Arduino ESP32-Nano Flipo clock

Generic manual to be adapted special for the Flipo clock.

The Arduino ESP32 Nano is used to drive the clock.
Time is synchronized with the Network Time Protocol (NTP) from the internet or from the very precise RTC module when no WIFI is available .
Settings can be controlled with a webpage, a PC or a Bluetooth Low Energy (BLE) serial terminal app installed on a phone, PC or tablet.

Before starting

The clock receives time from the internet or from the RTC module inside the clock.
To connect to the internet the name of the WIFI station and its password must be entered in the clock software to be able to connect to a WIFI router.
The name of the WIFI-station and password has to be entered once. These credentials will be stored in memory of the microprocessor.
To make life easy it is preferred to use a phone or tablet and a Bluetooth communication app to enter the WIFI credentials into the clock.

| BLESerial nRF | BLE Serial Pro | Serial Bluetooth Terminal |

- Download a Bluetooth UART serial terminal app on your phone, PC, or tablet.
For IOS: BLE Serial Pro or BLESerial nRF.
For Android: Serial Bluetooth Terminal.

Compilation and uploading
The settings of the Arduino Nano ESP32 board is as follows.
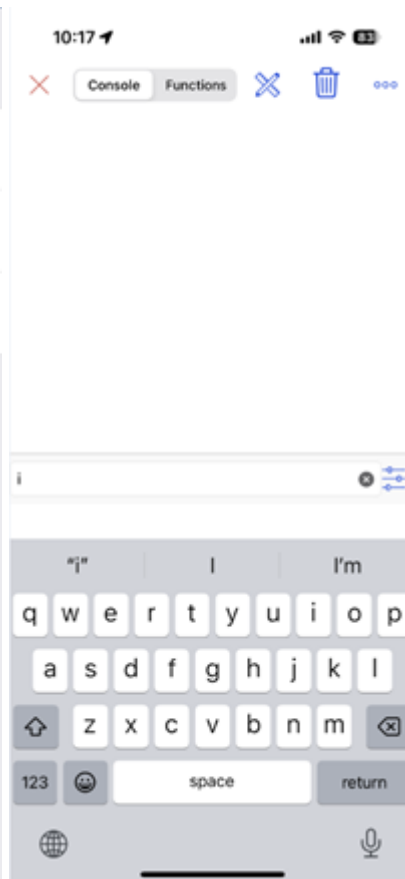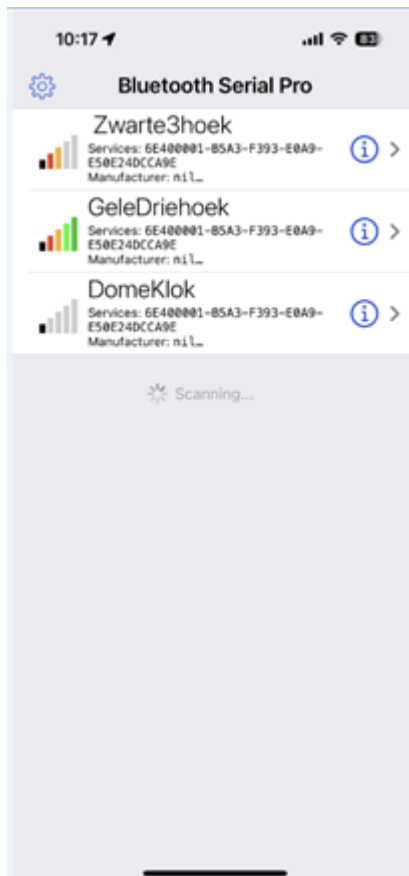
```
Install "Arduino Nano ESP32" boards
Board: Arduino Nano ESP32
Partition Scheme: With FAT
Pin Numbering: By Arduino pin numbering (default)

Locate the ELEGANTOTA_USE_ASYNC_WEBSERVER macro in the
libraries\ElegantOTA.h file, and set ELEGANTOTA_USE_ASYNC_WEBSERVER to 1:
#define ELEGANTOTA_USE_ASYNC_WEBSERVER 1
```

Installations

To connect to a WIFI network the SSID (WIFI name) and password of the WIFI router the clock must be connected to.

There are a few methods:
- Connect the Arduino Nano ESP32 in the clock with a USB-C serial cable to a PC and use a serial terminal.

For a PC the app **Termite** or the Arduino IDE is fine as serial terminal.

- Use a BLE serial terminal app on a phone or tablet for connection.
For IOS use: **BLE Serial Pro** or **BLEserial nRF**.
For Android use: **Serial Bluetooth terminal**.

- Start the BLE tterminal app and start a connection with the clock. Some apps automatically start with a connection window but for some a connection symbol must be pressed. You will most probably find only one station to select from.

- Select the clock in the list.

- The app will display a window and a line where commands can be entered and send to the clock.

- Sending the letter I or i for information will display the menu followed with the actual settings of several preferences.

In the clock there is a LED that will have a red dot lighted when the program is running.
A green dot will turn on when there is a WIFI connection.
When there is a Bluetooth connection a blue dot in the LED will light.

In both cases **send the letter I of Information and the menu shows up**.
Enter the first letter of the setting you want to changes followed with a code.
Some entries just toggle On and Off. Like the W to set WIFI Off or On.

