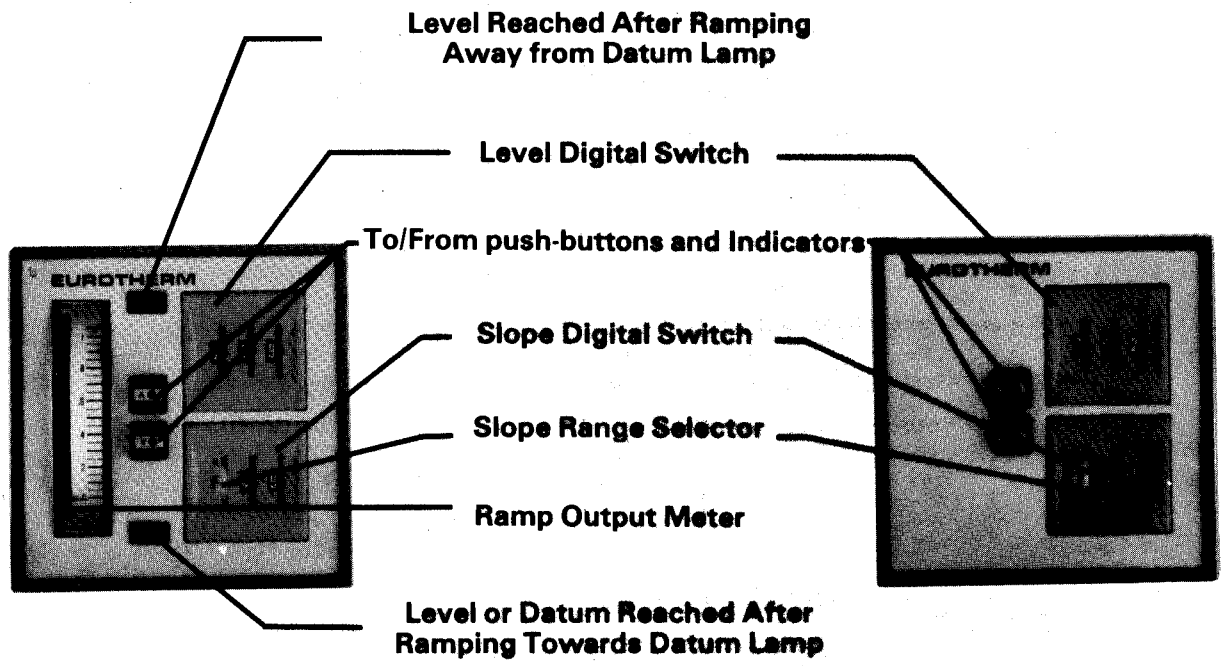
EUROTHERM

PROGRAMMER TYPE 125

AND AUXILIARY UNIT TYPE 126

DESCRIPTION, INSTALLATION & OPERATION

MANUAL



General Description

The Programmer type 125, illustrated on the front cover, can be used with any potentiometric temperature controller to provide smooth rise and fall programmes for a wide range of heat treatment and temperature cycling applications in industry and research.

The programmer generates a small linear ramp voltage which is injected in series with the sensor input to a potentiometric controller, as shown in Fig. 2. The ramp voltage simulates a linear rate-of-change in sensor voltage, so that the output of the controller increases or decreases accordingly, and the load temperature rises or falls smoothly to a preset value.

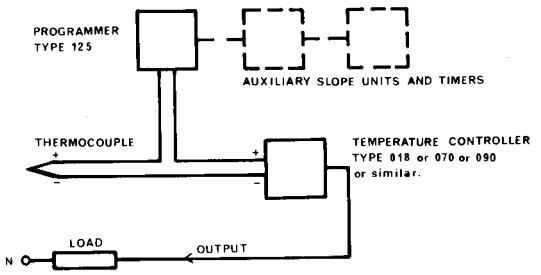


Fig. 2 Injection of Ramp Voltage

Initial and final temperatures can be preset on the controller and programmer respectively, or vice versa, and the rate-of-change of the ramp voltage can be preset on the programmer with slopes ranging from the equivalent of several degrees per minute to a few degrees per hour over periods of up to 2500 hours.

Manual Sequence

A typical programme is illustrated in Fig. 3, starting from a datum temperature set on the controller. The lower push-button on the programmer has been pressed to hold the programme at datum, and the level and slope digit switches are at zero.

The required temperature level and slope are preselected on the programmer, and the change is initiated by pressing the upper push-button for a slope away from datum to the new hold level. A lamp lights in the push-button to show that it is operating, and the instantaneous ramp voltage is indicated on the ramp output meter. The ramp voltage progressively increases from zero at the preselected rate until the required level is reached, and then remains constant. The push-button lamp goes out, and the upper lamp lights to indicate that the required level has been reached and is being held. At the same time, a relay in the programmer is energized for external use. Its contacts may be used to operate an external alarm or timer or other appropriate device.

After an interval at constant temperature, a second change can be programmed. The slope can be preselected, but the upper push-button will remain pressed if the required temperature is below the existing temperature, as in the example. In this instance, the new slope will be initiated when the level digit switch is reset to the new value. The Hold lamp will go out, and the relay will be de-energized. The push-button lamp will light, and the ramp voltage will increase at the preselected rate until the new level is reached. The ramp voltage then remains constant, and the hold sequence is repeated; the push-button lamp goes out, the upper lamp lights and the relay is energized.

After another interval at constant temperature, a third change can be programmed. If the required level is above the existing temperature, the required level and slope would normally be preselected before pressing the lower push-button for a slope towards datum. However, when the required level is the datum temperature itself, as in the example, there is no need to preselect it on the programmer since it is already set on the controller. Pressing the lower push-button will always initiate a return to datum if no intervening hold is selected. The ramp voltage then decreases to zero at the preselected rate, and the lower "level reached" lamp lights when datum is reached. At the same time, the push-button lamp goes out and a second relay is energized in the programmer. As with the first relay, the contacts can be used to operate an external alarm or other appropriate device. Alternatively, the two relays can be used to control an automatic switching sequence.

