



ITA Series

ITA-110 Operating Manual

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CHAPTER 1 - Overview

1.1 The *ITA-110* Acquisition Device

The *ITA-110* is a data acquisition device that measures vibration and process parameters from machinery and other mechanical systems. It can operate on both ethernet (LAN) and WiFi (WLAN) networks and is powered from a low-voltage external power source.



The basic operation is that analog signals are digitised by the on-board analog-to-digital converter (ADC) and stored in internal memory. This data can be passed over a 100base-T ethernet cable or a WiFi 802.11b/g/n network to a host computer for processing and display.

The *ITA-110* incorporates sixteen analog input channels. Each input can accommodate standard IEPE type accelerometers or AC voltage signals for dynamic measurements. Alternatively, any channel can operate as a process input for static measurements such as temperature. Channel configuration is jumper selectable.

The sixteen channels are multiplexed to a single signal path. Hardware high-pass filters and a hardware integrator are incorporated for flexibility in different monitoring environments. The resolution of the ADC is 24 bits, and gains up to 100 are available. Bearing demodulation is carried out by a software algorithm on the device. Anti-aliasing of the incoming signal is performed by continuous time analog pre-filters followed by digital filtering. Incoming data is therefore oversampled, but this process is entirely invisible to the user. The final data stream is buffered in

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internal memory and then transferred via the LAN or WLAN network under control of the host PC.

Accelerometers that provide temperature output can be accommodated by connecting the acceleration output to one of the IEPE channels and the temperature output to an adjacent DC coupled channel.

1.2 Communication

The *ITA-110* is controlled by a set of 'commands' sent from a host computer or similar device via the network. All commands issued are asynchronous and force a reply from the device, either as an item of data or as a simple acknowledgement. In this way, the controlling PC should always know the activity and status of each *ITA-110* on its network.

The *ITA-110* can communicate via an ethernet cable connected to the internal RJ45 connector to implement a standard 10Base-T or 100Base-T connection. Auto-negotiation of speed selects the maximum speed according to the network and auto-mdix allows for straight-through and cross-over ethernet cables. Alternatively, the device will communicate on any wireless network that is 802.11b/g/n compatible.

1.3 Configuration

Network settings are programmed into the *ITA-110* in one of two ways, namely

- manual input on the front panel colour touch screen, or
- commands sent over the network.

Network settings are normally entered via the front panel touch screen.

1.4 LAN and WLAN Network

Any number of *ITA-110* devices can exist on a network, and each is distinguished by its unique IP address. IP addresses can be allocated statically or can be allocated automatically by DHCP. Each *ITA-110* exists on a network in a similar fashion to any other wireless or LAN device.

1.5 Important Safety and Operational Information

The *ITA-110* contains a certified transmitting device. Certification is subject to the following:

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1. Only a single omnidirectional antenna with a maximum gain of 2.5dBi may be used.
2. The antenna must be installed to provide a separation distance of at least 20cm from all persons.

The *ITA-110* is supplied with a 2.5dBi antenna.

FCC warning statement:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

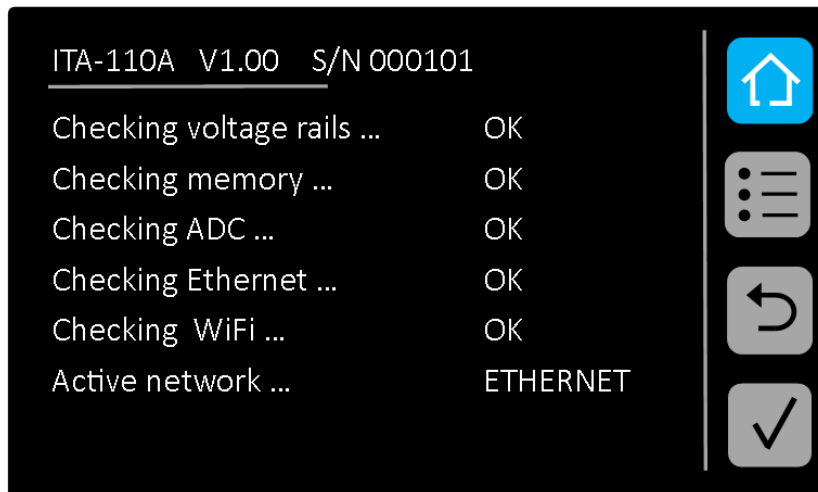
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CHAPTER 2 – Configuring the *ITA-110*

2.1 Initial Power-Up

The *ITA-110* incorporates a full VGA colour touchscreen for configuration and status information. Note that key presses are context sensitive – blue buttons mean that a key is active, grey means that it is non-active. The buttons on the right panel are (from top to bottom), **Home**, **Main Menu**, **Back** and **Accept**. Pressing the **Home** button always takes you back to the STATUS screen. If a button has not been pressed for five minutes, then the unit reverts to the STATUS screen.

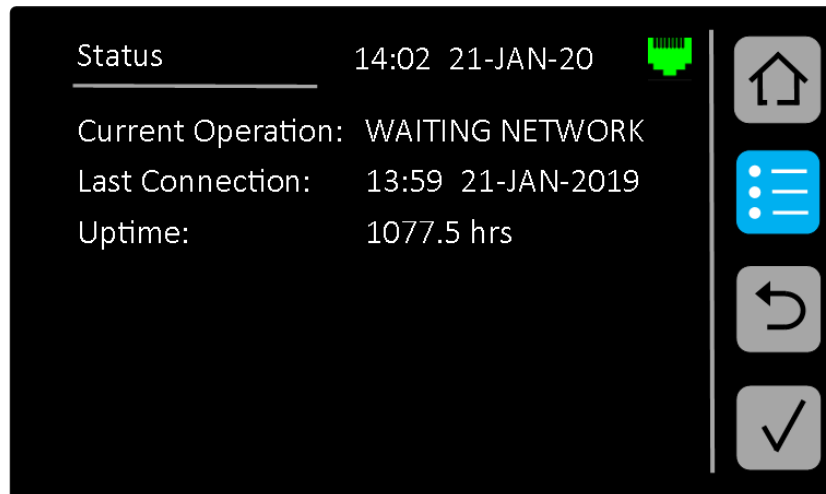
When the *ITA-110* is powered up, it carries out a self-test of its internal functions and displays these on the front screen as each is executed. A typical screen is shown below.



