



Agilent Technologies

Agilent 5DX Series II Installation Guide

E7200-90034



Revision A.1

April, 1998

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Agilent Technologies

Emergency Shut Down Procedure

In the event of a disaster or system emergency, shut down the Agilent 5DX by pressing one of the Emergency Stop Buttons, as indicated in **Figure T-1**:

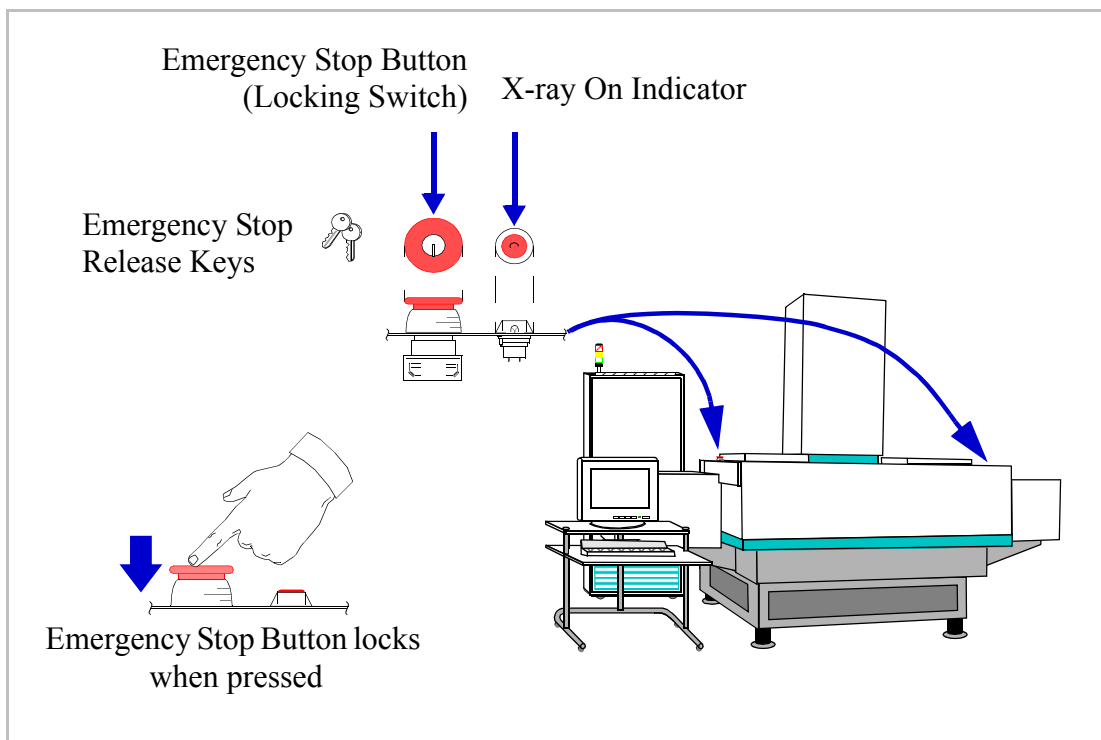


Figure T-3 Emergency Stop Button Locations

WARNING



120 Volt AC Power Connections are for Agilent Installed Accessories ONLY. Do not use these connections as utility outlets. Improper handling of these connections can result in electrical shock.

For additional information on Safety and the Agilent 5DX System, see the **Safety Summary** in the **Agilent 5DX Series II Service Guide**.

Agilent 5DX Series II Installation Guide Contents

Emergency Shut Down Procedure	ii
Warranty and Regulatory Data	v
Safety Information	ix
SAFETY SYMBOLS	ix
Electromagnetic Compatibility Requirements	xii
Emergency Stop	xiii
Preparing for 5DX Installation	1
System Arrival, Inspection and Placement	3
System Hardware Installation	9
System Performance Verification Procedure	24
Power Checks	24
System Startup	27
Panel Handling	30
Wiring Configuration	45
200-240 Volt 1-Phase Earthed	50
200-240 Volt 1-Phase Non-Earthed	52
200-240 Volt 3-Phase Delta with Phase Junction Earthed	54
200 - 220 Volt 3-Phase Wye or Delta	56
380-415 Volt 3-Phase Wye with Neutral	58
SMEMA Interface	61
X-RAY Safety Reference	67

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Manual Printing History And System Software Revisions:

This page lists this manual's printing history and the system's software revisions. If you receive manual updates or system software revisions, a new Printing History Page will accompany the updates and revisions. It is important that you insert the new Printing History Page in the manual and remove the old one.

Agilent 5DX Installation Guide

Software Revision

Manual Revision

5.2

Rev. A, April, 1998

AGILENT TECHNOLOGIES WARRANTY STATEMENT

Agilent PRODUCT

Agilent 5DX System and Accessories

DURATION OF WARRANTY

1 (One) Year

1. Agilent warrants Agilent hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.
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Regulatory Information

Agilent Technologies is registered with federal and state agencies to sell and service its own X-ray equipment manufactured in Loveland, Colorado, USA. The equipment was designed, and is used, to inspect printed circuit boards only. The X-ray equipment is classified in the United States and internationally as an “Industrial Cabinet X-ray System”. It is not large enough for human entry. The equipment has been designed and constructed to be safely used in any area.

The Agilent 5DX System utilizes an X-ray Tube operating at 160 kilovolts, 100 microamps shielded within the lead cabinet. The tube is rated for continuous duty operation with beam filtration of 0.07 inches Beryllium and 0.010 inches stainless steel.

The lead cabinet is fully interlocked such that the main power to the X-ray Tube is removed when any access panel is opened.

When the Agilent 5DX System is installed at the customer’s site, the equipment is surveyed by trained service people. A full radiation safety survey is performed and a report generated. The survey is made using a Geiger Mueller and a health physics ion chamber according to procedures on record with the CDRH.

The end user is responsible for registering the equipment with their local and state authorities.

Agilent Technologies warrants that the Agilent 5DX automated process test systems meets X-ray safety regulations in the following countries:

Canada Reference Statutes of Canada Chapter R-1, Chapter 1370, Schedule 1, Section 15, Schedule II and Part XV.

England Reference BS5724, (ISO 9000 601-1).

Germany Reference BGBII, S.114 & Din 54113 and the “Law on the Protection Against Injury or Damage Due to X-Rays” a.k.a. “X-Ray Decree”.

Japan Reference Ministry of Labor, Industrial Safety and Health, Law #57 and Cabinet ordinance #38.

Korea Reference Presidential Decree, Article 65, Chapter VII, of the Atomic Energy Act.

The Nordic Regions of **Denmark, Finland, Iceland, Norway and Sweden,**

Reference the Radiation Protection Institutes and the Radiation Protection Act.

United States

Regulation 21CFR 1010.2, 1010.3, and 1020.40 administered by the Department of Health and Human Services, Food and Drug

Administration, Center for Devices and Radiological Health (CDRH).

Safety Information

Warning



This product produces X-radiation. Do not attempt to open any part of the product. Exposure to X-radiation can cause serious bodily injury. Refer all servicing to service-trained personnel.

Warning



This product produces X-radiation. Do not operate this product or turn on the X-radiation source unless all shielding is in place. Operation without shielding in place can result in serious bodily injury.

SAFETY SYMBOLS



Instruction symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.



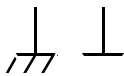
Alternating current (ac).



Indicates the field wiring terminal that must be connected to earth ground before operating the equipment — protects against electrical shock in case of fault.



Direct current (dc).



Frame or chassis ground terminal — typically connects to the equipment's metal frame.



Indicates hazardous voltage.

Warning



Calls attention to a procedure, practice, or condition that could result in bodily injury or death.

Caution



Calls attention to a procedure, practice, or condition that could cause damage to equipment or permanent loss of data.

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Agilent Technologies assumes no liability for the Customer's failure to comply with these requirements.

Ground the Equipment For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.

For continued protection against fire, replace the line fuses(s) only with the fuse(s) of the same voltage and current rating and type. **DO NOT** use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, **DO NOT** perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or by any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Do not service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do not substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Agilent Technologies
Loveland Manufacturing Center

Manufacturer's Address: 815 14th Street S.W.
Loveland, Colorado 80537

declares, that the products: Agilent Model 5DX Systems

and to which this declaration relates, are in conformity with the protection requirements of: The EMC Directive 89/336/EEC (inclusive 93/68/EEC) and carries the "CE" marking accordingly. Attestation is provided according to article 10 (2) of the Directive by a Technical Construction File.

Technical File Number: 95-0900-003-TCF **Rev:** A **Dated:** 31 March, 1995

The following standards are referenced in the file:

EMC: CISPR 11:1990/EN55011 (1991)
IEC 801-2:1991/EN50082-1 (1992)
IEC 801-3:1984/EN50082-1 (1992)
IEC 801-4:1988/EN50082-1 (1992)

A Technical Report/Certificate has been issued in accordance with Part V (Reg 50) of the UK Regulations (SI 1992 No. 2372) by a UK appointed Competent Body, namely,

Interference Technology International Limited
41-42 Shrivenham Hundred Business Park
Shrivenham, Swindon, Wilts. SN6 8TZ
England, UK

Certificate Number: C134FPI1.JES **Dated:** 1 April, 1996

Supplementary Information:

This product also herewith complies with the requirements of the Low Voltage Directive 73/23/EEC (inclusive 93/68/EEC).

Safety: IEC 1010-1 (1990) Incl. Amend 1 (1992)/EN61010-1 (1993)
CSA C22.2 #1010.1 (1992)
UL 3111

April 1, 1996

Loveland Quality Manager

European Contact: Your local Agilent Technologies Sales and Service Office or Agilent Technologies GmbH,
Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: +49-7031-143143).

Electromagnetic Compatibility Requirements

This product complies with EN 55011 (CISPR 11) Group 1, Class A for conducting emissions. The product exceeds the EN55011 (CISPR 11) Group 1, Class A limit for radiated emissions by less than 10 dB when measured on a test site at a distance of 30 meters. Therefore, some site preparations may have to be done in order to comply with the Class A limit in the frequency range of 30 MHz to 1 GHz for radiated emissions at 30 meters from the exterior wall of a building in which the equipment is installed. See the figure below for an illustration of the site calculations.

To obtain the necessary attenuation at the Customer's site, perform these calculations (if the calculated site attenuation (A) is less than 10 dB, contact the Technical Regulatory Support Engineer (TRSE) in your country):

1. The attenuation of a concrete wall (W) (without any openings) = 10 dB
2. The distance (D) (the distance from the equipment to the exterior wall plus 30 meters) increases the attenuation by X and can be calculated as follows:

$$X = 20 * \log (D/30)$$

Where: X = attenuation in dB

D = distance in meters

3. The total attenuation (A) is calculated as follows:

$$A = n * W + X$$

Where: A = total attenuation in dB

n = number of concrete walls within distance D

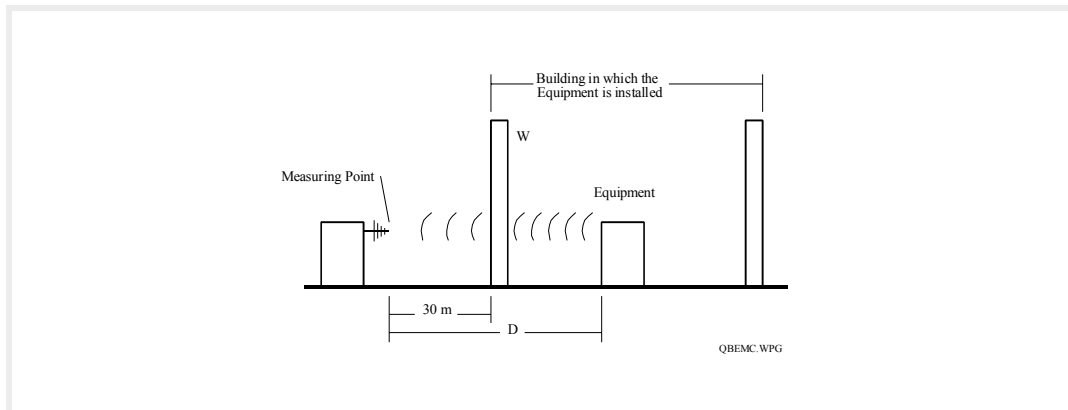


Figure Notices-2: Electromagnetic Emission Measurement

Emergency Stop

The Emergency Stop Subsystem is used to quickly shutdown the power to the Agilent 5DX **Main Cabinet**. The Emergency Stop Subsystem is intended for crisis situations only.

Caution



The **Emergency Stop Buttons** are intended for use in **emergency situations only** and should **not** be used for normal system shutdown. Repeated misuse of the **Emergency Stop Buttons** will eventually cause damage to certain components or the loss of data or both.

The Agilent 5DX System is equipped with two **Emergency Stop Buttons**. Refer to **Figure N-3** for their locations.

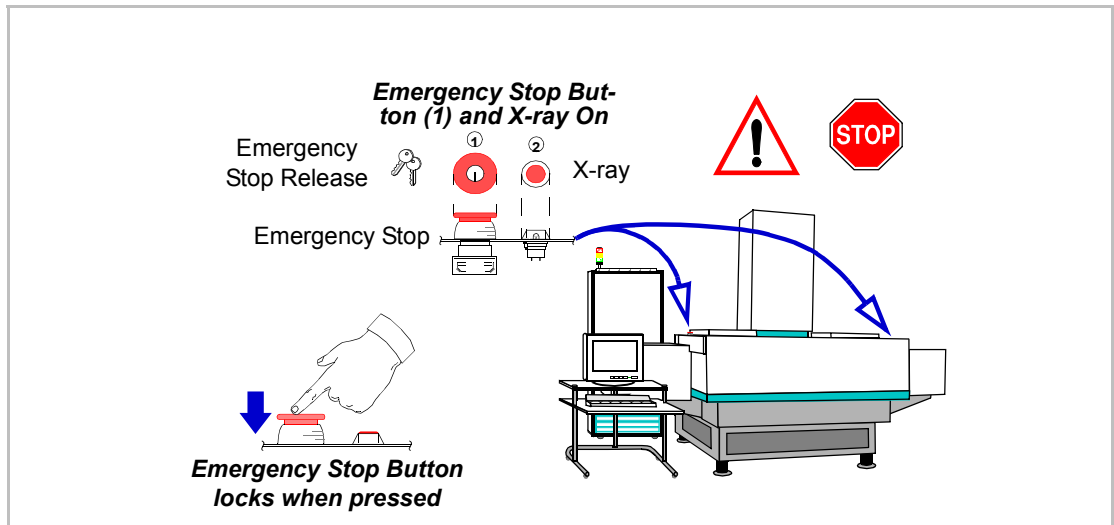


Figure N-3: Emergency Stop Locations

The **Emergency Stop Buttons** are located on either side of the Agilent 5DX System **Main Cabinet** just above the **loader assemblies**. When either Emergency Stop Button is pressed it will immediately interrupt the switched system power. The Emergency Stop Button will lock in the power off position and remain in the locked position until released with the Emergency Stop release key. (See the **Power Subsystem** chapter of the **Agilent 5DX Series II Service Guide** for a step-by-step procedure for restoring system power after an Emergency Stop procedure has been performed).

Preparing for 5DX Installation

Reference Documents: Agilent Electrostatic Discharge Control (A-5951-1589-1)
5DX Service Guide (E7200-90028)
System Administration Manual (E7200-90032)
Site Preparation Manual (E7200-90035)

Estimated Time: Two to Three Days (16 - 24 Hours)

Prerequisite: All System Components and Software have been delivered and an acceptable site has been chosen for installation. All utilities (air, electric, etc.) are ready for the installation and are at the site of installation as specified in the Site Preparation Manual.

Special Notes: CE must be present for crate unloading, system movement, system uncrating and system placement. (whenever possible)

ATTENTION

Static sensitive devices are present. Follow the Agilent approved ESD handling procedures while working with static sensitive components.

TABLE 1**Tools/Equipment Required**

Description	Quantity	Notes
CE standard tool kit including a full set of hex wrenches, standard sockets, torx drivers, etc.	1	
Confirmation and Adjustment Board	1	E7200-66527
Level	1	25cm (10 inch) min.
ESD Grounding Equipment	1-2	wrist strap - heel straps
Pallet Jack and hydraulic lift		
Torx Screwdrivers		10, 15, 20, 25 sizes
Safety Allen Wrenches		8710-2683 or 8710-2693
Extra Bay Retainer Clips	pkg.	0590-1366
Multimeter		
Radiation meters	1	Victoreen 440 RF/D Victoreen 290 GM, etc.

