



THERMISTOR AND CURRENT RELAY INSTRUCTION MANUAL

INSTRUCTIONS FOR INSTALLING THERMISTOR PROTECTION UNITS AND ELECTRONIC CURRENT RELAYS

This information provided should be carefully read before installing units. Their observance will ensure reliable and satisfactory service.

SPECIFICATION

Supply Voltage

The supply voltage range is dependant on the unit reference:-

Ref. TH 24 - Suitable for operation on 24 - 60v A.C. or D.C. by connection to appropriate terminals.

Ref. TH110, CR(AorB)110 - Suitable for operation on 110v-240v A.C. only by connection to the appropriate terminals.

Ref. TH415, CR(AorB)415 - Suitable for operation on 220v-440v A.C. only by connection to the appropriate terminals.

As switchgear applications will impose the most severe voltage requirements the units have been designed to accommodate the British Standard Switchgear voltage tolerances. Namely, satisfactory operation at 15% below the minimum voltage and 10% above the maximum voltage of the stated range.

Frequency

48.75-63Hz.

Ambient Temperature

Full stabilisation over the range -20°C to +50°C at standard altitudes and humidity conditions.

Extreme Conditions: When used at altitudes above 2,000 metres (6,600 ft.) consult Brook Crompton regarding derating of the unit.

Relay Contact Rating

The relay complies with section 4.8.2 of BS4999 Part 111, 1987 on switch rating requirements as listed below.

TEST DUTY	CARRY AND BREAK	MAKE
1	0.6A, 110V. 0.4 p.f. ± .05	6A, 110V. 0.7 p.f. ± .05
2	0.14A, 485V. 0.4 p.f. ± .05	1.4A, 485V. 0.7 p.f. ± .05
3	6A, 110V. 0.7 p.f. ± .05	6A, 485V. 0.7 p.f. ± .05
4	1.4A, 485V. 0.7 p.f. ± .05	1.4A, 485V. 0.7 p.f. ± .05

The test voltage of 110v and 485v represents an over voltage of 10% on the switching rated voltages of 100v and 440v. Care should be taken in low voltage control circuits to ensure that the continuous current through the contacts does not exceed 2 amps. Where the above limits would be exceeded a buffer relay of sufficient capacity to handle the load is required. Electrical life of relay: 10⁵ operations at rated load. Mechanical life of relay: 30 × 10⁶ operations.

CURRENT CONSUMPTION. - UPTO 20MA APPROX. DEPENDANT ON THE SUPPLY VOLTAGE

Input-Output Interaction

NIL on normal circuits. There is complete electrical isolation of the input driving circuit and the relay output contacts. The input-output capacity is less than 100pF.

Fusing

Where fusing of the circuit being controlled is considered necessary, the fuse should be inserted in the feed wire to terminal A2, A3 as appropriate. In order to adequately protect the printed circuit connections it is advisable to restrict the fuse to a maximum of 4 amps. HRC fuses are preferred.

WARNING

If the installation is arranged so that the thermistor circuit is 'live' even when the motor contactor is OFF, then a permanent label should be attached to the motor terminal box cover:- 'Warning - terminals alive until isolator is OFF'

Enclosure

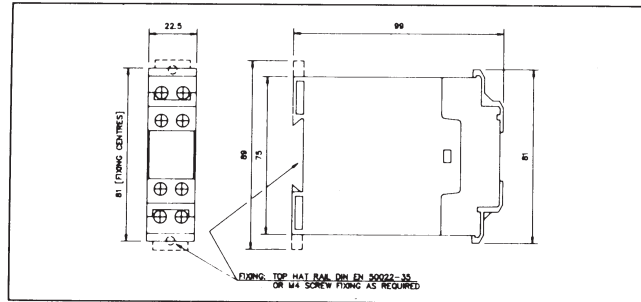
Terminal Housing: Polycarbonate/GVIV-O Grey

Case: ABS/V-O Grey

Finger Protection: Transparent Polycarbonate

Dimensions

Please note: All dimensions in millimetres.



Mounting

Either A: Snap mounting on top hat rail, DIN EN 50 022 35
or B: Screw mounting by slide out lugs.

THERMISTOR PROTECTION UNITS

MANUFACTURED TO BS4999 Part 111: 1987

For use in conjunction with PTC Thermistors as specified in the same British Standard

Thermistor units provide inherent positive protection against conditions which can cause over-temperature damage to the motor windings of electric motors by:-

1. Locked Rotor.
2. Under or over-voltage.
3. Too frequent starting.
4. Excessive run up times.
5. Impaired Ventilation.
6. High ambient temperature.
7. Single-phasing.
8. Sustained overload.
9. Unsuitable duty-cycles.
10. Unbalanced voltages.

