



APPLICATIONS

Frequency and time (F&T) signal generation and distribution for applications such as:

- Space telescope arrays and networks
- UTC time realization and distribution
- Ultra-stable F&T transfer and comparison
- Positioning, navigation and timing

BENEFITS

- Stability better than state-of-the art masers at RF outputs ($ADEV < 1E-13$ at 1 s)
- Full redundancy & no single point of failure
- **Remote or local control** via [EPICS](#)
- Advanced monitoring and control features

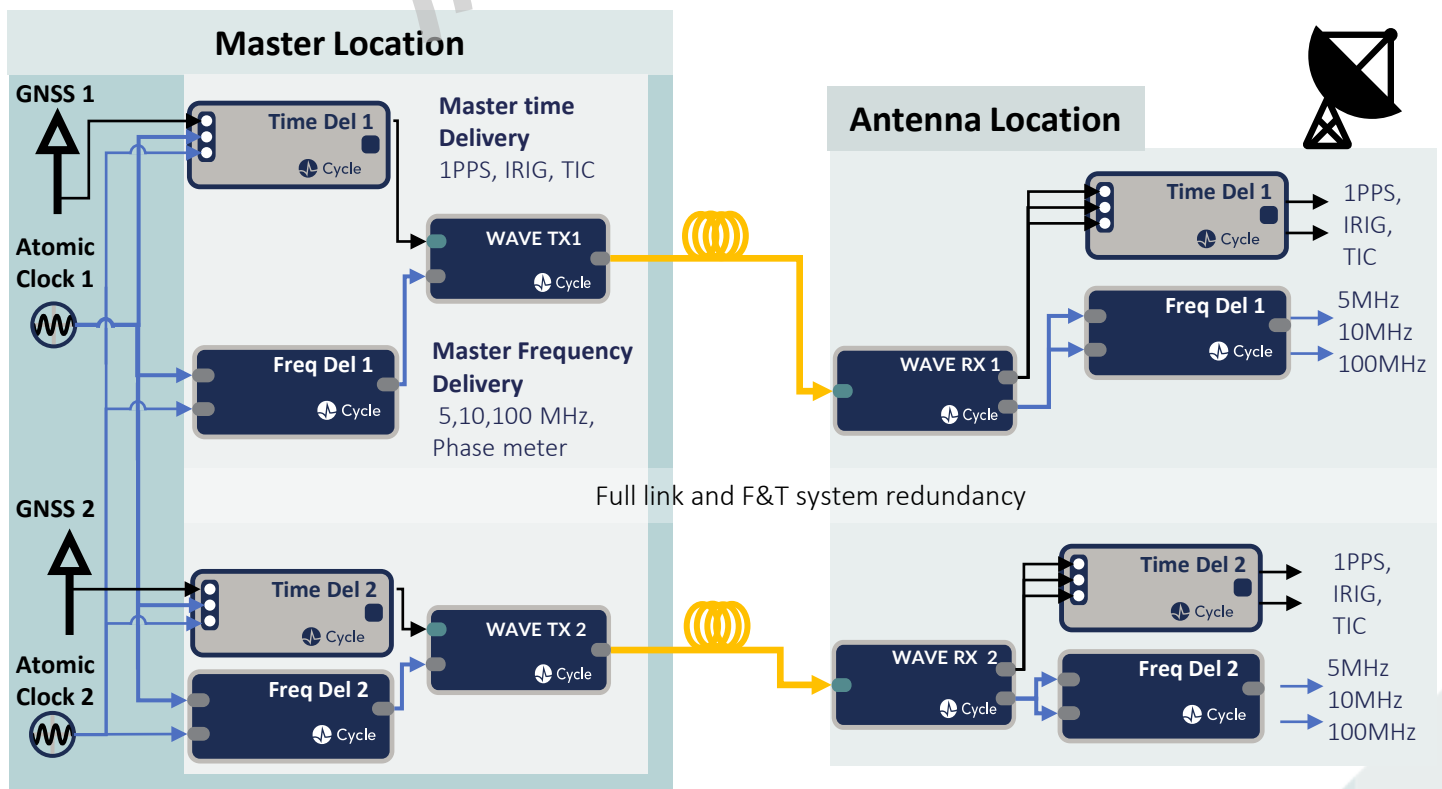
DESCRIPTION

The F&T system comprises of two redundant signal generation and distribution subsystems.