System Arrival, Inspection and Placement

Figure 1

5DX System Delivery



This photograph shows the 5DX as it comes off the truck on its special pallet. Make sure the moving equipment is of sufficient size and capability. (see the Site Preparation Manual (E7200-90035))

An acceptable site must be prepared prior to the installation of the 5DX Process Test System. This includes having a proper level floor capable of supporting 3630 kg (>8000 pounds), clearances for all equipment, power and air utilities, plus acceptable customer-supplied climate control. Movement to the final location should be considered prior to transportation, this includes a travel route with sufficient access clearances throughout the course of movement.

The main unit will be on a pallet 165 centimeters wide by 226 centimeters long (65 x 89 inches). This pallet will require a fork lift with tines at least 183 centimeters long (72 inches) and capable of lifting 3630 kilograms (8003 pounds). The main unit on its pallet will be 244 centimeters (96 inches) high.

It may be desirable to remove the 5DX from its pallet in the receiving area and move it to the installation location from there.

Figure 2

Fork Lift Use

Fork lift tines shall be set to 34.5 inch (87.5 cm) centers

Tines must be no less than 72 inches (183 cm) long

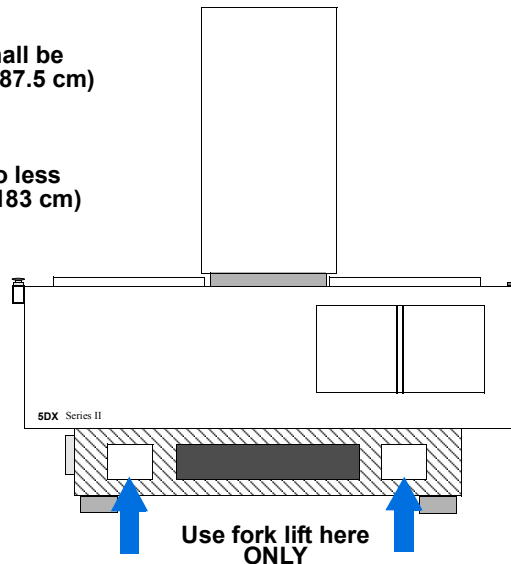
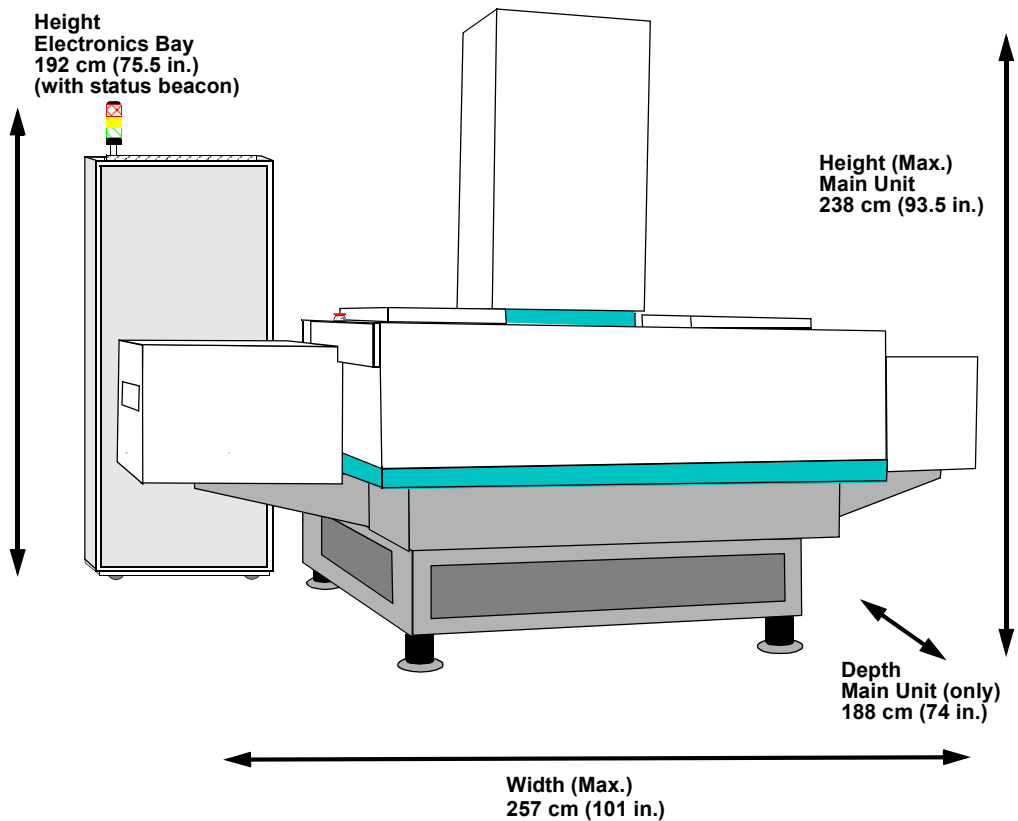


Figure 3

5DX System Dimensions



NOTE: The main unit while on its pallet is 2.44m or 96 inches high. This plus required forklift lifting distance should be noted for movement to the install location.

- ☐ 1. **Verify Items Shipped** — *CE must be present for system and crate unloading, system movement, and system placement: (whenever possible)* Inspect all received containers (*shipping boxes*) and verify the correct number of items arrived with the shipment (*See the packing list: If the packing list is missing, contact the customer facility receiving personnel*).
- ☐ 2. **Check for Gross Damage** — Look for and record any damage to exposed surfaces or packing materials. Document any damage on the waybill. Advise the carrier and contact **SPT Manufacturing** immediately. If significant damage exists, obtain photographic documentation whenever possible prior to further unpacking or movement.
- ☐ 3. **Unpacking** - Remove the protective shrink wrap and bubble pack from the main unit. To remove the 5DX from its pallet, remove the four (15/16") nuts from the 5DX. Using acceptable lifting equipment, raise the 5DX from its pallet.
- ☐ 4. **Uncrating** - It may be desirable to move the loader crate and accessories crate (or pallet) to the installation area before opening. Open the wooden crate(s) by removing the bolts from the front of each (there are bolts on top as well as on both sides.) Remove the boxes from the accessory crate or pallet.
- ☐ 5. **Electronics bay** — (Instructions for disassembly are on the box.) Remove the box from the Electronics bay pallet. Remove the ramp from the top of the bay. Remove the bolts securing the bay. Unfold the ramp, release the bay and roll down the

ramp. Move the bay to approximately where it will be placed during installation.

- ☐ **6. Staging** — Organize all materials in the installation area. Prior to beginning installation, find the box with the foot pads and spacers. These should be marked, but would be in the box with the part number E7200-80024.
- ☐ **7. Clear Packaging** — Remove all packing materials, straps, padding etc. from the installation area.
- ☐ **8. Inspect Items Shipped** — Inspect the shipment for damage. Inspect system exterior for abrasions or dents. Record any damage on the waybill. Advise the carrier and contact *SPT Manufacturing* immediately.
- ☐ **9. Move 5DX To Install Site** — When the system has been delivered to the install area, move it to the desired placement location. Position the system according to the customer's requirements then install the stabilizer pads with spacers for the estimated height requirement. (*Table 3*). The pads and spacers can be put on while this system is elevated by the fork lift or the system can be lowered on to the pads and spacers.

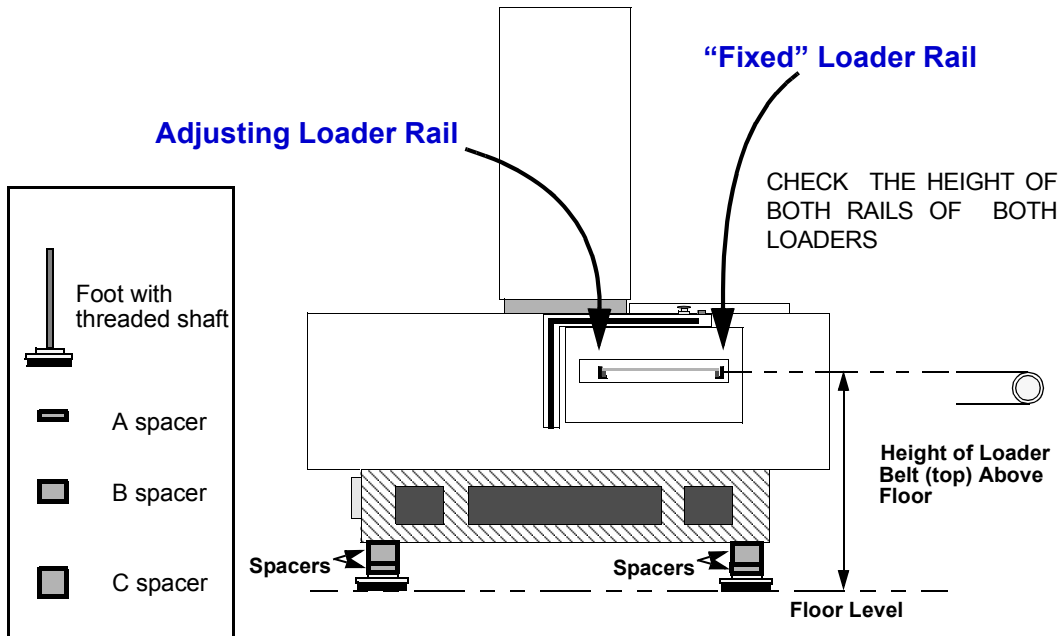
TABLE 2 **Spacer Size Reference**

Spacer	In Centimeters	In Inches	Quantity
Spacer A (E7200-24715)	1.6 cm	0.630 in.	4
Spacer B (E7200-24717)	3.175 cm	1.25 in.	8
Spacer C (E7200-24716)	7.6 cm	3.0 in.	4

- ☐ **10. Verify that the system is level** — Adjust pads as required. This is done by turning the top of the threaded shaft (*Figure 4*).

Figure 4

Loader Height Setup



ADVICE



If the 5DX system is to be integrated into a production line, **you** may wish to level and adjust height at the same time, after the loaders are installed.

TABLE 3 **Loader height Configuration Chart (Sample)**

Configuration #	Assembly Setup	Minimum Height Adjustment	Maximum Height Adjustment
1	Spacer A+C (inches)	89.00 cm (35.04)	90.90 cm (35.79)
2	Spacer B+C	84.58 cm (33.30)	86.48 cm (34.05)
3	Spacer A+B+C	92.18 cm (36.29)	94.10 cm (37.04)
4	Spacer A+B+B+C	95.35 cm (37.54)	97.26 cm (38.29)

* Loader height is not recommended below 88.1 cm (34.68 in.)
 Variance between Min and Max is due to the 19mm adjustment in the foot receptacle.

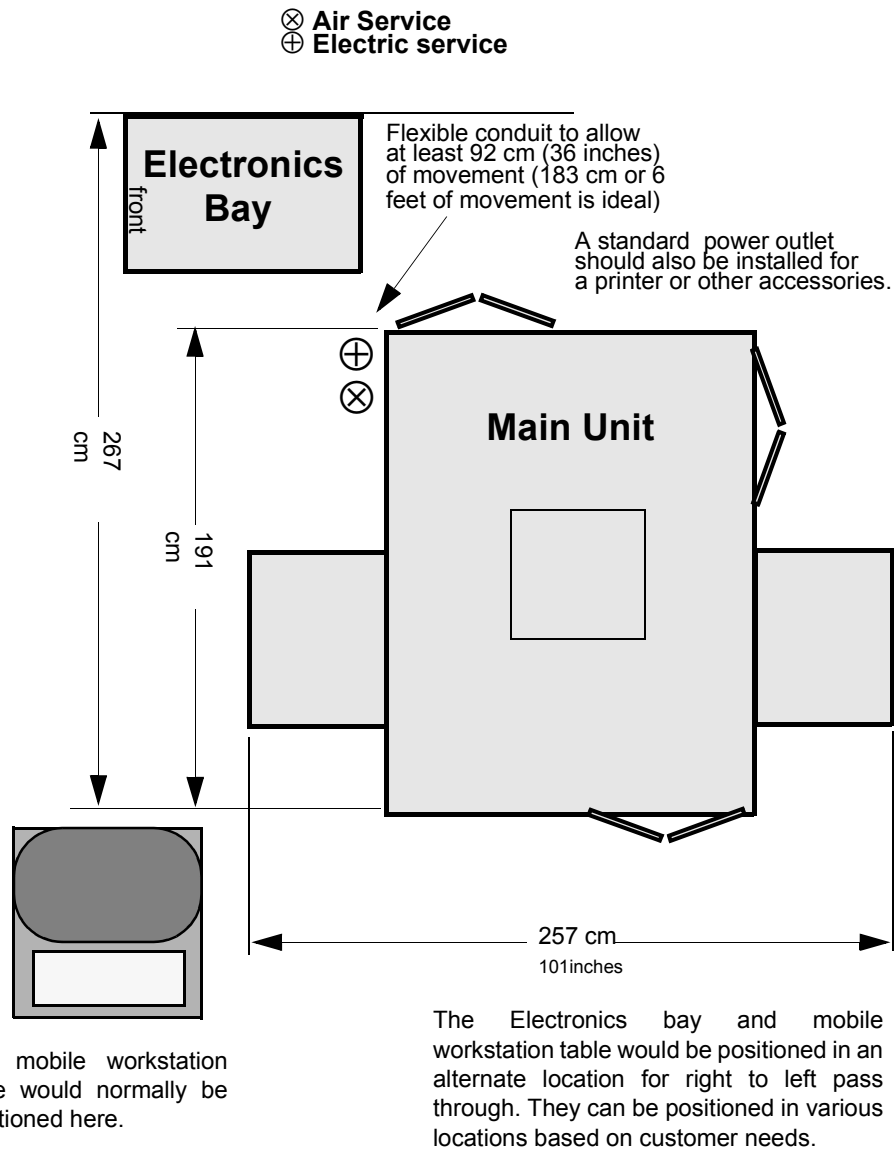
System Hardware Installation

Site preparation and movement to the final location should be complete at this stage. Verify correct placement of the main unit, and subsystems (such as electronics bay, user interface and monitor:) (*See Figure 5*) with your customer. Begin assembly of the 5DX system using the following procedure:

NOTE The forklift will be needed to unpack and install the loaders, make sure that it and its operator remain present.

Figure 5

Facility Hook-up, Clearances and Location



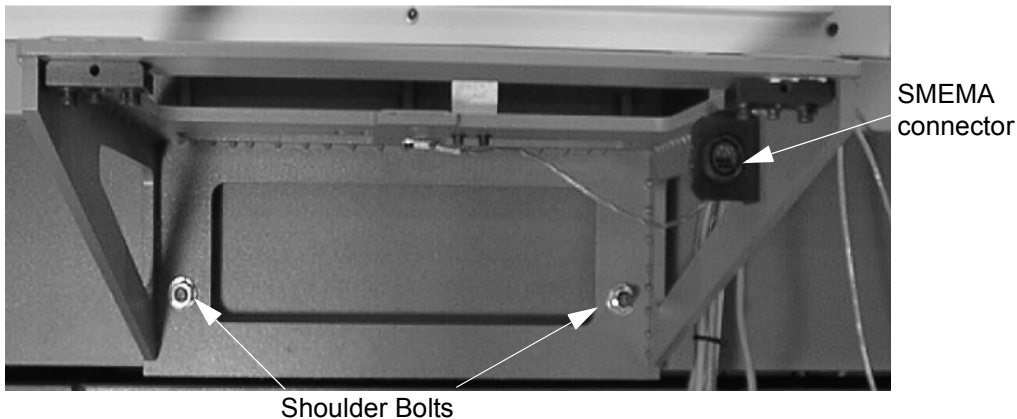
- ☐ 1. **Stage Release** — There are several tie wraps securing the stage, movement motors and assemblies inside the main cabinet. Remove these to allow both X and Y movement.
- ☐ 2. **Loader Shelf Mounting** — Remove the loader support shelves (only one for pass-back models) from the loader crate. They will be fastened to the bottom of the crate under the loader platform. There is a right and a left shelf, each with its own specific set of hardware. (The shelves are marked on the bottom “R” or “L” and the bags with the hardware are also marked).

On the left side of the unit, the stage needs to be moved to line up the guide holes with the screw holes at the back of the loader shelf.

Mount the Loader Shelves to the 5DX Main Cabinet using (four) bolts. The two shoulder bolts (3030-1071) are used in the two outer holes, for the inner holes use the standard bolts (3030-1083). Secure the bolts with a 1/4 in. hex wrench. Secure the lower side of each loader shelf to the standoffs on the side of the system. (Part numbers for these are: standoffs: 0570-1583, flat washers: (3050-0581, 3/4 in. nuts: 2950-0230). The loader support shelves are illustrated as installed in *Figure 7 on page 14*.

