

Operating Manual for Models :

Model 4004 / Model 5004

Programmable
Load Cell Indicator /
Controller



Safety

This equipment is supplied by a mains voltage which can cause an electric shock injury. Before removing the circuit board from its housing, switch the instrument off, isolate it from the mains power supply and make sure that it cannot be connected inadvertently by other persons.

If the circuit board is removed from its housing, do not apply power to the instrument unless specifically instructed to do so in these instructions. When working on live equipment, exercise great care, use insulated tools and test equipment, and do not work alone.

When fitting option boards, always put the circuit boards back in the housing with the back-plate securely fastened before powering up the instrument.

When handling circuit boards, ensure that full anti-static precautions are observed.

Replace mains fuse with one of an equivalent type or rating.

Cleaning

Do not clean the instrument while the instrument is on. Harsh abrasives, solvents, scouring cleaners and alkaline cleaning solutions, such as washing soda, should not be used especially on the display window. The outside of the instrument may be wiped down with a slightly damp clean cloth (lightly moistened with water only). Under no circumstances should you attempt to wipe the inside of the instrument.

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Introduction

The Model 4004 is a 4 digit (-1999 to 9999) LED indicator & Model 5004 is a 5 1/2 digit (-199999 to 199999) LED indicator. These DIN 48 x 96, high accuracy, high-quality load cell indicators are designed for mV inputs from load cells, strain gauges & strain gauge pressure transmitters.

The stable bridge excitation voltage includes sense feedback to compensate for line variations. The precision differential instrumentation op amp front end input ensures high stability and accuracy.

Options include programmable voltage or current analog output, alarm setpoints up to four alarms, tare function (front pushbutton & remote), peak / valley (max / min) hold, RS 232 & RS485 communications & lots more.

A feature of this programmable indicator / controller is the calibration method. Pre-calibrated ranges can be allocated zero and full scale values and these can be adjusted on site to allow for back-balance (deadweight) offset and span calibration (test weight calibration).

The instrument meets European Community EMC directive 89/336/EEC and Low Voltage directive 73/23/EEC.

NOTE (1) : These 4 input sensitivities cover the vast majority of applications. For specialised requirements, please consult the factory.

Electrical Specifications

Accuracy & linearity	: 0.03% of F.S., or 1 count
Internal resolution (Model 4004)	: 20000 counts (bi-polar)
Internal resolution (Model 5004)	: 24 bits
Temperature drift	: 0.1 μ V / °C typically
Conversion / settling time	: 0.15 secs approx. (no filtering)
Input amplifier impedance	: 2 M Ω (differential)
Operating temperature range	: -10 to +50°C
Storage temperature range	: -40 to +80°C
Humidity	: < 85% non-condensing
Warm-up time	: 10 minutes

Electro-mechanical relays	: 250V AC, 30V DC, 2A, PF=1
Solid state relays	: 400 V AC/DC, 0.5A, PF=1
Analog output accuracy	: 0.1 % of full scale
Current analog output load	: 500 Ω maximum
Voltage analog output load	: 1 k Ω minimum
Memory retention	: Full non-volatile operation
Option 3006 isolation rating	: 1500 V
Declaration of conformity	: See last page

Input Ranges

-10 to +10mV (1 mV/V), -20 to +20mV (2 mV/V), -30 to +30mV (3 mV/V), -100 to +100mV (up to 10 mV/V). See note 1.

Load Cell Excitation

Sense feedback	: Yes
Voltage	: \pm 5V (bipolar), 10 volts total
Temp. coefficient	: 10ppm typical
Max. number of LC's	: 1 x 350 Ω load cell (standard)
Max. number of LC's	: 4 x 350 Ω load cells (with optional power supply)

Power Supply

Standard

115 / 230 VAC \pm 10%, link selectable, 50/60Hz, 5VA typical

Optional

12VDC isolated power supply option, 8VA typical (Option 3008-12)

24VDC isolated power supply option, 8VA typical (Option 3008-24)

95V-265V AC/DC power supply option, 8VA typical (Option 3010)

The optional power supplies provide power for up to four load cells.

