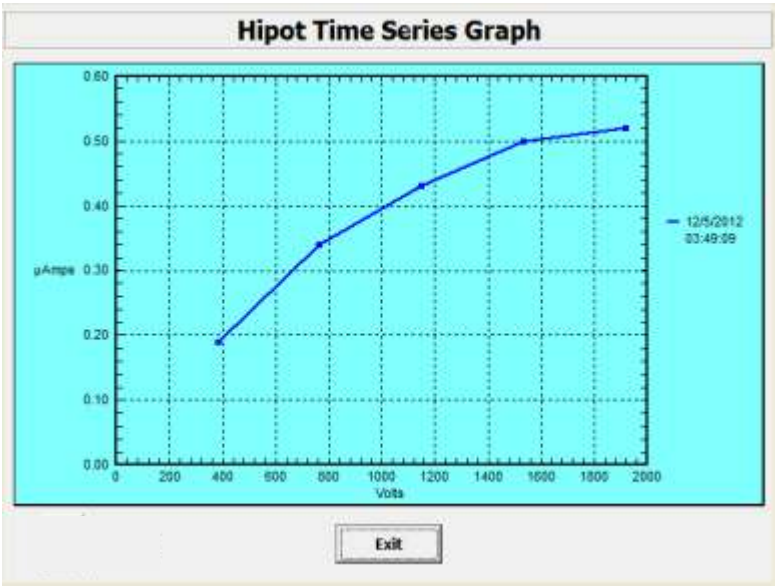
View PI & Step Voltage Time Series Graphs Model C

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.





Model C+ View Surge Tests

Model C+ 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 44 for pictures and more information on reviewing surge tests.

PRINT REPORT MODEL B & C

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 72.

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 and click the "Print Report" button. The print screen shown below comes up.

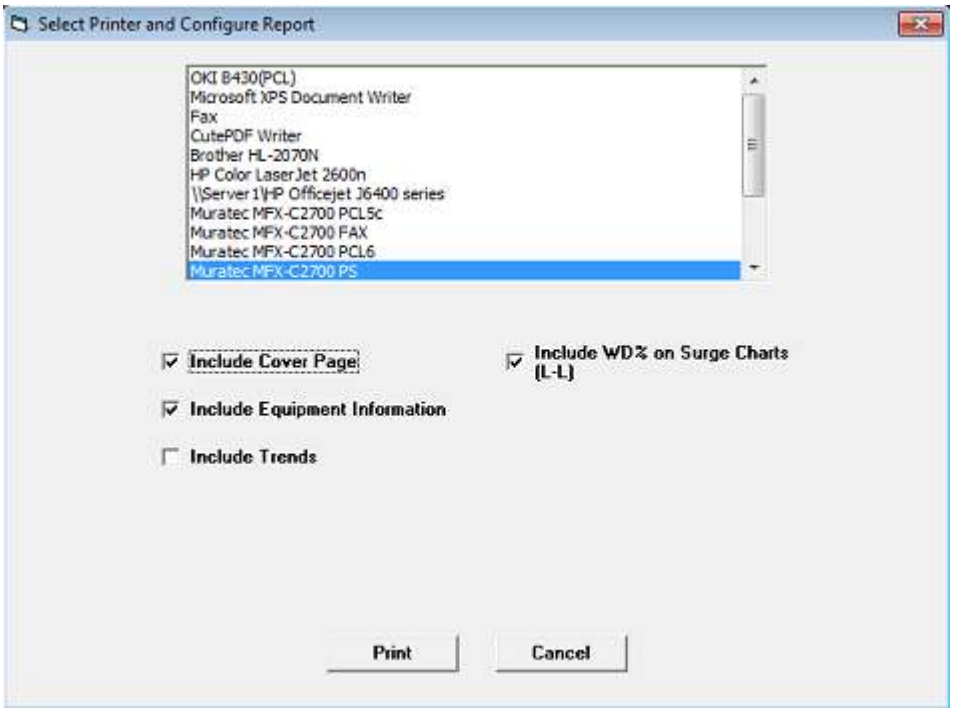
Select the printer to be used. The picture shows a list on a PC, the iTIG II may only have one printer available. It can also have the Electrom PDF Driver.

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

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.



