DIGITAL WEATHER COMPENSATOR WITH OPTIMUM START-UP

RTE 955 Eng. C1

- Power supply 220/240 Volt ac. Time switch power reserve about 10 years
- Control of flow temperature as a function of outside temperature
- One modulating output with PI action for control of valve or On-Off for control of boiler
- Two On-Off outputs for control of pump and boiler as a function of times and thermal demand
- Optimisation of switching-on and -off times
- Possibility of adjusting flow temperature in function of room temperature
- Control of minimum limit of boiler return temperature and of minimum and maximum limits of flow temperature
- Digital programming with four keys and alphanumeric display
- Facility for remote control : Automatic - continuous Day - Frost protection
- ECO Off function
- Adjustable pump overrun (1-30 min.)

$C\epsilon$

APPLICATION

RTE 955 weather compensator, on account of its capacity to optimise switching-on and-off times, finds its principal use in medium and large heating systems in, eg:
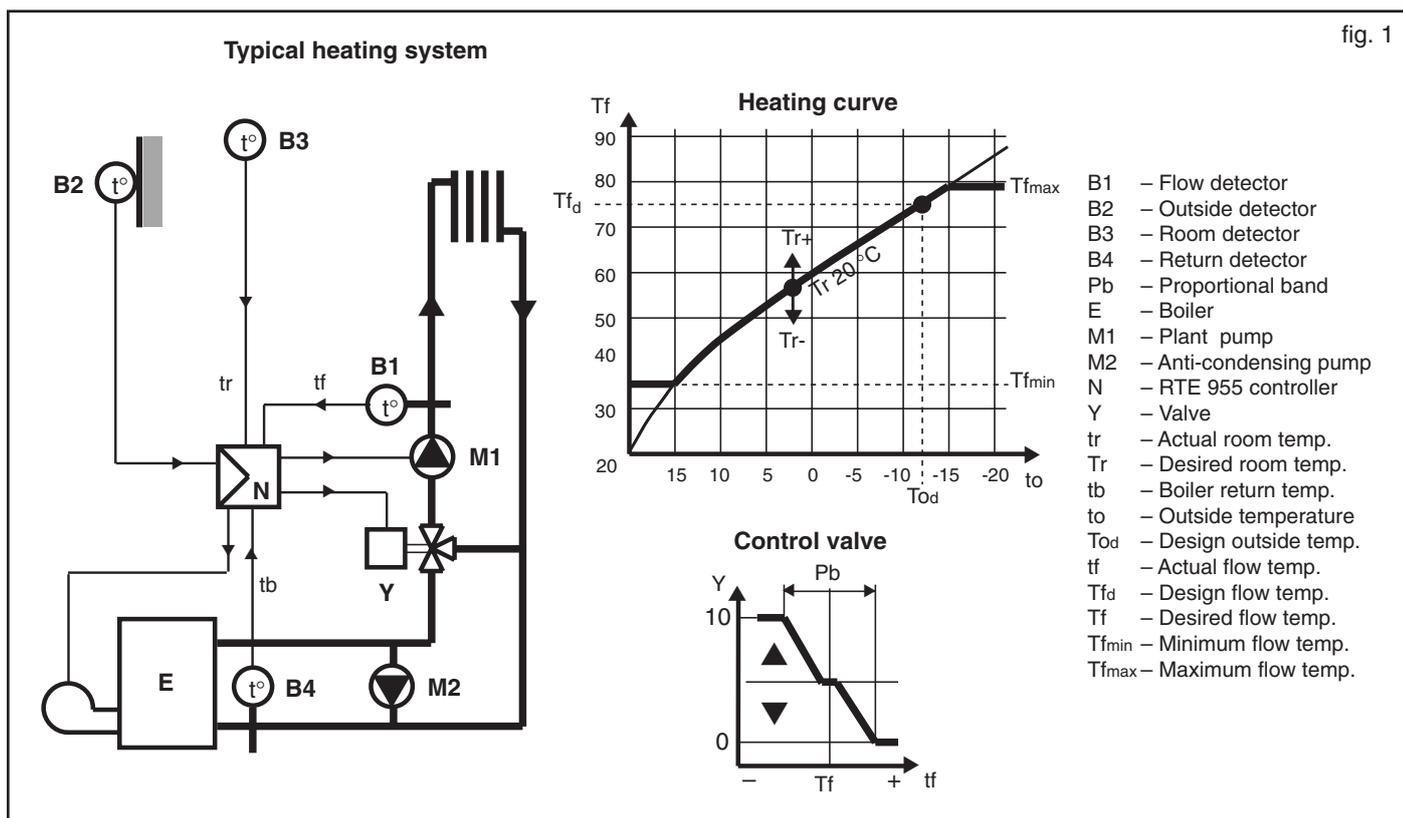- Residential and commercial complexes
- Schools and public buildings

Suitable for all climatic zones and for any type of heating media: eg panels, radiators, fan coils.

