

# Guildline 7520 Automated Voltage Divider

## The Replacement for Fluke's 752 Manual Divider



**GUILDLINE'S 7520 VOLTAGE DIVIDER** is the latest innovation in DC Voltage Dividers. The 7520 is a unique patented voltage divider. The 7520 contains temperature stabilized and EMI shielded voltage divider networks and is self-aligning (i.e. self-calibrating). The self-alignment is done via an internal Wheatstone Bridge, an internal Zener based Voltage Source, and an internal Optical Null Detector. These 7520 internal components utilize an advanced design to provide an automated self-alignment (i.e. self-calibration) process that is used to achieve long term sub-ppm ratio measurements.



The 7520 Voltage Divider replaces old divider technology and provides clear advantages such as:

- Patented Revolutionary Design!
- Automated Self-Alignment (i.e. Self-Calibration) Built-In!
- NO External Standards Required for Self-Alignment!
- Built-in Wheatstone Bridge, Voltage Reference and Null Detector for Self-Calibration!
- Advanced Internal Temperature Control Chamber for Resistive Divider Networks to Dramatically Reduce Temperature Effects (i.e. Very Low Temperature Coefficients)!
- Sub-ppm Ratio Uncertainties!
- Provides for Wide Range of Ratios: 1:1, 10:1, 100:1 1000:1 and Reverse!
- Fully Automated Operation with SCPI Command Set!
- Built-In Polarity Switching for Connected Voltage Reference!
- Ethernet / IEEE-488.2 and USB Ports!
- Automates Calibration of Voltage References, Calibrators, DMMs, etc.!

Why buy a Guildline 7520 Voltage Divider? The 7520 Precision Voltage Divider is ideal for voltage ratio measurements to sub-ppm accuracy and uncertainties. Input voltages in the range of 10 to 1100 volts can be divided by ratios of 1:1, 10:1, 100:1 and 1000:1 with respective uncertainties of 0.05, 0.1, 0.2 and 0.5  $\mu\text{V/V}$ . These uncertainties are better than any other commercially available DC Voltage Divider and include the calibration uncertainty.

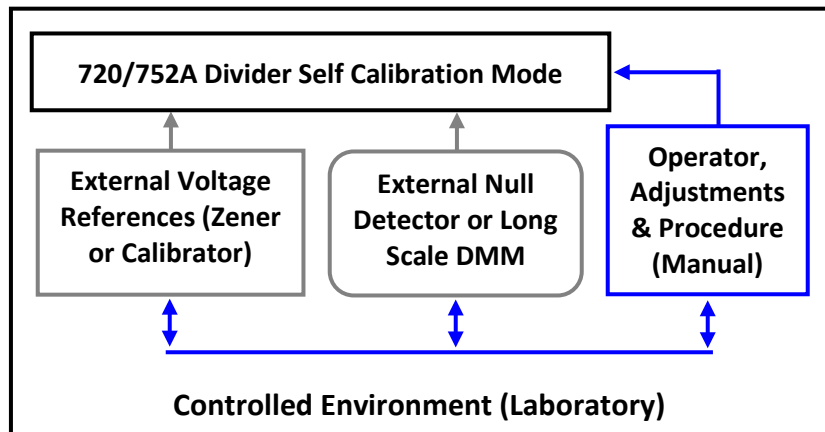
Special care has been taken to minimize thermal offsets and noise during use and during the 7520 self-calibration/self-alignment. The voltage reference and resistive voltage divider networks are all inside a thermally regulated chamber that is EMI shielded. The ultra-low thermal switches used are high isolation relays. In addition, the use of a newly designed optical null detector guarantees high isolation and minimizes the effect of EMI noise during the self-alignment process.

Equally importantly the 7520 can be calibrated by a touch of a button on the front panel, takes around 2 hours, and does NOT require external standards. This self-calibration is then valid at stated uncertainties for 140 hours (i.e. one-week operation).

