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**Technical Support**

Technical assistance is available Monday through Friday, 8:00 am to 6:00 pm (Eastern Standard Time).

Phone: 800-659-5922  
Fax: 800-659-7255  
Customer Service: 800-659-6560

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**CAUTION:** Federal law restricts this device to sale by or on the order of a dentist.
CATALOG OVERVIEW

Catalog 2120

Light Pole

Rear Mounted Cuspidor

Assistant’s Utilities with Touchpad

Multi-function Foot Switch

Wet/Dry Foot Control

Catalog 2610

Cabinet Wall

Rigid Arm

Mounting Bracket

Flex Arm (short)

Delivery Head

Catalog 2600

Wall Board

Mounting Bracket

Flex Arm (long)

Delivery Head

Umbilical
CATALOG OVERVIEW

Catalog 2500

Catalog 2510

Catalog 2520

Catalog 2530
**Definition of Symbols**
The following symbols and terms may be used throughout this manual and your equipment:

- **WARNING:** Failure to carefully follow the described procedure may result in damage to the equipment and/or injury to the patient/operator.

- Risk of electrical shock present. Make sure power is disconnected before attempting this procedure.

- See operating instructions.

- (AC) Alternating current.

- Protective earth (Ground)

- Manufacturing Date

- Manufacturing Place

- Waste Electrical and Electronic Equipment.

- Type B Applied part.


Conforms with the Essential Requirements of the European Medical Device Directive 93/42/EEC for Class IIa Devices.

Indicates conformity to General Requirements for Safety is certified by Intertek Testing Services.

General mandatory action required, important to follow instruction. Not a caution.

Warning, strong magnetic field.

- Off

- On

- Light Switch

**Product Disposal**
Contact your local authorized dealer for proper disposal of the device to ensure compliance with your local environmental regulations.

**Interference with Electromedical Devices**
To guarantee the operational safety of electromedical devices, it is recommended that the operation of mobile radio telephones in the medical practice or hospital be prohibited. Strong EMI sources such as electro surgery units or x-ray units may affect performance. If performance problems occur, move the unit to another electrical circuit or physical location.

**Incompatible Units or Accessories**
Incompatible Units or Accessories: To guarantee the operational safety and function of this device, the use of unapproved units or accessories is not advised. Doing so could result in potential hazard. Using accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Connecting electrical equipment to multiple socket outlets effectively leads to creating an ME SYSTEM, and can result in a reduced level of safety. All configurations shall comply with the system standard IEC 60601-1-1 or IEC 60601-1:2005

**Product Identification**
This product can be identified by its product label. This label states the unit model and serial number, electrical specifications, manufacture date and safety classification. Note the **SAMPLE** label shown below.

**Working Environment**
The unit is to be used in an office environment only.

**Recommended working condition:**
- Ambient Temperature: 68°F to 76°F (20°C to 25°C)
- Relative Humidity: 20% to 60% non-condensing
- Atmospheric Pressure: 13.1 to 15.3 PSI (900 to 1060hPa)

**WARNING:** It is not safe to use the unit where there is flammable gas or other hazardous material. Such materials can easily catch fire resulting loss of lives and heavy property damages

**Storage Conditions:** The device is appropriately packaged in a box. If product is to be stored before installation, storage and handling instructions in the packaging should be adhered to. Handling and storage conditions are marked on the box.

- Temperature: -4°F to 122°F/ -20°C to 50°C
- Relative Humidity: 10% to 90%

If the device is not to be used for some time, ensure the water line is disinfected and flushed with air before the master switch is switched off.

**European Authorized Representative**
Kaltenbach & Voigt GmbH
Bismarckring 39
88400 Biberach
Germany

**Authorized Representative:**
Kaltenbach & Voigt GmbH
Bismarckring 39
88400 Biberach
Germany

**European Authorized Representative**
As manufacturers of electro-medical products we can assume responsibility for safety-related performance of the equipment only if maintenance, repair and modifications are carried out only by Pelton & Crane or agencies we have authorized for this purpose, and if components affecting safe operation of the unit that may be needed are replaced with original parts.

We suggest that you request a certificate showing the nature and extent of the work performed, from those who carry out such work, and specify that the certificate show any changes in rated parameters or working ranges, as well as the date, the name of the firm and a signature.

The dental unit complies with IEC/EN 60601-1 third edition.
TECHNICAL DESCRIPTION

Intended Use - Dental Unit

Indications for Use:
The Spirit Dental Operative Units are intended to supply power to and serve as a base for other dental devices and accessories by providing air, water, vacuum and low voltage electrical power to hand held dental instruments. The Spirit Dental Operative Units are intended for use by professional dental practitioners in providing treatment to dental patients in a dental operatory.

Product Description:
The Spirit Dental Operative Units serves as a base that includes components to deliver air, water, electrical power, and vacuum to dental handpieces, instruments, and accessories. The controls are contained in a Doctor’s Unit, an Assistant’s Unit, and a Cuspidor. Additional parts include mount arms, foot control, and a junction box that houses a power supply and air/water regulators. Various Handpieces and accessories can be added to the Spirit Dental Operative Unit which Pelton & Crane does not manufacture but does provide a means to connect them into the Spirit Dental Operative Units. These include, but not limited to, pneumatic handpieces, electric motors with handpieces, scalers, intra-oral cameras, curing lights, air/water syringes, SE and HVE vacuum instruments.

The dental delivery system is classified as Class1 device under rule FDA CFR 21, Class II device under Health Canada guidelines and a Class Ila device under rule 11 of the MDD 93/42/EEC of Annex IX.

Air and Water Supply Requirements

<table>
<thead>
<tr>
<th>Air Quality: Dry, clean and oil free</th>
<th>Electrical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure: 80-100 psi (5.5 - 7.0 bar)</td>
<td>Volts</td>
</tr>
<tr>
<td>Water Quality: Water must meet EPA requirements for municipal water.</td>
<td>115 VAC</td>
</tr>
<tr>
<td>Hardness: 6.5 - 8.5 pH</td>
<td>230 VAC50/60 HZ</td>
</tr>
<tr>
<td>We recommend water treatment for very hard water to minimize mineral deposits in the water line fittings and valves. We do not recommend the use of distilled water as it is known to corrode components.</td>
<td>All fuses are labeled at point of use. Replace fuses only with type and rating as indicated.</td>
</tr>
<tr>
<td>Pressure: 40-80 psi (2.75-5.5 bar)</td>
<td></td>
</tr>
</tbody>
</table>

Handpiece Compatibility

This delivery system is designed to be compatible with air driven handpieces that conform to ISO 13294 and electric handpieces that conform to ISO 11498.