RTE 955 controls mixing and diverting valves operated by reversible electric actuators with three-wire control and with running times of from 2 to 60 minutes, or the boiler directly.

SCHEMATIC DIAGRAMS

fig. 1

Typical heating system

Heating curve

Control valve

B1	– Flow detector
B2	– Outside detector
B3	– Room detector
B4	– Return detector
Pb	– Proportional band
E	– Boiler
M1	– Plant pump
M2	– Anti-condensing pump
N	– RTE 955 controller
Y	– Valve
tr	– Actual room temp.
Tr	– Desired room temp.
tb	– Boiler return temp.
to	– Outside temperature
Tod	– Design outside temp.
tf	– Actual flow temp.
Tfd	– Design flow temp.
Tf	– Desired flow temp.
Tfmin	– Minimum flow temp.
Tfmax	– Maximum flow temp.

ACCESSORIES

No	Description	Model	Sensing element	Code	Data sheet
1	**Essential accessories:** Surface flow temperature detector	**SCH 010**	NTC 10 kΩ	B1	–
1	Outside temperature detector	**SAE 001**	NTC 1 kΩ	B2	–
1	Room temperature detector	**SDA 010**	NTC 10 kΩ	B3	–
1	Surface detector for return temperature limit	**SCH 010**	NTC 10 kΩ	B4	–
1 or 2	**Optional accessories** Immersion temperature detector to substitute surface detector SCH 010	**SIH 010**	NTC 10 kΩ	B1-B4	–

OPERATION

RTE 955

RTE 955 regulates flow temperature in function of outside temperature so as to provide a constant room temperature throughout the building.
All electronic functions of RTE 955 are processed by an HMOS microcontroller.

POWER SUPPLY

RTE 955 is energised by 220/240 V ac and is provided with a lithium battery which, in the event of a power failure, maintains the correct time of day and ensures that the data set are memorised for about ten years. The controller is supplied with the battery in its housing and the correct time of day set.

TEMPERATURE CONTROL

Detector B1 monitors flow temperature tf and detector B2 monitors outside temperature to.
RTE 955 establishes desired flow temperature Tf in function of outside temperature to and of heating curve (fig. 1) set on the basis of the design criteria:
– Type of heating media : panels, radiators, fan coils
– Design outside temperature to_d (- 30 to + 10 °C)
– Design flow temperature tf_d (5 to 99 °C)
The heating curve set in this way refers to a desired room temperature of 20 °C and can be adjusted by a parallel shift using the Day value. If this value is set to _ _ heating is excluded.
In the event of a difference between actual temperature tf and desired temperature Tf, RTE 955 produces a modulating signal with PI action for control of valve Y, or an On-Off signal for control of boiler.
The control parameters, Proportional Band and Neutral Zone, are automatically set by RTE 955.

ROOM TEMPERATURE AUTHORITY

By means of detector B3, RTE 955 compares actual room temperature with desired Day value, according to current operating mode.
In the event of a difference, it produces a variation of Tf value calculated by compensator function. This variation depends on the room authority TR set : 0 to 30 °C of water temperature variation for each 1 °C of difference in room temperature.

FLOW TEMPERATURE LIMITS

• Minimum limit - Used to adjust heating curve to high outside temperatures, or in fan coil systems to avoid emission of cold air into room. Acts only in periods with day room temperature.
• Maximum limit - Used in panel systems so as to avoid dangerous overheating. Acts in any situation.
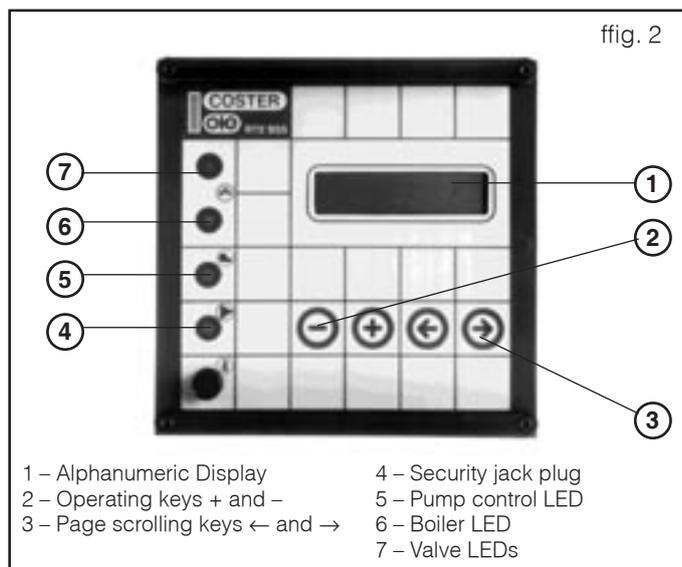
ANTI-CONDENSING FUNCTION

