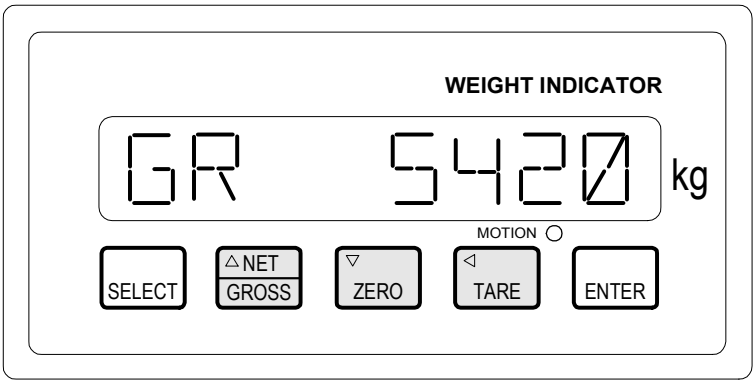
PR430D
WEIGHT
INDICATOR



Contents

1 OVERVIEW

1.1 Description

The PR430D is a micro-processor based amplifier/indicator with a DeviceNet interface. It is housed in a standard panel mounting DIN case and features a sealed tactile push-button panel with an 8 character LED display.

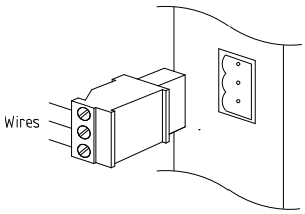
The unit connects with 1-4 standard 350 ohm strain gauge load cells to which it supplies 10 VDC excitation. It amplifies and conditions the resultant signal to produce a gross weight value to 16 bit resolution (1 part in 65,536) with negligible drift. The relatively high input resolution enables large standing weights to be accommodated without loss of output resolution.

NET, and TARE push-buttons cater for manual (hand-add) applications, including cumulative weighing. Having completed one weighment, operating TARE zeros the NET display ready for a further weighment.

This unit is factory calibrated to have a precise internal input range (PG setting 7 only) so that it may be replaced without the need for vessel emptying or re-calibration.
An internal self-calibration feature effectively removes error due to temperature drift or other causes by reducing them to less than 5ppm/oC.

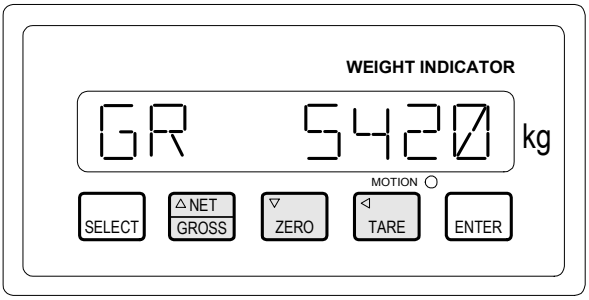
Being a micro-processor based product the PR430D operates from configuration and calibration settings stored in non-volatile memory: protected against loss indefinately.
The configuration data is entered and adjusted through the front panel. Similarly the weigh scale is calibrated in a single operation, by loading a known weight and by entering its value through the front panel or by entering precise load cell sensitivity and capacity figures.

All connections to the PR430D, including the DeviceNet port, are made by means of pluggable screw terminal blocks.



2 OPERATION

2.1 Front Panel



The PR430D display shows both the parameter type and its value. The working displays are:

GR Gross Weight
NT Net Weight

The three centre push-buttons: GROSS/NET, ZERO and TARE control the NT and GR readouts, as shown below:

NET/GROSS	Toggles the display from Net to Gross
ZERO	Zeroes the Gross if within 4% of the calibrated zero
TARE	Tares the Net

If the Gross is not within 4% of the calibrated zero when the ZERO button is pressed the unit will generate the following error.

Display shows "MAX ZERO"
Error Code = 1814

MOTION indicator LED is illuminated whenever weight display changes by more than two adjacent values within a 5 second period.

