NEOL ®

NeoClock®

User's guide

Radio controlled clock

E N G L I S H

TABLE OF CONTENTS

1. FOREWORD

NeoClock is a radio controlled clock that can be used to synchronise various sorts of systems requiring precise time information (PCs, automatons, display boards ...).

NeoClock is available in two versions:

DCF Version: This version incorporates a radio receiver that picks up the DCF77 signal broadcast by the Mainflingen transmitter located near Frankfurt (Germany). The transmitter broadcasts long waves at a frequency of 77.5 kHz. Its waves can be picked up as far as 1,000 to 1,500 km away from Frankfurt.

France Inter Version: This version incorporates a radio receiver that picks up the France Inter signal broadcast by the Allouis transmitter located near Bourges (France). This transmitter broadcasts long waves at a frequency of 162 kHz. Its waves can be picked up as far as 2,500 to 3,500 km away from Allouis.

NeoClock consists of a plastic case (desk version in a blue ABS casing or industrial version in a polycarbonate IP67 casing) equipped with a 5-meter serial cable. The cable features a 9 points SUB-D female connector that can be directly connected to the standard serial port of a PC.

Inside the case, an original 2-antenna device guarantees the best reception of the signal whatever the geographical situation of the case in relation to the transmitter.

An autonomous clock with a temperature-compensated crystal oscillator makes possible for NeoClock to deliver extremely precise time information even in the event of a disturbance in the reference radio signal.
Two control LEDs allow you to check if the product works correctly and if the radio signal is correctly received.

The use of CMOS-technology components makes it possible to power the system through the V24/RS232 serial link of a PC compatible (5-wire link).

2. GUARANTEE

NeoClock is guaranteed for a period of **two years** from the purchase date. This guarantee includes the cost-free replacement of a defective product or defective parts, including repair work and return to customer.

Damage due to external accidents, non-approved interventions or overvoltage are excluded from this guarantee.

GUARANTEE LIMITS

Due to the complexity of computer technology, it is not possible to exclude data treatment errors in any situation of use.

NEOL guarantees that the product will perform substantially in accordance with this manual under normal use and service.

No liability for consequential damage: neither NEOL nor its suppliers shall be liable for any damage whatsoever, including without limitation any loss of business profits, data loss or any financial loss resulting from the use of or the inability to use the NeoClock product, even if NEOL has been advised of the possibility of such damage. In any case, NEOL cannot be liable for an amount exceeding the price actually paid for the purchase of the product.

The present agreement shall be governed by French laws. Any litigation will be submitted to the sole jurisdiction of the courts of the city of STRASBOURG.

The pieces of information mentioned in this document can be modified without notice.

3. TECHNICAL SUPPORT

By returning your registration card, you **get free technical support for 90 days.** This offer is valid within two years of the purchase date.

The 90-day period starts at the first support request.

You will find answers to the most frequent questions in the present manual, appendix E Troubleshooting.

The latest data on NeoClock are available on Internet. You're welcome on our web support page at www.neol.com

e-mail: support@neol.com

or

fax +33.03.88.33.37.72

4. INSTALLING THE RECEIVER

1. Switch your system off and **unplug it**.

2. Connect the cable of the NeoClock receiver to the V24/RS232 serial connector of your system. For the pin assignment, see **APPENDIX F** TECHNICAL FEATURES).
   If you want to connect NeoClock to a computer equipped with a standard 9 points SUB-D male connector, you can plug directly NeoClock to this computer.

3. Plug in and switch on your system again.

5. INSTALLING YOUR PROGRAM

First at all, your software MUST activate the RTS and DTR lines since they power the NeoClock receiver.
Both lines must have a positive potential; they correspond respectively to the pins 4 and 7 of the NeoClock cable connector.

As soon as these lines have a positive potential, the POWER LED (or left LED in front view on the desk version) of the NeoClock receiver starts flashing to indicate its good functioning.