## Self Calibration to a Whole New Level!

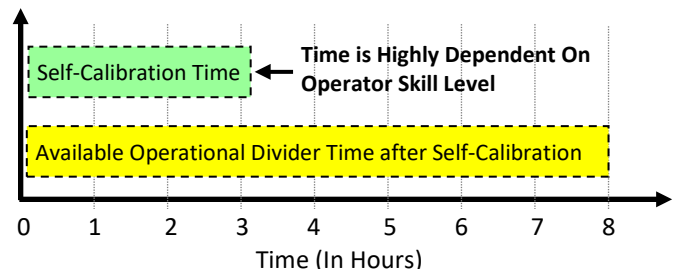
Why is Self-Calibration important for a voltage divider? Any ratio division based on resistors will continuously change due to the drift of the resistors. Also, resistors networks are extremely susceptible to temperature changes and other environmental affects, hence low uncertainty voltage dividers require a calibration practically every time the divider is used.

But is it really a “self-calibration” process? In the case of the Fluke 720, or 752A, or any other manufacturer's resistor-based voltage divider, multiple external standards and an experienced operator are required to perform this “self-calibration” taking anywhere from 1 to 3 hours, or even longer. These external standards required for "self-calibration" include voltage references, voltage calibrators, Long Scale Digital Multimeters, Null Detectors and more. Also, during the self-calibration process it is important to keep the temperature environment stable as changes in temperature

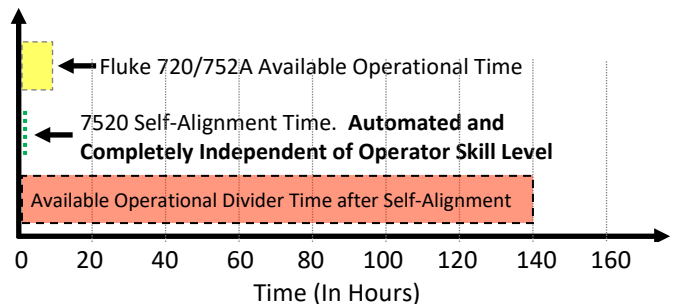


will have a large effect on the ratios being calibrated. The real question becomes if you have to use a skilled operator, multiple external standards, and a manual process; is this really a self-calibration process?

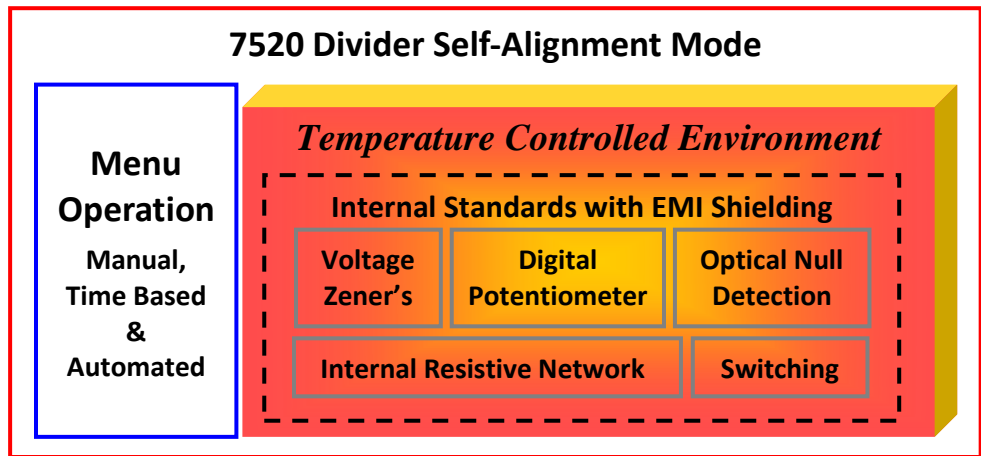
Then once this 720 or 752A “self-calibration” is performed – you only have a short period of time, typically no more than 8 hours, to use a 720 or 752A at its full specifications. This relationship is shown graphically to the right for the Fluke 752A. Note that the bottom scale is a typical 8-hour day.



