6622A Series

Direct Current Comparator Resistance Bridges

World's First **ONE BRIDGE** *Family of Modular DCC Bridges*

6622A SERIES FEATURES

- Wide Available Range from 1 m ~1 GΩ
- Modular Design, Upgradeable Paths, Investment Protection
- Built-In Voltages to 500 Vdc
- Linearity: ± 0.01 ppm of Full Scale
- Resolution: ± 0.001 ppm of Full Scale
- Internal Current Option to 3 Amps
- Available Temperature Model
- Best Accuracy: ± 0.04 ppm of Reading
- Wide Range of Ratios: 0.001:1 ~ 100:1
- Extended Low End Range down to 1μΩ with currents to 3000 Amps
- Extended Modular Range Extension Design with no external Power Supplies / Switches
- Fully Programmable IEEE 488.2
- BridgeWorks™ Data Acquisition Software
- Unique Calibration Support Strategy
- Complete Measurement Systems Available
- Unique Temperature Stabilized Resistance Standards Available

GUILDLINE INSTRUMENTS 6622A SERIES introduces new concepts and the best in measurement uncertainties for Direct Current Comparator (DCC) Resistance Bridges manufactured by anyone today. Unique innovations in 6622A design and modularity means users no longer have to decide what Bridge satisfies current requirements as well as guess as to what Bridge would meet future requirements.

The 6622A Series modular design allows you to buy what is required today with existing budgets, and when workload requirements change, simply upgrade your bridge to meet these requirements without any loss of your original investment! Modular design provides a **ONE BRIDGE** solution reducing life cycle costs not only for equipment support, but for software development and technician training. Modular design provides the perfect solution for current and future needs, whether you need secondary uncertainties or a Primary Laboratory Standard.

The concept and implementation is easy. You can start with the low-cost 6622A base DCC Bridge with measurement uncertainties down to 0.1 ppm and measurement range to 100 kOhms. Workload requirements demand better measurement uncertainties or range? Then you can either start out with an eXtended Performance (XP) or eXtended Range (XR) model or even the best of the best – the High Voltage and Temperature Model (HVT) with uncertainties down to 0.04 ppm and a measurement range of 1 Gohms with voltages to 500 Vdc.

The 6622A Series Provides the Best Measurement Specifications, Widest Range of Options, and Most Innovative Modular Design of Any Commercially Available DCC Bridge!

If you already own the base model, Guildline can upgrade it to provide extended range, extended performance or even improve both range and uncertainties. The choices are yours and designed to meet your workload, not ours! And best of all, your current software programs will work and the menus will be the same, thus dramatically reducing learning curves and training requirements. Ongoing operating costs are also dramatically reduced because a **ONE BRIDGE** unit means reduced life cycle costs when it comes time for calibration.

Available upgrades include internal currents to 3 Amps, external range extension to 1μΩ with currents to 3000 Amps, internal voltages to 500 Volts and even add a complete temperature capability -all from the base model. Or simply invest in the best from the beginning!

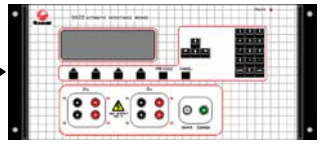
6622A Series DCC Bridges

When used in a resistance measurement application, the 6622A Series is suitable for Quantum Hall measurements for the determination of the ohm. For temperature calibration, the wide measurement range of 6622A Base Series **accommodates PRT's and thermistors**, from 0.25Ω to 100kΩ. The 6622A Series is an excellent solution for precision temperature measurements.

6622A Series – Models and Upgrade Paths

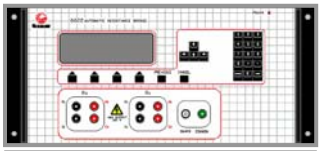
The unique design is based on over 30 years of knowledge and experience in building DCC Bridges. **Innovation abounds** and your **Investment is protected.** When you buy any 6622A Series Bridge and it's as if you know them all. Menu operations, measurement setups, measurement operations and software are identical. When you want extended range or enhanced performance – you still have only **ONE BRIDGE to support for calibration**. Just look at the **models and upgrade paths** available for you with the 6622A Direct Current Comparator **ONE BRIDGE** Series.

6622A-"Base"
1 mΩ ⇔ 100kΩ
0.1 ppm



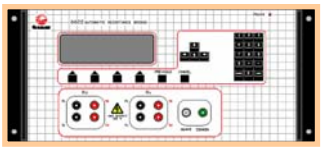
You can **start** with our very competitively priced **6622A Base unit**. The 6622A "Base" unit provides an outstanding measurement range of 0.001 Ohms to 100 kOhms, with best uncertainties starting in the 0.1 ppm range. A perfect solution to meet demanding workloads and laboratory budgets.

Need a **higher top- end measurement** range? Move up to our model **6622A-XR** (e**X**tended **R**ange). This laboratory standard provides an outstanding working measurement range of 0.001 ohms all the way to 100 MOhm's and with an internal 100 Volt supply. The best part is **No-Buyers Remorse**. If you had previously purchased a 6622A-Base, and now your workload evolved up to 100M, simply send the instrument back to Guildline and we will **modify your 6622A to a 6622A-XR** at a very attractive price. You will already know how to operate the unit, your software will continue to work with the unit, no procedures will have to be rewritten, and you will still only have **ONE BRIDGE** to support.



