

MultiLab 2000 Series 2CP-R

Service Manual

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Section 1: General Description

The purpose of the MULTILAB SERIES II 2CP-R (hereinafter “2CP”) is to meet market requirements for a noninvasive diagnostic tool for investigation of PAD (Peripheral Arterial Disease). It is designed to perform all standard noninvasive physiological arterial and venous studies.

The 2CP unit should enable technicians to perform noninvasive studies and evaluation of PAD. It should display the diagnostic information derived from each study, to simplify the vascular diagnosis by the physician. Dual-channel photoplethysmography (PPG), incorporating easily applied PPG clips, provides dual-channel pressure testing of segmental arteries or digital arteries. Full segmental studies should be possible in 20 to 25 minutes. A two-channel calibrated Pulse-Volume Recording should be capable of obtaining bilateral waveforms simultaneously. Doppler probe should be capable to show waveform of arterial blood flow and corresponding audible tone. Temperature probe should be capable to conduct Raynaud’s Examination. It should also have facility to record and communicate the test results for further consultation with other experts.

Intended Use

The MultiLab Series II devices are non – invasive vascular diagnostic instruments. They are designed to diagnose patients with Peripheral Vascular Disease (PVD) non-invasively. The MultiLab instruments were designed to provide accurate results, quickly and easily, and provide many years of use when properly maintained.

Note: The accuracy of non-invasive vascular diagnostic studies depends on the knowledge, skill and experience of the technologist and the physician performing the interpretation of the study. This service manual is intended to be used as a guide to instrument operation only, and as such, should not be viewed as a substitute for formal clinical vascular education.

The system uses a structured menu guided sequence and procedures wherein professional health care provider will use the data to diagnose the patient or keep the record for further consultation. During this test until its completion, the professional health care provider will be in close proximity to the patient. The patient connectors for blood pressure cuffs have been designed for easy detachment in case of discomfort apart from other automatic safety feature in the unit.

Power Requirements

Supply Voltage 110-130VAC
Frequency 60Hz +/- 5%
Max Power 100 W (exclude printer)

Leakage Current

Less than 100 uAmp.

Dimensions and Weight

Chassis dimensions: 13”Wx11”Dx10”H
Approximate weight of system: 16lbs

Cart dimensions: 21"Wx25"Dx41"H (optional)
Approximate weight of cart: 69lbs (optional)

Bi-directional Doppler

TruDop 8: frequency 8 MHz +/- 5%, continuous wave, NPL estimated in-situ total power 6.7 mW maximum.

TruDop 5: frequency 5 MHz +/- 5%, continuous wave, NPL estimated in-situ total power 4.7mW maximum.

Photoplethysmography

IR emitter and receiver centered at 880 nm. Operable in either AC or DC coupled mode.

Pneumatics

Manometer, Simultaneous Dual Channel

Range: 0-300 mm/hg

Accuracy: +/- 1%

Pneumoplethysmograph, Simultaneous Dual Channel

Range: 0-100 mm/hg

Sensitivity: >.0015mm/hg

Cuff Set

SC-10, Nylon Shell, 300 mm/hg max pressure

11 x 85 cm

SC-12, Nylon Shell, 300 mm/hg max pressure

13 x 85 cm

PC-2.5, Natural Latex, 100 mm/hg max pressure

2.5 x 12 cm

Infrared Thermometry

Range 0 – 39 degrees C (32 – 100) degrees F

Response < 1 second

Accuracy + / - 2% Full Scale

External Hoses

Material: PVC

Section 2: Installation Guide

Please refer to 11996-0003-01 in Section 4.

Section 3: Operator's Manual

MultiLab Operator's Manual



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CHAPTER 1: CARE OF EQUIPMENT

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Technical Support

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Or contact your local Unetixs Vascular Field Representative

Contact Unetixs, Inc. for:

- Any questions regarding the operation of the system
- Service and repair information
- To purchase consumable items (paper, gel, replacement accessories) or options.

Do not return the system or accessories to the factory without prior authorization from the Customer Service Manager. Unauthorized returns will be returned to the sender at the sender's expense. To obtain authorization, write or call:

Customer Service hours are between 8:30 am and 5:00 p.m. Eastern Time. Please have your model and serial numbers ready prior to calling.

NOTES

Our Responsibility

As the manufacturer, Unetixs Vascular, Inc. is responsible for the effects on safety and performance only when:

1. Installation procedures, training, programming, modifications, or repair are performed by individuals authorized by Unetixs Vascular, Inc.
2. The MultiLab is used in accordance with instructions for use.

The Customers Responsibility

The user of the MultiLab is responsible for using the system according to instructions. The user is further responsible for the establishment of a general cleaning and maintenance schedule, the lack of which could lead to failure and premature retirement of the device.

Note: This system can be affected by radio frequency energy from other medical and non-medical devices. If other devices are causing interference:

1. Relocate either the MultiLab or other device.
2. Increase the distance between the MultiLab and the other device.
3. Power the MultiLab from a different source than the other device.
4. Consult Unetixs Service for other suggestions.

Note: Do not use other devices which intentionally transmit RF Signals such as cell phones, radio transceivers, or radio controlled products near the MultiLab while in operation.

Troubleshooting

Most problems can be fixed by simply restarting the system. Turn off the system with the power switch. Unplug the system from power for 10 seconds. Plug back in and turn back on. If this does not fix your problem then contact technical support above.

Note for **2CP**: By default the system power settings, in Windows, are set to disable sleeping and to disable turning off the display. If these are changed, you may notice a color inversion or a partial shifting of the display. To fix this, just restart the system. To turn these off again, connect a keyboard. Press the "windows" key and type "power". Touch "Power and Sleep Settings". Set Screen "Turn off after:" to "Never". Set Sleep "PC goes to sleep after:" to "Never". Close the Settings window and restart the system.

Intended Use and Misuse

Intended Use

The MultiLab is intended for use as a non-invasive diagnostic device by trained medical personnel following physician orders. This device is intended for the detection of obstruction to blood flow in human arteries and

veins as an aid for the diagnosis of disease in the peripheral vascular system. **IT IS NOT INTENDED FOR MONITORING PATIENT VITAL SIGNS OR TO ADVISE IN THE ADMINISTRATION OF ANY DRUG.**

NOTE: The accuracy of non-invasive vascular diagnostic studies depends on the knowledge, skill and experience of the technologist and the physician performing the interpretation of the study. This operator's manual is intended to be used as a guide to instrument operation only, and as such, should not be viewed as a substitute for formal clinical vascular education.

NOTE: The manufacturer and its agents cannot accept liability for loss, indirect or consequential damages resulting from misuse of or modification to the device or from operator negligence.

Because the results of the studies are dependent upon operator skill, procedures and interpretation beyond the manufacturer's control, the manufacturer or its agents cannot accept any liability arising from operator error or Physician misinterpretation.

It is recommended, in the event of an uncertain diagnosis following a primary testing with the system, that the patient be referred to an expert vascular practitioner and/or laboratory for further evaluation.

Limited Warranty

Your system is warranted to be free from defects in both workmanship and in materials for:

- 24 months of parts
- 24 months of labor
- 6 months on cuffs
- 12 months on probes

This warranty period commences from the original date of purchase. The Acknowledgement of Acceptance must be returned within 10 days of the date of purchase.

All material found defective within the warranty period will be repaired or replaced at no extra charge by the manufacturer. Unetixs Inc. assumes no liability for service representation. The warranty will be void if the instrument is determined to have been subjected to abnormal environmental conditions, mechanical or physical abuse.

This warranty is exclusive and is in lieu of all other warranties expressed or implied, including but not limited to any implied merchantability or fitness for a particular purpose or use. Unetixs Incorporated will not be liable for any special, indirect, incidental or consequential damages or loss, whether in contract, tort or otherwise.

NOTE: Unetixs Incorporated reserves the right to make improvements in the design, construction and appearance of its products without notice.

The following incoming inspection is required whether it is a first time arrival or a return from service. Prior to clinical use, the instrument should be inspected for the following:








- Fill out and return your Acknowledgement of Acceptance immediately.
- Carefully inspect the cartons for damage that may have occurred during shipping. Open the carton carefully.
- Remove the system and its accessories (see packing list and shipping documents) from the shipping carton. Inspect the system for damage that might have been incurred during shipping.
- If you find any damage, notify the carrier and Unetixs Inc. (the manufacturer) Customer Service Department immediately. See the CUSTOMER SERVICE AND WARRANTY section of this manual for further information.
- Please also go through the packing documents and inspect your accessories for completeness and possible damage.

IMPORTANT: Save the entire original packing materials until you have confirmed the system operates properly. We **STRONGLY** recommend you save them for future service or moving.

Specified Environmental Conditions for use of MultiLab



1. Indoor use ONLY.
2. 68 – 78 Degrees Fahrenheit (20 – 25.5 Celsius)



SYMBOLS

<u>Symbol</u>	<u>Definition</u>
	Refer to Operator's Manual for Information
	Shock Hazard
	Do not dispose of in municipal waste. Wheeled bin symbol indicates separate collection for electrical and electronic equipment <input type="checkbox"/> (WEEE Directive 2002/96/EEC)
IPX0	Identifies the degree of protection against Fluid & Dust.
	Alternating Current (AC)
	Type BF Equipment
	Class I
	Technical Support Phone Number



















Safety

Definition of Warning and Caution symbols:

 **WARNING**  Designates a possible dangerous situation. Non-observance may lead to death or the most severe injuries.

 **CAUTION**  Designates a possible dangerous situation. Non-observance may lead to minor injuries or damage to the product.

Warning

-  Before operating instrument, please go through the Operator's Manual which contain theory of operation, setup, and application of device to minimize the risk of improper usage
-  Inspect for damage! User should inspect the system for signs of damage. Do not use the system if damage is evident or failure is evident or suspected.
-  Make frequent electrical and visual checks on Power cables, Doppler & PPG cables and Pneumatic hoses.
-  When the unit or its accessories have been dropped or severely abused, it should be checked by the qualified service personnel from Unetixs Inc. to verify proper operation.
-  Possible explosion hazard! Do not use the MultiLab Series II in the presence of anesthetics.
-  Possible explosion hazard! Do not use the MultiLab Series II in the presence of gas mixtures which may be flammable.
-  The device should not be used in MRI environment.
-  The device is to be operated by trained medical personnel only.
-  All the cables and tubing should be carefully routed to avoid the possibility of patient entanglement and strangulation. Patient should not be left unattended
-  Operators are not to leave the patient unattended during testing.
-  If the patient should feel severe discomfort during cuff inflation, the cuff can be deflated by pressing the deflate button on the MultiLab Series II screen or cuff pressure can be rapidly exhausted by pressing the capture button. The same result can be obtained by physically removing the air hose from the blood pressure cuff.
-  All power cords must have hospital grade plugs and be plugged into hospital grade outlets. (The electrical installation of the relevant room must comply with NFPA 70: National Electric Code of NFPA 99: Standard for Health Care Facilities. Outside the United States, the relevant room must comply with all electrical installation regulations mandated by the local and regional bodies of government.)
-  Use proper power cord with the correct attachment plug style. If the power source is 120 VAC, use a power cord which is a Hospital Grade Power Cord with NEMA 5-15 style plug, labeled for 125 volts AC with UL and C-UL approvals. If the power source is a 240 VAC supply, use the tandem (T blade) type attachment plug with ground conductor power cord that meets the respective European country's safety regulations.
-  Device should be located, such that user should have easy access for the removal of power card.
-  Changes or modifications not expressly approved by UNETIXS, Inc., may cause unexpected results (Shock Hazards to the patient or the operator), and may also void the warranty.
-  Risk of electrical shock! Do not remove cover. There are no user serviceable parts.
-  Do not re-use accessories labeled as single use.
-  U.S. Federal law restricts this device to sale by or on the order of a physician.

- ⚠ When transporting equipment always use the transport position (if applicable).
- ⚠ People who are suffering from Deep Vein Thrombosis (DVT, i.e., blood clot in the veins of the legs) should not undergo for an ABI test.
- ⚠ Do not connect luer or bayonet fittings into any other equipment.
- ⚠ Do not connect cuffs with luer lock or bayonet connectors to intravenous fluid systems or air may enter the patient. Immediately consult a physician if this occurs.
- ⚠ When inflated above 10mmHg, make sure the cuffs will not remain on patient for more than 10 minutes, which may lead to patient distress, disturbance in blood circulation and injury to the peripheral nerves.
- ⚠ Cuffs should not be wrapped on patient where skin is delicate or damaged.
- ⚠ Cuffs should not be wrapped very tightly, at least a space of 1 finger must be allowed between the patient and the top of the cuff.
- ⚠ The Doppler probes are not intended to be used on open skin. Disinfect the probe before using it again in case of open wound contamination.
- ⚠ The Doppler probes are not intended to be used on or near the eyes.
- ⚠ The Doppler probes are not intended for fetal use.

Caution

- ⚠ The system is not intended for continuous or unattended monitoring.
- ⚠ The MultiLab Series II is non-invasive vascular diagnostic equipment and thus is neither for monitoring the patient's vital signs nor for use in ICU or in operating theater, administering or advice for administering any kind of drugs.
- ⚠ Testing to be performed by trained medical personnel in a separate room where care against fluid ingress has been taken.
- ⚠ Doppler and PPG connectors are push/pull connectors ONLY for easy detachment. Any attempt to twist or "screw" these cables in or out will result in damage to the cables and instrument.
- ⚠ Use the equipment only with recommended accessories! Use of unapproved accessories may cause inaccurate readings.
- ⚠ Do not store equipment at extreme temperatures. Temperatures exceeding specified storage temperatures (-5 to 50 °C) could damage the system and accessories.
- ⚠ Do not press on the keys and screen with surgical instruments or other tools. Sharp or hard objects could damage the keys and screen. Use only your fingertips to press on the keys and screen.
- ⚠ Do not use the Ethernet ports for internet access, as computer viruses may occur. Ethernet connection is intended for communication with EMR and other patient healthcare software. If Ethernet port must be used, use of firewalls and/or virus protection scanning software is recommended.
- ⚠ Do not use devices like USB memory stick which is used with the system without scanning for virus or malware bytes. UNETIXS, Inc. assumes no responsibility if the user chooses to leave the system unprotected.
- ⚠ Unit to be operated in an un-interrupted power supply environment.
- ⚠ Do not operate the system on an unstable cart or stand. The system may fall causing injury. Use the system with a cart approved or supplied by the manufacturer.
- ⚠ Do not hang anything from the monitor arm (LHS ERGO IDC option only).

- ⚠ Refer to the sections below for proper use of the monitor arm (LHS ERGO IDC option only) when the system is being transported, is at rest, or is in use.
- ⚠ Do not remove the cover of your MultiLab Series II or attempt to service the system. Any service on the MultiLab Series II must be performed by the factory or by a factory-authorized technician. Unauthorized service or part substitution may impair operation and will void the manufacturer warranty.
- ⚠ Unit to be serviced by UNETIXS, Inc. trained service personnel.
- ⚠ When products and accessories are near expiry dates and/or require disposal, these items must be processed in accordance with relevant product processing regulations. For further information, please contact UNETIXS, Inc., or its representative agencies.
- ⚠ Use only in specified environmental conditions.
- ⚠ Avoid placing the device near diagnostic or therapeutic equipment like X-ray machines, ultrasound machines, electrically operated beds, etc.
- ⚠ Avoid use of mobile phones in the vicinity of the device.
- ⚠ If the PPG probe is applied using Velcro™, avoid excessive pressure during wrapping as this can obliterate arteriolar flow causing an abnormal waveform.

Preventive Maintenance & Cleaning

Preventive Maintenance - General

The MultiLab Series II has been designed in such a way as to minimize the amount of preventive maintenance required; however there are some things that should be monitored on a regular basis.

1. Check the connectors on the cable assemblies to insure that the connections are secure.
2. Check that the all ventilation slots are clear of obstructions and dust. Vacuum if necessary.
3. Inspect all cable assemblies (including power cables) for damage or wear. Replace any suspect cables.
4. Inspect blood pressure cuff bladders for signs of wear and air leakage, replace as needed.
5. Check monitor base to insure clamps are secure and that the monitor base is undamaged.
6. Check nuts and bolts used to secure the wheels to the cart to insure tightness.
7. Check all exposed hardware for tightness and correct functionality.

The module from the unit should be returned to the factory once every 24 months for calibration (this service is included in Unetixs .Inc service contracts.)

Preventive Maintenance - Technical

Please refer to LHS Assembly document, 11949-0003-01(see Technical Manual) to perform the following:



In addition to the user Preventive Maintenance above, the following should be performed by qualified service personnel once per year. Perform this maintenance more often if equipment is used in dusty or damp locations.

1. Remove all covers from MultiLab (if applicable)
2. Turn unit on.
3. Verify that the fan in the back of the module is working.
4. Verify that the fan in the computer assembly is working.
5. Turn unit off and unplug from power mains.
6. Remove computer assembly (11945-0000-01) from cart. (Except Roodra. The All-in-One Computer is not user serviceable)

7. Remove Module Assembly (11903-0000-01) from cart.
8. Vacuum the interior of the cart.
9. Check all interior cables for wear, replace as needed.
10. Check that all interior hardware is securely fastened.
11. Remove cover from Module assembly.
12. Vacuum interior of module.
13. Check that the module fan is clean and rotates freely.
14. Replace module cover.
15. Remove left side of cover from CPU assembly. (Except Roodra)
16. Vacuum interior of computer.
17. Check that CPU fan is clean and rotates freely.
18. Replace Cover on computer assembly.
19. Reinstall computer assembly into cart.
20. Reinstall module assembly into cart.
21. Replace all covers onto MultiLab Cart.

Cleaning

- ⚠ Shock Hazard! Turn the power off and disconnect the power cable before cleaning the Power supply parts, sensor, or probes.
- ⚠ Do not use abrasive cleaners on the MultiLab series or on any sensors or probes. Abrasive cleaners can damage the MultiLab series, sensors, display, and probes.
- ⚠ The exterior surface of the MultiLab series, except for the display screen, may be wiped clean with alcohol and dried with a soft, dry cloth. It is best to use a cotton cloth to clean the MultiLab series. Paper towels or tissues can scratch the surface of the display.
- ⚠ Do not use full strength alcohol on the display screen. Repeated use of strong cleaners can damage the screen. Clean the display window by wiping it with a clean, soft, lint-free cloth sprayed with common glass cleaner. Do not spray glass cleaner directly on the display.

The following products are approved for exterior surfaces except the touch screen surface:

- 70% isopropyl alcohol (IPA)
- Oxivir Tb (accelerated hydrogen peroxide based)
- Protex spray or wipes
- Sani-Cloth HB (QUAT based)
- Sani-Cloth Plus (QUAT/IPA based)
- DISPATCH® Hospital Cleaner/Disinfectant with Bleach

Caution: Do Not Use T-Spray on Unetixs Products

The following products are approved for Doppler Probes, PPG Probes/Clips, and Lead Wires:

Do not immerse any UNETIXS PPG sensor, and probe connector in any liquid. Doing so may damage the connector. PPG sensor and probe can be wiped clean with alcohol or you may use:

- SONO Wipes™
- Sani Professional® No-Rinse Sanitizing Multi-Surface Wipes
- Sani-Cloth® Bleach Germicidal Disposable Wipe – Safe - However will cause discoloration to the probe casing)
- DISPATCH® Hospital Cleaner/Disinfectant with Bleach - (Safe - However cause discoloration to the probe casing)

The following products are approved for the Touch Screen and Roodra All-In-One:

- PDI Easy Clean cleaning wipes

Unetixs Infectious Control Keyboard Cleaning Instructions:

Lock keyboard: Hold down the lock key (1B) or both Ctrl keys (1) for 3 seconds to lock. The lock indicator signals that the keyboard is locked (1 and/or 2). Clean keyboard with approved cleaning method and approved disinfectant or soap and water. To unlock keyboard, repeat procedure.

Unetixs Infectious Control Keyboard Approved cleaning methods:

The use of the Following Cleaners are Approved to Clean the Unetixs Infectious Control Keyboard:

- SONO Wipes™
- Sani-Cloth – No Bleach

The following products are approved for cleaning keyboards:

1. To clean while the keyboard is plugged in, lock the keyboard by pressing the Locking Key for three seconds – Ergo and Roodra only.
2. Clean the surface of the product by wiping, brushing, spraying or dipping it. Use only rags, sponges or soft bristle brushes. DO NOT place the USB connector into the fluid.
3. Either wipe with dry cloth or allow to air dry.
4. Unlock the keyboard by pressing the Locking key for three seconds.

Disinfectants recommended

- Chlorine based (max 10% solution) – Chlorox, Novalsan, etc.
- Formaldehyde based - Formaldehyde Solution 37%, Vinco Formaldegen...
- Glutaraldehyde based – Aldacide 200, Lysofume, Wavicide, etc.
- Phenol based – Lysol I.C., Beaucoup, Magna Clean, Tek-Trol, etc.
- Alcohol based – Cavicide, Isopropyl Alcohol, Medicide, etc.
- Oxidizing – Hydrogen Peroxide 3% Solution, Lifeguard Series, etc.
- Quaternary Ammonium – Roccal-D, Bacto-Sep, Parvosol, etc.
- Soap and water.
- **DO NOT USE: Petroleum based cleaning fluids, such as Gasoline, Acetone, over 10% bleach solutions, temperature or pressure sterilization, buffing pads or scrubbing pads.**

Cleaning Procedure for Unetixs MultiLab and Accessories:

Manufacturer's instructions for Proper Care of Straight and Contoured Cuffs: Web: www.hokanson.cc
 Cleaning Cuffs: Removable covers on straight and contoured cuffs make cleaning easy. The cuff covers are made of Nylon and Velcro.

1. Remove the bladder then wash the cuff cover in warm water using mild soap in a washing machine on gentle cycle or by hand.
2. Open the top of the cuff cover and line dry only. When completely dry, reinsert the bladder. If bladder is contaminated, wash it in soapy water, and rinse well without getting any liquid in the bladder or tubing.

Disinfecting Cuffs:

1. Spray or wipe entire surfaces of cuff with disinfectant until wet.
2. Allow the cuff to remain visibly wet for a minimum of 10 minutes to insure complete disinfection.
3. Wipe dry with clean cloth.

The following disinfectants have been tested for compatibility with our cuffs:

Please Note: The manufacturers do not claim effective disinfection on porous surfaces; we have been unable to find any disinfectants that claim disinfection on porous surfaces.

1. Hydrogen peroxide
2. Hydrogen peroxide with silver (Sanosil®)

3. Hydrogen peroxide
4. Peroxyacetic acid, silver (Steriplex™)
5. Silver with citric acid (PureGreen24™ & SpectraSan™ 24)
6. Octyl decyl dimethyl ammonium chloride with dioctyl dimethyl ammonium chloride with didecyl dimethyl ammonium chloride with dimethyl benzyl ammonium chloride (Protex™)
7. 99% isopropyl alcohol.

Note: Some disinfectants may cause the cuff blue color to bleed into cuff labeling. This does not affect the cuff's performance.

Do not sterilize cuffs: The design of the Cuffs is such that they are not sterilizable.

Pneumatic Hose Cleaning:

Clean the hose according to hospital protocol for cleaning of reusable equipment cables. Typically this protocol consists of the following:

1. Disconnect the hose from the monitor and cuff.
2. Wipe the hose with a nonabrasive cloth moistened with a mild detergent and warm water or a disinfectant.
3. Dry thoroughly.
4. Do not use alcohol or solvents to clean the hose.
5. Do not allow the connectors to come in contact with liquids.
6. Do not fully immerse the hose in liquids.
7. Do not Autoclave, nor EtO sterilize, the hose.

Operation of the LHS Cart

- **Storage Drawer**

Accessory storage is conveniently located on the front of the cart, under the printer. Simply push down on the latch and pull. The latch will automatically re-engage when the drawer is closed.

- **Power Switch**

The main power switch is located on the front of the cart, under the drawer. Make sure the computer has been properly shut down before turning off main power.

- **Cable Storage**

An opening at the rear of the cart, at the bottom, is provided for power and network cables.

- **Casters**

The cart has 4 locking casters. When the switch is up on each caster, the cart will move in any direction. The front casters lock completely (wheel brakes and directional lock) when the switch is down; use this position when performing studies (for ERGO IDC option, lock all four casters). The rear casters only lock directionally; they do not have wheel brakes. When transporting the cart, the front wheel switches should be up and the rear wheel switches should be down.

- **Rear Access Panel**

This panel is found on the rear of the cart, near the top. Its main use is for service and maintenance functions. There are two latches holding the panel; both have to be disengaged simultaneously for the panel to be opened. Take care when removing as the whole panel comes off the cart. When replacing the panel, insert the bottom tabs first; the latches will re-engage automatically when the panel is closed.

- **Computer Access Panels**

These panels are found on the Left (front of Computer Tower) and Right (rear of Computer Tower). Their main use is for service and maintenance functions. Take care during removal as the whole panel comes off of the cart. When replacing the panel, insert the bottom tabs first; the latch will re-engage automatically when the panel is closed.

Operation of the Monitor Arm (ERGO IDC option)

The MultiLab Series II LHS provides mobility of the monitor with its arm option. Benefiting from the fully ergonomic design, the arm has 31" of horizontal range and 18" of vertical range. It allows the monitor to tilt over 200 degrees. The arm rotates 360 degrees in three joints and can be easily folded in just 3"W x 10"H x 14"L of space for transportation or rest position. The operator can raise or lower the monitor, adjust the viewing angle or rotate the monitor. The state-of-art mechanical design also makes it durable, cleanable and recyclable.

Arm Alignment (if necessary)

Follow instructions below to counterbalance the arm using the provided 7/32" or 3/32" Allen Wrenches.

1

7/32" Allen Wrench

IMPORTANT!

- Monitor must be on arm
- Arm must be in mount

Press the arm down to approximately parallel with the desk prior to turning the strength adjustment screw.

If the arm drifts upward, turn the adjustment screw clockwise.

If the arm drifts downward, turn the adjustment screw counter-clockwise.

Depending on the weight of your monitor, you may have to make 15-20 turns.

Counterbalance the Arm

2

3/32" Allen Wrench

In some instances, further counterbalance adjustments are needed to allow the arm's instant height adjustment function to work properly.

If your arm is not staying in position after performing step 1, follow these steps:

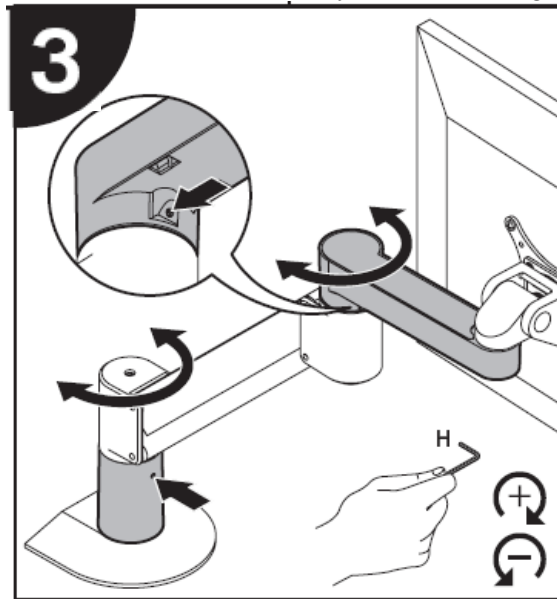
With arm in raised position, tighten set screw (A).

With arm in horizontal position, tighten set screw (B).

Do not over tighten screws.

Counterbalance the Arm

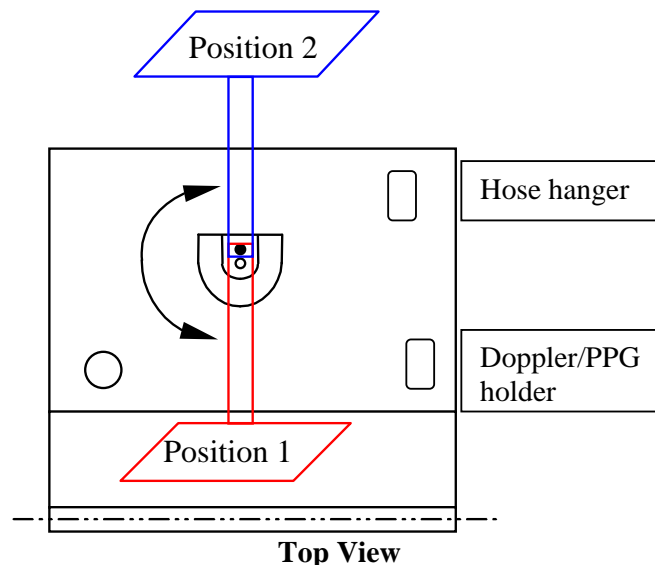
To align the arm rotation stability, adjust the arm as shown below using the provided 7/32" or 3/32" Allen Wrenches, so that the each section on the arm can move freely without drifting.



Arm rotation adjustment

Using the Arm

Your MultiLab Series II LHS will be set up so that the hose hanger and Doppler/PPG holder are located on the right side of the cart. The monitor arm is then free to move on the left half of the cart as shown. It can travel from Position 1 to Position 2 freely and stop at any position that you want in between (see below). The arm suspends the monitor weightlessly above the cart. It helps you to move the touch screen close and avoid glare on the monitor.



Top View

Since the MultiLab Series II LHS cart has four casters for its mobility, before you start your test you should lock all four casters (see previous section on LHS Cart Operation) to prevent the cart from moving while you are working with the arm. Move the caster switches down for the lock position.

The monitor arm operation is very straight forward. There are two handles on each side of the monitor for your convenience. To adjust the height, you can easily grab the handle and position the monitor up and down (see below).



Positions of the monitor

To adjust the viewing angle, you can tilt the monitor to the desired angle by holding the monitor with both handles. You can also rotate the monitor by moving the two handles and rotating the tilter.



Viewing angles

Cautions

For your safety and your patient's safety, the following instructions have to be followed during the study.

- DO NOT tip the cart more than 5 degrees in any direction at any time.
- DO NOT hang foreign articles on the monitor arm. It might tip the cart.

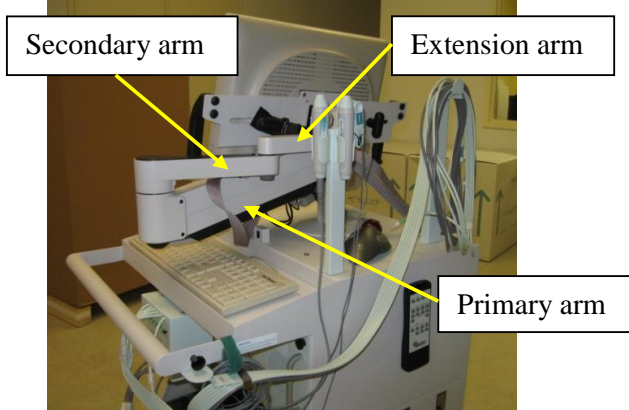
Transportation position

Follow the steps listed below to move the MultiLab Series II LHS unit from one location to another:

- Rotate the primary monitor arm counter-clockwise so that the primary arm is right in the middle of the cart front as shown below
- Adjust the position of the monitor so that the secondary arm and the extension arm rest right above the primary arm, aligning to it as shown.
- Rotate the monitor so that it stays to the left of the arm as close as possible.

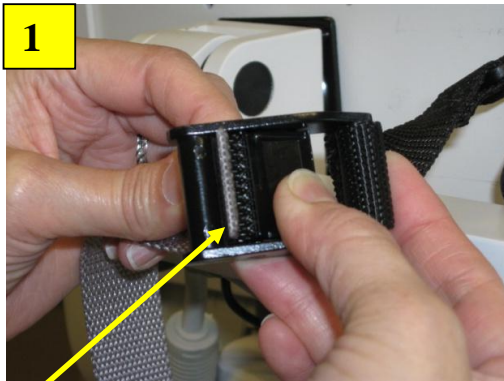


Transportation position (left view)

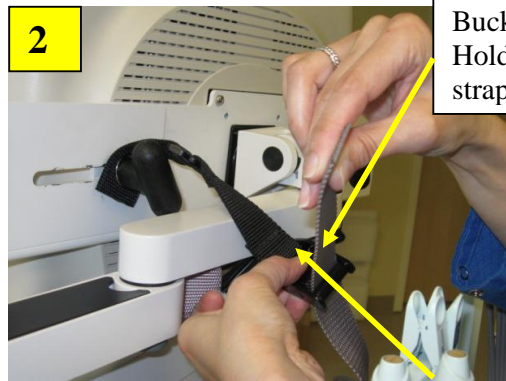


Transportation position (right view)

- Buckle the hold down strap and pull the free end tight by following the steps as shown below. This will secure the arm and prevent the monitor from moving.



1



2

Buckle & Hold-down strap

Push the latch open with one hand and lead the strap through the gap using another hand.



3

Make sure the buckle is installed so that this latch can only be pushed inward.

Pull the free end of the strap until the monitor is securely locked in place.

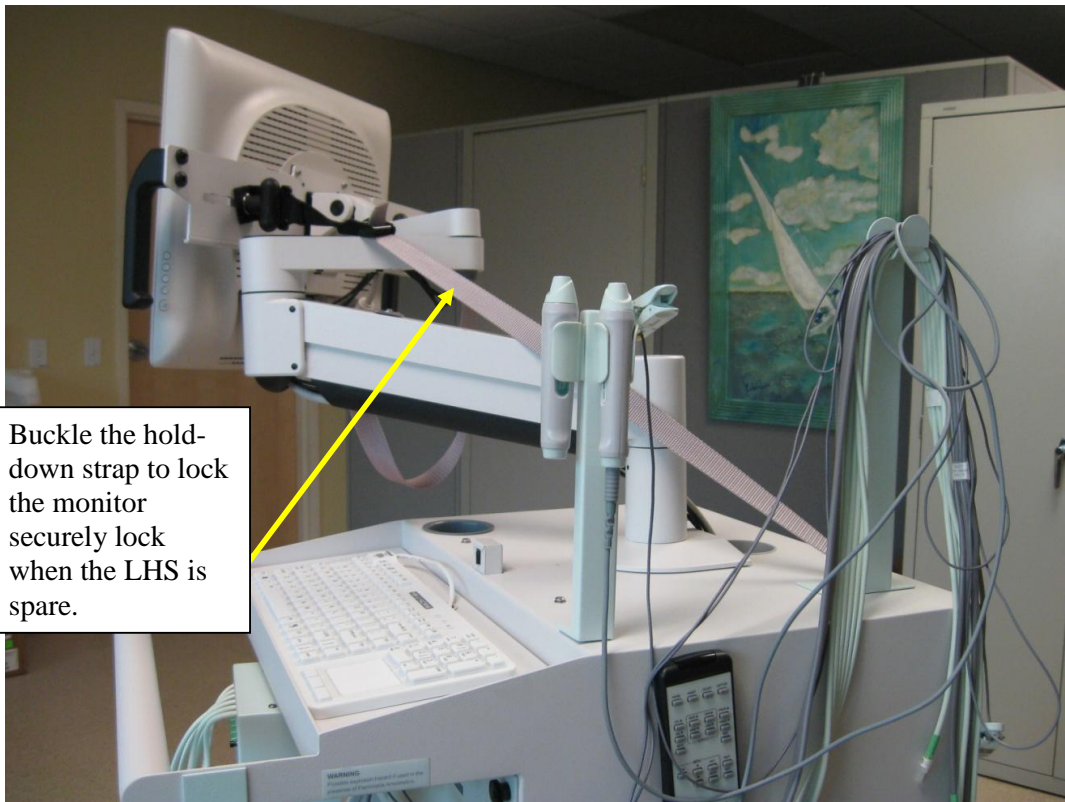


Transportation position: side view

- Unlock all four wheels.
- Push the handle to move the cart around. Watch out for bumps and obstacles.
- Cart should not be tipped more than 5 degree during transportation.
- At your destination, unbuckle the hold-down strap and lock all four wheels.

Rest/Safety position

Another usage of the buckle and hold-down strap is to keep the monitor in a secured position when the unit is not in use. The hold-down strap can be easily tied with the buckle so that the monitor is locked securely to prevent any unexpected abrupt movement.

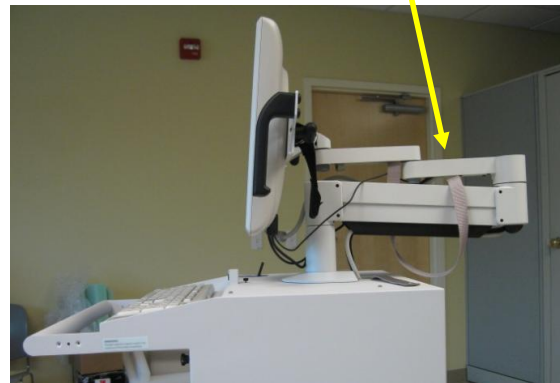


Keyboard position

While adding mobility to the monitor, the arm can still provide a center position for working on the collected data by pushing and folding the arm to the back of the monitor as shown below.



Front view



Fold the arm and push it to the back of the monitor.

Side view

Keyboard position

Using the Medical Grade Keyboard (ERGO IDC, Roodra, 2CP)

The medical grade keyboard that is installed in Ergo, Roodra, and 2CP is a waterproof and contaminant resistant keyboard with an integrated three-button touchpad mouse. The touchpad is positioned on the right side of the keyboard under the same silicon rubber housing. The sealed rigid surface is durable and moisture resistant for easy cleaning. It is also quieter than most other keyboards and mice.

There are some specially designed keys on this keyboard for the user's convenience:



Locking key: Press and hold this key for three seconds to lock the keyboard and the touchpad. Press and hold the key for three seconds to unlock the keyboard and the touchpad.



Touchpad Locking key: Press and hold this key for three seconds to lock the touchpad. Press and hold the key for three seconds to unlock the touchpad.



Cleaning Reminder Key: To set cleaning reminder, press and hold the Left Ctrl key and press Cleaning Reminder key

- 1 time for every hour reminder,
- 2 times for every 2 hours reminder,
- 3 times for every 4 hours reminder,
- 4 times for every 8 hours reminder,
- 5 times for every 12 hours reminder,
- 6 times for every 24 hours reminder,
- 7 times for every 48 hours reminder, or
- 8 times for every 1 week reminder.

The C LED light (the LED to the left of the Num Lock LED) will blink when it is time to clean the keyboard. After the keyboard is cleaned, press the Cleaning Reminder key once to stop the blinking C LED and reset the timer to the last setting.



Backlight Key: Press this key

- 1 time for 30% brightness.
- 2 times for 60% brightness.
- 3 times for full brightness.
- 4 times to turn the backlight off.

Operation of the Roodra Cart

- **Adjust Cart Height**

A foot switch is located between the front wheels. Depress the foot switch to raise or lower the All-in-One Monitor, Keyboard Shelf, and Storage Drawer. At the lowest setting, the technologist can reach the touch screen from a seated position. When transporting or at rest, the Roodra should be in the lowest possible position.



- **Storage Drawer**

Accessory storage is conveniently located on the front of the cart below vascular module shelf. Simply pull to open. There is no latch.

- **Electric Cord Management**

The top of the keyboard shelf lifts up. Underneath one can visualize the power supply and power cords for the various electrical components of the Roodra. The lid of the electrical storage area can be locked with the supplied key.

CAUTION – If the lock is utilized, do not misplace the key!

- **Pneumatic Hose Hanger**

Drrape the pneumatic hoses over the hangers found at the top of the Roodra tower.



- **Casters**

The cart has 4 brake locking casters that rotate 360 degrees. The brake is engaged by depressing the textured edge of the caster as demonstrated in the figure below:



- **Roodra Module Power Switch**

The power switch for the Roodra module is located on its back panel, next to the power cord. To turn on, simply move the switch to the “I” position. To turn off, move the switch to the “O” position.

CAUTION – If relocating the Roodra to another room, be sure to turn off the Roodra module prior to unplugging the system.



- **All-in-One Computer and Monitor Power Switch**

The power switch for the all-in-one computer and monitor can be found on the lower right corner of the front of the monitor. Touch momentarily to turn on. Press the Shutdown button from the software or use Windows™ Commands (Press Alt+F4 to open the Shut down Windows Dialog Box. Click the down arrow to choose Shut Down, touch OK)

- **All-in-One Computer and Monitor Batteries**

If the supplied batteries are utilized in the all-in-one computer and monitor, the unit will stay on should Roodra lose power or be unplugged for relocation.

CAUTION – Turn off the Roodra module prior to unplugging the system.

- **Network Cable Connection**

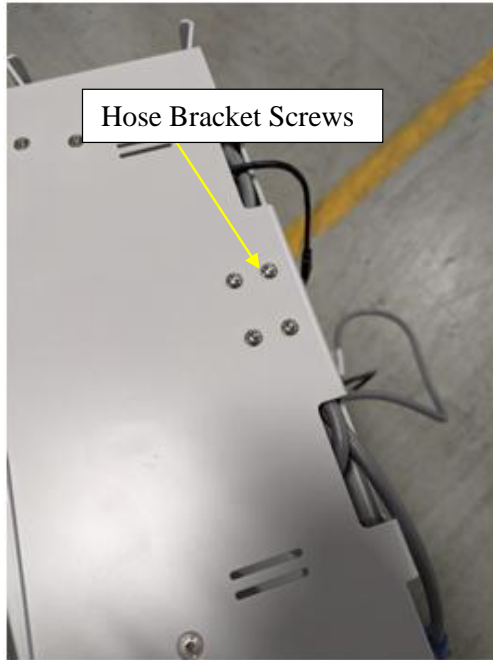
Find the network connection port on the bottom of keyboard tray, facing downward.



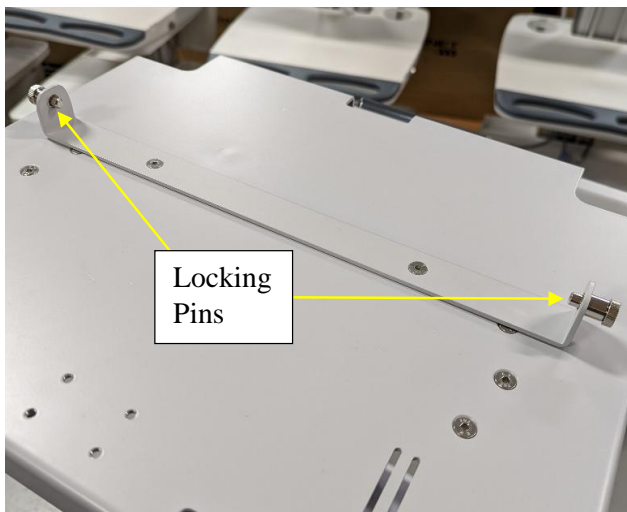
Operation of the 2CP Cart

- **Assembly**

1. Attach the hose bracket to the tabletop using the four M5 x 8 pan head screws that are attached to the tabletop already along with the Allen wrenches provided.



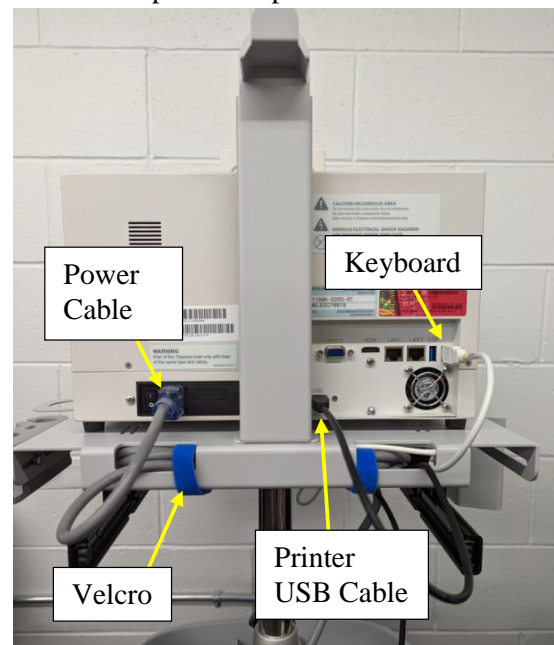
2. On the 2CP mount located on the tabletop of the cart, there are two spring loaded locking pins. Pull the pins out and place the 2CP chassis into the bracket, letting the pins slide into the mounting holes on either side of the chassis to secure it in place.



- Place the printer on the printer shelf. Connect the printer power cable and USB printer cable to the printer. Connect the other end of the printer power cable to the power strip.

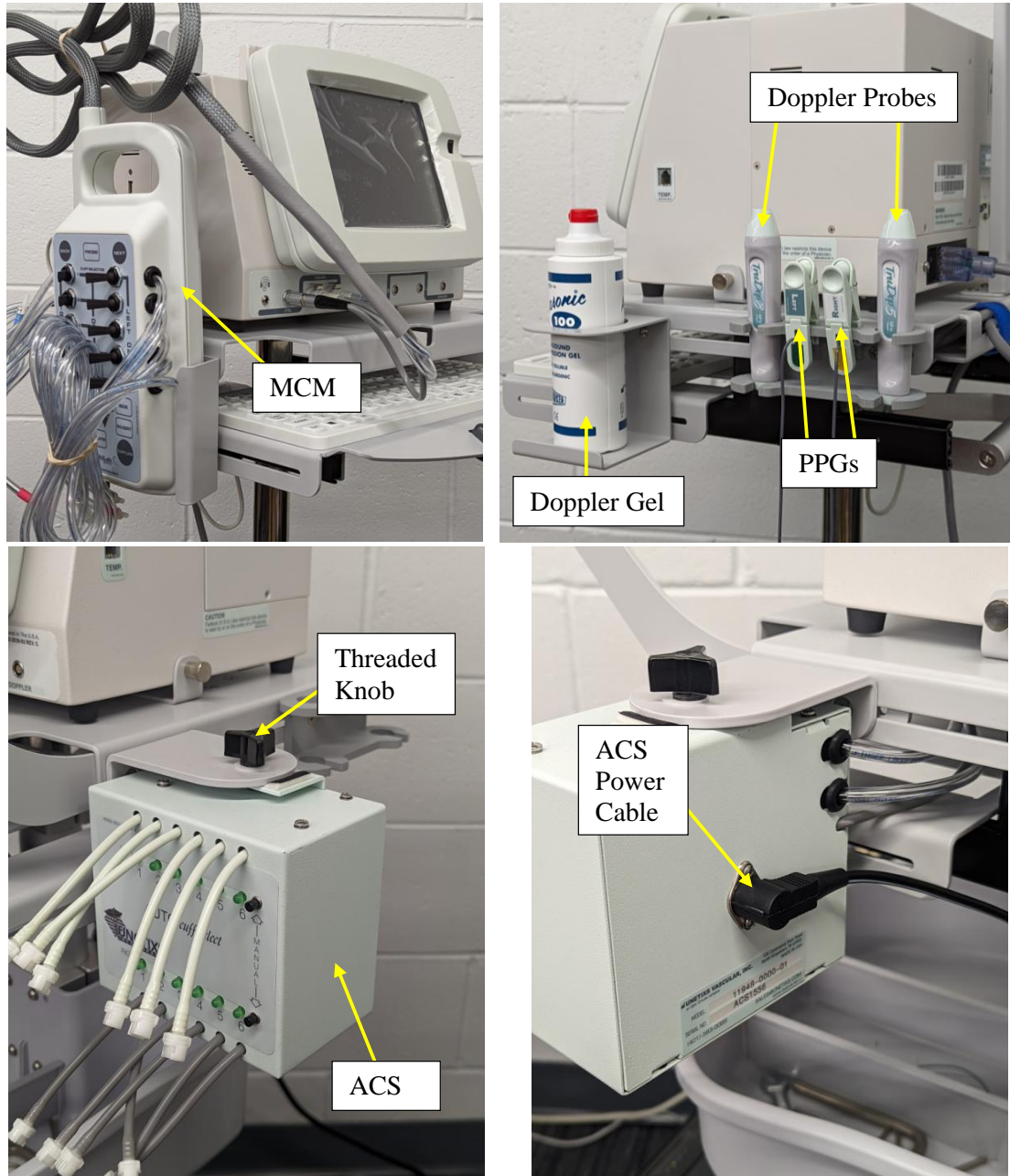


- Pull out the keyboard tray as far as it will go. Place the keyboard on the keyboard tray and run its USB cable underneath the tabletop, through the back of the tabletop and connect to the back of the chassis. Bundle the excess keyboard USB cable within the Velcro straps underneath the tabletop and return keyboard tray to its closed position. Connect the power cable and USB printer cable to the 2CP chassis. Connect the other end of the power cable to the power strip.



5. Attach the ACS, MCM, PPGs, Doppler probes, and doppler gel accessories to the cart as shown below. For the ACS, mount to the cart using the threaded knob of the ACS module and connect the ACS power cable to the rear DIN connector on the ACS.

Note: Actual accessories will vary depending on your system.



- **Usage**

- **Adjust Cart Height**

To adjust the height of the cart, loosen the height adjustment knob on the pole. The gas assisted cylinder will allow you to raise or lower the tabletop. Once you have reached the desired height, tighten the knob to hold it in place.



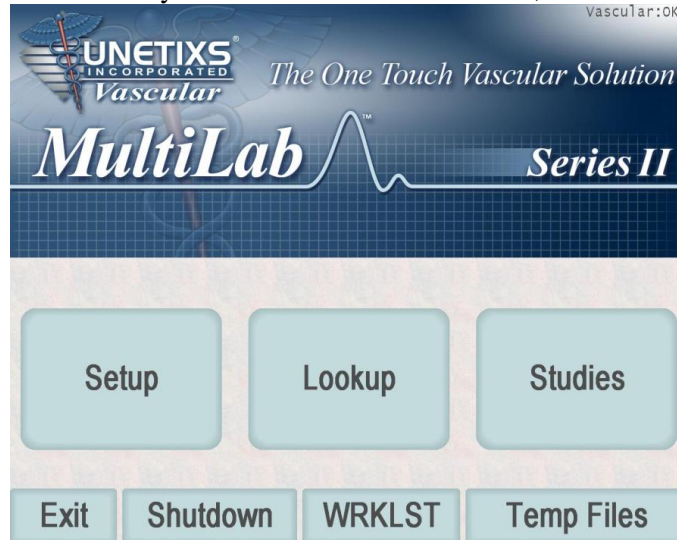
- **Casters**
The cart has 4 casters that can rotate 360 degrees. The front two casters can be locked by depressing the brake.



- **Keyboard Tray**
The keyboard tray can be pulled out for more convenient access to the keyboard. When the tray is pulled out all the way in an extended position, it will lock in place. To return to a closed position, pushing with a small amount of force will allow the tray to move again. It will lock in place again in the retracted position.
- **Transportation/Resting Position**
When the cart is at rest or in transportation the height should be set to the lowest possible position, the keyboard tray should be locked in the closed position, the chassis should be secured in its mount, and there are no loose cables dangling. Also, when at rest the front casters should be in the locked position.

CHAPTER 2: START SCREEN FUNCTIONS

The MultiLab Series II is shipped ready to be used. Now that the system has been unpacked, assembled and plugged in, turn it on. On the MultiLab Series II-LHS, the power switch is located beneath the storage drawer in the bottom of the system cart. This switch will activate ALL electrical aspects of the MultiLab, including the printer. On the MultiLab Series II-P models, the power switch is located on the rear panel next to the power cord input. Once powered up, the first screen you see will be the Start Screen, as shown below:



Please note that the system can be controlled via the touch-sensitive video screen, the keyboard, or the remote control unit. The Start screen displays the following options:

- SETUP** Allows the user to go into the system to change factory presets, perform diagnosis and calibration of the system, configure custom exam protocols, etc.
- LOOKUP** Allows the user to access any patient studies archived on the Hard Disk Drive. **Note:** the name of this button is defined in the System Setup
- STUDIES** Allows the user access to the various vascular tests to be performed.
- TEMP. FILES** Allows user to access patient studies that have been performed, but not yet been archived to the Hard Disk Drive. (NOTE: if you suffer a power outage or interruption during patient testing, press this button after power resumes to access and resume the study in progress.)
- WRKLIST** Activates DICOM worklist query. This requires our optional DICOM software. **Note:** the name of this button is defined in the System Setup.
- SHUTDOWN** Exits the MultiLab software and signals the Operating System to shut down.
- EXIT** Allows user to exit MultiLab Software.

The following are optional replacements to the exit button (see System Setup)

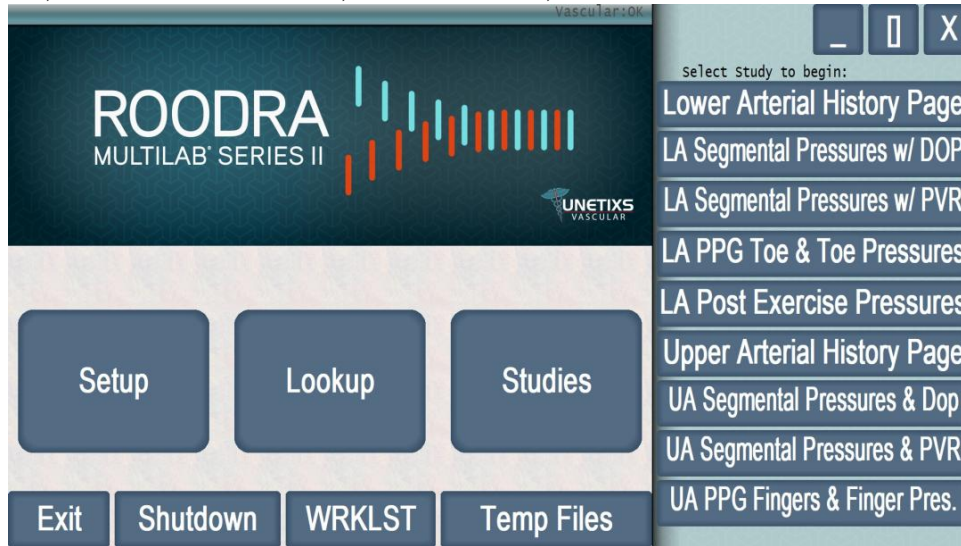
- EXIT TO WINDOWS** (For Windows™ Operating System) Allows user to exit MultiLab Software.
- CONTRAST UP & DOWN** (NOT functional on color screen models) Allows user to adjust visibility of the monochrome LCD screen to compensate for room lighting conditions.

Roodra Interactive Live Reporter (ILR)

Some MultiLab systems utilize a wide screen format, allowing more information and functionality on screen. Throughout the software on Roodra the left hand portion (2/3) of the screen will contain all MultiLab functions.

The right hand portion (1/3) of the screen contains the Interactive Live Reporter or ILR. Here we will discuss the start screen and the most common ILR buttons, other buttons will be discussed later in the manual.

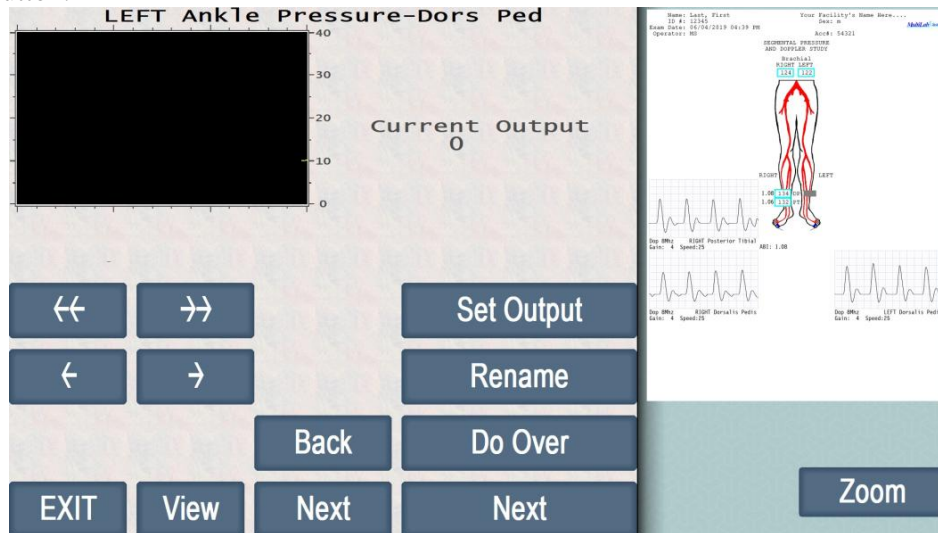
On the Start Screen, the ILR can be blank or, as shown below, can contain short cuts to studies:



The user may access all of the functions detailed above or go straight into a study. The buttons in the upper right corner will minimize the application (-), Restore the application (□), or Close the application (X).

ILR View

During an exam, the ILR can display the report as it is generated (see below); if the report is not shown, simply press the View button:



ILR Zoom

The ILR's Zoom button doubles the size of the report. The default zoom is to show the upper center of the report, where the pressures are shown, but simple press Zoom again to return to a full page view. When in the zoomed mode, you may change the focus by dragging, with the mouse or touch screen, on the report image itself; note that the focus will be remembered even if you change screens.

ILR Copy

When not performing an exam, the report can still be viewed. In these instances a Copy button will be provided instead of Zoom. The Copy button places a copy of the report onto the Windows™ clipboard (24-bit color, 2400x3150 pixels).

ILR Controls

During an exam, for some modalities, the Controls button will allow for following parameters to be modified:

- Speed:** Adjusts the waveform sweep speed up ↑ or down ↓.
- Inflate to:** Adjusts the target inflation, for automatic inflation, up ↑ or down ↓.
- Defl. rate:** Adjusts the deflation rate, for automatic deflation, up ↑ (faster) or down ↓ (slower).

Note: Not that the parameters provided are dependent on the active modality for the exam.

Importing Patient Information (DICOM Worklist)

If you have the DICOM option on your system, you can use DICOM modality worklist to import patient information. Pressing the WRKLST button from the start screen will bring up the query screen:

NAME	I.D.	Perform Procedure
Cool^Joe	SIMPLEDICOM00000216	do pvr waveforms

Requested Procedure Priority: ROUTINE
 Requested Procedure ID: PROCSIMPLEDI0217
 Modality: US
 Scheduled Station AE Title: UNETIXS
 Scheduled Procedure Step Start Date: 6/27/2018
 Scheduled Procedure Step Start Time: 5:07:00 PM
 Scheduled Procedure Step Descriptio: do pvr waveforms
 Scheduled Procedure Step ID: PSTEPSIMPLED0218
 Scheduled Station Name: UNETIXS
 Scheduled Procedure Step Location: unetixs
 Requested Procedure Description: PVR waveforms
 Pregnancy Status: 4
 Patient's Sex: M
 Patient's Birth Date: 4/4/1944
 Patient ID: SIMPLEDICOM00000216
 Patient's Name: Cool^Joe
 Accession Number: ACNRSIMPLEDI0220

Name	I.D.	TODAY
↑	Info	UNETIXS DICOM
↓	Select	Cancel

The query buttons shown, for Name, ID, and TODAY, are configurable. To query for patient data, press one of the query buttons. **Note:** as shown above, one of the query buttons may be configured to happen automatically. Highlight the desired patient using the Up and Down Arrow buttons. Use the Info button if you need to see more information about the highlighted patient. Press Cancel to exit the query with no patient selected. Use the Select button to choose the highlighted patient.

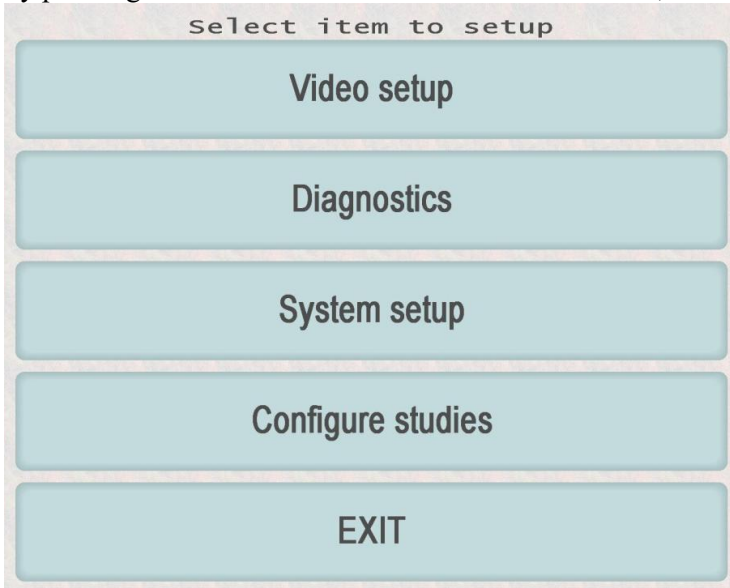
The selected patient will be shown on the start screen above the Lookup and Studies buttons. If you press Lookup, the selected patient will be searched for. If you press Studies, a study will be created using the information for the selected patient. To remove the selected patient, simply press the Temp. Files button followed by the Exit button.

Worklist ILR

The ILR will display the information for the highlighted patient, the same as the Info button. If the information does not fit on a single screen, a More button will be provided. Press the More button again to return to the initial information.

CHAPTER 3: SETUP FUNCTIONS

By pressing the “**SETUP**” button from the Start Screen, the following options become available:



CAUTION – There are areas within the **SETUP** menu which if accessed improperly, can decrease the performance of the instrument or cause it to stop working entirely. Only proceed in this portion of the program with factory assistance, or after thoroughly reading the operation of the functions listed below:

Note: There is no ILR function within Setup.

- VIDEO SETUP** Allows user to calibrate the touch sensitive screen (will not normally need to be accessed).
- DIAGNOSTICS** Allows user to access the Diagnostic and Calibration section of the instrument (do NOT access without consulting with Unetixs Service Technician)
- SYSTEM SETUP** Allows user to access common system functions, such as changing date and time, data backup and printer utilities.
- CONFIGURE STUDIES** Allows user to access the MultiLab custom study configuration editor to modify factory default studies or to create new unique studies.
- EXIT** Returns user to the MultiLab Start Menu.

Video Setup



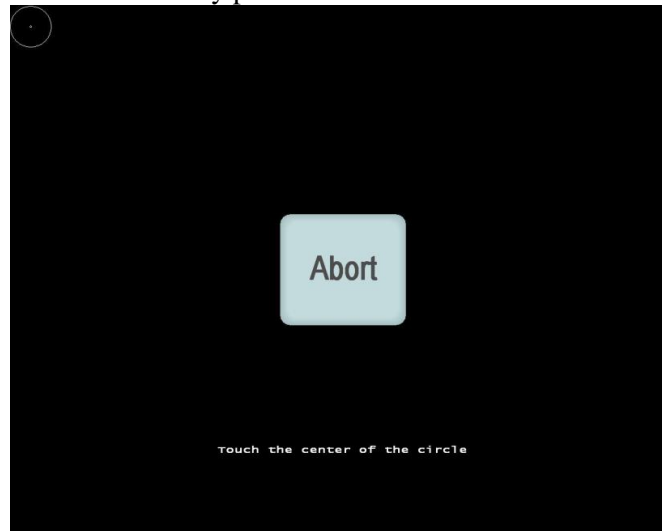
By pressing the “**VIDEO SETUP**” (or “**V**” key on the system keyboard) button on the touch-screen, the following options become available:

- Calibrate TOUCH
- EXIT

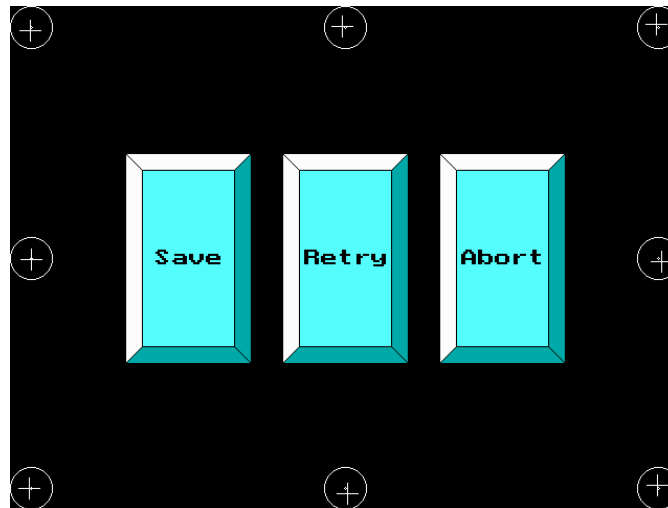
NOTE: If your system is functioning properly, do not re-calibrate the touch screen.

NOTE: Newer systems use a Windows™ touch driver to communicate with the touch screen. To calibrate these systems, exit the program from the start screen, and go to the control panel in Windows™. From there, select Touch screen and then press the Align button.

By pressing the “**Calibrate TOUCH**” button (or by pressing the “T” key on the system keyboard) the user can re-calibrate the touch screen should an unlikely problem occur:



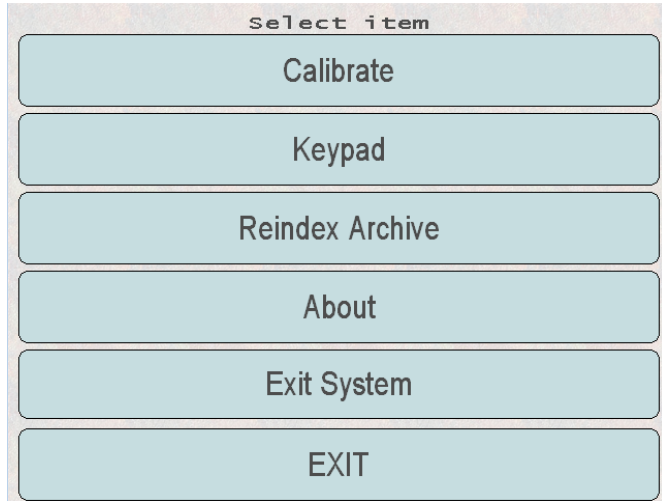
After pressing the Calibrate button you will see the above screen. Notice the circle in the upper left-hand corner. Touch it and another will appear. Keep touching the circles as they appear so the calibration of the touch capability will be complete. The following screen is a representation of all of the locations you will touch during this process.



If during this process you make a mistake you can select the retry button to retouch that location. You can also save your calibration when finished by pressing the save button (or “S” key on the system keyboard). If at any time you wish to quit this process press the Abort button. Once you press the save button you will return to the setup menu screen and then can continue with the setup of additional items in the system.

Diagnostics

If the **Diagnostics** option is selected from the **Setup** menu you will see the following screen.

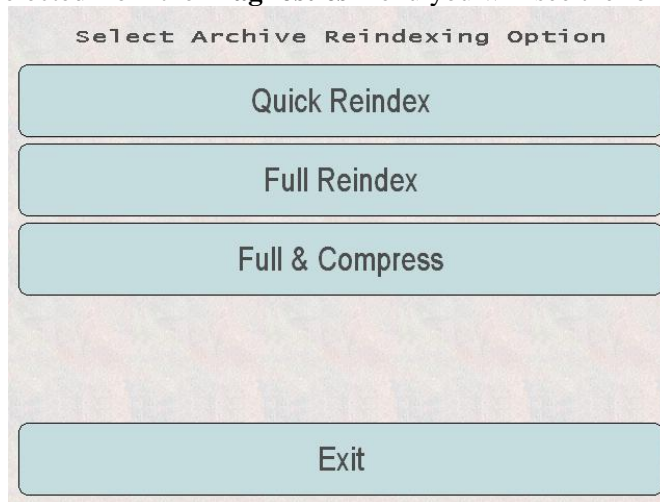


CAUTION: The “Calibrate” features on this screen should be used only while on the phone with a factory customer service representative. If for any reason you feel the unit is not functioning properly, first call the Unetixs Customer Service department before you enter this portion of the software program, as potential for misalignment of instrument is possible without proper supervision.

- KEYPAD** Allows the user to test the remote control keypad (see chapter 7).
- REINDEX ARCHIVE** Allows the user to check, rebuild, or compress the Archive database.
- ABOUT** Shows the software version, company name, address, and phone number. Remote Help can be accessed here. Reply “Yes” when asked for permission. A password is not required; just touch Connect (only if asked by Unetixs service).
- EXIT SYSTEM** Exits the MultiLab software (completely) and returns to the operating system.
- EXIT** Returns to the setup functions screen.

Reindex Archive

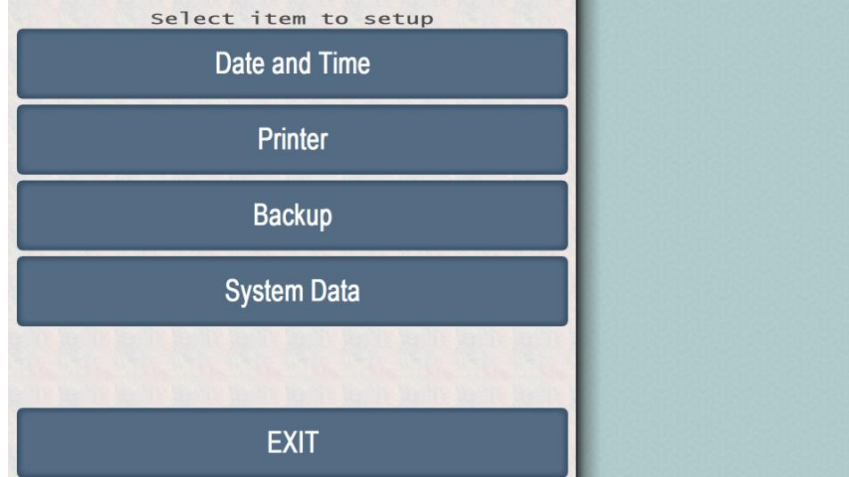
The archive is a collection of report pages where each page is a separate file in ascending order. A database is used to greatly increase the speed of all archive functions. A Maximum of 50000 pages can be stored. If the **Reindex Archive** option is selected from the **Diagnostics** menu you will see the following screen:



- QUICK REINDEX** Checks all entries in the database and repairs only those that have a problem.
- FULL REINDEX** Completely rebuild the database.
- FULL & COMPRESS** Renummer the ascending files in the archive so that there are no gaps, and then completely rebuild the database.
- EXIT** Returns to the Diagnostics Menu.

System Setup

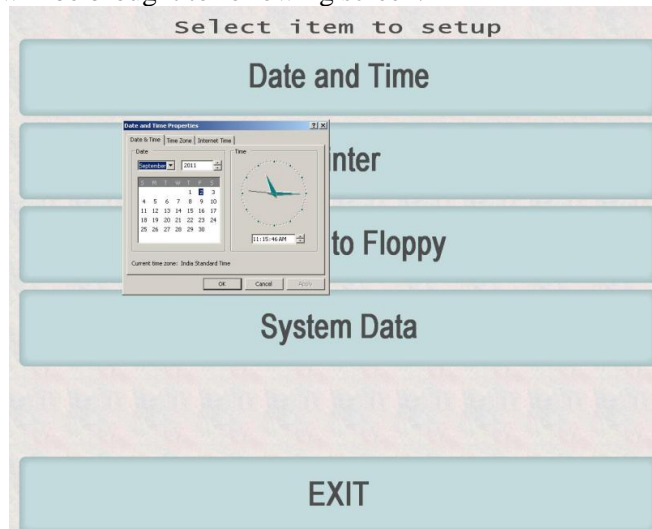
If the system setup option is selected you will see the following screen:



- DATE and TIME** Allows the user to adjust the system for different time zones or to allow compensation for Daylight Savings Time changes.
- PRINTER** Allows user to access the printer troubleshooting utility.
- BACKUP** Allows user to access the back-up utility to save patient files or custom studies to 3 ½" floppy disks or USB Memory sticks.
- SYSTEM DATA** Allows user to access various internal hardware and software settings for the instrument.
- EXIT** Returns user to basic SETUP menu.

Changing Date and Time

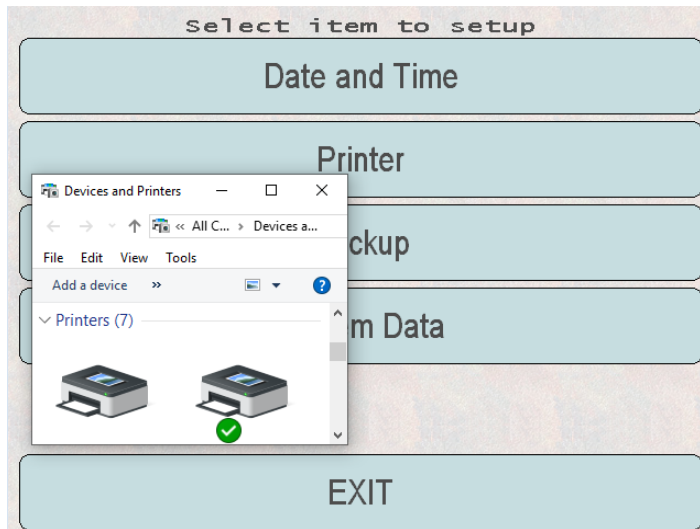
If you chose this option you will be brought to following screen:



Enter the date and time into the control panel, and then press 'OK'.

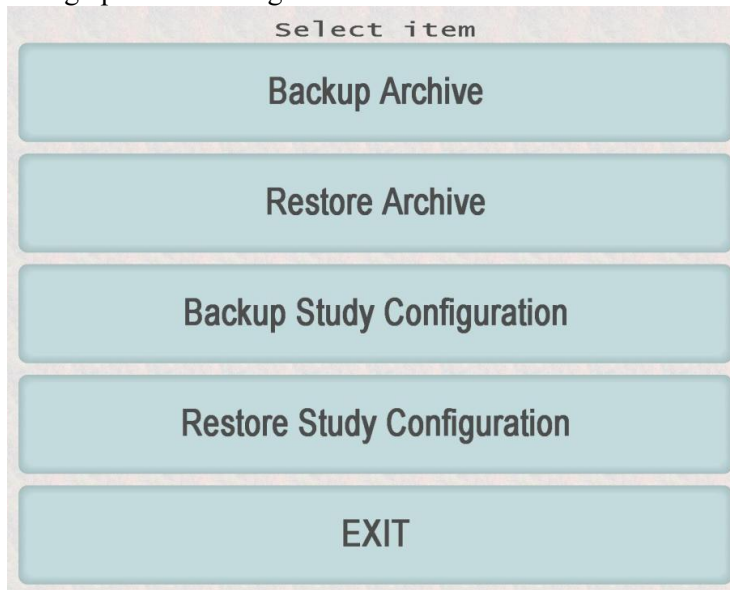
Printer Utility

NOTE: As Hewlett Packard™ frequently changes printer models and characteristics, the printer utilities are different as well. If your printer does not seem to be working properly, contact Unetixs Customer Service and identify the model of printer that came with your instrument.



Backing Up

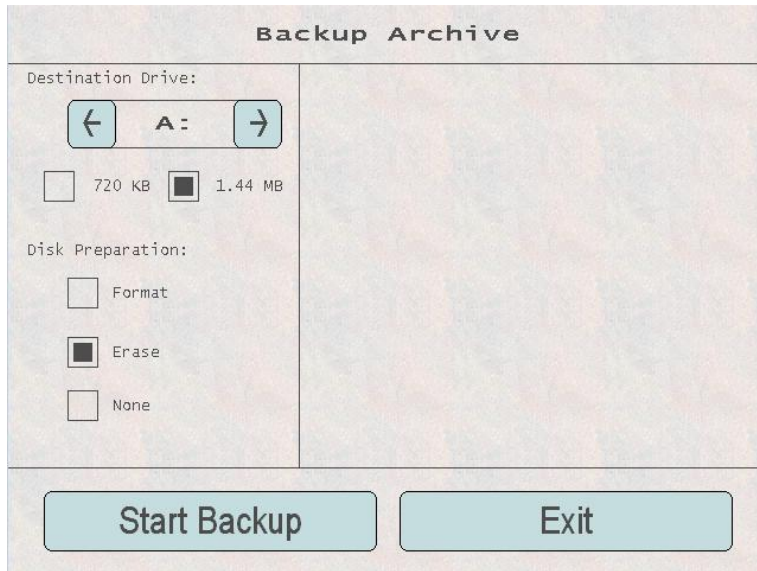
Touching “**Back UP**” will bring up the following screen:



- | | |
|------------------------------------|--|
| BACKUP ARCHIVE | Backs up the archive of all your patient studies |
| RESTORE ARCHIVE | Restores previously backed up patient studies. |
| BACKUP STUDY CONFIGURATION | Backs up the studies you have custom configured. |
| RESTORE STUDY CONFIGURATION | Restores your backed up configurations. |
| EXIT | Exits this screen to the previous one. |

Backing up Patient Studies

Touching 'Backup Archive', then 'Yes', will bring up the following screen:



To back up to floppy, set the destination drive to A or B, the size of the floppy, and then specify the disk preparation. If you have attached an external drive, such as a USB thumb drive, you may specify that drive's letter; no disk preparation is allowed for external drives. Press Start Backup to begin and follow any on-screen instructions.

When backing up to floppy, the filename on the floppy will be S2ARCBK.ZIP. When backing up to an external drive, the filename will start with UTX_0001.ZIP and count upwards from there.

Restoring Patient Studies

Touching 'Restore Archive', then 'Yes', will bring up the following screen:



Select the source drive and press Start Restore. Insert a disk into the source drive and press Continue. Press 'OK' on the reminder to reindex the archive when the restore is complete.

Overwrite Existing files are replaced by the files from the restore source.

Append Add the files from the restore source to the end of the Archive (files will be renamed).

Skip Existing archive file is kept and the restore source file is ignored.

Continue to follow the onscreen instructions until all source files are complete. For files on an external drive, each UTX_xxx.ZIP file is considered to be a separate disk. Press Cancel and then Exit when all disks are complete.

Backup Study Configuration

Touch "Backup Study Configuration" on screen. Insert a blank Floppy Disk or USB memory device into the drive bay; the system will erase the floppy if it is not blank. Press the "Y" key on the keyboard when prompted if you wish to continue. NOTE: it is a very good idea to make a backup Study Configuration Disk after the instrument has been customized to your specifications. If you have 2 or more MultiLab instruments, you only need to custom configure your studies on one system, and using the Backup and Restore Study Configuration utility, enable all systems to run the exact same programs.

Newer windows systems can also back up to external drives. If no floppy disk is found, then the system will switch to backing up to the first compatible external drive found.

The software creates a file call S2STYBK.ZIP on the root of the destination drive.

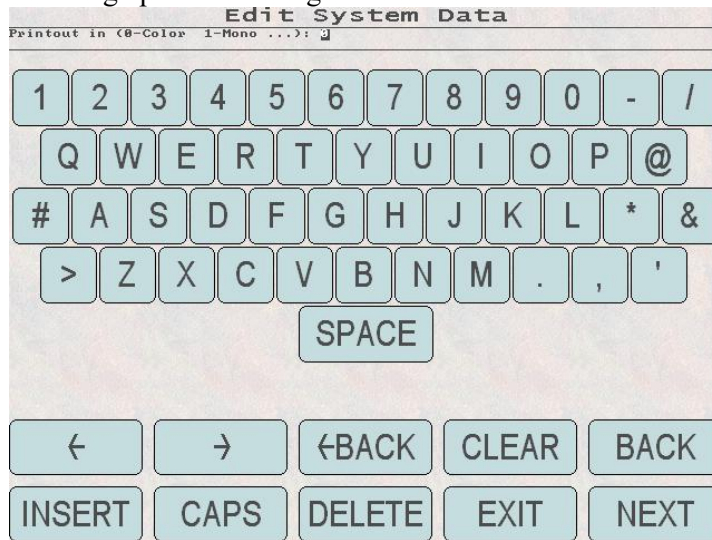
Restore Study Configuration

Press the “Restore Study Configuration” button on touch screen. Insert the desired Backup Study Configuration disk into the Floppy Disk Drive. Press the “Y” key on the keyboard when prompted to complete study restoration. Note: You may get a “file exists, do you want to overwrite it?” warning. Press “Yes” or “All” as a response.

Newer windows systems can also restore from removable USB drives. The floppy drive must be empty before the software will try to use an external drive. The software will use the first USB drive it finds.

System Data

Touching “System Data” will bring up the following screen:



Use the NEXT and BACK buttons to select an item. Use the EXIT button to return to the setup menu. The other buttons affect the currently selected item. The first item shown above affects the default output to the printer.

Pressing the NEXT button brings up the following item, which affects the output to the display when viewing reports:



Adding a value of two (+2) will change the default zoom when viewing reports.

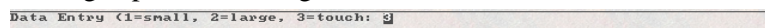
CAUTION: Changing data from this point onward may result in decreased performance of the instrument, or failure to operate at all. Do not continue unless advised by Unetixs service personnel.

Pressing the NEXT button brings up the following item, which controls the printer:

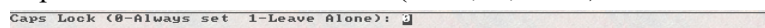


This is the name of the printer to print to (**Note:** for network printers use the network URL instead). The software will print directly to older compatible DeskJet™ and LaserJet™ printers; to print to all other printers, place a ‘+’ symbol as the first character as shown above. If no printer name is specified, as shown above, then the Windows™ default printer is used. A ‘-’ character disables printing.

Pressing the NEXT button brings up the following item, which affects the screen when entering text data:



Pressing the NEXT button brings up the following item, which affects the CAPS LOCK keyboard option. This action is taken right before patient information is entered (name, id, etc...).



Pressing the NEXT button brings up the following item, which affects exit options on the Start Screen. The 'P' option shows contrast buttons for monochrome LCD displays, the 'CP' option shows nothing, the 'Exit' option shows just an exit button, the 'Windows' option shows an exit to windows button and the 'Shutdown' option shows both exit & shutdown.

```
Start Menu (0=P,1=CP,2=EXIT,3=WINDOWS,4=SHUTDOWN):
```

Pressing the NEXT button brings up the following item, which inputs the hardware address of the RS232 touch.

```
Touch Port:
```

Pressing the NEXT button brings up the following item, which inputs the interrupt address of the RS232 touch.

```
Touch IRQ:
```

Pressing the NEXT button brings up the following item, which inputs the type of touch screen.

```
Touch Type (0=DYNAPRO 1=ELOTOUCH ...):
```

A value of 2 will open to a window instead of full screen, but the RS232 touch will be disabled. A value of 3 will start full screen but disable the R232 touch; this option will be used if a windows driver handles the touch screen. Adding four (+4) to the value will attempt to double the screen resolution, used by the software, to 1280 by 960 pixels (if the hardware is capable). Adding eight (+8) to the value will double the resolution but use as much vertical resolution as possible (usually up to 1280 by 1024 pixels). Adding twelve (+12) to the value will double the resolution, but use as much vertical resolution as possible while allowing the taskbar to remain visible (the taskbar must be arranged to be at the bottom of the desktop). Note: only one of the additive (+) options can be used.

Pressing the NEXT button brings up the following item, which inputs the type of digital I/O.

```
DIO type (0=port 1=LPT 2=SUSI 3=Sport):
```

Pressing the NEXT button brings up the following item, which inputs the hardware address of digital output.

```
DIO OUT Port:
```

Pressing the NEXT button brings up the following item, which inputs the hardware address of digital input.

```
DIO IN Port:
```

Pressing the NEXT button brings up the following item, which inputs the hardware address of the vascular.

```
Vascular Port:
```

Pressing the NEXT button brings up the following item, which inputs the interrupt address of the vascular.

```
Vascular IRQ:
```

Pressing the NEXT button brings up the following item, which enables the IR remote.

```
IR Remote Enabled (0-No, 1-Serial, 2-Module):
```

Pressing the NEXT button brings up the following item, which inputs the hardware address of the IR remote.

```
IR Remote Port:
```

Pressing the NEXT button brings up the following item, which inputs the interrupt address of the IR remote.

```
IR Remote IRQ:
```

Pressing the NEXT button brings up the following item, which enables the Automatic Cuff Selector (disabling the remote control cuff selector (see chapter 7). A value of 2 may be used if DIO is not needed.

```
AUTO cuff select (1=Yes, 0=No ...):
```

Pressing the NEXT button brings up the following item, which sets the initial operating system command.

```
Initial Run:
```

Pressing the NEXT button brings up the following item, which sets the operating system shutdown command.

```
Shut Down Run: shutdown -u -f
```

Pressing the NEXT button brings up the following item, which sets the type of vascular. Check your module's serial number, if it ends in a letter then set this appropriately. **Note:** use 3 for Roodra.

```
Vascular Module (0-No,1-Nor.,2-B,3-S,4-DL,5-S3):
```

Pressing the NEXT button brings up the following item, which sets the vascular supports for spectral Doppler.

Spectral Module Present (1-Yes, 0-No): 1

Pressing the NEXT button brings up the following item, which activates the spectral probe's mute switch.

Spectral Mute Switch (1-Active, 0-No): 1

Pressing the NEXT button brings up the following item, which sets the button color (0-normal, 1-Blue).

Button Color (0-Normal): 1

Pressing the NEXT button brings up the following item, which sets the main archive location. If you wish to disable the archive, just make the first character a '\ ' (as in \C:\ARCHIVE\).

Archive Path 1: \C:\ARCHIVE\

Pressing the NEXT button brings up the following item, which sets the file extension of the main archive.

Archive Ext. 1: .jtx

Pressing the NEXT button brings up the following item, which sets the secondary archive location.

Archive Path 2:

Pressing the NEXT button brings up the following item, which sets the file extension of the secondary archive.

Archive Ext. 2: .JTX

Pressing the NEXT button brings up the following item, which sets the text of the export button (6 char. max).

Export Button: Export

Pressing the NEXT button brings up the following item, which sets the first export control program.

Exp. Control 1: C:\programs\dicom

Pressing the NEXT button brings up the following item, which sets the first path to export to.

Export Path 1: \dcodata\

Pressing the NEXT button brings up the following item, which sets options for the first export.

Export Code 1: 129

Pressing the NEXT button brings up the following item, which sets the name for the first export.

Export Name 1: DICOM

Pressing the NEXT button brings up the following item, which sets the second export control program.

Exp. Control 2: \programs\unetpdf

Pressing the NEXT button brings up the following item, which sets the second path to export to.

Export Path 2: \Users\Multilab\Desktop\PDF\

Pressing the NEXT button brings up the following item, which sets options for the second export.

Export Code 2: 192

Pressing the NEXT button brings up the following item, which sets the name for the second export.

Export Name 2: PDF File

Pressing the NEXT button brings up the following item, which sets the import control program.

Import Control: \programs\dicomul

Pressing the NEXT button brings up the following item, which sets the import destination path.

Import Path: \import\

Pressing the NEXT button brings up the following item, which sets options for the import.

Import Code: 131

Pressing the NEXT button brings up the following item, which sets the text of the import button (6 char. max).

Import Button: JKRLST

Pressing the NEXT button brings up the following item, which sets the title of the third import field (after name and I.D.).

Import Text: Perform Procedure

Pressing the NEXT button brings up the following item, which sets the type of waveform scroll.

Waveform type (0-Scroll, 1-Line): 1

Pressing the NEXT button brings up the following item, which sets the new study button's text (10 char. max).

New Study Button: New Study

Pressing the NEXT button brings up the following item, which sets the lookup button's text (10 char. max)

Lookup Button: Lookup

Pressing the NEXT button brings up the following item, which sets the delay before manual inflation.

Inflate Delay: 20

Pressing the NEXT button brings up the following item, which sets the delay before manual deflation.

Deflate Delay: 20

Pressing the NEXT button brings up the following item, which inputs the right blood pressure offset.

Right BP Offset: 5

Pressing the NEXT button brings up the following item, which inputs the right blood pressure span.

Right BP Span: 30

Pressing the NEXT button brings up the following item, which inputs the left blood pressure offset.

Left BP Offset: 5

Pressing the NEXT button brings up the following item, which inputs the left blood pressure span.

Left BP Span: 30

Configure Studies

Due to the highly technical nature of study configuration, newer versions of the software have password protected this option. Contact Unetix customer support if you feel you need to access this feature. This should only be performed by trained personnel.

