POWER PROBLEMS

- Power Problems:
  - External causes (utility outages)
  - Internal causes (CB trip, inrush, bus failure)

- Power Problems:
  - Black-out, Brown-out, Sags, Swells, Surges, Transients, Waveform Distortion
On-Line UPS (Standard Features)

- On-line
- IGBT PWM inverters
- Superior output performance
- High-efficiency (up to 95%)
- Maintenance bypass
- Input current filter, high input PF
- Modular construction
- Battery monitoring
- Computer-aided diagnostic
- Advanced communications
- Small footprint
- Microprocessor controlled
- Low acoustic noise
- FCC Compliant
- UL & CUL1778
- ISO9001
UPS BATTERY

Sealed
- Low maintenance
- No gassing, can be installed in office environment
- LOI - 18 to 22 for electrical room,
- LOI - 28 to 32 for computer room/office (UL requirements)
- Racks or cabinets
- Float voltage = 2.26 VPC +/- 0.03
- Specific Gravity = 1.3
- Recharge current = Max. 25 amps/100 A-H rating
  - 12-475 = 33.5 amps per string

Flooded Wet Cells
- Require maintenance
- Gassing, Special installation
- LOI - 18, optional 28
- Racks only. 2 or 3-tier.
- Zone rated (basement or above grade)
BATTERY PARAMETERS

- Operating temperature
  - Specified protection time @ 77° F (25° C)
  - Higher temperature > protection time
  - Lower temperature < protection time

- Discharges
  - Number of discharges
  - Elevated cut-off voltage
  - Protection against deep discharge

- Battery charging
  - Re-charge current
  - Temperature compensation
  - DC ripple: less than 1%
Evolution & Paradigm Shift to IGBT and HF PWM

Semiconductor types
- SCR
- Bipolar
- IGBT

Inverter Topologies
- 6 Step
- 12 Step
- LF PWM
- HF PWM
- HF PWM w/ DPQ
Digital Power Quality Envelope

Output Waveform

Output Inverter Voltage

Correction Envelopes within ≠1%

Theoretical Signal

MGE UPS SYSTEMS
THE UNINTERRUPTIBLE POWER PROVIDER
High Efficiency even at lower loads means huge cost savings

Most manufacturers do not publish efficiencies under 50% where most UPSs operate

MGE maintains high efficiency at lower loads resulting in substantial cost savings

Certified by an independent agency

MGE Flat Efficiency Curve
SYSTEM CONFIGURATIONS

- Single module
Parallel for Capacity & or Redundancy
Isolated Redundant
Oversized Standby Static Bypass
Isolated Redundant
Primary Module Dual Bypass
Isolated Redundant
Primary Module Dual Bypass
Distributed Redundant

FUTURE EXPANSION

S1  PRIMARY BUS 2
Primary UPS System 2C
Primary UPS System 2A
Primary UPS System 2B

PRIMARY SYSTEMS

S1  PRIMARY BUS 1
Primary UPS System 1C
Primary UPS System 1A
Primary UPS System 1B
Other Loads i.e. HVAC to redundant bus

REduNDANT SYSTEM

S1  REDUNDANT BUS
Critical Bus Sync
Reducant UPS System
Other Loads i.e. HVAC

SOURCE SELECTION AND DISTRIBUTION

PMM/STS

CBS
2(N+1) Configuration
(one system redundant)

Load Calculation:
Load = 1,000KVA Total
UPS System = 50% Redundancy
Each System supports 500KVA

Total Load = 1,000KVA
Load Calculation:
Load = 1,000KVA Total
UPS System = 66% Redundancy
Each System supports 333KVA
Total Load = 1,000KVA
Critical Bus Synchronization Module
Critical Bus Sync (CBS)

- Synchronize two (or more) independent UPS systems to common signal when:
  - *Bypass sources are not available*
  - *Bypass sources are out of sync*
STS CONTROLS

- No single point of failure
- Fault tolerant
  > Independent controls per side
  > Isolated and Redundant Power supplies
STS CONTROLS

- Four independent Power Supplies
  - Redundant on each bus
- Isolated Gate Drive
Digital Static Transfer Switch
Redundant Output Breaker Option

- Parallel Output Breakers
- Output breaker failure detected and alarmed
- All breakers are either plug-in or draw-out type

KIRK-KEY INTERLOCK
N.C. NORMALLY CLOSED
N.O. NORMALLY OPEN
SOURCES CAN BE:
- TWO UPSs OR
- ONE UPS AND A UTILITY
- ONE UPS AND A GENERATOR

Preferred Source

Alternate Source

480V

DSTS

480V

208V

Distribution Panels (up to 252 breakers)

CRITICAL LOAD

CRITICAL LOAD

AUX PMM STS AUX

FOOT PRINT
PMM ULTRA
(208V DSTS)

SOURCES CAN BE:
- TWO UPSs OR
- ONE UPS AND A UTILITY
- ONE UPS AND A GENERATOR

DUAL TRANSFORMERS = ULTRA RELIABILITY

Distribution Panels (up to 252 breakers)

CRITICAL LOAD

AUX     PMM    _STS_     PMM
FOOT PRINT
The Branch Circuit Monitor Concept

- Monitors current of all branch circuits on a panel board (50 A max.)
- Alarms when current on any circuit exceeds user defined thresholds
- Currents and alarms visible on local LCD or centrally via PC / building managements system
- Network up to 63 panel boards (2,646 circuits) on one 4 wire RS-485 network!
Saves Time

- Avoid labor intensive exercise of manually checking currents on each breaker

VS.

Manual monitoring

Centralized monitoring

Scrolling local display
System Components

- Standard Square D Panel Board
- CT STRIP (fastened to side of panel board)
- Branch circuit wiring threaded through CT (#6 Max)
- Individual CTs
- Panel Board Breakers
- Normal raceway space (not decreased by CTs)
- Connection to control board (by factory)
- Multiplexer Control Board
- RS-485 Bus (4 wire connection to network up to 63 panel boards and/or connect to a building management system/PC)
- Dip switches (for setting unique network address)
- LCD display (optional)
Easy Installation

- Simply thread wire through CT, no electrical connection required
- Up to #6 THHN wire / 50 A breaker
- No reduction in raceway space
- Comes pre-installed in the PMM
Network Features

- Each panel board has an RS-485 serial connection carrying current measurement and alarm status of all branch circuits
- Up to 63 panel boards can be networked over one 4 wire connection
- System uses Modbus protocol to easily integrate with most building
- Future edition will also carry PMM monitor and panel board main breaker info on same network
Future Offerings
Panel Board Main Breaker Monitoring

- Monitoring of panel board main breakers
- kVA, kWh, V, A, Hz, cumulative kVA
- Alarm warning before breaker current exceeds 225A (the trip rating)

Monitoring of main breakers is vital as panel board circuit breakers can use three or for times the 225 A of current that the main breaker is rated for. This system also will provide cumulative kWh for billing purposes.
Future Offerings

Retrofit Installations

- Split core CT model allows installation into existing systems with no interruption to critical load – available 2001
- CTs come pre harnessed
- Consult Mod Kit Department