For the air driven handpieces, tubing is available in 4-hole Midwest tubing. For electric handpieces, dental units will be equipped with an “E-type” coupler and cordset.

For the air driven handpieces, tubing is available in 4-hole Midwest tubing. For electric handpieces, dental units will be equipped with an “E-type” coupler and cordset.

The end user will have specified the preferred type prior to ordering from the factory. It is the responsibility of the end user to procure appropriate handpieces for use with this delivery system. Certain countries may have particular regulations regarding which handpieces are acceptable for use; e.g. countries in the European Union require handpieces which meet the requirements of the Council Directive 93/42/EEC. See your local dealer for additional information.

The manufacturer will supply, upon request, circuit diagrams, component parts list, descriptions and other information needed to assist service technicians in repairing or servicing the dental unit.

Refer to handpiece manufacturer’s manual for safe and functional operations of the accessory.

IEC Medical Device Classification

Classification: I
Type: B
Operation Mode: Continuous
Splash Protection: IPX0

Handpiece Compatibility

This delivery system is designed to be compatible with air driven handpieces that conform to ISO 13294 and electric handpieces that conform to ISO 11498.

For the air driven handpieces, tubing is available in 4-hole Midwest tubing. For electric handpieces, dental units will be equipped with an “E-type” coupler and cordset.

The end user will have specified the preferred type prior to ordering from the factory. It is the responsibility of the end user to procure appropriate handpieces for use with this delivery system. Certain countries may have particular regulations regarding which handpieces are acceptable for use; e.g. countries in the European Union require handpieces which meet the requirements of the Council Directive 93/42/EEC. See your local dealer for additional information.

The manufacturer will supply, upon request, circuit diagrams, component parts list, descriptions and other information needed to assist service technicians in repairing or servicing the dental unit.

Refer to handpiece manufacturer’s manual for safe and functional operations of the accessory.

Incompatible Units or Accessories:
To guarantee the operational safety and function of the device, the use of approved units or accessories is not advised. Doing so could result in potential hazard. Using accessory equipment, not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Connecting electrical equipment to a multiple socket outlet effectively leads to creating a ME system and can result in a reduced level of safety. All configurations shall comply with the system standard IEC60601-1-1 or IEC60601-1-1:2005.
OPERATION

Location of Controls

All 2000 delivery heads have five instrument positions. The position of the handpiece cooling air and water flow controls are the same on all catalogs. The position of the flush control toggle will vary depending on the model.

**WARNING:** Refer to the handpiece manufacturer’s instructions for recommended drive air pressure. Exceeding the manufacturer’s recommendation may damage the handpiece.

Unit Flex Arm

All catalogs, except the 2500 & 2510, have flex arm mechanisms to ease the vertical movement of the delivery head. This mechanism provides ample vertical movement for the operator.

Pushing the head up or down is safe and easy. In models with a handle, grasp the handle, press and hold the brake button with the thumb, and push up or down. Little weight is felt in any direction. Brake remains engaged even if air pressure is lost.

Flex arm is factory tested and set. If the arm drifts, it is possible to adjust. Refer to page 20 for adjustment details.

The 2800 Flex Arm is made from heavier gauge materials because the lifting includes the working surface. Refer to page 21 for flex arm adjustments.

The 2500 does not have a Flex Arm. Arm tension may be adjusted by the respective tension set screws.
Delivery Head
All of the operating controls are located on the underside of the delivery head, where they are better sheltered from airborne contaminants. The delivery head has five positions. Position numbers are assigned as shown on the previous page illustration.

The Master On-Off Toggle:
Activates the air and water shut-off valves which control the air and water supplies to the unit. The toggle is located on the right side, near the front. Be sure to turn the Master On-Off Toggle OFF whenever the treatment room is unoccupied.

The Water Coolant Flow Controls:
Are located beneath the front of the control housing, near the right side. There is a separate control for each handpiece, and they are arranged to correspond with the positions of the handpiece holders.

Air Brake Control:
Activates and releases the air brake in the control arm. When the system is pressurized with air, the brake will remain engaged. To move the unit arm, squeeze and hold the air brake handle, which allows the arm to move vertically. Release the handle when delivery head reaches desired positions.

NOTE: Some models may not come equipped with the handpiece control head. Refer only to the sections of this manual that pertain to your particular unit.

WARNING: The maximum weight capacity for the control head is 3 lbs. Do not exceed this capacity. Failure to do so may result in patient/user injury and/or unit damage.

WARNING: Placing the handpieces in the wrong holder may cause injury.

WARNING: Operating two handpieces simultaneously is not safe. It may cause injury or device damage.

Handpiece Oil Collector:
The handpiece oil collector is located on the underside of the unit. It collects the excess oil coming from the handpieces. Before using the handpieces, remove the collector by unscrewing the cap. Place a piece of 2x2 gauze inside the collector. Reinstall collector.

WARNING: When not in use, turn the master switch to the ‘off’ position. The master switch is an important safety device that must be properly utilized to prevent accidental flooding.

The Spray Air Flow Control
Is located on the left side of the control head. This control affects the flow of coolant air to all of the handpieces.

The Handpiece Flush Toggle
Is used to flush the coolant water through the handpiece tubings. This is a momentary toggle, located on the left side of the control head, to the rear of the Master On-Off Toggle.

Handpiece Activation
The Handpiece Autoholders contain actuator valves that allow the operation of whichever handpiece is lifted from its holder, without the need for a manual selector.

Drive Air Controls
Each knob adjusts the amount of air supplied to its corresponding handpiece. Controls are factory set to turn knob clockwise to reduce flow & counterclockwise to increase flow.

Accessories
The 2000 dental unit may be equipped with:
• Quick Clean or Autoclavable syringe
• 4-hole tubing for air-driven handpieces
• 6-pin tubing for F/O lighting handpiece
• KaVo electric motor
• Acteon scaler and curing light
• Cavition Scaler

Accessories are accompanied by the manufacturer’s instructions for safe use.

