Z-200R

24V AC or DC POWERED

ZIGBEE RECEIVER

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1. INTRODUCTION

1.1 Hardware Features

The Z-200R ZigBee wireless receiver module provides a straightforward method of interfacing wireless sensors and transmitters to analogue outputs. It can be linked to wired Isoslice input and output units and so accept virtually every type of analogue input signal from millivolts to 40Vdc, mA, thermocouples and RTD's.

It can be used as a simple wireless 4-20mA cable replacement system, providing 4-20mA outputs from wireless sensors.

A built in display allows local monitoring of the individual inputs and outputs, and displays menu options when the unit is configured.

The unit can be powered by a DC or AC voltage between 16 and 36Vdc or 16 and 32Vac.

The instrument is packaged in a compact 22.5mm wide enclosure which can be mounted on standard TS35 DIN-rail.

The system can be expanded through the use of optional ISO-SLICE slice I/O modules. These modules connect automatically via the DIN rail mounted bus connector, allowing the easy addition and removal of extra I/O.

1.2 Isolation Details

The Z-200R has full 3 port isolation of 1000V between the Output Stage and Power Supply for functional reasons.

2. UNPACKING

The instrument should be carefully inspected for signs of damage which may have occurred in transit. In the unlikely case that damage has been sustained, DO NOT use the instrument, but please retain all packaging for our inspection and contact your supplier immediately.

3. QUICK START GUIDE

There are a number of different ways the Z-200R can be used, here we show QUICK START examples of two different systems.

3.1 Example 1

A single Z-Head provides a wireless transmission of a pressure level in a pipe and the Z200R outputs this value as a 4-20mA output

The Z-Head transmitter is configured to be channel 2.
Refer to the Z-Head installation instructions for details.
Open the Z-200R case and slide out the PCB (see section 4)
Set up the output switch to mA (see section 5)
For 4-20mA output the switch should be off (yellow switch away from PCB edge).
Refit the PCB into the housing and fit the complete unit onto the din rail.
Connect up output and power then switch on (see section 4)
Access the main menu by pushing and holding both buttons until OK is displayed.
Calibrate the mA output following the procedure in section 6.2
Display scaling values can be changed from the default 0-100% by following the procedure in section 6.3
The Z-200R output is channel 1 parameter 1.
The parameter that it represents must be changed to channel 2 parameter 1 by following the procedure described in section 6.5.
Measure the age of a reading in minutes by following the procedure in section 6.10.
Exit the main menu by holding both buttons until OK is displayed.

3.2 Example 2

The Z-200R receives temperature and humidity values from 2 Z-Heads and outputs these as 4-20mA outputs using an Isoslice-8 analogue output card

The Z-Head transmitters are configured to be channels 2 and 3.
Refer to the Z-Head installation instructions for details.
The Isoslice-8 unit is configured as channel 4.
Refer to the Isoslice-8 installation instructions for details.
Fit the Isoslice-8 and Z-200R units to the din rail.
Connect up power to the Z-200R then switch on (see section 4)