6622A-XR (0.1 ppm)
1 mΩ ⇔ 100MΩ

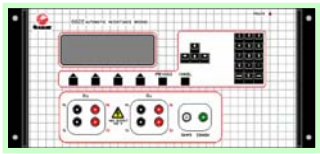
Or start out with the **6622A-XP** (e**X**tended **P**erformance) Model. This model has the same measurement range as the 6622A Base Model…



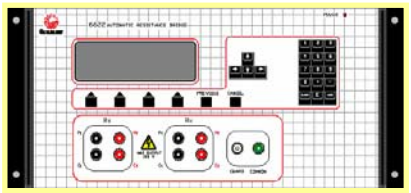
6622A-XP - 0.05 ppm
1 mΩ ⇔ 100kΩ

…however the uncertainties of the measurement ranges are significantly enhanced. If you already own the 6622A and now your workload uncertainties demand more, simply return the unit back to Guildline and we can **upgrade a 6622A to a 6622A-XP**. Instrument control and internal menus will be the same, and your software procedures will still work – the same instrument operation and calibration support but with the improved uncertainties your need!

Need Primary Laboratory Performance? Our **6622A-XPR** has both the e**X**tended **P**erformance and **R**ange not offered by anyone else. Primary Level Performance at secondary pricing structure and you can upgrade from any previous 6622A Series model. With 0.05 ppm measurement uncertainties, 100 Mohms range, current extension to 3000 Amps, this unit is a true primary laboratory work-horse. As an added bonus, all DCC Bridges within this series come complete with Bridgeworks™ Software make this series even better.



6622A-XPR – 0.05 ppm
1 mΩ ⇔ 100MΩ



6622A-HVT – 0.04 ppm
1 mΩ ⇔ 1 GΩ & Temperature
High Voltage (500 Vdc)

WHY NOT EQUIP YOUR LABORATORY WITH THE BEST! Our 6622A-HVT (High Voltage & Temperature) model has the highest measurement range (1 Gohms) and at 0.04 ppm provides **the lowest uncertainties of any commercially available DCC Bridge**. This bridge provides High Voltage to 500 Volts and rounds it off with a **complete Temperature measurement** capability. All in a **ONE BRIDGE** instrument with **no need** for additional **external standards** for this added capability. This Standard **does it all.** A complete DCC Bridge **with Temperature** for those laboratories which require the best in accuracy and capabilities not offered by anyone else. And the answer is **still Yes** – you can upgrade from the 6622A to the 6622A-XR or the 6622A-XP, and from all of these bridge models to the 6622A-XPR and the 6622A-HVT. How's that for innovation, workload and investment protection and now with the **ultimate upgrade flexibility!**

6622A Series – The Best in Engineering Design, and Innovation

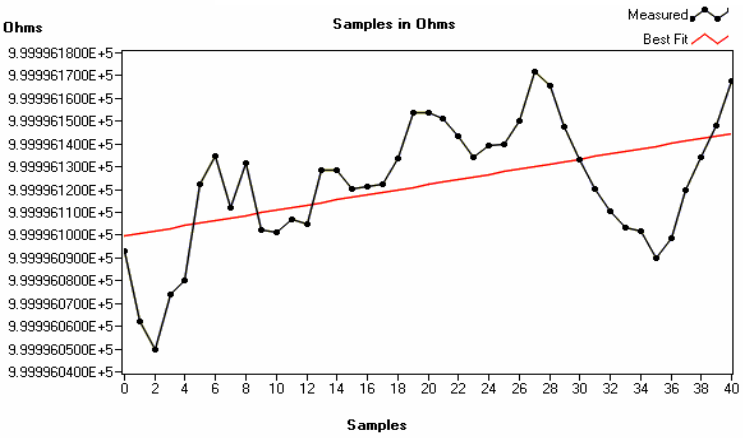
An easy-to-use, front panel, **menu system is common to all models** eliminating in-depth operator learning requirements. **IEEE 488.2** is standard on all models with the universally recognized **Standard Code Programmable Interface (SCPI)** based commands incorporated as the programming language of choice. In fact, you can have a rack or bench mount model and even have your choice of **front or rear terminals**. Your requirements, your needs, one family of instruments.

Every effort has been taken in the 6622A Series design to reduce noise and error. **Thermal EMF effects are eliminated** by automatic current reversal. The **unique architecture** of the bridge and a **control algorithm** further removes gain and offset errors in the **nanovolt balance detector** and the **precision toroid**. The end results are shown by **long term accuracy and linearity** without the need for routine, frequent verification tests.

The 6622A bridges can be used in either a **fixed or automatic reversal rate** mode of operation. In fixed reversal rate mode, **automatic current polarity reversal** is programmable from 4 seconds to 27 minutes. Automatic reversal rate mode is only available in computerized measurement. In automatic reversal rate mode, the bridge software optimizes the polarity reversal rate. In resistance measurement the **fastest measurement speed** is achieved while maintaining required measurement uncertainty. In temperature applications, this feature makes it possible to **track a fast changing temperature**.

And it's not just the modularity that makes the 6622A Series unique and the best **ONE BRIDGE** solution offered today. Historical 13:1 ratio ranges have been eliminated. With new resistance **measurement ratios from 0.001:1 up to 100:1**, the 6622A series allows the ultimate **flexibility in choosing standards** and minimizes the number of standards needed to support and/or verify the performance of a bridge.

