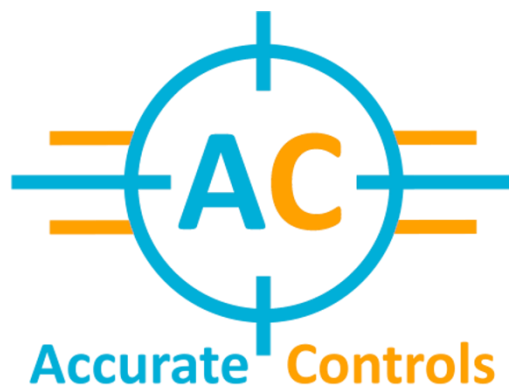


## Instruction Manual



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Accurate Controls Ltd.  
Pumps and Fans Monitor

Model Nos:    PFM – 1 - *Watchdog*  
                     PFM – 2 - *Watchdog*  
                     PFM – 1T - *Watchdog*  
                     PFM – 2T - *Watchdog*

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# PFM - Watchdog Instruction Manual

## Contents

<b>1. FEATURES:</b>	<b>4</b>
1.1 DISPLAY:	4
1.2 SUPPLY WATCHDOG (POWER LOSS ALARM)	4
1.3 INHIBIT SWITCHES:	5
1.4 INHIBIT STATUS:	5
1.5 FALSE OR INCORRECT INHIBIT:	5
<b>2. FUNCTIONS / LED INDICATIONS</b>	<b>5</b>
2.1 ALARM OUTPUT DELAY	5
2.2 CONFIGURATIONS	6
2.2.1 Single stage or fan only cooler monitoring (see paras 9.2 & 9.3 pages 11 & 12)	6
2.2.2 Two stage cooler monitoring (see paras 9.4 & 9.5 pages 13 & 14)	6
2.3 COOLER WORKING	7
2.4 COOLER FAILURE	7
2.5 INHIBITED CHANNEL	7
2.6 FALSE INHIBIT OF CHANNEL	7
<b>3. MOUNTING</b>	<b>8</b>
<b>4. CASE ENTRY POINTS:</b>	<b>8</b>
<b>5. ISOLATION TESTING:</b>	<b>8</b>
<b>6. WIRING THE PFM - WATCHDOG</b>	<b>9</b>
<b>7. ELECTRICAL CONNECTIONS:</b>	<b>9</b>
7.1 CT INPUTS	9
7.2 TERMINAL BLOCK INPUTS	9
7.3 ALARM & POWER LOSS OUTPUT RELAY:	9
7.4 CURRENT TRANSDUCERS - CTS:	10
7.5 POWER SUPPLY:	10
<b>8. OPTIONAL COOLER EXERCISE UNIT.</b>	<b>10</b>
<b>9. WIRING DIAGRAMS</b>	<b>11</b>
9.1 CT INPUT CONNECTIONS	11
9.2 SINGLE STAGE OR FAN ONLY COOLING WIRING CONFIGURATION WITHOUT TIMER.	12
9.2.1 Connections table – single stage or fan only cooling without Timer	12
9.3 SINGLE STAGE OR FAN ONLY COOLING WIRING CONFIGURATION WITH TIMER MODULE.	13
9.3.1 Connections table – single stage or fan only cooling system with Timer	13
9.4 TWO STAGE COOLING WIRING CONFIGURATION WITHOUT TIMER MODULE	14
9.4.1 Connections table - Two stage without timer module	14
9.5 TWO STAGE COOLING WIRING CONFIGURATION WITH TIMER MODULE & POWER LOSS ALARM RELAY.	15
9.5.1 Connections table – Two stage cooling system with Timer & Independent power loss alarm.	15
<b>10. PFE-1 EXERCISER – (TIMER ) OPERATION &amp; PROGRAMMING</b>	<b>17</b>

### NOTE:

**Failure to carry out the installation of this instrument in accordance with the following instructions will invalidate the warranty.**

## 1. Features:

### 1.1 Display:

LED display, indicating status information & fault identification.

The inhibit (blue) also indicates a channel not being used or under repair.

LED	INDICATION
Green	OK
Red	Fault
Blue	Inhibited
Pink	False inhibit

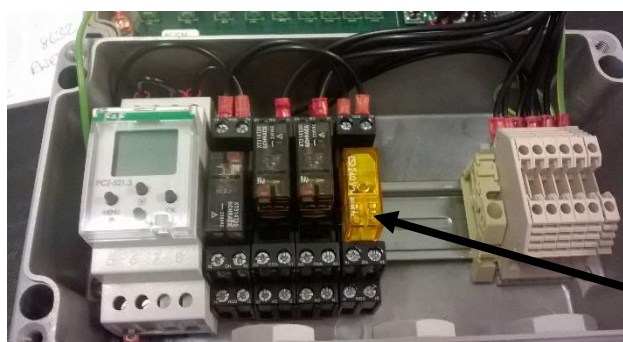
### 1.2 Supply watchdog (Power Loss alarm)

The alarm relay provides both the fault alarm and the power loss alarm functions.

The relay has normally open voltage free contacts and is configured as follows:

Terminal No	Description	Power On	Power Lost
4	Alarm relay output	N/O (normally open)	Closed
5		Common	Common
6		N/C (normally closed)	Open

**NOTE:** Some configurations may require a dedicated power loss alarm output, in which case an additional relay is required to be fitted in the unit. Please advise at the time of ordering.



Internal view of unit showing additional power loss alarm output relay fitted.

Powering the instrument from the cooler supply will enable the power loss alarm to operate if cooler supply fails.

### **1.3 Inhibit switches:**

There are 18 switches accessible from the front panel of the instrument to enable each channel to be independently inhibited.

Inhibits can be applied either:

- 1) To inhibit a channel not being used.
- 2) In the event of a failure, to temporarily inhibit the channel, allowing the unit to continue monitoring the remaining channels, until a repair has taken place to restore the channel to normal operation.

### **1.4 Inhibit status:**

A BLUE LED will indicate the presence of an inhibit on each individual channel.

### **1.5 False or incorrect inhibit:**

In the event that a channel is incorrectly inhibited a PINK LED will be displayed and an alarm output will be sent. False or incorrect inhibits are caused by the following:

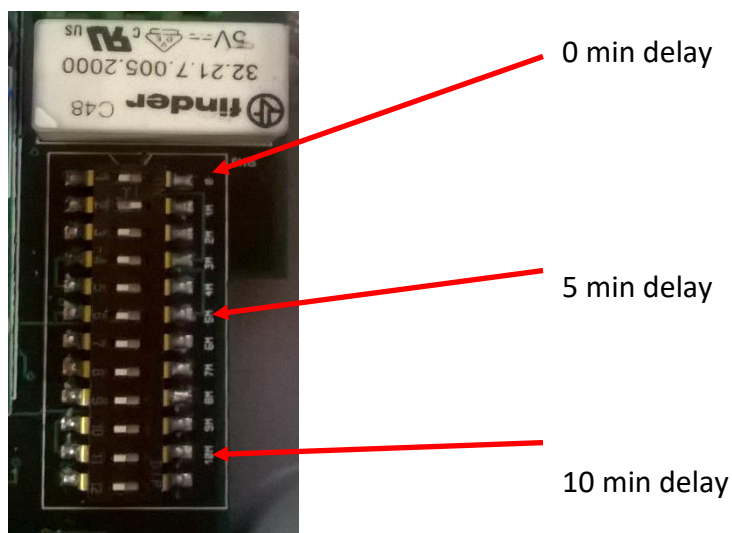
- 1) An inhibited channel receiving an input signal.
- 2) Following the repair of a failed channel and the inhibit not being removed.

