

DIGITAL OPTIMIZING THERMOSTAT

CMD 910 - 911

- Powered by three miniature 1.5 V alkaline batteries
- Proportional (P) control action
- One SPDT output
- 24-hour (CMD 910) or 7-day (CMD 911) programming
- Optimization of start up times
- Readout of room temperature
- Possibility of switching on by remote control or by RCT 919 telephone receiver
- Frost protection
- Temperature setback facility

APPLICATION

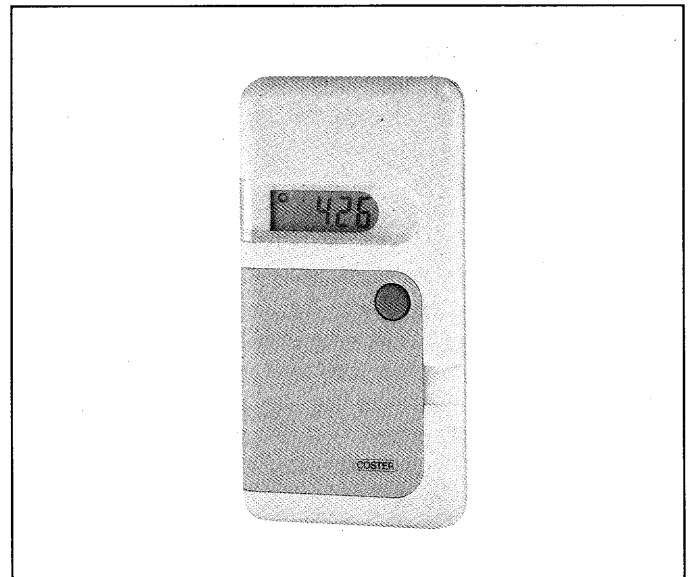
CMD digital thermostats have been designed for room/ space temperature control in small- or medium-size heating, air conditioning or mixed systems:

- Apartments with central or district heating
- Private residences
- Single units in industrial buildings

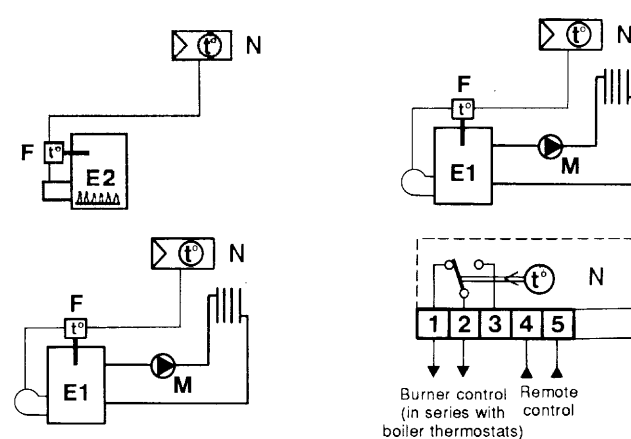
They are suitable for the ON-OFF control of:

- Gas boilers with atmospheric burners
- Blown air gas or gasoil burners
- Zone valves with 2- or 3-position electric control
- Circulation pumps
- Fan coils
- Electric radiators
- Air conditioning units