Important : All five lines used by NeoClock MUST be connected to your system (see **APPENDIX F** TECHNICAL FEATURES)

6. RECEIVER POSITIONING

1. After connecting the NeoClock receiver and starting your program, check that the POWER LED (or the left LED in front view on the desk version) flashes regularly every second. It shows that the NeoClock receiver works correctly.
   If this is not the case, go to **APPENDIX E** TROUBLESHOOTING.

2. Now find a place for your NeoClock receiver. This step is very important to ensure the good reception of the product.
   Do not fix the NeoClock receiver in any place yet, because you will perhaps have to move and test it in different places to find the best reception of the radio signal.

   The RADIO SIGNAL LED (or right LED in front view on the desk version) will help you find a place where the reception of the radio signal is clear enough.

   Once this **LED remains continuously on** during 2 to 3 minutes without switching off, you can fix the receiver with it wall support.

   The next section will explain you the meaning of the control LEDs.

   Positioning of the industrial IP67 casing

Wall

Flat angle bracket

NeoClock casing

Lid
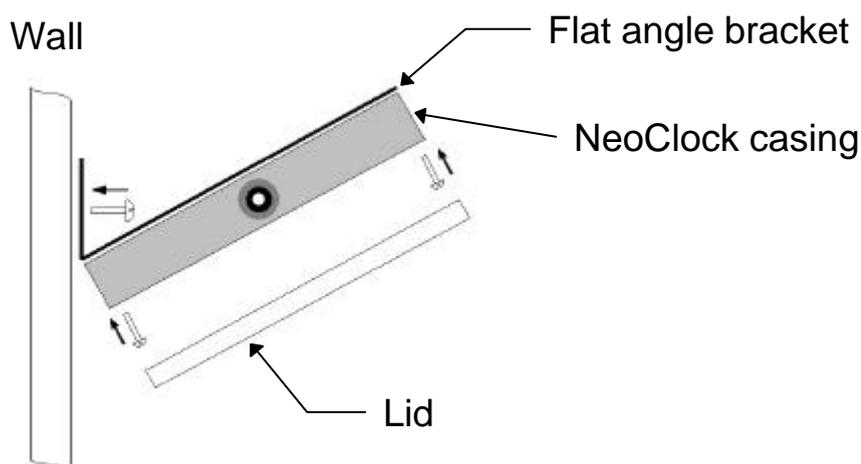
6.1 THE CONTROL LEDS

The NeoClock receiver is equipped with two control LEDs that indicate the status of the receiver at any time. The operation of these LEDs depends on the system of antennas (DCF77 or France Inter) used by the NeoClock receiver.

6.1.1 DCF77 antenna system

POWER LED
(or left LED in front view on the desk version)

red blinking:
Indicates that the NeoClock receiver has not yet been able to decode the time data coming from the atomic clock since it has been powered. Also indicates that the time data coming from the atomic clock could not be decoded without error by the NeoClock receiver for the past 24 hours.

green blinking:
Indicates that the time data coming from the atomic clock could be decoded without error. These data were sent to the connected PC through the V24/RS232 connection and were also used to synchronise the autonomous quartz clock of NeoClock.

RADIO SIGNAL LED
(or right LED in front view on the desk version)

off:
Indicates that the signal DCF77 is not received correctly.

green:
Indicate that the DCF77 signal is received correctly during more than 2 seconds. This LED must be lit without interruption so that the radio signal can be decoded without error.
This LED switches on as soon as the signal is picked up. It switches out during 2 seconds each time the reception is interrupted. If this happens, move the receiver until the LED switches on again.

See also **SECTION 6.2** IMPORTANT remarks for the positioning of the receiver.

6.1.2 France Inter antenna system

POWER LED
(or left LED in front view on the desk version)

red blinking:
Indicates that the NeoClock receiver has not yet been able to decode the time data coming from the atomic clock since it was powered.
Also indicates that the time data coming from the atomic clock could not be decoded without error by the NeoClock receiver for the past 24 hours.

green blinking:
Indicates that the time data coming from the atomic clock could be decoded without error. These data were sent to the connected PC through the V24/RS232 connection and were also used to synchronise the autonomous quartz clock of NeoClock.

