



Submarine Rescue System

SRS-RCS

Rescue Capable System

**Control Van Electrical
Power System
2A5A2**

Maintenance Manual

2A5A2-ELEC-MM-1-0

Submarine Rescue System – Rescue Capable System

Control Van (CV) Electrical Power System (ELEC) 2A5A2

Maintenance Manual

GOVERNMENT PURPOSE RIGHTS – TECHNICAL DATA

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1.1 Purpose

This manual provides specific maintenance procedures for the Control Van (CV) Electrical Power System (ELEC).

The information is intended to be used as a general reference and to assist with system understanding for training and maintenance purposes.

1.2 Scope

This manual applies only to the CV Electrical Power System and its interface to directly related subsystems.

1.3 Drawing References

Table 1 lists drawings referenced in this manual.

Table 1 Drawing References

NAVSEA #	OceanWorks #	Drawing Title
7532934	569-330-A38920	Control van structure demarc panel – power
7533008	569-610-S38007	CV Power system wiring diagram
7533009	569-620-A38035	Power system assembly (2A5A2)
7533010	569-620-A38148	Power system cable routing
7533011	569-620-S38035	CV electrical power system schematic (2A5A2)
7533013	569-610-S38014	Power distribution unit (PDU) wiring diagram
7533014	569-610-A38018	Power tray assembly
7533015	569-610-S38015	Power tray wiring diagram
7533016	569-610-S38167	Hotel and HPU transformer wiring diagram
7533026	569-610-A38180	Control/power console power bar installation details
7533028	569-610-A38181	Video console power bar installation details
7533031	569-610-A38182	Operators console power bar installation details
7533118	569-620-A38129	Power tray installation details
7533125	569-620-A38149	Lighting system assembly
7533127	569-620-A38150	Lighting cable routing
7533133	569-610-A38244	External light exterior cable assembly
7533135	569-610-A38246	External light interior cable assembly
7533224	569-610-S38216	Ground fault monitor wiring diagram
7533307	569-610-A38301	Hotel boost transformer installation details
7533308	569-610-A38302	Ground fault monitor modifications and installation details
7533316	569-130-A38306	Control power UPS and battery pack installation details
7533327	569-610-A38316	HPU Boost transformer general assembly
7533334	569-610-A38323	Hotel boost transformer sensor and terminal assembly
7533342	569-610-A38330	Hotel boost transformer assembly
7533343	569-610-A38331	HPU boost transformer assembly

1.4 Document References

Table 2 lists documents referenced in this manual.

Table 2 Document References

Document Type	Document #	Document Title
COTS Manuals	This manual does not reference COTS Manuals.	
SRS-RCS Documents	2A5A2-ELEC-OM	CV Electrical Power System Operating Manual
	2A13A9-INCONELEC-MM	PRMS-MSE-AE Deck Interconnects-Electrical Maintenance Manual
Other Documents	569-COTS-ISE 0029	3000 VA on-line UPS model MCP 3000E
	569-COTS-ISE 0063	Emergency light
	569-COTS-ISE 0077	Smoke detector
	569-COTS-ISE 0088	5000 VA on-line UPS model MCP 6001

1.5 Abbreviations and Acronyms

See the Glossary at the end of this manual for acronyms, abbreviations, and special term descriptions.

1.6 Danger, Warning, Caution, and Note

This manual uses the following safety and information related notations:

DANGER! Danger indicates a location, equipment, or system where imminent hazard exists that may result in personnel injury or death, or threaten the primary SRS-RCS mission.

WARNING! Warning indicates a location, equipment, or system where a potential hazard exists that may injure maintainers or operators if the approved procedures are not followed.

CAUTION! Caution indicates a hazard that could damage equipment, a system, or the SRS-RCS, causing loss of mission capability if the approved procedures are not followed.

Note: Notes call attention to supplemental information that may enhance a user's understanding and performance of the procedure.

The CV Electrical System consists of the following components:

- CV power room:
 - One (1) power demarcation panel
 - Two (2) CV service transformers
 - Two (2) HPU boost transformers
 - Two (2) PRM hotel boost transformers
 - One (1) PRM hotel uninterruptible power supply (UPS) unit
 - One (1) smoke detector
 - One (1) 2-foot, fluorescent light (white)
 - One (1) emergency light unit

- CV control room:
 - One (1) 480 VAC 3 Ø distribution panel
 - One (1) power distribution unit (PDU)
 - Two (2) 120/208 VAC 3 Ø distribution panels
 - Two (2) HPU transformer sensor panels
 - Two (2) hotel boost transformer sensors
 - One (1) power tray
 - One (1) signal/data demarcation panel
 - One (1) CV earth bus
 - One (1) ground fault monitor
 - Two (2) control power UPS units
 - Two (2) battery packs, UPS external
 - Twelve (12) power bars
 - One (1) smoke detector
 - Four (4) 4-foot, fluorescent lights (white)
 - Two (2) incandescent lights (red)

- CV exterior:
 - Two (2) external 500-watt flood lights
 - Two (2) rotating lights, amber

See the *CV Electrical Power System Operating Manual (2A5A2-ELEC-OM)* for a description of the system and its functions.

3

Preventive Maintenance

3.1 Preventive Maintenance Schedule and Index

Table 3 provides an index and schedule for preventive maintenance required for the CV Electrical Power System.

Table 3 Preventive Maintenance Schedule and Index

Section #	Procedure	Monthly	6 Months	Yearly	3-year Overhaul	Other
3.2	Replacing a UPS External Battery Pack				X	
3.3	Replacing a Control Power UPS Internal Battery Pack				X	
3.4	Replacing the PRM Hotel Power UPS Battery Pack				X	
3.5	Replacing a Smoke Detector Battery		X			
3.6	Replacing an Emergency Light Battery				X	

3.2 Replacing a UPS External Battery Pack

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

CAUTION! Avoid touching battery terminals with objects that could create a short circuit.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533316	Control power UPS and battery pack installation details

Special Tools

None

Spare Parts

569-COTS-ISE-0029 3000 VA on-line UPS model MCP 3000E
See COTS sheet for replacement battery ordering information.

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
4. Remove two (2) nuts from the bracket securing the battery packs.
5. Disconnect cable from the UPS and remove the battery pack.
6. Install the new battery pack. Secure it with the bracket and two (2) bolts.
7. Reconnect the cable to the UPS.
8. At the **480 V 3Ø DISTRIBUTION PANEL (2A5A2-PDP-EPO1)**, turn on both **MAIN DISCONNECT (2A5A2-C8-EPO8-1 and 2A5A2-C8-EPO8-2)** switches. Confirm functionality of the UPS.
9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.

11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

3.3 Replacing a Control Power UPS Internal Battery Pack

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

CAUTION! Avoid touching battery terminals with objects that could create a short circuit.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533316	Control power UPS and battery pack installation details

Special Tools

None

Spare Parts

569-COTS-ISE-0029 3000 VA on-line UPS model MCP 3000E
See COTS sheet for replacement battery ordering information.

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
4. Remove the brackets securing the UPS.
5. Open the UPS casing and remove the battery pack.
6. Install the new battery pack.
7. Close the UPS casing and reinstall the brackets securing the UPS.
8. At the **480 V 3Ø DISTRIBUTION PANEL (2A5A2-PDP-EPO1)**, turn on both **MAIN DISCONNECT (2A5A2-C8-EPO8-1 and 2A5A2-C8-EPO8-2)** switches. Confirm functionality of the UPS.

9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

3.4 Replacing the PRM Hotel Power UPS Battery Pack

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

CAUTION!

Avoid touching battery terminals with objects that could create a short circuit.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing

Special Tools

None

Spare Parts

569-COTS-ISE-0088 5000 VA on-line UPS model MCP 6001
See COTS sheet for replacement battery ordering information.

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS 1** (2A5A2-1B-EP01-1) and **POWER BUS 2** (2A5A2-CB-EP01-2) to **OFF**.
4. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT** (2A5A2-CB-EPO8-1) and **BUS #2 MAIN DISCONNECT** (2A5A2-CB-EPO8-2) switches.

5. Remove the bracket securing the UPS.
6. Open the UPS casing and remove the battery pack.
7. Install the new battery pack.
8. Close the UPS casing and reinstall the bracket securing the UPS.
9. At the **480 V 3Ø DISTRIBUTION PANEL**, turn on **BUS #1 MAIN DISCONNECT** (2A5A2-CB-EPO8-1) and **BUS #2 MAIN DISCONNECT** (2A5A2-CB-EPO8-2) switches.
10. In the Control Van (CV), at the **POWER DISTRIBUTION UNIT**, set **POWER BUS 1** (2A5A2-1B-EP01-1) and **POWER BUS 2** (2A5A2-CB-EP01-2) to **ON**.
11. Confirm functionality of the UPS.
12. Return valves and electrical switches to the state that they were in before this procedure was performed.
13. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
14. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

3.5 Replacing a Smoke Detector Battery

DANGER!