OPERATING AND WIRING DIAGRAMS



CENTRAL HEATING BOILERS + WARM AIR UNITS



SYSTEM WITH ELECTRIC RADIATORS

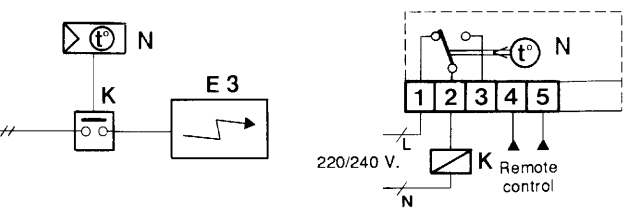


fig. 1 ZONE VALVES

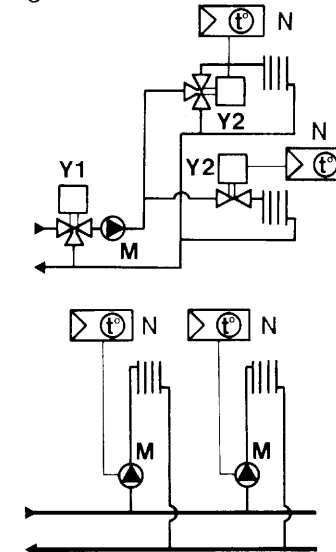


fig. 3

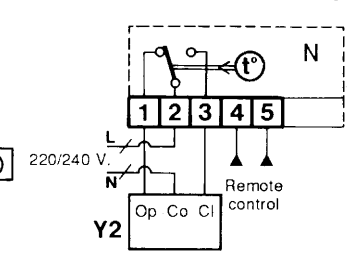
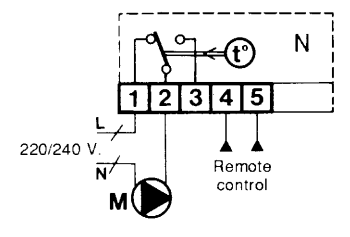


fig. 4



- N: CMD 91
- E1: Boiler
- E2: Warm air unit
- E3: Electric radiator
- F: Boiler thermostat
- K: Contactor
- M: Circulation pump
- Y1: Mixing valve
- Y2: Zone valve

MODELS

CMD 910 - With 24-hour programming

CMD 911 - With 7-day programming

On request both models can be supplied with remote room sensor (SDA 010 or SDA 020) for two monitoring points. With this version it is not possible to use the remote control.

OPERATION

CMD 91 is an electronic controller of room temperature with an ON-OFF type outlet and with Proportional control action.

The room temperature is monitored by an NTC thermistor; all the electronic functions are processed by a dedicated CMOS microprocessor.

CONTROL OF ROOM TEMPERATURE

A normal thermostat switches ON-OFF when the room temperature t° is above or below the desired temperature T° by a value equal to half its differential Δt° .

Switching ON when $t^\circ = T^\circ - 1/2 \Delta t^\circ$.

Switching OFF when $t^\circ = T^\circ + 1/2 \Delta t^\circ$.

The thermal inertia of the system tends, inevitably, to increase the real differential, thereby generating wide swings in the room temperature (fig. 5).

CMD 91, with its Proportional control action, starts to act when the room temperature enters the proportional band $Bp = T^\circ \pm 0.5^\circ\text{C}$ and therefore before the desired temperature T° is reached. In this way it gradually reduces the variations in room temperature until the desired value is reached (fig. 6).

Within the proportional band the ratio between the times of switching ON and the times of switching OFF depends on the error between the desired temperature and the actual temperature measured by the sensor. When the room temperature is at the desired value (half load), CMD 91 comes into action with ON-OFF commands of equal duration thereby maintaining the heating media at an average temperature.

We can say, therefore, that **CMD 91 programmes its actions not only in function of the actual room temperature but also in function of the speed of its variation over time.**

BATTERY POWER SUPPLY

Three 1.5 V alkaline batteries (type LR6/MN 1500), which last for a year, are required.

CMD 91 indicates when these require replacing by causing the whole display to flash and replacement should take place within a week of this warning. While the batteries are being changed all the data remain in the memory and CMD 91 continues to function normally for about 15 minutes thereby avoiding the need to re-programme it.

INDICATION OF TIMES

The display normally shows the correct time of day:

eg **20.58**

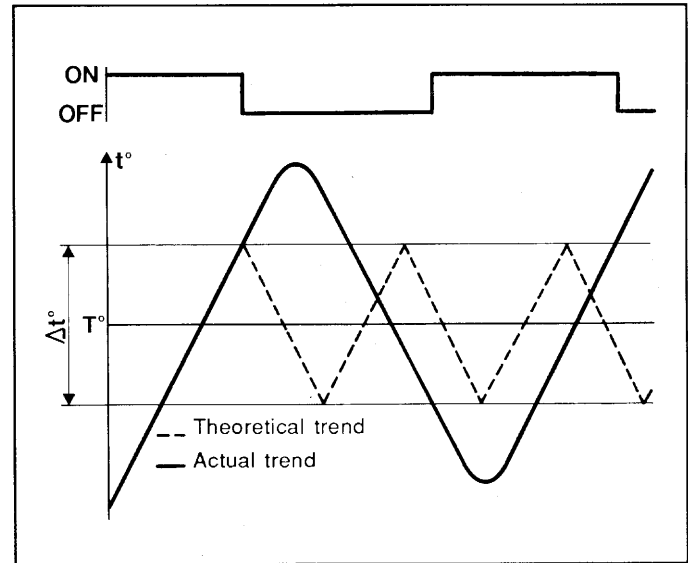
20 - hour

- counts the seconds

58 - minutes

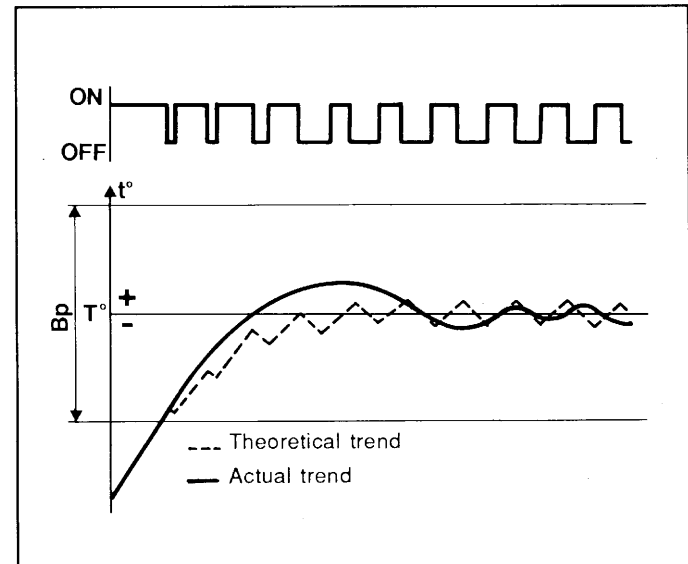
VARIATION OF THE ROOM TEMPERATURE WITH A NORMAL THERMOSTAT

fig. 5



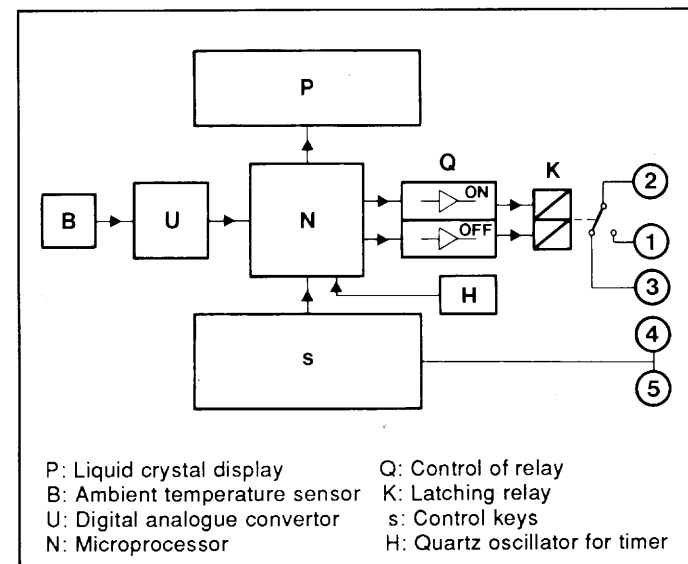
VARIATION OF THE ROOM TEMPERATURE WITH CMD 91

fig. 6



BLOCK DIAGRAM

fig. 7



When keyboard operations are performed, and accordingly shown on the display, after about 10 seconds from the last operation the correct time of day always reappears.

TEMPERATURE READOUT

Using the °C key (9) the following can be displayed:

- Actual room temperature
- Minimum and maximum room temperatures
- The two temperatures desired for the "Normal" and "Setback" operating modes.

eg: 19.5c

- 19 - degrees Centigrade
- .5 - tenths of a degree
- c - symbol of degrees Centigrade

