



GAMRY INSTRUMENTS IMX8 Electrochemical Multiplexer Owner's Manual

[Home](#) » [GAMRY INSTRUMENTS](#) » GAMRY INSTRUMENTS IMX8 Electrochemical Multiplexer Owner's Manual 



INSTRUMENTS IMX8 Electrochemical Multiplexer Owner's Manual



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Gamry Instruments, Inc.
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If You Have Problems

Please visit our service and support page at www.gamry.com/service-support/. This page contains information

on installation, software updates, and training. It also contains links to the latest available documentation. If you are unable to locate the information you need from our website, contact us via e-mail using the link provided on our website. Alternatively, you can contact us one of the following ways:

Internet www.gamty.com/service-support/

Telephone (215) 682-9330 9:00 AM-5:00 PM US Eastern Standard Time (877) 367-4267 Toll-free US & Canada Only

Please have your instrument model and serial numbers available, as well as any applicable software and firmware revisions.

If you have problems in the installation or use of a system containing an IMXB Electrochemical Multiplexer, please call from a phone next to your computer, where you can type and read the monitor while talking to us.

We will be happy to provide a reasonable level of free support for registered users of the IMX8 Electrochemical Multiplexer. Reasonable support includes telephone assistance covering the normal installation and use of an IMX8 Electrochemical Multiplexer connected to a Windows-10 or newer computer.

A service contract that extends both the hardware warranty and software update period is available at an additional charge. Software updates do not include software enhancements offered to our customers at additional cost.

Enhancements to the IMX8 Electrochemical Multiplexer and Gamry's standard applications software that require significant engineering time on our part can be performed on a contract basis. Contact us with your requirements.

Contents

- [1 Limited Warranty](#)
- [2 Chapter 1: Safety Considerations](#)
- [3 Chapter 2: Introduction](#)
- [4 Operation Overview](#)
- [5 Keyword Definitions](#)
- [6 Chapter 3: Installation](#)
- [7 Appendix A: IMX8 Specifications](#)
- [8 Appendix B: Grounding and Floating Operation](#)
- [9 Comprehensive Index](#)
- [10 Documents / Resources](#)
 - [10.1 References](#)
- [11 Related Posts](#)

Limited Warranty

Gamry Instruments, Inc. warrants to the original user of this product that it shall be free of defects resulting from faulty manufacture of the product or its components for a period of two years from the original shipment date of your purchase. Gamry Instruments, Inc. makes no warranties regarding either the satisfactory performance of the IMX8 Electrochemical Multiplexer including the software provided with this product, or the fitness of the product for any particular purpose. The remedy for breach of this Limited Warranty shall be limited solely to repair or replacement, as determined by Gamry Instruments, Inc., and shall not include other damages. Gamry Instruments, Inc. reserves the right to make revisions to the system at any time without incurring any obligation to install the same on systems previously purchased. All system specifications are subject to change without notice. There are no warranties that extend beyond the description herein. This warranty is in lieu of and excludes any and all other warranties or representations, expressed, implied or statutory, including merchantability and fitness, as well as any and all other obligations or liabilities of Gamry Instruments, Inc; including but not limited to, special or consequential damages.

This Limited Warranty gives you specific legal rights and you may have others that vary from state to state. Some states do not allow for the exclusion of incidental or consequential damages. No person, firm, or corporation is authorized to assume for Gamry Instruments, Inc., any additional obligation or liability not expressly provided herein except in writing duly executed by an officer of Gamry Instruments, Inc.

Disclaimers

Gamry Instruments, Inc. cannot guarantee that the IMXB will work with all computer systems, operating systems, and third-party potentiostat hardware. The information in this manual has been carefully checked and is believed

to be accurate as of the time of printing. However, Gamry Instruments, Inc. assumes no responsibility for errors that might appear.

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Chapter 1: Safety Considerations

Your IMX8 Electrochemical Multiplexer is supplied in a safe condition. This chapter of the IMX8 Operator's Manual contains some information and warnings that you must follow to ensure the continued safe operation of the IMX8.

An inspection

When you receive your IMXB Electrochemical Multiplexer, inspect it for evidence of shipping damage. If you note any damage, please notify Gamry Instruments Inc. and the shipping carrier immediately. Save the shipping container for possible inspection by the carrier.



Warning:

An IMX8 damaged in shipment can be a safety hazard. Do not operate a damaged apparatus until a qualified service technician has verified its safety. Tag a damaged IMXB to indicate that it could be a safety hazard.

Protective Grounding and Product Safety

As defined in IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, the IMX8 is a Class I apparatus. Class I apparatus is only safe from electrical-shock hazards if the case of the apparatus is connected to protective earth ground. In the IMXB this protective-ground connection is made via the ground prong in the AC line cord. When you use the IMX8 with an approved line cord, the connection to the protective earth ground is automatically made prior to making any power connections.



Warning:

Do not negate the protection of the IMX8's earth ground by any means. Do not use the IMXB with a two-wire extension cord, with an adapter that does not provide for protective grounding, or with an electrical outlet that is not properly wired with a protective earth ground. If the protective ground is not properly connected, it creates a safety hazard, which could result in personal injury or death.

The IMX8 is supplied with a line cord suitable for use in the United States. In other countries, you may have to replace the line cord with one suitable for your type of electrical outlet. You must always use a line cord with a CEE 22 Standard V female connector on the instrument end of the cable. This is the same connector used on the US standard line cord supplied with your IMX8.



Warning:

If you replace the line cord, you must use a line cord with the same polarity as that supplied with the IMX8. An improper line cord can create a safety hazard, which could result in personal injury or death.

The wiring polarity of a properly wired connector is shown in Table 1.1 for both US line cords and European line cords that follow the "harmonized" wiring convention.

Table 1-1 Line Cord Polarities and Colors

| | Line | Neutral | Earth Ground |
|----------|-------|------------|--------------|
| US | Black | White | Green |
| European | Brown | Light Blue | Green/Yellow |

If you have any doubts about the line cord for use with your IMX8, please contact a qualified electrician or instrument service technician for assistance. He or she can perform a simple continuity check that can verify the connection of the IMX8 chassis to earth and thereby check the safety of your IMX8 installation.

Ventilation

Your IMX8 Electrochemical Multiplexer was designed to operate at ambient temperatures between 0°C and 40°C.



