WATCH DOG

ELEVATOR MONITOR

MANUAL

Factory Mutual System
Approved

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INTRODUCTION:

'Watchdog' Motion, Alignment & Temperature Monitor

The 'Watchdog' is a microprocessor controlled system which is able to accept signals of speed and alignment from elevator buckets and bolts, also signals of bearing temperature and is able to cause alarm and shutdown control of the elevator, and or feeder, when hazardous conditions are detected. The control unit is housed in a self-contained wall mounting enclosure and the speed/alignment probes and temperature sensors are separate items for mounting on the elevator.

Motion Sensing — General Features

The control unit accepts signals from one or two probes mounted on the elevator, which provide one pulse for every ferrous object such as buckets or bolts which pass within their sensing range. Alternatively, the probes can detect the rotation of the elevator shaft or drum by means of a steel target(s) attached to the shaft or drum, thus providing one pulse for every target passing the probe. The control unit compares the speed of these input signals with a preset value of normal speed and is able to cause alarm and shutdown signals if the speed deviates from the normal by more than acceptable percentages. These percentages can be selected in the control unit during installation. A digital display of the speed signals is provided on the front of the control unit; this display can be calibrated in various units by adjustment of a 'scale factor' switch inside the control unit. The control unit also accepts a signal from the motor starter which initiates a start-up timer to allow the alarm and shutdown control to be inhibited during the start-up time. The length of time delay can be selected inside the control unit during installation. The acceleration of the elevator leg is continuously monitored during start up; in the event of deceleration or failure to move the belt, the stop signal will occur and shut down the elevator leg. A switch is fitted on the front of the control unit – when this switch is turned to 'Calibrate', the control unit measures the speed of the elevator and stores this 'normal' speed for future comparison. When the switch is turned to 'Test', the control unit displays the calibrated speed and the preset alarm and shut-down speeds in turn, testing the operation of the unit at each point.

Alignment Sensing — General Features

When two probes are correctly mounted on the elevator to detect the speed of buckets or bolts, both probes will generate one pulse for each bucket or bolt. If the elevator belt becomes misaligned, one of the probes will fail to detect the buckets or bolts. The control unit will recognise this absence of pulses as a misalignment condition and will cause an alarm signal, eventually resulting in shutdown.

Temperature Sensing — General Features

Each of the elevator bearings can be fitted with a temperature sensor to detect overheating of the bearing. Additionally, sensors can be fitted to detect the temperature of the oil in a gearbox, etc. The temperature sensors have a preset switching temperature; if any of the sensors exceeds it's switching temperature, a signal is sent to the control unit and will cause an alarm signal, eventually resulting in shutdown.

Installation

When installing the 'Watchdog' we strongly advise that you employ the services of a certified and licensed electrician, who is familiar with installation of electronic controls. If assistance is required in obtaining an installation electrician please contact us and we will recommend an electrical contractor.

1. SPECIFICATIONS

WDC1V1F (110 VAC)
WDC1V2F (220 VAC)

1.1 *The Control Unit*

A plastic enclosure houses the electronics and the terminal connections. The unit contains two printed circuit boards; the lower circuit board accommodates the power supply components, output relays and opto-isolators for the input signals; the upper circuit board includes the microprocessor and all associated components. When the lid is removed, a set of selector switches may be found at the lower edge of the circuit board. The right hand pair of switches enable the selection of the display scale factor in the range of 0-99 to be made by using a small screwdriver to rotate the switches. The left hand switch contains six separate selector switches to allow setting of start-up delay times, alarm/stop trip speed percentage, speed range and display range. The combinations of the switch positions are shown in the Table 1. Also mounted on the circuit board and viewed through the label on the front of the lid is the four digit LED display for speed indication and eight LED status lamps as detailed in Table 2. Also, a switch is provided for selection of 'Calibrate' and 'Test' functions.

TABLE 1 SELECTOR SWITCH POSITIONS

THERE IS A CHOICE OF 3 START-UP DELAY TIMES	Start-Up Delay 5 Secs. Start-Up Delay 15 Secs. Start-Up Delay 30 Secs.
THERE IS A CHOICE OF 3 ALARM/STOP TRIP SPEED PERCENTAGES	Alarm 5% Stop 15% Alarm 10% Stop 20% Alarm 15% Stop 20%
THERE IS A CHOICE OF 2 SPEED RANGES	Low Speed Range 20-200 Pulses/Min High Speed Range 200-2000 Pulses/Min
THERE IS A CHOICE OF 2 DISPLAY RANGES	Low Display Range: 99.99 In Low Speed; 999.9 In High Speed High Display Range: 999.9 In Low Speed; 9999 In High Speed

TABLE 2 LED STATUS LAMPS

G	PROBE 1	G = Green
G	PROBE 2	R = Red
R	HOT BEARING	
R	UNDERSPEED	All Five Lamps 'On' During Calibration
R	OVERSPEED	
R	MISALIGNMENT	
R	ALARM	
R	STOP	

Trip percentages, time delays etc. can be factory set for different values.

TABLE 3 ELECTRICAL RATINGS

2 Models are available:			
ELECTRICAL SUPPLY	—	110/120V±10% 50/60Hz :	220/240V±10% 50/60Hz
POWER CONSUMPTION	—	15VA :	15VA
STARTER INTERLOCK INPUT	—	110V ± 10% 50/60Hz 4ma :	220V ± 10% 50/60Hz 4ma
ALARM RELAY CONTACTS	—	1 Pole Changeover 240V AC Max. 10A Max.	
STOP RELAY CONTACTS	—	1 Pole Changeover 240V AC Max. 10 A Max.	
PROBE INPUTS	—	12V DC Approx.	
PROBE SUPPLY	—	12V DC Approx., 100ma Available	
PROTECTION	—	FM Approved — Class II Division 2, Groups F and G.	

TABLE 4 DIMENSIONS

HEIGHT	—	10.94"	275mm
WIDTH	—	7.40"	188mm
DEPTH	—	5.12"	130mm
FIXING CENTRES	—	10.0" × 6.46"	254mm × 164mm
CABLE ENTRY	—	3 Holes @ ½" Conduit	3 Holes @ 20mm Conduit
WEIGHT	—	7¼ lb	3.3 Kg

1.2 ***The Elevator Motion Probe*** — *Adjustable depth type* WDA1V3F

The Probe is designed to detect moving ferrous material which passes within it's sensing range. It will not detect plastics, rubber, stainless steel, aluminium, etc., and it will not detect a stationary or slow moving target. It is designed to detect steel elevator buckets, either from the side of the elevator leg or through the elevator belt, it can also detect steel bolts used to attach non-metallic buckets to the elevator belt, by sensing from the back of the belt. With two probes correctly mounted, misalignment of the belt/buckets/bolts can also be detected.

Contained within the probe body is a powerful magnet and an electronic detector circuit. The body itself is manufactured from nylon and all of the components are rigidly potted in epoxy resin. None of the materials used in the sensing end of the probe are capable of producing a friction spark from accidental collision within the elevator. A four core tough rubber cable is permanently attached to the outer end of the probe and an aluminium threaded conduit bushing is moulded into the body to permit the use of flexible conduit systems for cable protection. A small lamp is moulded into the outer end of the probe and this is arranged to flash each time that a target is detected; this LED enables easy setting up adjustment of the probe. An adjusting screw is provided at the outer end of the probe to enable the sensitivity of the probe to be altered. The maximum and minimum limits of the adjusting screw can be felt by positive stops. A clamp block is provided to attach the probe to the elevator panels and to allow easy adjustment of sensing distance. Performance details and dimensions are shown in Table 5.

The Elevator Motion Probe — *Surface mounting type* WDA2V3F

The surface mounting motion probe is used in applications where it is not necessary or not desirable to have a probe which intrudes into the elevator leg casing. Also this probe may be used where there is reduced space around the elevator leg. The detection system is the same as is used in the adjustable depth type, but the physical construction is different. The body is made from steel and is provided with a conduit entry for use with flexible conduit.

TABLE 5 ELEVATOR MOTION PROBE

ELECTRICAL SUPPLY	—	12V DC Approx., From Control Unit
SUPPLY CURRENT	—	20ma
OUTPUT SIGNAL	—	12V DC Approx., Pulsed
MIN. TARGET SIZE	—	1" (25mm) Dia.
MAX. TARGET DISTANCE	—	3" (75mm) Approx. (for 1" Dia. target)
MIN. TARGET SPEED	—	20 Ft/Min. (6 metres/min.)
MAX. TARGET SPEED	—	2000 Ft/Min. (610 metres/min.)
MAX. RATE	—	2000 Per Min.(High Speed Probes Available)

DIMENSIONS

ADJUSTABLE DEPTH TYPE		SURFACE MOUNTING TYPE	
DIAMETER	— 2″ (50mm)	DIMENSION	— 3¼″×3″×1¼″ (95×76×32)
LENGTH	— 6″ (150mm)		
WEIGHT	— 33oz (0.95Kg)	WEIGHT	— 3lbs. (1.36Kg)
CABLE	— 24oz (0.7Kg) 6ft (2 Mtr.) Long	CABLE	— 4-Core 0.75mm² 6ft (2 Mtr.) Long
CONDUIT ENTRY	— ½″ NPT thread with 20mm to ½ NPT Adaptor Available	CONDUIT ENTRY	— ½″ NPT thread with 20mm to ½ NPT Adaptor Available
PROTECTION	— FM Approved — Class II Division 1, Groups E, F and G.		

1.3. *Bearing Temperature Sensor* WDB14V3F

The temperature sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect excessive temperature of the bearing housing. The brass body of the sensor contains a positive temperature coefficient (PTC) thermistor which has a fixed switching temperature. Below this temperature, the thermistor has a low resistance and above this temperature it has a very high resistance. All of the sensors on the elevator bearings are connected electrically in series so that if any one of them exceeds its switching temperature the total resistance exceeds the trip resistance of the control unit. The system fails to safe, as if the wire is broken at one of the sensors, an alarm signal is generated. A three core rubber covered cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

SWITCHING TEMPERATURE	— 176°F + 10°F (80°C + 5°C) (Other Temperatures Are Available)
RESISTANCE AT 60°C	— 250 Ohms Max
RESISTANCE AT 100°C	— 2000 Ohms Max
SENSING VOLTAGE	— 12V DC Approx
MAX. CURRENT	— 10ma
FIXING THREAD	— 1/8" NPT
CABLE	— 3 Core 0.75mm² 6ft (2 Mtr.) Long
WEIGHT	— 7oz. (0.2Kg)
PROTECTION	— FM Approved - Class II Division 2, Groups F and G

1.4 *Bearing Temperature Sensor probe for Class II Division 1, Groups E, F and G Hazardous Locations*

WDB24V3F

The temperature sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect excessive temperature of the bearing housing. The brass body of the sensor contains a positive temperature coefficient (PTC) thermistor which has a fixed switching temperature. Below this temperature, the thermistor has a low resistance and above this temperature it has a very high resistance. All of the sensors on the elevator bearings are connected electrically in series so that if any one of them exceeds its switching temperature the total resistance exceeds the trip resistance of the control unit. The system fails to safe, as if the wire is broken at one of the sensors, an alarm signal is generated. A three core rubber covered cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

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CABLE	— 3 Core 0.75mm² 6ft (2 Mtr.) Long
WEIGHT	— 7oz. (0.2Kg)
PROTECTION	— FM Approved - Class II Division 1, Groups E, F and G

2. WATCHDOG INSTALLATION INSTRUCTIONS

2.1. *Mechanical*

To install the 'Watchdog' first check that all of the parts of the Hazard Monitor have been received —

Control Box
Motion/Alignment Sensors
Bearing Temperature Sensors

and that the control box is of the correct voltage.

