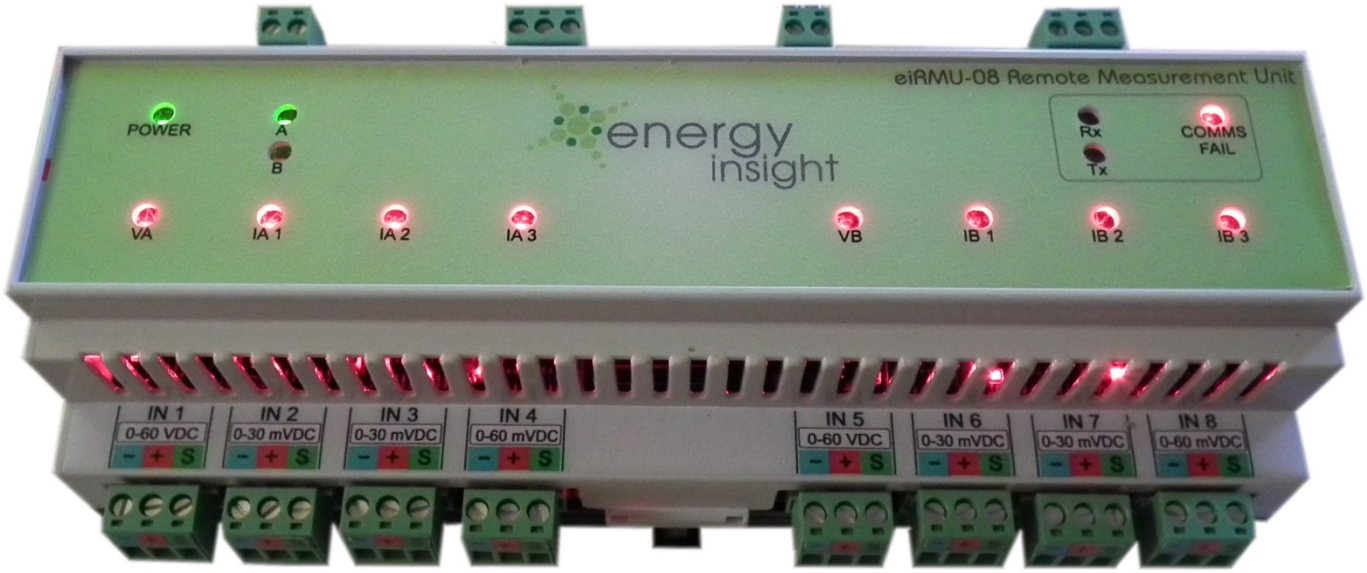
V1.01

eiRMU-08 User Manual



15th May 2014

eiRMU-08 User Manual.docx

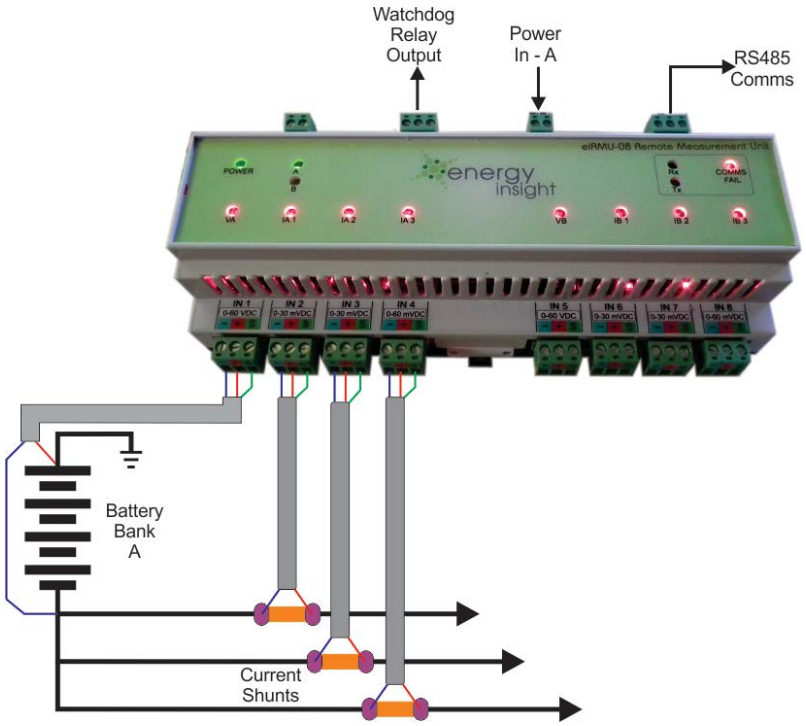
Contents

General Description

This product was designed to provide a cost-effective way to add eight, individually, galvanically isolated, analogue inputs to an existing data acquisition system. Modbus RTU and Danntech RMF serial protocols are supported with isolated RS485 and USB interfaces. The individual input isolation is vital in many applications especially in the original application of DC battery bank monitoring in a telecom system where the inputs are a combination of mV current shunt inputs (measuring battery currents) and DC voltage (measuring battery voltage). (Telecom systems work with a “so called” -48 V power supply, where the +ve battery connection is grounded, the historical reason being to reduce corrosion in the thin telecom wiring).

The most obvious unique features of the eiRMU-08 are:

- **Isolation** - each analogue input is individually isolated from each other and from the power supplies and the communications (>500 VDC). This means thirteen way isolation in the adspeak of analogue input modules (almost all others offer three way isolation at most) and…
- **Earthing** - the eiRMU-08 has very flexible screening and signal grounding options allowing you to make the most accurate mV measurements in electrically noisy environments. We have included a screen connection for each input as well as a proper instrument grounding facility.
- **Input Levels** - A very quick and easy way to see that all inputs are within the expected values, green, red flashing or red LEDs provide a fast way to diagnose fault/status conditions on each input.
- **Watchdog** - seperate hardware communications monitoring to ensure that each unit sends a response with a relay output to warn of communications failure – very useful for systems that need to run reliably and continously.
- **Dual Power Supply** - wide range isolated input power supplies for parallel redundancy so that the unit can be powered from the batteries and can be powered from either battery bank. This allows for continuous operation if either of the battery banks are switched off for any reason.

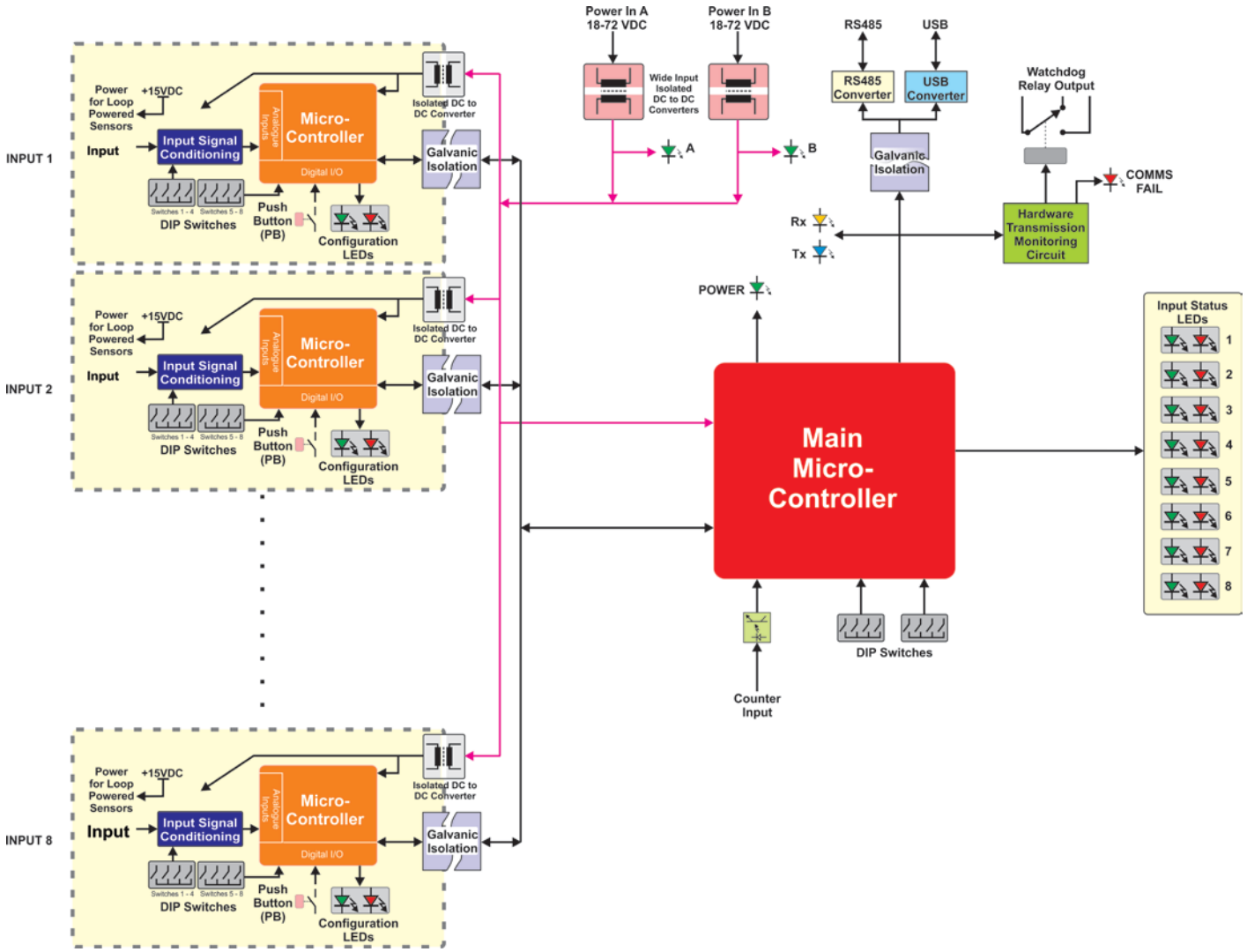


Technical Description

Internally the eiRMU-08 has two PCBs, the bottom one being the Input PCB with eight isolated analogue inputs each with its own microprocessor to do signal conversion, signal processing and isolated communication with the main processor on the Top PCB. The Input PCB also has two power isolation and conversion modules to provide an isolated and regulated internal +24 VDC supply from either of the power supply inputs. The two power inputs are provided for redundancy so either can be used and they are isolated from each other. A wide input voltage range is allowed from 18 to 75 VDC so that the batteries themselves can be used to provide the power to the unit.

High quality plug-in screw terminals are used and these can be keyed to reduce the risk of say plugging in a 0-60 V input into one set up for 0 to 30 mV.

Functional Diagram



CD Contents

On the CD included with each batch delivery you will find the following folders containing the relevant information:

- ModbusMAT
- RMF Utility
- usb info
- user manual

Some Terminology/Definitions

Input PCB – Bottom printed circuit board with all plug-in screw terminals, input circuits, power converters/isolators, input LEDs, input DIP switches, input configuration jumpers/links, instrument earth links, etc.

Top PCB – upper printed circuit board with main processor, front panel LEDs and top DIP switches.

Input Calibration Minimum – this is the minimum analogue input value which was injected and then captured during the input calibration for that input. Generally this will be the minimum value you want to be able to measure and will correspond to an Analogue Input register value of 0.