A SSID B Password C BLE beacon name
D Date (D15012021) T Time (T132145)
E Timezone (E<-02>2 or E<+01>-1)
F Toggle 15 seconds tick
I To print this Info menu
J Toggle use RTC module
K Reads/sec toggle On/Off
M Demo mode (sec) (M2)
N Display off between Nhhhh (N2208)

To change the SSID and password:
Send the letter **A** or **a** followed with the WIFI station name.
Amy-ssid and send this command.
For example: AFRITZ!Box01 or aFRITZ!Box01.
Starting with an upper or lower case character is an identical instruction in the command string
Then the letter B followed with the password.
Bmypassword and send the password.
Cbroadcastname will change to name displayed in the Bluetooth connection list. Something like: cFlipoClock

If the length of the SSID and/or password is less then 5 characters the WIFI will be turned off automatically to avoid connection errors.
Use a length of minimal 8 characters for SSID and password.
Restart the clock by sending a @ or turning off and on the clock
Check in the menu (third row from the bottom) if WIFI and NTP are on.

O Display toggle On/Off
P Status LED toggle On/Off
Q Flip disc speed (ms) (L10)
R Reset settings @ = Reset MCU
S Toggle Seconds tick
W=WIFI X=NTP& Y=BLE Z=Fast BLE
Ed Nieuwenhuys August 2024

_____

Display off between: 22h - 08h
SSID: FRITZ!BoxEd
BLE name: Flipo
IP-address: 192.168.178.181 (/update)
Timezone:CET-1CEST,M3.5.0,M10.5.0/3
WIFI=On NTP=On BLE=On FastBLE=On
Disc speed: 10
Time from: NTP
Software: FlipoClockV010.ino
26/07/2024 18:08:36

_____

Menu displayed in serial output.

Enter @ to restart the MCU. It will restart and connections will be made.
Sometimes a second or third reset must be given to get the clock connected to WIFI. If connection still fails check the SSID name and the entered password. (send the letter b, an easter egg))
If WIFI is connected the LED on the MCU will turn on a green dot.

Default the clock is set to Amsterdam time.
A reset with option R in the menu will restore this time zone to Amsterdam again.
To set a different time zone send the time zone string between the quotes prefixed with the character E or e.
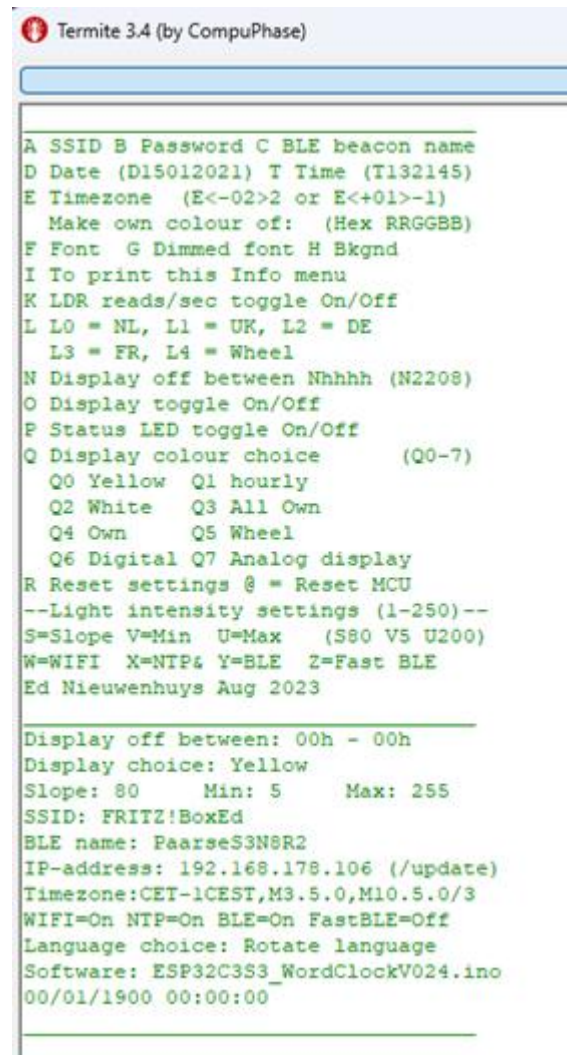At the bottom of this manual many time zones are printed.
For example; if you live in Australia/Sydney send the string, eAEST-10AEDT,M10.1.0,M4.1.0/3.
The clock will use the Daylight saving time (DST) when connected to an NTP server.
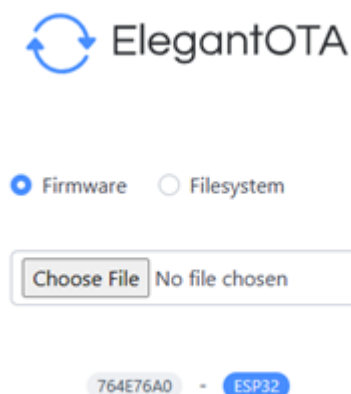
ESP32-Nano Word Clock

Enter time as: hhmmss (132145)

A SSID **B** Password **C** BLE beacon

D Date (D15012021) **T** Time (T132145)

E Set Timezone   E<-02>2 or E<+01>-1

L Language **L0** NL **L1** UK

L2 DE **L3** FR **L4** Wheel

N Display off between Nhhhh (N2208)

O Display On/Off

P Own colour design (0-F) (P00FF00)

Q Display colour choice (Q0-Q6)

