KEITHLEY

Model 2460 System SourceMeter®

Version v1.5.0g Firmware Release Notes

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General Information

Supported models

This firmware is intended for use on the following Keithley Instruments product models:

2460, 2460-NFP, 2460-RACK, 2460-NFP-RACK

Firmware Upgrade/Downgrade Instructions

NOTE: Do not turn off power or remove the USB flash drive until the upgrade process is complete.

From the front panel:

1. Copy the firmware upgrade file to a USB flash drive. The file is: `ki_2460_v1_5_0g.upg`.
2. Verify that the upgrade file is in the root subdirectory of the flash drive and that it is the ONLY firmware upgrade file in that location. 2460 firmware files end with the file extension .upg.
   (example: `H:\ki_2460_v1_5_0g.upg`)
3. Disconnect any input and output terminals that are attached to the instrument.
4. Turn on instrument power.
5. Insert the flash drive into the USB port on the front panel of the instrument.
6. From the instrument front panel, press the **MENU** key.
7. Under System, select **Info/Manage**.
8. Select the type of upgrade you want to do:
   To upgrade to a newer version of firmware: Select **Upgrade to New**.
   To force downgrading to an older version of firmware: Select **Downgrade to Older**.
9. If the instrument is controlled remotely, a message is displayed. Select **Yes** to continue.
10. When the upgrade is complete, reboot the instrument.

NOTE: A message is displayed while the upgrade is in progress. Do not remove power until the upgrade message shows complete (it should take less than 7 minutes).

For additional information about upgrading the firmware, refer to the "How do I Upgrade Firmware?" topic in the "Frequently Asked Questions (FAQs)" section of the Model 2460 Interactive SourceMeter® Instrument Reference Manual (document number: 2460-901-01). This manual is available online at http://www.keithley.com/support, Search for "2460 Reference Manual".

Upgrade considerations for the Model 2460

Upgrade files are available on the Keithley Instruments website (http://www.keithley.com).
To find firmware files on the Keithley Instruments website:

1. Select the **Support** tab.
2. In the model number box, type **2460**.
3. Select **Firmware**.
4. Click the search button. A list of available firmware updates and any available documentation for the instrument is displayed.
5. Click the file you want to download.

Version v1.5.0g Release

Overview

Version 1.5.0g is the fourth official firmware release for the Model 2460. Known Issues, Usage Notes, and Upcoming Enhancements are listed below in this document.
RELEASED 11-MAR-2016

Compatibility concerns

Firmware revision v1.5.0g can be installed on any vintage 2460. After upgrading to v1.5.0g, be advised that in order to downgrade back to previous versions of firmware, you MUST archive and remove all saved scripts before the downgrade will be allowed.

Critical Fixes

PR56630 AR50775 Problem with Trigger Model not waiting.

Models affected:

All 2460 models

Symptom:

Under certain conditions when an SMU is connected to a digitizing instrument (2461 or DMM7510) the digitizer will start digitizing before the trigger has been sent to start it.

Resolution:

This issue has been corrected.

PR57148 AR51367 Generating Sweep parameters does not save correctly in the Config List.

Models affected:

All 2460 models

Symptom:

When creating a new Source Config List and then immediately saving this Config List to a script, the instrument will hang.

Resolution:

This issue has been corrected.

PR56931 Throw an error is auto-range low is set and the source and measure function match.

Models affected:

All 2460 models

Symptom:

Certain command sequences will cause the SMU to display an error and this error is not consistent between the 2450, 2460, and 2461.

Resolution:
This issue has been corrected and the error message between the 2450, 2460, and 2461 now match.

PR56930 Throw an error is auto-range low is set and the source and measure function match.

Models affected:

All 2460 models

Symptom:

Certain command sequences will cause the SMU to display an error and this error is not consistent between the 2450, 2460, and 2461.

Resolution:
This issue has been corrected and the error message between the 2450, 2460, and 2461 now match.

PR56941 Sort binning template's constant limit blocks are jumping to the wrong blocks.

Models affected:

All 2460 models

Symptom:

When the SortBinning template was originally ported to the 2460, it correctly moved the notify block for external output. However, it did not correctly renumber the constant limit block's branch to block value.

Resolution:

This issue has been corrected.

PR57013 Memory corruption when using a Config List over 60,000 indexes.

Models affected:

All 2460 models

Symptom:

When creating a Config List of greater than 60,000 indexes, when trying to retrieve values above index 60,000, the wrong index was retrieved and the number of indexes over-flowed.

Resolution:

This issue has been corrected. The maximum number of indexes is correctly supported up to 1,000,000.

