
User Manual for the

M Enclosure for DL2e

Type M-ENCL-B



Delta-T Devices Ltd

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CE conformity

The CE marking identifies this product as complying with all relevant directives in the European Union (EU) For the DL2e weather station this may include one or more of the following products:

Product	Description	Standards
Modem	CT63 (CEP)	ETSI EN 301 489/EN 301 151 EN 61000-4-2 (Electrostatic discharge immunity) EN 61000-4-3 (Radio frequency immunity) EN 55022 (Radio frequency emission)
Solar regulator	Steca Solsum6.6F	2004/108/EC (EMC) 2006/95/EC (Low voltage directive)
Solar panel	BP SX series	IEC 61215

The DL2e logger has been assessed under EU EMC Directive 89/336/EEC and conforms to the following harmonised emissions and immunity standards:

EN 50081-1 : 1992 and EN 50082-1 : 1992

When used with systems according to the instructions contained in this document, the equipment does not significantly affect the EMC performance when assessed under EN 50081 and EN 50082.

If the equipment is used with any other non Delta-T products it is the responsibility of the user to ensure the EMC compliance of such systems.

Design changes

Delta-T Devices Ltd reserves the right to change the designs and specifications of its products at any time without prior notice.

User Manual Version: 4

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**Delta-T Devices Ltd
130, Low Road, Burwell
CAMBRIDGE CB25 0EJ
U.K.**

**Tel: +44 1638 742922
Fax: +44 1638 743155
e-mail: sales@delta-t.co.uk
www: [www: www.delta-t.co.uk](http://www.delta-t.co.uk)**

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Introduction

Summary of Features

The enclosure is designed for use with the M2 mast. It is an alternative to the weather station canopy and provides greater weather protection, electrical shielding, and security for DL2e and its related accessories.

- Weatherproof to IP54 standard
- Side opening door with twin locks
- Gland plate with 12 cable glands
- Two 2 inch diameter pole mounting brackets
- DIN rail for convenient mounting of additional equipment
- Fused power input terminal
- Double decker sensor power distribution terminals (10 off)
- Trunking for tidy cable routing
- Earthed back plate and cable

Scope of This Manual

This manual contains details of performance and specification of the M-ENCL-B and describes its installation with the M2 mast, DL2e, solar power, modems and power relays.

You may also need to refer to the following:

- ***DL2e User Manuals***
- ***Ls2Win software on-line Help***
- ***CT63 Terminal Technical Description V1.4***
- ***Steca Solsum 6.6F Operating Manual***
- ***Solar Panel Manufacturer's Instructions***

Health and Safety

Manual Handling

The enclosure is quite heavy and awkward to grip. Please take extra care and follow health and safety guidelines for manual handling in all aspects of lifting or moving this product

Batteries

Batteries prone to give off explosive gases at any stage of their charge or discharge cycle should not be mounted in the enclosure without sufficient additional ventilation.

The M-ENCL B for DL2e enclosure correctly fitted with a SOL4 Kit and LBAT4 battery is designed to minimise the risk of explosion.

Do not use non-approved batteries or other battery charger/regulators in un-ventilated enclosures.

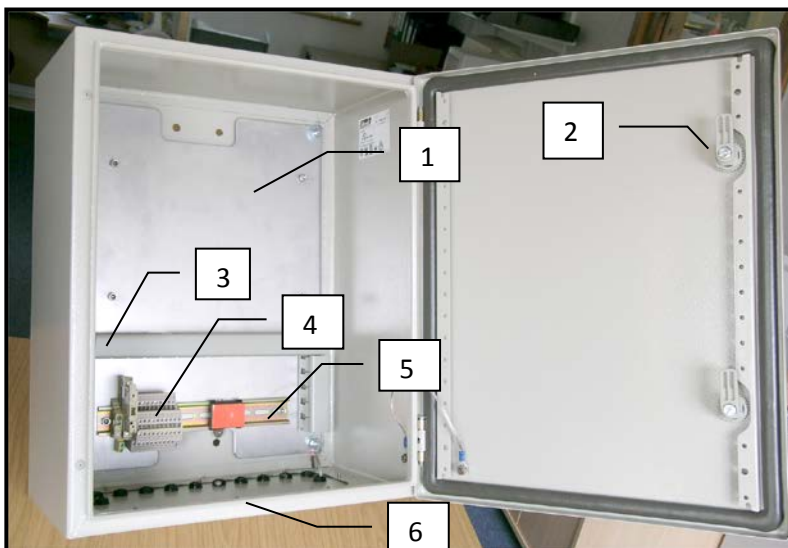
Note: For optimum thermal protection the Solsum solar charger/regulator should be installed in the same housing as any external battery.

See also Warnings on page 38

Installation

Description of Equipment

General Arrangement



Parts include -

- 1 Back Plate
- 2 Twin lockable door closures
- 3 Trunking
- 4 Fused power input and distribution terminals
- 5 DIN rail
- 6 Gland plate and cable glands (12)

Unpacking

Check for any damage that may have occurred to the consignment in transit.
Check that the contents of the consignment agree with the Packing List.

If any damage or shortage is apparent, notify the distributors and the carriers immediately.

Make a note of any equipment serial numbers, as these will be needed in any subsequent warranty claims, repairs or recalibration.

Mounting the Enclosure

Height and orientation

First determine at what height and rotation on the M2 mast or pole you want to mount the enclosure.

Temperature management

If the enclosure is exposed to direct solar radiation, its internal temperature may get quite high. To avoid this undesirable effect, reduce the exposure as much as possible, for example by re-orienting the enclosure, or positioning it beneath a solar panel, or by attaching supplementary reflective solar radiation shielding (not supplied).

Electrical Shielding

Thorough shielding of all the metal components of the enclosure is achieved with low impedance earth braids fitted with ring or spade tags.

An earth cable is supplied with the enclosure to attach the case to an earth stake.

For the best earth connect it to a 1m copper Grounding Rod.

Assembly to mast

The enclosure is mounted to the mast using two U bolt assemblies that will require disassembly prior fitting. It will also require extra assistance in order to make the installation process easier.

Partially assemble the top U bolt and clamp to the mast and whilst an assistant keeps these in place, offer the enclosure over the two M8 threaded studs, and quickly fit the two M8 nuts over the exposed threads inside the enclosure.

Warning: Please recognise Health and Safety precautions when lifting heavy and awkward loads. Also be careful that the door does not swing shut and trap fingers at this stage of installation.

Repeat the procedure for the second U bolt assembly under the base of the enclosure. Once correct height and orientation is established then tighten all four nuts with a 15mm socket wrench.

Fitting the DL2e

Most enclosure systems are assembled at the factory and the DL2e data logger fitted. It is mounted directly onto the back plate of the enclosure using four M6 x 10 socket cap screws.

In order to achieve this, the lid needs to be removed from the logger and a screw dropped down each of the hollow “legs”. Offer the logger up against the back plate over the threaded inserts and tighten in sequence using a 6mm A/F long hexagonal Allen key or ball driver.

Complete by re-fitting the lid of the logger quickly to reduce the exposure of the desiccant bag to atmosphere.

See also **Prepare the logger** (for GSM) on page 19

Gland plate and sensor cables

The gland plate is screwed to the underside of the enclosure, and is sealed with a foam gasket.

Feed the sensor cables through the gland plate, and tighten up the glands to seal them. You may need to provide extra sleeves if the cables are less than about 5 mm diameter.

Extra cable glands are fitted to enable further ancillary equipment to be easily incorporated into the system. Please ensure that un-used cable glands are blocked to prevent moisture ingress and condensation.

Note: Small cut off lengths of cable can be used to block unused cable glands.

System Earth

To comply with Health and Safety requirements the complete system should be correctly earthed.

The M-ENCL-B enclosure is provided with a 2m earth cable terminated in an M8 bolt ring for connection to an earth stake .

Note: Prior to August 2013 M-ENCL-B enclosures for DL2e loggers were fitted with used ~60 cm of earth braid suitable for connecting to the 2 m mast.

See also **Connect System to Earth** on page 12

Warning: If there is any doubt concerning electrical connection or earth arrangements please contact Delta-T or the local agent.

Wiring Instructions

Kit type B - Battery Powered

The Battery Powered System has been designed for the use with a 12V battery as the power source. This can be re-charged via mains charger or an additional solar power system.

In most instances the enclosure will arrive complete with DL2e data logger pre-wired to the fused power input terminal and the sensor power terminals.

The DL2e will also have its RS232 communication cable attached and routed inside the trunking.

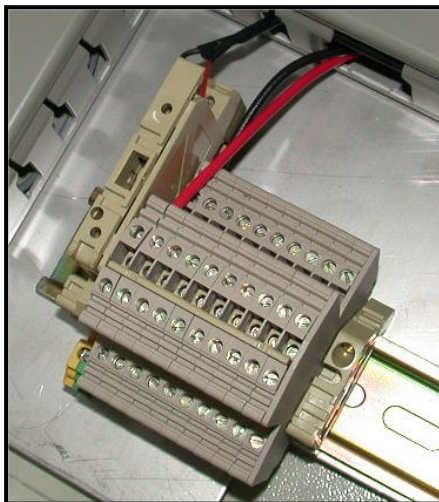
Fused Power Input Terminals

A 1A fast acting fuse is provided for connecting an external 12 V power source to the DL2e logger, and to a modem if fitted.

