

Z-2400-A2I

Wireless Node Using ZIGBEE[®] For
Analogue and Digital Interface With MicroScan.

FCC ID
2ACTT-1409

CE E2180



Installation Guide.

Z-2400-A2I Wireless Node Installation Guide Index.

Description.	Page 3
Ordering Information.	Page 3
Analogue Input 1~2 Specifications.	Page 4
Digital Input 1~4 Specifications.	Page 5
Digital Output 3~4 Specifications.	Page 5
Relay Output 1~2 Specifications.	Page 5
General Specifications.	Page 5
Physical Layout Z-2400-A2I.	Page 6
<i>Front Panel Connections and LEDs.</i>	Page 6
<i>Terminal Connections.</i>	Page 6
Diagnostic LEDs.	Page 7
<i>RF Signal Quality LED Indication.</i>	Page 7
<i>Z-2400-A2I Remote Network Status LED Definitions.</i>	Page 7
<i>Power and ZigBee Network LED Indication.</i>	Page 7
Z-2400-A2I DIP Switch Positions for MicroScan Installations.	Page 8
<i>DIP Switch Summary for Z-2400-A2I.</i>	Page 8
<i>Z-2400-A2I Node Address Settings & Table</i>	Page 8
<i>Z-2400-A2I MicroScan Communication Settings.</i>	Page 9
<i>Z-2400-A2I Network Type Settings.</i>	Page 9
<i>Z-2400-A2IO Kit DIP Switch Settings.</i>	Page 9
Programming the Z-2400-A2 Series.	Page 9
<i>XU Setup Programming Software.</i>	Page 9
<i>Z-2400-A2I USB Connection.</i>	Page 10
<i>ZigBee Mesh ID.</i>	Page 10
Connecting up the Z-2400-A2I.	Page 11
<i>Z-2400-A2I Power Supply Connection.</i>	Page 11
<i>Z-2400-A2I Analogue Input Connections.</i>	Page 11
<i>Connecting RTDs to the Z-2400-A2I Analogue Inputs.</i>	Page 11
<i>Connecting Thermocouples to the Z-2400-A2I Analogue Inputs.</i>	Page 12
<i>Connecting Voltage Signals to the Z-2400-A2I Analogue Inputs.</i>	Page 12
<i>Connecting Current Signals to the Z-2400-A2I Analogue Inputs.</i>	Page 12
<i>Connecting Pulse, Frequency & On/Off Signals to the Z-2400-A2I Analogue Inputs.</i>	Page 13
<i>Connecting Pulse, Frequency & On/Off State Signals to the Z-2400-A2I Digital Inputs.</i>	Page 14
<i>Connecting to the Z-2400-A2I Digital Outputs.</i>	Page 14
<i>Connecting to the Z-2400-A2I Relay Outputs.</i>	Page 15
Z-2400-A2 Series Wiring, Installation and Maintenance.	Page 15
<i>Z-2400-A2I Wiring and Installation.</i>	Page 15
<i>Z-2400-A2I Commissioning.</i>	Page 16
<i>Z-2400-A2I Maintenance.</i>	Page 16
Troubleshooting.	Page 17
Considerations & Limitations for Z-2400 Network Systems.	Page 17
Antenna Options for Z-2400-A2I.	Page 20

Product Liability. This information describes our products. It does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to ongoing research and development, designs, specifications, and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data are always specified by their average values and are based on Standard Calibration Units at 25°C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.

Warning: These products are not designed for use in, and should not be used for patient connected applications. In any critical installation an independent fail-safe back-up system must always be implemented.

Z-2400-A2I

Wireless Remote Node For
Analogue & Digital Signals.

Description.

The Z-2400 series of units support the communication of data signals via a ZigBee® wireless network. Built on the ZigBee® protocol, this allows for a true Mesh network where nodes are capable of communicating with each other.

The Base node is the master unit and coordinates all wireless network traffic.

Within this wireless network sits the well established wireless nodes such as the Z-2400-RB Remote and the Z-2400-Sleeper.

The **Z-2400-A2I** has been added to the wireless network to further increase the versatility of this system. The Z-2400-A2I node acts as a wireless remote station and seeks for the Base to transmit the input signals to.



Ordering Information.

- **Z-2400-A2I**
Input Remote Wireless node. 2x Isolated Universal Inputs, 4x Digital Inputs & Outputs.
(Universal inputs default set to RTD Pt100.)

Note: The Z-2400-A2I requires the XU-USB (Rev 1) Programming Key for Configuration:

XU-USB (Rev 1):	USB Programming Key for programming the Z-2400-A2I wireless node using XU Setup Programming software. (Same Key as used for programming XU Series transmitters, 2400-A16 / 2400-M-R, IN-uP4 and Z-2400-Sleeper.)
------------------------	--

Other MicroScan Z-2400 Wireless Nodes:

- **Z-2400-RB-T**
Serial Base or Remote, as selected by DIP switch.
- **Z-2400-TCP-T**
Ethernet TCP/IP Base Only.
- **Z-2400-SLEEPER**
2x Universal Input Sleeper, battery or plug pack powered.

System Limits:

Maximum 29 Z-2400-A2I Remotes per Base.

Analogue Input 1~2 Specifications.

Input Resolution	16 Bits, 50,000 Steps Average (some ranges may differ).
Input Isolation	2500Vac for 1 minute between All Input Channels.
Sensor Break	Upscale or Downscale Selectable.
Voltage Input Specifications:	
Input Impedance	>500K Ω on all ranges.
mV Maximum Over-range	3Vdc Continuous.
V Maximum Over-range	24Vdc Continuous.
mV Range	-200~200mV, -200~1000mV.
V Range	0~10V, 0~18V.
Accuracy	0.1% FSO Max.
Linearity and Repeatability	0.1% FSO Max.
Channel Separation	0.001% Max.
Ambient Drift	0.003%/°C FSO Typical.
Noise Immunity (CMRR)	160dB Tested @ 300Vrms 50Hz.
RF Immunity	1% effect FSO Typical.
Current Input Specifications:	
Minimum Recommended Span	0~1mA (gives 1000 steps on output).
Input Impedance	45 Ω .
Maximum Over-range	Protected by PTC Up to 24Vdc Max.
mA Range	0~20mA (4~20mA).
Accuracy	0.1% FSO Max.
Linearity and Repeatability	0.1% FSO Max.
Channel Separation	0.001% Max.
Ambient Drift	0.003%/°C FSO Typical.
Noise Immunity (CMRR)	160dB Tested @ 300Vrms 50Hz.
RF Immunity	1% effect FSO Typical.
Thermocouple (T/C) Input Specifications:	
Thermocouple Types	B, E, J, K, N, R, S, T.
Input Impedance	>500K Ω .
T/C Lead Resistance	100 Ω Max.
Cold Junction Compensation.	-10~60°C.
CJC Drift	0.02°C/°C For Installation Upright.
Accuracy	0.1% of FSO \pm 1°C Typical.
Sensor Fail	Upscale or Downscale Selectable (Upscale Default).
Type B Range	0~1800°C (30~3270°F).
Type E Range	-200~800°C (-320~1470°F).
Type J Range	-200~1000°C (-320~1830°F).
Type K Range	-200~1300°C (-320~2370°F).
Type N Range	-200~1300°C (-320~2370°F).
Type R Range	0~1700°C (30~3090°F).
Type S Range	0~1700°C (30~3090°F).
Type T Range	-200~400°C (-320~750°F).
RTD Input Specifications:	
Pt100 RTD Type	3 Wire Pt100 RTD DIN 43760:1980 Standard Input.
Pt1000 RTD Type	3 Wire Pt1000 RTD Standard Input.
Sensor Current	0.6mA Continuous.
Lead Wire Resistance	Pt100: 10 Ω /wire Max. Pt1000: 5 Ω /wire Max.
	0.1% FSO Offset Error per Ω of Lead Resistance.
Sensor Fail	Upscale or Downscale Selectable (Upscale Default).
Ambient Drift	0.003°C/°C Typical.
Accuracy	0~300°C \pm 0.1°C. 0~850°C \pm 0.3°C, Isolated Channels Only.
Resolution	0.01°C for -200~250°C, (-140~210°F). 0.1°C for -200~850°C (-320~1560°F).
Pulses & Frequency:	
	Meter Pulses, Frequency or On/Off State Inputs.
Input Type	Open Contact - NPN, PNP.
Frequency Range	0~2500Hz.
Frequency Resolution	0.1Hz.
Fast Counter Range	0~2500Hz.
Maximum Amplitude	0~5Vdc.
Debounce	0~50Hz Max.