Figure 6

Loader Shelf



NOTE

If the stop nuts on the shelf standoffs have moved or are loose the loader may require alignment. In addition it may be necessary to readjust the height and angle to level the loader module with the main unit.

WARNING



The loader modules are extremely heavy: DO NOT LIFT THE LOADER BY YOURSELF! Observe all lifting procedures and safety precautions: Obtain assistance or proper equipment for elevating the loaders onto the installed shelves.



- 3. SMEMA Connector Mounting** — Mount the **SMEMA** connectors (*Figure 7*) to the rear side of the loader mount using (two) hex bolts (3030-0869) and washers (3050-1909) with a 5/32" hex wrench. These bolts are in the mounting holes of the loader shelf. (*SMEMA stands for Surface Mount Equipment Manufacturing Association*)

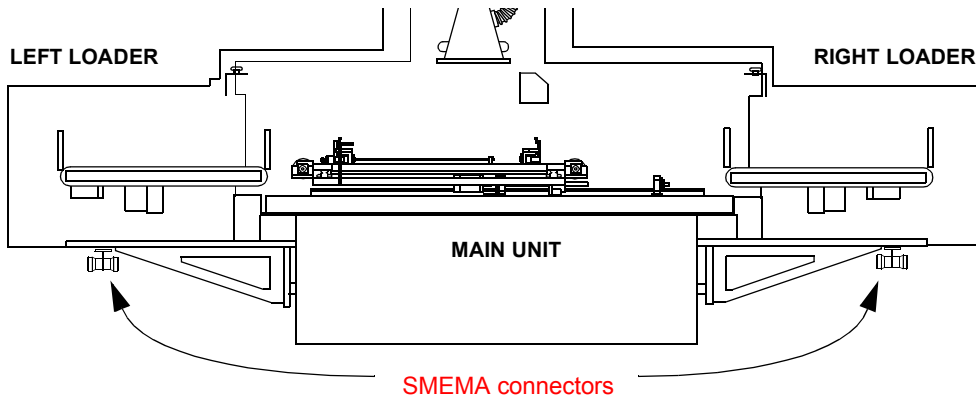
- ☐ **4. ESD Ground Mounting** — Mount the ESD wrist strap jacks to the front side of the loader shelf. The hardware is the same type as used for the SMEMA mounting.
- ☐ **5. Ground Connection** — Connect the loader ground wires to the rear of each loader shelf using a hex screw (3030-0227) and star washers (2190-0960) and a 5/32" hex wrench.
- ☐ **6. Loader Platform Removal** — The loaders are on a platform inside the loader crate. Remove the loader platform with a forklift. The platform with loaders do not allow much vertical movement within the crate so care should be used. Move the loader platform as close to the main unit as possible. It is desirable to use the fork lift to move the platform to each side of the main unit while moving the loaders onto the loader shelf.

CAUTION

If the loader platform is set on the floor before removing the loaders, caution is required. Removing one loader from the platform will cause the platform to tip due to the weight of the remaining loader.

Figure 7

SMEMA Connections at Loader Assemblies (Side View)



- ☐ **7. Lead Panel Installation** — The lead panels are shipped on top of the loaders, one for each side. Install the lead Panels (E7200-00616) inside the main unit above where the loader shelf attaches. The lead panels are secured to the shelf using four 10-32 allen head safety screws (2940-0304) and washers (3050-1909) using the special tool provided (8710-2683 or 8710-2693).

The tools have two part numbers. The one used depends on which type of screws and tools are shipped. The different screws will have the same part number.

IMPORTANT

The Lead Panels are interchangeable. You must be certain that the lead panels are positioned tightly against the outer cabinet wall to prevent radiation leakage. If only one loader is used (pass back system), only one panel will be installed.

☐ 8. Loader Installation —

- a. Remove the Loader securing straps and the braces located around the bottom edges of the loaders.
Obtain assistance and use a pallet jack or equivalent lifting device when putting the loader pallet into position.

WARNING



The loader modules are extremely heavy: **DO NOT LIFT BY YOURSELF!** Observe all lifting procedures and safety precautions: Use proper equipment for elevating the loaders onto the installed shelves. The loader(s) are very heavy (more than 135kg {300 lbs.}) and require at least two persons to safely handle the installation. Care must be taken when positioning the loaders to *avoid damaging the interlock switches.*

- b. *Using at least two persons, proper equipment and safety procedures:* Slide each loader onto the loader shelf and secure with the appropriate fasteners (3030-1083 washers, 3030-1114 and 3050-1231 screws using a 3/16" hex wrench).

NOTE

There is a (right) and a (left) loader. The protrusion on the side of each loader should be toward the rear of the main unit.

☐ 9. Check System Height and Level — If the 5DX is installed on a production line:

- a. Adjust the system location such that the fixed rail (*Figure 4*) aligns perfectly with the production line conveyors.
- b. Adjust the system height to coincide with the production conveyor height.

- c. Verify the system is still level.

ADVICE



When adjusting the 5DX for in-line production, work with the customers line engineer to find the best interface position for both the 5DX and the conveyor system.



- 10. Loader Interface Cabling** — Connect the loader interface cables, air hose and ground connections. The interface cables and corresponding connectors are marked and are not interchangeable. Dress these cables using tie wraps.



- 11. Electronics bay Setup** — Open the rear door of the bay and locate the bay door keys. Unlock the front door for accessibility. Remove the tie wraps securing the individual bay subassemblies. Remove the light stack and install on top of the bay with the 4-40 screws provided. (This will require removal of the top of the electronics bay. You may want to remove the doors and side panels at this time as well.)



- 12. Electronics Bay Subassemblies & PCBs** — Inspect the condition of electronics subassemblies and reset circuit boards if needed.

- a. Put on your ESD wrist strap. Prior to handling any circuit boards, attach the clip end to a grounded structure.

ATTENTION



Use your ESD wrist strap for the following procedure: You will be handling static sensitive components.

- b. Inspect the individual subassemblies and look for those which may have unseated during shipping. Particular attention should be paid to the motion driver assemblies.

- ☐ **13. Electronics bay Cabling** — The cable routing should be decided on site by the customer: You may want to remove the rear door and side panels of the electronics bay for easy access to all cabling.
- a.** Route the monitor, keyboard and operator console cabling toward the mobile workstation table. See *Figure 8*.
 - b.** Route and connect the main cable harness:
 - i.** Begin by feeding the main harness into the bottom of the electronics bay as shown in *Figure 8*.
 - ii.** Within the electronics bay, the Main Cable Harness should be routed from the access port to either side of the bay and to the specific device.
 - iii.** Connect all interface cables to the electronic subassemblies. All cable connections are labeled by **P** numbers (Pxxxx) which correspond to respective connector **J** numbers (Jxxxx) on the subassemblies.

Figure 8

Cable Harness Routing

There are two cable harnesses or bundles that route to/from the electronics bay. It is easiest to do the wiring with the rear door, access panel and sides removed.

The cable bundle from the main unit is routed through the larger hole in the bottom panel. The bundle containing the monitor, keyboard, etc. cables goes out the smaller hole.

Each hole has a removable cable clamp to make cable routing easier. It is best to remove the whole panel to route the cables initially.

Cables from the main unit and from the electronics bay are labeled. The labels indicate where each cable should be routed. Cables from the main unit show which connection is to be made at the electronics bay. Cables from the electronics bay are labeled for their routing to the workstation table.

ELECTRONICS BAY

Power to the mobile workstation table and the main cabinet come out here.

AC Main (installed by the Customer's electrician)

Keyboard, mouse, monitor, etc. cables come out here.

Cables from the main unit are routed into here.

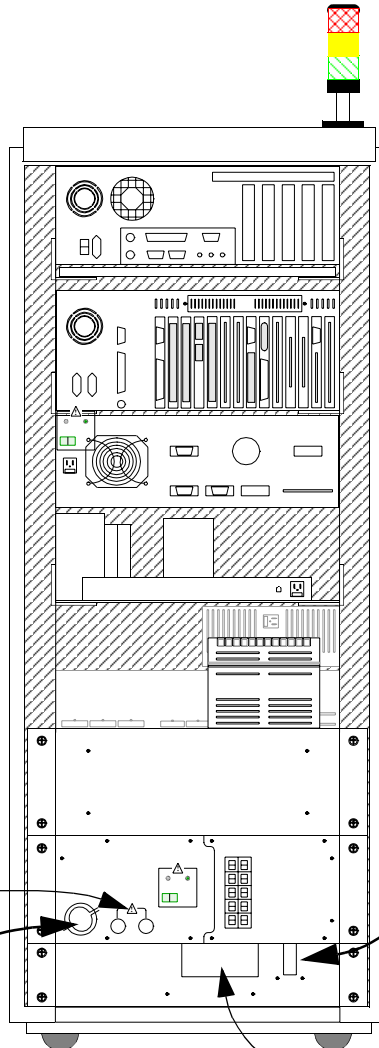


TABLE 4**Cables from Main Unit**

Part Number	Label	To	From
E7200-31736	P05060	EXPANSION BOX	XY SCAN SYNC
E7200-61400	P10018	DIO BOX	LOADER
E7200-61402	P10026	DIO BOX	CAMERA
E7200-61404	P10020, P28000	DIGITAL I/O	STAGE
E7200-61405	P10021	DIO BOX	LOADER
E7200-61406	P10022	DIGITAL I/O	RIGHT LOADER
E7200-61408	P10024	DIO BOX	X-RAY TOWER
E7200-61409	P10029	DIO BOX	CAMERA
E7200-61421	P03017	X-RAY SCAN CONTR	PULSE SENSOR
E7200-61423	P05004	E7200-61738 COM4	X-RAY PWR SUPPLY
E7200-61436	E3615A (+/-)*	POWER SUPPLY +/-	X-RAY TOWER
E7200-61444	P24013	PDU CABLE	EPO SWITCH
E7200-61447	P24012	PDU CABLE	EPO SWITCH
E7200-61601	P19011	MOTION CONTROL	STAGE
E7200-61602	P19000	MOTION CONTROL	STAGE
E7200-61603	P19001	MOTION CONTROL	STAGE
E7200-61605	P19002	MOTION CONTROL	STAGE
E7200-61606	P19003	MOTION CONTROL	STAGE
E7200-61607	P19004	MOTION CONTROL	STAGE
E7200-61609	P19005	MOTION CONTROL	STAGE
E7200-61612	P19006	MOTION CONTROL	STAGE
E7200-61613	P19007	MOTION CONTROL	STAGE
E7200-61614	P19008	MOTION CONTROL	STAGE
E7200-61616	P19009	MOTION CONTROL	STAGE
E7200-61632	P19010	MOTION CONTROL	STAGE
E7200-61670	P19015	MOTION CONTROL	LOADER
E7200-61677	P19013	MOTION CONTROL	LOADER
E7200-61699	P05039	COMPUTER CABLE	CAMERA

TABLE 4**Cables from Main Unit**

Part Number	Label	To	From
E7200-61700	P05040	COMPUTER CABLE	CAMERA
E7200-61701	P03018	X-RAY SCAN CONTR	X-RAY TOWER
E7200-61717	P05034	EXPANSION BOX	REAR LASER
E7200-61717	P05034	EXPANSION BOX	FRONT LASER
E7200-61717	P05034	EXPANSION BOX	XRAY TOWER
E7200-61733	CAMERA SERIAL COM2	E7200-61738 COM2	DIGITAL CAMERA
E7200-61734	P05048	COMPUTER	DIGITAL CAMERA
E7200-61735	P05049	MOTION CONTROL	VIEW CAMERA
E7200-61764	LD RMT +/-	LASER SENSOR	FRAME BOARD
E7200-61765	P19033	MOTION CONTROL	FRAME BOARD
E7200-61766	INTERLOCK 12V	LOW VOLTAGE PS	INTERLOCK BOARD
NOTE: The E7200-61436 cable connects to the + and - terminals of the E3615A output block, not the sense terminals. Match the laser power supply cable to the power supply serial number.			

- ☐ **14. Mobile Workstation Table Assembly** — Unpack and assemble the workstation “Computer Table” according to the manufacturer’s instructions included with the unit.
- ☐ **15. Operator Interface Assembly** — Unpack the monitor, keyboard, and mouse and put them on the workstation table. Connect all cables as shown by the labels. The power outlet box and speakers also need to be assembled with the mobile workstation cart.
- ☐ **16. Compressed Air and Ventilation Assembly** — Install the air filter canister by inserting and turning counter-clockwise. Connect the facility air input line.

NOTE

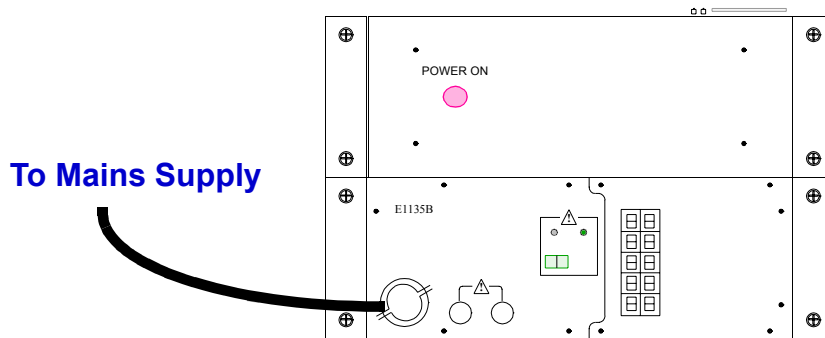
Air filter and connection are located on the lower left rear of the Main Cabinet. Verify the input air supplied is at least 80 psi (5.63Kg/cm²), and adjust as required.

- ☐ **17. Main Cabinet Inspection** — Inspect the inside of the Main Cabinet to:
 - verify that there are no loose items
 - remove excess grease from the X and Y axes lead screws with a clean cloth.
 - remove all stage securing ties and desiccant
- ☐ **18. Air Filter Installation** — Install the air filter on top of the x-ray tower. It fits into a beveled area on top of the tower
- ☐ **19. Install Camera Power Supply** - Install the SMD camera power supply under the 5DX.
 - a. Remove the 3/8 in. nuts and washers
 - b. Install the supply and replace the nuts and washers and tighten
 - c. Connect the frame grabber cable (E7200-61734), trigger cable (E7200-61733) and shutter cable (E7200-61736). *Be careful with the frame grabber cable because the pins are fragile.*
 - d. Connect the power cord between the power supply and the camera.
 - e. Connect the power cord to the supply and turn the switch on.
- ☐ **20. AC Mains Hookup** — Work with the customer electrician to provide main power installation to local code. For general service feed location, see *Figure 9*. Normal requirements are:

- Between 195 and 240 volts, Single Phase (1Φ), or three phase (3Φ) 50 or 60 Hz. (See appendix A for overall requirements)
- Suitable circuit protection for 7.5 KVA Peak
- Where allowed, the recommended attachment is via flexible conduit, allowing a range of motion for the electronics bay of a minimum of 1 meter (a bit over 3 feet) to allow for serviceability. For optimum flexibility, extend this to 2 meters. Cables must be the stranded type (not solid). **Follow local code if it supersedes these instructions.**
- A breaker panel near the 5DX installation area should be used to allow complete power down in case of an emergency

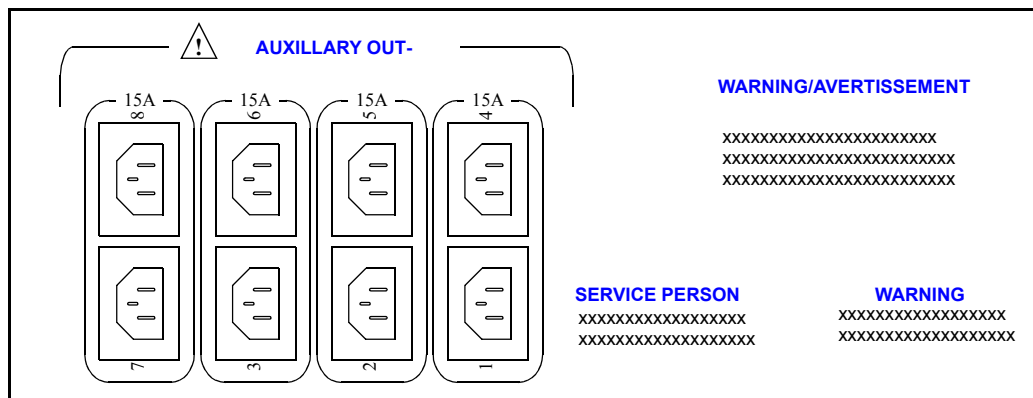
Figure 9

Location of AC Mains Connection



- a. Access the cover for the power distribution unit (PDU). (It's inside the rear door of the electronics bay.)
- b. Have the electrician secure the conduit with appropriate fittings to the PDU. Note that there is access on the lower left. (See appendix A).

