sub.net Substation Monitoring Simplified





Features

- Multiple substation monitoring functions
- Embedded event classifier saves engineering time
- Event reports sent via email, fax and text message
- Concurrent and prioritised reporting from multiple units
- Embedded web pages for viewing reports, inputs and set-up
- No dedicated master station software required
- Four concurrent recording rates
- Recorded data available in COMTRADE format
- Compact DIN rail mounting enclosure
- Portable & wall mounting optionsFully solid state design
- Embedded network, modem and GPS time sync.
- Low power consumption
- Ease of use

Applications

- Protection monitoring
- Quality of supply recording
- System stability monitoring
- Asset condition assessment
- Line fault location
- Power recording and submetering
- System planning
- Generator monitoring
- Grid code compliance
- Real time display
- Power quantities transducer
- Synchrophasor measurement
- Specialist applications -Capacitor bank switching Peterson coil monitoring

Locations

- Wind farms
- Generators
- Transmission sites
- Distribution substations
- Industrial plants

Protection Event Report



Measurement Summary RMS levels before, during and after the event

Ch	1	Pre	Max	Min	Post	
1	Vry	11.097	11.263	10.925	11.097	kV
2	Vyb	11.149	11.176	9.134	11.145	kV
3	Vbr	11.132	11.155	9.902	11.128	kV
4	Ir	65.227	142.170	64.641	80.850	A
5	Iy	62.102	638.790	61.321	78.116	A
6	Ib	62.102	580.008	61.907	78.116	A
7	Vbatt	33.911	33.937	33.670	33.835	V
8	Idc	0.259	5.736	0.238	0.719	A
	Frequency	50.030	50.035	50.009	50.015	Hz

Embedded Monitoring Systems



Sub.net is a web enabled, multi-functional substation monitoring system incorporating wide ranging monitoring and recording functionality for use in the electricity supply industry and industrial plants. This makes sub.net ideal for use with Smart Grid where the internet is used to deliver useful information on the state of the energy network.

Sub.net continuously monitors and reports on protection operations, quality of supply, stability and other substation asset conditions. Real time monitoring and metering are other integral features.

Sub.net is a completely new concept in substation monitoring, incorporating the very latest in software, hardware and communication technologies to meet the evolving needs and demands of the power supply industry. It will significantly reduce engineering fault analysis time, assist in network improvements, aid fault location and help reduce customer minutes lost (CML). Both installation costs and time are greatly reduced due to its very compact size.



Embedded software within sub.net provides automatic analysis of the recorded data resulting from system events and sends prioritised reports as email, fax or text messages. This enables rapid engineering assessments to be made and appropriate prompt actions to be taken. There is now no longer any need for large volumes of data to be retrieved from multiple instruments to a centralised master station before information can be made available to users.





Harmonics Trend Report



Remote communications are via LAN, PSTN or GSM connections. As event reporting is by email any number of sub.nets can process and transmit reports at the same time delivering timely information directly to user's desktops. Because sub.net works in this way a central master station application is not required saving time and money.

A web browser is all that is required to retrieve waveform and RMS files if signal data are required for further analysis. These files may also be sent as email attachments with the event report in COMTRADE format.

DIN rail mounting design enables rear panel fixing of the sub.net, close to the input connections. This, together with its very compact size, enables big reductions in both panel space requirements and wiring costs.

Sub.net uses field programmable devices and solid state storage to produce a high performance, flexible, low power instrument in a small enclosure. The low power consumption allows sub.net to be used in substations with older electromechanical protection.







Harmonic levels during the trend interval.

