CLOCK USER INTERFACES

Joe White, Moderator
U.S. Naval Research Laboratory

The following features were discussed:

Autolock: Locking on the wrong peak manually is a common problem, particularly in field sites where the operators do not have to work the clocks frequently.

Lower Weight: Many users felt that clocks, primarily cesium clocks, are too heavy. They expressed a willingness to trade some internal battery capacity for lower weight.

Computer Control/Monitoring: Several users felt that direct connection between a clock and a computer would simplify their operations by automatic clock monitoring. There was also interest in using a compputer interface to control the clock.

Outputs: In addition to the usual 1, 5, and 10 Mhz outputs, there was also interest in 100 MHz and 16 MHz. Fiber optic output was considered to be desirable in future desighns although some concern about noise was expessed.

Digital (calibrated) Frequency Control: This was considered desirable to achieve repeatable frequency adjustments. Tuning *via* synthesizer adjustment rather than C-field was felt desirable. The range of the tuning should be broad enough to get beats for measurements. Fine resolution was also desirable.

Cavity Tuning: Maser cavity tuning should also be user controllable.

Time of Day Ouput: This was felt to be immportant because of the ambiguity of tick measurements. Leap second handling is also important.

Reliability/Maintainability: Fewer periodic adjusments should be necessary. Infant mortality is a concern. Field *vs.* factory maintenance was an important owner decision. Issues include the high turnover of personnel, speed of repair, modular repair, and knowing that it works when fixed.

Remote Diagnosis and BIT (built-in-test): These were considered to be very important. Users wanted to be able to determine that a clock had really failed and be able to take appropriate action.

Monitors: More is better was the consensus to provide the operator with as much information about the health as possible. Microwave power level monitors were desired for cesium clocks. RS-232/HPIB and remote ops were felt to be important to provide the best interface to the user as opposed to front panel displays.

Output Isolation: Clocks with multiple outputs should have high isolation between outputs to minimize upsets caused by someone connecting or disconnecting loads. The parallel 5 MHz outputs on the front and rear panels of cesium clocks were cited as an example of this problem.

The following items were discussed regarding operators:

There is a trade-off on training. Factory training on clock maintenance is desirable. The availability of clocks and tet equipment was cited. It was agreed that it was impractical from the standpoints of cost and time to have every person trained at or even by the manufacturer. Instead, training a "trainer" at a factory facility was a good compromise.

Operators should be able to send data back from the field to a higher level of support for help in solving clock problems.

As expressed in the section on features, clocks should be self-diagnosing and the operator should be able to take corrective action based on that information.

Operators need help in locating problems (e.g. GPS/Rb hybrid). Troubleshooting flowcharts and on-line diagnostics would be helpful.