# 6xZ566M Nixie Clock user manual


**Clock Features:**
- Hours, Minutes and Seconds display
- selectable 12 or 24 hour mode
- Date display in either DD.MM.YY or MM.DD.YY format
- Alarm, with programmable snooze period
- Programmable date display each minute
- Blue LED tubes backlight
- Uses a Quartz Crystal Oscillator as the timebase
- Optional GPS synchronisation with status indicator LED
- Supercapacitor backup. Keeps time during short power outages
- Simple time setting using two buttons
- Programmable leading zero blanking
- Five programmable neon colon settings (Flashing AM/PM indication, illuminated AM/PM indication, both flashing, both on, both off)
- Maintains time during setup mode, eg. When changing between Standard Time and Daylight Savings Time
- Seconds can be reset to zero to precisely the set time
- Programmable night mode - blanked or dimmed display to save tubes or prevent sleep disturbance
- Separate modes for colon neons during night mode
- Standard or fading change of digits
- ‘Slot Machine’ Cathode poisoning prevention routine
- All user preferences stored to non-volatile memory

**Clock settings**
There are three buttons to operate the clock:

**SET** button (rightmost button when looking from the front side of the clock),

**ADJ** button (middle button),

**ALARM** button (leftmost button).

These buttons have following functions:

**SET**: Exit tube test routine on cold power-up; Show date; Set time and date; Enter configuration menu;

**ADJ**: Adjust: time, date, alarm time, configuration parameters;

**ALARM**: Set alarm time; snooze; cancel snooze/alarm.

**Entering configuration menu mode:**
The principal settings of the clock are stored in flash memory – your preferred configuration is stored even after powering off the clock for extended periods. To access the configuration mode press and hold the 'SET' button. After 2 seconds the seconds will become highlighted. Continue holding the button a further 2 seconds until the clock displays in this format:
00-XX-99. The '99' in the seconds digits tells you that you are in the configuration menu.
In configuration mode the hours digits diplay the current parameter being adjusted, and the minutes digits display the current value stored against the parameter.
For each parameter, and referring to the table below, scroll through the range of possible values by pressing the 'ADJ' button. When the desired value has been reached, move on to the next parameter by pressing the 'SET' button. When the last parameter has been set, pressing 'SET' one more time will revert the clock back to time display mode. The first parameter (0) cannot be changed as it is the software revision number. It will show for several seconds and then move to parameter 1.

**Configuration menu structure**

| Parameter | Description | Values |
|---|---|---|
| 0 | Software revision | 10 = version 1.0, 11 = version 1.1 etc |
| 1 | 12 / 24 Hr mode | 0 – 12 Hr (default)<br>1 – 24 Hr |
| 2 | Date format | 0 = MM.DD.YY (default)<br>1 = DD.MM.YY |
| 3 | Leading zero blanking eg. *0*1:54:32 | 0 – leading zero blanked (default)<br>1 – leading zero displayed |
| 4 | Night mode start hour | 0 - 23 |
| 5 | Night mode end hour | 0 - 23 |
| 6 | Night mode | 0 – Tubes off<br>1 – Dimmed display (default) |
| 7 | Display mode | 0 – standard change of digits<br>1 – fading digits (default) |
| 8 | Night mode override period (minutes) | 0 – 50 (default 0 gives 15 seconds override)[1] |
| 9 | Snooze period | 0 – 6 minutes (default)<br>1 – 9 minutes<br>2 – 12 minutes<br>3 – 15 minutes |
| 10 | Colon neons mode | 0 – AM/PM Indication, flashing<br>1 – AM/PM Indication, illuminated<br>2 – Both flash (default)<br>3 – Both illuminated<br>4 – Both off |
| 11 | Colon neons during night dimmed mode[2] | 0 – AM/PM Indication, flashing<br>1 – AM/PM Indication, illuminated<br>2 – Both flash<br>3 – Both illuminated (default)<br>4 – Both off |
| 12 | Radio time signal source | 0 – No Radio Time source (default)[3]<br>1 – DCF<br>2 – unused<br>3 – MSF<br>4 – GPS |
| 13 | GPS Baud rate | 0 – 4.8 Kbps (default)<br>1 – 9.6 Kbps<br>2 – 19.2 Kbps<br>3 – 38.4 Kbps |
| 14 | Radio time offset hours | 0-13 (default 0)[4] |
| 15 | Radio time offset mins | 0-45 (default 0)[4] |
| 16 | Radio time offset polarity | 0 - minus time (default)<br>1 – plus time |

