Medium Voltage Direct Current (MVDC) Casualty Power System (CPS)

The TCG MVDC Casualty Power System provides emergency, temporary power connections to restore MVDC power to shipboard electrical zones isolated from power generation as a result of fire, flood, or battle damage.

The Casualty Power System is versatile, rugged, watertight, easily installed and provides a ready source for dependable, backup power.

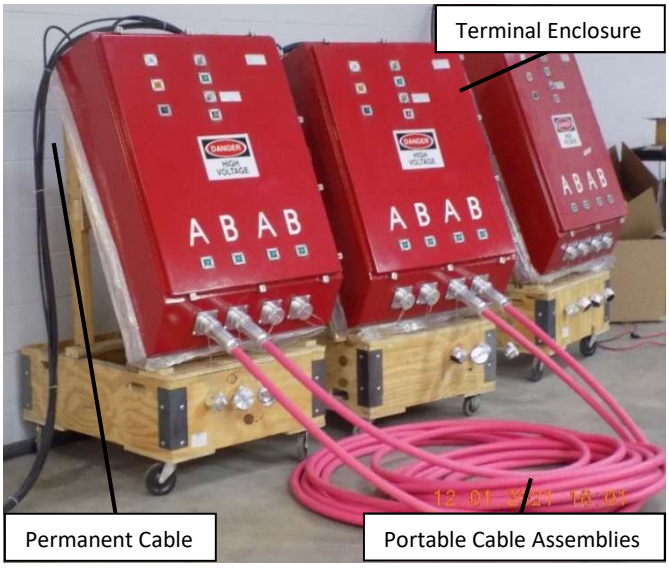
The system is designed to be connected and operable within 30 minutes of casualty. Portable elements are designed to be light enough to be safely handled by a team composed of sailors of size and strength ranging from the 5th percentile female to the 95th percentile male.

Hardware

Equipment and cable types used within MVDC Casualty Power System installations are:

- Bulkhead Terminals (MIL-DTL-XXXXX/1)
- MVDC Permanent Cable (MIL-DTL-YYYYY/1)
- Portable Cable Assemblies (MIL-DTL-XXXXX/2)
  - Plugs (DSI Dwg. SK211015-01)
  - MVDC Portable Cable (MIL-DTL-YYYYY/2)

The CPS is expected to bridge power between medium voltage DC components such as switchboard to switchboard, switchboard to power conversion module (PCM), and switchboard or PCM to a large MVDC load.



Safety Features

- Control circuitry interfaces with ship's Machinery Control System to enable detection of system connectivity prior to energizing system.
- Designed to prevent energizing system unless all terminal receptacles have either plug or cover correctly attached, connectivity is confirmed between all system components from load to power source, and all terminal enclosure doors are closed and locked.
- If system is energized, twisting any plug or receptacle cover from locked position or unlocking/opening any terminal door will automatically de-energize system.
- Terminal receptacles and plugs contain locking ring to prevent accidental disconnect.
- Terminal receptacle covers are insulated to prevent arcing if high voltage is present.
- Lights are provided to indicate when terminal is in a safe operating configuration.
- Pushbutton is provided for testing of indicator lights to ensure proper operation.
- Uninterruptable power supply (UPS) is provided within terminal to provide backup battery power for over 1 hour to allow for sufficient casualty power system rigging time after casualty occurs. UPS maintains safety features should normal power source be lost during casualty power evolution.
- Terminal enclosure to be grounded to the ship's hull for personnel safety.
- Power source for CPS should include a casualty power grounding circuit breaker/switch interlocked with the source casualty power circuit breaker/switch. When the system is de-energized, the grounding circuit breaker/switch shall be closed in order to ground the system and discharge capacitive voltage on the system.

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Technical Specifications

Material Specifications

- Metals are in accordance with MIL-DTL-917 to provide corrosion resistance.
- Non-metallic materials are non-flammable and non-toxic in accordance with MIL-DTL-917.
- Copper, hard temper terminal bus bars in accordance with ASTM B 187.
- Gaskets are in accordance with MIL-PRF-6855, Class 2, Grade 60.

Electrical Specifications

- System Voltage: ±9 kVDC Rated (18 kVDC)
- System Current: 500 Amps
- System is scalable to lower voltages and currents.
- Dielectric strength: ±20 kVDC (Testing based on MIL-STD-202-301.)
- Insulation resistance: 500 MΩ minimum (Testing based on MIL-STD-202-302.)
- Contact Resistance: 1.5 V maximum voltage drop at 250 A.