2.2 STATUS Screen

On completion of the start-up process, the unit displays the STATUS screen as shown below. This contains current operation status and information about previous connections. The symbol in the top right corner indicates connection status as follows:

- green ethernet symbol: ethernet network detected
- red ethernet symbol: no ethernet network detected
- wireless symbol: wireless network detected and signal strength shown
- yellow warning triangle: internal hardware fault on the WiFi network interface.

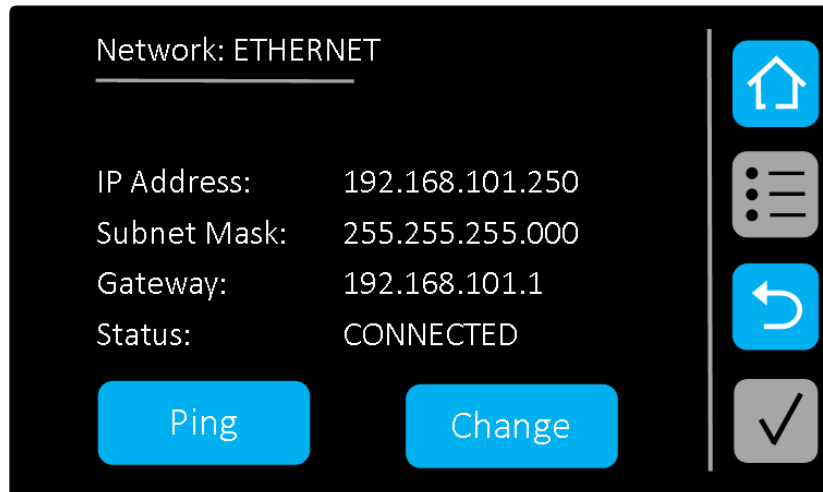


One of the messages in the table below will appear under *Current Operation*:

WAITING NETWORK	Waiting for ethernet link or access point to connect
WAITING SERVER	Listening for an incoming network connection
WAITING TIME	Waiting until it is time to dial-in
WAITING RETRY	Dial-in failed so waiting for retry period before trying again
CONNECTING	Trying to dial-in
CONNECTED	Connected to controlling computer / device
SAMPLING	Sampling of data is occurring
TESTING	Sensor tests are being carried out
FIRMWARE UPDATE	Firmware update is underway

If a button has not been pressed for five minutes, then the unit reverts to the STATUS screen.

From the STATUS screen, pressing the **Main Menu** button takes you to the screen below.



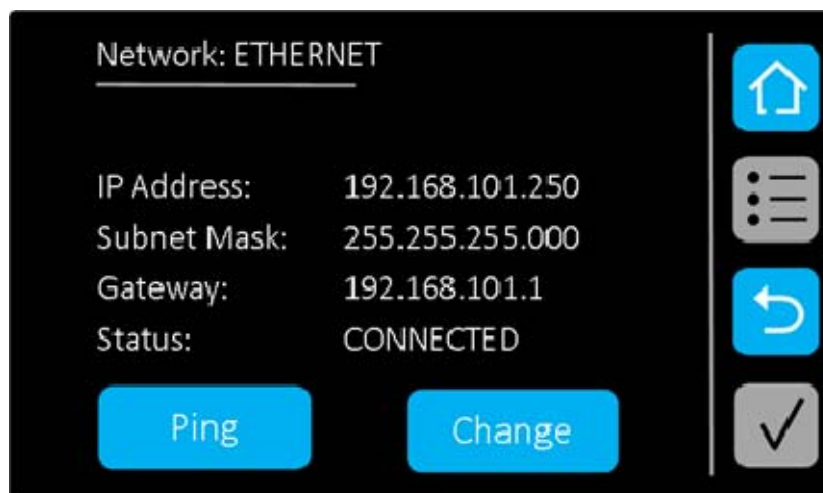
From here you can:

- Configure your network settings by pressing the **Network** button
- Carry out a check of sensors connected to the device by pressing the **Sensor Test** button
- Restart the *ITA-110* (equivalent to a power cycle) or set factory defaults. Refer to section 2.7 for resetting factory defaults.

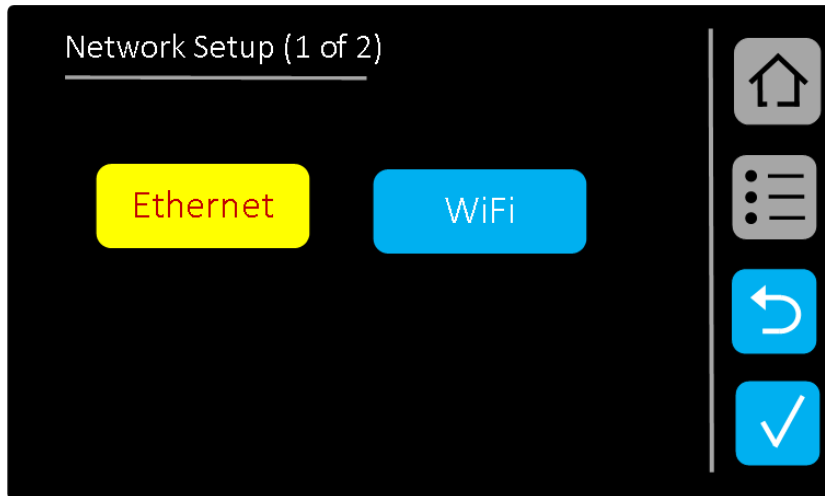
2.3 Configuring Ethernet Network Settings

For an ethernet LAN connection, connect a LAN ethernet cable to the RJ45 socket on the unit. The green link light on the RJ45 socket will illuminate steadily and flash when data is passing. The orange SP100 light will illuminate if a speed of 100Mbits is detected.

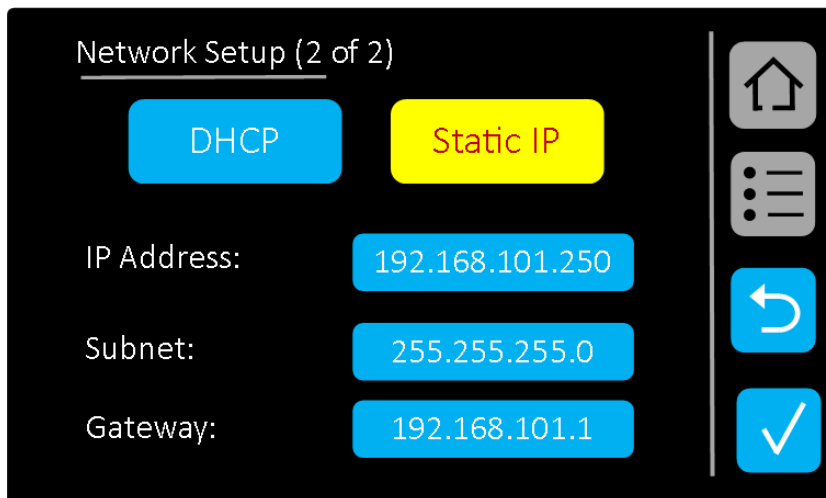
If you wish to change the network settings of the *ITA-110* that you are working on, you can do this by pressing **Change** on the screen below. In this example, we will specify ethernet network settings.