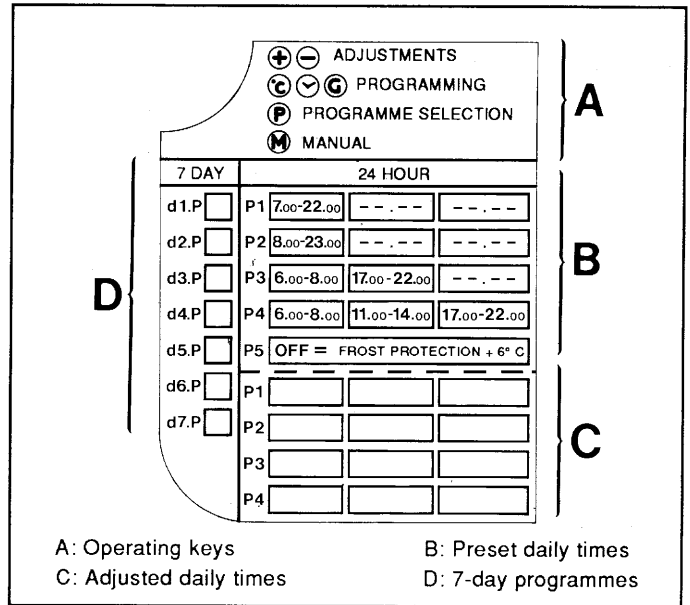
OPTIMIZATION OF START UP TIMES

This function permits CMD 91 to calculate the time necessary for the plant to bring the room temperature to the desired value and determine how long in advance the plant has to be switched on. It follows therefore that **the times to be set are not those for switching on the plant but those at which it is desired to have the desired temperature.**

The diagram (fig. 9) shows the room temperature trend t° over a period of 48 hours with a daily programme consisting of three periods in the "Normal" temperature mode at 20°C: 06 - 08, 11 - 14, 17 - 22; and three periods in the "Setback" temperature mode at 17.5°C: 08 - 11, 14 - 17, 22 - 06. CMD 91 sets a theoretical coefficient J (0 - 15), which represents the time necessary for the plant to raise the room temperature by 0.2°C, and it utilises this coefficient when switching on for the first daily time to establish, as a function of the current room temperature, how soon in advance the plant must be switched on. When the room temperature reaches the the desired value T°_N , CMD 91 notes the error made and makes a correction by setting a new coefficient J1 which it will use for the next two start-ups on that day and for the first start-up on the following day. At this point CMD 91 will recalculate any error and, if necessary, set a new coefficient J2.

DATA PLATE

fig. 8



PROGRAMMES

The following can be selected by means of key P (6):

- Four daily programmes "P1", "P2", "P3" and "P4".
- One frost protection programme "OFF" or "P5".
- (For CMD 911 only) One 7-day programme "AUTO".

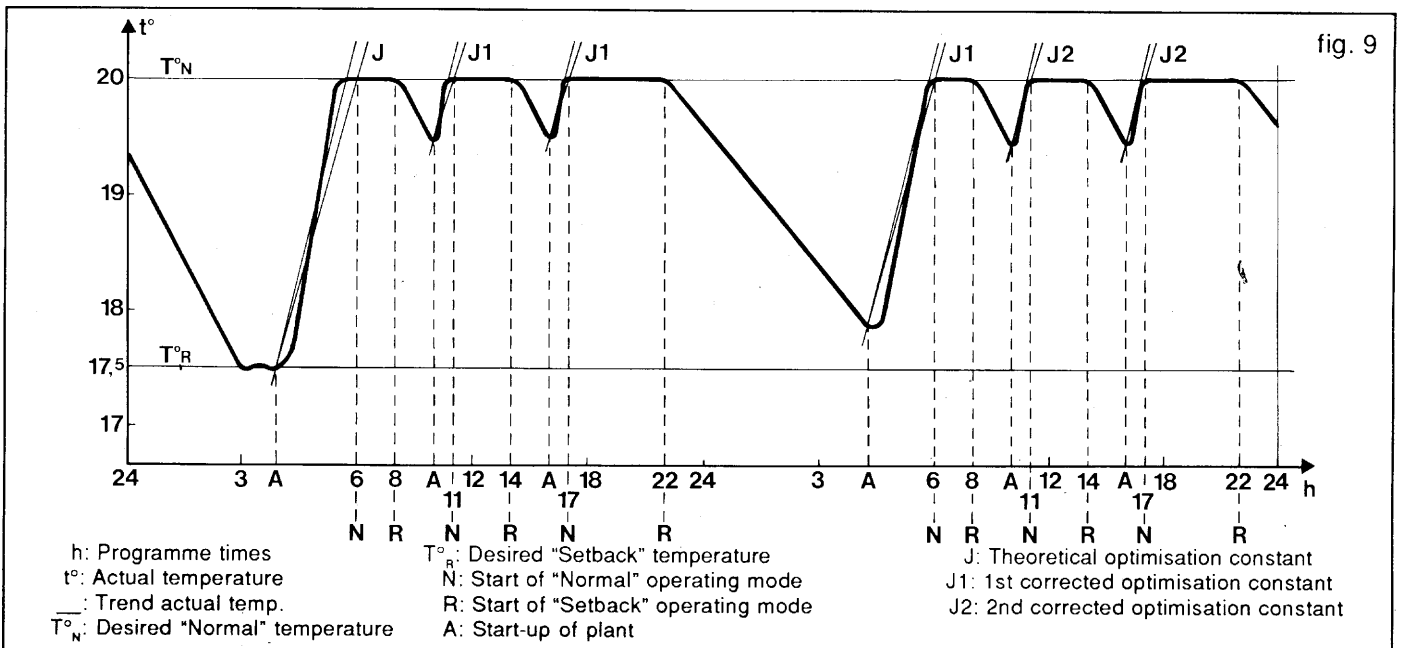
DAILY PROGRAMMES "P1", "P2", "P3", "P4".

