INFINITI

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INFINITI
VISION SYSTEM

Service Manual

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SECTION ONE
GENERAL INFORMATION

Alcon's *Infiniti*™ Vision System is an ophthalmic surgical instrument designed to be reliable, safe, and easy to operate. The *Infiniti*™ Vision System provides three modes for lens extraction using *AquaLase*®, *NeoSoniX*®, and high performance ultrasonic handpieces. This instrument has been developed to be user friendly, combining hardware that is easy to install and maintain along with software that increases the effectivity of the user.

The *Infiniti*™ Vision System is intended for use in small incision lens extraction surgical procedures. This system allows the surgeon to emulsify and aspirate the lens in the eye, while replacing aspirated fluid and lens material with balanced salt solution. This process maintains a stable (inflated) eye chamber volume. Using system controls the surgeon regulates the amount of power applied to the handpiece tip, the rate of aspiration, vacuum, and the flow of *BSS*® or *BSS Plus*® irrigation solution. The system controls include a footswitch to enable the surgeon to control irrigation flow, aspiration rate, phaco power, *AquaLase*® magnitude, vitrectomy cut rate, and coagulation power.

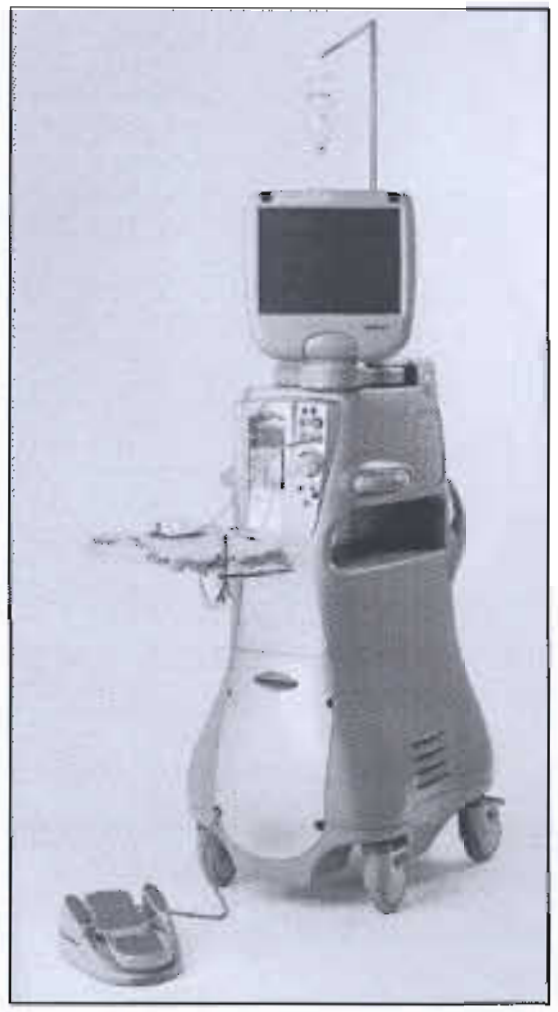


Figure 1-1 The *Infiniti*™ Vision System

ABOUT THIS MANUAL

This manual is divided into seven sections as follows:

Section One - General Information
This section gives a general description of the *Infiniti*™ Vision System features and components. Also included is an unpacking and installation procedure.

Section Two - Theory of Operation
This section gives a detailed description of how the *Infiniti*™ Vision System operates starting at the system level and working down to the PCB (Printed Circuit Board) level. Detailed block diagrams are provided at the end of this section.

Section Three - Parts Location and Disassembly
This section contains parts location diagrams along with field level disassembly procedures.

Section Four - Maintenance & Troubleshooting
This section contains system maintenace procedures and troubleshooting information.

Section Five - Schematics
This section contains the system interconnect diagram, PCB assembly drawings, and schematic diagrams.

Section Six - Parts Lists and Drawings
This section contains parts lists, engineering documentation for each major assembly, and cable drawings.

Section Seven - Additional Information
This section contains information on accessories or optional equipment that may require service.

UNPACKING AND SETTING UP THE SYSTEM

1. With the carton lying horizontally on its wooden pallet, cut and remove the binding straps securing the lid (see Figure 1-2). Lift the lid up and off the carton.

2. Remove accessories from the carton, then remove two top foam pieces and the outer cardboard sleeve (see Figure 1-3).

3. Ensure that the velcro straps securing the console are tightly bound, then carefully tip the shipping carton up into an upright position.

4. Remove the velcro straps to release the console, then roll the system away from the container (see Figure 1-4). Remove all remaining foam and the plastic protective cover.

5. Inspect console for signs of shipping damage.

6. Open footswitch drawer and remove footswitch cable (in bubble wrap). Connect footswitch cable to footswitch. Place footswitch in footswitch drawer.

7. Open side drawer and remove IV pole extension and small setscrew in zip lock bag (both wrapped in bubble wrap). With the hanger in position to point away from system when extended, secure the IV pole extension onto the IV pole with the setscrew.

8. Remove the remote from its carton and insert the supplied batteries. Place remote in a side drawer.

9. Unwrap the power cord from the rear panel and plug it into a power outlet.

10. Perform the *Infiniti*™ Vision System Service Test Procedure (STP).

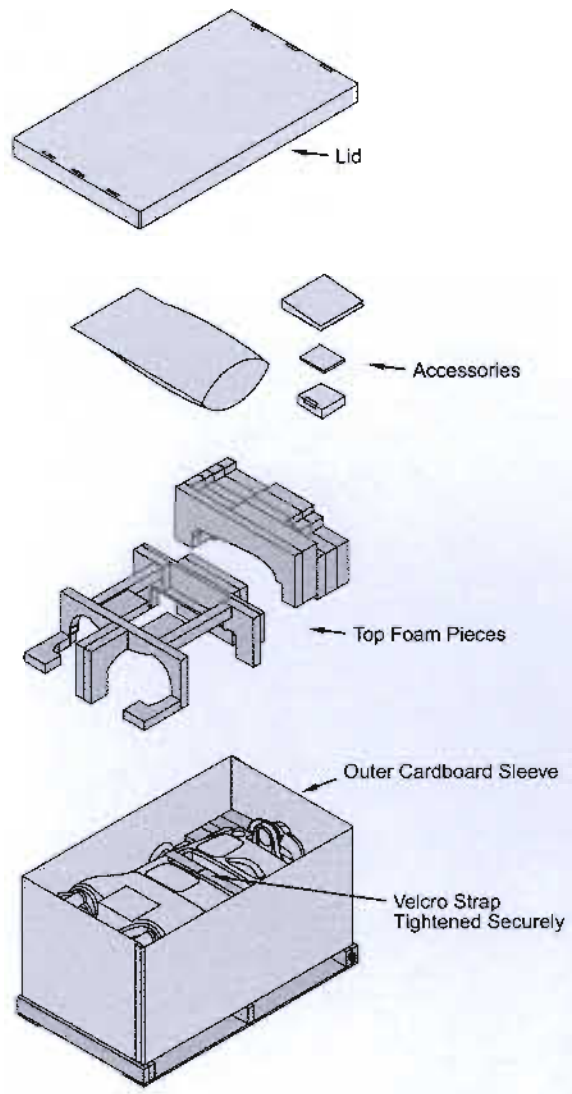


Figure 1-3 Accessories and foam removed from carton.

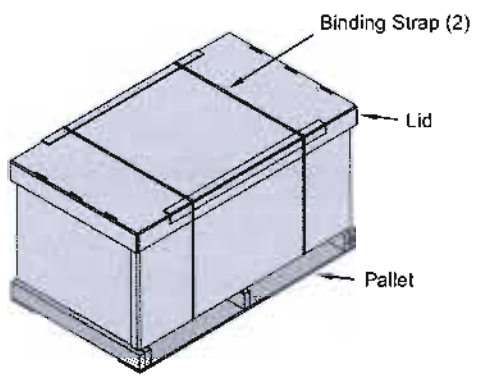


Figure 1-2 Carton lying horizontally on wooden pallet.

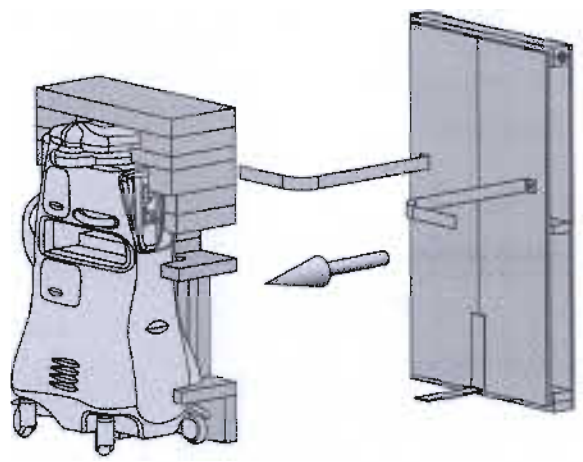


Figure 1-4 Roll the system away from the container.

REFERENCE DOCUMENTS

Although this manual provides the necessary information for maintaining optimum performance of the *Infiniti*™ Vision System, it does not contain all of the operating procedures or functional descriptions contained in the operator's manual. In addition, the Warnings and Cautions in the operator's manual also apply for this service manual. The operator's manual supplements information provided in this manual, and should be available on-site with the system.

If you have any questions or require additional information, please contact your local service representative or the Technical Services Department at:

Alcon Laboratories
15800 Alton Parkway
Irvine, CA 92718
(949) 753-1393
(800) 832-7827

If you are located outside the United States, please contact your local authorized Alcon distributor.

CAUTION

Federal Law restricts this device to sale by or on the order of a physician.

RECEIVING INSPECTION

The system was inspected mechanically and electrically prior to shipment. If the shipping container appears damaged, ask that the carrier's agent be present when the system is unpacked. The system should be inspected for external damage (i.e. scratches, dents, or broken parts). If damage is discovered or if the system fails any of the functional tests notify the carrier and an Alcon representative. Retain the shipping container and packing material for the carrier's inspection. As necessary, file a claim with the carrier or, if insured separately, with the insurance company.

Environmental Issues
Follow local governing ordinances and recycling plans regarding disposal or recycling of device components and packaging.

Universal Precautions
Universal precautions shall be observed by all people who come in contact with the instrument and/or accessories to help prevent their exposure to blood-borne pathogens and/or other potentially infectious materials. In any circumstance, wherein the exact status of blood or body fluids/tissues encountered are unknown, it shall be uniformly considered potentially infectious and handled in accordance with OSHA guidelines.

CAUTIONS AND WARNINGS

Most of these warnings are stated elsewhere in this manual; however, for easy reference they are repeated in greater detail here. If additional information is required, please contact your local Alcon service representative, or the Technical Services Department.

There are no user serviceable components inside the *Infiniti*™ Vision System console or footswitch. Refer all service issues to your factory-trained Alcon service engineer.

WARNINGS!

The *Infiniti*™ Vision System battery can only be serviced by a factory-trained Alcon service engineer. Access by untrained personnel can lead to injury.

Good clinical practice dictates testing for adequate irrigation, aspiration flow, and operation as applicable for each handpiece prior to entering eye.

Ensure that the tubings are not occluded during any phase of operation.

Inadvertent actuation of Setup Mode while a handpiece is in the eye can create a hazardous condition that may result in patient injury.

If the *Infiniti*™ Vision System is used at the 220V - 240V range in the United States or Canada, it should be used on a center-tapped, 240V single phase circuit.

Keep clear of the IV pole when it is in motion to prevent skin, hair, and/or clothing from being trapped in the IV pole mechanism. The IV pole moves during power on/off, priming, and bottle height adjustment.

GENERAL INFORMATION

The *Infiniti*™ Vision System is designed for use in anterior segment procedures that require simultaneous lens extraction, irrigation, and aspiration, as well as associated procedures such as vitrectomy and coagulation. It was developed with a dual purpose: to make it simple to operate, and to allow the surgeon tremendous versatility and control.

Following are key features of the *Infiniti*™ Vision System:

- Trimodal lens removal options:
  - *AquaLase*® liquefaction device handpiece, technology, and accessories.
  - *Infiniti*™ *NeoSoniX*® handpiece combining the features of a phaco handpiece with sonic oscillations.
  - High performance *Infiniti*™ U/S handpiece: 40 kHz, piezoelectric, slim, lightweight.
- Advanced fluidics with quick, smooth control of peristaltic aspiration.
- Fully programmable, multi-microprocessor control.
- Modularized fluidic connections in the form of a disposable Fluidic Management System (FMS).
- Emulation of venturi-like fluidic performance.
- Ability to drive a high performance *Infiniti*™ vitrectomy guillotine cutter.
- Bipolar coagulation capability.
- Several sub-modalities of ultrasonic power control including continuous, pulsed, and "burst" application of ultrasonic power, as well as duty cycle management.
- Automatic power reduction during low flow conditions.
- Automated IV pole, controlled via the front panel, footswitch, or remote control.
- Linear footswitch control of ultrasonic power in U/S steps (sophisticated control loop offers low-end control).
- Linear footswitch control of aspiration flow rate (AFR) in I/A, VIT, and lens removal modes.
- Linear footswitch control of vacuum in I/A, VIT, and lens removal modes.
- On-demand continuous irrigation.
- Programmable, pressurized reflux via the footswitch.
- Ability to set vacuum levels and aspiration flow rates to desired levels in phaco, I/A, and VIT steps.
- Ability to switch between surgical steps using touch screen, remote, or footpedal.
- Emission of variable tones for confirmation of system operational status.
- Voice confirmation during surgical step or mode changes.
- Flat screen, active matrix color LCD with touch screen display that is tiltable and rotatable.
- High-tech Graphical User Interface (GUI).
- Multi-channel wireless remote control.
- This product uses *SmartPhaco*™ technology.

Accessory Equipment
Accessory equipment connected to or used with this equipment must be certified according to the respective IEC Standard (e.g., IEC 950 for data processing equipment, and IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with System Standard IEC 60601-1-1. Anyone connecting additional equipment or otherwise causing a different system configuration than provided by Alcon is responsible for continued compliance to the requirements of System Standard IEC 60601-1-1. If in doubt, consult the Technical Services department or your local Alcon representative.

EMC Statement
This equipment has been tested and found to comply with the limits for medical devices to the EN60601-1-2:1993 and Medical Device Directive 93/42/EEC. These limits are designed to provide reasonable protection against harmful interference in a typical medical installation.

It is important to install and use the equipment in accordance with the instructions in order to prevent harmful interference with other devices in the vicinity. If this equipment causes harmful interference to other devices (determined by turning the equipment off and on), the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the other device(s).
- Increase the distance between the equipment.
- Connect this equipment into an outlet on a circuit different from that to which the other device(s) is connected.
- Consult the manufacturer or your Alcon field service engineer for help.

Handpiece Care
The *Infiniti*™ *AquaLase*®, *NeoSoniX*®, and high performance U/S handpieces are surgical instruments and must be handled with care. The handpiece tip should not touch any solid object while in operation. Immediately following surgery the tip must be removed and the handpiece thoroughly cleaned. Be sure cord plug is completely dry before connecting it to console. For cleaning and sterilization procedures, see the Directions for Use (DFU) supplied with the handpiece.

The *Infiniti*™ *NeoSoniX*® *and* U/S handpieces must be at room temperature just before use. Allow the handpiece to air cool for at least 15 minutes after autoclaving; never immerse the handpiece in liquid when hot.

CAUTIONS

Never ultrasonically clean the *Infiniti*™ *AquaLase*®, *NeoSoniX*®, or U/S handpieces; irreparable damage may result.

Prior to sterilization, the *Infiniti*™ *AquaLase*®, *NeoSoniX*®, and U/S handpieces should always have the connector end cap secured and placed in the sterilization tray. This will prevent damage to the connectors and handpieces during handling, and especially during autoclaving.

Do not test or operate *Infiniti*™ U/S or *NeoSoniX*® handpieces unless the tip is immersed in *BSS*® sterile irrigating solution or distilled water or is in surgical use. Irreparable damage to the handpiece and tip can result if run dry.

Ensure that test chamber is filled with *BSS*® sterile irrigating solution before tuning *Infiniti*™ U/S or *NeoSoniX*® handpieces. Tuning a handpiece dry may result in premature tip failure and breakage.

WARNINGS!

Use of the *Infiniti*™ *NeoSoniX*®, U/S, or *AquaLase*® handpiece in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

Appropriate use of *Infiniti*™ Vision System parameters and accessories is important for successful procedures. Use of low vacuum limits, low flow rates, low bottle heights, high power settings, extended power usage, power usage during occlusion conditions (beeping tones), failure to sufficiently aspirate viscoelastic prior to using power, excessively tight incisions, and combinations of the above actions may result in significant temperature increases at the incision site and inside the eye, and lead to severe thermal eye tissue damage.

Use of an ultrasonic handpiece other than the *Infiniti*™ *NeoSoniX*® or U/S, or use of a handpiece repaired without Alcon authorization, is not permitted, and may result in patient injury, including potential shock hazard to patient and/or operator.

The U/S tips supplied in the *Infiniti*™ Vision System pak are only to be used on the *Infiniti*™ *NeoSoniX*® or U/S handpieces. Each U/S tip is intended to be used only once per case, and then disposed of according to local governing ordinances.

Use 0.9 mm U/S tips exclusively with purple 0.9 mm infusion sleeves. Use 1.1 mm U/S and 1.1 mm liquefaction tips exclusively with blue infusion sleeves. Mismatching U/S tips and infusion sleeves may create potentially hazardous fluidic imbalances.

Directing energy toward non-cataractous material may cause tissue damage.

***Ultraflow*™* (I/A) Handpiece**
Prior to each procedure inspect the two O-rings where the tip screws onto the *Ultraflow*™* handpiece. If damaged, replace the o-rings. If in doubt, contact Alcon's Technical Services Department.

WARNINGS!

Use of non-Alcon surgical reusable or disposable I/A handpieces that do not meet Alcon surgical specifications, or use of an Alcon handpiece not specified for use with the *Infiniti*™ Vision System, may result in a fluidic imbalance. This, in turn, may cause a shallowing or collapsing of the anterior chamber.

Exceeding the recommended level of 100 mmHg with a 0.5 mm or larger I/A tip may cause anterior chamber shallowing and/or incarceration or tearing of the posterior capsule.

I/A tips are not to be used with U/S or *NeoSoniX*® handpieces.

Recommended Vacuum Range for I/A Tips
It is important that only the proper size I/A tip be used when operating with maximum vacuum. Only 0.2 mm or 0.3 mm I/A tips should be used with vacuum limits above 100 mmHg.

I/A adjustable vacuum range is 0-650+.

U/S, *AquaLase*®, and I/A Handpiece Tips
Ensure that handpiece tip is fully tightened to the handpiece. If not securely attached, an error may be generated and/or inadequate tuning will occur. Ensure that the tip is not too tight so that it can be removed after use.

Use of a tool other than tip wrenches supplied by Alcon may cause damage to the tip and/or handpiece.

WARNING!

Poor clinical performance will result if tip is not secured tightly to the handpiece.

***Infiniti*™ Vitrectomy Probe**

The *Infiniti*™ vitrectomy probe, an oscillating guillotine vitreous cutter, is intended for single use only.

WARNINGS!

Do not test or operate vitrectomy probes unless the tip is immersed in *BSS*® sterile irrigating solution or distilled water or is in surgical use. Irreparable damage to the handpiece and tip can result if run dry.

After priming and before surgical use, verify that the probe is properly actuating and aspirating. Prior to entry into the eye and with the probe tip in sterile irrigating solution, the surgeon should step on the foot treadle until there is visual verification that the probe is cutting.

- **If the cutter is observed to not fully close or does not move when the probe is actuated, replace the probe.**
- **The port should always remain in an open position in footpedal position 0 or 1. If the cutting port is partially closed while idle, replace the probe.**
- **If air bubbles are observed in the aspiration line or exiting the probe tip during priming, replace the probe.**
- **If a reduction of cutting capability or vacuum is observed during the surgical procedure, stop immediately and replace the probe.**

Aspiration/Vacuum Adjustments

Adjusting aspiration rates or vacuum limits above the preset values may result in aspiration levels (volumes) exceeding irrigation inflow.

WARNING!

Adjusting aspiration rates or vacuum limits above the preset values, or the use of Dynamic Rise setting 1, 2, 3, or 4, may cause chamber shallowing or collapse which may result in patient injury.

out in the region of the thorax or the head, unless these agents are sucked away.
- Non-flammable agents should be used for cleaning and disinfection wherever possible.
- Flammable agents used for cleaning or disinfecting, or as solvents of adhesives, should be allowed to evaporate before the application of HF surgery. Some materials, for example cotton, wool and gauze, when saturated with oxygen may be ignited by sparks produced in normal use of the HF surgical equipment.

WARNINGS!

- **Do not use the coagulation function on patients with pacemakers or implanted defibrillatory devices. If electrosurgery is used on patients with implanted cardiac pacemakers or defibrillatory devices or pacemaker electrodes, be aware that irreparable damage to the pacemaker or defibrillatory device and its function may occur and lead to ventricular fibrillation. Please check with the pacemaker or defibrillatory device manufacturers for their recommendations.**

- **Failure of the HF surgical equipment (coagulation circuitry) could result in an unintended increase of output power.**

CAUTION

The *Infiniti*™ Vision System is not protected against the effects of defibrillator discharge.

Cautery, Diathermy, Coagulation Definition
The *Infiniti*™ Vision System uses the word "Coagulation" in place of Cautery, based on the following definition:

Coagulation - an isolated bipolar current supplied to conductors (e.g. forceps). Current passes between these electrodes, halting bleeding. (Abbreviated "Coag" in some of the text of this operator's manual.)

Consumable Paks

Consumable items used with the *Infiniti*™ Vision System during surgery are designed to be used once and then discarded, unless labeled otherwise.

All *Infiniti*™ paks contain Directions for Use (DFU). It is important to read and understand the DFU's prior to use.

NOTE: If an inconsistency exists between the instructions in the operator's manual and the Directions For Use (DFU) supplied with a consumable pak or accessory, follow the DFU.

WARNINGS!

Mismatch of consumable components and use of settings not specially adjusted for a particular combination of consumable components may create a patient hazard.

Do not use paks that have exceeded the expiration date.

Sterile disposable medical devices should not be reused! (Accreditation Manual for Hospitals, 1982.) These components have been designed for one time use only; do not reuse.

The equipment used in conjunction with the Alcon disposables constitutes a complete surgical system. Use of disposables other than Alcon disposables may affect system performance and create potential hazards, and if it is determined to have contributed to the malfunction of the equipment under contract, could result in the voidance of the contract and/or invoicing at prevailing hourly rates.

In all cases, the instrument setup instructions contained in the manual should be thoroughly understood prior to using any of the pak configurations.

Read all package label material printed on the consumable paks prior to their use.

General Cautions
- Do not use the *Infiniti*™ Vision System near flammable anesthetics.

- Do not push or pull the unit by the display, the tray, or the IV pole. Handles located at the rear and sides of the unit are provided for moving the instrument. The unit should be pulled and not pushed, especially over elevator and door thresholds.

- Do not place more than a 20 lb. load on tray support.

WARNING!

Tray support must be set in its stored position when moving instrument.

Presurgical Check-out Tests
Presurgical check-out tests must be performed as outlined in the operator's manual. If an error message or advisory message is displayed on the front panel, refer to the Troubleshooting section of this manual. If the problem persists, DO NOT PROCEED.

WARNINGS!

When filling handpiece test chamber, if stream of fluid is weak or absent, good fluidics response will be jeopardized. Good clinical practice dictates the testing for adequate irrigation and aspiration flow prior to entering the eye.

Ensure that the tubings are not occluded during any phase of operation.

Footswitch
Never pick up or move the footswitch by the cable. Damage may result.

High Altitudes
Vitrectomy cutting performance may vary at high altitudes. Consult Alcon Technical Service for additional information.

Occlusion Tones
Two different occlusion tones (intermittent beeping tones during occlusion) indicate that the vacuum is near or at its preset limit, and aspiration flow is reduced or stopped to avoid exceeding the limit. The first type, the I/A occlusion tone, sounds when occlusion occurs during aspiration only (in the absence of ultrasonic power or *AquaLase*® magnitude). The I/A occlusion tone is a lower, intermittent single beep. The second type of occlusion tone, the phaco occlusion tone, is a higher, intermittent double beep, and sounds when occlusion occurs during application of ultrasonic power or *AquaLase*® magnitude.

The I/A occlusion and phaco occlusion tones indicate that the vacuum has reached its maximum allowed preset value. The I/A occlusion tone can be turned off, while the phaco occlusion tone cannot be turned off.

WARNINGS!

The U/S occlusion bell indicates no aspiration flow. Use of high U/S settings and/or prolonged use may lead to thermal injury.

Use of the *Infiniti*™ *NeoSoniX*®, U/S, or *AquaLase*® handpiece in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

Vacuum Tone
A vacuum tone is provided. The pitch will vary relative to the amount of vacuum. A high vacuum can indicate that little to no flow is occuring. This tone can be reduced in volume, but not turned off.

WARNING!

A moderate to high vacuum tone may indicate little to no flow is occuring. Use of the *Infiniti*™ *NeoSoniX*®, U/S, or *AquaLase*® handpiece in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

Coagulation Function
Listed below are general precautions to be followed when using the Coagulation function:

- To ensure safe operation of the coagulation function, only approved cables and accessories must be used (See your Alcon representative). Coagulation performance can be guaranteed only when using Alcon components or Alcon-endorsed components.
- To reduce the risk of accidental burns, caution should always be taken when operating high-frequency surgical equipment.
- Interference produced by the operation of high-frequency surgical equipment may adversely influence the operation of other electronic equipment.
- Accessories should be checked regularly; electrode cables should particularly be checked for possible damage to the insulation.
- Operation of the coagulation step is limited to extraocular uses only.
- The lowest power level in coagulation step should always be selected for the intended purpose.
- Skin-to-skin contact (for example between the arms and body of the patient) should be avoided, for example by insertion of dry gauze.
- When HF (high frequency) surgical equipment and physiological monitoring equipment are used simultaneously on the same patient, any monitoring electrodes should be placed as far as possible from the surgical electrodes. Needle monitoring electrodes are not recommended.
- In all cases, monitoring systems incorporating high frequency current-limiting devices are recommended.
- The cables to the surgical electrodes should be positioned in such a way that contact with the patient or other leads is avoided.
- Temporarily unused active electrodes should be stored so that they are isolated from the patient.
- The use of flammable anaesthetics or oxidizing gases such as nitrous oxide (N_2O) and oxygen should be avoided if a surgical procedure is carried

INFINITI™ VISION SYSTEM DESCRIPTION

Alcon's *Infiniti*™ Vision System is a multi microprocessor-controlled ophthalmic surgical instrument with associated memory and input/output (I/O) circuitry. The system communicates to the user via its Front Panel display, with voice confirmations, and with tones. An automatic self-test is initiated each time system power is turned on.

This test performs a variety of functions including the following:

- Tests the Central Processing Unit (CPU)
- Tests the RAM and ROM memory, and the I/O circuits
- Initializes the system

When the system successfully completes the self-test, it automatically goes into the Setup mode. If the system fails the self-test, an error message is displayed.

This section of the manual is broken into two major parts. The first part describes the console and its accessories. All the parts of the sytem will be described, including the display panel, IV pole, connectors, fluidic interface, footswitch, and remote control. The second part of this section describes the operator interface. This is where the display screens for system setup, surgery, programming, and dialogs are shown.

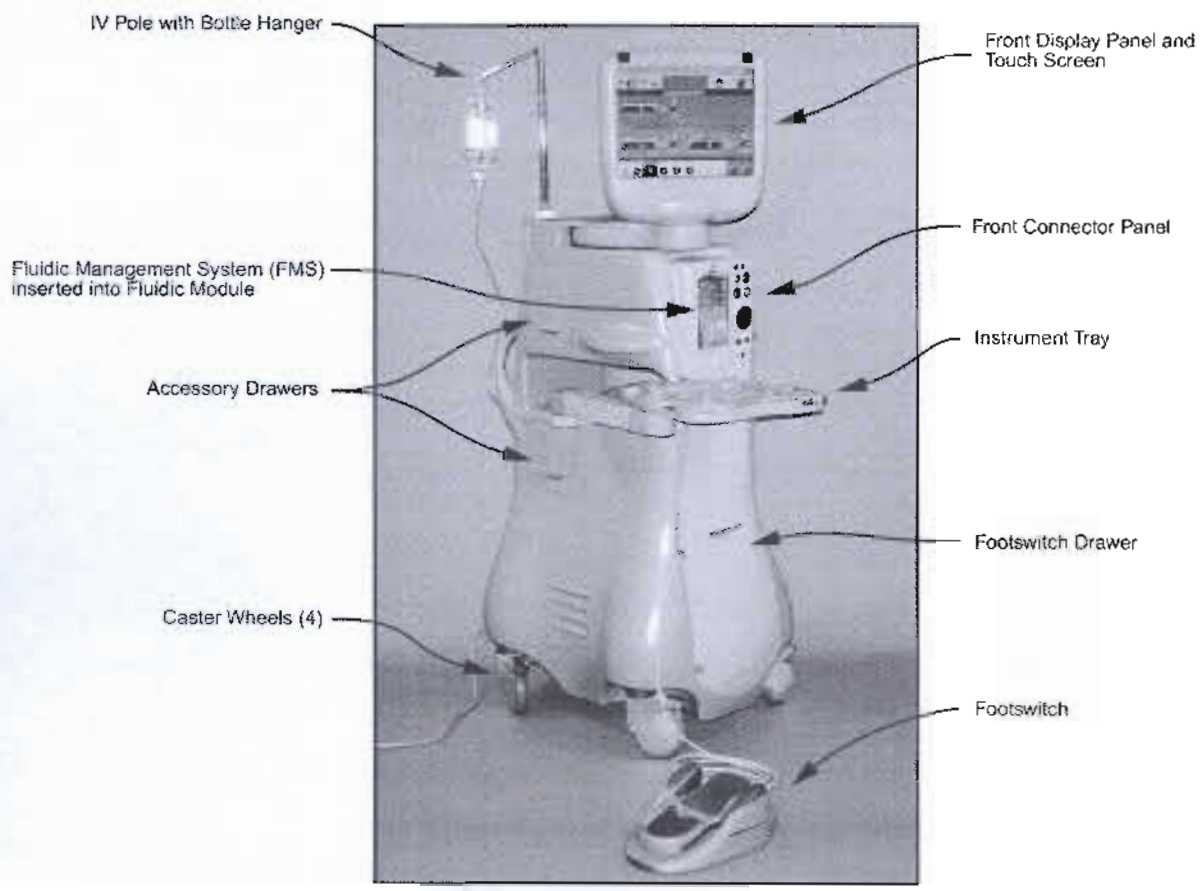


Figure 1-5 The Console - The console contains all the controls, connectors, and communication devices required by the surgeon to perform lens extraction surgery.

CONSOLE

Fluidics Module
The fluidics module is located at the top of the front panel (see Figure 1-5). The module allows fast and easy insertion of the Fluidic Management System (FMS), and because the module contains all the connections required, surgery can be started without delay.

Front Display Panel and Touch Screen
The front display panel tilts and rotates, allowing easy maneuverability during setup and surgery. For storage and transport the front panel folds down. The front display is the user's main source of system control, allowing fingertip command of system functions.

Front Connector Panel
The connector panel is located to the right of the fluidics module (see Figure 1-6). It provides two self-locking U/S handpiece connectors, one *AquaLase*® handpiece connector, two connectors for bipolar coagulation handpieces, an *AquaLase*®/balanced salt solution bottle receptacle, and one luer lock pneumatic connector for the anterior vitrectomy handpiece. Symbols near the connectors facilitate handpiece identification.

Footswitch Drawer
The footswitch drawer is at the bottom of the front panel. When not in use, this drawer is used to store and protect the footswitch. Two footswitch cable connectors are located behind this drawer. The top connector is for the *Infiniti*™ footswitch; the bottom for *Accurus*®/ *Legacy*® footswitch. The footswitch cord is also stored in, and exits from, the drawer.

Instrument Tray
Provides a movable instrument tray within the sterile field. There is a curved metal rod on the tray arm that allows for creation of a sterile pouch when used with sterile tray support cover. The tray is capable of accommodating a variety of positions in the operating room environment: right, left, front and rear of the surgeon as well as the front of the bed. The tray is height adjustable.

IV Pole with Bottle Hanger
A bottle of *BSS*® or *BSS Plus*® irrigating fluid is hung from the hook on top of this pole. The IV pole is used to raise and lower the bottle height, causing irrigation pressure to increase or decrease.

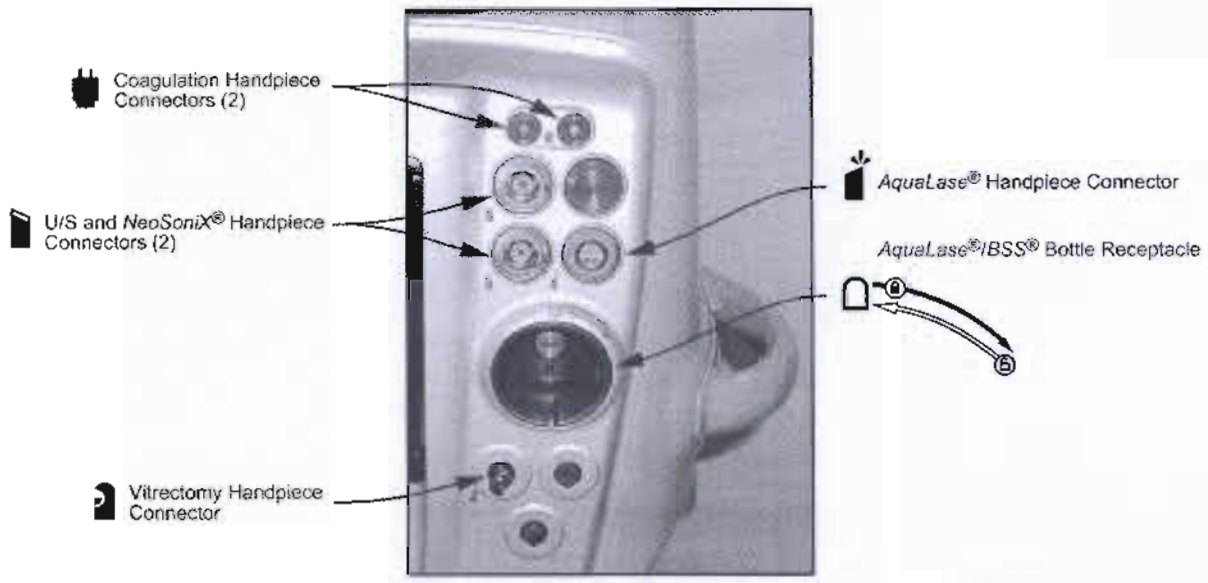


Figure 1-6 The Front Connector Panel - The front connector panel allows quick and easy connection of handpieces and consumables.

Connectors and CD/DVD Drive
This module, located in the middle of the rear panel, contains various connectors and outlets used for electrical interconnections. A CD/DVD drive, located next to the connectors, is used for software upgrades to the system.

- USB Connector - Not used.
- Serial Connector - Used for VideOverlay.
- Serial Connector - Not used.

Data Card Slot
A data card [e.g., Multi Media Card (MMC) or Secure Digital (SD)] can be inserted into this data card slot when the user wants to back up or restore system settings. This is done by using the Copy/Delete option from the Custom drop list. The Copy/Delete dialog allows the user to copy data from the *Infiniti*™ Vision System to a data card (backup), or copy data from a data card to the *Infiniti*™ Vision System (restore).

Standby Power Switch
This pushbutton switch is used to turn secondary power ON and OFF.

Audio Speaker
The audio speakers are located on each side of the console. These speakers produce voice confirmations, in conjunction with multiple tones, to allow the Infiniti to communicate with the user. Audible tones are generated to indicate a change in the operating mode and to alert the operator of certain conditions such as an occluded line. Additionally, a varied pitch tone is generated to audibly indicate vacuum levels; the pitch increases as the vacuum level increases. Speaker volumes are adjustable via the Custom menus.

Figure 1-8 The Right Side Panel - The right side panel contains the data card slot and one-of-two audio speakers. The left side panel has the other speaker and two accessory drawers.

Accessory Drawers
Two drawers allow storage of miscellaneous accessories.

Caster Wheels
Four large caster wheels support the *Infiniti*™ Vision System. The wheels rotate 360° for ease of system mobility. All four wheels have locking levers to secure the system in place; at least two should be locked when the unit is in use, and all must be unlocked when unit is being moved.

Handles
Handles are located on the sides and back of the instrument, and should always be used to move the unit. For greater safety and control, the unit should be pulled, not pushed.

CAUTION

Do not push or pull the unit by the display, the tray, or the IV pole. Handles located at the rear and sides of the unit are provided for moving the instrument. The unit should be pulled and not pushed, especially over elevator and door thresholds.

REAR PANEL

Power Module
The power module contains an AC power connector, AC power switch, and a fuse drawer (see Figure 1-7). The power module is located at the bottom of the rear panel. A standby power switch is located at the top of the rear panel.

- AC Power Connector - Power cord from AC power outlet connects here. A hospital grade power cord must be used.
- Main Power Switch - Connects AC power to power supply. This switch is used for overnight storage of the system.
- Fuse Drawer - Holds fuse. Refer to label on back of system to identify size and type.

Equipotential Ground Connector
For Service personnel use.

Cord Wrap
Used to store the power supply cord. Located on the right side of the rear panel.

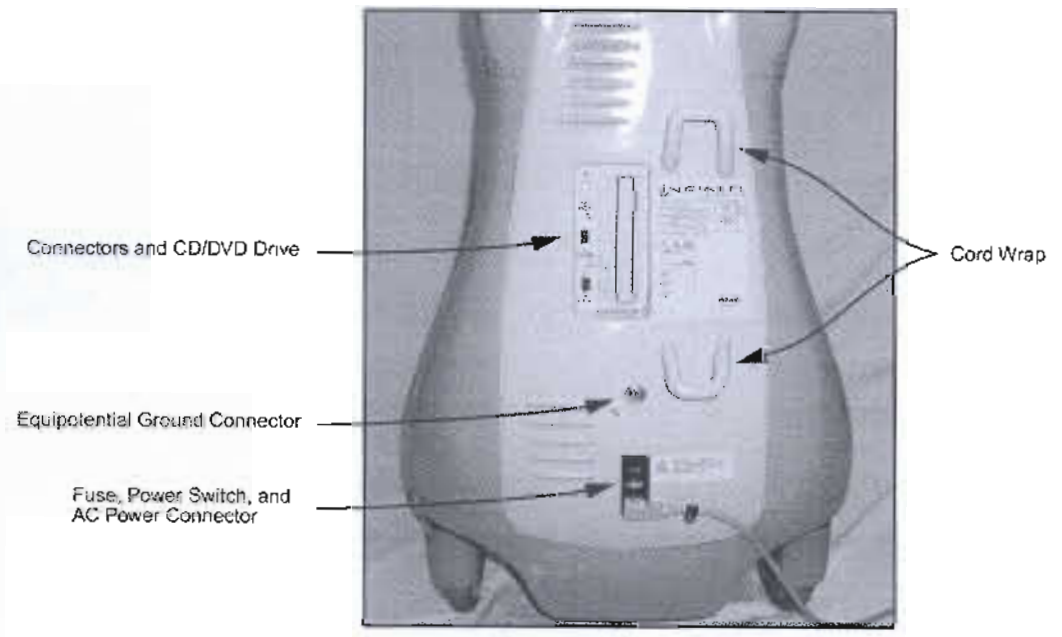


Figure 1-7 The Rear Panel - The rear panel contains the power module, electrical connectors, CD/DVD drive, cord wrap, and standby power switch (shown in Figure 1-8).

