



### 6622A SERIES FEATURES

- ◆ Widest Available Range from 1 mΩ ~1 GΩ
- ◆ Modular Design, **Expandable** Capabilities, Investment Protection
- ◆ Full 10.5 Digits (0.1 ppb) Display Resolution
- ◆ Unique Measurement Trending Display
- ◆ Provides Measurement Results on Display
- ◆ Change Key parameters "on-the-fly" while the measurement is running
- ◆ Built-In Voltages to 1000 Vdc
- ◆ Linearity: ± 0.01 ppm of Full Scale
- ◆ Resolution: ± 0.001 ppm of Full Scale
- ◆ Temperature Option Available
- ◆ Best Accuracy: ± 0.02 ppm of Reading
- ◆ Wide Range of Ratios: 0.1:1 ~ 100:1
- ◆ Extended Low End Range Down to 1 μΩ with Currents Up to 3000 A (up to 12,000 Amps coming in 2011)
- ◆ Range Extenders in 150A Increments with Built-In Power Supplies and Switching
- ◆ Fully Programmable IEEE 488.2
- ◆ BridgeWorks™ Data Acquisition Software
- ◆ Unique Calibration Support Strategy
- ◆ Complete Measurement Systems Available

**GUILDLINE INSTRUMENTS 6622A SERIES** introduces new design 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. Optional modules allow for normal and high ohms measurements without having to purchase two separate bridges.

The 6622A Series modular design allows you to buy what is required today with existing budgets, and when workload requirements change, simply expand 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 also 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 kΩ. Workload requirements demand higher measurement range? Then start with the eXtended Range (XR) model with its measurement range to 100 MΩ. You can move to better uncertainties with an eXtended Performance (XP) or eXtended Performance & Range (XPR) model. You can even start with or upgrade to the world's leading High Voltage Model (HV) with uncertainties down to 0.04 ppm and a measurement range of 1 GΩ and with voltages to 1000 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 this unit 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! 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** series offers reduced support costs when the time comes for calibration.

Available Bridge expansions for all models include external current range extenders at 3 Amps and at 150 Amp increments up to 3000 Amps, internal voltages to 1000 Vdc, and complete temperature capability. Or simply invest in the best from the beginning!

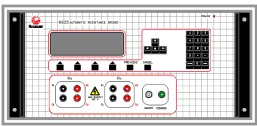
# 6622A Series of DCC Bridges

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 it's as if you know them all. Menu operation, measurement setup, measurement operation and software are identical among all models. When you want extended range or enhanced performance – you still have only **ONE BRIDGE to support for calibration**. Just look at the **models and expansion paths** available for you with the 6622A Direct Current Comparator **ONE BRIDGE** Series.

## 6622A Series – Models and Expansion Paths

You can start with our very competitively priced **6622A Base unit**. The 6622A “Base” unit provides an outstanding measurement range of 0.001 Ω to 100 kΩ, with best uncertainties starting at 0.1 ppm. A perfect solution to meet demanding

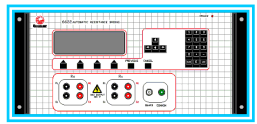
**ACCURACY: 0.1 ppm**  
**6622A-BASE**  
**RANGE: 1 mΩ ↔ 100kΩ**



workloads and laboratory budgets. Learn only One Menu and One Software package for all Bridges in this Series.

Or start out with the **6622A-XP (eXtended Performance)** Model. This model has the same measurement range as the 6622A Base Model...however the uncertainties of the measurement ranges are significantly enhanced. If you already own the 6622A and now your workload demands

**ACCURACY: 0.05 ppm**  
**6622A-XP**  
**RANGE: 1 mΩ ↔ 100kΩ**

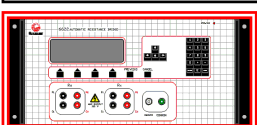


better uncertainties, simply return the unit to Guildline and we can **expand the 6622A to a 6622A-XP**. Instrument control and

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 you need!

The newest addition to our line is the **6622A-eXtended Performance Special accuracy model**. This bridge can be upgraded from our Base and XP series only and does not have the extended range available. This bridge was the result of many NMI's asking for the best uncertainties available. Guildline responded with the XPS model. Specially calibrated for 1:1 ratios expect better than 0.02 ppm in the mid-range of this bridge. Note that this is the only bridge that cannot be fitted with the Temperature option.

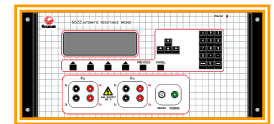
**ACCURACY: 0.02 ppm**  
**6622A-XPS**  
**RANGE: 1 mΩ ↔ 100kΩ**



of this bridge. Note that this is the only bridge that cannot be fitted with the Temperature option.

Need a **higher measurement range**? Move up to our model **6622A-XR (eXtended Range)**. This laboratory standard provides outstanding working measurement range of 0.001 Ω all the way to 100 MΩ and with an internal 100 V supply.

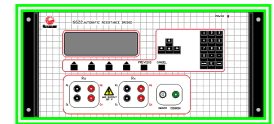
**ACCURACY: 0.1 ppm**  
**6622A-XR**  
**RANGE: 1 mΩ ↔ 100MΩ**



The best part is **No-Buyers Remorse**. If you had previously purchased a 6622A-Base Model, and now your workload has evolved to higher values, simply send the instrument back to Guildline and we will **enhance your 6622A to a 6622A-XR** at a very attractive price.

