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CONTENTS

GENERAL INFORMATION

SUPPORTED MODELS

This firmware is used on the following Keithley Instruments product models:

Model DMM6500 6½-Digit Multimeter

INSTALLATION INSTRUCTIONS

Firmware upgrade and downgrade instructions

CAUTION
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 (`.upg` file) to a USB flash drive.
2. Verify that the upgrade file is in the root subdirectory of the flash drive and that it is the only firmware file in that location.
3. Disconnect any terminals that are attached to the instrument.
4. Turn the instrument power off. Wait a few seconds.
5. Turn the instrument power on.
6. Insert the flash drive into the USB port on the front panel of the instrument.
7. From the instrument front panel, press the **MENU** key.
8. Under System, select **Info/Manage**.
9. Choose an upgrade option:
   - To upgrade to a newer version of firmware: Select **Upgrade to New**.
   - To return to a previous version of firmware: Select **Downgrade to Older**.
10. When the upgrade is complete, reboot the instrument.

A message is displayed while the upgrade is in progress.

For additional firmware installation instructions, refer to the "Upgrading the firmware" topic in the "Maintenance" section of the *Model DMM6500 6½-Digit Multimeter Reference Manual* (document number DMM6500-901-01). This manual is available online at <u>tek.com/keithley</u>.

VERSION 1.7.8 RELEASE

OVERVIEW

Version 1.7.8 provides fixes.

CRITICAL FIXES

Reference number:	NS-1964
Symptom:	After configuring a scan in SCPI 2700 or SCPI 2701 emulation mode, the READ? command closes the first channel and takes a reading, then advances to the second channel in the scan list. Subsequent READ? commands do not advance the scan to the next channel in the list. The subsequent READ? commands respond with a reading being measured on the second channel in the scan sequence and not on the expected channel.
Resolution:	This issue has been resolved.
Reference number:	NS-1972
Symptom:	After configuring a scan in SCPI 2000 emulation mode, the TRACe:DATA? command is used to trigger and scan through the channels in the scan list. The front panel indicates that the first channel closes, but the instrument does not audibly indicate closure and opening of the remaining channels in the scan list. No data is returned in response to the TRACe:DATA? command.
Resolution:	This issue has been resolved.
Reference number:	NS-2004
Symptom:	In SCPI 27xx emulation mode, non-measurement channels (such as those on a 7705 card) closed with the ROUTe:MULTi:CLOSe command prior to starting a scan do not remain closed during the scan as expected, as they are errantly opened when the scan is initiated.
Resolution:	This issue has been resolved.

VERSION 1.7.7 RELEASE

OVERVIEW

Version 1.7.7 provides a fix.

CRITICAL FIXES

Reference number:	NS-2025
Symptom:	While running a test loop in an application that sends the `reset()` command as part of the code, a blue screen appears after running the test for several days.
Resolution:	The issue has been resolved.
Reference number:	NS-2043
Symptom:	While remotely communicating with the instrument, if a new error is displayed on the front panel shortly after a previous error is being cleared from the front panel, the instrument may become unresponsive or inoperative.
Resolution:	The issue has been resolved.

VERSION 1.7.5 RELEASE

OVERVIEW

Version 1.7.5 provides fixes and enhancements.

CRITICAL FIXES

Reference number:	NS-1943
Symptom:	When recalling a saved system configuration containing four-wire measurement scan channels, the setup returns Error 1115: "Parameter error: no paired channels accepted."
Resolution:	This issue has been resolved.
Reference number:	NS-1974
Symptom:	After running a scan and then disabling a channel group from the scan on the front panel, running the scan again returns Error -285 TSP: "Syntax error at a line due to an unfinished string."
Resolution:	The issue has been resolved.

Reference number:	NS-2017
Symptom:	When appending buffer data to a .csv file using the buffer.saveappend command, the line with channel numbers is shifted over to start with the time column instead of starting with channel data columns, as the line for channel labels does.
Resolution:	This issue has been resolved.

ENHANCEMENTS

Category:	**General settings**
Reference number:	The "Branch to Block" setting on various branch blocks on the Trigger Flow screen on the front panel now allows a minimum value of 0.

VERSION 1.7.3 RELEASE

OVERVIEW

Version 1.7.3 provides fixes and enhancements.

CRITICAL FIXES

Reference number:	NS-1908
Symptom:	Changing an annunciator setting (such as auto zero or filter enable) on the Settings or Calculations screen is not reflected in the Home screen annunciators.
Resolution:	This issue has been corrected.
Reference number:	NS-1918
Symptom:	The internal system clock battery is drained when the instrument is not plugged in for several months or longer, causing the instrument to lose the current time and date when powered on. The instrument battery must then be replaced.
Resolution:	This issue has been corrected.
Reference number:	NS-1927
Symptom:	The LXI identification web page shows the incorrect LXI version and web page links.
Resolution:	This issue has been corrected.

