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VTA-LRT YARD SUBSTATION 3 MW UNIT
Photos
VTA’s Silicon Valley Berryessa Extension (BART Systems) Project
What are BART Systems?

- Traction Power
  - Delivery of Power to the Trains

- Automatic Train Control
  - Train Operator / Protection
  - Speed Control Mechanism

- Communications
  - Telephones, CCTV, Revenue Collection, etc.
  - Train Status to Patrons/Central Control
SVBX Traction Power System Overview

- **High Voltage Substations (HVS SRC, HVS SMR)**
- **To PG&E 115 kV Line**
- **34.5 kV Subtransmission**
- **1000 V DC**
- **6 Traction Power Substations**
SVBX Traction Power Components

- 2 High Voltage Substation
- 6 Traction Power Substations
  - Transformer-Rectifier units step down to 1000 V dc
  - 34.5 kV, 1000 V dc Breakers
  - DC Cables feed 1000 V dc Contract Rail
  - Running Rail serves as the return
- Contact Rail (3rd Rail) provides power to BART
SVBX Train Control Overview

WARM SPRINGS EXTENSION

WARM SPRINGS

S20

S24

S25

S26

S27

S28

S37

S40

BERRYESSA

S44

S45

S46

CROSSOVER

S50

S55

TRAIN CONTROL HOUSE ~3000 sqft

MILPITAS

TRAIN CONTROL ROOM
**Automatic Train Control Blocks**

**TRACK CIRCUITS (BLOCKS)**
- Length varies by location, 40-1100 feet.
- Current Track Circuits
  - Use both rails in a current loop
  - Delimited by current shunts
- Voltage Track Circuits
  - Use a single track and return conductor
  - Delimited by insulated joints
Simple Track Circuit Operation

[Diagram with labeled parts: track block, insulated gap, signal relay, reverse polarity in next block, signal displays "Clear".]
Simple Track Circuit Operation

occupied block

insulated gap

wheels & axle shunt tracks

signal relay de-energized

insulated gap

reverse polarity in next block

signal displays "Stop"
ATC Speed Control

- Signals carried through rails at Hundreds of mA
- 4 Audio Frequency pairs between 5 and 10 kHz
- 8 speed codes: 0, 6, 18, 27, 36, 50, 70, 80 Mph
Trackside Train Control Equipment

Track Circuits

Signal

Switch Machine
Track Bumper for the What if…
Communication Systems - BARTnet

Data
- Intrusion Detection
- Ventilation Control Panel
- Emergency Backup Panel
- Yard Emergency Trips
- Train Control
- Platform Trip Stations
- Elevator Monitoring
- Blue Light Stations
- SCADA

Audio
- PBX Telephones
- Emergency Telephones
- Radio System Expansion
- Fire Telephones
- Public Address

Video
- Closed Circuit Television
- Portal Intrusion Detection
- Railroad Intrusion Detection
Network Elements

Legend:
- Hardware Provided & Installed by BART In The Field
- Hardware & Software Provided by BART In BART Central
- Hardware Procured & Installed by SVRT Contractor(s)
- Hardware & Software Provided by SVRT Contractor(s) As Required
- Hardware Procured & Installed by SVRT Contractor(s) & Software Developed by BART
- Hardware Provided by BART and Installed by SVRT Contractors In The Field

Notes:
1. All Termination Panels in the field by SVRT Contractor
2. All BART Central Termination Panels by BART
3. Radio Tower Only At Designated Field Location
4. All Cables in the field by the SVRT Contractor
BARTnet (Fiber Backbone)

144 SM Fiber

TO OCC

S24

S28

S44

TO OCC

S26

S40

S50
BART SVBX Systems Cables

1000V DC Cables (30 miles)

Intrusion Detection (7 miles)

34.5 kV Cables (80 miles)

Train Control and Communications Cabling (110 miles)

Fiber Optic Cables (130 miles)

Total Cable Quantity = 350 Miles