


Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Topics

- Fluke Overview
- Meter Classifications
- Multimeter Safety
 - Know the hazards
 - Inspect the multimeter before using it
 - Avoid electrical shock
 - PPE
- AC Voltage Measurement
- DC Voltage and AutoHold
- Resistance
- Continuity
- Amps with Current Clamp
 - mV AC
- Test Lead Alert
- Auto-range vs. Manual Range
 - Notation and Symbols Used in Electrical Work
- Insulation Testing
 - Insulation Test button

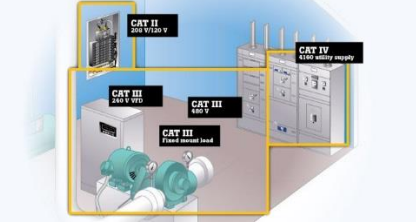


Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25



Topic	Script	Onscreen Text	Graphics
Fluke Overview https://www.bls.gov/news.release/cfoi.t02.htm	<ul style="list-style-type: none"> A digital multimeter is a testing instrument used extensively in the electric utility industry. It is utilized to measure a wide range of electrical quantities, for example: AC & DC voltage, current, and resistance. Choosing the right multimeter for the intended measurement is critical. According to the Department of Labor, in 2017 there were 136 fatal occupational injuries from exposure to electricity. It is of the utmost importance to choose the test instrument that provides the highest level of protection. 	<ul style="list-style-type: none"> Choosing the right multimeter for the intended measurement is critical 	




Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

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<p>Meter Classifications</p>	<ul style="list-style-type: none"> Multimeters have different Classification Categories, CAT for short Classification categories define the highest sustainable voltage level the multimeter can safely monitor without being damaged to the operator or the multimeter. CATs also are based on the highest transient voltage the multimeter can sustain to protect both the operator and the meter. These are also known as “Spikes.” <p>Click Next to continue</p>	<p>Knowledge Check:</p> <p>1. CAT ratings are dependent on the circuit voltage level and proximity to the power source. TRUE</p>	 <table border="1" data-bbox="1911 544 2679 1307"> <thead> <tr> <th>Measurement Category</th> <th>Description</th> <th>Examples</th> </tr> </thead> <tbody> <tr> <td>CAT IV</td> <td>Three-phase at utility connection, any outdoor conductors Limited only by the utility transformer feeding the circuit »50 kA short circuit current</td> <td> <ul style="list-style-type: none"> The “origin of installation”—where low-voltage connection (service entrance cables) is made to utility power. Electricity meters, primary overcurrent protection equipment. Outside and service entrance, service drop from pole to building, run between meter and panel. Overhead line to detached building, underground line to well pump. </td> </tr> <tr> <td>CAT III</td> <td>Three-phase distribution, including single-phase commercial lighting <50 kA short circuit current</td> <td> <ul style="list-style-type: none"> Equipment in fixed installations, such as switchgear and polyphase motors. Bus and feeders in industrial plants. Feeders and short branch circuits, devices fed directly from distribution panels. Lighting systems in larger buildings. Appliance outlets with short connections to service entrance </td> </tr> <tr> <td>CAT II</td> <td>Single-phase receptacle connected loads. <10 kA short circuit current.</td> <td> <ul style="list-style-type: none"> Appliances, portable tools, and other household and similar loads. Outlet and long branch circuits. <ul style="list-style-type: none"> Outlets at more than 10 meters (30 feet) from CAT III source. Outlets at more than 20 meters (60 feet) from CAT IV source. </td> </tr> </tbody> </table> <p>Measurement Categories IAW IEC/EN 61010-031</p>	Measurement Category	Description	Examples	CAT IV	Three-phase at utility connection, any outdoor conductors Limited only by the utility transformer feeding the circuit »50 kA short circuit current	<ul style="list-style-type: none"> The “origin of installation”—where low-voltage connection (service entrance cables) is made to utility power. Electricity meters, primary overcurrent protection equipment. Outside and service entrance, service drop from pole to building, run between meter and panel. Overhead line to detached building, underground line to well pump. 	CAT III	Three-phase distribution, including single-phase commercial lighting <50 kA short circuit current	<ul style="list-style-type: none"> Equipment in fixed installations, such as switchgear and polyphase motors. Bus and feeders in industrial plants. Feeders and short branch circuits, devices fed directly from distribution panels. Lighting systems in larger buildings. Appliance outlets with short connections to service entrance 	CAT II	Single-phase receptacle connected loads. <10 kA short circuit current.	<ul style="list-style-type: none"> Appliances, portable tools, and other household and similar loads. Outlet and long branch circuits. <ul style="list-style-type: none"> Outlets at more than 10 meters (30 feet) from CAT III source. Outlets at more than 20 meters (60 feet) from CAT IV source.
Measurement Category	Description	Examples													
CAT IV	Three-phase at utility connection, any outdoor conductors Limited only by the utility transformer feeding the circuit »50 kA short circuit current	<ul style="list-style-type: none"> The “origin of installation”—where low-voltage connection (service entrance cables) is made to utility power. Electricity meters, primary overcurrent protection equipment. Outside and service entrance, service drop from pole to building, run between meter and panel. Overhead line to detached building, underground line to well pump. 													
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WBT Script Overview
2019-07-25

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	<p>The CAT ratings are as follows:</p> <p>Measurement Category II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation.</p> <p>Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.</p> <p>Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation.</p> <p>Click Next to continue</p>	 <p style="text-align: center;">LLG CONSULTING CORPORATE TRAINING SOLUTIONS</p>	
<p>Multimeter Safety</p> <p>Transients and Spikes</p>	<ul style="list-style-type: none"> A transient overvoltage is a type of voltage surge. Specifically, it is a brief, undesirable, erratic energy spike that can reach thousands of volts. Prime generators of spikes include motors, lightning strikes, unfiltered electrical equipment, and power being switched on and off. Lightning strikes can cause extreme transients on outdoor transmission lines. Transients are an almost unavoidable hazard of testing electrical equipment. 	<p>Transients are an almost unavoidable hazard of testing electrical equipment</p>	

