

DOCUMENT TITLE: **PM / SETUP ELECTRICAL SAFETY TESTERS**

DOCUMENT TYPE: ☐ Calibration ☒ Preventive Maintenance

EQUIPMENT NAME: **ELECTRICAL SAFETY ANALYZER
QUADTECH GUARDIAN 6000
QUADTECH GUARDIAN 6000 PLUS
CHROMA 19032**

EQUIPMENT NUMBER: **735003029**

AUTHOR(S): **MATT BRULE**

DATE: **August 14, 2013**

REVISED BY: **MATT BRULE**

DATE: **July 01, 2016**

Table of Contents:

Reference Documentation	3
Scope and notes about this procedure	3
1. Calibration	4
2. Setup (All tester types)	4
3. QUADTECH Guardian 6000 Setup	5
4. Quadtech Guardian 6000 Installation	10
5. Quadtech Guardian 6000Plus or Chroma 19032 setup.....	11
6. Quadtech Guardian 6000 PLUS / CHroma 19032 Installation.....	16
Programming PARAMETERS QUADTECH Guardian 6000	18
Programming parameters QuadTech Guardian 6000 Plus / Chroma 19032	19
Electrical safety Analyzer Equipment List	20
QuadTech Guardian 6000 Setup Record.....	21
QuadTech Guardian 6000 PLUS / Chroma 19032 Setup Record.....	22

EQUIPMENT REQUIRED

Quantity	Part Number	Description
N/A	N/A	N/A

DISPOSABLES REQUIRED

Quantity	Part Number	Description
N/A	N/A	N/A

REFERENCE DOCUMENTATION

Document Number	Description
WAT046538	GENERIC HI-POT & GND CONT Test PROC.
730001799	Operating Procedure, Calibration and PM

SCOPE AND NOTES ABOUT THIS PROCEDURE

This procedure details the programming of electrical safety test equipment for use in testing Waters' product in manufacturing and at contract manufacturers worldwide.

There are three electrical safety analyzers that can be used to perform this testing:

- QuadTech Guardian 6000
- QuadTech Guardian 6000 Plus
- Chroma 19032

The QuadTech Guardian 6000, QuadTech Guardian 6000 Plus, and the Chroma 19032 are set up with a single program in memory location 1 named 12345678 to test all Waters' product.

The programming parameters for memory location 1 in all testers are equal, there are some differences in nomenclature, and the more advanced units have additional capability that is not used, but the tests executed are equivalent.

All figures in this procedure are for reference only and are intended to be representative of actual testers and may not be exact.

1. CALIBRATION

- 1.1. Referring to 730001799, outsource the calibration of the electrical safety analyzer.

2. SETUP (ALL TESTER TYPES)

Upon return from calibration (or anytime setup of a new or existing tester is required) follow the appropriate process below depending on the instrument model being setup.

- 2.1. Inspect all UUT interface cables and replace any that are worn.
- 2.2. Connect power cord
- 2.3. Power up instrument
 - 2.3.1. Complete sections 3 and 4 for the QuadTech Guardian 6000.
 - 2.3.2. Complete sections 5 and 6 for QuadTech Guardian 6000 Plus or the Chroma 19032.

3. QUADTECH GUARDIAN 6000 SETUP

3.1. Key Lock

- 3.1.1. Look at the analyzers front panel to see if Key Lock is locked by observing the LED in Figure 1. If Key Lock is locked go to step 3.1.2 to disable it, if not continue to step 3.2.
- 3.1.2. Type the **4 digit password** from the calibration database then press the **Off** key. The Key Lock LED will turn off, indicating that the Key Lock is unlocked.