This takes you to the first NETWORK SETUP screen of two.



In the above screen select **Ethernet**. The selected network connection is highlighted in yellow. Press the **Accept** button to confirm your selection and move on to the next screen as below.

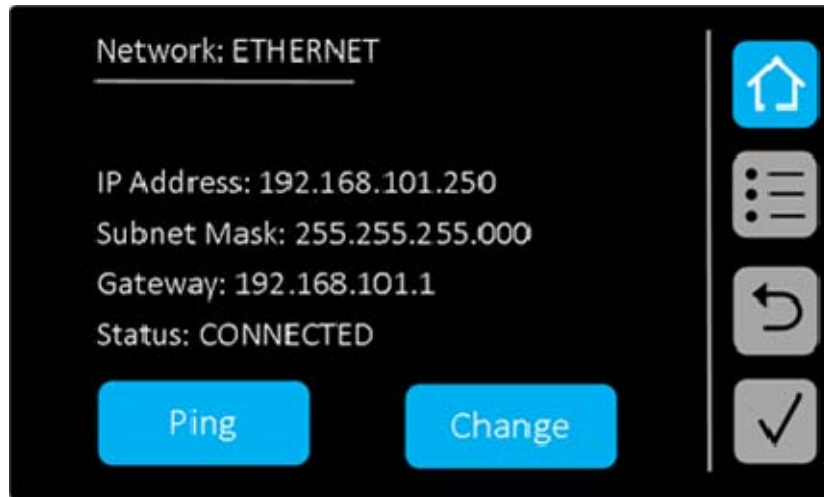


This screen shows that **Static IP** has been selected. Pressing on any of the buttons below brings up the keyboard screen and you can adjust the settings as required. Press **Accept** to confirm.

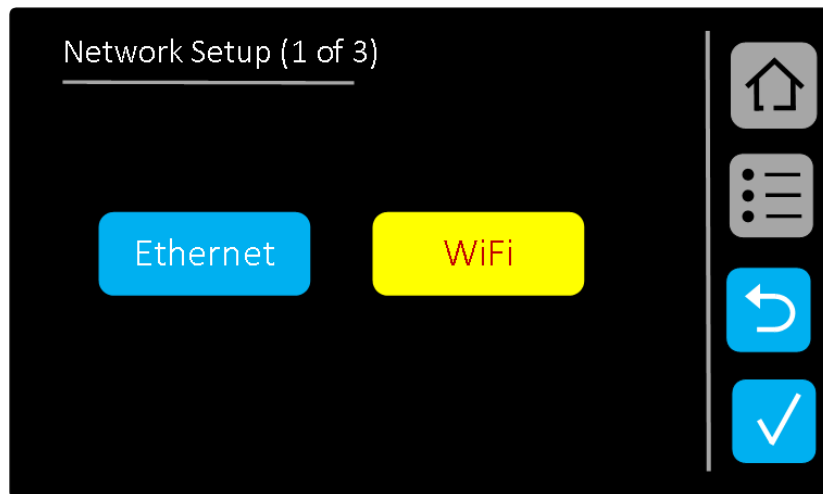
If you wish to use **DHCP**, press on this followed by the **Accept** button. The static IP fields will be overwritten with the message *DHCP Assigned*.

2.4 Configuring WiFi Network Settings

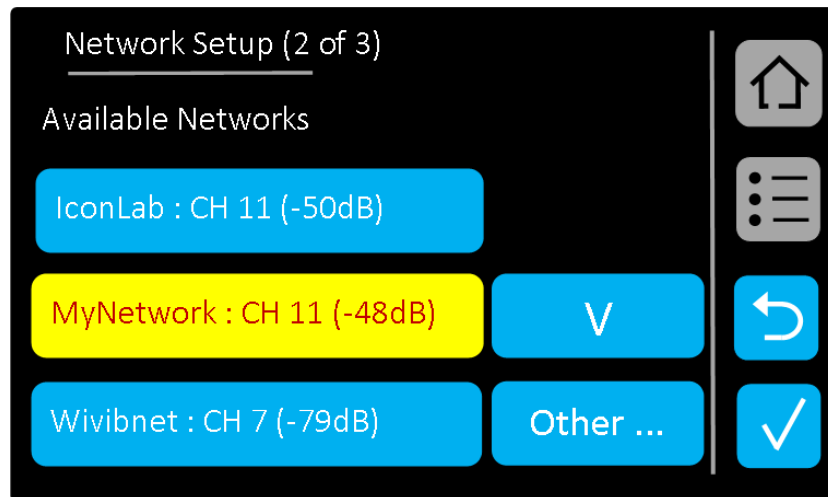
If you wish to change the network settings of the *ITA-110* that you are working on, you can do this by pressing **Change** on the screen below. In this example, we will specify WiFi network settings.



This takes you to the first NETWORK SETUP screen of three.

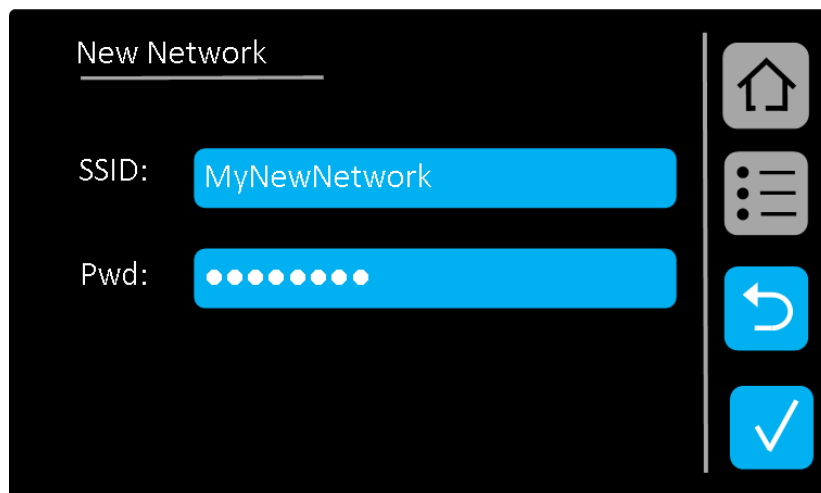


In the above screen select **WiFi**. The selected network connection is highlighted in yellow. Press the **Accept** button to confirm your selection and move on to the next screen as below.