Digital Input 1~4 Specifications.

Frequency Range	0~1Hz.
Input Threshold	1.4Vdc.
Maximum Amplitude	30Vdc continuous.
Excitation	3Vdc.
Isolation	Not isolated to the power supply common.

Digital Output 3~4 Specifications.

Open-Drain, 32Vdc Max. (Not isolated to the power supply common.)

Relay Output 1~2 Specifications.

Functions	2 on Board Controllers can be used as Set Point (SV), Switching Differential, Auto/Manual, Manual Output Setting, Dual Action Control, Single Action Control, Heat/Cool, Cool Only, Heat Only.
State	Default = Normally Open.
Relay Ratings	Form A Relay, 250V/30Vdc, 5A Max.
Approved to Standard	UL.

General Specifications.

Power:

Supply Voltage	9~36Vdc.
Consumption	2.5VA Max.
Isolation	1500Vac between power supply and input/output channels.

Environment:

Operating Temperature	-20~+55°C.
Storage Temperature	-20~+65°C.
Operating Humidity	0~85%.
Altitude	2000m.

Transmission:

RF Data Rate	250Kb/s.
RF Frequency	2405~2475MHz.
RF Channels	15.
RF Power	10mW or 100mW (<i>User Selectable to comply with region wireless standards</i>).
Spreading Method	Direct Sequence.
Modulation	O-QPSK.
Nodes - A2IO Wireless Network	1 Output Base, 1 Input Remote, and up-to 15 Repeaters per mesh network max.
MicroScan Wireless Network Capacity	62 nodes per mesh (1 Base, 29 Remotes (RB & A2I) and 32 Sleepers).
Antenna Connection	RP-SMA.
Tx Range	~4.0Km (<i>supplied antenna line of sight, Reduces to 50m typical with major obstruction</i>).
Tx Power	+10dBm or +20dBm (<i>User Selectable to comply with region wireless standards</i>).
Rx Sensitivity	-110dBm.
Connection Indication	Toggling LEDs.
Multiple Mesh Use	Mesh ID 0~255.
Default Mesh ID	1 (1, 2, 3, 4, 5, 6, 7, 8).
Link Connection Time	Time to Connect: Less than 1 Minute (No Repeater).

Programming Port:

Programmable via XU-USB (Rev1) Key.

Compliances:

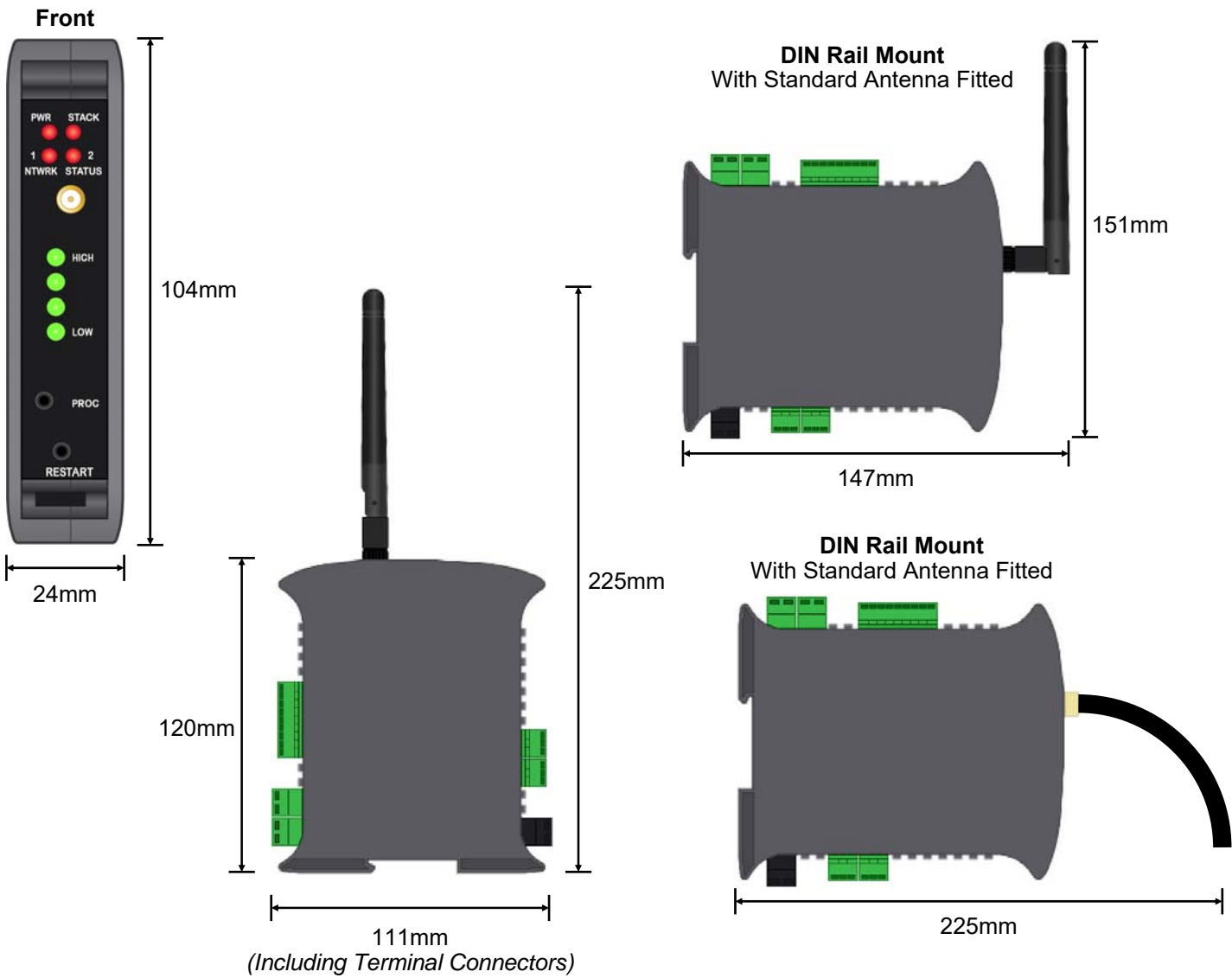
FCC Regulation	2ACTT-1409.
Radio Equipment and Systems	AS/ANS 4268:2012.
EMC Compliances	ETSI EN 300 440-2, V1.4.1, 2010. EN 301 489-3, V1.6.1, 2013.

Case:

35mm DIN Rail Mount.

