



STANFORD RESEARCH SYSTEMS

LORAN-C frequency standard



FS700 LORAN-C 10 MHz frequency standard

\$2950 (U.S. List)

- 10^{-12} long term stability
- 10^{-11} short term stability (opt. 1) (10^{-10} standard)
- Adjustable frequency output from 0.01 Hz to 10 MHz
- Four 10 MHz outputs
- Distribution Amplifier allows fanout to other locations or instruments
- Phase detector with strip chart output
- All transmitter stations preprogrammed
- Six adjustable notch filters
- GPIB (IEEE-488) interface
- Active remote antenna included

The FS700 brings the frequency stability of a Cesium atomic clock into your lab at a fraction of the cost. Capable of providing a NIST traceable frequency reference anywhere in the U.S.A., Europe or Asia, the FS700 is truly the **optimum frequency management system.**

The FS700 has eliminated the traditional problems associated with other frequency standards. The FS700 is immune to the frequency errors of WWV caused by changes in position of the ionospheric layer because it receives and locks to the LORAN-C ground wave. And, unlike GPS, coverage is complete. More than 50 LORAN-C transmitters are maintained by the U.S. Coast Guard. Each station maintains 3 Cesium atomic standards which are constantly compared, synchronized and calibrated by the U.S. Naval Observatory. The reception range of the FS700 is up to 1500 miles and GRIs for existing LORAN-C stations are preprogrammed. Future stations may be added by the user.

The FS700 provides a precision frequency output [FREQ OUT] which is selectable from 0.01 Hz to 10 MHz in a 1-2.5-5 sequence. In addition, there are four 10 MHz distribution amplifier outputs on the rear panel for precision frequency references or timebases for other laboratory instruments. If additional outputs are needed at



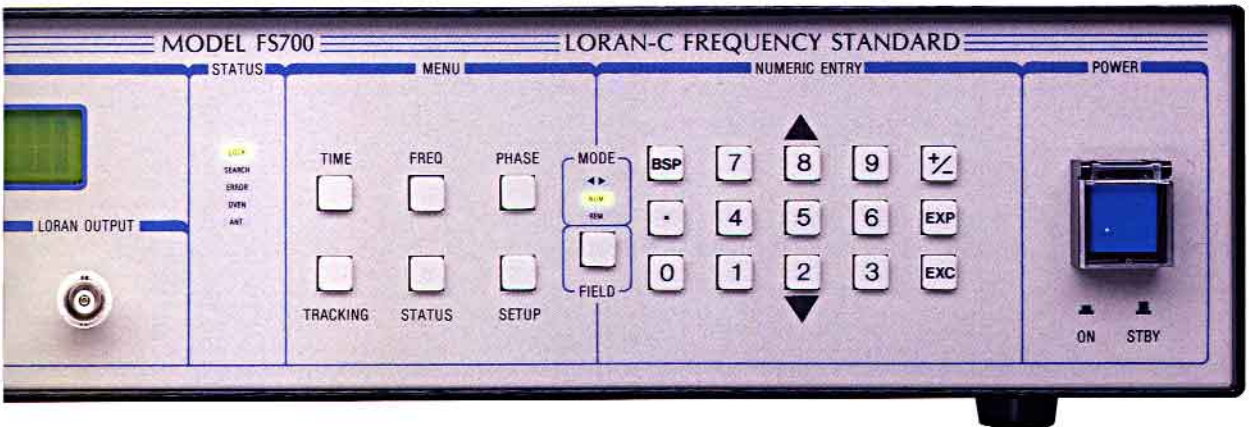
a remote location, the FS710 AGC Distribution Amplifier may be used. All outputs have long term stability equivalent to a calibrated cesium clock (10^{-12}). The internal oven-stabilized crystal oscillator provides short term stability of 10^{-10} and with the optional low phase noise oscillator, 10^{-11} short term stability is achieved.

An internal phase detector monitors the phase difference between the FREQ OUT and the OSC IN input for easy calibration of other time-bases or frequency sources. The phase difference is available both on the LCD display and at the PHASE OUT BNC as an analog voltage proportional to phase.

An 8-foot long remote active whip antenna, which is easily mounted on the roof of a building, is capable of driving up to 1000 feet of coaxial cable to the receiver. The weatherproof antenna base contains a FET preamplifier, bandpass filter and switchable attenuator. Six adjustable notch filters in the receiver allow the user to reject unwanted interference for optimum reception.

The FS700 gives you Cesium stability at a low cost with none of the drawbacks of other frequency standards.

The optimum frequency management system.