Q0 Yellow **Q1** Hourly **Q2** White

Q3 All Own **Q4** Own **Q5** Wheel

Q6 Digital **Q7** Analog -

R Reset settings   @ Restart MCU

W WIFI   On/Off   **X** NTP &Requery

Y BLE   On/Off   **Z** Fast BLE

`Send`

`AA`   192.168.178.34

HTML page on iPhone

Termite 3.4 (by CompuPhase)

```
A SSID B Password C BLE beacon name
D Date (D15012021) T Time (T132145)
E Timezone  (E<-02>2 or E<+01>-1)
  Make own colour of:  (Hex RRGGBB)
F Font  G Dimmed font H Bkgnd
I To print this Info menu
K LDR reads/sec toggle On/Off
L L0 = NL, L1 = UK, L2 = DE
  L3 = FR, L4 = Wheel
N Display off between Nhhhh (N2208)
O Display toggle On/Off
P Status LED toggle On/Off
Q Display colour choice       (Q0-7)
  Q0 Yellow  Q1 hourly
  Q2 White   Q3 All Own
  Q4 Own     Q5 Wheel
  Q6 Digital Q7 Analog display
R Reset settings @ = Reset MCU
--Light intensity settings (1-250)--
S=Slope V=Min  U=Max   (S80 V5 U200)
W=WIFI  X=NTP& Y=BLE   Z=Fast BLE
Ed Nieuwenhuys Aug 2023

Display off between: 00h - 00h
Display choice: Yellow
Slope: 80      Min: 5      Max: 255
SSID: FRITZ!BoxEd
BLE name: PaarseS3N8R2
IP-address: 192.168.178.106 (/update)
Timezone:CET-1CEST,M3.5.0,M10.5.0/3
WIFI=On NTP=On BLE=On FastBLE=Off
Language choice: Rotate language
Software: ESP32C3S3_WordClockV024.ino
00/01/1900 00:00:00
```

Termite Terminal from a PC

Upgrading software

ElegantOTA

Software can be upgraded over the air (OTA) by opening a web browser and entering the IP-address of the clock followed with /update.
For example: 192.168.178.78/update.
Choose firmware and click on Choose File.
Choose the appropriate bin file.

● Firmware   ○ Filesystem

`Choose File` No file chosen

764E76A0 - `ESP32`

Control and settings of the clock

The clock can be controlled with the WIFI webpage or BLE UART terminal app.
When the clock is connected to WIFI it has received an IP-address from the router it is connected to.
The IP-address is printed in the menu. If you can not use a terminal app the IP-address of the clock can be found in your WIFI router.

To start the menu in a web page the IP-address numbers and dots (for example: 192.168.178.77) must be entered in the web browser of your mobile or PC where you type your internet addresses (URL).

Or with a Bluetooth connection:
- Open the BLE terminal app.
- Look in the app for the clock to connect to and connect.

Every app has its own way of showing the Bluetooth device to connect to.

The iPhone/iPad/iMac BLE serial apps are made by me and work with their default settings.
With other apps settings for sending and receiving data may have to be changed.
Play with the font size and the CR and LF setting until you get
On a iPhone, iPad or iMac with the BLE serial app it is possible to speed up the transmission speed by selecting option 'Z Fast BLE' in the menu
Unfortunately some apps can not read strings longer than 20 characters and you will see the strings truncated or garbled.
If you see a garbled menu enter and send the character 'Z' to select the slower transmission mode.
If transmission is too garbled and it is impossible to send the character Z try the web page of the clock and send the character Z.

If all fails you have to connect the MCU inside the clock with a USB C cable to a PC and use a serial terminal app to send a Z.

Settings are set by entering the first character of a command following by parameters if necessary.
For example:

Turn off WIFI by sending a W.
Restart the clock with the letter @.
Reset to default setting by send R.
Turn off the display between 22:00 and 8:00 send N2208

HTML page   BLE menu

Updating the software

The software can be updated 'Over The Air' when the clock is connected to WIFI.
You can find the IP-address in the menu or in the digital display mode menu option Q6.
Enter the IP-address of the clock followed with /update
Something like this : 192.168.178.78/update

'Choose File' in the menu and select the bin file to update.
Something like: ESP32Arduino_WordClockV015.ino.arduino_nano_nora.bin
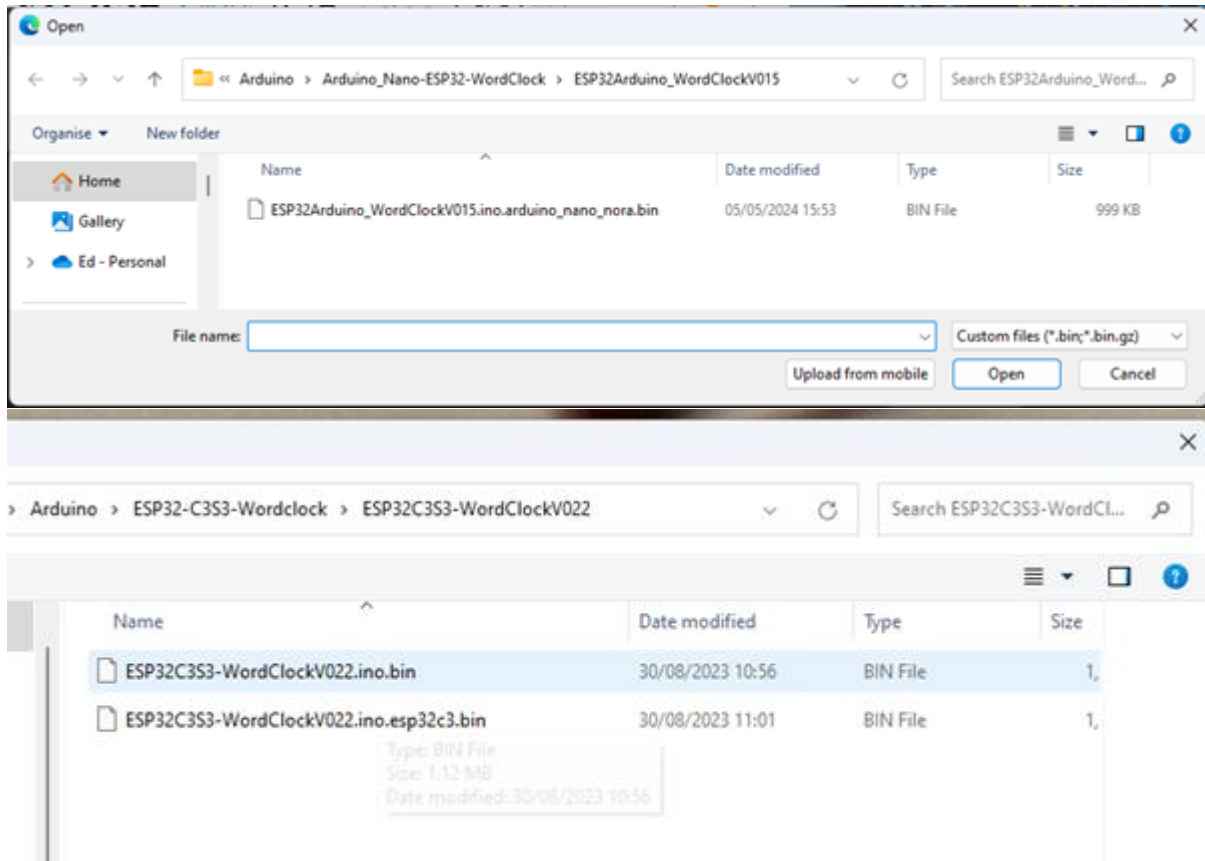
where V015 is the version number of the software.