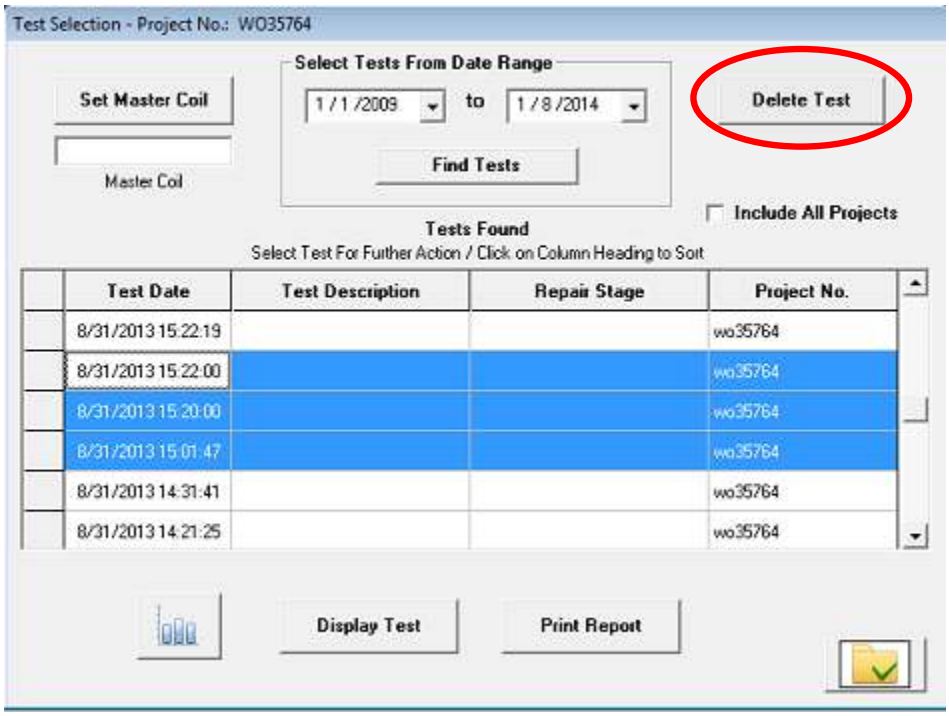
DELETE STORED TESTS

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

1. 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 Jobs and tests under that ID# will be deleted if the ID# is deleted
Jobs Mod C	Motor Information screen	One at a time	All tests under that Job 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.



2. **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, Jobs 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 - C 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 channel 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 the red lead 1 to one side of the coil and one ground lead to the other side.
   - 3.2 Connect the 2nd 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 channel 2 button, connect the red lead to the same coil end or side it was connected to on the first coil and the ground lead to the other side as before. Compare the yellow channel 2 wave to the green channel 1 wave on the screen.
5. For every next coil use channel 2 as in point 4 above and compare them to the first coil, the green wave on 1.

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

Return to:
Motor Information Screen Page 24.
Test Coil against First Coil - Mod D Page 57.
Foot Switch with Coil Test Page 60
DC Tests Page 62 and DC Surge Page 66.

NOTES:
1) *The energized red lead 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.*

Store Data, Model B & C Multi Coil Test

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.

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 A: Go to Page 62

Model C Surge Test against Master Coil

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.

How to Designate a Master Coil (MC) - see System vs ID# MC Page60 :

Designate a Master Coil

Model B:
Go to Page 62

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 Page60 .
   See pictures on Page 58. 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):

Test Using a Master Coil
Model C

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 Job #s, all rows with the same ID# will have a green X.
2. Select the Customer and ID#, maybe also Job 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 Channel 2 selector button on the right side of the screen is green.
7. Connect the red lead to the coil to be tested, and a black lead to the other side of the coil. ***See*** *3.2 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 Job # is used click on the same Job #. 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 C+ MULTI COIL TEST

Test Coils against the First Coil

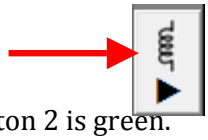
Model C+:

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).