- ☐ **21. Mark Outlet Boxes** — Mark any outlet boxes on the system and electronics cabinet for the voltage used (if they have not been marked already).
- ☐ **22. Connect Power from PDU** — Reinstall the PDU in the electronics bay and connect the power cords as described by the following information.

Figure 10**PDU Rear Panel**

The auxiliary outlets are numbered. The following components plug into the respective auxiliary outlets as follows:

- Outlet 1 — Motion Driver Assembly
- Outlet 2 — Low Voltage Assembly
- Outlet 3 — Electronics Bay Fans
- Outlet 4 — X-ray Scan Controller
- Outlet 5 — E3615A Power Supply
- Outlet 6 — Front Laser
- Outlet 7 — Isolation Transformer
- Outlet 8 — Rear Laser

TABLE 5**Assembly Part Numbers**

Description	Part Number
POWER DISTRIBUTION UNIT	E1135-80020
VACION PUMP POWER SUPPLY	E7200-67918
FRONT LASER	E7200-67952
ISOLATION TRANSFORMER	E7200-67991
REAR LASER	E7200-68034
MOTION DRIVER POWER SUPPLY	E7200-68082
X-RAY SCAN CONTROLLER	E7200-80026
LOW VOLTAGE ASSEMBLY	E7200-80027
DIGITAL I/O	E7200-80029
MOTION DRIVER ASSEMBLY	E7200-80030

System Performance Verification Procedure

The following procedures should be closely followed to verify proper system performance.

Power Checks

- ☐ **1. AC Voltage Check** — After the site power (mains) is connected to the Electronic Bay through the PDU, unplug all subassembly AC power cords. This is a precautionary measure to check that everything is correct before full power is applied to all assemblies.
 - a.** Turn the power **ON** using the **switch on the rear of the PDU**.

- b. Check the bay AC voltage using line voltage safety precautions:

WARNING


High Voltages Present in this assembly!

- c. The PDU output voltage should be between **195 volts**, and **240 volts AC**. If it is not:
 - i. Remove mains power supply from the system (at facility circuit breaker).
 - ii. Check the wiring into the PDU. Have the customer electrician verify all wiring. Repeat this process until the range above is reached.

NOTE The emergency power off (EPO) switches must not be engaged.

- d. Turn off the power to the PDU
- e. Reconnect all subsystem power cords. (Make sure the expander chassis (Advantek Industrial Computer) (below the CPU) power is **OFF**).

NOTE The power for the main CPU (Micron) is controlled by the power switch for the expander chassis.



2. CPU Power Up — The switch should be off on the expander chassis.

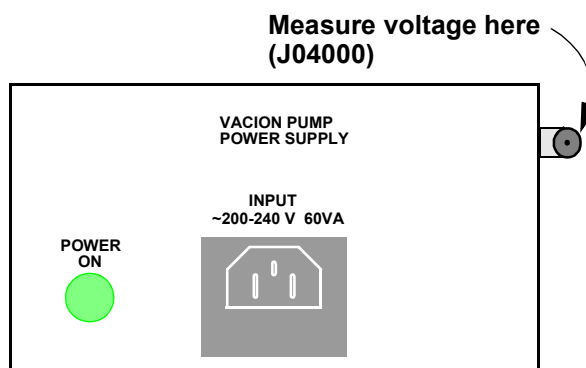
- a. Switch the PDU **ON** (if it is not already).
- b. Switch the expander chassis **ON**.
- c. Power **ON** the computer monitor. Allow CPU to boot up and note any warnings or errors. Errors would indicate a system (hardware/software) failure and therefore requires troubleshooting and repair before

proceeding. For troubleshooting, refer to the Service Guide (E7200-90028).

- ☐ 3. **Vacion™ Power Supply Voltage Check** — Use a voltmeter and measure the Vacion Power Supply at test point J04000 on the power supply. It is located under the main unit in the rear. Measure this at the BNC connector on the right of the power supply. The reading may be as high as 3VDC but after warm-up (~1/2 hour) it should read less than 10 mv.

Figure 11

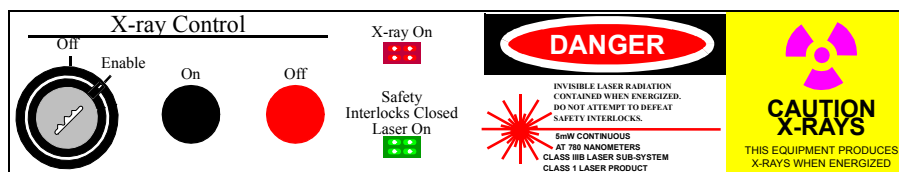
Vacion Power Supply I



- ☐ 4. **Check Interlocks** — Tap each of the doors, access panels and loaders with your hand. Watch to see if the interlock LED on the control panel goes off. If it does, adjustment of interlock switches may be required. (Refer to the Service Manual Safety Interlock Subsystem section)

Figure 12

Operator Control Panel



Watch the interlock LED to make sure it stays on.

System Startup

CAUTION

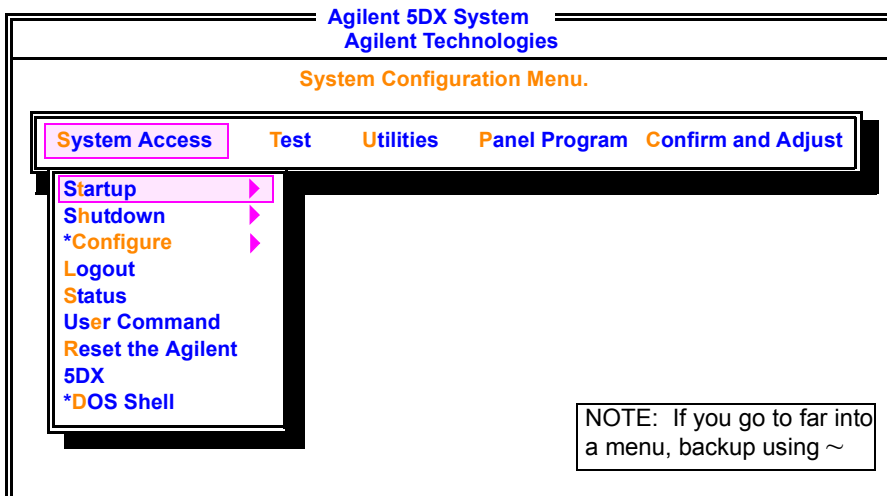


Do not power on the Motion Driver Power Supply until instructed by the Agilent 5DX Software to do so. Failure to wait until instructed may result in damage to Agilent 5DX System components.

- ☐ 1. **Log on to the Computer** - Press CAM and the login screen will appear. It already has “Administrator” as the user name. Type in the password and press **Enter**. You will see a dialog box appear with: **Warning in 5DX SYSTAT Select YES to start Agilent 5DX interface.** Press **Y** and **Enter**.
- ☐ 2. **Agilent 5DX Logon** - A box with **Enter your name** comes up. Type **S** and press **Enter**.
- ☐ 3. **Startup** - In the system configuration window, use the arrow and enter key (or select the letter shown in yellow) to select:
System Access then
Startup then
Automatic Startup

Figure 13

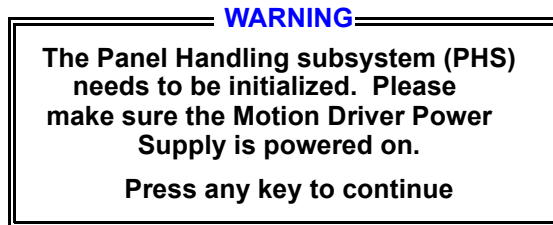
Automatic Startup



You will then get the following warning.

Figure 14

Warning Dialog Box



- ☐ 4. **PHS Initialization** - Turn on power to the motion driver power supply and reset it. **Press any key to continue.** The system should home the loader rails and reset panel handling. (LOADINIT)

NOTE If the system does not respond, check the green status LED on the operator control panel (*Figure 12 on page 27*)

- ☐ **5. PHS Startup** - There will be another warning like that in *Figure 14*. Press a key to continue. The system now should home the stage and start the rotary scintillator. (ROTATE -T)

WARNING



This product produces X-radiation. Do not operate this product or turn on the X-radiation source unless all shielding is in place. Operation without shielding in place can result in serious bodily injury.

- ☐ **6. X-ray Startup** - The system should now bring up a startup screen similar to *Figure 15* below. Press ~ since you don't want to bring up X-rays yet.

NOTE Other error and warning dialog boxes will appear, press ~ to clear these. If an error dialog box appears with a choice, use one of the choices. For example: "Failed to establish X-ray power on, do you wish to retry startup? (Y/N)" Press **N**.

Figure 15

X-ray Startup Screen

Agilent 5DX X-ray

COLD StartAgilent Technologiesxx minutes remaining

Kilovolts (160)
0

MicroAmps (100)
0

Focus (V)
765.0

Grid (V)
500.0

Filament (V)
0.0

Dialog

X-RAYS were down for an extended period (cold start)

To continue, turn X-ray Control switches on and
press <Enter>. To quit, Press <Esc>.

NOTE Self test may begin to run. If it does, it will fail and you can press ~ to continue.

Panel Handling

- ☐
1. **Verify Panel Handling System Operation** —
Verify operation and width adjust:
 - a. Under the **Utilities** menu, select **Panel Handling, Load Panel** and then **Manual -> Panel Load**.
 - b. At the prompt enter **11950** and press **Enter**.
This number is the width of the calibration panel in mils (1 mil equals 0.001 inches).

NOTE All cabinet access doors and panels must be closed and the green interlock enable light on the Operator Control Console must be lit, before this operation will work.

- ☐ **2. Loader Rail Adjustment** — Load the confirmation board (shipped with the system). (Press ~ to abort the load process if you need to.) After the board has loaded, unload it using **Panel Handling, Unload Panel**. If the confirmation board does not load or unload properly adjustment will be required; however you should perform the steps below anyway.

- a. Open the two sliding access doors on top of the main unit and the top access door for each loader. Use calipers (or equivalent) to measure the distance between the stationary rail and the adjustable rail for each Loader (Left and Right) and the Main Stage. The distance should be **11.080 (±0.005)** inches. Measure the width at both ends of the rails to verify that they are parallel.
- b. If this distance is incorrect on either loader or the Main Stage then select **Quit from 5DX** under the **System Access** menu.
 - i. At the **DOS** prompt type **ca** and press **Enter** to go to the **Calib** directory.
 - ii. Type **vs machine.cfg** and edit the appropriate home width that requires correction. (These should be the lines with “@Mach_####HomeWidth” Where #### is Left, Main, or Right.)

NOTE

The number on these lines is the distance from the home position (fully expanded), to move the rails in the number should increase.

- iii. After editing, press **ALT+W** to save the changes then press **ALT+X** to exit the file.
- iv. Type **ma** to return to the master directory.

- v. Type **Auto** and **Enter** to return to **AutoUI**.
- vi. Close all access doors and panels.
- c. From the **Utilities** menu select **Panel Handling**. From this menu, select **Home Rails**.
- d. Select **Manual** panel load. At the prompt enter **11950** again. Repeat the measurement procedure again (step 2.) until the measurements all meet the **11.080 (±0.005)** specification.



3. **Loader-to-Stage Alignment Verification** — Close all access doors and panels.

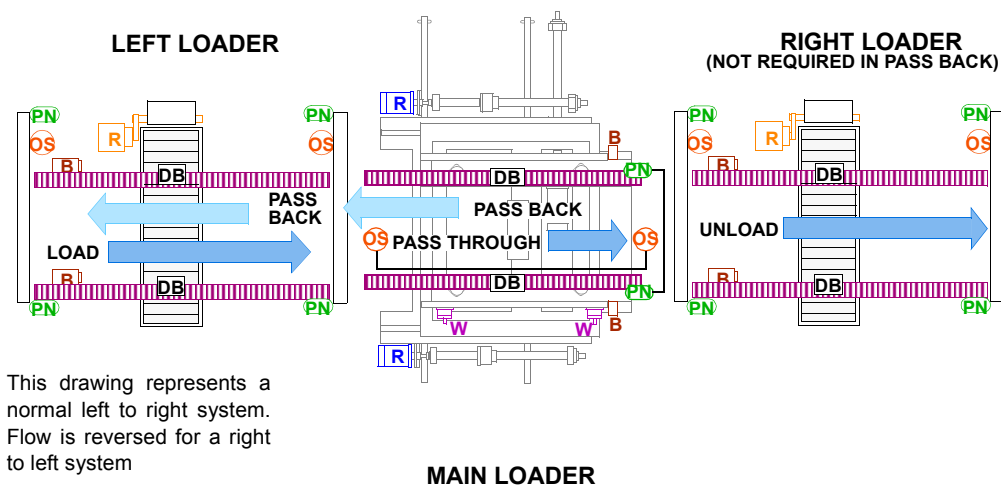
- a. Select **Load Panel Program** from the **Utilities** menu. From the pick list, choose **4picalibxxx/sub** (where xxx = the last three digits of the serial number of the machine).
- b. From the **Utilities Menu**, select **Panel Handling** and choose **Automatic**. Load and unload the calibration board several times, homing the rails after each load and unload iteration.

NOTE

On passback models, an error will occur twice. In each case you will need to perform **Reset Panel Handling**.

Figure 16

Loader Assemblies (Top Down View)



- i. Verify that the load and unload cycle is consistent, and the loader doors operate smoothly both in the open and the closed directions.
- ii. Verify that the stage rails align to the loader rails for the load and unload transitions. Refer to the Service Guide (E7200-90028) for troubleshooting.



4. XYZ Axis Checks — Verify the stage operation as follows:

- a. Load the Calibration Panel.
- b. Under the **Utilities** menu, select the **Service Menu**.
- c. Choose the **XYZ Stage** options.
- d. Select **Z Axis Test**.

The prompts will step you through the setup test parameters. The results should be contained in four graphs. There should be no more than 5 mil. difference (Z coordinates only) between the four.

(Passing means a sigma of equal to or less than **(±0.5)**.)

NOTE

This is not an absolute specification.

- ☐ 5. **Bring up X-ray High Voltage** — This step ramps the high voltage up slowly without drive current (no X-ray generation at this time).
- a. Use a volt meter to recheck the Vacion Power Supply at test point **J04000**. (*Figure 11 on page 26*) The reading *must be less than 10 mV* before operating the X-ray system.

IMPORTANT

If the reading is NOT equal to or less than 10 mV, then allow more time for the Vacion Pump to operate (and recheck) before ramping up the high voltage.

- b. Select **System Access** then **Quit from 5DX**.
- c. From the DOS prompt, type **ca** and press **Enter**.
- d. Type **vs xray.cfg** and edit the line **Cold Start Rampup** to have a value of **60** instead of **15**

CAUTION



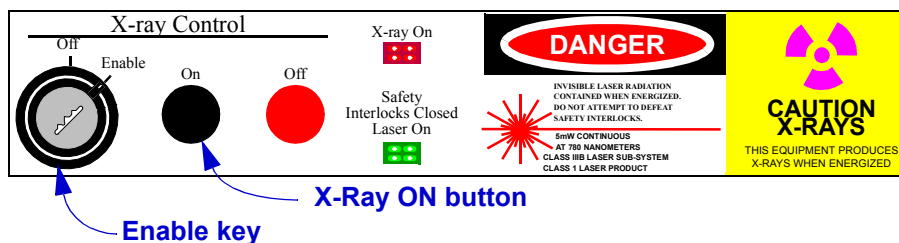
The X-ray tube has components that need to warm up before generating X-rays. In this case, the tube has been off for an extended period of time so it will require a 60 minute start up. Bypassing this step could result in permanent damage to the X-ray tube.

- e. After editing press **ALT+W** to *save* the file and press **ALT+X** to *exit* the editor.

- f. From the Operator Control Panel (*Figure 17*) turn the X-Ray Enable Key to **Enable**, then push the **X-Ray On Button**.

Figure 17

Operator Control Panel



- g. From the DOS prompt type **ma** and press **Enter** to enter the **Master** directory. From the DOS prompt type:
xrayon -zero and press **Enter**.