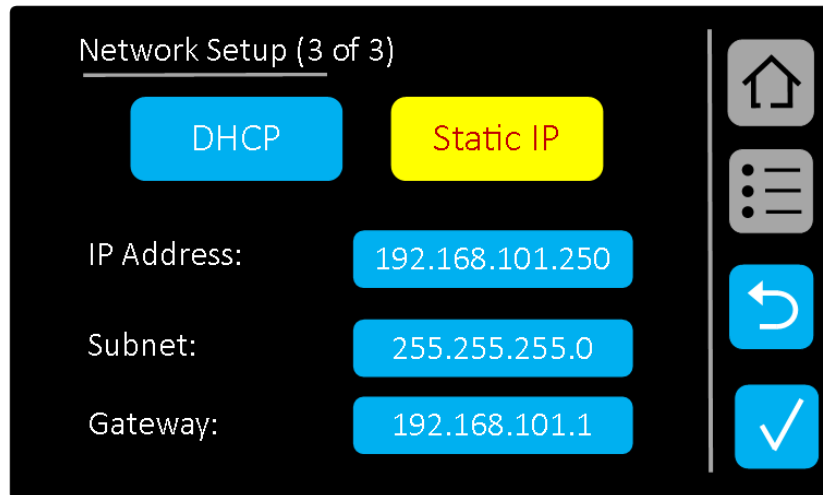


Select the network that you wish to connect to. This will be highlighted in yellow, and press the **Accept** button. If a password is required, you will be prompted to enter this.

If you want to select a network that is not listed, press the **Other ...** button. The following screen will appear.



Once a WiFi network and password (*Pwd*) has been specified, pressing **Accept** will take you to the next screen as below.

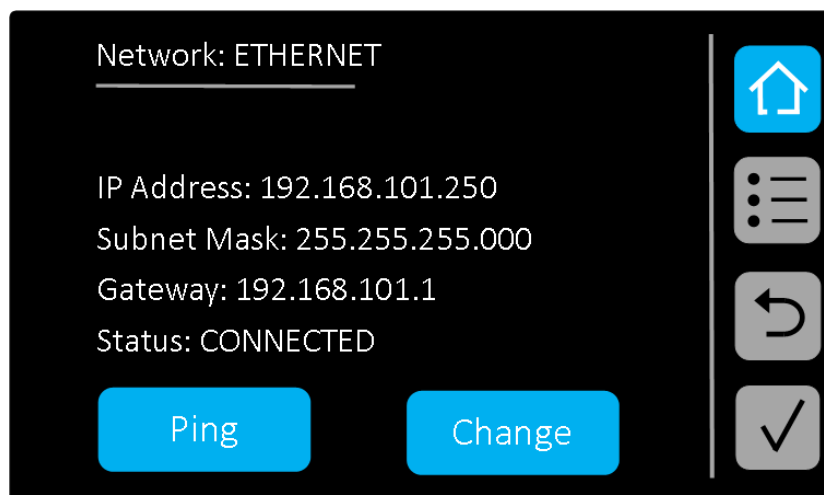


This screen shows that **Static IP** has been selected. Pressing on any of the buttons below brings up the keyboard screen and you can adjust the settings as required. Press **Accept** to confirm.

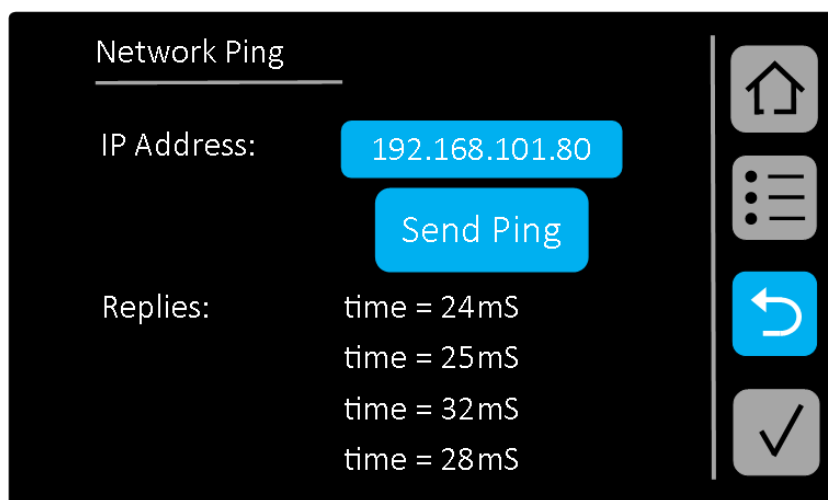
If you wish to use **DHCP**, press on the button followed by the **Accept** button. The static IP fields will be overwritten with the message *DHCP Assigned*.

2.5 Checking Your Network

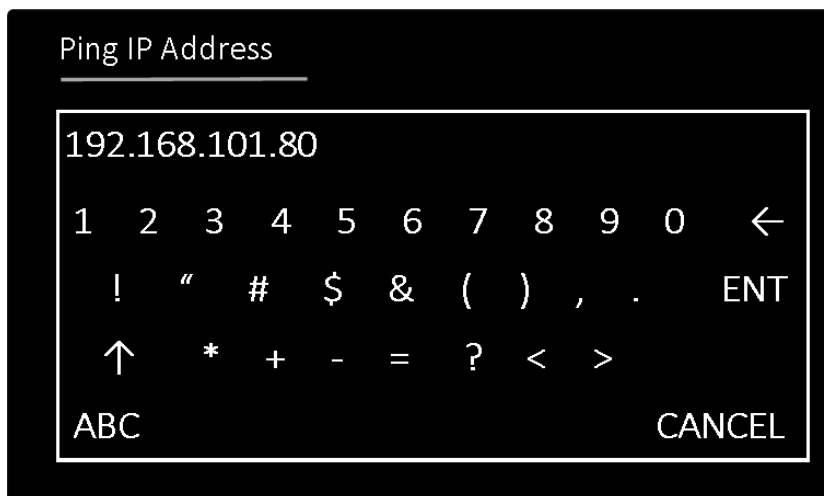
Pressing the **Network** button in the screen above takes you to the main NETWORK settings screen. At first, a screen similar to the one below appears which indicates the current network settings. If the network connection is wireless, then the SSID is also shown.