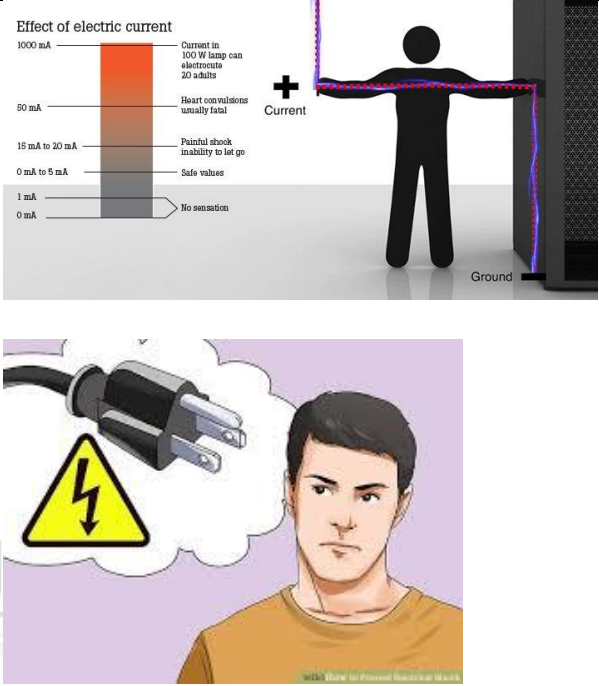
Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

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<p>Multimeter Safety Arc Flashes</p>	<ul style="list-style-type: none"> • Arc flashes and arc blasts are another hazard to be considered. They are an electric current discharged across an air gap that is caused by an excess voltage ionizing the air between two conductors. • They can also be caused by accidental contact between two conductors that results in them rapidly heating to the point of vaporization • Caution: An arc flash can happen when a power line transient such as a lightning strike or power surge occurs while a digital multimeter is being used to measure voltage in an electrical system. CAT-rated multimeters (which was explained previously) are designed to minimize or reduce the possibility of an arc flash occurring inside the multimeter. <p>Click Next to continue</p>	<p>Knowledge Checks:</p> <p>2. The _____ the CAT rating, the _____ the chance the meter will fail for a given transient signal.</p> <p>a. higher/higher b. higher/lower c. lower/higher d. lower/lower</p> <p>Knowledge Check:</p> <p>3. A/An _____ is a violent electrical discharge across a gap between two conductors or created when two energized conductors touch accidentally.</p> <p>a. Arc flash b. Arc gap c. Fault current d. Ground current</p>	



Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

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<p>Multimeter Safety</p> <p>Inspect the multimeter before using it</p>	<ul style="list-style-type: none"> Multimeter safety starts with a visual inspection of the device for signs of physical damage Inspect the input jacks for any signs of damage Inspect the probes and leads for excessive wear, cracks, or missing insulation Damaged probes cannot be repaired. They must be replaced 	<p>Damaged probes cannot be repaired They must be replaced</p> <p>Knowledge Checks:</p> <p>4. Test leads and probes should be inspected for signs of damage before use. TRUE</p> <p>5. It is acceptable practice to repair damaged multimeter test leads. FALSE</p>	
<p>Multimeter Safety</p> <p>Inspect the multimeter before using it</p> <p>https://www.fluke.com/en-us/learn/best-practices/test-tools-basics/digital-multimeters/safety-tips-dmm</p>	<ul style="list-style-type: none"> Be sure to review the calibration date, which is located on the bottom of the meter and ensure it has not lapsed. Never assume a multimeter is working properly. Before working on any circuit, you must verify that your meter is working as intended. When not in use, keep a multimeter, its test leads, and accessories in a protective case. <p>Click Next to continue</p>	<p>Meters that are past the calibration date must not be used</p> <p>Knowledge Checks:</p> <p>6. Test equipment/meters do not need to be inspected before each use. FALSE</p>	<p>Photo of someone inspecting multimeter and test leads.</p> 

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

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<p>Multimeter Safety</p> <p>Avoid electrical shock</p> <p>https://www.fluke.com/en-us/learn/best-practices/test-tools-basics/digital-multimeters/safety-tips-dmm</p>	<ul style="list-style-type: none"> • ALWAYS assume every electrical component in a circuit is energized until properly and positively discharged. • Shock occurs when the human body becomes part of an electrical circuit, so be aware of your body positioning when working in electrical environments. • Personal items such as keys, jewelry, and watches are potential conductors of electricity. • The severity of shock depends on the: <ul style="list-style-type: none"> ○ Amount of electric current ○ Length of time the body is exposed to current flow ○ Path the current takes through the body ○ Area exposed to electric contact ○ Condition of the body exposed to current (wet hands, for instance, have less resistance to current flow than dry hands) 	<p>ALWAYS assume every electrical component in a circuit is energized until properly and positively discharged</p> <p>Personal items such as keys, jewelry, and watches conductors of electricity.</p> <p>Knowledge Checks:</p> <p>7. _____ occurs when the body becomes part of an electrical circuit.</p> <ol style="list-style-type: none"> Electric shock System trip Pressure wave Phase change 	 <p>The top graphic, titled 'Effect of electric current', shows a vertical scale of current levels and their effects on the human body. The scale includes: 1000 mA (Current in 100 W lamp can electrify 20 adults), 50 mA (Heart convulsions usually fatal), 15 mA to 20 mA (Painful shock inability to let go), 0 mA to 5 mA (Safe values), 1 mA (No sensation), and 0 mA. To the right, a silhouette of a person is shown with a red lightning bolt symbol and a '+' sign, representing a current source. The person is standing on a 'Ground' surface. The bottom graphic shows a man's face with a thought bubble containing a lightning bolt symbol and a power plug, representing an electrical shock.</p>

Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

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<p>Multimeter Safety</p> <p>Personal Protective Equipment (PPE)</p>	<ul style="list-style-type: none"> • Use only approved personal protective equipment (PPE), both on-body (eyes, gloves, headwear. It's required when working on or near energized, exposed electrical circuits of greater than 50 V. • When working on or near exposed, energized equipment, the best practice is to work with a partner. • Avoid taking measurements in humid or damp environments as you are at a greater risk for being shocked. • Ensure no atmospheric hazards (flammable dust or vapor, for instance) are present in the area. • Watch for visual warnings in the multimeter LED display as it can alert operators if there is 30 Volts or greater at the test probes. <p>Click Next to continue</p>	<p>Knowledge Check:</p> <p>8. Proper Personal Protective Equipment (PPE) is required when working on or near exposed electrical circuits above ____ volts.</p> <ol style="list-style-type: none"> 25 50 75 100 	  <p>20190530_121718.mp4</p> <p>30 Volts or greater</p> <p>20190530_121718.mp4</p>

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 WBT Script Overview
 2019-07-25

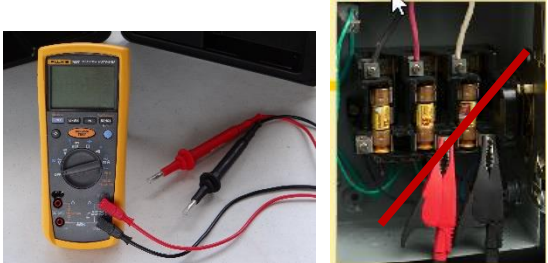
AC Voltage Measurement

The Fluke 1587 meter is both 600v CAT IV and 1000v CAT III safety rated. It is designed to be used on switchgear up to 600 V.

- Again, its CAT(Category) classification is based on the amount of transient voltage the multimeter can safely sustain.

Click the **Rotary Switch** to set the multimeter to read AC volts

The standard meter required by TRC is the Fluke 1587.



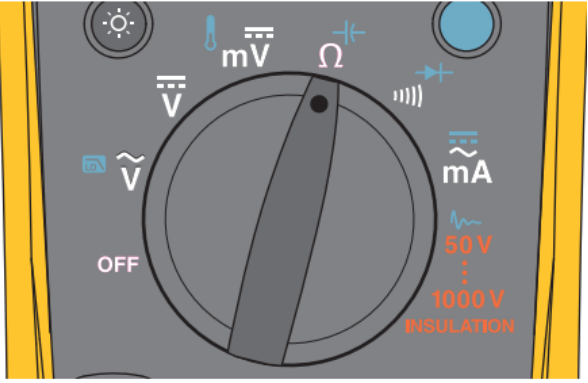


See chart – is it too deep for this WBT
<http://www.ni.com/white-paper/5019/en/>

Rated Voltage	IEC 61010-1 2nd Edition			UL 61010B-1 (UL 31111-1)		
	CAT IV	CAT III	CAT II	CAT III	CAT II	CAT I
150V	4,000V	2,500V	1,500V	2,500V	1,500V	800V
300V	6,000V	4,000V	2,500V	4,000V	2,500V	1,500V
600V	8,000V	6,000V	4,000V	6,000V	4,000V	2,500V
1,000V	12,000V	8,000V	6,000V	8,000V	6,000V	4,000V
Resistance	2 ohms	2 ohms	12 ohms	2 ohms	12 ohms	30 ohms







Storyline Button: Click the **Rotary Switch** to select  AC volts function

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25


Topic	Script	Onscreen Text	Graphics
			
<p>AC Voltage Measurement</p>	<p>This multimeter is a true-RMS (Root Mean Square) instrument and has 1% basic accuracy for AC voltage measurements up to 600V and 2% accuracy for the 1000V range.</p> <p>The AC multimeter ranges are: 600.0 mV, 6.00V, 60.00V, 600V. and 1000V</p> <p>Let's connect the digital multimeter to circuit AC108 in the TRC Lancaster Lab.</p> <p>Click Next to continue to DC Voltage and AutoHold</p>		 <p>The multimeter LCD screen should show 119.6 V</p>

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

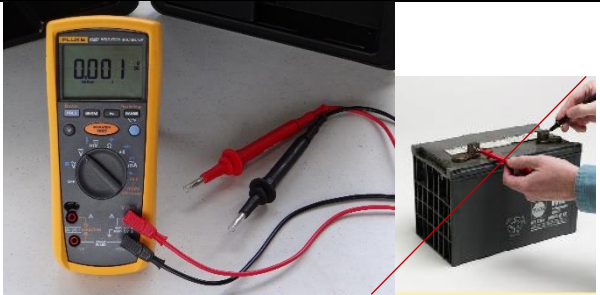
Topic	Script	Onscreen Text	Graphics
DC Voltage and AutoHold	<p>Use the DC volts function for measurements on DC powered components.</p> <p>The DC multimeter ranges are: 6.00V, 60.00V, 600V.0 and 1000V Basic DC accuracy is 0.09% for the 1587</p>	<p>Knowledge Check:</p> <p>9. On which setting should the multimeter be when testing circuit from the battery bank?</p> <ul style="list-style-type: none"> a. ACV b. DCV c. mV d. mA 	<div style="display: flex; flex-wrap: wrap;">     </div> <p>The multimeter LCD screen should show 0.001 V</p>



Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25


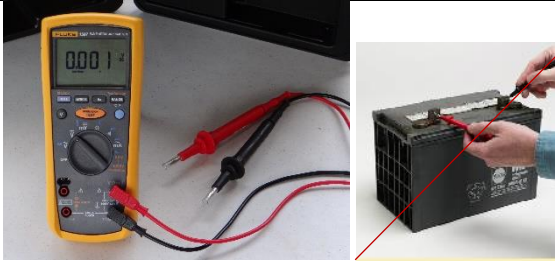

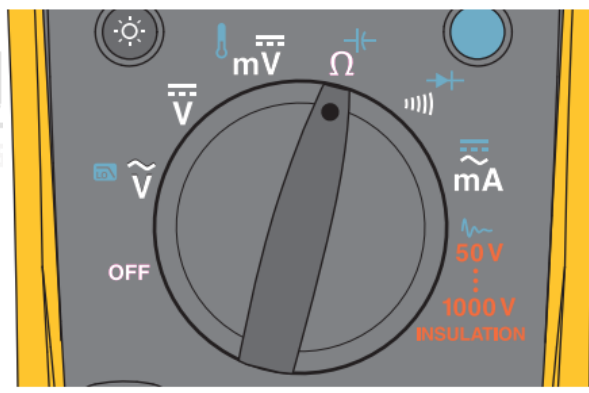
Topic	Script	Onscreen Text	Graphics
DC Voltage and AutoHold	<p>Now, let's perform a DC voltage measurement using the AutoHold mode.</p> <ul style="list-style-type: none"> • In AutoHold, the multimeter holds the reading on the display until it detects a new stable reading. • The multimeter beeps each time it captures a stable reading that is higher than the last reading. • When you're working on cramped systems, you can use the AutoHold mode and focus on where you are placing the probes. <p>Click the Hold button to hold the next measurement</p>		<div data-bbox="1876 235 2186 470"> </div> <div data-bbox="2221 341 2393 470"> </div> <p>The multimeter LCD screen should show 0.001 V</p> <p>https://www.dropbox.com/home/Applied%20Learning%20Sci%20Team%20Folder/TRC/courses/Power%20Fundamentals/Content/phase%20II/Atwater%20Substation%20photos</p> <p>Storyline: Click the Hold button to hold the next measurement</p> <div data-bbox="1876 803 2462 1079"> </div>

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

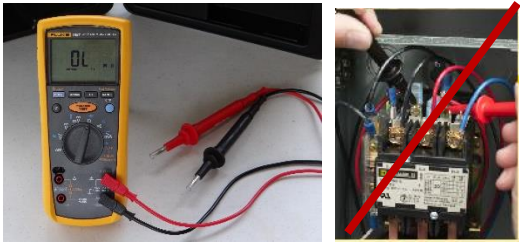

Topic	Script	Onscreen Text	Graphics
DC Voltage and AutoHold	<p>Now, let's take a voltage reading from the battery bank.</p> <p>The reading is captured on the display. Remove the probes and the multimeter will hold the reading.</p>	<p>Knowledge Check:</p> <p>10. The _____ function should be used when taking a reading, but you can't see the display.</p> <ol style="list-style-type: none"> a. Auto Hold b. Range c. Insulation Test d. Manual Range 	 <p>000.1 V on the screen... then the multimeter LCD screen should show 131.2 V when the probes are touched to the battery.</p>



Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25




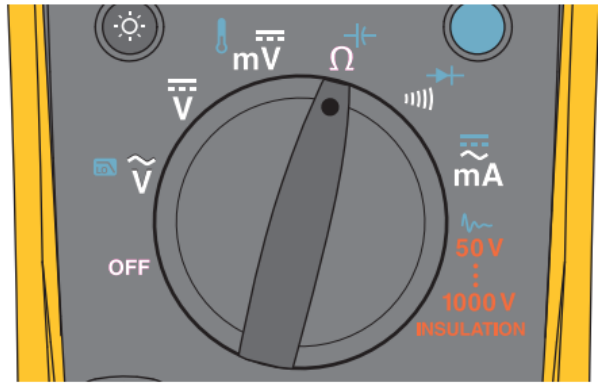
Topic	Script	Onscreen Text	Graphics
DC Voltage and AutoHold	<p>The value will stay on the display until you take a new, stable reading that is higher than the previous reading. You can also push the Hold button to release the AutoHold function.</p> <p>Click the Rotary Switch to select the Ohms function</p>		<div style="display: flex; justify-content: space-around;">  </div> <p>The multimeter LCD screen should show 131.2 V</p> <p>Storyline: Click the Rotary Switch to select the  Ohms function</p> 

Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25




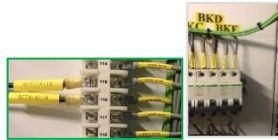

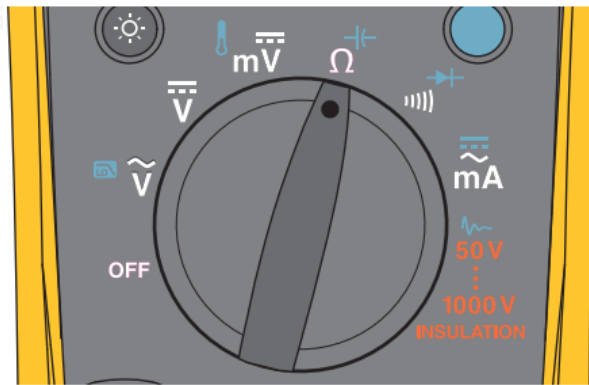
Topic	Script	Onscreen Text	Graphics
Resistance	<p>Resistance testing must ALWAYS be performed on a de-energized circuit. Never connect a multimeter set to resistance to an energized circuit.</p> <p>When using a Fluke 1587 during wire and continuity checks the multimeter can act like a jumper wire if accidentally connected to an energized circuit. This can lead to equipment mis-operation, equipment damage, or arc flash.</p> <p>Use the resistance function to measure resistance from 0.1 ohms up 50 mega-ohms. This function uses a much lower test voltage than the insulation test function, which will be covered shortly. It is used for measuring lower resistances such as relay coils.</p>	<p>Resistance testing must ALWAYS be performed on a DE-ENERGIZED circuit. Never connect a multimeter set to resistance to an energized circuit</p>	 <p>Jim Longo</p> 




Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

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Resistance	<p>Basic ohms accuracy of the 1587 is 0.9% up to the 6MΩ range and 1.5% for the 50MΩ range.</p> <p>The 1587 has six resistance ranges.</p> <p>The continuity function is similar to the ohms function, but it adds an audible tone and uses only the lowest resistance range.</p> <p>Click the Rotary Switch to select the Continuity Test function</p>	<p>Knowledge Check:</p> <p>11. When verifying wires are landed correctly or fuses are “good” you should use this function of the multimeter:</p> <ol style="list-style-type: none"> a. Continuity b. Range c. AutoHold d. Insulation Test 	 <p>Jim longo slide show. We may use this image below according to Charles.</p>  <p>Storyline: Click the Rotary Switch to select the  Continuity Test function</p> 

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 WBT Script Overview
 2019-07-25

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<p>Continuity</p>	<p>The continuity beeper sounds whenever resistance between the leads is less than 25 ohms. This function is used to check continuity of fuses and wiring, for example:</p> <p>Let's connect the digital multimeter to circuit Charlie, Hotel one, four, six (CH146) between Bravo, Kilo, Echo, dash, four (BKE-4) in Cabinet six and terminal one, one, six in Cabinet 7 in the TRC Lancaster Lab.</p> <p>Click the Rotary Switch to select AC Volts function.</p>		   <p>Storyline Button: Click the Rotary Switch to select  AC Volts function</p> 

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WBT Script Overview
2019-07-25

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Measure Amps with Current Clamp	<p>TRC requires the use of a clamp to measure current in a live circuit.</p> <p>There are two types of clamp accessories:</p> <ul style="list-style-type: none">• Clamps that output milli-amps• Clamps that output milli-volts <p>The clamp output is proportional to the current flowing between the jaws.</p>		 <p>0503191602a.jpg</p>



Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Amps with Current
Clamp

The TRC approved MN-103 clamp has 2 ranges and an AC milli-volt output:

- 1 milli-volt per milli-amp on the 10 amp range; 1 to 1 ratio
- 1 milli-volt per amp on the 100 amp range; 1000 to 1 ratio

The clamp is rated to measure currents from 1milli-amp to 100A AC.

On the 10 amp setting, a meter reading of 85.3 milli-volt means 85.3 milli-amps flowing in this branch primary. Whereas on the 100 amp setting the same reading would mean 85.3 amps in the circuit.




Show a animation of current flowing through a clamp on. Jim Longo will provide this image soon or examples of what could be created by Jonathon.



Show the clamp with the 10A setting.




Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Topic	Script	Onscreen Text	Graphics
			 <p>8.24 μA</p> <p>85.3</p>



Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

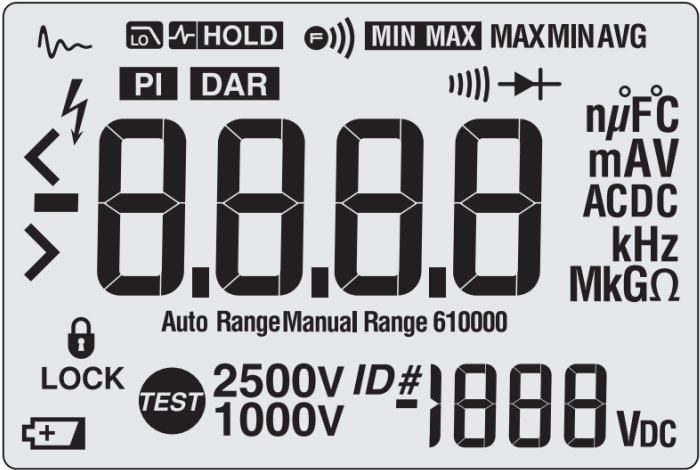


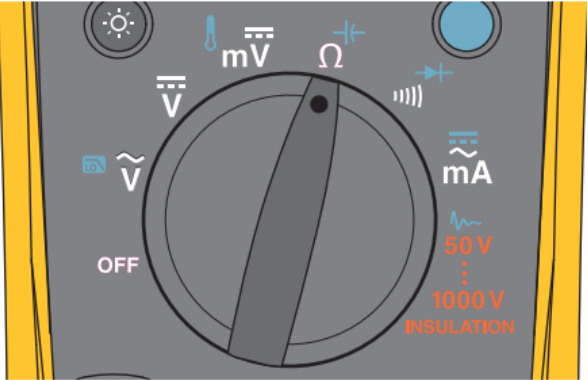
Topic	Script	Onscreen Text	Graphics
<p>Amps with Current Clamp</p>	<p>With the current clamp set to the 10 amp range, the meter displays a value of 5 Volts.</p> <p>This can be interpreted as 5 Amps in the wire being measured.</p> <p>Click Next to continue</p> <p>Click the Rotary Switch to select milli-volt DC function</p>	<p>Knowledge Check:</p> <p>12. Given a 1mV/A clamp and a multimeter reading of 0.094 volts, what is the current flowing through the primary (100A range)?</p> <p>a. .175 A b. 1.75 A c. 17.50 A d. 94.0 A</p>	 <p>5.000</p>

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WBT Script Overview
2019-07-25


