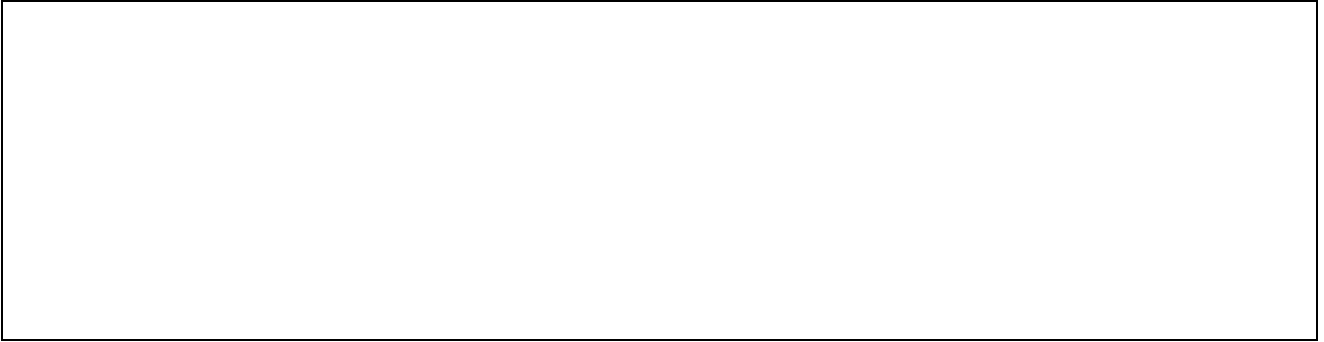


Datalogger D3200PRO

User manual

Ver. 2.0



Index

<i>Sensors wiring (mV, 4-20 mA, VW).....</i>	<i>3</i>
<i>Instructions for D3200PRO software.....</i>	<i>4</i>
<i>Battery life.....</i>	<i>10</i>
<i>Batteries replacement.....</i>	<i>12</i>
<i>Software conventions.....</i>	<i>12</i>
<i>Serial and USB connections.....</i>	<i>12</i>
<i>Trouble shooting.....</i>	<i>12</i>
<i>GSM Modem and solar panel connections.</i>	<i>13</i>
<i>Installation and maintenance.....</i>	<i>15</i>
<i>Specifications.....</i>	<i>16</i>

Sensors wiring (mV, 4-20 mA, VW)

Before connecting sensors to datalogger, it is advised to check their integrity and their own wiring. To do that, it might be useful to use a multimeter.

To connect a sensor with a mV output, find its power supply wire and plug it in the first of the four holes of the terminal block (first from top, labelled +15V). Plug its ground wire (GND) in the second hole (second from top) and its output signal wire to the third (SIGN).

If you're connecting a biaxial sensor (i.e. an inclinometer) then you need to connect its 2nd signal wire to the third hole of the next terminal block. You also need to connect the first hole of the first terminal block to the first hole of the next terminal block with a bridge. Doing so ensures a correct power supply to both the blocks and a correct wiring of the sensor. Datalogger reads voltages between -4.000 and +4.000 Vdc. Values beneath or above this range will not be correctly read and will be shown as Full Scale values.

To connect a sensor with a 4-20mA output (2 wires) you need to find out which one of its wires is the power supply wire (LOOP+) and which one is the signal output wire (LOOP-). Then connect LOOP+ wire to the first hole (from top, labelled +15V) of the terminal block. Connect LOOP- wire to the third hole (SIGN).

To connect sensors with a 4-20mA output (3 wires) you need to find out which wire is the power supply wire (LOOP+), which one is the signal output wire (LOOP-) and which one is the ground wire (GND). Then connect LOOP+ wire to the first hole (+15V), GND wire to the second and LOOP- wire to the third (SIGN).

To connect Vibrating Wire sensors you need to connect each used channel this way: vibrating wire signal on the first 2 holes from top and optional temperature signal on the 2nd and 3rd holes from top.

Check that each terminal is firmly screwed and that wires do not touch each other in order to avoid short circuits.

As soon as you complete the wiring process, you might want to perform a reading of all the sensor. This will help you to find out any connection error.