NOTE

The - key is the dash, or “minus” sign: -

NOTE

A warning will display. Press ~ to continue. The time remaining should indicate 60 minutes.

- h. Assuming the High Voltage has successfully ramped up (after 60 minutes) and remained on, from the DOS prompt, type **ca** and press **Enter**.

IMPORTANT

If the Kilovolts reading in the X-ray control window did not reach 160, or the X-ray system shut itself off, contact SPT second level support as soon as possible.

- i. Type **vs xray.cfg**, edit the line labeled **Cold Start Rampup** to have a value of **15** (the original value).
- j. After editing press **ALT+W** to **save** the file and press **ALT+X** to **exit** the editor.

- k. Type **ma** and press **Enter** to return to the master directory.



6. **5DX Main Cabinet Radiation Integrity Check** —

To verify the 5DX Cabinet Integrity and containment of X-Ray emissions, perform the following steps:

CAUTION



If any of the readings in the following tests exceed 0.15 mRems/hour, shut off the X-ray system and contact SPT second level support immediately.

- a. Turn **ON** the GM Radiation Meter (Victoreen™ Model 290 or equivalent). Allow a warm up period of 2 minutes.
- b. From the DOS prompt type **hvxray -s** and press **Enter**.
- c. At the hvxray menu use the arrow keys to select **“Cathode μA ”** and press **Enter**, then type **10** and press **Enter**. This will bring current to 10 microamps so X-rays are on slightly.
- d. Use the GM Meter and perform a quick survey of the 5DX Main Cabinet. Focus on areas where radiation leaks are suspect such as doors, access panels, etc. ***Leakage must be less than 0.15 mRems/hr.***
- e. Increase the **Cathode μA** and to **40** (using the same process as in **b** and **c** above) and press **Enter**.
- f. Use the GM Meter and perform another quick survey of the 5DX Main Cabinet. ***Leakage must be less than 0.15 mRems/hr.***
- g. Increase the **Cathode μA** and to **100** and press **Enter**.

- h. Perform a final quick survey of the 5DX Main Cabinet. *Leakage must be less than 0.15 mRems/hr.*
- i. Complete a formal on-site radiation survey. Use Document Number 5021-1979. (A sample is appended to this document.)
- j. From the DOS prompt type **auto** and press **Enter**.



7. Laminography Imaging Validation — To verify that laminographic imaging is functioning properly, perform the following steps:

- a. From the **AutoUI** menu, go to the **Utilities Menu** and select **Load Panel Program**. Select **4picalibxxx/sub** from the pick list.
- b. From the **Utilities Menu** select **Panel Handling** then choose **Automatic**, when prompted load the calibration board/coupon.
- c. From the **System Access Menu**, select **Quit from 5DX**. At the DOS prompt type **gotocal -dots** and press **Enter**.
- d. Type **loadsync -f400 -b1** and press **Enter**.
- e. Type **sync -e** and press **Enter**.
- f. Use the mouse pointer to select the camera icon on the graphic display window. Switch the display to Live Laminography: {.
- g. Verify that the **5 dot** calibration pattern is visible on the graphic display window.

NOTE

Some adjustment of the **Z Axis** may be required.

- h. From the DOS prompt type **auto** and press **Enter**.



8. Self Test Validation — To verify that Self Test is functioning properly, perform the following steps:

- a. From the **System Access** menu select **System Startup**.
- b. Select **Automatic Startup** to bring the 5DX to a ready state.
- c. Go to **Confirm and Adjust**. From the **Self Test Options** menu, select **Run Self test**.
- d. Verify that all tests **Pass**. (The tests are LASER TEST, GREY LEVEL ADJUSTMENT TEST, THICKNESS TEST, POF TEST and RESOLUTION TEST).
- e. If tests do not pass, refer to the Service Guide (E7200-90028) or try self test setup and run self test again.



9. System Operation Functional Checks — To verify that the overall system is functioning properly, perform the following steps:

- a. From the **Utilities** menu, select **Load CAD** then choose **4picalibxxx/sub**.
- b. Load the calibration board/coupon.
- c. From the **Utilities** menu, select **Align Board**. When prompted, choose **Manual** and **Use Previous Alignment for all views**.

A Caution Box will appear:

Board will need to be exposed to continuous X-rays. Do you want to turn on Live X-rays (Y/N)

Press Y.

Follow the steps on the screen: verify that the alignment points are in range. Perform adjustment if necessary, including the Z-axis for focus. Be aware that large corrections in any of the axes

indicate a possible change in an axes' zero reference, or change in rail location.

ADVICE



If the alignment is not where expected, it may mean that an alignment or reference in the axes assemblies has changed. If alignment is significantly moved (such as out of the view), verify the calibration panel is loaded correctly. Home the axes and recheck. Next, try a customer board and verify that the alignment is off by the same amount. If the alignment is significantly out of range, it may require a verification of the axes assemblies' alignment. Contact SPT second level support for additional information.

- d. Select **Automatic**. Verify that the images are clear and focused.
- e. From the **Utilities** menu, select **Surface Map**. Select **Automatic**.
- f. From the top level **AutoUI** menu, select **Test**. Select **Board**. Provide data entries as requested (for most items, simply pressing **Enter** will be appropriate). Verify that the **Dot** patterns are in focus during the test, and that the test successfully completes.

ADVICE



Focus on the dot patterns will be indicated by sharp edges on the thin (light gray) dots. The thickest dots (dark gray) will have "softer" edges, as they begin to extend to the limits of the laminography plane.

NOTE

The test run on the calibration panel does not result in any defect calls. You can however use the **Review Measurements** tool in the **Algorithm Setup** menu of the **Panel Programming** options to examine the measured thickness of the dots.



10. Hardware Reliability Functional Checks — To verify that system hardware is functioning properly, perform the following steps:

- a. Assuming you are still in the **AutoUI** menus, from the **System Access** menu, select **Quit**.
- b. From the DOS prompt type **auto -demo** and press **Enter**.

NOTE

This command will initiate and repeat automatic inspection mode for the calibration coupon.

- c. Select **Test**. Select **Panel** and press **Enter**. Follow the menu steps through to the start of inspection mode.
- d. When the first test run is completed, the process should continue to repeat without operator interaction. Allow the demo inspection mode to run for a minimum of two hours. If convenient at the time, let the tests run overnight.
- e. Press ~ to stop the inspection when done.
- f. When the demo period is complete, from the **System Access** menu, select **Quit**.
- g. Enter **AutoUI** from the DOS prompt by typing **auto** and press **Enter**.



- 11. Verify The Customer's Application** — Request a test panel/board from the customer for 5DX system results validation.

NOTE

This board must be a sample of an existing or acceptance application setup as generated at the applications center.

- a. From the **Utilities** menu, select **Load CAD** and choose the customer's **test panel** name.
- b. Load the sample panel/board.
- c. From the **Utilities** menu, select **Align and Map**.

- d. From the top level **AutoUI** menu, select **Test**. Select **Board**. Follow the menu steps. Verify that the images are clear and focused and that the test results are acceptable (within customer expectations).

☐ **12. Final Adjustments** — You will need to perform the final adjustments listed below. In each case, refer to system administration manual, section 7.

- a. Perform a photometric adjustment
- b. Perform a major X-Ray scan adjustment
- c. Exit from the **AutoUI** (return to DOS) and execute **fgcal 2** and **fgcal 4** (each will take about five minutes) DOS will tell you when each is finished.
- d. Type **auto** to return to the main menu and re-run the self test.

☐ **13. System Cleanup** — Replace all electronic bay access panels and doors. Clean the system exterior removing all dirt, hand prints, and so forth.

☐ **14. Set the Clock** — Set the system clock to the customer's time zone.

☐ **15. Check your work** — Verify that all steps are complete and all boxes (like the one on the left) are checked off.

☐ **16. Complete Install Documentation** — Complete all other hardware install related documentation and provide copies to the customer. *(It is likely the customer will need additional documentation - be sure the customer is aware that local radiation requirements must be met. This varies from state to state and from country to country.)*

- ☐ **17. Complete X-ray Survey Documentation** —
Make a copy of the X-ray survey document and test results: Provide a copy to the customer.
- ☐ **18. Mail All Original Documentation** — Mail original *Radiation Survey* (5021-1979) and signed *Hardware Acceptance* (5021-1982) to:

**SPT Support Manager
Agilent Technologies
815 14th Street S.W., MS BU221
Loveland, CO 80537-6330
USA**

INSTALLATION NOTES:

Appendix A

Wiring Configuration

This appendix contains all of the wiring configuration diagrams for the Agilent 5DX System.

The 220 volt outlet strip wire egress is through the holes on the front of the Power Distribution Unit. The 220 volt outlet strip for the mobile workstation table uses the wire egress hole on the left as indicated in **Figure A-1**. The Vacion Pump power supply uses the wire egress hole on the right.

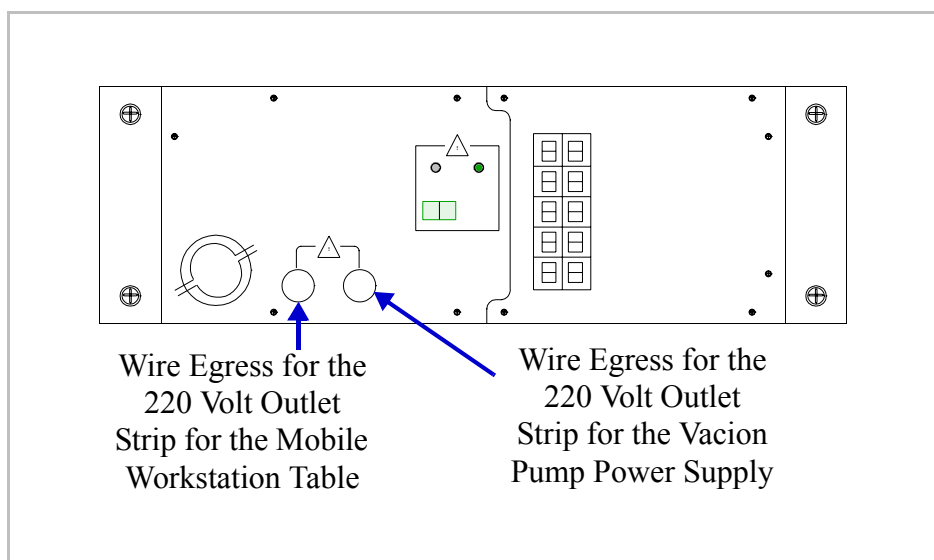


Figure A-1 PDU Wire Egress

Table A-1 Agilent 5DX Power Source and Loading Configurations Options

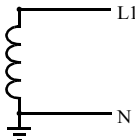
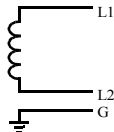
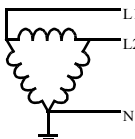
Power Source and Loading	Input Configuration, Input Wiring, and Terminal Block Wiring	200V	208 V	220 V	230 V	240 V	380/ 220V	400/ 230V	415/ 240V
1-Phase Earthed Load: L1-to-N (29 A)	 Input Wiring - Figure A-4 Terminal Block Wiring - Figure A-5	E11		E13	E14	E15			
1-Phase Non-Earthed Load: L1-to-L2 (29 A)	 Input Wiring - Figure A-6 Terminal Block Wiring - Figure A-7	P11	P12	P13	P14	P15			
Delta with Phase Junction Earthed Load: L1-to-N L2-to-N L1-to-L2 (15 A)	 Input Wiring - Figure A-8 Terminal Block Wiring - Figure A-9	DE1		DE3	DE4	DE5			

Table A-2 Agilent 5DX Power Source and Loading Configurations Options

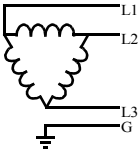
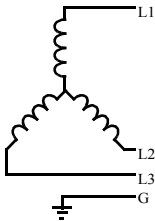
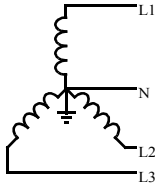
Power Source and Loading	Input Configuration, Input Wiring, and Terminal Block Wiring	200 V	208 V	220 V	230 V	240 V	380/ 220 V	400/ 230 V	415/ 240 V
3-Phase Delta Load: L1-to-L2 L1-to-L3 L2-to-L3 (22 A)	 Input Wiring - Figure A-10 Terminal Block Wiring - Figure A-11	3P1	3P2	3P3	3P4	3P5			

Table A-2 Agilent 5DX Power Source and Loading Configurations Options

Power Source and Loading	Input Configuration, Input Wiring, and Terminal Block Wiring	200 V	208 V	220 V	230 V	240 V	380/220 V	400/230 V	415/240 V
3-Phase Wye Load: L1-to-L2 L1-to-L3 L2-to-L3 (22 A)	 Input Wiring - Figure A-10 Terminal Block Wiring - Figure A-11	3P1	3P2	3P3	3P4	3P5			
3-Phase with Neutral Load: L1-to-N L2-to-N L3-to-N (15 A)	 Input Wiring - Figure A-12 Terminal Block Wiring - Figure A-13						3N6	3N7	3N8

NOTE



When a wire is indicated as going to terminal number one, any terminal numbered as one is the same. However, when there are two wires shown going to a specific terminal, it is recommended that the two wires be together. This has been done to remain within the current capabilities of the terminal.

Figure A-2 Input Wiring - General

On INPUT WIRING drawings on subsequent pages, the outlets shown are used as described here.

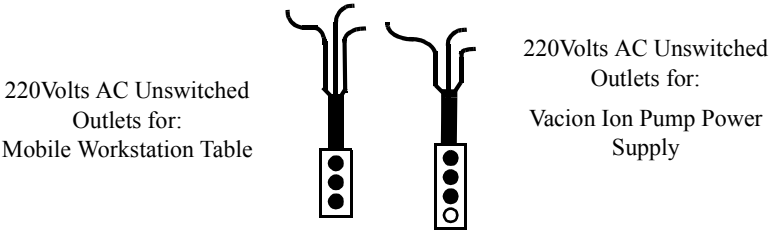
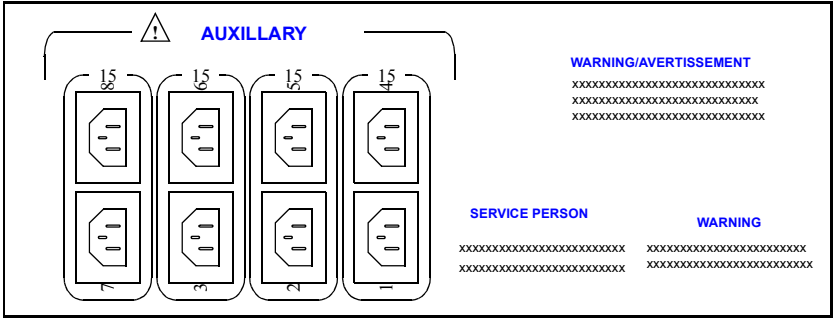


Figure A-3 PDU Outlets



- | | |
|-----------------------------------|----------------------------------|
| Outlet 1 — Motion Driver Assembly | Outlet 2 — Low Voltage Assembly |
| Outlet 3 — Electronics Bay Fans | Outlet 4 — X-ray Scan Controller |
| Outlet 5 — E3615A Power Supply | Outlet 6 — Front Laser |
| Outlet 7 — Isolation Transformer | Outlet 8 — Rear Laser |

