



MANUAL

WVB600USB USB PC CLOCK

29th July 2011

Meinberg Radio Clocks GmbH & Co. KG

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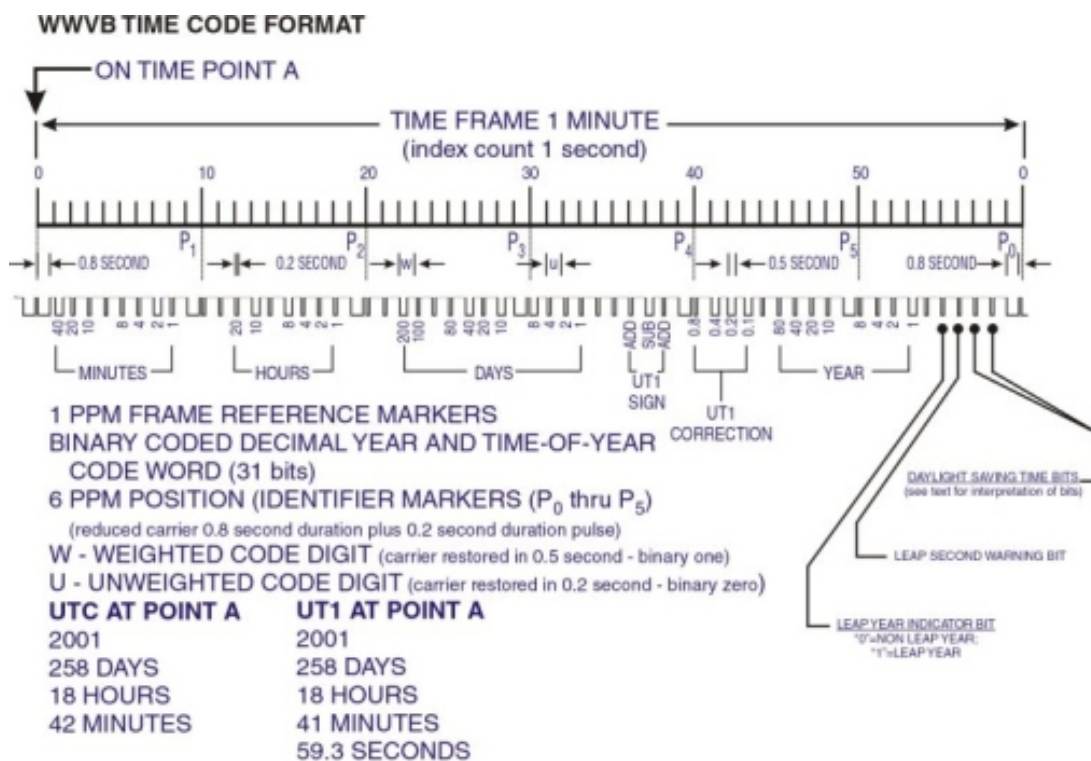
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1 General information about WWVB

NIST radio station WWVB is located near Fort Collins, Colorado, on the same site as station WWV. The WWVB broadcast is used by millions of people throughout North America to synchronize consumer electronic timing products such as wall clocks, clock radios, and wristwatches. In addition, WWVB is used for high level applications including network time synchronization and frequency calibration. The WWVB transmission is maintained by the National Institute of Standards and Technology (NIST).

WWVB continuously broadcasts a time and frequency signal at 60 kHz. The carrier frequency provides a stable frequency reference traceable to the national standard. There are no voice announcements on the station, but a time code is synchronized with the 60 kHz carrier and broadcast continuously at the rate of 1 bit per second using pulse width modulation. The carrier power level is modulated to encode the time data. The carrier power is reduced by 17 dB at the start of each second, so that the leading edge of every negative going pulse is on time. Full power is restored 0.2 s later for a binary #0#, 0.5 s later for a binary #1#, or 0.8 s later to convey a position marker. The binary coded decimal (BCD) format is used, which combines binary digits to represent decimal numbers. The time code contains the year, day of year, hour, minute, second, and flags that indicate the status of Daylight Savings Time, leap year, and leap seconds. WWVB identifies itself by advancing its carrier phase 45 degrees at 10 minutes after the hour and returning to normal phase at 15 minutes after the hour. If you plot WWVB phase, this results in a phase step of approximately 2.08 microseconds.

1.1 Code Format



2 Overview: WVB600USB

The radio remote clock WVB600USB has been designed for communication via the USB interface. The required power is provided via the USB cable as well, so there is no need for any external power supply.

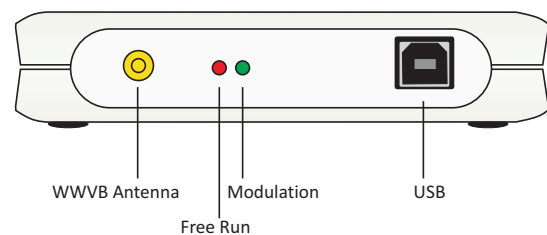
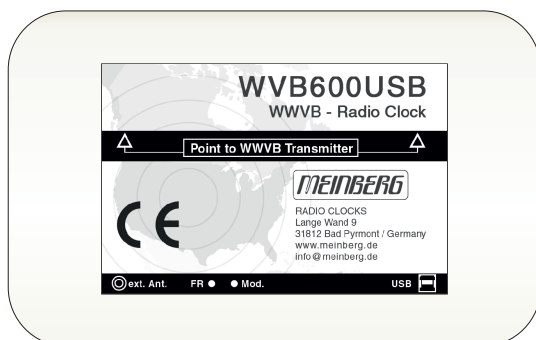
The WWVB signal received by the internal antenna is passed to the on-board LF receiver where it is demodulated by a synchronous detector with automatic gain control. The demodulated time marks from the receiver circuit are filtered and decoded by the microprocessor. If no errors are detected in the current time message an additional plausibility check against the previous time message is performed. If that plausibility check passes, too, the real time clock on the board is adjusted corresponding to the decoded time and date.