Specifications

Long Term Frequency Stability	10^{-12} , The same as the LORAN-C reference oscillator
Internal Oscillator	10^{-10} Short Term Stability, $50 \times 10^{-12}/s$ Allan Var.
Option 01 Oscillator	Low Phase Noise, 10^{-11} Short Term Stability, $5 \times 10^{-12}/s$ Allan Var.
Frequency Output	0.01 Hz to 10 MHz, 1,2.5,5 sequence, TTL level
10 MHz Outputs	4 Outputs, 1 Volt peak-to-peak into 50Ω
OSC IN Input	1 K Ω , 1 Volt peak-to-peak min. signal level required, 50 Volts max.
Phase Output	0.01 Volt/Degree, 0 to ± 360 Degrees. Gives Phase between OSC IN and Frequency Output for frequencies between 100 KHz and 10 MHz.
LORAN Output	Filtered and gain controlled antenna signal, typically 6 Volts pk-to-pk
Receiver Sensitivity	Will lock with signal-to-atmospheric noise ratio of -10 dB or better.
Station Search	All available stations preprogrammed, Auto-Seek finds and tracks strongest station.
Filters	6 Adjustable 30 dB notch filters, 3 at 40-90 KHz, 3 at 110-220 KHz.
Computer Interface	IEEE-488 included, RS232 optional
Antenna	8 Foot Active Whip with 0 dB and 30 dB switchable attenuator and bandpass filter in weatherproof housing.
Power	100/120/220/240 Vac, 50 Watts, 50/60 Hz
Dimensions	17.0" \times 17.0" \times 3.5" (W \times L \times H)
Weight	14 lbs.



FS710 AGC Distribution Amplifier

For installations of the FS700 which require many outputs at a remote location from the instrument, the FS710 AGC Distribution Amplifier offers 7 completely independent outputs from one input. With an AGC circuit capable of adding up to 30 dB of gain, this amplifier can be used at locations as far as a mile from the FS700.

Specifications

Input

Frequency	10 MHz \pm 100 kHz
Type	Insulated BNC, Transformer Coupled
Level	50 mV to 5 Vac peak-to-peak
VSWR	< 1.2 at 10 MHz

Output

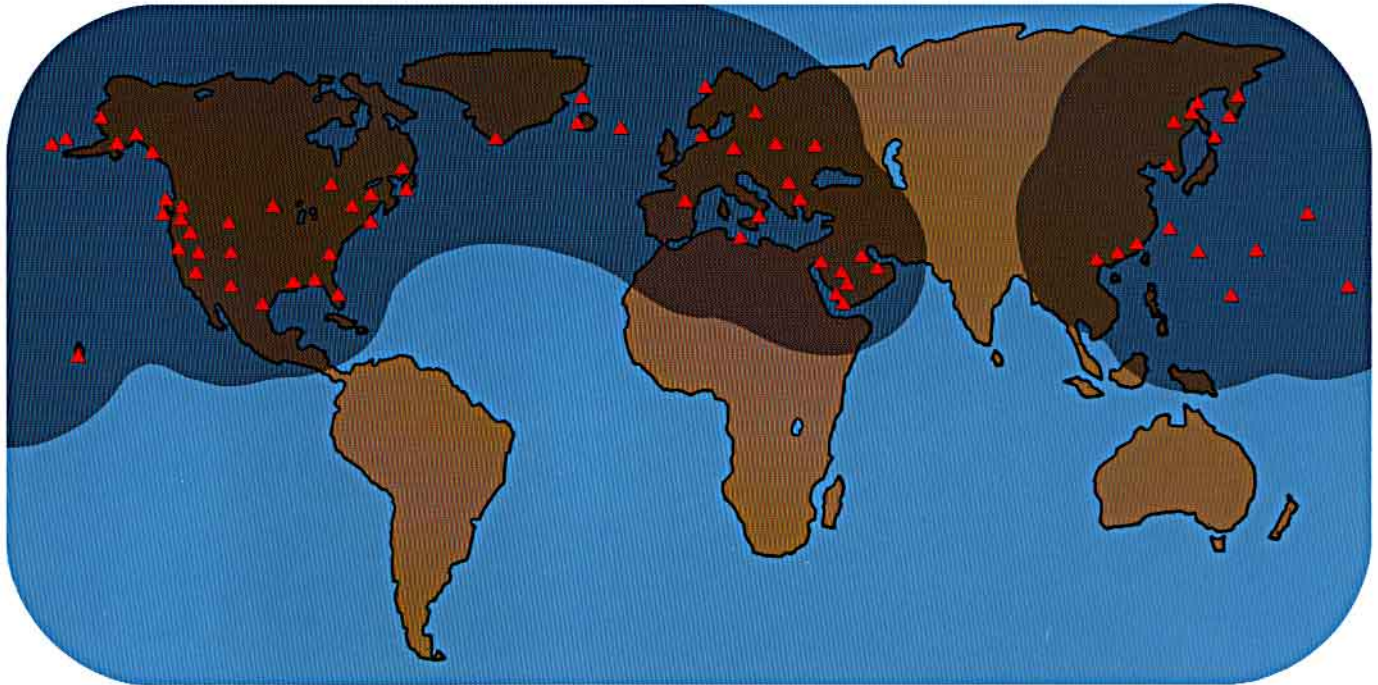
Type	7 Local Grounded BNCs
Level	1 V peak-to-peak into 50Ω , $\pm 10\%$ or 2 V peak-to-peak into 10 k Ω , $\pm 10\%$

VSWR	< 1.2 at 10 MHz
Distortion	< -25 dBc

General

Power	100/120/220/240 Vac, 3 Watts, 50/60 Hz
Dimensions	7.75" \times 7.5" \times 2" (W \times L \times H)
Weight	3 lbs.