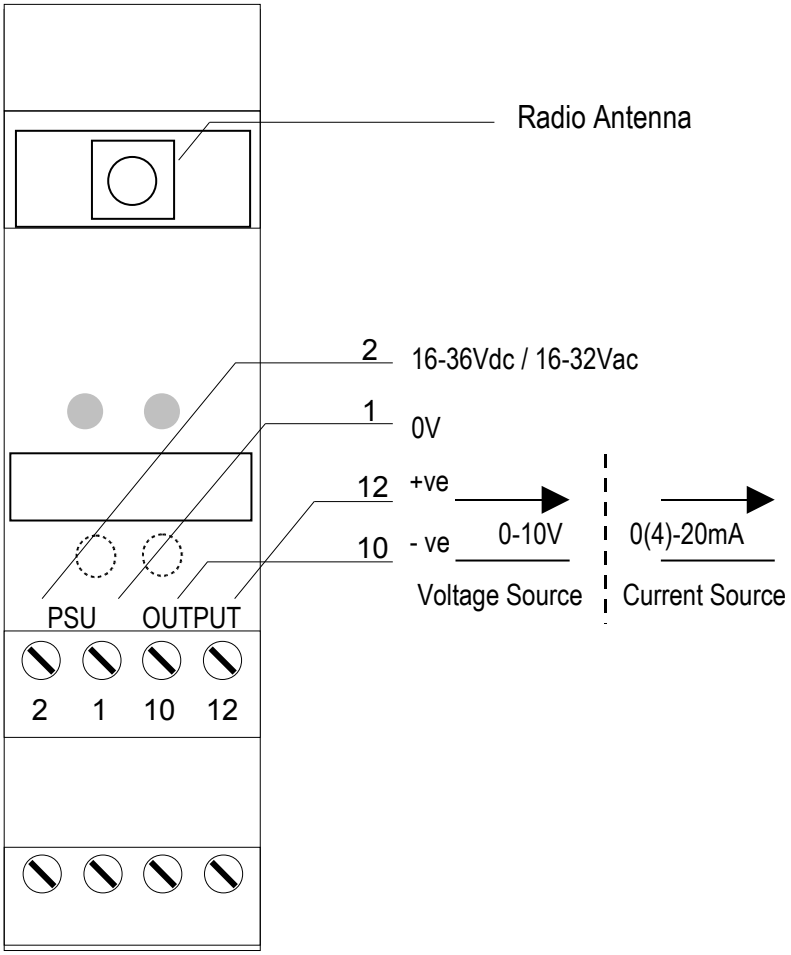
Access the main menu by pushing and holding both buttons until OK is displayed.
Display scaling values can be changed from the default 0-100% by following the procedure in section 6.3
The Isoslice-8 outputs must be configured to represent the Z-Head values of channels 2 and 3 by following the procedure described in section 6.5.
Measure the age of a reading in minutes by following the procedure in section 6.10.

Exit the main menu by holding both buttons until OK is displayed.

4. CONNECTIONS

The Z-200R is housed in a compact DIN rail mounting enclosure, with terminals, arranged in 4 rows. The power supply and analogue outputs are on the bottom rows.

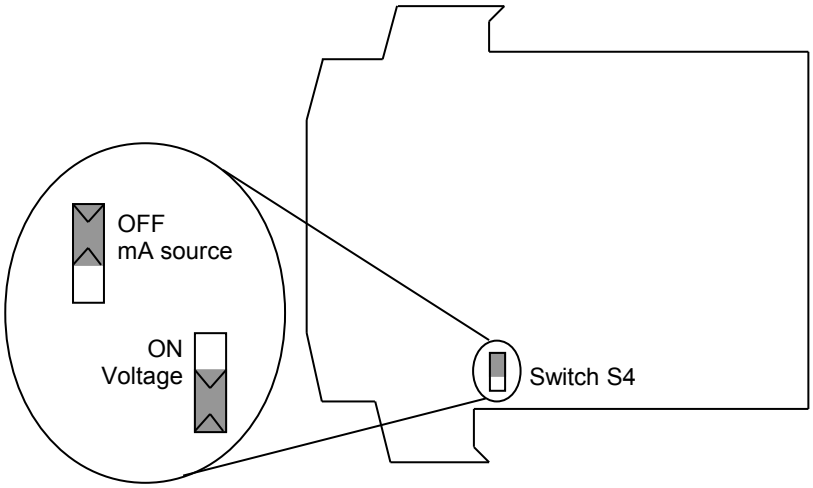
The diagram below shows how to connect to a Z-200R with an analogue output.



5. CONFIGURING THE Z-200R OUTPUT STAGE

If an analogue output is fitted the output type is selected with Switch S4.
The analogue output of the Z-200R is channel 1, parameter 1.

Output Type	S4 Position
mA Source	Off
Voltage	On



! WARNING !
DO NOT OPEN UNIT OR ADJUST SWITCHES WITH POWER SUPPLY, INPUT OR OUTPUT CONNECTED

6. CALIBRATING THE Z-200R

When the unit is shipped the Z-200R will be calibrated for the output type and range noted on the side label if it is fitted. If this label is blank then the unit will be calibrated for 4-20mA output.

