Cello

GSM Data Logger

User Manual
Version 4
August 2008

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1 Introduction

The Cello is a data logger with integrated GSM capability for remote communications. It combines the multi-channel logging capabilities of Technolog data loggers with the versatility of the GSM network. A GPRS version is also available.

The Cello concept is suitable for a wide range of applications with versions available for applications in the clean water, waste water, gas and electricity sectors.

The following Cello versions are currently available:

Water Applications

- Two channel flow
- Two channel flow and one channel pressure (integral or external pressure sensor)
- Universal 8 channel
- Two channel internal/external pressure with up to 6 channel flow
- Two channel 4-20mA Loop powered with up to 6 channel flow
- Ultrasonic Level Detector (Certified Intrinsically Safe for use in Gas Zone 0, Equipment Group II, Category 1 to EEx ia IIC T4) (TA = -20 to +60°c)

Gas Applications (Cello IS: Certified Intrinsically Safe for use in Gas Zone 0, Equipment Group II, Category 1 to EEx ia IIC T4) (TA = -20 to +60°c)

- Two channel flow
- Two channel flow and one channel pressure (integral pressure sensor)
- One channel pressure (integral pressure sensor)
- Cathodic protection (non-IS version)
- Two channel flow and 2 channel state (Cello 6 detailed in a separate manual)

Electricity Applications

- Cello EM (Detailed in a separate manual)

The Cello as standard utilises SMS (Short Message Service) provided by the GSM network. In order to maximise battery life, Cello is programmed to wake up at regular intervals or, in the event of an alarm, to send the latest data, alarms and other information across the network to a host PC running Technolog PMAC Plus software.

Data may be sent from several thousand Cellos simultaneously to one PC. The system allows data messages to be received in a controlled manner and avoids loss of information. If, for any reason, messages are lost by the GSM network, PMAC will recognise this as a data gap and request the missing data to be resent. Similarly, if a Cello is unable to send data messages due to poor signal strength etc., these will be sent the next time Cello connects to the GSM network.

The Cello supports high and low threshold alarms, windowed alarms and profile alarms on each channel. Alarms can be set remotely using the PMAC Alarm Wizard software on the host PC. Cello will send an alarm message to the host PC at the next logged interval after alarm limits are exceeded. Data can also be sent with the alarm and, if required, data can

be sent at more frequent intervals after an alarm for a user-defined period, for example, every hour for 6 hours.

An Hourly wake-up build option of the Cello is available. With this variant it is possible to poll the Cello to retrieve the most recent data.

When the Cello starts recording, the contents of its notepad are sent to the host PC. The notepad details are stored in a 'logger settings' file and can be viewed from the site database. Should there be any further changes made locally to the Cello notepad, the new notepad details are automatically sent to the host PC and the logger settings file is updated.

2 Preparing a Host Computer for use with Cello

Technolog's PMAC Plus software (issued August 2000 or later) should be installed on the host PC. The software installation procedure is detailed separately in the PMAC user manual.

Please note that there are regular software upgrades. It is recommended that the latest version of PMAC Plus should be utilised wherever possible.

2.1 Communications Devices

A communications device is required to receive data messages (Cello data) from the GSM network. There are several methods of providing a connection between the host PC and the GSM network. This manual covers the three most popular connection methods, the Falcom A2D or Tango GSM modem used throughout the world, the Vodafone Paknet Radio-PAD (for use with the UK Vodafone network only) and the Utility Data Network (UDN). Note that the Vodafone RadioPAD consists of two communications devices housed in a single package requiring only one antenna.

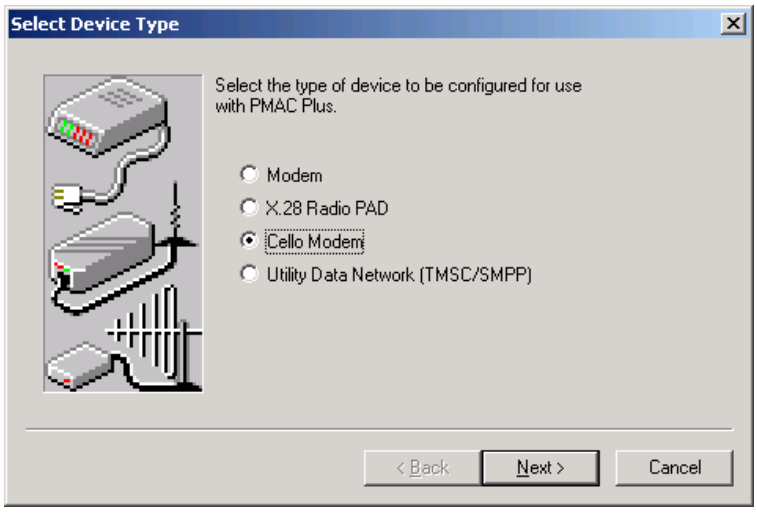
The choice of communications device depends on several factors including the country, GSM tariffs, number of Cellos etc. Please consult Technolog for specific advice on the most suitable communications device.

One or more modems can be configured in PMAC to receive Cello data, as shown below. In the case of multiple modems being used, each modem requires its own serial port (a Vodafone RadioPAD requires two serial ports to make use of both NUAs).

2.2 Adding a Communications Device to PMAC Plus – Modems and radioPADs

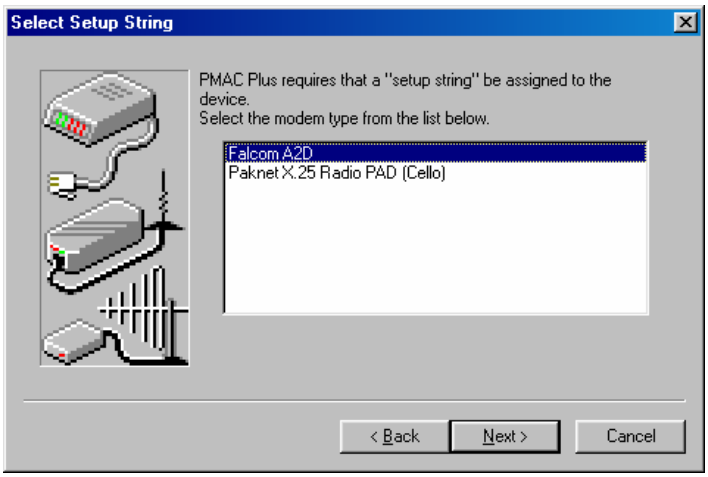
Connect the communications device to an available serial port (comms port) on the host PC, log in as a System Manager and proceed as follows:

(i) Click on the 'Devices' tab in the PMAC Communications Settings window. Click on Add… Select **Cello Modem** and then **Next**.



(ii) **Select Communication Port** is now displayed. Select the comms port to which the modem is attached and select **Next**.

(iii) The 'Select Setup String' window will now appear. Choose the modem you have attached and then select **Next**.



(iv) You are now required to select the Cello Baud Rate. This should be set according to the modem type as follows:

GSM modems (Falcom A2D or Tango): 9600 baud

X.25 Radio PAD: 4800 baud

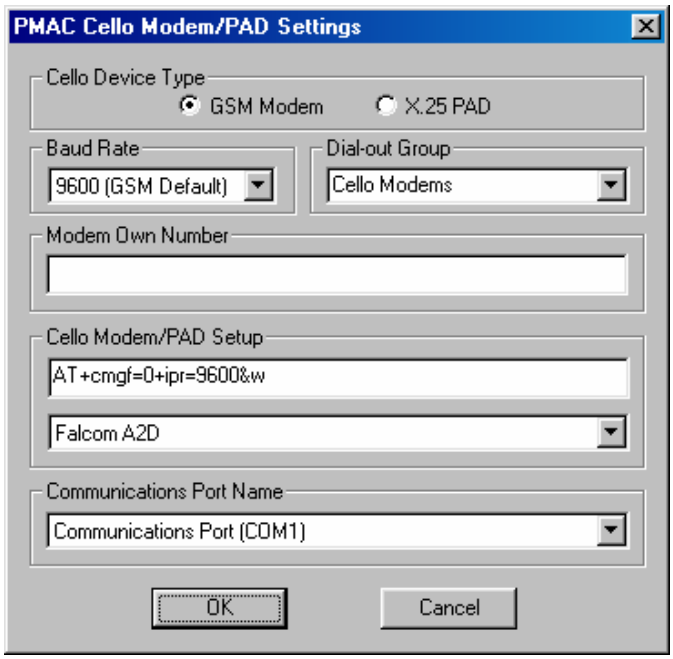
Select **Next**.

(v) Choose the Dial-out Group you wish your modem to belong to. Normally this would be Cello Modems. Select **Next**.

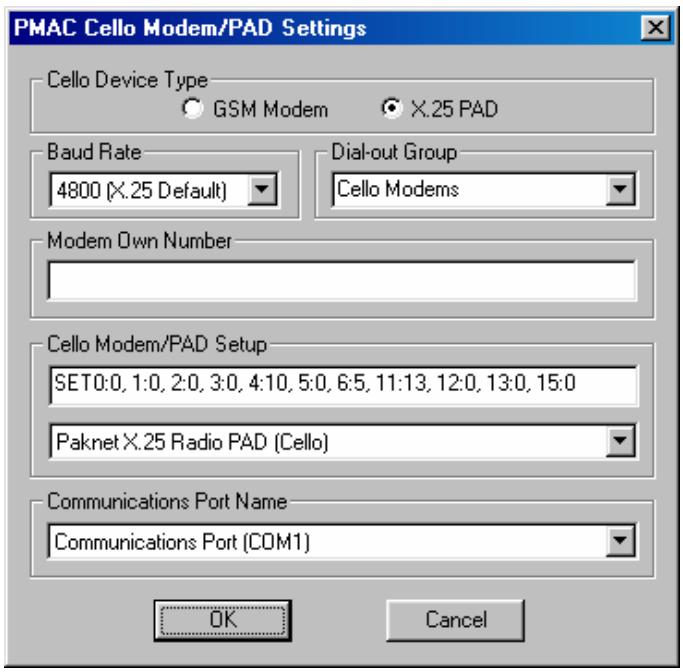
(vi) Choose a name to identify your modem within PMAC Plus and select **Finish**. The Cello modem will now be added to PMAC and is ready for use.

(vii) Complete the 'Modem Own Number' box in the modem properties. Double-click on the newly installed modem in the PMAC Communication settings and selecting **Properties**. Depending on the type of modem installed, one of the following windows will be displayed:

GSM modem (enter the telephone number of the GSM SIM card in either 07 or +447 format)



X25 RadioPAD (enter 23533900 followed by the six digit NUA of the Radio PAD). If both NUAs of the RadioPAD are to be used, each NUA should be set as a separate Cello modem. Two port cables are available to connect a RadioPAD to the two computer serial ports.

