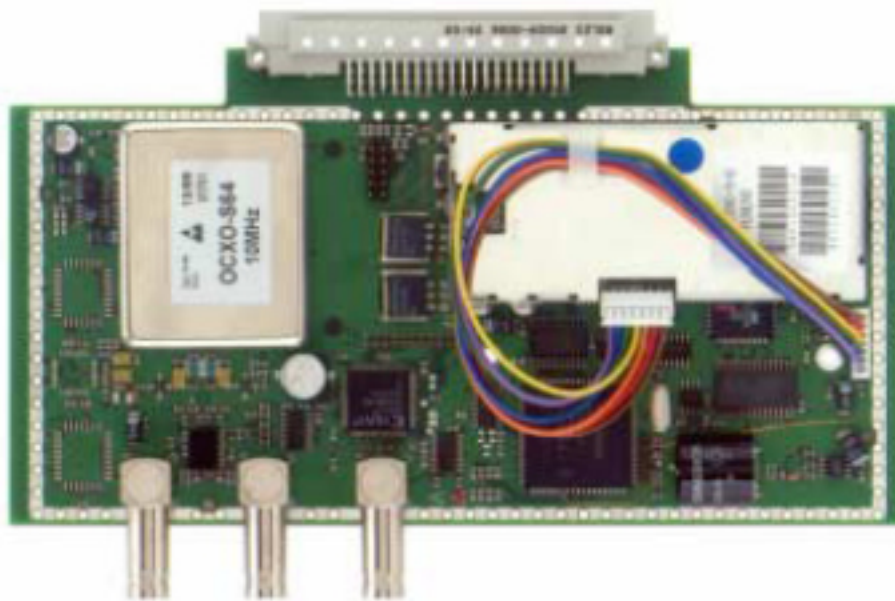


- ◆ Internal high-performance oscillator
- ◆ Class of accuracy 10^{-10}
- ◆ 10 MHz standard frequency
- ◆ Disciplined by the time signals of the GPS satellite system
- ◆ GPS receiver: 8 channels parallel
- ◆ 1 pps clock output (UTC-synchronous)
- ◆ Holdover-mode by OCXO
- ◆ Output of frequency and time error, geographical position, time (UTC), date and receiver status data
- ◆ World-wide application



The Frequency Standard FNX-GPS is a single-board solution and has been designed specially for integration into OEM systems. The module fully meets the technical requirements of digital broadcasting networks DAB and DVB.

The plug-in module provides both required references - precise time and accurate frequency. It generates a 10 MHz standard frequency which is disciplined by the time signals of the GPS satellite system and a 1 pps clock signal with an accuracy of better than 150 ns from UTC. The 1 pps clock signal is directly derived from the internal OCXO.

The insertion of a UTC-synchronized time-stamp is a requirement in digital DAB-T and DVB-T networks. Single Frequency Networks (SFN) are using precision carrier-frequencies. Minimum frequency deviations are guaranteed if all transmitters are supplied locally with an accurate standard frequency.

