Enhanced PM172-N Series
Advanced FEEDER Monitor

Power "P" Model

The SATEC Model PM172-N Series advanced monitors offer the best price/performance ratio for any advanced power instrumentation in the market today. PM172's extensive features make it ideal for applications such as revenue billing and utility SCADA. It is also ideal for substation automation because of its support for the industry standard DNP3.0 and Modbus RTU protocols. The PM172-N fits both the ANSI C39.1 4-inch round cutout for analog meter replacement as well as the DIN 96x96mm² cutout. Its galvanically isolated voltage, current, and power supply inputs make it extremely durable and reliable even in the harshest substation environment.

Choice of models
- **P** Model for real-time power measurements
- **E** Model for Energy and Demand measurements with memory

STANDARD FEATURES
Measurements
- Class 0.2S revenue accuracy
- 128 samples per cycle true RMS measurements
- Fast, real-time, cycle by cycle measurements, averaging values of 8, 16, or 32 cycles, selectable via front panel
- Four-Quadrant measurements
- Min/Max values (instantaneous & demands)

Wiring configurations
- Each model accepts all wiring configurations, selectable from the front panel
- Supports Wye and Delta in 2-element, 2½-element, and 3-element wiring configurations

Digital Inputs
- 2 Dry Contact Digital Inputs
- Status or breaker monitoring
- Time stamp operation to 1ms (E model)
- Pulse counting and accumulation with user configurable weighting factors

Integrated / Remote Display Module
- Display module can be integrated with the base unit or mounted remotely
- 3 line high-visibility 7-segment LED display, fully visible under bright sunlight
- Two 4-digit and one 6-digit window
- Simultaneous display of 3 phase parameters for quick phase balance assessment
- 6-digit Energy readings (E model)
- Configurable 8-segment LED % Load Bar mimics analog meter needle
- Energy pulse LED (E Model)
- Communications activity LEDs
- Kilo and Mega LEDs for automatic scaling indicators
- Menu driven selection and password protected device configuration
- Automatic scrolling with adjustable scroll time or fixed display
- User configurable, simple two-button Demand RESET operation
- Adjustable update time from 0.1 to 10 seconds
- Supports a second remote display module over RS485

RDM172E Remote Display Module

Relay Outputs
- 2 programmable Form A relays
- Energy pulsing output (Wh, VARh, VAh) (E model)
- Alarming via programmable set point triggers such as phase loss, low volts demands, etc
- Manual control via communication commands
- Fail Safe mode

Setpoints
- 16 user programmable setpoints with actions
- Independent Operate & Release Limits
- Independent Operate & Release Time Delays
- Logical AND/OR conditions
- Fast 50 ms update
- Choice of actions:
  - Close / Open relay
  - Increment / Clear counters
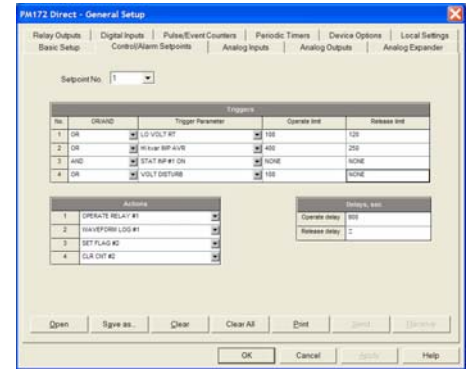
Logical Set Point Configuration

Demands
- Configurable demand calculation to match utility settings
  - Demand period from 1 to 60 minutes.
  - Number of demand periods from 1 to 15
- External synchronization for demand interval with Status Input or via communications

Basic Power Quality Measurements
- %THD Volts per phase
- % THD Amps per phase
- %TDD Amps per phase

Real-time Clock
- 30 ppm real-time clock
- Supports GPS Synchronization via digital input & communication

Communications
- Two independent communications ports
- **COM1** - optically isolated RS232/422/485 port, selectable via front panel
  - Supports industry standard Modbus RTU, ASCII, DNP3.0, Modbus/TCP, DNP3/TCP protocols
  - Optional 10/100 BaseT Ethernet
  - Optional 56K modem
  - Optional Profibus DP
- **COM2** - optically isolated RS422/485 port
- Supports industry standard Modbus RTU, ASCII and DNP3.0 protocols
- Unique "Assignable Register Map" allows users to assign registers from different ranges into a single contiguous Modbus address space or a DNP Class 0, 1, 2, or 3 poll, limiting the amount of data passed over the communications line and therefore making efficient use of the available bandwidth
- Supports up to 2 AX8 Analog Expanders for an additional 16 analog output channels
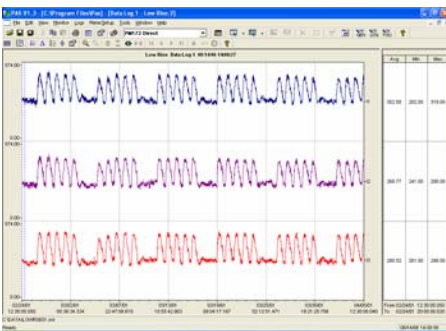- Firmware upgradeable via communications, eliminating chip replacement

