Dycon

Operation Manual
for the D2377
4G/3G/2G Signal Analyser

Table Of Contents

1   Description

This manual documents the use of the following products:

- D2377-UK – 4G/3G/2G European Bands signal analyser with UK plug-top charger
- D2377-EU – 4G/3G/2G European Bands signal analyser with global plug-top charger
- D2377-G – 4G/3G/2G North American Bands signal analyser with global plug-top charger

The D2377 is a signal analyser for use with GSM, 3G and 4G radio networks. Suitable for testing where automatic signalling equipment is used, including smart metering, any communication products and the full range of Dycon GSM/GPRS signalling equipment. It may be used to position an aerial and to test the performance of aerial systems.

The D2377 4G/3G/2G signal analyser displays mobile network information including; network provider names, cell identities, frequencies and signal strength. **Please note** that D2377 4G/3G/2G signal analyser is **UNABLE** to detect the presence of a jamming signal. The D2377 2G/3G/2G signal analyser contains a battery allowing remote operation for up to 12 hours. The internal battery may be recharged from the supplied mains power supply or a suitable car charger.

To improve battery performance and life, please ensure you charge the battery for a minimum of 12 hours before first use.

If the D2377 4G/3G/2G signal analyser is left switched on and unused, the unit will automatically switch off after a preset time.

The D2377 4G/3G/2G signal analyser is contained within a strong protective sleeve and is supplied complete with a charger and manual.

2   4G/3G/2G Signal Analyser Contents

Mains plug-top charger

(UK version)

(Global version)

4G/3G/2G signal analyser (referred to as the radio signal analyser in the rest of this document)

3 Quick Start Guide

1.   Charge the battery before use

Connect the aerial (see section 16).

To switch on the signal analyser, press the On/Off button until the logo is shown.[1]

2.   This is followed by the **Startup** screen (see section 6).

This screen is shown for about 10 seconds while the radio module is powering up.

3.   If a SIM is fitted that requires a PIN, this screen gives the option to use the Saved PIN or enter a new PIN (see section 5.1).
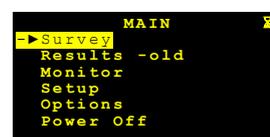
If not, the Main Menu screen will appear.

Once the Saved PIN is used or a new PIN is entered, the Main Menu screen will appear next.

4a.   **MAIN Menu HOURGLASS**

The hourglass is displayed while the radio module is initialising, during the time Monitor and survey screens can't be entered.

Results can be entered once the NVM has been initialised (approximately 5 seconds)

4b.   **MAIN Menu**

(See section 7 for information).

Press the right button to select the **Survey** screen.
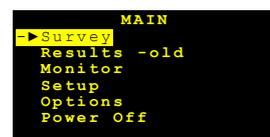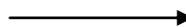
5.   **SURVEY Screen**

Please note a SIM is required for 4G surveys [2]

If Engineer mode is selected in Setup, the following screen will appear.
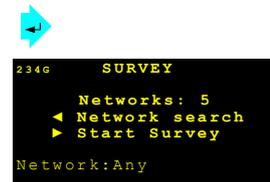
If Surveyor mode is selected in Setup, the following screen will appear.
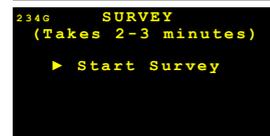
(See section 10 for information).

Press the right button to start the survey.
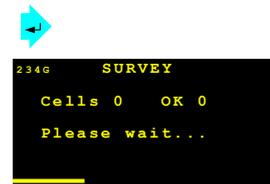
The signal and network analyser will measure all detectable cells.

Do not move or touch the aerial.

The survey may take up to 3 minutes to complete.

Shows number of cells detected
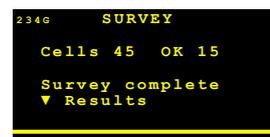
Press the down button to select the **Results** screen.

---

[1]   See Section 15 of this manual for Power-Up Functions.

[2]   SIM does not need to be 4G enabled

Quick Start Guide (continued)

6. RESULTS Screen

(See note below and section 11 for information).

The first 2 screens are a summary of the survey results followed by a list of detected cells (4G first then 3G and GSM), each in decreasing signal strength order.

```
234G    RESULTS
 Best Networks
Vodafone UK     GSM 54%
O2 UK           GSM 30%
EE UK           GSM 15%
EE UK           GSM  9%

SIM: Not Fitted
```
(Surveyor mode)

If a number, and not the name of the network, is shown, another network search should be done (see section 10).

Press the right button to display Top Cells then the next cell (weaker signal).

Press the left button to display the previous cell (stronger signal) or summary screens.

Press the down button to return to the **Main** menu**.**

6b. If multiple surveys have been performed and you are in Engineer mode, pressing down will take you to the **Results list**.

```
        RESULTS
 SURVEYA01
 SURVEYA02
-►SURVEYB01
```

Press the left button to return to the **Main** menu. (See section 11 for information).

In the main menu, scroll down then use the right arrow to enter the **Monitor** Screen.

```
        MAIN
 Survey
 Results
-►Monitor
 Setup
 Options
 Power Off
```

7. MONITOR Screen

(See section 12 for information).

```
234G    MONITOR

◄► EE UK

4G  1800     dBm:27%
ID:1CC       BAT:100%

SIM: Denied
```
**(4G mode)**

The display is updated every 8 seconds. It will normally show the strongest cell.