It can house Rubidium or Cesium clocks within the same rack or can alternatively integrate external active Hydrogen maser signals.

If necessary, the F&T signals can be transmitted to multiple remote locations either via phase-stable coaxial cables or via actively stabilized fiber optic links delivering femtosecond-level stability.

Additionally, the system includes redundant GNSS receivers with UTC tracking and referencing, high-resolution time interval counters for precise 1PPS measurements, and phase meters for detailed phase and frequency analysis, enabling real-time performance monitoring.





SPECIFICATIONS

Parameter	Specification	Comment	
Timing jitter	< 200 fs RMS	integrated residual noise [0.1 Hz – 100 kHz] ¹	
Frequency range	[10 MHz – 4 GHz]	at [10 – 13 dBm] input power	
Control system interface	EPICS	via TCP/IP	
Dimensions	42U or 47U	19” rack including all necessary F&T generation & distribution modules	
Residual ADEV	< 1.5E-13 at 1 s < 2E-14 at 10 s < 5E-15 at 100 s < 2E-15 at 1 000 s < 2E-15 at 10 000 s	with active fiber delay stabilization ¹	
Phase noise	Offset frequency	10 MHz carrier	100 MHz carrier
	1 Hz	-105 dBc/Hz	-100 dBc/Hz
	10 Hz	-130 dBc/Hz	-115 dBc/Hz
	100 Hz	-150 dBc/Hz	-125 dBc/Hz
	1 000 Hz	-160 dBc/Hz	-153 dBc/Hz
	10 000 Hz	-160 dBc/Hz	-162 dBc/Hz
	100 000 Hz	-160 dBc/Hz	-163 dBc/Hz
1PPS outputs			
Signal level	2.5 V TTL	50 Ω impedance	
Pulse rise and fall times	≤ 1 ns	from 10% to 90% level	
Pulse duration	20 μs – 500 ms	adjustable	
Return loss	30 dB	at signal outputs	
Delay adjustment	10-ns step size	at 100-MHz input	
Timing jitter	< 5 ps RMS	added noise to the RF input	
IRIG outputs			
Timecode	IRIG-B	contact Cycle for more details.	
F&T distribution amplifiers (multiple modules can be added)			
Frequency distribution	1 x 12	1 input, 12 outputs per module [5 MHz, 10 MHz & 100 MHz]	
1PPS or IRIG distribution	2 x 10	2 switchable inputs, 10 outputs per module	
Phase/frequency meter			
Input signal	Sine wave	[5 MHz – 100 MHz] frequency and [7 – 10 dBm] power	
Input channels	4 x SMA type	ch1 is reference. Real-time phase, frequency and ADEV at 1-s rate, all combinations of two channels are reported.	
ADEV measurement floor	< 4E-14 at 1 s < 1E-14 at 10 s < 2E-15 at 100 s < 1E-15 at 1 000 s < 1E-15 at 10 000 s		
Time interval counter			
Input signal	1 PPS	2.5 V TTL at 50 Ω impedance	
Input channels	4 x SMA type	real-time time interval measurements at 1-s rate, all combinations of two channels are reported.	
Resolution	20 ps RMS		
GNSS tracking & referencing			
GNSS receiver	Furuno GT-100	SMA-type, multi-GNSS receiver optional with a GNSS antenna	
Outputs	1PPS & 10 MHz	SMA-type, synchronized UTC time and frequency output	
Requirements			
Fiber link length	< 10 km	contact Cycle for longer fiber links.	
Fiber link loss	< 10 dB	if higher fiber loss, see option H: EDFA.	
Fiber link reflectance	< -40 dB	APC type fiber connectors are recommended.	

¹ TX and RX rack units shall be in a thermally controlled environment (temperature +18 to +24°C, with slope < 0.4°C/h and variation < 1°C pk-pk; humidity < 60 %RH with variation < 10 %RH pk-pk).