RADIO SIGNAL LED
(or right LED in front view on the desk version)

red blinking:
Indicates a very low level of reception of the radio signal.

green blinking:
Indicates a medium level of reception of the radio signal.

green:
Indicates a good level of reception of the radio signal.

off:
Indicates that the quality of the radio signal has been too low for more than one minute.
This LED switches on as soon as the signal is picked up. It switches off if the reception is interrupted. If this happens, move the receiver until the LED switches on again.

Important note about the FRANCE INTER receivers:

Every Tuesday between 2 a.m. and 5 a.m. approximately, the TDF France Inter transmitter stops to send time data for maintenance reasons.

However, you can still obtain a high-precision synchronization of your system during this period by using the NeoClock **quartz clock** data.

Also see § 6.2 IMPORTANT REMARKS for the positioning of the receiver.

6.2 IMPORTANT REMARKS

Since it consists of a radio receiver, the NeoClock system must be kept away from any source of electrostatic and electromagnetic disturbances. **To ensure correct reception**, follow these instructions:

To avoid interference, keep the receiver as far away as possible from:

- computers, screens, keyboards, television sets;
- fluorescent tubes;
- electric motors;
- dimmer switches;
- emission and reception antennas;
- any other interference source.

Reception is difficult in some areas. Try several different places before choosing the final location of the NeoClock receiver.

Place the receiver if possible

- close to a window
- high up.

Do not place it in rooms where reception is not possible, such as:

- in a basement
- in the middle of a building with a metallic structure.

If your computer is located in a room where reception is difficult, you can use an extension cable to move the receiver away. Take a shielded extension cable and connect the pins numbered 2, 3, 4, 5 and 7 of the 9-pin connector. The extension cable can be up to 100 meters long (330 feet).

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7. OPERATION

NeoClock picks up long wave signals broadcasting time reference signals. It is available with two different antenna systems. One picks up the DCF77 signal and the other picks up the France Inter signal.

The DCF77 signal comes from a long wave transmitter that broadcasts time signals on 77.5 kHz. T
he France Inter signal comes from a long wave transmitter that broadcasts time signals on 162 kHz.

Both transmitters use a very simple protocol: every minute, the full date and time are transmitted in 59 bits at a frequency of 1 bit per second. The 60th bit is not emitted and is thus used as a marker for the beginning of the next time sequence.

In order to achieve the best reception possible, NeoClock features an original system with two antennas. A sophisticated demodulator system sends its pulses to the microprocessor of NeoClock for sampling, decoding and saving.

In order to guarantee the safety of the data, the NeoClock processor discards any irrelevant data such as hour 27, day 32, month 18, … (these values can actually appear in the case of electromagnetic disturbances, for instance). The processor also checks three parity bits for each data string and the exact timing between all pulses.

If no errors were detected during the checking process, the whole data sequence is saved to be compared with the following sequence. If no error is detected at this point, the autonomous quartz clock of NeoClock is synchronised with the atomic clock as soon as the synchronisation signal is identified (it corresponds to the zero-second shift).

8. FOR SOFTWARE DEVELOPERS

<u>To ensure the safety of the data string</u>:

- Do not take into account the time sequence as long as the initialisation bit (byte JS, bit 5) is not set, i.e. the autonomous NeoClock quartz clock has not been synchronised since its last starting.

- Do not take into account the time sequence if the checksum is wrong. In this case, wait for the next data string.

- Before validation of the data, compare the last received data string with the previous one. If the difference is too big, do not take the time sequence into account.

- If possible, compare the time data you received with those from your system clock. If they are too different from each other, do not take the time sequence into account.

<u>To get the best possible accuracy</u>:

- Do not acknowledge the time sequence unless the atomic bit is set.

- Do not validate the time sequence if the value of the bad reception minute counter is too high. This counter can go up to 65535, meaning 45 days uninterrupted bad reception.

Year codification:

The year is codified on two bytes.

    Example: 00 means year 2000
                             23 means year 2023

Daylight saving evaluation:

No CMOS clock can manage the date of daylight saving. So, be careful with the evaluation of the daylight saving information transmitted by NeoClock as long as the time data transmitted by the system are coming from the NeoClock autonomous quartz clock.