Mechanical Specifications

- Ambient Temperature: Operable from -20 °C to 50 °C. (Testing based on Methods 501.6, Procedure II and 502.6, Procedure II of MIL-STD-810.)
- Humidity: Testing based on MIL-STD-202-103, Condition C.
- Fluid Immersion: Plugs are capable of being mated to terminal receptacles and operating within system parameters after having been immersed and wiped clean of fuel oil (MIL-DTL-16884) or turbine fuel (MIL-DTL-5624).
- Endurance: Coupling and uncoupling minimum durability of 500 cycles. (Testing based on EIA-364-09.)
- Mechanical Shock: Designed to meet MIL-DTL-901 Grade A, Class I, Medium weight, Type A. (Testing to be performed in future.)
- Vibration: Testing based on Type I test in accordance with MIL-STD-167-1.
- Salt Spray: Testing based on MIL-STD-202-101, Condition A.
- Moisture Resistance: Bulkhead terminals are NEMA 4X rated and watertight. (Testing based on MIL-STD-108.)

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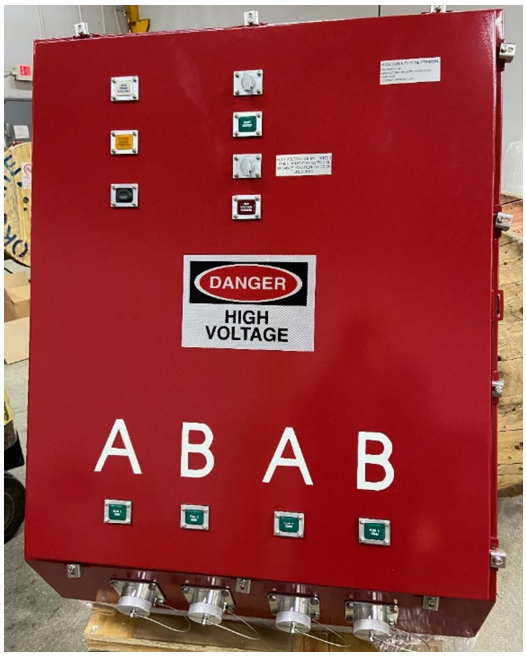
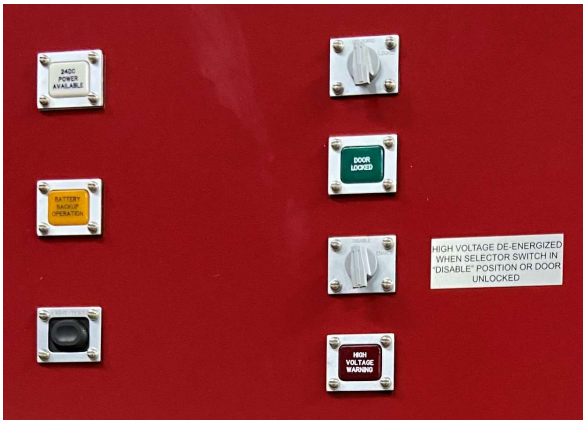
Terminals



- Main components consist of:
  - Lights for indication of power availability, UPS backup power operation, door locked confirmation, high voltage warning, and receptacle/plug connected confirmation.
  - Pushbutton for testing terminal door indicator lights.
  - Switches for locking/unlocking door and enabling/disabling system readiness.



  - Receptacles (with covers) for medium voltage power distribution.

  - UPS for providing backup power to control circuitry if normal power source is lost.
- Voltage: ±9 kVDC Rated (18 kVDC)
- Current: 500 Amps
- Dimensions: 42” H x 33” W x 14” D
- Weight: 250 lb. (Approximate)
- Moisture Resistance: Watertight
- Bulkhead mounted.
- Two receptacles are required to be connected for rated 500 A system operation.

MVDC Permanent Cable

- Voltage: 9 kVDC Rated
- Current: 500 Amps
- Low smoke, zero halogen jacket material.
- Non-flexing Service.
- Watertight.
- Weight: 1.44 lb/ft

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Portable Cable Assemblies

- Main components consist of:
  - (2) Plugs with cover (one installed on each end)
  - (1) MVDC Portable Cable

- Voltage: ±9 kVDC Rated (18 kVDC)
- Current: 250 Amps
- Weight: 152 lb. for 75’ standard length.
- Two portable cable assemblies are required to be connected between each bulkhead terminal for rated 500 A system operation.
- Portable cable length customizable at time of purchase.
- Plugs
  - Includes locking ring for securing plug to terminal receptacle and cover for protection against dust/moisture while portable cable assembly is stored and not in use.
  - Weight: 5.2 lb. each (less cable)

- MVDC Portable Cable
  - Low smoke, zero halogen jacket material.
  - Flexing Service.
  - Non-Watertight.
  - Weight: 1.89 lb/ft

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