NOTE: For installation in hazardous areas see also paragraph 2.3.

CONTROL UNIT

The control unit box should be installed in a suitable control or starter switch room and mounted at an eye level position so that the display and warning lights can be readily seen. The box should have sufficient space to open the unit main lid for adjustment. An audible alarm, hooter or visual indicator lamp can be installed in or outside the control room.

ATTENTION

The Control Unit is susceptible to static voltage. Connection of a clean ground to terminal 16 is essential for optimum performance. Prior to this connection, static handling precautions should be taken.

MOTION/ALIGNMENT SENSORS

There are two types of sensors, a standard 2" dia. x 6" adjustable depth sensor and a 3¼" x 3" x 1¼" rectangular surface mounting flat sensor. Both types need a suitable junction box for wiring on the elevator leg.

NOTE: Photocopy the mounting block template on page 42 and use for marking out the holes for the mounting blocks.

SET UP PROCEDURE:-

(i) ***FOR MOTION MONITORING (BELT SLIP) ONLY***
(For Motion and Alignment see following section)

- One sensor only is required.
- Mount the sensor on the up leg or tight belt side trunking, immediately above the boot section, either at the side for sensing on to steel buckets or between the legs for sensing on to the steel bolts in plastic buckets (or, in the case of single leg trunking, mount on a cross plate to sense the bolt heads). See Drawing 'A'
- **For side mounting** with wide pitched buckets at a minimum of 1" gap between buckets the sensor should be fitted approximately in a vertical line with the centre of the bucket, as Drawing 'B', at a distance of no more than 4" from the tip. For side mounting with very closed pitch buckets, such as GB 'bottomless' or Starco low profile, the sensor should be fitted with its outer edge in line with the tip of the bucket and within 2" of the bucket as drawing 'C'.
- **For rear mounting** sensing on to the bolt heads the sensor should be centered on to the back of any one of the vertical lines of bolt heads and at a distance of no more than 2" from the bolt head.
- The position of the round senor can be adjusted by slackening the clamp, sliding the sensor forward or back before re-tightening. The surface mounting sensor has no such adjustment and must be mounted within 2" of its object.
- The sensitivity of the sensor should be initially adjusted to its maximum by turning the screw at the rear end of the sensor clockwise. The Mk 1 round sensor has 20 turns to maximum sensitivity and the Mk 2 round sensor and surface mounting sensor only one turn to a positive stop for maximum sensitivity.
- When wired up an LED at the rear end of the sensor will pulse each time a ferrous object passes it and the sensor sensitivity screw should be screwed anti-clockwise until the pulse light just goes out and then screwed clockwise until the LED is pulsing regularly.

(ii) ***FOR BELT ALIGNMENT AND MOTION MONITORING***

- Two sensors are required and they will signal belt alignment and motion at the same time.
- Install the 2 sensors in the 'up' leg trunking or tight belt side, immediately above the boot, as shown in Drawing 'A'.
- **For side mounting** steel buckets a sensor should be installed at each side of the trunking, either in line with the centre of wide spaced buckets at a distance of no more than 4" from the buckets, or with the outer edge of the probe in line with the tips of the bottomless or very closely spaced steel buckets at a distance of no more than 2" from the steel buckets, and by backing the probe out, obtain the best position for the minimum sensitivity requirement of the probe. Set the probe so that it does not have to work at maximum sensitivity, as shown in Drawings 'B' and 'C'. After the probes have been wired up the sensitivity of the sensor should be adjusted so that when the steel bucket is moved away from the sensor by the maximum allowed misalignment distance, the sensor loses its influence and signals to the control box that the belt is out of alignment.

- **For rear mounting** for plastic buckets with steel bolt heads a sensor should be installed on either side of the rear of the trunking, each about ½" to the outside of the end cup bolt head, as on Drawing 'D'. Each sensor should be flush or protrude slightly through the trunking and be a maximum of 1½" from the cup bolt head, as shown in Drawing 'E'. When wired up the sensitivity of each sensor should be adjusted so that when the bucket bolt and belt is moved towards the other sensor, about 1" to 1½" dependent upon the allowed misalignment, the sensor loses it's influence and signals to the control box that the belt is out of alignment.

  NOTE: When adjusting the sensor depth, slacken the clamp bolt and also slacken the mounting bolts in the plastic block.

- The sensitivity should be initially adjusted to its minimum by turning the screw at the rear end of the sensor anti-clockwise and then the adjusting screw should be turned clockwise until the LED shows a steady pulse. The Mk 1 round sensor has 20 turns to maximum sensitivity and the Mk 2 round and surface mounting sensors only one turn to positive stops for maximum sensitivity. The sensitive areas of the probes are shown in Drawing 'G' and the variation of maximum sensitivity with the adjusting screw is shown in Drawing 'H'. For adjustment of probe sensor and control units in hazardous locations refer to paragraph 2.4.

NOTE: If the Motion/Alignment Sensors are to be mounted flush with the leg trunking, the hole in the trunking must be 3½" (approx.) diameter for the sensor to receive good signals from the passing buckets or bolts.

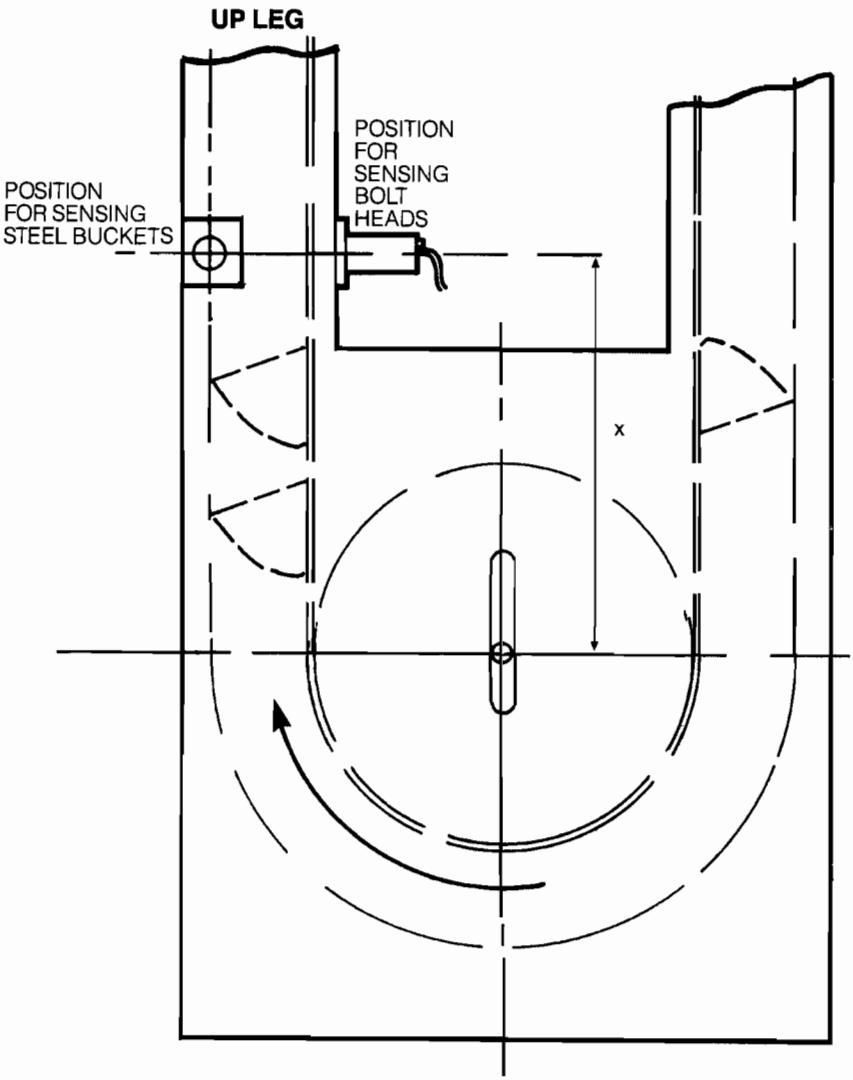
Please contact 4B if this mounting technique is to be applied.

(iii) ***BEARING TEMPERATURE SENSORS (GREASE THROUGH TYPE)***

- The standard temperature sensors, which are pre-set at 194°F (90°C) are screwed into the grease holes of the bearings for the elevator leg head pulley, boot pulley and jockey pulley, where fitted. If any of the sensors exceeds its switching temperature, a signal is sent to the control unit and will cause an alarm signal, eventually resulting in shutdown.
  Each sensor has a greasing by-pass and is installed in the bearing, as Drawing 'F'.

The standard temperature sensors, which are pre-set at 176°F (80°C) are screwed into the greas holes of the bearings for the elevator leg head pulley, boot pulley and jockey pulley, where fitted. any of the sensors exceeds its switching temperature, a signal is sent to the control unit and wi cause an alarm signal, eventually resulting in shutdown.
Each sensor has a greasing by-pass and is installed in the bearing, as Drawing 'F'.

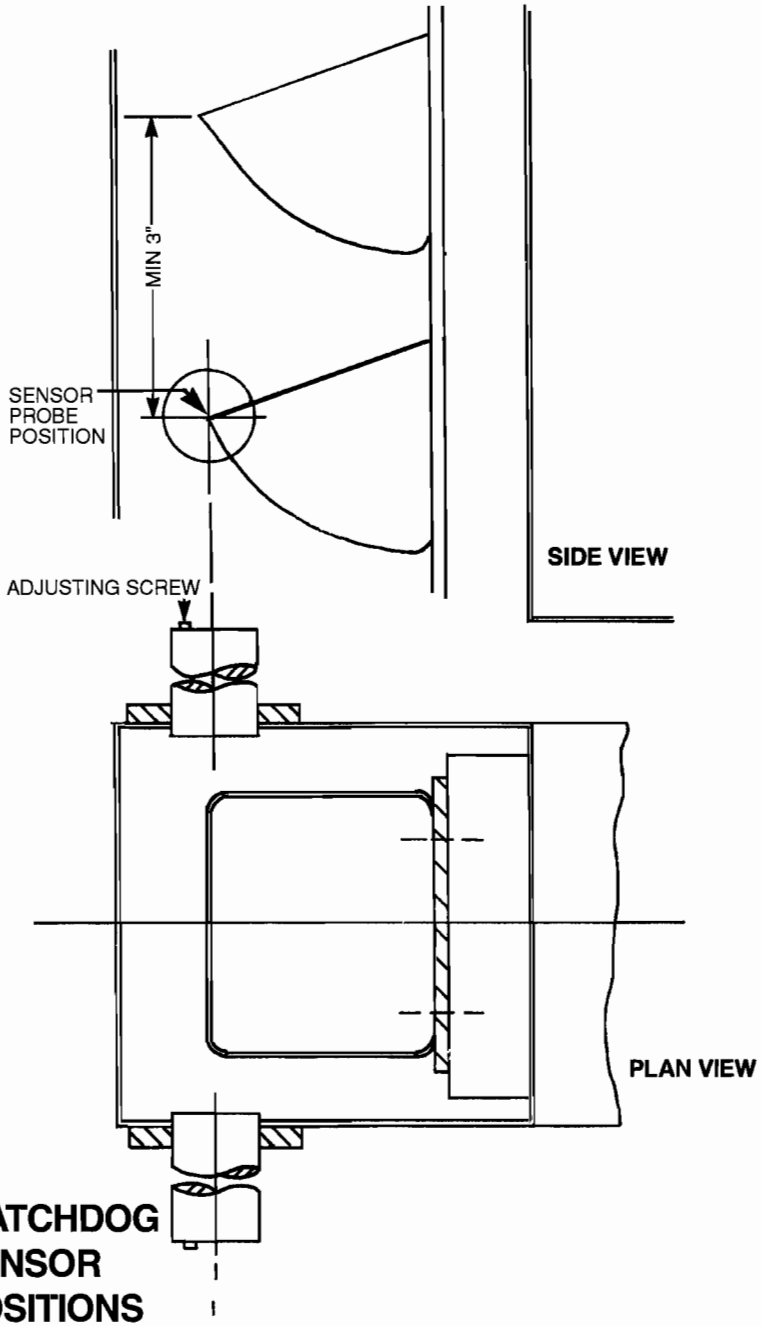
ELEVATOR BOOT



PROBE SENSING POSITIONS ON UP LEG

DRG. 'A'