FOOTSWITCH

The *Infiniti*™ Vision System can utilize two different Alcon footswitches. The *Infiniti*™ footswitch has a footpedal, on/off toe switches (horizontal and vertical), and on/off footpedal swivel switches. The *Accurus*®/*Legacy*® type of footswitch contains heel switches rather than a swivel footpedal (see Figure 1-9).

The footswitch icon button on the display screen is a graphical representation of the footswitch connected. When connected, the icon's footpedal position (0, 1, 2, or 3) is displayed in the center of the icon, and a triangular arrow appears next to the icon each time a switch is activated. If a footswitch is not connected, no footpedal position is displayed in the icon.

Several functions within the system's operating modes are controlled by the surgeon using the footswitch. The footpedal enables the surgeon to control irrigation flow, aspiration rate, *NeoSoniX*® or U/S power, *AquaLase*® energy, vitrectomy cut rate, and coagulation power. The switches are used to turn functions on/off, to adjust function settings, and to progress through surgical steps.

The footswitch's switch actions are shown in Figure 1-12. Footpedal positions are shown in Figure 1-11, and footpedal positions/functions in each mode of operation are listed in Table 1-1. To program the footswitch, see the ***Custom*** feature later on in this section of the service manual.

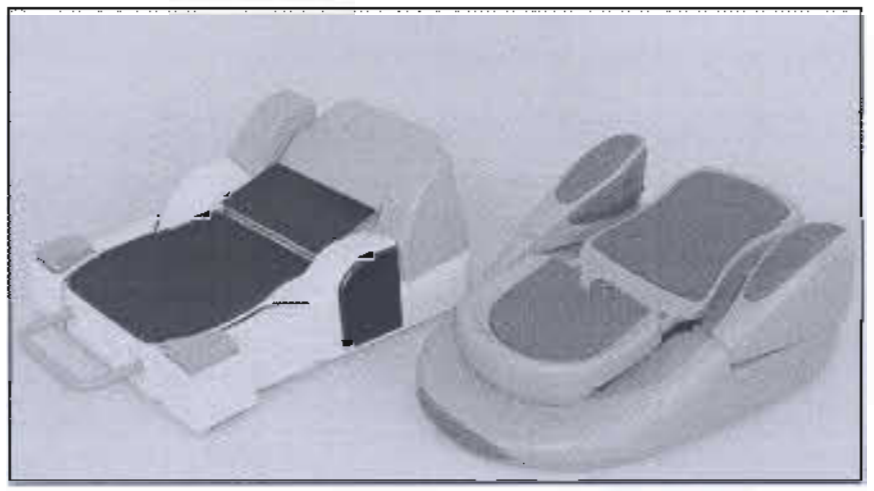


Figure 1-9 The *Accurus*®/*Legacy*® and *Infiniti*™ Footswitches

Plugging in the Footswitch

The footswitch plugs into one-of-two connectors behind the footswitch drawer (see Figure 1-10). The top connector is for the *Infiniti*™ footswitch; the lower is for the *Accurus*®/*Legacy*® footswitch. To plug in the footswitch follow the directions below.

1. Open the footswitch drawer.
2. Simultaneously press a metal drawer extension latch on each of two hinges to release the drawer and allow access to the footswitch cable connectors.
3. Grasping the footswitch cable connector, plug the cable into one of the two connectors. The red dot on the cable connector must be in alignment with the red dot on the console connector, and when the connector is in the correct position it will slide in smoothly.

NOTE: Only one footswitch connector is intended to be used at a time. If both connectors are used at the same time, only the top connector is functional.

4. A cable restraint is located on the back of the drawer. Loosen the two screws securing the cable restraint and place the cable through its center. Replace the cable restraint over the cable and secure it with the two screws. Ensure that a slight amount of excess cable exists between the connector and the restraint.
5. Loop the cable through the slot in the back of the drawer, then route it through the left or right slot of the cable management system in the front of the drawer. There are high and low slots on each side of the drawer.
6. Shut the footswitch drawer.

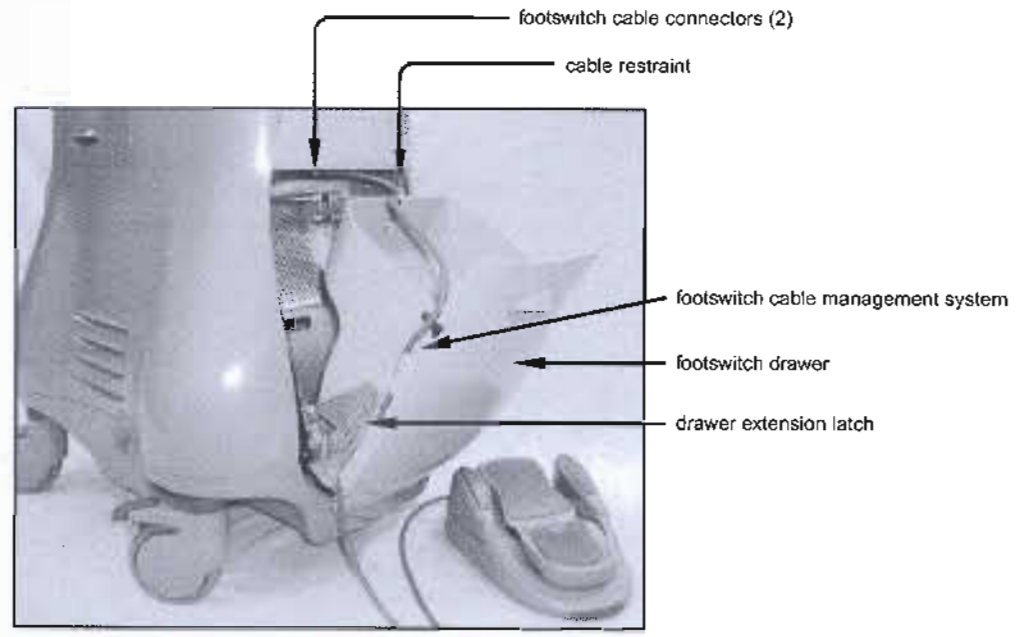


Figure 1-10 Footswitch Cable Routing

Footswitch Treadle Control

Depending on the surgery step, the user may have the option to select linear or fixed footpedal control of a surgical parameter (i.e., aspiration, vacuum, power, coagulation). With *linear* control, the angle of depression within the treadle range is directly proportional to the parameter output. The parameter output is 0 at the very start of the treadle range, and the parameter output is equal to the limit value specified at the end of the treadle range. With *fixed* control, the parameter output is fixed at its limit value throughout the treadle range. Detents identify the transition from one footpedal position to another, and are felt by the operator when slightly more pressure is required to press the footpedal from one position into the next. Detents can also be accompanied by vibration if programmed to do so.

The footswitch's Buttons and Treadle adjustments are programmable and are available by pressing the Footswitch Button in the Main Window. The Footswitch Button is described later in this section of the manual.

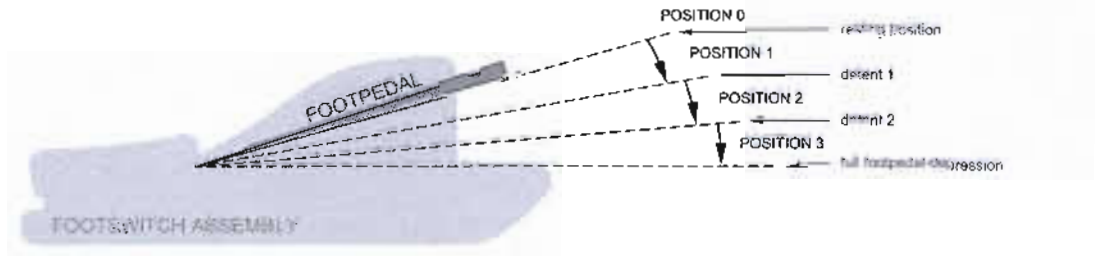


Figure 1-11 Diagram of Footpedal Positions

Mode	Footpedal Control of Surgical Functions			
	Position 0	Position 1	Position 2	Position 3
Phaco or *NeoSonix®* or *AquaLase®*	Resting	Irrigation	Irrigation/Aspiration	Irrigation/Aspiration Phaco Pwr/AqL Mag
	Continuous Irrigation		Irrigation/Aspiration	Irrigation/Aspiration Phaco Pwr/AqL Mag
I/A	Resting	Irrigation	Irrigation/Aspiration	
	Continuous Irrigation		Irrigation/Aspiration	
I/A Cut	Resting	Irrigation	Irrigation/Aspiration	Irrigation/Aspiration Cutting
	Continuous Irrigation		Irrigation/Aspiration	Irrigation/Aspiration Cutting
Cut I/A	Resting	Irrigation	Irrigation/Cutting	Irrigation/Cutting Aspiration
	Continuous Irrigation		Irrigation/Cutting	Irrigation/Cutting Aspiration
Coag	Resting		Coagulation Power	

Table 1-1 Table of Footpedal Positions - The footpedal is used by the surgeon to control several surgical functions. This table shows the functions controlled, dependent on mode of operation and type of irrigation selected. As the footpedal is depressed it travels from the resting position into its active positions.

Switch Control

The footswitch has six switches that can be programmed to control various surgical functions (see Figure 1-12). The *Infiniti*™ footswitch has left and right toe switches that operate horizontally and vertically, and footpedal switches that activate when the pedal is shifted left or right. The *Accurus®* /*Legacy®* footswitch has left and right toe switches that operate horizontally and vertically, and heel switches that activate when pressed down.

Switch functions are programmable by pressing the footswitch icon and making selections on the display. The left horizonal switch is the only switch with a factory default action: Reflux. The other five switches are listed as None, their functions are mutually exclusive, and must be programmed by the user. When a switch is given a function already designated to another switch, the other switch is given a None designation. Choices are Reflux, Cont. Irr., Step+, Step-, Step+/-, Grade+, Grade-, Grade+/-, Irr. Up, Irr. Down, and None.

If the footpedal is not depressed, any switch may be engaged; however, the switches are mutually exclusive and cannot be engaged until all other switches are disengaged. If the footpedal is depressed, depending on the mode of operation, certain switches may or may not be allowed to engage. Furthermore, even if a switch is permitted to be engaged with the treadle depressed, some functions are not available when the treadle is depressed, and the command will not be performed.

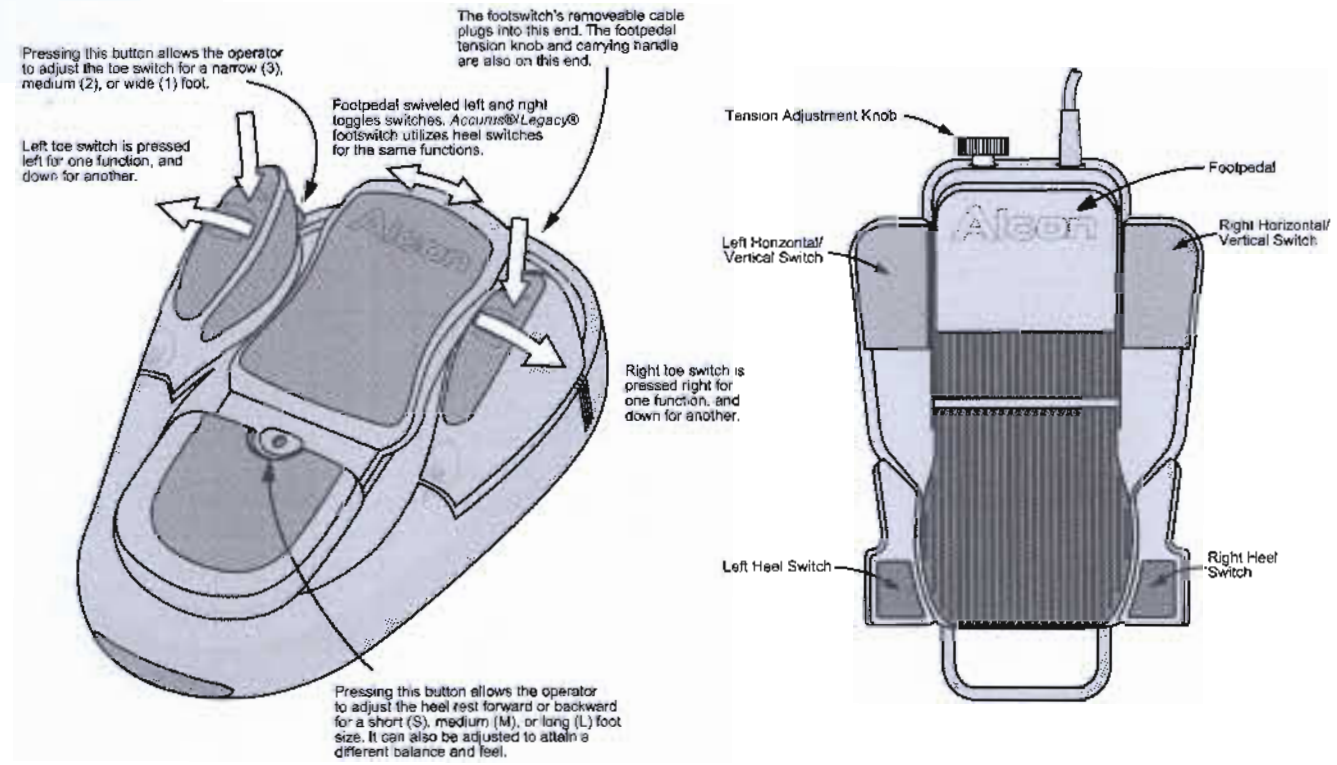


Figure 1-12 Footswitches Used with the *Infiniti*™ Vision System - Shown on the left is the *Infiniti*™ footswitch, and on the right is the *Accurus®*/*Legacy®* footswitch.

The following sections indicate whether each switch function is permitted with the treadle depressed. If it is permitted, and the user intends to control that function when the treadle is depressed, the function must be assigned to a switch that is permitted to be engaged with the treadle depressed.

• Reflux
The default reflux pressure is equal to the current bottle height pressure. The reflux pressure can be increased using the Reflux Offset control in the *Custom/Doctor* menu.

In all cases, reflux is not available when the footpedal is depressed, and is not available in a Coagulation step.

• Continuous Irrigation On/Off
When a switch assigned to Continuous Irrigation On/Off is toggled, the continuous irrigation status immediately activates/deactivates. Continuous irrigation toggling is available when the footpedal is in any position, but is not available in a Coagulation step.

• Step Advance, Step Back, Step Advance/Back
A switch may be assigned as step advance (Step +), step back (Step -), or step advance/back (Step +/-).The Setup, Coagulation, and Anterior Vitrectomy steps are excluded from this stepping sequence.

If step advance or step back is assigned, when the switch is pressed, the next or previous step to the current step is selected in the surgery menu. If step advance/back is assigned to a switch, then step advance will be activated if the switch is pressed for less than 1/2 second. If the switch is pressed for more than 1/2 second, then the step back function will be activated.

The stepping sequence applies to Phaco, *AquaLase®*, I/A, and Fill steps. Thus, if the current step is Coagulation or Anterior Vitrectomy, the next and previous step command will select the next or previous step relative to the last step used. If there is no next or previous step, the same step selection will be confirmed.

• Cataract Grade Increase, Decrease, Increase/Decrease
A switch may be assigned as cataract grade increase (Grade +), cataract grade decrease (Grade -), or cataract grade increase/decrease (Grade +/-). Footswitch control of the cataract grade is only available in phaco and *AquaLase®* steps, and is available whether or not the footswitch treadle is depressed.

If cataract grade increase or cataract grade decrease is assigned, when the switch is pressed, the next or previous cataract grade to the current cataract grade is selected. If cataract grade increase/decrease is assigned to a switch, then cataract grade increase will be activated if the switch is pressed for less than 1/2 second. If the switch is pressed for more than 1/2 second, then the cataract grade decrease function will be activated.

If the highest cataract grade is currently selected, and cataract grade increase is selected, the lowest cataract grade will be selected. Similarly, if the lowest cataract grade is currently selected and cataract grade decrease is selected, the highest cataract grade will be selected.

When a new cataract grade is selected, surgical parameters will be updated with those specified for the new cataract grade.

• Irrigation Up, Irrigation Down
A switch may be assigned as irrigation up or irrigation down. When the switch is pressed and immediately released, the IV pole position will increment up or down. If the switch is pressed and held for more than 1/2 second, the IV pole will move continuously up or down until the switch is released. Control of this irrigation function is available in all steps but coagulation, and in all footpedal positions.

REMOTE CONTROL

The *Infiniti*™ remote control (see Figure 1-13) is wireless and can be used in one of two ways. It can be laid in its tray assembly receptacle and operated under the sterile tray support cover supplied in the disposable pak; this offers the Scrub Nurse or Sterile Assistant access to the controls from the sterile field. Alternatively, the Circulating Nurse can operate the remote control in a non-sterile manner. Programmability and custom user setup features are functions which are not accessible from the remote control.

CAUTION

Do not sterilize the remote control as it will damage the unit.

Remote Control Keys
The following describes the remote control and the buttons provided (see Figure 1-14). The function of each button, and when these buttons are valid, is described. When a remote control key is pressed, the valid or invalid key tone is generated as appropriate.

The remote control is divided into three sections from top to bottom. Each section of the remote approximately corresponds to its associated section of the *Infiniti*™ Vision System display screen. The three sections of the display screen are 1) the setup status/surgery control window, 2) the main window, and 3) the setup steps/ surgery menu. The Adjust button and items in the Adjust bar are not accessible with the remote.

Figure 1-13 The Remote Control - The remote control fits securely in its tray assembly receptacle and allows rotation in any orientation. The sterile tray support cover is then draped over the remote and tray.

• Irrigation Control Up/Down Keys
The Irrigation Control up/down keys on the remote function as they do on the touchscreen. Each individual press raises the IV pole 1 cmH2O up or down. To move rapidly up or down, a key is pressed and held until the desired height is reached. The irrigation control keys are only valid in the Setup and Surgery screens, and are not valid when any dialog is displayed.

• Cataract Grade Key
The Cataract Grade key is only valid in the setup screen and during lens removal surgery steps, and is not valid when any dialog is displayed. Each time this key is pressed it cycles the cataract grade upward in a progression from 1 to 4, and then begins again at grade 1.

The first press of the Cataract Grade key, or the first press after five seconds have elapsed from the last press, simply invokes the voice confirmation of the currently selected grade. Each subsequent press of the key within five seconds selects the next cataract grade, with voice confirmation of the grade.

• Parameter Selection Button
The Parameter Selection button is used to navigate within the Surgery Control Window to select surgical parameters for adjustment. The current selection is indicated with a yellow border. With this button the user can navigate up, down, left, and right to select the desired surgical parameter. This button is valid when the footpedal and/or a footswitch button is up or depressed, but is invalid when a dialog is displayed.

• Parameter Value Adjustment Up/Down Keys
The Parameter Value Adjustment up/down keys affect settings in the Surgery Control Window that have adjustment arrows (i.e., power, vacuum, aspiration) and the linear/fixed toggle buttons. When a surgical parameter is selected via the Parameter Selection button, a yellow border indicates that the item is selected; the Parameter Value Adjustment up/down keys can then be used to adjust its value.

If a linear/fixed toggle button is selected, either of the parameter value adjustment up/down keys can be pressed to toggle the value between linear and fixed.

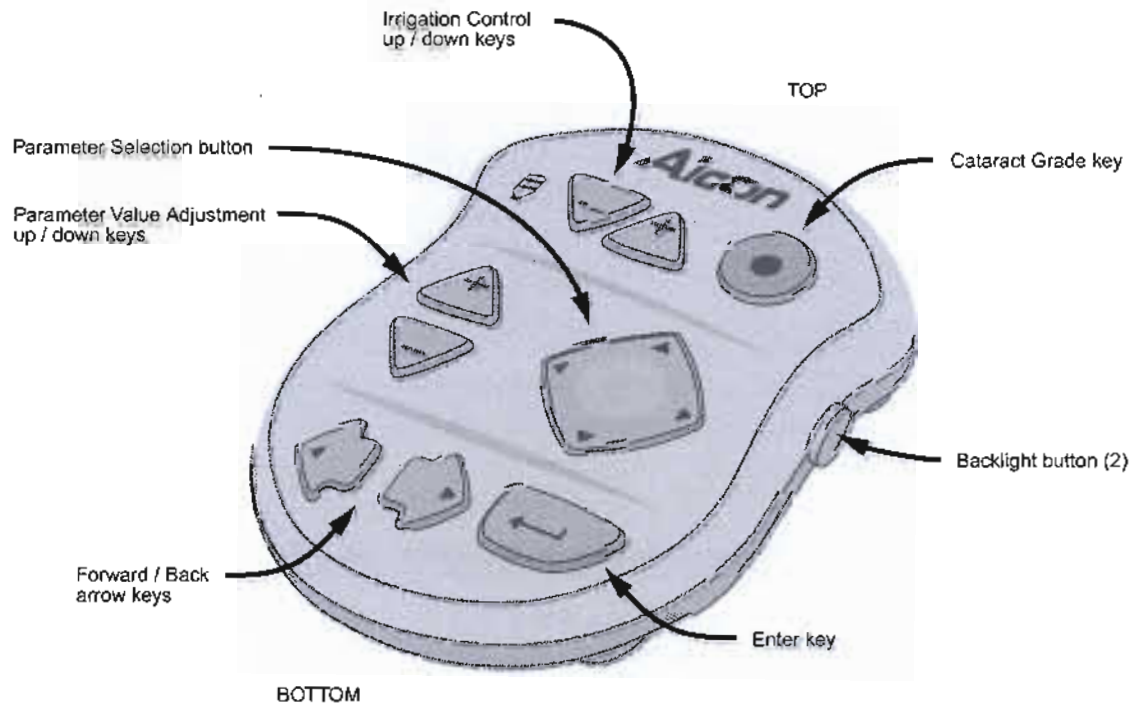


Figure 1-14 The Remote Control Keys

• Forward/Back Arrow Keys
The Forward/Back Arrow keys are used to move left and right through the Setup Step buttons and the Surgery Menu steps. In the Surgery screens, when a step is selected using the Forward key or Back key on the remote, the step is immediately selected. The Forward key and Back key do not wrap around.

If Coagulation or Anterior Vitrectomy is the current step (e.g., selected with the touchscreen), a Forward/Back key will select the next or previous step relative to the last non-coagulation and non-anterior vitrectomy step selected. Additionally, if the Back key scrolls all the way to the left, the system will select the Setup button; the Enter key must be pressed to invoke the Setup Screen.

In the Setup Screen, when a Forward/Back key is used to move to a Setup Step button, the button will be highlighted, but the Enter key must be pressed to activate the button. If the Forward key is pressed during the draw fluid portion of the priming sequence, the system will skip to the vacuum check.

The Forward key and Back key can also be used in an information dialog to select a button (e.g., OK, Cancel, Save, etc.).

• Enter Key
The Enter key is only valid to do the following: 1) go to the Setup Screen when the Setup button has been selected with the Back key, 2) invoke a setup function (e.g. prime FMS, fill, test handpiece.) when the function has been selected in the Setup screen with the Forward/ Back key, and 3) invoke the highlighted button in dialogs.

Remote Control Batteries
When the batteries in the remote control are low, the status message "Remote Battery Low" will appear below the irrigation controls each time a remote key is pressed. The message will disappear after new batteries are installed and a remote control key is pressed.

A battery holder inside the remote holds three (3) AAA (LR3) batteries. To replace batteries, refer to Section Four of this manual.

Select Remote Control Channel
The remote control can be configured to operate on one-of-four channels. This feature allows four remote controls to independently control four *Infiniti*™ Vision Systems operating in the same room or area. Remote controls are factory preset to channel A. For proper remote operation, the *Infiniti*™ Vision System must be set to the same channel as the remote.

The Custom/System Settings window allows the selection of four remote receive codes: A, B, C, & D. This selection must correspond to the channel selection on the remote control. Set the remote channel as instructed below.

To select a remote channel on the *Infiniti*™ Vision System:

1. Press the ***Custom*** key to activate its drop-down menu.
2. Press the ***System*** key to bring up the System Settings window.
3. Press the ***Remote Channel*** button to bring up the Remote Control Settings dialog (see Figure 1-15).
4. Hold the remote control in front of the *Infiniti*™ display screen and simultaneously press its ***parameter value adjustment up/down*** keys (labeled 1 & 2 on the screen). Simultaneously release the buttons.
5. Press the ***parameter selection*** button corresponding to the new channel (labeled A at 9:00, B at 12:00, C at 3:00, and D at 6:00 on the screen).
6. Press the ***Enter*** button on the remote (see Figure 1-14), then press ***Save*** on the screen.

No additional steps are needed once the remote channel is set, and only one remote channel is stored per unit.
NOTE: If necessary to distinguish between remote controls, identify the remote controls and the units with unique labels.

CAUTION
Do not sterilize the remote control as it will damage the unit.

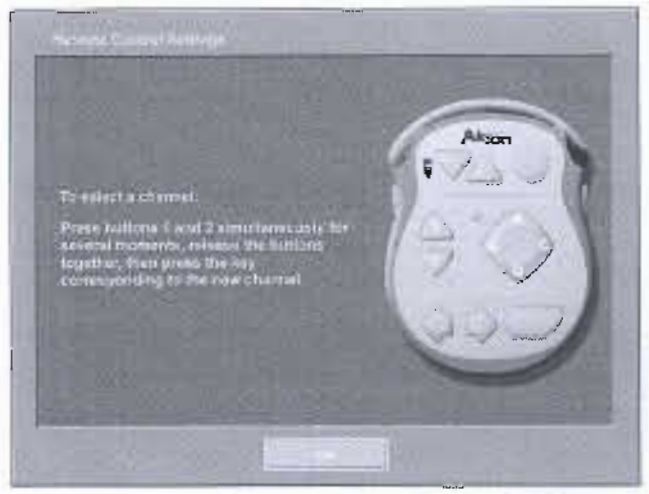


Figure 1-15 The Remote Control Settings Dialog

HANDPIECES AND TIPS

Different handpieces and tips are required for different procedural steps and/or functions. A full selection of handpieces, along with tip styles and sizes are available. Contact your Alcon representative for a complete listing of *Infiniti*™ Vision System products and accessories.

Following is a general description of the various handpieces and tips used to perform lens removal procedures.

Phaco Ultrasound Handpieces
Alcon's phaco handpieces integrate irrigation, aspiration and emulsification. The three functions of the lens extraction step enable the surgeon to simultaneously maintain or inflate the anterior chamber, emulsify the cataractous lens, and aspirate the lens material from the eye.

These handpieces require no disassembly other than removal of the disposable tubing, the ultrasonic tip, and the infusion sleeve with bubble suppression insert.

- *Infiniti*™ Ultrasonic (U/S) Handpiece - This handpiece is used for ultrasonic applications on the *Infiniti*™ Vision System with 1.1 mm *TurboSonics*® tips or 0.9 mm *TurboSonics*® tips, including flared and/or *ABS*® tips (see Figure 1-16).

- *Infiniti*™ *NeoSoniX*® Handpiece - The *NeoSoniX*® handpiece integrates all functions of the ultrasonic handpiece, and in addition provides sonic oscillations. This handpiece uses the same tips as the U/S handpiece (see Figure 1-17).

CAUTIONS

Do not test or operate *Infiniti*™ *U/S* or *NeoSoniX*® handpieces unless the tip is immersed in *BSS*® sterile irrigating solution or distilled water or is in surgical use. Irreparable damage to the handpiece and tip can result if run dry.

Ensure that test chamber is filled with *BSS*® sterile irrigating solution before tuning *Infiniti*™ *U/S* or *NeoSoniX*® handpieces. Tuning a handpiece dry may result in premature tip failure and breakage.

WARNINGS!
Use of an ultrasonic handpiece other than the *Infiniti*™ *NeoSoniX*® or U/S, or use of a handpiece repaired without Alcon authorization, is not permitted, and may result in patient injury, including potential shock hazard to patient and/or operator.

Use of the *Infiniti*™ *U/S* or *NeoSoniX*® handpiece in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential damage to the cornea and other tissues.

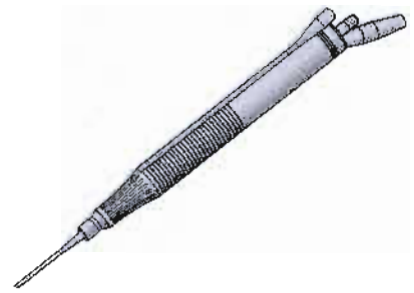


Figure 1-16 *Infiniti*™ Ultrasonic (U/S) Handpiece

Figure 1-17 *Infiniti*™ *NeoSoniX*® Handpiece

TurboSonics® Family of Tips

U/S tips are made of medical grade titanium alloy, and are attached to a U/S or *NeoSoniX*® handpiece to deliver mechanical energy to the lens, assisting in its removal by aspiration. Depending on the needs and technique preferred by the surgeon, various styles of tips and tip bevels are available (see Figure 1-18). Various U/S tip styles are color coded.

- 1.1 mm U/S Tips - The standard ultrasonic tips are the original *TurboSonics*® tips. They are designed for use only with blue infusion sleeves.
- 0.9 mm U/S Tips - The *MicroTip*™ ultrasonic tips are designed to allow entry through a smaller incision. They are designed for use only with purple infusion sleeves.
- Aspiration Bypass System - Tips with the *ABS*® feature contain a small hole in the distal portion of the tip's wall. This helps to maintain flow through the system even during occlusion of the tip's main port. The infusion sleeve used with an *ABS*® tip is dependent on the tip diameter (see 0.9 mm and 1.1 mm tips above).

WARNINGS!

Use 0.9 mm tips with purple 0.9 mm infusion sleeves. Use 1.1 mm tips with blue 1.1 mm infusion sleeves. Mismatch of consumable components and use of settings not specially adjusted for a particular combination of consumable components may create a patient hazard.

Read all package label material printed on the consumable paks prior to their use.

Standard U/S Tips - The *TurboSonics*® tip with the round shaft is the original, classical U/S tip shape. The *MicroTip*™ has a smaller diameter shaft

The Aspiration Bypass System - Tips with the *ABS*® feature contain a small hole in the distal portion of the tip's wall.

***Kelman*® Tips** - The *Kelman*® tips have a bent shaft which generates transverse ultrasound motion, in addition to the conventional longitudinal motion, to enhance cutting efficiency In addition, the bend allows better visibility during the surgical procedure.

Flared *ABS*® Tips - The flared tips have a larger proximal port, providing increased holding force. They narrow in the middle of the shaft, thus allowing smaller incisions and improving occlusion breaks by reducing outflow from the anterior chamber, following occlusion breaks. Flared tips also have the Aspiration Bypass System feature, to further enhance performance.

Figure 1-18 *TurboSonics*® Tips - Shown here are samples of U/S tips used with the *Infiniti*™ U/S or *NeoSoniX*® handpiece.

AquaLase® Liquefaction Handpiece

The *AquaLase*® handpiece (see Figure 1-19) utilizes warmed high energy rapid pulses of fluid to perform liquefaction on the lens, while at the same time irrigating the anterior chamber and aspirating the lens material from the eye.

- 1.1 mm Liquefaction Tip - Used with *AquaLase*® handpiece and for use with 1.1 mm blue infusion sleeves.

Figure 1-19 *AquaLase*® Liquefaction Handpiece

MicroSmooth™* Infusion Sleeves

Infusion sleeves cover the tip of the handpiece to provide irrigation to the anterior chamber of the eye during surgery (see Figure 1-20). Infusion sleeves are used with the *Infiniti*™ U/S, *NeoSoniX*®, and *AquaLase*® handpieces, and with some *Ultraflow*™* I/A handpieces. Infusion sleeves used with *Infiniti*™ U/S and *NeoSoniX*® require a BSI (bubble suppression insert). Infusion sleeves must be correctly matched to the specific tip type (see the following descriptions). *Infiniti*™ paks contain only *MicroSmooth*™* infusion sleeves.

Figure 1-20 *Infiniti*™ U/S Handpiece shown with Infusion Sleeve and Bubble Suppression Insert

- 1.1 mm *MicroSmooth*™* Infusion Sleeves - The 1.1 mm infusion sleeves are designed to work with 1.1 mm U/S and *AquaLase*® tips; for example, with 1.1 mm *ABS*® and 1.1 mm flared tips. The 1.1 mm infusion sleeves are colored blue.
- 0.9 mm *MicroSmooth*™* Infusion Sleeves - The 0.9 mm infusion sleeves are designed to work with 0.9 mm U/S tips; for example, with 0.9 mm *ABS*® and 0.9 mm flared tips. The 0.9 mm infusion sleeves are colored purple.
- *MicroSmooth*™* High Infusion Sleeves - High infusion sleeves (HIS) have a larger shaft diameter than traditional infusion sleeves. The larger shaft diameter of the high infusion sleeves is compatible with a larger incision, allowing for single incision surgery for a wider variety of IOL implants. Reduced resistance to irrigation flow resulting from this larger shaft diameter creates a more stable anterior chamber. High infusion sleeves are available in semi-transparent purple, to be used with 0.9 mm tips; and semi-transparent blue, to be used with 1.1 mm tips.

WARNINGS!

Use 0.9 mm U/S tips exclusively with purple 0.9 mm infusion sleeves. Use 1.1 mm U/S and 1.1 mm liquefaction tips exclusively with blue infusion sleeves. Mismatching U/S tips and infusion sleeves may create potentially hazardous fluidic imbalances.

Mismatch of consumable components and use of settings not specially adjusted for a particular combination of consumable components may create a patient hazard.

Read all package labelling on the consumable paks prior to their use.

Ultraflow™* Handpieces and Tips

The *Ultraflow™** handpiece is used in I/A mode to maintain chamber pressure with irrigation while removing cortical material via aspiration. (See Figure 1-22 to note the band markings on the tips that identify size of tip aperture.) Some configurations of the *Ultraflow™** IT and SP handpieces also use infusion sleeves. The following *Ultraflow™** I/A handpieces and tips are available:

- *Ultraflow™** IT Handpiece and Interchangeable Tips- The *Ultraflow™** IT consists of a handpiece body that accepts interchangeable tips(see Figure 1-21). These tips do not require an adapter or infusion sleeve as they contain a built-in metal infusion sleeve.

- *Ultraflow™** IT Handpiece and Threaded Tip Adapter-Reusable I/A tips with *TurboSonics®* silicone infusion sleeves can be used with the *Ultraflow™** IT handpiece with threaded tip adapter (see Figure 1-22).

- *Ultraflow™** SP Handpiece (Single-Piece with fixed tips) - The *Ultraflow™** SP consists of a single-piece handpiece with irrigation tip, threaded tip adapter, or I/A tip with a built-in metal infusion sleeve (see Figure 1-24). Various tip configurations are available.

WARNINGS!

Use of non-Alcon surgical reusable or disposable I/A handpieces that do not meet Alcon surgical specifications, or use of an Alcon handpiece not specified for use with the *Infiniti™* Vision System, may result in a fluidic imbalance. This, in turn, may cause a shallowing or collapsing of the anterior chamber.

Exceeding the recommended level of 100 mmHg with a 0.5 mm or larger I/A tip may cause anterior chamber shallowing and/or incarceration or tearing of the posterior capsule.

I/A tips are not to be used with U/S or *NeoSoniX®* handpieces.

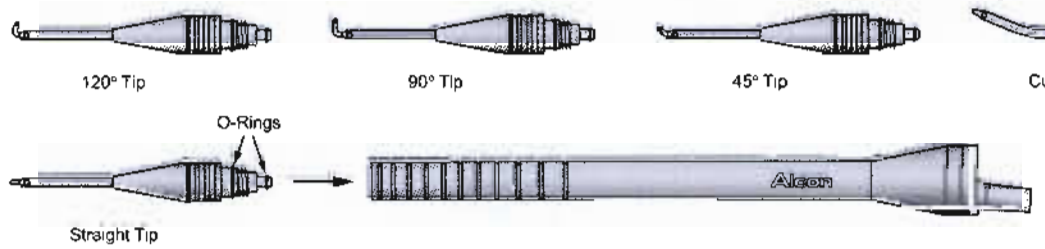


Figure 1-21 *Ultraflow™** IT handpiece and tips

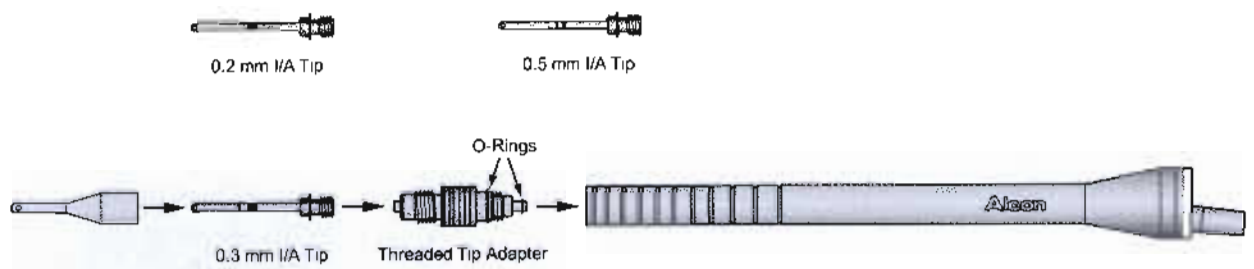


Figure 1-22 *Ultraflow™** IT handpiece with infusion sleeve, reusable I/A tip, and threaded tip adapter

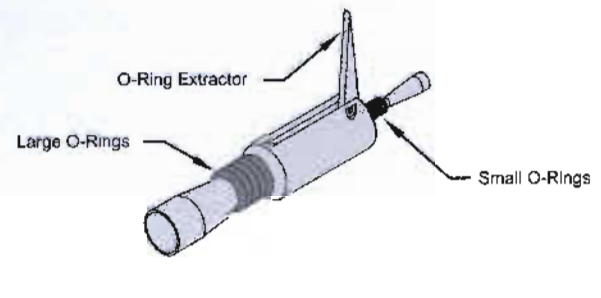


Figure 1-23 *Ultraflow™** O-ring tool with large and small O-rings

Figure 1-24 *Ultraflow™** SP handpiece (handpiece shown with .3 mm 45° tip)

Infiniti™ Vitrectomy Probe

The vitrectomy probe is a sterile, single-use, vitreous cutter which provides for aspiration and cutting (see Figure 1-25. An irrigating cannula is provided in the pak to allow for bimanual irrigation. An irrigation sleeve to allow for simultaneous coaxial irrigation is available as a separate accessory.

The handpiece is completely preassembled and requires no lubrication or cleaning prior to surgery. This oscillating guillotine vitreous cutter is intended for single use only.

WARNINGS!

Do not test or operate vitrectomy probes unless the tip is immersed in *BSS*® sterile irrigating solution or distilled water or is in surgical use. Irreparable damage to the handpiece and tip can result if run dry.

After priming and before surgical use, verify that the probe is properly actuating and aspirating. Prior to entry into the eye and with the probe tip in sterile irrigating solution, the surgeon should step on the foot treadle until there is visual verification that the probe is cutting.