The WVB600USB module provides two integrated LEDs, which show the demodulated time marks (MOD LED) and the state of synchronisation (FR LED). The scope of supply includes an USB cable with 3 mtrs. of length to connect the WVB600USB directly to a PC's USB port.

Also included is the driver software for Windows 2000/XP/VISTA/WIN 7 ® operating systems that is used to set the system time of the computer and shows the important status information of the WVB600USB.

Driver software for other operating systems can be found on the Meinberg homepage for download:
<http://www.meinberg.de/english/sw/index.htm>

2.1 Installation



2.1.1 Power Supply

The WVB600USB is powered via the PC's USB port. After connecting the USB port the radio clock is ready to operate. For proper operation it is essential to pay attention to the following points.

2.1.2 General information about position of antenna

The antenna of WWVB-receivers includes a ferrite rod which must be aligned to the transmitter. For best reception the longitudinal side of the antenna must point to the transmitter, which is located in Fort Collins, Colorado.

The antenna should be installed with a distance of at least 30cm to all metal objects because they would detune

the antenna resonance. A distance of several meters to computer monitors must be kept. If they are running in a high screen resolution mode, their line frequency is close to the carrier frequency of the WWVB transmitter, which would cause a worse or no reception.

2.1.3 Status LEDs

The two LEDs „Mod“ and „FR“ reflect the state of synchronisation of the decoded time marks of the WVB600USB. If the antenna is installed properly and the signal from WWVB can be received without strong distortions, the green LED labeled Mod starts blinking exactly once per second, corresponding to the time marks from WWVB. If this LED flashes intermediately, there is some electrical noise around which prevents the microprocessor from decoding the time message. In this case, a better location for the antenna must be found. After start-up, the red LED labeled FR (free running) indicates that the clock is running on XTAL and has not synchronized with WWVB yet. Due to the plausibility checks, it can take up to three minutes after power-up until the clock is synchronized and this LED is turned off. The state of this LED only changes when a new minute begins. Without or with a disturbed RF signal the clock runs on XTAL with an accuracy of 10^{-6} (after 24 hours of synchronous operation).

3 Technical Specifications WVB600USB

RECEIVER:	narrowband straight receiver with automatic gain control bandwidth: approx. 40Hz reception via internal or external ferrite antenna
MODULATION:	demodulated time marks indicated by LED
TIMECODE CHECK:	Multiple software check of the incoming timecode Parity and consistency check over a period of two minutes
FREE RUNNING:	Without RF signal the clock runs on XTAL with an accuracy of $1 \cdot 10^{-6}$ (after 24h of synchronous operation) Disturbed reception indicated by LED
BATTERY BACKUP:	In case of supply voltage failure the on-board RTC keeps the time based on XTAL for more than 140 hours (buffer capacitor)
RELIABILITY OF OPERATION:	Microprocessor supervisory circuit provides watchdog timer, power supply monitoring and backup-battery switchover
INTERFACE:	USB 2.0 (Universal Serial Bus)
TIME ZONE:	UTC/BST (standard)
CONNECTORS:	USB connector type B SMB antenna connector (male)
POWER SUPPLY:	5V, via USB interface of the PC current consumption: approx. 90 mA
HOUSING:	plastic housing, IP30 protected 73mm x 117mm x 24mm (width x depth x height)
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY: max.	85 %

CE Label



This device conforms to the directive 2004/108/EC on the approximation of the laws of the Member States of the European Community relating to electromagnetic compatibility.

4 Content of the USB stick

The included USB stick contains a driver program that keeps the computer's system time synchronous to the received time. If the delivered stick doesn't include a driver program for the operating system used, it can be downloaded from:

<http://www.meinberg.de/german/sw/>



On the USB stick there is a file called "readme.txt", which helps installing the driver correctly.

Konformitätserklärung

Declaration of Conformity

Hersteller
Manufacturer

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9
D-31812 Bad Pyrmont

erklärt in alleiniger Verantwortung, daß das Produkt
declares under its sole responsibility, that the product

Produktbezeichnung
Product Name

WWVB Funkuhr

Modell / Typ
Model Designation

WVB600USB

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt
to which this declaration relates is in conformity with the following standards

EN55022:2008-05, Class B

Grenzwerte und Meßverfahren für Funkstörungen von
informationstechnischen Einrichtungen

Limits and methods of measurement of radio interference characteristics of
information technology equipment

EN55024:2003-10

Grenzwerte und Meßverfahren für Störfestigkeit von
informationstechnischen Einrichtungen

Limits and methods of measurement of Immunity characteristics of
information technology equipment

gemäß den Richtlinien 2004/108/EG (Elektromagnetische Verträglichkeit), 2006/95/EG (Nieder-
spannungsrichtlinie) und 93/68/EWG (CE Kennzeichnung) sowie deren Ergänzungen.
following the provisions of the directives 2004/108/EC (electromagnetic compatibility), 2006/95/EC (low voltage directive) and
93/68/EEC (CE marking) and its amendments.

Bad Pyrmont, den 28.07.2011



Günter Meinberg
Managing Director