Test Overview 100:1 Transfer (10 kOhm to 1 MOhm)



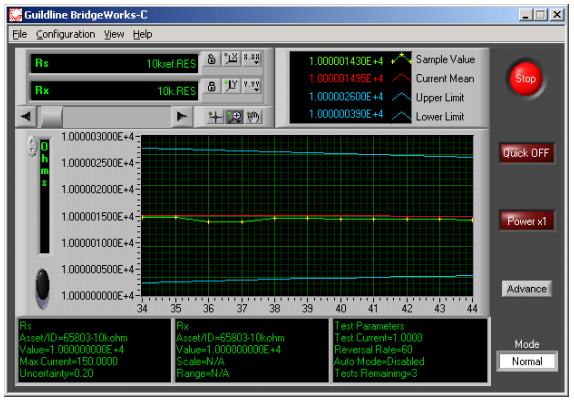
Just take a look at results from using a **10 kOhm Resistance Standard to 1 MOhm UUT** (Unit Under Test) measurement in a typical 100: 1 measurement. The results are good – very good. Wider measurement ratios equate to fewer standards required to perform measurements. In fact, the 6622A series can be used for measurements from **1 uOhm to 100 MOhm** with **just 4 (four) Resistance Standards required.**

Another advantage is that **temperature stabilized resistance standards** (both oil based or air based) which have **very-low temperature coefficients** can now be used to characterize high value resistors (which typically have high temperature coefficients). For example, you can now use a 100k Resistance Standard (Rs) from an oil bath to verify Rx values up to 10 MOhm. If you were to examine a typical measurement uncertainty workup, **measurement uncertainties** due to your resistance standard temperature coefficients are practically eliminated.

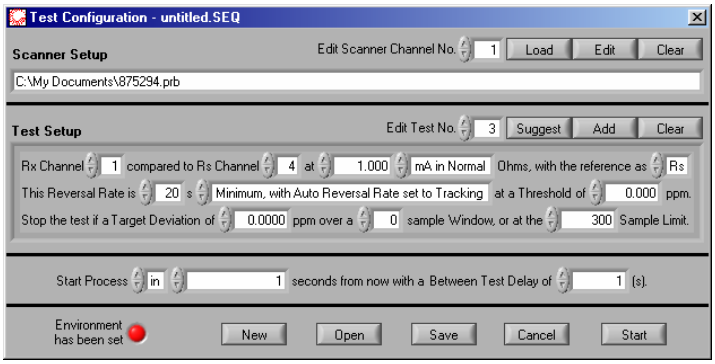
The 6622A Series, when used with the **Guildline Instruments Model 6634A or Model 6636 Temperature Stabilized Resistance Standards** effectively **eliminate error** due to the affects of temperature environment, even when used in a calibration laboratory environment of **23°C @ ± 2°C .**

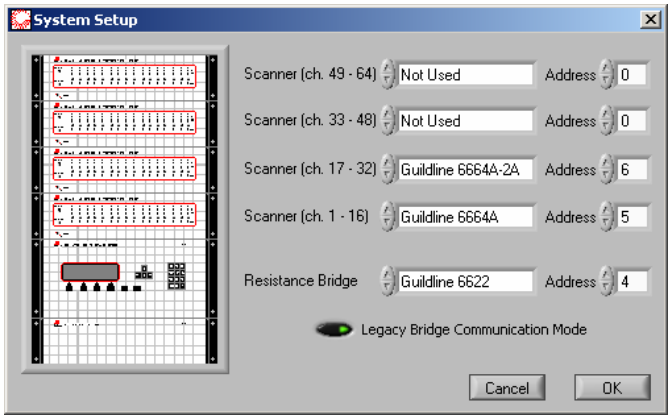
6622A Bridgeworks Software

Not only has Guildline provided uniqueness in DCC Bridge hardware, but we offer complete new solutions for software as well. Two new software programs called **Bridgeworks-R and Bridgeworks-C** are now provided for setup, control, measurements, and measurement reporting. Bridgeworks-R is provided free with each 6622A-Base, 6622A-XP, 6622-XR and 6622A-XPR. Bridgeworks-C is provided free of charge with every 6622A-HVT model. Users can always **upgrade** to **Bridgeworks-C from** Bridgeworks-R should the requirement arise. Programs developed in Bridgeworks-R will work equally well in Bridgeworks-C and **Bridgeworks-C** is the **upgrade path for current ResCal** Users.

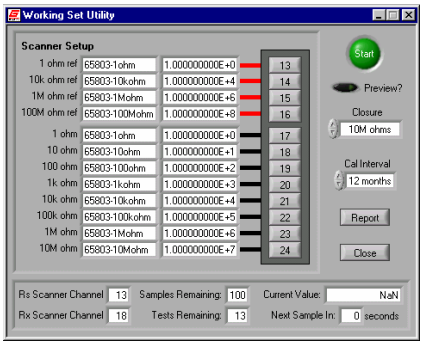


Bridgeworks software is extremely powerful, yet **straight forward and user friendly**. The software comes with all useful and convenient features found in commonly used **window based** commercial software programs. **On-line context help** is available to provide added assistance in understanding the functions of the software. BridgeWorks was **developed in LabVIEW©** offering direct compatibility to all National Instruments GPIB interfaces. These interfaces come in a wide variety of connection options to your PC such as **USB, FireWire, Ethernet, PCI, PCMCIA, RS232/485**, and more. Guildline can even provide a complete DCC system with the 6622A Series **ONE BRIDGE** you need, unique Resistance Standards, Scanners, Range Extenders and software integrated, verified and tested in a rack a little more than 36" high. **Complete turn-key solutions.**



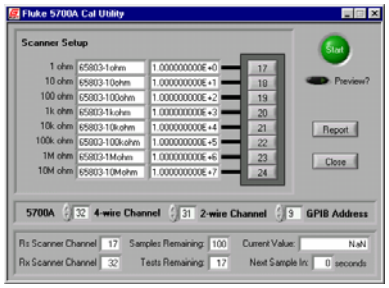


For a **complete, automated resistance** or **temperature** measuring system, a 6622A Series bridge can be used with Guildline's low thermal scanner 6664B**, Guildline's 6634A Temperature Stabilized Resistance Standards** & the 6634TS Temperature Stabilized Traveling Resistance Standard. .When the Bridge is used with a Guildline low **thermal matrix scanner,** the software can turn the bridge into a **multiple-channel** calibration and measurement system. Timed, sequenced or scheduled single or multiple tests can be initiated while the bridge is unattended. All user **definable test variables**, such as excitation current, reversal rate etc can be **programmed on a per test basis**, giving the **users full control and flexibility** in conducting well designed experiments. Additionally, internal utilities reside within the software to enhance and **simplify the calibration of the 6622A** Series DCC Bridge by using the Guildline 6634TS Temperature Stabilized Traveling Resistance Standard

