

UG Network Monitoring and Control System

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Introduction

- Derrick Harris
- Distribution Engineer (EIT) at Portland General Electric Co.
- 4 ½ years experience
- Project Manager of Distribution Monitoring and Control System for Core/Downtown area at PGE

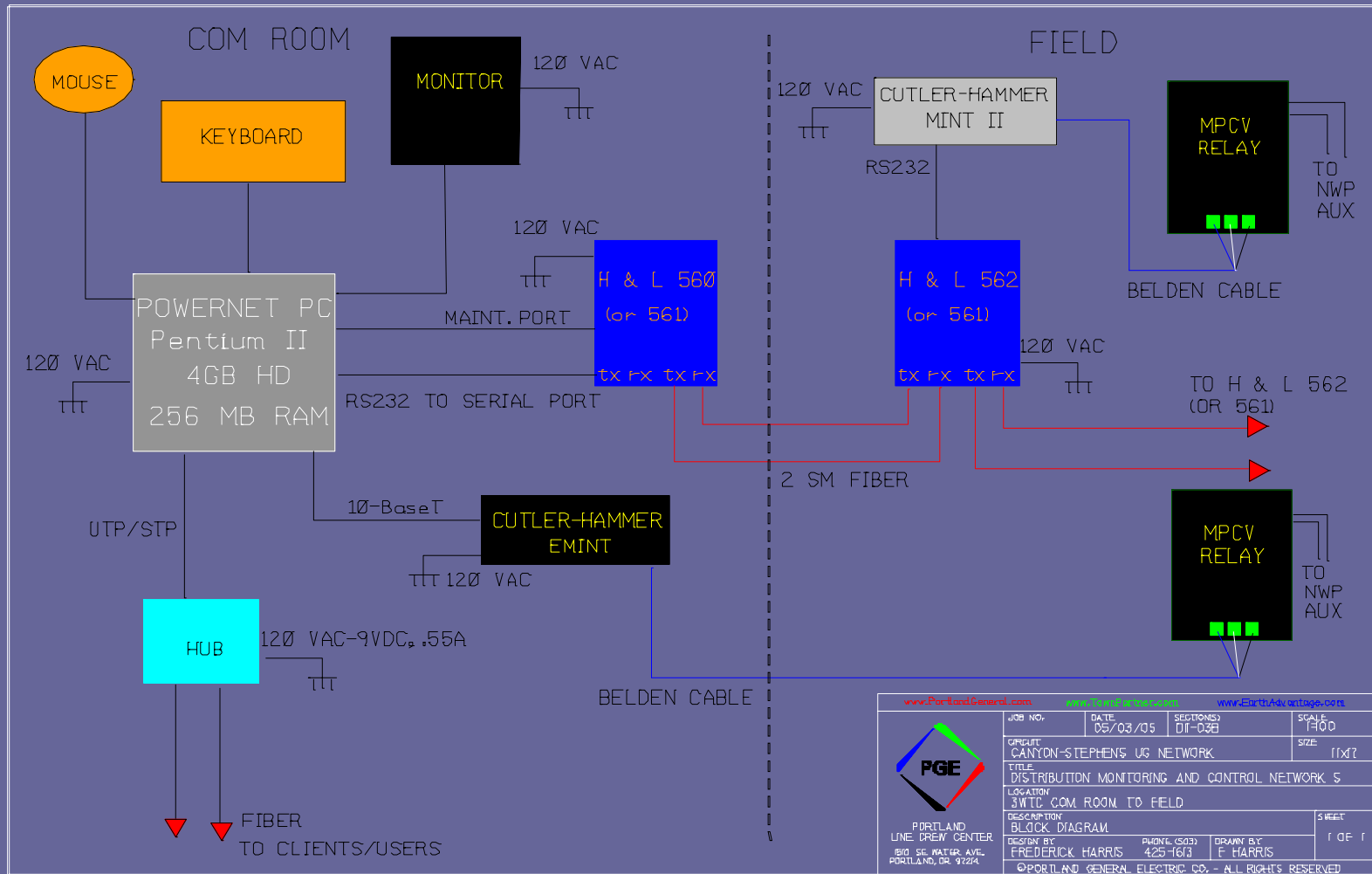
Network Monitoring and Control

- Canyon Network #1 – 31 units, 15 MVA
 - Monitoring system installed
- Canyon Network #2 – 43 units, 15 MVA
 - Monitoring system to be installed 2006
- Canyon Network #3 – 68 units, 30 MVA
 - Monitoring system to be installed 2007
- Stephens Network – 76 units, 25 MVA
 - Monitoring system to be installed 2008