Enclosure Rating	IP20.
Node Weight	0.15Kg
Dimensions (No Antenna)	H=104mm, W=24mm, D=120mm.

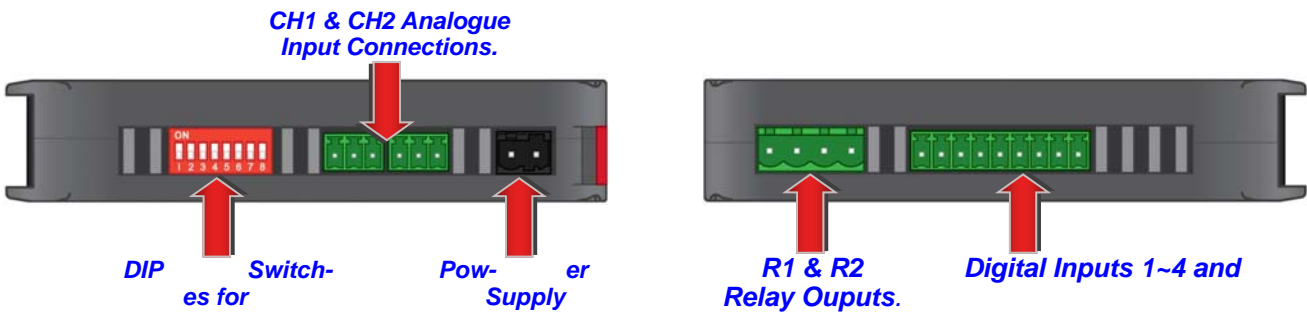
Physical Layout Z-2400-A2I.



Front Panel Connections and LEDs.

- Mounting:** 35mm DIN rail.
- LED indicators:** PWR - Power status.
STACK - Mesh network stack activity.
NTWRK STATUS - See *Network Status LED Definitions* Table for more information.
HIGH / LOW - High to Low Link Quality to next Z-2400 wireless node.
- Aerial:** Screw in to attach. (Additional High Gain Antennas Available.)
- PROG:** USB input to program Analogue Outputs via XU-USB Programming Kit.
(Software: XU Setup version 1.50.03 or later).
- RESET:** Restarts the Z-2400-A2I remote node.

Terminal Connections.



Diagnostic LEDs.

RF Signal Strength LED indication.

Each LED corresponds to the measured signal quality levels:

- One illuminated LED indicates very weak or no signal.
- Two illuminated LED's indicates low signal level.
- Three illuminated LED's indicates medium signal level.
- Four illuminated LED's indicate high signal level.



Z-2400-A2I Remote Network Status LED Definitions.

	Z-2400-A2I node is not running		Z-2400-A2 node is faulty.
	Z-2400-A2I node is booting.		Z-2400-A2 node is searching for the network.
	Z-2400-A2 node can not detect the network.		Z-2400-A2 node found the network and are ready to transmit.

OFF ON Flashing Toggling

Network Status:

2 = ON/Flashing, 1=OFF	Z-2400-A2I remote node starting up.
1, 2 Toggle	Z-2400-A2I remote node connected to network.
1, 2 Flash at same time	Z-2400-A2I remote node NOT connected. (Base not running, or no signal getting through, wrong Mesh ID set or DIP switches 7&8 are in the wrong position.)

Power and ZigBee Network LED indication.

	PWR	ON indicates power supplied connected.
	STACK	Flashes to indicate ZigBee® communications active.
	NTWRK STATUS 1, 2	See Previous table.

Z-2400-A2I DIP Switch Positions for MicroScan Installations.

DIP Switch Summary for Z-2400-A2I.

Switch:	Meaning:
1	Address 1.
2	Address 2.
3	Address 4.
4	Address 8.
5	Address 16.
6	Microscan ASCII / Microscan RTU
7	Reserved.
8	Reserved.

Similar to the Z-2400-RB Remote and Z-2400-Sleeper, the Z-2400-A2I is given a node address as set by DIP Switches. This allows the MicroScan software to identify each device, which means no two of the same devices should have the same address.

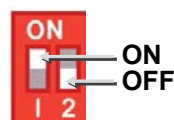
The Z-2400-A2I node address range is 1~14 and 16~30.

Z-2400-A2I Node Address Settings & Table.

DIP Switch A Address:					ON
					1 2 3 4 5 6 7 8
1	2	3	4	5	Node
ON	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	4
ON	OFF	ON	OFF	OFF	5
OFF	ON	ON	OFF	OFF	6
ON	ON	ON	OFF	OFF	7
OFF	OFF	OFF	ON	OFF	8
ON	OFF	OFF	ON	OFF	9
OFF	ON	OFF	ON	OFF	10
ON	ON	OFF	ON	OFF	11
OFF	OFF	ON	ON	OFF	12
ON	OFF	ON	ON	OFF	13
OFF	ON	ON	ON	OFF	14
OFF	OFF	OFF	OFF	ON	16
ON	OFF	OFF	OFF	ON	17
OFF	ON	OFF	OFF	ON	18
ON	ON	OFF	OFF	ON	19
OFF	OFF	ON	OFF	ON	20
ON	OFF	ON	OFF	ON	21
OFF	ON	ON	OFF	ON	22
ON	ON	ON	OFF	ON	23
OFF	OFF	OFF	ON	ON	24
ON	OFF	OFF	ON	ON	25
OFF	ON	OFF	ON	ON	26
ON	ON	OFF	ON	ON	27
OFF	OFF	ON	ON	ON	28
ON	OFF	ON	ON	ON	29
OFF	ON	ON	ON	ON	30

Note: The Z-2400-A2I node will **not** function if the address is set to zero.

Examples:



Address = 1



Address = 10

Note: The Z-2400-A2I cannot be set as node 15 or node 31. (See *troubleshooting on page 17 if this happens.*)

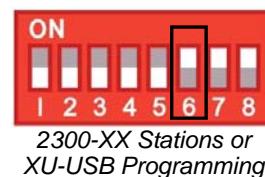
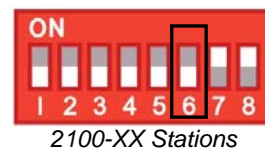
Z-2400-A2I MicroScan Communication Settings.

This setting depends on the type of field stations that are being used with other Z-2400-RB Remotes on the same ZigBee mesh network of the Z-2400-A2I.

Note: This also effects the use of the XU-USB Programming Key.

DIP Switch 6 Positions:

- Z-2400-RB Remotes with 2100-XX / 2400-XX stations and/or Shimaden Controllers = OFF.
- Z-2400-RB Remotes with 2300-XX stations or when using **XU-USB Programming Key** = ON.

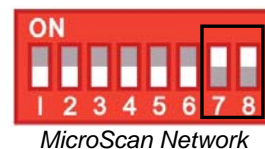


Z-2400-A2I Network Type Settings.

This DIP switch setting determines which type of ZigBee network the Z-2400-A2I is going to be communicating with. There is only Two choices: Z-2400-A2IO network (analogue input to analogue output), or a MicroScan ZigBee network.

DIP Switch 7 & 8 Positions:

- Z-2400-A2IO network = DIP switch 7 OFF, DIP switch 8 ON.
- MicroScan network = DIP switches 7 & 8 both ON.



Z-2400-A2IO Input DIP Switch Settings.

These are the default DIP switch positions when supplied as a Z-2400-A2IO Kit. If you are using the Z-2400-A2I as part of the Z-2400-A2IO Kit, make sure the DIP switches match the diagram to the right: Dip switches 6 & 8 set to ON only. Any attempt to set any of the DIP switches to another position will prevent the Z-2400-A2IO wireless link from working.



