NIH Case Study

- Background
- The Need
- The Challenges
- The Metering Plan (addressed separately)
- The Approach
- Lessons Learned

Background

- 325 Acre Campus
- 10,000,000 square feet of space
- Diverse functions – hospital, research, laboratory, industrial, & office
- District Heating & Cooling for steam, chilled water, and compressed air
- Water and electricity supplied by local municipal utilities

The Need

- $75,000,000 utility expenses in FY05
- Projected $95,000,000 FY06 expenses
- Only main meters existed for electricity and domestic water, none for steam or chilled water
- Which buildings are consuming all of this energy, and how much?

The Metering Goal

- Install metering for all major buildings for electricity, steam, chilled water, and domestic water
- Maximize accuracy, minimize installed costs and O&M costs

Greg's Plug

- Legislation essentially deals with electric metering
- Electricity could be less than _ the total energy cost
- Regardless of the legislation, try not to ignore the other metering (steam, chilled water, domestic water, compressed air, etc.) if possible

The Challenges

- Ensure the system is properly designed, specified, and installed
- Measure Twice, install Once ($) – redesign costs, new equipment, new installations cost double, schedule risk due to time lag for outages
- Approximately 150 meters (non-electric) needed to be installed, almost all requiring <u>outages,</u> over 200 electric meters installed

The Challenges cont'd

- Arranging for outages
- Reliable System

The Approach

- Higher end electric meters for substations, lower end for buildings
- Insertion steam, ultrasonic chw meters were selected for ease of maintenance & calibration w/o outages, & less piping w/o bypasses
- Reduce moving parts - can add design concerns, turndown (lessons learned)

The Approach cont'd

- BAS system used for all non-electric metering
- Separate system and LAN installed for electric
- Contracting & Funding

Costs to Consider

- Meter, sensors (ct/pt's, temp, press), processors, conduit, wire, comm's
- Labor – Mech (repipe?), Elec, Controls (BAS)
- Data Systems
- Engineering
- Electric – Meters $1.5k-$5k, PQ, memory, $5k install w/CT's, conduit, wire, integration, etc

Costs to Consider, cont'd

- Steam/Chilled Water – approx $21-24K
- Compressed Air - approx $10-12K
- Domestic Water - approx $10K

Lessons Learned

- Metering Must be designed, specified, & installed correctly
- Installation Survey – location, CT/PT's ratio's, **shorting blocks** for electric, test switches; geometry, obstructions, straight run, line size for fluids
- Communications availability - LAN, phone, cable
- Fluid Velocity, Turndown – Pay attention to meter's **minimum velocity**

Lessons Learned, cont'd

- Repipe if necessary
- Outages – Getting it right the first time; where do you shut it off, and what is affected
- LAN/communications reliability

Lessons Learned – cont'd

- Reputable Contractor - incidents in building 12 ("the ct circuit"), building 13 ("the drill"), 13kV pp breaker ("the wire"), time, sched
- Safety - "don't' worry, I'll wire that hot & it will be done tomorrow", (Building 10 vault)
- Management wont remember the 200 meters installed properly, but they'll remember the one that wasn't-guaranteed

Metering Plan

- It's a must for success, to minimize first costs, O&M costs, and schedule risk
- Used to determine what buildings to meter, what utilities, locations, parts & labor costs, data collection, priority, etc.
- Installed, managed, installed in-house, by contract, or hybrid
- Data collection systems

Metering Plan cont'd

- Site /Building Survey(s) - what exists, what do we need?
- Meter Matrix
- Design Criteria
- Note: Don't use the isolation valve to "shut off" the meter

