

Z-2400-RB/TCP TURBO

Wireless Data Links Using ZIGBEE®
For MicroScan Protocols.



Installation Guide.

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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-RB/TCP-TURBO

Wireless Data Link
Modules for MicroScan.

Description:

The Z-2400 series of units support the communication of data signals via a wireless network. The Base is the master unit and coordinates all wireless network traffic. The Remote allows Field Stations and Shimaden Controllers to be accessed via the wireless network.

Ordering Information:

- **Z-2400-RB-T**
Base and Remote, as selected by DIP switch.
- **Z-2400-TCP-T**
Ethernet Base Only.

Z-2400-RB-T as a Base:

Connect via RS485 or RS422 on an existing data loop.
Connect via RS485 or RS422 on a new data loop.
Connect via RS232 direct to a computer.

The Base is the master for the ZigBee mesh. There can only be one Base module per ZigBee network, which can consist of up to 32 Remotes (RB and A2I) and/or 32 Sleepers.
(See page 11 for using more than one Base module.)

System Limits:

Max 32 Remotes (RB and A2I) and/or 32 Sleepers per Base.

Specifications:

Voltage	9~36Vdc.
Power Consumption	2.5VA.
Operating temperature	-40~+85°C.
RF data rate	250Kb/s.
RF frequency	2405~2485MHz.
RF channels	16.
RF power	100mW.
Spreading method	Direct sequence.
Modulation	O-QPSK.
Nodes	64 nodes per mesh (1 Base, 32 Remotes (RB & A2I) and 32 Sleepers).
Tx range	~4.0Km (standard antenna, line of sight).
Tx power	+20dBm.
Rx sensitivity	-110dBm.
Protocols	ASCII. Std MicroScan Stations, Shimaden Controllers. 2300-XX Stations.
Serial port (Z-2400-RB)	RS232, RS422, RS485 (only 1 of which can be used at a time).
Ethernet port (Z-2400-TCP)	Lantronix XPort®.
Data rate	9600 (MicroScan), 19200, 57600 or 115200 baud.
Parity bit	Even or None (MicroScan).
Connection Indication	Toggling LEDs.
Multiple Mesh use	Mesh ID 0~255.
Default Mesh ID	1 (1, 2, 3, 4, 5, 6, 7, 8).

Important: Remotes with 2400-XX / 2100-XX stations and/or Shimaden Controllers cannot be mixed with 2300-XX stations on the same Base. If this is required, one Base & Remote network must be used for the 2400-XX / 2100-XX stations and/or Shimaden Controllers; and another Base & Remote with a different Mesh ID for the 2300-XX stations.



Z-2400-RB-T as a Remote:

Connects to RS422 stations.
Connects to RS485 stations.

Z-2400-TCP-T (Base Only):

This is a Base module only that connects to a computer via Ethernet.



Physical Layout Z-2400-RB-T:

Dimensions: 101 x 24 x 120mm (H x W x D).
 Mounting: 35mm DIN rail.
 LED indicators: PWR - Power status.
 STACK - Mesh network stack activity.
 NTRWK STATUS - See *Diagnostic LEDs* Tables for more information.
 Aerial: Not shown in diagram - Screw in to attach.
 (Additional High Gain Antennas Available.)
 Serial ports: RS422/485 via plug in terminal block, RS232 Via RJ11 or RJ12 plug.
 RESET: Restarts the Base/Remote.

Terminal Connections:

Power Supply: 9~36Vdc.

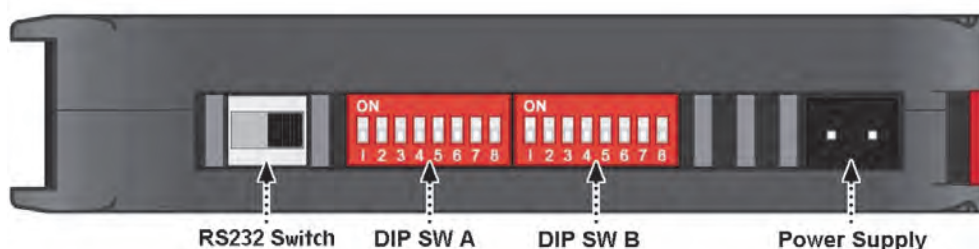
RS232:

RJ11 or RJ12. Connect to computer or device using supplied cable.