## **2. Functions / LED Indications**

### **2.1 Alarm output Delay**

The instrument has an alarm output delay, built in, to allow for the cooling system to settle down and for any sequential cooling start delays, such as, soft start.

Alarm output delay is factory set to 5 mins but is factory adjustable from 0-10 minutes in 1 min intervals. Preferred delay time is selected by moving the appropriate switch to the right. **Only 1 switch** should be selected, more than one switch and the time delay will cease to function correctly.



## 2.2 Configurations

### 2.2.1 Single stage or fan only cooler monitoring (see paras 9.2 & 9.3 pages 11 & 12)

The unit can be configured as single stage or fan only cooler monitor, capable of monitoring up to 18 inputs.

- Single stage: Pumps – channels 17 & 18 with fans channels 1-16
- Fan Only - Channels 1-18

#### 2.2.1a Single stage cooling system definition –( PFM – 1 - Watchdog)

Single stage cooling is where all the cooling is activated by a single switch of the Oil or Winding Temperature indicator at one pre-set temperature. It includes systems with soft starts and time delays between pumps and fans starting.

### 2.2.2 Two stage cooler monitoring (see paras 9.4 & 9.5 pages 13 & 14)

The unit can be configured to monitor a two stage cooling system.

#### 2.2.2a Two stage cooling system definition – (PFM - 2- Watchdog)

Two stage cooling is where the pumps are independently activated by one switch of the Oil or Winding Temperature indicator at one pre-set temperature and the fans are activated independently by a second switch of Oil or Winding Temperature indicator at a different pre-set temperature.

#### 2.2.2b Two stage cooler monitoring is achieved as follows:

- Upon receiving an input to the 1<sup>st</sup> stage cooling input, only channels 17 & 18 will be monitored, (usually used to monitor the pumps).
- Then upon receiving an input to the 2<sup>nd</sup> stage cooling input, the remaining 16 (1-16) channels are able to be monitored, (usually used to monitor the fans).

### **2.3 Cooler Working**

GREEN LEDs indicates that all channels are working or are on standby.

### **2.4 Cooler Failure**

RED LEDs indicates failed units, the channel LED showing which channel is at fault.

### **2.5 Inhibited channel**

BLUE LEDs indicate channels that are inhibited.

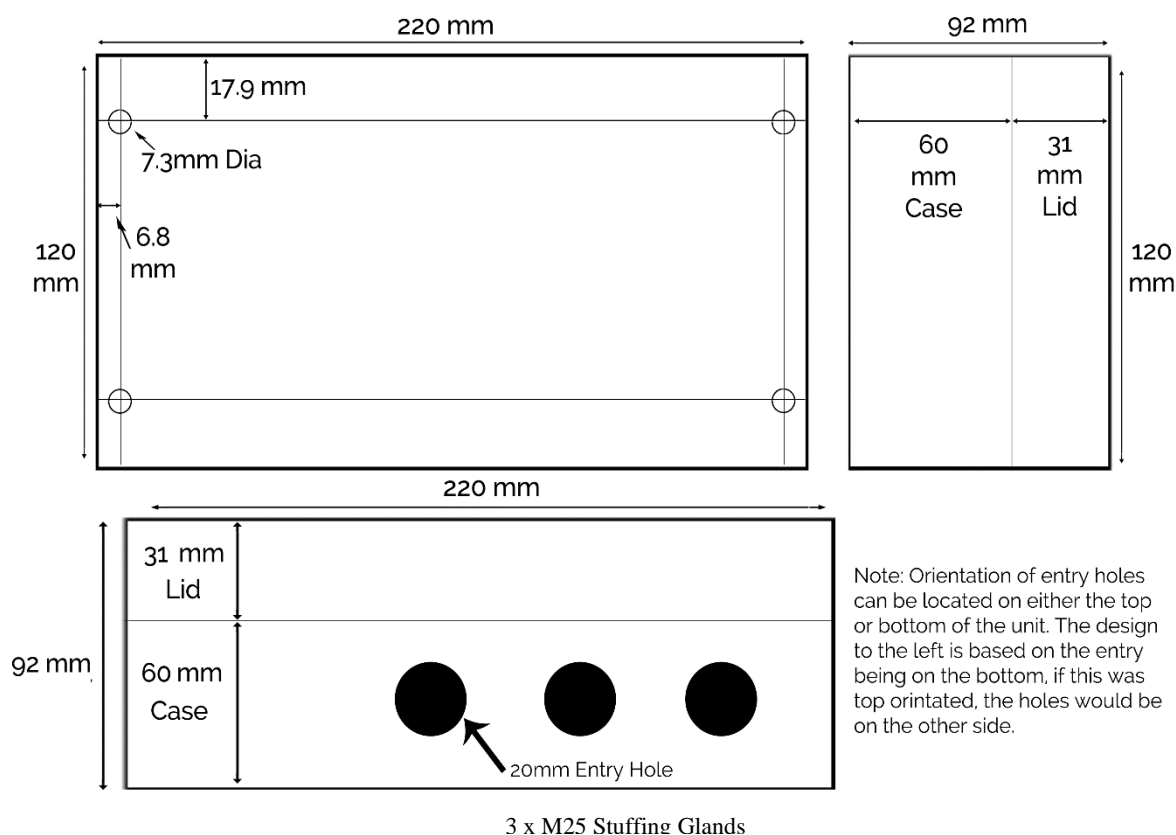
### **2.6 False Inhibit of channel**

PINK LEDs indicate channels that are incorrectly inhibited.

### 3. Mounting

The instrument is surface mounted.

#### CASE OUTLINE AND MOUNTING DETAIL



### 4. Case entry points:

Three M25 stuffing Glands.