If a solar power systems SOL4-Kit is used a second fuse is required, fitted with a 3 A medium speed fuse, for connection between to solar charge/regulator and the LBAT4 or any external 12V battery

Both fuse holders fit on the DIN rail.

From left to right the photo shows the a 1A fuse holder, the 3 A fuse holder, and then a set of 10 terminals which are connected together for providing optional warm-up power from the logger's channels 63 or 64 to sensors

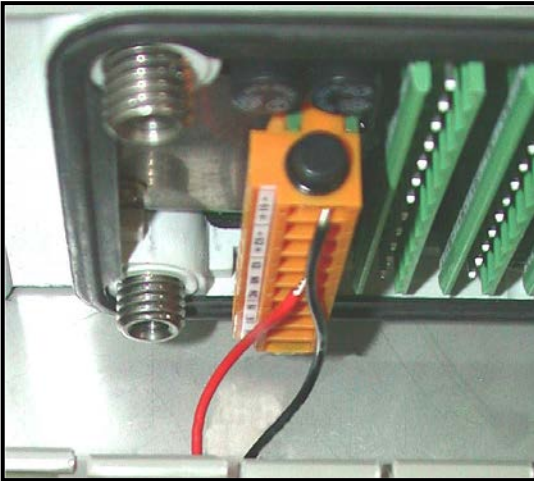


Sensor Power Terminals

The ten sensor distribution terminals are pre-wired to the DL2e on board relay through Channel 63. This relay will enable power to be switched to all sensors that require power before they can offer readings.

All ten terminals have been linked together so that their +ve and –ve terminals will be connected at the same reference points.

The upper half is +ve and wired to Channel 63 NO (*Normally Open*) and the –ve to Channel 61 –. (*This is the DL2e negative*).



Connect System to Earth

The enclosure is provided with an earth cable, ring terminal, nut, washer and M8 bolt.

This can be connected to one of the ground stakes provided with the M2 mast.

For the best quality connection to earth it is usually recommended that a 1m copper grounding rod be used. This can be ordered separately from Delta-T.

Note: Full lightning protection is difficult and expensive. Partial protection may be improved by providing by a separate earthed mast, higher than the M2 mast, situated close by enough in order to protect it under its ~45 degree “cone of influence”. Even then the induced electromagnetic surges from a nearby strike may destroy most electronics, so protection is a matter of judgment, balancing risk and cost.

If in doubt, seek professional advice.

GSM Modem type MD-GSM-1



Figure 1 A GSM modem with DB9 RS232 connector top left, antenna connector top right and a power cable at bottom

The MD-GSM-1 modem (if ordered with an M-ENCL enclosure) is pre-installed in the enclosure, but you will need to obtain and install your own SIM card.

The modem has an RJ11 connector for power.

It has an RS232 (DB9) connector for communicating with the logger and a round (50 Ohm FME male) connector for attaching to the antenna cable.

An external source of 5-32 VDC power is required for the modem.

This is normally supplied via a 12V battery such as the **LBAT4** 10Ah battery which can fit inside the M-ENCL enclosure.

The MD-GSM-1 modem is built into the system and mounted on the DIN rail. Its power is fed from the 12V battery, at the same point as the DL2e.

A special DL2e to modem RS232 cable is provided, see page 43.

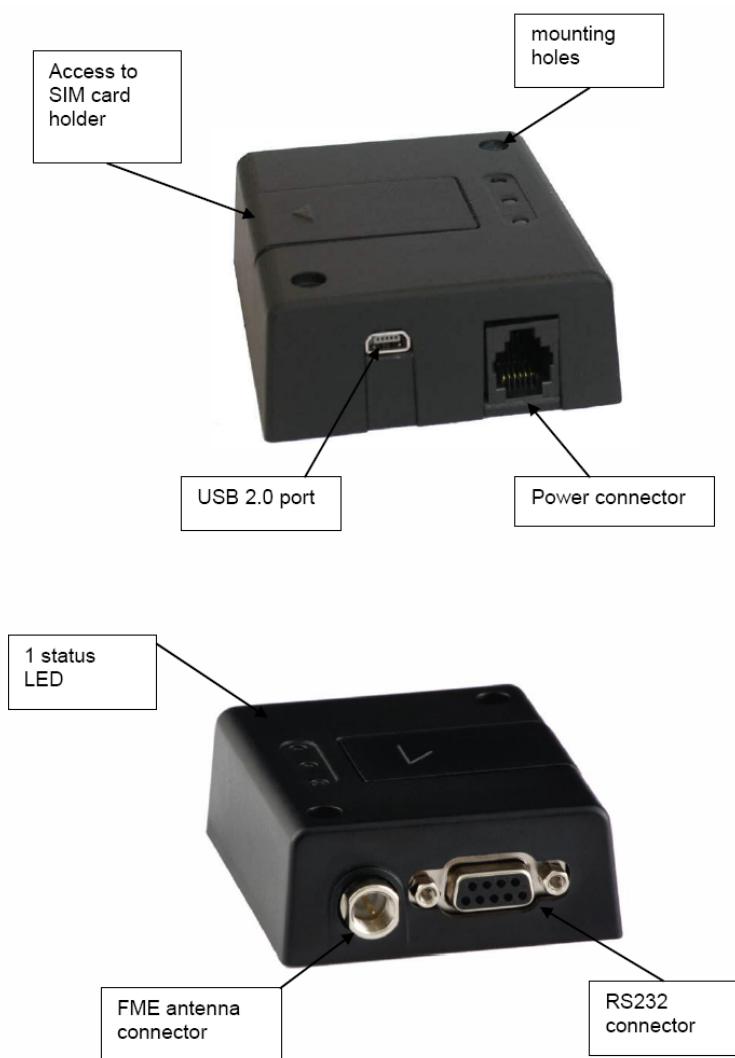


Figure 2 Modem parts

Antenna Options

Complete systems pre-built at Delta-T are supplied with the antenna/aerial mounted through a hole in the top of the enclosure and with the modem pre-wired to and configured to work with the DL2e logger .

Another option has the antenna mounted on an L-shaped bracket fitted outside on the back of the enclosure. The antenna cable enters the metal box via one of the cable glands in the base of the box.

We supply this if retrofitting a GSM modem to an existing DL2e+M-ENCL-B metal enclosure in the field (because it is easier to fit - not requiring any special tools to drill a hole in the metal box).



Figure 3 This external antenna option with L shaped bracket can be retrofitted to the M-ENCL-B enclosure in the field

Modem communication with Loggers

To connect to a logger in the field requires two modems, one at each end of the phone line.

These instructions cover setting up the modem used at the logger end.

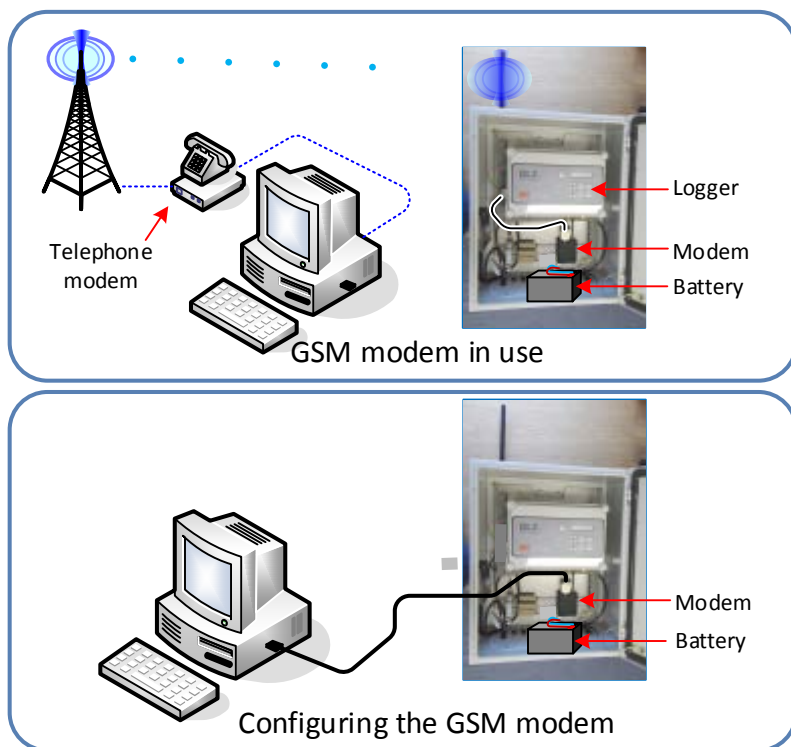


Figure 4 Upper diagram shows the modem in normal use, the lower diagram shows it connected directly to a PC serial COM port while it is being configured using the **GSMConfig** software.

If the modem and logger are ordered together from Delta-T then the modem will arrive pre-wired and configured.

The MD-GSM-1 modem includes accessories for use at the logger end.

An RS232 cable is provided to temporarily connect the GSM modem (at the logger) directly to a PC. This needs to be done just once when configuring the modem.

We provide configuration software **GSMConfig** to configure the modem and describe how to do it in the following pages.

Note: Once the MD-GSM-1 modem has been configured to work with your logger, the internal non-volatile memory ensures that these settings will remain even if the unit is removed, or power is removed.