RS422/485:

71 RX+
 70 RX-
 73 TX+
 72 TX-
 74 GND

These are the standard 2100-XX 422/485 comms terminal numbers.



RS232 Switch:

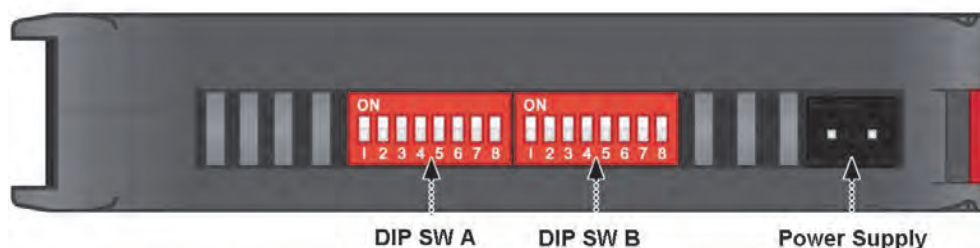
- ⇒ Switch to be in right position when used as a base.
- ⇒ Switch to be in left position when used as a remote.



Physical Layout Z-2400-TCP-T:

Dimensions: 101 x 24 x 120mm (H x W x D).
 Mounting: 35mm DIN rail.
 LED indicators: PWR - Power status.
 STACK - Mesh network stack activity.
 NTRWK STATUS - See *Diagnostic LEDs* Tables for more information.
 Aerial: Not shown in diagram - screw in to attach.
 (Additional High Gain Antennas Available.)
 Ethernet Port: Lantronix XPort®.
 RESET: Restarts the Base.
 Factory set IP: **192.168.1.100**, port 10001.
 Enable Packing ON, Inactivity timeout 15 seconds.

Note: Do not use two or more MicroScan systems to talk to an Ethernet Base. It is designed to be used with only ONE MicroScan.



Connections:

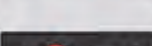
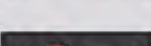
Power Supply: 9~36Vdc.

Ethernet Port: Connect to switch or hub via standard Ethernet cable.

Diagnostic LEDs:

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

BASE/REMOTE NODE - NETWORK STATUS LED DEFINITIONS

 Node is not running	 Address is out of range
 BASE: Node is booting	 REMOTE: Node is booting
 BASE: Node is forming network	 REMOTE: Node is searching network
 BASE: Remote node address table is full	 REMOTE: No network detected
 BASE: Network is formed	 REMOTE: Network joined - ready to transmit


● OFF
● ON
● FLASHING
↔ TOGGLING

Base Network Status:

1 = Flashing, 2= OFF	Base starting up.
1, 2 Toggle	Mesh formed ready to connect.

Remote Network Status:

2 = Flashing, 1=OFF	Remote starting up.
1, 2 Toggle	Remote Connected to Mesh.
1, 2 Flash at same time	Remote NOT connected. (Base not running, or no signal getting through or wrong Mesh ID set.)

Base & Remote Dip Switch Positions: - Dip Switch A:

Dip Switch A Summary:
Address Node Table + Baud Rate.

Switch	Meaning
1	Address 1
2	Address 2
3	Address 4
4	Address 8
5	Address 16
6	Address 32
7	Baud Rate
8	Baud Rate

Baud Rate Selection Table:

DIP Switch A Baud Rate: Base & Remote Only.		A
		ON
7	8	
OFF	OFF	9600 *
ON	OFF	57600
OFF	ON	19200
ON	ON	115200

* MicroScan Position.

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 devices should have the same address.

DIP Switch A Address:						
1	2	3	4	5	6	Node
OFF	OFF	OFF	OFF	OFF	OFF	0
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

(Base only.)

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

Base, Remote Dip Switch Positions:

- Dip Switch B:

Dip Switch B Summary: Base/Remote Function Selection.

Switch	Meaning	OFF	ON
1	Parity Selection	None *	Even
2	Protocol Selection	ASCII 2100/2400 Stations & Shimaden	2300 Stations (MODBUS)
3	Base/Remote Selection	Base	Remote
4	Transparent	Non Transparent	Transparent
5	Connections	Sleepers Only	All Types
6	RS485 Termination	N/C *	ON
7	RS485 Bias Gnd	N/C *	ON
8	RS485 Bias Vcc	N/C *	ON

Notes:

DIP switch 4 OFF for use with MicroScan.

