QuadTech

Application Note

Guardian 6000 Series Scanner Connections

Many scanner options are available for a Guardian 6000 Series instrument. With each instrument (6000, 6100 or 6200) an internal and/or external scanner can be used for multiple point testing. Provided herein are: a scanner list, accessories list, sample connection diagrams, sample programming instructions and two examples to illustrate this internal and external programming.

A Guardian 6000 Series instrument is defined as a Guardian 6000 Electrical Safety Analyzer or a Guardian 6100 Medical Production Safety Analyzer or 6200 Production Safety Analyzer. The Guardian 6100 is a Guardian 6000 with the 6000-05 Line Leakage Scanner & Probe. The Guardian 6200 is a Guardian 6000 with the 6000-04 Line Leakage Scanner installed. The Scanner Interface is standard on the Guardian 6100 and 6200. External scanner connection is through the black 25-PIN connector labeled 'SCAN' on the rear panel of the Guardian 6000 Series instrument. The Guardian 6000/6100/6200 unit may be used with internal and external scan unit(s) for multi-point grounding and Hipot tests. An internal scanner must be installed before attaching external scanners. Table 1 lists the scanners available for the G6000 Series instruments. Scanner accessories are listed in Table 2.

Table 1: Scanners for Guardian 6000 Series

ITEM DESCRIPTION	QTY	QT P/N
Internal (Plug-in) Scanner: 3 Ground Continuity/5 High Voltage Channels	1	6000-01
Internal (Plug-in) Scanner: 5 Ground Continuity/3 High Voltage Channels	1	6000-02
Internal (Plug-in) Scanner: 8 High Voltage Channels	1	6000-03
Internal (Plug-in) Scanner: Line Leakage Scanner	1	6000-04
External Scanner: 8 High Voltage Channels (Front)	1	5000-01
External Scanner: 8 HV Channels (Front), 4 Ground Continuity (Rear)	1	5000-02
External Scanner: 8 High Voltage Channels (Rear), Rack mountable	1	5000-03
External Scanner: 8 HV Channels (Rear), 4 Ground Continuity (Rear), Rack mountable	1	5000-04

Internal Scanner Options

Figure 1 illustrates the four INTERNAL Scanner options (P/N 6000-01, -02, -03, & -04) available for the Guardian 6000 Series instrument and the 6000-05 for the Guardian 6100. The 6000-01 has 3 Ground Continuity (GC) and 5 High Voltage (HV) channels. The 6000-02 has 5 GC and 3 HV channels. The 6000-03 has 8 HV channels. The 6000-04 Line Leakage Scanner has 2 HV and 2 Line channels. The 6000-05 has 2 HV, 2 Patient Probe and 2 Line channels. The Guardian 6000 instrument looks for an internal scanner as its 1st scanner and external scanner(s) as scanners #2-8. Up to 8 scanners can be connected in parallel for Hipot testing, up to 4 scanners for Ground Continuity testing.