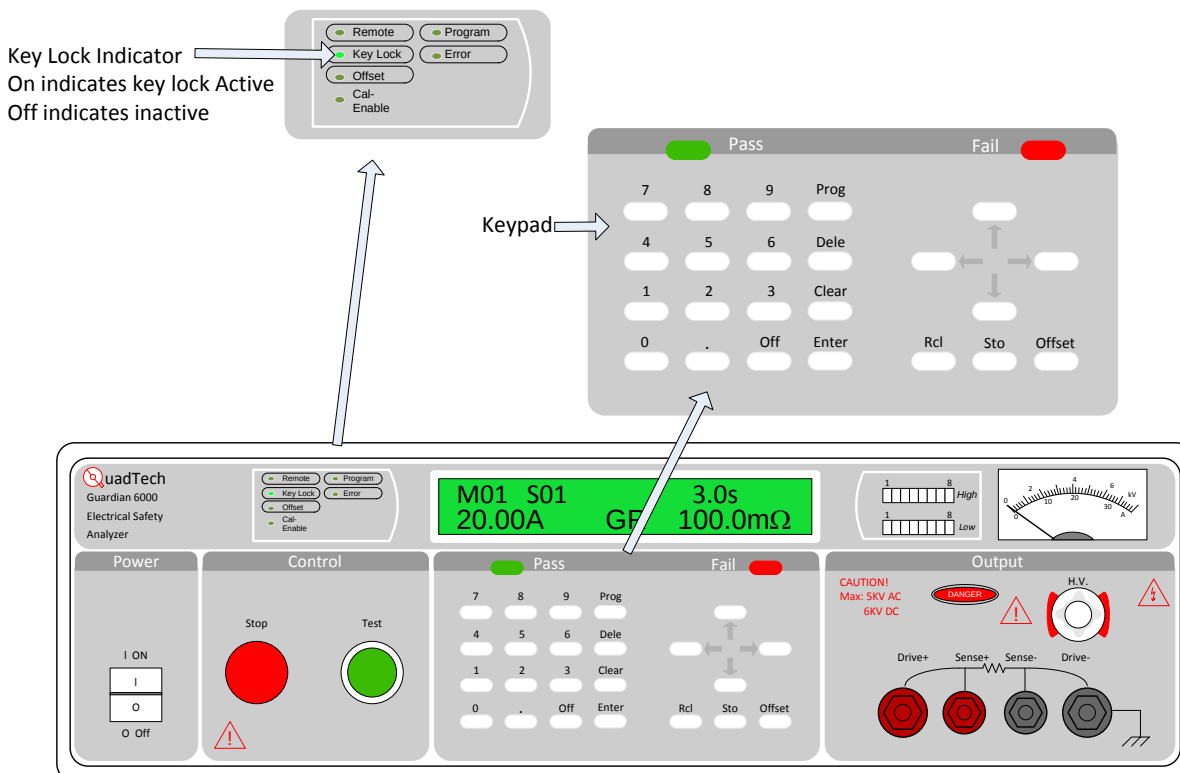


Figure 1: QuadTech Guardian 6000 front panel with Key Lock and keypad

- 3.2. Remove all installed programs.
- 3.2.1. With the analyzer in standby status, (no lights blinking).
- 3.2.2. Press the Red Stop button.
- 3.2.3. Press **Clear, 6, 0, 0, 0, Clear**, the display will appear as in Figure 2.

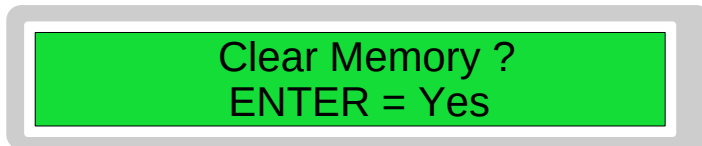


Figure 2: QuadTech Guardian 6000 Main screen with Memory location 1 loaded at step 1

- 3.2.4. Press the **Enter** key. The beeper will sound and all front panel LEDs will flash once, the display will return to STEP-01 in the upper left (Figure 3). The other text on the display can be ignored.



Figure 3: QuadTech Guardian 6000 at Step 1

- 3.3. Use left / right arrow keys to adjust the display contrast if necessary.

3.4. Program Memory Location 1.

Use the keypad and display (Figure 4) to program.

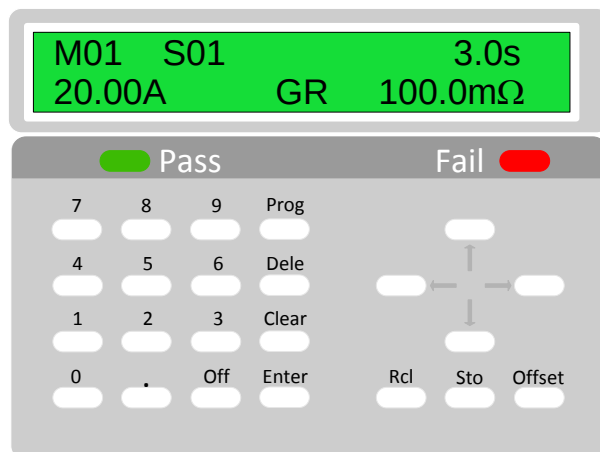


Figure 4: QuadTech Guardian 6000 display and keypad

3.4.1. Press the **Prog** key, the screen will appear as in Figure 5.

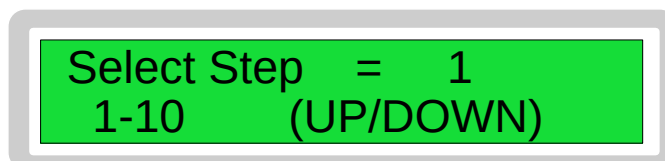


Figure 5: QuadTech Guardian 6000 Select Step

- 3.4.2. Press **Enter** to begin programming.
- 3.4.3. Enter all parameter settings to match the table below.

Use the **Enter** key to scroll through each parameter.

Use the up and down arrow keys to scroll through the settings for each parameter and the numeric keys to enter numeric values.

From the Select Step screen (Figure 5), use the up and down arrow keys to toggle between test steps.

- 3.4.4. Record all of the parameter settings on the QuadTech Guardian 6000 Setup Record on page 21.

PARAMETER	SETTING	DESCRIPTION
Step 1		
Mode	GR	Ground Continuity / Bond test
Current	20.00A	Test Current
High Limit	100.0mΩ	Test Upper Limit
Low Limit	Disable	Test Lower Limit
Test Time	3.0s	Total test time
Step 2		
Mode	WDC	Dielectric Withstand (Hi-Pot)
Voltage	2.121 kV	Test Voltage
High Limit	5.00mA	Test Upper Limit
Low Limit	Disable	Test Lower Limit (Not used)
Arc Limit	Disable	Arc Limit (Not used)
Hold / Test Time	3.0s	Time voltage is applied
Ramp Time	2.0s	Time voltage takes to rise from 0 V to Test Voltage

- 3.4.5. When programming is complete and all parameter settings are correct, press the **Prog** key to exit programming mode.