2.2 Data Entry

To enable stored parameters to be entered and modified the GROSS/NET, ZERO and TARE push-buttons operate as Raise, Lower and Digit Select push-buttons whenever the display is in the data entry mode as identified by one digit of the displayed value flashing on/off.
The data entry procedure is:

Operate SELECT until the required parameter is displayed

Operate ENTER, at which point the first digit of the parameter value flashes on/off.

Operate the GROSS/NET and ZERO and TARE push-buttons either by momentary operation or by holding down the buttons for more rapid adjustment, until the required setting is obtained. Alternatively, use the TARE push-button to select the digit to be modified and the Raise and Lower push-buttons to modify the individual digits until the required setting is obtained.

Operate ENTER again to steady the value.

3 PASSWORD PROTECTED DATA

3.1 Access to Control and Calibration Data

Access to the Control and calibration data is protected by password numbers. These are factory set to "1" and "2" respectively but may be changed by the user to provide additional security.

From the working displays, operate SELECT until the indicator shows PASS. Operate ENTER and use Raise and Lower push-buttons to enter the Password Number (Factory Setting 1). Operate ENTER again to show the first parameter in the list accessed. Use SELECT to increment through parameters. Operate ENTER at EXIT to return to the working displays.

3.2 Control Data (Factory set access code = 1)

Parameter	Range	Definition	Factory Setting
WI	YES/NO	WEIGHING IN, Not weighing-out	YES
WK	FREE/ LOCK	Weigh Keys, free or locked. When set to LOCK the NET/GROSS, ZERO, TARE pushbuttons are disabled.	FREE
MAC ID	0-64	DeviceNet slave address. A valid slave address is in the range 0 - 63. Set to 64 to enable setting of the slave address via the DeviceNet communications link.	63
BR	125/250/ 500/ PGM	DeviceNet communication speed (Kbps). Set to PGM to enable setting of the baud rate via the DeviceNet communications link.	125
PSET	0-99999	PASSWORD SET - Determines the password code number for access to control parameters.	1
EXIT		EXIT. Operate ENTER to return to working displays. Operate SELECT to cycle around to MAC ID again.	

4 CALIBRATION

4.1 Calibration Method

Calibration can be achieved in one of two ways:

a) By the normal method of physical loading of the weigher with calibrated weights or
b) by entry of the precise sensitivity and capacity figures from the load cells.

The latter method is only recommended when a matched set of high accuracy load cells is used and physical loading is impractical.

The parameter CM (Calibration Method) is used to select one of the two methods defined above.

4.2 Access to Calibrated Data

From the working displays, operate SELECT until the indicator shows PASS. Operate ENTER and use the Raise and Lower push-buttons to enter the password number (factory setting 2). Operate ENTER again to show first parameter CM. Use SELECT to increment through parameters. Operate ENTER at last parameter EXIT to return to the working displays.

To re-calibrate an existing installation go to 4.3 below.

To select the weigher range and the scaling factors, prior to calibrating a new installation, go to 4.4 below and then to 4.3 below.

4.3 Calibration Procedure

Before attempting to accurately calibrate a weigher first establish:

a) that the weigher is repeatable, both up and down the scale i.e. that it operates freely.

b) that in the case of multiple load cell installations the load cells are correctly rationalised ie that they produce the same weight reading to the same weight applied. To do this place a weight in different positions so that each position loads a particular load cell more than the others and verify that each position produces the same reading.

Each unit has a precise internal input range, factory set to 0 - 200,000 for 2mV/V input on the 0 - 20mV range (PG = 7). This provides for replacement of a unit without the need for re-calibration and for calibration without physical loading of weight.

NOTE

To calibrate a new installation go to 4.4 below to set the scaling constants before proceeding with calibration.

4.3.1 Calibration with Weights

NOTE: Set scaling constants before proceeding.