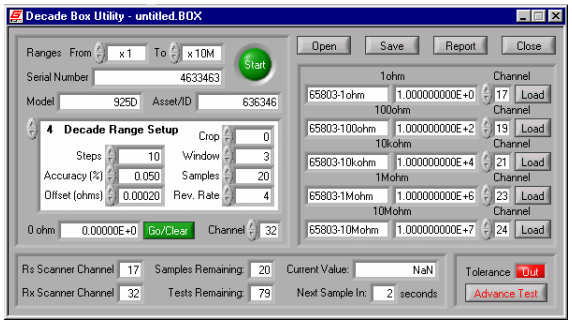


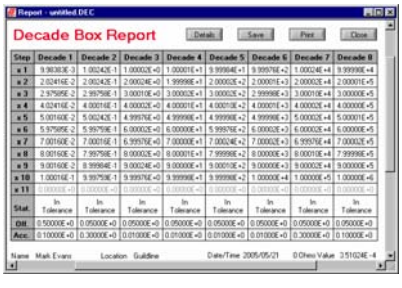
Bridgeworks Software provides comprehensive graphic display, math functions and trend analysis. Data can be **easily exported** to MS-Excel®, Crystal Reports® and in HTML format. All reports generated conform to traceability requirements of ISO-17025. Bridgeworks-C provides **additional temperature capability** for those metrologists requiring this additional capability.

Bridgeworks-C enhances resistance capabilities on other laboratory standards. These optional utilities include **calibration routines** for High End Calibrators such as the **Fluke 5700A and 5720A Series**, Aglient 3458A Long Scale DMM's and others. **Each output** value is calibrated by **direct ratio transfer** to the working set resistors, not calculated as by artifact cal**.**



There is even a utility for the **aautomated calibration of decade boxes**. This utility allows for direct calibration up to an 8 dial decade box spanning the full system measurement range. The utility is designed to **measure the absolute resistance value of each decade** box step and determine if the value is within the nominal tolerance specification. The utility incorporates a provision to **allow for trimming** of an adjustable decade box such as the ESI 925 and **supports both direct reading and standard decade boxes**.





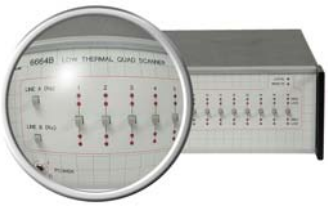
6622A Series for Thermometry Applications

Using the **latest DC current comparator technology**, Guildline model 6622A Series are very **well suited for temperature calibration** and their measurement ranges are designed for thermometry. DCC bridges have inherently **better noise immunity** to external electromagnetic and mechanical noise. Measurements are conducted in **true four-terminal mode** so long test leads can be used. Since excitation current is DC, reactance introduced by the probe and probe leads does not affect measurement accuracy. **Thermal EMF is eliminated** by periodic polarity reversal that is **programmable by the user**. The built-in, extremely stable current supply permits selection of output currents between 20μA and 150mA to satisfy a wide range of sensitivity requirements. Root 2 values can be conveniently chosen from the instrument front panel or via software. **Temperature conversion and display** is done using the optional bridge software BridgeWorks–C for all models except the 6622A-HVT.

The 6622A-HVT model has an **extensive internal menu** that addresses temperature requirements without the need for software or manual calculations. The menu operation and calculations are done internally via firmware and the results can be viewed on the front panel in **ohms, °C, °F, and K**. The menu also provides the ability to change **Temperature Scales** and other associated factors.

Making the 6622A Series Even Better

Guildline provides a variety of standards to **support the 6622A Series** of Bridges. For the **ultimate in ease of use and wide** temperature operating environment, look at our 6634A Temperature Controlled Resistance Standards. These resistance standards are a rack or bench mount unit with up to 10 decade values. The values are in a **shielded, self contained 30°C** temperature environment and usable in a laboratory environment of **23°C ± 5°C**. This series is extended in high values up to 100 TΩ by our model 6636. No more need for oil baths. For the **best in air resistances** see our 9334A, 9336 and 9337 Series of Air Resistance Standards.



For **multi-channel operation** look at our 6664B Scanners. These 16 Quad channel scanners can handle up to 2 Amps of current and 600Vdc. You can stack up to four scanners as if needed with a total of 64 channels accessible by Bridgeworks Software.

For the best Unit Under Test (UUT) environmental control Guildline produces the model **5030 Series** of **Precision Air Baths**. This series of programmable Air Baths not only maintain an **ultra stable 0.03°C** environment but provide EMI and EMF Shielding within the high quality Stainless Steel Chamber. Dual Fans provide for operational redundancy and the unit is fully IEEE 488.2 SCPI based programming. **Control Resolution** is a **0.001°C** and a second channel is available for a second user programmable sensor that can be read directly on the front panel. This bath incorporates an extensive **Metrology based menu operation.**

Guildline also provides **full system solutions and full system integration**. Need a base system with one scanner and a resistance standard in a rackmount? Not a problem. Need a **6622A-XPR with 48 channels**, Resistance Standards and with **Range Extension to 900 Amps**? We can do it! In fact, Guildline has produced over 80 - 6622 systems complete with Range Extension, Multi-Channel Scanners, and Resistance Standards all in about a 36" rack. Units were supplied with all hardware, software installed, tested and verified. Need the **ultimate resistance measurement** in a single stand solution? Combine any one of the 6622A Series with a 6634A Temperature Stabilized Resistance Standard, add 150A Range Extender and for the high end, put in a **6520 Digital Programmable Teraohmmeter** and start measuring from **1μΩ all the way to 10 PΩ**. Just ask and see what **Guildline can make for you**.