Input Calibration Maximum – this is the maximum analogue input value which was injected and then captured during the input calibration for that input. Generally this will be the maximum value you want to be able to measure and will correspond to an Analogue Input register value of 4095.

Standard Input Value (SIV) Minimum – this is the minimum standard analogue input value which was injected and then captured during the standard input value calibration for that input. Generally this will be the minimum working value you expect. Input below this value would be abnormal or a fault condition.

Standard Input Value (SIV) Maximum – this is the maximum standard analogue input value which was injected and then captured during the standard input value calibration for that input. Generally this will be the maximum working value you expect. Input above this value would be abnormal or a fault condition.

Input operational Modes – selected separately for each input using input DIP switches :

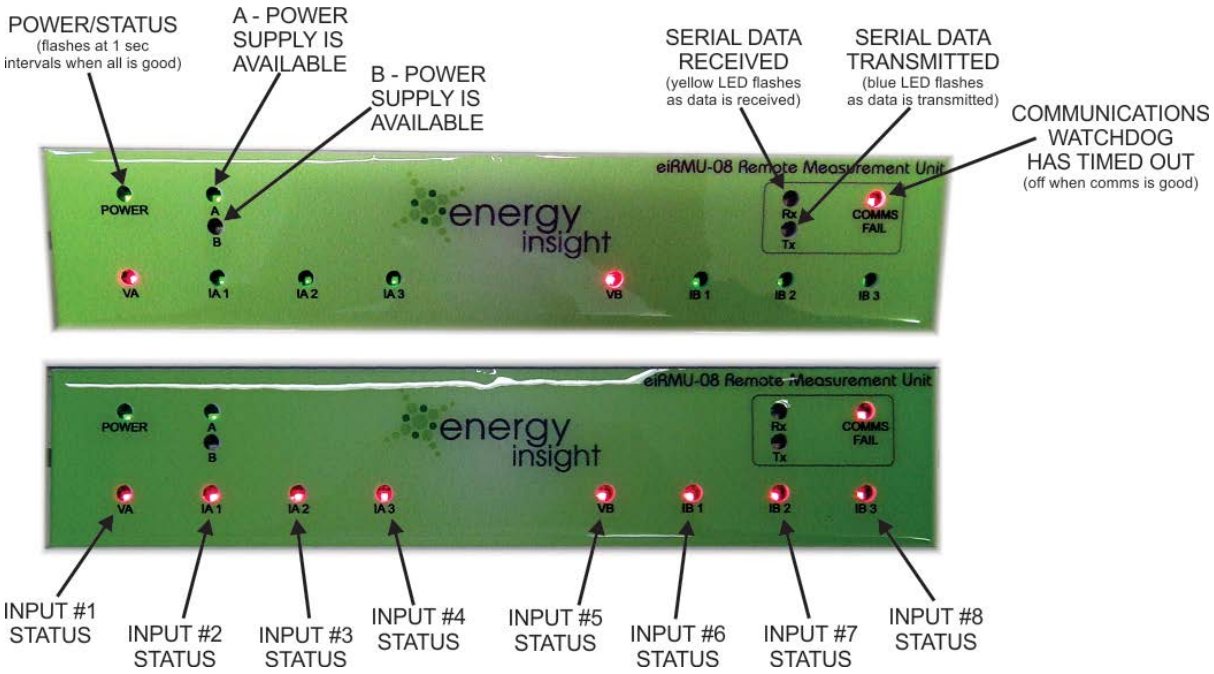
Run - normal operating mode

Calibration - capture of input minimum and maximum

SIV Capture - capture of Standard Input Value minimum and maximum

Raw Data - the unscaled A to D input values are used

Front Panel Details



LED Operation

The Power/Status LED is flashed slowly to indicate that the unit is “overall” healthy – like a heart-beat. So when this flashes slowly the main processor is operating correctly.

The A and B LEDs are illuminated green when the particular power supply is connected and healthy (within the range 18 to 72 VDC).

The communications LEDs Rx (yellow) flashes when data is received and Tx (blue) flashes as data is transmitted. The idea here is that if you see that data is being received and you are expecting a reply from the device but you are not receiving a reply, then you need to observe that Tx LED is flashing. If it is that means your address, baudrate, protocol, etc. are correct, if not then there is something set up incorrectly.

The COMMS FAIL LED illuminates red when the data transmission watchdog has timed out and the watchdog relay is open. This “timeout time” can be adjusted from 1 to 15 seconds – see the relevant section.

Input Status LED Operation

The idea behind the operation of the Input Status LEDs is that when the inputs are all within the normal operating range each one will show solid green. Any red or red flashing indicates that the particular input is outside of its expected “normal” operating range.

Below the Calibration Minimum and above the Calibration Maximum – RED on solid.

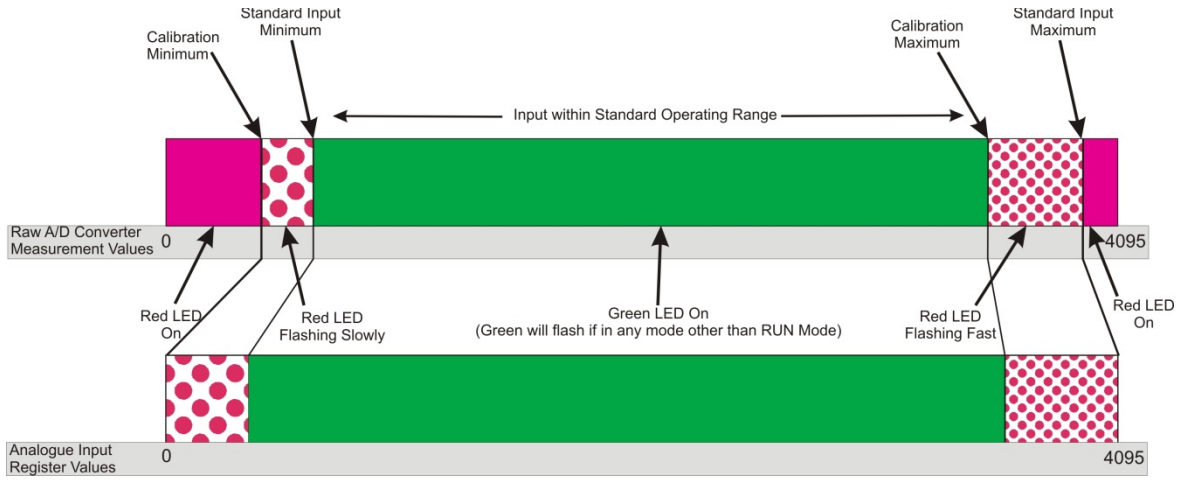
Below the SIV minimum and above Calibration Minimum – RED flashes slowly.

Above the SIV maximum and below Calibration Maximum – RED flashes fast.

Between SIV minimum and SIV maximum – GREEN on solid.

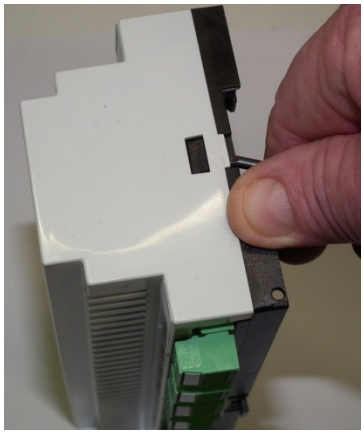
The input not set up in RUN Mode (set by bottom PCB DIP switches) it is either in Calibration, SIV capture or Raw Data modes – GREEN flashing. (For normal operation the GREEN LED must NOT be flashing !)

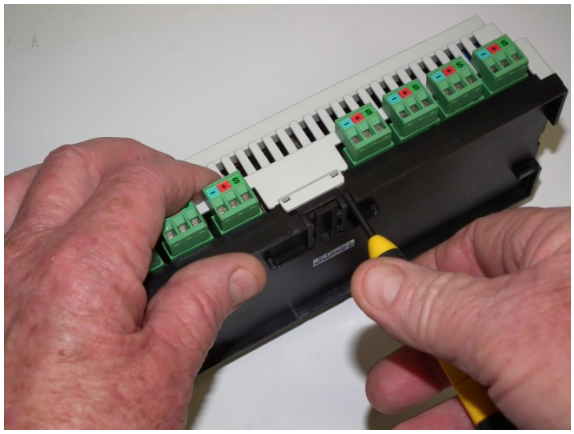
RED and GREEN flashing alternately – this means there is an internal communications fault with the particular input circuitry (this is not good and indicates a problem).

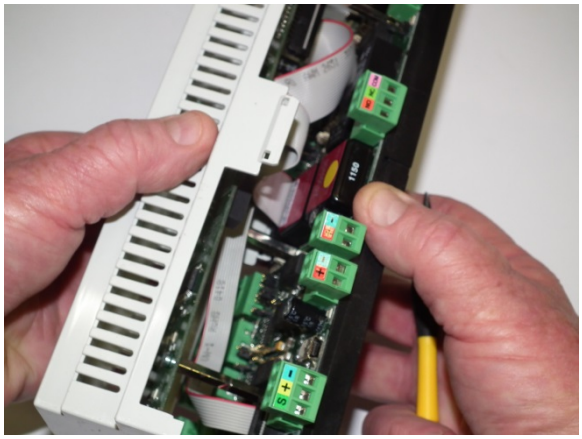


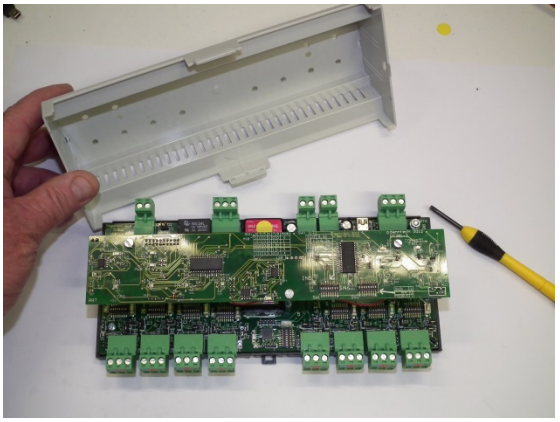
Opening the Unit

It is not possible to open the unit while fitted to a DIN rail, so it is necessary to unplug all the connections, remove from the DIN rail and then open the unit. In a way this is a good feature as it makes unauthorized tampering quite difficult and not obvious. During an installation we recommend fitting the units to the DIN rail, connecting everything up with the cover removed. When everything is working correctly and you are done then you can replace all the covers. The covers can be fitted while the unit is mounted on the DIN rail.





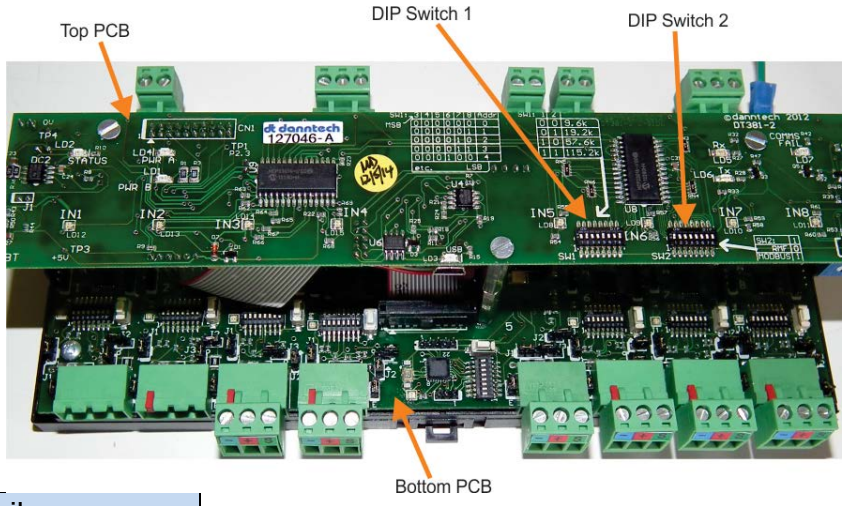




Setting the Address, Communications Speed and Protocol

This is done using SW1 and SW2 on the top PCB which can be accessed after removing the cover.