WARNING: Improper installation of a syringe tip may cause patient injury. Refer to the syringe manufacturer’s tip installation instructions to avoid injury.

WARNING: The autoclavable syringe tips supplied with the dental unit must be sterilized prior to use.
Foot Control
The Spirit 2000 units are equipped with wet-dry, variable speed, disc-type foot controls. Foot pressure on any part of the foot control disc controls the flow of air to the active handpiece. A light pressure on the foot control disc gives a slow handpiece (HP) speed. Full pressure on the pedal gives full speed. A signal relay within the foot control simultaneously activates the air and water coolant. The foot control also activates and regulates other handpiece options, i.e., e-motor & scaler.

Air/Water Coolant ON/OFF Toggle
The wet-dry toggle interrupts the flow of water coolant to the handpieces when you are performing a procedure that requires dry cutting. Flip toggle toward the blue dot to activate water coolant.

Drive Air
Depressing center of pedal controls drive air for the treatment instruments.

Junction Box
The J-box houses the utilities that deliver air, water and power to the 2000 unit. J-box is equipped with air/water regulators and power transformer.

Regulators are factory set to:
- Air: 80 psi
- Water: 40 psi

If adjustment is required, turn regulator knob clockwise to increase pressure and counter-clockwise to decrease.

The regulators are accompanied by gauges and filters. Water to the delivery should be potable and air should be dry and clean.

The 2100, 2105, 2600, 2801 and 2802 catalog have their regulators in a junction box (J-box). The cabinet-mounted units (catalog 2500, 2610 and 2800) use a small utility center that fits into the cabinet sub-base. Shut-off valves are installed to isolate the device from the supply lines.

Utility outlets in the J-box are exclusively for the dental system. It is unsafe to connect other devices into it.

WARNING: Do not use any bottle other than the pressurized bottle provided. Never use standard soft drink bottles, which might fail under pressure. Do not attempt to adjust the water pressure, which is preset at the factory. Pressurizing the bottle over 40 psi may cause it to rupture.
Self Contained Water Supply
Your unit is equipped with a self-contained water system that allows you to isolate your practice from the municipal water supply, which may contain undesirable contaminants.

When selected, the self-contained water system uses a pressurized bottle to supply water to the syringe and handpieces. The cup fill and bowl rinse features continue to draw water from the city water supply.

WARNING: The dental unit is accompanied by Installation Instructions, Use and Care manual and the accessory manufacturer’s Instructions for Use. Instructions are to be followed for effective and safe operation of the dental unit.

300W Transformer (box)
The 2000 dental units may use small power adapters for driving accessories. These adapters are safe to use them in-doors. Wires are labeled and easy to connect them to the eight conductor cable in the J-box.

The 2000 series may also use a 300W multi-tap transformer fitted into the J-box. Transformer connection is 115V or 230V, depending on the configuration. It has an output of qvac/24vac at 50/60 Hz. Electrical hazard may be created if precautions are not done. Labels are on the cover to warn and avoid hazard. They should be followed and met.

Power from the dental unit is disconnected by unplugging transformer cord from receptacle.

Fuse details are shown in the table below:

<table>
<thead>
<tr>
<th>Fuse Identity</th>
<th>Voltage(VAC)</th>
<th>Amps</th>
<th>Speed</th>
<th>Braking Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>250</td>
<td>4</td>
<td>Fast Acting</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F2</td>
<td>250</td>
<td>4</td>
<td>Fast Acting</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F3</td>
<td>250</td>
<td>4</td>
<td>Fast Acting</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F4</td>
<td>250</td>
<td>4</td>
<td>Time-lag</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F5</td>
<td>250</td>
<td>3.2</td>
<td>Time-delay</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F6</td>
<td>250</td>
<td>3.2</td>
<td>Time-delay</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F5*</td>
<td>250</td>
<td>1.6</td>
<td>Time-delay</td>
<td>35 A@250V</td>
</tr>
<tr>
<td>F6*</td>
<td>250</td>
<td>1.6</td>
<td>Time-delay</td>
<td>35 A@250V</td>
</tr>
</tbody>
</table>

F5* and F6* are for 230 VAC Units.
Operation- 2100, 2105 & 2120 Catalog
These are over-the-patient delivery units. The 2100 and 2105 are post-mounted units (PMU). The assistant instrumentation, cuspidor and light are also mounted on the PMU. The 2120 is an ellipse-mounted delivery unit. It may also have an optional rear-mounted ellipse for the assistant’s instrumentation and cuspidor. It may be mounted with another ellipse pole for the light.

These models each have a handle for the head. The brake push button for the vertical movement is at the tip of the handle. Button is pressed to release brake.

An optional touchpad may be installed to control movement of the chair and to switch on/off the dental light.

Operation- 2600 & 2610 Catalog
These units have the same delivery layout as the 2120. The 2600 is a wall mounted side delivery unit. It comes with a wall-board and the hardware to mount the unit. It employs a J-box.

The 2610 is a side cabinet-mounted unit with a much shorter flex arm. The delivery unit is controlled and operated the same as the over-the-patient delivery units. It comes with a utility center that fits into the cabinet subbase.
Delivery Head
The 2800 family has cabinet, wall or cart-mounted models. All have similar control layout as the over-the-patient units. The delivery arm is attached to the rigid arm that supports the working surface. The arms provide the necessary horizontal movement for handpiece positioning. Tension of the arms is adjustable.

Working Surface
The unit provides plenty of working surface with ergonomic features. The heavy gauge flex arm makes vertical movement of the work surface and the delivery unit easy and safe.

Air Brake Toggle
This toggle is located beneath the front edge of the work surface. It is used to release the air brake mechanism when adjusting the height of the work surface. To activate, move toggle to the left. Once the work surface is in desired position, move toggle to the right to lock the delivery system arm against vertical movement.

Water / Air Outlet and Flow Control
A water outlet is located on the left side of the utility housing, mounted beneath the work surface. The outlet accepts 1/4” QD fitting and has an integral shut-off valve.

Next to the water outlet is a control valve to adjust flow from the water outlet.

The air outlet accepts a 3/8” QD fitting.