The display is used to show scaled values of the inputs and outputs in the system, or ON and OFF for digital inputs and outputs. The left button scrolls through the available channels, and the right button scrolls through the available parameters. Whilst the button is held down, the channel number is shown on the left of the screen, and the parameter is shown on the right. The led can be configured to flash every 3 seconds to indicate that the unit is operating or configured to flash each time data is received. The display can be configured to remain on all the time, or switch off after 15 minutes.

When the Z-200R receives data from a Z-Head that counts pulses, it has to scroll the value on the display, because the display only has 4 digits (to show 0 to 65535). This happens automatically when the Z-200R recognises the data is from a Z-Head pulse counter. Values from Z-Heads with normal scaled data are displayed as decribed in section 6.3.

Output parameters should not be linked to follow pulse count input parameters, because the scaling is different. This is because an output linked to a normal scaled input value follows a value between 3869 and 61650 representing 0 to 100%, whereas a pulse count value can be between 0 and 65535.

6.1 Main menu

To access the main menu push and hold both buttons until OK is displayed.
These are the main menu options, use raise and lower buttons to cycle through:

1. OUT SPAN	*(sec 6.2)*	12. TIME time	*(sec 6.7)*
2. OUT ZERO	*(sec 6.2)*	13. VIEW BURNOUT	*(sec 6.8)*
3. DSV Cc Pp	*(sec 6.3)*		
4. DS span	*(sec 6.3)*		
5. DS zero	*(sec 6.3)*		
6. VIEW DSV	*(sec 6.4)*		
7. OUT Cc Pp	*(sec 6.5)*		
8. LINK Cc Pp	*(sec 6.5)*	19. DISPLAY time	*(sec 6.9)*
9. VIEW LINK	*(sec 6.6)*	20. AGE age	*(sec 6.10)*
10. BURNOUT Cc Pp	*(sec 6.7)*	21. LED led	*(sec 6.11)*
11. LEVEL level	*(sec 6.7)*	22. DEFAULTS	*(sec 6.12)*

Note that menu options 1 and 2 are only available if an analogue output is fitted.

To access the sub menu of one of the main menu options, use raise or lower to cycle to the option required then push and release both buttons. Change the parameter as required.

To return to the main menu, push and release both buttons.

To exit from the main menu and return to run mode, press and hold both buttons for 2 seconds until OK is displayed on the screen.

After two minutes of inactivity from the front buttons when the main menu (or a sub menu) had been accessed, a timeout will occur and the unit will automatically return to run mode.

6.2 Output Span and Output Zero (1. OUT SPAN and 2. OUT ZERO)

These menu options allow the Z-200R to learn the output span and zero values if there is an output fitted to the Z-200R. Default output values will make the DAC output approximately 4 to 20mA or 2 to 10V for the voltage option.

Display	Action
1.OUT SPAN	Press and release both buttons together
OS	Press raise/lower buttons to adjust output value until correct
OS✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
1.OUT SPAN	Push the raise button once to change menu item
2.OUT ZERO	Press and release both buttons together
OZ	Press raise/lower buttons to adjust output value until correct
OZ✓	The tick will appear when a valid value has been learnt
	Press and release both buttons together to go to main menu
2.OUT ZERO	

6.3 Display Scaling Values Adjustment (3.DSV Cc Pp, 4.DS span, 5.DZ zero)

The display can show a scaled numerical value for each parameter of each channel. Scaling values can be adjusted between –999 and 9999. The default scaling values are 0 to 100. For all channels, all 8 parameters can be changed even if the channel is not used, or some of the parameters are not used.

For channels with digital outputs, the display scaling values can be used to configure setpoints if the digital output is linked to follow an analogue input. The setpoints are compared to the analogue input value to switch the digital output on and off. The setpoints are configured as percentage values (0-100%). The span value is the on setpoint and the zero value is the hysteresis. The off setpoint is calculated by adding the span and hysteresis together.

The hysteresis value can be positive or negative. If hysteresis is negative, the digital output switches on (when the analogue value it is following is) above the on setpoint and off below the off setpoint. For example if span is 50% and zero is -10%, output switches on above 50% and off again below 40%.