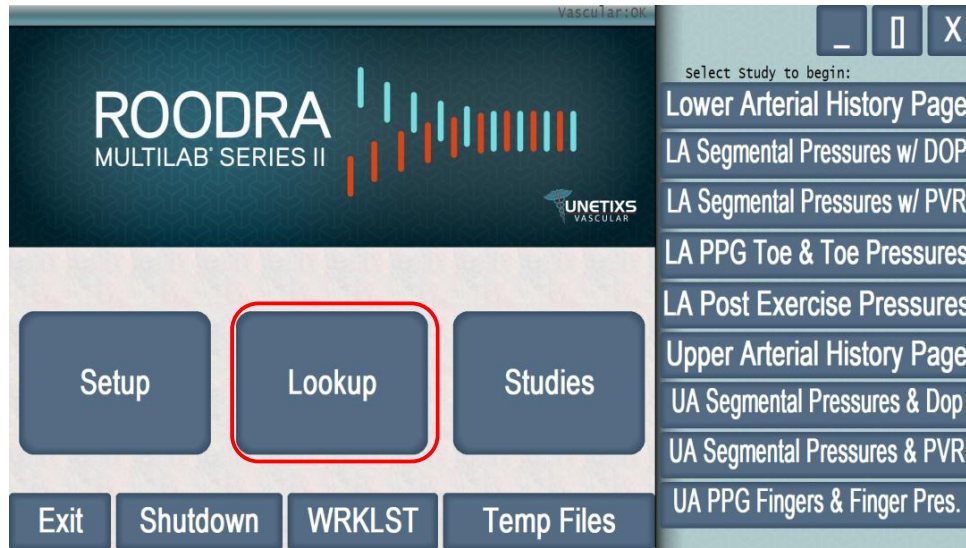
Since there are so many variables in the types of vascular studies that are performed, the order in which they are performed, and a multitude of personal preferences in the field of Physiologic Vascular Testing, the MultiLab Series II instruments have been designed to give unparalleled flexibility in customizing the MultiLab to each facility or even to each individual within the facility. See CHAPTER 11: CONFIGURING STUDIES.

Some of the more popular items that can be customized are: Inflation targets, which can be preset for each site (e.g. the Ankle site can be preset to inflate to 150 mmHg, while the calf can be set for 160 mmHg, Thigh – 175 etc. Deflation Rate – there are 40 different bleed rates for the pressure cuffs, adjustable in 1/8th mm per second intervals. Sequencing order, some prefer to do waveforms first, and then finish with Segmental Pressures. Others prefer the opposite. Some like to start at the thigh and work down the leg, others like to start at the ankle and move up. Wherever you like to start, and whatever order you like to proceed, the MultiLab can be configured exactly to your liking, even down to how you like your finished printed report to look.

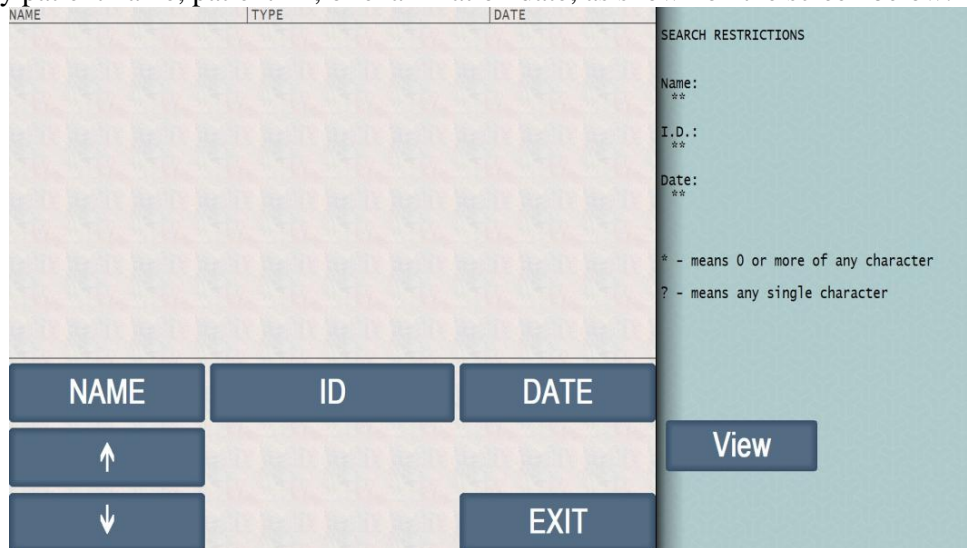
Since there are so many variables that can be modified, Configuring Studies merits a separate chapter of its own. Don't let the number of choices worry you, however, the MultiLab instruments come pre-loaded with a number of commonly performed standard vascular procedures.

The configuration utility does work with a touchscreen or mouse. On some screens an on-screen keyboard will be automatically displayed, but on others you must activate the onscreen keyboard by clicking the '⌨' in the upper right hand corner. If keyboard help exists, at the bottom of a screen, those fields can be clicked on directly to perform those functions. Text fields can be directly clicked into. Number fields can be changed by dragging left (-1), right (+1), up (+10), or down (-10). Selection fields can be changed by dragging left or right.

CHAPTER 4: LOOKUP FUNCTIONS



The Lookup Function allows you to access patient reports that have been archived to the MultiLab hard disk drive. These files can be accessed at any time by pressing the “**Lookup**” button from the Start screen. You may get the error message “database missing: reindex for speed”; either continue as normal, or from the Start screen press setup, then diagnostics, then reindex archive, then finally full & compress. You can then look up archived patient reports by patient name, patient ID, or examination date; as shown on the screen below:



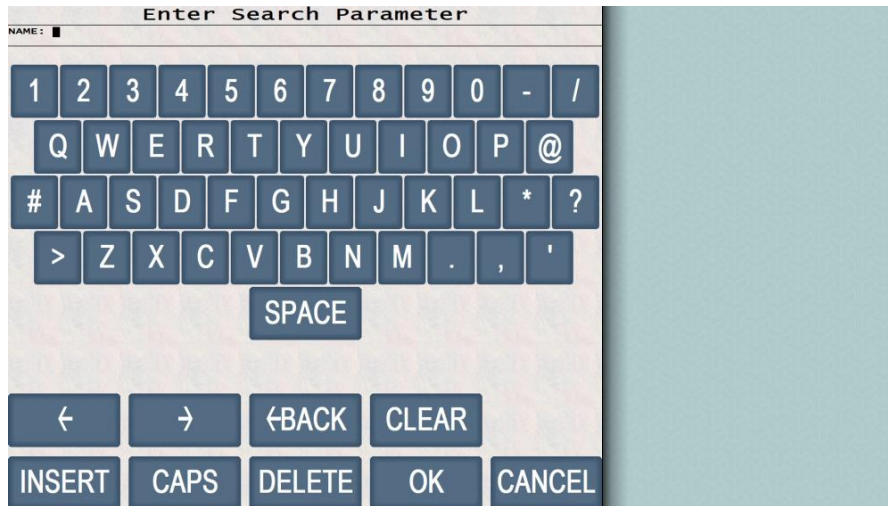
Lookup ILR

For the Lookup screen, the ILR can show the search restrictions entered. This is important since each search uses all three parameters, name, ID, and date, as restrictions to the patients found in the lookup. To view a highlighted patient report, simply press the View button and the ILR will display the report instead. To return from the report view, simply press the Clear button.

Lookup Example

For example, pressing the “NAME” button from the previous screen will prompt you to type in the patient name, as shown below. You can use the keyboard or the onscreen touch keyboard to enter this information. If you press the ENTER key on your keyboard or the “OK” button on the touch screen without entering in any name information, the MultiLab will display the first 100 archived patient reports.

It is not necessary to enter the full patient name. For example, to search for “Washington” simply type “wash” or “ingt” and the MultiLab will display any patient records that have those four letters in that order.

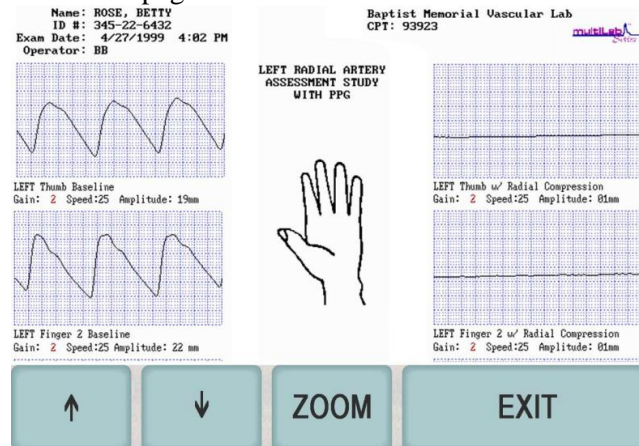


Once the patient's names are displayed (as shown below) you can select a patient by using the up or down arrow keys to highlight the desired patient report. You can then view, print, or delete the patient's report by pressing the appropriate button.

NAME	TYPE	DATE
VANAN	LA Segmental Pressures w/ PVR	09/02/2011 12:16 PM
VANAN	LA PPG Toe & Toe Pressures	09/02/2011 03:04 PM

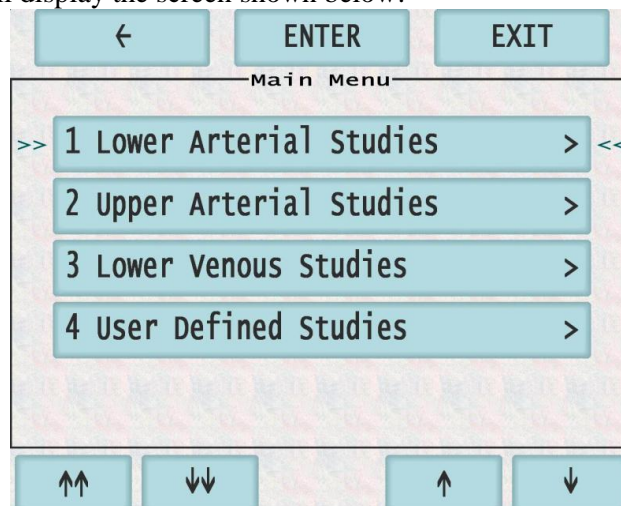
View	Print	Delete
↑	Search Again	
↓	Update History	EXIT

Below is an example of what will appear when you press the view button on the MultiLab screen. You can use the up or down arrows to view the entire page.



CHAPTER 5: STUDIES FUNCTION

The Patient Studies that can be performed by the MultiLab can be accessed by pressing the “**Studies**” button from the Start screen. This will display the screen shown below:



Note: the above screen is an example of the Factory Default main menu and can be modified in any desired fashion using the Study Configurator. The “Main Menu” shown above contains four sub-menus which in turn contain various studies. It is sometimes desirable to put your most common studies onto the “Main Menu” to reduce screen touches to access your patient exams.

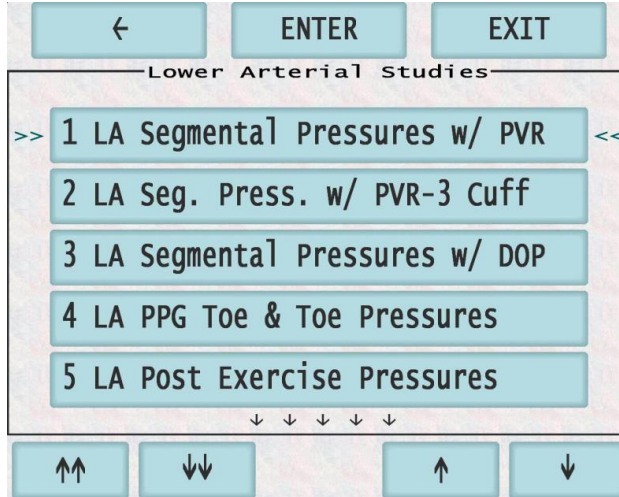
- ← This will take you to the previous screen.
- ENTER** This will take you into the study or sub-menu bracketed by the “>> <<” symbols.
- EXIT** This will take you back to the Start screen.
- ↓↓ This will display studies or sub-menus 6 and higher (if any).
- ↑↑ This will display studies or sub-menus one page up (if applicable).
- ↓ This will move the selector brackets (>> <<) down.
- ↑ This will move the selector brackets (>> <<) up.
- 1, 2, 3, 4 or 5** These will take you into the study or sub-menu according to the number touched.

Studies ILR

For Studies function, the ILR will show the list of measurements for the selected study. There are no buttons.

Studies Example

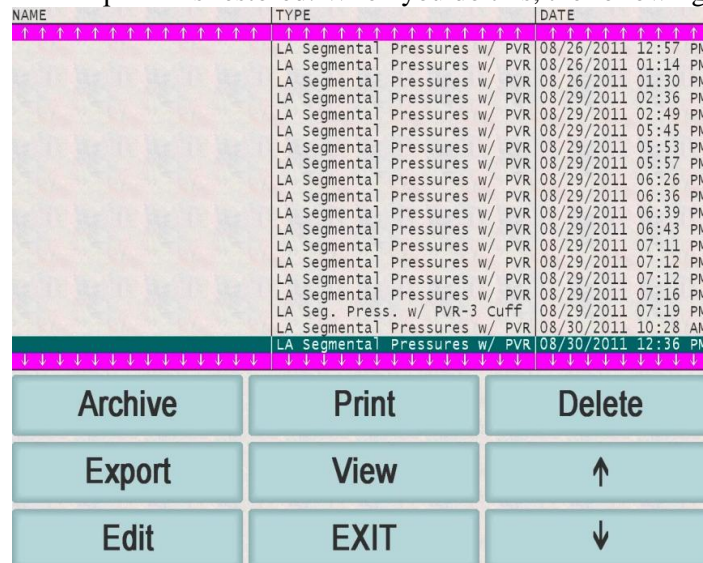
Pressing the “Enter” or “1 Lower Arterial Studies” from the above screen will bring up the Factory Default Lower Arterial Studies menu shown below:



Note: Any unwanted studies can be deleted and will not be displayed (see Configure Studies).

CHAPTER 6: TEMP. FILE'S FUNCTIONS

Pressing the “Temp Files” button from the Start screen will allow you to access patient reports that have not been archived to the MultiLab hard disk drive. For example, if the power should go out in the middle of a study press the “Temp Files” button when the power is restored. When you do this, the following screen will appear:



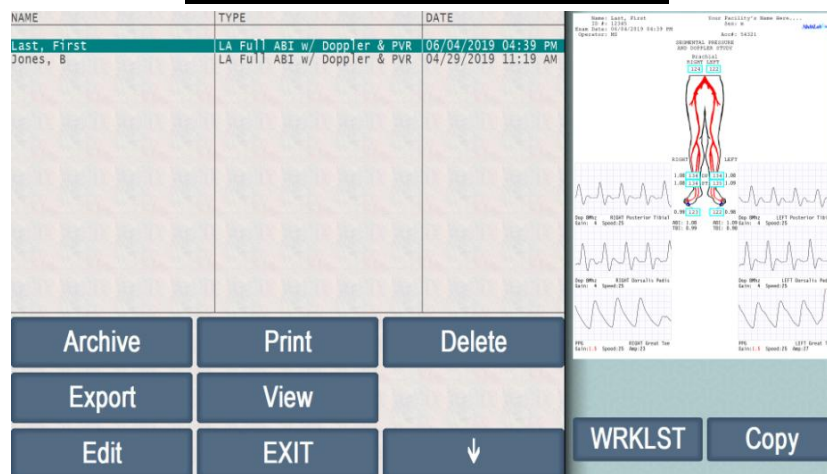
The most recent patient will be at the top. The following functions are available from the Temp. Files menu:

Archive Will save the patient report to the MultiLab hard disk drive. (See Archive Patient Reports in Chapter 10)

Print Will print the patient report. (See Printing Patient Reports in Chapter 10)

- Delete** Will delete the highlighted patient report. You will be given the opportunity to change your mind by touching “No” when prompted by the MultiLab “are you sure?” question.
- Export** Will export the patient report. (See Exporting Patient Reports in Chapter 10)
- View** Will allow you to view the patient report on the MultiLab screen.
- Edit** Will allow you to go into, resume, or make changes to the highlighted patient report. (See Chapter 10: Editing Patient Reports)
- Exit** Will exit to the Start screen.
 - ↑ This will allow you to move the highlight cursor up.
 - ↓ This will allow you to move the highlight cursor down.

ILR Temp File Functions



When Temp File is opened the ILR will display the first study in Temp Files; which is the most recent study performed. As other studies are highlighted, the displayed report will change.

WRKLIST Will allow user to see the worklist information for the selected study, if it exists. **Note:** the name of this button is defined in the System Setup.

More Will display more of the worklist. Keep pressing the button to return to the beginning of the worklist information.

View This is the default function. Will show the patient report for the select study

Copy Will copy a picture of the report to the Windows™ clipboard.

View ILR

If the View button is pressed, the ILR changes to show the patient's name and their file information on the system. The file information can be useful if you are viewing from the lookup and want to extract a particular patient's file. Also, a View button is available on the ILR. This View button will show the report for the patient which is the same report already being viewed, but the ILR may also have left and right arrow keys which can change the ILR's report view to other pages of the patient's study. From the report view, press the Info button to return to the file information.

CHAPTER 7: MULTILAB REMOTE CONTROLS

The MultiLab instruments will ship with either one or both of two devices for controlling the instrument remotely. They are the Remote Control Cuff Selector and the Wireless Remote Control.



The Remote Control Cuff Selector

The remote-control cuff selector manifold is used to hook up all the pressure cuffs at one time, and also allows remote control of the MultiLab Instrument. The cuff selector is best positioned between the patient's feet for most examinations. Upon inspection, you will notice 5 hoses exiting the cuff selector on each side. The #1 hose is longer than the remaining 4. Typically in a Lower Arterial study using the 4-cuff method, the #1 hose is attached to the arm cuff, the #5 hose to the ankle cuff, the #4 hose to the calf cuff, etc...

If you desire to obtain toe pressures, or transmetatarsal PVR waveforms, feel free to attach the #1 hose to those cuffs after the Arm pressures have been obtained. The 10 toggle switches on the selector direct the flow of air to the desired cuff. When the switches are in the center position, all air valves will be closed, and no air will be directed to the cuffs. Make sure that only one switch is open at a time, unless performing certain bilateral studies (such as PVR) that record left and right channels at the same time.

The remote controls are self-descriptive in most cases with a few exceptions. When a waveform or pressure reading is "Captured" the "Baseline" and the "Gain" keys become scrolling keys. To scroll a captured waveform or pressure, "Gain" is for fast scrolling, "Baseline" will scroll slowly.

Other Remote Control Functions (with exception of above paragraph) are:

BACK	This will take the user to previous screen or backward 1 site.
NEXT	This will take user to next screen or forward 1 site.
PROBE	Allows user to activate and change probes during Pressure studies.
VOLUME	One touch will adjust volume by 1 step; pressing and holding will be continuous.
GAIN	One touch will increase or decrease Gain by next increment.
BASELINE	One touch will move baseline up or down by 1 increment, and holding will provide continuous movement.
SIDE	Used while scrolling "Captured" 2 Channel Waveforms (PVR or PPG). If Left side waveform is acceptable, but right is not, press the "SIDE" key to enable of scrolling 1 waveform (Left or Right) at a time.
INVERT	Inverts the Doppler Waveform. This button is active only in Doppler Waveform mode.
DEFLATE	One touch will begin Auto-deflation at preset rate (see Note*).
INFLATE	One touch will begin inflating to preset target pressure (see Note*).
CAPTURE	One touch will "Freeze" waveform or pressure. 2 nd touch will move user to next site.

***Note:** If the Inflate or Deflate button is depressed slowly or held down for more than a moment, both buttons will revert to "Manual" mode allowing user to control inflation and deflation by continuing to hold

buttons down as long as Inflation or Deflation is desired. One Quick touch of either button will return controls to "Automatic" mode.

The Infrared Wireless Remote Control

The buttons on the remote control (Shown Below) function as follows:



PROBE	Allow user to change the active probe. The active probe will be displayed on the MultiLab Screen
INVERT	Invert the Doppler Signal (in Waveform Mode only)
D/OVER	"Do Over" an Exam Segment
CAPTURE	"Capture" a Waveform or Pressure
VOL ↑↓	Increase or decrease the volume of the Doppler probe
BASE ↑↓	Move the baseline (or waveform) up or down.
GAIN ↑↓	Increase or decrease the sensitivity of the active probe
PRESS ↑	Begins pump inflation. (See NOTE below)
PRESS ↓	Begins Cuff deflation. (See NOTE below)
MUTE	One touch will reduce the Doppler volume to zero. A second touch will restore the previous volume setting
SIDE	When performing bilateral studies, will activate Left, Right, or both sides for capturing waveforms or pressures, and when scrolling. The active side will be displayed on the Touch-Screen Color Monitor
BACK	Move one site back each time button is depressed.
NEXT	Advance one site forward each time button is depressed.

NOTE: The **PRESS ↑** and **PRESS ↓** buttons have TWO functions each: One brief touch of either button will begin automatic inflation or deflation. Depressing either button for more than one moment, will engage "Manual Mode", where button must be held down to continue inflation or deflation. When the instrument is operating in "Manual Mode" one quick touch of either button will resume automatic inflation or deflation.

Remote Control MENU Commands

This group of buttons is for use while navigating the MultiLab Video Menu screens. They are not used while performing studies on patients.

- NEW** Will allow user to select another exam to perform on a patient.
- ↑ And ↓ Buttons** Will allow user to navigate up or down while Menu items are displayed on the monitor.
- ENTER and EXIT** Will allow user to select study or menu item displayed on the video monitor, or to exit from the current selection.

Scrolling Button Functions

The BASELINE (BASE) and GAIN keys also function as "Scrolling" keys when you have captured or "Frozen" a waveform or pressure. (On any "active" screen they will increase or decrease the position of the waveform or baseline and increase or decrease the sensitivity of the active probe.

- The **BASE ↑** and **↓** are for SLOW scrolling (forwards and backwards)
- The **GAIN ↑** and **↓** buttons are for FAST scrolling (forwards and backwards)

Battery Installation



The Infrared Wireless Remote Control requires 2 “AAA” batteries for operation. Unetixs recommends the use of alkaline batteries for maximum remote performance. Slide lower back portion of remote downward to reveal battery compartment as shown.

Insert 2 “AAA” batteries, paying attention to positive (+) and negative (-) alignment and close battery cover by sliding upward until cover “snaps” into place.

CHAPTER 8: AUTOMATIC CUFF SELECTOR USAGE

The optional Automatic Cuff Selector allows the operator to perform pressure examinations without having to manually open and close valves at each desired site.

The valves will automatically open and close to correspond to the desired sites. The valves are automatically activated by the software commands within each selected study. For most applications, the #1, right and left, valves will control the arm cuffs, the #2 valves will control to the thigh cuffs, the #3 valves will control the Above Knee cuffs, the #4 valves will control the Calf cuffs, the #5 valve will control the Ankle cuffs, and the #6 valves will control the Great Toe/Metatarsal cuffs.

Note: the right side hoses are clear and the left side hoses are blue. For newer systems and the Roodra, the right side hoses are gray and the left side hoses are light green.

A study configurator screen is shown:

```

1 Pressure
Tag: "RIGHT Brachial Pressure"          Gain Units: Normal
Pressure Designation: PA                Gain Unlocked
Print-X: 900      Print-Y: 500         Gain is set from previous site
Hide Timer                               Initial Gain: 4
Outer Graphic Box Disabled              Baseline Invisible
Justification: Right                    Baseline Unlocked
Print if captured                       Baseline is set from previous site
Probe Unlocked                          Initial Baseline: 10.00 mm
Probe is set from previous site          Audio Unlocked
Initial Probe: Doppler 8 MHz            Audio is set from previous site
Inflation Type: Automatic                Initial Audio (<0 = Off>): 2
Target Pressure: 160                     Manometer Side: Right
Overflow Pressure: 300                    Auto Cuff Selector: Right 1
Deflation Type: Automatic                 Export Code: 128
Deflation Rate: 3.000 mmHg/s             Spectral: No
Capture Record: 0
Speed: 10 mm/sec
Filter: 28 Hz + HP
<F1> for Help                            <F10> to Save and Exit        <ESC> to exit
    
```

The bottom right column in the study configurator is where the valve assignments are made. We can see from the screen that the Right Valve 1 is active while taking a Right Brachial Pressure. The valve numbers can be changed as desired and/or reassigned easily from the “Configure Studies” portion of the software.

The Automatic Cuff Selector is quite simple in its operation. The software controls the valves for every study, and each valve has a green light on the Auto Manifold. If you are uncertain which valve is active when performing an examination, just look to see which light is illuminated. In cases of Bilateral PVRs or Pressures, both lights will be illuminated.

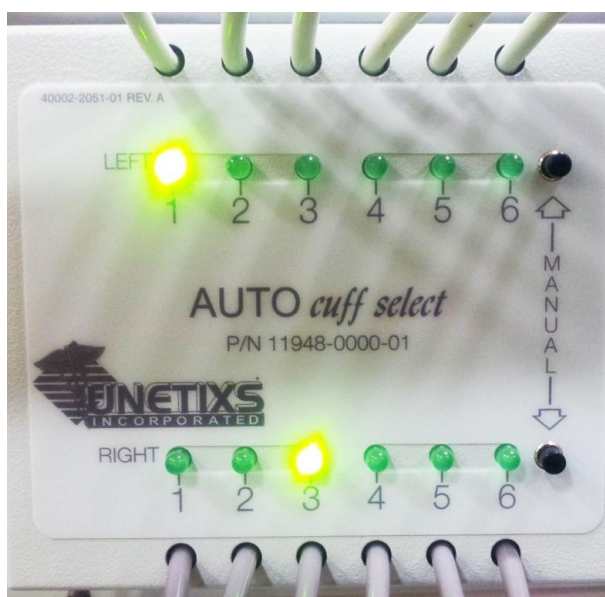
Auto Cuff Selector ILR

During an examination with a modality, the ILR report view will be highlighted with the current measurement. If the measurement involves the Auto Cuff Selector, that measurement will be highlighted with the color of the active hose:

Valve 1	Blue
Valve 2	Yellow
Valve 3	Green
Valve 4	Red
Valve 5	White
Valve 6	Black

Manual Operation on the Automatic Manifold

If for some reason, your Automatic Manifold is not switching properly, or if you simply wish to operate it manually, you will notice that there are two “Manual” switches on the front panel of the Automatic Manifold:



Repeatedly pressing the Left and Right “Manual” buttons will allow you to override the default setting in the software. Continue pressing the “Manual” button until the L.E.D. is illuminated over the desired valve number.

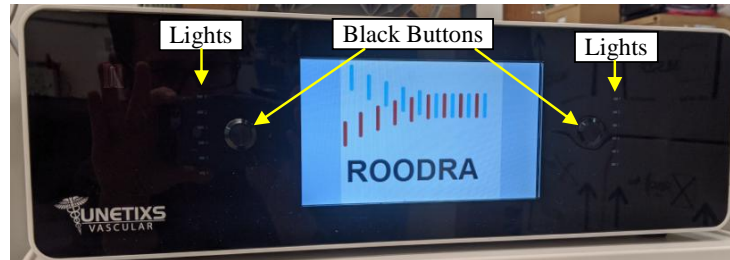
NOTE: If you are performing a field retrofit of these components, you must first alert the MultiLab so it will recognize this new component. Follow these steps to before you attempt to perform patient studies:

1. Press “Setup” from the Start-up Screen
2. Press: “System Setup”.
3. Press: “System Data”
4. Observing the top line of the video monitor, continue pressing the “Next” button on the Touch-Screen until you see the following command: Auto Cuff Select.
5. Press “1” to activate the Automatic Cuff Selector and then press exit until you return to the Start screen. The Automatic Cuff Selector should now be functional.

Roodra Cuff Manifold

The cuff manifold is housed within the Roodra Module. Small, green lights will illuminate on the front panel of the Roodra Module corresponding to the cuff hose that is about to be utilized in the procedure. In a Doppler pressure modality, one light will be active, in PVR waveforms and PPG pressures two lights will be active.

The user may override the procedure and choose a different hose, or a different pair of hoses. Simply press one of the two black buttons (Right and Left) to advance the light(s) to the desired hose.



CHAPTER 9: PATIENT TESTING

In this chapter you will be introduced to the methods and concepts of patient testing that can be performed with MultiLab Series II instruments. All patient testing exams discussed herein follow clinically accepted methods and protocols. As there is always some variation from lab to lab and from individual to individual; we have created the Study Configuration utility (see CHAPTER 11: CONFIGURING STUDIES) so you can define the manner in which you wish to perform your exams if you decide not to use the factory preset studies.

Before we begin, it is important that we understand the various modalities that are incorporated into the instrument and the merits and shortcomings of each modality.

Modalities of Testing

Today's peripheral vascular labs use the following transducers to produce physiologic information about arterial and venous circulation in the arms, legs and digits of the hands and feet.

Doppler

Doppler is able to detect flow within a vessel through the use of the Doppler principle. CW (Continuous Wave) Doppler is used to evaluate the quality of flow within a vessel allowing the user to determine:

1. Presence or absence of flow
2. Direction of flow
3. Frequency changes relative to velocity changes
4. Frequency (velocity) waveform.

When CW Doppler is utilized during the segmental pressure exam, it is being used as a "stethoscope" to detect the presence or absence of flow.

CW Doppler is non-imaging and uses a probe housing both sending and receiving crystals. The MultiLab supports both 5 and 8 MHz Doppler transducers. The 8 MHz probe is best utilized for shallow lying (superficial) vessels, while the 5 MHz transducer, offering deeper penetration through tissue, is best used for vessels located further from the skin surface.

Strength: Can determine direction of blood flow, better suited to smaller vessels than a stethoscope for segmental pressure exams.

Weakness: Cannot "see" the vessel being examined, cannot determine optimum angle for velocity measurements, very operator dependent.

Photoplethysmography (PPG)

Photoplethysmography (PPG) is able to detect flow in the arterial bed located in the digits of the hands and feet. PPG is very sensitive to the minute pulse-volume changes that occur with each systolic pressure rise that occurs in the arterial tree. PPG uses a sending non-visible light transducer and a photo-voltaic infrared receiver transducer. PPG waveforms are very similar to PVR waveforms. PPG is also used in venous reflux testing to determine the time for venous refilling after emptying. PPG may be used to replace CW Doppler during the segmental pressure exam.

Strength: Very good at measuring micro-circulation in fingers and toes.

Weakness: Sensitivity can be reduced if digits are cold, or if sensor is applied too tightly or loosely.

Calibrated pulse volume recording (PVR)

Calibrated pulse volume recording (PVR) is able to detect the “total flow” in a limb segment by the use of a cuff wrapped around a limb segment and inflated to 65 mmHg pressure (the inflation pressure is used to eliminate venous flow artifact). As Arterial blood flows underneath the cuff, the limb segment expands causing a change in air pressure in the cuff. (Tissue volume swells with systole and rebounds during diastole.) This subtle change in cuff pressure results in a wave tracing (see interpretation manual) which is an indirect measurement of the flow of all the arteries beneath the cuff.

The Unetixs' MultiLab uses “Calibrated PVR” (which displays exact pressure AND air volume inside each cuff during recording) to insure the clinical validity and repeatability of PVR testing. The cuff Volume and Pressure measurements are printed on the final report for accuracy during interpretation.

Strength: Quick, simple to perform, detects collateral flow, reproducible, low operator error.

Weakness: Cannot identify individual vessels

Clinical Techniques for Peripheral Vascular Testing

Cuff Application

NOTE: For accurate systolic pressure measurements, the general recommendation is that a cuff width should be 20% larger than the diameter of the limb. An under-sized cuff causes falsely elevated pressures. Although an over-sized cuff will not affect segmental pressures they will dampen the amplitude during calibrated PVR testing.

Since we are diagnosing vascular disease instead of hypertension, most practitioners in the vascular field today utilize the “4-cuff method” (using 4 pressure cuffs on each leg) when performing Lower Limb Arterial Studies. While usually artificially elevating the above knee and thigh pressures, it is viewed as preferable by being able to differentiate between Superficial Femoral and Aortoiliac disease (see interpretation manual section on Segmental Pressures for more information).

IMPORTANT: DO NOT APPLY BRACHIAL CUFFS IN THE FOLLOWING CONDITIONS:

- Over a “PICC” line, or venous access port.
- On an arm that is swollen, hot or hard (possible DVT).
- On female mastectomy patients as advised by their physician.

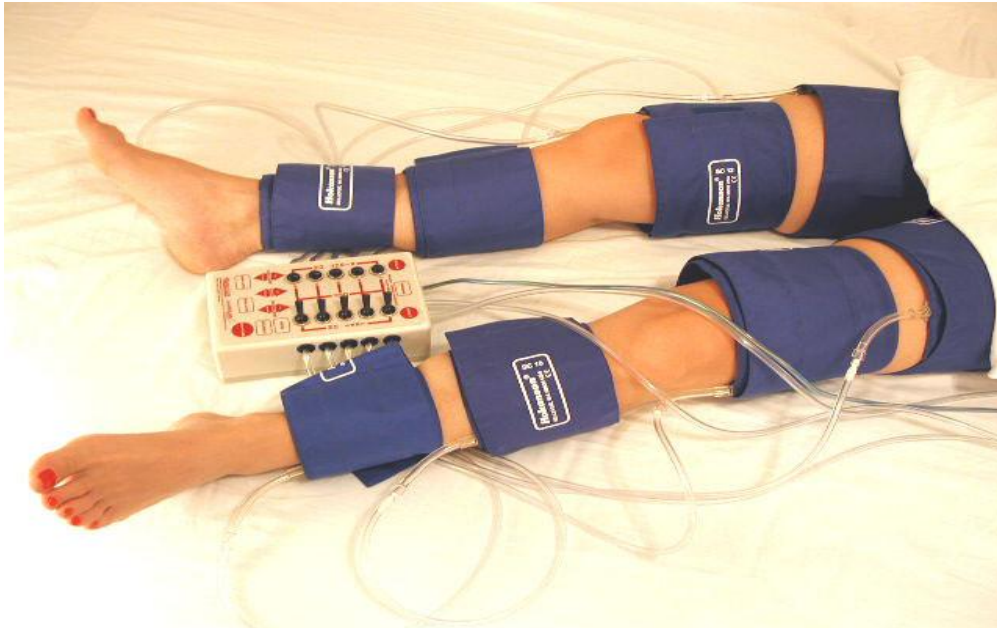
Cuff Sizes and Placement

The MultiLab instrument may ship with blood pressure cuffs designed for 3 or 4 cuff testing methods:

- CC-17** (17 Centimeters wide) Contoured Thigh cuff for 3-cuff method.
- SC-12** (12 Centimeters wide) for Above the Knee and High Thigh sites.
- SC-10** (10 Centimeters wide) for Calf, Ankle and Arm sites.
- TMC-7** (7 Centimeters wide) for Transmetatarsal or Hand use.
- PC-2.5** (2 ½ Centimeters wide) for Fingers and Toes.

Optional cuffs (may be ordered directly from Unetixs) include:

- CC-22** (22 Centimeters wide) Contoured Thigh cuffs for 3-cuff method.
- SC-12L** (12 Centimeters wide) Extra-length cuffs for large Thighs.
- DC-1.9** (1.9 Centimeters wide) for small Toes.



Proper cuff positioning for 4-cuff method

Cuffs should be wrapped snugly with looseness not exceeding “1-finger width” of the technologist. Wrinkles should be avoided. A poorly wrapped cuff will adversely affect PVR testing results.

When wrapping, place the tubing connector of the cuff on the medial side of the limb, this will insure that the bladder of the cuff is covering the area where the vessels are anatomically located. The non-bladder portion of the cuff should be away from this area.

Digital cuffs should be applied with the bladder surrounding the fleshy part of the digit and not toward the bony side or nail bed side. Be cautious of connector hose kinking on these cuffs.

Lift the patient's limb when applying a cuff. If the patient “tries to help you” by lifting their limb, tell them to relax, a contracted muscle during cuff application will usually result in a loose cuff when patient relaxes limb.

The patient should be supine or with head elevated (semi-Fowler) on padded exam table. Avoid having the limb or cuff rest on the edge or crease of stretcher, cot or bed since this will cause an uneven pressure within the cuff.

Cuffs should not be inflated to a pressure of greater than 250mmHg. If vessel is incompressible, “Capture” the pressure reading, and using the “Set Output” function, enter the value as “CNO”, “250+” or “>250” to avoid erroneous reporting of indices, and to signify limb segment was still pulsatile at that pressure to interpreting physician.

A patient complaint of severe pain during a pressure examination is sufficient reason to terminate the test on that particular cuff. Press “NEXT” and skip to the next segment. Do not press “CAPTURE”.

Cuff Application as Related to C-PVR™

The Unetixs' MultiLab features true calibrated PVR (C-PVR™) that allows the technologist to ascertain immediately when there is a cuff miss-selection, wrapping error, or cuff leaks. The PVR waveform, when printed, appears with the “true-scaled” graph and notations on inflating pressure, cuff volume, units of measure, and gain setting.

Cuffs of equal width and in the same limb location (such as 2 thighs) should not have a volume difference greater than 15% (15 cc's per Hundred.) Observe the volume during inflation and at the monitoring pressure. If a discrepancy exists, check the following:

- Ensure cuffs are equally sized left and right.
- Ensure equal wrapping of cuffs in terms of tightness and location on limb.
- Ensure no unusual folding or wrinkling of the cuffs.
- Ensure cuff is not leaking (observable by a slow loss in pressure during acquisition of waveforms.)
- Repeat the test if necessary by pressing "Capture" and "Do Over"

If volume discrepancies are not avoidable, (can be due to limb atrophy, or edematous tissue) then be certain to call attention to the problem when reporting to the reading physician.

CW Doppler Application

The Unetixs' MultiLab comes with two CW Doppler probes – 5MHz and 8MHz. These are also known as the "low frequency" and "high frequency" probes. According to the physical principles of Doppler ultrasound a higher frequency has a greater the sensitivity to flow; and a lower frequency has a lower the sensitivity to flow. However, increasing the frequency of a probe will cause an increased attenuation (Attenuation is the loss of Doppler power as the beam travels through tissue). Thus lowering the frequency will lessen the attenuation. Use the low frequency for deep vessels such as in the groin and the higher frequency for all other applications.

NOTE: You can use the Doppler probes in 2 different ways – to obtain Segmental Pressure measurements, or to record Doppler Waveform tracings. When using the Doppler probe to take pressure measurements, use the 8 MHz probe on all but very heavy patients. When using the Doppler probe to record Waveform tracings, use the 8 MHz probe on the more superficial vessels and the 5 MHz probe on the deeper vessels (commonly Femoral and Subclavian, and sometimes Popliteal).



Illustration of cuff placement and proper Doppler Angle at Brachial artery

Doppler Technique

Doppler probes should always be used with Ultrasound Gel and be held like a pencil with the use of light pressure. Applying too much pressure on the Doppler probe can result in occluding the vessel you are attempting to examine.

The Doppler probe must be held at an angle of less than 60 degrees and pointed in the direction of flow. Ideally an angle of 45 degrees or less will provide the best Doppler detection signal. Since the angle to flow is

“assumed” (you cannot “see” the vessel with CW Doppler) the visual angle of the probe may not be the actual sampling angle. The best technique is to start with a “good” angle and listen for the “best” sound.

Unetixs' Doppler probes are bi-directional and the MultiLab has an Invert Button that allows the Doppler signal to be “flipped”. Occasionally the best signal is derived with the probe pointing away from the direction of flow, resulting in a signal that is “upside down” or inverted. Always seek to create a graphic that is consistent with the signal that is heard. (This applies to all CW Doppler regardless of manufacturer.)

Use of filters when acquiring Doppler readings is usually not necessary and these should be set for the lowest setting in the System Configurations. Filters remove artifact but also decrease Doppler sensitivity.

If venous flow is causing artifact (visible or audible) in the arterial Doppler, apply a light pressure proximal or distal to the Doppler site. This will cause the venous flow to cease without affecting the arterial Doppler (in bi-directional CW Doppler, the venous flow can override, add to or subtract from the arterial signal).

PPG Application

The Unetixs PPG probes are light and thin and respond to the pulse volume of a digit very rapidly. The PPG probes can be applied using either the supplied Velcro™ straps, or the supplied PPG Clips. You can also remove the Velcro™ straps and use a short length of double-sided Scotch™ tape on the side of the probe containing the sensors. If Velcro™ is used, avoid excessive pressure during wrapping as this can obliterate arteriolar flow causing an abnormal waveform.

Both sensors should be in contact with the fleshy part of the digit and visually inspected to insure the absence of outside room-light interference.

Secure the PPG wires since wire motion and pulling can cause excessive motion artifact in the PPG graph with a prolongation of the testing time.



Illustration of PPG Sensor and digit cuff on Great Toe

Setting of Gain

The MultiLab has an automatic preset gain that can be altered during testing. Gain affects amplitude of the waveform, which is a diagnostic hallmark during interpretation.

Please note that Gain settings affect different studies in different ways. For example, when using the PPG sensor to obtain digit or segmental pressures, it is advantageous to reduce the gain as much as possible and still see distinct pulses on the MultiLab screen. Other studies may require you to increase the gain for an optimum examination. See the individual studies section to see how the Gain setting can be optimized for every exam. A reduction of Gain can reduce “overshoot” (when the waveform extends past the top and/or bottom of tracing).

Setting of Baseline

The MultiLab has an automatic preset baseline setting that can be altered during testing using the Baseline Up and Baseline Down controls on the touch-screen or the remote control.

The Baseline can be moved up or down without changing the size of the waveform on the display screen. It is advised when performing waveform studies using the Doppler, PVR or PPG sensors that the baseline be adjusted if necessary, so the entire waveform complex (peak to trough) is visible on the screen.

Setting the Volume (Audio)

Set the volume control for the Doppler probe for optimum listening. (NOTE: Remember that Doppler angle will also affect Doppler volume. If you are only hearing a faint Doppler sound, try adjusting the probe's position and angle before automatically reaching for the volume control.)

Optional Headphones can be plugged into the headphone jack on front of MultiLab. Plugging headphones in will disable system speakers, so others in the exam area will not hear the Doppler signals.

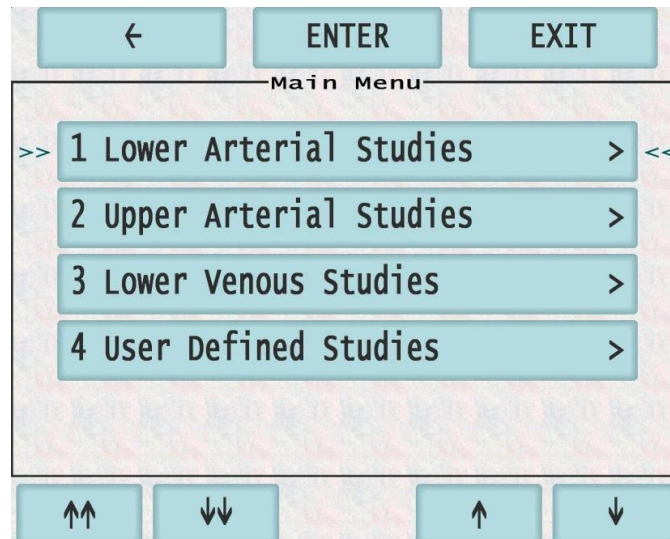
Lower Arterial Studies

NOTE: As the MultiLab instrument is almost infinitely configurable, the following section will pertain to individual types of exams. When any type of action is taken with the MultiLab, it will automatically sequence the user to the next site or even to a different type of study. It is possible to program the MultiLab to perform Segmental Pressures, Doppler Waveforms, PVR Waveforms, Digit Pressures, PPG waveforms and Post-Exercise Pressures all within the same custom program. For this reason we will treat each action separately.

NOTE: Depending on how the instrument has been set-up, the video screen may look different from those displayed below.

History Page

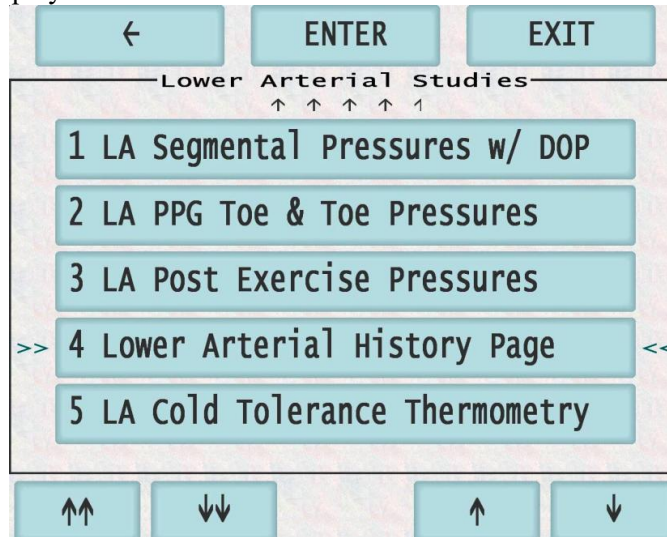
From MultiLab Start screen, press the “**Studies**” button on touch screen to bring up Main Menu Screen as seen below:



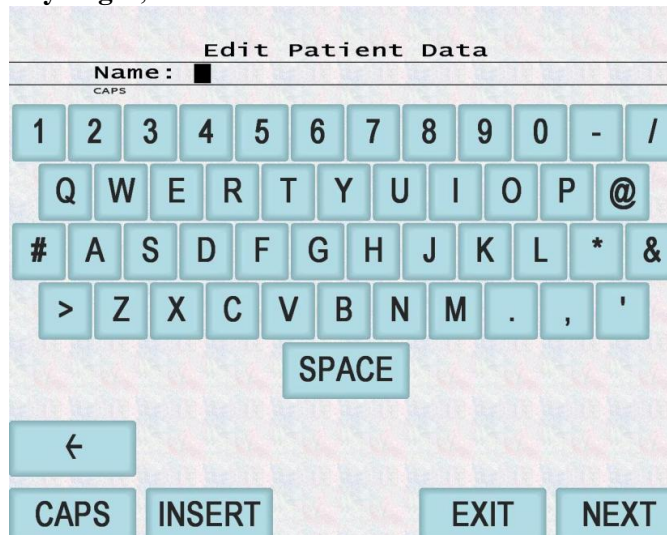
Touch “**Lower Arterial Studies**” button to display Factory Default Lower Arterial Studies Screen as shown:



Touch the “↓↓” button to display the rest of the Lower Arterial Studies as shown:



Touch “**Lower Arterial History Page**”, the Edit Patient Data screen will be shown as follows:



Using the Keyboard or Touch-Screen, type in the Patient's name, (typically last name first) and press the "Enter" key or touch the "NEXT" button on the touch-screen. Enter the Patient ID (usually a Social Security or Medical Records number) and press "Enter." Continue to enter data as prompted by the Video Screen.

Patient Data ILR

The ILR for this screen will show all of the Patient Data, not just the line being edited. You may touch the ILR to change the focus for editing to a particular field. The View button is available to see the report view. Press the Info button to return to showing all of the Patient Data.

Patient History

When you get to the Patient History section, you will see a number of questions presented on the screen. A simple "Yes" or "No" can answer most questions, or more data can be entered to provide more detail. You have 1 line of type in which to enter data about a particular question.

Press the "Escape" key on the keyboard to exit the Patient History Page. NOTE: this page is completely user definable, and the factory-preset page is just an example of some of the information commonly gathered before a vascular examination is performed. Please consult the section on Study Configuration or contact Unetixs, for assistance on modifying the report page.

Press the "New Study" button on touch-screen to retain current patient information and to select the examination to be performed, without have to re-enter patient data (name, ID, etc...).

Foreign Language Data

The software will allow the following foreign language characters to be entered as patient data: Ç, ç, Æ, æ, Ä, Å, â, ä, à, å, á, É, é, ê, ë, è, ì, î, ï, í, Ñ, ñ, Ö, ô, ö, ò, ó, Û, ü, û, ù, and ÿ. If you are using a keyboard for a different language, make sure the default input language is set in Windows™. NOTE: Unetixs does not provide keyboards for alternate languages.

History ILR

Only the report view is shown for the history page. The Zoom button is available to expand the report.

Arm Pressures

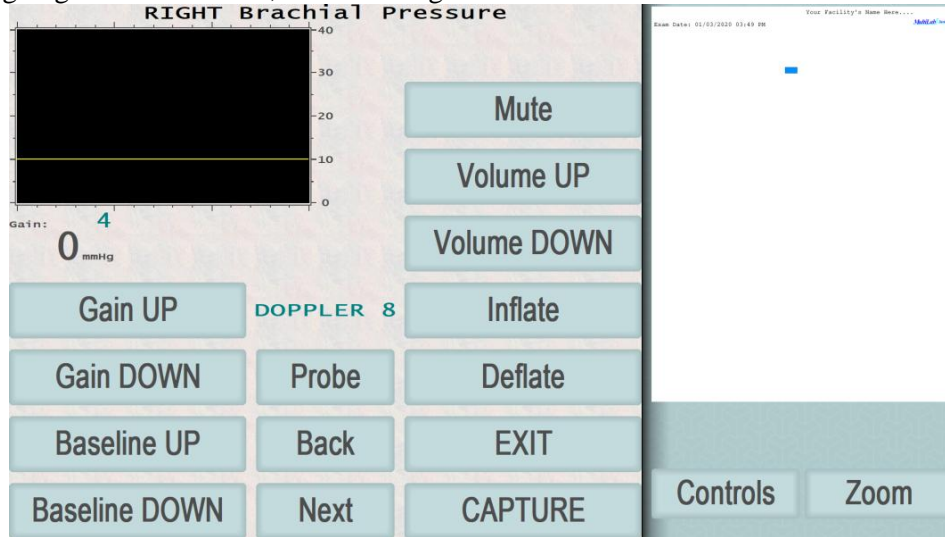
Patient Preparation

Patient should be supine on padded exam table. Have patient remove shoes, socks or stockings and clothing from legs (patient CAN leave undergarments on). It is advisable to have either a gown or some other covering over patient to ensure patient stays warm during exam. A cold examination room can cause vasoconstriction in certain patients, which can negatively affect the examination.

Apply 1 SC-10 blood pressure cuff to each arm (see page 50) and apply SC-10 cuffs at the ankle and calf sites, and SC-12 cuffs above the knee and at the high thigh sites (see page 49).

NOTE: Many technologists prefer to start the segmental pressure examination at the brachial sites to establish a "baseline" pressure then proceed to the ankle to see if ankle pressure equals or exceeds the brachial reference pressure (the higher of both arm pressures).

When performing Segmental Pressures, the following screen will be active:



The functions available on this screen are as follows:

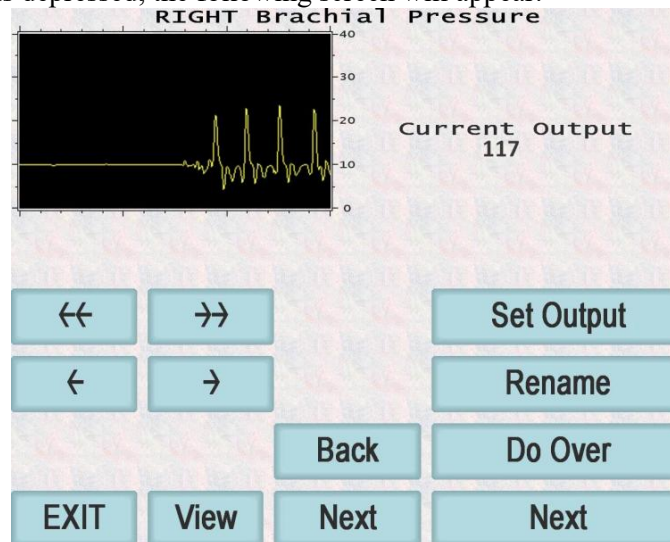
WAVEFORM SCREEN	Displays information from the active probe (see PROBE)
GAIN UP	Increases the size of the waveform from the selected probe.
GAIN DOWN	Reduces the size of the waveform from the selected probe.
BASELINE UP	Will move the waveform UP without changing its size.
BASELINE DOWN	Will move the waveform DOWN without changing its size.
PROBE	Allows user to change active probe.
BACK	Takes user back to previous site.
NEXT	This advances user to next site.
VOLUME / MUTE	This adjusts the volume.
INFLATE	Begins cuff inflation to preset target. NOTE: a brief touch of this button will begin automatic inflation. If button is depressed for more than a moment, the unit will switch to manual inflation mode, where pump will continue to operate as long as button is depressed (or until maximum allowed pressure is obtained). Auto-inflation can be resumed by quickly touching the “Inflate” button again. This button can be configured, in the study configuration, for manual inflation only.
DEFLATE	Begins automatic cuff deflation at preset bleed rate. Unit will emit a soft “ticking” sound to indicate deflation is in process. NOTE: a brief touch of this button will begin automatic deflation. If the button is depressed for more than a moment, the unit will switch to manual deflation mode, where the cuff is deflated at the maximum rate. Auto deflation can be resumed by touching the “Deflate” button again. This button can be configured, in the study configuration, for manual deflation only.
CAPTURE	Will capture the pressure displayed on the screen to the right of the Waveform Box.
EXIT	Takes operator to the “Edit” screen where user can View, Print or Edit the examination (see EDIT screen section below). NOTE: No patient data is saved when ‘EXIT’ is pressed from this screen.

To begin Segmental Pressure study at Right Brachial site, ensure the Right Brachial cuff is attached to the proper hose on the Cuff Selector and that the proper valve is active. Apply ultrasound gel to the brachial artery, and locate vessel using the Doppler probe at an approximate 45° angle to the surface of the arm (see page 50 for General Doppler positioning).

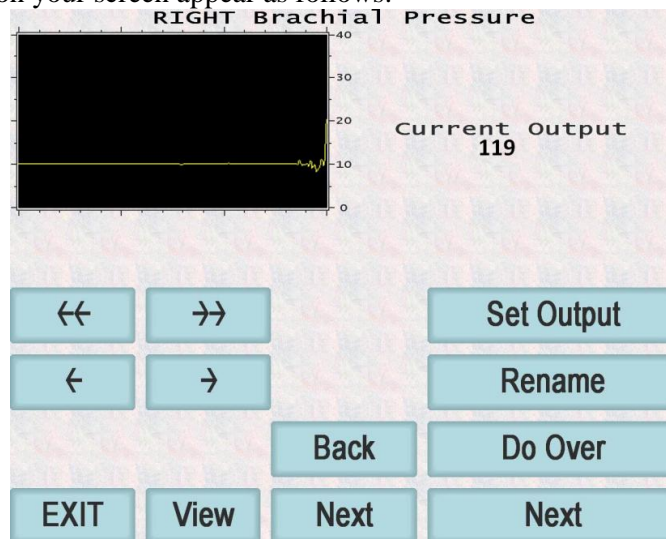
Move probe as necessary to maximize the level of the Doppler sounds. Press “Inflate” button once to begin inflating arm cuff. Inflate the cuff until the Doppler sound ceases (waveform on video screen will “flat-line” at

this point) and then press the “Deflate” button once. Press the “Capture” button when Doppler sound reappears. (NOTE: it is NOT necessary to capture the very first sound you hear – a small movement from the patient may emit a Doppler sound, so better to wait for several “beats” before “Capturing” the pressure.)

Once the “Capture” button is depressed, the following screen will appear:



The pressure displayed under “Current Output” (in this picture, 117 mmHg) represents the pressure in the cuff when the “Capture” button was depressed. To ensure accurate systolic pressures, scroll the pulses back to the first pulse to display the Peak Systolic Pressure. Use the “←←” button to scroll quickly and the “←” key to scroll slowly, so the results on your screen appear as follows:



You can now press the “Next” button to record this pressure and advance to the next site. You may press “Capture” on your remote to advance. The other buttons on this screen function as follows:

SET OUTPUT Use this button to manually enter information – Typically you will use this feature to denote a calcified or incompressible vessel, e.g. you have inflated the cuff to 250 mmHg pressure and you can still hear (and see) a pulse. Press the “Capture” button at this point and then the “Set Output” button. You would then type in “CNO”, “>250” or “250+” and then press “OK” or the “Enter” key to denote that the vessel was still pulsatile at this pressure. You could also type “AMP” if limb segment displayed at top of screen had been amputated.

RENAME If for some reason, you have taken a good pressure reading, but realized it did not match up with the site displayed on the MultiLab monitor, you do not need to re-do the

pressure. Instead, press this button and then the up and down arrow keys to display the proper pressure site.

DO OVER If you feel you have made an error after capturing a pressure, press this button to “unfreeze” the screen and repeat pressure reading at that site.

If satisfied with captured pressure, proceed to the next site by pressing “Next” (or “Capture” on remote control). Repeat procedure at Left Arm site.

NOTE: You can view captured pressures at any time by pressing “View”; return by pressing “Exit”.

Pressure ILR

The ILR for pressures allows for extra controls for sweep speed, inflation target, and deflation rate. You can also view the report. Use the Zoom button to see the pressures more easily while performing the exam.

Ankle and Leg Pressures

Ensure the Ankle cuff is attached to the proper hose on the Cuff Selector and that the proper valve is active. Locate Posterior Tibial (PT), or Dorsalis Pedis (DP), artery with the 8 MHz Doppler probe. Inflate to occlusion, deflate and capture pressure as in previous section.

NOTE: You can obtain Ankle pressures at both Posterior Tibial AND Dorsalis Pedis Arteries if desired – please refer to Study Configuration section.

NOTE: If artery is still pulsatile when pump reaches target setting, press and HOLD “**Inflate**” button down to continue inflating cuff to occlusion pressure. Do NOT exceed a pressure of 250 mmHg in the cuff unless instructed by your Medical Director.

Use ankle artery with strongest signal (PT or DP) and proceed in taking pressures up the leg. If no Doppler signal can be detected at the PT or DP artery, press the “**Probe**” button to activate the Right or Left PPG sensor and affix to Great Toe of foot being examined (see page 51). If a pulse is observable on-screen, inflate cuff until pulse “flat-lines.” Sometimes the flat line will disappear off-screen at point of occlusion. If this occurs, wait several seconds for the flat-line to reappear, press the “**Deflate**” button and “**Capture**” pressure when pulse reappears. Continue taking pressures up the leg using the PPG sensor.

Toe Pressures

Toe pressures can be obtained by applying the DC-2.5 Digit cuff to base of the Great Toe and affixing the Left or Right PPG sensor to the end of the digit. If a pulse is observable on-screen, inflate cuff until the pulse “flat-lines.” Sometimes the flat line will disappear off-screen at point of occlusion. If this occurs, wait several seconds for the flat-line to reappear, press the “Deflate” button and “capture” pressure when pulse reappears.

When taking 2 pressures simultaneously, it is possible to capture one side before the other; simply touch the waveform box or the side with the returned pulse. **NOTE:** it is also possible to switch to the Doppler probe after touching the waveform box; but only one size can be activated for Doppler (both boxes must be touched).

NOTE: There is an option to equip the MultiLab with Toe Bleed Valves that are attached to the cuff selector. The Toe Bleed Valve will automatically deflate the cuff; the “**Deflate**” button will not be used.

NOTE: It is desirable to adjust the Gain as low as possible ($\frac{1}{2}$ ” - $\frac{3}{4}$ ” tall pulses) when obtaining Toe pressures, as this will result in a “flatter” flat-line and will also be less susceptible to “wander” off the video screen during inflation and deflation.

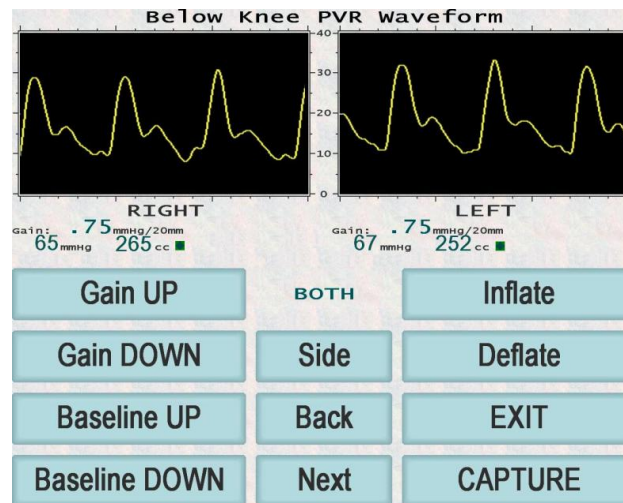
NOTE: If the PPG sensor or Velcro™ strip is touching the toe cuff during cuff deflation, artifact may be observed, resembling small pulses that coincide with the system “ticking.” Separate the sensor from the cuff to eliminate this communicating artifact.

PVR Waveforms

Before performing PVR waveforms, please read preceding chapter on “Calibrated PVR” to gain an understanding of how to obtain an optimum result using this modality. NOTE: For proper interpretation of PVR waveforms, ALL gain settings must be the same at all cuff sites. You may adjust the Gain downward to eliminate “overshooting” (tops and bottoms of waveforms out of the waveform box), but any waveforms captured before downward adjustment, must be redone at the new Gain setting.

Position pressure cuffs on Patient legs as shown on page 49. As the MultiLab performs PVR tracings bilaterally, ensure the proper cuffs are attached to the proper hoses on the Cuff Selector and that the proper valves are active. Push “**Inflate**” to begin cuff inflation. The pumps will automatically inflate the cuffs to between 62 and 68 mmHg on both sides.

NOTE: If the pressure in one or both cuffs drops below 62 mmHg, the letters “UND” will appear below the pressure reading indicating lower than optimum pressure. (This is not uncommon on patients with leg swelling or large limbs) Press the “**Inflate**” button again, and the MultiLab will automatically add pressure to one or both cuffs as needed.



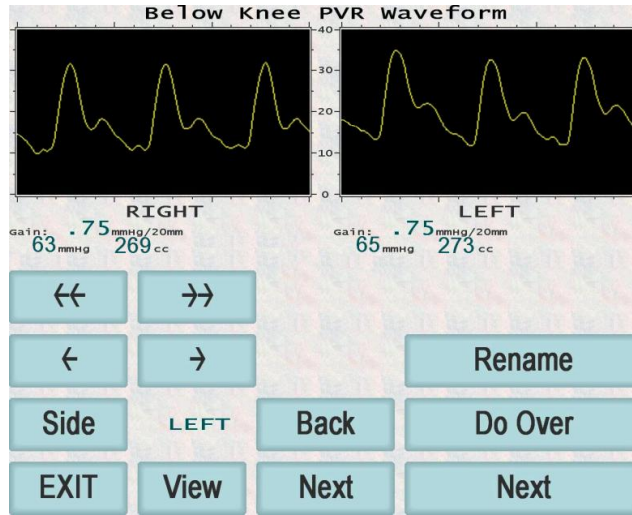
Before capturing the PVR waveforms, ensure cuff volumes are within 15% of each other by observing onscreen lights beneath waveforms. If cuff volumes are within 15%, both lights will glow green as on the screen above. If they are not, re-do the PVR waveforms (see below).

Also ensure that waveform Gain is properly set. The “peaks” and “troughs” of the waveform complex must be visible on the screen. On typical patients, the waveform amplitude will be lower at the ankle and high-thigh sites than at the calf and above-knee sites. If your ankle waveforms are taking up most of the video screen, your calf waveforms will almost certainly have the top and bottom “chopped off” at that gain setting. Use the “**Gain Down**” button to reduce the size of the waveform.

Use the “**Baseline**” buttons to center the Waveforms if needed, without changing the size of the waveform.

NOTE: It is very important for proper interpretation that all PVR waveforms are obtained at the same Gain setting. If you have to lower the Gain so that the calf PVR waveform will fit on the screen, press the “**Back**” button and then the “**Do-Over**” button to re-do the ankle tracing, making sure you lower the Gain to the same setting you used at the calf. It is also NOT advisable to make a PVR waveform “look bigger” by using the “**Gain Up**” button.

Once you observe consistent wave tracings on the screen, press “Capture” to freeze the waveforms and bring up the following screen:



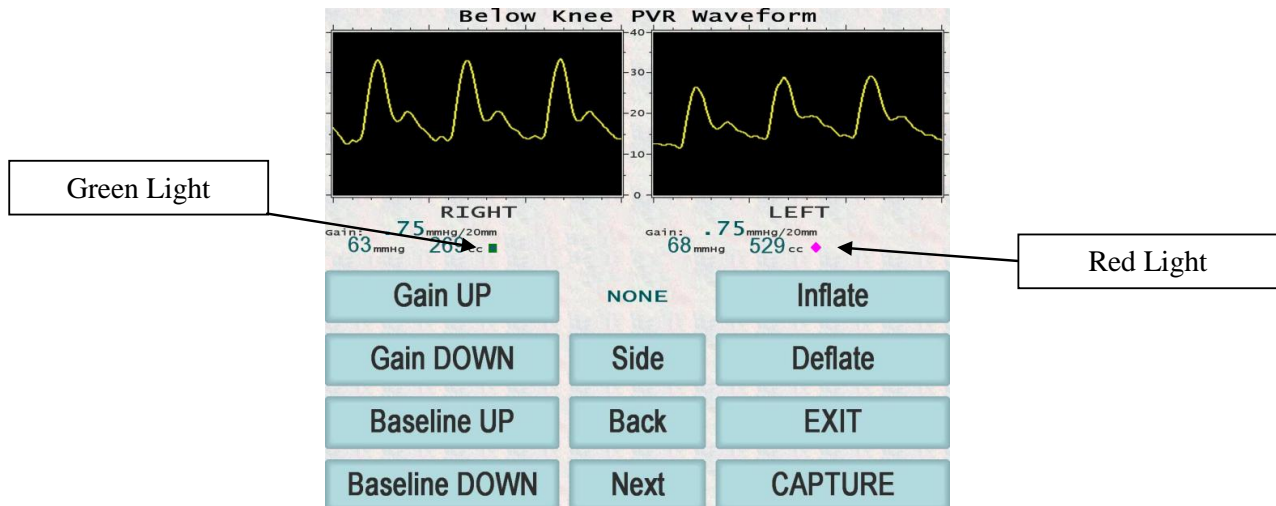
Once you have captured the waveforms, it is possible to “scroll” back up to 30 seconds on both sides or individually. You will notice the button labeled “Side” on this screen. The default setting is “Both” meaning both waveforms will be scrolled back together.

If you wish to scroll the waveforms individually press the “Side” button once to activate one side. Pressing the “Side” button again will activate the opposite side.

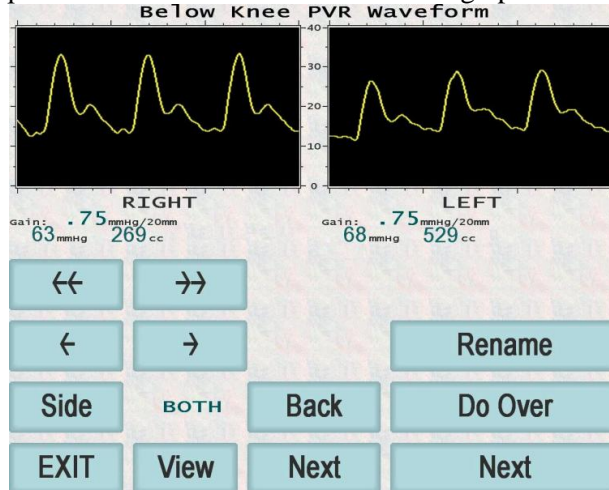
NOTE: you can view captured waveforms at any time by pressing “Exit” and “View”. Return to the examination by pressing “Exit” and “Back”.

Re-doing PVR Waveforms

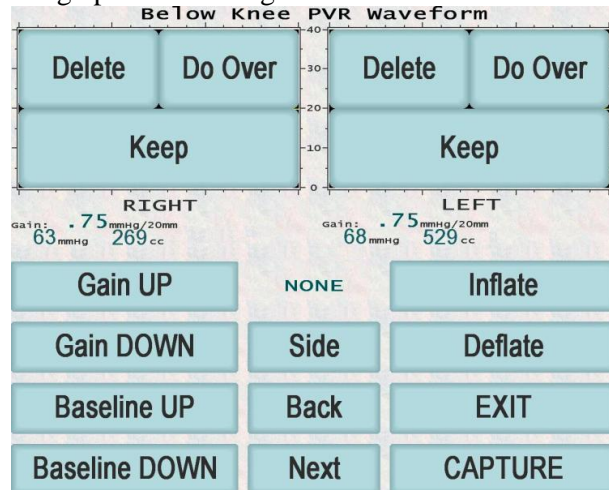
If PVR volumes are not within 15% of each other, a red light will appear underneath the waveform with too much volume. As is shown in the illustration below, an excess of air volume in a cuff can artificially dampen a PVR wave tracing and make it appear abnormal.



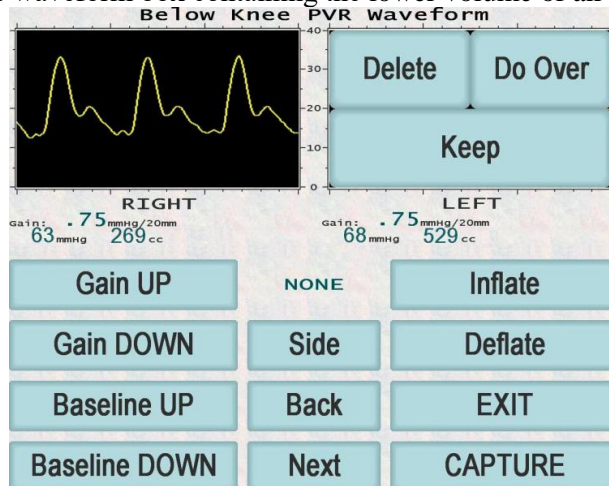
To correct such an occurrence, press the “CAPTURE” button to bring up the screen below:



Press the “Do-Over” button to bring up the following screen:



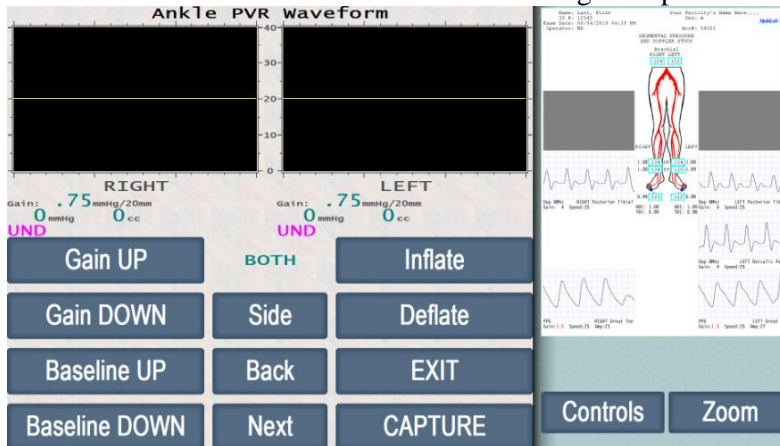
Press the “Keep” button on the waveform box containing the lower volume of air as shown below:



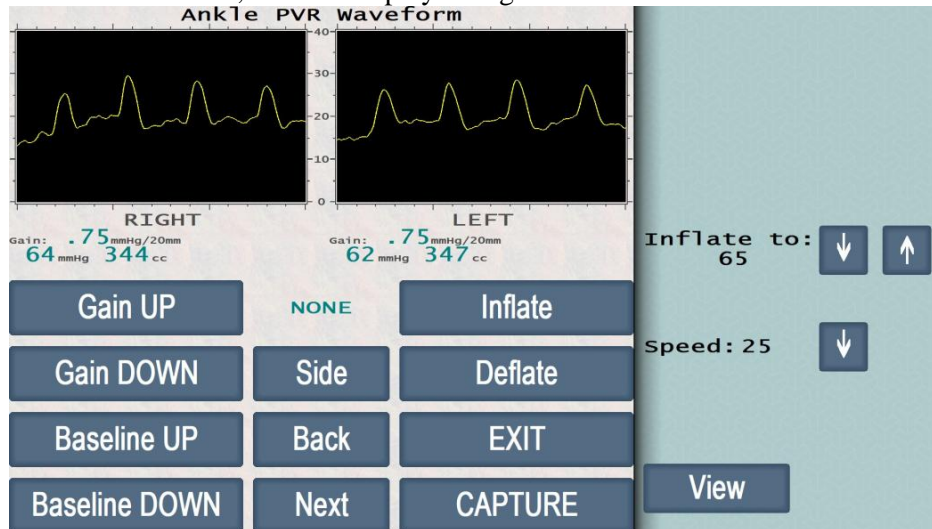
Press the “Do Over” button on the box containing the larger volume of air (the one with 529cc above). Disconnect the cuff with the greater volume from the hose, and re-wrap the cuff more snugly. Re-connect the hose, and press “Inflate” to continue. Note that it is not necessary to deactivate the frozen cuff when re-doing one waveform as the MultiLab will not port air to the cuff with the “kept” waveform.

ILR PVR Functions

In all modalities, the Controls button on the ILR allows the user to change test parameters.



When the Controls button is touched, the ILR display changes to this:

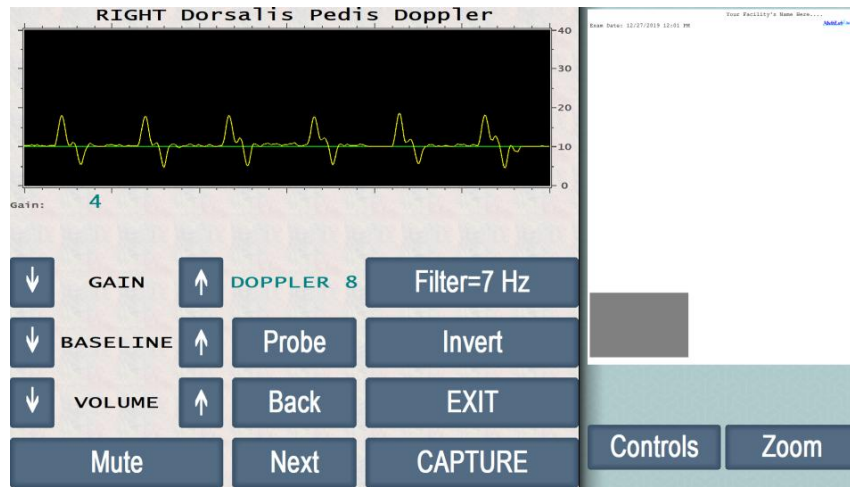


Here, the user can change the target inflation pressure (55 – 75 mmHg). The sweep speed can be slowed to 10 cm/sec.

Doppler Waveforms

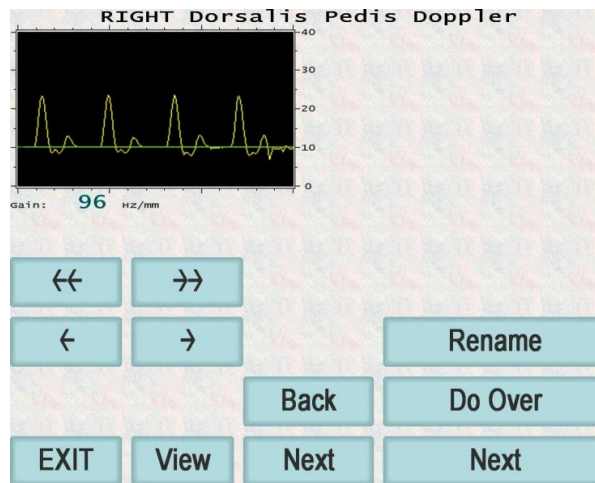
Before performing the Doppler Waveform exam on a patient, please read the information about CW Doppler in the “Modalities” section of the Manual. The Doppler Screen is shown below and contains many of the same buttons as previously discussed studies, with the exception of the “**Invert**” and the “**Mute**” buttons. Occasionally, you may obtain a better Doppler waveform by pointing the Doppler probe AWAY from the heart. Doing so will display flow information “upside down” on the MultiLab screen. Press the “**Invert**” button and the Systolic Flow will appear above the baseline.

The “**Mute**” button will automatically quiet the Doppler Probe, and is helpful when moving from one site to the next. Pressing the “**Mute**” button again will return the Doppler volume to the previous setting.



To obtain Doppler Waveform tracings, locate the vessel identified on the top of the MultiLab Screen with either the 8 MHz or 5MHz Doppler probe. As the vessels are sometimes in places you are not expecting, it is a good idea to apply a liberal amount of Ultrasonic Gel to the area of the vessel. This will allow you to move the probe to find the best signal without having to stop and apply more Gel.

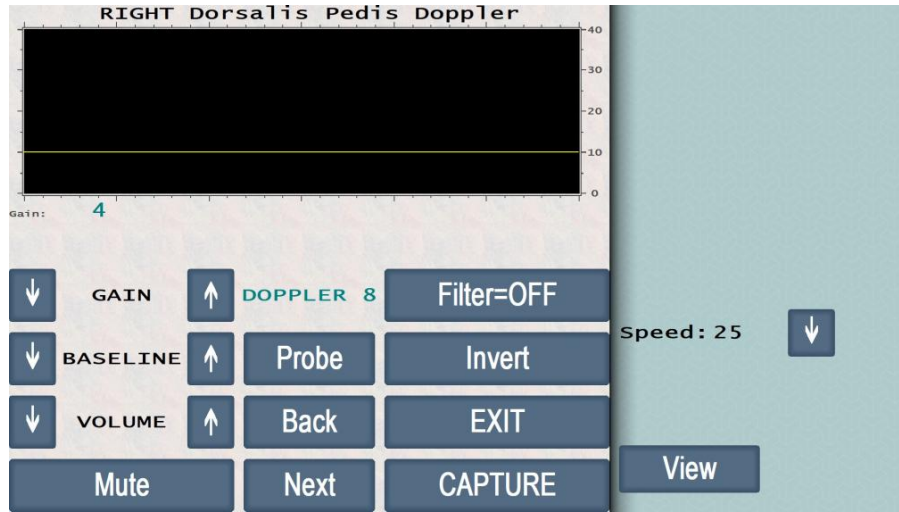
Keep in mind that the MultiLab will store 30 seconds of Doppler waveforms. If you are performing an exam on a patient with severe disease, it can sometimes be difficult to obtain several representative waveforms in a row. Once you have seen what you consider to be the best waveforms obtainable (always strive to display multiple phases on your waveforms) press the “Capture” button to store. As with the other studies, you can scroll the waveforms, rename them, or do them again by pressing the appropriate buttons. You can move to the next site by pressing “Next” from the following screen.



Do Over: In the event that scrolling does not provide the desired result of an artifact free waveform, touch Do Over. Obtain another waveform, touch capture. The just acquired waveform will be on the left, the previous waveform on the right. All 30 seconds of scroll time is available on the left side; use the swap button (not shown) to make the previous waveform the active one. Whichever waveform is on the left will be used for the report.

Doppler ILR Function

When the Controls button is touched in the Doppler modality ILR, the user can change the sweep speed of the Waveform from 25 cm/sec to 10 cm/sec.



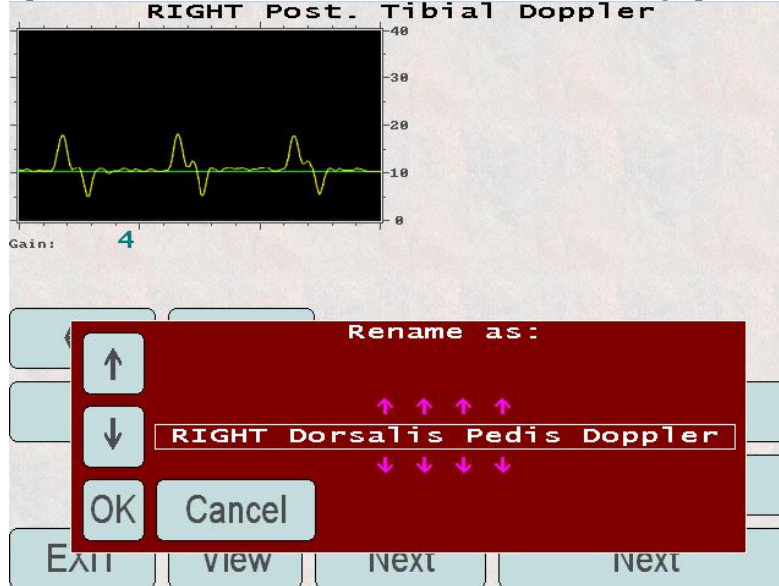
Helpful Hints for Doppler Waveforms

If you are hearing the Doppler sounds but not seeing waveforms on the screen, this usually means that your Doppler angle is 90° (perpendicular) to the vessel. Adjust the probe angle as needed to obtain a visible Doppler tracing.

If you can hear and see the Doppler but the waveform on the screen does not seem to represent what you are hearing; it is possible that the Doppler probe may be too high a frequency to get the sound wave into the center of the vessel (Where the flow is faster). Try switching to the 5 MHz probe, or pressing the probe into the limb (don't press too hard or you may cause your patient discomfort and/or compress the vessel you are attempting to examine).

You can capture and compare 2 waveforms at the same site by using Do-Over. For more than 2 waveforms, do the following (Using the Dorsalis Pedis artery as an example): Capture a waveform tracing at the Dorsalis Pedis artery. The next site that will typically appear will be the Posterior Tibial screen. Continue examining the Dorsalis Pedis artery, (possibly moving the probe to a different spot on the foot) and capture another waveform.

Press the “Exit” and “View” buttons to observe both waveforms on the MultiLab screen. If the second waveform (which in this case will be labeled “Posterior Tibial”) looks “better” than the first tracing, press “Exit” and “Back” to return to the captured waveform. Press the “Rename” button to bring up the following screen:



Use the up and down arrow buttons to display the proper artery name on the video screen (in this case “Dorsalis Pedis”), and then press “O.K.” The second waveform will automatically “overwrite” the first captured waveform. If upon examination the initial waveform looked “better” simply press the “Do Over” key to continue with the exam.

PPG Digit Waveforms

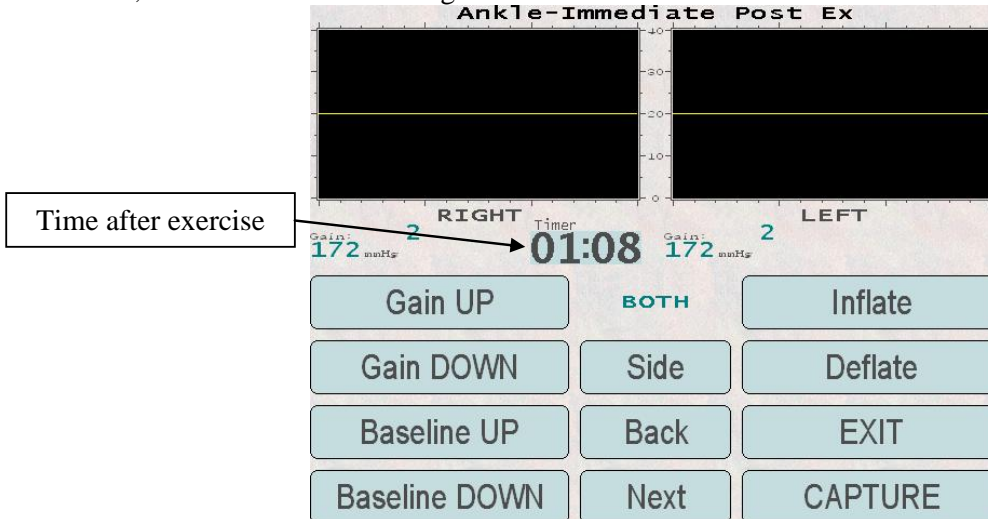
This exam can be performed on the fingers or toes. Apply Right PPG sensor to the Right digit and the Left PPG sensor to the Left digit (see page 51). Adjust the Gain so that waveform occupies a half to two-thirds of the Waveform Box on the MultiLab Screen. Capture waveforms and scroll if necessary to present several consistent waveforms. Repeat on remaining digits. Make sure Gain is set the same for all digits.

PPG Waveform ILR

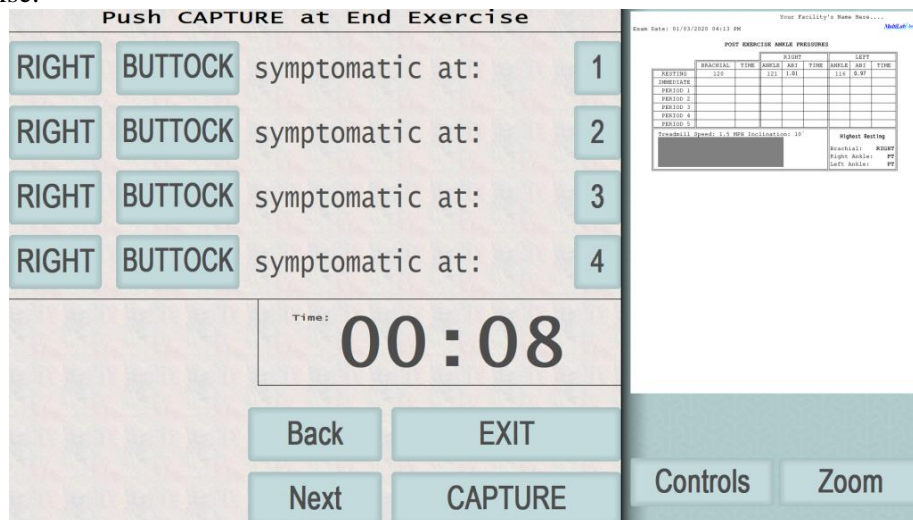
The ILR Controls button allows the user to adjust the sweep speed of the PPG waveform. View allows user to see the report.

Post Exercise Pressures

This exam compares pressures taken at rest (usually brachial and ankle) with pressures taken after exercise (or hyperemia). After the exercise it may take time for the pressures to return to normal, so pressures are usual taken at regular intervals after exercise. To help the technologist keep track of time, the MultiLab will include a timer on the screen; as shown in the following screen:



In addition to showing the time while operating the machine, the MultiLab has a special screen for showing the time during exercise:



- 1, 2, 3 or 4** If the patient shows symptomatic signs during exercise, press one of these buttons to capture the time that the symptom took place. This time will be placed next to the number pressed.
- RIGHT** Press this to indicate which side (or both) was symptomatic. Keep pressing this button until the desired side appears.
- BUTTOCK** Press this to indicate what location was symptomatic. Keep pressing this button until the desired location appears
- BACK** Takes user back to the previous site.
- NEXT** Advances user to the next site
- EXIT** Returns to the "Edit" screen. No symptoms or time is saved.
- CAPTURE** Will capture the time displayed. In the example above, this would be used to capture the amount of time the patient exercised.

Time Screen ILR

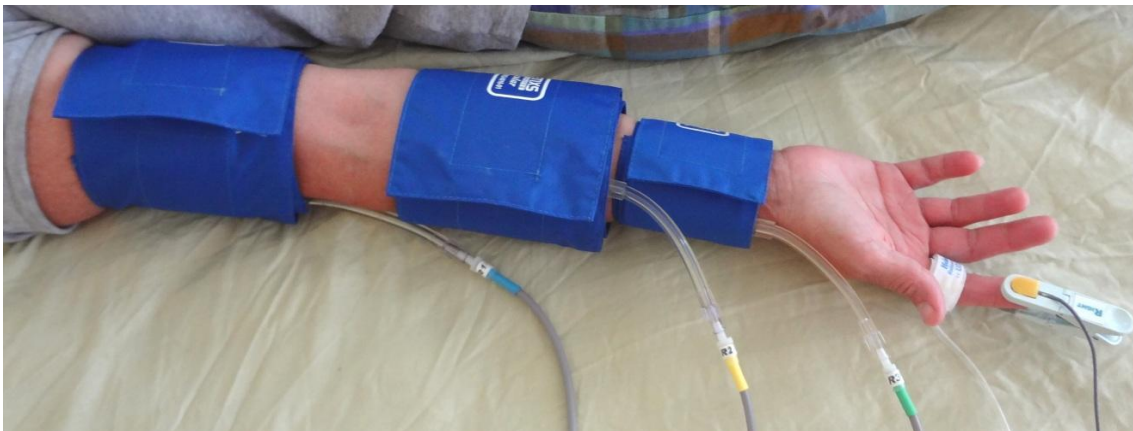
The Controls button offers nothing for the time screen. The report image does show the resting pressures and also indicates the higher pressure for the Brachial and Ankle sites. If you do not have the ILR, you can hit "Back" and "View" to see the report image; simply press "Exit" then "Back" to return to the study. **NOTE:** when taking the post-exercise Brachial pressure, the right hose will always be used.

