2.1 Instrument Layout

The 902/3/4 series of instruments can easily be configured to most customer requirements on site. The microprocessor, power supply and display boards are standard to all 902/3/4 series of instruments, see figure 5. Various plug-in hardware modules can then be fitted to provide the different functions. These modules can be allocated to one or two sites on the power supply board. If an options or analogue communications board is fitted in the instrument, a further two sites are available for installing these modules, as shown in Figure 6.

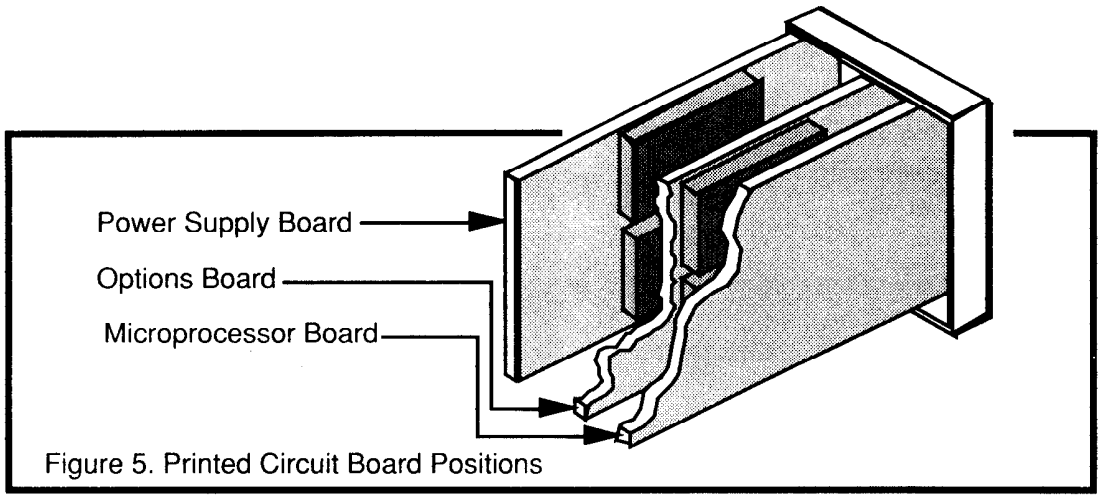


Figure 5. Printed Circuit Board Positions

