ULTRA≡LINK

Linking computers to the real world

DESCRIPTION

General

The Model 332 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).

All WWVB broadcast information including the date, time, flags and signal readability are available on the unit's display and via a RS232 interface.

Physical

The Model 332 consists of two primary physical elements, a receiver and a decoder/display. The receiver can be located for best reception with the decoder/display located for convenient viewing. The receiver is connected to the decoder using modular telephone cable.

Functional

Receiver

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 received signal data.

Decoder/Display

A microprocessor decodes WWVB time code signals using synchronous bit detection. Received data is correlated over time 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 is available on a 2 X 16 LCD display and RS232 interface.

Power circuitry provides internal operating voltages and maintenance of onboard rechargeable standby battery.

FEATURES

- Display of received WWVB information
- Signal readability indicated
- Transmitter station ID decoded
- Backlight LCD display
- Remote antenna/receiver
- Internal accurate clock during loss of signal
- 0.015 second accuracy
- 0.002 second repeatability when locked to WWVB
- RS232 interface with ASCII formatted data
- One pulse per second RS232 (DCE) output
- AC powered using wall mounted transformer
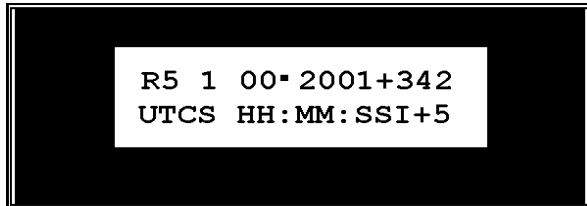- Battery backed-up RTC with onboard recharger

APPLICATIONS

- Accurate UTC clock
- Computer time synchronization
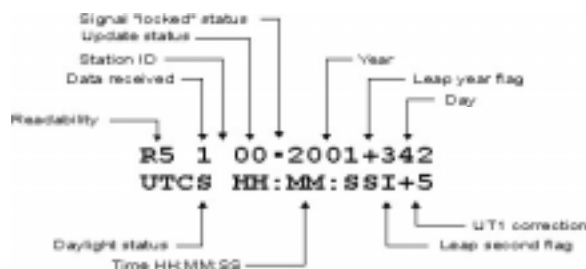- Facilities time standard

OPERATION

Front Panel

Displays are located on the Model 332 front panel as shown below:


```
R5 1 00■2001+342
UTCS HH:MM:SSI+5
```

Display - A two line by 16 character display shows date, time, flag and receive status information. Information format follows:

Readability - Signal readability from 1 to 5 (1 is unreadable, 5 is good).

Data received - Indicates value of previously received data bit = **0**, **1**, **M** (mark) or **?** (unknown).

Station ID - Indicates reception from **C**olorado or **H**awaii.

Hours since update - Indicates hours since last WWVB time and flag code update.

Signal "locked" status - Darkened box indicates the receiver is currently phase locked to WWVB.

Year - Indicates received year corrected to reflect proper century - valid from 2000 to 2099.

Leap year flag - Blank if not leap year, + if leap year.

Day - Shows number of the current day in the year.

Time zone - Indicates displayed time zone (automatically updated for Standard/Daylight if enabled in a selected time zone).

Daylight status -

UTC mode - Standard/daylight status indicated as follows:

   S   Indicates 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   Indicates daylight savings time (DST).

   **I**   Transition into STD from DST. Set at 0000Z on first STD day and changed to **S** 24 hours later.

Time - Time in hours, minutes, seconds. Upon time/date validation, time delimiters change from (sp) to colons (**:**).

Leap second flag - Changes from (sp) to +/- during month preceding leap second adjustment.

UT1 correction - UT1 adjustment (+/- .1 second increments).

Rear Panel

Connection of power and various signals is made on the rear panel of the Model 332. Rear panel components and their function is shown below:
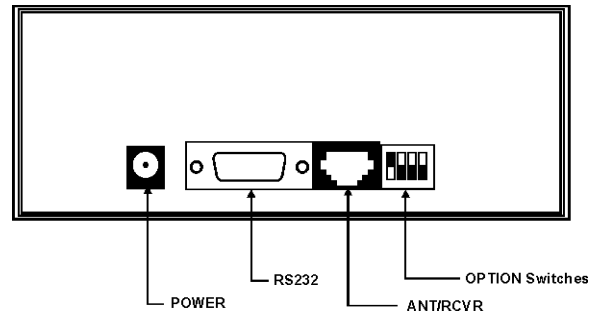
Power - 2.5mm dia jack mates with power cord on Ultralink supplied wall mounted power supply.

RS232 - 9 pin female "D" connector (DB9F) mates with RS232 cable to host computer using either DB9M or DB25F at host end. RS232 pin assignments are as follows:

Pin	Signal
1	1 PPS (DCE)
2	TXD (out)
3	RXD(In)
5	GND
7	RTS

Option switches - 4 position dip switch provides installed option selection as follows:

1	Battery backup - ON is enabled
2	Report time each second - ON is enabled
3,4	Reserved

ANT/RCVR - RJ11 6/4 jack mates with 4-wire modular cable to connect to Ultralink antenna/receiver assembly. This cable is supplied with the antenna/receiver assembly. RJ11 connector pinouts are as follows:

Pin	Signal
1	Reserved
2	VCC
3	TCO
4	AGC
5	GND
6	Reserved

Pin 1 is at the left with the locking tab facing down.