- 3.5. Store the program in Memory location 1.
- 3.5.1. Press the **Sto** key, use the arrow keys to select location memory location 1 and Press **Enter**
- 3.5.2. Enter '**12345678**' and Press the **Enter** key, the screen will appear as in Figure 6.

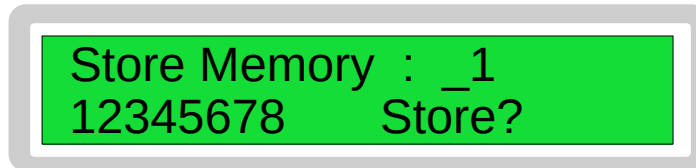


Figure 6: QuadTech Guardian 6000 Store memory location 1

- 3.5.3. Press **Enter** to store the program the display will look like Figure 7.



Figure 7 QuadTech Guardian 6000 programmed

4. QUADTECH GUARDIAN 6000 INSTALLATION

- 4.1. Apply preventative maintenance sticker per 730001799.
- 4.2. Install at point of use per test procedure WAT046538.
- 4.3. Demonstrate correct parameter settings to Test Engineering and Manufacturing.
 - 4.3.1. From the initial screen, press the **RcL** key.
 - 4.3.2. Press **Enter twice** to recall memory location 1, 12345678.
 - 4.3.3. From the initial screen, press the **Prog** key.
 - 4.3.4. If necessary, scroll to step 1 using the arrow keys
 - 4.3.5. Use the **Enter** key to scroll through each parameter for step 1, repeat as necessary to review all parameters. Test settings are summarized on page 18.
 - 4.3.6. From the Select step screen use the arrow keys to select step 2.
 - 4.3.7. Use the **Enter** key to scroll through each parameter for step 2, repeat as necessary to review all parameters. Test settings are summarized on page 18.
 - 4.3.8. Press the **Prog** key to exit.
 - 4.3.9. Load the correct program: Memory location 1.
 - 4.3.9.1. Press the **Rcl** key
 - 4.3.9.2. Use the up and down arrow keys to scroll to the correct program.
 - 4.3.9.3. Press **Enter twice** to recall the program.
 - 4.3.9.4. Press the **Clear** key.
- 4.4. Lock the Key Lock.
 - 4.4.1. From the initial screen, type the **4 digit password** from the calibration database then press the **Off** key. The Key Lock LED will illuminate. The display will appear as in Figure 8

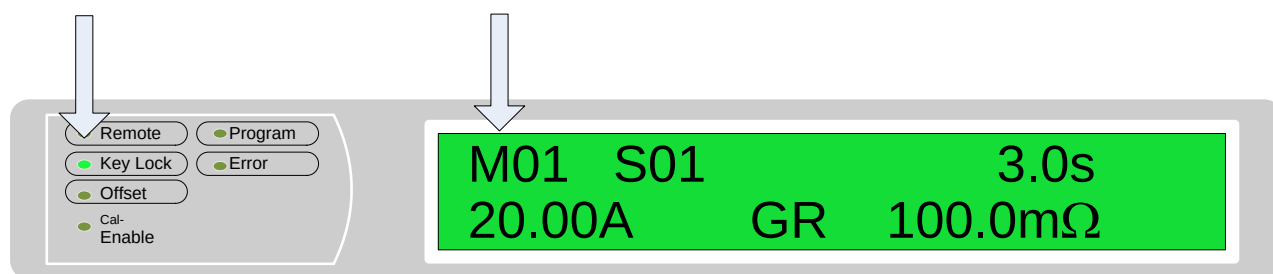


Figure 8: QuadTech Guardian 6000 Final setup screen

- 4.5. Sign and date the QuadTech Guardian 6000 Setup Record (Page 21).
- 4.6. Obtain signature on the QuadTech Guardian 6000 Setup Record of Test Engineering and the Manufacturing Technician that setup is correct, the correct program is loaded, and the keypad is locked.
- 4.7. Store the Setup Record in the calibration folder per procedure 730001799.

The Electrical Safety Analyzer is now ready for use. Sections 5 and 6 only need to be completed for the QuadTech Guardian 6000 Plus or Chroma 19032.

5. QUADTECH GUARDIAN 6000PLUS OR CHROMA 19032 SETUP

The only difference on the front control panel between a QuadTech Guardian 6000 Plus and a Chroma 19032 is the name of the instrument, see Figure 9. This section will refer to both testers, pictures will reference the QuadTech Guardian 6000 Plus.