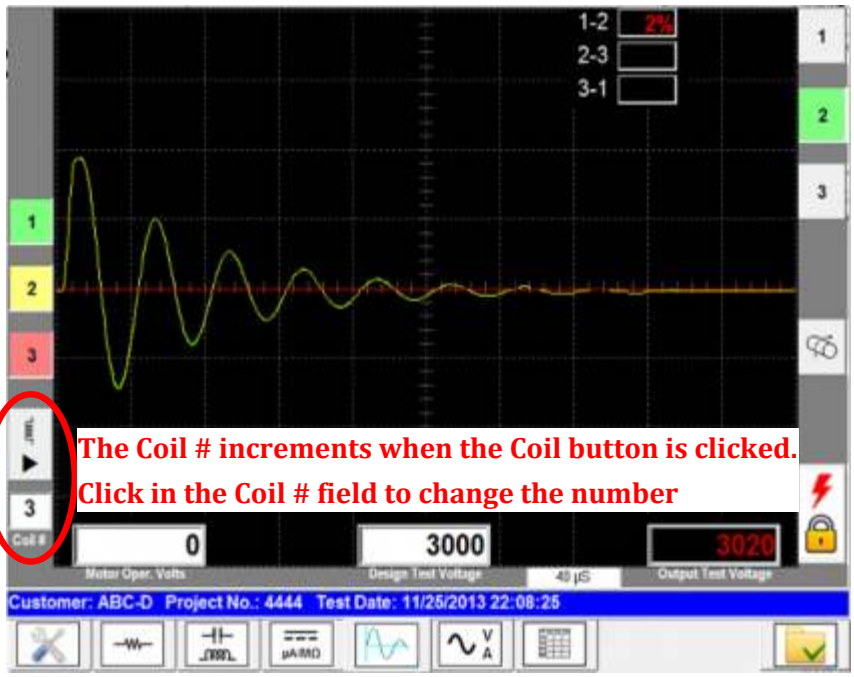
To save the data create a new or use an existing Customer and ID#. Add a Job number and other test descriptions as normal. With the test voltage set on the Setup screen, go to the Surge test screen and do the following:

1. Test the first coil (button 1 on top right side of the surge screen should be green - the default when you start a surge test).
   1.1 Connect the red lead to one side of the coil and a black lead (grounded) to the other side.
   1.2 Connect the 2nd black ground lead to the stator or housing if it exists. If not it does not have to be connected for a surge test.
2. For the second coil connect the red lead to the same coil side as on the first coil and connect the black lead to the other side as before. Repeat 1.2.
3. Click the "Next Coil" button in the lower left corner.
   Note that coil number 2 appears below the button.
   Also note that channel 2 is automatically selected, button 2 is green.



4. Start the test (unlock and press Start) and compare the yellow channel 2 wave to the green channel 1 wave on the screen.
5. For every next coil repeat the process from 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.
6. **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 channel 2 to get started.

Return to:
Model D, Armature Test Page 67.
DC Surge Test Page 66



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

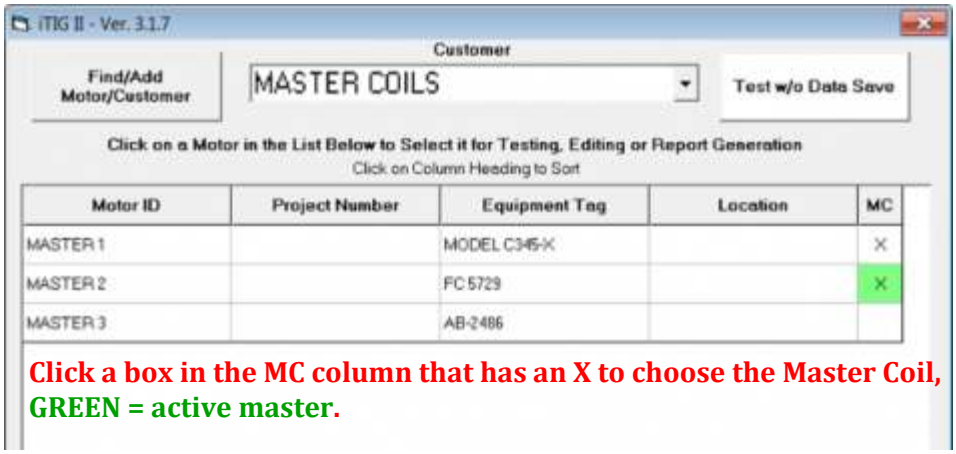
USE EXTREME CAUTION TO AVOID ELECTRIC SHOCK. *A foot switch symbol appears in the right side frame when the FS-01 is used.*

Test Coils Using a Master Coil - Model C+

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.