Detailed description

With the menu many preferences can be set. These preferences are stored on a SD-card or in the ESP32-S3 storage space.

Enter the first character in the menu of the item to be changed followed with the parameter.
There is no difference between upper or lower case. Both are OK.

A SSID B Password C BLE beacon name
Change the name of the SSID of the router to be connected to.
For example: aFRITZ!BoxEd or AFRITZ!BoxEd.
Then enter the password. For example: BSecret_password.
Restart the clock by sending @.
Entering a single 'b' will show the used password. This 'Easter egg' can be used to check if a valid password was entered.

D Set Date and T Set Time
If you are not connected to WIFI you have to set time and date by hand.
For example enter: D06112022 to set the date to 6 November 2022.
Enter for example T132145 (or 132145 , or t132145) to set the time to 45 seconds and 21 minute past one o'clock.
E Set Timezone E<-02>2 or E<+01>-1
At the bottom of this page you can find the time zones used in 2022.
It is a rather complicated string and it is therefore wise to copy it.

Let's pick one if you happen to live here: Antarctica/Troll,"<+00>0<+02>-2,M3.5.0/1,M10.5.0/3"
Copy the string between the " "'s and send it with starting with an 'E' or 'e' in front.
E<+00>0<+02>-2,M3.5.0/1,M10.5.0/3

F Toggle 15 seconds tick
There are three separator flipdisc's. By turning on this option every 15 second a disc is turned

I To print this Info menu
Print the menu to Bluetooth and the serial monitor connected with an USB-cable.

J oggle use RTC module
Sending 'J' will toggle the use of an time module ON and OFF.
If the clock does not has an internet connection time will probably drift undesirably quick. The installed accurate time module will reduce the drift to a few seconds per year. Time can be entered with option T and D in the menu.

K Reads/sec toggle On/Off
Entering a K toggles printing shows how many times the processor loops through the program and checks its tasks to run the clock.

N Display off between Nhhhh (N2208)
With N2208 the display will be turned off between 22:00 and 8:00.

O Display toggle On/Off
O Toggles the flip discs off and on.

P Status LEDs toggle On/Off
P Toggles the status LEDs on the MCU off and on.

Q Flip disc speed (ms) (L10)
The discs can be turned at a certain speed. You can change that speed with values between 0 and 225 ms

R Reset settings
R will set all preferences to default settings, it also clears the SSID and password.
--Light intensity settings (1-250)--

S Toggle Seconds tick

The clock can make a second sound by switching a flip disc every second. This option turns this on or off

! = Show NTP, RTC and DS3231 time

! will display and update with the NTP time the NTP, RTC and accurate RTC module time as they are stored in the clock.
Same as & option but this option will not get the time from the internet NTP server.

@ = Reset MCU

@ will restart the MCU. This is handy when the SSID, et cetera are changed and the program must be restarted. Settings will not be deleted.

& = Get and stores NTP time in RTC and accurate RTC module time

& will get the NTP time immediately from the internet and stores it in the RTC clocks. This option is convenient to force the clock to get the proper NTP time.
In other cases the program will check the time running in the clock and on the NTP server so now and then and update the RTC clocks.

W=WIFI, X=NTP&, Y=BLE

Toggle WIFI, NTP on and off.
Enter the character will toggle it on or off.
At the bottom of the menu the stated is printed.

```
        Display off: 00h - 00h
    Display choice: Yellow
              SSID: FRITZ!BoxEd
          BLE name: ESPWordClock
        IP-address: 192.168.178.78
  Timezone:CET-1CEST,M3.5.0,M10.5.0/3
   WIFI=On NTP=On BLE=On FastBLE=On
   Language choice: Rotate language
```

Sending a & will start a query from the time server.

Z Fast BLE

The BLE UART protocol sends default packets 20 bytes long. Between every packet there is a delay of 50 msec.
The IOS BLEserial app, and maybe others too, is able to receive packets of 80 bytes or more before characters are missed. This makes the menu appears faster.
Option Z toggles between the long and short packages.

