

TSR-37

Rubidium Timing Signal Reference



Key Features

- Cost-effective timing source for telecom/metrology test/measurement applications
- SDH/SONET/PDH, Jitter/Wander measurement source
- Compact, robust and lightweight, easy handling
- Cesium reference input with auto-calibration feature
- Accuracy 1×10^{-12} with GPS reference
- Outputs: E1/T1, 2048/1544 kHz
- With and without GPS input available

Product description

The TSR-37 is a low-cost portable timing reference based on a superior rubidium oscillator technology for universal use in telecom and metrology as well as in test and measurement applications.

It provides a number of coherent output signals

- Sine wave 10 MHz and 5 MHz
- 2048 kHz and 1544 kHz balanced and unbalanced
- E1 2048 kbps balanced and unbalanced
- T1 1544 kbps balanced and unbalanced

with excellent stability and aging performance specially designed for both stationary applications and mobile operations.

All reliable output signals are based on the highly accurate and stable rubidium oscillator inside. The rubidium's fast warm up eliminates the need of bulky backup batteries.

The TSR-37 can be locked to an external primary source such as a cesium standard for automatic frequency calibration of the rubidium oscillator.

The unit is available in two versions:

- TSR-37
- TSR-37 GPS

The GPS version supports a high performance GPS functionality to control the rubidium oscillator. Nearly cesium quality can be achieved in GPS controlled operation by using a standard L1 GPS installation. Additionally GPS can be used as an alternative calibration input, without using an expensive primary reference source.

Applications

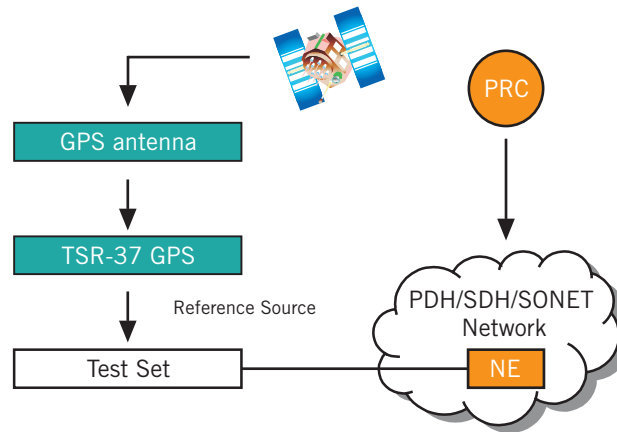
Telecom

The TSR-37 is a powerful reference source to quickly measure and test the synchronization quality of PDH/SDH/SONET digital networks. MTIE and TDEV measurements for up to 1000 seconds can be easily performed without a GPS reference. Coupled with the external GPS antenna, the range of observation time can be largely extended to meet specific requirements.

Metrology

Standard 5 MHz and 10 MHz sine wave outputs of the TSR-37 are typically provided for metrology and calibration laboratory equipment such as

- Universal counter
- Spectrum analyzer
- Synthesized signal generator



Typical application

Operation with other JDSU products

The TSR-37 provides the reference clock for wander analysis using the ANT-20, ANT-10G Advanced Network Tester.



Functional features of the product

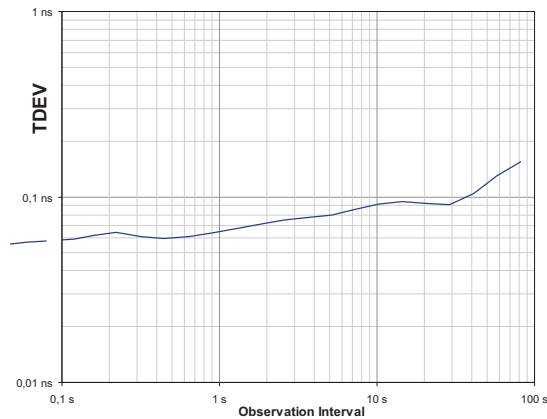
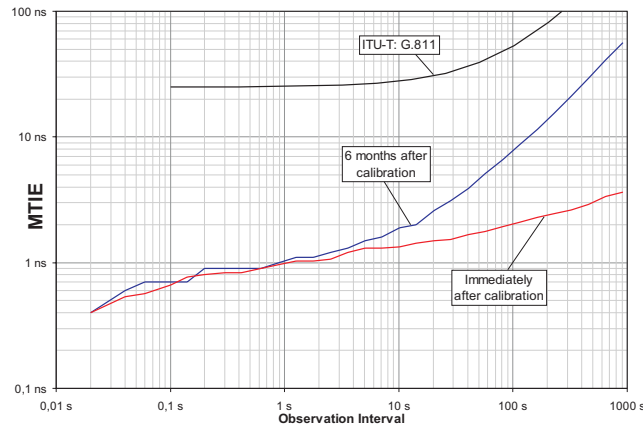
Automatic frequency adjustment

Calibration of the TSR-37 has been made extremely simple. There is no need for external frequency difference meters or phase comparators. Just connect a 5 MHz or 10 MHz reference signal from a primary standard (cesium, GPS disciplined rubidium) to the rear panel input. The TSR-37 will automatically sense the signal, evaluate its stability and slowly (typically within 10 minutes) tune the output signals to a frequency accuracy of $< 2 \times 10^{-11}$. The unit will continue to operate with the excellent performance of the internal rubidium oscillator until a new calibration cycle is started. The calibration parameters will be retained in a non-volatile memory.