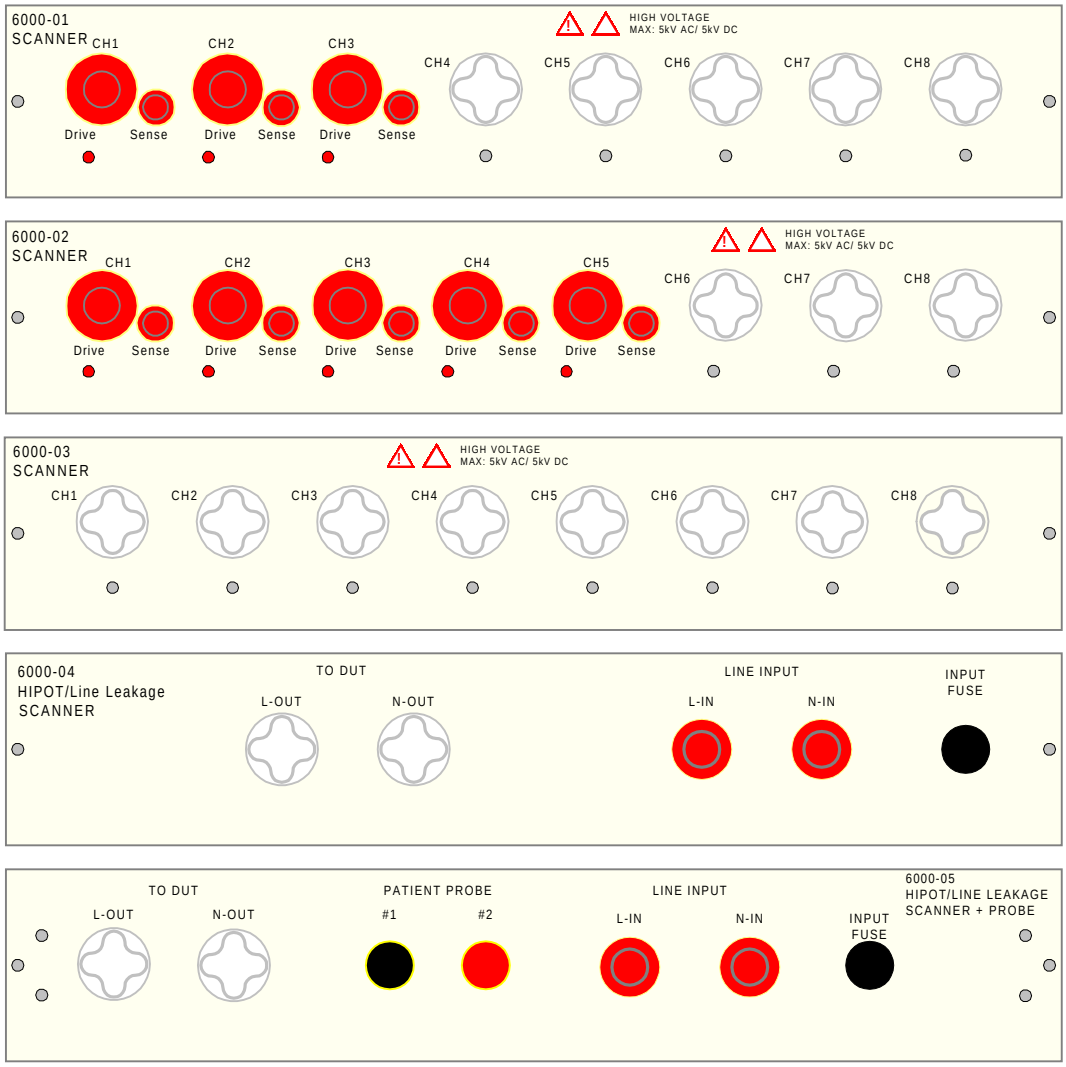

Figure 1: Internal Scanner Options for Guardian 6000 Series

External Scanner Options

Figure 2 illustrates the four EXTERNAL Scanners (P/N 5000-01, -02, -03, & -04) available for use with the Guardian 6000 Series instruments. The 5000-01 Scanner has 8 front panel High Voltage (HV) channels. The 5000-02 scanner has 8 front panel HV channels and 4 rear panel Ground Continuity (GC) channels. The 5000-03 Scanner has 8 rear panel HV channels and is rack mountable. The 5000-04 Scanner has 8 rear HV channels, 4 rear GC channels and is rack mountable.

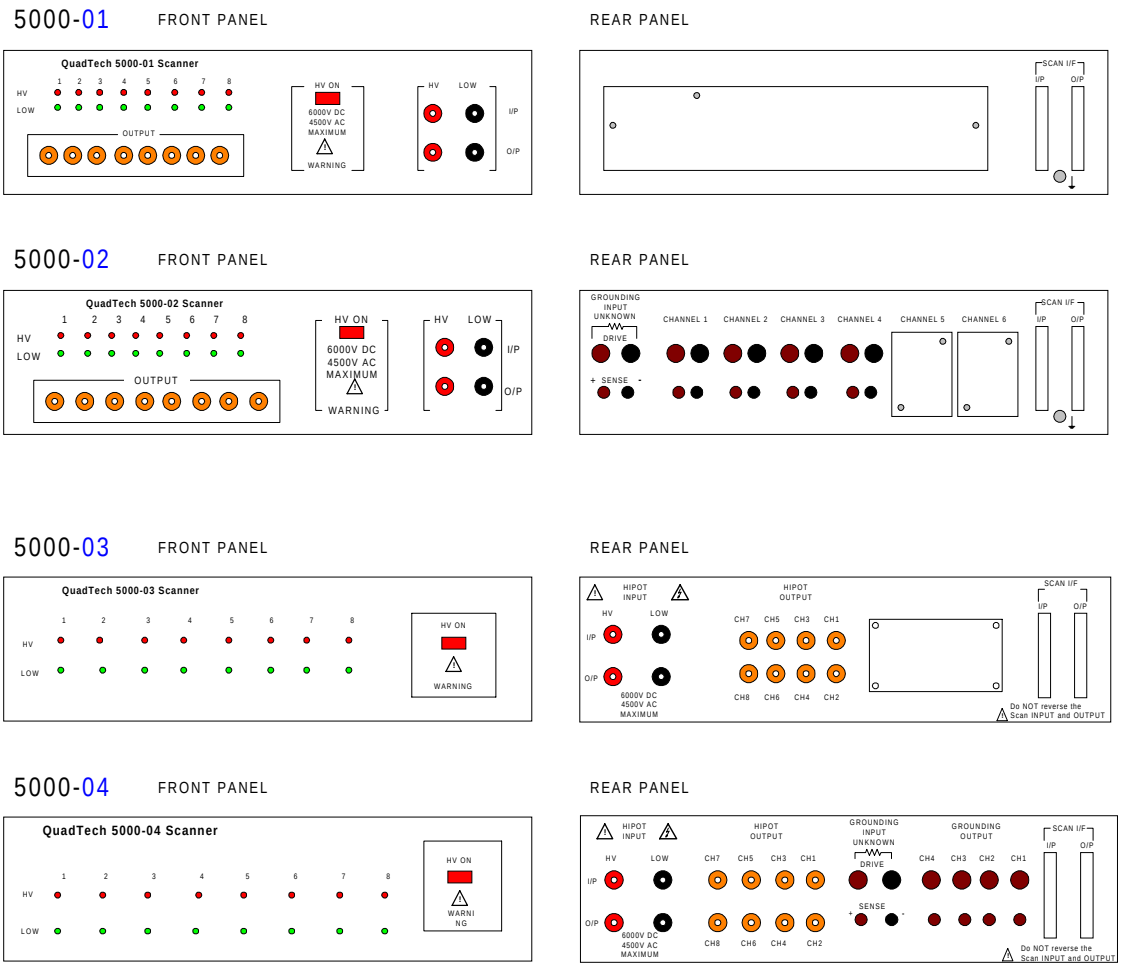

Figure 2: Guardian 5000-01, 02, 03 and –04 External Scanners

External Scanner Connections

Before connecting the scanner to the Guardian 6000 or connecting devices for test, press the [STOP] key and make sure the red DANGER light is OFF.

The G17 25-PIN SCAN control cable is connected from the G6000 rear panel SCAN connector to the 5000-01 rear panel SCAN I/P connector.

The G18 lead set connects the HV terminals. The white custom banana plug is connected to the G6000 front panel HV output terminal and the red banana plug is connected to the 5000-01 front panel HV I/P terminal.