Shock hazard! When performing work in the CV power room, be aware of potential exposure to high voltage sufficient to cause lethal electric shock.

Drawing References

7533009 Power system assembly (2A5A2)

Special Tools

None

Spare Parts

569-COTS-ISE-0077 Smoke detector

See COTS sheet for replacement battery ordering information.

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. Open smoke detector.
4. Remove battery.
5. Install new battery and close the smoke detector.

6. Test the smoke detector by pressing the test button.
7. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
8. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

3.6 Replacing an Emergency Light Battery

DANGER!

Shock hazard! When performing work in the CV power room, be aware of potential exposure to high voltage sufficient to cause lethal electric shock.

Drawing References

7533125 Lighting system assembly

Special Tools

None

Spare Parts

569-COTS-ISE-0063 Emergency light
See COTS sheet for replacement battery ordering information.

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. Disconnect the light unit from power outlet.
4. Open the light casing.
5. Replace battery and close the casing.
6. Reconnect the light unit to power outlet.
7. Turn on the light switch. Confirm functionality by pushing the test button.
8. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
9. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4

Corrective Maintenance

4.1 Corrective Maintenance Index

Table 4 provides an index to procedures for correcting malfunctions of the CV Electrical Power System. See Chapter 5, Troubleshooting, for assistance in selecting an appropriate procedure.

Table 4 Corrective Maintenance Index

Section #	Procedure
4.2	Replacing a Cable
4.3	Replacing the Ground Fault Monitor
4.4	Measuring High Voltage
4.5	Replacing an HPU Boost Transformer
4.6	Replacing a Hotel Boost Transformer
4.7	Replacing a Service Transformer
4.8	Replacing a Control Power UPS
4.9	Replacing the Hotel Power UPS
4.10	Replacing a Power Bar
4.11	Replacing a Power Tray Power Supply
4.12	Replacing a Power Tray Fuse
4.13	Replacing a Power Room Fluorescent Assembly
4.14	Replacing a Control Room Fluorescent Assembly
4.16	Replacing an Exterior Light Assembly
4.17	Replacing a Rotating Light

4.2 Replacing a Cable

WARNING! Shock hazard! Verify power to the unit is isolated before performing this corrective maintenance procedure.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)

Special Tools

None

Spare Parts

7533422	Exterior utility power cable assembly
7533460	GFM power cable assembly
SPC11683	Power cable – SPC Technology

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. If power is connected to the unit, isolate power. For the power tray and the ground fault monitor cable, turn off the device and disconnect the power cable from the power bar. For the exterior utility, at the 208/120 VAC 3Ø distribution panel, **BUS #1**, turn off breaker **CB 7, EXTERIOR UTILITY OUTLET**.
4. Disconnect cable at both ends.

CAUTION!

Use only industrial grade, 99% pure isopropyl alcohol.

5. For exterior cables, clean receptacle and new cable with isopropyl alcohol.
6. Connect new cable.
7. For the power tray and the ground fault monitor cable, reconnect the power cable to the power bar and turn on the device. For the exterior utility, at the 208/120 VAC 3 Ø distribution panel, **BUS #1**, turn on breaker **CB 7, EXTERIOR UTILITY OUTLET**.
8. Confirm functionality of the device.
9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.3 Replacing the Ground Fault Monitor

WARNING! Shock hazard! Verify power to the unit is isolated before performing this corrective maintenance procedure.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533224	Ground fault monitor wiring diagram
7533308	Ground fault monitor modifications and installation details

Special Tools

None

Spare Parts

B980045057	Ground fault monitor rack – Bender
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. Disconnect the ground fault monitor (GFM) power cable from the power bar.
4. Disconnect three (3) cables and one (1) earth cable from the back of the unit.
5. Unscrew four (4) screws and pull the GFM tray out of the console.
6. Install the new GFM tray into the console and secure with four (4) screws.
7. Reconnect three (3) cables and one (1) earth cable to the unit.
8. Reconnect the power cable at the power bar and confirm functionality of the GFM.
9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.4 Measuring High Voltage

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this corrective maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

Drawing References

7532934 Control van structure demarc panel – power

Special Tools

Digital MultiMeter (DMM), high voltage probe rated to at least 4000 VAC

Spare Parts

None

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1** (2A5A2-1B-EP01-1) and **POWER BUS #2** (2A5A2-CB-EP01-2) to **OFF**.

DANGER!

Before disconnecting any cable, power must be turned off and locked out.

4. At the power demarcation panel, disconnect the cable. For the HPU boost transformer, disconnect HPU power bus #1 cable (2A5/2A7-CBL-EPO1) or HPU power bus #2 cable (2A5/2A7-CBL-EPO2). For the hotel boost transformer, disconnect hotel power bus #1 cable (2A5/2A7-CBL-EPO3) or hotel power bus #2 cable (2A5/2A7-CBL-EPO4).
5. Using a Digital MultiMeter (DMM) with a high voltage probe rated to at least 4000 VAC, clip the DMM probes to the test points.
6. Ensure that the clips and test leads do not contact each other or any conductor. Position the DMM so that it can be read from several feet away.
7. Move non-essential personnel 10 feet from the open enclosure. Ensure that the maintainer who will read the meter is clear and safely away from any conductors.
8. Restore HPU/hotel power.

9. Read the voltage and confirm acceptable reading.

Table 5 Acceptable High Voltage Readings

Test point		Acceptable readings
HPU power Bus #1 or #2		
Negative	Positive	
ØA	ØB	3000 ± 300 VAC
ØA	ØC	3000 ± 300 VAC
ØB	ØC	3000 ± 300 VAC
Hotel power Bus #1 or #2		
Negative	Positive	
ØA	ØB	1900 ± 190 VAC

10. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1** (2A5A2-1B-EP01-1) and **POWER BUS #2** (2A5A2-CB-EP01-2) to **OFF**.
11. At the power demarcation panel, reconnect the cable. For the HPU boost transformer, reconnect HPU power bus #1 cable (2A5/2A7-CBL-EPO1) or HPU power bus #2 cable (2A5/2A7-CBL-EPO2). For the hotel boost transformer, reconnect hotel power bus #1 cable (2A5/2A7-CBL-EPO3) or hotel power bus #2 cable (2A5/2A7-CBL-EPO4).
12. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
13. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.5 Replacing an HPU Boost Transformer

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533016	Hotel and HPU transformer wiring diagram
7533327	HPU boost transformer general assembly
7533343	HPU boost transformer assembly

Special Tools

None

Spare Parts

7533343	HPU boost transformer assembly
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1 (2A5A2-1B-EP01-1)** and **POWER BUS #2 (2A5A2-CB-EP01-2)** to **OFF**.
4. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
5. Disconnect wires at the output transformer terminal beam.
6. Disconnect three (3) power wires and two (2) voltage conditioner wires at the input transformer tap.
7. Disconnect the ground cable.
8. Remove the transformer sensor panel support straps.

9. Remove the transformer.
10. Install the new transformer.
11. Reinstall the transformer sensor panel support straps.
12. Reconnect ground wire.
13. At the input transformer tap, reconnect the input power wires at each of three (3) taps **480**. Reconnect two (2) voltage condition wires at **ØA** at tap **0** and **480**.
14. At the output transformer terminal beam, reconnect three (3) PRM HPU power wires at tap **3100**.
15. Perform high voltage test (see Section 4.4, Measuring High Voltage).
16. If voltage reading is not acceptable, repeat Steps 12 through 14. Ensure wires are reconnected properly and the input voltage at the transformer is 480 VAC, 3 Ø.
17. Restore power and confirm functionality of the system with the PRM attached.
18. Return valves and electrical switches to the state that they were in before this procedure was performed.
19. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
20. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.6 Replacing a Hotel Boost Transformer

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533016	Hotel and HPU transformer wiring diagram
7533307	Hotel boost transformer installation details
7533334	Hotel boost transformer sensor and terminal assembly
7533342	Hotel boost transformer assembly

Special Tools

None

Spare Parts

7533342

Hotel boost transformer assembly

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1** (2A5A2-1B-EP01-1) and **POWER BUS #2** (2A5A2-CB-EP01-2) to **OFF**.
4. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT** (2A5A2-CB-EPO8-1) and **BUS #2 MAIN DISCONNECT** (2A5A2-CB-EPO8-2) switches.
5. Disconnect two (2) power wires and the voltage conditioner wires at the input transformer tap.
6. At the transformer output, disconnect PRM hotel power and the ground fault sensor wires.
7. Disconnect the ground cable.
8. Remove four (4) bolts securing the transformer and remove the transformer.
9. Install the replacement transformer.
10. Secure it with four (4) bolts.
11. Reconnect the ground cable.
12. Reconnect the input power wires and the voltage conditioner wires at tap **0** and tap **210**.
13. At the transformer output, reconnect PRM hotel power and the ground fault sensor wires at tap **0** and tap **1900**.
14. Perform high voltage test (see Section 4.4, Measuring High Voltage).
15. If voltage reading is not acceptable, repeat Steps 11 through 13. Ensure wires are reconnected properly and the input voltage at the transformer is 208 VAC.
16. Restore power to the control van. Power up hotel power to the PRM and confirm functionality.
17. Return valves and electrical switches to the state that they were in before this procedure was performed.
18. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
19. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.7 Replacing a Service Transformer

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)

Special Tools

None

Spare Parts

CDTCD010RHA6XXBA Service Transformer – Delta Transformers

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
4. Remove four (4) bolts securing the transformer.
5. Open the transformer casing.
6. Disconnect wires at the service transformer.
7. Disconnect the ground cable.
8. Install the replacement transformer.
9. Reconnect the ground cable.
10. Reconnect the wires at the transformer.
11. Close the transformer casing.
12. Secure the transformer with four (4) bolts.
13. Restore power to the CV and confirm functionality.

