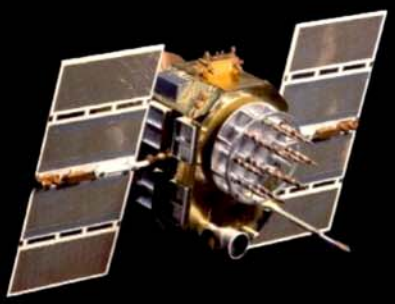
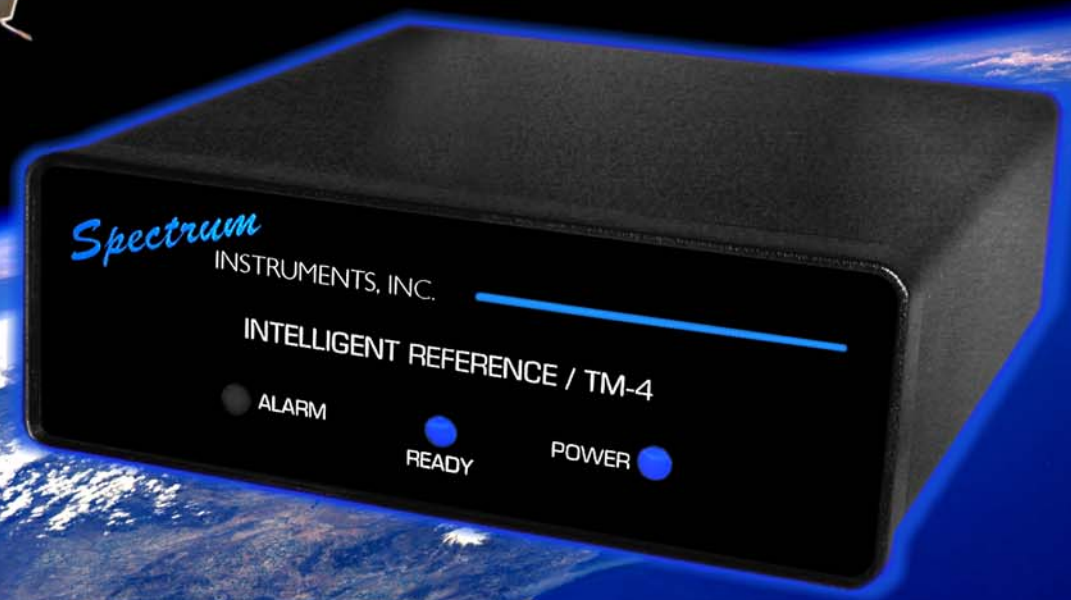


INTELLIGENT REFERENCE/TM-4™ and TM-4/OEM™



PRECISE FREQUENCY AND SYNCHRONIZATON REFERENCE FROM SPECTRUM INSTRUMENTS

The Intelligent Reference/TM-4ô is our most advanced standard product, and we designed it to achieve new levels of performance, quality and value. The TM-4 and TM-4/OEM deliver a vast and useful array of standard and optional features in a very small and easy to integrate package. Even better, it isnít limited to our idea of what a reference should be. The flexibility of the TM-4 platform allows for custom modifications to meet your exact requirements, often at little or no additional cost.

FEATURES and PERFORMANCE

- ï State-of-the-art 12-channel GPS timing receiver
- ï Choice of oscillator type and qualities, including ultra-low power OCXO and low cost TCVCXO
- ï MTIE Stratum-1 compliant
- ï Intelligent Holdoverô provides near-Rubidium stability during temporary GPS unavailability
- ï FastStartô technology provides high accuracy within just minutes of startup
- ï Simultaneous event time-tag and programmed output pulse functions
- ï Optional programmable wide-range filtered timing pulse, synchronous to PPS, with ultra-low jitter
- ï Optional GPS-corrected PLL frequency synthesizer generates almost any frequency up to 125 MHz
- ï Multiplexer outputs for divide-down multiples of the primary oscillator output, TTL level
- ï Optional CTCSS tone generator
- ï Standard 1PPS output with separate ASCII serial time message
- ï 25ns timing accuracy
- ï Optional Network Time Protocol output
- ï Optional IRIG and NASA-36 time codes
- ï Very high spectral purity sine wave output
- ï Very low phase noise (OCXO versions)
- ï Small size (4.125î x 4.0î x 1.50î excluding connectors)
- ï Available as OEM board-only product
- ï Simple RS-232C ASCII command and message set, includes navigation information and NMEA-0183 subset
- ï Wide input power range: 9-35 VDC
- ï Standard input and output connectors
- ï Windows® based control software included
- ï Choice of GPS antennas (antenna kit sold separately)
- ï Optional multiple sine wave outputs
- ï Highly customizable