The G19 lead set connects the GND terminals. The black banana plug with retaining bracket is connected to the G6000 front panel GND output terminal and the black banana plug is connected to the 5000-01 front panel LOW I/P terminal.

Interconnect the Rear Panel Ground Lugs (Chassis Ground, silver screw/banana plug) using a banana-to-banana cable or banana to u-clip cable. This assures that the scanner(s) retains connection to earth ground.

WARNING
THE REAR PANEL GROUND LUGS ON ALL INSTRUMENTS (Guardian 6000 and Scanners) MUST BE INTERCONNECTED

Table 2: Scanner Accessories

ITEM DESCRIPTION	QTY	QT P/N
25 pin interconnect cable (G6000 to Scanner)	1	G17
Hipot Test Lead Set (G6000 to Scanner I/P) HV plug to sheathed banana plug (red) Banana Plug (with retaining bracket) to sheathed banana plug (black)	 1 1	 G18 G19
Hipot Scan Clip Leads (Scanner to front panel outputs of DUT) Sheathed banana plug (orange) to alligator clip (red)	 8	 G21
GC Interconnect Cable (G6000 output to Scanner rear panel GC input) Banana plug/lug (red/black) to banana plug/lug (red/black)	 1	 G20*
GC Scan Clip Lead Set (Scanner rear panel GC outputs to DUT) Large alligator clips (red/black) to banana plug/lug (red/black)	 4	 G15*
Scanner to Scanner Banana Plug to Banana Plug Cable set, 1 black, 1 red	2	G24
Scan Card for G6000	1	700120
Corded Product Adaptor for 6000-04 / -05 Line Leakage Scanner	1	G30
500VA Isolation Transformer for 6000-04 /-05 Line Leakage Scanner	1	G31
1000VA Isolation Transformer for 6000-04/ -05 Line Leakage Scanner	1	G32

*Included with GC Scanner only (6000-01, 6000-02, 5000-02 and 5000-04).

Scanner Connection: 5000-01

Figure 3 illustrates the front panel connection of two Guardian 5000-01 Scanners to a Guardian 6000 unit for Hipot/IR Testing. Connect the G17 Scan Control cable from the G6000 SCAN interface to the "I/P" of the 1ST 5000-02 Scanner. Connect a second G17 from the "O/P" of the 1ST 5000-02 Scanner to the "I/P" of the 2ND 5000-02 Scanner. Connect the G19 Lead Set between the G6000 front panel OUTPUT terminals (white to HV, black to Drive-) and the 1ST 5000-02 front panel I/P terminals (red to HV, black to LOW). Connect the front panel "O/P" HV and LOW outputs of the 1ST 5000-01 Scanner to the front panel "I/P" HV and LOW inputs of the second 5000-01 Scanner using the G24 Banana Plug lead set.