Other Specifications

DIN 48 x 96 housing, 147mm depth
Industrial strength single piece housing

Housing is flame retardant ABS plastic that meets UL94 V-0
Circuit board is flame retardant material that meets UL94 V-0

Front facia rating : IP65 (with o-ring seal supplied as standard)

Programmable Specifications

Model 4004

Zero & full scale setting : -1999 to 9999
Decimal point : Adjustable on all digits
Input sensitivity : 1, 2, 3 or 10mV/V
Balance range adjustment : 100% of load cell capacity
Tare range adjustment : 100% of load cell capacity
Filtering range : 0 - 10.0 seconds

Options :

Analog output zero & span : -1999 to 9999
Alarm setpoint values : -1999 to 9999
Alarm hysteresis : 0 to 255 (default 1)
Alarm delay : 0 to 255 seconds (default 0)
Alarm relay settings : Selectable HIGH or LOW alarm
Alarm relay state : Selectable NO or NC
Unit address : 1 to 127 (0 is for factory use)
Baud rate : 2400, 4800, 9600, 19200

Model 5004

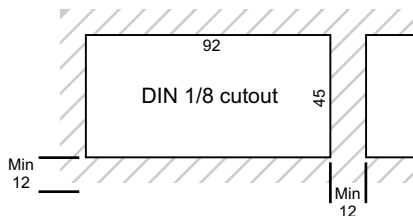
Zero & full scale setting : -199999 to 199999
Decimal point : Adjustable on all digits
Input sensitivity : 1, 2, 3 or 10mV/V
Balance range adjustment : 100% of load cell capacity
Tare range adjustment : 100% of load cell capacity
Filtering range : 0 - 10.0 seconds

Options :

Analog output zero & span : -199999 to 199999
Alarm setpoint values : -199999 to 199999
Alarm hysteresis : 0 to 255 (default 1)
Alarm delay : 0 to 255 seconds (default 0)
Alarm relay settings : Selectable HIGH or LOW alarm
Alarm relay state : Selectable NO or NC
Unit address : 1 to 127
Baud rate : 2400, 4800, 9600, 19200

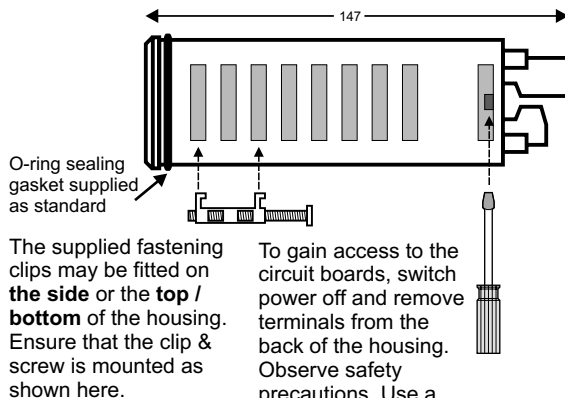
Installation

Panel Cutout



Installation

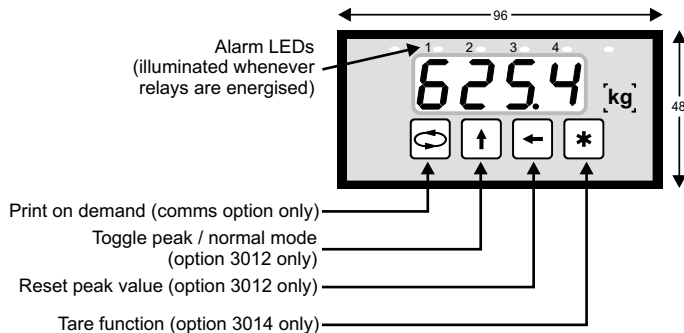
Fastening



Caution : Do not overtighten the screws.