By means of detector B4, RTE 955 compares the measured return temperature with the minimum return temperature set (pag. 45). For each °C the measured return temperature falls below the minimum set the calculated flow temperature is reduced by 8 °C.

OPTIMISATION OF SWITCHING-ON AND -OFF TIMES

RTE 955 is able to run heating system with maximum economy by varying switching-on times so as to provide desired room temperature at time occupation begins (ON) and by advancing switching-off times so as to obtain a slight lowering of room temperature at time when occupation ends (OFF).
The advance switching times are calculated in function of room temperature and of following coefficients:

OPERATION

ffig. 2

1 – Alphanumeric Display
2 – Operating keys + and –
3 – Page scrolling keys ← and →
4 – Security jack plug
5 – Pump control LED
6 – Boiler LED
7 – Valve LEDs

– Switching-on inertia: time necessary for heating system to increase room temperature by 1°C.
– Switching-off inertia: time necessary for room temperature to decrease by1 °C with heating system switched off and with an outside temperature of 12 °C.
By means of room detector B3, RTE 955 uses actual value of room temperature and the coefficients are adjusted automatically in relation to errors committed.

BOOST SWITCHING ON

To decrease period of advance switching on, RTE 955 can increase flow temperature (Boost) by simulating an increase in desired room temperature.

PROGRAMS

Eight operating programs can be used:
– Four 24-hour programs: 'P.1", "P. 2", "P. 3", "P. 4"
– One Continuous Day program "P. D"
– One Frost Protection program "P. F"
– One 7-day program "WEEK"
– One HOLIDAYS program
• 24-hour programs : **P. 1, P. 2, P. 3, P. 4**
These can contain:
– from 1 to, 3 ON times: start of Day temperature period - start of occupation of premises.
– from 1 to 3 OFF times: start of Frost Protection temperature period - end of occupation of premises.

RTE 955 is preset to memorise following times

|	P.1	P.2	P.3	P.4
On 1	07.00	08.00	06.00	06.00
Off 1	22.00	23.00	08.00	08.00
On 2	– –.– –	– –.– –	17.00	11.00
Off 2	– –.– –	– –.– –	22.00	14.00
On 3	– –.– –	– –.– –	– –.– –	17.00
Off 3	– –.– –	– –.– –	– –.– –	22.00

These times can be read on pages of display by using ← and → keys (fig. 2 .3) and adjusted by 15 minutes at a time using the + and – keys (fig. 2 .2).

When a time is not used it must be cancelled by pressing – key until – –.– – appears on display.

- Continuous Day program **P. D.**
  Provides continuous operation at desired Day temperature.
- Continuous Frost Protection program **P. F.**
  Provides continuous operation at desired Frost Protection temperature.
- 7-day program **WEEK**
- Permits assigning a different program to each day of the week:
  P. 1, P. 2, P. 3, P. 4, P. D, P. F.
- **HOLIDAYS** program

Establishes a period during which premises are not used and heating system operates with Frost Protection program.

It is set the day before the start of holidays by inserting, on appropriate page, the number of days, and it starts to function from 24.00 of the same day. As the days go by the number set decreases until 00 is displayed on the last day of holidays; at this point the program previously in use returns and switches on in advance, without taking into account the maximum advance limit, so as to bring the premises to Day temperature at the time their occupation begins.
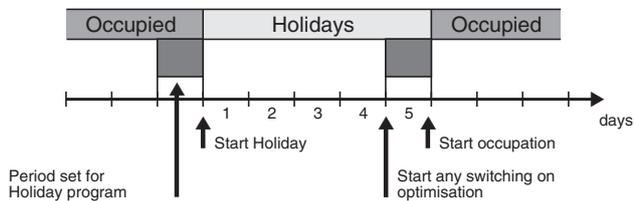
DAY MODE (ECO FUNCTION)

In the Day mode, if the outside temperature becomes higher than, or equal to, the pre-set value, the boiler, and the pump after overrun time, are switched off .

The boiler and pump outputs are activated if the outside temperature becomes lower than , or equal to the preset limit of – 2 °C (differential).