When using Sleepers only, set the Base with both Dip Switch 2 and 5 OFF.

When using All Types (i.e. Sleepers & Remotes), turn Dip Switch 5 ON. This means that Sleepers must connect to the Base via Remotes ONLY.

Do **not** use Switch 3 (Remote ON) for Z-2400-TCP-T only.

DIP Switch B Settings for Base Operation:

Base with Sleepers only (Small System). • All DIP switches OFF.	B 
Base with Sleepers + Remotes connected to 2100-XX Stations and/or Shimaden Controllers. • DIP switch 5 ON, Remainder OFF.	B 
Base with Remotes connected to 2300-XX Stations (and Sleepers if required). • DIP switches 2 & 5 ON, Remainder OFF.	B 

DIP Switch B Settings for Remote Operation:

Remote with 2100-XX stations, Shimaden Controllers. • DIP Switch 3 ON, Remainder OFF.	B 
Remote with 2300-XX stations. • DIP Switches 2 & 3 ON, Remainder OFF.	B 

Example: Setting the Z-2400-RB-T for Base Operation:

Choose Node Address, eg. 1, for the Base (normally 1 or 0)	DIP switch A, 1 set to ON.
Set Baud rate at 9600	DIP switch A, 7 & 8 are both set to OFF.
Set Parity to None	DIP switch B, 1 set to OFF.
Set Protocol to ASCII	DIP switch B, 2 set to OFF.
Set unit to Base Operation	DIP switch B, 3 set to OFF.
Set Transparency to Non Transparent	DIP switch B, 4 set to OFF.
Set Base Operation Type, eg All Types	DIP switch B, 5 set to ON.
Set RS485 Termination, RS485 Bias Gnd & RS485 Bias Vcc	DIP switch A, 6, 7 & 8 are all set to OFF.

Z-2400-TCP-T Base Data Connections:

Connect the Ethernet cable to the ETHNET port on the front of the unit, and connect to the switch or hub. The IP address is factory set at **192.168.1.100**. To change the IP Address of the unit use 'XPort Installer Software' see:

www.intech.co.nz/xport

Z-2400-RB-T Base Data Connections:

Connecting Base on an existing RS485 data loop:

2100-IS RS485 Data Loop	Base	Signal Name
70	70	RX-
71	71	RX+
74	74	GND

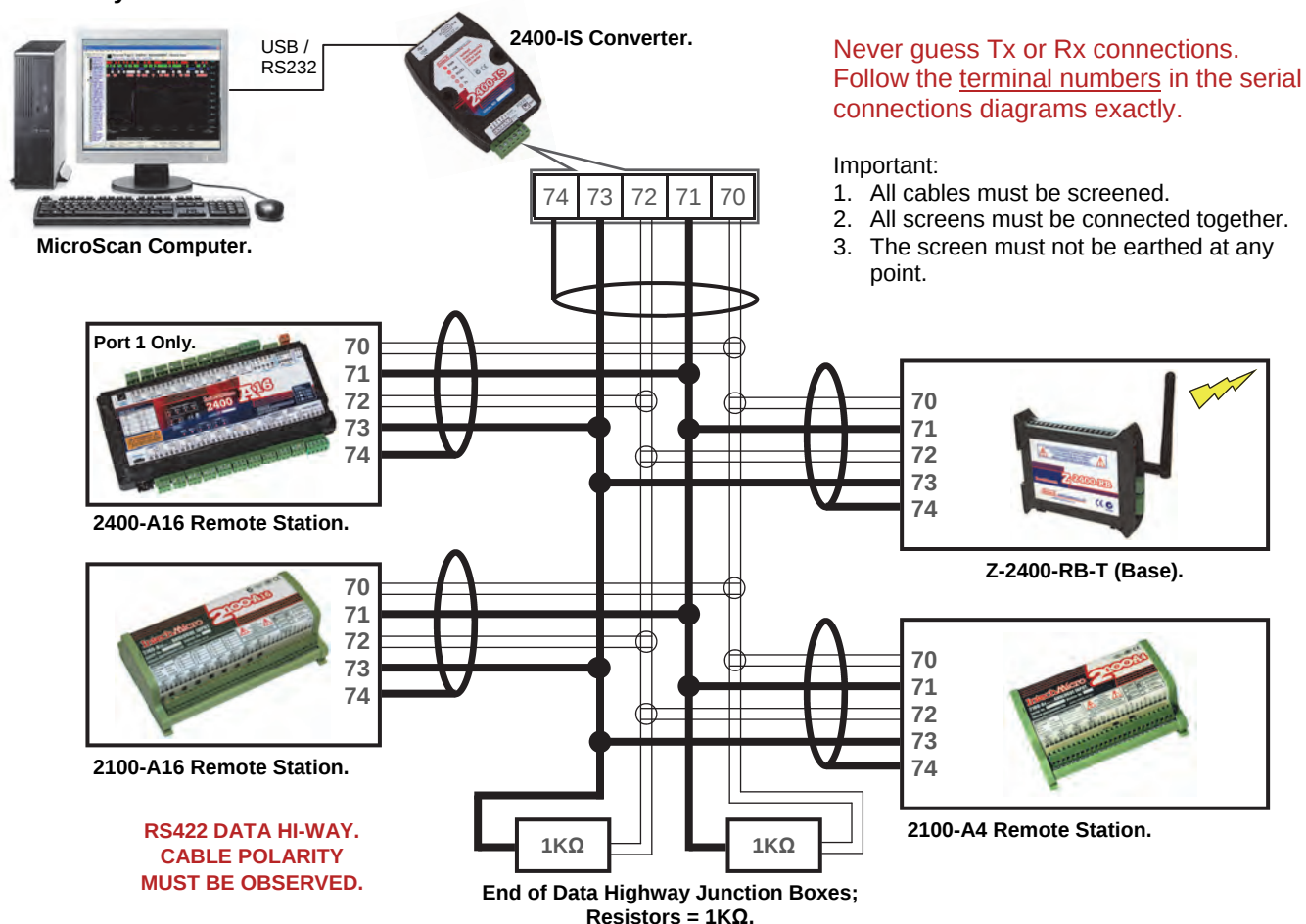
Connecting Base on an existing RS422 data loop:

2100-IS RS422 Data Loop	Base	Signal Name
70	70	RX-
71	71	RX+
72	72	TX-
73	73	TX+
74	74	GND

Connecting Base to computer via RS232:

Computer		
DB9 Serial	RS232 Cable	Base RS232 Port

Outstation Layout - 4 Wire RS422 Connections:



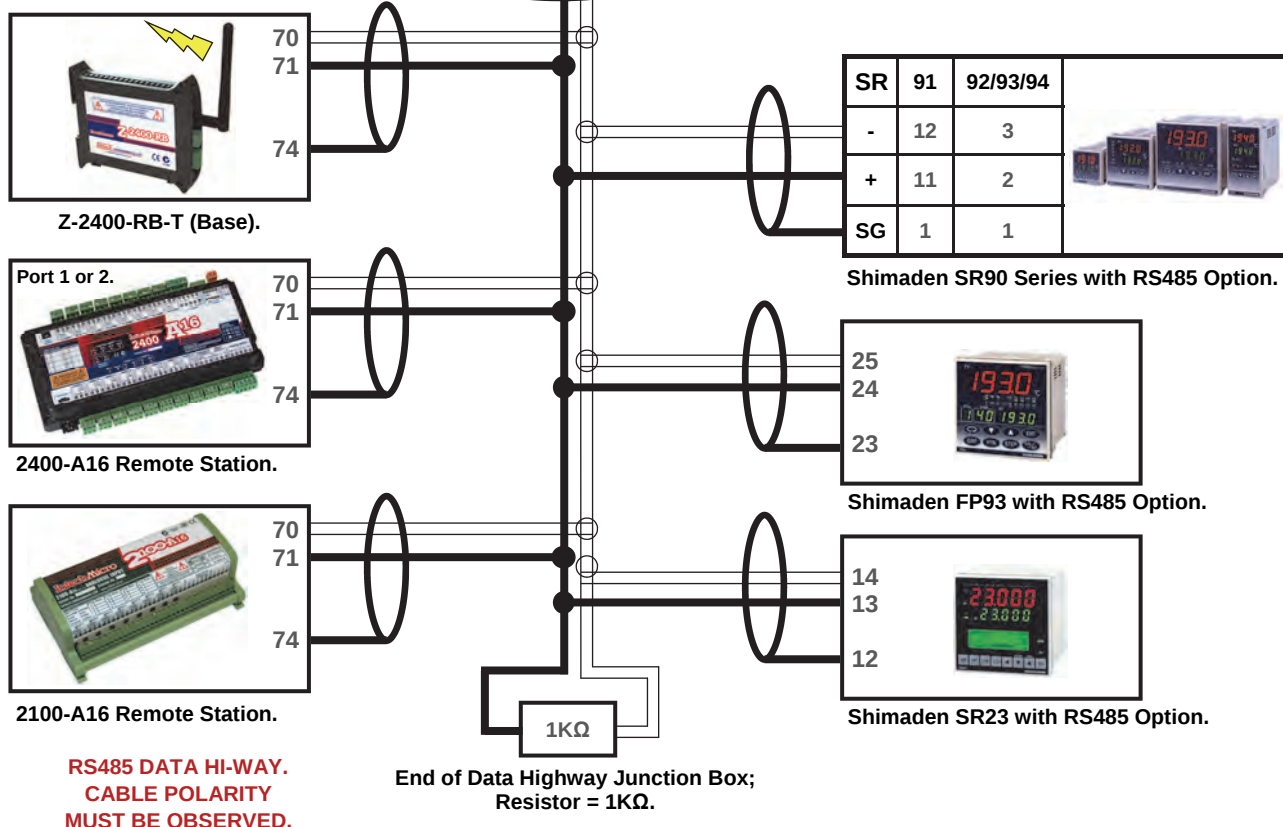
Outstation Layout - 2 Wire RS485 Connections:



Never guess Tx or Rx connections.
Follow the terminal numbers in the serial connections diagrams exactly.

Important:

1. All cables must be screened.
2. All screens must be connected together.
3. The screen must not be earthed at any point.



Z-2400-RB-T Remote Data Connections:

Setting the Z-2400-RB Remote Operation (Z-2400-RB ONLY):

Choose a node address for the Remote (normally 2 or above).

All Remotes, Set DIP switch B, 3 ON.

Stations connected are 2100-XX or 2400-XX, Dip Switch B 2 OFF.

Connecting Remote to RS422 stations (Note TX to RX pin swapping):

RS422 Station	Remote	Signal Name
72 (TX-)	70	RX-
73 (TX+)	71	RX+
70 (RX-)	72	TX-
71 (RX+)	73	TX+
74	74	GND

Connecting Remote to RS485 stations:

RS485 Station	Remote	Signal Name
70	70	RX-
71	71	RX+
74	74	GND

Connecting Remote to RS485 Shimaden Controllers:

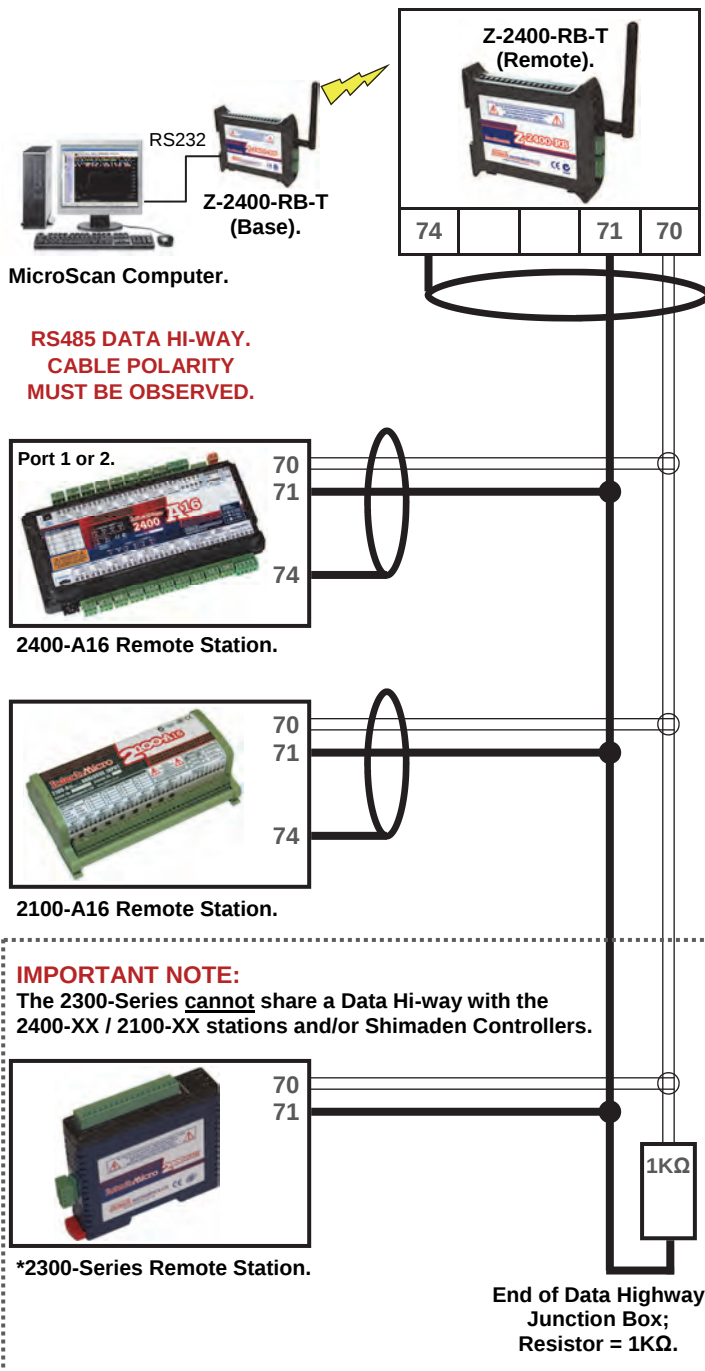
Shimaden Controller	Remote	Signal Name
-	70	RX-
+	71	RX+
SG	74	GND