Network Monitoring and Control

- System Objective
 - To provide a Distribution Monitoring and Control System on the Low Voltage Secondary Network System which provides service to the Downtown Core Area.

Network Monitoring and Control



Network Monitoring and Control

- NWP Relay is a device used to control the Network Protector operation under various conditions
- Monitoring attributes includes the following:
 - Protector Status
 - Transformer Voltages
 - Network Voltages
 - Phase Currents
 - Power
 - Reactance
 - Temperature
 - Power factor
 - Three auxiliary positions



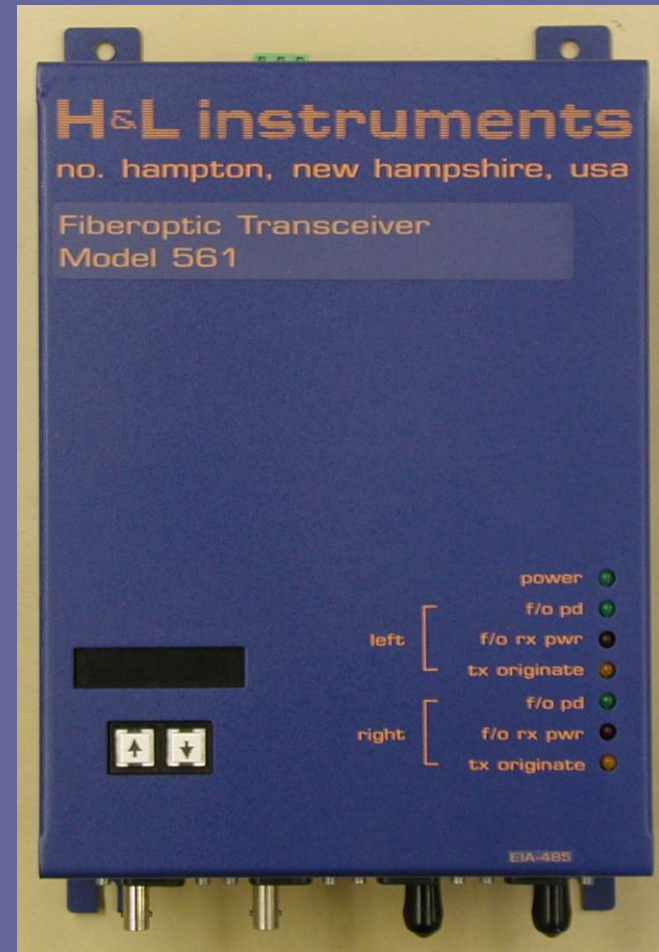
Network Monitoring and Control

- Master Incom Network Translator
 - Translates Incom (relay) protocol to ASCII encoded hex messages