### 5. Isolation Testing:

**This instrument MUST NOT be subjected to an isolation test**

**DO NOT FLASH TEST**



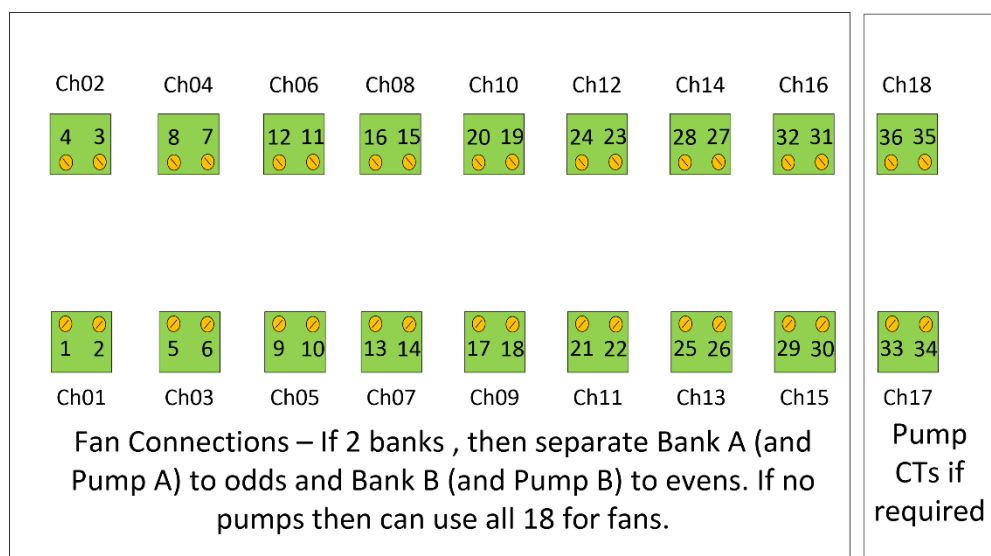
## 6. Wiring the PFM - Watchdog

Refer to electrical connections Section 7.

**Powering the instrument from the cooler supply via its own fuse and link will enable the power loss relay to operate if cooler supply fails.**

## 7. Electrical Connections:

### 7.1 CT Inputs



### 7.2 Terminal Block Inputs

Terminal No.	Description	Connection
1	Mains Power supply input	EARTH
2		N
3		LIVE
4	Alarm & Power Loss relay output	NO
5		Common
6		NC

### 7.3 Alarm & Power Loss Output Relay:

The instrument has one voltage free single pole double throw relay which can be configured for NO or NC. Ratings as follows:

Switching Voltage	Rated Current
250Vac	6A

30Vdc	3A
110Vdc	0.35A
220Vdc	0.2A

#### 7.4 Current transducers - CTs:

Fit a miniature CT around any one of the phases from the cooler contactors for each PUMP and FAN being monitored and wire up into the connectors appropriate to each channel as required. Pumps using channels CH17 & CH18 only.

There are two types of CT :

a) CT-1 Standard; for motors of ½ HP and above.

b) CT-2 High Sensitivity; for motors of ¼ HP and below.

With both types of CT additional turns maybe required to detect pumps or fans with small motors.

Figure 1: Shows the motor supply cable going straight through the CT.

Figure 2: Shows the motor supply cable with an additional turn through the CT.

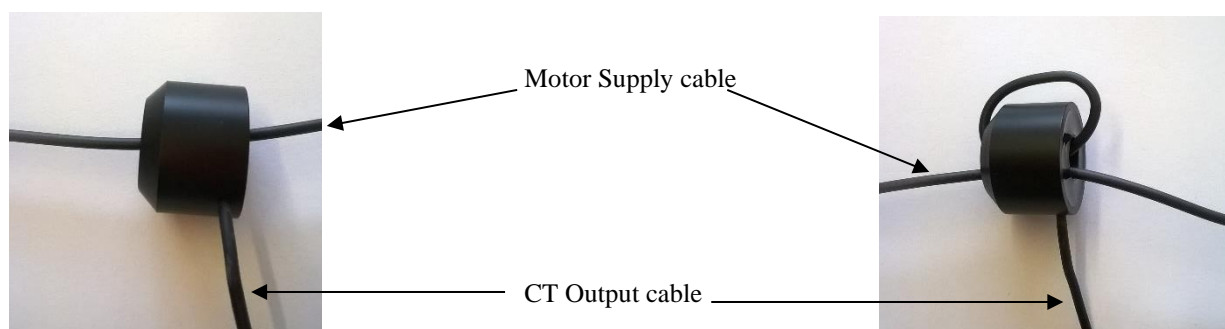


Fig 1

Fig 2

#### 7.5 Power supply:

The instrument has a switch mode power supply capable of the following power connections:

85 – 264 Vac @ 47 – 440Hz and 110–370 VDC

AC connections: LIVE, NEUTRAL, EARTH

DC connections: LIVE – DC positive NEUTRAL – DC negative

**The instrument should be supplied from its own fuse and link with the fuse rated at  
3 amps.**

#### 8. Optional Cooler Exercise Unit.

The instrument can be fitted with an optional Cooler Exercise unit that can be programmed to activate the cooler at regular weekly intervals to ensure continued availability of the cooling. Time and day are customer selectable.

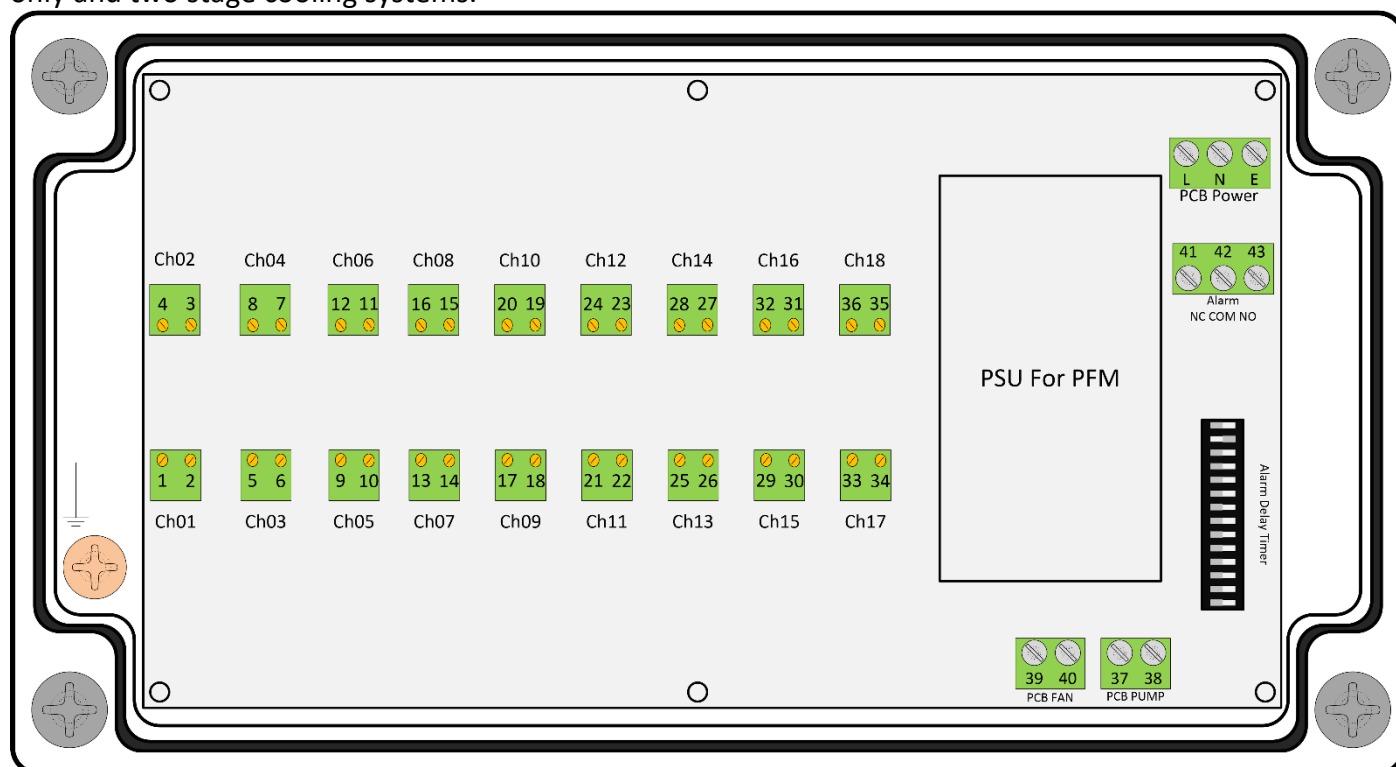
The Exerciser will be internally mounted in the instrument case and connected to the instruments power supply.