By connecting the GPS antenna, the TSR-37 can serve as a GPS disciplined frequency standard exceeding even the long-term frequency accuracy of cesium. Automatic frequency adjustment can be disabled with a recessed slide switch. Switch tampering can be prevented by placing a calibration sticker across its access opening.

Functional monitoring/built-in test equipment

Continuous extensive self tests monitor the critical functions of the TSR-37 to ensure its high accuracy. Failures of the equipment hardware compromising the frequency accuracy of the output signals will be detected. When power is applied the unit enters into a warm-up phase for a few minutes until it reaches full accuracy. Front panel LED indicators inform the user about the status of the unit.



MTIE and TDEV

Specifications

Powersupply

Voltage	100 ... 240 VAC, 50 ... 60 Hz
Current consumption	max. 1.0 A
Power consumption typically	30 W at 230 VAC, 22 W at 110 VAC

Input

1 × external reference signal
5 MHz or 10 MHz sine wave or square wave, 0.5 ... 5.0 Vpp into 50 Ω/BNC, MTIE (200 s) < 1 ns

Unframed outputs

1 × 5 MHz sine wave, 1 Vrms into 50 Ω, BNC
1 × 10 MHz sine wave, 1 Vrms into 50 Ω, BNC
2 × 2048 kHz, G.703.13 (10/98), 75 Ω unbalanced, BNC
2 × 2048 kHz, G.703.13 (10/98), 120 Ω balanced, BNC Twinax
1 × 1544 kHz, 2.5 Vpp, 75 Ω unbalanced, BNC
1 × 1544 kHz, 3 Vpp, 120 Ω balanced, BNC Twinax

Framed outputs

1 × 2048 kbps (E1) G.703.9 (10/98), HDB3, 75 Ω unbalanced, BNC
1 × 2048 kbps (E1) G.703.9 (10/98), HDB3, 120 Ω balanced, BNC Twinax
1 × 1544 kbps (T1) AMI, 75 Ω unbalanced, BNC
1 × 1544 kbps (T1), AMI, 120 Ω balanced, BNC Twinax

Frequency accuracy

Factory shipment:	<5 × 10 ⁻¹¹ at 25°C
With primary reference adjusted:	<2 × 10 ⁻¹¹ relative to the reference

Internal time base

Rubidium oscillator	
Aging	<5 × 10 ⁻¹¹ /month <1 × 10 ⁻⁹ over 10 years

Physical data

Size	maximum 260 × 120 × 365 mm 10.24 × 4.72 × 14.37 inch (W × H × D, without handle)
Weight	maximum 4.3 kg

Regulations and standards

EN 61326-1: 1997, EN 61010-1: 1993, CE-mark

Environmental conditions

Humidity	95% non-condensing
Temperature	+5°C ... +40°C operating with specified accuracy -10°C ... +55°C operating with de-rated accuracy -55°C ... +85°C storage

Specifications TSR-37 GPS only

Input

GPS antenna signal with 5 VDC feeding;
N-type connector, female

Frequency accuracy

Factory shipment	<5 × 10 ⁻¹¹ at 25°C
With primary reference adjusted:	<2 × 10 ⁻¹¹ relative to the reference
with GPS connected	typically <1 × 10 ⁻¹² (ADEV typically <2.5 × 10 ⁻¹²)

GPS engine

12-channel C/A code receiver (L1), tracks up to 12 satellites continuously

Allan deviation (10 MHz sine wave)

t = 1 second	<2.5 × 10 ⁻¹¹ typically <1.0 × 10 ⁻¹¹
t = 10 seconds	<0.8 × 10 ⁻¹¹
t = 100 seconds	<0.25 × 10 ⁻¹¹

Ordering information

DA81700010	TSR-37 Rubidium Timing Signal Reference
DA81700012	TSR-37 GPS Rubidium Timing Signal Reference

Options and accessories

DA83009002	GPS antenna kit, 25 m cable RG58
DA83009003	GPS antenna kit, 50 m cable RG213
DA83009004	GPS antenna kit, 75 m cable RG213
DA83009005	GPS antenna kit, 100 m cable RG213
DA83009006	GPS antenna kit, 150 m cable "low loss"
DA83009007	GPS antenna kit, 200 m cable "low loss"

DA83009025 Lightning protector kit for RG58 cables

DA83009023 Lightning protector kit for RG213 cables

DA83009024 Lightning protector kit for "low loss" cables

DA13116010 Twinax output cable plug

DA81700001 Transport case for TSR-37

DA89990006 Certificate of calibration (when ordered together with a new TSR-37)

DA89990502 Certificate of compliance (COC)

Note: The upgrade to the GPS version can be done only in the factory

Test & Measurement Regional Sales

NORTH AMERICA TEL: 1 866 228 3762 FAX: +1 301 353 9216	LATIN AMERICA TEL:+55 11 5503 3800 FAX:+55 11 5505 1598	ASIA PACIFIC TEL:+852 2892 0990 FAX:+852 2892 0770	EMEA TEL:+49 7121 86 2222 FAX:+49 7121 86 1222	WEBSITE: www.jdsu.com
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