- **If the cutter is observed to not fully close or does not move when the probe is actuated, replace the probe.**
- **The port should always remain in an open position in footpedal position 0 or 1. If the cutting port is partially closed while idle, replace the probe.**
- **If air bubbles are observed in the aspiration line or exiting the probe tip during priming, replace the probe.**
- **If a reduction of cutting capability or vacuum is observed during the surgical procedure, stop immediately and replace the probe.**

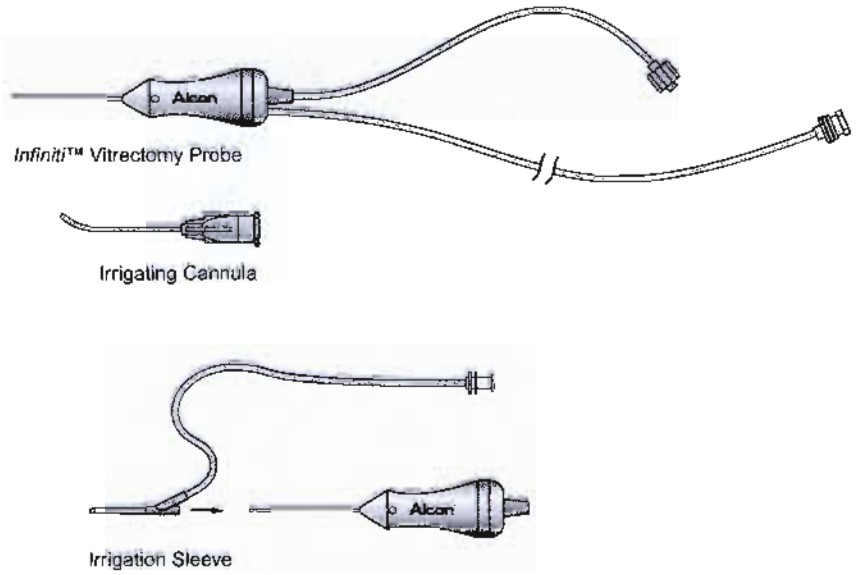


Figure 1-25 *Infiniti*™ vitrectomy probe with irrigating cannula and optional irrigation sleeve.

Bipolar Coagulation Handpieces

- Bipolar Coagulation Forceps are lightweight and ergonomically designed to reduce hand fatigue as well as to provide precise control and safety. The forceps are available with a wide variety of tip styles.

- Bipolar Coagulation Brushes are available in a wide variety of configurations: straight, curved, tapered, and widestroke. All disposable bipolar accessories are available both with and without cords.

  Coagulation Cords are available in disposable and reusable configurations.

See your Alcon representative for a complete listing of products and accessories.

Figure 1-26 Single use bipolar brush

FLUIDIC MANAGEMENT SYSTEM

Two types of Fluidic Management Systems (FMS) are offered for use with the *Infiniti*™ Vision System: one FMS for ultrasound applications (see Figure 1-27), and another for *AquaLase*® Liquefaction Device applications. The type of FMS inserted is automatically identified by the system when it is inserted into the fluidics module. Inserting the FMS into the console fluidics module establishes fluidics system connections, contributing to quick and easy surgical setup.

The FMS is an interface between the *Infiniti*™ console and the surgical handpiece. It is used to regulate *BSS*® irrigating fluid to the handpiece, aspirate debris from the handpiece, monitor irrigation and aspiration pressure, and deposit the debris in a sealed drainage bag for disposal. This single assembly contains a rigid plastic fluidic chamber, non-invasive pressure sensor, drain bag, irrigation (clear) and aspiration (blue stripe) tubing, and a clear tubing with spike for connection to the bottle of *BSS*® irrigating solution. For *AquaLase*® Liquefaction Device there is an additional tubing (black stripe) for connection to the bottle of *AquaLase*® balanced salt solution.

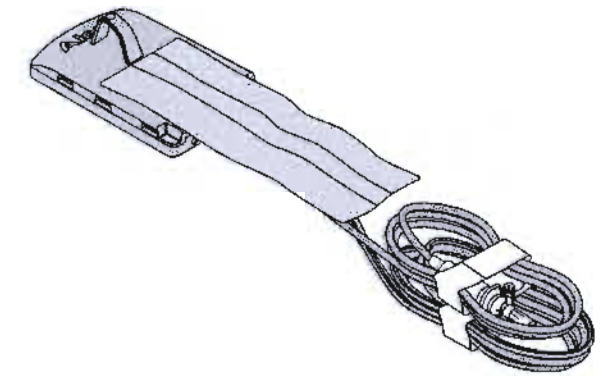


Figure 1-27 The *Infiniti*™ Ultrasound Fluidic Management System (FMS)

AQUALASE® BALANCED SALT SOLUTION BOTTLE

When performing an *AquaLase*® liquefaction procedure, the *Infiniti*™ Vision System must be equipped with an *AquaLase*® balanced salt solution bottle containing *BSS*® (see Figure 1-28). This solution is emitted in warm high energy pulses from the tip of the handpiece.

During the setup procedure the bottle is pressed into its receptacle on the front of the console and turned clockwise to secure it in position. The spike on the black-striped tubing is inserted into the *AquaLase*®/ *BSS*® bottle and then connected to the *AquaLase*® handpiece.

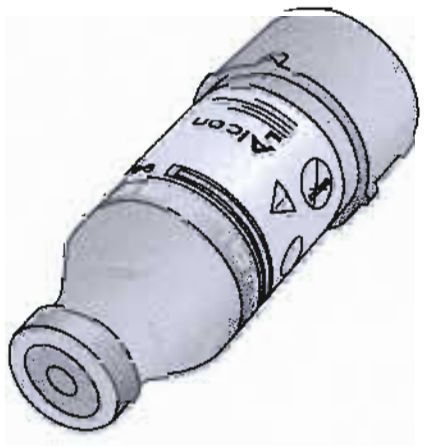


Figure 1-28 The *AquaLase*® Balanced Salt Solution Bottle

CONSUMABLE PAK CONFIGURATIONS

The family of *Infiniti*™ paks consist of various combinations of fluidic management systems (FMS), handpiece tips, infusion sleeves, and other components. Complete *AquaLase*® paks include a bottle of *AquaLase*®/ *BSS*® solution. Consumable items used with the *Infiniti*™ Vision System during surgery are designed to be used once and then discarded, unless labeled otherwise.

Please contact your Alcon Sales representative for up-to-date listings, and for in-service information prior to initial use of Alcon paks. All cases of *Infiniti*™ paks contain a written Directions for Use (DFU). It is important to read and understand the DFU prior to use.

NOTE: If an inconsistency exists between the instructions in the operator's manual and the Directions For Use (DFU), follow the DFU.

Custom Pak™* Configurations

To better serve our customers we offer the opportunity for surgeons to specify a *Custom Pak*™* for their own individual needs. Please contact your Alcon Sales representative for more information on how to design your own *Custom Pak*™*.

WARNINGS!

Mismatch of consumable components and use of settings not specially adjusted for a particular combination of consumable components may create a patient hazard.

Do not use paks that exceed the expiration date.

Sterile disposable medical devices should not be reused! (Accreditation Manual for Hospitals, 1982.) These components have been designed for one time use only; do not reuse.

The equipment used in conjunction with the Alcon disposables constitutes a complete surgical system. Use of disposables other than Alcon disposables may affect system performance and create potential hazards, and if it is determined to have contributed to the malfunction of the equipment under contract, could result in the voidance of the contract and/or invoicing at prevailing hourly rates.

In all cases, the instrument setup instructions in the manual should be thoroughly understood prior to using any of the pak configurations.

Read all package label material printed on the consumable paks prior to their use.

Infiniti™ U/S Fluidic Management System Pak

When performing a phacoemulsification procedure, one of the *Infiniti*™ U/S family of paks with handpiece tip is used. The pak can contain all the items listed below (see Figure 1-29).

- Fluidic Management System (FMS) - This single assembly consists of irrigation (clear) and aspiration (striped) tubing, a plastic reservoir/pump device, and a drainage bag (maximum capacity of 500 cc). Inserting the FMS into its console receptacle establishes the *Infiniti*™ fluidic system, allowing quick and easy surgical setup.
- U/S Tip with Tip Holder/Wrench - The tip attaches to the ultrasonic handpiece. Securely tighten the tip with the all-in-one tip wrench/assembly, then remove the wrench from the tip. Several tip designs are available.
- Infusion Sleeve with BSI - This single-piece silicone sleeve fits over the handpiece tip to provide irrigation into the eye, protection to the surrounding tissues, and fluidic balance. One infusion sleeve contains a bubble suppression insert (BSI); a second infusion sleeve is included to be used with the I/A handpiece/tip.
- Test Chamber - The test chamber is a small elastomeric cap that fits over the handpiece tip to facilitate a functional irrigation and aspiration check of the handpiece and instrument prior to surgery.
- I/A Tip Wrench - A separate wrench is required to securely fasten the I/A tip to its handpiece, and also to remove the tip when the surgery is completed.
- Tray Support Cover - The tray support cover is a sterile plastic bag that is placed around the instrument tray and support arm. The cover is used to form a pouch in the tray to provide storage for the handpiece and tubing during surgery.
- Directions for Use (DFU) - Instructions for setup and removal of pak contents. One DFU is included in each case of *Infiniti*™ paks.

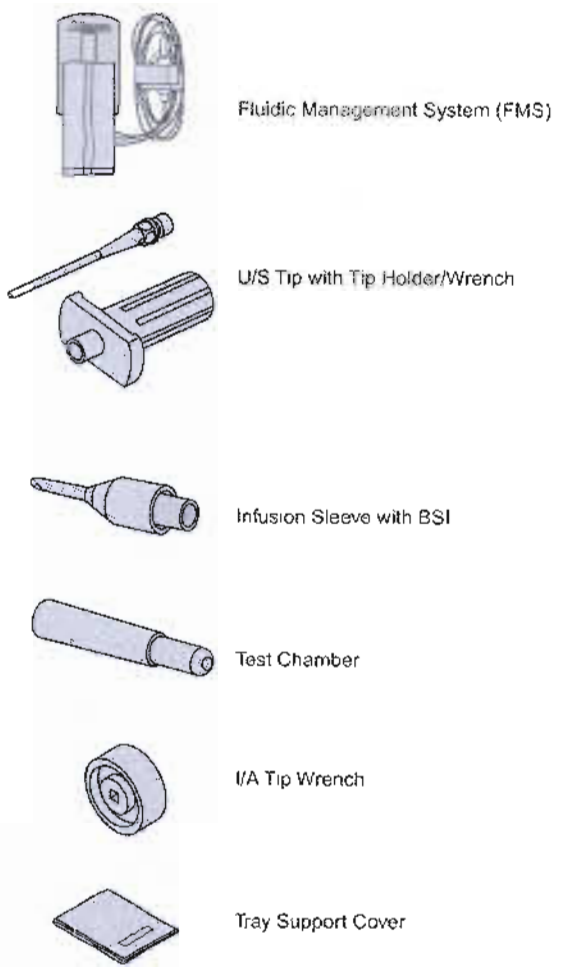


Figure 1-29 Contents of the *Infiniti*™ U/S Fluidic Management System Pak (parts not to scale).

***Infiniti™ AquaLase®* Fluidic Management System Pak**

When performing a lens extraction procedure with the *AquaLase®* handpiece, a single-use *Infiniti™ AquaLase®* pak is used. This pak can contain all the items listed below (see Figure 1-30).

- Fluidic Management System (FMS) - This single assembly consists of irrigation (clear), aspiration (blue striped), and *AquaLase®* (black striped) tubing; a plastic reservoir/pump device, and a drainage bag (maximum capacity of 500 cc). Inserting the FMS into its console receptacle establishes the *Infiniti™* fluidic system, allowing quick and easy surgical setup.
- *AquaLase®* Liquefaction Tip with integral Tip Holder/Wrench - The tip attaches to the *AquaLase®* handpiece. Securely tighten the tip with the all-in-one tip wrench/assembly, then remove the wrench from the tip.
- Infusion Sleeve - This single-piece silicone sleeve fits over the handpiece tip to provide irrigation into the eye, and fluidic balance. A second infusion sleeve is included to be used with the I/A handpiece/tip.
- Test Chamber - The test chamber is a small elastomeric cap that fits over the handpiece tip to facilitate a functional irrigation and aspiration check of the handpiece and instrument prior to surgery.
- I/A Tip Wrench - A separate wrench is required to securely fasten the I/A tip to its handpiece, and also to remove the tip when the surgery is completed.
- Tray Support Cover - The tray support cover is a sterile plastic bag that is placed around the instrument tray and support arm. The cover is used to form a pouch in the tray to provide storage for the handpiece and tubing during surgery.
- *AquaLase®* Balanced Salt Solution Bottle - Liquefaction solution.
- Directions for Use (DFU) - Instructions for setup and removal of pak contents. One DFU is included in each case of *Infiniti™* paks.

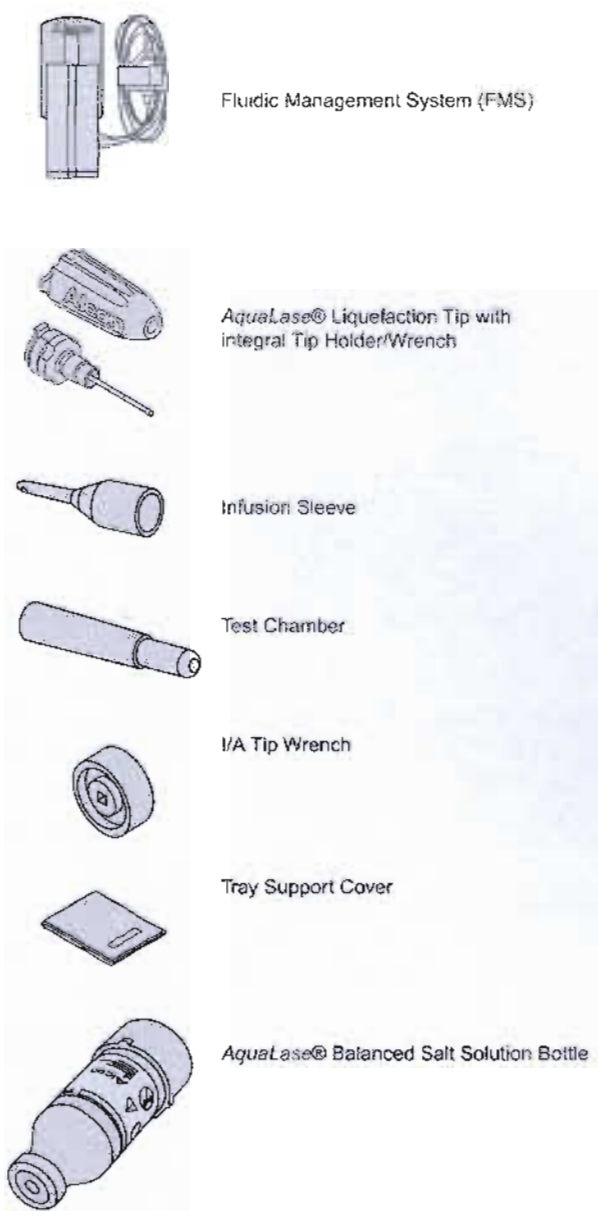


Figure 1-30 Contents of the *Infiniti™ AquaLase®* Fluidic Management System Pak (parts not to scale).

FRONT DISPLAY PANEL AND TOUCH SCREEN

The *Infiniti™* Vision System front display panel and touch screen has a flat, non-glare surface, and is mounted above the console (see Figure 1-31). For ease of viewing the display panel swivels and rotates, and it folds down into a protected position for storage.

Pushbuttons are located on the active touch screen. There are two basic types of pushbuttons on the display screen: up/down arrow buttons and momentary buttons. The user can press and hold the up/down arrow buttons until the desired adjustment is complete, and he can press the momentary buttons with a single push-and-release to activate a function.

Figure 1-31 The *Infiniti™* Front Display Panel and Touch Screen

The *Infiniti™* Vision System emits an audible tone to indicate pushbutton activation. Activation of a valid touchscreen pushbutton or remote control button results in a valid key tone; an invalid button results in an invalid key tone, and sometimes its icon symbol is ghosted to indicate an invalid function.

There are three types of display screens: the Setup screen, Surgery screens, and Dialogs.

- The Setup screen is used to prepare for surgery; i.e., priming the fluidic management system and testing the handpiece.
- Surgery screens contain special surgical settings for each of the current surgical procedures. Pressing the touch screen pushbuttons (or footswitch or remote control) allows the user to adjust the settings for his current step.
- Dialogs are displayed as a result of selecting an option from the Custom drop list (i.e., System, About, Doctor, etc.) or pressing the Metrics or Footswitch pushbutton. Dialogs enable the user to view and modify system settings, doctor settings, and some surgical settings. There is another class of dialogs that are displayed when the user needs to be advised or warned of a situation, or to indicate progress on a function in the Setup screen.

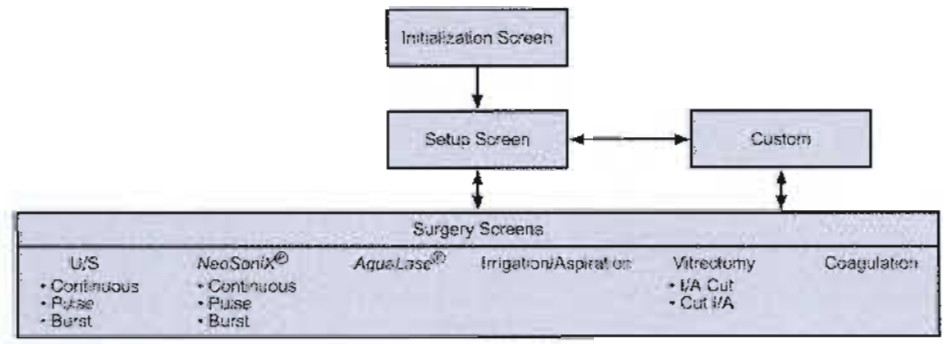


Figure 1-32 Navigating the *Infiniti™* User Screens

SETUP SCREEN

The Setup screen is displayed when one of the following occurs:

- The system is powered up and initialization is successful.
- The screen is explicitly invoked by pressing the Setup pushbutton from a Surgery screen.
- The FMS is removed while in a surgery screen other than Coagulation.
- The handpiece tip is changed in a surgery screen and the user indicates on the resulting popup message that he selects the Setup screen.
- A handpiece is selected in a surgery screen and the handpiece is not tuned.
- A valid FMS is inserted while the user is in a surgery screen.

The Setup screen is divided into three sections. At the top is the Main Window, below that is the Setup Status Window, and below that are the Setup Steps.

1. Main Window

The Main Window consists of pushbuttons and readouts that are used to set up the system and then perform surgery (see Figure 1-33). The Setup Main Window is the same in most areas as the Surgery Main Window discussed later.

1.1 Doctor Name

The Doctor Name pushbutton displays the currently-selected doctor. When pressed, this pushbutton displays a drop list of all the doctors entered in the system. The first doctor at the top of the list is the Alcon Settings doctor, which contains all the Alcon defaults. Listed in the second position from the top is the Add Doctor selection which allows the user to add a new doctor to the list. The remaining doctors will be listed with the most-recently-selected doctor in the third position.

When a doctor is selected (other than Add Doctor), the following occurs:

- The drop list collapses and the selected doctor name is displayed.
- The surgical handpiece, phaco tip, procedure, and I/A tip are selected in accordance with the following:
  - The I/A tip is changed to that last used by the doctor.
  - If the currently-selected handpiece is not connected, the surgical handpiece, tip, and procedure are changed to those last used by the doctor.
  - If the currently-selected handpiece is connected but not tuned, the selected handpiece does not change. The tip and procedure change to those last used by the doctor for the selected handpiece. If the tip or procedure do change, a dialog is displayed notifying the doctor that the tip and/or procedure have changed.
  - If the currently-selected handpiece is tuned, the selected handpiece and tip do not change. The procedure changes to that last used by the doctor for the selected surgical handpiece and tip.
- The Cataract Grade is set to the doctor's default.

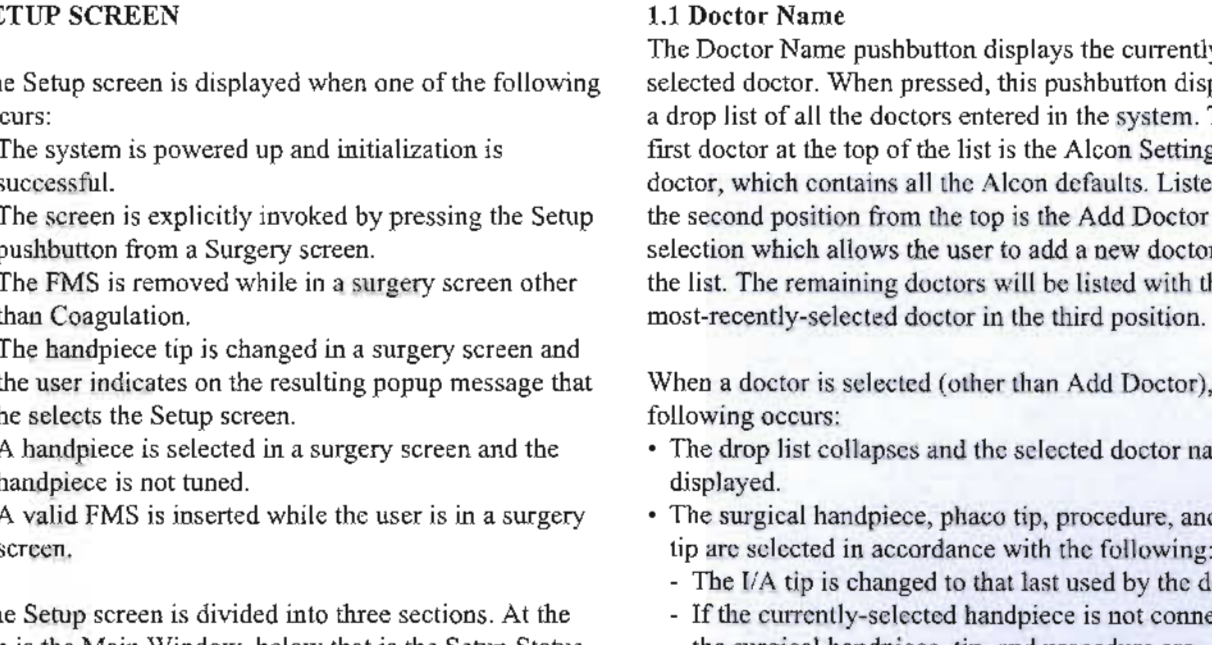


Figure 1-33 Functional Areas of the Setup Screen

Add Doctor

When Add Doctor is selected from the doctor drop list, a dialog window with keyboard appears. The user can enter a doctor's name in the designated box using the alphanumeric keypad. When a doctor's name is typed and the OK pushbutton is pressed, the dialog window disappears and the doctor name is saved with Alcon's default parameters (names are not case-sensitive). When a new doctor is successfully saved, he becomes the current doctor and is entered in the third position from the top, just below Add Doctor.

1.2 Handpiece Type

The Handpiece Type pushbutton displays the currently-selected surgical handpiece: Ultrasound (U/S), *NeoSoniX*® (Neo), or *AquaLase*® (AqL). Pressing this pushbutton displays a drop list of available surgical handpieces. When a handpiece is selected, the following occurs:

- The drop list collapses and the selected handpiece is displayed.
- The surgical tip and procedure are changed to those last used by the doctor for the selected handpiece. The current surgical steps in the Surgery Menu are replaced with the steps associated with the newly selected procedure, and the first step is entered.

The system has two surgical connectors for U/S and *NeoSoniX*® handpieces; however, only one connector can be used at one time. There is a third connector for an *AquaLase*® handpiece, and it can be connected at the same time as a U/S or *NeoSoniX*® handpiece.

If handpieces are plugged into both of the U/S / *NeoSoniX*® connectors, the message "2 handpieces" will appear. The message can be dismissed by pressing the OK pushbutton; however, U/S power will not be available until one of the handpieces is removed.

1.3 Tip Type

The Tip Type pushbutton displays the currently-selected surgical tip. When pressed, this pushbutton displays a drop list of available tips for the selected handpiece. When a tip is selected, the following occurs:

- The drop list collapses and the selected tip is displayed.
- The Procedure Type is changed to that last used by the doctor for the selected handpiece and tip.
- If there are unsaved changes to surgical parameters, a dialog will be displayed giving the user the option either to save or discard the changes, or just cancel the dialog. If the dialog is canceled, the surgical tip is not changed.

1.4 Procedure Type

The Procedure Type pushbutton displays the currently-selected surgical procedure name. When pressed, this pushbutton displays a drop list of the available procedures for the selected handpiece tip. When a procedure is selected, the following happens:

- The drop list collapses and the procedure is selected.
- If there are unsaved changes to surgical parameters, a dialog will be displayed giving the user the option to save or discard these changes, or just cancel the dialog. If the dialog is canceled, the procedure is not changed.

Procedures can be customized by pressing the Custom pushbutton and using the Copy/Delete function.

1.5 Cataract Grade

The Cataract Grade pushbutton displays the currently selected cataract grade: 1, 2, 3, or 4. When selected, this pushbutton displays a drop list of the four cataract grades. When a new cataract grade is selected, the following occurs:

- The drop list collapses and the selected cataract grade is displayed.
- The cataract grade is enunciated.
- Surgical step parameters that are dependent upon the cataract grade are updated with the parameter values specified for the new cataract grade. The cataract Default Grade can be set in the Custom/Doctor screen.

1.6 Irrigation Controls

- Irrigation/Continuous Irrigation and PEL Indicators - When continuous irrigation is enabled from the *Custom/Doctor* menu, pressing the area of the pushbutton indicating "Irrigation" will toggle to "Continuous Irrigation." Pressing again will toggle back to "Irrigation." Toggling back and forth can also be accomplished by programming the footswitch for that function.

  The Patient Eye Level (PEL) readout indicates the number of centimeters below the FMS that the patient's eye is located. The PEL is programmed in the *Custom/Doctor* menu. When the PEL is set to a value other than 0, "PEL= xx" is displayed in the lower-right corner of the box.

- Irrigation Pressure Bar Display - This bar display is a visual indication of the irrigation pressure as measured by the fluidics mechanism, irrespective of the IV pole position.

- Bottle Height and Adjustment Arrows - The bottle height readout is representative of the actual bottle height, respective to the PEL. The adjustment arrows are pressed to adjust the IV pole height, and thus change the irrigation value and readout.

Irrigation Control

Irrigation operates on a gravity-feed principle from the IV bottle to the FMS to the handpiece. The console's irrigation valve is normally closed when the fluidic interface device is inserted. In most modes of operation irrigation begins flowing when the footpedal transitions from position 0 to position 1.

Irrigation pressure is increased or decreased by raising or lowering the IV pole that holds the irrigation bottle. Default height is 78 cm from the center of the drip chamber to the center of the FMS aspiration pressure sensor. Patient Eye Level (PEL) is measured from the FMS aspiration pressure sensor to the patient's eye. Maximum bottle height of 110 cm results in maximum irrigation pressure. In the event of power loss, bottle position is maintained; however, if the unit is turned off using the Standby switch, the IV pole automatically retracts to its storage position.

Continuous Irrigation

Continuous Irrigation is available in all applicable surgical steps and allows for continuous irrigation of the eye during surgery. Footpedal position does not affect the continuous irrigation function. Exiting from a U/S, *NeoSoniX®*, *AquaLase®*, I/A, or Vit step shuts off continuous irrigation, allowing exchange of irrigation and aspiration tubing between handpieces without loss of irrigation solution.

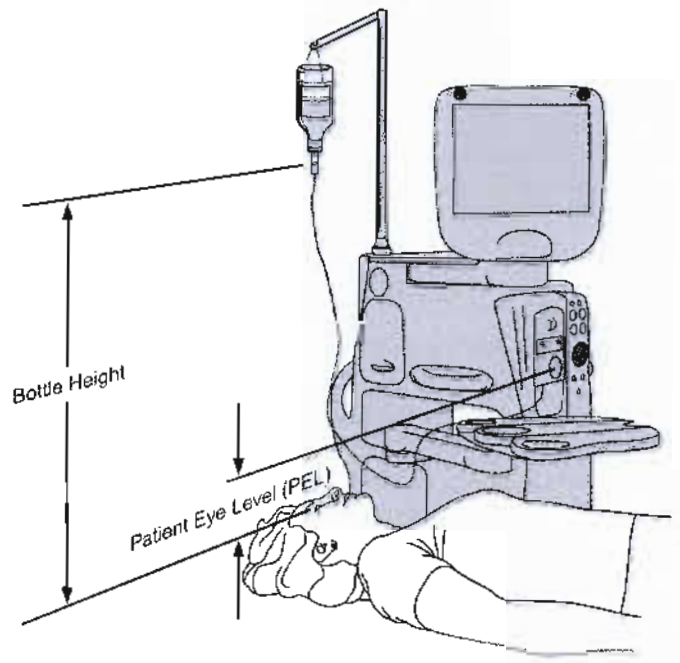


Figure 1-34 BOTTLE HEIGHT MEASUREMENT - Bottle height for gravity-fed irrigation is measured from the center of the drip chamber to the patient's eye. Default bottle height is 65 cm above the center of the round aspiration pressure sensor in the FMS. PEL is measured from the aspiration pressure sensor to the patient's eye.

Selecting Continuous Irrigation and depressing the footpedal activates continuous irrigation. Continuous irrigation is not available in Setup or Coagulation modes.

When continuous irrigation is on, footswitch treadle range 0 is eliminated, the detent entering position 1 is eliminated, and ranges 1 & 2 are expanded.

- Enabling Continuous Irrigation - The continuous irrigation feature is normally disabled. To enable this feature, the user must enter the the *Custom/Doctor* menu and select Continuous Irrigation, then exit. For convenience, enabling continuous irrigation can be programmed into a doctor's preferences.

- Actual Use of Continuous Irrigation - Continuous irrigation will not turn on automatically even though it is enabled. It can be invoked by either pressing the footpedal, pressing the Irrigation pushbutton on the front display panel, or by activating a designated footswitch button. One audio beep confirms that the continuous irrigation valve is opened and starting continuous irrigation, and two beeps indicate the valve is closed. It can be turned off by pressing the Irrigation pushbutton on the front display panel, or by activating a designated footswitch button. It will be activated again in I/A or Vit mode when footpedal is pressed.

NOTE: Before switching handpieces it is advised to tap the designated footswitch button, or change steps after exiting the eye, to prevent excess *BSS®* sterile irrigating solution from flowing out of the handpieces.

WARNING!
Avoid setting patient above FMS. Operating with patient above FMS will result in a lower irrigation pressure than indicated on the display, and possible underventing.

1.7 Metrics Display

The Metrics display is available in the surgery screen during lens removal steps. During a U/S surgical procedure the metrics figures shown in this box display U/S Time and Average Power. During an *AquaLase®* procedure the metrics figures shown are *AquaLase®* Time, Pulses, and Average Magnitude. When the Metrics box is pressed, the Metrics dialog is displayed, and the metrics readouts can be reset to 0.

1.8 Footswitch Pushbutton

The Footswitch pushbutton is a graphical representation of the currently-installed footswitch (either *Infiniti™* or *Accurus®/Legacy®* footswitch). The current footpedal position (0, 1, 2, or 3) is displayed in the center of the footswitch. Right/left and up/down arrows appear in the box whenever a momentary switch is activated.

When the Footswitch Button is pressed, the Footswitch Buttons dialog (see Figure 1-35) or Footswitch Treadle dialog (see Figure 1-36) appear. These dialogs allow the user to view and modify the current settings of the footswitch. Switching between the Buttons and Treadle dialogs is performed by pressing the corresponding tab on the viewing screen.

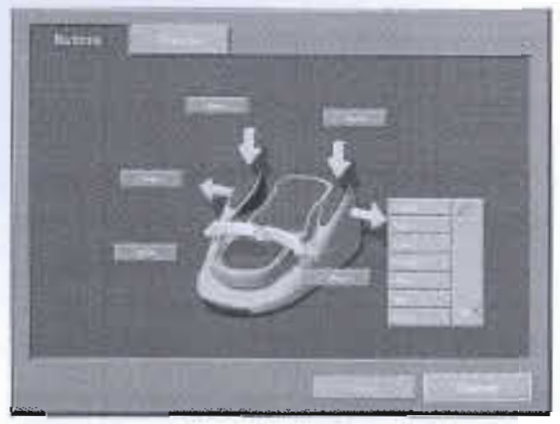


Figure 1-35 FOOTSWITCH BUTTONS DIALOGS - Pressing the Footswitch Button pulls up a dialog that corresponds to the connected footswitch. Pressing the Buttons tab activates one of these dialogs. Shown here is the *Infiniti™* footswitch. Pressing a button next to a switch activates a drop-down list, with functions that can be selected.

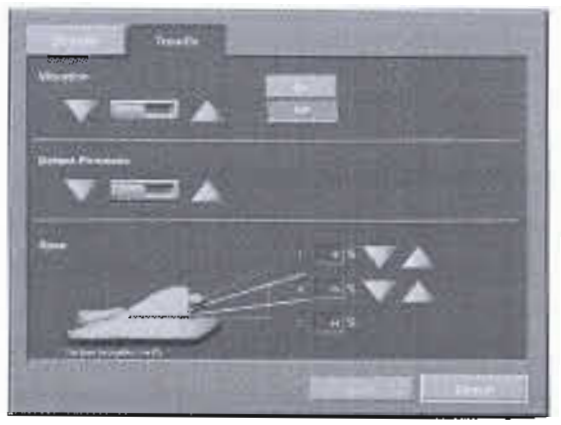


Figure 1-36 FOOTSWITCH TREADLE DIALOGS - Pressing the Footswitch Button pulls up a dialog that corresponds to the connected footswitch. Pressing the Treadle tab activates one of these dialogs. Shown here is the *Infiniti™* footswitch. The buttons on the screen allow you to adjust the treadle settings to your own personal preferences.

1.9 Custom Button

The Custom button enables the user to view and modify system settings, doctor settings, and some surgical settings. When the Custom button is pressed, a drop list menu appears with the following options (see Figure 1-37). When one of the options is selected from the menu, the respective dialog for that option is displayed and the drop list menu disappears. If no selection is made, the drop list menu disappears after about five seconds.

The following describes the purpose of each drop list menu item, the function of the controls in its dialog, and how the selections are invoked. The selections may be invoked whether the footswitch treadle and/or a footswitch button is depressed or not depressed, and the footswitch is functional when the dialog is displayed. The drop list menu items provide the user with options relating to viewing, copying, deleting, modifying, backing up, and restoring doctor/system settings.

- Doctor
- Save
- Copy/Delete
- System
- Sound
- U/S Occlusion
- AqL Occlusion
- About
- Shutdown

• Doctor

The Doctor Settings dialog is invoked when the user presses Doctor on the Custom drop list menu (see Figure 1-38). The Doctor Settings dialog enables the user to view and modify surgeon preferences for the currently selected doctor.

The dialog has Save and Cancel buttons. When Save is selected, all settings changed since the dialog was invoked are saved to persistent storage, the doctor dialog closes, and the settings take immediate effect. If the current doctor is the Alcon Settings default, the changes take immediate effect, but they are not saved to persistent storage; the changes are temporary. If Cancel is selected, the whole doctor dialog closes and the system returns to its prior settings.

Fill Before/After I/A Steps
Vit Before/After I/A Steps
Coag Before Phaco Steps
According to doctor's preferences the Fill, Vit, and Coag steps can be placed at different locations in the surgery step sequence by enabling these buttons.

Surge Watch
When there is an occlusion break surge, and Surge Watch is turned on, the system will quickly perform occlusion break venting to control the surge. Surge Watch is active even when this feature is turned off, but its sensitivity is greatly reduced, and even disabled at lower vacuum ranges.

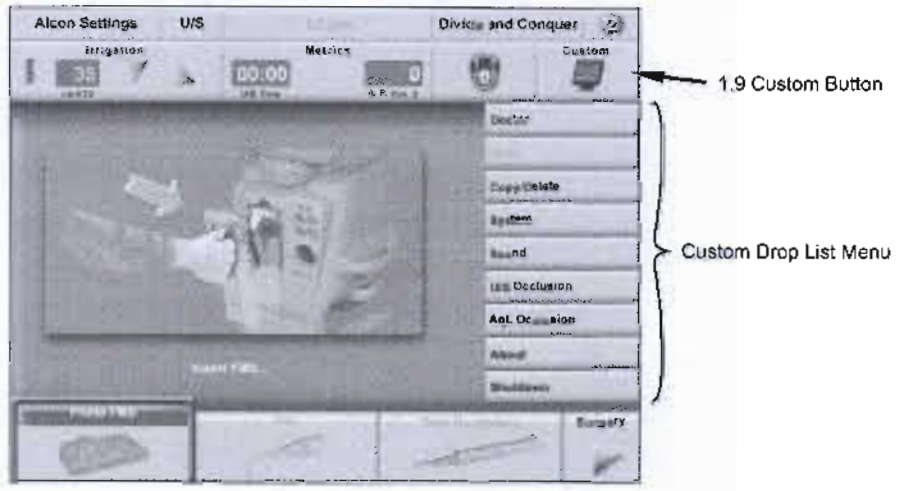


Figure 1-37 Setup Screen with Custom Drop List Menu

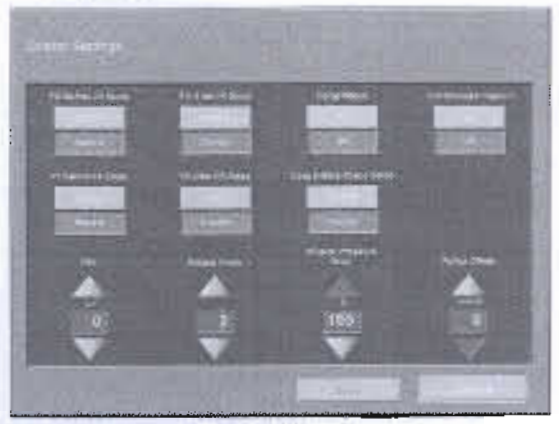


Figure 1-38 Doctor Settings Dialog

Continuous Irrigation
Continuous irrigation is applicable for lens removal, I/A, and vitrectomy surgical steps. When Continuous Irrigation is set to On (enabled), continuous irrigation will be active following the first footpedal depression. When activated "Continuous Irrigation" is displayed in the irrigation section of the Main Window, and the continuous irrigation On tone is generated. When transitioning to another step of the same surgical type, continuous irrigation remains activated. When transitioning to a step that is a different surgical type (other than Coagulation), continuous irrigation is inactivated but then re-activated when the footpedal is depressed.

PEL
The Patient Eye Level (PEL) indicates the number of centimeters below the FMS that the patient's eye is located. The IV pole height is automatically adjusted to compensate for the PEL when the Save button is pressed.

Default Grade
Indicates the initial cataract grade that will be selected when a doctor is selected.

Infusion Pressure Drop
When the acquired value of the irrigation pressure sensor is below the value specified for the Infusion Pressure Drop, the system will display an advisory dialog. When this setting is 100%, this feature is disabled.

Reflux Offset
The software limits reflux pressure to a level equal to the current infusion pressure plus the value specified for the Reflux Offset, or the maximum infusion pressure the system is capable of, whichever is less.

• Save

The Save dialog can be invoked when a change has been made to the current settings and the user selects the Save option from the Custom drop list menu. If there are no unsaved changes, the Save button is disabled.

The Save dialog provides the user with three buttons: Save, Discard Changes, and Cancel. If the Save button is pressed, the changes are saved to the current doctor. If Discard Changes is selected, the unsaved changes to the surgical parameters for the current doctor will be discarded and the dialog will be closed. If Cancel is selected, surgical parameters will not be saved to the current doctor and the dialog will close.

The Alcon Settings doctor is the factory default and cannot be permanently changed. When Alcon Settings is the current doctor, the Save dialog provides the user with three buttons: Save As, Discard Changes, and Cancel. If the Save As button is pressed, a keyboard appears allowing the user to add a new doctor. Once the new doctor is added, the changes are saved to the new doctor. If Discard Changes is selected, the unsaved changes will be discarded and the dialog will be closed. If Cancel is selected, changes will not be saved and the dialog will close.

