Differences between the new 6517B and the 6517A version

The following document lists the known differences between the revised Model 6517B and the previous 6517A. Although the goal was to make the 6517B as functionally identical to the 6517A, there are some enhancements and changes that are documented so that you can communicate specific changes to your customers.

Contents

1. Enhancements over 6517A

➢ 6517B now includes a 50,000 point battery-backed reading buffer, no longer limited by the number of reading elements stored. 6517A capacity was 15,706 readings and was limited by the number of elements stored in the buffer.

➢ Faster reading rates to the internal buffer (~425rdgs/sec) and to the IEEE bus (400rdgs/sec).

➢ Up to 5x faster settling time when measuring low currents.

➢ 6517B now uses flash upgradeable firmware.

➢ 6517B now supports up to 115200 baud. The 6517A only supported up to 19200 baud.

➢ User selectable line power values of 100, 120, 220, 240VAC instead of the 6517A switch that selected either a range of 90-125VAC or 180-250VAC.

2. Hardware differences

➢ Preamp, analog output, and common jacks are no longer 5-way binding posts. These binding posts for the Electrometer Outputs have been replaced with safety jacks that meet current safety standards. The ground lug has also been replaced with a pluggable ground lead.

➢ The hardware interlock connector has been changed. The 6517B interlock connector has been changed to a 4-pin Phoenix Connector compared to the 4-pin DIN connector on the 6517A. The old connector has been obsoleted. To accommodate the new connector, two new accessories have been added:

  ▪ 6517B-ILC-3: 4-pin Phoenix connector to 4-pin DIN Interlock Cable has been added to support use with the 8009A Resistivity Test Chamber.

  ▪ CS-1305: Interlock Connector

  ▪ The interlock is now a real hardware interlock for the operation of the High Voltage power supply. This is to bring the unit up to the latest safety standards. Note that because of this, the 6517B voltage source will not operate without the interlock whereas the 6517A voltage source would operate without an interlock connection.

➢ The Digital I/O connector has been changed to a DB9 male connection instead of the older mini DIN connector.

➢ External trigger signals are part of the digital I/O connector. Space limitations prohibited the BNC connectors. BNC connectors were redundant and market demands no longer required them.

➢ The main input jack on the rear panel was moved away from the rear panel plastic foot to improve customer accessibility and ease of use.

➢ The voltage source operate indicator is smaller (same design as 6221). For consistency with newer models, the 6517B indicator has been changed to Blue in color (No longer Red) and centered in the right side front panel.

➢ The line voltage selector is now hidden under the left front "foot bracket" that holds the handle onto the box. There was no room on the rear panel to place the switch. The switch allows the selection of 4 different input voltages: 100V / 120V / 220V / 240V, not just 2 as in the 6517A version. The line fuse remains changeable from the rear panel if the instrument.

3. Functional differences

3.1 Calibration

➢ Front panel calibration is no longer supported with the 6517B due to the complexities of the new calibration requirements. A customer front panel calibration would have been very tedious, time consuming, and would have been very easy to make mistakes due to the number of measurements that would have to be entered manually. The customer can still calibrate the unit over the GPIB bus. The 6517B calibration commands are provided in the service manual. Since the front panel calibration is no longer supported, the front panel calibration switch is no longer present. Calibration is now unlocked with a password.

➢ Voltage and current offset calibration is no longer needed outside of normal calibration. The 6517A required this, but was not implemented correctly. The 6517B has an improved voltage and current offset calibration, but requires additional

equipment. Because of this requirement, the voltage and current offset calibration was removed from the front panel menus as it is no longer necessary for the user to perform this periodically.

3.2 Communication

➢ The original 617 DDC emulation language is no longer supported.

➢ GPIB talk-only mode is no longer supported. This was a little-used feature from the 6517A.

➢ RS-232 parity, data, and stop bit settings are now fixed at N,8,1. There is little need to use anything besides this setting, and the 6517B hardware would have difficulty supporting all the possible settings the 6517A had.

3.3 Measurements

➢ The "Out-Of-Limit" message now applies whenever the input signal exceeds the maximum input range of the A/D, which is approximately 120% of range. The 6517A could show "Underflow" when measuring resistance in this condition, which is confusing. The 6517B manuals have been updated accordingly to include a better description of the Overflow/Out-Of-Limit indications.

➢ Readings can be displayed when ZeroCheck is turned on. This user selectable setting for this functionality is accessed by pressing CONFIG and Z-CHK.

➢ The Zero Check function (when turned on) now presents a 1 MegOhm load to the input terminal (referenced to input low). This was necessary for updated ESD and stability requirements.

3.4 New features

➢ All non-volatile memory can be reset to defaults by the user for data security.

