



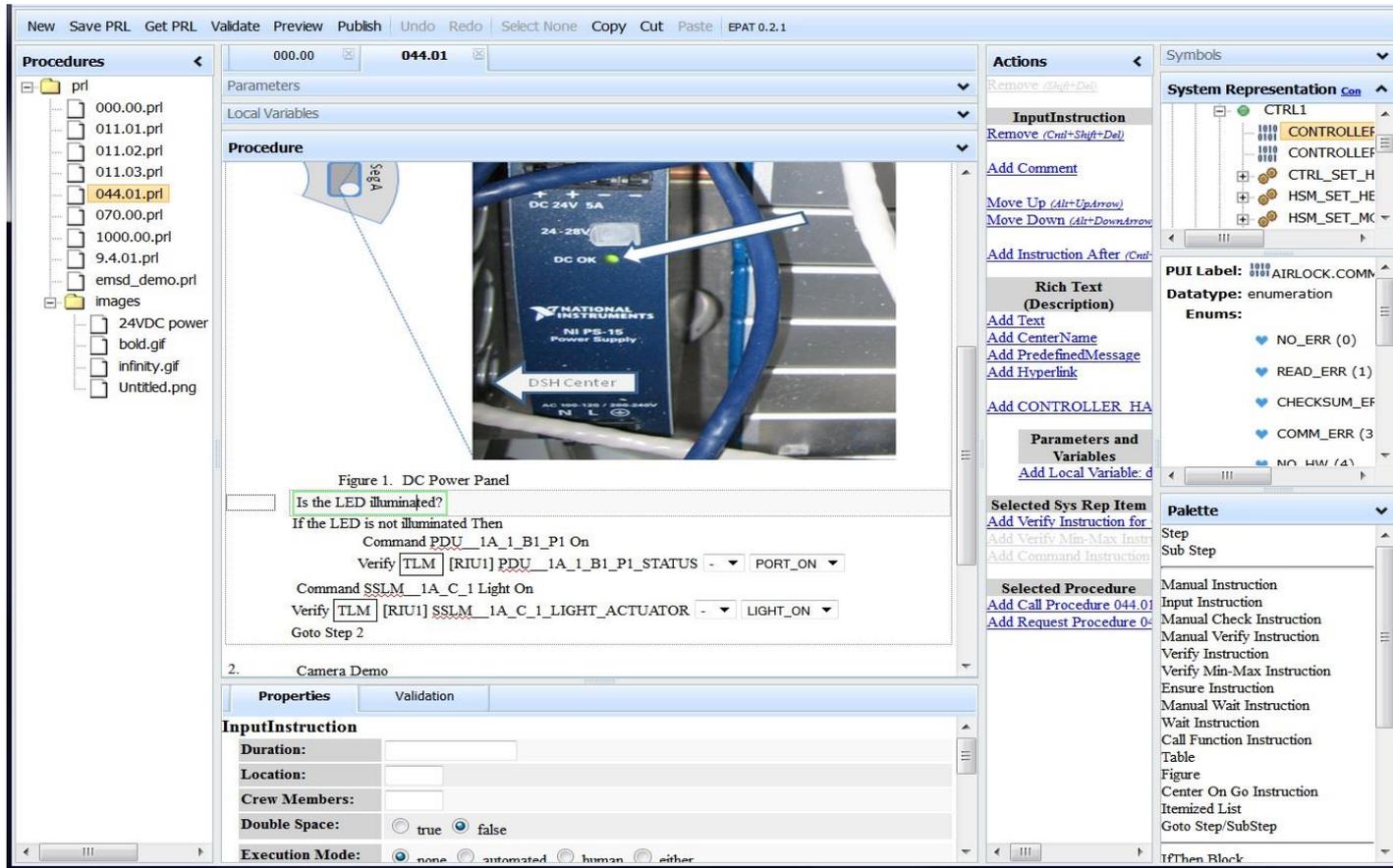
Augmented Reality Electronic Procedure System (AR-eProc)

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Web based Authoring Tool



- HTML5 Technology
- Drag-n-drop user interface.
- Supports the full Semantics of the Procedure Representation Language