9. DATA TRANSMISSION

At the initialisation, NeoClock transmits the time data in binary mode as shown in APPENDIX B table 1. These data are transmitted automatically once a minute:

a) **In the case of bad reception of the radio signal:**
   at the zero-second shift of the autonomous quartz clock.

b)   **In the case of good reception of the radio signal:**
   at the reception of the synchronisation signal from the radio signal corresponding to the zero-second shift.

Using control codes (see **APPENDIX A** CONTROL CODES), it's possible to select a second binary output mode (see **APPENDIX C** TABLE 2) or an ASCII output mode (see **APPENDIX D** TABLE 3).

9.1 FORMAT

Serial transmission parameters	
Baud rate	2 400
Format	8 bits
Parity	no
Stop bits	2

9.2 PROTOCOL

NeoClock does not use any handshake.

APPENDIX A

CONTROL CODES

The operation mode of NeoClock can be to configured using following ASCII control codes:

Selecting the mode

"8"   transmission of the data string in binary mode
"9"   transmission of the data string in ASCII mode

"N"   select the binary data string as shown in table 2
          (with header indicating the antenna system in use and time string
          with hundreds of seconds)

Selecting the data output rate

"A"   automatic transmission of 1 data string / second
"E"   automatic transmission of 1 data string / minute
"@"   transmission of the data string only on request

Serial number

"$"   ask for the serial number of the receiver (6 bytes).

Firmware Version

"V"   firmware version and copyright

APPENDIX B

TABLE 1 (BINARY OUTPUT 1)

This mode is selected after initialisation.

Byte #	Code	Meaning	Decimal value	Explanations
1	SH	N/A	1	Header for binary output 1
2	DD	Day of the month	1-31	
3	MM	Month	1-12	
4	YY	Year*	0-99	
5	HH	Hours	0-23	
6	MM	Minutes	0-59	
7	SS	Seconds	0-59	
8	WD	Weekday bit 0-2 :	1-7	1=Monday, 2=Tuesday...
		bit 3 :	0	The data come from the quartz clock of NeoClock because the atomic clock signal was not decoded correctly.
			1	The data come from the atomic clock. The radio signal was decoded correctly.
		bit 4 :	0	Daylight saving time (bit 17 of the radio signal) *
			1	Winter time *
		bit 5 :	0	The quartz clock of NeoClock has not been synchronised with the atomic clock since the last starting of the receiver.
			1	The autonomous quartz clock was synchronised with the atomic clock since the last starting of the receiver.
		bit 6 :	0	Normal value.
			1	Switches to 1 one hour before the time change.
		bit 7 :	0	reserved
9	RD	Reception disturbed	0-255	Number of minutes since the last good reception of the atomic clock signal.
10	-	N/A	1	Internal use NEOL.
11	CS	Checksum (modulo 255)	0-255	Checksum of the first 10 bytes.

APPENDIX C

TABLE 2 (BINARY OUTPUT 2)

Byte #	Code	Meaning	Decimal value	Explanations
1	VL	Antenna system	2 or 3	2 = DCF77 antenna system 3 = France Inter antenna system
2	DD	Day of the month	1-31	
3	MM	Month	1-12	
4	YY	Year*	0-99	
5	HH	Hours	0-23	
6	MM	Minutes	0-59	
7	SS	Seconds	0-59	
8	HS	Hundredth of seconds	0-59	
9	WD	Weekday		
		bit 0-2 :	1-7	1=Monday, 2=Tuesday...
		bit 3 :	0	The data come from the quartz clock of NeoClock because the atomic clock signal was not decoded correctly.
			1	The data come from the atomic clock. The radio signal was decoded correctly.
		bit 4 :	0	Daylight saving time (bit 17 of the radio signal) *
			1	Winter time *
		bit 5 :	0	The quartz clock has not been synchronised with the atomic clock since the last starting of the receiver.
			1	The quartz clock was synchronised with the atomic clock since the last starting of the receiver.
		bit 6 :	0	Normal value.
			1	Switches to 1 one hour before the time change.
		bit 7 :	0	reserved
10	BH	Bad reception High byte	0-255	Number of minutes since the last good reception of the radio signal.
11	BL	Bad reception Low byte	0-255	Number of minutes since the last good reception of the radio signal.
12	CS	Checksum (modulo 255)	0-255	Checksum of the first 10 bytes.