The unit is delivered with addresses starting at 1 (depending upon the number ordered, they are delivered in sequence), communications speed at 19.2 bps and Modbus protocol.



SW1 DIP Switch Details								
1	2	3	4	5	6	7	8	
								Selects Communication Speed (baudrate)
0	0							9,600 bps
0	1							19,200 bps
1	0							57,600 bps
1	1							115,200 bps
								Selects Device Address
		0	0	0	0	0	0	0
		0	0	0	0	0	1	1
		0	0	0	0	1	0	2
		0	0	0	0	1	1	3
		0	0	0	1	0	0	4
		0	0	0	1	0	1	5
		0	0	0	1	1	0	6
		0	0	0	1	1	1	7
		1	1	1	1	1	0	62
		1	1	1	1	1	1	63

SW2 DIP Switch Details								
1	2	3	4	5	6	7	8	
								Selects RMF or Modbus Communications Protocol
0								RMF
1								Modbus
								not used

Configuring the Analogue Inputs

Each of the analogue Inputs is separately configured and each or some can be used in the following ways:

1. Use exactly as delivered (you have ordered the input setup as you require and no adjustments are necessary).
2. Use in the same input configuration but change the Standard Input Values (for LED indication).
3. Use in the same input configuration but **Re-Range** or **Re-Calibrate** the input range.
4. Change the **Input Configuration** to a different type available which will also generally require re-calibration and re-capturing of the Standard Input Values (SIV).

For the purposes of clarity we will call **Input Configuration** as the changing of the links/jumpers and DIP switches 1 to 6 to change the input between the five standard configurations available to you.

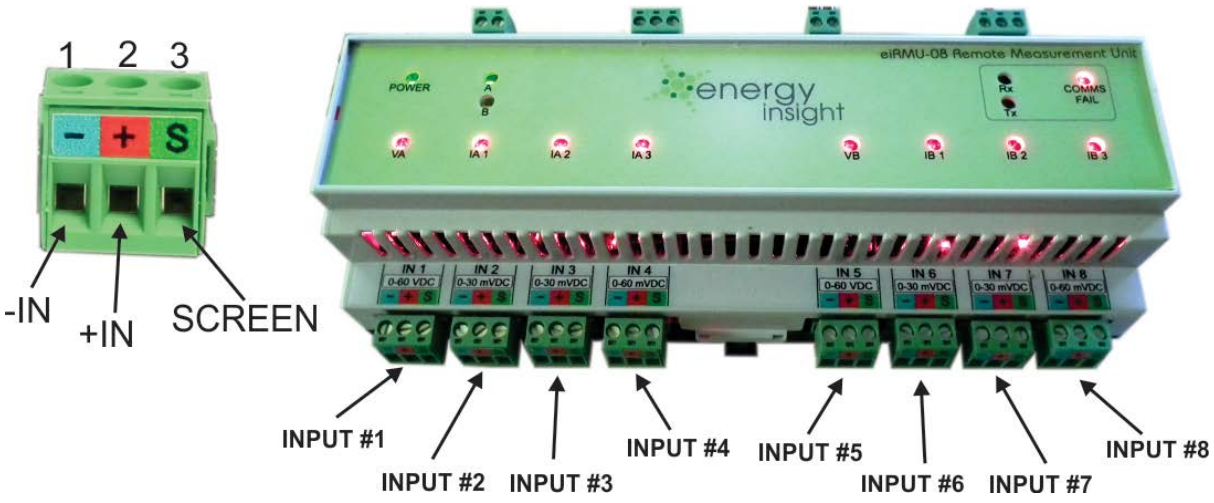
Possible Input Configurations for this model are:

I. 0-60 VDC,
II. 0-30 mVDC,
III. 0-60 mVDC,
IV. 4-20 mA self-powered and,
V. 4-20 mA loop powered.

We will call **Re-Ranging** the **Re-Calibration** of an input within the existing Input Configuration. For example changing a 0-60 VDC input to be 0-30 VDC (in the case say where instead of being 48 V batteries they are 24 V). Re-Calibration is just updating or redoing an existing calibration.

In the case where you would like to change a 0-60 VDC input to say 0-74 VDC this has to be done at the factory as the input circuitry is configured for the range as delivered. Generally one Re-Ranges within the range as delivered but not outside. Actually you may have about ±10% lee way when going outside, and when Re-Ranging within the Input Configuration you just sacrifice accuracy.

[**Input Accuracy** - the effects on accuracy can be estimated by assuming about 0 to 4095 (12 bit A/D converter) over the input range plus 20% and then working out the effects on Re-Ranging. For example the 0-60 VDC has a resolution of approximately 60 V + 20%= 72V / 4095 = 17.5 mV, resulting in an accuracy of 0.0175 V / 60 V = 0.03% so when re-ranging to 0-30 VDC this resolution remains, meaning that the accuracy will now be 0.0175 / 30 = 0.05%. In reality we would expect the accuracy measured to worse than this and probably find it to be about double that calculated, due to noise, measurement errors, temperature effects, etc.]



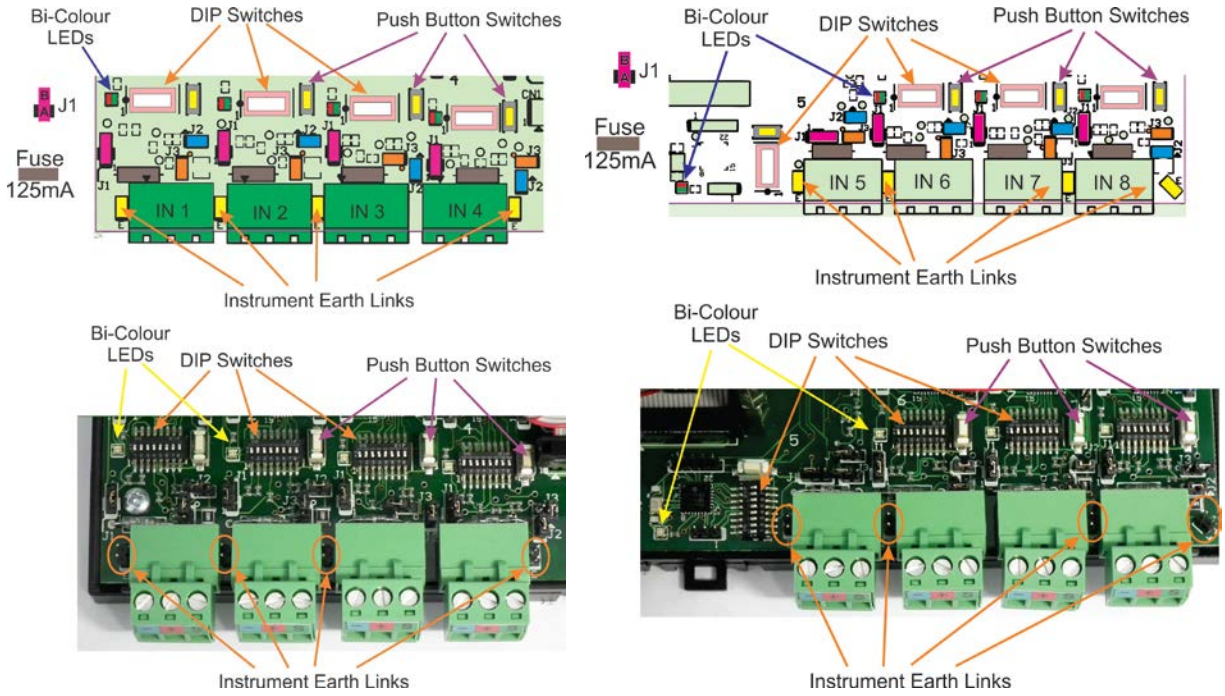
It is best to do Re-Calibration when the unit is at operating temperature at the place where it will be used. Good quality instruments, Voltage/Current Source and DVMs are also required, to produce the best results.

We will cover the Analogue Input Configuration in reverse order, since:

doing the option #4 - *Change the **Input Configuration*** requires all four steps to be carried out,

doing option #3 - ***Re-Range*** *or* ***Re-Calibrate*** *the input range* requires steps 1, 2 and 3 to be carried out and

doing option #2 - *Use in the same input configuration but change the SIVs* requires steps 1 and 2 to be done.



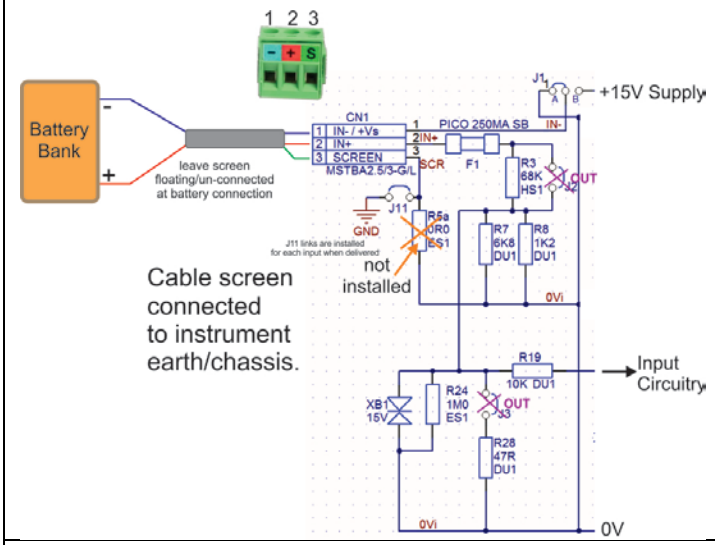
The following table shows the links/jumper settings for the various inputs:

Input Configuration:

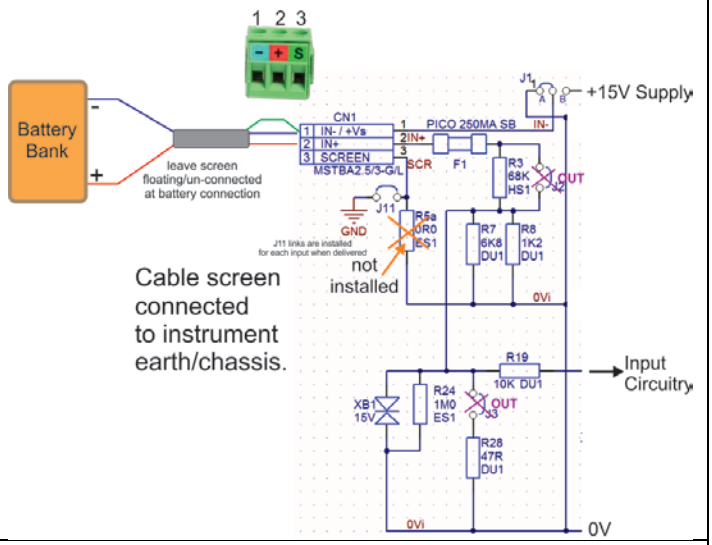
	J1	J2	J3	DIP SW1	DIP SW2	DIP SW3	DIP SW4	DIP SW5	DIP SW6
0-60 V	A	0	0	0	0	0	0	0	0
0-60 mV	A	1	0	1	0	0	0	0	1
0-30 mV	A	1	0	0	1	0	0	1	0
4-20 mA	A	1	1	0	0	0	0	1	1
4-20 mA loop powered by eiRMU-08	B	1	1	0	0	0	0	1	1
	1=link in, 0=link out			1=switch on, 0=switch off					