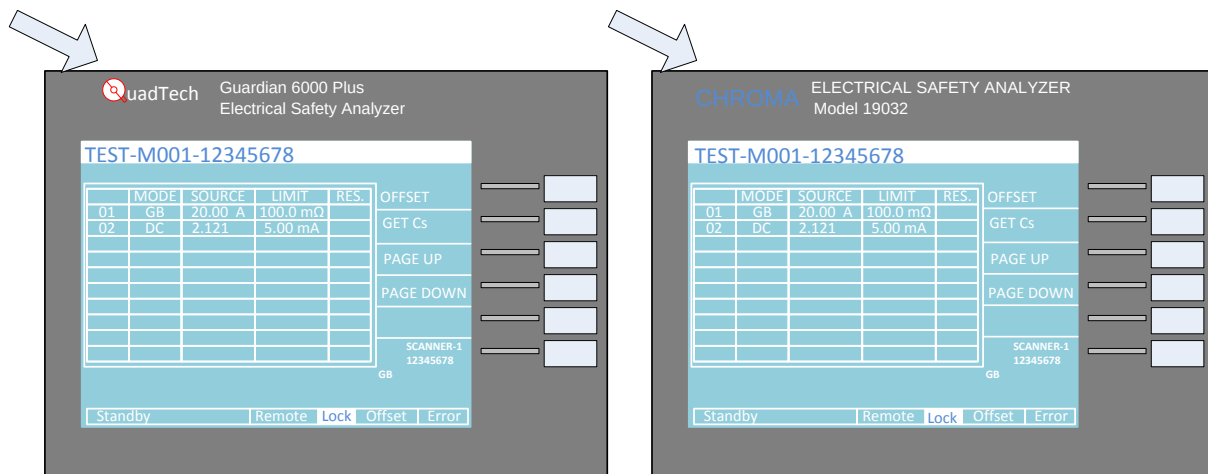


Figure 9: Difference between QuadTech Guardian 6000 Plus and the Chroma 19032

The primary interface for the QuadTech Guardian 6000Plus and the Chroma 19032 is the blue LCD, it's 'soft keys', and the numeric keypad. Figure 10 shows the interface at the MAIN MENU.

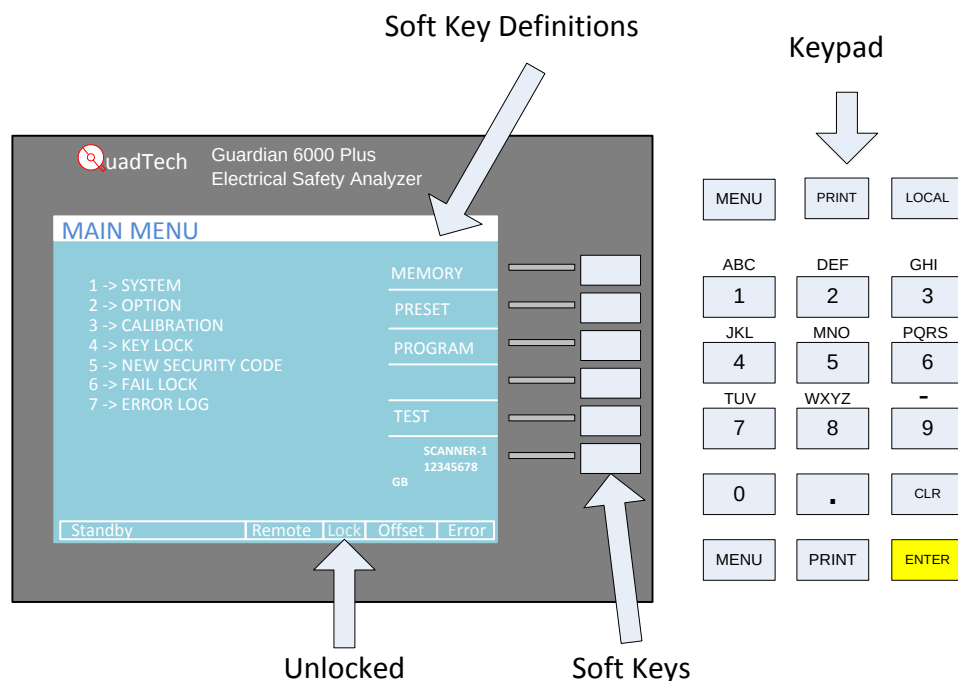


Figure 10: QuadTech Guardian 6000 Plus / Chroma 19032 Key soft keys and keypad

5.1. Key Lock

- 5.1.1. Look at the analyzers front panel to see if Key Lock is locked by observing '**Lock**' on the bottom of the display is in reverse text (see Figure 11 left). If Key Lock is locked go to step 5.1.2 to unlock it, if not continue to step 5.2.

