# 1.3 PLANNING AND ENGINEERING

## 1.3.1 Electrical Specifications

**Outputs/Frequency/Waveform:**

MFTS Series: 4 to 40/5, 10 MHz sinewave and/or 1 PPS outputs

MFTD Series: 4 to 40/5, 10 MHz sinewave and/or 1 PPS outputs

Output Levels into 50 Ohms:

| | |
|---|---|
| Sinewave Outputs: | 3 - 5 Vpp |
| 1 PPS Output: | TTL compatible |
| TTL Outputs: | 1.544 and 2.048 MHz outputs (optional)<br>Max. Low 0.25 Vdc<br>Min. High 2.5 Vdc<br>Rise Time ≤20 ns<br>Fall Time ≤100 ns<br>Min. Pulse Width 10 µ s (typical 400 µ s)<br>Jitter ≤10ns pulse to pulse |

Short Term Stability Rubidium:

| | |
|---|---|
| 1.0 Second (Allan Variance): | 3E-4 |
| 10 Second (Allan Variance): | 1E-11 |
| 100 Second (Allan Variance): | 0.3E-11 |

Short Term Stability Crystal:

| | |
|---|---|
| 1.0 Second (Allan Variance): | 1E-10 |

Frequency Accuracy at shipment: ≤5E-11*

Timing Accuracy: ±100 ns*

24h Flywheel (no GPS disciplining): ≤3 µ s (Rb)**
≤30 µ s (XO)**

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* Includes SA and assumes 24h continuous operation in a fixed stationary position. Temperature changes of ≤10˚C/day at a rate of change ≤2˚C/hour. Subject to sufficient satellite availability.

** Assumes 24 hour continuous GPS lock prior to start of flywheel with maximum temperature change of ±2˚C.

| | | |
|---|---|---|
| Isolation: | Between Outputs* | ≤-80 dBc |
| | Between Outputs Available | ≤-80 dBc |
| | Between Modules | ≤-90 dBc |

| | | |
|---|---|---|
| Phase Noise (Rb): | 10 Hz from carrier: | -88 dBc/√Hz |
| | 100 Hz from carrier: | -125 dBc/√Hz |
| | 1 kHz from carrier: | -130 dBc/√Hz |
| | 10 kHz from carrier: | -130 dBc/√Hz |

| | | |
|---|---|---|
| Phase Noise (XO): | 10 Hz from carrier: | -88 dBc/√Hz |
| | 100 Hz from carrier: | -125 dBc/√Hz |
| | 1 kHz from carrier: | -130 dBc/√Hz |
| | 10 kHz from carrier: | -130 dBc/√Hz |

Harmonic/Non-Harmonic Distortion: -40 dBc/-75 dBc

| | | |
|---|---|---|
| Power Required: | | 115 Vac ±10%/220± 10% |
| | Option 1: | -48 Vdc only |
| | Option 2: | +24 Vdc only |
| | Option 3: | 220 Vac, ±10% |
| | Option 4: | Dual power supply modules (for redundancy) |

| | | Warm-up | Steady State |
|---|---|---|---|
| Power Consumption: | MFTS | ~130W | ~95W |
| (fully loaded systems) | MFTD | ~40W | ~40W |

"Hot Pull" Modules - Insertion and removal of modules is possible with power applied.

| Switchover Difference: (after 3 GPS updates) | Rb/Rb | Rb/XO |
|---|---|---|
| Primary to secondary | | |
| Timing of 1 PPS: | <1 µs | <1 µs |
| Frequency offset: | <2E-11 | <3E-10 |
| Secondary to primary: | | |
| Timing of 1 PPS: | <1 µs | <1 µs |
| Frequency offset: | <2E-11 | <3E-10 |

| Switchover Interval: (after 3 GPS updates) | Rb/Rb | Rb/XO |
|---|---|---|
| Primary to secondary | | |
| Timing of 1 PPS: | <5 µs | <5 µs |
| Frequency offset: | <5E-12 | <1E-9 |
| Secondary to primary: | | |
| Timing of 1 PPS: | <5 µs | <5 µs |
| Frequency offset: | <5E-12 | <1E-9 |

* of same MBF module

## 1.3.2 Environmental Specifications:

Operating Temperature Range: 0˚C to +50˚ C (ambient) (32˚F to ~120˚F)

NOTE: In a well controlled environment where cabinet and chassis ambient temperatures do not exceed 60˚C, multiple MFTS/MFTD systems can be placed directly on top of each other without any airflow gap between front panels. If temperatures are not maintained at this level it is recommended that MFTS and MFTD systems be installed in a cabinet so that there is not less than .5" of open space between the top and bottom of each system chassis to provide adequate convective air flow. Equipment installed below the system must not be a severe producer of heat.

| | |
|---|---|
| Storage Temperature Range: | -20˚C to +70˚C |
| Altitude: | 0 to 10,000 feet (operating) |
| Relative Humidity: | 10% to 95% Non-condensing |
| EMI: | certified to meet CE and FCC Part 15, Class B, requirements, conducted and radiated susceptibility, CE/FCC/UL |
| Vibration: (non-operating) | Ground benign |

## 1.3.3 Mechanical Specifications:

| | | |
|---|---|---|
| Size: | MFTS | 5.25"H X 19.0"W X 20"D (w/handles & connectors) (13.33 cm X 48.26 cm X 50.80 cm) |
| | MFTD | 5.25"H X 19.0"W X 10.0"D (w/handles & connectors) (13.33 cm X 48.26 cm X 25.40 cm) |
| Weight: | MFTS | <35 pounds (15.75 kg) |
| | MFTD | <25 pounds (11.25 kg) |