Intech INSTRUMENTS LTD

Z-2400-SLEEPER

Wireless Data Links Using ZIGBEE®
For MicroScan Protocols.

E2180

Installation Guide.

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Z-2400-SLEEPER

Wireless Data Link Modules for MicroScan.

Description:

The Z-2400 SCADA series of units support the communication of data signals via a wireless network. The Sleeper node is a two universal input unit that wakes up at a selected time interval, and sends its values through to the Base node. The Sleeper is a battery powered module, ideally suited for mobile monitoring applications. It can also be used with a power plug pack.

Ordering Information:

- **Z-2400-Sleeper:**
  2x Universal Input Sleeper, battery or plug pack powered.
- **XU-USB:**
  USB Programming Key - for programming analogue inputs.

System Limits:
Max 32 Sleepers and/or 32 Remotes per Base.

Specifications:

Voltage	9~36Vdc.
Operating temp.	-40~+85°C.
RF data rate	250Kb/s.
RF frequency	2405~2485MHz.
RF channels	16.
RF power	1mW.
Spreading method	Direct sequence.
Modulation	O-QPSK.
Nodes	64 nodes per mesh (1 Base, 32 Remotes and 32 Sleepers).
Tx range	~100m (line of sight).
Tx power	+4.5dBm in boost mode.
Rx sensitivity	-100dBm in boost mode.
Analogue Inputs	RTD (Pt100, Pt1000), Thermocouple (B, E, J, K, N, R, S, T.), mA, V, & mV.
Analogue Input Scan Rates	1, 2, 5, 15, 30 & 60 Minutes Selectable.
Battery Type	Inorganic Lithium, 3.6Vdc.
Battery Life	Typical: 1min scan rate = 1 year, 2min scan rate = 2 years,
	5min or longer scan rate = 5 years.
Connection Indication	Toggling LEDs on start-up.
Multiple Mesh use	Mesh ID 0~255.
Default Mesh ID	1 (1, 2, 3, 4, 5, 6, 7, 8).

Software Versions:

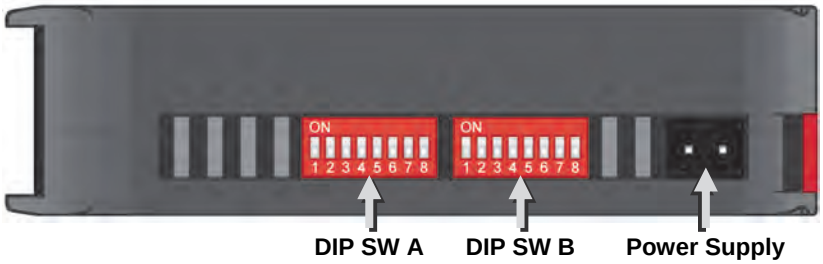
The Z-2400 series of units require the following software versions for operation:

- **MicroScan V5.1** (or later) - all units.
- **XU Software V1.30** (or later) - for programming Sleeper analogue inputs.

The latest version of software can be downloaded via the link online at **www.intech.co.nz/downloads**

Physical Layout Z-2400-SLEEPER:

Dimensions:	101 x 36 x 120mm (H x W x D). - With Antenna 225mm, with Coax 225mm.
Mounting:	35mm DIN rail.
LED indicators:	NTWRK STATUS - See *Diagnostic LEDs* Tables for more information.
Aerial:	Not shown in diagram - screw in to attach. (*Additional High Gain Antennas Available*).
Analogue Inputs:	(x2) - RTD (Pt100, Pt1000), Thermocouple (B, E, J, K, N, R, S, T.), mA, V, & mV.
RESET:	Restarts the Sleeper.
IP PROG:	USB input to program Analogue inputs via XU-USB Programming Kit. (*Version 1.30 or greater*).
Power Supply:	9~36Vdc. **Warning**: Do not share this power supply with the universal inputs.



Diagnostic LEDs:

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

Sleeper Node - Network Status LED Definitions.

SLEEPER node is sleeping/stopped if no power is supplied.

SLEEPER node is booting.

SLEEPER node's address or sleep time has not been set yet.

No network detected.

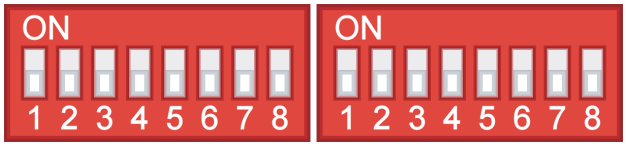
Network joined - ready to transmit.