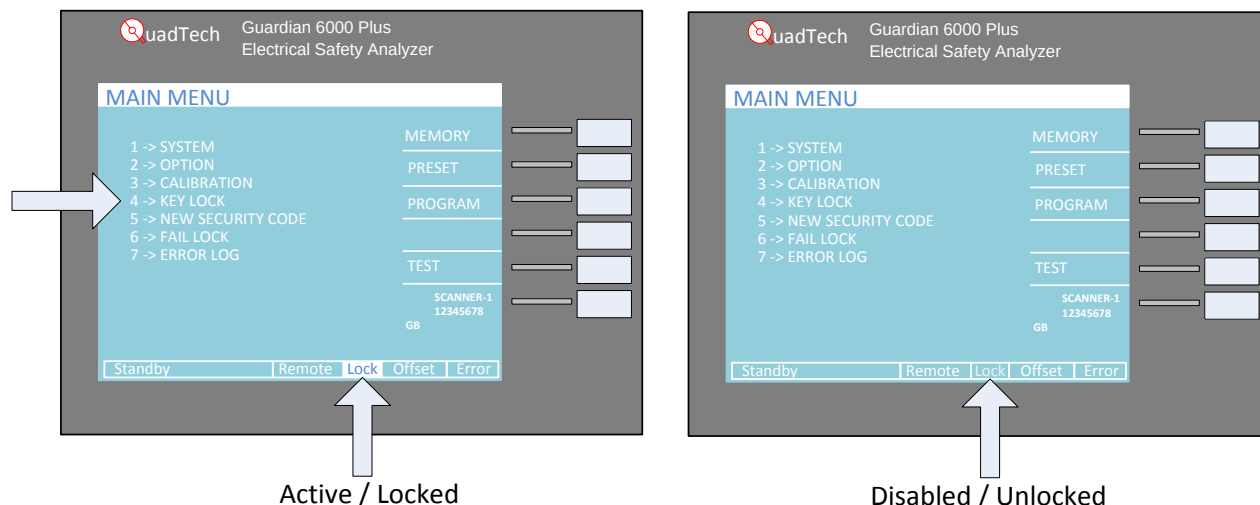


Figure 11: QuadTech Guardian 6000 Plus / Chroma 19032 Key Lock indicator and menu choice

- 5.1.2. From the Main menu (Figure 11), press the **4** key.
- 5.1.3. Type the **4 digit password** from the calibration database then press **Enter**, the screen will return to the main menu with Key Lock unlocked.
- 5.2. Remove all installed programs.
- 5.2.1. From the MAIN MENU, press the **MEMORY** soft key.
- 5.2.2. Using the **PAGE UP** and **PAGE DOWN** soft keys, scroll through all 100 memory locations and verify that there are none programmed. Use the **DELETE** soft key to delete any found.

Program locations 2- 10 in Figure 12 are not programmed, note there is no program name and 0 program steps. While program location 1 shows 2 steps and the name '.12345678'

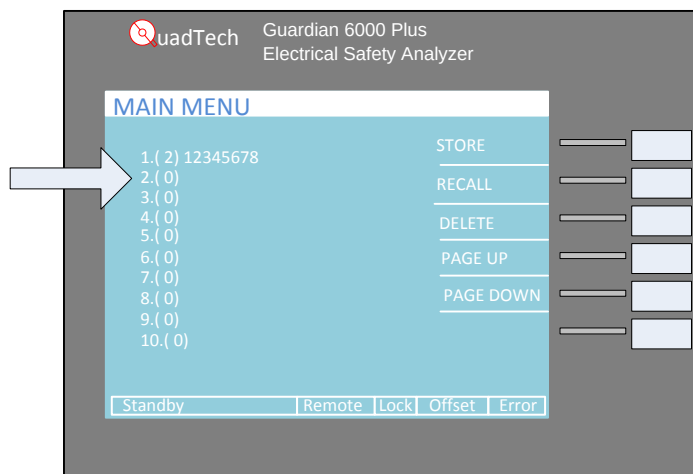


Figure 12: QuadTech Guardian 6000 Plus / Chroma 19032 Identifying a program

- 5.3. Program Memory Location 1.
- 5.4. Use the display and keypad (Figure 13) to program.

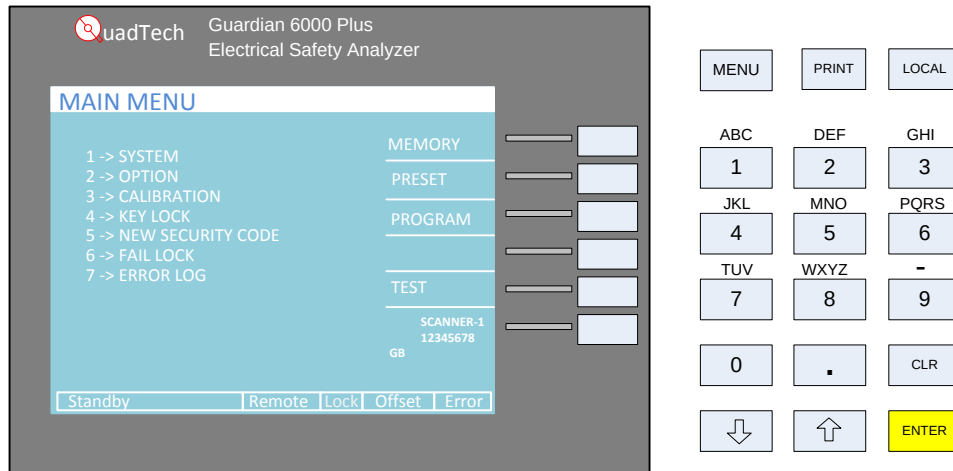


Figure 13: QuadTech Guardian 6000 Plus / Chroma 19032 display / keypad

5.4.1. From the MAIN MENU, press the **PROGRAM** soft key.

5.4.2. Enter all parameter settings to match the table below (also shown in Figure 14 for reference).

Use the up and down arrow keys to scroll through for each parameter, the soft keys to select setting, and the numeric keys to enter numeric values.