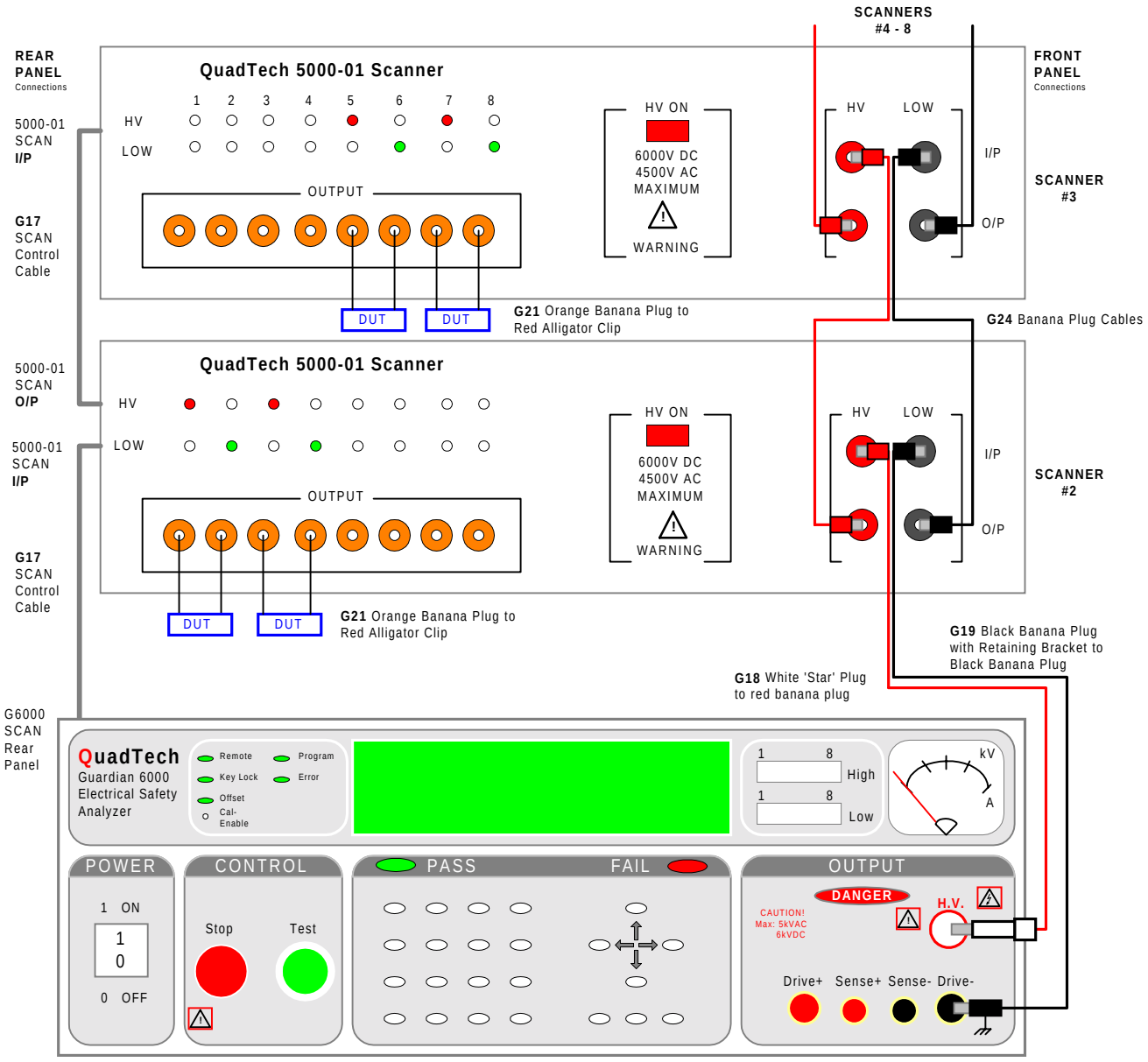

Figure 3: Guardian 6000 to 5000-01 External Scanner Connection

Scanner Connection: 5000-02

Figure 4 illustrates the rear panel connection of a Guardian 5000-02 Scanner to a Guardian 6200 unit for the purpose of ground continuity testing. Connect the G18 lead set between the HV Output on the G6200 rear panel and the HV I/P terminal on the front of the 5000-02 Scanner. Connect the G17 Scan Control cable between the 5000-02 Scanner rear SCAN I/F I/P 25-pin connector and the G6200 rear SCAN connector. Use the G15 ground continuity lead set to connect the DUT to Channels 1 & 2 on the rear of the 5000-02 Scanner. Interconnect the Chassis Ground lugs on the rear panels of each instrument.

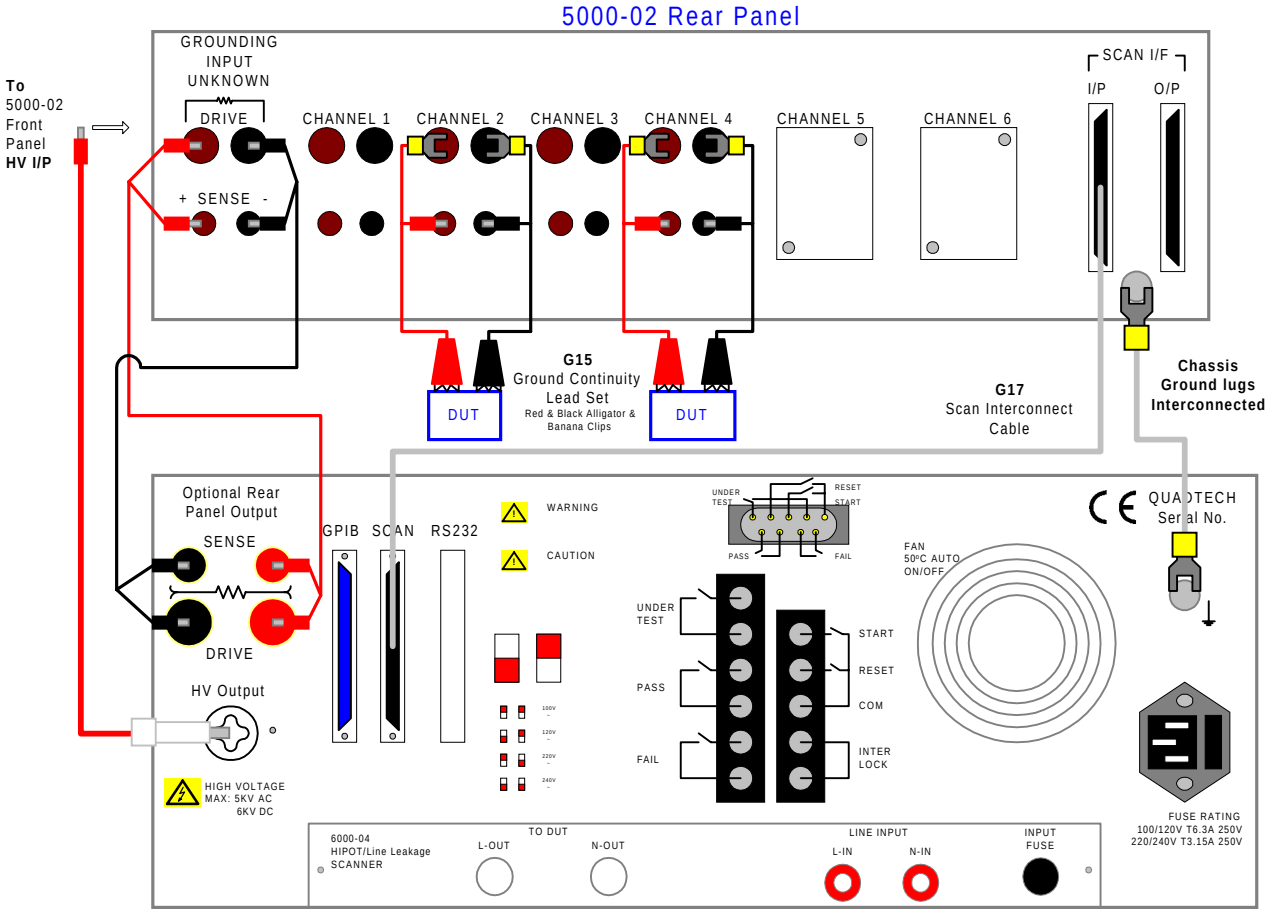

Figure 4: Guardian 6200 to 5000-02 External Scanner Connection

Scanner Connection: 6000-04

Figure 5 illustrates the connection of the 6000-04 Line Leakage Scanner using the G31 isolation transformer, the G30 Corded Product Adaptor and one of the G15 Continuity Leads. Connect the G30 white custom banana plugs to the L and N OUT of the 6000-04 Scanner. Connect the black banana of the G30 to the Sense - connector on the G6200. Connect the Black lug to the Drive - on the G6200. Connect the banana of the G15 to the Sense + connector on the G6200 and lug to the Drive + on the G6200, Connect the alligator end of the G15 to exposed metal on your DUT. Connect the G31 outputs to the Line Inputs of the 6000-04. (PE = Protective Earth, i.e. chassis ground)