Each daily programme can contain three times for starting a period in the "Normal" temperature mode and three times for starting a period in the "Setback" temperature mode.

The following times are preset and memorised by CMD 91:

	Norm.	Setb.	Norm.	Setb.	Norm.	Setb.
P1:	7.00	22.00	---	---	---	---
P2:	8.00	23.00	---	---	---	---
P3:	6.00	8.00	17.00	22.00	---	---
P4:	6.00	8.00	11.00	14.00	17.00	22.00

These times can be displayed using the "Clock" key (10) and adjusted by 15 minutes at a time by the two operating keys +(7) and -(8).



If a time is not used it must be cancelled by pressing the two operating keys + and - at the same time; --.-- will appear on the display.

To obtain continuous operation in the "Setback" mode a programme with all the times cancelled must be used. To obtain continuous operation in the "Normal" mode a programme must be used with the first time set at 0.00 and all the other times cancelled.

On the back of the keyboard door is a data plate (fig.8) on which the times of the various programmes can be recorded. These can be written and erased with an ordinary lead pencil and rubber.

FROST PROTECTION "OFF" or "P5" PROGRAMME

When the premises are unoccupied for long periods this mode permits continuous operation at a room temperature of 6°C.

7-DAY PROGRAMME (CMD 911 only)

This permits assigning to each day of the week one of the four daily programmes P1 - P4 or the frost protection programme P5.

REMOTE CONTROL "TELE"

This mode permits the economical use of the heating plant when the premises are occupied only occasionally.

During the unoccupied period CMD 91 keeps the plant running with a pre-selected programme. eg frost protection or continuous "Setback".

When the user decides to occupy the premises he can switch to the "Normal" mode by means of a remote control eg the RCT 919 telephone receiver.

CMD 91 maintains the "Normal" mode for the number of hours previously established (24 hours max.).

At the end of this period, if the user does not use a manual override, CMD 91 returns to the unoccupied programme.

CONSTRUCTION

CMD 91 digital optimising thermostats comprise two main parts:

- Plastic base (fig. 10) for wall mounting, consisting of:
 - terminal block for the electrical connections protected against accidental contacts (1);
 - conduit entries for cables coming from the rear (2);
 - conduit entries for cables coming from the side (3);
 - screw holes (4) for fixing to wall.
- Plastic casing (fig. 11) which houses the electronic circuit; on the facia are located the liquid crystal display (1) protected by a transparent window, and below this a hinged door (4), the keyboard (2) and the battery compartment (3).

The electrical connections between the circuit and the base are by means of pins which are inserted directly into the sockets of the terminal block.