| | | |
|---|---|---|
| **17** | **Set DST in GPS mode** | **0 – No DST offset**<br>**1 – 1 hour DST offset[5]** |
| **18** | **Auto date display each minute** | **0 – Off**<br>**1 – On (default)[6]** |
| **19** | **Reserved – leave as 0** | **0** |
| **20** | **Reserved – leave as 0** | **0** |
| **21** | **Reserved – leave as 0** | **0** |
| **22** | **Slots Mode[7]** | **0 – Slots disabled**<br>**1 – Slots every minute**<br>**2 - Slots every 10 minutes (default)**<br>**3 - Slots every hour**<br>**4 – Slots at midnight** |
| **23** | **RFT Sync Mode[8]** | **0 – DCF / MSF Sync once per day only as per parameter(24) (default)**<br>**1 – DCF / MSF Sync every hour** |
| **24** | **RFT Daily Sync Hour** | **0 – 23 (default 2)** |
| **25** | **RFT Seek Blanking** | **0 – Keep tubes lit for DCF / MSF seek**<br>**1 – Blank tubes for DCF / MSF seek (default)** |
| **26** | **LED Tube Lighting Brightness** | **0 - 10 (default 10)** |
| **27** | **LED Tube Lighting Brightness (Night Mode)** | **0 - 10 (default 3)** |
| **28** | **Restore default settings** | **0 – Keep user settings**<br>**1 – Restore original default settings[9]** |

*Notes:*

1. Press ‘SET’ briefly during blanking to show time for prescribed period.
2. Night time neons mode is active when night mode is set to dim. During night time blanking
the tubes AND neons are disabled.
3. Clock is fully functional without DCF / MSF / GPS synchronisation. Set time manually.
4. Enter your time zone offset from the synchronisation source. Note that GPS transmits UTC.
5. In GPS Sync mode, this parameter is used to set DST. Set to ‘1’ during DST.
6. Date will be displayed each minute between 50 and 55 seconds past the minute.
7. Visual effect / cathode poisoning prevention – all digits on all tubes are cycled for 10 seconds. Not active during night blanking or dimmed modes (10 seconds).
8. DCF / MSF synchronisation takes place on the hour. If no valid frame is received in 6 minutes, the clock reverts to normal operation.
9. Set this parameter to ‘1’ to restore original default settings. Internal operations will then load
all the original settings and restore the value to ‘0’

***Setting the Time and Date:***
From time display mode, press and hold ‘SET’ button for 2 seconds until the seconds digits are highlighted.
Press the ‘ADJ’ button to reset seconds to zero.
Briefly Press ‘SET’ again and the hours will be highlighted
Press the ‘ADJ’ button to set the minutes.
Briefly Press ‘SET’ again and the hours will be highlighted.
Press the ‘ADJ’ button to set the hours.
Proceed in this fashion to set the calendar: Year, Month and Day.
Finally, briefly Press ‘SET’ again to revert to normal clock operation.

***Showing Date:***
From time display mode, briefly press ‘SET’ button. Date will be shown for 5 seconds, then revert to time display.

***Auto Date Display:***
Setting parameter (18) to ‘1’ will enable auto display of date between 50 and 55 seconds past each minute.

***Night Blanking Override:***
During programmed night blanking, the blanking may be overridden to see the time by briefly pressing the ‘SET’ button. Tubes will remain lit for the period defined in parameter (8).

***Manual RFT Call:***
In DCF / MSF modes, pressing ‘ADJ’ briefly during time display will initiate a manual time seek for maximum 6 minutes, or until a valid time frame is received.