OPERATION

Power Up

AC power is indicated by screen illumination.

Backup Battery Enable

Upon power up, place Option Switch 1 in the ON position to enable RTC battery backup. During shipment and periods of no use, set this switch to OFF to avoid battery cell reversal.

Time Synchronization

Immediately after start up. Immediately after power up, the display will start counting seconds, rolling over to minutes as the time correlation process continues. Flag fields will be blank or "?".

Once verified, the time will appear on the display and the time delimiters will change to colons (:).

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.

RS232 Interface

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"**. Alternately time is reported every second if the RS232 auto report mode is selected (see Option Switches).

RS232 data is a 34 byte string beginning with (cr)(lf) followed by an ASCII string exactly as shown on display. The sequence is as follows:

(cr)(lf)59+1C00N 2004+342UTCS HH:MM:SSL+5

The first character **(cr)** is the time "MARK" and is output within one millisecond of the time returned. The **N** character (Hex A5) is active if the unit is locked to WWVB, otherwise it is a space.

Sending an **"I"** returns the 10 byte ID string:

(cr)(lf)ULM332.A

Power for the RS232 circuitry is derived from the RTS signal line. The host RS232 communication program should allow a 10 millisecond delay after making the RTS signal active before initiating RS232 communication.

Reset

The decoder may be reset by removing power and setting Option Switch 1 to OFF for a few seconds.

INSTALLATION

Receiver

The receiver unit is designed to be used indoors in a wood frame structure. Operation inside metal buildings or buildings with metal reinforcements may be marginal. Locate the receiver in a good reception area such as near a window or in an attic.

The 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. Best reception is obtained with the long side perpendicular to Fort Collins, Colorado.

Avoid locating near suspected interference sources such as:

Lamp dimmers	Fluorescent lamps
Electronic igniters	CRT monitors
Battery chargers	Switching power supplies
Motors	Automobile ignition systems
Power lines	Nearby radio transmitters

> **Note:** Interference is diminished by the square of the distance (i.e., doubling the distance from the source will reduce its effect by 4).

Orient the antenna/receiver for maximum signal readability. With readability of less than three (3) time code data is not reliable enough to decode time information. In this case, move antenna to a location where readability improves or wait until night.

After final orientation secure receiver to prevent inadvertent movement (double sticky tape is OK).

Decoder/Display

Connect the receiver to the decoder/display unit using the modular cable supplied. This connection should be made before connecting the unit to power or enabling battery backup.

If longer modular cable length is required to move the receiver away from noise sources, use a modular cable with pin 1 to pin 1 connections (normal telephone modular cables are reversed) or use a telephone extension cable (normally wired with 1 to 1 connection) available from local sources.

Connection to the power supply is by the 2.5 mm power jack. A mating plug is on the cord attached to the wall mounted power supply furnished. Install power supply in a 120 VAC outlet before connecting to the unit.

Computer connection is by the DB9 connector. This cable may be up to 25' in length. A null modem cable is not required when connecting to a PC.

SPECIFICATIONS

Operational

Receiver

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 (S9)	14 dB average daylight background
AGC signal	0.55 to 0.96V @ 0.007 V/dB
	50 uV/meter (S9) = 0.72V
Reception	Est >23 hours/day @ 50 uV/meter signal strength with background noise only (electrically noise free environment)

Decoder

Time acquisition	Approximately 5 minutes for complete time and flag validation under noise free signal reception conditions
Clock absolute accuracy	+/- 0.015 sec upon reception. 0.015 sec/hour drift during loss of signal periods
Clock repeatability	+/- 2 milliseconds when "lock" indicated
Display	2 X 16 LCD alphanumeric character display with LED backlight
Readability	Indicated in units from 1 to 5, based on the number of good bits per 5 seconds (inverse of bit error rate).
Date range	Indicates correct year from 2000 to 2099
RS232 baud rate	9600
RS232 protocol	8,1,N
Receiver enable	Continuous
1 PPS signal	50% duty cycle TTL. Low to high transition indicates beginning of second

Physical

Receiver/decoder cable	RJ11-4/6 wired pin 1 to pin 1 - 500 feet maximum length
Data cable	DB9M - 25 feet maximum length
Size	
Antenna/receiver	5.2" L X 2.6" W X 1" H
Decoder	5" W X 2" H X 5" D
Weight	1.5 Lb
Construction	Polystyrene enclosures for both units

Electrical

Power	120 VAC @ .04A primary converted to 5 V DC @ 300 mA with UL approved plug mounted power supply
Backup power	3.6V NiCad rechargable with 24 hour backup for RTC. Display is not operational while running on backup power.

Environmental

Operating temperature	+10 to +35 C
Storage temperature	-40 to +70 C

ORDERING INFORMATION

Order Model 332.

> Includes:
> Receiver with antenna
> Decoder with display
> 14' modular connecting cable
> Wall mounted power supply
> 6' DB9M/F RS232 cable

For special applications, contact factory.

Made in the USA.

ULTRALINK