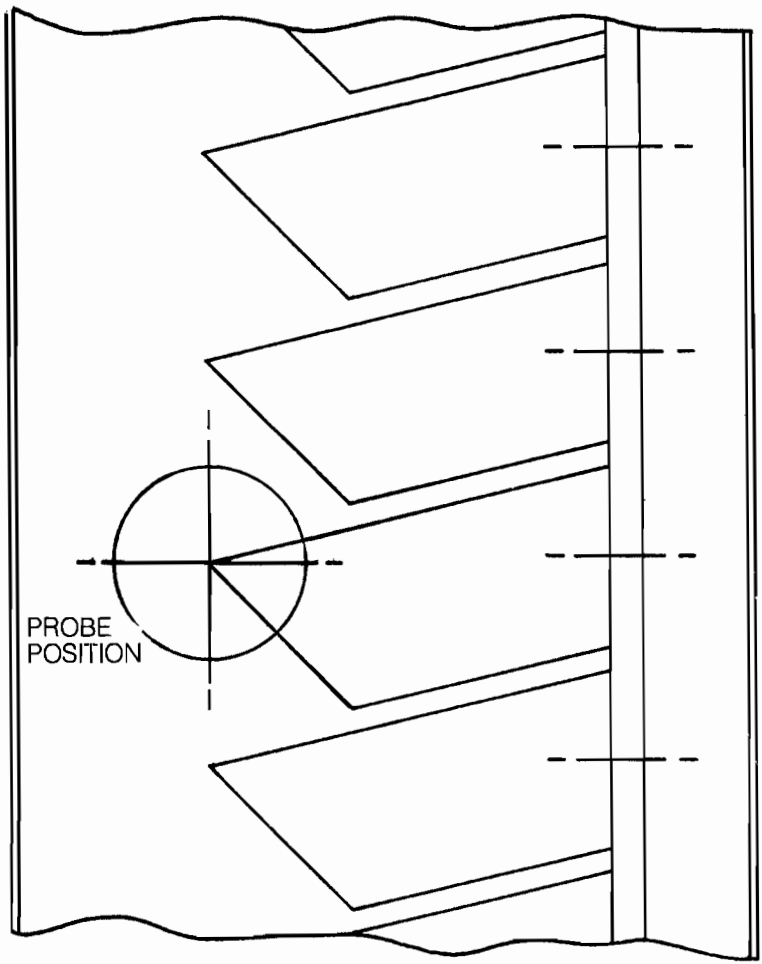
X = 3' - 0" (1M) Approx.



WATCHDOG SENSOR POSITIONS

FOR BELT ALIGNMENT AND BELT SLIP SENSING ON STEEL BUCKETS

DRG. 'B'

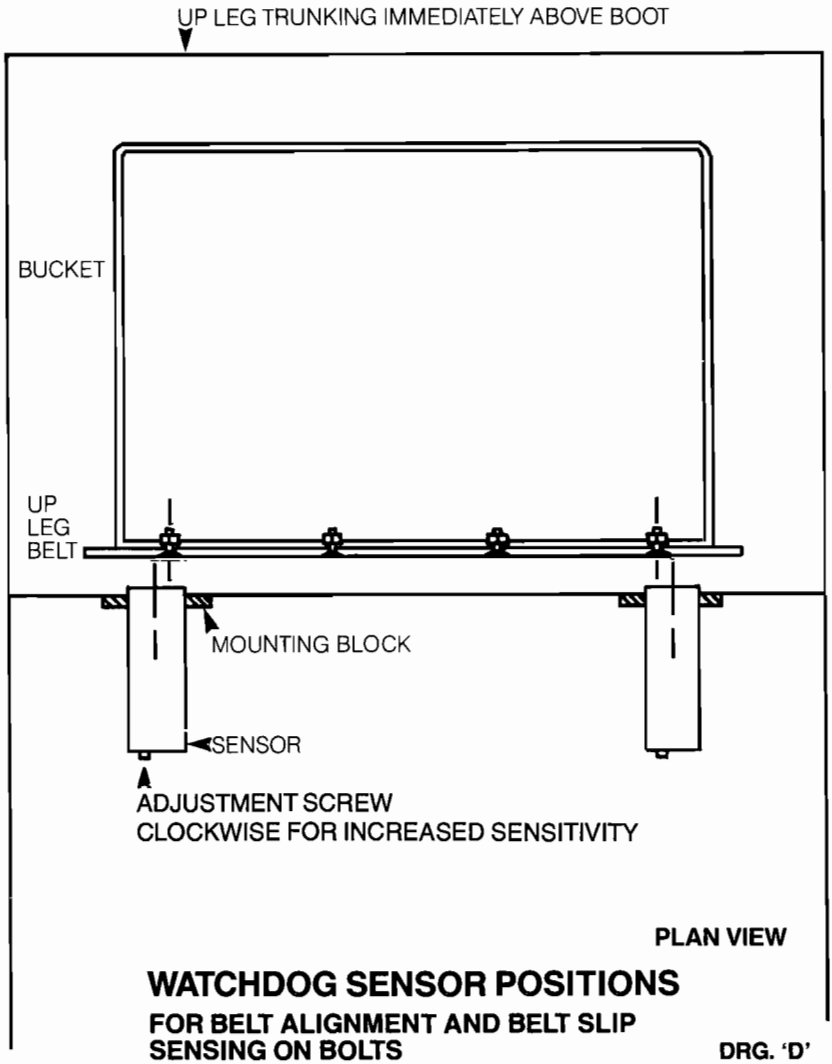


DRG. "C"

SIDE VIEW

WATCHDOG SENSOR POSITIONS

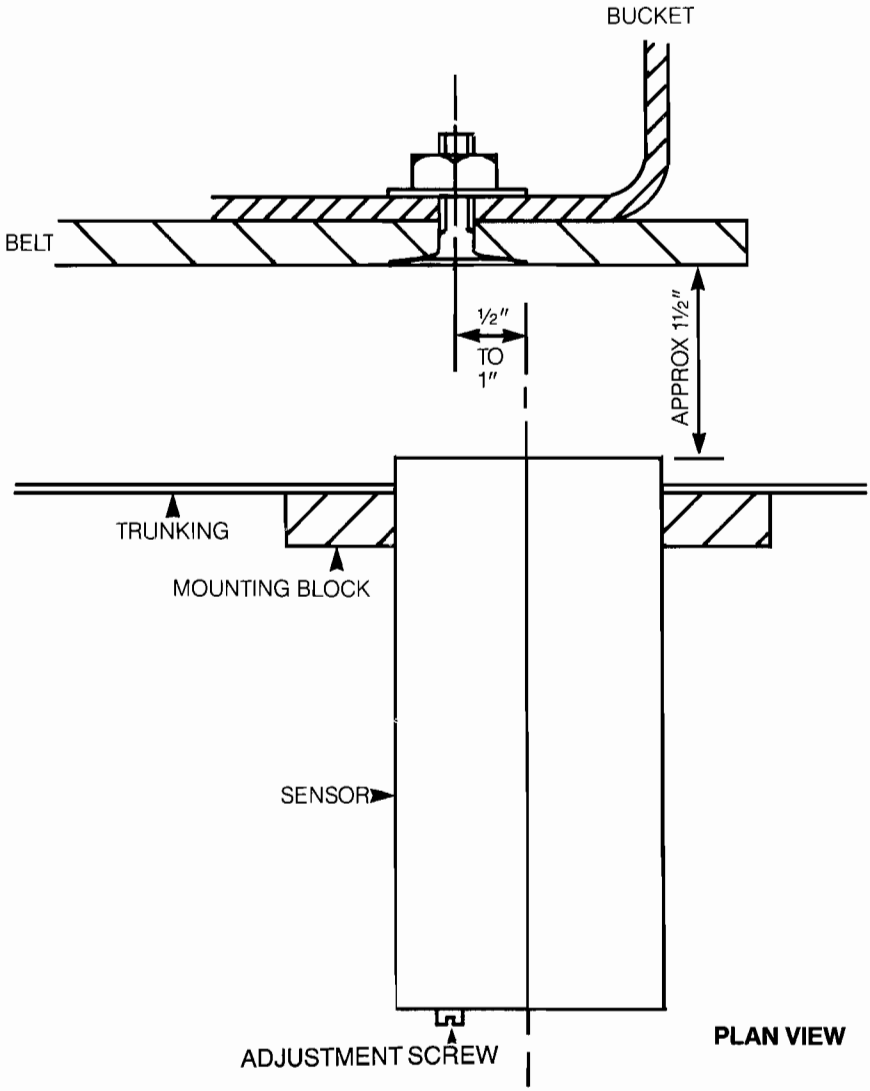
SIDE VIEW OF ELEVATOR LEG TRUNKING SHOWING BEST POSITION FOR THE INSTALLATION OF THE PROBE WITH G.B. BOTTOMLESS OR STARCO LOW PROFILE OR VERY CLOSE CENTERED BUCKETS TO GIVE THE MAXIMUM DIFFERENTIAL BETWEEN THE BUCKETS



WATCHDOG SENSOR POSITIONS

FOR BELT ALIGNMENT AND BELT SLIP SENSING ON BOLTS

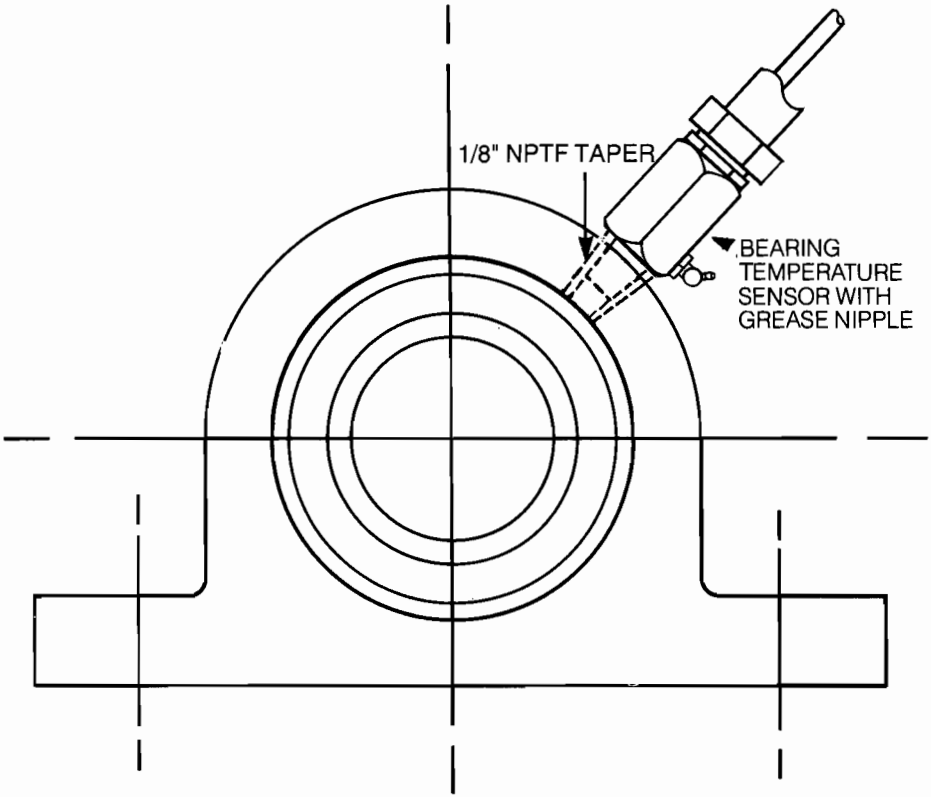
DRG. 'D'