6622A Series Range Specifications (6622A-Base, 6622A-XP and 6622A-HVT)

Note: The 6622A-Base and 6622A-XP are limited to a maximum of 100 kOhms with a maximum Rs (Resistance Standard) of 10 kOhms. The 6622A, XR and XPR would include the 6622A-Base and 6622A-XP Lower Ranges listed below. See the next page for the higher ranges found on these models.

Because of the unique variable ratios available on all models, it is possible to measure UUT's with a variety of Rs Standards. For example, a 10k Ohm UUT could be measured with a 100, 1k and 10 kOhm Resistance Standard (Rs). To determine the measurement uncertainty due to the bridge, simply look at the Rs you are using, then go to the appropriate Sub range. For example, if you were measuring a 10 kOhm UUT with a 100 ohm Rs, your uncertainty would be 0.2 ppm for a model 6622A-Base model.

Measurement Specifications (12 Month)	6622A (Base)	6622A-XP (eXtended Performance)	
	6622A-HVT (High Voltage & Thermometry)		

	Total Measurement Range: 0.001Ω ⇔ 100Ω				24 Hour Range Stability
	0.08Ω • R_x • 0.8Ω	0.8Ω • R_x • 6.3Ω	6.3Ω • R_x • 13.4Ω	13.4Ω • R_x • 107.5Ω	
R_S	± 0.6 ppm	± 0.1 ppm	± 0.1 ppm	± 0.1 ppm	< ± 0.03 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.05 ppm	± 0.05 ppm	< ± 0.02 ppm
1Ω	± 0.4 ppm	± 0.04 ppm	± 0.04 ppm	± 0.05 ppm	< ± 0.02 ppm
	0.8 mΩ•R_x•0.008Ω	0.008Ω • R_x • 0.08Ω	For Below Rows Only – See Range Extenders for lower Range and Currents		
	± 0.4 ppm	± 0.4 ppm	• Specifications for 6622A & 6622A-XR w/3A Internal Option		
	± 0.4 ppm	± 0.4 ppm	• Specifications for 6622A-XP, 6622A-XPR w/3A Internal Option		
	± 0.3 ppm	± 0.3 ppm	• Specifications for 6622A-HVT w/3A Internal Option		

	Total Measurement Range: 1Ω ⇔ 1kΩ				24 Hour Range Stability
	1Ω • R_x • 8Ω	8Ω • R_x • 63Ω	63Ω • R_x • 134Ω	134Ω • R_x • 1075Ω	
R_S	± 0.6 ppm	± 0.1 ppm	± 0.1 ppm	± 0.1 ppm	< ± 0.03 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.05 ppm	± 0.05 ppm	< ± 0.02 ppm
10Ω	± 0.4 ppm	± 0.04 ppm	± 0.04 ppm	± 0.05 ppm	< ± 0.02 ppm

	Total Measurement Range: 10Ω ⇔ 10kΩ				24 Hour Range Stability
	10Ω • R_x • 80Ω	80Ω • R_x • 630Ω	630Ω • R_x • 1340Ω	1.34kΩ • R_x • 10.75kΩ	
R_S	± 0.6 ppm	± 0.1 ppm	± 0.1 ppm	± 0.2 ppm	< ± 0.03 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.05 ppm	± 0.1 ppm	< ± 0.02 ppm
100Ω	± 0.4 ppm	± 0.04 ppm	± 0.04 ppm	± 0.1 ppm	< ± 0.02 ppm

	Total Measurement Range: 100Ω ⇔ 100kΩ				24 Hour Range Stability
	100Ω • R_x • 800Ω	800Ω • R_x • 6.3kΩ	6.3kΩ • R_x • 13.4kΩ	13.4kΩ •R_x• 107.5kΩ	
R_S	± 0.6 ppm	± 0.1 ppm	± 0.1 ppm	± 0.8 ppm	< ± 0.03 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.05 ppm	± 0.5 ppm	< ± 0.02 ppm
1kΩ	± 0.4 ppm	± 0.04 ppm	± 0.04 ppm	± 0.5 ppm	< ± 0.02 ppm

	Total Measurement Range: 1kΩ ⇔ 1MΩ				24 Hour Range Stability
	1kΩ • R_x • 8kΩ	8kΩ • R_x • 63kΩ	63kΩ • R_x • 134kΩ	134kΩ • R_x • 1.075MΩ	
R_S	± 0.6 ppm	± 0.1 ppm	± 0.2 ppm	NA on Base Model	< ± 0.05 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.15 ppm	NA on XP Model	< ± 0.03 ppm
10kΩ	± 0.4 ppm	± 0.05 ppm	± 0.15 ppm	± 1 ppm	< ± 0.03 ppm

1 - Specifications are based on 60 second reversal rate, 10 mW R_s power dissipation and temperature of 23°C ±3°C.
2 - Lowest possible R_x Ratio is defined as R_{xlow} = R_s x .08 and Maximum possible R_x Ratio is determined by R_{xhigh} = R_s x 107.5.
3 - Maximum Upper Range is limited to 134k for 6622A and 6622A-XP with the maximum R_s allowed as 10k Ohms.
4 - Maximum Upper Range is limited to 134M for 6622A-XR and 6622A-XPR with the maximum R_s allowed as 10M Ohms.
5 - Maximum Upper Range is limited to 1.34G for 6622A-HVT with the maximum R_s allowed as 100M Ohms.
6 - Ranges below 1 Ohm are only available for a R_s of 1 Ohm.