FROST PROTECTION

- The Frost Protection mode comes into operation at the end of the Day mode. During the latter, the boiler and pump are always switched on.
- For the Frost Protection mode it necessary to set the following values:
– Three minimum temperature limits: Room, Outside, Boiler return
– Differential in respect of above three limits.
- When changing to Frost Protection mode, provided current temperature values are above limits set, RTE 955:
  – opens valve, which remains open
  – switches Off boiler
  – keeps pump switched On for overrun time and then switches it Off • Subsequently, RTE 955 operates as follows:
  – If outside temperature falls below limit set, switches On pump
  – If room temperature falls below limit set, switches On pump and boiler.
  – If boiler return temperature falls below limit set, switches On pump and boiler.

PUMP EXERCISE

Pump is switched on for 15 minutes at 12 noon irrespective of current operating mode.

REMOTE CONTROL

RTE 955 can be overridden by means of a remote control (SDA 040) which is able to set a desired operating mode irrespective of the programme in use at that moment.

It is used in the following way :

By rotating the key switch to the left (Extension) and back to

OPERATIONAL DIAGRAMS

fig. 3
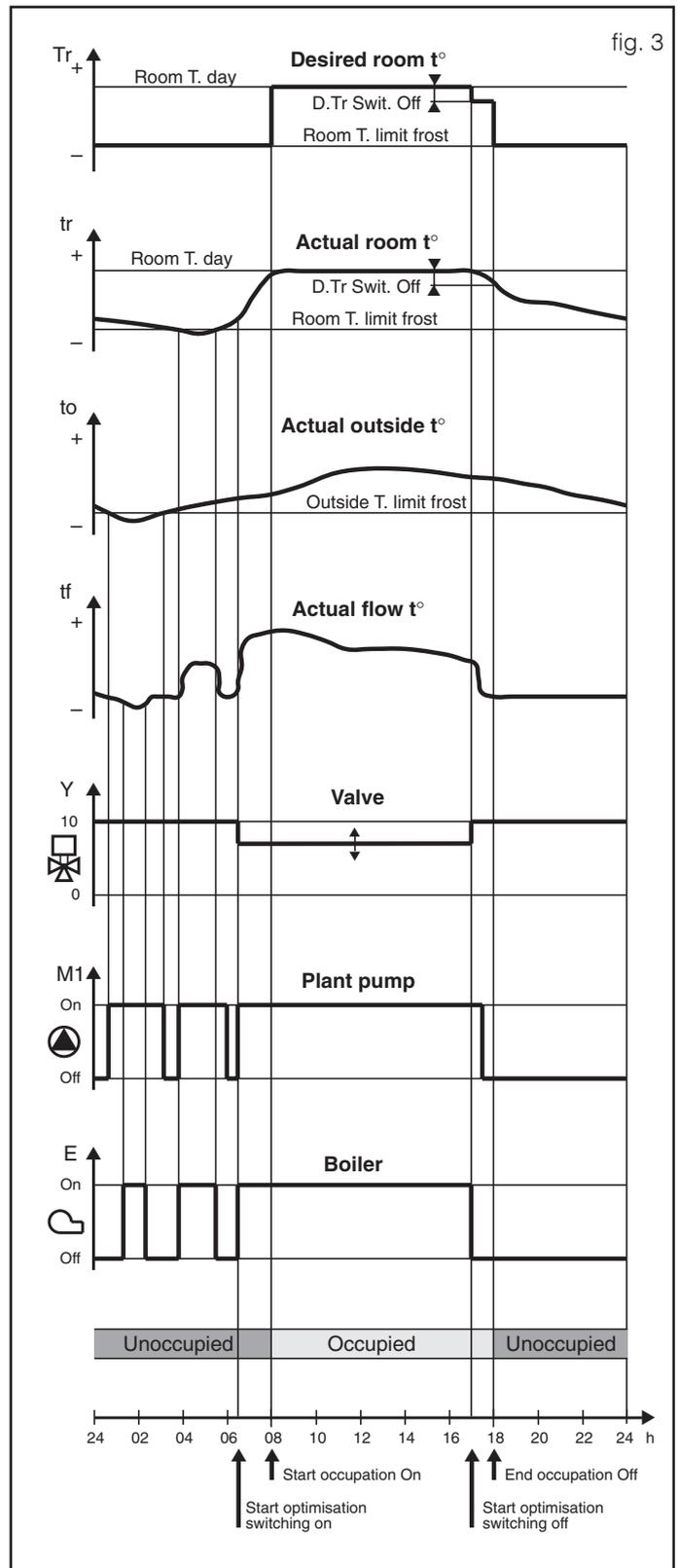
centre (Auto), RTE 955 starts a period of heating, at the desired Day temperature, for the Extension (Tele) period set on page 11 of the display. At the end of the Extension (Tele) period the controller returns to the current programme.