WATCHDOG SETTING UP SENSOR

FOR BELT ALIGNMENT
SENSING ON BOLTS
DETAIL 'D'

DRG. 'E'

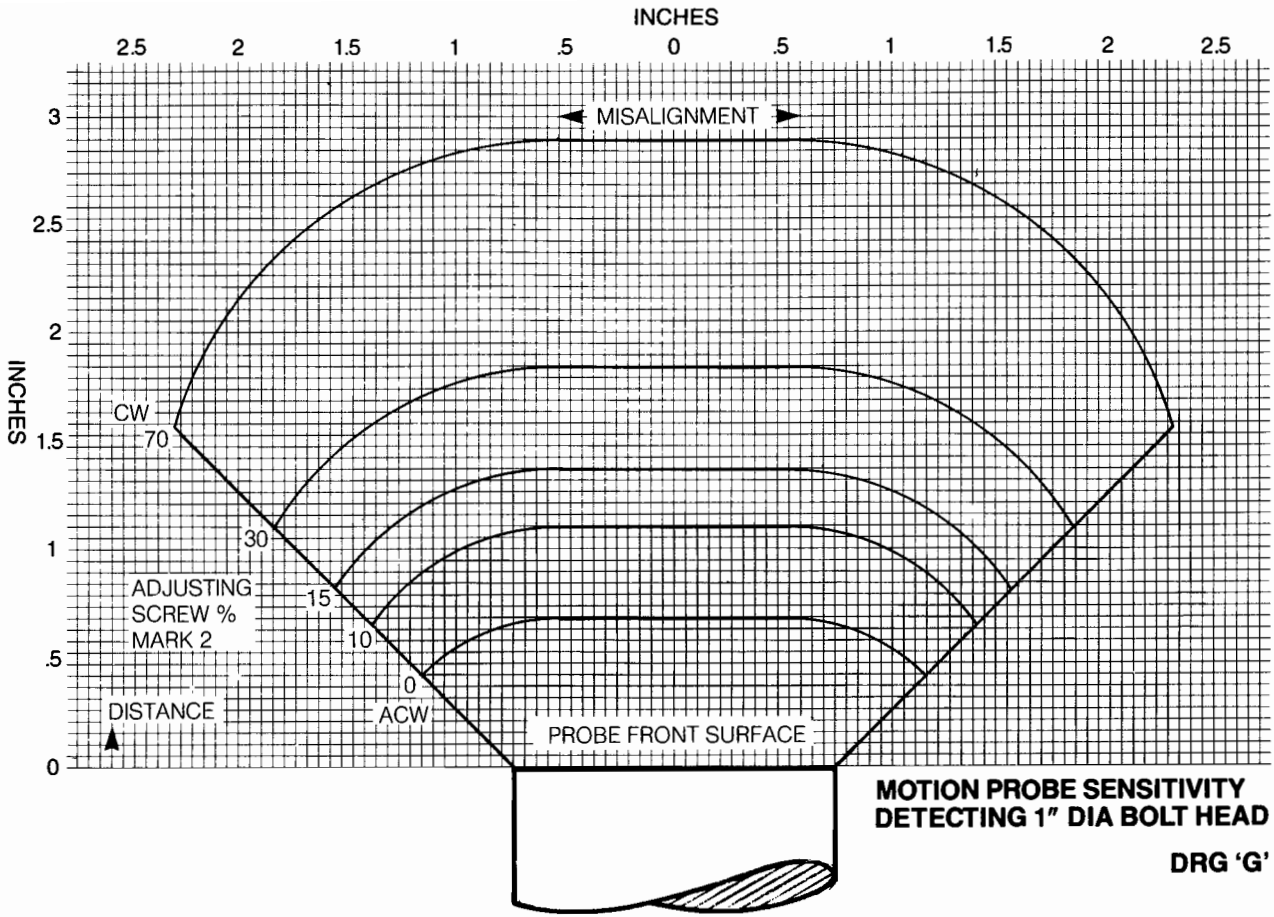


FITMENT TO BEARING OF TEMPERATURE SENSOR

DRG. 'F'

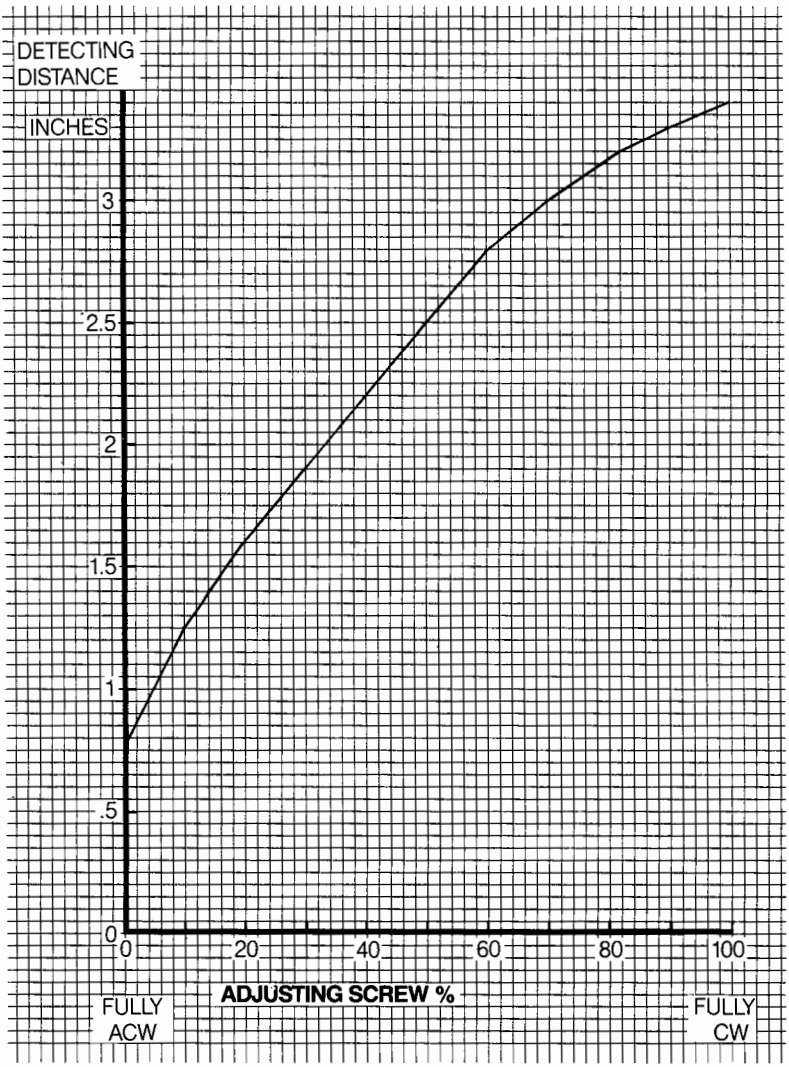
NOTE

The special temperature sensor probe for use in a Class II Division 1 location has a connection for liquidtight flexible metal conduit.



MOTION PROBE SENSITIVITY DETECTING 1″ DIA BOLT HEAD

DRG 'G'



MARK 2: MOTION PROBE SENSITIVITY WITH ADJUSTING SCREW

DRG 'H'

ACW — Counter clockwise
CW — Clockwise

ALL WIRING MUST BE IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES AND SHOULD BE UNDERTAKEN BY AN EXPERIENCED AND PROFESSIONAL, QUALIFIED ELECTRICIAN.

2.2. *Installation and Wiring - Non Hazardous Areas*

The installation of the motion probes should be done generally as described in paragraph 2.1. Wherever possible, the probes should be mounted in a position which is accessible for adjustment and protected from damage. As the probes will probably have to be moved slightly during adjustment, the wiring to them must be carried out in flexible conduit. Mount a conduit junction box within 6 ft (2 metres) of the motion probe — generally one junction box can be used for a pair of motion probes. Connect the probe(s) to the junction box using flexible conduit. Connect the junction box back to the control unit using either conduit or cable suitable for permanent wiring.

The installation of the temperature probes into the bearing housings should be done generally as describec in paragraph 2.1. Mount a conduit junction box within 6 ft (2 metres) of each probe (or each pair of probes). Connect the flexible cable from the temperature probe into the conduit junction box using a strain relief cable gland (cord clamp). Connect the junction box back to the control unit using either conduit or cable suitable for permanent wiring.

The wiring between the motion probes, temperature sensors and control unit has to be suitable for low level electrical signals (nominally 12 volts DC) and care should be taken to avoid electrical interference from other equipment. These wires should be run in either rigid steel conduit, without any other cables, or should be run with shielded wires, the shield being grounded at one end only. **We strongly recommend the use of shielded wires when wiring the motion probes to the microprocessor control unit.**

The control unit is designed for wall mounting either in a control room or near to the motor start equipment. However, as with all computerised systems care should be taken not to expose the microprocessor unit to excessive ambient temperatures.

It should be located where it is readily accessible for adjustment and for easy inspection to determine the nature of elevator problems. The three conduit entries are suitable for ½" conduit, but as the enclosure of the control unit is non-metallic, no ground continuity is provided through the enclosure. Each conduit must be terminated in a suitable bushing which provides ground continuity such as Allen-Bradley 1490-N19.

2.3. *Installation and Operation in Hazardous Locations*

The Watchdog equipment has been designed for use in certain hazardous locations, where the hazard is known to be Ignitable Dust.

If the Watchdog equipment is to be used on an elevator which will be handling grain or grain products, it is likely that the atmosphere inside the elevator leg during normal use will contain ignitable dust in suspension in the air. The location within the elevator leg is defined as a Class II Division 1 hazardous location.

If the elevator is contained within a building where ignitable dust is not normally in suspension in the air but can accumulate normally on the surfaces of equipment, this can also be hazardous. This location is normally defined as a Class II Division 2 hazardous location.

The Watchdog Motion Probes are designed for use in a Class II Division 1 location.

The Watchdog Control Unit and Standard Temperature Probes are designed for use in a Class II Division 2 location.

A Special Temperature Sensor Probe is available for use in a Class II Division 1 location.

Installation and Wiring — Hazardous Locations

The installation of the motion probes should be done generally as described in paragraph 2.1. Wherever possible, the probes should be mounted in a position which is accessible for adjustment and protected from damage. As the probes will probably have to be moved slightly during adjustment, the wiring to them must be carried out in liquidtight flexible metal conduit with approved fittings. Mount a dust tight conduit junction box within 6 ft (2 metres) of the motion probe — generally one junction box can be used for a pair of motion probes. Connect the probe(s) to the junction box using liquidtight flexible metal conduit with approved fittings. Connect the junction box back to the control unit using either conduit or cable suitable for permanent wiring and ensure that dusttight seals are used.