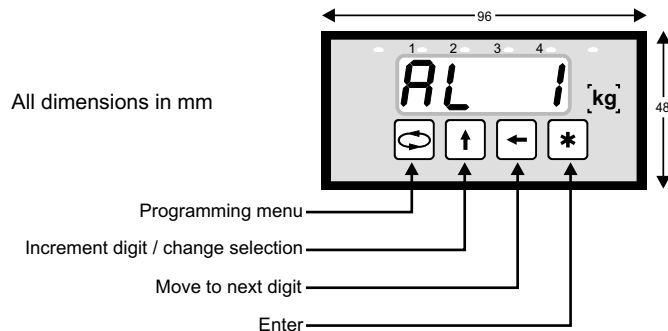
During normal display mode

Display & Keypad

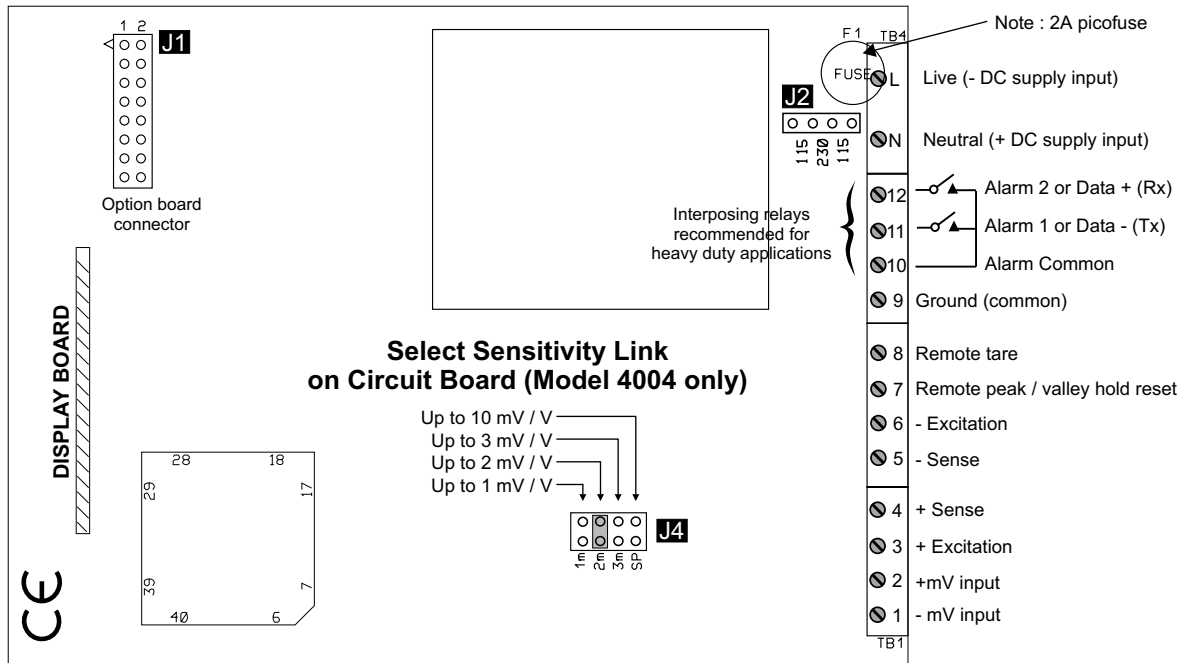


During programming mode

Display & Keypad



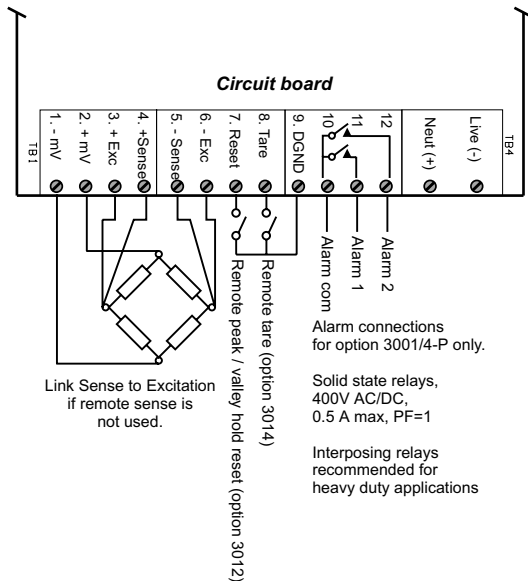
Hardware Links & General Layout



Remember : Configuring this instrument requires two steps:

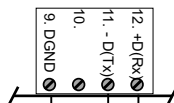
(1) Select the correct hardware links as shown. (2) Program the instrument with the programming chart on page 10.

Load Cell & Option Connections



RS232 / RS485 Option

If the RS232 or RS485 option is ordered, then the alarm relays can be found on the option card that slots in the top part of the housing. See diagram "P" or "M" on the last page.

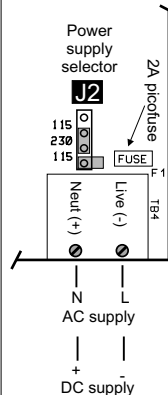


For RS485,
use pins 11 & 12.

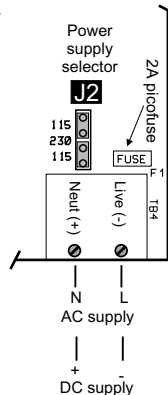
For RS232,
use pins 9, 11, 12.

Power Supply Links

For 230V operation



For 115V operation



J2 link positions do not matter for DC supply or for Option 3008 or Option 3010.

Place hardware links as shown in the diagrams.

Remember : Configuring this instrument requires two steps. (1) Select the correct hardware links as shown. (2) Program the instrument with the programming chart on page 10.