This display is used to locate an area for the strongest signal strength.

Use this position when installing the aerial. (See section 16 for more information).

Press the down button to return to the **Main** Menu.

8. Select a new survey etc... as required.

```
        MAIN
-►Survey
 Results
 Monitor
 Setup
 Options
 Power Off
```

9. To switch off, select Power Off in the **Main** menu, or press the On/Off button until the **Shutdown** screen is displayed. "Battery Low" may be displayed instead when battery needs charging.
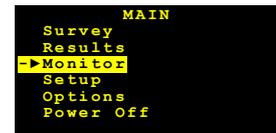
```
 Shutting down...
```

NOTE: The radio signal analyser will still retain the results from the surveys. In surveyor mode only the most recent will be accessible.

The D2377 will take longer to start and shutdown that the D2366 and D2376.

Operating Manual

4 Site Survey

It is recommended that a site survey is conducted prior to installation of any GSM or 3G equipment and associated aerial system to confirm that an adequate radio signal is available at the site.

It is particularly important that a site survey is conducted when:

a. There may be a weak signal strength at the proposed site;

b. It is known that the aerial will be fitted inside a sheet metal covered building or under a sheet metal roof;

c. The aerial will be on lower floors of buildings in heavily built-up areas.

The radio signal analyser is ideal for surveying a proposed site for a suitable radio signal. Note the point of best signal. Install the aerial at this location.

Use the radio signal analyser to find the point of best signal. This means maximising the signal strength.

Full details on optimising signal strength are in section 16.

5 Fitting a SIM card

Note: Before inserting or removing a SIM card, please make sure the unit is switched off.

Please note: a SIM is required for 4G surveys and monitoring - it does NOT need to be a 4G-enabled SIM.

To access the SIM card holder, simply remove the radio aignal analyser out of the rubber sleeve from the bottom end. You will find a small yellow button - press on it with a pen and the SIM card holder will be ejected. Fit the SIM card onto the holder and push the latter back into the radio signal analyser.

When no SIM card is fitted, the unit will display results for all networks detected.

When a SIM card is fitted, the unit will be locked to that operator's network, unless unlocked via Network Options menu (see section 9.1).

5.1 Entering the SIM Card's PIN Number

When a SIM card is used that requires a PIN, the following menu will appear:

```
-►Use Saved PIN?
  Enter PIN
```

To use the Saved PIN:

Alternatively scroll down and then right to Enter a new PIN.

The following screen will appear to enter a new PIN:

```
Enter PIN:0

▲= Clear PIN
◄= Change digit
►= Accept digit
▼= Accept PIN
```
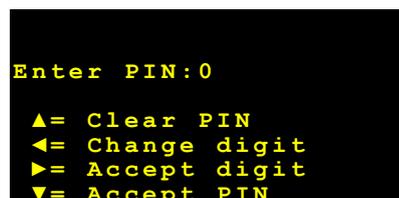
Follow the on-screen instructions to enter your PIN then press down to validate.

Alternatively pressing up twice will take you back to the use saved PIN/enter PIN menu.

Enter the SIM card's PIN number the first time the SIM card is used. Once the radio signal analyser has shut down, this PIN number will be kept in memory until another PIN is entered.

In case of an incorrect PIN number, the following screens will be shown:

```
    Please wait...


SIM: Wrong PIN
```

then

```
    Dycon Ltd.

  4G/3G/2G Signal
   Analyser V4.00

Error: GSM Fault 5
```

Press Up ▲ or Down ▼ arrows to get to the **Main Menu**.

In order to enter the correct PIN number, turn the radio signal analyser off then power it up again. The screen with the "Use saved PIN?" or "Enter PIN" options will appear. Choose "Enter PIN" and follow the instructions on the next screen.

NOTE: The SIM card will be locked after 3 failed attempts at entering the correct PIN code. To resolve a locked SIM you will need to contact the SIM card supplier for a PUK and enter this using a suitable module phone.

6 STARTUP Screen

```
        Dycon Ltd.

     3G/GSM Signal
     Analyser V3.33

     Please Wait...
```

If any errors are detected during power-up, a warning symbol will be displayed on the main menu and on the start-up screen, a GSM fault number and description will be shown alternately (see section18.1).

Press Up 🔼 or Down 🔽 arrows to get back to the **Main Menu**.

7 MAIN Menu

This is the menu from which all functions are selected.

```
            MAIN
-▶Survey
  Results -old
  Monitor
  Setup
  Options
  Power Off
```
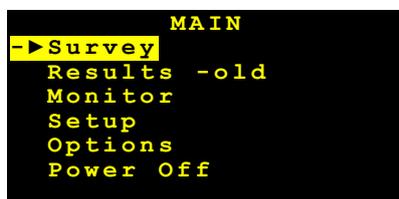
⌛	Hourglass symbol is displayed in the top right while the radio module is initialising – Survey and monitor mode can't be entered.
⚠	Warning triangle is displayed in the top right if a failure occurred during initialisation - press the **left** arrow to go to the start-up screen to find out what the fault is.

🔼	Up (highlight an option).
	Then select the required option (see below).
🔽	Down (highlight an option).
	Then select the required option (see below).
➡	Select the highlighted option:
	Survey (see section 10) Results (see section 11) Monitor (see section 12) Setup (see section 8) Options (see section 9) Power off = switch off (same as Off button)
◀	Go to **Start-up** screen.
	(See section 6).

