MicroScribe 3D

Desktop Digitizing Systems

User's Guide & Set-Up Instructions

Immersion

Immersion Corporation
San Jose, CA

HARDWARE LIMITED WARRANTY

Limited Warranty. Immersion Corporation ("Immersion") warrants the Microscribe 3-D™ product (the "Product") against defects in workmanship and materials for a period of one (1) year from the date of delivery (the "Warranty Period"). Your sole and exclusive remedy, and Immersion's sole liability shall be for Immersion, in its discretion, to repair or replace the defective Product or to refund the purchase price. This limited warranty is void if the defects have occurred as a result of accident, abuse, or misapplication.

Return for Service. In the event that you discover a defect during the Warranty Period, notify Immersion or the reseller from whom you purchased the Product. Immersion or the reseller will provide you with a return authorization for the Product ("RMA"). Upon receipt of such RMA, return the Product to Immersion's designated repair facility, freight prepaid, with a statement describing the defect in reasonable detail. In the event that you need to contact Immersion directly, contact:

Immersion Corporation
801 Fox Lane
San Jose, CA 95131

microscribe_tech@immersion.com

Phone: 408-467-1900
Fax: 408-467-1901

Radio and Television Interference

The equipment described in this manual uses and generates radio-frequency energy. Because of this, improper use and/or installation may cause interference with radio and television reception. This equipment is certified to comply with Chapter 15 of the FCC Rules. Changes or modifications not expressly approved by Immersion Corp. could void the user's authority to operate the equipment.

If you suspect interference from the Immersion MicroScribe, please turn off the unit and check for the interference. If your Immersion Probe does appear to be causing interference to radio and/or radio reception, attempt to correct the problem with the following suggestions:

- Turn the television or radio antenna until the interference stops.
- Move the interfering device to one side or the other of the television or radio.
- Move the television or radio farther away from the interfering device.
- Use only shielded cables to connect the device to it's attachments.
- Plug the interfering device into an outlet that is on a different circuit than the radio or television.

If problems persist, contact Immersion Corp. or an experienced radio/television technician for additional suggestions. For further information, you may find the following booklet informative: "How to Identify and Resolve Radio-TV Interference Problems" (stock number 004-000---345-4). This booklet is published by the Federal Communications Commission and is available from the U.S. Government Printing Office, Washington, DC 20402.

Immersion Corporation

Version 1.0 May, 1995
Version 1.1 September, 1995
Version 1.2 March, 1996
Version 1.3 June, 1998
Version 1.4 March, 2000

This copy printed March 28, 2000.

MAILING & SHIPPING:
801 Fox Lane
San Jose, CA 95131

Phone: 408-467-1900
Fax: 408-467-1901
www.microscribe.com
www.immersion.com

Immersion

Table of Contents

CHAPTER 1 Overview

Congratulations on your purchase of a MicroScribe-3D, model 3D, 3DX, 3DL, or 3DLX. This manual provides you with the information you need to quickly begin digitizing 3-D objects.

FUNCTIONAL OVERVIEW

The Immersion MicroScribe-3D is a powerful tool for performing 3-dimensional digitizing. Unlike any system you have ever used before, the Immersion MicroScribe-3D employs a unique mechanical linkage system which provides support to its stylus. The MicroScribe-3D has been designed with the user in mind. The counterbalanced arm and smooth gliding motion ensure hours of fatigue-free and comfortable use. The unique stylus is comfortable to hold and allows for easy manipulation between the fingertips.

The MicroScribe-3DX offers higher resolution for more demanding applications. The MicroScribe-3DL offers a larger workspace for convenience and flexibility. The MicroScribe-3DLX combines a larger workspace and increased accuracy.

Technical Overview

The MicroScribe-3D communicates with a host computer through a standard RS-232 serial port. The system includes the digitizing arm unit, which houses the internal electronics, a serial cable, an input device, and an external power module.

A series of optical encoders inside each of the joints work with a microchip in the base to calculate the position of the stylus tip in 3D space. A foot pedal or hand switch can be attached to the rear panel of the digitizing arm to input data.

A number of software packages currently exist for the MicroScribe-3D. See our web site, http://www.microscribe.com, for free software offerings including InScribe and the Software Development Kit (SDK).