Pressing **Ping** enables you to ping other devices on the network. This is useful, for example, in ensuring that a host computer is reachable. A screen similar to the one below appears.



Pressing **Send Ping** sends a ping to the IP address specified on the screen. Replies or other unreachable messages will appear. An example of a successful ping is shown above. If you wish to change the address being pinged, press on the IP address (in this example **192.168.101.80**) and the keyboard screen will appear enabling you to change the IP address.



2.6 Default Settings

On leaving the factory, the *ITA-110* is configured with default settings. These are detailed in the table below.

Item	Setting
Name	<i>ITA-110:<serial no></i>
Network Type	LAN (Ethernet)
IP Address	192.168.101.250
Subnet Mask	255.255.255.0
Default Gateway	192.168.101.1
DHCP Enable	Off
Wireless SSID	<i>wivibnet</i>
Security	Off
Host IP Address	192.168.101.80
Host Port Number	8020
Timeout	5 minutes
Dial-in Mode	Disabled

LAN Connection

For a LAN connection, connect a LAN ethernet cable to the RJ45 socket on the unit. The green link light marked LINK will illuminate steadily and flash when data is passing. The orange SP100 light will illuminate if a speed of 100Mbits is detected.

To enable your *ITA-110* onto your LAN network quickly, just ensure that your *ITA-110* and host computer both have the same subnets. The default *ITA-110* subnet is 192.168.101.xxx.

For existing systems, you will need to carry out the ethernet network configuration procedure to set up appropriate IP addresses etc for each *ITA-110*, the SSID and the IP address of the host computer.

WLAN Connection

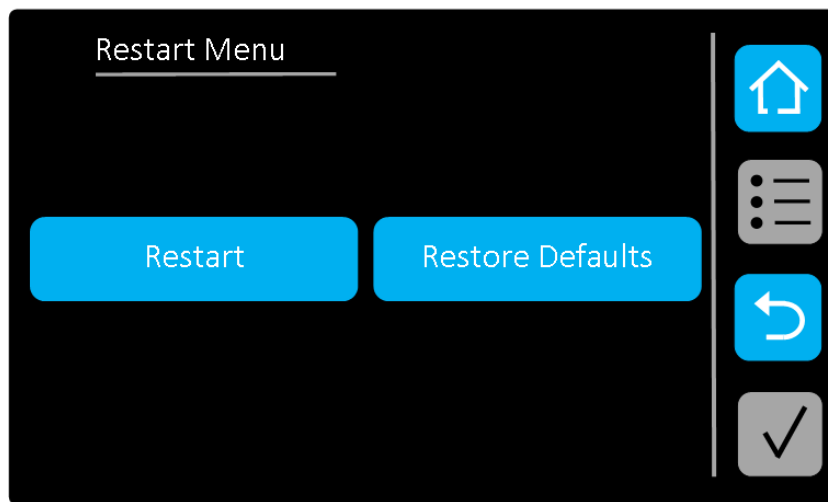
To establish a “quick-start” connection between a computer and *ITA-110*, all you need to do is to program your access point to an SSID of “*wivibnet*” and an IP address of 192.168.101.xxx (where xxx is any unused address in the range 0 to 255),

and assign a static IP to your computer of 192.168.101.80 (via **Control Panel ... Network Connections**).

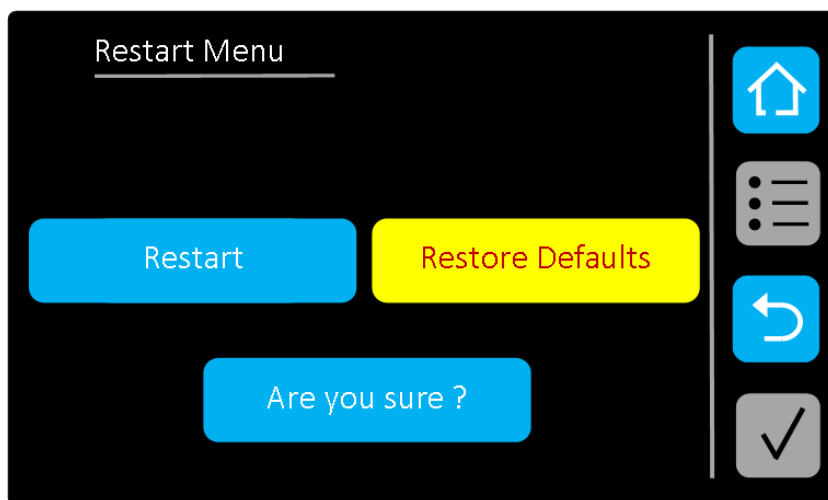
For existing systems, you will need to carry out the WiFi network configuration procedure to set up appropriate IP addresses for each *ITA-110*, the SSID and associated settings of the wireless network (including security settings, if used) and the IP address of the host computer.

2.7 Restoring Factory Defaults

When the **Restart** button is pressed from the main menu, the screen below will appear. If you wish to restart the *ITA-110*, press **Restart** again followed by **Accept**.



If you wish to restore factory defaults, press **Restore Defaults**. The screen below will appear.



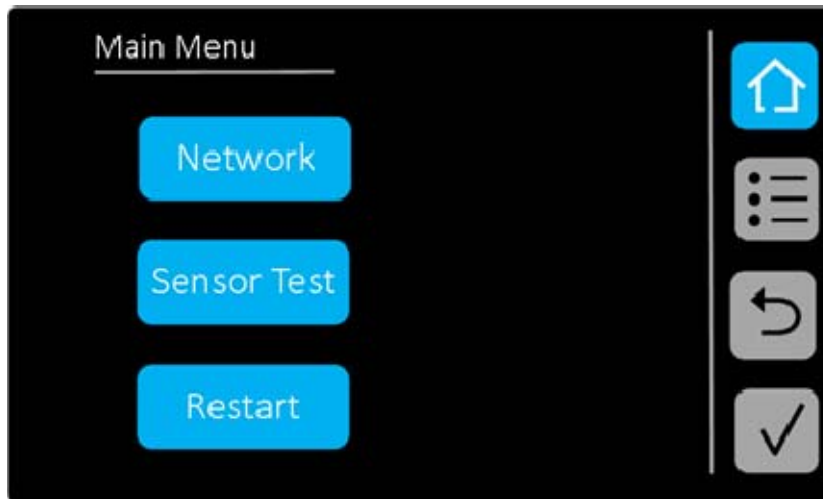
Press **Are you sure ?** to enable the **Accept** button. Now press **Accept** to complete the restore defaults process and reboot the unit. This will reset all network settings and other stored parameters to the values as in section 2.6.