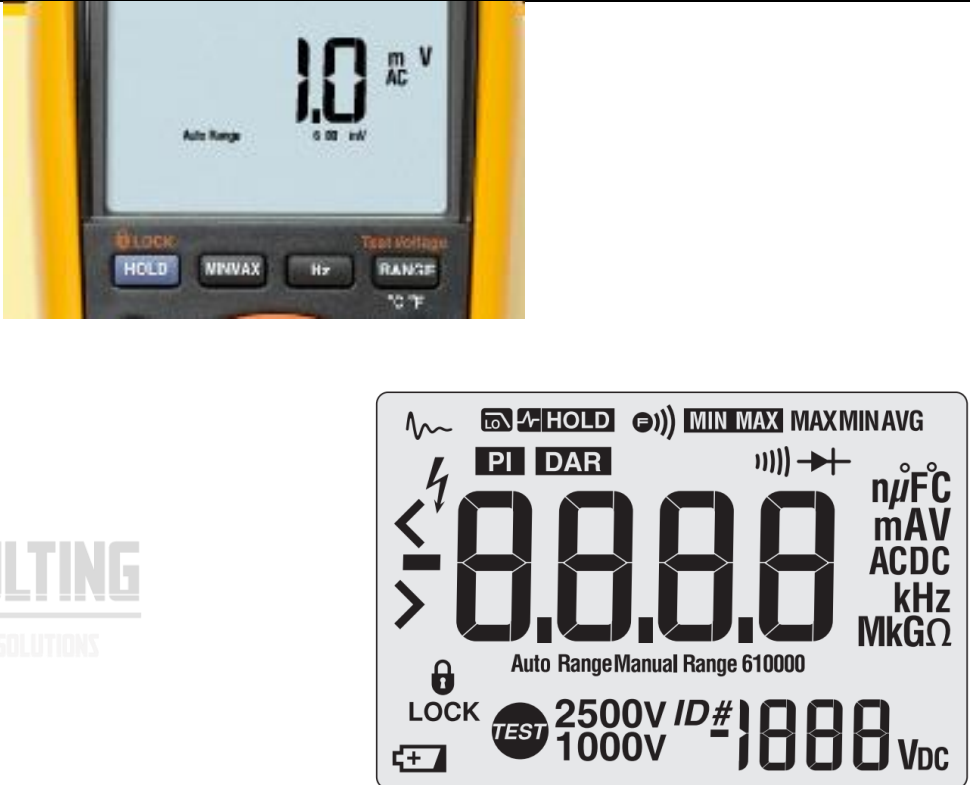
Topic	Script	Onscreen Text	Graphics
Amps with Current Clamp	<p>Other Fluke current clamps have outputs of milli-Volts DC and milli-amps AC. You may see them in the field from time to time.</p> <p>Click Next to continue</p>		



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 WBT Script Overview
 2019-07-25

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<p>Test Lead Alert</p>	<p>A common mistake is leaving a test lead in the milli-amp jack and trying to measure voltage. This results in a blown multimeter fuse.</p> <p>To remind you to check that the test leads are in the correct terminals, LEAd shows momentarily alarm when you move the rotary switch to or from the mA position.</p> <p>Note: The milli-amp function should only be used with a current clamp that supports this function.</p> <p>Click the Rotary Switch to select Volts AC function</p> 	<p>Knowledge Check:</p> <p>13. The Test Lead Alert feature of the multimeter serves what purpose?</p> <ol style="list-style-type: none"> The leads are in the correct terminals The leads polarity is backward The leads are damaged The leads are correct 	 <p>https://www.dropbox.com/s/y8pjbgldagtoj5f/Potential%20Junction%20Box.png?dl=0</p> <p>https://www.shutterstock.com/image-photo/two-high-voltage-fuses-fuse-block-68705248?src=lpW8mpQtW8pY-PhM5y8n6Q-1-8</p> <p>See page 6 of Fluke manual to see what displays.</p> <p>Storyline Button: Click the Rotary Switch to select  AC Volts function</p> 

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 WBT Script Overview
 2019-07-25

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<p>Auto-range vs. Manual Range</p> <p>pg.17 in the manual</p>	<p>The multimeter has both Manual Range and Auto Range modes.</p> <ul style="list-style-type: none"> In the Auto Range mode, the multimeter selects the range with the best resolution. In the Manual Range mode, the operator can override Auto Range and select the range. <p>When the multimeter is turned on, it defaults to Auto Range and Auto Range displays.</p> <ol style="list-style-type: none"> To enter the Manual Range mode, press Range. Manual Range is shown. In the Manual Range mode, press Range to increment the range. After the highest range, the multimeter wraps to the lowest range. To exit Manual Range, press Range for one second or turn the rotary switch. The multimeter returns to Auto Range and Auto Range displays. <p>Note: It can take a few seconds for the multimeter to capture a measurement when using Auto-range.</p> <p>Click Next to continue to Scientific Notation</p>	<p style="text-align: center;"></p> <p>Note: It can take a few seconds for the multimeter to capture a measurement when using Auto-range.</p>	