Sleeper Network Status:

2 = ON, 1=OFF	Sleeper starting up.
1, 2 Toggle	Sleeper Connected to Mesh. (Only toggles for 5 seconds when first switched on).
1, 2 Flash at same time	Sleeper NOT connected. (Base not running, or no signal getting through or wrong Mesh ID set).

Sleeper Dip Switch Positions:

DIP Switch A **DIP Switch B**



Address **Sleep Time**

DIP Switch A Summary for Sleeper:

Switch:	Meaning:
1	Address 1.
2	Address 2.
3	Address 4.
4	Address 8.
5	Address 16.
6	Address 32.
7	Reserved.
8	Reserved.

DIP Switch B Settings for Sleeper:

Switch:	Meaning:
1	Sleep Time 1 Minute.
2	Sleep Time 2 Minutes.
3	Sleep Time 5 Minutes.
4	Sleep Time 15 Minutes.
5	Sleep Time 30 Minutes.
6	Sleep Time 60 Minutes.
7	Blank.
8	Battery Power (Turns Sleeper ON).

Sleep Time vs Typical Battery Life:

Sleep Time:	Typical Battery Life:
1 Minute	1 Year.
2 Minutes	2 Years.
5 Minutes	5 Years.
15 Minutes	5 Years.
30 Minutes	5 Years.
60 Minutes	5 Years.

To achieve best results from your Sleeper battery life, please observe the following:

- Poor signal strength may reduce battery life, carefully consider placement for a good signal.
- Do NOT leave the Sleeper operating for long periods while the base is switched off.
- Do NOT leave the Sleeper connected to XU-USB for long periods of time.
- Do NOT leave the Sleeper turned ON while the node address, and/or sleep time are not selected.

Base, Remote & Sleeper Node Address Settings & Table:

Each ZigBee® Base + Remote is given a Node address as set by DIP Switch A. This allows the software to identify each device. No two device types should have the same address.

Each Sleeper should also have its own address, as this is a separate node table, Sleepers can be addressed 1~32 and Remotes can also use address 1~32 on the same Base.

DIP Switch A Address:						
1	**2**	**3**	**4**	**5**	**6**	**Node**
ON	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	OFF	4
ON	OFF	ON	OFF	OFF	OFF	5
OFF	ON	ON	OFF	OFF	OFF	6
ON	ON	ON	OFF	OFF	OFF	7
OFF	OFF	OFF	ON	OFF	OFF	8
ON	OFF	OFF	ON	OFF	OFF	9
OFF	ON	OFF	ON	OFF	OFF	10
ON	ON	OFF	ON	OFF	OFF	11
OFF	OFF	ON	ON	OFF	OFF	12
ON	OFF	ON	ON	OFF	OFF	13
OFF	ON	ON	ON	OFF	OFF	14
ON	ON	ON	ON	OFF	OFF	15
OFF	OFF	OFF	OFF	ON	OFF	16
ON	OFF	OFF	OFF	ON	OFF	17
OFF	ON	OFF	OFF	ON	OFF	18
ON	ON	OFF	OFF	ON	OFF	19
OFF	OFF	ON	OFF	ON	OFF	20
ON	OFF	ON	OFF	ON	OFF	21
OFF	ON	ON	OFF	ON	OFF	22
ON	ON	ON	OFF	ON	OFF	23
OFF	OFF	OFF	ON	ON	OFF	24
ON	OFF	OFF	ON	ON	OFF	25
OFF	ON	OFF	ON	ON	OFF	26
ON	ON	OFF	ON	ON	OFF	27
OFF	OFF	ON	ON	ON	OFF	28
ON	OFF	ON	ON	ON	OFF	29
OFF	ON	ON	ON	ON	OFF	30
ON	ON	ON	ON	ON	OFF	31
OFF	OFF	OFF	OFF	OFF	ON	32

Note: The Remote and Sleeper will **not** function if the address is set to zero.

Example: Setting the Z-2400-SLEEPER:

Choose Sleeper Node Address (1~32), e.g. Sleeper Node 1:	DIP switch A, 1 set to ON.
Select the Sleep Time Intervals, e.g. Every 2 Minutes:	DIP switch B, 2 set to ON.
Power Up Sleeper:	DIP switch B, 8 set to ON.