CHAPTER 3 – Sensor Testing and Commissioning

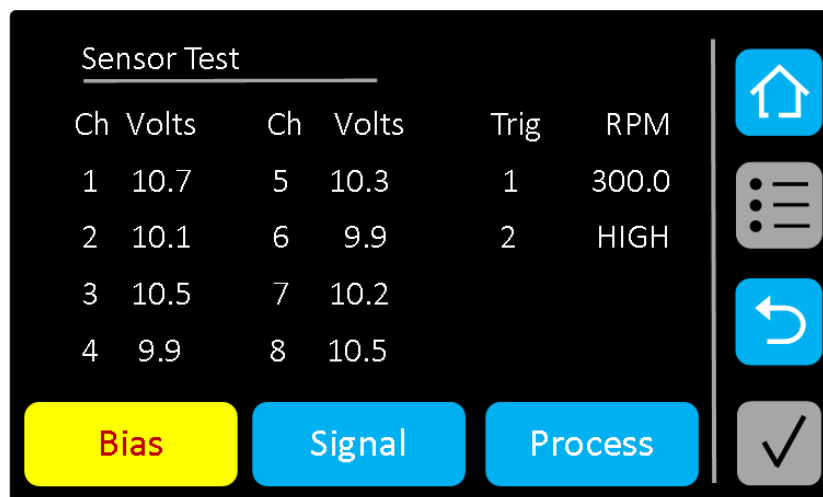
3.1 Sensor Testing

The *ITA-110* allows sensors connected to the devices to be tested for integrity at any time. *The ITA-110* does not have to be connected to a network thus enabling sensor checks to be carried out during installation and prior to connecting to a host computer. **Note that, on all *Sensor Test* screens, eight analog input channels are shown at a time and the display horizontally scrolls though the channels in increments of four to enable all sixteen channels to be viewed.**

Pressing the **Main Menu** button takes you to the screen below.



Now press the **Sensor Test** button to take you to the first sensor test screen.



The first screen shows the bias voltage levels of all the dynamic channels together with status of the trigger inputs. If an accelerometer is not connected or the cabling

Chapter 3 – Sensor Testing and Commissioning

is open circuit, then a voltage around 24V will be reported. If a cable is shorted, a voltage around 0V will be shown. If pulses are detected on a trigger input, then the calculated RPM is shown assuming one pulse per revolution of the machine. Note that if the sensor is fitted to a gearwheel, then the RPM figure will be multiplied by the number of teeth on the gear. If no pulses are detected, the logic level of the input is indicated (high or low).

The bias voltage measurements are continually refreshed so that remedial action on sensor cables will be indicated as sensors are connected or cabling fixed.

Pressing the **Signal** button shows the real-time voltages on each dynamic channel as in the screen below.

Sensor Test					
Ch	Vp-p	Ch	Vp-p	Trig	RPM
1	0.12	5	1.05	1	300.0
2	0.10	6	0.06	2	HIGH
3	1.01	7	0.00		
4	1.02	8	0.00		

Bias

Signal

Process

The voltages shown are the peak-to-peak voltages measured on the corresponding channel. Knowing the sensitivity, for example, of the accelerometer connected, the value in g's can be calculated. The RPM readouts are as in the BIAS screen. The measurements continually refresh.

Pressing the **Process** button shows the real-time voltages on each process channel as in the screen below.

Sensor Test					
Ch	Volts	Ch	Volts	Trig	RPM
1	0.72	5	1.01	1	300.0
2	1.10	6	0.19	2	HIGH
3	0.01	7	0.01		
4	0.01	8	0.00		

Bias

Signal

Process

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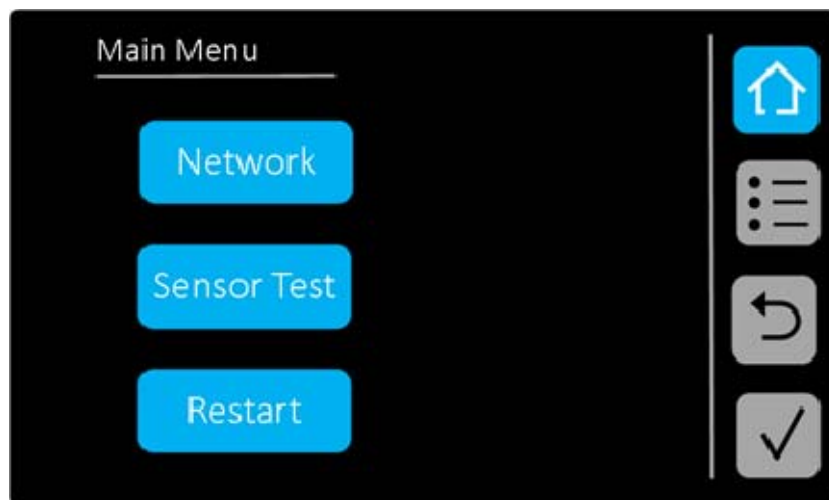
The voltages shown are the DC levels measured on each input in the range $\pm 10V$. The RPM readouts are as in the BIAS and SIGNAL screens. The measurements continually refresh.

3.2 Commissioning

Using the sensor test functionality, it should be possible to check all sensors and wiring during installation and while installation technicians are on-site.

Thereafter, the network settings can be applied and the network connection tested back to the host computer. The Ping function is useful for this purpose. If there is no host computer on the network, the Ping function can be used to access a router on any other *ITA-110*'s on the network. Remember that every *ITA-110* has to have a unique IP address on the network. During normal operation, the test screens can be interrogated at the device at any time.

If during commissioning you wish to restart the *ITA-110*, this is done by pressing the **Restart** button as in the screen below. Refer to section 2.7 for details.



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CHAPTER 4 – Physical Connections

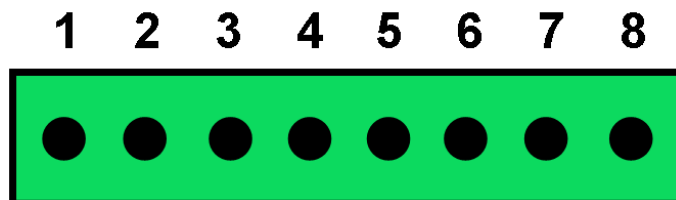
4.1 Analog Inputs

The *ITA-110* has a total of sixteen input channels. Each input comprises two pins in blocks of four inputs on a 8-way connector. The four connectors are marked **CH 1** to **CH 16** from left to right on the unit.