When connecting sensors with mV output, you need to make sure that the 100 Ohm load resistor is not connected. If a 100 Ohm load resistor is connected, datalogger will read unexpected load values.

On the contrary, when connecting a sensor with 4-20mA output, you need to make sure that the 100 Ohm load resistor is connected to the sensor terminal block. Resistor needs to be connected to the second and the third hole of the terminal block, between ground and signal wires.

Datalogger can read currents between -40.000 and +40.000 mA. Instructions for 4-20 mA sensors apply to 0-20mA sensors too.

Please refer to Appendix A for wiring scheme.

Instructions for D3200PRO software

Software installation

Insert CD that was shipped with datalogger and run SETUP.

For details about the installation procedure, please refer to the Quick Reference Guide.

Connection to Datalogger

Connect a serial cable to your PC and to datalogger. Wait for the datalogger LED to turn off.

While datalogger LED is on, it is not possible to communicate with datalogger (when you power on your datalogger, it may happen that its LED turns on and stays on for some minutes. This is a normal process and indicates that datalogger is acquiring data. Wait for the completion of data acquisition).

Once the LED is off, run D3200PRO software.

Select the serial port you are using to communicate with datalogger and click on Connect. If you chose the proper serial port and datalogger is correctly connected, connection will be established. Datalogger LED will turn on and the yellow window in D3200PRO software will become green. You need to wait until the software reads all the parameters stored in datalogger.

General

This tab shows general information about the connected datalogger.

ID is the name of your datalogger. You can edit it on screen and then, in order to store the new name in datalogger internal memory, you need to click *Write ID* button.

Read ID button will retrieve datalogger name from internal memory of datalogger.

Memory State shows the number of data acquisitions: *All* represents how many acquisitions can be stored in memory. *Free* shows how many acquisitions are still available before memory is full.

D3200pro datalogger is provided with circular memory. When memory is full, a new data acquisition session will be stored in memory anyway, overwriting the oldest one.

Download

This tab allows you to download data from datalogger to your computer.

The file name that will be created depends on datalogger name and current date, like this:

DATALOGGERNAME_DD_MM_YY.TXT

This ensures a correct, unique and easy to find file name. But you can change folder and file name, if you need to.

If you happen to download data twice from the same datalogger in the same day, then you will be prompted twice the same file name for data storage. Saving the second file with the same exact name of the first file, will result in overwriting the first file.

Therefore be sure not to download data from datalogger after erasing its data memory (a file with no acquisitions data would overwrite a file containing your actual acquisitions data)

Read now

This tab lets you immediately read outputs from all the connected sensors.

It is recommended to perform a reading right after completing sensors wiring, to check that they are correctly connected.

Read mux [mux number] lets you read sensors connected to the selected mux. Datalogger will read one sensor after the other and show its output in the corresponding textbox.

When all the sensors are read, datalogger stops and waits for further instructions.

D800 has just one 8-channels Mux (Mux0), therefore only the button *Read Mux 0* can be used.

D1600 has one 16-channels Mux. D3200 and D3200PRO have two 16-channels Muxes (for a total of 32 channels).

D3200PRO has a total of 64 channels, 32 channels plus 32 temperature channels, in case Vibrating Wire sensors are connected.

Read mux [mux number]Temp lets you read temperature values on the selected mux (D3200PRO only).

At the bottom of the tab you can read internal parameters of datalogger. (They can be retrieved again clicking the corresponding button *Read internal parameters*).

5 Volt textbox should show a voltage value between 5 Volt +/- 5% and *battery voltage* needs to be between 5.8 and 7.2 Vdc.

If battery voltage drops below 5.8 Vdc, battery needs to be recharged or replaced.

Read MUX0+MUX1 and write file allows you to read all sensors in a cyclic way, until the operation is stopped. Data will be saved on PC hard drive and datalogger memory will not be used. This operation requires your PC to be constantly connected to datalogger. Features like power saving, screen savers, automatic standby are to be turned off in case your laptop is not plugged to power supply. Failing to disable these features will interrupt data acquisition and visualization.