14. Return valves and electrical switches to the state that they were in before this procedure was performed.
15. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
16. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.8 Replacing a Control Power UPS

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533316	Control power UPS and battery pack installation details

Special Tools

None

Spare Parts

569-COTS-ISE-0029	Control power UPS
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
4. Remove the brackets securing the UPS.
5. Disconnect four (4) cables at the UPS.
6. Remove the UPS.
7. Install the new UPS.
8. Reconnect four (4) cables at the UPS.
9. Reinstall the brackets securing the UPS.

10. Restore power and confirm functionality of the UPS.
11. Return valves and electrical switches to the state that they were in before this procedure was performed.
12. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
13. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.9 Replacing the Hotel Power UPS

DANGER!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure. This procedure exposes conductors that carry high voltage sufficient to cause lethal electric shock.

When performing work in the CV power room, be aware of potential exposure to high voltages sufficient to cause lethal electric shock.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)

Special Tools

None

Spare Parts

90000334	PRM Hotel power UPS – Minuteman model MCP 6001
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1** (2A5A2-1B-EP01-1) and **POWER BUS #2** (2A5A2-CB-EP01-2) to **OFF**.
4. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT** (2A5A2-CB-EPO8-1) and **BUS #2 MAIN DISCONNECT** (2A5A2-CB-EPO8-2) switches.
5. Disconnect two (2) cables at the PRM hotel UPS.

6. Remove the UPS.
7. Install the new UPS.
8. Reconnect two (2) cables at the UPS.
9. At the **480 V 3Ø DISTRIBUTION PANEL**, turn on **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
10. In the CV, at the **POWER DISTRIBUTION UNIT**, set **POWER BUS #1 (2A5A2-1B-EP01-1)** and **POWER BUS #2 (2A5A2-CB-EP01-2)** to **ON**.
11. Confirm functionality of the UPS.
12. Return valves and electrical switches to the state that they were in before this procedure was performed.
13. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
14. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.10 Replacing a Power Bar

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533008	CV power system wiring diagram
7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533026	Control/power console power bar installation details
7533028	Video console power bar installation details
7533031	Operators console power bar installation details

Special Tools

None

Spare Parts

SP187A	Power bar – Black box
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the **480 V 3Ø DISTRIBUTION PANEL**, turn off **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
4. Disconnect all devices connected to the power bar.
5. Disconnect the power bar from the power outlet.
6. Remove four (4) screws securing the power bar to the console.
7. Install the new power bar with four (4) screws.
8. Reconnect the power bar to the power outlet.
9. Reconnect all devices to the power bar.
10. At the **480 V 3Ø DISTRIBUTION PANEL**, turn on **BUS #1 MAIN DISCONNECT (2A5A2-CB-EPO8-1)** and **BUS #2 MAIN DISCONNECT (2A5A2-CB-EPO8-2)** switches.
11. Turn on the power bar. Confirm functionality of each device connected to the power bar.
12. Return valves and electrical switches to the state that they were in before this procedure was performed.
13. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
14. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.11 Replacing a Power Tray Power Supply

WARNING! Shock hazard! Verify power to the unit is isolated before performing this corrective maintenance procedure.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533014	Power tray assembly
7533015	Power tray wiring diagram
7533118	Power tray installation details

Special Tools

None

Spare Parts

HAA15-0.8A	Power supply, Power-One®
HAA5-1.5/OVP-A	Power supply, Power-One®
HC12-3.4A	Power supply, Power-One®

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the power tray front panel, turn off **BUS 1 POWER** and **BUS 2 POWER**.
4. Remove four (4) bolts securing power tray to the control/power console and gently pull out power tray. Ensure cables at the back of the tray are protected.
5. Disconnect wires at the power supply.
6. Remove screws securing the power supply.
7. Remove the power supply.
8. Install new power supply.
9. Reconnect wires to the power supply.
10. Gently push in power tray and reinstall four (4) bolts securing power tray to the control/power console. Ensure cables at the back of the tray are protected.

11. At the power tray front panel, turn on **BUS 1 POWER** and **BUS 2 POWER**. Confirm functionality of the power supply.
12. Return valves and electrical switches to the state that they were in before this procedure was performed.
13. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
14. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.12 Replacing a Power Tray Fuse

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)
7533014	Power tray assembly
7533015	Power tray wiring diagram

Special Tools

None

Spare Parts

GMA-750ma	0.75A Fuse, Bussman
GMA-500ma	0.5A Fuse, Bussman

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the power tray front panel, turn off **BUS 1 POWER** and **BUS 2 POWER**.
4. Remove four (4) bolts securing power tray to the control/power console and gently pull out power tray. Ensure cables at the back of the tray are protected.
5. Replace the fuse at the fuse terminal block.
6. Gently push in power tray and reinstall four (4) bolts securing power tray to the control/power console. Ensure cables at the back of the tray are protected.
7. At the power tray front panel, turn on **BUS 1 POWER** and **BUS 2 POWER**. If replacing fuse 2A5A2-F-EP03, confirm the functionality of the DGPS unit. If replacing fuse 2A5A2-F-EP04, confirm the functionality of the P-code GPS unit.
8. Return valves and electrical switches to the state that they were in before this procedure was performed.
9. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
10. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.13 Replacing a Power Room Fluorescent Assembly

DANGER!

Shock hazard! When performing work in the CV power room, be aware of potential exposure to high voltage sufficient to cause lethal electric shock.

WARNING!

Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533008	CV power system wiring diagram
7533011	CV electrical power system schematic (2A5A2)
7533125	Lighting system assembly
7533127	Lighting cable routing

Special Tools

None

Spare Parts

V224-217IST8ELE	Fluorescent lamp – vapor proof, 2L x 2FT
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the 208/120 VAC 3 Ø distribution panel, **BUS #2**, turn off breaker **CB 10, POWER ROOM OUTLET , POWER ROOM LIGHT, and EMERGENCY LIGHTS**.
4. Remove the light bulb cover in the defective assembly.
5. Remove both fluorescent light bulbs.
6. Open the ballast cover.
7. Disconnect the power wires to the ballast.
8. Remove the ballast.
9. Install the new ballast.
10. Reconnect the power wires to the ballast.
11. Close the ballast cover.
12. Install new fluorescent light bulbs as required.
13. Reinstall the light bulb cover.
14. At the 208/120 VAC 3Ø distribution panel, **BUS #2**, turn on breaker **CB 10, POWER ROOM OUTLET , POWER ROOM LIGHT, and EMERGENCY LIGHTS**. Confirm functionality of the fluorescent light assembly.
15. Return valves and electrical switches to the state that they were in before this procedure was performed.
16. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
17. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.14 Replacing a Control Room Fluorescent Assembly

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533008	CV power system wiring diagram
7533011	CV electrical power system schematic (2A5A2)
7533125	Lighting system assembly
7533127	Lighting cable routing

Special Tools

None

Spare Parts

DM 2 32 120 ES	Fluorescent lamp – vapor proof, 2L x 4FT
GOB48271202	Fluorescent dimming ballast – Lutron

Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. At the 208/120 VAC 3 Ø distribution panel, **BUS #2**, turn off breaker **CB 4, CV ENTRANCE OUTLET, CONTROL ROOM LIGHT, and EMERGENCY LIGHT**.
4. Remove the light bulb cover in the defective assembly.
5. Remove both fluorescent light bulbs.
6. Open the ballast cover.
7. Disconnect the power wires to the ballast.
8. Remove the ballast.
9. Install the new ballast. For the port fluorescent lights, use GOB48271202, fluorescent dimming ballast – Lutron. For starboard lights, use DM 2 32 120 ES, fluorescent lamp – vapor proof, 2L x 4FT.
10. Reconnect the power wires to the ballast.
11. Close the ballast cover.
12. Reinstall fluorescent light bulbs.
13. Reinstall the light bulb cover.

14. At the 208/120 VAC 3 Ø distribution panel, **BUS #2**, turn on breaker **CB 4, CV ENTRANCE OUTLET, CONTROL ROOM LIGHT, and EMERGENCY LIGHT**. Confirm functionality of the fluorescent light assembly.
15. Return valves and electrical switches to the state that they were in before this procedure was performed.
16. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
17. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.15 Replacing an Exterior Light Assembly

WARNING! Shock hazard! Verify power to the unit is isolated before performing this corrective maintenance procedure.