Caution:

Be careful when operating the IMX8 in an enclosed space (such as an enclosed relay rack or NEMA enclosure). The temperature within the enclosure must not exceed 40°C. You may need to provide ventilation holes or even forced air cooling for the enclosure if the temperature rises excessively.

Defects and Abnormal Stresses

You should treat your IMX8 Electrochemical Multiplexer as potentially hazardous if any of the following is true of the unit:

- It shows visible damage.
- It does not operate properly.
- It has been stored for a long period of time under unfavorable conditions.
- It has been dropped or subjected to severe transport stress.
- It has been subjected to environmental stress (corrosive atmosphere, fire, etc.).

Do not use your IMX8 or any other apparatus if you think it could be hazardous. Have it checked by qualified service personnel.

There are limited conditions on the storage, shipping, and operation of this equipment. The IMXB is not designed for outdoor use.

Storage

Ambient Temperature.....—20°C to 60°C

Relative Humidity.....Maximum 90% non-condensing

Shipping

Same as storage plus

Acceleration.....Maximum 30 G

Operation

Ambient Temperature..... 10°C to 40°C

Relative Humidity..... Maximum 90% non-condensing

Cleaning

Disconnect the IMXB from all power sources prior to cleaning.

Use a cloth lightly dampened with either clean water or water containing a mild detergent, to clean the outside of the IMX8 enclosure. Alternatively, you may use isopropyl alcohol. Do not use a wet rag or allow fluid to enter the IMX8 enclosure. Do not immerse the IMX8 in any type of cleaning fluid (including water). Do not use any abrasive cleaners.

Service

Your IMX8 Electrochemical Multiplexer has no user-serviceable parts inside. Refer all services to a qualified service technician.

Warning:

Never operate the IMX8 with any cover or panel on the chassis open. Dangerous AC line voltages are present at several points within the IMX8 chassis, including PC board traces. Always remove the power connection before opening the IMX8 case.

RFI Warning

Your IMX8 Electrochemical Multiplexer generates, uses, and can radiate radio-frequency energy. The radiated levels are low enough that the IMX8 should present no interference problem in most industrial laboratory environments. The IMX8 is likely to cause radio-frequency interference if operated in a residential environment.

Electrical Transient Sensitivity

Your IMX8 Electrochemical Multiplexer was designed to offer reasonable immunity from electrical transients. However, in severe cases, the IMX8 could malfunction or even suffer damage from electrical transients. If you are having problems in this regard, the following steps may help:

If the problem is static electricity (sparks are apparent when you touch the IMX8):

- Placing your IMX8 on a static-control work surface may help. Static-control work surfaces are now generally available from computer-supply houses and electronics-tool suppliers. An antistatic floor mat may also help, particularly if a carpet is involved in generating static electricity.

- Air ionizers or even simple air humidifiers can reduce the voltage available in static discharges.
If the problem is AC power-line transients (often from large electrical motors near the IMX8):
- Try plugging your IMX8 into a different AC-power branch circuit.
- Plug your IMX8 into a power-line surge suppressor Inexpensive surge suppressors are now generally available because of their use with computer equipment.

Contact Gamry Instruments, Inc. if these measures do not solve the problem.

CE Compliance

The European Community has instituted standards limiting radio-frequency interference from electronic devices and mandating several safety requirements. Gamry Instruments, Inc. has modified its instruments, including the IMX8, to comply with these standards.

The relevant CE regulations include EN55022 Class B and EN60950.

Chapter 2: Introduction

The IMX8 Electrochemical Multiplexer was developed to increase the throughput of your electrochemical testing program. It allows one potentiostat/galvanostat/ZRA to drive up to eight electrochemical cells. Under the control of an external computer, the IMX8 connects one cell at a time to the potentiostat, which makes an electrochemical measurement on that cell.

The IMX8 was specially designed for the needs of electrochemists. Extra features such as sense line and shield-switching, and control of inactive cells separate the IMX8—designed specifically for electrochemists—from other general-purpose switching devices.

This chapter of the IMX8 Operator's Manual provides an overview of the operation of the IMX8. It discusses the following topics:

- Operation overview
- Switching and inactive cell control
- Communications overview

The material in this chapter is only an overview. If you are using your IMX8 with Gamry Instruments software this overview should give you sufficient understanding to make intelligent use of your IMX8.