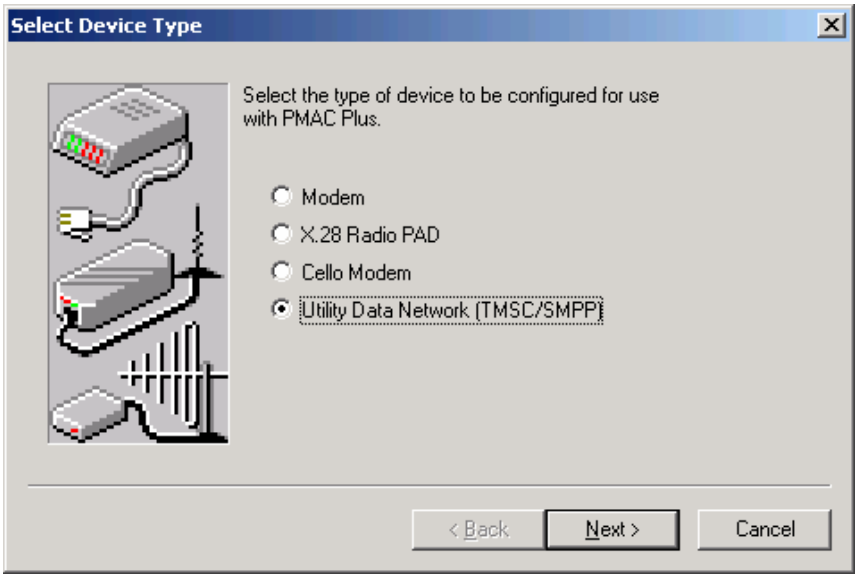


2.3 The Utility Data Network (UDN)

The Utility Data Network (UDN) allows the user to receive Cello data through a dedicated internet link as opposed to external modems. The UDN is a receiving, storage and routing facility that can process many thousands of messages in a minute. The benefits of this system include complete redundancy as two external connections are made to receive the data, 30 day backup of all messages, re-send of data during working hours, storage of all undelivered messages indefinitely if receiving PC fails for example and much faster receipt of messages. Messages are not opened or interpreted at Technolog; the presence of the UDN between the GSM network and customer host PMAC PC is transparent to the user.

UDN accounts have to be set up at Technolog and also on the host PC; contact your Technolog representative for account details. The host PC connection is configured through the PMAC Communication Settings window, following the opening of Port 8100 in your software and/or hardware firewall.

(i) Click on the 'Devices' tab in the PMAC Communications Settings window. Click on Add… Select **Utility Data Network (TMSC/SMPP)** and then **Next**.



(ii) Select TMSC 1 from the drop down menu and then **Next**.

(iii) Insert your account name and Password as supplied by Technolog and then **Next**.

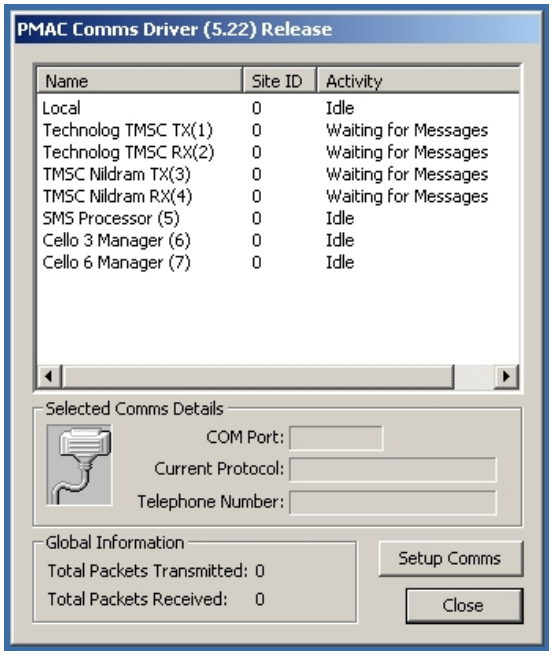
(iv) Select Dial-out Group Utility Network and then **Next**.

(v) Insert your required connection name and then **Next**.

(vi) Select **Finished**.

(vii) Repeat for the second TMSC connection

The TMSC connection can be verified by looking in the PMAC Comms Driver after you have installed both TMSC connections and closed the PMAC Communications Settings window. A correctly configured system will have a pair of connections stating 'waiting for messages' for each TMSC connections you set up. A response of 'Failed to connect to SMPP Server' would indicate either incorrect account details or that the firewall port has not been opened.



3 Installation

The Cello is housed in an enclosure that allows installation in the typical environments found in the gas and water utilities. This includes 'domestic water meter boundary boxes', 'district water meter chambers', 6" x 6" underground chambers and above ground kiosks.

A wall mounting bracket also is available.

(i) For further details of installations in Non-I.S. applications, refer to the latest revision of Technolog document UG583000 (Cello Mk.3) or UG5A3000 (Cello Mk.4) as applicable.

(ii) For further details of installations in I.S. applications refer to the latest revision of Technolog Document UG593000.

TIP: The PMAC SMS system can be used to automatically confirm that Cello is correctly setup in the PMAC site database. PMAC SMS is described separately in the PMAC SMS manual

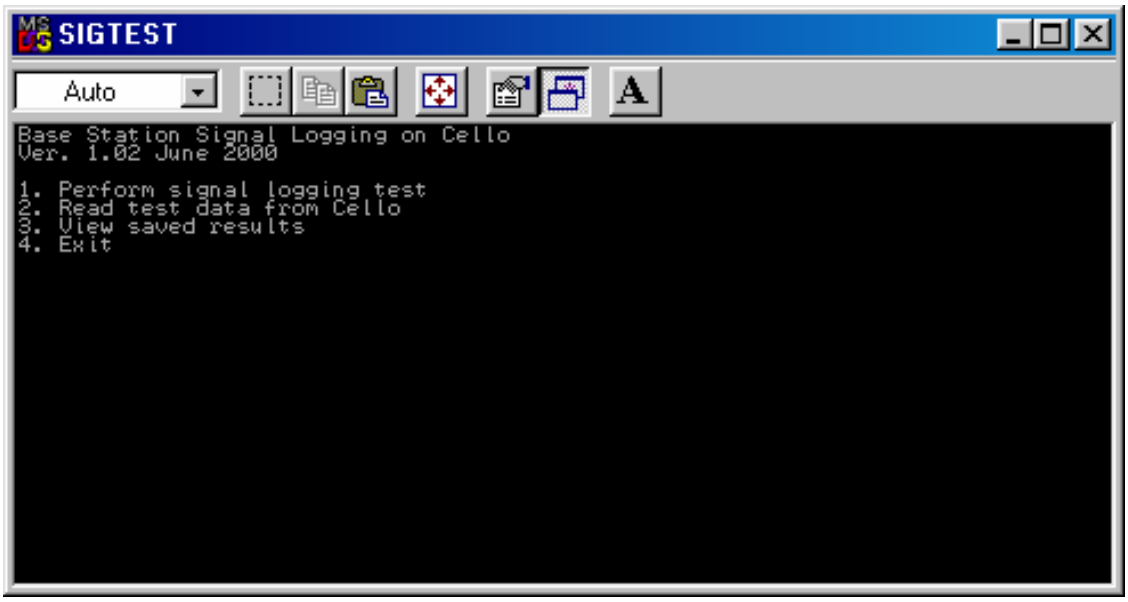
3.1 Signal Strength Test

Note : In I.S. applications, the associated Fast Barrier Unit ('FBU') must be located in the 'safe' area along with the P.C.

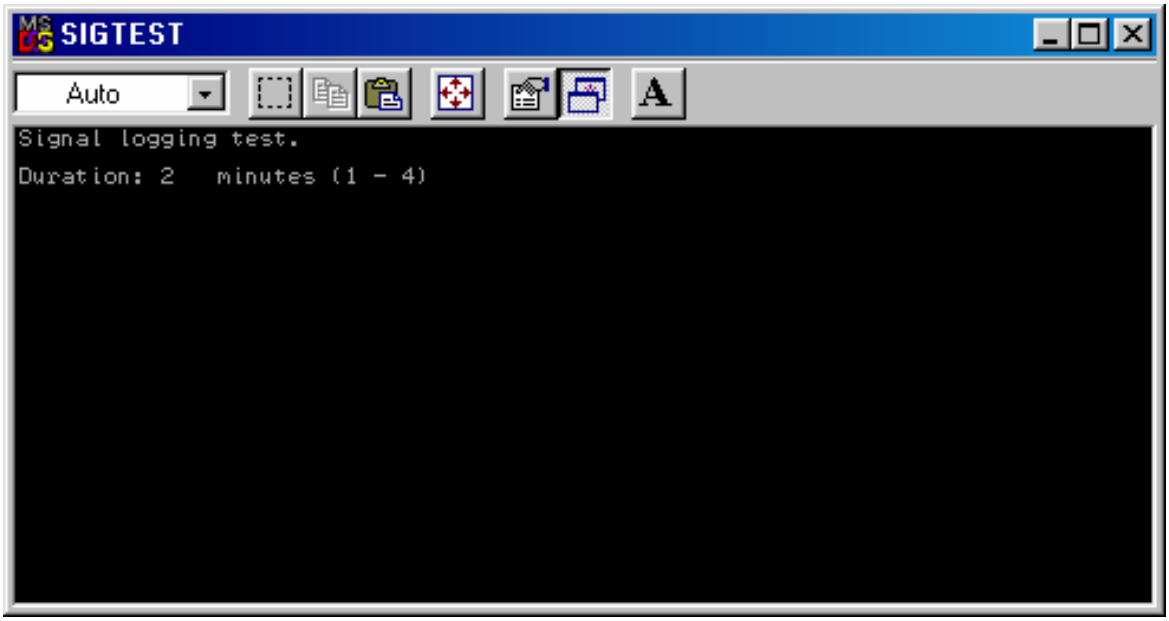
(i) Configure the Cello for signal strength testing (cesigtsa.cfg). Section 3.2 provides instruction on configuring Cello using selected software.

(ii) Execute the signal strength test program and a DOS window will appear with the following menu.

(iii) Choose option **1** to perform the test.



The following screen will appear:



Enter the duration of the test (a minimum of 2 minutes is recommended) and press **RETURN**. Then press **1** to start the test.

(iv) Disconnect the communication cable and place the Cello as close as possible to its anticipated location. If installing in an underground location, ensure that the Cello is raised as high as possible to improve the signal strength (but not within two inches of any metal part of the chamber lid, as this can disrupt the outgoing signal).

The PC will indicate the remaining time to complete the test and will report when the test is complete. When the test is complete, press **any key** to return to the **main menu**.

Note: If the Cello is located under a metal cover and the test reveals inadequate signal strength, a meter boundary box (with a plastic cover), or similar, should be considered. In this case, the test should be repeated but with the Cello placed above ground and adjacent the chamber.

(v) Choose option **2** to read the test data. Connect the communication cable to the Cello and press any key. The program will then read the signal strength data from the Cello.

(vi) Enter the site details as required. The data will be stored in the same directory as the Signal Strength Test program with the format xxxx_01.sig (proprietary format) and xxxx_01.txt (text format), where: xxxx is the 4-digit id for the site. You will then be returned to the main menu.

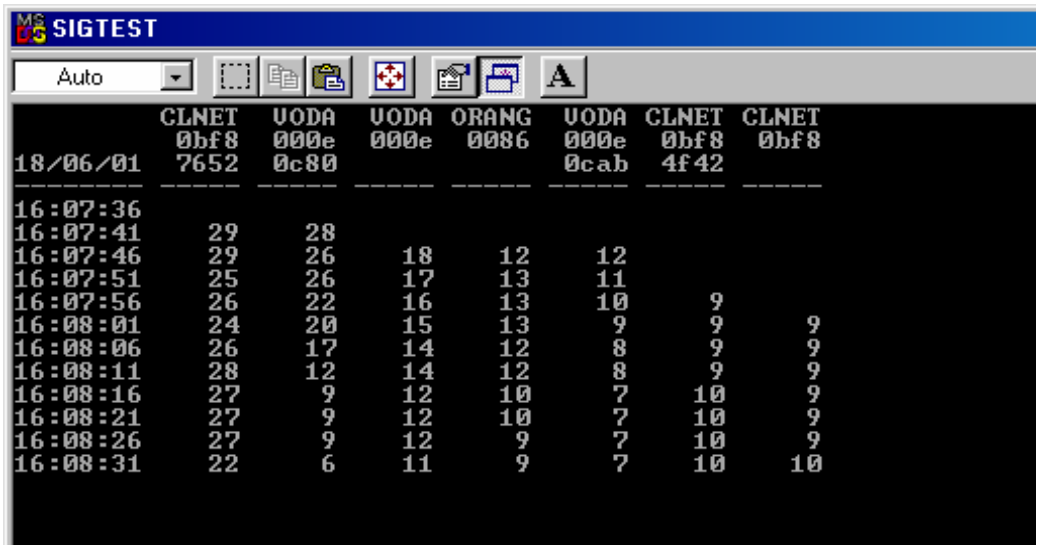
(vii) Choose option **3** to view the data and then **1** to view the most recent file or **3** to view a different file.

