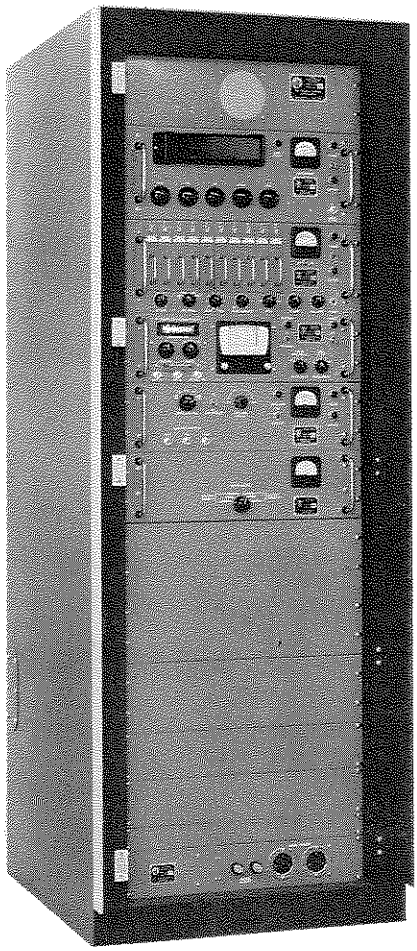
TECHNICAL BULLETIN NUMBER 6003A

VLF Frequency Comparison System
TMC Model VLFC-1
AN/URR-50(v)



Model VLFC-1

- Rapid-direct frequency comparison
- Correctable to 1 part in 10^{11} stability
- 10 channel VLF receiver
- 10 to 100 KC (1 cycle steps)
- 0.1 microvolt sensitivity
- Solid state construction
- Built-in frequency comparator
- Built-in chart recorder
- Optional features
  - "Failsafe" battery supply

As is now common knowledge, the network of standard frequency stations operating in the VLF range of 10 to 100 kc is being expanded world-wide. The overall stability of these stations is designed to exceed one part in 10^{11}. These stations are, of course, required because of the tremendously increased emphasis on precise timing and control which can be applied to missile work and particularly to maintain stability in synthesized transmitters and receivers. In addition, these stations may also be used for ultra-stable intelligence transmission. Obviously, the receiving equipment must be equally stable, must be capable of receiving the desired information and must be "fail safe". Means must be provided to record and use the service which is available.

VLF Frequency Comparison System

The VLFC-1 Frequency Comparison System fulfills all of the foregoing requirements by providing:

1. An excellent VLF receiver capable of receiving all known information to be carried on these stations.

   This receiver contains ten fix tuned channels which may be instantly selected, and a small antenna for receiving work can be supplied.

2. The system provides for the direct comparsion and correction of a local standard to practically the same stability as the transmitting station. The word "practically" is used due to the diurnal frequency shift to the transmitting station at sunrise and sunset. To defeat this, measurements should be taken when the effect is not present.

3. In the event of power failure, the unit will automatically switch to battery power, when battery power is included in the system.

   Once the signal has been received and the station standard "locked on", not only can the variation be observed and recorded, but by simple accessory equipment, such as our Model LMC-10 Multicoupler, this ultrastable frequency can now be distributed to a number of synthesized transmitters or receivers.

Many other features are also included in this system, such as an alarm if drift goes beyond tolerance. Solid state technology is employed throughout and the frequency comparison unit has a built in chart recorder.

TECHNICAL SPECIFICATIONS, TMC MODEL VLFC-1.

FREQUENCY RANGE:	10 to 100 kc with plug-in fixed tuned RF amplifiers selectable by front panel control. Up to 10 plug-in modules can be inserted into the receiver.
MODES OF OPERATION:	Continuous carrier and CW. FSK with appropriate converter.
STABILITY:	1. Continuously corrected to parts in 10^9. 2. 1 part in 10^9 for 24 hours.
INPUT IMPEDANCE:	50 ohms nominal.
SENSITIVITY:	A 0.1 microvolt signal impressed across 50 ohms at the input of the receiver will produce a minimum of 10 db signal + noise ratio at 100 cps bandwidth.
IF BANDWIDTH:	100 cycles at 3 db points, 50 cps bandpass is available at a slight increase in cost.
TUNING:	1 cycle steps from 10 kcs to 99.99 kcs and displayed on 1″ illuminated nixie indicators.
REFERENCE STANDARD CORRECTION:	An internal phase detector provides a DC correction voltage to the reference standard that is derived from the difference between the received RF signal's phase and that of the synthesizer output.