APPENDIX D

TABLE 3 (ASCII OUTPUT)

Byte #	ASCII Codes	Meaning	Hex Code
1-3	FIA or DCF	FIA: indicates a France Inter Allouis antenna system DCF: indicates a DCF77 antenna system	46, 49,41h or 44,43,46h
4	Sp	Space	32H
5-12	xx/xx/xx	Day/Month/Year*	
13	-	Indent	2Dh
14-24	xx:xx:xx:xx	Hours:Minutes:Secondes:hundred of seconds	
25	-	Indent	2Dh
26-27	xx	Weekday	
28	-	Indent	2Dh
29	C or A	C : indicates CMOS clock data A : indicates radio clock data	43h or 41h
30	S or W	S : indicates Summer * W : indicates Winter *	53h or 57h
31	X or I	X: indicates that the autonomous quartz clock of NeoClock was not synchronised yet with the atomic clock since it's been powered. I: indicates that the autonomous quartz clock of NeoClock has already been synchronised with the atomic clock since it was powered.	58h or 49h
32	-	Indent	2Dh
33-34	xx	Number of minutes (hex.) of good reception of antenna 1 (DCF77 et France Inter)	xxh
35	-	Indent	2Dh
36-37	xx	Number of minutes (hex.) of good reception of antenna 2 (DCF77)	
38	CR	Carriage return	0Dh
39	LF	Line Feed	0Ah

 * **Daylight saving evaluation:**
No CMOS clock can manage the date of daylight saving. So, be careful with the evaluation of the daylight saving information transmitted by NeoClock as long as the time data transmitted by the system are coming from the autonomous quartz clock of NeoClock.

APPENDIX E

TROUBLESHOOTING

The POWER LED (or left LED on the desk version) **remains out**

Problem: The microprocessor system of NeoClock is not correctly powered.

Solution: Check that the cable is correctly connected to the serial port of your system and that the DTR and RTS lines are activated (positive potential).

The RADIO SIGNAL LED (or right LED on the desk version) **remains out**

This LED remains out or does not stay on continuously although the POWER LED (left LED on the desk version) flashes regularly every second.

Problem: the microprocessor system works correctly but cannot decode the radio signal.

Solution: move the receiver until you find a place providing a better reception of the signal (see **SECTION 6.2** IMPORTANT REMARKS FOR THE POSITIONING).

Your system does not receive data from NeoClock

Problem: line TXD is not connected (pin 3 of the DB-9 connector) or you do not use the right setting on your serial port.

Solution: check the connections and the settings of your serial port.

APPENDIX F

TECHNICAL FEATURES

Casing	**ABS** casing		**Polycarbonate** industrial casing, IP67	
Size	Diameter = 160 mm H = 46 mm		130 X 180 X 35 mm	
Temperature tolerances	0 to +50 ° Celsius		-25 to +75 ° Celsius	
Weight	750 g, incl. cable		950 g, incl. cable and bracket	
Cable	5-wire cable, length 5 m			
Connection	DB9 female			
Pin function	Pin	Signal	Direction	PC
	2	TxD	→	Rxd
	3	(-)	←	TxD
	4	(+)	←	DTR
	5	Gnd	¾	Gnd
	7	(+)	←	RTS
Power supply	through PC serial link (TxD, RTS and/or DTR)			
Consumption	around 5 mA at 8 V DC			
Picked-up radio signal	**DCF77 version:** DCF77 signal from the Mainflingen transmitter (near Frankfurt in Germany), frequency 77.5 kHz			
	France Inter version : France Inter signal from the TDF transmitter of Allouis (near Bourges in France), frequency 162 kHz			
Reception antennas	**DCF77 version:** 2 antennas with two demodulators			
	France Inter version: 2 antennas with 1 demodulator			
Autonomous quartz clock	Accuracy: +/- 0.165 sec per day between 0°C and +40°C Battery life: 8 years (lithium battery on support)			