ENHANCEMENTS

Category	Remote commands
Reference number	NS-1931: Added a TLS option when using the tspnet.connect command. *connectionID = tspnet.connect(ipAddress, portNumber, initString, useTLS)* *ipAddress*: a string that indicates the IP address or host name to connect to. *portNumber*: default 5025. *initString*: sends string to *ipAddress*. *useTLS*: 0; do not use TLS with the connection (default) 1: Use TLS with the connection. When *useTLS* is set to 1, the instrument negotiates the security protocol when connecting to the host or IP address that is used. This security protocol is used when using tspnet.write to send data or tspnet.read to receive data. The following is an example of how to use a host name with the TLS option: *connectionID* = tspnet.connect (“hostname.domain.com”, 443, “”, 1)
Reference number	NS-1960: The localnode.gettimewithfractional() TSP command is available to retrieve the number of seconds elapsed since January 1, 1970, with fractional seconds appended to the returned response.

VERSION 1.7.2 RELEASE

OVERVIEW

Version 1.7.2 provides fixes and required support.

NONCRITICAL FIXES

Reference number:	NS-1915
Symptom:	When running a Test Script Processor® (TSP) script application with a custom user interface that has an End App button, the custom user interface may not close properly when "End App" is selected.
Resolution:	This issue has been corrected. This fix also introduces a behavior change from previous firmware versions. If you are running a nested script (scripts running within a script), the user interface only displays the first running script. Previously, the user interface displayed name changes between nested scripts.

VERSION 1.7.0 RELEASE

OVERVIEW

Version 1.7.0 is a significant maintenance firmware release for the DMM6500 that brings numerous updates along with stability and reliability improvements. See the *Model DMM6500 6½-Digit Multimeter Reference Manual* (document number DMM6500-901-01) for more information.

CRITICAL FIXES

Reference number:	AR55036, AR62150, NS-339
Symptom:	Repeated creation and deletion of user-defined buffers may cause out-of-memory errors. Error messages indicating the maximum size for buffers being created are wrong and provide misleading guidance.
Resolution:	Reading buffer memory management now allows users to easily allocate the largest size available when creating a reading buffer. Documentation has been clarified to explain the creation process. Improved buffer memory management also greatly reduces the possibility of getting out-of-memory errors.
Reference number:	AR56349, AR60259, NS-929
Symptom:	USB communication issues.
Resolution:	To better accommodate the variety of VISA installation options available to users, the STALLing USBTMC is not active as it had been before.
Reference number:	AR61116, AR62660, NS-529, NS-1558
Symptom:	Repeatedly saving a buffer to a file on a USB flash drive using the `buffer.saveappend` command eventually causes Error 2203, "Cannot open file."
Resolution:	This issue has been corrected.
Reference number:	AR62310
Symptom:	Exercising various combinations of front panel settings for the Event Log may cause the front panel to lock up.
Resolution:	This issue has been corrected.
Reference number:	AR61734, NS-1097
Symptom:	Pressing shortcut while swipe screen is moving causes the instrument to become inoperable.
Resolution:	This issue has been resolved.
Reference number:	AR61766, NS-1049
Symptom:	Graph is unresponsive to touch after some screen input sequences.
Resolution:	This issue has been corrected.

Reference number:	AR61925, NS-1108
Symptom:	Manual scaling of histogram display does not work correctly.
Resolution:	This issue has been resolved.
Reference number:	AR62144, NS-879
Symptom:	Touching the swipe screen while maximizing or minimizing the swipe screen may cause the instrument to become inoperable.
Resolution:	This issue has been resolved.
Reference number:	AR62394, NS-1384
Symptom:	Instrument may lock up using LAN and 2000 SCPI mode.
Resolution:	Eliminated timeout caused by `*trg` in corner-case race condition immediately following `*init`.
Reference number:	AR62632, NS-647, NS-682, KS-2983
Symptom:	Fast continuous streaming of data (at rates > 50 kS/s) results in report of buffer overrun condition.
Resolution:	Enhancements have been made in firmware to better support streaming to the computer while using digitizing, however, hardware limitations are still present. The KickStart software provides the framework and code to help the user achieve 50 kS/s runs for up to 5 hours.
Reference number:	AR62869, NS-1771
Symptom:	Instrument may slow down or become inoperable storing data to a USB flash drive in scan mode.
Resolution:	This issue has been resolved.

KNOWN ISSUES

Reference number:	NS-1386
Symptom:	Errors and mis-aligned information may be displayed if you are using applications designed for earlier versions of firmware
Workaround:	Download updated applications from the tek.com/keithley website and install them on the instrument.
Reference number:	AR61781, NS-1002, NS-1048
Symptom:	Speed issues when using the ACV, Frequency, and Period functions.
Workaround:	To improve measurement speed, select a fixed range instead of the automatic range or use a higher detector bandwidth. For frequency and period measurements, select a specific threshold range instead of the automatic range.