Spectrum INSTRUMENTS, INC. • 570 E. ARROW HIGHWAY • SUITE D • SAN DIMAS, CA 91773 • TEL:(909) 971-9710
WWW.SPECTRUMINSTRUMENTS.COM

Specifications: INTELLIGENT REFERENCE/TM-4™ and TM-4/OEM™

PHYSICAL (In Enclosure)

HEIGHT:	1.50 in.	(38.1 mm)
WIDTH:	4.125 in.	(104.8 mm)
DEPTH:	4.00 in.	(101.6 mm)
WEIGHT:	13.0 ozs.	(0.369 kg)

ENVIRONMENTAL

OPERATING TEMPERATURE: -20 to +70°C, extended range optional

STORAGE TEMPERATURE: -40 to +85°C

HUMIDITY: Up to 95% R.H., non-condensing

POWER

INPUT SUPPLY VOLTAGE: 9 to 35 VDC, 24 VDC nominal

INPUT CONNECTOR: DB-15HD (female)

POWER CONSUMPTION: 3.4 watts after warm-up. Low-power option available.

ANTENNA POWER OUT: 5 VDC, 20 mA

GPS BACKUP: Rechargeable lithium battery

OSCILLATORS

HIGH-PERFORMANCE OCXO: standard
LOW-POWER OCXO: optional
TCVCXO: optional
STANDARD FREQUENCY: 10 MHz
OPTIONAL FREQUENCIES: 5, 12.8, 13 MHz
ï consult factory for additional oscillator options

PERFORMANCE (GPS)

RECEIVER TYPE: Twelve parallel channel, code + carrier tracking, CA code, L1 carrier

TIME TO FIRST FIX (typical):
Hot Start: <15 seconds (valid almanac, time, date, position & ephemeris)
Warm Start: <40 seconds (valid almanac, time, date & position)
Cold Start: <60 seconds (no information)

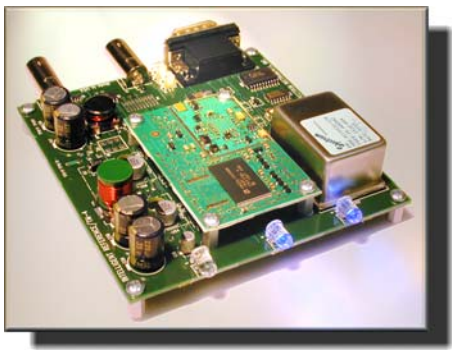
POSITION UPDATE RATE: Once per second, nominal.

POSITION ACCURACY: Less than 25m SEP

PERFORMANCE (TIME)

1 PPS OUTPUT: (Referenced to UTC)

Accuracy: 25ns RMS
Accuracy while coasting: Same as primary frequency output



PERFORMANCE (FREQUENCY)

PRIMARY FREQUENCY: 10 MHz. Meets MTIE requirement for Stratum-1 primary clock source.

LONG-TERM STABILITY: $1x10^{-12}$ after 24 hours of tracking. (Δt=24 hours)

SHORT-TERM STABILITY:
$1x10^{-11}$ (Δt=1 second)

ACCURACY WHILE COASTING: $5x10^{-10}$ per day after 3 days of locked operation, standard OCXO.

PHASE NOISE, 1 HZ BANDWIDTH:

10 Hz:	< -124 dBc
100 Hz:	< -139 dBc
1 kHz:	< -149 dBc
10 kHz:	< -151 dBc
100 kHz:	< -155 dBc

HARMONIC OUTPUTS: <-50 dBc

SPURIOUS OUTPUTS: <-70 dBc

OPTIONS

ï IRIG and/or NASA-36 serial time code
ï NTP output
ï Filtered timing pulse
ï GPS-corrected PLL frequency synthesizer
ï GPS-corrected auxiliary frequency output
ï CTCSS (PL) tone generator
ï Higher baud rates for serial time messages
ï Low-power OCXO and other oscillator choices
ï Extended operational temperature range
ï Substitute other frequency for primary output
ï Custom multiplexer and/or other output
ï Multiple sine wave outputs
ï Custom functions
ï Customized user software

