

THE FTS 1050A/015 DISCIPLINED FREQUENCY STANDARD

ADVANTAGES

- ! Digital phase lock to external reference
- ! Low aging, $<10^{10}$ per day
- ! Outputs of 1 MHz, 5 MHz and 10 MHz; 100 kHz and 1 PPS optional
- ! Complete function controls on front panel
- ! Rear panel output
- ! Rear panel monitor output
- ! Retains reference frequency after loss of lock within 10^{-12} precision
- ! New low phase noise, -160 dBc at 10 kHz
- ! Internal Battery and Automatic Charger

APPLICATIONS

Makes an ideal and cost effective frequency standard for a remote station. The DFS provides full, state-of-the-art spectral purity and short-term frequency stability of an ultra-stable quartz oscillator. At the same time, it is controlled, in long term, by the signal received from the central master reference (usually cesium). Perturbations and interference due to the connecting link between the master station and remote site are removed. In case of breakdown in the master station or the link, graceful degradation of the long-term stability occurs: the last (cesium) reference frequency from the master reference is stored in the memory of the DFS.

- ! Very narrow band tracking filter at the output of a LORAN-C receiver or cesium standard.
- ! Low noise, low aging rate, frequency standard for satellite communications, radar and navigation systems.
- ! Portable clock for both time-transfer and frequency transfer applications. The DFS can be synchronized in time and in frequency (synchronized) to a local standard and transported to a remote site using internal battery power.

GENERAL DESCRIPTION

The FTS Disciplined Frequency Standard (DFS) is designated as Option 015, an additional feature to the FTS 1050A Quartz Frequency Standard. The DFS provides for phase lock to an external reference signal with digital memory of the last locked frequency. This instrument features multiple outputs and low-aging characteristics, as well as excellent short and long-term frequency stability. It also contains an Internal Battery and Automatic Charger (nominal 6h @25°C).

DESIGN FEATURES

The DFS automatically phase locks to an external 5 MHz reference. A loop time constant of 1 s or 100 s may be selected to optimize the overall performance of the phase lock loop in the presence of noise on the reference signal.



The phase lock integrator is implemented by means of a hybrid analog/digital integrator, which permits the attainment of very long time constants without the use of large capacitors and high values of integrator resistance. The analog/digital integrator retains the last value of the reference signal, thus providing a frequency memory with a resolution of 2.5×10^{-12} . The DFS will automatically re-lock upon restoration of the external 5 MHz.

In the absence of an external reference, the DFS provides performance identical to that of a standard FTS 1050A Quartz Frequency Standard. The DFS also provides unusually complete monitoring and alarm functions. In addition to oscillator and power supply indicators, front panel LED lamps are provided on the DFS, which indicate the following:

- ! Phase lock
- ! Latched - "loss of phase lock"
- ! Low internal oscillator RF amplitude
- ! Low external oscillator RF amplitude
- ! Phase detector output exceeds preset limits (static phase error)
- ! Digital tuning voltage exceeds preset upper or lower limits
- ! TTL-compatible (open collector) logic signals are provided at a rear-panel connector for remote monitoring of the above status indicators.

The DFS provides three buffered frequency outputs of 1 MHz, 5 MHz and 10 MHz. A 100 kHz output is available as Option 001 and a 1 PPS output as Option 003. The internal quartz crystal oscillator exhibits unusually high spectral purity at frequencies close to the carrier frequency, permitting multiplication to millimeter-wave frequencies with excellent signal-to-noise ratio. The oscillator module incorporates the unique FTS single stage solid state oven and advanced design and component selection techniques to insure high stability operation and ruggedness in field use.

Normally operated from a 115 or 230 V ac, 47 to 400 Hz power source, these instruments can also be operated from an external dc source (26 to 30 V). Option 002 is a built in standby battery charger. A unique dynamic battery tester is included in the design to permit determination of battery charge condition without perturbation of the output. In the event of external power failure, switchover to the internal battery is automatic.

FTS 1050A/015 SPECIFICATIONS

| PARAMETER | |
|---|--|
| Outputs Output amplitude/50Ω Harmonic distortion Spurious signals: 5 MHz 100kHz, 1 MHz, 10 MHz | 1 MHz, 5 MHz and 10 MHz 1 V rms - 40 dB - 80 dB - 70 dB |
| Aging Per Day (see note) Short-Term Stability For averaging time | 1×10^{-10} 1×10^{-12} 1×10^{-12} 1×10^{-12} |
| SSB Phase Noise(BW=1 Hz) For offset from signal of (5 MHz output) | 1 Hz -116 dBc 10 Hz -140 dBc 100 Hz -150 dBc 1000 Hz -157 dBc 10000 Hz -160 dBc |
| Warm-Up Time to Lock | 30 minutes |
| Frequency Adjustment Range Front Panel (5 digit) | 4×10^{-7} |
| Maximum Frequency Change as Function of: Operating Temperature Load change (50Ω" 10%) | 1×10^{-9} 5×10^{-11} |
| Operating Temperature Range | 0 to 50°C |
| Non-Operating Temperature Range with Optional Battery | -60 to 80°C -40 to 60°C |
| External Phase Lock External Oscillator Frequency External Oscillator Level Resolution Loop Time Constant Digital Tuning Range Automatic Acquisition Range | 5 MHz 1 V rms " 2.5×10^{-12} 1 s or 100 s switch-selectable 2×10^{-8} 2×10^{-8} |
| Power Requirements dc Input ac Input Battery | 26 to 30 V 13 W (typical) at 25°C 115 or 230 V " 10% 47 to 400 Hz 30W (typical) at 25°C (~6 h) |
| Dimensions Height Width Depth | 32 " (89 mm) 19" (483 mm) 18" (457 mm) |
| Weight Basic Unit | 33 lb. (15 kg) |

OPTIONS

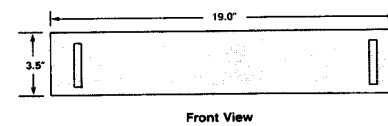
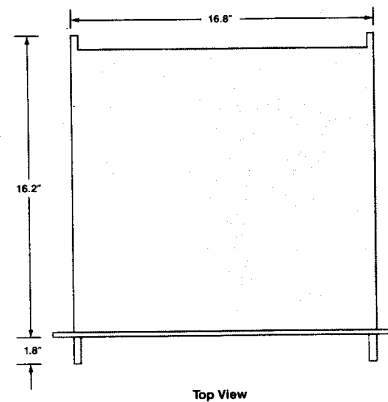
Option 001

100 kHz Output: 1 vrms/50 ohm on rear panel

Option 003

1 PPS Output: Rear panel output; may also be used to drive a digital clock.

Other options or features to support your needs are available. Please contact the factory for more information.



NOTE: Aging typically improves to a level of parts in 10^{11} per day. Aging rates as low as 1×10^{-12} observed after years of unperturbed operation.

11/98 - Specifications subject to change without notice.

1050A015.WPD