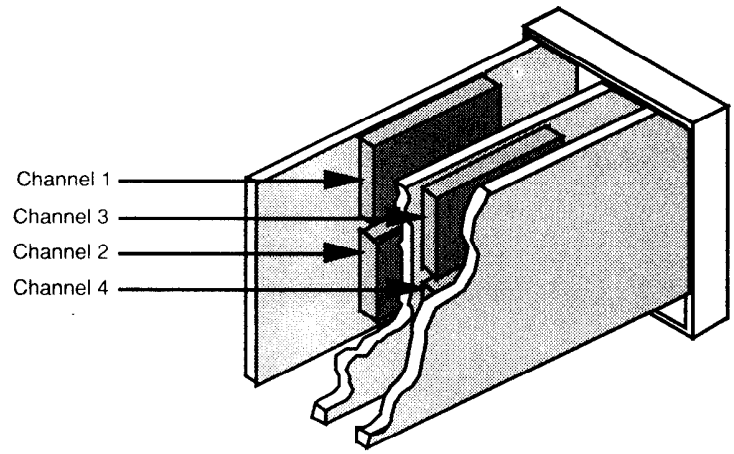
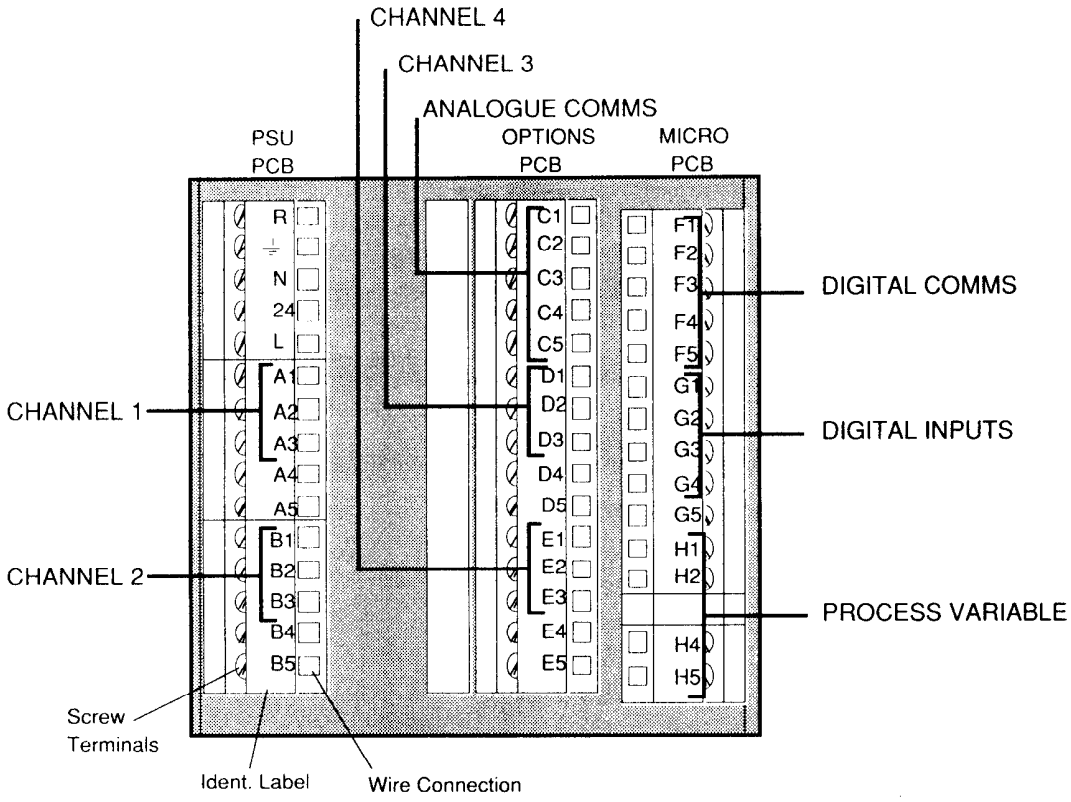


Figure 6. Plug-in Module Slot Positions

2.2 Rear Terminal Connections

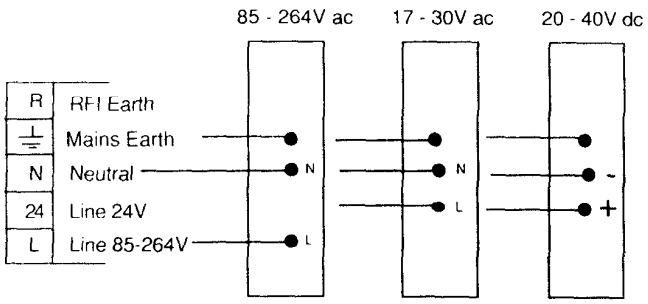


2.2.1 Power Supply

The power supply can be 85V to 264V, or a low level ac/dc supply of 17-30Vac / 20 - 40Vdc.

Power supply

85V to 264V ac,
17V to 30V ac,
20V to 40V dc



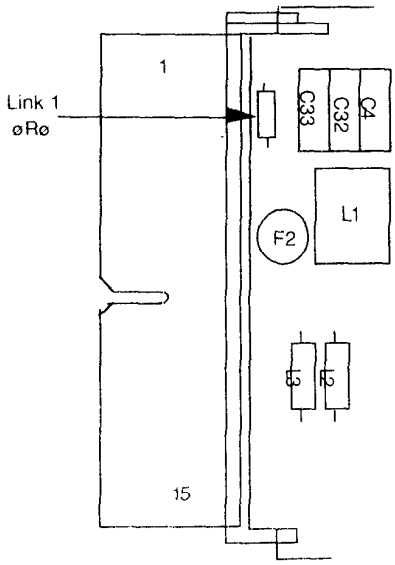
Suppression Earth

Terminal R is the radio frequency interference reference for the instrument.

When despatched from the factory, terminal R and are connected together. In most cases it is acceptable to connect these terminals to supply earth.