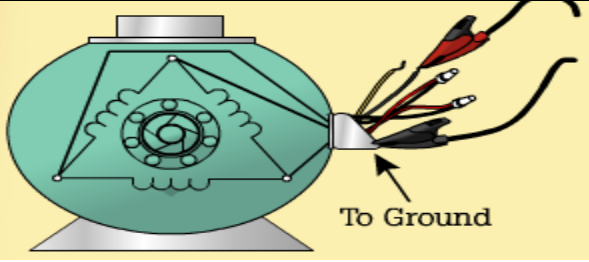

Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Topic	Script	Onscreen Text	Graphics																																			
<p>Notation and Symbols Used in Electrical Work</p>	<p>Scientific notation is a way of expressing numbers that are too big or too small to be conveniently written or read in decimal form.</p> <p>This table illustrates the prefix, unit abbreviation, exponential factor, meaning, and example in a unit of measure, such as volts. These are the most common prefixes you will see in the field. of Testing and Commissioning.</p> <p>Click Next to continue to Insulation Testing</p>	<p>Use the table below for this section.</p>																																				
	<p>Scientific Notation Table</p> <table border="1"> <thead> <tr> <th>Prefix</th> <th>Unit Abbrev.</th> <th>Exponential Factor</th> <th>Meaning</th> <th>Example in Volt</th> </tr> </thead> <tbody> <tr> <td>giga</td> <td>G</td> <td>10⁹</td> <td>1,000,000,000</td> <td>1 gigavolt (GV) = 10⁹ V</td> </tr> <tr> <td>mega</td> <td>M</td> <td>10⁶</td> <td>1,000,000</td> <td>1 mega volt (MV) = 10⁶ V</td> </tr> <tr> <td>kilo</td> <td>k</td> <td>10³</td> <td>1000</td> <td>1 kilovolt (kV) = 1000 V</td> </tr> <tr> <td></td> <td></td> <td>10⁰</td> <td>1</td> <td>1 volt (V)</td> </tr> <tr> <td>milli</td> <td>m</td> <td>10⁻³</td> <td>1/1000</td> <td>1 millivolt (mV) = 0.001 V</td> </tr> <tr> <td>micro</td> <td>μ</td> <td>10⁻⁶</td> <td>1/1,000,000</td> <td>1 microvolt (μV) = 10⁻⁶ V</td> </tr> </tbody> </table>		Prefix	Unit Abbrev.	Exponential Factor	Meaning	Example in Volt	giga	G	10 ⁹	1,000,000,000	1 gigavolt (GV) = 10 ⁹ V	mega	M	10 ⁶	1,000,000	1 mega volt (MV) = 10 ⁶ V	kilo	k	10 ³	1000	1 kilovolt (kV) = 1000 V			10⁰	1	1 volt (V)	milli	m	10 ⁻³	1/1000	1 millivolt (mV) = 0.001 V	micro	μ	10 ⁻⁶	1/1,000,000	1 microvolt (μV) = 10 ⁻⁶ V	
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Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
<p>Insulation Testing</p>	<p>In an electric circuit, current is delivered by a conductor, it performs work and returns to the source on another conductor.</p> <p>Insulation keeps the current contained within the system. If the insulation is faulty the current will possibly take an unwanted path.</p> <p>Insulation is like the walls of a water pipe. To look for leaks in water pipes we carefully apply a higher than normal pressure to the system. This makes it easy to see even small leaks.</p> <p>The insulation resistance test (also known as a Megger test) is an inspection which uses an applied DC voltage. Typical test voltages include 250Vdc, 500Vdc or 1,000Vdc for low voltage equipment carrying 600V or less.</p> <p>Test voltages of 2,500 Vdc or higher are used to measure insulation resistance in either kilo-ohm, mega-ohm, or giga-Ohm. Be sure that you don't apply any higher voltage than the devices allow for a given test.</p> <p>This test is ONLY performed on a de-energized circuit</p>	<p>This test is ONLY performed on a de-energized circuit</p> <p>Knowledge Check:</p> <p>14. The Insulation Test is also known as a _____ test.</p> <p>a. Megger b. Capacitance c. Inductive d. Pressure</p>	<p>https://youtu.be/uUTHMcjtQCc</p> <p>https://youtu.be/UZIVUA2Ce7wl</p>



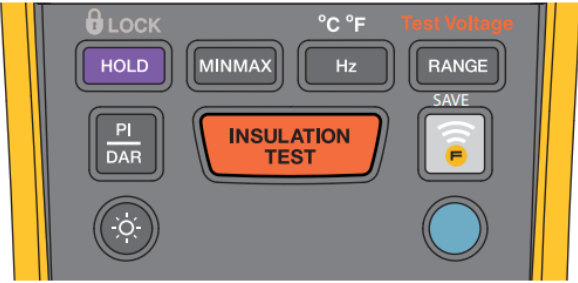
Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Topic	Script	Onscreen Text	Graphics
Insulation Testing	<p>To look for leakage current in an electrical circuit, an insulation tester applies a higher-than-normal test voltage. The circuit must first be isolated from other circuits not being tested and any grounds normally present.</p> <p>The multimeter limits the test current to help protect the operator. It measures the precise current and voltage then uses Ohm's law to calculate insulation resistance.</p> <p>The most common Megger testing TRC performs is to verify single point grounds on a CT circuit and verify no unwanted shorts or grounds on new cable bundles.</p> <p>Click Next to continue to Human Performance Tools</p>	 <p>LLG CONSULTING CORPORATE TRAINING SOLUTIONS</p>	 





Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
Insulation Testing Human Performance Tools	<p>TRC has assembled and provides Isolation/Human Performance (HP) Kits to assist with isolation, identification, and barricading while working on or around energized parts during testing and commissioning.</p> <p>HP Kits include:</p> <ul style="list-style-type: none"> • Black and Colored Vinyl Electrical Tape • TRC High-Strength Magnets • Wire Clips • Danger Signs • Restricted Access Banners • Hanging Tags • Rubber Wire Caps • Test Jack Isolators <p>HP tools provide barriers to restrict access to only qualified people. They also help operators keep the work area clean and free of obstacles.</p>		 
Insulation Testing Human Performance	<p>Before conducting any work such as Insulation Testing, be sure to review system drawings to verify proper equipment and circuit. Use a multimeter to verify ALL circuits are de-energized.</p> <p>Use only TRC approved PPE (Personal Protective Equipment) when performing insulation tests as it helps protect the user against health or safety risks.</p>	<p>Use a multimeter to verify ALL circuits are de-energized.</p> <p>Use only TRC approved PPE (Personal Protective Equipment) when performing insulation tests as it helps protect the user against health or safety risks.</p>	