Data are saved on file as soon as they are acquired. They are also shown on screen. Their visualization can be tabular or graphical. Opening and closing of the Graphs window will not interrupt data acquisition. Graphs window will show only picked channels. If no channel is picked, no data will appear on screen. Graphs require a higher PC memory as new data are collected or more channels are picked. This can result in a time-lag between data acquisition and graphic visualization on screen.

Calendar

This tab allows you to access datalogger internal clock and to enable automatic data acquisition.

Buttons *Read Clock* and *Write Clock* respectively read and write datalogger internal date and time. Buttons *Read START time* and *Write START time* respectively read and write the date and time for the next scheduled data acquisition.

Acquire Now lets you schedule an immediate automatic data acquisition (though datalogger will not run a data acquisition until it is connected to computer and D3200PRO software is open)

Enable Acquisitions enables or disables automatic data acquisitions. If it is checked, then datalogger will automatically acquire data when it's time to do that and if it is disconnected from computer or D3200PRO software is closed.

If *Enable Acquisitions* is unchecked, then datalogger is in stand-by mode and will not acquire any data. Power consumption is about 200 uA when datalogger is in stand-by mode.

Timers

This tab allows you to set the time interval between two data acquisitions.

You can not set an interval shorter than one minute and if data acquisition takes longer than time interval, then next data acquisition will be delayed.

If you have a GSM version of datalogger, time interval can not be shorter than 10 minutes.

In this tab you can also set a pre-heating time. That is a waiting time between sensor power up and sensor reading.

Channels

This tab is used to set how many channels are active and connected to sensors. You can read and write the number of channels using the buttons *Read channels #* and *Write channels #*.

Each mux can have up to 16 active channels.

When you edit channels number, D3200PRO software asks for your confirmation. If you confirm and proceed, be aware that all data that are stored in memory will be deleted. Therefore, before adding or removing channels, remember to download data from datalogger.

Delete Acquisitions cancels any data that was acquired and stored in datalogger.

Reset Datalogger completely resets datalogger restoring default settings and deleting data memory too. Use it only when strictly needed.

Sensors

You can access this form clicking on *Sensors* button in *CHANNELS* tab.

Each sensor is identified by a number between 0 and 15, by its MUX (from 0 to 3), and by its VW value (that is, vibrating wire sensors need to be set as VW).

Changes to VW checkbox values require changes on physical jumpers onboard the datalogger.

You can set a name and four numeric values for each sensor. These values allow you to express sensor output in whatever measure unit you need.

You may refer to the following formula:

$$\text{Out} = \left(\left(\frac{\text{In} - Z_V}{F_V - Z_V} \right) \times (F_F - Z_F) \right) + Z_F$$

Where:

Out = output value

In = input value, expressed in tenth of millivolt

Z_V = zero, expressed in tenth of millivolt
 F_V = full scale, expressed in tenth of millivolt
 F_F = full scale, expressed in your unit of measure
 Z_F = zero, expressed in your unit of measure

This formula is quite simple and does not require complex computations.
 You just need to take note of two distinct output levels of the sensor and proceed as follows:

• *Example 1*

Potentiometric transducer 4-20mA, with full scale 100mm

Transducer output is 4mA when measuring 0mm and is 20mA when measuring 10mm.
 Load resistor is 100 Ohm.
 So, when sensor output is 4mA, zero value is 4000 (expressed in tenth of millivolt)
 When sensor output is 20mA, full scale value is 20000 (expressed in tenth of millivolt)

So, the four parameters for the sensor are:

$Zero_volt = 4000$
 $Fs_Volt = 20000$
 $Zero_Physical = 0$
 $Fs_Physical = 100$

Output is expressed in mm.

If you want to express it in cm, you just need to set $Fs_Physical = 10$

• *Example 2*

Inclinometer with output 2.5Volt +/- 2 Volt and full scale = +/- 30°

Transducer has a nominal zero at 2.5 V which corresponds to 25000 tenth of millivolts.