ACCESSORIES

ï GPS antenna kits
ï Power/Control/Data cable
ï 1U Rack mount kit
ï Distribution amplifiers
ï Connection (breakout) board
ï AC power adapter, US or by country
ï Rechargeable battery pack/UPS

INPUTS & OUTPUTS

1 PPS OUTPUT

Connector: BNC
Drive: TTL levels into 50Ω
Rise Time: 10 ns, maximum
Pulse Width: Positive pulse, 1 ms nominal. Rising edge on-time. PPS connector can be factory-reconfigured to deliver IRIG, multiplexer, or other output instead of PPS.

10 MHz OUTPUT

Connector: BNC
Drive: High spectral-purity sine wave, +10 dBm into 50Ω, ±2dB

GPS ANTENNA

Connector: TNC

CONTROL and AUXILIARY I/O

Connector: DB-15HD (female)

SERIAL CONTROL I/O: RS-232C, 9600bps

ALARM OUTPUT: Open collector

SERIAL TIME MESSAGE: RS-232C, 1200-19200 bps standard, ASCII date and time of next 1 PPS epoch. NMEA-0183 message subset. Factory configurable for optional NTP output. Optional rates of 38400, 57600 and 115200 bps.

EXTERNAL EVENT INPUT: TTL/CMOS level, edge-triggered, polarity selectable

PROGRAMMED OUTPUT PULSE:
Drive: TTL levels into 50Ω
Rise/Fall Time: 10 ns, maximum
Pulse Width: User-selectable, 1μsec-250 ms
Polarity: Selectable

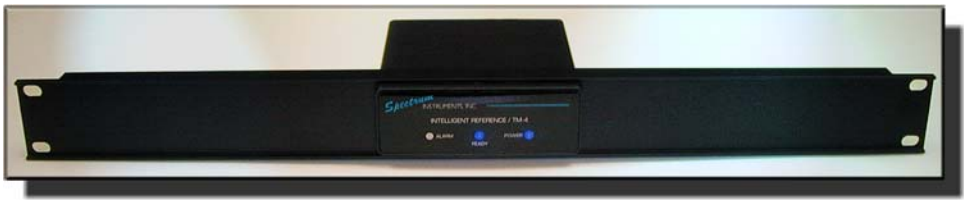
MULTIPLEXER OUTPUTS:
Drive: TTL levels into 50Ω
Rise/Fall Time: 10 ns, maximum
Mux 1: 1,10,100 kHz, 1,5,10 MHz, PPS, baseband IRIG (optional)
Mux 2: 10 MHz, Mux 1 mirror, PPS, baseband IRIG (optional), baseband NASA-36 (optional), custom outputs 1-3 (special option)

OPTIONAL IRIG/NASA-36 OUTPUT:
Type: TTL and modulated
Output Level: 2.7 V_{ptp} into 600Ω
Modulation Level: 3.3:1

OPTIONAL PLL FREQUENCY SYNTHESIZER:
Frequency: Virtually any frequency desired from 2.5 to 125 MHz. Factory set.
Drive: TTL levels into 50Ω
Accuracy: Same as primary frequency output.
Rise/Fall Time: 2 ns, maximum
Output: 50% duty-cycle

OPTIONAL AUXILIARY FREQUENCY OUTPUT:
Frequency: VCXO-derived. Divide or multiply possible. Factory set.
Drive: TTL levels into 50Ω
Accuracy: Same as primary frequency output.
Rise/Fall Time: 10 ns, maximum
Output: 50% duty-cycle

OPTIONAL FILTERED TIMING PULSE:
Frequency: Virtually any frequency up to 100 kHz, such as 1 Hz, 25 Hz, 216.66 Hz, etc. Factory set.
Drive: TTL levels into 50Ω
Rise/Fall Time: 10 ns, maximum
Output: Positive pulse, 10 μsec, nominal. Rising edge on-time.
Accuracy: Same as primary frequency output.
Characteristics: Coherent with primary frequency output. Leading edge synchronized with average value of PPS from GPS receiver. Extremely low jitter.



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Specifications subject to change without notice. Consult factory for performance specifications for optional configurations.