Release Notes

Included in your MicroScribe-3D System Package you will find the following items, shown in Figure 1. If, after setting the system up completely as described in the next chapter, any of these items are missing or defective please contact Immersion Corporation customer service as soon as possible. Please note that other items that you may have ordered along with your MicroScribe system are not listed below.

Hardware:

- MicroScribe-3D Digitizing Arm.
- Serial Cable (may vary depending on computer system used)
- Power Supply Module (may vary depending on country of use)
- Foot Pedal or Hand Switch

Software may also be included, if sold with the MicroScribe as a bundle. Take a moment and make sure that you have received both a disk and a manual. Also verify that the software received is the appropriate format for your computer system.

FIGURE 1 – What's in the Box?

(Packaging may differ slightly from photo).

CHAPTER 2 Getting Started with the MicroScribe-3D

Immersion

The MicroScribe-3D: Overview

Congratulations on your purchase of the MicroScribe-3D digitizing system. The MicroScribe-3D enables you to digitize 3-dimensional objects quickly and easily. Parts of the MicroScribe and important features are labeled in Figure 2.

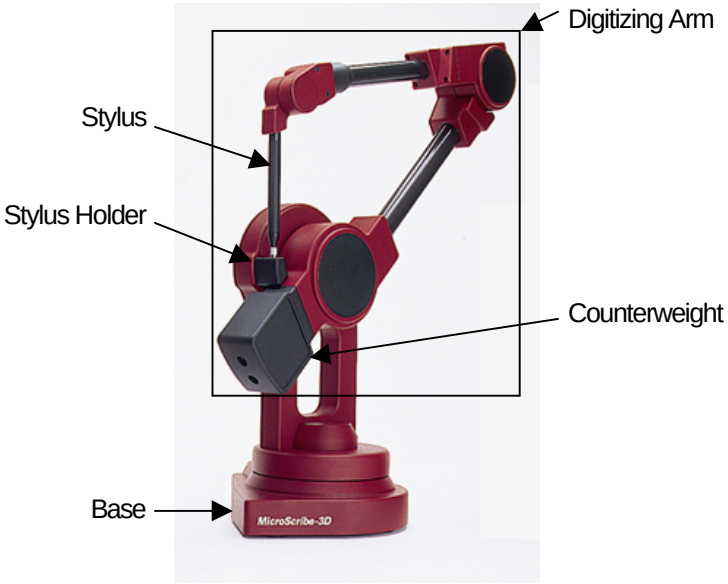


FIGURE 2 - Guide to MicroScribe Anatomy.

This chapter provides all of the information you will need to connect and begin using the MicroScribe-3D. Please read this section before unpacking your system to make sure that the unit is handled correctly.

Unpacking and Assembly

Your MicroScribe-3D is a precision instrument and has been packed carefully to protect the calibrated electronic and mechanical components. Due to shifting during shipment, we ask that you take extra care when removing the MicroScribe-3D and accessories. We recommend you unpack the MicroScribe-3D according to the instructions in this section.

PLEASE SAVE ALL OF YOUR PACKING MATERIALS. They are designed to protect your MicroScribe-3D, and should be retained in case the MicroScribe-3D should ever require transporting or service. Should you choose to travel extensively with the MicroScribe, you may wish to purchase a traveling case available from Immersion Corporation or from your MicroScribe dealer.

You are now ready to unpack the MicroScribe-3D system. If you remove the top protective sheet of foam, you will find that the system is packed as shown in Figure 1. The MicroScribe-3D fits into the large cutout and the accessories, such as the power supply, serial cable, and foot pedal, drop into the other cutouts. Software is added above the system components and should be located immediately above or below the top protective sheet of foam.

UNPACKING and ASSEMBLY PROCEDURE:

1. Remove the top protective sheet of foam, revealing all of the contents of the package.
2. Remove software packages (may be packed in shrink-wrapped or bubble-wrapped bags containing disks and documentation).
3. Remove the MicroScribe from the foam materials by lifting it from the cutout shown in Figure 3. The system weighs approximately 12 pounds, so be sure to have a firm grasp before beginning. Using a single hand to lift the device should be sufficient, but have the other hand ready to catch the arm as it unfolds upon emerging from the packaging.

FIGURE 3 – Lifting the MS out of package.

FIGURE 4 – The MicroScribe in the Home Position.

Set the base of the digitizer on a hard flat surface (not on carpet or fabric).

Place the stylus into the resting hole on the MicroScribe. This position is referred to as the “Home Position.” See Figure 4.