Parameter	Range	Definition
CM	WTS/CALC -	CALIBRATION METHOD determines whether calibration is to be achievd by application of weights (WTS) or by calculations based upon precise load cell characteristics (CALC).
ZR		ZERO. The display shows the 'live' gross weight. To register the empty weight and thereby establish the gross zero, operate the Enter, at which point the weight will flash, then operate the ZERO (display goes to Zero) followed by ENTER again to steady the display.
Z	0-200000	ZERO COEFFICIENT. This shows the value registered in ZR above and can be entered into a replacement unit without the need to empty the weigher.
CA	0-99999	CALIBRATION. The indicator shows the "live" gross weight. It may be modified by entering a different weight value. The calibration procedure is: Load a known test weight. Enter the test weight in Kgs by operating ENTER and using the Raise, Lower and TARE keys followed by ENTER again to steady the display and to establish the calibration.

G	0-999999	GAIN COEFFICIENT. This shows the value registered in CA above and can be entered into a replacement unit without the need to recalibrate.
CC	0-99999	CALIBRATION COUNTER. This shows the number of calibrations to date. It is incremented by 1 max. when any number of changes are made to calibration prior to EXIT.

4.3.2 Calibration by Calculation

NOTE: Set scaling constants before proceeding

Parameter	Range	Factory Setting
CM	WTS/CALC	CALIBRATION METHOD, determines whether calibration is to be achieved by application of weights (WTS) or by calculations based upon precise load cell characteristics (CALC).
ZR		ZERO. The display shows the 'live' gross weight. To register the empty weight and thereby establish the gross zero, operate the Enter, at which point the weight will flash, then operate the ZERO (display goes to Zero) followed by ENTER again to steady the display..
Z	0-200000	ZERO COEFFICIENT. This shows the value registered in ZR above and can be entered into a replacement unit without the need to empty the weigher.
LC	0-99999	LOAD CELL CAPACITY sets the total load capacity of the load cells and provides the means to calculate the calibration in conjunction with SENSITIVITY below..
S	0-9.99999	SENSITIVITY MV/V, sets the sensitivity to match that of the load cells and provides the means to calculate the calibration in conjunction with the Load Cell Capacity above. (2.00000 Factory Setting)

CC	0-99999	CALIBRATION COUNTER. This shows the number of calibrations to date. It is incremented by 1 max. when any number of changes are made to calibration prior to EXIT.

There are two error conditions which may occur specifically at this point in the procedure. These are:

Display shows "OVER SPAN"

Error Code = 1812

Occurs when attempting to enter a test weight value greater than the span setting. i.e. a vetting on the data entry. Either the test weight value or the SPAN setting must be incorrect.

Display shows "RANG SAT" (RANGE SAT)

Error Code = 1813

Occurs if the load cell signal at the time of entering a test weight value indicates that with the current PG (Pre Gain) setting, the input amplifier will saturate (reach its upper limit) before the current SPAN setting is reached. Possible causes are: incorrect SPAN setting, PG setting too high for load cells, load cell faulty.

Other error conditions not specific to calibration i.e. equipment faults are listed under Section 8.

4.4 Scaling Constants

Parameter	Range	Definition	Factory Setting
DP	9.9.9.9.9	DECIMAL POINT, Max of 4 decimal places.	No dec. pl.
SP	0-99999	SPAN, set the full scale reading (or deflection, FSD). Used for validation check during calibration.	9
FL	1-100	FILTER determines the number of load cell input readings over which the weight is calculated, from a rolling average, each time a reading is taken (every 50mS). 1 Corresponds to no averaging. 100 Corresponds to maximum averaging.	10
IN	0-99	DISPLAY INCREMENT, determines the minimum value by which the weight displays increment. 0 corresponds to no suppression. Note that this suppression does not apply to calibration.	0

Parameter	Range	Definition	Factory Setting
PG	0-7	PRE-GAIN, determines the load cell amplifier input sensitivity from 0-2.5V to 0-20mV, as follows: Settings Full Scale Input 0 2.56V 1 1.28V 2 640mV 3 320mV 4 160mV 5 80mV 6 40mV 7 20mV	7
UP	0-1	UPDATE RATE. This determines display update rate in seconds.	0.4
PSET	0-99999	PASSWORD SET - Determines the password code number for access to calibration parameters.	2
EXIT		EXIT. Operate ENTER to return working displays. Operate SELECT to cycle around to CM again.	