Operation Overview

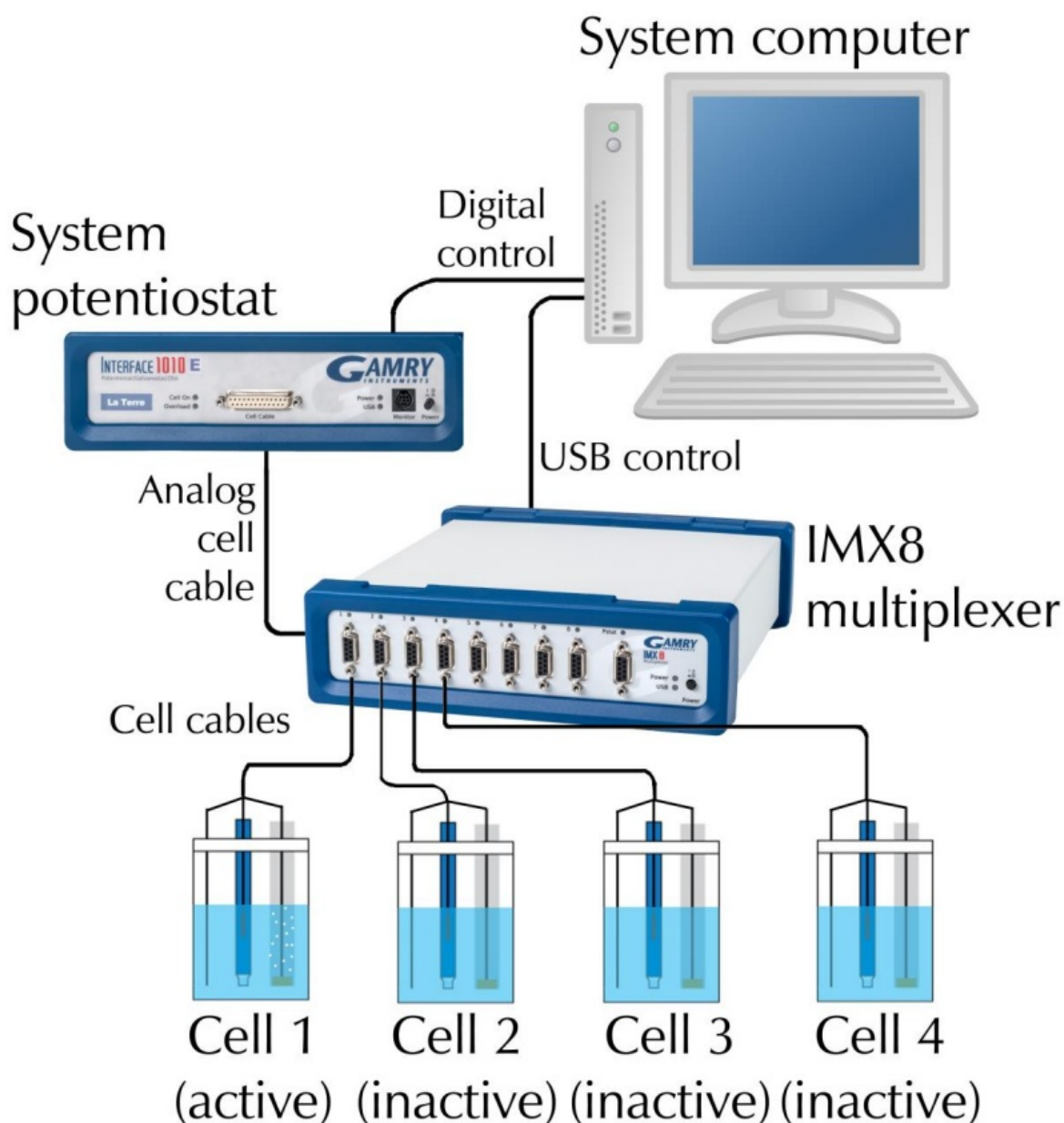
Figure 2-1 shows a “typical” electrochemical test system built around an IMX8 Electrochemical Multiplexer. Only four cells are shown in this figure, although up to eight cells can be connected simultaneously. The label on the block marked as a potentiostat is slightly misleading. Most potentiostats can also be used as a galvanostat or as a ZRA (zero resistance ammeter) in an IMX8 system.

In the description of this figure, keywords are in bold type and are defined in the next section.

Figure 2-1 A Typical Electrochemical Test System Using the IMX8

System computer

Figure 2-1
A Typical Electrochemical Test System Using the IMX8



The system computer is a critical component of the system. It controls the IMX8 by sending it simple commands through a USB connection.

The most important function of these commands is to select which cell is active (connected to the system potentiostat). You can think of an IMX8 as a complex switch. One of the eight-cell cables on the IMX8 is switched so that it connects to the potentiostat's cell cable. All of the wires (including sense leads and shields) in the cell cable are switched. Other commands select the IMXB's control mode for the cells that are inactive (not presently connected to the potentiostat).

The system computer also controls the system potentiostat. When a cell is connected to the system potentiostat cell leads, the computer causes a test to be run on that cell. The test can be as simple as a single current or potential measurement or as complex as a cyclic scan. The computer software and system potentiostat are responsible for taking the measurement and storing it.

In a typical IMX8 experiment, the system computer cycles through the cells. Each cell is connected in turn to the system potentiostat and used to collect a measurement. Usually the computer delays at the end of each cycle through the cells so that the measurements on each cell are separated by a fixed time period.

Keyword Definitions

The following key terms are used throughout this manual.

Active Cell

The active cell is the cell (if any) currently connected to the system potentiostat. Any electrochemical measurements are made on the active cell.

Cell

The term cell is used to describe either an electrochemical cell or the switches needed to connect an electrochemical cell to the system potentiostat.

Channel

An IMX8 contains eight channels. A channel includes cell-switching, a local potentiostat, and a D/A converter. The term cell is used when only the cell-switching portion of a channel is being discussed.

Inactive Cell

The term inactive cell is any cell not currently connected to the system potentiostat. Inactive is a slightly misleading term since an inactive cell can actually be potentiostat by the IMX8's local potentiostat on that channel.

Inactive Mode

Inactive cells can be open, connected to a local potentiostat, or shorted. The term inactive mode describes this choice of control mode for inactive cells.

Local Potentiostat

A simple low-current potentiostat that maintains potential control on inactive cells. Unlike the system potentiostat, the local potentiostat is incapable of making electrochemical measurements.

System Computer

The computer is responsible for coordinating the operation of an IMX8-based electrochemical test system, not to be confused with the very simple micro-controller buried within the IMX8.

System Potentiostat

This is the potentiostat responsible for making electrochemical measurements on the cells used in the experiment. The system potentiostat is typically a full-featured, computer-controlled instrument.

Switching and Inactive Cell Control

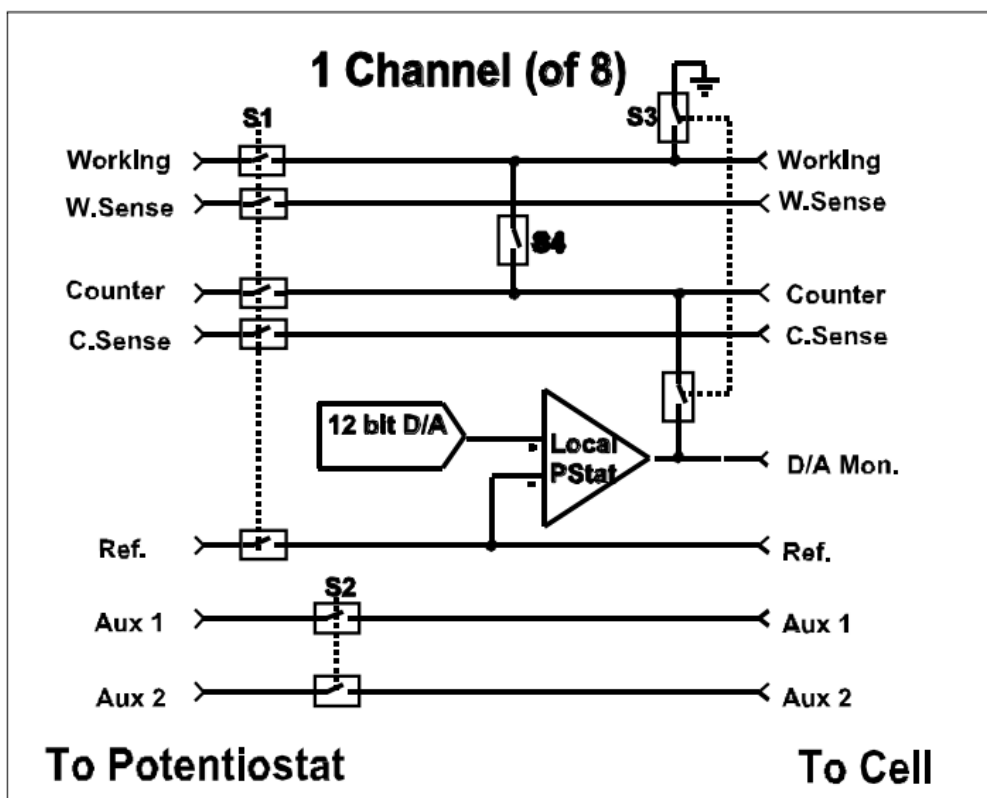
In the Operation Overview, we said you can think of the IMXB as a complex switch. This section of the manual describes the IMXB-switching in some detail. In addition, control modes for inactive cells are discussed.