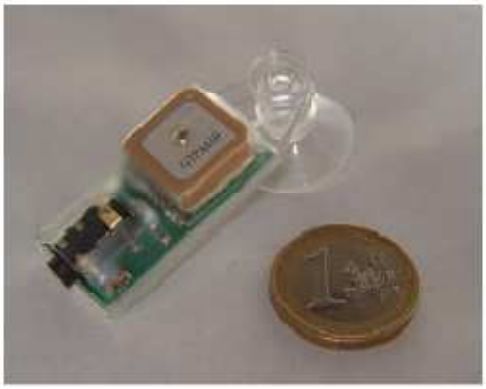
***Setting Alarm:***
Press the ‘ALARM’ Button. The seconds digits show the on / off status of the alarm: 00 or 01 (off or on).
Set on / off status, then minutes followed by hours by using the ‘ALARM’ and ‘ADJ’ buttons. When set, the alarm red LED will also light.

***Cancelling Alarm*:**
Press ‘ALARM’ briefly to cancel alarm and enter snooze mode, or a longer press until the clock bleeps, to cancel snooze. Alarm remains set for the next day.

**USING A GPS RECEIVER**
The clock can receive time from a GPS receiver that transmits information using NMEA-0183 protocol, using the $GPRMC sentence.

**Configuring for GPS Synchronisation.**
• Set parameter 12 to:
4 - GPS
• Set the baud rate in parameter (13)
0 - 4.8 Kbps
• Set parameters 14 and 15 for the hours and minutes your time zone is offset from the synchronisation source. This is usually only whole hours. Examples:
o UK is 1 hour offset from the time transmitted by the DCF transmitter
o France has no offset from the time transmitted by the DCF transmitter
• Set parameter (16) to identify whether the offset is minus (0) or positive (1) of the time source.
• If using GPS, parameter (17) acts as a DST bit. Set to 1 during DST period, and 0 during standard time period.

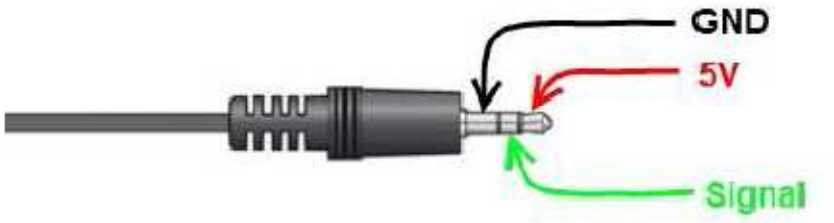
**Connecting a GPS receiver**
The clock accepts input directly from GPS Sync Time Receiver Module:




The GPS Sync module outputs data at 4,800 bps in a RS232 format.

Connection to the clock is made with a 3.5mm male / male cable.

Connections at the jack socket / plug are as follows:




**Function of the GPS / RFT indicator LED (D9):**

• *No Radio Synchronisation source installed (parameter (12) = 0)*
LED is permanently off

• *RFT or GPS Synchronisation enabled (parameter (12) = 1-4)*
The LED will be ON if the clock has synchronised in the last two hours; slowly flashing if the last synchronisation was between 2 hours and 24 hours ago; and off if the last synchronisation is older than 24 hours.

• Whilst seeking DCF or MSF the LED will flash very briefly once per second. Additionally, the indicator will flash rapidly whilst the clock is actually receiving and processing a valid time frame.

The function of the RFT indicator LED may be summarised in the table below:

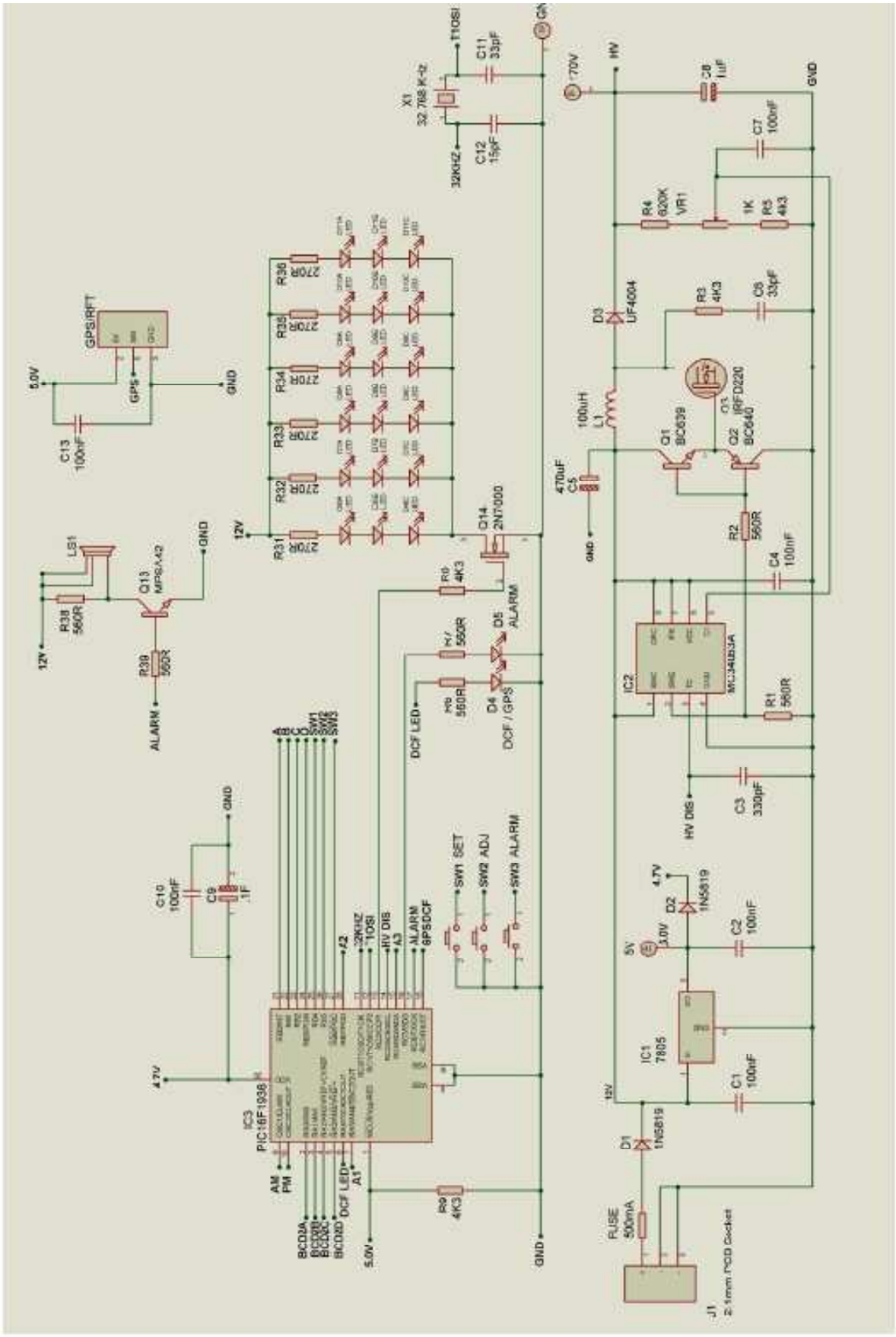
| Radio Time Source | Seeking DCF / MSF Frame | Aquiring DCF / MSF Frame | Sync < 2 Hrs | Sync >2 Hrs Sync < 24 Hrs | Sync > 24 Hrs |
|---|---|---|---|---|---|
| **None** | **-** | **-** | **Off** | **Off** | **Off** |
| **DCF / MSF** | **Brief flash each second** | **Fast Flash** | **On** | **Slow Flash** | **Off** |
| **GPS** | **-** | **-** | **On** | **Slow Flash** | **Off** |