Drawing References

7533008	CV power system wiring diagram
7533010	CV electrical power system schematic (2A5A2)
7533125	Lighting system assembly
7533127	Lighting cable routing
7533133	External light exterior cable assembly
7533135	External light interior cable assembly

Special Tools

None

Spare Parts

7411286	External light – Navsea type
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. Turn off the light.
4. For the forward external light, disconnect cable **2A5A2-CBL-EP31**, connector **J4** at the signal demarcation panel. For the aft external light, disconnect cable **2A5A2-CBL-EP32**, connector **J7** at the signal demarcation panel.
5. Remove the light assembly and cable from the CV frame.
6. Install the new light assembly.
7. Reroute the cable. For the forward external light, connect cable **2A5A2-CBL-EP31**, connector **J4** at the signal demarcation panel. For the aft external light, connect cable **2A5A2-CBL-EP32**, connector **J7** at the signal demarcation panel.
8. Turn on the light and confirm functionality.
9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.16 Replacing an Emergency Light

DANGER! Shock hazard! When performing work in the CV power room, be aware of potential exposure to high voltage sufficient to cause lethal electric shock.

Drawing References

7533011	CV electrical power system schematic (2A5A2)
7533125	Lighting system assembly
7533127	Lighting cable routing

Special Tools

None

Spare Parts

M636120CSCSA	Emergency light – Lithonia
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. Turn off the emergency light switch.
4. Disconnect emergency light assembly from the power outlet.
5. Remove the light assembly from the wall.
6. Install the new light assembly.
7. Reconnect the light assembly to the power outlet.
8. Turn on the light switch. Confirm functionality by pushing the test button.
9. Return valves and electrical switches to the state that they were in before this procedure was performed.
10. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
11. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

4.17 Replacing a Rotating Light

WARNING! Shock hazard! Verify power to the unit is isolated before performing this maintenance procedure.

Drawing References

7533009	Power system assembly (2A5A2)
7533010	Power system cable routing
7533011	CV electrical power system schematic (2A5A2)

Special Tools

None

Spare Parts

AVG 110 Y	Rotating light – ISE Inc
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Preconditions

None

Procedure

1. Follow instructions in Section 6.2, General Notes, regarding hazmat requirements, torque specifications, inspection of mounting hardware, and use of Nylok® nuts, as applicable.
2. Perform the following steps in accordance with local requirements for SOC and tag in/out, as applicable.
3. If power is connected to the unit, isolate power. At the power tray, turn off **HOTEL #1** and **HOTEL #2**, and tag out.
4. At the mast assembly, remove the defective rotating light.
5. Install the new light.
6. At the power tray, turn on **HOTEL #1** and **HOTEL #2** and confirm functionality of the light.
7. Return valves and electrical switches to the state that they were in before this procedure was performed.
8. Inspect and determine disposition of any parts removed. If applicable, dispose of removed parts and/or fluids in accordance with local requirements.
9. Ensure the preceding steps were performed in accordance with local requirements for SOC and tag in/out, as applicable.

5.1 Overview

DANGER!

The decision trees provided in this Chapter are a guide, not a step by step procedure. Follow tag in/out and other safety procedures as set out in the corrective and preventive maintenance procedures in this manual.

This Chapter provides troubleshooting decision trees for identifying malfunctioning components of the CV Electrical Power System.

Each decision tree addresses one malfunction and points to corrective procedures in Chapter 4, Corrective Maintenance, or other decision trees, as applicable.

In all cases, test the parts replaced (see the specific corrective and preventive maintenance procedures).

See schematics 7533008, 7533011, 7533013, 7533015, and 7533016 when using the troubleshooting decision trees.

5.2 Troubleshooting Subroutine — 10 kVA 480-208/120 VAC 3Ø Transformer #1 or #2 Power Check

Procedure

- Follow the troubleshooting steps in Figure 1.

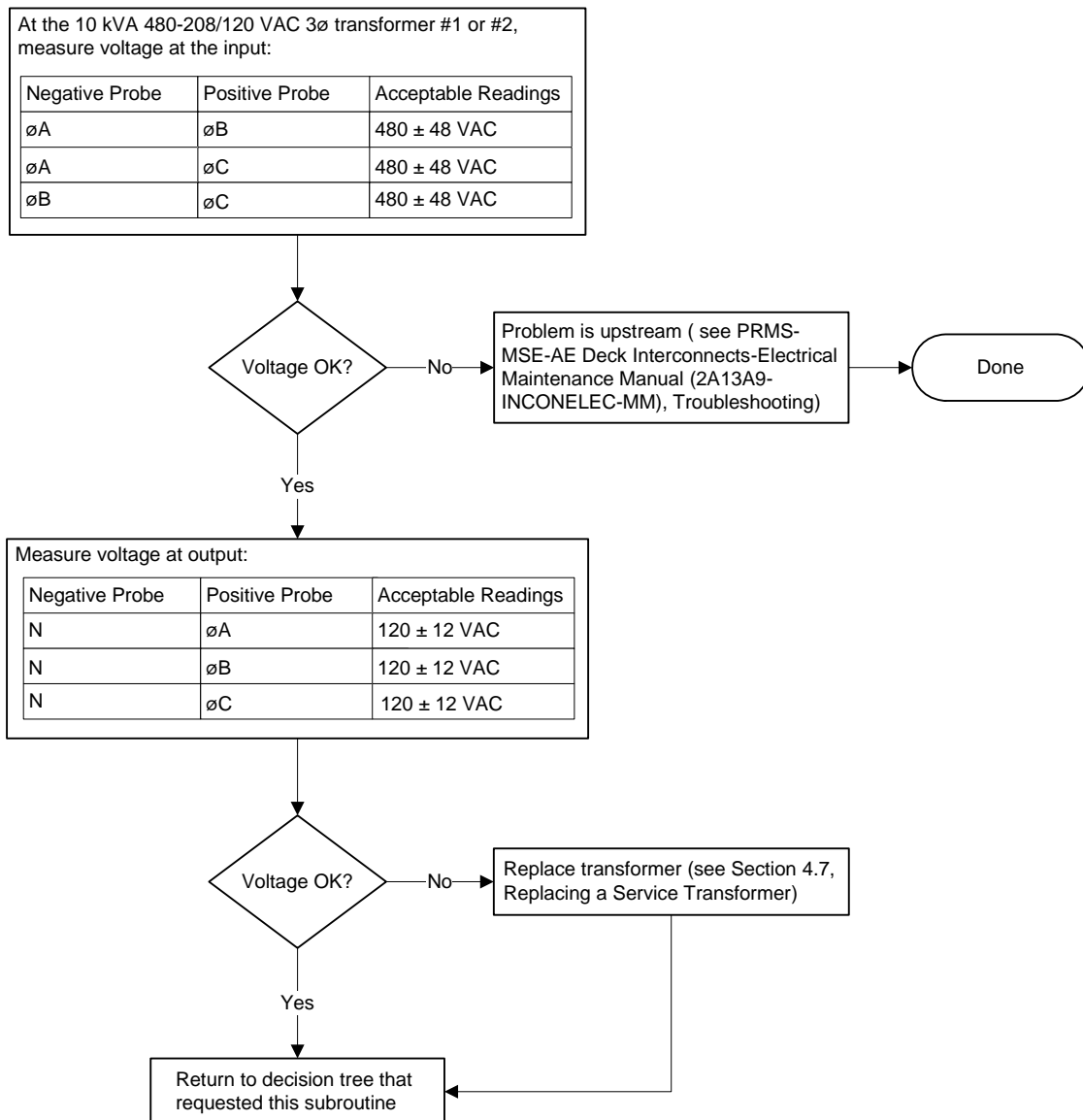


Figure 1 Troubleshooting Subroutine – 10 kVA 480-208/120 VAC 3Ø Transformer #1 or #2 Power Check

5.3 PRM Hotel Power #1 Doesn't Work

Procedure

- Follow the troubleshooting steps in Figure 2.

