

Testing Power Line Filters using the Guardian 1030S

The Guardian 1030S is an AC, DC, IR Hipot Tester with an Eight Channel built in scanner. The scanner is a useful feature when it comes to testing Power line filters. A typical safety test for filters requires a Hipot test of all line connections to ground in addition to Hipot between line to line. This test can become time consuming when moving test leads from connection to connection. The Guardian 1030S allows for the operator to connect to the tester once as illustrated in Figure 1.0 and with one push of the start button perform all the necessary tests. Here's how.

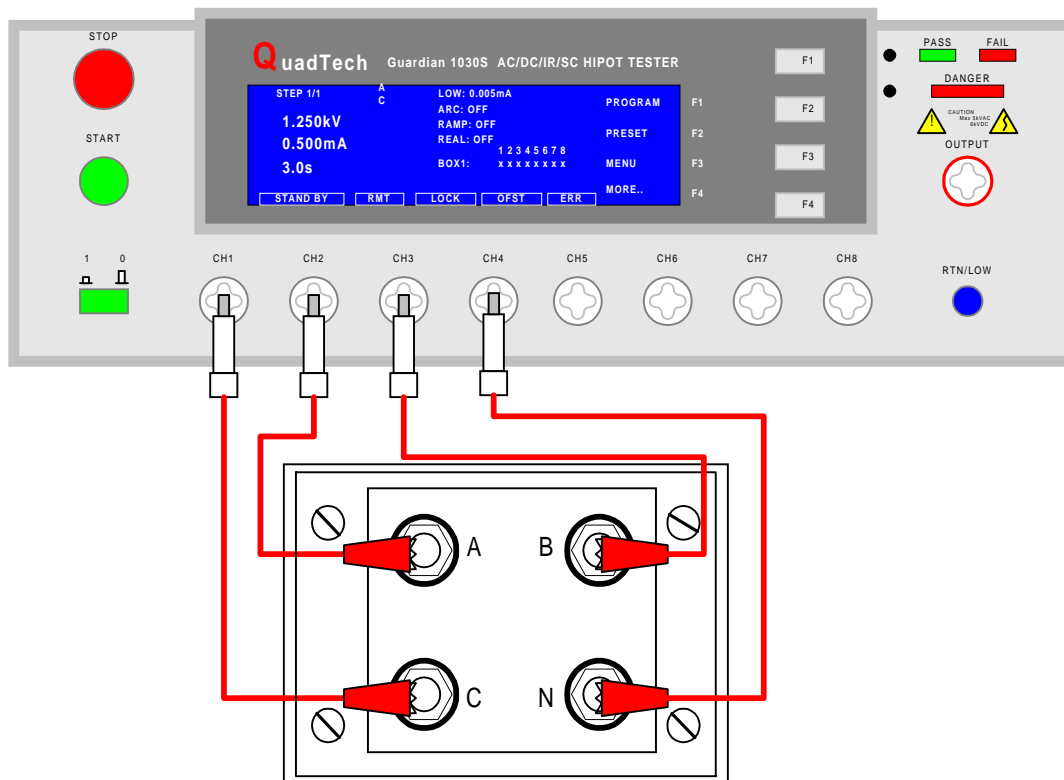


Figure 1.0: Guardian 1030S connection to a 3 – Phase filter line inputs

Programming the Guardian 1030S

The first Step we will program will be for connection C to Ground. A typical line to ground test would be to apply 2.250 kV DC for 60 seconds. The leakage will vary from product to product. We selected a 5mA high limit for the sake of this example.