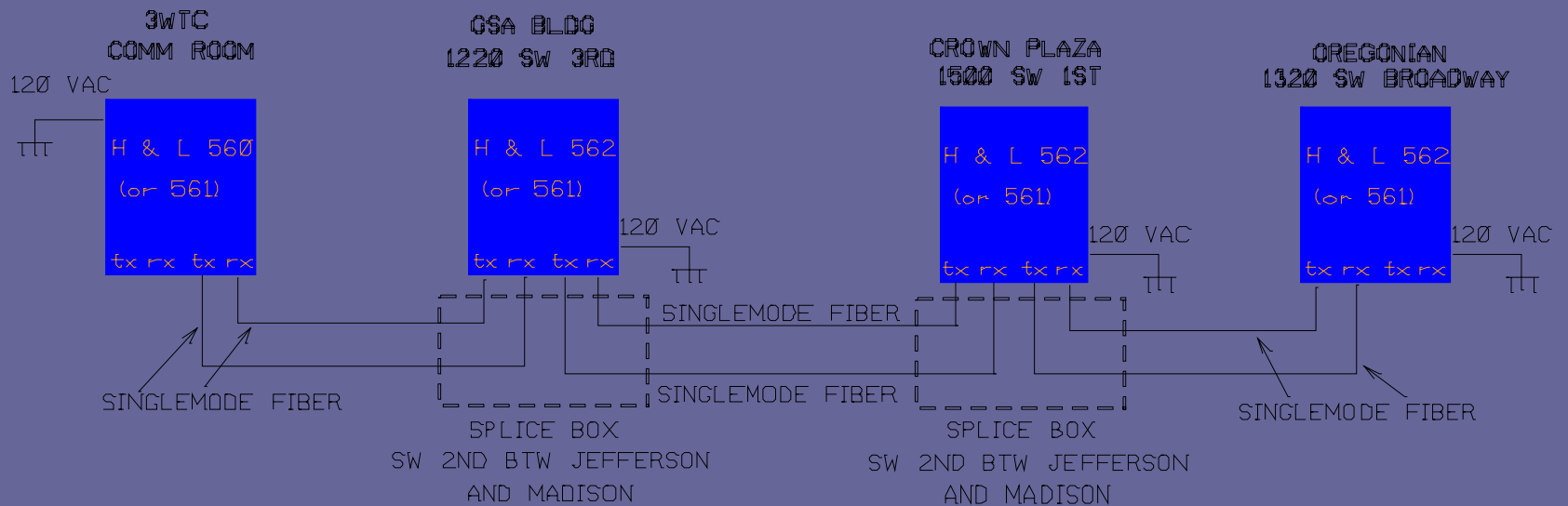


Network Monitoring and Control

- H&L Fiber Transceivers
 - Used to transmit data over long distances via RS-232 ports and fiber optic cable



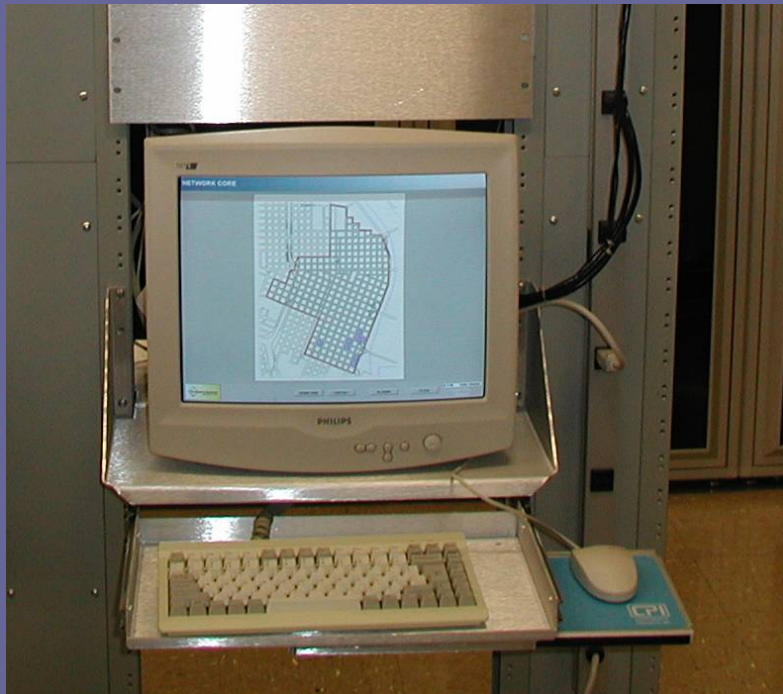
Network Monitoring and Control





Network Monitoring and Control

- Powernet PC
 - Polls data from relays via media previously discussed.





MODE: On-Line

Network Interface

- DeviceServer
- CON1
- COM Port Direct
- COM Port Permanent

Subnetwork Master

Empty text area for Subnetwork Master configuration.

Device

Empty text area for Device configuration.