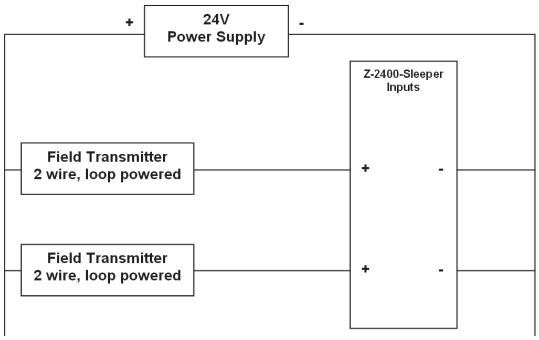
Z-2400-Sleeper Analogue Input Connections:

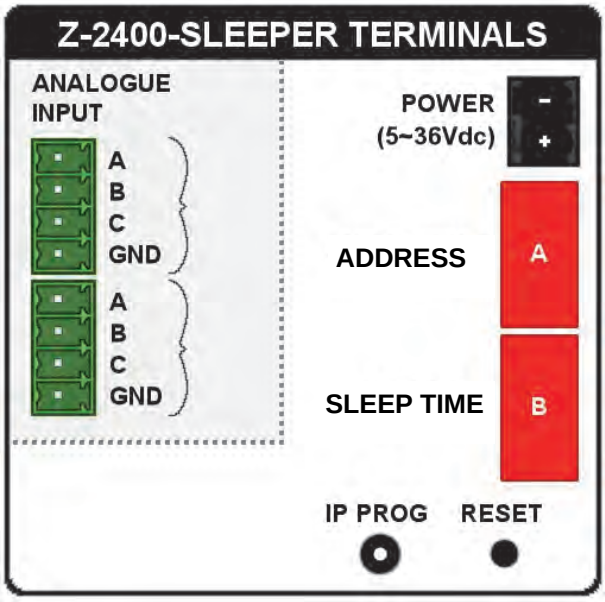
ALWAYS program the Sleeper before connecting inputs!

Choose a node address for the Sleeper - 1~32 (*can be same node number as base or remote*).
Choose a sleep time for the Sleeper (1, 2, 5, 15, 30 or 60 minutes).
Connect the Sleeper to a PC using the XU-USB Programming Kit. Use the XU Setup software to select each Sleeper input channel separately and program the inputs required (DIP switch B, 8 must be set to ON while connected).
Connect analogue input wires into the input terminals of Sleeper (refer to following diagrams).
Set DIP switch B, 8 to ON to power up Sleeper unit.
Check the Sleeper has made a connection (LEDs 1 & 2 should toggle for 5 seconds once a stable connection is made).
Remember to always reset (power off and on), the Sleeper after programming.

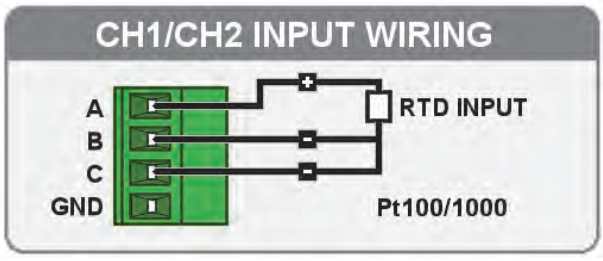
Note:

1. The two analogue inputs are not isolated from each other, and care must be taken when connecting signals that are not isolated from each other or ground.
2. Both analogue signals can share a common as per this 4~20mA example hookup:
3. If permanently powering the Z-2400-Sleeper, use only an isolated power supply; i.e. isolated from ground and other devices.
   Do not use this power supply to power external devices. If only a common power supply is available, use the PSW isolating power supply to power the Sleeper only, to maintain isolation (see page 10).





Connecting RTDs to a Sleeper:

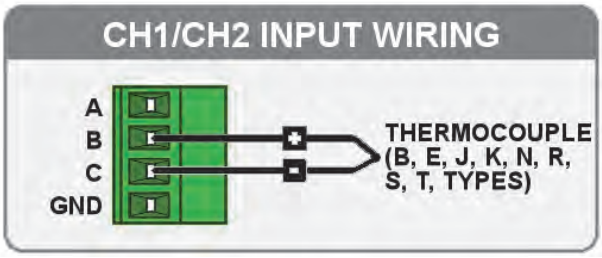


Input	Sleeper
+	A
-	B
-	C
	GND

RTD Specifications:

- RTD Input Pt100 or Pt1000 DIN 3-wire Type. (2-wire can be used with offset calibration).
- Sensor Current 0.15mA Nominal.
- Lead Wire Resistance Pt100: 10Ω/wire Maximum.
- Pt1000: 5Ω/wire Maximum.
- 0.02% FSO Offset Error per Ω of Lead Resistance.
- USB Programmable Zero 0~±99% of the Span.
- USB Programmable Span -200~850°C.
- Linearity (Pt100):
  - 0.02% FSO for Span Inputs ≤200°C.
  - 0.1% FSO for Span Inputs ≤850°C.
- Linearity (Pt1000):
  - 0.02% FSO for Span Inputs ≤200°C.
  - 0.2% FSO for Span Inputs ≤520°C.
- Sensor Break Output Drive:
  - Function High Upscale.
  - Function Low Downscale.

Connecting Thermocouples to a Sleeper:

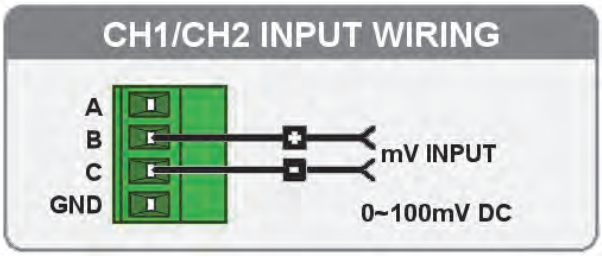


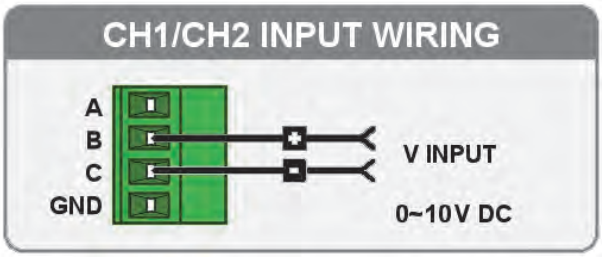
Input	Sleeper
	A
+	B
-	C
	GND

Thermocouple (T/C) Input Specifications:

- Thermocouple Types B, E, J, K, N, R, S, T.
- USB Programmable Zero 0~±99% of the Span.
- USB Programmable Span Within Thermocouple Type limits.
- Input Impedance 1MΩ Minimum.
- T/C Lead Resistance 100Ω Maximum.
- Cold Junction Comp. -20~90°C.
- Accuracy:
  - E, J, K, N, T <±1°C.
  - B, R, S <±2°C.
- Temperature Drift:
  - E, J, K, N, T <±0.05°C.
  - B, R, S <±0.2°C.
- CJC Error <±1°C.
- Sensor Break Output Drive:
  - Function High Upscale.
  - Function Low Downscale.

Connecting Voltage Signals to a Sleeper:



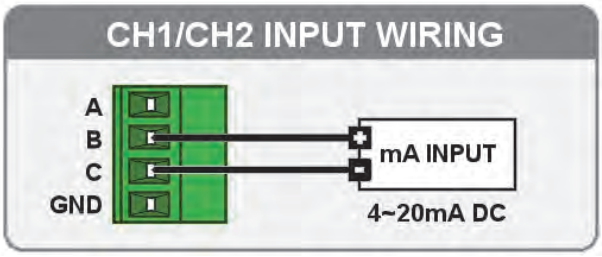


Input	Sleeper
	A
+	B
-	C
	GND

Voltage Input Specifications:

- USB Programmable Zero 0~±99% of the Span.
- USB Programmable Span ±100mVdc to ±10Vdc and Bipolar.
- Minimum Input Resistance 300kΩ.
- mV Maximum Over-range 3Vdc Continuous.
- V Maximum Over-range 60Vdc Continuous.
- Linearity and Repeatability <±0.02% FSO Typical.