(viii) The data will appear as a list of base stations (GSM radio transmitters) and signal strengths as below. The greater the value, the better the signal strength. The maximum signal strength is 63.

Signal strength greater than 13 for the duration of the test is normally required to ensure satisfactory operation at all times.

The example below shows the results of a 1 minute test.

For the above test, a Cello with a Cellnet sim would be selected as the first choice of GSM service provider as signal strength is greater than 13 for the duration of the test. Press **Esc** to return to the main menu and then choose option **4** to exit the program.



18/06/01	CLNET 0bf8 7652	VODA 000e 0c80	VODA 000e	ORANG 0086	VODA 000e 0cab	CLNET 0bf8 4f42	CLNET 0bf8
16:07:36							
16:07:41	29	28					
16:07:46	29	26	18	12	12		
16:07:51	25	26	17	13	11		
16:07:56	26	22	16	13	10	9	
16:08:01	24	20	15	13	9	9	9
16:08:06	26	17	14	12	8	9	9
16:08:11	28	12	14	12	8	9	9
16:08:16	27	9	12	10	7	10	9
16:08:21	27	9	12	10	7	10	9
16:08:26	27	9	12	9	7	10	9
16:08:31	22	6	11	9	7	10	10

(ix) If the Cello has a SIM card fitted, only base stations for that particular GSM service provider will be reported. For example, if the test is performed using a Cello with a Vodafone SIM card fitted, only Vodafone base stations would be reported.

To search all available networks a Cello without a SIM card fitted should be used. Performing a test with such a Cello will bring back results from the strongest base stations, regardless of network.

3.2 Configuration and Setup

The setup procedure is performed by connecting the Cello communications port to a computer installed with Technolog software. Several computer types and operating systems are supported. This User Guide describes the procedure for the PC General Purpose Software (GP1 and GP2), PC PMAC Plus and PMAC Lite software, Psion Workabout Dragons software and PDA Pocket PMAC software. Cello Wizard software for PC and PDA is also suitable and is covered in a separate manual.

Note : Cello I.S. requires a 'Fast Barrier Unit' ('FBU') to be interposed in the 'safe' area, between the Cello I.S. and the P.C. (or other).The following stages should be completed in order:

(i) Connect Cello to the host PC
(ii) Configure Cello for an application
(iii) Enter site details in the Cello Notepad
(iv) Set the remote communications parameters
(v) Set the Cello clock
(vi) Check inputs signals and adjusting offsets
(vii) Start recording

Please refer to the relevant software user guides for further information.

IMPORTANT: Cellos supplied in the UK with prepaid GSM service charges will require activation. To activate a Cello, contact Technolog Cello Support (+44 (0)1629 823611). The Cello Serial Number will be required. If the Cello is not activated it will cease transmitting data after approximately 5 days (depending upon configuration).

3.2.1 PC GPX Software

Version x.46 or later versions of the Technolog GPS software should be installed on the host PC. The software installation procedure is detailed separately in the GPS user manual.

(i) Connecting Cello to the host PC

Connect the PC serial port to the Cello communications port (4-pin connector).

Note: Cello IS requires a 'fast barrier unit' (FBU) to be interposed between the PC and the Cello IS.

(ii) Configuring Cello for an application

Execute the GPS software and proceed as follows:

From the Main Menu	Select **NEWLOG**
From the Communication Menu	Select **LOCAL**
From the Newlog Menu	Select **SETUP**
From the Setup Menu	Select **CONFIGURE**
From the Configure Menu	Select **LOGGER**

Select the required config file and press **RETURN** to send the file to the Cello. To view details of the file before selection, press F2.

Note: Configuring any logger will overwrite any data currently stored in the logger.

The Cello is now configured for the application.

(iii) Entering site details in the Cello Notepad

Enter the site details and PMAC ID

From the Main Menu	Select **NEWLOG**
From the Communication Menu	Select **LOCAL**
From the Newlog Menu	Select **SETUP**
From the Setup Menu	Select **NOTEPAD**

The Cello Notepad will be displayed. The precise details will be dependent on the configuration file but will generally be as follows:

Site name: _____ (Enter the **Site Name**)

Site No.: _____ (Can be left blank)

PMAC ID: _____ (Enter the unique four digit **PMAC ID**)

Other channel specific fields may be displayed. These would include, for example, the pressure range for a pressure channel or the flow scale factor for a flow channel.

When the Notepad has been entered, the following menu is displayed:

REVIEW
WRITE
PRINT
QUIT

Select **WRITE** to transfer the changes to Cello.

Press **ESCAPE** to the return to the Newlog Menu.

(iv) Setting the remote communications parameters

Enter the remote communications parameters as follows:

From the Newlog Menu	Select **REMOTE**
From the Remote Menu	Select **ALARMS**

A window will appear containing the alarm details. In most cases these should not require change.

Press **ENTER** for each field until the next screen appears containing the dial-out details. Two changes are to be made to this screen.

Time: 05:00 Disabled

(the time of day that Cello sends data to the host PC)

Highlight the word **Disabled** and press the '-' (minus) key to change to **Enabled**.

Secondly,

Data message number:

Add the number of the host PC communications device that will receive the data. For Cellos using the UK Vodafone network, this will be **23533900** followed by the six-digit NUA of the RadioPad e.g. **23533900123456**. For UK TMSC Cellos this will be **81714**.

Once this has been completed, press **ENTER**.

The following menu will appear:

REVIEW
WRITE
QUIT

Select **WRITE**, this will write the information to the Cello and return you to the Setup menu.

(v) Setting the Cello clock

All Cellos used in the UK should be permanently set to GMT.

Select **CLOCK** from the setup menu. The current date and time of the PC and Cello are displayed. The PCs date and time can be set by pressing function key 1 **(F1)**. Press **ENTER** to set the Cello clock to the PC clock.

IMPORTANT: Do not press ENTER before ensuring the PC clock is correct. For UK systems ensure the PC is set to GMT at all times*.*

(vi) Checking signal inputs and adjusting offsets

From the Newlog Menu	Select **STATUS**
From the Status Menu	Select **INPUT**

The 'live' reading for the first channel will be displayed. If the reading appears to be incorrect, this may be due to the scale factor entered in the Notepad being incorrect or the offset requiring adjustment.

If the input requires zeroing, or the offset to be adjusted, this is achieved as follows:

From the Newlog Menu	Select **STATUS**
From the Status Menu	Select **INPUT**

Press **F1** and overtype the displayed value with the required value e.g. 0 for a pressure channel.

Press the **SPACE** key to change to the next channel and check all enabled channels.

IMPORTANT: Cellos with an integral pressure sensor must always be zeroed after configuration!

Press **ESCAPE** twice to return to the Newlog menu.

(vii) Starting recording

Select **START/STOP**

The current Cello status will be presented. This should read as follows:

Cello 3.xx is at Standby (where xx is the firmware version)
Ready to start immediately
Rotating store mode
10 sec. time resolution

The following menu will also be displayed:

Clr+Start
Pre-set
Mode
Time res.
Quit

Select **Clr+Start**.

The Cello will now commence logging.

The Cello will automatically send its logger settings details to the PMAC PC, and the site will be created in the PMAC database.

The setup is now complete.

Disconnect the PC/Laptop from the Cello/FBU.

IMPORTANT: Ensure that the dustcaps are fully tightened as the Cello is unlikely to be visited regularly. Do not use lubricant on Cello connectors!

3.2.2 PC PMAC Software

Technolog's PMAC Plus (versions issued August 2000 or later) or PMAC Lite (versions issued July 2005 or later) should be installed on the host PC. The software installation procedure is detailed separately in the appropriate software user manual.

(i) Connecting Cello to the host PC

Connect the PC serial port to the Cello communications port (4 way connector).

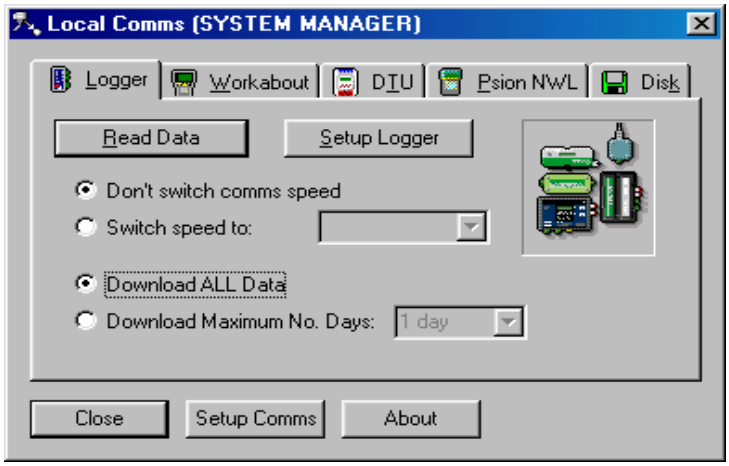
Note: Cello IS requires a 'fast barrier unit' (FBU) to be interposed between the PC and the Cello IS.

(ii) Configuring Cello for an application

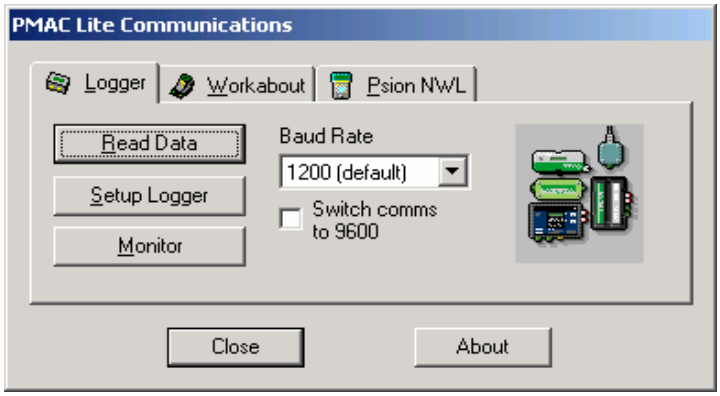
Execute the PMAC software and proceed as follows:

For PMAC Plus, from the PMAC Main Window, choose **Local Comms** and click on the **Logger** tab. For PMAC Lite select the **Local Communications** button from the PMAC Lite toolbar

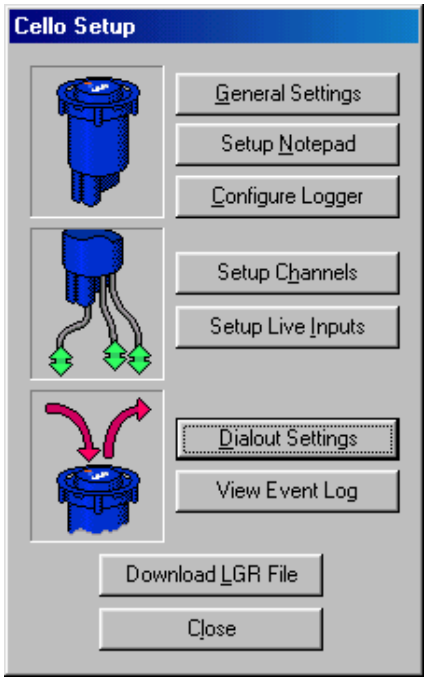
PMAC Plus:



PMAC Lite:



Select **Setup Logger** to display the Cello Setup window.