Please see paragraph 10 (page 15) or the separate instruction sheet, supplied with the exerciser, for the setting up instructions.

## 9. Wiring Diagrams

### 9.1 CT input connections

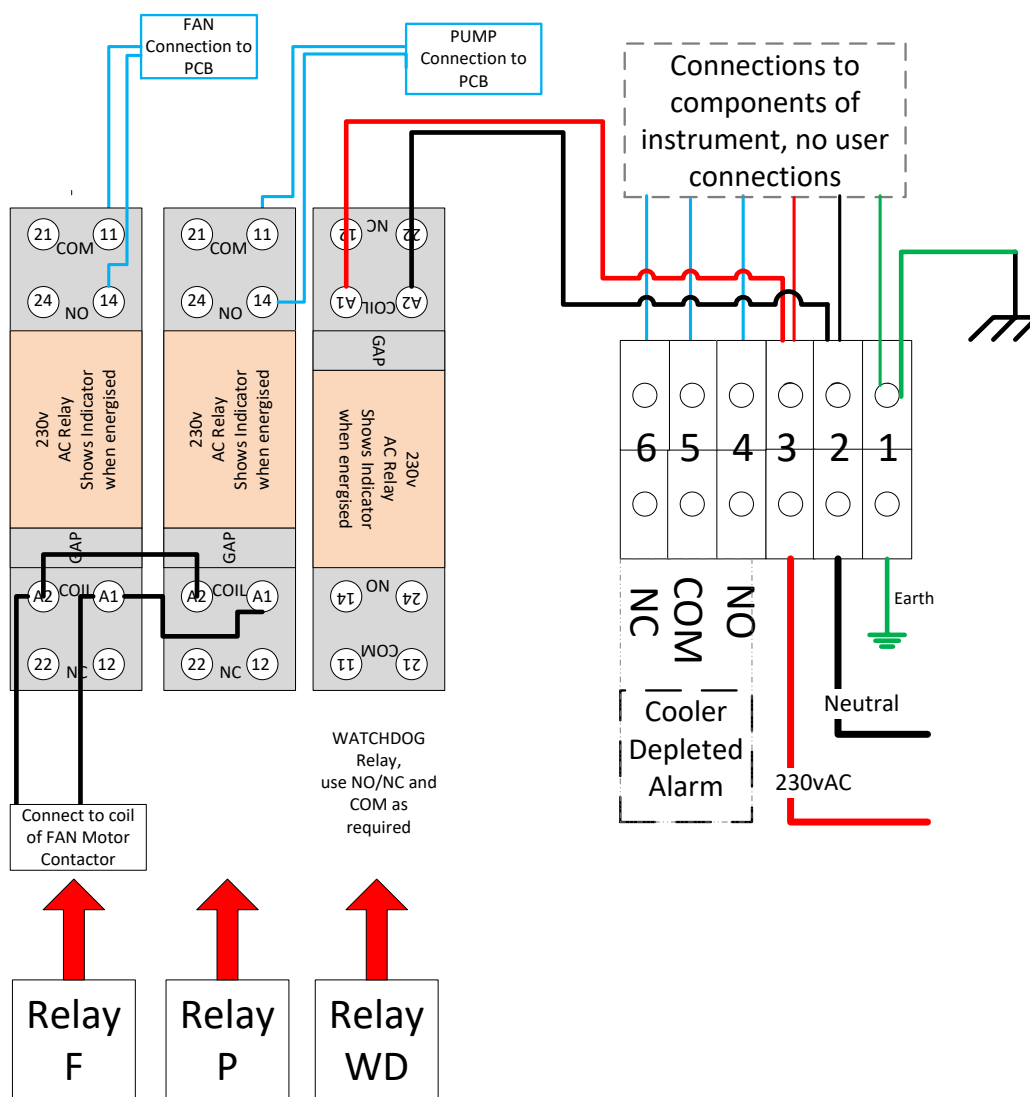
The lid of the box contains the connections for the CT inputs and is common to both single stage, fan only and two stage cooling systems.



Connection Configurations	
Fan only configuration	All 18 channels can be used for Fans
Pump & Fan configuration	For Pumps use channels 17 & 18 and channels 1-16 for Fans