$Zero_Volt = 25000$

In this position the transducer nominally measures 0°

$Zero_Physical = 0$

Transducer full scale output is 4.5V (45000 tenth of millivolts)

$Fs_Volt = 45000$

In this position, inclination is + 30°

$Fs_Physical = 30$

This way you found all the four parameters needed to read the inclinometer (if needed, software allows you to enter floating-point parameters)

- *Example 3*

Piezometric transducer 4-20mA, with full scale 20 m H2O

Transducer output is 4mA when measuring 0m of water and is 20mA when measuring 20m.

Load resistor is 100 Ohm.

So, when sensor output is 4mA, zero value is 4000 (expressed in tenth of millivolt)

When sensor output is 20mA, full scale value is 20000 (expressed in tenth of millivolt)

So, the four parameters for the sensor are:

Zero_volt = 4000

Fs_Volt = 20000

Zero_Physical = 0

Fs_Physical = 20

Output is expressed in m.

If you want to express it in cm, you just need to set Fs_Physical = 2000

- *Example 4*

Barometer with output in Volts

Our transducer output is 0.1V when measuring 15KPa and is 2.35V when measuring 115KPa, so:

Load resistor is 100 Ohm.

When sensor is measuring 15KPa, zero value is 1000 (expressed in tenth of millivolt)

And when sensor is measuring 115KPa, full scale value is 23500 (expressed in tenth of millivolt)

So, the four parameters for the sensor are:

Zero_volt = 1000

Fs_Volt = 23500

Zero_Physical = 15

Fs_Physical = 115

Output is expressed in KPa.

Alerts

Your datalogger is equipped with a double threshold alerting system. Thresholds can be enabled channel by channel. Each channel can be set with different thresholds.

Inner thresholds (Up and Down) are called Warnings, and outer thresholds (Up and Down) are called Alerts.

“Up” thresholds have effect only when sensor values exceed threshold value, “Down” thresholds have effect only when sensor values are below threshold value.

Example:

Sensor #3 is a 4-20mA crackmeter with a 50mm Full Scale. Its output is expressed in [mm] as its parameters are the following:

Electric Zero = 4000

Electric FS = 20000

Physical Zero = 0

Physical FS = 50

Crackmeter #3 is installed so that it initially reads 25 [mm]. You want a Warning when it moves +/- 10 [mm] from your initial 25 [mm] reading. You want an Alert when it moves +/-15 [mm].

Enabled = 1

Alert Down = 10

Warning Down = 15

Warning Up = 35

Alert Up = 40

When sensor #3 reads 12, a Warning is raised and sensor Enabled state is set to 2. When sensor #3 reads 8, an Alert is raised and sensor Enabled state is changed to 3.

Datalogger can not be in both Warning or Alerting state. If some sensor raises a Warning state and some other sensor raises an Alert state, datalogger state will be Alert.

Min # of Sensors to raise Warning sets the minimum required number of sensors out of thresholds to enter Warning state.

Min # of Sensors to raise Alerts sets the minimum required number of sensors out of thresholds to enter Alert state.

A low # of sensors for Alert raises a Warning sets whether datalogger should enter Warning State when some sensors are out of Alert thresholds, but their number is lower than *Min # of Sensors to raise Alerts*.

Duration of Onboard Alert/Warning output [s] sets the duration in seconds for local warning/alerting output. Value “0” means that local alerting output will stay active until no newly acquired data are out of threshold.

Data file example

Data that are downloaded from datalogger are easily readable and show all the sensors parameters too.

If you want to immediately visualize your data, then check *Create Table* before downloading.

A downloaded ASCII text file is here copied as an example.

It contains download date and time, sensors parameters and acquired data, splitted by commas.

DATA ACQ.: 06/01/2005 17.55.37,Numero Canali Attivi: 3 ,Numero Dati per Canale: 234