Input Connection Examples

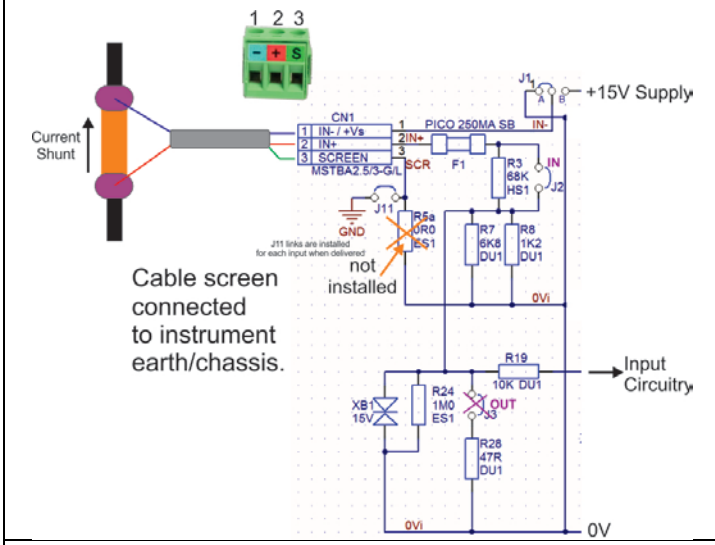
0-60 VDC input with screen connected to Instrument Earth



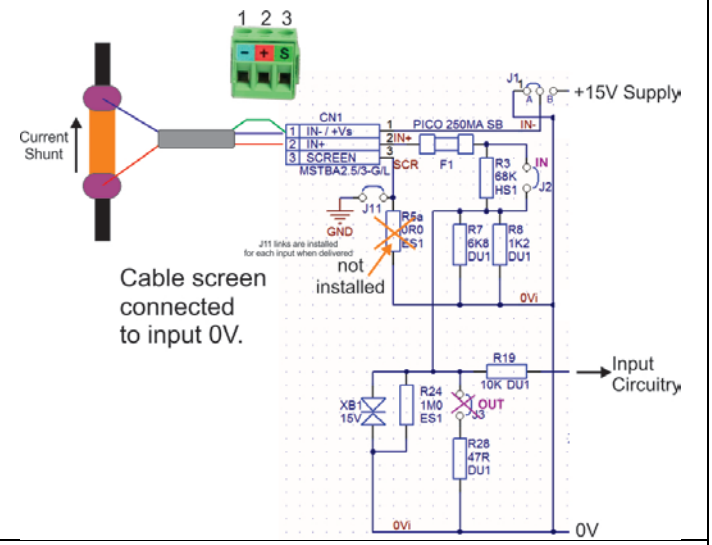
0-60 VDC input with screen connected to Input 0V



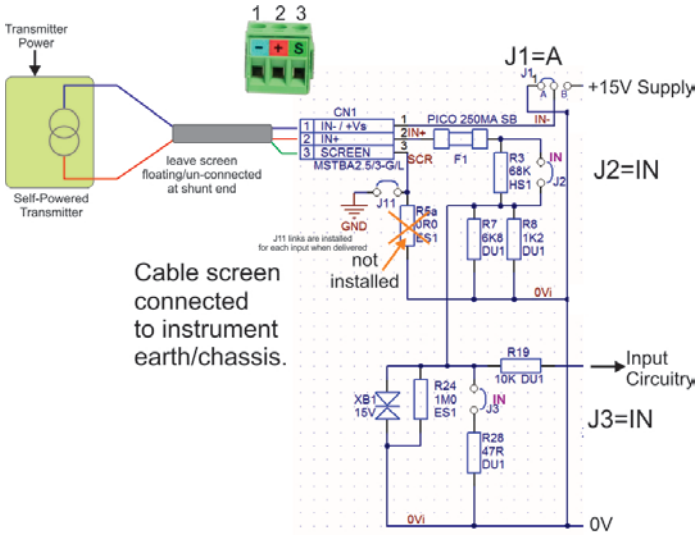
mV/shunt input with screen connected to Instrument Earth



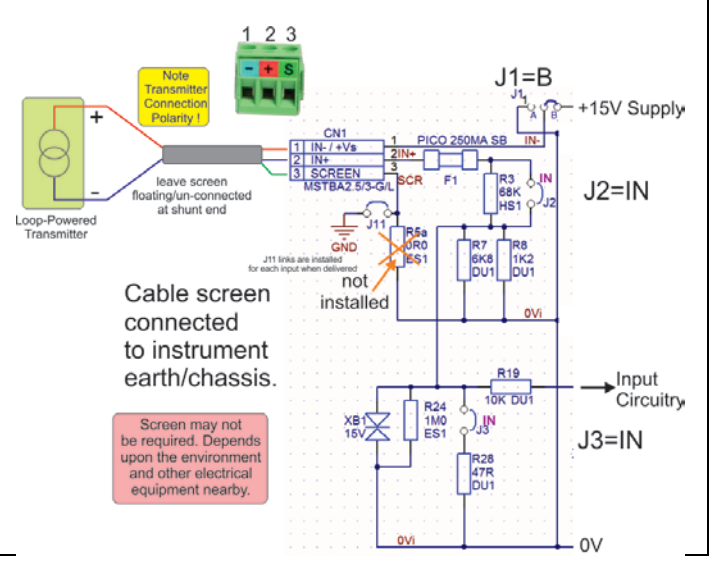
mV/shunt input with screen connected to input 0V



4-20 mA input with screen connected to Instrument Earth

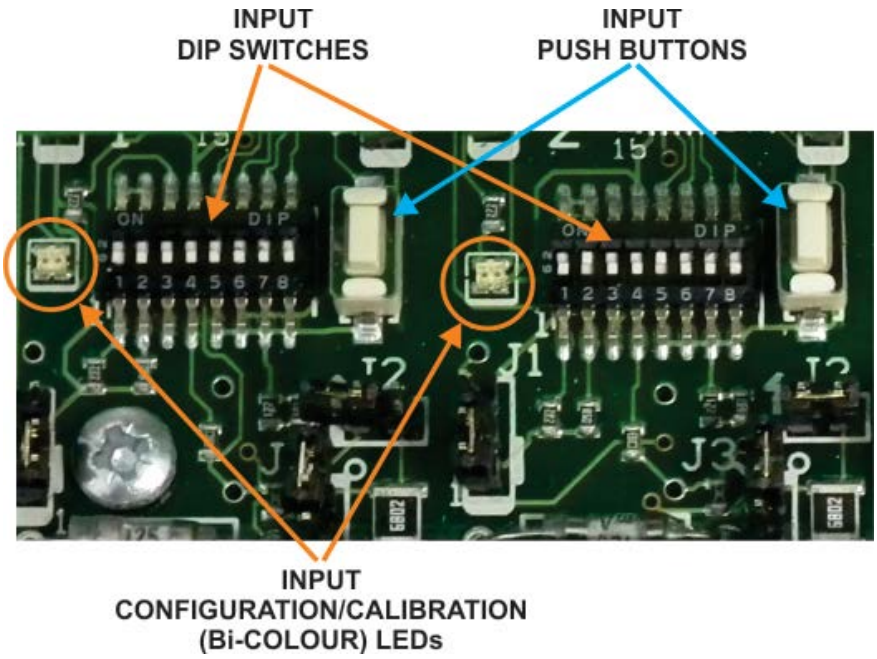


Loop powered 4-20 mA input with screen connected to Instrument Earth



Input Calibration

Each input has an eight way DIP switch, a Bi-Colour Configuration/Calibration LED and a push button switch which are used to do the Calibration and Setting the Standard Input Values.



The table in the section Input Mode Selection summarizes the Calibration procedure and the Setting of the Standard Input Value.

To do the input calibration:

This assumes you have opened the unit, have the input Configured as you wish, have powered up and you have an accurate voltage, mV or current source available to use as an input.

1. Set DIP switch 8 on (switch 7 must be off), the LED will flash green slowly.

2. Inject the Input **Minimum** Calibration Value, when stable, press and hold the Push Button until the LED flashes red briefly and then release the Push Button, the green LED with stay on for a second or so indicating that the input value has been captured, then the green LED will flash slightly faster.

3. Now, inject the Input **Maximum** Calibration Value, when stable, press and hold the Push Button until the LED flashes red briefly and then release the Push Button, the green LED with stay on for a second or so indicating that the input value has been captured, then the green LED will flash slowly again.

4. You can repeat steps 2 and 3 any number of times and when you are done switch DIP switch 8 off.

This completes the Input Calibration, and any input value is now scaled from 0 to 4095 from the Input **Minimum** Calibration Value to the Input **Maximum** Calibration Value, i.e.

When the Input = **Minimum** Calibration Value, data read from register = 0

When the Input = **Maximum** Calibration Value, data read from register = 4095

When the Input = (**Max** Cal Value - **Min** Cal Value)/2, data read from register = 2047

Setting the Standard Input Value

This assumes you have opened the unit, have the input Configured as you wish, have powered up, done the Input Calibration (if required) and you have an accurate voltage, mV or current source available to use as an input.

1. Set DIP switch 7 on (switch 8 must be off), the LED will flash green slowly.

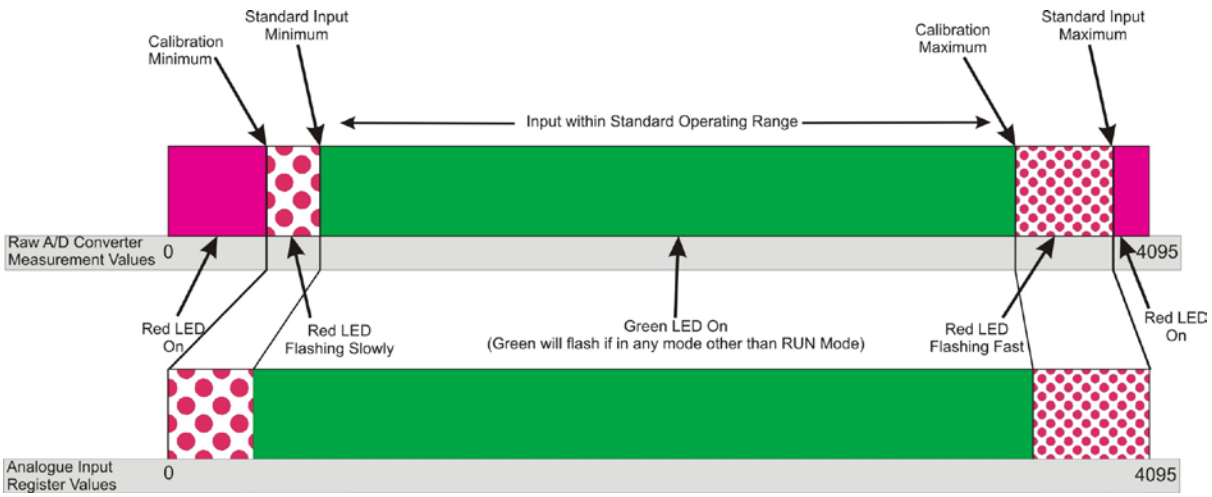
2. Inject the Standard Input **Minimum** Value, when stable, press and hold the Push Button until the LED flashes red briefly and then release the Push Button, the green LED with stay on for a second or so indicating that the input value has been captured, then the green LED will flash slightly faster.