Upper Arterial Studies

Upper extremity arterial studies are fundamentally similar to the lower arterial studies with the exception of the Thoracic Outlet Syndrome, Raynaud's disease, Allen's Test and Radial Artery Assessment studies, which will be described in detail below.

Segmental Pressures and Waveforms

This exam is indicated when the patient presents with *chronic* arm, hand or finger pain with no visible signs of trauma, swelling or redness. With patient lying supine on exam table, SC-10 cuffs are positioned at the biceps area, the forearm and the wrist, while a DC-2.5 digit cuff is attached to the base of the index finger with the corresponding Right and Left PPG sensors at the tips of both index fingers (see below).



Upper arterial cuff placement, left arm

To obtain pressure from the biceps cuff, use the 8 MHz Doppler transducer at the brachial artery. For the forearm and wrist cuffs, use the 8 MHz Doppler at the radial artery. When doing finger pressures, the MultiLab will automatically activate the Right and Left PPG sensors for this portion of the exam (refer to above section on Toe pressures for obtaining finger pressures).

For a complete upper arterial exam, you will need to obtain waveform tracings of the arms to accompany the pressure readings. You can use PVR or Doppler to obtain these tracings. (Refer to PVR and Doppler Waveform sections above for detailed information.)

Thoracic Outlet Study

This study is indicated when the patient presents with *intermittent* arm, hand or finger pain or numbness. These symptoms can be caused by a mechanical compression of the Subclavian artery and/or attending nerve bundle as they exit the chest cavity, during specific patient movements.

Patient should be seated on exam table for this exam with Right PPG sensor attached to right index or third finger, and Left PPG sensor attached to the corresponding left finger.

Although this exam can be performed with any number of patient maneuvers, the following 5 positions are commonly used for the Thoracic Outlet Examination. We begin the study by recording baseline PPG wave tracings. The Baseline Position is typically hands in lap resting, with palms up.



Adjust the Gain so that the on-screen waveform takes up from $\frac{1}{2}$ to $\frac{2}{3}$ of the waveform box. When the waveforms are stable, depress the capture button.

Adson's Maneuver – Have patient take a deep breath and turn head toward the extreme right (or left) side. Typically, the head is turned in the direction of the side being measured. As patient holds breath and has head turned capture wave tracings when stable.



Costoclavicular Maneuver – Have patient take a deep breath and try to touch chin to chest. At the same time ask patient to move both shoulders back as far as possible. Capture wave tracing when stable.



Hyperabduction "A" Maneuver – Have patient sit erect and move arm with active sensor out 90 degrees with the palm facing the floor. Capture waveforms when stable.



Hyperabduction "B" Maneuver – Have patient sit erect and move arm with active sensor straight over head with the palm facing forward. Capture waveforms when stable.



Note that while the above example shows only one active sensor, it is possible to perform this exam with both sensors at the same time. For example, in the case of the Hyperabduction "B" Maneuver show above, it would be done with both sensors and both arms over the head.

Raynaud's Examination (Cold Immersion)

There are various methods for performing the Raynaud's exam. One of the most efficient methods for this evaluation is the use of infrared thermometry (optional accessory for the MultiLab Series II instruments).

Baseline digital temperatures are taken by pointing the temperature sensor directly at the pads of the fingertips, **maintaining a distance of ¼ to ½ inch from digit.** Depress the trigger on the temperature instrument to activate the sensor. Releasing the trigger "captures" the temperature. Repeat this process on the remaining digits.



After all digit temperatures have been obtained, have patient immerse hands (or feet) in an ice-water bath for 30 seconds. After immersion take all digit temperatures quickly after patting the hands dry.

Repeat this procedure at 5, 10, 15, and 20 minute intervals after immersion. Digit temperatures in normal patients will return to or exceed baseline temperatures after 10 minutes. If the temperatures of all digits have returned to or exceeded baseline temperatures, the study can be terminated at that point. Continue temperature measurement until all digits have returned to or exceeded baseline temperatures or until the 20 minute interval has been reached.

Thermometry ILR

The Controls button offers nothing for the thermometry screen. The report can be viewed and zoomed.

Allen's Test

The Allen's test is useful in assessing arterial contribution to the fingers, and the patency of the Palmar Arch. With patient seated, attach the right PPG sensor to the right index or 3rd finger, and the left PPG sensor to the corresponding left digit.

- Record a "baseline" waveform with patient's hands in lap, palms up (left photo below).
- Compress the Radial artery, and capture on-screen waveform after stabilization. (right photo below)



- Release the Radial Artery; compress the Ulnar Artery. Capture waveform after it stabilizes (left photo below).
- Compress both of the Radial and Ulnar arteries simultaneously, and capture waveform, (or lack thereof) when stable (right photo below).



Radial Artery Assessment Study

This study is useful in ascertaining the suitability of the Radial artery for harvest in Coronary Bypass Graft

surgery. To perform the exam, patient should be seated with hands in lap. Place the PPG sensor on the thumb of the hand to be examined. Adjust Gain so that waveform takes up a half to two-thirds of the on-screen waveform box. Capture waveform when stable. Leaving the sensor in place, compress the radial artery with your index, third and ring fingers (see Allen's Test). The resulting on-screen waveform will reflect the blood flowing to the thumb from the Ulnar Artery through the Palmar Arch. Capture this waveform when stable.

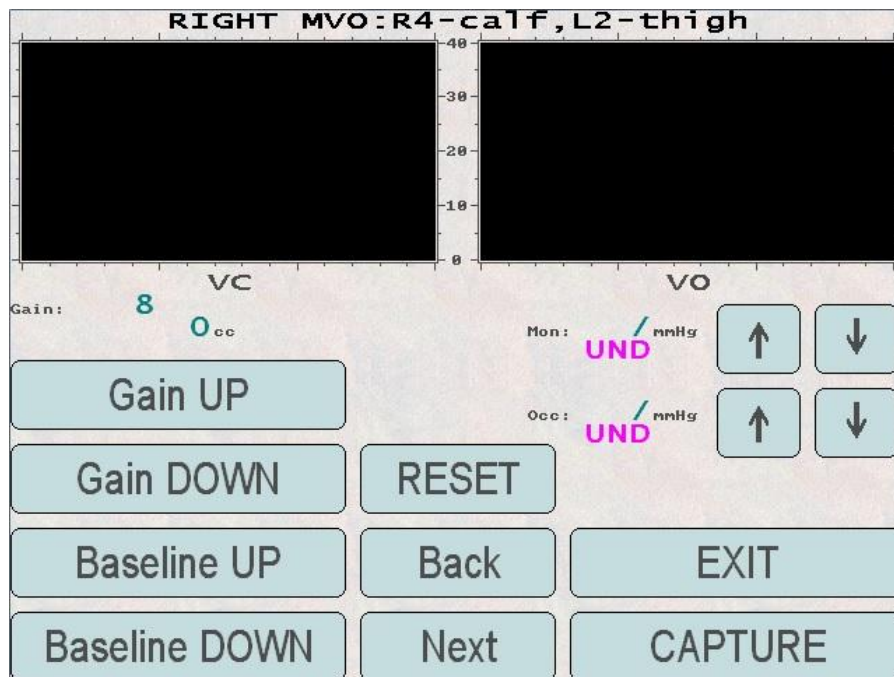
Next, place the PPG sensor on the index finger and capture waveforms with and without Radial artery compression. Repeat on remaining digits.

Lower Venous Studies

MVO/Maximum Venous Outflow Examination

This examination will test for obstruction to venous outflow from the lower leg regardless of the cause. It is a measure of the speed which blood can flow out of a maximally congested lower leg where an occluding thigh cuff is suddenly removed. The advantage of this study is that it is sensitive to obstruction due to any cause at almost any level. It is also capable of detecting obstructing thrombus in the calf veins, iliac veins, and vena cava where ultrasonography and venography are less effective. It also detects venous obstructions due to tumors, and other extrinsic disease processes. The disadvantage to this test is that it is only able to detect significant venous obstructions and will not rule out deep vein thrombosis.

First, raise patient's leg while in supine position, approximately 8" using a pillow or other cushioned material. The knee of the leg to be examined should be flexed and externally rotated. With the patient properly positioned, place a 10 CM cuff around the maximum circumference of the calf and attached the R4 hose. Place a thigh cuff to the high thigh area and attach the L2 hose.



On the screen we will see two waveform tracings: on the left venous capacitance (VC), and on the right venous outflow (VO). Inflate the 10 CM calf cuff pressure to 15 mmHg using the up arrow for "Mon:" on the software screen. Allow for the pressure to stabilize in the cuff and adjust the pressure as necessary to get to 15 mmHg (**NOTE:** do not adjust the "Mon:" cuff for the remainder of the exam). Now press the "Reset" button to calibrate the baseline. Next, inflate the thigh cuff to 60 mmHg using the up arrow for "Occ:" on the software screen. The thigh cuff will then inflate and cause the veins in the thigh area to occlude; the arterial flow into the calf will cause swelling and displace air in the 10 CM cuff (**NOTE:** continue to adjust the pressure in the "Occ:" cuff to

keep the pressure at 60 mmHg). The waveform tracing will rise above the baseline in the VC capture box (If after 30 seconds the tracing goes off the chart, abort the test by removing the hoses from the cuffs and reducing gain). The waveform tracing will rise until it reaches a plateau for a period of 10 seconds with no increase.

When the plateau is reached press "Capture" and then, a second later, release the air pressure in the occluding thigh cuff (**NOTE:** it is advisable to use a rapid deflator on the thigh cuff). This will activate the VO capture box and the waveform tracing will go down toward the baseline. You must press "Capture", again, within 5 to 25 seconds of the first capture. In the VO capture box scroll the point of the pressure release, of the occluding thigh cuff, to the left $\frac{1}{3}$ of the box. Position the white vertical line at the point of deflating the cuff. The red line will represent the expected time (typically 1 second) for measurement of venous outflow (after 1 second); the desired result is a percentage of VC to VO1 (venous outflow after 1 second) (**NOTE:** the waveform's trace point at the right size of the VC capture box indicates the value for VC). If the flow returns to baseline within 1-2 seconds, no significant venous obstructions are indicated. If the flow takes longer to return, this will demonstrate that there is a significant venous obstruction.

MVO ILR

The Controls button offers a change to the sweep speed. The report can be viewed and zoomed.

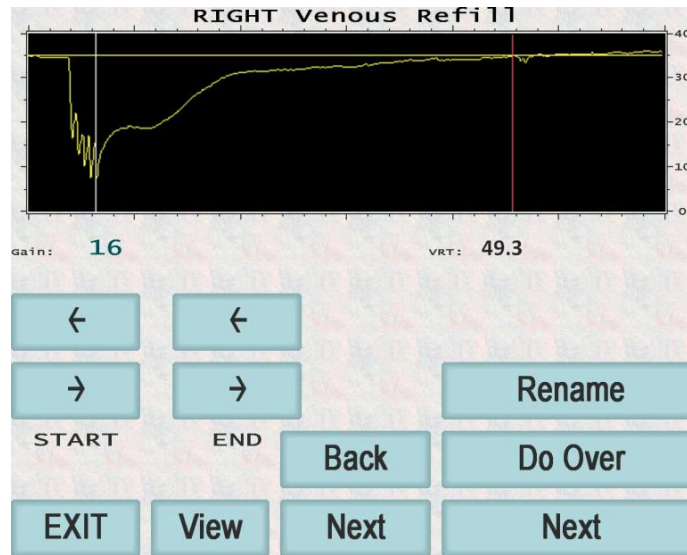
Venous Refill Examination

This examination will test the competency of the valves in the leg veins. Patient should be seated on padded examination table with legs hanging unsupported (exam can also be performed with patient seated in chair with knee bent and foot slightly forward). It is important that the exam table have adequate padding so as not to compress the Saphenous (SP) Vein.

For right leg examination, place the right PPG sensor approximately 2" above the ankle on the Medial aspect of the leg. Press the "Reset" button on the MultiLab screen to display output from PPG sensor. It is important to have the leg at a stable venous capacitance state before beginning the examination. This is achieved by continuing to press the "Reset" button until the on-screen tracing from the PPG sensor shows no more upward movement.



When on-screen tracing is stabilized, press the "Reset" button once more and wait for 5 – 7 seconds. (This will allow the interpreting physician to see that indeed the patient had achieved a stable venous state before exercise.) After the 5 – 7 second period, have patient dorsiflex and plantar flex the foot 5 to 7 times to empty the calf veins. Have patient relax limb and wait for the screen to auto-capture. (**NOTE:** you can also capture the results by pressing the "Capture" button any time after the deflected tracing re-crosses the baseline.)



Each foot flexion should result in a downward deflection of the PPG tracing. Gain should be adjusted so that the downward deflections measure 15 or more millimeters (total) on the MultiLab screen. Occasionally you will encounter a patient who through arthritis or other motion limiting condition, will not be able to flex the foot deep enough or often enough to produce the vein emptying necessary for a clinically acceptable examination. In these instances, it may become necessary to augment the limb manually to achieve the vein emptying required.

To manually augment the limb, place both hands around the calf of the limb to be examined and squeeze the limb 5 – 7 times within 5 – 7 seconds. Augmentation should produce a downward deflection of the PPG signal like is shown in photo above. Remove hands from limb and wait for screen to auto-capture.

Venous Refill ILR

The Controls button can change the sweep speed and inflation target. The report can be viewed and zoomed.

Calculating the Results

When the capture screen is displayed, you must adjust the timing calipers to calculate an accurate Venous Refill Time (VRT). Using the END “→” key, move the end timing caliper (in Red) to the point at which the deflected PPG tracing crosses the baseline (see previous figure).

Use the START “← →” buttons to move the Start timing caliper (in white) to the end of the last downward deflection as shown above.

The time displayed, between the two timing calipers, is the Venous Refill Time for that limb (shown onscreen).

Use of Tourniquets

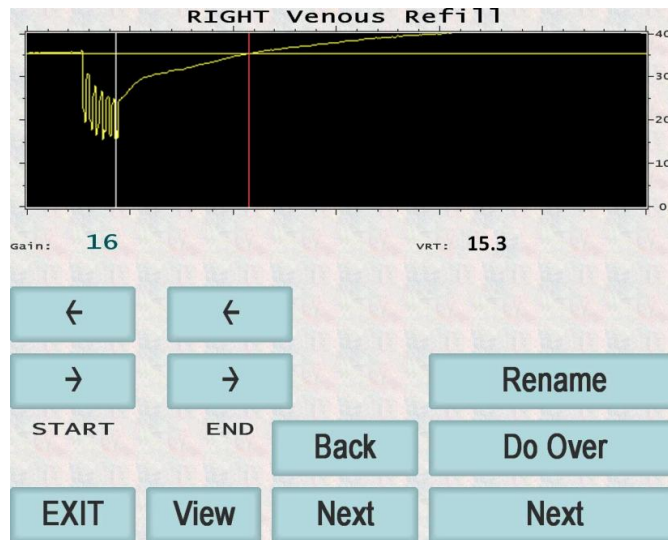
The MultiLab instruments can be configured to print up to five VRT graphs on a single page. Many practitioners like to measure VRT after isolating the superficial or perforating veins using tourniquets above the ankle and above or below the knee. There are two common methods of applying the tourniquets. The first method is to take a wide rubber strip or length of tubing and to tie it around the desired area. The second method involves the use of a tourniquet cuff (typically a 5cm width). This cuff is inflated to 60 mmHg pressure by attaching the appropriate pneumo hose from the MultiLab to the tourniquet cuff and pressing the “Inflate” button once.

Helpful Hints for Venous Refill Exams

As the veins are elastic, it is not uncommon for the veins to expand during the examination. The sign of this occurring is when the venous refilling trace bisects the baseline after the foot exercises, and continues up and off the screen (see photo below). This is an indication that the venous capacitance has increased. To reduce or

eliminate this artifact, you can “condition” the venous system prior to the examination, by asking the patient to perform 10 – 15 toe raises before applying the sensors and beginning the examination.

If you observe an abnormal tracing (VRT of <20 sec. with increased capacitance) like the one below, press “Do-Over” and repeat the exam.



CHAPTER 10: EDITING EXAM AND PRINTING REPORTS

If you are in the middle of an examination, and wish to jump to the middle or end of the program, press the “EXIT” button to bring up the EDIT screen as shown:

Name: TEST PATIENT BLUE SKY VASCULAR
 ID #: 0123 CPT: 93923
 Exam Date: 09/03/2011 11:58 AM
 Operator: TESTER

DATA	LOCATION
0	RIGHT Ankle Pressure-Dors Ped
0	RIGHT Ankle Pressure-Post Tib
0	RIGHT Below Knee Pressure
0	RIGHT Above Knee Pressure
0	RIGHT High Thigh Pressure
0	LEFT Ankle Pressure-Dors Ped
0	LEFT Ankle Pressure-Post Tib
0	LEFT Below Knee Pressure
0	LEFT Above Knee Pressure
0	LEFT High Thigh Pressure
0	RIGHT Great Toe Pressure
0	LEFT Great Toe Pressure
6mm	RIGHT Metatarsal PVR waveform
6mm	LEFT Metatarsal PVR waveform
18mm	RIGHT Ankle PVR waveform
18mm	LEFT Ankle PVR waveform
8mm	RIGHT Below Knee PVR waveform
8mm	LEFT Below Knee PVR waveform
9mm	RIGHT Above Knee PVR waveform
9mm	LEFT Above Knee PVR waveform
10mm	RIGHT High Thigh PVR waveform
10mm	LEFT High Thigh PVR waveform
0	Immediate Post Ex-Brachial
0	Immediate Post Ex-RIGHT Ankle
0	Immediate Post Ex-LEFT Ankle
0	Period 1 Post Ex-Brachial
0	Period 1 Post Ex-RIGHT Ankle

Navigation buttons: Main Menu, New study, Pat. Info, Export, Archive, View, Print, Back, Strip, Up Arrow, Down Arrow.

The cursor will automatically default to the location you exited from. Using the “↑” and “↓” buttons, you can scroll to any other location quickly by highlighting the desired location and touching the “Back” button. In the event of a power outage, simply move the highlighted cursor to the first blank data field, as shown above, and then press the “Back” button to resume the patient study.

The buttons shown on the Edit Screen function as follows:

- BACK** will return user to the site that is highlighted
- STRIP** will print (in black and white) JUST the information that the cursor is currently highlighting
- UP ARROW** will move the cursor bar up
- DOWN ARROW** will move the cursor bar down

MAIN MENU	will exit user to the MultiLab Start Screen
NEW STUDY	will allow user to perform another study on current patient without having to re-enter patient name or identification. Note: the name of this button is defined in the System Setup.
PAT. INFO	will allow user to add or correct any patient information that is missing or incorrect
EXPORT	will bring up the export control menu (see below)
ARCHIVE	will bring up the archive control menu (see below)
VIEW	will display any captured information, as it will appear on the printed page
PRINT	will bring up the print control menu (see below)

Edit Exam ILR

The exam edit ILR defaults to the report view and allows you to touch the report to retake a patient measurement. The controls are the same as "ILR Temp File Functions" on page 42. The following buttons are also provided:

- RIGHT ARROW** will change the edit focus to the next page of the patient exam.
- LEFT ARROW** will change the edit focus the previous page of the patient exam.

Printing Patient Reports

The MultiLab software has a sophisticated printing system. It can queue and print multiple report pages while allowing the user to continue operation of the MultiLab. Report pages will print in the background while you operate other functions of the MultiLab. Depending on your usage of the MultiLab printing may temporarily be suspended, but will continue as system resources become available. For example, entering patient information requires fewer resources than inflating cuffs. Note that in the Windows version, the print queue is handled by the operating system.

Note: You should not exit or turn off the MultiLab program (see Exit on the Start Screen) until printing has finished. If this or other incidents, such as a paper jam or paper out, should occur your patient data will be cleared from the printing system, but can be re-printed at any time in the future. Simply select "Temp Files" from the Start screen and re-print any unprinted report pages after any problem is resolved. Also, after clearing problems with a printer (paper out, paper jam, etc...) it is a good idea to power cycle (turn off then turn on) the printer before reprinting any pages.

When you press the print button from a menu screen, the following screen will appear:

NAME	ID	DATE
TEST PATIENT	LA Segmental Pressures w/ PVR	09/03/2011 11:58 AM
TEST PATIENT 1	UA Segmental Pressures & Dop	09/03/2011 12:01 PM
TEST PATIENT 2	VRT - Venous Refill Time	09/03/2011 12:02 PM

Print Page	Print Patient	Print All
Copies	Mono	↑
View	Cancel	↓

Printer Queue Status: Stopped | Copies: 1

The following functions are available from the print control menu screen:

- Print Page** adds the page that is highlighted to the printing system and exits.
- Print Patient** adds all pages matching the highlighted patient name to the printing system and exits.
- Print All** adds all of the listed pages to the printing system and exits.

- Copies** will allow the user to print multiple copies of the same report. Number is in lower right of screen.
- Mono/Color** will allow the user to print reports in Color or Monochrome (Black & White), e.g. press Mono if you want a report in Black and White.
- View** will display the highlighted study, as it would appear on the printed page. Note: the report color in view is set in the System Setup.
- Cancel** will exit the print control menu. Also resets the number of copies.
- Up Arrow** will move the cursor bar up.
- Down Arrow** will move the cursor bar down.

Printing ILR

The ILR will, by default, show the report page for the highlighted line. The INFO button changes the ILR to the name of the printer and its status. Press the Update button to refresh the printer's status as it changes over time.

Archiving Patient Reports

Your MultiLab is capable of storing fifty thousand report pages in its archive. **The limitation is that once a study is archived, it can no longer be changed.** Thus, you shouldn't archive a report page until you are sure that no further changes are needed (say, after a physician signature). Once a report page has been archived, it is permanently removed from the temporary file and then placed into the lookup (see Chapter 4, Lookup Functions).

When you press the archive button from a menu screen, the following screen will appear:

NAME	TYPE	DATE
TEST PATIENT	LA Segmental Pressures w/ PVR	09/03/2011 12:06 PM
TEST PATIENT	UA Segmental Pressures & Dop	09/03/2011 12:07 PM
TEST PATIENT 1	VRT - Venous Refill Time	09/03/2011 12:08 PM

Arc. Page	Arc. Patient	Arc. All
		↑
View	Cancel	↓

The following functions are available from the archive control menu screen:

- Arc. Page** archives the page that is highlighted, removes it from the temporary file, and exits.
- Arc. Patient** archives all pages matching the highlighted patient name, removes them from the temporary file, and exits.
- Arc. All** archives all of the pages, removes all pages from the temporary file, and exits.
- View** will display the highlighted study, as it would appear on the printed page.
- Cancel** will exit the archive control menu.
- Up Arrow** will move the cursor bar up.
- Down Arrow** will move the cursor bar down.

Archive ILR

The Archive ILR will show, by default, the destination file paths for the archive. The View button is available.

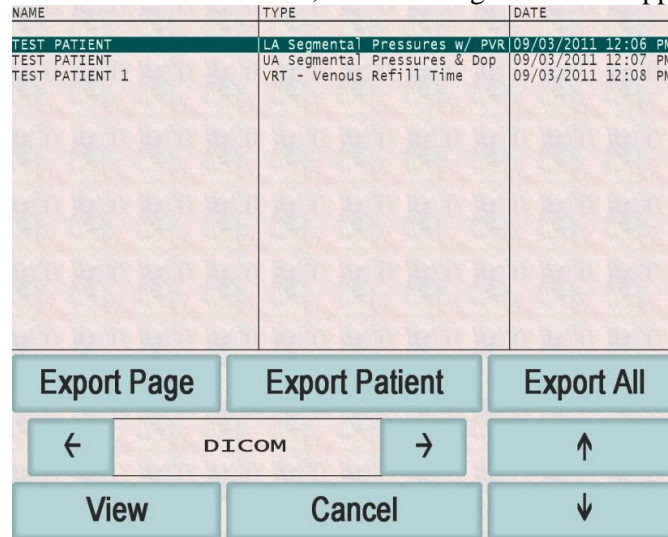
Exporting Patient Reports

The export feature of the MultiLab is designed to be a configurable way of connecting the MultiLab to an external device (not the printer, display, or internal storage of the MultiLab). Some examples of external devices are:

PACS (DICOM)	ZIP Drive	ICAVL Database	CD-R/W
Network Server	Floppy Disk	Facsimile	USB Drive

Note that connectivity is an option for the MultiLab and must be purchased separately. Specific connectivity options are outside the scope of this manual and are typically unique for each user. This section is included here because the export menu is standard, regardless of what device is being exported to.

When you press the export button from a menu screen, the following screen will appear:



The following functions are available from the export control menu screen:

- Export Page** exports the page that is highlighted and exits.
- Export Patient** exports all pages matching the highlighted patient name and exits.
- Export All** exports all of the pages and exits.
- View** will display the highlighted study, as it would appear on the printed page.
- Cancel** will exit the export control menu.
- Up Arrow** will move the cursor bar up.
- Down Arrow** will move the cursor bar down.
- Right Arrow** change the type of export
- Left Arrow** change the type of export

Export ILR

The Export ILR will show, by default, what will be exported and where the export will go. The View button is available.

CHAPTER 11: CONFIGURING STUDIES

Since there are so many variables in the types of vascular studies that are performed, the order in which they are performed, and a multitude of personal preferences in the field of Physiologic Vascular Testing, the MultiLab Series II instruments have been designed to give the user unparalleled flexibility in customizing the MultiLab to each facility or even to each individual within the facility.

Some of the more common items that can be customized are:

- Inflation targets** which can be preset for each site (e.g. the Ankle site can be preset to inflate to 165 mmHg, while the calf can be set for 175 mmHg, Thigh – 180 etc...)
- Deflation Rates** there are 40 different bleed rates for the pressure cuffs, adjustable in 1/8th mm per second intervals.
- Sequencing order** some prefer to do waveforms first, and then finish with Segmental Pressures. Others prefer the opposite. Some like to start at the thigh and work down the leg, while others like to start at the ankle and move up.

Wherever you like to start, and whatever order you like to proceed, the MultiLab can be configured exactly to your liking, even down to how you like your finished printed report to look.

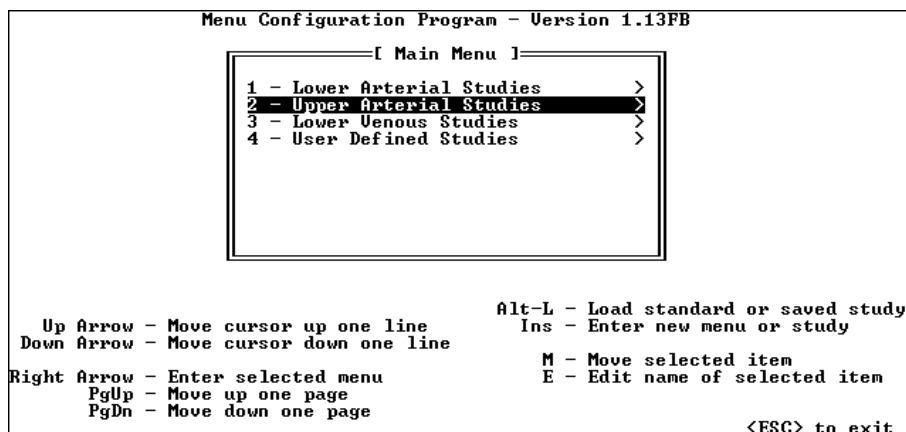
Before you begin, start to think about the protocol that you use for a specific type of study. Whether it is an upper or lower extremity exam, it may consist of any combination of Patient questions, Limb Pressure measurements, Doppler, PVR or PPG wave tracings, Post-exercise measurements, digit pressures, and possibly technologist notes or a physician interpretation. Unlike any instrument ever designed, the MultiLab is not “modality driven” but “protocol driven”, meaning that a given study may combine any or all of the above listed components, and that unlike any other vascular instrument available, allows the user to determine what the final exam print-out will look like. For example, you can take a pressure measurement anywhere you desire, follow that with a digit PPG wave tracing, a PVR tracing at the Right and Left Ankles, and then finish with Doppler wave tracings at the Common Femoral sites. You can then press the “Print” button and combine all these various modalities on a 1 page printed report.

Although there are many variables that can be modified, the MultiLab instrument comes pre-loaded with a number of commonly performed standard vascular procedures that are ready to use. If you are an advanced Vascular Specialist, and want to set the instrument up to your exact specifications, this chapter will familiarize you with the basics to really personalize your instrument. Please bear in mind that your instruments’ Patient studies can be modified at any time, and if you should require more assistance in customizing any portion of your studies, please do not hesitate to contact Unetixs Vascular. It is a simple matter to call us on the phone, describe the desired modifications, and let us configure custom protocols for you.

The easiest way to custom-configure a study is to choose a pre-loaded MultiLab Standard study which most closely matches your desired protocol. (Please don’t be afraid to proceed, as if a mistake is made, the study can be deleted, and a new one loaded an infinite number of times from a directory within the MultiLab software program.)

NOTE: Before custom configuring any Patient studies, press the “Temp Files” button on the Start screen and archive any files in the directory. Failure to do so may result in loss of data in an un-archived Patient study.

Press the “Setup” button, followed by the “Configure Studies” button. If there are no studies in the “Temp Files” directory, you will see the following screen, which is a representation of the Main Study Menu as it ships from the factory:



Customizing an Existing Study

The keyboard keys work as stated below the Main Menu box. If, for example, we wished to customize the existing Lower Arterial Patient History Page, you would highlight the “Lower Arterial Studies” entry (#1) and press the “Enter” or the Right Arrow key to bring up the following screen:

```

Menu Configuration Program - Version 1.13FB

-----[ Lower Arterial Studies ]-----
1 - LA Seg. Press. w/ PUR-3 Cuff
2 - LA Segmental Pressures w/ PUR 3
3 - LA Segmental Pressures w/ DOP 2
4 - LA PPG Toe & Toe Pressures 4
5 - LA Post Exercise Pressures 5
6 - Lower Arterial History Page 1

Alt1 to Alt9, <Alt0> - Set/<Clear> Slot #   ALT-E - Set ALL 'THE END' records
Alt-S - Save copy of study to disk         Alt-L - Load standard or saved study
                                           Ins - Enter new menu or study
Down Arrow - Move cursor down one line     Del - Delete current menu or study
Left Arrow - Back up one menu              M - Move selected item
Right Arrow - Enter selected study         E - Edit name of selected item
                                           Alt-C - Copy study to clipboard

                                           <ESC> to exit
    
```

Highlight the “Lower Arterial History Page” entry by using the up and down arrow keys, and press the “Enter” key to open the Lower Arterial History Page for editing, as seen below:

```

-----[ Lower Arterial History Page ]-----
1 - Variable Text -----
2 - Variable Text --- HISTORY
3 - Variable Text --- Prev. Uasc. Testing
4 - Variable Text --- Prev. Uasc. Surgery
5 - Variable Text --- Diabetic
6 - Variable Text --- Malignancies
7 - Variable Text --- Stroke
8 - Variable Text --- Cholesterol Levels
9 - Variable Text --- Smoking
                               ↓ ↓ ↓

Down Arrow - Move cursor down one line   End - Move to last line
Left Arrow - Return to Menu Configuration Ins - Insert new test item
Right Arrow - Configure Item             Del - Delete current test item
                                           Alt-C - Copy current item
PgDn - Move cursor down one page        M - Move item

                                           <ESC> to exit
    
```

Inside any MultiLab standard or custom studies, you will find a variety of components or “modules” that make up that study. Fixed Text and Variable Text modules are examples of these. These modules are for printing text entries on the report page. As you might imagine, a “Fixed Text” module will place a text entry on the report page that is “Fixed” or in other words, not able to be changed by the operator during the examination. The “Variable Text” module, on the other hand, would allow the user to input text data, such as a Patients name or ID, or whether the patient is diabetic, a smoker, or has a history of Heart Disease.

If for example, you wished to change a question on the Patient History page from “Malignancies” to “Hypertension” you would simply highlight the sixth Variable Text entry that reads “Malignancies” (using the down arrow key) and then press the “Enter” key to bring up the variable text screen shown below:

```

Variable Text
Tag: "Malignancies"
Print-X: 630          Capture Record: 0
Print-Y: 205         Single text line
Export Code: 0       Import Code: 0
                    Import Text + Default Text
Header printed if there is data to print
Use last Print-Y position +50
Header Color: Black   Text Color: Black
Header Bold: Disabled Text Bold: Disabled
Header Underline: Disabled Text Underline: Disabled
Header text:
Malignancies:
Max Text Size: 59
Default text:
<F1> for Help      <F10> to Save and Exit    <ESC> to exit
    
```

Note: Since this chapter is a basic primer on configuring studies, only some of the properties will be described.

Some various fields and functions of the “Variable Text” entry are described below:

TAG Will display the text printed in the highlighted text box inside the study configurator and on the MultiLab screen (but WILL NOT be displayed on the printed page.)

PRINT X Defines where on the page the data will be printed on the horizontal plane (left to right)

PRINT Y Defines where on the page the data will be printed on the vertical plane (top to bottom)

HEADER TEXT Will print the text printed in the highlighted text box below on the MultiLab report

In the example below, we have substituted the word “Hypertension” for the previous entry (Malignancies) in “Tag” box but not in the “Header Text” box. Failure to change both field entries will result in a discrepancy between the on screen prompts and the printed text.

```

Variable Text
Tag: "Hypertension"
Print-X: 630          Capture Record: 0
Print-Y: 205         Single text line
Export Code: 0       Import Code: 0
                    Import Text + Default Text
Header printed if there is data to print
Use last Print-Y position +50
Header Color: Black   Text Color: Black
Header Bold: Disabled Text Bold: Disabled
Header Underline: Disabled Text Underline: Disabled
Header text:
Malignancies:
Max Text Size: 59
Default text:
<F1> for Help      <F10> to Save and Exit    <ESC> to exit
    
```

The screen below shows both variable text entries as they should appear:

```

Variable Text
Tag: "Hypertension"
Print-X: 630
Print-Y: 205
Export Code: 0
Header printed if there is data to print
Use last Print-Y position +50
Header Color: Black
Header Bold: Disabled
Header Underline: Disabled
Header text:
Hypertension:
Max Text Size: 59
Default text:

Capture Record: 0
Single text line
Import Code: 0
Import Text + Default Text
Text Color: Black
Text Bold: Disabled
Text Underline: Disabled

<F1> for Help      <F10> to Save and Exit      <ESC> to exit
    
```

Note: it is necessary to add 1 space after the colon when changing "Header Text" entries, before pressing the "F10" key to save and exit. Failure to do so will result in a text misalignment on the printed report.

As seen by the following screen, the #6 variable text entry now reads: Hypertension, instead of Malignancies:

```

[ Lower Arterial History Page ]
1 - Variable Text --- -----
2 - Variable Text --- HISTORY
3 - Variable Text --- Prev. Uasc. Testing
4 - Variable Text --- Prev. Uasc. Surgery
5 - Variable Text --- Diabetic
6 - Variable Text --- Hypertension
7 - Variable Text --- Stroke
8 - Variable Text --- Cholesterol Levels
9 - Variable Text --- Smoking
      ↓ ↓ ↓

Up Arrow - Move cursor up one line
Down Arrow - Move cursor down one line
Left Arrow - Return to Menu Configuration
Right Arrow - Configure Item
PgUp - Move cursor up one page
PgDn - Move cursor down one page

Home - Move to first line
End - Move to last line
Ins - Insert new test item
Del - Delete current test item
Alt-C - Copy current item
M - Move item

<ESC> to exit
    
```

Changing the Sequence of an Examination

To give an example of how to change the sequence of an exam's components, we'll go into a Lower Arterial Segmental Pressure study with Doppler Waveforms.

```

[ LA Segmental Pressures w/ DOP ]
1 - Doppler ----- RIGHT Common Femoral Doppler
2 - Doppler ----- RIGHT Sup. Femoral Doppler
3 - Doppler ----- RIGHT Popliteal Doppler
4 - Doppler ----- RIGHT Post. Tibial Doppler
5 - Doppler ----- RIGHT Dorsalis Pedis Doppler
6 - Doppler ----- LEFT Common Femoral Doppler
7 - Doppler ----- LEFT Sup. Femoral Doppler
8 - Doppler ----- LEFT Popliteal Doppler
9 - Doppler ----- LEFT Post. Tibial Doppler
      ↓ ↓ ↓

Down Arrow - Move cursor down one line
Left Arrow - Return to Menu Configuration
Right Arrow - Configure Item
PgDn - Move cursor down one page

End - Move to last line
Ins - Insert new test item
Del - Delete current test item
M - Move item

<ESC> to exit
    
```

You will notice that the first item that will come up is a Doppler waveform at the Right Common Femoral site. If you wanted to rearrange the sequence of the study, and take your Doppler tracings after your pressures, you can simply scroll down to the desired pressure site, and select it by pressing the "M" (for Move Item) key. Once

selected, you can now move the selected pressure site to the number one position, and “paste” it into place by pressing the “Enter” key when it is in its desired location.

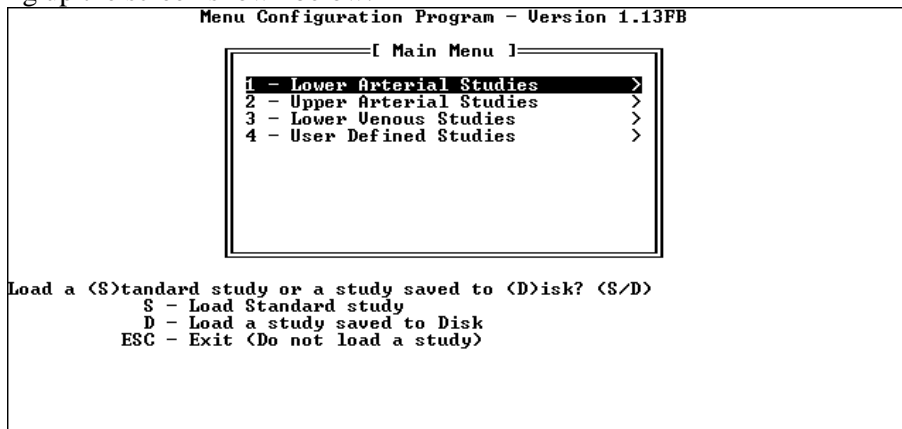
Loading and Customizing a New Standard Study

Again, you can customize an existing patient study as shown above or you can load a standard study. Unetixs' “Standard” studies include almost every aspect or “modality” that someone may wish to perform in a patient encounter. For example the “Segmental Pressures with PVR” standard study includes: Resting systolic pressures at the (Right and Left) Brachial, Ankle DP, Ankle PT, Calf, Above Knee, and High Thigh sites as well as PVR tracings at the Trans-Metatarsal, Ankle, Below Knee, Above Knee and High-Thigh sites.

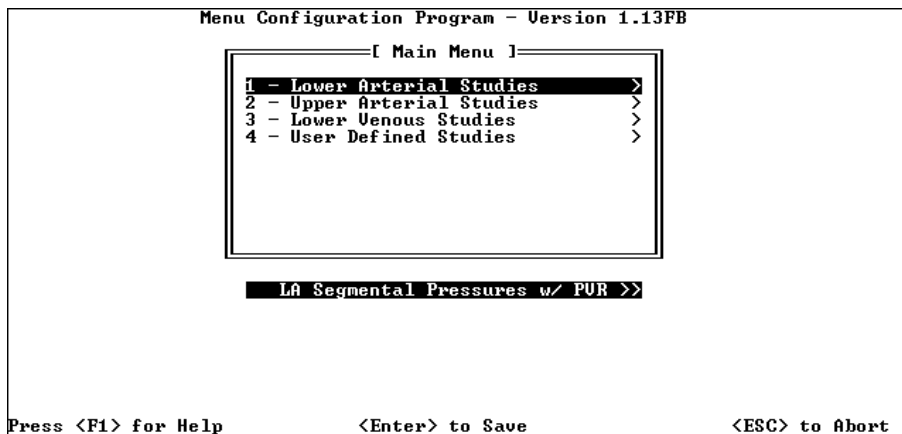
Also included in this “Standard” are Systolic Toe Pressures, immediate Post-Exercise pressures at the Brachial and Ankle sites, and 3 more intervals of Post Exercise pressures after that. As is pre-programmed into this Standard Study, the intervals will read: Period 1, 2, and 3 Post Exercise. If your exam protocol calls for pressures to be taken 3 minutes, 6 minutes and 9 minutes after exercise, the program can be easily modified to reflect these values both on-screen and on the printed report.

If you do not perform Toe Pressures or Post-Exercise Pressures as part of your Lower Arterial protocol, these items can simply be deleted, and will not show up on your on-screen prompts or your printed report. The “Segmental Pressures with Doppler” Standard is similar in configuration, but will prompt the user to obtain Doppler tracings at the Common Femoral, Superficial Femoral, Popliteal, Posterior Tibial, and Dorsalis Pedis arteries. Any one of these Waveform Tracing sites can be deleted or renamed as desired.

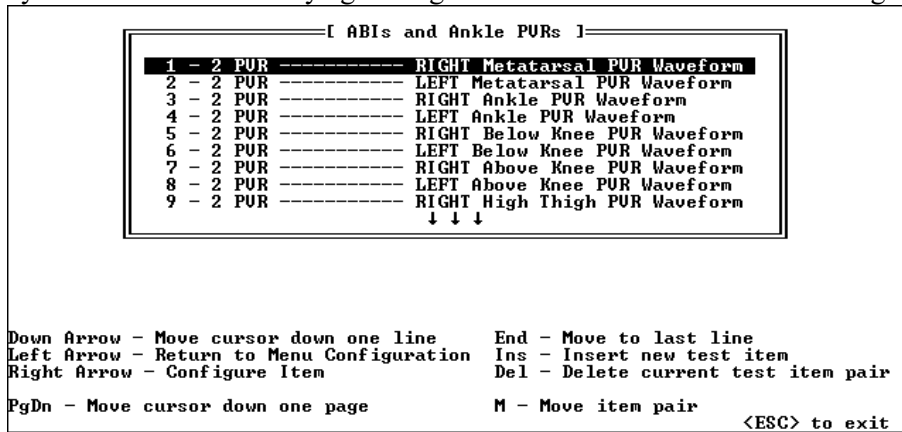
To load a new “Standard Study” to modify, simply press the “Alt L” key from anywhere in the study configurator, to bring up the screen shown below:



Pressing the “S” key to load one of the standards stored in permanent MultiLab memory will bring up the following screen:



Using the “backspace” key, delete the contents of the cell, and then type in “ABIs and Ankle PVRs” and then press the “Enter” key. Press the “Enter” key again to go into the exam itself. The following screen will appear:

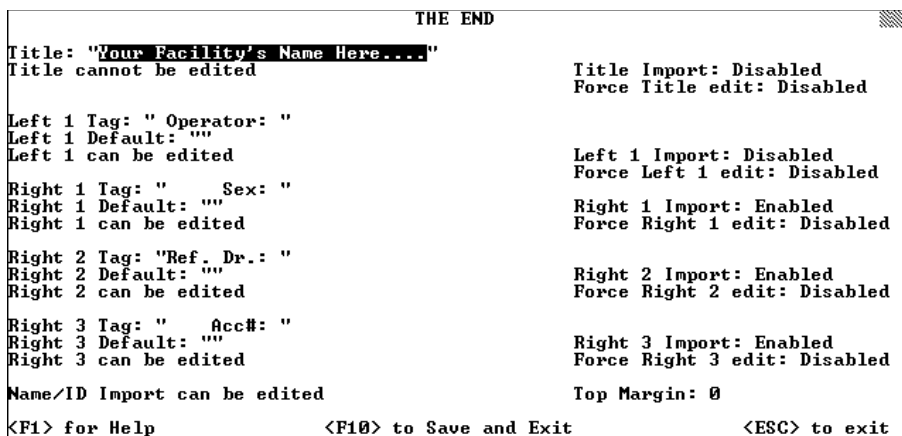


To remove the Metatarsal waveforms, press the “delete” key and then pressing the “Y” key when asked “Are you sure you wish to delete this item?”. Note that both the left and right will be removed with a single deletion. Since we wish to keep the Ankle waveforms, we will skip those two sites and continue on by deleting the Below Knee, Above Knee, and High Thigh waveforms the same way.

We will then skip over the Brachial and Right Ankle pressures, now items 3, 4, 5, and 6, and delete the Below Knee, Above Knee, and High Thigh pressures leaving the Left Ankle pressures as items 7 and 8. Then delete the Below Knee, Above Knee and High Thigh pressures for the Left side along with the Great Toe pressures (only one delete for the pair!). It will appear at this point that our goal has been accomplished, but there is one more step to perform: removing the Post-Exercise pressures and setting the Facility Name that will print on the top of the report page.

There are two ways to remove the Post Exercise pressures; you can scroll down and manually delete them or put them below the “The End” entry. Since we need to make a modification in “The End” entry any way, we will choose to put them below it. To get to the “The End” entry, simply press the “End” key and your cursor will automatically be moved to that location (#108). We will then proceed by moving the “The End” entry up to position #44 and pressing the “Enter” key to “lock” it in that location. Any item that appears below the “The End” entry will not be a part of the examination.

To finish our custom exam, we will press the “Enter” key on the highlighted “The End” entry to bring up the following screen:



Use the backspace key and keyboard to correct the facility name. Press F10 key to save the change. The new exam is finished. Press the “escape” key several times to return to the MultiLab Start screen to perform the exam.

Customizing Pressure Studies

As mentioned earlier, there are a number of parameters that can be configured within a pressure examination. Below is an example of a single pressure screen. Rather than explain all the parameters in detail, we will instead focus on the most common modified elements.

Note: You must press the F10 key to save any changes made to the following screen:

```

1 Pressure
Tag: "RIGHT Brachial Pressure"      Gain Units: Normal
Pressure Designation: PA           Gain Unlocked
Print-X: 1060 Print-Y: 470        Gain is set from previous site
Hide Timer                         Initial Gain: 4
                                   Baseline Invisible
                                   Baseline Unlocked
                                   Baseline is set from previous site
Outer Graphic Box Enabled         Initial Baseline: 10.00 mm
Justification: Right             Audio Unlocked
Print if captured                Audio is set from previous site
                                   Initial Audio <0 = Off>: 2
Probe Unlocked                   Manometer Side: Right
Probe is set from previous site   Auto Cuff Selector: Right 1
Initial Probe: Doppler 8 MHz     Export Code: 128
                                   Spectral: No
Inflation Type: Automatic
Target Pressure: 160
Overflow Pressure: 300
Deflation Type: Automatic
Deflation Rate: 3.000 mmHg/s
Capture Record: 0
Speed: 10 mm/sec
Filter: 28 Hz + HP
<F1> for Help                    <F10> to Save and Exit        <ESC> to exit
    
```

Changing the Target Pressure

The target pressure is the pressure the MultiLab will inflate the pressure cuff to with one touch of the screen, or remote control. To change the target pressure, simply toggle down to the "Target Pressure" line; then, using the right and left arrow keys, the default value can be increased or decreased. Some users prefer to set the target pressure to 200mmHg, and simply stop the inflation process by pressing the "deflate" button once the vessel is compressed.

Changing the Deflation Rate

By moving your cursor down to the "Deflation Rate" line the deflation rate can be changed by using your left and right arrow keys. The factory preset deflation setting is 3 mmHg deflation per second, but that rate may be increased or decreased by 1/8th mmHg increments. The maximum bleed rate available is 5 mmHg of deflation per second.

Changing Active Inflation Hoses

You can assign any inflation hose, on a MultiLab with an auto cuff selector, to any cuff site. Move the cursor to the "Auto Cuff Selector" line and using the right and left arrow keys to select Right or Left hoses 1 – 6 to be assigned to the site listed at the top of the screen.

Modifying Doppler Studies

If you are performing a Doppler Waveform study, there are a number of parameters that you can adjust to further customize your instrument.

Some of the more common parameters to modify in a Doppler Waveform Study would be Site to examine, where the waveform is to be printed on the finished report, Gain units, Baseline, and Sweep Speed.

```

Doppler
Tag: "LEFT Common Femoral Doppler"      Waveform width: 75.00 mm
Waveform Designation: WF                Export Code: 19
Print-X: 1512   Print-Y: 205            Grid Visible
Hide Timer                               Capture Record: 0
Gain Units: Doppler Hz/mm               Initial Probe: Doppler 8 MHz
Gain Unlocked                           Probe Unlocked
Gain is set from previous site           Probe is set from previous site
Initial Gain: 96 Hz/mm                  Flow Direction: Bidirectional
Baseline Visible                         Invert Waveform: No
Baseline Unlocked                       Audio Unlocked
Baseline is set from previous site       Audio is set to Initial Audio below
Initial Baseline: 10.00 mm              Initial Audio (0 = Off): 2
                                          Spectral: No

Speed: 25 mm/sec
Filter: Off
Auto Cuff Selector: None

Text lines displayed below waveform:
"Dop 8MHz LEFT Common Femoral"
"Gain: 96 Hz/mm Speed: 25"

<F1> for Help          <F10> to Save and Exit      <ESC> to exit
    
```

Doppler Gain Units

Doppler gain units can be expressed in “Hz/mm” (Hertz per millimeter) or “Normal” values. The former is a value that describes the frequency shift of the Doppler probe, and the latter would be more a “laymen’s” version of this. The factory default setting is “96 Hz/mm”. What this means is that a Doppler shift of 96 Hz from the Doppler probe will cause an upstroke of 1 mm (one millimeter) in the on-screen waveform box and on the printed report.

Even though scientifically correct, this display of gain may be counter-intuitive to some, as the smaller the gain units expressed in this fashion, the HIGHER the gain. For example, a gain setting of 48 Hz/mm would require half the amount of Doppler shift to generate the same 1 mm upstroke, effectively increasing the gain by a factor of two.

For those with a more linear mindset, we have the ability to display the Gain units in the “Normal” mode, in which a Gain setting of “4” correlates to the 96 Hz/mm setting described above. With “Normal” Gain units, a doubling of the Doppler gain would be “8” (correlating to 48 Hz/mm), a value that is twice that of 4. Changing these values (by using the Left and Right arrow keys in the configurator) will change how they are displayed on the MultiLab Video Screen and on the printed report.

Doppler Filter

The operator also has the ability to “preset” a Doppler Filter to remove waveform artifact in subjects with very low blood flow at high gain settings. The factory preset for this feature is “Off” as the Unetixs Doppler, while being quite sensitive, is relatively free of artifact. There are four levels of filtering available from 28 Hz (least amount of filtering) to 3.5 Hz (highest level of filtering). As filtering can affect important diagnostic waveform criteria, Unetixs recommends not using Doppler Filters from the preset, but to use only filtering when necessary during patient examinations.

Doppler Baseline

The factory baseline preset for Doppler Waveforms is 10 mm, meaning that of the 40 mm vertical space in the waveform box, the top 30 mm will display flow above the baseline (typically forward flow), while the bottom 10 mm will display flow below the baseline (typically reverse flow). You can change the default baseline settings for each site by using the Left and Right arrow keys. Please note that the baseline can be adjusted “on-the-fly” at any time during a patient examination, so keep that in mind when considering changing this factory preset.

Doppler Sweep Speed

For Doppler Waveform Studies, the default sweep speed is 25 millimeters per second. As the waveform box on the report page is 75 millimeters wide, this will allow you to capture 3 seconds worth of waveform information. If for some reason you wished to “slow” down the sweep speed, you could display more waveforms by reducing the sweep speed using your Left arrow key. A sweep speed of 10 mm/second would allow for the capture of 7.5

seconds of waveforms. Please note, however, that sweep speeds of less than 25 mm/second (which is typically considered "real-time") will result in waveform compression, making waveform analysis more difficult.

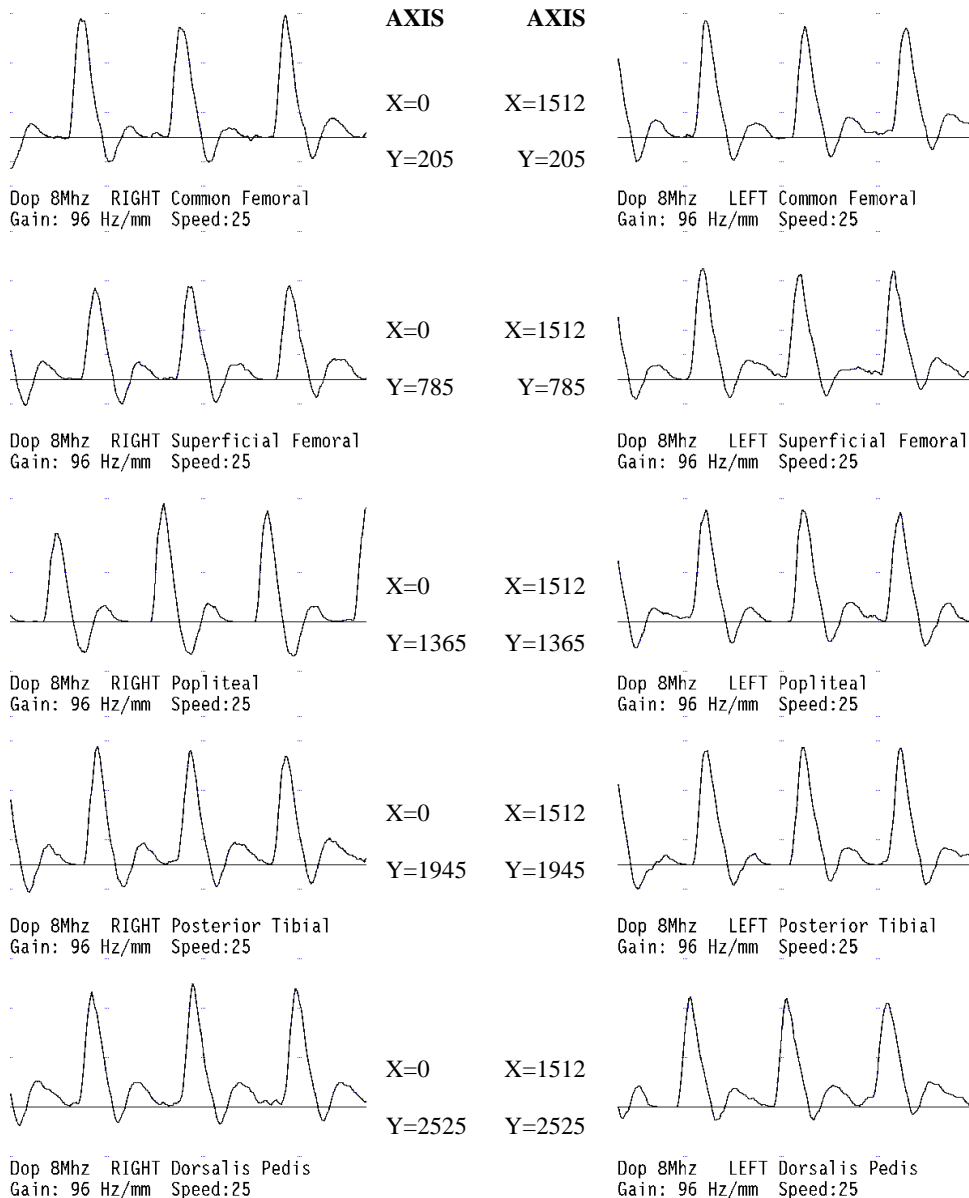
Changing Location to Examine

The default settings for Lower Arterial Doppler Wave tracings are the Common Femoral, Superficial Femoral, Popliteal, Posterior Tibial, and Dorsalis Pedis Arteries. Some facilities may not wish to exam the Superficial Femoral Artery, for example. In this instance, the Left and Right Superficial Doppler Waveform entries could simply be deleted. If you wished to substitute one location for another, (like changing the Dorsalis Pedis site to the Peroneal Artery, for instance) this can be accomplished by changing both the "Tag" line and the "Text Line to be displayed below waveform". Change them so that they read, or mean, the same (see the previous example in changing a "Variable Text" item).

Changing the Waveform Location on the Printed Page

Name: WAVEFORM LOCATIONS
ID #: 555-55-5555
Exam Date: 8/18/2003 4:31 AM
Operator: UNETIXS

OPERATION MANUAL SUPPLEMENT
CPT: 93923



You will notice that each Doppler Waveform has a different “X” and “Y” coordinate that determine where it will be printed on the finished report. The MultiLab software will allow for the printing of ten 75mm wide waveform boxes on each report page.

In the example above where we simply deleted the Superficial Femoral Doppler Waveforms, the printed report would have a “hole” where the Superficial Femoral waveforms would normally be printed. To make for a more visually pleasing report page, you could move the Popliteal, Posterior Tibial, and Dorsalis Pedis up, thus leaving the blank space at the bottom of the page. Since there is room on each printed page for ten 75 mm waveform boxes, you could even make use of that space by inserting some Toe Waveforms, for example.

The above page gives the coordinates for the locations of the waveform boxes. Simply change the Print “X” and “Y” coordinates for any waveform you wish to print in other than its default position.

Inserting Waveforms

As was mentioned earlier, it is possible to “mix and match” various waveforms on a single page. In order to do this however, you must have available space on the page you wish to put the waveforms. Looking at the previous page you will notice that there are ten Doppler waveforms already on that page. You would not be able to insert any more waveforms into that study. However as in the previous example of “Changing the Waveform Location on the Printed Page” where we deleted the Superficial Femoral Doppler and moved the remaining sites up, there would be 2 spaces at the bottom of the page (X=0, Y=2525, and X=1512, Y=2525).

If we desired, we might put some Toe PPG waveforms in that space by pressing the “Insert” key after the “Left Dorsalis Pedis Doppler” entry as shown below:

```

┌ LA Segmental Pressures w/ DOP ─┐
├──────────────────────────────────┤
1 - Doppler ----- RIGHT Common Femoral Doppler
2 - Doppler ----- RIGHT Popliteal Doppler
3 - Doppler ----- RIGHT Post. Tibial Doppler
4 - Doppler ----- RIGHT Dorsalis Pedis Doppler
5 - Doppler ----- LEFT Common Femoral Doppler
6 - Doppler ----- LEFT Popliteal Doppler
7 - Doppler ----- LEFT Post. Tibial Doppler
8 - Doppler ----- LEFT Dorsalis Pedis Doppler
9 - 1 Pressure ----- RIGHT Brachial Pressure
├──────────────────────────────────┤
┌──────────────────────────────────┐
2 PPG ────────────────────────────>>
└──────────────────────────────────┘

<Left Arrow> - Go to previous selection
<Right Arrow> - Go to next selection
<Enter> - Save selection
<ESC> - Abort selection
    
```

You will then be presented with a number of “modules” that you could insert into the exam you are creating. Press the Right Arrow key to bring up “2 PPG” and press the “Enter Key. This will load the “2 PPG waveform” module into your study as shown below:

```

┌ LA Segmental Pressures w/ DOP ─┐
├──────────────────────────────────┤
1 - Doppler ----- RIGHT Common Femoral Doppler
2 - Doppler ----- RIGHT Popliteal Doppler
3 - Doppler ----- RIGHT Post. Tibial Doppler
4 - Doppler ----- RIGHT Dorsalis Pedis Doppler
5 - Doppler ----- LEFT Common Femoral Doppler
6 - Doppler ----- LEFT Popliteal Doppler
7 - Doppler ----- LEFT Post. Tibial Doppler
8 - Doppler ----- LEFT Dorsalis Pedis Doppler
9 - 2 PPG ----- RIGHT
├──────────────────────────────────┤
┌──────────────────────────────────┐
Up Arrow - Move cursor up one line      Home - Move to first line
Down Arrow - Move cursor down one line   End - Move to last line
Left Arrow - Return to Menu Configuration Ins - Insert new test item
Right Arrow - Configure Item             Del - Delete current test item pair
PgUp - Move cursor up one page           M - Move item pair
PgDn - Move cursor down one page
└──────────────────────────────────┘
<ESC> to exit
    
```

Now to complete the exam, highlight the "Right PPG" entry and press the "Enter" key. Then type "Great Toe PPG Waveform" in the Tag line. Using your Down Arrow key move the cursor to the "Print Y" parameter (since the location we wish to insert this new waveform is going to be X=0 and Y=2525, we skipped directly to "Y") and change the value to "2525". To change a number, you may use the Right and Left arrow keys to raise or lower the desired values; add in the "Ctrl" key to go even faster or press "End" to go to the maximum value (In the "Y" axis, one touch of the "End" key will change the value to "2571" and on the "X" axis will take you to "1512".)

Once the print parameters have been properly set, use the "Down arrow" key to move the cursor to the entry that reads: "Text lines displayed below waveform" and type "Waveform Right Great Toe" after the "PPG" entry. Press "F-10" to Save and Exit. Repeat steps for the Left Toe Waveform, but make the Print "X" value "1512" and the "Y" value "2525".

Modifying a PVR Study

```

2 PUR
Tag: "RIGHT Ankle PUR Waveform"      Waveform width: 75.00 mm
Waveform Designation: WC             Export Code: 37
Print-X: 0       Print-Y: 1945       Grid Visible
Hide Timer                               Capture Record: 0

Gain Units: Normal
Gain Unlocked
Gain is set to Initial Gain below
Initial Gain: 4
Baseline Invisible                    Deflation Type: Automatic 1 mmHg
Baseline Unlocked                    Inflation Type: Automatic Pressure
Baseline is set from previous site    Low Target Pressure: 62
Initial Baseline: 20.00 mm           Target Pressure: 65
                                       High Target Pressure: 68
                                       Overflow Pressure: 100
Speed: 25 mm/sec                     Low Volume Target: 0
Filter: 28 Hz                         Target Volume: 0
Auto Cuff Selector: Right 5           High Volume Target: 999

Text lines displayed below waveform:
"PUR PPPmmHg JUUcc RIGHT Ankle"
"Gain:GGG Spd:SS Amp:AA"

<F1> for Help          <F10> to Save and Exit          <ESC> to exit
    
```

If you are performing a PVR Waveform study, there are a number of parameters that you can adjust to further customize your instrument. Most commonly, you may wish to adjust Gain Units, Default Gain settings, and Target Pressures.

Gain Units

PVR Gain units can be expressed in "Pneumo mmHg/20mm" or "Normal" values. The former is an engineering value that describes the sensitivity setting of the PVR sensors, and the latter would be more a "laymen's" version of this. The factory default setting for the Ankle, Calf, Above Knee, and High Thigh sites is ".75 mmHg/20mm". What this means is that a pressure increase of .75 mmHg (three quarters of one millimeter of Mercury) at the internal PVR sensor will cause an upstroke of 20mm (twenty millimeters) in the on-screen waveform box and on the printed report.

Even though scientifically correct, this display of sensitivity may be counter-intuitive to some, as the smaller the gain units expressed in this fashion, the HIGHER the sensitivity. For example, a gain setting of .375 mmHg/20mm would require half the amount of pressure increase to generate the same 20 mm upstroke, effectively increasing the sensitivity of the gain by a factor of two.

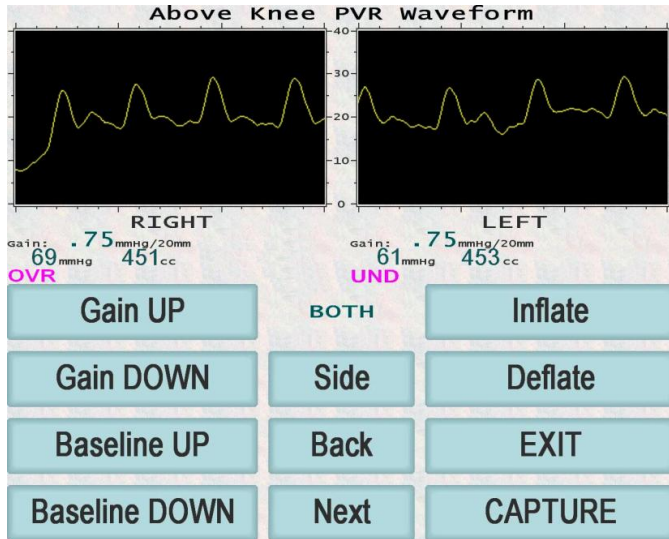
For those with a more linear mindset, we have the ability to display the Gain units in the "Normal" mode, in which a Gain setting of "4" correlates to the .75 mmHg/20mm setting described above. With "Normal" Gain units, a doubling of the PVR sensitivity would be "8" (correlating to .375 mmHg/20mm), a value that is twice that of 4. Changing these values (by using the Left and Right arrow keys in the configurator) will change how they are displayed on the screen and on the printed report.

Default Gain Settings

Default Gain settings can be adjusted individually site by site, either in the “XX mmHg/20” or “Normal” modes by using the Left and Right arrow keys.

NOTE: Be sure to check with your Medical Director and Interpreting physician before altering the factory-preset values.

Target Pressures



The “Target Pressure” is the amount of air pressure (in mm’s of Hg) that the blood pressure cuff will automatically be inflated to, with one touch of the on-screen or remote controls. The default factory setting is 65 mmHg, as that is the value most commonly used by the U.S. medical community. This “Target Pressure” can be raised or lowered by using the Left and Right arrow keys. We also allow the user to define “High” and “Low” target pressures as well. These High and Low settings serve two purposes. First, they will alert the MultiLab operator if the desired air pressure in the PVR cuffs should go above or below these values by displaying the letters “OVR” and “UND” in red below the on-screen pressure value as shown below. The second use of these upper and lower targets is for the benefit of the interpreting physician, whereas the cuff pressure will print out in red on a color report page if it does not fall into the range between the “High” and “Low” Target pressures.

Saving Custom Study Configurations

After you have customized your MultiLab protocols to your satisfaction, remember to save a copy of these customized protocols in the event you have a computer problem or a hard disk drive failure. To save your unique studies, get a blank 3 ½” floppy disk (or a USB thumb drive). Label it “MultiLab Custom Studies”, and insert it into the “A” drive bay (or USB port). From the MultiLab Start screen, press “Setup”, System Setup”, “Backup” and then “Backup Study Configuration”. Save this disk (or USB drive) in a safe place.

Restoring Custom Study Configurations

Obviously it is a good idea to backup your custom study configuration in the event of a computer problem. This is also an ideal way to “synchronize” one or more MultiLab instruments at either the same or remote locations, thus ensuring standardization of exams from instrument to instrument or location to location. To “restore” or duplicate a custom set of studies, simply place the backup disk (or USB drive) created in the paragraph above into the desired MultiLab system and press “Setup”, System Setup”, Backup” and ”Restore Study Configuration”. You may get a request to insert the last disk of the backup set; just answer OK to continue. After this, you may get an overwrite warning; answer “yes to all” to this warning. Remove the floppy disk (or USB Drive) when finished.

***WARNING –** To prevent data loss in the Temp. Files area, all data should be printed and deleted before restoring a study configuration. You may also Archive the data instead. In either case the Temp. Files must be empty before restoring a study configuration.

Configuring the ILR

Up to 9 study shortcuts can be placed on the ILR Start Screen. To place a study shortcut on the ILR, choose a menu in the study configurator. Highlight the study. Use the Alt key and numbers 1 – 9 (Alt1, Alt2....) to choose a location on the ILR. To remove a study from the ILR, highlight and touch Alt0. As can be seen below, the studies do not have to be in order when selecting positions on the ILR:

```

Menu Configuration Program - Version 1.13FB

-----[ Lower Arterial Studies ]-----
1 - Lower Arterial History Page      1
2 - LA DOP Waveforms                 2
3 - LA Full ABI w/ Doppler & PUR    3
4 - LA Simple ABI with Ankle PUR     4
5 - LA Segmental Pressures w/ PUR   5
6 - LA PPG Toe & Toe Pressures       7
7 - LA Post Exercise Pressures       6
8 - LA Seg. Press. w/ PUR-3 Cuff     9

Alt1 to Alt9, <Alt0> - Set/<Clear> Slot #  ALT-E - Set ALL 'THE END' records
Alt-S - Save copy of study to disk          Alt-L - Load standard or saved study
Up Arrow - Move cursor up one line         Ins - Enter new menu or study
Down Arrow - Move cursor down one line     Del - Delete current menu or study
Left Arrow - Back up one menu              M - Move selected item
Right Arrow - Enter selected study         E - Edit name of selected item
PgUp - Move up one page                   Alt-C - Copy study to clipboard
PgDn - Move down one page

<ESC> to exit
    
```

Studies from other menus can also be placed on the ILR:

```

Menu Configuration Program - Version 1.13FB

-----[ Upper Arterial Studies ]-----
1 - Thoracic Outlet Study
2 - Allen's Compression Test
3 - UA Segmental Pressures & PUR  8
4 - UA Segmental Pressures & Dop
5 - UA PPG Fingers & Finger Pres.
6 - Upper Arterial History Page

Alt1 to Alt9, <Alt0> - Set/<Clear> Slot #  ALT-E - Set ALL 'THE END' records
Alt-S - Save copy of study to disk          Alt-L - Load standard or saved study
Down Arrow - Move cursor down one line     Ins - Enter new menu or study
Left Arrow - Back up one menu              Del - Delete current menu or study
Right Arrow - Enter selected study         M - Move selected item
PgDn - Move down one page                  E - Edit name of selected item
Alt-C - Copy study to clipboard

<ESC> to exit
    
```

CHAPTER 12: THEORY OF OPERATION

PVR Cuff

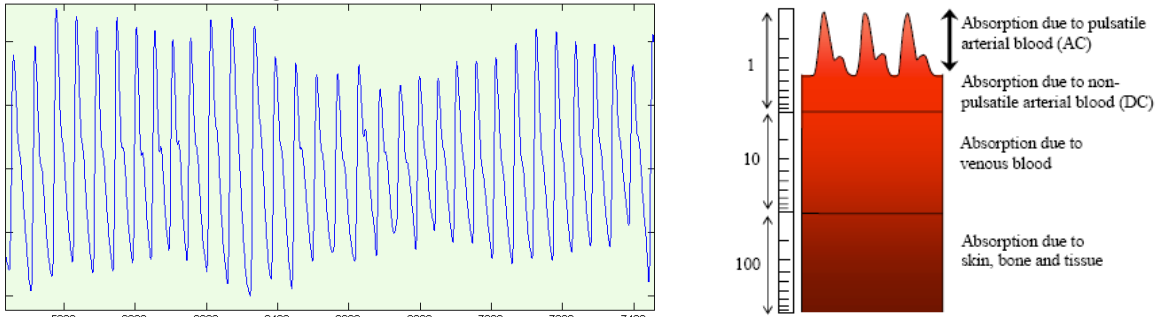
Pulse volume recording or PVR is a test that measures blood flow in the leg arteries. PVR can be used to diagnose PAD in the legs, determine how severe the disease is, and find the general location of the blockage. The PVR test is fast and painless, and does not require entering the body.

Blood does not flow through the body with continuous, uninterrupted flow. Instead, with each beat of the heart blood is pushed through the body in "pulses." The PVR test uses pressurized cuffs to monitor how these pulses travel through the legs, allowing doctors to find blood flow problems that may be caused by PAD. The pulsing of blood is measured at several different parts of the leg; PVR can also show roughly where the blockages are.

PPG

Photoplethysmography (PPG) is optically performed by using IR LED, which monitors the perfusion of blood to the dermis and subcutaneous tissue of the skin. The change in volume caused by the pressure pulse is detected by

Beaming the IR light through the skin using IR LED and then measuring the amount of light either transmitted or reflected to a photodiode. Each cardiac cycle appears as a peak in the waveform of the photodiode's light-generated current, as seen in figure below:

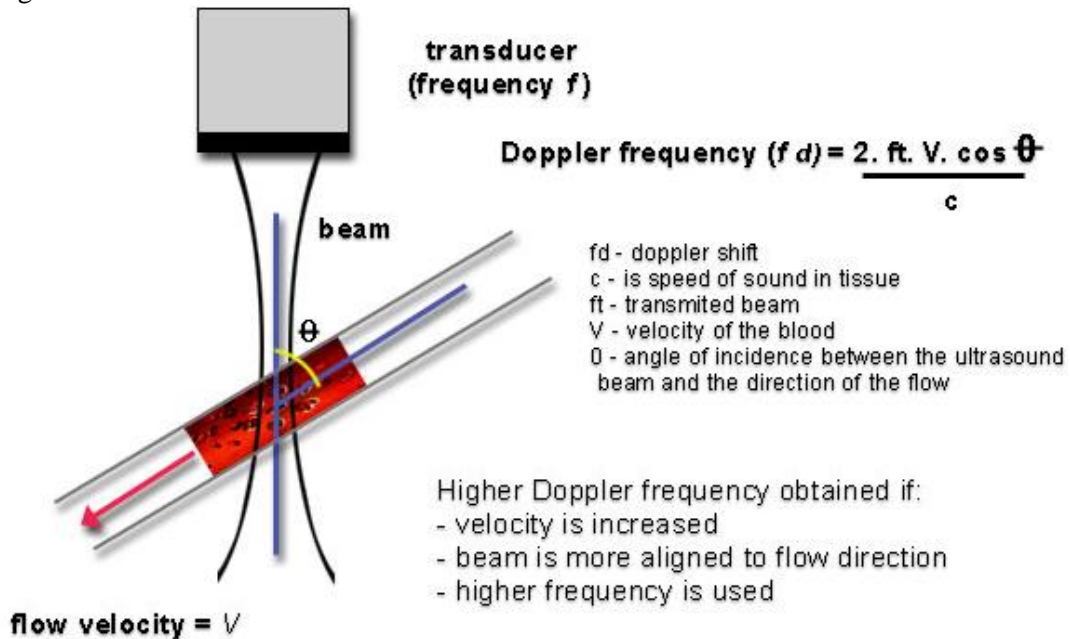


Example of Pulsed IR LED waveform received by the sensor

The DC component of the signal reflects the bulk absorption of the skin tissue, while the AC component is directly attributable to variation in blood volume in the skin caused by the pressure pulse of the cardiac cycle.

Doppler Ultrasound

Doppler ultrasound measures the movement of the scatterers (blood corpuscles) through the beam as a phase and frequency change in the received signal. The resulting Doppler frequency can be used to measure velocity if the beam/flow angle is known.



5MHz probe (TD5) typical values

Acoustic Output		MI	$I_{SPTA.3}$ mW/cm ²	$I_{SPPA.3}$ W/cm ²
Global Maximum Value		0.032	173.13	.18
Associated Acoustic Parameter	P_r (MPa):	.086		
	W_0 (mW)		25.8	25.8
	f_0 (MHz)	5.09	5.09	5.09
	Z_{sp}	.70	.70	.70
	Beam Dimensions	X_{-6} (mm) Y_{-6} (mm)		5.30 3.21

8MHz probe (TD8) typical values

Acoustic Output		MI	$I_{SPTA.3}$ mW/cm ²	$I_{SPPA.3}$ W/cm ²
Global Maximum Value		0.02	56.44	0.06
Associated Acoustic Parameter	P_r (MPa):	.05		
	W_0 (mW)		18.9	18.9
	f_0 (MHz)	7.90	7.90	7.90
	Z_{sp}	1.1	1.1	1.1
	Beam Dimensions	X_{-6} (mm) Y_{-6} (mm)		6.26 1.64

$I_{SPTA.3}$ Derated Spatial-peak temporal-average intensity

$I_{SPPA.3}$ Derated Spatial-peak pulse-average intensity

MI Mechanical Index

P_r Peak-rarefactional acoustic pressure

W_0 Output power

f_0 Acoustic Center frequency

Z_{sp} Depth at which the reported parameter is measured

Operating Conditions: There are no user controls which affect the ultrasound output.

Measurement Uncertainties: ±19.4 percent for all intensity values reported

±9.7 percent for all the pressure values

±9.7 percent for the Mechanical Index

CHAPTER 13: GLOSSARY OF TERMS

A

ABI: Ankle Brachial Index; the Ankle pressure divided by the Brachial Pressure.

Amplitude: The height of a waveform. This can be affected by changing scale. For a Doppler waveform this can be affected by the angle of approach.

Angle of approach: The angle of the Doppler probe to the vessel being insonated. The amplitude is directly proportional to the cosine of this angle. At 90° to the vessel, the amplitude will approach 0 (cosine of 90° = 0).

Artifact: Waveform output that is not generated by the patient. For Doppler signals, this can be reduced by lowering the filter to a value closer to 3.5Hz.

B

Baseline: A center point for a waveform. For Doppler waveforms, the baseline is the point of zero flow. This point can be moved up or down by using the Baseline control.

Bayonet fitting: Used to connect the pneumatic hose to the cuff. The cuff has a male Bayonet fitting and the hose has a male Bayonet fitting.

Brachial artery: A continuation of the axillary artery beyond the lower margin of the teres major muscle.

C

C-PVR™: See Calibrated pulse volume recording.

Calibrated pulse volume recording: A technique for ensuring the accuracy of PVR waveforms by alerting the operator in cuff wrapping issues.

Capture: Operator control to end obtaining patient information and to move on to editing that information.

CNO: Shorthand for "Could Not Occlude". The operator may enter this in lieu of a pressure when said pressure is above safe levels (typically 200 to 250 mmHg).

Control panel: Part of the operating system software that controls facets of its operation. These are not created by Unetixs Vascular Inc.

Cuff: Thin sealed air bladder encased in an elongated cloth covering. The cloth covering contains Velcro to hold the cuff in place when wrapped around a limb segment. The air bladder is connected to a MultiLab hose for taking pressures and PVR waveforms.

D

Default printer: The printer that is selected in the operating system.

Deflation cycle: When taking a pressure measurement, the deflation cycle is initiated after the completion of the inflation cycle (See Inflation cycle). The deflation cycle starts after the press and release of the deflate button which causes the pressure in the cuff to be released in a controlled fashion.

Doppler probe: Ultrasonic device which connects to the MultiLab to display arterial waveforms.

Doppler waveform: Waveform made by Doppler probe.

Dorsalis Pedis artery (DP): Dorsal artery of the foot. It arises at the anterior aspect of the ankle joint and is a continuation of the anterior Tibial artery.

DVT: Deep Vein Thrombosis; the formation of a blood clot in a deep vein.

E

Exam: A collection of measurements performed upon a patient for diagnostic purposes.

F

Facility name: A title line at the top of every MultiLab report; usually the name of the facility where exams are performed.

Flat (or Flat-line): When taking a pressure measurement, a complete and correct inflation cycle (See Inflation cycle) is when the waveform tracing has become flat. This means that the waveform tracing is a horizontal line. It is usually a good idea to see a couple of seconds of flat-line, after the inflation cycle, before starting the deflation cycle (See Deflation cycle).

G

Gain: The amount of amplification applied to the waveform. This directly affects the amplitude of the waveform by using the Gain control. Lower Gain mean lower amplitude.

I

Incompressible: A vessel is considered incompressible when its systolic blood pressure exceeds safe levels (typically 200 to 250 mmHg).

Invert: A Doppler waveform control to reverse the displayed directions. Normally, forward flow (towards the probe) is above baseline. If invert is active then reverse flow (away from the probe) is above baseline.

L

Luer fitting: Previously used to connect the pneumatic hose to the cuff. The cuff has a female Luer fitting and the hose has a male Luer fitting.

M

Medial Malleolus: Protruding bone on the inner side of the ankle

Medial: A position in the middle of a body part.

P

PAD: Peripheral Arterial Disease

Patient data/information/study: Exam results for a patient.

PDF (file): Adobe Portable Document Format. A computer file that is readable across most computer platforms.

PICC line: Peripherally Inserted Central Catheter line for delivery of treatments such as antibiotics or chemotherapy.

Pneumatic hoses: Hoses to connect the MultiLab to a cuff.

Posterior Tibial artery (PT): Artery located on the inside of the ankle behind the medial malleolus.

PPG: Photoplethysmography, or a device to measure arterial flow using a light emitter and sensor.

PPG (toe) waveforms: Arterial waveforms of the toe obtained using a PPG sensor.

PPG clips: Special clip to increase the efficiency of applying a PPG sensor to a toe.

PPG connector: Port on the MultiLab (both right and left) to connect the PPG sensor to the MultiLab.

PPG sensor: See PPG.

Protocol: Sequence of measurements in a patient exam.

Proximal: Nearest to the center of the body.

Pulsatile: Having a pulse.

Pulse: Arterial vibration caused by a bulbous of blood pumped by the heart.

Pulse volume recording: See PVR.

PVR: Pneumoplethysmography, or a device to measure arterial volume through the ankle using a cuff.

PVR (waveform) tracing: Waveform obtained using a Pulse Volume Recorder.

R

Radial artery: A main artery on the lateral side (side with the thumb) of the forearm.

Report: Either a PDF file or a printout of a completed exam.

S

Scroll: Movement of the waveform in either a left to right or right to left direction. After a waveform or pressure has been captured, the Scroll control allows the user to exactly set the waveform position or select the correct pressure measurement point.

Set output: User control to manually set a pressure output. This is especially useful for incompressible vessels (see CNO).

Shutdown: User control to initiate an operating system shutdown. It is strongly recommended to use this control before turning off the system.

Signal: True waveform output from the patient (as opposed to artifact; See Artifact).

Start screen: Main navigation screen for the MultiLab.

Study: See Exam.

Supine: Lying on back with face upwards.

Systolic pressure: The high number of a patient's blood pressure, typically 120mmHg at the arm. This is the type of pressure that the MultiLab measures at the Arm (brachial), Ankle, and Toe.

T

TBI: Toe Brachial Index; the Toe pressure divided by the Brachial Pressure.

Temp. files: The place where the MultiLab stores patient studies that have not been saved or printed (see Storage mode).

Thumb drive: See USB flash (storage) drive.

Touch screen: A user input device which overlays the main output screen. The input device allows the MultiLab to register the exact position that the operator is touching on the screen.

TruDop®: The trademark name of Unetixs Vascular Inc.'s Doppler probe used on the MultiLab.

U

Ulnar artery: A main artery of the medial aspect (side away from the thumb) of the forearm.

Ultrasound gel: A hypoallergenic water based gel used to couple the Ultrasonic transducer of the TruDop® Doppler probe with the arterial vessel of a patient.

USB memory stick: (also USB thumb drive, USB memory device, or USB drive) A file storage device that connects to the MultiLab via its USB port.

V

Vascular studies: Patient exams pertaining to their vascular system. These are the types of studies that the MultiLab performs.

Vasoconstriction: The narrowing of a blood vessel resulting from the contracting of the vessel's muscular wall.

Venous access port: A tube inserted into a vein (typically the Subclavian or Jugular) for the delivery of medicine and the taking of blood samples. The plastic or metal port can be found near the surface of the skin.

W

Waveform box: When taking a pressure or waveform measurement, this is the area at the top of the MultiLab screen with the waveform in it.

Waveform tracing: The patient signal or artifact (See waveform box).

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For Additional Help Contact:

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Fax - 401-294-3893

E-mail: sales@unetixs.com

WWW.UNETIXS.COM



Do not dispose of in municipal waste. Wheeled bin symbol indicates separate collection for electrical and electronic equipment (WEEE Directive 2002/96/EEC)

Dispose of any contaminated/biohazard materials through the proper channels.

Section 4: Maintenance Guide

Maintenance instructions for MultiLab 2000 Series 2CP-R include the following documents:

- 11905-0003-01 (SLC) Basic S2 CP w/Remote & USB Chassis Assembly: Assembly Procedure
- 11905-0006-01 (SLC) Basic S2 CP w/Remote & USB Chassis Assembly: Test/Calibration Procedure
- 11912-0003-01 (IRB) Infrared Remote PCB Assembly: Assembly Procedure
- 11919-0006-01 (SSB) S2 SMT Motherboard Assembly: Test/Calibration Procedure
- 11933-0003-01 (ACB) Auto Cuff Selector PCB Assembly: Assembly Procedure
- 11935-0003-01 (SPB) Series 2P Pump & Valve Bracket Assembly: Assembly Procedure
- 11948-0003-01 (ACS) Auto Cuff Selector Assembly: Assembly Procedure
- 11948-0006-01 (ACS) Auto Cuff Selector Assembly: Test/Calibration Procedure
- 11972-0003-01 (MCM) Molded 2CP Manifold Assembly: Assembly Procedure
- 11972-0006-01 (MCM) Molded 2CP Manifold Assembly: Test/Calibration Procedure
- 11996-0003-01 Final Assembly, 2CP-R: Assembly Procedure
- 11996-0006-01 Final Assembly, 2CP-R: Test/Calibration Procedure

Step 1 Chassis Modification

- 1.1. Attach the Serial Number Label (20007-0000-01) to the Main Chassis (40000-0432-01) as shown in Figure 1 (left).
- 1.2. Slot a hole of the Chassis (see detail of Figure 1 (right)) for a total width of 0.3".

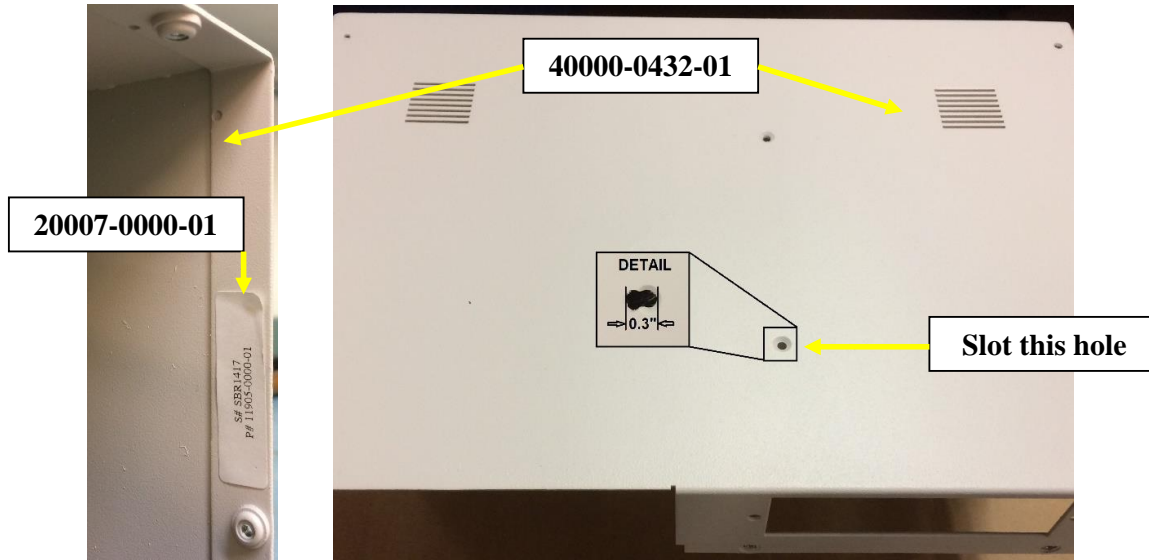


Figure 1

Step 2 Doppler Cable

- 2.1. Cut a 15" piece of 4 Conductor 30AWG Wire (10701-0001-01).
- 2.2. Strip outer insulation on **Side 1** to 1 ¼" (see Figure 2).
- 2.3. Pull out wires from the base of the braided shield, leave the shield for now. Cut off the green wire. Cut the white, red and black wires to 1". Strip and tin wires ⅛".
- 2.4. Place (3) ⅜" long pieces of 1/16" Heat Shrink Tubing (10621-0001-01) over each wire.
- 2.5. Carefully solder the wires into the solder cups on the 4 Pin Panel Mount LEMO Connector (10517-0004-01) starting at the key going clockwise: red, black, skip, white.
- 2.6. Heat the Tubing into place over the solder joints.
- 2.7. Strip the outer insulation on **Side 2** to ¾" (see Figure 2).
- 2.8. Pull out the wires from the base of the braided shield. Cut off the green wire. Strip and tin the white, red and black wires ⅛". Tin the end of the shield wire and set aside for now.