• Copy/Delete

The Copy/Delete dialog is opened when the user selects Copy/Delete from the Custom drop list menu (see Figure 1-39). The Copy/Delete dialog allows the users to perform these actions:

- Copy data from the *Infiniti*™ Vision System to a data card (backup).
- Copy data from a data card to the *Infiniti*™ Vision System (restore).
- Save changes previously made to surgical parameters.
- Copy, delete, and rename groups of doctor settings on the *Infiniti*™ Vision System. These settings include 1) surgical parameters for handpieces, tips, procedures, and steps; and 2) doctor preferences.

In the Copy/Delete dialog two hierarchies are shown: the left hierarchy is the **source pane** invoked with the Copy button, and the right hierarchy is the **destination pane**. The source pane can be manipulated using the source level buttons below it (Save, Save As, Edit, Reset, Delete, Rename). The destination pane cannot be similarly manipulated. The Info Window, immediately below each hierarchy, provides additional information about the selected hierarchy level.

Upon entry to the Copy/Delete dialog, the hierarchy of the source pane (on the left side) reflects the current surgical procedure. The destination hierarchy (on the right side) is not expanded and the destination pane is INFINITI.

Data Hierarchy

The first level of the hierarchy is either INFINITI or DATA CARD.

The second level under DATA CARD is either Full Backup or Doctors. The level under Full Backup is the doctor backup name, and all doctors included in that full backup are displayed. The level under Doctors is the doctor backup name, and all doctors that have been individually backed up are displayed.

The second level under INFINITI is the doctor name. When the doctor name is selected, there is a third level which may be a handpiece, step, or preference. When a handpiece is selected, the fourth level is either an I/A tip or a phaco tip. When an I/A tip is selected, the fifth level is an I/A step. When phaco tip is selected, the fifth level is a phaco procedure, and the sixth level is a phaco step.

Collapse/Expand Buttons

The Collapse button (–) is displayed to the left of each non-selected level in the hierarchy. Touching this button hides all lower levels, making the label at that level the selected label. The Expand button (+) is displayed to the left of each level for which a lower level exists. Touching this button opens the node selection drop-down menu for the next lower level.

Label Selection Button

Each hierarchy level is a button which displays a drop-down menu of possible labels for that level when

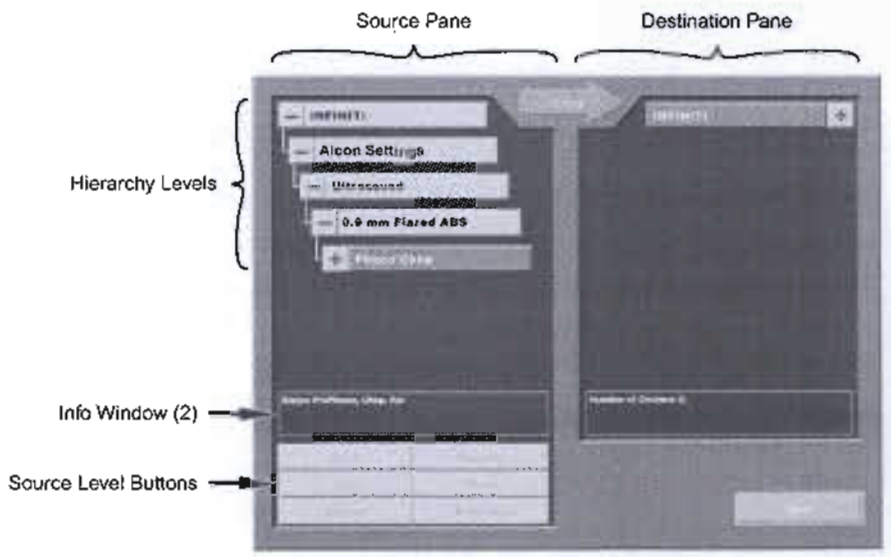


Figure 1-39 Copy/Delete Dialog

touched. Selecting an item from this list collapses all lower levels, changes to the selected label, and opens the drop-down menu for the next lower level. The system provides a visual indication in all levels to indicate there are unsaved parameters.

Copy Button

The Copy button, located above and between the left and right hierarchies, is used to copy data from the source (left) node to the destination (right) node. When the Copy button is touched the action taken is determined by the source and destination.

The button is labeled Copy when the source node is a surgeon, and the destination node is a surgeon. The button is labeled Back Up when the source node is INFINITI, and the destination node is DATA CARD. The button is labeled Restore when the source node is the DATA CARD, and the destination node is INFINITI.

Source Level Buttons

The Save, Save As, Delete, Reset, Edit, and Rename buttons are used to manipulate the source node. The destination node cannot be similarly manipulated.

BACKUP / DELETE / RESTORE EXERCISE

Data card must be blank before beginning this procedure.

1. Backup data from *Infiniti*™ console to data card.

1.1 Press Doctor Name (**Alcon Settings**) button in upper-left corner of screen.
1.2 Select **Add Doctor** from drop down list, type TEST DOC on keyboard, then press OK.
1.3 Select **U/S** handpiece, Cataract Grade 1, and press **Surgery** button to enter surgery screen. Select **Ultrasound Continuous**, and set **Power Limit** to **50**.
1.4 Press the **Custom** button, then **Save**. The dialog "There are unsaved changes to the current settings" appears. Press the **Save** button to save new doctor settings.
1.5 Insert data card into its slot on the right side of the *Infiniti*™ console below the speaker.
1.6 Press the **Custom** button, then **Copy/Delete**.
1.7 Press the top-left source pane button to select **INFINITI**. Select **TEST DOC**.
1.8 Press the top-right destination pane button to select **DATA CARD**.
1.9 Press the **Backup** arrow button in the top-center of the screen. The system archives the TEST DOC data from the *Infiniti*™ console to the data card.

2. Delete TEST DOC data from *Infiniti*™ console.

2.1 Press **Delete** in the lower-left corner of the screen. The dialog "Delete selected doctor setting? It is currently in use" appears. Press the **OK** button.
2.2 Press **Exit** to leave Copy/Delete screen and return to surgery screen.
2.3 Press **Alcon Settings** and verify TEST DOC has been deleted from *Infiniti*™ console drop down list.

3. Restore TEST DOC data from data card to *Infiniti*™ console.

3.1 Press the **Custom** button, then **Copy/Delete**.
3.2 Press top-left source pane button to select **DATA CARD**.
3.3 Press **Doctors** and select **TEST DOC**.
3.4 Press top-right destination pane button to select **INFINITI**.
3.5 Press the **Restore** arrow button in the top-center of the screen. The system restores the TEST DOC data from the data card to the *Infiniti*™ console.
3.6 Press **Exit** to leave Copy/Delete screen and return to surgery screen.
3.7 To verify transfer of TEST DOC cataract grade 1 settings to *Infiniti*™ console, press **Alcon Settings**, select **TEST DOC**, press Cataract Grade **1** button, **Ultrasound Continuous**, and verify **Power Limit** is **50**.

4. Delete TEST DOC data from data card and *Infiniti*™ console.

4.1 Press the **Custom** button, then **Copy/Delete**.
4.2 Press top-left source pane button to select **DATA CARD**.
4.3 Press **Doctors** and select **TEST DOC**.
4.4 Press **Delete** in the lower-left corner of the screen. The dialog "Delete doctor backup on Data Card" appears. Press the **OK** button.
4.5 Press the top-left source pane button to select **INFINITI**. Select **TEST DOC**.
4.6 Press **Delete** in the lower-left corner of the screen. The dialog "Delete selected doctor setting? It is currently in use" appears. Press the **OK** button.
4.7 Press top-left source pane button to select **INFINITI**. Press its "+" button to ensure **TEST DOC** is no longer on *Infiniti*™ console.
4.8 Remove data card from its slot.

• System

The Systems Settings dialog is invoked when the user selects System from the Custom drop list menu. This dialog enables the user to view and modify the current system settings such as Language, Remote Channel, Date, and Time. System settings apply to all doctors, and remain in effect until modified; the settings are not lost when the system is powered down. The System Settings dialog has a Save button and a Cancel button. If Save is selected, the current settings are saved to persistent storage, the dialog closes, and the settings take immediate effect. If Cancel is selected, the dialog closes and any changes made to the system settings are neglected.

Setting Remote Channel

The remote channel displayed in the System Settings dialog is for display only. To change the remote channel, press the Remote Channel button to bring up the remote control graphic with instructions to change the remote channel; this screen must be displayed while changing the remote channel (see Figure 1-15). The newly-selected remote channel takes effect immediately. Pressing Cancel on the System Settings dialog returns the system to its previously-saved remote channel.

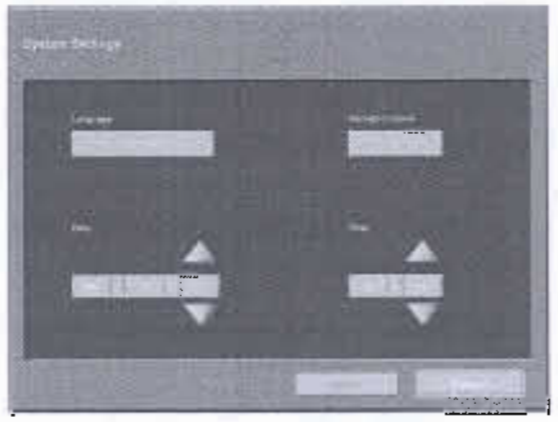


Figure 1-40 System Settings Dialog

• Sound

The Sound dialog is invoked when the user selects Sound from the Custom drop list menu. The Sound dialog enables the surgeon to set a volume level for all tones and voice confirmations.

The volume levels are set individually. When an individual button is selected, the volume level adjustment will pertain only to the selected tone. Each selection, except for Phaco Occlusion and Coagulation Power, may be turned Off so that no tone will be heard. Pressing the Play Sound button emits a sample of the volume level selected.

Figure 1-41 Sound Settings Dialog

• U/S Occlusion

The U/S Occlusion option is invoked when the user selects U/S Occlusion from the Custom drop list menu. The U/S Occlusion option enables the surgeon to specify parameters (Power and On-Time) for reduction of ultrasonic power at the Onset of occlusion, and at Full Occlusion, during ultrasonic and *NeoSoniX*® surgery steps. The Total Power Reduction readout is the product of the Power and On-Time settings.

The U/S Occlusion feature can be enabled and disabled by pressing the appropriate button in this option. The Adjust bar indicates whether occlusion watch is off or on, and when enabled in the U/S Occlusion option, user is able to turn this feature on and off in the Adjust bar.

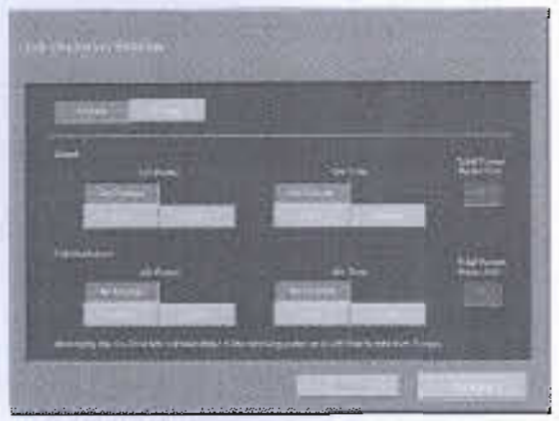


Figure 1-42 U/S Occlusion Settings Dialog

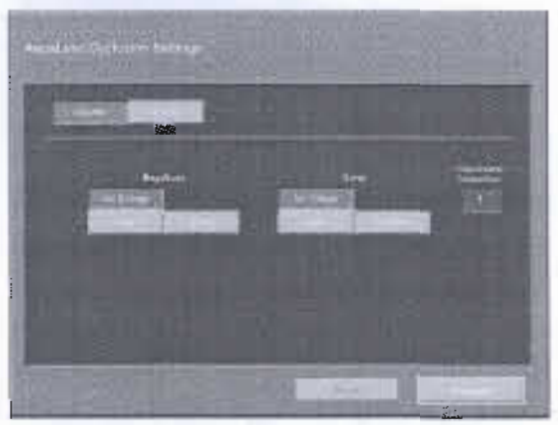


Figure 1-43 *AquaLase*® Occlusion Settings Dialog

• AqL Occlusion

The *AquaLase*® Occlusion option is invoked when the user selects Aql Occlusion from the Custom drop list menu. The *AquaLase*® Occlusion option enables the surgeon to specify parameters (Magnitude and Burst) for reduction of *AquaLase*® power at the onset and full occlusion during *AquaLase*® surgery steps. The Total Power Reduction readout is the product of the Magnitude and Burst settings.

The *AquaLase*® Occlusion feature can be enabled and disabled by pressing the appropriate button in this option. The Adjust bar indicates whether occlusion watch is off or on, and when enabled in the *AquaLase*® Occlusion option, user is able to turn this feature on and off in the Adjust bar.

• About

The About dialog is invoked when the user selects About from the Custom drop list menu. The About dialog displays the software and hardware revisions for system mechanisms, is for display only, and may not be modified by the user. Pressing OK closes the About dialog and returns the system to its prior state.

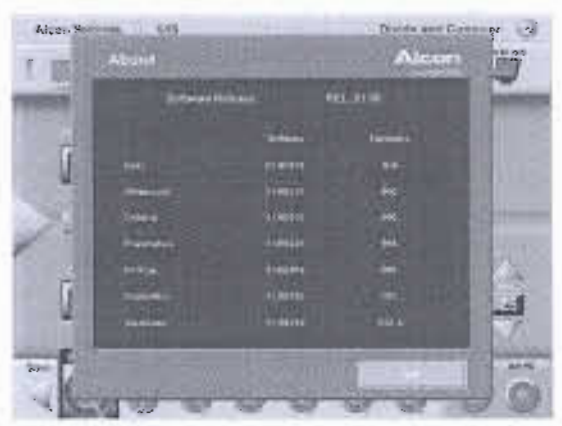


Figure 1-44 About Dialog

• Shutdown

Pressing the Shutdown button invokes a message asking if the user wants to Shutdown system? Pressing the Cancel button in the dialog returns the system to its prior state; pressing OK turns standby power off. To turn system power off the user must then press the power switch at the bottom of the *Infiniti*™ Vision System rear panel.

2.Setup Status Window
This area of the Setup Screen is used to display current system status during the setup phase of operation, and is for display only (see Figure 1-45). The user is alerted to situations like handpiece status ("Tuned," "Not Tuned," etc.), prime status, and type of FMS. The user can also be alerted when a remote control battery is low, or the *AquaLase*®/Balanced Salt Solution bottle is inserted. This area is also used for pictures to help the user perform a procedure (i.e., luers being connected to a handpiece).

If a valid FMS is not inserted, "No FMS" is displayed in the Setup Status area, and the Prime FMS, Fill, and Test Handpiece Setup Steps are unavailable. Text is displayed in the Setup Status area indicating "Insert FMS. . ."

When a valid FMS is inserted, "Calibrating FMS" is displayed while the fluidics mechanism performs a test of the aspiration pressure sensor. If the test fails, a dialog is displayed and the FMS is rejected. If the test succeeds, the FMS type and "Not Primed" is displayed, and the Prime FMS and Fill Setup Steps are available. The Test Handpiece button is not available until the system is primed and a valid handpiece is connected to the system.

3.Setup Steps
This area of the Setup Window is used for initiating setup functions as well as activating the surgery screen (see Figure 1-46). When the Setup Screen is initially entered, the Prime FMS button is highlighted.

3.1 Prime FMS Button
The Prime FMS button may be selected as long as a valid FMS is installed, regardless of current prime and tune status. With the irrigation and aspiration luer fittings connected together, the priming sequence is 1) raise the IV pole, 2) draw fluid, and 3) vacuum/vent check. When selected, the Prime FMS button is highlighted, metrics are reset to 0, and a priming dialog box is invoked which contains the following:

- Progress bar to show the progress of the draw fluid priming sequence.
- Vacuum bar as well as the actual vacuum value to show the vacuum check progress and actual vacuum value.
- Text message indicating "Drawing Fluid…", "Checking Vacuum…"
- Two buttons; one for Advance to Vacuum Check, and another for Cancel.

Once the prime sequence is initiated and the system is raising the IV pole or drawing fluid, then pressing

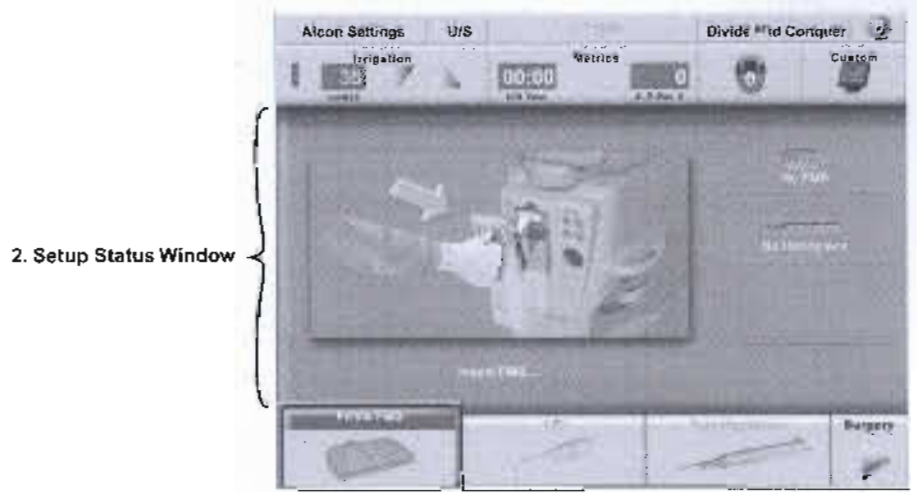


Figure 1-45 Functional Area of the Setup Status Window

Advance to Vacuum Check on the dialog will immediately skip to the vacuum/vent check. Once the prime sequence is initiated it can be aborted by pressing Cancel or by removing the FMS.

When the priming and vacuum checks are completed successfully, the prime status becomes "Primed" and the Fill Button is highlighted.

3.2 Fill Button
The Fill button is automatically highlighted when the priming sequence has completed successfully. Pressing the Fill Button activates the fluidics system to fill the handpiece. During the fill process a text message indicating "Filling Handpiece…." appears on the screen. Also displayed is a dialog with a Cancel button and an Advance To Test button. (Note that the Advance to Test button is ghosted if the conditions for testing are not met.)

Once the fill sequence is initiated it can be aborted by pressing Cancel or by removing the FMS, whereby the Fill dialog closes and the Fill Button remains highlighted. If Advance To Test is pressed, or if the system is left to proceed to completion, the Fill dialog closes and the Test Handpiece function is selected.

3.3 Test Handpiece Button
The Test Handpiece button may be selected only when the FMS is primed and the selected handpiece is inserted. In addition, if an *AquaLase*® handpiece is selected, the *AquaLase*® bottle must be inserted.

The *Infiniti*™ Vision System allows an *AquaLase*® and a U/S or *NeoSoniX*® handpiece to be connected at the same time, but the user must perform the Test Handpiece sequence for each handpiece: once when the U/S or *NeoSoniX*® handpiece is selected, and once when the *AquaLase*® handpiece is selected.

When the Test Handpiece button is selected the test handpiece dialog will display progress of the flow check with a vacuum bar as well as the actual vacuum value. A Cancel button also appears. Once the test sequence is initiated, it can be aborted by the user by pressing Cancel or removing the FMS, or it can be left to proceed to completion. For the *AquaLase*® handpiece only, a momentary collapse of the test chamber is normal.

Upon successful completion of the handpiece test sequence, the system exits the Setup Screen and enters the appropriate Surgery Screen.

3.4 Surgery Button
If the Surgery button is pressed the system goes to the appropriate Surgery Screen as follows. The first surgery step for the doctor's procedure is entered if 1) a surgery was terminated while in the Setup Screen, or 2) the surgical procedure was changed. Otherwise, the system returns to the Surgery Screen that was active before the Setup Screen was entered.

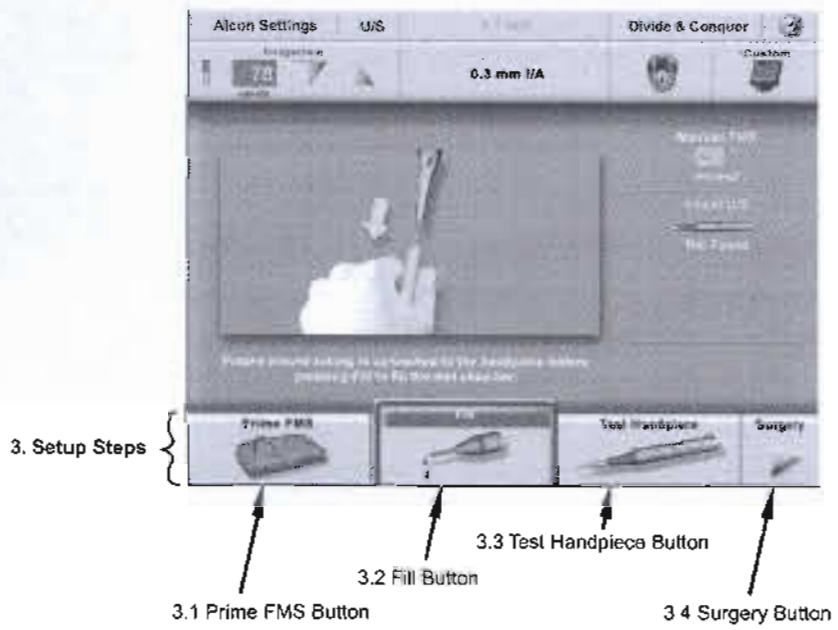


Figure 1-46 Functional Areas of the Setup Steps Window

SURGERY SCREEN

The Surgery Screens contain the buttons, readouts, and controls that allow the user to perform surgical functions. This screen is displayed when one of the following occurs:

- The Surgery button is pressed from the Setup Screen.
- The Test Handpiece function is completed in the Setup Screen and no other connected handpieces are "Not Tuned."

The Surgery Screen is divided into three sections (see Figure 1-47). At the top is the Main Window, below that is the Surgery Control Window, and below that is the Surgery Menu. Depending on the handpiece, procedure type, and surgery step selected, the Surgery Screen is updated with the buttons and surgical parameters corresponding to the selections. Although several representative surgery screens are shown in this section of the manual, screens showing all handpiece/procedure/steps are not shown.

1.Main Window

The buttons in the Surgery Main Window for U/S are nearly the same as in the Setup Main Window (read 1.1 through 1.9 in the Setup Screen for descriptions). The Main Window for I/A, Coagulation, and Vitrectomy are discussed later in this section.

Depending on the active surgery step, the buttons available in the Main Menu vary; however, the behavior of a button is consistent, regardless of the surgery step from which it is pressed. All buttons are available regardless of whether the footpedal and/or a footswitch button is depressed or not depressed, and the functionality provided by the footswitch will continue.

- Doctor Name - When a new doctor is selected, the system setup is changed to the settings associated with the newly-selected doctor.
- Handpiece Type, Tip Type, Procedure Type, and Cataract Grade - These selections along the top row of the Main Window are displayed during U/S, *NeoSoniX*®, and *AquaLase*® steps. The selections change during I/A, Vitrectomy, and Coagulation steps.
- Irrigation Controls, Metrics Display, Footswitch Button, and Custom Button - These selections along the second row of the Main Window are displayed in all step types. Their descriptions, except for Metrics, are the same as in the Setup Screen.

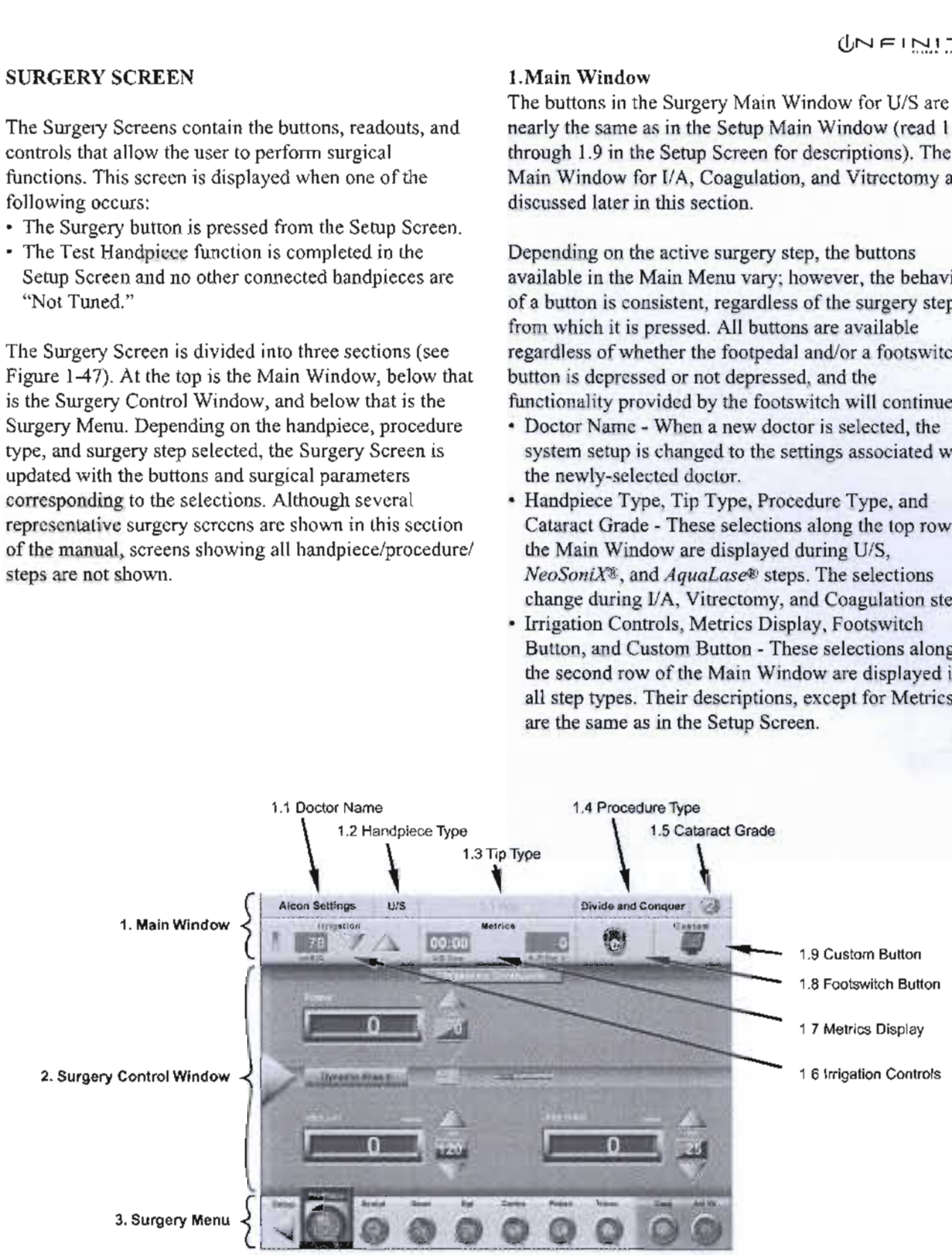


Figure 1-47 Functional Areas of the *Infiniti*™ Vision System Surgery Screen - This screen is for the Ultrasonics Continuous mode of operation. Other modes of operation look similar to this, but may have more or fewer buttons and surgical parameters corresponding to the surgery step.

2.Surgery Control Window

This window contains an Information Bar (see Figure 1-48). Surgical parameters are situated above and below the bar. Parameters related to the fluidics, vacuum, and aspiration flow rate are located below the bar. Parameters related to the chosen mode, for example ultrasound power, are located above the bar. Parameters above the bar are independent of the fluidics parameters. The content of these areas is determined by the active surgical step.

The actual values for certain parameters are shown using Display Bars. With the exception of the Vacuum parameter, the upper limits of the power bars are equal to their maximum settings. For the Vacuum parameter, if the vacuum limit is set to 650+, then the upper limit does not exist; otherwise, the upper limit is equal to the vacuum limit setting.

Saving Modifications to Surgical Parameters

Each surgery step has surgical parameter values that are established by default. During surgery the user may change surgical parameters in any of the steps. Any parameter changes made may be explicitly saved by the user using the Quick Save option in the Custom drop list. Also, if there are unsaved changes to the surgery steps and the user 1) ends the surgery or 2) changes the doctor, phaco handpiece, phaco tip, I/A tip, or lens removal procedure, a dialog box appears asking the user to save or discard any unsaved changes. Powering down the system automatically dismisses any unsaved changes.

2.1 Fluidics Controls

Below the Display Bar in the Surgery Control Window are the Fluidics Controls. These parameters are always vacuum and aspiration and are independent of the Surgery Controls. Fluidics Controls are available in all steps but Coagulation.

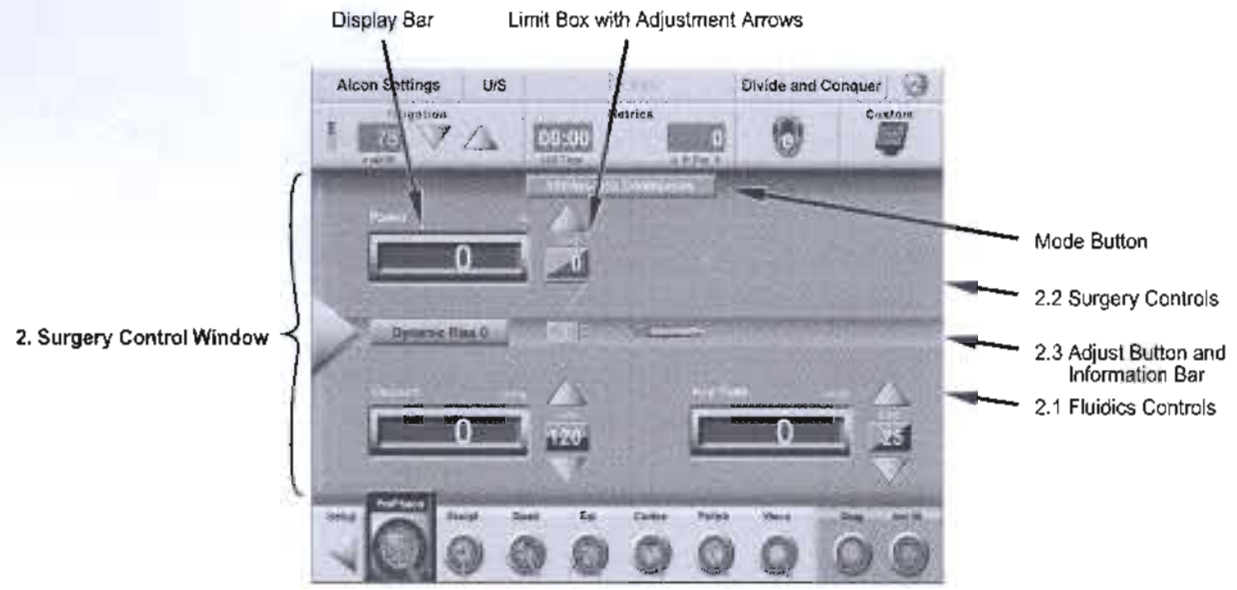


Figure 1-48 Surgery Control Window - Above the Adjust bar is the area reserved for Surgery Controls, and below the bar is the area reserved for Fluidics Controls. This Window is used to adjust system settings with the up/down arrows, and to observe current performance levels on the power bar displays. Depending on the mode of operation, the Adjust Bar is used to adjust other settings.

2.2 Surgery Controls

For Phaco steps, the area above the Display Bar contains the Surgery Controls for U/S functions. The surgery controls available are dependent on the type of lens removal step and mode selected. The possible parameters are a power bar to display a real-time representation of the actual power level, a linear/fixed button to toggle between linear (/) or fixed (-) footswitch-controlled power, and limit boxes with adjustment arrows to display and set maximum settings.

The Mode Button in the top-center of this area displays the current mode (continuous, pulse, burst) for the step. The mode can be changed by pressing the Mode Button and selecting another from a drop list. Depending on the current handpiece the selections are:

- Ultrasonics Continuous
- Ultrasonics Pulse
- Ultrasonics Burst
- *NeoSoniX®* Continuous
- *NeoSoniX®* Pulse
- *NeoSoniX®* Burst

For *AquaLase®* liquefaction and Irrigation/Aspiration the Mode Button in the Surgery Controls area is for display only.

2.3 Adjust Button and Information Bar

When the Adjust button is pressed, the Display Bar is depicted with buttons representing the current settings of each of the Adjust parameters. The Adjust parameters may be changed at this time. If the parameter is a drop down type, when the parameter button is pressed, a drop down list appears and the user can select the option desired. If the parameter is a toggle type, when the parameter button is pressed, the value will be toggled. The Display Bar can be removed manually by pressing the Adjust Button again, or by waiting five seconds and it will be disappear automatically. The Display Bar is available in all surgery steps except Coagulation.

Dynamic Rise - The value in the display bar indicates the current rise time for the aspiration pump rate adjustment at occlusion onset. The Dynamic Rise setting can vary from –2 to 4, in increments of 1. When Dynamic Rise -2 is displayed in the Adjust Bar, it indicates that the rise time in aspiration pump rate adjustment is slowest. When Dynamic Rise 4 is displayed in the Adjust Bar, it indicates that the rise time in aspiration pump rate adjustment is fastest. The Alcon default setting is 0.

MODE	Power % Bar	Power Limit Linear/Fixed Button	Burst % Time On Bar	Burst % Time On Limit Linear/Fixed Button	pps Box	% Time On Box	ms Box	Amplitude Box	Threshhold Box	Cut Rate cpm Bar	Cut Rate Limit Box
Ultrasonics Continuous	X	X									
Ultrasonics Pulse	X	X			X	X					
Ultrasonics Burst	X	X					X				
NeoSoniX® Continuous	X	X						X	X		
NeoSoniX® Pulse	X	X			X	X		X	X		
NeoSoniX® Burst	X	X					X	X	X		
AquaLase®	X*	X*	X	X	X						
Coagulation	X	X									
Vitrectomy										X	X

* For *AquaLase®* these labels are Magnitude instead of Power.

Table 1-2 PARAMETERS IN SURGERY CONTROLS AREA - The top half of the Surgery Control Window contains surgery controls; fluidics controls are in the lower half. Listed here are the operating parameters in the surgery controls section for identified surgical modes.

WARNING!
The use of Dynamic Rise setting 1, 2, 3, or 4 may result in aspiration levels (volumes) exceeding irrigation flow. This may cause chamber shallowing or collapse which may result in patient injury.

Occlusion Watch Off/On - Occlusion Watch is enabled in the *Custom/U/S Occlusion* or *AqL Occlusion* menus. When enabled it can be turned on and off in this information bar. When Occlusion Watch On is displayed in the Adjust Bar, it indicates that auto-attenuation of occlusion-based phaco power is active. When Occlusion Watch Off is displayed in the Adjust Bar, it indicates that auto-attenuation of occlusion-based phaco power is inactive.

Status Icons - Presence and status of handpiece and FMS.

2.4 Surgery Controls Window with I/A Steps

All I/A steps contain the same Fluidics Controls for vacuum and aspiration. The Surgery Controls area above the Display bar does not contain any surgical parameters, but does display a Mode Button showing the Irrigation/Aspiration step type.

2.5 Surgery Controls Window with Vitrectomy Steps

All Vitrectomy steps contain Surgery Controls for cut rate parameters, and Fluidics Controls for vacuum and aspiration parameters. The Surgery Controls area also contains a Mode Button indicating the current Vitrectomy step type (Vitrectomy I/A Cut or Vitrectomy Cut I/A).

2.6 Surgery Controls Window with Coagulation Steps

All Coagulation steps contain just one surgical parameter: Power. This parameter is displayed in the upper portion of the Surgery Control Window. This window also contains a Mode Button with the step type (Coagulation).

3.Surgery Menu

The Surgery Menu consists of the pushbuttons at the very bottom of the surgery display (see Figure 1-49). These pushbuttons represent all the surgery steps for the currently selected surgery mode, plus a Setup button to quickly return to the Setup screen.

The Setup button is always on the far left, followed by several pushbuttons (seven buttons displayed) dedicated to lens removal and I/A steps. The last two buttons are for the coagulation and anterior vitrectomy steps. The

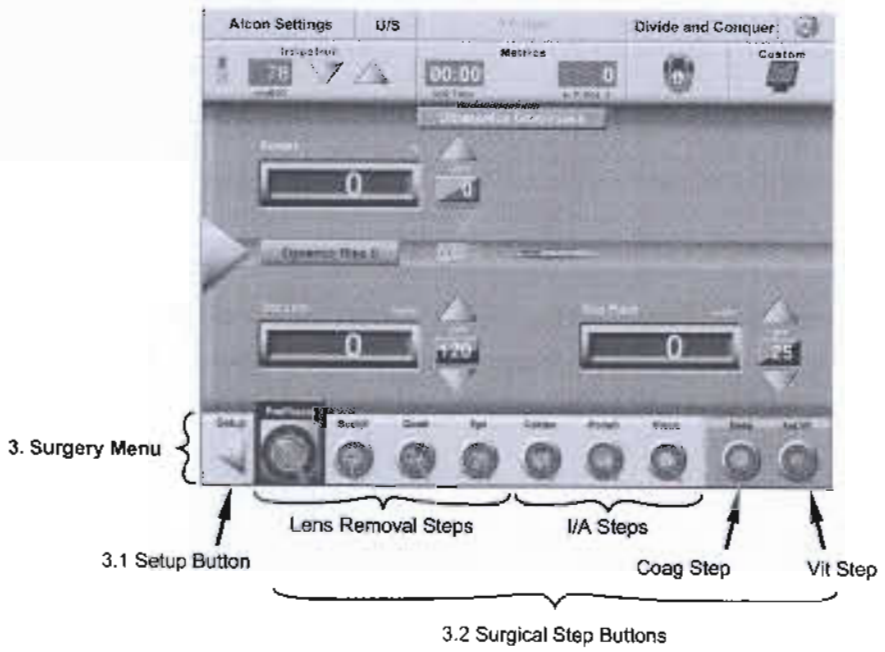


Figure 1-49 Surgery Menu - At the bottom of the display screen is the Surgery Menu. The buttons in this area allow the surgeon to control the surgical step progression.

Setup, coagulation, and anterior vitrectomy buttons are fixed, however the seven displayed pushbuttons for lens removal and I/A steps are scrollable left and right. This scrolling is necessary since more than seven lens removal and I/A steps may be specified for the selected surgical mode.

The lens removal steps correspond to the selected tip, procedure, and handpiece. The I/A steps correspond to the selected I/A tip and procedure. When selecting the step that is furthest left (e.g. next to the Setup button) or furthest right (e.g. next to the coagulation button), the lens removal and I/A steps will scroll so that all steps before or after the selected step, respectively, can be seen.

3.1 Setup Button

When the Setup button is pressed, the user will be taken to the Setup screen. To enter the Setup screen the footpedal must be released, and the footswitch buttons must not be activated.

3.2 Surgical Step Buttons

When a surgery step is selected, its button is highlighted with a frame, and the surgical parameters for the surgery step are displayed in the Surgery Control Window. In addition, the Surgery Main Window is updated with the buttons that are applicable for the selected step.

Step changes in lens removal and I/A modes are allowed regardless of footpedal position. A step change into Coag or Vit is allowed with the footpedal depressed, but the footpedal must be released to exit.

Surgical Steps

The *Infiniti*™ Vision System provides operational surgical steps to support efficient lens removal. Each step allows for the adjustment of surgical parameters such as power, aspiration, and vacuum settings according to doctor preferences. These steps are arranged in sequential order from left to right across the bottom of the screen to provide a complete surgical procedure of different settings associated with different aspects of the procedure. Complete procedures can be saved for future use without having to re-program the instrument.