5. Now, inject the Standard Input **Maximum** Value, when stable, press and hold the Push Button until the LED flashes red briefly and then release the Push Button, the green LED with stay on for a second or so indicating that the input value has been captured, then the green LED will flash slowly again.

6. You can repeat steps 2 and 3 any number of times and when you are done switch DIP switch 7 off.

This completes setting of the Standard Input Values, and now both the Input LED (on the input PCB) and the Input Status LEDs (on the front panel) will light according to the Input Calibration Values and the Standard Input Values, i.e.

Red on Solid	Input is either below the Input Minimum Calibration Value or above the Input Maximum Calibration Value
Red Flashing Slowly	Input is above the Input Minimum Calibration Value and below the Standard Input Minimum Value
Green on Solid	Input is above the Standard Input Minimum Value and below the Standard Input Maximum Value
Red Flashing Fast	Input is above the Standard Input Maximum Value and below the Input Minimum Calibration Value



Input Mode Selection

Mode Selection:

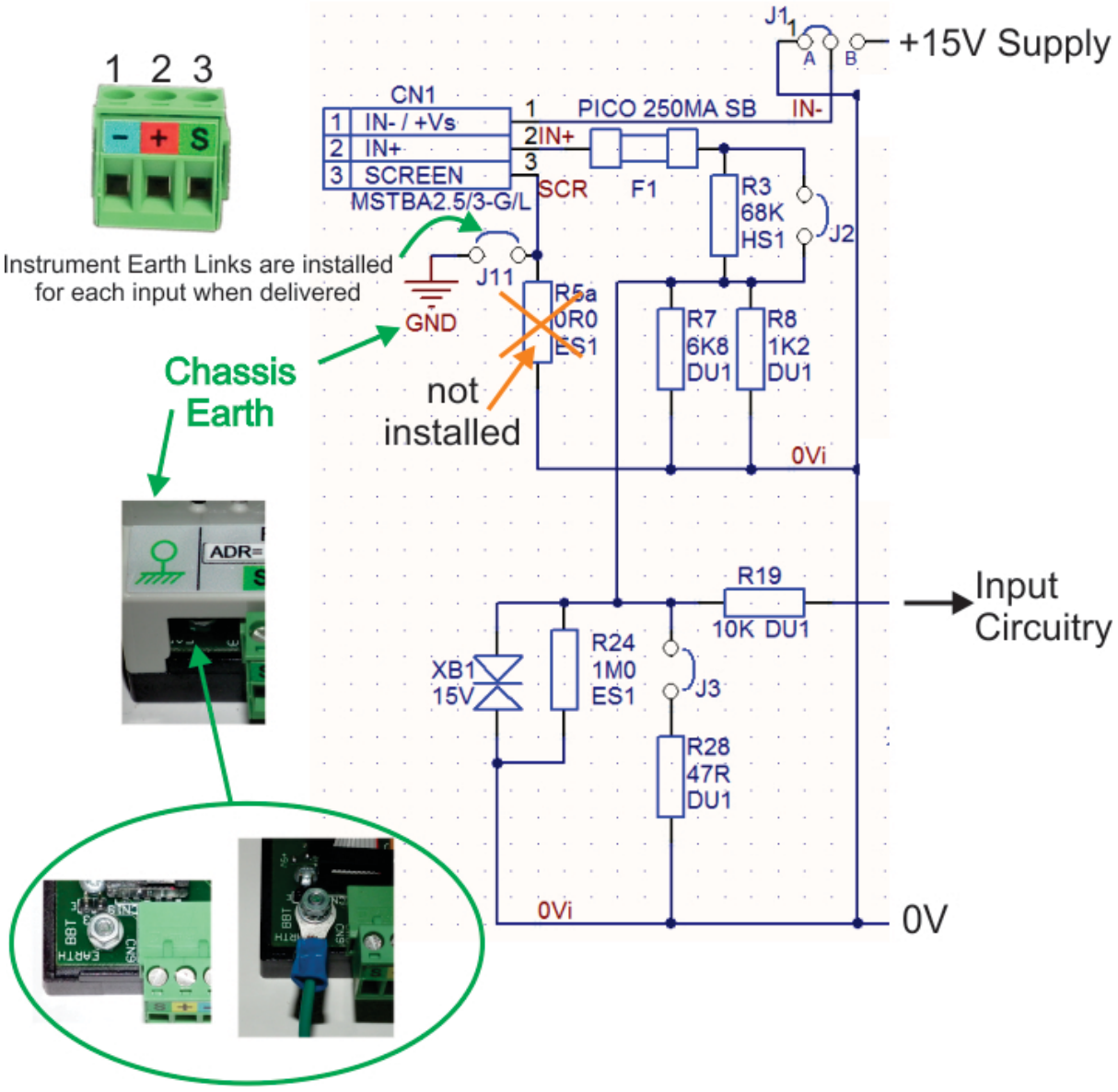
	DIP SW7	DIP SW8		
Run Mode	0	0	Green LED on if input value > Low Input Value and < High Input Value. Otherwise Red LED on or flashing.	Normal operating mode
Calibration Mode	0	1	To setup and capture input minimum and maximum for input scaling. Green LED flashes - Red LED off.	Inject minimum input value then press and hold down push button switch until value is captured, then inject maximum calibration value and press and hold down push button switch until value is captured. When the value is captured the red LED flashes briefly and the green LED goes on for 2 seconds. Release the push button switch as soon as the red LED flashes.
Standard Input Value Capture Mode	1	0	To setup Standard Input Minimum Value and Standard Input Maximum Value. Green LED flashes - Red LED off.	Inject the Standard Input Minimum Value then press and hold down push button switch until value is captured, then inject Standard Input Maximum Value and press and hold down push button switch until value is captured. When the value is captured the red LED flashes briefly and the green LED goes on for 2 seconds. Release the push button switch as soon as the red LED flashes.
Raw Data Mode	1	1	Input sends the raw input data not scaled values. (Used for diagnostics) Green LED flashes - Red LED off	Values in the device registers are not scaled by calibration values. The raw A to D values are sent from the input to the analogue input registers.

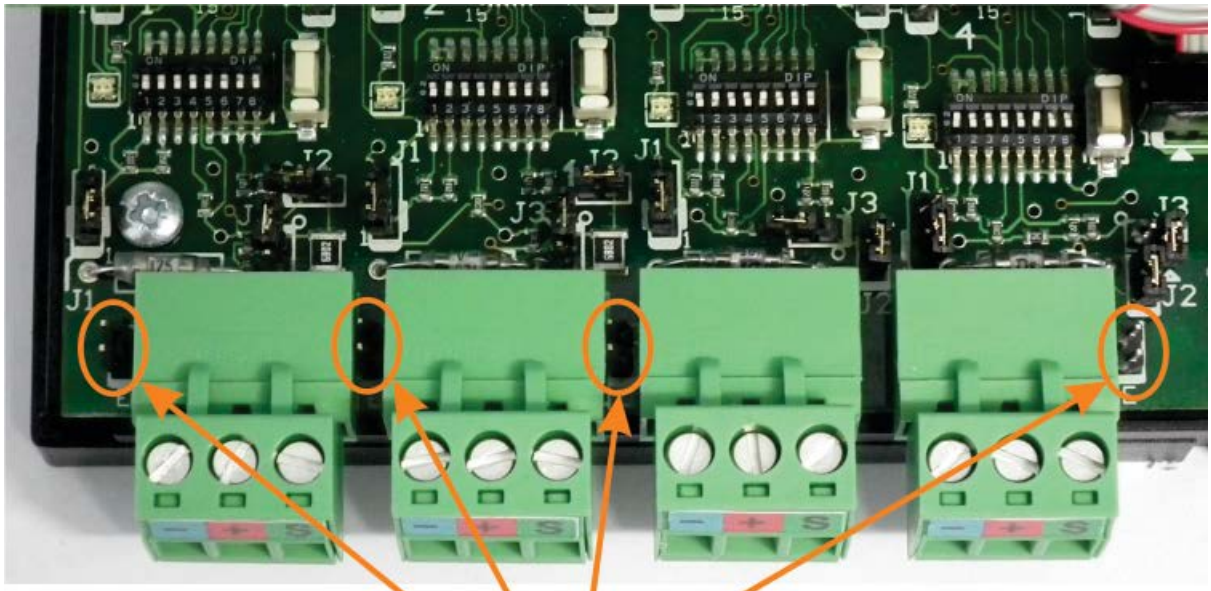
Earthing/Screening

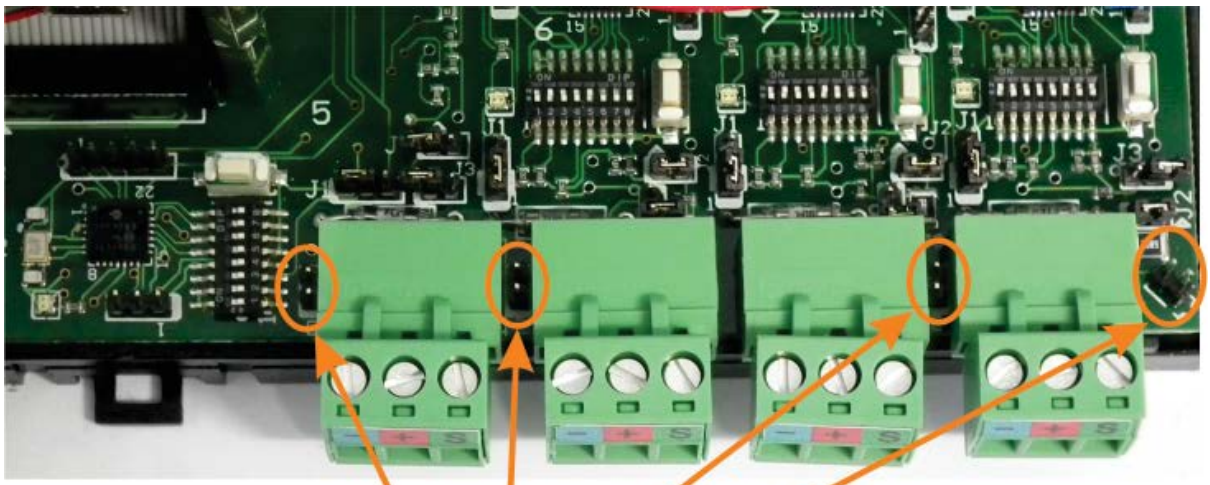
Significant attention has been paid to the design of the eiRMU-08 with regard to input screening and instrument earthing. When dealing with mV inputs in an industrial environment where you really require measurement resolutions of better than 100µV, some care needs to be taken as well as the option of various earthing/grounding regimes to suit each particular environment.

