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Relaxed Eddy Accumulator (REA)

GENERAL

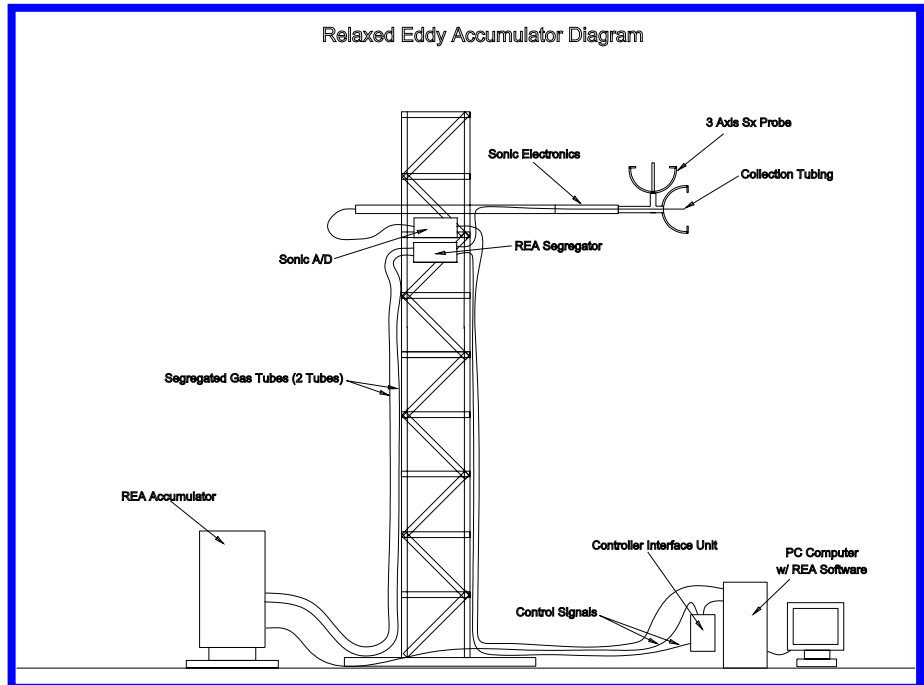
Relaxed eddy accumulation is a conditional sampling technique used to measure the vertical flux of atmospheric chemical constituents. Basically, the technique accumulates two segregated samples, one extracted from the rising air currents, the other from the falling currents. The flux is deduced from the difference in concentration between the two samples and the magnitude of the atmospheric vertical velocities during the sample collection period.

Unlike proportional eddy accumulation schemes, relaxed eddy accumulation sample collection flow rates do not vary directly with the magnitude of the vertical velocity; this flow is either "ON" or "OFF". Relaxing systemic requirements by eliminating proportionality allows sample collection using simple valves and a constant flow pump. Furthermore, compensation for measurement and switching time can now be provided, by queuing sample gas before segregation.

This technique was developed and verified by the National Center for Atmospheric Research, (NCAR), and has been patented.

The REA SYSTEM 5 is a fifth generation Relaxed Eddy Accumulator that provides uncompromising performance. The system supports eddy capture and real-time data collection at both 10 Hz and 20 Hz operations. Capture valve timing accuracy is better than ten microseconds within a resolution of one millisecond. Unlike other systems, this performance is not degraded when the high-speed data is written to disk or when data acquisition interrupts the processor.

Any REA systems or parts of systems purchased from Applied Technologies, Inc. include a license to use NCAR's patents.



REQUIREMENTS

- PC-AT or better hardware environment with 256 KB of memory.
- Disk size dependent upon required storage
- Two RS-232C compatible ports at 9600 baud
- A parallel port (LPT1)
- One ISA slot
- I/O space – 300 to 30F Hex
- Interrupt 7

BASIC SPECIFICATIONS

Flow Rate:	200 ml/min. to 50 l/min range, maintained within 10% of the software configurable flow value
Valve Latency:	Capture valves complete the change of state within <15.
Materials:	Materials in contact with the sample gas; Teflon®, Stainless Steel, Tedlar, Viton®, and PPS
Eddy Capture Ports:	3 eddy capture ports are provided, UP samples, DOWN samples and DEADBAND bypass
Phase Jitter:	Can automatically correct for up to 100 ms of data phase jitter from the sonic anemometer
Data Storage:	Velocity, Temperature, Tilt and Vibration can be stored to disk at 10 or 20 Hz – can also output to a remote computer
Valve Delay:	Capture valve delay programmable from 400 to 25,600 ms; can match required timing within 1 ms and valve switching signals repeatable within 10 µs
Sample Size:	User configurable from 3000 to 288,000 samples (5 min. to 8 hours @ 10 Hz)
Buffer Size:	Rolling buffer sizes, for averaging wind data, are configurable from 100-16,000 data points
Capture Valves:	Software control over the switching current and timing; 0-2 A, 15 ms pulses, followed by 0-500 ma holding current, can provide for high capacity valves
Purge Time:	The complete air path can be purged prior to sample collection
Start & Stop:	Programmable for minutes, hours, years in advance; controlled by the keyboard or a connected laptop
Logfile:	Status and operational information is stored to disk

OPTIONAL SPECIFICATIONS

Manual Accumulators:	Supports manual accumulators using 1 or 2 sets (a set may be either 2 or 3 bags)
Automatic Accumulators:	Supports automated accumulator arrays using 2 to 15 sets (custom arrays to 255 sets)
Accumulator Index Delay:	Compensates for the time a sample of air takes to move from the inlet to the accumulator bag (1 to 1,740 seconds)
Purge Time:	Air path can be purged prior to sample collection, for auto accumulators a range of 0-32, 400 seconds
Pump Flow:	Software flow control is provided for (6) optional pumps
A to D:	Supports 64 optional 16 bit A/D conversions @ 20 Hz, or 16 @ 100 Hz
Flow Configurations:	Supports a single pump pushing sample (start/stop in each feed line), or (3) pumps pulling sample and zero gas (continuous flow in each feed line)
Data Storage:	Sonic data and up to 8 data channels can be stored to disk in the REA Controller. This data is also sent to the Supervisor. Up to 64 additional channels can be acquired by the REA and sent to the Supervisor, but not stored in the Controller.
Supervisory Interface:	The software can interface with a laptop, providing control of the experiment using “Click and Drag” programs such as Labview, Visual Basic, etc. without introducing any timing errors inherent in Windows type environment.