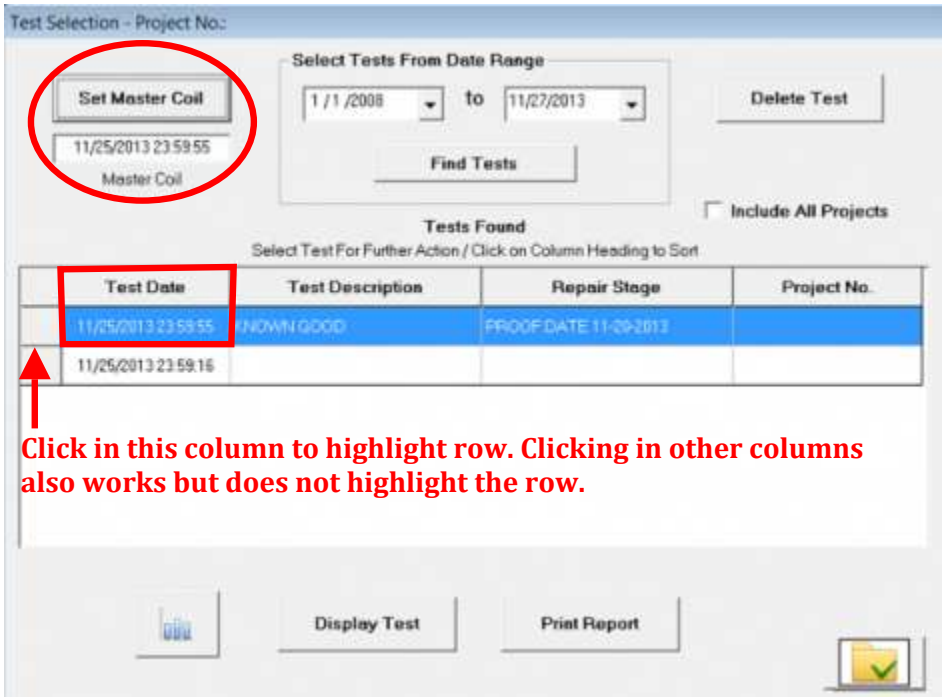
How to Designate a Master Coil (MC):

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).



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 Page17
Model C Master Coil Test Page 56.



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.

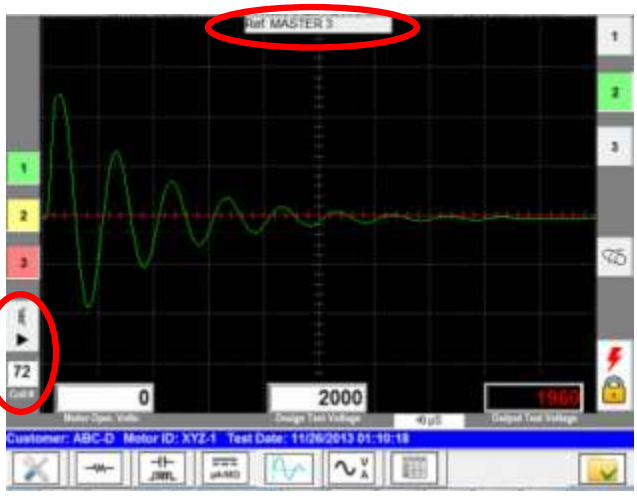
Test Against a Master Coil

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 Job #s, all rows with the same ID# will have a green X as each Job used the same MC.

1. Select or set up the Customer and ID# for the coils to be tested, maybe also a Job 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 Channel 2 button on the right side of the screen is green.
6. Connect the red lead to the coil to be tested, and a black lead to the other side of the coil. The 2nd 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 channel 2 to the green channel 1 wave.
9. For every next coil repeat the process. Click the "Next Coil" button, unlock and start the test. Compare all to the Master Coil.
10. 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.
11. It is more efficient to use a Foot Switch. See next page.

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 he 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

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).