There are some basics to be observed with instrument earthing/grounding, however, in many cases it is dependent upon the particular installation and flexibility is always good.

So we have designed the eiRMU-08 to accommodate screened cables on all analogue inputs which can either be connected to the particular analogue input 0V or to the "Instrument Earth". Often one will try either option to see which results in the least measurement noise (the most stable measurement values with a stable input).

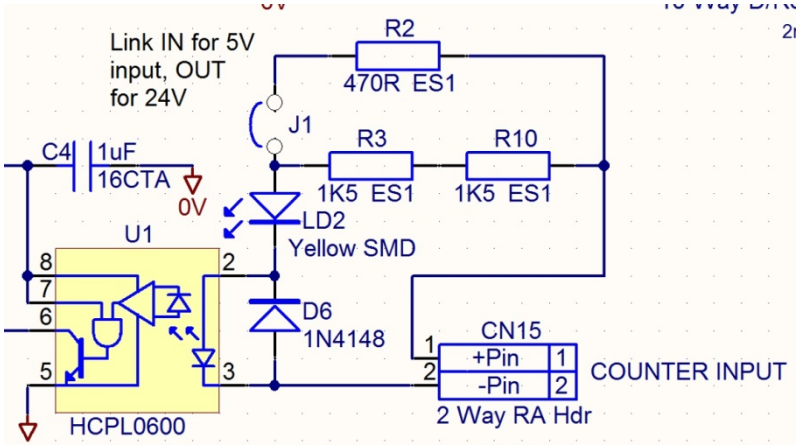



J1
J2
J3
Instrument Earth Links


J1
J2
J3
Instrument Earth Links

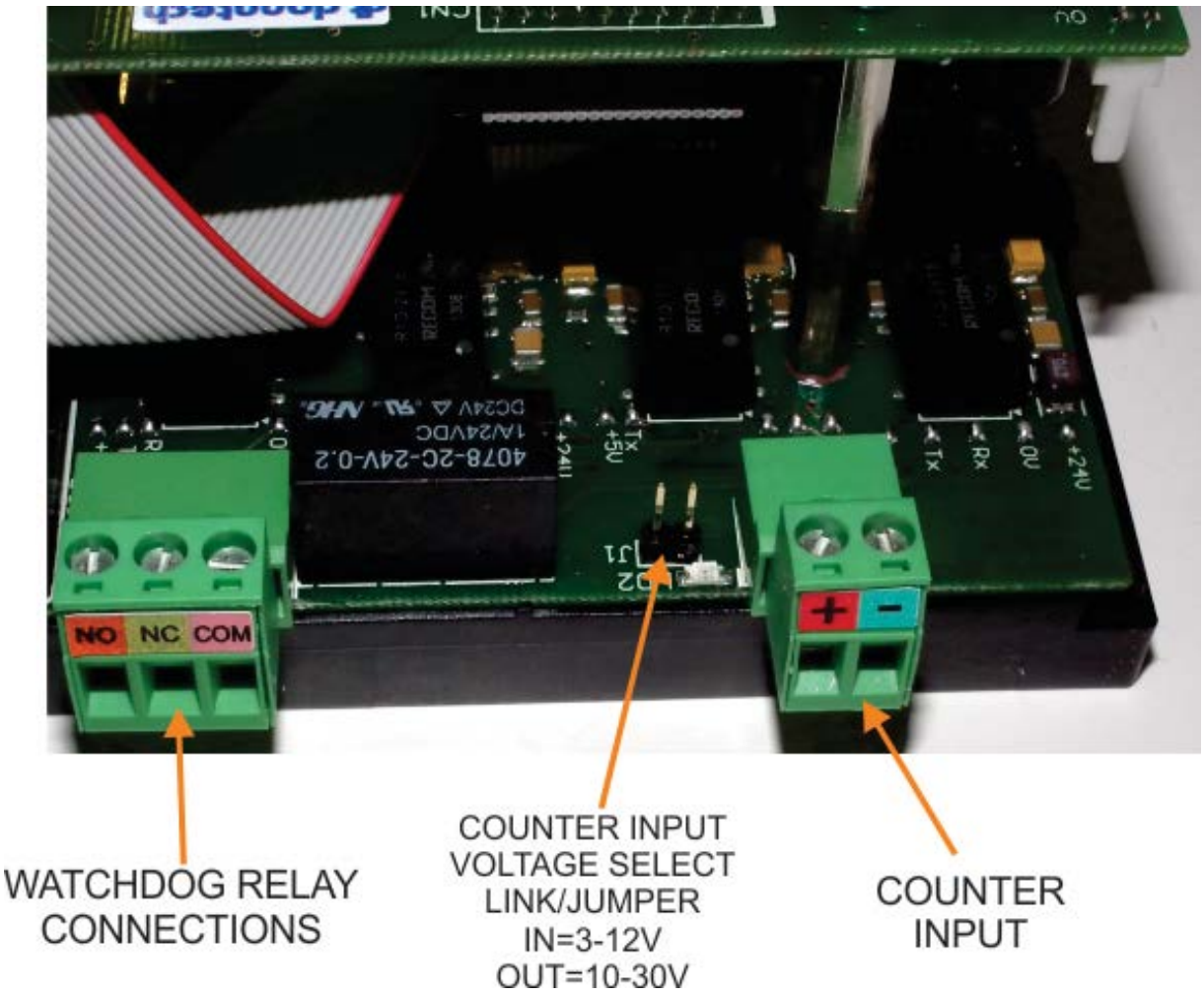
Using the Counter Input

The counter input provides a way of counting pulses, measuring the frequency or period of a digital signal. The counter mode register sets up how the counter will work, the counter timebase register is used for frequency measurements and the counter value register gives the count/frequency/period value. (see the section “Read and Write Registers – (RMF and Modbus)”)

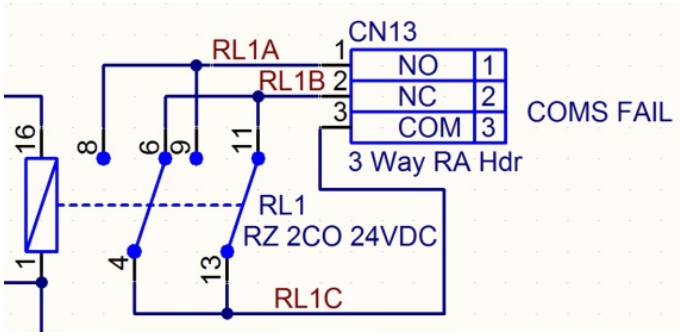


The maximum input frequency is 100 kHz.

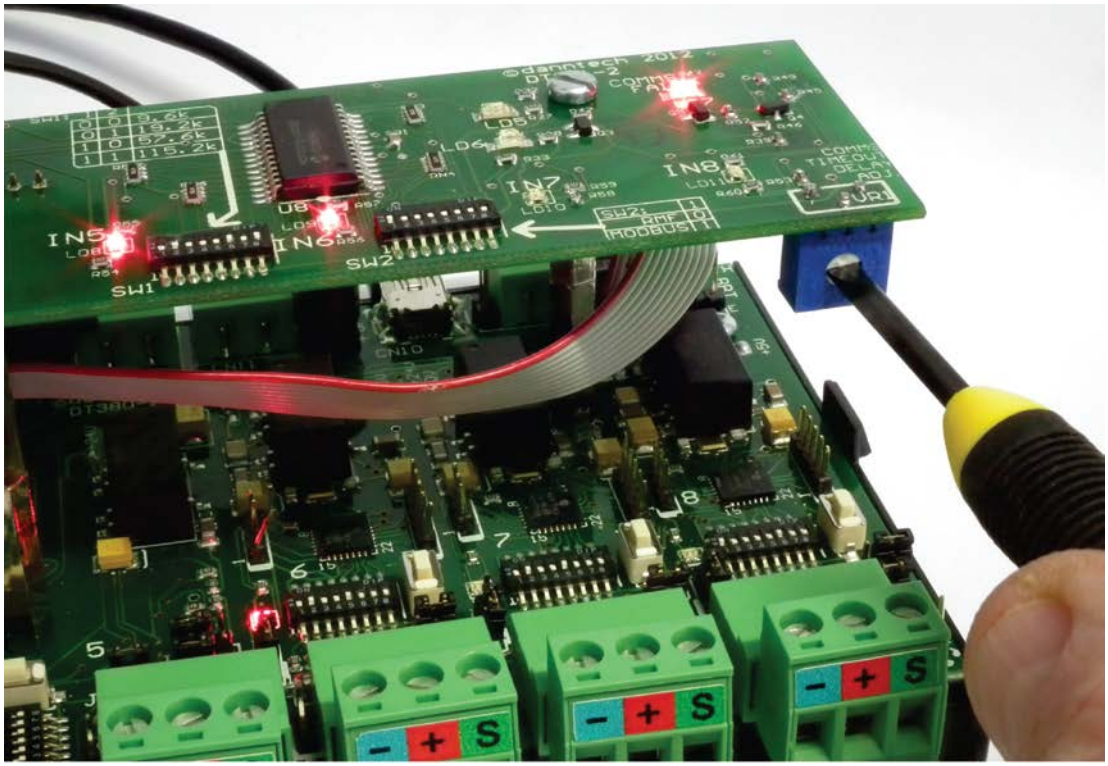
A link/jumper is used to facilitate inputs from 3 to 12 V and 10 to 30 V. With the jumper J1 out the input is used for 10 to 30 V inputs and with J1 in, 3 to 12 V inputs.



Watchdog Relay Output



The watchdog is a hardware circuit which uses the transmit signal from the eiRMU-08 to keep a capacitor charged. When the capacitor discharges below a certain level because there has been no transmission from the unit then the Watchdog relay is de-energised (opened). The idea is that a separate circuit is used to keep a reliable check that the eiRMU-08 is polled and responds within a certain time (this time can be adjusted from about 1 to 15 seconds using VR1). It is a crude but reliable way to provide a healthy relay output when all is working correctly.