## 9.2 Single Stage or Fan only Cooling Wiring Configuration without Timer.

### PFM- 1 - Watchdog

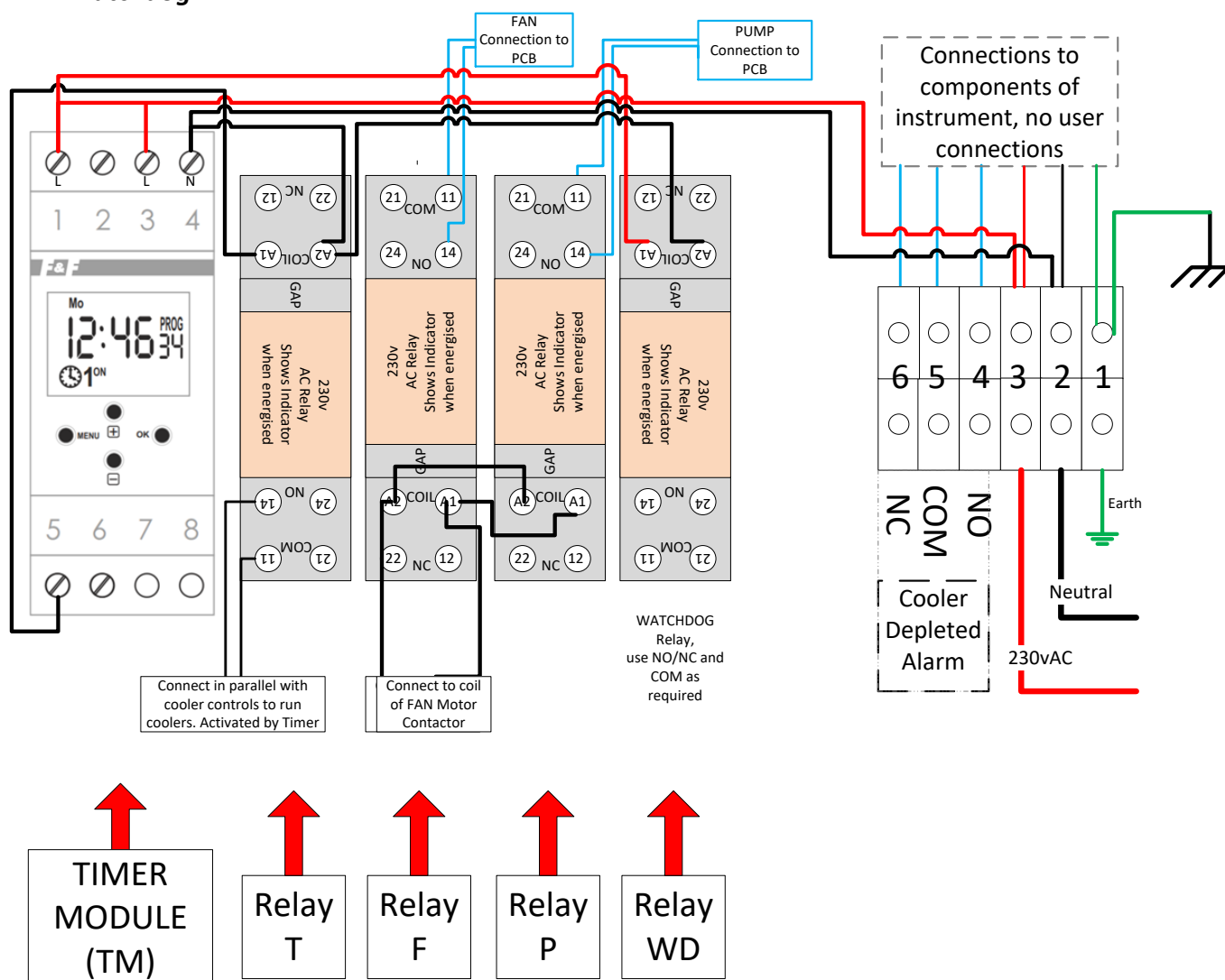


#### 9.2.1 Connections table – single stage or fan only cooling without Timer

Customer connections – single stage or fan only			
Item	Description	Terminals	Comments
Relay F & P	Relay coil	A1, A2	Connect relay coils to coil of Pump motor contactor, or for fan only, Fan motor contactor. Link both Relay terminals A1 and A2 as shown. Relay coil voltage: 230Vac
Terminal Block	Mains input	1	EARTH
		2	N
		3	LIVE
	Alarm Output	4	NO
		5	Common
		6	NC

### 9.3 Single Stage or Fan only Cooling Wiring Configuration with Timer Module.

#### PFM- 1T - Watchdog



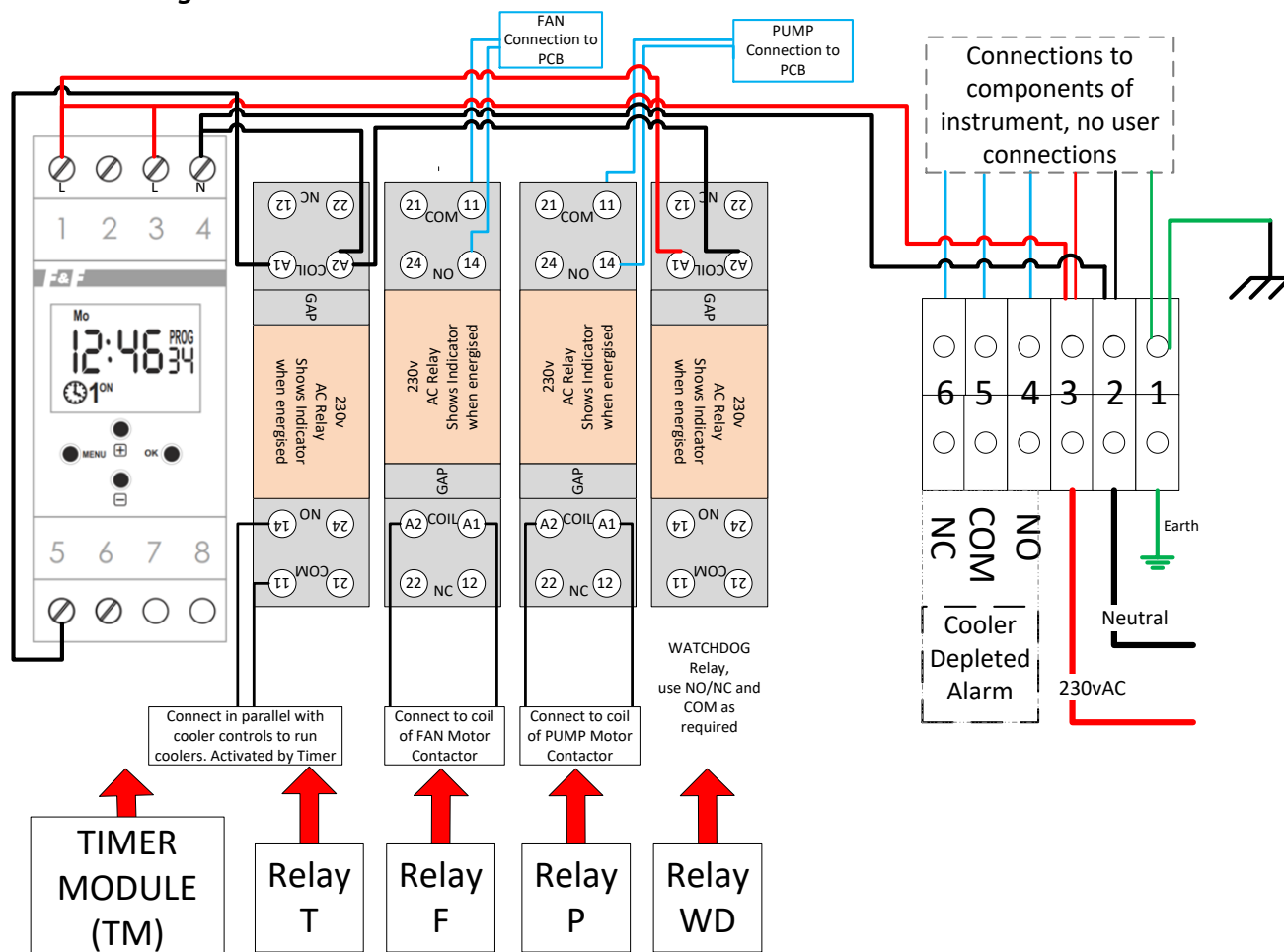
#### 9.3.1 Connections table – single stage or fan only cooling system with Timer

Customer Connections – single stage or fan only with timer module			
Item	Description	Terminals	Comments
Relay F & P	Relay Coils	A1, A2	Connect relay coils to coil of Pump motor contactor, or for fan only, Fan motor contactor. Link both Relay terminals A1 and A2 as shown .Relay coil voltage: 230Vac
Relay T	Relay Output	11 & 14 or 12 & 24	Connect in parallel with cooler control switch of WTI. 14 & 24 and 11 & 21 are internally connected
Terminal Block	Mains input	1	EARTH
		2	N
		3	LIVE
	Alarm Output	4	NO
		5	Common
		6	NC