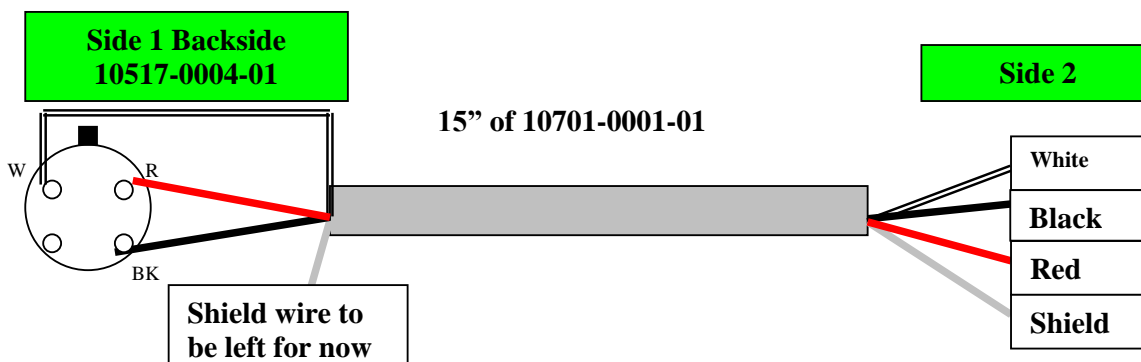


Figure 2

Step 3 PPG Cable (2X)

- 3.1. Cut a 15" piece of 4 Conductor 30AWG Wire (10701-0001-01).
- 3.2. Strip outer insulation on **Side 1** to 1 ¼" (see Figure 3).
- 3.3. Pull out wires from the base of the braided shield, leave the shield for now. Cut off the green wire. Cut the white, red and black wires to 1". Strip and tin wires ⅛".
- 3.4. Place (3) ⅜" long pieces of 1/16" Heat Shrink Tubing (10621-0001-01) over each wire.
- 3.5. Carefully solder the wires into the solder cups on the 3 Pin Panel Mount LEMO Connector (10517-0003-01) starting at the key going clockwise white, red, black.
- 3.6. Heat the Tubing into place over the solder joints.
- 3.7. Strip the outer insulation of **Side 2** to ¾" (see Figure 3).
- 3.8. Pull out the wires from the base of the braided shield. Cut off the green wire. Strip and tin the white, red and black wires ⅛". Tin the end of the shield wire and set aside for now.
- 3.9. Repeat steps 3.1 to 3.8 for the other PPG Cable.

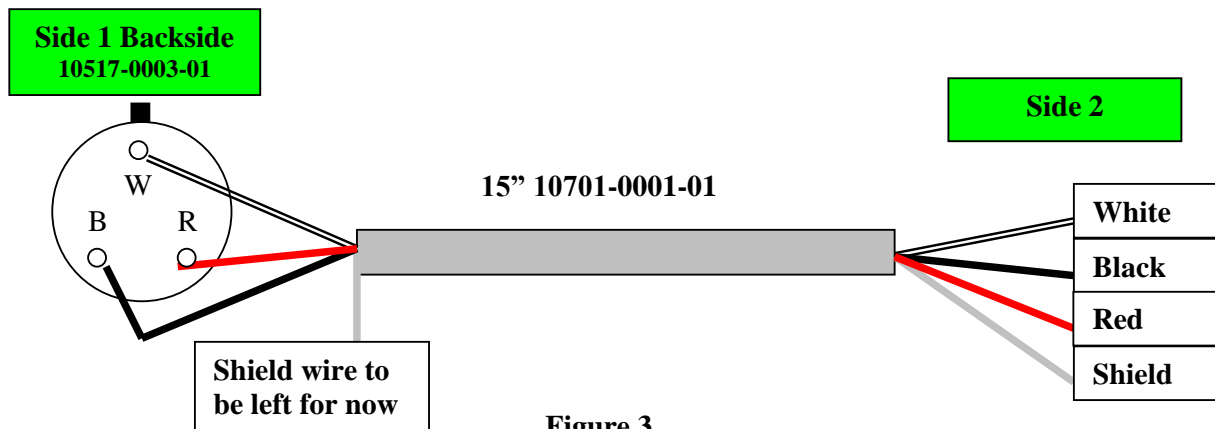


Figure 3

Step 4 Headphone Jack Cable

- 4.1. Cut 28" pieces of 26 AWG Wire in Green (10703-0005-01), Blue (10703-0006-01), Black (10703-0001-01), Red (10703-0003-01) and White (10703-0002-01).
- 4.2. Strip one end, of each wire, ⅛" and tin.
- 4.3. Solder wires carefully onto the Stereo Connector Jack (10511-0002-01) pins. See Figure 4.
- 4.4. Place a ½" long piece of 1/16" Heat Shrink Tubing (10621-0001-01) over the five (5) connections after soldering (see Figure 5). Shrink down.
- 4.5. Twist all of the wires together. Crimp the wires onto the 5 Pin .100" Housing (10516-0005-01) (see Figure 4 and Figure 5): Pin 5-black, Pin 4-red, Pin 3-blue, Pin 2-green and Pin 1-white.

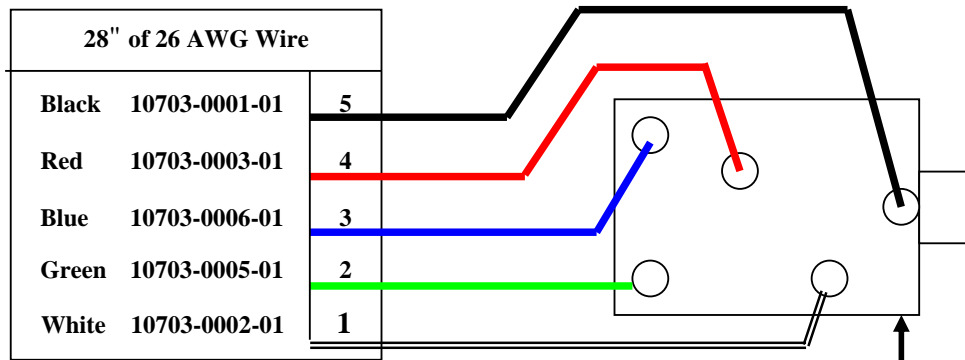


Figure 4

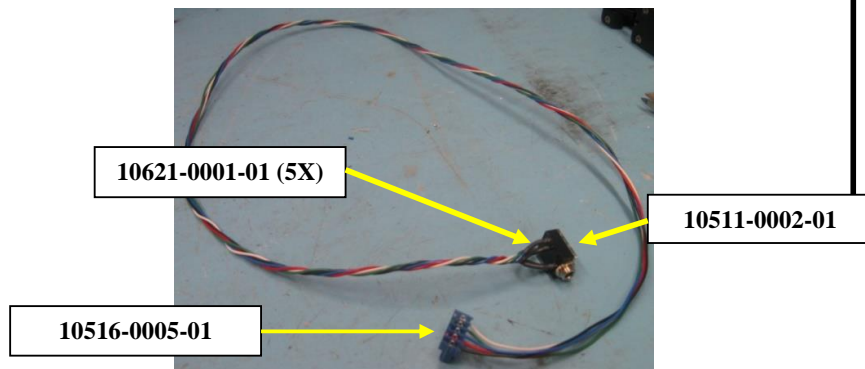


Figure 5

Step 5 Manifold Lemo Cable

- 5.1. Cut 6" pieces of 26 AWG Wire in White (10703-0002-01), Red (10703-0003-01), Green (10703-0005-01), Black (10703-0001-01), Yellow (10703-0004-01) and Blue (10703-0006-01). Strip one end of each wire 1/8" and tin.
- 5.2. Solder each wire carefully into the solder cups of the 6 Pin Panel Mount Lemo (10530-0006-01) as shown in Figure 6.
- 5.3. Cut and place six (6) 1/2" long pieces of 1/16" Heat Shrink Tubing (10621-0001-01) over each connection and shrink into place.

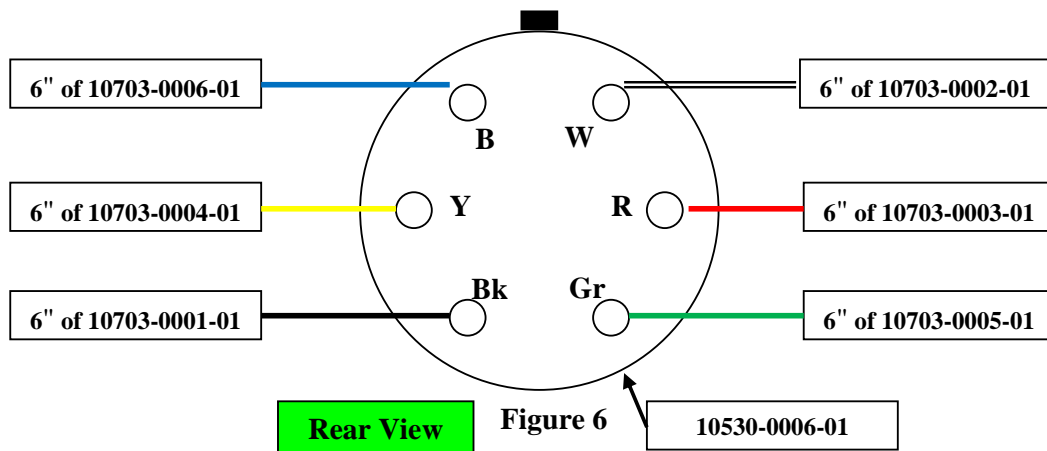


Figure 6

Step 6 Speaker Assemblies

Right:

- 6.1. Cut 12" pieces of 26 AWG Wire in Red (10703-0003-01) and Black (10703-0001-01). Strip one end of each wire ¼" and tin.
- 6.2. Solder the Red Wire to the (+) of a Speaker (10609-0001-01), see Figure 7.
- 6.3. Solder the Black Wire to the (-) of the Speaker.
- 6.4. Twist the Red and Black Wires together, see Figure 8.
- 6.5. Crimp the Black Wire to pin 2 of a 2 Pin .100" Housing (10516-0002-01).
- 6.6. Crimp the Red Wire to pin 1 of the Housing. Label this speaker as right.

Left:

- 6.7. Cut 23" pieces of 26 AWG Wire in Green (10703-0005-01) and White (10703-0002-01). Strip one end of each wire ¼" and tin.
- 6.8. Solder the White Wire to the (+) of another Speaker (10609-0001-01), see Figure 7.
- 6.9. Solder the Green Wire to the (-) of the Speaker.
- 6.10. Twist the White and Green Wires together, see Figure 8.
- 6.11. Crimp the Green Wire to pin 2 of 2 Pin .100" Housing (10516-0002-01).
- 6.12. Crimp the White Wire to pin 1 of the Housing. Label this speaker as left.

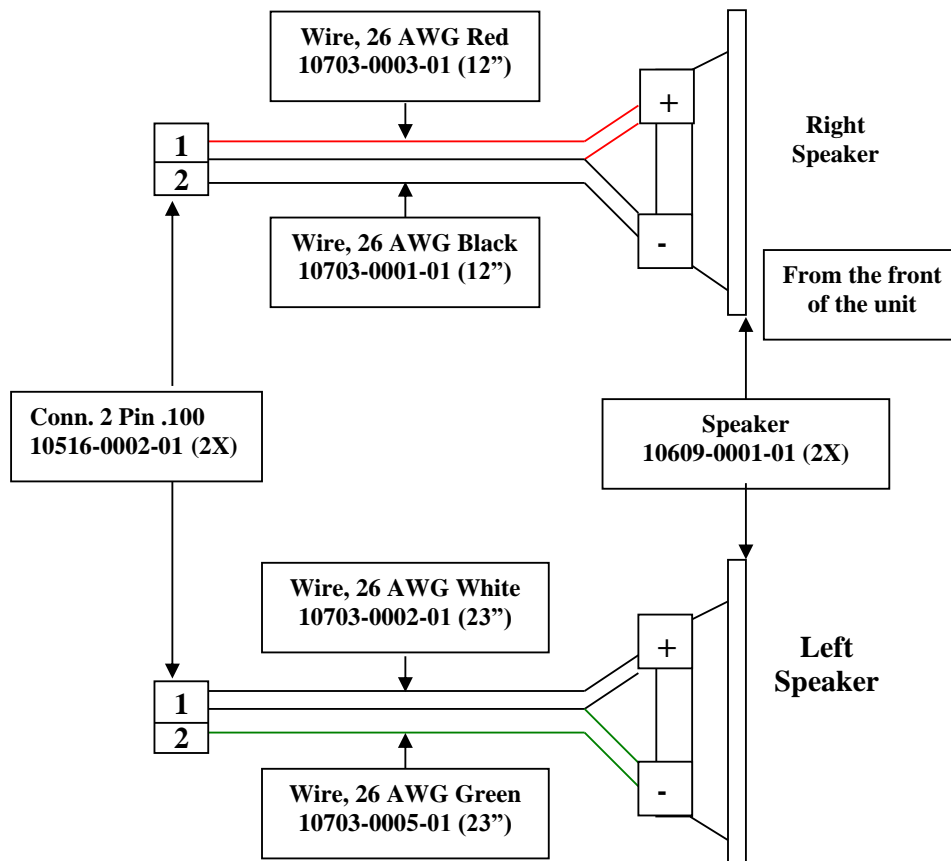


Figure 7

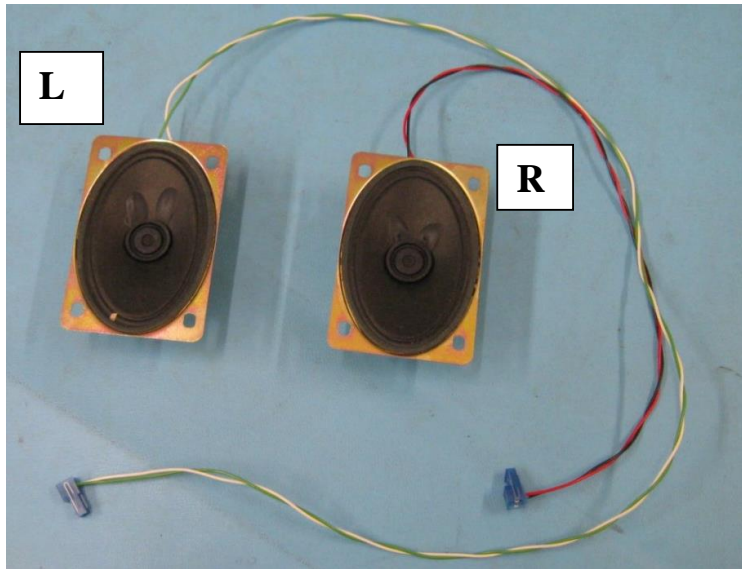


Figure 8

Step 7 Temperature Cable

- 7.1. Cut 9" pieces of 26 AWG Wire in Black (10703-0001-01), Red (10703-0003-01), Yellow (10703-0004-01) and Green (10703-0005-01). Strip one end of each wire ¼" and tin.
- 7.2. Solder the wires to their corresponding color from the 4 pin Phone Jack (10528-0003-01).
- 7.3. Cover each connection with four (4) ½" long pieces of 1/16" Heat Shrink Tubing (10621-0001-01) and shrink into place.
- 7.4. Cut the Wires to an over-all length of 15". Crimp the Wires into to a 4 Pin .100" Housing (10516-0004-01) as shown in Figure 9, Green to pin 4, Yellow to pin 3, Red to pin 2 and Black to pin 1.

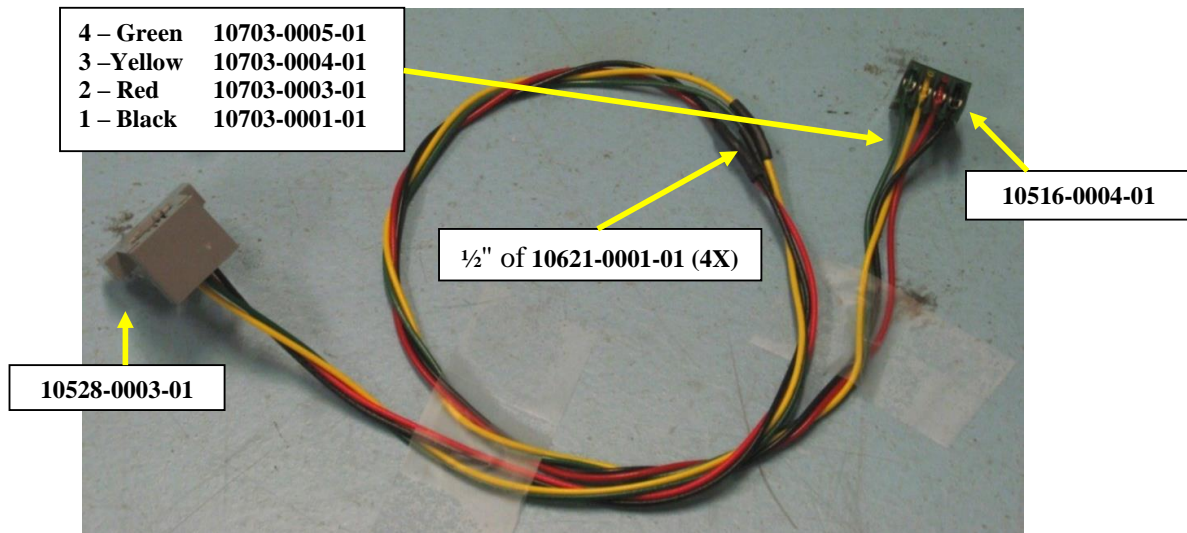
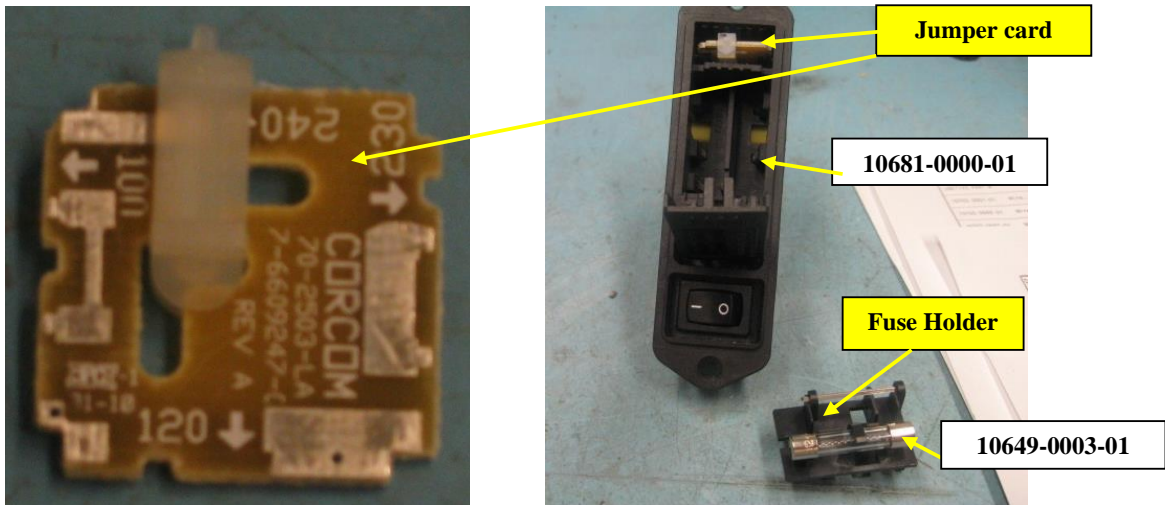


Figure 9

Step 8 Power Entry Module

- 8.1. Remove the jumper card from Power Entry Module (10681-0000-01). Set it to 120V as shown in Figure 10. Reinsert back to the Power Entry Module.
- 8.2. Remove the fuse holder and install a 3 Amp 3AG Fuse (10649-0003-01) into it, as shown in Figure 10. Replace the fuse holder, with fuse back, into Power Entry Module (Fuse towards the inside).



Jumper card orientation

Power Entry Module disassembled

Figure 10

- 8.3. Cut 15" pieces of 18AWG Wire in Brown (10706-0008-01), Blue (10706-0006-01), Green/Yellow (10706-0009-01) and a second Green/Yellow. Strip one end of Blue and Brown Wires ¼" (see Figure 11). Strip both ends of Green/Yellow Wires ¼".
- 8.4. Cut another 12" piece of Green/Yellow wire. Strip one end ¼".
- 8.5. Terminate one end of the two 15" Green/Yellow Wires with two (2) #8 Ring Terminals (10548-0008-01), see Figure 11.
- 8.6. Crimp un-stripped end of the Brown and Blue Wires into the 3 Pin .156" Housing (10503-0003-01). Blue to pin 3 and Brown to pin 1 as shown in Figure 11.

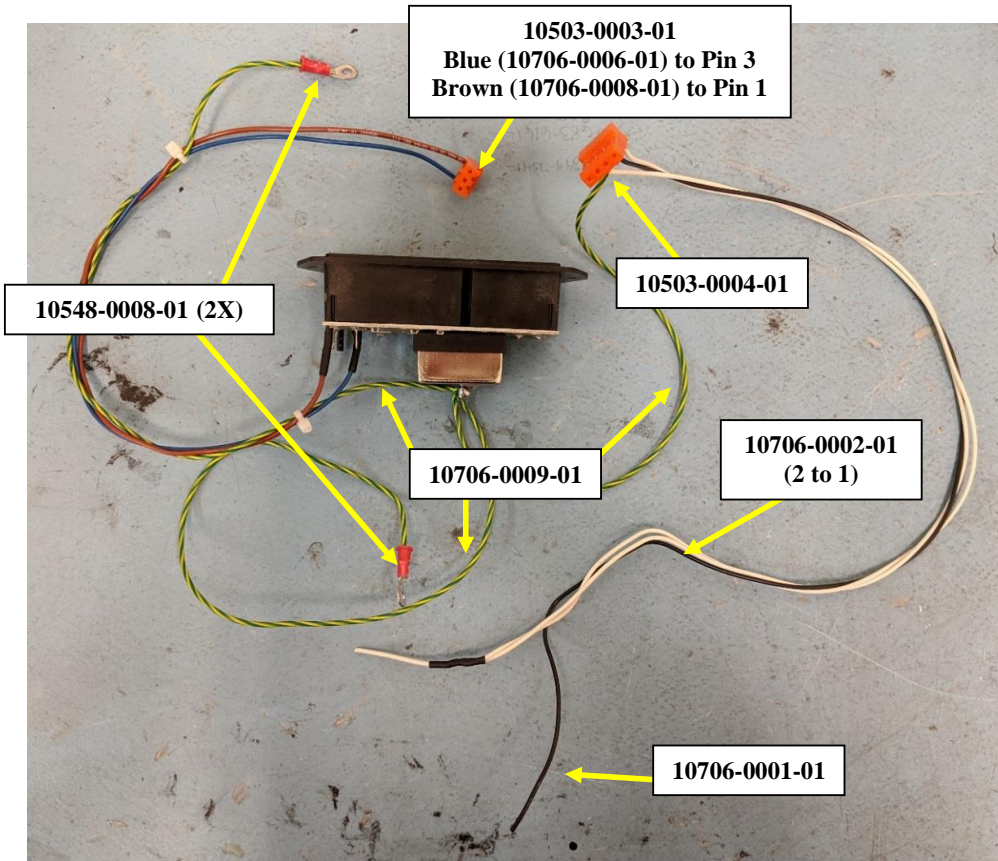


Figure 11

- 8.7. Tin the other ends of all (5) wires.
- 8.8. Solder all three Green/Yellow wires to the ground terminal of the Power Entry Module as shown in Figure 12.

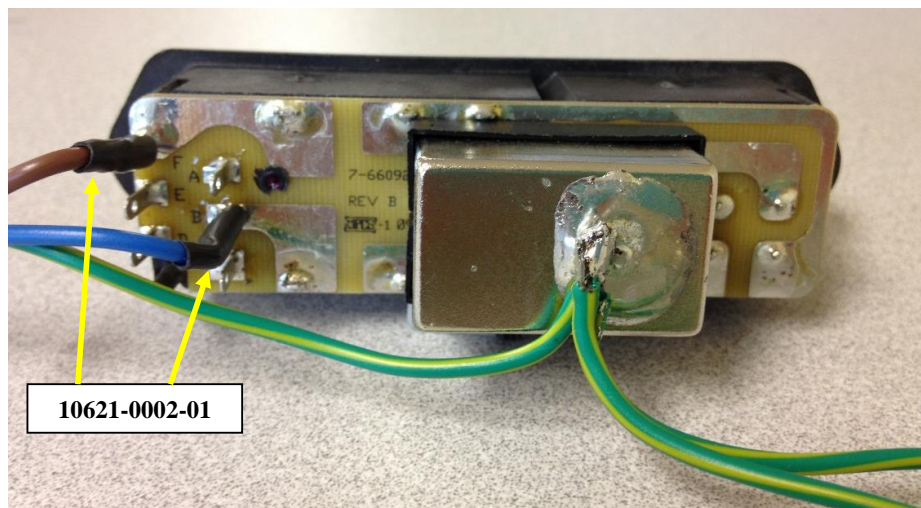


Figure 12

- 8.9. Cut a 1" piece of 1/8" Heat Shrink Tubing (10621-0002-01) and place it over the Blue Wire. Solder the Blue Wire to position "B" on the Power Entry Module as shown in Figure 12. Seal the Heat Shrink.

- 8.10. Cut a 1" piece of 1/8" Heat Shrink Tubing (10621-0002-01) and place it over the Brown Wire. Solder the Brown Wire to position "F" on the Power Entry Module as shown in Figure 12. Seal the Heat Shrink.
- 8.11. Attach two (2) 4" Tie Wraps (20008-0004-01) connecting the three 15 inch wires together. Place the tie wraps two inches from the Ring Terminal and 6 inches from the first tie wrap as shown in Figure 13.
- 8.12. Cut two 22" pieces of 18AWG White Wire (10706-0002-01) and a 22" piece of 18AWG Black Wire (10706-0001-01).
- 8.13. Crimp the following wires into a 4-Pin .156" Housing (10503-0004-01):
Pin 1 – 21.5" 18AWG White Wire
Pin 2 – 12" 18AWG Green/Yellow wire from power entry module (unstripped end)
Pin 3 – 22" 18AWG Black Wire
Pin 4 – 21.5" 18AWG White Wire
This will be considered the motherboard power cable.
- 8.14. Strip the ends of the two 18AWG wires and solder them together. Strip one end of a 1" piece of 18AWG white wire and solder that to where the previous white wires were connected. Cover the solder connection with a 1" piece of 1/8" heat shrink (10621-0002-01).

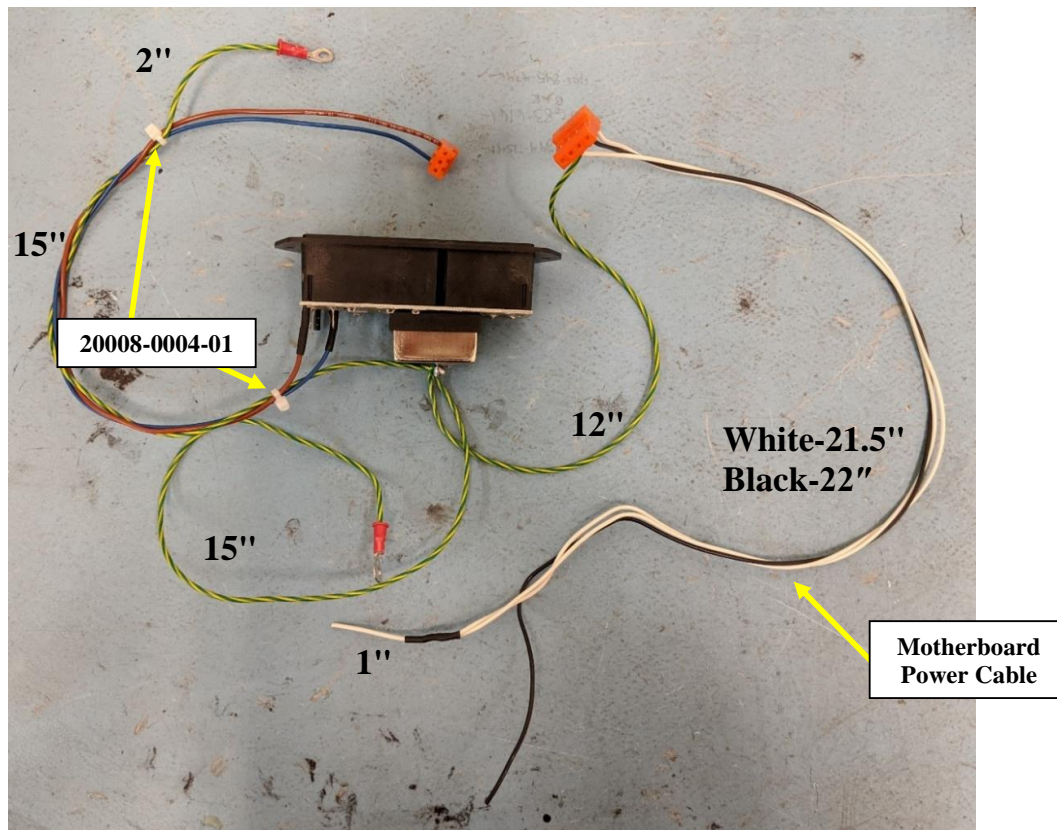


Figure 13

Step 9 IRB cable (see Figure 14)

- 9.1. Cut a 24" piece of 10 Conductor Ribbon Cable (10710-0010-01). Peel off the #10 wire (wire opposite from the red wire) from the Ribbon Cable.

- 9.2. Mark the Ribbon Cable 1½" from one end. Separate and pull back each wire to the 1½" mark. Cut/remove, at the mark, wires 1(red), 2, 6, and 8 from the Ribbon Cable. Strip back the remaining wires (3, 4, 5, 7, and 9) ¼" and tin.
- 9.3. Cut five (5) ½" long pieces of 1/16" Heat Shrink Tubing (10621-0001-01) and slide onto the remaining wires. Solder the wires to the .100" 5-Pin Header (10504-0005-01) per the table below. Note: Place pin 1 of the header to the side of the red wire.

Header	1	2	3	4	5
Ribbon	4	7	5	3	9

- 9.4. Connect the DB-9 Female Crimp Connector (10533-0009-02) to the end of the Ribbon Cable by crimping it on (Pin 1, red wire, of the Cable into pin 1 of the DB-9).

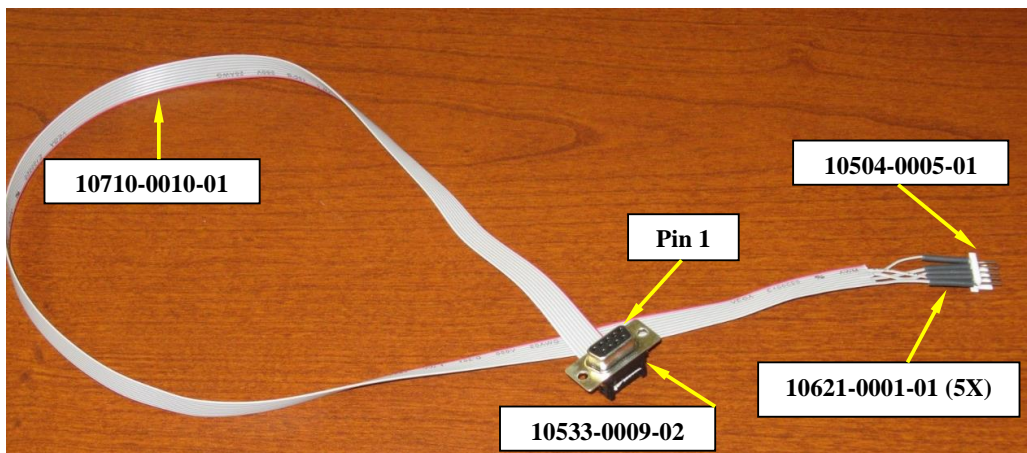


Figure 14

Step 10 Chassis Assembly

- 10.1. Apply the Front Panel Label (40002-2039-02) and the Temp Label (40003-1062-01) onto the Main Chassis as shown in Figure 15.

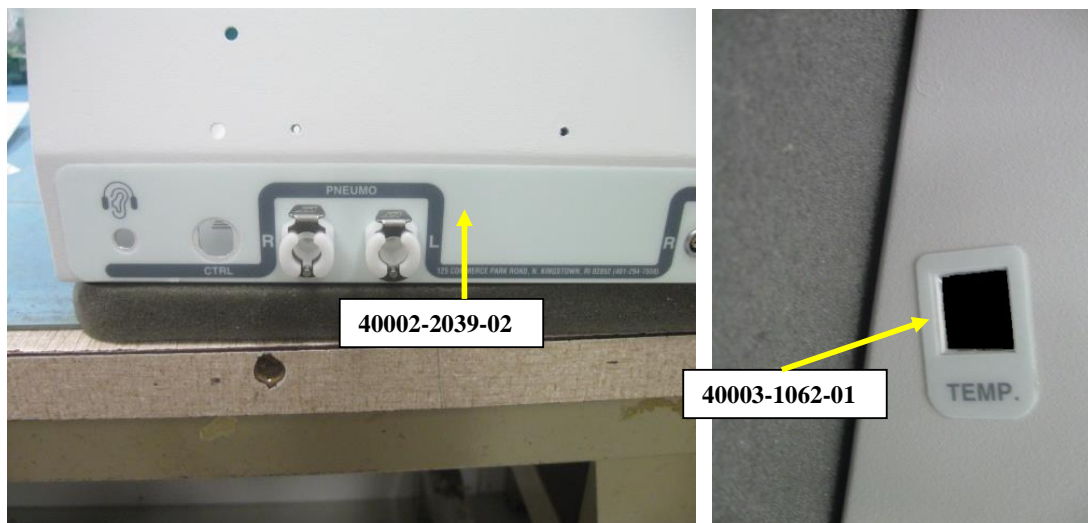


Figure 15

- 10.2. Attach four (4) Rubber Feet (10604-0000-01) to the Chassis using four (4) 6-32x¾" Pan Head Screws (20012-0006-01).

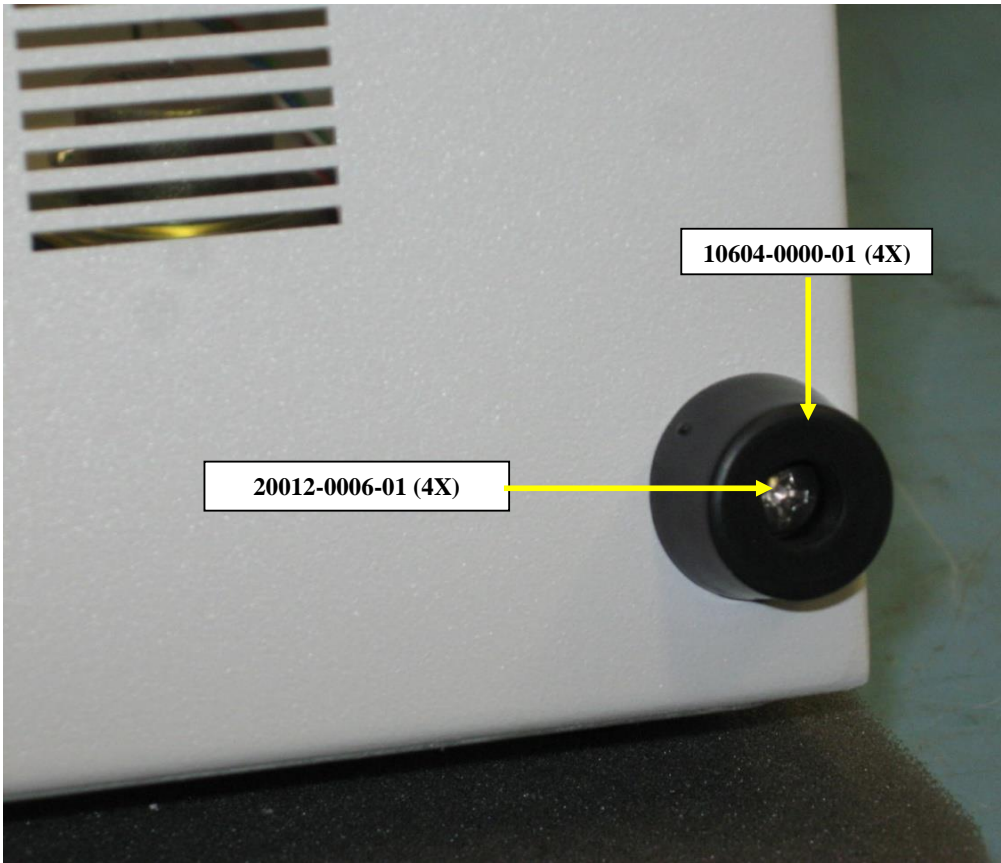


Figure 16

Step 11 Handle Assembly

- 11.1. Open up two holes on the Modified Handle (40003-1052-01) and two matching holes on the Handle's plate with a 5/32" drill to remove the paint (see Figure 17).

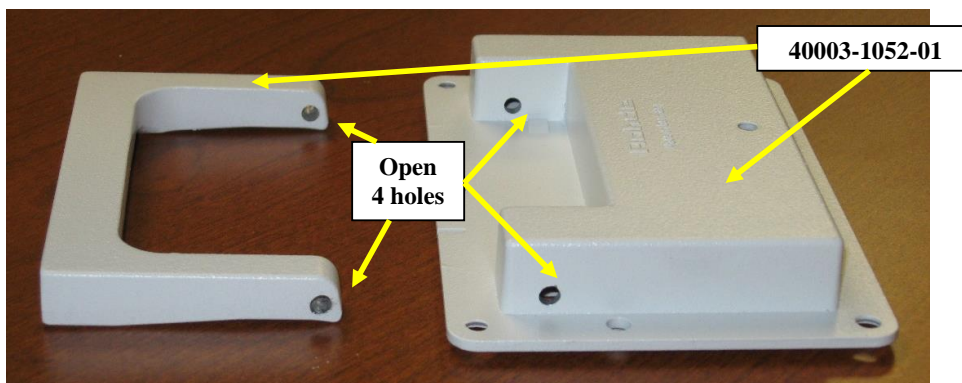


Figure 17

- 11.2. Place two (2) clips (provided with Handle) into the Handle's plate with the flat side down (see Figure 18).

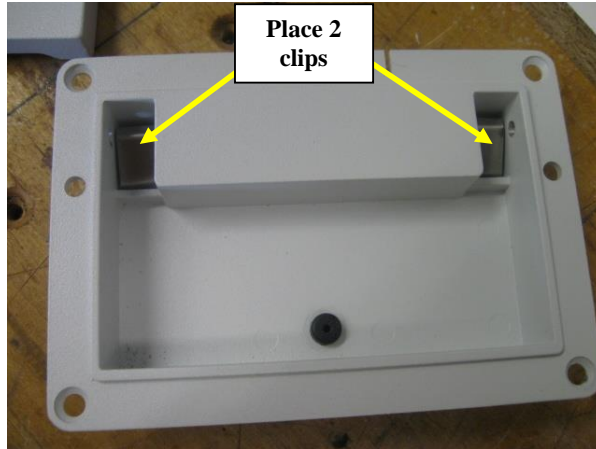


Figure 18

- 11.3. Install the handle into the base with the grips down (see Figure 19).



Figure 19

- 11.4. Install two (2) dowel pins (provided with Handle) into each side (see Figure 20). Use a hammer to make them flush.

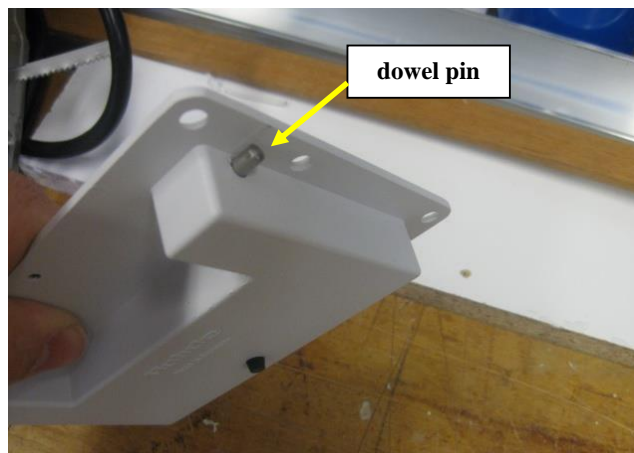


Figure 20

- 11.5. Install the black handle stopper (provided with Handle) into the hole of the Handle's plate (see Figure 21).

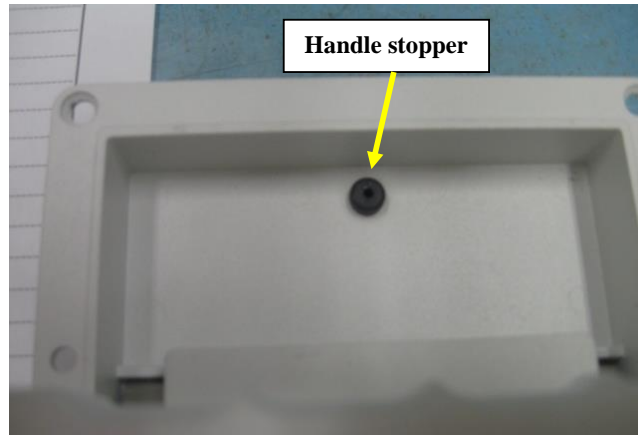


Figure 21

- 11.6. Install the Handle into the Chassis using four (4) #6 Lockwashers (20002-0632-01) and four (4) 6-32 Nuts (20003-0632-01) by using a 5/16" wrench (see Figure 22).

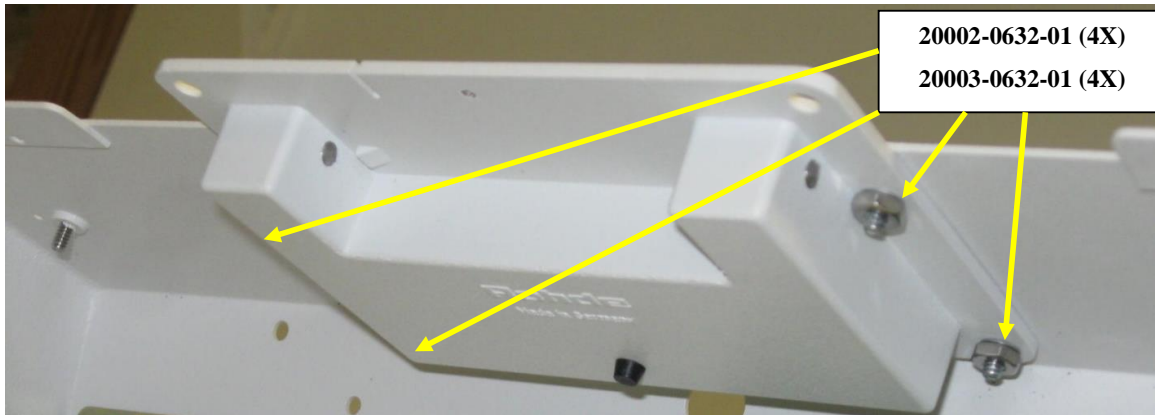


Figure 22

Step 12 Cables to chassis

Doppler cable

- 12.1. Attach LEMO connector of the Doppler Cable, made in Step 2, into the Chassis using a 3/8" Solder Lug (20021-0006-01), in place of the lockwasher provided with the LEMO, in-between the nut (provided with LEMO) and the Chassis (see Figure 24). Tighten the nut with an 11mm wrench.
- 12.2. Note: Keep the RED DOT key on the LEMO connector UP when installing.
- 12.3. Bend the Solder Lug after the nut has been tightened and keep the leg part to the top side.
- 12.4. Solder the shield from Side 1 of the Doppler Cable (see Figure 2) to the Solder Lug so that the shield will act as a strain relief for the white, red and black wires.
- 12.5. Add 1" of 1/8" Heat Shrink Tubing (10621-0002-01) to the shield on Side 2 of the Doppler Cable.
- 12.6. Solder the wires of Side 2 of the Doppler Cable into a 4 Pin .100" Housing (10516-0004-01): white to pin 4, black to pin 3, red to pin 2 and shield to pin 1.

PPG cables

- 12.7. Attach each of the two (2) LEMO connectors of the PPG Cables (made in Step 3) into the Chassis using two (2) 3/8" Solder Lugs (20021-0006-01), in place of the lockwashers provided with the LEMOs, in between the nut (provided with LEMOs) and the Chassis (see Figure 24). Tighten the nut with an 11mm wrench.
- 12.8. Note: Keep the RED DOT key on the LEMO connector UP when installing.
- 12.9. Bend the Solder Lug after the nut has been tightened and keep the leg part to the top side.
- 12.10. Solder the shields from Side 1 of the PPG Cables (see Figure 3) to the Solder Lug so that the shield will act as a strain relief for the white, red and black wires.
- 12.11. Add 1" of 1/8" Heat Shrink Tubing (10621-0002-01) to the both shields on Side 2 of the PPG Cables.
- 12.12. Solder the wires of Side 2 of the PPG Cables into two (2) 4 Pin .100" Housings (10516-0004-01): white to pin 4, black to pin 3, red to pin 2 and shield to pin 1.

Air Fittings

- 12.13. Mount two (2) Panel Mount Air Fittings (10606-0003-01) to the Chassis using two (2) 9/16" Lockwashers (20013-0000-01) and the nut, provided with the Air Fittings (see Figure 23 and Figure 24). Tighten nut using a 5/8" open wrench.



Figure 23

Manifold Lemo cable

- 12.14. Install the Manifold LEMO Cable (made in Step 5) into Chassis using the lockwasher and nut supplied with the LEMO connector (See Figure 23 and Figure 24). Tighten using a 14 mm wrench. *Note: Keep the RED DOT key on the LEMO connector UP when installing.*
- 12.15. Twist the wires, of the Manifold LEMO Cable, together and connect to a 6 Pin .100" Housing (10516-0006-01) as shown in Figure 24 (right): blue to pin 6, yellow to pin 5, black to pin 4, green to pin 3, red to pin 2, and white to pin 1.

Headphone Jack Cable & Speaker Assemblies

- 12.16. Mount the Headphone Jack Cable (made in Step 4) to the Chassis using the supplied hardware (see Figure 24). Keep the wires to the top side.

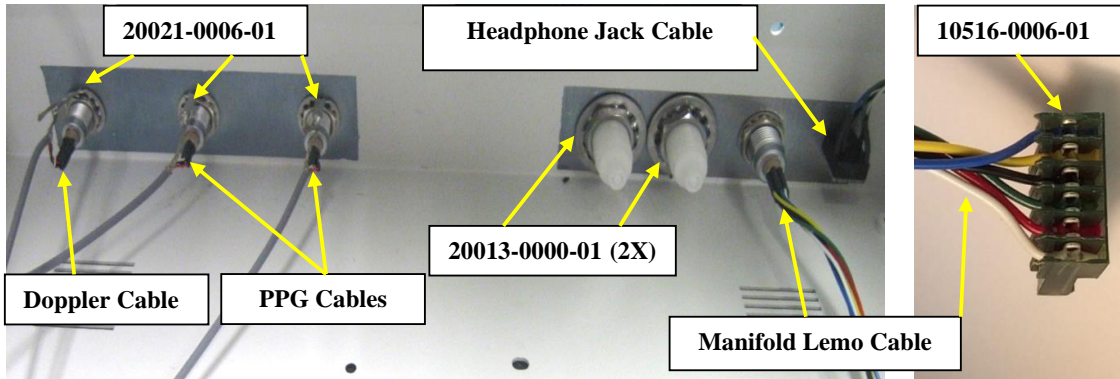


Figure 24

- 12.17. Mount the Right Speaker (made in Step 6) using four (4) #4 Lockwashers (20002-0440-01) and four (4) 4-40 Nuts (20003-0440-01) to the left side of the chassis (viewed from inside) as shown in Figure 25. Keep the wire to the top of the chassis.

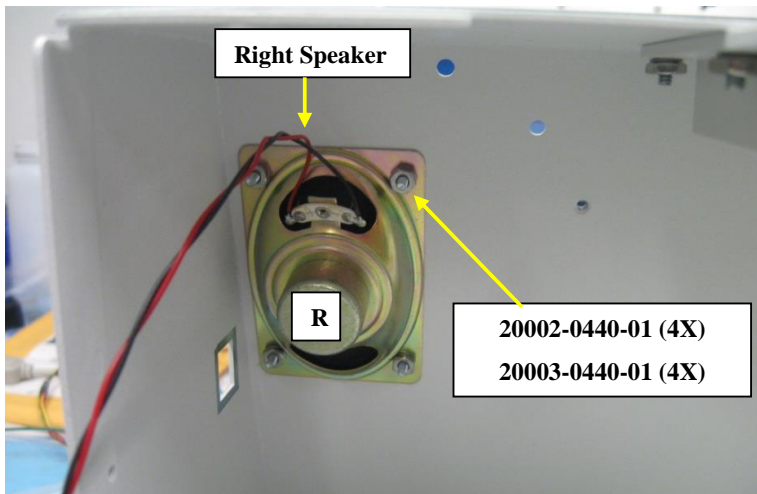


Figure 25

- 12.18. Attach the phone jack of the Temperature Cable (made in Step 7) to the Chassis using super glue (3M CA4 or equivalent) as shown in Figure 26. *Note: the speaker must be mounted before the Temperature Cable.*

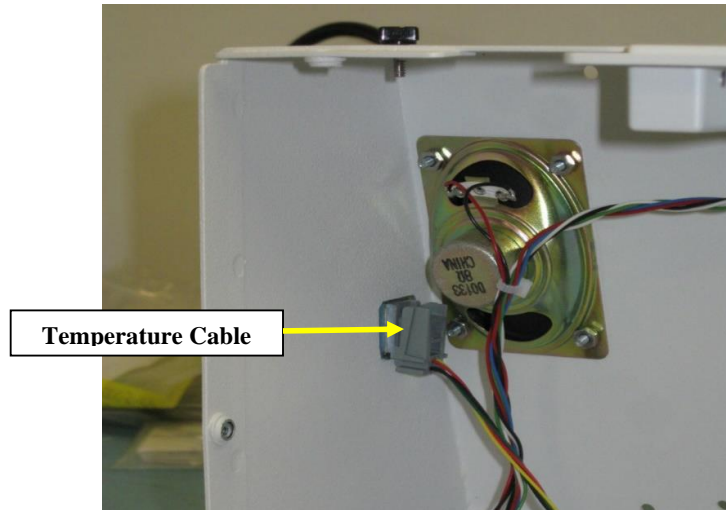


Figure 26

- 12.19. Mount the Left Speaker (made in Step 6) using four (4) 4-40 Lock washers (20002-0440-01) and four (4) 4-40 Nuts (20003-0440-01) to the right side of the chassis (viewed from inside) as shown in Figure 27.
- 12.20. Attach two (2) Plastic Loop Clamps (20029-0016-02) to the Chassis using two (2) 4-40x³/₈" Pan Head Screws (20004-0006-01) and two (2) #4 Lockwashers (20002-0440-01) as shown in Figure 27. *Note: Only mount the back half the Clamp and the Screws can be finger tight.*
- 12.21. Twist and secure the Left Speaker wires with the Headphone Jack Cable using a 4" Tie Wrap (20008-0004-01) as shown in Figure 27. Continue to route the cables through the Clamps then over the Right Speaker. Twist in the Right Speaker wires with the other cables and attach another Tie Wrap near that Speaker (see Figure 28).

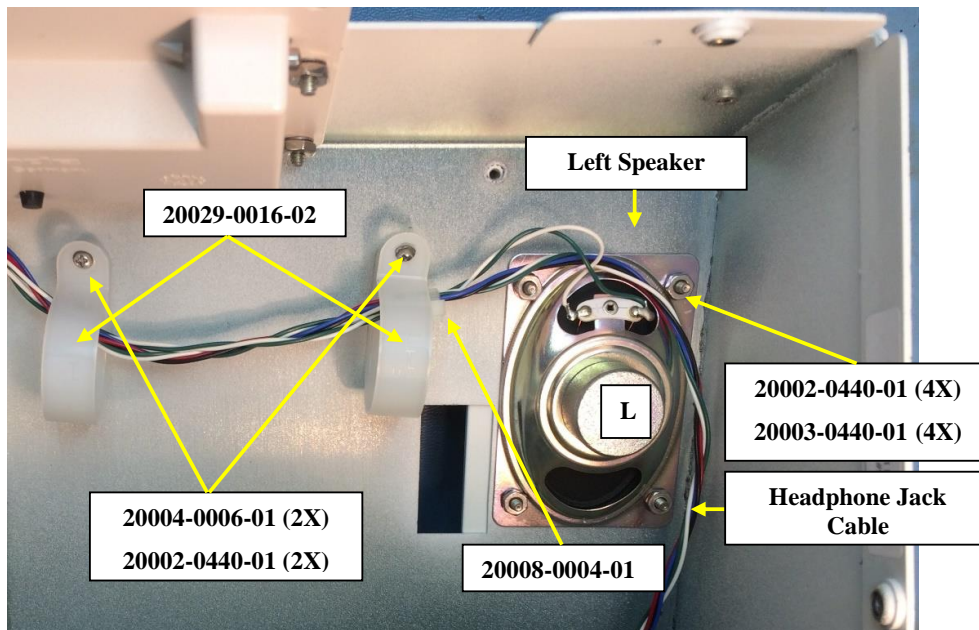


Figure 27

- 12.22. Attach two (2) Plastic Headed Thumb Screws (20051-0006-01) as shown in Figure 28.

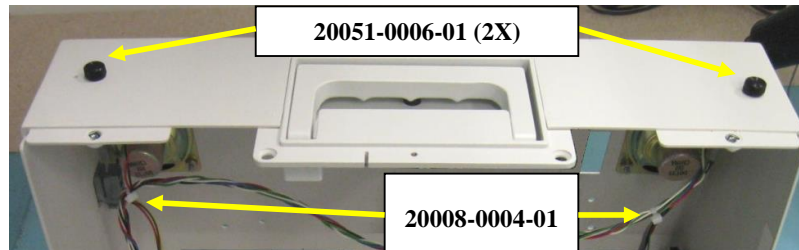


Figure 28

- 12.23. Attach Internal Hose Assemblies (11936-0000-01) to the Panel Mount Air Fittings, one for each, as shown in Figure 29. Save the serial numbers, for the Hose assemblies, until later. *Note: The long end of the tubing will be connected.*

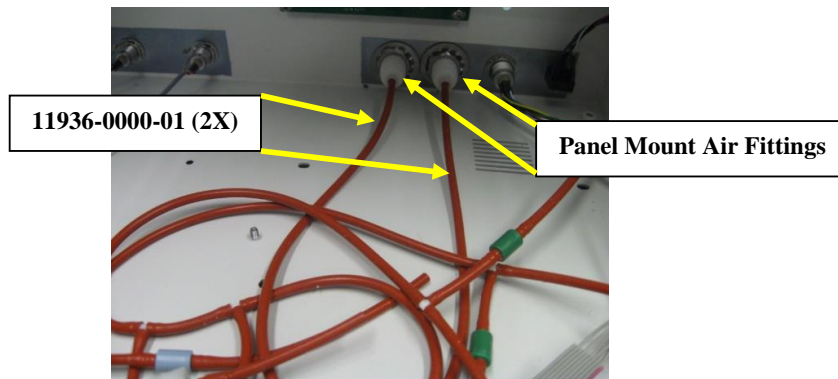


Figure 29

Step 13 Display Assembly

- 13.1. Attach the Touch Screen (10369-0013-02) to the LCD Display (10370-0006-03) using twenty-five (25) inches of ½" double sided tape (3M, Model #926 or equivalent) around all sides as shown in Figure 30. Note the orientation of the Touch Screen to the Display and make sure the active area of the Touch Screen aligns with the active area of the Display. Make sure there is no dust or particles between the Touch Screen and Display.

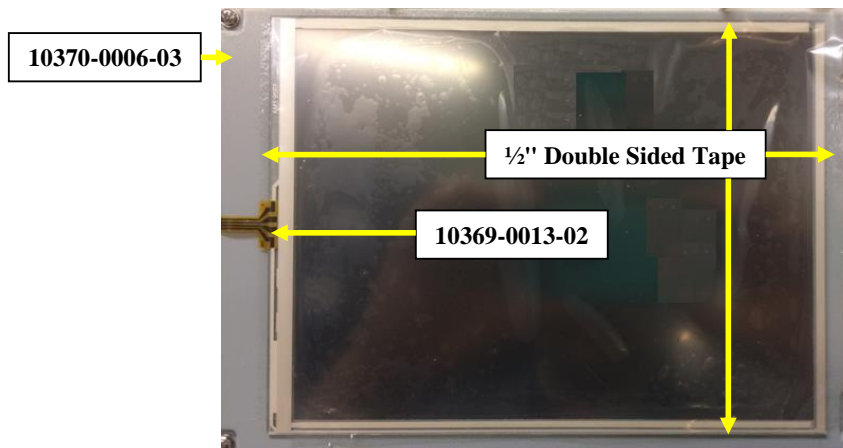


Figure 30

- 13.2. Attach 2" of 1" Foam Tape (McMaster.com part#7598A72 or equivalent) to the back of the Touch Controller (10369-0012-02). Place the Controller onto the Display as shown in Figure 31.

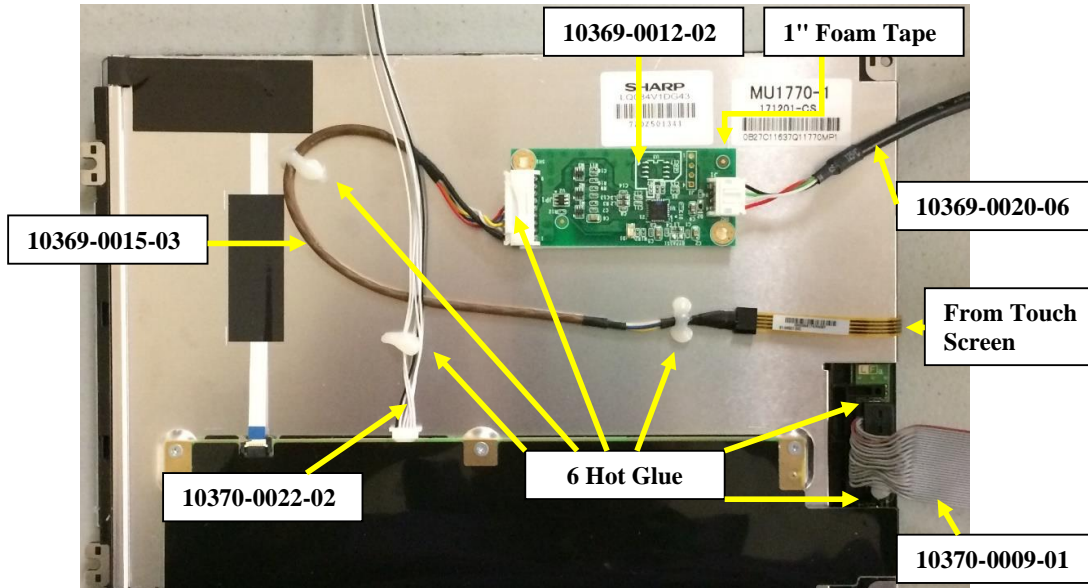


Figure 31

- 13.3. Attach one end of the Touch-to-Ctrl Cable (10369-0015-03) to Touch Screen and the other end to the Touch Controller as shown in Figure 31.
- 13.4. Attach the Penmount Touch Cable (10369-0020-06) to the open connector on the Touch Controller as shown in Figure 31.
- 13.5. Attach the Display Ribbon Cable (10370-0009-01) and Backlight Cable (10370-0022-02) to the display as shown in Figure 31.
- 13.6. Apply hot glue, as shown in Figure 31, to secure the Cables in position.
- 13.7. Place the Display w/ Touch Screen assembly into the Molded Frame (40000-0445-02), as shown in Figure 32.

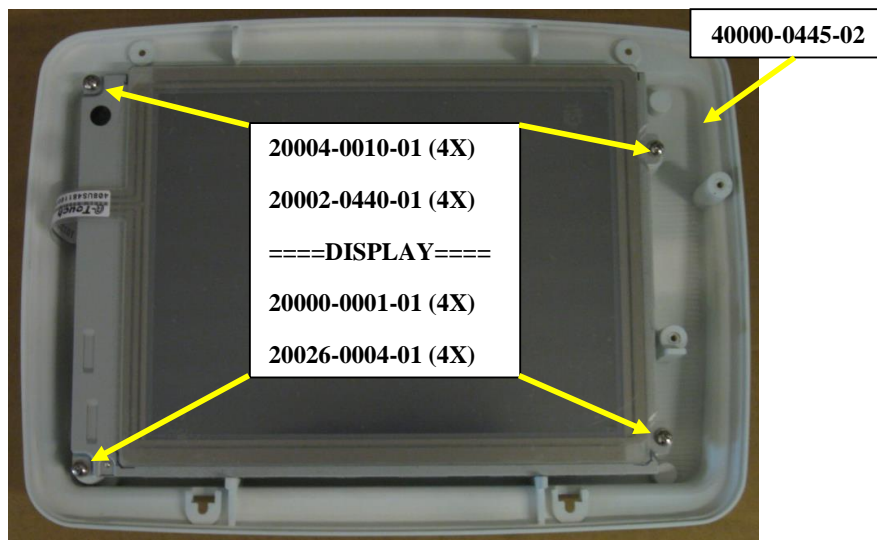
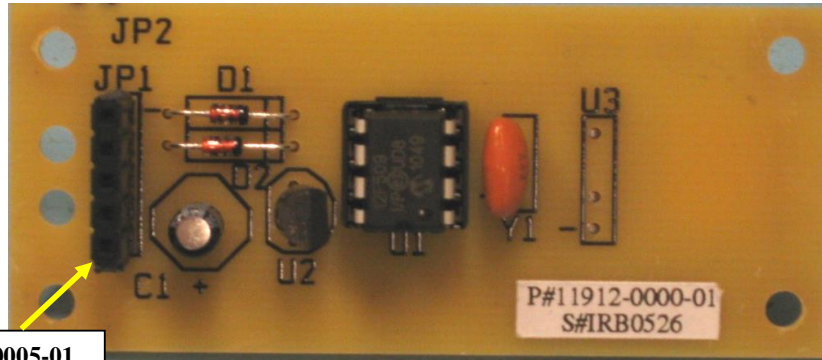


Figure 32

- 13.8. Secure the Display to the Molded Frame with four (4) 4-40x $\frac{5}{8}$ " Pan Head Screws (20004-0010-01), four (4) #4 Lockwashers (20002-0440-01), four (4) 1/16" Fiber Washers (20000-0001-01) and four (4) 1/4" Nylon Spacers (20026-0004-01) as shown in Figure 33. Keep the Nylon Spacers and Fiber Washers below the display. Torque the Screws to 5 inch pounds using a torque driver.
- 13.9. Solder the .100" 5 Pin Housing (10505-0005-01) to JP1 of the Infrared Remote PCB (11912-0000-01), as shown in Figure 33.



10505-0005-01

Figure 33

- 13.10. Cut a 1/2" of 1" Foam Tape (McMaster.com part#7598A72 or equivalent) and fold in half. Place under the IR as shown in Figure 34.

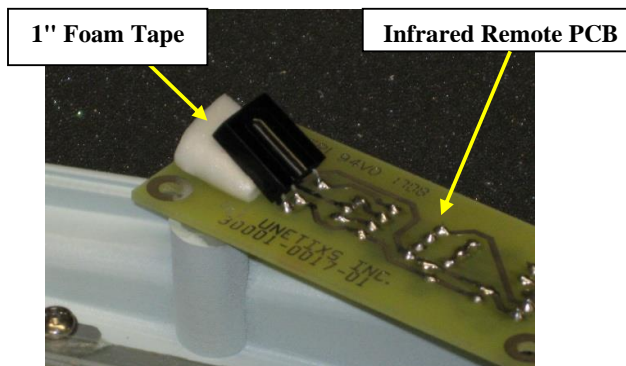


Figure 34

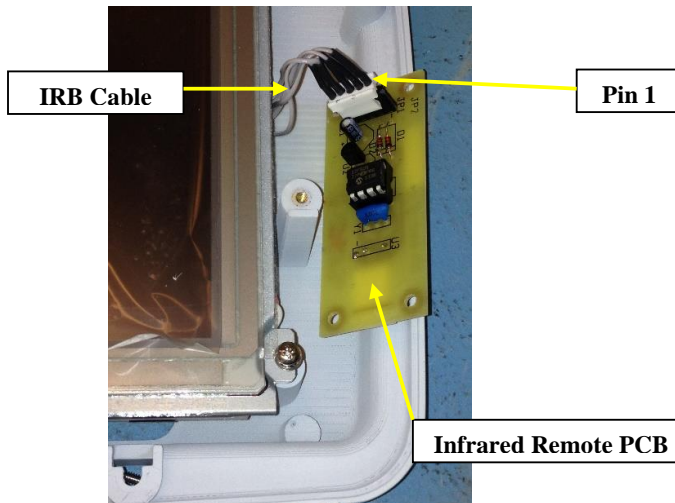


Figure 35

- 13.11. Slide the header of the IRB Cable (made in Step 10) through the opening as shown in Figure 36. Attach to JP1 of the Infrared Remote PCB. Pin 1 of the header (red side of cable) goes to pin 1 of the connector (JP2).
- 13.12. Mount the Infrared Remote PCB to the Frame using two (2) 4-40x $\frac{1}{4}$ " Pan Head Screws (20004-0004-01) and two (2) #4 Lockwashers (20002-0440-01) (see Figure 36). Torque the Screws to 5 inch pounds using a torque driver.

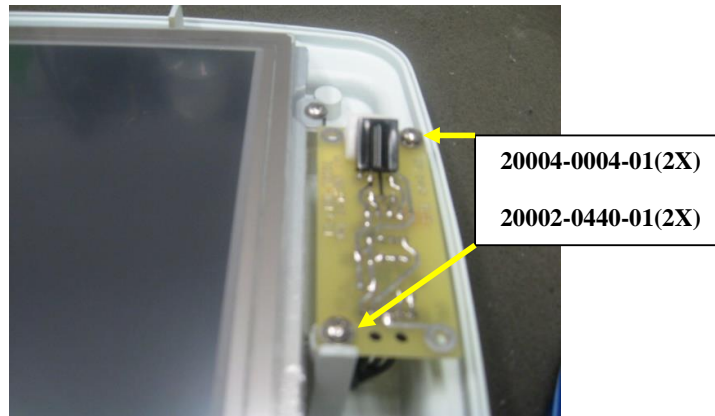


Figure 36

- 13.13. Place the Molded Bezel (40000-0445-01) onto the Frame using four (4) 4-40x $\frac{3}{8}$ " Pan Head Screws (20004-0006-01) and four (4) #4 Lockwashers (20002-0440-01) as shown in Figure 37. Torque the Screws to 5 inch pounds using a torque driver.

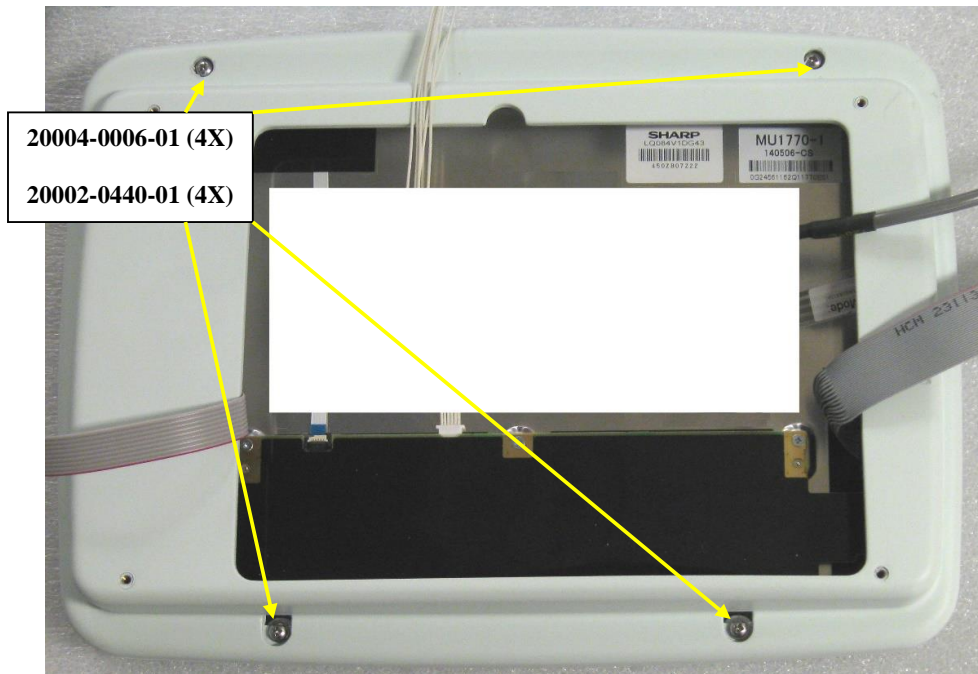


Figure 37

- 13.14. Place the Bezel face down onto a pad and install the cables through the opening of the chassis, as shown in Figure 38.

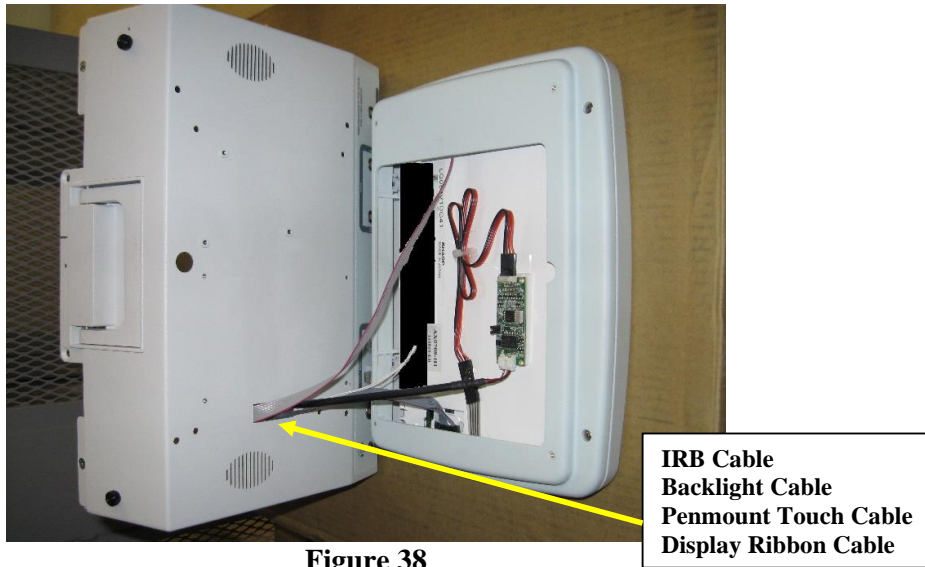


Figure 38

- 13.15. Secure the Bezel to the Chassis using four (4) 4-40x1/4" Pan Head Screws (20004-0004-01) and four (4) #4 Lockwashers (20002-0440-01) as shown in Figure 39. Torque the Screws to 5 inch pounds using a torque driver.

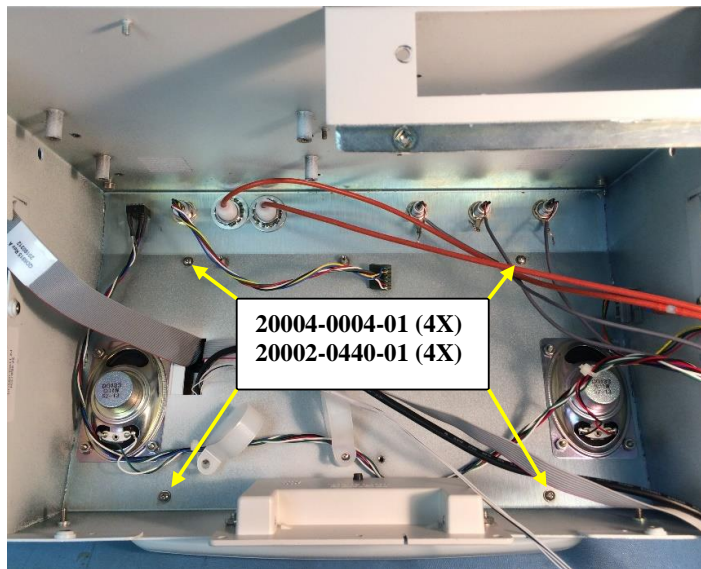


Figure 39

Step 14 Install Front Inner Divider into Chassis

- 14.1. Route the green/yellow, brown and blue wires of the Power Entry Module (made in Step 8) through the slot on the bottom of the Front Inner Divider (40000-0434-01) as shown in Figure 40. Then route the two hoses, of the Internal Hose Assemblies, through the same slot.
- 14.2. Attach the Divider to the Chassis using a 4-40x1/4" Pan Head Screw (20004-0004-01) and a #4 Lockwasher (20002-0440-01) as shown in Figure 40.
- 14.3. Add a 4-40x3/16" Flat Head Screw (20028-0003-01) into the Divider from the bottom of the chassis as shown in Figure 40.

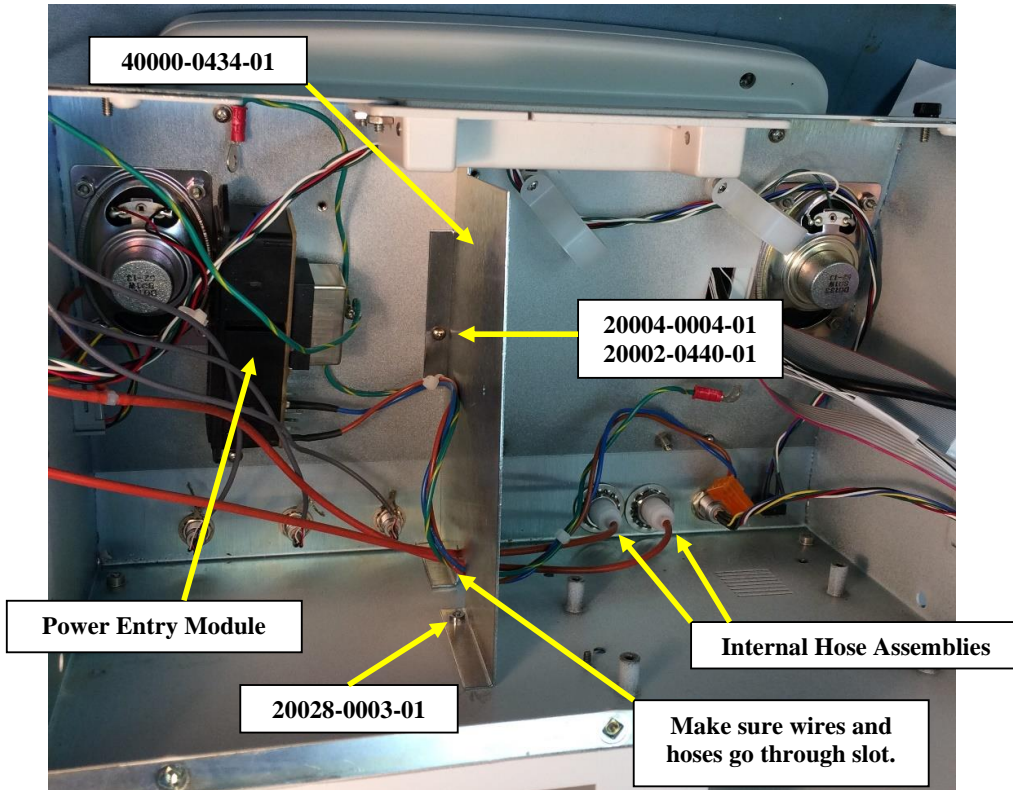


Figure 40

Step 15 Power Supply Mounting

- 15.1. Install two (2) 1/16" Fiber Washers (20000-0001-01) and two (2) 4-40x2¼" Hex Standoffs (20038-0036-01) into the bottom of the Chassis as shown in Figure 41.

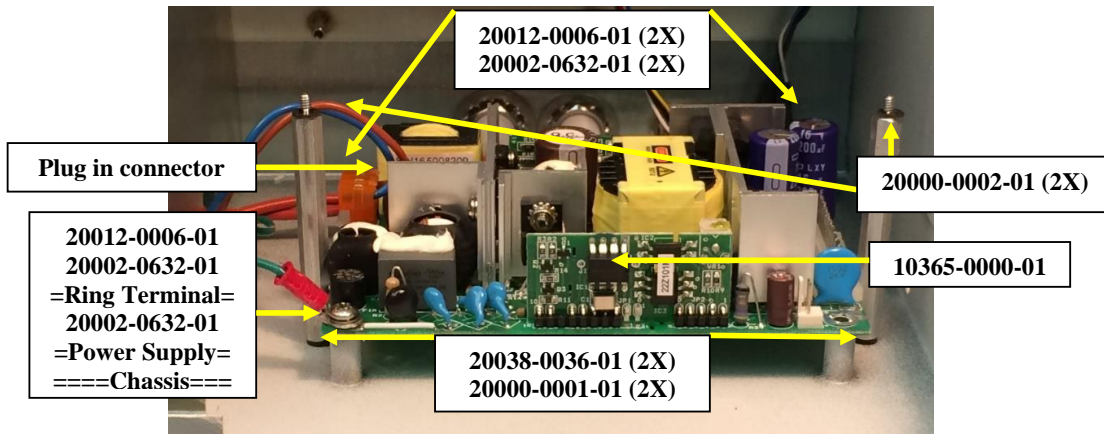


Figure 41

- 15.2. Mount the Power Supply (10365-0000-01) onto the Chassis using three (3) 6-32x3/8" Pan Head Screws (20012-0006-01) and four (4) #6 Lockwashers (20002-0632-01) as shown in Figure 41. Secure the ring terminal on the green/yellow wire of the Power Entry Module (made in Step 8) to the Power Supply as shown.
- 15.3. Plug the connector with the brown & blue wires from the Power Entry into 2-pin connector on the Power Supply as shown in Figure 41.

Step 16 Mount Brackets onto the Series 2 SMT Motherboard (11919-0000-01)

- 16.1. Attach the two (2) PCB Brackets (40002-2026-01) to the bottom of the SMT Motherboard (11919-0000-01) using four (4) 6-32x $\frac{3}{4}$ " Pan Head Screws (20012-0012-01) and four (4) #6 Lockwashers (20002-0632-01) as shown in Figure 42. Also attach a 6-32 x $\frac{1}{2}$ " spacer (20014-0008-01) using a 6-23 x $\frac{3}{8}$ " pan head screw (20012-0006-01) and a #6 lockwasher as shown in Figure 42.

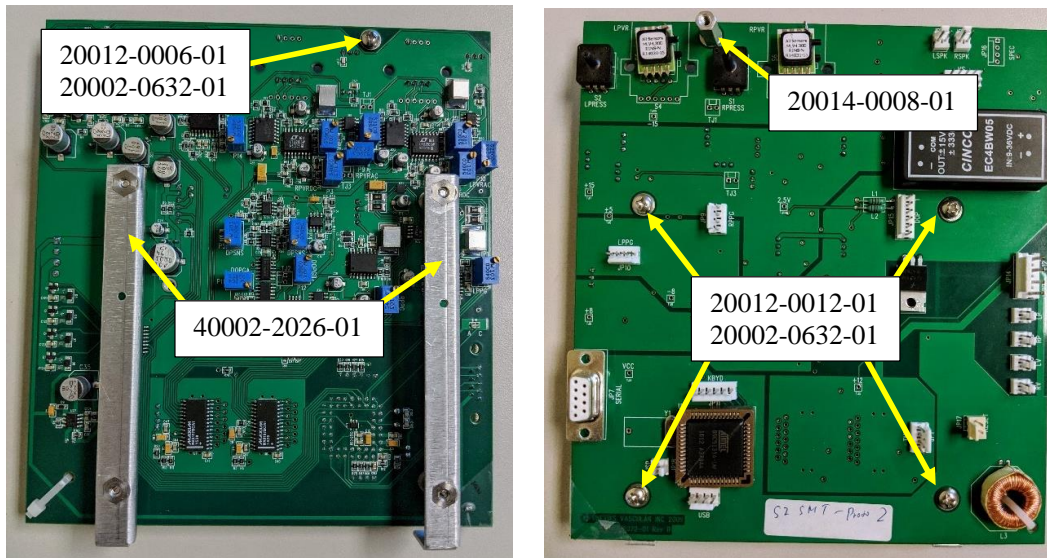


Figure 42

Step 17 Prep the Series 2 Motherboard for the Chassis

- 17.1. Attach the Internal Hose Assemblies to the motherboard according to Figure 43. Left Hose from the Air Fitting on the left side of Chassis (as viewed from inside) goes to S2 and S5 of the motherboard. Right Hose from the Air Fitting on the right side of the Chassis (as viewed from the inside) goes to S1 and S6 of the motherboard. Make sure the connection with the orifice restrictor goes to S2 and S1 as shown. A complete schematic of Hose connections can be found in Figure 49.

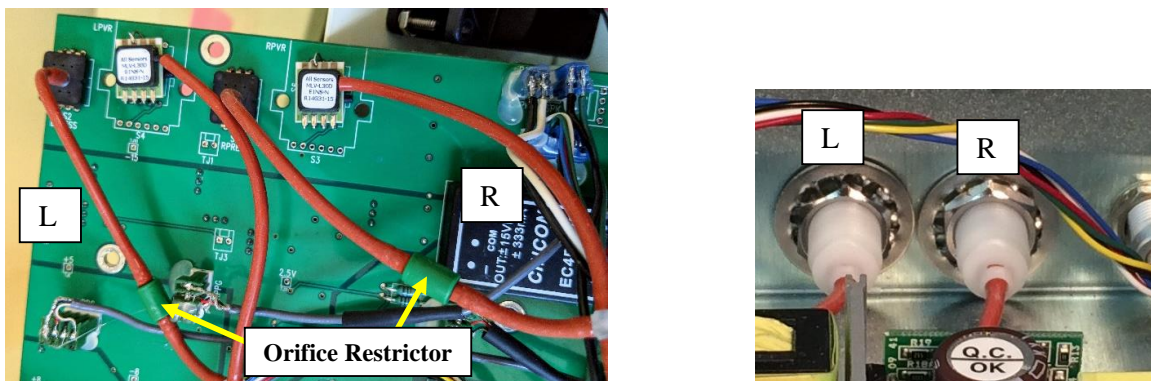


Figure 43

- 17.2. Connect the Doppler Cable on the Chassis to JP15 on the motherboard as shown in Figure 44 (purple block).

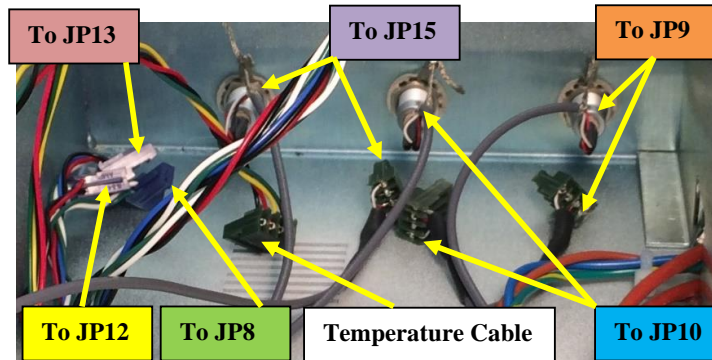


Figure 44

- 17.3. Connect the Left PPG Cable on the Chassis to JP10 on the motherboard as shown in Figure 44 (blue block).
- 17.4. Connect the Right PPG Cable on the Chassis to JP9 on the motherboard as shown in Figure 44 (orange block).
- 17.5. Connect the Temperature Cable (green/yellow/red/black) on the Chassis (shown in white block of Figure 44) to JP1 on the motherboard.
- 17.6. Connect the Headphone Jack Cable (black/red/blue/green/white) on the Chassis to JP8 on motherboard as shown in Figure 44 (green block).
- 17.7. Connect the cable from the Right Speaker (red/black) on the Chassis to JP12 as shown in Figure 44 (yellow block).
- 17.8. Connect the cable from the Left Speaker (green/white) on the Chassis to JP13 as shown in Figure 44 (pink block).
- 17.9. Connect the 4-pin connector of the Motherboard Power Cable (made in Step 8) to JP14 on the motherboard.
- 17.10. Apply hot glue to secure the connections made above, in Steps 17.2 through 17.9, to the motherboard.
- 17.11. Place the motherboard into the Chassis as shown in Figure 45. The motherboard must be in the Chassis before attaching the Power Entry Module or the Pump and Valve Bracket Assembly (11935-0000-01). Route the Motherboard Power Cable over the Front Inner Divider and through the Plastic Loop Clamps. Route the Temperature Cable to the right of the motherboard. Route the Headphone Jack Cable and Speaker wires to the left of (behind) the motherboard, then over the top near the connectors.

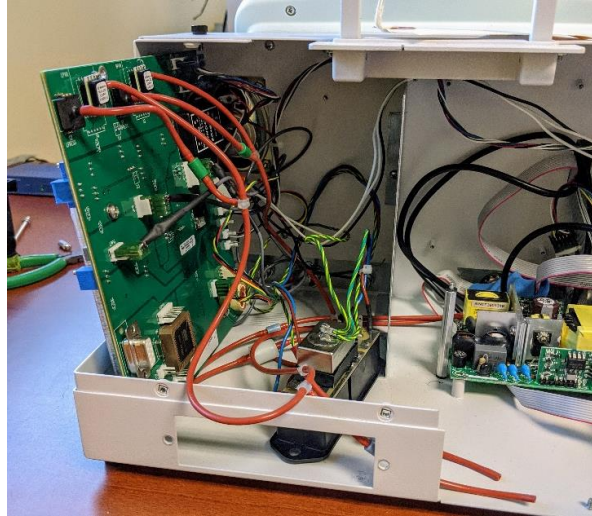


Figure 45

- 17.12. Place the Series 2 Pump & Valve Bracket Assembly (11935-0000-01) into the Chassis as shown in Figure 46. Attach the Internal Hose serial numbers, saved in Step 12.23, to the Bracket Assembly near its serial number.

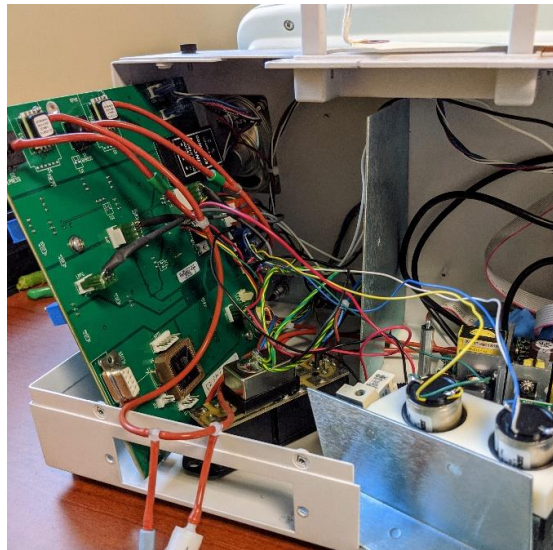


Figure 46

- 17.13. Attach the cables from the Pump & Valve Bracket Assembly to the Motherboard:
- Connect right valve to JP4.
 - Connect left valve JP3.
 - Connect the right pump (yellow & green wires) to JP6.
 - Connect the left pump (white & blue wires) to JP5.
- 17.14. Apply hot glue to the connections made in step 17.13 to secure them to the motherboard.