If hysteresis is positive, the digital output switches on below the on setpoint and off above the off setpoint. For example if span is 50% and zero is 20%, output switches on below 50% and off again above 70%.

Example: To change the scaling of channel 3 parameter 2, from 0 - 100 to 4 - 20:

Display	Action
3.DSV C1 P1	C1 P1 is channel 1 parameter 1
	Press and release both buttons together
01 1	Press lower button to choose channel (on left: 1 to 32)
03 1	Press raise button to choose parameter (on right : 1 to 8)
03 2	Press and release both buttons together
3.DSV C3 P2	C3 P2 is channel 3, parameter 2
	Push the raise button once to change menu item
4.DS 100	Display Span value is 100
	Press and release both buttons together
100	Press raise/lower buttons to adjust display span value
20	Press and release both buttons together
4.DS 20	Display Span value is now 20
	Push the raise button once to change menu item
5.DZ 0	Display Zero value is 0
	Press and release both buttons together
0	Press raise/lower buttons to adjust display zero value
4	Press and release both buttons together
5.DZ 4	Display Zero value is now 4

3.DSV Cc Pp is used to select the channel and parameter that need display values changing, where c represents the channel and p indicates the parameter.
To select a different channel or parameter enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32) and the raise button increases the parameter (1 to 8).

For the channel and parameter chosen in menu 3:
4.DS span indicates what the display span value is (span is –999 to 9999)
To change the display span value enter the sub menu and adjust it.
5.DZ zero indicates what the display zero value is (zero is –999 to 9999)
To change the display zero value enter the sub menu and adjust it.

6.4 View Display Scaling Values (6.VIEW DSV)

To view all eight parameter scaling values of a particular channel, enter this sub menu. The first channel shown will be the one selected in 3.DSV Cc Pp. The scaling values will be shown in a scrolling message in this format: e.g. channel 3:

C3.P1 100,0 P2 20,4 P3 100,0 P4 100,0 P5 100,0 P6 100,0 P7 100,0 P8 100,0

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again, for a different channel.

6.5 Linking Outputs to other Parameters (7. OUT Cc Pp, 8. LINK Cc Pp)

The Z-200R 4-20mA or 0-10V output can represent the value of any parameter within the system. The outputs of Isoslice units can also represent any parameter within the system. This is done using a link table, which links the outputs to the parameters (usually of input devices) they must represent.

By default outputs are linked to themselves, so that an output is controlled by a Modbus write to its associated register.

Go to main menu item 7.OUT Cc Pp where c and p show the channel and parameter of the output that needs to be linked to an input value. To select a different output, enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32), the raise button increases the parameter (1 to 8). Once the channel and parameter of an output have been chosen, exit the sub menu.
Go to main menu item 8.LINK Cc Pp where c and p show the channel and parameter that the output chosen in 7 is currently linked to. (Note the distinction: it allows the user to see what parameter an output is linked to without needing to go into the LINK submenu).

Use this submenu to choose the parameter that the output needs to follow. The display will show the channel on the left and the parameter on the right. The left button increases the channel (1 to 32), the right button increases the parameter (1 to 8). Once the channel and parameter of the input that the output chosen in 7 is to be linked to has been chosen, exit the sub menu.

The link function typically allows analogue outputs on the isoslice bus to reproduce analogue values from remote sensors, or allow digital outputs on the isoslice bus to reproduce digital values from remote sensors.

Analogue outputs can be linked to digital inputs. If an analogue output is linked to a digital input, it will output 100% if the digital input is On and 0% if it is Off.

Digital outputs can be linked to analogue inputs, with programmable setpoints to control at what analogue input value the digital output is switched on and off. The setpoints are programmed as Display Scaling Values, as described in section 6.3.

The link table only affects output parameters. If an input parameter is linked to follow another, its value will be unaffected by the link table operation.

Example:
Channel 1 is the Z-200R with 1 analogue output, parameter 1.
Channel 2 is an Isoslice-2 with 8 analogue inputs, parameters 1 to 8.
Channel 3 is an Isoslice-8 with 4 analogue outputs, parameters 1 to 4.