Integrated Water
The city/water toggle allows the user to choose between controlled water from the water bottle or city water from the city municipal water supply. The Left/Right bottle selector toggle switches from one bottle to the other.

Work Surface Medicament (Optional)
This convenient storage organizer is located on the back of the work surface. It provides finger tip access to frequently used consumables.

Tray Holder (Optional)
The swing-out tray holder provides easy access to dental accessories and can be positioned on the left or right side of the work station.
Air Brake Toggle
The vertical position of the control head is adjustable. While supporting the control head with one hand, release the brake which locks the vertical position by switching the air brake toggle to the upward position. Re-engage the brake by switching the air brake to the lower position. Brake remains engaged even if air pressure is lost.

WARNING: The maximum load on the counter top shall not exceed 5lbs. Weights exceeding this may cause device damage or injury.

Water/Air Outlet and Flow Control
A water outlet is located on the lower right of the housing under the work surface. The outlet accepts 1/4” QD fitting and has an integral shut-off valve.

The flow control knob is next to the water outlet and can be adjusted to alter the rate of waterflow.

The air outlet accepts a 3/8” QD fitting and has an integrated shut-off valve.
ADJUSTMENTS

Water Outlet & Flow Control
Water outlets are located on the PMU, rear mount or utility tray. The water outlet accepts a 1/4 inch QD fitting adjacent to water. The air outlet accepts a 1/4 inch QD fitting (optional on this unit). Each has an integral shut off valve.

Solids Collectors
Remove solids collector’s cap and clean or replace strainer screen as needed. The collector may be located in the PMU or assistant’s instrumentation arm.

Foot Control Function
The Spirit 2000 units are equipped with wet-dry, variable speed, disc-type foot controls. Foot pressure on any part of the foot control disc controls the flow of air to the active handpiece. A signal relay within the foot control activates the water coolant. The foot control also activates and regulates other handpiece options i.e., e-motor & scaler.

The wet-dry toggle interrupts the flow of water coolant to the handpieces when you are performing a procedure that requires dry cutting. Flip toggle to activate water coolant. Optional chip air toggle is also available.

Drive Air
Depressing the center of pedal controls drive air for the treatment instruments.

WARNING: Do not dispose of amalgam residues found in the debris cup directly into sink. Dispose of the amalgam residue properly per your local environmental regulations.

Drive Air Water Coolant
OFF/ON Toggle
Receptacle
Collector Cap
Collector
City/Bottle
Selector
Water Bottle
Water
Outlet
Air &Water Regulator
Gauges
Electrical Receptacle
(Supplied by contractor)
Air Shut-Off Valve
Water Shut-off Valve

062050 r05
Drive Air Pressure
Maximum handpiece speed is controlled by adjusting the drive air pressure. The adjusting screws are located inside the control head on all models except the 2500. The adjusting screws on the 2500 are located on the bottom of the control head. There is a separate adjusting screw for each handpiece.

**Note:** Refer to the handpiece manufacturer’s instructions for recommended drive air pressure. Exceeding the manufacturer’s recommendation may damage the handpiece.

Raise the hinged cover to expose the internal components by removing securing screws, locate the drive air gauge under the control head, and the drive air adjusting screws on the control block.

**Note:** The drive air gauge reads pressure at the control block. Because of the normal restrictions in tubing and connectors, the pressure delivered to the handpiece will be about 5 psi less than shown on the gauge. Take this into account when using the built-in gauge. Alternatively, a more accurate reading may be obtained by using a gauge that screws onto the connector, right at the handpiece.

Install a bur in the handpiece you are going to adjust. The adjusting screws should correspond in sequence with the positions of the handpieces on the hanger bar. Use a small straight-slot screwdriver to make the adjustment. Set Handpiece pressures to manufacturing specifications.
ADJUSTMENTS (CONT’D)

Handpiece Air Coolant
The air coolant flow control will affect all of the handpiece positions in unison. Since the air coolant characteristics of most handpieces are similar, one setting is normally acceptable for all of your handpieces.

NOTE: Some handpieces draw their air coolant from the drive air. These include any handpiece that uses a 2-hole handpiece tubing, as well as some that have a coaxial swivel connector. These handpieces will not be affected by the air coolant adjustment.

1. On the foot control, flip the wet-dry toggle OFF (away from the blue dot). Install a bur in the handpiece that you are going to run while making this adjustment.
2. Press the foot control to run the handpiece at normal operational speed. While the handpiece is running, turn the air coolant flow control to achieve the desired flow.
3. If you have the optional chip blower button on your foot control, you may wish to double-check your adjustment to be sure you have satisfactory air flow for this function as well.

Handpiece Water Coolant
The water coolant characteristics vary significantly from one handpiece to another, so individual flow controls are provided. Perform the following steps to adjust the water coolant for each handpiece.

1. After adjusting the air coolant as described above, flip the wet-dry toggle on the foot control ON (toward the blue dot). Install a bur in the handpiece for which you are making this adjustment.
2. Turn the water coolant flow control knob clockwise to its stop. Press the foot control to run the handpiece at normal operation speed. Gradually open the flow control (counterclockwise) until a fine mist appears around the bur.
3. This setting achieves optimum cooling, while minimizing the creation of potentially hazardous aerosols.

NOTE: Some handpieces draw their air coolant from the drive air. There handpieces will not be affected by the air coolant adjustment.

WARNING: When installing and using instruments and attachments, refer to all manufacturer’s instructions and recommendations before operating instruments.

WARNING: Do not activate syringe while tip is in direct contact with skin.

Spirit Cuspidor / Utility Center

Cuspidor Bowl
Bowl Rinse: The Bowl Rinse function is set to run for a 30 second time period and is activated by pressing the bowl rinse activator.

Cup Filler: The cup filler is set to fill a 5 ounce cup 1/3 to 2/3 full. This function is activated by gently pushing the cup filler stem forward until the pivot valve is activated. Pushing the cup filler stem back and away from the cup will stop water flow.
**FINAL ADJUSTMENTS**

**Unit Flex Arm Tension Adjustment**

**Spring Tension**

**NOTE:** Before adjusting front flex arm bolt, loosen the smaller set screw. After adjustment is complete, re-tighten.

The flex arm has been set at the factory for normal operating weight. If the arm drifts during use it will be necessary to adjust the flex arm tension using the following procedure:

1. Remove the flex arm end caps by pulling them off.
2. Using a 3/16” hex wrench, adjust the correct tension bolt as indicated. Spring tension is increased by turning the rear flex arm bolt clockwise. Spring tension is decreased by turning the front flex arm bolt clockwise.
3. When spring tension is properly set, reinstall the end caps.