Step 18 Attach the Power Entry Module to the Chassis

- 18.1. Place a 6-32x $\frac{3}{8}$ " Pan Head Screw (20012-0006-01) through a #6 Lockwasher (20002-0632-01) then through the Chassis hole on the left side (see Figure 47), attach the Power Entry Module, place a #6 Lockwasher (20002-0632-01), then a 6-32 Nut (20003-0632-01). Repeat for right side. Do not tighten the Screws yet.

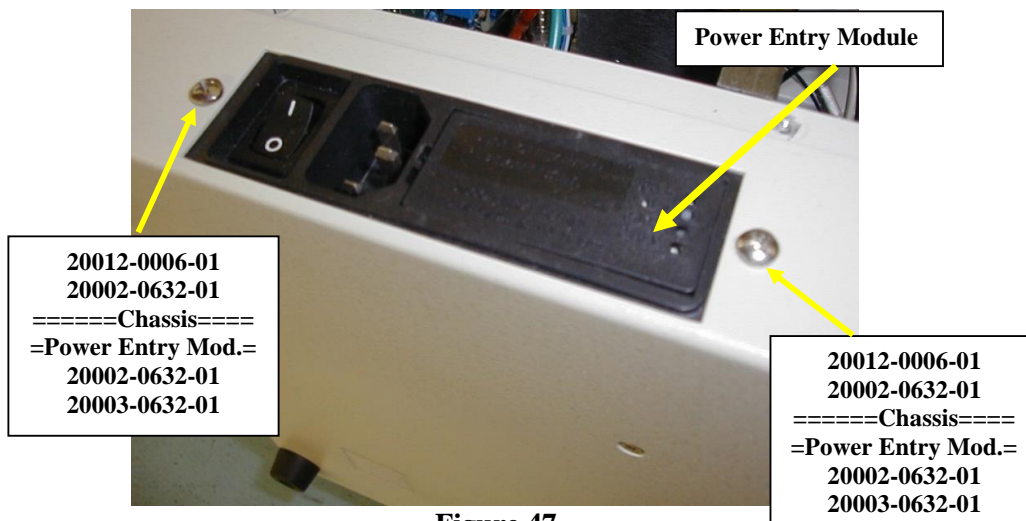


Figure 47

- 18.2. Slide the Power Entry Module as far left as possible and then tighten the Screws.

Step 19 Connect Hoses to the Pump & Valve Bracket Ass'y and install into Chassis

- 19.1. Remove any protective caps on pumps of the Pump & Valve Bracket Assembly (11935-0000-01). Attach the Internal Hose Assemblies (11936-0000-01) to the pumps and valves per Figure 49 as shown in Figure 48.
- Attach the left Hose (see Figure 43 right), with filter, to the left valve.
 - Attach the right Hose (see Figure 43 right), with filter, to the right valve.
 - Attach the remaining left Hose to the left pump's pressure side (closest to valves).
 - Attach the remaining right Hose to the right pump's pressure side (closest to valves).

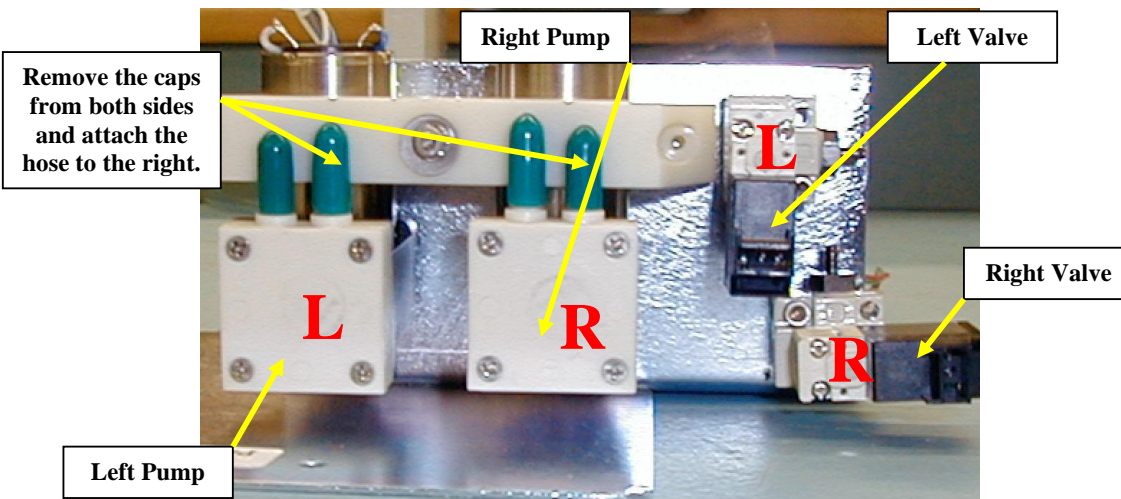


Figure 48

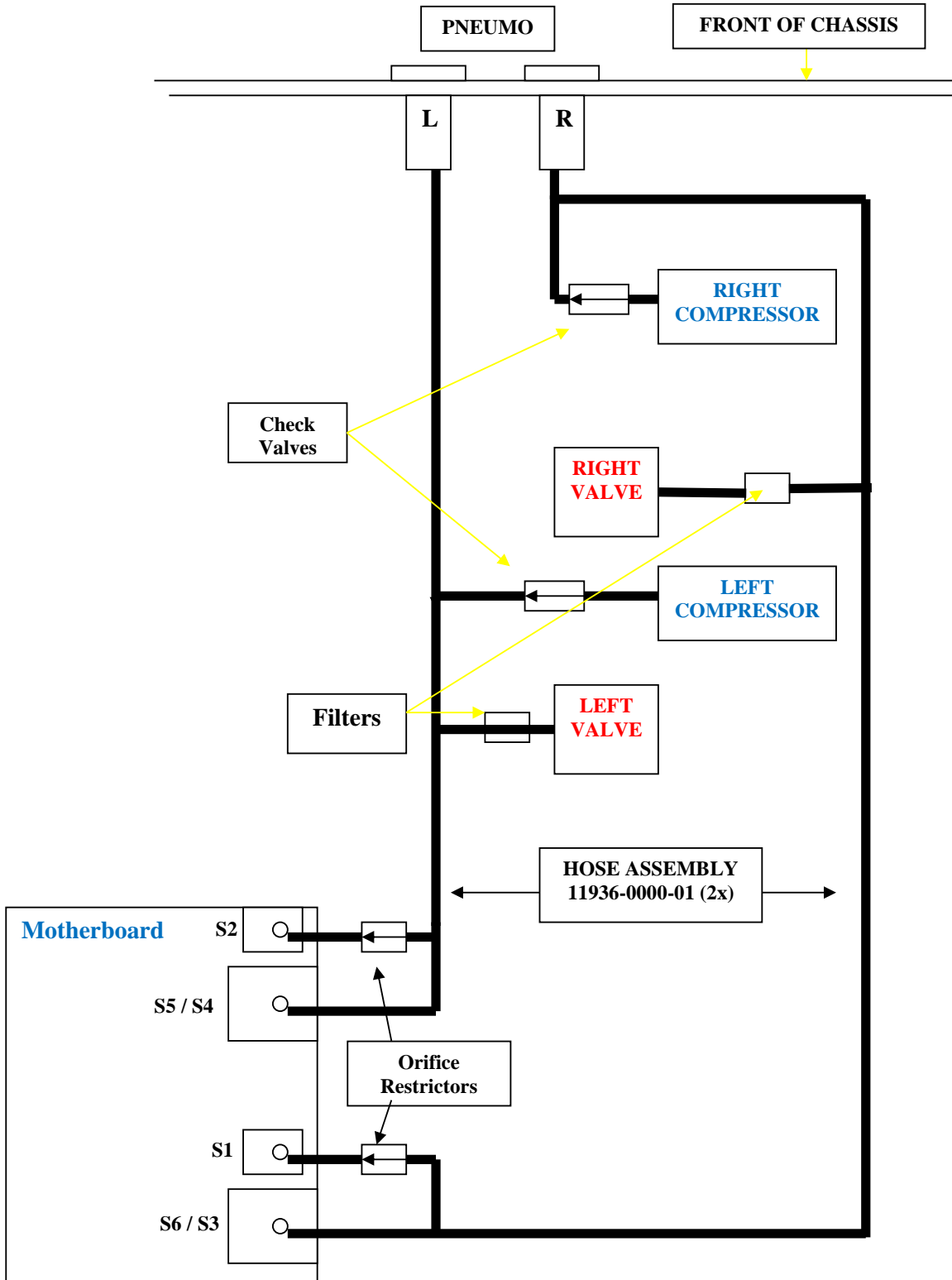


Figure 49

19.2. Attach the Pump & Valve Bracket Assembly onto the Front Inner Divider using a 4-40x1/4" Pan Head Screw (20004-0004-01) and a #4 Lockwasher (20002-0440-01) as

shown in Figure 50 (left). Make sure to fit the Bracket Assembly into the slot on the Modified Handle as shown. Route the longer green/yellow wire from Power Entry Module behind the Bracket Assembly.

- 19.3. Secure the Bracket Assembly to the Chassis using a 4-40x1/4" Pan Head Screw (20004-0004-01) and #4 Lockwasher (20002-0440-01) through the bottom of the chassis as shown in Figure 50 (right). Move the Bracket assembly as far away from the Power Entry module as possible.

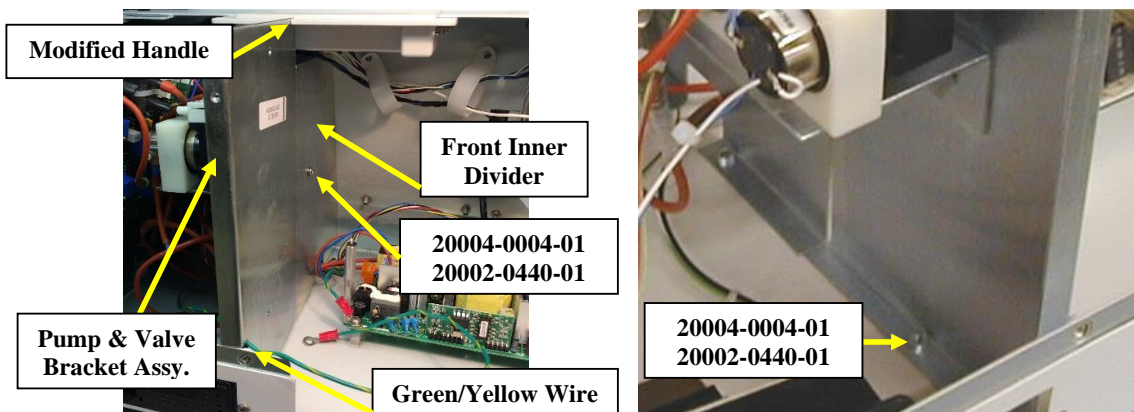


Figure 50

- 19.4. Mount the Motherboard onto the Chassis using two (2) 6-32x3/8" Pan Head Screws (20012-0006-01) and two (2) #6 Lockwashers (20002-0632-01) as shown in Figure 51 (screws come up from bottom of chassis into the PCB Brackets).

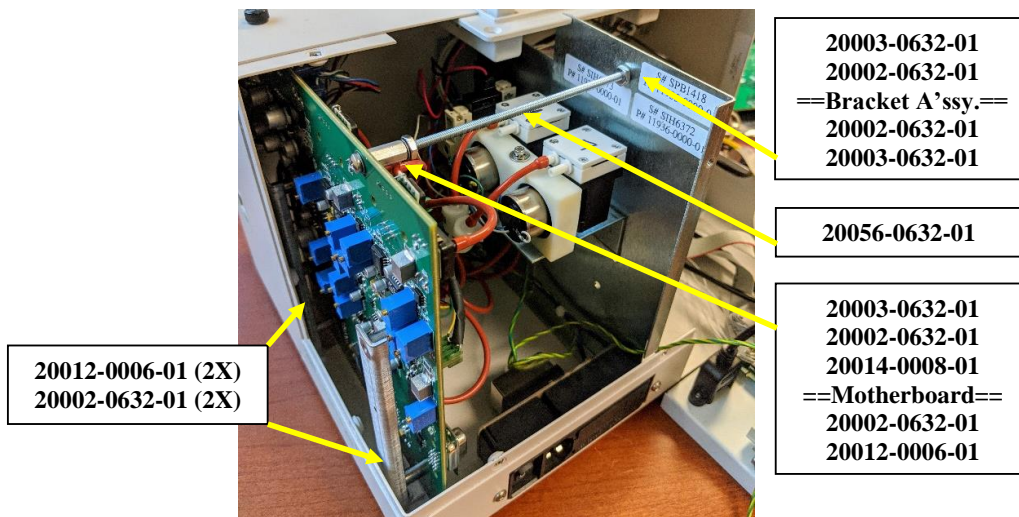


Figure 51

- 19.5. Add two (2) 6-32 Nuts (20003-0632-01) to a 5" piece of 6-32 Threaded Rod (20056-0632-01), on both sides, as shown in Figure 51. Add two (2) #6 Lockwashers (20002-0632-01) onto each end. Place the Rod through the Bracket Assembly and screw into the standoff on the motherboard. Secure the Nut at the motherboard. Adjust the Nut by the Pump & Valve Bracket so that the motherboard is held vertical. Add a #6 Lockwasher and a 6-32 Nut to secure the Rod to the Bracket Assembly.

Step 20 Mount CPC into chassis

- 20.1. Cut a 5" piece of Black 18AWG Wire (10706-0001-01), then strip one end ¼". Crimp a #8 Ring Terminal (10548-0008-01) over the stripped end.
- 20.2. Crimp the 9-pin .156" Housing(10503-0009-01) to the black wire of 4-pin housing from the Motherboard Power Cable (made in Step 8), the 18AWG Black Wire from the previous step, and the MB80580 Power to Wire Cable (10369-0020-02) as shown in Figure 52 (left). Crimp the white wire from the 4-pin housing of Motherboard Power Cable to pin 8 of the 9-pin housing. Connect the Housing to the Power Supply as shown in Figure 52 (right). All wires mentioned in this step, except the Ring Terminal, should be draped through the Plastic Loop Clamps.

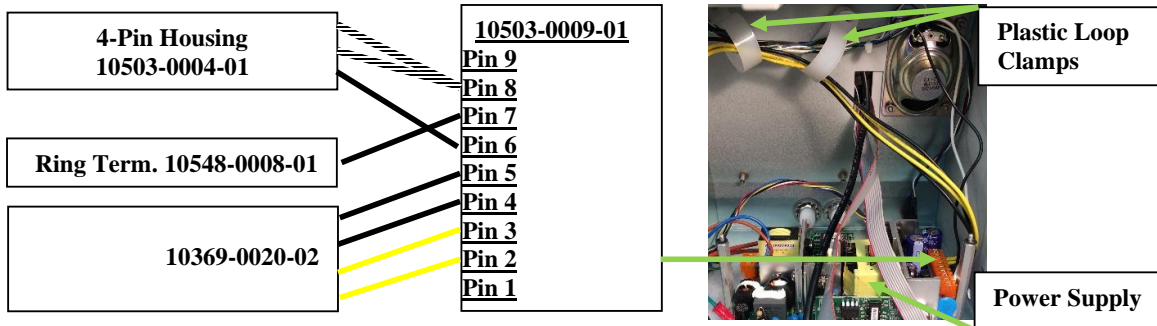


Figure 52

- 20.3. Attach the Ring Terminal to the Power Supply and Chassis using a 6-32x¾" Pan Head Screw (20012-0006-01) and two (2) #6 Lockwashers (20002-0632-01) as shown in Figure 53 (left).

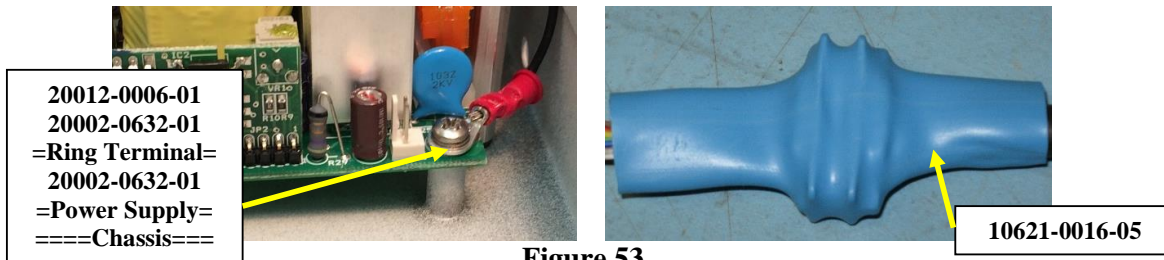


Figure 53

- 20.4. Cut 3" of 1" Blue Heat Shrink Tubing (10621-0016-05) and pass the IRB cable (now coming through the hole in the Chassis from the display) through it. Connect the DB9 connector of a MB80580 COM Cable (10369-0020-04) to the DB9 connector on the IRB Cable. Remove the protective shroud from the DB9 end of the COM Cable and discard. Heat the Shrink Tubing over both connectors as shown in Figure 53 (right).
- 20.5. Connect the MB80580 GPIO Cable (10369-0020-08) to the Manifold Lemo Cable (made in Step 5) as shown in Figure 54. Note: Red wires are on the same side.
- 20.6. Thread the IRB Cable (coming from the display) through the Plastic Loop Clamps as shown in Figure 54. Thread the IRB Cable through again, as shown. Thread the free end of the COM Cable (attached in Step 20.4) under the Power Supply, towards the right, as shown.
- 20.7. Hook the Manifold Lemo Cable over the closest Plastic Loop Clamp as shown in Figure 54. Thread the GPIO Cable (attached in Step 20.5) under the Power Supply, towards the right, as shown.

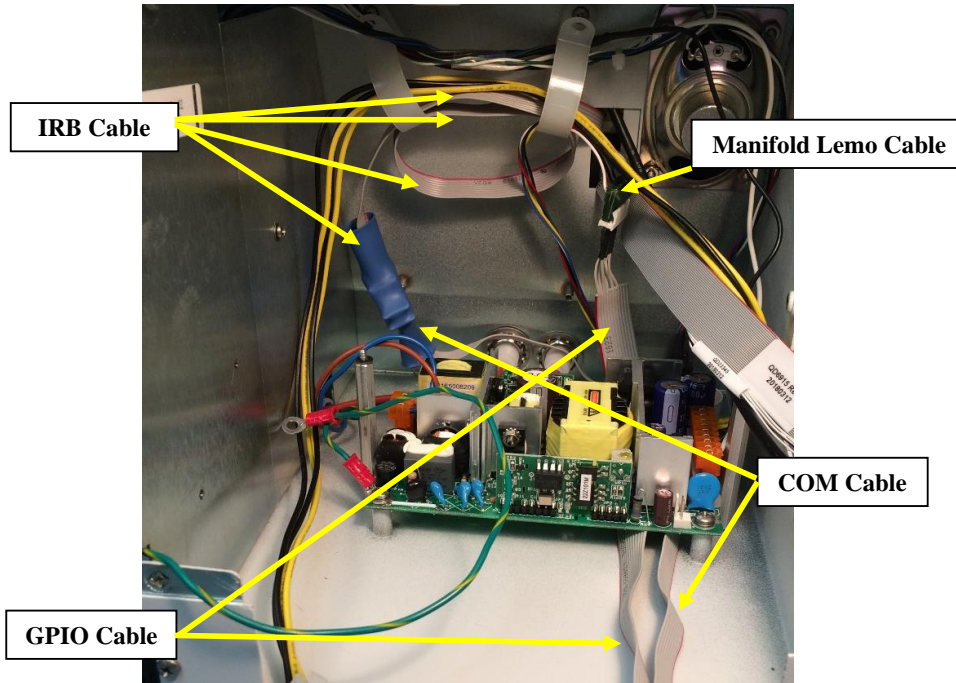


Figure 54

- 20.8. Thread the Penmount Touch Cable (coming from the display) under the Plastic Loop Clamps, then through them, as shown in Figure 55. Thread the Touch Cable through again, as shown. Thread the free end of the Touch Cable under the Power Supply, towards the right, as shown.

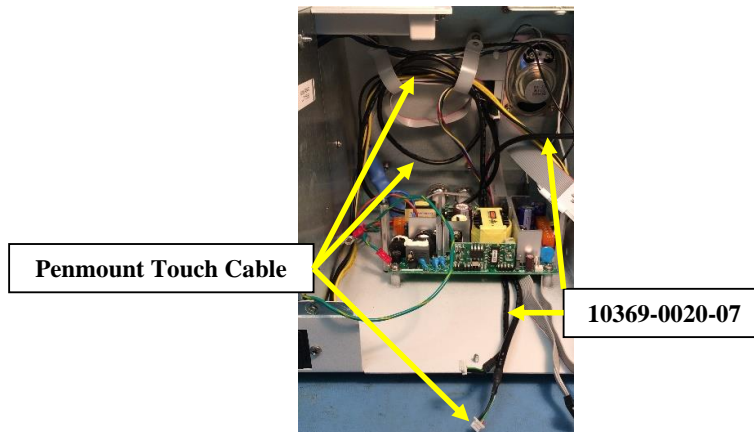


Figure 55

- 20.9. Thread the MiniPCI USB to Panel Cable (10369-0020-07) under the Power Supply, towards the right, as shown in Figure 55.
- 20.10. Thread the Backlight Cable (coming from the display) under the Power Supply towards the middle as shown in Figure 56 (left).
- 20.11. Thread the Display Cable (coming from the display) under the Power Supply, towards the middle as shown in Figure 56 (left).
- 20.12. Place the PC CPU Assembly (11910-0000-01) face down near the Cables at the rear of the Chassis as shown in Figure 56 (right). Attach the Display Cable to CN2 of the CPU Assembly's converter board as shown.

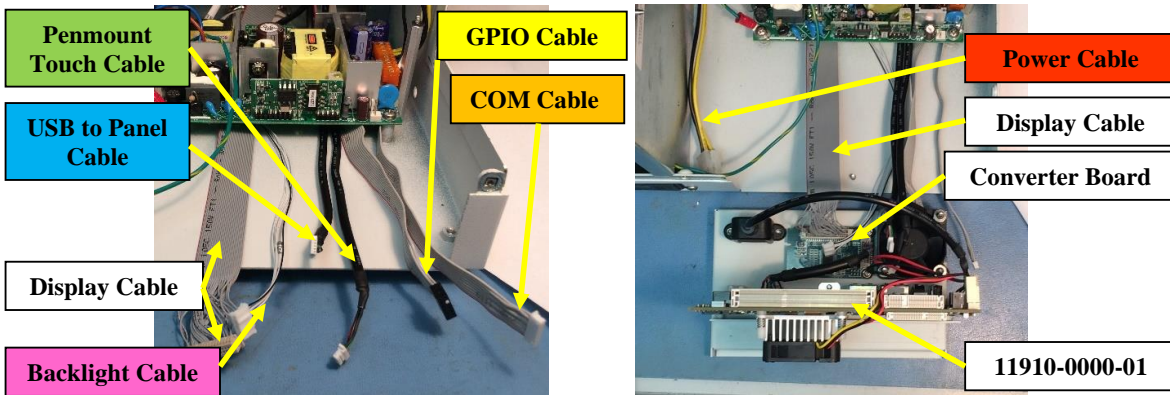


Figure 56

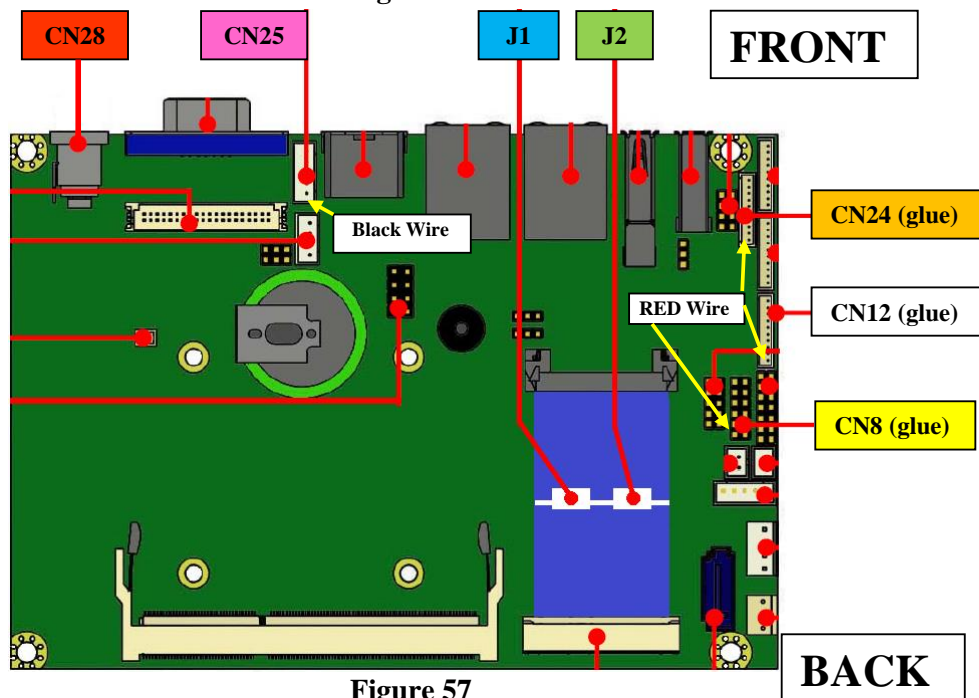


Figure 57

20.13. Attach the Cables to the MB80580 Computer of the CPU Assembly (see Figure 57):

- Connect the COM Cable to CN24 of the Computer (orange blocks). Red wire (pin 1) is toward the back of the Computer. Use a small amount of hot glue to secure the connection.
- Connect the GPIO Cable (connected to the Manifold Lemo Cable in step 20.5) to CN8 of the Computer (yellow blocks). Red wire (pin 1) is toward the back of the Computer. Use a small amount of hot glue to secure the connection.
- Connect the Penmount Touch Cable to J2 of the dual USB card attached to the Computer (green blocks). Red wire (pin 1) is toward the middle of the Computer.
- Connect the USB to Panel Cable to J1 of the dual USB card attached to the Computer (blue blocks). Red wire (pin 1) is toward the middle of the Computer.
- Connect the Backlight Cable to CN25 of the Computer (pink blocks). Pin 1 (black wire) is toward the back of the Computer.
- Connect the Power Cable to CN28 of the Computer (red blocks). Yellow wires are toward the back of the Computer.

- Route the wire of the second MB80580 COM Cable (10369-0020-04) behind the Power connection (CN28) of the Computer with the red wire down as shown in Figure 58. Then route the wire under the fan and connect to CN12 (see Figure 57) of the Computer with the red wire (pin 1) away from the front of the Computer. Use a small amount of hot glue to secure the connection.

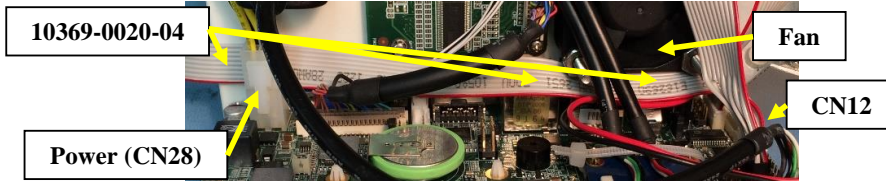


Figure 58

- 20.14. Thread a 4" Tie Wrap (20008-0004-01) under and through the Computer's bracket holding the dual USB card. Collect up the Penmount Touch Cable and the USB to Panel Cable as shown in Figure 59.

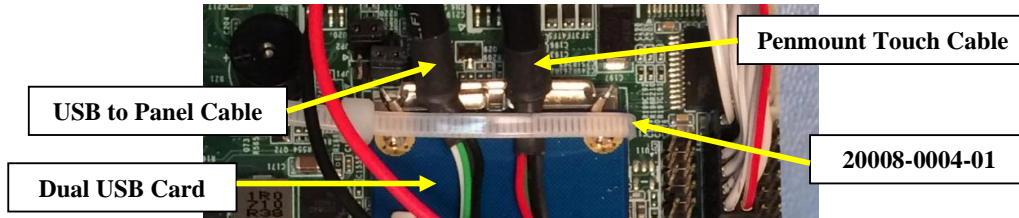


Figure 59

- 20.15. Add a 1/32" Fiber Washers (20000-0002-01) to the top of each Standoff as shown in Figure 41.
- 20.16. Insert the CPU Assembly into the Chassis, as shown in Figure 60, while pulling up excess cable from the far side of the power supply. Secure the rear of the CPU with two (2) Rounded Standoffs (20039-0016-01). Secure the front of the CPU with a #4 Lockwasher (20002-0440-01) and a 4-40 Acorn Nut (20033-0440-01).

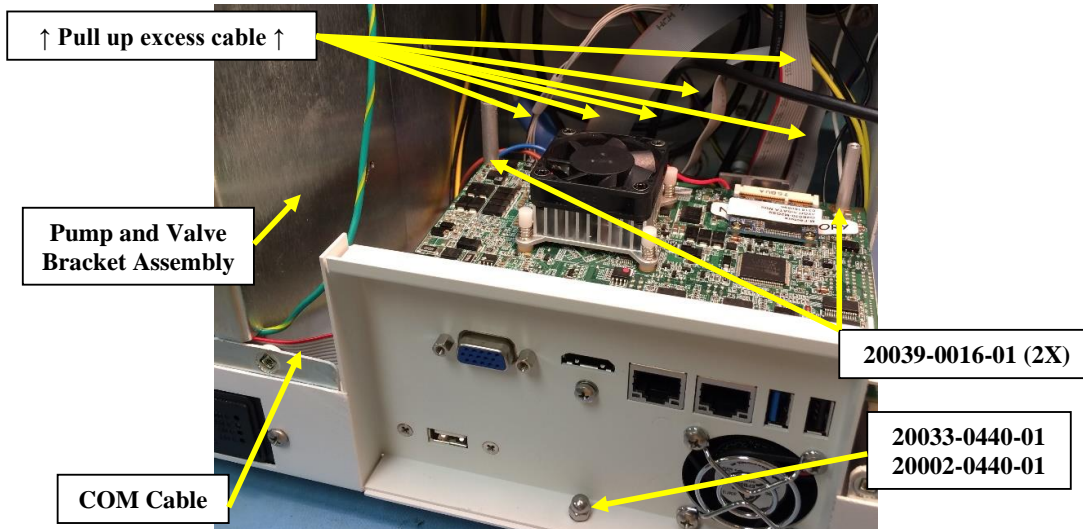


Figure 60

- 20.17. Route the COM cable behind the Pump & Valve Bracket Assembly as shown in Figure 60. Remove any hardware from the protective cover on the DB9 end of the COM Cable. Secure the COM Cable to JP7 on the motherboard with hot glue.

- 20.18. Hook the excess cable pulled up in Step 20.15, except for the Display Cable, into at least one of the Plastic Loop Clamps as shown in Figure 61. Temporarily remove the 4-40 Screw and #4 Lockwasher holding the Clamps and then reinstall with the Clamps closed.

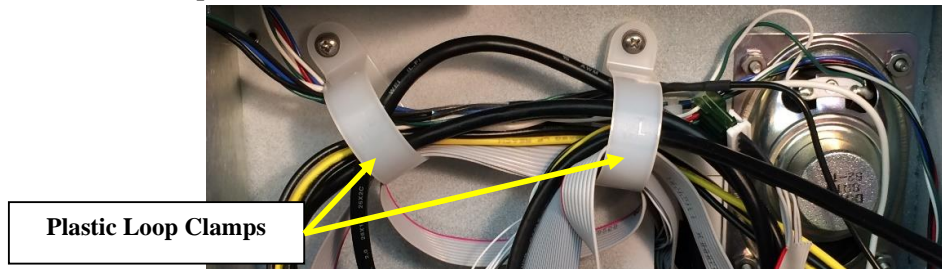


Figure 61

- 20.19. Mount the Mount the USB to Panel Cable to the Cover (40000-0433-01) using two (2) 4-40x1/4" Flat Head Screws (20028-0004-01) as shown in Figure 62 (left).

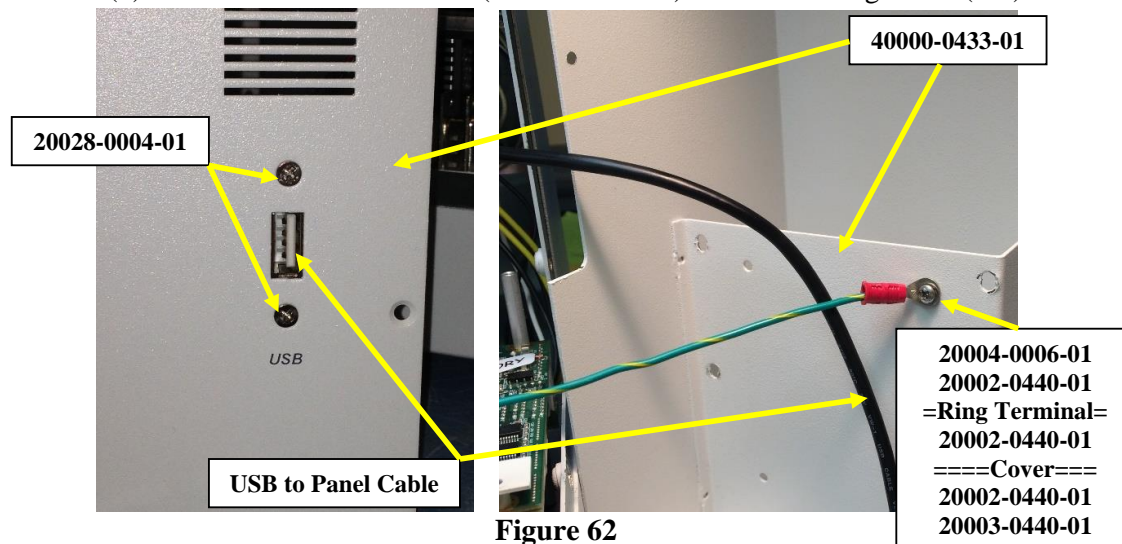


Figure 62

- 20.20. Attach the Ring Terminal from the green/yellow wire (from the Power Entry Module) to the Cover using a 4-40x3/8" Pan Head Screw (20004-0006-01), three (3) #4 Lockwashers (20002-0440-01), and a 4-40 Nut (20003-0440-01) as shown in Figure 62 (right).

Step 21 BIOS Setup

- 21.1. Connect a test Monitor w/RGB (65003-0000-01) to the RGB port on the back of CPU Assembly. Connect a test 2CP USB Keyboard (65038-0000-01) to the USB port, to the left of the fan, on the back of the CPU Assembly. Turn the power switch off on the Power Entry Module and connect a test Power Cord (65029-0000-01). Note the MB80580 Updater's (60024-0000-01) manufacturer and insert into a free USB port.
- 21.2. Turn the unit on. Press **Delete** key to get into the BIOS. You may have to press this key a few times. The BIOS setup screen will show.
- 21.3. Press **RIGHT ARROW** 4 times to "Boot", press **DOWN ARROW** 5 times to "Hard Drive BBS Priorities", press **ENTER**, press **ENTER** on "Boot Option #1", use **UP** and **DOWN ARROWS** to select flash drive noted in step 21.1, press **ENTER**, press **F4** and then press **ENTER** on "Yes". MB80580 computer will boot.

- 21.4. At the “press any key to continue” prompt, press **ENTER** to continue. Check that the firmware updated (CH7511B command) with no errors (Programming...OK). Turn the unit off.
- 21.5. Turn the unit on. Press **DELETE** key to get into the BIOS. You may have to press this key a few times. The BIOS setup screen will show.
- 21.6. Press **RIGHT ARROW** 4 times to “Boot”, press **DOWN ARROW** 4 times to “Boot Option”, press **ENTER**, press **ENTER** on “Boot Option #1”, use **UP** and **DOWN ARROW** to select “Disabled”, press **ENTER**, press **F4** and then press **ENTER** on "Yes". MB80580 computer will boot to EFI.
- 21.7. At the “Shell>” prompt. Type “**fs0:**” (eff, ess, zero, colon with no quotes) and press **ENTER**. Type “**cd bios**” and press **ENTER**. Type “**fpt64 -f E6336B03.bin**” and press **ENTER**. BIOS will update. Check that the BIOS updated with no errors. Turn the unit off. Remove the MB80580 Updater from the USB port.
- 21.8. Turn the unit on. Press **Delete** key to get into the BIOS. You may have to press this key a few times. The BIOS setup screen will show.
- 21.9. Set the date and time to US Eastern time (EDT or EST).
- 21.10. Press the **F3** key for “Optimized Defaults” then press **Enter** for “Yes”.
- 21.11. Set the following BIOS settings:
 - Advanced
 - ❖ Platform Function (press **ENTER**)
 - LVDS Support: **Enabled**
 - LVDS Channel Modes: **640*480**
 - ❖ F81866 SuperIO Configuration
 - Serial Port 2 Configuration
COMB Mode Select: **RS422**
 - Serial Port 3 Configuration
Serial Port: **Disabled**
 - Serial Port 4 Configuration
Serial Port: **Disabled**
 - ❖ SATA Configuration
 - SATA Mode: **AHCI Mode**
 - Serial-ATA Port 1: **Disabled**
 - Chipset
 - ❖ South Bridge
 - Azalia HD Audio
Audio Controller: **Disabled**
 - Restore AC Power Loss: **Power On**
 - Boot
 - ❖ Bootup Numlock State: **Off**
- 21.12. Press the **F4** key to “Save & Exit” then press **Enter** for “Yes”. Computer will reboot. Turn the unit off.

Step 22 Image the Solid State Drive

- 22.1. Insert a test Clonezilla Thumbdrive (60022-0000-01) into unit and try to leave 1 free USB3.0 (blue) slot; note the manufacturer of the Thumbdrive for Step 22.4.

- 22.2. Make sure a test Monitor w/RGB (65003-0000-01), a test 2CP USB Keyboard (65038-0000-01), and a test Power Cord (65029-0000-01) are connected. Turn unit on and keep pressing **DELETE** to enter BIOS setup.
- 22.3. **RIGHT ARROW** 4 times to "Boot". **DOWN ARROW** 5 times to "Hard Drive BBS Priorities". Press **ENTER**.
- 22.4. Press **ENTER** on "Boot Option #1", then use **UP** and **DOWN ARROWS** to select the Clonezilla Thumbdrive. Press **ENTER**.
- 22.5. Press **F4**. Press **ENTER** on "Yes". System will boot to Clonezilla. *YOU HAVE 30 SECONDS TO DO THE NEXT STEP!*
- 22.6. Press **DOWN ARROW** to "Other modes of Clonezilla live". Press **ENTER**
- 22.7. Press **DOWN ARROW** to "Clonezilla live (default settings, VGA 640x480)". Press **ENTER**. Clonezilla (in Linux) will boot. Wait 1 minute for next step.
- 22.8. At the "Choose language" prompt, insert a test CzImages Thumbdrive (60023-0000-01) into unit, preferably into a USB3.0 (blue) slot. Note the manufacturer of the CzImage Thumbdrive for Step 22.11. Press **ENTER** on "en_US.UTF-8 English".
- 22.9. Press **ENTER** on "Keep". Press **ENTER** on "Start_Clonezilla". Press **ENTER** on "device-image".
- 22.10. Press **ENTER** on "local_dev". The CzImages Thumbdrive was already inserted in Step 22.8, so just press **ENTER** at the text prompt to continue.
- 22.11. Make sure the CzImages Thumbdrive is shown at the top. You may be able to tell from the manufacturer text or the size (size is on the right). If it is missing then remove and reinsert the device and wait 5 seconds for device to appear. Press **CTRL-C** to continue.
- 22.12. Use **DOWN ARROW** to select the CzIMAGES device and press **ENTER**.
- 22.13. Use **UP** and **DOWN ARROWS** to select "IMAGES" folder (if necessary) and press **ENTER**. Press **TAB** twice to "Done" and press **ENTER**. Press **ENTER** to continue at text prompt.
- 22.14. **DOWN ARROW** to "Expert" and press **ENTER**. Press **DOWN ARROW** to "restoreparts" and press **ENTER**.
- 22.15. Select the image to restore using **UP** and **DOWN ARROWS**. Press **ENTER**.
- 22.16. Press **SPACE**, **DOWN ARROW**, **SPACE** to place a "*" on both partitions. Press **ENTER**. Press **ENTER** to continue at text prompt.
- 22.17. **DOWN ARROW** to "-t" and press **SPACE** to remove the "*". Press **ENTER**.
- 22.18. **DOWN ARROW** to "-k1" and press **ENTER**.
- 22.19. **DOWN ARROW** to "-scr" and press **ENTER**.
- 22.20. **DOWN ARROW** twice to "-p poweroff" and press **ENTER**. Press **ENTER** to continue at text prompt.
- 22.21. Press **Y** key and **ENTER** to say "yes" to continue question.
- 22.22. Press **Y** key and **ENTER** to say "yes" to the really *really* continue question. The Cloning will take place (takes time).
- 22.23. System will automatically shut down at the end. Remove both the Clonzilla and CzImages Thumbdrives. Turn off the unit.

Step 23 Software Setup

23.1. Windows Setup

- 23.1.1. Plug in a network cable to the unit. Turn the unit back on.

- 23.1.2. Click **Start --- Settings --- System --- Power & Sleep**. Ensure all options are set to **Never**.
- 23.1.3. On the desktop, click **Show Hidden Icons** button (arrow pointing up on taskbar). Click **PM (PenMount) --- Beep --- Device 0** (ensure it is unchecked). Click **PM --- Control Panel --- PenMount 6000 USB --- Configure --- Standard Calibration**. Touch screen as indicated. Click **OK --- OK**.
- 23.1.4. In the search box on the taskbar, type **about** and select "About your PC".
- 23.1.5. Write down the **Windows Version** on the QA Record (11905-0005-01).
- 23.1.6. Select **Change product key or upgrade your edition of Windows --- Change product key**. Enter the 25 digit key from the Windows 10 Pro, Entry, Embedded License (10361-0009-01) and hit **Next**.
- 23.1.7. Affix the Windows key code label onto the back of the Cover as shown in Figure 67.

23.2. Install S2 Software

- 23.2.1. Double click "**My PC**" from Desktop. Type **ftp.unetixs.com** into address field and press "**Enter**". Double click "**pub**" folder.

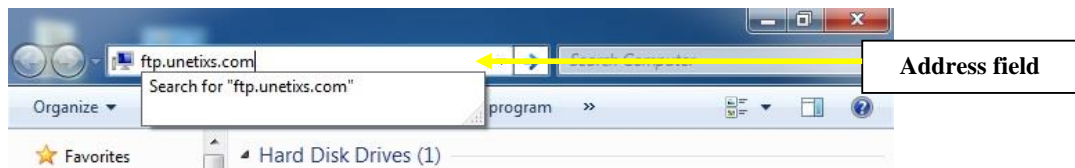


Figure 63

- 23.2.2. Double click "**multilab**" folder (near the bottom of the window). Check with DMR 11399-00xx-0x to verify that the software revision levels on the FTP site match the current DMR documents. Write down the software revision levels onto the QA Record (11905-0005-01).
- 23.2.3. Highlight four (4) 11399-xxxx-xx files (**11399-0000-01, 11399-0001-01, 11399-0002-01** and **11399-0004-01**) and **right click** on the highlighted area. Click "**Copy to Folder**". Select "**Desktop**" folder and click "**Ok**". The copy process may take more than 4 minutes to complete.
- 23.2.4. Double click "**11399-0001-01 Rev....exe**". Click "**Yes**", then "**Continue**" 3 times and then click "**OK**". Unetixs DICOM icon will show on Desktop.
- 23.2.5. Double click "**11399-0000-01 Rev....exe**". Click "**Yes**" once and "**Continue**" 3 times. Then click **OK --- Setup --- Install**. When the install is complete, close the explorer window and then click "**OK**".
- 23.2.6. Double click "**11399-0002-01 Rev....exe**". Click "**Yes**". Click "**Continue**" 2 times. Uncheck "**Videos for LHS**" and then click "**Next**" --- "**OK**".
- 23.2.7. Double click "**11399-0004-01 Rev....exe**". Click "**Yes**". Click "**Continue**" 3 times and then click "**OK**".
- 23.2.8. Drag the 4 installers to the Recycle Bin.
- 23.2.9. **Right click** S2WIN on desktop. Click **Copy**. In the search box on the taskbar, type **run** and hit **enter**. In the window that appears type **shell:startup** and

click **OK**. Paste the copied icon into the window that appears. Close the window.

23.3. S2WIN Setup

- 23.3.1. From the Windows Desktop, drag and drop any icon (other than S2WIN) to S2WIN icon using the mouse. This will open up a System Data window.
- 23.3.2. Click **Next** to go through the System Data and make the following changes if necessary:
 - Start Menu: 4
 - Touch Type: 3
 - DIO Type: 2
 - Vascular Port: 2
 - IR Remote Enabled: 1
 - IR Remote Port: 1
 - Auto Cuff Select: 0
 - Vascular Module: 3
 - Exp. Control 2: C:\programs\unetpdf
 - Export Path 2: C:\Users\MultiLab\Desktop\PDF\
 - Export Code 2: 192
 - Export Name: PDF File
- 23.3.3. Click **Exit** to go back to Windows Desktop (press more than once if necessary).
- 23.3.4. Double click **Computer** --- **Local Disk (C:)** --- **programs** --- **VascFilter**. When the program is finished running, press any key to exit.
- 23.3.5. Right click on the Desktop and select **New** --- **Folder**. Name the folder PDF.

23.4. Install FinTek Driver

- 23.4.1. Double click "**My PC**" --- "**Local Disk (C:)**" --- "**programs**" --- "**FitSDK Install**".
- 23.4.2. Right click on the **install** application and select **run as administrator**. Click **Yes**. A window will open briefly and then close to indicate the process is done.
- 23.4.3. **Restart** the computer. The Unetixs Diagnostic software Main Menu will appear. Click **Setup** --- **Yes** --- **Diagnostics** --- **Reindex Archive** --- "**Full & Compress**". Click **Exit** 4 times to Main Menu.
- 23.4.4. Click **Setup** --- **Yes** --- **Configure Studies**. Press **Alt + Enter** on the keyboard to exit full screen mode.
- 23.4.5. Right click on the logo in the upper left corner, then click **properties**. See Figure 64 for reference.

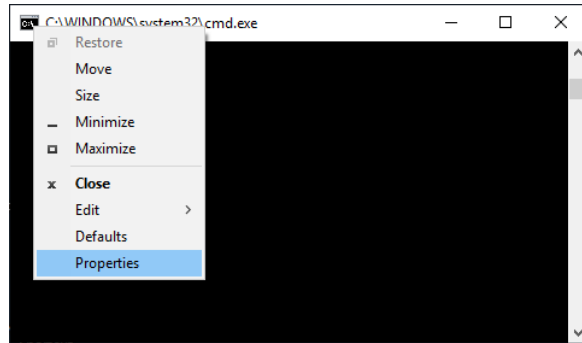


Figure 64

- 23.4.6. Open the options tab. Under the “Edit Options” and “Text Selection” sections, make sure all the boxes are NOT checked. Check the box next to **Use Legacy Console**. Hit **Enter** and then press **ESC** key until you reach the Main Menu.
- 23.4.7. Click **Setup --- Yes --- Configure Studies**. Press **Alt + Enter** on the keyboard to exit full screen mode. Right click on the logo in the upper left corner. Uncheck **Use Legacy Console**, hit **Enter**, and then press **ESC** until you reach the desktop.

23.5. Windows Updates

- 23.5.1. Select **Start --- Settings --- Update & Security --- Windows Update --- Check for updates**. Perform any updates necessary.
- 23.5.2. **Right Click** the “Recycle Bin” on the desktop. Click “**Empty Recycle Bin**” if necessary.
- 23.5.3. **Shutdown** the computer. Wait for black screen then turn off the unit.

Step 24 Test the assembly per 11905-0006-01

Step 25 Labels

- 25.1. Apply the Explosion Warning Label (40002-2040-02) to the side of the Chassis with the USB as shown in Figure 65.

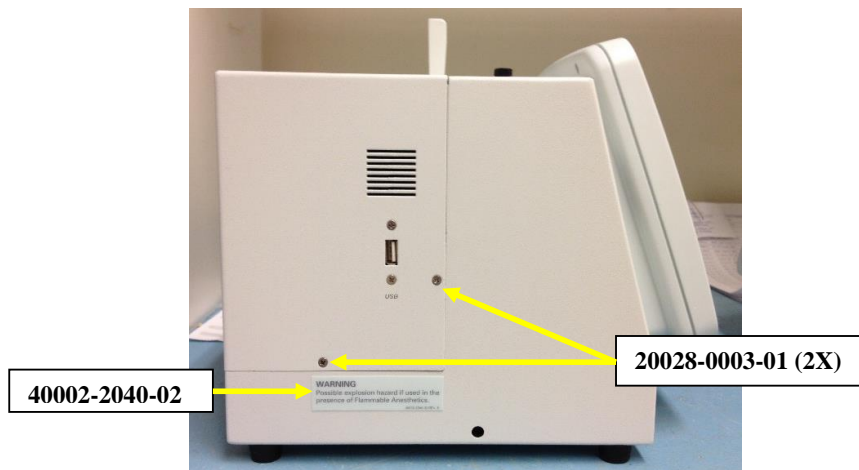


Figure 65

- 25.2. Apply the Physician Caution Label (40002-2040-04) to the other side of the Chassis as shown in Figure 66.

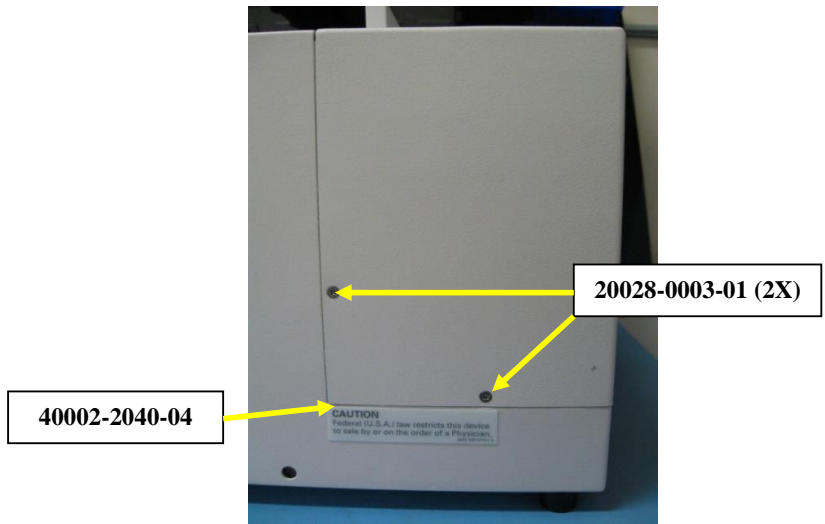


Figure 66

- 25.3. Apply the Fire Warning Label (40002-2040-03) to the Cover above the Power Entry Module (see Figure 67).
- 25.4. Apply the Caution Label (40002-2040-01) to the Cover, centered between the two screws (see Figure 67).

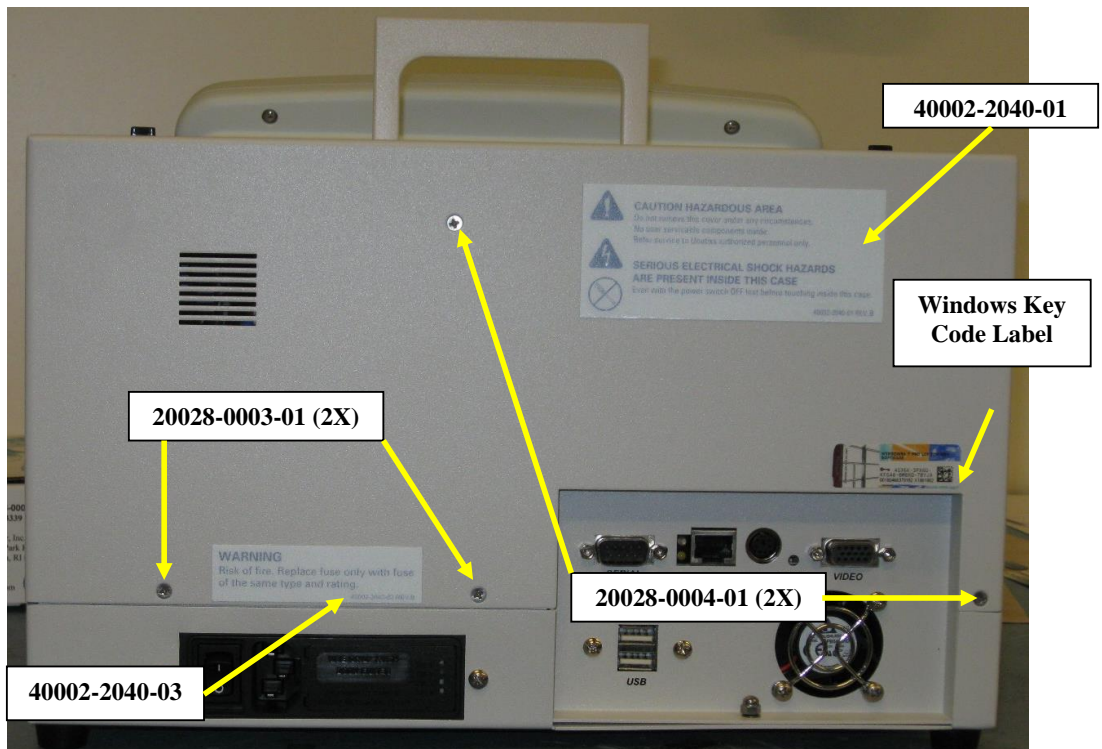


Figure 67

- 25.5. Attach the Cover to the Chassis with nine (9) 4-40x3/16" Flat Head Screws (20028-0003-01) as shown in Figure 65, Figure 66, Figure 67 and Figure 68.
- 25.6. Attach the Cover to the Chassis with two (2) 4-40x1/4" Flat Head Screws (20028-0004-01) as shown in Figure 67.

Unetixs Vascular, Inc.
Ass'y Chassis, S2 CP w/Remote & USB (SBR)
Assembly Procedure *11905-0003-01 Rev R*



Figure 68 Finished Assembly

*Unetixs Vascular, Inc.**Ass'y Chassis, Basic S2 CP w/Remote & USB (SBR)**Test / Calibration Procedure**11905-0006-01 Rev I***Step 1 Test Equipment Checklist**

Check which motherboard is used in chassis. If it is not 11919-0000-01, stop and use 11905-0006-01 Rev G.

Gather all the test equipment needed and copy down their control numbers. Check the calibration or maintenance date to confirm that all equipment is good to use. Have a bottle of ultrasonic gel (10628-0001-01) ready for use.

Test Equipment Name	Control # / Serial #	Due Date
Headphone Jack Test Device P/N: 65033-0000-01		N/A
2CP USB Keyboard (65038-0000-01)		N/A
MB80580 Updater (USB flash drive) P/N: 60024-0000-01		N/A
MCM or equivalent Unetixs P/N: 11972-0000-01		N/A
Digital Manometer		
Digital Multimeter		
Manometer with Accessories P/N: 60005-0000-01		N/A
Scope Meter		
Remote Control P/N: 10377-0000-01		N/A
TruDop 8 Probe P/N: 11963-0000-01		N/A
Doppler Cable P/N: 11930-0000-01		N/A
PPG Ass'y P/N: 11938/11978-0000-01		N/A
CP105 Temp Gun Ass'y P/N: 11951-0000-01		N/A

Unetixs Vascular, Inc.
Ass'y Chassis, Basic S2 CP w/Remote & USB (SBR)
Test / Calibration Procedure *11905-0006-01 Rev I*

Step 2 Grounding Test

- 2.1. Touch the ground lead of the digital multimeter to the ground lead of the power entry module and then touch the positive lead to the following positions and check if the resistance is less than 1 ohm:

Testing Point	Resistance Ω
Ring Terminal – Back Panel Screw	
Power Supply Screw – Power Cable Gnd	
Power Supply Screw – Power Entry Gnd	
Power Entry Supply Screw	
Lemos Connector Chassis Metal – PPG/Dop	
Lemos Connector Chassis Metal – Pnuemo/CTRL	

Step 2 tested by: _____

Step 3 Setup

- 3.1. Connect the 2CP USB Keyboard (65038-0000-01) to a USB port on the back of the unit. Connect Power Cord (65029-0000-01) to the unit.
- 3.2. Turn the unit on. Verify the Main Menu of Unetixs software will show.
- 3.3. Connect a monitor w/RGB (65003-0000-01) to the RGB port on the back of the unit. Verify the connected monitor matches the LCD display. Disconnect the monitor.


Step 3 tested by: _____

Step 4 Test the Touch screen

- 4.1. Click “**Exit**” to go to Windows Desktop.
- 4.2. Verify that touch screen is functional by touching all four corners of the screen. The cursor should follow your finger.
- 4.3. Verify that the “Start” menu and other icons on the bottom of screen can be selected.

Step 4 tested by: _____

Step 5 USB Port Test & Lookup Archive

- 5.1. Double click “**Computer**” on the Desktop.
- 5.2. Insert the MB80580 Updater flash drive (60024-0000-01) into a USB port on the unit. Double click the flash drive icon.
- 5.3. Verify that the “**How to BIOS and Firmware**” file exists on the flash drive.
- 5.4. Click the “” key on the address field to go back to “Computer”. Right click flash drive icon. Then click “**Eject**”. A message will pop up on the taskbar showing the removable device can be safely removed. Unplug it from the USB port.
- 5.5. Repeat Steps 5.2 ~ 5.4 on another USB port until all 4 USB ports are tested successfully (port on left side, 2 ports on CPU card, and port next to fan).
- 5.6. Close the window. Double click “**S2WIN**” from the desktop

Unetixs Vascular, Inc.
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Test / Calibration Procedure *11905-0006-01 Rev I*

- 5.7. Click “**Lookup**”. Verify that the patient study history window appears and the log is empty with no errors. Click “**Exit**” to go to the Main Menu.

Step 5 tested by: _____

Step 6 Blood Pressure Calibration

- 6.1. Double click on the **S2WIN** icon on the desktop. The S2 Vascular Software Main Menu will display. Confirm that **Vascular: OK** shows on the screen.
- 6.2. From the Main Menu, click **Studies --- Lower Arterial Studies --- LA Segmental Pressures with PVR --- Exit**. Then click **Right Brachial Pressure Study --- Back**.
- 6.3. Connect the Manometer with Accessories (60005-0000-01) and the Digital Manometer to the Right Pneumo port on the unit. Click **Inflate**. Pump the manometer to a value between 270-250 mmHg and ensure that the value on manometer matches what is displayed on the screen within a 1 mmHg. Repeat process for a value between 170-150 and 70-50.

Pressure Range	Manometer Reading	Screen Reading
RT 70-50 mmHg		
RT 150-170 mmHg		
RT 250-270 mmHg		

- 6.4. Repeat step 6.3 for the Left Pneumo port.

Pressure Range	Manometer Reading	Screen Reading
LT 70-50 mmHg		
LT150-170 mmHg		
LT 250-270 mmHg		

- 6.5. If the values are within the acceptable range for both the left and right, skip to Step 7. If not, recalibrate blood pressure via steps 6.6 – 6.12.
- 6.6. From the main menu. Click **Setup --- Yes --- Diagnostics --- Calibrate --- Blood Pressure**. Click **Ok** on the warning screen and then click **Yes**.
- 6.7. Connect digital manometer and manometer with accessories to right pneumo port. With hand pump valve open, press **R 0mm** on screen.
- 6.8. Close the hand pump valve and start to pump it manually until the Digital Manometer reading reaches 302~310mmHg. Manually release the hand pump valve slowly until the Digital Manometer reads 300+0.10 mmHg (between 300.0 and 300.1). Press **R 300mm** on screen.
- 6.9. Verify that at least 3 other manometer readings on the screen match the Digital manometer readings as in step 6.3 above. Record in table below.
- 6.10. Connect digital manometer and manometer with accessories to left pneumo port. With hand pump valve open, press **L 0mm** on screen.

Unetixs Vascular, Inc.

Ass’y Chassis, Basic S2 CP w/Remote & USB (SBR)

Test / Calibration Procedure

11905-0006-01 Rev I

- 6.11. Close the hand pump valve and start to pump it manually until the Digital Manometer reading reaches 302~310mmHg. Manually release the hand pump valve slowly until the Digital Manometer reads 300+0.10 mmHg (between 300.0 and 300.1). Press **L 300mm** on screen.
- 6.12. Verify that at least 3 other manometer readings on the screen match the Digital manometer readings as in step 6.3 above. Record in table below. Click **Save**. Exit back to the main menu.

Pressure Range	Manometer Reading	Screen Reading
RT 70-50 mmHg		
RT 150-170 mmHg		
RT 250-270 mmHg		
LT 70-50 mmHg		
LT 150-170 mmHg		
LT 250-270 mmHg		

Step 6 tested by: _____

Step 7 Doppler

7.1. Set Baseline

- 7.1.1. From the Main Menu, click **Setup --- Yes --- Diagnostics --- Calibrate --- Zero Dop Baseline**.
- 7.1.2. Set the following parameters if necessary: **Side** button to **Forward**, **Filter** to **3.5 Hz** and **Gain** to **24 Hz/mm**.
- 7.1.3. Click **Forward Clear** button; wait until the waveform has fully crossed the screen and then click **Forward Set** button.
- 7.1.4. Click **Side** button to change the side to **Reverse**.
- 7.1.5. Click **Reverse Clear** button; wait until the waveform has fully crossed the screen and then click **Reverse Set** button.
- 7.1.6. Change the **Gain** to **256 Hz/mm** and repeat step 7.1.3 through 7.1.5. When finished, exit back to main menu.

7.2. Doppler Sensitivity

- 7.2.1. From the Main Menu screen, click **Studies --- Lower Arterial Studies --- LA Segmental Pressures with Doppler --- Exit --- Right Common Femoral Doppler --- "BACK"**. Click "Gain ↑" to 16. Set **Filter** to 7 Hz. Verify that the line is solid Yellow at 10mm.
- 7.2.2. Connect a TruDop 8 Doppler Probe (11963-0000-01) with a Doppler Cable (11930-0000-01) to the front of the unit. Turn the gain all the way up and set filter to off.
- 7.2.3. Turn trimpots **P4** and **P5** CW all the way up.

Unetixs Vascular, Inc.
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- 7.2.4. Adjust **P4** and **P5** to get a waveform as shown in **Figure 1**. Ticks above and below baseline must be evenly balanced.

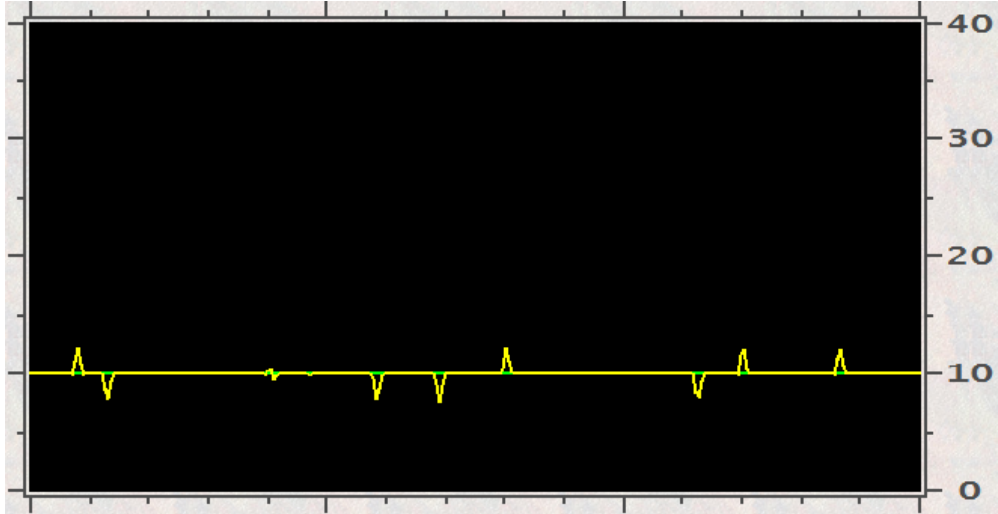


Figure 1 – Ideal Doppler Sensitivity

- 7.2.5. Set **Gain** to 6, **Filter** to 7 Hz and turn the volume up. Perform a self-test. Check for clear waveforms. Verify that the Doppler can be heard in both speakers: **Right for up/forward flow** and **Left for down/reverse flow**.
- 7.2.6. Plug a Headphone Jack Test Device (65033-0000-01). Repeat Step 7.2.5 and verify that the internal speaker is mute and the left and right sound comes from the Headphone Jack Test Device. Click “**Exit**” button to Main Menu.

Step 7 tested by: _____

Step 8 PPG

- 8.1. From Main Menu, click **Studies --- Lower Arterial Studies --- LA PPG Toe & Toe Pressures --- Exit --- Right Great Toe PPG Waveform --- Back**. Click “**GAIN UP**” to 16.
- 8.2. Adjust **P1 for left** and **P2 for right** to center baselines at 20 on screen.
- 8.3. **Verify Correct PPG Sides** – Plug the test PPG Ass’y (11938/11978-0000-01) into Left PPG port on the front of the unit. Verify that a clear waveform shows on the Left side.
- 8.4. Plug the test PPG Ass’y (11938/11978-0000-01) into Right PPG port on the front of the unit. Verify that a clear waveform shows on the Right side.
- 8.5. **Verify PPG VRT** – From the main menu, click **Studies --- Lower Venous Studies --- VRT Venous Refill Time --- Exit --- Right Venous Refill --- Back**. Turn **Gain** to 16. With the PPG on your finger and click **RESET** button. Verify that the waveform is present.
- 8.6. Unplug the test PPG probe from right side and plug it on to the left side. Click **NEXT** and repeat the test on the left side. Exit back to **Main Menu**.

Step 8 tested by: _____

Unetixs Vascular, Inc.
Ass'y Chassis, Basic S2 CP w/Remote & USB (SBR)
Test / Calibration Procedure *11905-0006-01 Rev I*

Step 9 Remote & Series 2 Electronic Manifold (MCM)

- 9.1. Click “**Setup**” --- “**Yes**” --- “**Diagnostics**” --- “**Keypad**”.
- 9.2. Press Gain ↑, Gain ↓, Base ↑, Base ↓ buttons on the Remote Control (10377-0000-01) keypad. Verify that each corresponding button on the touch screen lights up.
- 9.3. Connect the MCM (11972-0000-01) Control cable with 6-pin LEMO to the Ctrl port on the front.
- 9.4. Press every button on the MCM keypad, verifying that each corresponding button on the screen lights up. Leave MCM connected to the unit.
- 9.5. Click “**Exit**” 3 times to the Unetixs Main Menu.

Step 9 tested by: _____

Step 10 Pneumo Tests

- 10.1. Attach Right and Left Hoses from MCM (11972-0000-01) to R and L pneumo fittings on SBR front panel. Click on **Studies** --- **Lower Arterial Studies** --- **LA Segmental Pressures with PVR** --- **Exit** --- **Right Metatarsal PVR waveform** --- **BACK**.
- 10.2. **Set Baselines** – Set all valves to on position. With the gain at .188mmHg/20mm and 0mmHg of pressure, center PVR baselines to 20. Adjust **P9 for right** and **P10 for left**.
- 10.3. **Check for Leaks** – Set all valves to off position. Click **Inflate**. Verify that the baselines remain between 15 and 20 on screen with mmHg between 60-99.
- 10.4. **Verify Hose Orientation (left/right, up/down)**. Click **Side** button so the screen now reads **Right**. Squeeze the right hose a few times to verify that the right-side waveform moves accordingly (Up when pinched and Down when released). Select **deflate**. Right side mmHg number should drop 1 or 2 mmHg.
- 10.5. Click **Side** button so the screen now reads **Left**. Repeat step 10.4 on the left.
- 10.6. Click **Exit** --- **Right Brachial Pressure** --- **Back**. Close all valves on cuff selector. Select **Inflate**. Select **Inflate** again and hold briefly. Unit should now be at 290 mmHg (± 30 mmHg).
- 10.7. Click **Deflate** once, the unit will slowly deflate **1 or 2 mm at a time**. Pressing and holding **Deflate** should **quickly deflate** the system.
- 10.8. Repeat steps 10.6 to 10.7 at **Left Brachial Pressure** by clicking **Next**. Exit to Main Menu.

Step 10 tested by: _____

Step 11 Temperature Gun and clear Temp. Files.

- 11.1. Connect Temp Gun Ass’y (11951-0000-01) to Temp port on the side.
- 11.2. Click **Studies** --- **User Defined Studies** --- **UA Cold Tolerance Thermometry** --- **Exit** --- **BASELINE, Right Thumb** --- **Back**. Do 5 readings. Verify the reading on the Temp Gun is within 1 degree of the temperature reading on the screen.
- 11.3. Disconnect the Temp Gun Ass’y. Press “**ESC**” key 2 times to main menu.

Unetixs Vascular, Inc.

Ass’y Chassis, Basic S2 CP w/Remote & USB (SBR)

Test / Calibration Procedure

11905-0006-01 Rev I

11.4. Click “Temp. Files”. Click “Delete” --- “Yes” for any studies present. Click “Exit” --
- “Exit” to the windows desktop/

Step 11 tested by: _____

Step 12 Windows Updates and Network

- 12.1. Connect a network cable to either network jack on the back of the unit. Open internet explorer (blue ‘e’) and verify web page displays.
- 12.2. Move the network cable to the other network jack on the back of the unit. Open internet explorer and verify web page displays.
- 12.3. Click “Start” (located on lower left of the screen) --- **Settings --- Updates & Security**. Select and install any important updates or click “X” to close the window if no updates are available.
- 12.4. Click “Start” --- “Shut Down” wait for black screen and turn off the unit. Disconnect all the cables and hoses from the unit if necessary.

Step 12 tested by: _____

End of Test/Calibration

Pass/Fail _____

Test/Calibration Performed By: _____ Date: _____

*Unetixs Vascular, Inc.
Ass'y, Infrared Remote PCB (IRB)*

Assembly Procedure

11912-0003-01 Rev D

Step 1: Through Hole Assembly

Assemble and solder components onto the Board (30001-0017-01 rev A).

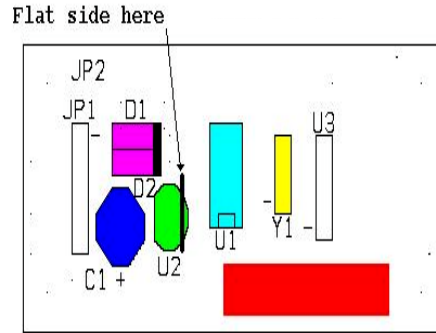


Figure 1

Unetixs Part	Description	Qty	Reference Designators
20007-0000-01	Label, Serial Number	1	
10053-0106-01	Cap. 10uF 16V Electrolytic	1	C1
10612-0914-01	Diode, 1N914	2	D1, 2
10512-0008-01	Socket DIP 8 Pin	1	U1A
10228-0005-01	VREG, 5V LDO (Note: Incorrect silkscreen)	1	U2
10642-4000-01	Resonator 4.00 MHz	1	Y1

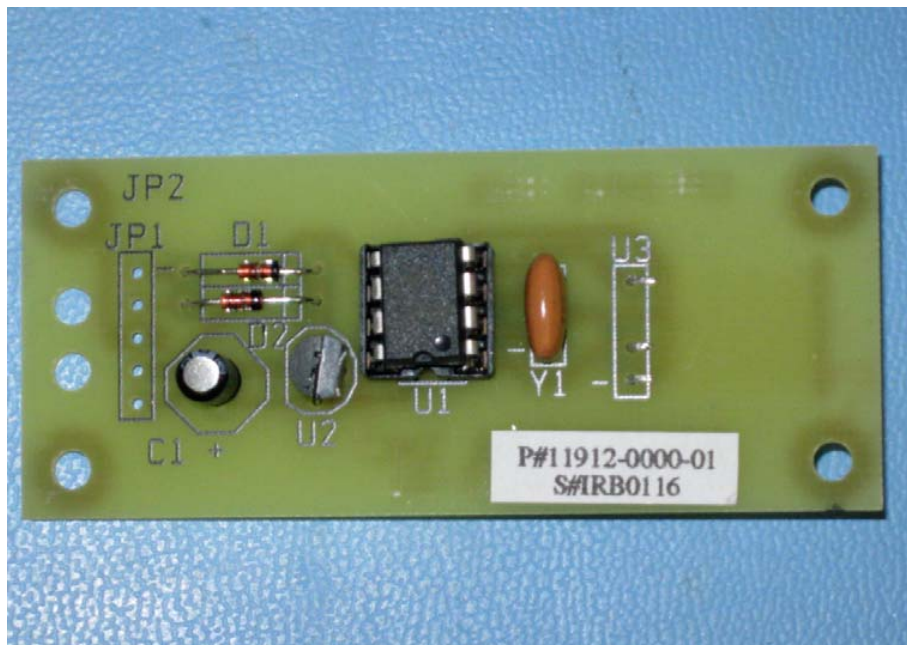


Figure 2

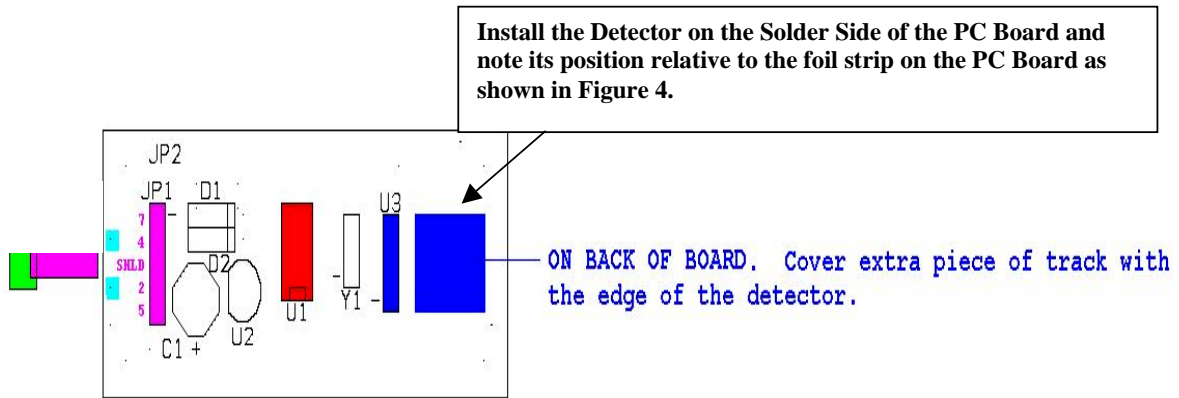


Figure 3

Unetixs Part	Description	Qty	Reference Designators
10145-0000-01	IC, PIC12F509	1	U1, programmed
Note: Program U1 per SOP-30-004 section 7.0 or equivalent. Place the socket U1A in the board first, and then add the IC.			
10405-0000-01	IR Detector Module	1	U3

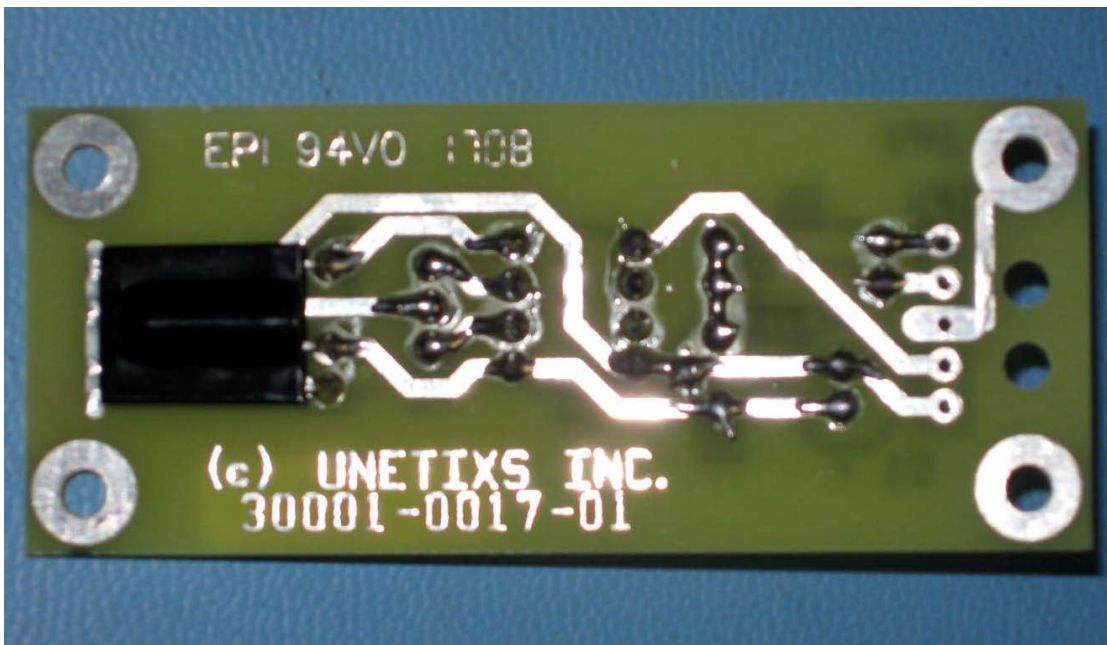


Figure 4

Serial No: _____

Unetixs Vascular, Inc.

PCB Ass'y, S2 SMT Motherboard (SSB)

Test / Calibration Procedure

11919-0006-01 Rev B

1. Test Equipment Checklist

Gather all the test equipment needed and copy down their control numbers. Check the calibration or maintenance date to confirm that all equipment is good to use, record date below. Have a bottle of ultrasonic gel (10628-0001-01) ready for use.

Test Equipment Name	Control # / Serial #	Due Date
S2 Motherboard Test Fixture P/N: 60001-0000-01		N/A
Test Computer P/N: 60007-0000-01		N/A
Digital Voltage Meter		
Oscilloscope		
Digital Manometer		
Manometer with Accessories P/N: 60005-0000-01		N/A
TruDop 8 Probe P/N: 11963-0000-01		N/A
Doppler Cable P/N: 11930-0000-01		N/A

2. Install Poly Caps

2.1. If C96-99 are not installed with through hole Cap. 1uf poly (10050-0105-02), install them per SOP-30-030 and record lot numbers. If caps are already installed, enter N/A for lot number.

Lot Number: _____

Step 2 performed by: _____

3. Setup

- 3.1. Place the S2 SMT Motherboard (referred as **SSB** in the following context) on the S2 Motherboard Test Fixture (referred as **Test Fixture** in the following context).
- 3.2. Plug the **Power Supply** connector (w/ 2pin-to-4pin adapter) into **JP14**. Connect provided Alligator Clip from **U16 Gnd** to the Ground socket on the right side of the Test Fixture. Set the Digital Voltage Meter (referred as **DVM** in the following context) to

Serial No: _____

Unetixs Vascular, Inc.

PCB Ass'y, S2 SMT Motherboard (SSB)

Test / Calibration Procedure

11919-0006-01 Rev B

read **DC Volts**. Attach the **DVM ground** lead (black) to another Ground socket on the left side of the Test Fixture.

3.3. Turn on the **AC Power** of the Test Fixture.

3.4. Check the following voltages (tolerances $\pm 10\%$). Write down the values.

Voltage	Nominal value	Accepting Range (volt)	Measurement (volt)
TJ6 (Analog 5V)	+5V	4.5 ~ 5.5	
TJ4 (VCC)	+5V	4.5 ~ 5.5	
TJ5 (+12V)	+12V	10.8 ~ 13.2	
TJ11 (+2.5V)	+2.5V	2.25 ~ 2.75	
TJ7 (+15V)	+15V	13.5 ~ 16.5	
TJ10 (-15V)	-15V	-16.5 ~ -13.5	
TJ8 (+8V PPG)	+8V	7.2 ~ 8.8	
TJ9 (-8V PPG)	-8V	-8.8 ~ -7.2	

3.5. Download Software:

3.5.1. Turn the **Test Fixture** power OFF.

3.5.2. Add the provided ISP jumper to **JP18** (shunt ISP on the SSB).

3.5.3. Connect the **USB Download Cable** from the Test Computer to **JP2** (USB).

3.5.4. Turn the Test Fixture power back **ON**.

3.5.5. On the Test Computer desktop, drag the hex file (**11919-0008-01**) to the ISP Programmer software (**SPECPGMR.bat**). Then download of hex file starts and runs automatically.

3.5.6. After a few seconds the program should read "Passed 9". Press any key to continue. The process will continue and then the window will close when finished.

3.5.7. Turn the Test Fixture power **OFF**.

3.5.8. Remove the ISP jumper from shunt ISP on the SSB. Disconnect the USB Download Cable from the SSB.

3.5.9. Turn the Test Fixture power back **ON**. Verify that LED **D10** is flashing.

3.5.10. Record the version of the hex file.

11919-0008-01 Rev _____

- 3.6. On the Test Computer, ensure that the LHS RJ45 cable is connected to the RS232 to RS422 converter. Ensure the DB25 cable adapter is connected the Module end of the PSC cable. Connect the DB9 end of the DB25 adapter to **JP7**. Connect the **Doppler Cable** on the Test Fixture to **JP15** (pin 1-4 leaving pin 5 & 6 open).
- 3.7. Start up the Test Computer so that it displays the Desktop. Click the **S2WIN-S** shortcut from the Desktop. Vascular OK will show on Main Menu.
- 3.8. Connect the oscilloscope to the **Function Generator** BNC jack on the right side of Test Fixture using the provided **BNC cable**. Set the toggle switches on the test fixture to **Test** mode. A steady square waveform will appear on the screen. Measure the clock frequency and copy it down.

Quantity	Nominal Value	Accepting Range	Frequency (kHz)
3.840kHz Square Wave	3.840 kHz	3.821 ~3.859 kHz	

Step 2 tested by: _____

4. Doppler

4.1. Set Baseline

- 4.1.1. Disconnect **JP15** from the Motherboard. Turn **P11** & **P12** all the way clockwise.
- 4.1.2. Set the toggle switches on the test fixture to **Probe**. From the Main Menu, click **Setup --- Yes --- Diagnostics --- Calibrate --- Zero Dop Baseline**.
- 4.1.3. Set the following parameter if necessary: **Side** button to **Forward**, **Filter** button to **3.5Hz** and Gain to **24 Hz/mm**.
- 4.1.4. Click **Forward Clear** button; wait until the waveform has fully crossed the screen and then click **Forward Set** button.
- 4.1.5. Select **Reverse** side. Click **Reverse Clear** button; wait until the waveform has fully crossed the screen and then click **Reverse Set** button.
- 4.1.6. Change the Gain to **256 Hz/mm** and repeat steps 4.1.4 and 4.1.5.

4.2. Doppler Frequency

- 4.2.1. Reconnect Doppler cable to **JP15**. Turn trimpots **P4** and **P5** all the way clockwise. Click **Exit** once and then click **Doppler Frequency**.
- 4.2.2. Set the toggle switches on the test fixture to **Test** & **R84**. Set the gain to **96 Hz/mm**. Set the **Side** to **R84 SUP**. Adjust **P11** until the Calibration Value is steady at **64**. The waveform should locate below the baseline.
- 4.2.3. Set the toggle switches to **Test** & **R43**. Set **Side** to **R43 SDW**. Adjust **P12** until the value is steady at **64**. The waveform should locate above the baseline.
- 4.2.4. Repeat Step 4.2.2 ~ 4.2.3 for a couple of times until Calibration Values are steady at **64**. Exit to Main Menu.

4.3. Doppler Sensitivity

- 4.3.1. Connect the Doppler Cable (11930-0000-01) to the **Doppler** Lemos connector on the Test Fixture. Connect the TruDop 8 (11963-0000-01) to the Doppler cable.
- 4.3.2. From the Main Menu, select **Studies --- Lower Arterial Studies --- Lower Segmental Pressure w/ Doppler --- Exit --- Right Common Femoral Doppler --- Back**. Set Gain to **24 Hz/mm**, Filter to **7 Hz**.
- 4.3.3. Adjust **P4** and **P5** to get a waveform as shown in **Figure 1**. Ticks above and below baseline must be evenly balanced.

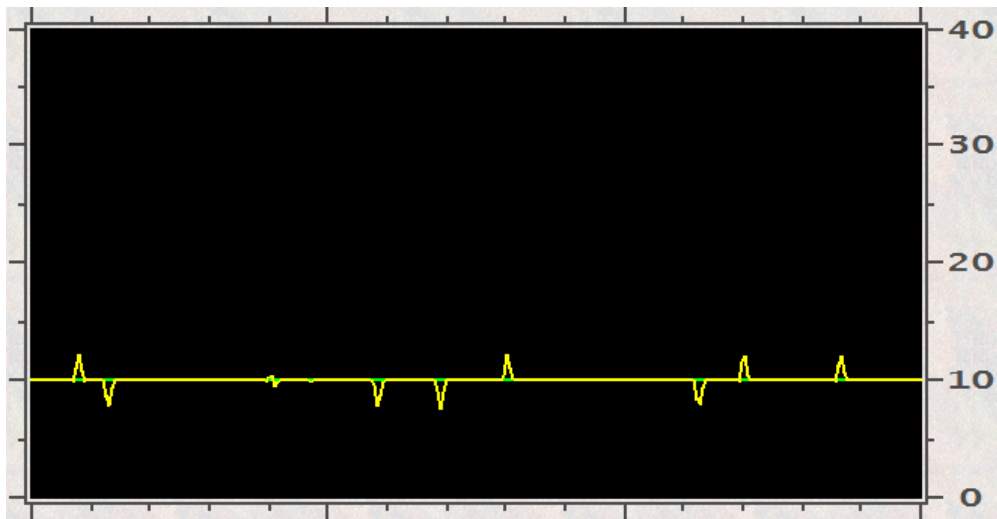


Figure 1 – Ideal Doppler Sensitivity

- 4.3.4. Connect **Right Speaker** cable (red & black) to **JP12**. Connect the 5-pin connector that is with the speaker cables to **JP8**. Perform a self-test. Check for clear waveforms (Up/Forward flow with small Down/Reverse flow). Verify that the doppler can be heard clearly in the right speaker. Disconnect right speaker.
- 4.3.5. Connect **Left Speaker** cable (blue & white) to **JP13**. Perform a self-test. Check for clear waveforms (Down/Reverse flow with small Up/Forward flow). Verify that the doppler can be heard clearly in the left speaker. Disconnect left speaker. Disconnect the **TruDop8** Probe from the Doppler Cable. Exit to the Main Menu.

Step 4 tested by: _____

5. Valve and Pump Test

- 5.1. Connect the Test LED's:

Yellow	JP3
White	JP4
Green	JP5
Blue	JP6

- 5.2. From Main Menu, select **Studies --- Lower Arterial Studies --- LA Segmental Pressure w/PVR --- Exit --- Right Great Toe Pressure --- Back**.
- 5.3. Select the **Left Side** and press the **Inflate** key. Verify **Left Pump LED** and **Left Valve LED** are turned **on**. Press **Inflate** again and verify the **Left Pump LED** is turned **off**. Press and hold the **Deflate** key and verify the **Left Valve** is turned **off**.
- 5.4. Switch to the **Right Side** and press **Inflate**. Verify **Right Pump LED** and **Right Valve LED** are turned **on**. Press **Inflate** again and verify the **Right Pump LED** is turned **off**. Press and hold the **Deflate** key and verify the **Right Valve** is turned **off**.
- 5.5. Switch to **Both** sides and then **Inflate**. Verify all 4 LED's are **on**. Press the **Capture** key and verify **all** the LED's are turned **off**.
- 5.6. Exit to the Main Menu.