CANALE: 00	Y	25000	45000	0	2000
CANALE: 01	X	25000	45000	0	2000
CANALE: 02	T	5000	10000	0	50

05/01/2005 14.01.26	,-710.8	,228.8	,17.96
05/01/2005 14.03.48	,-711.8	,228.4	,17.56
05/01/2005 14.05.48	,-712.0	,228.4	,17.26
05/01/2005 14.07.48	,-711.4	,229.4	,16.94
05/01/2005 14.09.48	,-711.2	,229.4	,16.72
05/01/2005 14.11.48	,-711.0	,229.6	,16.48
05/01/2005 14.13.48	,-710.8	,230.0	,16.26
05/01/2005 14.15.48	,-711.6	,229.4	,16.04
05/01/2005 14.17.48	,-711.0	,229.8	,15.84
05/01/2005 14.19.48	,-712.0	,229.6	,15.64
05/01/2005 14.21.48	,-711.8	,229.8	,15.48
05/01/2005 14.23.48	,-711.6	,230.0	,15.32
05/01/2005 14.25.48	,-711.2	,230.4	,15.24
05/01/2005 14.27.48	,-711.8	,230.0	,15.12
05/01/2005 14.29.48	,-711.4	,230.6	,15.04
05/01/2005 14.31.48	,-712.0	,230.2	,14.92
05/01/2005 14.33.48	,-711.6	,230.8	,14.86
05/01/2005 14.35.48	,-711.4	,230.8	,14.78
05/01/2005 14.37.48	,-712.0	,230.4	,14.68
05/01/2005 14.39.48	,-711.8	,231.0	,14.6
05/01/2005 14.41.48	,-712.2	,230.4	,14.5
05/01/2005 14.43.48	,-711.8	,231.2	,14.44
05/01/2005 14.45.48	,-712.2	,231.0	,14.38
05/01/2005 14.47.48	,-712.2	,230.8	,14.3
05/01/2005 14.49.48	,-712.0	,231.4	,14.24
05/01/2005 14.51.48	,-712.2	,230.8	,14.16
05/01/2005 14.53.48	,-711.4	,231.4	,14.08
05/01/2005 14.55.48	,-712.2	,230.8	,14.0
05/01/2005 14.57.48	,-712.4	,231.0	,13.92
05/01/2005 14.59.48	,-712.0	,230.8	,13.88
05/01/2005 15.01.48	,-712.4	,231.0	,13.8
05/01/2005 15.03.48	,-712.2	,231.0	,13.76

Battery life

Expected battery life for a datalogger without modem.

During stand-by mode, datalogger consumption is about 200 uA.

Consumption peak is during data acquisition and is about 100 mA.

For each channel, acquisition time is approximately 4 seconds.

Further 10 seconds need to be calculated each time the datalogger wakes up to acquire data.

Assuming these approximate values, we can compute an expected battery life, as follows:

Example 1:

15A/h battery, 4 acquisitions a day, 16 sensors connected:

Daily power consumption:

$$200 \mu\text{A} \times 24 + 4 \times 100 \text{ mA} \times \left(\frac{16 \times 4}{3600} + \frac{10}{3600} \right)$$

$$0.0048 \text{ A} + 0.0082 \text{ A per day}$$

$$\text{Expected battery life: } \left(\frac{15}{0.0130} \right) = 1154 \text{ days approximately.}$$

To be sure not to overestimate battery life, let's divide the result by a factor of 3. We obtain an expected battery life of 1 year.

Example 2:

15A/h battery, 96 acquisitions a day, 2 sensors connected:

Daily power consumption:

$$200 \mu\text{A} \times 24 + 96 \times 100 \text{ mA} \times \left(\frac{2 \times 4}{3600} + \frac{10}{3600} \right)$$

$$0.0048 \text{ A} + 0.048 \text{ A} = 0.0528 \text{ A per day}$$

$$\text{Expected battery life: } \left(\frac{15}{0.0528} \right) = 284 \text{ days approximately}$$

To be sure not to overestimate battery life, let's divide the result by a factor of 3. We obtain an expected battery life of 3 months.

Expected battery life for a datalogger connected to modem

If datalogger is connected to a modem, then it is bundled with a solar panel and/or a battery charger too.

Modem power consumption is around 30 mA. Solar panels and battery chargers may vary and depend on where datalogger needs to be installed and how it needs to be used.

If solar panel and battery charger provide the right power and are kept in optimal conditions (no snow on the panel, no leaves etc..) battery life is to be considered no longer than 2 years, as batteries naturally deteriorate over time.

It's highly recommended to avoid connecting datalogger to powerline battery chargers that have no protection against voltage peaks, thunders, etc. etc.