<p>"STAND BY" or "Power-Up" Display</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">STEP 1/1</td> <td style="width: 10%;">AC</td> <td style="width: 15%;">LOW : OFF</td> <td style="width: 15%;">ARC : OFF</td> <td style="width: 10%;"></td> <td style="width: 30%; text-align: center;">PROGRAM</td> </tr> <tr> <td></td> <td></td> <td>RAMP: OFF</td> <td>REAL: OFF</td> <td></td> <td style="text-align: center;">PRESET</td> </tr> <tr> <td style="text-align: center; font-size: 1.2em;">1.250kV</td> <td></td> <td></td> <td></td> <td style="text-align: center;">1 2 3 4 5 6 7 8</td> <td style="text-align: center;">MENU</td> </tr> <tr> <td style="text-align: center; font-size: 1.2em;">15.00mA</td> <td></td> <td></td> <td></td> <td style="text-align: center;">BOX 1: X X X X X X X X</td> <td style="text-align: center;">MORE..</td> </tr> <tr> <td style="text-align: center; font-size: 1.2em;">3.0s</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">STAND BY</td> <td style="text-align: center;">RMT</td> <td style="text-align: center;">LOCK</td> <td style="text-align: center;">OFST</td> <td style="text-align: center;">ERR</td> <td></td> </tr> </table>	STEP 1/1	AC	LOW : OFF	ARC : OFF		PROGRAM			RAMP: OFF	REAL: OFF		PRESET	1.250kV				1 2 3 4 5 6 7 8	MENU	15.00mA				BOX 1: X X X X X X X X	MORE..	3.0s						STAND BY	RMT	LOCK	OFST	ERR		<p>F1 To enter programming mode.</p> <p>F2 To view/change preset (initial) test parameters.</p> <p>F3 To view/change system parameters: memory, system, option, calibration, key lock, password, error, & about.</p> <p>F4 To view the programmed test setups and access offset function.</p>
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Programming Instructions – continued

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STEP 1	DC	LOW : OFF	UP																																				
VOLT: 2.250 kV		ARC : OFF	DOWN																																				
HIGH: 5.0 mA		RAMP: 2.0 s	ENTER																																				
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0 - 999s 0=OFF	RMT	LOCK	OFST	ERR	EXIT																																		
Set SCAN Channel 1	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td>STEP 1</td> <td>DC</td> <td>LOW : OFF</td> <td>MOVE</td> <td></td> </tr> <tr> <td>VOLT: 2.250 kV</td> <td></td> <td>ARC : OFF</td> <td>CHANGE</td> <td></td> </tr> <tr> <td>HIGH: 5.0 mA</td> <td></td> <td>RAMP: 2.0 s</td> <td>ENTER</td> <td></td> </tr> <tr> <td>TIME: 60.0 s</td> <td></td> <td>1 2 3 4 5 6 7 8</td> <td>EXIT</td> <td></td> </tr> <tr> <td></td> <td></td> <td>BOX 1 : H X X X X X X X X</td> <td></td> <td></td> </tr> <tr> <td colspan="5" style="border-top: 1px solid black; padding-top: 5px;"> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">SELECT BOXS</td> <td style="border: 1px solid black; padding: 2px;">RMT</td> <td style="border: 1px solid black; padding: 2px;">LOCK</td> <td style="border: 1px solid black; padding: 2px;">OFST</td> <td style="border: 1px solid black; padding: 2px;">ERR</td> <td style="border: 1px solid black; padding: 2px;">EXIT</td> </tr> </table> </td> </tr> </table>	STEP 1	DC	LOW : OFF	MOVE		VOLT: 2.250 kV		ARC : OFF	CHANGE		HIGH: 5.0 mA		RAMP: 2.0 s	ENTER		TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT				BOX 1 : H X X X X X X X X			<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">SELECT BOXS</td> <td style="border: 1px solid black; padding: 2px;">RMT</td> <td style="border: 1px solid black; padding: 2px;">LOCK</td> <td style="border: 1px solid black; padding: 2px;">OFST</td> <td style="border: 1px solid black; padding: 2px;">ERR</td> <td style="border: 1px solid black; padding: 2px;">EXIT</td> </tr> </table>					SELECT BOXS	RMT	LOCK	OFST	ERR	EXIT	F1 F2 F3 F4	To move underscore cursor to highlight a scan channel 1. To change status of a scan channel 1 as H (high)