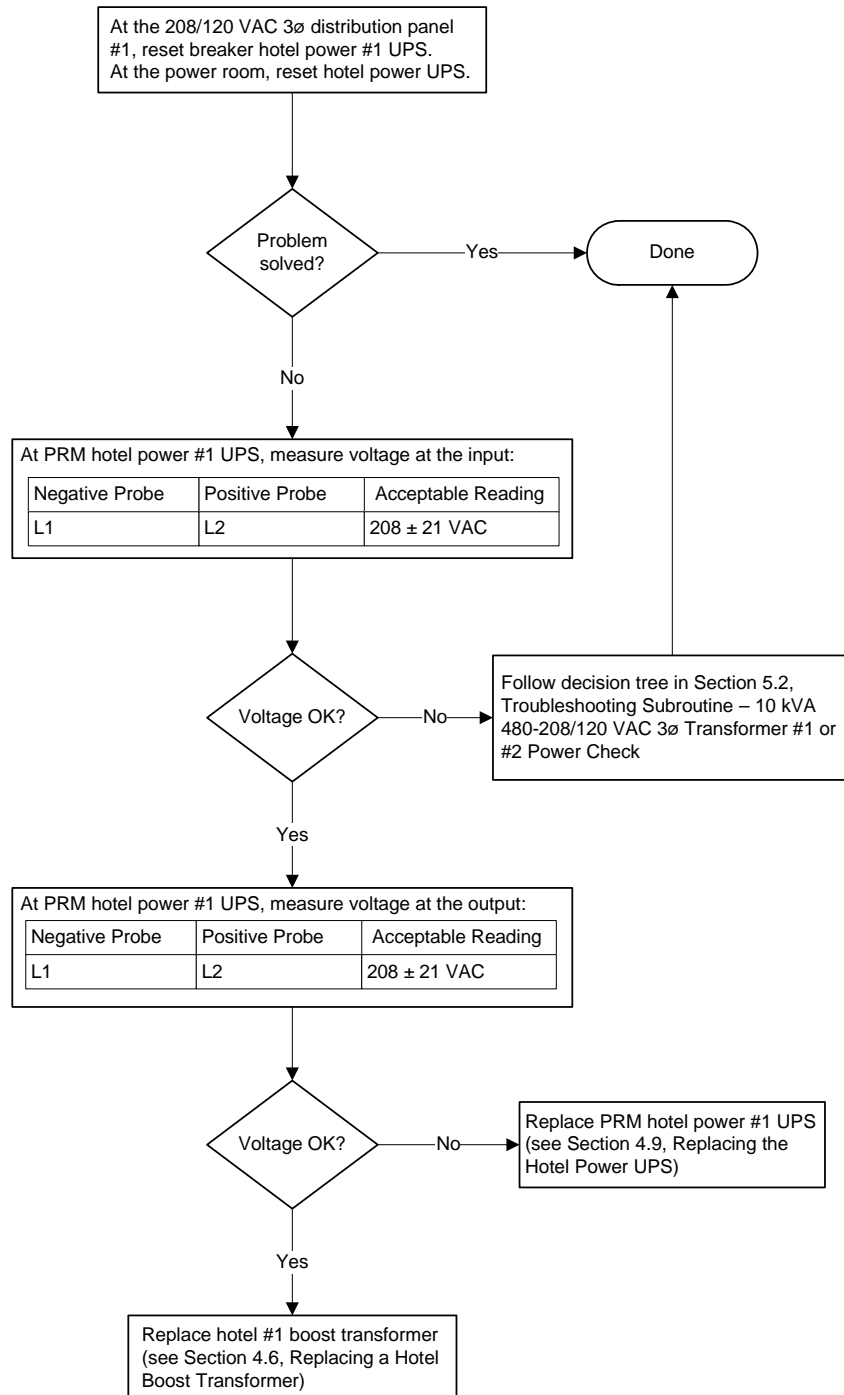


Figure 2 Troubleshooting – PRM Hotel Power #1 Doesn't Work

5.4 PRM Hotel Power #2 Doesn't Work

Procedure

1. Follow the troubleshooting steps in Figure 3.

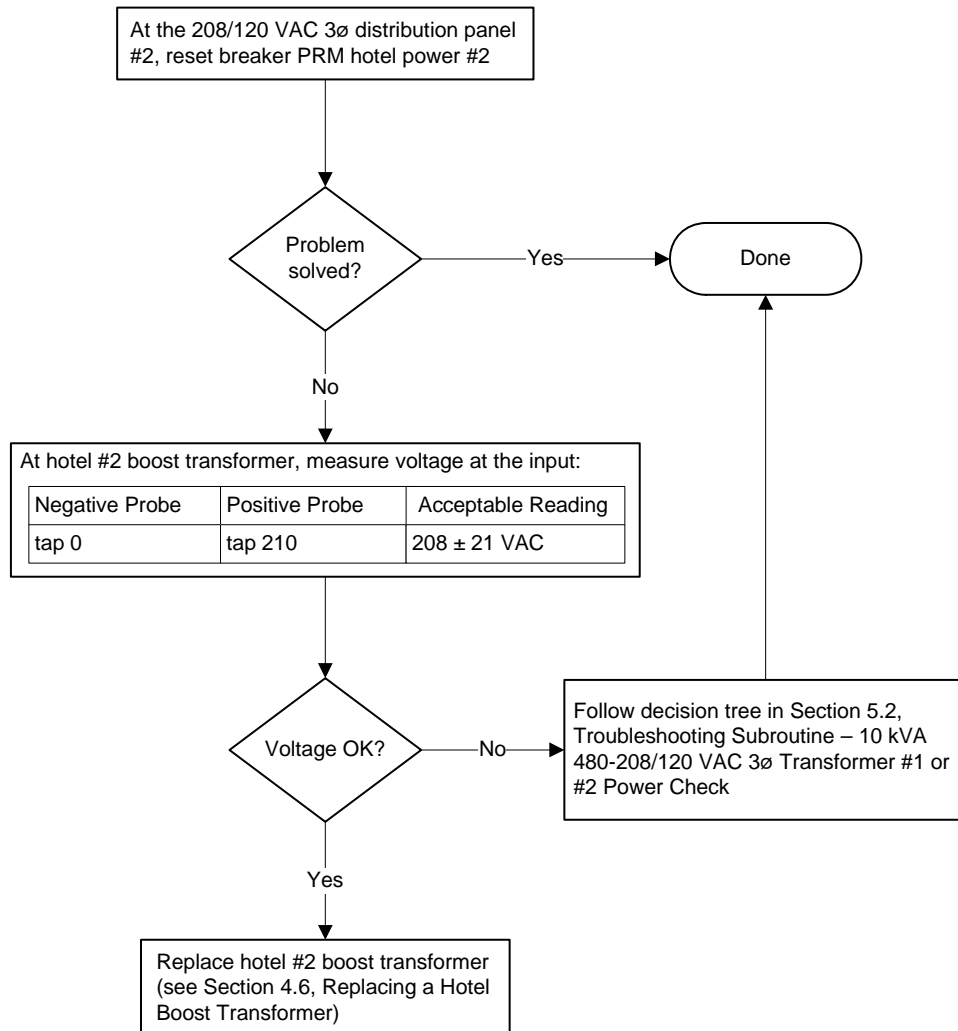


Figure 3 Troubleshooting – PRM Hotel Power #2 Doesn't Work

5.5 HPU Power #1 or #2 Doesn't Work

Procedure

1. Follow the troubleshooting steps in Figure 4.

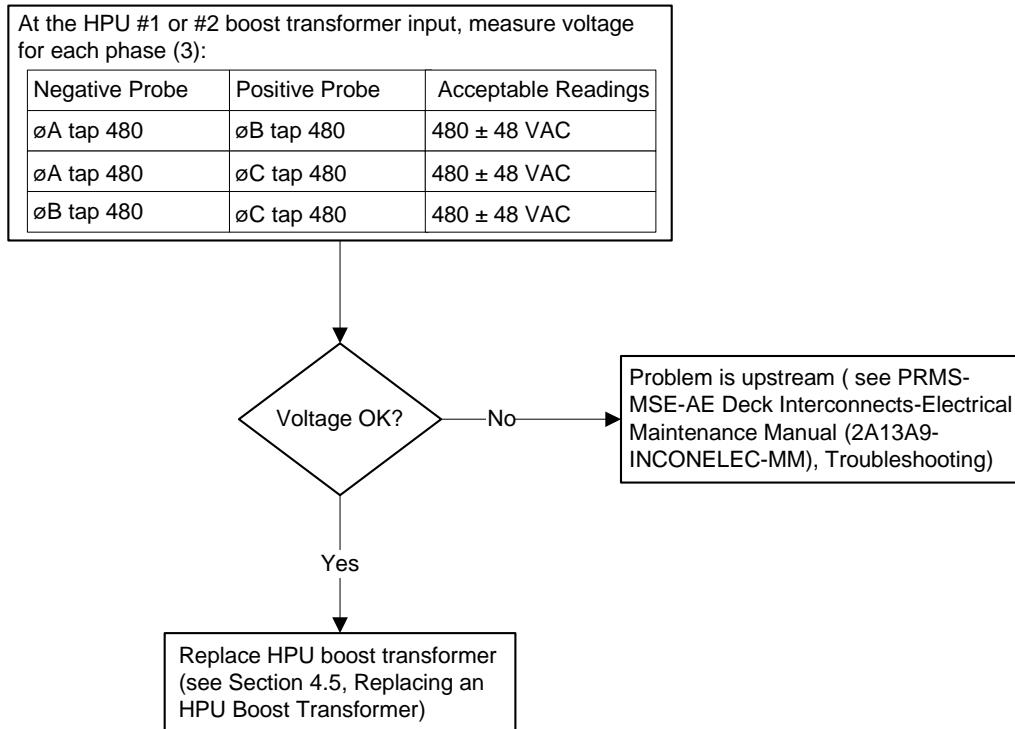


Figure 4 Troubleshooting – HPU Power #1 or #2 Doesn't Work

5.6 Unit Plugged in UPS #1 Doesn't Work

OTL-EPO2-7	PB-EPO2-2	PB-EPO2-8	PB-EPO2-1	PB-EPO2-7	PB-EPO2-3
<ul style="list-style-type: none"> - Pilot video projector 	<ul style="list-style-type: none"> - Sonar VGA splitter - INS VGA splitter - UWT 	<ul style="list-style-type: none"> - Video SW box - INS computer - Sonar computer 	<ul style="list-style-type: none"> - APS C/D module - RS232/RS422 - APS sensor repeater - Touchscreen VGA splitter 	<ul style="list-style-type: none"> - Power tray - SCC #1 - Pilot Touchscreen 	<ul style="list-style-type: none"> - Sonar LCD