5 DEVICENET INTERFACE

5.1 Overview

The PR430D uses the Predefined Master/Slave Connection Set to produce/consume data over the DeviceNet network. As the connection objects are almost entirely configured at power-up, the only remaining step necessary to begin the flow of data is for a master device to claim ownership of the predefined connection set within the PR430D. Polled I/O slave messaging is used to produce Gross and Net weight values and Error Codes and to consume Zero and Tare commands. As 10 bytes of data are produced the fragmentation protocol is employed by the PR430D when sending a poll response messsage.

5.2 The Poll Command

Assuming that the predefined master/slave connection has been established the poll command shown below can be used to read the gross/net weights and error code and also set the zero gross and tare net flags within the PR430D.

5.2.1 Master To PR430D

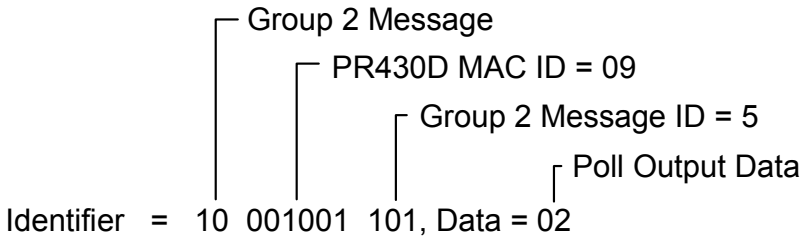
Poll command message, 1 byte of output data (optional)
Master MAC ID = 01
PR430D MAC ID = 09
CAN Identifier Field = 44D hex.

The output data is used to set the zero gross and tare net flags ie.

Output Data = 01 hex to Zero the Gross weight, only if within 4% of the calibrated zero.

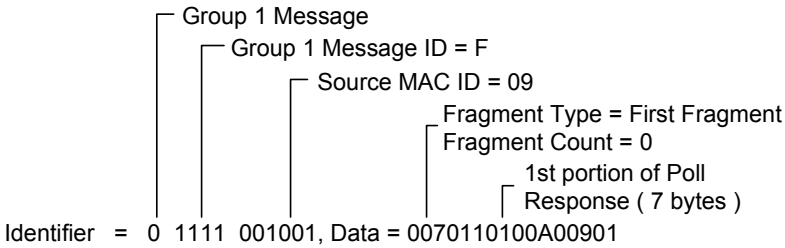
Output Data = 02 hex to Tare the Net weight.

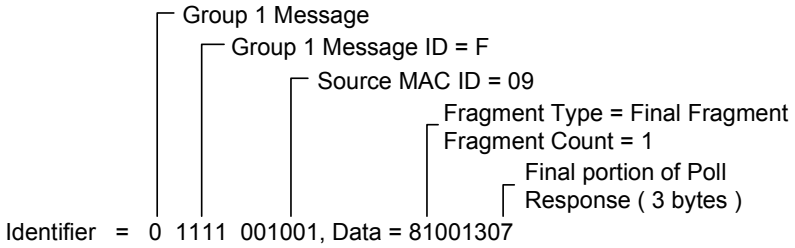
The poll command message can be sent with a zero data byte or no output data byte at all if the master should receive the gross/net weight and error code without using the zero/tare flags.



5.2.1 Master From PR430D

Poll Response Message, 10 bytes of data (Fragmented)
Master MAC ID = 01
PR430D MAC ID = 09
CAN Identifier Field = 3C9 hex





The following data was retrieved from the PR430D, for more information on the response data bytes see assembly data sect. 5.7.

Gross Weight = 11170 hex (Type DINT)
Net Weight = 109A0 hex (Type DINT)
Error Code = 713 hex (Type UINT) see sect. 2.1, 4.3.2 and 8 for error codes.