**Swivel Tension**

1. Using a 1/8” hex wrench, slowly turn the screw counterclockwise to increase spring tension until the desired amount of tension is achieved; reversing the direction will decrease the amount of tension on the arm.

**WARNING:** To prevent unit damage and/or personal injury, tension should be adjusted so that arm will not drift.

**Unit Head Leveling Adjustment**

If the tray or unit head is not level (front-to-back) it may be necessary to adjust the front knuckle of the unit flex arm. Check the level reading by fully extending the unit pole, flex arm and head in the same direction (as stop pins permit). Place a level in the orientation shown, either on a tray or directly on top of the unit head - whichever is intended to be the supporting platform. While leaving the arms fully extended, make the adjustment as follows:

1. Remove the flex arm end cap closest to the unit head.
2. Using a 3/32” hex wrench, loosen the smaller set screw on the left side of the knuckle.
3. Adjust the larger shoulder bolt in the middle of the knuckle while observing the reading on the level. Continue turning until surface is level.
4. Re-tighten the smaller set screw.
5. Replace the end cap.

**Drag Tension**

Drag tension works in unison with spring tension to provide controlled and regulated movement of the arm. Adjust the arm’s drag tension using the following procedure:

1. Remove the bottom cover by popping it off and accessing the drag tension set screw.
2. Using a 3/32” hex wrench, turn the set screw clockwise to increase drag tension; counterclockwise to decrease.
3. Raise and lower the arm several times to ensure the correct amount of drag tension and adjust if necessary.
4. Reinstall bottom cover.
**2800 Unit Flex Arm Tension Adjustment**

1. This adjustment allows the arm to raise more freely once the arm brake is depressed. Raise arm to the uppermost position.

   a) Remove the lower screw and loosen the upper screw securing the upper flex arm cover.
   b) Lift cover slightly to gain access to the tension adjusting screw.
   c) Using the T-handle supplied with the unit, turn the adjusting screw counterclockwise to increase flex arm tension and clockwise to decrease tension.
   d) Once adjusted to the desired tension, replace lower cover screw and tighten the upper cover screw. Tighten fasteners securely.

2. This adjustment allows the upper arm to rotate more freely. Lower flex arm to its lowest position.

   a) Remove the two screws from the upper flex arm cover to gain access to the adjusting screw located in the front knuckle of the flex arm.
   b) Using a 1/8" hex driver, turn the adjusting screw clockwise to increase tension and counterclockwise to decrease tension.
   c) Once desired tension is obtained, replace upper cover and fasteners.
PROGRAMMING THE AUTO BUTTONS

STORING PRESET POSITIONS 0 and 1
1 Using the manual buttons, adjust the chair into the desired position.
2 Press and hold desired auto ("0" or "1") button to be programmed for several seconds (5).
3 Listen for beep to confirm the position has been set, then release.

TO OPERATE — Use manual buttons to move chair from stored position. Press desired auto preset button once. Chair will move to new stored position.
PROGRAMMING THE AUTO BUTTONS

STORING PRESET POSITIONS 0 and 1

1. Using the manual buttons, adjust the chair into the desired position.
2. Press and hold the unmarked LEARN button, the chair will beep once to confirm. Continue holding the LEARN button, while pressing desired auto (“0” or “1”) button TWO TIMES.
3. After pressing preset button 2 times, listen for one quick beep to confirm the position has been set. Release LEARN button after confirmation.

To program the second auto button, repeat procedure.

TO OPERATE — Use manual buttons to move chair from stored position. Press desired auto preset button once. Chair will move to new stored position.

STORING PRESET POSITIONS 2 and 3

NOTE: In order to access preset positions 2 and 3 with this style of touchpad, a jumper must be placed and left on pin# 7 of the main chair board.

1. Using the manual buttons, adjust the chair into the desired position.
2. Press and hold the LEARN button. The chair will beep twice to confirm. Press and hold the LEARN button while pressing the desired auto button (“0” or “1”) FOUR TIMES.
3. After pressing preset button 4 times, listen for two quick beeps to confirm the position has been set. Release LEARN button after confirmation.

To program the second auto button repeat the procedure.

TO OPERATE — Use manual buttons to move chair from stored position. Press desired auto preset button once. Chair will move to new stored position.

NOTE: Accessing preset position 2 and 3 will cause the dental chair to have a 3 second delay before moving.
PROGRAMMING THE AUTO BUTTONS

STORING PRESET POSITIONS 0 and 1
1  Using the manual buttons, adjust the chair into the desired position.
2  Press and hold the unmarked LEARN button, the chair will beep once to confirm. Continue holding the LEARN button, while pressing desired auto ("0" or "1") button TWO TIMES.
3  After pressing preset button 2 times, listen for one quick beep to confirm the position has been set. Release LEARN button after confirmation.

To program the second auto button, repeat procedure.

TO OPERATE — Use manual buttons to move chair from stored position. Press desired auto preset button once. Chair will move to new stored position.
**CLEANING, DISINFECTING & STERILIZATION**

**Barrier Technique**
Pelton & Crane recommends the use of disposable barriers on all controls that may be contacted by dental practitioners during a dental procedure. The use of disposable barriers helps preserve the finish and appearance of the equipment in addition to infection control. Pelton & Crane recommends the use of an FDA market-cleared barrier (example: Pinnacle Cover-all™). Follow barrier manufacturer instructions for proper use of products.

**Chemical Disinfection**
In addition to the use of barriers, Pelton & Crane recommends the use of an EP registered and FDA market-cleared chemical disinfectant (example: Cavicide™) to be used on all surfaces that may come in contact with dental instruments during dental procedures. Follow chemical disinfectant manufacturer instructions for proper use of products.

**General Purpose Cleaning**
For general purpose cleaning, Pelton & Crane recommends one of two methods:
1) Use a mild detergent and warm water
2) Use a 10% solution of bleach with water

Even with the use of chemical disinfectants, it is recommended that the equipment be thoroughly washed with soap and warm water at least once per day. This washdown will minimize the harmful effects of the disinfectant residues that can accumulate on the equipment.