Use the UP / DOWN soft keys to navigate between test steps.

5.4.3. Record all parameter settings on the QuadTech Guardian 6000 Plus / Chroma 19032 Setup Record on page 22.

PARAMETER	SETTING	DESCRIPTION
Step 1		
Mode	GB	Ground Continuity / Bond test
Current	20.00A	Test Current
High Limit	100.0mΩ	Test Upper Limit
Low Limit	OFF	Test Lower Limit
Test Time	3.0s	Total Test Time
Twin Port	OFF	Not Used
Step 2		
Mode	DC	Dielectric Withstand (Hi-Pot)
Voltage	2.121 kV	Test Voltage
High Limit	5.00mA	Test Upper Limit
Low Limit	OFF	Not Used
Dwell Time	OFF	Not Used
Arc Limit	OFF	Not Used
Arc Filter	3-230 kHz	Not Used
Test Time	3.0s	Time voltage is applied
Ramp Time	2.0s	Time voltage takes to rise from 0 V to Test Voltage
*Fall time	OFF	Not used
CHNL (H_L)	OFF	Not Used

*Fall time is only present on the Chroma 19032 instruments, N/A Guardian 6000 Plus

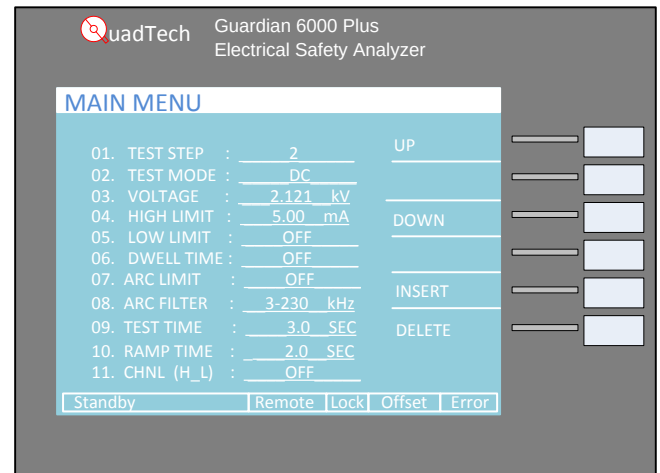
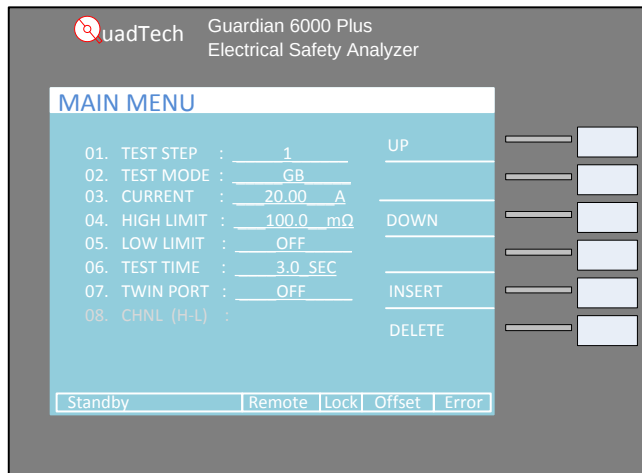