5.3 Rear Panel LED

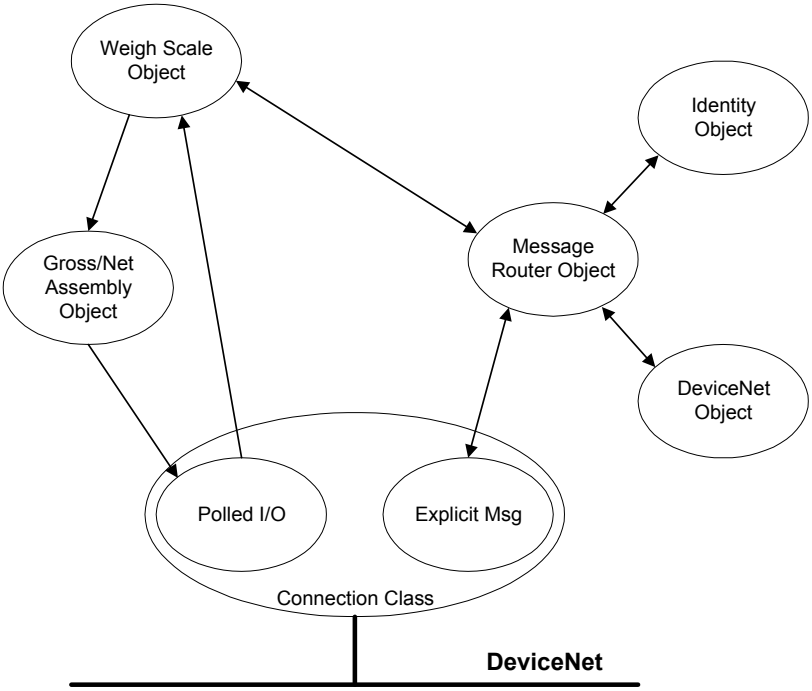
The single bi-colour LED provides device and communication status. It is fully compliant with the DeviceNet specification for a Combined Module/Network Status LED.

5.4 Object Model

The Object Model and table below represents the PR430D

.

Object Class	Number of Instances
Identity	1
Message Router	1
DeviceNet	1
Connection	1 I/O , 1 Explicit
Assembly	1
Weigh Scale	1



5.5 Object Behaviour

Each object affects the device behaviour as shown below.

Object	Effect on behaviour
Identity	Supports the reset service
Message Router	No effect
DeviceNet	Configures port attributes
Connection	Contains the number of logical ports into/out of the device
Assembly	Defines I/O data format
Weigh Scale	Affects value

5.6 Object Interface

The objects have the interfaces shown below.

Object	Interface
Identity	Message Router
Message Router	Explicit messaging connection instance
DeviceNet	Message Router
Connection	Message Router
Assembly	I/O connection
Weigh Scale	Message Router, Assembly Object , I/O Connection

5.7 Assembly Instance

The following table identifies the I/O assembly instance supported by the PR430D.

Number	Type	Name
100	Input	Gross/Net and Error Code

5.8 Assembly Data Attribute Format

The I/O assembly data attribute has the format shown below.

Instance	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
100	0	Gross Weight Low							
	1	Gross Weight							
	2	Gross Weight							
	3	Gross Weight High							
	4	Net Weight Low							
	5	Net Weight							
	6	Net Weight							
	7	Net Weight High							
	8	Error Code Low							
	9	Error Code High							

5.9 Mapping Assembly Data Attribute Components

The following table indicates the I/O assembly data attribute mapping.

Data Component Name	Class		Instance	Attribute	
	Name	Number	Number	Name	Number
Gross Weight	Weigh Scale	100	1	Gross Weight	100
Net Weight	Weigh Scale	100	1	Net Weight	101
Error Code	Weigh Scale	100	1	Error Code	103

6 DeviceNet Conformance

The following tables are extracts from the DeviceNet Statement Of Conformance, the complete document is available upon request.

6.1 General Information

General Device Data	
DeviceNet Specification	Volume I - Release 2.0 Volume II - Release 2.0
Device Profile	Generic
Product Revision	1.1

DeviceNet Physical Conformance Data	
LEDs Supported	Combo Mod/Net
MAC ID Setting	Software Selectable and Device User Interface
Default MAC ID	63
Baud Rate Setting	Software Selectable and Device User Interface
Baud Rates Supported	125, 250, 500 kbps

DeviceNet Communciation Data	
Communication Method	Predefined Master/Slave Connection Set. Group 2 Only Server. Fragmented Messaging Supported.