**Dental Handpiece, Instruments and Accessories**
Please refer to respective manufacturer’s Instructions for Use (IFU) for appropriate cleaning, disinfecting and sterilization requirements. These include, but are not limited to, pneumatic handpieces, electric motors with handpieces, scalers, intra-oral cameras, curing lights, air/water syringes, SE and HVE vacuum instruments.

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**Cleaning and Disinfecting Assistance**
For assistance with cleaning and disinfecting, contact the Pelton & Crane Technical Service Department at 1-800-659-5922.

Additional information is available from the organizations listed below:
- **Organization for Safety and Asepsis Procedures**: www.osap.org
- **American Dental Association**: www.ada.org
- **Department of Health and Human Resources Centers for Disease Control and Prevention (CDC)**: www.cdc.gov
- **European Dental Association**: www.eda-eu.org

**WARNING**: Only disinfect by wiping, no spray disinfectants. Pelton & Crane expressly rejects any claims for warranty or damages if spray disinfectants are used.

**WARNING**: Do not use powdered cleansers, scouring pads or abrasive scrubbers on any of the painted, plastic or metal surfaces of the dental unit. To remove dried-on material, use a soft-bristled brush and a solution of mild detergent.

**WARNING**: Pelton & Crane makes no warranty, expressed or implied, that the use of chemical disinfectants will not damage the surface finish of the equipment. Damage and discoloration of the surface finishes are not covered under the warranty.
MAINTENANCE
Care of the Unit

Control Head and Arm

The control head and post can be cleaned with a solution of mild detergent and warm water. A variety of surface disinfectants are available for use in dental treatment rooms. Some of these can cause discoloration of painted, plated or anodized surfaces with repeated use. This can be minimized by careful adherence to the disinfectant manufacturer’s instructions and by frequent washing with soap and water.

Handpiece Flush — Daily Maintenance
The control system is equipped with a handpiece flush system that allows you to periodically flush fresh water through the handpiece tubings. The need for this is caused by the low flow of water through the tubings during normal use, which can lead to stagnation and the potential growth of “biofilm” contamination.

We recommend that you flush the handpiece tubing, syringes, quick disconnect and cuspidor spouts for two to three minutes at the beginning of each day. This may be done with or without handpieces installed, but having handpieces on the tubings will restrict flow, so a longer flush time will be required. We also recommend flushing handpiece tubing for 20 to 30 seconds between patients to prevent cross-contamination. Ensure water flow control valves are fully open whenever flushing.

All of the tubings are flushed simultaneously. Hold them together and direct them into a basin, sink or cuspidor to catch the water. Flip and hold the flush toggle.

Allow adequate time for fresh water to make its way through the entire system and displace all standing water. The American Dental Association and the Centers for Disease Control can provide additional recommendations regarding this procedure, including information on frequency and duration of flushing and the use of antibacterial solutions in the self-contained water system.

Weekly Maintenance

The weekly cleaning procedure should be performed at least once a week, preferably at the start of the week before treating patients. If the unit is to be stored for any length of time, perform the weekly maintenance routine immediately before and after storage.

1. Purge the unit with air.

2. Flush the system with disinfectant solution:
   a. Turn the unit off. Empty the water bottle, replacing the water with cleaning solution (see Disinfectant Solution, next page).
   b. Hold the handpiece tubings and syringe over the cuspidor or other suitable container. Turn the unit on, wait a few moments, then operate the flush toggle, syringe and foot control until a continuous stream of solution is running through the system.

3. Allow the disinfectant to remain in the unit for 10 to 20 minutes, then flush the system again until all the solution is used up.

4. Purge the unit with air:
   a. Hold the handpiece tubings and syringe over a container. Turn the unit on, wait a few moments, then operate the flush toggle, syringe and foot control until all solution is purged from the system.
   b. Turn the unit off. (If the unit will be stored, stop here.)

5. Fill with clean water:
   a. With the unit turned off, remove the empty disinfectant bottle. Replace with clean bottle and water.
   b. Hold the handpiece tubings over a suitable container. Turn the unit on, wait a few moments, then operate the flush toggle until a continuous stream of water is flowing through the system. Replace handpieces and do the same with the syringe. The unit is now ready for use.

Handpiece Oil Collector:
Replace the 2 x 2 gauze with a clean gauze in the handpiece oil collector every 90 days or more often if handpieces are oiled frequently.
CLEAN WATER SYSTEM

The water bottle system is designed to optimize the quality of water being delivered to the handpieces and syringe. The system may be filled with filtered or sterile water for patient use.

WARNING: Disinfect new water bottle prior to use. Minimize contamination when handling the bottle.

EASE OF MAINTENANCE

1. The system may be filled with disinfectant for flushing the syringe and handpiece tubings.
2. The unit can be purged with air to inhibit the growth of biofilm.

NOTE: When filling water bottle, leave an air gap at the top of the bottle to allow the bottle to depressurize when removing it from the unit.

In order to minimize infection risk, daily and weekly cleaning procedures must be performed in a consistent, regular manner. The American Dental Association and the Center for Disease Control can provide additional recommendations regarding this procedure, including information on frequency and duration of flushing and the use of antibacterial solutions in the self-contained water system. Failure to properly maintain system could result in contaminated water lines and a lower water quality than what is acceptable for patient use.

Once a month, activate the City/Bottle Water Switch ensuring that the switch functions properly. If any issues are found, call an authorized service representative to replace the toggle valve.

Once a month, activate the Foot Control toggle valve ensuring that the toggle valve functions properly turning the water on and off to the handpiece. If any issues are found, call an authorized service representative to replace the toggle valve.

Disinfecting the bottle:

Fill bottle with the 100 ml disinfectant solution, shake vigorously and let it settle for 10 minutes. Shake again, then rinse at least twice with clean water.

The Disinfectant Solution:

| 9 parts (90 ml) Tap water |
| 1 part (10 ml) 5.25% Sodium Hypochlorite (household bleach) |

Always use a fresh mixture every week.

Once a month, visually check handpiece holders for excessive wear and handpiece activation. If any issues are found, call an authorized service representative to replace.