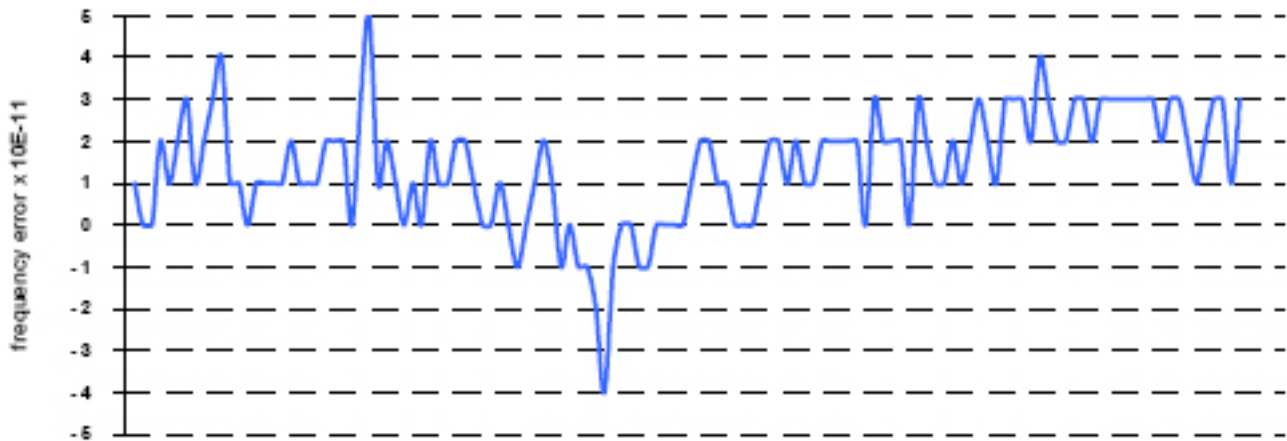
The internal oscillator (OCXO) is continuously monitored. Drifts are corrected by the GPS time signals. If the GPS input signals are lost, the module will operate automatically in a holdover mode. The performance of the OCXO is sufficient in this free-run mode for maintaining the accuracy of the 1 pps clock signal to better than 9 µs after 24 hours of unlocked operation.

The GPS status data, UTC-time, date and frequency time / error are accessible by remote control via the serial RS 485 and RS 232 interface. The last 128 measured values of frequency error, time error (compared to UTC) and the position of the D/A converter are stored in the FNX-GPS and can be read-out via the serial interface.

Print-out of stored data in the FNX-GPS:

	DATE/TIME	D-FRQ x 10 E-11	D/A-STEPS	D-SEC X 100 ns	!(128 lines max.)
→	000912/17:33	1	36153	-1	
→	000912/17:51	0	36153	0	
→	000912/18:09	0	36153	0	
→	000912/18:28	2	36153	0	
→	000912/18:46	1	36153	0	
→	000912/19:04	2	36153	0	
→	000912/19:23	3	36153	0	
→	000912/19:41	1	36153	-1	
→	000912/20:00	2	36153	0	
→	000912/20:18	3	36153	0	
→	000912/20:36	4	36154	0	
→	000912/20:55	1	36154	0	
→	000912/21:13	1	36154	-1	
→	000912/21:31	0	36154	0	
→	000912/21:50	1	36154	0	
→	000912/22:08	1	36154	0	
→	000912/22:26	1	36154	0	
→	000912/22:45	1	36154	0	
→	000912/23:03	2	36154	0	
→	000912/23:22	1	36154	0	
→	000912/23:40	1	36154	-1	
→	000912/23:58	1	36154	0	
→	000913/00:17	2	36154	0	
→	000913/00:35	2	36154	-1	
→	000913/00:53	2	36154	1	
→	000913/01:12	0	36154	0	

Diagram of the FNX-GPS frequency error which has been measured from 12. Sept. 2000 17:33 (UTC) to 14. Sept. 2000 08:25 (UTC):



The active GPS antenna can be mounted quickly and easily. For optimum antenna position a free visibility to all view of directions is recommended. Then the GPS receiver can track the best satellites required to precisely determine the geographical position and to calculate the 1 pps clock signal.

When using the active GPS antenna (BN 86810.101) an attenuation up to 20 dB of the antenna interconnect cable is possible. The remaining signal level guarantees operation of the FNX-GPS even under worse weather conditions. The maximum length of the antenna cable depends on the impedance and the attenuation. In spite of mismatch at the GPS receiver input a 75 Ω coax cable allows greater distances than 50 Ω coax cables.