Connecting Current Signals to a Sleeper:



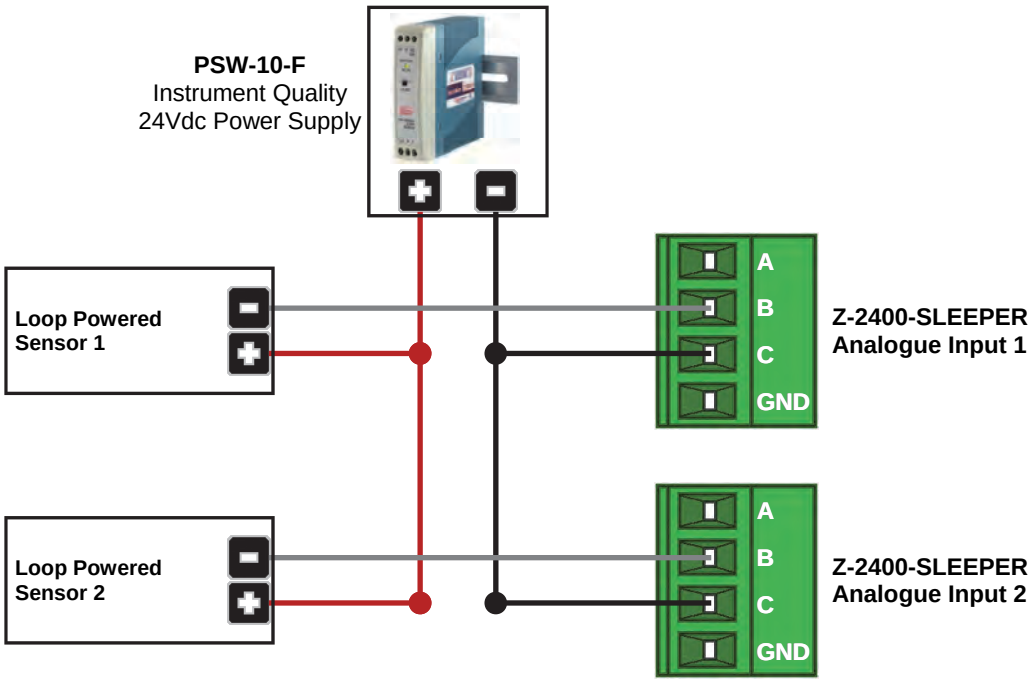
Warning: Do NOT use the Sleeper power supply to power the input loops, as damage to the Sleeper will result.

Input	Sleeper
	A
+	B
-	C
	GND

Current Input Specifications:

- USB Programmable Zero 0~±99% of the Span.
- USB Programmable Span 1μAdc~24mAdc.
  - Standard range = 4~20mA.
- Minimum Recommended Span 0~1mA (gives 1000 steps on output).
- Input Resistance 10Ω.
- Maximum Over-range 50mAdc Continuous.
- Linearity and Repeatability <±0.02% FSO Typical.

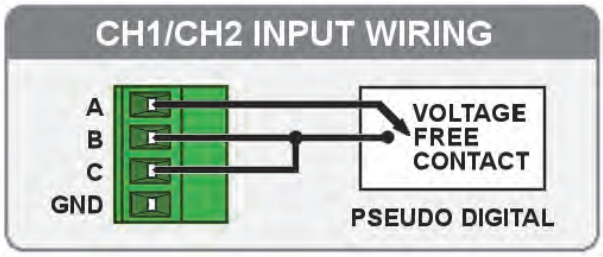
Connection Example: Connecting 2 Loop Powered 4~20mA Sensors.



Note:

1. Do not common the Sleeper positive inputs.
2. Loop is open when the Sleeper is inactive between scan intervals. If a constant loop is required, use a 500Ω resistor across terminals B & C of the Sleeper, and re-program the Sleeper to read 2~10V instead.

Connecting Pseudo Digital to a Sleeper:

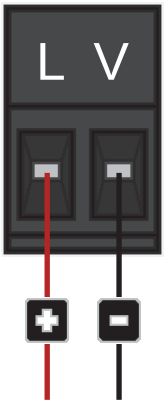


Input	Sleeper
	A
	B
	C
	GND

Pseudo Digital Specifications:

- Used to detect an on-off state input via an analogue input.