PR57206 Incorrect source value after using OCOMP ohms.

Models affected:

All 2460 models

Symptom:

Under certain conditions, after running OCOMP ohms and immediately switching ranges while digitizing, an incorrect source value is returned.

Resolution:

This issue has been corrected.

PR57264 Certain scripts cause error code 5093 “Cannot change the source function, range, level, or limit when using the Resistance measure function.”

Models affected:

All 2460 models

Symptom:

Certain scripts cause the “createconfigscript()” function to put a source function call after the measure resistance function.

Resolution:

This issue has been corrected.

PR57391 Auto-Range limits do not match the 2450 Auto-Range limits.

Models affected:

All 2460 models

Symptom:

Certain Auto-Range limits on the 2460 do not match the 2450.

Resolution:
The Auto-Range limits FOR "AUTO OHMS" ONLY (measure function = RESISTANCE) have been changed to used 10/100% to match 2450 auto-ohms mode.

PR57512 Cursor statistics don’t display if x1 > x2.

Models affected:

All 2460 models

Symptom:

Notice that the stats are displayed as long as x2 is to the right of x1. As soon as they cross, hash marks are displayed for all stats.

Resolution:

This issue has been corrected.

PR57650 Virtual front panel scrolling issue.

Models affected:

All 2460 models

Symptom:

When using the virtual front panel, the user is unable to scroll up and down in the system settings menu. Using the web interface, the user should be allowed to at least scroll through the system settings.

Resolution:

This issue has been corrected.

Enhancements

No PR **Models affected:**

All 2460 models

Enhancement:

The behavior of the command `display.waitevent()` has changed. When the example below is run, a dialog will be shown. If Yes or No is not pressed within 1 second, then `display.waitevent()` will time out. The `buttonId` will now contain `display.BUTTON_SELF` instead of 0 (zero). It will also return `display.BUTTON_SELF` if the prompt is removed with `display.delete()`.

```
display.prompt(display.BUTTONS_YESNO, "Press Yes or No…")
objectID, buttonId = display.waitevent(1)
```

PR57905 AR50675 **Models affected:**

All 2460 models

Enhancement:

Add a command to put the instrument into LOCAL mode.

The command `logout` can be used to log out of remote mode and force the instrument into LOCAL mode. This command was previously failing in certain situations. This command is now fully supported.

Noncritical Fixes

N/A

Known issues

PR49308 `Trigger.BLOCK_BRANCH_COUNTER` loop without a measure or delay block causes hang.
SCPI: `:TRIGger:BLOCk:BRANch:COUNter`
TSP: `trigger.model.setblock() with trigger.BLOCK_BRANCH_COUNTER`

Models affected:

All 2460 models

Symptom:

When running a tight trigger loop without a measurement or delay in the sequence, the 2460 will be unresponsive until the loop ends.

Workaround: Simply add any measurement or short delay in the trigger loop and the 2460 will perform normally. A future firmware release will work around this problem automatically.

Version v1.3.0s Release

Overview

Version 1.3.0s is the third official firmware release for the Model 2460. Known Issues, Usage Notes, and Upcoming Enhancements are listed below in this document.
RELEASED 10-JUN-2015

Compatibility concerns

N/A

Critical Fixes

PR55188
AR42592

Models affected:

All 2460 models

Symptom:

:READ? Query always returns the last reading at the end of the continuous butter.
For example, if a basic measurement is set up to defbuffer1 (size 10000) and then takes 11000 readings, the last 1000 readings will all return the same value. This should act as a circular buffer.

Resolution:

This issue has been corrected.

PR55433
AR42690

Models affected:

All 2460 models

Symptom:

2460 locks up when programming a certain voltage step.
When programming a voltage step from 1V to 5V in 1V increments and the performance is set to 1700 readings per second, after pressing the TRIGGER button and waiting for approximately one minute, the instrument begins to slow down and eventually locks up.

Resolution:

This issue has been corrected.

PR55600 *TRG command trigger source does not work in SCPI mode trigger model.

Models affected:

All 2460 models

Symptom:

Using a trigger model .wait block with the command event in SCPI does not work when *TRG is sent.

Instead, it generates the following error ==> Error 2713 - "No trigger model engine available".

Resolution:

This issue has been resolved. Now, the *TRG command will satisfy the wait block when sent if waiting for a command event.

PR55749 Reads overflow instead of the compliance current on the 100uA range and below

Models affected:

All 2460 models

Symptom:

Under a very specific sequence of events, the front panel of the 2460 will report OVERFLOW on the 100uA and lower ranges.