Once a month, visually check handpiece tubing for wear and tear and any separation of the tubing from the connector. If any issues are found, call an authorized service representative to replace.

Once a month, verify that the Electrotorque motor handpiece water flow is functioning properly. If not, call an authorized service representative to replace gauze in oil collector.
ASSISTANT’S VACUUM INSTRUMENTS

After Each Patient
Draw clear water through each valve, while opening and closing it several times. Leave the valve open for several seconds to allow all of the water to clear the hoses. The HVE and Saliva Ejector tips should always be replaced with sterile ones before each patient.

At the End of Each Day
We recommend that you draw a vacuum system sanitizing solution which is non-toxic and environmentally safe through each valve, while opening and closing it. Flush drain line with sanitizing solution at end of day.

Cleaning the Solids Collector
At least once a day the solids collector screen should be cleaned or replaced as needed. Turn off the vacuum pump before removing the solids collector cap and lift out the screen. If you find an excessive amount of material in the screen, more frequent cleaning is necessary. Place screen into the canister and install the cap after cleaning is completed.

Cleaning
Clean the external surfaces of the vacuum instruments using a solution of mild detergent and warm water. Thoroughly rinse the syringe with clean water, then dry with a clean, soft, lint-free cloth.

Sterilization
Remove each valve from its tubing for sterilization. A vacuum plug may be inserted into the quick disconnect while there is no valve in place.

In any situation involving high-risk patients, it is recommended that the instruments be removed for sterilization after every patient.

WARNING: Ultrasonic cleaning is not recommended, as the chemicals used may damage the surface finishes of the instrument.

WARNING: Do not use sodium hypochlorite or any chlorine bleach on the vacuum instruments. These products will permanently damage the instruments. Never use powdered cleansers, scouring pads or abrasive scrubbers, any of which can damage the finishes.

Once a month, visually check the HVE and SE for proper functions verifying that the air flow adjustment is regulated by the thumb lever and that the HVE and SE are being cleaned and maintained properly.

Disassemble the valve and lubricate the internal parts when operation becomes stiff or sticky. Clean the inner surfaces and apply a small amount of O-ring lubricant to the moving parts and O-rings.
ASSISTANT’S VACUUM INSTRUMENTS

ON/OFF Master Switch
If unit is equipped with an assistant’s unit only, the master ON/OFF switch is located on the Assistant’s Holder.

Solids Collector
The collector is located in the assistant’s instrumentation. The strainer screen must be cleaned and disinfected at least once a day. Remove collector cover and pull out screen.

Instrument Holder
The instrument holder accommodates a saliva ejector valve, an HVE valve and an autoclavable syringe. The holder swings horizontally, and can be rotated on its axis on either side of the workstation for maximum flexibility in positioning the instrument.

The molded plastic instrument hanger cover is held into place by two locking tabs located on the bottom cover.
CUSPIDOR

After Each Patient
Thoroughly rinse the bowl, and pour a couple of cups of water down the drain to flush-out the lines and prevent the buildup of material in the drain tubing.

At the End of Each Day
We recommend that you flush the drain line with a sanitizing solution. EcoVac (Part no. 5835 and 5837) is an effective, bio-organic system cleaner that is nontoxic and environmentally safe.

Autoclavable Spouts: The bowl rinse and cup filler spouts are removable for cleaning and sterilization. Pull upward on the spouts to remove them.

Both spouts (with O-rings in place) can be cleaned and sterilized.

To reinstall the spouts, insert them into their sockets until the O-rings seat. The cup filler spout has a small hole in the bottom flange that engages an alignment pin in the socket. Rotate the spout as needed to align the pin and hole.

Drain Screen: The drain screen in the bottom of the bowl lifts out for cleaning. Disposable screens are available (Part no. 5312).

Cuspidor Bowl: The cuspidor bowl can be lifted out for cleaning or to clean the bowl socket, where amalgam will tend to settle. After removing the cup fill and bowl rinse spouts, lift the cover from the cuspidor. Lift the cuspidor bowl straight up from its socket.

Before reinstalling the bowl, lubricate the O-rings with water or a light application of O-ring lubricant (Part no. 066046). Insert the bowl firmly in the socket. Reinstall the spouts.
PLUMBING DIAGRAM - 2000 UNIT

Tubing Identification Chart

- Clear
- Transparent Yellow
- Red
- Orange
- Yellow
- Green
- Blue
- Purple
- Gray
- White
- Transparent Green
- Black
ELECTROMAGNETIC COMPATIBILITY

MEDICAL ELECTRICAL EQUIPMENT ELECTROMAGNETIC COMPATIBILITY (INSTRUCTIONS FOR USE)

ELECTROMAGNETIC COMPATIBILITY
Electrical medical devices are subject to special EMC safety measurements and as a result the equipment must be installed according to the Pelton and Crane installation instruction manual.

PORTABLE ELECTRONIC DEVICES
Portable and mobile high frequency electronic communications equipment may interfere with electronic medical devices.

STATIC SENSITIVE DEVICES
Where labeled this equipment contains static sensitive devices that require special precautions when handling. At a minimum, a grounded wrist strap that is connected to a ground stud should be worn to reduce the possibility of damage to the unit.

MEDICAL ELECTRICAL EQUIPMENT ELECTROMAGNETIC COMPATIBILITY (TECHNICAL DESCRIPTION)

ELECTROMAGNETIC COMPATIBILITY
This equipment has been tested and found to comply with the requirements for medical devices of IEC 60601-1-2 and is intended to be installed in a typical medical environment.

ACCESSORY USE
Using accessory devices not specified by Pelton and Crane for use with their equipment may results in an increase of electromagnetic emissions and/or a decrease in electromagnetic immunity of the system.