Step 5 tested by: _____

6. PVR Calibration and Baseline Adjustment

- 6.1. With DVM Red lead on **TJ1 pin 1 (square)**, adjust **P13** to so DVM reads $1V \pm 2mV$ (0.098-1.002). Connect the Digital manometer to the manometer with accessories and connect open end to **S4 or S5**. Turn Digital Manometer **ON**. Make sure the Digital Manometer is zeroed per the manufacturer's instructions. Inflate to **100.00-100.01 mmHg**. Adjust **P7** so DVM reads $3.978V \pm 5mV$ (3.973 – 3.983). Release pressure. Re-adjust **P13** to $1V \pm 2mV$ (0.098-1.002). Repeat **P13** & **P7** adjustments for several times until the DVM readings are stable. Record the final voltages in the chart below.

Quantity	Nominal Value (volt)	Accepting Range (volt)	Voltage (volt)
TJ1 pin 1 (Square) @ 0mmHg (P13)	1.000	0.998 ~ 1.002	
TJ1 pin 1 (Square) @ 100mmHg (P7)	3.978	3.973 ~ 3.983	
TJ3 pin 1 (Square) @ 0mmHg (P6)	4.50	4.49 ~ 4.51	
TJ3 pin 1 (Square) @ 50mmHg	2.68	2.48 ~ 2.88	

- 6.2. Release the pressure. Attach DVM Red lead on **TJ3 pin 1 (square)**. Adjust **P6** to obtain a reading of $4.50V \pm 10mV$ (4.49 – 4.51). Inflate to **50mmHg**. Verify that the reading is within **200mV of 2.68 volts (2.48 – 2.88)**. Copy down these two voltages in the chart above.

Serial No: _____

Unetixs Vascular, Inc.

PCB Ass'y, S2 SMT Motherboard (SSB)

Test / Calibration Procedure

11919-0006-01 Rev B

6.3. Repeat Steps 6.1 through 6.2 with the open end of the manometer set connecting to **S3** or **S6** using potentiometers and test points in the following table. Record your measurements as required in the chart below.

Quantity	Nominal Value (volt)	Accepting Range (volt)	Voltage (volt)
TJ1 pin 2 (Circle) @ 0mmHg (P14)	1.000	0.998 ~ 1.002	
TJ1 pin 2 (Circle) @ 100mmHg (P8)	3.978	3.973 ~ 3.983	
TJ3 pin 2 (Circle) @ 0mmHg (P3)	4.50	4.49 ~ 4.51	
TJ3 pin 2 (Circle) @ 50mmHg	2.68	2.48 ~ 2.88	

- 6.4. Disconnect the digital manometer and manometer with accessories from the board.
- 6.5. From the Main Menu, select **Studies --- Lower Arterial Studies --- LA Segmental Pressure w/PVR --- Exit --- Right Metatarsal PVR waveform --- Back**.
- 6.6. Set the gain to **0.188mmHg/20mm** and adjust **P10** so that the left baseline is on the center (20).
- 6.7. Repeat Step 6.6 for right side at **P9**.
- 6.8. Exit to the Main Menu.

Step 6 tested by: _____

7. Calibrate Blood Pressure

- 7.1. Select **Setup --- Yes --- Diagnostics --- Calibrate --- Blood Pressure**.
- 7.2. Connect the digital manometer and manometer with accessories to **S1**. Leave the hand pump valve open, press **R 0mm**.
- 7.3. Close the hand pump valve and pump it manually until the manometer reads 302 ~ 305 mmHG. Manually release the hand pump valve carefully so that digital manometer reads 300.00-300.10 mmHg. When the pressure reaches the target press **R 300mm**.
- 7.4. Manually release the hand pump carefully so that the digital manometer is within the first range in the table below. Record the value from digital manometer and the value on screen into the table. Verify readings are within 1mmHg of one another. Repeat for the other 2 ranges.
- 7.5. Connect the digital manometer and manometer with accessories to **S2** and repeat steps 7.2 - 7.4 for the left side (pressing **L 0mm** and **L 300mm**).

Serial No: _____

Unetixs Vascular, Inc.

PCB Ass'y, S2 SMT Motherboard (SSB)

Test / Calibration Procedure

11919-0006-01 Rev B

7.6. Disconnect the digital manometer and manometer with accessories and click **Save**. Exit to the Main Menu.

Pressure Range	Manometer Reading	Screen Reading
RT 250-270 mmHg		
RT 150-170 mmHg		
RT 70-50 mmHg		
LT 250-270 mmHg		
LT 150-170 mmHg		
LT 70-50 mmHg		

Step 7 tested by: _____

8. PPG

8.1. On the Main Menu, verify the voltages at pin 2 on **JP9** & **JP10** are under $0.1V+10\%$ (typ. 70mV). Record the voltages in the chart below.

Quantity	Nominal Value	Accepting Range	Voltage (V)
JP9 pin 2 (Main Menu)	0.1 V	0 ~ 0.11 V	
JP10 pin 2 (Main Menu)	0.1 V	0 ~ 0.11 V	

8.2. From the Main Menu, select **Studies --- Lower Arterial Studies --- LA PPG Toe & Toe Pressure --- Exit --- Right Great Toe PPG waveform --- Back**.

8.3. Adjust **P1** to set the **Left baseline** to **20**. Adjust **P2** to set the **Right baseline** to **20**. Increase the Gain to **16** and repeat the **P1** & **P2** adjustment if needed.

8.4. Check the voltages at **JP9** pin 2 and **JP10** pin 2 in this study. They should be $2.1V\pm 50mV$ (2.05 ~ 2.15). Record the readings as below.

Serial No: _____

Unetixs Vascular, Inc.

PCB Ass'y, S2 SMT Motherboard (SSB)

Test / Calibration Procedure

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Quantity	Nominal Value	Accepting Range	Voltage (Volts)
JP9 pin 2 (Study)	2.1 volts	2.05 ~ 2.15 volts	
JP10 pin 2 (Study)	2.1 volts	2.05 ~ 2.15 volts	

- 8.5. Touch the **JP9** & **JP10** connector pins with your fingers. A visible deflection of the waveform should take place on each screen (Right and Left).
- 8.6. Exit back to the Main Menu. Click **Temp Files --- Delete --- Yes**. Do this for all study files.
- 8.7. Exit to the Desktop and turn off the power of the Test Fixture. Disconnect all the cables from the SMB and fill out the remaining paperwork.

Step 8 tested by: _____

End of Test

Pass/Fail: _____

Test Performed By: _____ **Date:** _____

Unetixs Vascular, Inc.
Ass'y, Auto Cuff Selector PCB (ACB)

Assembly Procedure

11933-0003-01 Rev D

Step 1: Through Hole Assembly

Assemble and Solder Components onto the Board (30001-0018-01 rev A).

Top solder is not mandatory for through hole components as long as the hole is 75% full and there is evidence of good wetting. Flux residue is permitted to be left on the board.

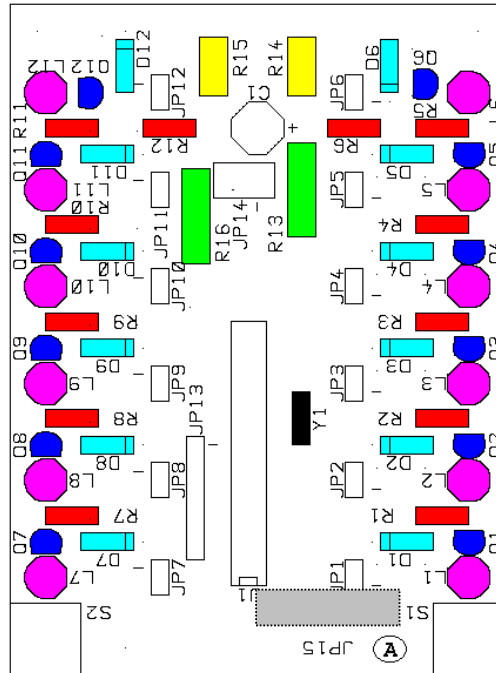











Figure 1

<u>Unetixs Part#</u>	<u>Description</u>	<u>Qty</u>	<u>Reference</u>
 20007-0000-01	Serial Number Label in this location on back.	1	
 10000-4750-01	Res. 475 ohm 1% 1/4W Metal Film	12	R1 – R12
 10008-0101-01	Res. 100 ohm 5% 1/2W Carbon Film	2	R14, R15
 10000-0000-01	Res. 0 ohm 1/4W Metal film	2	R13, R16
 10612-0914-01	Diode 1N914	12	D1 – D12
 10642-4000-01	Resonator, 4.00MHz	1	Y1
 10644-2222-01	Transistor, 2N2222A	12	Q1 – Q12
 20060-0008-01	Spacer, LED ½"	12	L1 – L12
 10647-0002-01	LED Green T 1¼	12	L1 – L12

Place the spacer between the board and LED. Note polarity when inserting LED wires: the flat (negative) of the LED (short wire) goes toward the flat indicated on PC board silkscreen.

Unetixs Vascular, Inc.
Ass'y, Auto Cuff Selector PCB (ACB)

Assembly Procedure

11933-0003-01 Rev D

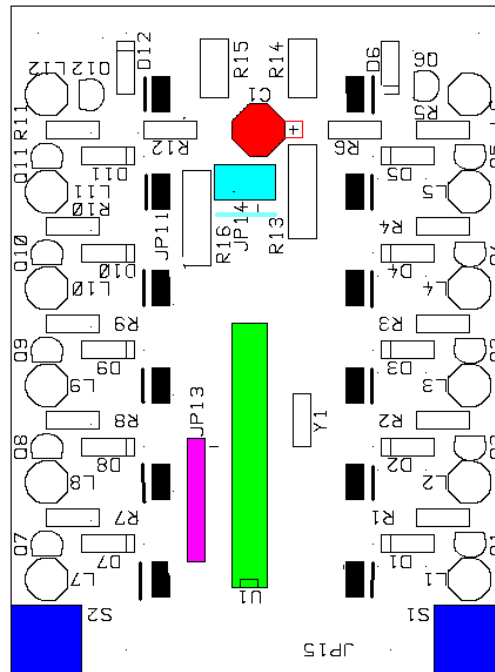








Figure 2

<u>Unetixs Part#</u>	<u>Description</u>	<u>Qty</u>	<u>Reference</u>
 10053-0106-01	Cap. 10uF 16V Alum Elect. Radial	1	C1
 10512-0028-02	Socket, IC 28pin .300 ctrs.	1	U1A
 10145-0001-01	PIC 16F873 (programmed)	1	U1
Note: Program U1 per SOP-30-004 section 7.0 or equivalent. Place the socket in the board first, and then add the IC.			
10502-0002-01	Conn., .156" Header 2 pin	1	JP14
Place this header on the back of the PC board.			
 10504-0002-01	Conn., .100" Header 2 pin	12	JP1-JP12
Place these headers on the back of the PC board.			
 10637-0001-01	Switch, pushbutton BLACK	2	S1, S2
 10505-0007-02	Conn. 7p PCB Mt. Housing (make from 10505-0036-01)	1	JP13
Place this header on the back of the PC Board			

*Unetixs Vascular, Inc.
Ass'y, Auto Cuff Selector PCB (ACB)*

Assembly Procedure

11933-0003-01 Rev D

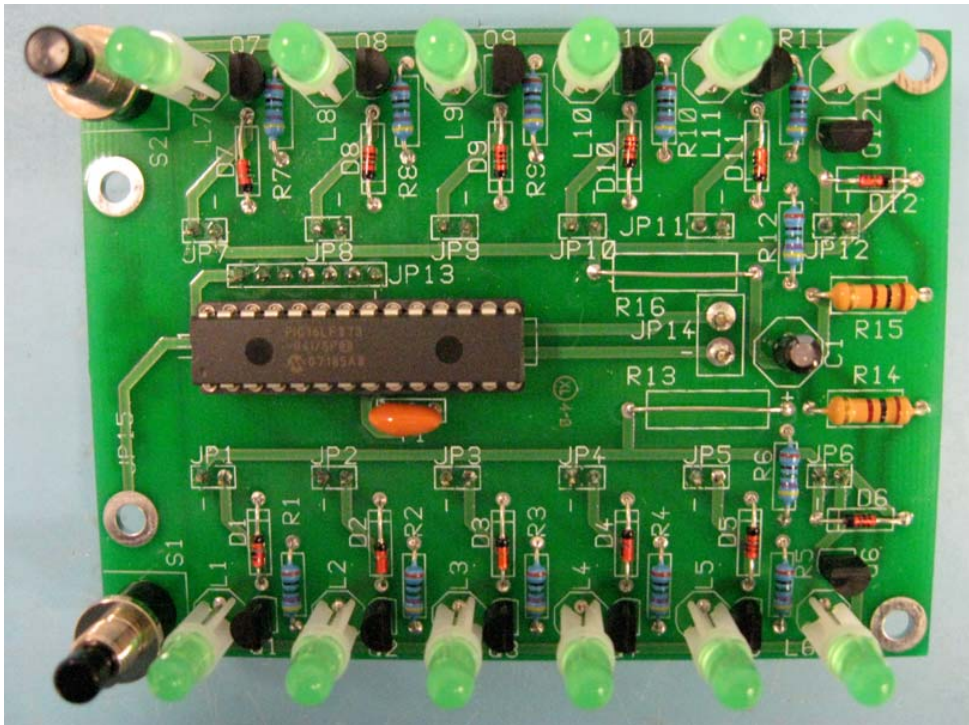


Figure 3

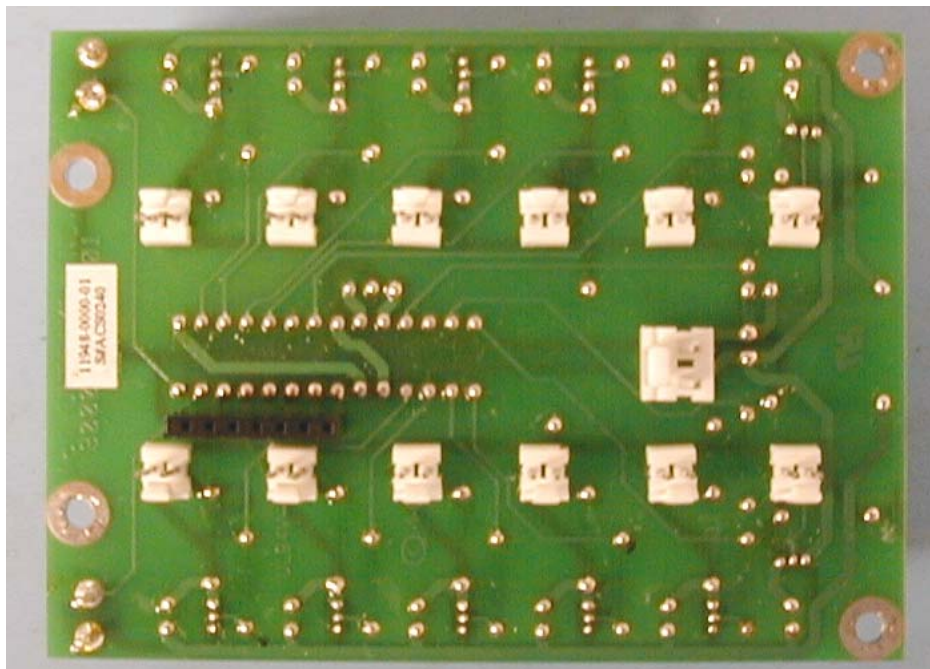


Figure 4

Unetixs Vascular, Inc.
Ass'y, Series 2 Pump & Valve Bracket (SPB)
Assembly Procedure *11935-0003-01 Rev H*

Step 1 Compressor and Valve Assembly

- 1.1. Obtain the Rear Inner Divider (40000-0434-02) and attach the Label, Serial Number (20007-0000-01) as shown in Figure 1. Attach (2) 4-40 x 3/4" Nylon Stand Offs (20035-0012-01) onto the PEM studs as shown in Figure 1.

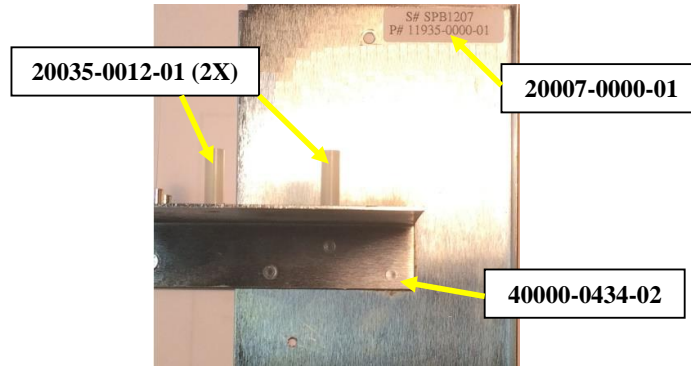


Figure 1

- 1.2. Modify the Dual Pump Bracket (40002-2037-01) by opening up the mounting holes on the bottom, as shown in Figure 2, with a tapered ream. The finished hole size is 1/4" diameter.

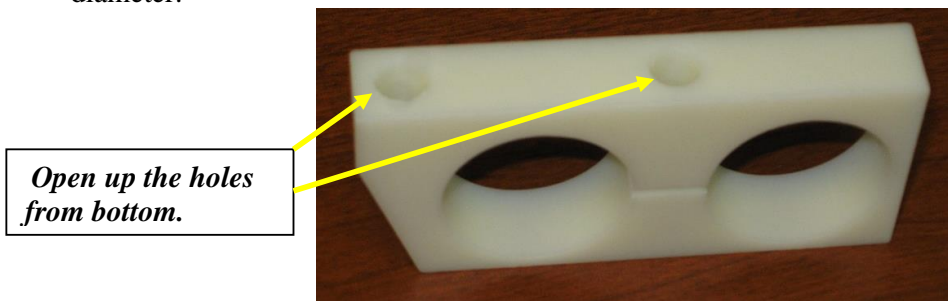


Figure 2

- 1.3. Cut 12 inches each of the following 26 AWG Wires: Green (10703-0005-01), Yellow (10703-0004-01), Blue (10703-0006-01) and White (10703-0002-01). Strip one end of each wire back 1/8".
- 1.4. Solder the stripped ends of the 12" Wires onto an Air Compressor (10328-0001-01) as shown in Figure 3: Yellow to positive (+) and Green to negative (-). Crimp the other end of Yellow Wire to pin 1 of a 2 Pin Connector (10516-0002-01) and the other end of the Green Wire to pin 2 (see Figure 7). Mark an "R" on this pump as Right.
- 1.5. Solder the stripped ends of the 12" wires to another Air Compressor (10328-0001-01) as shown in Figure 3: White to positive (+) and Blue to negative (-). Crimp the other end of White Wire to pin 1 of a 2 Pin Connector and the other end of the Blue Wire to pin 2. (see Figure 7). Mark an "L" on this pump as Left.
- 1.6. Attach (3) ORings (40003-1036-01) onto both Air Compressors as shown in Figure 3.

Unetixs Vascular, Inc.
Ass'y, Series 2 Pump & Valve Bracket (SPB)
Assembly Procedure *11935-0003-01 Rev H*



Figure 3

1.7. Install the Air Compressors into the Dual Pump Bracket as shown in Figure 4.

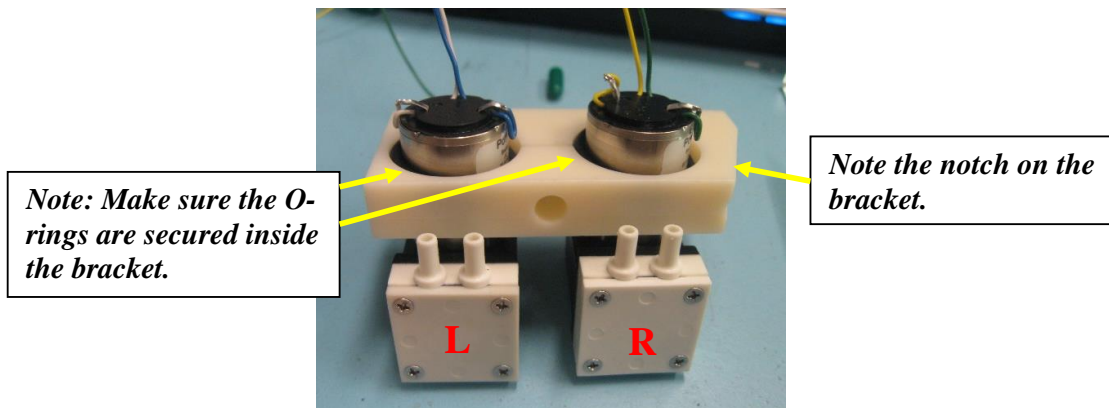


Figure 4

- 1.8. Mount the Air Compressor assembly onto the Rear Inner Divider using (1) 4-40x7/8" Socket Head Cap Screw (20019-0014-01), (1) 4-40 Lockwasher (20002-0440-01), and (1) 6-32 Flatwasher (20017-0632-01) as shown in Figure 6. Use an Allen wrench to tighten.
- 1.9. Drill out the mounting holes on both 3-way SMC Valve (10667-0002-01) bases to accommodate a 4-40 screw (1/8" drill). See Figure 5 Left.
- 1.10. Install an (1) Air Fitting (10666-0001-01) into both of the 3-way SMC Valves at port E. (Figure 5 Right). Tighten the fitting using a wrench.

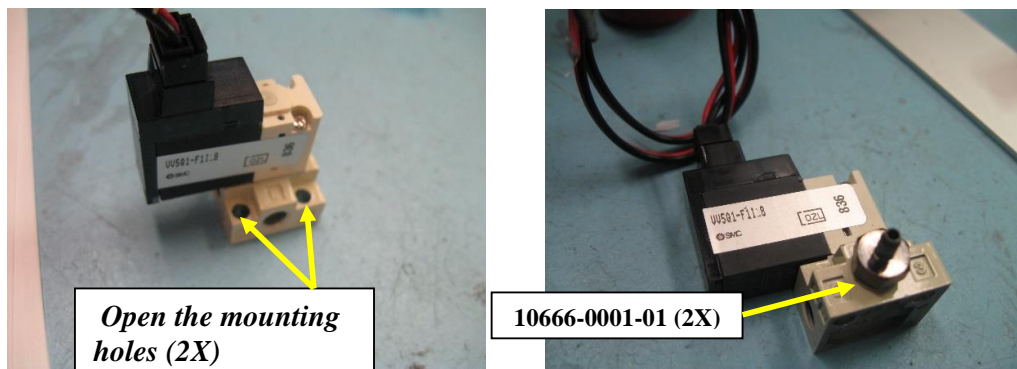


Figure 5

- 1.11. Mount the (2) 3-way SMC Valves onto the Rear Inner Divider with (2) 4-40 x 3/8" Socket Head Cap Screws (20019-0006-01) using Loctite (20089-0000-01) sparingly as shown in Figure 6.

Note: Be careful NOT to get any loctite on the plastic pump bracket.

- 1.12. Crimp the free end of red wire from both 3-way SMC Valves to pin 1 of a 2 Pin Connector (10516-0002-01) and the free end of the black wire to pin 2 (see Figure 7).

- 1.13. The finished assembly is shown in Figure 7.

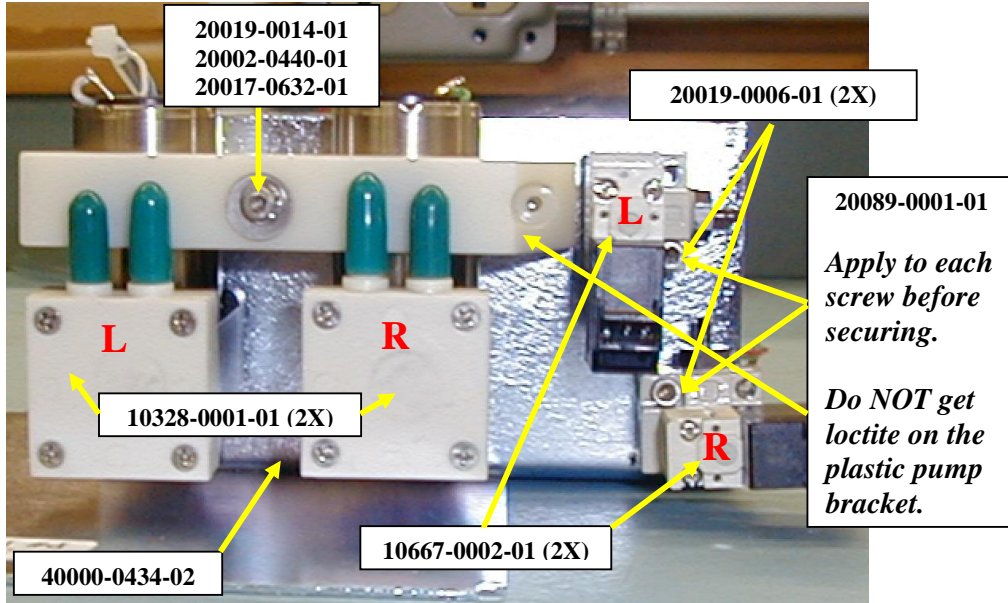


Figure 6

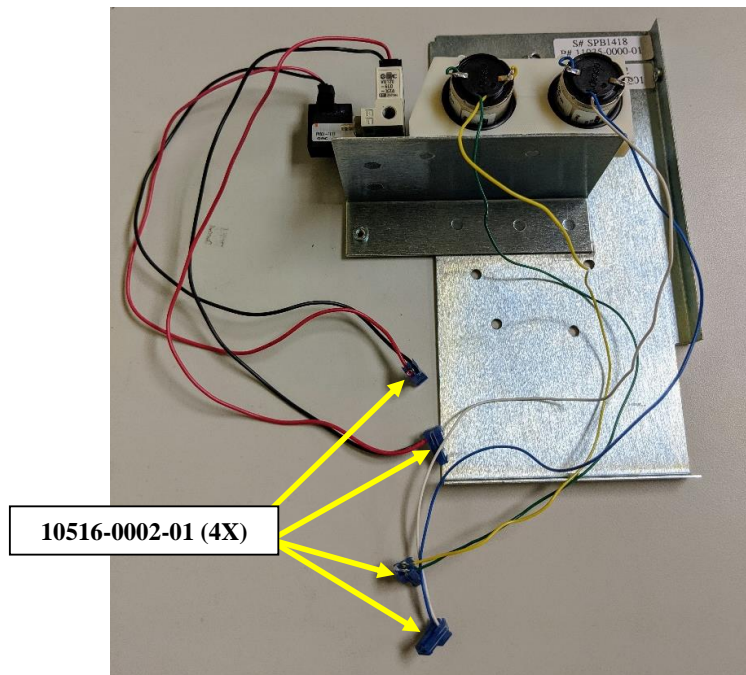
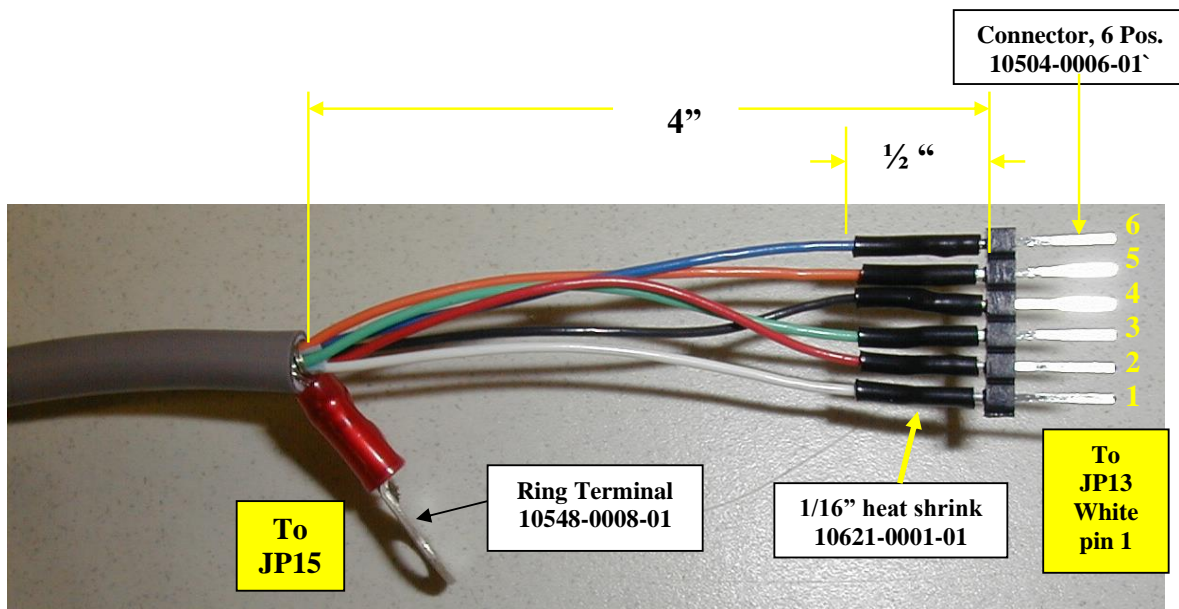


Figure 7

Step 1 Control Cable – Side A

- 1.1. Cut the 6 conductor cable (10708-0006-01) to 28”.
- 1.2. Strip the outer insulation from one end of the cable back 4”.
- 1.3. Twist shield together. Place this onto a #8 Ring Terminal (10548-0008-01) and slide all of the way to the conductor cable. Cut excess shield off.
- 1.4. Strip and tin the 6 conductor wires to ¼” inch.
- 1.5. Cut and place a ½” long piece of 1/16” heat shrink (10621-0001-01) over each wire.
- 1.6. Solder the wires to the 6 Pin Header (10504-0006-01) with White to pin 1, Red to pin 2, Green to pin 3, Black to pin 4, Orange to pin 5, Blue to pin 6.
- 1.7. Shrink the heat shrink over solder connections.
- 1.8. Place this cable aside for now.



Step 2 Electronic Manifolds

- 2.1. Drill the Manifolds Left (10673-0001-01) and Right (10673-0001-02) with a 9/16" drill bit.

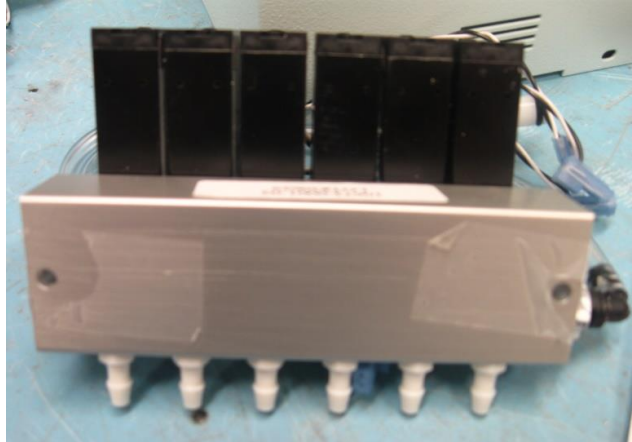


Figure 2

- 2.2. Cut the wires for the left (10673-0001-01) & right manifolds (10673-0001-02):
 - 2.2.1. (12) 4" 26AWG Black (10703-0001-01) – strip & tin one end only
 - 2.2.2. (12) 4" 26AWG White (10703-0002-01) – strip & tin one end only.
- 2.3. Cut (24) 3/8" long piece of 1/16" heat shrink (10621-0001-01).
- 2.4. Cut the posts (tabs) on the manifolds to 1/4".
- 2.5. Solder the black & white wires to the posts and cover with a 3/8" long piece of 1/16" heat shrink (10621-0001-01). Alternate White and black wires as shown. (Start from left to right)

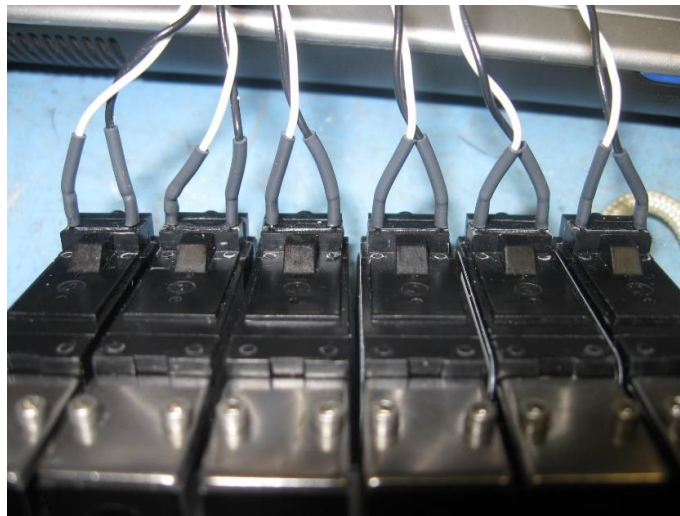


Figure 3

- 2.6. Attach a .100" 2 Pin Wire Connector (10516-0002-01) to the wires on each valve: Pin 2 Black, Pin 1 White. Repeat for 11 more times on the rest of wire pairs.

Unetixs Vascular, Inc.
Ass'y, Auto Cuff Selector (ACS)

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- 2.7. Cut aqua hoses (10605-0010-01) to 4 inches long. Remove each individual by pulling them apart.
- 2.8. Cut gray hoses (10605-0009-01) to 4 inches long. Remove each individual by pulling them apart.
- 2.9. Attach (1) 4" Aqua hoses to each barb (6 total) on the Lt Manifold (10673-0001-01).
- 2.10. Attach (1) 4" Grey hoses to each barb (6 total) on the Rt Manifold (10673-0001-02).
- 2.11. Attach one 20" Clear 1/8" ID Hose (10605-0002-01) to the Right Manifold fitting. Slide a grommet (20020-0002-01) onto the tubing.
- 2.12. Attach one 18" Clear 1/8" ID hose (10605-0002-01) to the Left Manifold fitting. Slide a grommet (20020-0002-01) onto the tubing.

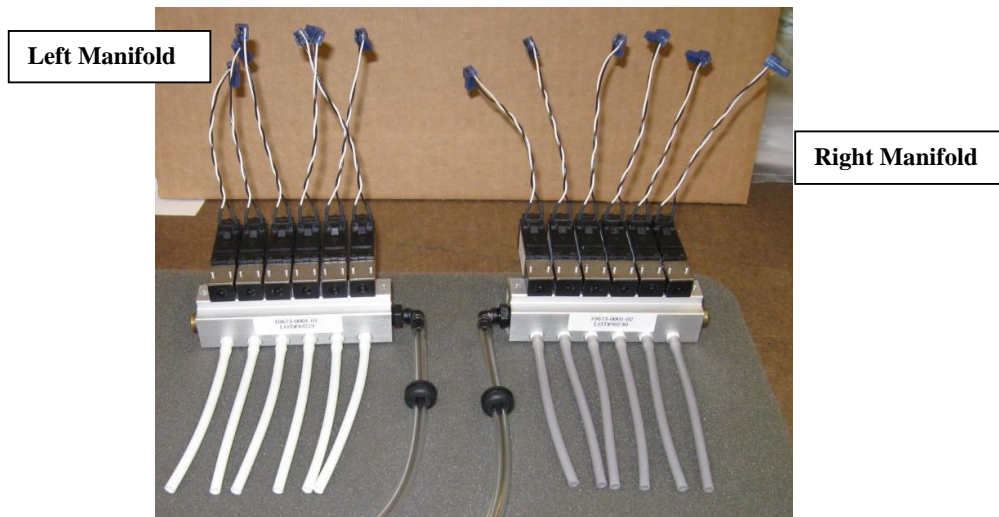


Figure 4

- 2.13. Glue (4) 1/16" fiber washers (20000-0000-01) to the manifolds as shown in Figure 5.

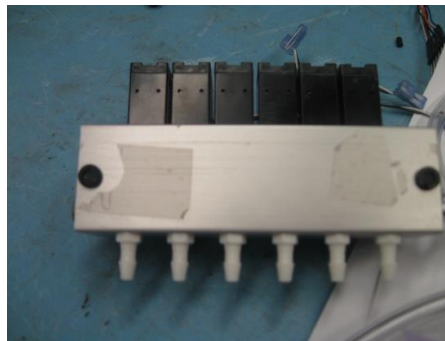


Figure 5

Step 3 Internal Power Cable

- 3.1. Cut 7 inches of 18AWG Black Wire (10706-0001-01) and 18AWG White Wire (10706-0002-01).
- 3.2. Cut 10" of 18AWG Green Wire (10706-0005-01).
- 3.3. Strip and tin one end of the 18AWG Black, White and the Green Wire.

Unetixs Vascular, Inc.
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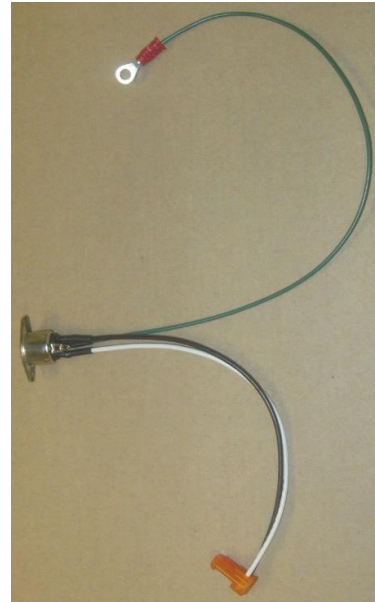
Assembly Procedure

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- 3.4. Solder the wires to the DIN Socket terminals (10549-0000-01) as follows: White (1), Green (2), Black (3). The connector after soldering is shown in Figure 6 (a).
- 3.5. Cut (3) ½ inch pieces of 1/8" shrink tubing (10621-0002-01) and place it onto the wire. Place these over each solder connections and shrink down.
- 3.6. Strip the free end of the green wire by ¼" and then crimp it to the # 8 Ring Terminal (10548-0008-01).
- 3.7. Attach the other 2 wires to the .156" 2 Pin AMP Housing (10503-0002-01), Black pin (2) and White pin (1), as shown in Figure 6 (b).



(a)



(b)

Figure 6

- 3.8. Attach the Cuff Selector Label (40002-2051-01) to the outside of the Front Housing (40001-3042-01).

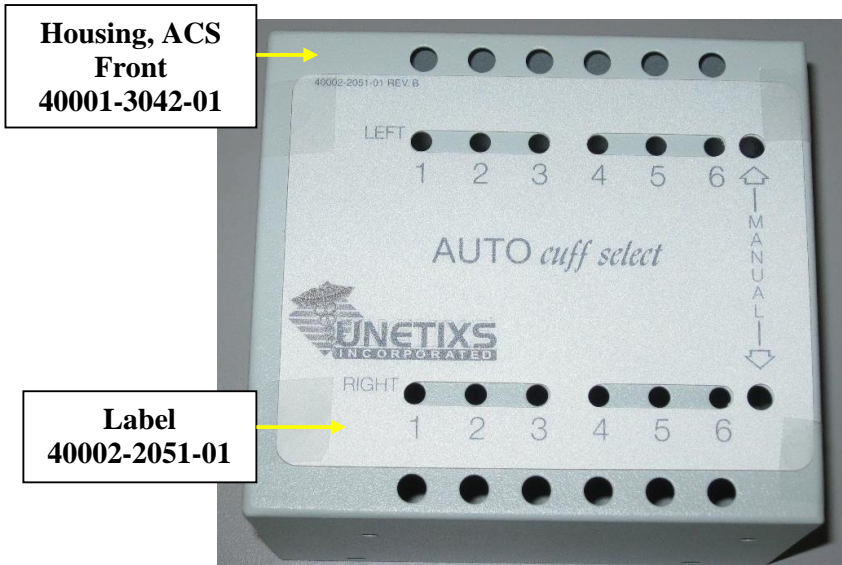


Figure 7

Step 4 Install PC Board Ass'y & Control Cable

- 4.1. Secure ACS PC Board Ass'y (11933-0000-01) to the ACS front housing (40001-3042-01) with (3) 4-40 Pan Head 1/2" Screws (20004-0008-01), & (3) #4 Lock washers (20002-0440-01) in holes shown in Figure 8.

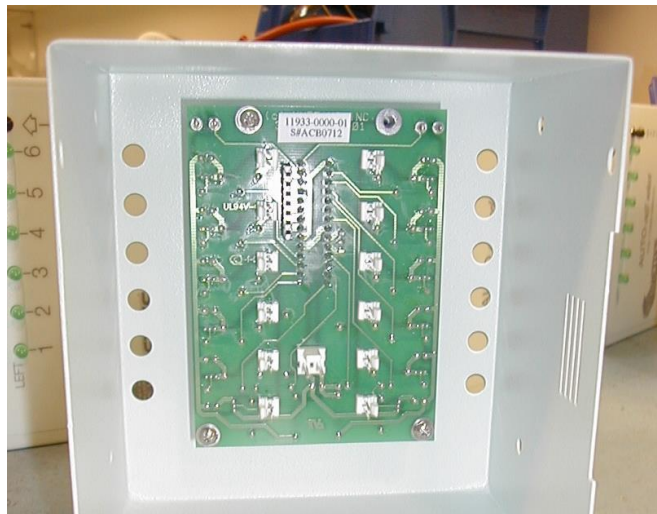


Figure 8

- 4.2. Attach the 3 Pin Panel Mount DIN Socket (10549-0000-01) to the inside Back Housing (40001-3042-02) by passing it through the opening.
- 4.3. Secure it with (2) 4-40 pan head 3/16" screws (20004-0003-01) and (2) #4 lock washers (20002-0440-01). Note the direction of the Key is toward the slots for the hoses as shown in Figure 9.

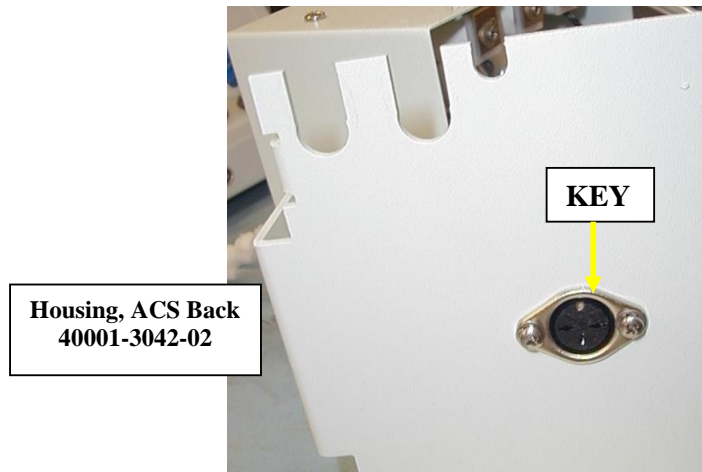


Figure 9 Outside view of ACS Back Housing

- 4.4. Plug the inline connector from the Control Cable (Step 1) into JP13 of the PCB (white connects to pin 1). Pin 7 of JP13 remains empty.
- 4.5. Attach the #8 ring terminal from the Control Cable and the # 8 ring terminal from the Power Cable to the remaining open hole @ JP15 in PC Board Ass'y with (1) #4 lock washer (20002-0440-01) and (1) 4-40 X 5/8" pan head screw (20004-0010-01).

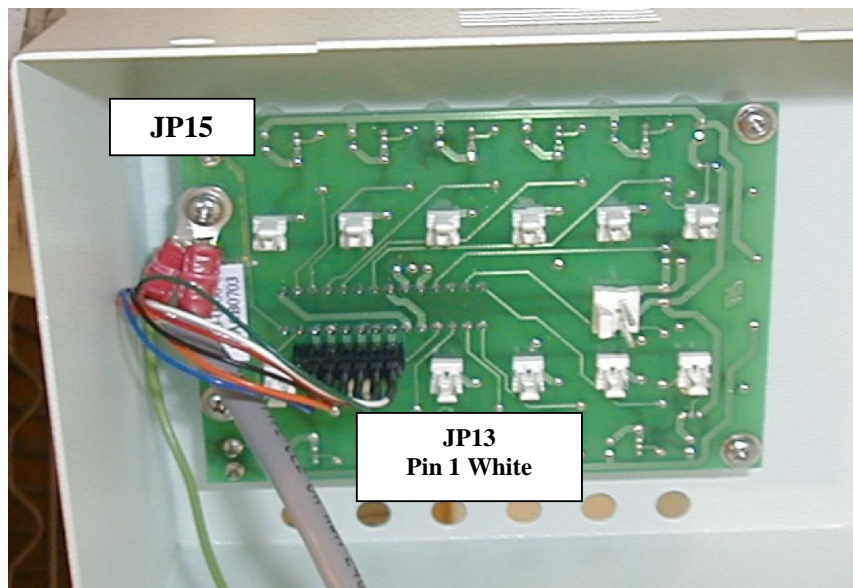


Figure 10

Step 5 Install Electronic Manifolds

- 5.1. Pass the hoses from the manifolds through the openings on the front housing. Gray right side and aqua left side.
- 5.2. Attach the (12) .100" 2 pin housings from the left and right manifolds to the PC Board Ass'y at JP1 through JP12 (Figure 11).
- 5.3. Attach the power cable 2 pin connector to JP14 on the PC Board Ass'y.

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- 5.4. Attach the manifolds to the inside of the front housing using (4) 6-32 1½" Pan Head Screws (20012-0024-01), on the outside, with (4) #6 Lock washers (20002-0632-01) and (4) 6-32 Nuts (20003-0632-01) on the inside.

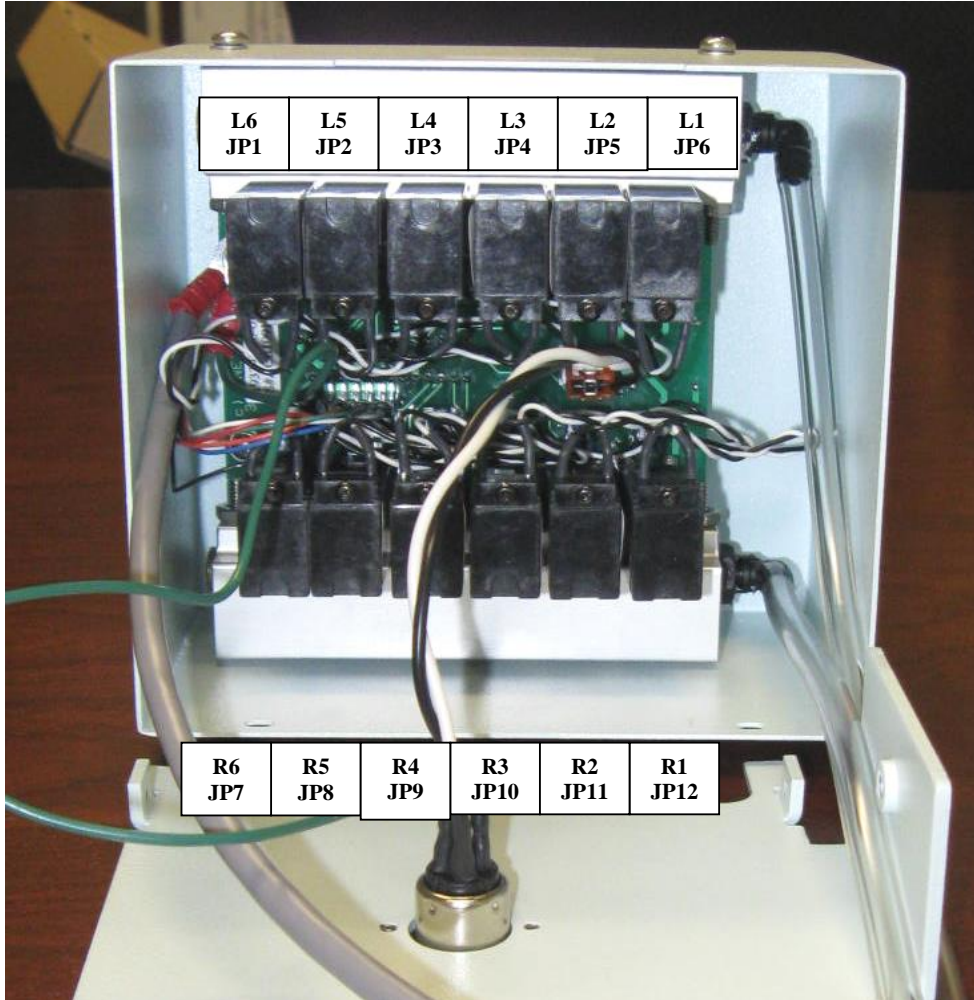


Figure 11

Step 6 Case Assembly

- 6.1. Attach 12 Inline Fittings (10606-0005-01) to the Aqua and Grey hoses as shown in Figure 12.

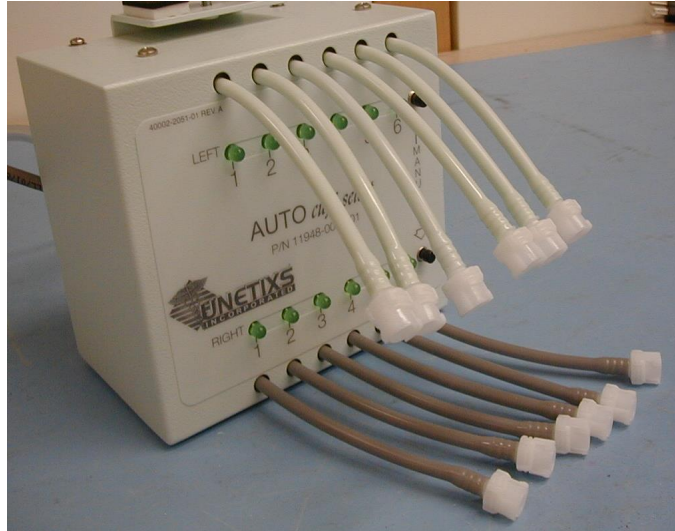


Figure 12

- 6.2. Slide the 2 grommets for the clear tubing to their appropriate slots on the back housing (Left – Top / Right – Bottom). See Figure 14 for reference.
- 6.3. Place the cable through the last slot on the back housing.
- 6.4. Check to be sure that the 1/8” hoses are 14 1/2” from the outside of the case and are even at the ends. Cut off extra if needed.
- 6.5. Attach the back housing to the front housing with (4) 4-40 pan head 3/8” screws (20004-0006-01) and (4) #4 lock washers (20002-0440-01). Place the 1/32” Fiber Washers (20000-0002-01) in between the mating housing pieces. Note: May not be required depending upon the fit of the metalwork.
- 6.6. Mount the Knob (10656-0002-01) onto the side of the top housing.
- 6.7. Cut (2) 1/2” x 1 inch pieces of white double sided foam tape (10635-0002-01) and (2) black rubber foam strip 1/2 X 1” (20025-0002-01) and mount to the opposite side of the knob. See Figure 14.
- 6.8. Cut and attach a piece of 1 inch long clear shrink tubing (10621-0006-06) onto each tubing.
- 6.9. Print the Kroy label (10685-0006-02) marked “left” per SOP-30-003 section 7.0 or equivalent and attach it onto the left manifold tubing.
- 6.10. Print the Kroy label (10685-0006-02) marked “right” per SOP-30-003 section 7.0 or equivalent and attach it onto the right manifold tubing.
- 6.11. Attach airline fitting (10606-0004-01) onto each tubing.
- 6.12. Shrink down the Kroy label. Note: Do not heat the letter side, otherwise the print will be shrunk and illegible. Then add the clear shrink tubing over the label and shrink down.



Figure 13

6.13. Apply Serial Number Label (40002-2040-05) as shown in Figure 14.

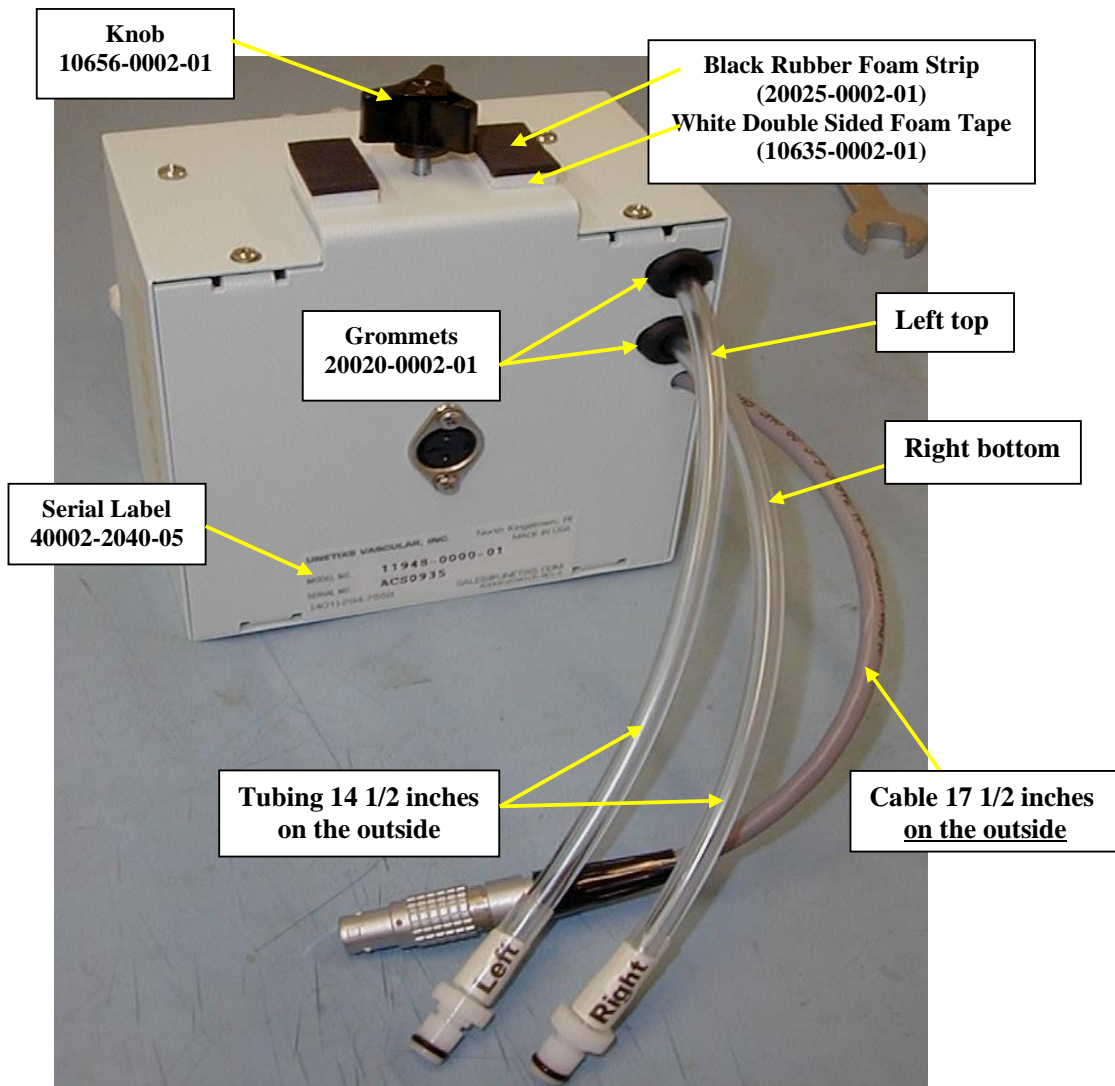


Figure 14

Step 7 Control Cable – Side B

- 7.1. Verify that the 6 conductor cables (10708-0006-01) from Step 1 are 17 1/2” on outside of case.
- 7.2. Strip and remove the outer jacket and foil shield of the cable 3/4”.
- 7.3. Carefully twist the braid into a single conductor.
- 7.4. Strip the wires 1/16” and tin.
- 7.5. Place the Strain Relief (10542-5459-01) and pieces A & B of the LEMO Connector (10508-0006-01) over the cable as shown in Figure 15.
- 7.6. Place a 3/8” piece of 1/16” heat shrink tubing (10621-0001-01) over each wire.
- 7.7. Carefully solder the wires into the solder cups of piece C of the LEMO Connector as shown in Figure 16. Connect white to pin 1 (keyed). Going counterclockwise with the solder cups facing you consecutively solder the White, Red, Green, Black, Orange, and Blue wires. Then move the shrink tubing into place and shrink.
- 7.8. Fold the braid as shown in Figure 15 so that it is trapped underneath piece B and fold the braid back up through the slot. Cut off excess braid.
- 7.9. Place the 2 inner shell LEMO pieces over piece C and assemble the connector together. Tighten the housing using a 10mm wrench on piece D and a 9mm wrench on piece A. Do not over tighten.
- 7.10. Pull the strain relief into place at the end of the LEMO Connector as shown in Figure 17.

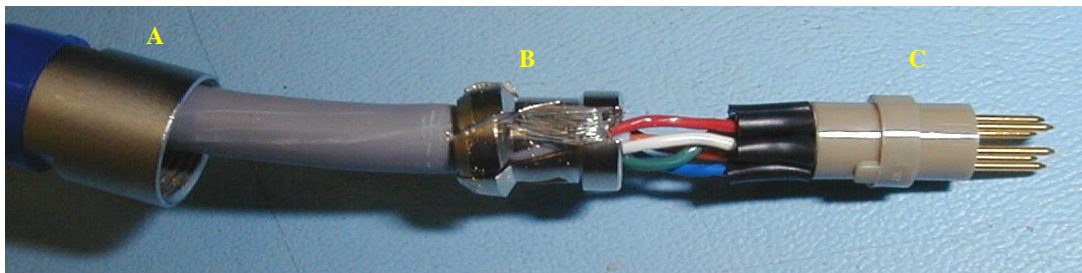


Figure 15

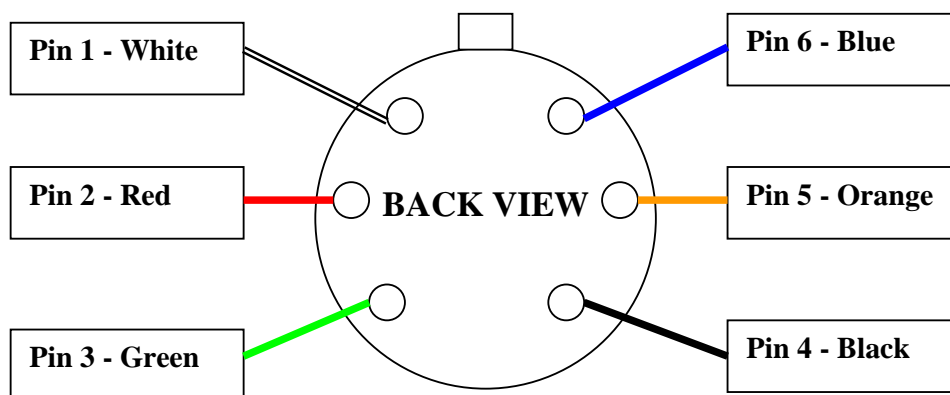


Figure 16

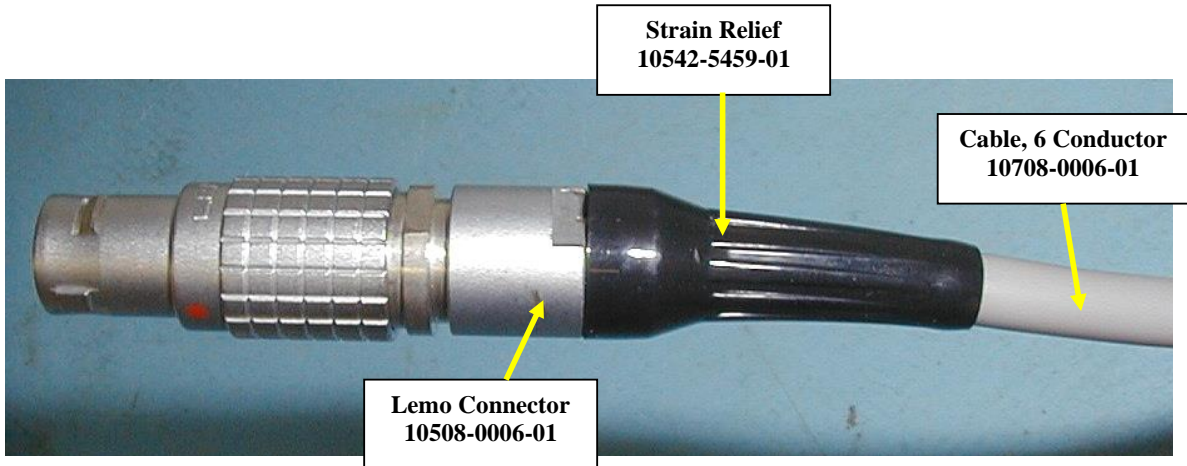


Figure 17

Unetixs Vascular, Inc.
Auto Cuff Selector (ACS)

Test / Calibration Procedure**11948-0006-01 Rev D****1.0 Test Equipment Checklist**

- 1.1 Gather all the test equipment needed and copy down their control numbers. Check Calibration/Maintenance due date from the equipment.

Equipment Name	Control # / Serial # / Lot #
LHS TI final Ass'y (Unetixs 11949-0000-01) or equivalent (see list below)	
LHS Chassis 11903-0000-01	
ACS Power Cable 11934-0000-01	
Test Computer 60007-0000-01	

2.0 Test

- 2.1 Skip this step if LHS TI (11949-0000-01) is used for the test. Connect LHS Chassis to the Test Computer (60007-0000-01).
- 2.2 Connect Auto Cuff Selector (11948-0000-01) to the LHS Chassis (11903-0000-01) using ACS Power Cable (11934-0000-01). Connect ACS LEMO connector to the port marked as "CTRL" on LHS Chassis front panel. Attach the ACS Left and Right hoses to the L and R on the LHS Chassis front panel.
- 2.3 Turn LHS on. From Desktop, double click **S2WIN** icon. Then click **Studies --- Lower Arterial Studies --- LA Segmental Pressures with PVR --- Exit**. Then click **Right Brachial Pressure Study --- Back**. Now **R1** should light up.
- 2.4 *Communication Test:* Click "**Next**" and verify **L1** LED lights up. Then click "**Back**" and verify **R1** LED lights up and L1 LED turns off. Click "**Exit**" once.
- 2.5 Click "**Right Metatarsal PVR waveform**" and "**BACK**". The PVR test interface will appear on the screen. Set the gain to **16** (or **.188 mmHg/20mm**).
- 2.6 *Leakage Test:* Press the black buttons to turn **R1 & L1** on. **Block** off R1 & L1 hoses. Click **Inflate** while keeping R1 & L1 hoses blocked. Verify that the PVR baseline on screen stays between **15 and 20**.
- 2.7 Repeat Step 2.6 for the rest of hoses: R2-L2, R3-L3, R4-L4, R5-L5 and R6-L6.
- 2.8 *Blockage Test:* Press the black buttons to turn R1 & L1 on. Click "**Inflate**" to verify that the air is passing through the R1 & L1 hoses without any hesitation.
- 2.9 Repeat Step 2.8 for hoses: R2- L2, R3- L3, R4- L4, R5- L5 and R6-L6.
- 2.10 Exit to Main Menu. Disconnect all the accessories and turn the LHS OFF.

End of Test

Pass/Fail: _____

Test Performed By: _____ Date: _____

Step 1 Manifold Block Assemblies

Apply Teflon Tape (10675-0000-01) onto the threaded portion of the following components:

P/N	Discription	Length	Qty.
10667-0001-01	Cuff Selector Toggle Valve	2 ½"	10
10671-0000-01	Manifold Port Plug	3"	4
10672-0003-01	1/8" NPT to 1/8" Barb Elbow Swivel Fitting		2

Note: Wrap tape clockwise.

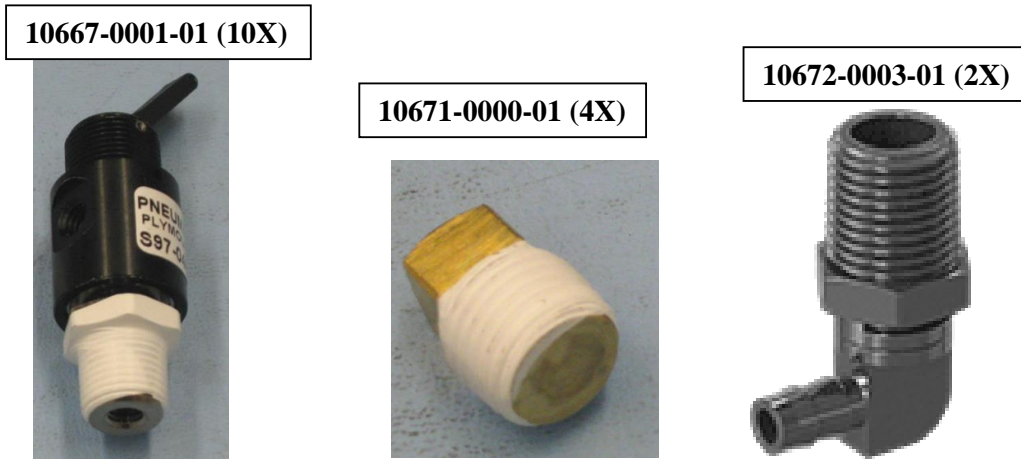


Figure 1

Install the Toggle Valves, Plugs and Elbow Fittings into the Manifold Block (10673-0000-01).

1. Each Cuff Selector Assembly requires 2 of these manifold assemblies.
2. Carefully clamp the manifold block (10673-0000-01) into a vise as shown in Figure 3.
3. Install the End Plugs (10671-0000-01) using #10 wrench as shown in Figure 4.
4. Install the Elbow fitting (10672-0003-01) using #11 wrench as shown in Figure 4.
5. Install the Toggle Valves (10667-0001-01) using a 1/2" wrench. When installing the Toggle Valves maintain a 1" distance as shown in Figure 2. Install the valve closest to the elbow first and move in order till the end of the manifold block. Turn valves so that openings are facing one side on one manifold and on the opposite side on the other manifold as shown in Figure 4.



Figure 2



Figure 3

6. Use a 1/4" nut driver to install the 10-32 x 1/8" barb fittings (10670-0000-01) into the side of the toggle valves as shown in Figure 4. Tighten until snug.

*Unetixs Vascular, Inc.
Ass'y, Molded 2CP Manifold (MCM)*

Assembly Procedure

11972-0003-01 Rev G

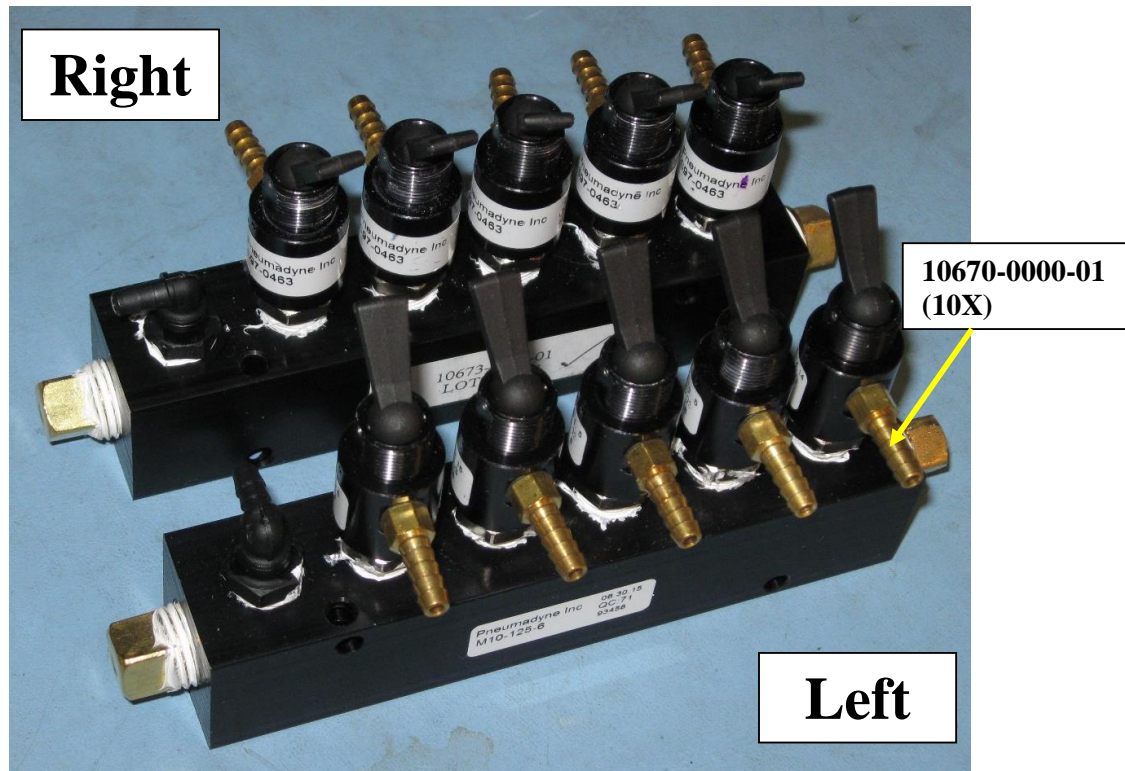


Figure 4

Perform a leak test as follows:

1. Close all toggle valves.
2. Connect Manometer to the Elbow Fitting.
3. Inflate the manifold block with the Manometer to 300mmHg. Bleed off pressure until the needle on the Manometer is exactly over a line between 260~280mmHg and let it hold there for one minute.
4. The manifold assembly should not lose more than 1 mmHg of pressure during this holding period.
5. Check each toggle valve one at a time by first inflating to 260-300mmHg and then releasing toggle valve so that air bleeds quickly without hesitation. Then close the toggle valve.

Step 2 Label & Grommets

1. Apply the Series 2 Cuff Selector Keyboard Label (40002-2033-02) onto the front of the Cuff Selector Top Housing (40000-4021-01) case as shown in Figure 5. Make sure it is properly aligned with the holes in the front of the case and the cable from the keyboard label fits freely through the rectangular slot without interference.
2. Install the Rubber Grommets (20020-0002-01) 10 per into the case as shown in Figure 5.

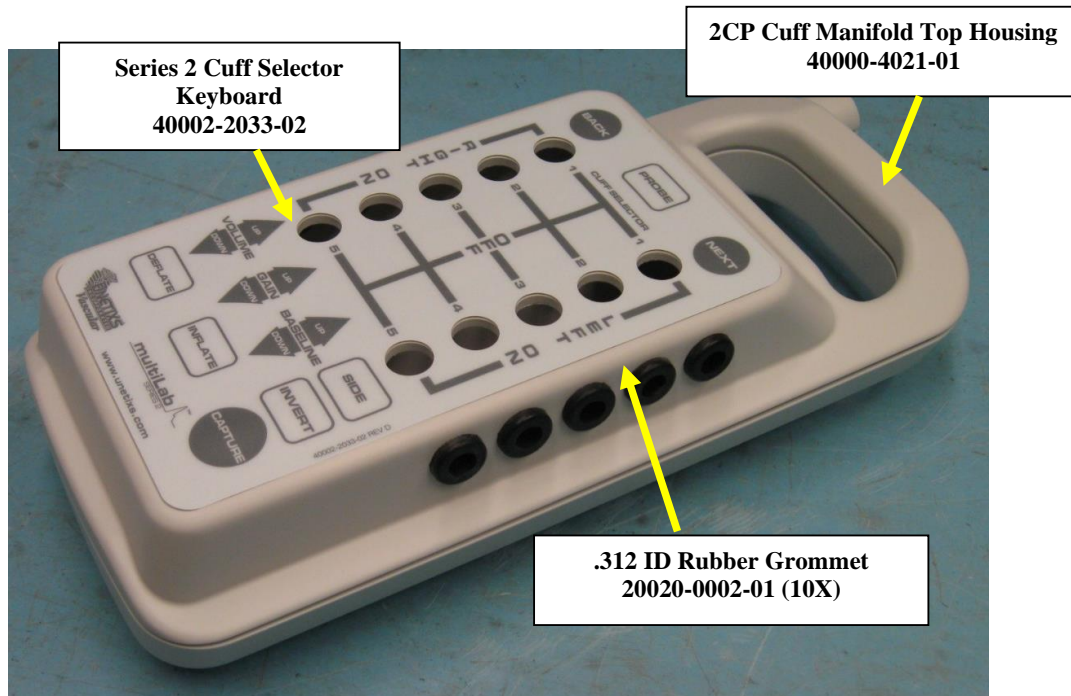


Figure 5

Step 3 “L” Shaped Tubing Assemblies (2)

Cut 4 pieces of the 1/8” ID Silicone Tubing (10605-0005-01) 1 ½” long.

Using 4 pieces of the 1/8” x 1/8” Barb Elbow Fitting (10672-0002-01) and the Silicone Tubing, make 2 hose assemblies as shown in Figure 6.

Note: Use a thin coating of Silicone RTV over the barbed fitting before applying the tubing. Make sure that silicone does not go into any of the openings.

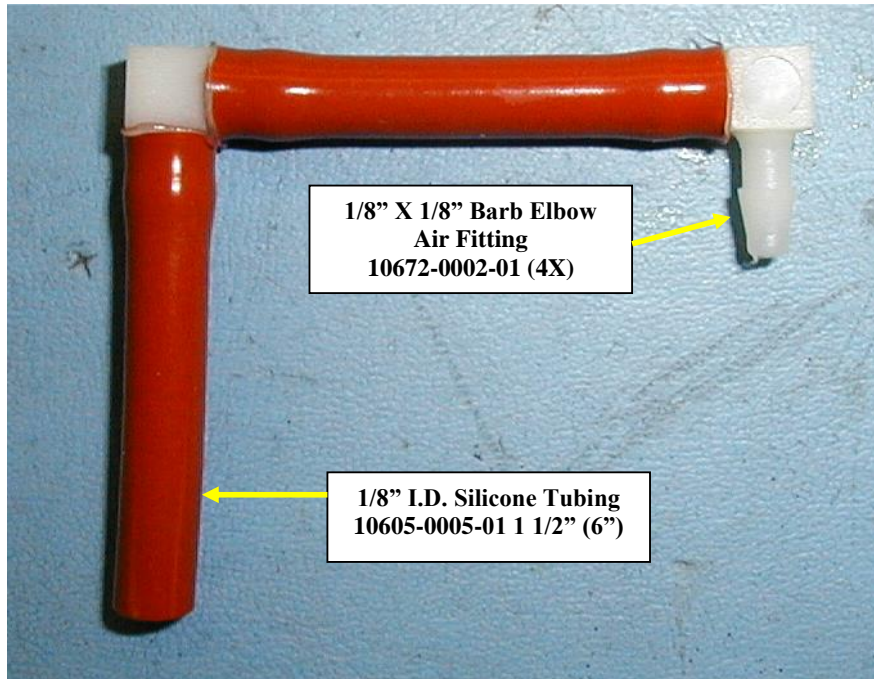


Figure 6

Step 4 6 Conductor Cable Assembly

1. Cut the 6 Conductor Cable (10708-0006-01) 8 ½ feet.
2. Strip outer jacket 3" and remove foil shield and unshielded wire.
3. Strip the 6 wires 1/8" and tin.
4. Cut (6) ½ inches long pieces of 1/16" I.D. shrink tubing (10621-0001-01).
5. Place a 1/2" long piece of 1/16" I.D. shrink tubing over each wire
6. Using a lap joint, solder the wires to the 6 position connector (10504-0006-02).
7. Place the shrink tubing over the solder joints and heat shrink in place.

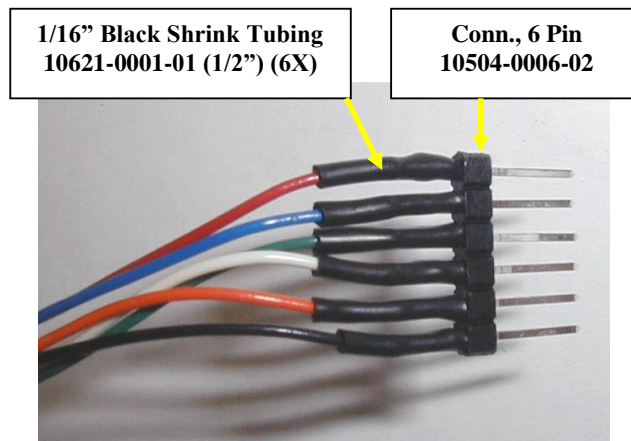


Figure 7

Step 5 Manifold Installation

1. Cut (12) pieces of the 1/8" I.D. clear tubing (10605-0002-01) to the following lengths:

<u>Qty</u>	<u>Length</u>
8	2'
2	4'
2	8 ½'

2. Insert a 4 feet long tubing through the grommet into the case approximately 6" at position 1 on the right side of the Case.
3. Insert the (4) 2 feet long tubings through the grommets into the case approximately 6" at positions 2 through 5 on the right side of Case.
4. Install the tubing onto the corresponding valve on the Manifold Block Assembly.

Note: Position #1 valve where the 4' tubing goes is the furthest away from the plastic Elbow Fitting on the Manifold Block Assembly.



Figure 8

5. Work the Manifold Block Assembly with the Tubing into place until the toggles on the Toggle Valves protrude through the top of the case and the Manifold Block Assembly is sitting as flat as possible along the inside of the case as shown on Figure 9.

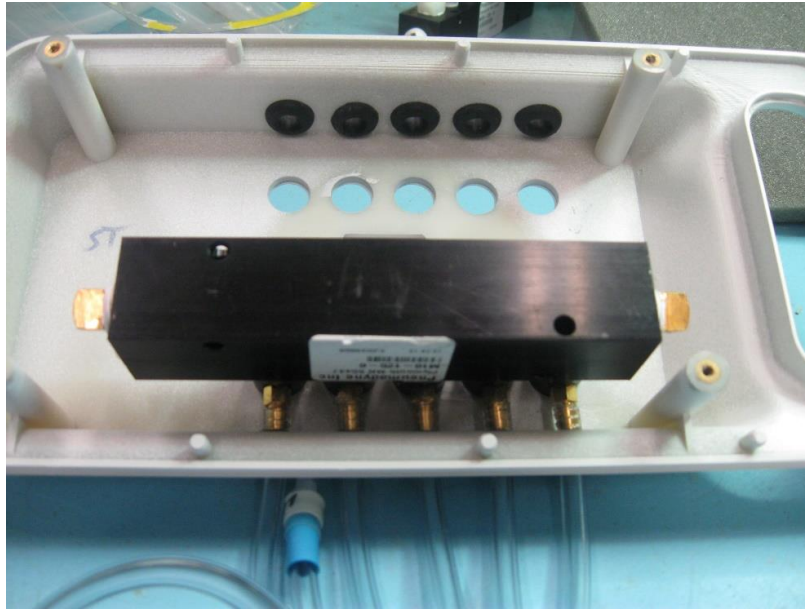


Figure 9

6. Repeat this procedure for the left side of the Case.
7. Secure the left and right Manifold Assemblies to the Case with the lock washer and Hex Nut supplied with the Toggle Valves using a 9/16" socket as shown in Figure 10. **Note: Make sure not to cross thread the nut.**

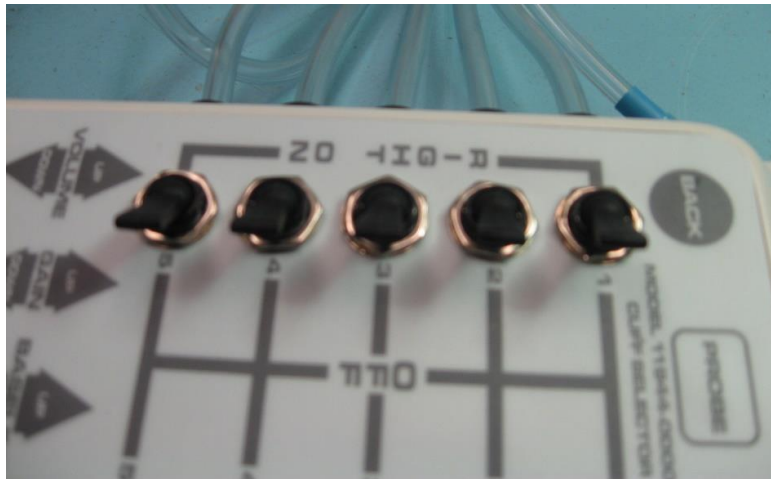


Figure 10

8. Apply a coating of the Silicone RTV onto the barbed end of the plastic elbow fittings on the Manifold Assemblies and insert the "L" shaped tubing assemblies onto the fittings as shown in Figure 11.



Figure 11

Step 6 Cable and Tubing Installation

1. Apply a coating of Silicone RTV onto the ends of the plastic fittings of “L” shaped tubing assemblies and insert a 8 ½’ long of tubings onto each of them as shown in Figure 12.

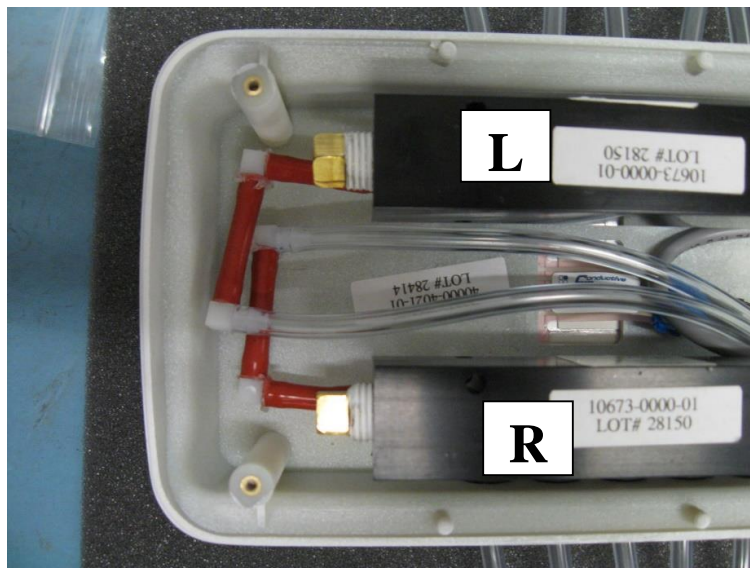


Figure 12

2. Mark the tubing that goes to the Right Manifold Assembly with a marker on its free end as shown in Figure 14. Refer to the keyboard label on the top of the case to identify the right manifold.
3. Connect the 6-pin connector from the 6-pin cable to the keyboard label connector: pin 1 (with arrow mark) of keyboard label connector to the pin with red wire as shown in Figure 13.

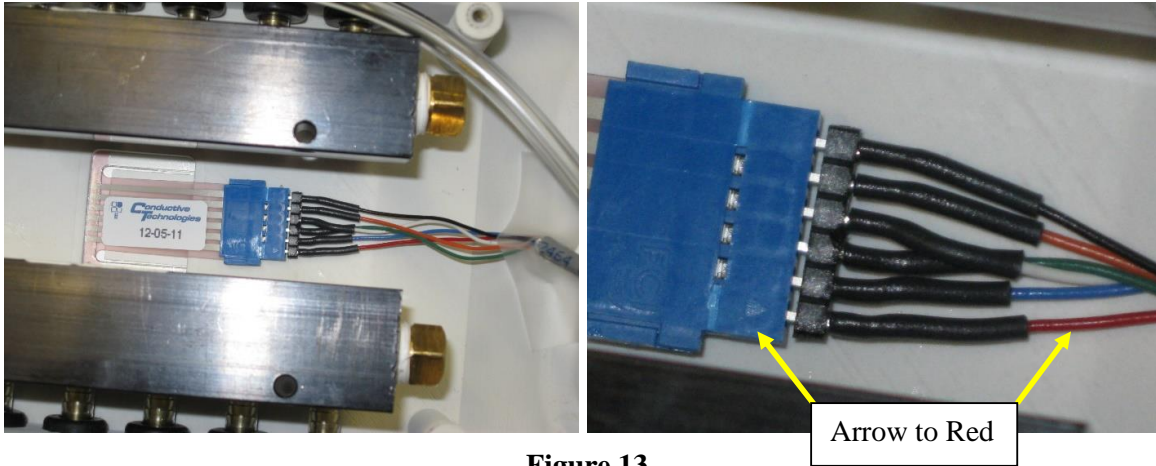


Figure 13

4. Bundle (2) 8 ½” long hoses and the cable together using scotch tapes, every 6” or so as shown in Figure 14.



Figure 14

5. Cut 89 inches of gray ½” polyester woven sleeving (10707-0008-07).
6. Pull the bundle through the sleeving. Then secure the loose end of the sleeving using tape as shown in Figure 15.
7. Apply (5) 4” tie wraps (20008-0004-01) to the bundle around housing exit for strain relief as shown in Figure 15. **Note: The tie wraps should be tight but do not crush the tubing.**

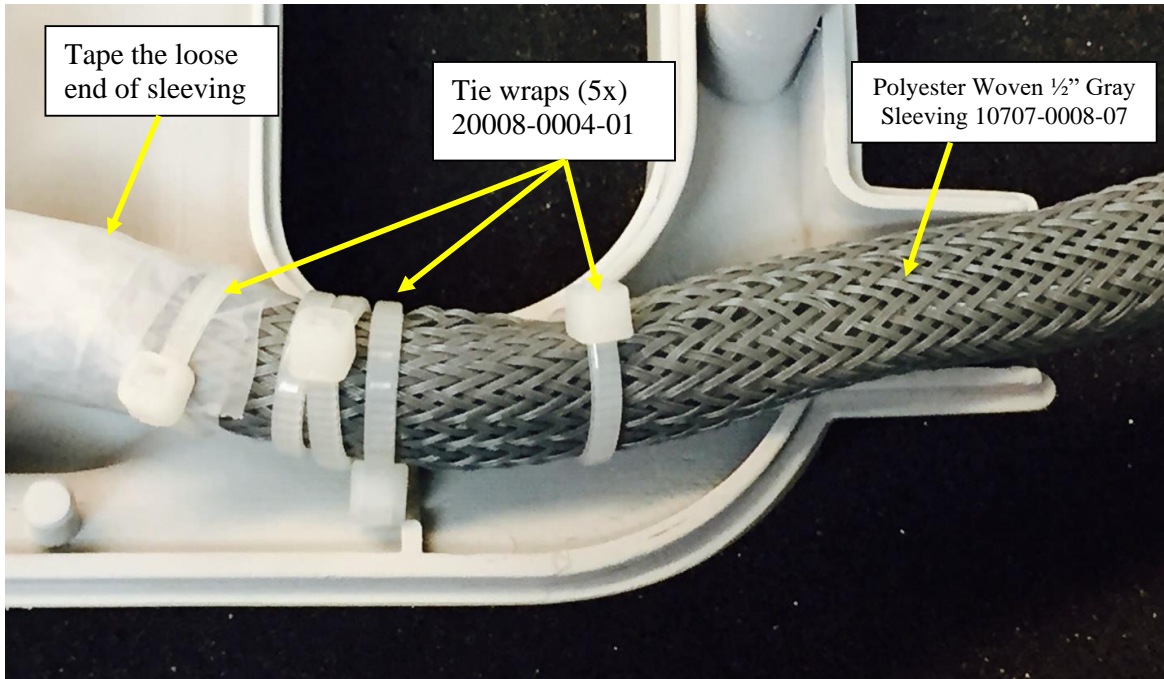


Figure 15

Step 7 Housing Assembly

1. Lead the sleeved bundle out of the housing exit and assemble the bottom housing (40000-4021-02) to the top housing (40000-4021-01) using (5) 6-32 x ¼” screws (20012-0004-01) and (5) 6-32 lock washers (20002-0632-01) as shown in Figure 16.