Each input can be configured as a dynamic IEPE/AC input or as a DC-coupled process input. Standard accelerometers will therefore be connected to the two pins and, if the cable has a screen, this should be routed to the chassis earth post on the left side of the unit. If dual output accelerometers (acceleration and temperature) are being used, then the accelerometer signal and ground are connected to the two input pins of a channel and the third (temperature) wire is connected to the signal pin of an adjacent channel.

Each channel has a three-way jumper associated with it for configuring IEPE power source, AC coupling or DC coupling.

Channel numbering is printed on the cover of the unit. The front view pinout numbering of each of the four input connectors is shown below. The pin numbers correspond to the function in the table.



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Connector	Channel	Pin No	Function
1	Ch 1	1	Signal (IEPE, AC or DC input)
		2	Signal Common
	Ch 2	3	Signal (IEPE, AC or DC input)
		4	Signal Common
	Ch 3	5	Signal (IEPE, AC or DC input)
		6	Signal Common
	Ch 4	7	Signal (IEPE, AC or DC input)
		8	Signal Common
2	Ch 5	1	Signal (IEPE, AC or DC input)
		2	Signal Common
	Ch 6	3	Signal (IEPE, AC or DC input)
		4	Signal Common
	Ch 7	5	Signal (IEPE, AC or DC input)
		6	Signal Common
	Ch 8	7	Signal (IEPE, AC or DC input)
		8	Signal Common
3	Ch 9	1	Signal (IEPE, AC or DC input)
		2	Signal Common
	Ch 10	3	Signal (IEPE, AC or DC input)
		4	Signal Common
	Ch 11	5	Signal (IEPE, AC or DC input)
		6	Signal Common
	Ch 12	7	Signal (IEPE, AC or DC input)
		8	Signal Common
4	Ch 13	1	Signal (IEPE, AC or DC input)
		2	Signal Common
	Ch 14	3	Signal (IEPE, AC or DC input)
		4	Signal Common
	Ch 15	5	Signal (IEPE, AC or DC input)
		6	Signal Common
	Ch 16	7	Signal (IEPE, AC or DC input)
		8	Signal Common




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Looking at the inputs in more detail:

SIGNAL (IEPE, AC or DC input): The signal inputs can accommodate both dynamic and process (DC coupled) signals. Dynamic signals can utilise the on-board IEPE current sources to power standard accelerometers, or can be driven by AC coupled signals, for example, from a proximity (eddy current) probe. To enable the internal IEPE power source for an accelerometer, insert a jumper into position **A**. Remove the jumper for AC coupled measurements.

The signal input can also accept DC signals in the range $\pm 10V$. Insert the jumper into position **B** in this case.

Jumper positions are summarised in the table below.

Coupling	Jumper Position	Fitting
IEPE Interface	A	
DC Coupled	B	
AC Coupled	Not Fitted	

SIGNAL COMMON: This is the common for both signal and process inputs.

Physical connection is by indirect terminal connectors that can be removed from the board to make termination easier.

Dynamic IEPE / AC Connection

The sixteen analog inputs incorporate an IEPE interface that can be enabled or disabled by jumper selection. Each input has its own IEPE interface (ie. they are not multiplexed). If the jumper is inserted in position **A**, then IEPE power is applied to that channel. If the jumper is not inserted, then an AC signal can be applied. The maximum input range of these inputs is $\pm 10V$ for both IEPE and AC connection. This equates to a maximum input range of $\pm 100g$ for a $100mV/g$ accelerometer, though a standard accelerometer output range is typically $\pm 5V$ (ie. $\pm 50g$ range for a $100mV/g$ sensor).

The nominal voltage of the IEPE interface is $24V$ with a constant current of $3.6mA$. Bias voltage checking is available and the bias voltage can be read for each channel on the front panel touchscreen or by the host application communicating with the *ITA-110*.

DC Process Input Connection

When the jumper is inserted in position **B**, the corresponding input is DC coupled, intended for accurate measurement of process signals. Gain is fixed at a value of 1 providing a +/-10V input range.

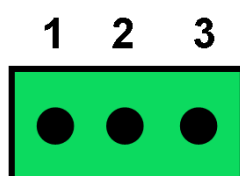
If a dual output accelerometer is being used, then the accelerometer signal would be connected to a channel with the jumper in position **A** and the temperature wire connected to a channel with the jumper in position **B**.

4.2 External Trigger Inputs

The *ITA-110* has two trigger channels. These inputs act as external trigger for data acquisition synchronisation and order analysis, and for tachometer speed inputs. External trigger inputs are identified by the labels **TRIG 1** and **TRIG 2**.

They can also act as gates – refer to section Gated Inputs later in this section.

Both trigger channels are electrically isolated from the main unit and so can be connected to an external trigger source without the *ITA-110* common being connected to the source common. Both inputs are identical.



Pin No	Function
1	Power (+24Vdc)
2	Signal
3	Common

The front view pinout numbering is shown below. The pin numbers correspond to the function in the table.

An external trigger requires a logic pulse and is compatible with any voltage pulse input in the range 5V - 24Vdc. The input is TTL compatible. Logic '0' must be less than 0.7V. Drive current for the digital triggers is minimum 2mA.

Triggers are detected on the rising edge of an incoming trigger signal. The corresponding LED will flash green to indicate that a trigger has been detected. If the trigger pulse rate is very high, the LED will appear to be permanently illuminated.

Gated Inputs

The external trigger inputs can also act as gates to enable or disable sampling depending on the status of these inputs. This mode is set up as configured by the controlling host application. In gate mode, the application reads the logic level of

Chapter 4 – Physical Connections

one or both of the trigger inputs and makes a decision based on their status. The same logic level thresholds apply as for normal triggering.

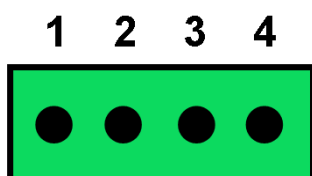
4.3 Relays

The *ITA-110* contains two relays that are under software control from the host. Relay outputs are identified by the label **RELAY OUT**.

Relay types are user selectable, but recommended type is the G3VM series from Omron. For example, the G3VM-61A1 is a SPST-NO relay rated at 60Vac (ie. bidirectional) and 500mA.

The relays are 4-pin devices and fit into the sockets inside the unit. When fitting the relays, ensure that the orientation is correct ie. the dot on the relay must line up with the white dot on the board.

The front view pinout numbering is shown below. The pin numbers correspond to the function in the table.