Web Based Viewer/Display



Active

- 5.10(1) Ultrasound - Kidney Scan

Completed

TOC

- 2.01 T61P Device Changeout
- 2.02 Hard Drive Not Functioning
- 2.1a T61P Device Changeout Without Unstow
- 2.1b T61P Device Changeout Without Unstow Or Stow
- 2.2a Power On and Login To Laptop
- 3.01 Atrium H2O Resupply - Main
- 3.02 Atrium H2O Resupply - Aux
- 3.03 Terminate Atrium H2O Resupply
- 3.04 Atrium Main Transfer - Flow High
- 3.05 Atrium Aux Transfer - Flow High
- 3.06 Atrium H2O Resupply With A3 Failed High
- 3.07 Atrium Main Transfer - Flow Low
- 3.08 Atrium Aux Transfer - Flow Low
- 4.01 Filter Changeout
- 4.02 IRED Canister Inspection and Cleaning
- 5.01 Calf and Bicep Muscle Atrophy and Pain
- 5.02 SLM Measurement
- 5.03 Ultrasound - Configure CX50 Unit
- 5.04 Ultrasound - Appendicitis Scan
- 5.05 Examination - Abdominal Pain
- 5.06 Genitourinary Anatomy
- 5.07 Treating Pain
- 5.08 Vital Signs
- 5.09 Genitourinary Procedure - Urine Retention and
- 5.10 Ultrasound - Kidney Scan**
- 5.11 Ultrasound - Gallbladder Scan
- 5.12 Ultrasound - Bladder Scan
- 6.01 Sample Transfer
- 6.02 Plant Soil pH Determination
- 7.01 24 VDC Power Supply LED Check
- 7.02 28 VDC Power Supply Check
- 7.03 Wireless Sensor Node Off Line
- 7.04 cRIO 1 9477 Card Off Line
- 7.05 28 V Power Supply Failed
- 7.06 cRIO 1 Off Line
- 7.07 24 V Power Supply Off Line

Objective:
To acquire images and measurements of the patient's right and left kidney.

PARTS:

- Ultrasound CX50
- Ultrasound Probe - C5-1
- - Probe Scanhead Cover
- - Probe Connector Cover
- - Reference Documents
- - Keyboard and Probe Placement Cue Card
- Ultrasound Echo Gel (one bottle)
- Dry Wipes

U 1 CONFIGURE CX50 ULTRASOUND DEVICE

NOTE

- The body has two kidneys and they are not always symmetrical in shape or position. As a result the operator will have to image and measure both kidneys. The right kidney is usually lower in the body by 1-2 inches and is easier to find.
- Supine position (lying down) is preferred for the patient and they can roll to the right and left for the right and left kidneys, respectively.

U 1.1 Configure the CX50 Ultrasound Device with the C5-1 probe using procedure "5.3 Ultrasound - Configure CX50 Device" Done Submit

U 1.2 For "Preset" on the CX50, select "Abd Renal"

U 1.3 The gel should be applied to applied and resemble what is seen in Figure 1.

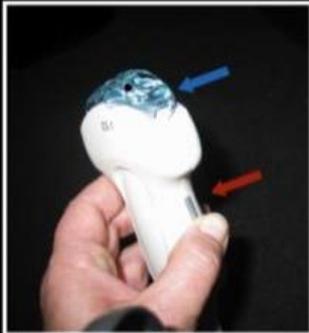


Figure 1 Ultrasound probe with gel applied to the scan head. The thumb lying over the indicator notch (red arrow). The gel application in this picture (blue arrow) is correct for any of the probes that are used for any ultrasound image application.

U 2 SCANNING PROCEDURE

U 2.1 Expose the patient's abdomen



Examples of AR-eProc Applications



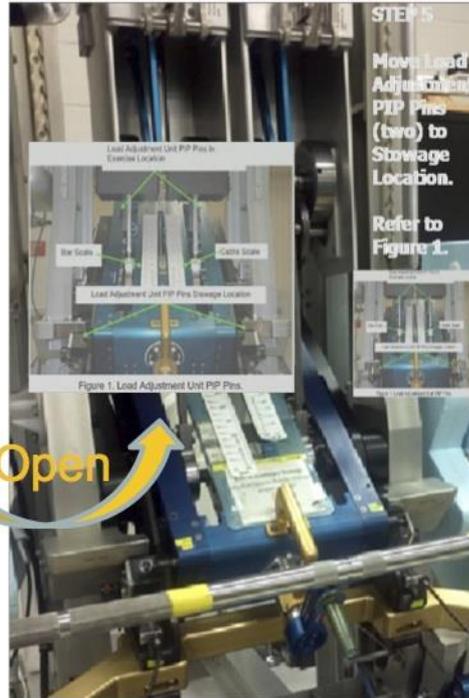
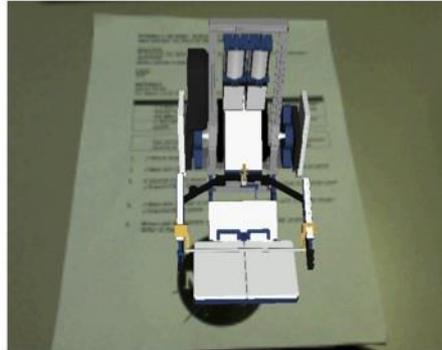
- Prototypes of AR-eProc for Maintenance of Devices on the International Space Station, Deep Space Habitat and UnderSea Lab
 - Advanced Resistive Exercise Device Maintenance (ARED)
 - Total Organics Carbon Analyzer (TOCA) Cartridge Replacement Procedure
 - Miniature Exercise Device Assembly (MED) Procedure
 - Augmented Reality Ultrasound Medical Procedure Assistant
 - Deep Space Habitat (DSH) Assets Locator