## 9.5 Two Stage Cooling Wiring Configuration with Timer Module & Power loss alarm relay.

### PFM- 2T- Watchdog



#### 9.5.1 Connections table – Two stage cooling system with Timer & Independent power loss alarm.

Customer connections – Two stage cooling system				
Item	Description	Terminals	Comments	
Relay P	Relay coil	A1, A2	Connect to coil of pump motor contactor. Relay coil voltage: 230Vac	
Relay F	Relay coil	A1, A2	Connect to coil of fan motor contactor. Relay coil voltage: 230Vac	
Relay T	Relay Output	11 & 14 or 12 & 24	Connect in parallel with cooler control switch of WTI. 14 & 24 and 11 & 21 are internally connected	
Watchdog Relay	Relay Output	12, 22	NC	POWER LOSS ALARM OUTPUT: Connect as required to kiosk terminals for alarm signal.
		11, 21	Common	
		14, 24	NO	
Terminal Block	Mains input	1	EARTH	
		2	N	
		3	LIVE	
	Alarm Output	4	NO	
		5	Common	
		6	NC	

## 10. PFE-1 Exerciser – (Timer ) Operation & Programming

### PURPOSE

Programmable control timer is used to time control the devices in home or industrial automation systems by an individual time program set by the user.

### OPERATION

Timer activates and deactivates the device or electrical circuit on the programmed hours in cycles: daily, weekly, working days (Mon-Fri) or weekend (Sat, Sun).

### OPERATING MODES AND FUNCTIONS

**ON-OFF COMMAND** – program entry for enabling or disabling the receiver.

**500 MEMORY CELLS** – internal memory for individual program entries, allowing to program

250 pairs of ON-OFF COMMANDS.

**AUTOMATIC MODE** - operation by ON-OFF COMMANDS programmed by the user in the timer memory [🕒 icon on display]

**MANUAL MODE** - [ON] permanently closed contact (position 1-5) or [OFF] permanently

open contact (position 1-6) when the AUTOMATIC MODE is off [no 🕒 icon on display]

**CYCLE MODE** - adjustable, weekly cycle (7 days from Monday to Sunday) of the receiver switching in accordance with the programmed ON-OFF COMMANDS:

\* single day of the week: Mo; Tu; We; Th; Fr; Sa or Su.

\* working days: Mo Tu We Th Fr (Monday to Friday).

\* weekend: Sa Su (Saturday and Sunday)

\* daily: Mo Tu We Th Fr Sa Su (Monday to Sunday).

**AUTOMATIC TIME CHANGE** - change from winter time to summer time with options to change automatically or not. User can set the time zone so that the switching time is consistent with the local time.

**PREVIEW DATE** - the ability to preview the set date (OK.)

**PREVIEW OF THE CURRENT PROGRAM** – pressing the +/- keys in the date preview mode displays information about the number and details of the current program.



**NFC WIRELESS COMMUNICATION** - wirelessly read and write timer configuration from an Android phone equipped with the NFC module.  
**„PCZ KONFIGURATOR” APP** - free application for Android mobile phones and tablets equipped with the NFC module for wireless communication.

Features:

- timer configuration in Offline mode (without the connection with the PCZ-521 timer);
- read and write the setup from and to the controller;
- quick programming of multiple controllers using a single configuration;
- read and write the configuration from and to a file;
- sharing the configuration via e-mail, Bluetooth, network drives...
- identification of the connected timer and the ability to name individual devices;
- automatic configuration backups. Along with a unique identifier for each timer, user can easily restore previous configuration;
- set the time and date according to the clock in mobile phone;

The app is available on Google Play!

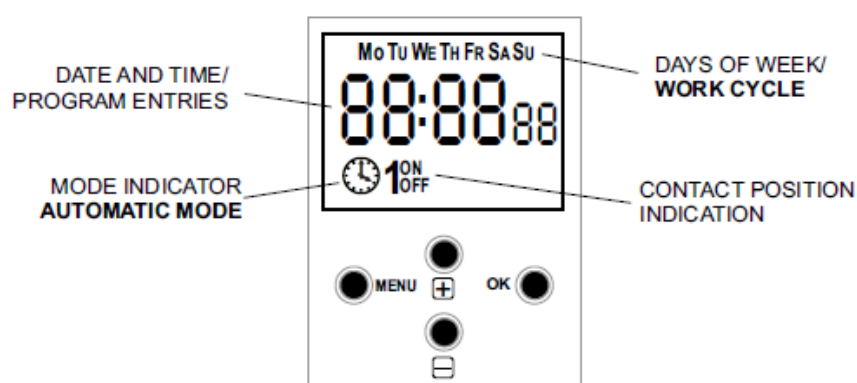
**CLOCK TIME CORRECTION** – set monthly adjustment of the system clock.

**BATTERY INDICATOR** - the controller comes with built-in control system of the backup timer battery used in the case of main power supply failure. If the battery is low, user will receive information that the battery needs to be replaced. Battery life depends on the ambient temperature and the degree of the battery wear.

**LCD BRIGHTNESS ADJUSTMENT** - change the contrast of the display to get a clear LCD read-out in different viewing angles.

**RELAY STATE MEMORY** - the relay state in manual mode will be remembered even after power supply failure.

#### DISPLAY AND CONTROL PANEL DESCRIPTION



Mo – Monday; Tu – Tuesday; We – Wednesday; Th – Thursday; Fr – Friday;  
 Sa – Saturday; Su – Sunday.

## USER CONTROL FUNCTION SUMMARY

### MENU:

- enter the program menu
- return to the previous position (back).

### OK:

- move to the next setting
- accept setting
- preview of the date and the current program

### + [Plus]:

- change the setting by one position up for the selected programming option (holding down the button continuously changes the setting by one position up in a loop)
- in MANUAL MODE: permanent ON and OFF contact switching

### - [Minus]:

- change in the setting by one position down for the selected programming option (holding down the button continuously changes the setting by one position down in a loop)
- in MANUAL MODE: permanent ON and OFF contact switching

## PROGRAMMING

### 1. START

- 1.1 Connect the power supply.
- 1.2 The clock will start at the root level and the display will show set hour.

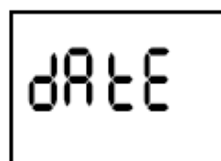


In the absence of any program entries timer will automatically run in manual mode. If the previous entries are present, timer will execute the program. To erase all previous settings, see section 8.6.

- 1.3 Set individual timer program with internal configuration menu or using the "PCZ Konfigurator" app for mobile devices.

### 2. DATE

Press MENU. The clock will enter program menu. Using the +/- buttons select the mode for date setting [date]



Confirm with OK.

Clock will show settings for the next parameters: year, month, and day. Use the +/- keys to set the parameters; move to the next parameter with the OK button. Go back to the previous item by pressing MENU.



Press OK to accept date entry. The clock will automatically exit from the date setting mode and go to the program menu.

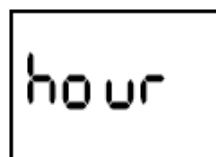
The date setting is tantamount to time determination: winter or summer. In Poland, the time change from winter to summer is done automatically at night, on the last Sunday of March at 2.00 AM (by adding 1 hours to the current time). Time change from summer to winter is done automatically at night, on the last Sunday of October at 3.00 AM (by subtracting one hour from the current time).