Max. cable length for different types of RF coax cables:

RF coax cable 50 Ω	RG 58:	20 m
	RG 213:	50 m
	CELLFLEX CF 3/8":	100 m
RF coax cable 75 Ω	LCD 90:	60 m
	LCD 99:	65 m

Specifications FNX-GPS

10 MHz standard frequency OCXO:

Output frequency: 10 MHz
 Outputs (2 x BNC-sockets):
 Output level: $1 V_{RMS}$ into 50 Ω
 Output (1 x at 60-pin connector):
 Output level (source imped. $\leq 10 \Omega$): $2 V_{RMS}$ into 100 Ω
 Harmonics: ≤ -25 dBc *
 Discrete spurious: < -80 dBc
 SSB-phase noise (10 kHz offset): ≤ -146 dBc/Hz
 (1 kHz offset): ≤ -136 dBc/Hz
 Short-term stability (1 s): $\leq \pm 1 \times 10^{-11}$
 Ageing: none - corrected by GPS **
 Temperature effects: none - corrected by GPS **
 Frequency accuracy: $\leq \pm 3 \times 10^{-10}$

Time reference signal:

Time format: 1 pulse/sec
 Pulse width: 100 ms
 Ageing: none - corrected by GPS **
 Temperature effects: none - corrected by GPS **
 Time accuracy: $\leq \pm 150$ ns relative to UTC (typ.)
 Output level: TTL (fan-out 2)
 Connector: BNC-socket

GPS receiver (C/A-code L1):

Input sensitivity: ≤ -134 dBm
 Receiver acquisition: 8 channels, parallel-tracking
 Lock-in time to normal operation: ≤ 1 min
 after break-down of operation
 Input impedance: 50 Ω
 Antenna connector: socket, S-FL2-R-SMT

Monitoring and remote-control:

Accessible data:
 GPS receiver status data, number of available and tracked satellites, time and date (UTC), geographical position, GPS-data valid/invalid, ident-number and S/N of tracked satellites, time error of the 1 pps clock signal, frequency error of FNX-GPS, present position of the D/A converter.
 Data format: ASCII
 Interface: RS 232 and RS 485

General data:

Power supply: externally via 60-pin connector
 + 5 V $\pm 5\%$; 210 mA
 + 7.5 V $\pm 5\%$; 160 mA
 - 7.5 V $\pm 5\%$; 20 mA
 + 15 V ... + 25 V; 250 mA
 (500 mA during warm-up of OCXO)
 Operating temperature: + 5 $^{\circ}$ C ... + 65 $^{\circ}$ C
 Connector: 60-pin connector; DIN 41612
 Dimensions (W x H x D): 123 mm x 200 mm x 30 mm

Recommended max. length for antenna cables:

RF coax cable (50 Ω) RG 58: 20 m
 RF coax cable (50 Ω) RG 213: 50 m
 RF coax cable (50 Ω) CELLFLEX CF 3/8": 100 m
 RF coax cable (75 Ω) LCD 90: 60 m
 RF coax cable (75 Ω) LCD 99: 65 m

Supplied accessories:

1 ea antenna cable, 20 cm with TNC-socket
 1 ea Operating Manual

Recommended accessories:

GPS-antenna:

Type: active, weather-proof
 Characteristic: hemispherical
 Gain: 28 dB (typ.)
 Impedance: 50 Ω
 Operating temperature: - 30 $^{\circ}$ C ... + 75 $^{\circ}$ C
 Connector: TNC-socket

Cable for GPS-antenna:

Impedance: 75 Ω
 Cable length: 50 m
 Connector: TNC-plug

Ordering information:

Frequency Standard FNX-GPS BN 86810.000
 GPS-antenna BN 86810.101
 Cable for GPS-antenna BN 86812.115

* typical specification of the 10 MHz signal at the 60-pin connector

** internal OCXO unlocked to GPS (holdover-mode):

Ageing (after 30 days contin. operation): $\leq \pm 2 \times 10^{-10}$ /day
 $\leq \pm 3 \times 10^{-8}$ /year
 Temperature stability (+ 5 $^{\circ}$ C ... + 65 $^{\circ}$ C): $\leq \pm 3 \times 10^{-9}$
 Time error after 24 hours unlocked operation: $\leq 9 \mu$ s
 (constant environmental conditions)
 Time error ($\Delta t = 5 \text{ }^{\circ}$ C for 1 hour): $\leq 1.8 \mu$ s (typ.)