Setup Procedure & Calibration

REFER TO THE PROGRAMMING FLOW CHART on page 10 while using this setup procedure.

This instrument offers an easy & straightforward way to pre-calibrate and field calibrate the load cell system. Follow the steps below:

Step 1 : Setting instrument sensitivity

The load cell sensitivity must be set in via jumper link J4 on the circuit board (see circuit board layout diagram on page 6). The sensitivity setting must also be set in the programming menu (use the programming chart on page 10 to assist you, as well as the examples below). If the load cell system sensitivity is not exactly one of the pre-determined ranges of 1mV/V, 2mV/V, 3mV/V or 10mV/V, then use the next highest sensitivity. E.g. if the load cell sensitivity is 1.6mV/V, then use the 2mV/V range. Remember to set the sensitivity link (J4) on the circuit board as well.

See example 1 and 2 below.

Step 2 : Entering the decimal point, the load cell zero, and the full scale capacity value

The load cell can be pre-calibrated by entering the zero and load cell full scale capacity in the programming menu. The load cell system zero value can normally left at 0 for the pre-calibration. The load cell full scale capacity is then entered.

Example 1:

For a 1 x 5.000 ton load cell that has a 3mV/V sensitivity.

Carefully remove circuit board from the housing and link for 3mV/V on jumper J4 (see step 1 above).

Program the instrument as follows:

- Go to the "Inp" and "Cal" menu.
- Set "3 mV" which represents the load cell sensitivity.
- Set decimal point to "0.000" (three decimal places).
- Set load cell "zero" to "0.000".
- Set load cell full scale capacity "LC.FS" to "5.000".

The instrument has now been pre-calibrated.

Example 2:

For a 3 x 1000 kg load cell system with 2mV/V each.

Carefully remove the circuit board from the housing and link for 2mV/V on jumper J4 (see step 1 above).

Program the instrument as follows:

- Go to the "Inp" and "Cal" menu.
- Set "2 mV" which represents the load cell sensitivity.
- Set decimal point to "0000" (no decimal point).
- Set load cell "zero" to "0".
- Set "LC.FS" to "3000" (as there are 3 x 1000 kg load cells).

The system has now been pre-calibrated.

Step 3 : Field calibration of load cell system for back-balance (deadweight)

Make sure that steps 1 & 2 on the previous page have been completed before proceeding with step 3.

The following procedure removes the deadweight from the weighing system (which is normally the bin / hopper / scale weight), and returns the display reading to show zero with the bin empty.

Make sure that the bin / hopper is empty. Use the programming chart to go to "Inp", followed by "Tare". Press enter. The display will flash "Tare" indicating that the instrument is measuring and averaging the bin weight. Allow for a few seconds of averaging, then press the enter (star) button to stop the process. The instrument will exit programming mode and the display should read zero.

Step 4 : Field calibration of span (test weight calibration)

Make sure step 3 above has been completed before proceeding with step 4.

The following procedure allows the weighing system to be accurately calibrated using test weights.

Place the test weights on the bin / hopper / scale. The instrument should read the weight of the test weights. If the reading is not of sufficient accuracy, then use the programming chart to go to "Inp", followed by "LOAD" and press enter. The instrument now prompts you to enter the weight of the test weights. Then press enter. The display will flash "LOAD" for a few seconds, indicating that the instrument is measuring and averaging the test weights in the bin / hopper / scale. The instrument automatically exits programming mode after a few seconds.

Step 5 : Store away calibrated instrument parameter for future use

Once steps 1 - 4 above have been completed, the instrument automatically alters the pre-calibration parameters "Zero" and "LC.FS" in the "CAL" sub-menu (entered in step 2 above). These altered parameters may not resemble the original values entered by the user. This is normal as these parameters fully characterise the weighing system.