Fully Anti-Clockwise
timeout=1 sec

Mid-Point
timeout=7 sec

Fully Clockwise
timeout=14 sec

Modbus Testing Software

Modbus testing software is available from the following sources

SimplyModBus - www.simplymodbus.ca US$60

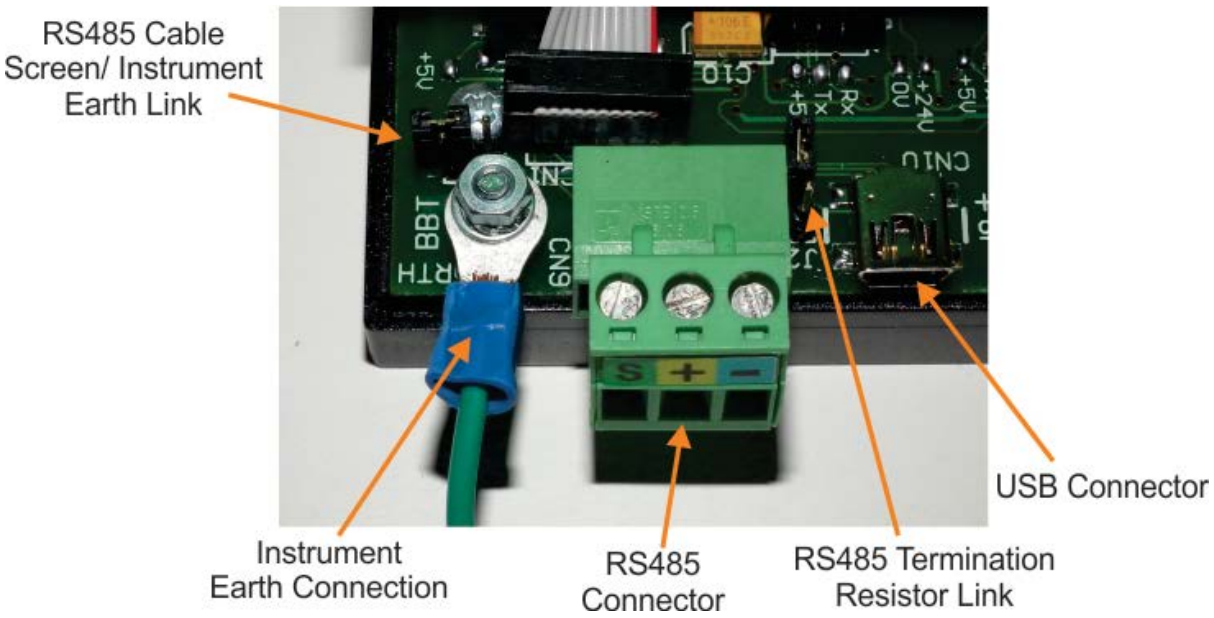
[We prefer to pay for software if possible – no doubt it costs to write and maintain]

ModbusMAT - www.ataytugal.com free

RMFUtils - a Danntech utility included on the installation CD

RS485 Termination and Cable Screen Connection

The RS485 connection has the facility to connect the cable screen to Instrument Earth if required – install link/jumper Jx. In addition a 220Ω termination resistor can be connected if required by installing Jx.

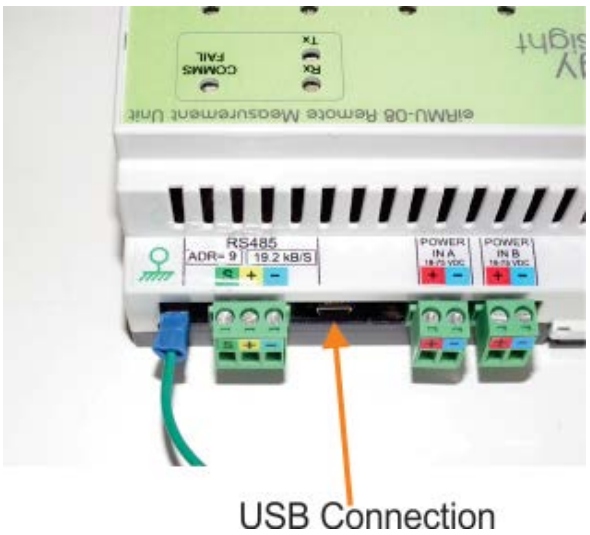


Installing and Using the USB Interface

Drivers for our USB interface are available for most versions of Windows including Windows 8 and the latest Windows Server version. Linux and Android drivers are also available. Once the drivers have been installed and the converter is connected to your computer's USB port, a virtual COM port will be created.

For recent windows versions, simply plug the USB into your computer, if you are connected to the internet it should find the drivers, otherwise use the CD supplied and install the driver for your operating system.

For a more comprehensive installation guide please see the USB installation information on the CD or go to the link http://www.ftdichip.com/Support/Documents/InstallGuides.htm.



A USB cable will be supplied with each batch of units ordered.

USB Specification

- Drivers for Windows 8 32/64, Windows 7 32/64, Vista 32/64, XP 32/64, Server 2003/8R2 32/64, 2000, ME, 98Se, Mac, 8/9/X, Linux.
- WHQL compliant COM drivers included.
- Galvanically isolated from all power supplies, inputs and outputs.
- Powered by the eiRMU-08.
- FTDI232 USB chip.
- UART I/F Supports 7 / 8 Bit Data, 1 / 2 Stop Bits and Odd/Even/Mark/Space/No Parity.
- USB Plug and Play with Windows 7 and 8.
- USB 1.1 and USB 2.0 compatible.
- Typical communications speed: maximum 115.2Kbps at 1,000m.
- Up to 32 nodes in network configuration.

Latest drivers and software are included on the CD or the very latest are available at:
http://www.ftdichip.com/Drivers/VCP.htm
http://www.ftdichip.com/Support/Documents/InstallGuides.htm
http://www.ftdichip.com/Support/FTDocuments.htm

General RMF Communication Format

When communicating using the RMF commands the following format must be observed:

@address, command, register, data, checksum

where:
@ -this character must be transmitted to signal the start of the command sequence

address - the address as set by SW1.3 - SW1.8, (0 to 63).

command - the command (0 to 127): Note that for the modbus operation these additional commands have been mapped into other registers:

1	Read Configuration	Registers+1000
2	Read Registers	as per list
3	Write Registers	as per list

register - the register number as applicable to the respective command.

data - the data as applicable to the respective command.

checksum - the checksum is the sum of all the values (excluding the start character) modulo 2^{16}.

Note that the checksum is a 16-bit number which wraps around through zero should the sum exceed 65535

i.e. if the sum of the data from the address through to data is 65537 then the checksum should be sent as 1.

All values are 16-bit except for the address and command and have a range of 0 to 65535.

Upon receipt of any command between (i.e. checksum matches and command is recognized)

the device will reply with a copy of the original command with the command value increased by 128 (i.e. the most significant bit is set);

data is the requested data. The **checksum** is also updated to reflect the changes.

Read and Write Registers – (RMF and Modbus)

Read and Write Registers - (RMF and Modbus) - V1.20

2 = read register — Allows access to the all the input and current output values and the DIP switch settings

3 = write register — Allows writing to the all the output registers

RMF Register #	Modbus Read Reg Address	Modbus Write Reg Address	Description	Range	Register Type	Notes
1	40001		Analogue Input #1	0 to 4095	Read Only	Value of analogue input. 0 = minimum calibrated value, 4095 = maximum calibrated value. e.g. 0 = 0 VDC in, 4095 = 60 VDC in
2	40002		Analogue Input #2	0 to 4095	Read Only	ditto
3	40003		Analogue Input #3	0 to 4095	Read Only	ditto
4	40004		Analogue Input #4	0 to 4095	Read Only	ditto
5	40005		Analogue Input #5	0 to 4095	Read Only	ditto
6	40006		Analogue Input #6	0 to 4095	Read Only	ditto
7	40007		Analogue Input #7	0 to 4095	Read Only	ditto
8	40008		Analogue Input #8	0 to 4095	Read Only	ditto
9	40009		Analogue Input #1 Status	0 to 255	Read Only	Made up of four bits (8 through 5) of input firmware DIP switch configuration plus input state (bits 1 through 4 have binary value). 0=Input>LIV and <HIV; 1=Calibrate Mode; 2=Standard Input Value Mode; 3=Input < LIV or >HIV; 4=Input is below lowest allowable value or above highest allowable value. These values are set in the firmware; 5=Input LED functions disabled.
10	40010		Analogue Input #2 Status	0 to 255	Read Only	ditto
11	40011		Analogue Input #3 Status	0 to 255	Read Only	ditto
12	40012		Analogue Input #4 Status	0 to 255	Read Only	ditto
13	40013		Analogue Input #5 Status	0 to 255	Read Only	ditto
14	40014		Analogue Input #6 Status	0 to 255	Read Only	ditto
15	40015		Analogue Input #7 Status	0 to 255	Read Only	ditto

16	40016		Analogue Input #8 Status	0 to 255	Read Only	ditto
17	40017	60017	Counter Value	0 to 65535	Read and Write	Counter value
18	40018	60018	Counter Overflow Register	0 to 65535	Read and Write	When the counter overflows this register increments. When this register is read it clears the overflow flag and thus when the normal timer is read (register 17) the current hardware counter is returned (total count is thus overflow * 65535 + counter value). If the counter has overflowed and register 17 is read before the overflow register is read then the value returned is just 65535, indicating the overflow. This register doesn't affect the operation of the counter in any way, it just adds a little more information about the overflow. Note that it follows the same mode conventions as the counter. i.e. mode 0 it simply accumulates, mode 1 it clears after every read, mode 2 the frequency counter mode doesn't apply.
19	40019	60019	Counter Mode	0 to 65535	Read and Write	The operation of the modes: 0 = simple count mode - number of pulses received which stays at 65535 if the counter overflows. Can be cleared or preset by writing a value to the counter value register. 1 = count mode with clear on read - number of pulses received which stays at 65535 if the counter overflows. Is cleared when the counter is read. Can be cleared or preset by writing a value to the counter value register. 2 = frequency mode - the counter value is updated every n x 100 mSecs. Where n is the value set by register 21
20	40020	60020	Counter Mode Power-up Value	0 to 65535	Read and Write	Counter Mode which is set on power up.
21	40021	60021	Counter Timebase Value	0 to 65535	Read and Write	0 to 65535 which represents the time * 100 mSecs over which the counts are accumulated in the frequency mode
22	40022	60022	Counter Timebase Power-up Value	0 to 65535	Read and Write	Counter Timebase which is set on power up.
23	40023		DIP switch #1 setting in binary	0 to 255	Read Only	Setting of the DIP switch on the top PCB. Sets communication speed (baudrate) and device address.
24	40024		DIP switch #2 setting in binary	0 to 255	Read Only	Used to switch between RMF and Modbus Communication Protocol.
30	40030		Device Type	0 to 65535	Read Only	Danntech allocated device type

31	40031		Firmware Version	0 to 65535	Read Only	Firmware version *100. e.g. version V1.23 returns a value of 123
32	40032		Serial Number	0 to 65535	Read Only	Six digit serial number - should correspond to the serial number affixed to the device
33	40033		Serial Number Flag	0 or 65535	Read Only	will be =0 if serial number has been set; otherwise=65535
34	40034		LED Mask	0 to 65535	Read and Write	Can be used to enable or disable the front panel LEDs - High byte for Green LEDs, low byte for Red LEDs. 0xFFF = all on, 0x000=all off, 0xFF00 = All reds off, green on.
40	40040		Runtime (seconds)	0 to 59	Read Only	Approximate time since the last power up or reset - seconds.
41	40041		Runtime (minutes)	0 to 59	Read Only	Approximate time since the last power up or reset - minutes.
42	40042		Runtime (hours)	0 to 23	Read Only	Approximate time since the last power up or reset - hours.
43	40043		Runtime (days)	0 to 65535	Read Only	Approximate time since the last power up or reset - days.