Network Tree

- DeviceServer CHUG (192.168.1.1)
 - N01-E-MINT (192.168.1.11)
 - D0004- MPCV Relay V0200C13115 (0x8)
 - D0005- MPCV Relay V0200C13116 (0x9)
 - D0006- MPCV Relay V0200C13117 (0x10)
 - D0007- MPCV Relay V0179C13114 (0x15)
 - D0008- MPCV Relay V0179C13115 (0x16)
 - D0009- MPCV Relay V0179C13116 (0x17)
 - D0010- MPCV Relay V0179C13117 (0x18)
 - D0011- MPCV Relay V0197C13114 (0x23)
 - D0012- MPCV Relay V0197C13115 (0x24)
 - D0013- MPCV Relay V0197C13116 (0x25)
 - D0014- MPCV Relay V0197C13117 (0x26)
 - D0015- MPCV Relay V0202C13114 (0x39)
 - D0016- MPCV Relay V0202C13115 (0x40)
 - D0017- MPCV Relay V0202C13117 (0x41)
 - D0018- MPCV Relay V0196C13114 (0x32)
 - D0019- MPCV Relay V0196C13115 (0x33)
 - D0021- MPCV Relay V0196C13116 (0x34)**
 - D0026- MPCV Relay V0214C13114 (0x46)
 - D0027- MPCV Relay V0214C13115 (0x47)
 - D0028- MPCV Relay V0214C13116 (0x48)
 - N02-CDM Port Direct (#3)
 - D0199- MPCV Relay 2nd Test Relay (0xc7)
 - D0200- MPCV Relay Test (0x1e0)
 - N03-CDM Port Direct (#4)
 - D0001- MPCV Relay V0180C13114 (0x1)
 - D0002- MPCV Relay V0180C13116 (0x2)
 - D0003- MPCV Relay V0180C13117 (0x3)
 - D0022- MPCV Relay V0195C13114 (0x58)
 - D0023- MPCV Relay V0195C13115 (0x59)

Details Window

MPCV Relay

Description: V0196C13116

Dev. Number	Address [hex]	Network Interface
21	34	Direct

Enable Polling
 Reset Time Stamp Event
 Time Stamp Event

Enable Energy

Status Poll: High Low Edit Menu

Status: **Closed**

Reason: **Normal**

Change Delete Cancel

MPCV Relay Setpoints



Device Number

Firmware Version

Description

Comm Version

Frequency

Reverse Trip

Phase Sequence

Time Delay Time

CT Ratio

Infinite

System Voltage

Non-Sensitive Trip Zero

Watt/Var

Non-Zero

Lagging var/PF Sign Convention

Anti-Pump

Master Line

Pumping Cycles

Master Line

Pumping Time

Phasing Line (Straight)

Pump Lockout Reset Time

Phasing Line (Curved)

Left Hand Master Line



Alarm

DeviceServer	Connected?	Device	Device Type	Sub Master	PID/DIV/CV	Address
CHUG (192.168.1.1)	Yes					

Current & Energy | Alarm (28)