6.2 Attributes and Services

6.2.1 Identity Object - 0x01

Class Attributes			
ID	Name	Get	Set
1	Revision	X	
2	Max Instance	X	

Instance Attributes			
ID	Name	Get	Set
1	Vendor ID	X	
2	Device Type	X	
3	Product Code	X	
4	Revision	X	
5	Status	X	
6	Serial Number	X	
7	Product Name	X	
8	State	X	

Class Services
Get_Attribute_Single

Instance Services
Get_Attribute_Single
Reset

6.2.2 Message Router - 0x02

The message router has no externally visible attributes or services.

6.2.3 DeviceNet Object - 0x03

Class Attributes			
ID	Name	Get	Set
1	Revision	X	
2	Max Instance	X	

Instance Attributes			
ID	Name	Get	Set
1	MAC ID	X	X
2	Baud Rate	X	X
3	BOI	X	
4	Bus-Off Counter	X	
5	Allocation Informaton	X	
6	MAC ID Switch Changed	X	
7	Baud Rate Switch Changed	X	
8	MAC ID Switch Value	X	
9	Baud Rate Switch Value	X	

Class Services
Get_Attribute_Single

Instance Services
Get_Attribute_Single
Set_Attribute_Single
Allocate M/S Connection Set
Release M/S Connection Set

6.2.4 Assembly Object - 0x04 (Static Input, Instance ID 100)

Class Attributes			
ID	Name	Get	Set
1	Revision	X	
2	Max Instance	X	

Instance Attributes			
ID	Name	Get	Set
3	Data	X	

Class Services
Get_Attribute_Single

Instance Services
Get_Attribute_Single

6.2.5 Connection Object - 0x05

Class Attributes			
ID	Name	Get	Set
1	Revision	X	

The attributes apply to both connection instances ie.
- Explicit Message
- Polled I/O, Server, Transport Class 3.

Instance Attributes			
ID	Name	Get	Set
1	State	X	
2	Instance Type	X	
3	Transport Class Trigger	X	
4	Produced Connection ID	X	
5	Consumed Connection ID	X	
6	Initial Comm. Characteristics	X	
7	Produced Connection Size	X	
8	Consumed Connection Size	X	
9	Expected Packet Rate	X	X
12	Watchdog Time-Out Action	X	X
13	Produced Connection Path Length	X	
14	Produced Connection Path	X	
15	Consumed Connection Path Length	X	
16	Consumed Connection Path	X	

Class Services
Get_Attribute_Single

Instance Services
Reset
Delete
Get_Attribute_Single
Set_Attribute_Single

6.2.6 Weigh Scale - 0x64

Class Attributes			
ID	Name	Get	Set
100	Revision	X	

Instance Attributes			
ID	Name	Get	Set
100	Gross Weight	X	
101	Net Weight	X	
102	ZeroTare		X
103	Error Code	X	

Class Services
Get_Attribute_Single

Instance Services
Get_Attribute_Single
Set_Attribute_Single

7 SPECIFICATION AND INSTALLATION

7.1 Mains Supply

Mains supply
Supply : 85-264v ac. 50 / 60 Hz
Power consumption: 10VA max.
Internal Fuse: Wire ended Wickman 1A Anti-Surge type TR5.

7.2 Load Cell Excitation

10V DC @ 125mA max, up to four 350 ohm load cells may be connected in parallel, 4 or 6 wire, remote sensing for volt-drop compensation in long cables.

7.3 Input Characteristics

Range : 0-20mV min, 0-2.5 max.
Filter adjustable 0.2 to 20Hz.
Accuracy : Up to 65, 000 divisions with negligible drift due to internal self correction.