Specification changes from 6517A

Section	Spec	Description	6517A Spec	New 6517B Spec
Volts	NMRR	Legacy spec problem. Need to add line sync on. Placed as a footnote	**NMRR:** 60dB on 2V, 20V, >55dB on 200V, at 50Hz or 60Hz ±0.1%.	**NMRR:** 2V and 20V range > 60dB, 200V range > 55dB. 50Hz or 60Hz[2] [2] Line sync on

Volts	Input Impedance	Impedance changed from 10M (6517A) to 1M (6517). Stability improvement with zero check on.	**INPUT IMPEDANCE:** >200TΩin parallel with 20pF, < 2pF guarded (10MΩwith zero check on).	**INPUT IMPEDANCE:** >200TΩ in parallel with 20pF, < 2pF guarded (1MΩ with zero check on).
Current	Input Bias Current	Spec intended for lowest current range only. Added clarification to indicate 20pA range	**INPUT BIAS CURRENT:** <3fA at TCAL. Temperature coefficient = 0.5fA/°C.	**INPUT BIAS CURRENT:** <3fA at Tcal. Temperature coefficient = 0.5fA/°C, 20pA range
Current	Input Bias Current Noise	Spec intended for lowest current range only. Added clarification to indicate 20pA range	**INPUT BIAS CURRENT NOISE:** <750aA p-p (capped input), 0.1Hz to 10Hz bandwidth, damping on. Digital filter = 40 readings.	**INPUT BIAS CURRENT NOISE:** <750aA p-p (capped input), 0.1Hz to 10Hz bandwidth, damping on. Digital filter = 40 readings, 20pA range
Current	Input voltage burden at Tcal ±1°C:	Voltage burden fails on 20mA range for both 6517A and 6517B. Changed from <4mV to <5mV	**INPUT VOLTAGE BURDEN at TCAL ±1°C:** <20μV on 20pA, 2nA, 20nA, 2μA, 20μA ranges. <100μV on 200pA, 200nA, 200μA ranges. <2mV on 2mA range. <4mV on 20mA range.	**INPUT VOLTAGE BURDEN at TCAL ±1°C:** <20μV on 20pA, 2nA, 20nA, 2μA, 20μA ranges. <100μV on 200pA, 200nA, 200μA ranges. <2mV on 2mA range. <5mV on 20mA range.
Current	NMRR	Legacy spec problem. Need to add line sync on. Placed as a footnote	**NMRR:** >95dB on pA, 60dB on nA, μA, and mA ranges at 50Hz or 60Hz ±0.1%.	**NMRR**: >60dB on all ranges at 50Hz or 60Hz.[2] [2] Line sync on
Coulombs	Input bias current	Spec intended for lowest charge range only. Added clarification to indicate 2nC range	**INPUT BIAS CURRENT:** <4fA at TCAL. Temperature coefficient = 0.5fA/°C.	**INPUT BIAS CURRENT:** <4fA at T_{CAL}. Temperature coefficient = 0.5fA/°C, 2nC range

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Ohms	Preamp Settling Time	Added an additional statement to indicate the need for additional settling based on the characteristics of the load.	**Preamp settling time:** Add voltage source settling time to preamp settling time in Amps specification.	**Preamp settling time:** Add voltage source settling time to preamp settling time in Amps specification. Ranges over 20Gohm require additional settling based on the characteristics of the load.
Voltage Source	Maximum output current	Changed "active current limit" to "hardware short circuit protection" to help clarify that spec is intended to limit current for a DUT short. It is not intended to be a SMU current compliance	**MAXIMUM OUTPUT CURRENT:** ±10mA; active current limit at <11.5mA for 100V range. ±1mA; active current limit at <1.15mA for 1000V range.	**MAXIMUM OUTPUT CURRENT:** 100V Range: ±10mA, hardware short circuit protection at <14mA 1000V Range: ±1mA, hardware short circuit protection at <1.4mA
Voltage Source	Maximum output current	Range of maximum output current needs to be widened from 10mA-11.5mA to 10mA-14mA to better ensure the 10mA limit can be reached over the entire programmable voltage source range.	**MAXIMUM OUTPUT CURRENT:** ±10mA; active current limit at <11.5mA for 100V range. ±1mA; active current limit at <1.15mA for 1000V range.	**MAXIMUM OUTPUT CURRENT:** 100V Range: ±10mA, hardware short circuit protection at <14mA 1000V Range: ±1mA, hardware short circuit protection at <1.4mA
Voltage Source	Noise:	Changed noise spec to a "typical" spec over a specific frequency range	**NOISE:** <150µV p-p from 0.1Hz to 10Hz for 100V range. <1.5mV p-p from 0.1Hz to 10Hz for 1000V range.	**NOISE (Typical):** **10Hz – 20MHz** 100V range: <2.6,Vrms, <16mVpp 1000V range: < 2.9mVrms, <21mVpp

IEEE-488 Bus Implementation	Multiline Commands	Removed, older IEEE standard information that is no longer on new specifications. Changed for consistency with new models	**MULTILINE COMMANDS:** DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD.	
IEEE-488 Bus Implementation	Implementation	Removed DDC, no longer supported	**IMPLEMENTATION:** SCPI (IEEE-488.2, SCPI-1993); DDC (IEEE-488.1).	**IMPLEMENTATION:** SCPI (IEEE-488.2, SCPI-1999.0)
IEEE-488 Bus Implementation	Uniline Commands	**Removed** older IEEE standard information that is no longer on new specifications. Changed for consistency with new models	**UNILINE COMMANDS:** IFC, REN, EOI, SRQ, ATN.	
IEEE-488 Bus Implementation	Interface Functions	**Removed** older IEEE standard information that is no longer on new specifications. Changed for consistency with new models	**INTERFACE FUNCTIONS:** SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.	