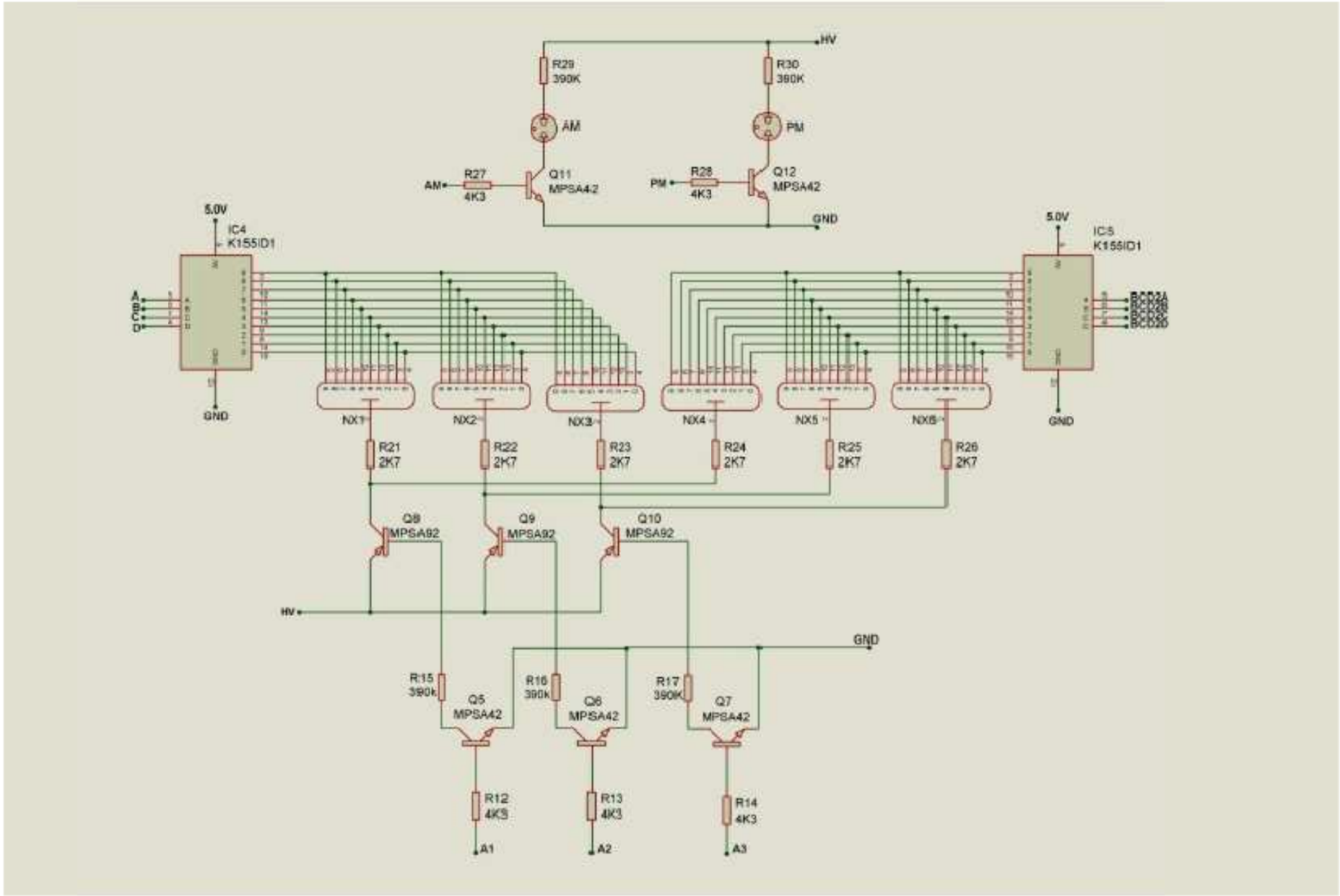
**Clock maintenance**
To avoid scratches always use delicate cloth or dust whisk when cleaning clock. For wet cleaning use cloth slightly moist with water and some detergent. Do not use any solvent or alcohol as for cleaning.

**Power supply**
12V DC power adapter with barrel plug connector (5,5mm/2,1mm) and minimum current output 500mA.

**Power consumption**
average 3W

## Circuit diagram




HV
R29
390K
R30
390K
AM
PM
R27
4K3
Q11
MPSA42
R28
4K3
Q12
MPSA42
GND
5.0V
IC4
K155ID1
IC5
K155ID1
A
B
C
D
GND
NX1
NX2
NX3
NX4
NX5
NX6
R21
2K7
R22
2K7
R23
2K7
R24
2K7
R25
2K7
R26
2K7
Q8
MPSA92
Q9
MPSA92
Q10
MPSA92
HV
GND
R15
390k
R16
390k
R17
390K
Q5
MPSA42
Q6
MPSA42
Q7
MPSA42
R12
4K3
R13
4K3
R14
4K3
A1
A2
A3