Note

 '-old' will be displayed next to RESULTS if a survey hasn't been performed since power up.

8 SETUP Screen

Settings to make the test set operate how you require.

```
              SETUP
◄►Exit/Save
  Contrast:      70
  Survey Options
  Auto Off:   12 mins
  Mode: Engineer
  Load defaults
```

▲	Up (highlight an option). Then select the option (see options below).
▼	Down (highlight an option). Then select the option (see options below).
↵	**Right arrow** for the selection **Option:** Exit/Save = save settings then go to **Main** menu (see section 7) Contrast = increase display brightness Survey Options = enter survey options menu Auto Off = increase minutes to auto-power off Mode = Select between Easy, Surveyor or Engineer mode Load Defaults = load factory default settings
◄	**Left arrow** for the selected **Option:** Exit/Save = **DOES NOT** save settings then go to **Main** menu [1] Contrast = decrease display brightness Survey Options = no action Auto Off = decrease minutes to auto-power off Mode = Select between Easy, Surveyor or Engineer Load Defaults = no action

Notes:
[1] The selected settings will remain active until the radio signal analyser is switched off.

8.1 Survey Options

Settings to make the test set operate how you require.

```
     SURVEY  OPTIONS
◄►Exit/Save
   Delay:         0  secs
   Max  Cells:    40
   Label:SURVEY
   OverWrite:  Always
   Reset  Sequence  ID
   Delete  All
```

Up (highlight an option).
Then select the option (see options below).

Down (highlight an option).
Then select the option (see options below).

Right arrow for the selection **Option:**
Exit/Save = save settings then go to **Main** menu (see section 7)
Delay = Increase delay before survey start, from 0 to 99 seconds [1]
Max Cells = Increase the number of cells to find during a survey [2]Label
= Rename the default label/name given to a new survey
Overwrite = Select between prompt user when memory in full and
always overwrite oldest without asking.
Reset Sequence ID = reset the Survey label suffix to A01
Delete All = Delete all stored survey results

Left arrow for the selected **Option:**
Exit/Save = **DOES NOT** save settings then go to **Main** menu [3]
Delay = Decrease delay before survey start, from 99 to 0 seconds [1]
Max Cells = Decrease the number of cells to find during a survey [2]
Label = Rename the default label/name given to a new survey
Overwrite = Select between prompt and always
Reset Squence ID = No Action
Delete All = No Action

Notes:
[1] This allows postioning of the radio signal analyser in a location and for the surveyor to retreat before survey starts.

[2] The default is 40 Cells. If you are looking for a particular network's results, reducing this number may mean you will not see all the available cells on your network. To perform a survey on a particular network, use the facility in the Monitor screen to lock onto a network, then do the survey.

[3] The selected settings will remain active until the radio signal analyser is switched off.

9 OPTIONS

```
         O P T I O N S
◄►Exit/Save
   Language:  English
   Sounder:   ON
   Network Options
   Advanced:  OFF
   GPRS Test
```

Up (highlight an option).
Then select the option (see options below).

Down (highlight an option).
Then select the option (see options below).

Right arrow

Exit/Save = save settings then go to main menu (see section 7)
Language = toggle between available languages
Sounder = select On
Network Options = enters network menu (see section 9.1)
Advanced = select ON [1] (Engineer mode **only**)
GPRS Test = test the GPRS link (requires a GPRS-enabled SIM card) (see section 9.3)

Left arrow

Exit/Save = **DOES NOT** save settings then go to Main Menu
Language = toggle between available languages
Sounder = select OFF
Network Options = no action
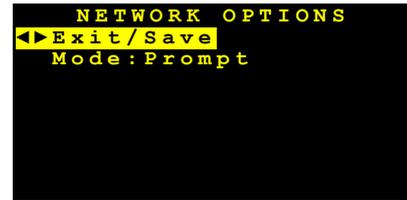Advanced = select OFF [1]
GPRS Test = no action

Notes:
[1] – if Advanced = ON is selected, minimum and maximum values will be displayed on the **Monitor** screen and BSIC/PSC will be replaced with LAC.

Remember: in order to select ON or OFF in Advanced, **Engineer mode** must be first selected in Set-up. In Surveyor mode, the option is always OFF.

9.1 Network Options

Engineer Mode

Surveyor Mode

⬆	Up (highlight an option). Then select the option (see options below).
⬇	Down (highlight an option). Then select the option (see options below).
↵	**Right arrow** Exit/Save = **Save** settings then go to Options Menu (see section 9) Mode = Selects the Radio Access Technology (RAT) to use; (Prompt, GSM & 3G, 3G, GSM) If 'Prompt' is selected, the user will have to select the required RAT mode each time they enter Survey or Monitor 4G = Selects the RF bands for use with 4G 3G = Selects the RF bands for use with 3G GSM = Selects the RF bands for use with GSM Network = Unlocked [1]
⬅	**Left arrow** Exit/Save = **DOES NOT** save settings then go to Options Menu Mode = Selects the Radio Access Technology (RAT) to use; (Prompt, GSM & 3G, 3G, GSM) If 'Prompt' is selected, the user will have to select the required RAT mode each time they enter Survey or Monitor 4G = Selects the RF bands for use with 4G 3G = Selects the RF bands for use with 3G GSM = Selects the RF bands for use with GSM Network = Locked [1]

Notes:
[1] Only available if SIM is fitted.