Programming the Z-2400-A2 Series.

XU Setup Programming Software.

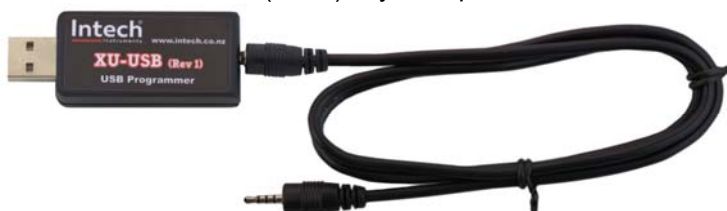


The XU Programming software version 1.50.03 is free to download from Intech's website:
www.intech.co.nz/downloads

The XU Programming software features easy user programming using USB connection. It allow you to:

- Set up the analogue input types of the Z-2400-A2I. (Default input setting is RTD Pt100.)
- Configure the digital inputs and outputs.
- Set the ZigBee Mesh ID network. (Default Mesh ID = 1.)
- Configure the RF output to comply with the wireless standards of your region.
- No calibration required after input range has been programmed.

To use the XU Programming software an XU-USB (Rev1) key is required.



Installation Notes.

- Ensure that the XU Programming software version 1.50.03 is installed before plugging in the XU-USB as this ensures that the required USB driver is installed.
- When upgrading from a previous version - please disconnect the XU-USB before installing.
- The XU software requires Microsoft .NET 2.0 to be installed first (Microsoft .NET 3.5 SP1, which includes .NET 2.0, can be downloaded free).
- Windows 7 / Vista users:
 - ♦ Installation requires the user to be an administrator.
 - ♦ Desktop shortcut icon will only be installed to the currently logged on user.
 - ♦ Extract all files to a folder.
 - ♦ Right click on setup.exe and click 'run as administrator'.

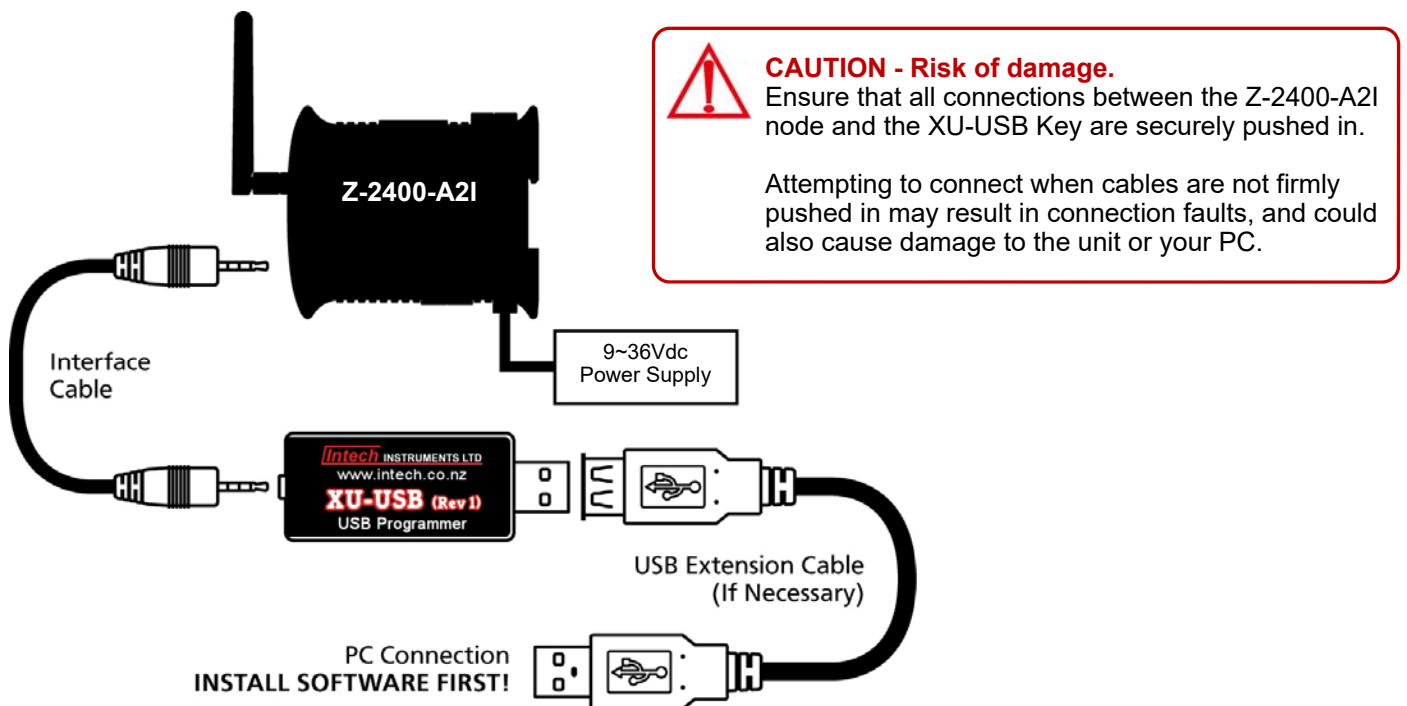
WARNING: Ensure that **all programming is carried out BEFORE** any wiring takes place!

Z-2400-A2I USB Connection.

To connect a Z-2400-A2I node to your PC requires the **XU-USB** Programming Key.
(Same Key as used for programming XU Series transmitters, 2400-A16 / 2400-M-R, Z-2400-Sleeper, IN-uP4 and uP4-Din.)

BEFORE YOU CONNECT:

- Ensure that you have a **XU-USB** Programming Key and a low voltage power supply (9~36Vdc).
- Check the Dip Switches are set correctly (see page 9).
- Install the XU Setup software before connecting the XU-USB to your computer (see page 8). XU Setup may not be able to detect your Z-2400-A2 node if it was already connected to your computer at the time of installation.
- Ensure that all programming is carried out **BEFORE** any input/output wiring takes place!



Connecting up:

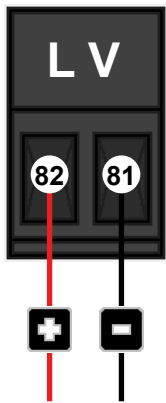
- Connect the XU-USB key to your computer's USB port and the other end of the cable to the programming port on the Z-2400-A2I front panel (see page 6), ensuring that the cable between the XU-USB programming key and the Z-2400-A2I node are firmly 'pushed in'. Failure to do so could cause damage to your computer.
- Connect your Z-2400-A2I node to a low voltage power supply (9~36Vdc, Wiring diagram on page 11).
- Confirm the node is working by checking the 'PWR' LED is lit.
- Click 'Connect' on the XU Setup software.

ZigBee Mesh ID.

The Mesh ID allows for multiple Bases and thus networks to be used where the mesh signals will overlap. You can program the Mesh ID of the Z-2400 wireless nodes via the XU Setup software version 1.50.03.

Note: The mesh ID is not to be confused with the node addresses as set by the DIP switches on the side of the Z-2400 unit. The node address refers to the Z-2400 node address number within it's Mesh, and the Mesh ID refers to the ZigBee wireless mesh network that the Z-2400 node belongs to.

Connecting up the Z-2400-A2I.



Z-2400-A2I Power Supply Connection.

Power Supply: 9~36Vdc.
Power Consumption: 2.5VA.

Z-2400-A2I Analogue Input Connections.

ALWAYS program the Z-2400-A2I before connecting inputs!

Remember to always reset (power off and on), the Z-2400-A2I after programming.