To make the Z-200R output 1 follow Isoslice-2 input 1 and
make output 1 on the Isoslice-8 follow input 2 of the Isoslice-2

Display	Action
7.OUT C1 P1	C1 P1 is the Z-200R output which needs to be linked
	Push the raise button once to change menu item
8.LINK C1 P1	This shows the Z-200R output is under Modbus control
	because it is linked to itself, C1 P1
	Push and release both buttons together
02 1	Press lower button to choose channel 2 (on left: 1 to 32)
	Press and release both buttons together
8.LINK C2 P1	Z-200R output is now linked to the Isoslice-2, input 1
	Push the lower button to change menu item
7.OUT C1 P1	C1 P1 is the Z-200R output.
	We need to select the Isoslice–8 on channel 3
	Push and release both buttons together
03 1	Push left button to select C3, the Isoslice-8, output 1
	Press and release both buttons together
7.OUT C3 P1	C3 P1 is output 1 of the Isoslice-8 on channel 3
	Push the raise button once to change menu item
8.LINK C3 P1	This shows the Isoslice-8 output 1 is under Modbus control
	Because it is linked to itself, C3 P1
	Push and release both buttons together
03 1	We need to link it to the Isoslice-2, Channel 2 Parameter 2
02 1	Push lower button to select channel 2 (on left: 1 to 32)
02 2	Push raise button to select parameter 2 (on right: 1 to 8)
	Push the raise button once to change menu item
8.LINK C2 P2	Isoslice-8 output 1 is now linked to Isoslice-2 input 2

6.6 View Link Table (9.VIEW LINK)

To view the parameters that a channel is linked to use the 9.VIEW LINK menu. The channel and parameters that the outputs are linked to can be seen in a scrolling message in this format
e.g. for channel 3:

C3.P1 2,2 P2 3,2 P3 3,3 P4 3,4 P5 3,5 P6 3,6 P7 3,7 P8 3,8

This shows that channel 3 parameter 1 is linked to channel 2, parameter 2, and all the other channel 3 parameters link to themselves and are therefore under modbus control.

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again, for a different channel.

6.7 Burnout Control (10.BURNOUT Cc Pp, 11.LEVEL level, 12.TIME time)

10.BURNOUT is used to select the channel and parameter of an output for menu 11.LEVEL level (where level is HI or LO for that output parameter) and the channel for menu 12.TIME time (where time is the timeout value for that input channel).

Go to main menu item 10.BURNOUT Cc Pp where c and p show the channel and parameter of the output that needs its burnout level to be changed or the input channel that needs its timeout value to be changed. To select a different channel or parameter, enter the submenu. The display will show the channel on the left and the parameter on the right. The lower button increases the channel (1 to 32), the raise button increases the parameter (1 to 8). Once the channel and parameter have been chosen, exit the sub menu.

Burnout Level Control

When an output is following an input (because it is linked to it via the LINK and OUT menu) at some stage it may need to indicate the value it is following is not valid. This occurs if the input has any error condition (burnout, data not available etc) or has timed out because data has not refreshed recently enough (see Burnout Time Control in the next section).

The Burnout Level menu allows individual outputs to indicate this condition by either going to a HI burnout value (23mA or 11.5V for an analogue output, On for a digital output), or a LO burnout value (0mA or 0V for an analogue output, Off for a digital output).

To change the burnout level of an output first select the correct channel and parameter using menu 10.BURNOUT. Then select menu 11.LEVEL level and in the sub menu choose HI or LO.

The default Burnout Level for all parameters of all channels is HI.

Burnout Time Control

Each channel has an Age parameter associated with it to give an indication of how old the data is. If the device providing that data becomes unable to send any new data, there comes a time when the data held by the Z-200R can be considered too old to be valid. It is possible to set a time limit on each channel that will make the Z-200R change old data values to a timeout error condition (0xFFFE or E 15 on the display) if the time limit is reached.

To change the timeout value for an input channel first select the correct channel using menu 10.BURNOUT. Then select menu 12.TIME time and in the sub menu choose OFF to disable the timeout, or a value between 1 and 255 inclusive.