Resolution:

This issue has been corrected.

PR55867 1uA Current Source error when using Config List
AR43082

Models affected:

All 2460 models

Symptom:

Under a very specific sequence of events, setting the Source Config List source value to 1.0uA will revert to 0uA after pressing the Trigger button on the front panel.

Resolution:

This issue has been corrected.

PR56135 QuickSet Performance Setting does not work on fastest setting
AR50078

Models affected:

All 2460 models

Symptom:

On the QuickSet Menu, when editing the Performance Slide bar, if you choose the fastest speed, the dial indicates a speed of ~1700/sec. However, the actual speed is only 10/sec no matter how much the other settings are optimized. The only way to achieve this speed is to create a simple trigger model configuration that sources, measures, and loops back continuously, then manually set NPLC to .01, turn auto ranging for source and measure off, and set source delay to 0.

Resolution:

This issue has been corrected and the Performance Slide bar works correctly for all settings.

Enhancements

GENERAL **Models affected:**

All 2460 models

Enhancement:

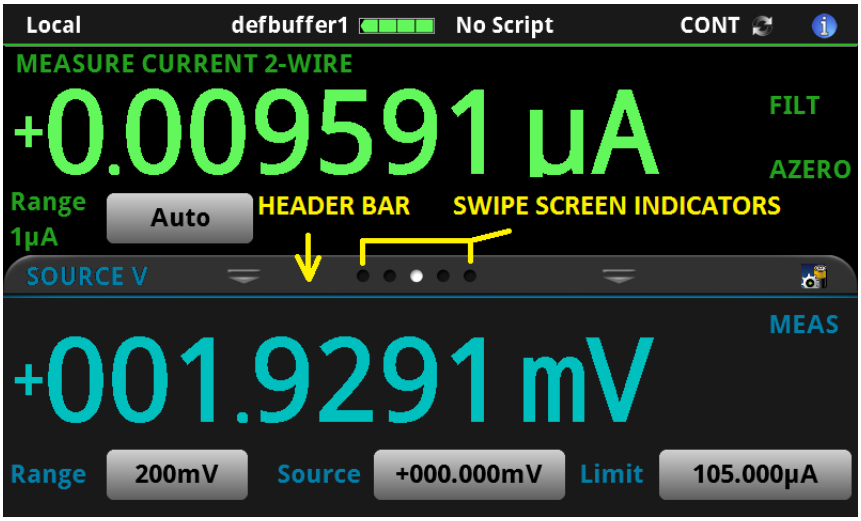
A number of improvements have been made to the overall Graphical User Interface as follows:

1. Screen Colors: All screen colors have been modified for better contrast and easier readability.

2. Pinch-to-Zoom Performance: Throughout the user interface, the "Pinch-to-zoom" touch screen motion has been improved and is more responsive.

3. Improve Swiping:
   a. The swipe user interface gesturing has been dramatically improved and is more responsive.
   b. Added Vertical Swiping in various screens in the GUI.
   c. Horizontal swiping has been made more smooth and is consistent with Vertical Swiping.
   d. "Fling" swiping has been implemented where faster swiping actions result in rapid scrolling followed by decay based on the velocity of the "fling."
   e. Swipe Down on the Home screen will display larger readings.

4. Tabs and Buttons: Throughout the user interface multiple data display options have been made available through tabs (header bars) with swipe screen indicators to show how many different display options are available and which display tab is active.

