h/p 103AR

h/p 103AR and 104AR Quartz Oscillators make possible improved accuracy in Primary Frequency and Time Standard systems because they provide increased stability, maximum reliability and are easy to adjust.

Long-term stability of h/p 103AR and 104AR is conservatively rated at 5 parts in 10^{10}/day. Short-term stability, specified as 5 parts in 10^{10}*, includes effects of variations in supply voltage, load resistance, ambient temperature and other environmental conditions. Models 103AR and 104AR typically display short-term stability of one part in 10^{10} when operated in a reasonably constant environment.

Model 103AR provides two sinusoidal output signals, 1 MC and 100 KC, from a low source impedance at a power level well suited for distribution over 50-ohm systems. A separate 100 KC output is available for driving h/p 113BR Frequency Divider and Clock for time comparison measurements and for generating time signals.

Proportionally-controlled double ovens house the crystal and all critical frequency-determining elements and maintain their temperature constant within a few hundredths of a degree. Crystal dissipation level is kept constant at less than ¼ microwatt by AGC action. Frequency changes due to variations in supply voltage and load impedance are virtually eliminated as a result of internal voltage regulation and excellent buffering.

Completely transistorized, h/p 103AR and 104AR Quartz Oscillators are compact and rugged, withstand severe environmental conditions and operate for extended periods from standby batteries of moderate size.

Model 104AR has the same high stability as h/p 103AR and in addition provides a 5 MC output of extreme spectral purity. Spectra only a few cycles wide in the gigacycle region may be obtained by multiplication of this 5 megacycle output.

*Averaged over 1 second intervals.

Specifications

Overall Stability: Long-Term: 5 parts in 10^{10} per day. Short-Term: Better than 5 parts in 10^{10} averaged over 1-sec. intervals.

Output Frequencies: 103AR 1 MC, 100 KC, 1 v rms into 50 ohms; 100KC for driving h/p 113.
104AR 5 MC, 1 MC, 100 KC, 1 v rms into 50 ohms; 100 KC for 113.

Harmonic Distortion: At least 40 db below rated output.

Non-Harmonically Related Output: At least 80 db below rated output.

Output Terminals: 103AR and 104AR: 1 MC, 100 KC, front and rear BNC connectors. Clock drive 100 KC, rear BNC.
104AR: 5 MC front and rear BNC connectors.

Frequency Adjustments: Coarse: Screwdriver adjustment with range of approximately 1.5 parts in 10^6. Accessible through front panel by removing threaded plug.
Fine: Front panel control with range of approximately 600 parts in 10^{10}. Accessible through front panel by removing threaded plug. Digital indicator calibrated directly in parts in 10^{10}.

Monitor Meter: Ruggedized front-panel meter and associated selector switch monitors:
103AR and 104AR: SUPPLY voltage, OSC voltage, INNER OVEN current, OUTER OVEN current, 100 KC output, 1 MC output. 104AR: BIAS, 5 MC output.

Temperature Range: 0 to 50°C.

Size: Rack Mount: 5¼" high, 19" wide, 14" deep behind panel, including cable allowances. 16" deep overall.

Weight: 103AR, net approx. 17 lbs. 104AR, net approx. 17 lbs.

Power Requirements: 22 to 30 v dc, approx. 5 watts operating, approx. 10 watts during warmup. Dual power connectors at rear.

Accessories Furnished: 6 ft. power cable for connecting Quartz Oscillator to h/p 724 or 725AR Standby Power Supply.

Price: h/p 103AR, $2,500.00 (rack mount); h/p 104AR, $3,250.00 (rack mount).

Data subject to change without notice.

h/p 113BR

Specifications

Input Frequency: 100 KC for solar time, input bandwidth ± 300 cps. 100.3 KC for sidereal time, on special order.

Accuracy: 1) Accuracy of output pulse and sine-wave signals determined by accuracy of input frequency. 2) Time reference dial linearity ± 10 μsec.

Input Voltage: 0.5 to 5 volts rms.

Input Impedance: 300 ohms nominal.

Tick Pulse Output, positive: 1 pps with amplitude of 10 volts or more into minimum recommended load impedance of 4,700 ohms and 200 pf. Rise time, 2 μsec maximum; duration 20 μsec minimum; jitter 1 μsec maximum. Rear BNC connector.

Tick Pulse Output, negative: 1 pps with amplitude of 10 volts or more into minimum recommended load impedance of 1 Megohm and 100 pf. Rise time, 2 μsec maximum; duration 20 μsec minimum; jitter 1 μsec maximum. Front BNC connector.

Auxiliary Pulse Output, 1 pps: At least 2 volts positive into minimum recommended load of 50 ohms and 5,000 pf. Rise time, 1 μsec maximum; duration 200 μsec; jitter, 1 μsec maximum. Rear BNC connector.

Auxiliary Pulse Output, 1,000 pps: At least 4 volts positive into minimum recommended load of 1,000 ohms and 1,000 pf. Rise time, 2 μsec maximum; duration 20 μsec minimum; jitter, 1 μsec maximum. Rear BNC connector.

Auxiliary Output: 100, 10 and 1 KC sinusoidal, 0.25 volts rms, min. Source Impedance 1,200 ohms nominal. Front panel BNC connectors.

Time Reference: Continuously adjustable. Directly calibrated in 10 microsecond increments on dial and in milliseconds on mechanical counter.

Frequency Divider: Manually starting, regenerative type, fail-safe.