Obtain a SIM card

The modem is supplied without a SIM card.

It is up to you to determine the most appropriate GSM network and obtain a suitable SIM card.

Two frequencies are used in the UK, 900MHz used by Vodafone and O₂ and 1800MHz used by EE.

When establishing the account please ask the network provider for a Data Account, as this will be subject to a cheaper monthly rate.

Warning:

Whatever type of account is established, it is vital that the SIM card is “Data Enabled for GSM”. This can also be called “Circuit Switched Data Enabled”.

Note this is different from being enabled for internet data i.e. as used in mobile phones and GPRS. Please make sure that when ordering that the network provider confirms this requirement.

The modem will not function correctly if this requirement is not met.

Normally three telephone numbers are received with each account, Audio, Fax and Data.

The Data phone number is the one to use, but check with the network provider if there is no separate Data number.

Check that the SIM card PIN number is not enabled by placing the SIM card in a normal GSM phone. Switch on the phone and if “need to insert the PIN number” message appears, use the phone’s menu to disable this function. If there is no message then it has already been done.

Fit SIM card

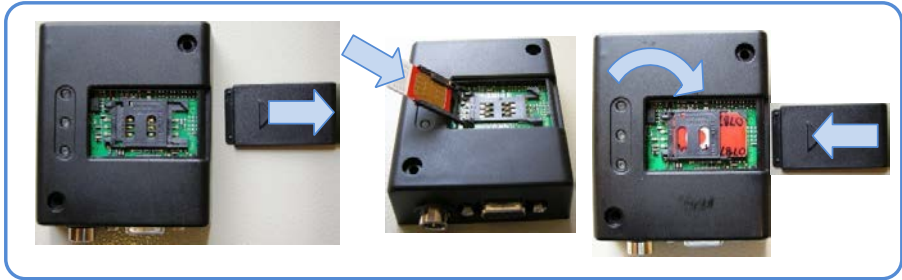


Figure 5 Fitting a SIM card

Place the SIM card in the modem as shown in Fig 5.

Warning: Take care to fit the SIM card the right way up, ensure the card holder slides freely into the modem.

Connect the battery or power supply to power the modem up and check the network connection.

GSM Modem Power LED status Indicator

The modem has 3 indicator LEDs. The central green power-up LED indicates various operating states as described below.

Operating state of CT63 Terminal	Power-up LED state
Device off	Permanently off
net search / not registered	Fast blinking
registered full service	Slow blinking
A call is active	Permanently on

Configure and Test modem

If your GSM modem is supplied pre-fitted in a M-ENCL-B enclosure with a DL2e it will have already been preconfigured as much as possible.

You will need to obtain and fit a SIM card.

Then you may skip the first part of this section and go to **Test modem connection**: on page 21

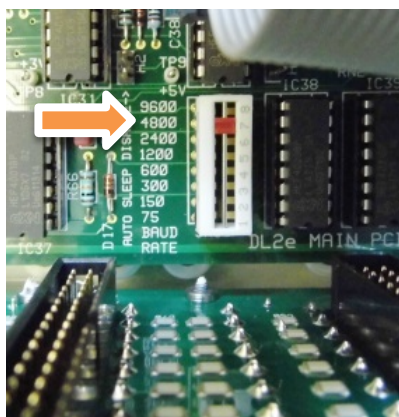
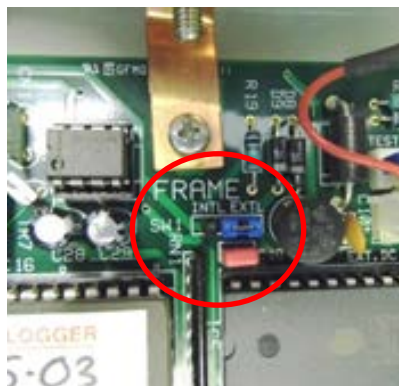
This section describes how to use the GSM modem configuration software **GSMConfig** to:

- Configure the modem
- Test your modem connection

See also the complete sequence of configuration software screenshots in the **Appendix: GSMConfig Screenshots** on page 25

Prepare the logger

1. (Optional)
To run the DL2e off the external battery, set the INTL/EXT jumper on the DL2e main PCB is to "EXTL".
This may make sense if the external battery is being recharged by the solar panel.
If not being recharged, you may choose to protect the logger by running it separately, off its own internal battery.
2. Ensure the baud rate switch in the DL2e is set to set 4800.



Configure the modem:

You need a PC with an RS232 serial port or a USB to RS232 adapter.

1. Disconnect the modem from serial cable in the M-ENCL-B enclosure and connect it directly to your PC serial port using the PC-modem serial cable **GSM-RS-DB9** as shown in Figure 4
2. From the PC Start menu select **Programs, Ls2Win, GSMConfig** utility.

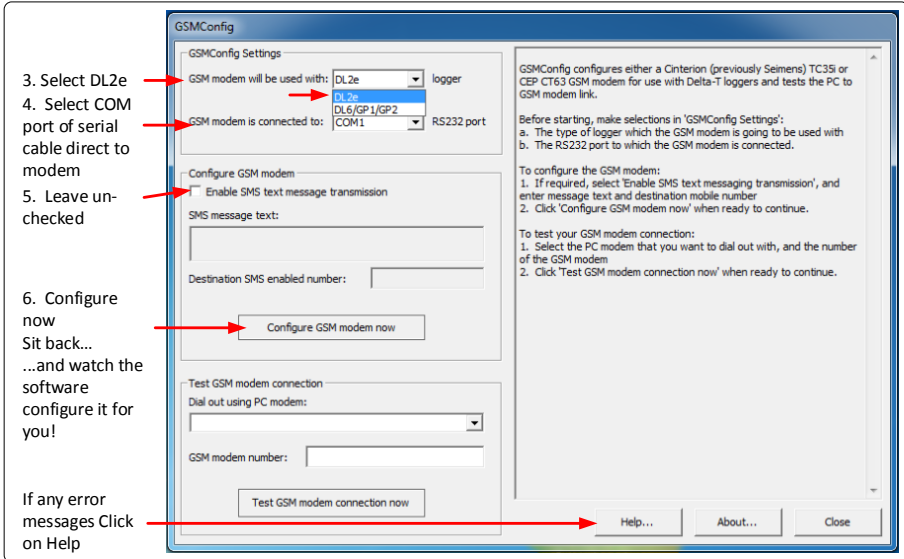


Figure 6 The **GSMConfig** program

3. Set **GSM Modem will be used with:** to DL2e.
4. Set **GSM modem is connected to:** the PC COM port that you are using.
5. Leave **Enable SMS text messaging** unchecked.
6. Click **Configure GSM modem now**.
7. Follow the on-screen instructions, turning off and on the power to the modem when asked.
See **Configuring GSM Modem** on page 25 for the complete sequence.
8. Click **Help** if needed (for additional on-screen instructions).

Test modem connection:

Complete stages 1-4 on page 20 then

1. Connect your PC modem to a telephone line, and enter the connection details as shown.

The screenshot shows the 'GSMConfig' application window. It has a title bar and a menu bar. The main area is divided into several sections. The 'GSMConfig Settings' section at the top left has two dropdown menus: 'GSM modem will be used with:' set to 'DL2e' and 'GSM modem is connected to:' set to 'COM5'. Below this is the 'Configure GSM modem' section with a checkbox for 'Enable SMS text message transmission' and a text field for 'SMS message text:'. The 'Test GSM modem connection' section at the bottom left is highlighted with an orange border; it contains a dropdown for 'Dial out using PC modem:' set to 'Zoom V92 USB Faxmodem' and a text field for 'GSM modem number:' containing '0123456789'. To the right of these sections is a large text area with instructions. At the bottom right are three buttons: 'Help...', 'About...', and 'Close'.

GSMConfig

GSMConfig Settings

GSM modem will be used with: **DL2e** logger

GSM modem is connected to: **COM5** RS232 port

Configure GSM modem

☐ Enable SMS text message transmission

SMS message text:

Destination SMS enabled number:

Test GSM modem connection

Dial out using PC modem:

Zoom V92 USB Faxmodem

GSM modem number: **0123456789**

Before starting, make selections in 'GSMConfig Settings':

- a. The type of logger which the GSM modem is going to be used with
- b. The RS232 port to which the GSM modem is connected.

To configure the GSM modem:

1. If required, select 'Enable SMS text messaging transmission', and enter message text and destination mobile number
2. Click 'Configure GSM modem now' when ready to continue.

To test your GSM modem connection:

1. Select the PC modem that you want to dial out with, and the number of the GSM modem
2. Click 'Test GSM modem connection now' when ready to continue.