Return to:
MC Model C Page56

Master Coil Setup Recommendation

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

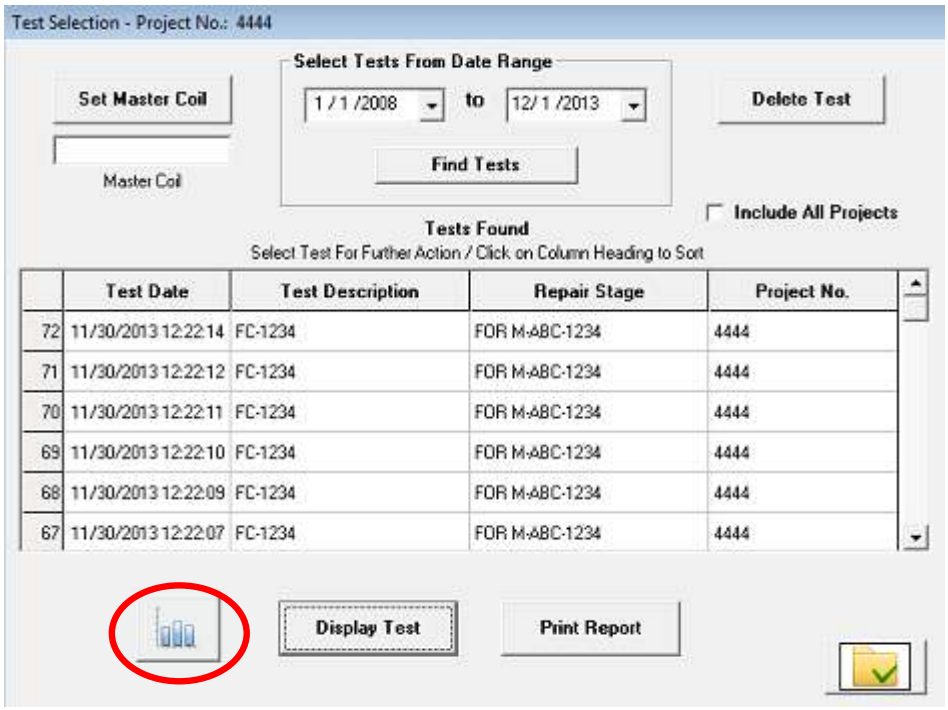
The ID# can be descriptive so it is easily recognized by the test operator. The Equipment Tag and Location fields can be used for further descriptions. They are attached to the ID# for the Master, not to the ID# or the motor or coils that are tested.

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

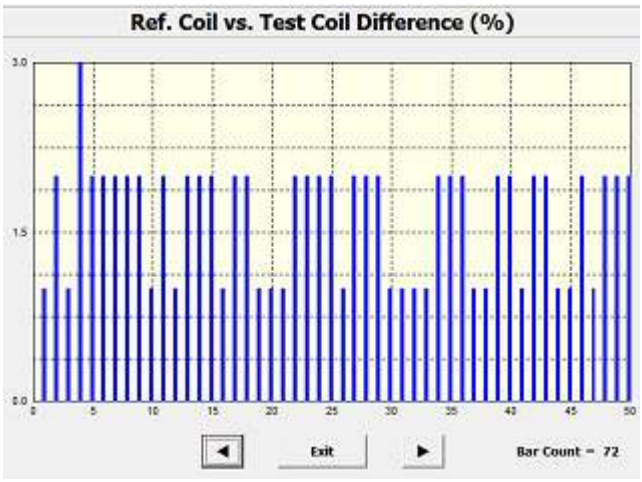
To view multi coil %WD test results in a bar graph when the "Next Coil" button has been used (the coils must have been numbered), click "View Past Tests" on the Motor Information screen. (See Page 24.) The Test Selection screen below appears. There will be a column next to the Test Date column with the 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.



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.



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.

Return to:
View Past Tests *Page 50*
DC Surge Test *Page 66*

CHAPTER 10 C Motor Tests, NOT MODIFIED for the MINI

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 32 to Page 51. **Continue with the "Megohm and Hipot" paragraph below.**

DC SCREEN BUTTONS

Model B & C : When testing DC motors make sure "DC" is selected on the "New Motor" information screen, *B model Page 23. C & D model Page 24.* 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 66.*