Reference number:	AR62218, NS-1241
Symptom:	Rapidly changing the Quickset performance slider between medium and fast settings can result in the slider becoming unresponsive.
Workaround:	Switch to another screen and back to Quickset.

ENHANCEMENTS

Category	**Reading buffers**
	• Reading buffer memory management now allows users to easily allocate the largest size available when creating a reading buffer.
	• Added a method to clear the active buffer by pressing the MENU + EXIT keys.
	• When selecting the active buffer, an option now exists to create a new user buffer.
	• Added the `display.activebuffer` TSP remote command and `DISPlay:BUFFer:ACTive` SCPI command to specify the active buffer for the instrument using remote commands.
Category	**Configuration lists**
	• Added the ability to use remote commands to store inactive measure function settings in a configuration list index.
	• Added the ability to use remote commands to query or configure inactive measure function attributes.
Category	**New commands and options**
	• Added a method to automatically install any scripts to internal storage memory that reside in an autoinstall directory on the USB drive when inserted into the instrument.
	• Added `fs.*` TSP commands for accessing and managing file system settings.
	• Added remote commands to set continuous measurement.
	• Added an outside high/low limit option for scan monitor mode.
Category	**Ease of use**
	• Graph and Histogram settings are now shared for ease of viewing data between the two screens. Also added other graphing enhancements.
Category	**General changes**
	• The maximum TSP node ID is now 63. The previous maximum was 64.

VERSION 1.0.04

OVERVIEW

Version 1.0.04 is a maintenance release of the DMM6500 firmware. This release includes one critical fix and one noncritical fix.

CRITICAL FIXES

Reference number:	NS-1094
Symptom:	Input overload protection triggered on one channel caused overflow readings on subsequent channels during high-speed scans.
Resolution:	This issue has been corrected.

NONCRITICAL FIXES

Reference number:	NS-1217
Symptom:	The channel delay when using the Model 2000-SCAN, 2001-SCAN, and 2001-TC-SCAN Scanner cards is shorter than expected. The delay is only 90% of the specific value.
Resolution:	This issue has been corrected.

ENHANCEMENTS

There were no enhancements included in this release. See the "Critical fixes" sections for more information about release content.

VERSION 1.0.03

OVERVIEW

Version 1.0.03 is a maintenance release of the DMM6500 firmware. This release includes one critical fix and several noncritical fixes.

CRITICAL FIXES

There were no "Critical fixes" included in this release. See the "Noncritical fixes" section for more information about release content.

NONCRITICAL FIXES

Reference number:	NS-867
Symptom:	In emulation mode, setting an aperture larger than allowed by native mode commands causes an error -222, "Parameter data out of range" to be generated.
Resolution:	The instrument will record and report the aperture selected, but will internally use the largest aperture supported.
Reference number:	NS-929
	NS-1016
Symptom:	The instrument does not respond properly when using Keysight VISA in some applications.
Resolution:	This issue has been corrected.
Reference number:	NS-1162
Symptom:	When writing to the Accessory Card DIO as an output port the 6 outputs transition at different times rather than simultaneously.
Resolution:	The issue has been corrected.

ENHANCEMENTS

There were no enhancements included in this release. See the "Noncritical fixes" sections for more information about release content.

VERSION 1.0.02

OVERVIEW

This Firmware Release is a result of changes to the internal production process. There were no issues or concerns that needed to be addressed in this release.

VERSION 1.0.01

OVERVIEW

Version 1.0.01 is a maintenance release of the DMM6500 firmware. This release includes two critical fixes and several noncritical fixes.

CRITICAL FIXES

Reference number:	NIHK-6215
Symptom:	In any emulation mode, a 4-wire reading may incorrectly return an overflow.
Resolution:	In all emulation modes, 4-wire readings return the correct reading.

Reference number:	NIHK-6331
Symptom:	Using the Keithley Model 7701, 7706, or 7708 to make measurements may result in overflows and inaccuracies when, without opening all of the channels in between, you make a 2-wire measurement followed by a 4-wire measurement or a 4-wire measurement followed by a 2-wire measurement. A scan with both 2-wire and 4-wire measurements may be inaccurate after the change-in-function has occurred. A scan with a single function, either 2-wire or 4-wire measurements, would contain accurate measurements. The USB interface may exhibit lockups when used for extended periods.
Resolution:	The 7701, 7706, or 7708 now make accurate measurements for all combinations of 2-wire and 4-wire measurements, whether in a scan, script, or from the display.