If it is desired to interrupt the Extension (Tele) period before its time has elapsed, the key switch is rotated to the right (Holiday) and back to centre (Auto).

To set controller in continuous Frost Protection programme, the key switch is rotated to the right (Holiday) and left in this position. The key may be removed in this position only.

When switch is returned to Auto at the end of desired Holiday period, plant will return to set programmes.
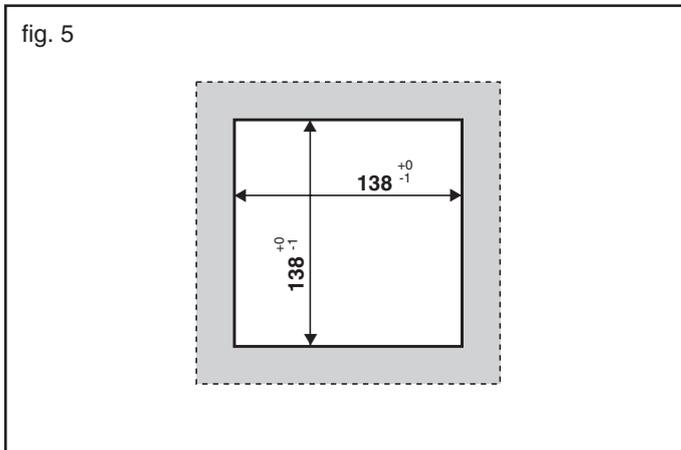
OVERALL DIMENSIONS

fig. 4
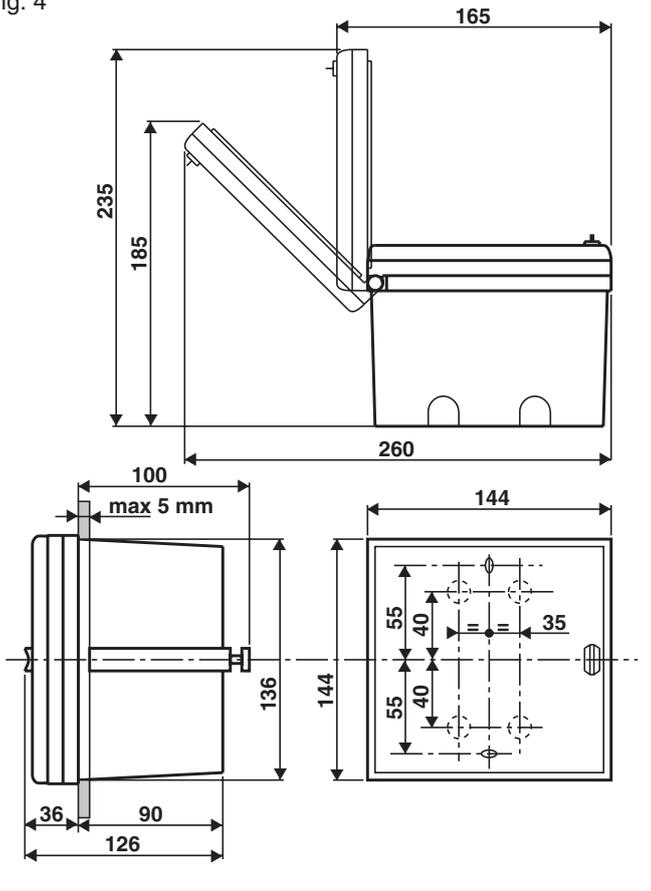
CUT-OUT FOR PANEL MOUNTING

fig. 5

$138 \, ^{+0}_{-1}$

$138 \, ^{+0}_{-1}$

SECURITY JACK PLUG

On the facia of RTE 955 is a jack plug (fig. 2.4) which, if extracted, prevents any modification of memorised data.
This facility can be put out of action by means of an internal link (fig. 7).

CONSTRUCTION

RTE 955 is constructed in a DIN 43700 standard 144 x 144 casing (fig. 4). This is made from shock-proof plastic and contains, on its base, the two terminal blocks into which the connecting tabs of the printed circuit are inserted.
The electronic unit, which is fitted into the casing by means of slight pressure, **is constructed according to Italian Electrotechnical Committee (CEI) standards** as a single unit comprising the printed circuit and the controls facia.
The cover, in transparent plastic, is hinged on the left of the casing and is provided with a mechanical closure.
RTE 955 is suitable for wall and panel mounting.

