

DESCRIPTION

General

The Model 325 provides accurate time and date information referenced to the United States Atomic Clock Standard. The unit receives VLF (very low frequency) radio signals broadcast by WWVB operated by the National Institute of Standards and Technology (NIST).

Physical

The Model 325 is housed in an attractive enclosure for mounting in a convenient indoor reception location. Connection to the host computing device is via a "modular" cable with adapters available for both DB9 and DB25 RS-232 connectors.

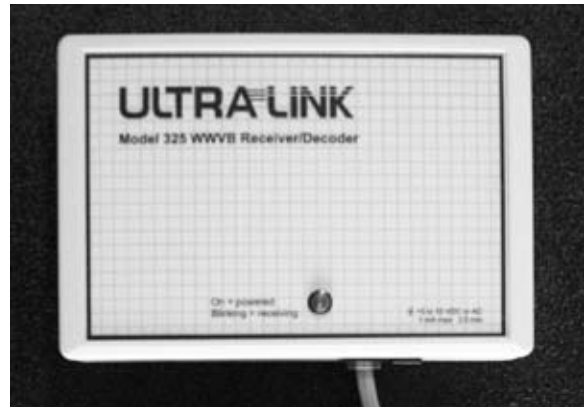
Functional

The receiver incorporates a high quality ferrite loopstick antenna, factory tuned for maximum sensitivity and selectivity. The receiver uses baseband amplification with crystal bandpass filtering. A demodulator provides a digital output corresponding to the received signal data.

A microcomputer processes WWVB signals, maintains an accurate real time clock and hosts the serial communication interface. Received time data is correlated to set an internal real-time clock (RTC). The RTC is driven by a precision quartz crystal for continuous accurate time reference.

Reception status and broadcast time information are available via the RS-232 interface.

Power circuitry provides internal operating voltages from RS-232 or external AC/DC power.



FEATURES

- 24 hour Reception
- Signal readability indicator
- 0.015 second accuracy
- 0.002 second repeatability when locked to WWVB
- Quartz backup clock during loss of signal
- All WWVB time information is decoded
- RS-232 serial ASCII communication protocol
- One pulse per second RS-232 signal output
- RS-232 powered

APPLICATIONS

- Personal computers
- Security/entry systems
- Data acquisition systems
- Timers/sequencers

BENEFITS

- Accurate - traceable to NIST atomic clock
- Secure - no modem connection
- Cost effective - no monthly line charges

CONTROLS and DISPLAYS

Operating controls and displays are via the RS-232 serial data port. Commands are by a single ASCII character sent to the unit. A carriage return is not required after each command. Invalid characters are ignored.

Time data is read by sending a "T".

RS-232 data is a 34 byte string beginning with (cr)(lf) followed by an ASCII string as follows:

(cr)(lf)R5_1C00L2004+342UTCS_HH:MM:SSL+5

Data above is defined as follows (underline is space):

Chr 1- Carriage return (cr) is output at the exact beginning of each new second.

Chr 2- Line feed (lf).

Chr 3,4 - Signal readability from **R1** to **R5** (1 is unreadable, 5 is good).

Chr 5 - Space

Chr 6 - Value of previously received data bit = **0**, **1**, **M** (mark) or **?** (unknown).

Chr 7 - Reception from **Colorado** or **Hawaii**.

Chr 8,9 - Hours since last WWVB time and flag code update - 00 to 99.

Chr 10 - Space if reception is poor. ASCII **N̄** (Hex A5) when receiver is locked to WWVB, .

Chr 11,12, 13, 14 - Year corrected to reflect proper century - valid from 2000 to 2099.

Chr 15 - "+" if leap year. Space if not.

Chr 16,17,18 - Number of the current day in the year - 000 to 365/6

Chr 19, 20, 21 - Reported time is **UTC**

Chr 22 - Standard/daylight status as follows:

- S** Standard time (STD).
- O** Transition into DST from STD. Set at 0000Z on first DST day and changed to a **D** 24 hours later.
- D** Daylight savings time (DST).
- I** Transition into STD from DST. Set at 0000Z on first STD day and changed to **S** 24 hours later.

Chr 23 - Space

Chr 24,25 - Time hours **00** to **24**

Chr 26 - Delimiter Upon time/date validation, time delimiters change from space to colons (:).

Chr 27,28 - Time minutes **00** to **59**

Chr 29 - Delimiter - see above.

Chr 30,31 - Time seconds **00** to **59**

Chr 32 - Leap second flag - Changes from space to **I**nsert or **D**elate during month preceding leap second adjustment.