BASE

fig. 10

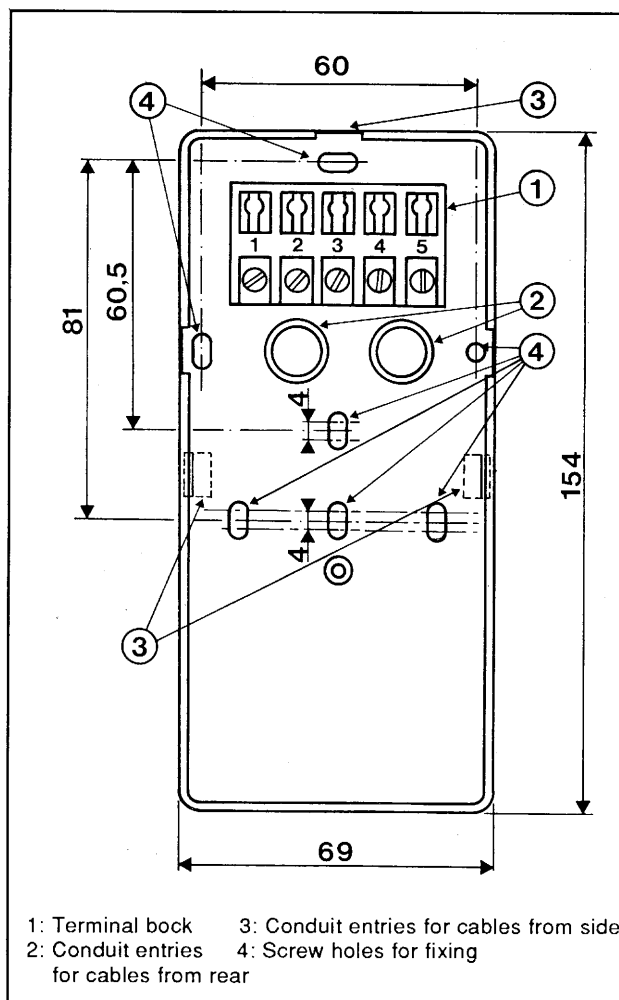
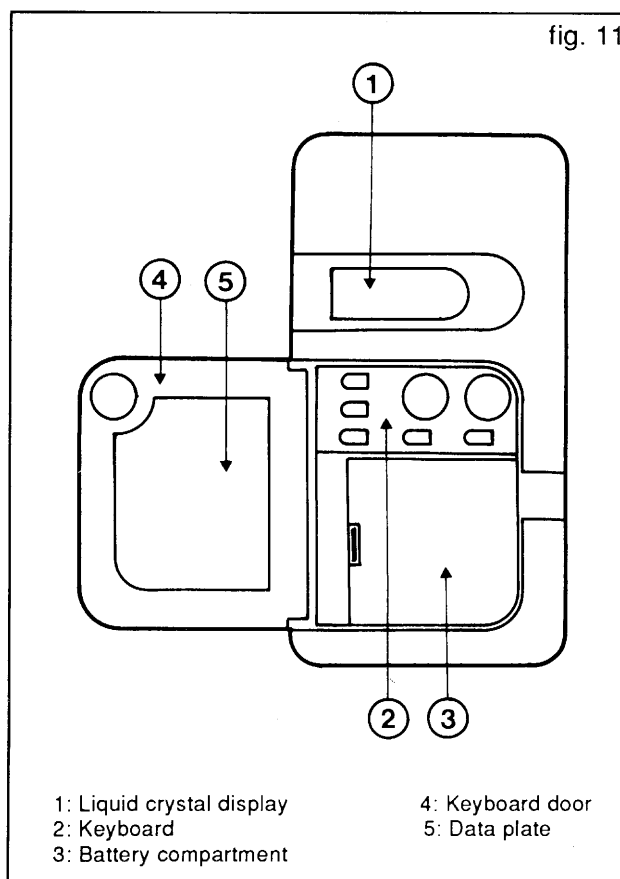


fig. 11

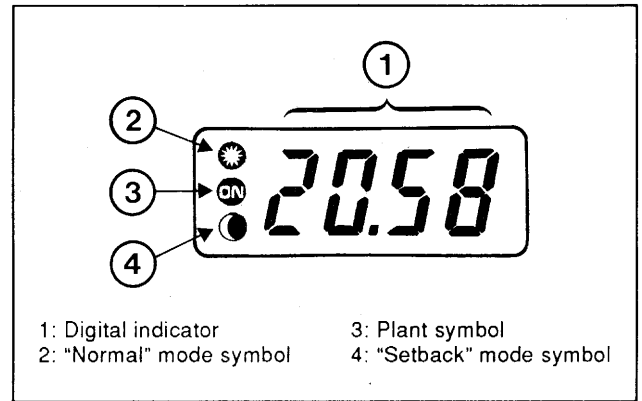


LIQUID CRYSTAL DISPLAY (fig. 12)

- The digital indicator (1) can display:
 - The correct time of day.
 - The programme times.
 - The actual room temperature.
 - The maximum and minimum room temperatures registered.
 - The desired "Normal" and "Setback" temperatures.
 - (For CMD 911 only) the days of the week with their relative programmes.
- "Normal" symbol (2): CMD 91 is in a "Normal" operating mode period.
- ON symbol (3): CMD 91 orders the heating plant to operate with contact 1-2 closed and 2-3 open.
- "Setback" symbol (4): CMD 91 is in a "Setback" operating mode period.
- Symbols (2) and (4) out: CMD 91 is in the frost protection mode P5 or "OFF".
- Symbols (2) and (4) lit: CMD 91 is in the remote control tELE mode.