INSTALLATION

RTE 955

This must be installed in a dry location with a temperature not above 35 °C, and away from any water leakages or sprays.
If installed in locations classified as "dangerous" it must be mounted inside a cabinet for electrical appliances constructed according to the regulations in force for the type of danger involved. In any event, the electrical connections must be made strictly according to the wiring diagram (fig. 6) and in observance of the safety regulations in force.

DETECTORS

For RTE 955 to function correctly it is essential that all the following four detectors are connected.
Room SDA 010
This must be installed at a point which represents the average temperature of a typical heated room of the building, at a height of 1.5 to 1.6 meters from the floor, on an internal wall, and as far as possible from windows, doors and sources of heat, avoiding corners, shelving and curtains.
Flow SCH 010 OR SIH 010
If circulation pump is on flow pipe, detector must be installed downstream of pump. If pump is on return pipe, detector must be installed downstream of the control valve at a minimum distance of 1.5 meters so that it is not subject to indirect heat and also because, before reaching this point, the water is not sufficiently well mixed.
Outside SAE 001
This must be installed outside the building on the north or north-west side, at a height from the ground of not less than three meters in order to prevent tampering and to allow better monitoring of weather conditions.
It must be protected from the sun's rays and be as far as possible from windows, doors, chimneys or other possible thermal disturbances.
Boiler return SCH 010 OR SIH 010
Control of anticondensing temperature of boiler. It must be installed on return pipe between boiler and anticondensing pump.

TECHNICAL DATA

Power supply	220/240 Vac
Frequency	50 to 60 Hz.
Consumption	5 VA
Output:	
– maximum switched voltage	250 Volt ac
– maximum switched current	10 (2.5) A
Setting range:	
– days holiday	1 to 30
– Day room temp.	excluded to 30 °C
– Frost Protection room temp.	excluded to 30 °C
– Frost Protection outside temp.	– 30 to + 10 °C
– Frost Protection return temp.	0 to 99 °C
– Frost Protection differential	0.5 to 10 °C
– design outside temp.	– 30 to + 10 °C
– design flow temp.	5 to 99 °C
– maximum and minimum flow temp.	5 to 99 °C
– ECO T. outside	15 to 25 °C
– auxiliary temperature limit	5 to 99 °C
– actuator speed	2 to 60 minutes
– room authority	0 to 30 °C
– boost	1 to 30 °C
– maximum advance switching on	0 to 40 hour
– switching on inertia	0 to 7.45 h / °C room
– reduction in room temperature switching off	0 to 3.5 °C
– maximum advance switching off	0 to 5 hour
– switching off inertia	0 to 7.45 h / °C room
– minimum interval between program times	15 minutes
– overrun time	1-30 minutes
– Room temperature :	
– operating	0 to 45 °C
– storage	– 25 to + 60 °C
Room humidity	class F (DIN 40040)
Protection	IP 40
Weight	1.1 kg