Connecting Remote 2300-XX stations:

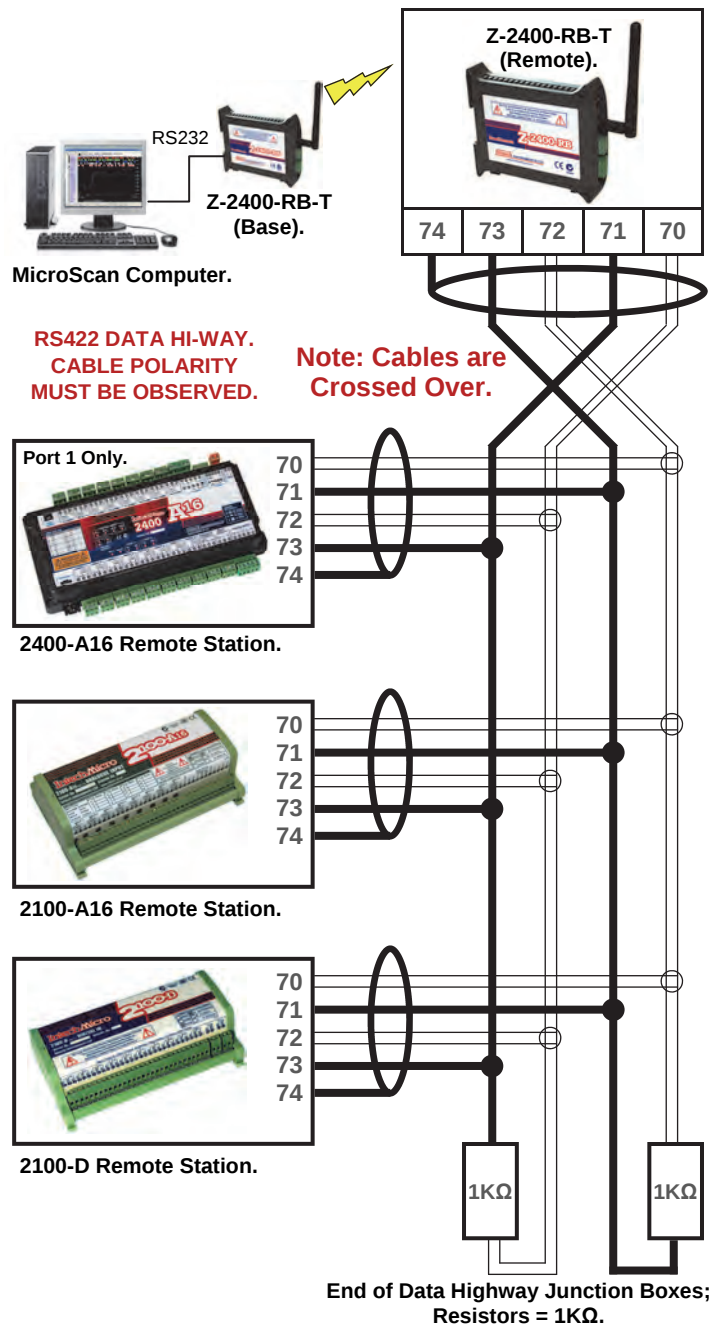
2300-XX Station	Remote	Signal Name
70	70	RX-
71	71	RX+
74	74	GND