Each of the eight IMXB channels is made up of an independent set of switches and control circuits. Figure 2-2 is a simplified schematic diagram for one channel of the IMX8. Switches connected with dotted lines are always switched together and are therefore treated as one multi-pole switch. All the switches are under the control of the system computer. Shield relays are not shown.

The cell cable from the system potentiostat is connected at the left side of the schematic. The system-potentiostat cell cable is also connected to all of the other channels. The system computer must ensure that only one cell at a time is connected to the system potentiostat.

Figure 2-2 Simplified Schematic of One IMX8 Channel

Figure 2-2
Simplified Schematic of One IMX8 Channel



Switch S1 controls which cell is active. S3 and S4 control the inactive mode of the cell on this channel.

Looking at the schematic, you can see that switch S_i connects this channel's cell to the system potentiostat. An active channel always has S3 and S4 open. The relays in S1 are rated to carry 2 A and switch 1 A. You can normally use the IMX8 with potentiostats rated at up to 100 V of output compliance and 2 A of output current.

To avoid transients, always turn off the cell at the system potentiostat prior to switching S1. The IMX8 switches all its relays nearly simultaneously (even those in different channels), but there is still about 1 millisecond in which the relay pattern in the IMX8 is in neither the initial or final configuration. Switching transients as the IMX8 switches channels with a "live" potentiostat can be particularly severe because the system potentiostat's feedback goes through one of the S1 relays. To avoid the problem, turn off the cell at the system potentiostat before switching channels.

The switch labeled S2 connects one of eight pairs of uncommitted contacts to a common input/output connector. The system computer must make sure that S2 is closed for only one channel at a time. Switch S2 is controlled independently of S1, although they are often switched together.

You have a choice of three different control schemes for inactive cells. These are tabulated in Table 2-1 along with the active mode.

Table 2-1 IMXB Control Modes

| Mode | S1 | S3 | S4 |
|--------------------|--------|--------|--------|
| Active | Closed | Open | Open |
| Open | Open | Open | Open |
| Local potentiostat | Open | Closed | Open |
| Shorted | Open | Open | Closed |

The inactive control mode labeled "open" is the simplest. In this mode the cell is disconnected and isolated from both the system potentiostat and the IMX8. No cell current can flow between any electrodes. This is the most common inactive mode in corrosion studies, where the cell behavior at open circuit is of interest.

The inactive control mode labeled "local potentiostat" is used to maintain potential control between readings made with the system potentiostat. If you know something about operational amplifiers and potentiostats, you may recognize that the operational amplifier in Figure 2-2 is wired as a simple potentiostat. With S3 closed, the working electrode is connected to the ground on the IMX8 circuit board and the counter electrode is connected to the

output of an operational amplifier. The feedback for this amplifier is taken from the cell's reference electrode. This mode can be used whenever it is important to maintain potential control between readings. One experimental example is tests on amperometric chemical sensors.

Unlike a typical system potentiostat, the local potentiostat is very limited in capability. The amplifier in this local potentiostat is not a large power amplifier. Its output is typically capable of generating ± 30 mA at up to ± 5 V. The local potentiostat has no cell switch other than S3, and it cannot measure current.

Notice that the reference electrode is always connected to the local potentiostat amplifier. You must make sure that the reference electrode potential does not go beyond ± 5 volts with respect to the IMX8 chassis voltage. This is true in all operating modes including the active mode.



Caution: You can damage the local potentiostat's amplifier if the reference electrode potential exceeds ± 24 volts versus the IMX8 chassis.

The final inactive mode is labeled "shorted" in Table 2-1. In this mode a relay shorts the working and counter electrodes. This mode was added so that the IMX8 could be used in galvanic corrosion studies. In a galvanic corrosion experiment, the current flow between two electrically connected metals is measured. The device that makes this measurement is called a zero-resistance ammeter (ZRA).

In the shorted inactive mode the two metals are connected, even when the system ZRA is measuring other channels. The shorted mode is subject to some errors at high currents because of the resistance in relays, wires, and connectors. With a 1.5 m Gamry Instruments cell cable, the resistance between the two electrodes should be less than 0.2 Ω . A good ZRA is much better in this regard, with electrode-to-electrode impedances in the low m Ω .

Chapter 3: Installation

This chapter of the IMX8 Electrochemical Multiplexer Operator's Manual covers the normal installation of the IMX8. Both installation as part of a Gamry Framework-based electrochemical-measurement system and installation as a component in a user-configured system are discussed.

Initial Visual Inspection

After you remove your IMX8 from its shipping carton, check it for any signs of shipping damage. If you note any damage, please notify Gamry Instruments, Inc. and the shipping carrier immediately. Save the shipping container for possible inspection by the carrier.



Warning: An IMX8 damaged in shipment can be a safety hazard. Do not operate a damaged apparatus until a qualified service technician has verified its safety. Tag a damaged IMX8 to indicate that it could be a safety hazard.