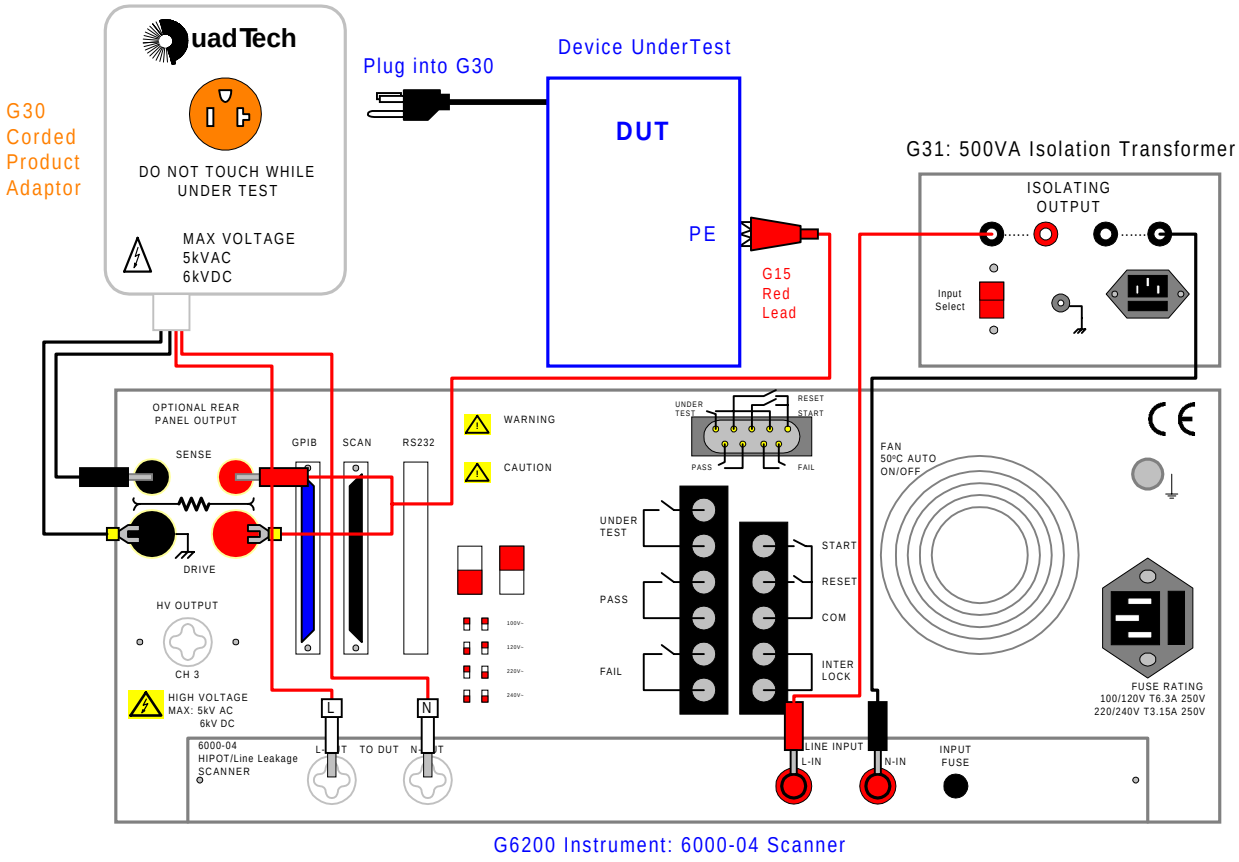

Figure 5: 6000-04 connection to DUT for Line Leakage Test

Scanner Connection: 6000-05

Figure 6 illustrates the connection of the Guardian 6100, G30, G31 and device under test for the Patient Leakage – Applied Part to Ground test. Connect the G31 Isolation Transformer to the 6000-05 LINE INPUT terminals (L-IN and N-IN). Connect the black leads of the G30 Corded Product Adapter to the black (low) SENSE and DRIVE "Optional Rear Output Terminals" of the G6100. Connect the red leads of the G30 to the white L-OUT and N-OUT terminals on the 6000-05. Connect the G15 red lead between the red (high) SENSE and DRIVE terminals and the chassis of the DUT. Plug the DUT into the G30 Corded Product Adapter. (PE = Protective Earth, i.e. chassis ground)