Figure 14: QuadTech Guardian 6000 Plus / Chroma 19032 step 1 settings

5.4.1. From the MAIN MENU, press the **MEMORY** soft key. The MEMORY SETUP screen will be displayed (Figure 15)

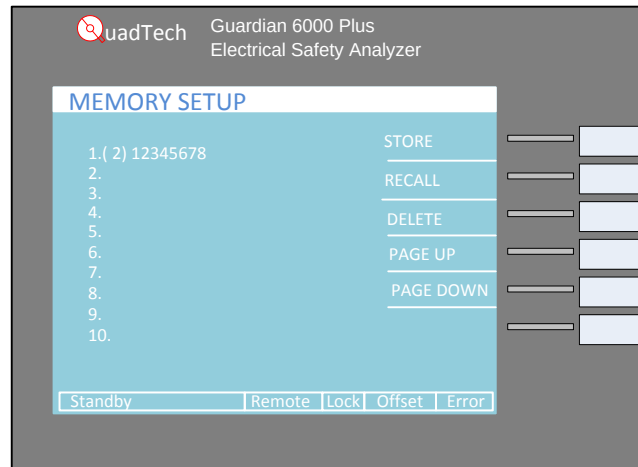


Figure 15: QuadTech Guardian 6000 Plus / Chroma 19032 memory setup

5.4.2. Press the **STORE** soft key.

5.4.3. Enter the program name 12345678, then press the **ENTER** key.

6. QUADTECH GUARDIAN 6000 PLUS / CHROMA 19032 INSTALLATION

- 6.1. Apply preventative maintenance sticker per 730001799.
- 6.2. Install at point of use, setup per test procedure WAT046538.
- 6.3. Demonstrate correct parameter settings to Test Engineering and Manufacturing Technician.
 - 6.3.1. From the MAIN MENU, Press the **MEMORY** soft key.
 - 6.3.2. Press the **RECALL** soft key with the program in memory location 1, 12345678 highlighted to recall it.
 - 6.3.3. Press the **ENTER** key to confirm the recall.
 - 6.3.4. Press the **MENU** key to display the MAIN MENU.
 - 6.3.5. Press the **PROGRAM** soft key.
 - 6.3.6. Verify test step 1 settings.
 - 6.3.7. Press the **UP** soft key.
 - 6.3.8. Verify test step 2 settings.
 - 6.3.9. Press the **MENU** key to display the MAIN MENU
 - 6.3.10. Press the **MEMORY** soft key. The MEMORY SETUP screen will be displayed.
 - 6.3.11. Press the **RECALL** soft key with the program in memory location 1, 12345678 highlighted to recall it.
 - 6.3.12. Press the **ENTER** key to confirm the recall.
 - 6.3.13. Press the **MENU** key to display the MAIN MENU.

- 6.4. Lock the Key Lock.
 - 6.4.1. Press the 4 key to recall the Key Lock
 - 6.4.2. Type the **4 digit password** from the calibration database then press **Enter**.
 - 6.4.3. Verify that the MESSAGE is **RECALL LOCK : YES**, press the **EXIT** soft key. The MAIN MENU will be displayed.
 - 6.4.4. Press the **TEST** soft key. The display will appear as in Figure 16, with the test program displayed (TEST-M001-12345678), and the **LOCK** text in reverse test.

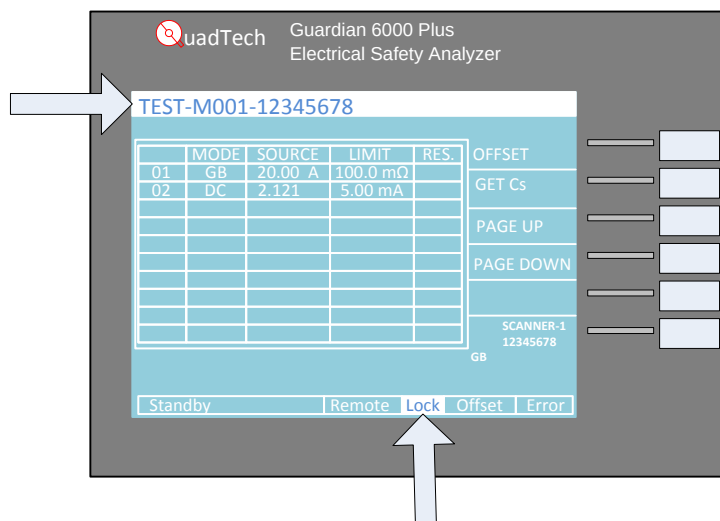


Figure 16: QuadTech Guardian 6000 Plus / Chroma 19032 Final Setup Screen

- 6.5. Sign and date the QuadTech Guardian 6000 Plus / Chroma 19032 Setup Record.
 - 6.6. Obtain signatures on the QuadTech Guardian 6000 Plus / Chroma 19032 Setup Record of Test Engineering and Manufacturing that setup is correct, the correct program is loaded, and the keypad is locked.
 - 6.7. Store the Setup Record in the calibration folder
- Electrical Safety Analyzer is now ready for use.**

PROGRAMMING PARAMETERS QUADTECH GUARDIAN 6000

Following is a summary of programming parameters for the QuadTech Guardian 6000. This procedure details how to program and verify these parameters into memory location 1 named 12345678. As well as provides record / sign off / and approval of these settings and the locking of the analyzer keypad before production use.

Step 1		
PARAMETER	Memory Location _1 12345678	DESCRIPTION
Mode	GR	Ground Continuity / Bond test
Current	20.00A	Test Current
High Limit	100.0mΩ	Test Upper Limit
Low Limit	Disable	Test Lower Limit
Test Time	3.0s	Total test time
Twin Port	OFF	Channel selection (Not used)
Step 2		
Mode	WDC	Dielectric Withstand (Hi-Pot)
Voltage	2.121 kV	Test Voltage
High Limit	5.00mA	Test Upper Limit
Low Limit	Disable	(Not used)
Arc Limit	Disable	(Not used)
Hold Time	3.0s	Time voltage is applied
Ramp Time	2.0s	Time voltage takes to rise from 0 V to Test Voltage

The critical parameters are in **reverse text**.

Waters instruments require a ground continuity test, an instantaneous measurement, on a routine production basis. The test equipment used performs a ground bond test, which is the same as a ground continuity test, but, with current applied, and for a specified time. This Ground Bond test is more stringent than the Ground Continuity requirement, due to the increased current and longer duration.

PROGRAMMING PARAMETERS QUADTECH GUARDIAN 6000 PLUS / CHROMA 19032

Following is summary of programming parameters for the QuadTech Guardian 6000 Plus and the Chroma 19032. This procedure details how to program and verify these parameters into Memory location 1 named 12345678. As well as provides record / sign off / and approval of these settings and the locking of the keypad before production use.