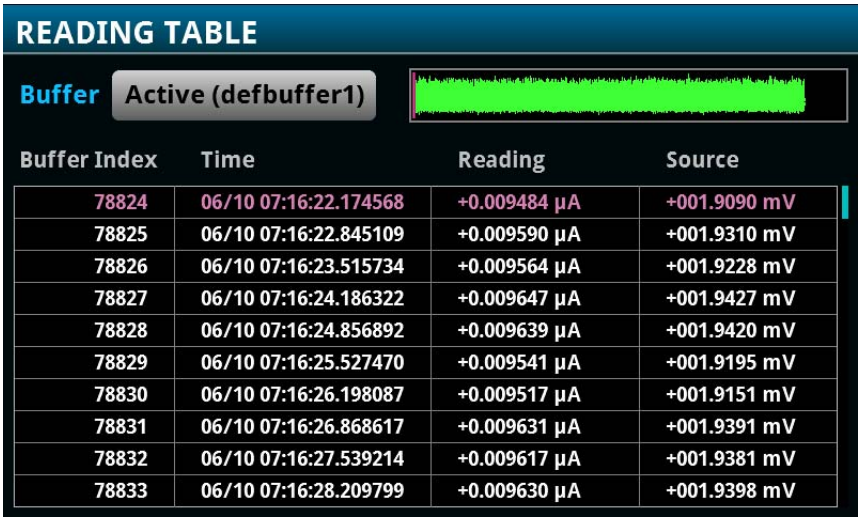


5. Graphing:
   a. New Auto Scale Options (X-Axis) ➔ Track Latest, Track Group
   b. New Auto Scale Options (Y-Axis) ➔ y-swim lanes, y-shared, y-per trace
   c. Multi-Trace Line Plots
   d. Multi-Trace Scatter Plots
   e. Various refresh and performance improvements

6. Histogram:
   a. New Auto-Scale, Auto-Bin, and Fit
   b. Smartscale choose best scaling option
   c. Various refresh and performance improvements

7. TTI Synchronization: All Touch, Test, Invent® Keithley Models including the 2450, 2460, and 7510 have been carefully updated so that they are all consistent in look, feel, and general navigation.

8. Updated Reading Table: Added new reading table features and a new Reading Preview Graph. Please see the Reference Manual for further details.



Buffer Index	Time	Reading	Source
78824	06/10 07:16:22.174568	+0.009484 µA	+001.9090 mV
78825	06/10 07:16:22.845109	+0.009590 µA	+001.9310 mV
78826	06/10 07:16:23.515734	+0.009564 µA	+001.9228 mV
78827	06/10 07:16:24.186322	+0.009647 µA	+001.9427 mV
78828	06/10 07:16:24.856892	+0.009639 µA	+001.9420 mV
78829	06/10 07:16:25.527470	+0.009541 µA	+001.9195 mV
78830	06/10 07:16:26.198087	+0.009517 µA	+001.9151 mV
78831	06/10 07:16:26.868617	+0.009631 µA	+001.9391 mV
78832	06/10 07:16:27.539214	+0.009617 µA	+001.9381 mV
78833	06/10 07:16:28.209799	+0.009630 µA	+001.9398 mV

PR56127 **Models affected:**

All 2460 models

Enhancement:

Add an API command to mark the start of a group for writable buffers.

A status optional parameter has been added to the following TSP and SCPI commands:

SCPI

```
TRACe:WRITe:READing <standard writable reading buffer>, <reading value>,
[<time sec>, <time nsec>,[<status>]]

TRACe:WRITe:READing <full writable reading buffer>, <reading value>,
<extra value>, [<time sec>, <time nsec>,[<status>]]
```

TSP

```
buffer.write.reading(<standard writable reading buffer>, <reading value>,
[<time sec>, <time nsec>], [<status>])

buffer.write.reading(<full writable reading buffer>, <reading value>,
<extra value>, [<time sec>, <time nsec>],[<status>])
```

The optional status parameter indicates if the reading being added is start of group for plotting on the graph. The default is 0. Set this to 0 if not start of group or set to 256 if start of group. This parameter only accepts 0 or 256 - any other value generates an error

For TSP, `buffer.STAT_START_GROUP` can be used to set it. You would set status to 256 to help graph a family of curve traces on the graph.

PR53815 **Models affected:**

All 2460 models

Enhancement

Add a :`TRIGger:LOAD` command that takes a template name as a first argument

Old Command	New Command
`:TRIGger:LOAD:EMPTy`	`:TRIGger:LOAD "Empty"`
`:TRIGger:LOAD:CONFiguration:LIST`	`:TRIGger:LOAD "ConfigList", <parameter list as before>`
`:TRIGger:LOAD:TRIGger:EXTernal`	`:TRIGger:LOAD "LogicTrigger", <parameter list as before>`
`:TRIGger:LOAD:LOOP:SIMPle`	`:TRIGger:LOAD "SimpleLoop", <parameter list as before>`
`:TRIGger:LOAD:LOOP:DURation`	`:TRIGger:LOAD "DurationLoop", <parameter list as before>`
`<not present>`	`:TRIGger:LOAD "LoopUntilEvent", <parameter list as before>`
`<not present>`	`:TRIGger:LOAD "GradeBinning", <parameter list as before>`
`<not present>`	`:TRIGger:LOAD "SortBinning", <parameter list as before>`

Example:

before:

```
:TRIGger:LOAD:LOOP:DURation <duration>, <delay>, “<reading buffer>”
```

after:

```
:TRIGger:LOAD <duration>. <delay>, “<readingBuffer>”
```

Usage Notes:

- The template name is not case-sensitive
- The template name needs to be in quotes
- This makes the SCPI command more like the TSP equivalent trigger.model.load() command
- See the Reference Manual for more details

AR42567
PR55190 **Models affected:**

All 2460 models

Enhancement:

Add a direct shortcut from the HOME view measurement line to the measurement settings menu.