Z-2400-Sleeper Power Supply Connections:

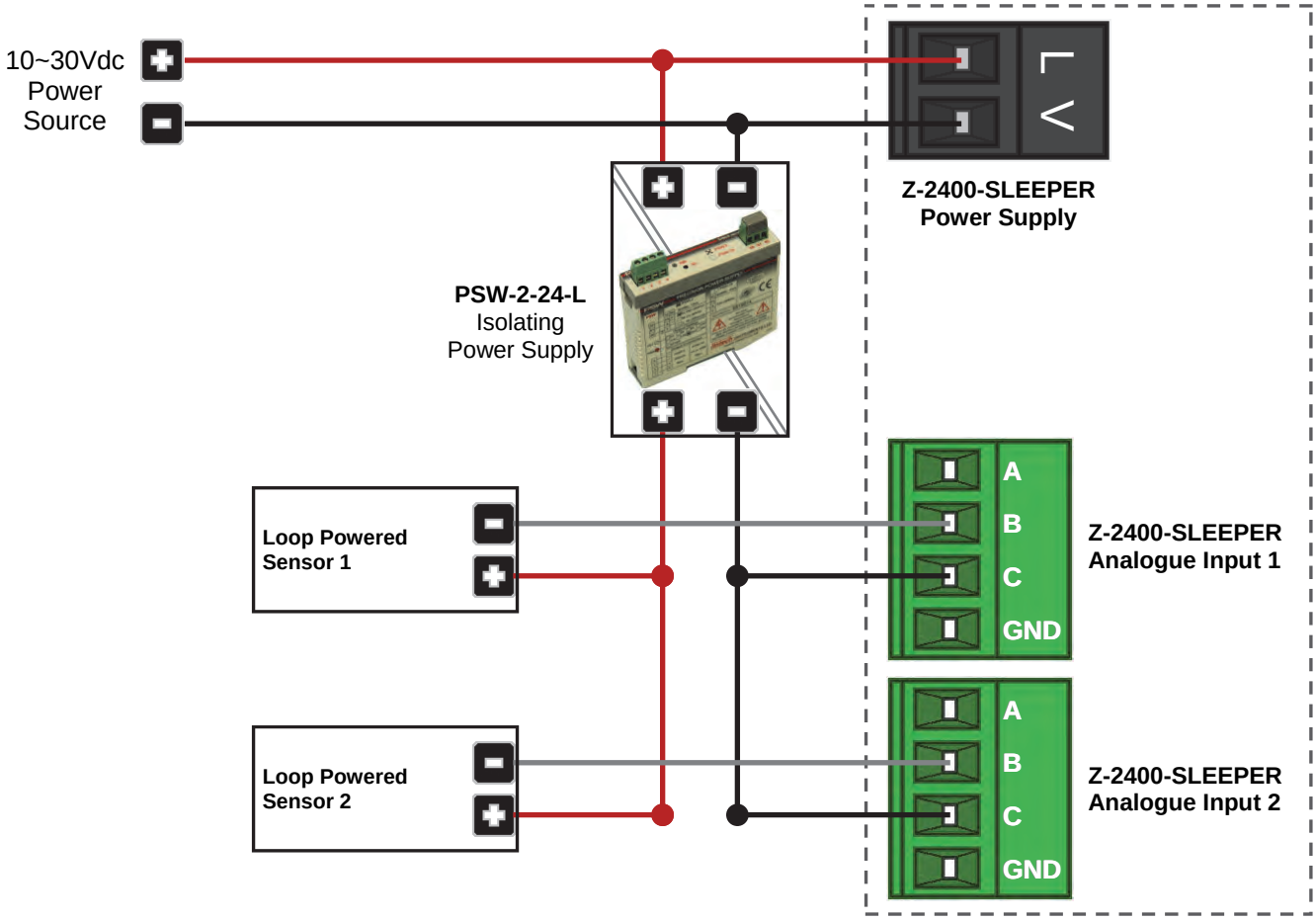


Power Supply:	9~36Vdc.
Power Consumption:	<0.30VA typical.
Power Consumption 'Sleeping':	<0.10VA typical.

Connecting up the Sleeper with a Single Power Source: *(e.g. Solar Power Site.)*

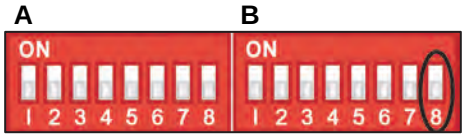
It is essential to maintain an isolated power source between the Sleeper power supply and the Sleeper analogue inputs (i.e. mA, mV and V type analogue inputs). Therefore if you have only one power source available, the analogue inputs must be driven through a power isolator as shown.

Connection Example: Powering Two 4~20mA Loops with a Low Voltage Power Isolator.