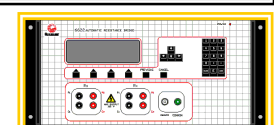
Need **Primary Laboratory Performance**? Our **6622A-XPR** has both the eXtended Performance and Range. Primary Level Performance at a secondary pricing structure and you can expand from any previous 6622A Series model. With 0.05 ppm measurement uncertainties, 100 MΩ range, current extension to 3000 A, this unit is a true primary laboratory work-horse. As an added bonus, all DCC Bridges within this series come complete with Bridgeworks™ Software.

**ACCURACY: 0.05 ppm**  
**6622A-XPR**  
**RANGE: 1 mΩ ↔ 100MΩ**



**WHY NOT EQUIP YOUR LABORATORY WITH THE BEST!** Our **6622A-HV (High Voltage)** model has the highest measurement range @1 GΩ, the highest voltage @ 1000Vdc and at 0.04 ppm this standard provides **the ultimate measurement capabilities of any multi-ratio DCC Bridge available today**. You can expand from the 6622A-Base to the 6622A-XR or the 6622A-XP, and from all of these bridge models to the 6622A-XPR and the 6622A-HV. Innovation, performance, and investment protection delivered with the **ultimate in expansion flexibility!**

**ACCURACY: 0.04 ppm**  
**6622A-HV (1k<sub>VDC</sub>)**  
**RANGE: 1 mΩ ↔ 1GΩ**



## 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. 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.

All 6622A Bridges now provide a full  $10^{1/2}$  digits of resolution and the ability to graphical see the data (trending). You can have the data presented in a summary or detailed format right on the Bridge Screen or available via PC Base Bridgeworks Software. Measurement and **Uncertainty Analysis** you need as a Metrologist or to meet the requirements of ISO Accreditation.



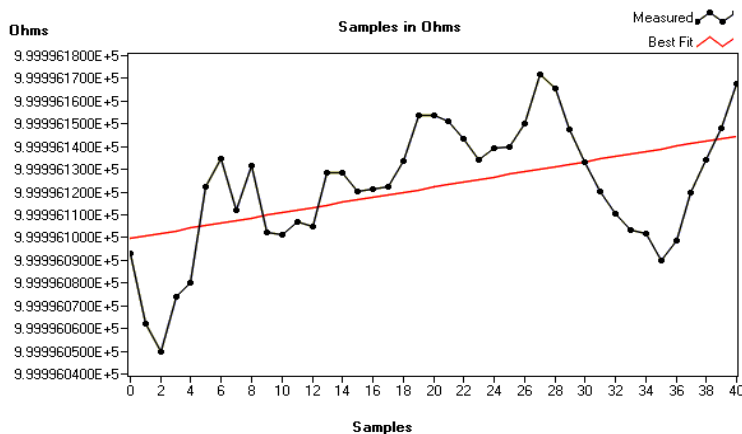
Every effort has been taken in the 6622A Series design to reduce noise and error. **Thermal EMF effects are eliminated** by automatic current reversal. The **unique architecture** of the bridge and its **control algorithm** further removes gain and offset errors in the **nanovolt balance detector** and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

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 giving measurements from every 2 seconds to 14 minutes. Unique computerized measurement mode provides automatic reversal rates, optimizing 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 fast changing temperatures**.

And it's not just the modularity that makes the 6622A Series unique and the best **ONE BRIDGE** solution offered today. Historical limitations of 13:1 ratio ranges have been eliminated.

### 100:1 Transfer (10 kΩ to 1 MΩ)

#### Test Overview



With new resistance **measurement ratios from 0.001:1 up to 100:1**, the 6622A series allows the ultimate **flexibility in choosing standards**.

Just take a look at results from using a **10 kΩ Resistance Standard to 1 MΩ 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 μΩ to 100 MΩ** with **just 4 (four) Resistance Standards** required.

Another advantage is that **temperature stabilized resistance standards** (both oil based and 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 100 kΩ Resistance Standard (Rs) from an oil bath to verify Rx values up to 10 MΩ. If you were to examine a typical measurement uncertainty workup, **measurement uncertainties** due to your resistance standard temperature coefficients are practically eliminated.

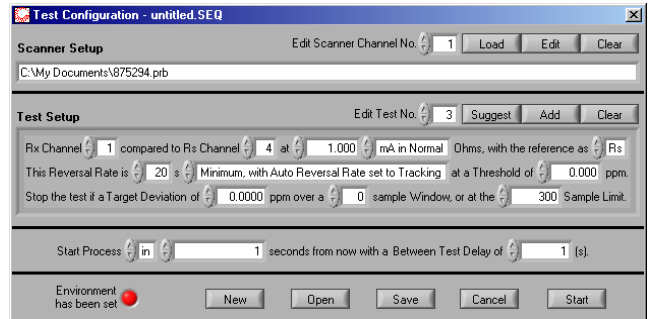
The 6622A Series, when used with the **Guildline Instruments Model 6634A or Model 6636 Temperature Stabilized Resistance Standards**, effectively **eliminate errors** due to the affects of temperature environment, even when used in a calibration laboratory environment of **23°C @ ± 3°C**.