Terminals R and ⏚ are connected together by a link on the power supply pcb.

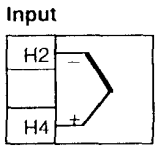
In a particularly noisy environment it may be advantageous to separate the RFI from the mains earth and connect to a cleaner earth reference if available. If this is the case cut link LK 1.



2.2.2 Inputs

This instrument has one input which can be set in the configuration to accept a number of different sensor types. Having set the configuration, the sensor must be connected to the correct terminals as shown on the following pages.

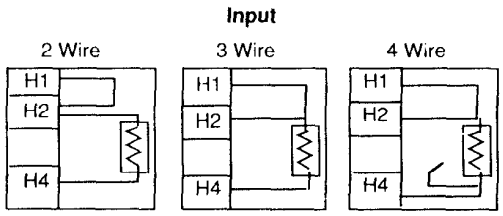
Thermocouple



When the instrument has been configured for internal cold junction compensation (CJC), compensation cable of the correct type for the thermocouple used, or the thermocouple itself, must be wired to these terminals. Copper wire must NOT be used.

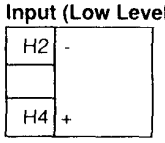
If an external cold junction (oven/ice reference) is to be used, then copper wires must be used between the rear terminals of the instrument and the cold junction reference.

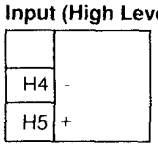
Resistance Thermometer



Note: When three conductors between the bulb and the rear terminals have identical resistances, the lead resistance error be minimised. When a four wire RTD is used the fourth wire is insulated from all other connections. If a two wire system is used the lead resistance will give errors.

Pyrometer

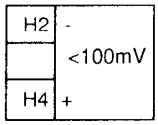




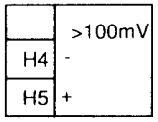
The pyrometer model number determines the rear terminal connections to be used. Paragraph 4.2.1 of section 4, the configuration, gives a table listing the various pyrometer model numbers. If the last column of this table carries the abbreviation "HL I/P" then the "Input (High Level)" terminals should be used. For all other models of pyrometer, use the "Input (Low Level)" terminals. For pyrometer codes 48 and 51, (Q004, Q005), a 500Ω resistor must be connected across the rear terminals "H2" and "H4", together with the pyrometer wiring. In this case a suitable resistor, Part No. SUB902 SPARE 500R, colour coded yellow, will be found in the instrument packing. Pyrometer code 54, (R026/ORK), requires cold junction compensation within the instrument. The instrument software will automatically enable this feature, but the value of "C1(A)", see paragraph 4.2.1 of section 4, the configuration, must be set to "0", to ensure the correct amount of compensation is applied.

DC Signals

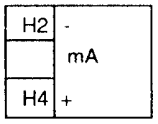
Input



For inputs less than 100mV use terminals 2 and 4, polarity as shown.



For inputs from 100mV to 10V use terminals 4 and 5, polarity as shown.



For mA inputs a burden resistor module will be supplied.

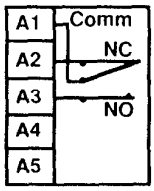
This burden resistor must be connected across terminals 2 and 4 (polarity is not important) together with the external wiring, so that the resistor terminates the incoming control signal.

An area on the top of the burden resistor module is colour coded to indicate the value of resistor:-

RED	- 5Ω module,	P.V. mA I/P's	(Part No. SUB902 SPARE 5R)
BROWN	- 50Ω module,	Remote mA Inputs	(Part No. SUB902 SPARE 50R)
YELLOW	-500Ω module,	Pyrometer Inputs	(Part No. SUB902 SPARE 500R)

2.2.3 Heat / Process [+] Outputs (Channel 1)

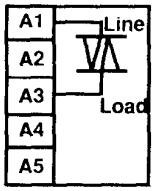
Relay



Relay Output

The relays are shown in the de-energised state, i.e. with the instrument not powered. If the instrument has been configured as reverse acting then the relay will energise when power to the load is required for a conventional temperature controller. The relay contact rating is 2A/264V r.m.s.