Chr 33,34 - UT1 correction (+/- .1 second increments).

The units ID and software revision is read by sending an "I". This returns a 10 byte ID string:

(cr)(lf)ULM325.F

INSTALLATION

Power

Power for the Model 325 may be derived from any of the following sources:

+5 to +12 VDC or AC to the "AUX" pin below or the 2.5 mm dia. jack

RS-232 from RTS(+) and RXD(-) signal lines

Serial (RS-232) interface

A 6 pin modular jack is used to connect to all operating signals. Signal pin connections are as follows:

Pin	Signal	Direction
1	Power(AUX)	In
2	RXD	In
3	GND	
4	TXD	Out
5	RTS	In
6	1 PPS(DCD)	Out

Note: If RS-232 powered and 1PPS signal not required, a 4 pin modular cable is used.

Automatic time report

In some applications it may be desirable to have the unit report automatically at the beginning of each second. This is enabled by shorting the W1 jumper (holes) near the socketed microprocessor. The enclosure cover may be removed by use of screwdriver to pry the cover apart at slots located at the top and bottom sides.

Receiver location

The antenna/receiver unit is designed to be used indoors in a wood frame structure. For operation inside metal structure locate the unit in a window facing the transmitter (see below).

The antenna/receiver should be mounted with the long side horizontal. It may be mounted flat (table/shelf) or vertical (wall mounted). The antenna/receiver is directional with best reception obtained with the top or back facing Fort Collins, Colorado.

Avoid locating within 15 feet of the following:

CRT monitors	Lamp dimmers
Fluorescent lamps	Electronic igniters
Battery chargers	Switching power supplies
Motors	Automobile ignition systems

Avoid locating under power lines or near radio transmitter antennas.

If interference is suspected (as indicated by poor readability indication), it can be diminished by moving the unit away from the source. Doubling the distance from the source will reduce its effect by 4

OPERATION

Initialization

When powered up, the decoder initiates a reset cycle which lasts one second. RS-232 commands sent during the reset cycle will be ignored. Once power is connected the Model 325 will become active and operation is commenced.

The Model 325 may be reset by removing power for a few seconds.

Final antenna orientation

Orient the antenna/receiver for steady blinking of the power/signal LED. After final orientation secure receiver to prevent inadvertent movement (double sticky tape is OK).

In some areas of the country the signal may not be available 24 hours a day. In these cases setup and initial reception are usually best done at night. The unit is designed to keep accurate time during marginal reception periods after time is initially acquired.

Time synchronization

Upon initialization, time and flag fields are blank. The unit automatically verifies time, date and flag information. Upon complete time/date correlation, time delimiters change to colons (:). Flag quality is shown after correlated flag values are received.

Time validation may take from a few minutes to hours depending on reception conditions. Once time and flags have been validated, time re-synchronization and flag validation is continuous.

SPECIFICATIONS

Operational

Transmitter received	WWVB
Receive frequency	60 kHz
Transmitter location	Ft. Collins, Colorado USA Barking Sands, Kauai, Hawaii, USA
Modulation type	10 dB carrier reduction
Receive bandwidth	7Hz @ 3dB points
S/N @ 50uV/meter	14 dB average daylight background
Reception	Est >23 hours/day @ 50 uV/ meter signal strength with background noise only (electrically noise free environment)
Time acquisition	Approximately 5 minutes for complete time and flag validation under noise free signal reception conditions

Absolute accuracy	+/- 0.015 sec upon reception
Drift	.015 sec/hour drift during loss of signal periods
Clock repeatability	+/- 2 milliseconds when lock indicated
Date range	Indicates correct year from 2000 to 2099
Serial baud rate	9600
Serial protocol	8,1,N
Receiver enable	Continuous
1 PPS signal	50% duty cycle. Low to high transition indicates beginning of second

Physical

Data cable	4 or 6 wire modular (telephone) cable up to 250' maximum length.
Size	5.4" L X 3.6" W X 1" Tk
Weight	1.0 Lb
Construction	Polystyrene enclosure

Electrical

Power	+5 to + 12 V AC/DC - 3 mA or RS-232
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Environmental

Operating temperature	0 to +40 C
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ORDERING INFORMATION

Order Model 325 - Includes:

- 25' modular cable (4 wire)
- DB9 RS-232 mating connector.

Options include:

- 5 VDC power supply with 2.5 mm jack
- 25', 50' 6 wire modular cable
- 50', 100' 4 wire modular cable
- Modular to DB25 connector

Special data formats and signal outputs available.
Contact factory for information.

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