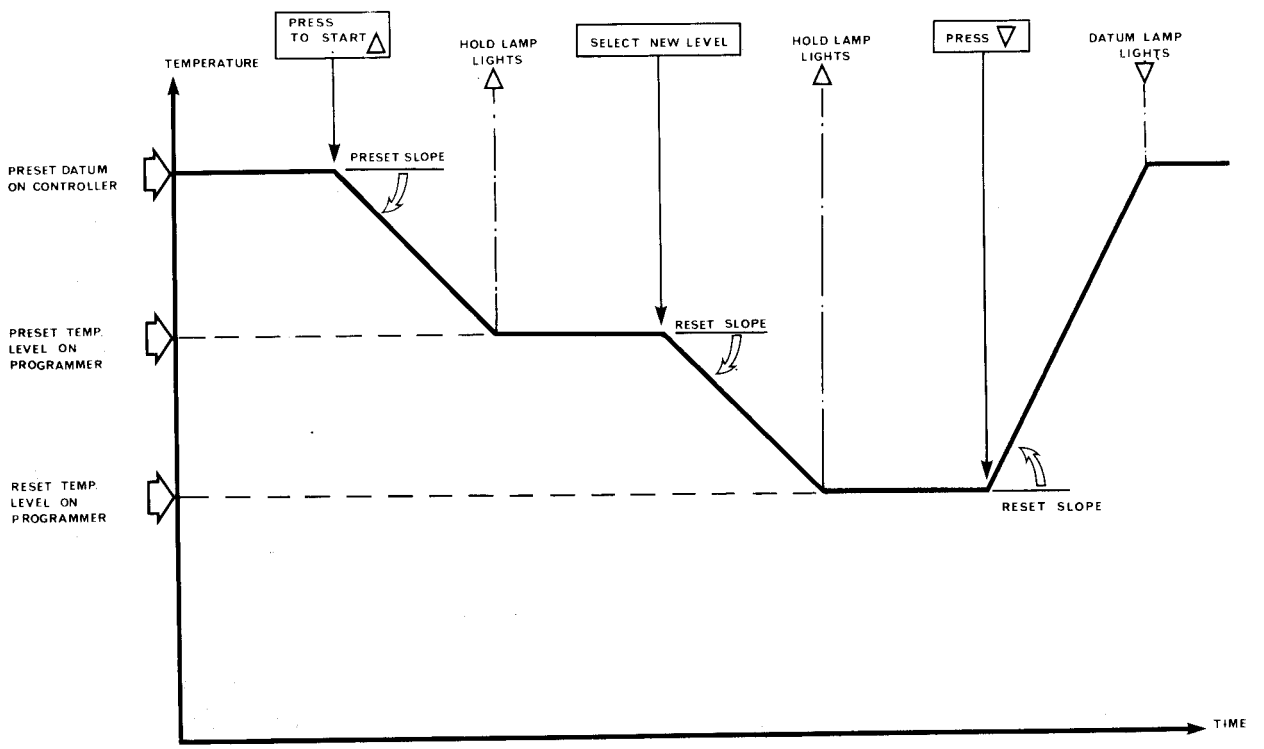


Fig. 3 Typical Programme for Manual Operation

Automatic Sequence

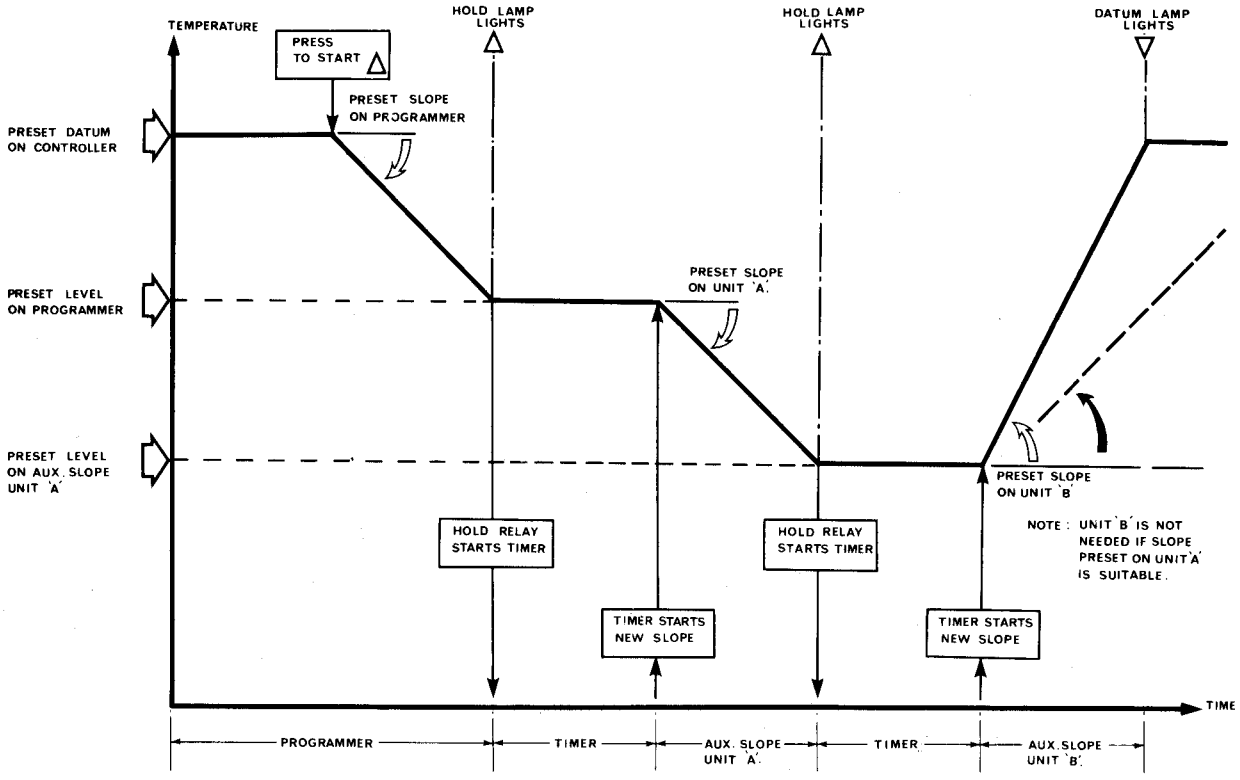
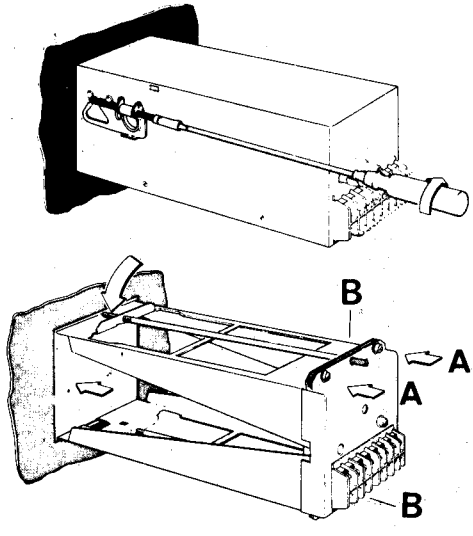


Fig. 4 Typical Automatic Sequence

Manually-operated programmes are suitable for many applications, but automatically-sequenced programmes are almost essential for processes which continue overnight or over long periods including weekends. Consequently, the programmer can be operated manually when installed by itself, or automatically when installed with auxiliary slope units and timers. Various slopes, temperature levels and holding periods can be preselected on different units, and each unit is selected in sequence to complete the required programme. There is no limit to the number of auxiliary units that may be used, and temperature profiles can be built up with any desired complexity or duration.

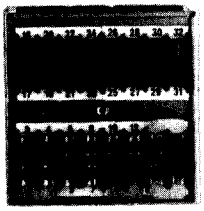
A typical sequence is illustrated in Fig. 4, duplicating the profile of Fig. 3 with a programmer plus two timers and two auxiliary slope units. More complex profiles can be achieved with an extra timer for each additional holding period, and an extra slope unit for each additional rise or fall in temperature.

Installation of Programmer 125 & Auxiliary Slope Unit 126

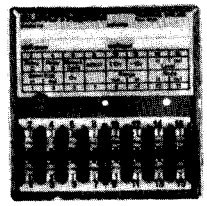


The instrument can be panel-mounted directly in a DIN size 92 × 92 mm cut-out as illustrated. Remove the mounting clamps and insert the instrument through the cut-out from the front of the panel. Fit the clamps from the rear of the panel and tighten lightly with a screwdriver as shown. A programmer can be coupled to a timer or slope unit with a coupling clip, and similarly mounted in a 188 × 92 mm cut-out.

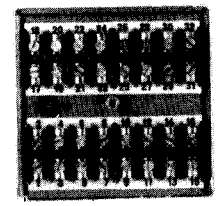
Alternatively, the instrument can be mounted in a plug-in sleeve which fits in the same 92 × 92 mm cut-out to fit the sleeve. Partially unscrew flange bolts A, and tighten the clamp screws B. If straps are fitted to the rear terminals of the programmer, transfer them to corresponding terminals on the sleeve. Insert the instrument fully into the sleeve from the front of the panel and secure by depressing the locking lever located in the lower right hand corner of the facia. To withdraw the instrument, raise the locking lever and pull the instrument out of the panel.



125 Programmer



126 Auxiliary Unit



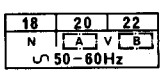
126 Auxiliary Unit with Option 78

Connections and Wiring for Programmer 125

Electrical connections are made via 16-way terminal blocks fitted with either blade or screw terminals. All connections are low-current and a 16/0.20mm wire size is adequate. A label mounted above the terminal block shows input, output and power supply connections for the instrument. The wiring to the rear terminals should be long enough to allow complete withdrawal of the instrument from the panel. This will enable the case to be removed without disconnecting the instrument if internal adjustments are needed.

When fitting a plug-in assembly, bear in mind that the terminals on the mounting sleeve are not identified. The mounting sleeve is a general purpose unit which can be used with various instruments, and must be wired according to the identification label on the particular instrument that is being fitted. The instrument itself must be available for reference before making any termination, but apart from that the wiring procedure is the same as for a directly-wired instrument.

Supply

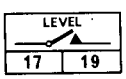


The instrument supply is connected to terminals 18 and 20 for a supply voltage in the range 100-130V, or 18 and 22 for a supply voltage in the range 200-260V.