Procedure

1. Follow the troubleshooting steps in Figure 5.

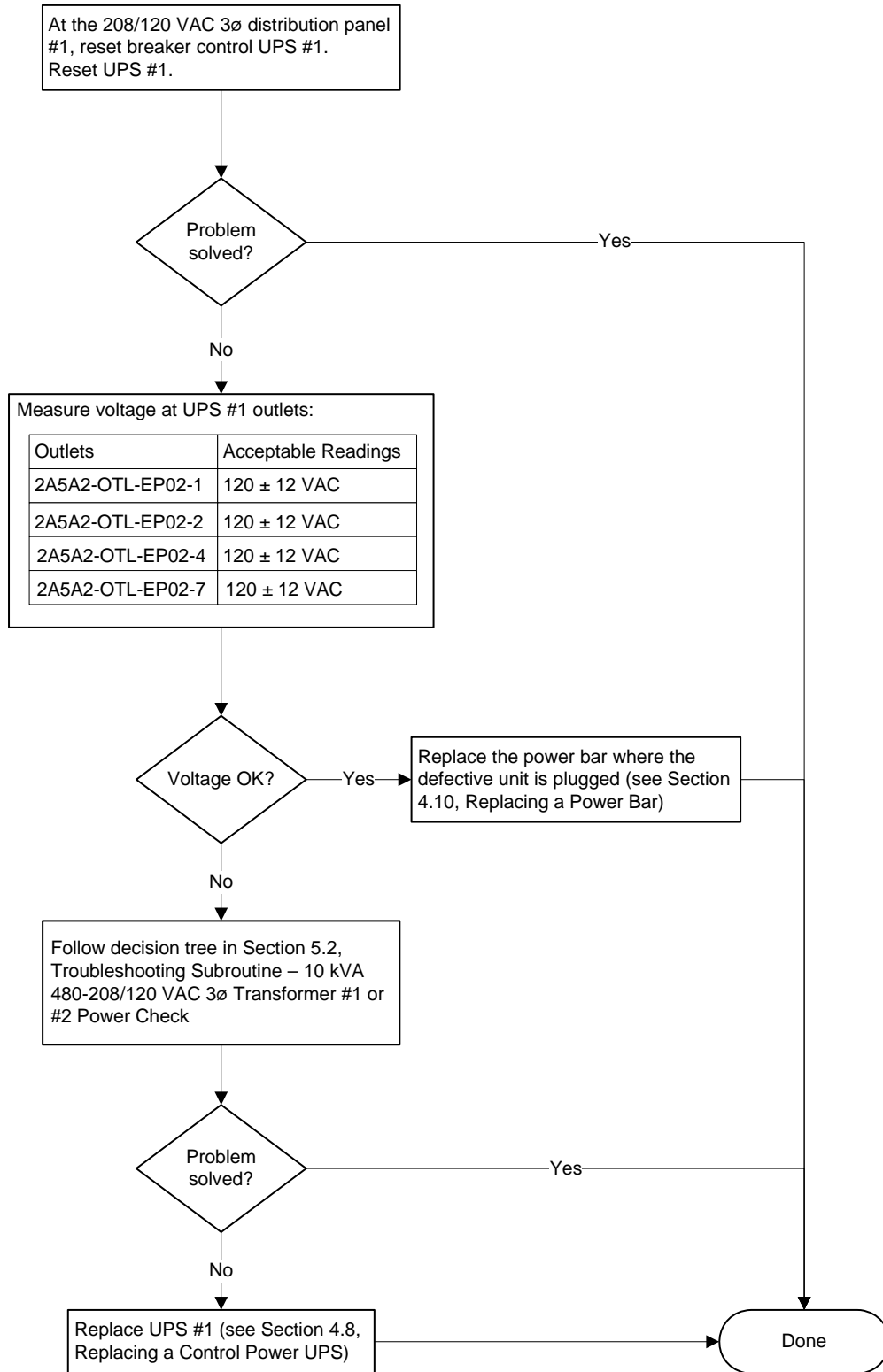


Figure 5 Troubleshooting – Unit Plugged in UPS #1 Doesn't Work

5.7 Unit Plugged in UPS #2 Doesn't Work

PB-EPO2-4	PB-EPO2-12	PB-EPO2-9	PB-EPO2-5	PB-EPO2-6	Hardwired
<ul style="list-style-type: none"> - Ethernet hub - VSC - Overlay computer - Video switcher 	<ul style="list-style-type: none"> - TDT generator 1 - TDT generator 2 - Sonar VGA converter - APS VGA converter - INS VGA converter - SWBD translator 	<ul style="list-style-type: none"> - Overlay VGA splitter - Intercom - VHF radio - VCR display 2 - VCR 2 	<ul style="list-style-type: none"> - SCC #2 - Power tray - GFM 	<ul style="list-style-type: none"> - Pilot LCD - Navigator LCD - Life support LCD - KVM switcher 	<ul style="list-style-type: none"> - Fluorescent light (starboard)