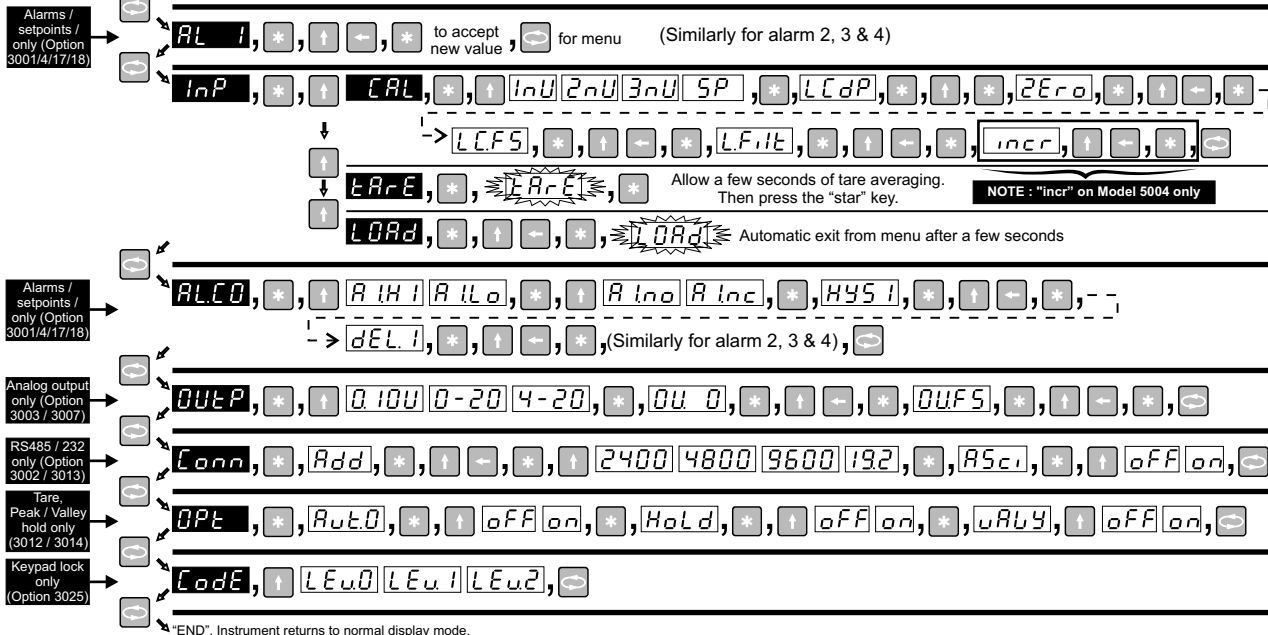
DO NOT change these parameters. It is suggested that these parameters be noted for future use, especially if the instrument is replaced. These parameters can be re-entered into the new instrument with the result that reasonable accuracies can still be obtained without re-doing a field calibration. This is especially useful when minimum downtime is critical, and to avoid wastage if failure occurs when the bin / hopper still contains materials. It is still recommended that complete field calibration is done when the situation permits.

Programming Chart

READ ME FIRST !

**START
HERE**

- Note 1 : This programming chart is a simplified flowchart for users that have previous experience with this instrument. A programming example is available in the next few pages to assist new users in understanding this programming chart.
- Note 2 : Because this instrument has many options, all possible option menus are shown. Options that are not ordered will not appear in the programming sequence.
- Note 3 : Configuring this instrument requires two steps. (A) Select the correct hardware links (page 6). (B) Program the instrument with this chart.
- Note 4 : To enter programming mode, press the menu key for a few seconds (unless the optional keypad lock has been set). Programming mode timeout is about 20 seconds. If no key is pressed for 20 seconds during programming, the instrument returns to normal display mode.



Display Codes Explained

AL 1 **AL 2** **AL 3** **AL 4** 1st, 2nd, 3rd, 4th setpoint value

ALCO Alarm configuration menu (shown for 1st alarm only)

ALH1 **ALO** 1st alarm setpoint select HIGH / LOW alarm

ALno **ALnc** 1st alarm setpoint normally OPEN / CLOSED contact

HYS1 1st alarm setpoint hysteresis

DEL1 1st alarm setpoint delay

OUTP Analog output menu

010V **0-20** **4-20** Output selection (0-10V, 0-20mA, 4-20mA)

000 Output zero selection

OUFS Output full scale selection

Conn Communications menu (RS232 / RS485)

Add Unit address (default 0)

2400 **4800** **9600** **192** Available baud rate values

ASC1 **OFF** **ON** Protocol selection. On = AsciiBus. Off = DigiBus.

OPT Option menu for Tare feature and Peak / Valley Hold

AUTO Tare feature select (auto-zero / auto-tare)

OFF **ON** Turn the tare feature on or off

Hold Peak / valley hold feature (min / max hold)

OFF **ON** Turn the peak / valley hold feature on or off

VALY Peak / valley hold selector

OFF **ON** If "off", peak hold mode. If "on", valley hold mode

Code Keypad lock security menu. See Option 3025 more information.

LEu0 **LEu1** **LEu2** Keypad lock security level. Level 0 = none, Level 1 = alarm value changes, Level 2 = full

INP Input & calibration sub-menu

CAL Sub-menu for manual setting of deadweight / back-balance and load cell capacity (pre-calibration).