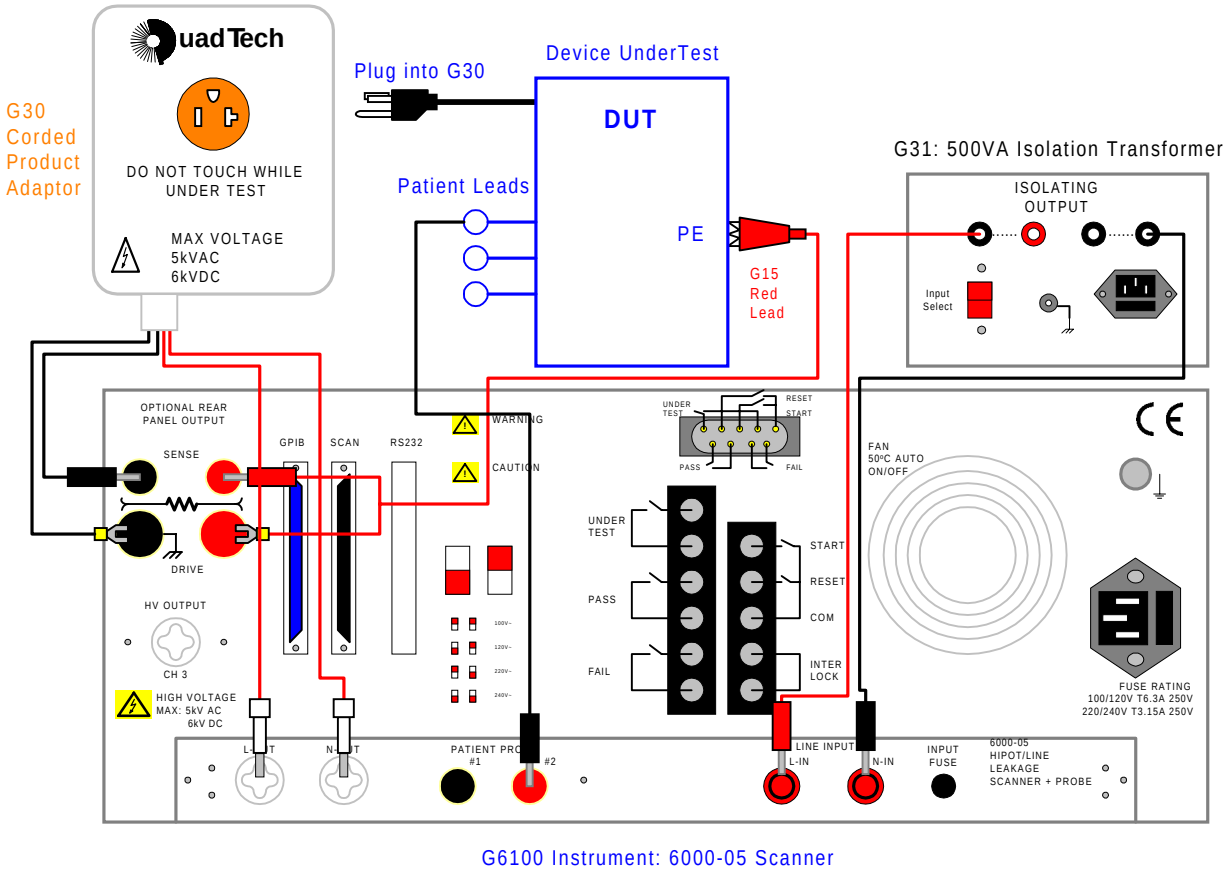

Figure 6: 6000-05 Connection for Patient Applied Part To Ground Test

Scanner Programming

The Guardian 6000 instrument will look for the **first scanner** to be an **internal** scanner (6000-01, -02, -03, –04 or -05). Scanners #2-8 are external scanners (5000-01, -02, -03 or –04). When programming scanner channels (high or low) the scanner number (1 through 8) is shown on the G6000 display.

When using **one** scanner, the scan box channels 1-8 can be programmed high or low prior to entering the test voltage. Use the numerical keys and enter the high scan channels. Press [ENTER] to accept. Use the numerical keys and enter the low scan channels. Press [ENTER] to accept.

When using **more than one** scanner, the Initial Parameter setting: "Scan No" must be setup for the total number of scanners connected.
Press [ENTER] [6] [0] [0] [0] to enter Initial Parameter setting mode. ([Enter 6100 for G6100])
Press [→] [↑] [↑] to enter "Scan No" screen.
Press numerical keys to enter the total number of scanners from 1 to 8.
Press [ENTER] to accept.
Press [PROG] to exit Initial Parameter setting mode.

Connection of up to 8 scanners for Hipot or IR testing is possible for a total of 64 channels (The 6000-03 as the 1ST scanner and seven external 5000-01 or 5000-03's as scanners #2-8). Ground Continuity testing is possible with the 6000-01 (3 GC channels) or the 6000-02 (5 GC channels). Three external GC Scanners (5000-02 or 5000-04) can be added in parallel for a maximum of 4 GC scanners.

There are 16 LED indicators (8 high, 8 low) on the front panel of 5000 series external scanner. During test these LED's indicate which channels are programmed for High Voltage (red) or Low (green) connection. When the scanner and Guardian 6000 are connected (G17 25-pin interconnect cable) the instrument will accept entry of scanner connections. A High or Low entry is made during the programming process preceding the entry of a test voltage. It is possible to have one or multiple entries for scanner connections, i.e. if 1,2 and 3 are entered for the Hi connection all three outputs will be connected to the High Voltage terminal during the test.

NOTE

When the scanner is programmed for multiple connections in the same test step the devices under test are connected in parallel. To test several devices independent from each other requires an individual test step (1 to 15) for each. Refer to paragraphs 2.3 – 2.7 of the Guardian 6000 & Guardian 6100/6200 Instruction Manuals.

Scanner Example #1: Hipot Test 6000-03 Internal Scanner

This example illustrates how testing multiple DUTs at once can increase production throughput. Connect DUT to 6000-03 Scanner as shown in Figure 7 using the red HV cable (700057) supplied with the scan unit. Connect the white custom banana plug to Channel #1 on the 6000-03 and the corresponding red alligator clip is connected to the DUT's low terminal. Program Channel #1 'low'. Connect the white custom banana plug to Channel #2 on the 6000-03 and the corresponding red alligator clip is connected to the DUT's high terminal. Program Channel #2 'high'. Continue with second DUT: Channel #3 = low, Channel #4 = high. This exercise will program 1000 Volts AC with a current limit of 1.5mA, Channel 1 and 3 will be low and channel 2 and 4 will be High.