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

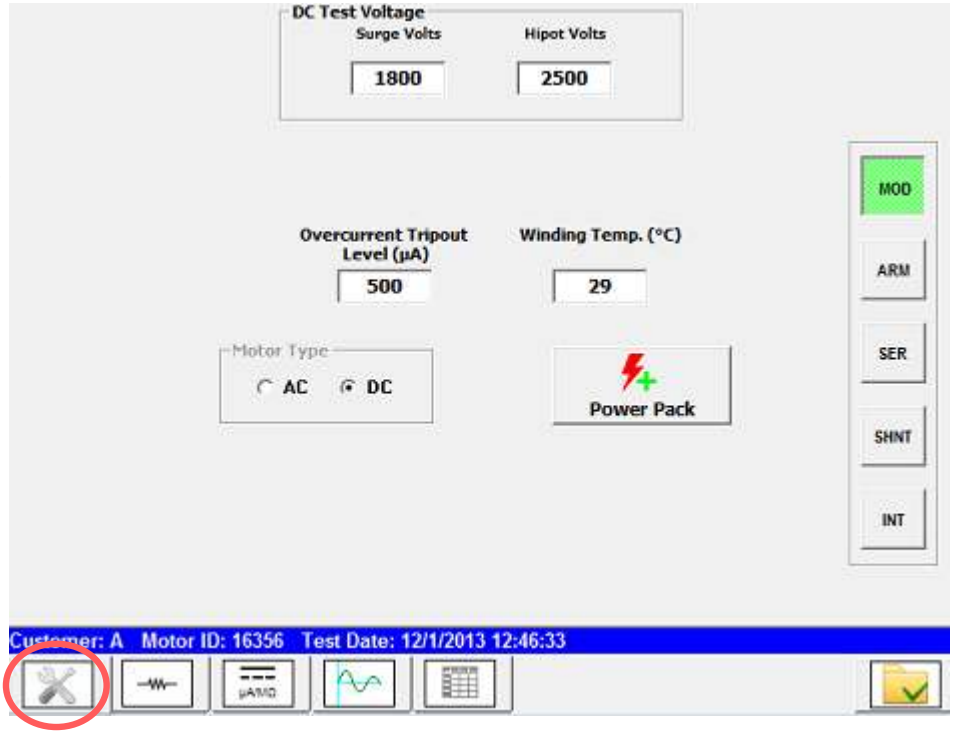
Model A: The Setup screen is the same in AC and DC mode. See Page 27. Enter the test voltage for Surge tests into the Test Volts field in the formula. For the other tests dial the voltage up to the appropriate voltage as in AC mode.

Meg and Hipot tests are done the same way AC motors are tested. ***Go to Page 64 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 65).

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.



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 65).

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).

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 t 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 -C: 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: 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 C+ model Page 57 on.

DC MODULE/STATOR TESTS

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 C+: Bar to Bar Resistance Measurement

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

Resistance, Meg & Hipot

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.

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.

Return to AC Motor Surge Test Page 41.

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

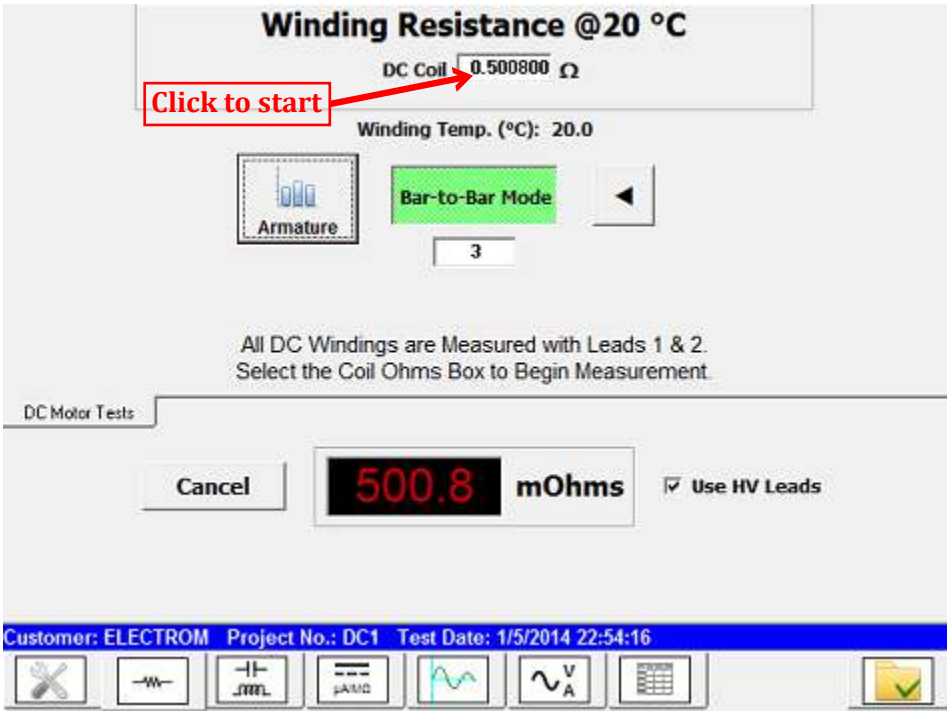
Test voltage = (AOV/#Bars) x Factor x Span