#### NOTE!

The automatic time change can be turned off (see section 8.1).

### 3. HOUR

Press MENU. The clock will enter program menu. Using the +/- buttons select the mode for time setting [hour].



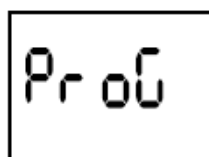
Clock will show settings for the next parameters: hour and minutes. Move to the next parameter with the OK button. Go back to the previous item by pressing MENU.



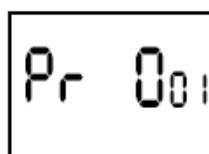
Press OK to accept time entry. The clock will automatically exit from the date setting mode and go to the program menu.

#### 4. ON-OFF COMMAND - setting the parameters

Press MENU. The clock will enter the program menu. Using the +/- buttons select the mode for time setting [**prog**].



Press OK to accept. The clock will enter the memory cell number selecting mode. The display will automatically show the number of the first empty memory cell.



Press OK to accept (or select another number using the +/- keys). Clock will enter the single ON-OFF COMMAND parameters setting mode.

##### A. Operation cycle



Set OPERATION CYCLE using +/- keys:

- \* single day of the week: Mo; Tu; We; Th; Fr; Sa or Su.
- \* working days: Mo Tu We Th Fr (Monday to Friday).
- \* weekend: Sa Su (Saturday and Sunday)
- \* daily: Mo Tu We Th Fr Sa Su (Monday to Sunday)

Press OK to accept.

##### B. Hour and minutes

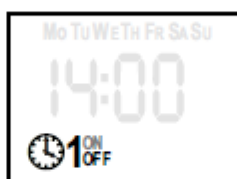
Clock will show setting for the next parameters: hour and minutes.

Set the values using +/- keys; move to the next parameter with the OK button. Go back to the previous item by pressing MENU.



## B. ON / OFF

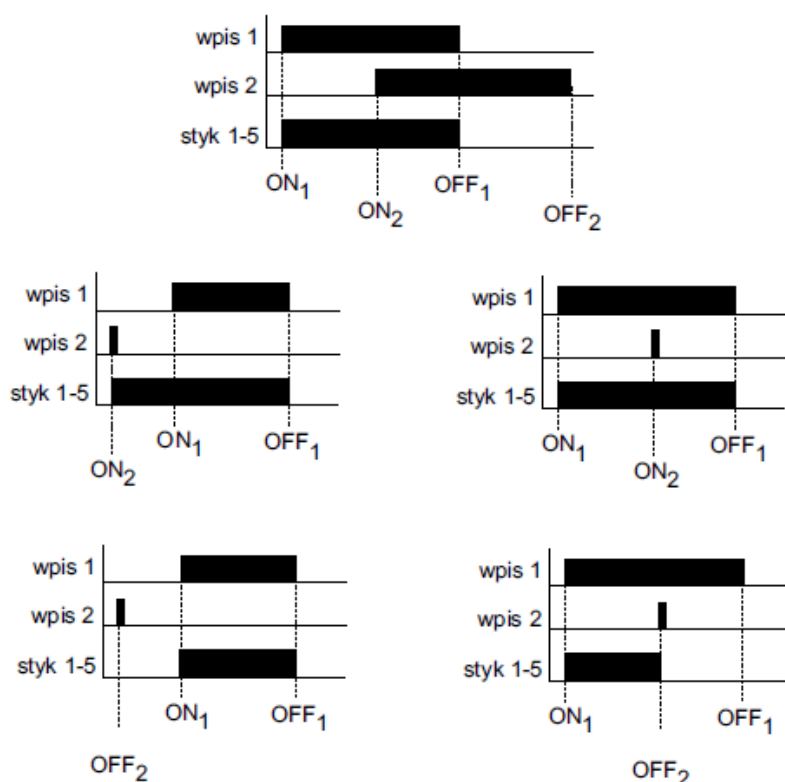
Clock will allow to choose [ON] or [OFF] option.



Set ON or OFF using +/- keys; confirm with OK. Clock will automatically enter the next ON-OFF COMMAND parameter input mode.

### NOTE!

\* The entered ON-OFF commands do not constitute solid pairs of commands for switching on and switching off a contact. They are treated as individual commands and executed in accordance with the specified time chronology. Cases of overlapping contact closing times from two pairs of ON-OFF commands are illustrated in the following diagrams:

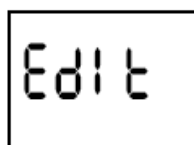


\* Switch-on time of contact established by a pair of ON-OFF commands can be longer than 24 hours, which means that [ON] command can be set to any time and any day of the week (e.g. Tuesday, 1:45 PM) and [OFF] command to any hour of another day of the week (e.g. Thursday, 5.05 PM).

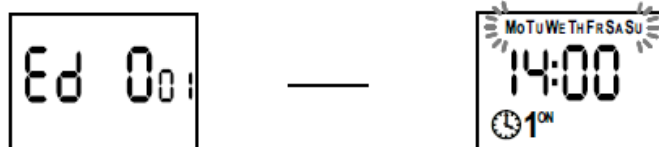


## 5. EDITION OF ON / OFF COMMANDS PARAMETERS

Press MENU. The clock will enter the program menu. Using the +/- keys select the parameter edit mode [edit]



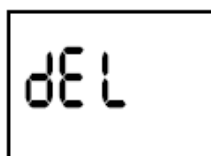
Press OK to accept. The clock will enter the memory cell number selecting mode. Select the cell to edit and accept by pressing OK.



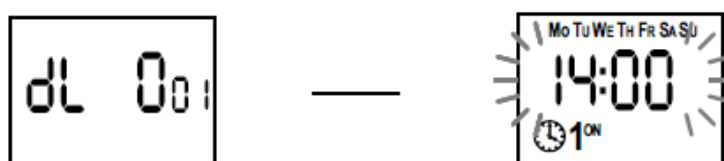
Proceed as with ON-OFF COMMAND parameters setting (see section 4).

## 6. CLEARING A PROGRAM – removing entries

Press MENU. The clock will enter the program menu. Using the +/- keys select ON-OFF COMMANDS reset mode [del].



Press OK to accept. The clock will enter the memory cell number selecting mode. Select the cell to be deleted and accept by pressing OK. The clock will be waiting for confirmation of deletion. This is indicated by alternating flashing of the number of the selected cell and its set parameters.



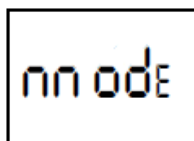
Confirm by pressing OK. The cell will be deleted. The clock will display the next programmed cell number.

Pressing MENU will take you to the root level.

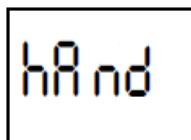
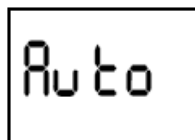
**NOTE!** To erase all previous ON-OFF COMMANDS settings see section 8.6.

## 7. OPERATION MODE

Press MENU. The clock will enter the program menu. Using the +/- keys select [mode].