Help... About... Close

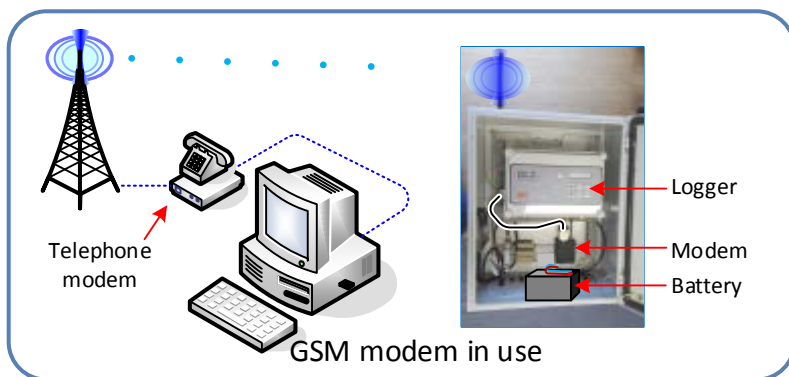
2. Turn your modem power off then on again.
3. Click **Test GSM modem connection now**

Watch as the program runs through its test sequence and reports its progress.

See **Test Modem (and SIM Card and Phone Line)** on page 31 for the complete sequence

4. Click Help for additional on-screen instructions.

Connecting the logger to the PC via the Network



Before you start

Ensure the logger is connected to the modem via the **DL2e to GSM modem RS232 cable** as above.

Ensure the logger baud rate is set to 4800 : see page 19.

Ensure you have the right kind of data enabled SIM card - see page 17.

Ensure the SIM card is correctly fitted: see page 18.

Ensure the modem has power, see LED status indicator on page 18.

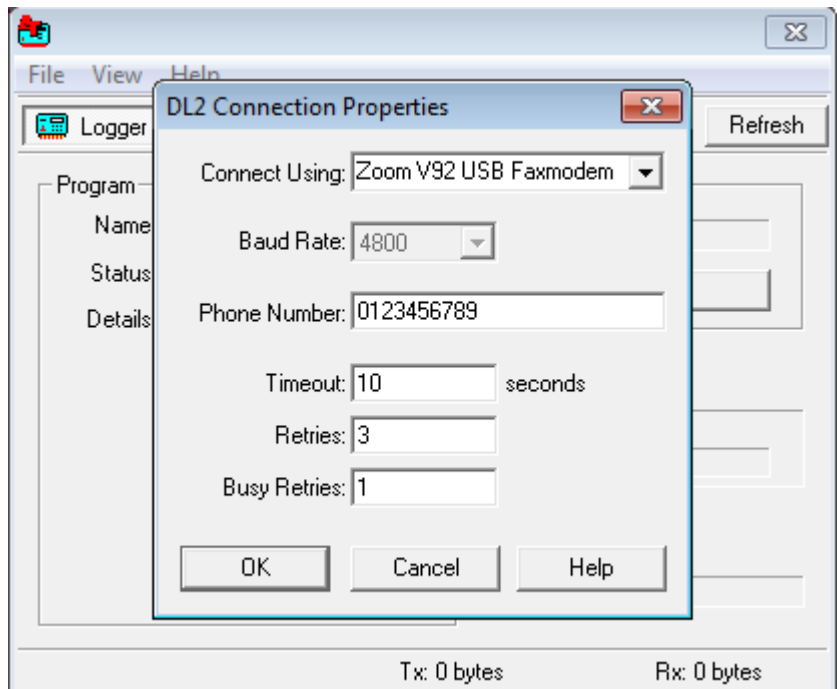
Ensure the modem connection works – see page 2118

Communicate with the DL2e

The GSM modem is supplied complete with a modified RS232 cable for communicating with the DL2e.

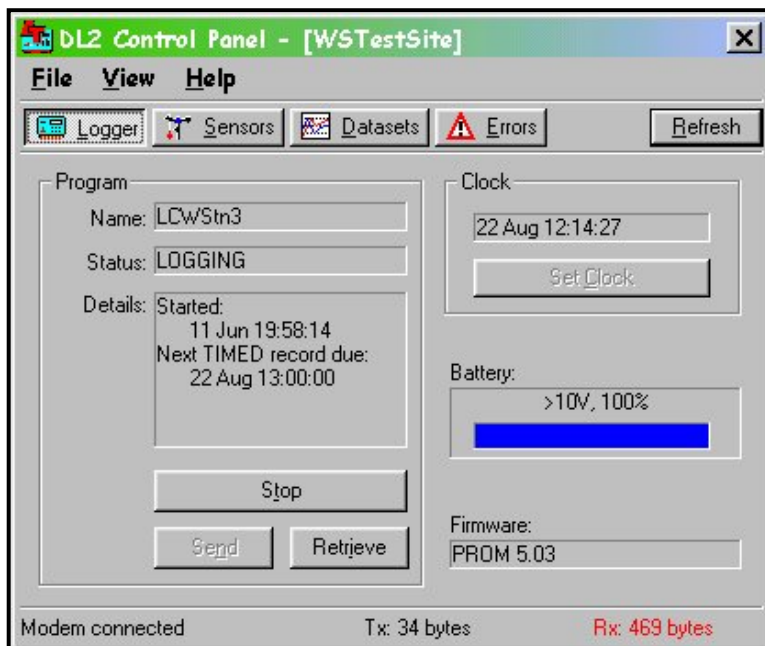
Note: The MD-GSM-1 modem has been configured for working with the DL2e, and even if the unit is removed, or power is removed the internal non-volatile memory ensures that these settings will remain.

1. In the PC program **Ls2Win** start a **New DL2e Control Panel** by double clicking the appropriate icon



2. Modify the DL2 Connection Properties settings accordingly:
For **Connect Using**: select the name of the modem on your PC
For **Baud Rate**: select 4800
For **Phone Number** enter the phone number of the SIM card in the GSM modem at the logger
Click **Help** if you need further information on these settings..

Ls2Win screen shot



Once communication has been established Ls2Win is fully operational from the PC terminal through to the logger.

Note: It is worth bearing in mind that all time the logger is connected via the modem, the cost of the call is increasing. It is easy to forget that the modem is connected when other applications are being run from the same computer and the Ls2Win window is "behind" another application.

The "connected" icon is visible in the bottom task bar whilst Ls2Win is running via the modem.

Please refer to the **Ls2Win Quick Start** and **User Manual** for further information and clarification.

Appendix: GSMConfig Screenshots

Configuring GSM Modem

The following series of screenshots shows what to expect to see on your PC when configuring your GSM modem using the **GSMConfig** program:

See also **Configure and Test modem** on page 19

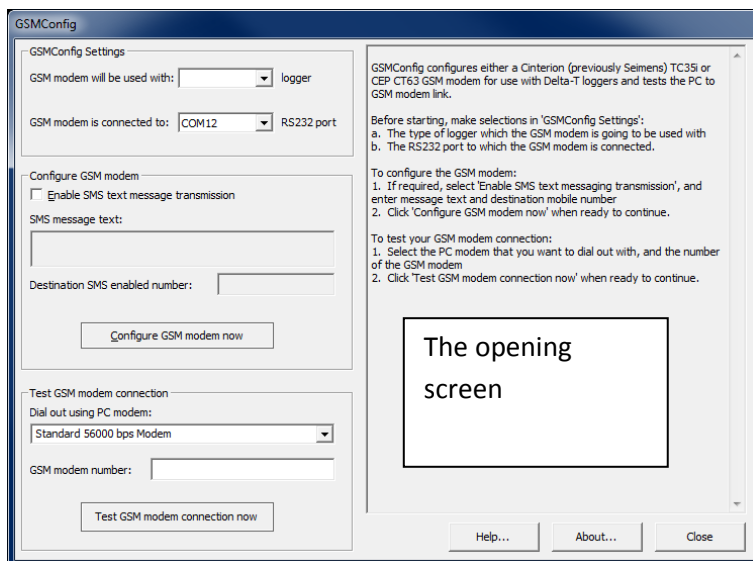
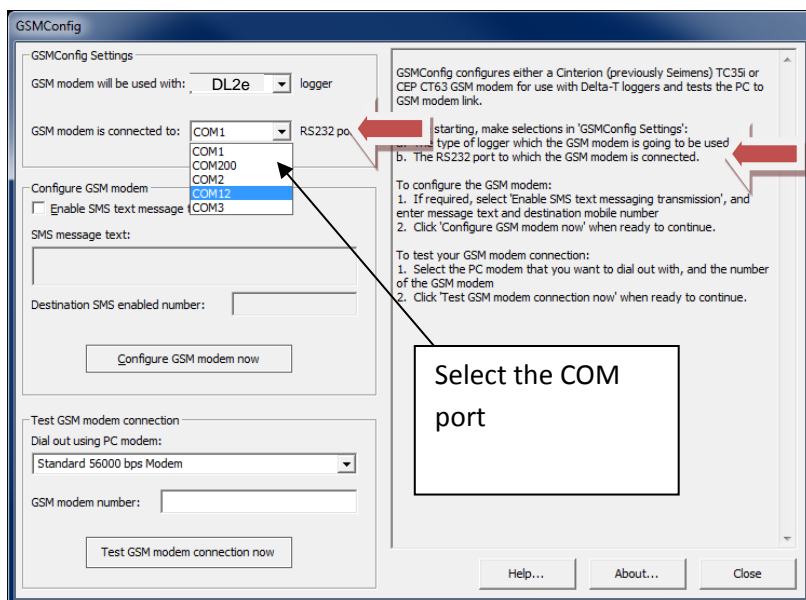
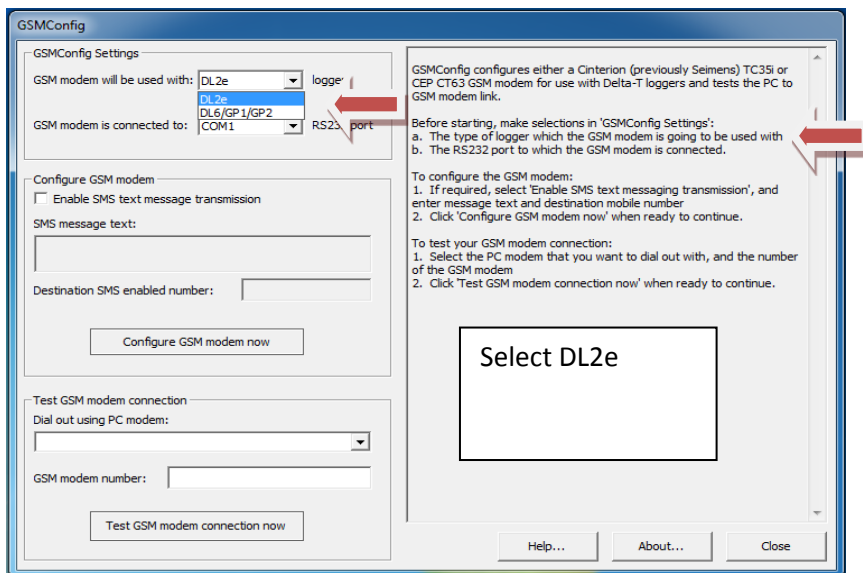