LIQUID CRYSTAL DISPLAY

fig. 12

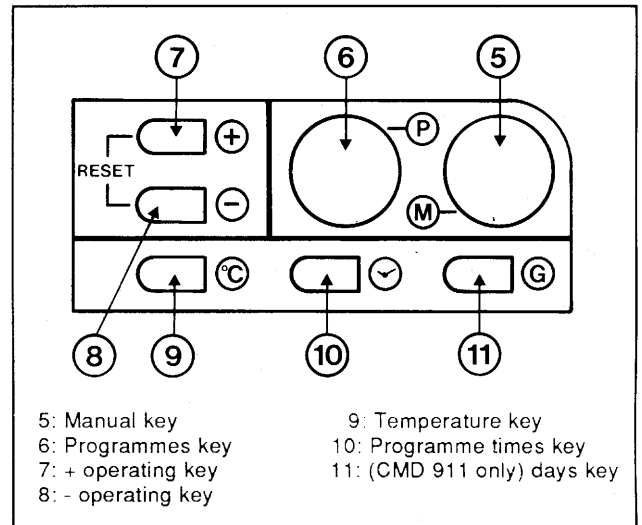


KEYBOARD (fig. 13)

- M key (5): pressed at intervals permits a rapid changeover from the "Normal" to the "Setback" mode and vice versa; pressed for more than two seconds it puts the remote control tELE mode in operation.
- P key (6): permits the display and selection of the operating mode.
- + operating key (7): permits increasing the value displayed at that moment; pressed continuously it increases the value rapidly; pressed at intervals it increases the value by one figure at a time.
- - operating key (8): permits decreasing the value displayed at that moment; pressed continuously it decreases the value rapidly; pressed at intervals it decreases the value by one figure at a time.
- Temperature °C key (9): permits the display of the temperature: 1st press: the actual room temperature; 2nd press: the desired "Normal" temperature; 3rd press: the desired "Setback" temperature.
- Programme times key (10): pressed at intervals displays the programme times; with each time is displayed intermittently the symbol of the relative "Normal" or "Setback" operating mode.
- (CMD 911 only) 7-day key G (11): pressed at intervals displays the days of the week with the relative operating programme

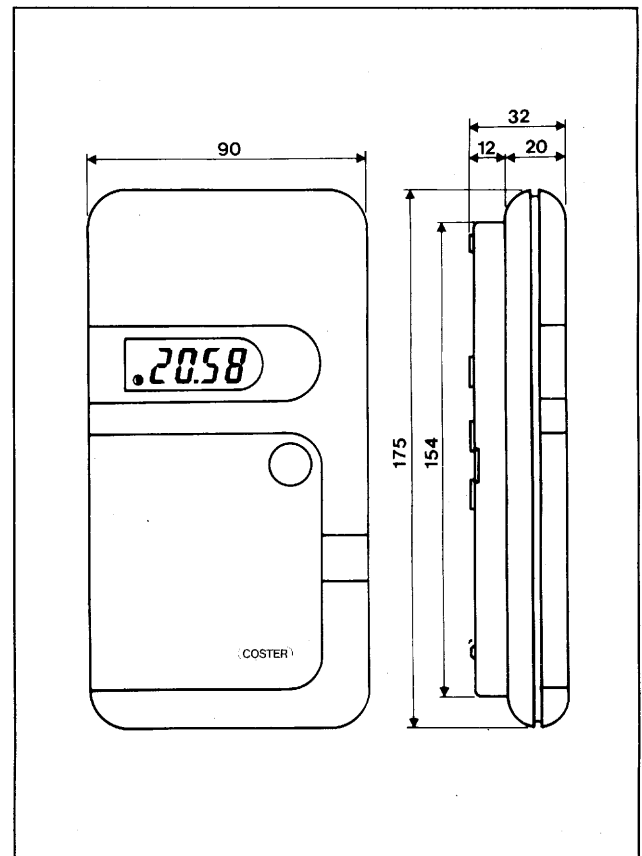
KEYBOARD

fig. 13



OVERALL DIMENSIONS

fig. 14



INSTALLATION

CMD 91 must be installed at a height of 1.5 to 1.6 metres from the floor, at a point on an internal wall of the room which best represents the average temperature. It must be as far as possible from windows, doors and sources of heat, and corners, shelves and curtains must be avoided.