Group 1 | Group 2

Device	Status	Reason	I(A)	I(B)	I(C)	I(G)	I(N)	Watts	Vars	kWh	PF	PK Dmd
CHUG: D17-V0202C13117	Closed	Normal	452.1	466.8	500.1			348,300	197,370		0.87	
CHUG: D18-V0196C13114	Closed	Normal	269.1	283.5	289.3			187,130	150,940		0.77	
CHUG: D19-V0196C13115	Closed	Normal	367.9	386.5	384.2			262,840	185,060		0.81	
CHUG: D21-V0196C13116	Closed	Normal	397.7	425.8	424.6			333,600	106,710		0.95	
CHUG: D22-V0195C13114	Closed	Normal	357.4	376.9	399.0			261,810	160,590		0.84	
CHUG: D23-V0195C13115	Closed	Normal	481.8	499.5	518.3			361,800	184,260		0.88	
CHUG: D24-V0195C13116	Closed	Normal	507.1	535.3	574.3			428,200	114,930		0.96	
CHUG: D25-V0195C13117	Closed	Normal	439.3	446.6	464.6			332,300	131,920		0.92	
CHUG: D26-V0214C13114	Closed	Normal	446.0	456.6	455.6			282,740	255,680		0.74	
CHUG: D27-V0214C13115	Closed	Normal	526.3	538.2	501.7			361,500	248,610		0.82	
CHUG: D28-V0214C13116	Closed	Normal	611.5	605.1	603.8			464,800	212,340		0.91	
CHUG: D29-V0219C13114	Closed	Normal	859.5	848.5	826.0			263,560	142,470		0.88	
CHUG: D30-V0349C13115	Closed	Normal	950.5	992.9	973.5			317,930	165,370		0.89	
CHUG: D31-V0349C13117	Closed	Normal	923.5	930.0	913.0			311,960	129,530		0.92	
CHUG: D32-V0180C13115	Closed	Normal	580.1	581.7	563.1			431,600	215,390		0.89	
CHUG: D1-V0180C13114	Closed	Normal	383.3	390.0	388.7			275,690	163,430		0.86	

CH PowerNet CHUG:D21 MPCV Relay

Description: V0196C13116

Status: **Closed** Reason: **Normal** Close

Always on top

Quick Tab Select: **Overview**

Overview | Phasors | Control

Breaker Position: **Closed** Remote Trip (ROBO): **Inactive**

Network Voltages L-N		Transformer Voltages L-N	
V(A-N)	285 V	V(A-N)	285 V
V(B-N)	280 V	V(B-N)	280 V
V(C-N)	282 V	V(C-N)	282 V

Phasing Voltages		Currents	
V(A-P)	0.1 V	I(A)	409.5 A
V(B-P)	0.2 V	I(B)	437.7 A
V(C-P)	0.3 V	I(C)	433.8 A

Auxiliary Inputs		PFact	
Aux 2	Active	Watts	338,900 W
Aux 3	Inactive	Vars	123,310 var
Aux 4	Inactive	Temp	39 °C

Time of Last Event: **None**

CH PowerNet CHUG:D21 MPCV Relay

Description: V0196C13116

Status: **Closed** Reason: **Normal** Close

Always on top

Quick Tab Select: **Control**

Overview | Phasors | Control

Device Control Commands:

- Clear Block Open
- Clear Protective Close
- Protective Close
- Remote Open and Block Open**
- Reset Pumping Fault

<< Execute Control

Network Monitoring and Control

- Clients/Users
 - Uses HMI software to model system/alarms
 - 5 clients using HMI software over secure network

The screenshot displays the Cutler-Hammer MPCV Network Protector HMI software interface. The window title is "Cutler-Hammer MPCV". The main display area shows the following information:

MPCV NETWORK PROTECTOR 0.063 0.002 0.061
S:\SWITCHVUGCORE\CutlerHammer\Graphics\HELPFILES\CHUG_D21_DESCR.HTM