- 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



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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.*

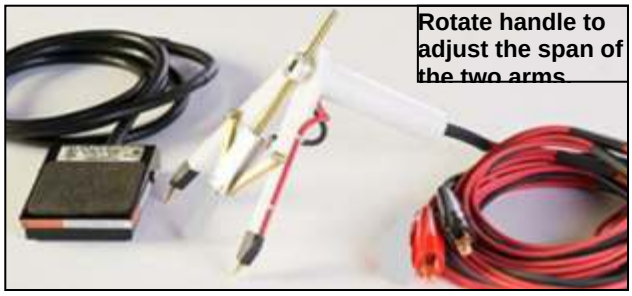
Equalizers may force a change in the span if a single wave pattern cannot be repeated after a few tests. If so, change the span and start over. The same number of equalizers must be spanned in each test.

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.

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 57.

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.

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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 be-

tween 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

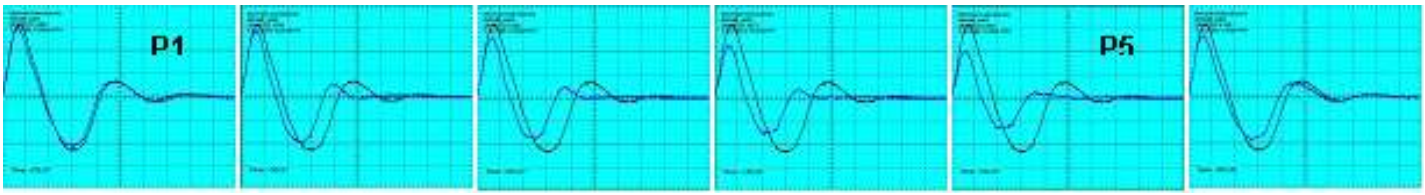
Finding a Fault Location with a Span Test

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, us 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 12 Online Measurements

AC & DC ONLINE MEASUREMENTS MODEL C & D

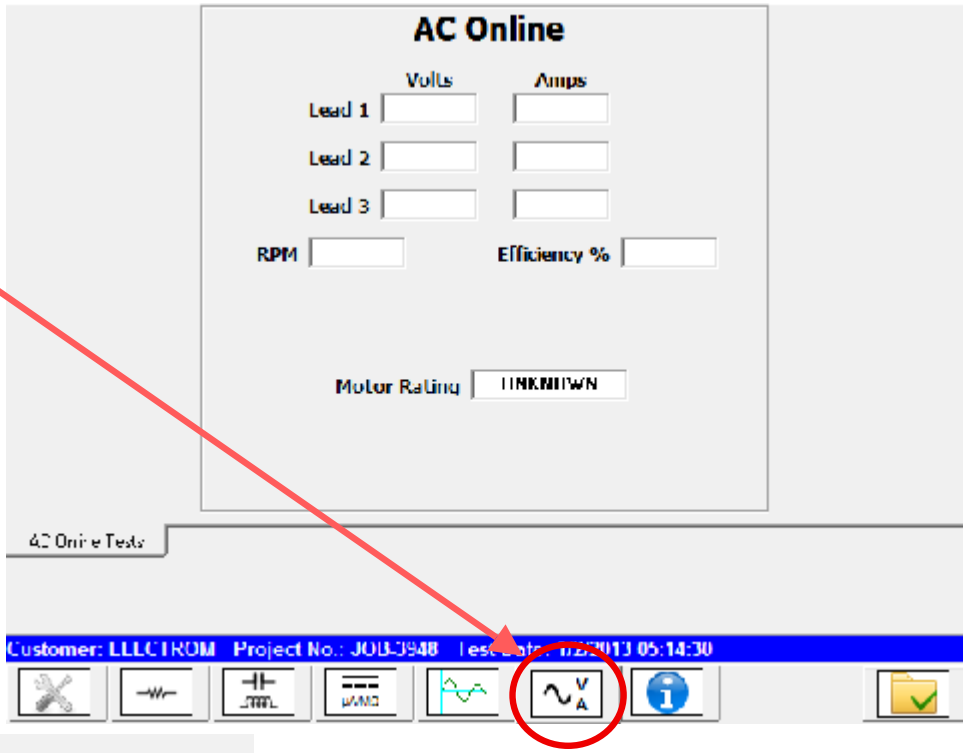
Online measurements are made with other instruments while the motor is running.