Click on **Configure Logger** and select the configuration file required for the application.

Click on **Open** to write the configuration to Cello. You will be prompted to either close the window or configure another logger once this process is complete.

Note: Configuring any logger will overwrite any data currently stored in the logger.

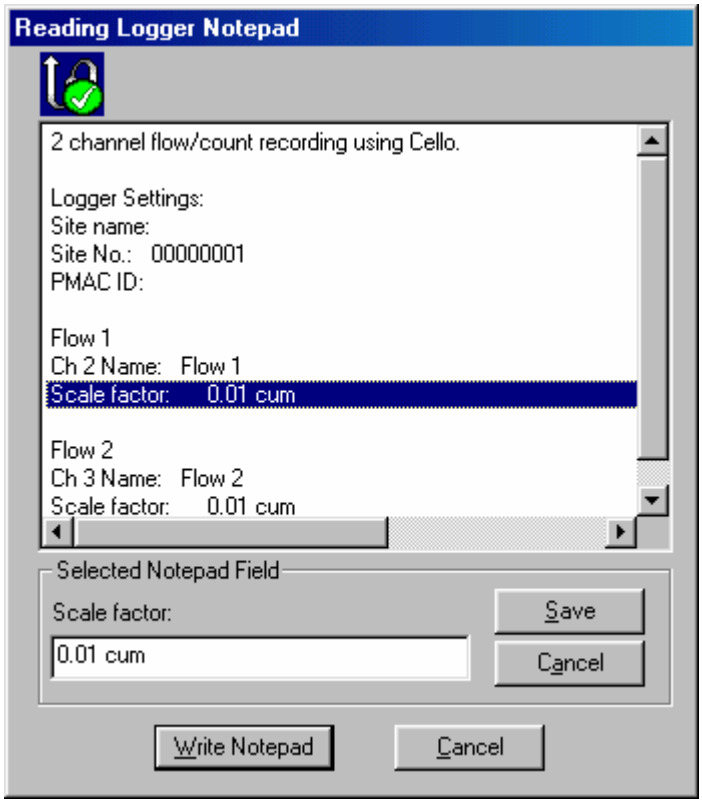
The Cello is now configured for the application.

(iii) Entering site details in the Cello Notepad

From the Local Comms menu, click on the **Logger** tab.

Select **Setup Logger** to display the Cello Setup window.

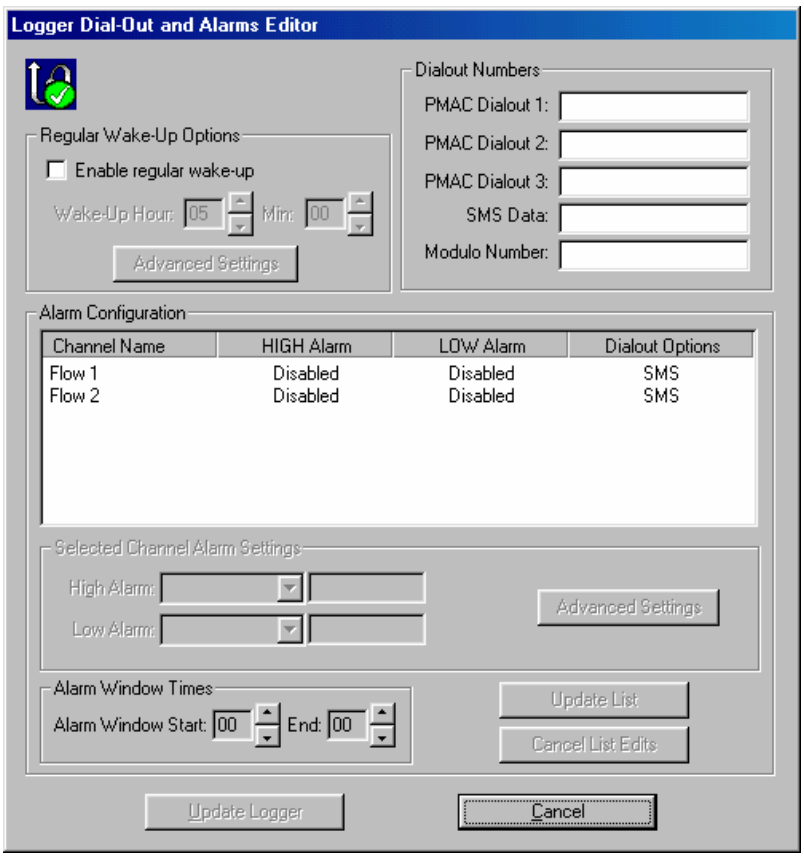
Choose **Setup Notepad**. The Cello Notepad will be displayed. The precise details will be dependent on the configuration file but will generally be as follows:



This would normally include Site name, Site No. and PMAC ID, all of which may be edited. Click on each one in turn and enter the site specific details. Additional lines relate to the individual channels and would include, for example, the pressure range for a pressure channel or the flow scale factor for a flow channel. Select **Write Notepad** to save the details to Cello.

(iv) Setting the remote communications parameters

Select the **Dial-Out Settings** button to display Logger Dial Out and Alarm Editor window.



First, tick the box **Enable regular wake-up**.

Second, enter the number of the host PC communications device that will receive the data into the **SMS Data** field. For Cellos using the UK Vodafone network, this will be **23533900** followed by the six-digit NUA of the RadioPad e.g. **23533900123456**. For UK TMSC customers this will be **81714**.

If required, the Logger **Wake-Up Hour** can be changed.

Once completed click **Update Logger** to return to the Cello Setup Window.

(v) Setting the Cello clock

The Cello clock can be set at any time during the setup procedure by clicking on the **General Settings** option in the Cello Setup window and choosing **Sync to PC Time**.

IMPORTANT: Do not exit before ensuring the PC clock is correct. For UK systems ensure the PC is set to GMT at all times.

(vi) Checking signal inputs and adjusting offsets

Select **Setup Live Inputs** from the Cello Setup window.

The Input configuration for the first channel will be displayed. If the reading appears to be incorrect, this may be due to the scale factor entered in the Notepad being incorrect or the offset requiring adjustment.

If the input requires zeroing, or the offset to be adjusted, this is achieved as follows:

Zeroing an input channel

Apply a signal representing zero (e.g. for a pressure channel, vent the pressure port to atmosphere) then select **Set Input** followed by **Zero Input**. Select **Close** to return to the Cello Setup window.

Select the <Prev Channel or Next Channel> buttons to change to the next channel. Check all enabled channels.

IMPORTANT: Cellos with an integral pressure sensor must always be zeroed after configuration!

Adjusting the offset for an input channel

Apply a signal representing a known value and select **Set Input.** Overtype the displayed value with the required value and select **Write Changes** to return to the Cello Setup window.

(vii) Starting recording

Choose the **General Settings** option in the Cello Setup window and select **Start Logger**. PMAC will now start the Cello logging.

The Cello will automatically send its logger settings details to the PMAC Host PC, and the site will be created in the Host PC PMAC database.

The setup is now complete. Close down the **Local Comms** window and disconnect the PC/Laptop from the Cello/FBU.

IMPORTANT: Ensure that the dustcaps are fully tightened as the Cello is unlikely to be visited regularly. Do not use lubricant on Cello connectors!

3.2.3 Psion Workabout DRAGONS Software

The Technolog DRAGONS software can be navigated using either the Menu key to present a list of options, or by using the 'Psion shortcut' method. This User Guide assumes the use of shortcuts.

To enter a shortcut, hold down the key labelled **u** whilst briefly pressing the letter of the shortcut. For example, the shortcut for Interrogate is **uI**, this is entered by holding down the **u** key whilst briefly pressing the **I** key.

All of the setup menus are accessed by interrogating the Cello. Whilst in this mode, a power save feature operates to conserve the Cello's internal battery. After interrogating the Cello, if a key is not pressed for approximately 120 seconds, the interrogation is halted and information that has been entered during that session may be lost. A warning sound is produced after approximately 90 seconds of not pressing a key.

Version 1.11ß16 or later of the Technolog DRAGONS software should be installed on the host PC. The software installation procedure is detailed separately in the DRAGONS user manual.

(i) Connecting Cello to the Psion Workabout

Connect the Workabout RS232 port to the Cello communications port (4 way connector).

Note: Cello IS requires a 'fast barrier unit' (FBU) to be interposed, in the 'safe' area, between the PC and the Cello IS.

(ii) Configuring Cello for an application

Execute the DRAGONS software and proceed as follows:

Enter the shortcut **uI** to interrogate the Cello.

Enter **uO** to display the configuration window and use the cursor keys to select the required configuration file. Once chosen, press **Enter** to configure the Cello. The Cello will now be configured for the application.

(iii) Entering site details in the Cello Notepad

Enter **uN** to display the Notepad details.

The precise details will be dependent on the configuration file but will generally be as follows:

Logger details
Site name:
Site No.: 00000001
PMAC ID:

This would normally include Site name, Site No. and PMAC ID which are all editable. Use the cursor keys and the **Enter** key to enter the required details for each field. Other fields would include details for individual channels, for example, the pressure range for a pressure channel or the flow scale factor for a flow channel.

Once complete, press **uX** to exit the Notepad window. Press **Enter** to write the changes to Cello.

(iv) Setting the remote communications parameters

Enter **uI** to interrogate the Cello
Enter **uA** to display the Remote/Alarms menu
Enter **uD** to change the Dial-Out Settings

Use the cursor keys to highlight the line and press **Enter** and change the details.

Enter the number of the host PC communications device that will receive the data into the **Host PC Number** field. For Cellos using the UK Vodafone network, this will be **23533900** followed by the six-digit NUA of the RadioPad e.g. **23533900123456**. For UK TMSC customers this will be **81714**.

If required, the **Logger Dial-out time** can be changed.

Once completed, press Enter **to return to the Remote/Alarms menu.**

Enter **uR** to enable the Regular Dial-Out and then press **Enter**. Enter **uX** to exit.

(v) Setting the Cello clock

All Cellos used in the UK should be permanently set to GMT.

Enter **uL** to display the current date and time of the Workabout and the Cello.

Press **ENTER** to set the Cello clock to the Workabout clock.

IMPORTANT: Do not press ENTER before ensuring the Workabout clock is correct. For UK systems ensure the Workabout clock is set to GMT at all times. BST.

(vi) Connecting the Cello for pressure measurement with Dragons

From the interrogated Cello menu press **uI** to check the logger input. After a short delay the current pressure input measurement will appear. Ensure that this is zero before connecting the Cello by pressing **Shift+Ctrl+Enter** to zero the input.

(vii) Checking signal inputs and adjusting offsets

Enter **uI** to display the inputs.

The 'live' reading for the first channel will be displayed. If the reading appears to be incorrect, this may be due to the scale factor entered in the Notepad being incorrect or the offset requiring adjustment.