Physical Location

Place your IMX8 on a normal workbench surface. The IMX8 is not restricted to operation in a horizontal position. You can operate it on its side, or even upside-down. It may even be stacked on top of a Gamry Instruments potentiostat. To the right is an example of stacking the IMX8 on top of your potentiostat.

Power cord



Power cord

Plug the AC line cord into the **Power In** jack on the left side of the IMX8's rear panel. Connect the line cord to the power module. Then plug the line cord into your AC power outlet (mains).



Before you make any other connections to your IMX8, check that the IMX8 is at least partly functional. Switch on the IMX8 by depressing the **Power** button on the lower right of the front panel.



One quick test is to check the eight LED indicators on the front panel of the instrument. Watch these LEDs as the IMX8 is powered up. The LEDs should flash on momentarily, then go out. If any of the eight cell LEDs stay on after the IMX8 powers up, the IMX8 is malfunctioning.

Connection to Gamry Instruments Reference 600, 600+, or 620 and Interface 1000 or 1010

Connection of your IMX8 to a Gamry Instruments Reference 600, 600+, 620, or Interface 1000 or 1010 potentiostat is quite simple. Gamry Instruments supplies a standard cable (part number 985-00080) that properly connects the cell wires. This 1.5 m cable is equipped with a male 9-pin D-connector on the IMX8 end and a male 25-pin D-connector on the Reference 600, 600+, 620, or Interface 1000 or 1010 end.

Connect the 9-pin end to the **Pstat** jack on the IMX8. Connect the 25-pin end to the **Cell Cable** jack on the potentiostat. Be sure to tighten the knurled knobs on each end of the cable to affix them properly to the instruments.



Caution:

Never substitute a generic 25-to-9-pin cable designed for computer interconnection for this cable. The Gamry Instruments' cable includes individual shielding for several signals in this cable. The use of a generic cable is likely to create excessive noise and system oscillation.

The Reference 600, 600+, 620, or Interface 1000 or 1010 can identify the cable plugged into its cell connector. It detects the presence of an IMX8 in your system. The Reference 600, 600+, 620, or Interface 1000 or 1010 cannot identify the cables used to connect the eight individual cells to the IMX8.

EIS performance with an IMX8 and a Reference 600, 600+, 620 or Interface 1000 or 1010 is optimal when all the cell cables are 1.5 m cables. All other cables may create errors in phase and magnitude.

Connection to Gamry Instruments Reference 3000

Connect the dual ends of the Y-cable (part number 985-00108) to the appropriate jacks on the front of the Reference 3000. Attach the single end of the Y-cable to the 985-00080 (PCS-to-IMX8 cable). Attach the other end of the 985-00080 cable to the Pstat connector on the front of the IMX8.

Cell Cables

Each cell to be tested in an experimental run requires a cell cable. Newer IMX8 multiplexers are shipped with eight-cell cables.

When you are using the IMX8 with a Gamry Instruments potentiostat, cell-cable connections to the cell are made in the manner described in the potentiostat's Operators Manual.

When you are using the IMX8 with a Gamry Instruments potentiostat, cell-cable connections to the cell are made in the manner described in the potentiostat's Operators Manual.

1.5 m, 4 m, and 9 m cables are available with banana-plug/alligator-clip termination. Specialized cables are also

available, including cables designed for connection to standard three-terminal corrosion-monitoring probes. Contact us for more information.

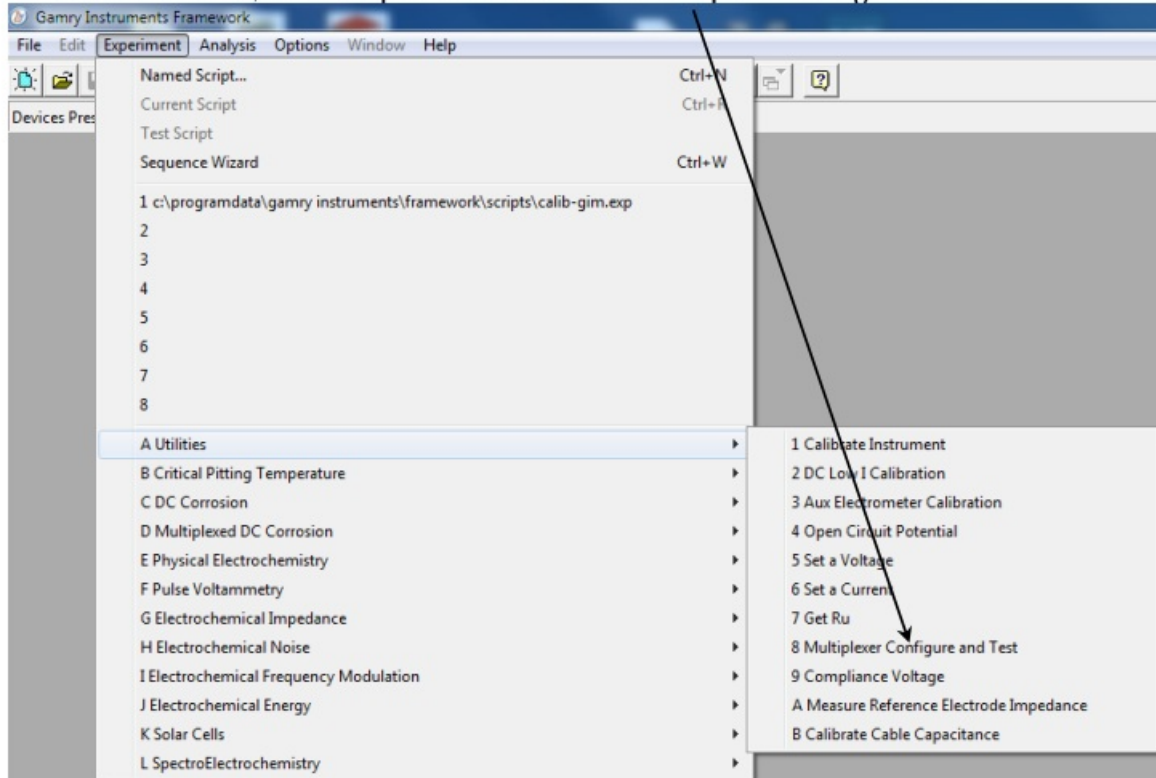
If you need to design a cell cable for your specific needs, refer to the pin-out of the IMXB cell cable in Appendix C of this manual.