RF NOISE CANCELLATION:	An RF noise cancelling circuit is incorporated in the individual RF tuning modules and is controlled on the front panel.
FREQUENCY STANDARD ADJUSTMENT:	Multi-turn front panel control with 1000 dial divisions provides total deviation of $\pm$ 100 parts in 10^9 with resettable accuracy of 1 part in 10^9.
ELECTRONIC CORRECTION: (from synthesizer)	$\pm$ 100 parts in 10^9 (BNC connector).
OUTPUTS (front panel):	1. 1 mc at 1 volt across 50 ohm load (BNC). 2. 100 kc at 1 volt across 50 ohm load (BNC). 3. 10 mc at 1 volt across 50 ohm load (BNC).
OUTPUTS (rear panel):	1. 1 mc at 1 volt across 50 ohm load (BNC). 2. 100 kc at 1 volt across 50 ohm load (BNC). 3. 10 mc at 1 volt across 50 ohm load (BNC). (1, 2, and 3 are in parallel with front panel outputs. 4. 1 mc output direct from standard through isolation resistor.
ERROR READABILITY:	Minimum detectable error $\pm$ 2 parts in 10^{10}.
MAXIMUM ERROR DISPLAY TIME:	Maximum time to display; 1 part in 10^{10}, 1 second; 1 part in 10^{11}, 10 seconds.
ERROR MULTIPLICATION FACTOR:	Adjustable error multiplication rate from 10 to 10,000 in 4 detented switch positions.
BANDWIDTH:	100 cycles, 50 cps bandwidth available at slight increase in cost.
AGC:	Amplified and delayed AGC provides no greater than 3 db change in output for an 80 db change in input signal.
TYPE OF DETECTION:	Product detector.
BFO:	Adjustable 0 to 2.5 kc from IF frequency.
DISTORTION:	Total harmonic and intermodulation distortion 1% or less at full power output.
AUDIO OUTPUT:	500 milliwatts, 4 ohm unbalanced and one milliwatt (0 dbm) 600 ohm balanced center tapped output.
AUDIO AMPLIFIER RESPONSE:	Constant within $\pm$ 1.5 db from 100 to 2500 cps.
ENVIRONMENTAL CONDITIONS:	Designed to operate in any ambient temperature range from 0 to 50° C and any value of humidity up to 90%.
BATTERY:	A battery drawer is provided that will accept up to four BA-101 plug-in batteries (listed under OPTIONS/ACCESSORIES) to provide up to 16 hours emergency operation. When batteries are used in the system, they are maintained on trickle charge.

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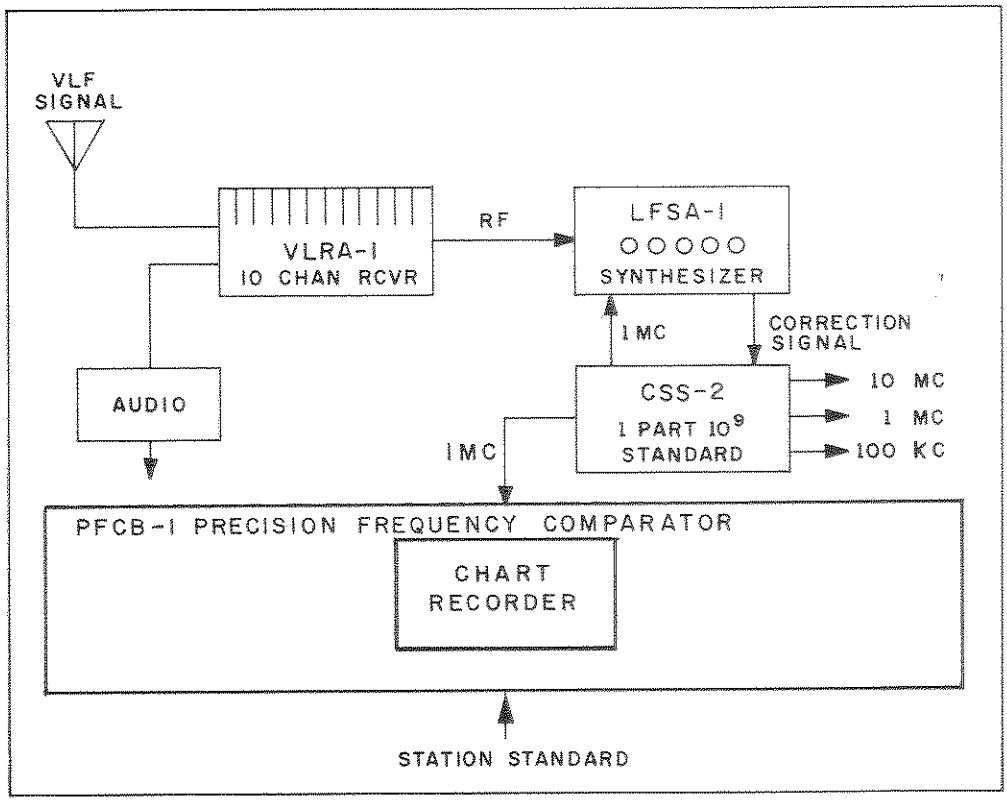
SIZE:	30½″ h × 20½″ w × 21½″ d with battery supply for four hour operation (less shock mounts.)
POWER:	105/115/125/210/230/250 v AC, 50/60 cycles, single phase, 24 watts.
NOMENCLATURE:	AN/URR-50(v)
COMPONENTS AND CONSTRUCTION:	All equipment manufactured in accordance with JAN/MIL specifications wherever practicable.
WEIGHT:	Approximately 110 pounds. (less batteries.)
OPTIONS/ACCESSORIES:	(Priced Separately).
Batteries:	Type BA-101 rechargeable nickel cadmium batteries plug into BPSX-1. Each battery has 26.5 volts with a 2.5 ampere hour rate. 2 batteries supply 4 hour operation. 4 batteries supply 8 hour operation.



FUNCTIONAL BLOCK DIAGRAM MODEL VLFC-1

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