Effect of Transients: Will not gain or lose time because of: 1) ±300 volt step function on 100 KC input. 2) 0 to ±50 volt pulses, 0 to 500 pps, 1 to 10 μsec duration on 100 KC input. 3) ± 4 volt step in 26 v dc input.

Clock Mechanism: 24-hour dial; minute hand adjustable in 1 minute steps; second hand continuously adjustable. Manual start. Front panel adjustment of clock hands does not affect tick output. (12-hour dial on special order.)

Monitor Meter: Ruggedized meter and selector switch on front panel for checking supply voltage, divider operation (100 KC, 10 KC, 1 KC) and total clock current.

Increased accuracy from frequency and time standard systems is possible by use of the new h/p 113BR Frequency Divider and Clock. Precise comparisons between local standards and hf or vlf broadcasts based on national standards of time and frequency may be made simply and conveniently. Model 113BR also generates precise, adjustable time signals with accuracy determined by the driving oscillator.

Use of the 113BR simplifies recording drift rates, determining time or frequency differences in widely separated systems and permits adjustment of systems for maximum accuracy. By averaging out the effect of hf propagation path errors, use of the 113BR can reduce comparison error to a few parts in 10^{10} within several days. Model 113BR also simplifies vlf comparisons, especially where ICW transmissions are involved.

The h/p optical gating system (no contacts, no wear, cannot add jitter) and a directly-calibrated, precision phase shifter make possible the unique accuracy of the 113BR and provide time comparison capability of ± 10 microseconds, where signal conditions permit.

Fail-safe dividers and clock motor reduce the possibility of error, since (1) neither dividers nor motor can respond to spurious signals, (2) interruptions in driving signal or supply power stop all outputs.

Model 113BR is fully transistorized and meets performance requirements of MIL-E-16400.

Power Required: 22-30 v dc, approximately 2 watts. Recommended supply h/p 724BR, 725AR.

Dimensions: 19" wide, 7" high, 19½" deep behind panel.

Weight: Net 10 lbs. Shipping approximately 21 lbs.

Accessories Furnished: h/p 113A-16E Cable, 6 ft. long, connects 113BR to 724BR or 725AR Standby Power Supply.

Price: h/p 113BR, $2,750.00.

Data subject to change without notice.

h/p 724BR

Specifications

Output Voltage: 24 ±1 volts dc.

Rated Current (total external load): 300 ma, nominal.†

Over-Current Protection: Current limiter provides short-circuit protection, eliminates need for load fuses.

Alarm Indicators: Panel lamps indicate (1) OPEN AC LINE FUSES, or (2) AC OFF, indicating ac is not reaching power transformer and load is being supplied by standby battery.

Remote Alarm Provisions: DPDT relay contacts (form C) provided at rear terminals for operating remote alarm from separate power system. Contacts rated at 3 amperes (resistive) at 115 volts ac or 28 v dc.

Panel Meters: Voltmeter and ammeter indicate battery voltage and battery charge/discharge current.

Power Requirements: 115/230 ±10% v ac, 50-1,000 cps.

Output Connectors: MS type female connectors at rear mate with h/p 103AR/104AR, 113BR power cables.

Battery (supplied): h/p 724BR, Vented Nickel-Cadmium, 16 ampere hour: h/p 725AR, Sealed Nickel-Cadmium, 2 ampere hour.

Additional (external) Battery Provision: MS 3106E-14S-2S female connector, with cap, at rear. Mating connector supplied.

Weight: h/p 724BR, net 75 lbs., including battery.
h/p 725AR, net 20 lbs., including battery.

Dimensions: h/p 724BR, 19" wide, 7" high, 14" deep behind panel, including allowance for cables. h/p 725AR, 19" wide, 3½" high, 12" deep behind panel, including allowance for cables.

Accessories Furnished: Power cable, 6 feet long.

Price: h/p 724BR, including battery, $850.00 (rack mount).
h/p 725AR, price on request (rack mount).

†Suitable for operating h/p 113BR and 103AR or 104AR at any temperature from 0 to 50°C.

Data subject to change without notice.

h/p Standby Power Supplies, Models 724BR and 725AR, improve performance and reliability of frequency and time standard systems by assuring continued operation in the event of ac line power failure. Also, with these standby supplies you can use a standard at various locations, since the system can be kept in operation for extended periods during transport.

Models 724BR and 725AR are completely automatic, solid-state supplies specially designed to power the h/p 113BR Frequency Divider and Clock and h/p 103AR or 104AR Quartz Oscillators.* These supplies are designed to operate with standby batteries. The standby battery is kept charged and instantly assumes the load, without switching, in case of ac failure. When line power is restored the supply reassumes the load and automatically recharges the battery.

After a week of operation h/p 724BR provides a minimum of 48 hours standby operation at an average temperature of 25°C for an h/p Quartz Oscillator and a 113BR Frequency Divider and Clock. Under similar conditions, Model 725AR provides at least six-hour standby operation. A switch at the rear of the 724BR increases standby period at least 50%.

Output is voltage-regulated and current-limited, eliminating the need for output fuses. Operating aids include alarm lamps, contacts for remote alarms and connectors for additional standby batteries.

Both supplies will withstand severe environmental conditions. Model 724BR is equipped with heavy-duty chassis tracks. Models can be supplied to meet performance requirements of MIL-E-16400, Class 4.

*h/p 724AR, required for operation with h/p 113AR Frequency Divider and Clock, available on special order.