1 World Trade Center
V0196C13116
Device 21 / Address 034h

	Current		Network Voltage
A	401	AN	284
B	426	BN	279
C	427	CN	282

kW 325 kVar 127 PF 0.93

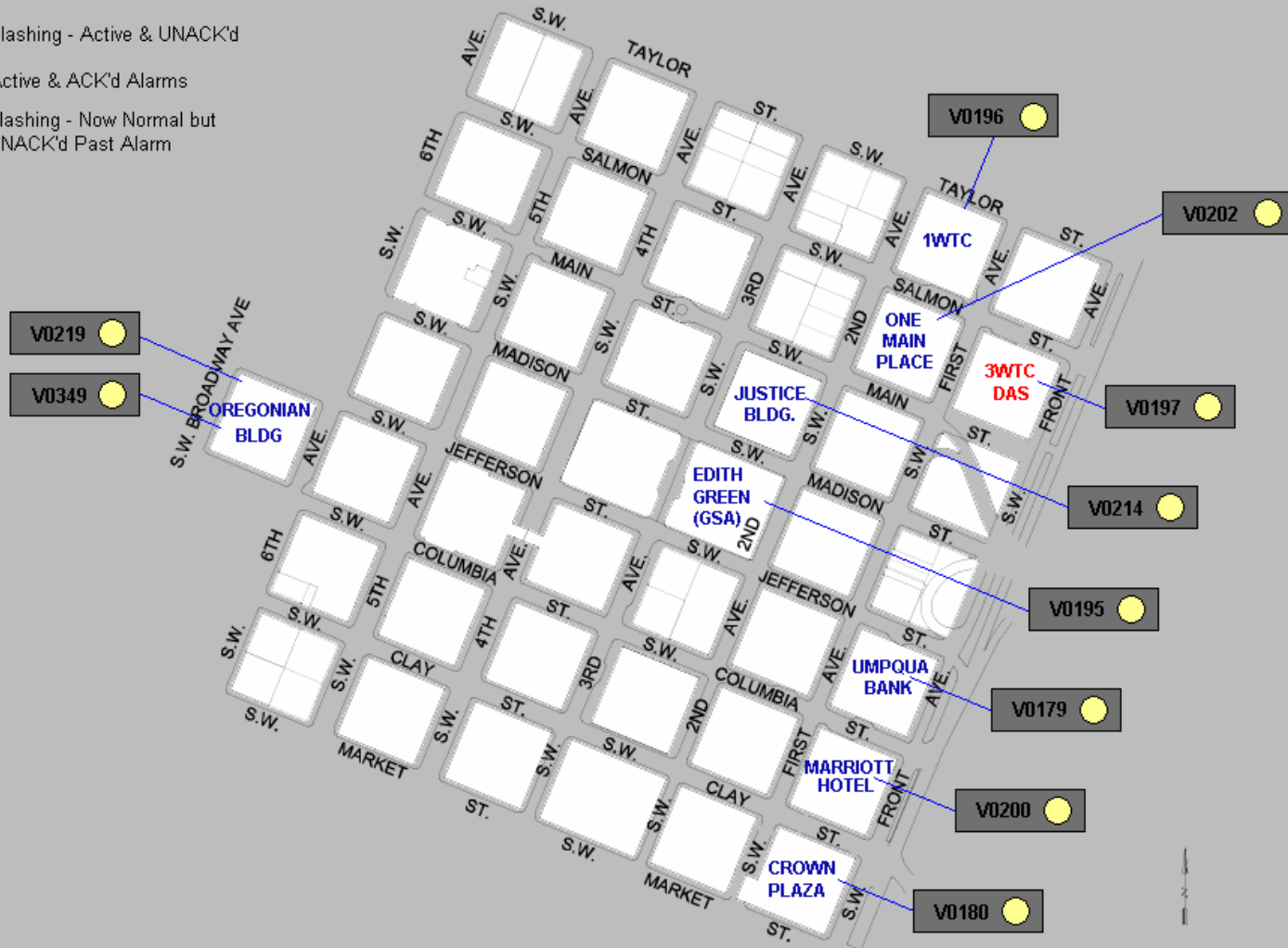
Status: **Closed**
Reason: **Normal**

ALARM SETPOINTS
LOW SP HIGH SP Deadband set at 5%
V 263 291 Enable
I 0 1600 Enable
I Diff 0.20 PF 0.00

Buttons: Clear Entry, Save Log Entry, View Log, NWP CLOSED, AUX 2 Off, AUX 3 Off, AUX 4 Off, OPEN & BLOCK OPEN, CLEAR BLOCK OPEN, RESET PUMP FAULT, Close Window, Acknowledge All, Login, Logoff, Cancel, Activate.