CAUTION

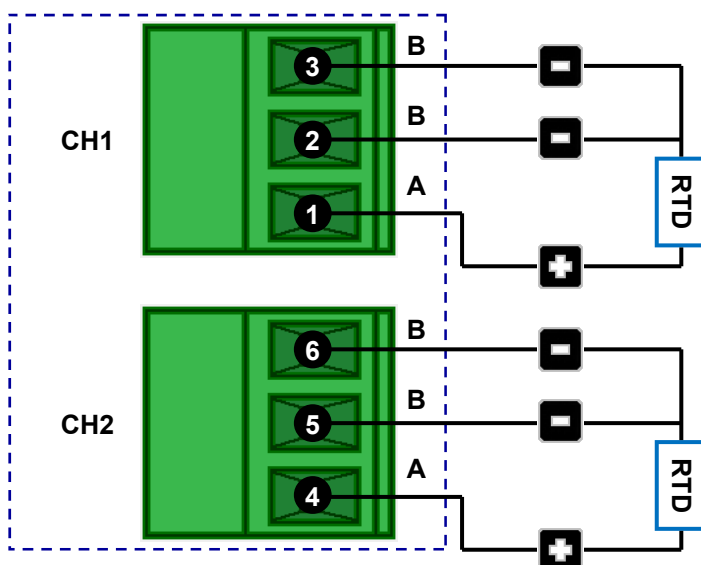
Risk of electric shock. Dangerous and lethal voltages may be present on the terminal of the device. Please take appropriate precautions to ensure safety.



CAUTION

Risk of Danger. The sensor input can potentially float to dangerous and unexpected voltages depending on what external circuit it is connected to. Appropriate considerations must be given to the potential of the sensor input with respect to earth common.

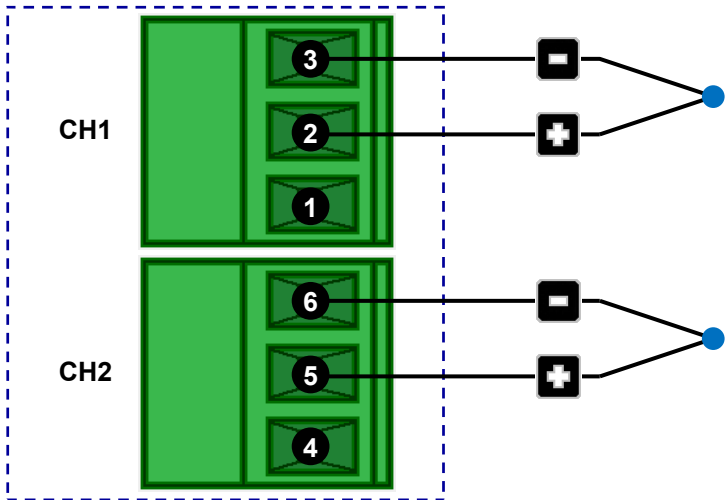
Connecting RTDs to the Z-2400-A2I Analogue Inputs.



Note 1. To minimise lead resistance errors, 3 wire RTDs should be used. If 2 wire RTDs are used small offset errors can be compensated for in the software.

Note 2. All RTD cable to be screened, and the screens earthed at one end only. The three wires must be the same resistance. (i.e. the same type and size.) Refer to 'Z-2400-A2I Wiring and Installation' for recommended types.

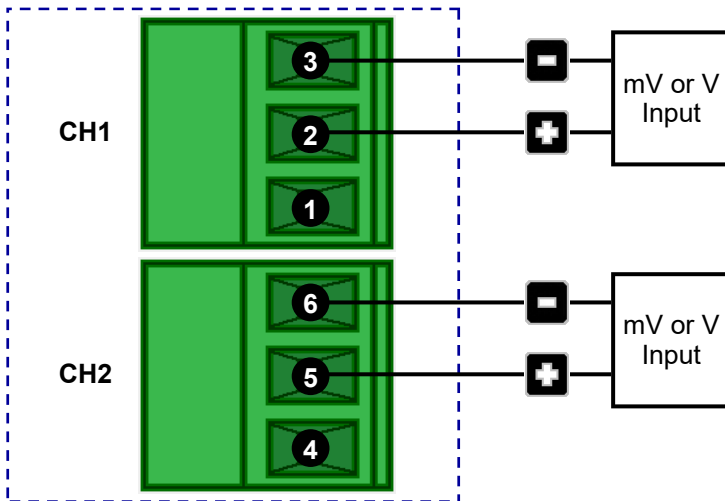
Connecting Thermocouples to the Z-2400-A2I Analogue Inputs.



Note 1. When using the default integral CJC for accurate thermocouple measurement, especially low temperature:

- Avoid drafts and temperature differences across terminals (not to be exposed to direct sunlight).
- Once installation is complete, close the cabinet door and allow the cabinet to reach equilibrium. This may take several hours.
- Place all the thermocouple probes into a calibrated thermal bath at temperature of interest. Any errors can be zeroed out in software.

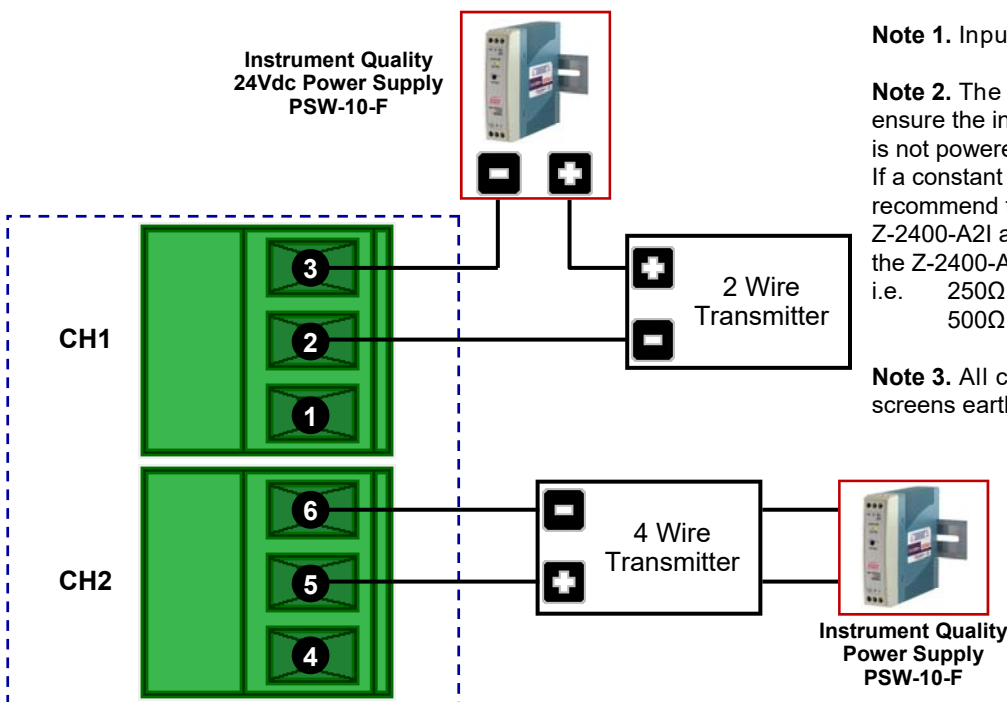
Connecting Voltage Signals to the Z-2400-A2I Analogue Inputs.



Note 1. Input voltage must not exceed 24Vdc.

Note 2. All cables to be screened, and the screens earthed at one end only.