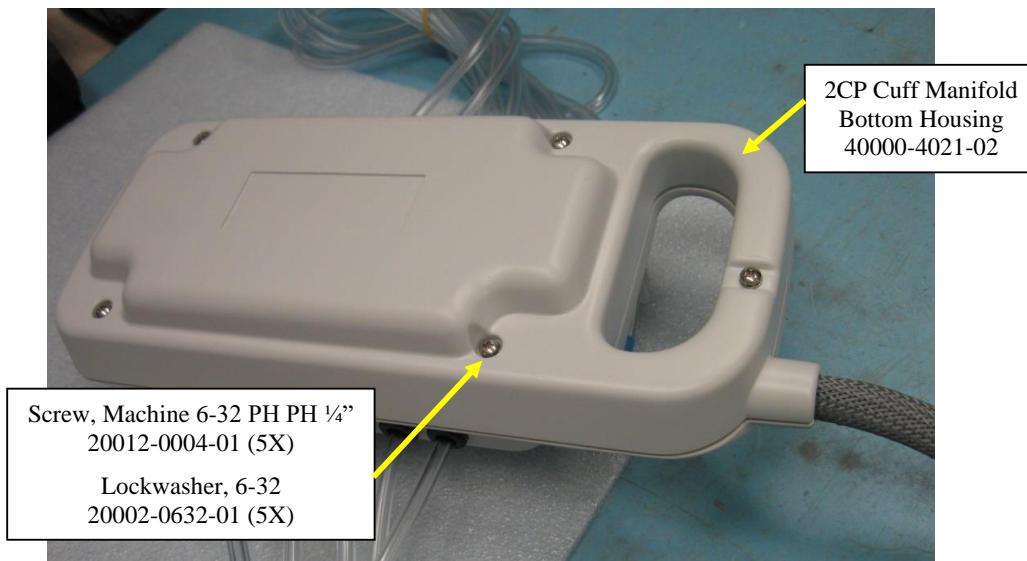


Figure 16

2. If necessary, cut the conductor cable and two main hoses to the length so that the following length is left outside the polyester sleeve for each of them as shown in Figure 17 (a).

Cable & Left hose	7”
Right hose	6”

Secure the loose sleeve end using a piece of tape. Place a 7" of grey heat shrink tubing (10621-0012-08) to the location where the sleeve ends and shrink it as shown in Figure 17 (b).

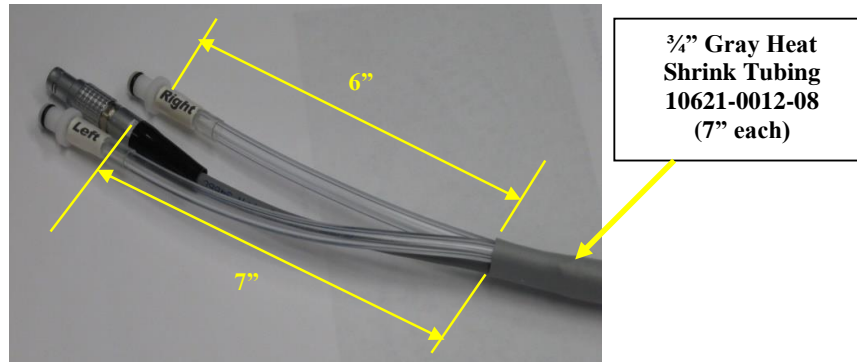


Figure 17

Step 8 6 Conductor Cable Assembly

1. Place the Strain Relief (10542-5459-01) over the Cable.
2. Place pieces A & B of the LEMO Connector (10508-0006-01) over the cable as shown in Figure 18.
3. Strip back the outer jacket, remove the foil shield and drain wire of the cable ½”.
4. Strip wires 1/16” and tin.
5. Place a 1/8” long piece of 1/16”I.D. shrink tubing (10621-0001-01) over each wire.
6. Carefully solder the wires into the solder cups of Piece C of the LEMO Connector as shown in Figure 19 and then shrink the tubing.
7. Assemble the LEMO Connector together using Pieces D, E, & F. Tighten the housing pieces using a 10mm open ended ground down wrench on Piece D, and a 9mm open ended wrench on Piece A. Do not over tighten.
8. Pull the Strain Relief into place at the end of the LEMO Connector. The finished LEMO is shown in Figure 20.

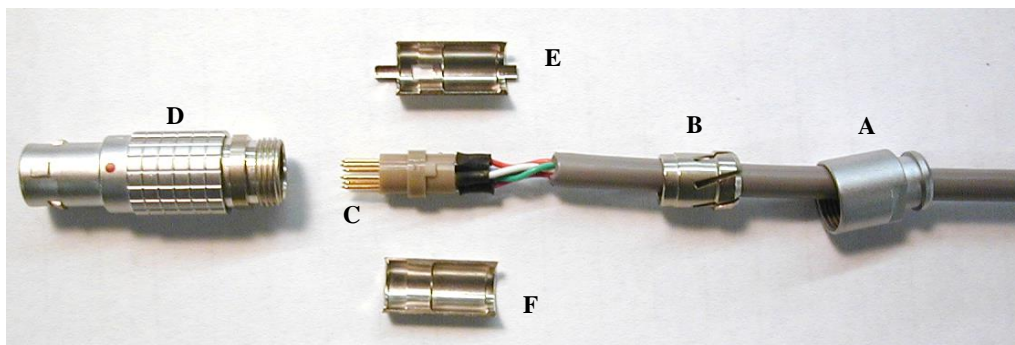


Figure 18

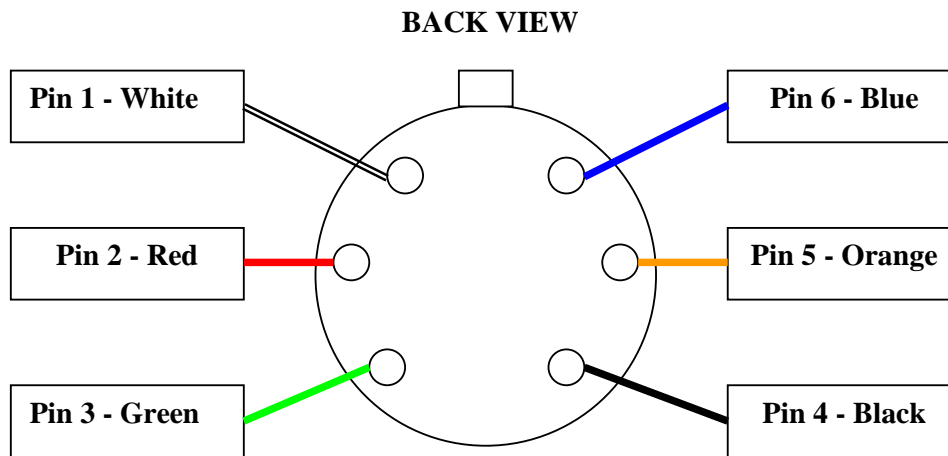


Figure 19

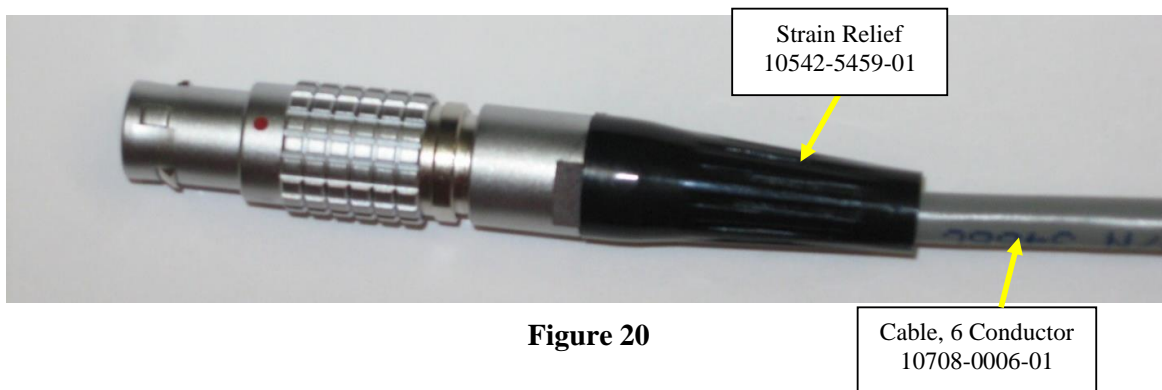


Figure 20

Step 9 Left & Right Main Hoses

1. Place (2) 1" long clear shrink tubing (10621-0006-06) onto both of the main hoses.
2. Take the (2) Male Air Line Fittings (10606-0004-01) and insert the fitting into each of the tubings. You may need to use a pair of needle nose pliers to open up the tubing a bit to be able to place it all the way over the fitting.
3. Print the heat shrink tubing Labels, Right and Left, using Kroy Label Printer per SOP-30-003 Section 7.0. Place both labels over each 8 ½" long hose. The Right label goes over the tube coming from the center hole.
4. Orient the direction of the writing as shown in Figure 21 and heat shrink in place.
5. Position the Clear Shrink Tubing over the left and right labels and shrink in place.

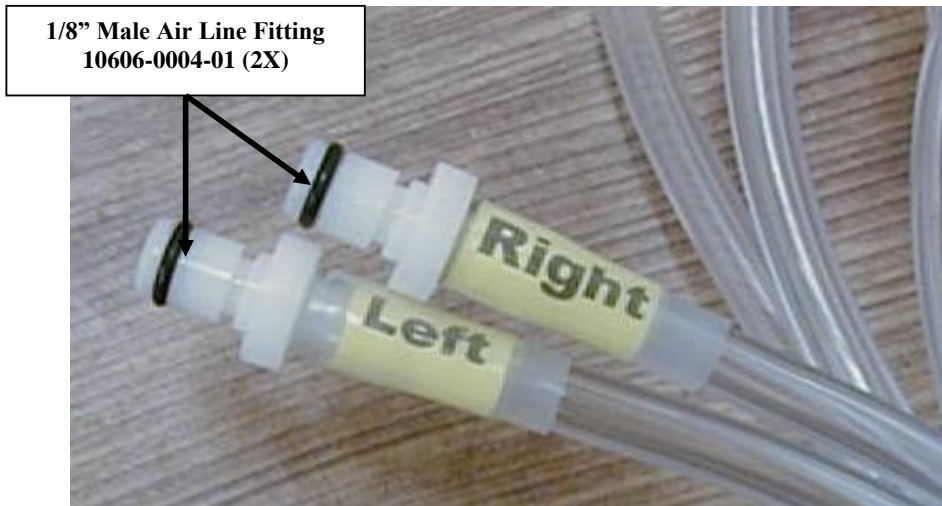


Figure 21

Step 10 Cuff Hoses

1. Cut (10) 3/4 inch pieces of clear shrink tubing (10621-0006-06).
2. Place a piece of clear shrink tubing on each of the cuff hoses.
3. Print the heat shrink tubing Labels, R1 through R5 and L1 through L5 on 10685-0006-02, using Kroy Label Printer per SOP-30-003 Section 7.0. Place labels on each applicable side hose.
4. Place the colored shrink tubing on each of the side hoses. Please note which color goes with its appropriate number:

L1	R1	Blue	10621-0006-07	(3/4 inch" x 2)
L2	R2	Yellow	10621-0006-02	(3/4 inch" x 2)
L3	R3	Green	10621-0006-05	(3/4 inch" x 2)
L4	R4	Red	10621-0006-03	(3/4 inch" x 2)
L5	R5	White	10621-0006-04	(3/4 inch" x 2)

5. Take the Inline Female B.P. Fitting 1/8" (Bayonet) (10607-0004-01), 10 per assembly, and insert them onto the ends of the tubing (10 places).
6. Move the colored tubing into place as shown in Figure 22 and shrink in place.
7. Move the numbered tubing into place as shown in Figure 22 and shrink in place.
8. Move the clear tubing into place as shown in Figure 22 and shrink in place.



Figure 22

Apply the serial number label to the bottom of the case.



Figure 23

The finished part is shown in Figure 24.

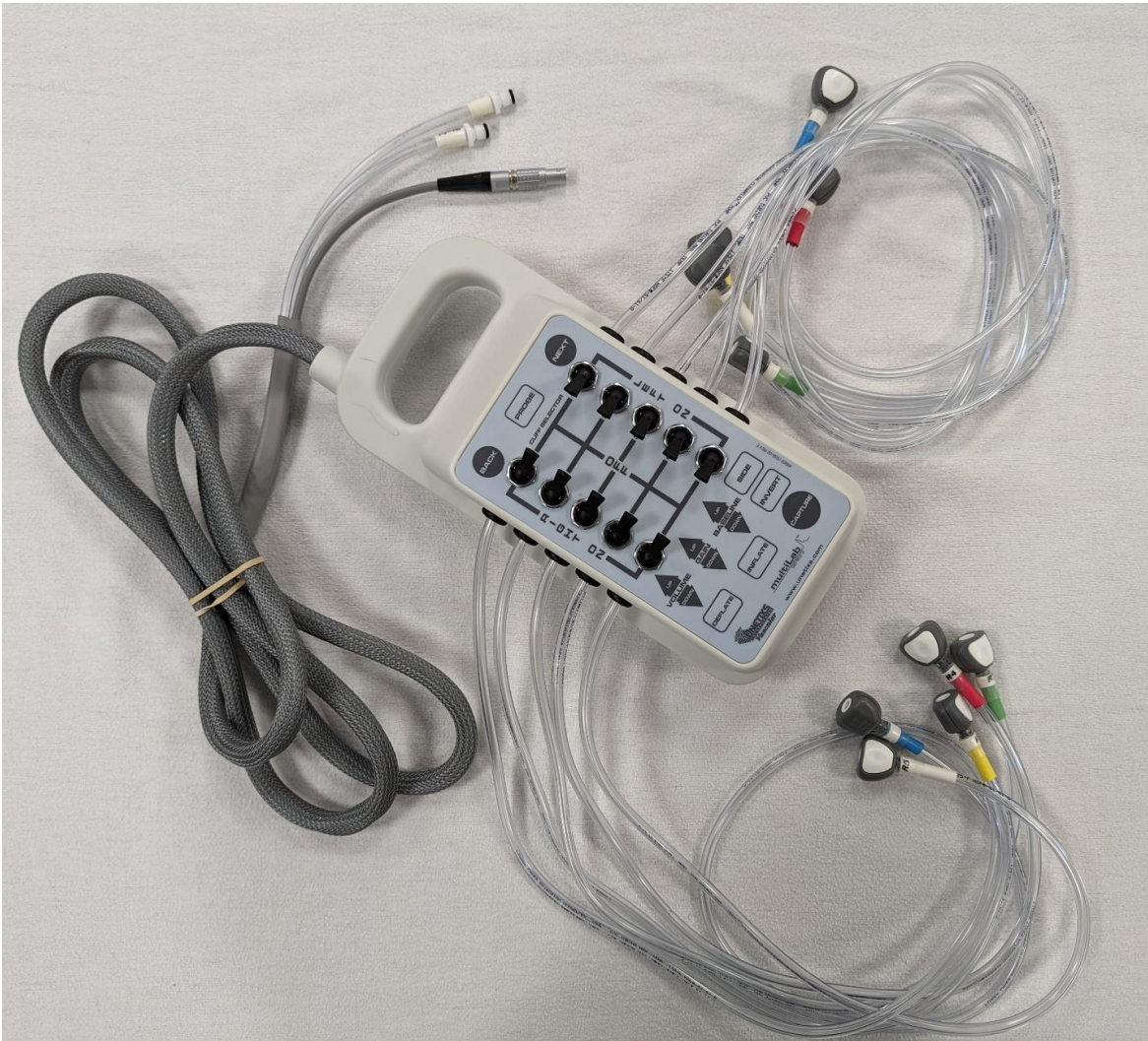


Figure 24

*Unetixs Vascular, Inc.
Ass’y, Molded 2CP Manifold (MCM)*

Test / Calibration Procedure

11972-0006-01 Rev C

1.0 Test Equipment Checklist

- 1.1 Gather all the test equipment needed and copy down their control numbers. Check Calibration/Maintenance due date from the equipment.

Equipment Name	Control # / Serial # / Lot #
Basic S2 CP w/ Remote & USB Ass’y (SBR) (Unetixs 11905-0000-01) or equivalent	

2.0 Test

- 2.1 Connect Molded 2CP Manifold (11972-0000-01, MCM) to the 2CP Chassis (11905-0000-01) by connecting the LEMO connector to the port marked as “CTRL” on 2CP Chassis front panel and attaching the MCM Left and Right hoses to the L and R on the 2CP Chassis front panel. Make sure all valve switches are toward the center.
- 2.2 Turn 2CP on. Click **Studies --- Lower Arterial Studies --- LA Segmental Pressures with PVR --- Exit**. Click “**Right Metatarsal PVR waveform**” and “**BACK**”. The PVR test interface will appear on the screen. Set the gain to **16** (.188mmHg/20mm).
- 2.3 *Leakage Test:* Turn the valve switches **R1 & L1** on. **Block** off R1 & L1 hoses. Click **Inflate** while keeping R1 & L1 hoses blocked. Verify that the PVR baseline on screen stays between **15 and 20**. Turn the valve switches **R1 & L1** off.
- 2.4 Repeat Step 2.3 for the rest of hoses: R2-L2, R3-L3, R4-L4, and R5-L5.
- 2.5 *Blockage Test:* Turn the valve switches **R1 & L1** on. Click “**Inflate**” to verify that the air is passing through the R1 & L1 hoses without any hesitation.
- 2.6 Repeat Step 2.5 for hoses: R2- L2, R3- L3, R4- L4, and R5- L5.
- 2.7 Exit to Main Menu. Disconnect all the accessories and shutdown the 2CP.

End of Test

Pass/Fail: _____

Test Performed By: _____ Date: _____

Assembly Procedure

Step 1 Assembly

1.1. Power Requirements

- 1.1.1. Check WOPL 20 Page 1 for power requirements. If it is 110V, go to Step 1.2.
- 1.1.2. Remove the fuse holder from the power entry module of the 2CP chassis (11905-0000-01). Install (2) 3.15 Amp AG Fuses (10649-0315-01) into the fuse holder as shown in Figure 1. Remove the single fuse from the other side and discard.

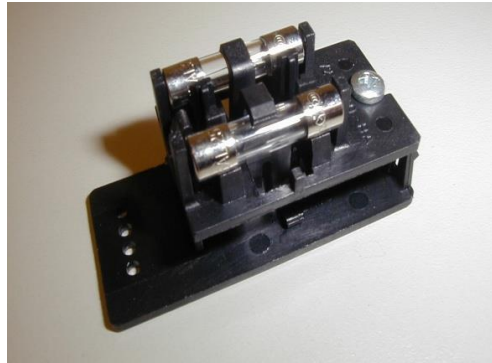


Figure 1

- 1.1.3. Remove the card from the power entry module. Rotate and re-insert the card to 220v as shown in Figure 2.



Figure 2

- 1.1.4. Replace the fuse holder. Make sure the two fuses are toward the inside of the power entry module.

1.2. Cart (11971-0000-01)

- 1.2.1. Check WOPL for 2CP Cart option 11971-0000-01 (2CP Molded Cart Ass'y). If not, skip to Step 1.3.
- 1.2.2. Install the Printer's power supply and/or cord into the cart. Refer to the cart assembly for specific instructions (11971-0003-01).
- 1.2.3. Check WOPL 20 Page 1 for power requirements. If it is 110V, go to Step 1.3.
- 1.2.4. From 2CP cart base (40002-2064-01), remove the (2) screws (20082-0014-01), (2) lock-washers (20002-1032-01) and (2) nuts (20003-1024-01), as shown in Figure 3, to detach the power strip (10357-0005-01). Remove the power strip (10357-0005-01) from the base (discard the power strip). Keep the hardware for later use.
- 1.2.5. Place the 220V power strip into the base housing. Refer to the cart assembly for specific instructions (11971-0003-01). *Note: Use the hardware from Step 1.2.4.*

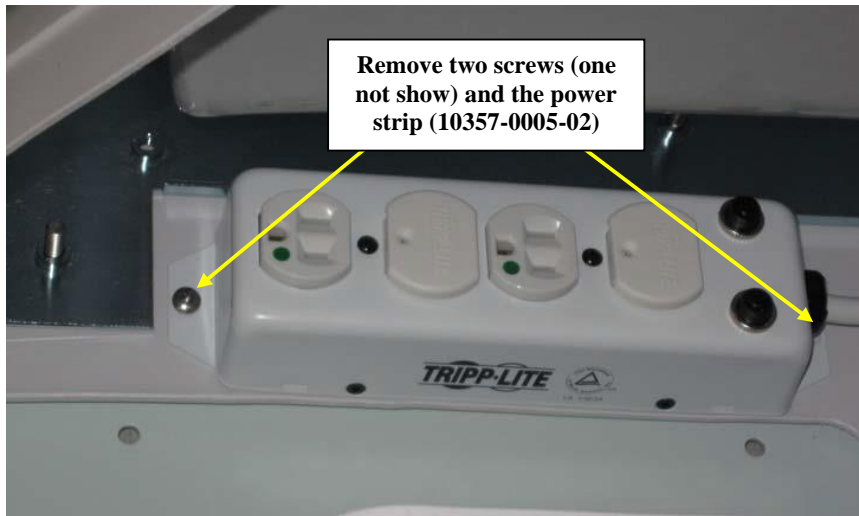


Figure 3

1.3. ACS Power Cable

- 1.3.1. Check WOPL for Auto Cuff Selector (11948-0000-01) option. If not skip to step 1.4.
- 1.3.2. Cut the connector end off from the AC Adapter (10378-0004-01).
- 1.3.3. Disassemble the 3 Pin Inline DIN connector (10549-0001-01) as shown in figure. Place plastic strain relief (A in Figure 4) of the DIN connector over the cable of the AC adapter.

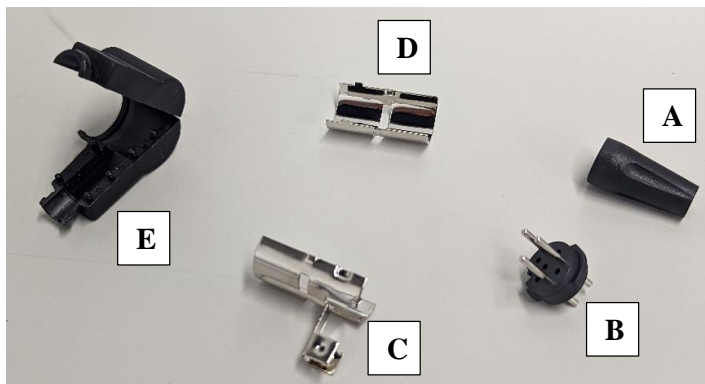


Figure 4

- 1.3.4. Solder the wires of the AC adapter to the 3 pin DIN (B in Figure 4 & Figure 5).
AC adapter positive wire – Pin 1
AC adapter negative wire – Pin 3

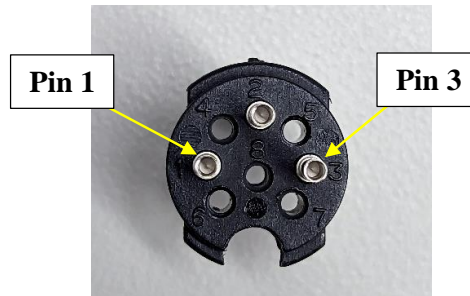


Figure 5 – Item B

- 1.3.5. Crimp the metal strain relief (C in Figure 4) over the cable and then attach metal sleeve (D in Figure 4) to the DIN connector.
- 1.3.6. Place the plastic housing (E in Figure 4) onto the metal strain relief and sleeve. Attach plastic strain relief (A in Figure 4) over plastic housing.

1.4. Cart (10355-0005-01)

- 1.4.1. Check WOPL for 2CP cart option 10355-0005-01 (2CP Cart, Better Enterprise). If not skip to step 1.5.
- 1.4.2. When installing any parts of the cart in the following steps, ensure that each piece is level once installed and any screws are tightened well enough to prevent the pieces from moving once attached. When tightening pieces with clamps, try to tighten both sides of clamp equally, this will ensure the piece is straighter and more level on the cart.

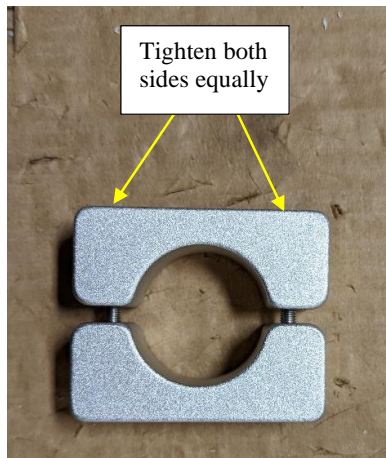


Figure 6

- 1.4.3. Attach pole (10355-0005-02) to the base (10355-0005-19) using a M10x40 screw (10355-0005-12), M10 spring washer (10355-0005-11), and M10 flat washer (10355-0005-10). Ensure the knob used for height adjustments is facing front. See Figure 7 for reference.



Figure 7

- 1.4.4. Attach the printer shelf (10355-0006-01) using clamp, two M5 x12 screws, two M5 spring washer, and two M5 flat washer (hardware comes with shelf). Attach about 1" from bottom as shown in Figure 8. Ensure the shelf is facing the front of the cart.



Figure 8

- 1.4.5. Attach the basket (10355-0005-03), using clamps and four M5 x 25 screws, 5" from top lip of pole as shown in Figure 9. Ensure the basket is facing the front of the cart.

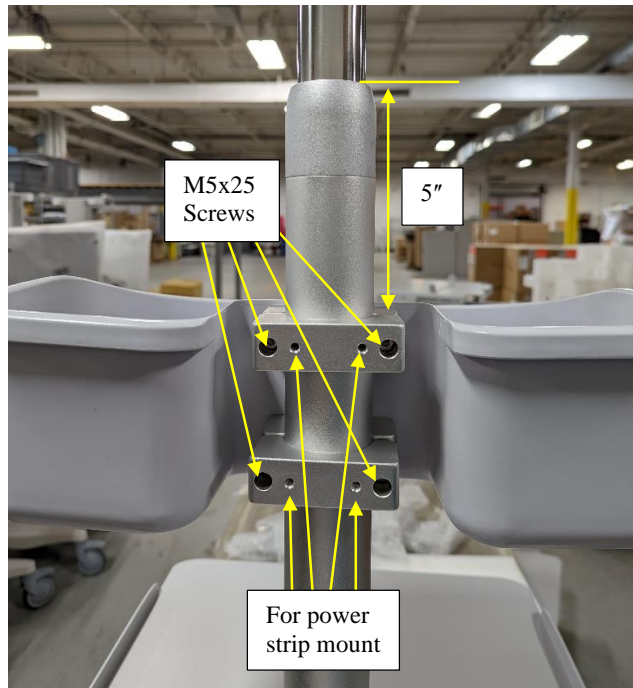


Figure 9

- 1.4.6. Attach power strip mount (10355-0005-27) to basket clamps with four M5 x 12 screws (10355-0005-17). See Figure 9 and Figure 10 for reference.



Figure 10

- 1.4.7. Attach tabletop with keyboard tray (10355-0005-06) to adapter plate (10355-0005-04) on top of the pole with four M8 flat washers (10355-0005-13), four M8 spring washers (10355-0005-14), and four M8 hex nuts (10355-0005-15). Ensure the keyboard tray is facing the front of the cart.

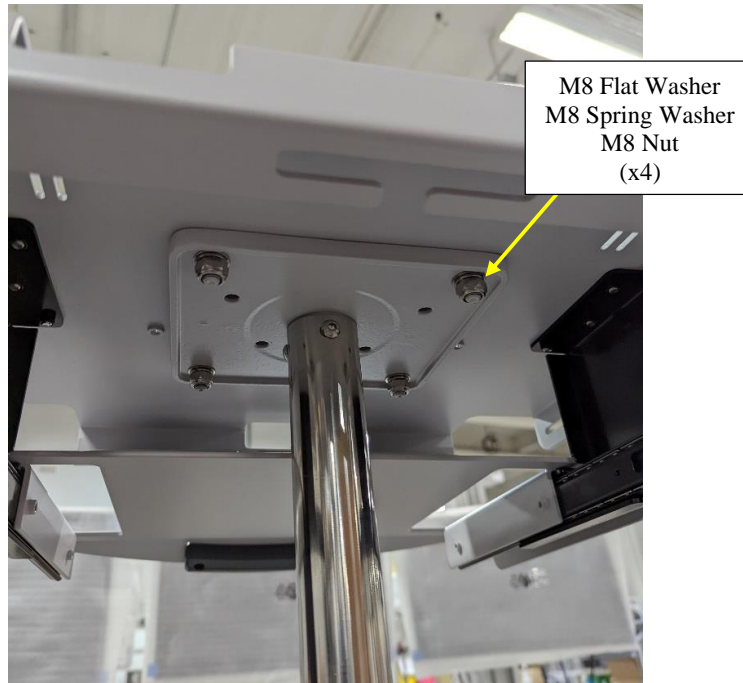


Figure 11

- 1.4.8. Attach the handle (10355-0008-01) about 3 ½” from the adapter plate using the provided clamp and M5 x 12 flat head screws.

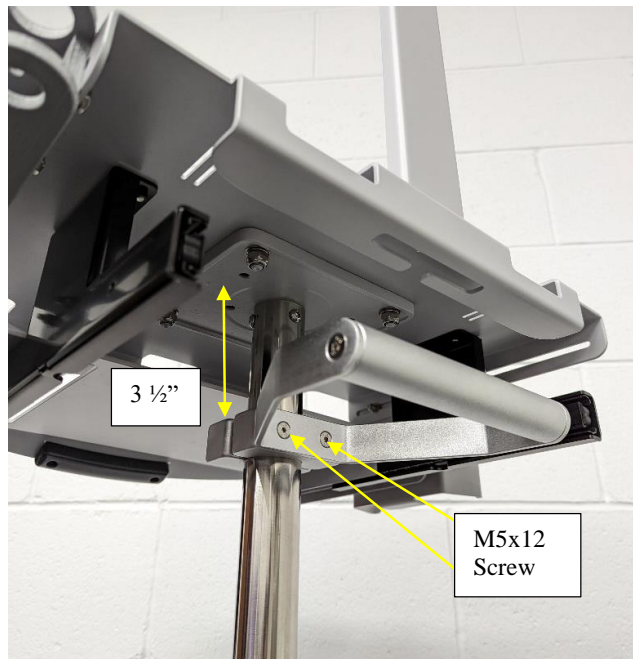


Figure 12

- 1.4.9. Attach 2CP mounting bracket (10355-0005-07) to the top of the tabletop with keyboard tray using two M5 x 8 flat head screws (10355-0005-18). Ensure that the 2CP chassis (11905-0000-01) fits securely in the mounting bracket. If necessary, carefully bend the tabs to ensure a good fit.

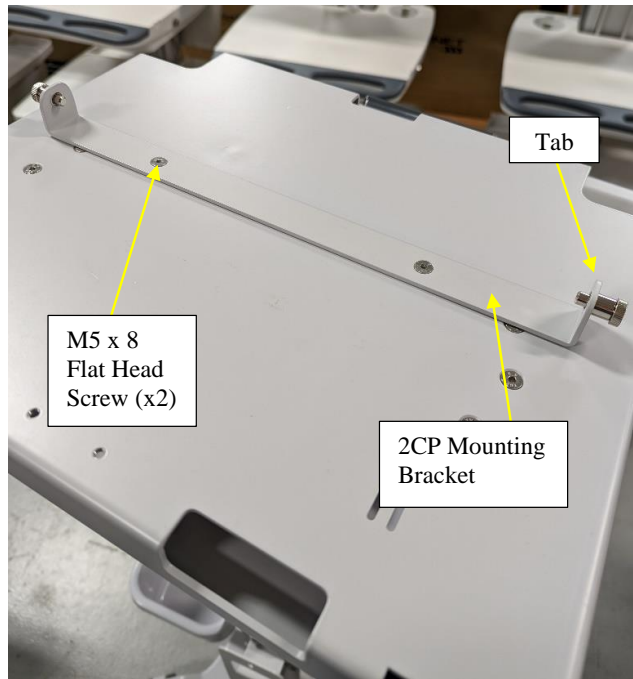


Figure 13

1.4.10. Attach the hose bracket (10355-0005-28) to the back side of the tabletop with keyboard tray using four M5 x 8 pan head screws (10355-0005-29).

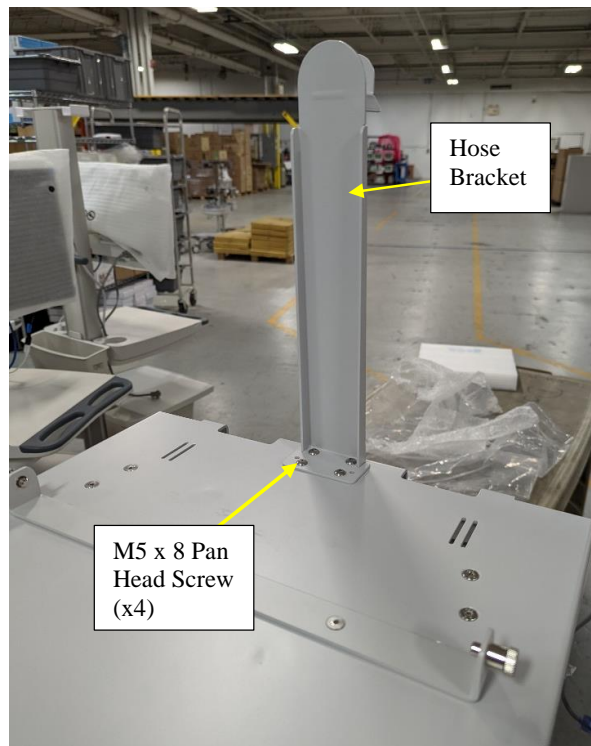


Figure 14

1.4.11. Check WOPL for SEM bracket (10355-0007-01) or ACS bracket (10355-0009-01) option.

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If SEM bracket: Attach the front handle (10355-0010-01) to front of tabletop tray with SEM bracket mounted on the front left of the tabletop and the Doppler gel holder (10355-0005-23) mounted on the front right of tabletop. See Figure 15 & Figure 17 for reference.

If ACS bracket: Attach the front handle (10355-0010-01) to front of tabletop tray with ACS bracket mounted on the front right of the tabletop and the Doppler gel holder (10355-0005-23) mounted on the front left of tabletop. See Figure 16 & Figure 17 for reference.

Attach SEM bracket using the provided hardware.

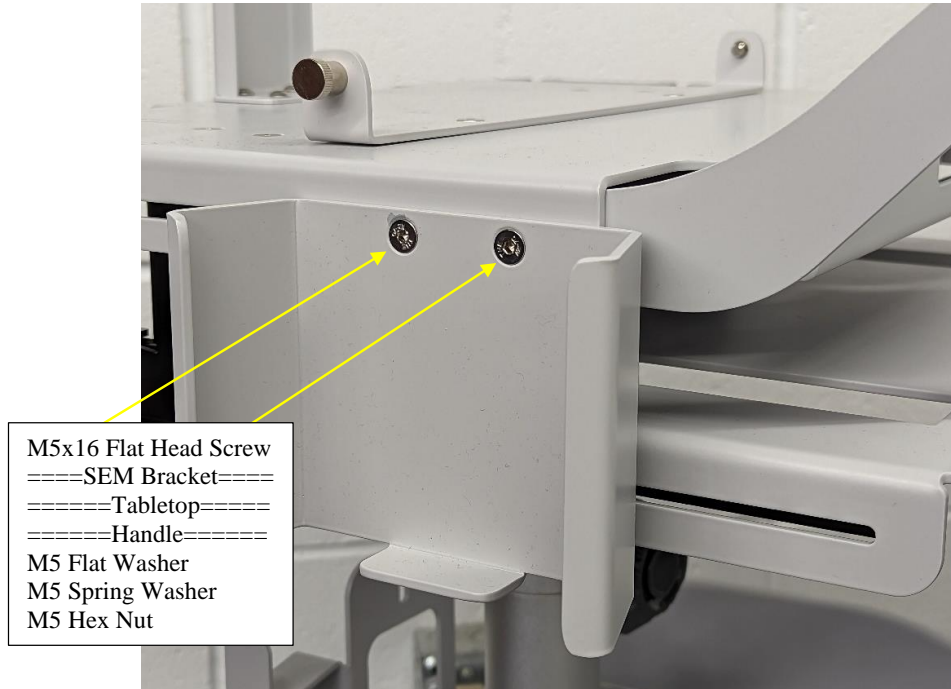


Figure 15 – SEM Bracket Mounting

Attach ACS bracket using the provided hardware.

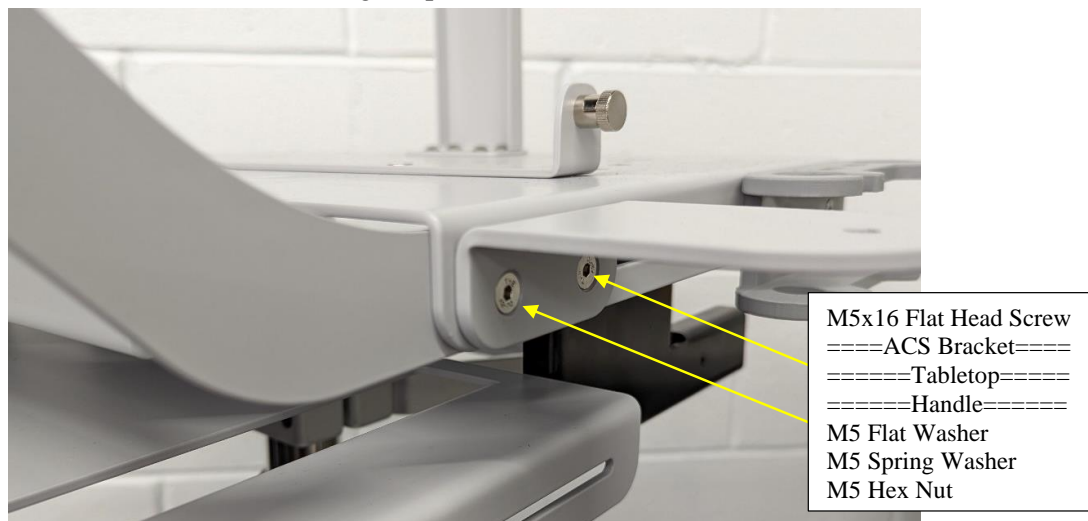


Figure 16 – ACS Bracket Mounting

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Attach doppler gel holder using two M5 x 16 screws (10355-0005-23), two M5 flat washers (10355-0005-24), two M5 spring washers (10355-0005-25), and two M5 hex nuts (10355-0005-26).

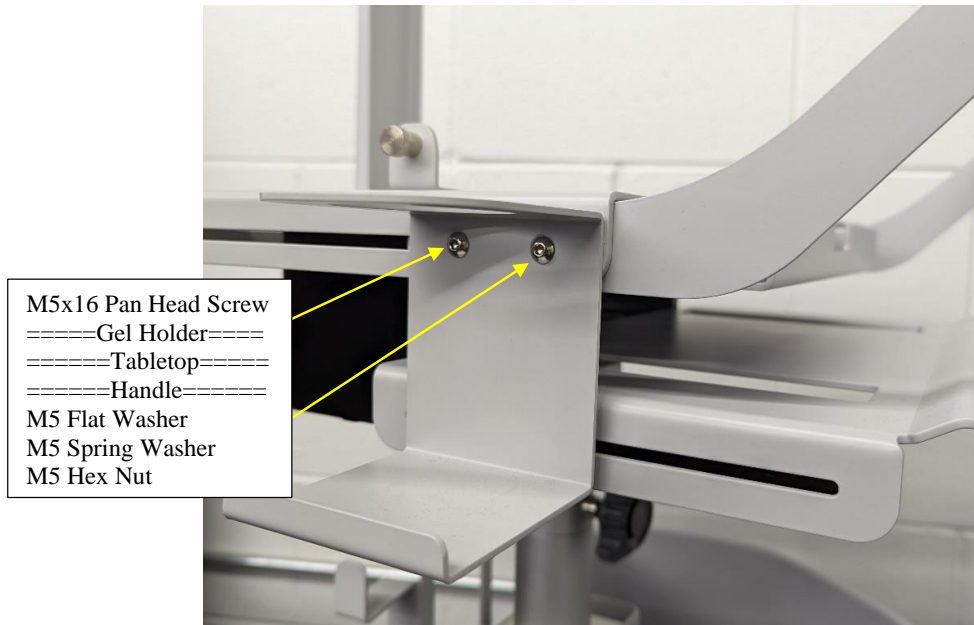


Figure 17 – Doppler Gel Holder Mounting

1.4.12. Attach doppler/ppg holder (40001-1005-02) to right back side of the tabletop using two 10-32 x 5/8 PH flat screws (20097-0010-01), two #10 lock washers (20002-1032-01), two #10 flat washers (20017-0010-01), and two 10-32 nuts (20003-1032-01).

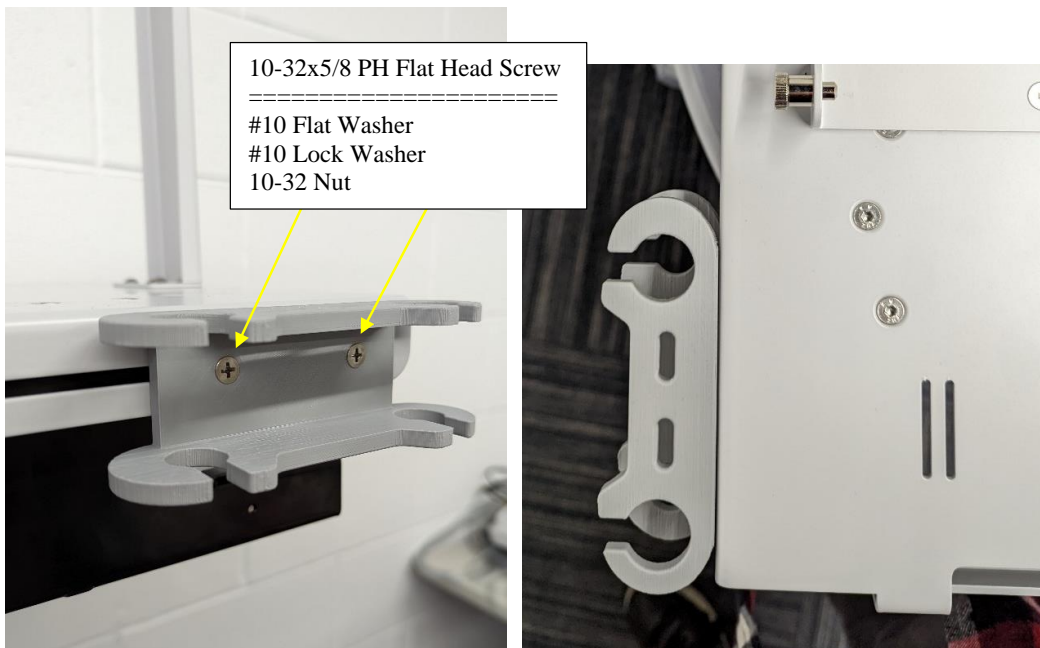


Figure 18

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- 1.4.13. Attach power strip (10357-0005-02) to the power strip mount using two 10-32 x 3/8" Pan Hd PH screws (20032-0006-01), two #10 lock washers (20002-1032-01), two #10 flat washers (20017-0010-01), and two 10-32 nuts (20003-1032-01).

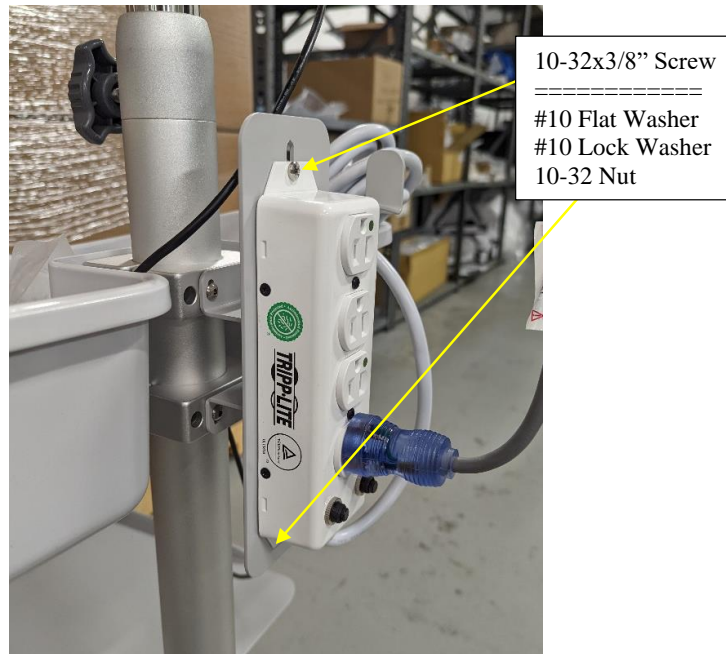


Figure 19

- 1.4.14. See Figure 20 and Figure 21 for reference. Take the USB printer cable (10326-0006-01), line cord (10629-0003-01), and ACS power cable (if applicable) and starting from the back underside of the tabletop, leave the following approximate length of each cable hanging out. Tuck excess wire under tabletop and secure with 2 Velcro straps (10683-0003-01), about 6" in length each.

- Line Cord – Tabletop to chassis – 9"
- Line Cord – Tabletop to power strip – 30"
- USB Printer Cable – Tabletop to chassis – 9"
- USB Printer Cable – Tabletop to printer – 53"
- ACS Power Cable – Tabletop to ACS – 14"
- ACS Power Cable – Tabletop to power strip – 22"

Connect the power cord and ACS power cable (if applicable) to the power strip.

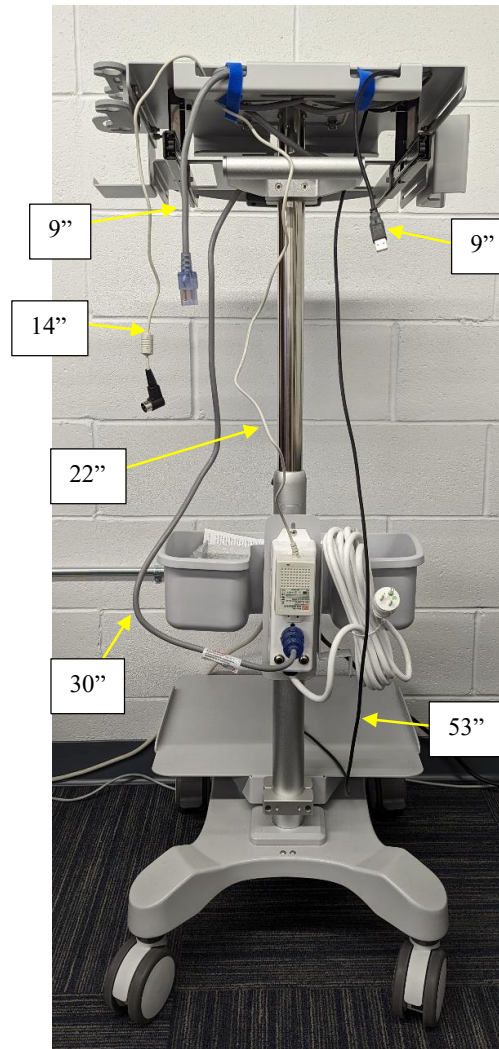


Figure 20



Figure 21

- 1.4.15. Attach Roodra Computer Logo Label (40003-3000-01) to front right of tabletop as shown in Figure 22.



Figure 22

- 1.4.16. Place provided Allen wrenches in basket. If they are no longer in their original packaging, place them in a plastic bag.

1.5. Prepare the Remote

- 1.5.1. Install the (2) 1.5V AAA Batteries (10686-0000-01) into the Remote Control Transmitter (10377-0000-01) as shown in Figure 23.
- 1.5.2. Secure the 1/8" Thick Rubber Magnet (20072-0000-01) material to the bottom of the Remote Control Transmitter per SOP-30-028 as shown in Figure 23 using CA4 or equivalent.

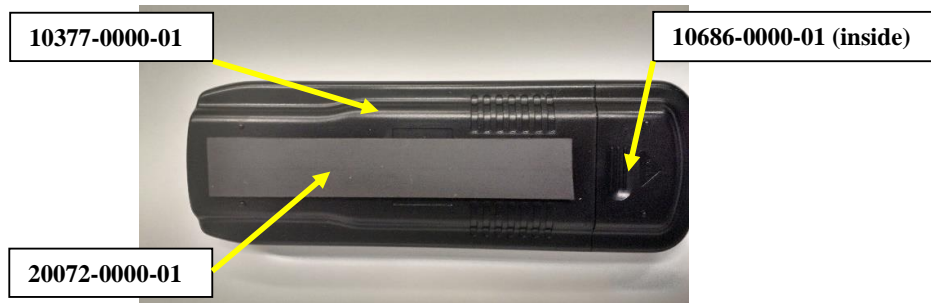


Figure 23

1.6. Serial Number



Figure 24

- 1.6.1. Turn on the 2CP and in the S2 software select **Setup --- Yes --- System Setup --- System Data**. Click **Next** until you reach **Vascular Module**. If it is set to **1**, the serial number should have a “**R**” designator at the end. If it is set to **3**, the serial number should have a “**S**” designator at the end. Check that the information on the WOPL correctly matches this.
- 1.6.2. Apply Serial Number Label (40002-2040-05) information on to the label per SOP-30-003. Attach label to the back of unit above the Ethernet connection as shown in Figure 24.
- 1.6.3. Create UDI Label per SOP-30-026. Attach label to the back of unit as shown in Figure 24.
- 1.6.4. Connect the USB keyboard (10304-0005-02/10304-0006-01) and line cord (10629-0003-01) to the 2CP Chassis (11905-0000-01). Turn the chassis on. When the Unetixs Main Menu appears, click “**Exit**”.
- 1.6.5. Right-click “**My PC**” on the desktop and click “**Properties**”. Go to the “**Computer name, domain, and workgroup settings**” section (near the bottom of the window) and click “**Change settings**”. A “**System Properties**” window will show. Select the “**Computer Name**” tab and click “**Change**”.
- 1.6.6. Update the computer name field to the serial number of the system (check the WOPL) and click “**OK**” --- “**OK**” --- “**X**” (to close window) --- “**Restart Now**” to restart the system. The Unetixs Main menu screen should appear.

1.7. DICOM (11952-0000-01) Installation

- 1.7.1. Check WOPL 20 to see if True DICOM 3 Networking Package (11952-000-01) is included. If not, skip to Step 1.8.
- 1.7.2. From the Unetixs Main Menu, click “**Setup**” --- “**Yes**” --- “**System Setup**” --- “**System Data**” and then press “**Enter**” 37 times until “**Import Control**” shows on the screen. Type in “**C:\programs\DICOMMWL**”, then press “**Enter**”.
- 1.7.3. Click “**Exit**” four times to Windows Desktop. Double click “**Unetixs DICOM**” icon on the Desktop.

- 1.7.4. Click the “**Identifier**” tab. Enter the 2CP-R Serial Number (from the WOPL such as “MLS2C1001”). Do not include the trailing “**R**” or “**S**” character.
- 1.7.5. Click on “**Generate Product Code**”. Write down the letters of the given product code and make sure it is consisted of 8 letters. **DO NOT PRESS ANY KEYS.**
- 1.7.6. Bring this Product Code along with the WOPL to obtain a pass-code and license number from IT or Engineering. Move the cursor to the “**pass-code**” field and type in the pass-code (**DO NOT CLICK “ENTER”**).
- 1.7.7. Click “**Set Machine UID**”. The license number given will appear in the UID field. Click “**OK**”. If it does not appear, repeat Steps 1.7.5 through 1.7.7.
- 1.7.8. Enter the license number on the WOPL as Lot Number for DICOM.

1.8. Install the appropriate printer driver based on the printer model and the 2CP system compatibility per SOP-30-023.

1.9. Install Study Configuration and UnetView Networking

- 1.9.1. Check Page 1 of WOPL 20 for a “Preloaded Study Configuration” and check Page 3 for a UnetView Networking Package (11950-0000-01). If none of them are included, skip to 1.10. Otherwise, see IT or Engineering for instructions.

1.10. ACS settings for S2

- 1.10.1. Check WOPL for Auto Cuff Selector (11948-0000-01). If present, launch S2 program. From the main menu select **Setup --- Yes --- System Settings --- System Data**. Set Auto Cuff Select to **Yes**. If not included, skip to Step 2

Step 2 Test and DICOM Worksheet Instructions

- 2.1. Test the 2CP Chassis Ass’y (11905-0000-01) and all applicable accessories per Test / Calibration Procedure 11996-0006-01.
- 2.2. Follow the instructions below to configure the DICOM if DICOM (11952-0000-01) is on the WOPL and there is a DICOM Worksheet attached to the WOPL.
 - 2.2.1. Exit to the Windows desktop. Double click “**Unetixs DICOM**” icon.
 - 2.2.2. On the SCP page, enter the information from the DICOM worksheet in Sections B5, B6, B7, C1, C2, C3 and C4 as shown in Figure 25.

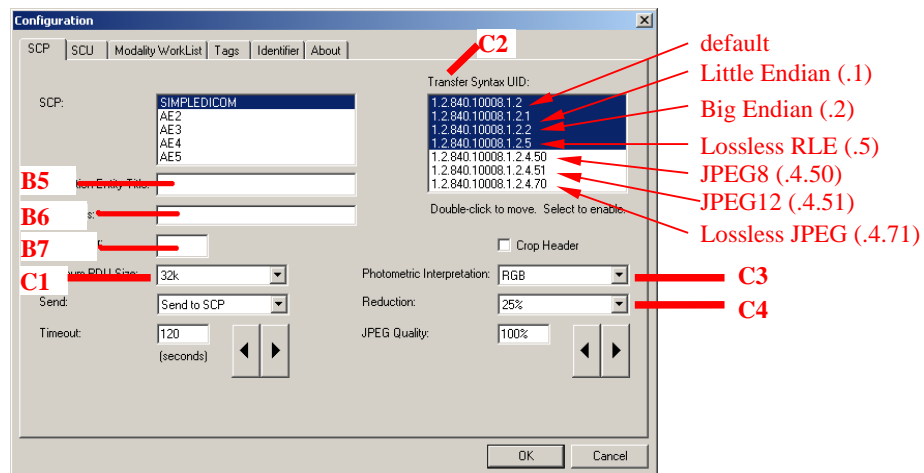


Figure 25

2.2.3. Click the “SCU” tab.

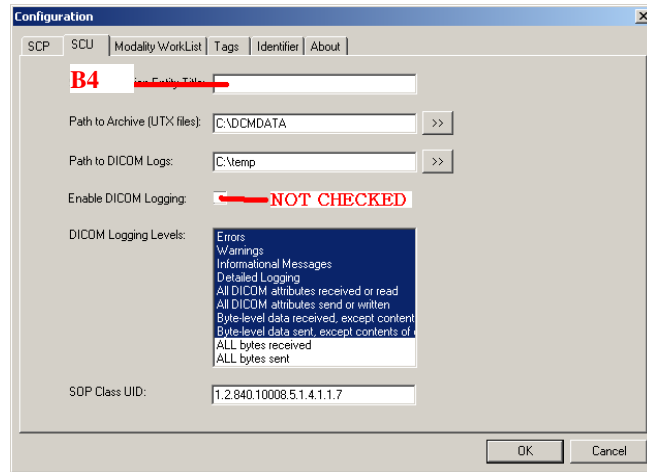


Figure 26

2.2.4. Enter the information from the DICOM worksheet in Section B4 as shown in Figure 26.

2.2.5. Ensure the “Enable DICOM Logging” box is not checked.

2.2.6. Click the “Modality Worklist” tab.

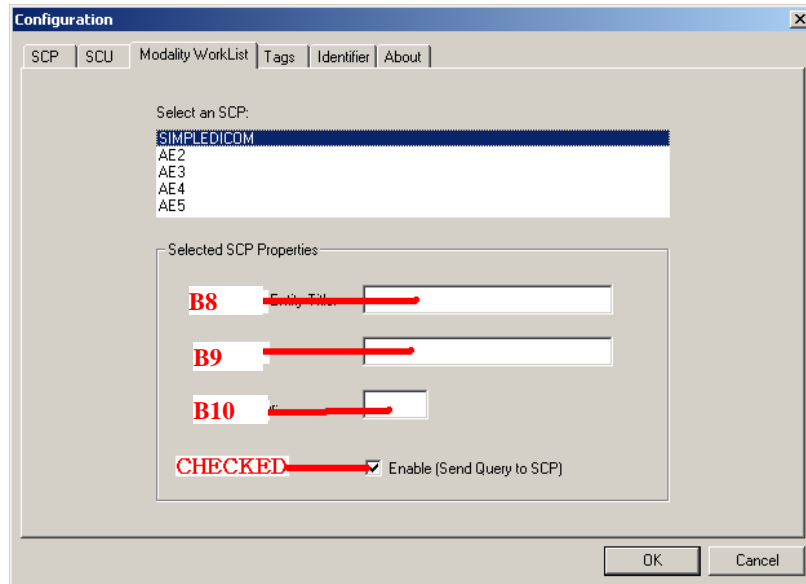


Figure 27

2.2.7. Enter the information from sections B8, B9, and B10 from the DICOM worksheet as shown in Figure 27.

2.2.8. Ensure the “Enable” box is checked.

2.2.9. Click the “SR” tab.

2.2.10. Enter the information from sections B11, B12, and B13 from the DICOM worksheet as shown in Figure 28.

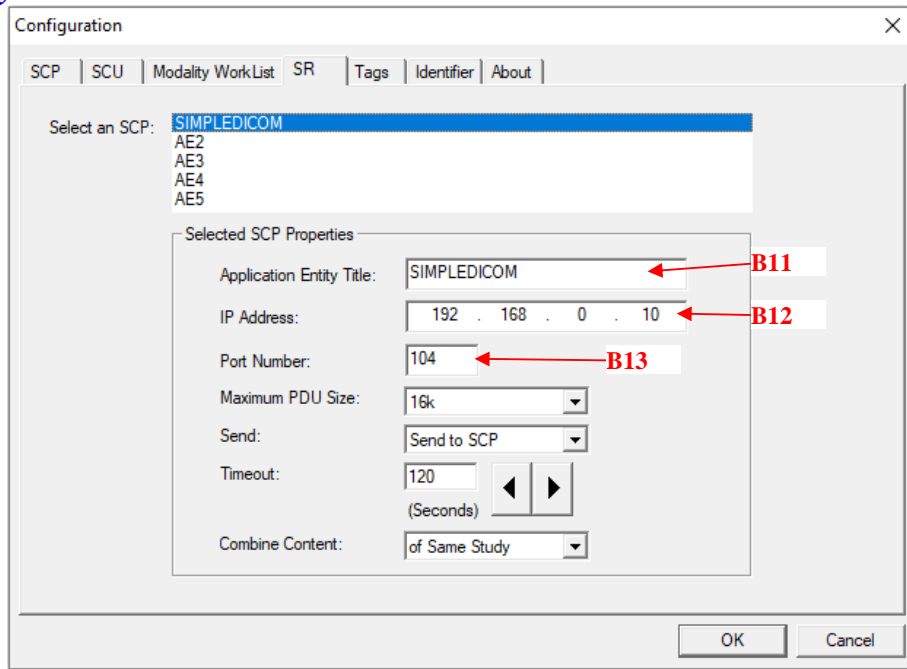


Figure 28

2.2.11. Press the “OK” button.

Step 3 Packaging

Prepare the 2CP-R Chassis Ass’y (11905-0000-01), the optional 2CP Molded Cart Ass’y (11971-0000-01) or 2CP Cart, Better Enterprise (10355-0005-01) and all applicable accessories for shipping.

3.1. Pack the Printer.

- 3.1.1. Repack the printer into its original packaging and seal the box.
- 3.1.2. Apply a Fragile 3x5 Label (20007-1003-01) to the top.

3.2. Pack the 2CP Module Box Set Accessories Box (part of 2CP Module Box Set (10695-0003-01)).

Pack the following items into the box. This list is inclusive. Pack only the ones that apply to the WOPL you are working on.

Note 1: Figure 29 through Figure 37 and Steps 3.2.1 through 3.2.10 are for illustration purposes / reference only. Any reliable method of packing the 2CP Module Box Set Accessories Box is acceptable.

Part Number	Description
10638-0000-01	Deskjet Paper
11300-0000-01	Manual, Operators Series2 PM 03
10339-0007-04	Manual, Daigle Vascular & CME 4 th Edition
11306-0000-01	Service Manual
F03 01	Acknowledgement of Acceptance
10635-0001-01	Scotch 667 Double Coated Tape
PM 08	Manual, Service S2

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Part Number	Description
11962-0000-01	Ass'y, TruDop 5 Doppler (TD5)
11963-0000-01	Ass'y, TruDop 8 Doppler (TD8)
10628-0001-01	Ultrasonic Doppler Gel (250 ml)
11930-0000-01	Doppler Cable, Straight VP (VPC)
11928-0000-01	Left Finger Clip Ass'y
11929-0000-01	Right Finger Clip Ass'y
11938-0000-01	Left Green PPG Ass'y
11939-0000-01	Right Yellow PPG Ass'y
11965-0000-01	LHS Doppler/PPG Holder Ass'y (LDP)+
11966-0000-01	ACS Bleed Valve Ass'y (ABV) (x2)
11967-0000-01	SEM Bleed Valve Ass'y (SBV) (x2)
11968-0000-01	S2 Left Cuff Ass'y (LCH)
11969-0000-01	S2 Right Cuff Ass'y (RCH)
10377-0000-01	Remote Control Transmitter
10686-0000-01	Battery, Alkaline, 1.5V AAA
10304-0005-02	Mini USB Keyboard w/ Trackball
10304-0006-01	Keyboard, w/ touchpad Med. Grade
10629-0003-01	Line Cord, 10ft. Gray Med. Grade
11948-0000-01	Auto Cuff Selector Ass'y (ACS)
11980-0000-01	Left 6 Tube Aqua 8' Hose Ass'y (SAH)
11981-0000-01	Right 6 Tube Grey 8' Hose Ass'y (SGH)
11972-0000-01	Molded 2CP Manifold Ass'y (MCM)
40002-2047-01	Doppler Gel Holder
10326-0006-01	6' USB Printer Cable
10632-0010-01	SC10, Blood Pressure Cuff(s)
10632-0012-01	SC12, Blood Pressure Cuff(s)
10633-0025-02	PC2.5 Digit Pressure Cuff(s)
10632-0012-02	SC-12L Long Blood Pressure Cuff(s)
10632-0007-01	TMC-7 Transmetatarsal Cuff(s)
10634-0017-01	CC-17 Blood Pressure Cuff(s)
10684-0003-01	Cover, 2CP Cart
11951-0000-01	CP-105 Temperature Gun Ass'y (TMP)
10346-0000-01	Telephone Cable for Temp. Gun

3.2.1. Wrap the MCM (11972-0000-01) in a 16 x 20 plastic bag.



Figure 29



Figure 30



Figure 31

- 3.2.2. Place the Doppler cable (11930-0000-01) into a 4 x 6 bag.
- 3.2.3. Remove the (2) 1.5V AAA Batteries (10686-0000-01) from the Remote Control Transmitter (10377-0000-01) and place both into a 6 by 9 plastic bag.

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- 3.2.4. Place the left clip (11928-0000-01) with the green PPG cable (11938-0000-01) into a 6 x 9 plastic bag.
- 3.2.5. Place the right clip (11929-0000-01) with the yellow PPG cable (11939-0000-01) into a 6 x 9 plastic bag.
- 3.2.6. Place the blood pressure cuffs PC-2.5 (10633-0025-02) into a 6 x 9 plastic bag.
- 3.2.7. Place the Doppler gel (10628-0001-01) into a 6 x 9 bag.
- 3.2.8. Place the Doppler's (11962-0000-01 and/or 11963-0000-01) into the box.
- 3.2.9. Place the other bags and accessories into the 2CP Module Box Set Accessories Box.



Figure 32



Figure 33



Figure 34



Figure 35

3.2.10. Fill a 24 x 30 bag with peanuts. Place over the top of the accessories and seal the 2CP Module Box Set Accessories Box.



Figure 36



Figure 37

3.3. Pack the 2CP-R Chassis Ass'y (11905-0000-01)

3.3.1. Examine 2CP-R Chassis for cleanliness and make sure all labels are in place.



Figure 38

3.3.2. Place the USB flash drive (10383-0001-01) into a 3 x 4 plastic bag. Place into the handle area.

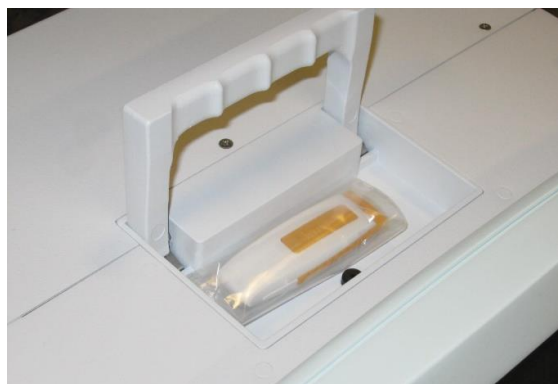


Figure 39

3.3.3. Wrap the 2CP-R Chassis using 24 x 30 in bag.



Figure 40

3.3.4. Tape the 2CP Module Box Set Outer Box (part of 2CP Module Box Set) to close the bottom side and add the 2CP Module Box Set Bottom Foam (part of 2CP Module Box Set) to the bottom of the box.

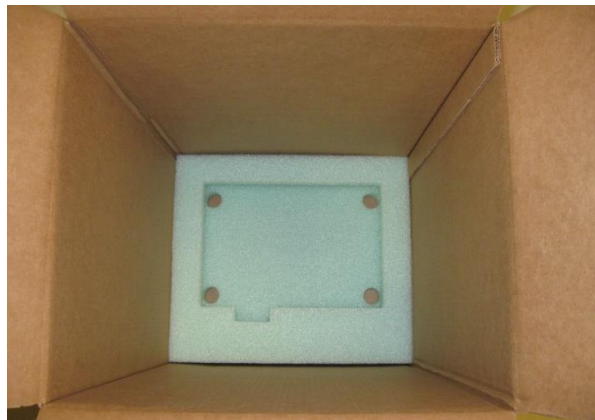


Figure 41

3.3.5. Place the 2CP chassis into the 2CP Module Box Set Outer Box on top of the 2CP Module Box Set Bottom Foam.



Figure 42

3.3.6. Place the 2CP Module Box Set Top Foam (part of 2CP Module Box Set), letting the monitor stick out through the cutout on the front.



Figure 43

3.3.7. Place the 2CP Module Box Set Accessories Box on top of the 2CP Module Box Set Top Foam and seal the box.



Figure 44



Figure 45

3.3.8. Place Fragile 3x5 Label (20007-1003-01) on the top of the 2CP Module Box Set Outer Box.



Figure 46

3.4. Pack the 2CP Molded Cart Ass'y (11971-0000-01)

- 3.4.1. Check WOPL for 2CP Molded Cart Ass'y option (refer to as cart). If not, skip to step 3.5. Examine cart for cleanliness and make sure all labels are in place.



Figure 47

- 3.4.2. Remove the cart's top shelf assembly from the pole assembly by removing the hardware as shown in Figure 48 and then put the hardware back in these (7) locations (loose fit).

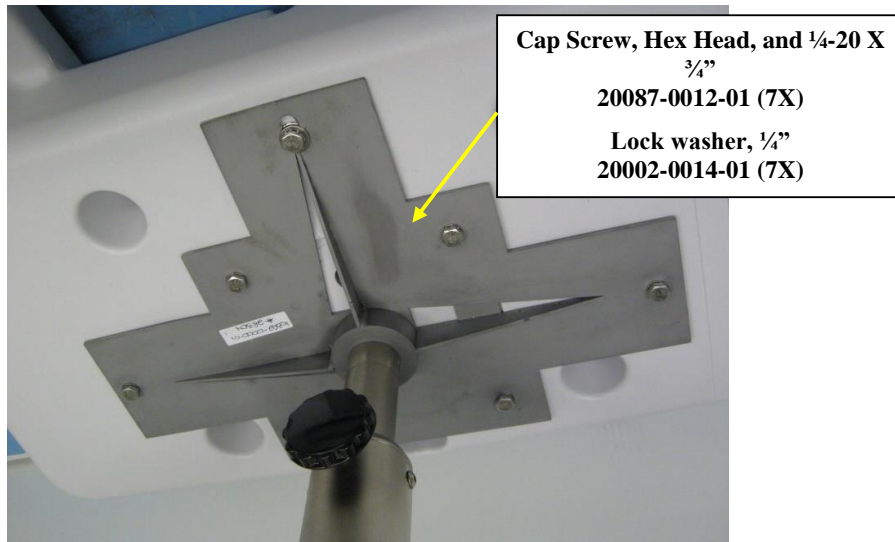


Figure 48

- 3.4.3. Clean the cart's top shelf assembly with Windex.
- 3.4.4. Place the cart's top shelf assembly in a 24" X 30" clear plastic bag.



Figure 49

- 3.4.5. Place (1) piece of 2CP/Revo Cart Box Set Top Shelf Thick Foam (part of 2CP/Revo Cart Box Set (10664-0004-01)) in the bottom of the 2CP/Revo Cart Box Set Top Shelf Box (also part of 2CP/Revo Cart Box Set).



Figure 50

- 3.4.6. Place (2) pieces of 2CP/Revo Cart Box Set Top Shelf Thin Foam (part of 2CP/Revo Cart Box Set) into the sides of the 2CP/Revo Cart Box Set Top Shelf Box.



Figure 51

3.4.7. Put the cart's top shelf assembly into the 2CP/Revo Cart Box Set Top Shelf Box.



Figure 52

3.4.8. Put another piece of 2CP/Revo Cart Box Set Top Shelf Thick Foam between the cart's top shelf assembly and the 2CP/Revo Cart Box Set Top Shelf Box to protect the Top Shelf Mounting Plate.

3.4.9. Put a third piece of 2CP/Revo Cart Box Set Top Shelf Thick Foam into the 2CP/Revo Cart Box Set Top Shelf Box then seal the box.



Figure 53



Figure 54

3.4.10. Remove the cart's pole assembly from its base assembly by removing the hardware as shown. Put the hardware back on the pole as shown.



Figure 55

- 3.4.11. Clean the cart's pole assembly with Windex.
- 3.4.12. Compress the cart's pole assembly all the way and secure in place with the knob.
Then place the pole assembly in a 24" X 30" clear plastic bag.



Figure 56

- 3.4.13. Place 2CP/Revo Cart Box Set Top Pole Foam and 2CP/Revo Cart Box Set Bottom Pole Foam pieces (both part of 2CP/Revo Cart Box Set) onto the cart's pole assembly as shown (see Figure 57).



Figure 57

- 3.4.14. Put the cart's pole assembly into the 2CP/Revo Cart Box Set Pole Box (part of 2CP/Revo Cart Box Set) as shown. The 2CP / Revo Cart Box Set Top Pole Foam piece will be at the bottom of the box. Seal the bottom of the box.



Figure 58

- 3.4.15. Clean cart's base assembly and wheels with Windex.

- 3.4.16. Wrap (2) tie wraps (20008-0011-01), along with cords, in bubble wrap and place cords and accessories in side compartment of cart's base assembly as shown.



Figure 59

- 3.4.17. Put 2CP/Revo Cart Box Set Printer Tray Foam piece (part of 2CP/Revo Cart Box Set) on top of the cart's printer tray. Place the cart's entire base assembly in a large plastic bag.
- 3.4.18. Insert 2CP/Revo Cart Box Set Pole Box into the 2CP/Revo Cart Box Set Base Resting Station (part of 2CP/Revo Cart Box Set). See Figure 60.
- 3.4.19. Place the 2CP/Revo Cart Box Set Base Resting Station into 2CP/Revo Cart Box Set Outer Box (part of 2CP/Revo Cart Box Set). Make sure the 2CP/Revo Cart Box Set Base Resting Station is in the correct position with respect to the 2CP/Revo Cart Box Set Outer Box.
- 3.4.20. Place the 2CP/Revo Cart Box Set Pole Blocking Cardboard (part of 2CP/Revo Cart Box Set) between the open end of the 2CP/Revo Cart Box Set Pole Box and the 2CP/Revo Cart Box Set Outer Box.



Figure 60

- 3.4.21. Place the cart's base assembly onto the 2CP/Revo Cart Box Set Base Resting Station inside the 2CP/Revo Cart Box Set Outer Box. Make sure the cart's base assembly is correctly in place.



Figure 61

- 3.4.22. Place 2CP/Revo Cart Box Set Top Shelf Box on top of the cart's base assembly inside the 2CP/Revo Cart Box Set Outer Box (see Figure 62). Seal the box (see Figure 63).



Figure 62

- 3.4.23. Make sure the 2CP/Revo Cart Box Set Outer Box indicates what assembly is enclosed. Add a Fragile 3x5 Label (20007-1003-01) on the top.

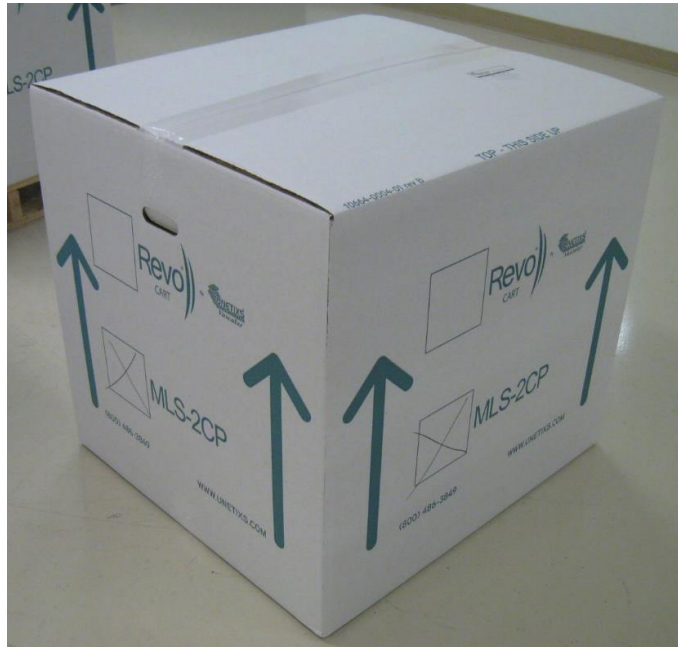


Figure 63

3.5. Pack the 2CP Cart, Better Enterprise (10355-0005-01)

- 3.5.1. Check WOPL for 2CP Cart, Better Enterprise option (refer to as cart). If not, skip to step 3.6.
- 3.5.2. To package the 2CP cart you will be using the box set 10664-0010-01. Place the front bottom foam (10664-0010-04) and the back bottom foam (10664-0010-05) on the skid (10664-0010-07) as shown in Figure 64.

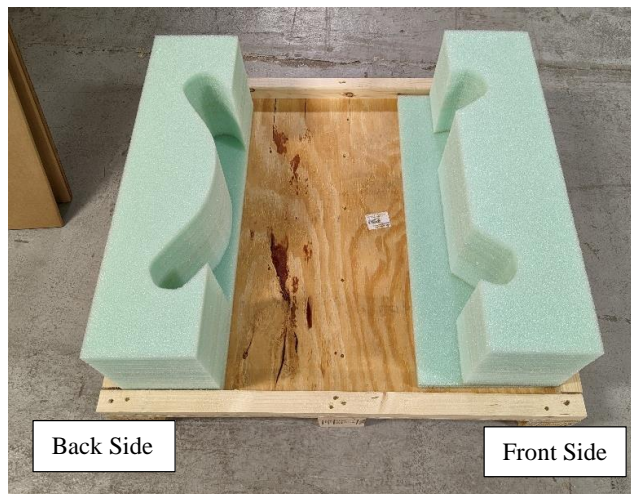


Figure 64

- 3.5.3. Add the cart to the skid placing it within the bottom foam pieces. See Figure 64 and Figure 66 for reference of orientation. Remove hose bracket (see Figure 14) and reattach the screws/hardware to tabletop. Wrap hose hanger in plastic wrap or bubble wrap and place in bucket. Also coil up the cable from the power strip and place that in the bucket as well.

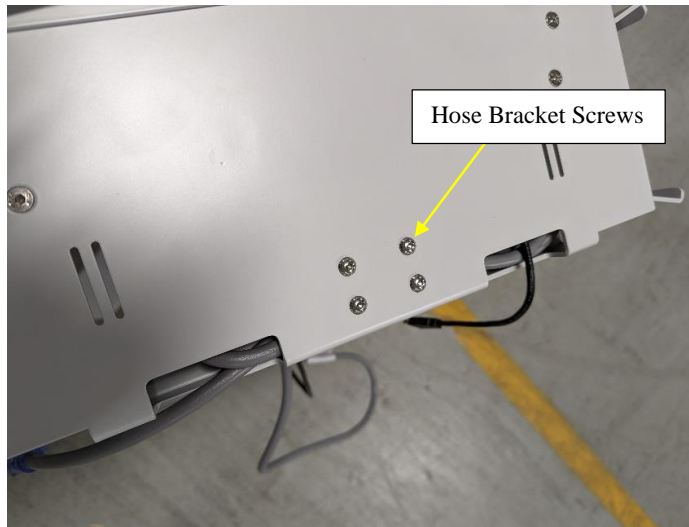


Figure 65

- 3.5.4. Place the top foam (10664-0010-06) on the tabletop so the cutout in the foam is over the 2CP mounting bracket. If applicable, remove the cardboard piece on the same side with doppler/ppg holder. Raise cart height so the distance between the top of the bottom foam and the top of the top foam is about 33 ½”.

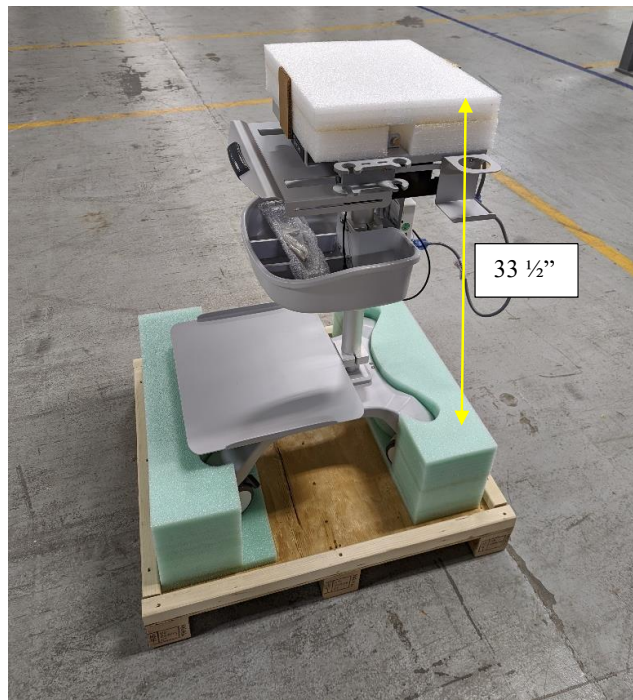


Figure 66

- 3.5.5. Wrap cart in plastic wrap to ensure keyboard tray does not move, items do not fall out of bucket and top foam stays in place.



Figure 67

- 3.5.6. Wrap the box (10664-0010-02) around the cart starting with the front as the first side so you finish wrapping the box at the front resulting in an overlap. The box should fit snug between the inner sides of the skid and the bottom foam. Secure the box with packaging at tape the seam.



Figure 68

- 3.5.7. Place the box cover (10664-0010-03) on top. Secure the box with 2 packing straps. Place Up-Stack-Fragile labels (20007-1001-01) on all four sides of box and a shockwatch indicator (20007-1002-01) on one side.



Figure 69

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3.6. Carry Case Packing

- 3.6.1. Check WOPL 20 to see if 2CP Carrying Case (10350-0002-01) is included. If not, continue to step 3.7.
- 3.6.2. Pack 2CP Carrying Case into its original packaging.

3.7. Prepare the Shipping Documentation

- 3.7.1. Prepare the shipping documents per SOP-30-018.

**Unetixs Vascular, Inc.
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Test / Calibration Procedure

11996-0006-01 Rev I

Step 1 Test Equipment Checklist and Setup

Gather all the test equipment needed and copy down their control numbers. Check the calibration or maintenance date, if necessary, to confirm that all equipment is good to use.

Test Equipment Name	Control #
Optional 110VAC to 220V AC Converter, Unetixs P/N: 65020-0000-01	

- 1.1. Connect a USB Keyboard (10304-0005-02/10304-0006-01) to a USB port on the back of the 2CP chassis (10905-0000-01) (refer as 2CP Chassis).
- 1.2. Check WOPL Page 2 to see if CP-105 Temp Gun Ass’y (11951-0000-01) is included. If yes, plug the Temperature Gun (11951-0000-01) to the Temp Gun Phone Cable (10346-0000-01) and then into the 2CP Chassis.
- 1.3. Check WOPL Page 2 to see if 2CP Molded Cart (11971-0000-01) or 2CP Better Enterprise Cart (10355-0005-01) is included.
 - 1.3.1. If yes, connect Power Cord (10629-0003-01) and USB Cable (10326-0006-01) from the cart to the 2CP Chassis. Check WOPL Page 1 to find out the power configuration. For 110V, plug the power cord to the power outlet; for 220V, plug the power cord to 65020-0000-01.
 - 1.3.2. If not, connect Power Cord (10629-0003-01) and USB Cable (10326-0006-01) to the 2CP Chassis. Check WOPL Page 1 to find out the power configuration. For 110V, plug the power cord to the power outlet; for 220V, plug the power cord to 65020-0000-01.
- 1.4. Turn the printer off. Connect USB Cable to the printer.

Step 2 Test Accessories

- 2.1. Turn the unit on. Verify that Unetixs Main Menu screen loads and displays Vascular: OK on the top right corner.
- 2.2. Check the applicable accessories listed in Table 1 for the completeness of their tests. Check that each accessory operates correctly with the system. Write a check mark on the “Test Passed” column or N/A if not applicable.

Table 1 Applicable Accessories

Unetixs P/N	Assembly Description	Test passed
11905-0000-01	Ass’y Chassis, Basic S2 CP w/ Remote & USB (SBR)	
11928-0000-01	Ass’y, Left Finger Clip (LFC)	
11929-0000-01	Ass’y, Right Finger Clip (RFC)	
11938-0000-01	Ass’y, Left Green PPG (LGP)	
11939-0000-01	Ass’y, Right Yellow PPG (RYP)	
11930-0000-01	Doppler Cable Ass’y, Straight VP (VPC)	

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Unetixs P/N	Assembly Description	Test passed
11962-0000-01	Ass’y, TruDop 5 Doppler (TD5)	
11963-0000-01	Ass’y, TruDop 8 Doppler (TD8)	
11966-0000-01	Ass’y ACS Bleed Valve (ABV) (first valve)	
11966-0000-01	Ass’y ACS Bleed Valve (ABV) (second valve)	
11967-0000-01	Ass’y, SEM Bleed Valves (SBV) (first valve)	
11967-0000-01	Ass’y, SEM Bleed Valves (SBV) (second valve)	
11968-0000-01	Ass’y, S2 Left Cuff Hose (LCH)	
11969-0000-01	Ass’y, S2 Right. Cuff Hose (RCH)	
11948-0000-01	Ass’y Auto Cuff Selector (ACS)	
11980-0000-01	Ass’y Left 6 Tube Aqua 8’ Hose (SAH)	
11981-0000-01	Ass’y Right 6 Tube Grey Hose (SGH)	
11972-0000-01	Ass’y, Molded 2CP Manifold (MCM)	
11951-0000-01	Ass’y, CP-105 Temp Gun (TMP)	

- 2.3. Press “Setup” --- “Yes” --- “Diagnostics” --- “About”. Verify the software version, e.g. W1.59, matches the version written on page 1 of the WOPL.
- 2.4. Click “Exit” to turn off Unetixs diagnostic program “S2WIN”.
- 2.5. Install the printer driver per SOP-30-023.
- 2.6. Verify that touch screen is functional by touching any icon on the Windows Desktop. The cursor should follow your finger.
- 2.7. Click “**Start**”. In “**Search Programs and Files**” field, type “**notepad**” and press **Enter**.
- 2.8. Start pressing a few keys on the keyboard and verify the character pressed appears on the screen. Then close the program, but do not save.
- 2.9. On the Windows Desktop, conduct a few operations to check if the trackpad/mouse works properly including the mouse tracking and the left and right buttons.
- 2.10. Double click “**S2WIN**” to open Unetixs Main menu.
- 2.11. Check WOPL Page 2 for Temp Gun Ass’y. If not, go to Step 2.12. From the Main Menu, click “**Studies**” --- “**User Defined Studies**” --- “**UA Cold Tolerance Thermometry**” --- “**Exit**” --- “**Baseline - Right Thumb**” --- “**Back**”. Do 2

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Temperature readings. Verify the reading on the Temperature Gun matches the temperature on the screen. Press “ESC” key as necessary to the Unetixs Main Menu.

- 2.12. From the Main Menu, click “**Studies**” --- “**Lower Arterial Studies**” --- “**LA Segmental Pressures w/ PVR**” --- “**Exit**” --- “**Right Brachial Pressure**” --- “**Back**”.
- 2.13. Test the **Remote Control** (10377-0000-01), verifying that all buttons except the “side” button work.
- 2.14. Click **Exit** once and then click “**Right Metatarsal PVR waveform**” --- “**Back**”. Test the “**side**” button on the Remote control. Press **Exit** on the remote until you reach the Unetixs Main menu.
- 2.15. Check the WOPL for **LHS Doppler/PPG Holder Ass’y** (11965-0000-01) and **Doppler Gel Holder** (40002-2047-01). If not, go to Step 2.16. Check the two items for cosmetic purpose. Verify that they fit on the 2CP Chassis.
- 2.16. Check Page 2 on WOPL for 2CP Molded Cart (11971-0000-01) or 2CP Better Enterprise Cart (10355-0005-01). If not go to Step 2.18. Inspect the cart:
 - Verify 4 wheels are moving freely.
 - Lock the 2 front wheels to verify that it prevents the wheels from rotating. Unlock them when the inspection is completed.
- 2.17. Inspect the whole cart cosmetically.
- 2.18. Click “**Temp Files**”. Highlight the study and verify time and date of the study matches current time. Delete all the study files. Then click “**Exit**” to Unetixs Main Menu.
- 2.19. Attach the LEMO connector on Doppler Cable (11930-0000-01) to the module. Attach the **TruDop5** probe (11962-0000-01) to the other end of the Doppler Cable.
- 2.20. From Main Menu, click “**Studies**” --- “**Lower Arterial Studies**” --- “**LA Segmental Pressure w/ DOP**” --- “**Exit**” --- “**Right Common Femoral Doppler**” --- “**Back**”. A straight clean yellow baseline should show up on the screen. Verify that there is no noticeable tick consistently showing on the screen.
- 2.21. **Tap** the probe tip several times to see if the waveform changes accordingly and then go back to a straight line standing at “10”. Listen to the speakers while you are tapping. The right speaker should act while the probe is tapped on and the left speaker should act while the finger is released away from the probe.
- 2.22. Conduct a **vascular test** on different spots, such as wrist, pinky tip or index finger. Verify the waveform, the pulsing sound, the noise level and sensitivity are correct.
- 2.23. Repeat Step 2.20 through 2.22 on TruDop8 (11963-0000-01).
- 2.24. Check Page 2 on WOPL to see if 2CP Cart Cover (10684-0003-01) is included. If yes, inspect it cosmetically.

Step 2 tested by: _____

Step 3 Flash drive test

- 3.1. Plug the USB Flash drive (10383-0001-01) into the 2CP Chassis.

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- 3.2. From Windows Desktop, double click “S2WIN”, then click “Setup” --- “Yes” --- “System Setup” --- “Backup” --- “Backup Study Configuration” --- “Yes”. After a few seconds, the same screen will flash which means the backup file is created in the USB flash drive. Then press “ESC” as necessary to exit to Windows Desktop.
- 3.3. From Windows Desktop, double click “This PC”. Then double click the **USB Drive** icon to verify that “s2stybk.zip” file is there. Then **delete** this file from the USB flash drive. Close any opened windows and go back to Windows Desktop.
- 3.4. Right click “Recycle Bin” and click “Empty Recycle Bin” if necessary. Verify the bin is empty.
- 3.5. Double click “S2WIN” on Desktop to go to Main Menu.
- 3.6. Click “Lookup”. Verify that the patient study history window appears and the log is empty with no errors. Click “Exit” once.