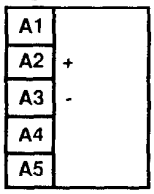
Triac



Triac Output

The live supply is connected to A1 terminal. One side of the load is connected to the A3 terminal, the other side of the load should be connected to the neutral line. The triac is rated at 1A/264V r.m.s.

Logic

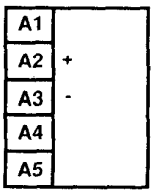


Logic Output

Logic outputs are connected to terminals A2 and A3, A2 being the positive. This output is isolated from all other inputs and outputs.

The maximum capability of this output is 20mA and 15 volts.

D.C.



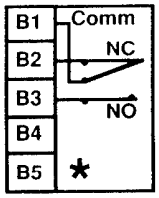
D.C.Output

The isolated D.C. output is connected to terminals A2 and A3, A2 being positive. This output is isolated from all other inputs and outputs. This output can be either current or voltage.

The capability of this output is 0-20mA for current and 0-10v for voltage.

2.2.4 Cool / Process[-] Output (Channel 2)

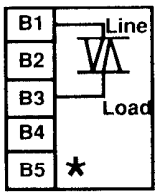
Relay



Relay Output

The relays are shown in the de-energised state, i.e. with the instrument not powered. If the instrument has been configured as reverse acting then the relay will energise when power to the load is required for a conventional temperature controller. The relay contact rating is 2A/264V r.m.s.

Triac

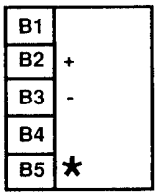


Triac Output

The live supply is connected to B1 terminal. One side of the load is connected to the B3 terminal, the other side of the load should be connected to the neutral line.

The triac is rated at 1A/264V r.m.s.

Logic

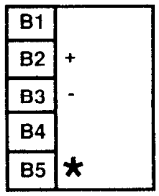


Logic Output

Logic outputs are connected to terminals B2 and B3, B2 being the positive. This output is isolated from all other inputs and outputs.

The maximum capability of this output is 20mA and 15volts.

D.C.



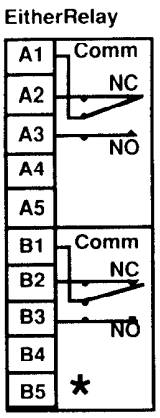
D.C.Output

The isolated D.C. output is connected to terminals B2 and B3, B2 being positive. This output is isolated from all other inputs and outputs. This output can be either current or voltage.

The capability of this output is 0-20mA for current and 0-10v for voltage.

NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

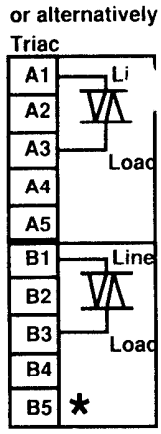
2.2.5 Valve Positioner Outputs (Channels 1 and 2)



Relay Connections.

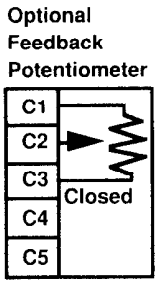
If relays are fitted in the controller, join terminals "A1" to "B1" and also join these terminals to one side of the motor supply. Connect terminal "A3" to the raise connection of the motor and terminal "B3" to the lower connection on the motor. The common connection of the motor should be connected to the other side of the motor supply.

The instrument configuration can be changed to allow terminal "A3" to give the lower signal and terminal "B3" to give the raise signal.



Triac Connections

If triacs are fitted to the instrument, carry out the wiring procedure given under 'Relay Connections' above.



Optional Feedback Potentiometer (Options Board)

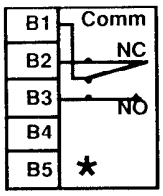
It is not necessary to fit a feedback potentiometer to the controller before the loop will control correctly. If fitted this potentiometer will enable the controller to display the true position of the valve at all times and allow the setting of limits in the movement of the valve. If a potentiometer with a resistance between 100 and 1000 Ω is fitted into the motor it should be wired as shown above observing the direction of drive.

NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

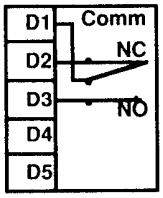
NOTE :- The installation of a valve positioner loop in the 902, 3 or 4 controller limits the instrument to a single channel output. This can be used to control either a heat / process [+] or a cool / process [-] loop.