Note that the stylus can only insert one way into the retaining socket. If you find that the stylus is unable to reach the hole, do not try to force it in. Twist the final joint element in the direction opposite to the hard stop until the stylus can be inserted.

On 3DL and 3DLX models, it is possible to place the stylus in its holder with the wrist roll joint 180 degrees out of proper alignment - this will result in the stylus being at a slightly non-perpendicular angle relative to the desktop.

To correct this, remove the stylus from its holder, spin it 180 degrees, and place it back in the stylus holder.

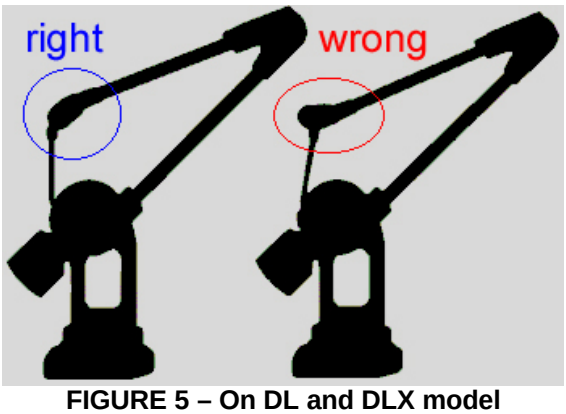


FIGURE 5 – On DL and DLX model MicroScribes it is possible to twist the stylus in the home position.

Once the MicroScribe is securely in its home position, remove all of the other system components from the packaging.

Moving the MicroScribe Around your Home or Office

Figure 6 - The proper way to carry a MicroScribe.

In addition to using the proper packaging materials for transporting the MicroScribe to and from various locations, you must also take precautions when carrying it around your home or office.

The stylus tip is sharp and can be dangerous if not held still during transport. Always pick up the MicroScribe by the base to prevent damage to the arm. See Figure 6 for the correct carrying procedure.

System Connections

There are three connections you must make before the MicroScribe-3D is ready to go:

1. Serial Cable
2. Accessory Cable (Foot Pedal or Hand Switch)
3. Power Supply Cable

FIGURE 7 – MicroScribe Rear Panel Connections.
From left to right: Power switch (ON when pressed in the left position), power, serial I/O, and accessory input.

Power supply may vary depending on country on use.

Serial cable will vary depending on type of computer system.

Input accessory may be a foot pedal (not shown) or one of two kinds of hand switches.

1. Serial Cable
The first step is to install the serial cable. The serial cable is used to communicate with the host computer. It also provides protection against static electricity build-up in the arm. Because of these critical functions, be sure that the serial cable is inserted firmly into the proper socket in the rear of the MicroScribe-3D. Connect this cable to the large round connector second from the right. See Figure 7 for details.

2. Accessory Cable
To connect the foot pedal or hand switch, simply unpack the sealed bubble wrap bag and connect

the cord into the rear panel of the MicroScribe. The pedal is designed to be foot-operated and should therefore be placed on the floor under the desk at which the MicroScribe will be used.

3. Power Supply Cable
Last, connect the power cable. Before connecting the power supply, be sure the MicroScribe-3D is turned off (the switch on the rear should be pressed to the right). Plug the round plug from the power supply into the opening on the back panel of the electronics module as shown in Figure 7.

To prevent possible accidents make sure that all cabling is secured out of the way of drawers or passersby.

Configuring the MicroScribe-3D for DigitizingPlacement of the MicroScribe
Now that your MicroScribe is connected and ready to use, you should situate it on your desktop, workbench, or other workplace so that it is optimally configured for digitizing.

Figure 8 shows the recommended set-up for digitizing (see Figure 10 for a more detailed example). Note that the rear panel of the MicroScribe-3D faces away from the user and that the MicroScribe-3D is set up along the side of the digitizing workspace. This is completely arbitrary, since the MicroScribe can digitize in any volume it can reach. We suggest that you first try a configuration like the one in Figure 10, and then customize the positioning of the MicroScribe-3D based on your experience and special needs.

FIGURE 8 - The recommended workspace for he MicroScribe.

We suggest that you work on one side of the unit, with the center of your workspace about halfway from full extension of the arm.