Assignable Register Map

Energy "E" Model

Internal Memory (E Model)
- 1MB of non-volatile memory
- User-partition for Event Log and Data Logs.
- Up to 140 days of trending & load profile (16 measurements @ 15 minute interval)

Log Profile / Data Trend

Event Log
- 1 Event Log of programmable depth
- Supports wrap-around and stop-on-full recording modes

Data Logs
- 16 Data Logs of 16 parameters each
- Configurable depth
- Recording intervals from 1 to 9999 seconds

- Supports wrap-around and Stop-on-Full recording modes

Data Log Setup

Time-Of-Use (TOU)
- Configurable to match any utility billing profile
- 8 Energy and Maximum Demand Registers
- 8 tariffs for each energy register

TOU Calendar with Daily Profiles

TOU Registers

Optional Inputs/Outputs
Analog Outputs (optional)
- 2 isolated, programmable Analog Outputs
- Fast 1-cycle update time
- Settable to any electrical measurement
- Programmable HI/LO Ranges
Analog Inputs (optional)
- 2 isolated, programmable Analog Inputs
- Fast 1-cycle scan time
- For monitoring substation and transformer temperature, oil level and pressure, etc.

Software and Integration
System Integration
- Easy integration with Energy Management or SCADA systems via Modbus RTU, ASCII, DNP3.0 protocols
- Remote display and logging of all measured parameters
- Automatic/Remote Alarm & Control
- Remote configuration

PAS Software
- Included with every SATEC device
- Easy to use remote configuration software
- Supports off-line programming to allow easy downloading of a standard configuration to multiple meters
- Supports scheduled polling, viewing of real-time data, and automatic retrieval of historical data
- Provides the ability to export waveform and data logs to COMTRADE and PQDIF formats
- Advanced Power Quality Analysis

Installation & Connections
- Each model accepts all wiring configurations, selectable via the front panel
- Analog meter replacement. Mounting standard to both ANSI C39.1 4-inch round and DIN 96x96 mm² cutouts
- Direct connection up to 400/690V or via PT
- Configurable PT and CT ratios via front panel
- Optional switchboard case for retrofit situations

Contact factory for details

Warranty:
3 Year limited warranty

Environmental Conditions
Operating Temp.: -4 to 140°F (-20 to +60°C)
Storage Temp.: -13 to 176°F (-25 to +80°C)
Humidity: 0 to 95% non-condensing

Accuracy

Voltage: 0.2% reading + 0.01% F.S.
(10% to 120% Nominal)
Range: 0 to 1,150,000V
Starting Voltage: 1.5% F.S.
Current: 0.2% reading + 0.02% F.S.
(1% to 200% Nominal)
Range: 0 to 10,000A
Starting Current: 0.1% F.S.
I Neutral: 0.6% F.S. (2% to 150% Nominal)
Frequency: 0.02% reading (15 to 480 Hz)
PF: 0.2% F.S. ($|PF| \geq 0.5$)
THD: 1.5% reading + 0.1% F.S.
THD $\geq$ 1%
V $\geq$ 10% F.S.V
I $\geq$ 10% F.S.I.
TDD: 1.5% F.S.
TDD $\geq$ 1%
I $\geq$ 10% F.S.I.
Watts: 0.2% reading + 0.02% F.S.
($|PF| \geq 0.5$)
-10,000,000 to +10,000,000 kW
VARs: 0.3% F.S. ($|PF| \leq 0.9$)
-2,000,000 to +2,000,000 kVAR
VAs: 0.2% F.S. ($|PF| \geq 0.5$)
0 to +2,000,000 kVA
Wh: Class 0.2S as per IEC 62053-22:
2003   -999,999,999 to +999,999,999
MWh
VARh: Class 0.2S as per IEC 62053-22:2003
-999,999,999 to +999,999,999
MVARh
VAh: Class 0.2S as per IEC 62053-22:
2003   0 to 999,999,999 MVAh

INPUT SPECIFICATIONS

Power Supply:
- 85-265V AC/DC universal power supply
  - 85-265VAC 50/60Hz, 88-290VDC, 10W
  - Isolation:
    - Input to output: 3000VAC
    - Input to ground: 2000VAC
  - Options:
    - 12VDC: 10-16VDC
    - 24VDC: 18-36VDC
    - 48VDC: 36-72VDC