NONCRITICAL FIXES

Reference number:	NIHK-4779
Symptom:	The USB interface may exhibit lockups when used for extended periods.
Resolution:	The USB interface has been changed to improve performance, status byte responsiveness, and long-term reliability. There is no impact to VISA compatibility.
Reference number:	NIHK-6176
Symptom:	Using the infinite count in a trigger model can yield unexpected results.
Resolution:	The use of an infinite count in a trigger model has been improved and functions as expected.
Reference number:	NIHK-6183, NIHK-6204, NIHK-6211
Symptom:	When the KTTI-GPIB card is installed and GPIB communications are used, the SRQ line on the GPIB interface is not functional
Resolution:	The SRQ line is now properly driven on the GPIB interface.
Reference number:	NIHK-6184
Symptom:	Frequent switching using the FRONT/REAR TERMINALS switch may make the instrument inoperable.
Resolution:	The switching between front and rear terminals has been improved.

Reference number:	NIHK-6242
Symptom:	When the instrument is emulating the Keithley Model 2700 the instrument uses a different version of the moving average filter than the actual Keithley Model 2700 or 2701.
Resolution:	Emulation of the Keithley Model 2700 and 2701 now uses the same version of the moving average filter as the original products. This type of filter is also available in non-emulation modes under the name Hybrid Average filter. Channels do not support the hybrid filter type.
	A hybrid filter combines characteristics of the repeating and moving filter types. A hybrid filter always averages an entire window of readings before returning the requested filtered reading. If the window is empty when the first reading is triggered, multiple readings are made to fill the window, after which the single requested filtered reading is returned. This process may take longer than a single reading. Once the window is filled, subsequent triggers make a single reading, add it to the window, and return the single requested filtered reading. This process will take the duration of a single reading.
	The TSP and SCPI commands for these filter-type options are `dmm.measure.filter.type = dmm.FILTER_HYBRID_AVG` and `[SENSe[1]]:<function>:AVERage:TCONtrol:HYBRid.`
Reference number:	NIHK-3957
Enhancement:	When the EXIT key is pressed, the previous screen becomes active. Previously, the instrument returned to the menu screen.
Reference number:	NIHK-5778
Resolution:	The scan time for scans with a count greater than one and autoranged functions has been improved. The instrument now retains the range learned from the first scan iteration and uses it as a basis for delays and ranging on subsequent scans. Previously, only worse case values were considered.
Reference number:	NIHK-6156
Resolution:	SCPI commands were added to programmatically control the display's active reading buffer and watch list. Additional documentation can be found in the latest reference manual under the `:DISPlay:WATch:CHANnels` and `:DISPlay:BUFFer:ACTive` commands.
Reference Number	NIHK-6158
Enhancement	The Reset Popups button on the Event Log screen and Log Settings tab now clears the error log of any suppressed warning popups. When a warning event occurs, the user interface displays a popup. You can suppress the popup so that subsequent warnings do not generate a popup. Previously, the suppression list could not be cleared.
Reference number:	NIHK-6168
Enhancement:	SCPI now allows the use of the dBm unit in a writable buffer. Additional documentation can be found in the latest reference manual under the `:TRACE:WRITE:FORMAT` command.

Reference number:	NIHK-6171, NIHK-6172
Enhancement:	A moving average filter is no longer allowed as a filter type on a channel. The moving average filter makes a reading, averages it with a previous set of readings, and returns the result. This can yield unexpected results during a scan because the averaged readings will not be sequential in time. To prevent inadvertent errors, this option has been removed for channels. It is still available for normal DMM usage.
Reference number:	NIHK-6195
Enhancement:	The time taken to switch functions using the front panel has been reduced substantially across all function.
Reference number:	NIHK-6213
Enhancement:	All emulation modes now support a beeper for continuity and limits.
Reference number:	NIHK-6221, NIHK–6236
Enhancement:	The scan screen menu has been changed as follows. The command Create New has been renamed to Create New List. Save has been renamed to Save System. The functionality is the same. There are two additional menu entries. The first is Reset Scan Settings, which clears the scan list and resets all settings associated with a scan, but not DMM settings. The other is Reset System, which redirects you to System Info and Management where the Reset button, which resets the entire instrument to power-on defaults, is located.
Reference number:	NIHK-6258
Enhancement:	TCP/IP communication speeds have been improved for short packets.
Reference number:	NIHK-6277
Enhancement:	All emulation modes now support a beeper for continuity and limits.
Reference number:	NIHK-6303
Enhancement:	In 2701 emulation mode, the following command is now supported as described in the Model 2701 User's Manual `:TRACe:POINts:ACTual`...
Reference number:	NIHK-6329
Enhancement:	When opening and appending a file on a USB flash drive, if the file does not exist it will be created. If the file exists, it will be appended to as before. This affects the `file.open()` and `io.open()` TSP commands.

ENHANCEMENTS

There were no enhancements included in this release. See the "Critical fixes" and "Noncritical fixes" sections for more information about release content.