15 kV Switchgear Lineup


SIEMENS

Relays

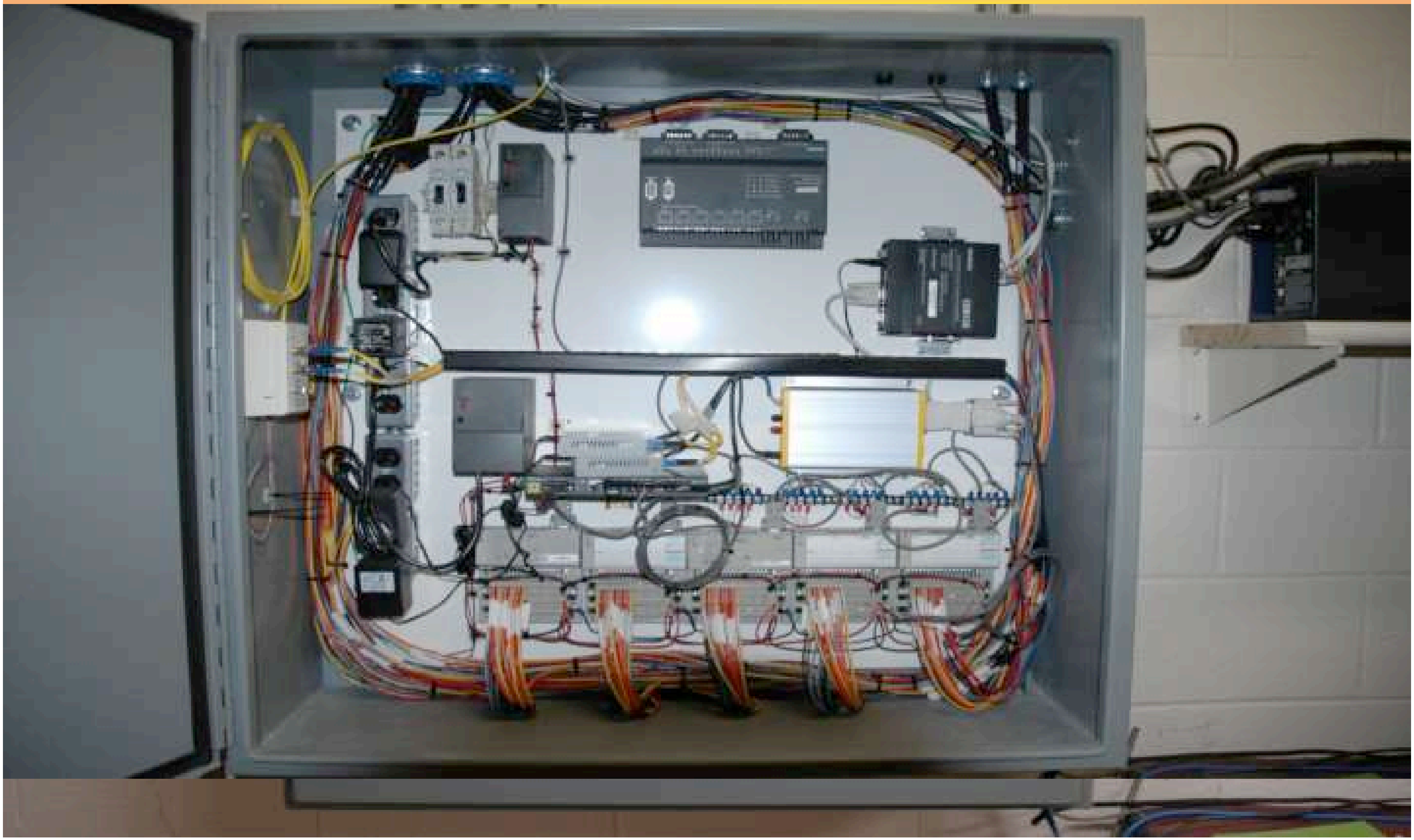

SIEMENS
SIPROTEC
Event Log
Primary Meter
Last Fault
Reset
F1
F2
F3
F4
Event Log
Primary Meter
Last Fault
F1
F2
F3
F4
Event Log
Primary Meter
Last Fault
F1
F2
F3
F4

