

# Precise Time and Frequency Equipment



Drumgrange has specialist, broad based expertise in time standards technology and offers both Caesium and Rubidium Precise Time and Frequency Equipment (PTFE). The Caesium based system has an integral 4th generation GPS receiver module, which disciplines a secondary Rubidium; the Rubidium based system uses dual redundant Rubidiums.

Both PTFEs utilise the US Naval Observatory maintained co-ordinated Universal Time (UTC), obtained via the NAVSTAR Global Positioning System (GPS). In the temporary absence of GPS satellite received time, the Drumgrange PTFE will maintain precise time to an accuracy of:

- Caesium: less than 50 $\mu$ sec after 90 days without GPS
- Rubidium: less than 250 $\mu$ sec after 45 days without GPS

## Options

- Custom interface and output signal requirements implemented (frequency outputs, time messages, fibre optic interfaces) via Interface Modules, as required, including customised distribution
- Alternative levels of redundancy available (with marginal decrease in reliability)
- Back-up battery (available in separate shelf unit providing more than one hour at full load)



## Caesium

- Caesium tube primary oscillator
- Rubidium secondary oscillator
- Highly stable phase-lock-loop control circuit for the secondary rubidium source
- Integral GPS receiver module
- Highly accurate and stable precise time and frequency in the temporary absence of GPS satellite information
- Automatic and instantaneous switching to internal source should GPS be lost or degraded
- Supports the NATO PTTI interface in accordance with STANAG 4430
- High reliability due to self-arbitration and redundancy

Drumgrange's rubidium based PTFE is currently in service with the Royal Navy as Outfit FSF and is fitted to some twenty-five operational ships. Outfit FSF is in service on the Royal Navy Type 45 Destroyer and is being fitted to Type 26.



## Rubidium

- Dual redundant internal Rubidium frequency source
- Highly stable phase-lock-loop control circuit for each RB oscillator
- GPS interface in accordance with ICD-GPS-060
- Supports the NATO PTTI interface in accordance with STANAG 4430
- High reliability due to self-arbitration and redundancy

Technical Specification	Caesium	Rubidium
Frequency Accuracy	$3 \times 10^{-12}$	$5 \times 10^{-11}$
Frequency Stability (short term)	better than $5 \times 10^{-12}$ per day	better than $2.5 \times 10^{-12}$ per day
Frequency Stability (long term)	better than $8 \times 10^{-14}$	-
Ageing	-	$5 \times 10^{-11}$ /month
Time Accuracy (GPS accessible)	within 100ns	within 100ns
Time Accuracy (GPS lost)	less than $50\mu\text{s}$ after 90 days	less than $250\mu\text{s}$ after 45 days
Electrical Power Source	115V AC 60Hz / 240V AC 50Hz	115V AC 60Hz / 240V AC 50Hz
Electrical Consumption	250W	250W
Back-up Batteries	optional	optional
Physical Characteristics		
	Weight: 23kg Height:(5U) 222mm Width: (19") 482mm Depth: 460mm	Weight: 50kg** Height:(8U) 355mm** Width: (19") 482mm Depth: 460mm
** 50kg & 8U including integral battery modules		

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