ARE Sub-menu for field calibration of deadweight / back-balance. Press the "star" key to start process.

LOAD Sub-menu for field calibration of span using test weight method. Set to test weight value and press the "star" key to start process.

TARE During field calibration of deadweight / back-balance, display flashes "tare" until the "star" key is pressed.

LOAD During field calibration using test weights, display flashes "load" until the "star" key is pressed.

10u **20u** **30u** **SP** Load cell sensitivity (up to 1mV/V, up to 2mV/V, up to 3mV/V, up to 10mV/V. Remember to set jumper link J4 (Model 4004 only) on the circuit board as well.

LCdP Load cell (display) decimal point selection (non-floating point)

PERO Manually entered back-balance (dead weight) value (enter as positive value)

LCFS Manually entered load cell full scale capacity (e.g. enter 1000 for a 1000 kg load cell system)

LFILt Load cell input filter with a range of 0 to 10.0 seconds. Default is 0.0.

incr Model 5004 only. Display increment. Value range is 0 - 100. e.g. "10" would give a dummy zero.

Please Note :

PASS

If the front keypad has been locked, then the word "PASS" will appear. See option 3025 for more information.

Please Note :

Display screens shown in black are to indicate the beginning of sub-menus.

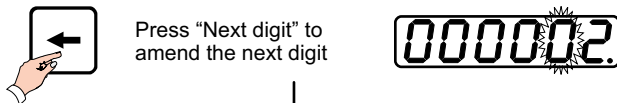
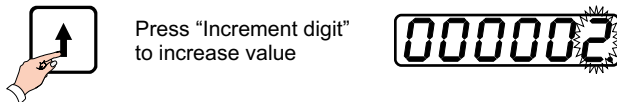
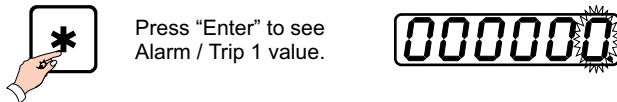
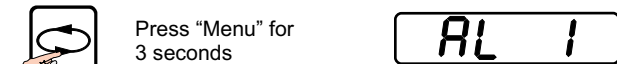
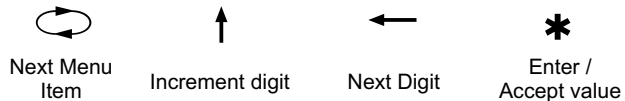
0000 **8888** Process overscale. Input has exceeded full scale value. / Display test mode.

- - - - Hardware overrange. Reduce input signal to reduce saturation.

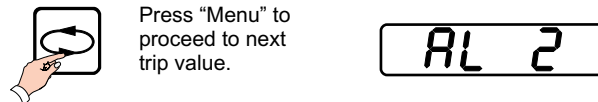
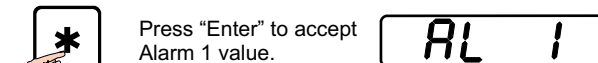
Programming Example

Setting Up Alarm Values (Option)

Remember, the symbols on the keypad have the following definitions during programming.



Amend the other digits in the same way until the desired trip value is entered.



Use the same menu steps above to change trip levels for trip 2, 3 and 4.

The entire programming menu operates in a manner similar to the example described above.

IGNORE THIS PAGE unless communications option has been ordered. When the RS232 (option 3013) or RS485 (option 3002) is ordered, two protocols are made available, namely ASCIIbus & DIGIbus protocols. DIGIbus is the default protocol which is used for the calibration and configuration of the instruments, and whenever the instrument is connected to master-slave systems. DIGIbus protocol is therefore used in complex bus systems, and is NOT described here. Please contact factory for the DIGIbus protocol.

ASCIIbus, which is described here, is much easier to use as it can easily interface to third party systems with very little engineering work required. It is a purely ASCII based (7 bit) protocol. The protocol is essentially designed for one way communications (instrument to PC). Under the "Conn" (connection) programming menu, ASCIIbus is enabled by selecting "ASCII" to "ON". If "OFF" is selected, the DIGIbus protocol will be active. Although designed for one way communications only, the ASCIIbus protocol contains an address. The address range is "00" to "99".

Using address "00" : If this address is selected, the instrument will only transmit data on demand by either momentarily pressing the 'menu' key, or by transmitting a byte (any ASCII character) to the DPM. This mode is useful for interfacing to printers. In addition, field 'A A' will contain the ASCII character "blank/space". Field 'P' will also contain the ASCII character "blank/space".

Using address "01" to "99". If any of these addresses are used, the meter continuously transmits information at approximately 5 times a second.