Voltage:
Direct Input: Up to 400V-ln/690V-ll
Input impedance: 500 kΩ
PT Ratio: 1.0-6500
Range: 1-999,000V
Burden: <0.4VA for 400VAC
<0.04VA for 120VAC
Overload withstand: 1000VAC
continuous, 2000VAC for 1 second
Galvanic Isolation: 3500VAC
Wire size: Up to 12AWG (2.5mm^2)

Current:
5A secondary:
Operating Range: Continuous 10A RMS
Burden: < 0.1VA
Overload: 15A continuous 300A RMS for 1 second

1A secondary:
Operating Range: Continuous 2A RMS
Burden: < 0.02VA
Overload: 6A continuous
80A RMS for 1 second
CT Ratio: 1-50,000A
Range: 0-60,000A
Galvanic Isolation: 3500VAC
Wire size: Up to 12AWG (2.5mm^2)

Digital Inputs:
- 2 dry contact digital inputs
- Internal supply: 15V
- Scan time: 1ms
- Isolation: 2000V RMS
- Wire size: Up to 14AWG (1.5mm^2)

Analog Inputs (optional):
- 2 optically isolated analog inputs
  - 0-1mA (100% overload)
  - ±1mA (100% overload)
  - 0-20mA
  - 4-20mA
- Accuracy: 0.5% F.S.
- Scan time: 1 cycle
- Isolation: 2000V RMS
- Wire size: Up to 14AWG (1.5mm^2)

OUTPUT SPECIFICATIONS

Relay Outputs:
- 2 Form A relays for alarming and control
- 3A @ 250VAC/30VDC
- Galvanic Isolation:
  - 2000VAC/1min. between contacts and coil
  - 1000VAC between open contacts
- Operate time: 10 ms max.
- Release time: 5 ms max.
- Update time: 1 cycle

Analog Outputs (optional):
- 2 optically isolated analog outputs
  - ±1mA, max. load 5kΩ (100% overload)
  - 0-20mA, max. load 510Ω
  - 4-20mA, max. load 510Ω
  - 0-1mA, max. load 5kΩ (100% overload)
- Accuracy 0.5% F.S.
- Update time: 1 cycle
- Isolation: 2000V RMS
- Wire size: Up to 14 AWG (1.5mm^2)

COMMUNICATION:
2 independent and simultaneous connections

COM1
- Standard
  - Optically isolated RS-232/422/485
  - Isolation: 2000V RMS
  - Selectable baud rate to 115,200 maximum
  - 7/8 bit even parity or 8 bit no parity
  - Protocols supported: Modbus RTU & ASCII, and DNP3.0

- Optional Ethernet
  - Transformer-isolated 10/100BaseT
  - Connector: RJ45
  - Protocols supported: Modbus TCP, DNP3/TCP
  - 2 simultaneous connections
- Optional Dial-up Modem
  - Transformer-isolated 56KB modem
  - Connector: RJ11
  - Protocols supported: Modbus RTU
- Optional Profibus DP (IEC 61158)
  - RS-485 optically isolated Profibus interface
  - Baud rate: 9600 - 12Mbps auto detection
  - 32 bytes input, 32 bytes output
  - Protocol supported: Profibus DP

COM2
- Optically isolated RS-422/RS-485 port
- Isolation: 2000V RMS
- Connector: 5-pin removable connector
- Selectable baud rate up to 115,200
- 7/8 bit even parity or 8 bit no parity
- Protocols supported: Modbus RTU & ASCII, and DNPV3.0
- Wire size: up to 14 AWG (1.5mm²)

Real-time clock:
- Accuracy: 15 seconds per month @ 25°C (25 PPM)