Software Installation

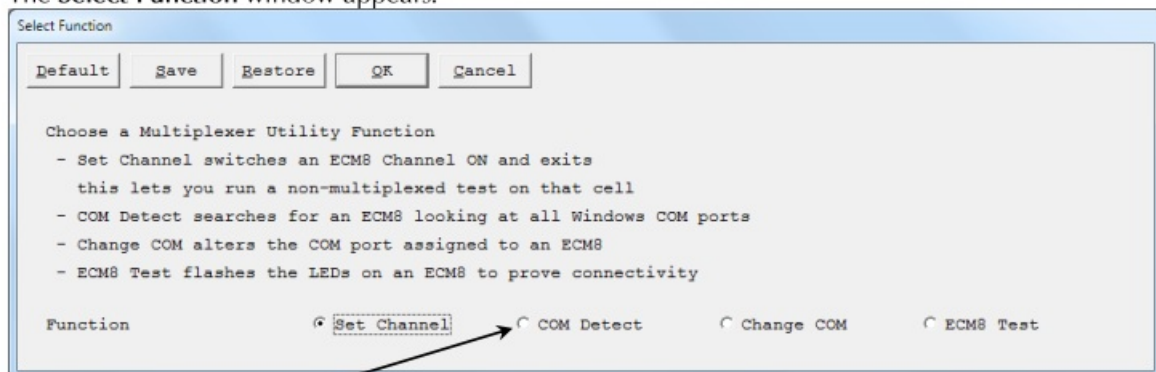
The installation process for the Gamry Framework also installs Gamry's Framework application packages and installs any multiplexed scripts that are available for those applications. Test the Communications and Run Your Experiment

1. Be sure your host computer is on, the multiplexer is on, and your potentiostat is on.
2. Run the Gamry Framework™ software.

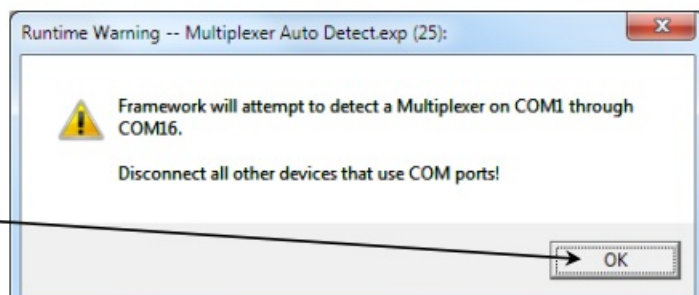
In the main menu bar, choose **Experiment > Utilities > Multiplexer Configure and Test.**



The **Select Function** window appears:

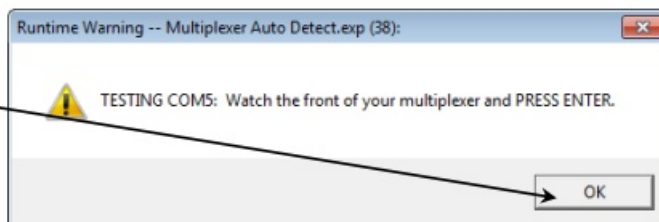


4. Select the **COM Detect** radio button, then click the **OK** button.
5. The **Runtime Warning – Multiplexer Auto Detect** window appears.
6. Click the **OK** button.



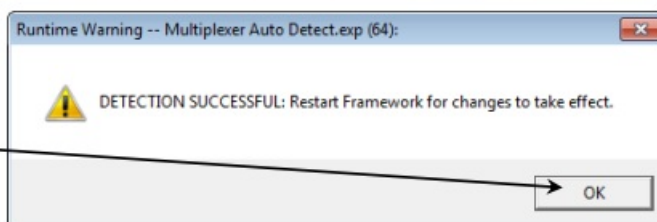
A window informs you that the test will begin.

Click the **OK** button, and watch the eight amber LEDs on the front of the multiplexer illuminate in sequence three times. Listen for the simultaneous clicks of the relays.



A window asks you to restart Gamry Framework.

Click the **OK** button. Connect the included cell cables to the desired channels on the back of the multiplexer, then restart Framework.



In the Framework software, run the desired multiplexed experiment.

Activate the checkboxes corresponding to the active channels on the multiplexer.

When a particular channel runs, the amber LED for that channel illuminates.

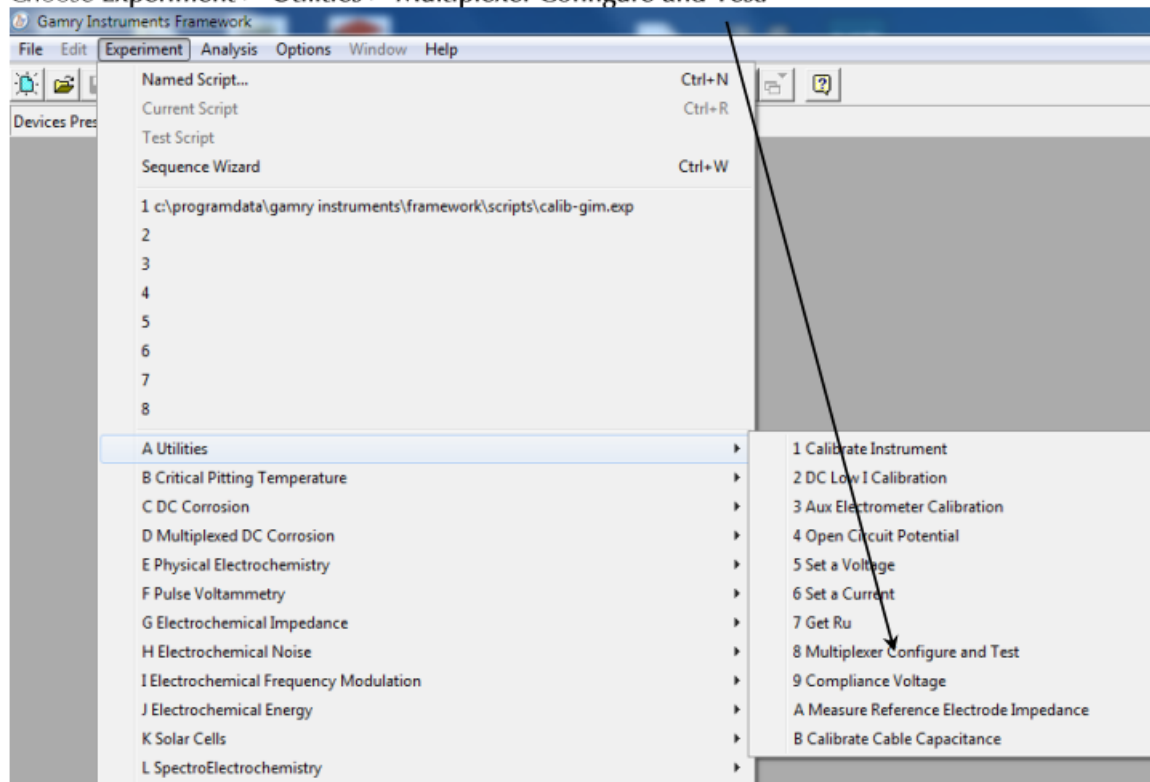
| Channel | Identifier | System | Area | Notes |
|----------------------------|------------|---------|------|--------------------------|
| <input type="checkbox"/> 1 | Test1 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 2 | Test2 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 3 | Test3 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 4 | Test4 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 5 | Test5 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 6 | Test6 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 7 | Test7 | DEFAULT | 1 | <input type="checkbox"/> |
| <input type="checkbox"/> 8 | Test8 | DEFAULT | 1 | <input type="checkbox"/> |