The default Burnout Timeout for all channels is OFF.

6.8 View Burnout (13.VIEW BURNOUT)

To view the burnout configuration for each channel use the 13.VIEW BURNOUT menu. The channel burnout time and parameter burnout levels can be seen in a scrolling message.

e.g. for channel 2:
C2 30 P1 HI P2 HI P3 HI P4 HI P5 HI P6 HI P7 HI P8 HI

This shows that if this is an input, its data will become invalid if it is older than 30 seconds (or minutes depending on AGE parameter selected, see section 6.15).

e.g. for channel 3:
C3 OFF P1 HI P2 HI P3 HI P4 HI P5 HI P6 HI P7 HI P8 HI

This shows that if this is an output, all burnout indications are set to HI. If it is an input, data values are not affected by any timeout.

The channel being viewed can be changed using the lower or raise buttons, each press will cause the scrolling message to begin again, for a different channel.

6.9 Display Timer (19.DISPLAY display)

Choose if the display remains on all the time or switches off 15 minutes after a button was last pressed.

ON	select this to make the display stay on all the time
15	select this to make the display switch off after 15 minutes (default)

6.10 Age Select (20.AGE age)

The age of a parameter can be counted in seconds or minutes, which will depend on the update of the wireless sensors concerned. Use this menu to select between

SEC	select this to count in seconds (default)
MIN	select this to count in minutes

6.11 Led Control (21.LED led)

The led can be used in 2 different ways, depending on the frequency of data received from wireless transmitters.
For applications where wireless transmissions occur continuously, it is recommended to set this to BEAT. For applications where wireless sensors are perhaps sending data every 10 minutes or more, choose LINK to see an LED flash each time data is received

BEAT	select this to see the led flash every 3 seconds (default)
LINK	select this to see the led flash when a wireless transmission is received

6.12 Restore Defaults (22.DEFAULTS)

All values that can be changed using the menu system can be restored to default values.
Choose to do this by selecting YES

NO	select this to change nothing
YES	select this to restore all menu values to defaults

To select YES, hold down the raise button for about 5 seconds until the display says YES.

If it returns to the main menu when YES was displayed SAVE will be displayed and the red led will come on for a few seconds while default data is restored and saved to eeprom.

7. ISOSLICE BUS

The Isoslice units are powered from the Din rail mounted bus connectors.

The Z-200R will scan the bus when it powers up to find Isoslice units that are attached. Initially the data values of all data registers are 0xFFF0, which indicates there is no data available.

Each Isoslice is read twice a second. Output data is written to the Isoslice as it is received.

If an Isoslice unit needs to be added to the bus, first switch the power off, add the new Isoslice unit and switch the power on again.

In a standard Z-200R the maximum number of isoslice units that can be fitted is 31. This gives up to 249 parameters per Z-200R if 8 input Isoslices are used, if the Z-200R has an output fitted.

Channels are allocated to wireless devices and Isoslice units within the system, the channels must not be duplicated.

If scaling data is entered on a Z-200T which has an Isoslice bus, it will be local to the display of the Z-200T. The same information would need to be entered on the Z-200R as well.

Special versions of the Z-200R allow more than 32 channels at the expense of having less parameters per channel or provide a combination of channels with different numbers of parameters allocated. Modbus addressing depends on the mode since there is a varying amount of LQI and Age values to contend with. Isoslice units with more parameters than are available for the channel selected can be used, but the higher parameter values are unavailable.

Mode 1	*8 parameters, 32 channels (default)*	*32 Age and LQI*
Mode 2	*4 parameters, 64 channels*	*64 Age and LQI*
Mode 3	*2 parameters, 128 channels*	*128 Age and LQI*
Mode 4	*1 parameters, 256 channels*	*256 Age and LQI*
Mode 5	*8 p, 16 c + 4 p, 32 c*	*48 Age and LQI*
Mode 6	*8 p, 16 c + 2 p, 64 c*	*80 Age and LQI*
Mode 7	*8 p, 16 c + 1 p, 128 c*	*144 Age and LQI*
Mode 8	*8 p, 8 c + 4 p, 16 c + 2 p, 32 c + 1 p, 64 c*	*120 Age and LQI*

8. INSTALLATION

The Z-200R's input and output circuits are classed as Separated Extra Low Voltage (SELV). This means that they must not be externally connected to voltages exceeding 30V ac or 60V dc, nor do they generate voltages above these limits internally. Where a higher voltage input is required a specially designed DIVIDER unit can be used to condition the input signal prior to connection to the process input terminals.