LORAN-C transmitter locations and reception range



Chain / GRI	Transmitter Location	Chain / GRI	Transmitter Location	Chain / GRI	Transmitter Location
West Coast USA 99400 μ s	Fallon, Nevada, USA George, Washington, USA Middletown, California, USA Searchlight, Nevada, USA	Canadian East Coast 59300 μ s	Carolina Beach, North Carolina, USA Dana, Indiana, USA Caribou, Maine, USA Nantucket, Mass., USA Cape Race, Newfoundland, Canada Fox Harbor, Labrador, Canada	Western USSR 80000 μ s	Al Muwassam, SA Bryansk, USSR Petrozavodsk, USSR Solnim, USSR Simferopol, USSR Syzran, USSR
Canadian West Coast 59900 μ s	Williams Lake, BC, Canada Shoal Cove, Alaska, USA George, Washington, USA Port Hardy, BC, Canada	Icelandic 99800 μ s	Sandur, Iceland Angissoq, Greenland Ejde, Faeroe Island, Denmark	Eastern USSR 79500 μ s	Aleksandrovsk, USSR Petropavlovsk, USSR Ussuriysk, USSR
North Central USA 82900 μ s	Havre, Montana, USA Baudette, Minnesota, USA Gillette, Wyoming, USA Williams Lake, BC, Canada	Labrador 79300 μ s	Fox Harbor, Labrador, Canada Cape Race, Newfoundland, Canada Angissoq, Greenland	East Asian 59700 μ s	Pohang, Korea Hokkaido, Japan Hampyong, Korea Gesashi, Okinawa Xindu, PRC
South Central USA 96100 μ s	Boise City, Oklahoma, USA Gillette, Wyoming, USA Searchlight, Nevada, USA Las Cruces, New Mexico, USA Raymondville, Texas, USA Grangeville, Louisiana, USA	Norwegian Sea 79700 μ s	Ejde, Faeroe Island, Denmark Sylt, Germany BO, Norway Sandur, Iceland	Chinese 69300 μ s	Xinhe, PRC Zhangxi, PRC Iwo Jima, Japan Marcus Island, Japan Hokkaido, Japan Gesashi, Okinawa, Japan Barrigada, Guam
Great Lakes 89700 μ s	Dana, Indiana, USA Malone, Florida, USA Seneca, New York, USA Baudette, Minnesota, USA Boise City, Oklahoma, USA Malone, Florida, USA	Mediterranean Sea 79900 μ s	Jan Mayen, Norway Sellia Marina, Italy Lampedusa, Italy Kargabaran, Turkey Estarrit, Spain	Northwest Pacific 99700 μ s	Saint Paul, Pribilof Is., Alaska, USA Aitu Alaska, USA Point Clarence, Alaska, USA Narrow Cape, Kodiak Is., Alaska, USA Tok, Alaska, USA
Southeast USA 79800 μ s	Grangeville, Louisiana, USA Raymondville, Texas, USA Jupiter, Florida, USA Carolina Beach, North Carolina, USA	France 89400 μ s	Lessay, France W-Soustons, France	North Pacific 99900 μ s	Narrow Cape, Kodiak Is., Alaska, USA Shoal Cove, Alaska, USA Port Clarence, Alaska, USA Johnston Island, Hawaii, USA Upolu Point, Hawaii, USA Kure Island, Hawaii, USA
Northeast USA 99600 μ s	Caribou, Maine, USA Nantucket, Massachusetts, USA	Saudi Arabia North 89900 μ s	Salwa, SA Afif, SA Ar Rugi, SA Ash Shaykh Humayd, SA Al Lith, SA	Gulf of Alaska 79600 μ s	
		Saudi Arabia South 71700 μ s	Al Muwassam, SA Al Khamasin, SA Salwa, SA Afif, SA Al Lith, SA	Central Pacific 49900 μ s	

Ordering Information

FS700	LORAN-C Frequency Standard	\$2950
Option 01	Low Phase Noise Oscillator	\$ 450
Option 02	RS232 Computer Interface	\$ 350
0700ANT	Replacement Antenna Assembly	\$ 250
0700LNG	Lightning Protection Module	\$ 100
FS710	Distribution Amplifier	\$1000



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1290 D Reamwood Avenue • Sunnyvale, CA 94089
Telephone (408) 744-9040 • FAX: 4087449049

email: info@thinkSRS.com Web: www.thinkSRS.com