- Remove the base from the casing after having loosened the screw in the battery compartment.
- Fix the base to the wall using the screw holes provided and taking care to pass the cables through the appropriate conduit entries.
- Make the electrical connections in accordance with

the wiring diagrams and observing any local safety precautions.

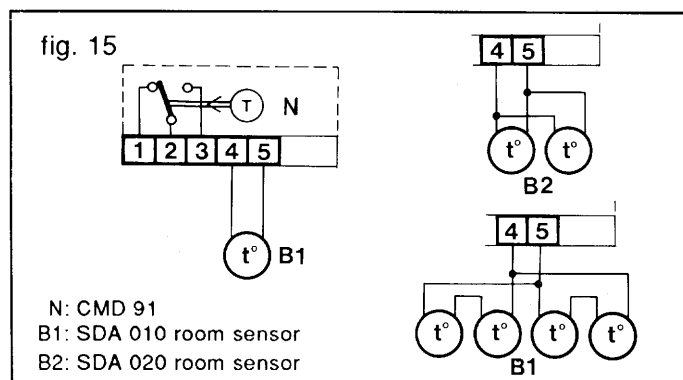
- Replace the casing on the base and tighten the securing screw.
- Insert the batteries in their compartment carefully checking the polarities indicated on the bottom.

REMOTE SENSOR

When used with a remote sensor CMD 91 can be installed anywhere because it is supplied without the internal sensitive component and the room sensor is connected to the two terminals 4 and 5 (fig. 15), which cannot therefore be used for the remote control.

To install the sensor the same criteria described under INSTALLATION must be followed.

In particularly large spaces it is advisable to use two SDA 020 sensors connected in parallel or four SDA 010 sensors connected in series-parallel, located so as to monitor the average temperature of the premises.



SETTING

Following the procedure in the instruction booklet supplied with CMD 91, set:

- The correct time of day.
- The desired "Normal" room temperature.
- The desired "Setback" room temperature.
- Adjust, if necessary, the daily programme times P1 - P4 according to personal requirements.
- (CMD 911 only) assign the desired programme to each day of the week.
- Select the programme to be used: P1 - P4 or frost protection "OFF" or (CMD 911 only) the 7-day "AUTO" programme.

TESTING

- Set the desired "Normal" temperature to a value of 2°C above the actual room temperature.

- Set the desired "Setback" temperature to a value of 2°C below the actual room temperature.
- By means of the M key (5) switch to the "Normal" mode: symbols (2) and (3) should be lit and the heating plant in operation.
- By means of the M key (5) switch to the "Setback" operating mode: symbol (4) should be lit and symbol (3) out and the heating plant off.

TECHNICAL DATA

Power supply:	three 1.5 V alkaline batteries
Battery life:	one year
Data memory without batteries:	15 minutes
Display:	liquid crystal
Keyboard:	silicon elastomer
Output SPDT:	
- rated voltage	250 V AC
- rated current	5(1) A
Temperature adjustment range:	0 to 40°C
Proportional band:	+/- 0.5°C
Temperature:	
- monitoring	every minute
- sensitivity	0.1°C
Operating cycle at half load:	20 minutes
Frost protection programme:	6°C
Minimum interval between programme time	15 minutes
Ambient temperature:	
- operating	0 to 45°C
- storage	-20 to 60°C
Room humidity:	class G (DIN 40040)
Test class:	III (VDE 0631)
Protection:	IP 30
Weight:	0.30kg

RCT 919 TELEPHONE RECEIVER

The RCT 909 telephone receiver, in combination with CMD 91, makes it possible to switch on a heating plant for a preset period by telephone.

It is battery-powered and is connected to CMD 91 by means of a two-wire cable with jack.

Since the RCT 919 receiver is not connected to the telephone system but merely placed near the telephone, no authorization is required.

RCT 919 is able to decode the number of telephone rings and, when these correspond to a preset code, to send a signal to CMD 91 which switches on the heating plant.

To avoid false activation it is necessary to make two telephone calls one after the other, each of which should produce a preset number of rings.