Connecting Current Signals to the Z-2400-A2I Analogue Inputs.



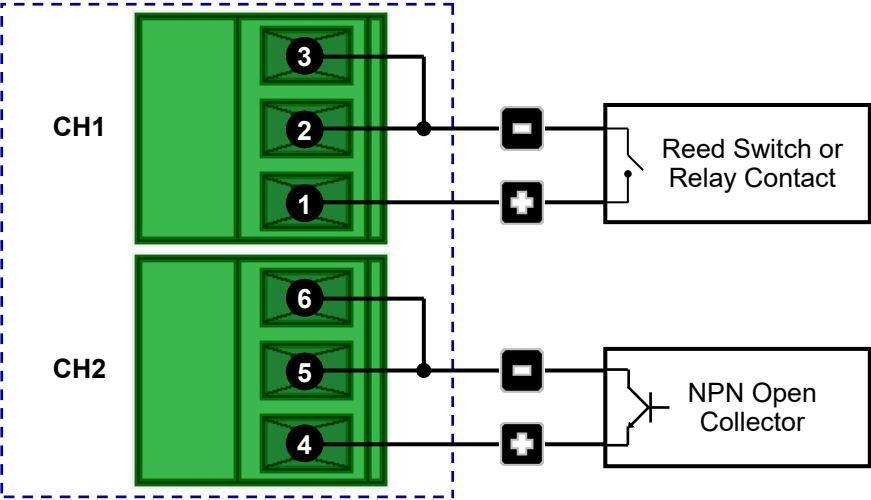
Note 1. Input voltage must not exceed 24Vdc.

Note 2. The Z-2400-A2I must remain powered up to ensure the integrity of the mA loop. If the Z-2400-A2I is not powered; the 4~20mA loop is broken. If a constant 4~20mA loop connection is required; it is recommend that you use a resistor across the Z-2400-A2I analogue input terminal, and re-program the Z-2400-A2I input for Voltage instead.
i.e. 250Ω for 1~5V input.
500Ω for 2~10V input.

Note 3. All cables to be screened, and the screens earthed at one end only.

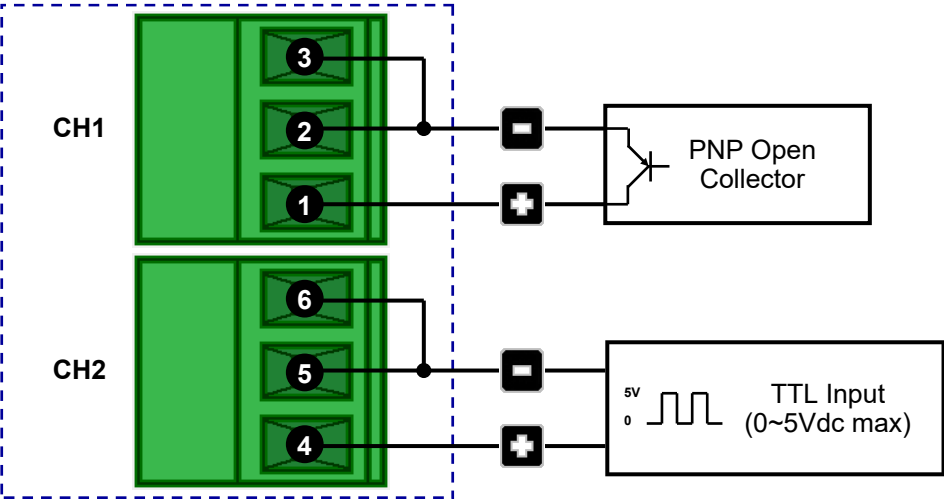
**Connecting Pulse, Frequency & On/Off State Signals to the Z-2400-A2/
Analogue Inputs.**

Both the two analogue inputs (CH1&2) can be used for pulse and frequency outputs from flow or energy meters (0~2500Hz). They can also be used for on/off state inputs.



Note 1. Inputs can be used as state Pseudo Digital inputs for sensing a clean, voltage free, field contact.

Note 2. All cables to be screened, and the screens earthed at one end only.



Connecting Pulse, Frequency & On/Off State Signals to the Z-2400-A2I Digital Inputs.

The four digital inputs of the Z-2400-A2I can be used for pulse and frequency outputs from slower sensor types, for example Rain Gauge, and also for on/off state inputs.

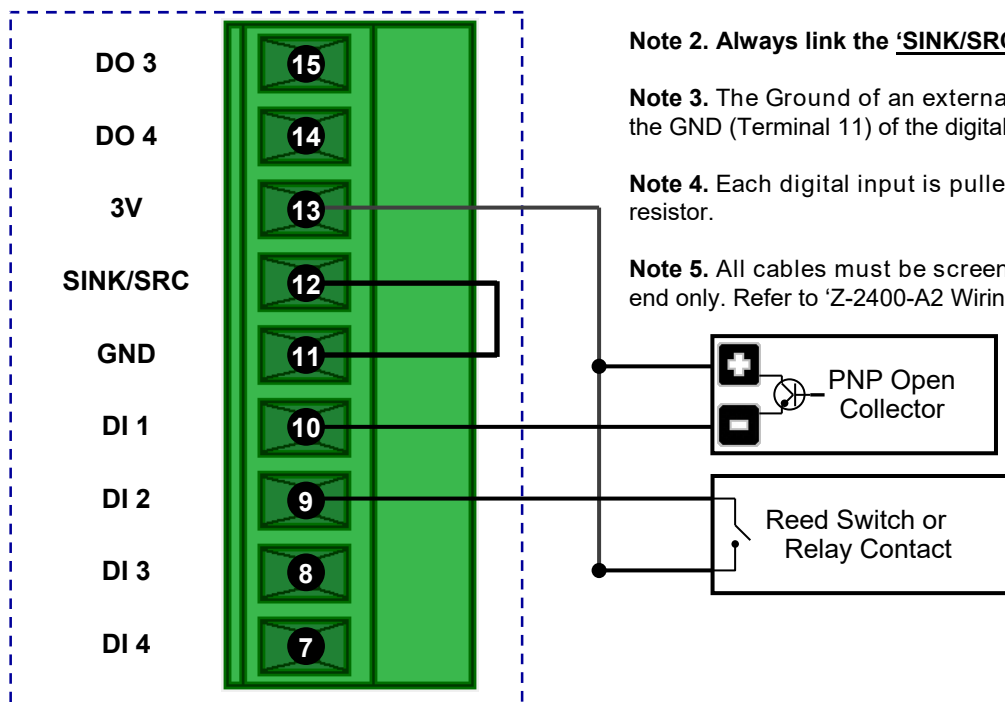
Note 1. Inputs can be either: State - i.e. ON / OFF (DI 1 & DI 2)
or Frequency - 0~1Hz Max (DI 3 & DI 4).

Note 2. Always link the 'SINK/SRC' & 'GND' terminals.

Note 3. The Ground of an external power supply must be connected to the GND (Terminal 11) of the digital inputs.