# 6622A Series of DCC Bridges

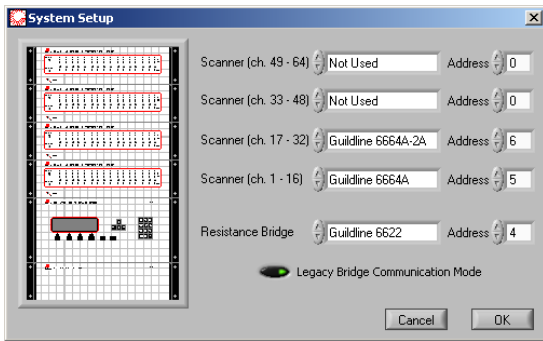
## 6622A Bridgeworks Software

Not only does Guildline provide unique DCC Bridge hardware, but we offer complete new solutions for software as well. Software programs called **Bridgeworks-R** and **Bridgeworks-C** are now provided for setup, control, measurements, and reporting. Bridgeworks-R is provided free with any of the Bridges in the 6622A Series. Optional Bridgeworks-C upgrade is also available for all models. Users can always **upgrade** to Bridgeworks-C from Bridgeworks-R should the requirement arise in the future. Programs developed in Bridgeworks-R will work equally well in Bridgeworks-C. Bridgeworks, either version, is the **upgrade path for current ResCal** Users.

Bridgeworks software is extremely powerful, yet **straight forward and user friendly**. The software comes with all of the useful and convenient features commonly found in **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 Resistance Measurement System with the 6622A Series **ONE BRIDGE** solution by adding Resistance Standards, Scanners, Range Extenders and software. This system is integrated, verified and tested in a rack a little more than 36" high. **Complete turnkey solutions.**

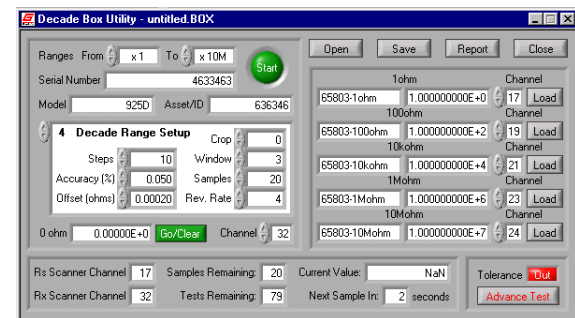
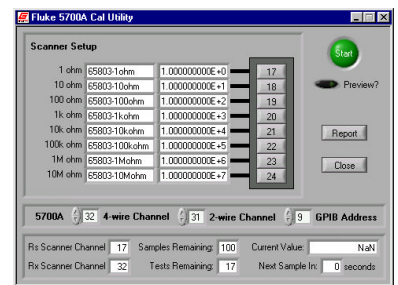


For a **complete, automated resistance or temperature** measuring system, a 6622A Series bridge can be used with Guildline's 6664C Low Thermal Scanners and Guildline's 6634A Temperature Stabilized Resistance Standards. When the Bridge is used with a Guildline low **thermal matrix scanner**, the software can turn the bridge into a **multiple-channel** calibration and measurement system. Timed, sequenced 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

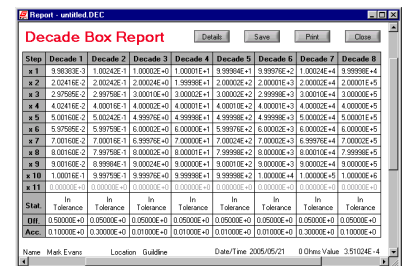


**Bridgeworks Software** provides comprehensive graphic display, math functions and trend analysis. Data can be **easily exported** to MS-Excel®, Crystal Reports® and in HTML format. All reports generated conform to traceability requirements of ISO-17025. Bridgeworks-C also provides **additional temperature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

**Bridgeworks-C** enhances resistance capabilities on other laboratory standards through the use of utilities. These optional utilities include **calibration routines** for High End Calibrators such as the **Fluke 5700A and 5720A Series**, Agilent 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 calibration.



There is even a utility for the **automated 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 12 Month Range Specifications

**Note:** The 6622A-Base and 6622A-XP models are limited to a maximum of 100 kΩ with a maximum  $R_s$  (Resistance Standard) of 10 kΩ. Because of the unique variable ratios available on all models, it is possible to measure UUT's with a variety of  $R_s$  Standards. For example, a 10 kΩ UUT could be measured with a 100 Ω, 1 kΩ and 10 kΩ Resistance Standard ( $R_s$ ). To determine the measurement uncertainty due to the bridge, simply look at the  $R_s$  you are using, and then go to the appropriate UUT Sub range.