6622A Series Range Specifications (6622A-XR, 6622A-XPR and 6622A-HVT)

Measurement Specifications (12 Month)	6622A-XR (Extended Range)	6622A-XPR (eXtended Performance & Range)
	6622A-HVT (High Voltage & Thermometry)	

	Total Measurement Range: 1kΩ ⇔ 1MΩ				24 Hour Range Stability
R_S	1kΩ • R_x • 8kΩ	8kΩ • R_x • 63kΩ	63kΩ • R_x • 134kΩ	134kΩ • R_x • 1.075MΩ	
10kΩ	± 0.6 ppm	± 0.1 ppm	± 0.2 ppm	± 3 ppm	< ± 0.05 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.15 ppm	± 1 ppm	< ± 0.03 ppm
	± 0.4 ppm	± 0.05 ppm	± 0.15 ppm	± 1 ppm	< ± 0.03 ppm

	Total Measurement Range: 10kΩ ⇔ 10MΩ				24 Hour Range Stability
R_S	10kΩ • R_x • 80kΩ	80kΩ • R_x • 630kΩ	630kΩ•R_x•1.34MΩ	1.34MΩ •R_x• 10.75MΩ	
100kΩ	± 1 ppm	± 0.3 ppm	± 0.5 ppm	± 6 ppm	< ± 0.15 ppm
	± 0.7 ppm	± 0.2 ppm	± 0.3 ppm	± 3 ppm	< ± 0.10 ppm
	± 0.7 ppm	± 0.2 ppm	± 0.3 ppm	± 3 ppm	< ± 0.10 ppm

	Total Measurement Range: 100kΩ ⇔ 100MΩ				24 Hour Range Stability
R_S	100kΩ • R_x • 800kΩ	800kΩ • R_x • 6.3MΩ	6.3MΩ•R_x•13.4MΩ	13.4MΩ•R_x•107.5MΩ	
1MΩ	± 2.5 ppm	± 0.6 ppm	± 0.8 ppm	± 8 ppm	< ± 0.25 ppm
	± 1.5 ppm	± 0.4 ppm	± 0.6 ppm	± 6 ppm	< ± 0.20 ppm
	± 1.5 ppm	± 0.4 ppm	± 0.6 ppm	± 6 ppm	< ± 0.20 ppm

	Total Measurement Range: 1MΩ ⇔ 100MΩ				24 Hour Range Stability
R_S	1MΩ • R_x • 8MΩ	8MΩ • R_x • 63MΩ	63MΩ •R_x• 134MΩ	134MΩ•R_x•1.075GΩ	
10MΩ	± 8 ppm	± 4 ppm	± 8 ppm		< ± 2 ppm
	± 6 ppm	± 2.5 ppm	± 4 ppm		< ± 1.5 ppm
	± 4 ppm	± 1 ppm	± 2 ppm	± 8 ppm	< ± 1 ppm

	Total Measurement Range: 100MΩ ⇔ 1GΩ				24 Hour Range Stability
R_S	10MΩ • R_x • 80MΩ	80MΩ • R_x • 630MΩ	630MΩ•R_x•1.34GΩ		
100MΩ	± 6 ppm	± 2.5 ppm	± 4 ppm		< ± 1.5 ppm

6623-100 Amp Range Extender (Current Available Model)

The current 6623-100 Amp Range Extender will work with any of the 6622A Series of DCC Bridges. The 6623 also **works with previous Guildline DCC Bridges** such as the 9975 and the 6675 Series. The 6623 allows you to extend the current all the way to 100 Amps (vs 150 mA in Base Unit). This means that whether your decide to upgrade or buy the Extended Bridge Ranges, your 6623A will continue to work without having to be modified or without having to invest in more standards. Again **Complete Investment Protection** from Guildline.

6623-100 Amp Range Extender Specifications for Models 6622A and 6622A-XR

6623 Rs/Rx Uncertainty Ratio[1] •	10^{-6} : 1	10^{-5} : 1	10^{-4} : 1	10^{-3} : 1	10^{-2} : 1	10^{-1} : 1
6622A-Base / 6622-XR•	± 25 ppm	± 15 ppm	± 6 ppm	± 1.5 ppm	± 1.2 ppm	± 1.2 ppm
6622A-XP / 6622A-XPR / 6622A-HVT	± 10 ppm	± 5 ppm	± 2.5 ppm	± 0.7 ppm	± 0.5 ppm	± 0.5 ppm

1 – Uncertainties are Based on using an RS of 1 Ohm from 10^{-6}:1 to 10^{-2}:1 ratios and an RS of 10 Ohms for 10^{-1}:1 ratio.

NEW - 6623A-Series of Modular Range Extenders

Range Extenders allows DCC Bridges to measure "lower" resistance values (shunt) at higher current. Using proprietary technologies, Guildline engineers have again provided our customers with the most value and flexibility in expanding the **shunt measurement** capability. For calibration at current higher than 3A, additional range extenders **can be cascaded** by the 6622A to expand the maximum allowable current for **improved calibration uncertainty.** The range extender carries out polarity reversal automatically, at user selected intervals. Standard models are 6623A-150, 6623A-450, 6623A-900 and 6623A-3000, each with built-in current source with maximum current of **150A, 450A, 900A and 3000A** respectively. Models with other maximum current levels are available in multiples of 150A. If you buy lower current models such as the 150A, and now need 900A, no worries. **Units are completely upgradeable** and you only need to buy the additional current you need. Your Investment is protected. NOTE that NO **external power supplies**, **external switches** or compressed air **are required** for operation, thus dramatically reducing the purchase/installation cost and ongoing training, calibration support and operating costs.