Bolting the MicroScribe down (optional)
The MicroScribe-3D is designed to sit securely on a flat, rigid surface. You may also mount it rigidly to your work surface by using a single bolt (size 3/8”-16) inserted through your work surface up through the center of the MicroScribe base. Be sure that the bolt you use does not extend too far into the MicroScribe. The bolt used should extend NOT MORE than ½” (1.25 cm) from the surface to which the MicroScribe is being mounted. Longer bolts could interfere with internal electronics and damage the system. In other words, the bolt length should be the thickness of the surface you are mounting to plus up to ½” (1.25 cm) to attach to the MicroScribe.

Do NOT bolt the MicroScribe down to an electrically conducting surface unless that surface is grounded and not subject to electrical interference or noise. You may also use a large tripod mount, as the threading on the mounting hole should correspond to standard tripod mounts.

Changing Stylus Tips (optional)
Should you need to replace the digitizing tip which screws into the end of the stylus, simply remove the it by unscrewing it counterclockwise. Only the silver portion of the tip can be removed. Be sure that when you replace the tip that it is tightened firmly enough to avoid coming loose during use.

Replacement tips and alternate tips are available directly from Immersion Corporation or an authorized reseller. Please call for details.

Using USB Adapters
If the Macintosh or PC that you are using does not have any free serial ports, or none at all, you have the option of using a Universal Serial Bus (USB) adapter.

On the Mac we recommend using a Keyspan Twin Serial Adapter. Plug the MicroScribe serial cable into port one of the adapter. Within the software specify the printer port.

On the PC we recommend using a Keyspan USB PDA Adapter. Windows will assign the next available COM Port number to the USB port using the adapter. Please note: Some software supporting the MicroScribe does not allow connection past COM 4. Check the application's manual for details.

Powering Up and Digitizing

With everything unpacked, connected, and configured, it is time to activate the system and begin digitizing.

Checking the Home Position
The MicroScribe-3D needs to be in the "Home Position" when it is powered up. Otherwise, it may appear that the unit is inaccurate or non-functional. The stylus is perpendicular to the surface on which the MicroScribe rests. The stylus tip is completely and firmly seated in the stylus holder. The counterweight is pressed up against the bottom of the stylus holder. See Figure 9 for details.

Each time it is powered up, the MicroScribe performs a sort of "self-calibration". The "Home" position is the one position that can be consistently repeated (base joint position aside); therefore it gives the MicroScribe a reference point against which all other points can be measured.

In Figure 9 notice that the stylus is fully inserted and the counterweight section is held up against the stylus holder.

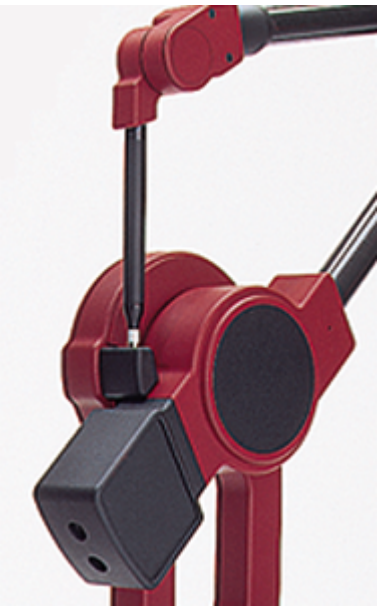


FIGURE 9 - Correct Home Position for the MicroScribe 3D.

Setting the proper base angle - PROPER START-UP POSITION
While the MicroScribe will work properly regardless of the base joint angle at start-up (as long as it is in the home position described above) the coordinate system of the MicroScribe depends upon the orientation that the arm is at when the system is turned on. Figure 10 shows the suggested power-up position. Notice that the MicroScribe base is facing the back of the desk as suggested earlier.

FIGURE 10 - The default start-up orientation of the MicroScribe.

At power-up, the default origin (0,0,0 point) is set directly below the center of the base joint axis, flush with the bottom of the base plate. This also corresponds to the center of the threaded insert used for tripod-mounting the MicroScribe.

The default X axis runs parallel to the shoulder upright (or "tombstone"), with positive X being in the direction that the counterweight points (opposite the direction the "elbow" points.) The default Y axis runs perpendicular to the tombstone, with positive Y extending straight out from the face (front) of the tombstone. The Z axis is up (from the desktop.)

In most cases the start-up base joint angle will not matter because many 3D applications allow you to define an origin and X- and Y-axes.