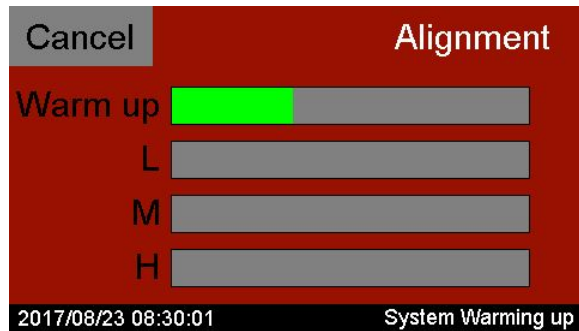
The Guildline 7520 provides a true self-calibration / self-alignment as NO external standards are required and it is an automated process that does not need to have an operator present. This self-calibration process can be run anytime, including overnight or over a weekend. In addition the 7520 can be used for a full week, rather than for a single day, and can be used in a temperature environment of  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ . This breakthrough in true self-calibration, the extended time of operation, and the wide operating temperature range is based on an innovative and unique design as described in the 7520 Datasheet.



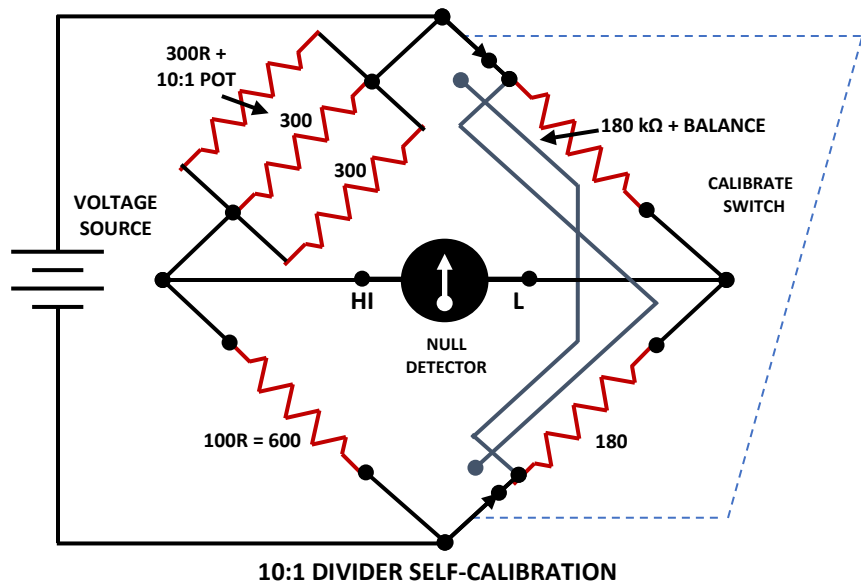
The 7520 measurement circuitry, and the internal self-alignment components, are contained within a temperature-controlled and EMI shielded chamber. This is illustrated in the following diagram. Again note that the self-calibration process is initiated by simply pressing a start key, or by sending a SCPI command from a computer. This is a new patented and unique approach only used by the Guildline 7520.



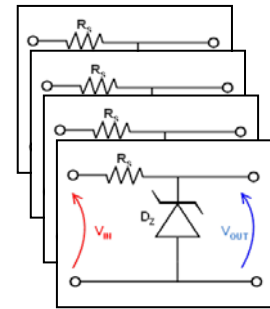
Multiple design features are incorporated into the 7520 ensuring that critical parameters are monitored, and an operator advised if any condition that may affect performance is encountered. For example, the temperature-controlled chamber is continually monitored so a self-alignment cannot be performed unless this chamber is stable. Also, if the temperature changes during a ratio measurement, the operator is notified. Dates when self-calibrations are performed are stored internally so an operator can always verify if the unit is within its calibration interval.



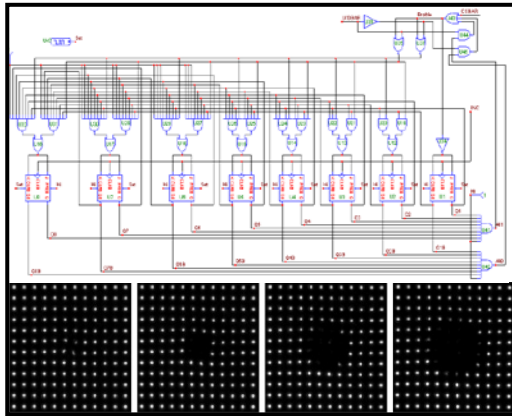
During the self-alignment (i.e. self-calibration) process the resistor divider network is reconfigured into a series / parallel combination (i.e. three 3Rs in parallel compared to 1R) and placed into an internal Wheatstone Bridge which uses the internal voltage reference and the internal null detector. The bridge is balanced by using a digital potentiometer to adjust one of the resistors. Once the self-calibration is complete the resistor divider network is reconfigured into a 10:1 ratio network (i.e. 1R : 10R). There are three 10:1 ratio networks which are placed in series to give 10:1, 100:1, and 1000:1 ratios.