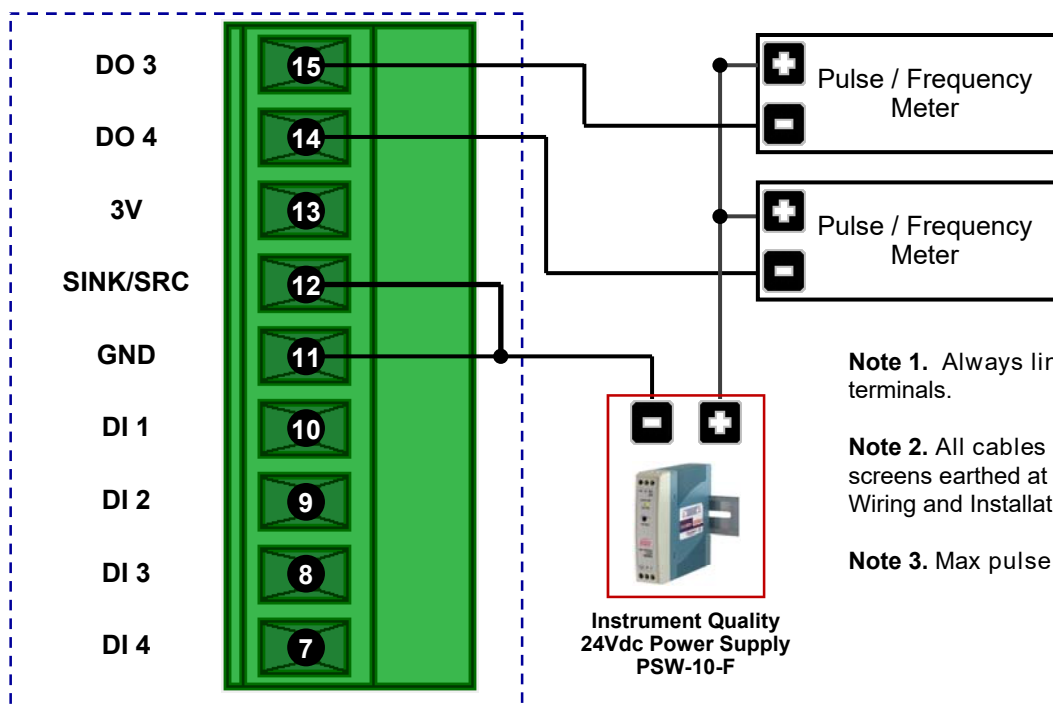
Note 4. Each digital input is pulled down to 3V through an internal 22K resistor.

Note 5. All cables must be screened and the screens earthed at one end only. Refer to 'Z-2400-A2 Wiring and Installation'.



Connecting to the Z-2400-A2I Digital Outputs.

The two digital outputs can be used for pulse and frequency into a counter or totaliser. 32Vdc max.



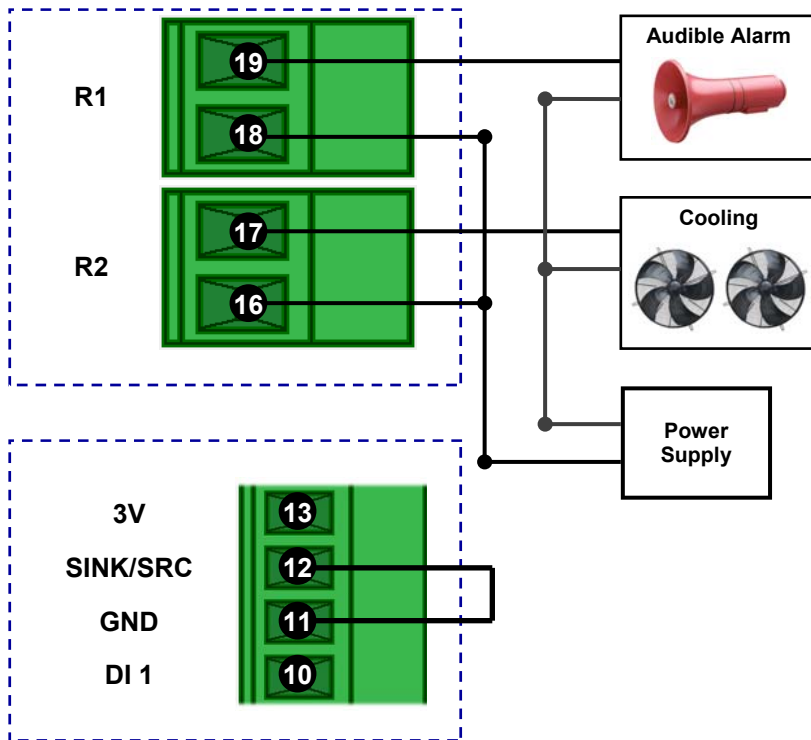
Note 1. Always link the 'SINK/SRC' & 'GND' terminals.

Note 2. All cables must be screened, and the screens earthed at one end only. Refer to 'Z-2400-A2I Wiring and Installation'.

Note 3. Max pulse rate = 1Hz.

Connecting to the Z-2400-A2I Relay Outputs.

The two relay outputs can be used for contact switching.



Note 1. Both relay default setting is set to normally open.

Note 2. Relay Rating: 265Vac, 250Vdc, 5A Max.

Note 3. Each relay can be configured for a 'Normally Closed' or 'Normally Open' output state (e.g. for fail safe operation).

Note 4. Remember to link the 'SINK/SRC' & 'GND' terminals on the digital input end, otherwise the relay outputs will remain closed regardless of operation.

Note 5. All cables must be screened, and the screens earthed at one end only. Refer to 'Z-2400-A2I Wiring and Installation'.

Z-2400-A2I Wiring, Installation and Maintenance.

**THE Z-2400-A2I NODES ARE TO BE INSTALLED AND SERVICED BY SERVICE PERSONNEL ONLY.
NO OPERATOR / USER SERVICEABLE PARTS.**

BEFORE YOU BEGIN WIRING: Ensure that all programming is carried out **BEFORE** any wiring takes place! All power and signals must be de-energised **BEFORE** connecting any wiring.

Z-2400-A2I Wiring & Installation.

Mounting:

* Also refer to Physical Layout (Page 5).

- 1) Mount so the terminals are in a clean environment.
- 2) Do not subject to vibration or excess temperature or humidity variations.
- 3) Do not mount in cabinets with power control equipment, 200mm separation required from any high voltage.
- 4) Allow 20mm minimum clearance between the Z-2400-A2 terminals and ANY conductive material.
- 5) **Warning:** Minimum distance of 1 metre between any Z-2400 node, otherwise damage to RF radio could result.

Analogue Signal Wiring:

- 1) All signal cables should be good quality overall screened INSTRUMENTATION CABLE with the screen earthed at one end only.
- 2) Signal cables should be laid a minimum distance of 300mm from any power cables.
- 3) For 2 wire current loops, 2 wire voltage signals or 2 wire current signals, B5102ES is recommended. For 3 wire transmitters and RTDs B5103ES is recommended.
- 4) It is recommended that you do **not** ground analogue signals.
- 5) It is recommended to use power supplies with ungrounded outputs.
- 6) Lightning arrestors should be used when there is a danger from this source.
- 7) Refer to diagrams for connection information.

Thermocouple Extension Wire:

- 1) Use the correct thermocouple extension or compensation cable. i.e. Thermocouple type, insulation type, correct colour coding.
- 2) Thermocouple cables should be laid a minimum distance of 600mm from any power cables.
- 3) It is recommended to install extension or compensation cable in a grounded conduit by themselves, or use overall screened cable with the screen earthed at one end only. Never run electrical wires in the same conduit.
- 4) All wires that must be spliced should be soldered, or a proper thermocouple termination block used.
- 5) Lightning arrestors should be used when there is a danger from this source.