200-240 Volt 1-Phase Earthed

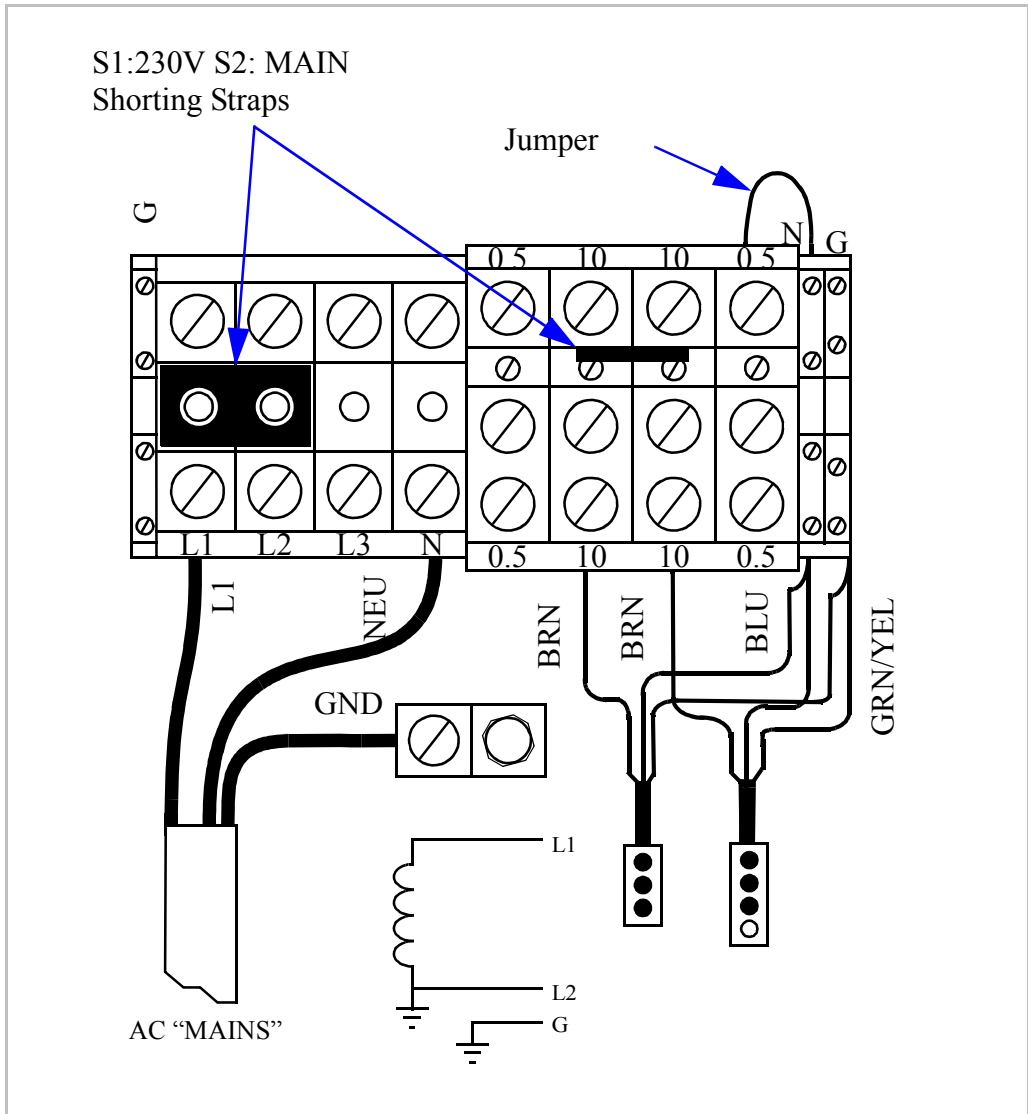
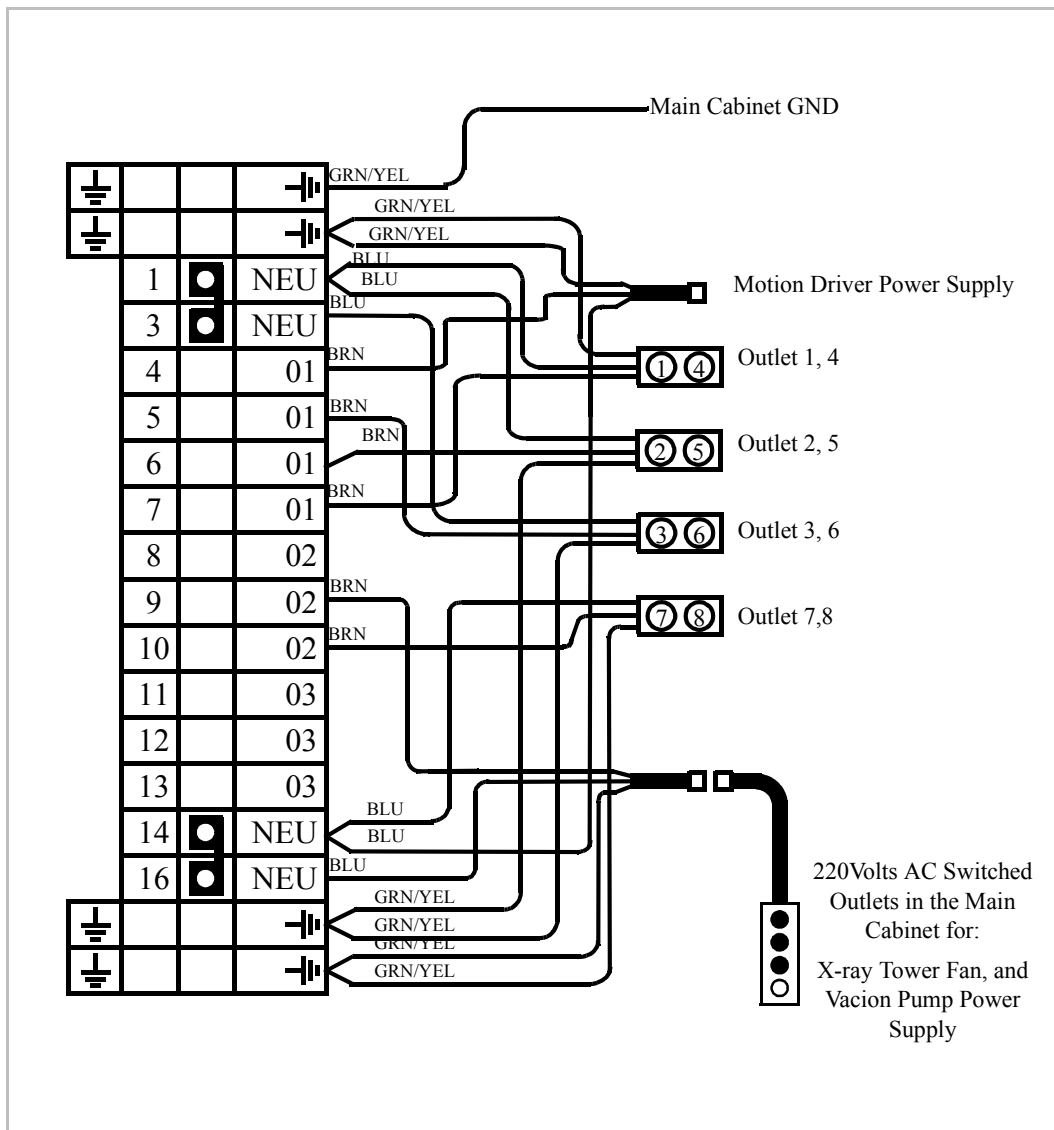