A shortcut icon has been added to the swipe bar on the HOME source/measurement tab.

Noncritical Fixes

N/A

Known issues

N/A

Version v1.1.0c Release

Overview

Version 1.1.0c is the second official firmware upgrade release for the Model 2460. Known Issues, Usage Notes, and Upcoming Enhancements are listed below in this document.
RELEASED 4-FEB-2015

Compatibility concerns

N/A

Critical Fixes

PR53544
AR41757

Models affected:

All 2460 models

Symptom:

2460 sinks wrong current value after range change.
In certain cases when the 2460 is connected to a power supply AND the power supply is sourcing positive voltage and the 2460 is sinking current, the 2460 will occasionally sink the wrong current value. This error happens only when changing to/from the 1A range AND the source level is a very small value.

Resolution:

This issue has been corrected.

PR54745
AR42806

Models affected:

All 2460 models

Symptom:

Problem with source read back with voltages less than 1 (rounding problem).
When the source read back is turned off, the programmed voltages should be returned. However, when the programmed values are less than 1V, incorrect values are returned. This is due to a floating point rounding problem. The numbers will appear correct in the data sheet, however, the numbers returned via the bus are incorrect.

Resolution:

This issue has been corrected.

PR54626

Models affected:

All 2460 models

Symptom:

Hardware in wrong state after setting auto-range low.
Changing the measure low range setting (used for auto-range) could result in incorrect operation if the new range is higher than the active measure range.

Resolution:

This issue has been corrected.

Enhancements

N/A

Noncritical Fixes

PR53474 **Models affected:**

All 2460 models

Symptom:

In some cases, the display will show XXX's in the measure area of the display.
When the source function is Resistance and Measure offset compensation is on, the display will sometimes display XXX.

Resolution:

This issue has been corrected.

PR54455 **Models affected:**

All 2460 models

Symptom:

Under very rare conditions, the Ohm symbol on the display will get cut off.

Resolution:

This cosmetic issue has been corrected.

PR54941 **Models affected:**

All 2460 models

Symptom:

Certain *.tsp file names cannot be processed on the "Scripts→Manage" menu.
Trying to access a 32 character (or longer) script name from a flash drive on the front panel generates an error when trying to move or run the script file.

Resolution:

This issue has been corrected. The 32 character limit is now better enforced.

Known issues

PR48636 Model 2460 does not respect a USB Flash drive that is read only.
REPAIRED in v1.3.0s

Models affected:

2460

Symptom:

The 2460 will write over read-only files on flash drives. Specifically, if the 2460 attempts to write to file aaa.txt and aaa.txt is marked read-only, the 2460 will rewrite file aaa.txt without warning. This problem does NOT suggest the 2460 randomly overwrites arbitrary files on a flash drive.

Workaround:

There is no known workaround for this issue at this time.

PR49308 `Trigger.BLOCK_BRANCH_COUNTER` loop without a measure or delay block causes hang.
SCPI: `:TRIGger:BLOCk:BRANch:COUNter`
TSP: `trigger.model.setblock() with trigger.BLOCK_BRANCH_COUNTER`

Models affected:

2460

Symptom:

When running a tight trigger loop without a measurement or delay in the sequence, the 2460 will be unresponsive until the loop ends.

Workaround: Simply add any measurement or short delay in the trigger loop and the 2460 will perform normally. A future firmware release will work around this problem automatically.

PR55364 When executing the Resistor Demo immediately after the LED Demo, the Demo gets stuck.
REPAIRED in v1.1.0c

Models affected:

2460

Symptom:

When executing the Resistor Demo immediately after the LED Demo, the Demo will appear to be stuck and will not execute.

Workaround:

If this problem occurs, simply navigate to the Data tab of the Graph view and clear the default buffer (`defbuffer1`). The test will then continue as expected. This issue will be repaired in the next firmware release.

Version v1.0.0f Release

Overview

Version 1.0.0f is the initial firmware release for the Model 2460. No fixes are listed since this is the very first firmware release. Known Issues, Usage Notes, and Upcoming Enhancements are listed below in this document.
RELEASED 10-OCT-2014

Compatibility concerns

N/A

Critical fixes

N/A

Enhancements

N/A

Noncritical fixes

N/A

Known issues

N/A