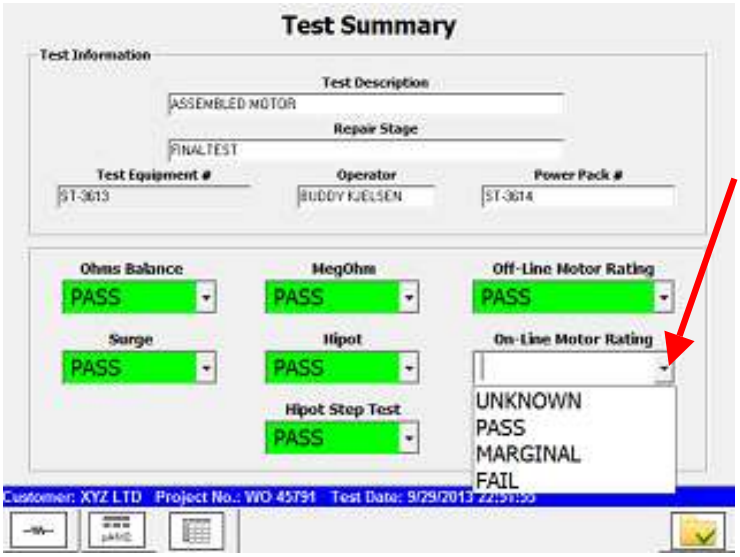
This screen is available so online data can be entered into the iTIG II and be part of a comprehensive report, especially for tests done in the field.

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.





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: 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 C. Options can also be added with software. Model level software upgrades are accomplished the same way as software updates.

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Screen Model A
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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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Data Entry Methods
Page13
Prepare for Test
Page16

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!

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.

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Print reports Page 52.

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 72 .
   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.

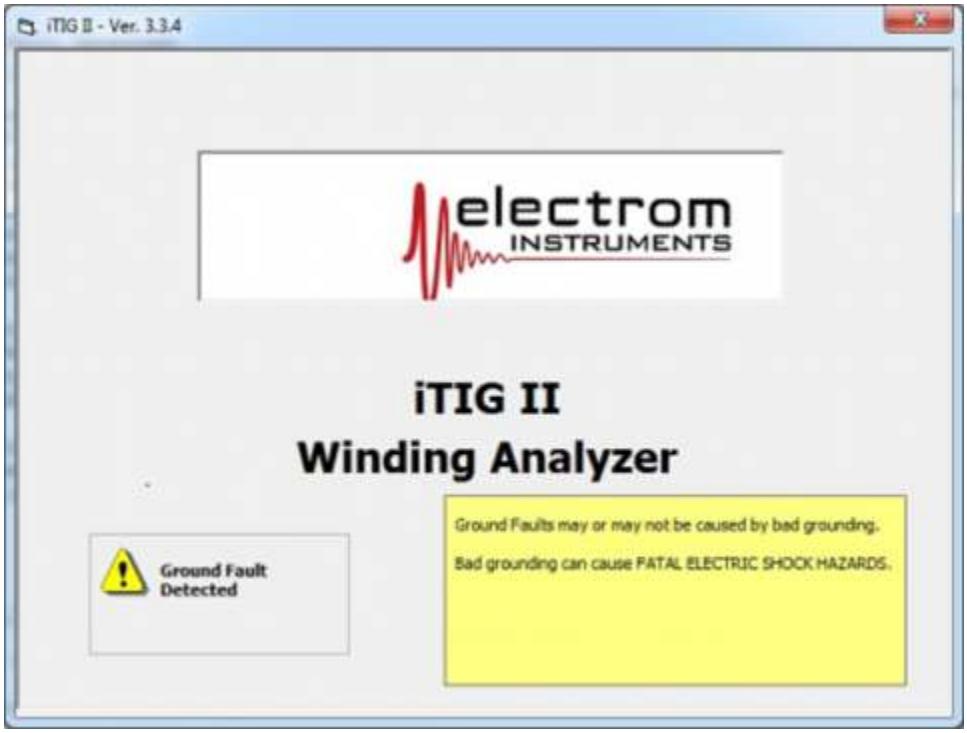
   b. Plug the FD into a local PC that has TRPro installed and that is set up to get its data from the server/remote PC. In TRPro click "Sync Files with Flash Drive" on the Motor Selection screen. The data will be transferred to the Server.
   Requires software version 3.2.x or higher.

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 revered 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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Earth Ground Page 11.

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.