Test Output

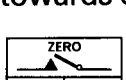
A ramp output voltage in the 0-9V range is available at terminal 7 for test purposes and high-level applications only. It must not be used with thermocouples or resistance thermometers.

Level reached after ramping away from datum relay contact



A normally-open contact rated at 1A/250V a.c. is available for external connection between terminals 17 and 19. The contact closes across the terminals when a level is reached after ramping away from Datum, remains closed while the level is held, and opens when a slope is initiated.

Level or datum reached after ramping towards datum relay contact

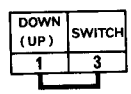


A normally-open contact rated at 1A/250V a.c. is available for external connection between terminals 21 and 23. The contact closes when level or Datum is reached after ramping towards datum, remains closed while level or datum is held, and opens again when a slope is initiated.

Auxiliary Connections

A number of internal connections are brought out to the rear terminals of the programmer for external connection to auxiliary slope units when fitted. For automatic operation, each of the four selector switches on the programmer is connected in series with the corresponding selector switch on every auxiliary slope unit, while d.c. supplies are connected in parallel. Parallel connections are also used for remote operation of the slope range relays A, B, and C in the programmer. The series-parallel wiring arrangements are illustrated in Fig. 10, with individual connections as follows:-

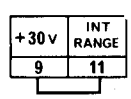
To/From Datum (or Up/Down) Switch



The to/from push-button switch is internally connected in series with terminals 1 and 3. The terminals are strapped together when the programmer is used by itself, and the strap is removed when an auxiliary slope unit is fitted.

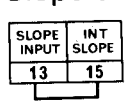
To/from push-buttons on auxiliary slope units are similarly connected in series with terminals 1 and 3 on each unit. Consequently, the correct series connection will be maintained when terminal 1 on the programmer is connected to terminal 3 on the first slope unit, and terminal 1 on the first slope unit is connected to terminal 3 on the second unit, and so on until terminal 1 on the last unit is returned to terminal 3 on the programmer to complete the external loop.

Range Selector



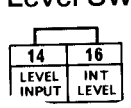
The slope range selector is internally connected in series with terminals 9 and 11. The terminals are strapped together when the programmer is used by itself, and the strap is removed when an auxiliary slope unit is fitted. Range selectors on auxiliary slope units are similarly connected in series with terminals 9 and 11 on each unit. Consequently, the correct series connection will be maintained when terminal 9 on the programmer is connected to terminal 11 on the first slope unit, and terminal 9 on the first slope unit is connected to terminal 11 on the second unit, and so on until terminal 9 on the last unit is returned to terminal 11 on the programmer to complete the external loop.

Slope Switch



The slope switch is internally connected in series with terminals 13 and 15. The terminals are strapped together when the programmer is used by itself, and the strap is removed when an auxiliary unit is fitted. Slope switches on auxiliary slope units are similarly connected in series with terminals 13 and 15 on each unit. Consequently, the correct series connection will be maintained when terminal 13 on the programmer is connected to terminal 15 on the first slope unit, and terminal 13 on the first slope unit is connected to terminal 15 on the second unit, and so on until terminal 13 on the last unit is returned to terminal 15 on the programmer to complete the external loop.

Level Switch



The level switch is internally connected in series with terminals 14 and 16. The terminals are strapped together when the programmer is used by itself, and the strap is removed when an auxiliary unit is fitted. Level switches on auxiliary slope units are similarly connected in series with terminals 14 and 16 on each unit. Consequently, the correct series connection will be maintained when terminal 14 on the programmer is connected to terminal 16 on the first slope unit, and terminal 14 on the first slope unit is connected to terminal 16 on the second unit, and so on until terminal 14 on the last unit is returned to terminal 16 on the programmer to complete the external loop.

D.C. Supplies

0v		26	28
5		-10v	±10v

Auxiliary slope units are supplied in parallel with OV from terminal 5, -10V d.c. from terminal 26, and either +10V or -10V d.c. from terminal 28, depending on ramp voltage polarity.

Terminal 5 on the programmer is connected to terminal 5 on each slope unit in parallel.

Terminal 26 on the programmer is connected to terminal 12 on each slope unit in parallel.

Terminal 28 on the programmer is connected to terminal 10 on each slope unit in parallel.

Slope Range Relays

2	4	6
RELAY C	RELAY B	RELAY A

Four alternative slope ranges are obtained with three relays energized by the range switch, as follows:—

(1) Fast, with relay A energized.
(2) Multiply by ten, with relay B energized.
(3) Normal, with relay C energized.
(4) Divide by ten, with no relay energized.

The relays can be energized remotely by range switches in auxiliary slope units when fitted. Parallel connections are used since only one switch at a time is activated during a programme. Terminals 6, 4 and 2 in the programmer are connected to terminals 6, 4 and 2 respectively on each slope unit in parallel.

Ramp Output for Thermocouple or Resistance Thermometer

10	12
−	+
mV	

A ramp output in the normal millivoltage range is provided across terminals 10 and 12 for connection to the input circuit of the controller. Any output between 0-5mV and 0-50mV is available for use with different types of sensor, and the range is preset during manufacture to customer's specification. Polarity is important; carefully read through the following instructions before making any connection to the output terminals.

Ramp Output Polarity

The polarity of the output will depend on the datum selected for the programme. The datum is set on the controller usually at the highest but sometimes at the lowest value in the range. Consequently, all other levels usually will be set below the datum, but sometimes they may be above, and the output of the programmer must be connected accordingly.

If the datum is the highest in the range, connect the programmer output voltage in series addition to the sensor voltage, i.e. with unlike polarity as shown in Fig. 5. The positive wire from the sensor should be connected to the negative output terminal on the programmer, (or vice versa; see thermocouple polarity in next section). The other output terminal can then be connected to the input terminal on the controller with corresponding polarity, giving a positive-to-positive (or negative-to-negative) connection between the two instruments.

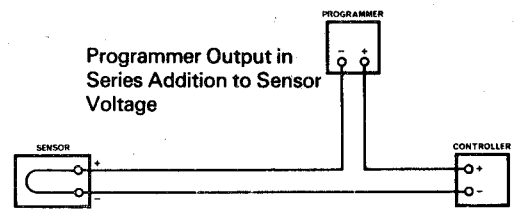


Fig. 5 Typical Output Connections for High Datum Programme

If the datum is the lowest in the range, connect the programmer output voltage in series opposition to the sensor voltage, i.e. with like polarity as shown in Fig. 6. The positive wire from the sensor should be connected to the positive output terminal on the programmer (or vice versa; see thermocouple polarity in next section). The other output terminal can then be connected to the input terminal on the temperature controller with opposite polarity, giving a negative-to-positive (or positive-to-negative) connection between the two instruments.

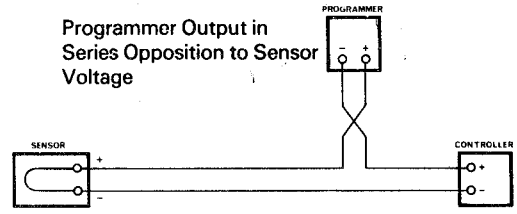


Fig. 6 Typical Output Connections for Low Datum Programme

Thermocouple Combination	Conductors of Compensating Cable Positive	Conductors of Compensating Cable Negative	British to BS1843/1952 Colour of Insulation Overall	British to BS1843/1952 Colour of Insulation Positive	British to BS1843/1952 Colour of Insulation Negative	American to ISA-RPI ASA – C96-1 Colour of Insulation Overall	American to ISA-RPI ASA – C96-1 Colour of Insulation Positive	American to ISA-RPI ASA – C96-1 Colour of Insulation Negative	German to DIN 43710 - 4 Colour of Insulation Overall	German to DIN 43710 - 4 Colour of Insulation Positive	German to DIN 43710 - 4 Colour of Insulation Negative	Loop Resistance of 13/0.2mm (Ω/metre)
T Copper v Constantan	Copper*	Constantan	Blue	White	Blue	Blue	Blue	Red	Brown	Red	Brown or Brown/Red	1.24
E Nickel-Chromium v. Constantan	Nickel-Chromium*	Constantan	Brown	Brown	Blue	Violet	Violet	Red	–	–	–	2.95
J Iron v Constantan	Iron*	Constantan	Black	Yellow	Blue	Black	White	Red	Blue	Red	Blue or Blue/Red	1.52
K Nickel-Chromium v. Nickel-Aluminium	Copper*	Constantan*	Red	White	Blue	Red	Brown	Red	Green	Red	Green	1.24
K "	Nickel-Chromium*	Nickel-Aluminium	Red	Brown	Blue	Yellow	Yellow	Red	Green	Red	Green	2.44
K "	Iron*	Copper-Nickel	–	–	–	White	Green	Red	Green	Red	Green	–
S&R Platinum v Platinum-Rhodium	Copper*	Copper-Nickel	Green	White	Blue	Green	Black	Red	White	Red	White	0.11