Procedure

1. Follow the troubleshooting steps in Figure 6.

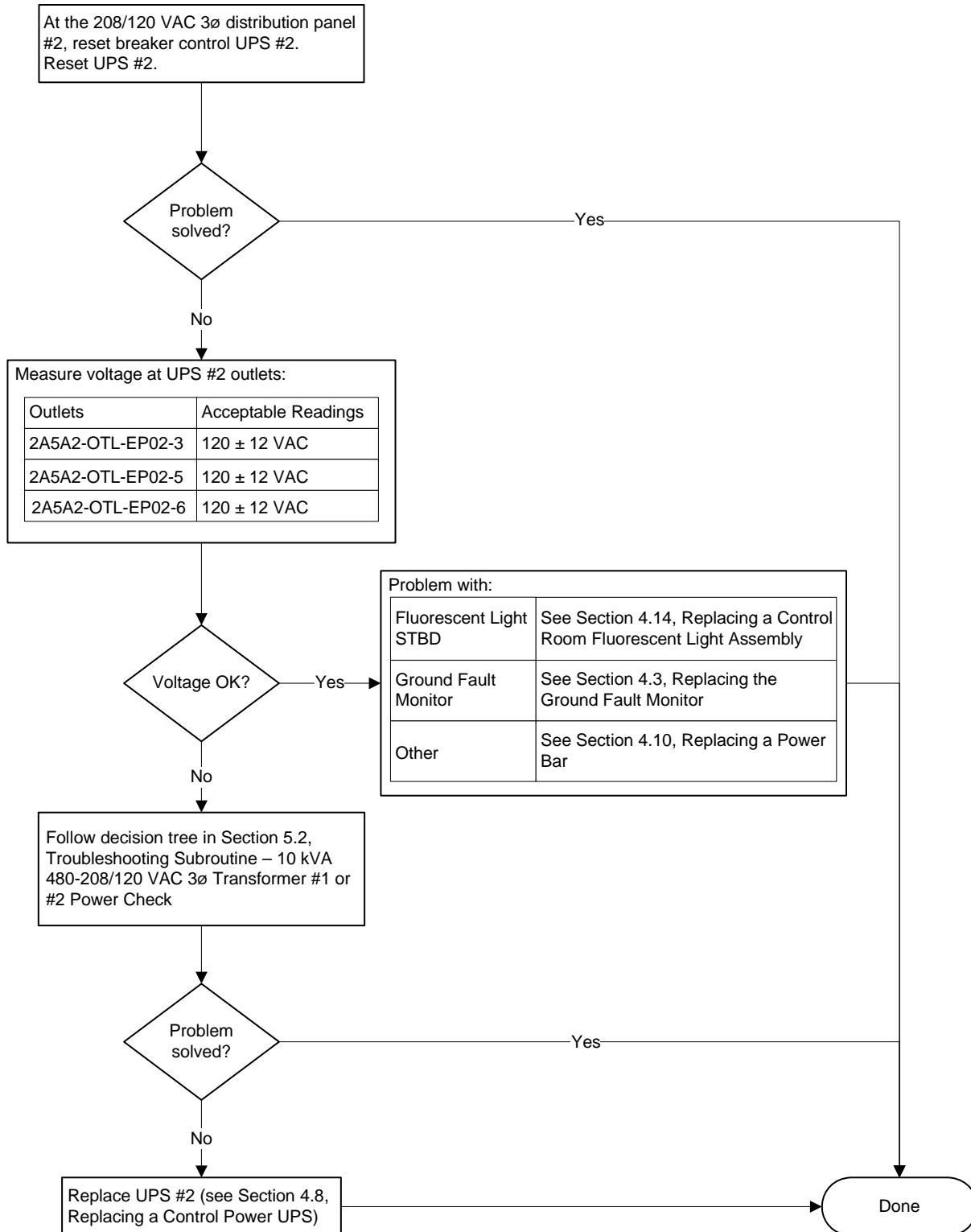


Figure 6 Troubleshooting – Unit Plugged in UPS #2 Doesn't Work

5.8 Unit Plugged in Power Bus #1 Doesn't Work

PB-EPO2-11	PB-EPO2-10	Hardwired	OTL-EPO1-1
<ul style="list-style-type: none"> - VCR display 1 - VCR 1 	<ul style="list-style-type: none"> - Winch control panel 	<ul style="list-style-type: none"> - Red lights 	<ul style="list-style-type: none"> - Empty

Procedure

1. Follow the troubleshooting steps in Figure 7.

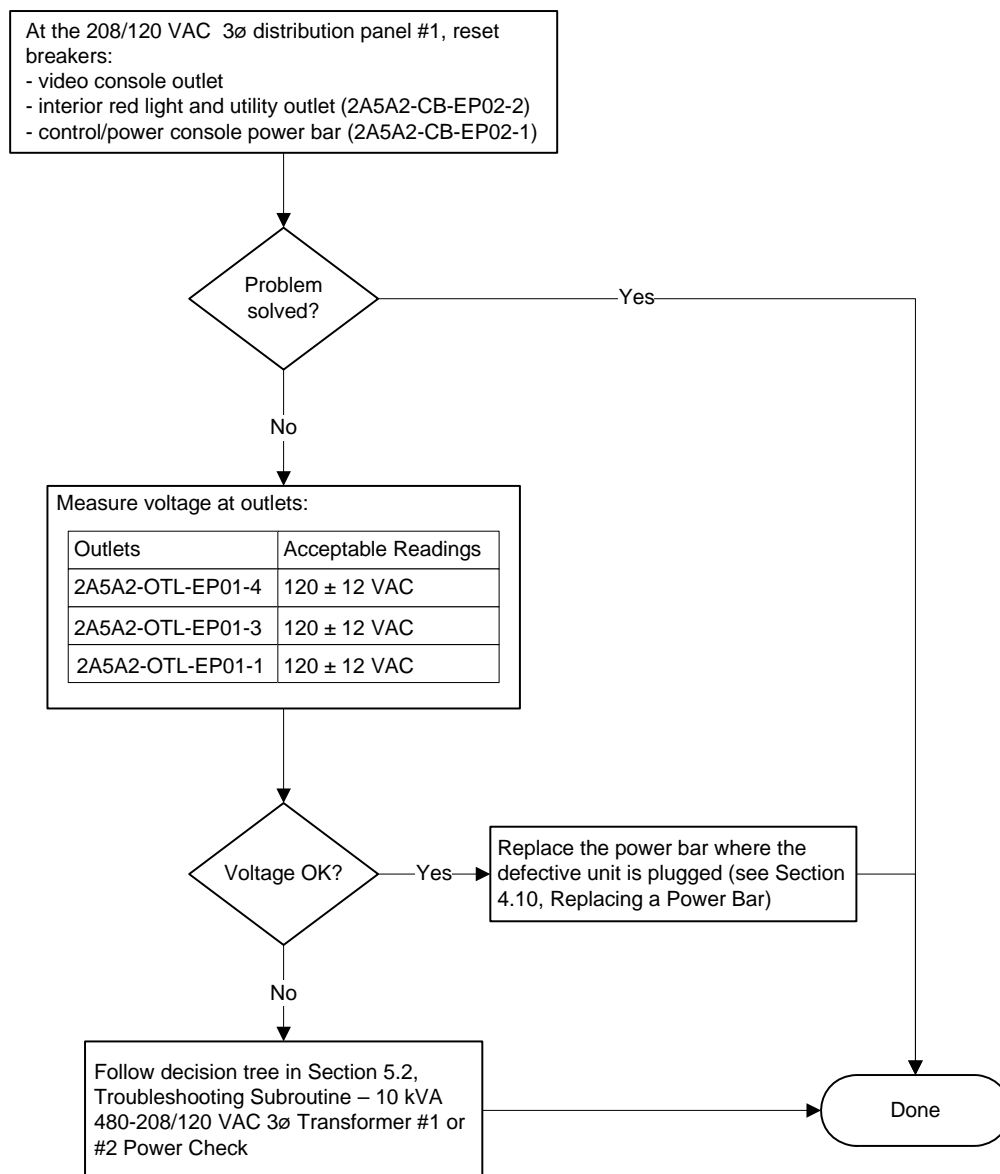


Figure 7 Troubleshooting – Unit Plugged in Power Bus #1 Doesn't Work

5.9 Unit Plugged in Power Bus #2 Doesn't Work

OTL-EPO1-9	OTL-EPO1-7	OTL-EPO1-8	Hardwired	OTL-EPO1-6	OTL-EPO1-5
<ul style="list-style-type: none"> – Center video projector – Forward video projector 	<ul style="list-style-type: none"> – Emergency light (control room) 	<ul style="list-style-type: none"> – Emergency light (power room) 	<ul style="list-style-type: none"> – Fluorescent light (port) – Fluorescent light (power room) 	<ul style="list-style-type: none"> – Empty 	<ul style="list-style-type: none"> – Empty