Whenever possible it is recommended to use solar panels and rechargeable batteries that completely isolate datalogger from unwanted external noises.

Batteries replacement

To replace sealed Lead batteries, use sealed Lead batteries 6Vdc 12Ah after a correct and full recharge.

Software conventions

For a correct use of D800 software, you need to check some Windows settings in Control Panel.

Go to Start > Settings > Control Panel > Regional and language > Formats > Advanced settings

Decimal digits separator needs to be a “.”
Thousands separator needs to be “ “ “.”

If decimal digits separator is a comma “ , “ D800 software will not correctly receive correct values from datalogger.

Serial and USB connections

Datalogger D3200PRO uses a standard serial RS232 connection (3 wires + 1 wake-up wire).
Datalogger D3200PRO version for GSM modem uses protocol 9600,n,8,1

Common USB/Serial adaptors can be used for connecting to datalogger D800. If you use an adaptor, you can establish a direct communication between PC and datalogger, without the need to use serial cable included in datalogger box.

Trouble shooting

Datalogger does not connect to PC

- Check you chose the right COM port
- Check your cable is properly connected
- Check your cable status
- Check battery voltage

Datalogger does not acquire data

- Check Acquisition Enabled checkbox
- Check datalogger date and time

Measures seem incorrect

- Check sensors wiring
- Remove humidity
- Check international settings in Windows Control Panel
- Check battery status
- In case you are measuring biaxial sensors, check that a bridge is properly connecting the two used terminal blocks

Data download is too long

- Check that Pc is not running other programs that may slow it down.

GSM Modem and solar panel connections

Connecting to modem

To connect datalogger to GSM modem you need to use the serial cable provided together with datalogger.

T connector needs to be connected to modem. C connector needs to be connected to datalogger.

When modem is powered on, its LED starts blinking quickly. When it gets connected to GSM network, it goes on blinking, but slowly.

Use only SIM cards that can receive incoming calls. Cards can be prepaid or not prepaid.

PIN on the SIM card must be disabled.

Connecting to solar panel

If your datalogger is connected to a GSM modem, it is connected to a solar panel too.

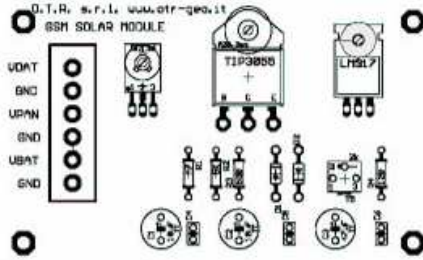
Solar panel supplies 10W. Battery charger for solar panel accepts 12/18Vin and supplies 7.2 Vout.

Lead battery is sealed and is 6V-12A/h with a very long life.

Do not use the battery charger with panels supplying more than 15W.

Do not use different battery chargers (standard chargers supply 12 Vdc Out)

Warning: battery charger radiator can reach a high temperature, up to 70°C.

Connecting solar panel and battery charger for solar panel:

VDAT:

Positive datalogger power supply (red wire)

GND:

Negative datalogger power supply (black wire)

VPAN:

Positive solar panel voltage (wire color depends on solar panel)

GND:

Negative solar panel voltage(wire color depends on solar panel)

VBAT:

Positive battery voltage (red wire)

GND:

Negative battery voltage (black wire)

A stabilized charger with 12/18 Vdc 1A output can be connected to VPAN/GND to recharge your battery before datalogger installation or to supply power to datalogger from the electricity grid.

NB: in case you supply power to datalogger from electricity grid, you need to choose a professional charger, with protection from voltage peaks and provided with filters against noise. Voltage peaks or noise on the grid can result in a system malfunction.

Installation and maintenance

Installation

Datalogger box is an IP65 or IP66 protection class box.

Box needs to be correctly closed and every hole in the box needs to be filled with a cable connecting a sensor (if a sensor is connected), or a short piece of cable anyway (if sensor is not used).

If you are installing your datalogger in a particularly wet place or a place with repeated low and high temperature cycles, a further level of protection is needed in order to avoid condensation inside the box.

Maintenance

Datalogger maintenance is fairly simple:

- Every time you download data, check battery voltage.
- Check box interior to prevent condensation.