Press [BUTTON]:		**Display Reads:**
[PROG]		Select Step = 1 1 - 99 (UP/DOWN)
Select Test Step	Press UP or DOWN arrow key to enter test step	
[ENTER]		Select Mode = WAC Press (UP/DOWN)
Select Test Mode		
[ENTER]		High = 24 Box-1 Channel (1 - 8)
Select Scanner High channels	Press Numerical keys to enter 2 and 4 as high scanner channels	
[ENTER]		Low = 13 Box-1 Channel (1 - 8)
Select Scanner Low channels	Press Numerical keys to enter 1 and 3 as low scanner channels	
[ENTER]		Voltage = 1.00KV 0.05-5KV
Select Test Voltage (KV)	Press Numerical & Decimal keys to enter test voltage	
[ENTER]		High LImit = 1.500mA 0.001-40mA
Select High LImit (mA)	Press Numerical & Decimal keys to enter high current limit	
[ENTER]		Low = Disable 0-40mA 0 = Disable
Select Low Limit (mA)	Press Numerical & Decimal keys to enter low current limit	

Press [BUTTON]:	Display Reads:
[ENTER]	Arc Limit = Disable 0-40mA 0 = Disable
Select Arc Limit (mA)	Press Numerical & Decimal keys to enter Arc limit
[ENTER]	Test Time = _10.0s 0-999 s 0 = Disable
Select Test Time (sec)	Press Numerical & Decimal keys to enter Test Time
[ENTER]	Ramp Time = Disable 0-999 s 0= Disable
Select Ramp Time (sec)	Press Numerical & Decimal keys to enter Ramp Time
[ENTER]	Select Step = 1 1-10 (UP/DOWN)
Press [PROG]	Press Program to exit

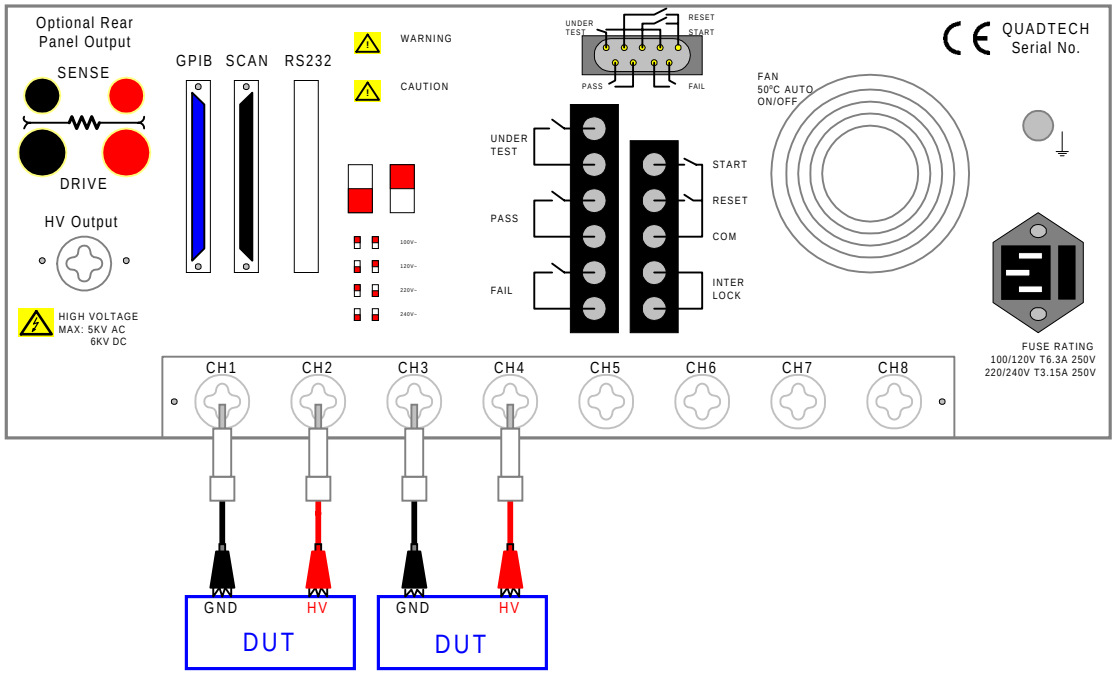

Figure 7: 6000-03 Scanner Connection to DUT

Scanner Example #2: Ground Bond Test with 5000-02 Scanner

At times it is desirable to perform Ground Bond to multiple points of a chassis. This example will illustrate how to perform a Ground Bond test on 3 external points followed by an AC Hipot using the G13, 5000-02 and the G6000. The 5000-02 is connected to the G6000 as shown in Figure 8.

Press [BUTTON]:	**Display Reads:**
[PROG]	Select Step = 1 1 - 99 (UP/DOWN)
Select Test Step	Press UP or DOWN arrow key to enter test step
[ENTER]	Select Mode = GR Press (UP/DOWN)
Select Test Mode	Press UP arrow key to display GR for Ground Bond Test
[ENTER]	High = 123 Box-2 Channel (1 - 8)
Select Scanner High channels	Press Numerical keys to enter 1,2 and 3 as scanner channels
[ENTER]	Current = 25..00A 1 - 30 A
Set Ground Bond Current	
[ENTER]	High Limit = 100.00 mΩ 0.1 - 510m Ω
Select High Limit (mΩ)	Press Numerical & Decimal keys to enter high limit
[ENTER]	Low LImit = Disable 0 - 510 m Ω 0 = Disable
Select Low LImit (mΩ)	Press Numerical & Decimal keys to enter low limit
[ENTER]	Test Time = 5.0s 0 - 999 s 0 = Disable
Select Test Time	Press Numerical & Decimal keys to enter test time
[ENTER]	Select Step = 2 1 - 99 (UP/DOWN)
Select Test Step	Press Up or DOWN arrow key to enter test step
[ENTER]	Select Mode = WAC Press UP/DOWN
Select Test MODE	Press UP or Down arrow key to display WAC for AC Hipot
[ENTER]	High = Disable Box - 1 Channel (1-1)
Select Scanner High Channels	We will not be using the scanner for the Hipot , Press Off to disable