**Material with lowest thermal E.M.F. in contact with copper*

Thermocouple Polarity

Check the type and polarity of the compensating cable before connecting a thermocouple in series with the programmer. Compensating cable materials and polarities can be identified by referring to the standard colour codes tabulated above. —

The internal wiring of the programmer is made of copper, and a thermal emf will be generated if a different metal is connected to the output terminals. Consequently, the programmer output should be connected in series with a copper wire in the compensating cable if possible. If there is no copper wire in the compensating cable, then connect in series with the wire that produces the lowest thermal emf in contact with copper. To minimise the thermal effect, the same wire not copper should be used to connect the other output terminal to the appropriate thermocouple input terminal on the temperature controller.

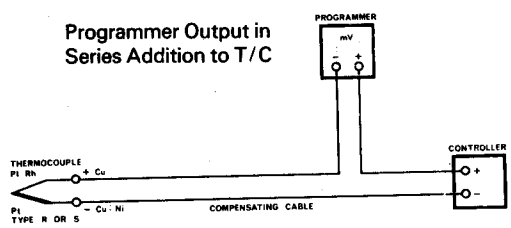


Fig. 7 Typical Thermocouple Connections

Typical connections are shown in Fig. 7 for a thermocouple with copper/copper-nickel compensating cable (compensating cable for platinum/platinum rhodium thermocouples) and a high datum temperature set on the controller. If the datum is set at the lowest temperature in the range, the programmer output connections should be reversed. A similar transposition may be needed if the programmer is connected to the negative instead of the positive wire of the compensating cable, but the correct output polarity should be established as described in the previous section.

Resistance Thermometer Polarity

The programmer output can be connected in series with either of the two "voltage" wires to a 4-wire platinum resistance thermometer. However, the wires are not individually colour-coded and must be identified at the input terminals of the temperature controller. The current terminals are usually designated as I1 and I2, and the voltage terminals as V1 and V2. Terminals V1 and V2 are negative and positive respectively on Eurotherm controllers, but the polarity of the terminals can easily be identified with a millivoltmeter in the range between 30mV and 150mV.

The programmer output can be connected in series with either the positive or the negative voltage wire to the temperature controller provided that the polarity is correct for the datum temperature. For consistency the following instructions relate to a series connection in the positive wire.

If the datum temperature is the highest in the range, connect the positive wire from the resistance thermometer to the negative output terminal 10 on programmer, as shown in Fig. 8. Then connect positive terminal 12 on the programmer to the positive terminal V2 on the controller.

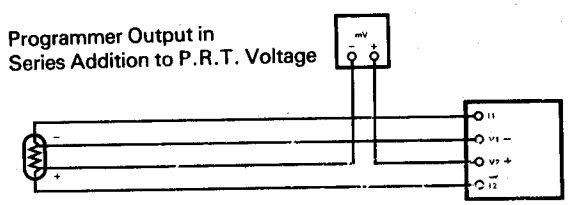


Fig. 8 Typical P.R.T. Connections for High Datum Temperature.

If the datum temperature is the lowest in the range, connect the positive wire from the resistance thermometer to the positive terminal 12 on the programmer, as shown in Fig. 9. Then connect negative terminal 10 on the programmer to the positive terminal V2 on the controller.

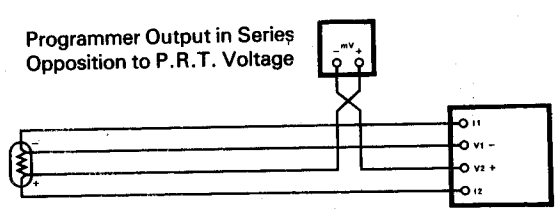


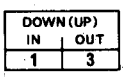
Fig. 9. Typical P.R.T. Connections for Low Datum Temperature

Wiring of Auxiliary Slope Unit 126

General

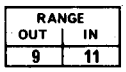
Auxiliary slope units are fitted when automatic operation is required. The slope units are panel-mounted like the programmer, and wired in much the same way. Each front-panel switch is wired in series with the corresponding switch on the programmer and on other auxiliary slope units, while the range relays and d.c. supplies are wired in parallel to all units. The series-parallel wiring arrangement is illustrated in Fig. 10, with individual connections as follows:-

To/From Datum (or Up/Down) Switch



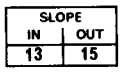
The to/from switch across terminals 1 and 3 is connected in series with the to/from switches on the programmer and all other units in the installation.

Range Selector



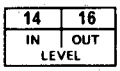
The range selector switch across terminals 9 and 11 is connected in series with the range selector switches on the programmer and all other units in the installation.

Slope Switch



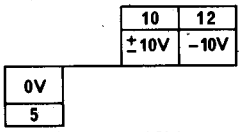
The slope digit switch across terminals 13 and 15 is connected in series with the slope switches on the programmer and all other units in the installation.

Level Switch



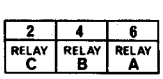
The level digit switch across terminals 14 and 16 is connected in series with the level switches on the programmer and all other units in the installation.

D.C. Supplies



D.C. Supplies from the programmer are connected in parallel to terminals 5, 10 and 12 on all auxiliary slope units, with OV to terminal 5, -10V to terminal 12, and either +10V or -10V depending on ramp polarity to terminal 10.

Slope Range Relays



The slope range relays in the programmer are operated remotely by parallel connections to terminals 2, 4 and 6 on auxiliary slope units. Terminal 2 is connected to relay C; terminal 4 to relay B; and terminal 6 to relay A (fast).

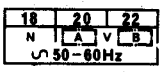
Unit Selection

The unit is activated by a built-in relay which is energized when a +30V d.c. supply is applied to terminal **8.**

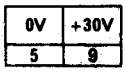
Optional Functions

30V Relay Supply — 78

Option 78 provides an auxiliary slope unit with a 30V 150mA d.c. supply for activating up to five 30mA relays in parallel. The first five auxiliary slope units in a sequence can be activated from a similar supply in the programmer. Consequently, option 78 is normally specified for one auxiliary slope unit in every five thereafter.



The a.c. supply is connected to terminals 18 and 20, or 18 and 22 according to supply voltage. Terminal 18 is the neutral connection. Terminals 20 and 22 are the live connections for 100/130V and 200/260V supplies respectively.



The +30V d.c. relay supply is available at terminal 9, with OV at terminal 5.