Step 1		
PARAMETER	Setting	DESCRIPTION
Mode	GR	Ground Continuity / Bond test
Current	20.00A	Test Current
High Limit	100.0mΩ	Test Upper Limit
Low Limit	OFF	Test Lower Limit
Test Time	3.0s	Total test time
Twin Port	OFF	(Not used)
Step 2		
Mode	DC	Dielectric Withstand (Hi-Pot)
Voltage	2.121 kV	Test Voltage
High Limit	5.00mA	Test Upper Limit
Low Limit	OFF	(Not used)
Dwell Time	OFF	(Not Used)
Arc Limit	OFF	(Not used)
Arc Filter	3-230 kHz	Not Used
Test Time	3.0s	Time voltage is applied
Ramp Time	2.0s	Time voltage takes to rise from 0 V to Test Voltage
*Fall time	OFF	(Not used)
CHNL (H-L)	OFF	(Not used)

*Fall time is only present on the Chroma 19032 instruments, N/A Guardian 6000 Plus

The critical parameters are in **reverse text**.

Waters instruments require a ground continuity test, an instantaneous measurement, on a routine production basis. The test equipment used performs a ground bond test, which is the same as a ground continuity test, but, with current applied, and for a specified time. This Ground Bond test is more stringent than the Ground Continuity requirement, due to the increased current and longer duration.

ELECTRICAL SAFETY ANALYZER EQUIPMENT LIST

Instrument Serial Number	Identifier	Manufacturer	Model	Location
8280865	86041	Quadtech	Guardian 6000	Flextronics
1140656	90259	Quadtech	Guardian 6000	Milford
1140659	90261	Quadtech	Guardian 6000	Milford
1140657	90265	Quadtech	Guardian 6000	Milford
1140663	90266	Quadtech	Guardian 6000	Milford
1140662	90270	Quadtech	Guardian 6000	Milford
1140660	90282	Quadtech	Guardian 6000	Flextronics
5037654	91354	Quadtech	Guardian 6000	Milford
7312754	91356	Quadtech	Guardian 6000	Venture
5278621	91683	Quadtech	Guardian 6000	Venture
1140658	91862	Quadtech	Guardian 6000	Milford (Regulatory)
11173729	91890	Quadtech	Guardian 6000	Venture
1140661	92599	Quadtech	Guardian 6000	Milford
19032G400201	93237	Chroma	19032	Milford
19032G400202	93238	Chroma	19032	Milford
19032G400225	93260	Chroma	19032	CEI
19032G400264	93467	Chroma	19032	Venture
5037655	95037	Quadtech	Guardian 6000	Flextronics
G600000000174	95050	Quadtech	Guardian 6000 Plus	Venture
9111936	95051	Quadtech	Guardian 6000 Plus	Milford
6069766	98206	Quadtech	Guardian 6000	Flextronics
8060121	98210	Quadtech	Guardian 6000 Plus	Milford
3505384	99099	Quadtech	Guardian 6000	Milford
3505383	99102	Quadtech	Guardian 6000	Milford
3505382	99103	Quadtech	Guardian 6000	Milford
3505381	99104	Quadtech	Guardian 6000	Milford

QUADTECH GUARDIAN 6000 SETUP RECORD

ID Number: _____

Performed By: _____

Date: _____

Memory 1: 12345678			
	PARAMETER	VALUE	SETTING
Step 1	Mode	GR	
	Current	20.00A	
	High Limit	100.0mΩ	
	Low Limit	Disable	
	Test Time	3.0s	
Step 2	Mode	WDC	
	Voltage	2.121 kV	
	High Limit	5.00mA	
	Low Limit	Disable	
	Arc Limit	Disable	
	Test Time	3.0s	
	Ramp Time	2.0s	

Key Lock locked ☐ (Key Lock LED illuminated)

Program displayed: _____ (M01)

Approved by:

Performer: _____

Date: _____

Verified By: Test Engineering

Name: _____

Title: _____

Signature: _____

Date: _____

End User Approval: Manufacturing Technician

Name: _____

Title: _____

Signature: _____

Date: _____

QUADTECH GUARDIAN 6000 PLUS / CHROMA 19032 SETUP RECORD

ID Number: _____

Performed By: _____

Date: _____

Memory 1: 12345678			
	PARAMETER	VALUE	SETTING
Step 1	Mode	GB	
	Current	20.00A	
	High Limit	100.0mΩ	
	Low Limit	OFF	
	Test Time	3.0s	
	Twin Port	OFF	
Step 2	Mode	DC	
	Voltage	2.121 kV	
	High Limit	5.00mA	
	Low Limit	OFF	
	Dwell Time	OFF	
	Arc Limit	OFF	
	Arc Filter	3-230 kHz	
	Test Time	3.0s	
	Ramp Time	2.0s	
	*Fall Time	OFF	
	CHNL (H-L)	OFF	

*Fall time is only present on the Chroma 19032 instruments, N/A Guardian 6000 Plus

Key Lock locked ☐ ('Lock' text in reverse)

Program displayed: _____ (TEST-M001-12345678)

Approved by:

Performer: _____

Date: _____

Verified By: Test Engineering

Name: _____

Title: _____

Signature: _____

Date: _____

End User Approval: Manufacturing Technician

Name: _____

Title: _____

Signature: _____

Date: _____