Figure 7 The opening screen of GSMConfig.



GSMConfig

☐ GSMConfig Settings

GSM modem will be used with: logger

GSM modem is connected to: RS232 port

☐ Configure GSM modem

☒ Enable SMS text message transmission

SMS message text:

Destination SMS enabled number:

☐ Test GSM modem connection

Dial out using PC modem:

GSM modem number:

GSMConfig configures either a Cinterion (previously Siemens) TC35i or CEP CT63 GSM modem for use with Delta-T loggers and tests the PC to GSM modem link.

Before starting, make selections in 'GSMConfig Settings':

- The type of logger which the GSM modem is going to be used with
- The RS232 port to which the GSM modem is connected.


To configure the GSM modem:

- If required, select 'Enable SMS text messaging transmission', and enter message text and destination mobile number
- Click 'Configure GSM modem now' when ready to continue.

To test your GSM modem connection:

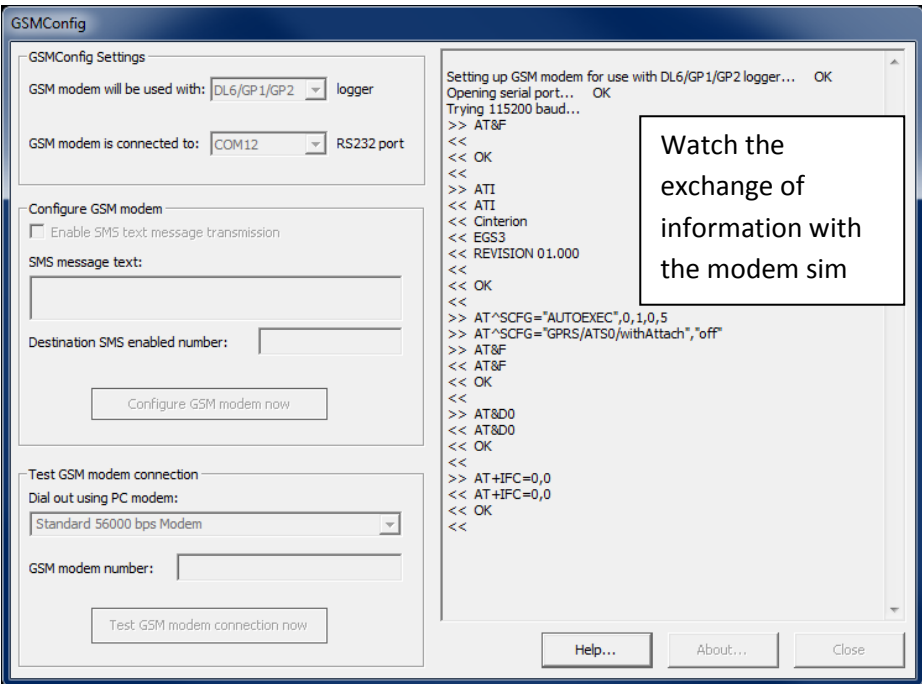
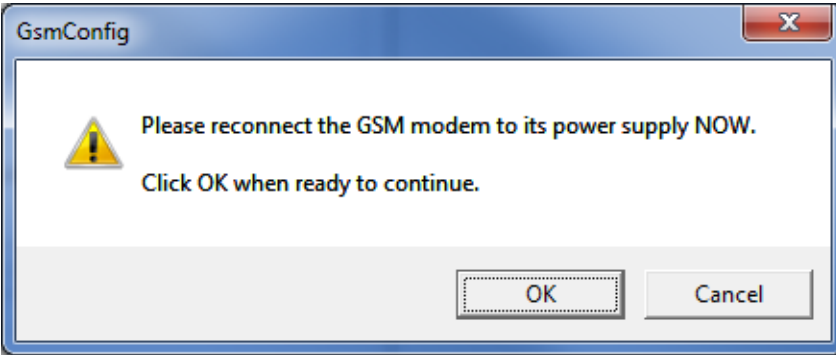
- Select the PC modem that you want to dial out with, and the number of the GSM modem
- Click 'Test GSM modem connection now' when ready to continue.

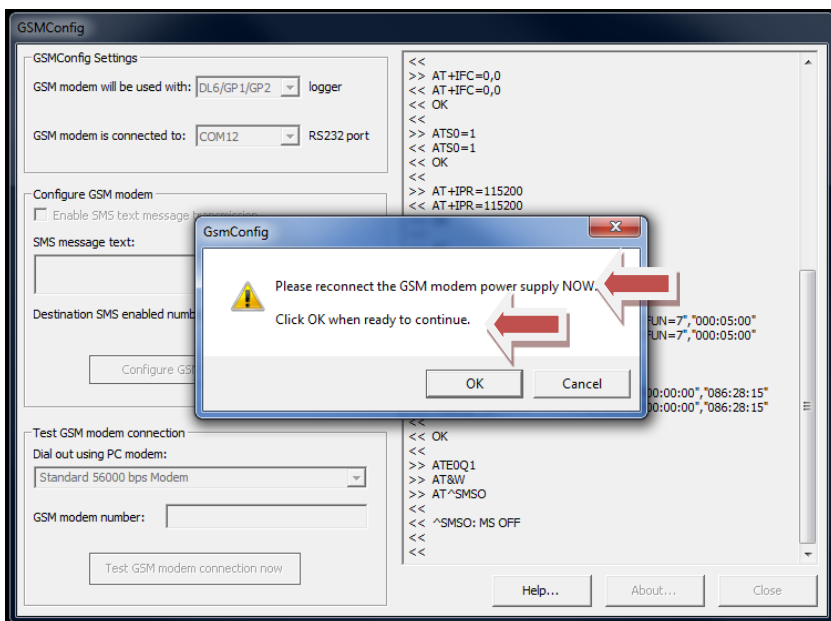
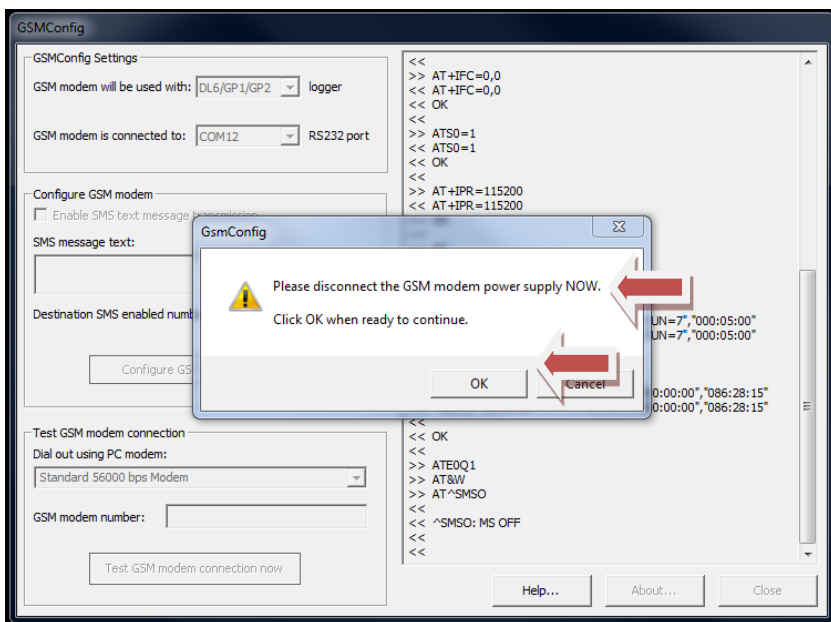
GsmConfig X