If the input requires zeroing, or the offset to be adjusted, this is achieved as follows:

Zeroing an input channel

Apply a signal representing zero (e.g. for a pressure channel, vent the pressure port to atmosphere) then hold down the **Shift**, **Ctrl** and **Enter** keys together.

Use the ← or → keys to change to the next channel. Check all enabled channels.

IMPORTANT: Cellos with an integral pressure sensor must always be zeroed after configuration!

Adjusting the offset for an input channel

Apply a signal representing a known value and hold down the **Shift**, **Ctrl** and ***** keys**.** Overtype the displayed value with the required value and select **Enter**.

(viii) Starting recording

Enter **uZ** to toggle the recording status.

Select **Enter** to start recording.

The Status, date & time, PMAC ID, timebase and recording mode will now be displayed.

IMPORTANT: Ensure that the dustcaps are fully tightened as the Cello is unlikely to be visited regularly. Do not use lubricant on Cello connectors!

3.2.4 PDA Pocket PMAC Software

Version 1.7 or later of the Technolog Pocket PMAC software should be installed on the host PDA. The software installation procedure is detailed separately in the Pocket PMAC user manual.

(i) Connecting Cello to the PDA

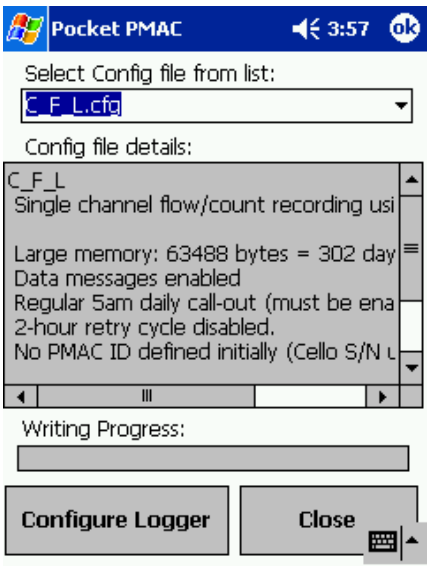
Connect the PDA to the Cello communications port (4 way connector) using the PDA – logger cable (Supplied by Technolog) and the PDA serial cable (supplied with your PDA).

Note: Cello IS requires a 'fast barrier unit' (FBU) to be interposed in the 'safe' area, between the PDA and the Cello IS.

(ii) Configuring Cello for an application

Execute the Pocket PMAC software and proceed as follows:

From the Pocket PMAC Main Window, Select Setup Logger to display the Setup Logger Window followed by Configure. Select the configuration file required for the application from the drop down menu and choose Configure Logger. The Cello will now be configured for your chosen application. When complete, select Close to return to the Setup Logger window.

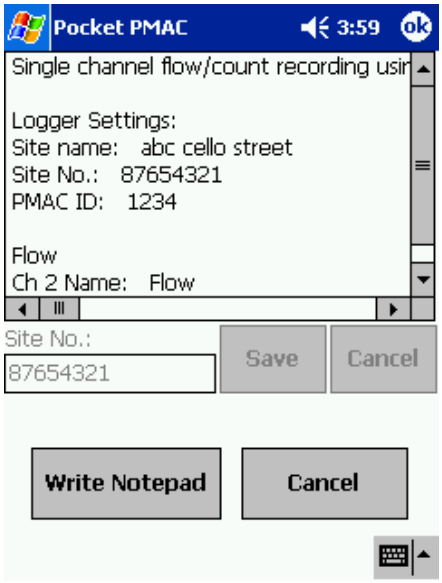


Note: Configuring any logger will overwrite any data currently stored in the logger

(iii) Entering site details in the Cello Notepad

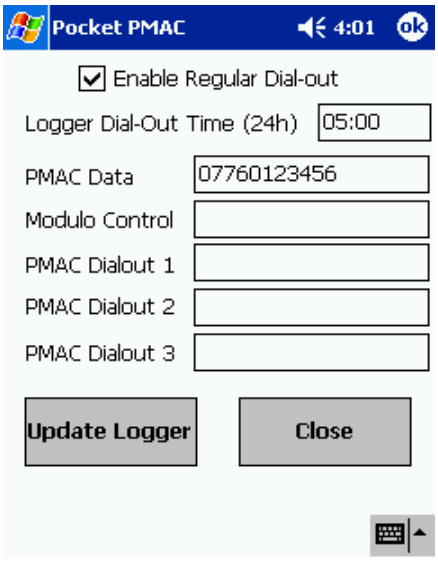
From the main menu on Pocket PMAC, select Setup Logger followed by Setup Notepad. The Cello Notepad will be displayed. The precise details will be dependent on the configuration file but will generally be as shown on the next page:

This would normally include Site name, Site No. and PMAC ID which are all editable. Click on each one in turn and enter the site specific details using the pop-up keyboard. Additional lines relate to the individual channels and would include, for example, the pressure range for a pressure channel or the flow scale factor for a flow channel. Select Save After amending each line followed by Write Notepad to write the details to the Cello and return you to the Setup Logger menu.



(iv) Setting the remote communications parameters

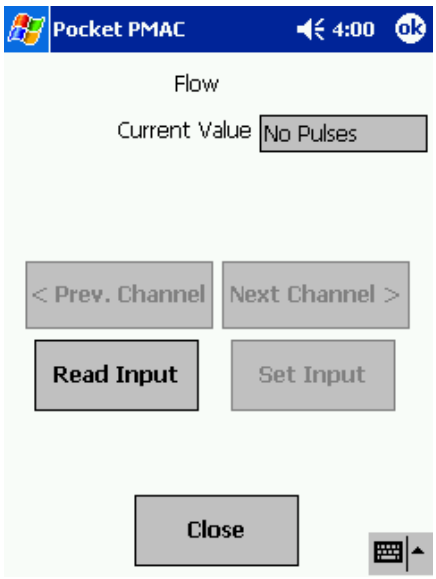
Select Dial-out Settings-> from the Setup Logger window and then select Setup Dial-Out. Tick the 'Enable Regular Dial-out' box and change the 'Logger Dial-Out Time' if required. Enter the number of the host PC communications device that will receive the data into the **PMAC Data** field. For Cellos using the UK Vodafone network, this will be **23533900** followed by the six-digit NUA of the RadioPad e.g. **23533900123456**. For UK TMSC Cellos this will be **81714** For other Cellos this will be the phone number of a GSM modem. Choose Update Logger to save these details to the Cello and then choose Close.



(v) Checking signal inputs and adjusting offsets

Select Set Inputs from the Setup Logger window. The 'live' reading for the first channel will be displayed. If the reading appears to be incorrect, this may be due to the scale factor entered in the Notepad being incorrect or the offset requiring adjustment.

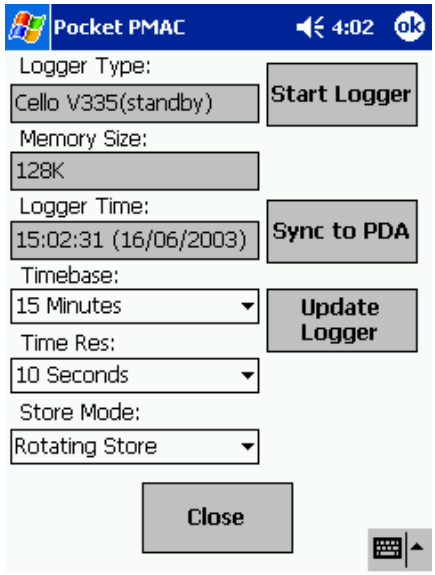
If the input requires zeroing, or the offset to be adjusted, this is achieved as follows: choose the channel and select Set Input followed by Zero Input. Ensure that all pressure channels (if fitted) are zeroed before continuing.



NB: ***Cellos with an integral pressure sensor must always be zeroed after configuration!***

(vi) Setting the Cello clock and starting recording

Select Start/Stop, Status + Clock. Ensure that the Cello is set to the correct time by clicking Sync to PDA. Obviously you will need to ensure that your PDA clock is set correctly. Finally select Start Logger. The Cello will commence logging. The Pocket PC may now be disconnected.



IMPORTANT: Ensure that the dustcaps are fully tightened as the Cello is unlikely to be visited regularly. Do not use lubricant on Cello connectors!

4 Additional Features

4.1 Cello Alarms

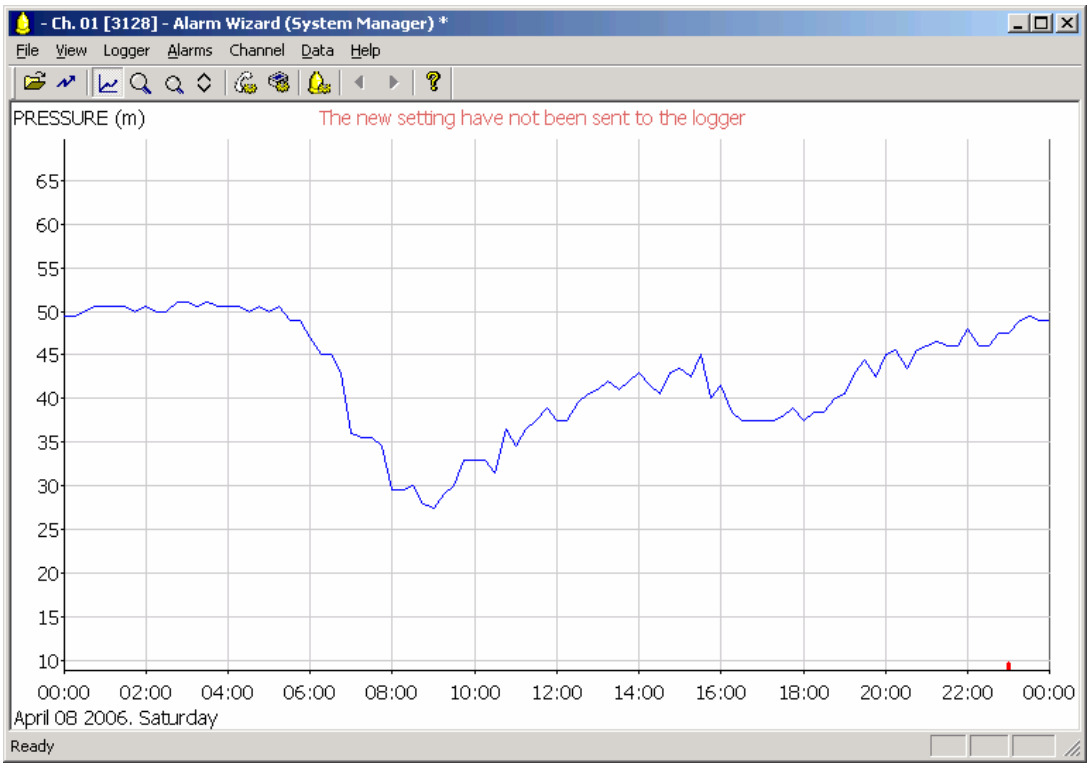
Cello supports three types of alarm strategy. These are high and low threshold alarms, high and low threshold alarms that operate only during a preset time window (windowed alarms) and profile alarms. All alarms can be programmed using the PMAC Plus Alarm Wizard software.

To amend or save Cello alarms, execute PMAC and login with System Manager privileges.

(i) Execute the Alarm Wizard for your chosen site. The alarm wizard icon is displayed as a Bell in the top line of the site database screen for all sites where alarms are possible.