NOTE: You cannot mix Remotes using 2300-XX stations and Remotes using 2400-XX / 2100-XX stations and/or Shimaden Controllers on the same Base.

Outstation Layout - 2 Wire RS485 Connections:



Outstation Layout - 4 Wire RS422 Connections:



Using Z-2400 Modules Within MicroScan:

Adding a Base to MicroScan:

Connect the base to the computer using the RS232 cable or 422/485 data loops (Z-2400-RB), or via Ethernet (Z-2400-TCP-T only), and then apply power to the Base. On MicroScan in the Setup Tools screen, click 'Add New Station'. Click Next, select Add a ZigBee Z-2400-XXX Base (*separate options for serial and TCP*), click Next. Choose settings that apply to the Base: node address, base type and serial port or IP address as required. Click Next, Click Next, Click Finish.

Z-2400-TCP-T Installation:

Factory Set IP Address is: **192.168.1.100**

Factory Set Port is: **10001**

To assign the Z-2400-TCP-T with a new IP address in MicroScan V5.1 software, go to 'Setup Tools' and click on 'Program Station Setups'. Next click on 'XPort Tools', click 'Search' to find your device on the TCP network. Next click on the device you want to change (Note: it's default IP Address should be: 192.168.1.100), and then click on 'Assign IP'. Now type in an IP address that your IT support staff has approved and click OK, Close, Close.

Note 1: You will need to allow the MicroScan V5.1 software access through the Windows Firewall in order to find the Ethernet converter (XPort®) and set the IP address. When the Windows Security Alert window appears, click 'Allow access' (Win7) or 'Unblock' (XP).

Note 2: This software is to be installed and/or setup by the Installer with Network IT support staff. **(Please note that Intech will not be able to help with the setup and operation of a TCP/IP network and assigning of IP addresses.)** As part of commissioning, IT support staff should assign a static address to each Z-2400-TCP module. The Z-2400-TCP should be listed as part of the Ethernet system for support by the IT support staff. It is considered good practice to write the assigned IP address/port numbers onto a label and attach to the unit for easy future reference.

Note 3: Installed antivirus software may interfere with the sockets operations. You may need to open the IP address and port numbers for the commands to go through. We have found problems with Nortons system Works 2003, and found it necessary to disable email scanning of messages, as this was blocking the sockets requests. These problems may or may not exist on other antivirus programs.

Note 4: The Z-2400-TCP will support one MicroScan Active only. It is not possible to have multiple Active MicroScan systems permanently communicating to the Z-2400-TCP.

Adding a Station to a Remote:

Setup the ZigBee Base and Remotes as per previous instructions. Make sure Base, Remote and all attached stations are powered up.

Add Base First. Add the attached station using 'Add New Station', add the station normally, but in Select Serial Port step, choose 'Station attached to ZigBee 2400-Remote', the Base will then be queried for a list of attached Remotes, select the correct one and the wizard will attempt to read the station info via the Remote.

To show Base information, click on 'Program Station Setups', select the Base and click Program Station. Relevant information will be displayed indicating Base connections and Sleeper information. Once a station has been added, it appears on the Station map in 'Configure Pages and Lines' as a normal station - No further settings to lines or tags are required.

Accessing Speeds:

Stations connected to Remotes:

Under ideal conditions, the round trip for a message from Base to Remote to station to Remote back to Base is approximately 400 mSec. Therefore we allow for 2 comms messages per second. So to read all 16 channels from an A16 would take 2 seconds. For this reason it is not recommended to use stations on a Remote when a guaranteed response from other wired or Ethernet stations is required – the timeout delay while waiting for the Remote will begin to affect the other stations update rates.