INTERFERENCE FROM OTHER EQUIPMENT
If other equipment is used adjacent to or stacked with the Pelton and Crane equipment the system must be observed to verify normal operation.
ELECTROMAGNETIC COMPATIBILITY

Guidance and manufacturer’s declaration—electromagnetic emissions

<table>
<thead>
<tr>
<th>Emissions Test</th>
<th>Compliance</th>
<th>Electromagnetic Environment Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions</td>
<td>Group 1</td>
<td>The Spirit 2000 Delivery Units use RF energy only for its internal function. Therefore, their emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>CISPR-11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF emissions</td>
<td>Class A</td>
<td>The 2000 Delivery Units are suitable for use in all establishments, other than domestic establishments and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.</td>
</tr>
<tr>
<td>CISPR-11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmonic Emissions</td>
<td>Class A</td>
<td></td>
</tr>
<tr>
<td>IEC 61000-3-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage Fluctuations/ Flicker Emissions</td>
<td>Complies</td>
<td></td>
</tr>
<tr>
<td>IEC 61000-3-3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommended separation distances between portable

The Spirit 2000 Delivery Units are intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the 2000 Delivery Units can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 2000 Delivery Units as recommended below, according to the maximum output of the communications equipment.

<table>
<thead>
<tr>
<th>Rated maximum output power of transmitter W</th>
<th>Separation distance according to frequency of transmitter m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150 kHz to 80 MHz</td>
</tr>
<tr>
<td>0.01</td>
<td>0.12</td>
</tr>
<tr>
<td>0.1</td>
<td>0.38</td>
</tr>
<tr>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
## ELECTROMAGNETIC COMpatibility

### Guidance and manufacturer’s declaration-electromagnetic immunity

The Spirit 2000 Units are intended for use in the electromagnetic environment specified below. The customer or the user of the Spirit 2000 Units should assure that it is used in such an environment.

<table>
<thead>
<tr>
<th>Immunity Test</th>
<th>IEC60601 Test Level</th>
<th>Compliance Level</th>
<th>Electromagnetic Environment Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTROSTATIC DISCHARGE (ESD) IEC 61000-4-2</td>
<td>+/-6 kV contact</td>
<td>+/-6 kV contact</td>
<td>Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material the relative humidity should be at least 30% Where labeled, a ground strap (connected to ground lug) should be worn to reduce the possibility of damage to the unit when servicing.</td>
</tr>
<tr>
<td></td>
<td>+/-8 kV air</td>
<td>+/-8 kV air</td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL FAST TRANSIENT/BURST IEC 61000-4-4</td>
<td>+/-2 kV for power</td>
<td>+/-2 kV for power</td>
<td>Mains power quality should be that of typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>supply lines</td>
<td>supply lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+1-1 kV for input</td>
<td>Not applicable, No I/O lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>output lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURGE IEC61000-4-5</td>
<td>+/-1 kV differential mode</td>
<td>+/-1 kV differential mode</td>
<td>Mains power quality should be that of typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>+/-2 kV common mode</td>
<td>+/-2 kV common mode</td>
<td></td>
</tr>
<tr>
<td>VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS ON POWER SUPPLY INPUT LINES IEC 61000-4-11</td>
<td>&lt;5% U&lt;sub&gt;i&lt;/sub&gt; (&gt;95% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 0.5 cycle</td>
<td>&lt;5% U&lt;sub&gt;i&lt;/sub&gt; (&gt;95% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 0.5 cycle</td>
<td>Mains power quality should be that of typical commercial or hospital environment. If the user of the Spirit 2000 Units requires continued operation during power mains interruptions, it is recommended that the 2000 Units be powered by an uninterrupted power supply.</td>
</tr>
<tr>
<td></td>
<td>40% U&lt;sub&gt;i&lt;/sub&gt; (60% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 5 cycles</td>
<td>40% U&lt;sub&gt;i&lt;/sub&gt; (60% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 5 cycles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70% U&lt;sub&gt;i&lt;/sub&gt; (30% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 25 cycles</td>
<td>70% U&lt;sub&gt;i&lt;/sub&gt; (30% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 25 cycles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;5% U&lt;sub&gt;i&lt;/sub&gt; (&gt;95% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 5 seconds</td>
<td>&lt;5% U&lt;sub&gt;i&lt;/sub&gt; (&gt;95% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 5 seconds</td>
<td></td>
</tr>
<tr>
<td>VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS ON POWER SUPPLY INPUT LINES IEC 61000-4-12</td>
<td>10% U&lt;sub&gt;i&lt;/sub&gt; (10% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 10 cycles</td>
<td>10% U&lt;sub&gt;i&lt;/sub&gt; (10% dip in U&lt;sub&gt;i&lt;/sub&gt;) for 10 cycles</td>
<td></td>
</tr>
<tr>
<td>POWER FREQUENCY (50/60 Hz) MAGNETIC FIELD IEC61000-4-8</td>
<td>3 A/m</td>
<td>3 A/m</td>
<td>Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.</td>
</tr>
</tbody>
</table>

U<sub>i</sub> is the AC. mains voltage prior to application of the test level.
## ELECTROMAGNETIC COMPATIBILITY

<table>
<thead>
<tr>
<th>Immunity Test</th>
<th>IEC60601 Test Level</th>
<th>Compliance Level</th>
<th>ELECTROMAGNETIC ENVIRONMENT GUIDANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted RF</td>
<td>3 Vrms</td>
<td>3 Vrms</td>
<td>Portable and mobile RF communications equipment should be used no closer to any part of the Model 2000, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</td>
</tr>
</tbody>
</table>
| IEC 61000-4-6| 150 kHz to 80 MHz     |                  | Recommended separation distance :  
|               |                      |                  | $d = 1.2 \sqrt{P}$  |
| Radiated RF   | 3 V/m                | 3 V/m            | Portable and mobile RF communications equipment should be used no closer to any part of the Model 2000, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. |
| IEC 61000-4-3| 80 MHz to 2.5 GHz     |                  | Recommended separation distance :  
|               |                      |                  | $d = 1.2 \sqrt{P}$ 80 MHz 800 MHz  
|               |                      |                  | $d = 2.3 \sqrt{P}$ 800 MHz 2.5 GHz  |
|               |                      |                  | where $P$ is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and $d$ is the recommended separation distance in meters (m).  |
|               |                      |                  | - Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, (a) should be less than the compliance level in each frequency range. (b) - Interference may occur in the vicinity of equipment marked with the following symbol: |

**NOTE 1:** At 80 MHz to 800 MHz, the higher frequency range applies.  
**NOTE 2:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures objects and people.  

**a)** field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Model 2000 delivery unit is used exceeds the applicable RF compliance level above, the 2000 delivery unit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the 2000 delivery unit.  

**b)** Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3/Vm.