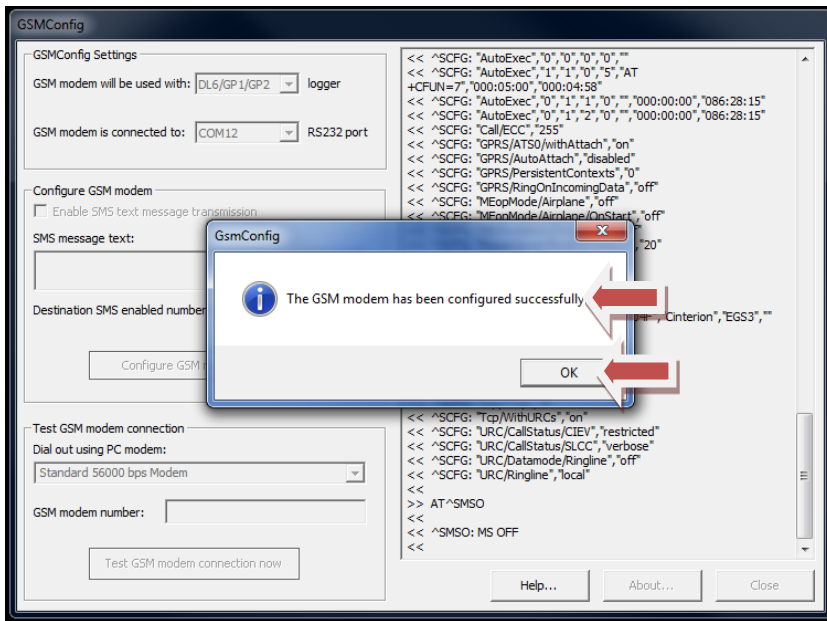
 **Please ensure the GSM modem is powered down.**

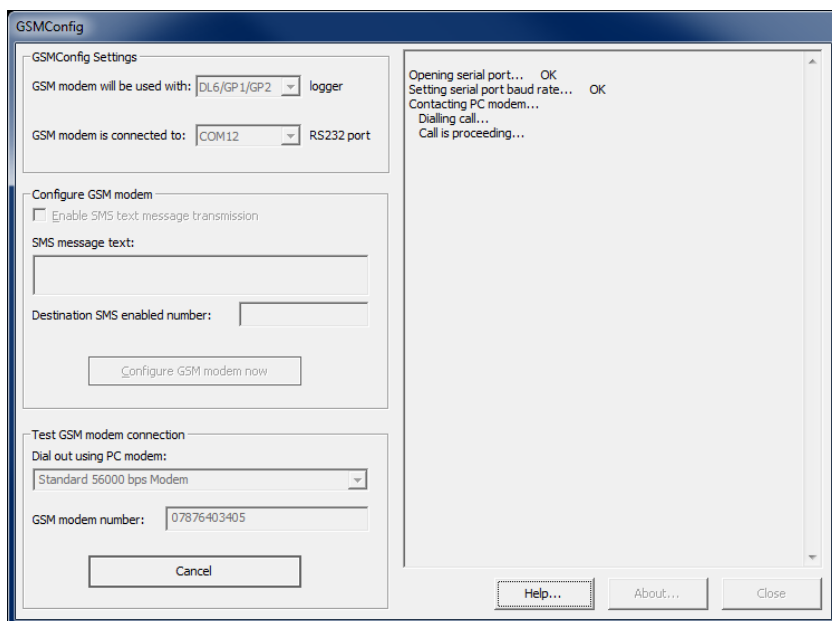
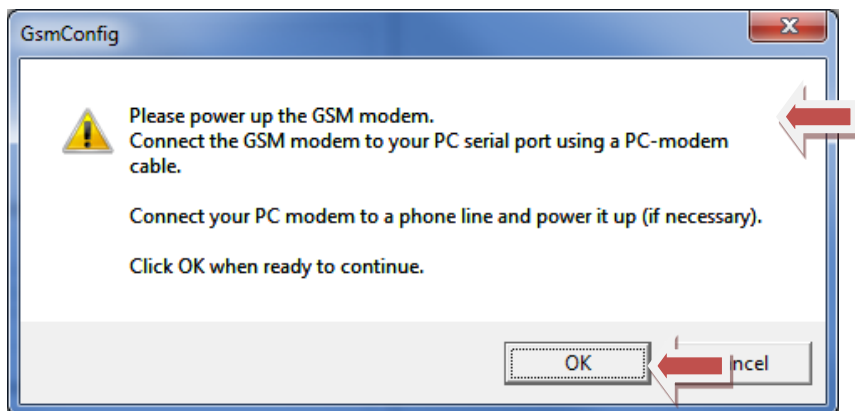
IF NOT, disconnect the GSM modem power supply NOW.

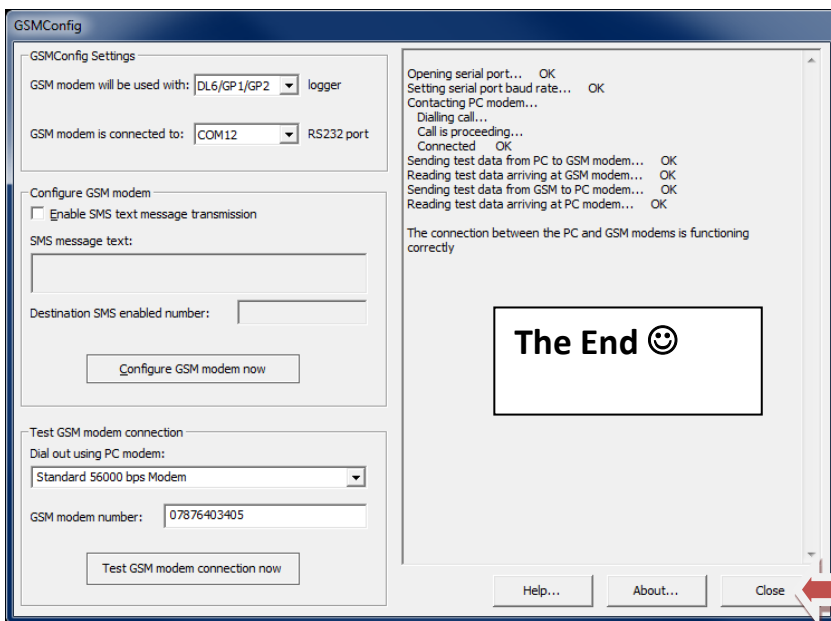
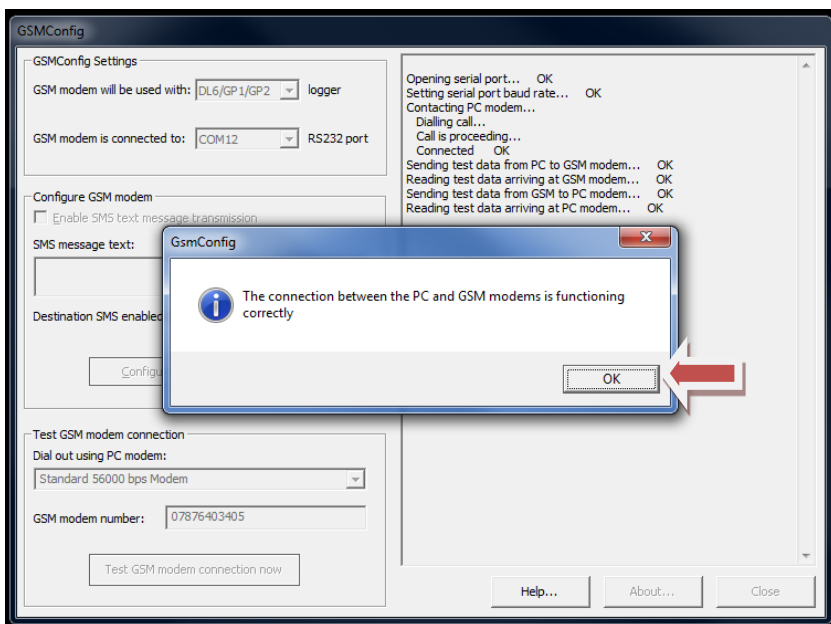
Click OK when ready to continue.









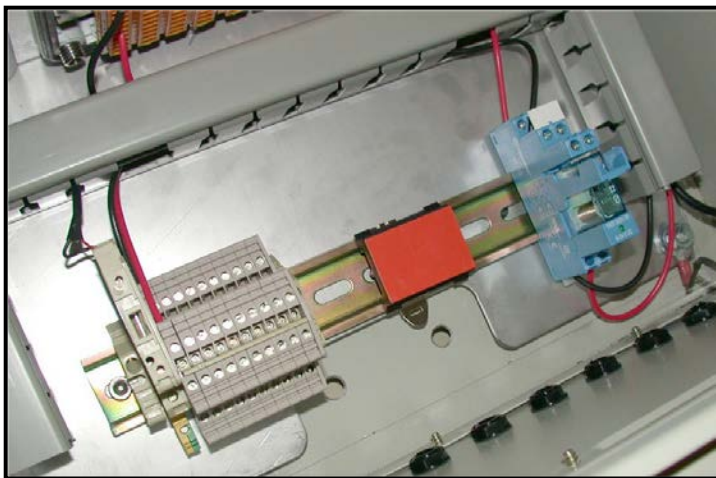


Power Relay type DL2-REL

The DL2e has two relays fitted internally, but these are both limited to around 1A and so to enable a system to run with larger switching currents an external power relay is required.

The power relay provided is a 5A Double Pole Double Throw device, which has been selected to fit onto the existing DIN rail within the enclosure. This relay can provide power from a power supply or external battery under the control of the DL2e internal relay(s).