The MicroScan driver allows a 2 Minute timeout on non responding stations (due to the long time that the mesh can take to respond). It will keep the last value read (Marked as Suspended). After several retries (adjustable), the station will return Error 1 and be marked as Not Found.

ZigBee Mesh ID:

The Mesh ID allows for multiple Bases and thus networks to be used when the mesh signals will overlap. You can program the Mesh ID of the Base & Remote via MicroScan V5.1 software. Go to 'Setup Tools' and click on 'Program Station Setups', select the device you want to change, click 'Program Station', click 'Set Base/Remote Mesh ID'.

The Z-2400-Sleeper and Z-2400-A2I Mesh ID is programmed via the XU Setup software using the XU-USB programming key. (For more information; use MicroScan V5.1 Help and search for 'Changing Mesh ID'.)

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

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 a Remote connecting directly to the Base, it may connect to other Remotes which then connect to the Base. Therefore the network formation is not predictable. If one of the Remotes, which happens to be forwarding messages for other Remotes powers down, it may take a minute or two for the wireless network to reform and the remaining Remotes to regain communications to the Base.

Stations Supported in Z-2400 Network Systems:

- 2400-XX stations.
- 2300-XX stations (setup on a separate data hi-way to the 2100-XX & 2400-XX stations or Shimaden Controllers).
- 2100-XX stations.
- Shimaden Controllers: SR90 Series, SR80 Series, SR23, SRS10A Series, MR13, FP23, FP93, SD16A, SD24.

RS422/485 Comms Signal Cabling:

1. Use only high quality low capacitance, twisted pair, overall screened data cable.
2. Minimum cable pairs: RS422 = 2 (plus overall screen). RS485 = 1 (plus overall screen).
3. Take care not to stress or damage cables during installation.
4. Total length of trunk line, including spurs, is not to exceed typically 1200m without isolating boosters for RS422 and not to exceed typically 500m without isolating boosters for RS485.
5. End of line terminating resistors = 1k Ω .
6. Cabling paths should avoid sources of radio frequency interferences such as fluorescent lights, variable speed motor drives, welding equipment, radio transmitters, etc.
7. There should be a minimum of 200mm physical separation between power cables and data cables.
8. Data cables should not be exposed to excessive heat or moisture, and should not be buried directly in the ground without protection.
9. Avoid powering from the same power supply as a variable speed drive.
10. All unused twisted pairs should be terminated at both ends with 1k Ω resistors. DO NOT ground unused pair.

Troubleshooting:

1. Check the Base is powered up and PWR LED is lit.
2. Check the Base network status LEDs are toggling 1, 2 then 2, 1.
3. Check the Remote is powered up and PWR led is lit.
4. Check the Remote network status LEDs are toggling 1, 2 then 2, 1. If these LEDs flash 1 & 2 at the same time it means the Remote cannot connect to the mesh either because:
 - a) The Base module is not powered up.
 - b) The ZigBee signal strength is too weak to connect.
 - c) The node address has not been selected on the Remote.
 - d) A wrong mesh ID has been programmed into the units.
5. Use the Program Station Setup dialog within MicroScan to show Base stats. This will show how many Remotes and Sleepers have connected to the Base and what their node addresses are.
6. Check that the Base and Remote have been set to different node addresses (DIP Switch A).
7. After a power cycle of the Base or Remote, the Remote may take up to 1 minute to re establish a mesh connection.

If the Base & Remote powers up at the same time, it may take up to 1 min for the Remote to connect due to the different startup times of the units.

Antenna Options for Z-2400 Wireless Series:

MODEL	DESCRIPTION
ZB-BKT01	Bracket Kit for Z-2400 indoor Antennas. (1m of low loss cable and bulkhead attachment included.) Designed for indoor use.
ZB-OD24-5	2.4GHz 5.5dBi Rubber Duck antenna. Designed for indoor use.
ZB-OD24-3	2.4GHz 3dBi Omni Directional antenna. (0.3m of coax cable with bulkhead included.) Designed for outdoor use.
ZB-OD24-8	2.4GHz 8dBi Omni Directional antenna. (Mounting brackets & 6m of low loss coax cable included.) Designed for outdoor use.
ZB-PG24-19	2.4GHz 19dBi Parabolic Grid directional antenna. (Mounting brackets & 6m of low loss coax cable included.) Designed for outdoor use.

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

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