The installation of the temperature probes into the bearing housings should be done generally as described in paragraph 2.1. Mount a dust tight conduit junction box within 6 ft (2 metres) of each probe (or each pair or probes). Connect the flexible cable from the temperature probe into the conduit junction box using a strain relief cable gland (cord clamp) which meets dust tight requirements. Connect the junction box back to the control unit using either conduit or cable suitable for permanent wiring and ensure that dust tight seals are used.

The installation of the Class II Division 1 temperature sensor probes is identical to that on the standard temperature probe except that liquid tight flexible metal conduit with approved fittings is required between the temperature probe(s) and the conduit junction box.

If you are in any doubt, consult NEC articles 351A and 502-4.

The wiring between the motion probes, temperature probes and control unit has to be suitable for low level electrical signals (nominally 12 volts DC), and care must be taken to avoid electrical interference from other equipment. If rigid steel conduit is used, do not run any other cables in the same conduit. Avoid running the signal wiring near any motor cables or other heavy power cables.

We strongly recommend the use of shielded wires when wiring the motion probes to the microprocessor control unit.

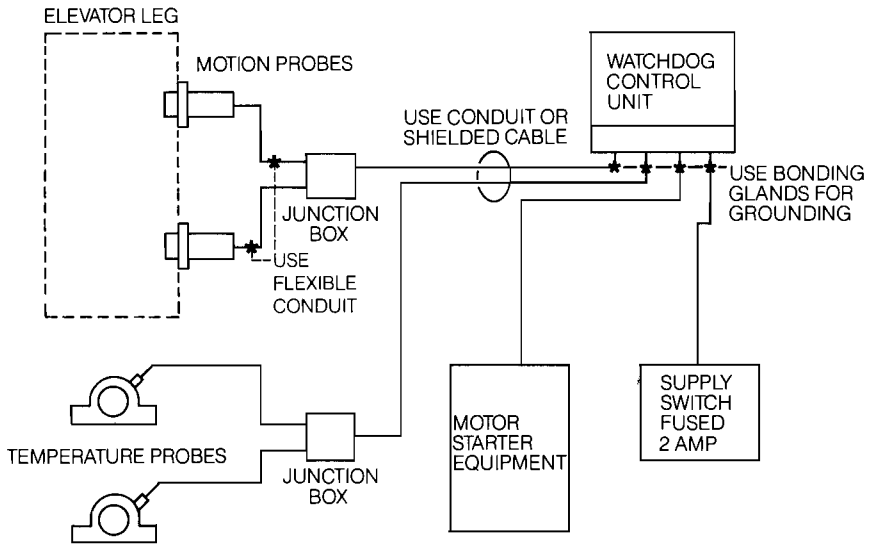
2.4 *Operation and Adjustment in Hazardous Locations*

The motion probes can be adjusted for physical position on the elevator leg, but great care must be taken to ensure that there is no possibility of the elevator belt or buckets striking the motion probes, and damaging the probes.

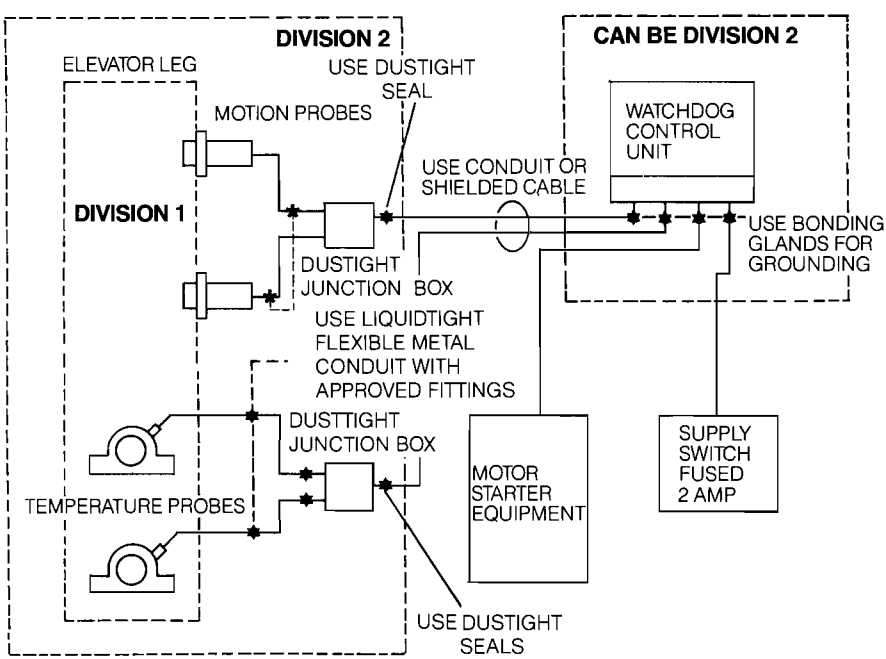
The control unit should not be opened whilst power is applied. When adjusting the internal switches during commissioning, switch off the power and wait for a few minutes before unfastening the main lid of the unit. The lid can then be removed to give access to the selector switches. When the switches have been adjusted, close and screw down the lid before applying power again. During running, the switch can be operated to calibrate or test the unit without any restriction.

3. ELECTRICAL WIRING

3.1.1 Block Diagram — Non Hazardous Locations



3.1.2 Block Diagram — Class II Hazardous Locations



3.2. *Wiring Requirements*

(i) Voltage to Control Unit (Model C1)
110 Volt ± 10% 50/60 Hz 15 VA
3 conductor wire 1 to 2 amps capacity

(ii) Voltage to Control Unit (Model C2)
220V ± 10% 50/60 Hz 15 VA
3 conductor wire 1 to 2 amps capacity

(iii) Sensors to Control Unit (Models C1 & C2)
12 Volts DC from Control Unit
Supply current 20 ma
4 conductor wire - Shielded

NOTE: Avoid running wires near any motor wires as this could cause false signals.

3.3 *Wiring Diagrams for Alternative Methods of Control*

(i) Arrangement to stop the elevator leg only — see Diagram 'I' and schematic drg. 'J'.

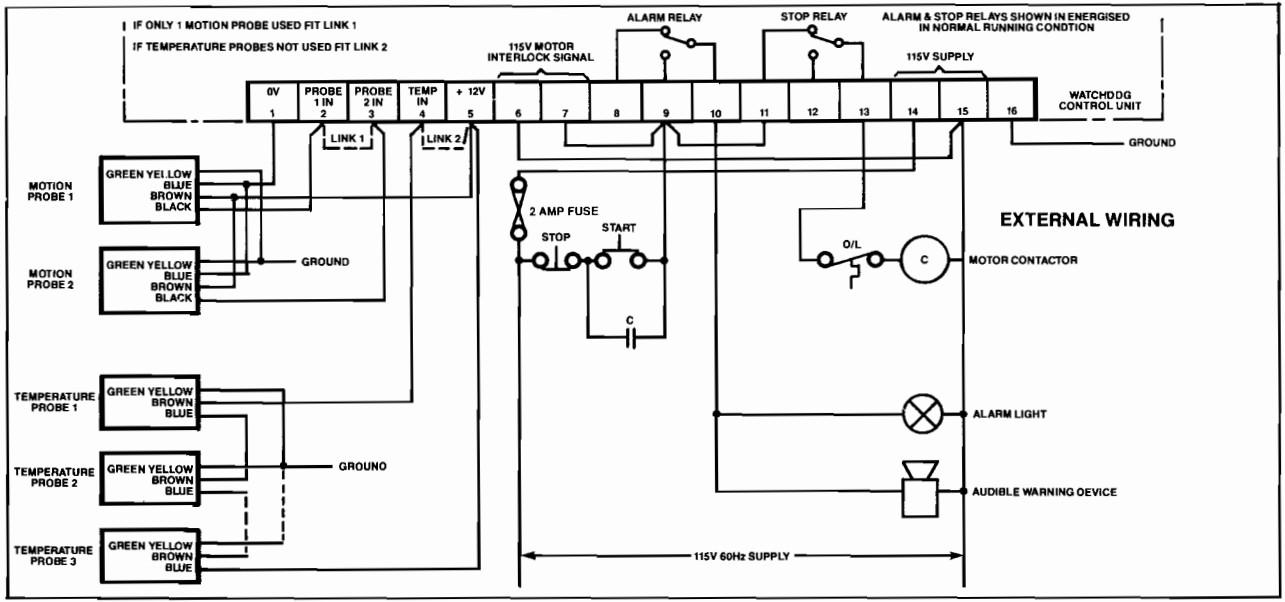
(ii) Arrangement to stop feeder and elevator leg/manual restart — See Drg. 'K'.

(iii) Arrangement to stop feeder and elevator leg with a feeder auto restart — See Drg. 'L'.

(iv) Arrangement to stop feeder with manual restart and elevator leg stop after delay — See Drg. 'M'.

(v) Arrangement to stop feeder with auto restart and elevator leg stop after delay — See Drg. 'N'.

NOTE: **Starter Interlock.**
In all cases a voltage must be applied across terminals 6 and 7 when the motor is running to establish the starter interlock. See table 3, Electrical ratings. This causes the alarm and stop relays to energise and activates the average speed measuring circuit and the start-up delay.



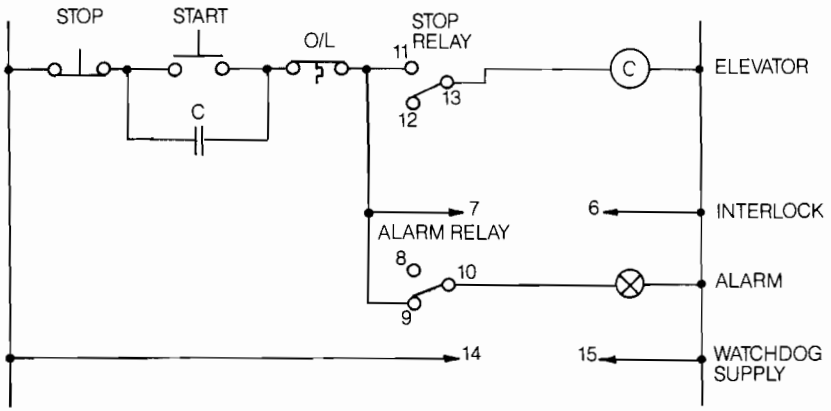
WIRING DIAGRAM 'I'

MODEL C1 115 VOLT SUPPLY

NOTE: **Starter Interlock.**

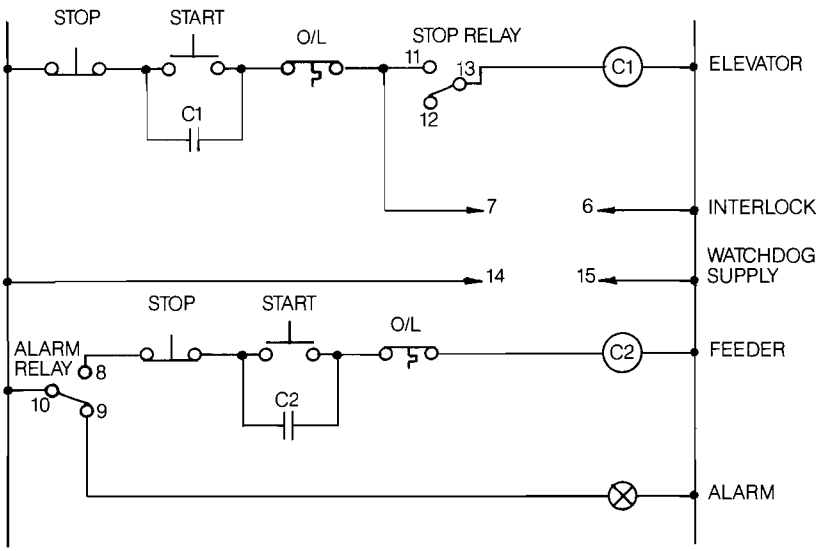
In all cases a voltage must be applied across terminals 6 and 7 when the motor is running to establish the starter interlock. See table 3, Electrical ratings. This causes the alarm and stop relays to energise and activates the average speed measuring circuit and the start-up delay.

