

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



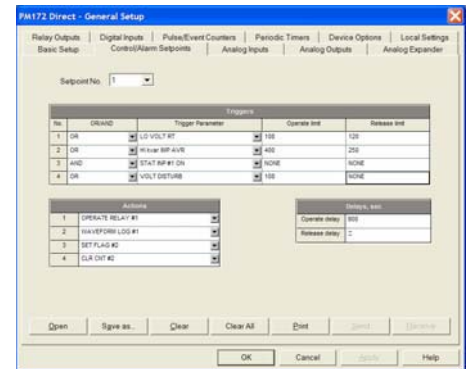
RDM172E Remote Display Module

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

Enhanced PM172-N Series Advanced FEEDER Monitor

Reg	Addr	Reg	Addr	Reg	Addr	Reg	Addr	Reg	Addr
0	1	20	0056	40	0056	60	0056	80	0056
1	0056	21	0056	41	0056	61	0056	81	0056
2	0056	22	0056	42	0056	62	0056	82	0056
3	0056	23	0056	43	0056	63	0056	83	0056
4	0056	24	0056	44	0056	64	0056	84	0056
5	0056	25	0056	45	0056	65	0056	85	0056
6	0056	26	0056	46	0056	66	0056	86	0056
7	0056	27	0056	47	0056	67	0056	87	0056
8	0056	28	0056	48	0056	68	0056	88	0056
9	0056	29	0056	49	0056	69	0056	89	0056
10	0056	30	0056	50	0056	70	0056	90	0056
11	0056	31	0056	51	0056	71	0056	91	0056
12	0056	32	0056	52	0056	72	0056	92	0056
13	0056	33	0056	53	0056	73	0056	93	0056
14	0056	34	0056	54	0056	74	0056	94	0056
15	0056	35	0056	55	0056	75	0056	95	0056
16	0056	36	0056	56	0056	76	0056	96	0056
17	0056	37	0056	57	0056	77	0056	97	0056
18	0056	38	0056	58	0056	78	0056	98	0056
19	0056	39	0056	59	0056	79	0056	99	0056

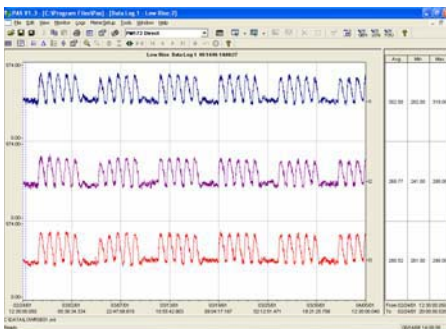
Assignable Register Map



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

No.	Group	Parameter	No.	Group	Parameter
1	AVR PHASE	V1	8	AVR TOTAL	KVA
2	AVR PHASE	V2	9	DEMANDS	Env RFP 3D
3	AVR PHASE	V3	10	DEMANDS	Env RFP 3D
4	AVR PHASE	I1	11	DEMANDS	Env RFP 3D
5	AVR PHASE	I2	12	DEMANDS	Env RFP 3D
6	AVR PHASE	I3	13	DEMANDS	Env RFP 3D
7	AVR PHASE	I0	14	DEMANDS	Env RFP 3D
8	AVR TOTAL	ENV	15	ENERGY	Env RFP 3D
9	AVR TOTAL	Env	16	ENERGY	Env RFP 3D

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

Reg	TOU	On-Peak	Off-Peak	Super-Peak	Other	Source	Register	Register	Target
1	SP	SP	SP	SP	SP	Env RFP 3D	1	1000	Reg 41
2	SP	SP	SP	SP	SP	Env RFP 3D	2	1000	Reg 42
3	SP	SP	SP	SP	SP	Env RFP 3D	3	1000	Reg 43
4	SP	SP	SP	SP	SP	Env RFP 3D	4	1000	Reg 44
5	SP	SP	SP	SP	SP	Env RFP 3D	5	1000	Reg 45
6	SP	SP	SP	SP	SP	Env RFP 3D	6	1000	Reg 46
7	SP	SP	SP	SP	SP	Env RFP 3D	7	1000	Reg 47
8	SP	SP	SP	SP	SP	Env RFP 3D	8	1000	Reg 48
9	SP	SP	SP	SP	SP	Env RFP 3D	9	1000	Reg 49
10	SP	SP	SP	SP	SP	Env RFP 3D	10	1000	Reg 50
11	SP	SP	SP	SP	SP	Env RFP 3D	11	1000	Reg 51
12	SP	SP	SP	SP	SP	Env RFP 3D	12	1000	Reg 52
13	SP	SP	SP	SP	SP	Env RFP 3D	13	1000	Reg 53
14	SP	SP	SP	SP	SP	Env RFP 3D	14	1000	Reg 54
15	SP	SP	SP	SP	SP	Env RFP 3D	15	1000	Reg 55
16	SP	SP	SP	SP	SP	Env RFP 3D	16	1000	Reg 56

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

Enhanced PM172-N Series Advanced FEEDER Monitor

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| ≥ 0.5)

THD: 1.5% reading + 0.1% F.S.
THD ≥ 1%
V ≥ 10% F.S.V
I ≥ 10% F.S.I.

TDD: 1.5% F.S.
TDD ≥ 1%
I ≥ 10% F.S.I.

Watts: 0.2% reading + 0.02% F.S.
(|PF| ≥ 0.5)
-10,000,000 to +10,000,000 kW

VARs: 0.3% F.S. (|PF| ≤ 0.9)
-2,000,000 to +2,000,000 kVAR

VAs: 0.2% F.S. (|PF| ≥ 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-In/690V-II
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 (2.5mm²)

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 (2.5mm²)

Digital Inputs:

- 2 dry contact digital inputs
- Internal supply: 15V
- Scan time: 1ms
- Isolation: 2000V RMS
- Wire size: Up to 14AWG (1.5mm²)

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 (1.5mm²)

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 (1.5mm²)

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 DNP3.0
- 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

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	■	■



www.byramlabs.com
 Branchburg, NJ 08876
 Phone: 800-766-121
 Fax: 908-252-0822