Press [BUTTON]:		**Display Reads:**
ENTER		High = Disable Box -2 Channel (1 -8)
Select Scanner High Channels	We will not be using the scanner for the Hipot, Press OFF to disable	
[ENTER]		Low = Disable Box - 2 Channel (1 - 8)
Select Scanner Low Channels	We will not be using the scanner for the Hipot, Press OFF to disable	
[ENTER]		Voltage = 1.200kV 0.05 - 5.00 kV
Select Test Voltage	Press Numerical keys 1.20 to enter test voltage in (kV)	
[ENTER]		High Limit = 1.500mA 1 0.001 - 40 mA
Select HIgh Limit (mA)		
[ENTER]		Low Limit = Disable 0 - 40 mA 0 = Disable
Select Low Limit (mA)		
[ENTER]		Arc LImit = Disable 0 - 40 mA 0 = Disable
Select Arc LImit (mA)	Press Numerical key 0 to disable Arc limit	
[ENTER]		Test Time = 10.0s 0 - 999 s 0 = Disable
Select Test Time	Press Numerical & Decimal keys to enter test time	
[ENTER]		Ramp Time = 1.0 s 0 - 999 s 0 = Disable
Select Ramp Time	Press Numerical & Decimal keys to enter ramp time	
[ENTER]		Select Step = 2 1 - 10 (UP/DOWN)
Press [PROG]	Press Program to exit setup	
		STEP-01 3.0s 25.00A GR 100.0mΩ

Connection of 5000-02 Scanner and G13 Corded Product Adapter

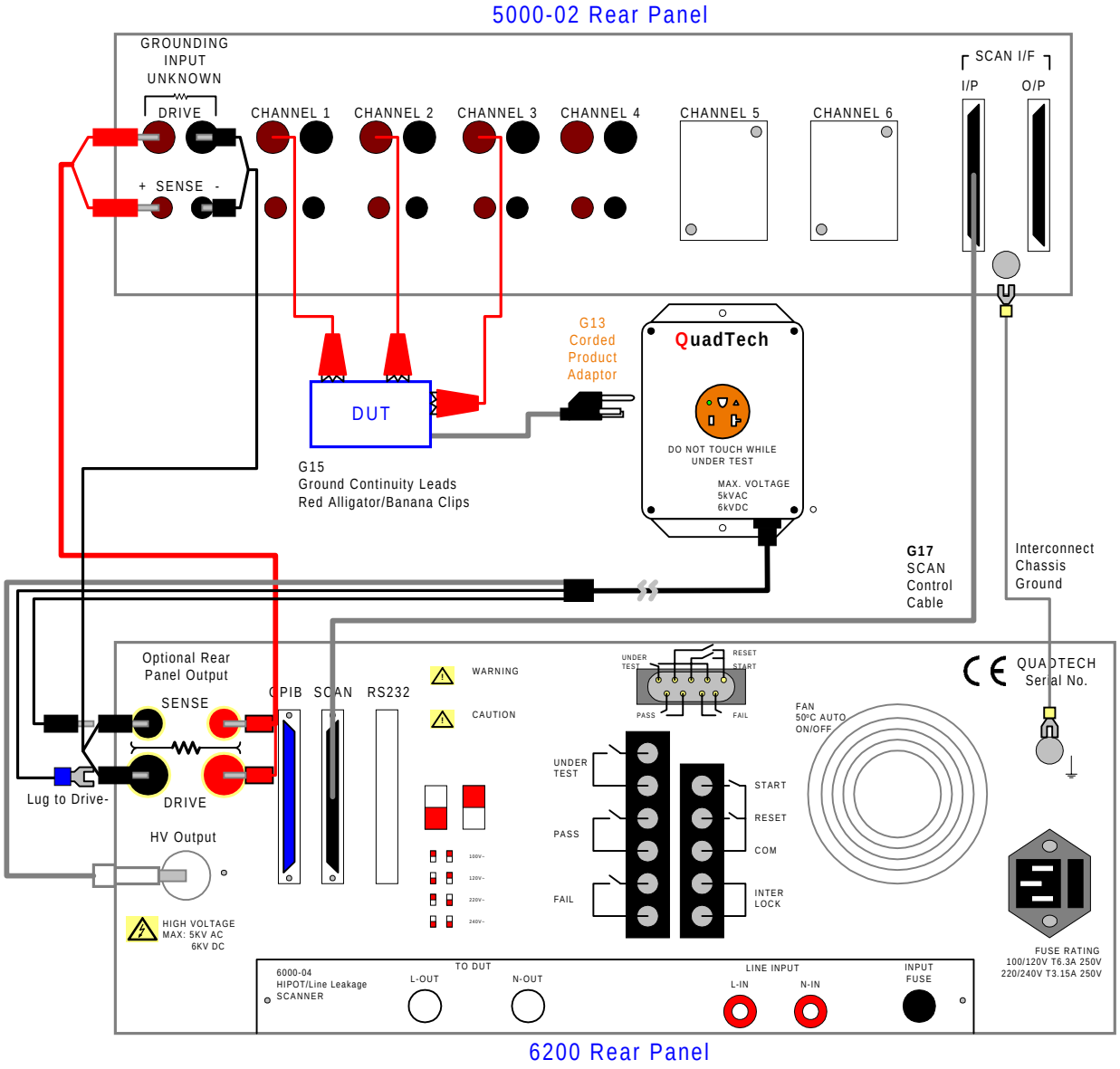

Figure 8: 5000-02 connection to DUT with G13

For complete product specifications on the Guardian 6000 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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