7.4 DeviceNet Interface

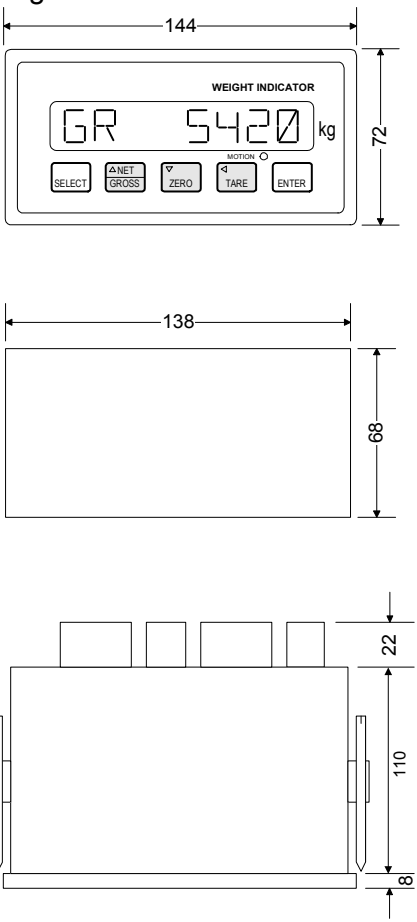
Connector : 5 pin open style plug-in type.
Power : No power required from the bus. (DeviceNet interface is powered from the Mains Supply)
Interface Type : Isolated CAN-based slave
Device Type : Generic
Baud Rates : 125, 250, 500Kbps
I/O Slave Messaging: Polling

7.5 Environment

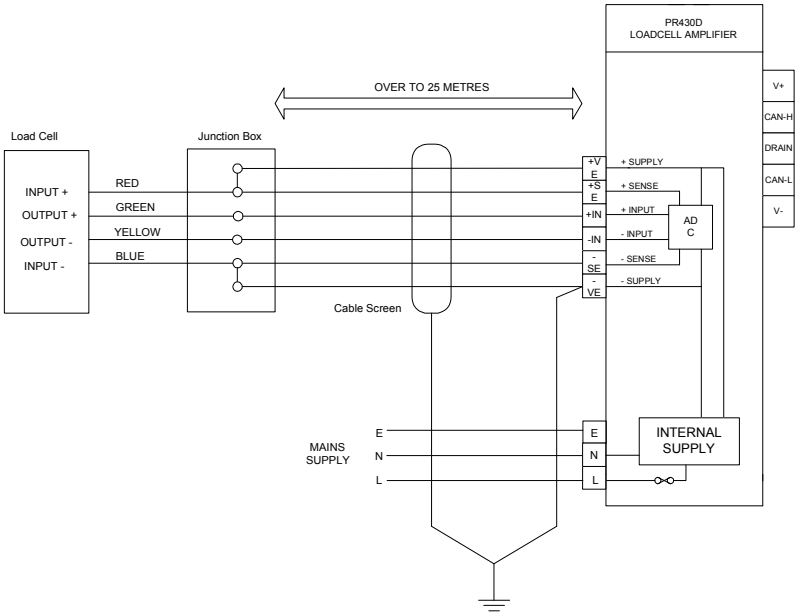
Operating 0 to +50C, 20 to 75% RH Non-Condensing
Storage -20 to + 80C