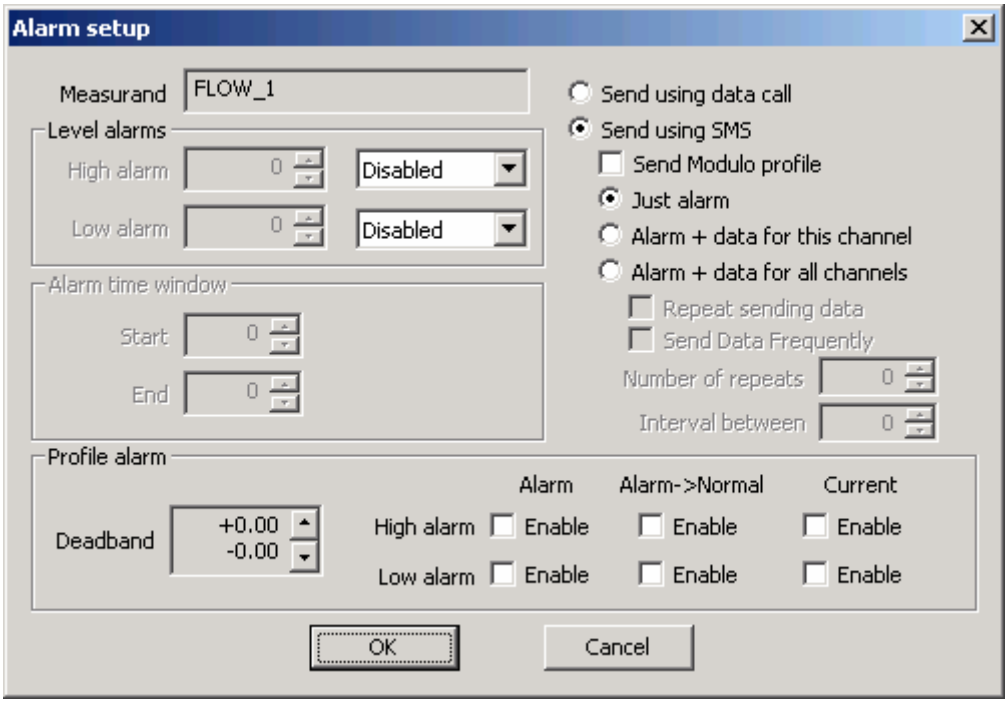
(ii) Click on File-> Open and load the .dat file for the particular channel of the Cello you wish to create alarms for.

(iii) One day of data for the channel of data selected will be displayed. Use the arrow keys in to move around the data.

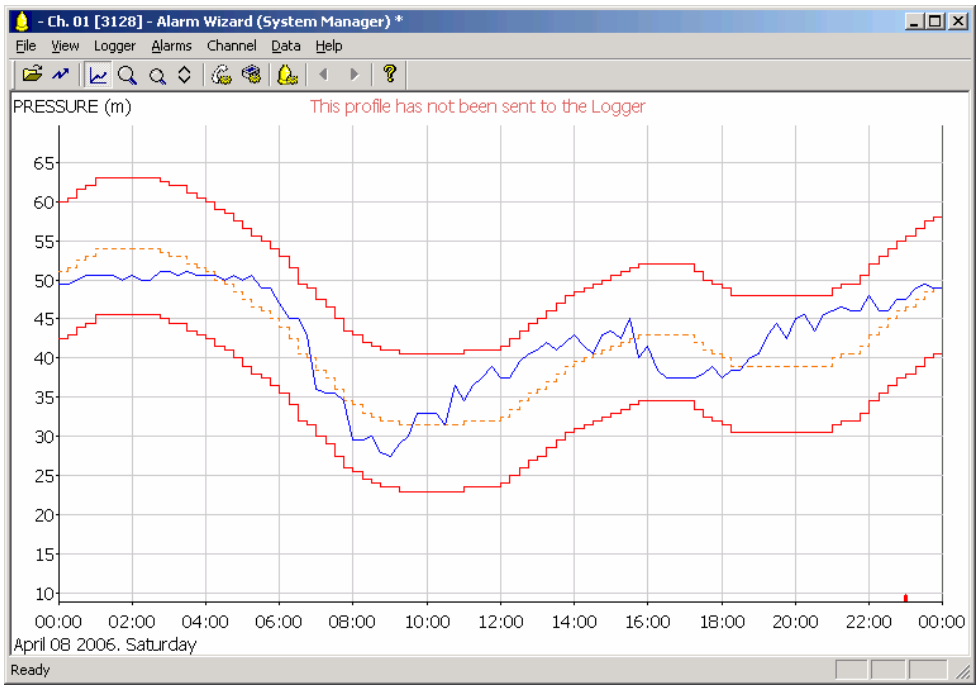


The red mark at the bottom of your screen is the time that Cello transmits data.

(iv) Select **Alarms** then **Alarm Setup**, to display the Alarm Setup window. Modify the alarm options as required.



(v) Select OK. The alarms levels will now appear on screen. The following colour scheme is used:



Feature	Line
Alarms	Solid red
Data	Solid blue
Windowed alarms	Red dashed
Current alarm profile	Orange dashed (with the corresponding deadband limits above and below in solid red)

To adjust the profile from the default flat line (set at zero), use the mouse to draw lines as required.

Any adjustments can be made by returning to the Alarm Settings window or by adjusting the alarms (drag and drop) on screen. Following any adjustments being made, a message will be displayed at the top of the screen stating 'This profile has not been sent to the Logger'.

(vi) Once the alarm levels have been set, the settings can be transferred to the Cello. Click on **File** then **Send to Remote Logger**. At this point you may be asked to save the alarms details to the .lgr file. PMAC will now send the alarm details to the Cello. At some time in the future (depending on the Cello settings this may take several days!) the host PC receive confirmation that the alarm settings have been transferred to the Cello and the message at the top of the Alarm Wizard screen will change accordingly.

(vii) At the recording interval following where the data has crossed an alarm threshold, an alarm message will be transmitted to the host PC. Depending on the settings, the Cello may also update the data for a predefined period of time following the alarm (e.g. 6 updates at intervals of 30 minutes), or send a 'Safe' message at the recording interval following the data returning within limits.

IMPORTANT: Care should be taken when setting alarm limits. If the limits are set incorrectly, or too close to the normal limits, the alarm system will become a nuisance to the user, reduce battery life and waste messages. Profile alarms are not supported on Cellos earlier than Version 3.33.

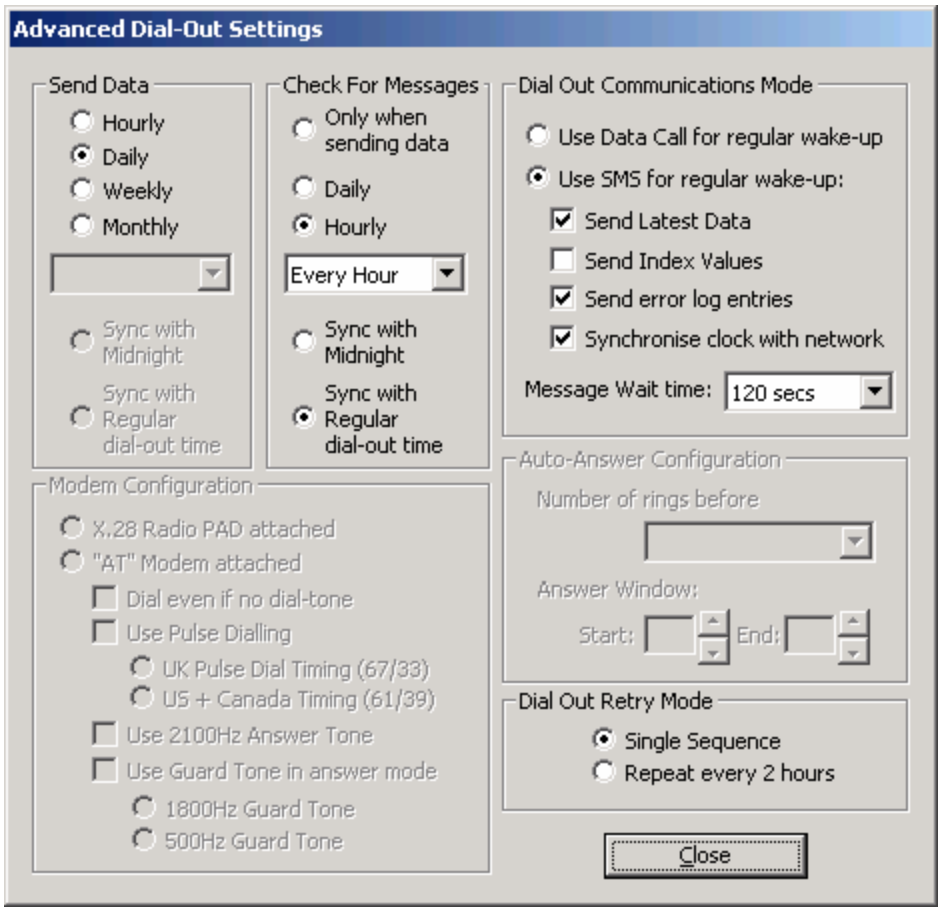
4.2 Hourly Wake-up

Advancements in battery technology have allowed a greater variety in data send and wakeup options. These are accessed either locally through the advanced section of the dialout window in local comms or remotely through the dialout settings option on the Alarm Wizard.

Normal use on hourly wakeup Cellos has Data send frequency set to 'Daily' and Message check frequency set to 'Hourly'. Under these circumstances Cello will send data daily and wake every hour to check for update data requests, responding accordingly. Data requests can be initiated from the **Line** -> **Update Line** option on the graph or via PMAC SMS. Please note that regular use of the data request facility or modifying the data send frequency to hourly will use large numbers of text messages and deplete battery life greatly.

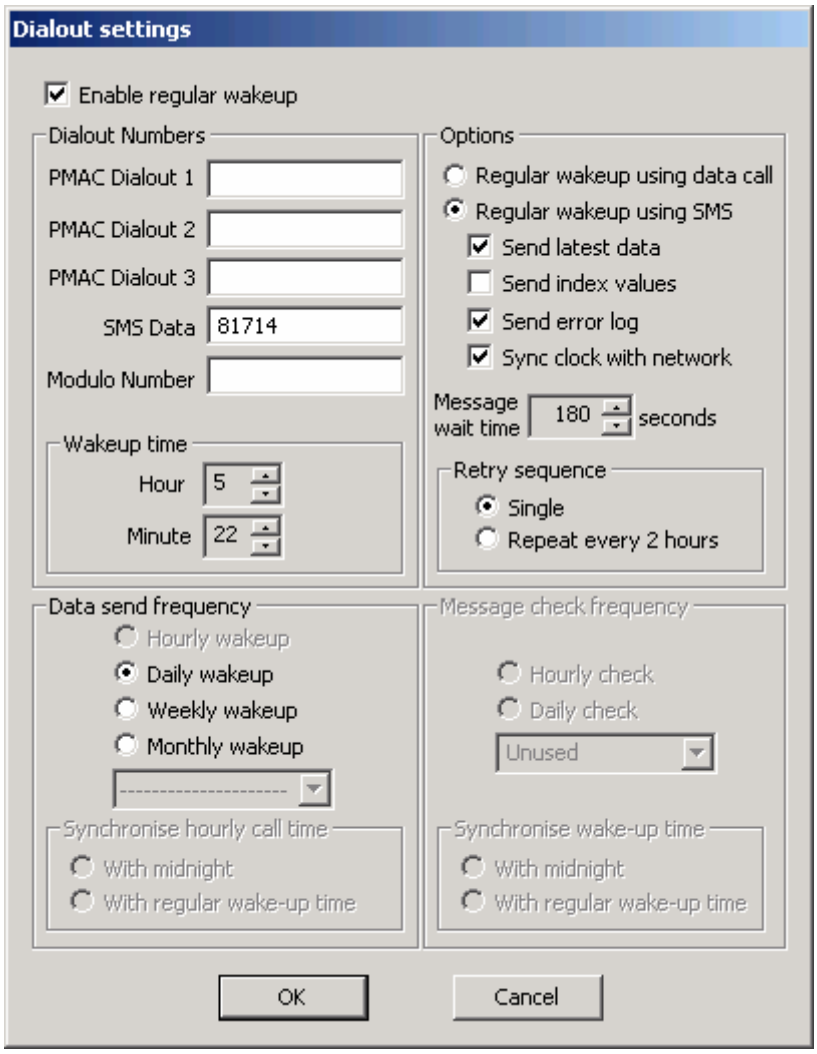
4.2.1 Local Activation

From the Local Comms screen choose **Setup Logger** to view the Cellos Setup window. Select **Dialout Settings** and then choose **Advanced Settings**. For Cellos using firmware 3.44 or above, modifications can be made to Send Data frequency and Check For Messages frequency. Modify as appropriate and select **Close** to return to the Logger Dial-out and Alarms Editor window. Select **Update Logger**.