Thermistors are inserted deep into the motor windings where subsequent varnish impregnation ensures that they come into good thermal contact with the actual insulated wire they are designed to protect. If the motor winding temperature rises above its safe point the resulting vast change of resistance of the thermistors is utilized to activate an external control unit which initiates the stopping of the motor.

These thermistors have the advantage of very small size and mass and medium impedance, hence the connecting wire between the motor and device can be of inexpensive light gauge.

It should be noted, however, that certain special types of motors prove difficult to protect because of more rapid rates of temperature rise in other parts of the motor, particularly the rotor.

If very long runs are required, or if runs are close to heavy conductors it may be necessary to take precautions against induced voltage pick-up. In such cases lightly twisting the two conductors together before drawing in the conduit will usually be sufficient. For extreme cases see effect of capacitance.

The following thermistors are available:-

Type Ref.	Colour Code of Leads	Type Ref.	Colour Code of Leads
PTCR100	Red	PTCR140	Blue & White
PTCR110	Brown	PTCR160	Blue & Red
PTCR120	Grey	PTCR190	Grey & Brown
PTCR130	Blue		

Note: The same Thermistor Protection Unit can be used with all PTCR's.

Operation

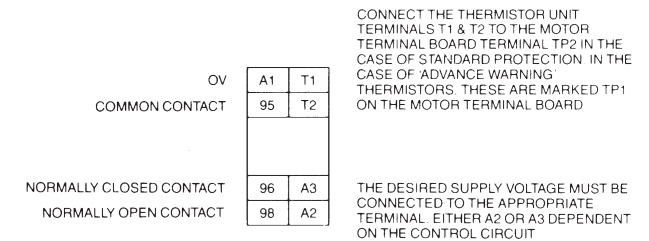
The change-over output contacts operate immediately on application of the desired supply voltage. If an over temperature condition occurs, when the motor winding temperature rises above its safe working threshold, it is detected by the thermistors resulting in a vast change of resistance. This initiates the unit, de-energises the relay and breaks the control circuit, therefore switching off the supply to the motor.

Important

The Thermistor unit is inherently a self-resetting device. Therefore, if used with 'Auto-start' circuits where unexpected re-starting could cause danger an arrangement similar to the manual reset circuit ref. 33 should be employed.

Indefinite application of the supply voltage is not detrimental to the unit.

External Connections



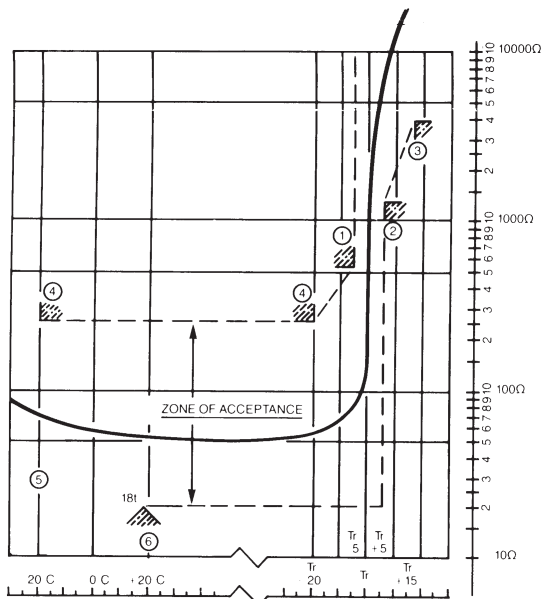
Supply Voltage Connections - (-15% +10%)

	A2	A3
TH24	24/60v	
TH110	220/240v	110/125v
TH415	380/440v	220/240v

Temperature/Resistance Characteristics

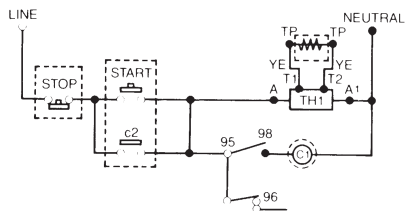
Note:-

As a ready rule, but not as a specification point, the thermistors can be regarded as having a resistance of approximately 1,000 ohms at the reference temperature Tr.



Effect of Capacitance

Long runs of certain types of cable in the thermistor circuit may affect the operation of the Thermistor unit, causing the relay to remain energised even when the thermistor(s) reach the tripping value. If it is suspected that trouble of this nature is being experienced, the thermistor circuit should be disconnected at the motor terminals when the contactor should drop out. If this does not happen, then a small isolation transformer should be fitted, usually available from stock, see circuit diagram ref. 32. Should, however, an earthed Neutral (ie. earthed at the supply distribution transformer) be available when the Neutral of the control circuit should always be connected directly (without interceding auxiliary switches, etc.) to terminal A1 of the Thermistor unit (see typical key diagram below). When the above is carried out, the cable length may be increased by about ten times without an isolation transformer being necessary.