2.2.6 Alarm Outputs

Alarm 1 Relay
Either CH2



or CH3

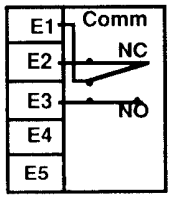


Alarm 1 Output (Channels 2 or 3)

In the instrument configuration alarm 1 can be set to be active from terminals "B" or "D". To identify the configuration of a particular instrument refer to the instrument label. The default condition of the alarm relays is to drive them to the normally closed condition when the alarm is active. The ordering code does however permit the customer to specify the alarms to be in the normally open position for active alarms. The alarm relay contacts are rated at 2 A maximum at a voltage between 30 and 264 volts a.c.

NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

Alarm 2 Relay
or CH4



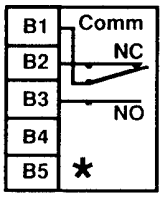
Alarm 2 Output (Channel 4)

The relay connections from this alarm always appear on terminals "E". The default condition of the alarm relays is to drive to the normally closed condition when the alarm is active. The ordering code does however permit the customer to specify the normally open position when the alarm is active.. The label on the instrument will indicate how these are set. The relay contacts are rated at 2A maximum at a voltage between 30 and 264 volts a.c.

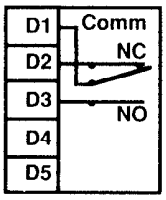
2.2.7 Programme and Comms. Driven Relays (Channels 2, 3 or 4)

Terminals "B", "D" and "E" are those used for relay connections driven by segments of the programme or via the digital communications link. The instrument configuration sets the number of relays driven by the programme and / or the digital communications link which can be none, one, two or three. To confirm how many and which relays are driven by programmer segments or digital communications link on a particular instrument, refer to the label mounted on the instrument.

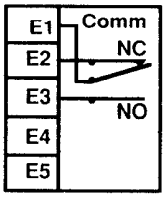
Either CH2



or CH3



or CH4



Programme Driven Relays

Parameters for defining for output condition are found in the programmer scroll list and set the state of these relays. A number being displayed indicates that particular relay will have its normally open contacts in the closed position during that segment. The assignment of these numbers to the rear terminals is shown below :-

Number 2 indicates the condition of output terminals "B"
Number 3 indicates the condition of output terminals "D"
Number 4 indicates the condition of output terminals "E"

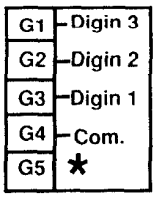
Digital Communications Driven Relays

In this case the three relays are driven by status words "OS" and "XS". Status word "XS" bit "6" sets the relay connected to terminals "B", status word "OS" bit "13" sets the relay connected to terminals "D" and status word "OS" bit"12" sets the relay connected to terminals "E". Setting these bits to a "1" will cause the relay to be set into the normally open position.

All of these relay contacts are rated at a maximum current of 2A operating on a voltage between 30 and 264 volts a.c.

NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

2.2.8 Digital Inputs



Three digital inputs are provided on this instrument. These inputs are not isolated from one another or from the input on "H" terminals.

To activate any of these inputs connect between the particular input and the common "G4", by either a resistance of less than 100Ω, or a voltage of less than 0.7 volts d.c. For an input to be switched to the inactive state, the input device must have a resistance greater than 28kΩ, or a voltage greater than 4.0 volts d.c.

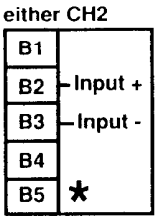
For a description of the available digital input functions;
See Operation Section 8.0.

NOTE (*) :- Terminal G5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

2.2.9. Remote Analogue Inputs

One remote analogue input can be configured within the instrument, this will appear at either terminals "B", "C" or "E". refer to the instrument label for the configuration of a specific controller.

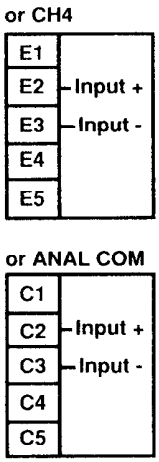
The remote analogue input can be a voltage or current. Potentiometer inputs can be accommodated but only when using terminals "C1", "C2" and "C3".