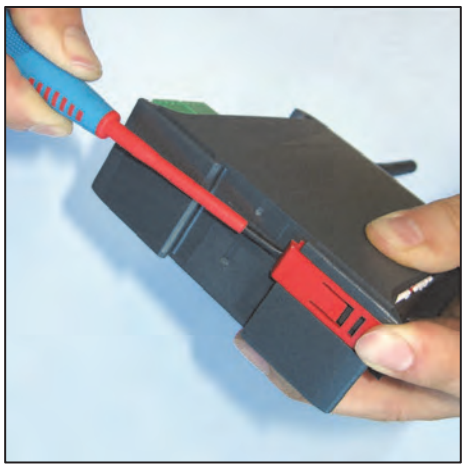


Changing the Z-2400-Sleeper Battery:

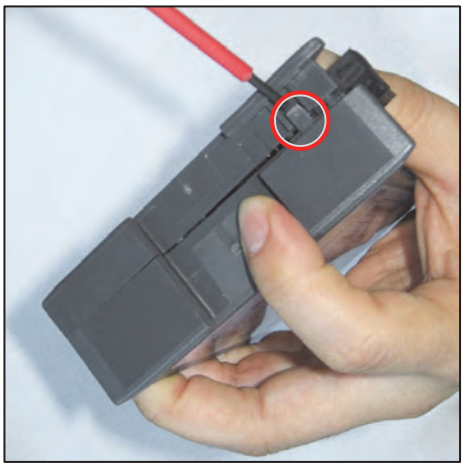
1. Power off the Sleeper by changing the 8th bit of Dip Switch B to the “OFF” position.

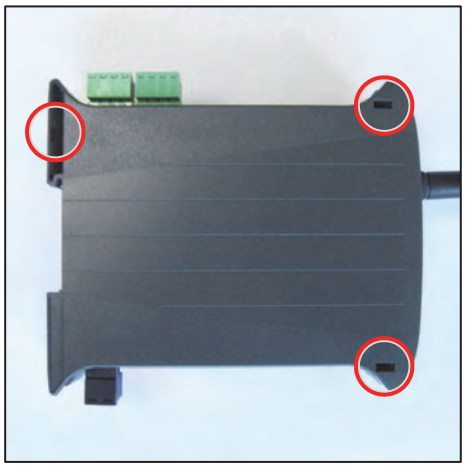


2. Remove the DIN rail clip from the rear of the Sleeper by levering the lower end with a screwdriver, while simultaneously sliding the clip towards the centre with your other hand; removal of the red clip does not need a lot of force, the key is to lever the screwdriver in carefully. Keep the DIN rail clip in a safe place, and do not lose the spring.

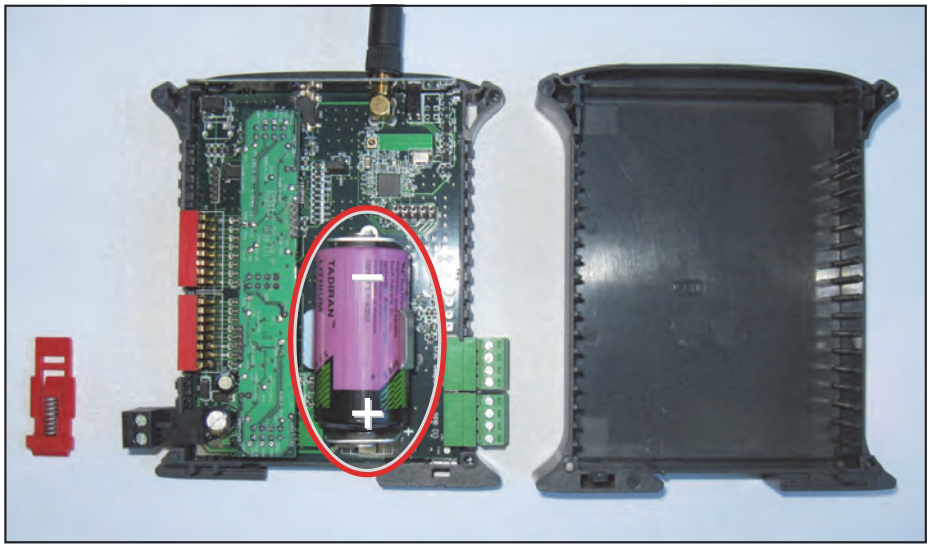


3. Use a small screwdriver to lever up the back and side clips as shown in the images below. Once all four clips have been released, gently ease the two covers apart.