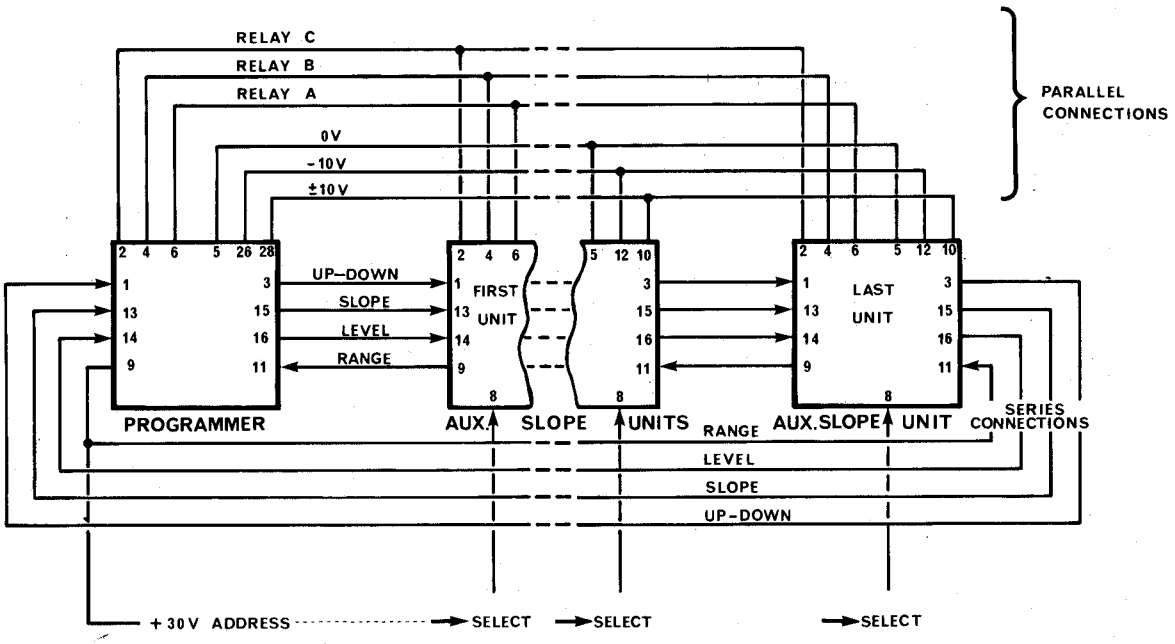


Fig. 10 Interconnection Between Programmer and Auxiliary Slope Units

Wiring an Automatic Sequence

An automatic sequence of slopes and holds can be built up to create a profile of any desired complexity or duration using a programmer, a switching circuit, and as many auxiliary slope units and timers as necessary. Interconnections between the programmer and auxiliary units are given in Fig. 10, and any convenient switching method may be used.

Typical relay switching arrangements are included in three general-purpose wiring schemes A, B and C illustrated on pages 11 & 12. In effect, these three circuits are universal "building blocks" which can be wired together as shown schematically in Fig. 11 to construct any kind of profile. Circuit A provides starting facilities for the first slope set on the programmer; circuit B provides a timed hold followed by a slope; and circuit C provides a slope only. Thus the programmer is first connected to the starter relays in circuit A, and thereafter to any combination of B and C circuits in sequence to achieve the required profile. Four connections from the last unit in the sequence are returned to the programmer terminals to complete the series loop connections.

A suitable relay unit can be readily constructed with simple hand tools. D.C. and mains-operated plug-in relays with screw-terminal bases can be mounted on a chassis made of metal or wood or other suitable material. The chassis can then be enclosed for safety in a small box or cabinet with lamps and push-button switches fitted in the front panel.

Alternatively, if engineering facilities are available, it would not be difficult to devise a more elegant construction using a uniselector or other switching device where appropriate. Alternative switching arrangements can be based on the following considerations:-

(1) The switching sequence can be controlled by the "level reached after ramping towards and away from datum" relay contacts in the programmer. Both contacts are normally open and rated at 1A/250V a.c. The "level reached after ramping toward datum" contact is closed during all levels preceded by a slope towards datum, and holds at datum, and is maintained throughout the hold, but is open at all other times. Similarly, the "level reached after ramping away from datum" contact is closed during all levels preceded by a slope away from datum, and during the programmer hold level, and is maintained throughout the hold, but is open at all other times.

(2) Each auxiliary slope unit is activated by an internal relay which is energized when +30V d.c. supply is connected to terminal 8 on the particular unit. The addressing voltage must be applied for the duration of the particular slope, and also for any subsequent hold period that may be required after the preset level has been reached.

(3) If more than one slope unit is addressed, the last unit in the sequence will be activated. If no unit is addressed, the programmer will be activated.

(4) The +30V d.c. supply from the programmer can activate the relays in up to five slope units in parallel. Thereafter, option 78 should be specified for one slope unit in every five so that an extra 30V 150mA d.c. supply is available for the additional units.

(5) Any suitable timer may be used. Switching circuits for proprietary timers should be based on the manufacturer's recommendations.

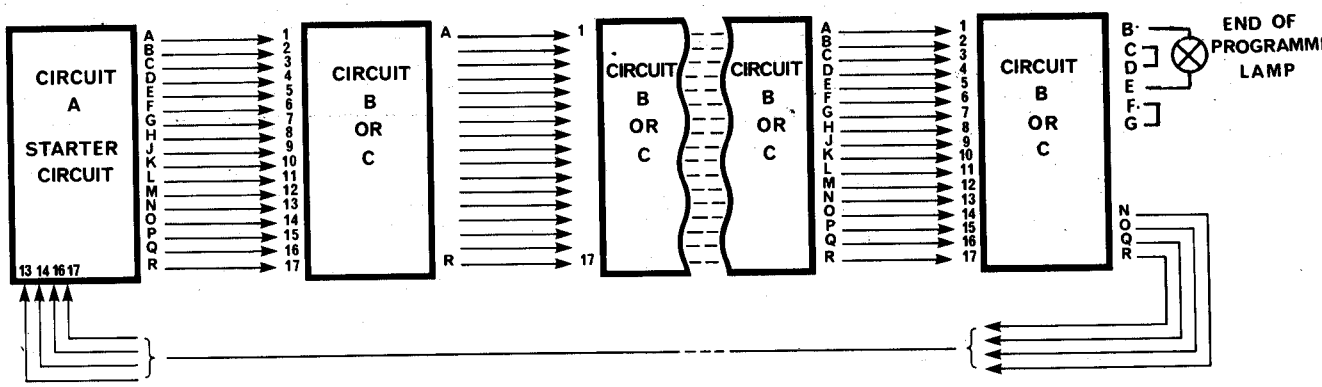


Fig. 11 Schematic Arrangement of Automatic Sequencing Circuits

Operating Instructions

General

Temperature profiles can be programmed in four ways, as illustrated in Fig. 15. Firstly, the instruments can be wired to set the datum either at the highest temperature or at the lowest temperature in the range. Secondly, the instrument can be adjusted to start the programme either at the datum temperature or at some other selected hold level.

Briefly, the datum temperature is set on the temperature controller, and all other levels including the starting level are selected on the programmer. To start at datum temperature, the programmer is initially set to datum (zero output) and not some other level.

Bear in mind that the programmer gives a temperature difference from datum, and the level digit switch does not directly indicate load temperature unless the datum happens to be 0°C. In certain applications it may be operationally convenient to set the datum at 0°C so that load temperatures are directly indicated on the level digit switch.

Some additional adjustment is needed if either the datum or the initial hold level is set at ambient temperature. Alternative procedures for each of the initial conditions are as follows:-