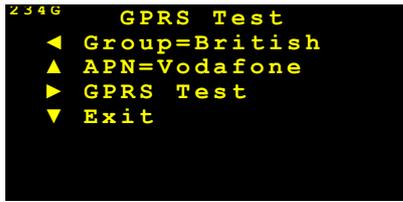## 9.2 Select Mode

This screen appears before you enter Survey or Monitor, if 'Prompt' has been selected in Network Options menu, RAT mode.

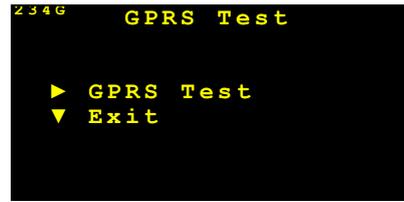|	
⬆ ⬇	Up/Down (Scroll to highlight an option). Then select the option (see options below).
↵	**Right arrow** Select RAT mode and go to next screen (Survey or Monitor)
⬅	**Left arrow** Returns to Main Menu (see section 7)

9.3 GPRS Test

```
234G    GPRS Test
    ◄ Group=British
    ▲ APN=Vodafone
    ► GPRS Test
    ▼ Exit
```
Engineer Mode

```
234G      GPRS Test


    ► GPRS Test
    ▼ Exit
```
Surveyor Mode

Option available only in Engineer Mode

◄ APN settings have been grouped to make it easier to find your APN options.

Press the left arrow to change the APN group to suit your SIM.

▲ Press the up arrow to select a suitable APN:

Internet – for use anywhere in the world with a GPRS-enabled SIM card

All others – use the corresponding SIM card

► Press the right arrow to start the GPRS test.

Note: a SIM card must be inserted in the radio signal analyser.

If not, the following screen will be displayed:

```
234G    GPRS Test
    ◄ Group=British
    ▲ APN=Vodafone
    ► GPRS Test
    ▼ Exit


SIM: Registered
```
Engineer Mode
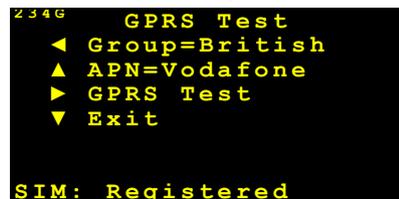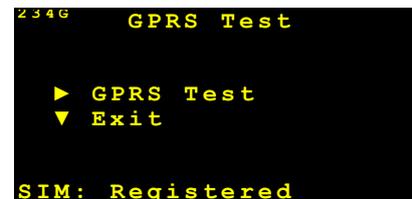
```
234G      GPRS Test


    ► GPRS Test
    ▼ Exit


SIM: Registered
```
Surveyor Mode

The screen will display a pass or fail message:

```
234G      GPRS Test
    ◄ Group=British
    ▲ APN=Vodafone
    ► GPRS Test
    ▼ Exit


GPRS Test OK
```
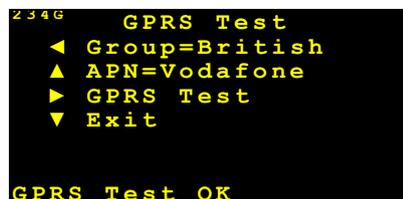
▼ Down arrow

Exit = go to Main Menu

A GPRS test can only be performed if a GPRS-enabled SIM is inserted into the radio signal analyser.

There are 2 different GPRS tests that can be performed:

1.   The first (applicable to any GPRS-enabled SIM) is a test to determine whether the unit can attach to the GPRS network from that location/base station.

For any GPRS enabled SIM, select 'Internet' from the GPRS menu and press ►
Pass/Fail indicates if the radio signal analyser could successfully attached or not.

2.   The second is a test to determine whether the unit can initiate a GPRS session on that particular network. Select the relevant APN for the SIM and press ►

If the correct APN option is not available for you SIM card, you will be unable to perform this type of GPRS test.

A pass indicates successful GPRS session on the particular network has been opened. A fail indicates the unit was unable to start a GPRS session from that location/base station.

10 SURVEY

This looks for all cells in the area and measures their performance. A survey can take up to 3 minutes.

```
234G      SURVEY
        SURVEYC01
      Networks: 5
   ▲ Rename
   ◄ Network search
   ► Start Survey

Network:Any
```
Engineer Mode

```
234G      SURVEY
    (Takes 2-3 minutes)

      ► Start Survey
```
Surveyor Mode

| | The Mode Selection screen will appear if 'Prompt' is selected in Network Options (see section 9.2). | ```234G   MODE

-►ALL
   4G
   3G
   GSM
``` |
| ⬆ | Go to **Main Menu** (see section 7).

Engineer mode only - go to rename screen (see section 11.3)

Note: in Engineer mode you can restrict the survey to a network and this will be displayed at the bottom of this screen. (See Monitor screen to change selected network). | ```234G   SURVEY
        SURVEYC01
      Networks: 5
   ▲ Rename
   ◄ Network search
   ► Start Survey
Network:Any
``` |
| ↵ | Start the survey. | ```234G   SURVEY

   Searching...

   Please wait...
``` |
| | The Survey screen shows quantity of cells [2]. | ```234G   SURVEY

   Cells 0   OK 0

   Please wait...
``` |
| ◄ | When complete, press the Down arrow to get the results of this survey (see section 11).