Voltage Inputs

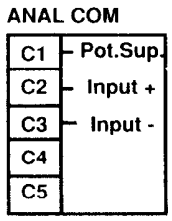
For voltage inputs wire the incoming supply to terminal "2" and "3". Terminal "2" must be connected to the positive side of the supply.

Current Inputs



Instruments ordered for a remote current analogue input will be supplied with a 50Ω resistor, colour coded Brown (Part No. SUB902 SPARE 50R), within the instrument packing. This resistor should be wired across terminals "2" and "3", polarity is not important. The incoming supply should also be wired to terminals "2" and "3", the positive side of the supply being taken to terminal "2"

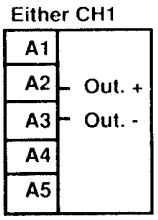
Potentiometer Inputs



If the remote analogue input is to be derived from a potentiometer this must have an element resistance between 1kΩ and 100kΩ. Wire the zero end of the potentiometer to terminal "C3" and the span end of the potentiometer to terminal "C1". The wiper of the potentiometer should then be wired to terminal "C2".

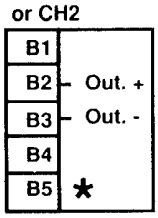
NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

2.2.10 Retransmission Analogue Output



Only one retransmission output is available in the instrument and this will be routed to either terminals "A", "B", "C" or "D". Refer to the terminal label on the side of the instrument to confirm the configuration in this case.

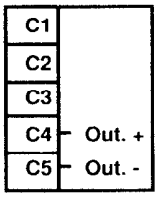
Wire to the appropriate terminals, as shown on the left of this page, observing the correct polarity.



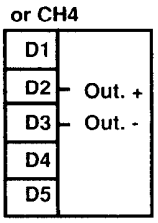
The range of the output, which can be either current or voltage, and the parameter being retransmitted is set in the instrument configuration. The maximum range of the output which can be voltage or current is :-

-5 to +10 volts out of terminal "C"

0 to 10 volts out of terminals "A", "B" or "D".



The maximum current range for all outputs is 0 to 20mA.



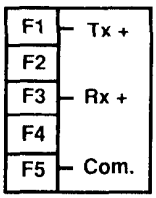
NOTE (*) :- Terminal B5 marked above with an "*" is internally connected to the controller circuitry. It is important that no external wiring is connected to this terminal.

2.2.11. Digital Communications

Digital Communications

The instrument will support the digital communications specification type RS232 C or RS422. The instrument can be changed from one standard to the other by changing a link position on the rear of the microprocessor board, see Figure 1, paragraph 2.0, section 6, Communications.

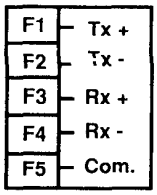
RS 232 C



RS 232 C Standard

If the instrument has been configured for the RS232 C standard, connect the common wire to terminal "F5", the instrument transmit wire to terminal "F1" and the instrument receive wire to terminal "F3".

RS 422



RS 422 Standard

If the instrument is configured for the RS422 standard make connections to the instrument as follows :-

Connect the instrument transmit positive wire to terminal "F1"

Connect the instrument transmit negative wire to terminal "F2"

Connect the instrument receive positive wire to terminal "F3"

Connect the instrument receive negative wire to terminal "F4"

3.0 CAUTION NOTES & IMPORTANT INFORMATION

RECEIVING AND UNPACKING YOUR INSTRUMENT

This unit is a precision electronic instrument, designed for applications in industrial control rooms, research labs etc. Its shipping container is designed to withstand reasonable shocks. Unpack it carefully, inspect the contents for damage, and keep the original packing materials if re-shipment is required.

If there is evidence of shipping damage, please notify Eurotherm or the carrier within 72 hours. The packaging should be retained for inspection by the manufacturer's representative and/or carrier.