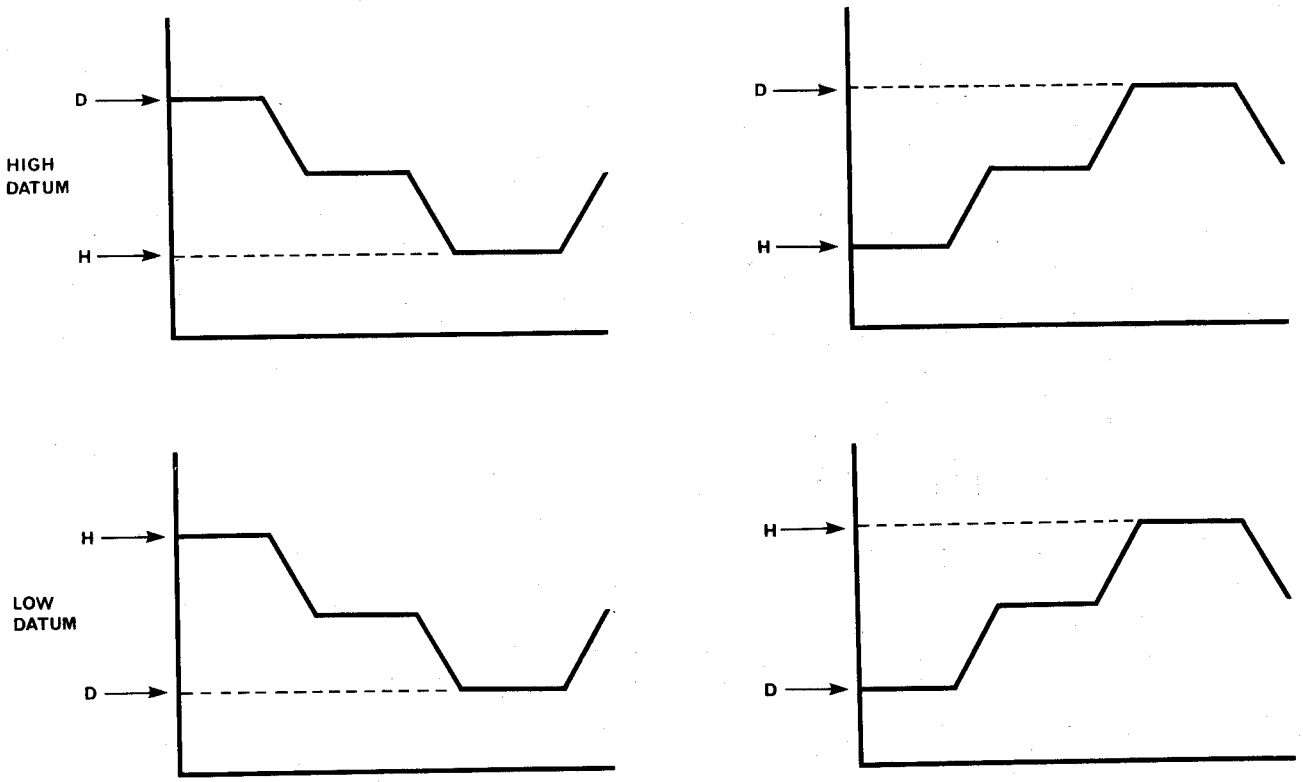


Fig. 15 Typical Temperature Profiles

(a) To Start from Datum Set at Ambient Temperature

Switch on power to the instruments, but not to the load. Set the level digit switch on the programmer to zero, and press the lower push-button for datum. Set the slope range to Fast, and set the slope digit switch to maximum rate.

Wait a second or two for the lower "level reached" lamp to light, then adjust the setpoint of the controller to set the deviation meter at zero.

Datum is now set at ambient temperature. Switch on power to the load, and prepare to start the programme.

(b) To Start from Hold Level at Ambient Temperature

Switch on power to the instrument, but not to the load.

Set the level digit switch on the programmer to zero, and press the lower push-button for datum. Set the slope range to Fast, and set the slope digit switch to maximum rate.

Wait a second or two for the lower "level reached" lamp to light, then adjust the setpoint of the controller to the required datum temperature. Check that the deviation meter moves fully down-scale or up-scale, as appropriate.

Press the upper push-button on the programmer for hold level, then adjust the level digit switch gradually until the deviation meter is set at zero. First adjust the hundreds decade, then the tens decade, and finally the units decade. After each adjustment, wait a second or two for the hold lamp to light before making the next adjustment. Increase the hundreds setting one step at a time until the deviation meter moves sharply from down-scale to up-scale, or vice versa, then go back one step. Repeat the sequence with the tens decade, and finally increase the units one at a time until the meter is set at zero.

The hold level is now at ambient temperature. Switch on power to the load, and prepare to start the programme.

(c) To Start from Datum at any other Temperature

Switch on power to the instruments, but not to the load.

Adjust the setpoint of the controller to the required datum temperature.

Set the level digit switch on the programmer to zero, and press the lower push-button for datum. Set the slope range to Fast, and set the slope digit switch to maximum rate. Check that the lower "level reached" lamp lights after a second or two.

Switch on power to the load, and wait for the load to attain datum temperature. Initially the deviation meter will move down-scale or up-scale as appropriate, but will eventually settle at zero when datum temperature is reached. The programme can then start from datum.

(d) To Start from Selected Level at any other Temperature

Switch on power to the instruments, but not to the load.

Adjust the setpoint of the controller to the required datum temperature.

Set the level digit switch on the programmer to the required initial level, and press the upper push-button for Hold level. Set the slope range to Fast, and set the slope digit switch to maximum rate. Check that the upper "level reached" lamp lights after a second or two.

Switch on power to the load, and allow the load to attain the required temperature. Initially the deviation meter will move down-scale or up-scale as appropriate, and will eventually settle at zero when the required temperature is reached. The programme can then start from the selected level.

Manual Programme

Starting from Datum

Check that the lower "level reached" lamp is on, and that the deviation meter is at zero. Set the required level of the level digit switch.

Set the appropriate range on the range switch (i.e. $\times 10$, $\times 1$ or $\div 10$).

Set the required slope on the slope digit switch.

Press the upper push-button to initiate the slope away from datum.

The lower "level reached" lamp will go out, and the upper push-button lamp will light to indicate slope-in-progress. The ramp voltage indicated on the output meter will increase at the selected rate until the selected level is reached, and then remains constant. The push-button lamp will go out, and the upper "level reached" lamp will light to indicate that the selected level is being held.

The selected level will be held until a new slope is selected. After an appropriate interval at constant temperature, the programme can be continued with one of the three alternatives (a), (b) or (c) in the next section. After that, further selections can be made as necessary to complete the required profile.

Starting from a Selected Level

Check that the upper level reached lamp is on, and that the deviation meter is at zero.

Set the appropriate range on the slope range switch.

Set the required slope on the slope digit switch.

The programme can start with one of three alternatives, as follows:—

(a) If the required level is further away from datum, the upper push-button remains pressed. A slope away from datum is initiated when the level digit switch is reset to the required level. The upper "level reached" lamp will go out, and the upper push-button lamp will light to indicate slope in progress. The ramp output voltage will increase at the selected rate until the selected level is reached, and then remains constant. The upper "level reached" lamp will light, and the push-button lamp will go out.

(c) If datum itself is required, simply press the lower push-button. The upper "level reached" lamp will go out, and the lower push-button lamp will light to indicate slope-in-progress. The level digit switch need not necessarily be set to zero. The ramp output will decrease to datum at the selected rate if no intervening hold has been selected.

The lower "level reached" lamp will light when datum is reached, and the push-button lamp will go out.

The selected level (or datum) will then be held until a new slope is selected. Continue with further selections to complete the required profile.

Automatic Programme

An automatically-sequenced programme does not need detailed operating instructions as such. The various steps in the profile have been established, and the system has been engineered accordingly. However, the instruments must be preset correctly before starting the programme. Before switching on power to the load, set the digit switches and push-buttons on each unit to obtain the correct sequence of slopes, hold levels and times required in the programme.

Switch on power to the instruments and to the load. Wait for the "Ready" lamp to light on the relay unit, and for the deviation meter on the controller to settle at zero. Press the "Start" button to initiate the programme.

Note *The "Ready" lamp will light after thirty seconds or so, but the deviation meter may not settle at zero for some time, perhaps an hour or more, depending on the starting temperature and the mass of the load.*

The programme will then continue automatically until the last slope in the sequence has been completed. The end-of-programme lamp will light, and the last selected level will be held until the "Reset" push-button is pressed.

The programme will revert to the starting conditions if a mains interruption occurs, or if the "Reset" push-button is pressed, while the programme is in progress.

Programme Check

When the installation is complete, set the range switches on the programmer and the auxiliary slope units to FAST for a quick check of the programme sequence. If the auxiliary slope units are not readily accessible, the facia of the programmer can be removed to reveal a recessed micro-switch that directly operates the fast relay, and the micro-switch can be pressed with a screwdriver or similar tool to over-ride all the range switches in the system. However, the facia is easily distorted, and this microswitch should only be used in exceptional circumstances.