Start a network search (Engineer Mode)[1]. | ```234G   SURVEY

   Cells 45   OK 15

   Survey complete
   ▼ Results
``` |
↵	Engineer mode only - go to rename screen (see section 11.3).	
⬆	Go to **Main Menu** (see section 7).	
⬇	Go to the Results screen.	

Notes:
[1] – The network search is done automatically when a survey is started in Surveyor mode
[2] – If a network is selected, only these cells will be OK (see section 12 for network selection)

11 RESULTS

Displays the performance of all cells measured in the survey. The first 2 screens are a summary of the results, Best Networks and Top Cells.

Best Networks Summary

Best Networks shows the highest signal strength for the networks (best 5 if more than 5 are detected) [1].

```
234G        RESULTS
 Best Networks
EE UK          GSM  54%
Vodafone UK    GSM  42%
O2 UK          GSM  30%
EE UK          GSM   9%

SIM: Not Fitted
```
Percentage

```
234G        RESULTS
 Best Networks      dBm
EE UK           18 -77
Vodafone UK     14 -85
O2 UK           10 -93
EE UK            3 -107

SIM: Not Fitted
```
dBm[2] and CSQ value

▲ Up Arrow returns to the Survey screen.

In Engineer mode, up arrow will toggle between percentage and dBm view.

▼ Go to **Main Menu** (see section 7) [3].

▶ Display Top Cells Summary screen.

◀ Display last cell in results (weakest).

Top Cells Summary

Top Cells lists the signal strength of the first 5 Cells in the list (Strongest first) [1].

```
234G        RESULTS
 Top Cells
EE UK          GSM  54%
EE UK          GSM  48%
Vodafone UK    GSM  42%
EE UK          GSM  36%
O2 UK          GSM  30%
SIM: Not Fitted
```
Percentage

```
234G        RESULTS
 Top Cells          dBm
EE UK           18 -77
EE UK           16 -81
Vodafone UK     14 -85
EE UK           12 -89
O2 UK           10 -93
SIM: Not Fitted
```
dBm[2] and CSQ value

▲ Up Arrow returns to the Survey screen

In Engineer mode, up arrow will toggle between percentage and dBm view.

▼ Go to **Main Menu** (see section 7) [3].

▶ Display first cell in results (strongest).

◀ Display Best Networks Summary screen.

Notes:

[1] – if the survey include All 4G/3G/2G cells, the summary screens will include all. In Best networks this is the strongest signal for either 4G, 3G or GSM. In Top Cells all 4G cells are listed first.

[2] – dBm only available in Engineer mode.

[3] – Engineer mode - with more than one survey stored you will be returned to the Result List.

RESULTS (continued)

Individual cell details

```
234G    RESULTS          234G     RESULTS
◄►  Index:3              ◄►  Index:1
GSM 1800    SIG:60%      4G  1800    SIG:27%
CELL:45723              ID:1CC
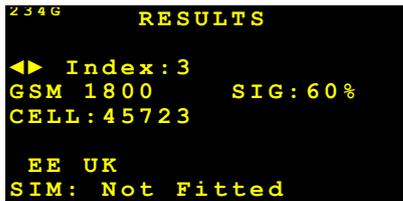
 EE UK                   EE UK
SIM: Not Fitted         SIM: Denied
```
Surveyor Mode – GSM   Surveyor Mode – 4G

⬆	Swap between Summary (basic) and Detailed views (only in Engineer mode - see next page).
⬇	Go to **Main Menu** (see section 7) [1].
➡	Display cells in decreasing order of signal strength.
⬅	Display cells in increasing order of signal strength.

NOTE: when first switched on, the test set will still retain the results from the last survey. These will be available until a new survey is started.

Summary (basic) View

GSM 3G	The radio frequency band used by the displayed cell Radio signals using lower frequencies penetrate better into buildings
CELL	Cellular identification number (decimal) of the cell (GSM)
ID	Cellular identification number (hexadecimal) of the cell (3G)
INDEX	During the survey, each detected cell is given a number. The cell with the strongest signal is given number 1. Higher numbers = lower strength signal
NETWORK	The network name of the displayed cell [2]
SIG	Signal Strength Shown as a percentage – 33% and above is useable.
SIM	Current SIM status

Notes:

[1] – Engineer mode with more than one survey stored you will be returned to the Result List.

[2] – If the MCC and MNC codes are shown instead of the network name, do another network search (Engineer mode) or another survey.

RESULTS (continued)

Detailed View – available only in Engineer Mode

From the **Results** menu, press the up arrow to toggle between detailed view and summary view screens:

```
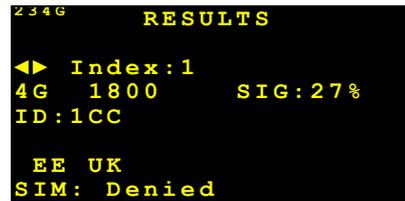234G      RESULTS
◄► Index:3
ARFCN:717      dBm:-73
CELL:45723     MMC:234
LAC:421        MNC:30