SETTING

The programming is set in a system of pages which can be scrolled on the luminous alphanumeric display by means of ← and → keys (fig. 2.3).
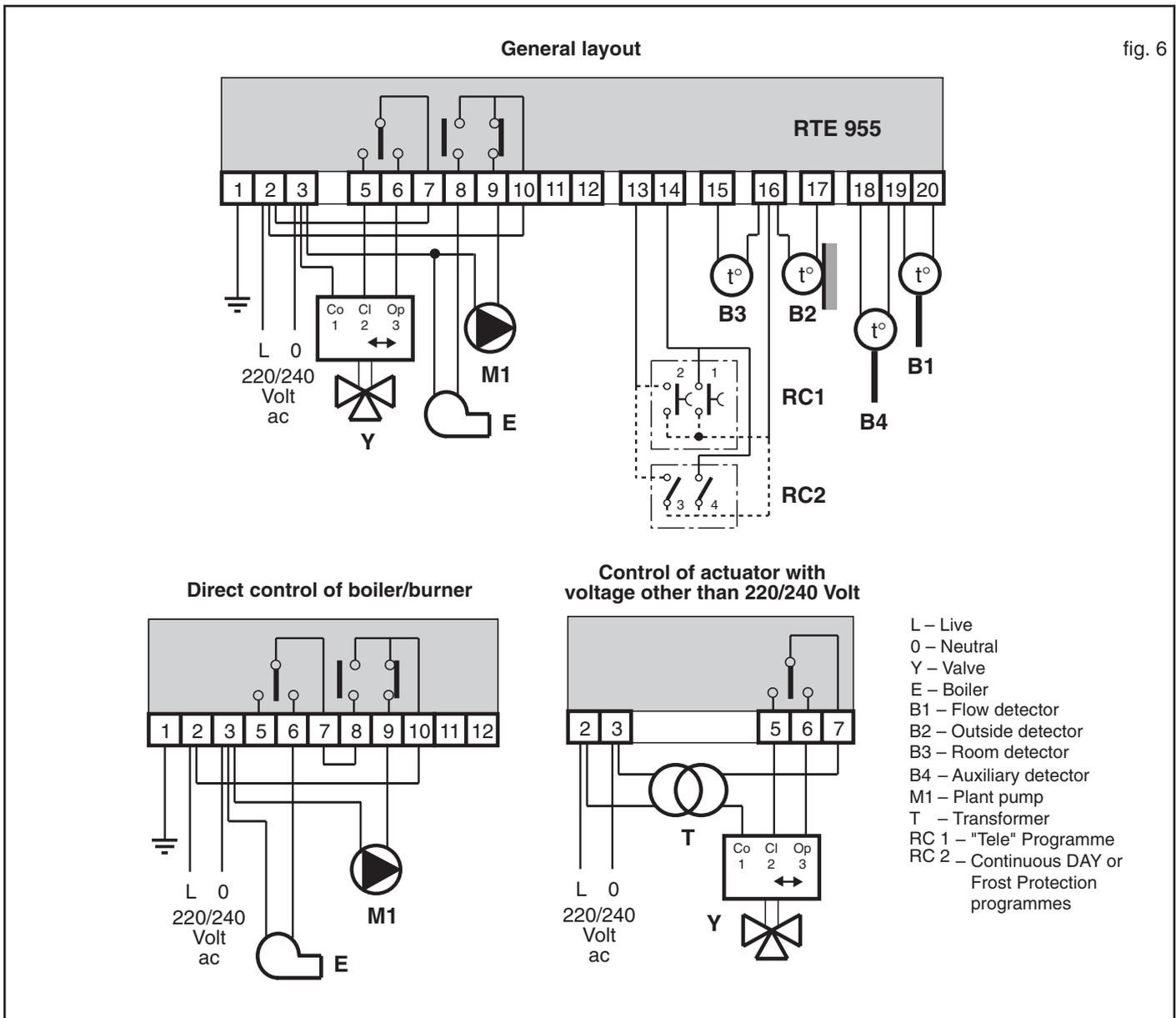The data ▦ are preset and can be adjusted using the + and – keys (fig. 2.2).
Whichever page is displayed, at the end of each 15 minutes the 1st page returns to display. To return quickly to 1st page, press keys ← and → simultaneously.
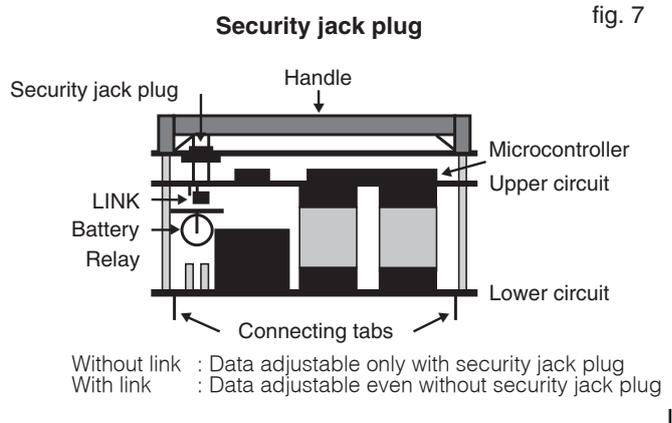
Page	Display	Description
1	**12.18**[1] **TUESDAY**[2] **Prg. WEEK** [3] **Mode D** [4]	(1) Current time (2) Current day (3) Program used – P.1/2/3/4 : With daily times – P.D. : Continuous Day – P.F. : Frost Protection – WEEK : 7-day (4) Current mode: D : Day F : Frost Protection. H : Holiday period : A : Advance switching on S : Advance switching off
2	**PROG. HOLIDAYS DAYS – –**	The day before start of holiday period insert number of days – – : Holiday period ended 0 0 : Last day of holiday period
3	**Desired T. room Day 20.0**	Desired room temperature Day
4	**Room T. limit Frost 08.0**	Minimum room temperature limit for Frost Protection
5	**Outside T. limit Frost 03.0**	Minimum outside temperature limit for Frost Protection
6	**Return T. limit Frost 08.0**	Minimum temperature return to boiler limit for Frost Protection
7	**Differential T. Frost 02.0**	Desired temperature differential in respect of above three Frost Protection values.
8	**tr 19.8 to –05.5 tf65.0 tb 59.0**	Temperature measured by detector: – tr: Room – to: Outside – tf : Flow – tb: Boiler return
9	**Mode D** [1] **Tfc 68.5** [2] **Until 22.00** [3]	(1) Current mode (2) Flow temperature calculated by RTE 955 (3) End of current mode
10	**Last ON 07.00** [1] **tr 19.8** [2] **to 02.0** [3]	(1) Last operation carried out (2) Room temperature at last operation (3) Outside temperature at last operation
11	**Tele Period Hrs 00.00** – – . – –	Setting duration of Manual Programme. Range : 00.00 to 23.45 (1) Time left at end of Manual Programme
12	**Current HOUR 12**	Adjustment of hour
13	**Current MINUTES 18**	Adjustment of minutes
14	**Current DAY TUESDAY**	Adjustment of day
15	**PROGRAM P.1 TIME ON 1 07.00**	