6623A-3 Range Extension Option (Internally Installed)

The 6622A series of DCC bridges has an **available built-in 3A range extender** and integral current source as an option. With this option, users can **calibrate shunts and low value resistance standards** with currents up to 3A, without the requirements of additional range extension hardware. This optional extender is also used with other range extenders **up to 3000 Amps**.

6623A-3 Amp Range Extender Specifications

	Models 6622A-Base / 6622A-XR			Models 6622A-XP/6622A-XPR/6622A-HVT		
6623A-3A Ratio[1]	**10^{-3} : 1**	**10^{-2} : 1**	**10^{-1} : 1**	**10^{-3} : 1**	**10^{-2} : 1**	**10^{-1} : 1**
Rx/Rs Uncertainty	**± 0.4 ppm**	**± 0.4 ppm**	**± 0.4 ppm**	**± 0.3ppm**	**± 0.3 ppm**	**± 0.3 ppm**

1 – Uncertainties are Based on using an RS of 1 Ohm from 10^{-3}:1 to 10^{-1}:1 ratio

6623A Range Extension Option (External)

6623A-150 Amp Range Extender Specifications

6623A (Rx/Rs) Ratio[2]·Uncertainties	10^{-6} : 1	10^{-5} : 1	10^{-4} : 1	10^{-3} : 1	10^{-2} : 1	10^{-1} : 1
Base Model & XR Models	**± 5 ppm**	**± 5 ppm**	**± 5 ppm**	**± 0.3 ppm**	**± 0.3 ppm**	**± 0.3 ppm**
6622A-XP/XPR/HVT Models	**± 4 ppm**	**± 4 ppm**	**± 4 ppm**	**± 0.2 ppm**	**± 0.2 ppm**	**± 0.2 ppm**

6623A-450 Amp Range Extender Specifications

6623A (Rx/Rs) Ratio[2]·Uncertainties	10^{-6} : 1	10^{-5} : 1	10^{-4} : 1	10^{-3} : 1	10^{-2} : 1	10^{-1} : 1
Base Model & XR Models	**± 1 ppm**	**± 1 ppm**	**± 1 ppm**	**± 0.2 ppm**	**± 0.2 ppm**	**± 0.2 ppm**
6622A-XP/XPR/HVT Models	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.15 ppm**	**± 0.15 ppm**	**± 0.15 ppm**

6623A-900 Amp Range Extender Specifications

6623A (Rx/Rs) Ratio[2]·Uncertainties	10^{-6} : 1	10^{-5} : 1	10^{-4} : 1	10^{-3} : 1	10^{-2} : 1	10^{-1} : 1
Base Model & XR Models	**± 1 ppm**	**± 1 ppm**	**± 1 ppm**	**± 0.2 ppm**	**± 0.2 ppm**	**± 0.2 ppm**
6622A-XP/XPR/HVT Models	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.15 ppm**	**± 0.15 ppm**	**± 0.15 ppm**

6623A-3000 Amp Range Extender Specifications

6623A (Rx/Rs) Ratio[2]·Uncertainties	10^{-7} : 1	10^{-6} : 1	10^{-5} : 1	10^{-4} : 1	10^{-3} : 1	10^{-2} : 1	10^{-1} : 1
Base Model & XR Models	**± 5 ppm**	**± 1 ppm**	**± 1 ppm**	**± 1 ppm**	**± 0.2 ppm**	**± 0.2 ppm**	**± 0.2 ppm**
6622A-XP/XPR/HVT Models	**± 4 ppm**	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.9 ppm**	**± 0.15 ppm**	**± 0.15 ppm**	**± 0.15 ppm**

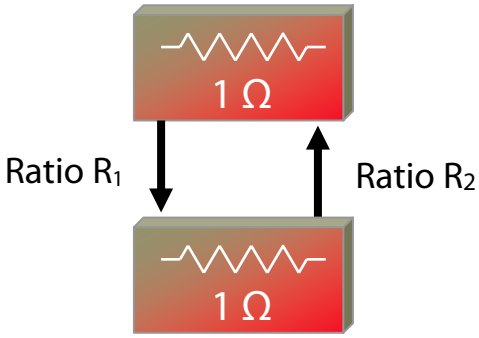
2 – Uncertainties are Based on using an RS of 1 Ohm from 10^{-6}:1 to 10^{-2}:1 ratios and an RS of 10 Ohms for 10^{-1}:1 ratio.

Verification of Performance

Historically the maintenance of a precision DCC bridge was challenging. A Harmon type transfer standard was needed for the verification of a bridge's non 1:1 measurement ratio along with high technical skill levels required. With the introduction of the 100:1 measurement ratio, the performance of a 6622A type bridge can be carried out with ease. Frequent verification of the bridge performance can also provide insight into the bridge's short and long-term stability to improve user's confidence level.