SIM: Not Fitted
```
Detailed View - GSM

```
234G      RESULTS
◄► Index:1
ARFCN:1667     dBm:-96
ID:1CC         MMC:234
LAC:2941       MNC:30

SIM: Denied
```
Detailed View - 4G

```
234G      RESULTS
◄► Index:3
GSM 1800       SIG:60%
CELL:45723

 EE UK
SIM: Not Fitted
```
Summary View - GSM

```
234G      RESULTS
◄► Index:1
4G  1800       SIG:27%
ID:1CC

 EE UK
SIM: Denied
```
Summary View - 4G

INDEX	During the survey, each detected cell is given a number The cell with the strongest signal is given number 1 Higher numbers = lower strength signal
GSM	The radio frequency band used by the displayed cell
3G	Radio signals using lower frequencies penetrate better into buildings
ARFCN	Absolute Radio Frequency Channel Number
CELL	Cellular identification number (decimal) of the cell (GSM)
ID	Cellular identification number (hexadecimal) of the cell (3G)
SIG	Signal Strength Shown as a percentage – 33% and above is useable
LAC	Local Area Code – identifies the area in which the cell is situated
SIM	Current SIM status
dBm	FSSI Signal Strength – scale = decibels ref to 1mW
MCC	Mobile Country Code – a 3-digit number = country (234 = UK)
MNC	Mobile Network Code – a 2 or 3-digit number = network within the country (15 = Vodafone UK)

11.1 Result List

In Engineer mode if there is more than one survey stored in memory the user will be presented with a list of survey results to select from when attempting to view the results. You will be returned to the list when you exit the results.

The list can take some time to create.

```
        RESULTS
 SURVEYA01
 SURVEYB01
 SURVEYB02
 SURVEYB03
-►SURVEYC01
```

▲ ▼	Scroll up and down through the list of stored survey results.
◄	Go to **Main Menu** (see section 7).
↵	Display the highlighted survey results.
Press and hold ↵	Edit the highlighted survey.

11.2 Result Options

```
  RESULT OPTIONS

     SURVEYC01
 ►  View
 ▲  Delete
 ▼  Rename
 ◄  Exit
```

↵	View the current survey results.
▲	Remove this survey from the Device memory.
▼	Change the name of the survey.
◄	Edit the highlighted survey.

11.3 Rename survey