The Z-200R unit clips directly onto 'Top Hat' (TS35) symmetrical DIN rail. Ideally, mounting orientation should be vertical. Good airflow around the unit will maximise reliability of the instrument.

The use of bootlace ferrules is recommended on wiring terminations.

Do not exceed terminal torque rating of 0.4 Nm – use an appropriate screwdriver. The unit can be removed from the DIN rail by sliding a small screwdriver into the slot at the rear of the enclosure on the lower face and gently levering the metal clip, whilst lifting the unit from the rail.

9. TROUBLESHOOTING

The Z-200R has some built in self diagnostic functions. Errors encountered will be displayed on screen.

E 1	The input value is not available
ERR1	The radio module did not reset correctly. Switch power off for 10 seconds.
ERR2	Eeprom Error: Stored data has been corrupted. Push and release both buttons then recalibrate the output options and values.
ERR3	Link Table Error: Stored data has been corrupted. Push and release both buttons then reprogram the link table values
ERR4	Burnout Table Error: Stored data has been corrupted. Push and release both buttons then reprogram the burnout levels and timeouts
E 4	The input value is currently unavailable
E 5	The input span value is too close to the (saved) input zero value
E 6	The input zero value is too close to the (saved) input span value
E 8	There is no data available
E 14	Low burnout indication on an output
E 15	Timeout Error: An input device value has timed out.
E 16	Burnout Error: Check wiring connections of RTD or TC on an input. High burnout indication on an output

9.1 Incorrect Reading

- Check that Unit is configured for the correct Sensor
- Check that Input Scaling is as required.
- Check that Linearisation has been set correctly.

9.2 Sensor Failure

- Check that sensor wiring is correct.
- Check Thermocouple polarity.
- Check that all RTD leads are connected to correct terminals.
- Check that the Z-200R is configured for correct sensor.
- Check that applied voltage is not out of range.
- Check that applied current is not out of range.
- Check that applied millivoltage is not out of range.

10. SPECIFICATIONS (@ 25°C)

Operating Temperature		0 to 55 °C
Operating Altitude		Sea Level to 2000m
Humidity		0-90% RH
Power Requirements	DC Supply	16 to 30Vdc
	AC Supply	16 to 32Vac
Current Consumption		120 mA @ 24Vdc (20mA in & out)
Transmitter Power Supply		22V to 29V @ up to 24mA Dependant on supply voltage and load
Calibration accuracy		±0.05% full scale
Linearity		±0.05% full scale
Temperature Stability		50ppm / °C
Input Impedance:		
Current Input		15 ohms
Voltage Input		1 Mohm
Millivolt Input		Greater Than 10 Mohm
Thermocouple Burn Out Current:		500nA Nominal
Cold junction compensation accuracy		±0.5°C over operating range
Maximum Voltage Output		11.5 V into a minimum of 7Kohm
Maximum Current Output		23.0 mA into a maximum of 1Kohm

Unit has full 3 port Isolation to 1kV between Power Supply, Input and Output.
The unit can also withstand transients of 2.5kV for 50 µsecs.

Dimensions	114.5 mm x 99mm x 22.5mm (H x D x W)
Mounting	DIN Rail TS35
Connections	Screw Clamp with pressure plate
Conductor Size	0.5 to 4.0 mm
Insulation Stripping	12 mm
Maximum Terminal Torque	0.4 Nm
Weight	Approx. 140g
EMC Emissions	BS EN61326
LVD Standards	EN61010-1
Installation Category (IEC 664)	II
Pollution Degree (EN61010-1)	2
Equipment Class (IEC 536)	II