Figure A-4 Input Wiring — 200-240V 1-Phase Earthed



200-240 Volt 1-Phase Non-Earthed

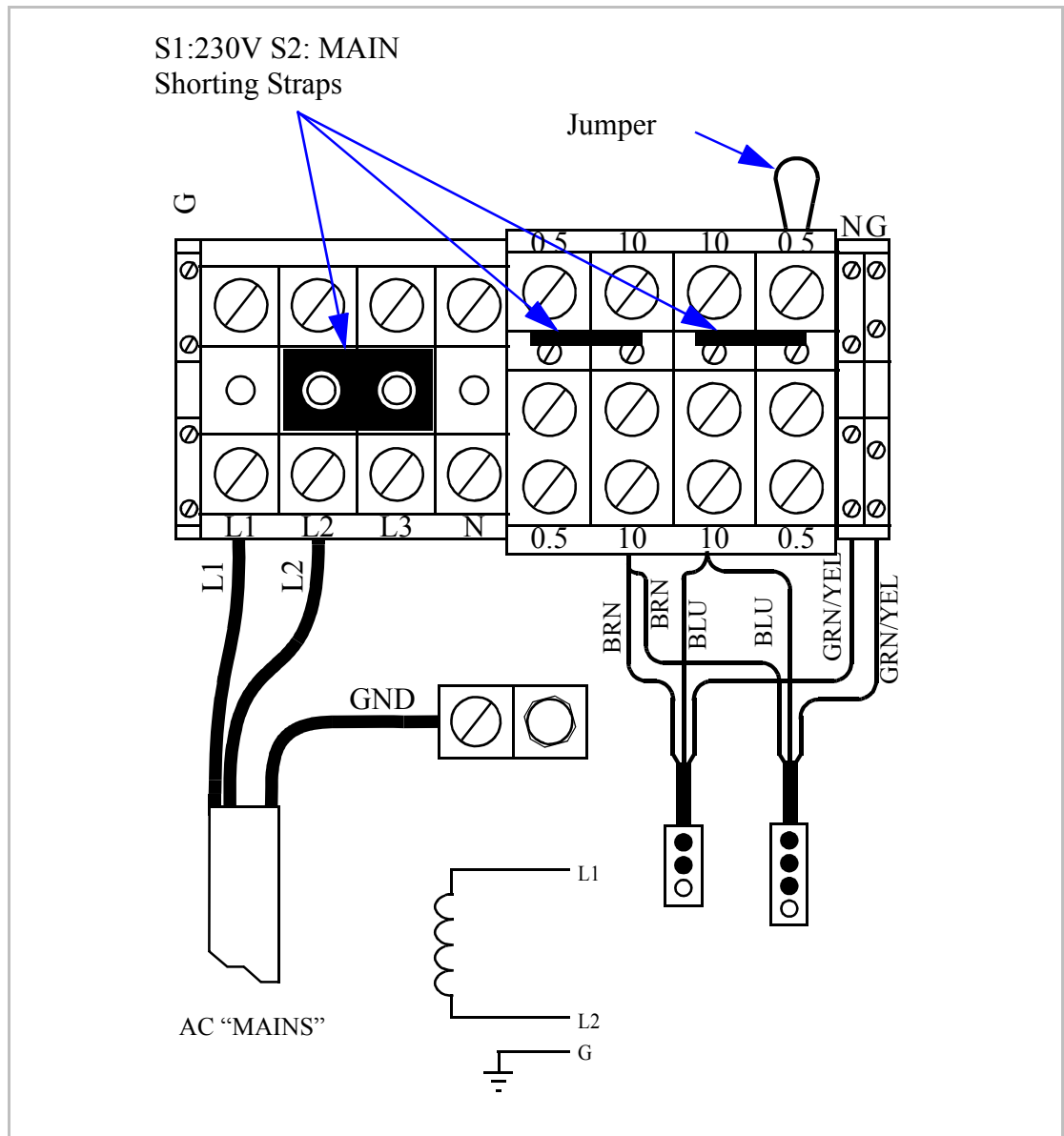


Figure A-6 Input Wiring — 200-240V 1-Phase Non-Earthed

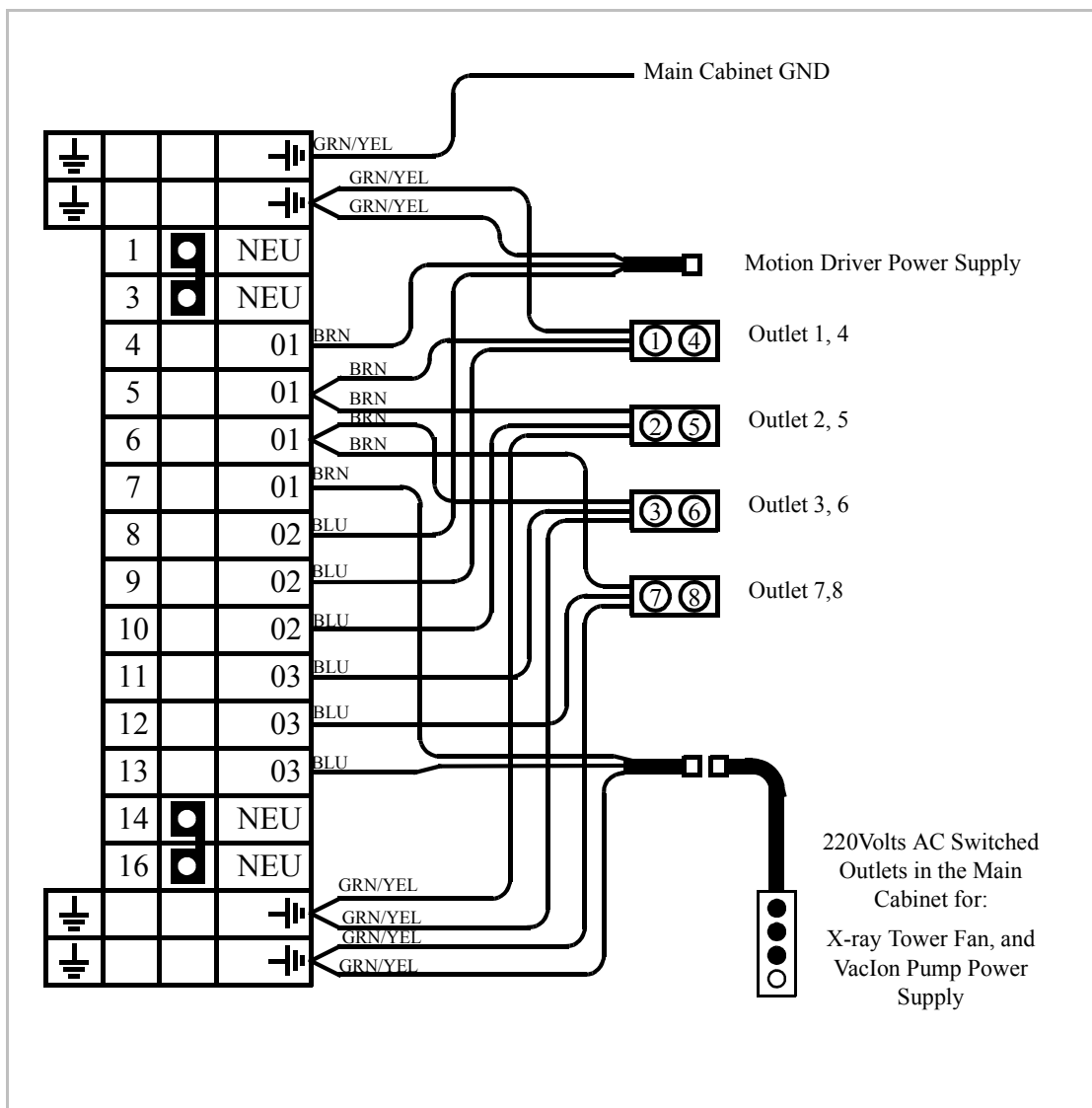


Figure A-7 Terminal Block Wiring — 200-240V 1-Phase Non-Earthed

200-240 Volt 3-Phase Delta with Phase Junction Earthed

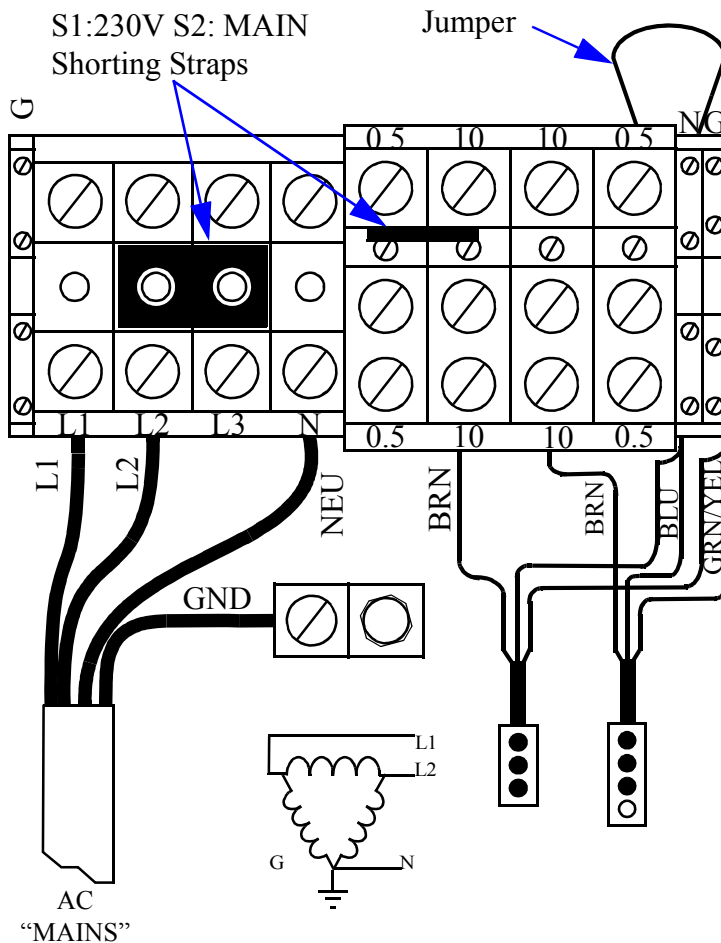
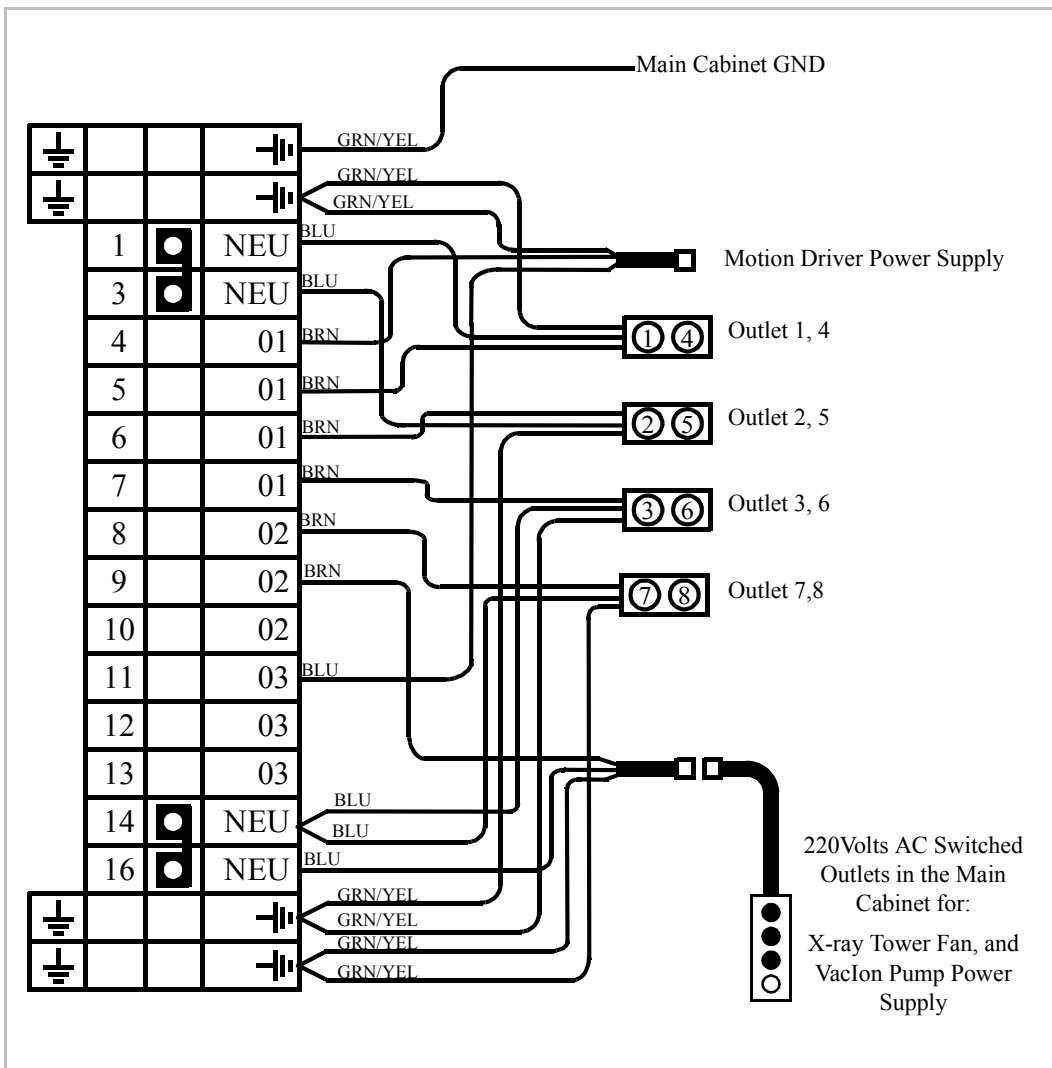


Figure A-8 Input Wiring — 200-240V 3-Phase Delta with Phase Junction Earthed



200 - 220 Volt 3-Phase Wye or Delta

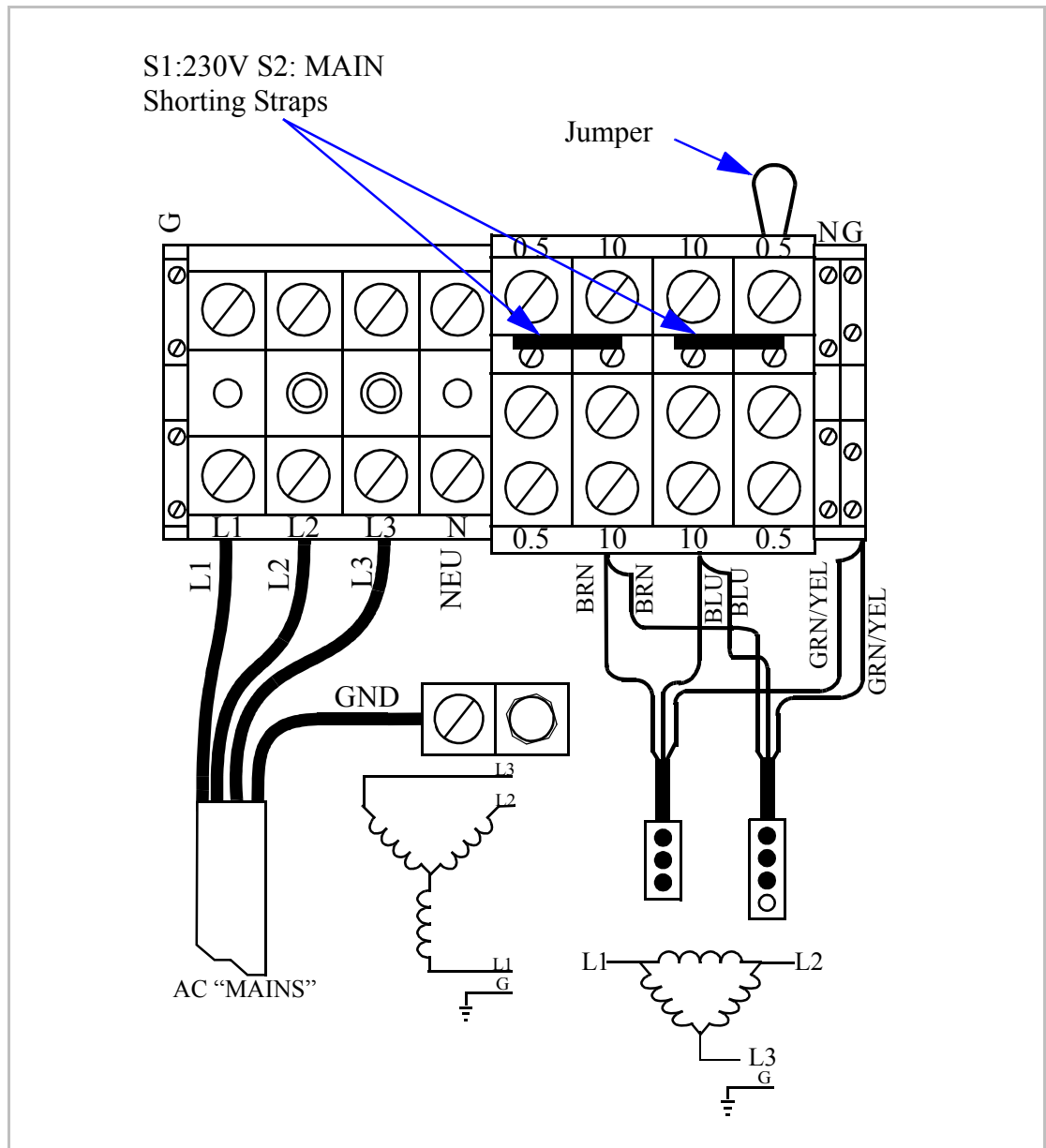


Figure A-10 Input Wiring — 200V or 240V 3-Phase Wye or Delta

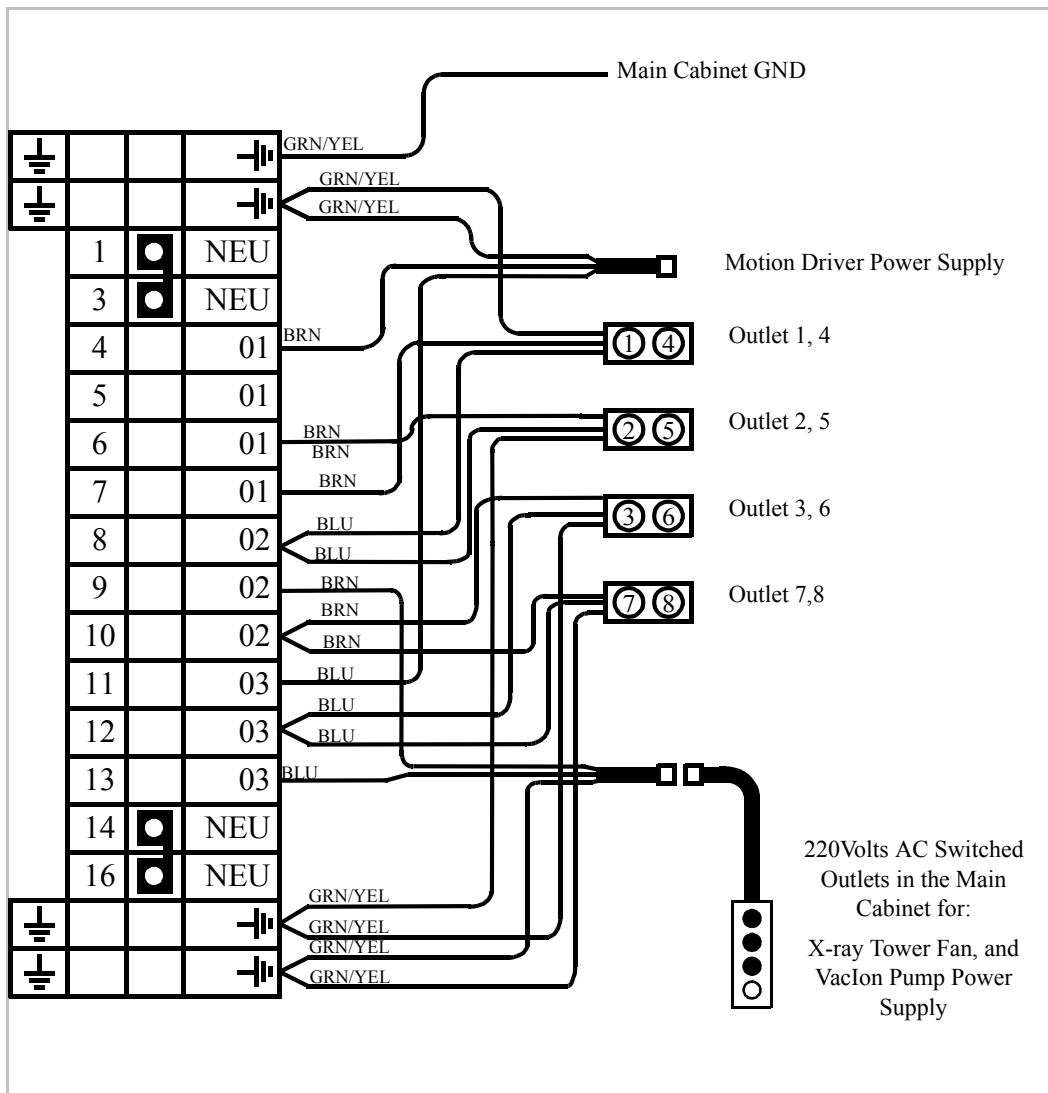


Figure A-11 Terminal Block Wiring — 200-240V 3-Phase Wye or Delta

380-415 Volt 3-Phase Wye with Neutral

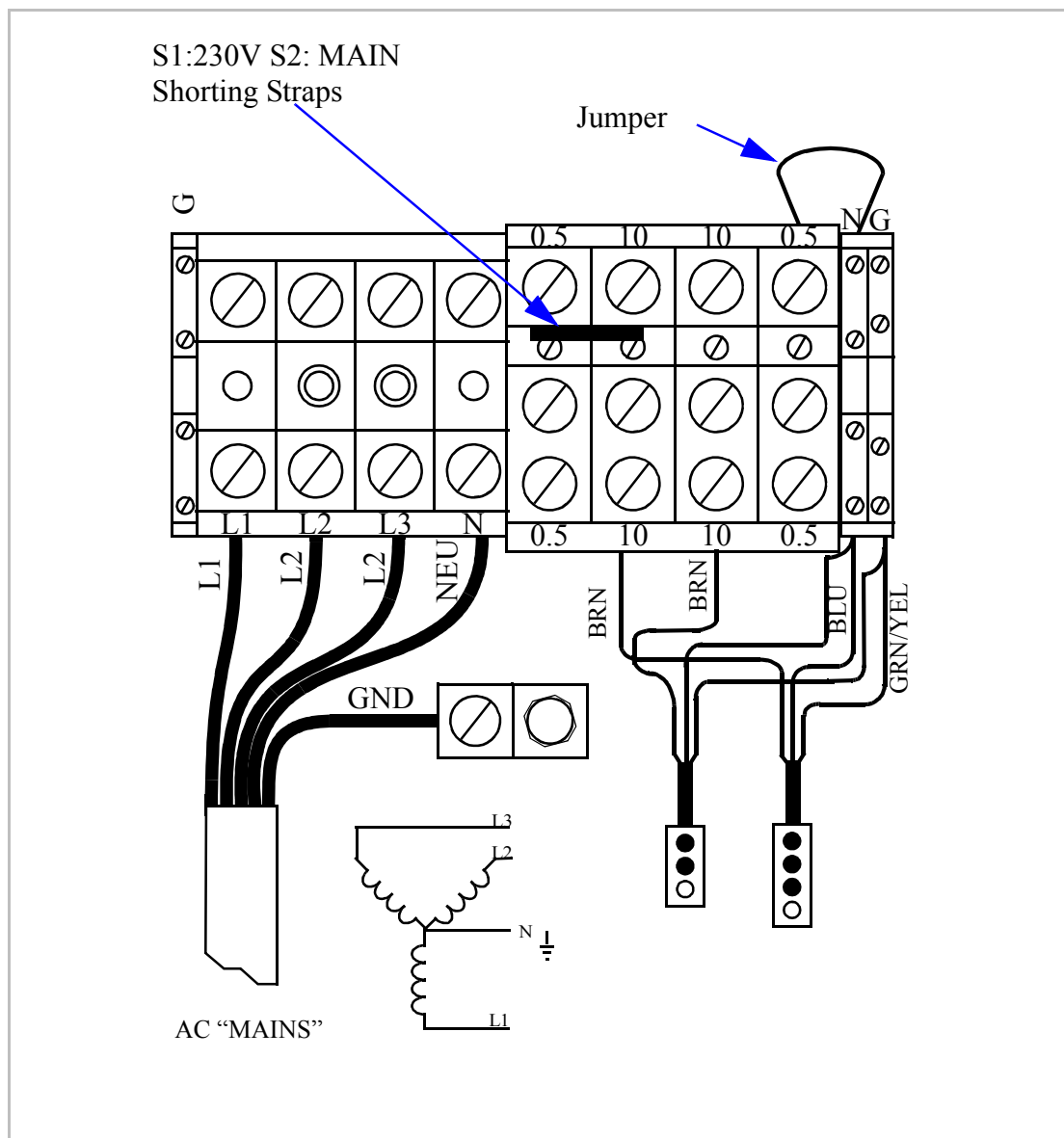
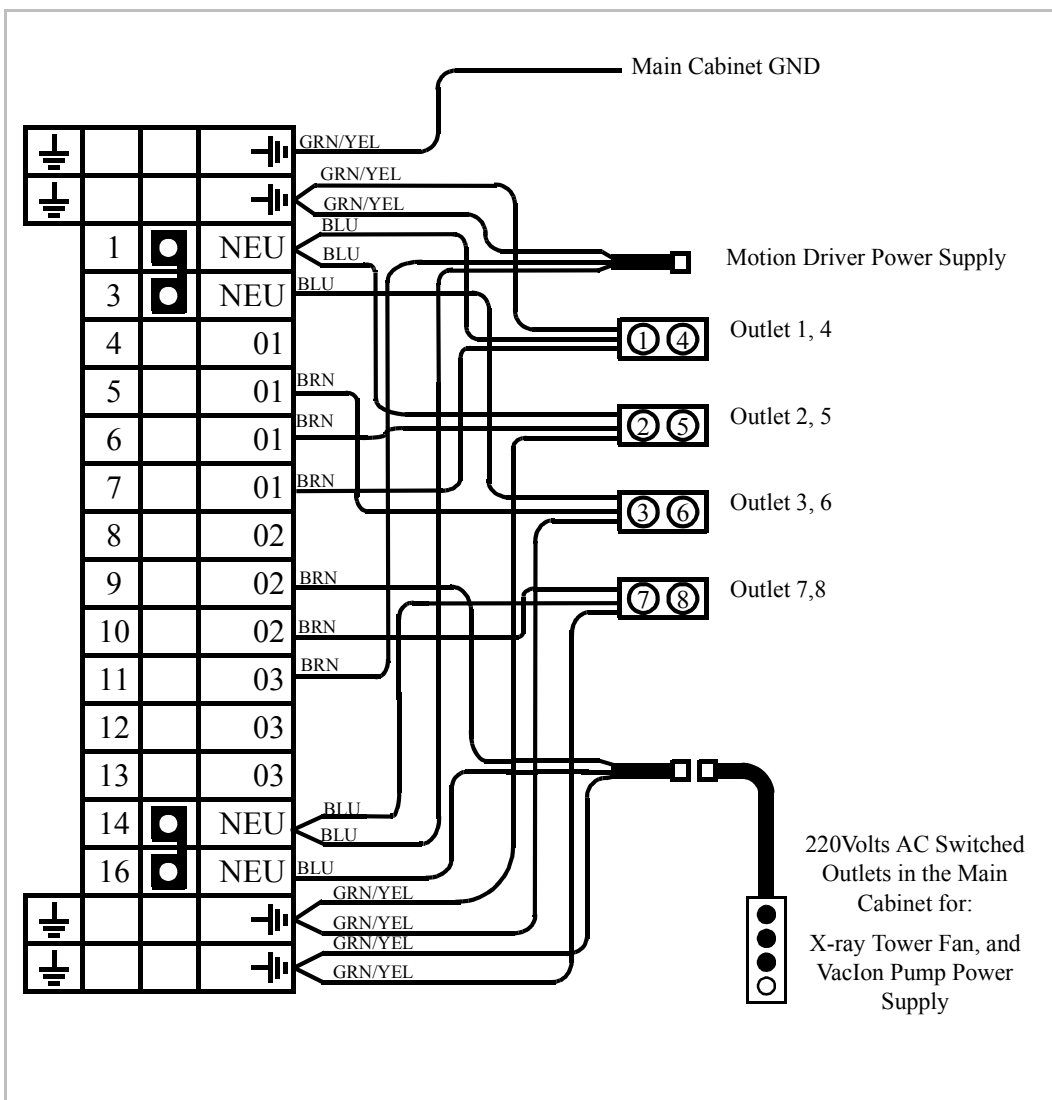