If you are running AC experiments (e.g., EIS), you must run AC calibration of your potentiostat with the multiplexer connected. For all DC experiments calibration is not needed.

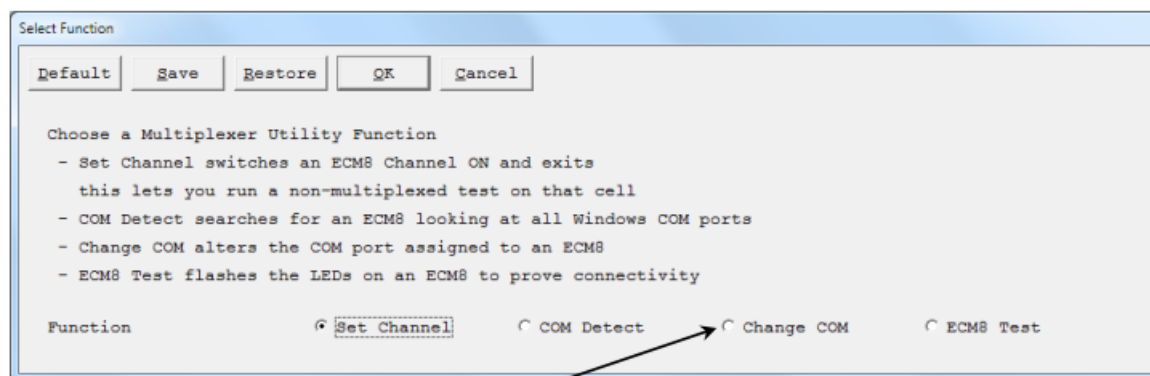
To Change the Multiplexer COM Port

1. Be sure your host computer is on, the multiplexer is on, and your potentiostat is on. 2. Run the Gamry Framework software.

Choose **Experiment > Utilities > Multiplexer Configure and Test**.

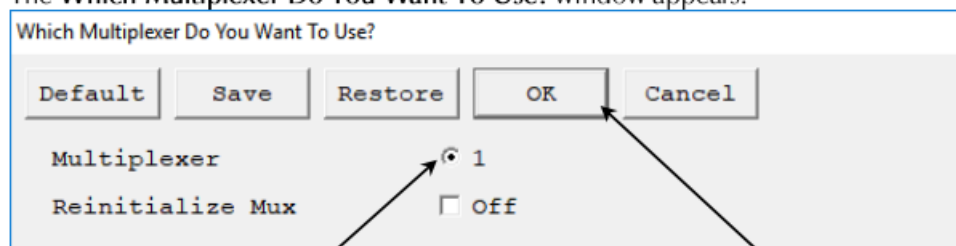


The **Select Function** window appears.



Choose the **Change COM** radio button.

The **Which Multiplexer Do You Want To Use?** window appears.



Choose the desired radio button (if there is a choice), then click the **OK** button.

Appendix A: IMX8 Specifications

Specifications apply at 25°C, 116 V AC power, and operation with a Gamry Instruments potentiostat unless otherwise noted.

Channel Characteristics

| | | |
|---------------------------|-----------------------------|-------------------------------------|
| Modes | Active, Off, Local, Shorted | |
| Channel switching time. | <10 ms | |
| Cell current | 2A | Maximum carried |
| Input voltage (operating) | 1A | Maximum switched |
| Input voltage (no damage) | ±12 V | Measured versus IMX8 chassis ground |
| Counter electrode voltage | ±24 V | Measured versus IMX8 chassis ground |
| | ±120 V | Measured versus IMX8 chassis ground |

Channel Isolation

Current leakage..... <2 nA maximum

Impedance>500 MO..... <20 pF

Live channel pin from any source. equiv. impedance to IMX8 chassis ground.

Local Potentiostat

| | | |
|-------------------------|---------------|--------------------------|
| Compliance-current | ±20 mA | 500 iZ load |
| Compliance-voltage | ±11 V | 1 ko load |
| Applied E Range | ±5.12 V | Working versus Reference |
| Resolution | 2.5 mV/bit | 0 V output into |
| Zero-offset error | <4 mV typical | 10 kCI load |
| Gain error | <10 mV max | 10 ko load |
| Reference input current | <0.2% <50 pA | |

Note: Applied voltage error is the sum of zero-off set error and gain error.

Power Input

Input voltage ranges.....100-240 V RMS..... Selectable

Allowed voltage variation.....±10%.....All ranges

Power.....<50 VA.....Worst case rating

Environmental

Operating temperature..... 0 to 40°C

Humidity 0 to 90% noncondensing

Appendix B: Grounding and Floating Operation

Overview As shipped from the factory, the IMX8 has not been configured for use with “floating” potentiostats. As you can see from the specifications, in normal operation all the electrodes except the counter electrode are limited to potentials ±12 V versus the IMX8 chassis ground. The IMX8 chassis is connected to the protective earth line in the power cord, so the potential is limited to ±12 V versus earth ground.