APPENDIX G

CE CONFORMITY DECLARATION

We

Name : NEOL SA
Address :   4 Rue Nationale
Place/Country   67800 – BISCHHEIM   (France)

Declare under our sole responsibility that the following product:

Trademark :   NEOL   Type designation :   NeoClock

which whom this declaration refers, is conform with the following standards or other normative document(s) provided that it is installed, maintained and used in the application for which it is made, with respect of the "professional practices" relevant installation standards and manufacturer's instructions :

EN 60950 (09/92)   + amendments 1 (1993), 2 (1993), 3 (1995)
                                       and 4 (1996)
EN 55022 (09/98)   Radio disturbance characteristics of Information
                                       Technology Equipment
EN 55024 (01/99)   Immunity characteristics of Information Technology
                                       Equipment

According to the requirements of the:

− Directive 1999/5/EC of the European parliament and of the council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

− Electromagnetic Compatibility Directive 89/336/EEC, amended by 92/31/EEC and 93/68/EEC

− Low Voltage Equipment directive 73/23/EEC, amended by 93/68/EEC

Bischheim, 9th May 2000   Paul REYSER – General Manager

APPENDIX H

REGISTRATION CARD

NEOCLOCK V. /B627 V0.08

Dear Customer,

By returning this registration card, you **get a free technical support for 90 days**(within 2 years of the purchase date). The 90-day period starts at the first support request.

You also will receive information about new products and updates.
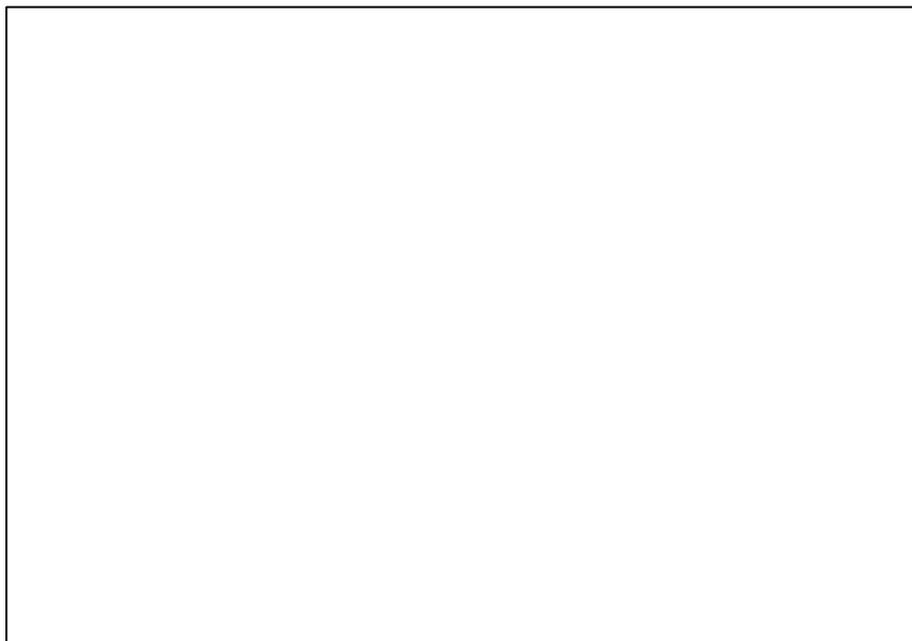
NEOL S.A.

Date: _____

Name: _____

Company: _____

Address: _____

Zip: _____   City: _____

Country: _____   E-mail: _____

Phone: _____   Fax: _____

Version: ☐ DCF77   Serial Nr: _____
          ☐ France Inter

Seller: _____   Date of purchase: _____

Stamp and signature:

Your retailer:

Designed and made in France by:

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4 Rue Nationale BP 11 - 67801 BISCHHEIM Cedex
Fax: +33 03.88.33.37.72

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