Time zones

Copy the text **between the quotes** and paste them after the character E

```
Africa/Abidjan,"GMT0"
Africa/Accra,"GMT0"
Africa/Addis_Ababa,"EAT-3"
Africa/Algiers,"CET-1"
Africa/Asmara,"EAT-3"
Africa/Bamako,"GMT0"
Africa/Bangui,"WAT-1"
Africa/Banjul,"GMT0"
Africa/Bissau,"GMT0"
Africa/Blantyre,"CAT-2"
Africa/Brazzaville,"WAT-1"
Africa/Bujumbura,"CAT-2"
Africa/Cairo,"EET-2"
Africa/Casablanca,"<+01>-1"
Africa/Ceuta,"CET-1CEST,M3.5.0,M10.5.0/3"
Africa/Conakry,"GMT0"
Africa/Dakar,"GMT0"
Africa/Dar_es_Salaam,"EAT-3"
Africa/Djibouti,"EAT-3"
Africa/Douala,"WAT-1"
Africa/El_Aaiun,"<+01>-1"
Africa/Freetown,"GMT0"
Africa/Gaborone,"CAT-2"
Africa/Harare,"CAT-2"
Africa/Johannesburg,"SAST-2"
Africa/Juba,"CAT-2"
Africa/Kampala,"EAT-3"
Africa/Khartoum,"CAT-2"
Africa/Kigali,"CAT-2"
Africa/Kinshasa,"WAT-1"
Africa/Lagos,"WAT-1"
Africa/Libreville,"WAT-1"
Africa/Lome,"GMT0"
Africa/Luanda,"WAT-1"
Africa/Lubumbashi,"CAT-2"
Africa/Lusaka,"CAT-2"
Africa/Malabo,"WAT-1"
Africa/Maputo,"CAT-2"
Africa/Maseru,"SAST-2"
Africa/Mbabane,"SAST-2"
Africa/Mogadishu,"EAT-3"
Africa/Monrovia,"GMT0"
Africa/Nairobi,"EAT-3"
Africa/Ndjamena,"WAT-1"
Africa/Niamey,"WAT-1"
Africa/Nouakchott,"GMT0"
Africa/Ouagadougou,"GMT0"
Africa/Porto-Novo,"WAT-1"
Africa/Sao_Tome,"GMT0"
Africa/Tripoli,"EET-2"
Africa/Tunis,"CET-1"
Africa/Windhoek,"CAT-2"
America/Adak,"HST10HDT,M3.2.0,M11.1.0"
America/Anchorage,"AKST9AKDT,M3.2.0,M11.1.0"
America/Anguilla,"AST4"
America/Antigua,"AST4"
America/Araguaina,"<-03>3"
America/Argentina/Buenos_Aires,"<-03>3"
America/Argentina/Catamarca,"<-03>3"
America/Argentina/Cordoba,"<-03>3"
```

```
America/Argentina/Jujuy,"<-03>3"
America/Argentina/La_Rioja,"<-03>3"
America/Argentina/Mendoza,"<-03>3"
America/Argentina/Rio_Gallegos,"<-03>3"
America/Argentina/Salta,"<-03>3"
America/Argentina/San_Juan,"<-03>3"
America/Argentina/San_Luis,"<-03>3"
America/Argentina/Tucuman,"<-03>3"
America/Argentina/Ushuaia,"<-03>3"
America/Aruba,"AST4"
America/Asuncion,"<-04>4<-03>,M10.1.0/0,M3.4.0/0"
America/Atikokan,"EST5"
America/Bahia,"<-03>3"
America/Bahia_Banderas,"CST6CDT,M4.1.0,M10.5.0"
America/Barbados,"AST4"
America/Belem,"<-03>3"
America/Belize,"CST6"
America/Blanc-Sablon,"AST4"
America/Boa_Vista,"<-04>4"
America/Bogota,"<-05>5"
America/Boise,"MST7MDT,M3.2.0,M11.1.0"
America/Cambridge_Bay,"MST7MDT,M3.2.0,M11.1.0"
America/Campo_Grande,"<-04>4"
America/Cancun,"EST5"
America/Caracas,"<-04>4"
America/Cayenne,"<-03>3"
America/Cayman,"EST5"
America/Chicago,"CST6CDT,M3.2.0,M11.1.0"
America/Chihuahua,"MST7MDT,M4.1.0,M10.5.0"
America/Costa_Rica,"CST6"
America/Creston,"MST7"
America/Cuiaba,"<-04>4"
America/Curacao,"AST4"
America/Danmarkshavn,"GMT0"
America/Dawson,"MST7"
America/Dawson_Creek,"MST7"
America/Denver,"MST7MDT,M3.2.0,M11.1.0"
America/Detroit,"EST5EDT,M3.2.0,M11.1.0"
America/Dominica,"AST4"
America/Edmonton,"MST7MDT,M3.2.0,M11.1.0"
America/Eirunepe,"<-05>5"
America/El_Salvador,"CST6"
America/Fortaleza,"<-03>3"
America/Fort_Nelson,"MST7"
America/Glace_Bay,"AST4ADT,M3.2.0,M11.1.0"
America/Godthab,"<-03>3<-02>,M3.5.0/-2,M10.5.0/-1"
America/Goose_Bay,"AST4ADT,M3.2.0,M11.1.0"
America/Grand_Turk,"EST5EDT,M3.2.0,M11.1.0"
America/Grenada,"AST4"
America/Guadeloupe,"AST4"
America/Guatemala,"CST6"
America/Guayaquil,"<-05>5"
America/Guyana,"<-04>4"
America/Halifax,"AST4ADT,M3.2.0,M11.1.0"
America/Havana,"CST5CDT,M3.2.0/0,M11.1.0/1"
America/Hermosillo,"MST7"
America/Indiana/Indianapolis,"EST5EDT,M3.2.0,M11.1.0"
America/Indiana/Knox,"CST6CDT,M3.2.0,M11.1.0"
America/Indiana/Marengo,"EST5EDT,M3.2.0,M11.1.0"
America/Indiana/Petersburg,"EST5EDT,M3.2.0,M11.1.0"
America/Indiana/Tell_City,"CST6CDT,M3.2.0,M11.1.0"
America/Indiana/Vevay,"EST5EDT,M3.2.0,M11.1.0"
America/Indiana/Vincennes,"EST5EDT,M3.2.0,M11.1.0"