| <b>6622A-B</b> |           | Measurement Range | Range w/6623A         | Max Current  | Max Current w/6623A    | Max Voltage       |                 |                  |
|----------------|-----------|-------------------|-----------------------|--------------|------------------------|-------------------|-----------------|------------------|
|                |           | 1 mΩ ◀▶ 100 kΩ    | <b>1 μΩ</b> ◀▶ 100 kΩ | 150 mA       | <b>3A to 3000 Amps</b> | N/A               |                 |                  |
| Ratio          | Maximum ▶ | 107.5 : 1         | 13.4 : 1              | 6.3 : 1      | 0.8 : 1                | 24 Hour Stability | 0.08 : 1        | 0.008 : 1        |
|                | Nominal ▶ | <b>100 : 1</b>    | <b>10 : 1</b>         | <b>1 : 1</b> | <b>0.1 : 1</b>         |                   | <b>0.01 : 1</b> | <b>0.001 : 1</b> |
| $R_s$          | 1 Ω ▶     | ± 0.1 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      | ± 0.7 ppm       | ± 0.8 ppm        |
|                | 10 Ω ▶    | ± 0.1 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                | 100 Ω ▶   | ± 0.2 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                | 1 kΩ ▶    | ± 0.8 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                | 10 kΩ ▶   | NA                | ± 0.2 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.05 ppm      |                 |                  |

| <b>6622A-XP</b> |           | Measurement Range | Range w/6623A         | Max Current  | Max Current w/6623A    | Max Voltage       |                 |                  |
|-----------------|-----------|-------------------|-----------------------|--------------|------------------------|-------------------|-----------------|------------------|
|                 |           | 1 mΩ ◀▶ 100 kΩ    | <b>1 μΩ</b> ◀▶ 100 kΩ | 150 mA       | <b>3A to 3000 Amps</b> | N/A               |                 |                  |
| Ratio           | Maximum ▶ | 107.5 : 1         | 13.4 : 1              | 6.3 : 1      | 0.8 : 1                | 24 Hour Stability | 0.08 : 1        | 0.008 : 1        |
|                 | Nominal ▶ | <b>100 : 1</b>    | <b>10 : 1</b>         | <b>1 : 1</b> | <b>0.1 : 1</b>         |                   | <b>0.01 : 1</b> | <b>0.001 : 1</b> |
| $R_s$           | 1 Ω ▶     | ± 0.05 ppm        | ± 0.05 ppm            | ± 0.05 ppm   | ± 0.4 ppm              | < ± 0.02 ppm      | ± 0.6 ppm       | ± 0.7 ppm        |
|                 | 10 Ω ▶    | ± 0.05 ppm        | ± 0.05 ppm            | ± 0.05 ppm   | ± 0.4 ppm              | < ± 0.02 ppm      |                 |                  |
|                 | 100 Ω ▶   | ± 0.1 ppm         | ± 0.05 ppm            | ± 0.05 ppm   | ± 0.4 ppm              | < ± 0.02 ppm      |                 |                  |
|                 | 1 kΩ ▶    | ± 0.5 ppm         | ± 0.05 ppm            | ± 0.05 ppm   | ± 0.4 ppm              | < ± 0.02 ppm      |                 |                  |
|                 | 10 kΩ ▶   | NA                | ± 0.15 ppm            | ± 0.05 ppm   | ± 0.4 ppm              | < ± 0.03 ppm      |                 |                  |

| <b>6622A-XR</b> |           | Measurement Range | Range w/6623A         | Max Current  | Max Current w/6623A    | Max Voltage       |                 |                  |
|-----------------|-----------|-------------------|-----------------------|--------------|------------------------|-------------------|-----------------|------------------|
|                 |           | 1 mΩ ◀▶ 100 MΩ    | <b>1 μΩ</b> ◀▶ 100 MΩ | 150 mA       | <b>3A to 3000 Amps</b> | 100 Vdc           |                 |                  |
| Ratio           | Maximum ▶ | 107.5 : 1         | 13.4 : 1              | 6.3 : 1      | 0.8 : 1                | 24 Hour Stability | 0.08 : 1        | 0.008 : 1        |
|                 | Nominal ▶ | <b>100 : 1</b>    | <b>10 : 1</b>         | <b>1 : 1</b> | <b>0.1 : 1</b>         |                   | <b>0.01 : 1</b> | <b>0.001 : 1</b> |
| $R_s$           | 1 Ω ▶     | ± 0.1 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      | ± 0.7 ppm       | ± 0.8 ppm        |
|                 | 10 Ω ▶    | ± 0.1 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                 | 100 Ω ▶   | ± 0.2 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                 | 1 kΩ ▶    | ± 0.8 ppm         | ± 0.1 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.03 ppm      |                 |                  |
|                 | 10 kΩ ▶   | ± 3 ppm           | ± 0.2 ppm             | ± 0.1 ppm    | ± 0.6 ppm              | < ± 0.05 ppm      |                 |                  |
|                 | 100 kΩ ▶  | ± 6 ppm           | ± 0.5 ppm             | ± 0.3 ppm    | ± 1 ppm                | < ± 0.15 ppm      |                 |                  |
|                 | 1 MΩ ▶    | ± 8 ppm           | ± 0.8 ppm             | ± 0.6 ppm    | ± 2.5 ppm              | < ± 0.25 ppm      |                 |                  |
| 10 MΩ ▶         | NA        | ± 8 ppm           | ± 4 ppm               | ± 8 ppm      | < ± 2.0 ppm            |                   |                 |                  |