Augmented Reality (AR-eProc ARED)



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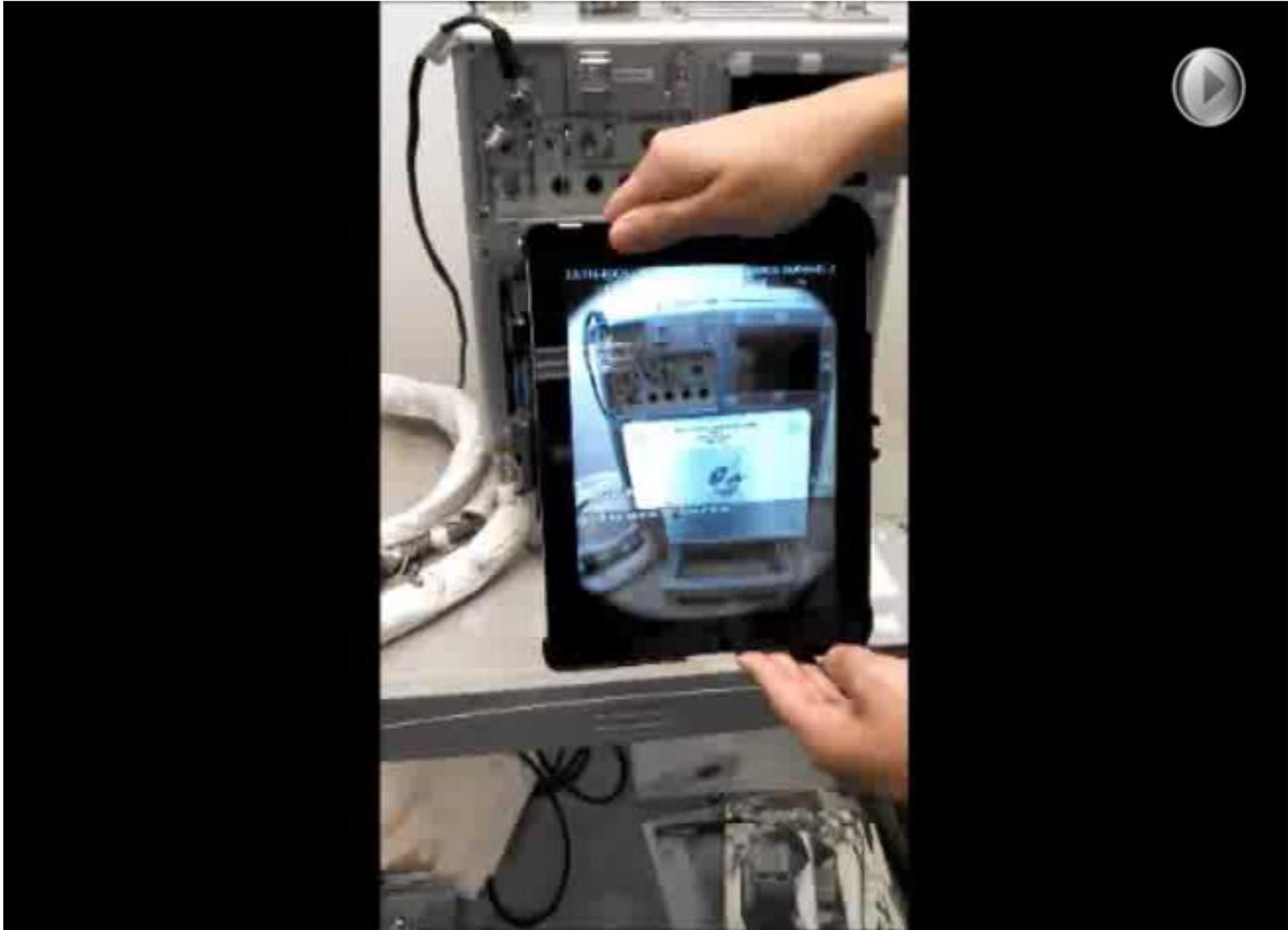