Procedure

1. Follow the troubleshooting steps in Figure 8.

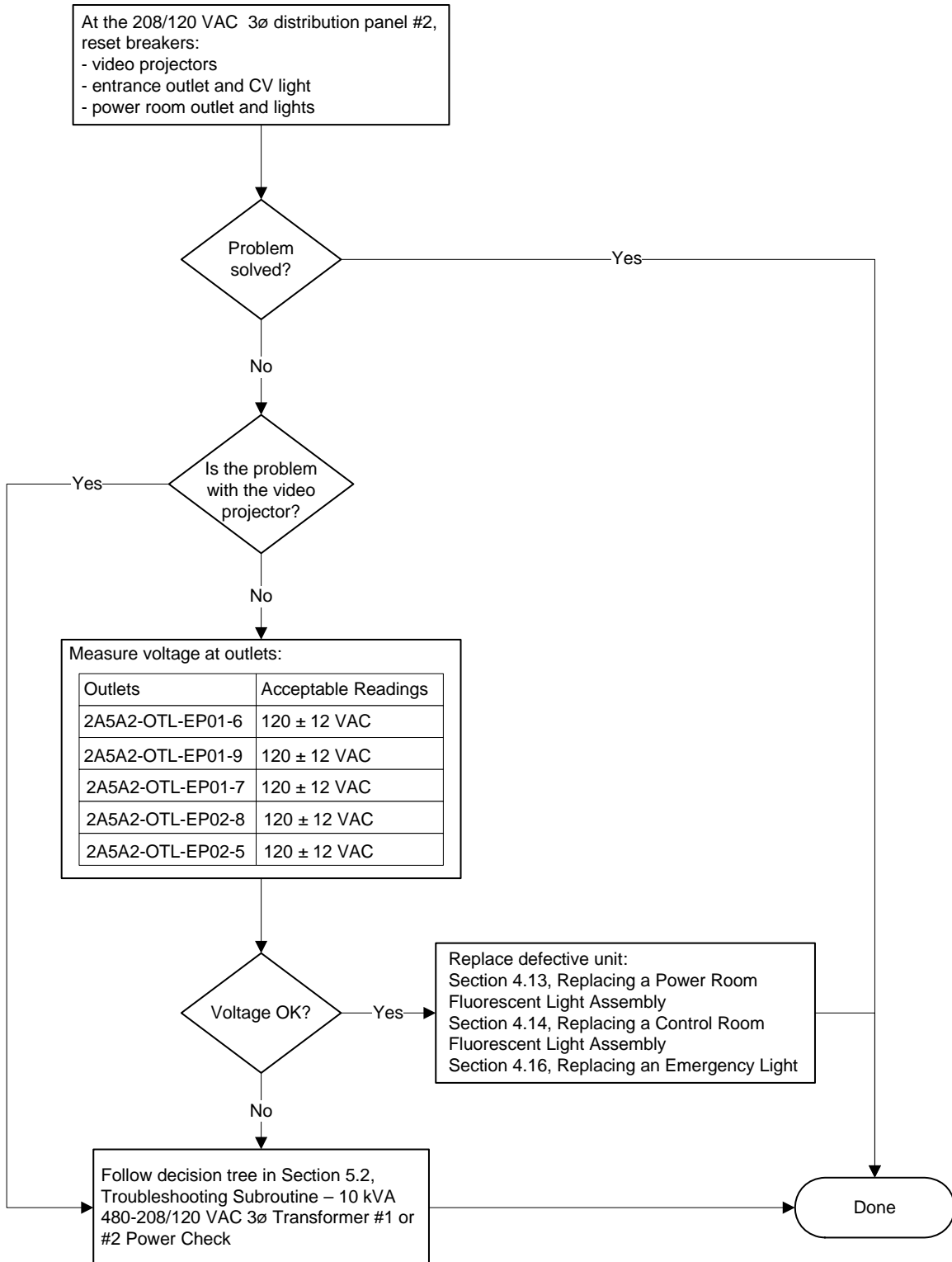


Figure 8 Troubleshooting – Unit Plugged in Power Bus #2 Doesn't Work

5.10 Device Related to Power Tray Doesn't Work

Procedure

1. Follow the troubleshooting steps in Figure 9.

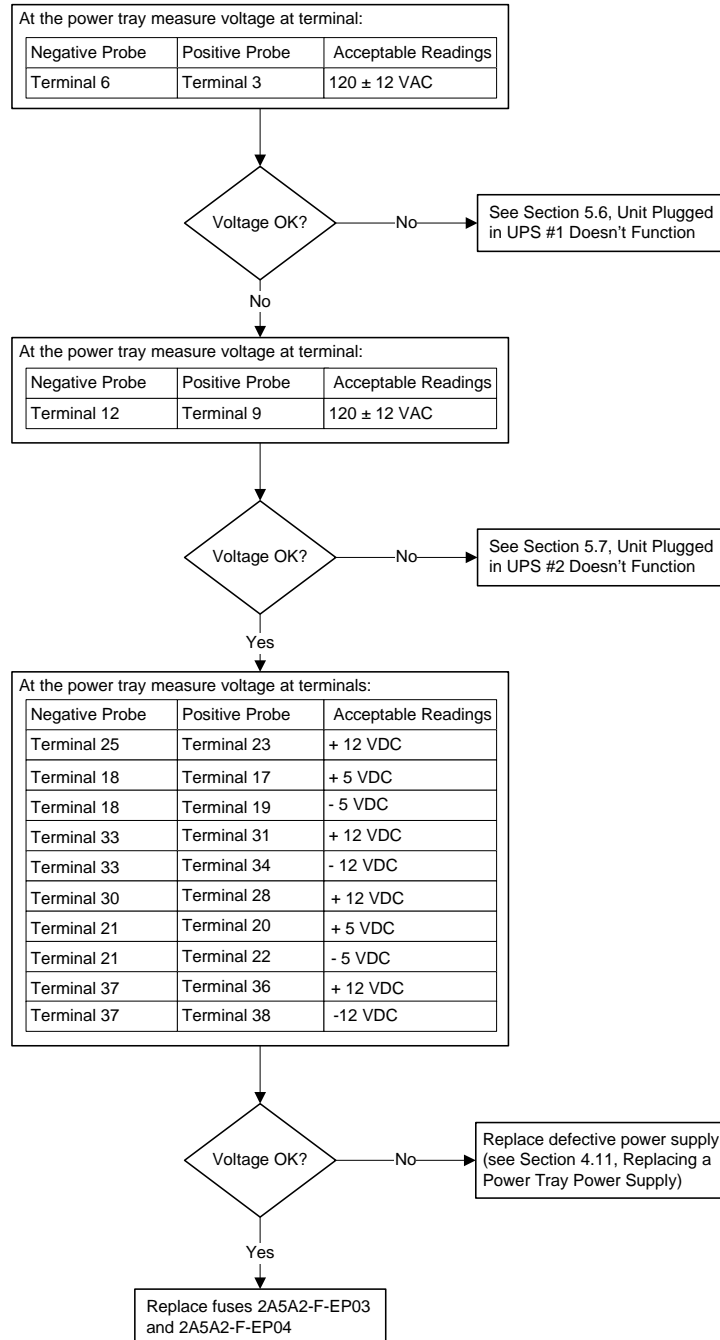


Figure 9 Troubleshooting – Device Related to Power Tray Doesn't Work

6 General Maintenance Routines

6.1 Overview

This Chapter contains general maintenance routines that apply to several corrective and preventive procedures for the CV Electrical Power System.

6.2 General Notes

6.2.1 Hazmat Requirements

When disposing of parts and/or fluids removed from the CV Electrical Power System, follow hazmat procedures in accordance with local requirements.

6.2.2 Torque Specifications

Fasteners, through hull penetrators, and tube fittings are torqued to standard values.

Some corrective or preventive maintenance procedures identify unique torque values or torque reference materials. In all other cases, see the following drawings:

7530452	Torque specifications – fasteners
7530551	Torque specifications – tube fittings and through hull penetrators

6.2.3 Mounting Hardware

When removing and replacing parts, check the mounting hardware and surrounding area for damage, rust, and corrosion.

6.2.4 Lock Fasteners (Nylok Nuts)

Most of the nuts used as mounting hardware on the outside of the PRMS are the Nylok® type.

Nylok® nuts are disposable items. Whenever they are removed during a maintenance procedure, replace with new nuts. Dispose of the used nuts in accordance with local requirements.

Before attaching a Nylok® nut, the bolt may need to be lubricated using a specified lubricant. See the assembly drawing for the specified lubricant.

6.3 Electrical Cables Testing

CAUTION!

If salt water remains on a connector when it is inserted, the salt crystals could potentially ruin the rubber connector seal. Thoroughly clean the contact points with alcohol before connecting.

Special Tools

500 VDC insulation resistance meter

Calibrated thermometer

Procedure

Verify Continuity

1. Using a Digital MultiMeter (DMM) and the cable schematic, verify the cable continuity. Verify that the resistance of each conductor is less than 1 ohm. Most DMMs have a continuity test that will beep when the probes are connected across 1 ohm or less.
2. If any conductor has an end to end resistance greater than 1 ohm, replace the cable as soon as possible.

Measure Insulation Resistance

3. Measure and record ambient temperature.
4. For all conductor to conductor combinations and all conductor to connector shell combinations, using an insulation tester at 500 VDC, measure the resistance between the test conductor and the remaining conductors connected together in a group. That is, when testing a 25-pin cable, for the first test measure the resistance between pin 1 and pins 2 through 25 connected as a group. For the second test, measure the resistance between pin 2 and pins 3 through 25 connected as a group. The sequence is shown in the table below:

Pin	Pin
Shell	1-25
1	2-25
2	3-25
3	4-25
4	5-25
5	6-25

5. Record the measured insulation resistance twice, once at 30 seconds, and once at 60 seconds.
6. If any measurement is less than value shown in table below, measure the resistance between all combinations of single conductor to single conductor to check for a failure.
7. If any single conductor to single conductor resistance test is less than value shown in table below, record the result and replace the cable as soon as possible.

Minimum Required Insulation Resistance Values for Observed Test Temperatures		
Range of Test Temperature Observed		Required Minimum Insulation Resistance Reading
Degrees F	Degrees C	Megohm
41–50	5–10	40
50–59	10–15	30
59–68	15–20	20
68–77	20–25	15
77–86	25–30	10
86–95	30–35	7.5
95–104	35–40	5

Dielectric Absorption Ratio

8. If the insulation resistance of any measurement taken at 30 seconds is less than full scale, then calculate and record the dielectric absorption ratio, by dividing the measurement at 60 seconds by the measurement at 30 seconds.

Example:

Measurement at 30 seconds = 20 megohm

Measurement at 60 seconds = 50 megohm

Dielectric Absorption Ratio is $50/20 = 2.5$

9. If the Dielectric Absorption Ratio is less than 1.3, replace the cable.

Glossary

This Glossary contains definitions specific to this manual.

AC	Alternating current
AE	Auxiliary equipment
APS	Acoustic positioning system
C/D	Command/display
CV	Control van
DC	Direct current
DGPS	Differential global positioning system
DMM	Digital MultiMeter
FWD	Forward
GFM	Ground fault monitor
GPS	Global positioning system
HPU	Hydraulic power unit
INS	Integrated navigation system
kVA	Kilo volt amps
KVM	Keyboard-video-mouse
LCD	Liquid crystal diode
LED	Light emitting diode
MSE	Mission support equipment
PDU	Power distribution unit
PRM	Pressurized rescue module
SCC	Surface control computer
SOC	Scope of certification
STBD	Starboard
SW	Switch
SWBD	Switchboard
TDT	Time domain transmission
UPS	Uninterrupted power supply
UWT	Underwater telephone
VAC	Volts alternating current
VCR	Video cassette recorder

VGA	Video graphics array
VHF	Very high frequency
VSC	Video switching computer
3 Ø	Three phase