7.6 Enclosure Dimensions

Panel Mounting DIN case front sealed to IP65

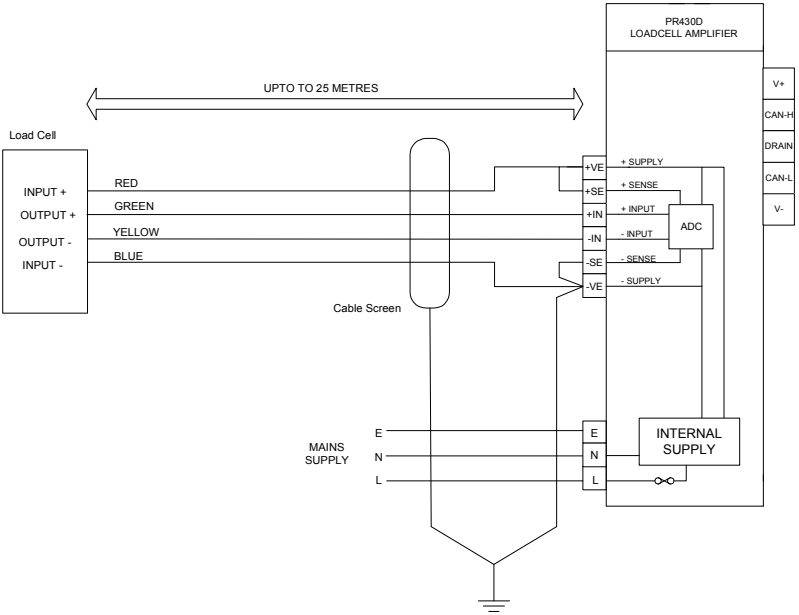


7.7 Wiring Diagram : Remote Load Cell Sensing

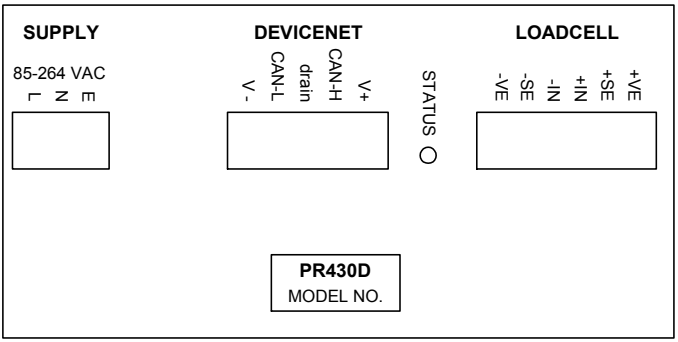


The PR430 provides for remote sensing to compensate for volt-drop in long leads to load cells. It is recomended that remote sensing be adopted for maximum temperature stability where cables longer than 25 metres are to be used.

7.8 Wiring Diagram : 4 Wire Load Cell Connection



7.9 Wiring Connections



7.10 Installation Procedure

Following power-up, carry out the calibration procedure as described in Section 4.

Once the calibration is complete, enter the DeviceNet data to obtain the required communications.

7.11 EMC

The PR430D complies with the European EMC directive 89/336/EEC and has been tested to the following standards:

BS EN 50081-2 Industrial Generic Emissions
BS EN 50082-2 Industrial Generic Immunity

The usual guidlines for good EMC practice should be adopted as follows:-

7.11.1 Shielding

Good shielding practice applies to both the enclosure as well as cables.

Enclosure - The PR430D is best situated within a metal enclosure which is not used to house noise generating equipment such as unsuppressed relays, contactors, transformers etc. and especially inverter motor drives which are capable of generating large amounts of RFI.

8 EQUIPMENT FAULTS

8.1 Out of range

This condition occurs if the load cell input signal is outside the full scale range as defined by the amplifier pre-gain (parameter PG under 4.4 above).

Display shows "ADC-SAT+"

Error Code = 1811

Indicates that the input is outside the range in the positive direction. Either the signal is too large due to a load cell fault or the pre-gain (PG) is set too high.

Display shows "ADC SAT-"

Error Code = 1810

Indicates that the input is outside the range in the negative direction
i.e. below zero.

Display shows "SENSE ER"

Error Code = 1821

Indicates that the sense voltage is no longer within 3V of the voltage registered at calibration

8.2 Failures

Although unlikely, the following types of equipment failure are possible. In all cases the unit may be returned to Practicon or its agents for repair.

No Response

No indication or response of any kind. Possibly a supply circuit failure.
A soldered-in PCB (Printed Circuit Board) fuse may need replacing as a result. Alternatively the fuse failure could be the only fault.

Display shows "REGFAULT"

Error Code = 1818

This occurs if the internal 10V load cell supply is overloaded i.e. >150mA

Display shows "ERR nnnn" where nnnn Fault Code Number

Error Code = nnnn

This indicates that a micro-processor fault has occurred. It may help to report the Fault Code Number to Practicon when returning the unit for repair.

8.3 Lost Pass Numbers: Restore Factory Settings

In the event of the passwords being lost the original factory default settings of 1 and 2 can be reloaded by holding down the SELECT and ENTER keys for approximately 30 seconds when the display shows gross weight, GR (operate ENTER key first). After approximately 30 seconds the display changes to read PASS *. The two password numbers will then have been restored to the values 1 and 2.