STEP 1	DC	LOW : OFF	MOVE																																				
VOLT: 2.250 kV		ARC : OFF	CHANGE																																				
HIGH: 5.0 mA		RAMP: 2.0 s	ENTER																																				
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SELECT BOXS	RMT	LOCK	OFST	ERR	EXIT																																		
Set SCAN Channel 8	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td>STEP 1</td> <td>DC</td> <td>LOW : OFF</td> <td>MOVE</td> <td></td> </tr> <tr> <td>VOLT: 2.250 kV</td> <td></td> <td>ARC : OFF</td> <td>CHANGE</td> <td></td> </tr> <tr> <td>HIGH: 5.0 mA</td> <td></td> <td>RAMP: 2.0 s</td> <td>ENTER</td> <td></td> </tr> <tr> <td>TIME: 60.0 s</td> <td></td> <td>1 2 3 4 5 6 7 8</td> <td>EXIT</td> <td></td> </tr> <tr> <td></td> <td></td> <td>BOX 1 : H X X L X X X X</td> <td></td> <td></td> </tr> <tr> <td colspan="5" style="border-top: 1px solid black; padding-top: 5px;"> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">CHANNEL</td> <td style="border: 1px solid black; padding: 2px;">RMT</td> <td style="border: 1px solid black; padding: 2px;">LOCK</td> <td style="border: 1px solid black; padding: 2px;">OFST</td> <td style="border: 1px solid black; padding: 2px;">ERR</td> <td style="border: 1px solid black; padding: 2px;">EXIT</td> </tr> </table> </td> </tr> </table>	STEP 1	DC	LOW : OFF	MOVE		VOLT: 2.250 kV		ARC : OFF	CHANGE		HIGH: 5.0 mA		RAMP: 2.0 s	ENTER		TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT				BOX 1 : H X X L X X X X			<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">CHANNEL</td> <td style="border: 1px solid black; padding: 2px;">RMT</td> <td style="border: 1px solid black; padding: 2px;">LOCK</td> <td style="border: 1px solid black; padding: 2px;">OFST</td> <td style="border: 1px solid black; padding: 2px;">ERR</td> <td style="border: 1px solid black; padding: 2px;">EXIT</td> </tr> </table>					CHANNEL	RMT	LOCK	OFST	ERR	EXIT	F1 F2 F3 F4	To move underscore cursor to highlight a scan channel 8. To change status of a scan channel 4 as L (low)
STEP 1	DC	LOW : OFF	MOVE																																				
VOLT: 2.250 kV		ARC : OFF	CHANGE																																				
HIGH: 5.0 mA		RAMP: 2.0 s	ENTER																																				
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT																																				
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STEP 1	DC	LOW : OFF	MOVE																																				
VOLT: 2.250 kV		ARC : OFF	CHANGE																																				
HIGH: 5.0 mA		RAMP: 2.0 s	ENTER																																				
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT																																				
		BOX 1 : H X X L X X X X																																					
<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">CHANNEL</td> <td style="border: 1px solid black; padding: 2px;">RMT</td> <td style="border: 1px solid black; padding: 2px;">LOCK</td> <td style="border: 1px solid black; padding: 2px;">OFST</td> <td style="border: 1px solid black; padding: 2px;">ERR</td> <td style="border: 1px solid black; padding: 2px;">EXIT</td> </tr> </table>					CHANNEL	RMT	LOCK	OFST	ERR	EXIT																													
CHANNEL	RMT	LOCK	OFST	ERR	EXIT																																		

