SAN FRANCISCO MUNI LOAD BREAK SWITCH

Overview and Component Details
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Lecture Topics

- Switch overview
  - Ratings
  - Detailed Pictures
- Features
- Indications
- Controls
- Component level details
Switch overview

- 4000A/750VDC rated load break switch
- 108VDC control power, converted off rail
- Remote or local controlled
- Hardwired or fiber optic remote indications
- Local indication for high voltage
- Local indication for control power available
- Interlock to prevent access while switch closed
- Battery backup
- Automatic dehumidifying Heater
Switch Ratings

- **Ritter RGL-7200 DC LOAD BREAK SWITCH:**
  - Full Load current: 4000ADC
  - Voltage 750VDC
  - Insulation Voltage 1200VDC
  - Making Ampacity: 31,500ADC
  - Breaking Ampacity: 10,000ADC
  - Short Time withstand: 50,000ADC

- **Absopulse DC-DC Converter**
  - Input Voltage: 400-1000VDC
  - Output Voltage: 108VDC
  - Power: 1000W
  - Output Current: Clamps at 9-12A at 108VDC

- **Battery:** 96VDC, should open switch twice and last 1 hour off bus for one open cycle, 2 hours for indication
Click once to show prototype (green) switch with door open. Click again to show low voltage compartment open. Click again to show high voltage compartment open. NOTE: wiring not complete at time of picture, arc chute removed from LBS.
Shows local controls picture after one click. Second click brings up description. Either side of switch bus voltage being greater than 50VDC will turn on high voltage >50VDC red light. This is a warning that high voltage is present at a lethal level. 96VDC from battery will always be present up to the back of the battery disconnect switch.
Disconnects only isolate DC/DC converters. VSRs cannot be taken off the bus without lifting leads. This allows for high voltage monitoring even with disconnects open to avoid looking “dead” while still hot.
Features

- Switch enclosed in NEMA 3R rated fiberglass enclosure
- Outer door 3 point latched, padlockable
- Interior door for high voltage access restriction
- Low voltage compartment has 108V or less only wires.
- Indications transmitted over copper or fiber optic cable
- Control power is converted right off the rail power
More Features

- Battery Backup automatically opens switch on loss of Bus Power
- Intrusion Alarm indicates when outer door is open
- Remote operation is disabled when outer door is open
- Inner door is locked in closed position when switch is closed
- CLOSE pushbutton local and remote disabled when inner door is open.
125nm is sheath diameter, 62.5nm is glass core diameter, 1300nm is light wavelength. Fiber optic cables are ST terminated. Numbered indications are actually the number on SEL module with respect to each output.
Controls

- Local:
  - Open / Close switch – 3 way spring return pistol handle: Right position: Close; Left position: Open
  - Battery Disconnect, two position rotary switch:
    - ON / OFF - disconnects both poles of battery
    - Switch Cover has pad lock ability for lock out/tag out
  - Internal to high voltage compartment:

- Remote (through SEL Module or hardwired)
  - Open Switch
  - Close Switch
Control Power

- Control power is provided through two 1kW DC-DC power converters.
- Each side of switch is tied to a converter which is then connected to negative return for a potential of rated rail voltage. Converter will work and power indications down to 350VDC. Converter will turn motor down to 450VDC.
- 96VDC battery is constantly charged by converter output power. On loss of both converters, Battery is automatically on the control bus and will open switch automatically and provide indicating power to SEL module.
NOTE: Insulation is failsafe. Not designed to protect workers during live bus conditions. Note bus and lugs still exposed.
Component level details

- Ritter load break switch. Ratings already covered.
- Load Break Switch operates with motor that swings operator arm against spring pressure. When the force is overcome, it opens or closes under spring pressure.
- Arcing contacts take the arc on opening and closing by breaking last and making first.
- Arc Chute dissipates arc.
- Pressure relieved through enclosure vents.
HIGH voltage inputs are shown as the large green terminals. Low voltage control power output from smaller black terminals with clear shield.
Click once to show VSR cutsheet. Info can be found in O&M manual. VSRs located on back wall of enclosure shown on slide 8. VR interposing relays the VSR drives are located on circuit board in low voltage control compartment shown on slide 7.
SEL Remote I/O Module

- Takes inputs from switch in the form of indication signals, transmits them over fiber

  SEL-2115 Remote I/O Module
  LOCAL OUTPUTS TO RTU
  1. SWITCH FULLY OPEN
  2. SWITCH FULLY CLOSED
  3. INTRUSION ALARM
  4. LINE ‘A’ CONTROL PWR AVAILABLE
  5. LINE ‘B’ CONTROL PWR AVAILABLE
  6. LINE ‘A’ HIGH VOLTAGE >50VDC
  7. LINE ‘B’ HIGH VOLTAGE >50VDC
  8. BATTERY DISCONNECT SW. OPEN

  REMOTE INPUTS FROM RTU
  1. CLOSE SIGNAL
  2. OPEN SIGNAL
  3. SPARE
  4. SPARE
  5. SPARE
  6. SPARE
  7. SPARE
  8. SPARE

- 8 max signals in either direction.
- Fiber optic range: 4,000 meters

Click once to show I/O chart for SEL Module. Note that hardwired copper I/O is the exact same, but wires up to terminal board 2 terminals.
Click to cycle through component details one at a time.

Hookstick for disconnects located on inside of outer door. 10A fuse is basically for lighting and hard faults. Circuit should never go above 2A.

Switch UP is closed, DOWN is open. Switches come with arc taking quick break.