America/Indiana/Winamac,"EST5EDT,M3.2.0,M11.1.0"
America/Inuvik,"MST7MDT,M3.2.0,M11.1.0"
America/Iqaluit,"EST5EDT,M3.2.0,M11.1.0"
America/Jamaica,"EST5"
America/Juneau,"AKST9AKDT,M3.2.0,M11.1.0"
```

```
America/Kentucky/Louisville,"EST5EDT,M3.2.0,M11.1.0"
America/Kentucky/Monticello,"EST5EDT,M3.2.0,M11.1.0"
America/Kralendijk,"AST4"
America/La_Paz,"<-04>4"
America/Lima,"<-05>5"
America/Los_Angeles,"PST8PDT,M3.2.0,M11.1.0"
America/Lower_Princes,"AST4"
America/Maceio,"<-03>3"
America/Managua,"CST6"
America/Manaus,"<-04>4"
America/Marigot,"AST4"
America/Martinique,"AST4"
America/Matamoros,"CST6CDT,M3.2.0,M11.1.0"
America/Mazatlan,"MST7MDT,M4.1.0,M10.5.0"
America/Menominee,"CST6CDT,M3.2.0,M11.1.0"
America/Merida,"CST6CDT,M4.1.0,M10.5.0"
America/Metlakatla,"AKST9AKDT,M3.2.0,M11.1.0"
America/Mexico_City,"CST6CDT,M4.1.0,M10.5.0"
America/Miquelon,"<-03>3<-02>,M3.2.0,M11.1.0"
America/Moncton,"AST4ADT,M3.2.0,M11.1.0"
America/Monterrey,"CST6CDT,M4.1.0,M10.5.0"
America/Montevideo,"<-03>3"
America/Montreal,"EST5EDT,M3.2.0,M11.1.0"
America/Montserrat,"AST4"
America/Nassau,"EST5EDT,M3.2.0,M11.1.0"
America/New_York,"EST5EDT,M3.2.0,M11.1.0"
America/Nipigon,"EST5EDT,M3.2.0,M11.1.0"
America/Nome,"AKST9AKDT,M3.2.0,M11.1.0"
America/Noronha,"<-02>2"
America/North_Dakota/Beulah,"CST6CDT,M3.2.0,M11.1.0"
America/North_Dakota/Center,"CST6CDT,M3.2.0,M11.1.0"
America/North_Dakota/New_Salem,"CST6CDT,M3.2.0,M11.1.0"
America/Nuuk,"<-03>3<-02>,M3.5.0/-2,M10.5.0/-1"
America/Ojinaga,"MST7MDT,M3.2.0,M11.1.0"
America/Panama,"EST5"
America/Pangnirtung,"EST5EDT,M3.2.0,M11.1.0"
America/Paramaribo,"<-03>3"
America/Phoenix,"MST7"
America/Port-au-Prince,"EST5EDT,M3.2.0,M11.1.0"
America/Port_of_Spain,"AST4"
America/Porto_Velho,"<-04>4"
America/Puerto_Rico,"AST4"
America/Punta_Arenas,"<-03>3"
America/Rainy_River,"CST6CDT,M3.2.0,M11.1.0"
America/Rankin_Inlet,"CST6CDT,M3.2.0,M11.1.0"
America/Recife,"<-03>3"
America/Regina,"CST6"
America/Resolute,"CST6CDT,M3.2.0,M11.1.0"
America/Rio_Branco,"<-05>5"
America/Santarem,"<-03>3"
America/Santiago,"<-04>4<-03>,M9.1.6/24,M4.1.6/24"
America/Santo_Domingo,"AST4"
America/Sao_Paulo,"<-03>3"
America/Scoresbysund,"<-01>1<+00>,M3.5.0/0,M10.5.0/1"
America/Sitka,"AKST9AKDT,M3.2.0,M11.1.0"
America/St_Barthelemy,"AST4"
America/St_Johns,"NST3:30NDT,M3.2.0,M11.1.0"
America/St_Kitts,"AST4"
America/St_Lucia,"AST4"
America/St_Thomas,"AST4"
America/St_Vincent,"AST4"
America/Swift_Current,"CST6"
America/Tegucigalpa,"CST6"
America/Thule,"AST4ADT,M3.2.0,M11.1.0"
America/Thunder_Bay,"EST5EDT,M3.2.0,M11.1.0"
America/Tijuana,"PST8PDT,M3.2.0,M11.1.0"
America/Toronto,"EST5EDT,M3.2.0,M11.1.0"
America/Tortola,"AST4"
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America/Vancouver,"PST8PDT,M3.2.0,M11.1.0"
America/Whitehorse,"MST7"
America/Winnipeg,"CST6CDT,M3.2.0,M11.1.0"
America/Yakutat,"AKST9AKDT,M3.2.0,M11.1.0"
America/Yellowknife,"MST7MDT,M3.2.0,M11.1.0"
Antarctica/Casey,"<+11>-11"
Antarctica/Davis,"<+07>-7"
Antarctica/DumontDUrville,"<+10>-10"
Antarctica/Macquarie,"AEST-10AEDT,M10.1.0,M4.1.0/3"
Antarctica/Mawson,"<+05>-5"
Antarctica/McMurdo,"NZST-12NZDT,M9.5.0,M4.1.0/3"
Antarctica/Palmer,"<-03>3"
Antarctica/Rothera,"<-03>3"
Antarctica/Syowa,"<+03>-3"
Antarctica/Troll,"<+00>0<+02>-2,M3.5.0/1,M10.5.0/3"
Antarctica/Vostok,"<+06>-6"
Arctic/Longyearbyen,"CET-1CEST,M3.5.0,M10.5.0/3"
Asia/Aden,"<+03>-3"
Asia/Almaty,"<+06>-6"
Asia/Amman,"EET-2EEST,M2.5.4/24,M10.5.5/1"
Asia/Anadyr,"<+12>-12"
Asia/Aqtau,"<+05>-5"
Asia/Aqtobe,"<+05>-5"
Asia/Ashgabat,"<+05>-5"
Asia/Atyrau,"<+05>-5"
Asia/Baghdad,"<+03>-3"
Asia/Bahrain,"<+03>-3"
Asia/Baku,"<+04>-4"
Asia/Bangkok,"<+07>-7"
Asia/Barnaul,"<+07>-7"
Asia/Beirut,"EET-2EEST,M3.5.0/0,M10.5.0/0"
Asia/Bishkek,"<+06>-6"