Programming Instructions - continued

Repeat for Steps 2 – 3, only changing the Scanner configuration for each step. Refer to Table 1-1.

Table 1-1: Hipot test steps for Line to Ground

Test Point	Step #	Voltage	High	Time	Low	Arc	Ramp	Box1: 1 2 3 4 5 6 7 8
C	1	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	HXXLXXXX
A	2	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	XHXLXXXX
B	3	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	XXHLXXXX

Steps 4 - 6 will test line to line. A typical line-to-line test would be to apply 1.450 kV DC for 60 seconds. The leakage will vary from product to product. We selected an 8mA high limit for the sake of this example.

"PROGRAM"
Display

STEP 3	DC	LOW : OFF	UP				
		ARC : OFF	MORE..				
		RAMP: OFF	ENTER				
			EXIT				
		1 2 3 4 5 6 7 8					
		BOX 1 : X X H L X X X X					
		VOLT: 2.250kV					
		HIGH: 5.0mA					
		TIME: 60.0s					
		PROCESS STEP	RMT	LOCK	OFST	ERR	

F1

F2

F3

F4

Select
STEP
#

STEP 4	AC	LOW : OFF	UP				
		ARC : OFF	MORE..				
		RAMP: OFF	ENTER				
			EXIT				
		1 2 3 4 5 6 7 8					
		BOX 1 : X X X X X X X X					
		VOLT: 0.000kV					
		HIGH: 15.0mA					
		TIME: 3.0s					
		PROCESS STEP	RMT	LOCK	OFST	ERR	

F1

F2

F3

F4

◀ To move to Step 4

◀ To move highlighted box around display to select parameter to change

Select
DC
Test Mode

STEP 4	DC	LOW : OFF	UP				
		ARC : OFF	DOWN				
		RAMP: OFF	ENTER				
			EXIT				
		1 2 3 4 5 6 7 8					
		BOX 1 : X X X X X X X X					
		VOLT: 0.000kV					
		HIGH: 0.500mA					
		TIME: 3.0s					
		SELECT MODE	RMT	LOCK	OFST	ERR	

F1

F2

F3

F4

◀ To set test mode to DC.

◀ To move highlighted box to VOLT.

Set
Test
VOLTage

STEP 4	DC	LOW : OFF	UP				
		ARC : OFF	DOWN				
		RAMP: OFF	ENTER				
			EXIT				
		1 2 3 4 5 6 7 8					
		BOX 1 : X X X X X X X X					
		VOLT: 1.450 kV					
		HIGH: 0.500 mA					
		TIME: 3.0 s					
		0.05 - 6kV	RMT	LOCK	OFST	ERR	

F1

F2

F3

F4

◀ To enter test voltage 1.450 kV

◀ To move highlighted box to HIGH.

Set
HIGH Current
Limit

STEP 4	DC	LOW : OFF	UP				
		ARC : OFF	DOWN				
		RAMP: OFF	ENTER				
			EXIT				
		1 2 3 4 5 6 7 8					
		BOX 1 : X X X X X X X X					
		VOLT: 1.450 kV					
		HIGH: 8.000 mA					
		TIME: 3.0 s					
		0.0001 - 10mA	RMT	LOCK	OFST	ERR	

F1

F2

F3

F4

◀ To enter high current limit 8 mA

◀ To move highlighted box to TIME.

Programming Instructions – continued

Set Test TIME

STEP 4	DC	LOW : OFF	UP		
VOLT: 1.450 kV		ARC : OFF	DOWN		
HIGH: 8.0 mA		RAMP: OFF	ENTER		
TIME: <input style="width: 50px;" type="text" value="60.0"/> s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : x x x x x x x x			
<input style="width: 100px;" type="text" value="0, 0.1 - 999s"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To enter test time 60 second
- F2
- F3 To move highlighted box to LOW.
- F4

Set LOW Current Limit

STEP 4	DC	LOW : <input style="width: 50px;" type="text" value="OFF"/>	UP		
VOLT: 1.450 kV		ARC : OFF	DOWN		
HIGH: 8.0 mA		RAMP: OFF	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : x x x x x x x x			
<input style="width: 100px;" type="text" value="0 - 10mA 0=OFF"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To enter low current limit in 0.001mA increments
- F2
- F3 To move highlighted box to ARC.
- F4

Set ARC Limit

STEP 4	DC	LOW : OFF	UP		
VOLT: 1.450 kV		ARC : <input style="width: 50px;" type="text" value="OFF"/>	DOWN		
HIGH: 8.0 mA		RAMP: OFF	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : x x x x x x x x			
<input style="width: 100px;" type="text" value="0 - 10mA 0=OFF"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To enter ARC limit in 0.001mA increments
- F2
- F3 To move highlighted box to RAMP.
- F4

Set RAMP Time

STEP 4	DC	LOW : OFF	UP		
VOLT: 1.450 kV		ARC : OFF	DOWN		
HIGH: 8.0 mA		RAMP: <input style="width: 50px;" type="text" value="2.0 s"/>	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : x x x x x x x x			
<input style="width: 100px;" type="text" value="0 - 999s 0=OFF"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To enter ramp time 2.0 s
- F2
- F3 To move highlighted box to BOX1.
- F4

Set SCAN Channel 1

STEP 4	DC	LOW : OFF	MOVE		
VOLT: 1.450 kV		ARC : OFF	CHANGE		
HIGH: 8.0 mA		RAMP: 2.0 s	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : <u>H</u> x x x x x x x x			
<input style="width: 100px;" type="text" value="SELECT BOXS"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To move underscore cursor to highlight a scan channel 1.
- F2 To change status of a scan channel 1 as H (high)
- F3
- F4