Powering up the unit
Once the MicroScribe-3D is in the home position and all connections (serial cable and power cable minimum) are made, turn on the power switch (move it to the left position) on the back of the MicroScribe. The Power-indicator light on the back of the base should illuminate, indicating that you are ready to digitize.

Loading the software
You are now ready to load whichever software package you plan to use. Do this by following the instructions provided with the software.

If you plan to use InScribe, the free utility from Immersion Corporation, follow the installation instructions on the Utilities Disk that accompanied the MicroScribe.

CHAPTER 3

Maintenance and Troubleshooting for your MicroScribe-3D

This section contains information on how to care for your MicroScribe-3D, how to troubleshoot problems you may have, and technical specifications.

Caring for Your MicroScribe-3D

Your MicroScribe-3D has been designed to require little maintenance and to provide years of trouble-free service. This short section contains suggestions for maintaining your Immersion MicroScribe-3D and servicing it, if necessary.

The MicroScribe is a precision measurement device and should be handled with care. Dropping, collapsing, or otherwise abusing the MicroScribe may result in damage not covered under warranty.

Protect the MicroScribe Digitizing Arm from the following dangers:

- Excessive heat (the MicroScribe is designed to work at room temperature).
- Avoid direct sunlight.
- Static electricity discharge (be sure the serial cable is always connected).
- Physical shock, particularly to any of the three instrumented joints or the shafts joining them.
- Allow for proper air circulation (for cooling) around the device. We recommend an air gap of at least 3 inches around the device.
- Avoid moisture and all contaminants.

In addition, please observe the following precautions:

- Turn off the power while the system is not in use.
- Never connect any external cables while power is on.
- Clean off any spills immediately using a sponge or other absorbent material.

Follow common sense when handling the MicroScribe-3D. Please use the original packing materials or otherwise identical packaging when transporting the system.

Never pack the system with the stylus of the digitizing arm inserted into the holder (i.e. never ship the system in a bound state such as the home position). This can permanently damage the system.

To clean the MicroScribe, use a slightly damp, lint-free cloth. Avoid liquid cleaners or abrasive materials, as these may create a risk of electric shock or damage the surface finish of the product.

WARNING: Never remove the bottom circuit board, never open up the MicroScribe housing, and never

attempt to service the device yourself. Doing so will void your warranty and could potentially be hazardous due to residual electrical charges potentially present in the device.

Final Notes and Precautions
Never try to force the MicroScribe-3D beyond its physical limits. If the MicroScribe requires excessive force to move, it is because a mechanical limit has been reached. Forcing beyond these limits can result in damage, which would constitute negligence, and not be covered under the warranty.

Service and Technical Support

Before calling for technical support we encourage you to check with the Troubleshooting section in this chapter. If you can not determine and correct the source of your problems, call Immersion Corp. technical support or contact your retailer.

To reach our technical support staff, call Immersion Corp. at (408) 467-1900. You may also send e-mail, the address is microscribe_tech@immersion.com. Or, visit the support section of our web site for extensive technical information: http://www.microscribe.com/support/

Depending on the problem, you may need to return your MicroScribe to Immersion Corporation for servicing. If this is the case, we will issue you a Return Merchandise Authorization number (RMA #) and give you information on how to send the MicroScribe back to our central facility. We do not recommend or authorize any other agents to service the MicroScribe-3D, and such repair will void the warranty.

Troubleshooting

If the unit fails to operate normally, check the following points to determine whether the fault can be corrected with the simple measures suggested. If it cannot be corrected, or the fault is not listed below, disconnect the power cord and contact Immersion Corporation for service information or technical support.