Application 1
Watchdog arranged to stop the elevator
SCHEMATIC DRAWING 'J'



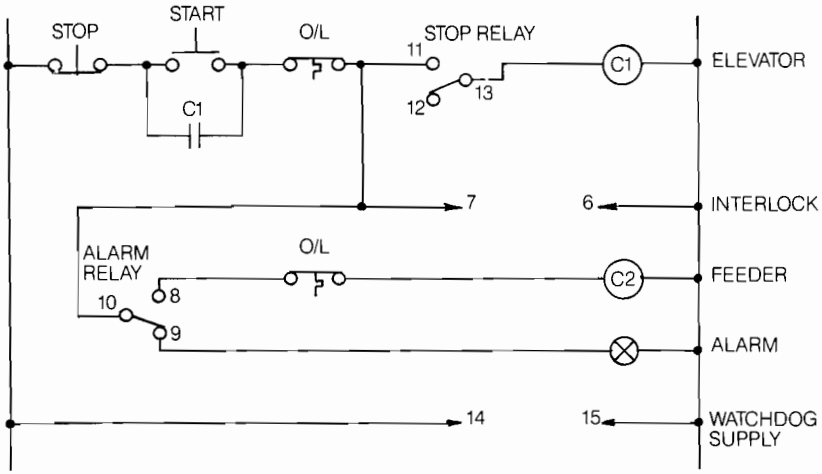
- Shown de-energised
- When start button operated, supply appears on 7
- This causes alarm and stop relays to energise
- C energises and holds in — elevator starts
- Alarm condition illuminates lamp
- Stop condition stops elevator and extinguishes alarm lamp

Application 2
Watchdog arranged to stop feeder and elevator — manual re-start
DRAWING 'K'



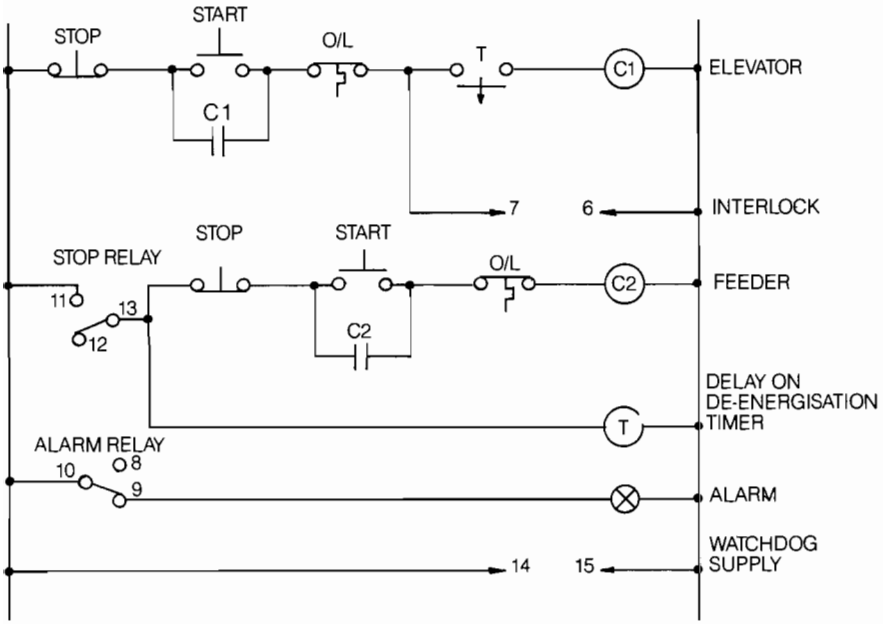
- Shown de-energised.
- Elevator must be started first — this causes supply to appear on 7 — alarm and stop relays energise.
- Elevator contactor C1 energises and holds in.
- Alarm lamp extinguished
- Feeder can be started — C2 energises and holds in.
- Alarm condition stops feeder — illuminates lamp
- When alarm condition cleared, lamp extinguished and feeder must be manually re-started.
- Stop condition stops elevator but alarm lamp stays illuminated

Application 3
Watchdog arranged to stop feeder and elevator — feeder auto re-start
DRAWING 'L'



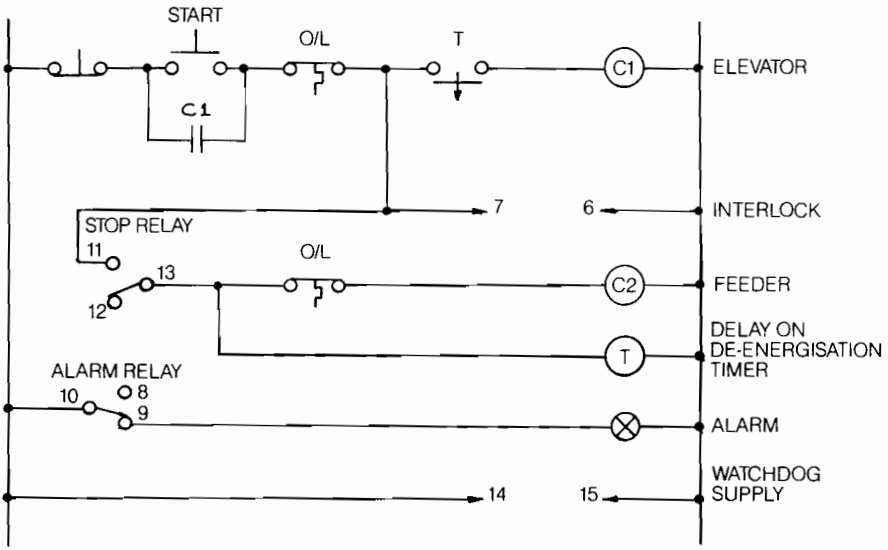
- Shown de-energised
- When start pushbuttons operate, supply appears on 7
- This causes alarm and stop relays to energise
- Elevator and feeder start together and C1 holds in
- Alarm condition stops feeder and illuminates lamp
- When alarm conditions cleared, lamp extinguished and feeder re-starts automatically
- Stop condition stops elevator and extinguishes alarm lamp

Application 4
Watchdog arranged to stop feeder — manual re-start. Elevator stops after time.
DRAWING 'M'



- Shown de-energised
- Elevator must be started first — this causes supply to appear on 7 — alarm and stop relays energise
- Timer energised and elevator starts, C1 holds in
- Feeder can be started — C2 holds in
- Alarm condition illuminates lamp only
- Stop condition stops feeder — timer starts to time
- When time expired, elevator stops
- Feeder must be re-started manually

Application 5
Watchdog arranged to stop feeder — auto re-start. Elevator stops after time.
DRAWING 'N'



- Shown de-energised
- Elevator must be started first — this causes supply to appear on 7 — alarm and stop relays energise.
- Timer energised and elevator starts, C1 holds in
- Feeder can be started — C2 holds in
- Alarm condition illuminates lamp only
- Stop condition stops feeder — timer starts to time
- When time expired, elevator stops
- Feeder re-starts automatically

4. OPERATING INSTRUCTION

The equipment should have been installed and wired in accordance with the Installation Instructions and in accordance with National and Local Codes.

NOTE: FIRST TIME USE

The control unit contains a small re-chargeable battery for memory protection and you must ensure that this battery is at least partly charged before attempting to operate the unit. To charge the battery, connect a power supply to the unit and switch on for a few hours (theoretical full charge time is 100 hours). Your supplier may have done this charging for you. Under normal use, the battery will be automatically maintained in a fully charged state.

Initial Calibration

Calibration of the unit to the normal speed of the machine is achieved by running the machine under light load and operating the CALIBRATE switch. When the unit is being used for the first time, no calibration will be stored in memory and this will have the following effect.

The ALARM and STOP relays will be energised and this will allow you start the machine. When the start up time delay has expired the ALARM relay will pulse continuously and the lower five red lamps on the unit will flash. Check that the machine is running at normal speed and then turn the switch to the CALIBRATE position and hold in that position for a few seconds until the five lamps illuminate steadily and the ALARM relay energises – then return the switch to the RUN position. The unit will stay in this condition for about 16 seconds during which time it will measure the rate of the input signals from the probes, average the measured rates and store the average rate in memory. When this has been completed, the five lamps will extinguish and the unit will be in full operation. Any change of speed or misalignment or temperature beyond the accepted levels will now cause the appropriate ALARM and STOP action.

Re-Calibration

You can re-calibrate the unit at any time while the machine is running normally, by turning the switch to the CALIBRATE position as before. You are strongly advised against indiscriminate re-calibration, as you may be attempting to calibrate the unit while the machine is not running normally. If you have persistent ALARM conditions there is either something wrong with the machine or the adjustment of the probes.

Wrong Calibration

If the unit was calibrated while the machine was not running at full speed, it will display overspeed, alarm and stop when running at full speed. This indicates that the calibration is wrong and the belt tension should be checked and adjusted as required. The unit should then be re-calibrated.

If the unit **PREVENTS** the machine from starting because of wrong calibration, turn the switch to **CALIBRATE** and hold it in this position while the machine is started, until the five lamps illuminate.

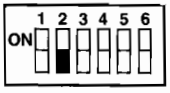
Setting the Selector Switches

Fully slacken the four screws holding the lid of the control unit, *and remove the lid.* On the circuit board, along the lower edge, are two sets of selector switches. The left hand set of switches allows the selection of various ranges as follows.

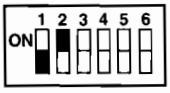
The six small switches on the left hand set are adjusted by sliding UP or DOWN with a small screwdriver. When a switch is UP it is ON.

Switches 1 and 2 - **Start-up Delay**

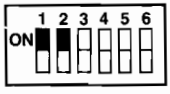
This is the time delay after starting the motor, during which the ALARM and STOP relays remain energised, to allow the machine to reach normal speed.



SWITCH 1 ON or OFF
SWITCH 2 OFF — 5 SECS DELAY



SWITCH 1 OFF
SWITCH 2 ON — 15 SECS DELAY

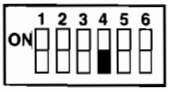


SWITCH 1 ON
SWITCH 2 ON — 30 SECS DELAY

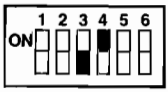
During the start up delay the elevator is monitored for acceleration.

Switches 3 and 4 - **Alarm and Stop trip percentages**

These are the underspeed and overspeed percentages of normal speed, beyond which the relevant relays de-energise. For example, a 5% trip setting would cause an ALARM when the speed falls to less than 95% of normal or when the speed rises to more than 105% of normal.



SWITCH 3 ON or OFF
SWITCH 4 OFF — ALARM 5% STOP 15%

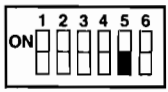


SWITCH 3 OFF
SWITCH 4 ON — ALARM 10% STOP 20%

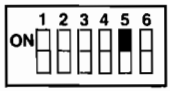
SWITCH 3 ON
SWITCH 4 ON — ALARM 15% STOP 20%

Switch 5 - **Speed range**

Two speed ranges are provided but the low speed range provides a better accuracy and resolution of low speeds.



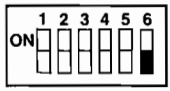
SWITCH 5 OFF - LOW SPEED RANGE 20-200 PULSES/MIN.



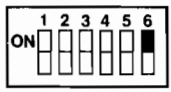
SWITCH 5 ON - HIGH SPEED RANGE 200-2000 PULSES/MIN.