The data format string output from the indicator is (7 bit ASCII code is used):

Line Settings : 7 Data Bits, 1 Parity bit, Odd Parity, 1 Stop Bit.
 Baud Rate : Selectable 2400, 4800, 9600, 19200.
 Data Bits : Numerical ASCII characters : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
 Other ASCII characters : #, blank/space, +, -, CR, LF
 Protocol format is : # A A S D D D D D D D P CR LF
 where : # = indicates start of message
 : A A = Instrument address. ASCII 00 to 99. 00 is default.
 : S = sign (polarity) (ASCII "+" or "-").
 : D = data bits (data for 8 numerals). See Note (1).
 : P = decimal point position. ASCII 0 to 8.
 : CR = ASCII carriage return.
 : LF = ASCII line feed.

The output will follow the display reading. This means that if the peak-hold option has been ordered and activated, the communications output will peak-hold as well.

Note 1 : This protocol allows for future expansion. Therefore if Model 4001 is used for example, the first four digit data will contain the ASCII character "blank/space" and the last four digits will contain the display reading. Similarly, if the Model 5001 is used for example, the first 2 digit data will contain the ASCII character "blank/space" and the last six digits will contain the display reading.

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Option 3001-P**Two Setpoint Alarms (Solid State Relays)**

See page 7 for connection details. However, if option 3002 / 3013 is also fitted, then the relays are fitted on an option board that slots into the upper slot of the panel meter box (terminals numbered 13-28). See diagram "P" on page 20 for the relay connections. Wire for AL1 & AL2 only.

Option 3001-M**Two Setpoint Alarms (Electro-Mechanical Relays)**

This option provides two alarm setpoints with electro-mechanical relays. This option board slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. Both normally open and normally closed contacts are provided with each relay. The relays are rated at 250VAC / 30VDC @ 2A. Visual LED alarm indication is provided on the panel meter front. For connection wiring details, see diagram "M" on page 20. Connect wires for AL1 & AL2 only.

Option 3002**RS485 Communications Option**

See page 7 for connection details. Select DIGIbus or ASCIIbus protocol from the program menu. See additional protocol documents.

Option 3003**0 - 20mA / 4 - 20mA Analog Output Option**

This option is provided on an option board that slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. See diagram "M" or "P" on page 20 for wiring details.

Option 3004-P**One Setpoint Alarm (Solid State Relay)**

See page 7 for connection details. However, if option 3002 / 3013 is also fitted, then the relays are fitted on an option board that slots into the upper slot of the panel meter box (terminals numbered 13-28). See diagram "P" on page 20 for the relay connections. Wire for AL1 only.

Option 3004-M**One Setpoint Alarm (Electro-Mechanical Relay)**

This option is similar to option 3001-M described above, but offers one alarm relay only. See option 3001-M above for more information, but wire for AL1 only.

Option 3006**Isolated Options (Analog Output / RS232 / RS485)**

This is ordered with option 3002, 3003, 3007 or 3013. It provides a minimum of 1500V isolation between input and output signal. Wiring connections are different for these isolated options. Use diagram "P" or diagram "M" on page 20 for wiring connections.

Option 3007**0 - 10V Analog Output Option**

This option is provided on an option board that slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. See diagram "M" or "P" on page 20 for wiring details.

Option 3008**Galvanic Isolation (12V / 24V Supply) Option**

This power supply option provides 12 or 24VDC supply isolation. See page 7 for connection details. This option also provides excitation for up to four load cells.

Option 3009**Parallel BCD Output Option**

This option is supplied as an additional slot-in card in the top part of the instrument housing. See the additional documentation. Note that this option cannot be used in conjunction with any of the alarm setpoint options, not with the bar graph display option.

Option 3010**95V-265V AC / DC Power Supply Option**

This options allows the instrument to operate from a wide range of AC & DC power supplies. The supply connections are on page 7. This option also provides excitation for up to four load cells.

Option 3012**Peak Or Valley (Max or Min) Hold Option**

This option displays and holds the maximum or minimum value (not both) of an input signal. This option is activated in the programming menu "Opt" by selecting whether "Hold" should be "On" or "Off", and selecting whether valley ("valy" = "On") or peak ("valy" = "Off") hold should be displayed.

The display can be toggled to show the peak / valley value or normal value by toggling the "up" arrow key (press for about 3 seconds each time). For rapid response to step changes on the input, ensure that the filter in the programming menu is set to 0.0. To reset the peak / valley hold value, press the "side" arrow key for 3 seconds, or use an external potential free contact (see page 7 for connection details). If analog output option is fitted, the output will hold as well.

