Workshop 3: Real Time Automated Systems

Definition

Provides time/frequency to user specification in real time

- May have historical calibration

Do not require frequent operator action

- No full time operator
- May be fully unattended or remotely controlled

Typical applications include

- National time scales
- Remote time stations
- Imbedded part in Military systems and Telecommunications systems

Performance

- Time Accuracy — typically 100 nsec or better
- Frequency accuracy — 10^{-11} or better
- Frequency Stability — as good as 10^{-13} at 1 second to 10^{-13} at 1 day
- Usually require synchronization to national standard via GPS or 2 Way

Measurements

- Accurate time tagging of measurements very important

  - Use telephone or network time sync for control computer time

- Measurement system must produce quiet, unambiguous measurements

  - RF (5 MHz) measurements preferred over tick measurements
  - 1PPS measurements problems are rise time, triggering, cable length

Distribution Systems

- Environmental effects, temperature & humidity

- Use of high quality cable and connectors

- Greater than 100 db isolation between ports including output to input

- Widely distributed systems such as communication networks have special problems

Robustness

- Small errors should only cause small problems

  - e.g. loss of 1 device shouldn't kill the system

- Computer needs stable operating system and user software

- There is a trade-off between single point failures and problems caused trying to avoid single point failures.

- User equipment driven from real time systems should be tolerant of small output glitches

- Robustness is difficult to specify

  - Depends on user environment
  - Hard to think of everything

Maintenance and testing

- Box level field maintenance

  - Hardware is too complex to fix in the field

- Built-in test

- Remote diagnostic capability