Page	Display	Description
16	**PROGRAM P.1 TIME OFF 1 22.00**	6 Pages Times of program P.1
17	**PROGRAM P.1 TIME ON 2 – –.– –**	ON: Start of occupation
18	**PROGRAM P.1 TIME OFF 2 – –.– –**	Day temperature
19	**PROGRAM P.1 TIME ON 3 – –.– –**	OFF:
20	**PROGRAM P.1 TIME OFF 3 – –.– –**	End of occupation Start of Frost Protection

A further 18 pages follow with programs P.2, P.3 and P.4

34	**7-DAY PROGRAM MONDAY P1**	Program assigned to 1st day of week: – P.1/2/3/4 : with daily times

– P.D : Continuous Day

– P.F. : Frost Protection

A further 6 pages follow for other days of the week

41	**Design T. outside – 10.0**	Design outside temperature
42	**Design T. ow 80.0**	Design flow temperature
43	**HEATING SYST. RADIATORS**	Type of heating media: panels; radiators; fan-coils.
44	**T. MAX. FLOW 99.0**	Maximum flow temperature limit
45	**T. MIN. FLOW 05.0**	Minimum flow temperature limit Only in Day mode
46	**T. MIN. RETURN 30.0**	Minimum boiler return temperature limit
47	**ECO T. outside 20.0**	Desired outside temp. at which boiler, and pump after overrun time, switched off during Day mode
48	**ACTUATOR 10.30**	Type of output. On-Off: Press – key until BOILER appears Modulating: Set actuator running time
49	**Tr AUTHORITY 06.0**	Increase/decrease of flow temperature for each 1 °C difference between actual and desired room temperature.
50	**D. Tr BOOST 01.0**	Simulated increase in desired room temperature in °C to re-duce switching-on period advance
51	**MAX. ADVANCE ON HOURS 05.00**	Maximum period of advance switching on. Excluded during Holidays
52	**INERTIA SWIT. ON MANUAL 03.00** MANUAL and AUTOM.	By pressing – key until 00.00 appears choose between – Manual: Set value – Autom.: Set value which then adjusted by room detector
53	**D. Tr SWIT. OFF 0.5**	Desired room temperature decrease when Off
54	**MAX. ADVANCE OFF HOURS 01.00**	Maximum advance period for switching Off
55	**INERTIA SWIT. OFF MANUAL 03.00**	By pressing - key until 00.00 appears choose between MANUAL and AUTOM.

– Manual: Set value

– Autom.: Set value which then adjusted by room detector

56	**Overrun Time Minutes 20**	Desired pump overrun time
57	**RTE 955 Eng. C1**	Identity card of controller

WIRING DIAGRAMS

General layout

fig. 6

RTE 955

B3 B2 RC1 RC2 B1 B4

Co Cl Op
1 2 3

L 0
220/240
Volt
ac

Y M1 E

Direct control of boiler/burner

L 0
220/240
Volt
ac

M1 E

Control of actuator with voltage other than 220/240 Volt

L 0
220/240
Volt
ac

T

Co Cl Op
1 2 3

Y

L – Live
0 – Neutral
Y – Valve
E – Boiler
B1 – Flow detector
B2 – Outside detector
B3 – Room detector
B4 – Auxiliary detector
M1 – Plant pump
T – Transformer
RC 1 – "Tele" Programme
RC 2 – Continuous DAY or Frost Protection programmes

INTERNAL LINK

Security jack plug

fig. 7

Security jack plug
Handle
Microcontroller
Upper circuit
LINK
Battery
Relay
Lower circuit
Connecting tabs

Without link : Data adjustable only with security jack plug
With link : Data adjustable even without security jack plug