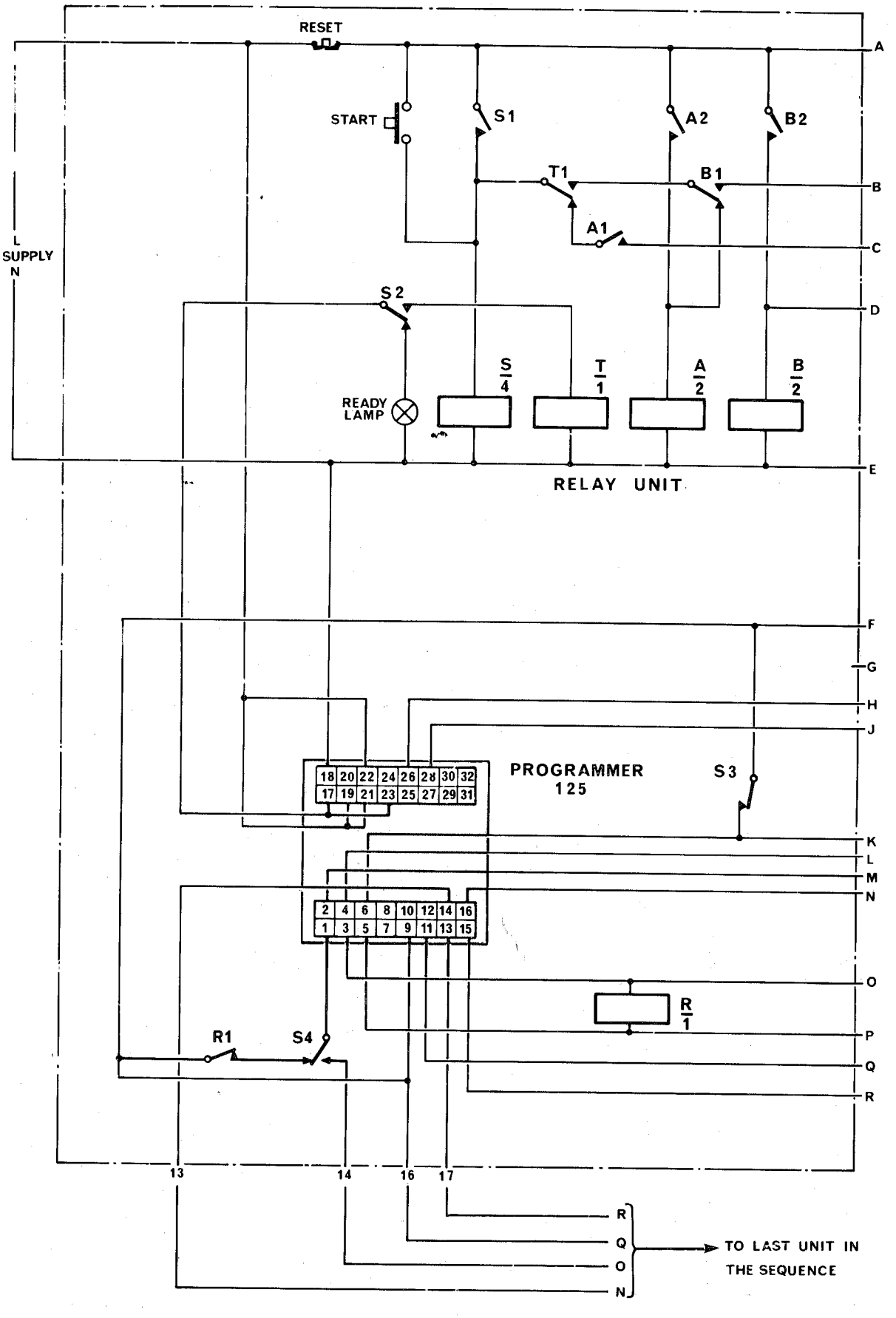


Fig. 12 Starter Circuit A

Items not manufactured by Eurotherm available from R.S. Components Ltd, 13-17 Epworth Street, London EC2P 2HA