```
  RESULT OPTIONS

Name:SURVEYC01
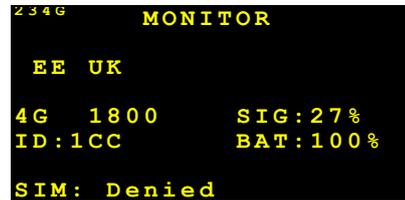        ▲
 ◄+hold Delete
 ►+hold Accept
```

▲ ▼	Change the current character.
◄ ↵	Scroll through the characters of the name.
Press and hold ◄	Delete the survey.
Press and hold ↵	Edit the highlighted survey.

12 MONITOR

The display is updated every 8 seconds. The displayed cell is the strongest on the selected network.   As the aerial is moved, a different, stronger cell may be displayed.

If GSM / 3G mode is selected, a 3G cell will be displayed if available, even if a lower signal strength than a GSM cell.

Surveyor Mode – GSM

Surveyor Mode – 3G

Go to Main menu.
(see section 7).

Additional options only available in engineer mode (see following pages for details).

Swap between Summary (basic) and Detailed views.

When SIM card is fitted and Locked = no action
When SIM card is fitted and Unlocked = lock onto selected network
First highlight the network required (use left button), then... press the right button to select. Wait for network to be selected. (May take 2 minutes to change). Selecting a network also affects the survey results (see section 10).
When SIM card is absent the device is unable to lock onto selected networks. Survey results will still be filtered to the selected network.

When SIM card is fitted and Locked = no action
When SIM card is fitted and Unlocked, or when SIM card is absent = highlight Network
Press repeatedly to highlight the required network, then press the right button to select.

To obtain the list of network operators, select **Network Search** by pressing the left arrow, then press the right arrow.

To return to auto mode after having selected a particular network operator, select **Auto** and press the right arrow.

Summary of Terms (Surveyor mode)

GSM 3G / 4G	The radio frequency band used by the displayed cell Radio signals using lower frequencies penetrate better into buildings
CELL	Cellular identification number (decimal) of the cell (GSM)
ID	Cellular identification number (hexadecimal) of the cell (3G)
SIG	Signal Strength Shown as a percentage – 33% and above is useable.
BAT	% = charge remaining in battery – 100% = fully charged EXT = charger connected
SIM	Current SIM status

MONITOR (continued)

Detailed View for GSM – available only in Engineer Mode

From the Monitor menu, press the up arrow to toggle between the detailed view and summary view screens:

²³⁴G **MONITOR** ◄► **EE UK** **ARFCN:717 dBm:-73** **BSIC:11 CSQ:19** **CELL:45723 BAT:100%** **SIM: Not Fitted**	Detailed View	²³⁴G **MONITOR** ◄► **EE UK** **Min:-73 Max:-73** **ARFCN:717 dBm:-73** **LAC:421 CSQ:19** **CELL:45723 BAT:100%** **SIM: Not Fitted**
²³⁴G **MONITOR** ◄► **EE UK** **GSM 1800 SIG:60%** **CELL:45723 BAT:100%** **SIM: Not Fitted**	Summary View	²³⁴G **MONITOR** ◄► **EE UK** **Min:60% Max:60%** **GSM 1800 SIG:60%** **CELL:45723 BAT:100%** **SIM: Not Fitted**
Advanced (in Setup) = OFF		**Advanced (in Setup) = ON**

NETWORK	The network to which the cell belongs, e.g. Vodafone
GSM 3G / 4G	The radio frequency band used by the displayed cell Radio signals using lower frequencies penetrate better into buildings
ARFCN	Absolute Radio Frequency Channel Number
BSIC	Base Station Identity Code – identifies the beacon frequency
CELL	Cellular identification number of the cell (decimal)
dBm	FSSI Signal Strength – scale = decibels ref to 1 mW
CSQ	Signal Quality – scale = 0 – 31 (11 and above is acceptable)
SIG	Signal Strength Shown as a percentage – 33% and above is useable
Min	The minimum signal strength measured on this cell - if the cell number changes this value is reset
Max	The maximum signal strength measured on this cell - if the cell number changes this value is reset
BAT	% = charge remaining in battery – 100% = fully charged EXT = charger connected
SIM	Current SIM status
LAC	Local Area Code – identifies the area in which the cell is situated. Displayed when in engineer mode and advance on for version 3.29 and up

MONITOR (continued)

Detailed View for 4G/3G – available only in Engineer Mode

From the Monitor menu, press the up arrow to toggle between the detailed view and summary view screens:

Detailed View

Summary View

Advanced (in Setup) = OFF   **Advanced (in Setup) = ON**

NETWORK	The network to which the cell belongs, e.g. Vodafone
3G / 4G	The radio frequency band used by the displayed cell Radio signals using lower frequencies penetrate better into buildings
ARFCN	Absolute Radio Frequency Channel Number
PSC	Primary Synchronisation Code
ID	Cellular identification number of the cell (hexadecimal)
dBm	FSSI Signal Strength – scale = decibels ref to 1 mW
CSQ	Signal Quality – scale = 0 – 31 (11 and above is acceptable)
Min	The minimum signal strength measured on this cell - if the cell number changes this value is reset
Max	The maximum signal strength measured on this cell - if the cell number changes this value is reset
BAT	% = charge remaining in battery – 100% = fully charged EXT = charger connected
SIM	Current SIM status
LAC	Local Area Code – identifies the area in which the cell is situated. Displayed when in engineer mode and advance on for version 3.29 and up

13 Jamming Detection

The D2377 does not support radio jamming detection. Should you wish to detect a jamming signal on 2G or 3G signal, the Dycon D2376/D2366 radio signal analysers support jamming detection.

14 SCREENSAVER

It reduces battery usage to a minimum.

Moving Logo

Press any button to return to the previous screen.

15 Power-Up Functions

By holding down the different keys, several functions are available to the user:

- Holding down the **UP** key = load defaults, clear survey log, clear network list

- Holding down the **RIGHT** key = delete saved SIM PIN

- Holding down the **LEFT** key = display the logo for 30 seconds

- Holding down the **DOWN** key = clear network list

16 Aerial Siting

ALWAYS do a site survey to find the point of best signal before installation.

The aerial should normally be mounted vertically at the point of best signal. This is usually the highest point in the building (often the loft area). For security applications, the position chosen should be inside the protected area.

Large metal structures can affect radio signals. Therefore, whenever possible, avoid installing the aerial directly under sheet metal roofs or within sheet metal covered buildings because this will reduce the signal strength. If this is unavoidable, the strongest signal will be found away from the metal roof or close to large external windows or skylights.

Many large buildings closely spaced together will reduce the signal strength, particularly for aerials on the lower floors, e.g. ground floor installation in city centres. The strongest signal will normally be found close to external windows or skylights as high as possible.

Wherever possible, do not install the aerial close (2 metres) to sources of interfering signals. These include: fluorescent or neon lighting, power distribution panels, power cable runs, fridges, freezers, air-conditioning and ventilation equipment as well as electronic equipment, e.g. photocopiers, fax machines, computers, televisions...

Reliable radio operation is unlikely with low signal strength, with an incorrectly installed aerial or with strong interfering signals.