Switch 6 - **Display range**

Two display ranges are provided which combine with the speed ranges to give three different display ranges



SWITCH 6 OFF - LOW DISPLAY RANGE — 99.99 IN LOW SPEED, 999.9 IN HIGH SPEED



SWITCH 6 ON - HIGH DISPLAY RANGE — 999.9 IN LOW SPEED, 9999 IN HIGH SPEED

Setting the Display

The right hand set of selector switches can be adjusted with a small screwdriver to give any number in the range of 00 to 99. The function of these switches is to set the Scale Factor for the display, i.e. to change the displayed numbers from Pulses per Min. to some other units with may be more convenient for your installation. The Scale Factor is factory set to 12, which gives a display of pulses/minute. The equation for calculating the Scale Factor to the other units of display is as follows:-

DISPLAY = INPUT PULSES/MIN × SCALE FACTOR ÷ 12

Therefore: $\text{SCALE FACTOR} = \frac{\text{DESIRED DISPLAY} \times 12}{\text{INPUT PULSES/MIN}}$

NB: Ignore the decimal point in the Desired Display value for this calculation. In many cases, it will not be possible to set the Scale Factor to the exact figure required, in which case the nearest number should be used.

Example 1 : Percentage

If the elevator normal speed is 850 PULSES/MIN
And the desired display is 100.0 (%)

$$\text{SCALE FACTOR} = \frac{1000 \times 12}{850} = 14.1$$

Set the Scale Factor to 14
Set Switch 6 to OFF to put the decimal point in the correct position.

Example 2 : Tons/Hour
If the elevator normal speed is 420 PULSES/MIN
And the desired display is 3000 TONS/HOUR

$$\text{SCALE FACTOR} = \frac{3000 \times 12}{420} = 85.7$$

Set the Scale Factor to 86
Set Switch 6 to ON to put the decimal point in the correct position.

There are two special cases for setting the Scale Factor which are useful to know -

- With Scale Factor set at 12, the display will show the input Pulses/min. directly.
- With Scale Factor set to the pitch in inches of the buckets on the belt the display will show the belt speed in feet/min.

Example 3 : Feet/Min
If the pitch of the elevator buckets is 9 inches
And the desired display is in feet/min.

Set the Scale Factor to 9
Set Switch 6 to ON to put the decimal point in the correct position.

Example 4 : Feet/Min
If the pitch of the elevator buckets is 4.5 inches
And the desired display is belt speed in feet/min

Set the Scale Factor to 4
Set Switch 6 to ON

Alternatively: Set the Scale Factor to 45
Set Switch 6 to OFF for greater accuracy of the display.

Example 5 : Cubic Metres/Hour
Calculate the standard speed of the elevator in pulses/minute.

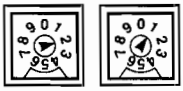
Example - using a bucket with 2.9 litres capacity @ 2.5 m/sec and 9/metre

2.5 m/sec × 60 × 9 = 1350 pulses/min

Calculate the capacity required at 2.5 m/sec (1350 pulses/min)

Example - 2.9 litre × 3.6 × 2.5 m/sec × 9 cup/metre = 235 m/hr

$$\text{SCALE FACTOR} = \frac{235\text{m}^3/\text{hour} \times 12}{1350 \text{ pulses/hr}} = 2.09$$



Set the Scale Factor to 2.1
Set Switch 6 to OFF.

Example 6 : Tonnes/Hour
1) Calculate the standard speed of the elevator in pulses/min.

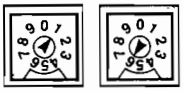
Example - using a bucket with 2.9 litres capacity @ 2.5 m/sec and 9/metre

2.5 m/sec × 60 × 9 = 1350 pulses/min

2) Calculate the tonnes/hours

Example - 2.9 litre × 3.6 × 2.5 m/sec × 9 cup/m × 0.752 density = 176.64

$$\text{SCALE FACTOR} = \frac{177 \text{ tonnes/hour} \times 12}{1350} = 1.57$$



Set the Scale Factor 1.6
Set Switch 6 to OFF

Example 7 : Metres/sec to mm/sec or cms/sec

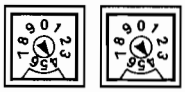
Calculation $\frac{12}{\text{buckets/metre} \times 60}$ = Scale Factor

Example: $\frac{12}{9 \text{ buckets/metre} \times 60}$ = 0.022

Set the Scale Factor to 22
Set Switch 6 to ON = mm/sec
Set Switch 6 to OFF = cms/sec

Ft/Min

Example: Bucket Pitch @ 9/metre = 4.375 inches



Set Scale Factor to 4.4

Percentage. If normal speed is 1350 pulses/min

Example : $\frac{1000 \times 12}{1350}$ = 8.88

Set Scale Factor to 8.9

Examples 5, 6 & 7

All of the switches concerned with the display settings can be operated without affecting the speed calibration or speed trip settings, i.e. they only change the numbers which are displayed not the actual speeds.

If at any time the display shows — — — —, this indicates an over-range condition, i.e. a number greater than 9999 is being displayed. This usually means that the scale factor is incorrectly set or that the wrong speed or display range has been selected.

Example 8: Bushels/Hour

1 Calculate the standard speed of the elevator in pulses/min. Example: Using one row of buckets each with 377 cu ins capacity at 600 ft/min and at 6″ spacing.

$\frac{600 \text{ ft/min} \times 12}{6\text{″ Spacing}}$ = 1200 Pulses/min

2 Calculate the capacity required at 600 ft/min (1200 pulses/min)

Example: $\frac{1 \text{ Row} \times 377 \text{ cu ins} \times 0.3349 \times 600 \text{ ft/min}}{6\text{″ spacing}}$ = 12,626 BPH

Scale Factor = $\frac{12626 \text{ BPH} \times 12}{1200 \text{ Pulses/min}}$ = 126

Set scale factor to 13
Set switch 6 to ON = BPH and
BPH ÷ 10 if over 9,999 BPH capacity

Example 9: Cubic feet/hour

1 Calculate the standard speed of the elevator in pulses/min. Example: Using one row of buckets each with 430 cu ins capacity at 660 ft/min and at 8″ spacing.

$\frac{660 \text{ ft/min} \times 12}{12\text{″ Spacing}}$ = 990 Pulses/min

2 Calculate the capacity required at 660 ft/min

Example: $\frac{1 \text{ Row} \times 430 \text{ cu ins} \times 720 \times 660 \text{ ft/min}}{8\text{″ spacing}}$ = 14,781 cu ft/hr

Scale Factor = $\frac{14781 \text{ cu ft/hr} \times 12}{990 \text{ Pulses/min}}$ = 179

Set scale factor to 18
Set switch 6 to ON= CFH and CFH ÷ 10
if over 9,999 cu/ft hr capacity

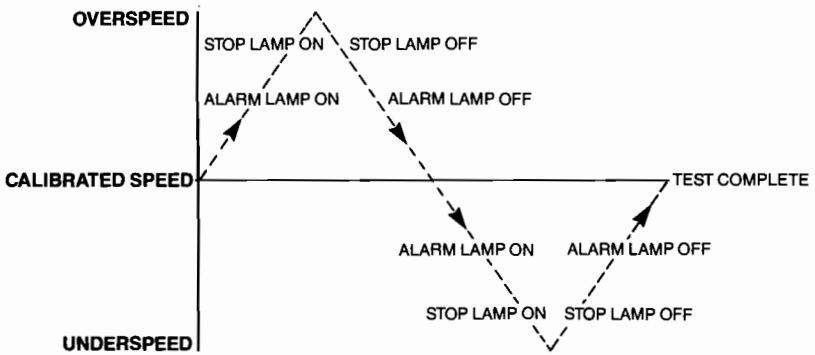
The Test Function

When the control unit has been calibrated and when Switches 3 and 4 have been adjusted for the desired Alarm and Stop trip percentages, the TEST function can be used to show the actual Alarm and Stop trip speeds and to prove the operation of the control unit throughout the range of these speeds.

To perform the TEST function, turn the keyswitch to TEST and, after a few seconds, the following routine will begin (the switch can be returned to RUN at this point).

1. The display will show the CALIBRATED SPEED for about four seconds.
2. The display will start to increase (as if the speed of the machine was increasing) and after a few seconds it will reach the value of the OVERSPEED ALARM. The display will stop at this value for about four seconds and the OVERSPEED and ALARM lamps will illuminate but the Alarm relay will not operate.
3. The display will increase further until it reaches the value of the OVERSPEED STOP; it will stop at this value for about four seconds and the STOP lamp will illuminate (the OVERSPEED and ALARM lamps remain illuminated) but the Stop relay will not operate.
4. The display will increase futher beyond the OVERSPEED STOP value then it will start to decrease.
5. The display will continue to decrease, extinguishing the STOP lamp as it decreases past the OVERSPEED STOP value and extinguishing the OVERSPEED and ALARM lamps as it decreases past the OVERSPEED ALARM value; it will not pause as it decreases through these values.
6. The display will continue to decrease through the Calibrated Speed until it reaches the value of the UNDERSPEED ALARM. It will stop at this value for about four seconds and the UNDERSPEED and ALARM lamps will illuminate but the Alarm relay will not operate.
7. The display will decrease further until it reaches the value of the UNDERSPEED STOP; it will stop at this value for about four seconds and the STOP lamp will also illuminate. Again the Stop relay will not operate.
8. The display will decrease further beyond the UNDERSPEED STOP value then it will start to increase again.
9. The display will continue to increase, extinguishing the STOP lamp as it increases past the UNDERSPEED STOP value and extinguishing the UNDERSPEED and ALARM lamps as it increases past the UNDERSPEED ALARM value; it will not pause as it increases through these values.
10. The display will continue to increase until it reaches the Calibrated Speed at which point the test is completed. The display will then show the current value of the machine speed.

The following diagram will serve to illustrate the Test function:



The TEST function can be performed at any time whether the machine is running or stationary; as the relays do not operate from the TEST function, the normal running of the machine is unaffected.

If, during the TEST function, a real ALARM or STOP condition occurs, the relevant relay will operate to take the appropriate action but the lamps will not show this action until the TEST is completed.

Normal Operation

As soon as the Motor Interlock input is energised to show that the motor has started, the start up timer begins to time out. When this time has expired, the input speed is compared to the Calibrated Speed and if it is within the preset limits, no action is taken.

When the machine is running, the two green lamps PROBE 1 and PROBE 2 will flash on or off once for each bucket or bolt that the probes detect.

These lamps actually show the signals after they have been processed by the control unit and they may not show the true phase relation of the signals. The speed display shows the current speed of the input signals — if there should be a difference in speed between the two probe signals it shows the higher speed of the two.

NOTE: The unit averages the rate of the input signals to smooth out any small variations in running speed and bucket pitch.

Underspeed Detection

If the machine speed falls below the ALARM trip speed, the ALARM and UNDERSPEED lamps will illuminate as soon as the control unit detects the condition. If the underspeed condition persists for more than about 1.5 seconds, the ALARM Relay will de-energise to provide the appropriate warning. If the speed then rises above the ALARM trip speed, the lamps are extinguished and the relay energises as soon as the higher speed is detected. However, if the speed falls further, below the STOP trip speed, the STOP lamp will illuminate and again, if the underspeed persists for more than about 1.5 seconds, the STOP relay will de-energise to stop the motor. When this situation occurs the UNDERSPEED, ALARM and STOP lamps remain illuminated and the ALARM and STOP relays remain de-energised. When the motor is re-started, the LEDs and relays are re-set.