4.2.2 Remote Activation

From the PMAC Site Database select the Alarm Wizard icon. From the **Logger** Menu select **Dialout Settings**. For Cellos using firmware 3.44 or above, modifications can be made to Data send frequency and Message check frequency. Modify as appropriate and select OK to return to the Alarm Wizard screen. From the **File** menu select **Send to Remote Logger**.



5 Troubleshooting

If you are experiencing difficulty with your Cello, Use the Cello diagnostics features described in section 5.2 and check the Cello Event/Error Log table below. If you still have problems after this, contact Technolog Cello Support on +44 (0) 1629 823611 or email cellosupport@technolog.com.

5.1 Cello Error Codes

The Cello records errors in an error log. Each entry in the error log contains the date and time of the error, the signal strength at the time the error occurred (if known), the duration the modem was switched on and the error code or message. The Cello is normally configured to send error messages to the host PC when it next has contact with the network. PMAC displays errors in the form of Alarm Banners, and records the information in the Alarm Log.

This error log can be accessed locally through the error log option in the remote menu of GPS, the Event Log option on the Cello Setup Window in PMAC, The Cello Error Log option in the Logger Tools Window in Pocket PMAC or by using the MON-2 diagnostic program.

Error Message	Possible Cause	Suggested Remedy
Modem failed to register	Cello unable to register on network. Probably due to poor signal strength.	Perform new signal strength test or reposition Cello.
Message send longer than normal & Unknown Code 26	Cello message sending takes more than 5 seconds. Probably due to more data than usual in the message.	Usually due to PMAC requesting missing data. Check for gaps in data.
No response to initial AT command	Cello internal fault	Contact Technolog
Timeout sending message	Difficulties sending/receiving messages due to poor signal strength or network failure.	See +CMS ERROR: 38 or reposition Cello to improve signal strength.
+CME ERROR: 10	Modem cannot detect SIM card.	Contact Technolog
+CMS ERROR: 21	Connection between local base station and message centre is unavailable.	Temporary network fault, probably due to maintenance. Should not re-occur.
+CMS ERROR: 28	Unidentified Subscriber, Usually a non Vodafone Cello trying to contact a Vodafone Radiopad.	Correct Cello Dial-in number.

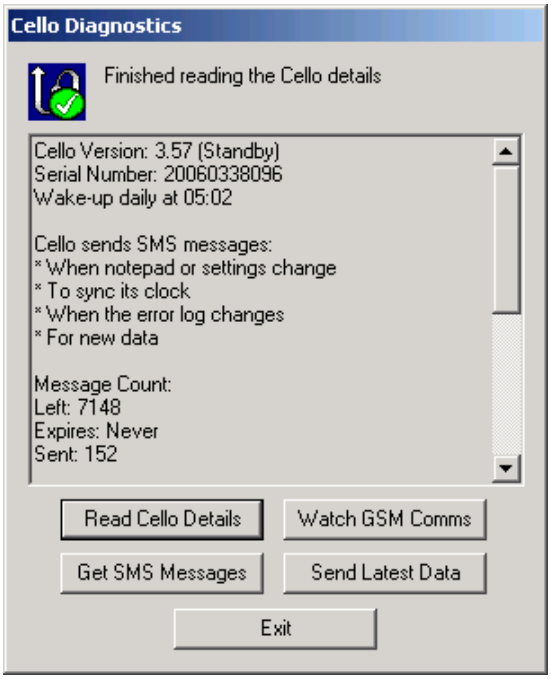
Error Message	Possible Cause	Suggested Remedy
+CMS ERROR: 38	Network out of order	If problem persists, contact the GSM service provider.
+CMS ERROR: 42	Network congestion	Change dial-out time to less busy part of day.
+CMS ERROR: 512 & Unknown Code 27	Generic network errors.	If error regularly occurs, contact Technolog.
+CMS ERROR: 513 & Unknown Code 28	Generic network errors.	If error regularly occurs, contact Technolog.
+CMS ERROR: 514 & Unknown Code 29	Generic network errors.	If error regularly occurs, contact Technolog.
+CMS ERROR: 515	Generic network errors.	If error regularly occurs, contact Technolog.
RING ERROR	Cello has received incoming voice call.	Ignore, error should disappear over time.
Message Count register empty	Cello has used up all the SMS messages available to it.	Contact Technolog to arrange for more SMS messages to be sent to the Cello.
Message Count Register expired	Cello messages have expired due to excessive time since last use.	Contact Technolog to arrange for a Clear Expiry message to be sent to Cello.
Low Battery	Cello battery is failing	Replace battery within two weeks
Battery Failure During Comms	Insufficient power for remote communications	Replace battery
No Battery	Main battery failure	Replace battery
+CMS ERROR: 35865	Cello unable to register on GPRS network. Probably due to poor signal strength.	Perform new signal strength test or reposition Cello.

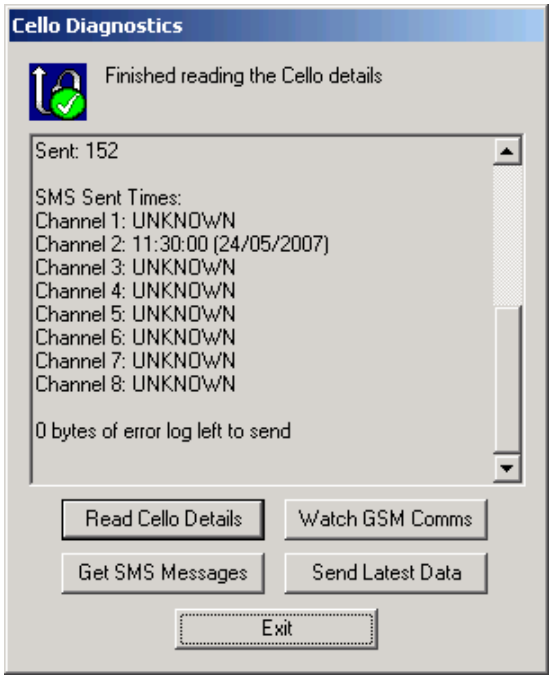
5.2 Cello Diagnostics

Within Pocket PMAC, PMAC Lite and PMAC Plus there is an additional button for diagnostic operations on Cello. This allows the user to watch the progress of his GSM communications, read additional modem details, receive incoming messages and force send the most recent data.

Read Cello Details

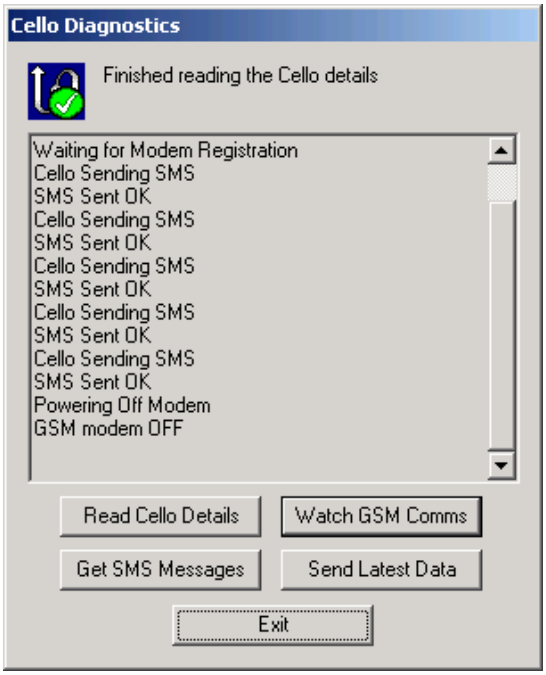
The top part of the Read Details screen gives you further information about the Cello itself. Its registered serial number, dialout configuration and message count. The bottom half of the screen tells the user when data was last sent for each individual channel.





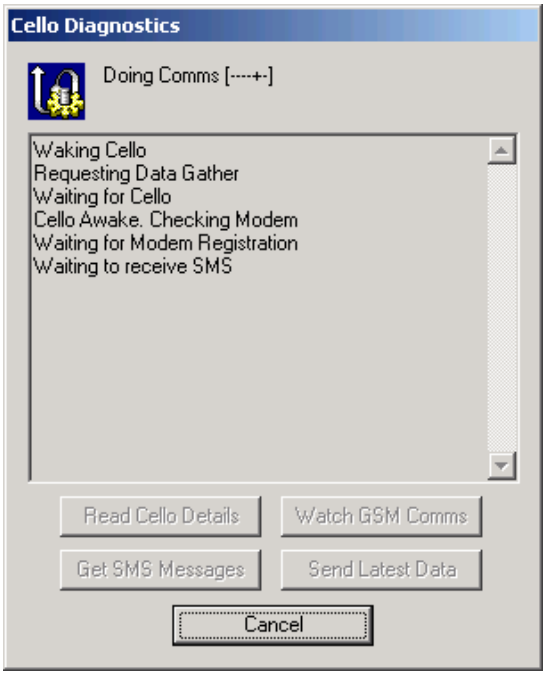
Watch GSM Comms

This feature allows the user to view the communication between the Cello modem and the network as it happens. Particularly useful for observing the sending of a .lgr file starting the Cello recording.



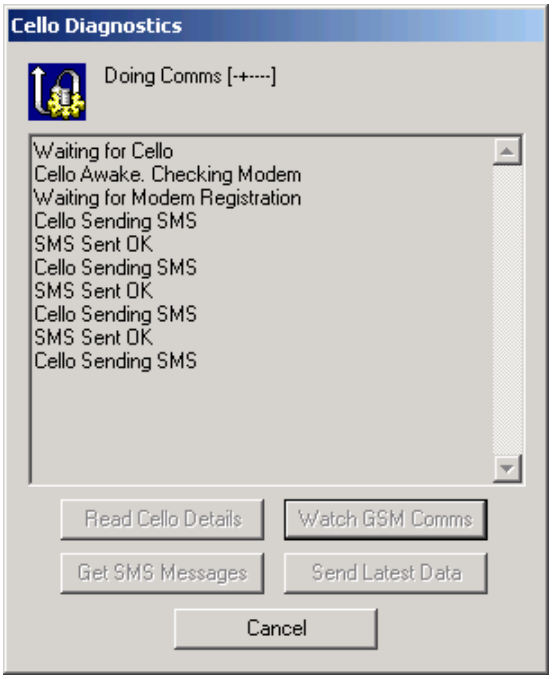
Get SMS Messages

This feature forces the Cello to wake up and contact the network to receive any incoming messages. Particularly useful on UK messages for receiving message/airtime updates whilst on site, or world wide for ensuring receipt of alarm level modifications etc.