The surgical steps are selectable from the unit's front display screen, from the remote control unit, or from the footswitch. Step changes will result in voice confirmation. (The user has the ability to turn this feature off via the *Custom/Sound* menus.)

Preset operating parameters for each step are programmed into the system. These default operating parameters can be modified by using the front panel or remote. These parameters can then be saved and will be associated with the current doctor, handpiece, tip, and procedure name.

Abbreviation	Description	Abbreviation	Description
A	Amperes	IP07	International protection level 07 (temporary immersion)
AC	Alternating Current		
AqL	*AquaLase*®	IRR	Irrigation
Asp	Aspiration	IT	Interchangeable Tip
C	Centigrade	MMC	MultiMedia Card
cc/min	Cubic centimeters per minute	mmHg	Millimeters of Mercury
Coag	Coagulation	PEL	Patient Eye Level
DFU	Directions for Use	RCAT	Remote Control Aseptic Transfer
F	Fahrenheit	SP	Single-Piece
FMS	Fluidic Management System	UL	Underwriters Laboratories
FTSW	Footswitch	U/S	Ultrasonic
HIS	High Infusion Sleeve	USB	Universal Serial Bus
HP	Handpiece	V	Volts
Hz	Hertz	Vac	Vacuum
I/A	Irrigation/Aspiration	Vit	Vitrectomy
IEC	International Electrotechnical Commission		

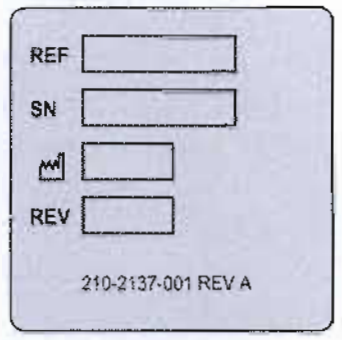
Table 1-3 ABBREVIATIONS USED WITH THE *INFINITI*™ VISION SYSTEM

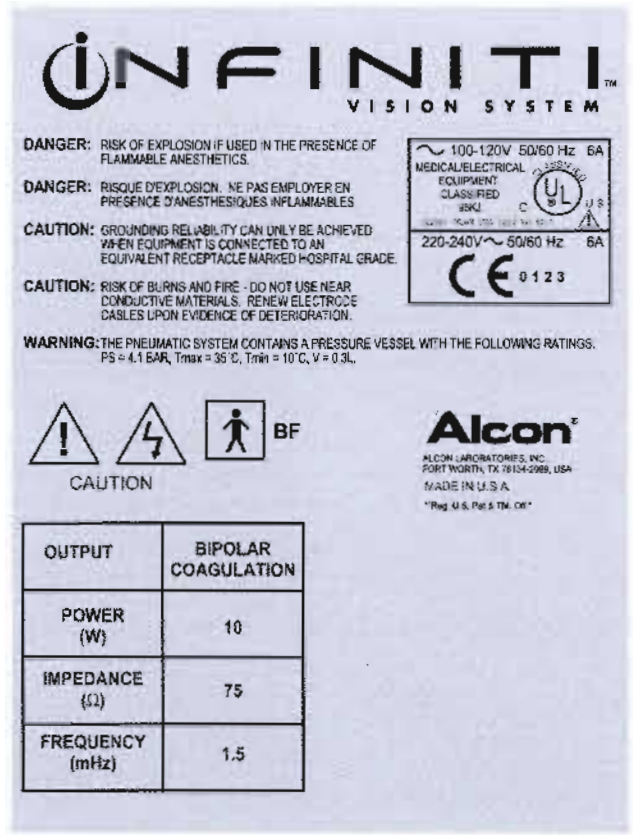
CLASSIFICATIONS:	Regulatory: Class I according to 93/42/EEC Medical Device Directive for EEA. Electro-Mechanical: Class I per IEC60601-1, UL2601, CSA 22-2 601-1 and JIST 0601.			
CONSOLE DIMENSIONS:	Height: Width: Depth:	138 cm (63 inches) 51 cm (23 inches) 57 cm (30 inches)		
CONSOLE WEIGHT:	Unpacked: Packed:	107 kg (235 pounds) 150 kg (330 pounds)		
ENVIRONMENTAL LIMITATIONS:		Operating	Non-Operating	Packaged for Transport
	Altitude:	2438 meters (8,000 feet)	- -	12,191 meters (40,000 feet)
	Temperature:	10° C to 35° C (50° F to 95° F)	-10° C to 55° C (14° F to 131° F)	-40° C to 70° C (-40° F to 158° F)
	Relative Humidity:	10% to 95% without condensation	10% to 95% without condensation	10% to 95% without condensation
ELECTRICAL REQUIREMENTS:	Auto select to accomodate input power of 90 VAC - 264 VAC, 50/60 Hz. Maximum input current is 6 Amps, and maximum power consumption does not exceed 1000 Watts.			
POWER SYSTEM:	24VDC 650W AC to DC power supply; 12VDC 450W AC to DC power supply; AC input module; 12V lead acid battery; Power Distribution PCB; Host DC to DC PCB.			
LEAKAGE CURRENT:	300µA @ 132 VAC, 60 Hz; 500µA @ 264 VAC, 50 Hz			
PROTECTION AGAINST ELECTRIC SHOCK:	Class I			
CLASSIFICATION OF ALL APPLIED PARTS:	Type BF			
DATA CARD:	MMC (MultiMedia Card), or SD (Secure Digital), 32 Mb minimum			
TOUCH SCREEN AND DISPLAY:	15" analog resistive touch screen, 15" TFT-LCD, 1024 x 768 pixels, +12 VDC ±5%, 3 Amps maximum. Tilt +5° to -90°, Spin +45° CW to -180° CCW, Swivel ±87.5° CW & CCW			
ULTRASOUND DRIVER:	34 KHz to 42 KHz, 3.5 ±0.5 mils stroke			
U/S HANDPIECE:	Resonant Frequency: 40 kHz Dynamic Operating Frequency: 35.5 kHz to 40.5 kHz			
NEOSONIX® HANDPIECE:	Resonant Frequency: 40 kHz Dynamic Operating Frequency: 36 kHz to 41 kHz			
VIT CUTTER:	50 to 800 cpm			
IV POLE:	Travel range of 97 cm (38.19 inch), speed from 8.0 cm/s to 12.0 cm/s			
REMOTE CONTROL:	One way wireless transmitting device. IR transmitting diodes in the range of 880 nm to 950 nm wavelength. Requires three AAA batteries.			
FOOTSWITCH DIMENSIONS:	Height: Width: Length:	12.7 cm (5.0 inches) 24.1 cm (9.5 inches) 34.9 cm (13.75 inches)		
FOOTSWITCH WEIGHT:	Stand Alone: With Cable:	16.5 kg (7.5 pounds) 18.7 kg (8.5 pounds)		

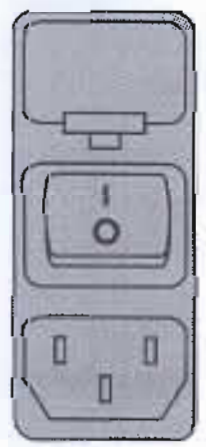
Table 1-4 **SPECIFICATIONS - This table is a quick reference point to identify basic system specifications, system requirements, and performance figures.**

BF — Type BF equipment, providing both the attributes of basic insulation and "floated" isolation.	Insert/Eject Fluidic Management System
Dangerous Voltage	U/S Handpiece Cable Connector
CAUTION: Consult accompanying documents	*AquaLase*® Handpiece Cable Connector
Equipotential ground connection	Vitrectomy Probe Tubing Connector
AC Voltage	*AquaLase*® Bottle Receptacle
Power stand-by state for a part of equipment	Coagulation Cable Connector
	USB Connector
ON (POWER)	Serial Connector (10101)
OFF (POWER)	*Infiniti*™ Port
Footswitch	ESD Alert
Fuse Size and Rating (T6.3A/250)	UL Mark - With respect to electrical shock, fire and mechanical hazards only in accordance with UL 2601-1 (95-KJ), IEC 60601-1-2 and IEC 60601-2-2

Figure 1-50 ICONS USED WITH THE *INFINITI*™ VISION SYSTEM - Icons identifying modes, functions, etc., that are used with the *Infiniti*™ Vision System are identified in this chart.

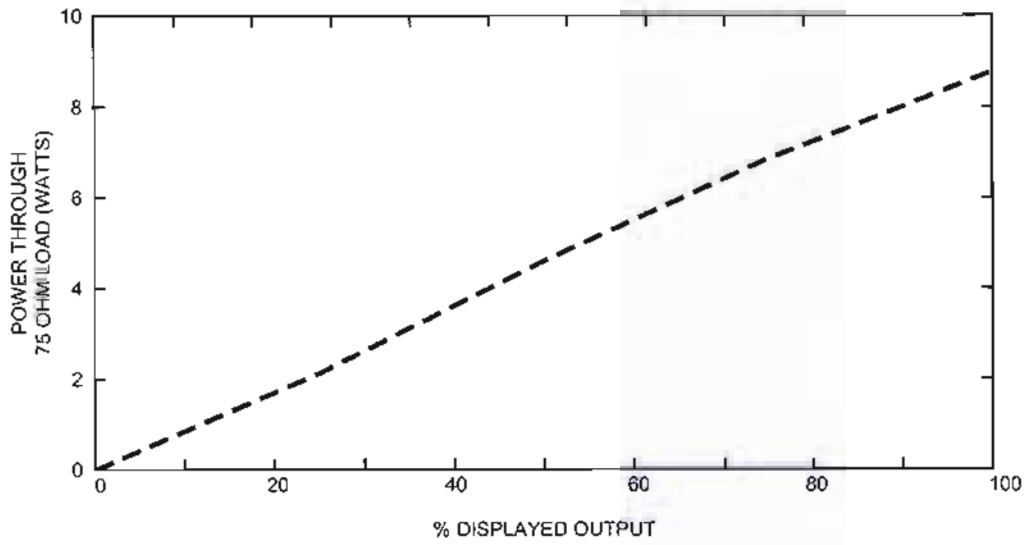




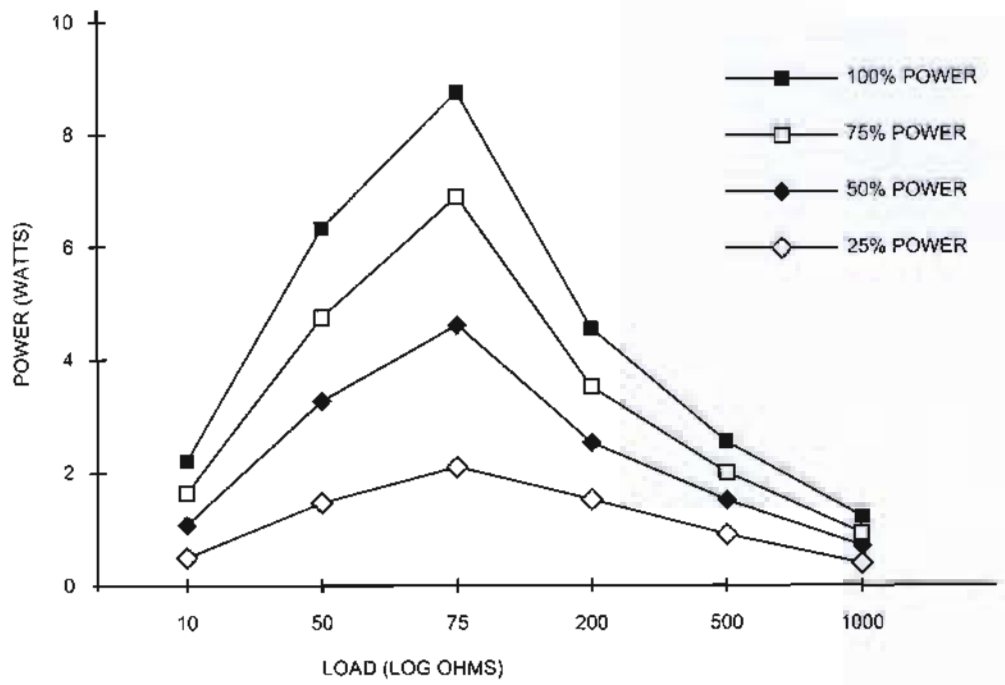


T6.3A/250 WARNING: FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE.

Figure 1-51 LABELING ON *INFINITI*™ VISION SYSTEM - Labels used on the *Infiniti*™ Vision System are illustrated here. The labels on this page are intended for reference only.



COAGULATION POWER THROUGH 75 OHM LOAD



COAGULATION POWER VS. LOAD IMPEDANCE

Figure 1-52 COAGULATION POWER OUTPUTS - Set coagulation power at the intended output control setting in the intended operating mode in reference to figures above.

SECTION TWO
THEORY OF OPERATION

INTRODUCTION

The theory of operation includes a system overview and subsystem theories of operation. The theories are accompanied by block diagrams. In some cases, the theory goes into more detail than shown on the block diagrams. When this occurs, refer to the schematic diagrams located in Section Five.

SYSTEM OVERVIEW

System Design Approach
- Electrical and software infrastructure consisting of all of the elements necessary to implement customer requirements with a goal towards future surgical modalities.

Distributed Processing
- Guarantees real-time execution of surgical algorithms.
- Provides maximum flexibility and future expansion.

Network Topology
- Flat
- Unlimited nodes
- Simple twisted pair
- High bit rate

Controller Area Network (CANbus)
- Minimum communication S/W needed
- Automatic retries performed in silicon
- Built-in CRC
- Built-in message priority
- Non-destructive bitwise arbitration
- "Smart" transceivers

System Messaging
- Subsystems respond to:
  - Parameter configuration via Host GUI
  - Inputs from physician via footswitch
- Subsystems can see all bus data
  - Provides for subsystem dependencies, e.g. occlusion mode phaco
- Host displays system data via GUI

Subsystem Hardware
- Uses a common microcontroller (ST10F168)
- Uses a common hardware interface

System/Subsystem Software
- Windows 2000
- 'C' Programming language

Power Distribution
- Uses standard power supplies
- Subsystem creates needed voltages
- Use common subsystem connectors
- Provide for power upgrade path
- Three Supplies
  - 24 V single voltage system supply
  - 12V/5V system supply
  - ATX style Host supply
- Provide flexibility in Host connectivity
  - 4KV Host isolation in power and communication

Host Platform
- Pentium class CPU
- Consolidated video and audio
- Large application execution memory
- Large persistent storage devices
- PCI bus for expansion
- Significant expansion I/O
  - USB, serial, parallel, IDE

Infiniti™ Display (GUI)
- Large flat panel
- Hi brightness/contrast/viewing
- Touchscreen
- 16 million colors
- Digital differential interface
- No hard keys

Subsystems
- Footswitch Module
- IV pole Module
- Fluidic Module
- Pneumatic Module
- Ultrasonic/Coag Module
- *AquaLase*® Module

INFINITI™ SYSTEM THEORY

Figure 2-1 shows the *Infiniti*™ Vision System in block diagram form. Each block is reviewed in detail on the page number indicated within the block. The Host is not considered a module, but it monitors communications between all the modules, and the information is displayed on the GUI. Host and intermodule connections are made through the Power Distribution PCB and the CAN Distribution PCB, mounted on the Host card cage. The Footswitch, IV Pole, Fluidics, Pneumatics, U/S & Coag, and *AquaLase*® modules contain their own microcontrollers and software which all modules use to communicate with each other directly.

CAN

CAN (Controlled Area Network) is a serial bus system especially suited for real time control with a very high level of security. All data contains a "message identifier" which does not indicate the destination, but rather the meaning of the data (message filtering) so that all modules can decide whether or not they need to act on the data. This data is then handled via a proxy (intermediate software) which decodes raw data from the bus to each microcontroller, and a broker (software library) that contains all the necessary routines to transmit and receive the data.

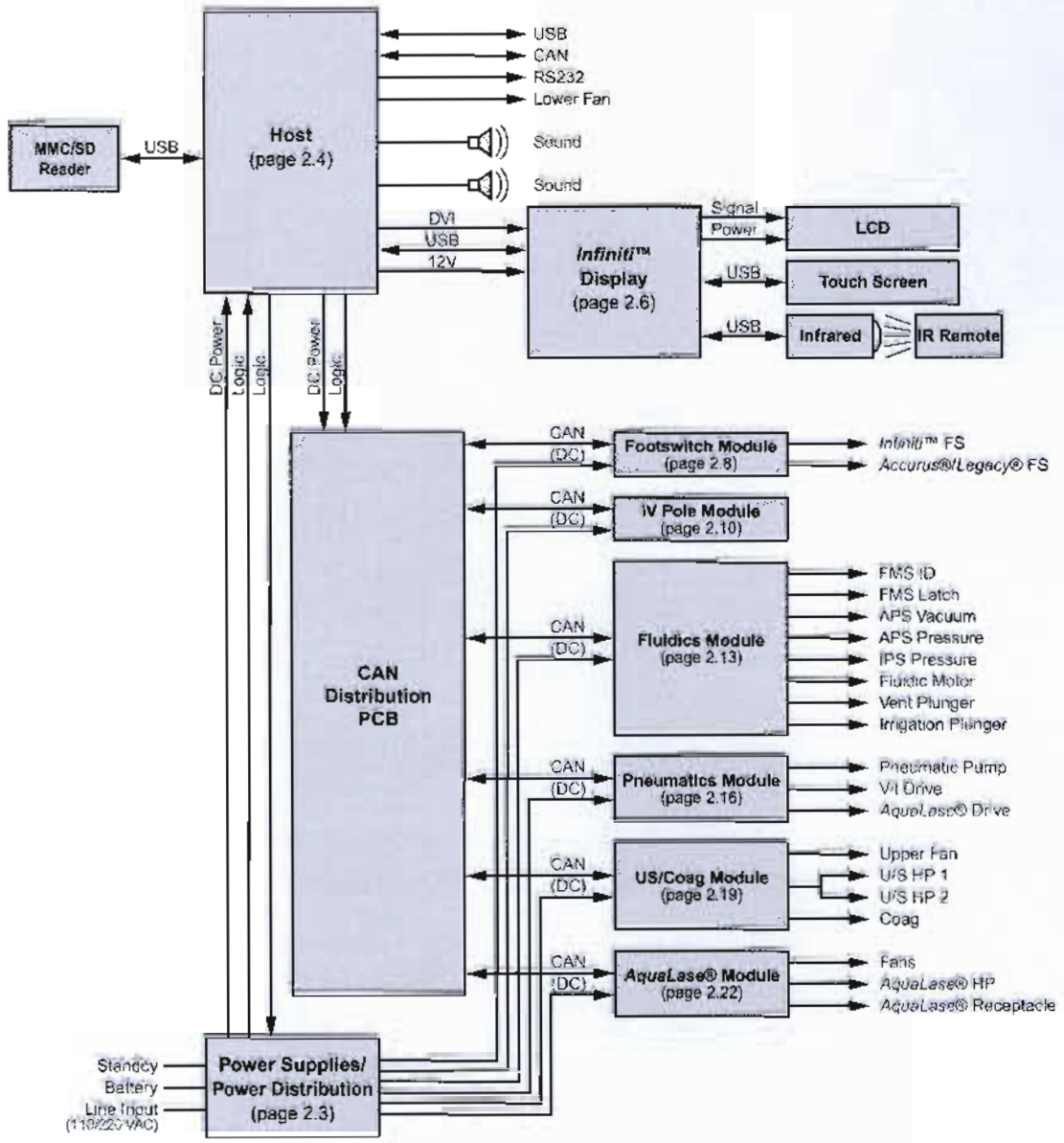


FIGURE 2-1 SYSTEM BLOCK DIAGRAM - The center of the *Infiniti*™ Vision System is the Host which monitors all communications between the modules.

POWER DISTRIBUTION THEORY

The *Infiniti*™ Vision System uses two vendor-issued power supplies and an Alcon-manufactured Power Distribution PCB to supply voltages throughout the system. The power system consist of the AC Power Input Module, Power Distribution PCB, +12V Battery, and two DC Power Supplies.

AC power enters the system through the AC Power Input Module and continues on to the Power Distribution PCB. The AC power is then sent from the Power Distribution PCB to the two DC power supplies. The two power supplies send +12 V and +24 V back to the Power Distribution PCB from where the voltages are distributed throughout the system.

AC Power Input Module

115/220 VAC goes through two 6.3 amp fuses directly to the Power Distribution PCB.

Power Distribution PCB

The Power Distribution PCB inhibits the 12 V and 24 V power supplies via software. When the Standby Switch is pressed, 12 V is enabled by a signal sent from the Host through the Power Distribution PCB. When the *Infiniti*™ application software starts up, 24 V is enabled by a signal sent from the Host through the Power Distribution PCB.

12 V Battery

The +12 V battery provides power to the Host to allow the operating system to shutdown properly only in case of AC failure. The battery is charged through a circuit from the Power Distribution PCB.

12 VDC Power Supply

The 12 V power supply outputs an auxiliary +5 V to the Standby Switch, and +12 V is distributed to the Host Power PCB via the Power Distribution PCB. The Host Power PCB redistributes the +12 V and also supplies +5 V and +3.3 V to the DVI Controller, CAN Controller, Host CPU, hard drive, and DVD/CD-ROM.

24 VDC Power Supply

The 24 V is distributed to every module through the Power Distribution PCB. The 24 V is used to generate +12 V, -12 V, 5 V, and 3.3 V through a DC-DC converter that resides in every module.

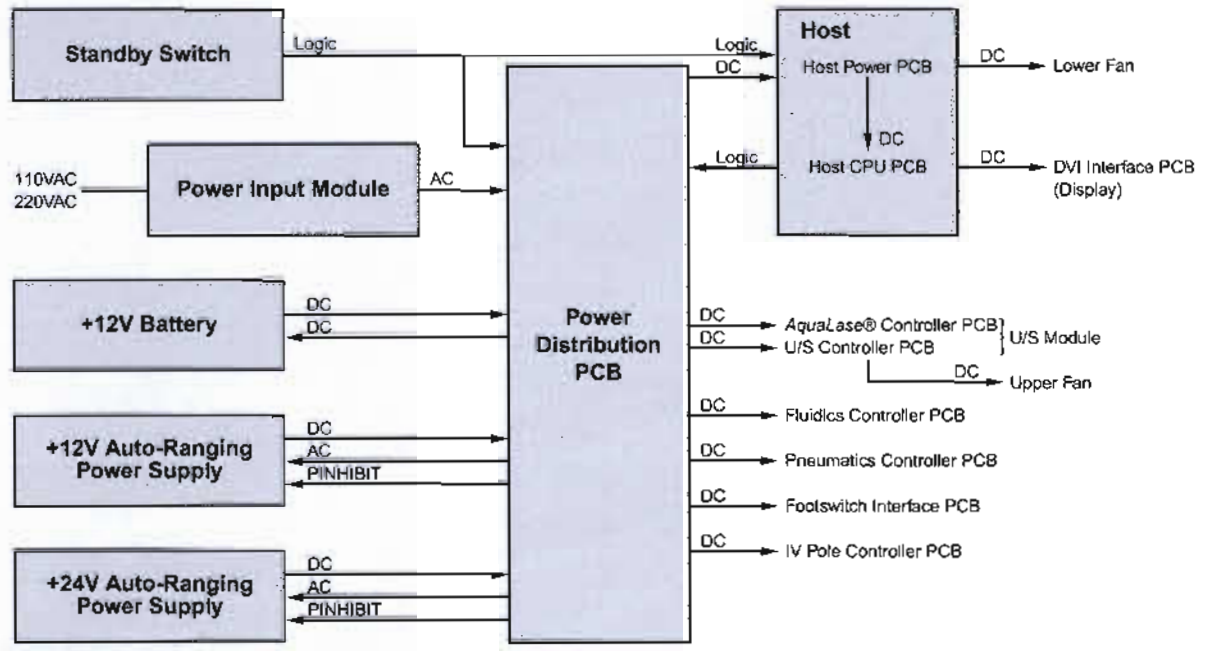


FIGURE 2-2 POWER DISTRIBUTION BLOCK DIAGRAM

HOST THEORY

Internal Interface
The *Infiniti*™ Host electronics is comprised primarily of a CPU board, processor w/heatsink, DRAM, HDD, DVD, PCI-DVI+, PCI-CAN, Host Power PCB, and interconnect cables.

External Interface
The *Infiniti*™ Host electronics is connected to the rest of the system via CAN, serial port, parallel port, USB, standby switch, and DVI video. Each interface presents the Host with a different mechanism for control and monitoring.

- CAN – Subsystem Communication Configuration and Real time Feedback
- Serial Port – VideOverlay Telemetry Communication
- Parallel Port – Power Supply Control and Status Monitoring
- USB – User Interface (touch screen, IR remote, SD/MMC card reader)
- DVI Video – Graphics Output to TFT LCD
- Standby Switch – Power Up and Standby Modes

Boot Up Process (Power On – Standby Switch)
With AC power on (input module switch ON), pressing the standby switch should toggle its back light from amber to blue; this initiates +12 V. The status LED's on the Host should indicate Green for Power Good, and Green for all voltages on the Host Power PCB. If any voltage status LED's are not illuminated, then the Power Good LED will stay Red and the Host CPU will not commence boot up.

The *Infiniti*™ LCD should indicate that *Infiniti*™ is starting via the custom graphics splash screens that appear during the normal boot process, accompanied by a quick double beep.

After a successful boot, the *Infiniti*™ application software begins to execute. After verifying system and file resources, the application initializes CAN and enables +24 V.

System I/O
CAN Bus
The *Infiniti*™ Host CAN interface contains two high speed CAN ports; one that interfaces to the *Infiniti*™ subsystems, and one spare. The primary CAN channel is

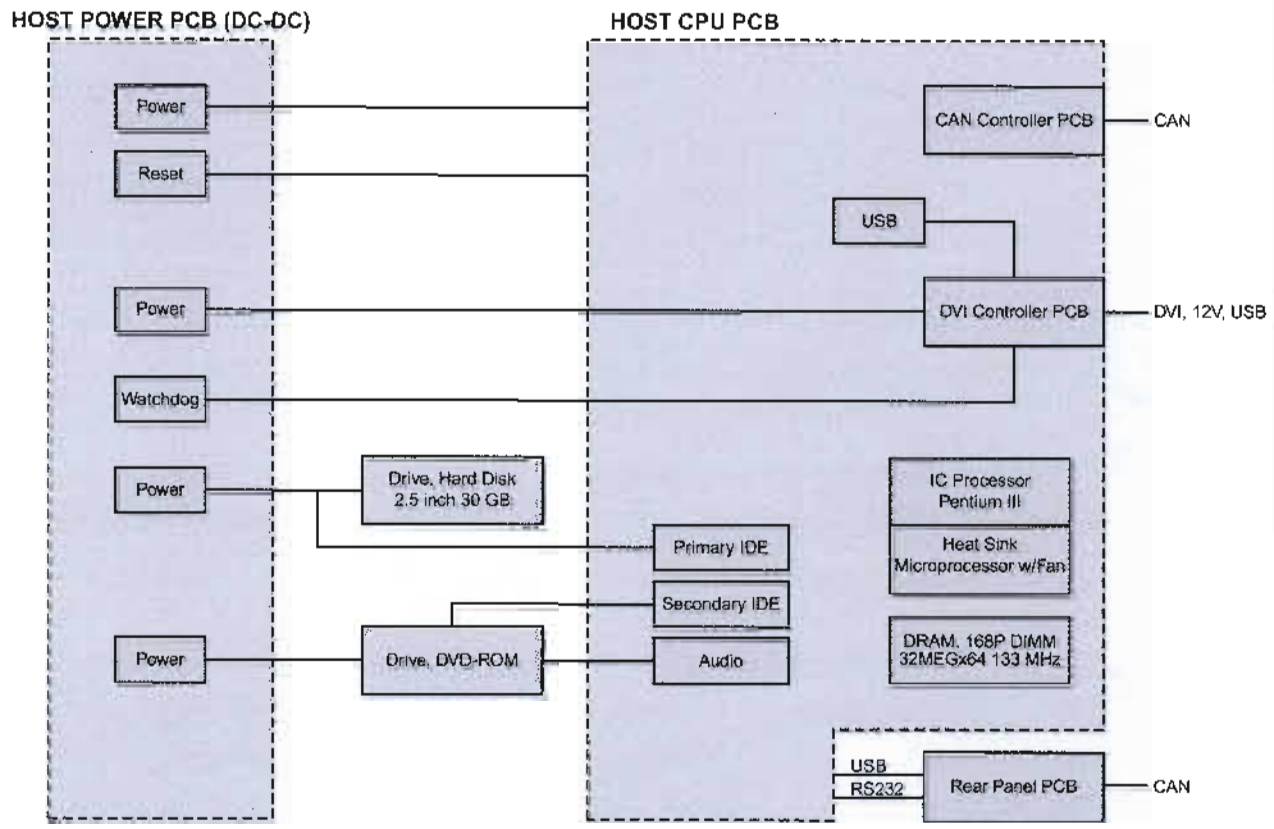


FIGURE 2-3 HOST BLOCK DIAGRAM

configured as a 500 Kbaud interface to subsystems. The CAN interface requires an accurate voltage on the PCI bus in order to initialize correctly. The lack of sufficient PCI bus voltage and subsequent initialization failure is evident from subsystems faults during Host application start. The system uses CAN in a "star" configuration with respect to termination. A single central termination is deployed so that a disconnect along the network doesn't eliminate half of the network because of the physical location of the fault, but rather because of a dependency not met by the fault.

Serial Port
The *Infiniti*™ Host serial port communicates telemetry data to an external VideOverlay Parameters System. On the rear panel, the VideOverlay connector is a DB-9 Female.

Parallel Port
The *Infiniti*™ Host parallel port controls the Power Distribution PCBA. This allows the Host to both control and monitor features of power delivery, battery backup, and AC faults.

User I/O
USB SD/MMC Card Reader
This reader is plugged into the CPU's primary external USB port. The reader is capable of reading any SD/MMC Card. The primary use of SD/MMC is for Dr. Data backup and restore.

USB Touch Screen
The Host's primary cursor control is via a USB touch screen controller. The touch screen controller resides on the DVI+ interface, which contains the CPU's primary internal USB port. This port is shared within the display assembly by a USB hub chip, which services the touch screen controller and IR Receiver PCB's.

USB IR Remote Control Receiver
The Host accepts numerical keypad keystrokes from a USB IR Receiver PCB.

INFINITI™ DISPLAY THEORY

The *Infiniti*™ display system is comprised of:

- PCI DVI Controller PCBA
- DVI-D Dual Cable
- DVI Interface PCBA
- Backlight Inverter
- LCD
- Touch Screen
- Touch Screen Controller PCB
- IR Sensor PCB's
- IR Receiver PCB

System Interface Description

The *Infiniti*™ display system contains a DVI Graphics Controller, DVI Interface Receiver, Display + Inverter, Touch Screen + Controller, and IR Receiver. The DVI Graphics Controller provides the DVI interface from Host to the front panel, as well as routing USB and +12 V power to the panel. The DVI Interface PCB provides for power conversion and distribution to other boards in the front panel, and converts the DVI-TMDS interface to LVDS for the TFT LCD. The USB channel also gets a 4-port hub on the DVI Interface PCB for routing to both the IR Receiver PCB and Touch Screen Controller PCB. The Host enumerates the USB Touch Screen Controller as a HID pointing device. The Host enumerates the USB IR Receiver as a HID keyboard device. +12 V @ 1.5 A is delivered on the DVI-D cable for use by the inverter, converted to +5 V on the DVI Interface PCB for use by the board, USB devices, and +3.3 V for the LCD.

PCI DVI Controller

The PCI DVI PCB is a Host PCI graphics adapter based on Asiliant B69030 video graphics controller. Setting video to PCI in the BIOS graphics settings configures the board as the default graphics adapter in the Host. There is also a custom VGA BIOS resident on this board that configures the B69030 to drive the *Infiniti*™ TFT panel to its native XGA resolution and full color. Upon Host power-up, the *Infiniti*™ display is the primary video display, and it immediately displays a graphics BIOS sign-on message, followed by system boot information. The PCI DVI Controller PCB outputs XGA video as TMDS (DVI-D) on the DVI-D dual cable.

24 Pin DVI-D Input Connector (J3) - The DVI-D Digital Video Output Connector is the main output connector bringing in the TMDS and DDC signals. Additional dual link DVI-D connections are used to pass through USB and display power.

4 Pin Auxiliary Power Input Connector (J4) - Power input from standard PC power supply. Powers display sub-system.

USB Pass Through Connector (J2) - USB pass through rrom internal (Intel Calabasis) motherboard connector.

External Motherboard Reset (J1) - Allows watch-dog timer to reset the system.

CRT Connector Output (J5) - CRT output. Normally off. Auto-detect on for test/diagnostics.

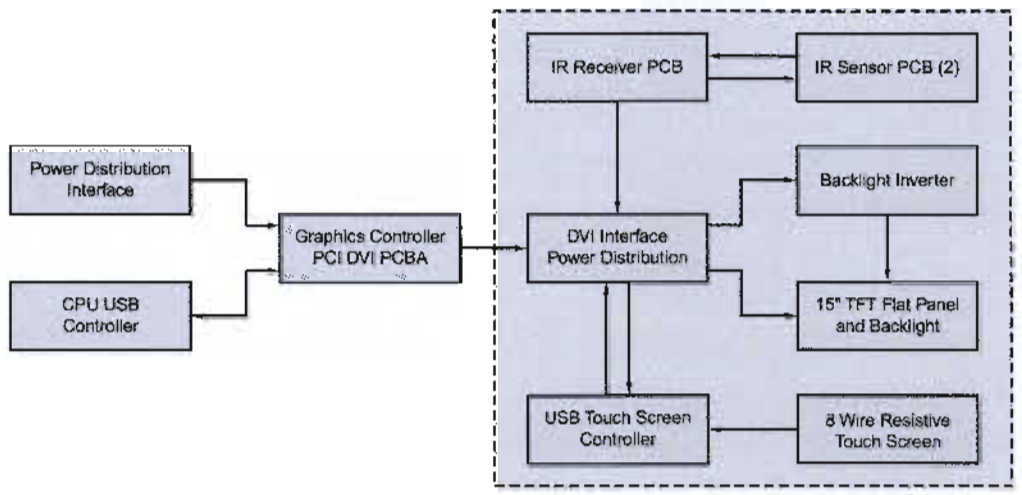


FIGURE 2-4 DISPLAY BLOCK DIAGRAM

DVI Interface and Power Distribution Controller

This device receives digital video data over the DVI Interface and formats it for the required physical panel interface. It performs power input, conversion, and filtering. It has a configurable I/O to support unforeseen changes in future interfaces. It supports standard EDID responses for DVI and monitor compatibility, and supports a range of backlight inverters. Additionally it passes through Host USB to external USB touch-screen controller, and external IR receiver.

24 Pin DVI-D Input Connector (J3) - The Main input connector bringing in the TMDS, DDC signals, power, and USB from the Host. Uses DVI-D dual link cable to implement interface.

USB1 Connector (J5) - The USB connector to Touch Screen Controller.

USB2 Connector (J6) - The USB connector to IR Control Interface.

20 Pin LVDS Panel Interface Connector (J1) - 24 bit LVDS panel interface. Connection is direct match to Samsung LTM150XH-L04 panel. In dual pixel mode, this connector supports "First Pixel Out" data.

20 Pin LVDS Panel Interface Connector (J2) - 24 bit LVDS panel interface. Connection is direct match to Samsung LTM150XH-L04 panel. In dual pixel mode, this connector supports "Second Pixel Out" data.

Inverter Connector (J4) - Inverter connector to support range of +12 V inverters.

LVDS Panel Data Mapping - Defines connection of panel color data to corresponding LVDS output transmitter for use by Samsung LTM150XH-L06 24 bit LVDS panel interface.

Touch-Screen

The Hampshire touch-screen controller implements a USB mouse emulation and is powered by the USB interface itself.

- 15.0 TFT
- Communication Options (factory set): USB.
- Touch Screen Interface: Analog resistive 8 wire.
- Resolution: 12 bit (4096 x 4096).
- Static: 24 KV.
- Power Options: Power from USB port is regulated 5 VDC by USB port: >5 VDC ±10%.

IR Sensor/Receiver

IR Sensor PCB (2) - Each IR Sensor PCB contains an IR sensor that demodulates the signal received from the remote control. The IR signal is modulated and wire-AND'ed such that either active low sensor will drive the IR receiver processors input LOW. The IR receiver processor decodes the received IR signal, and if the checksum is successful, creates the USB data packet to send down to the Host as a valid key press via the IR Receiver PCB.

IR Receiver PCB - The IR Receiver PCB receives signals from the sensor PCB's. The signals are wire-AND'ed such that either active low sensor will drive the IR receiver processors input LOW. The IR receiver processor decodes the received IR signal, and if the checksum is successful, creates the USB data packet to send down to the Host as a valid key press.

FOOTSWITCH MODULE THEORY

General Overview

The *Infiniti*™ footswitch and its console interface are comprised of the following basic elements:

- A footswitch with an optical quadrature encoder coupled to the footswitch treadle.
- A DC motor coupled to the footswitch treadle for force feedback.
- Footswitch button switches for user functions.
- Interface electronics capable of decoding the optical quadrature encoded signal representing treadle position.
- Interface electronics capable of driving the treadle's DC feedback motor.
- Interface electronics capable of reading the footswitch button switches.
- Communication interface capable of broadcasting the footswitch real time status to all subsystems.
- All necessary cable assemblies.

The *Infiniti*™ footswitch interface is designed to support *Infiniti*™ and *Accurus®/Legacy®* footswitches. Two physical connections are implemented. For simplicity, just a single interface is discussed here.

Footswitch Functions

This section describes the functionality of the *Infiniti*™ footswitch interface operation:

- Inter-subsystem and Host communications.
- Treadle position sensing.
- Footswitch type detection.
- Footswitch user switches (buttons).
- Treadle force feedback.
- Spring failure and tilt switches.

Inter-Subsystem and Host Communications

The footswitch interface, and therefore the footswitch, communicate to the rest of the system via CAN. The Host configures the footswitch operational ranges, detent, and user switches via configuration commands. Subsystems respond the footswitch through real time status messages that describe the footswitch position, and user switches state.

Treadle Position Sensing

Treadle position sensing (quadrature encoding/ decoding) includes the ability of the footswitch/interface to detect an UP position as well as a DOWN position with precise encoder counts reflecting the actual physical position. Physical encoder counts are converted to percentage of penetration within a logical position by software. The optical quadrature encoder within the footswitch sends out signals on phase A and phase B of its outputs that are converted to an UP/DOWN signal and associated clock by the footswitch interfaces on board EPLD. An internal 16-bit counter within the ST10F168 microcontroller then uses the direction and clock signals to monitor the treadle position.

Footswitch Type Detection

In keeping with *Accurus®/Legacy®* footswitches, the type is first detected by way of a revision resistor. If an *Infiniti*™ footswitch is detected, then the *Infiniti*™ footswitch EEPROM is read via SPI, and maximum treadle counts at the time of manufacturing is acquired in order to accurately scale treadle position detection, position penetration, and detent location.