Option 3013**RS232 Communications Option**

See the additional documentation supplied for protocol details & page 7 for connection details. Ensure that maximum cable length from instrument to PC is less than 15 metres.

This option provides three alarm setpoints with electro-mechanical relays. This option board slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. Both normally open and normally closed contacts are provided with each relay. The relays are rated at 250VAC / 30VDC @ 2A. Visual LED alarm indication is provided on the panel meter front. For connection wiring details, see diagram "M" on page 20. Connect wires for AL1, AL2 & AL3 only.

Option 3018-P**Four Alarm Setpoints (Solid State Relays)**

This option is similar to option 3017-P, but contains four relays (see option 3017-P). For connection wiring details, see diagram “P” on page 20. Connect wires for AL1, AL2, AL3 & AL4.

Option 3018-M**Four Alarm Setpoints (Electro-Mechanical Relays)**

This option is similar to option 3017-M, but contains four relays (see option 3017-M). For connection wiring details, see diagram “M” on page 20. Connect wires for AL1, AL2, AL3 & AL4.

Option 3022**Vertical Bar Graph Display Option**

This option is only available on Model 4004. The vertical bar-graph display option provides a graphic linear representation of the process variable being measured. The bar graph's zero and full scale setting is programmed by the 'Outp' sub-menu of the programming menu, which also controls the analog output option. The 'Out.O' controls the zero point of the graph, and the 'Ou.Fs' controls the full scale value of the graph. See the programming menu page 10 for more information.

Option 3025**Keypad Lock Option**

The keypad lock option is used to prevent un-authorised access to the programming menu. When this option is ordered, a new sub-menu called “CODE” appears at the end of the programming sequence. See programming page 10.

Three levels of keypad lockout are available:

Level 0 - Full access to programming menu.

Level 1 - User only has access to alarm setpoint values.

Level 2 - Total programming menu lockout.

If this option is ordered, the factory default is “Lev 0”.

If the keypad has been locked with either level 1 or 2, then the word “PASS” will appear on the display if the user attempts to enter programming mode. Pressing the menu key will return the instrument to normal display mode. However, if the user wishes to enter the programming menu, then when the word “PASS” appears, press in succession, 1 second apart, all four keys from right to left.

Option 3026**Display Hold Option**

The option is at no-extra charge and allows the user to freeze the display via an external potential-free contact. Closing the switch will freeze the display. See page 7 for wiring connections.

Diagram "P"

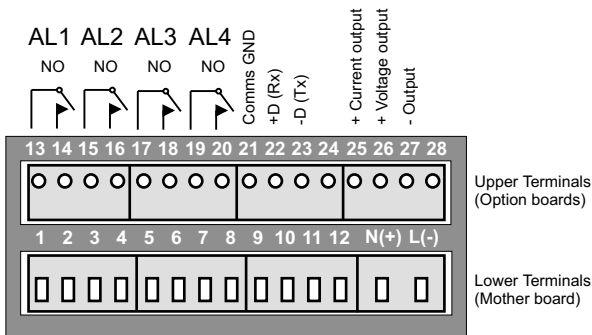
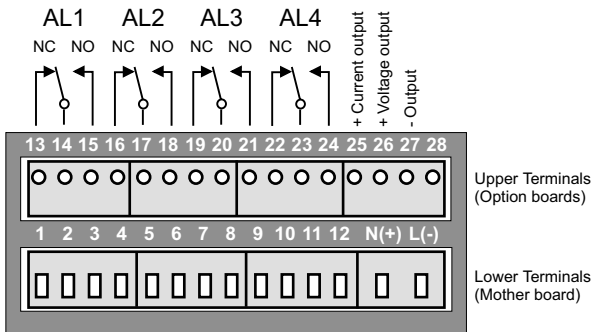


Diagram "M"



Declaration of Conformity

Programmable Load Cell Indicator / Controller

Manufacturer : DPM

Type : 4004, 5004
Options : 3000 to 3026

Corresponds to the requirements of the following EC directives:

EMC directive : 89/336/EEC
Low voltage directive : 73/23/EEC
The applicable harmonised standards are : EN 50081-1
: EN 50082-1
: EN 61010

Guarantee

This product is guaranteed against faulty workmanship or defective material, for a period of 3 (three) years from date of delivery.

The manufacturer undertakes to replace without charge all defective equipment which is returned to it (transportation costs prepaid) during the period of guarantee, provided there is no evidence that the equipment has been abused or mishandled in any way.

The manufacturer reserves the right to alter any specification without notice.