Analogue Input Status Register Details

			Status Information MSB				Input DIP Switches (DIP SW5 to 8)			LSB
		bit	7	6	5	4	3	2	1	0
Status Information:		Hex Value					DIP SW5	DIP SW6	DIP SW7	DIP SW8
LEDs Disabled	All functions still operate just LEDs are disabled, both on bottom and top PCBs	0x00	0	0	0	0				
Red Flash Slow	Input is below minimum standard input and above minimum calibration values	0x01	0	0	0	1			Mode	
Red Flash Fast	Input is above maximum standard input and below maximum calibration values	0x02	0	0	1	0			0	0
Red ON	Input outside of maximum and minimum calibrated input values	0x03	0	0	1	1			0	1
Green Flash Slow	Waiting for minimum input value and push button	0x40	0	1	0	0			1	0
Green Flash Fast	Waiting for maximum input value and push button	0x80	1	0	0	0			1	1
Green ON	Input between minimum and maximum standard input values	0xC0	1	1	0	0				
Red ON (0.2s) _ Green on (2s)	Calibration confirmation	0xE0	1	1	1	0				

	Input Range		Hex Value
0-60 V	0	0	0
0-60 mV	0	1	1
0-30 mV	1	0	2
4-20 mA	1	1	3

Hex Value	
0	Run Mode
1	Calibration Mode
2	Standard Input Value Capture Mode
3	Raw Data Mode

Delivery Configuration

Delivery Configuration V1.2

	Input 1 0-60 VDC	Input 2 0-30 mV	Input 3 0-30 mV	Input 4 0-60 mV	Input 5 0-60 VDC	Input 6 0-30 mV	Input 7 0-30 mV	Input 8 0-60 mV
Calibration Minimum	0	0	0	0	0	0	0	0
Calibration Maximum	60	30	30	60	60	30	30	60
SIV Minimum	44	1.5	1.5	3	44	1.5	1.5	3
SIV Maximum	55.2	28.5	28.5	57	55.2	28.5	28.5	57
SIV %	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

Typical Test Results

Test Results	eiRMU-08			Eight Analogue Input Remote Measurement Unit											
Date:	14 May 2014							Tested By MD				Serial #:	127038		
Input #	User Tag	Units		Input #	User Tag	Units		Input #	User Tag	Units		Input #	User Tag	Units	
IN1	**VA**	**V**		**IN2**	**IA 1**	**mV**		**IN3**	**IA 2**	**mV**		**IN4**	**IA 3**	**mV**	
Delivery Configuration:		0-60V		Delivery Configuration:		0-30mV		Delivery Configuration:		0-30mV		Delivery Configuration:		0-60mV	
Cal Min=	0	Cal Max=	60	Cal Min=	0	Cal Max=	30	Cal Min=	0	Cal Max=	30	Cal Min=	0	Cal Max=	60
Std Min=	44	Std Max=	55.2	Std Min=	1.5	Std Max=	28.5	Std Min=	1.5	Std Max=	28.5	Std Min=	3	Std Max=	57
Input (V)	**Output (Reg 1)**	**Error**		**Input (mV)**	**Output (Reg 2)**	**Error**		**Input (mV)**	**Output (Reg 3)**	**Error**		**Input (mV)**	**Output (Reg 4)**	**Error**	
0	1	0.02%	0.0	0	0	0.00%	0.0	0	1	0.02%	0.0	0	1	0.02%	0.0
15	1028	0.10%	1023.8	7.5	1024	0.01%	1023.8	7.5	1024	0.01%	1023.8	15	1023	-0.02%	1023.8
30	2043	-0.11%	2047.5	15	2046	-0.04%	2047.5	15	2046	-0.04%	2047.5	30	2048	0.01%	2047.5
45	3067	-0.10%	3071.3	22.5	3070	-0.03%	3071.3	22.5	3071	-0.01%	3071.3	45	3074	0.07%	3071.3
60	4095	0.00%	4095.0	30	4092	-0.07%	4095.0	30	4093	-0.05%	4095.0	60	4092	-0.07%	4095.0
Input #	User Tag	Units		Input #	User Tag	Units		Input #	User Tag	Units		Input #	User Tag	Units	
IN5	**VB**	**V**		**IN6**	**IB 1**	**mV**		**IN7**	**IB 2**	**mV**		**IN8**	**IB 3**	**mV**	
Delivery Configuration:		0-60V		Delivery Configuration:		0-30mV		Delivery Configuration:		0-30mV		Delivery Configuration:		0-60mV	
Cal Min=	0	Cal Max=	60	Cal Min=	0	Cal Max=	30	Cal Min=	0	Cal Max=	30	Cal Min=	0	Cal Max=	60
Std Min=	44	Std Max=	55.2	Std Min=	1.5	Std Max=	28.5	Std Min=	1.5	Std Max=	28.5	Std Min=	3	Std Max=	57
Input (V)	**Output (Reg 5)**	**Error**		**Input (mV)**	**Output (Reg 6)**	**Error**		**Input (mV)**	**Output (Reg 7)**	**Error**		**Input (mV)**	**Output (Reg 8)**	**Error**	
0	0	0.00%	0.0	0	0	0.00%	0.0	0	0	0.00%	0.0	0	0	0.00%	0.0
15	1028	0.10%	1023.8	7.5	1024	0.01%	1023.8	7.5	1024	0.01%	1023.8	15	1023	-0.02%	1023.8
30	2048	0.01%	2047.5	15	2045	-0.06%	2047.5	15	2045	-0.06%	2047.5	30	2048	0.01%	2047.5
45	3067	-0.10%	3071.3	22.5	3070	-0.03%	3071.3	22.5	3070	-0.03%	3071.3	45	3073	0.04%	3071.3
60	4095	0.00%	4095.0	30	4093	-0.05%	4095.0	30	4093	-0.05%	4095.0	60	4093	-0.05%	4095.0

Mechanical Details

Product dimensions: 21.0 x 11.0 x 6.0 cm (length x width x height off DIN rail) including connectors - weight 0.41 kg

Multi-strand wire connections: cross sectional area = 2.5mm^2

Packaged size: 43.5 x 33 x 27.5 cm (length x width x height) – weight 0.6 kg.

Specifications

Eight analogue inputs.

Communications protocols Modbus RTU and Danntech RMF.

Isolation >500 VDC between each Input/Main Processor/Communications/Power In - A/Power In - B/ Watchdog Relay Output/Counter Input.

Inputs: 0-30 mV, 0-60 mV, 0-60 V, 4-20 mA - Link/Jumper and mini-DIP switch selectable, each input can be different.

12 bit analogue input resolution. (accuracy better than ±0.25% of the range).

General analogue response time fastest at less than 0.1 seconds.

Bi-colour LED indication of each input status with configurable indication values.

Input calibration using switches and push button to capture input values for zero and full scale.

Standard Input Value settings using switches and push button to capture input values for minimum and maximum.

Individual instrument earthing, selectable using links/jumpers for each input and the RS485 communications.

Communications - isolated RS485 Modbus at speed 9,600 bps and 19,200 bps.

Isolated USB interface.

Address and communications speed DIP switch selectable.

Plug-in screw terminals with each input to include screen, RS485 to have screen and input connectors can be keyed so that Analogue inputs cannot be inadvertently mixed and cause damage.

Two on-board power supplies 18V – 72V for redundancy purposes (A-feed and B-feed).

Operating temperature range -10°C to +55°C.

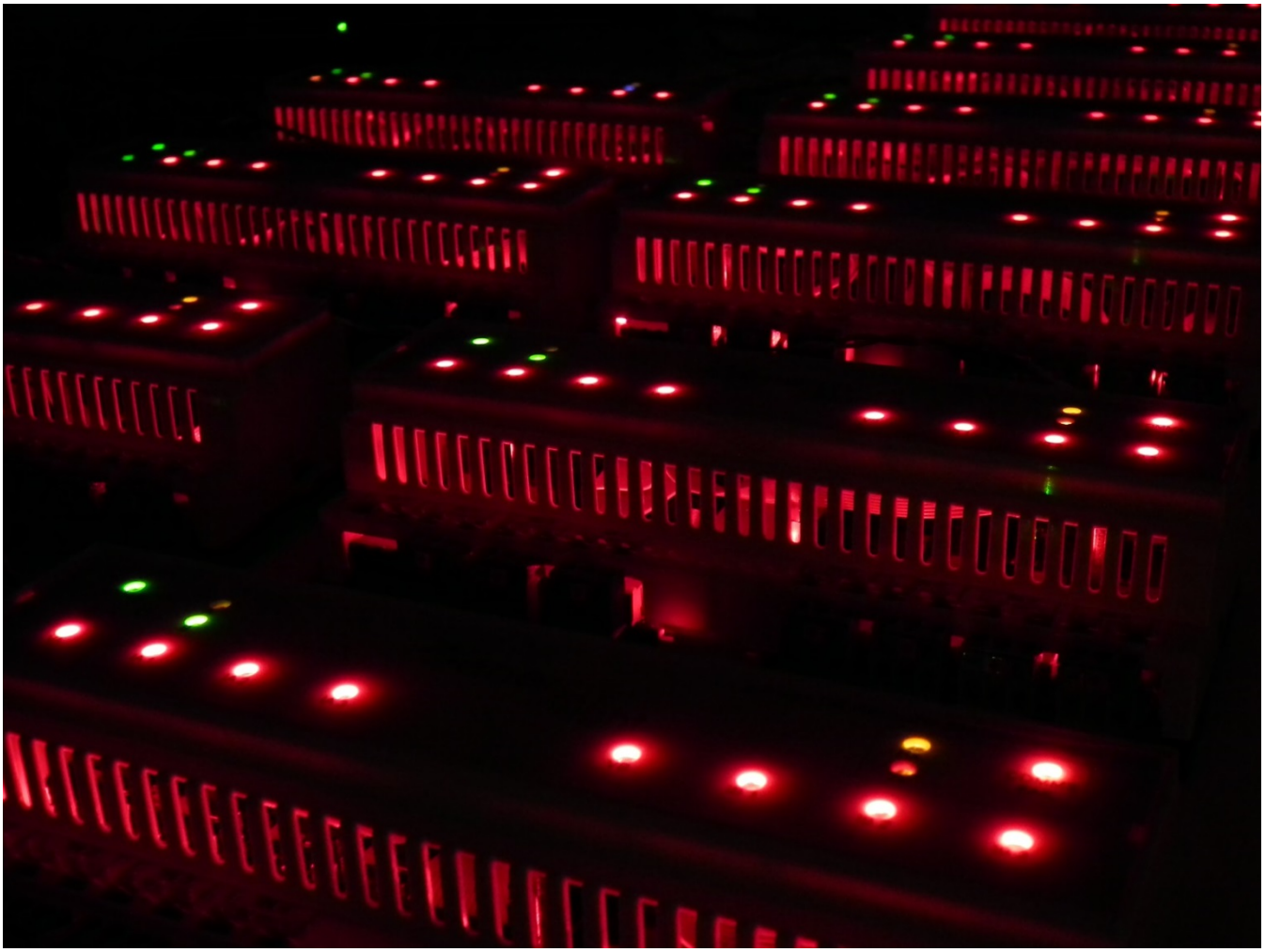
Test sheet supplied for each unit after burn-in with calibration and accuracy information shown for each input.

Enclosure – plastic, IP20, DIN rail mounting.

Part Numbering

So far there is only one product in this series:

eiRMU-08 EI - 8 Analogue Input RMU with Dual Power Inputs



To get the latest user manual please download from:

http://danntech.com/user manuals/eiRMU-08 User Manual.pdf

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