This limitation prevents the IMX8 from working with cells where the counter electrode must be earth-grounded. Some autoclaves use the earth-grounded wall of the autoclave as the counter electrode. You should be able to use the IMX8 with cells that have an earth-grounded working electrode, as long as the potentials of the IMX8’s earth ground and the cell’s earth ground are reasonably close together.

The ground pin on the IMX8’s potentiostat connector is not connected to the IMX8’s chassis ground. It is quite possible to have a several-volt difference between these grounds without any adverse effects on measurements made through the IMX8. Larger ground differences are likely to cause a violation of the ±12 V electrode-to-chassis-ground limitation.



Warning: It is very dangerous to defeat the IMX8’s connection to the protective earth ground. The earth-ground protection is there for operator safety in case of a severe power-supply problem with the instrument. Even if you do break the earth-ground connection in the AC power cord, the USB connection usually re-establishes an earth ground.

If you really need to multiplex cells with earth-grounded counter electrodes, see the next section. It tells how you can move jumpers in the IMX8 to remove the ±12 volt limitation. Unfortunately, this change also disables the local

potentiostats in the IMX8.

Disabling the IMX8 Local Potentiostats [Needs more input from R&D]

Under many circumstances, the IMX8 cannot operate with cells that contain earth-grounded electrodes. See the Overview above. The reference-electrode connection in the IMX8's local potentiostats is the cause of the problem.

Fortunately, you can disable the local potentiostats, thereby eliminating the problem with floating operation.

Disable the local potentiostats by moving eight jumpers inside the IMXB chassis. Follow these instructions to disable the IMXB's local potentiostats:

1. First, remove the IMXB power cord from the IMX8's rear-panel power-entry module.



Warning: Dangerous voltages are exposed if the IMXB chassis is open with the power cord connected to a source of AC power. To prevent a shock hazard that could result in personal injury or even death, always unplug the IMXB from its AC power source before removing any panel or cover.

2. The IMXB top cover is held in place by one screw at the middle rear of the cover. Remove this screw, making sure that you do not lose it.
3. Slide the IMXB top cover backward and off the chassis. You may need to loosen (do not remove!) the set of screws on one side of the IMX8 if the cover does not slide off easily
4. All the IMXB circuitry is contained on one large printed circuit board. All locations and directions are given assuming that you are looking over the IMXB's front panel towards the IMX8's rear panel. The local potentiostat jumpers are near the back of the instrument. There are eight jumpers, one for each channel. They are located in a gap within the "field" of relays on the IMXB printed circuit board. There are also two jumpers on the right side of the IMX8's board.



Caution: These jumpers are near the IMXB's microprocessor, a large 40-pin integrated circuit. Do not change the position of these jumpers.

Each jumper is located on one side of a set of three pins. If the jumper is on the leftmost pair of pins, the local potentiostat is enabled. If the jumper is on the rightmost pair of pins, the local potentiostat is disabled.

5. If you need a local potentiostat operation and don't need a floating operation, move the jumper on each channel to the left side. If you need a floating operation and don't need the local potentiostats, move the jumper to the right side.




You can enable the local potentiostat on some channels and disable it on others.

6. Replace the IMX8 top cover and its retaining screw.
7. Replace the IMX8 power line cord.
8. If you have disabled some or all of the IMX8's local potentiostats, we recommend that you label the outside of your IMX8 to show that you have done this.

Comprehensive Index

| | |
|---|---|
| 985-00080, 2, 3 985-00108,3 AC line cord, 1-1 active cell, 2-3, 2-4 autoclaves, 3-1 CE Certificate, 3-1 CE Compliance, 1-4 cell definition, 2-4 cell cable, 3 Change the Multiplexer COM Port, 5 channel definition, 2-4 schematic, 2.5 cleaning, 1-3 contract engineering, i CSA Certificate, 3-1 current carrying, 2-5 switching, 2-5 Disabling Local Potentiostats, 3.1 earth ground, 3-1 electrical transients, 1-3 environmental specifications, 1 environmental stress, 1-2 Experiment, 4, 6 Floating Operation, B-1 floating potentiostats, 3-1 Framework software, 3, 5 ground, B-1 host computer, 3, 5 inactive definition, 2-4 modes, 2-6 inactive cell, 2-3 inactive mode, 2-4 installation, 1 Interface 1000, 2 Interface 1010, 2, 3 | local potentiostat, 2-4, 2-6, 1 Multiplexer Auto Detect, 4 Multiplexer Auto Detect window, 4 Multiplexer WM Port, 6 OK button, 4, 5, 6 open, 2-6 operation, 1-3 PC5 to ECMS cable, 3 potentiostat, iii, 2.1, 2-2, 2-3, 24, POTENTIOSTAT connector, 3 power line transient, 1-4 protective grounding, 1-1 Reference 3000, 3 Reference 600+, 2, 3 reference electrode, 2.6 RFI, 1-3 safety, 1-1 schematic channel, 2-5 service, 1-3 service contract, i shipping, 1-3 shorted inactive mode, 2-6 specifications, 1 static electricity, 1 -4 storage, 1-3 support, i system computer, 2-3 definition, 24 system potentiostat, 2-3, 2-4 telephone assistance, i Utilities, 4 ventilation, 1-2 Warranty, ii Which Multiplexer Do You Want To Configure? window, 6 Y-cable' 3 ZRA,2-2,2-6 |
|---|---|

Documents / Resources

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|---|--|
|  | <p>GAMRY INSTRUMENTS IMX8 Electrochemical Multiplexer [pdf] Owner's Manual IMX8, Electrochemical Multiplexer</p> |
|  | <p>GAMRY INSTRUMENTS IMX8 Electrochemical Multiplexer [pdf] User Guide IMX8, Electrochemical Multiplexer, IMX8 Electrochemical Multiplexer</p> |
|  | <p>GAMRY INSTRUMENTS IMX8 Electrochemical Multiplexer [pdf] User Guide IMX8, Electrochemical Multiplexer, IMX8 Electrochemical Multiplexer</p> |

References

-  [Documentation Downloads: Quick Start Guides|Manuals|Installation Notes Gamry Instruments](#)