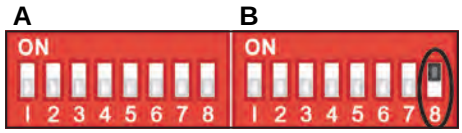
4. Remove the old battery and replace it with a new one, as shown.



5. Carefully align the top and bottom covers, and close the case. The cover will ‘snap’ on when you apply pressure – no screwdriver leverage is necessary at this stage.

6. Put the DIN rail clip back into place. It helps to do this from below, as pictured, so that the spring does not fall out while the clip is being positioned.

7. Power the Sleeper on again by changing the 8th bit of Dip Switch B back to the “ON” position.



To achieve best results from your Sleeper battery life, please observe the following:

- Poor signal strength may reduce battery life, consider placement for a good signal.
- Do Not leave the Sleeper operating for long periods while the base is switched off.
- Do Not leave the Sleeper connected to XU-USB for long periods of time.
- Do Not leave the Sleeper turned ON while the node address, and/or sleep time are not selected.

Using Z-2400 Modules within MicroScan:

Adding Sleepers:
Add the Base first. On the Base Station Map, you will see Sleeper 1~32 inputs 1 & 2, drag those over to your lines. Inputs using RTD/Tc are auto scaled. Inputs using DC signals are scaled 0~100 %, and therefore will need to be scaled using Input Scaling settings, similar to 2100-A16 inputs. Pseudo Digital input is auto scaled and will read in a PD Input scaled for ON when open circuit, OFF when short circuit (switch on A+B, B-B shorted).

Programming Sleeper Input ranges:
Using XU Setup Version 1.30 (or greater), connect the XU-USB to the front IP PROG connection of the Sleeper (ensure Sleeper is powered up), start the XU Setup software and click Connect. The software will read the settings of CH1 display them and show test values. Make changes and click Program to write to the Sleeper, press CH1/CH2 to select the channel to view – Programing is applied ONLY to the displayed channel.
Note: when connected to the XU-USB, the LED 2 flashes once every 3 seconds, and ZigBee® communications to the Base **DOES NOT** take place.
To Remove the XU-USB click 'Disconnect' and remove the USB Cable from the Sleeper. The Sleeper will automatically reboot and join the mesh network.

Accessing Speeds:

Sleeper Inputs:
The Sleeper supplies its values to the Base via timed messages according to the Sleeper update period. No time penalty is involved in reading Sleeper values as MicroScan simply reads the last value read from the Base. If the Sleeper does not update values to the Base, it has a small window displaying when it last supplied the value reading. Once the time between update readings has expired, the Sleeper values will show Error 1.

ZigBee® Mesh ID:

The Mesh ID allows multiple Bases and thus networks to be used when the mesh signals will overlap. You can program the Sleepers Mesh ID via the XU Setup software.
The Mesh ID is not to be confused with the node addresses as set by the DIP switches on the Base/Remotes and Sleepers.

Considerations & Limitations for Z-2400 Network Systems:

The ZigBee® system does not offer 100% connectivity as losses due to radio signals being used do occur.
Due to the mesh network nature connection, the Remotes can connect to the Base via different network paths, i.e. if more than one Remote is used, instead of Remotes connecting directly to the Base, they may connect to other Remotes which then connect to the Base. Thus the network formation is not predictable. If one of the Remotes that happens to be forwarding messages for another Remotes powers down, it may take a minute or two for the remaining Remotes to regain access to the Base.

Troubleshooting:

If the LEDs toggle on sleeper start-up, the Sleeper has found the base (LEDs flash alternately).

If the base does not show that the Sleeper has been connected, check the sleeper node address is unique and that there is not another Sleeper with the same DIP Switch A settings.

If the Sleeper does not toggle on start-up (LEDS flash at the same time):
1. The Sleeper cannot connect due to low signal.
2. The incorrect mesh ID has been set on the Sleeper.

If the Sleeper does not toggle on start-up (LEDS Light up constantly):
Check that both the Node Address and the Sleep Time Dip switches have been set correctly.

If you receive faulty readings from the Sleeper inputs:
1. Check that the inputs are programed correctly using the XU Setup software.
2. Use a calibrator or field tester to check the fidelity of the sensor.
3. Check that there is not another Sleeper set to the same Node Address, Dip Switch A settings.

Press the Reset button on the front of the Sleeper with a screwdriver to make the Sleeper begin its start-up sequence again.

For information on wireless antenna options and distances, see the '**Z-2400-Sleeper Extended**' brochure.

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