Thermocouples:

1. Thermocouple cables should be laid a minimum distance of 600mm from any power cables.
2. Avoid locating the thermocouple where it will be in a direct flame.
3. Never insert a porcelain or refractory tube suddenly in a hot area. Pre-heat gradually while installing.
4. Locate it where the average temperature will be measured. It should be representative of the mass. If necessary use several thermocouples to obtain the average temperature.
5. Immerse the thermocouple far enough so that the measuring junction is entirely in the temperature to be measured: nine to ten times the diameter of the protection tube is recommended. Heat conducted away from the junction causes an error in reading.
6. If the thermocouple is mounted horizontally and the temperature is above the softening point of the tube, a support should be provided to prevent the tube sagging. Otherwise install the tube vertically.
7. Keep the junction head and cold junction in the approximation of the ambient temperature. Especially in the Noble Metal Class.

RTDs:

1. RTD cables should be laid a minimum distance of 600mm from any power cables.
2. Avoid locating the RTD where it will be in a direct flame.
3. Locate it where the average temperature will be measured. It should be representative of the mass.
4. Immerse the RTD far enough so that the measuring point is entirely in the temperature to be measured, i.e. nine to ten times the diameter of the protection tube is recommended. Heat that is conducted away from the measuring point causes an error in reading.

Power Supply Wiring:

1. Use Only Instrument Quality Power Supplies.
2. A readily accessible disconnect device and a 1A, 250Vac overcurrent device must be in the power supply wiring.

Z-2400-A2I Commissioning.

- 1) **WARNING: Ensure that all programming is carried out BEFORE any wiring takes place!**
- 2) Check that the Z-2400-A2I has been set to the correct input ranges and all functions such as Upscale/Downscale Drive etc. Observe polarity and the correct terminal connections for wiring correctly. Only use certified calibration equipment. For Thermocouple calibration place the Z-2400-A2I and calibration equipment directly next to each other, in still air, with no direct sunshine. Allow the CJC junctions to equalise in temperature before commencing calibration. Lower temperature ranges are affected more by the CJC Junction (allow more time to equalise).
- 3) Once the above conditions have been met, and the wiring checked, apply power to the Z-2400-A2 and the loops and/or sensors. Allow at least a 5 minute warm-up period.
- 4) **Thermocouple Inputs only:** Due to the limits of error in a standard Thermocouple probe, and standard extension wire and compensating wire, an error can occur. E.g. In a type K Thermocouple installation an error of 2.2°C or 0.75% FSO can occur (whichever is greater). The Z-2400-A2I has an integral CJC sensor, the enclosure must be assembled and installed where it avoids drafts and temperature differences across terminals. Once installation is complete, close the cabinet door and allow the cabinet to reach equilibrium. This may take several hours. Place all the Thermocouple probes into a calibrated thermal bath at the temperature of interest or use a calibration standard Thermocouple at the same immersion depth and temperature of interest and adjust the Zero until the two temperatures agree.
- 5) **Calibration Check:** Take a reading of the value being measured on the Z-2400-A2I input, and ensure that this agrees with the level being indicated by the MicroScan Software. Adjust for any differences. It is recommended to measure both a high and low value and compare these readings with your calibration device.

Z-2400-A2I Maintenance.

DC Voltage and Current Inputs:

- 1) Check the Sensor or Transducer supplying the signal to the Z-2400-A2I for wear or damage and replace if defective.
- 2) Check the cables connected to the Sensor or Transducer.
- 3) Repeat (5) of commissioning. **Do it regularly - at least once per year.**

Thermocouple Inputs:

- 1) Replace defective protection tubes - even if they look good they may not be air or gas tight.
- 2) Check extension and compensating cable circuits, especially cables entering the Thermocouple sensor head.
- 3) Do not use the same Chromel-Alumel (Type K) Thermocouple below 540°C if it was used above 860°C.
- 4) Repeat (5) of commissioning. **Do it regularly - at least once per year.**

RTD Inputs:

- 1) Replace defective protection tubes - even if they look good they may not be air or gas tight.
- 2) Check cables entering the RTD sensor head.
- 3) Repeat (5) of commissioning. **Do it regularly - at least once per year.**

Troubleshooting.

It is possible that the ZigBee® wireless nodes will fail to communicate if they are in too close a proximity to each other. If you are trying a lab test before you fully commission on site, as is recommended, then make sure the distance between the Z-2400 wireless nodes is at least one metre.

Commonly overlooked settings on the Z-2400-A2I that cause connection issues:

- Dip Switch #6 has been left ON after programming with the XU Setup Software. Set to OFF for use with MicroScan.
- Check Dip Switches 7&8 are set to ON for MicroScan compatibility.
- Check the Node address is NOT the same as the Z-2400 Base, and also unique to other Z-2400 nodes in the field.

Establishing a wireless connection:

1. Check the Base wireless node is powered up, PWR LED is lit and network status LEDs are toggling 1, 2 then 2, 1.
2. If you are using a wireless Repeater, check the node is powered up and PWR LED is lit.
3. Check the repeater node network status LEDs are toggling 1, 2 then 2, 1. If these LEDs flash 1 & 2 at the same time it means the Repeater cannot connect to the Mesh either because:
 - a) The Output node is not powered up.
 - b) The ZigBee signal strength is too weak to connect (also check the Signal Quality LEDs).
 - c) A wrong Mesh ID has been programmed into the node.
4. Check the input wireless node is powered up and PWR led is lit.
5. Check the Input node network status LEDs are toggling 1, 2 then 2, 1. If these LEDs flash 1 & 2 at the same time it means the Input node cannot connect to the Mesh either because:
 - a) The Base node is not powered up.
 - b) The ZigBee signal strength is too weak to connect.
 - c) A wrong DIP switch has been set.
6. After the power supply of the Output and Input nodes have been switched on, the Input node may take up to 1 minute to re-establish a wireless connection.

Incorrect input values on MicroScan from a Z-2400-A2I wireless remote:

If the Z-2400-A2I has been accidentally set as node 15 or node 31, then it will need to be set to another node number and reprogrammed using the XU Setup Software.

- Check the Z-2400-A2I node address is set to a unique number between 1~14 or 16~30.
- Connect the Z-2400-A2I to the XU-USB key and plug into the PC (remember to set dip switch 6 to Modbus). Use the XU Setup Software to program both analogue input channels 1 & 2 to a completely different input type (e.g. from Pt-100, to Thermocouple type J). When the Z-2400-A2I has been programmed, return the input types back to your original settings and program again (e.g. from Thermocouple back to Pt-100 again). (Remember to set dip

Considerations & Limitations for Z-2400 Network Systems.

The ZigBee® system does not offer 100% connectivity, even when all the precautions are taken into account no one can guarantee a good link, as there are many factors that cause problems. With the Z-2400-A2 Series, additional repeaters can be used in between the Input and Output wireless nodes (particularly good when transmitting through solid walls). Instead of, or in addition to the use of repeaters, higher gain antennas can be used to extend the wireless range further.

Antenna Options for Z-2400 Wireless Series.

MODEL	DESCRIPTION
ZB-ANT-02	2.4GHz 2.2dBi Whip Antenna Can be used either outdoor or indoor.
ZB-ANT-05	2.4GHz 5.5dBi Rubber Duck Antenna. Designed for indoor use only.
ZB-ANT-08	2.4GHz 8dBi Omni Directional Antenna. (Mounting brackets included.) Designed for outdoor use.
ZB-ANT-14	2.4GHz 14.5dBi Yagi Directional Antenna. (Mounting brackets included.) Designed for outdoor use.
ZB-ANT-19	2.4GHz 19dBi Parabolic Grid Directional Antenna. (Mounting brackets included.) Designed for outdoor use.



For more information on wireless antenna options and distances, see the 'Z-2400-Turbo Antenna Range sales brochure.