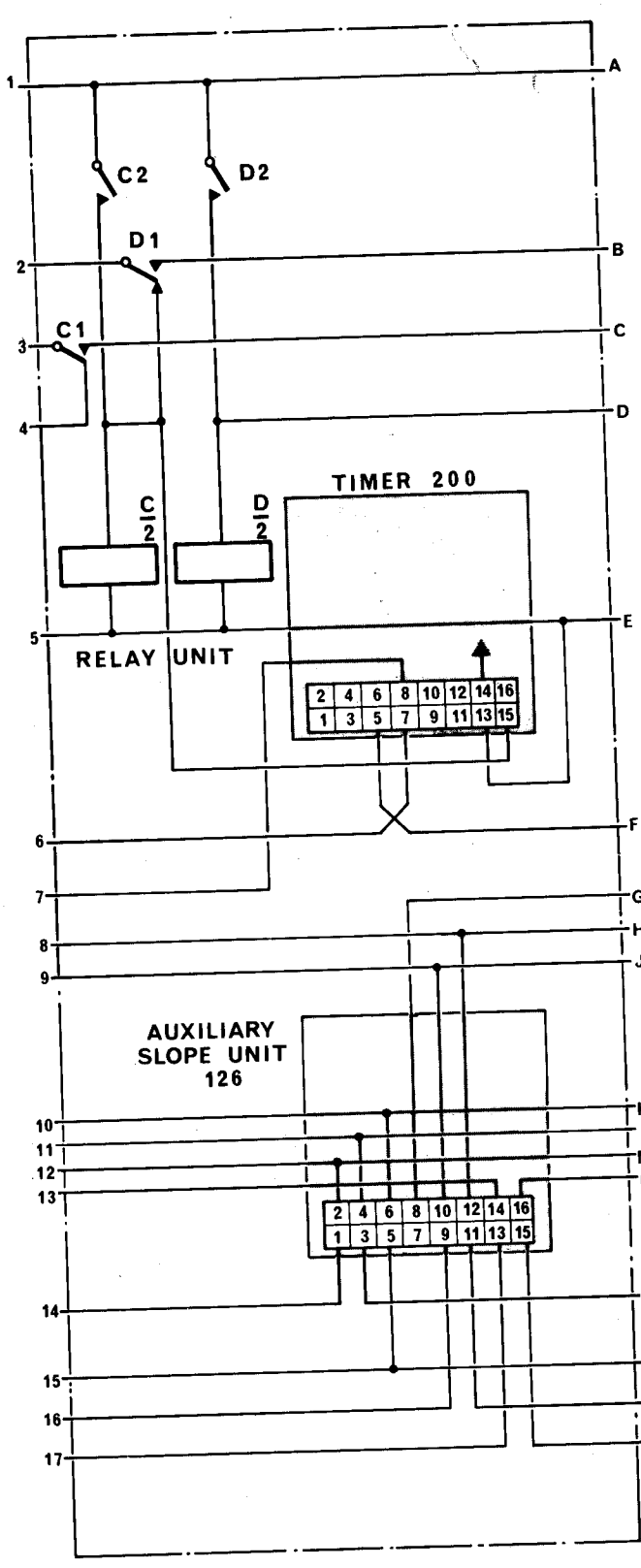


Fig 13 Time and Slope Circuit B

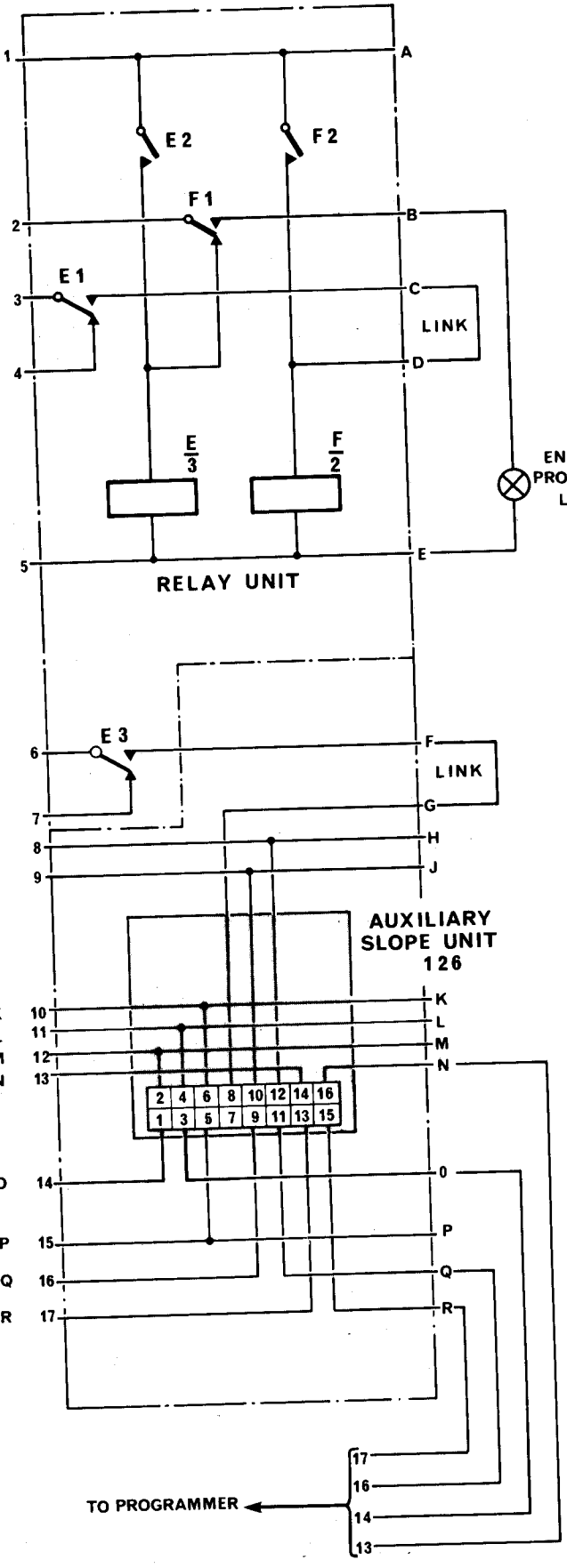
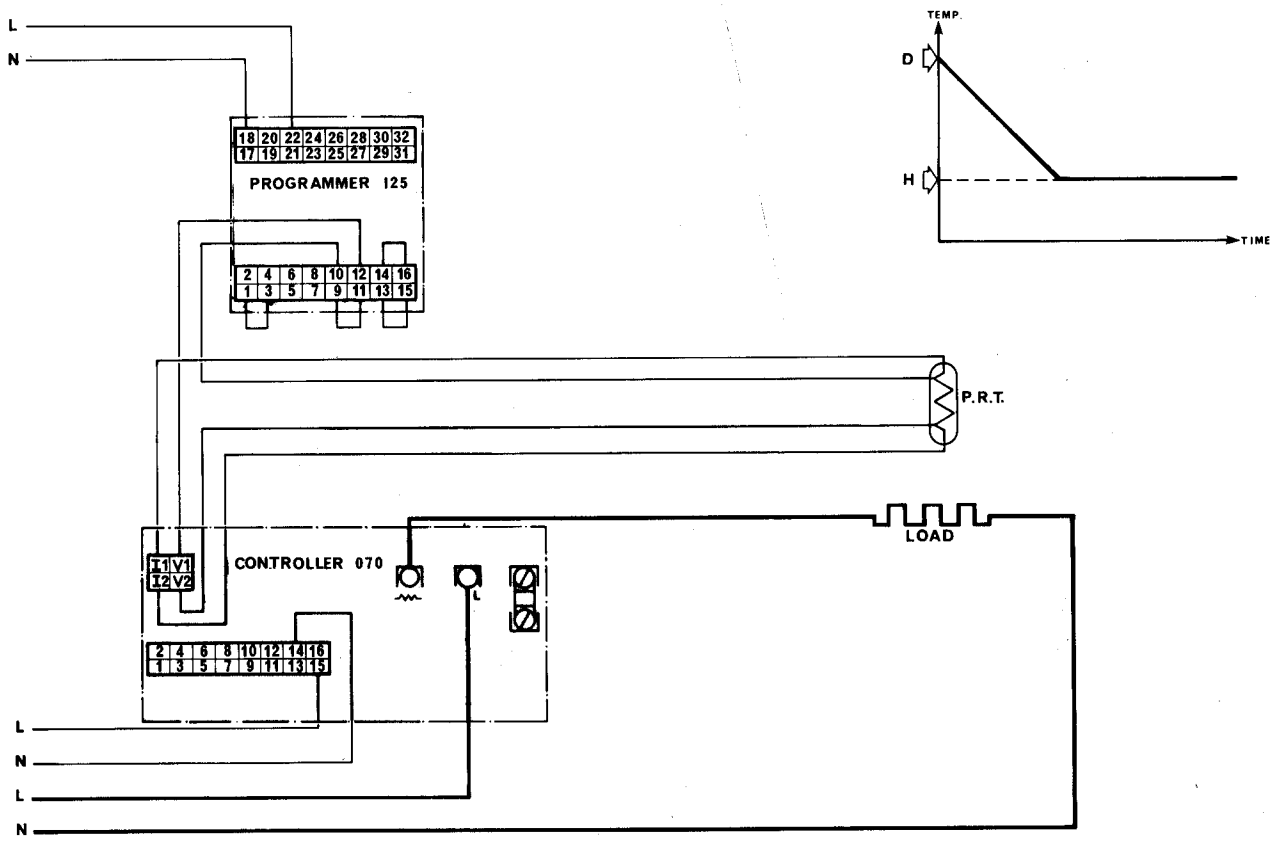


Fig. 14 Slope Circuit C

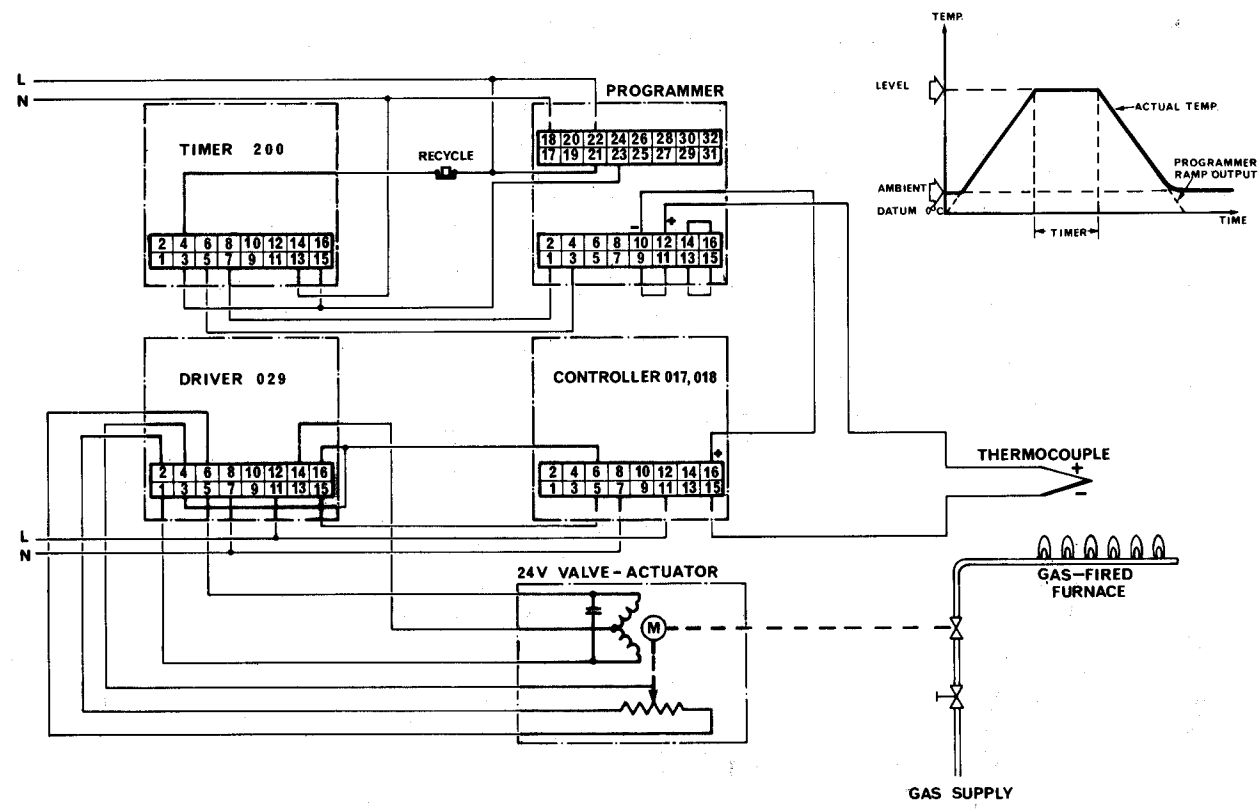
as follows:-

D.C. Relays (R)	Type No. 348 - 829
A.C. Relays (S,T,A,B,C,D,E and F)	Type No. 348 - 813
Relay Bases (For all Relays Above)	Type No. 401 - 712
Indicator Lamps (Ready and End of Programme)	Type No. 576 - 260
Push-Buttons (Start and Reset)	Type No. 339 - 550 339 - 493

Typical Wiring Schemes.



Electrically Heated, Low Temperature, Single Slope Programming System Using a P.R.T. 070 Instrument



Gas Fired, Automatic Sequencing System Using a Thermocouple 017, 018, Instrument.