Pin No	Function
1	Relay 1 Contact 1
2	Relay 1 Contact 2
3	Relay 2 Contact 1
4	Relay 2 Contact 2

4.4 WiFi Module

The WiFi module is situated on the top edge of the unit towards the right hand side. An external antenna is required and a UFL connector socket is incorporated to allow connection of a suitable antenna. **The antenna gain must be 2.5dBi or less to comply with the wireless module certifications.**

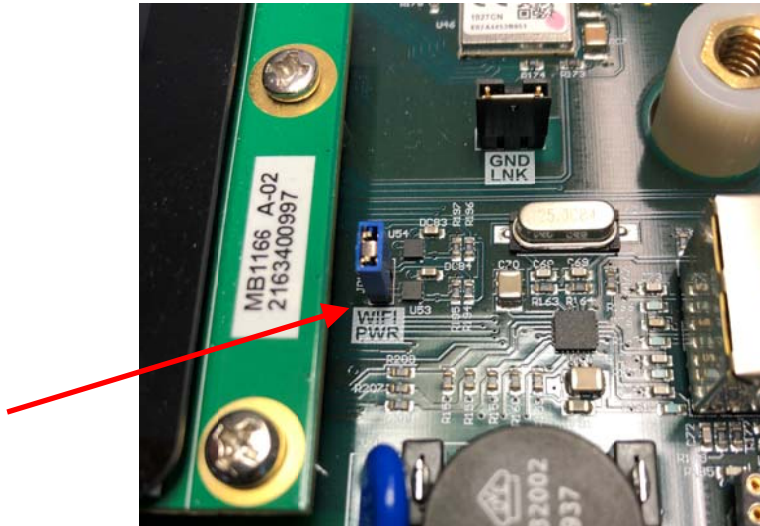
When the WiFi module is powered up, the green LED adjacent to it is illuminated.

For security reasons in certain locations, it may be required that the WiFi module cannot be powered up even under fault conditions. To disable the WiFi module completely in hardware and prevent it powering up under any circumstances, a jumper can be removed that cuts power to the WiFi module. To carry out this hardware disconnection, remove the four panel screws, lift off the cover and locate the jumper marked **WIFI PWR**. Remove this jumper. Refer to the table and picture below.

Chapter 4 – Physical Connections

WiFi PWR Jumper

Position	WiFi Power
Inserted	Enabled
Not Inserted	Disabled



4.5 Grounding Considerations

Good practice should be applied when connecting the ground system at installation to ensure good signal integrity and reduce noise and interference from other cabling and machinery in the area.

The common of the *ITA-110* circuitry is isolated from the incoming DC supply and also from the digital trigger inputs (including the trigger supply output. Sensors connected to the device should be isolated from their case (as is typical of any accelerometer) so that the common of the *ITA-110* is not connected to the machine being monitored.

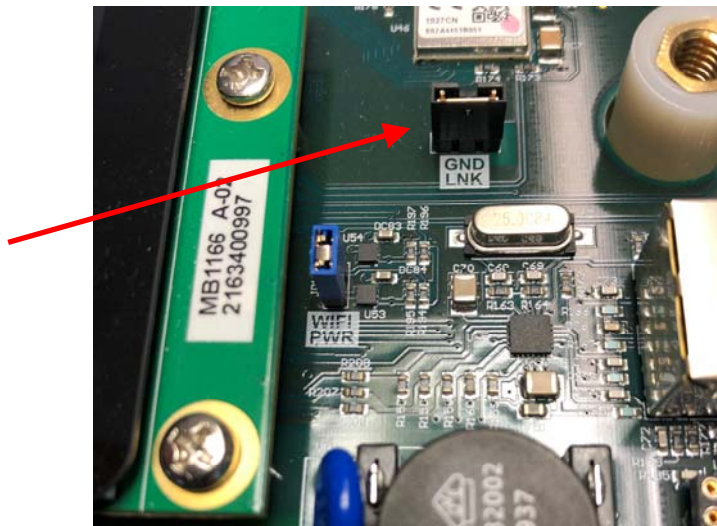
Sensor screens should be routed to chassis ground – this can be achieved by connecting the screens to the earthing stud on the left side of the unit. The back panel of the unit should be earthed, either by direct contact between the DIN rail mount and an earthed DIN rail, or by connecting an external ground to the earth stud. In this way sensor cable screens are earthed at the *ITA-110* end of the cables. If the screens are already earthed at the sensor end, then they should not be connected at the *ITA-110* end ie. connect the screens to ground at one end only.

Chapter 4 – Physical Connections

There is a jumper labelled **GND LNK** (ground link) that connects the common on the *ITA-110* to chassis ground. A jumper is fitted by default. It is good practice to connect the *ITA-110* common to chassis earth at one point only, and this is achieved by this jumper being inserted. If the *ITA-110* main circuitry is grounded at some other point due to grounding of sensor cables, then the link should be removed. If you need to access the jumper, remove the four panel screws, lift off the cover and locate the jumper marked **GND LNK** (see table and picture below). **Note that the above is a guideline only and local earthing policies for safety and signal integrity must be followed.**

GND LNK Jumper

Position	Electronic Common
Inserted	Connected to Chassis
Not Inserted	Isolated



4.6 Ethernet Port

The ethernet port is a standard RJ45 connector incorporating two LED's. The green LED acts as a link indicator which flashes when data is passing. The yellow LED illuminates when a 100Base speed network is detected.

4.7 USB Port

A USB port is available on the right side of the unit and is indicated by a USB symbol. This is used as an output for diagnostic information and is not usually utilised in day-to-day operation of the unit.

4.8 SD Connector

The *ITA-110* is fitted with a SD connector that can accommodate any microSD card up to 32GByte. This is not currently supported but is available for future enhancements.

CHAPTER 5 – Powering the *ITA-110*

5.1 Power Source

The *ITA-110* is powered from an external power supply in the range 10-30Vdc. The peak current drawn from a power supply set to 24Vdc is about 125mA. At 12Vdc, it is about 250mA. Any DC power source in the range 10V to 30V can be used to power the *ITA-110*. Simply ensure that it can supply the peak current required. However, due to inrush current at switch-on, it is recommended that a supply with at least twice the required current is used. Typically, a supply rated at 1A-2A output is a good choice as it will be operating well below its maximum capacity which will help with ongoing reliability.

Power is connected to the connector marked **PWR**. The positive connection is on the lower pin. The unit is reverse polarity protected and so cannot be damaged if the power source is temporarily connected the wrong way round.