Log Memory (E Model):
- 1MB on-board memory with battery backup

Standards of Compliance:
UL   Recognized – E129258
UL61010B-1
CE   EMC: 89/336/EEC as amended by
92/31/EEC and 93/68/EEC
LVD: 73/23/EEC as amended by
93/68/EEC and 93/465/EEC
Harmonized standards to which conformity is declared:
EN   EN55011: 1991; EN 50082-1: 1992
EN61010-1: 1993; A2/1995
EN50081-2: 1994 Generic Emission
Standard – Industrial Environment
EN50082-2: 1995 Generic
Immunity Standard – Industrial
Environment
EN55011:1994 Class A
EN61000-4-2: 1995 Electrostatic
Discharge
EN61000-4-4: 1995 Electrical Fast
Transient
EN61000-4-8: 1993 Radio AM-
Frequency Electromagnetic Field,
ENV50140: 1995 (200Hz) RF
Electromagnetic Field, Pulse
Modulated
ENV50204: 1995 (900MHz)
ENV50141: 1993 RF Common Mode
AM
ANSI C37.90.1: 1989 SWC
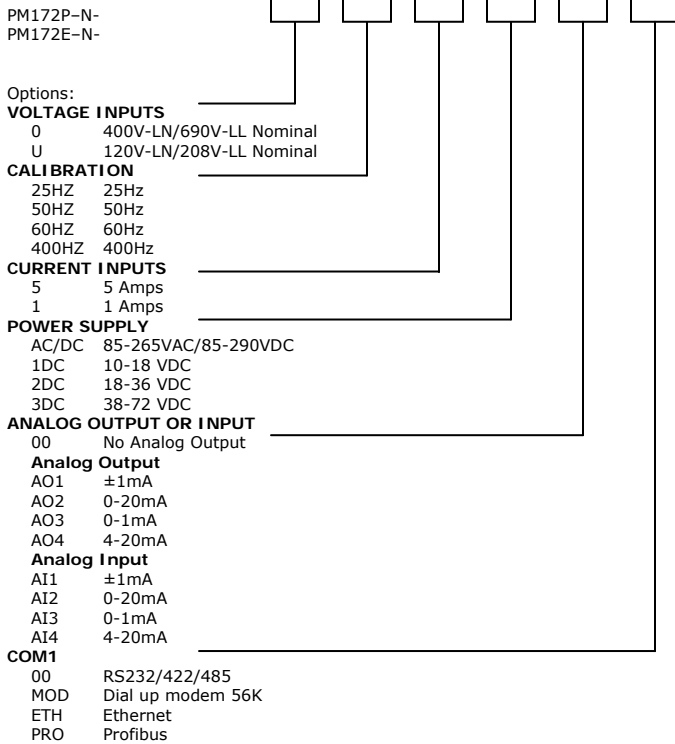ANSI C62.41: 1991 Standard Surge

SATEC
Powerful Solutions

Construction

Case enclosure: Plastic PC/ABS blend
Display body: Plastic PC/ABS blend
Front panel: Plastic PC PCB: FR4 (UL94-V0)
Terminals: PBT (UL94-V0)
Plug-in connectors: Polyamide PA6.6 (UL94-V0)
Dimensions: 5x5x5.8" (127x127x147mm)
Mounting: ANSI 4" round DIN 92x92mm cutout
Weight: 1.23kg (2.7 lb.)

MODELS AND MEASUREMENTS MISCELLANEOUS

PM172-N SERIES ADVANCED FEEDER MONITOR

PM172P–N-
PM172E–N-

Options:

VOLTAGE INPUTS
0   400V-LN/690V-LL Nominal
U   120V-LN/208V-LL Nominal

CALIBRATION
25HZ   25Hz
50HZ   50Hz
60HZ   60Hz
400HZ   400Hz

CURRENT INPUTS
5   5 Amps
1   1 Amps

POWER SUPPLY
AC/DC   85-265VAC/85-290VDC
1DC   10-18 VDC
2DC   18-36 VDC
3DC   38-72 VDC

ANALOG OUTPUT OR INPUT
00   No Analog Output
Analog Output
AO1   ±1mA
AO2   0-20mA
AO3   0-1mA
AO4   4-20mA
Analog Input
AI1   ±1mA
AI2   0-20mA
AI3   0-1mA
AI4   4-20mA

COM1
00   RS232/422/485
MOD   Dial up modem 56K
ETH   Ethernet
PRO   Profibus

EXAMPLES:
PM172P-U-60HZ-5-ACDC-AO4-ETH
PM172E-U-50HZ-1-2DC-AI3-MOD

Measurements	PM172-N	
	P	E
Voltage L-L per phase	■	■
Voltage L-N per phase	■	■
Current per phase	■	■
Neutral current	■	■
Frequency	■	■
Phase Rotation	■	■
Relay Status	■	■
Counters	■	■
TxD, RxD Comm Status	■	■
Alarm Trigger Code	■	■
PF per phase and total	■	■
kW per phase and total	■	■
KVAR per phase and total	■	■
KVA per phase and total	■	■
Voltage Unbalance	■	■
Current Unbalance	■	■
%THD Volts per phase	■	■
%THD Amps per phase	■	■
%TDD Amps per phase	■	■
K-Factor per phase	■	■
Fundamental Volts, Amps per phase	■	■
Fundamental kW, kVAR, kVA per phase & total	■	■
Displacement PF per phase and total	■	■
Voltage & Current Phasors	■	■
Volts Demands		■
Amps Demands		■
kW, kVAR, kVA Demands		■
V, I THD Demands		■
kWh Imp/Exp, per phase & total		■
kVARh Imp/Exp, per phase & total		■
kVAh per phase and total		■
TOU parameters		■
16 Data Logs		■
1 Event Log		■
Internal memory		■