*A = A2 or A3 dependant on unit reference.

Final Check of Installation

AFTER taking due precautions against receiving an electric shock, or causing a short circuit, test each installation by breaking the thermistor circuit AT THE MOTOR END whilst the motor is running. The motor should stop. The above test, whilst desirable on average installations, becomes essential where there are unusual lengths of cable runs as, by so doing, any possible inductive or capacitive effect on the cables will be checked.

Combined Remote Stop and Test Circuit

At little extra cost, as the same Thermistor circuit cabling will be utilised, a permanent combined remote stop/overload test facility can be provided near the motor drive. Connect a standard type stop push button, with a 5,000 ohm resistor across the terminals, in series with thermistor circuit operation of the push button will insert the resistor into the thermistor circuit and so stop/test the installation.

Important – Testing Thermistor Circuits

On no account should a 500 volt insulation tester or other high voltage test equipment be connected ACROSS the thermistor terminals as this will damage the thermistors. High test voltages (up to 2,200v) can, however, be applied from the thermistor to the motor winding to check the thermistor insulation.

Thermistor Protection Units Combinations in Enclosures

Combinations in enclosures are referenced by the supply voltage required followed by a suffix code:-

Supply Voltage Codes	Supply Voltage Range +10% – 15%
TH110	110 – 120
TH240	220 – 240
TH415	380 – 440

Combination	Suffix Code	Circuit Ref.
Thermistor Protection Unit	B	25
T.P.U. and Buffer Relay	C	37
T.P.U. with Isolation Transformer	F	32
T.P.U. for Advance Warning and Buffer Relay for operating alarm (fitted with Cancel Alarm button)	H	27
T.P.U. with Manual Reset Relay	K	33

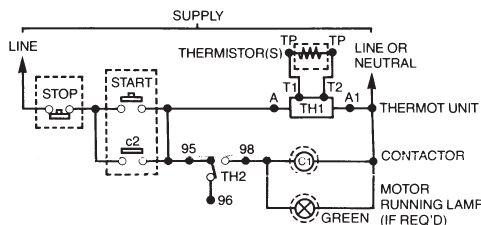
Typical Example:- TH240F

This is a Thermistor Protection Unit fitted with an isolation transformer suitable for use on a supply range of 220-240v a.c. +10% – 15%.

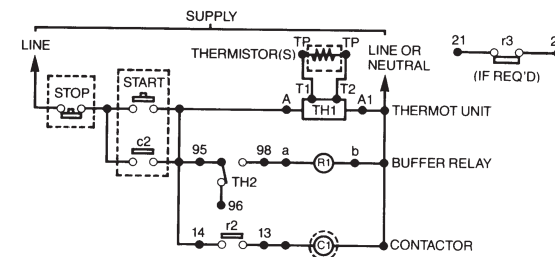
Key Diagrams for Combinations in Enclosures Important

*A = A2 or A3 dependent on thermistor unit reference.

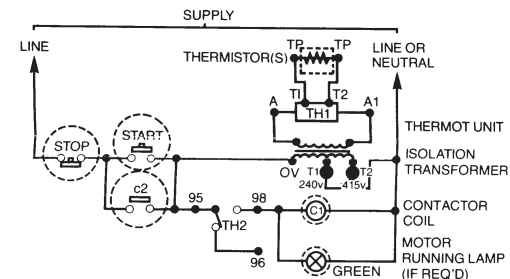
Circuit Reference 25: Standard Circuit for Code B



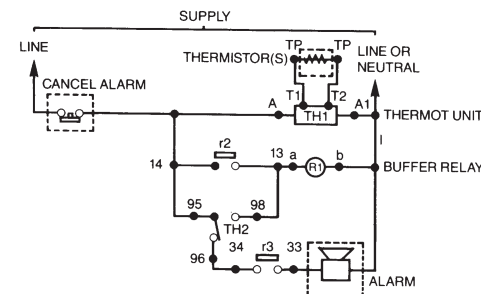
Circuit Reference 37: Standard Circuit for Code C



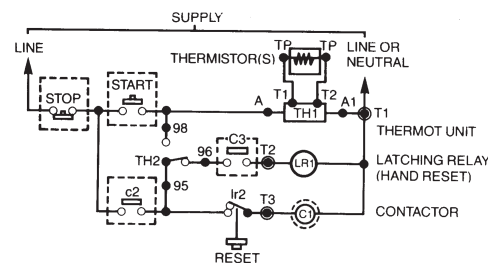
Circuit Reference 32: Standard Circuit for Code F