		Harmon	nics (kV)	%				
N	Min	50%	95%	Max	Min	50%	95%	Max	
1	10.972	11.074	11.147	11.197	99.75	100.67	101.34	101.79	
3	0.030	0.036	0.043	0.046	0.27	0.33	0.40	0.42	
5	0.028	0.085	0.131	0.152	0.25	0.77	1.19	1.39	
7	0.095	0.140	0.189	0.201	0.86	1.27	1.71	1.83	
9	0.007	0.010	0.016	0.022	0.07	0.09	0.14	0.20	
11	0.008	0.034	0.052	0.067	0.07	0.31	0.47	0.61	
13	0.005	0.015	0.026	0.034	0.05	0.13	0.23	0.31	
15	0.002	0.004	0.011	0.013	0.02	0.03	0.10	0.12	
17	0.002	0.006	0.012	0.014	0.02	0.06	0.11	0.12	
19	0.002	0.003	0.006	0.008	0.02	0.03	0.05	0.07	
21	0.001	0.002	0.003	0.004	0.01	0.02	0.03	0.03	
23	0.002	0.003	0.004	0.005	0.02	0.03	0.04	0.04	
25	0.001	0.002	0.003	0.003	0.01	0.02	0.02	0.02	
27	0.001	0.002	0.002	0.002	0.01	0.02	0.02	0.02	
29	0.002	0.002	0.002	0.002	0.02	0.02	0.02	0.02	
31	0.002	0.002	0.002	0.002	0.02	0.02	0.02	0.02	
33	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
35	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
37	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
39	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
41	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
43	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	
45	0.002	0.002	0.003	0.003	0.02	0.02	0.02	0.02	
47	0.002	0.003	0.003	0.003	0.02	0.02	0.02	0.02	
49	0.002	0.002	0.002	0.002	0.02	0.02	0.02	0.02	
THD					1.01	1.59	2.05	2.19	

Measurement Limits Summary (G5/4)

nonic limits during the trend interval.

	0/0					% limit					
N	Min	50%	95%	Max	Limit%	Min	50%	95%	Max	Pass	
2	0.03	0.04	0.04	0.04	1.50	1.94	2.50	2.50	2.77	Yes	
3	0.27	0.33	0.40	0.42	3.00	9.02	10.96	13.18	13.87	Yes	
4	0.02	0.03	0.03	0.03	1.00	2.50	2.91	2.91	3.33	Yes	
5	0.25	0.77	1.19	1.39	3.00	8.46	25.66	39.81	46.19	Yes	
6	0.03	0.03	0.04	0.04	0.50	5.83	6.66	7.49	7.49	Yes	
7	0.86	1.27	1.71	1.83	3.00	28.72	42.45	57.15	60.90	Yes	
8	0.02	0.02	0.03	0.03	0.40	5.20	6.24	7.28	7.28	Yes	
9	0.07	0.09	0.14	0.20	1.20	5.55	7.63	11.79	16.99	Yes	
10	0.02	0.03	0.04	0.04	0.40	6.24	8.32	9.36	9.36	Yes	
11	0.07	0.31	0.47	0.61	2.00	3.75	15.40	23.51	30.38	Yes	
12	0.02	0.03	0.03	0.03	0.20	10.40	14.57	16.65	16.65	Yes	
13	0.05	0.13	0.23	0.31	2.00	2.50	6.66	11.65	15.40	Yes	
14	0.02	0.02	0.02	0.02	0.20	10.40	10.40	12.48	12.48	Yes	
15	0.02	0.03	0.10	0.12	0.30	6.94	11.10	31.91	40.23	Yes	
16	0.01	0.02	0.02	0.02	0.20	6.24	10.40	12.48	12.48	Yes	
17	0.02	0.06	0.11	0.12	1.60	1.30	3.64	6.76	7.80	Yes	
18	0.01	0.02	0.02	0.02	0.20	6.24	8.32	10.40	12.48	Yes	
19	0.02	0.03	0.05	0.07	1.20	1.39	2.43	4.51	5.90	Yes	
20	0.01	0.01	0.02	0.02	0.20	6.24	6.24	8.32	8.32	Yes	
THD	1.01	1.59	2.05	2.19	4.00	25.26	39.69	51.31	54.86	Yes	

sub.net Substation Monitor



sub.net substation monitor delivers visibility of today's ageing electrical grid, and tomorrow's smart grid, to maximise efficiency and reduce risk.

Sub.net introduces **automatic analysis** to the substation, monitoring and identifying problems throughout grid installations – reducing costs and saving time and money.

sub.net...