Send Latest Data

This feature forces the Cello to wake up, contact the network and send any unsent data and/or error log entries. Particularly useful for forcing data to be sent so that Cello can be stopped, modified and started which would ordinarily cause a gap in the data on main PC between its daily send time and site visit.



5.3 PMAC Files

Several file types are used by PMAC with Cellos.

(i) Logger files (.lgr), stored in the PMAC/Loggers directory. This file contains details of the Cello's notepad. These are created when the Cello is started recording and is amended if any details are changed locally in the Cello. Alarm settings are also saved as part of this file

(ii) Data files (.dat), stored in the PMAC/Data directory. Each file contains the data from each Cello, sorted by PMAC ID and channel. Data is appended to the .dat file every time the Cello dials in with new data.

(iii) Message Information File (.mif), stored in the PMAC/Data/Log directory. Holds information on the number of messages in the Cello and when the last message was received. Used in the Cello Message Count software.

(iv) Alarm Information File (.aif), stored in the PMAC/Data/Log directory. Holds information on the current alarm settings for the Cello in question.

(v) Debug files (.txt), stored in the PMAC/Debug directory. Contains information relating to all activity on the Communication ports during the day the file was created. Files of the type Year_Month_Day_PMACDbg.txt are used in the GetCello diagnostic software. Debug files are automatically deleted when they become more than thirty days old.

(vi) By Site files (.txt), stored in the PMAC/Debug/BySite directory. Contains all communications information relating to each individual site since the site was created. These files are no longer generated on version of PMAC after November 2003 unless specifically requested

If you delete a Cello site from PMAC, be sure that all relevant .dat, .lgr, .mif, .aif and .txt files are deleted.

APPENDIX 1

TECHNOLOG APPLICATION NOTES ('TAN's') -
(Contact Technolog for latest revision).

TAN056	Scotch-lok connectors
TAN097	Cello Flow input connections
TAN102	Flowmeter wiring details for 2 channel Cello + Pressure & Flow Cello
TAN108	Cello I.S. Flow Input Connections
TAN115	Cello Mk. IV Flow input connections
TAN116	Flowmeter wiring details for Cello Mk. IV (2 channel + Pressure & Flow)

APPENDIX 2

USER GUIDES - Refer to latest revision.
(Contact Technolog for latest revision).

UG583000	Cello Mk. 3 User Guide & EC Declaration of Conformity
UG593000	Cello I.S. User Guide & EC Declaration of Conformity
UG5A3000	Cello Mk. IV Certificate & EC Declaration of Conformity

APPENDIX 3

CELLO SPECIFICATIONS

Pressure and Flow Cello	
Inputs	Channel 1 - absolute pressure; Channels 2 & 3 - flow
Pressure Inputs	Input range 0 - 100m or 0 - 200m Operating temperature range: +1°C to +20°C (water) Accuracy/resolution: +/-0.5% of range Pressure port: Standard quick-fit male probe
Flow Inputs	Pulses counted over, and recorded at, preset intervals
Universal Cello	
Inputs	Channel types: Voltage, event, state, count, frequency (independently selected on each channel) Input impedance: >300k Input protection: Protected against reverse connection and over voltage Voltage input: Range 0 to 2.5 volts, 0.01 volt accuracy and resolution Event input: Switch closure or logic pulse, date and time of event stored, resolution 1 second or 10 seconds State input: Switch closure or logic state. On state change, date, time and new state are stored, resolution 1 second or 10 seconds. Count input: Switch closures or logic pulses, maximum rate Channel 1, 4, 5, 6, 7, 8 = 10 per second, Channel 2 and 3 = 45 per second (Counted over and recorded at preset intervals). 16,000 maximum per logging interval Frequency input: Switch closures or logic pulses, maximum frequency 16 kHz, programmable sampling period of 1 to 250 seconds. independent of recording rate. Resolution 0.01% maximum
Outputs	2 independent digital outputs for transducer power control and alarm signalling (0 and 3 volt levels, active low, 100k output impedance) 1 fixed output for “open collector” signal bias (3 volts, 33k output impedance)
Cello 4 - 20mA	
Inputs	Channel types: 2 channels dedicated to 4-20mA (High or Low resolution) loops, remaining 6 channels specifications as per Universal Cello 4 - 20mA measurement accuracy: Dependent on the accuracy of external sensor equipment connected to the loop. Channels: One or two 4 - 20mA loops, 12 Volt self 'flash' powered, or 12 Volt loop powered. Logger accuracy: Better than +/- 0.1% full scale. Logger resolution: Better than 0.02% (High resolution version); Better than 0.7% (Low resolution version).
Outputs	2 individually switched 12 Volt 'flash' power supplies for powering 4 - 20mA loops.
General Specifications	
GSM Modem	Frequency: 900 MHz (Vodafone UK, O2 UK), 1800 MHz (Orange UK, T-Mobile UK) & 1900 MHz - Integral antenna.
Serial Port	Type: Full duplex, asynchronous Data rate: 1200, 2400, 4800, 9600 bps
Memory	Type: Solid state, non-volatile Size: 128K, allocatable between channels as required (max 64K/channel)

Clock	Type: Crystal controlled calendar clock with leap year adjustment Accuracy: 100 seconds per month maximum error over operating temperature range Synchronisation: Option to synchronise clock to GSM network
Supply	Type: Internally powered by a replaceable lithium cell (Internal back up cell maintains logging and local communications when main battery pack is discharged) Life: Typical battery life 5 years depending on mode of use
Recording	Recording interval: Programmable between 1 second and 1 hour Data storage: Rotating store, or store until full
Alarm Dial-Out	High/low alarms independently programmable on each channel. Continuous, time window and profile modes of operation. Option to update data more frequently after an alarm
Environmental	Operating temperature: -20°C to +50°C Protection classification: IP68, submersible to 1 metre
Connectors	Military specification, conforming to MIL-C-26482
Mechanical	Dimensions: 191mm x 140mm x 150mm Weight: 1 kg Suitable for use in water meter boundary boxes: Ebco, Atplas, Fusion Meters, Talbot. (For others, please contact Technolog.)

Cello IS Specifications

Certification	Intrinsically safe EEx ia IIC T4 (TA = -20 to +60°c) SIRA 02ATEX 2016X
Inputs	Channel 1 – Pressure Channel 2 - Flow Channel 3 – Flow
Pressure Input	Input range (gauge): 0 - 75 mbar, 0 - 100 mbar, 0 - 350 mbar, 0 - 1 bar, 0 - 2 bar, 0 – 7 bar Input range (absolute): 0 - 10 bar, 0 - 20 bar, 0 - 50 bar, 0 - 70 bar Recording strategy: pressure sampled at 1 min rate, mean value stored at the recording interval Accuracy/resolution: ± 0.5% of range Pressure port: female ¼ BSP taper thread as standard, others by request
Flow Inputs	Pulses counted over and recorded at preset intervals
Serial Port/Fast Barrier	Type: full duplex, asynchronous Data rate: 1200, 2400, 4800, 9600 bps
GSM Modem	Frequency: 900 MHz (Vodafone, MMO2), 1800 MHz (Orange, T-Mobile), 1900 Mhz Integral antenna
Data Storage	Type: solid state Size: 128k, allocated between channels as required (max 64k/channel) Data retention: 5 years (life of battery)
Clock	Type: crystal controlled calendar clock with leap year adjustment Accuracy: 100 seconds per month maximum error over operating temperature range Synchronisation: option to synchronise clock to GSM network
Supply	Type: internally powered by an intrinsically safe replaceable lithium battery pack Life: typical battery life 5 years depending on mode of use Internal back-up cell maintains logging and local communications during main battery change
Recording	Recording interval: programmable between 1 second and 1 hour Data storage: rotating store or store until full
Alarm Dial-Out	High/low alarms independently programmable on each channel. Continuous, time window and profile modes of operation. Option to send data more frequently after an alarm.
Environmental	Operating temperature: -20°C to +50°C Protection classification: Flow versions and absolute pressure versions: IP68 Gauge pressure versions: IP66
Connectors	Flow input: M12, 3 pole, dual keyway stainless steel Communications: M12, 4 pole, single keyway, stainless steel
Mechanical	Dimensions: 191 x 140 x 150 Weight: 1 kg

Cello XO Specifications

Inputs	Channel 1 - absolute pressure (optional) Channel 2 - flow Channel 3 - flow Channel 4 - absolute pressure (optional)
Pressure Sensors	Integral or external
Pressure Inputs	Input range 0-100 m or 0-200 m Operating temperature range: +1°C to +20°C (water) Accuracy/resolution: ±0.5% of range Pressure port: standard quick-fit male probe
Flow Inputs	Pulses counted over and recorded at preset intervals
GSM Modem	Frequency: 900 MHz (Vodafone, O2), 1800 MHz (Orange, T-Mobile), 1900 MHz
Antenna	Integral or external
General Specifications	
Serial Port	Type: Full duplex, asynchronous Data rate: 1200, 2400, 4800, 9600 bps
Memory	Type: Solid state, non-volatile Size: 128K, allocatable between channels as required (max 64K/channel)
Clock	Type: Crystal controlled calendar clock with leap year adjustment Accuracy: 100 seconds per month maximum error over operating temperature range Synchronisation: Option to synchronise clock to GSM network
Supply	Type: Internally powered by a single lithium battery pack, user exchangeable Battery Life: Typically 5 years depending on mode of use Internal back up cell maintains logging and local communications when main battery pack is discharged
Recording	Recording interval: Programmable between 1 second and 1 hours Data storage: Rotating store, or store until full
Alarm Dial-Out	High/low alarms independently programmable on each channel. Continuous, time window and profile modes of operation. Option to update data more frequently after an alarm
Environmental	Operating temperature: -20°C to +50°C Protection classification: IP68, submersible to 1 metre
Connectors	Military specification, conforming to MIL-C-26482

Cello CSO Specifications

Input Specifications	
Input	Ultrasonic Level Measurement
Range	0.25 to 5 m (liquids) 0.25 to 2.5 m (solids)
Accuracy	+/-0.25% F.S. (liquids)
Typically	+/-0.5% F.S. (solids)
Temperature Compensation	Built-in to compensate over the operating range
Beam Angle	10° at -3 dB boundary
General Specifications	
GSM Modem	Frequency: 900 MHz , 1800 MHz. Integral antenna
Serial Port	Type: Full duplex, asynchronous Data rate: 1200, 2400, 4800, 9600 bps
Memory	Type: Solid state, non-volatile Size: 128K, allocatable between channels as required (max 64K/channel)
Clock	Type: Crystal controlled calendar clock with leap year adjustment Accuracy: 100 seconds per month maximum error over operating temperature range Synchronisation: Option to synchronise clock to GSM network
Supply	Type: Internally powered by a single lithium battery pack, factory exchangeable Life: Typical battery life 3 years depending on mode of use Internal back up cell maintains logging and local communications when main battery pack is discharged
Recording	Recording interval: 15, 30 or 60 minutes
	Data storage: Rotating store, or store until full
Alarm Dial-Out	High/low update data more frequently after an alarm
Environmental	Operating temperature: -20°C to +50°C Protection classification: IP66
Connectors	Military specification, conforming to MIL-C-26482
Dimensions (mm)	Sensor: 217(h) x 82(w) x 88(d) Cello: 191(h) x 140(w) x 150(d)