SYMPTOM	CAUSE	REMEDY
MicroScribe power indicator light fails to illuminate when POWER switch is pressed.	Power cord is not plugged in properly.	Verify that the wall-mounted power unit is plugged in and receiving power. Make sure that the power supply is plugged in completely into the rear panel of the MicroScribe.
Computer fails to communicate with the MicroScribe. (HCI Communication Error or other indicated in software)	Improperly configured serial cables.	Check that an appropriate serial cable is in use and that it is attached securely to both the computer and the MicroScribe.
	Serial port is available but nothing is connected to it.	Check that the MicroScribe power is on and all the cables are firmly connected.
	Serial port is not available because it does not exist or it is already in use.	Make sure the MicroScribe is disconnected inside of any other program that may use it. Try closing any program that could be using the MicroScribe. Remove any drivers or files that may have been associated with a device formerly using that serial port.
MicroScribe is transmitting inaccurate data.	Mis-initialized MicroScribe.	Be sure to follow all MicroScribe initial configuration procedures in Chapter 2.0 of this manual.
	Mis-configured software	Please check with the software documentation provider to ensure proper use.
	Incorrect stylus tip	If you are using multiple tips, make sure that you started the unit with the correct tip and followed tip replacement procedures.
Possible radio or television interference	Improperly set-up MicroScribe system.	Turn the television or radio antenna until the interference stops. Move the television or radio farther away from the interfering device. Use only shielded cables to connect the MicroScribe to it's attachments. Plug the interfering device into an outlet that is on a different circuit than the radio or television.

CHAPTER 4

Hardware Reference and Specifications

This section contains information on the MicroScribe-3D hardware. Further information is contained in the MicroScribe-3D Technical Reference Manual, which is available to Immersion Corp. developers.

This section details all of the physical connections on the outside of the MicroScribe-3D and provides general specifications for the MicroScribe-3D System.

Connection Pin Assignments

In this section, all the pin assignments for external connectors on the Immersion Micro-Scribe-3D are presented.

WARNINGS: Be sure to use only the appropriate connector with each port. Any incorrect device attached or otherwise improper use of external connections voids the warranty.

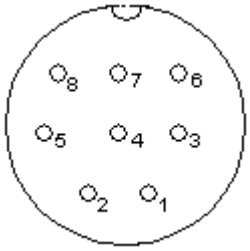
Never make connections while the MicroScribe-3D power switch is in the on position.

The following connectors are found on the rear panel of the MicroScribe-3D:

- Serial Port
- Digital Pedal or Accessory Port
- Power Port

Serial Port

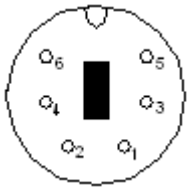
- Used to connect the MicroScribe to the Host Computer
- Uses Mini-DIN 8 type connector
- Serial cables for PC-AT (DB-9) and Apple Macintosh (Mini-DIN 8) are available from Immersion Corp. Order part# CABLE-PCD8 (PC and compatibles) or part# CABLE-MACD8 (for Macintosh and select SGI systems).



Pin Number	Signal Name	Signal Description
1	NC	Not connected
2	NC	Not Connected
3	Tx	Transmit Data
4	GND	Electrical Ground
5	Rx	Receive Data
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected

Digital Pedal Ports

- Mini-DIN 6 type connector.
- Use only with Immersion Corp. approved pedal/digital input device.



Pin Number	Pedal Port Signal Name	Signal Description
1	GND	Electrical Ground
2	NC	Not Connected
3	A3	Signal 3
4	A0	Signal 0
5	A2	Signal 2
6	A1	Signal 1

Power Port

- Use Immersion Corp. supplied power supply or +5V DC, 500 mA third party power supplies with standard 2.1 mm DC-coax type plug, center tip positive. Immersion Corporation can provide power supplies for international use. Please call for details. *Immersion Corp. is not responsible for any damage resulting from the use of a non-Immersion Corp. authorized power supply.*
- Immersion P/N CPS5-120 is designed for domestic United States power.
- Immersion P/N CPS5-U is designed to accommodate worldwide voltages.

Specifications

Specifications

Position Resolution:	0.005” (0.13 mm) (mean value)
Position Accuracy:	MicroScribe-3DX 0.009” (0.23 mm) (mean value)
	MicroScribe-3D 0.015” (0.38 mm) (mean value)
	MicroScribe-3DL 0.017” (0.43 mm) (mean value)
	MicroScribe-3DLX 0.012” (0.30 mm) (mean value)
Reach of Digitizing Arm:	25” (50” diameter) (Models 3D and 3DX)
	33” (66” diameter) (Model 3DL and 3DLX)
Footprint Size:	6” x 6”
Interface:	RS-232C
Baud Rate:	Up to 115 Kbps
Latency:	1.0 ms
Button Options:	Foot-pedal, desktop unit, and hand-held units available.
Power Requirements:	External 115V or 220V power supply
	Uses +5V DC, 600 mA max.
	(Immersion Power Supplies CPS5-120, CPS5-U)

All specifications subject to change by Immersion Corp.

Index

S

T

U

W