If you are not going to use datalogger for an extended period of time, in order to avoid internal backup battery failure:

- Recharge or replace main battery after the last data acquisition and data download
- Put datalogger in stand-by mode, without disconnecting the main battery.

In these conditions, backup battery life can be considered unlimited.

Backup battery life is very long if you use datalogger regularly. But it falls down to just 6-12 months if you do not use datalogger and disconnect its main battery. That is the reason for you should keep main batteries connected to datalogger and put datalogger in its stand-by mode.

Backup battery replacement

In case the datalogger was not used for a long period of time and the above mentioned instructions were not followed, it is recommended to replace the backup battery.

Backup battery is a Li battery and can be easily found in stores (model PANASONIC CR2330 or equivalent)

If datalogger LED blinks 4 times when you power it up, it means that backup battery is to be replaced. Datalogger performed a reset and all data were lost.

You can find the backup battery to replace removing datalogger metallic cover and turning it upside down. Replace backup battery with an equivalent battery paying attention not to create a short-circuit and inserting it with the right polarization.

This operation must be performed disconnecting the main Lead battery.

If you do not disconnect the main battery while replacing the backup battery, once you replaced the backup battery you need to push the little yellow reset button on the datalogger board.

Specifications

Microprocessor:

Rabbit 3000

Measurable channels:

Up to 64 channels (Volt or 4-20 mA)

Resolution:

40000 points between +/-4Vdc or +/- 2Vdc or +/-1Vdc or +/- 4.5 Vdc

Sensors power supply:

+15V or +12V

Temperature drift:

<15 ppm/°C

Usage temperature:

From -20°C to +55°C

Memory:

256 KB RAM (with backup battery) and 256 KB Flash Memory

Power consumption:

200 uA (stand-by) and 100 mA (data acquisition)

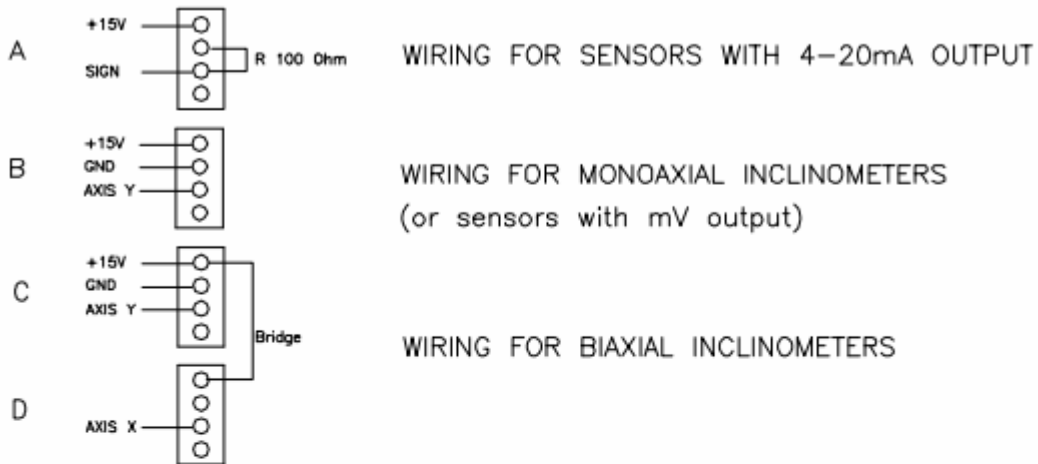
MUX

Sequential relais

Appendix A

D3200PRO sensors wiring

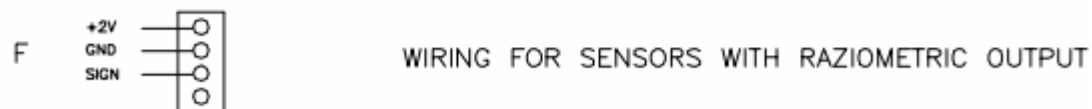
mV CHANNELS



mA CHANNELS (Optional internal Resistance needed)



RAZIOMETRIC CHANNELS



VW CHANNELS (VIBRATING WIRE)