## 6622A Series of DCC Bridges

|                  |                   |                |             |                     |             |
|------------------|-------------------|----------------|-------------|---------------------|-------------|
| <b>6622A-XPR</b> | Measurement Range | Range w/6623A  | Max Current | Max Current w/6623A | Max Voltage |
|                  | 1 mΩ ◀▶ 100 MΩ    | 1 μΩ ◀▶ 100 MΩ | 150 mA      | 3A to 3000 Amps     | 100 Vdc     |

|       |           |           |          |         |         |                   |          |           |
|-------|-----------|-----------|----------|---------|---------|-------------------|----------|-----------|
| Ratio | Maximum ▶ | 107.5 : 1 | 13.4 : 1 | 6.3 : 1 | 0.8 : 1 | 24 Hour Stability | 0.08 : 1 | 0.008 : 1 |
|       | Nominal ▶ | 100 : 1   | 10 : 1   | 1 : 1   | 0.1 : 1 |                   | 0.01 : 1 | 0.001 : 1 |

|                      |          |            |            |            |           |              |           |           |
|----------------------|----------|------------|------------|------------|-----------|--------------|-----------|-----------|
| <b>R<sub>s</sub></b> | 1 Ω ▶    | ± 0.05 ppm | ± 0.05 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.02 ppm | ± 0.6 ppm | ± 0.7 ppm |
|                      | 10 Ω ▶   | ± 0.05 ppm | ± 0.05 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.02 ppm |           |           |
|                      | 100 Ω ▶  | ± 0.1 ppm  | ± 0.05 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.02 ppm |           |           |
|                      | 1 kΩ ▶   | ± 0.5 ppm  | ± 0.05 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.02 ppm |           |           |
|                      | 10 kΩ ▶  | ± 1 ppm    | ± 0.15 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.03 ppm |           |           |
|                      | 100 kΩ ▶ | ± 3 ppm    | ± 0.3 ppm  | ± 0.2 ppm  | ± 0.7 ppm | < ± 0.10 ppm |           |           |
|                      | 1 MΩ ▶   | ± 6 ppm    | ± 0.6 ppm  | ± 0.4 ppm  | ± 1.5 ppm | < ± 0.20 ppm |           |           |
|                      | 10 MΩ ▶  | NA         | ± 4 ppm    | ± 2.5 ppm  | ± 6 ppm   | < ± 1.5 ppm  |           |           |

|                 |                   |               |             |                     |             |
|-----------------|-------------------|---------------|-------------|---------------------|-------------|
| <b>6622A-HV</b> | Measurement Range | Range w/6623A | Max Current | Max Current w/6623A | Max Voltage |
|                 | 1 mΩ ◀▶ 1 GΩ      | 1 μΩ ◀▶ 1 GΩ  | 150 mA      | 3A to 3000 Amps     | 1 kVdc      |

|       |           |           |          |         |         |                   |          |           |
|-------|-----------|-----------|----------|---------|---------|-------------------|----------|-----------|
| Ratio | Maximum ▶ | 107.5 : 1 | 13.4 : 1 | 6.3 : 1 | 0.8 : 1 | 24 Hour Stability | 0.08 : 1 | 0.008 : 1 |
|       | Nominal ▶ | 100 : 1   | 10 : 1   | 1 : 1   | 0.1 : 1 |                   | 0.01 : 1 | 0.001 : 1 |

|                      |          |            |            |            |             |              |           |           |
|----------------------|----------|------------|------------|------------|-------------|--------------|-----------|-----------|
| <b>R<sub>s</sub></b> | 1 Ω ▶    | ± 0.05 ppm | ± 0.04 ppm | ± 0.04 ppm | ± 0.4 ppm   | < ± 0.02 ppm | ± 0.6 ppm | ± 0.7 ppm |
|                      | 10 Ω ▶   | ± 0.05 ppm | ± 0.04 ppm | ± 0.04 ppm | ± 0.4 ppm   | < ± 0.02 ppm |           |           |
|                      | 100 Ω ▶  | ± 0.1 ppm  | ± 0.04 ppm | ± 0.04 ppm | ± 0.4 ppm   | < ± 0.02 ppm |           |           |
|                      | 1 kΩ ▶   | ± 0.5 ppm  | ± 0.04 ppm | ± 0.04 ppm | ± 0.4 ppm   | < ± 0.02 ppm |           |           |
|                      | 10 kΩ ▶  | ± 1 ppm    | ± 0.15 ppm | ± 0.05 ppm | ± 0.4 ppm   | < ± 0.03 ppm |           |           |
|                      | 100 kΩ ▶ | ± 3 ppm    | ± 0.3 ppm  | ± 0.2 ppm  | ± 0.7 ppm   | < ± 0.10 ppm |           |           |
|                      | 1 MΩ ▶   | ± 6 ppm    | ± 0.6 ppm  | ± 0.4 ppm  | ± 1.5 ppm   | < ± 0.20 ppm |           |           |
|                      | 10 MΩ ▶  | NA         | ± 2 ppm    | ± 1 ppm    | ± 4 ppm     | < ± 0.70 ppm |           |           |
| 100 MΩ ▶             | NA       | ± 6 ppm    | ± 3.5 ppm  | ± 8 ppm    | < ± 2.5 ppm |              |           |           |