Meter Display

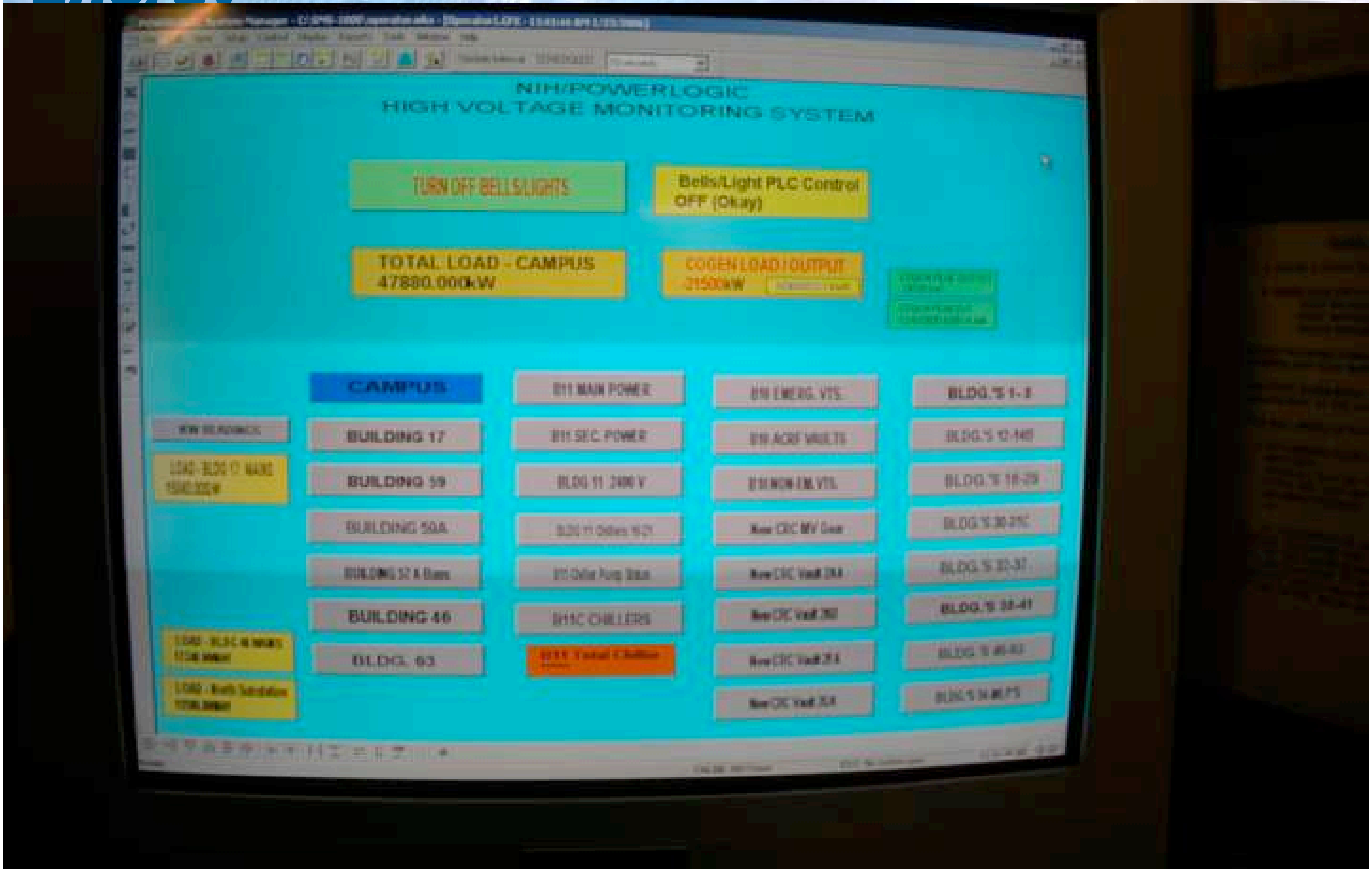
Physical Meter Installed

Typical Meter

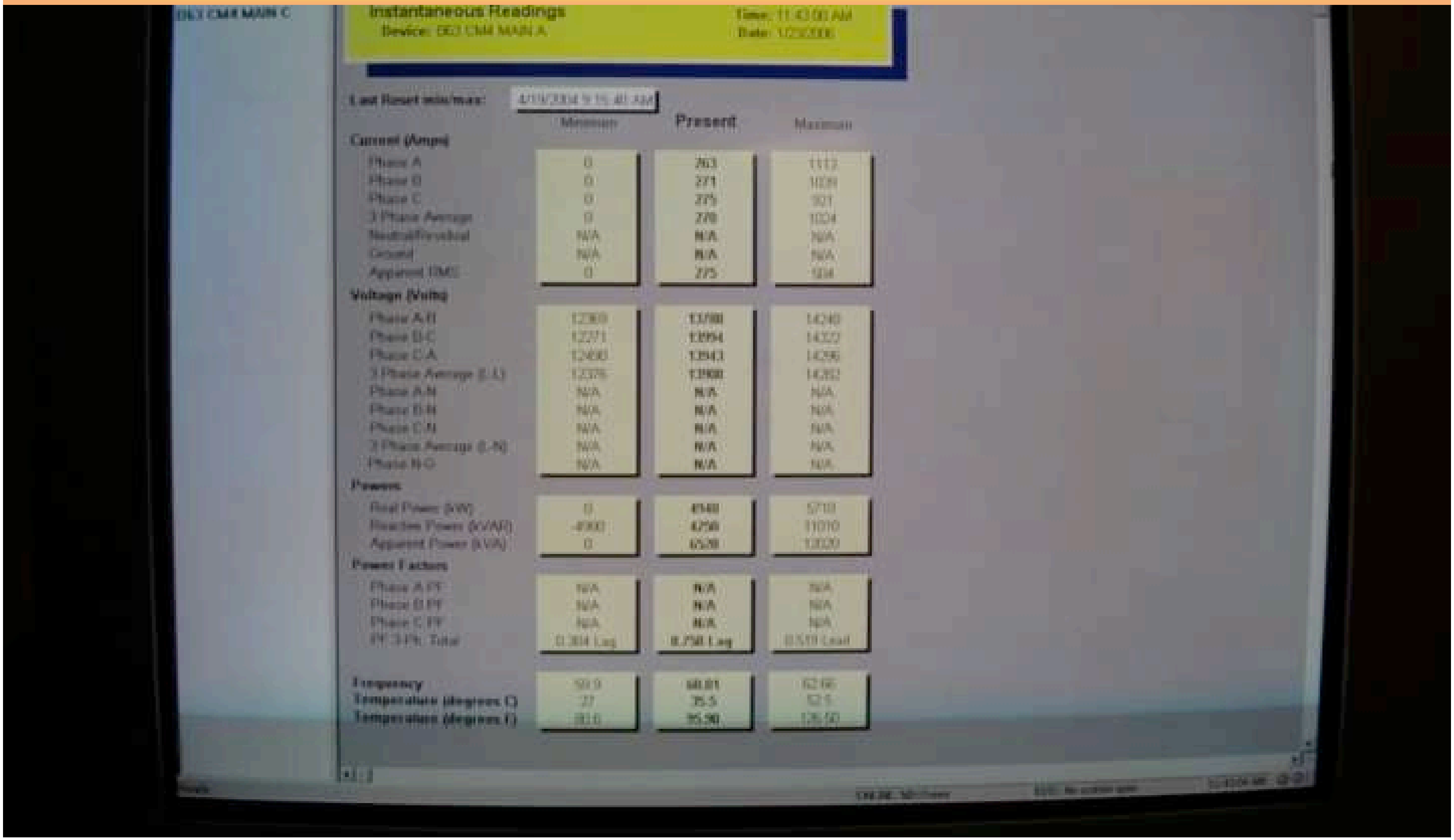
Communications Cabinet

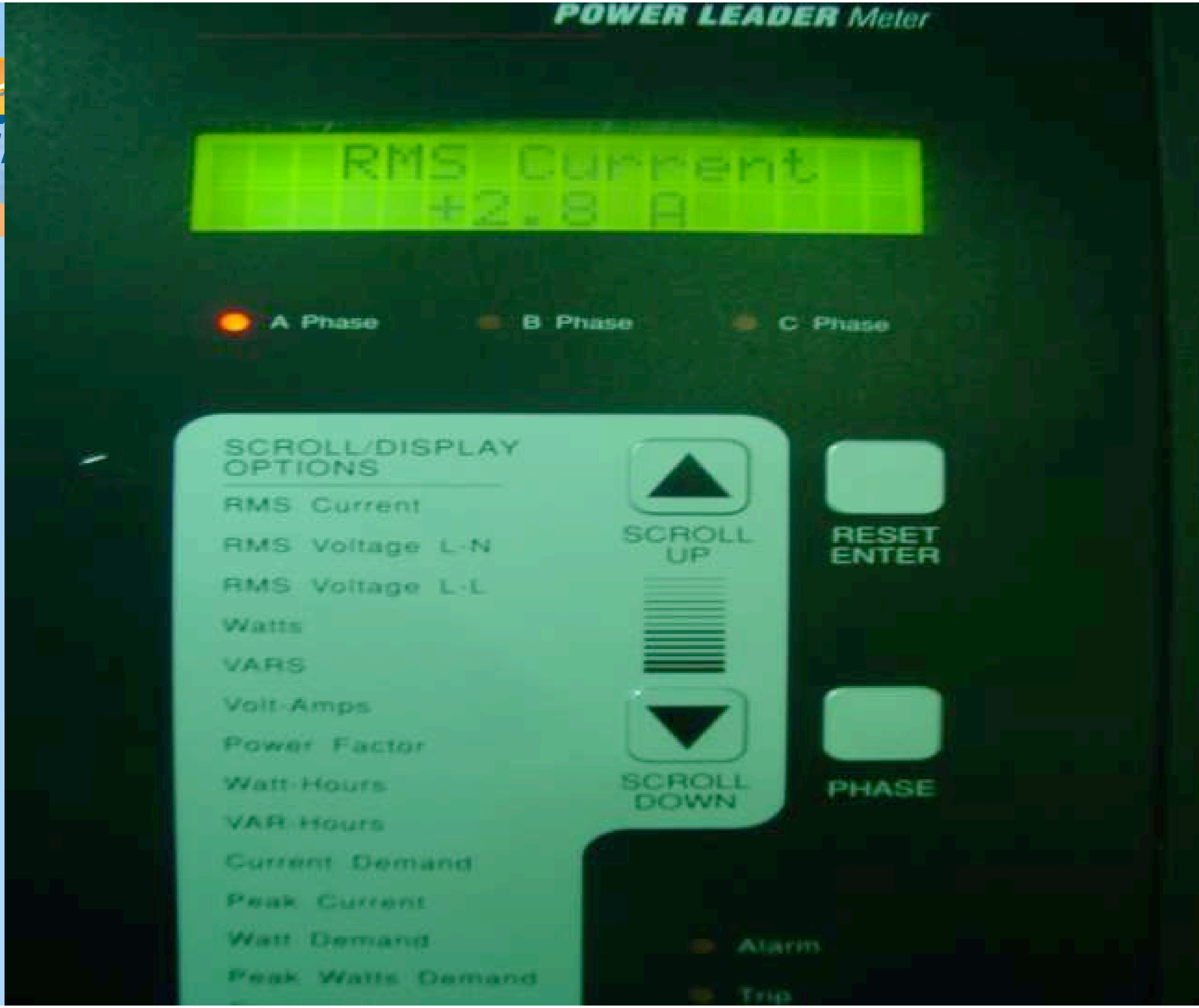


Main Display



Metered Data





POWER LEADER Meter
RMS Current
+2.8 A
A Phase
B Phase
C Phase
SCROLL/DISPLAY OPTIONS
RMS Current
RMS Voltage L-N
RMS Voltage L-L
Watts
VARS
Volt-Amps
Power Factor
Watt-Hours
VAR-Hours
Current Demand
Peak Current
Watt Demand
Peak Watts Demand
SCROLL UP
SCROLL DOWN
RESET ENTER
PHASE
Alarm
Trip


CHWS
CHWR
75.36
PSI
08.19.2005 12:49


CONTROLOTRON
55.28
2281.45
F1
F2
F3
F4
System 1010
Multifunction
Ultrasonic
Flowmeter
08-19-2005 11:27


CHILLED
RETURN
08 19 2005 11:26


08.19.2005 12:59


02.16.2005 14:44


FP-93
Analog output
out of range
EMCO
FLOW PROCESSOR
EMCO
08 19 2005 11 08