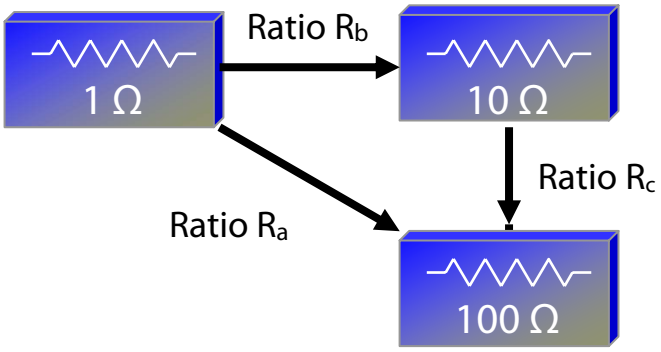
The 1:1 measurement ratio can be easily verified by interchange measurement tests, using two stable standard resistors of same nominal values, as illustrated by the block diagram to the right. Bridge 1:1 measurement ratio error e_i (in ppm) is calculated using the following formula

$$e_i = (1/2)\cdot |R_1 \cdot R_2 - 1| \cdot 10^6$$



Non 1:1 measurement ratios, such as 10:1 and 100:1 ratios can be easily confirmed by closure measurement tests, using three stable standard resistors, as illustrated by the block diagram to the right. Bridge non 1:1 measurement ratio error e_c (in ppm) is calculated using the following formula

$$e_c = (1/3)\cdot |R_a - R_b \cdot R_c| / R_a \cdot 10^6$$



Note: Resistance values in these block diagrams are only representative values and are selected for the illustration of methodology only.

General Specifications

Measurement Range (Ω)	w/o range extension	10^{-3} ~ 10^{5} (6622A-Base/ XP), 10^{-3} ~ 10^{9} (6622A-XR/XPR/HVT)
	w range extension	10^{-6} ~ 10^{5} (6622A-Base/ XP), 10^{-6} ~ 10^{9} (6622A-XR/XPR/HVT)
Resistance ratio range		0.1:1 ~ 100:1
Linearity		± 0.01 ppm of full scale (Full scale defined as 13.4:1 and 100:1)
Display resolution (ppm)		± 0.001 ppm
Temperature coefficient of resistance ratio		0.01 ppm/°C of reading
Automatic current reversal rate (in seconds) s		4 s to 1637 s programmable, increment of 1second
Communication		IEEE 488.2 (SCPI Based Language Instructions)
Test current (for measurement to 100kΩ)	Usable range (±30V compliance)	20 µa ~ 150 mA (extension to 3000A available)
	Resolution (µA)	1 µa
	Accuracy [error(ppm) + offset(A)]	±200 ppm ± 10 µA
Test voltage (for measurement above 100kΩ)	Range (±1mA compliance) (V_{DC})	0 ~ 100 (HVT Model has 0 ~ 500 Volts)
	Resolution (V)	1 V
	Accuracy [error (%) + offset(V)]	± 0.5% ± 10 mV
Dimensions and weight		465(D)·440(W)·200(H) mm, 27kg
Environmental		Operating: 18~28°C, 20%~50%RH / Storage: –20~60°C, 15%~
Power Requirements		VAC: 100V, 120V, 220V and 240V ± 10% / 50 or 60Hz ±5%, 200VA

Warranty

50 Years of Guildline innovation in engineering and design. **ONE BRIDGE** meeting customer requirements. **ONE BRIDGE** providing **complete upgradeability and flexibility** that meets your current and future measurement needs. Options that satisfy real measurement issues and all this with complete investment protection. How can you improve? Simple! Offer an industry leading **2-Year Warranty** to show your confidence. All 6622A Series of DCC Bridges now come with a 2-year Warranty. This warranty covers both parts and labor.

Service and Support

Guildline is pleased to announce that they are **ISO 17025 Accredited**. We have the widest range of resistance accredited with a range of **1 µΩ all the way to 10PΩ**. Whether you own a Guildline product and have other manufacturer's standards, **call today** and see what we can do for you.

Ordering Information

Model	*List One Of Following Bench Models**
6622A	Base Accuracy, Range 100 kOhm
6622A-XR	Base Accuracy, Extended Range to 100 MOhm
6622A-XP	Extended Performance, Range 100 kOhm
6622A-XPR	Extended Performance, Extended Range to 100 MOhm
6622A-HVT	Extended Performance, 500 V, 1 GOhm Range & Temperature
	*All Bridges include Calibration Certificate, Operator and Software manual, and one set of Rs/Rx Low Thermal Leads
6622A-09	Rack Mount Kit for 6622A Series Bridge
/RC	Report of Calibration Available at Nominal Charge
/RT	Specifies Rear Terminals versus Front Terminals (Default)
SM6622A	Service Manual (Extra Charge)
6622A SERIES OPTIONS	
Bridgeworks-UPG	Upgrades Bridgeworks-R to Bridgeworks-C
/57XX UTL	Bridgeworks-C 57XX Resistance Calibration Utility
/3458 UTL	Bridgeworks-C 3458A Resistance Calibration Utility
/Controller	System Controller with IEEE and Software Integrated
IEEE-PCI	NI IEEE-488.2 Interface for a PCI slot (Win 9X/NT/ME)
IEEE-2m	NI IEEE-488.2 Interface cable, 2m double shielded
6634A-X	Temperature Stabilized Resistance Standard for 6622A Series
6623-100A	100 Amp Direct Current Comparator Range Extender
66233	100 Amp Programmable Power Supply for 6623-100A
6623A-3	3 Amp Internal Range Extender Option
6623A-150	External 150A Range Extender for DCC Resistance Bridge
6623A-450	External 450A Range Extender for DCC Resistance Bridge
6623A-900	External 900A Range Extender for DCC Resistance Bridge
6623A-3000	External 3000A Range Extender for DCC Resistance Bridge
6664B	16 Channel, 2 Amp Low Thermal Scanner
6664A-11	SCW Lead pair with gold plated banana plug, 1m in length
6664A-12	SCW Lead pair with gold plated banana plugs, 2m in length
SCW/18-30	30 Meters Shielded, Copper, Low Thermal Wire 18 Gauge
Many other leads and accessories to include system integration and IEEE are available.	

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