|                  |                   |                     |             |                     |                |
|------------------|-------------------|---------------------|-------------|---------------------|----------------|
| <b>6622A-XPS</b> | Measurement Range | Max Voltage         | Max Current | Max Current w/6623A | Range w/6623A  |
|                  | 1 mΩ ◀▶ 100 kΩ    | 100 V <sub>DC</sub> | 150 mA      | 3A to 3000 Amps     | 1 μΩ ◀▶ 100 kΩ |

|       |           |           |          |         |         |                   |          |           |
|-------|-----------|-----------|----------|---------|---------|-------------------|----------|-----------|
| Ratio | Maximum ▶ | 107.5 : 1 | 13.4 : 1 | 6.3 : 1 | 0.8 : 1 | 24 Hour Stability | 0.08 : 1 | 0.008 : 1 |
|       | Nominal ▶ | 100 : 1   | 10 : 1   | 1 : 1   | 0.1 : 1 |                   | 0.01 : 1 | 0.001 : 1 |

|                      |         |            |            |            |           |               |           |           |
|----------------------|---------|------------|------------|------------|-----------|---------------|-----------|-----------|
| <b>R<sub>s</sub></b> | 1 Ω ▶   | ± 0.05 ppm | ± 0.03 ppm | ± 0.02 ppm | ± 0.4 ppm | < ± 0.015 ppm | ± 0.6 ppm | ± 0.7 ppm |
|                      | 10 Ω ▶  | ± 0.05 ppm | ± 0.03 ppm | ± 0.02 ppm | ± 0.4 ppm | < ± 0.015 ppm |           |           |
|                      | 100 Ω ▶ | ± 0.1 ppm  | ± 0.03 ppm | ± 0.02 ppm | ± 0.4 ppm | < ± 0.015 ppm |           |           |
|                      | 1 kΩ ▶  | ± 0.5 ppm  | ± 0.03 ppm | ± 0.02 ppm | ± 0.4 ppm | < ± 0.015 ppm |           |           |
|                      | 10 kΩ ▶ | NA         | ± 0.15 ppm | ± 0.05 ppm | ± 0.4 ppm | < ± 0.03 ppm  |           |           |

- 1 - Specifications are based on 10 mW R<sub>s</sub> power dissipation or the maximum current in R<sub>s</sub> or the limit of 6622A output and temperature of 23°C ±3°C.
- 2 - Ratio uncertainties Less than 0.08 : 1 for R<sub>s</sub> 10 Ohm and below are calculated using 6623A Range Extender Series with the 6622A Series Bridge.
- 3 - Lowest possible R<sub>x</sub> Ratio is defined as R<sub>xlow</sub> = R<sub>s</sub> x .08 and Maximum possible R<sub>x</sub> Ratio is determined by R<sub>xhigh</sub> = R<sub>s</sub> x 107.5.
- 4 - Maximum Upper Range is limited to 134 kΩ for 6622A, 6622A-XP and 6622A-XPS with the maximum R<sub>s</sub> allowed as 10 kΩ.
- 5 - Maximum Upper Range is limited to 134 MΩ for 6622A-XR and 6622A-XPR with the maximum R<sub>s</sub> allowed as 10 MΩ.
- 6 - Maximum Upper Range is limited to 1.34 GΩ for 6622A-HV with the maximum R<sub>s</sub> allowed as 100MΩ based on 1000 V.

| 6622A Series General Specifications            |   |   |        |
|--|---|---|--------|
| Linearity                                      |   | ± 0.01 ppm of full scale (Full scale defined as 13.4:1 and 100:1)       |        |
| Display resolution (ppm)                       |   | ± 0.1 <b>ppb</b>  |        |
| Temperature Coefficient                        |   | 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)          | 10 µA ~ 150 mA (extension to 3000A available)                           |        |
|  | Resolution (µA)                         | 1 µA  |        |
|  | Accuracy [error(ppm) + offset(A)]       | ±100 ppm ± 10 µA  |        |
| Test voltage (for measurement above 100kΩ)     | V <sub>DC</sub> Range (±1mA compliance) | 0 ~ 100 Vdc (XR and XPR models). HV Model has 0 ~ 1000 Vdc              |        |
|  | Resolution (V)                          | 1 V for Bridges with 100 Volt Module, 256 bit for 1000 Volt Model (≈4V) |        |
|  | Accuracy error (%)                      | ± 0.2% of full scale voltage output                                     |        |
| Environmental                                  |   | Operating: 18~28°C, 20%~50%RH / Storage: -20~60°C, 15%~ 80%RH           |        |
| Power Requirements                             |   | VAC: 100V, 120V, 220V and 240V ± 10% / 50 or 60Hz ±5%, 200VA            |        |
| Dimensions (Width x Height x Depth)            |   |   | Weight |
| 440 mm x 200 mm x 465 mm                       |   | 17.3" x 7.8" x 18.3"  |        |
|  |   | 27 kg   |        |
|  |   | 59.5 lbs  |        |

**NEW** - 6623A-Series of Modular Range Extenders

**Range Extenders** allow DCC Bridges to measure “lower” resistance values (including current shunts) at higher current. Using proprietary technologies, Guildline engineers have again provided our customers with the most value and flexibility in expanding their **shunt measurement** capability. For calibration at higher currents, 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-3, 6623A-150, 6623A-300, 6623A-450, 6623A-600 6623A-1000, 6623A-2000 and 6623A-3000, each with built-in current source with maximum currents of **3A, 150A, 300A, 450A, 600A, 1000A, 2000A 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. **Just return the unit to Guildline** and we will upgrade it to a 900A model for you. Your Investment is protected. NOTE that **NO external power supplies, NO external mechanical switches, and NO compressed air are required** for operation. This results in dramatically reducing the purchase/installation cost, as well as ongoing training, calibration support, and operating costs. The 6622A-150 and 6623A-300 can both be operated from a **single-phase 120VAC input** and do **NOT** require a dedicated 3 phase circuit.