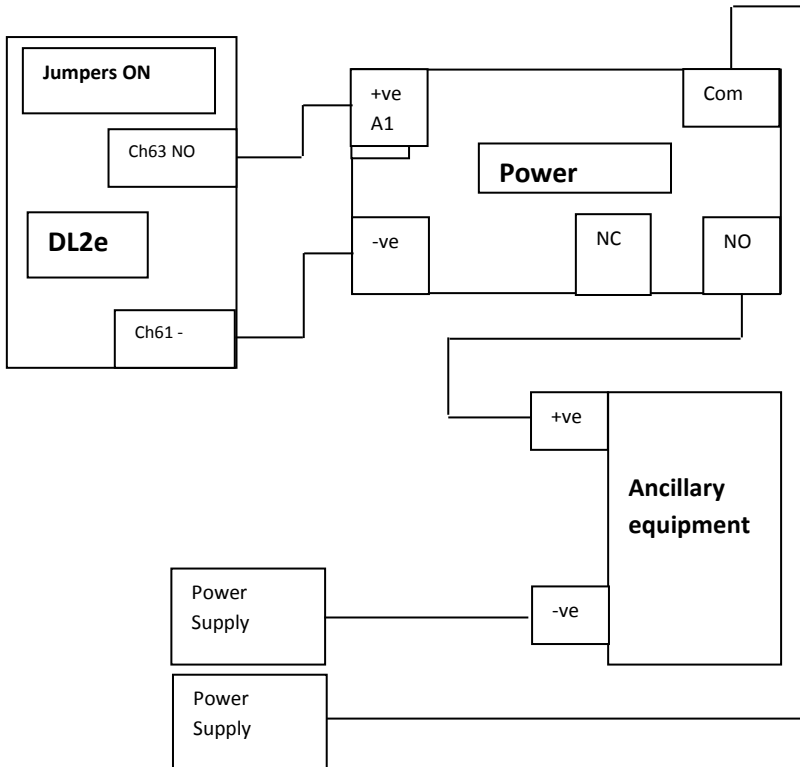
Note: Typically used where a large number of sensors are switched on at the same time, whose combined current consumption is greater than 1Amp or when ancillary equipment needs a greater than 1A switching current.



Test and wiring

To test for functionality, switch on DL2e and allow channel 63 relay to toggle “ON”. The power LED should light and the battery voltage should be observed at the Normally Open terminal of the power relay. Operating voltage is now at the ancillary equipment.

See typical circuit diagram below –



SOL4 Solar Power Kit

This includes:

- 30 W solar panel
- Solar panel mounting bracket and U bolts
- Solar regulator/battery charger
- 10Ah sealed lead acid battery
- Din rail fuses
- Cables



Wiring

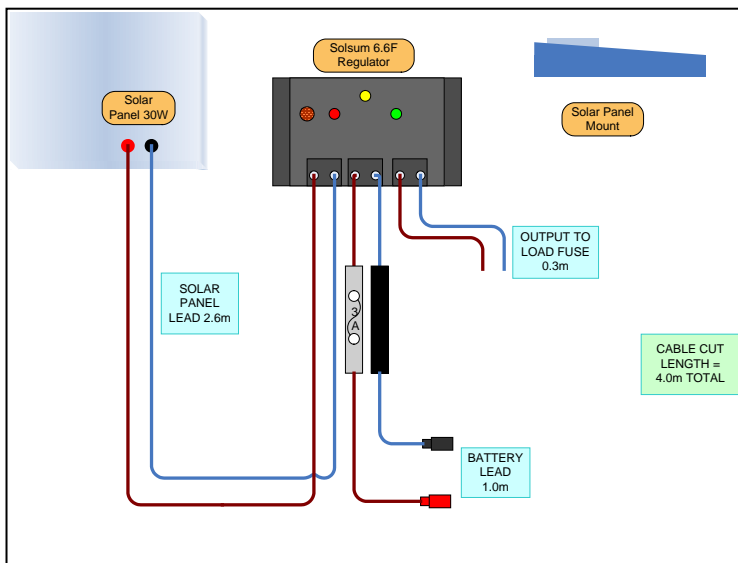


Figure 1 – SOL4-KIT Items (excluding battery and breather)

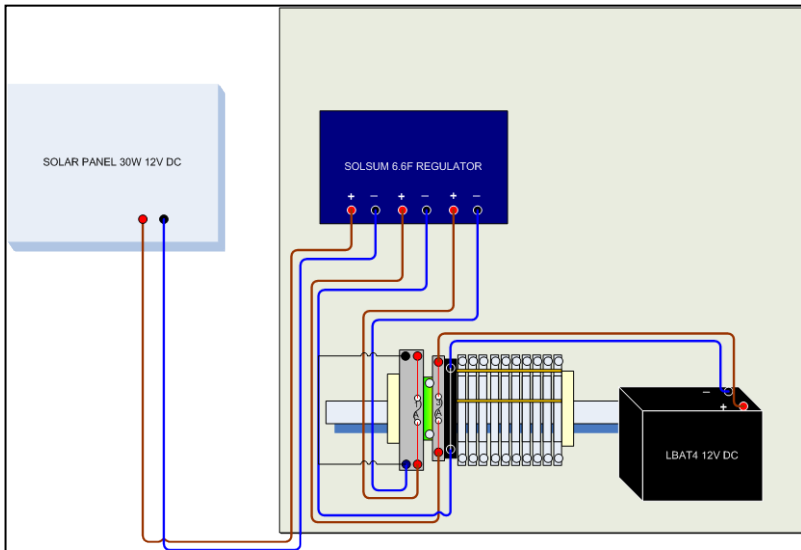


Figure 2: SOL4-KIT wiring scheme when used with enclosure M-ENCL-B

Warnings

Observe the warnings given with any solar panel documentation and Solsum solar charger/regulator instructions.

Cover the panel before wiring it up to avoid electric shock from bare wires.

Observe the polarity requirements of both the solar panel and the Solsum regulator.

Mount the Solsum regulator vertically and in the same chamber as the battery.

Only used Delta-T approved sealed lead-gel batteries.

Use of other batteries or battery chargers can cause hydrogen gas production which can spontaneously explode unless installed in a well-ventilated enclosure.

The M-ENCL-B enclosure with DL2e, when pre-fitted at Delta-T with SOL4 Kit, is modified to include a breather to ventilate the enclosure.

Do not assume it is safe to use non-approved batteries or other battery chargers without additional ventilation.

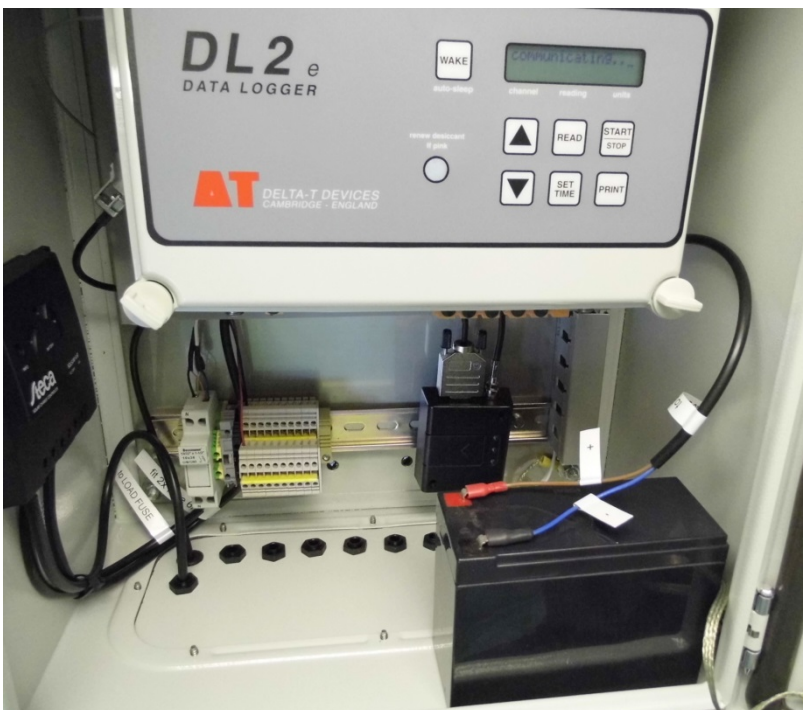


Figure 3: SOL4-KIT fitted in enclosure M-ENCL-B

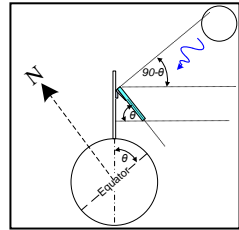
Considerations when mounting solar panel

Observe the warnings above, of course.

Tilt it to the angle of latitude, or in high latitudes up to 10 degrees more, to capture more light early in the day.

You may wish to place the panel to shield your logger enclosure from the sun.

Do not site an air temperature or RH sensor directly above the panel, rising hot air may distort ambient readings.