- monitors your network assets for any faults 24/7 365 days a year.
- 2. performs **automatic fault analysis,** to verify performance of network assets.
- 3. e-mails ready analysed and prioritised event reports within moments, ensuring that the right people get **the right information right away.**

Manufacturing Options

Enclosure

- DIN rail mounting
- Portable case
- Wall / Pole mounting cabinet

Power supply

- 110/230V ac & 110/220V dc
- 30/50V dc
- 110/230V ac with external battery

Communications

V90 modem

- GSM/GPRS modem
- PSTN router

•

- SCADA (Modbus RS485/TCP)
- Synchrophasor (IEEE C37.118)

Time sync

- GPS receiver
- GPS aerial and cable

Input modules

- 3x VT & 3x CT
- 6x CT
- 1x DC

Current transformers

- Wedding ring (toroidal)
- Split core
- AC clamp
- Hall effect DC clamp
- 3 phase Rogowski probe

sub.net Specifications

INPUTS

Analogue inputs

VT - input - burden

- isolation

CT - input

Accuracy

- range Frequency response Sampling scheme Quantising resolution

Contact inputs

- wetting voltage

- debounce

16 30, 50, 110 & 220V dc. Polarity independent 0 - 10 ms

16 bits (65535 levels)

12. VTs, CTs or transducers

Scaled for load or fault levels

True synchronous sampling

Better than 0.1% of scale

24mW (500kR)

2.5kV ac

up to 8

150/300 Vac max. Phases isolated

30Hz - 3kHz (VT), DC - 3kHz (CT)

External interposing CT (clamp, toroidal etc.)

128 samples per cycle. (6.4 or 7.68kHz)

Up to 50 selected parameters.

& reactive power, NPS, ZPS, etc.

2-10s pre event, 10-60s post event

~ 800 parameters. Voltage, current & frequency, apparent, real & reactive power,

NPS, ZPS, power factor, imbalance,

Max, min & avg every 10 minutes

harmonics and flicker

50 or 60 samples per second

4-10 cycles pre event, 8-60 cycles post event

Voltage, current, frequency, apparent, real

EVENT CAPTURE (DFR)

- Waveform recording - sampling rate
 - recording time
 - records per event

RMS/swing recording

- channels
- sampling rate
- recording times

CONTINUOUS RECORDING

Trend recording

- channels

- sampling rate
- duration
- RMS log recording (DDR)
 - channels - sampling rate
 - recording time

OPERATING LIMITS

Voltage Current Frequency

Maximum & minimum value, rate of change Rate of change Maximum & minimum value, rate of change

REAL TIME CLOCK

Crystal Drift Synchronisation GPS accuracy

DATA STORAGE

Buffer storage Data storage

16Mbvtes 1024Mbytes flash memory

GPS (optional) Better than 1us

Temperature compensated 32 kHz Better than 4 ppm (~2s per week)

INTERFACE FUNCTIONS

User interface	Web browser (Internet Explorer, Firefox, etc.)
Event report delivery	Email, SMS or fax
Input data file format	COMTRADE (IEEE C37.111-1999)
Synchrophasor (PMU)	IEEE C37.118 (2005)

8 status, 2 LAN.

400V dc, 1A continuous

Solid state (IGBT)

System OK (N/C) Event (N/O)

Attention (N/O)

4

5A for 1s

3.75kV ac

COMMUNICATIONS

Modem - baud rate Up to 56 kbaud - DTE rate Up to 115 kbaud - line isolation 3kV PPP data protocol RJ11 - connector LAN 10/100 Mbps - datarate TCP/IP - protocol RJ45 - connector SCADA RS485/TCP - Modbus HTTP, SMTP **Network services**

LEDs

Top panel

STATUS RELAYS

Status outputs Contact rating Surge current Isolation Relay type Functions

POWER SUPPLY

Standard supply DC supply (option) Isolation Battery back up (option) Battery support time Power consumption

ENCLOSURE

DIN rail enclosure	
- size	315 x 110 x 75 mm
- weight	1.4 kg (3V & 9I)
Portable enclosure	
- size	406 x 330 x 174 mm
- weight	5.2 kg
Wall mounting cabinet	
- size	400 x 300 x 210 mm
- weight	11.5 kg
ENVIRONMENT	

Operating temperature Relative humidity up to 95%

eMS Limited reserves the right to update this specification without notice. Copyright © 2011 Embedded Monitoring Systems Limited.

110/230Vac 50/60 Hz and 110/220Vdc 30V or 50Vdc 1.5 kVac External 12V gel cell >2 Hrs (0.8Ah battery) <4W

E

-5 to 60 Deg C

26 weeks rotating buffer 12 selected parameters (as RMS/swing) 10 samples per second 14 day rotating buffer