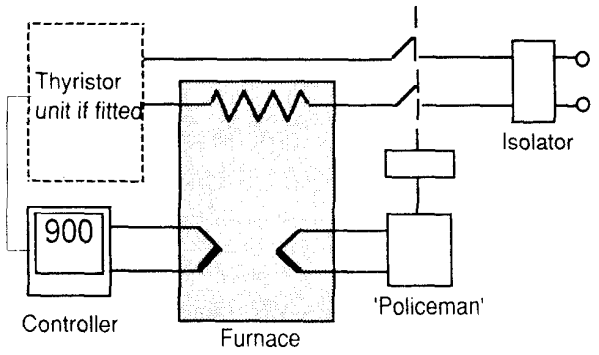
PLANT AND PERSONNEL PROTECTION

When designing any control system it is essential to consider what will happen if any individual part of the system malfunctions.
In a temperature control application, for example, the danger is that for some reason the heating system remains permanently switched on. This could happen if:-

1. Thermocouple or sensor becomes 'detached' from the system, i.e. is no longer measuring the actual temperature achieved.
2. Thermocouple, or thermocouple wiring, becomes short circuited.
3. Component failure within the controller in such a way as to leave the output switched on.
4. Microprocessor or software failure in the system.
5. Failure of a valve movement or valve linkage.
6. Remote setpoint to controller is faulty.
7. Operation by unauthorised personnel e.g.
   a) Controller left in manual with high output power set
   b) Setpoint set too high
8. Any lack of maintenance in serviceable parts
   ...and many other unforeseen situations.

If leaving the heater on all the time can cause damage either to the plant itself or its contents, then an independent protection device must be provided.

The best form of protection is a completely independent 'policeman'. This is a separate overtemperature alarm with its own thermocouple or sensor, and, on alarm will pull out the main contactor or shut off the valve to ensure the plant's safety.
The normal function of the 'Policeman' is to act as an over temperature alarm forming part of the overall process protection strategy. As such it is essential that all elements of the alarm system be regularly checked to ensure that they are in full working order. We recommend therefore that the system operation, including the 'policeman', be fully tested, on a weekly basis, in order to maximise process protection. See example shown.



GUIDELINES FOR SAFE USE OF ELECTRONIC EQUIPMENT

NOTE: All Eurotherm equipment is designed to operate in harsh industrial environments and is thoroughly tested. These guidelines represent good engineering principles for safe and trouble free operation and are recommended for all control equipment, whether from Eurotherm or any other supplier. They should be used in conjunction with local regulations.OVERCURRENT PROTECTION

It is recommended that AC power supplies to instruments be protected by fuses or automatic circuit breakers rated at not more than 2 Amperes, and must be separated from any load current circuits.

VOLTAGE RATINGS

Care must be taken to ensure that maximum voltage ratings are not exceeded. Unless otherwise stated in the specification of any particular unit, the maximum voltage which may be applied between any two isolated circuits, or between any isolated circuit and earth, is limited to the highest rated supply voltage for that unit. Take particular care not to connect AC supplies to low voltage control inputs such as sensor inputs, logic inputs and outputs.

ENCLOSURE OF LIVE PARTS

Some metal parts of certain types of equipment can become electrically 'live' in some conditions of normal operation.

Unless clearly intended to be panel mounted and accessible during normal operation, all units should be installed inside a suitable earthed metal enclosure to prevent live parts being accessible to human hands and metal tools.

It is recommended that rear terminal covers (available on most Eurotherm units) be fitted wherever possible.

WIRING

It is important to connect all equipment correctly in advance with the installation data provided for each type of unit.

Most connections to equipment require correct polarity to be maintained and due attention must be given to ensure this.

Unlabelled terminals must not be used as 'tie points' for other wires.

Conductors should be commensurate with voltage and current ratings of the units, and should conform to appropriate standards of good practice and local codes and regulations.

SCREENED CABLES

In installations where high electrical noise cannot be avoided, twisted pairs of screened cables are recommended as below:

Thermocouples inputs	Use screened compensating cable
Resistance Thermometers	Use screened cable
Logic Inputs/Outputs	Use screened twisted conductors
Analogue Control Outputs	Use screened twisted pairs
Logic Control Outputs	Use twisted pairs
Retransmission Signals	Use twisted pairs
Relay Outputs	Use standard cable

Where screened twisted pairs are used the screen must be earthed at one end only, preferably at the instrument.