NOTE that **NO external power supplies, NO external mechanical switches, and NO compressed air are required** for operation. This results in dramatically reducing the purchase/installation cost, as well as ongoing training, calibration support, and operating costs. The 6622A-150 and 6623A-300 can both be operated from a **single-phase 120VAC input** and do **NOT** require a dedicated 3 phase circuit.

**NEW MODELS WITH CURRENTS UP TO 12,000 AMPS COMING IN 2011**

**For More information about the 6623A Series, Please refer to the Datasheet.**

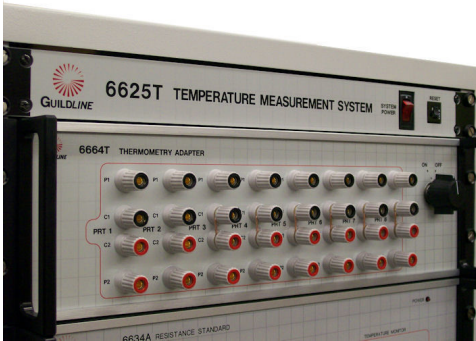
**NEW** - 6622A “T” Option for Thermometry Applications

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

## 6622A Series of DCC Bridges

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 20 $\mu$ A and 150mA to satisfy a wide range of sensitivity requirements. Root square values can be conveniently chosen from the instrument front panel or via software. **Temperature conversion and display** is done on the front panel, or on a PC using the BridgeWorks–C software

All 6622A models can be expanded to address temperature requirements without the need for a separate thermometry bridge, separate 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, display graphics**, and control all parameters.



One of the **key features** of the temperature option is how the unit is calibrated. This option is specifically **calibrated** at the **lower currents** found in thermometry and these offsets are stored separately from the Resistance calibration constants.

Not only does Guildline provide the temperature option for the bridge, but check out our full line of thermometry options including our **new 6664T Thermometry adaptor**. This adaptor provides a constant keep warm current to all SPRT's

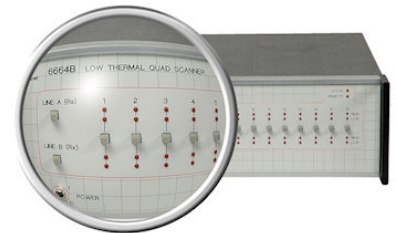
connected substantially reducing the time for calibration over the competition.

## 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-resistance values. The values are in a **shielded, self contained 30°C** temperature environment and usable in a laboratory environment of **23°C  $\pm$  5°C**. This series is extended in high values up to 100 T $\Omega$  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 6664C Scanners. These 8 or 16 Quad channel scanners can handle up to 2 A of current or voltages up to 1000Vdc. You can stack up to four scanners as needed with a total of 64 channels accessible by Bridgeworks Software.



For the best Unit Under Test (UUT) environmental control Guildline produces the **5030 Series of Precision Air Baths**. This series of programmable Air Baths not only maintain an **ultra stable 0.03°C** environment but also 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 programmable**. **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**.

And Guildline's **innovation** continues with the **66252 DMM Switch**. The purpose of this switch is to electrically isolate the Bridge, when using Resistance Standards that are connected to a scanner. This usefulness can be seen using a 5700 Calibrator as an example. The user is able to connect resistance standards that are on a scanner channel to Artefact calibrate the Calibrator and then simply switch over and run the complete Resistance verification of the 5700 values including the 1.9X Values.



Guildline also provides **full system solutions and full system integration**. Need a base system with one scanner and a resistance standard in a rack? 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 one hundred 6622A based systems complete with Range Extension, Multi-Channel Scanners, and Resistance Standards all in 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 Bridges with a 6634A Temperature Stabilized Resistance Standard, a 150A to 600A Range Extender for low Ohm measurements, and a **6520 Digital Programmable Teraohmmeter**. Start measuring from **1 μΩ all the way to 10 PΩ**. Just ask what **Guildline can make for you**.



## Verification of Performance

Bridges are not self-calibrating. All Bridges must have an initial calibration done at time of manufacture, and subsequently must be verified or re-calibrated on a periodic time schedule. Competitors misleadingly state that their Bridges are self-calibrating but in reality their Bridges are calibrated the same way as all commercial bridges including Guildline's – via external resistance standards.

Historically the verification that a precision DCC Bridge is operating as per its last calibration was challenging. A Harmon type transfer standard was needed for the verification of a bridge's non 1:1 measurement ratios along with high technical skill levels. With the introduction of the 6622A multi-ratio bridge, the verification of performance 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 levels and uncertainties.