Accept by pressing OK. The clock will enter work mode menu (auto – hand).  
With +/- keys select desired operation mode:



\*MANUAL – “hand”

\*AUTOMATIC – “auto”

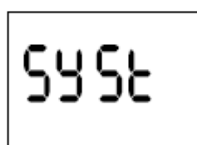
Accept by pressing OK. The clock will automatically exit the operation mode selection and go to the program menu. Pressing Menu one more time will take the clock back to the root menu.

**NOTE!** To change the contact position in the MANUAL OPERATION mode use the +/- keys at the root level.

In the absence of any program entries timer will automatically run in MANUAL MODE (there is no option to set AUTOMATIC OPERATION MODE).

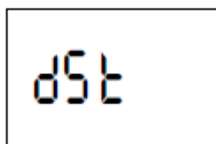
## 8. SYSTEM SETTINGS

Press MENU. The clock will enter the program menu. Using the +/- keys select system settings [syst].



Confirm by pressing OK. The clock will enter the System Settings submenu (dst - utc - batt - cal - LCD - clear - info). Select the parameter and confirm with OK. Pressing MENU will take you to the upper level.

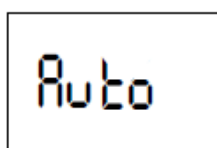
## 8.1 Automatic time change - dst



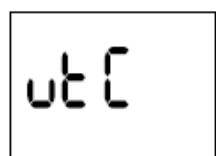
DST – Daylight Saving Time – international name of summer time. Confirm by pressing OK. The clock will enter the menu with the option to disable automatic time change (auto-off). With +/- keys select desired mode:

\***with** AUTOMATIC TIME CHANGE – “auto”

\***without** AUTOMATIC TIME CHANGE – “off”



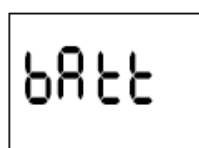
## 8.2 Timezone – utc



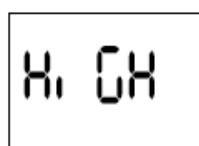
Confirm by pressing OK. The clock will display current parameter for time zone (12/-12). Pressing +/- keys set time zone for the clock. Confirm by pressing OK. Time zone for Poland is +1.



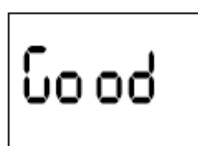
## 8.3 Battery charge indicator – batt



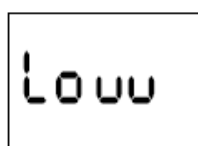
Confirm by pressing OK. The clock will display information about battery charge level.



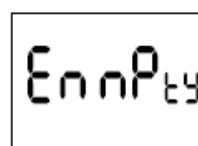
High - (100%)



Good - (80%)



Low – (15%)



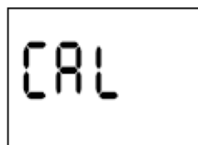
Empty – (0%)



#### 8.4 System clock time adjustment - cal

Time adjustment is the number of seconds by which the system clock is adjusted per month. Setting range: +/- 300seconds.

For example: If the clock is fast 4 seconds per month, set the parameter value -4.

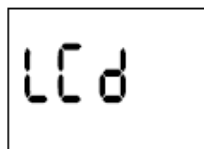


Confirm by pressing OK. The clock will display current parameter of time adjustment. Press +/- keys to set desired number of seconds. Confirm by pressing OK.



#### 8.5 Display contrast - lcd

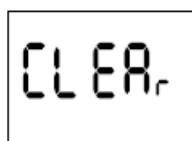
Setting the display contrast. Range: -3 (lowest) ... +3 (highest).



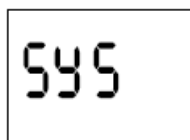
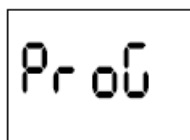
Confirm by pressing OK. The clock will display the current contrast parameter. Use the +/- keys to set the contrast parameter. Confirm by pressing OK.



#### 8.6 Resetting the commands, parameter settings and errors - clear



Confirm by pressing OK. The clock will enter the submenu (prog - sys - error). Use the +/- keys to select reset option.



Confirm by pressing OK. The clock will enter the submenu (prog - sys - error).

Use the +/- keys to select reset option:

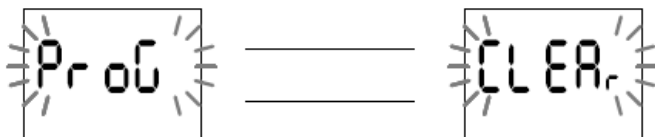
\* [prog] - deleting ON/OFF entries

\* [sys] - resetting the system settings

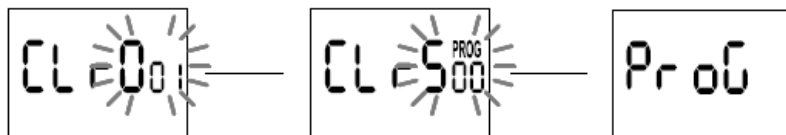
Confirm by pressing OK.

### A. prog

Confirm selected option by pressing OK. The clock will enter standby mode awaiting for deletion confirmation. This is indicated by alternating flashing of "prog" and "clear" on display.

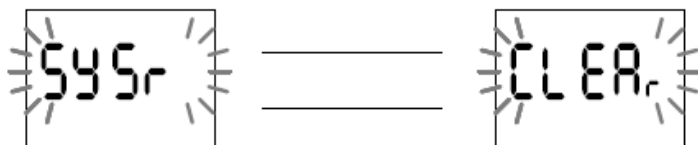


Confirm by pressing OK. The clock will start deleting entries. The display will count off consecutive numbers of deleted entries (from 1 to 500). Upon completion the display will show [prog].

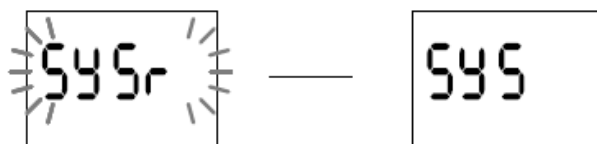


### B. sys

Confirm selected option by pressing OK. The clock will enter standby mode awaiting for deletion confirmation. This is indicated by alternating flashing of [sysr] and [clear] on display.



Confirm by pressing OK. The clock will start deleting entries. The display will count off consecutive numbers of deleted entries (from 1 to 500). Upon completion the display will show [sys].



### C. error

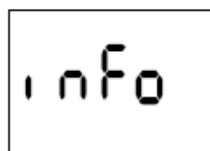
If the timer system detects an error, the display will show "error" message at the root level. At the same time in the "clear" section the extra "error" item will appear. Error reset is possible only through the menu (menu -> syst -> clear -> error).

Confirm the "error" option by pressing OK. The clock will enter standby mode awaiting for deletion confirmation. This is indicated by alternating flashing of "error" and "clear" on display.



Confirm by pressing OK. The clock will reset the error. The display will show "error". The clock will return to standard operation mode.

### 8.7 System information – info



Confirm by pressing OK. The clock will enter the information menu. Browse the information by pressing +/- keys:

\*clock type

\*software version