Footswitch User Switches

The footswitch contains six programmable user switches that can be programmed per the users preferences menu

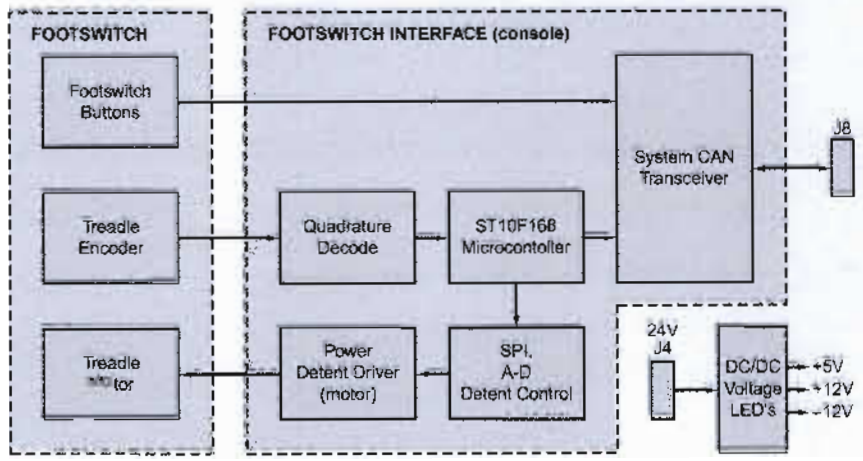


FIGURE 2-5 FOOTSWITCH MODULE BLOCK DIAGRAM

for surgical flexibility. The six switches are active LOW and read by an input port on the ST10F168. When a switch is read as active by software, then the appropriate programmed user command is broadcast via CAN to the Host and other subsystems.

Force Feedback

The footswitch contains a DC motor arranged as a torque-generating device. As a torque-generating device, the motor is mounted firmly to the base of the footswitch and geared to the treadle shaft to apply reverse torque to the force applied by the user's foot. The motor is not the same between *Infiniti*™ and *Accurus®/Legacy®* footswitches, so it has to be driven slightly differently. The drive capability is selected based on footswitch revision detection. When the correct footswitch is detected, then the user's preferences are configured for the particular footswitch. Detent and stepped force in logical positions is accomplished using a constant current driver in the Footswitch Interface PCB. As the treadle travels through the logical positions and detent locations, the constant current driver sets up a torque profile based on position. If the user has selected vibration detent, then the vibration detent driver controls the motor during the detent period based on frequency and stiffness.

Spring Fail and Tilt Switches

There are two failure mode switches that force a treadle UP condition and therefore a "safe state" to the footswitch interface. Spring Fail and Tilt each cause the footswitch interface to see an UP condition. The spring fail switch is opened in the event of a treadle return spring failure. A spring failure would cause the treadle to drop and encoder counts to be realized with no user actually pressing on the treadle. A tilt condition also forces an UP because the footswitch is accidentally oriented and poses an unintentional functional hazard.

IV POLE MODULE THEORY

The IV Pole PCBA provides motor signals to drive the IV pole three phase brushless DC motor. The major output signals are output to the motor via J8. These signals consist of three phases which are output via the complementary MOSFET motor drivers. These drivers either source, sink, or tri-state the motor drive currents which energize the motor connected in a Y configuration. Motor rotation is controlled by the intensity of the modulated drive currents and their phasing.

The position of the motor rotor is determined by decoding the state of the three Hall Effect sensors that are housed in the motor. The sensor signals are open collector outputs which are applied to the motor controller.

The motor drive voltage is controlled by the setting of the +24 VDC to +15 VDC motor voltage converter. The converter output is set by a serial D/A converter. The converter input receives a control value from the MCU via the SSI bus. Useful motor control voltages may be set ranging from +14 VDC to +24 VDC.

Motor velocity is controlled by the VELV signal applied to the motor controller via the serial D/A converter. The D/A in turn is controlled by the MCU.

Dynamic braking is accomplished by controlling the phasing of the motor control signals when a brake signal is input to the motor controller. The motor controller tri-states the top PMOS drivers thus canceling the motor drive currents. At the same time, the motor controller effectively shorts the NMOS drivers thereby shorting the Y connected motor winding to ground. The dynamic brake controller then applies a steady state current to the phase C connection of the motor. This current locks the rotor with a force proportional to the amount of current applied.

A relay shorts the windings of the motor when the +24V1 is not applied. This has the effect of causing the motor to generate a back emf when it is driven by an external load such as two filled IV bottles. This results in a very slow downward motion which provides static braking of the IV pole mechanism.

The IV pole lead screw position is monitored by an absolute encoder. The encoder provides a PWM

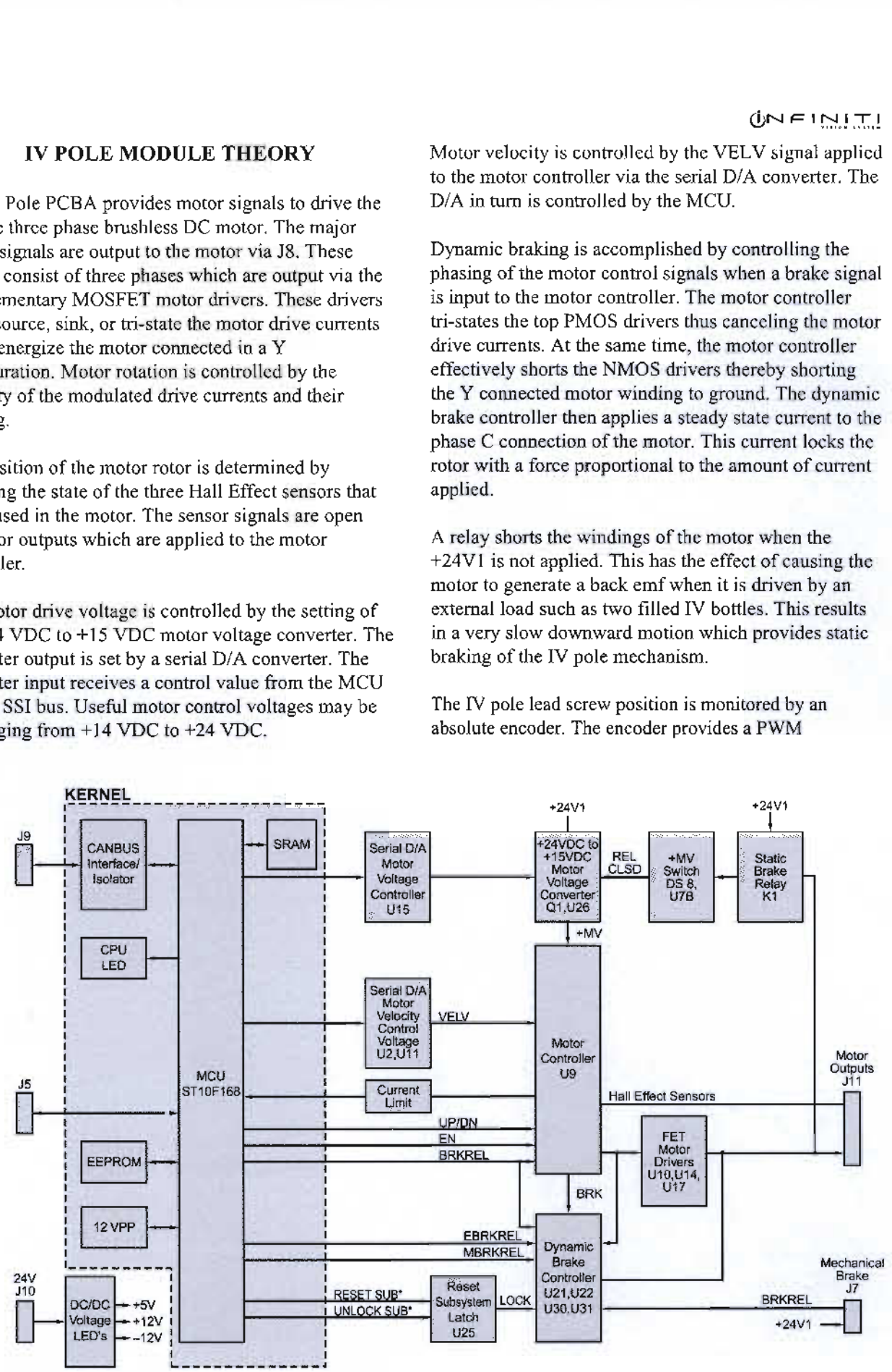


FIGURE 2-6 IV POLE MODULE BLOCK DIAGRAM

modulated signal whose width is 9.0 microseconds per inch of displacement. Since the IV pole mechanism will provide at least 30 inches of displacement, signal width maximum can be as high as 270 µS. The conversion from pulse width to displacement is accomplished by the MCU. The pwm displacement signal is updated at a 1 kHz rate.

Since the MCU has an indication of displacement, it can control the IV pole mechanism at any time. Velocity control is accomplished by sending current control and voltage control signals to the motor controller circuitry.

IV Pole Controller

The IV Pole Controller PCB consists of the following control circuits and monitor functions:

- ST10F168 MCU
- CAN-bus Interface
- Serial Bus Interface Connector
- Status LED's
- Power Inputs/DC-DC Converter
- Subsystem Configuration EEPROM
- Reset Subsystem/Unclock Subsystem
- +12VPP Programming Voltage
- Motor Controller & FET Motor Drivers
- Motor Voltage Converter
- Serial D/A Motor Voltage Controller Input
- Serial D/A Motor Velocity Controller Input
- Dynamic Brake Controller
- Static Brake Relay

ST Microcontroller U13

The 16-bit ST10F168 MCU interfaces to the Host through the Can-bus network and enables the processor control and monitor module functions. The microprocessor provides 111 I/O lines with individual bit addressability. On-chip peripheral subsystems are available such as 16-Channel 10-bit ADC, Two 16-Channel Capture/Compare Units, 4-Channel PWM, Serial channels, and CAN-bus interface.

Port 0:
- Port 0 is used for accessing external SRAM.

Port 1:
- Port 1 is used for accessing external SRAM.

Port 2:
- HSNR1: Hall effect sensor.
- HSNR1: Hall effect sensor.
- SIS: Status input signal for J7
  SIS =1, Connection
  SIS =0, No Connection
- PWM: TTL Pulse width modulated input from absolute encoder.

Port 3:
- HSNR1:Hall effect sensor input.
- RTOS_OUT: Timer 6 toggle output.
- PWM: Pulse width modulated signal input from absolute encoder.
- MISO: SPI master data input.
- MOSI: SPI master data output.
- TXD0: Transmit data to UART.
- RXD0: Receive data from UART.
- WRH*: Write high output.
- SCLK: SPI serial clock.
- CLK_OUT: System clock output.

Port 4:
- A16: External segment address line A16.
- A17: External segment address line A17.
- 12VPPSD_L: Disable +12VPP-programming voltage.
- UNLOCK_SUB*: Use to clear subsystem persistence reset from the reset output.
- LED_GRN: CPU's status LED.
- CAN_RxD: CAN receive data.
- CAN_TxD: CAN transmit data.
- LED_RED: CPU's status LED.

Port 5:
- /AN0 - +5V_OK: +5V bus voltage.
- /AN1 - +24V1_OK: Filtered and fused primary voltage bus value.
- /AN2 - +12V_OK: +12V bus voltage.
- /AN3 - +15V1_OK: +15V1 bus voltage.
- /AN4 - VELV: Zero to +5 volts control voltage applied to motor controller U21.
- /AN5 – VREF_OK: Motor controller output.

Port 6:
- /CS0 - SRAMCS*: Select external SRAM.

Port 7:
- /OUT1: Enables the motor controller U21.
  EN =1, enabled.
  EN=0, disabled.
- /OUT2: Sets motor controller direction bit, UP/DN.
  UP/DN =1, direction is up.
  UP/DN =0, direction is down.
- /OUT3: 100 KHz output clock.
- /OUT7: Releases dynamic and mechanical motor brakes.
  BRKREL=1, brakes released.
  BRKREL=0, dynamic and mechanical brakes engaged.

Port 8:
- SPI_CS0*: SPI chip select for Xicor SPI serial.
- SPI_CS1*: SPI chip select for the Maxim serial input.
- SPI_CS2*: SPI chip.

CAN-bus Interface
The MCU CAN interface uses two pins (CAN_TxD, CAN_RxD) to communicate with the host through CAN-bus transceiver U9 and connector J5. U7 is a 5.2 KV isolation DC-DC converter to provide +5 V isolation to CAN-bus J5-8 and the CAN-bus isolation network consisting of IC's U7, U8, U9, & U10. U8 and U10 are optical couplers which provide optical isolation up to 4.5 KV for CAN-bus networks.

Serial Channel Interface: J7
J7 is a 2 mm low profile 8-pin socket. It provides the signal connections for the bootstrap programming header which programs the start code into the internal RAM. It also provides RS232 TTL interface with the MCU UART.

Status LED's: DS1 to DS9
- DS1: Green = +5V ON
- DS2: Green = -12V ON
- DS3: Green = +12V ON
- DS4: Green = +24V1 ON
- DS5: CPU Status
  Green Illuminated = LED_GRN LOW
  Red Illuminated = LED_RED LOW
- DS6: Red = Current Fault
- DS7: Static Brake Relay
  Red = Relay Closed
  Green = Relay Open
- DS8: Enable Controller
  Green = Enabled
  Red = Disabled
- DS9: Brake
  Red = Brake ON
  Green = Brake OFF

Power Inputs/DC-DC Converter
Power input connector J2 is connected to +24V source. The DC-DC converter is mounted on top of the IV Pole PCBA. The DC-DC converter provides +5 V, +12.5 V and –12.25 V to the IV pole subsystem.

Subsystem Configuration EEPROM
U11 is an 8K x 8 serial EEPROM used for subsystem configuration. The EEPROM communicates with the MCU via the Serial Peripheral Interface (SPI).

Reset Subsystem/Unclock Subsystem
The MCU reset output (RESET_SUB*) is used to disable the driver electronics through flip-flop U12 and transistor inverter Q4. The UNLOCK_SUB* is controlled by software to clear the latched reset.

+12VPP Programming Voltage
+12V programming voltage is provided through the p-channel MOSFET when 12VPPSD_L High. The programming voltage is normally off when 12VPPSD_L Low.

Motor Controller and Driver: U21, U19, U20, U22, J8
The IV pole is driven by a three phase brushless DC motor. Motor driver controller U21 outputs the three phase signals required by the motor. The outputs are a function of the Hall effect sensor inputs received from the motor, and the condition of the EN, UP/DN, BRK, and VEL.V control signals. The output signals are amplified by N and P type MOS switches U19, U20, and U22. Connection is made to the motor via J8. J8-4 connects +5 VDC to the motor for the Hall effect sensors contained in the motor. The output drive signals are labeled PH_A, PH_B, and PH_C.These signals are push pull drive signals which either source or sink the motor drive currents. Only two phases are active at any one time. A third output is tri-stated.

Dynamic Brake
Dynamic braking is accomplished by pulling BRK signal U21 low. This opens the top side drivers and shorts the bottom drivers output from the motor controller. In addition the logic and switching functions of U23, U24, and U26 forces a tri-state output from U22 while applying a holding current to the PH_C motor input via U24B.

Static Brake: K1
Removal of +24V1 power to K1 causes K1 to revert to the normally closed position which shorts the windings of the motor. When this is done, the motor generates a back emf voltage when it is driven by an external load. This causes the motor to brake itself.

Mechanical Brake: U26A
A mechanical brake may be activated via J10 which provides +24V1 and a return. The can sink several hundred mils via NMOSFET U26A.

Motor Voltage Controller: U2, U3
Motor performance is a function of load and motor voltage applied. To accommodate the motor voltage requirements for optimum performance U2 and U3 function as the processor controlled DC-DC converter.

Motor Velocity Control: U15, U16
Motor velocity is controlled by the MCU via U15 and U16. U15 is a serial input D/A which provides a DC control voltage to the E+ input of motor controller U21.

FLUIDICS MODULE THEORY

General Overview
The *Infiniti*™ fluidics module provides the interface between the *Infiniti*™ console and the Fluidic Management System (FMS). The fluidics module must perform the following functions:
- Power up tests.
- Power conversion and control.
- Interface to the Aspiration Pressure Sensor (APS).
- Interface to the Irrigation Pressure Sensor (IPS).
- Interface to the aspiration pump.
- Interface to the FMS.
- Interface to vent/irrigation valves and FMS latching.

Power Up Tests
At power up the fluidics module does substantial testing which provides a high degree of confidence in proper operation. With the exception of IPS shunt and offset calibration, a failure of any of these items would render the fluidics module inoperable. These tests include:
- Vent and irrigation valve mechanical activation.
- Aspiration motor speed and direction.
- Latch motor current and position.
- APS shunt calibration and offset voltage.
- APS linear actuator home position.
- DC voltages including APS & IPS load cell bias voltages.
- IPS load cell shunt calibration and offset (only if FMS is removed & rails fully open).
- FMS ID sensors (only if FMS removed & rails open).
- RAM and FLASH memory test.

***Infiniti*™ Fluidics**
The fluidic system utilizes a peristaltic pump system with fluid venting. The fluidic system is completely islolated from contact with the console by the non-invasive Aspiration Pressure Sensor (APS).

As with the APS, the FMS also employs an Irrigation Pressure Sensor (IPS). At priming, when the aspiration and irrigation luer fittings are connected, this sensor is used as a means to confirm proper operation of the APS. It also provides the additional feature of real time measurement of actual irrigation pressure (for indication of low bottle warning) and a means by which to infer irrigation flow. The IPS is implemented by a simple flexible diaphragm which contacts a load cell.

Venting of the aspiration line is accomplished by shunting across the pump itself, rather than a fluid connection to the irrigation line. This has the advantage of minimizing venting pressure transients, as well as eliminating the irrigation check valve within the FMS. Venting is accomplished both by the vent valve as well as by pump reversal. The vent reservoir provides the feature of limited reflux capability, performed by pump reversal. This reservoir allows pump reversal without the inclusion of air into the aspiration line.

All of the FMS fluid channels are molded within the FMS body. The flexible elastomer cover provides the means of implementing the peristaltic pump along with the vent and irrigation valves, and the flexible diaphragm for the IPS. The elastomer cover is secured to the FMS body through grooved channels. This provides sealing as well as providing rigidity to the pump segment, and high fluidic pump performance.

Aspiration Pressure Sensor
The Aspiration Pressure Sensor (APS) consists of a stainless steel diaphragm on the FMS, and a load cell in the console. The APS functions by measuring the change in force applied to a load cell in response to a change in pressure in the aspiration line. When the FMS is inserted the load cell is advanced up to the surface of, and pressed against, the diaphragm.

The load cell is tested prior to pressing it up against the FMS diaphragm. This test is called shunt calibration, and confirms the electrical functionality of the load cell. Shunt calibration consists of establishing a signal offset and confirmation of load cell sensitivity. A signal is seen at TP5 during shunt calibration of the APS load cell.

The load cell is mounted to a linear translation stage, which in turn is driven by a stepper motor to control the position of the load cell. Knowledge of the load cell location is provided by a photo interrupter which gives the system a home state. Once the home state is known, then load cell position is known by software that counts the number of steps provided to the stepper motor. At power up the mechanical linkage of the translation stage is performed where the load cell is advanced, then returned to the home position.

At FMS insertion the software confirms the integrity of this mechanism by the force vs. load cell relationship which is measured when the load cell is pressed up against the FMS diaphagm.

Irrigation Pressure Sensor
The Irrigation Pressure Sensor (IPS) measures the pressure within the irrigation line. The IPS is up stream from the irrigation valve and thus measures and confirms the height of the irrigation bottle independent of irrigation valve position. It functions by measuring the force applied with a flexible diaphragm on the surface of a plunger. Unlike the APS which measures

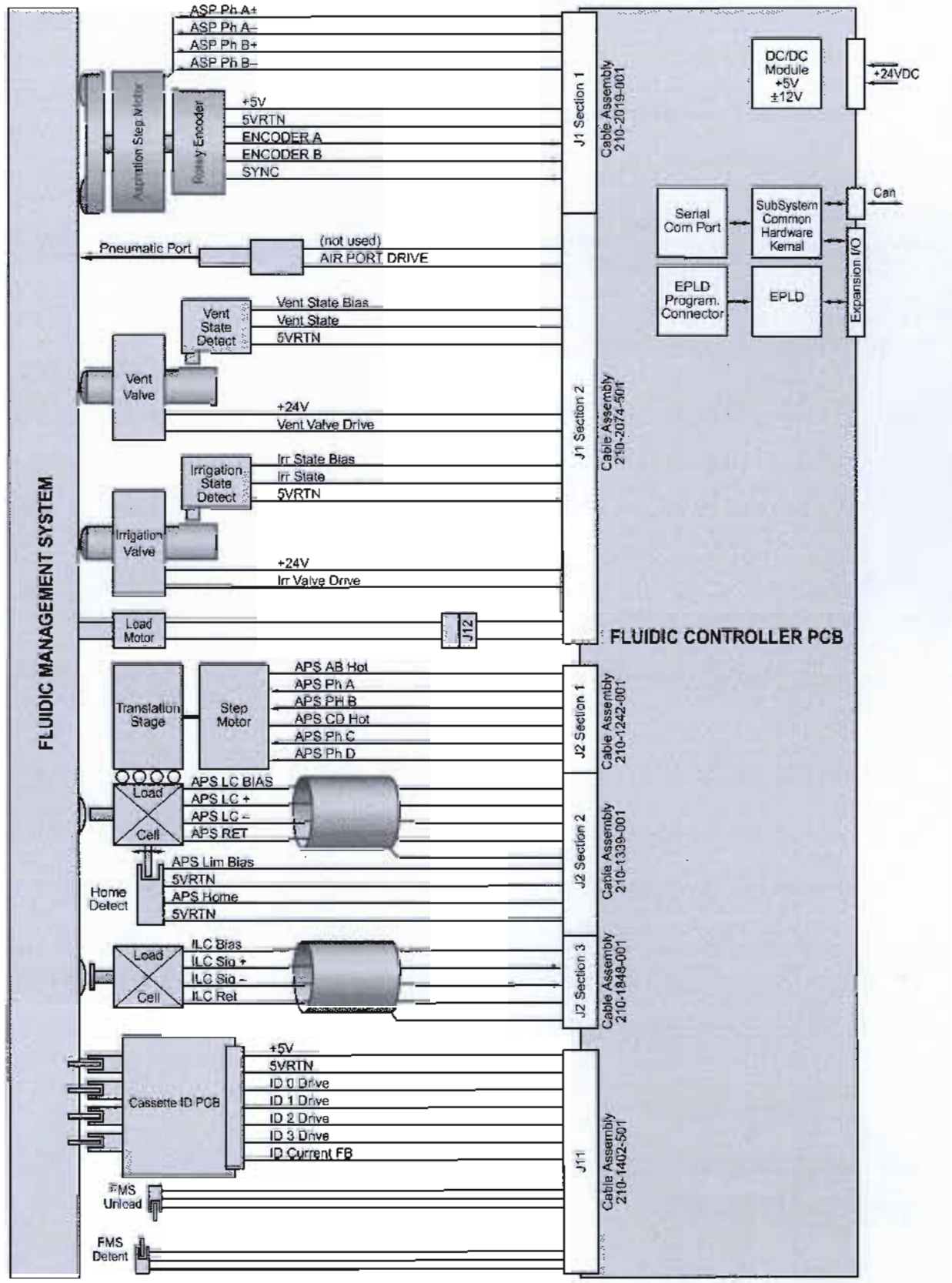


FIGURE 2-7 FLUIDICS MODULE BLOCK DIAGRAM

both pressure and vacuum, the IPS can only measure pressure. Like the APS, the IPS has a shunt calibration process which confirms proper operation of the load cell.

Aspiration Motor Control Circuitry

The aspiration pump motor is a two phase stepper motor which is driven as a synchronous AC motor. The *Infiniti*™ ASP motor is driven with a microstep controller which approximates sinusoidal phase winding current. With a microstep drive, each positive and negative portion of the motor current cycle is divided into smaller increments, and follows a sinusoidal profile, from zero to its peak positive value and back through zero, then to its peak negative value and then back to zero. The motor increments one level for each rising edge of the ASP_STEP signal. The reference signals are available at TP2 and TP3.

U30 is also programmed to implement the logic for closed loop current control. This control mechanism ensures that the motor phase winding current tracks the reference signals (TP2 & TP3). Actual current magnitude is compared to the reference by two phase current comparators (U3 A & B). U30 reacts to the current feedback signal present at TP7 & TP8 and controls the current direction, either positive or negative, via logic signals PH_A1, PH_A2, & PH_B1, PH_B2.

U30 is also responsible for generation of two synchronizing signals {zero} and {peak} which are used to control the direction of the motor current in each phase as through a full bridge drive circuit. Since the motor must be able to operate in both directions (during venting as well as linear vacuum modes), the proper motor phasing must be generated to provide forward and reverse motor directions in response to the {dir_in} signal.

Absolute feedback of motor position and direction is provided by three encoder signals. The motor position encoder is mounted to the back of the ASP motor and is keyed to the hub roller. U30 also has the function of decoding the ENC_0 ENC_1 and Index signals such that the microcontroller can determine absolute hub roller position. These signals are also used to ensure that the motor is moving in the proper direction.

FMS Interface Circuitry

This circuitry provides the interface to the Fluidics Management System. The key feature this circuitry provides is an indication of the FMS type. Each FMS type has a unique type encoded into the presence or absence of 4 reflective tabs located at the top of the FMS. When present these tabs are designed to deflect the light of a photo transistor.

At power up (if the FMS is removed from the system) these photo transistors are tested and calibrated. The four pulses shows the individual calibration and testing of each of the four photo transistors. The micro controller iterates the duty cycle of the ID_DRIVE signal until the current feedback signal is present at TP24.

FMS detent and unload signals are created by photo-interrupters located at the top of the mechanism. They inform the micro-controller when the FMS has been inserted and when to eject.

Valve & FMS Latch Circuitry

The vent and irrigation valves are created by the force applied by associated solenoids. To overcome the initial high starting force due to return spring tension when initially activated, the solenoid is driven with 100% duty cycle. After this period of time the solenoids are driven at 50% duty cycle to help keep the devices running cool.

FMS loading is accomplished by rotation of the side rails into a locked position. The rail motion is provided by a DC motor which must operate in both directions to load and unload the FMS. Motor winding current is fed back to the micro-controller so that motor speed and current limiting can be employed. The micro-controller controls motor speed by a PWM signal applied to H-bridge driver U28. The latched position occurs when the drive wheel reaches an "over-center" position. The DC motor rotates the drive wheel which has two spring-loaded arms attached to the drive wheel. These springs rotate past the "over center" position, at which time the motor is slowed down by the microcontroller to prevent driving the motor into a hard stop.

In the event of a power failure it is a requirement to be able to manually release the FMS from the system. Whenever the 24 V power is not present, relay K1 is open which electrically disconnects the load motor from the drive electronics. This enables "back-driving" the motor and facilitates manual FMS release.

The fluidics module safe state condition is defined as vent valve open, irrigation valve closed, and aspiration motor off. The logic for this safe state condition is programmed as a function of U30, and is latched by a low transition of the RESET_SUB* signal. The safe state condition is removed by the micro-controller with a low level on the UNLOCK_SUB* signal. The SAFE_STATE* logic level signal is used to control the switched 24 V power (24VSW). The 24VSW power is used to drive the vent and irrigation solenoids as well as the aspiration motor. When power is off to these devices, the safe state is achieved.

PNEUMATICS MODULE THEORY

Functional Description
The *Infiniti*™ pneumatic system includes the air source, air dryer/filters, and pneumatic manifold assembly. The Pneumatic Controller PCB monitors feedback signals and provides overall control of the air source, solenoids, and pressure transducers to drive the *Infiniti*™ Vit cutter and to provide pressure to the *AquaLase*® subsystem.

Air Source
When commanded from the Pneumatic Controller PCB, the air source provides 100 PSI continuous pressure through an ambient air dryer, filter, and check valve to the manifold assembly. The pressure is further reduced on the manifold through relief valve RV1 prior to filling the manifold accumulator. This pressure is used to drive the Vit cutter or *AquaLase*® subsystem. The air pump is controlled by the Pneumatic Controller PCB through signal PUMPWM* low, which is inverted by MOSFET driver U20 to enable Q4, and sent to the air pump through connector J11. The pump feedback current is converted to voltage by resistor R61, and buffered by U24 prior to reaching the microprocessor.

Manifold Assembly
The manifold provides a platform for mounting various solenoids, fittings, pressure sensors, and relief valves. The subsystem generates and monitors air accumulator pressure, provides a continuous air supply to the *AquaLase*® subsystem, and is responsible for driving the Vit handpiece.

In *AquaLase*® setup mode the pneumatics provides continuous pressure by enabling *AquaLase*® valve SV4. Footswitch control is not available in this mode. In *AquaLase*® step mode the pneumatics provides controlled pressure in footpedal positions 0 and 1, and provides continuous pressure in footpedal positions 2 and 3.

In VIT IAC step mode the pneumatics provides controlled pressure in footpedal positions 0, 1, and 2, and provides continuous pressure that enables Vit Valve SV3 for handpiece cutting. In VIT ICA step mode, the pneumatics provides controlled pressure in footpedal positions 0 and 1, and disables the cutting Vit valve. If the footpedal is in range 2 or 3, the mechanism provides continuous pressure, and enables the cutting VIT valve.

The Pneumatic Controller PCB, mounted on the opposite side of the acrylic manifold, controls various pneumatic functions. The PCB is designed around a ST Thompson 16-bit microcontroller with 256 KB flash memory and 8 KB RAM. It operates at an oscillator rate of 20 MHz, resulting in an execution state time of 100 nS. This kernel configuration is the same on all modules in the *Infiniti*™ Vision System.

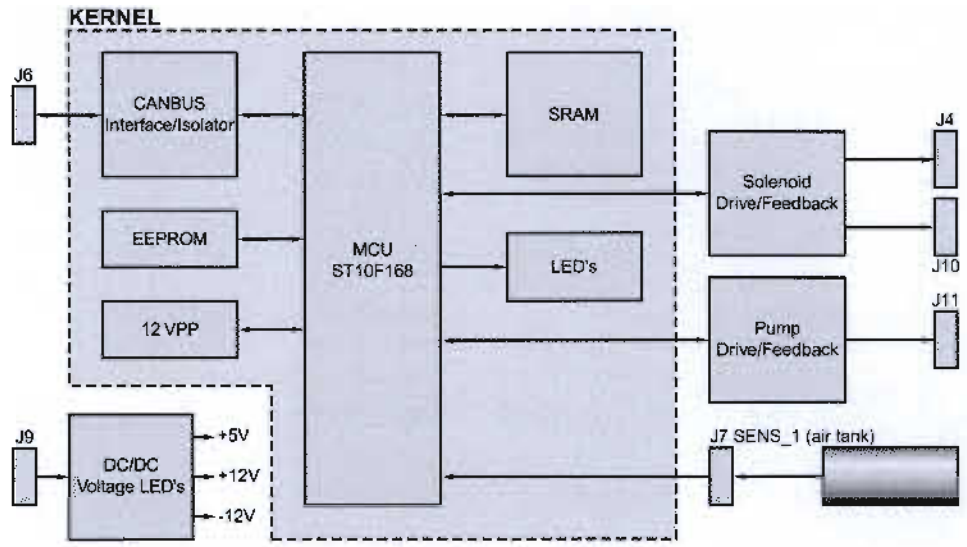


FIGURE 2-8 PNEUMATICS MODULE BLOCK DIAGRAM

The Pneumatic Controller PCB monitors and controls the following functions:
- Microcontroller (MCU) Inputs/Outputs
- CANBUS Interface
- Serial Bus Interface Connector
- Pump/Solenoid Control/Feedback & Status LED's
- Pressure Transducer Interface
- Power Inputs/DC-DC Converter
- Subsystem Configuration EEPROM
- Reset Subsystem/Unclock Subsystem
- +12 Vpp Programming Voltage

Microcontroller Inputs/Outputs
A 16-bit ST10F168 MCU interfaces to the *Infiniti*™ host through a CANBUS network. The microprocessor provides 111 I/O lines with individual bit addressability.

Port 0:
- Accessing external SRAM.

Port 1:
- Accessing external SRAM.

Port 2:
- ACCLSD_H: Releases accumulator pressure to atmosphere when power off.
- PUMPVNT_H: Directs air source to accumulator when enabled.
- VITCTRL_H: Enables the 35 PSI relief valve for general purpose pneumatic functions.
- AQUA_H: Enables the *AquaLase*® port.
- HP1_H: General purpose (HP1) pressure valve.
- HP2_H: General purpose (HP2) pressure valve.
- VNT1_H: General purpose (VNT1) vent valve.
- VNT2_H: General purpose (VNT2) vent valve.

Port 3:
- RTOS_OUT: Timer 6 toggle output. Used as common subsystem hardware output.
- MISO: SPI master data input. Used to read the serial 65 K-bit (8K x 8) EEPROM.
- MOSI: SPI master data output. Used to write the serial 65 K-bit (8K x 8) EEPROM.
- TXD0: Transmit serial data to UART.
- RXD0: Receive serial data from UART.
- WRH*: Write high output.
- SCLK: SPI serial clock.
- CLK_OUT: System clock output. Used as common subsystem hardware output.

Port 4:
- A16: External segment address line A16.
- A17: External segment address line A17.

- 12VPPSD_L: Disable +12VPP-programming voltage.
- UNLOCK_SUB*: The unlock subsystem when asserted enables subsystem safety critical hardware ;i.e., the pump. When set high the output puts the subsystem in the safe state. The Unlock command pin is configured as push-pull output. Active low signal, default is high.
- LED_GRN: CPU's status LED (0 = status LED green ON).
- CAN_RxD: CAN receive data.
- CAN_TxD: CAN transmit data.
- LED_RED: CPU's status LED (0 = status LED red ON).

Port 5:
- ACCLSD_FB: Air tank closed valve feedback voltage.
  .7V = indicate valve On, 30 mA ON current through 22.1 Ω.
- PUMPVNT_FB: Pump vent feedback voltage.
  0.4V - 0.8V = indicate valve On, 167 mA max ON current through 5 Ω resistor.
- VITCTRL_FB: 35 PSI relief valve feedback voltage.
  0.4V - 0.8V = indicate valve On, 167 mA max ON current through 5 Ω resistor.
- AQUA_FB: *AquaLase*® valve feedback voltage.
  0.7V = *AquaLase*® valve On, 30 mA ON current through 22.1 Ω.
- VITPWM_FB: Accurus VIT handpiece feedback voltage. Duty cycles vary by cut rate.
  0.4V - 0.8V = VIT HP pulse width modulation On, 167 mA max ON current through 5 Ω resistor when solenoid open.
- MOT_FB: Pump On feedback voltage.
  >0.3V = indicate pump On.
- +12V_OK: 12 V status.
  2.9V = +12V OK.
- +24V_OK: 24 V status.
  2.9V = +12V OK.
- SENS_ACCUM: Air accumulator tank pressure transducer output voltage.

Port 6:
- SRAMCS1*: Select external SRAM.

Port 7:
- PUMP_PWM: Enables/disables the DC pump.
- VIT_PWM*: Enables/disables the PWM output to drive the VIT solenoid.

KERNEL

CANBUS Interface (J6, U11, U12, U7, U15):
The CAN interface uses two pins (CAN_TxD, CAN_RxD) to communicate with the host through the CANBUS transceiver U11, connector J6. U12 provides 5.2 KV isolation for +5VISO output to CANBUS connector J6. U7 and U15 are used as optical isolators up for the CANBUS network.

Serial Channel Interface (J5):
The bootstrap programming header shorts EA* and D4 to ground to enable programming the start code into the internal RAM of microcontroller U13. The serial channel also provides RS232 to TTL interface with the microcontroller UART.

Pump/Solenoid Control/Feedback and Status LED's:
Pump Driver and Status consists of U20, Q4, CR9, CR7, R61, F1, L2, C56, C54, CR15, CR16, U24, & J11. The air source pressure pump is software enabled through port 7.1. U20 provides high speed and current to drive the pump MOSFET Q4. The +24 V supply to the pump is fused and transient protected by fuse F1, and diodes CR7 & CR9. A LC filter provides filtering L2, C56, & C54. Pump feedback current is converted to voltage through R61 and buffer U24A.

The microcontroller controls pneumatic valves SV1, SV3, SV4, & SV10, and monitors valve feedbacks J4 & J10. Status LED's are provided on board. DC voltage (+24 V, +12 V) feedbacks are provided through resistor divider R1, R2, R45, R46, & R44.

Pressure Transducer Interface (J7, U10):
A pressure transducer to monitor the accumulator is mounted directly on the manifold through quick connect/disconnect fittings (SEN_1). The accumulator pressure output from the transducer (1.65 V = 60 PSI) is connected to J7 and amplified by U10 to provide two times (x2) amplification through 49.9 K gain resistor R22. –1 V offset nulling is applied to U10-5 Vref input in order to maintain pressure transducer 1 V at 0 PSI at the output of amplifier U10.

Power Inputs/DC-DC Converter (J9):
Power input connector J9 is connected to +24 V source from Power Distribution PCB. The DC-DC Converter PCB is mounted on top of the Pneumatic Controller PCB. The DC-DC Converter provides +5 V, +12.5 V, and –12.5 V to the subsystem PCB.

Subsystem Configuration EEPROM (U5):
U5 is a serial EEPROM (8K x 8) used for subsystem configuration. The EEPROM communicates with the MCU via Serial Peripheral Interface (SPI).

Reset Subsystem/Unlock Subsystem (U8, U13):
In the event of hardware/software error, the MCU reset output (RESET_SUB*) is used to disable the pump through flip-flop U8 and NAND gate U13. To resume pump activity from the reset, the UNLOCK_SUB* enable low is fed to flip-flop U8 D input to enable NAND gate U13.

+12VPP Programming Voltage:
+12V programming voltage is provided through the Q2 p-channel MOSFET when 12VPPSD_L High. The programming voltage is normally off when 12VPPSD_L Low.

U/S MODULE THEORY

Phaco/Coag Subsystem

The Phaco/Coag subsystem consists of six assemblies:
- Phaco/Cautery Controller PCB (1).
- Phaco/*NeoSoniX*® Cable (2).
- Cautery Cable (1).
- CAN Communication Cable (1).
- 24 V Power Supply Cable (1).

The Phaco/Cautery Controller PCB contains three major circuits:
- Phaco circuit which drives Phaco and *NeoSoniX*® handpieces.
- *NeoSoniX*® circuit which drives *NeoSoniX*® handpiece.
- Cautery circuit which drives electrosurgical probes.

SPI Bus
The SPI bus is used to communicate with the following peripherals:
- Serial EEPROM on the PCB (U10).
- Serial EEPROM embedded in each handpiece.
- Numerically Controlled Oscillator (NCO, U13).
- Current DAC (U40).
- Programmable Logic Device (PLD, U12).

Numerically Controlled Oscillator (NCO)
The NCO is used to generate the desired handpiece tune frequency (35 Khz-41 KHz), handpiece drive frequency (≈38 KHz) and cautery frequency (1.5 MHz).

Programmable DC-DC Power Supply
This circuit generates the desired supply voltage for driving the phaco handpiece and cautery probes. DC to DC takes 24 VDC as an input and generates output voltages between 1 VDC through 20 VDC.

Phaco Switching Amplifier (AMP)
The phaco switching power amplifier can provide up to 35 watts of power over a frequency range of 35 to 42 kHz. The amplifier consists of a programmable DC-DC converter described earlier, analog power switch (Q7, Q10), power transformer (T1), and two power MOSFET's (Q3, Q4). The DC-DC output is connected to the center tap of the power transformer through the analog power switch. The remaining two inputs of the power transformer are alternately pulled to ground by the power MOSFET. The output of transformer T1 is converted to a sine wave through a low pass filter network.