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IEEE-488 Bus Implementation	Programmable Parameters	**Removed** older IEEE standard information that is no longer on new specifications. Changed for consistency with new models	**PROGRAMMABLE PARAMETERS:** Function, Range, Zero Check, Zero Suppress, EOI (DDC mode only), Trigger, Terminator (DDC mode only), 100-Reading Storage (DDC mode), 15706 Max. Reading Storage (SCPI mode), Calibration (SCPI mode only), V-Source Output, Display Format, SRQ, Status (including V-Source I-Limit), Output Format, Guard.	
IEEE-488 Bus Implementation	Address Modes	**Removed** older IEEE standard information that is no longer on new specifications. Changed for consistency with new models	**ADDRESS MODES:** TALK ONLY and ADDRESSABLE.	
IEEE-488 Bus Implementation	RS-232 Implementation	Added new baud rates. 38.4k, 57.6k and 115.2k	**RS-232 IMPLEMENTATION: Supports:** SCPI 1991.0. **Baud Rates:** 300, 600, 1200, 2400, 4800, 9600, 19.2k.	**RS-232 IMPLEMENTATION:: Supports**: SCPI 1991.0. **Baud Rates**: 300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k, and 115.2k.
IEEE-488 Bus Implementation	Protocols	Changed protocols to flow control	**PROTOCOLS:** Xon/Xoff, 7- or 8-bit ASCII, parity-odd/even/none.	**FLOW CONTROL:** none, Xon/Xoff.

General	Isolation	Changed from 10^10 in parallel with 500pF to 10^10, <500pF" for better indication of what the user should expect to see. Also for consistency with new models	**ISOLATION (Meter COMMON to chassis):** Typically 1010Ωin parallel with 500pF.	**ISOLATION (Meter COMMON to chassis):** $> 10^{10}\Omega$, < 500pF
General	2V Analog Output	Legacy spec issue. Change ohms from non inverting to inverting. Both 6517A and 6517B operate per the change	**2V ANALOG OUTPUT:** 2V for full range input. Non-inverting in Volts and Ohms modes, inverting when measuring Amps or Coulombs. Output impedance 10kΩ.	**2V ANALOG OUTPUT:** 2V for full range input. Non-inverting in Volts mode, inverting when measuring Amps, Ohms or Coulombs. Output impedance 10kΩ
General	EMC	Change to reflect new standard tested to	**EMC:** Conforms to European Union Directive 89/336/EEC.	**EMC:** Conforms to European Union Directive 89/336/EEC, EN 61326-1.
General	Safety	Change to reflect new standard tested to	**SAFETY:** Conforms to European Union Directive 73/23/EEC (meets EN61010-1/IEC 1010).	**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN 61010-1.
General	Reading Storage	Changed to 50k in SCPI to reflect new memory capacity, removed DDC since it is no longer supported	**READING STORAGE:** 100 readings (DDC mode), 15706 max. readings (SCPI mode).	**READING STORAGE:** 50,000.

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General	Reading Rate	Changed to reflect speed increase with new circuitry.	**READING RATE:** To internal buffer: 125 readings/second[1] To IEEE-488 bus: 115 readings/second[1,2] Bus transfer: 2500 readings/second[2] (1) 0.01 PLC, digital filters off, front panel off, temperature + RH off. (2) Binary transfer mode.	**READING RATE:** To internal buffer: 425 readings/second[1] To IEEE-488 bus: 400 readings/second[1,2] Bus transfer: 3300 readings/second[2] (1) 0.01 PLC, digital filters off, front panel off, temperature + RH off, Line Sync Off. (2) Binary transfer mode
General	Altitude	Added due to new safety requirements		**ALTITUDE:** Maximum 2000 meters above sea level per EN61010-1.
General	Power	Added user selectable ranges, new standard requires 4 taps instead of two	**POWER:** 105–125V or 210–250V (external switch selected), 90–110V (internal switch selected), 50–60Hz, 50VA.	**POWER:** User selectable 100, 120, 220, 240VAC +/-10%; 50/60Hz, 100VA Max.
General	Power	Changed VA to indicate level for the new model	**POWER:** 105–125V or 210–250V (external switch selected), 90–110V (internal switch selected), 50–60Hz, 50VA.	**POWER:** User selectable 100, 120, 220, 240VAC, 50/60Hz, 100VA Max.
General	Net Weight	Changed to reflect weight of new model	**Net Weight:** <4.6 kg (<10.1 lbs).	**Net Weight:** 5.4 kg (11.8 lbs).
General	Shipping Weight	Changed to reflect weight of new model	**Shipping Weight**: <9.5 kg (<21 lbs).	**Shipping Weight:** 6.9 kg (15.1 lbs).

General	EMI/RFI	Removed this spec. This spec is now covered in the revised EMC specification	**EMI/RFI:** Meets VDE-0871 and FCC Class B limits.	