Circuit Reference 27: Standard Circuit for Code H



Circuit Reference 33: Standard Circuit for Code K



ELECTRONIC CURRENT RELAYS

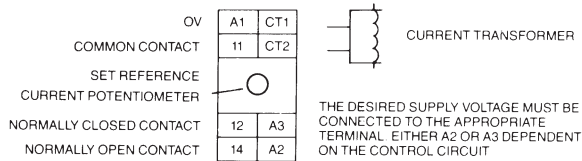
Introduction

The electronic current relay is used to monitor and react to motor current. It was originally designed for use in baling press applications to control the pressing to a preset current level, at which the process was complete. It has a built in response time to prevent tripping due to excess starting currents and can be used in numerous other applications where over-current sensing is desired.

Operation

The output relay energises immediately on application of the desired supply voltage. The relay switches when the monitored current exceeds the set reference current. The relay is re-energised when the current falls approximately 10% below the reference value. The unit is designed to operate in conjunction with a 100A/25mA current transformer, ref. CT 4000:1.

External Connections



Supply Voltage Connections – (-15% +10%)

		A2	A3
CRA110	CRB110	220/240v	110/120v
CRA415	CRB415	380/440v	220/240v

Reference Current Setting

The current range of the unit is given by the prefix CRA or CRB to the voltage reference.

CRA: Up to 13 amps.

CRB: 6 to 50 amps.

The current reference is set by rotating the potentiometer to the desired setting on the calibrated scale. The current at this setting is dependant on the number of times the conductor is passed through the current transformer as given by the chart on the side of the unit and as shown below:-

POTENTIOMETER POSITION						NUMBER OF TURNS THROUGH 4000:1 CT
A	B	C	D	E	F	
1.5	1.6	1.75	2.0	2.4	3.25	4
2.0	2.1	2.3	2.6	3.25	4.3	3
3.0	3.1	3.5	4.0	4.9	6.5	2
6.0	6.25	7.0	8.0	9.75	13.0	1
CRA CURRENT VALUES – AC AMPS						

POTENTIOMETER POSITION							NUMBER OF TURNS THROUGH 4000:1 CT
A	B	C	D	E	F	G	
5.75	6.5	7.25	8.0	9.0	10.5	12.5	4
7.6	8.6	9.6	10.6	12.0	14.0	16.6	3
11.5	13.0	14.5	16.0	18.0	21.0	25.0	2
23.0	26.0	29.0	32.0	36.0	42.0	50.0	1
CRB CURRENT VALUES – AC AMPS							

Example:- To achieve an over-current trip at 18 amps with a control supply voltage of 440v a.c.

Unit Required:- CRB415

The Current Relay would be installed with the voltage connected across A1 and A2. The current reference would be set by passing the monitored conductor twice through the 4000:1 current transformer with the potentiometer wound to position E on the calibrated scale.

Note:- The current settings can be further reduced, if more turns can be physically wound through the current transformer.

Above 50 amps an additional current transformer is required with a turns ratio sufficient to reduce the monitored current to a level which falls within the limits of either current range A or range B.

Example:- The achieve an over-current trip at 250A F.L.C. with a supply voltage of 110v a.c.

A 300:5 current transformer could be used to reduce the monitored current, ie:-

$$\frac{250}{300} \times 5 = 4.16A$$

Therefore, unit now required to monitor 4.16A: CRA110. The Current Relay would be installed with the voltage connected across A1 and A3. The current reference would be set by passing the monitored conductor once through the 300:5 current transformer, the secondary of which would be passed **twice** through the standard 4000:1 C.T. The potentiometer would then be set to position D to give an effective reference current of approximately 250 amps.

Health and Safety at Work Act 1974

It is most important that equipment is used in its correct application according to the purpose for which it was designed and that the relevant instructions, regulations, procedures and codes of practice are strictly complied with.

Installation, operation and maintenance of the equipment should be carried out by appropriately qualified personnel and customers and users are referred to the information contained in this leaflet and to the specific technical literature. Additional information on individual products and a free technical advisory service can be provided on request.

Particular attention should be made to the Electricity at Work Regulations 1989.

Guarantee

All goods are guaranteed for one year from date of purchase. This does not effect the statutory rights of the user.

All information contained in this publication is, as far as possible, correct at the time of going to print. However, due to our policy of continued improvement, we reserve the right to alter specifications without prior notice.



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