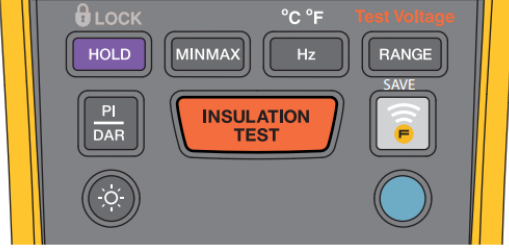

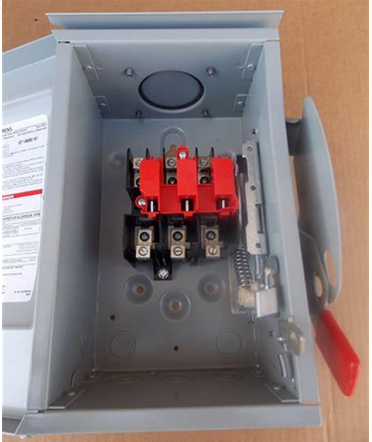
Fluke 1587 Digital Multimeter
WBT Script Overview
2019-07-25

Topic	Script	Onscreen Text	Graphics
	<p>When performing an insulation test on a conductor it always needs to be properly isolated at both ends.</p> <p>Click the Rotary Switch to select Insulation Testing</p>	<p>Knowledge Check:</p> <p>15. When performing an insulation test on a conductor it does not need to be properly isolated at both ends.</p> <p>FALSE</p>	
Insulation Testing	<p>Now, let's setup the meter to check the insulation on the load side of a disconnect.</p> <p>When you turn the Rotary Switch to the Insulation setting, the multimeter performs a quick battery check to ensure it has enough power to perform the test.</p> <p>Note: The Fluke 1587 multimeter uses 4 AA batteries.</p>		<p>Storyline Button: Click the Rotary Switch to select 1000 V INSULATION Insulation</p> 
Insulation Testing	<p>The range button is used to cycle through the available test voltages.</p> <p>The higher test voltages such as 500 volts and 1000 volts are typically used for power distribution gear, control wiring, and transformer fan motors.</p> <p>Click the Range button to select the 1000 volt test voltage.</p>	<p>ALWAYS select the appropriate test voltage for the circuit</p> <p>Click the Range button to select the 1000v test voltage</p>	<p>Storyline: Click the Range button to hold the next measurement</p> 

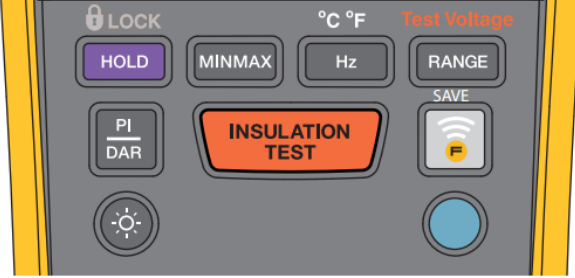

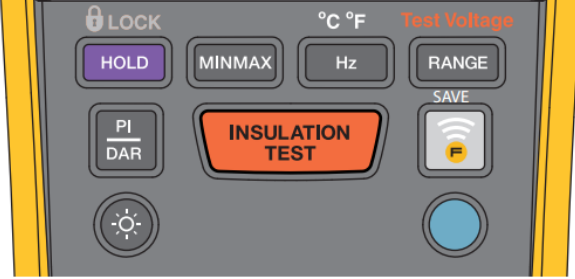

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
Insulation Testing	<p>While the multimeter is in the Insulation test setting, the meter checks for live voltage.</p> <p>If the multimeter detects more than 30 volts through the leads the multimeter displays greater than 30 volts and will not allow an insulation test.</p>		 
Insulation Testing	<p>As long as you press the test button, the multimeter:</p> <ul style="list-style-type: none"> • Applies test voltage to the leads • Measures the precise voltage and current • Calculates and displays resistance <p>Click the Insulation Test button to conduct the test.</p>	<ul style="list-style-type: none"> • Applies test voltage to the leads • Measures the precise voltage and current • Calculates and displays resistance 	<p>Storyline: Click the  Insulation Test button to conduct the test</p>

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
			
<p>Insulation Testing</p>	<p>In this example the insulation resistance is higher than the meter can measure and is noted by the greater than symbol. The insulation on this disconnect and the source side wiring is okay.</p> <p>When the test button is released the meter discharges any residual voltage on the conductors being tested.</p>	<p>Knowledge Check:</p> <p>16. What does the “>” symbol on the display mean during an insulation test?</p> <ol style="list-style-type: none"> The resistance is greater than the meter can display. The voltage is greater than the meter can display. The current is greater than the meter can display. The leads are plugged into the incorrect ports. 	 <p>greater than symbol</p> 
<p>Insulation Testing</p>	<p>When you press the Insulation test button in the lock mode, the multimeter applies the test voltage until you stop the test</p>		

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
			
Insulation Testing Insulation Test Button	Pressing the Insulation Test button, a second time will stop the test and freeze the last reading on the multimeter display.		
Insulation Testing	The insulation resistance reads 0.8 mega-ohms this time. You need to start looking for damaged insulation on the cable, or another path to ground , and you would work with your utility client to define the steps for mitigation. Note: Each TRC customer has their own threshold to investigate damaged insulation.	<p>Work with your utility client to define the steps for mitigation.</p> <p>Each TRC customer has their own threshold to investigate damaged insulation.</p> <p>Knowledge Check: 17. The DMM displays 0.18 MΩ during a Megger test. What does it mean?</p>	

Fluke 1587 Digital Multimeter
 WBT Script Overview
 2019-07-25

Topic	Script	Onscreen Text	Graphics
		<ul style="list-style-type: none"> a. The conductor insulation has failed. b. The multimeter has a low battery. c. The incorrect test amperage was applied. d. The probes were placed into the incorrect ports. 	
Fluke 1587 Summary	Great job! Now that you have a good understanding of the Fluke 1587 multimeter capabilities, let's test your knowledge.		