Asia/Brunei,"<+08>-8"
Asia/Chita,"<+09>-9"
Asia/Choibalsan,"<+08>-8"
Asia/Colombo,"<+0530>-5:30"
Asia/Damascus,"EET-2EEST,M3.5.5/0,M10.5.5/0"
Asia/Dhaka,"<+06>-6"
Asia/Dili,"<+09>-9"
Asia/Dubai,"<+04>-4"
Asia/Dushanbe,"<+05>-5"
Asia/Famagusta,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Asia/Gaza,"EET-2EEST,M3.4.4/48,M10.5.5/1"
Asia/Hebron,"EET-2EEST,M3.4.4/48,M10.5.5/1"
Asia/Ho_Chi_Minh,"<+07>-7"
Asia/Hong_Kong,"HKT-8"
Asia/Hovd,"<+07>-7"
Asia/Irkutsk,"<+08>-8"
Asia/Jakarta,"WIB-7"
Asia/Jayapura,"WIT-9"
Asia/Jerusalem,"IST-2IDT,M3.4.4/26,M10.5.0"
Asia/Kabul,"<+0430>-4:30"
Asia/Kamchatka,"<+12>-12"
Asia/Karachi,"PKT-5"
Asia/Kathmandu,"<+0545>-5:45"
Asia/Khandyga,"<+09>-9"
Asia/Kolkata,"IST-5:30"
Asia/Krasnoyarsk,"<+07>-7"
Asia/Kuala_Lumpur,"<+08>-8"
Asia/Kuching,"<+08>-8"
Asia/Kuwait,"<+03>-3"
Asia/Macau,"CST-8"
Asia/Magadan,"<+11>-11"
Asia/Makassar,"WITA-8"
Asia/Manila,"PST-8"
Asia/Muscat,"<+04>-4"
Asia/Nicosia,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Asia/Novokuznetsk,"<+07>-7"
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Asia/Novosibirsk,"<+07>-7"
Asia/Omsk,"<+06>-6"
Asia/Oral,"<+05>-5"
Asia/Phnom_Penh,"<+07>-7"
Asia/Pontianak,"WIB-7"
Asia/Pyongyang,"KST-9"
Asia/Qatar,"<+03>-3"
Asia/Qyzylorda,"<+05>-5"
Asia/Riyadh,"<+03>-3"
Asia/Sakhalin,"<+11>-11"
Asia/Samarkand,"<+05>-5"
Asia/Seoul,"KST-9"
Asia/Shanghai,"CST-8"
Asia/Singapore,"<+08>-8"
Asia/Srednekolymsk,"<+11>-11"
Asia/Taipei,"CST-8"
Asia/Tashkent,"<+05>-5"
Asia/Tbilisi,"<+04>-4"
Asia/Tehran,"<+0330>-3:30<+0430>,J79/24,J263/24"
Asia/Thimphu,"<+06>-6"
Asia/Tokyo,"JST-9"
Asia/Tomsk,"<+07>-7"
Asia/Ulaanbaatar,"<+08>-8"
Asia/Urumqi,"<+06>-6"
Asia/Ust-Nera,"<+10>-10"
Asia/Vientiane,"<+07>-7"
Asia/Vladivostok,"<+10>-10"
Asia/Yakutsk,"<+09>-9"
Asia/Yangon,"<+0630>-6:30"
Asia/Yekaterinburg,"<+05>-5"
Asia/Yerevan,"<+04>-4"
Atlantic/Azores,"<-01>1<+00>,M3.5.0/0,M10.5.0/1"
Atlantic/Bermuda,"AST4ADT,M3.2.0,M11.1.0"
Atlantic/Canary,"WET0WEST,M3.5.0/1,M10.5.0"
Atlantic/Cape_Verde,"<-01>1"
Atlantic/Faroe,"WET0WEST,M3.5.0/1,M10.5.0"
Atlantic/Madeira,"WET0WEST,M3.5.0/1,M10.5.0"
Atlantic/Reykjavik,"GMT0"
Atlantic/South_Georgia,"<-02>2"
Atlantic/Stanley,"<-03>3"
Atlantic/St_Helena,"GMT0"
Australia/Adelaide,"ACST-9:30ACDT,M10.1.0,M4.1.0/3"
Australia/Brisbane,"AEST-10"
Australia/Broken_Hill,"ACST-9:30ACDT,M10.1.0,M4.1.0/3"
Australia/Currie,"AEST-10AEDT,M10.1.0,M4.1.0/3"
Australia/Darwin,"ACST-9:30"
Australia/Eucla,"<+0845>-8:45"
Australia/Hobart,"AEST-10AEDT,M10.1.0,M4.1.0/3"
Australia/Lindeman,"AEST-10"
Australia/Lord_Howe,"<+1030>-10:30<+11>-11,M10.1.0,M4.1.0"
Australia/Melbourne,"AEST-10AEDT,M10.1.0,M4.1.0/3"
Australia/Perth,"AWST-8"
Australia/Sydney,"AEST-10AEDT,M10.1.0,M4.1.0/3"
Europe/Amsterdam,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Andorra,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Astrakhan,"<+04>-4"
Europe/Athens,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Belgrade,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Berlin,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Bratislava,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Brussels,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Bucharest,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Budapest,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Busingen,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Chisinau,"EET-2EEST,M3.5.0,M10.5.0/3"
Europe/Copenhagen,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Dublin,"IST-1GMT0,M10.5.0,M3.5.0/1"
Europe/Gibraltar,"CET-1CEST,M3.5.0,M10.5.0/3"
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Europe/Guernsey,"GMT0BST,M3.5.0/1,M10.5.0"
Europe/Helsinki,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Isle_of_Man,"GMT0BST,M3.5.0/1,M10.5.0"