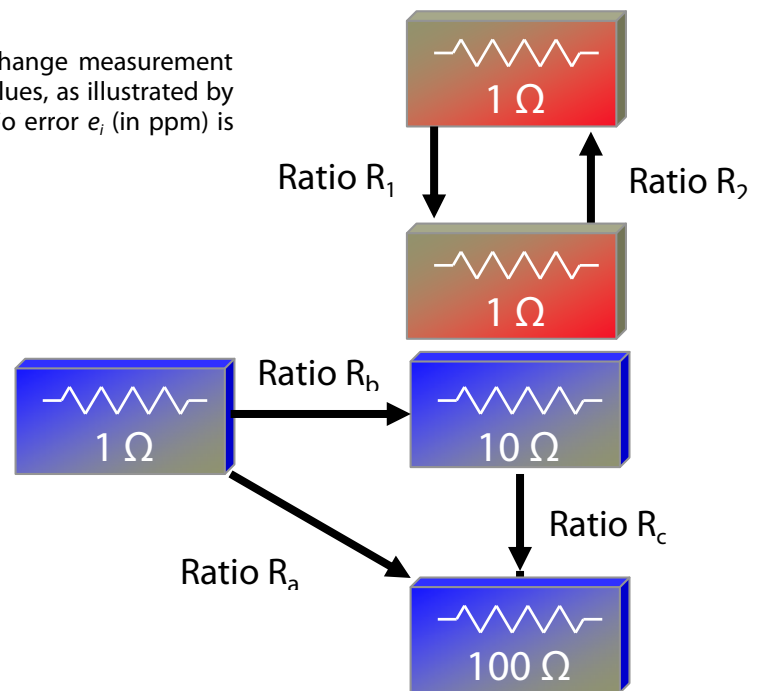
The 1:1 measurement ratio can be easily verified by interchange measurement tests using two stable standard resistors of same nominal values, as illustrated by the block diagram to the right. Bridge 1:1 measurement ratio error  $e_i$  (in ppm) is calculated using the following formula

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

Non 1:1 measurement ratios, such as 10:1 and 100:1 ratios can be easily verified 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.



## Warranty

**Over 50 Years of Guildline innovation** in engineering and design. **ONE BRIDGE** providing **complete expandability and flexibility** that meets your current and future measurement needs. Options that satisfy real measurement needs and provide 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 that covers both parts and labour.

# 6622A Series of DCC Bridges

## 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  $\mu\Omega$  all the way to 10 P $\Omega$** . 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   | Specify One Of Following Models (Bench or Rack)*   |
| <b>6622A-B</b>  | Base Accuracy, Range 100 k $\Omega$  |
| <b>6622A-XR</b>   | Base Accuracy, Extended Range to 100 M $\Omega$  |
| <b>6622A-XP</b>   | Extended Performance, Range 100 k $\Omega$   |
| <b>6622A-XPR</b>  | Extended Performance, Extended Range to 100 M $\Omega$   |
| <b>6622A-XPS</b>  | Extended Performance Special, Range 100 k $\Omega$   |
| <b>6622A-HV</b>   | Extended Performance, 1000 V, 1 G $\Omega$ Range   |
|   | *All Bridges include Calibration Certificate, Operator and Software manual, and one set of Rs/Rx Low Thermal Leads |
| /T  | Add's Temperature Option to Bridge   |
| /RC   | Report of Calibration Available at Nominal Charge  |
| /RT   | Specifies Rear Terminals versus Front Terminals (Default)  |
| SM6622A   | Service Manual (Extra Charge)  |
| <b>6622A SERIES OPTIONS</b>   |  |
| <b>Bridgeworks-UPG</b>  | 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  |
| <b>6634A-X</b>  | Temperature Stabilized Resistance Standard for 6622A Series  |
| <b>6623</b>   | 100 Amp Direct Current Comparator Range Extender   |
| 66233   | 100 Amp Programmable Power Supply for 6623-100A  |
| <b>6623A-3</b>  | External 3A Range Extender for DCC Resistance Bridge   |
| <b>6623A-150</b>  | External 150A Range Extender for DCC Resistance Bridge   |
| <b>6623A-300</b>  | External 300A Range Extender for DCC Resistance Bridge   |
| <b>6623A-450</b>  | External 550A Range Extender for DCC Resistance Bridge   |
| <b>6623A-600</b>  | External 600A Range Extender for DCC Resistance Bridge   |
| <b>6623A-1000</b>   | External 1000A Range Extender for DCC Resistance Bridge  |
| <b>6623A-2000</b>   | External 2000A Range Extender for DCC Resistance Bridge  |
| <b>6623A-3000</b>   | External 3000A Range Extender for DCC Resistance Bridge  |
| <b>6664C</b>  | 8 or 16 Channel, 2 Amp Low Thermal Scanner   |
| <b>6664A-12</b>   | SCW Lead pair with gold plated banana plugs, 2m in length  |
| <b>SCW/18-30</b>  | 30 Meters Shielded, Copper, Low Thermal Wire 18 Gauge  |
| Many other types of test and communication leads and accessories are available. |  |

**Guildline** IS DISTRIBUTED BY:

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