Cautery Switching Amplifier
The cautery switching power amplifier can provide up to 10 watts of power at 1.5 MHz. The amplifier consists of a programmable DC-DC converter described earlier, analog power switch (Q11, Q12), power transformer (T5), and two power MOSFET's (Q5, Q6). The DC-DC output is connected to the center tap of the power transformer through the analog power switch. The remaining two inputs of the power transformer are alternately pulled to ground by the power MOSFET. The T5 output is converted to a sine wave through a band pass filter network.

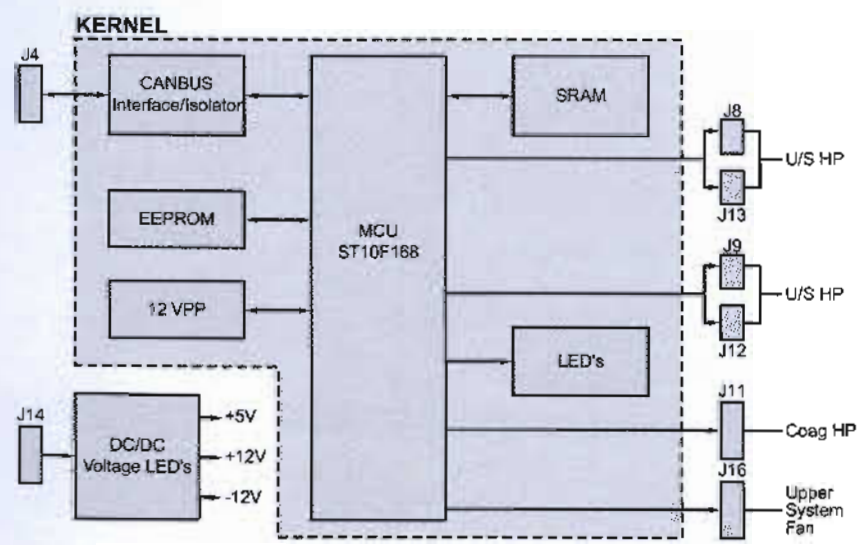


FIGURE 2-9 PHACO/COAG SUBSYSTEM KERNEL

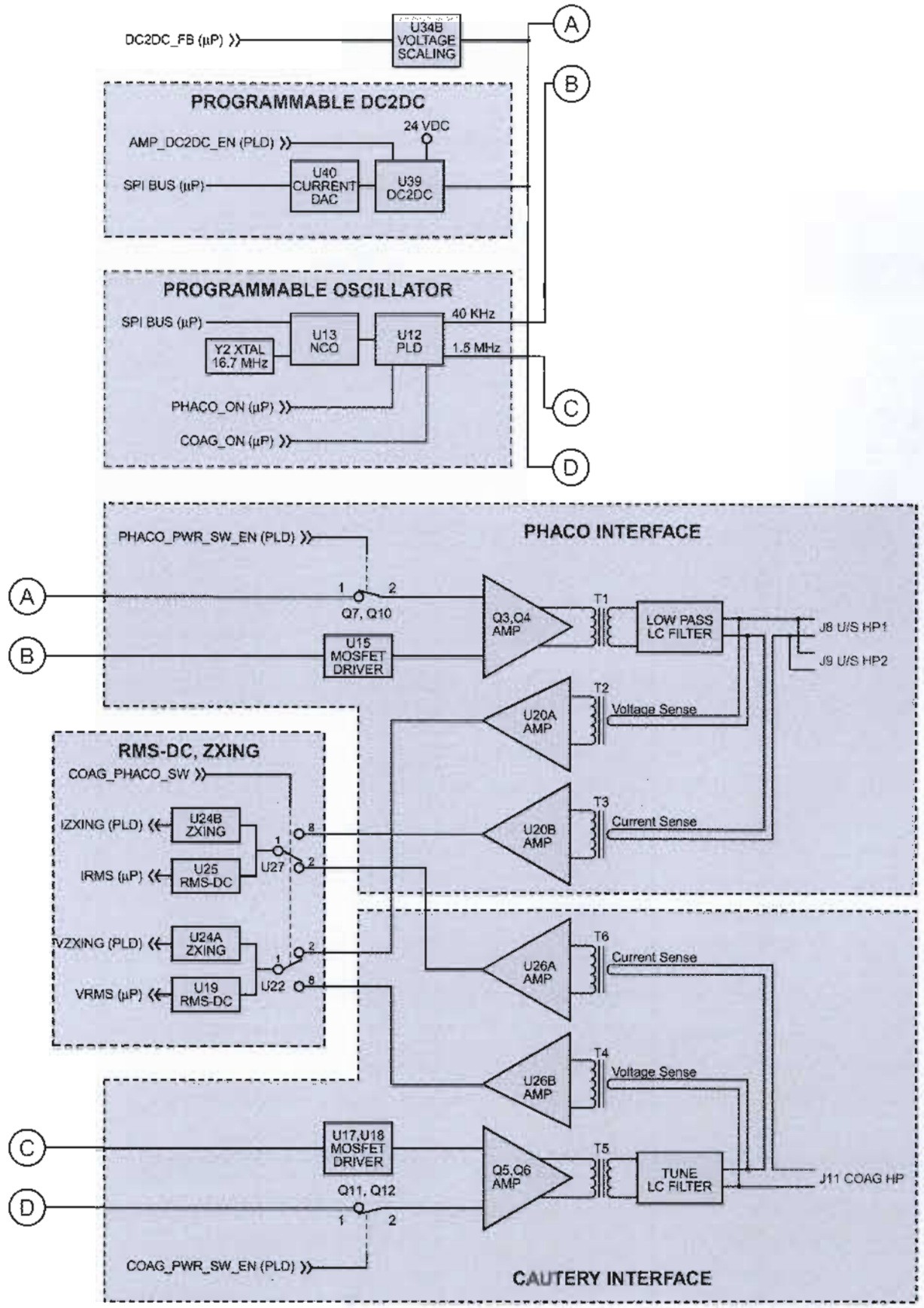


FIGURE 2-10 PHACO/COAG SUBSYSTEM BLOCK DIAGRAM

Phaco Driver
The phaco driver contains all electrical circuits necessary to drive a variety of ultrasonic handpieces. Handpiece voltage adjustment occurs through the programmable DC-DC described earlier. Two interdependent control loops (power and frequency) are used to control the stroke of the ultrasonic handpiece. The power control loop monitors and maintains the appropriate handpiece drive power. The frequency control loop maintains continuous tuning of the handpiece to compensate for handpiece loading and drift. The phaco driver contains the circuitry to create the sinusoidal drive voltage and frequency with analog feedback to close the loop. The phaco driver digitizes and processes this feedback to provide a continuous tracking of both digital control loops. The phaco driver also contains various circuitries to detect fault conditions and to disable power output. The Phaco/ Cautery Driver PCB then communicates this fault to the Host.

Phaco Voltage and Current Feedback
As previously stated, the phaco subsystem utilizes two interdependent control loops for maintaining real time tuning of the handpiece. The information necessary for these control loops is contained within the handpiece.

Handpiece voltage feedback is measured on the secondary of power transformer T1, and is related to the actual handpiece voltage by the turns ratio of current transformer T2. This voltage is scaled to appropriate levels by scaling amplifier U20A. The scaled AC handpiece voltage is then passed to RMS/DC converter U19, which converts the RMS value of the AC voltage to an equivalent DC level.

Handpiece current feedback is measured on the secondary of power transformer T1, and is related to the actual handpiece current by the turns ratio of current transformer T3. This current is scaled to appropriate levels by scaling amplifier U20B. The scaled AC handpiece current is then passed to RMS/DC converter U25, which converts the RMS value of the AC voltage to an equivalent DC level.

Cautery Driver
The cautery driver is a proportional bipolar high frequency coagulator. It contains all of the electrical circuits necessary to supply energy to electrosurgical cautery probes for the purpose of coagulating vessels and other soft tissues. Probe voltage adjustment occurs through programmable DC-DC described earlier. A power control loop is used to control the power delivered to the probe. The power control loop monitors and maintains the appropriate probe drive power. The cautery driver contains the circuitry to create 1.5 MHz sinusoidal drive voltage and frequency with analog feedback to close the loop. The cautery driver digitizes and processes this feedback to provide a continuous tracking digital control loop. The cautery driver also contains various circuitries to detect fault conditions and to disable power output. The Phaco/Cautery Controller PCB then communicates this fault to the Host.

Cautery Voltage and Current Feedback
As previously stated, the cautery subsystem utilizes a power control loop to control the power delivered to the probe.

Probe voltage feedback is measured on the secondary of power transformer T5, and is related to the actual handpiece voltage by the turns ratio of transformer T4. This voltage is scaled to appropriate levels by scaling amplifier U26B. The scaled AC probe voltage is then passed to RMS/DC converter U19, which converts the RMS value of the AC voltage to an equivalent DC level.

Probe current feedback is measured on the secondary of power transformer T5, and is related to the actual handpiece current by the turn ratio of transformer T6. This current is scaled to appropriate levels by scaling amplifier U26A. The scaled AC handpiece current is then passed to RMS/DC converter U25, which converts the RMS value of the AC voltage to an equivalent DC level.

***NeoSoniX*® Driver**
The *NeoSoniX*® driver circuit consists of an electrically isolated 18 VDC supply voltage, H-bridge motor driver, two PWM signals, and two optical isolators.

High efficiency switching regulator U42, along with transformer T7 is used to convert 24 VDC to an isolated 18 VDC. Motorola H-bridge driver U21 is used to drive both phases of the motor. PWM1 (100 Hz, 50% duty cycle) is used to control back-and-forth oscillation of the motor. PWM2 (1600 Hz, 100% duty cycle) is used to control the oscillation amplitude. Both PWM signals are generated by the CPU. PWM signals are supplied to the H-bridge motor driver through optical isolators U34 & U37.

***NeoSoniX*® Feedback**
The *NeoSoniX*® driver applies power to the motor in open loop fashion.

SECTION THREE
PARTS LOCATION & DISASSEMBLY

Sub-Assembly Locations
The major sub-assemblies contained inside the *Infiniti*™ console are identified in Figure 3-1. To access the sub-assemblies, the console panels must be removed from the frame.

Removal of Panels from *Infiniti*™ Console
These instructions are written to help you safely remove the panels from the *Infiniti*™ frame. The panels must be removed in the order listed, from Figure 3-3 through Figure 3-5. With the panels removed, access to sub-assemblies is possible. Figure 3-2 identifies the types of fasteners securing the panels to the frame, and Figures 3-3 through 3-5 identify where the fasteners are located. These figures show fasteners on the right side of the console; fasteners on the left side are identical.

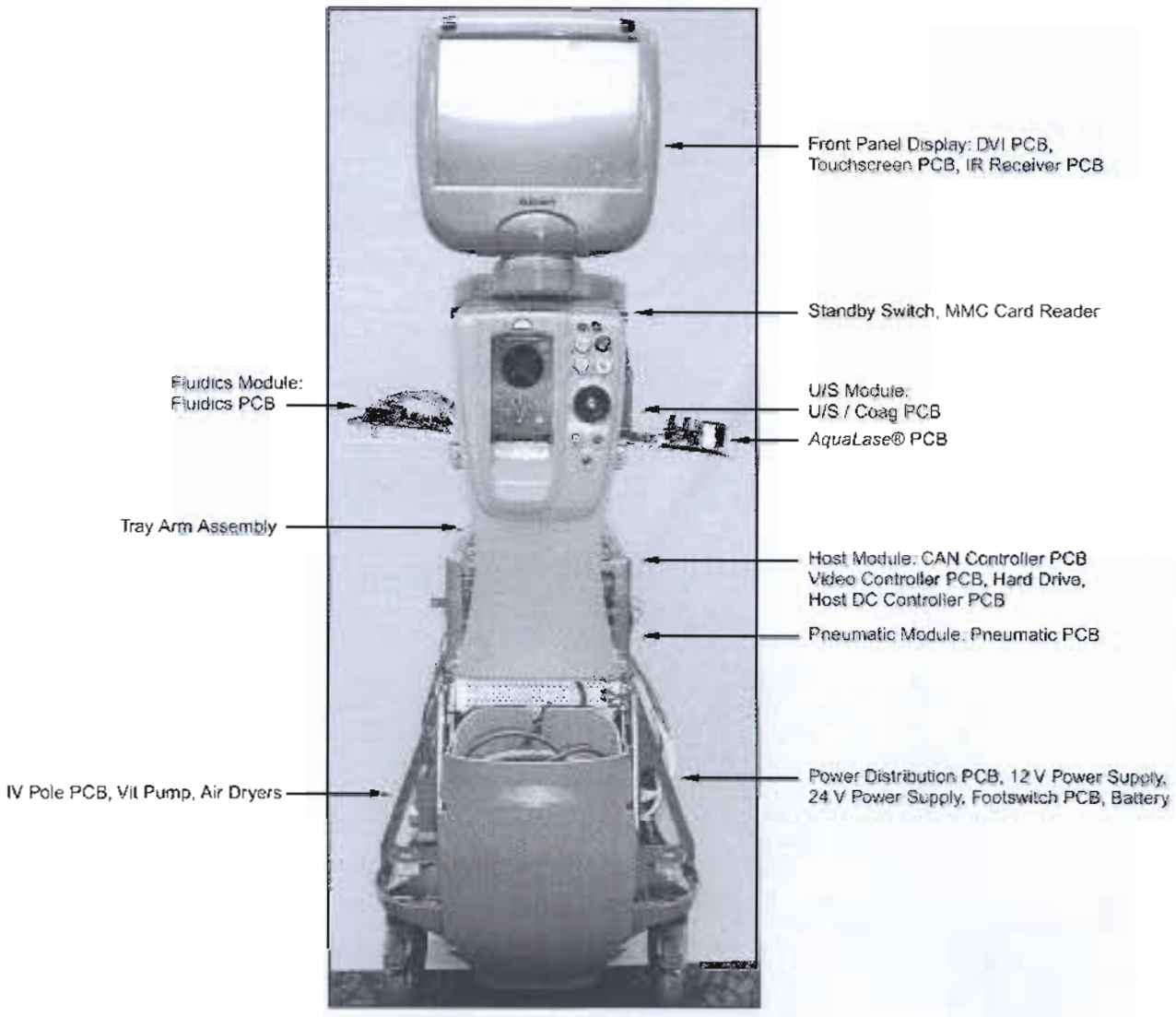


Figure 3-1 Sub-Assemblies Inside the *Infiniti*™ Console

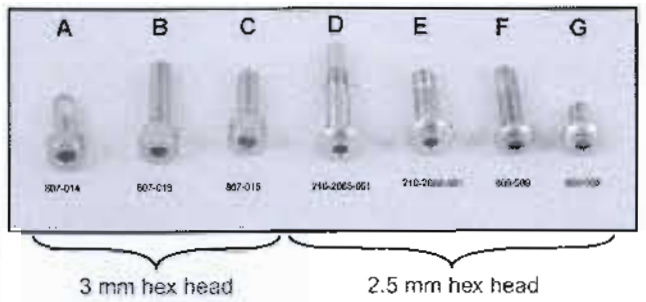


Figure 3-2. Fasteners Used to Secure Panels to the *Infiniti*™ Frame

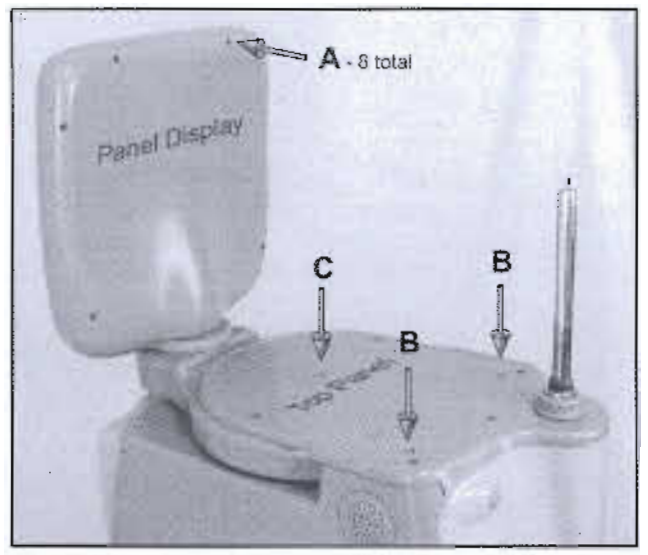


Figure 3-3. Fastener Locations for Top Panel and Panel Display (rubber mat removed from top to expose fasteners). The Top Panel must be removed before the Upper Side Panel can be removed in Figure 3-4.

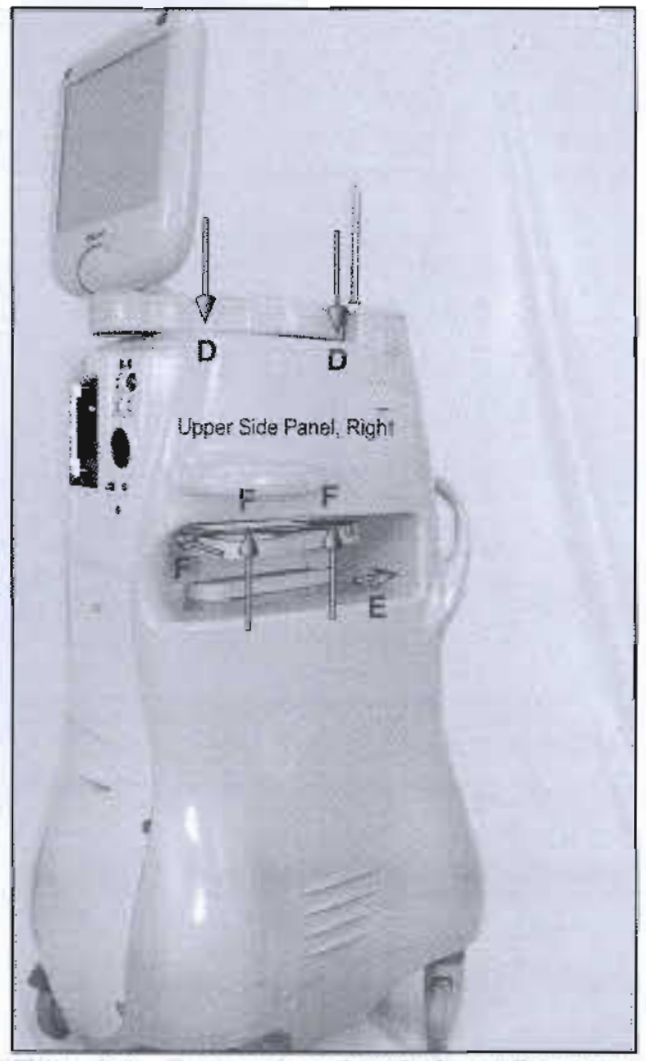


Figure 3-4. Fastener Locations for Upper Side Panel. This panel must be removed before the Lower Side Panel can be removed.

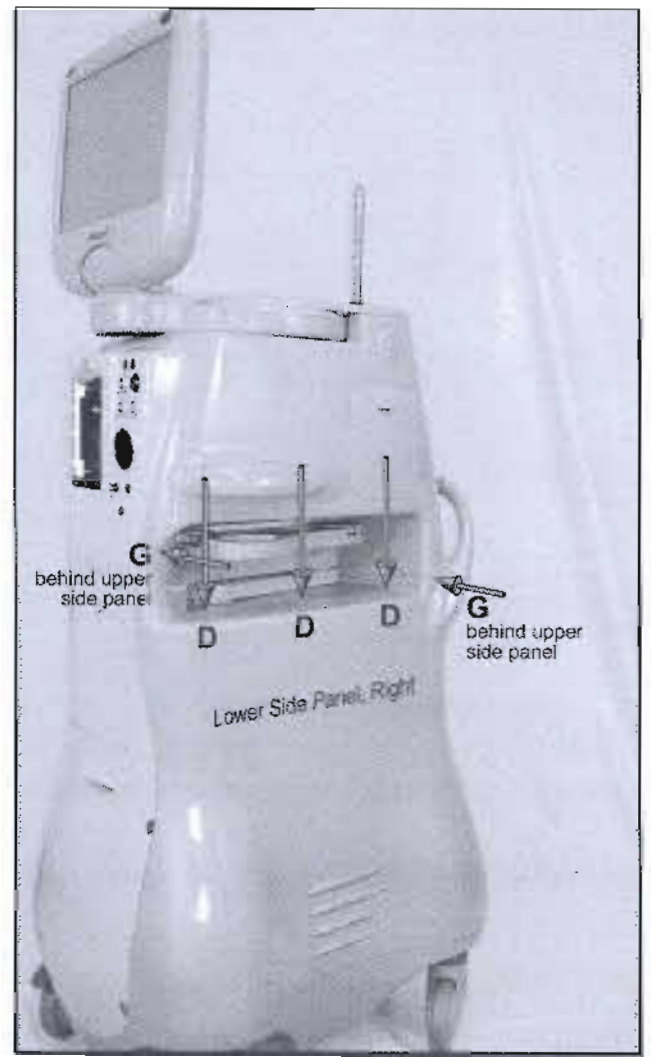


Figure 3-5. Fastener Locations for Lower Side Panel.

SECTION FOUR
MAINTENANCE & TROUBLESHOOTING

GENERAL INFORMATION

This section of the manual contains information to assist the Field Engineer in maintenance, troubleshooting, and repair of the *Infiniti*™ Vision System.

SERVICE TEST PROCEDURE

Each time a field engineer works on a system it is required that system checkout is performed. The checkout is performed by following instructions written in the Service Test Procedure (STP), then returning its associated checklist to the local service support center for filing.

The STP is an independent document, and can be ordered from the local service support center by using part number SOP-0637.

Description	Part Number	Quantity
Standard Tools		
PS2 keyboard		1
PCMCIA 4 in 1 card reader		1
MMC card - 64MB (minimum – must be formatted)		1
T-handle 2.0, 2,5, 3.0, 4.0 mm		Set
Metric allen ball 1.5 - 5.0mm		Set
Flat screwdriver		2
Phillips screwdriver		2
Metric socket set 1.5 – 10mm		Set
Standard service tool kit:		
• Allen's static protection wrist strap, hemostat, screwdrivers		
• Oscilloscope or DVM		
• Vacuum/Pressure meter		
Special Tools		
Test FMS fixture	995-2100-044	1
FS, socket, HP connector	995-2100-106	1
AquaLase® load box	210-2229-501	1
AquaLase® adapter assembly	210-2287-001	1
NeoSoniX® load box adapter cable	210-2052-501	1
Cautery load box	200-2199-501	1
Cable, interface, DVI 3 meter BK (W26)	020-136	1
Check valve	316-2284-001	4
Cable, RG59, BNC/BNC 6	023-042	1
BNC/Phone plug	066-014	1
(http://www.pomonaelectronics.com) model 1297		
Caster wrench	210-2173-001	1
Test Supplies		
Infiniti™ phaco pak (FMS only)	8065741080	Box of 6
Infiniti™ phaco pak (small parts kit, 0.9 mm tip)	8065741081	Box of 6
Infiniti™ *AquaLase*® pak (tip, *AquaLase*® bottle)	0065079614	Box of 6
Infiniti™ marketing brochure	INF4382	1

TABLE 4-1 RECOMMENDED TOOLS AND TEST SUPPLIES

Description	Part Number	Quantity
Recommended Spare Parts		
Assy, PCB,Fluidics Control	210-1023-501	1
Assy, PCB, Cassette ID	210-1193-501	1
Assy, PCB, U/S Controller	210-1025-501	1
Assy, Cable, U/S Handpiece	210-1827-501	1
Assy, PCB, Receptacle, *AquaLase*®	210-1850-501	1
Assy, PCB, Controller, *AquaLase*®	210-1033-502	1
PCBA, Interface, DVI	210-1278-001	1
PCB Assy, PCI CANBUS, 2CH	276-299	1
PCBA, Controller,PCI Video	210-1395-001	1
Assy, PCB, Host Power	210-1160-501	1
Assy, PCB, DC-DC Converter	210-1201-501	1
Assy, PCB, Comm Distribution	210-1392-501	1
Assy, PCB, Power Distribution	210-1328-502	1
Assy, Cable, DC PWR Fluid	210-1447-502	1
Assy, Cable, CAN W16/W17/	210-1448-502	1
Cable, Footswitch, *Infiniti*™	8065750214	1
Tubing, PEU, .062X.125 YE	043-014	1
Tubing, PEU, .062X.125 GR	043-015	1
Cable, Interface, DVI 3 meter	020-136	1
Assy, Cable, XDCR Sensor1 W74	210-1246-501	1
Male CPC Connector	202-1333-002	2
Reader, Card, Digital MMC	276-309	1
Fasteners, Panel, set of 20	210-2248-001	1
Additional Spare Parts		
Assy, CPU, Host	210-1036-501FS	1
Assy, Power Supply, 24V	210-2163-501FS	1
Assy, Power Supply, 12V	210-2164-501FS	1
Assy, Fluidics Mechanism	210-1022-501FS	1
Assy, Manifold	210-1236-501FS	1
Assy, Air Source	210-1047-501FS	1
Assy, Display, Arm (with cable, without display)	210-2272-501FS	1
Assy, Tray, Arm	210-1104-501FS	1

TABLE 4-2 SPARE PARTS

MAINTENANCE PROCEDURES

1. Replace Main Power Fuse

1.1 Turn the Main power switch OFF. It is located at the bottom of the rear panel, in the power module, above the power cord. Disconnect power cord from power source.

1.2 Insert a flat instrument (small screw driver) into opening below the fuse drawer.

1.3 Push instrument up until tab releases fuse drawer.

CAUTION

The tab must be pressed carefully to ensure it does not break.

1.4 Grasp fuse drawer and slide it out of power module (see Figure 4-1).

1.5 Gently remove and replace fuses.

1.6 Slide fuse drawer into power module; a snap is heard when it is secured inside power module.

1.7 Connect power cord to power source.

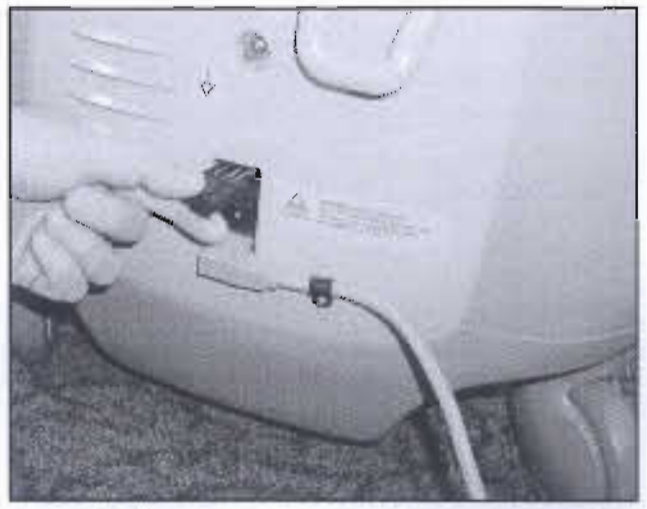


Figure 4-1 Remove fuse drawer from power module.

2. Replace CPC Connector

2.1 Place a 2 mm hex head wrench in the center of the connector and turn counterclockwise until connector separates from front panel.

2.2 Line up notch in new CPC connector with key post in front panel (see Figure 4-2).

2.3 Place 2 mm hex head wrench in center of new CPC connector and turn clockwise until secure. Be sure notch is lined up with key post while tightening.

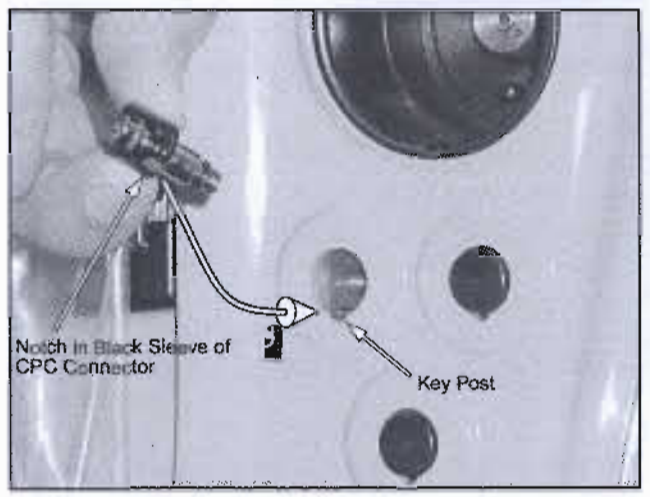


Figure 4-2 Replacing CPC Connector.

3. Replace 12 Volt Lead-Acid Battery

3.1 Remove lower-right side panel (see Section Three).

3.2 Open footswitch drawer to its full extension by pressing its right and left hinge levers.

3.3 Inside footswitch drawer, loosen two captive thumb screws to release sheet metal cover over battery.

3.4 Loosen thumb screw to release sheet metal clamp over battery.

3.5 Disconnect cable connector J13 from Power Distribution PCB. The PCB is accessed through the lower-right side panel.

3.6 With cable W3 connected to battery, carefully lift battery with cable up and out of console.
NOTE: Dispose of battery following local governing ordinances and recycling plans.

3.7 Place new battery in console, then re-install in reverse order of these instructions.

4. Replace Remote Control Batteries

4.1 Remove two screws from bottom of remote.

4.2 Wiggle two halves of remote to access inside.

4.3 Remove spent batteries and replace with new AAA batteries. Orient batteries as diagramed in base. Spin batteries in base to ensure good electric connection.

4.4 Grasp two halves of remote and tip edges together as shown (see Figure 4-3). Two tabs inside bottom edge of remote must match up with two notches in other half of remote.

4.5 Gently place two halves together.
NOTE: Observe rubber buttons shown in Figure 4-4 while putting two halves together. The rubber buttons must slide into slots in other half of remote without binding.

4.6 Secure two halves of remote together with two captive screws.

4.7 Squeeze rubber buttons on side of remote. If batteries are installed correctly, backlights will illuminate on face of remote, then turn off after a few seconds.
NOTE: If backlights do not turn off, rubber buttons are not properly inserted into slots, so you must repeat procedure.

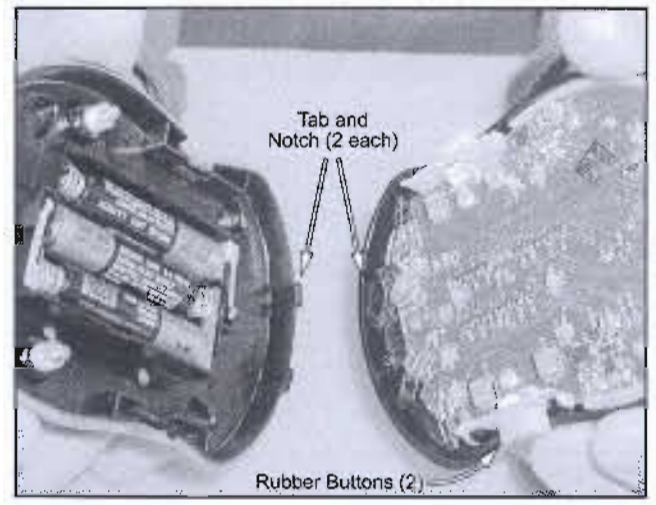


Figure 4-3 Two Halves of Remote Control

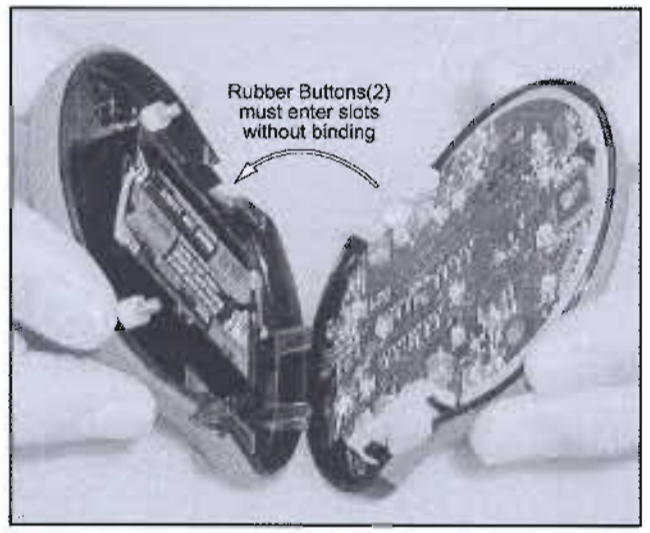


Figure 4-4 Proper orientation of two halves of remote control

5. Remove, Clean, and Replace Upper Air Filter

5.1 Loosen captive thumb screw securing upper air filter to top section of console (see Figure 4-5), then remove air filter from console.
5.2 Slide metal mesh filter out of its sheet metal holder.
5.3 Clean filter in soapy water, then shake it dry.
5.4 Replace air filter in reverse order of these instructions.

6. Remove, Clean, and Replace Lower Air Filters

6.1 Remove lower side panels (see Section Three).
6.2 Loosen two 3 mm setscrews to release metal mesh filter from inside each panel.
6.3 Slide filter out of its holder.
6.4 Clean filter in soapy water, then shake it dry.
6.5 Replace air filter in reverse order of these instructions.

7. Remove and Replace Pneumatic Oil Separator and Air Dryer

7.1 Remove lower-left side panel (see Section Three).
7.2 Disconnect two tubings from each unit (see Figure 4-6). Tubing is easily disconnected by simultaneously pressing in on plastic connector while pulling out on tubing.
7.3 Remove two 3.0 mm hex screws from the top of the oil separator, and two 4.0 mm hex screws from the top of the air dryer. Remove from console.
7.4 Replace components in reverse order of these instructions.

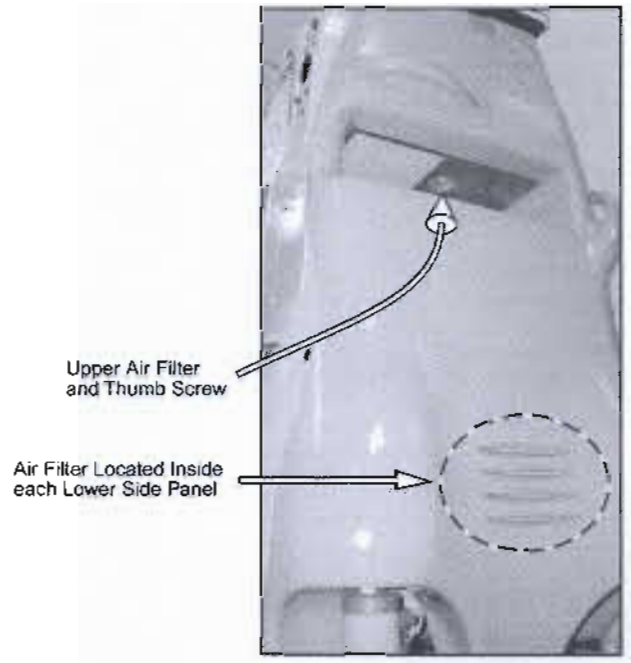


Figure 4-5 Locations of Console Air Filters

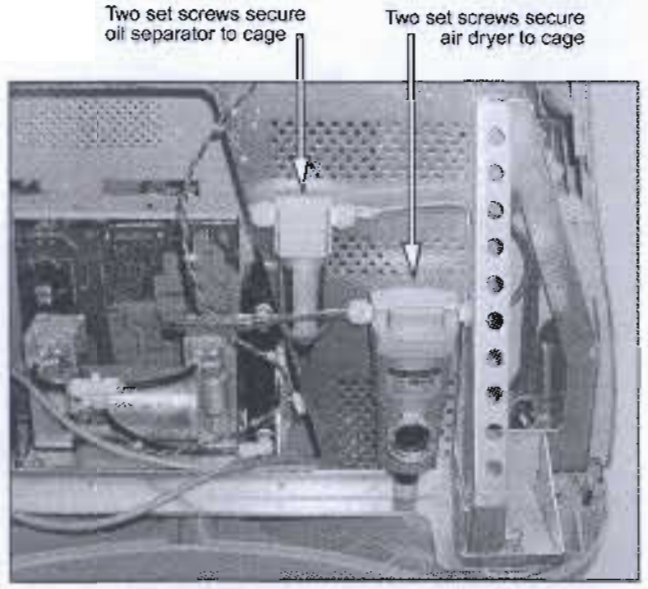


Figure 4-6 Pneumatic oil separator and air dryer

8. Remove and Replace CPU PCB Lithium Battery

CAUTION

The CPU PCB contains electrostatic discharge (ESD) sensitive devices. Always wear a wrist strap when working with this device.

8.1 Remove lower-right side panel (see Section Three).
8.2 Remove CAN Bus Interface PCB from Host cage.
8.3 Remove DVD thumbscrew from bottom of Host cage, disconnect cables, and slide out DVD.
8.4 Remove angle bracket from chassis.
8.5 Remove Host from console and set on flat surface.
8.6 Remove old battery from CPU PCB by pressing small metal clip (see Figure 4-7).
8.7 Install new battery.
8.8 Replace components in reverse order of these instructions.

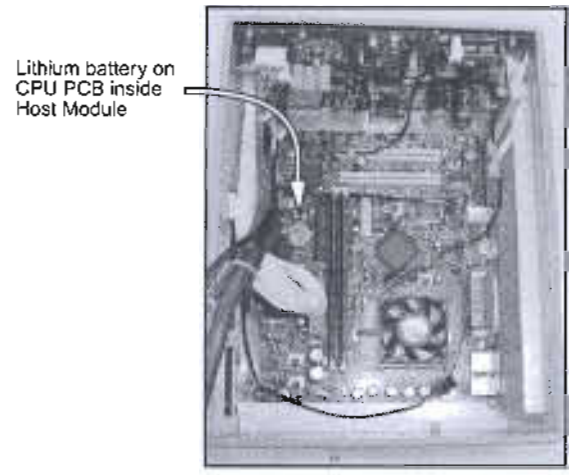


Figure 4-7 Location of CPU battery inside Host Module. DVI and CANBUS PCB's removed for clarity.

EQUIPMENT MALFUNCTION

The system communicates equipment malfunctions through the display of Advisories, Warnings, and Faults based on the level of severity. Listed below is a general sequence of events for each.

Advisories

An advisory is a message to the user (see Figure 4-1). The advisory may require user intervention, or it may be for information purposes only. When an advisory condition is detected, the following occurs:

- The advisory tone is generated.
- A dialog is displayed indicating the advisory.

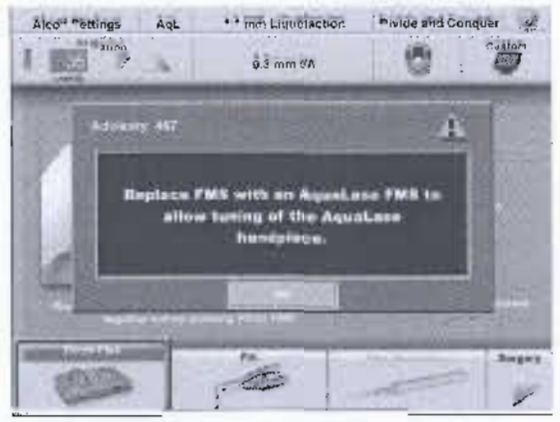


Figure 4-8 ADVISORIES SCREEN - This is a typical example of an Advisories dialog.

Warnings

Warnings are generated to indicate a non-system fault (see Figure 4-2). When a warning is detected, the following occurs:

- The warning tone is generated.
- Affected mechanisms are placed in a safe state.
- A dialog is displayed indicating the warning.

Figure 4-9 WARNINGS SCREEN - This is a typical example of a Warnings dialog.

Faults

System faults are the result of an exceptional condition resulting from an error or a hardware failure that renders the software unable to carry out a requested service, or one that results in unacceptable risk (see Figure 4-3). When a system fault is detected, the following occurs:

- The fault tone is generated.
- All mechanisms are disabled.
- A dialog is displayed indicating the fault. If the fault occurs during system initialization, shutdown, or when the touchscreen graphics software is unavailable, the fault dialog will be displayed in English.
- All requests for functions are ignored, including key activations.