Figure A-12 Input Wiring — 380-415V 3-Phase Wye with Neutral



Appendix B

SMEMA Interface

The communication interface between adjacent machines is provided by way of a Surface Mount Equipment Manufacturers Association (SMEMA) compliant protocol. The purpose of multi-machine in-line interfacing is to allow the Agilent 5DX to be integrated directly with a customer’s current printed circuit assembly manufacturing process. The following illustrations and charts provide the connection specifications for the SMEMA-compliant interconnections.

TABLE B-1. SMEMA Electrical Interface Signals

SMEMA Signal Name	Digital I/O Bits	Digital I/O Signal Name	Function
Send Request Input (SRI)	IDC 11	SMEMA SRI - Panel In Available	The upstream equipment forces this signal low when it is ready to send a panel to the Agilent 5DX.
Transfer Request Output (TRO)	ODC 6	SMEMA TRO - Agilent 5DX Not Busy	The Agilent 5DX forces this signal low when it is ready to accept the panel from the upstream equipment.
Send Request Output (SRO)	ODC 7	SMEMA SRO - Panel Out Available	The Agilent 5DX forces this signal low when it is ready to send a panel to the downstream equipment.
Transfer Request Input (TRI)	IDC 13	SMEMA TRI - Output Not Busy	The downstream equipment forces this signal low when it is ready to accept the panel from the Agilent 5DX.

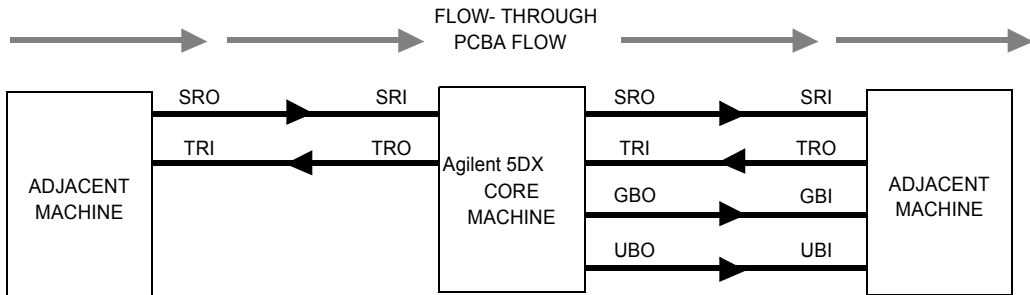
SMEMA

TABLE B-1. SMEMA Electrical Interface Signals

SMEMA Signal Name	Digital I/O Bits	Digital I/O Signal Name	Function
Good Panel Output (GPO)	ODC 8	SMEMA GPO - Panel Passed	The Agilent 5DX uses this signal to indicate that the panel being sent has been tested and is good.
Untested Panel Output (UPO)	ODC 20	SMEMA UPO - Untested Panel Output	The Agilent 5DX uses this signal to indicate that the panel being sent has not been tested.

- **SRI — Send Request Input** — The upstream equipment forces this signal low when it is ready to send a panel to the Agilent 5DX.
- **TRO — Transfer Request Output** — The Agilent 5DX forces this signal low when it is ready to accept the panel from the upstream equipment
- **SRO — Send Request Output** — The Agilent 5DX forces this signal low when it is ready to send a panel to the downstream equipment.
- **TRI — Transfer Request Input** — The downstream equipment forces this signal low when it is ready to accept the panel from the Agilent 5DX.
- **GPO — Good Panel Output** — The Agilent 5DX uses this signal to indicate that the panel being sent has been tested and is good.
- **UPO — Untested Panel Output** — The Agilent 5DX uses this signal to indicate that the panel being sent has not been tested

FIGURE B-1. Agilent 5DX Multiple Machine Interface / Process Flow Diagram:



SMEMA Functions

The following board handling functions are supported between adjacent machines using SMEMA compliant signal communication protocol. Processor functions that can be remotely engaged are described in the following:

Load (External)

- **Accept PCBA into Left Loader** — Move PCBA from the Input Conveyor into the Left Loader. (Forward mode operation)
- **Accept PCBA into Right Loader** — Move PCBA from the Input Conveyor into the Right Loader. (Reverse mode operation)

Load (Internal)

- **Accept PCBA forward into Main Loader** — Move PCBA from the Left Loader forward onto the Main Loader.
- **Accept PCBA reverse into Main Loader** — Move PCBA from the Right Loader reverse onto the Main Loader.

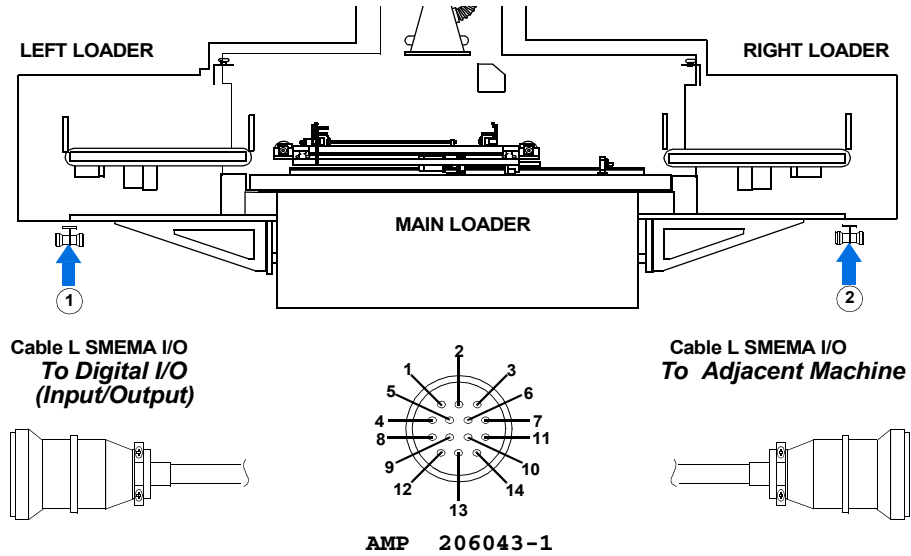
Unload (Internal)

- **Eject PCBA forward from Main Loader** — Move PCBA from the Main Loader onto the Right Loader.
- **Eject PCBA reverse from Main Loader** — Move PCBA from the Main Loader onto the Left Loader.

Unload (External)

- **Eject PCBA forward from Main Loader** — Move PCBA from the Right Loader onto the output conveyor.
- **Eject PCBA reverse from Main Loader** — Move PCBA from the Left Loader onto the output conveyor.

FIGURE B-2. SMEMA Connections at Loader Assemblies (Side View)



Appendix C

X-ray Safety

ATTENTION

This is an originally Controlled Document, all hard copies are uncontrolled copies. Original document number is 5021-1979. *(This appendix does not match the most current document and is appended to the installation guide for reference purposes only!)*

X-RAY Safety Reference

Purpose

This procedure provides instructions to check the safety interlock switch set operation and to measure the X-ray emission at all points outside the external surfaces of the Agilent 5DX X-ray system cabinet (Ref. 21 CFR, paragraph 1020.40, 13(c)). This procedure shall be utilized as follows:

- as part of System Integration Procedure for First Time (low power) power up and for the initial system tests;
- as part of Preshipment Procedure before shipping the system;
- as part of Installation Procedure after the systems installation at a customer site.

Until otherwise specified, this procedure can also be utilized as a radiation survey performed by a trained and authorized customer.

Warning and safety consideration

Caution

If any local reading exceeds 0.5 mR/hr, shut off X-rays and fix the problem.



Caution



Use Caution if any reading approaches 0.5 mR/hr.

Tools required

- Victoreen 290 Pancake GM meter (In calibration) *or*
- Radiation Alert® Inspector
- Victoreen 440 (Or 450P) Ionization meter (In calibration)
- X-Ray Test Board PN E7200-80021
- Set Gauge (0.100" Thick Side) or Steel Rule
- X-Ray Safety Test Report Form PN E7200-90026_1

1. Safety Interlock switch sets adjustment and operation.

- 1.1. If the X-ray system is on, shut off X-ray power from the Autonomics menu and remove the X-ray control key.
- 1.2. Check the actuation point and operation of each safety interlock switch set on each moveable barrier and access panel (see Form E7200-90026_1 Figures 1 and 2).

ATTENTION

NOTE. If any safety interlock switch set is inoperable, replace it.

- 1.3. If any safety interlock switch set does not meet its actuation distance requirement, adjust the switch until the conditions are met.
- 1.4. Initial in the appropriate section of Table 1 (see Form E7200-90026_1) when specification is met.

NOTE

NOTE: For a Pass-Back system with fewer movable barriers or access panels, write N/A in the appropriate boxes

2. Radiation meter scanning: Follow these directions for scanning each surface with the appropriate radiation meter.

- 2.1. Maintain a 5 cm (about 2.0 in.) gap between the test instrument detector face and any surface under test.
- 2.2. Use a series of parallel scans of the test instrument on each surface under test. To provide overlap, separate the scans 3.8 cm (1.5") from each other with the GM meter and 2.4 cm (1.0") with the Ion chamber.
- 2.3. Use a scan rate of about 0.5 in/sec. for the GM meter and .05 in/sec. for the Ion Chamber.
- 2.4. On the most sensitive scale (0.1 mR/hr full scale) of the test instrument, a scan rate of about 0.5 in/sec is adequate, except when the readings start to rise and approach the upper limit of this scale. When this occurs, slow down the scan rate, set the instrument to the next scale, find the local maximum reading and record it in the appropriate location of the corresponding system view. If any reading exceeds 0.1 mR/hr, be sure to allow at least 15 sec before taking the reading.

3. X-ray emission survey

- 3.1. Visually inspect the Agilent 5DX system skins for any damaged shielding parts and missing or damaged seals or safety wires. If found, fix the problem and/or inform your supervisor.
- 3.2. Close, screw down or lock all access panels that were opened for inspection in step 2. Make sure all access panels are secure.
- 3.3. Close the loader assembly outer movable barrier(s) and open the inner one(s).
- 3.4. Turn on both radiation test instruments and allow at least 1 minute warm up.
- 3.5. Check the Victoreen 440RF (or 450P) using its operational source.
- 3.6. Set the Victoreen 440RF (or 450P) to the most sensitive scale (0 to 0.1 mR/hr).
- 3.7. Check the Victoreen 290 using its operational source.
- 3.8. Set the Victoreen 290 or Radiation Alert® Inspector to the most sensitive scale (0 to 0.1 mR/hr).
- 3.9. Measure the background radiation level with the X-ray source HV off and record it in the space provided on Form E7200-90026_1.
 - at the DOS prompt, type: **loadsync -b0 -F400**
 - at the DOS prompt, type: **loadsync -b1**
 - at the DOS prompt, type: **sync -e**

- 3.10. Turn on the Agilent 5DX system, set it to 165 kV, 20 microamps, and configure for live laminographic image. Click on the live image icon: {
- 3.11. Position the Fixed Z-axis board support (Board Rail) directly under the X-ray tube at the following coordinates: X=0.0, Y= 6.000, Z=0.0.
- 3.12. Initialize the Z-axis exercise routine as follows: From the DOS prompt type: **AXTEST -M1 -Z1500 -T1000**.
- 3.13. This will exercise the Z-rail up and down the range of Inspection Fields of View, to simulate all possible radiation conditions.

ATTENTION

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- 3.14. Scan each exterior surface of the X-ray cabinet. Make sure that no reading exceeds the background radiation level by more than 0.5 mR/hr. If any reading is more than 0.5 mR/hr above the background level, shut off the system and fix the problem.
- 3.15. Close the loader assembly inner movable barrier(s) and open the outer one(s).
- 3.16. Rescan all loader assembly surfaces using steps 9-14.
- 3.17. Set the Agilent 5DX system to 165 kV, 125 microamps by running HVXRAY -S and configure for a live laminographic image. Click on the live image icon: {

- 3.18. Position the Fixed Z-axis board support (Board Rail) directly under the X-ray tube at the following coordinates: X=0.0, Y= 6.000, Z=0.0.
- 3.19. Initialize the Z-axis exercise routine as follows: From the DOS prompt type **AXTEST -M1 -Z1500 -T1000**.
- 3.20. This will exercise the Z-rail up and down the range of Inspection Fields of View, to simulate all possible radiation conditions.

Caution

If any local reading exceeds 0.5 mR/hr, stop the inspection, shut down X-rays and fix the problem.



- 3.21. Scan all cabinet surfaces and record the three highest readings taken on each surface in the survey document corresponding locations (Figures 3 through 8 of E7200-90026_1).
- 3.22. Close the loader assembly outer movable barrier(s) and open the inner one(s).
- 3.23. Rescan all loader assembly surfaces and record the three highest readings taken on each surface in the survey document corresponding locations (Figures 3 through 8 of E7200-90026_1).
- at the DOS prompt, type: **loadsync -b0 -Fdump**
 - at the DOS prompt, type: **loadsync -b1**
 - at the DOS prompt, type: **sync -e**
- 3.24. Set the 5DX system to 16kV, 100 microamps by running HVXRAY -S.

4. High reading check with the Victoreen 440RF (Or 450P).

- 4.1.** Select the five highest readings taken on the X-ray cabinet with the Victoreen 290 or Radiation Alert® Inspector GM meter and quantify them by measuring the X-ray emission on the corresponding spots of the cabinet with the Victoreen 440RF. Record the Victoreen 440RF (Or 450P) readings on the appropriate figures.
- 4.2.** Turn off both test instruments.
- 4.3.** Record the final results of this test (see Form E7200-90026_1). Indicate whether the X-ray cabinet passed or failed the test and write down the maximum reading.
- 4.4.** Fill in all specific spaces in Form E7200-90026_1, sign the X-ray Safety Test Report and forward to the Field Service Manager or if in plant the Manufacturing Manager (include address) for approval. When complete, store the report in the Agilent 5DX System Log Book.

Upon any rejection of a cabinet X-ray system, Production Engineering and Production Management shall meet and review the inspection results. At that time, the Production Engineer will address the recommend means and procedures to bring the particular cabinet X-ray system into compliance as well as to prevent a similar recurrence.