Assembly

Mounting bracket, bolts, cabling and U bolts are provided



- Assemble the two halves of the solar panel bracket with the bolts provided.
- Attach that to a mast (not provided)
- ➔ • Before uncovering the solar panel ensure that any attached power leads cannot touch or otherwise short-out – for in the light the leads will be live, and any short-circuit current may cause damage.
- Mount the solar panel
See also: Solar panel Instruction Sheet and any wiring diagram and Warnings on the back of the Solar Panel.
- ➔ • Cover the solar panel to exclude light.
- Attach the power cable from the solar panel to the Solsum solar charger/regulator
Brown = positive, blue = negative

See also: Solar Charger/Regulator Instructions for the the Solsum 6

Environmental specifications

	Min °C	Max °C	IP rating	Notes
M-ENCL box	-	-	IP54	
TC35i modem	-20	55	IP40	5-80% RH non condensing
Lead acid battery				25-85%RH
Charge	0	40		
Discharge	-15	50		
Storage	-15	40		
Solar Panel	-40	85	IP54	Junction box IP54
Solar charger/regulator	-25	50	IP22	
Extension Cabling				
Static	-30	90	IP68	Black PUR cable
when flexing	-5	90	IP68	

Maintenance

Leakage and condensation

The greatest danger to instrument enclosures is from water.

Any signs of moisture ingress from leakage should be tracked down and eliminated as soon as they appear.

Keep the desiccant in a sealed container until you have installed all the equipment and wiring in the enclosure, and blocked off all unwanted holes. Then place the desiccant inside the enclosure before shutting the door.

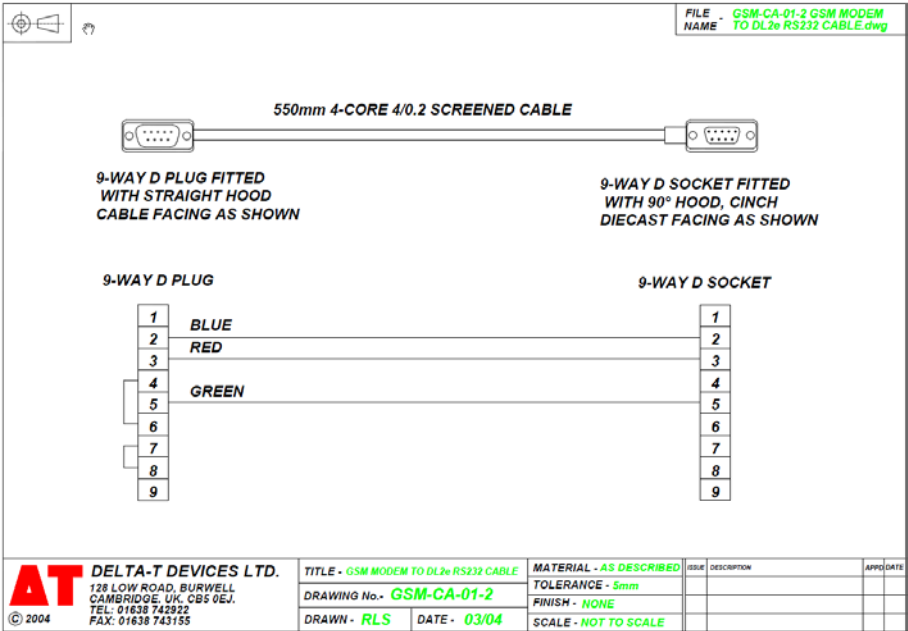
Desiccant

Condensation in the enclosure is likely to occur if the desiccant becomes exhausted. Refresh it from time to time by heating the desiccant packs to 150°C for 4 hours, and then allow them to cool in a sealed (heat proof) container.

Repairs and Spares

In instances of damage or wear, some components are available as replacement parts. Check with Delta-T.

DL2e to Modem RS232 Cable



Warranty and Service

Terms and Conditions of Sale

Our Conditions of Sale (ref: COND: 1/07) set out Delta-T's legal obligations on these matters. The following paragraphs summarise Delta-T's position but reference should always be made to the exact terms of our Conditions of Sale, which will prevail over the following explanation.

Delta-T warrants that the goods will be free from defects arising out of the materials used or poor workmanship for a period of **twelve months** from the date of delivery.

Delta-T shall be under no liability in respect of any defect arising from fair wear and tear, and the warranty does not cover damage through misuse or expert servicing, or other circumstances beyond their control.

If the buyer experiences problems with the goods they shall notify Delta-T (or Delta-T's local distributor) as soon as they become aware of such problem.

Delta-T may rectify the problem by replacing faulty parts free of charge, or by repairing the goods free of charge at Delta-T's premises in the UK during the warranty period.

If Delta-T requires that goods under warranty be returned to them from overseas for repair, Delta-T shall not be liable for the cost of carriage or for customs clearance in respect of such goods. However, Delta-T requires that such returns are discussed with them in advance and may at their discretion waive these charges.

Delta-T shall not be liable to supply products free of charge or repair any goods where the products or goods in question have been discontinued or have become obsolete, although Delta-T will endeavour to remedy the buyer's problem.

Delta-T shall not be liable to the buyer for any consequential loss, damage or compensation whatsoever (whether caused by the negligence of the Delta-T, their employees or distributors or otherwise) which arise from the supply of the goods and/or services, or their use or resale by the buyer.

Delta-T shall not be liable to the buyer by reason of any delay or failure to perform their obligations in relation to the goods and/or services if the delay or failure was due to any cause beyond the Delta-T's reasonable control.

Service, Repairs and Spares

Users in countries that have a Delta-T distributor or technical representative should contact them in the first instance.

Spare parts for our own instruments can be supplied and can normally be despatched within a few working days of receiving an order.

Spare parts and accessories for products not manufactured by Delta-T may have to be obtained from our supplier, and a certain amount of additional delay is inevitable.

No goods or equipment should be returned to Delta-T without first obtaining the return authorisation from Delta-T or our distributor.

On receipt of the goods at Delta-T you will be given a reference number. Always refer to this reference number in any subsequent correspondence. The goods will be inspected and you will be informed of the likely cost and delay.

We normally expect to complete repairs within one or two weeks of receiving the equipment. However, if the equipment has to be forwarded to our original supplier for specialist repairs or recalibration, additional delays of a few weeks may be expected. For contact details see below.

Technical Support

Users in countries that have a Delta-T distributor or technical representative should contact them in the first instance.

Technical Support is available on Delta-T products and systems. Your initial enquiry will be acknowledged immediately with a reference number. Make sure to quote the reference number subsequently so that we can easily trace any earlier correspondence.

In your enquiry, always quote instrument serial numbers, software version numbers, and the approximate date and source of purchase where these are relevant.

Contact Details:

Tech Support Team

Delta-T Devices Ltd

130 Low Road, Burwell, Cambridge CB25 0EJ, UK

email: tech.support@delta-t.co.uk

email: repairs@delta-t.co.uk

web: www.delta-t.co.uk

Tel: +44 (0)1638 742922

Fax: +44 (0)1638 743155

Troubleshooting

Problems

The Enclosure

- **Condensation** can occur inside the enclosure and lead to corrosion or electrical shorting. Please make sure that there is adequate desiccant that has been refreshed mounted inside. See the maintenance section for guidance.
- **Cable Glands** need to be tightened adequately and be aware that the cable diameter needs to be between 4 and 8mm in order for them to seal to specification. Please add sleeves to increase the diameter around the sealing area or fit different glands to accommodate larger diameters of cable.
- **Locks and keys** are sources of difficulty if they are allowed to corrode. Please ensure that water repellent is applied inside the lock when there is a risk of corrosion. All locks and keys are the same and interchangeable. In the event of loss or damage please contact your local representative for replacement(s).
- **Heat from solar radiation** can be problem. The inside of the enclosure can become 30°C greater than the outside air temperature. If this is likely please ensure that extra shading is created to accommodate the effects of the sun at its most powerful.
See also Mounting the Enclosure section for guidance.

The Data Logger

- **External power switch** must be made in order to benefit from an alternative external power supply. If this is not correctly positioned, the logger will be powered from the internal batteries whose life will be severely limited when there is a demand from external sensors.

- **See DL2e Hardware Reference** for more detailed information concerning problems encountered with this product. (Available on the Delta-T Software and Manuals DVD)

The Modem

- **SIM Card** needs to be data enabled in order to function correctly. Please make sure that when ordering this that the network provider confirm this.
- **LED status** needs to be checked to ensure that power is reaching the modem. See the LED status indication table on page 18.
- **Network problems** associated with low signal strength and coverage are linked to some network providers and geographical locations. Please check using a mobile phone or call the provider if there is a particular coverage problem. Mounting the enclosure in a different location away from obstructions such as trees and tall buildings can prevent or reduce such occurrences.
- **Baud rate matching** between the modem and the DL2e must be maintained at 4800 in order that data transferring can occur. See page 19.
- **Aerial/antennae** connection and mounting can be very important aspects of the correct function of the modem. Please make sure that all connections to the aerial are correctly made and that it is mounted as high as possible to maximise its ability to transmit and collect data.

Power Relays

- **Correct wiring** of the power relays is essential to their function. Please ensure that the terminals to each part of the relay are identified and the wiring diagram is correctly followed.
- **External Power** must be greater than 12v in order that the relay functions correctly. The red LED will illuminate when there is power at the relay.
- **DL2e Internal Jumper** must be in position in order that the logger's internal relay functions correctly. See the Hardware manual for further information and guidance.