Set SCAN Channel 8

<input style="width: 50px;" type="text" value="STEP 4"/>	DC	LOW : OFF	MOVE		
VOLT: 1.450 kV		ARC : OFF	CHANGE		
HIGH: 8.0 mA		RAMP: 2.0 s	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : <u>H</u> <u>L</u> x x x x x x			
<input style="width: 100px;" type="text" value="CHANNEL"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1 To move underscore cursor to highlight a scan channel 8.
- F2 To change status of a scan channel 2 as L (low)
- F3
- F4

Program additional Steps

<input style="width: 50px;" type="text" value="STEP 4"/>	DC	LOW : OFF	MOVE		
VOLT: 1.450 kV		ARC : OFF	CHANGE		
HIGH: 8.0 mA		RAMP: 2.0 s	ENTER		
TIME: 60.0 s		1 2 3 4 5 6 7 8	EXIT		
		BOX 1 : <u>H</u> <u>L</u> x x x x x x			
<input style="width: 100px;" type="text" value="CHANNEL"/>	<input type="button" value="RMT"/>	<input type="button" value="LOCK"/>	<input type="button" value="OFST"/>	<input type="button" value="ERR"/>	

- F1
- F2
- F3 To move highlighted box to STEP to Program Step 5
- F4

Completion of Test

Repeat for Steps 5 – 6, only changing the Scanner configuration for each step. Refer to Table 1-2. Press EXIT once all 6 steps have been programmed.

Table 1-2: Hipot test steps for Line to Line

Test Point	Step #	Voltage	High	Time	Low	Arc	Ramp	Box1: 1 2 3 4 5 6 7 8
C - A	4	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	HLXXXXXX
C - B	5	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	HXLXXXXX
A - B	6	2.250 kV	5.0 mA	60.0 s	Off	Off	2.0 s	XHLXXXXX

This example used the three-phase external power line filter for frequency converts shown in Figure 2.0. The Guardian 1030S instrument has been widely accepted to test power line filters for additional applications such as telecommunications, power switching supplies and healthcare equipment.

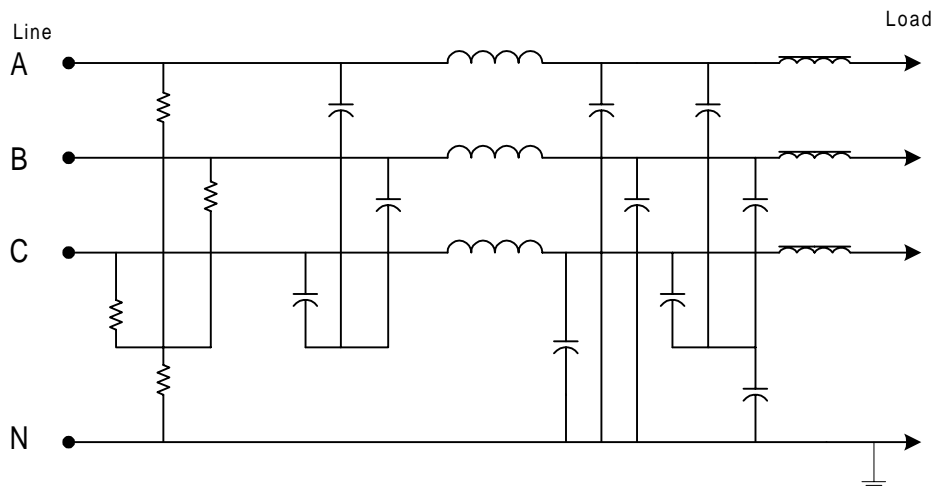


Figure 2.0: Electrical Schematic of 3 Phase filter



Figure 3.0: Guardian 1030S AC/DC/IR/SC Hipot Tester

For complete product specifications on the Guardian 1000 Series Electrical Safety Analyzers or any of QuadTech's products, visit us at <http://www.quadtech.com/>. Do you have an application specific testing need? Call us at 1-800-253-1230 or email your questions to info@quadtech.com.

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