Acceleration Detection

During start-up conditions the UNDERSPEED detector is inhibited by the start-up timer. Under these conditions the ACCELERATION of the elevator leg is monitored to ensure that blockages are quickly detected, also if the elevator fails to turn when the motor is started, this is quickly detected.

Overspeed Detection

If the machine speed rises above the ALARM trip speed the ALARM and OVERSPEED lamps will illuminate and if the condition persists for more than 2 seconds, or other factory preset delay, the ALARM relay will de-energise, generally as previously described for underspeed detection. Similarly, further increase of speed will cause the STOP lamp to illuminate and then the STOP relay will de-energise after 20 seconds, the lamps and relays remaining in this state after the machine has stopped. The main reasons for overspeed detection are either wrong calibration or interference from other electrical devices such as motors or the motion probe is adjusted too sensitively.

Misalignment Detection

If the input signals from one of the probes should cease (or fall to less than two thirds of the rate of the other probe) this is treated as a misalignment condition. If this condition persists for more than 2 seconds, the MISALIGNMENT and ALARM lamps will illuminate. If the fault does not clear within a further 13 seconds, or other factory preset delay, the ALARM relay will de-energise to provide the appropriate warning.

Bearing Over-Temperature Detection

If the temperature of any of the bearing temperature sensors rises above its trip point, the HOT BEARING and ALARM lamps will illuminate. After a further 1.5 seconds, the ALARM relay will de-energise to provide the appropriate warning.

Persistent Alarm Conditions

If the ALARM lamp is illuminated (and the ALARM relay de-energised) because of UNDERSPEED, OVERSPEED, MISALIGNMENT or HOT BEARING and if this condition persists for about three minutes, the STOP lamp will illuminate and the STOP relay will de-energise to stop the motor. If the alarm condition persists for less than three minutes and is then cleared, the amount of alarm elapsed time is stored in memory. This elapsed time is cancelled after an equal time without any alarm condition. Consequently, if the alarm condition is intermittent, but no single interval of alarm exceeds three minutes, the persistence of the alarm can eventually result in a STOP condition. The following example will serve to illustrate this useful function.

	ALARM ELAPSED TIME
ALARM for 2 minutes	2 MINS
NO alarm for ½ minute	1½ MINS
ALARM for 1 minute	2½ MINS
NO alarm for 1 minute	1½ MINS
ALARM for 2 minutes	MORE THAN 3 MINS (CAUSES STOP CONDITION)

A SHUTDOWN condition will of course stop the motor dependent upon the interlocking stopping circuit. When the motor re-starts, the alarm elapsed time is cancelled.

Short persistent alarm conditions will cause the relevant lamp to flicker on and off without de-energising the alarm or stop relays. This can serve as a warning that elevator maintenance may be required.

No Power Conditions

If the power supply to the control unit is removed, the internal battery will retain the CALIBRATED SPEED which was last stored in memory. When power is re-applied, this calibration will remain for immediate operation of the machine. The battery should be able to retain the memory for a few months without power but this depends on such factors as ambient temperature and the state of charge of the battery.

Contact manufacturer for technical assistance if required.

CHECK LIST
For problems after initial start-up

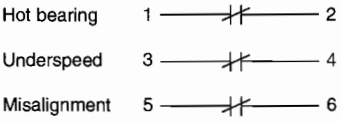
1. Are all the buckets magnetic (steel) or non-magnetic (plastic, rubber or stainless steel)? If magnetic, ie steel, the motion probe should be directed at the bucket as in drawings B and C. If non-magnetic, the motion probe should be directed at the steel bolt heads as drawings D and E.
2. Are all the buckets present on the belt (none missing) and equally spaced?
3. Is there excessive interference on the electrical power supply? Power conditioners and surge (spike) suppressor may have to be fitted.
4. Is the motor interlock wired correctly and is the correct interlock voltage present when the motor is running?
5. Has the Watchdog been calibrated (switch)?
6. Has the wiring for the probes been routed away from power cables? See paragraph 2.2.
7. Are the probes mounted away from plastic abrasion liners (which could cause static interference), electric motors and other magnetic fields?
8. Is the Watchdog circuit properly grounded?
9. Is the elevator leg grounded to prevent static build-up?
10. Is the belt running true?
11. Does the belt stay in alignment when material is fed into the elevator leg?
12. Is the elevator leg belt tightened up sufficiently to prevent belt slip?
13. Check that there is no tramp metal in the intake, no loose head pulley lagging, and no loose abrasion liners.
14. Have the probes been mounted rigidly and free from vibration?
15. Check that the probes do not foul the buckets or the bolts.
16. If sensing on the bolt heads, are the probes positioned on the outside of the bolt heads as drawing E?
17. Is the Micro-processor control unit overheating, if so mount in temperature-controlled environment of maximum temperature 104°F (40°C).
18. If the elevator bucket bolts are non magnetic (stainless steel), insert mild steel fender washers under the bolt heads as targets.
19. Check that high powered 'Walkie Talkie' radios are not operated immediately near the Watchdog control unit or probes as this will affect the performance.
20. If your bucket elevator has a weighted take up please contact '4B' to ensure sufficient weight is placed upon it.
21. If the "Watchdog" is used in conjunction with a PLC (programmable logic controller) it is possible for a residual voltage to appear across terminals 6 and 7. Contact '4B' if this occurs.

ACCESSORIES AND MODIFICATIONS

1.Custom 'EPROMS'
WDEPV31 - Standard EPROM (Mk1).
WDEPV41 - No shutdown on misalignment, only alarm (Mk1).
WDEPV51 - No shutdown on overspeed, only alarm (Mk1).
WDEPV61 - Wide parameter, troublesome elevators (Mk1).

WDEPV32 - Standard EPROM (Mk2).
WDEPV42 - No shutdown on misalignment, only alarm (Mk2).
WDEPV52 - No shutdown on overspeed, only alarm (Mk2).
WDEPV62 - Wide parameter, troublesome elevators (Mk2).

2. PLC Interface Board
Provides voltage-free (isolated) relay outputs for:



Contacts rated 0.5A
at 250VAC max
(Supression required for
inductive loads)

Contacts shown in the healthy energised condition.
Contacts open when a fault condition is detected.

FAULT FINDING

	SYMPTOM	CAUSE	REMEDY
1.	LED on motion probe does not flash	Probe too far away from buckets Probe adjustment incorrect Wiring connection faulty	Move closer to bucket if possible Turn screw clockwise Check wiring
2.	LED on motion probe flashes excessively	Probe too close to buckets Probe adjustment incorrect Interference in wiring	Move away from buckets Turn screw anti-clockwise Use shielded cable and rigid conduit
3.	PROBE LED on control unit does not flash	Elevator is not running Motion probe not operating Wiring fault	See 1 above and Table 5
4.	HOT BEARING LED 'ON'	Bearing is HOT Wiring connection faulty	Check the bearing Check wiring
5.	MISALIGNMENT LED 'ON'	Elevator belt is misaligned Motion probe not adjusted	Check the belt See 1 and 2 above
6.	UNDERSPEED LED 'ON'	Elevator belt is slipping Incorrect calibration	Check the belt Check belt speed and re-calibrate
7.	OVERSPEED LED 'ON'	Incorrect calibration	Check belt speed and re-calibrate
8.	ALARM LED 'ON'	HOT BEARING LED 'ON' MISALIGNMENT LED 'ON' UNDERSPEED LED 'ON' OVERSPEED LED 'ON' Alarm trip settings incorrect	See 4 above See 5 above See 6 above See 7 above Refer to instructions and set switches
9.	STOP LED 'ON'	Alarm accumulated for 3 min. Severe underspeed Severe overspeed Stop trip settings incorrect	Check cause of alarm See 6 above See 7 above Refer to instructions and set switches
10.	Speed display unstable	Incorrect probe adjustment Missing buckets/bolts	See 1 and 2 above Replace
11.	Speed display ' — — — — '	Over-range ie greater than 9999	Refer to instructions and set switches
12.	Speed display incorrect	Scale factor incorrectly set	Refer to instructions and set switches
13.	Elevator fails to start	STOP LED stays 'ON'	Check 'interlock' wiring.
14.	Elevator starts but fails to keep running	Start-up time too short Not calibrated Incorrect calibration Motion probe not adjusted	Refer to instructions and set switches Check belt speed and calibrate Check belt speed and re-calibrate See 1 and 2 above
15.	Five RED LED's flashing	Not calibrated	Check belt speed and calibrate
16.	Power on, but unit does not work	Micro-processor may be in a wait condition	Switch off the power for a short time and then switch back on
17.	Speed displays 'P'	Supply voltage low	Check supply voltage
18.	Speed display flashes	Interlock voltage present but speed zero	Check wiring to interlock
19.	Speed display flashes	No interlock voltage	Check wiring to interlock

If any questions arise please call '4B Elevator Components' 24-hour hotline.

WATCHDOG CONTROL UNIT

INSTRUCTIONS FOR FITTING ALTERNATIVE OR CUSTOM SOFTWARE EPROM

An EPROM device (Electrically Programmable Read Only Memory) is fitted in each Watchdog Control Unit. This device contains all of the control instructions for the Control Unit. The EPROM is illustrated in FIG. 1 so that it may be easily recognised.

CAUTION — The EPROM is fragile — take care note to bend the pins out of alignment.

CAUTION — The EPROM is easily damaged by static electricity and is protected during shipping and handling by conductive wrapping/packing material. Do not remove this wrapping until you are ready to fit the EPROM.

CAUTION — The EPROM is easily erased by strong sunlight. Do not remove the identification label which also covers the transparent window.

If you are unsure about the above cautions and the following procedure, you are advised to contact an electronics technician to do the work for you.

1. Switch off power to the Watchdog Control Unit.
2. Wait a few minutes.
3. Open the main lid of the Control Unit by unscrewing the four large screws and removing the lid.
4. Remove the four nylon nuts which secure the aluminium backplate to the back of the lid, noting the location of the earth (grounding) lead. If the earth (grounding) lead (shielded/ESD cable) has not been fitted, contact manufacturer.
5. Remove the four hexagon bushes and lift off the circuit board, leaving the cable connection intact.
6. Refer to FIG. 2 to identify the existing EPROM.
7. Using an approved IC extraction tool, remove the existing EPROM from the socket on the printed circuit board by pulling firmly and straight out of the socket and place it in conductive wrapping such as aluminium foil.
8. Using an approved IC insertion tool, grasp the replacement EPROM carefully, checking that the notch at the end of the EPROM is on the left. Check that all 24 pins are perfectly straight.
9. Insert the EPROM into its socket, taking care that all 24 pins are aligned and push evenly and firmly until it is retained in the socket.
10. Remove the IC insertion tool and firmly push the EPROM until it is fully seated in the socket.
11. Check that none of the pins have been bent.
12. Refit the backplate and replace the nylon nut, re-connect earth (grounding) lead.
13. Close the lid and tighten the four screws.
14. Apply power to the control unit and check that the calibration is satisfactory by operating the TEST switch.

FIG. 1. EPROM

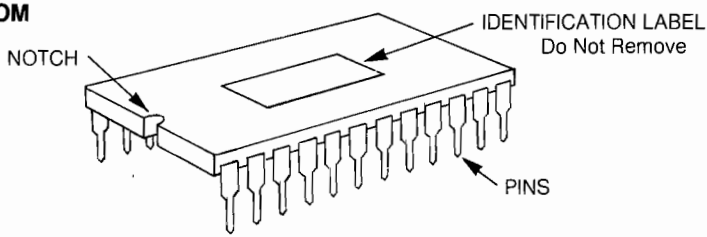


FIG. 2. LOCATION OF EPROM ON P.C.B.