Augmented Reality (AR-eProc TOCA)

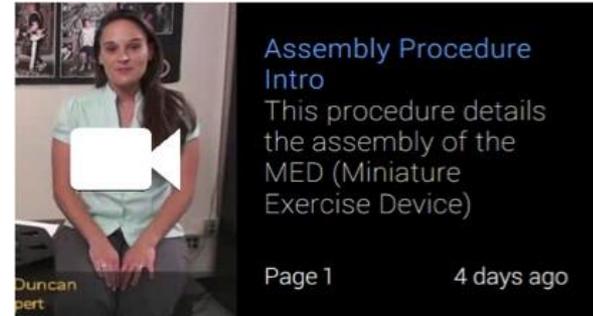


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Glass Procedure Just-in-time Training (JITT)



Miniature Exercise Device Assembly & Dis-assembly Tasks

Sani-tank Purge Glass Procedure

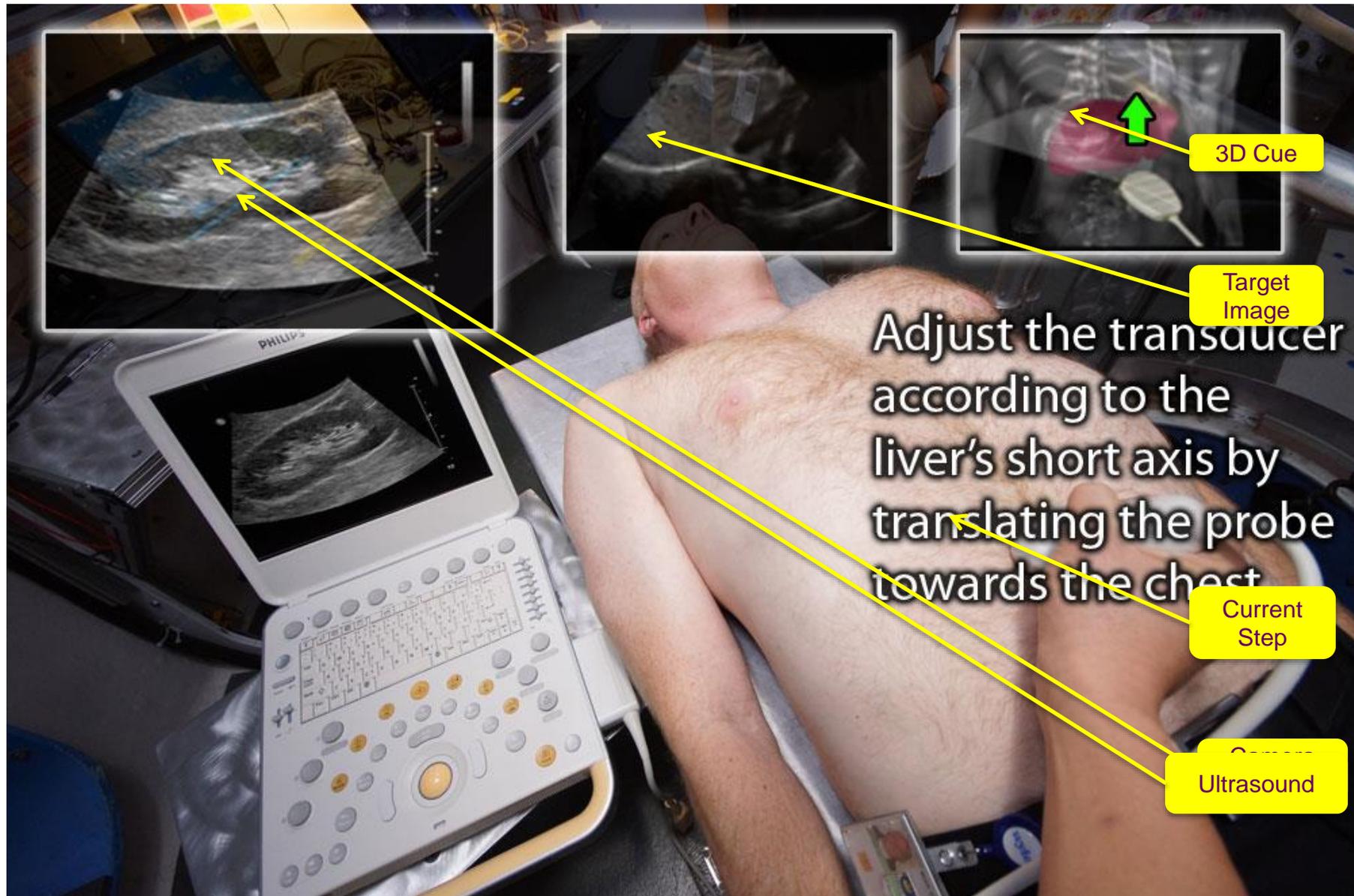




Augmented Reality to Enhance Crew Medical Training

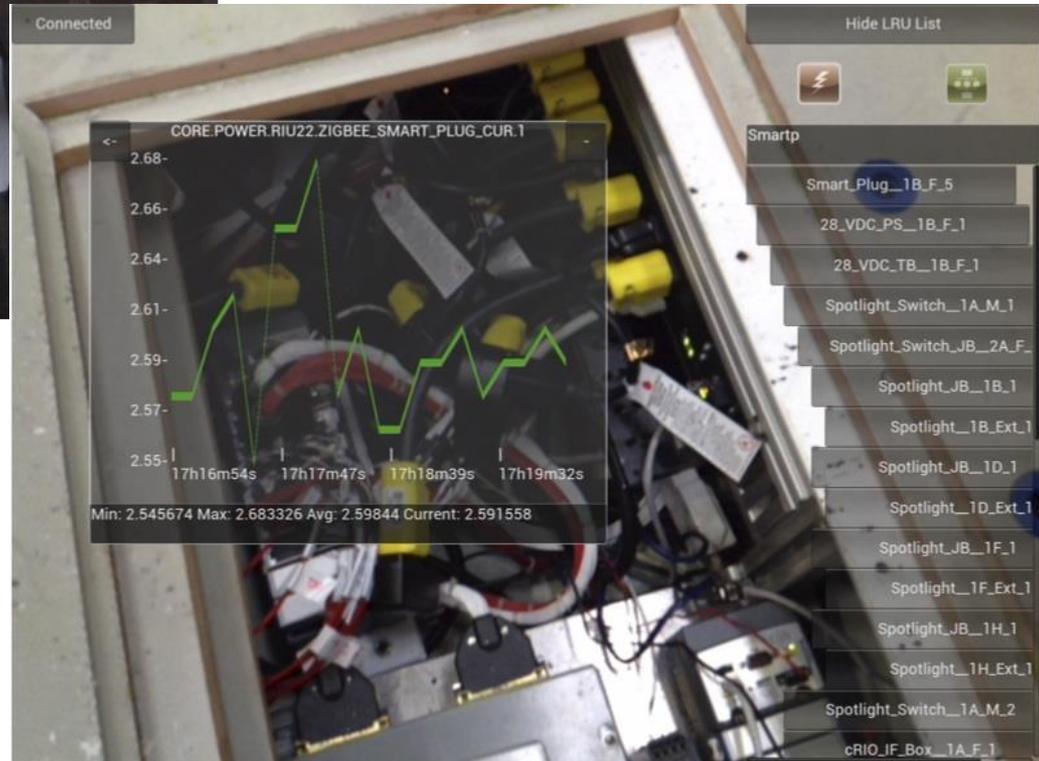


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DSH Power System Hardware Locator





AR-eProc Technology Summary



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- AR-eProc Applications Types
 - Marker-less Registration
 - Augmented Reality Advanced Exercise Device Cylinder Evac Proc.
 - AR TOCA Buffer Change out Proc.
 - Marker Registration
 - Deep Space Hab AR Assets Locator
 - AR TOCA Buffer Change out Proc.
 - No Registration
 - Autonomous Ultrasound guidance
 - GlassProc Just-in-time training for SEATESTII
- Develop Advanced GPU-based marker-less algorithms





Benefits



- Astronauts & Astronauts trainers identified the following benefits of the use of AR-eProc technology:
 - More efficient just in time training
 - Faster learning curve
 - Less prone to error
 - Faster procedure execution
 - More intuitive direct object annotation