Figure 4-10 FAULTS SCREEN - This is a typical example of a Faults dialog.

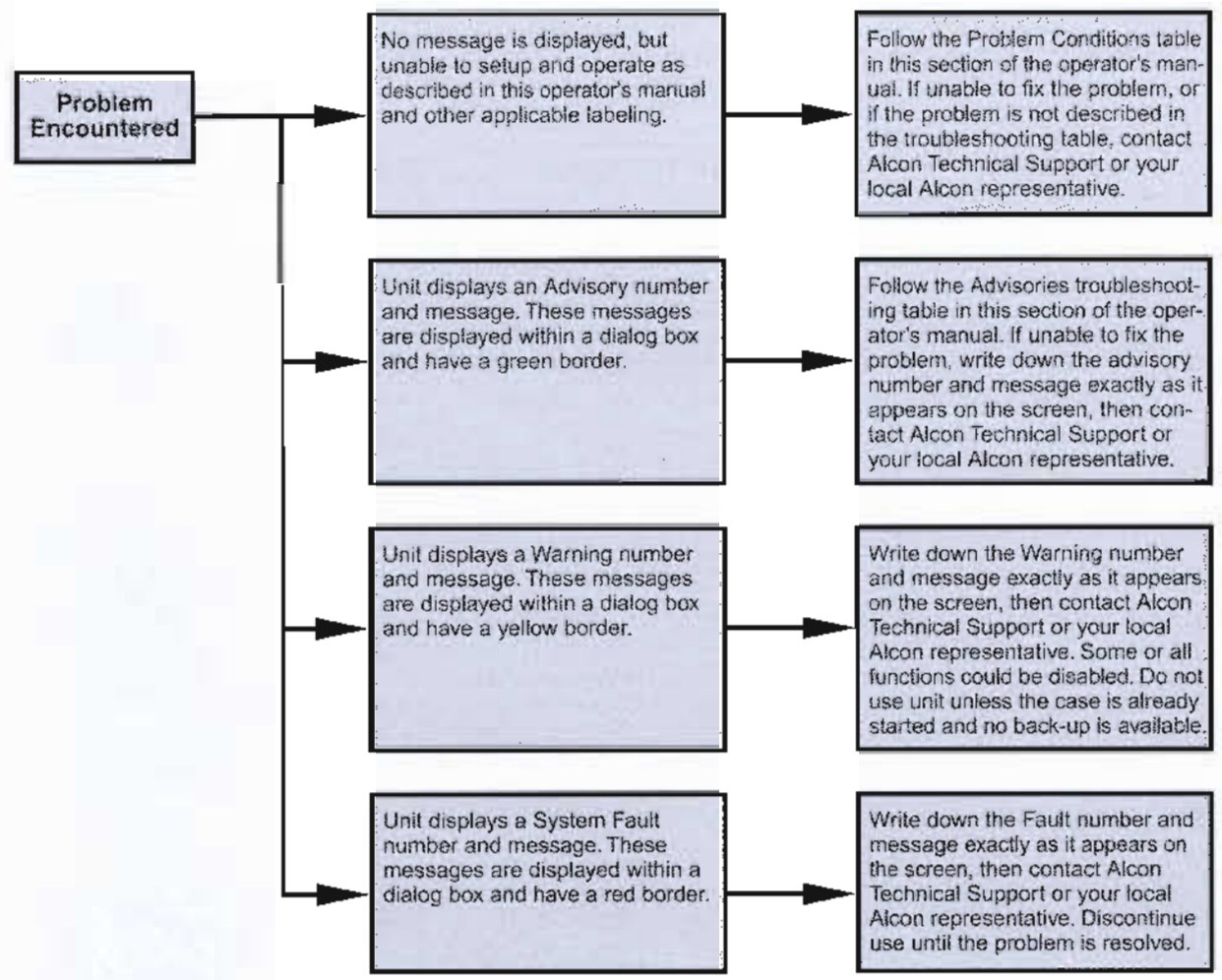


Figure 4-11 TROUBLESHOOTING GUIDE - When a problem is encountered, refer to this chart first.

PROBLEM CONDITIONS

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
System does not power-up.	1. Main power switch in OFF position.	1. Turn main power switch near power cord to ON position.
	2. Blown power fuse.	2. Replace power fuse near power cord.
Test chamber does not fill—insufficient irrigation.	1. Restriction to irrigation inflow.	1. Check for kinks in irrigation line or twisted infusion sleeve.
	2. Bottle too low or handpiece too high.	2. Put bottle at 78 cm and put handpiece at patient eye level.
	3. Drip chamber not adequately filled with fluid.	3. Squeeze drip chamber until 2/3 to 3/4 full.
	4. Clogged handpiece or tips.	4. Check handpiece and tips.
	5. Faulty Fluidic Management System (FMS).	5. Replace FMS.
	6. Drip chamber valve stuck.	6. Tap drip chamber with finger to free ball valve.
Test chamber collapses—does not refill.	1. Bottle too low or handpiece too high.	1. Put bottle at 78cm and put handpiece at patient eye level.
	2. Clogged handpiece or tips.	2. Check handpiece and tips.
	3. Drip chamber valve stuck.	3. Tap drip chamber with finger to free ball valve.
Vacuum check failure.	1. Improper FMS insertion.	1. Reinsert FMS.
	2. IRR and/or ASP fittings are not connected together or not connected tightly to handpiece.	2. Ensure both fittings are tightly connected together or to handpiece.
	3. Drip chamber not 2/3 to 3/4 full.	3. Flush irrigation line and fill drip chamber halfway using Fill button in Test mode. Reprime.
	4. Test chamber not on handpiece or not secured tightly over handpiece.	4. Secure test chamber tightly onto handpiece.
	5. Faulty FMS.	5. Replace FMS.
	6. Priming with HP attached.	6. Remove HP, then connect blue and white luer fittings together.
	7. Cracked blue luer fitting.	7. Check fitting and replace FMS as necessary.
Vent test failure or vacuum and vent test failure.	1. Restriction in irrigation or aspiration lines.	1. Check kinked irrigation or aspiration lines or twisted tip cap sleeve.
	2. Machine insufficiently primed.	2. Press Test to reprime.
	3. Faulty FMS.	3. Replace FMS.
	4. Drip chamber vent valve stuck.	4. Tap drip chamber with finger to free ball valve.

Table 4-3 PROBLEM CONDITIONS - Listed in this table are problem conditions that may be observed. The observed Symptom is followed by the Probable Cause and its Corrective Action.

PROBLEM CONDITIONS

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Ultraflow™* I/A handpiece leaking at tip and handpiece connection.	1. Loose tip.	1. Retighten tip.
	2. Damaged O-ring.	2. Retest. Inspect O-ring and replace, as necessary. To replace: • Using the special O-ring tool, remove damaged O-ring. • Roll new O-ring off tool and roll it into place on tip.
	3. Leak in tubing.	3. Replace HP silicone tubing.
Fluidics balance test does not pass.	1. Clogged I/A handpiece or tip.	1. Check HP and tip for occlusion.
	2. Clogged I/A HP aspiration line.	2. Activate reflux.
	3. Clogged I/A handpiece irrigation line.	3. • Remove test chamber. • Flush irrigation line. • Replace test chamber. • Retest. **NOTE: If available, use a sterile syringe and a container with sterile fluid. Draw fluid through the handpiece irrigation line. Retest.**
Backflow regurgitation.	Machine insufficiently primed.	Reprime.
Insufficient aspiration.	1. Loose blue luer fittings.	1. Reconnect securely.
	2. Kinked or damaged tubing.	2. Check tubing and/or replace.
	3. Damaged O-ring.	3. Inspect O-ring and replace, as necessary.
	4. Clogged tip.	4. • Flush tip with sterile water or *BSS*® sterile irrigating solution. Retest. • Replace tip. Retest.
	5. Cracked blue luer fitting.	5. Check fitting and replace FMS as necessary.
Tune Failed: Loose Tip.	Loose tip.	Retighten and retune.
Tune Failed: Tuning in Air.	Attempted to tune tips in air.	Fill test chamber completely. Retune.
Prime Complete / Tune Failed.	1. Faulty Handpiece.	1. Replace handpiece. Retest.
	2. Faulty Connector.	2. Unplug, reinsert into socket, retest.
	3. Faulty tip.	3. Remove tip and replace if faulty. Retighten. Retest.
	4. Other	4. Record the failed code number and contact Alcon Surgical Technical Services Department.
	5. *AquaLase*® HP inject path clogged.	5. Flush path with sterile fluid.
	6. *AquaLase*® bottle empty or low.	6. Insert new *AquaLase*® bottle.

PROBLEM CONDITIONS

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
No tune or loss of U/S power.	1. Handpiece tuned while hot.	1. Retune.
	2. Loose tip.	2. Retighten and retune.
	3. HP connector not seated correctly.	3. Disconnect and reinsert HP connector.
	4. Faulty handpiece.	4. Try alternate handpiece.
Irrigation does not stop.	System in Continuous Irrigation mode.	Enter and exit Test mode.
Air in irrigation line causing bubbles.	1. Drip chamber not sufficiently full.	1. Fill drip chamber 2/3 to 3/4 full. Flush irrigation line in Free Flow or footpedal position 1.
	2. Air in line or handpiece.	2. Tap handpiece 2-3X during flow test.
	3. Loose irrigation luer fitting.	3. Check irrigation line and reseat.
	4. Improper priming.	4. Reprime per setup procedure.
Ant Vit probe does not work at all (no movement).	1. Faulty probe.	1. Replace probe.
	2. An actuation line filling with *BSS*® fluid due to improper setup.	2. Check for correct tubing connections, then replace probe.
Ineffective or poor Vit cutting.	1. Port not closing fully as the inner cutter moves.	1. Reduce cutting speed until port closes completely.
	2. Kinked, damaged or loose actuation tubing.	2. Check for damaged or kinked tubing; straighten if necessary. Tighten any loose luer fittings. Replace probe if visual inspection shows any damaged components.
	3. Faulty probe (activated in air instead of fluid).	3. Replace probe.
Remote control does not work.	1. Remote and system set on different channels.	1. Verify system channel selection and remote channel select switches are set to same channel (A, B, C, or D).
	2. Batteries discharged.	2. Replace batteries in remote control.
IV pole does not retract completely upon shutdown.	System error.	Turn system on, wait until system powers up, then turn system off using Standby power switch located on upper rear panel.
Footpedal not responding properly.	1. Footpedal was pressed when system was powered up, or footpedal was pressed when footswitch was plugged in.	1. Release footpedal and power off system. Make sure footswitch is properly connected to system, and turn power back on, with footpedal in full up position.
	2. Footswitch connector not seated properly.	2. Disconnect and reconnect footswitch cable connector.
	3. Faulty footswitch.	3. Replace footswitch.

PROBLEM CONDITIONS

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
"Please Install Footswitch" Advisory is displayed. Error code 460.	1. Improperly connected or disconnected footswitch.	1. Verify proper insertion of footswitch connector (while footpedal/treadle is in full up position).
	2. Footswitch connector not seated properly.	2. Disconnect and reconnect footswitch cable connector.
	3. Faulty footswitch.	3. Replace footswitch.
System Fault occurs; entire system inoperative, red screen with stop sign is displayed.	System Fault has several possible causes.	Carefully record all text appearing in Fault screen, on display. Turn system off, wait until screen goes dark, then turn system back on to see whether fault clears. Contact Technical Services.
AquaLase® handpiece test failed.	1. Short circuit error.	1. Replace handpiece.
	2. Open circuit error.	2. Ensure *AquaLase*® fluid is flowing to handpiece. Replace HP.
	3. Flow obstruction.	3. Ensure *AquaLase*® fluid is flowing to handpiece. Flush injection flow path per HP DFU and verify fluid exits tip.
	4. *AquaLase*® bottle empty or low.	4. Insert new *AquaLase*® bottle.
AquaLase® handpiece leak at tip interface.	1. Loose tip.	1. Reapply wrench and tighten tip.
	2. Missing gasket.	2. Replace tip.
Diminished pulsing performance.	*AquaLase*® fluid container near empty.	Replace *AquaLase*® fluid container.
Low irrigation flow.	Irrigation sleeve too distal.	Move sleeve so holes are proximal to tip flare.

ADVISORIES

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
160	Advisory xxx: Reinsert FMS. Replace FMS if problem persists.	System automatically closes the advisory when the FMS is reinserted.
161-164	Advisory xxx: Please check fittings and reprime. Replace FMS if problem persists.	1. System goes to Not Primed status. 2. Tune status is unaffected.
165-167	Advisory xxx: Flow obstruction. Please check handpiece free flow.	1. Prime status is unaffected. 2. Selected handpiece goes to Not Tuned status.
170	Advisory xxx: Reflux terminated. Reflux fluid volume depleted.	1. Prime status is unaffected. 2. Tune status is unaffected.
171	Advisory xxx: Excessive pressure in drain bag. Replace FMS.	1. Prime status is unaffected. 2. Tune status is unaffected.
176	Advisory xxx: Infusion pressure sensor calibration error. Remove FMS. If problem persists contact Alcon Technical Services.	1. Prime status is unaffected. 2. Tune status is unaffected. 3. System will not accept a FMS while the failure condition exists. The condition is periodically tested while a FMS is not installed.
175	Advisory xxx: Infusion pressure sensor calibration error. Remove FMS. If problem persists contact Alcon Technical Services.	1. Prime status is unaffected. 2. Tune status is unaffected. 3. System will not accept a FMS while the failure condition exists. The condition is periodically tested while a FMS is not installed.
180	Advisory xxx: Invalid FMS ID. Replace FMS.	1. System goes to Not Primed status. 2. Tune status is unaffected.
181	Advisory xxx: Excessive Ambient Light. Unable to calibrate FMS ID sensors.	System will not accept a FMS while the failure condition exists. The condition is tested at initialization and upon FMS removal. It is retested until successful.
182	Advisory xxx: Excessive Ambient Light. Unable to read FMS ID.	1. FMS is ejected. 2. Advisory is cleared when user removes FMS. Condition is tested upon FMS insertion.
169	Advisory xxx: Irrigation pressure is low. Please check bottle and fittings.	1. System disables phaco power, *AquaLase®* power, vacuum, aspiration, and vitrectomy for all steps. These functions will be made available when the low infusion pressure condition is no longer true and the footswitch treadle has been released to position 1. 2. Press OK button to remove the advisory or the system will automatically remove the advisory when the condition is no longer true. The advisory is redisplayed if the condition is true and the footswitch treadle is depressed from position 0. 3. This advisory is only displayed in Surgery Mode when the footswitch treadle is not in position 0. It is not displayed in the Coagulation step.
250	Advisory xxx: Tuning in air.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).

Table 4-4 ERROR CODES - Listed in this table are error codes shown on the *Infiniti*™ Vision System display panel when the system detects a problem. The error codes are separated between Advisories, Warnings, and Faults.

ADVISORIES

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
251	Advisory xxx: Insert handpiece.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).
252	Advisory xxx: Multiple handpieces detected. Remove a handpiece.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).
254	Advisory xxx: Loose tip.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).
256-270	Advisory xxx: Replace handpiece. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).
271	Advisory xxx: Two handpieces detected. Remove a handpiece.	1. Prime and U/S Tune status are unaffected. 2. System stops applying U/S power. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).
272-274	Advisory xxx: Replace handpiece. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status goes to "Not Tuned". 2. Prime status is unaffected. 3. System stops applying U/S power. 4. FP3 is not functional (user can go to FP3 but there will be no U/S power).
276	Advisory xxx: Ultrasound error. Release treadle and retry. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status stays as "Tuned". 2. Prime status is unaffected. 3. System stops applying U/S power in FP3, but user can re-apply U/S power by exiting FP3 and then re-entering FP3. 4. Advisory will automatically be removed after 5 seconds.
277	Advisory xxx: Handpiece disconnected while applying U/S power. Release treadle then insert and tune handpiece.	1. U/S Tune status goes to "Not Tuned". 2. Prime status is unaffected. 3. System stops applying U/S power. 4. FP3 is not functional (user can go to FP3 but there will be no U/S power).
278	Advisory xxx: Replace handpiece. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status is "Not Tuned". 2. Prime status is unaffected. 3. FP3 is not functional (user can go to FP3 but there will be no U/S power).

ADVISORIES

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
281	Advisory xxx: Cautery compliance error. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status is unaffected. 2. Prime status is unaffected. 3. System stops applying cautery power in FP2, but user can re-apply cautery power by exiting FP2 and then re-entering FP2. 4. Advisory will automatically be removed after 5 seconds.
282	Advisory xxx: Coagulator error. If problem persists after restarting system, contact Alcon Technical Services.	1. U/S Tune status is unaffected. 2. Prime status is unaffected. 3. System stops applying cautery power in FP2, but user can re-apply cautery power by exiting FP2 and then re-entering FP2. 4. Advisory will automatically be removed after 5 seconds.
350-353	Advisory xxx: Footswitch failure, replace footswitch.	1. Irrigation valve is open. Irrigation valve will close when new footswitch is plugged in. 2. Footswitch icon displays position 0. If the icon is pressed, the advisory message is displayed but the advisory tone is not emitted.
450	Advisory xxx: Footswitch is depressed. Release footswitch before pressing Prime FMS, Fill, or Test Handpiece.	The system does not initiate the requested function.
460	Advisory xxx: Please install footswitch.	1. Mechanisms behave as if footswitch is at position 0. 2. Irrigation valve is open. Irrigation valve will close when footswitch is plugged in. 3. If the footswitch icon is pressed, the advisory message is displayed.
461	Advisory xxx: Infiniti backup power service needed, contact Alcon Technical Services.	
462	Advisory xxx: Power supply service needed. Contact Alcon Technical Services.	
463	Advisory xxx: Invalid language(s) found during initialization. One or more installed languages may not be available.	Invalid languages are not available.
464	Advisory xxx: The language specified by system settings is invalid.	The language is set to English.
465	Advisory xxx: The tune sequence was interrupted by removal of the handpiece.	1. Tune status is "Not Tuned". 2. Prime status is unaffected.

ADVISORIES

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
466	Advisory xxx: *AquaLase*® handpiece test failed. Handpiece tune failed. Check *AquaLase*® handpiece connection.	1. Tune status is "Not Tuned". 2. Prime status is unaffected.
467	Advisory xxx: Replace FMS with an *AquaLase*® FMS to allow tuning of the *AquaLase*® handpiece.	
468	Advisory xxx: The *AquaLase*® tune sequence was interrupted by the removal of the *AquaLase*® container.	
550-551	Advisory xxx: *AquaLase*® handpiece test failed. Retry test. If problem persists contact Alcon Technical Services.	1. *AquaLase*® Tune status is "Not Tuned". U/S or *NeoSonix*® Tune status not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
552-558	Advisory xxx: *AquaLase*® handpiece test failed. Check fluid container and retry test. If problem persists contact Alcon Technical Services.	1. *AquaLase*® Tune status is "Not Tuned". U/S or *NeoSonix*® Tune status not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
559	Advisory xxx: *AquaLase*® handpiece test failed. Check fluid container and retry test. If problem persists replace *AquaLase*® handpiece.	1. *AquaLase*® Tune status is "Not Tuned". U/S or *NeoSonix*® Tune status not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
560	Advisory xxx: *AquaLase*® handpiece test failed. Check *AquaLase*® handpiece and retry test. If problem persists replace *AquaLase*® handpiece.	1. *AquaLase*® Tune status is "Not Tuned". U/S or *NeoSonix*® Tune status not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
570	Advisory xxx: *AquaLase*® handpiece failed. Replace *AquaLase*® handpiece.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSonix*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
571	Advisory xxx: *AquaLase*® handpiece deactivated. Check fluid container and retry test. If problem persists replace *AquaLase*® handpiece.	1. *AquaLase*® , U/S and *NeoSonix*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional, unless the user exits FP3 and reenters into FP3.
572	Advisory xxx: *AquaLase*® handpiece disabled. Retest handpiece.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSonix*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
573	Advisory xxx: *AquaLase*® handpiece deactivated. Retry test. If problem persists contact Alcon Technical Services.	1. *AquaLase*® , U/S and *NeoSonix*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional, unless the user exits FP3 and reenters into FP3.

ADVISORIES

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
574	Advisory xxx: *AquaLase*® handpiece disabled. Check *AquaLase*® handpiece connection and retest the handpiece.	1. *AquaLase*® Tune status is "No Handpiece", and not tuned. U/S and *NeoSoniX*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
580-581	Advisory xxx: Replace *AquaLase*® container.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSoniX*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
582	Advisory xxx: *AquaLase*® handpiece deactivated. Retry test. If problem persists contact Alcon Technical Services.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSoniX*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
583	Advisory xxx: *AquaLase*® pressure failure. Check fluid container and retry test. If problem persists contact Alcon Technical Services.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSoniX*® Tune status are not affected. 2. Prime status is unaffected. 3. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power).
650	Advisory xxx: IV Pole jammed. Check for external obstacles. Pole may not have achieved desired height.	Nothing
651	Advisory xxx: The IV pole cannot attain the requested height due to the PEL setting.	Nothing
750	Advisory xxx: Pneumatic pump leakage. If problem persists, contact Alcon Technical Services.	Nothing
751	Advisory xxx: Low pressure. System is charging…	If the system charges successfully, then the system will automatically clear the advisory.

WARNINGS

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
100-152	Warning xxx: Fluidics not available. Restart system. If problem persists after restarting system, contact Alcon Technical Services.	1. System enters Setup Screen (surgery modes no longer available). Blue area of Setup Screen does not contain any message/graphic. 2. Prime, Fill and Test buttons are disabled. Surgery button is active so that the surgical screens can be accessed. 3. System goes to Not Primed status. 4. System goes to Not Tuned status. 5. Irrigation valve is open.
200-233	Warning xxx: Ultrasound and Coagulation not available. Contact Alcon Technical Service.	1. U/S or *NeoSoniX*® Tune status is "Not Tuned". *AquaLase*® Tune status not affected. 2. Prime status is unaffected. 3. Test Handpiece button in Setup screen is ghosted if current handpiece is U/S or *NeoSoniX*®. Test Handpiece button in Setup is not ghosted if current handpiece is *AquaLase*®. 4. FP3 in U/S and *NeoSoniX*® steps is not functional (user can go to FP3 but there will be no U/S power). 5. If the Coagulation button is pressed, the subsystem status warning dialog is displayed.
300-331	Warning xxx: Footswitch not available. Restart system. If problem persists after restarting system, contact Alcon Technical Services.	1. All footswitch functionality is disabled. 2. Prime, Fill, and Test Handpiece buttons are disabled. If a button is pressed, the subsystem status dialog is displayed. 3. System goes to Not Primed status. 4. System goes to Not Tuned status. 5. Irrigation valve is open. 6. Footswitch icon displays position 0.
441	Warning xxx: AC power lost. System is shutting down.	System powers down.
500-544	Warning xxx: *AquaLase*® not available. If this function is required, restart system. If problem persists after restarting system, contact Alcon Technical Services.	1. *AquaLase*® Tune status is "Not Tuned". U/S and *NeoSoniX*® Tune status are not affected. 2. Prime status is unaffected. 3. Test Handpiece button in Setup screen is ghosted if current handpiece is *AquaLase*® . Test Handpiece button in Setup is not ghosted if current handpiece is U/S or *NeoSoniX*®. 4. FP3 in *AquaLase*® steps is not functional (user can go to FP3 but there will be no *AquaLase*® power). 5. If a ghosted button is pressed, the subsystem status dialog is displayed.
600-633	Warning xxx: IV Pole not available. Restart system. If problem persists after restarting system, contact Alcon Technical Services. Use external IV Pole.	1. Pole remains in its current position. 2. Ghost infusion controls. 3. Blank infusion value. 4. If a ghosted button is pressed, the subsystem status warning dialog is displayed.

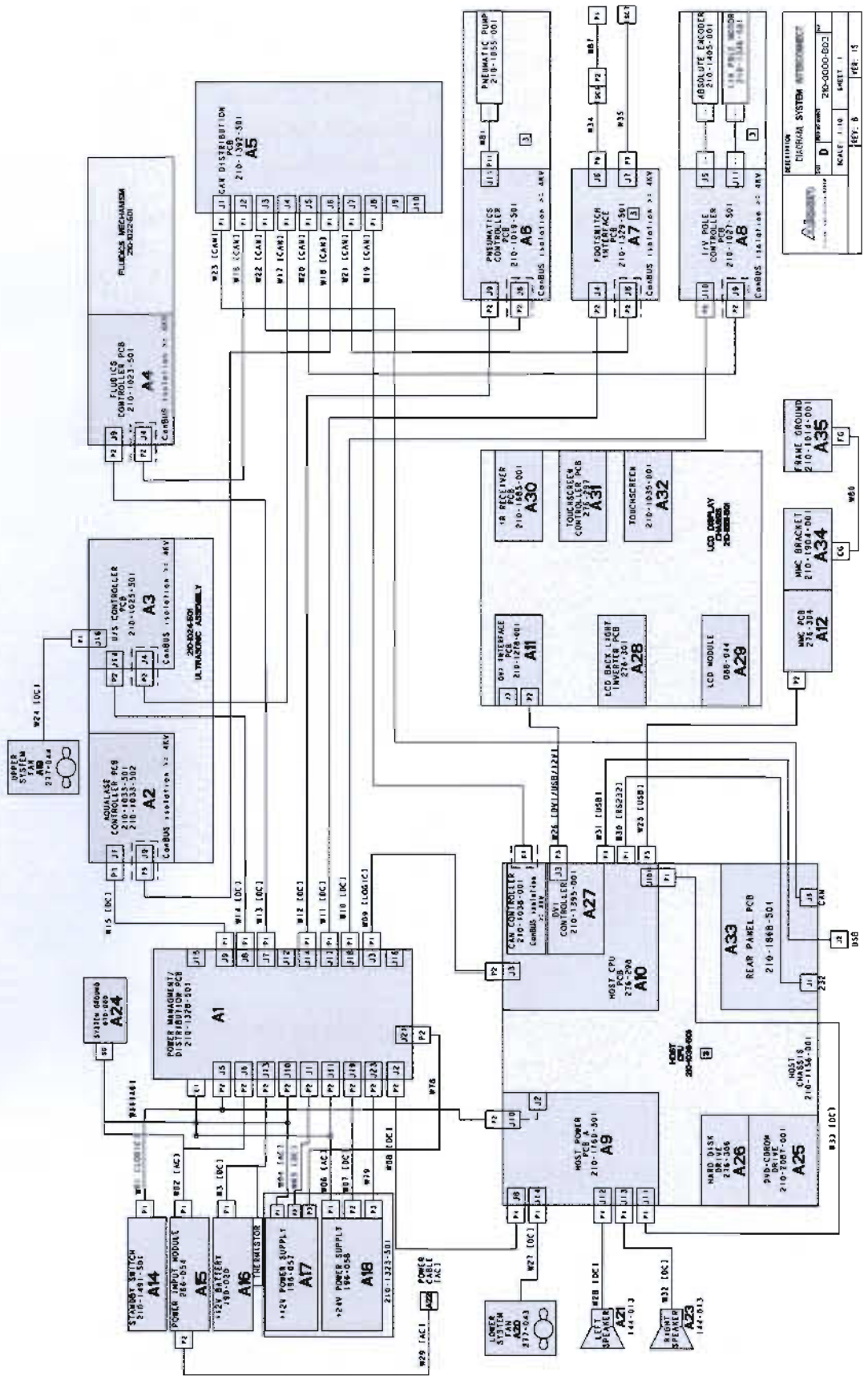
WARNINGS

ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
700-740	Warning xxx: Vitrectomy and *AquaLase®* not available. If these functions are required, restart system. If problem persists after restarting system, contact Alcon Technical Services.	1. *AquaLase®* Tune status is "Not Tuned". U/S or *NeoSoniX®* Tune status not affected. 2. Prime status is unaffected. 3. "Vitrectomy Unavailable" message in Cut Rate area of Vitrectomy steps. 4. Test Handpiece button in Setup screen is ghosted if current handpiece is *AquaLase®*. Test Handpiece button in Setup is not ghosted if current handpiece is U/S or *NeoSoniX®*. 5. Cutting in FP2 and/or FP3 (depending on IAC or ICA) not available in Vit steps. 6. FP3 in *AquaLase®* steps is not functional (user can go to FP3 but there will be no *AquaLase®* power). 7. If a ghosted button is pressed, the subsystem status dialog is displayed.

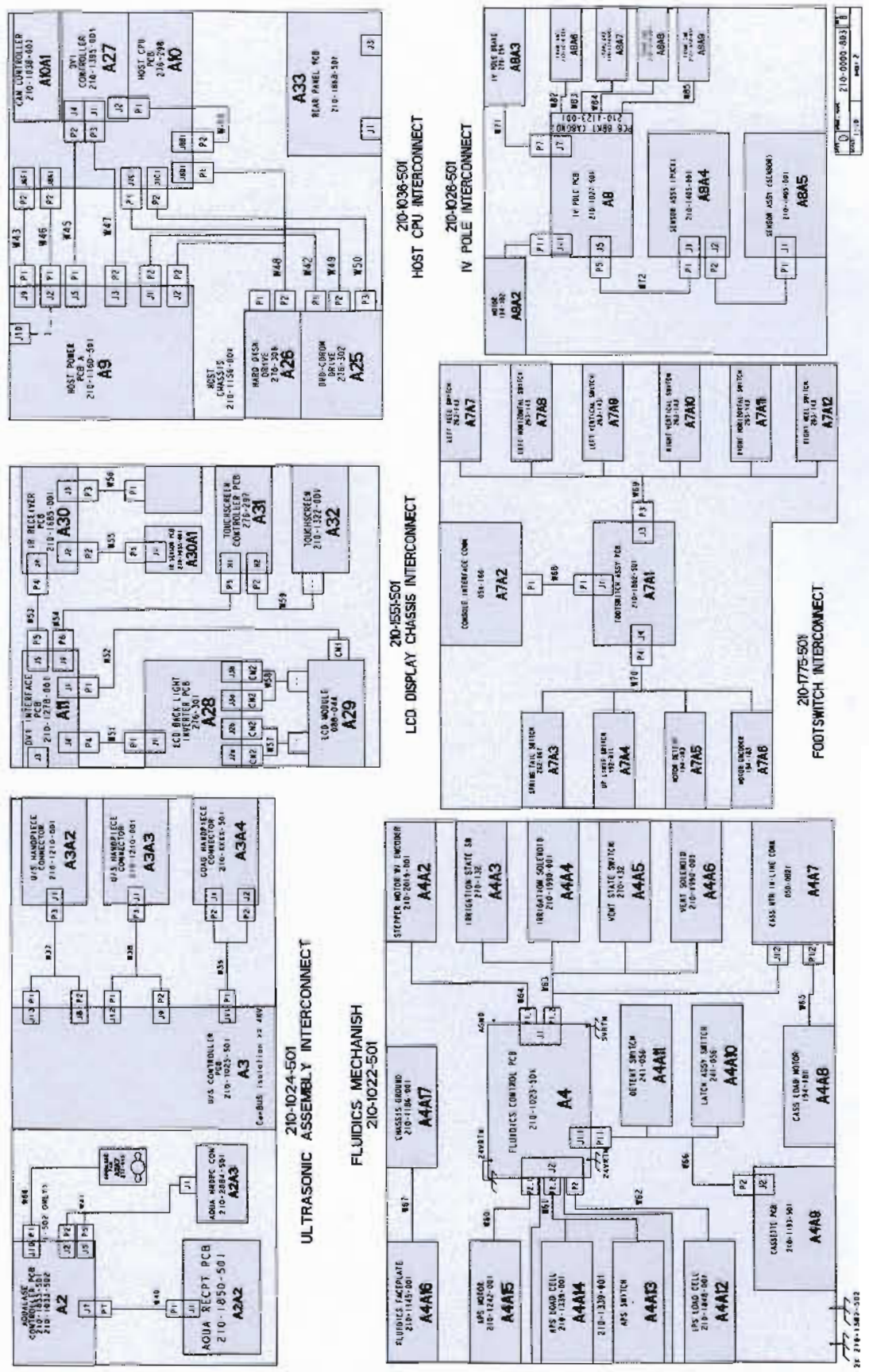
FAULTS

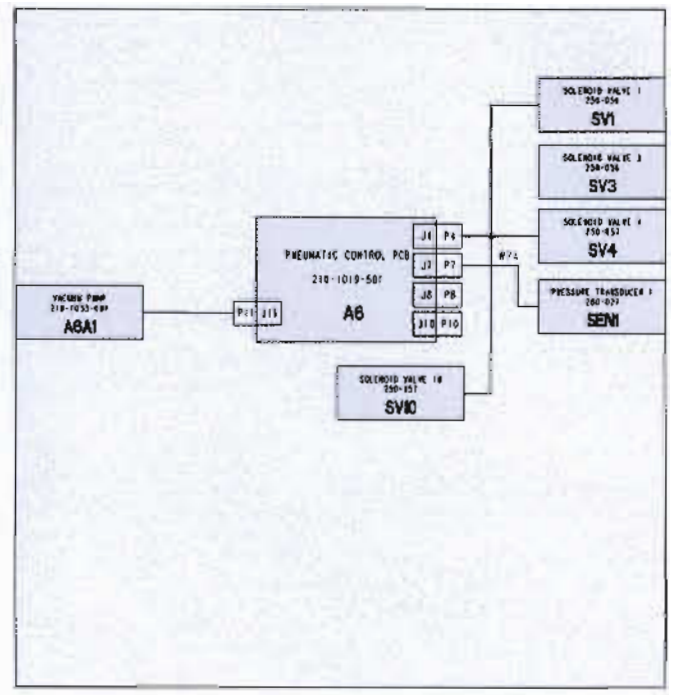
ERROR CODE	MESSAGE DISPLAYED	LIKELY ACTION TAKEN BY SYSTEM
400	System Fault xxx: Please restart system.	All mechanisms go to safe state (irrigation valve open, IV pole stays in current position, etc.)
401	System Fault xxx: Bus failure.	
402	System Fault xxx: 24 V Out of Tolerance.	
403	System Fault xxx: Software error.	
404	System Fault xxx: Corrupt/Missing File.	
405	System Fault xxx: Incompatible Software Version.	

SECTION FIVE
SCHEMATICS



210-0000-803 DIAGRAM, SYSTEM INTERCONNECT (1 of 6)


210-1036-501
HOST CPU INTERCONNECT
210-1028-501
IV POLE INTERCONNECT
210-1551-501
LCD DISPLAY CHASSIS INTERCONNECT
210-1775-501
FOOTSWITCH INTERCONNECT
210-1024-501
ULTRASONIC ASSEMBLY INTERCONNECT
FLUIDICS MECHANISH
210-1022-501


210-1236-501
PNEUMATICS INTERCONNECT

CABLE INTERCONNECTION (1 of 3)

REF DES	PART NUMBER	FROM	TO
W1	210-1438-501	A1J5	A1*P1, A9J10
W2	210-1439-501	A1J6, A1E1	A15P1, A15P1B
W3	210-1440-501	A1J13	A16P1, A16P1A, A16P1B
W4	210-1443-501	A1J10, A1E1	A17P1
W5	210-1442-501	A1J1	A17P2
W6	210-1443-501	A1J11, A1E1	A18P1
W7	210-1444-501	A1J19, A1J20	A18P2, A18P3
W8	210-1445-501	A1J2	A9J8
W9	210-1446-501	A1J3	A10J3
W10	210-1454-501	A1J18	A8J10
W11	210-1454-501	A1J17	A7J4
W12	210-1447-501	A1J14	A6J9
W13	210-1447-502	A1J7	A4J9
W14	210-1454-502	A1J8	A3J14
W15	210-2101-501	A1J9	A2J1
W16	210-1448-502	A5J2	A4J4
W17	210-1448-502	A5J4	A3J4
W18	210-1448-502	A5J6	A2J9
W19	210-1455-501	A5J8	A10X4
W20	210-1448-501	A5J5	A8J9
W21	210-1448-501	A5J7	A7J8
W22	210-1448-501	A5J3	A6J6
W23	210-1459-501	A5J1	A33J3
W24	210-1449-501	A3J16	A19
W25	023-078	A10P5	A12P2
W26	020-136	A10J3	A11J3
W27	210-1452-501	A9J14	A20
W28	210-1453-501	A9J12	A21
W32	210-1453-501	A9J13	A23
W29	023-079	A15P2	A22
W30	210-1456-501	A10P1	A33J1
W31	023-078	A10P4	A33J2
W33	023-077	A9J11	A10J1D1
W34	210-1498-502	A7J6	FSC6
W35	210-1498-501	A7J7	FSC7
W36	210-1458-501	A15P1A	A24SG

CABLE INTERCONNECTION (2 of 3)

REF DES	PART NUMBER	FROM	TO
W37	210-1827-501	A3J13, A3J8	A3A2J1
W38	210-1827-501	A3J12, A3J9	A3A3J1
W39	210-1826-501	A3J11	A3A4J1, A3A4J2
W40	210-1703-501	A2J7	A2A2J1
W41	210-2084-501	A2J2, A2J5	A2A3J1
W42	210-1872-501	A25P1	A9J1
W43	210-1873-501	A9J9	A10J6F1
W44	210-1876-501	A27J2	A10J8B1
W45	210-1874-501	A9J5	A27J4
W46	210-1875-501	A9J2	A10J8A1
W47	210-1880-501	A9J3	A27J1
W48	020-140	A26P2	A9J2, A10J8D1
W49	020-141	A25P2	A10J7E1
W50	020-142	A25P3	A10J1C1
W51	210-1280-501	A11J4	A28J1
W52	210-1281-501	A11J1	A29CN1
W53	210-1829-501	A11J5	A30J4
W54	210-1882-501	A11J6	A31H1
W55	210-1830-501	A30J2	A30A1J1
W56	210-1835-501	A30J3	A30A2J1
W57	088-044	A29	A28J2a, A28J2b
W58	088-044	A29	A28J3a, A28J3b
W59	210-1322-001	A32	A31H2
W60	210-1242-001	A4A1P2_1	A4A15
W61	210-1339-001	A4A1P2_2	A4A13, A4A14
W62	210-1848-001	A4A1P2	A4A12
W63	210-2074-501	A4A1P1_2	A4A3, A4A4, A4A5, A4A6, A4A7J12
W64	210-2019-001	A4A1P1_1	A4A2
W65	210-1614-501	A4A7P12	A4A8
W66	210-1402-501	A4A1P11	A4A9P2, A4A10, A4A11
W67	100-0079-501	A4A16	A4A17
W68	210-2022-501	A7A1J1	A7A2P1
W69	210-1775-501	A7A1J3	A7A7, A7A8, A7A9, A7A10, A7A11, A7A12
W70	210-2023-501	A7A1J4	A7A3, A7A4, A7A5, A7A6
W71	210-1828-501	A8A1J7	A8A3
W72	210-1831-501	A8A1J5	A8A4J1

INFINITI

CABLE INTERCONNECTION (3 of 3)

REF DES	PART NUMBER	FROM	TO
W74	210-1246-501	A6J7	SEN1
W77	210-1221-502	A6J4	SV2, SV1, SV4, SV10
W78	210-1460-501	A1J21	A17P3
W79	210-1461-501	A1J23	A18P3
W80	200-1582-502	A34CG	A35FG
W81	210-1047-501	A6J11	A6A1
W82	200-1582-502	A8GND	A8A6
W83	200-1582-502	A8GND	A8A7
W84	200-1582-502	A8GND	A8A8
W85	200-1582-502	A8GND	A8A9
W86	210-2129-501	A2J10	A2A7
W87	210-2001-001	P2	FSC6