Use the radio signal analyser to find the point of best signal. This means maximising the signal strength.

The supplied short black aerial is for hand-held use, i.e. site surveys.

OR

Use an aerial adapter to connect and test a remote aerial.

Remember: It is **always** easier to find the point of best signal before the equipment is fitted on the wall. Moving aerials, cables, trunking... after installation is wasted time and effort.

17 Battery and Charging

Before first use, fully charge the battery.

When charging, use only the supplied mains plug-top power supply.

Charging will typically take 3 hours. Please ensure a full charge is given as the battery state reading can be in error after a short charge.

A fully charged battery will operate the test set for up to 12 hours.

The battery state may be read on the **Monitor** screen. See page 16.

When the charger is connected, the unit is always on and the On/Off button will not turn the unit off. The charger can be left plugged in indefinitely.

When the charger is disconnected, the radio signal analyser will automatically switch off within one minute or after the preset time has expired.

If the radio signal analyser is left switched on and unused (no buttons are being pressed), the unit will automatically switch off after a preset time to preserve the battery life. The preset time may be changed in the **Setup** screen. See page 9.

The internal battery is a Solid Electrolyte Lithium long type that may be transported, charged and used in any orientation. It should be protected from frost and temperatures above 40°C.

As with all rechargeable batteries, over several years, its capacity to store power will degrade. If the operational life of the battery reduces below 1 hour, contact your supplier for replacement information.

Do not attempt to open the case or remove the battery.

18 APPENDIX 1 - Trouble shooting

SURVEY Cells 0 OK 0 Poor signals or interference, please relocate and repeat	The survey failed. This may be due to poor signal strength or low battery. Please wait 30 seconds and try again.
SURVEY Networks: 5 ◄ Network search ► Start Survey Not ready or No signal, please wait	The radio module is not ready. This may be due to poor signal strength or low battery. Please wait 30 seconds and try again.
SURVEY Searching... Search Incomplete, Please repeat	Network search failed. This may be due to poor signal strength or low battery. Press the RIGHT arrow to continue.
Dycon Ltd. 4G/3G/2G Signal Analyser V3.33 Error: GSM Fault: 11	Part of the hardware has failed to power up - it is likely that this is due to low battery. Switch the unit off, plug the charger in and switch the charger on. Leave charging for at least 3 hours.
RESULTS ◄► Index:3 GSM 1800 SIG:60% CELL:45723 234 30 SIM: Not Fitted	Name of the network is not showing on the RESULTS. The Network MCC and MNC numbers are shown as the radio signal analyser has been unable to translate the numbers into a Network name. The network table may be full - power up the radio signal analyser with the DOWN arrow held and perform a network search.

18.1 GSM Faults

The list below shows all the faults that may be shown on power up:

Fault number	Meaning
1	Timeout waiting for PIN - power off-on to re-enter the SIM PIN number. Or continue to use the radio signal analyser in SIM-less mode
2	No response from module - power off then on to reset the radio module.
3	SIM not fitted (not a fault).
4	PUK required - contact SIM card provider for PUK number.
5	Wrong PIN number has been entered - power off-on to re-enter the SIM PIN number. Please note that entering an incorrect PIN 3 times will disable the SIM card.
6	Not used.
7 - 10	Module fault.
11	Radio module failed to start - the battery may need to be charged.

19 APPENDIX 2 - Specification

Model	D2377 4G/3G/2G signal analyser
Dimension (h x w x d)	135 x 78 x 33mm
Weight	210 grams (including aerial)
Temperature	-20°C to +60°C transit / -4°C to +40°C operating
Humidity	0 – 80% non condensing
Warranty	2 years
Radio Path	4G, 3G, GPRS and GSM
Battery	3.7 volt, 640mA/h Solid Electrolyte Lithium Ion
Charger	Nokia Type ACP-12X or equivalent specifications
Power Consumption	Mains 50mA (operation and battery recharging)

International Radio Approval

The D2377 4G/3G/2G signal analyser incorporates an independently tested and approved 4G/3G/2G radio module that meets the requirements of European radio communication standards.

Approval Authority: **CE1909**

CE

20 APPENDIX 3 - Glossary of Terms

CELL – Cellular Identity Number

A number to uniquely identify each GSM/GPRS base station in the UK.

FSSI – Forward Signalling Strength Indication

This is a value indicating the radio signal strength received from the base station at a GSM communicator or the radio signal analyser.

GPRS – General Packet Radio Service

A packet-based network, within the GSM system, where cost is determined by data quantity (as distinct from a circuit switched network, where cost is determined by time). Data rates range from14.4kbps, using just one of the available TDMA time slots, up to a theoretical 115 kbps when all eight time slots are used. Being a packet-switched system, the bandwidth within each GPRS cell sector will be divided between all the subscribers.

GSM – Global System for Mobile communication

A second generation cellular telecommunication system, originally for Europe, now global. A circuit-switched network, where cost is determined by time. It operates in 4 frequency bands: 850Mhz, 900MHz, 1800MHz and 1900MHz. Also referred to as **2G**.

3G – Third Generation System for Mobile communication

A third generation cellular telecommunication system. A packet switched network, where cost is determined by the amount of data transferred. It operates in several frequency bands. Also referred to as **UMTS** and **WCDMA**.

4G – Fourth Generation System for Mobile communication

A fourth generation cellular telecommunication system. A packet switched network, where cost is determined by the amount of data transferred. It operates in several frequency bands. Also referred to as **LTE**.

SIM – Subscriber Identity Module

This is usually referred to as a SIM card. The SIM is the user subscription to the mobile network. The SIM contains relevant information that enables access onto the subscripted operator's network.

EDGE – General Packet Radio Service

An extension to GPRS allowing higher data rates. Sometimes referred to as 2.5G.

HSDPA – General Packet Radio Service

An extension to 3G allowing higher data rates. Sometimes referred to as 3.5G.

TDMA – Time Division multiple access

Allows multiple users to share the same frequency by dividing the signal into different timeslots.

21 APPENDIX 4 - Product Range and supported Bands

Band	GSM					3G							Telit Module	4G								
	850	900	1800	1900	GSM-r	800	850	900	1800	1900	2100	AWS		700	800	850	900	1800	1900	AWS	2100	2600
D2377-EU	x	x	x	x				x	x		x		LE920-EUG		x		x	x			x	x
D2377-NA	x	x	x	x		x	x			x	x	x	LE920-NAG	x		x			x	x	x	
D2376-EU		x	x					x			x		UC864-E-Dual									
D2376-G	x	x	x	x			x			x	x		UC864-G									
D2366	x	x	x	x									GE864-QUAD-V2									
D2386	x	x	x	x	x								GE863-rail									

Table should the Dycon range of radio signal analysers and the frequency bands that they cover.