Time / Date	Event Time	Description
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- All OK
- Flashing - Active & UNACK'd
- Active & ACK'd Alarms
- Flashing - Now Normal but UNACK'd Past Alarm



Network Monitoring and Control

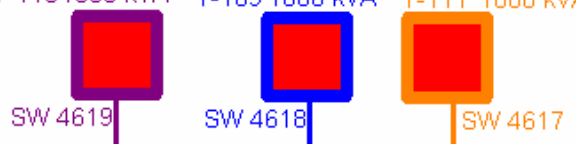
- PI node added
 - PI is a program used to monitor and trend substation data via SCADA and MV-90
- Gives read-only rights of network system to engineers throughout PGE
- Allows trending of selected relay attributes

4

ONE MAIN PLACE

la 457	la 544	la 419
lb 474	lb 545	lb 406
lc 505	lc 580	lc 437
Vat 279	Vat 283	Vat 280
Vbt 281	Vbt 279	Vbt 282
Vct 282	Vct 281	Vct 281
Van 284	Van 285	Van 283
Vbn 281	Vbn 279	Vbn 282
Vcn 282	Vcn 281	Vcn 281
P 364,500	P 393,500	P 280,340
Q 192,630	Q 255,660	Q 216,040
pf 0.89	pf 0.82	pf 0.80
temp 40	temp 42	temp 38

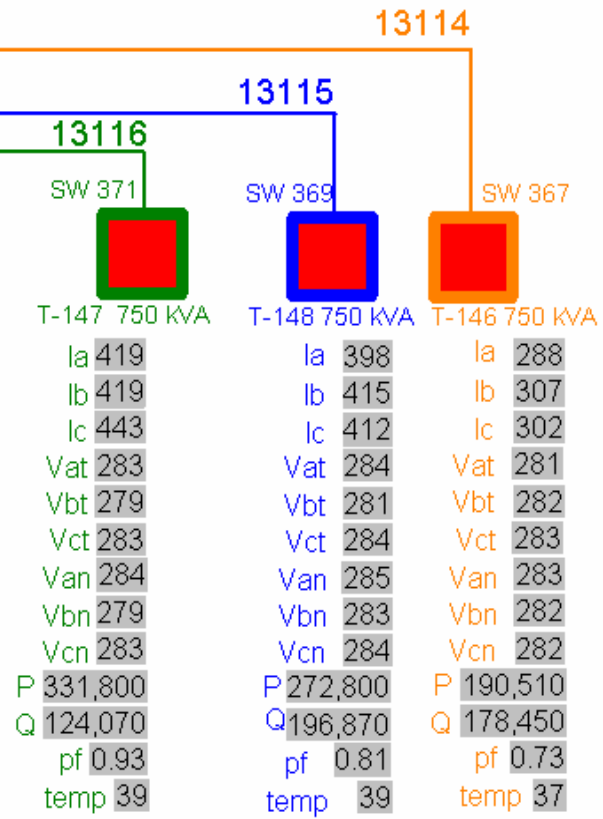
T-110 1000 KVA T-109 1000 KVA T-111 1000 KVA