Europe/Istanbul,"<+03>-3"
Europe/Jersey,"GMT0BST,M3.5.0/1,M10.5.0"
Europe/Kaliningrad,"EET-2"
Europe/Kiev,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Kirov,"<+03>-3"
Europe/Lisbon,"WET0WEST,M3.5.0/1,M10.5.0"
Europe/Ljubljana,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/London,"GMT0BST,M3.5.0/1,M10.5.0"
Europe/Luxembourg,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Madrid,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Malta,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Mariehamn,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Minsk,"<+03>-3"
Europe/Monaco,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Moscow,"MSK-3"
Europe/Oslo,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Paris,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Podgorica,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Prague,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Riga,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Rome,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Samara,"<+04>-4"
Europe/San_Marino,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Sarajevo,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Saratov,"<+04>-4"
Europe/Simferopol,"MSK-3"
Europe/Skopje,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Sofia,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Stockholm,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Tallinn,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Tirane,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Ulyanovsk,"<+04>-4"
Europe/Uzhgorod,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Vaduz,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Vatican,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Vienna,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Vilnius,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Volgograd,"<+03>-3"
Europe/Warsaw,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Zagreb,"CET-1CEST,M3.5.0,M10.5.0/3"
Europe/Zaporozhye,"EET-2EEST,M3.5.0/3,M10.5.0/4"
Europe/Zurich,"CET-1CEST,M3.5.0,M10.5.0/3"
Indian/Antananarivo,"EAT-3"
Indian/Chagos,"<+06>-6"
Indian/Christmas,"<+07>-7"
Indian/Cocos,"<+0630>-6:30"
Indian/Comoro,"EAT-3"
Indian/Kerguelen,"<+05>-5"
Indian/Mahe,"<+04>-4"
Indian/Maldives,"<+05>-5"
Indian/Mauritius,"<+04>-4"
Indian/Mayotte,"EAT-3"
Indian/Reunion,"<+04>-4"
Pacific/Apia,"<+13>-13"
Pacific/Auckland,"NZST-12NZDT,M9.5.0,M4.1.0/3"
Pacific/Bougainville,"<+11>-11"
Pacific/Chatham,"<+1245>-12:45<+1345>,M9.5.0/2:45,M4.1.0/3:45"
Pacific/Chuuk,"<+10>-10"
Pacific/Easter,"<-06>6<-05>,M9.1.6/22,M4.1.6/22"
Pacific/Efate,"<+11>-11"
Pacific/Enderbury,"<+13>-13"
Pacific/Fakaofo,"<+13>-13"
Pacific/Fiji,"<+12>-12<+13>,M11.2.0,M1.2.3/99"
Pacific/Funafuti,"<+12>-12"
Pacific/Galapagos,"<-06>6"
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Pacific/Guam,"ChST-10"
Pacific/Honolulu,"HST10"
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Pacific/Kosrae,"<+11>-11"
Pacific/Kwajalein,"<+12>-12"
Pacific/Majuro,"<+12>-12"
Pacific/Marquesas,"<-0930>9:30"
Pacific/Midway,"SST11"
Pacific/Nauru,"<+12>-12"
Pacific/Niue,"<-11>11"
Pacific/Norfolk,"<+11>-11<+12>,M10.1.0,M4.1.0/3"
Pacific/Noumea,"<+11>-11"
Pacific/Pago_Pago,"SST11"
Pacific/Palau,"<+09>-9"
Pacific/Pitcairn,"<-08>8"
Pacific/Pohnpei,"<+11>-11"
Pacific/Port_Moresby,"<+10>-10"
Pacific/Rarotonga,"<-10>10"
Pacific/Saipan,"ChST-10"
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Etc/GMT+9,"<-09>9"
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Etc/GMT+11,"<-11>11"
Etc/GMT+12,"<-12>12"
Etc/UCT,"UTC0"
Etc/UTC,"UTC0"
Etc/Greenwich,"GMT0"
Etc/Universal,"UTC0"
Etc/Zulu,"UTC0"
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