The 7520 incorporates all the “Standards” needed to perform the self-alignment process, thus requires no external standards. These internal standards include a Wheatstone Bridge, Zener Voltage Reference, unique Optical Null Detector, a highly accurate Digital Potentiometer, and ultra-low thermal switching circuitry. The Voltage Reference that is used internally for the 7520 contains the same Zener Diodes that are used in a primary level voltage standard – and for the ultimate in stability, we use four Zener references and average the output. The internal voltage reference, and internal resistive network, are also temperature stabilized during the self-alignment process to further improve stability.



The 7520 Optical Null Detection circuitry is also a patented design that allows a true zero-volt detection. There are no ranges in the null detector because it is based on light (or absence of light) detection. When voltage flow is at zero, no light will be visible to the optical detector. Outside influences such as electrical or EMI noise do not affect the optical null detector since it is light based. This allows for real nano-volt resolution. The Digital Potentiometer used in the 7520 is completely electronic with course and fine adjustments. When used with the optical null detector it allows adjustments to the internal resistive network to 1 ppb (part per billion) resolution. This adjustment is completely automated (hands-off) requiring no operator



intervention.

Internal Polarity Switching plays an integral part in the Model 7520 Design. With the Fluke 752A, an operator must either switch leads or turn a polarity switch every time a negative voltage is required. This is a task that is now fully automated with the 7520 Voltage Divider. Either from the front menu with a push of a button, or via a connected computer, this capability is now available.

Technology, Design and Obsolescence – The Fluke 720 was first available in 1969, almost 50 years ago. While very good during its time, the 720 was obsoleted and replaced by the Fluke 752. Fluke no longer manufactures or supports the 720. The Fluke 752 was initially released in 1983, almost 35 years ago. Given that both the 720 and 752 were designed more than 35 years ago, it is difficult to find replacement parts for both dividers and repairs are very time consuming.

Input Divider	Open	+REF
	10mV	
Divider with Ref.	100mV	
	1V	-REF
Setup	10V	
Status	100V	
	1000V	
2017/08/23 08:30:01		System Warming up

IET Labs does manufacture a standard and calls it a Fluke 720 replacement. Historically IET does not design or develop new products, rather acquires rights to build a product and then simply states that they can make this standard the same way as the original manufacturer. However, IET has to replace obsolete components and their versions often do not meet the original manufacturer's specifications. In fact, all one really has to do is examine the scope of accreditation by IET and see that they cannot possibly check the ratio accuracy of the products that they build to the required uncertainty.

Guildline has been manufacturing some of the best dividers in the world for over 50 years. So the Company decided not to copy 35 or 40 year old technology and developed a new patented design for a voltage divider. Equally important Guildline developed a design that provides a true self-calibration / self-alignment that requires no external reference standards and that requires no operator intervention. In addition, Guildline's innovative 7520 design provides full automation of the voltage divider during operation including polarity reversal of the connected external voltage reference. Finally the use of an internal temperature stabilized chamber and EMI shielding allows operation for a full week at best uncertainties, rather than just for 8 hours.



### In Summary:

Guildline's 7520 Precision Automated Voltage Divider is based on the latest patented techniques and replaces 30 to 50-year-old voltage dividers such as the Fluke 720 and 752A. The 7520 provides true automated self-calibration which does not need external standards and only takes about 2 hours; does not have to be calibrated every time before use; is fully automated with respect to calibrating voltage references, voltage meters, DMMs, and calibrators; and provides much lower uncertainties than the competition.

**For more information about the 7520 Automated Precision Voltage and our other primary level standards contact Guildline Instruments at:**

*Guildline Instruments Limited  
21 Gilroy Street, PO Box 99, Smiths Falls, ON, Canada, K7A 4S9*

*International Phone: 1.613.283.3000  
Email: [sales@guildline.com](mailto:sales@guildline.com)*

*Copyright © 2022.11.24 Guildline Instruments Limited. All rights reserved. Subject to change without notice.*