13117

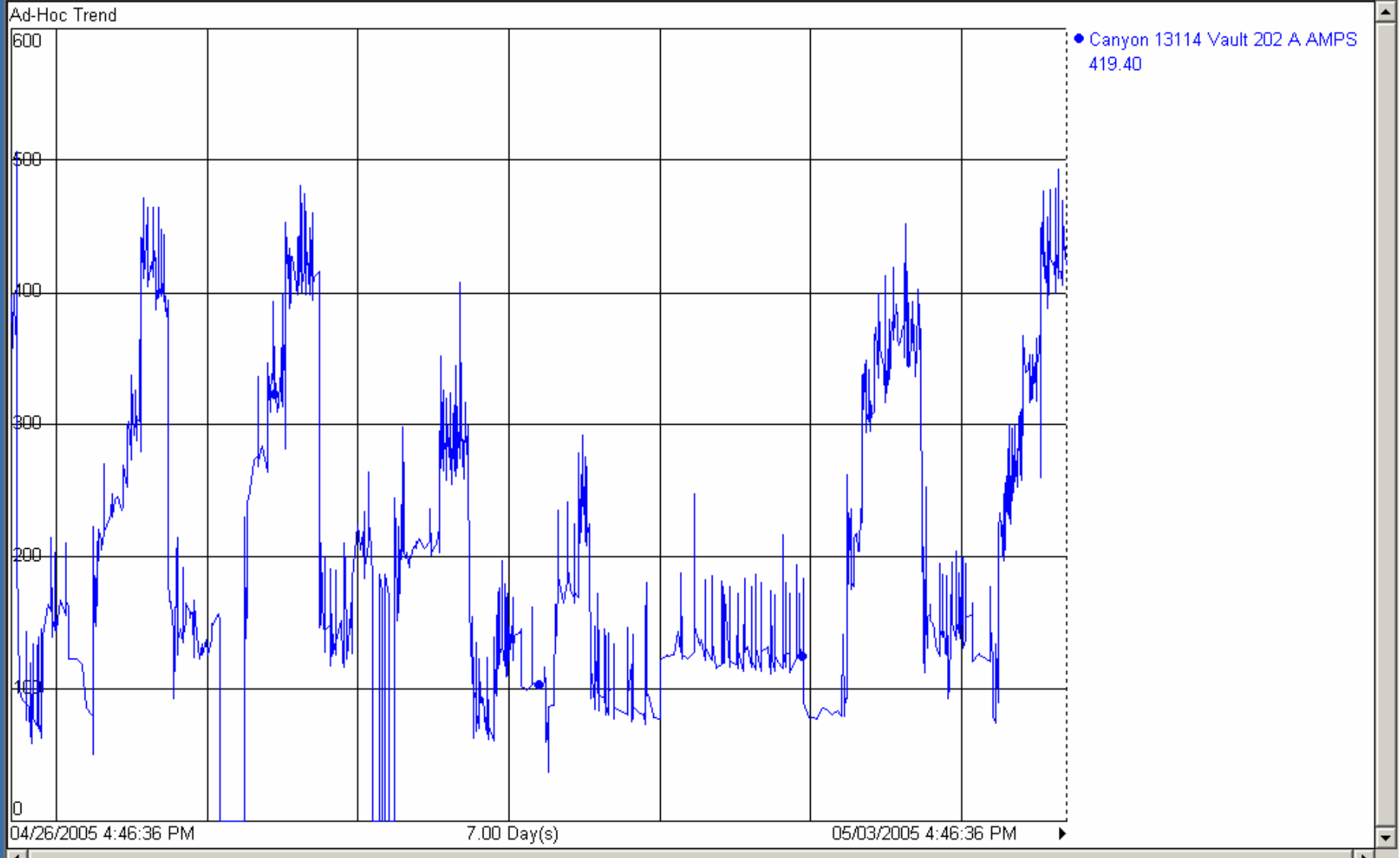
la 363	Vat 285	Van 285	pf 0.79
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SW 4628



la 419	la 398	la 288
lb 419	lb 415	lb 307
lc 443	lc 412	lc 302
Vat 283	Vat 284	Vat 281
Vbt 279	Vbt 281	Vbt 282
Vct 283	Vct 284	Vct 283
Van 284	Van 285	Van 283
Vbn 279	Vbn 283	Vbn 282
Vcn 283	Vcn 284	Vcn 282
P 331,800	P 272,800	P 190,510
Q 124,070	Q 196,870	Q 178,450
pf 0.93	pf 0.81	pf 0.73
temp 39	temp 39	temp 37

1WTC V-196



Network Monitoring and Control

- SYSTEM BENEFITS
 - Economical
 - Extends Routine Maintenance Period
 - Protector Cycling can now be monitored
 - Eliminates Extra Trips During Outages
 - Protector Closed status is now visible
 - Reduction of Rebuilds
 - Problems will be caught before they occur

Network Monitoring and Control

- SYSTEM BENEFITS

- Economical cont.

- Reduces Field time gathering load/current info
 - Relay settings can be viewed

- Reduces time in troubleshooting

- Now able to see which protectors hang up during feeder outages
 - Now able to better determine existing problems with network protectors based on given data (phase currents, voltages, etc.)

Network Monitoring and Control

- System Benefits
 - Better System Design
 - With real-time data, system can be modeled more accurately, and apparent problems can be fixed
 - More accurate study in system loading will keep system from being overbuilt

Network Monitoring and Control

- System Benefits
 - Safety
 - Remote control can de-energize spot network collector busses
 - Back-feeding network protectors can be easily detected
 - Potential hazards can be detected

Questions?