Step 3 tested by: _____

Step 4 Verify Serial Number

- 4.1. Verify the serial number on the label (found on the back of the 2CP chassis) matches the serial number on the WOPL.
- 4.2. Right click “This PC”, click “Properties”. In the “Computer name, domain, and workgroup settings” section (near the bottom of the window), verify the “Full computer name” field matches the serial number on the WOPL. Close the window.

Step 4 tested by: _____

Step 5 Test Software Options

- 5.1. If DICOM (11952-0000-01) is not included on the WOPL page 2, skip to Step 5.7.
- 5.2. Double click “S2WIN” icon on the Desktop. From the Main Menu, click “WRKLST”. Click “Name”, enter “A” and then click “OK”. Verify that the DICOM service company names show.
- 5.3. Then click “Select” --- “Studies” --- “Lower Arterial Studies” --- “LA Segmental Pressure w/ PVR” --- “Next” --- “Next” --- “Capture” --- “Exit” --- “Export” --- “Export Page”. Check the status to see if “Success” appears.
- 5.4. Click “Exit” --- “Export” --- “Right Arrow” to select “PDF File” --- “Export Page”. Then finished exit to Desktop.
- 5.5. Open the PDF folder on the desktop and ensure that the test patient PDF file is inside. Delete all files in the folder and empty recycle bin.
- 5.6. Launch S2WIN and from the Main Menu, click “Temp Files” --- “Delete”. Answer “Yes” when you are asked to delete the file. Do this for all files.
- 5.7. If UnetView Networking Package (11950-0000-01) is included on the WOPL page 2, test is by IT or Engineering.
- 5.8. Press “ESC” as necessary to the Windows Desktop.
- 5.9. Click “Start” --- “Shut Down” wait for black screen and turn off the unit. Disconnect all the cables and hoses from the unit if necessary.

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Step 5 tested by: _____

Step 6 Test extra power cord (if necessary)

- 6.1. Connect the power cord to the 2CP Chassis and turn it on. Verify that the Main Menu shows up correctly.
- 6.2. Touch “**Shut Down**”. Wait for black screen and then turn off the unit. Disconnect the power cord from the unit.

Step 6 tested by: _____

Step 7 Earth Leakage Test

- 7.1. Record the control number and calibration due date of the Electrical Safety Analyzer.
Control #: _____ Due Date: _____
- 7.2. Turn Electrical Safety Analyzer on. Push **Setup**, scroll to Standard and press **Enter**. Select IEC60601-1, push **Enter**. Set GFCI to 10 mA. Set Polarity Delay set to 1 sec.
- 7.3. Connect power cord of the 2CP Final Assembly to the Equipment Outlet on the Electrical Safety Analyzer as shown in Figure 3. Ensure Doppler probe, PPG probes, Cuff Selector (if applicable), cart (if applicable), printer (if applicable), and Temp Gun (if applicable) are connected to chassis.



Figure 1

- 7.4. Push **µA** button to access the Leakage Current main menu.
- 7.5. Push the **function button** that corresponds to the **Earth** leakage test to enter the test.
- 7.6. Push **Polarity** button to switch the polarity of the mains voltage applied to the test receptacle between Off, Normal, and Reverse. Push **Neutral** button to open and close the neutral connection.

Perform all combinations in the table below and record the leakage current for each. Compare the measured leakage to the allowable leakage for each combination and record Pass (P) or Fail (F).

	Polarity	Neutral	Measured Leakage	Allowable Leakage	Pass / Fail
1	Normal	Closed		≤10mA	
2	Normal	Open		≤10mA	
3	Reverse	Closed		≤10mA	
4	Reverse	Open		≤10mA	

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Step 7 tested by: _____

End of Test

Pass/Fail: _____

Test Performed By: _____ Date: _____

Section 5: Replacement Parts List

11905-0002-01 (SLC) Basic S2 CP w/Remote & USB Chassis Assembly

11912-0002-01 (IRB) Infrared Remote PCB Assembly

11919-0002-01 (SSB) S2 SMT Motherboard PCB Assembly

11933-0002-01 (ACB) Auto Cuff Selector PCB Assembly

11935-0002-01 (SPB) Series 2P Pump & Valve Bracket Assembly

11948-0002-01 (ACS) Auto Cuff Selector Assembly

11972-0002-01 (MCM) Molded 2CP Manifold Assembly

WOPL 20 Final Assembly, 2CP-R

Device Record	Assy, Basic S2 CP w/Remote & USB (SBR) [11905-0002-01 Rev L]	Page 1 of 4		
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10361-0009-01	Windows 10 Pro, Entry, Embedded	1		
10365-0000-01	Power Supply, Switcher UL544	1		
10369-0012-02	PCB Board, Touch Controller PenMount	1		
10369-0013-02	Touch Screen, 172.00x129.50mm active	1		
10369-0015-03	Cable, 1mm FPC-2mm 9pin JST tch-to-ctrl	1		
10369-0020-02	Cable, MB80580 Power to Wire	1		
10369-0020-04	Cable, MB80580 COM 16"	2		
10369-0020-06	Cable, MiniPCI USB to Permount touch	1		
10369-0020-07	Cable, MiniPCI USB to Panel	1		
10369-0020-08	Cable, MB80580 GPIO	1		
10370-0006-03	TTL Display w/ LED backlight 8.4"	1		
10370-0009-01	cable, display ribbon	1		
10370-0022-02	Cable, MB80580 backlight to SHLP-06V-S-B	1		
10503-0003-01	Conn. .156" Housing 3 pin	1		
10503-0004-01	Conn. .156" Housing 4 pin	1		
10503-0009-01	CONN. .156" HOUSING 9 PIN	1		
10504-0005-01	Conn. .100" Header 5 pin	1		
10505-0005-01	Conn., .100" Housing 5 pin	1		
10511-0002-01	Conn. 1/8" stereo jack N.C.	1		
10516-0002-01	Conn. .100" Housing 2 pin Wire Connect	2		
10516-0004-01	Conn. .100" Housing 4 pin Wire Connect	4		
10516-0005-01	Conn. .100" Housing 5 pin Wire Connect	1		
10516-0006-01	Conn. .100" Housing 6 pin Wire Connect	1		
10517-0003-01	Conn. 3 Pin Panel Mount Lemo	2		
10517-0004-01	Conn. 4 Pin Panel Mount Lemo Connector	1		
10528-0003-01	4pin phone jack w/ wires	1		
10530-0006-01	Conn. 6 pin Panel Mnt. LEMO 1B	1		
10533-0009-02	Conn DB9 Female to IDC crimp	1		
10548-0008-01	Ring terminal, #8, insulated	3		
10604-0000-01	Rubber Feet	4		

Device Record	Assy, Basic S2 CP w/Remote & USB (SBR) [11905-0002-01 Rev L]	Page 2 of 4		
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10606-0003-01	Fitting, Panel Mnt 1/16" Air	2		
10609-0001-01	Speaker, 2" by 3"	2		
10621-0001-01	Heat Shrink Tubing 1/16" i.d., black	14 inches (actually 13.375)		
10621-0002-01	Heat Shrink Tubing 1/8" i.d., black	6 inches		
10621-0016-05	Heat Shrink Tubing, 1" BLU.	3 inches		
10649-0003-01	Fuse, 3 AMP 3AG	1		
10681-0000-01	Power Entry Module Series 2	1		
10701-0001-01	Wire, 4 Cond. 30AWG	45 inches		
10703-0001-01	Wire, Belden 8505 26AWG BLACK	55 inches		
10703-0002-01	Wire, Belden 8505 26AWG WHITE	57 inches		
10703-0003-01	Wire, Belden 8505 26AWG RED	55 inches		
10703-0004-01	Wire, Belden 8505 26AWG YELLOW	15 inches		
10703-0005-01	Wire, Belden 8505 26AWG GREEN	66 inches		
10703-0006-01	Wire, Belden 8505 26AWG BLUE	34 inches		
10706-0001-01	Wire, Belden 8501 18AWG BLACK	27 inches		
10706-0002-01	Wire, Belden 8501 18AWG WHITE	44 inches		
10706-0006-01	Wire, 18AWG BLUE	15 inches		
10706-0008-01	Wire, 18AWG BROWN	15 inches		
10706-0009-01	Wire, 18AWG GREEN/YELLOW	42 inches		
10710-0010-01	wire, 10 cond. ribbon cable	24 inches		
11910-0000-01	Assy. Series 2 486 PC CPU (CPC)	1		
11912-0000-01	Assy, Infrared Remote PCB (IRB)	1		
11919-0000-01	PCB Ass'y, S2 SMT Motherboard (SSB)	1		
11935-0000-01	Ass'y, Series 2 Pump & Valve brack (SPB)	1		
11936-0000-01	Assy. Series 2 internal hose (SIH)	2		
20000-0001-01	Washer, 1/16" Fiber	6		
20000-0002-01	Washer, Fiber 1/32"	2		
20002-0440-01	Lockwasher, 4-40	31		
20002-0632-01	Lockwasher, 6-32	24		
20003-0440-01	Nut, Machine 4-40	9		

Device Record		Assy, Basic S2 CP w/Remote & USB (SBR) [11905-0002-01 Rev L]		Page 3 of 4
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
20003-0632-01	Nut, Machine 6-32	9		
20004-0004-01	Screw, Machine 4-40 PH PAN HEAD 1/4"	9		
20004-0006-01	Screw, Machine 4-40 PH PAN HEAD 3/8"	7		
20004-0010-01	Screw, Pan Head Philips 4-40 x 5/8"	4		
20007-0000-01	Label, Serial Number	1		
20008-0004-01	Tie Wrap 4"	5		
20012-0006-01	Screw, Machine 6-32 PH PAN HEAD 3/8"	13		
20012-0012-01	Screw, Machine 6-32 PH Pan Head 3/4"	4		
20013-0000-01	Lockwasher, 9/16" I.D.	2		
20014-0008-01	Spacer, Hex Threaded 6-32 1/2"	1		
20021-0006-01	Solder Lug, 3/8"	3		
20026-0004-01	Spacer, Nylon 6-32 clearance 1/4"	4		
20028-0003-01	Screw, FH PH 4-40 3/16" 100 Degree	10		
20028-0004-01	Screw, FH PH 4-40 1/4" 100 Degree	4		
20029-0016-02	Loop Clamp, Plastic 1"	2		
20033-0440-01	Acorn Nut, 4-40	1		
20038-0036-01	Standoff, Hex Male to Female 4-40 2.25"	2		
20039-0016-01	Standoff, Rnd Threaded 3/16 OD 4-40 1"	2		
20051-0006-01	Thumb Screw, 6-32 x 3/8", Plastic Headed	2		
20056-0632-01	Threaded Rod, 6-32 Zinc Plated Steel	5 inches		
40000-0432-01	Main Chassis, Series 2 P	1		
40000-0433-01	Cover, Series 2	1		
40000-0434-01	Front Inner Divider, Series 2	1		
40000-0445-01	Bezel, Molded 2CP	1		
40000-0445-02	Frame, Molded 2CP	1		
40002-2026-01	Bracket, Freedom Pcb	2		
40002-2039-02	Label, Front Panel S2 P & CP	1		
40002-2040-01	Label, Caution Series 2	1		
40002-2040-02	Label, Warning Exp. Series 2	1		
40002-2040-03	Label, Warning Fire Series 2	1		

UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
40002-2040-04	Label, Caution Physician Series 2	1		
40003-1052-01	Modified Handle, Series 2	1		
40003-1062-01	Label, Temp. S2 P & CP	1		

Device Record		PCB Ass'y, S2 SMT Motherboard (SSB) [11919-0002-01 Rev E]		Page 1 of 4
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10001-0000-01	SMT Res., 0ohm 0.33W 0805 ROHS	2	C117-118	
10001-0015-02	SMT Res. .15ohm 1/4w 1% 0805 ROHS	1	R1	
10001-0100-01	SMT Res. 10ohm 1/8w 1% 0805 ROHS	9	R3-11	
10001-0270-01	SMT Res., 27.0ohm 1/8W 1% 0805 ROHS	2	R136-137	
10001-0499-02	SMT Res. 49.9ohm 1/8w 1% 0805 ROHS	2	R82-83	
10001-1000-01	SMT Res. 100ohm 1/8w 1% 0805 ROHS	1	R12	
10001-1001-01	SMT Res. 1.0K 1/8w 1% 0805 ROHS	8	R13-18,133-134	
10001-1002-01	SMT Res. 10.0k 1/8w 1% 0805 ROHS	28	R19-45,140	
10001-1003-01	SMT Res. 100k 1/8w 1% 0805 ROHS	18	R46-63	
10001-1004-01	SMT Res. 1 Meg 1/8w 1% 0805 ROHS	8	R64-71	
10001-1053-01	SMT Res. 105K 1/8w 1% 0805 ROHS	2	R72-73	
10001-1501-01	SMT Res. 1.5K 1/8w 1% 0805 ROHS	3	R74-76	
10001-1873-01	SMT Res. 187k 1/8w 1% 0805 ROHS	2	R77-78	
10001-2001-01	SMT Res., 2.00k 1/8W 1% 0805 ROHS	1	R135	
10001-2003-01	SMT Res. 200K 1/8w 1% 0805 ROHS	3	R79-81	
10001-2211-01	SMT Res. 2.21K 1/8w 1% 0805 ROHS	2	R84-85	
10001-2213-01	SMT Res. 221K 1/8w 1% 0805 ROHS	2	R86-87	
10001-2493-01	SMT Res. 249K 1/8w 1% 0805 ROHS	4	R88-91	
10001-2672-01	SMT Res. 26.7K 1/8w 1% 0805 ROHS	1	R92	
10001-2802-01	SMT Res. 28.0K 1/8w 1% 0805 ROHS	2	R93-94	
10001-3013-01	SMT Res. 301K 1/8w 1% 0805 ROHS	2	R95-96	
10001-3162-01	SMT Res. 31.6K 1/8w 1% 0805 ROHS	1	R97	
10001-3242-01	SMT Res. 32.4K 1/8w 1% 0805 ROHS	1	R98	
10001-3322-01	SMT Res. 33.2K 1/8w 1% 0805 ROHS	2	R99-100	
10001-3901-01	SMT Res. 3.90K 1/8w 1% 0805 ROHS	2	R138-139	
10001-4022-01	SMT Res. 40.2K 1/8w 1% 0805 ROHS	1	R101	
10001-4641-01	SMT Res. 4.64k 1/8w 1% 0805 ROHS	4	R102-105	
10001-4991-01	SMT Res. 4.99K 1/8w 1% 0805 ROHS	3	R106-108	
10001-4992-01	SMT Res. 49.9K 1/8w 1% 0805 ROHS	4	R109-112	
10001-5621-01	SMT Res. 5.62K 1/8w 1% 0805 ROHS	2	R113-114	

Device Record		PCB Ass'y, S2 SMT Motherboard (SSB) [11919-0002-01 Rev E]			Page 2 of 4
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER	
10001-5622-01	SMT Res. 56.2K 1/8w 1% 0805 ROHS	2	R115-116		
10001-6191-01	SMT Res. 6.19K 1/8w 1% 0805 ROHS	4	R117-120		
10001-6192-01	SMT Res. 61.9K 1/8w 1% 0805 ROHS	1	R121		
10001-6492-01	SMT Res. 64.9K 1/8w 1% 0805 ROHS	2	R122-123		
10001-7682-01	SMT Res. 76.8K 1/8w 1% 0805 ROHS	1	R124		
10001-7871-01	SMT Res. 7.87K 1/8w 1% 0805 ROHS	1	R125		
10001-8252-01	SMT Res. 82.5K 1/8w 1% 0805 ROHS	2	R126-127		
10001-9531-01	SMT Res. 9.53K 1/8w 1% 0805 ROHS	1	R128		
10004-0103-01	Res. 10K POT 3/8" Cermet Multiturn	6	P1-6		
10004-0201-01	Res. 200 ohm POT 3/8" Cermet Multiturn	2	P7-8		
10004-0203-01	Res. 20K POT 3/8" Cermet Multiturn	2	P9-10		
10004-0204-01	Res. 200K POT 3/8" Cermet Multiturn	2	P11-12		
10004-0502-01	Res. 5K POT 3/8" Cermet Multiturn	2	P13-14		
10015-0100-04	SMT Res. 10ohm 1/2w 1% 2010 ROHS	1	R2		
10015-1000-04	SMT Res. 100ohm 1/2w 1% 2010 ROHS	4	R129-132		
10050-0105-02	Cap. 1uf poly	4	C96-99		
10059-0101-11	SMT Cap., 100pF 16V 10% MLCC 0805 ROHS	2	C40-41		
10059-0102-23	SMT Cap., 1nF 16V 5% NPO MLCC 0805 ROHS	4	C42-45		
10059-0103-11	SMT Cap., .01uF 16V 10% MLCC 0805 ROHS	10	C46-55		
10059-0104-11	SMT Cap., .1uF 16V 10% MLCC 0805 ROHS	39	C60-91,119-125		
10059-0105-11	SMT Cap., 1uF 16V 10% MLCC 0805 ROHS	2	C94-95		
10059-0106-01	SMT Cap. 10uf X5R MLCC 0805 ROHS	2	C56-57		
10059-0220-11	SMT Cap., 22pF 16V 10% MLCC 0805 ROHS	3	C100-102		
10059-0222-11	SMT Cap., 2200pF 16V 10% MLCC 0805 ROHS	2	C103-104		
10059-0472-11	SMT Cap., 4700pF 16V 10% MLCC 0805 ROHS	4	C105-108		
10059-0473-11	SMT Cap., .047uF 16V 10% MLCC 0805 ROHS	8	C109-116		
10059-0474-11	SMT Cap., .47uF 16V 10% MLCC 0805 ROHS	2	C92-93		
10060-0105-03	SMT Cap., 1uF 25V Tnt. 1206 20%<8ESR ROHS	5	C1-5		
10060-0106-04	SMT Cap., 10uF Tnt. 25V 2312 <3ESR ROHS	2	C6-7		
10060-0475-05	SMT Cap., 4.7uF 16V Tnt 1206 20%<8ESR ROHS	5	C8-12		

Device Record		PCB Ass'y, S2 SMT Motherboard (SSB) [11919-0002-01 Rev E]		Page 3 of 4
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10064-0106-01	SMT Cap., 10uF 16V Alum. 20% 5.3mm2 ROHS	18	C13-30	
10064-0107-02	SMT Cap., 100uF 16V Alum. 20% 8.3mm2 ROHS	3	C31-33	
10064-0108-03	SMT Cap., 1mF 10V Alum. 20% 10.3mm2 ROHS	1	C34	
10064-0227-04	SMT Cap., 220uF 25V Alum 20% 10.3mm2 ROHS	5	C35-39	
10103-0132-01	SMT IC, Positive-OR Gate 2IN SOT-23-5	1	U3	
10103-4027-02	SMT IC, 4027 SOIC-16 ROHS	1	U1	
10103-4093-02	SMT IC CD4093BCM SOIC-14 ROHS	1	U2	
10104-0259-02	SMT IC 74HC259 SOIC-16 ROHS	1	U4	
10140-0000-02	SMT IC, MAX197BCWI SOIC-28 ROHS	2	U6-7	
10141-0000-02	SMT IC MAX488 SOIC-8 ROHS	1	U8	
10147-0000-02	IC, AT89C5131A-M 52PLCC ROHS	1	U9	
10200-0000-02	SMT IC LT1014 SOIC-16W ROHS	4	U10-13	
10201-0000-02	SMT IC, OP07CD SOIC-8 ROHS	2	U14-15	
10202-0005-01	VREG. 7805CT	1	U16	
10203-0000-02	SMT IC LM386 SOIC-8 ROHS	2	U17-18	
10207-0000-02	SMT IC LM2907M-8 SOIC-8 ROHS	2	U19-20	
10208-0000-02	SMT IC LM358 SOIC-8 ROHS	3	U21-22,24	
10213-0000-02	SMT IC LM10CWM SOIC-14 ROHS	2	U25-26	
10215-0000-02	SMT IC LM3578A SOIC-8 ROHS	1	U27	
10222-0000-02	SMT IC, LT1125 SOIC-16W ROHS	2	U28-29	
10223-0000-02	SMT IC LT1010CDD DFN-8 ROHS	2	U30-31	
10224-0000-02	SMT IC LTC14511S8 SOIC-8 ROHS	2	U32-33	
10225-0008-02	SMT IC, VREG +8V 78L08 SOIC-8 ROHS	1	U34	
10226-0008-02	SMT IC, VREG -8V 79L08 SOIC-8 ROHS	1	U35	
10231-0062-01	SMT IC, JFET Opamp TL062CD SOIC8	2	U5,23	
10232-3157-01	SMT IC, SPDT Analog Switch SOT23-6	2	U38-39	
10250-1972-02	SMT IC, LM1972 SOIC-20 ROHS	1	U36	
10364-0000-01	Power Supply +/-15V 10W	1	U37	
10401-0001-02	BP Sensor, Fujikura AP30R-050KG-XBP	2	S1-2	
10401-0004-01	Pressure Sensor, MLV-L30D	2	S5-6	

Device Record		PCB Ass'y, S2 SMT Motherboard (SSB) [11919-0002-01 Rev E]		Page 4 of 4
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10450-0102-01	Inductor 1000uH	2	L1-2	
10452-0451-01	Inductor 450UH 1.5A Toroidal ROHS	1	L3	
10502-0004-01	Conn. .156" Header 4 pin	1	JP14	
10504-0002-01	Conn. .100" Header 2 pin	7	JP3-6,12-13,18	
10504-0004-01	Conn. .100" Header 4 pin	4	JP1-2,9-10	
10504-0005-01	Conn. .100" Header 5 pin	1	JP8	
10504-0006-01	Conn..100 Header 6 p. w/lckng ramp	2	JP11,15	
10512-0052-01	Socket, 52 pin PLCC	1	U9(S)	
10541-0009-01	Conn. DB-9 Female PCB Mnt.	1	JP7	
10612-4148-02	SMT Diode IN4148 SOD 123 ROHS	8	D1-8	
10612-5818-02	SMT Diode, Schottky 5818 ROHS	1	D9	
10642-1600-01	Crystal, 16.000MHZ HC-49	1	Y1	
10643-0335-02	SMT MOSFET FDN335NCT SSOT-3 ROHS	4	Q1-4	
10647-2002-01	SMT LED, 2.3mmx1.3mmx1.4mm Green	1	D10	
30001-0022-01	PCB, S2 SMT Motherboard	1		

Device Record		Assy, Auto Cuff Selector PCB (ACB) [11933-0002-01 Rev C]		Page 1 of 1
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10000-0000-01	Res. 0 ohm 1/4W 1% Metal Film	2	R13,R16	
10000-4750-01	Res. 475 ohm 1% 1/4W Metal Film	12	R1-R12	
10008-0101-01	Res. 100 ohm 5% 1/2W Carbon film	2	R14,R15	
10053-0106-01	Cap. 10uF 16V Alum. Elect. Radial	1	C1	
10145-0001-01	IC, PIC 16F873	1	U1	
10502-0002-01	Conn., .156" Header 2 pin	1	JP14	
10504-0002-01	Conn. .100" Header 2 pin	12	JP1-JP12	
10505-0007-02	Conn. .100" 7p housing (PCB Mt.)	1	JP13, made from 10505-00036-01	
10512-0028-02	Socket, IC 28 pin .300 ctrs.	1	U1A	
10612-0914-01	Diode 1N914	12	D1-D12	
10637-0001-01	Switch, momentary pushbutton BLACK	2	S1,S2	
10642-4000-01	Resonator, 4.00 MHz	1	Y1	
10644-2222-01	Transistor 2N2222A	12	Q1-Q12	
10647-0002-01	LED Green T 1 3/4	12	L1-L12	
20007-0000-01	Label, Serial Number	1		
20060-0008-01	Spacer, LED	12	L1-L12	
30001-0018-01	PCB, Electronic Manifold	1		

Device Record	Ass'y, Series 2 Pump & Valve brack (SPB) [11935-0002-01 Rev I]	Page 1 of 1		
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10328-0001-01	Air Compressor, Gillian, Freedom V	2		
10516-0002-01	Conn. .100" Housing 2 pin Wire Connect	4		
10666-0001-01	Air Fitting, SMC M5 1/16	2		
10667-0002-01	Valve, 3-way SMC M5	2		
10703-0002-01	Wire, Belden 8505 26AWG WHITE	12	inches	
10703-0004-01	Wire, Belden 8505 26AWG YELLOW	12	inches	
10703-0005-01	Wire, Belden 8505 26AWG GREEN	12	inches	
10703-0006-01	Wire, Belden 8505 26AWG BLUE	12	inches	
20002-0440-01	Lockwasher, 4-40	1		
20007-0000-01	Label, Serial Number	1		
20017-0632-01	Flatwasher, 6-32	1		
20019-0006-01	Screw, Socket head CAP, 4-40 3/8"	2		
20019-0014-01	Screw, Socket Head Cap, 4-40 x 7/8"	1		
20035-0012-01	Stand Off, Nylon 3/4" Rnd 4-40 Thrd.	2		
40000-0434-02	Rear Inner Divider, Series 2	1		
40002-2037-01	Dual Pump Bracket	1		
40003-1036-01	ORings, Freedom Pump Mount	6		

Device Record		Assy., Auto Cuff Selector (ACS) [11948-0002-01 Rev L]		Page 1 of 2
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10503-0002-01	Conn., .156" Housing 2 pin	1	JP14	
10504-0006-01	Conn..100 Header 6 p. w/lckng ramp	1		
10508-0006-01	Conn. 6 pin male lemo .1b.	1		
10516-0002-01	Conn. .100" Housing 2 pin Wire Connect	12	JP1 - JP12	
10542-5459-01	STRAIN RELIEF, LEMO 5.4-5.9MM	1		
10548-0008-01	Ring terminal, #8, insulated	2		
10549-0000-01	Conn. DIN 3 pin Panel Mnt. Socket	1		
10605-0002-01	Tubing, 1/8" I.D. Clear	38	inches	
10605-0009-01	Tubing, 6 tube 1/4"od 1/8" id GRY	4	inches	
10605-0010-01	Tubing, 6 tube 1/4"od 1/8" id AQUA	4	inches	
10606-0004-01	Air line fitting, 1/8" Male	2		
10606-0005-01	Fitting, Inline 1/8" Body	12		
10621-0001-01	Heat Shrink Tubing 1/16" i.d., black	15	actually 14.25 inches	
10621-0002-01	Heat Shrink Tubing 1/8" i.d., black	2	actually 1.5 inches	
10621-0006-06	Heat Shrink Tubing, 3/8", Clear	2	inches	
10635-0002-01	Tape, foam 2-side 1"	1	inch	
10656-0002-01	Knob, 3-Arm Clamp	1		
10673-0001-01	Manifold, Electronic 6 pos. Left	1		
10673-0001-02	Manifold, Electronic 6 pos. Right	1		
10685-0006-02	Cartridge, 3/8" wht. Kroy	2		
10703-0001-01	Wire, Belden 8505 26AWG BLACK	48	inches	
10703-0002-01	Wire, Belden 8505 26AWG WHITE	48	inches	
10706-0001-01	Wire, Belden 8501 18AWG BLACK	7	inches	
10706-0002-01	Wire, Belden 8501 18AWG WHITE	7	inches	
10706-0005-01	Wire, 18AWG GREEN	10	inches	
10708-0006-01	Cable, 6 conductor, Shielded	28	inches	
11933-0000-01	Assy, Auto Cuff Selector PCB (ACB)	1		
20000-0001-01	Washer, 1/16" Fiber	4		
20000-0002-01	Washer, Fiber 1/32"	4		
20002-0440-01	Lockwasher, 4-40	10		

Device Record		Assy., Auto Cuff Selector (ACS) [11948-0002-01 Rev L]		Page 2 of 2
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
20002-0632-01	Lockwasher, 6-32	4		
20003-0632-01	Nut, Machine 6-32	4		
20004-0003-01	Screw, Pan PH 4-40 3/16"	2		
20004-0006-01	Screw, Machine 4-40 PH PAN HEAD 3/8"	4		
20004-0008-01	Screw, Pan PH 4-40 x 1/2"	3		
20004-0010-01	Screw, Pan Head Philips 4-40 x 5/8"	1		
20012-0024-01	Screw, Machine 6/32 PH Pan Hd. 1 1/2"	4		
20020-0002-01	Grommet, Rubber .312 ID	2		
20025-0002-01	Foam, Black 2mm 9"x12"	1	square inches	
40001-3042-01	Hsng., Auto Cuff Sel. Front	1		
40001-3042-02	Hsng., Auto Cuff Sel. Back	1		
40002-2040-05	Label, Serial Series 2	1		
40002-2051-01	Label, Auto Cuff Selector	1		

Device Record		Assy, Molded 2CP Manifold (MCM) [11972-0002-01 Rev H]		Page 1 of 2
UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
10504-0006-02	Conn. .100" 6 p. header w/o lckng ramp	1	Made from 10504-0036-01	
10508-0006-01	Conn. 6 pin male lemo .1b.	1		
10542-5459-01	STRAIN RELIEF, LEMO 5.4-5.9MM	1		
10605-0002-01	Tubing, 1/8" I.D. Clear	492	inches	
10605-0005-01	Tubing, 1/8" I.D. Silicone	6	inches	
10606-0004-01	Air line fitting, 1/8" Male	2		
10607-0004-01	Inline female B.P. fitting 1/8" (Bayonet)	10		
10621-0001-01	Heat Shrink Tubing 1/16" i.d., black	4	actually 3.75 inches	
10621-0006-02	Heat Shrink Tubing, 3/8", Yellow	2	actually 1.5 inches	
10621-0006-03	Heat Shrink Tubing, 3/8", Red	2	actually 1.5 inches	
10621-0006-04	Heat Shrink Tubing, 3/8", WHT.	2	actually 1.5 inches	
10621-0006-05	Heat Shrink Tubing, 3/8", Green	2	actually 1.5 inches	
10621-0006-06	Heat Shrink Tubing, 3/8", Clear	9	inches	
10621-0006-07	Heat Shrink Tubing, 3/8", Blue	2	actually 1.5 inches	
10621-0012-08	Heat Shrink Tubing, 3/4", GRY	7	inches	
10667-0001-01	Valve, Toggle Cuff Selector	10		
10670-0000-01	Barb Fitting, 10-32 X 1/8	10		
10671-0000-01	Plug, Manifold Port	4		
10672-0002-01	Air Fitting, 1/8" X1/8" Barb Elbow	4		
10672-0003-01	Fitting, Swivel 1/8NPT to 1/8" barb elbow	2		
10673-0000-01	Manifold 6 pos.	2		
10675-0000-01	Teflon Thread Sealing Tape	42	inches	
10685-0006-02	Cartridge, 3/8" wht. Kroy	7	inches	
10707-0008-07	Sleeving, Polyester Woven, 1/2" GRY	89	inches	
10708-0006-01	Cable, 6 conductor, Shielded	102	inches	
20002-0632-01	Lockwasher, 6-32	5		
20008-0004-01	Tie Wrap 4"	5		
20012-0004-01	Screw, Machine 6-32 PH PAN HEAD 1/4"	5		
20020-0001-01	Grommet, rubber	1		
20020-0002-01	Grommet, Rubber .312 ID	12		

UNETIXS PART #	DESCRIPTION	QUANTITY	REFERENCE DESIGNATORS	LOT NUMBER
20090-0000-01	Caulk, Clear RTV silicone	1		
40000-4021-01	Top Hsng., 2CP Cuff Manifold	1		
40000-4021-02	Bottom Hsng., 2CP Cuff Manifold	1		
40002-2033-02	Keyboard, Series 2 Cuff Select.	1		
40002-2040-05	Label, Serial Series 2	1		

Work Order #: _____ Quote and/or PO #: _____ Date: _____

Options: 2CP-R 2CP-R Express

Entered By: _____ Checked By: _____ Approved By: _____

Customer: _____ * Ship to: _____

Phone: _____

Unit Serial #: MLS2C

Software Version: _____ By / Date: _____

Special Instructions (Shipper Take Notice):

Preloaded Study Configurations:

Power Requirements: 110V

*** Note: It is likely that units shipped outside of the United States will have special power supply requirements. For 220V configuration, choose amount "2" for 10649-0315-01, pick the power strip that fulfills the destination country regulations and fill in the P/N in the WOPL.**

Part Number	Description	Qty	Serial No. / Lot No.	Packed By
10638-0000-01	Deskjet Paper	1		
10339-0007-04	Manual, Daigle Vascular & CME 4 th Edition	1		
11300-0000-01	Manual, Operators Series2 PM 03	1		
F03 01	Acknowledgement of Acceptance	1		
10383-0001-01	Flash Drive, USB	1		
10635-0001-01	Scotch 667 Double Coated Tape	1		
11306-0000-01	Manual, Service S2	0	*	
10695-0003-01	Box Set, 2CP Module	1		
20007-1003-01	Label, Fragile 3x5	2		
10350-0002-01	Carrying Case, Rolling w/ side zip	0	*	

* Option

Part Number	Description	Qty	Serial No. / Lot No.	Packed By
11962-0000-01	Ass'y, TruDop 5 Doppler (TD5)	1	+	
11963-0000-01	Ass'y, TruDop 8 Doppler (TD8)	1		
10628-0001-01	Ultrasonic Doppler Gel (250 ml)	1		
11930-0000-01	Doppler Cable, Straight VP (VPC)	1		
11928-0000-01	Left Finger Clip Ass'y (LFC)	1		
11929-0000-01	Right Finger Clip Ass'y (RFC)	1		
11938-0000-01	Left Green PPG Ass'y (LGP)	1		
11939-0000-01	Right Yellow PPG Ass'y (RYP)	1		
11965-0000-01	LHS Doppler/PPG Holder Ass'y (LDP)	0	*	
10377-0000-01	Remote Control Transmitter	1		
10686-0000-01	Battery, Alkaline, 1.5V AAA	2		
20072-0002-01	Magnet 1/8"	1		
11905-0000-01	2CP Chassis Ass'y w/Remote & USB (SBR)	1		
40002-2040-05	Label, Serial Series 2	1		
10649-0315-01	Fuse, 3.15A 5x20mm	0	*	
10304-0005-02	Mini USB Keyboard w/Trackball	0		
10304-0006-01	Keyboard, w/ touchpad Med. Grade	1	*	
10629-0003-01	Line Cord, 10 ft., Gray Med. Grade	1		
40002-2047-01	Doppler Gel Holder	0	*	
11968-0000-01	S2 Left Cuff Hose Ass'y (LCH)	1	#	
11969-0000-01	S2 Right Cuff Hose Ass'y (RCH)	1	#	
11972-0000-01	Molded 2CP Manifold Ass'y (MCM)	1	+	
11967-0000-01	SEM Bleed Valve Ass'y (SBV)	2	*	
11948-0000-01	Auto Cuff Selector Ass'y (ACS)	1	*	
11966-0000-01	ACS Bleed Valve Ass'y (ABV)	2	*	
11980-0000-01	Left 6 Tube Aqua 8' Hose Ass'y (SAH)	1	*	
11981-0000-01	Right 6 Tube Grey 8' Hose Ass'y (SGH)	1	*	
10378-0004-01	AC Adapter, 5V Med. Grade	1	*	
10549-0001-01	Conn. DIN 3-Pin Inline Plug	1	*	
	Printer, HP Deskjet	1		
10326-0006-01	6' USB Printer Cable	1		
10632-0010-01	SC10, Blood Pressure Cuff	0		
10632-0012-01	SC12, Blood Pressure Cuff	0		
10633-0025-02	PC2.5 Digit Pressure Cuff	0		
10632-0012-02	SC-12L Blood Pressure Cuff Long	0		
10632-0007-01	TMC-7 Transmetatarsal Cuff	0		
10634-0017-01	CC-17 Blood Pressure Cuff	0		
11971-0000-01	2CP Molded Cart Ass'y (CMC)	0	*	
	Power Strip, 15' Med. Grade (for 220V)	0	*	
10664-0004-01	Box Set, 2CP/Revo Cart	0	*	
20007-1003-01	Label, Fragile 3x5	0	*	
20008-0011-01	Tie Wrap, 11"	0	*	

Section 6: Schematics

Schematics for MultiLab 2000 Series 2CP-R include the following documents:

11905-0004-01 (SLC) Basic S2 CP w/Remote & USB Chassis Assembly

11912-0004-01 (IRB) Infrared Remote PCB Assembly

11919-0004-01 (SSB) S2 SMT Motherboard PCB Assembly

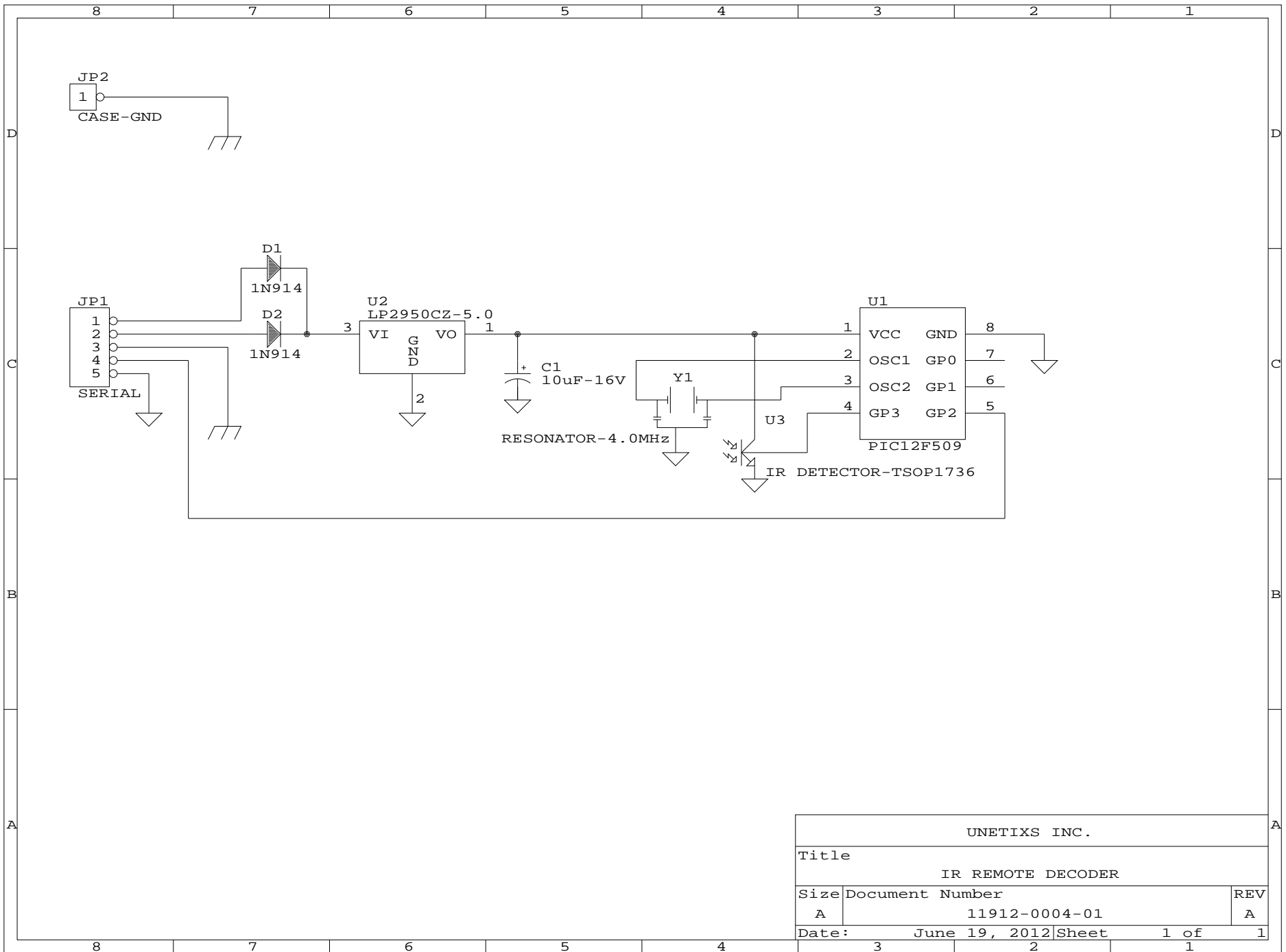
11933-0004-01 (ACB) Auto Cuff Selector PCB Assembly

11935-0004-01 (SPB) Series 2P Pump & Valve Bracket Assembly

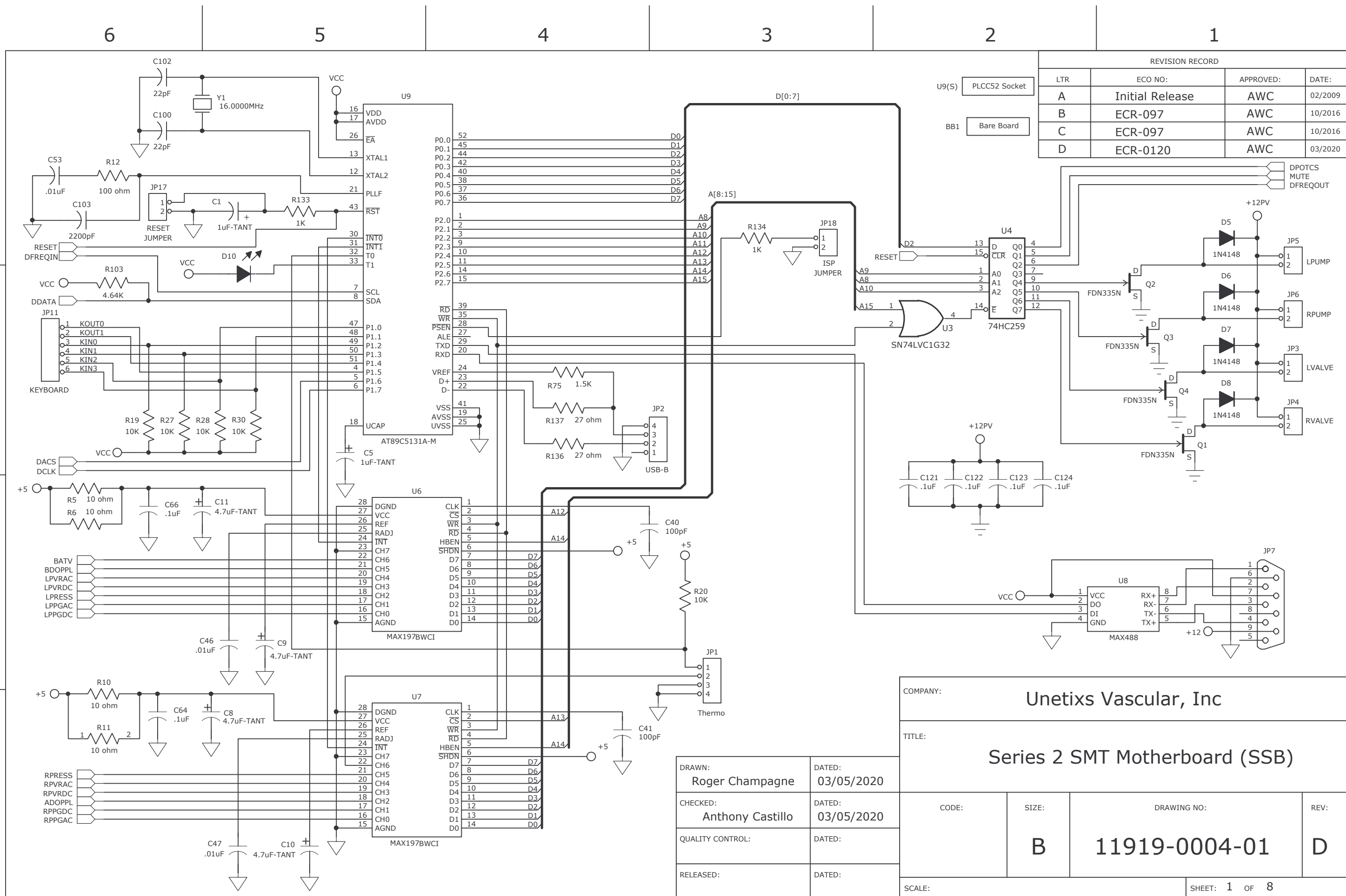
11948-0004-01 (ACS) Auto Cuff Selector Assembly

11972-0004-01 (MCM) Molded 2CP Manifold Assembly

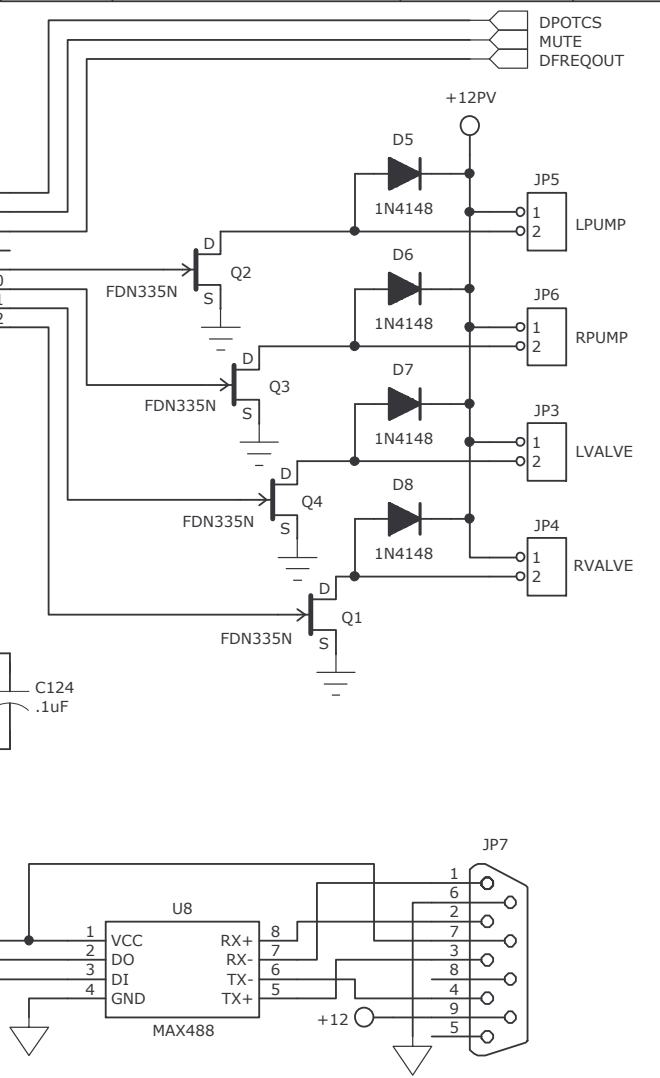
11996-0004-01 Final Assembly, 2CP-R



UNETIXS INC.		
Title		
IR REMOTE DECODER		
Size	Document Number	REV
A	11912-0004-01	A
Date:	June 19, 2012	Sheet 1 of 1

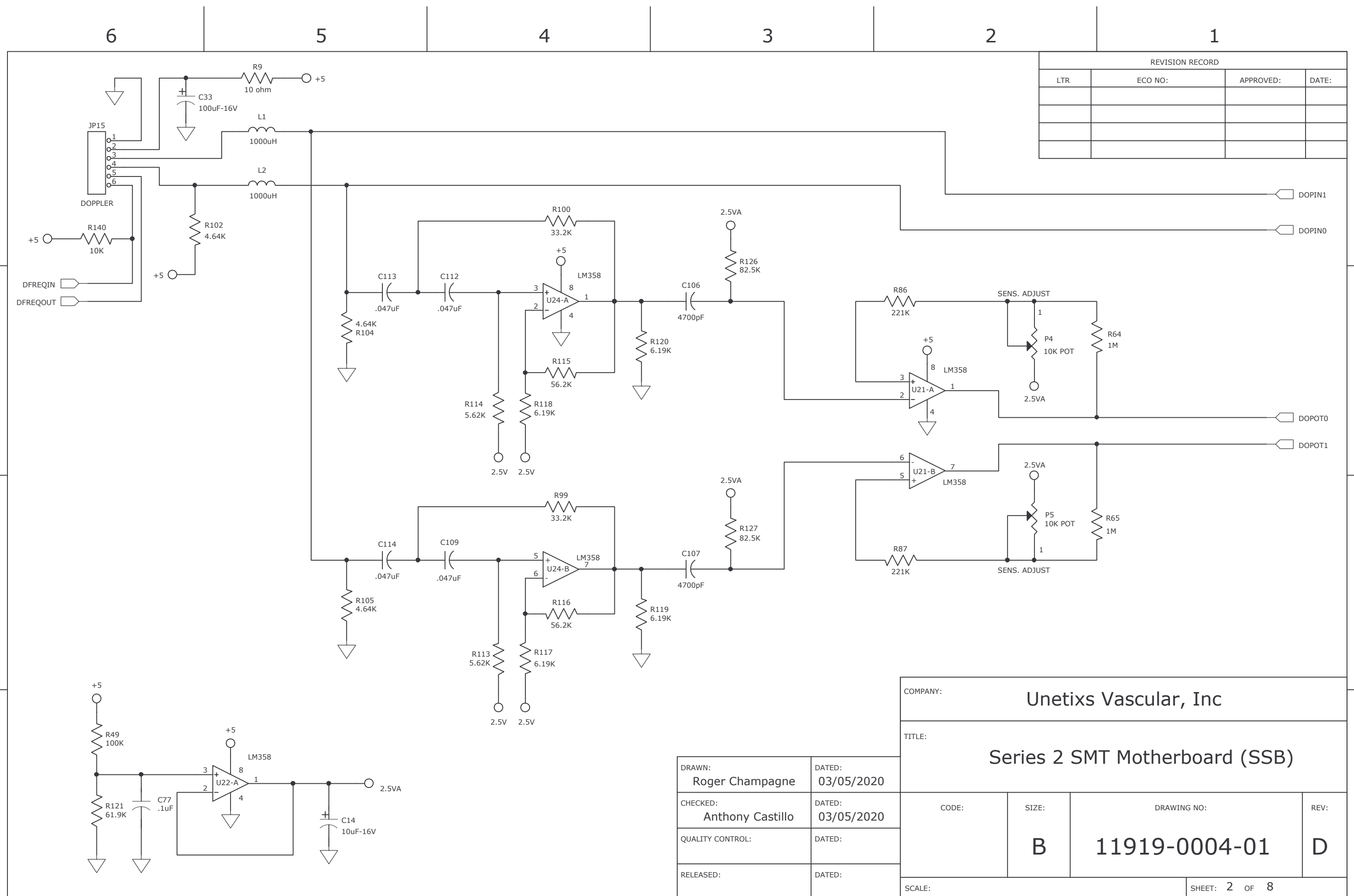


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A	Initial Release	AWC	02/2009
B	ECR-097	AWC	10/2016
C	ECR-097	AWC	10/2016
D	ECR-0120	AWC	03/2020



COMPANY:				Unetixs Vascular, Inc			
TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
	B	11919-0004-01		D			
SCALE:				SHEET: 1 OF 8			

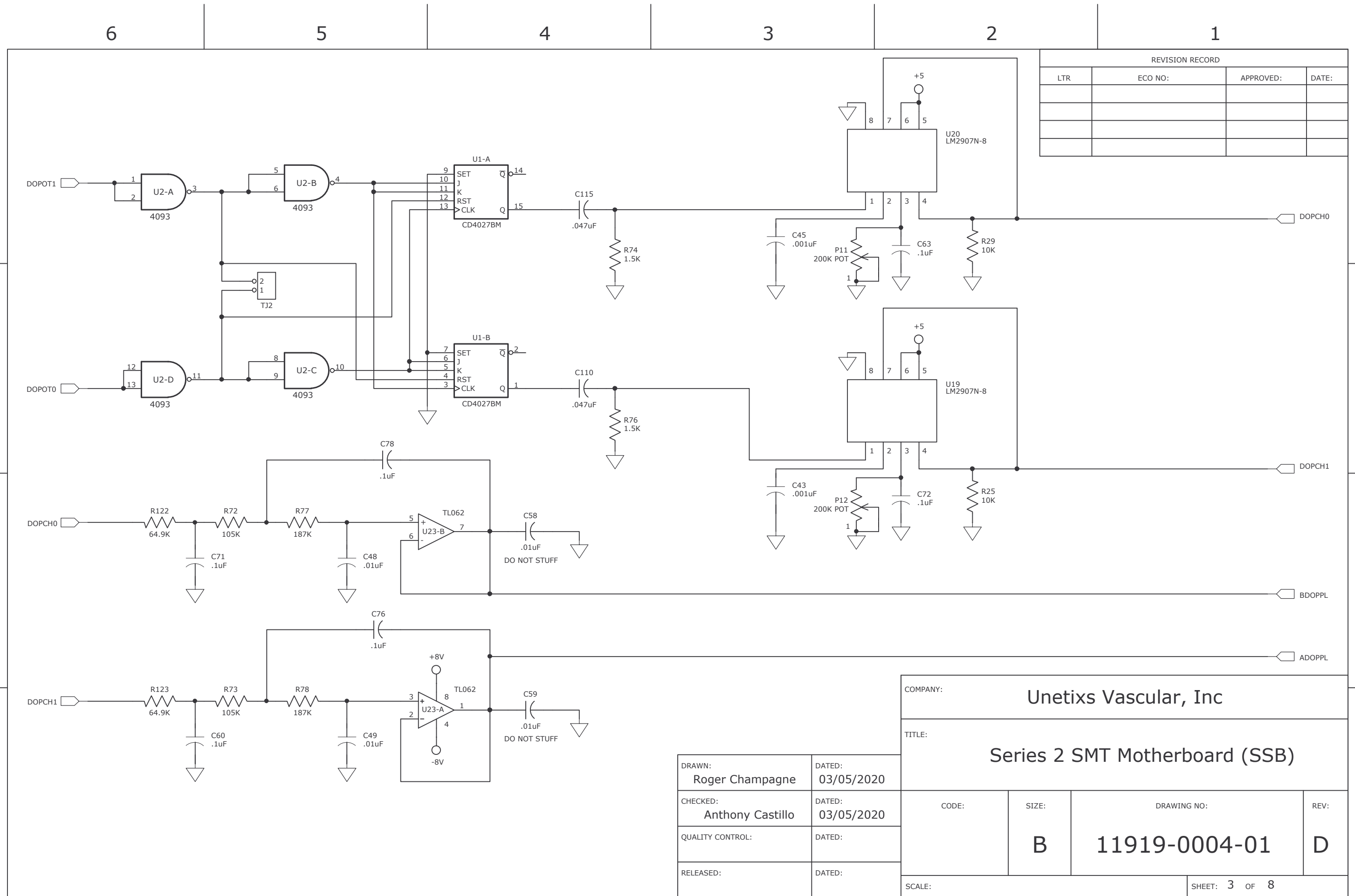
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Roger Champagne	03/05/2020
CHECKED:	DATED:
Anthony Castillo	03/05/2020
QUALITY CONTROL:	DATED:
RELEASED:	DATED:



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

COMPANY:				Unetixs Vascular, Inc			
TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
	B	11919-0004-01		D			
SCALE:				SHEET: 2 OF 8			

DRAWN:	DATED:
Roger Champagne	03/05/2020
CHECKED:	DATED:
Anthony Castillo	03/05/2020
QUALITY CONTROL:	DATED:
RELEASED:	DATED:



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

COMPANY:				Unetixs Vascular, Inc			
TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
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SCALE:				SHEET: 3 OF 8			

6

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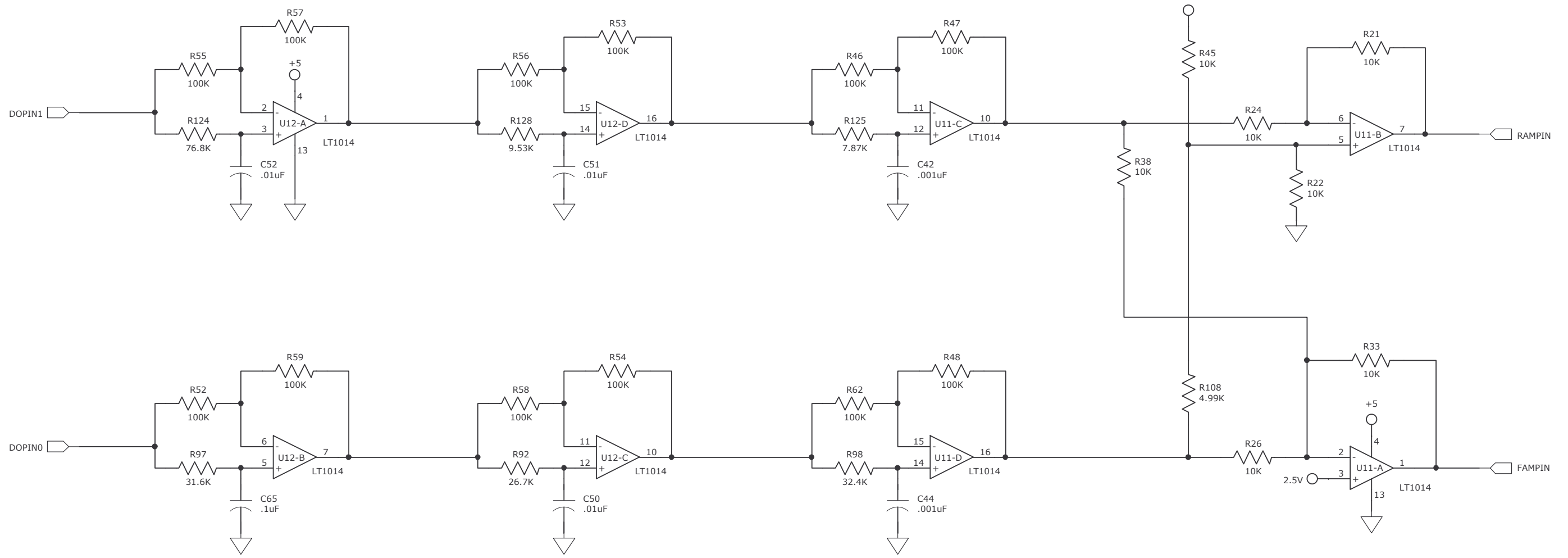
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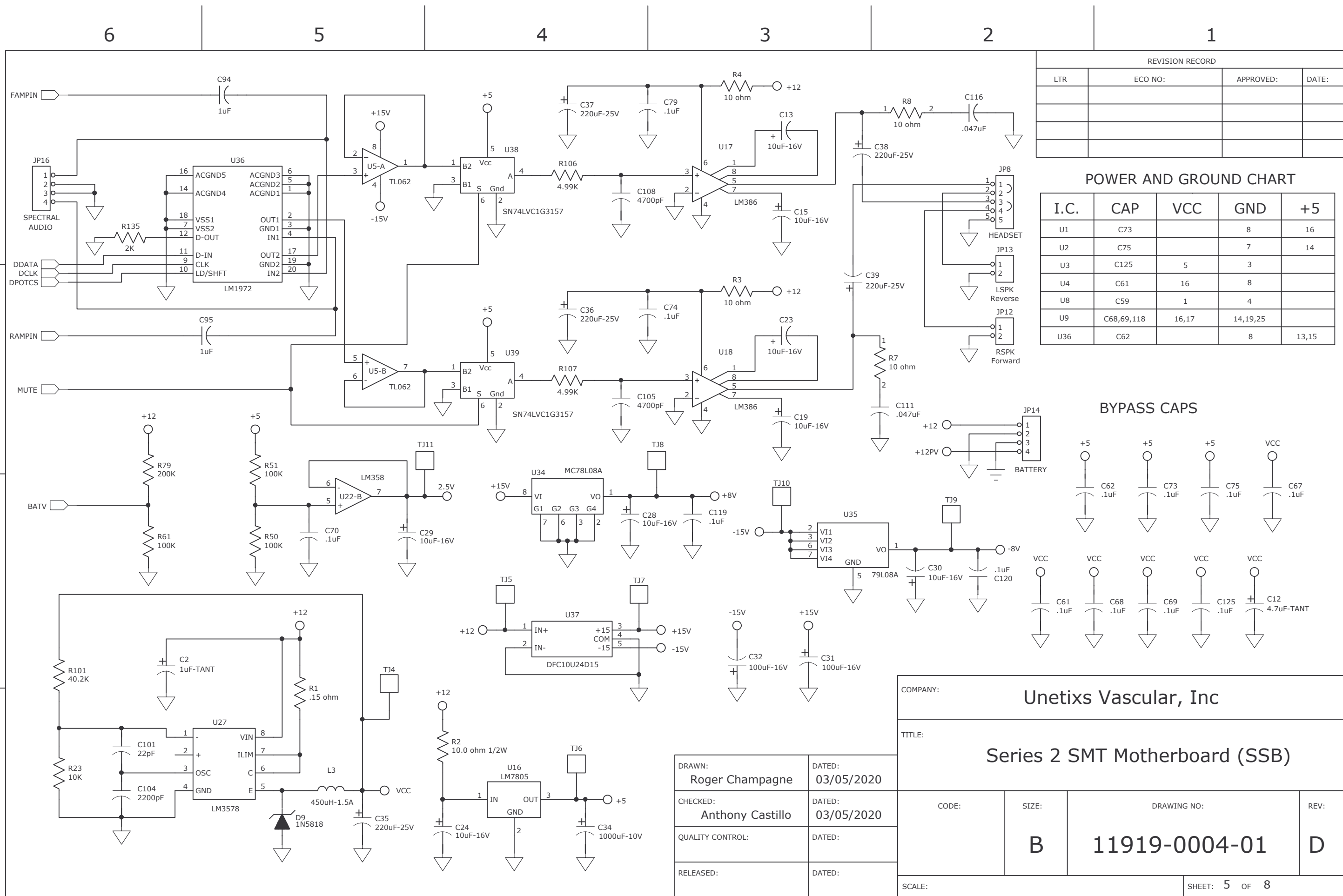
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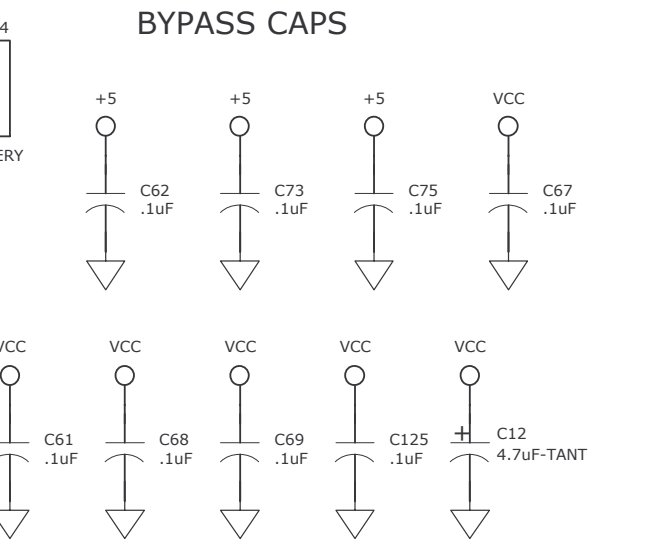
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TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
	B	11919-0004-01		D			
SCALE:				SHEET: 4 OF 8			

DRAWN:	DATED:
Roger Champagne	03/05/2020
CHECKED:	DATED:
Anthony Castillo	03/05/2020
QUALITY CONTROL:	DATED:
RELEASED:	DATED:



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

POWER AND GROUND CHART				
I.C.	CAP	VCC	GND	+5
U1	C73		8	16
U2	C75		7	14
U3	C125	5	3	
U4	C61	16	8	
U8	C59	1	4	
U9	C68,69,118	16,17	14,19,25	
U36	C62		8	13,15



COMPANY: Unetixs Vascular, Inc			
TITLE: Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:	REV:
B		11919-0004-01	D
SCALE:			SHEET: 5 OF 8

DRAWN: Roger Champagne	DATED: 03/05/2020
CHECKED: Anthony Castillo	DATED: 03/05/2020
QUALITY CONTROL:	DATED:
RELEASED:	DATED:

6

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2

1

PPG RIGHT BASELINE ADJUST

REVISION RECORD			
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D

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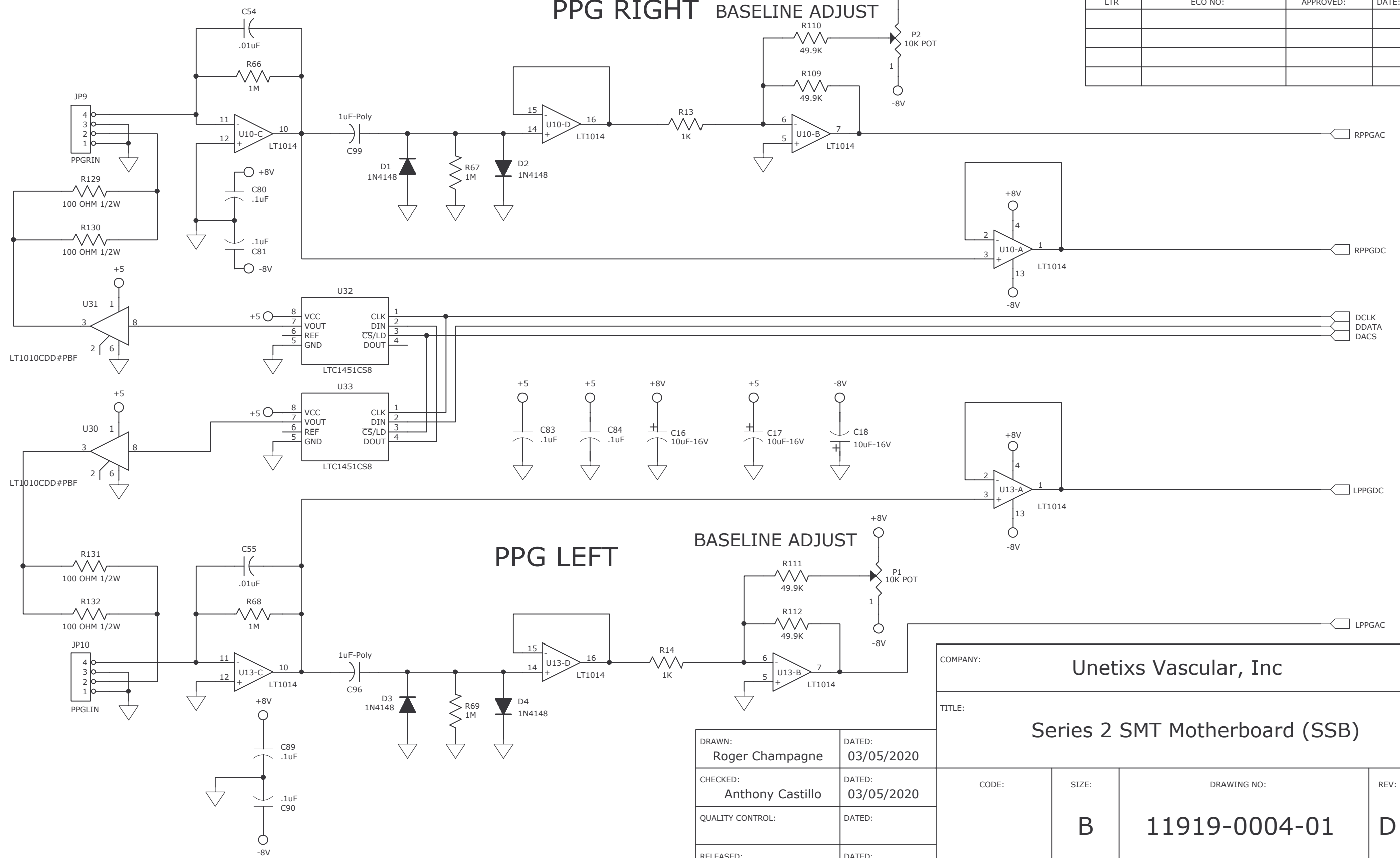
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B

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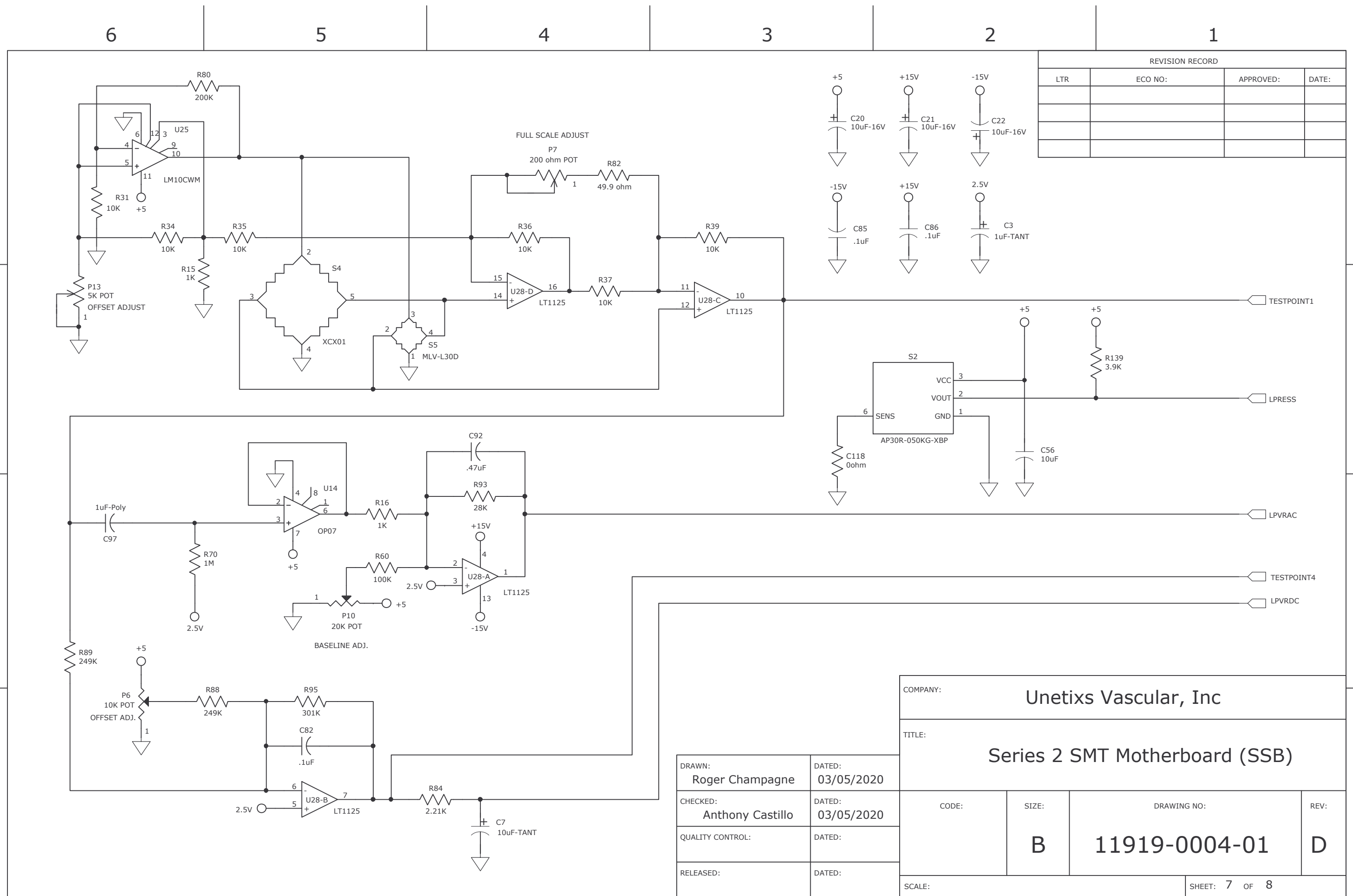
A

A



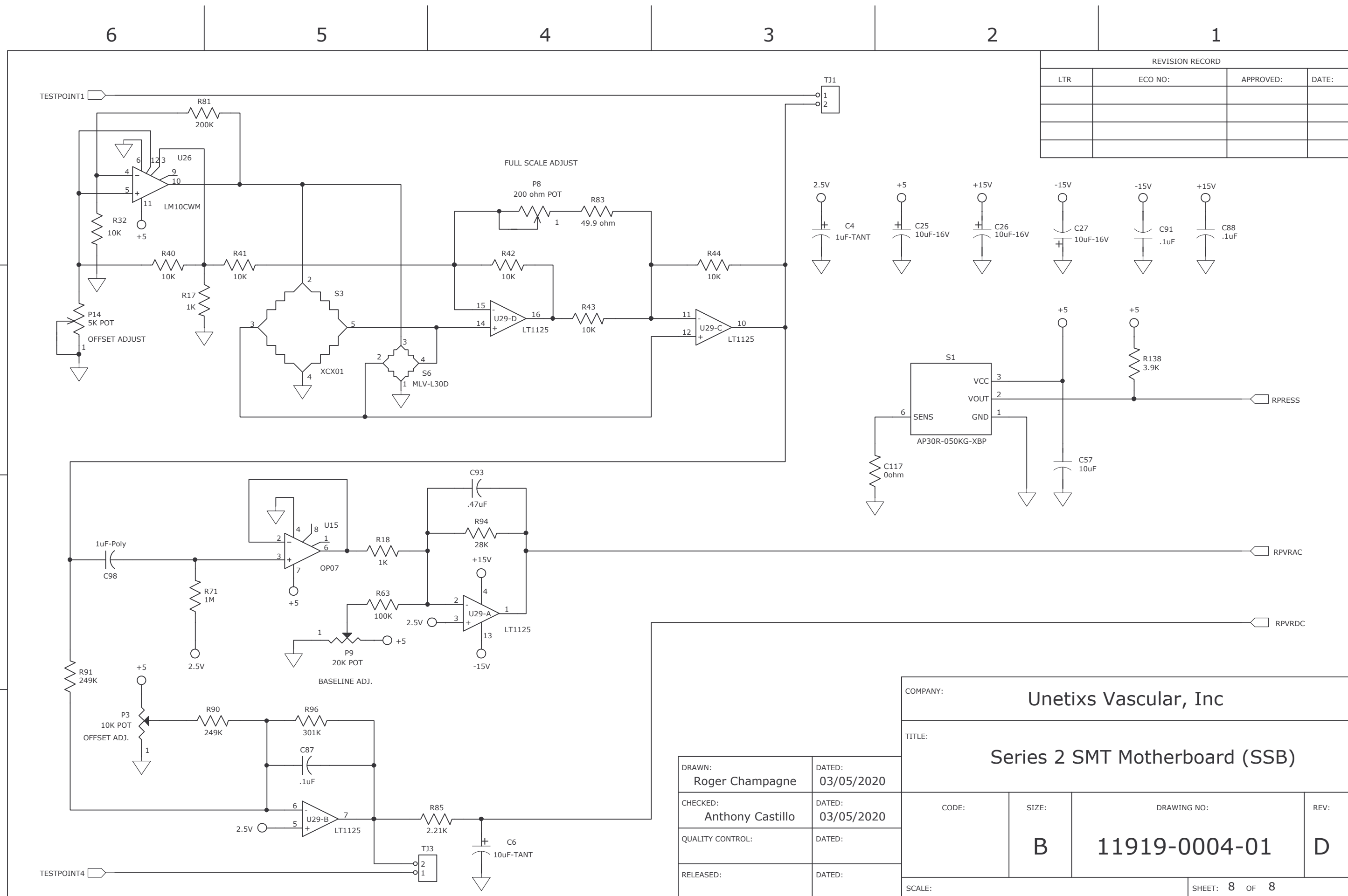
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TITLE: Series 2 SMT Motherboard (SSB)			
CODE:	SIZE: B	DRAWING NO: 11919-0004-01	REV: D
SCALE:		SHEET: 6 OF 8	

DRAWN: Roger Champagne	DATED: 03/05/2020
CHECKED: Anthony Castillo	DATED: 03/05/2020
QUALITY CONTROL:	DATED:
RELEASED:	DATED:



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

COMPANY:				Unetixs Vascular, Inc			
TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
	B	11919-0004-01		D			
SCALE:				SHEET: 7 OF 8			



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

COMPANY:				Unetixs Vascular, Inc			
TITLE:				Series 2 SMT Motherboard (SSB)			
CODE:	SIZE:	DRAWING NO:		REV:			
	B	11919-0004-01		D			
SCALE:				SHEET: 8 OF 8			

6

5

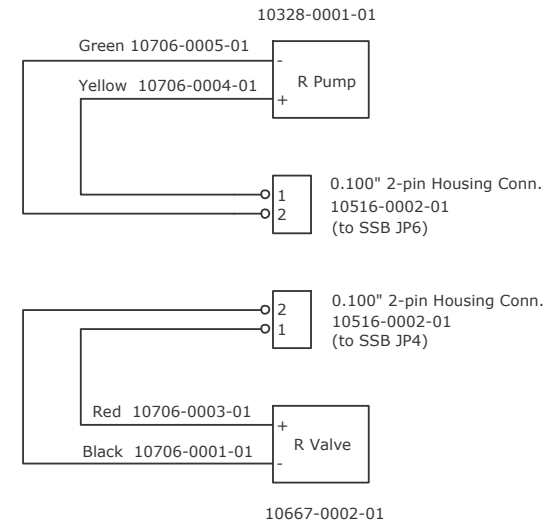
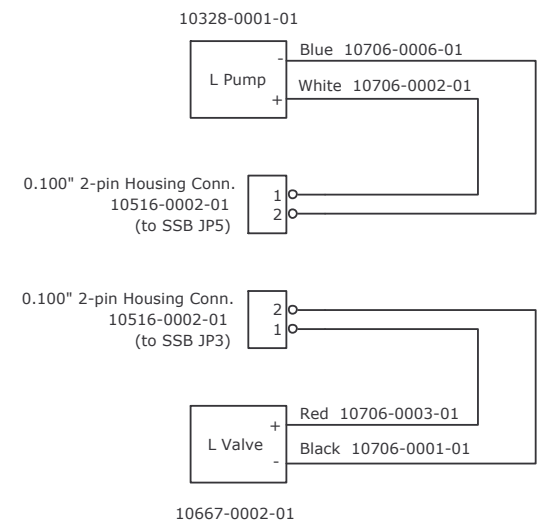
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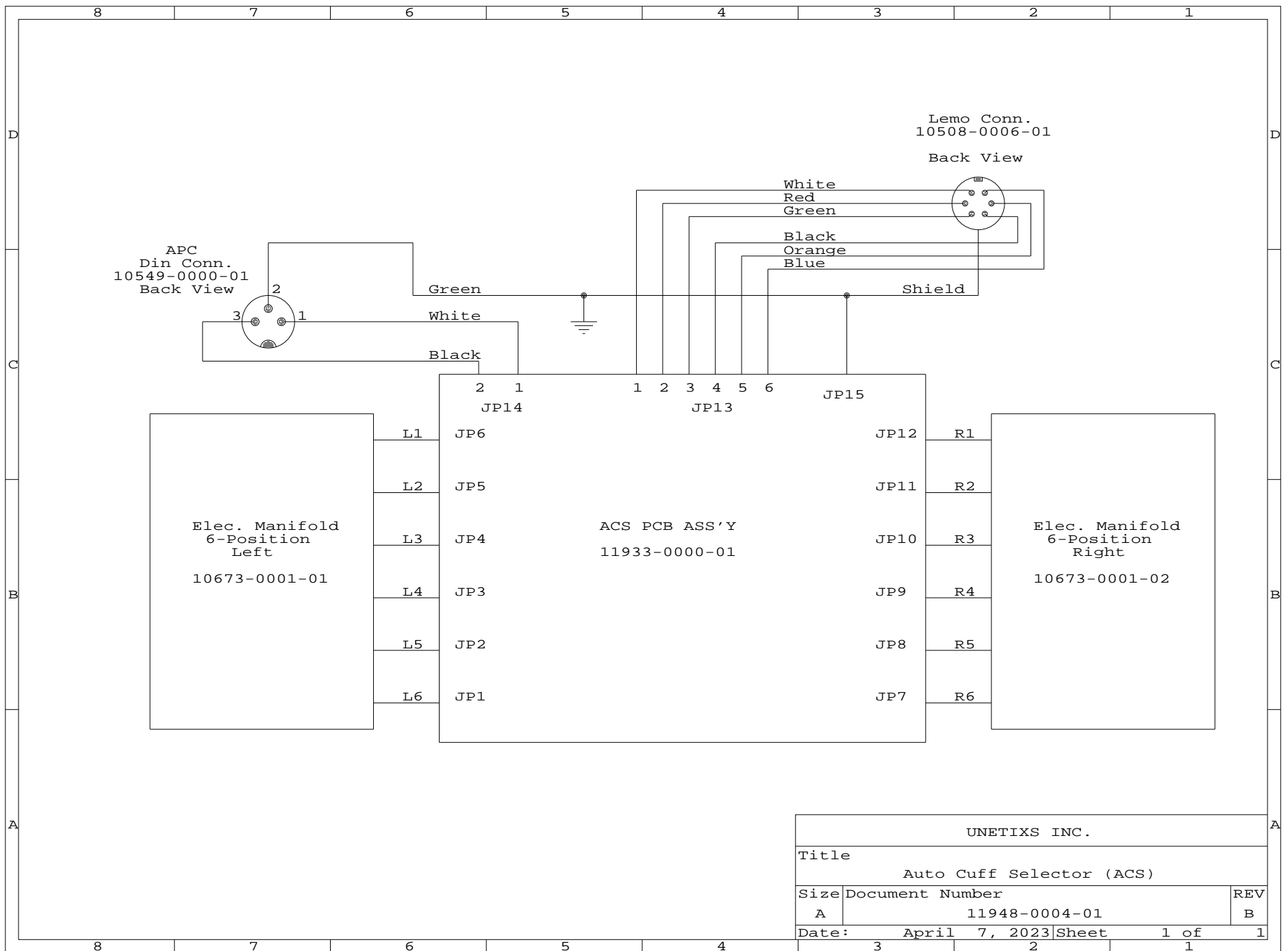
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LTR	ECO NO:	APPROVED:	DATE:
A	Initial Release	AWC	06/2014
B	ECR-0084	AWC	08/2015
C	ECR-0115	AWC	05/2018
D	ECR-0120	AWC	03/2020



COMPANY:
Unetixs Vascular Inc.
 125 Commerce Park Rd.
 North Kingstown, RI 02852

TITLE:
S2 Pumps & Valves Ass'y

DRAWN: R. Champagne	DATED: 03/08/2020	CODE:	SIZE: B	DRAWING NO: 11935-0004-01	REV: D
CHECKED: A. Castillo	DATED: 03/08/2020	SCALE:		SHEET: 1 OF 1	
RELEASED: A. Castillo	DATED: 03/08/2020				



UNETIXS INC.		
Title		
Auto Cuff Selector (ACS)		
Size	Document Number	REV
A	11948-0004-01	B
Date:	April 7, 2023	Sheet 1 of 1
	3	2 1

6

5

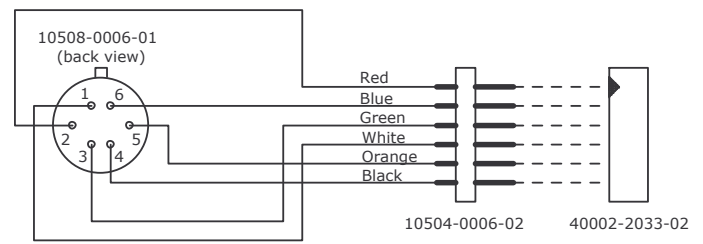
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2

1

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:



COMPANY:
Unetixs Vascular Inc.
 125 Commerce Park Rd.
 North Kingstown, RI 02852

TITLE:

DRAWN:	DATED:	CODE:	SIZE:	DRAWING NO:	REV:
CHECKED:	DATED:		B	11972-0004-01	A
RELEASED:	DATED:	SCALE:		SHEET: 1 OF 1	

6

5

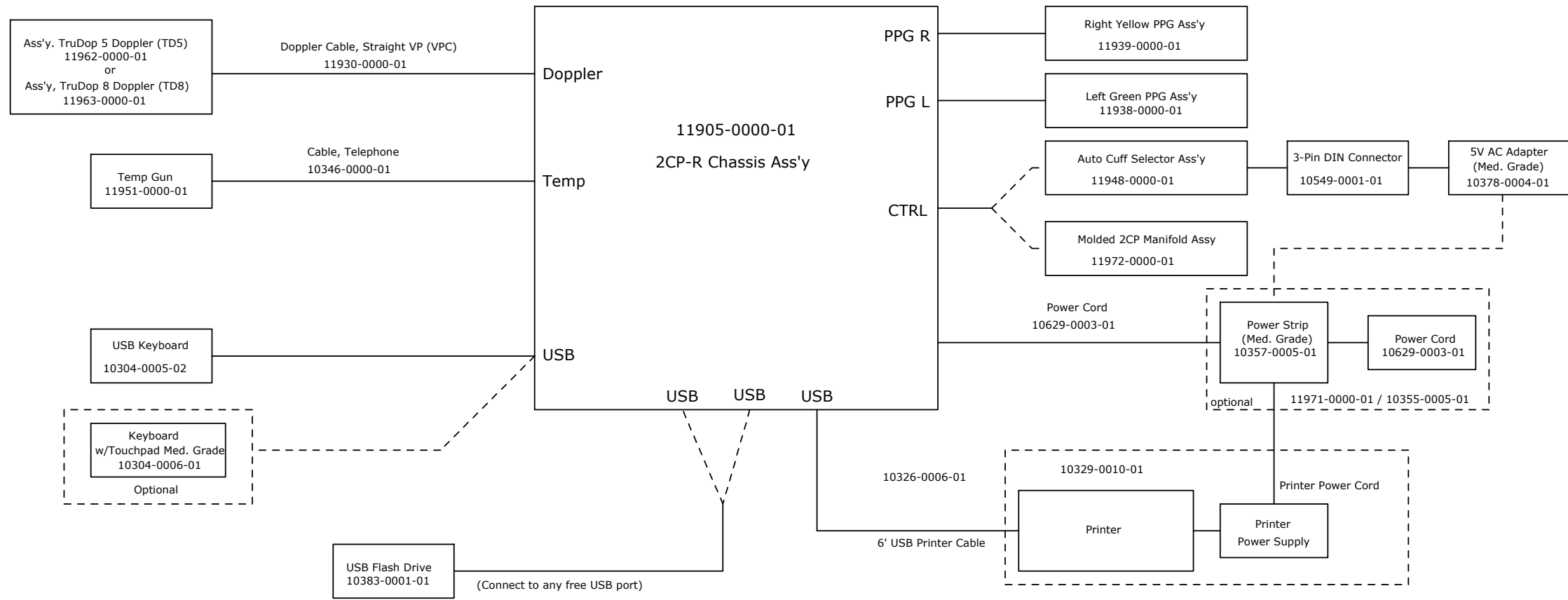
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REVISION RECORD			
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A	ECR-0014	AWC	06/2014
B	ECR-0115	AWC	06/2018
C	ECR-0131	NG	06/2022
D	ECR-0138	NG	04/2023



COMPANY:
Unetixs Vascular Inc
 333 Strawberry Field Road Suite 11
 Warwick, RI 02886

TITLE:
MultiLab Series 2 CP-R Final Ass'y

DRAWN: R. Champagne	DATED: 04-19-2023	CODE:	SIZE: B	DRAWING NO: 11996-0004-01	REV: D
CHECKED: N. Gomes	DATED: 04-19-2023	SCALE:		SHEET: 1 OF 1	
RELEASED: N. Gomes	DATED: 04-19-2023				

D

C

B

A

D

C

B

A

WWW.UNETIXS.COM

For Additional Help Contact:
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